

THE PROPOSED PEBBLE MINE PRESENTS UNACCEPTABLE RISK TO BRISTOL BAY SALMON

PLP Refuses To Acknowledge Any Risk And The Corps To Date Has Not Fully Analyzed It

Tom Collier, CEO of Pebble Limited Partnership (PLP), recently stated that “[t]he debate is now over” and that the U.S. Army Corps of Engineers, through its Draft Environmental Impact Statement (DEIS) for the proposed mine, “unequivocally concluded that the project will not harm the Bristol Bay fishery.” Contrary to Mr. Collier’s statement, the public record demonstrates that **Pebble poses significant risk to the Bristol Bay salmon fishery**. As part of its review of PLP’s permit application for the proposed Pebble mine, EPA states that the proposed mine “may have substantial and unacceptable adverse impacts on fisheries resources in the project area watersheds.” The United States Fish and Wildlife Service (FWS) agrees, and also recommends “that a permit not be issued for the project as currently proposed.”

Mr. Collier’s reliance on the DEIS to support his statement is similarly false. The DEIS offered formal opportunity for public and expert review of and comment upon the impacts of the proposed Pebble mine. Both the public and agency **experts identify significant deficiencies with the salmon impact analysis** in the DEIS and elsewhere. The National Marine Fisheries Service (NMFS) states that PLP’s salmon studies, which form the basis for what is in the DEIS, “are limited, sparse, lack scientific rigor, and do not fully address all salmon life stages.” The Department of the Interior states that “the DEIS is so inadequate that it precludes meaningful analysis.” In fact, every fishery expert that commented on the DEIS raises concerns about the limitations of the salmon impact analysis in the DEIS and elsewhere. These include comments submitted by EPA, the Department of the Interior, the State of Alaska, academia, tribal and subsistence interests, commercial fishing interests, sport fishing interests, local government, Alaska Native Corporations, and the general public.

For its part, and to some audiences, the Corps deflects these critiques by stating that its only responsibility under the law is to consider the impacts of the direct placement of fill material into waters of the United States. This is categorically false. The black letter law under the Clean Water Act, the National Environmental Policy Act, the Magnuson Act and others laws require the Corps to analyze, disclose, take input on, and consider not only direct impacts but the full range of potential impacts from Pebble. There is no exception under law for ignoring impacts from aspects of the proposed mine over which another agency may have jurisdiction. The Corps itself recognizes this in the DEIS, as it identified indirect, secondary, and cumulative impacts of the proposed mine as areas needing analysis.

More importantly, **expert federal agencies propose remedies to bring the Corps’ process back on track**. The Department of the Interior, for example, states that a revised or supplemental DEIS is necessary. NMFS and the Alaska Department of Fish & Game call for further fish surveys, and NMFS additionally calls for independent third party review of PLP’s survey information. The public record shows that the Corps has not resolved the concerns of the experts, and the Corps remains on track to finalize the EIS and make a final decision in Spring 2020, well before these remedies could be implemented. The tension between the expert’s remedies and the Corps’ schedule leads the educated public to call into question the Corps’ permitting integrity.

Expert Correspondence with the US Army Corps of Engineers

Below are links to the direct expert sources concerning the risk of Pebble to the Bristol Bay salmon fishery, the deficiencies in the DEIS and related analyses, and remedies advanced by the experts. Risks are highlighted yellow, deficiencies red, and remedies blue. These sources are all in the public record.

TAB 1	Environmental Protection Agency
TAB 2	Department of the Interior
TAB 3	US Fish and Wildlife Service
TAB 4	State of Alaska
TAB 5	National Marine Fisheries Service
TAB 6	Academia and Other Expert

US Environmental Protection Agency Correspondence with the US Army Corps of Engineers



Environmental
Protection
Agency

1. June 29, 2018 letter from EPA to Army Corps on NEPA scoping
2. July 1, 2019 letter from EPA to Army Corps on Draft EIS
3. July 1, 2019 letter from EPA to Army Corps on CWA 404 Permit Application; initiating CWA 404(q) elevation
4. July 25, 2019 letter from EPA to Army Corps extension request on CWA 404(q)
5. July 26, 2019 letter from Army Corps to EPA granting 404(q) extension
6. October 22, 2019 letter from EPA to Army Corps extension request on CWA 404(q)
7. October 24, 2019 letter from Army Corps to EPA granting 404(q) extension

Excerpts from Correspondence

Pebble poses significant risk to the Bristol Bay salmon fishery

The EPA has concerns regarding the extent and magnitude of the substantial proposed impacts to streams, wetlands, and other aquatic resources that may result, particularly in light of the important role these resources play in supporting the region's valuable fishery resources. [...] Region 10 finds that this project as described [...] may have substantial and unacceptable adverse impacts on fisheries resources in the project area watersheds, which are aquatic resources of national importance. at pg. 1-146

See also, examples on pages 1-29 1-30

Significant deficiencies with the salmon impact analysis

The DEIS and the Draft EFH Assessment make unsupported conclusions related to habitat quality (see list below). In particular, conclusions related to "low use" and "low quality" fish habitat are not supported by the information provided in the DEIS. at pg. 1-83

The DEIS and the Draft EFH Assessment do not characterize the full seasonal distribution and abundance of resident and anadromous fish or capture interannual variability in these parameters. Because the distribution and abundance of fish can vary substantially both seasonally and interannually, and because the project will affect the area in perpetuity, long-term data on fish distributions and abundances are needed to evaluate impacts of the project. at pg. 1-86

The DEIS does not fully describe the value of the Bristol Bay fisheries, which includes the largest sockeye salmon fishery in the world, or the Pebble Project's and project alternatives potential impacts to these fisheries. at pg. 1-97

See also, examples on pages 1-29 1-32

Remedies to bring the Corps' process back on track

we recommend that the EIS conduct additional analyses of habitat characterization, function, quantification, spatial arrangement and connectivity, and the full seasonal distribution of fish species and life stages across multiple years. at pg. 1-48

See also, examples on pages 1-33 1-80 1-83



**UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10**

1200 Sixth Avenue, Suite 155
Seattle, WA 98101-3140

OFFICE OF
ENVIRONMENTAL REVIEW
AND ASSESSMENT

June 29, 2018

Mr. Shane McCoy, Project Manager
U.S. Army Corps of Engineers
Regulatory Division
P.O. Box 6898
JBER, Alaska 99506-0898

Dear Mr. McCoy:

The U.S. Environmental Protection Agency has reviewed the U.S. Army Corps of Engineers' March 29, 2018, Notice of Intent initiating the scoping process for the proposed Pebble Project Environmental Impact Statement development (EPA Region 10 Project Number 18-0002-COE). We have also reviewed the additional project information available on the Corps website. The EPA is providing comments for your consideration pursuant to the National Environmental Policy Act, Council on Environmental Quality regulations (40 C.F.R. §§ 1500-1508) and Section 309 of the Clean Air Act. The EPA is also supporting the Corps in EIS development as a cooperating agency, due to our special expertise. We appreciate the opportunity to provide early input in the analysis of the Pebble Project.

The Pebble Limited Partnership (PLP) is proposing to develop the Pebble deposit in southwest Alaska, containing copper, gold, and molybdenum. The proposed project includes an open-pit mine, tailings storage facility, a low-grade ore stockpile, an overburden stockpile, a mill facility, a natural gas-fired power plant, and other mine site facilities. The anticipated throughput at the mill facility is 160,000 tons of ore per day, and the proposed mine operating life is 20 years. The proposed project also includes development of a 188-mile natural gas pipeline across Cook Inlet and Lake Iliamna and two compressor stations used to transport natural gas from the Kenai Peninsula to the mine site. The proposed transportation network includes 65 miles of roads, ferry terminals on the north and south shores of Lake Iliamna for use by an ice-breaking ferry, and the Amakdedori Port on Cook Inlet (including dredging and disposal of up to 20 million cubic yards of dredged material).

The scoping comments that follow are provided to inform the Corps of issues the EPA believes are significant and warrant explicit treatment in the EIS, based on current information. Overall, the EPA encourages the development of an EIS that evaluates and compares a full range of reasonable alternatives and comprehensively discusses the reasonably foreseeable direct, indirect, and cumulative impacts of the proposed action.

The EPA has significant concerns regarding the potential impacts of mining activities near the world-class fisheries of the Bristol Bay Watershed.¹ Many of these concerns have been previously documented in the EPA's 2014 Bristol Bay Watershed Assessment, which evaluated the potential impacts of large-scale mining on the region's fish resources, and in the Agency's 2014 Proposed Determination under

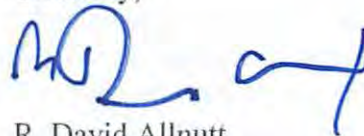
¹ See <https://www.epa.gov/bristolbay> for more information.

Section 404 of the Clean Water Act. This Proposed Determination proposed restrictions on the discharge of dredged or fill material to waters of the U.S. to protect waters that support fishery areas in and near the Pebble deposit area. Because the Watershed Assessment and the Proposed Determination were completed before PLP submitted its permit application to the Corps, these assessments did not consider and were not based on the specific parameters of PLP's pending proposal. The EIS should thoroughly analyze the potential impacts of PLP's proposal to aquatic and other resources, including the anticipated direct impacts of the proposed action, and the reasonably foreseeable indirect and cumulative impacts. We note that the geographic extent of the proposed project infrastructure is not limited to the Bristol Bay watershed, and we recommend that the EIS analyze all areas of impact from the project, including Cook Inlet.

We appreciate the information provided in the Corps' scoping package, including the list of resources to be analyzed in the EIS, and we agree that the suite of issues presented are appropriate to analyze in detail in the EIS. Our enclosed scoping comments provide our recommendations for analysis of key areas that will be the focus of our review of the project, including natural resource impacts, as well as human health and impacts to communities and federally recognized tribes. Our scoping comments also include recommendations related to: risk analysis and hazardous materials management, including geotechnical stability; analytical tools and methodologies, including predictive modeling of impacts to water, air, fish, and other aquatic resources; mitigation and monitoring; and financial assurance. Identification of these key issues and recommendations is based on the EPA's knowledge of the proposed project as well as our experience with mining projects in Alaska and other Region 10 states.

We appreciate the opportunity to participate early in the planning process for this project and are looking forward to working with you as you develop the EIS. Should you have any questions regarding our comments, please contact Patty McGrath, EPA Region 10 Mining Advisor at (206) 553-6113 or mcgrath.patricia@epa.gov.

Sincerely,

A handwritten signature in blue ink, appearing to read "R. David Allnutt".

R. David Allnutt
Director

Enclosure:

1. U.S. Environmental Protection Agency Detailed Scoping Comments for the Pebble Project EIS

*EPA Region 10 Detailed Scoping Comments for the
Pebble Project Environmental Impact Statement*

GENERAL COMPONENTS OF NEPA ANALYSIS

Purpose and Need

We recommend that the EIS include a clear and concise statement of the underlying purpose and need for the proposed project, consistent with the implementing regulations for NEPA² and the Clean Water Act Section 404(b)(1) Guidelines (Guidelines).³ In presenting the purpose and need, the EIS should reflect not only the Corps' purpose in responding to the permit application, but also the broader public interest and need for this project. An appropriately defined purpose and need statement is of critical importance to setting up the analysis of a range of reasonable and practicable alternatives in the EIS that will meet the requirements of both NEPA and the Guidelines.

Range of Alternatives

We recommend that the EIS include a range of reasonable alternatives that meet the stated purpose and need for the project, are responsive to the issues identified during the scoping process and through tribal consultation, and include options for avoiding significant environmental impacts. This will ensure that the NEPA analysis provides agency decision makers and the public with information that defines the issues and identifies a clear basis for the choices made among the range of alternatives, as required by NEPA. The EIS should clearly outline the physical design of current and proposed facilities and alternatives (including ore storage sites, waste rock disposal areas, tailings areas, water storage and conveyance facilities, and supporting infrastructure including the transportation corridor, port site, and pipeline).

The EIS should "rigorously explore and objectively evaluate all reasonable alternatives"⁴ even if some of them are outside the capability or the jurisdiction of the agency preparing the EIS for the proposed action.⁵ This includes identifying the specific criteria that were used to (1) develop the range of reasonable alternatives, (2) eliminate certain alternatives, and (3) identify the agency preferred alternative, as appropriate. In addition, we recommend the EIS provide a clear discussion of the reasons for the elimination of alternatives that are not evaluated in detail.

While NEPA requires the evaluation of *reasonable* alternatives to the proposed action, the Guidelines require the analysis of *practicable*⁶ alternatives in order to identify the least environmentally damaging

² 40 C.F.R. § 1502.13.

³ Within the context of the Guidelines, practicable alternatives to the proposed discharge of fill or dredged material are identified "in light of overall project purposes," which is also termed "the basic purpose of the proposed activity." 40 C.F.R. § 230.10(a)(2).

⁴ 40 C.F.R. § 1502.14(a).

⁵ 40 C.F.R. § 1502.14(c).

⁶ An alternative is practicable if it is available and capable of being done after taking into consideration cost, existing technology, and logistics in light of overall project purposes. 40 C.F.R. § 230.10(a)(2).

practicable alternative (LEDPA), which is the only alternative that can be permitted.⁷ The analysis of alternatives for NEPA can provide the information for evaluation of alternatives under the Guidelines.⁸ We recommend that the EIS range of alternatives include the practicable alternatives developed for the Guidelines analysis.

In evaluating the proposed project and alternatives, the analysis should include an evaluation of performance and effectiveness, as well as the planned monitoring to ensure efficacy of proposed design features, environmental protection measures, and mitigation.⁹

Regarding mitigation for purposes of NEPA, we recommend that the alternatives analysis include appropriate mitigation measures not already included in the proposed action or alternatives.¹⁰ The EIS should evaluate reasonable alternatives, including mitigation measures, to reduce or minimize adverse impacts to environmental resources. We recommend that, in conducting such an evaluation, the Corps consider:

- The disturbance footprint;
- Habitat value, cultural significance, and risks in siting project components for the proposed mine site components, as well as the port site, transportation corridor, and pipeline components;
- Source control measures (effective management of waste rock and tailings to prevent acid generation and metal leaching) and containment (liners and covers);
- Measures to reduce contact between mine waste materials and surface water and groundwater (such as surface water diversions and liners and covers as recommended above);
- Impacts of pit dewatering on groundwater and stream flows;
- Treatment to promote compliance with water quality standards;
- The physical stability of structures (e.g., pit walls, ore storage and waste rock facilities, tailings facility) during operations and closure, such as considering dry stack tailings;
- Impacts along the pipeline route and transportation corridor, including to Lake Iliamna;
- Impacts from dredged material disposal;
- Impacts to the marine environment at the Amakdedori Port site;
- Air pollutant emissions; and
- Impacts to traditional and cultural uses and resources, including key subsistence species and sites.

Indirect Impacts

We recommend that the EIS include consideration of all reasonably foreseeable indirect effects caused by the action but that may occur later in time or farther removed in distance.¹¹ The indirect effects analysis “may include growth inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural

⁷ 40 C.F.R. § 230.10(a)

⁸ 40 C.F.R. § 230.10(a)(4).

⁹ The term mitigation included in this “Range of Alternatives” section is referring to the general term as it applies to NEPA. Compensatory mitigation for purposes under CWA section 404 cannot be used to reduce environmental impacts in the evaluation of the least environmentally damaging practicable alternatives for the purposes of requirements under Section 40 C.F.R. § 230.10(a). *See* 1990 Memorandum of Agreement between Army and EPA concerning the determination of mitigation under CWA section 404(b)(1) Guidelines.

¹⁰ 40 C.F.R. § 1502.14(f).

¹¹ 40 C.F.R. § 1508.8(b).

systems, including ecosystems.”¹² While NEPA does not require agencies to engage in speculation, “[t]he EIS must identify all of the indirect effects that are known, and make a good faith effort to explain the effects that are not known but are reasonably foreseeable.”¹³

We therefore recommend that the EIS evaluate the expansion and continued operation of the currently proposed project to the extent that the Corps considers it to be a reasonably foreseeable indirect effect of the proposed action. The current proposed Pebble Project description includes mining of approximately 1.1 billion tons of mineralized material, while the 2011 Preliminary Assessment Technical Report¹⁴ estimated that the total Pebble mineral resource may be 11.9 billion tons. It may be reasonable to predict that a mine at the Pebble deposit will eventually operate for longer than 20 years and recover and process additional ore based on the size of the deposit, the significant infrastructure that will be developed under the current project description, and statements made by the Pebble Limited Partnership regarding the potential to examine expanding the mine once initial production has begun on the current proposal.¹⁵ Accordingly, we recommend that the EIS consider the potential impacts associated with reasonably foreseeable mine expansion scenarios, including up to 11.9 billion tons.

In addition, we recommend that the EIS consider the extent to which it is reasonably foreseeable that the proposed transportation corridor and natural gas pipeline may be made accessible to the public and may stimulate additional reasonably foreseeable mining projects in the area, and potential environmental effects associated with that induced mining. Although PLP’s current proposal only includes private access to the infrastructure components, public access may be granted in the future. This potential may be different for the different infrastructure elements. For example, if the pipeline is regulated as a common carrier, then public access could be allowed if capacity permits. We recommend that the EIS discuss any reasonably foreseeable future public access to the project’s infrastructure components and analyze any reasonably foreseeable indirect effects of this action.

Construction and operation of the project would result in increased vessel traffic in Cook Inlet and on Lake Iliamna because vessels will bring supplies to the site and transport products off-site. In addition to evaluating the direct effects of the increased transportation, we recommend that, if it is reasonably foreseeable that the ports and ferry landings will become available for public use, then any reasonably foreseeable future use of these components should be assessed in the EIS as indirect or cumulative effects. Should the port and ferry terminals remain open following mining, this infrastructure may result in increased use and vessel traffic beyond what PLP is currently proposing.

Indirect project impacts under NEPA can include secondary effects, which are defined by the Guidelines as “effects on the aquatic ecosystem that are associated with the discharge of dredged or fill materials, but do not result from the actual placement of the dredged or fill material.”¹⁶ The consideration of secondary effects is necessary for the Guidelines analysis, and examples of potential secondary effects are discussed in the section on aquatic resources below.

¹² *Id.*

¹³ Forty Most Asked Questions Concerning CEQ’s NEPA Regulations, Question 18 (CEQ, 1981).

¹⁴ Preliminary Assessment of the Pebble Project, Southwest Alaska, February 2011. Developed by Wardrop, A Tetra Tech Company, for Northern Dynasty Minerals, Ltd.

¹⁵ e.g., see <http://www.alaskajournal.com/2018-01-10/permit-application-reveals-size-scaled-down-pebble-project>. “Collier has acknowledged the company might look to expand after initial production commences but contends growing the project would require additional rounds of environmental reviews and permitting that would be independent from any approvals Pebble already had.”

¹⁶ 40 C.F.R. § 230.11(h).

Cumulative Impacts

In accordance with NEPA, the cumulative impacts analysis should identify how resources, ecosystems, and communities in the vicinity of the project have already been, or will be affected by, past, present, or reasonably foreseeable future activities in the project area, “regardless of what agency (federal or non-federal) or person undertakes such other actions.”¹⁷

The Guidelines also fundamentally require consideration of reasonably foreseeable cumulative effects in determining whether a project complies with the significant degradation prohibition and to ensure that discharges will not have an unacceptable adverse impact either individually or in combination with known and/or probable impacts of other activities affecting the ecosystems of concern.¹⁸ Cumulative effects are “the changes in an aquatic ecosystem that are attributable to the collective effect of a number of individual discharges of dredged or fill material,” which individually may be minor, but cumulatively may result in a “major impairment of the water resources and interfere with the productivity and water quality of existing aquatic ecosystems.”¹⁹

For the cumulative impacts assessment, we recommend that the EIS delineate appropriate geographic boundaries, including natural ecological boundaries whenever possible, as well as consider an appropriate time period for the project’s effects. We recommend that resources be characterized in terms of their response to change and capacity to withstand stresses. Trends data should be used to establish a baseline for the affected resources, to evaluate the significance of any historical degradation (e.g., due to exploration activities), and to predict the environmental effects of the project components.

Past, present, and reasonably foreseeable future activities that should be considered in the cumulative impact assessment will vary across the geographic scope of the various mine-site and infrastructure components. Please refer to CEQ’s “Considering Cumulative Effects Under the National Environmental Policy Act”²⁰ and the EPA’s “Consideration of Cumulative Impacts in EPA Review of NEPA Documents”²¹ for assistance with identifying appropriate boundaries and identifying appropriate past, present, and reasonably foreseeable future projects to include in the analysis.

In particular, we recommend that the cumulative effects analysis consider, but not be limited to, the following activities:

- Past and current exploration activities conducted by PLP and others at the Pebble site;
- Current exploration activities occurring in the Bristol Bay watershed region;
- Reasonably foreseeable expansion and continued operation of the currently proposed project (while this is an indirect effect under NEPA, as discussed above, it is a cumulative effect under the Guidelines);
- Reasonably foreseeable future use of project infrastructure (road, port, pipeline); and,
- Reasonably foreseeable development of additional mining projects as a result of increased exploration activity in the region. Even if those activities are not determined to be indirect effects of the proposed action (as discussed above), they are still reasonably foreseeable.

¹⁷ 40 C.F.R. § 1508.7.

¹⁸ 40 C.F.R. § 230.10(c).

¹⁹ 40 C.F.R. § 230.11(g).

²⁰ <http://ceq.hss.doe.gov/nepa/ccenepa/ccenepa.htm>.

²¹ <http://www.epa.gov/compliance/resources/policies/nepa/cumulative.pdf>.

ENVIRONMENTAL RESOURCE IMPACTS

Aquatic Resources, Including Wetlands, Streams, and Fish

Evaluating Compliance with the Clean Water Act Section 404(b)(1) Guidelines

The Corps' potential CWA Section 404 permitting action is triggering preparation of the EIS. We recommend that the Corps' permitting regulations and the Guidelines therefore provide the context for identifying relevant issues and evaluating alternatives in the EIS.

The Guidelines are the substantive environmental criteria for the evaluation of proposed discharges of dredged or fill material, and applicants must demonstrate compliance with the Guidelines.²² The EIS is a significant component of the administrative record for the District's permit decision, which can and should provide sufficient information to address compliance with the Guidelines and the Corps' public interest review.²³ Although it is not mandatory, we support the Corps' decision to include of the public interest review factors into the list of issues to be considered in the EIS. This will enable the expected benefits to be balanced against reasonably foreseeable detriments, and all relevant public interest factors to be weighed.

We recommend that the organization of the EIS facilitate the evaluation of the proposed project's compliance with the Guidelines. Issues relevant to compliance with the Guidelines should be addressed explicitly in the EIS where possible. Alternatively, a stand-alone Section 404(b)(1) analysis could be included as its own section of, or appendix to, the EIS. As mentioned above, we recommend that the range of alternatives evaluated in the EIS be sufficient to identify the LEDPA. In addition, we recommend that the final EIS identify which alternative is the LEDPA.

The Guidelines prohibit, for example, the authorization of a proposed discharge that would cause or contribute to the violation of an applicable water quality or toxic effluent standard, jeopardize a listed threatened or endangered species, or impact a marine sanctuary.²⁴ We recommend that these criteria be used to evaluate and compare alternatives.

The Guidelines also prohibit the authorization of a proposed discharge which will cause or contribute to significant degradation of the aquatic ecosystem.²⁵ Findings of significant degradation must be based upon specific factual determinations, evaluations, and tests identified in the Guidelines. These include the evaluation of the direct, secondary, and cumulative effects of the proposed discharge and alternatives on specific resources including fish, wildlife, and special aquatic sites. The significant degradation findings must also evaluate the effects to resource characteristics including aquatic ecosystem diversity, productivity, and stability. Evaluating the potential for significant degradation also requires the consideration of effects to human uses or values, including recreational, aesthetic, and economic values. With regard to fisheries, the Guidelines require, for example, an evaluation of effects to all forms and life stages of aquatic organisms in the food web, including fish and the plants and animals on which they feed and depend upon for their needs.²⁶ The Guidelines also require an evaluation of effects to

²² 40 C.F.R. § 230.12(a)(3)(iv).

²³ See 33 C.F.R. § 320.4.

²⁴ 40 C.F.R. § 230.10(b).

²⁵ 40 C.F.R. § 230.10(c).

²⁶ 40 C.F.R. § 230.31.

recreational and commercial fisheries, which includes harvestable fish, crustaceans, shellfish, and other aquatic organisms used by man.²⁷ The Corps has proposed including a number of these evaluations in the EIS. We recommend that as many of the specific factual determinations, evaluations, and tests required by the Guidelines as possible be included in the EIS, and be used to evaluate and compare alternatives.

The Guidelines also prohibit any proposed discharge that does not include all appropriate and practicable measures to minimize potential harm to the aquatic ecosystem.²⁸ Subpart H of the Guidelines identifies numerous possible steps to minimize impacts, including reducing the footprint of the project, using co-location of facilities whenever possible, implementation of best management practices to reduce environmental impacts, configuring the project footprint to reduce or eliminate impacts to higher functioning aquatic resources and other appropriate and practicable measures. Also, as previously discussed, we recommend that the EIS include appropriate minimization measures both as part of the action alternatives and relative to the affected environment. The discussion of minimization measures should include assessment of their likely effectiveness.

Compensatory Mitigation

For unavoidable impacts to wetlands, streams, and other aquatic resources, the Guidelines require appropriate and practicable compensatory mitigation to offset unavoidable environmental impacts associated with discharges permitted under CWA Section 404. We recommend that the EIS consider potential mechanisms to offset likely unavoidable aquatic resource impacts. We also recommend that the EIS include the applicant's proposed compensatory mitigation plan. Compensatory mitigation requirements, including the components of a compensatory mitigation plan, are described in Subpart J of the Guidelines. Pursuant to the Guidelines, the level of detail in the compensatory mitigation plan should be commensurate with the scale and scope of the impacts.

Compensatory mitigation may be provided through purchase of credits from an approved mitigation bank, purchase of credits from an approved in-lieu fee mitigation program, and/or completion of a permittee-responsible compensatory mitigation project(s). Final compensatory mitigation requirements must be commensurate with the amount and type of impact that is associated with a particular Section 404 permit.²⁹ Compensatory mitigation required by the Guidelines is separate from, and may be in addition to, proposed project impact mitigation under NEPA.

Characterizing the Affected Environment

We recommend that the EIS describe aquatic habitats in the affected environment by resource type using the data sources and classification approaches that provide the greatest resolution possible. For example, if wetlands are mapped using a Cowardin classification, that mapping should be to the smallest identifiable map unit. Likewise, streams should be classified and mapped accordingly. The baseline information for aquatic resources should include their functional condition and integrity. We also recommend that the EIS evaluate the characteristics of the potentially affected aquatic resources, how those characteristics provide fish habitat, and how such habitat could be adversely impacted by the proposed project. Wetlands and streams perform different functions at different rates, and capturing this information is critical for evaluating the potential environmental impacts of the proposed action, alternatives, and reasonably foreseeable actions (exploration and mining) on these resources.

²⁷ 40 C.F.R. § 230.51.

²⁸ 40 C.F.R. § 230.10(d).

²⁹ 40 C.F.R. § 230.93(a)(1).

Characterizing the distribution of resident and anadromous fish in potentially affected streams and other aquatic resources is also important, and we recommend the use of data sources such as the Anadromous Waters Catalog³⁰ and the Alaska Freshwater Fish Inventory³¹ to help with this characterization.

Aquatic Resource Impacts Analysis

We recommend that the areal extent (i.e., acreage) of impacts to aquatic resources be quantified in the EIS for both direct and secondary effects. The acreage values for the direct and secondary impact footprints should include the acreage for streams as well as for wetlands, ponds, lakes, mudflats, and other waters. In other words, reported acreage losses should represent the total loss of jurisdictional waters. For streams, the loss of channel length should also be quantified by linear feet and/or miles. Channel length values are a more intuitive metric for some, and facilitate different types of analyses than the acreage values. In addition to the areal or linear extent, impacts to aquatic resources should also be quantified by the expected change in the function these resources perform, including fishery support functions, or change in the condition of the resource.

Direct effects are impacts on aquatic resources within the footprint of the discharge of dredged or fill material. Direct effects at the mine site would include stream and other aquatic resource losses within the footprints of the tailings storage facility, the ore and overburden storage sites, the mine pit, and other mine site facilities described in the permit application. Construction of the transportation and pipeline corridors and port facility will likely involve such discharges as well.

Secondary effects, as defined by the Guidelines, are associated with the discharge of dredged or fill material, but do not result from actual placement of this material. These effects are also considered indirect impacts under NEPA. Examples of secondary effects that should be evaluated in the EIS include the following:

- Elimination of streams and wetlands due to drowning by the tailings impoundment and other mine components;
- Dewatering of streams and other aquatic resources due to pumping of groundwater during open pit mining and filling during closure;
- Fragmentation of aquatic resources due to the placement of the mine pit, ore storage sites, tailings storage facility, and other mine components;
- Degradation of downstream fish habitat due to streamflow alterations resulting from water capture, withdrawal, storage, treatment, or release at the mine site;
- Degradation of downstream fish habitat due to water quality impacts associated with mine construction and operation;
- Degradation of downstream fish habitat due to the loss of important inputs such as nutrients and groundwater from upstream sources;
- Degradation of aquatic resources due to dust deposition from mining and transportation activities.

The evaluation of the proposed project's impacts and alternatives should fully consider the physical, chemical, and biological effects of each of the direct and secondary effects, and should consider incremental changes from these impacts along each stream segment downstream of the impact site.

³⁰ See <https://www.adfg.alaska.gov/sf/SARR/AWC/>.

³¹ See <http://www.adfg.alaska.gov/index.cfm?adfg=ffinventory.main>.

Considering the value of the region's commercial, subsistence, and recreational fishery resources, we recommend that the EIS focus on quantifying direct, indirect, and cumulative impacts on resident and anadromous fish and their habitat resulting from losses of streams with documented fish occurrences; losses of headwater source areas of these streams; losses of wetlands, lakes, and ponds; and streamflow alterations. We appreciate that the Corps has made the EPA's 2014 Bristol Bay Watershed Assessment available on the Pebble Project website, and we also recommend that this document be referenced in preparing the EIS.³²

The losses of stream reaches and adjacent wetlands from dewatering, as well as changes to downstream reaches and adjacent wetlands, may result in physical, chemical, and biological changes which would impact fishery habitat and habitat support. We recommend that the EIS model and consider these impacts compared to baseline conditions, including but not limited to:

- Evaluate changes in water volume in the stream areas of impact, as well as changes in the downstream reaches of the watershed resulting from losses of upstream contributions of water. We recommend that the analysis address seasonal changes to the different stream segment hydrographs, including changes to seasonal temperatures, dissolved oxygen levels, sediment transport capabilities, and any associated changes to sediment grain sizes in the different stream segments;
- Evaluate flow changes in the impacted stream reaches, both from pit dewatering as well as any proposed in-stream discharge points, to assess any potential changes to stream profile, form, and pattern, and to identify any areas of accretion and/or scouring which may reasonably be anticipated. We also recommend that areas of stream incision as a result of flow changes be identified, as well as losses of connectivity to floodplains and riparian wetlands currently connected to the downstream reaches;
- Identify potential changes to nutrient levels, turbidity, and dissolved oxygen, particularly with respect to seasonal patterns in the downstream reaches. We further recommend that both the direct losses of both autochthonous and allochthonous inputs from upstream reaches lost and/or disconnected from wetland and other riparian habitats, as well as the incremental reductions in those inputs in downstream segments throughout the stream reaches and their effects on system-wide primary, secondary, and tertiary production, be evaluated. These analyses should consider the direct changes to downstream habitats as well as changes to fisheries support in the different stream reaches;
- Evaluate decreases in anticipated invertebrate transport and production in downstream segments and those effects on fish production; and
- Evaluate the effects of disconnecting any off-channel habitat both near the areas of direct impact and throughout the downstream reaches, both for losses of allochthonous inputs and also for potential losses of nursery habitat.

We recommend that the direct, indirect, and cumulative impacts of any of these potential physical, chemical, and biological alterations be examined for how they may result in the loss and/or degradation of fish habitat, including alterations with respect to spawning, overwintering, nursery, and migration. Habitat losses that may result from freeze-through or seasonal warming of fish production areas should also be evaluated.

³² See <https://www.epa.gov/bristolbay/bristol-bay-assessment-final-report-2014>.

Water Quality and Quantity

Evaluating Impacts to Surface Water and Groundwater Quality and Quantity

Water quality is one of the EPA's principal concerns at mine facilities due to the potential for acid-generating and metal-leaching waste materials (ore, waste rock, tailings, pit walls) that are exposed to the environment and require management over long periods of time. In addition, road construction and operation have the potential to contribute a significant quantity of sediment to streams. We recommend that the EIS characterize baseline surface water and groundwater quality, quantity, and interactions, and evaluate the impacts of all aspects of the proposed operations and alternatives (including pit dewatering and backfilling, tailings management and disposal, water management, and port-site and transportation aspects) on these hydrologic components and describe mitigation for adverse impacts.

Given the potential impacts of the proposed Pebble Project, the EPA recommends that the Corps specifically include in the water resources analysis for the EIS (see also our recommendations for Analysis Tools and Methodologies):

- Characterization of existing groundwater, surface water, springs, and wetland resources within the area of both the project and all potential alternatives, including groundwater levels, flow direction and gradients, and chemistry;
- Development of a hydrogeologic conceptual site model, including:
 - Maps of groundwater, surface water, springs, and wetland resources in the area to be developed or affected;
 - Baseline data on the extent and quality of groundwater, surface water, springs and wetlands;
 - Information on the quantity and location of all aquifers, including Underground Sources of Drinking Water, recharge zones and source water protection areas;
 - Identification of any CWA § 303(d) listed waterbodies and any existing restoration efforts for these waters;
 - Identification and description of all wetlands and surface waters that could be affected by the project and alternatives; where applicable, acreages, channel lengths, habitat types, values and functions of these waters should be identified;
 - Identification and description of hydrologic pathways (e.g., the connectivity of springs or groundwater to surface waters; the connectivity of all streams to each other and to wetlands); and
 - A detailed water balance for the proposed action and each alternative.
- Assessment of which waters may be impacted, the sources and nature of potential impacts (both quality and quantity), specific pollutants likely to impact those waters and a comparison to applicable environmental standards (e.g., surface water and drinking water quality standards);
- Consideration of downstream impacts and potential for changes in metal speciation and bioavailability (in particular, the impacts of copper, which can have adverse effects on salmon at very low concentrations);
- Evaluation of surface water and groundwater use, including maps and source identification of agricultural, domestic, and public water supply wells or intakes; and
- Consideration of effects of seasonality on water quantity and quality impact assessment, including predictions for all phases of the project (construction, operations, and closure).

Anti-degradation

The anti-degradation provisions of the CWA apply to those waterbodies where water quality standards are currently being met. In certain high-quality waters, the anti-degradation provisions prohibit

degrading water quality unless it is determined that allowing lower water quality is necessary to accommodate important economic or social development in the area in which the waters are located.³³ We recommend that the EIS discuss whether and how the CWA anti-degradation requirements could be met.

Water Management and Treatment

We recommend that the EIS describe the plans for water management, treatment, and discharge during all phases of the project (construction, operations, and closure), including plans for long-term water treatment. The EIS should evaluate and disclose the adequacy, reliability, effectiveness, and operational uncertainty associated with proposed operation and closure (long-term) water management and treatment techniques, taking into account seasonality and potential changes associated with future climate scenarios. We also recommend that the analysis characterize chemical compositions and quantities of process waters, mine drainage, storm water, and treated and untreated effluent. This information should be supported by the results of treatability testing. Assumptions used in the analysis should be disclosed and be reasonably conservative. If long-term water treatment is needed, we recommend that the EIS include modeling of predicted stream concentrations of contaminants of concern, both with and without treatment, to evaluate the potential impacts to water quality if the treatment system is not working properly.

The EIS should also identify the Alaska Pollutant Discharge Elimination System (APDES) discharge locations, identify applicable water quality standards, and analyze the likelihood and ability of all discharges to meet applicable standards and the direct, indirect, and cumulative impacts of such discharges to the receiving waters. We recommend that any applicable water quality variance requests, site-specific criteria proposals, and/or any other planned or potential requests for water quality standard revisions also be disclosed in the EIS.

Sediment Management and Stormwater Runoff

Since the project has the potential to cause or contribute to erosion of soils and subsequent sediment loading to nearby surface waters, we recommend that the EIS evaluate construction design and operation practices that will be used to minimize erosion and control stormwater runoff from the mine site, port sites, transportation corridor, and pipeline route. We recommend that the EIS discuss specific mitigation measures that may be necessary or beneficial in preventing and minimizing adverse impacts to water quality and disclose the effectiveness of such measures. We suggest that the Corps consider the Best Management Practices identified by the EPA for mining facilities³⁴ and specify those that would be suitable and likely implemented at the Pebble Project. We also recommend that the EIS document the project's consistency with applicable APDES stormwater permitting requirements.

Hydrostatic Test Water

Hydrostatic testing will likely be utilized to verify pipeline integrity. We recommend that the EIS identify and describe the location of the water sources required for hydrostatic testing, in terms of surface area, depth, volume, withdrawal rate, and project requirements. For each water source, we recommend that the EIS discuss the presence of any anadromous and/or resident fish species, including discussion of any direct and cumulative impacts to fisheries resources. In addition, we recommend that locations and methods of discharges to land and/or surface waters be specified in the EIS. Emphasis should be placed on minimizing inter-basin transfers of water to the maximum extent practicable, to

³³ 40 C.F.R. § 131.12.

³⁴ https://www3.epa.gov/npdes/pubs/sector_g_metalmining.pdf.

minimize the risk of mobilizing invasive species. We recommend that the EIS describe the mitigation measures and control devices that would be implemented to minimize environmental impacts.

Marine Environment and Freshwater Lakes

Port Construction and Dredging Impacts

According to the Permit Application Appendix D – Project Description, the Amakdedori Port will require dredging of a channel and turning basin for shipping access to berths. According to the application, annual maintenance dredging will be necessary throughout the life of the port facility. Dredging activities potentially affect habitats and key ecological functions that support recruitment and sustainability of estuarine and marine organisms. We recommend that the EIS:

- Characterize the marine benthic environment and organisms, sediment composition and grain size, etc.;
- Identify any biologically important areas, such as migratory routes, benthic communities, and subsistence areas;
- Evaluate marine dredging, dewatering, transloading (from water to land), placement methods and options (summer and winter), and disposal sites (offshore, nearshore, upland, and open-water), as well as beneficial uses of the dredged material;
- Include and evaluate a sampling and analysis plan, as well as a marine dredging and disposal plan;
- Evaluate the following potential impacts of dredging activities on species and their habitats:
 - Substrate removal and any resulting habitat and species removal (entrainment);
 - Potential changes to estuarine bathymetry, fluvial and tidal energy, and substrate roughness, and any attendant impacts to salinity structure and estuarine circulation;
 - Potential changes to sediment transport processes, including effects on adjacent shorelines;
 - Alteration of sediment composition in and around the dredging site (including changes to the nature and diversity of benthic communities);
 - Local resuspension of sediments and any turbidity increases;
 - Spread of sediments (and any associated contaminants) into the area surrounding the dredging site;
 - Release of sediment-associated nutrients, potential increases in eutrophication and resulting decreases in dissolved oxygen concentrations;
 - Decreased primary production due to reduced transparency of the water column and/or smothering, particularly at in-water disposal sites; and
 - Enhanced bioavailability and ecotoxicological risk of background contaminants and/or chemical or biochemical changes of contaminants;
- Consider implementation of effective mitigation measures to ensure that marine resources and habitats are adequately protected; and
- Incorporate a monitoring plan for marine protected resources and associated habitats to ensure effectiveness of mitigation measures.

Because of the magnitude of the proposal, dredging and disposal operations will need to be carefully planned and scheduled to avoid and minimize impacts to sensitive marine mammals, fish, shellfish, and their habitat at critical spawning and migration periods.

Dredged Material Disposal

According to the Permit Application Appendix D, dredged material will be used to construct the jetty, causeway, and/or the main terminal patio area, if suitable. Excess dredged material will be stockpiled in

an upland location adjacent to the port facilities. The EPA recommends an on-the-ground wetland delineation at the proposed dredged material disposal site to verify whether there are any jurisdictional waters of the United States at this location.

The proposed discharge of dredged material effluent from the confined disposal facility into Kamishak Bay is subject to regulation under Section 404 of the CWA. Thus, the EIS should include sufficient information to support making the required determinations and findings under the Guidelines. For example, Subpart G of the Guidelines includes general evaluation procedures and specific testing procedures to reach the determinations required by 40 C.F.R. § 230.11. The Inland Testing Manual³⁵ also provides detailed technical guidance on how to evaluate and test dredged material consistent with the Guidelines. In particular, the EPA recommends using the ITM Appendix B, “Guidance for Evaluation of Effluent Discharges from Confined Disposal Facilities.”

To support disposal decisions, we recommend that the EIS provide an inventory of the physical and chemical characteristics of the dredged material and an assessment of disposal alternatives. We recommend that the range of dredged material management alternatives include: no action; the proposed action; beneficial uses such as beach nourishment or construction material; a disposal site in internal waters, landward of the Kamishak Bay closing line (regulated under the CWA); and an ocean disposal site seaward of the Kamishak Bay closing line (regulated under the Marine Protection, Research and Sanctuaries Act).

Potential for Ocean Disposal of Dredged Material

Under Section 102 of the MPRSA, the EPA is responsible for designating and managing ocean dumping sites for all materials, including dredged material. The EPA designates ocean disposal sites through rulemaking and sites are published at 40 C.F.R. § 228.15. The EPA bases the designation of an ocean disposal site on environmental studies of a proposed site, studies of regions adjacent to the site, and historical knowledge of the impact of disposal on areas similar to the site in physical, chemical, and biological characteristics. All studies for the evaluation and potential selection of dredged material disposal sites should be conducted in accordance with the criteria for the selection of disposal sites for ocean dumping published in 40 C.F.R. §§ 228.5 and 228.6. The minimum requirements for baseline assessment surveys are found in 40 C.F.R. § 228.13.

The evaluation process includes conducting oceanographic studies to establish the environmental conditions at all alternative locations being considered as potential sites, as well as the area or region encompassing the alternative sites. Results from oceanographic studies and other sources are used to model likely dispersion and deposition of material disposed at the alternative sites and evaluate potential impacts. If there are no practicable alternatives to ocean dumping that will have a less adverse impact on the environment, this information is used to select the best ocean site proposed for designation.

If ocean disposal is to be considered as an alternative, we encourage the Corps to engage early and actively with the EPA to ensure that site selection activities are consistent with the MPRSA and the ocean disposal criteria. The EIS must be adequate for the EPA to ensure that use of the site selected for designation will not likely cause unreasonable degradation to the surrounding marine environment. In addition, only dredged material that is authorized for disposal under the MPRSA and 40 C.F.R. Part 227 may be disposed in an EPA-designated ocean dredged material disposal site.

³⁵ See <https://www.epa.gov/cwa-404/inland-testing-manual>.

Impacts of Vessel Traffic

Marine traffic, including barges and other vessels associated with construction and operation of the proposed project, may also result in impacts to the marine environment. For example, vessel traffic may result in potential impacts to marine mammals, including threatened and/or endangered species, and their migration patterns and routes; subsistence, commercial, and recreational fisheries; and other vessel use. We recommend the EIS describe the vessel traffic schedule in Cook Inlet; patterns and marine transportation routes; subsistence, commercial, and recreational fishery resources; and the migration period, patterns, and routes of potentially affected marine mammals, including Cook Inlet Belugas. The direct, indirect and cumulative impacts from vessel traffic on marine mammals, threatened and endangered species, critical habitats, and fishery resources should be analyzed in the EIS, and the EIS should discuss the mitigation measures that would be implemented to minimize such impacts.

Use of the proposed ice-breaking ferry on Lake Iliamna may result in similar impacts to the freshwater lake environment, including the potential for wake impacts to the shoreline. We recommend the EIS analyze the direct, indirect, and cumulative impacts of the year-round use of the lake proposed by the applicant on threatened and/or endangered species, fishery resources, and other lake user groups, and discuss mitigation measures to minimize impacts.

Air Quality

The EPA recommends that the EIS evaluate how the construction and operation of the proposed project and alternatives could affect air quality and what measures may be needed to mitigate potentially significant impacts. Such an evaluation is necessary to ensure compliance with state and federal air quality regulations, and to disclose the potential impacts from temporary or cumulative degradation of air quality. To address potential air quality impacts, the EIS should consider whether the direct, indirect, or cumulative impacts of project-related air emissions would result in any adverse impact on air quality or air quality-related values.

Potential air pollutant concerns for the proposed project include:

- Operation of heavy machinery and equipment, including marine vessels, during construction and operations that result in the emission of fossil fuel combustion exhausts. Such exhausts will include oxides of nitrogen, oxides of sulfur, carbon monoxide, and particulates. The significance of the contribution of project emissions to the formation of secondary particulate matter (PM_{2.5}) and ozone should also be evaluated;
- Fugitive dust emissions may be generated from construction and operation of the mine, ancillary facilities, and supporting infrastructure. In addition to human health effects, dust blown from the roadway can settle onto wetlands, vegetation, or waterbodies, impairing their health as well; and
- Hazardous air pollutants may result from fuel combustion and ore processing. The *National Air Toxics Assessment* asserts that numerous human epidemiology studies show increased lung cancer rates associated with diesel exhaust and significant potential for non-cancer health effects (see <http://www.epa.gov/ttn/atw/nata>). Also, the Control of Emissions of Hazardous Air Pollutants from Mobile Sources Final Rule (66 Fed. Reg. 17,230, March 29, 2001) lists 21 compounds emitted from motor vehicles that are known or suspected to cause cancer or other serious health effects. The EPA recommends the EIS disclose whether hazardous air pollutant emissions would result from project construction and operations, discuss the cancer and non-cancer health effects associated with air toxics and diesel particulate matter, and identify sensitive receptor populations and individuals likely to be exposed to these emissions.

We recommend the following steps for the EIS air quality analysis:

- Characterize the existing conditions to set the context for evaluating project impacts, including:
 - Regional climate and meteorology,
 - Air quality and air quality related values (e.g., visibility),
 - Identification of sensitive receptors in the vicinity;
- Review air quality regulations and any air permitting requirements that apply to the air pollutant sources associated with the project;
- Provide a comprehensive emissions inventory of criteria pollutants (in tons per year), greenhouse gas emissions (in metric tons CO₂ equivalents per year), and significant HAP emissions for all project components (mine site, transportation corridor, port, and pipeline) and project phases; and
- If projected emissions are significant, conduct near-field and far-field air quality modeling to assess project-related air quality and visibility impacts. Also, see our recommendations related to Predictive Modeling, later in this document.

We recommend that the Corps evaluate and incorporate best management practices and mitigation measures into the EIS to reduce emissions of criteria pollutants and HAPs, which also have co-benefits of reducing GHGs. We recommend that the EIS include a comprehensive fugitive dust control plan as well as a construction air pollutant emissions control plan to address reduction of engine emissions.

These recommendations are separate and distinct from, and are not intended as a substitute for compliance with, any additional obligations of the Corps and the project proponent to comply with the federal Clean Air Act and any applicable state or tribal air pollution laws, which may require, among other things, obtaining pre-construction permits and operating permits, compliance with new source performance standards and/or national emission standards for hazardous air pollutants, as well as any applicable state implementation plan (SIP) requirements, including, as applicable to the Corps, the requirements under Section 176 of the Clean Air Act regarding conformity of federal activities to implementation plans approved or promulgated under section 110 of the Clean Air Act.

Climate Adaptation

The EPA recommends that the EIS include a discussion of reasonably foreseeable effects that changes in the climate may have on the proposed project and the project area, including its long term infrastructure. This could help inform the development of measures to improve the resilience of the proposed project. If projected changes could notably exacerbate the environmental impacts of the project, the EPA recommends these impacts also be considered as part of the NEPA analysis.

Fish and Wildlife, including Endangered Species and Essential Fish Habitat

The EPA recommends that the EIS evaluate impacts to fish and wildlife from the proposed project and alternatives. The aquatic resources section above also provides recommendations related to fisheries.

Special consideration should be given to listed and proposed species under the Endangered Species Act and Essential Fish Habitat under the Magnuson Stevens Fishery Conservation and Management Act. NEPA regulations require that, to the fullest extent possible, the EIS be prepared concurrently with

environmental analyses required by the ESA and other environmental laws.³⁶ Magnuson Stevens Act and ESA implementing regulations also encourage coordination with other environmental reviews.^{37, 38}

We recommend that the EIS discuss the species listed and proposed as threatened or endangered under the ESA and the essential fish habitat within the project area (including the pipeline, roads, and port site) and the potentially impacted area surrounding the project. The EIS should describe impacts to ESA species and EFH and discuss the activities proposed to avoid, minimize, mitigate, and monitor listed and proposed species and EFH. We understand that the Corps will develop a biological assessment to evaluate impacts to listed and proposed endangered species and EFH, and recommend that it be included with the draft EIS. We also recommend that the federal action agencies work together to ensure that a single biological assessment is developed that meets all agencies' needs.

National Historic Preservation Act

Section 106 of the National Historic Preservation Act of 1966 requires federal agencies to consider the effects of their actions on historic properties, including those of traditional religious and cultural importance, following regulations in 36 C.F.R. Part 800. The NHPA requires a federal agency, upon determining that activities under its control could affect historic properties, to consult with the appropriate State Historic Preservation Officer /Tribal Historic Preservation Officer. We support the Corps' early engagement with the Advisory Council on Historic Preservation, and we recommend that the EIS discuss any potential impacts to historic properties, including any tribal, cultural, or other treaty resources that are historic properties or traditional cultural properties. In addition, the EIS should identify alternatives and mitigation to avoid significant impacts. Recommendations related to traditional uses and resources that are not historic properties are discussed further below.

Invasive Species

We know that ballast water from barges or vessels can be a major source of non-native species into marine ecosystems. Non-native species can adversely impact the economy and the environment and cause harm to human health. Impacts may include reduction of biodiversity of species inhabiting coastal waters due to competition between non-native and native species for food and resources. We recommend that the EIS discuss potential impacts from non-native invasive species associated with ballast water in vessels that will be utilizing the Amakdedori Port associated with this project and identify mitigation measures to minimize adverse impacts to the marine environment and human health.

SAFETY, RISK ANALYSIS, AND HAZARDOUS MATERIALS MANAGEMENT

Accidents and Failures

An array of spills, accidents, and failures can occur at mining sites. We recommend that the EIS describe the control measures that will be in place to prevent these events from occurring during construction, operations, and closure. To identify these events, we recommend that the Corps evaluate the proposed design and management of the tailings facility, dams, and other structures and evaluate PLP's waste and water management and reclamation plans to determine the project-specific likelihood of different types of accidents and failures. Designs and management plans for the pipeline and transportation components

³⁶ 40 C.F.R. § 1502.25.

³⁷ 50 C.F.R. § 600.92 (c), (f).

³⁸ 50 C.F.R. § 402.06.

(road, ports, shipping) should also be evaluated to determine the probability of accidents and failures. We recommend that the results of these evaluations be documented in the EIS. For those events that are determined to be of low probability but high consequence, we recommend that the EIS evaluate the potential effects of such events on aquatic ecosystems, particularly fishery resources, and other resources. The EIS should also discuss mitigation measures that could minimize the risk or damages of such events.

Physical Stability of Structures

The EIS should assess the likelihood of earthquakes in the region and describe the geotechnical stability of the tailings and waste storage facilities and open pit walls during operations and closure. We recommend including a description of how these facilities are designed and how they would be operated, closed, and monitored to ensure stability. In addition, we recommend that a risk assessment, such as a Failure Modes Effects Analysis, (FMEA) be conducted on each of the tailings dams with the results summarized in the EIS. An FMEA considers potential failure modes and identifies the relative likelihood and consequences of the failure modes, which are key considerations for impact assessment. We recommend that the EIS incorporate mitigation or alternatives to improve stability should the FMEA identify failure modes that are anything other than a tolerable risk.

For the tailings impoundment in particular, we recommend that the Corps require a demonstration that the structure complies with state dam safety criteria and has been designed by qualified persons. In addition, we recommend that the Corps require that the dam be independently reviewed (and modified if indicated by the review)³⁹. Given the proposed size of the dams associated with the Pebble project and value of the downstream resources, we believe that an independent review of the dam structure is appropriate. We recommend that the results of the independent review be documented in the EIS in order to support the assessment of geotechnical stability.

As mentioned above in the Range of Alternatives section, we recommend that the Corps consider alternatives to improve physical stability of the tailings, including consideration of filtered tailings (dry stack). We note that consideration of a filtered tailings alternative and assessment of safety and stability via a FMEA and independent review panel are consistent with recommendations of *The Independent Expert Engineering Investigation and Review Panel Report on Mount Polley Tailings Storage Facility Breach* (January 30, 2015). In addition to investigating the cause of the Mount Polley tailings storage facility failure, the Review Panel made recommendations on actions that could be taken to ensure that similar failure does not occur at other mines. We recommend that the Corps consider the Review Panel Report and, in particular, the recommendations related to best available technology for new impoundments, design commitments to support permit applications, and actions to validate the safety of tailings storage facilities.

Hazardous Materials

We recommend that the EIS address the potential direct, indirect, and cumulative impacts of hazardous materials/wastes management and storage from the construction and operation of the proposed project and alternatives. Mining activities may involve the transport of hazardous materials, and we recommend that the EIS disclose the types and amounts of materials that will be used at each step of mining operations. In addition, we recommend that the EIS describe measures that will be taken to minimize the

³⁹ 33 C.F.R. § 325.1.

chances of an accidental release, emergency measures that will be implemented should such an event occur, and how potential adverse impacts from spills may be mitigated by effective containment and cleanup operations.

We also recommend that potential health impacts to local communities or other project area users be identified, as well as any strategies employed to communicate risks or actual emergencies. As part of this analysis, we recommend that the EIS use scientific and traditional ecological knowledge to describe potential health effects from exposure to hazardous materials and the effects on the palatability of eating potentially contaminated foods.

HUMAN HEALTH AND IMPACTS TO COMMUNITIES

Sociocultural Impacts

It is anticipated that the proposed project will result in employment opportunities for Alaska Native residents, as well as generate local and corporate revenues in the region. While employment opportunities and local revenues generally increase a community's standard of living, there can also be impacts to families, communities, and cultures, especially in areas where residents are participating in traditional cultural practices. Noise and physical structures may disturb and/or displace subsistence wildlife from the project area. Other project impacts may affect a community's ability to access traditional and accustomed subsistence use areas. We recommend that the EIS identify the specific communities, federally recognized tribes, and corporations that could be impacted, both positively and negatively, which will help agency decision makers and the public understand the scope of the potential sociocultural impacts.

We recommend that the sociocultural impacts associated with this project and alternatives be fully evaluated and disclosed in the EIS and include, but not be limited to, the following:

- **Socioeconomic Impacts**
 - Evaluate potential changes to the region's economy as a result of the mine construction and operation (e.g., changes to commercial fishery, recreational fishery, and tourism sectors).
 - Evaluate impacts associated with economic changes to families, communities, and cultures, including potential changes to those aspects of the area's economy that are currently subsistence-based;
 - Evaluate the potential decline in the region's economy following mine closure; and
 - Evaluate replacement costs of traditional foods if access or availability are impacted by the proposed project.
- **Accessibility of Traditional Use Areas**
 - Identify community traditional use areas for subsistence, harvesting, hunting and trapping, fishing, travelling, camping, berry picking, and other uses;
 - Describe the potential access limitations to these traditional use areas and their impacts to local communities; and
 - Coordinate with the tribes and communities on options for mitigating impacts associated with accessibility to traditional and accustomed use areas.
- **Compatibility of Traditional Use Areas**
 - Identify project activities that may conflict with traditional and accustomed uses; and

- Coordinate with the affected tribes and communities to identify mitigation options for avoiding and minimizing conflicts between traditional and accustomed subsistence uses and the construction and operation of this project.

Environmental Justice and Impacted Communities

In compliance with NEPA and Executive Order 12898 on Environmental Justice, actions should be taken to conduct adequate public outreach and participation that ensures that the public and Native American tribes understand possible impacts to their communities and trust resources.

Executive Order 12898 requires each federal agency to identify and address disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations, low-income populations, and Native American tribes.⁴⁰ The EPA also considers children, the disabled, the elderly, and those of limited English proficiency to be uniquely vulnerable populations that may be impacted.

The CEQ has developed guidance concerning how to address Environmental Justice in the environmental review process.⁴¹ In accordance with this guidance, the EPA recommends that the EIS address the following points:

- Identify low income, minority, and Alaska Native communities that may be impacted by the project;
- Describe the efforts that have been or will be taken to meaningfully involve and inform affected communities about project decisions and impacts;
- Disclose the results of meaningful involvement efforts, such as community identified impacts;
- Evaluate identified project impacts for their potential to disproportionately impact low income, minority, or Alaska Native communities, relative to a reference community;
- Disclose how potential disproportionate impacts and environmental justice issues have been or will be addressed by the Corps' decision making process;
- Propose mitigation for unavoidable impacts that will or are likely to occur; and
- Include a summary conclusion, sometimes referred to as an "environmental justice determination" that concisely expresses how environmental justice impacts have been appropriately avoided, minimized, or mitigated.

We also recommend that particular attention be given to consideration of the dependence of local communities on local and regional subsistence resources, access to those resources, and perception of the quality of those resources. Additional information and tools for environmental justice analysis can be found on the EPA's website at: <https://www.epa.gov/environmentaljustice>.

Health Risk or Impact Analysis

The EPA recommends that the Corps undertake a screening process to determine which aspects of health (including but not limited to public, environmental, mental, social, and cultural) could be impacted by the proposed project. Depending on the screening results, an analysis of health effects, such

⁴⁰ EO 12898: Federal Actions To Address Environmental Justice in Minority Populations and Low-income Populations. February 11, 1994.

⁴¹ <http://ceq.hss.doe.gov/nepa/regs/ej/justice.pdf>.

CONSULTATION AND COORDINATION WITH TRIBAL GOVERNMENTS

Executive Order 13175, Consultation and Coordination with Indian Tribal Governments (November 6, 2000), was issued to establish regular and meaningful consultation and collaboration with tribal officials in the development of federal policies that have tribal implications, and to strengthen the United States' government-to-government relationships with Indian tribes. In addition, pursuant to Public Law 108-119, 118 Stat. 452, as amended by Public Law 108-4217, 188 Stat. 3267, federal agencies are required to consult with Alaska Native Claims Settlement Act corporations on the same basis as Indian tribes under Executive Order 13175. We recommend that the EIS describe the process and outcome of any government-to-government and/or government-to-corporation consultations regarding the Pebble Project, issues that were raised during the tribal consultations and how those issues were addressed.

Cooperating agency involvement establishes a mechanism for addressing intergovernmental issues throughout the EIS development process, and we support the Corps' inclusion of two tribal governments as cooperating agencies. We recommend that the Corps remain open to including other potentially affected tribal governments that have the resources and interest in serving as cooperating agencies for EIS development, consistent with the July 28, 1999, memorandum from CEQ to the heads of federal agencies.

ANALYSIS TOOLS AND METHODOLOGIES

Baseline Data Adequacy

We suggest categorizing and synthesizing existing data to ensure pertinent information is available for review and use in the EIS analysis. We understand that the Corps intends to establish focused workgroups during development of the EIS. We support this approach and recommend that the workgroups include cooperating agency subject matter experts for key areas (air, water, wetlands, fisheries, etc.) to review baseline data for completeness, identify data gaps, and recommend approaches toward resolving those gaps in a timely manner. For example, additional analysis or collection of additional data may be required to characterize the accuracy of best available baseline estimates of resources such as fish populations, groundwater elevations, or wetland extents. Such information will be critical for designing and developing a robust monitoring framework and for assessing impacts during and after project development and comparing those to the baseline.

Geochemistry/Characterization of Ore, Waste Rock, and Tailings

To provide reliable predictions of water quality and impacts to surface water and groundwater due to wastewater and mine waste management, we recommend that the physical and chemical characteristics of the ore, pit walls, waste rock, and tailings should be determined and disclosed in the EIS. Environmental samples used to support projections should represent a range of conditions that currently occur and that could occur in the future as a result of the project, including under potentially altered future climate conditions. Waste materials (ore, waste rock, tailings) used for environmental projections should be representative of the material to be mined and related to the mine plan and proposed processing methods. Physical and chemical characterization should be conducted in a manner that provides environmentally conservative estimates of impacts.

It may be helpful to consider EPA Region 10's Sourcebook for Hardrock Mining for recommendations related to the NEPA analyses of mining projects.⁴⁷ We recommend that the following information be utilized to characterize geologic and mineralogy setting/aqueous geochemistry in the baseline environment and impact prediction sections of the EIS:

- Whole rock analysis;
- Mineralogy;
- Drill core descriptions;
- Block model or similar model (a computerized estimate of the quantity and characteristics of ore and waste);
- Available literature on the ore deposit;
- Mineral occurrences (e.g., on fracture surfaces, in groundmass, using hand specimens and thin section) with an emphasis on sulfides and carbonates;
- Acid-base accounting;
- Long-term kinetic testing (including possible startup of test pads if sufficient material and access to site are available);
- Baseline surface and ground water quality and flows (including springs);
- Potentiometric surface for groundwater;
- Hydraulic properties (e.g., hydraulic conductivity, porosity, permeability) of soil, vadose zone, and groundwater aquifers, especially under proposed locations of mine facilities; and
- Hydrogeochemical models for prediction of water quality.

Predictive Modeling

We recommend that predictive modeling be based on a site-specific conceptual model that describes the system boundaries, spatial and temporal scales, hydraulic (for water modeling) and chemical characteristics, sources of data and data gaps, and the mathematical relationships used to describe processes. We also recommend that our suggestions be applied to any environmental and predictive modeling used for assessing impacts in the EIS. The water quality model, in particular, should be capable of predicting both whole water and dissolved fractions of metals/metalloids and should provide temporal predictions that are consistent with the time-steps in applicable water quality criteria.

Any modeling documentation should include:

- Tables of parameter values used in the model;
- Tables and graphs of results;
- Uncertainty and sensitivity analyses;
- Errors associated with both measured and assumed data; and
- Recommendations for further analysis, if applicable.

We recommend that discussions on modeling include a clear statement of the management objectives intended to be achieved by the modeling, the level of analysis required to meet the objectives, and uncertainties associated with modeled outcomes. For your reference, please refer to EPA's guidance that provides recommendations for the effective development, evaluation, and use of models in

⁴⁷U.S. EPA Region 10. 2003. EPA and Hardrock Mining: A Source Book for Industry in the Northwest and Alaska January 2003.

environmental decision making.⁴⁸

We recommend that the EIS use caution in describing absolute outcomes based on modeling. Mathematical modeling used for describing the physical and chemical characteristics of the project site and potential impacts includes a level of uncertainty; understanding these uncertainties and associated risks is necessary for informed decision making. We recommend that the study plan for modeling analysis clearly state the purpose, questions of concern, method, data, and limitations of the model to generate valuable interpretations. We also strongly recommend an appropriately conservative approach be taken with modeling and a range of predictive outcomes be discussed (e.g., most likely case, reasonable worst-case, and reasonable best-case scenarios) that reflect a range of climatic settings and critical input values. Inclusion of a reasonable range of outcomes allows the agencies to make better informed plans for mitigation, adaptive management, and contingencies to respond to reasonably foreseeable adverse impacts.

Traditional Ecological Knowledge

Due to the location of the proposed project and traditional uses of the area, we recommend the identification, inclusion, and integration of traditional ecological knowledge into the EIS analysis, as appropriate. Such anthropological work can include the collection of local and traditional knowledge concerning the affected environment, anticipated impacts from the project, and traditional hunting and land use patterns in the area. We recommend that, in addition to reviewing any pertinent traditional ecological knowledge currently available, additional studies be conducted as necessary to clearly identify concerns and potential impacts, including cumulative impacts, from the proposed project and project alternatives. This information should be reviewed and included in the EIS to the extent possible and utilized in the analysis of potential impacts.

MITIGATION, MONITORING, AND ADAPTIVE MANAGEMENT

Mitigation

CEQ regulations at 40 C.F.R. § 1508.20 define mitigation to include five categories of actions to address impacts. Briefly stated, these are: avoiding, minimizing, rectifying, reducing, and compensating. The regulations at 40 C.F.R. § 1502.14(f), 1502.16(h), and 1508.25 indicate that appropriate mitigation measures should be addressed in an EIS both as part of the analysis of alternatives and in discussions of environmental consequences.

Mitigation is also relevant to evaluating compliance with the Guidelines, which prohibit discharges of dredged or fill material that will cause or contribute to significant degradation of the waters of the United States, and prohibit all discharges *“unless appropriate and practicable steps have been taken which will minimize potential adverse impacts of the discharge on the aquatic ecosystem.”*⁴⁹

The Guidelines identify numerous types of actions to mitigate potential adverse impacts, which include

⁴⁸ Guidance Document on the Development, Evaluation and Application of Environmental Models (PDF), EPA/100/K-09/003. March 2009. <http://www.epa.gov/crem/cremlib.html>.

⁴⁹ 40 C.F.R. § 230.10(d).

measures to avoid, minimize, and compensate for impacts. Avoidance, minimization, and compensation form a “mitigation sequence” that must be followed in order to comply with the Guidelines’ requirement that all appropriate and practicable steps be taken to mitigate impacts to aquatic resources.⁵⁰ Compensatory mitigation considerations under the Guidelines are discussed further in the section on aquatic resources above.

The EPA recommends that the EIS identify the type of activities that would require mitigation measures during the construction, operation, and closure phases of this project. In addition, we recommend identifying whether implementation of each measure is required by the Corps or any other governmental entity and which entity will be responsible for implementing the measure. To the extent possible, mitigation goals and measurable performance standards should be identified in the EIS to reduce impacts to a particular level or adopted to achieve an environmentally preferable outcome. CEQ guidance on the Appropriate Use of Mitigation and Monitoring seeks to enable agencies to create successful mitigation planning and implementation procedures with robust public involvement and monitoring programs.⁵¹

Monitoring

Environmental monitoring programs should be designed to assess both impacts from the project and whether implemented mitigation measures are effective. We recommend that the monitoring programs:

- Define the monitoring goals and objectives;
- Provide details to demonstrate that goals and objectives will be achieved such as the parameters to be monitored, monitoring locations and frequency, data analysis, and reporting;
- Discuss actions (contingencies, triggers, adaptive management, corrective actions, etc.) that will be taken based on monitoring results;
- Identify and incorporate controls and pre-project data with quantified bias and precision to enable detection of impacts, success of BMPs, and ability to distinguish these from natural variation; and
- Require regular analysis and reporting of data to oversight agencies, including submittal of a sampling and quality assurance plan for agency approval.

We recommend that the monitoring programs be described in the EIS and that the EIS also discuss public participation, and how the public can get information on mitigation effectiveness and monitoring results.

Adaptive Management Planning

We recommend that the EIS utilize adaptive management and contingency planning to describe the strategy for responding to unforeseen circumstances at the site. The strategy should include “trigger levels” (e.g., exceedance of ecological benchmarks) or observations (e.g., statistically significant trends in indicators, permit violations, water balance problems, changes in discharge or chemistry of springs/seeps) that would set follow-up actions into motion. This strategy or plan should be described so that reviewers may comment on its adequacy. This type of plan, when coupled with the monitoring program, is necessary to mitigate for uncertainties and risks associated with predictions of

⁵⁰ 40 C.F.R. § 230.10(a), (d); *See* Memorandum of Agreement between U.S. Department of Army and the Environmental Protection Agency on the Determination of Mitigation Under the Clean Water Act Section 404(b)(1) Guidelines.

⁵¹ https://ceq.doe.gov/docs/ceq-regulations-and-guidance/Mitigation_and_Monitoring_Guidance_14Jan2011.pdf.

environmental outcomes, and will provide an early warning system of unexpected outcomes.

FINANCIAL ASSURANCE

NEPA provides for the disclosure of all information concerning the environmental consequences of a proposed action to agency decision makers and the public before decisions are made and actions are taken. A key component in determining the environmental impacts of a mining project is the effectiveness of the closure and reclamation activities, including long-term water management. In turn, whether any closure and reclamation activities that may be necessary will be adequately funded is key to determining whether those activities will be effective. We therefore recommend that the project's ability to self-fund, and/or any third-party financial assurance mechanisms, be disclosed. Disclosure of the financial assurance amount and mechanism is particularly important for this project given that PLP's proposal includes long term water management and treatment.

We recommend that the draft EIS disclose the estimated costs to reclaim and close the site in a manner that achieves reclamation goals and post-mining land use objectives. The EPA recommends that the final EIS identify proposed financial assurance mechanisms and demonstrate that these mechanisms would ensure that necessary reclamation work is completed.

The EPA is available for further conversations about the level of detail to include in the document. Below are the main elements that we believe should be disclosed in the EIS:

1. Site Reclamation (facility closure, earth moving/stabilization, revegetation, etc.):

- Phases of reclamation;
- Estimated cost (+/- percent) to reclaim and close the site in a manner that achieves reclamation goals and post-mining land use objectives;
- Criteria for determining success of reclamation activities for financial assurance release; and
- Costs associated with implementing contingency measures to address reasonably foreseeable but not specifically predicted outcomes.

2. Long-Term Site Management (post-closure water treatment, mitigation of impacts to aquatic resources, site maintenance, and monitoring):

- Itemized cost estimate (including reasonable contingencies) and appropriate economic variables to calculate the net present value of future expenses; and
- If a trust fund is utilized, address the "mechanics" of the fund, including:
 - Trust fund mechanism (e.g., current value trust, net present value trust, etc.);
 - Requirements for timing of payments into the trust fund;
 - How the Corps would ensure that the trust fund or other financial assurance could not be claimed by a creditor in the case of bankruptcy;
 - Acceptable financial instruments;
 - How trust management fees and taxes will be paid;
 - Identity of the trust fund beneficiaries; and
 - Identity of the operator with responsibility/liability for financial assurance.



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION 10

1200 Sixth Avenue, Suite 155
Seattle, WA 98101-3123

OFFICE OF REGIONAL
ADMINISTRATOR

JUL - 1 2019

Shane McCoy, Program Manager
U.S. Army Corps of Engineers, Alaska District
645 G Street, Suite 100-921
Anchorage, Alaska 99501

Dear Mr. McCoy:

In accordance with our responsibilities under the National Environmental Policy Act and Section 309 of the Clean Air Act, the U.S. Environmental Protection Agency has reviewed the U.S. Army Corps of Engineers' February 2019 Draft Environmental Impact Statement for the Pebble Project (CEQ Number 20190018; EPA Region 10 Project Number 18-0002-COE). The EPA is also supporting the Corps in development of specific sections of the EIS as a cooperating agency in accordance with the cooperating agency agreement. As a cooperating agency, we have participated in meetings and provided comments on early drafts of EIS material, including on sections of the Preliminary DEIS in December 2018. We also provided scoping comments to the Corps on June 29, 2018.

Project Background

The Pebble Limited Partnership (PLP) is proposing to develop the Pebble copper, gold, and molybdenum ore deposit in southwest Alaska. The Pebble deposit lies within the Nushagak and Kvichak watersheds, which together account for more than half of the land area in the Bristol Bay watershed.

The proposed project includes an open-pit mine, tailings storage facilities (TSFs), water management ponds, a mill facility, a natural gas-fired power plant, and other mine site facilities. Approximately 1.3 billion tons of ore would be processed at a rate of 180,000 tons of ore per day, over the proposed mine operating life of 20 years. The initial surface disturbance footprint is approximately 8,086 acres and the 608-acre pit would have a maximum pit depth of 1,970 feet. Potentially acid generating (PAG) tailings and non-PAG bulk tailings would be disposed in two tailings facilities that would cover a total of approximately 3,867 acres. Water discharges from the pit lake following mine closure would require water treatment in perpetuity.

The proposed project also includes development of a 188-mile natural gas pipeline across Cook Inlet and Lake Iliamna and two compressor stations used to transport natural gas from the Kenai Peninsula to the mine site. The proposed transportation network would include construction of: 77 miles of new roads, including mine and port access roads and spur roads to communities; ferry terminals on the north and south shores of Lake Iliamna for use by an ice-breaking ferry; and the Amakdedori Port on Cook Inlet.

In addition to the no action alternative and the proposed action (Alternative 1), the DEIS analyzes two additional alternatives and includes variants to the alternatives.

Overview of Comments and Recommendations

We appreciate the progress that the Corps has made and the improvement to the analysis resulting from engagement with the EPA early in the NEPA process. However, the DEIS appears to lack certain critical information about the proposed project and mitigation, and there may be aspects of the environmental modeling and impact analysis which would benefit from being corrected, strengthened, or revised. Because of this, the DEIS likely underestimates impacts and risks to groundwater and surface water flows, water quality, wetlands, aquatic resources, and air quality from the Pebble Project. Inclusion of the additional information and analyses we have identified, or further explanation in the EIS of these issues, is essential to more fully evaluate and disclose the potential project impacts and identify practicable measures to mitigate those impacts. The EPA is committed to working with the Corps to provide our expertise where it can be of assistance.

Our priority comments and recommendations are summarized below. We have enclosed detailed comments explaining these priority comments and recommendations. Our detailed comments also address other issues identified in the EPA's review of the DEIS, including geohazards, environmental justice, and subsistence.

Project Description and Mitigation Details

The DEIS and supporting reference information acknowledge that key aspects of the Pebble Project are at a conceptual level (i.e., early or initial stage) of design and development. Critical but conceptually developed project components include: the open pit mine dewatering system; the dams retaining the mine's tailings and main water management pond; the collection, pumpback, and monitoring systems for managing seepage from the TSFs and main water management pond; and the closure water treatment plant. Critical plans that are yet to be developed or are only conceptually described in the DEIS include plans for: mine reclamation and closure; environmental monitoring; adaptive management; tailings and waste rock characterization and management; fugitive dust control; and strategic timing of water discharges.

More detailed versions of these project components and plans, however, are critical to the evaluation of environmental impacts, alternatives and mitigation. Without more detail, many of the predictions associated with these components and plans in the DEIS do not appear to be fully supported based on the current level of documentation. Given the scale of the project and importance of the aquatic resources in the Bristol Bay watershed, we recommend including more developed designs and plans in the EIS to provide a level of detail that will allow for more meaningful disclosure of the project's potential impacts and the effectiveness of its pollution control infrastructure and plans that are important for environmental protection and mitigation.

Range of Alternatives

The DEIS predicts that groundwater contamination would occur under the bulk TSF. We therefore recommend that the EIS include as an alternative, variant, or mitigation measure the use of a liner under the bulk TSF (with appropriate overdrains to ensure stability). In addition, we recommend that the EIS discuss in detail an alternative or variant that includes the infrastructure elements that would be anticipated under the Pebble Mine Expanded Development Scenario (i.e., diesel pipeline, port site at Iniskin Bay). This would enable consideration of options that would avoid or minimize cumulative impacts that would occur as result of redundant infrastructure associated with expanded development. The EPA recommends that these alternatives or variants be further analyzed in the NEPA analysis as they may be components for the least environmentally damaging practicable alternative (LEDPA) under

Section 404 of the Clean Water Act. We recommend that the alternatives analysis provide the information necessary to support an evaluation of alternatives under the Clean Water Act Section 404(b)(1) Guidelines, including information to support identification of the LEDPA. This issue is further discussed in the EPA's separate comments to the Corps on the Clean Water Act Section 404 Public Notice.

Alternative 3 includes a port site variant that would include a water treatment plant at the port to treat and discharge process wastewater from the concentrate pipeline to Cook Inlet. The discharge of process wastewater alone as defined under this variant likely is not allowed under the Clean Water Act and the National Pollutant Discharge Elimination System (NPDES) regulations (see 40 CFR 440 Subparts J and L). Therefore, we recommend that this variant be reconsidered.

Groundwater and Streamflow Impacts

The DEIS relies on watershed, groundwater, and water balance models to predict how mine site activities will change groundwater conditions and impact surface water and aquatic resources. The uncertainty analysis for the groundwater model, however, concludes that the model may significantly underpredict the amount of water produced during mine pit dewatering. The DEIS discloses that this could result in the groundwater zone of influence being larger than predicted and North Fork Koktuli, South Fork Koktuli, Upper Talarik Creek, and tributary stream flows being reduced to a greater extent than is currently predicted in the DEIS. **Significant adverse impacts to wetlands and to streams with documented anadromous fish occurrence may result from such stream flow reductions.** We recommend that the groundwater model be revised to reduce this uncertainty and provide more accurate predictions associated with open pit dewatering. We have additional recommendations to verify the water balance model and clarify how uncertainties associated with the watershed model effect EIS predictions. We recommend that the EIS fully analyze the potential adverse impacts to groundwater, wetlands, and streams with documented anadromous fish occurrence based on the results of the revised modeling.

Water Quality Impacts

The DEIS may substantially underpredict potentially significant impacts to water quality. Our key comments are:

- The DEIS provides inadequate support for several assumptions regarding the behavior of leachate and relies on very limited sample representativeness for prediction of acid rock drainage and metal leaching. This may result in unanticipated leaching of metals/metalloids at elevated concentrations;
- The DEIS lacks critical details regarding the design and operation of the water treatment plants, particularly at closure. The DEIS reference material states that there is insufficient available information to evaluate the effectiveness of the closure water treatment plant to meet water quality criteria. This prevents meaningful analysis and disclosure of potential water quality impacts related to water treatment;
- As a result of groundwater model uncertainty, the DEIS states that the water treatment plants may need to treat and discharge more mining process water than that for which the plants are currently designed. Significant impacts to water quality could occur if that is the case; and
- Use of conceptual drainage and seepage containment systems for the TSFs and water management pond do not fully support the DEIS assumption that 100% of the seepage would be captured.

The EPA also recommends that the EIS include a data quality assessment for background water quality data, a modeling sensitivity analysis of the water quality modeling and inputs, a reasonably complete analysis of water quality impacts in the closure and post-closure phases, and monitoring and adaptive management plans.

Wetlands Impacts and Compensatory Mitigation

The Pebble Project would result in the permanent loss of approximately 3,560 acres of jurisdictional wetlands and other aquatic resources, including 3,443 acres of wetlands, 55 acres of lakes and ponds, 81 miles (50 acres) of stream channels, and 11 acres of marine waters. An additional 510 acres of streams, wetlands, lakes, ponds, and marine waters would be temporarily filled for construction access, and 2,345 acres would experience secondary impacts due to groundwater drawdown (449 acres) and fugitive dust (1,896 acres). The DEIS, however, does not fully identify and characterize existing aquatic resources and wetland functions to establish the environmental baseline for an impact analysis and mitigation considerations because the analysis area is limited and salient available site-specific data is not utilized. In addition, the EPA recommends a more complete analysis of secondary/indirect effects, which is important to analyze project impacts and compare alternatives.

In terms of compensatory mitigation, the draft Compensatory Mitigation Plan includes only a conceptual discussion, notwithstanding the proposed project's substantial impacts to wetlands and aquatic resources. The plan also does not fully address the types of direct and indirect impacts to waters of the U.S. that may occur and does not identify specific mitigation projects. Therefore, the availability, practicability, and effectiveness of compensatory mitigation to offset unavoidable impacts is unsupported. To ensure disclosure of practicable means to mitigate the direct, indirect, and cumulative impacts of the Pebble Project, the EPA recommends the EIS include a reasonably detailed draft Compensatory Mitigation Plan. This recommendation is further discussed in the EPA's separate comments to the Corps on the CWA Section 404 Public Notice.

Impacts to Fish and Fish Habitat

The impacts on ecologically important streams, wetlands, lakes, and ponds and the fishery areas they support should be more fully addressed in the EIS. The EPA recommends significant improvements to: habitat characterization, assessment, quantification, and spatial referencing; assessment of linkages between the loss and/or degradation of habitat and impacts to fish species and life stages (i.e., incubating eggs, spawning fish, and rearing juveniles); groundwater and surface water flow characterization at a scale that is more relevant to fish and fish habitat; and analysis of the potential population-level effects and effects on genetic diversity in the context of the Bristol Bay salmon portfolio. We recommend that the analysis in the DEIS be revised to address these issues.

Air Quality Impacts

Priority issues associated with the air quality analysis include:

- Particulate matter impacts from the mine site may be underpredicted in the EIS based on the modeling parameters used to predict impacts from the mine pit; and
- Assumptions and potential errors in the air quality modeling assessment for the port facilities include lack of evaluation of substantial mobile emissions from vessel traffic, and differences in

meteorological conditions at the Diamond Point port site as compared to the Amakdedori port site.

Our detailed comments provide recommendations to strengthen the air quality analysis.

Tailings Containment and Spill Risk

The DEIS does not fully characterize the stability and performance of the dams containing tailings and contact water in the event of an earthquake. A deformation analysis and seismic safety factor were determined for a past design of the bulk TSF, but this analysis was not provided for the current TSF dam design or for the other dams. The TSFs and main water management pond dams are significant structures that range in height up to 545 feet with combined lengths of 7.2 miles (for the TSF dams) and 3.6 miles (for the WMP dams). We recommend seismic safety factors and potential earthquake induced stability impacts be assessed for these dams so that the EIS discloses how the dams will be impacted by a potential earthquake.

The DEIS, based on conclusions of a Failure Modes Effects Analysis (FMEA), does not evaluate the potential release of tailings from the bulk TSF due to a dam breach or failure. The FMEA risk register, referenced in the DEIS, identifies a number of adverse factors that could occur during engineering, construction, and operations, but assumes that all of these challenges would be overcome. Support for this determination is limited given the simplified conceptual dam designs, lack of operational, monitoring, and closure plans and lack of representative seismic analysis for the bulk TSF. We recommend that a bulk TSF breach or failure scenario be developed, and potential impacts be evaluated and disclosed.

In addition, the spill risk analysis for concentrate and tailings warrants improvement. The current analysis may underpredict impacts of spills due to assumptions and incomplete information related to the role of oxygen in aquatic environments, timing for release of mineral components, and reactivity in porewater. We recommend revising the analysis to address these issues, so that potential adverse impacts to water and sediment quality from leaching of metals are fully disclosed, as well as any associated impacts on fish populations.

Indirect Effects and Cumulative Impacts

The DEIS summarizes potential indirect effects and cumulative impacts in general terms, with limited quantitative analysis of large-scale additional impacts resulting from reasonably foreseeable future actions. We recommend a more robust evaluation of indirect impacts and cumulative effects, particularly in terms of the Pebble Mine Expanded Development Scenario.

Conclusion

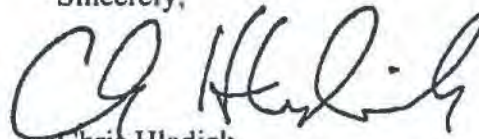
The enclosure includes detailed discussion and specific recommendations regarding the key issues summarized above, as well as other issues identified in the EPA's review. **Given the substantial potential impacts and risks of the proposed project and weaknesses in the DEIS, the DEIS likely underestimates adverse impacts to groundwater and surface water flows, water quality, wetlands, fish resources, and air quality. Therefore, conclusions that the project will not violate applicable water quality and air quality standards should be further supported.** Our detailed comments include recommendations to provide

significant additional information about key project components and plans and improve the environmental modeling and other aspects of the impact assessment.¹

We will continue to work constructively with the Corps as a cooperating agency, providing special expertise in specific areas requested by the Corps, including: alternatives; recreation; aesthetics and visual resources; soils; surface- and groundwater hydrology; water and sediment quality; wetlands and special aquatic sites; vegetation; and mitigation. We also continue to request the ability to assist the Corps in additional areas of the Pebble Project EIS, including fisheries and air quality, where we have special expertise and jurisdiction. In addition, we recommend that resource-specific interagency technical workgroups be developed to work through significant issues. We look forward to working with you and the other cooperating agencies on the next steps in the NEPA process.

If you have questions concerning our comments, please contact Patty McGrath, Mining Advisor and lead for the Pebble Project NEPA/Permitting Team, at mcgrath.patricia@epa.gov or 206-553-6113, or Molly Vaughan, NEPA Reviewer, at vaughan.molly@epa.gov or 907-271-1215.

Sincerely,



Chris Hladick
Regional Administrator

Enclosure: U.S. Environmental Protection Agency Detailed Comments for the Pebble Project Draft Environmental Impact Statement

cc: Colonel Phillip Borders, USACE Alaska District

¹ Effective October 22, 2018, the EPA no longer includes ratings in our comment letters. Information about this change is explained in the Memorandum on Changes to EPA's Environmental Review Rating Process, available at <https://www.epa.gov/nepa/policy-and-procedures-review-federal-actions-impacting-environment-under-section-309-clean-air>.

*EPA Region 10 Detailed Comments for the
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*EPA Region 10 Detailed Comments for the
Pebble Project Draft Environmental Impact Statement*

We have reviewed the DEIS and provide detailed comments and recommendations below for improved information and analyses to strengthen disclosure of the impacts of the project and alternatives and potential mitigation measures. This enclosure provides discussion of the key issues summarized in the cover letter to which these comments are attached and also includes additional comments and recommendations.

These comments are organized in the following major sections:

1. Description of the Proposed Project;
2. Alternatives;
3. Comments on specific resource sections of the EIS, including Groundwater and Surface Water Hydrology, Water Quality, Wetlands and Other Waters/Special Aquatic Sites, Fish Values, Commercial and Recreational Fisheries, Geohazards, Air Quality, Environmental Justice, Subsistence;
4. Spill Risk;
5. Indirect and Cumulative Impacts, including the impacts of the Pebble Mine Expanded Development Scenario;
6. Mitigation and monitoring, including compensatory mitigation; and
7. Availability and use of data, including data gaps and data quality.

These comments are generally organized following the structure of the DEIS: project description and alternatives, resource-specific sections, spill risk, and mitigation. For efficiency, we grouped like comments associated with conceptual project features and plans, indirect and cumulative impacts, and availability and use of data. Comments on specific resource sections are ordered by, first, those areas where the Corps has requested our special expertise (hydrology, water quality, wetlands) followed by the other resources areas where we have comments and recommendations (fish, geohazards, air quality, environmental justice, and subsistence). A summary paragraph at the beginning of each of the major sections lists the most significant issues that are discussed further in the section. Additional detailed comments are provided following the discussion of the key issues in each of the major sections, as well as EPA's recommendations. EPA encourages the Corps to further explain why its analysis in the DEIS is sufficient if the Corps, after consideration, disagrees with some or all of the recommendation.

DESCRIPTION OF THE PROPOSED PROJECT

A priority issue related to the description of the Pebble Project is the conceptual (early or initial stage) of design and development of aspects of the Pebble Project that are important to environmental protection. We recommend that the following key project features and plans be further developed to support the assessment of impacts to groundwater and surface water flows, water quality, streams, wetlands, lakes, and ponds and the fishery areas they support; and impacts to air quality:

- Open pit dewatering system;
- Waste rock characterization and management plan;

- Seepage water management system associated with TSFs and water management ponds (WMPs);
- Tailings storage facility (TSF) and main WMP embankment designs and plans;
- Closure water treatment plant;
- Plan for strategic timing of water discharges;
- Reclamation and closure plan;
- Financial assurance cost estimate;
- Monitoring plan;
- Adaptive management plans; and,
- Fugitive dust control plan.

We recommend that Pebble Limited Partnership (PLP) consider developing the Project Description into a more detailed draft plan of operations that includes a tailings and waste management plan, reclamation and closure plan, monitoring plan, and updated water management plan. These plans are typically supplied or required as a basis for development of state of Alaska permit applications and provide more detailed information that is frequently used in the analysis of the impacts of large mining projects in Alaska under NEPA. The development of these plans may efficiently help address several areas where the EPA recommends further information be provided to support the EIS.

Our recommendations regarding these key issues are described below followed by additional comments and recommendations for improvement related to the project description.

Conceptual Level of Design of Key Project Features and Plans

Open Pit Dewatering System: The DEIS states that the pit dewatering design has not been developed (pg 2-16) and that the conceptualized plan for pit dewatering consists of approximately 30 wells (pg. 4.17-3). The extent of the groundwater cone of depression and changes to groundwater and surface water hydrology are dependent upon the pit dewatering system design. We recommend that the pit dewatering system design be developed to provide a basis for the impact assessment, to provide more certainty to the assessment of pit dewatering impacts to groundwater and surface water, including alterations to streamflow. As one component of the design, we recommend clarifying whether the well array will include the entire vertical expanse of the aquifer(s) relevant to the depth of the adjacent pit, to ensure that an inward gradient of groundwater flow with depth is achieved. If more detailed design information is not developed, then we recommend that the EIS summarize the uncertainty associated with the conceptual design and how future design changes could impact groundwater hydrology predictions associated with pit dewatering.

Waste Rock Characterization and Management: The DEIS provides general statements about how PAG/ML (Potentially Acid Generating/ Metal Leaching) and NPAG/non-ML wastes would be managed. We recommend the inclusion of the following additional information, which is typically included in mining EISs, to provide a more specific basis for evaluating the effectiveness of waste management procedures and subsequent environmental impacts to water quality due to acid rock drainage and metals leaching. This information could be provided in a waste management plan as is frequently done for large mining projects in Alaska (see also our comments on Water Quality regarding this information).

1. The specific criteria that would be used to separate PAG from NPAG rock are not described in Chapter 2. Section 4.18 discusses an NP/AP ratio of 1.4, but it is not clear if that is the ratio that

would be used in practice, since it does not appear in the Project Description and a waste management plan has not been developed. We recommend that the DEIS provide the criteria that would be used to separate PAG from NPAG waste.

2. The statement on page 2-16 that, “PAG and ML waste rock would be stored in the pyritic TSF until mine closure” implies that there are two different kinds of rock – PAG rock and ML rock. We recommend that the EIS provide the definition of ML waste rock to support statements made in this Chapter and the Project Description (Appendix N).
3. In addition to identifying the criteria or thresholds that would be used to distinguish PAG from NPAG rock and ML from non-ML rock, we recommend that the EIS include the specific procedures that would be used to separate these materials. Some examples of general procedures are currently provided, such as visual inspection, blast hole sampling, and bench mapping, however, additional detail on the actual procedures would improve support for conclusions regarding potential impacts to water quality.
4. Chapter 2 discusses the segregation of waste rock and overburden and that “NPAG and non-ML waste rock could be used for embankment construction.” On page 4.18-10 the DEIS discusses that some PAG rock would be used at “limited locations” on the northern embankment of the pyritic TSF. We recommend that the EIS clarify these conflicting statements regarding the use of NPAG and non-ML waste rock and PAG waste rock for construction. We recommend that the EIS discuss how the non-acid generating and non-metals leaching material would be determined, where this waste rock will be stored, and how runoff would be managed, if the materials are not used for construction. In addition, we recommend that PAG waste rock not be used for embankment construction due to the possibility of leaching that could impact stability or result in contamination.

TSF and Water Management Pond Seepage Management: The DEIS in Chapter 2 and Section 4.18 provides general descriptions of the seepage management systems and assumes that 100 percent of the seepage from these project features would be captured. We recommend that the EIS include additional information describing the seepage management and collection systems for the Bulk TSF, pyritic TSF, and water management ponds in order to provide a basis for seepage capture estimates and more accurately evaluate impacts.

In regard to the Bulk TSF, the DEIS states that, “[t]he underdrains would enhance the flow-through design concept by providing a preferable seepage path from the tailings mass to the [seepage collection pond (SCP)] downstream of the embankment toe... [D]etails of the underdrains would be developed following more detailed site-specific geotechnical and geological investigations and observations made during the preliminary and detailed designs, in accordance with the ADSP guidelines.” (pg. 2-22). Without a preliminary design of the underdrain and seepage collection system included for review in the EIS, we were not able to verify that “[a]ll bulk TSF contact water that seeps through the embankment would be hydraulically contained,” (pg 2-24) and that groundwater contaminated by seepage that bypasses the capture system would further be detected by the seepage pumpback monitoring wells at “potential” well locations (Section 4.18.3.1). The DEIS also states that additional seepage collection, cutoff walls, and/or pumpback systems may be installed downgradient, if necessary, as determined by monitored water quality, but locations and design information for these features and a monitoring plan is not currently provided.

The EPA recommends that the Corps provide further detail to support the seepage capture efficiencies for the Pyritic TSF and water management ponds. Liners are currently proposed only under the pyritic TSF and water management ponds. The DEIS states that, “[l]iner materials would be selected during the preliminary and detailed designs in accordance with the [Alaska Dam Safety Program (ADSP)] guidelines...” (pg. 2-21). Liners are an essential component of the seepage management approach and liner characteristics influence predictions made about groundwater quality. We recommend that the EIS include additional information about liner materials and design to support EIS impact predictions that rely upon liner efficiencies.

We recommend that the EIS provide the following information related to seepage management for the TSFs and water management ponds: specific location of the underdrains in relation to project features and seepage and groundwater flow paths; performance criteria and capacity of the underdrain systems; for facilities with liners, specific types of liner and performance criteria; number of groundwater monitoring and pumpback wells and their actual locations and depths in relation to groundwater flow paths; monitoring that would occur to determine if pumpback systems are implemented; analysis of these seepage management design features in relation to Pebble Project features, and; predicted extent of groundwater contamination.

We recommend this level of detail because it supports evaluation of the effectiveness of seepage control, supports seepage rate estimates in groundwater modeling, and assists in determining environmental impacts. If specific detailed seepage collection and pumpback system design is not included in the EIS, we recommend that the EIS further evaluate the efficiency of existing systems in similar environments, to either support and demonstrate that 100 percent capture is possible or any alternative seepage capture efficiencies indicated by that evaluation.

TSF and Main Water Management Pond Embankment Design and Plans: According to Section 4.15 (Geohazards) and DEIS reference materials, the designs of the tailings and water management embankments are early stage and conceptual. We recommend using a more detailed level of design in order to evaluate with more specificity stability and impacts to environmental resources from significant mining structures, such as the TSF and WMP embankments. This is particularly important since the design of the tailings dams was identified as a significant issue during scoping (per Appendix A of the DEIS, tailings dam design ranked in the top five key issues). We recommend that preliminary designs be provided for all the embankments, as they serve as the basis for the impact assessment. See our comments on Section 4.15 for more details.

The DEIS identifies plans that will be developed for the TSFs during the ADSP permitting process including the Operations & Maintenance Manual, Emergency Action Plan, and monitoring (pg. 2-28). We recommend that the main elements of the emergency action plan and monitoring plan be described in more detail so that responsive actions in the event of changes in embankment performance (stability, seepage), accidents, or failures are further explained and effectiveness of these actions at reducing impacts can be better understood.

Pyritic TSF and Tailings Deposition: Page 2-26 states that “[t]he PAG waste would be placed on the geomembrane cover layer around the perimeter of the TSF before the tailings would be placed, and the PAG waste would be covered by the pyritic tailings. The entire pyritic TSF would be continually inundated with water to prevent the tailings and PAG waste from oxidizing and generating ARD.” We recommend replacing the word “prevent” with “minimize the likelihood,” or alternatively, adding discussion of how complete anoxic conditions would be created and maintained. Further, page 2-28

states that “[t]he surface level of the tailings would be maintained below the level of the PAG waste rock bench so that the tailings would always be buffered from the embankments by the PAG waste rock. The pyritic tailings would be kept submerged to prevent oxidation and potential acid generation.” These two pages contain conflicting information. We recommend that the EIS clarify these points and describe why the PAG waste around the perimeter would be covered by tailings if the desire is for the tailings to be away from the perimeter to allow water to pool over the tailings without being too close to the embankments, causing risk of embankment failure. Additionally, we recommend that the EIS describe whether the tailings are going to be maintained at a surface level below the PAG waste rock bench, since then the PAG waste rock would not be inundated with water. It also seems that embankment stability would be impacted if water is intended to cover the PAG rock as well as the tailings. Further, if the PAG waste rock is not inundated and therefore anoxic, it will be exposed to the atmosphere, and the resultant acidity and metals from the oxidation of minerals in the PAG rock would runoff with precipitation into the water overlying the tailings. We recommend that the waste rock and tailings management aspects be clarified in an updated project description or waste management plan and that the EIS further clarify both PAG waste and pyritic tailings placement and method for minimization of oxidation of both wastes.

Closure/Post-Closure Water Treatment: Based on our review of Section 4.18, K4.18, and referenced documents, we recommend that the Corps provide additional information to evaluate whether the proposed closure/post-closure water treatment process (WTP #3) would be able to treat water from the open pit to meet applicable water quality standards. In addition, there are significant uncertainties associated with the design of the operations main water treatment plant (WTP #2) due to the potential for the buildup of salts and selenium. We recommend that additional evaluation of water treatment occur as recommended in AECOM’s independent review of the WTPs (AECOM 2018i) and that the water management plans be revised to reflect water treatment designs and processes that will treat operations and closure/post-closure water discharges to meet the state standards. Section 4.18 and Appendix K4.18 of the DEIS do not definitively conclude that the closure WTP will meet standards; instead the DEIS states that “water quality of discharge from the open pit WTP is the subject of ongoing engineering analysis” (pg. 4.18-52). See our comments on Water Treatment, below, related to this issue for more information.

Reclamation and Closure: The lack of a detailed reclamation and closure plan is identified as a data gap in Section 3.1 of the DEIS. Reclamation and closure plans are frequently provided in mining EISs and we recommend that a reclamation and closure plan with a reasonable level of detail be provided to support the Pebble Project EIS analysis as this information is important to determine the effectiveness of reclamation and closure actions and resulting environmental impacts. The DEIS states that to accomplish dry closure, the bulk TSF tailings surface “would be covered with soil and/or rock and possibly a geomembrane or other synthetic material” (pg. 2-39). RFI 091 presents advantages and disadvantages of these cover types although it does not state what cover type would be used. We recommend that the EIS describe what specific cover material would be used to close the bulk TSF so that the effectiveness and timing of achieving dry closure can be better determined. Regarding the pyritic TSF, we recommend that the reclamation and closure plan and the EIS more fully assess the ability to adequately remove the pyritic tailings, PAG waste, liner, and any contaminated soil underneath. Further we recommend that the reclamation and closure plan describe plans for restoring any streams, wetlands, and ponds. In addition, we recommend that the EIS describe with more specificity how the cited State of Alaska reclamation standards would be implemented and met.

Financial Assurance: The DEIS states that “[a] detailed reclamation and closure cost model would 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” (pg. 2-41). We recommend a more specific discussion of the estimated financial assurance amount and mechanism be provided, given that long term water management and treatment would be required in accordance with State of Alaska regulations. This would provide a basis for evaluating whether the reclamation and closure activities would be effective in the event of a bankruptcy or compliance issues. Our scoping comments (pg. 24) provided recommendations on the level of information to include in the financial assurance estimate. Other mining EISs developed by the Corps that that may serve as models for developing financial assurance estimates include the Donlin Gold, Haile Gold, and Northmet Mine EISs.

Plan for Strategic Timing of Water Treatment Plant Discharge: There are statements in the DEIS that the treated water discharges will be managed to optimize downstream fish and aquatic habitats (pg. 4.18-7 and elsewhere). However, the DEIS does not specify how the discharges would “optimize downstream habitat.” We recommend adding a discussion and details of the strategy and how effectively it will mitigate project impacts to stream flow, water quality, and fish. We also recommend discussing how the water will be discharged or whether or where water would be stored in the interim between being treated and being discharged to accomplish strategic timing.

Fugitive Dust Control Plan: The project relies on a Fugitive Dust Control Plan to control and mitigate impacts from fugitive dust generated by the project. The DEIS provides examples of control measures that might be included in the fugitive dust control plan but does not provide the plan itself, nor does it state whether the example control measures represent project commitments. We recommend that a draft fugitive dust control plan be included in the EIS that specifies the control measures that would be used in order to more fully explain the extent to which fugitive dust releases would be mitigated and therefore reduce uncertainty regarding the level of potentially significant environmental and human health impacts due to dust releases. Our comments below on Mitigation provide a list of elements that we recommend be included in the Fugitive Dust Control Plan.

Monitoring Plan: The DEIS states that PLP proposes to use monitoring measures through construction, operations, and closure of the proposed project to assess predicted impacts and effectiveness of mitigation and that the monitoring plans would be developed during state permitting. Monitoring plans are typically included or referenced in mining EISs. We recommend that a monitoring plan with a reasonable level of detail be developed for the EIS to better provide a basis for the Corps conclusion that the monitoring plan would be effective at detecting changes. We recommend that the monitoring plan specify resources and locations that would be monitored, monitoring frequencies and parameters, and discussion of how monitoring results would be compared to baseline conditions and trends to determine if project impacts are different than predicted.

Adaptive Management Plan: Adaptive management plans are mentioned in the hydrology, water quality, and fish sections of the DEIS as an approach to respond to site conditions and project impacts that are different than predicted. The DEIS identifies that adaptive management could occur as a result of excess site water, changes to water flows and chemistry, uncontrolled potential seepage from northwest ridge of the bulk TSF, salt and selenium buildup in the water treatment plants, and impacts to water and fish that are greater than predicted. The DEIS provides examples of adaptive management and contingency actions but does not include an adaptive management plan or describe whether these examples represent project commitments. We recommend that PLP develop an adaptive management plan(s) for these elements so that the effectiveness of adaptive management at identifying and responding to changes and mitigation impacts can be assessed in the EIS. We recommend that the adaptive management plan describes which project elements would be subject to adaptive management and, for each of these

project elements, identifies the specific monitoring that would occur, thresholds or trigger levels that would result in an adaptive management or contingent actions, and the specific actions that would be taken in the event of the threshold or trigger level being exceeded.

Additional Comments on the Proposed Project

Following are additional comments related to the description of the Proposed Project.

Mine Site Material Sources: The DEIS states that surface runoff from the quarries for mine site material is non-contact water (pg. 2-18). Quarries are classified as gravel pits and subject to the CWA National Pollutant Discharge Elimination System (NPDES) Effluent Limitation Guidelines (ELGs)¹ and any surface runoff is defined as mine drainage. This type of discharge could be covered by an Alaska Pollutant Discharge Elimination System (APDES) general stormwater permit because this is one of the non-stormwater discharges that can be covered. We recommend that the characterization of this type of water be corrected.

Material Management and Supply: Chapter 2 of the DEIS states that “Appendix K2 provides a table that shows average annual quantities of fuel, mining, milling, and miscellaneous consumables, as well as common mining supplies, processing reagents, and materials” (pg. 2-30). Table K2-5 does not include the chemicals required for the water treatment plants during operations and closure. We recommend that the chemicals and estimated quantities that would be required for water treatment be added to Table K2-5 so that both the type and amount of chemicals are included. In addition, since large quantities of specific chemicals would be required, we recommend ensuring that both traffic estimates for materials being brought to the site and onsite storage requirements during operations and closure include the chemicals needed for ongoing water treatment.

Transportation Corridor, Ferry: Regarding bilge water, which would be treated and discharged to Lake Iliamna, the Vessel Incidental Discharge Act (VIDA) requires the EPA to develop performance standards for those discharges and requires the U.S. Coast Guard to develop implementation, compliance, and enforcement regulations. Under VIDA, all provisions of the EPA NPDES Vessel General Permit (VGP) remain in force and effect until the U.S. Coast Guard regulations are finalized. We recommend that Chapter 2 of the EIS be updated to acknowledge the existing and future regulatory requirements for discharges from vessels, such as the ferry across Lake Iliamna. The DEIS also states that there will be office and maintenance buildings at both terminals (pg. 2-50), and we recommend that this section include a description of wastewater disposal for the terminal buildings.

Port Operations and Materials Transport: The DEIS describes the potential for wash water from rinsing the mine/ore concentrate containers to be treated and discharged at the port site (pg. 2-69). This water is mine process water, and as such, it is not an allowable discharge under the CWA. See our additional comments under Alternative 3, below.

Natural Gas Pipeline: The DEIS discusses that “mainline sectionalizing valves would be installed as required by code, with a spacing of no more than 20 miles for the onshore sections” of the natural gas pipeline (pg. 2-75). We recommend that the spacing for off-shore sections also be included.

¹ 40 CFR § 436.

Summary of Project Phases: Table K2-2 (Appendix K2) summarizes the activities that would occur during the project phases. During the closure and post-closure phases, the activity is listed as “Closure” and “Monitoring.” We recommend that the need for active long-term water management and treatment be included during each of these project phases, including a specific description of the activities during the closure and post-closure phases.

ALTERNATIVES

Our primary issue and recommendation related to alternatives is that the EIS analyze additional alternatives so that the EIS range of alternatives includes alternatives that may be the Least Environmentally Damaging Practicable Alternative (LEDPA) under Section 404 of the CWA. Our letter on the CWA 404 Public Notice (see Section VI of the letter) also reflects these issues and discusses the CWA 404(b)(1) Guidelines.

Alternative 3 – Concentrate Pipeline Variant: Alternative 3 includes a port site variant that would include a water treatment plant at the port to treat and discharge process wastewater from the concentrate pipeline. That wastewater would consist solely of process wastewater resulting from use of a froth floatation process in the mill. Discharge of that process wastewater is prohibited under the New Source Performance Standards (NSPS) of the Effluent Limitation Guidelines (ELG) which were promulgated under the Clean Water Act by the EPA in 1982 (see 40 CFR 440.104(b)(1)). Discharge of process wastewater should not be included as a variant to an alternative in the EIS because this discharge is not feasible as that term is used under in NEPA (i.e., it cannot be authorized in an NPDES permit).

The New Source Performance Standards (NSPS) found in 40 CFR § 440 Subpart J cover three different types of discharges. Mine drainage and excess precipitation falling on the treatment area are allowable discharges under 40 CFR 440.104(a) while process water is not.

40 CFR 440.104(b), states:

(b)(1) Except as provided in paragraph (b) of this section, there shall be no discharge of process wastewater to navigable waters from mills that use the froth-flotation process alone, or in conjunction with other processes, for the beneficiation of copper, lead, zinc, gold, silver, or molybdenum ores or any combination of these ores. . . .

While there are exceptions in the regulation that would allow the discharge of excess precipitation or recycle water, these exceptions do not apply in the case of the treatment system at the port facility as the pipeline would solely transport process wastewater. The exceptions stated in the 1982 NSPS are as follows:

(b)(2)(i) In the event that the annual precipitation falling on the treatment facility and the drainage area contributing surface runoff to the treatment facility exceeds the annual evaporation, a volume of water equal to the difference between annual precipitation falling on the treatment facility and the drainage area contributing surface runoff to the treatment facility and annual evaporation may be discharged subject to the limitations set forth in paragraph (a) of this section.

(b)(2)(ii) In the event there is a buildup of contaminants in the recycle water which significantly interferes with the ore recovery process and this interference cannot be eliminated through appropriate treatment of the recycle water, the permitting authority may allow a discharge of process wastewater in an amount necessary to correct the interference problem after installation of appropriate treatment. This discharge shall be subject to the limitations of paragraph (a) of this section. The facility shall have the burden of demonstrating to the permitting authority that the discharge is necessary to eliminate interference in the ore recovery process and that the interference could not be eliminated through appropriate treatment of the recycle water.

The language of the net precipitation allowance may lead one to the conclusion that any volume of water equivalent to the net precipitation could be discharged, regardless of water composition. The language of 40 CFR 440 Subpart L explains the concept of combined waste streams, which allows for discharge if allowable and nonallowable waste streams are treated together or stored together (as in a tailings impoundment facility):

“Combined waste streams. In the event that waste streams from various subparts or segments of subparts in part 440 are combined for treatment and discharge, the quantity and concentration of each pollutant or pollutant property in the combined discharge that is subject to effluent limitations shall not exceed the quantity and concentration of each pollutant or pollutant property that could have been discharged had each waste stream been treated separately. In addition, the discharge flow from the combined discharge shall not exceed the volume that could have been discharged had each waste stream been treated separately.” 40 CFR 440.131(a).

Further, the EPA wishes to correct a misunderstanding stated in the following discussion in the RFI 066:

From RFI-066: “EPA’s regulations do not limit where allowable discharges of process wastewater may occur nor do they restrict the process wastewater to certain processes within the mill or limit process wastewater discharges to those directly from the tailings facility. Rather, EPA’s regulations only limit the total volume of process wastewater that may be discharged and leave open questions of “when, where, and how.” As provided in EPA’s 1982 Guidance document describing application of the net precipitation exception “[t]he volume allowed to be discharge[d] may be apportioned as the operator sees fit.” See Development Document for Final Effluent Limitations Guidelines and New Source Performance Standards for the Ore Mining and Dressing Point Source Category, pp. 536 (EPA November 1982). This suggests that the mine operator has significant discretion on discharges of the process wastewater provided the operator does not exceed the volumes allowable under the regulations.”

The above quote on apportioning the discharge is from a section of the Development Document that was part of the record for the ELGs discussing the discharge of net precipitation, not process discharges. As stated at 40 CFR 440.104(b), there shall be no discharge of process wastewater to navigable waters from mills that use the froth floatation process alone or in conjunction with other processes. The examples provided in the Development Document discuss the timing of the discharge of excess precipitation (more in wetter months, less in drier) and not the overall composition of the discharge. That analysis found in the Development Document does not address the commingling provisions of the NPDES regulations.

Alternatives 2 and 3 – Transportation and Port Site: Alternatives 2 and 3 include a port at Diamond Point, which is currently being developed as a rock quarry. Development of the Diamond Point rock

quarry involves construction of an access road, breakwater, barge landing, and a solid-fill dock. It also involves 11.42 acres of intertidal fill and dredging in Iliamna Bay. The DEIS does not consider the Diamond Point alternative in light of this rock quarry. Specifically, the DEIS does not explain whether and how the rock quarry and Diamond Point alternative will cause impacts to the same aquatic resources. The DEIS would be strengthened by a discussion of whether and how the dredging for the rock quarry would reduce the 58 acres of dredging and 16 acres of onshore dredge materials storage proposed for Alternatives 2 and 3. In addition, the DEIS does not consider whether and how the two projects will be integrated, if at all. We recommend that the DEIS address this in order to more fully explain whether there is a practicable alternative to the Diamond Port alternative that would have less adverse impact on the aquatic ecosystem. We recommend that the EIS document whether and how the rock quarry and proposed Diamond Point port infrastructure, dredging, and vessel operations will cause impacts to the same aquatic resources. In addition, we recommend that the EIS explain whether and how the two projects will be integrated, if at all. In the alternative, we recommend that the EIS further explain why its existing description of the alternatives analysis for the Diamond Port alternative is sufficient.

Mine Site Component Locations: The DEIS evaluates one location for each of the TSFs, both of which involve a discharge to wetlands or other special aquatic sites. TSFs are not water dependent, and as a result, practicable alternatives that do not involve a discharge to wetlands and other special aquatic sites “are presumed to be available, unless clearly demonstrated otherwise.” DEIS Appendix B (TSF-025, pg B-80) indicates that the Corps considered 26 different locations for the TSFs that were not evaluated as alternatives. The DEIS identifies the location of three of these 26 options in Figure B-3 and the locations of the other 23 options are found in RFI 098. RFI 098 identifies TSF location options assessed by PLP that have less impacts to streams with anadromous fish than the proposed action. The DEIS does not fully explain why these 26 options are not practicable. To strengthen the TSF location options screening, we recommend that the Corps should include all 26 TSF options on Figure B-3 and explain why each of the 26 TSF locations are not practicable. Alternatively, we recommend that the Corps further explain why its existing description and analysis of the 26 TSF options is sufficient.

The location proposed for the main WMP involves a discharge to wetlands or other aquatic sites. WMPs are not water dependent, and as a result, practicable alternatives that do not involve a discharge to wetlands and other special aquatic sites “are presumed to be available, unless clearly demonstrated otherwise.” The options screening analysis in DEIS Appendix B does not appear to consider any alternative locations for the main WMP. The DEIS does not explain why the main WMP location is the only practicable alternative or explain how the WMP location was optimized to avoid and minimize impacts to aquatic resources. We recommend that the EIS describe why the proposed location for the main WMP is the only practicable alternative and explain the extent to which the proposed WMP location was optimized to avoid and minimize impacts to aquatic resources. In the alternative, EPA recommends that the Corps further explain why its existing description of the main WMP is sufficient.

According to RFI 098, the 26 TSF layouts were compared to several attributes, including minimizing managed water volume, impacts to fish-bearing streams, and impacts to wetlands and stream miles. None of the attributes consider downstream impacts in the event of a tailings dam failure. In light of the value of fisheries resources in the potentially affected watersheds (see Section II), downstream impacts in the event of a tailings dam failure should be one of the attributes included in the comparison. EPA notes that the current best practice for evaluating the different tradeoffs between TSF location, dam type, and impacts is a Multiple Accounts Analysis (MAA). We recommend that the EIS evaluate and document the potential downstream impacts in the event of a tailings dam failure to support its LEDPA

determination and conclusions that there are not alternate location(s) that would have less impacts in the event of a tailings dam failure. We recommend that the EIS explain whether a MAA was performed for the TSFs or further explain why its existing description of the alternatives analysis for the TSFs is sufficient.

Transportation Alternatives – Corridors: The DEIS presents alternatives for the proposed transportation corridor, each of which involves discharges to wetlands and other special aquatic sites. The road and pipeline alignments are not water dependent, and as a result, practicable alternatives that do not involve the discharge to wetlands and other special aquatic sites “are presumed to be available, unless clearly demonstrated otherwise.” We recommend that the DEIS more fully explain the information it considered when selecting which alternative road alignments to evaluate and in particular how this information relates to impacts on the aquatic ecosystem. In addition, the figures presented in K4.22 only provide information on wetlands and other aquatic resources inside the proposed corridors and do not indicate the status of areas outside the corridors. We recommend that the EIS explain and document the information it considered for the transportation corridor alternatives to demonstrate that there are not practicable alternatives to the transportation corridors analyzed that would have less adverse impact on the aquatic ecosystem, in order to clarify whether impacts to aquatic resources in the proposed transportation corridors could have been avoided and minimized. In addition, we recommend that the EIS include information about how wetlands and other aquatic resources were avoided and minimized to the extent practicable or further explain why its existing description of the alternatives analysis for the transportation corridor is sufficient.

Bulk TSF Liner: The DEIS predicts that groundwater contamination will occur under and beyond the bulk TSF. The DEIS assumes that all contaminated groundwater will be collected by the seepage management system. However, this assumption could be further supported with information about the seepage collection system design in relation to groundwater and geologic characteristics and the predicted contaminant plume (see our comments above and on Section 4.17). We have had discussions with the Corps about the considerations and trade-offs involved with inclusion of a liner. The EPA’s letter on the CWA 404 Public Notice explains why the EPA believes this alternative could be part of the LEDPA. A liner is a typical management practice for TSFs that minimizes groundwater contamination, and we note that the Corps has recently permitted two fully lined tailings facilities at the Donlin and Haile mines and that a liner is included for the pyritic TSF. We recommend that the EIS evaluate the use of a liner as an alternative, alternative variant, or mitigation or further explain why a liner is not a practicable alternative to mitigate the predicted groundwater contamination. If a liner alternative or variant is analyzed, we recommend considering the inclusion of overdrains on top of the liner to help mitigate stability problems. Pumping tailings supernatant to the main WMP could be an additional mitigation measure to enhance stability, by further removing water from a lined tailings storage facility.

Potential Additional Alternative - Infrastructure Associated with Expanded Mine Development:

The DEIS indicates that expanded surface mining would require construction of the north access road and concentrate pipeline as described in Action Alternative 3. However, the concentrate pipeline would terminate at a new deepwater port facility constructed in Iniskin Bay² rather than at Diamond Point. A diesel pipeline following the road route and a diesel terminal at the Iniskin Bay port would also be required (DEIS Table 4.1-2). The Iniskin Bay port and diesel pipeline are not, however, being evaluated as alternatives for the currently proposed project. These components may be practicable now and it is

² The project proponent previously evaluated Iniskin Bay as a potential port site and multiple years of baseline data were collected.

possible that they could be part of the LEDPA. In evaluating whether the Iniskin Bay Port and diesel pipeline are part of the LEDPA, the Corps must evaluate the direct, secondary/indirect, and cumulative impacts to jurisdictional waters resulting from each alternative considered. One potential advantage of the Iniskin Bay port and diesel pipeline is that constructing this infrastructure now may avoid redundant infrastructure for expanded surface mining. Specifically, when the cumulative impacts of expanded mine development are considered, infrastructure such as the southern access route and ferry would appear to be redundant and therefore involve avoidable impacts. The Council on Environmental Quality (CEQ) cumulative effects guidance (CEQ 1997) states that lead agencies can “[m]odify or add alternatives to avoid, minimize, or mitigate significant cumulative effects.” The cumulative effects of an additional port site and pipeline to accommodate future mine expansion could be significant. We recommend that the EIS evaluate this additional transportation corridor alternative terminating in Iniskin Bay or further explain why it is not practicable.

GROUNDWATER AND SURFACE WATER HYDROLOGY

Priority issues related to groundwater and surface water hydrology include potential inaccuracies and uncertainties associated with the hydrologic modeling and conceptual level of pit dewatering design, seepage management system design, and adaptive management which may result in underpredictions of the magnitude and extent of impacts to groundwater and surface water hydrology. The following detailed comments describe these key issues and provide recommendations for additional analysis to fully explain potential impacts to hydrology; comments related to open pit dewatering, seepage management, and adaptive management are also found in “Conceptual Level of Design and Development of Key Project Features and Plans”. Additional comments on groundwater and surface water hydrology are provided following our key comments.

Hydrologic Modeling

Verification of Water Balance Model: Section 3.16 states that the water balance model incorporates three modules (watershed, groundwater, and mine plan modules) and that “the watershed module is a semi-distributed spreadsheet-based precipitation-runoff model” (pg. 3.16-18). However, there is no detailed explanation of the model and its application included in the DEIS. Most applied models are reviewed for accuracy and validity by analyzing inputs, model components, equations of those component relationships, and comparison of model outputs with measured/observed data at different study watersheds. We recommend that the Corps provide documentation to address these important components of model application. We recommend that the Corps consider EPA guidance on evaluation, application, and reporting of environmental models for impact prediction,³ and include further information regarding water balance model accuracy and validity and verification of the merits and limitations of the model. In addition, we recommend that the NEPA document include: a description of the input parameters, including which hydrologic cycle components are included in the model; what water balance equations are used to determine the relationships of different water balance components; whether the spreadsheet method of water balance approach has been tested at different watersheds for its applicability; and how calibration and validation years were determined.

Groundwater Model Calibration and Sensitivity Analysis: The DEIS states that the groundwater model is still in the process of being updated and has not been fully calibrated and that “[c]ompletion of a model calibration report demonstrating adequate calibration of the model and including a more robust

³ Guidance Document on the Development, Evaluation, and Application of Environmental Models, EPA/100/K-09/003.

sensitivity analysis would enhance the reliability of the model findings” (pg. K4.17-2). Because groundwater model findings are essential to the evaluation of groundwater impacts and input into the water balance model, we recommend completing the groundwater model calibration and sensitivity report to better demonstrate the adequacy of the groundwater model and water balance model results used for the EIS analysis of impacts.

Appendix K3.17 states that Monte Carlo analysis was used to assess groundwater model uncertainty and that “[t]his methodology differs from standard sensitivity analyses in which model realizations frequently exceed calibration criteria, meaning that the scenarios simulated may not be physically credible compared to existing field data.” (pg. K3.17-33). We recommend that the Corps further explain this discrepancy in methodology regarding the differences of the two methods (Monte Carlo vs. standard sensitivity analysis) in a quantifiable way, or further explain why quantification is not necessary in this regard. We also recommend that the groundwater model be revised to improve accuracy or that the EIS discuss how these potential inaccuracies with the model affect the impact predictions.

Groundwater Model and Extent of Groundwater Hydrology Impacts: The DEIS uses the groundwater model to predict changes in groundwater conditions resulting from mine site activities. The DEIS states that the model may underpredict the impacts of pit dewatering as “the range of capture zones shown on Figure 4.17-2 are based on evaluating a modest range of variability in hydrogeologic properties assigned to the different layers and zones in the model to estimate the effect of uncertainty in these parameters.” Considering the model uncertainties, the actual results of dewatering the pit may differ from projections described above. The DEIS states that “[i]t is expected that the amount of water produced during pit dewatering could be larger than simulated, and the capture zone and zone of influence could be larger” (pg. 4.17-6).

We recommend revising the groundwater model to reduce this level of uncertainty and provide more accurate and conservative predictions relevant to the amount of water produced during pit dewatering, capture zone, zone of influence and changes in groundwater conditions. We recommend that the Corps evaluate the model’s hydrogeological input parameters that have the most influence on groundwater model results and adjust these input parameters, as needed, to develop more accurate predictions of the capture zone and open pit dewatering amounts. We recommend that groundwater model results be provided for expected conditions and conditions that could occur during dry and wet years and that the EIS explain the range of conditions modeled.

The groundwater flow model results provide the basis for other estimates and models. Therefore, we recommend that impact analyses based on the groundwater flow model results be revised based on the revised groundwater modeling, including the water balance estimates and stream flow reduction estimates, in order to reduce the likelihood that the severity of effects on groundwater and surface water flows and the ecologically important wetlands, lakes, and ponds and the fishery areas they support be underpredicted.

Watershed Module: In the calibration and validation plots for the North Fork of the Koktuli River and the South Fork of the Koktuli River provided in RFI-104, the model underestimates streamflow during higher flows and overestimates streamflow during lower flows, but it doesn’t appear that there is consistency within or between years. The differences are evident also for the Upper Talarik Creek sites but appear less dramatic. There is a statement in RFI-104 that the model may not be able to predict the lowest flows. Low streamflows are associated with groundwater base flow in systems where there is interaction between surface water and groundwater. Because it is important to ensure that the Watershed

Module and Water Balance Model calibration accounts for the seasonal and annual variability of streamflow to address low, average, and peak flow periods or dry, average, and wet years and because of the apparent differences in model predictability based on seasonal flows (peak months and baseflow months), we recommend considering running models for separate flow seasons to see if there were closer fits to the actual data that would more fully capture the seasonal and annual variability. Alternately, we recommend discussing in the EIS how the potential inability to predict the lowest streamflows influences interpretation and use of model results and groundwater and streamflow estimates. We also recommend discussing whether the use of seasonally-separated flow models would better predict actual conditions.

Discussion of the calibration in RFI-104, Watershed Model Documentation, states that, “[i]n general, modeled flows replicate the winter low flows and the peaks created by freshet and fall rains. The cumulative plots show that the total water passing the gage over the calibration period matches well; however, the model over predicts the cumulative volume of water over the first two years of the calibration period and under predicts the cumulative flow for the remaining 3 years for most gage sites. The maximum discrepancy between calculated and measured cumulative flows is up to about 20 percent across the sites.” However, the plots in RFI-104 indicate that some of the absolute differences between measured and calculated streamflows differ by more than 20 percent. We recommend that the EIS discuss how the 20 percent discrepancy in cumulative flows is considered in the Watershed Model output and what influence those results have on the output of other modules, such as the Water Balance Module, utilizing the same data.

Watershed Model inputs are based on monthly averages. Extreme precipitation events can have significant impacts in the affected environment, which cannot be simulated using the month-to-month approach. We recommend consideration of modeling the maximum and minimum values, or following a daily or event-based approach, to capture the variability in conditions, or that the EIS demonstrate how the current approach represents the range of flows that occurs over each month and takes into account extreme events on the water balance components in the watershed. We recommend that the EIS discuss how variability in input data for the Watershed Module (and other modules) is accounted for in model output. This is especially important if outputs from one module are used as inputs to another module. If the uncertainty in the model output (from both the assumptions used to develop the model and from the variability in each component of input data) is not carried forward with any use of model outputs as inputs for another module, we recommend that the EIS describe how this practice affects the mine site water balance.

We also recommend that the EIS more fully explain how the baseline data set does or does not consider extreme climate conditions. Long-term historical hydrologic assessment helps to understand how the watersheds in the area respond to natural events, especially extreme events related to drought and flooding. The baseline surface hydrology data used in this analysis spans a period of approximately 10 years or less (primarily from 2004 to 2012). Because the data set does not appear to capture historical conditions, we recommend using models to assess historical conditions by incorporating modelled weather and climate parameters. We understand that synthetic precipitation and temperature records were developed as part of the analysis for the DEIS. We recommend that the EIS discuss how the synthetic weather variables were developed by describing the equations or methods used for development, the objective criteria to assess the synthetic variables, the uncertainty analysis used to evaluate the accuracy of synthetic products, and how the peak flows were estimated from those parameters.

Spatial variability of hydrologic components over the geographic area is notable, and we recommend that the modeling address this variability. Without accounting for spatial variability, it is difficult to conclude that the model applied is a semi-distributed model. We recommend that the EIS include whether any interpolation of weather parameters at gaging stations was conducted for the model to cover spatial variability of watersheds.

Finally, we recommend that the Corps further consider addressing the magnitude and extent of increase/or decrease of the surface water flow in streams within the project study boundaries and beyond. Quantifying the watershed's response as a system, rather than solely looking at changes at gaging points, can help to assess the environmental consequences. We recommend including predictions of possible consequences on surface water magnitude and timing from the full implementation of the mining project using different scenarios, for example minimum, average, and maximum impacts.

Hydrology Impacts

Bulk TSF Groundwater Hydrology Impacts at Closure: The DEIS (Section 4.17.3.1) discusses changes in groundwater hydrology due to the presence of the bulk TSF during operation, but not during closure and post-closure. The bulk TSF will remain as a permanent site feature at closure and post-closure and therefore we recommend that the EIS describe expected impacts to groundwater hydrology during these phases.

Bulk TSF Seepage Estimates and Environmental Consequences: The DEIS includes inconsistent statements regarding the amounts of bulk TSF seepage that would flow through the embankment and the amount of seepage that would flow vertically into bedrock fractures.

Regarding flow into fractures, the DEIS states that seepage from the bulk TSF will flow laterally to the SCP and that some could also flow vertically downwards into deeper bedrock fractures (pg 4.17-4). Table 4.17-1 states that diverted groundwater would be "largely captured, treated, and discharged." Other sections of the DEIS imply that 100 percent of the seepage would be captured. We recommend resolving these conflicting statements and that the EIS describe how much seepage could flow into deeper bedrock fractures, where these fractures are located, and the extent to which these fractures could contaminate groundwater and transmit it beyond the mine site during operations, closure and post-closure.

The DEIS states that seepage through the embankment would be about nine cubic feet per second and seepage to groundwater would be 0.1 cfs (Section 4.17.3.1). The DEIS Geohazards Section (Section K4.15.1.4) states that seepage would be from 3 to 14 cfs and up to 20 cfs. The water quality section (Section 4.18.3.1) states that seepage would contribute 0.2 cfs to underlying groundwater (assumed to be accurate within a factor of 5) as compared to 9 cfs through the embankment. To resolve inconsistent estimates provided in the DEIS of seepage from the bulk TSF, we recommend that the EIS consistently describe the estimates of seepage through the embankment, to shallow groundwater, and to deeper bedrock fractures and that the EIS describe the uncertainty associated with these estimates.

Bulk TSF Seepage Adaptive Management and Contingencies: The DEIS states that "because tailings along the northwestern ridge of the bulk TSF would be built up higher than the two saddles along this ridge, it is possible that there would be a potential for groundwater flow paths through these saddles in late operations" (pg. 4.17-14). According to the document, "contingencies such as relief wells and/or seepage recovery wells would be implemented" if seepage through the ridge is detected by piezometers

along the ridge and downstream. However, no details are provided regarding the adaptive management strategy that would be used to monitor, detect, and respond to any uncontrolled potential seepage. Nor does the referenced technical report (Knight Piésold 2018n) provide this detailed information. We recommend providing a detailed plan to detect and respond to uncontrolled potential seepage through the saddles and elsewhere as a reference document and summarizing the findings in the EIS.

Water Balance and WTP Capacity: The DEIS (Section 4.16.3.1) states that the water balance estimates may be subject to significant uncertainty since the predictions of groundwater flow to the pit are more likely to be low than high, and therefore the WTPs may need to process and discharge more water than currently anticipated (during both operations and closure). The DEIS does not include whether the WTPs are currently designed to treat higher flows and significant impacts to water quality could occur if the water treatment plant designs are based on an underestimate of the volume of water that will need to be treated. As noted above, we recommend revising the groundwater model and the water balance model to reflect higher pit inflow and also comparing the updated water balance results to WTP capacities so that the ability of the WTPs to treat the expected volume of wastewater is evaluated and included.

Excess Water Adaptive Water Management: The DEIS describes conceptual and general strategies for managing excess water at the mine site (pg 4.16-8). Given the uncertainty associated with the water balance estimates and the real potential for excess site water, we recommend that the EIS further examine the strategies and discuss their implementation and effectiveness to manage excess water. One of the strategies includes directing excess water to the open pit; we recommend that the EIS explain how this strategy could be implemented in practice, since the open pit is to be kept dry during mining. Another strategy is to direct excess water to the bulk TSF; we recommend that the EIS explain how this strategy could impact the freeboard and stability of the TSF. Conceptual adaptive strategies are listed, but an adaptive management plan is not provided. We recommend providing an adaptive management plan that describes the monitoring, trigger levels, and actions that would be taken in the event of water flows or chemistry that is greater than predicted, to enable determination of how adaptive management would be implemented and whether it would be effective.

Additional Hydrology Comments & Recommendations

Following are additional comments related to groundwater and surface water hydrology.

Groundwater Hydrology

Characterization of Aquifers and Confining Units: The DEIS displays cross-sections developed from borehole data to illustrate the subsurface distribution of aquifers and confining units in the mine vicinity. While the document states that the cross-sections illustrate lateral variability in surficial geology, this conclusion does not appear to be drawn from the figures. We recommend showing the extent of the aquifers on a plan view figure and providing additional information to clarify whether the aquifers and confining units in the mine vicinity are considered continuous or discontinuous.

Figures are also included to illustrate shallow groundwater flow patterns in the surficial aquifer at seasonal low and seasonal high-water levels (Figure 3.17-9a and Figure 3.17-9b). We recommend providing data points and representative elevation measurements utilized to generate the flow contours to show how the measured data support the contours. (Pg 3.17-4/3.17-6)

Characterization of Groundwater and Surface Water Interaction: We recommend providing additional information regarding how surface and groundwater interact across the mine site area, including an assessment/quantitative estimates of discharge from and recharge to groundwater (e.g., locations, forecasted volumes, seasonal variations, etc.) to indicate the extent of surface/groundwater interaction. This information could be provided in the EIS as a range of the minimum, average, and maximum discharge/recharge values. The DEIS concludes that the majority of stream reaches in the region are “gaining” reaches, that is, they receive groundwater discharge from the underlying aquifer. Losing stream segments are shown in Figure 3.17-11, however, a limited number of data points are displayed on this figure. We recommend that the EIS describe how determinations regarding which reaches are gaining versus losing were made, and that the Corps provide additional data points and representative elevation measurements where needed to support such determinations (i.e., relevant surface water and groundwater measuring points and values). We also recommend providing additional figures in the EIS that show representative gaining and losing scenarios based on existing data. (Pg 3.17-21/3.17.1.7)

Characterization of Flood Hazards: The DEIS states that because the project area watersheds “... are essentially undeveloped, a pre-mine flood hazard does not exist.” This statement appears to neglect other potential factors contributing to flood hazard, such as soil moisture content and extreme precipitation events. We recommend including additional discussion in the EIS to support the conclusion that baseline conditions throughout the project area include zero risk of flood hazard.

Water Management Pond Impacts to Groundwater: The DEIS acknowledges that “impacts to groundwater from the main WMP and open pit WMP would occur” (pg. 4.17-12) but provides little detail regarding the extent and magnitude of the impacts to groundwater elevations and flow. We recommend that the EIS include additional information regarding the potential impacts to groundwater from the WMPs. In addition, we recommend clarifying the statement in the DEIS that “effects could slightly exceed historic seasonal variation but would not extend beyond project component areas” with regard to magnitude and extent of impacts to groundwater elevations, as well as clarifying how the extent of impacts will be assessed beyond the component areas.

Private Groundwater Wells: The DEIS discloses the presence of 11 private groundwater wells within 0.5 miles of the pipeline infrastructure on the eastern side of Cook Inlet and provides a figure showing the location of those wells. While Section 4.17 acknowledges that the horizontal directional drilling (HDD)-installed pipeline would be expected to intersect aquifers used by these private wells, it does not address the potential for impacts to water quality or quantity. We recommend that the EIS evaluate and explain whether any hydrologic impacts are expected to affect private wells in the project vicinity and the plans for adaptive management as well as community outreach and support for safe drinking water should a pipeline failure occur.

Key Issues Summary, Table 4.17-1: We recommend that the uncertainty associated with the estimates to changes in groundwater be included in the table or as a footnote, particularly since they may be underestimated due to significant uncertainty identified in the groundwater model.

Surface Water Hydrology

Streamflow Changes: The DEIS (Section 4.16.3.1) states that streamflow predictions during operations and closure may be subject to significant uncertainties due to underestimates of groundwater flow into the pit. This could result in stream reaches that are not currently predicted to be impacted to be impacted, due to the underestimation of groundwater flow to the pit. As discussed above (see our

recommendations for the groundwater model), we recommend that the groundwater modeling be revised based on higher inflows and that predicted changes to water balance, discharge volumes, and streamflows be subsequently revised such that the EIS more accurately predicts the magnitude and extent of streamflow impacts during mine operations, closure and post-closure.

Tables 4.16-2 and 4.16-4 provide estimates of the changes in average monthly streamflow during operations at a 50th percentile probability. We recommend providing summary tables in the EIS that show the changes associated with low and high flows. The 5-year low, 10-year low, 5-year high, and 10-year high flow information is provided in the cited reference, AECOM 2019b. The extent and magnitude of changes in streamflow are important to characterize in Section 4.16 and are also important for the subsequent sections that describe impacts to wetlands and aquatic resources (due, in part to these streamflow changes). Because of the importance of this information, we recommend including the low and high flow tables from AECOM 2019b in the EIS and/or Appendix K4.16 rather than in a reference document. In addition, we recommend adding figures to the EIS that show the locations of the stream reaches shown in Table 4.16-2, so that the geographic extent of streamflow changes are more fully explained.

Operations Water Management: According to the DEIS, the average annual process water surplus treated and discharged during maximum operations is estimated to be 29 cfs. We recommend further discussing the uncertainty around this estimate, particularly given the significant uncertainty in open pit water inflows (see Hydrologic Modelling comments, above). There are statements in the DEIS that the treated water discharges will be managed to optimize downstream fish and aquatic habitats. We recommend that the EIS provide a description of the system for managing treated water discharge and assess its effectiveness at optimizing downstream habitats.

Design Criteria (Freeboard) for Water Management Structures: We recommend that the DEIS provide numerical values related to the inflow design flood and freeboard in feet for the WMPs, SCPs and TSFs (see Table 4.16-1) or otherwise show that these facilities are designed with adequate freeboard and factors of safety, pertinent to both the Surface Water Hydrology and Geohazards (Section 4.15) environmental consequences sections.

Water Extraction Impacts Along Transportation Corridor: The EIS would be strengthened by additional evaluation of the potential effects from water extraction during construction and operation along the transportation corridor. Both temporary and long-term water extraction has the potential to reduce streamflow, alter wetland hydrology, and affect fish habitat. The DEIS, Chapter 2, provides a summary of water extraction sites and estimated annual water use, along with the length and area of access roads that would be constructed to extract the water. The specific locations of water extraction, the anticipated rate of extraction, and years of use are provided in Appendix K2. Many water extraction sites are stated to operate throughout the “life of mine” in Appendix K2, including four stream locations and five lake locations under Alternative 1. We recommend that the EIS provide additional information and analysis to further explain the amount of water available at each extraction site, in order to better support conclusions regarding the effects of these water withdrawals on streamflow and fish habitat. Furthermore, the discussion of effects resulting from water extraction is limited to those on waters that contain anadromous fish. The DEIS states that “[p]ermit compliance would avoid the potential for impacts from water withdrawal at streams” (pg. 4.16-30). We recommend that the EIS explain whether anadromous fish are located at every water extraction site, and therefore whether this conclusion is appropriate for every water extraction site. We further recommend that the EIS discuss the types of measures that the permit would require to protect fish generally, including anadromous fish, and how

impacts would be reduced using those measures. We recommend that for each extraction site, the DEIS explain how much water, wetlands, and habitat are currently present (the baseline), and the potential for impacts to streamflow, wetland hydrology, and fish habitat. We recommend that the analysis include information about the specific water bodies where water extraction will occur, including more information than a simple water resource categorization of “stream,” “lake,” or “pond,” and that the analysis include a comparison of proposed water extraction to streamflow data collected from stream gaging stations (Figures 3.16-4 and 3.16-15).

Amakdedori Port Design and Analysis of Nearshore Sediment Transport: The DEIS provides a cursory discussion and analysis of coastal processes and does not include a coastal engineering assessment for the Amakdedori Port location, nor an assessment of the prevailing littoral drift direction along the shoreline in that area. The drivers and magnitude of shoreline sediment transport processes and sediment sources are not discussed, nor are the long-term changes (erosion, accretion, substrate characteristics) to the shoreline and associated resources (e.g., at the mouth of Amakdedori Creek). Statements in the DEIS that no predominant littoral sediment transport nor alongshore currents exist at Amakdedori Port are based on “historical and current photos of the coastline,” though the details, scope, and sufficiency of this analysis are not provided. In addition, the document states that the shoreline is currently “in equilibrium,” and that while some accumulation at the base of the causeway is inevitable, there are no signs that such accumulation would be large or persistent. We recommend that the EIS more fully explain the details and analysis supporting this statement.

Proposed construction of the Amakdedori Port marine facility (11 acres) includes an earthen access causeway (500 feet wide x 1200 feet long) extending out to a marine jetty, located in water depth -15’ below mean lower low water (MLLW). The marine jetty (120 feet wide x 700 feet long) would continue to extend into the Bay from there and would be a sheet pile cell structure filled with granular material. Thus, the overall structure would extend perpendicular to the shoreline, almost 2000 feet into Cook Inlet (see Figures 2-28 and 2-33), and would affect coastal processes in this area. Therefore, we recommend conducting a coastal engineering analysis specific to the two marine port alternative locations to assess the effects of the alternative port causeway/jetty structures on adjacent shorelines, sediment transport processes, and associated resources. We recommend including the information in the EIS to further support conclusions regarding potential impacts to nearshore sediment transport.

The Amakdedori Port description states that “dredging of the port site would not be required.” Required navigable depths for fully loaded lightering barges and marine traffic other than tugs (12-foot draft) are not provided, and there is currently no analysis to support the statement that maintenance dredging would never be required at this site. The previously recommended coastal engineering analysis would also provide a prediction of the frequency and potential volumes of sediment associated with any maintenance dredging required for each alternative for decision makers and the public to consider. We additionally recommend evaluating and disclosing the impacts to the immediate and adjacent shoreline from the pile-supported causeway and jetty variant (Section 2.2.2.7 Action Alternative 1 – Pile-Supported Dock Variant), as dense piling structures affect sediment transport.

Diamond Point Port Design and Analysis of Nearshore Sediment Transport: The DEIS lacks a sediment transport assessment, and we have the same recommendations on this topic for the Diamond Point alternative as for Amakdedori, although we note that the marine footprint is larger (14 acres), so impacts may be greater. In addition, the DEIS analysis anticipates dredging a -20’ MLLW channel (58 acres), producing 650,000 cubic yards of dredged material. A portion of the material would be used for dock construction, with the remainder of the material placed upland for disposal (see figures 2-52 and 2-53).

The DEIS states that “[t]he frequency of required maintenance dredging is unknown but could be every 5 years.” There is no supporting documentation for this statement, nor for the size of upland disposal areas anticipated to take initial and future volumes of maintenance dredged material. We reiterate our recommendation for a more complete coastal engineering analysis to support these dredging and disposal predictions. We also recommend evaluating and disclosing impacts to the immediate and adjacent shoreline from the pile-supported causeway and jetty alternative (Section 2.2.3.6 Action Alternative 2 – Pile-Supported Dock Variant), as dense piling structures affect sediment transport.

Alternative 3 – Concentrate Pipeline Variant: The DEIS (Section 4.16.5.5) concludes that the reduced discharge from WTPs associated with this alternative could result in greater reduction in stream flows than those described under Alternative 1. The significance of this reduction is not described. We recommend that the magnitude, duration, and extent of this reduction in stream flows be described in the EIS so that this alternative can be better compared to Alternative 1 and the other alternatives.

Summary of Key Surface Water Hydrology Issues: The key issues summary table (Table 4.16-5) provides summaries of mean annual streamflow changes. We recommend also providing a summary of changes due to extreme conditions (high and low flows) so that the magnitude and extent of streamflow changes is fully summarized. In addition, some of the differences among the alternatives described in the text are not provided in the key issues table (such as streamflow changes for the Alternative 3 concentrate pipeline variant) and we recommend that these be added to the table. We also recommend summarizing the uncertainty associated with these flow estimates in the table.

Impacts of Future Potential Changes in Climate: In our scoping comments, the EPA recommended that the EIS include a discussion of reasonably foreseeable effects that changes in the climate may have on the proposed project and the project area, including its long-term infrastructure. To complement the general discussion of climate change and its potential effects on aquatic resources in the DEIS, we recommend projected changes in the type (e.g., snow vs. rain) and timing of precipitation be addressed. Given the long closure and post-closure time periods that include management of the open pit and water discharges in perpetuity, the Corps should consider whether projected changes in climate should be evaluated for longer time frames than the few decades during which the mine is proposed to be operational. The DEIS refers to Knight Piésold 2009, which summarized relevant literature regarding likely changes to the climate in the mine region; we recommend that the relevant conclusions of that study, updated by recent national assessments, be discussed in the EIS. Where projected changes could notably exacerbate the environmental impacts of the project, we recommend that the EIS include more robust discussion of those potential effects. This would include the EIS assessing the impacts on the water balance and hydrology impacts of increased extreme precipitation events due to climate change. The project appears to rely on water management pond freeboards and adaptive management to respond to changes; however, an adaptive management plan is not provided, which makes it difficult to assess the effectiveness of adaptive management. We recommend that an adaptive management plan be prepared and provided in the EIS, and that it include the monitoring and specific measures to manage and mitigate impacts that could result from changes in the climate around the mine region.

WATER QUALITY

Key issues with the analysis of impacts to water quality include: poor representativeness of the geochemical dataset, lack of supporting information for many assumptions regarding the behavior of leachate, need for additional information to assess the effectiveness of water treatment at closure, incomplete detail to evaluate the effectiveness of seepage management, incomplete data quality

assessment for background water quality data, lack of a modeling sensitivity and uncertainty analysis, and incomplete analysis of water quality impacts in closure/post-closure phases. These issues may result in underpredictions of the magnitude and extent of impacts to groundwater and surface water quality which could result in exceedances of water quality standards. The following detailed comments describe these key issues and provide recommendations for additional analysis to fully explain potential impacts to water quality. Additional comments on water quality are provided following our key comments.

Geochemical Sample Representativeness

The comments below describe the key issues with the representativeness of the geochemical dataset, which include: the lack of a quantitative analysis to support representativeness; the limited geochemical testing performed on tailings representative of the current metallurgical process; and the fact that geochemical data utilized to characterize ore and waste rock includes many samples that were collected from outside of the area of the proposed mine. Because this dataset forms the basis for the predicted water and sediment quality impacts, bias in the geochemical dataset could result in water and sediment quality predictions that are not representative of conditions during and after mining at the Pebble Project site. We recommend that only ore and waste rock samples from within the current footprint of the proposed mine and that only tailings samples that are representative of the current metallurgical process be included in the geochemical dataset to support EIS water quality predictions.

Ore and Waste Rock Representativeness: In several locations, the DEIS mentions that the geochemical dataset is representative of the different types of materials associated with the mine (e.g., Ch 3.18, pg. 3.18-2). However, quantitative analysis to support the conclusion regarding representativeness is not included. We recommend that this be addressed by providing a table in the EIS that shows the percentage of each ore type for the proposed mine and the percentage of samples that were used to characterize each ore type. We also recommend that the number of samples used in the characterization be similar to the percent abundance of the particular ore-type in order to more fully support the conclusion regarding representativeness.

In Appendix K3.18, Table K3.18-3 shows a summary of the rock and tailings used in the geochemical testing program. The above information could also be added to this table to support the conclusion. In addition, we recommend that this table include information regarding the sedimentary and volcanic origins of the materials associated with the mine, as well as the presence of hydrothermal alterations zones within the different types of materials, since this information is important to understand the acid generation potential of the different materials.

The geochemical data utilized in the DEIS includes many samples that were collected from outside of the area of the proposed mine. The DEIS states that “data from both the PEZ and PWZ are used, and when appropriate, combined to create a more robust dataset (SRK 2018f)” (pg. 3.18-3). The proposed project includes mining only the west pit (PWZ); therefore, data obtained from outside the PWZ are not representative of the conditions encountered in proposed project. As a result, the water and sediment quality predictions (which utilized the data from both the PWZ and PEZ) are not representative of the impacts associated with the proposed mine project.

The rationale for combining the PEZ and PWZ data is provided in the SRK 2018f reference, a draft memorandum, which had the objective of performing a “high-level analysis comparing data from Pebble East and West.” The draft memorandum uses five lines of evidence to support using the combined dataset:

1. The draft memorandum provides a general description of how the PWZ and PEZ have similar geology. However, this analysis is non-quantitative and focuses on broad similarities as opposed to discussing lateral variability in the geological units, variations in the depth of oxidation, variations in the coverage of tertiary rocks, and variability in the sulfur and trace metals concentrations. In the SRK 2011a document, Table 11-1 shows the Pebble Deposit Rock types for the PEZ and PWZ. While this table shows that there are many similarities between the PWZ and PEZ geology, there are also notable differences. For example, the PWZ has the following rock types that are not present in PEZ: Quarternary Ferricrete, Pre-tertiary quartz monzonite monzodiorite, gabbro, pyroxenite, igneous breccia, skarn, and felsite. Also, the PEZ has the following rock types not present in PWZ: Tertiary Latite, siltstone, and volcanoclastic rocks. Overall, despite high-level similarities in the geology of the PWZ and PEZ, there remain significant differences when looking at more specific rock types and characteristics.
2. The draft memorandum states that the HCTs had 10 more samples from the PWZ than the PEZ (36 compared to 26). However, there is no discussion of whether the results from the humidity cell tests (HCTs) showed any significant differences.
3. The draft memorandum refers to Figure 11-27 in Chapter 11 of the SEBD which shows that there is overlap in the graph of sulfide versus sulfate release in the PEZ and PWZ. However, this analysis is based on a small dataset (n=36 samples) and only focuses on a single geochemical parameter, sulfur.
4. The draft memorandum mentions that the barrel tests had more PWZ than PEZ rock in them. However, this does not provide evidence that the leaching chemistry was not biased by the addition of the PEZ material. In addition, the data from the barrel tests was not used to develop the source term concentrations used for water quality modeling, and therefore these results are disconnected to the predicted water quality impacts from the mine.
5. The draft memorandum mentions that the shake flask tests were from the PWZ. However, this is a relatively small part of the geochemistry dataset, and, as with the barrel tests, the shake flask data were not used directly in any of the water quality predictions models.

Overall, the SRK 2018f memo makes the case for combining the PEZ and PWZ data based on the comparisons of very small datasets. Because there is a lot of variability in the geochemistry data, comparisons of small datasets will be biased towards not being able to identify significant differences between the two sample populations (i.e., the PWZ and the PEZ).

However, there is a much larger dataset of acid base accounting (ABA) results for both the PEZ and PWZ in Appendix 11B of the PLP 2018a document (>1,000 samples). Due to its larger sample size, this dataset is more well suited for addressing questions of similarities between the PEZ and PWZ. We performed statistical t-test analyses on some of this data to determine if there were statistically different concentrations between the PWZ and PEZ. Our results show that the PWZ samples had a significantly lower pH than the PEZ (t-test assuming equal variance, $t=7.76$, $df=1082$, $p<0.001$: PWZ pH: 7.4 ± 1.2 ; PEZ: 8.0 ± 1.5). The higher pH in the PEZ dataset suggests that combined PEZ and PWZ dataset would underestimate the acid rock drainage (ARD) risk relative to using just the PWZ data. Similarly, analysis of this dataset showed that the percent total sulfur and the percent sulfate were both significantly higher in the PWZ than the PEZ (Sulfur PWZ: $2.6 \pm 1.9\%$; PEZ: $1.5 \pm 3\%$; $p<0.001$, $df=1082$; Sulfate: PWZ: $0.06 \pm 0.01\%$; PEZ: $0.04 \pm 0.01\%$; $df=1082$, $p<0.001$). Again, these results show that the combined PEZ and PWZ dataset would underestimate the ARD risk relative to using just the PWZ data. In addition, the

concentration of arsenic in waste rock was significantly higher in the PWZ than the PEZ (PWS As: 45 ± 94 ppm, PEZ: 25 ± 35 ppm; $p=0.004$, $df=554$). These results indicate that the combined dataset would predict lower arsenic concentration than if using just the PWZ. It is also worth noting that many of the statistical tests between other metals/metalloids did not indicate that the PWZ samples were associated with higher metal leaching or ARD risk. However, in the above examples, using the combined dataset has the potential to underpredict the environmental impacts of the proposed mine for some parameters. We recommend that the dataset most representative of the project (i.e., the PWZ data only) be used as a basis for the impact assessment rather than the combined data set.

The DEIS and supporting documents focus on explaining the similarities in the PEZ and PWZ dataset (which is not entirely supportable based on the given information); however, the specific benefit of including many samples collected from outside of the proposed mine area is not established. We recommend that all PEZ data be removed from the analysis and the characterization of the impacts of the mine include only data from the PWZ, which is a more scientifically accurate approach. Alternatively, the Corps should further explain why this approach was adequate.

If the EIS analysis continues to rely on the combined dataset, we recommend providing a statistical analysis that supports this approach and that the EIS describe any limitations or influences on modeling and the conclusions made in the EIS based on use of this combined data. We also recommend that the EIS discuss limitations on statements and conclusions associated with variability in the data analysis (i.e., how variability affects modeling output and how that affects water quality predictions and conclusions).

Tailings Representativeness: The DEIS states that “limited geochemical testing has been performed on the representative concentrate because possible designs for metallurgical processes are still at an investigative stage” (pg. 3.18-3). Because the characteristics of the tailings appear to be different from the ones used in the geochemical testing, the predictions may not be representative of the actual water quality. The tailings supernatant data used to represent tailings water quality is based on tailings produced via flotation and “gold plant tails” (Appendix K4.18). We assume “gold plant tails” means cyanide leach tailings, although we recommend that this be clarified in the EIS. Since the current project processing flowsheet does not include a gold plant, these samples may not be representative of the tailings at the mine site. We recommend that metallurgical processes be established prior to conducting the geochemical analysis, such that representative information can be included in the EIS. We recommend that gold plant tails samples be removed from the data used to represent tailings water quality or that further discussion be provided in the EIS that explains the variability and uncertainty around the tailings water quality estimates due to inclusion of this data. In addition, there should be information included on how the grain size of the tailings relates to the grain size of the material used in the HCTs because this can be an important variable affecting the release of metals/metalloids.

Metal/Metalloid Mobilization and Behavior of Leachate

We recommend that the DEIS expand its consideration of several important aspects of leachate behavior, including the potential for metal/metalloid mobilization. The distinctions between PAG and non-PAG materials in the DEIS do not appear to be conservative estimates, metal/metalloid mobilization under neutral pH conditions has not been fully considered, the DEIS appears to underestimate metal/metalloid whole water concentrations, and differences in selenium, mercury, and chromium speciation are not fully considered. These issues impact the accuracy of the impact analysis and appears

to underestimate those impacts. Our detailed technical comments regarding these key water quality issues and recommendations follow.

Distinctions Between PAG and Non-PAG Materials: It appears that the distinctions between PAG and non-PAG materials are not conservative and could result in unanticipated water quality impacts. This is important because mine materials are managed differently depending on whether they are PAG or are non-PAG. Material determined in the DEIS to be non-PAG could leach metals/metalloids at elevated concentrations and impact water quality. The DEIS states: “During mining, rock materials will be assessed using the block model to determine whether the mined rocks are PAG or non-PAG, and whether the mined material would be processed and disposed as tailings, or not processed and set aside as waste rock” (pg. 3.18-5); and, “The ABA and humidity cell data indicate that PAG and non-PAG rocks can be distinguished using an NP/AP ratio of 1.4 (PLP 2018a), and are applicable to pre-Tertiary, Tertiary, and overburden materials.” (pg. 3.18-3)

Although not specifically stated in the main text of the DEIS, we assume that the site-specific value of neutralizing potential to acid producing (NP/AP) ratio value of 1.4 would be used to segregate PAG from non-PAG materials. We reviewed the referenced document (PLP 2018a), specifically Section 11.7.1.3.1, and the derivation of the 1.4 value is not explained. The text references Figure 11-28, which shows a plot of NP/AP versus sulfate release, but this plot does not show specifically how the 1.4 value was derived. We recommend that the rationale for the 1.4 ratio and description of how it was calculated be described in the EIS.

Elsewhere in the supporting documents of the DEIS, a more conservative ratio value of 2 is used to indicate where the materials have uncertain acid generating potential (e.g., Figure K3.18-2 and pg. 11-9 of the EBD). Ratio values larger than 2 have also been proposed for other mine sites to provide a more conservative approach to distinguishing PAG from non-PAG. For example, the EPA’s 1994 document, Acid Mine Drainage Prediction, states that, “[W]hen the ratio of a sample’s neutralization potential and acid production potential is greater than 3:1, experience indicates that there is lower risk for acid drainage to develop (Brodie et al. 1991). For ratios between 3:1 and 1:1, referred to as the zone of uncertainty, additional kinetic testing is usually recommended.”

There are several factors that can affect the calculation of NP/AP ratios and result in biased calculations. Uncertainties associated with these different variables is one reason why more conservative ratios (such as 2 or 3) are often used to differentiate PAG from non-PAG. Because the DEIS is using a relatively low NP/AP ratio of 1.4, we recommend that it is important that the EIS address the multiple factors that can potentially result in biased ratios. For example, in the discussion of NP/AP ratios, we recommend that the EIS provide information on the presence of non-pyrite sulfide minerals, the presence of acid-producing minerals other than sulfides, the presence of carbonate minerals that do not produce alkalinity, and the presence of non-carbonate minerals that can buffer acidity (e.g., chlorite, biotite). In addition, the PLP 2011 supporting document indicates that both the Sobek and the modified Sobek methods were used for the estimation of the neutralizing potential (NP). The modified Sobek method is preferred for the determination of PAG material because it is less likely to overestimate neutralizing capacity. We recommend that the EIS clarify whether data from both these types of tests were used in the calculations or just the more conservative modified Sobek data were used.

Distinctions Between Metal Leaching and Non-Metal Leaching Materials: The DEIS assumes that mine materials with NP/AP ratios >1.4 are non-PAG, have less risk of metal leaching and will be handled differently at the mine site compared to PAG materials. We recommend that the Corps evaluate whether

the NP/AP ratio of 1.4 is a good predictor of lower metal concentrations and explain the determination in the EIS. To address this, we analyzed the data in SRK 2011a, Table 11-10, to determine whether there were significantly lower metal concentrations associated with samples with NP/AP ratios of >1.4 for several elements (As, Cu, Hg, Pb, Se, and Zn). For As, Hg, Pb and Zn, there was no significant difference in concentrations depending on whether the ratio was greater or less than 1.4:

- Arsenic NP/AP >1.4: 63 ± 63 mg/kg; As NP/AP <1.4: 140 ± 241 mg/kg, t-test p-value: 0.34, df=28;
- Mercury NP/AP >1.4: $0.10 \pm .26$ mg/kg; Hg NP/AP <1.4: 0.20 ± 0.07 mg/kg, t-test p-value: 0.25, df=28;
- Lead NP/AP >1.4: $17 \pm .11$ mg/kg; Pb NP/AP <1.4: 11 ± 12 mg/kg, t-test p-value: 0.24, df=28; and,
- Zinc NP/AP >1.4: 4.4 ± 2.9 mg/kg; Zn NP/AP <1.4: 4.3 ± 3.3 mg/kg, t-test p-value: 0.94, df=28;

Only copper and selenium showed significantly higher concentrations when the NP/AP ratio was <1.4. Our analysis shows that the NP/AP ratio of 1.4 is not a good predictor of metal concentrations and may not correctly identify materials that have the potential for elevated metal leaching. We recommend that either a more conservative ratio value (such as 2 or 3) be used to differentiate PAG from non-PAG material or that the rationale for the 1.4 ratio value be better explained in the EIS to demonstrate protection of water quality.

Use of Dissolved/Filtered Water Concentrations: The water quality predictions in the DEIS are based on dissolved/filtered water concentrations for metals parameters and these lower numbers are compared to State of Alaska water quality standards that are based on whole water concentrations. Our assessment of the information provided in the DEIS and supporting technical documentation indicates that the water quality predictions that are based only on dissolved metals concentrations can result in an underestimation of the metal/metalloid whole water concentrations and a biased comparison to WQS. We recommend that whole water concentrations be used instead or that the EIS further explain why the current analysis is sufficient as discussed below.

Chapter 3.18 p 3.18-4 of the DEIS states that “[e]lement release rates determined from kinetic tests, which were performed on both filtered and unfiltered samples, were mainly a function of leachate pH rather than the element content of the samples (SRK 2011a).” While it is correct that the barrel tests analyzed dissolved and whole water fractions, the other kinetic tests (HCTs, the saturated column tests, and the stored bag tests) did not perform that analysis. Most importantly, the HCTs release rates were used in generating the source term element releases rates that were incorporated into the water quality modeling. The results from the barrel tests do not appear to be directly used in the water quality modeling and the distinctions between the dissolved and whole water concentrations obtained from these tests is not discussed or analyzed in the DEIS or supporting documents.

The SRK 2018 document, Geochemical Source Terms for Water Treatment Planning, (SRK 2018a) states that the modeling source terms were developed based on dissolved concentrations and that this is a limitation of their use in predictive water quality modeling. SRK 2011a, Appendix 11J includes a table that provides whole water and filtered water concentrations from the barrel tests. Doing a statistical paired t-test for the whole water and filtered water shows that for some metals the whole water values are significantly higher. For example, the whole water aluminum concentrations were 29 percent higher than the filtered concentrations ($p < 0.001$); the whole water iron concentrations were 17 percent higher

($p=0.001$) and the whole water mercury concentrations were 79 percent higher ($p<0.001$). These results indicate that water quality predictions included in the DEIS based only on dissolved metals concentrations are underestimating the whole water concentrations. We recommend that the ratios of whole water to filtered water from the barrel tests be used in the EIS to estimate the whole water concentrations from the dissolved values that are provided by the model.

Metal/Metalloid Mobilization Under Neutral pH Conditions: We recommend that the EIS analyze the potential impacts from metal/metalloid mobilization under neutral pH conditions. As stated in the DEIS: “metalloids such as arsenic, molybdenum, and selenium, and salts such as sulfate, can be released into the environment even if the water draining the rock has a neutral or basic pH” (pg. 3.18-3); and, “[F]or some elements (arsenic, molybdenum, and selenium), release can be environmentally significant under neutral pH conditions, as described in SRK (2011a)” (3.18-4). Because determinations regarding how a material will be handled (i.e., whether it can be used for road construction, etc.) will be based on whether it is PAG or non-PAG, there is the potential that non-PAG materials could become sources of some metals/metalloids leached under neutral pH conditions. We recommend that the EIS consider this potential when discussing non-PAG material to determine if there are elevated concentrations of metals/metalloids that could be mobilized under neutral pH conditions. This is particularly important for areas where the runoff from these materials would not be captured by any water treatment facility.

Influence of Bulk Metal Concentrations Versus pH on Leaching Rates: Statements in the DEIS indicate that the leachate pH is a more important variable than the element content of the mine material for predicting water quality impacts. This assumption does not appear to be supported by statistical analysis and could result in an underestimation of water quality impacts from materials with elevated metal/metalloid concentrations but lower acid generating potential. The DEIS states, “Element release rates determined from kinetic tests, which were performed on both filtered and unfiltered samples, were mainly a function of leachate pH rather than the element content of the samples (SRK 2011a). Leaching of copper accelerated as pH decreased; therefore, the potential for metal release is linked to the potential for acid generation, and ABA data can be used to assess the potential for copper leaching.” (pg. 3.18-4)

A review of SRK 2011a shows that this statement is based on information in Figure 11-55 and 11-56 as well as Table 11-43, each of which are discussed in more detail below:

- Figure 11-55: This figure shows the copper (Cu) release rate plotted as a function of the total Cu content. In the figure, the highest release rates are associated with samples with $pH<6$; however, these samples are also associated with the highest bulk phase Cu concentrations. The figure and associated text do not provide any statistical analysis to support the statement that the pH is a larger driver of the Cu in leachate compared to the Cu content of the bulk material;
- The DEIS, and supporting document SRK 2011a, do not provide a table where the pH values associated with the element release rates are provided, and as such, it is not possible for reviewers of the EIS to perform the statistical analysis necessary to determine the relative importance of pH versus bulk phase element concentrations. In lieu of having that information, the EPA extracted/estimated data from Figure 11-55 using a web plot digitizer and performed a simple linear regression analysis between the bulk Cu concentration and the release rate. The results of this analysis showed a highly significant relationship ($p=0.00001$). While this analysis does not show that the bulk concentrations are a larger driver than pH in the Cu release rates (that would require multivariate analysis), it clearly shows that the bulk concentrations are an important factor affecting the Cu release rates;

- Figure 11-56: This figure provides similar information as 11-55 mentioned above, but instead focuses on Arsenic (As). Based on our visual assessment of the information included in this graph, the figure does not provide enough information to support the original statement in the DEIS regarding the importance of pH;
- Table 11-43. This table provides the summary information on the relationship between bulk concentrations and leaching rates. In the table, the correlation coefficients are presented for specific pH ranges (pH<3, pH<6 and pH>6). When the DEIS discusses leaching rates at neutral pH conditions, we presume that the discussion refers to leaching at pH>6, although we recommend that this point be clarified. Because rainwater pH is ~5, we recommend that the data be consolidated into categories of pH values less than and greater than 5, as this split is more relevant to field conditions at the mine site. Because the analysis in the DEIS relies on the assumption that non-acid generating conditions would occur at a pH of 6, the DEIS might be underestimating element leaching when exposed to rain water;
- Table 11-43 does not provide information on whether the correlations are significant, or the sample size associated with the analysis. These are both important pieces of information to include for the interpretation of the data in the table; and
- In Table 11-43, most elements have higher correlation coefficients at higher pH values (>6) relative to lower pH values (<3). Examples of this include the following elements: Al, As, Ba, Be, Bi, Ca, Cd, Co, Cr, Fe, Mn, Ni, Pb, Sb, and Se. Examples showing that the best correlation occurred at pH<3 include: Cu, Hg, K, Mg, Mo, and Zn. The text in SRK 2011a states, “For the acid leachates, some stronger correlations were observed, particularly in the case of the very acidic leachates (pH less than 3).” However, there were 15 elements that had higher correlations at pH<6 than at pH<3, and there were only six elements where the correlation was stronger when pH<3. As such, we recommend that the EIS include additional data to support this statement, as well as to support the statement in the DEIS regarding the importance of pH over bulk element concentrations in driving element leaching.

The multivariate component to element release rates is acknowledged on pg. 11-55 in the SRK 2011a document, which states that “[i]t is possible that the pH effect is masking any relationship that might have been present between the metal release rates and the bulk composition.” In summary, we recommend that multivariate statistical analysis be used to determine the relative influence of bulk metal concentrations versus pH on leaching rates. Alternatively, the Corps should further explain why its existing analysis is sufficient.

Timeframe for the Development of Acidic Conditions: The timeframe predicted for the development of acidic conditions may be underestimated and future mine expansion activities may delay the aqueous storage of PAG materials and result in some materials becoming acid generating and having higher metal/metalloid leaching rates than are predicted in the DEIS. The DEIS states that “[p]aste pH results for aged rock cores stored at the site suggest that acidification may be delayed up to 40 years for 95 percent of the pre-Tertiary mineralized rock (SRK 2011a). Given differences in the test conditions, laboratory and field tests suggest that oxidized pre-Tertiary mineralized rock may take up to several decades for acidification to occur.” (pg. 3.18-3). In reviewing the SRK 2011a document, it is not clear whether the rock cores were aged intact or crushed. If they were relatively intact, the greatly reduced surface area would limit the oxidation rate and these rates/time frames would be much longer than if the test was performed on crushed material, which may be more representative of actual site conditions. We

recommend that the EIS provide additional information regarding the grain size of the aged rock cores and how this would impact the acid rock drainage ARD timeframe.

The SRK 2011a reference also states that, “ARD generation under site conditions is at least a decade to several decades,” and PLP 2018a states that, “Under field conditions, onset of acid generation is expected to be delayed by at least two decades.” We recommend verifying which reference accurately reflects anticipated onset of acidic conditions in the waste storage areas and updating the information in the EIS.

Metal/Metalloid Speciation: Differences in selenium, mercury, and chromium speciation are not discussed in the DEIS. These metal/metalloids have different toxicological properties depending on their speciation, which we recommend be taken into consideration when determining the impacts of releases into the environment.

- For selenium, there is potential for the WTP to alter selenium speciation and potentially increase its toxicity. This is particularly important because the Se levels leaving the WTP are expected to be 5 µg/L, which is the concentration value of the water quality standard (Table B1.3 in Knight Piésold 2018a). From the dust deposition estimates, the Se concentrations in water are expected to increase by 0.65 percent (considered to be an underprediction and specifically discussed elsewhere in our comments). While this increase is relatively small, if the increase in Se concentration is added to the 5µg/L Se that is leaving the treatment plant, this could result in an exceedance of the 5µg/L surface water quality standard for Se; though there would be dilution occurring downstream which could lower this concentration. We recommend that the Se in the effluent from the WTP be further reduced through treatment methods available, to ensure that surface water quality standards are met when taking into consideration the additional Se inputs from fugitive dust deposition. Otherwise, the combined impacts of the project could result in an exceedance of water quality standards and violations of the CWA. If the WTP design and treatment process is not reconsidered, then we recommend that the EIS explain that it is known that the water quality standards for selenium could be exceeded.
- For mercury, there is potential for the formation of methylmercury (MeHg). MeHg is the more toxic and bioaccumulative form of Hg that can be produced under anoxic conditions and is associated with the activity of sulfate reducing bacteria. Appendix K4.18 states that, “PitMod predicts that the pit lake will become thermally and chemically stratified after about closure years 25 to 30 (Lorax Environmental 2018)” (pg. K4.18-40). The anoxic water in the stratified pit lake would provide good conditions for Hg methylation, and MeHg production could be quite large because of the high Hg concentrations in the pit lake (median concentrations predicted to be 113 ng/L) and sulfate concentrations >1,000 mg/L. While the pit lake water will be treated to meet water quality standards prior to discharge, the water treatment focuses on reducing inorganic Hg ion concentrations which have a +2 charge, whereas MeHg has a +1 charge. This difference in speciation may decrease the efficiency of the treatment facility to reduce its Hg concentrations. We recommend that information be added to the EIS that addresses Hg speciation, specifically as it applies to MeHg production.

Table B1.3, in Knight Piésold 2018a, shows that the predicted WTP outflow concentration of sulfate would be 151 mg/L. While this concentration is below the sulfate water quality standard, at 250 mg/L, it is an order of magnitude above the existing condition concentrations in the receiving water bodies. This large addition of sulfate could stimulate Hg methylation

downstream of the mine. Studies have shown that the addition of sulfate can increase MeHg production rates, even when the inorganic Hg concentrations have remained constant (Branfireun et al., 2001; Wasik et al., 2012). We recommend that the EIS address the potential for downstream MeHg production as a result of increased sulfate loading and also identify options to further reduce sulfate releases from the WTP.

The temperature corrections applied to the HCT release rates may underestimate leaching rates encountered at the mine site. For example, SRK 2018a states that, “The rate of accumulation of this load is indicated by weathering rates (on a mass basis) determined in humidity cells corrected for lower site temperatures and lower particle surface areas.” Use of an annual average air temperature could underestimate the weathering rates because the subsurface temperature within the waste rock/tailings and under snow cover will be significantly warmer than the air temperature. We recommend that the EIS include information on the site temperature that was used for this correction to confirm accuracy of the leaching rate estimates.

Water Quality Modeling

Our key issues related to the accuracy of the water quality modeling are detailed in the comments below.

Sensitivity and Uncertainty Analysis: A sensitivity and uncertainty analysis is the standard practice in the majority of major mine project EISs. This is important for identifying which input parameters are the most influential on the model outputs, in identifying the impact of how uncertainties in model input parameters would affect the outputs, and in establishing confidence in the model results. We recommend that a sensitivity and uncertainty analysis of the water quality modeling be conducted consistent with EPA guidance on environmental modeling (see reference under “Hydrologic Modeling” above). One particularly important area to be addressed by the uncertainty analysis is the related unknowns associated with the geochemical sample representativeness (see our comments on that topic, above). We recommend that uncertainty related to geochemical information be included in the modeling analysis by applying a range of values that could be the upper and lower end of potential concentrations.

For the source term chemistry, the upper 95th percentile of the data are utilized to provide a conservative estimate of water quality concentrations (Appendix K4.18, pg. 4.18-40). However, there are model components that are not based on source term concentrations that can also impact the model outputs (e.g., temperatures, infiltration rates, porosity, etc.). We recommend that the variability in these other model components be included in a sensitivity and uncertainty analysis and the information included in the EIS.

The water quality modeling included several assumptions, such as steady state, complete mixing, and no reactivity or degradation occurring. We recommend that the EIS include a discussion of the limitations of the model predictions and limitations of the subsequent use of the predicted data (pit, water treatment, etc.) during operations and closure, resulting from these assumptions.

Use of 95th Percentile of the Source Term Concentrations: As mentioned above, in lieu of performing sensitivity and uncertainty analysis, the DEIS states that model results are expected to be conservative/protective because they utilize the 95th percentile of the source term concentrations (Appendix K4.18, pg. K4.18-14). However, SRK 2018a, the document that describes the source term calculations, states that “[w]here the mean would be considered the best representation of the most likely condition and extreme low and high values will offset each other, the input was calculated as the upper

95% confidence limit on the mean (i.e., representing the statistical uncertainty on the mean).” There is an important difference between using the 95th percentile of all the data versus using the 95% confidence limit of the mean, with the latter being significantly less conservative. If the model is going to rely on using 95th percentile data, we recommend that this be used on the entire dataset, i.e., not only on the mean value, to provide a more conservative estimate of the potential water quality impacts from the Pebble Project.

The SRK 2018a source term document states that, “[r]elease rates per week (mg/kg/week) are calculated for each parameter for each week, based on the concentration (mg/L), leachate volume recovered (L/week) and mass of the sample (kg). 95th percentile rates are calculated separately for each major rock type category and grouped by pH of the leachate.” We note that separate source terms were developed for ~15 different types of material based on data from ~100 HCTs. If we understand correctly how these calculations were made, that would mean that, on average, seven HCT results would be available for each of the different types of material tested. Seven results represent a small sample size from which to develop a 95% confidence interval. We understand that the 95th percentile is used in the DEIS to infer a degree of conservatism in the dataset, however, we do not recommend basing an EIS impact analysis on the 95% confidence intervals of datasets with very small sample sizes. The variability in the data from a few samples may not be representative of the full range of variability encountered at the mine site, and therefore, the 95% confidence interval may not provide estimates with a high level of certainty to support the water quality predictions.

Source Term Concentrations: It appears that the source term concentrations used in the water quality model predictions underestimate the magnitude of the water quality impacts. For example, SRK 2018a states that “[t]he average rate following the end of the flush is calculated for each test.” By excluding the first flush of elevated metal/metalloid concentrations in the source term calculations, the modeled water quality concentrations during mine operations are underestimated. While the first flush effect may be temporally isolated for a given sample of rock, at an active mine site, fresh rock/ore is being generated daily. As such, the first flush effect considered to be a temporally isolated event in the HCTs will continue throughout mining operations, as new material is regularly exposed to water. While the percentage of material experiencing the first flush effect at the mine site decreases over the course of the mine life, the complete removal of these initial elevated concentrations from the modeling exercises likely will result in an underestimation of the actual water quality impacts. Therefore, we recommend that water quality modeling include the first flush effect in the source term calculations. Alternatively, the Corps should explain why its existing analysis is sufficient.

Use of Predicted pH: The pH was not modeled for any of the water sources previously modeled by GoldSim, however the DEIS pH is reported as “predicted” in the DEIS. Pg. K4.18-45: “PHREEQC predicts that the pit lake surface water would have slightly basic pH (7.6 to 8.2) within discharge limits.” Lorax Environmental 2018 states that, “Source terms used in the pit lake model were obtained from KP (2018) [Knight Piésold 2018d, closure water management plan], SRK (2018) [SRK 2018a, source term memo] and HDR (2018) [HDR 2018a, Pebble Base-Case Water Treatment Plant Engineering Revision].” It also states that input data were from the Year 15 data from KP, which corresponds to Closure Phase 1. Knight Piésold 2018d states that, “pH was not modeled”, and there are no entries for pH in Table B2.1 for Closure Phase 1. HDR 2018a includes a footnote on the results table that input came from the Knight Piésold 2018a (operations water management plan), which provides pH values of “7 to 8” for all sources, but has a footnote that, “pH was not modeled and pH values are based on the range of pH source terms provided by SRK (dated 20 June 2018).” Additionally, the SRK source term document (the input for the GoldSim modeling that gave output used by PitMod) states that pyritic

tailings were considered non-reactive due to saturated conditions. We note that those are not the conditions that would exist at the start of the pit filling with water, since material would be moved over several years and be exposed to atmospheric oxygen before the pit would reach saturated conditions. Finally, pit lake water quality predictions for all metals are summarized in Table K4.18-7 and Table K4.18-8 for Closure Phases 1 and 2, respectively. These tables also have footnotes stating that pH was not modeled. If the pit lake modeling (PitMod) used the seven to eight values from Knight Piésold 2018a (via HDR 2018a) for pH as input to the model, the pH output may be invalid because pH was not modeled to be used as input to PitMod. On page 4.18-12, the DEIS states that the pit water is expected to initially be acidic, so it is important to explain what pH value was used as input to PitMod.

We recommend removing the word “predicted” from the EIS discussion on pH, where modeling did not occur, and/or that the EIS clarify that pH was not predicted based on modeling. We also recommend explaining why pH was not modeled in GoldSim, since pH is a parameter that controls geochemical reactions. It may be that pH is not as important for the water treatment plant influents, since the pH likely would be assessed at the time of treatment to ensure proper dosing of chemicals; however, we recommend that it is important to understand the actual pH and speciation of metals/metalloids/non-metals in the mine site water reporting to the TSFs and the concentrations that might be expected to occur in the overlying pit water and tailings pore water that may be released accidentally through a failure or through seepage that escapes capture.

We recommend that the EIS also provide the value of pH used for input to the pit model, include support for statements regarding pH of the pit water, and discuss limitations on discussions and conclusions made based on use of the non-modeled pH. We also recommend that the EIS discuss limitations of using an assumed pH instead of a modeled pH, with respect to water treatment and water quality in seepage or from potential releases from storage facilities (TSFs and ponds) and on potential impacts from releases and management of materials.

Water Management and Treatment and Water Quality Impacts

Operations Water Treatment Plant Performance and Impacts: Regarding the operations WTPs (WTP #1 and #2), the DEIS states, “Based on an independent review of the WTP source terms and processes (Appendix K4.18, AECOM 2018i), discharge water from both WTPs is currently expected to meet ADEC criteria...” (pg 4.18-4). However, the independent review (AECOM 2018i) specifically did not conclude that WTP #2 is expected to meet the State of Alaska water quality standards. Instead it recommended additional investigation and mitigation measures and/or development of improved management processes to provide confidence that salt and selenium are properly sequestered and stabilized for long-term management in the solid form, and to ensure that WTP performance will meet treatment goals.

We recommend including a full discussion of the issues identified in AECOM 2018i regarding the potential for salt and selenium build up. The DEIS indicates that these issues “may” require further investigation as design progresses and/or as a long-term adaptive management strategy (pg 4.18-5). We recommend that language in the EIS accurately represent the AECOM 2018i reference document and the importance of the issues and recommendations of the independent review by deleting the term “may” and discussing the previously recommended additional investigation and appropriate up-front WTP design.

We recommend that PLP conduct the additional investigation recommended in AECOM's independent review and, based on the investigation, provide a revised design plan for WTP #2 that acknowledges and responds to the potential for salt and selenium buildup by describing what specifically will be done to either prevent it or to treat the higher total dissolved solids (TDS) and selenium levels in order to meet surface water quality standards. Whereas the DEIS states that more treatment units would be added, the EIS would be strengthened by describing the specific water treatment processes proposed, the flows and concentrations for which they would be designed to manage and the predicted effluent quality under average and high flow conditions. If this information is not provided in an updated project description and water management plan, then we recommend that the EIS base its water quality impact analysis on what is proposed, which is a WTP (WTP #2) with uncertain effectiveness, based on AECOM's independent review.

Closure Water Treatment Plant Performance and Impacts: It appears that the DEIS mischaracterizes the results of an independent review conducted by AECOM of the closure WTP process and the ability of the water treatment plant to meet water treatment goals and water quality standards and we recommend that the EIS clarify this issue, as discussed below.

Regarding closure WTP #3, AECOM's independent review referenced in the DEIS concluded that, "Insufficient information on WTP #3 design and process is currently available to assess effectiveness." The DEIS Appendix K4.18 states, "Water quality of the discharge from the open pit WTP is the subject of ongoing engineering analysis (PLP 2061-RFI 106)" (pg. K4.18-52). The DEIS concludes in Chapter 4.18 that "[i]n terms of magnitude and extent, the treated water would be discharged to the environment downstream of the mine site in Frying Pan Lake" (pg 4.18-13), and "[p]it lake water quality would exceed standards but would be pumped to maintain operational levels and treated prior to being discharged to the environment." (pg. 4.18-32). The DEIS does not specifically state that the treated water discharge would meet surface water quality standards, and does not reflect the conclusion of the independent analysis that information is currently insufficient to assess the effectiveness of the WTP #3 design and process.

We recommend that the Corps further supplement the information available in the DEIS to assess the effectiveness of water treatment at closure, because at present it appears to be a data gap. Currently, the impacts to surface water quality at closure from the WTP discharges cannot be assessed. We recommend that: 1) PLP develop a robust design for WTP #3 that will ensure that the discharge of the treated open pit water meets water quality criteria under the CWA and the State of Alaska water quality standards, and that PLP include the revised WTP #3 design and process in an updated project description, plan of operations or water management plan; and, 2) the Corps independently review, analyze and explain in the EIS that the revised WTP #3 design will result in discharges such that surface water quality standards will be met at mine closure. The DEIS does not currently include a flowsheet of the closure water treatment process and we recommend that be provided. Alternatively, we recommend that the EIS explain why its existing analysis is sufficient to support a conclusion that treated water discharged from WTP #3 will meet water quality standards at closure.

Bulk TSF Seepage Closure Water Treatment: The DEIS states that seepage water from the bulk tailings TSF embankment would be collected and treated until treatment is no longer necessary, anticipated after closure year 50 (Section 4.18.3.1). However, the reference for this statement (Knight Piésold 2018d) indicates that TSF seepage will require treatment over the long term. We recommend that the conflicting statements regarding how long seepage water will require treatment be addressed in the EIS to clarify the Pebble Project impacts on water quality.

Characterization of the Extent of Groundwater Contamination: As mentioned previously in this enclosure, the DEIS states that all seepage would be captured, however, there is no design information supplied regarding the seepage collection and monitoring well/pumpback system to support this conclusion. We recommend that such design information be analyzed in the EIS.

In addition, we recommend that the EIS include additional details to support the characterization of the lateral and vertical extent of groundwater contamination to both shallow and deep groundwater from the mine site features during mine operations, closure and post-closure. The groundwater model predicts that contact water that leaks through the WMP liner to shallow groundwater would migrate about two miles, unless it is captured by foundation drains and the monitoring well/pumpback system (Appendix K4.17). We recommend that figures be added that depict the lateral and vertical extent of groundwater contamination for constituents that exceed standards in shallow and deep groundwater from the bulk TSF, pyritic TSF, and WMP so that the extent of groundwater impacts are more fully explained. This information is routinely provided in mining EISs to show the magnitude and extent of groundwater impacts

The DEIS states that “groundwater quality beneath the NFK west and NFK east drainages in the immediate vicinity of the mine site would be impacted during operations but would be expected to improve in the decades after mine closure” (pg. 4.18-18). To support this statement, we recommend that the EIS include additional information on the magnitude of potential groundwater quality impacts at closure (including a figure that depicts geographic extent of the impacts, see our earlier comment above) and how groundwater quality is expected to improve over time.

Bulk TSF Seepage Closure Water Treatment: The DEIS states that seepage water from the bulk tailings TSF embankment would be collected and treated until treatment is no longer necessary, anticipated after closure year 50 (Section 4.18.3.1). However, the reference for this statement (Knight Piésold 2018d) indicates that TSF seepage will require treatment over the long term. We recommend that the conflicting statements regarding how long seepage water will require treatment be addressed in the EIS to clarify the Pebble Project impacts on water quality.

Adaptive Management and Monitoring at Closure: The DEIS states that “[i]f monitoring shows that water quality is not improving during the post-closure period, additional remedies would be implemented to treat the impacted groundwater, as needed.” (pg 4.18-18). However, since monitoring and adaptive management plans have not been provided for review, we currently cannot determine whether the monitoring and additional remedies would be successful. We recommend that monitoring and adaptive management plans be provided so that potential environmental impacts can be more fully analyzed and explained.

Characterization of Existing Water Quality Conditions

Characterization of Existing Water Quality Variability and Trends: Approaches used in the DEIS for combining baseline water and sediment quality data over space and time do not appear to accurately represent the variability in baseline conditions. This may lead to inaccuracies in predicting the magnitude of potential impacts on ecologically important streams, wetlands, lakes, and ponds and the fishery areas they support from the Pebble Project. In the DEIS, mean surface water concentrations are presented as the means for all samples taken over all years within a given water body; the mean groundwater concentrations are presented as all samples taken over time in all wells within a given area;

and sediment concentrations are stated as being means of each sampling location's means, also appearing to be over all time. This approach does not appear to account for seasonal and spatial trends expected in surface water and sediment concentration data. Surface water concentration trends are especially important for fish because their life-cycles are dependent on time, space and water quality within the watersheds. Trends in concentration data also may exist in groundwater (especially shallow groundwater) and in sediment in deeper water bodies, but may be of a lesser magnitude than in riverine systems.

We recommend that the EIS provide an assessment (i.e., quantitative results of statistical testing) that further supports the approach taken of combining data over space and time to calculate means (for groundwater, surface water, and sediment) and demonstrates that it is a scientifically valid approach. If this approach to calculating means is not supported by the assessment results, we recommend that the affected environment analyses be revised to better represent the temporal (seasonal) and spatial water and sediment chemistry. In addition, we recommend that the environmental consequences analysis be revised to more accurately predict potential changes to those conditions. We also recommend providing a discussion of the limitations on conclusions made regarding background water and sediment quality and impacts (and associated resources) based on the data analysis and variabilities associated with the mean concentrations provided.

Because background water and sediment quality data were not collected from January through March of each year, we recommend that the EIS discuss the limitations of conclusions in the DEIS based on the limited winter data available.

Additional Comments on Water Quality Analysis

Following are additional comments and recommendations on the water quality analysis.

Water Treatment Plant Operations: We recommend the following information be added to the EIS to strengthen the analysis and disclosure of potential water quality impacts related to water treatment:

The DEIS raises the possible need for increasing the temperature of the discharge to enhance selenium removal (Section 4.18.3.1, Mine Site - Water Treatment during Operations) but does not analyze the potential need for cooling the discharge to meet surface water quality standards for temperature. If cooling will be necessary to meet temperature standards, we recommend that this be included in the EIS.

The DEIS indicates that the waste stream would be split in Step 6 for the Main Water Treatment Plant (K4.18.2.2 Main Water Treatment Plant (WTP #2), Step 6). The text discusses reverse osmosis (RO) treatment and the possibility of evaporation; however, RO treatment and evaporation are not included in any step of the process identified in the DEIS. We recommend that the EIS clarify whether RO treatment and evaporation are a 7th step in the process;

Water Treatment Plant Residuals: We recommend that the following information be added to the EIS to strengthen the analysis of potential water quality impacts related to management of the water treatment plant residuals.

The DEIS discusses the placement of the precipitated calcium sulfate solids into the pyritic TSF and explains that modeling indicates that the conditions in this TSF should prevent re-dissolution of the solids (K4.18.2.2, Main Water Treatment Plant (WTP #2), Step 5). At least one other mine in Alaska has

issues with total dissolved solids chemistry, where the conditions indicate that calcium sulfate precipitate should form but that has not actually occurred. We recommend that the EIS include monitoring and specific adaptive management plans to address how issues with precipitate would be detected and remedied as necessary.

The DEIS states that rejected selenium solids from the Main Water Treatment Plant would be placed in the Bulk TSF (Section K4.18.2.2, WTP #2, Step 6), but that selenium solids from the Open Pit Water Treatment Plant would be transferred to the pyritic TSF (Section K4.18.2.1, WTP#1, Step 7). We recommend that the EIS clarify the difference between rejected selenium solids from WTP #2 and selenium solids from WTP #1 and explain why they would be directed to two different storage facilities.

The oxygen level in the open pit is anticipated to be above 2 mg/L for all depths and closure years (DEIS Figure K4.18-13, Pages 4.18-13 and 17). Considering that as little as 0.2 mg/L implies an oxidizing environment, it seems likely that there could be oxidation of the PAG material directly underlying the water column. Dissolved ferric iron will oxidize pyritic minerals as well as dissolved oxygen (DO) faster in the presence of microorganisms that oxidize the pyrite, and the cycle will continue. Precipitation of ferric oxyhydroxides releases protons that decrease solution pH. Addition of treatment plant wastes (e.g., alkaline sludge) to the bottom part of the water column, as discussed in this section, may aid in minimizing creation of acidic conditions; however, the potential for acidic conditions to occur should be discussed in the EIS, especially since the pH input to the pit lake water quality model was not based on chemical reactions that could be occurring in the pyritic TSF over the 20 years of material storage. We recommend that the EIS include further discussion regarding disposal of water treatment residuals into the open pit, including how those residuals are expected to influence water quality to be treated over extended time and the influence of sludge volumes disposed over extended time. We also recommend discussing limitations on data and concluding statements from assuming a “fully mixed pit lake during the four closure phases” when PitMod predicts that there would be thermal and chemical stratification after closure years 25-30, seasonal extension of well-oxygenated waters would reach a depth of about 50 feet (K4.18-10), and that oxic conditions also would exist in the lowermost 130 feet of the pit.

Fugitive Dust Impacts on Water Quality: The fugitive dust deposition calculations appear to underestimate the impacts to streams, wetlands, lakes, and ponds. The DEIS states that “[t]he equation used [in the analysis] conservatively assumes all of the metals from air deposition partition to sediment” (pg. K4.18-57). While we concur that this approach is conservative from the perspective of sediment concentrations, it results in an underestimation of surface water concentrations. Based on our understanding of the calculations, the metals deposited in water partition further into the sediment and then a small fraction of that concentration leaches back into the water from the sediment. Given the small particle sizes associated with fugitive dust deposition, we would anticipate that most of these particles could be entrained within the water column and would not immediately deposit to the sediment. Furthermore, we would also expect some metals partitioning directly from the entrained particles into the dissolved phase in the water. We recommend a more conservative approach be taken in the EIS impacts analysis from the perspective of water concentrations, i.e., if 100 percent of the fugitive dust deposited remains in surface water rather than partition into the sediment.

In addition, the DEIS (Section 4.18.3.1 Mine Site - Effects from Deposition of Fugitive Dust) states that the expected increase in the concentration of metals in surface water would not result in any exceedances of the most stringent water quality standards. Because this statement does not acknowledge that, based on baseline water quality monitoring, some of the waterbodies in the project area currently

exceed the most stringent criteria for metals concentrations more information is needed. We recommend that the analysis of fugitive dust impact on water quality consider the existing water quality conditions of potentially impacted waterbodies and that the EIS include locations and waterbodies where fugitive dust impacts will result in exceedances of water quality standards, if any. In addition, see our earlier water quality comment related to consideration of the additive impacts of selenium in fugitive dust and treated water discharges.

Impacts Due to Road Construction: The DEIS (Pg. 4.18-21) states that “[t]he extent of effects during road construction would likely be limited to stream crossing locations within the construction right-of-way (ROW).” We recommend providing supporting analysis for this conclusion.

Impacts Due to TSS From Ferry Operation: The DEIS (Pg. 4.18-21) states that “. . . if fine bottom sediments were resuspended by ferry operations, it is expected that TSS concentrations would be expected to return to background levels within a short distance (less than 100 feet) from the ferry.” We recommend providing additional information in the EIS to support this statement.

Impacts to Water Quality at Port Locations: The DEIS Section 4.18.4.3, Diamond Point Port, discusses the effect of marine water from the dredged material seeping into groundwater from the initial dredging when at least half of the dredged material would be used in the causeway. During future dredging events all the dredged material would be placed in the disposal area as it will no longer be needed for causeway construction. We recommend that the EIS further analyze potential groundwater impacts from disposal of material from future maintenance dredging.

DEIS Section 4.18.3.3, Amakdedori Port - Substrate/Sediment Quality, states that runoff would be treated and discharged to Amakdedori Creek, while Section 2.2.2.3, Amakdedori Port and Lightering Locations – Water Management, states that the runoff would be treated and discharged through an outfall at the end of the dock, presumably to Cook Inlet (more specifically, Kamishak Bay). We recommend that this apparent discrepancy in runoff discharge locations be clarified or corrected in the EIS.

DEIS Section 4.18.3.3, Amakdedori Port - Substrate/Sediment Quality, states that “[p]otential contaminants from marine vessels accessing Amakdedori Port would be diluted and flushed into the North Pacific Ocean and would not be expected to contribute a negligible amount of contamination to existing low background levels” (4.18-25). However, Section 3.18.3.3, Substrate/Sediment Quality, describes Kamishak Bay as a natural depositional area for hydrocarbons. Based on this information, while the rest of Cook Inlet is well flushed by high tidal exchanges, the same may not be true for Kamishak Bay. We recommend that the apparent discrepancy in the characterization of Kamishak Bay between Chapters 3 and 4 be addressed or clarified, and that the EIS further analyze the potential for hydrocarbon impacts in Kamishak Bay.

Impacts of Future Potential Changes in Climate: The modeling of water quality impacts was performed under a range of historic climate conditions, using long-term historical air temperature trends, but predictions are not included regarding future climate scenarios. The DEIS states that there is no long-term data for water temperatures, which influences dissolution of minerals, and discusses that there is an expected increase in trends. Currently, the DEIS does not address how any changes in air temperature may influence changes in water temperature (or whether they are relatable) or how changes in climate may affect precipitation patterns and subsequent influences on water chemistry. We recommend that the EIS include a discussion of how the water quality impacts might change under different climate

scenarios, including an explanation of the link between air temperature and water temperature. We recommend that the analysis address how water quality (and quantity, with respect to size of storage ponds and the amount of water released to streams) will change with projected temperature and precipitation changes and the influence of these changes on resources.

Additional Comments on Geochemistry: We recommend the additional technical comments on geochemistry below be addressed in the EIS.

The statements made in the DEIS regarding the tailings material suggest that the potential for metal leaching and acid generation is lower than is indicated in some of the supporting documents. For example, Chapter 3.18 states that, “Geochemical testing of 64 tailings samples indicates that the most volumetrically abundant product, bulk tailings, which would be produced under most of the processing approaches being considered, typically contains low to moderate total sulfur” (pg. 3.18-4). However, Table K3.18-3 shows that the tailings have an average NP/AP of 0.29. A ratio this low suggests that the tailings would be acid generating (Ch. 3.18 states that NP/AP values of less than 1.4 are potentially acid generating). Given the very low NP/AP value in Table K3.18-3, the geochemical ABA testing results show the tailings to be acid generating. We recommend that this be reflected in the main text of Chapter 3.18.

Chapter 3.18 of the DEIS states that “[d]ata analysis from the various geochemical tests performed yielded consistent results. Leaching data from humidity cell tests, barrel tests, and shake flask tests performed on samples collected in both the PWZ and PEZ were used to develop geochemical source terms for predictive water quality (SRK 2018c, 2018f). Additional information regarding how the data were used in water quality modeling is provided in Section 4.18, Water and Sediment Quality” (pg. 3.18-4). The reference SRK 2018c, Geotechnical Stability Assessment of the Pebble West Pit Memorandum, does not appear to contain information needed to support these statements. Similarly, SRK 2018f, Response to PLP Action Item from Water-Focused Technical Meeting, provides information on how the data from the east and west zones are similar, but does not provide supporting analysis to directly address the statement that there were consistent results between the humidity cell tests, the barrel tests, and the shake flask tests. We recommend that Section 4.18 of the EIS provide a summary of the information in the reference documents and that the EIS provide a statistical evaluation of the release rates from these different tests showing that there were no significant differences between the various geochemical test methods.

The second sentence in the quote above suggests that data from all three methods were used to develop the source terms used to predict water quality. Information from other supporting documents suggests that only the HCT data was used for this purpose. We recommend that this be clarified in the EIS; if the data were all used to develop the geochemical source terms, we also recommend including a discussion regarding how this data was combined/averaged in the EIS.

Chapter 3.18 states that “[b]ulk tailings can be categorized as non-PAG if the total sulfur remains below 0.2 percent” (pg. 3.18-4). However, this information is not supported by data presented in Table 11-29 in the reference document, PLP 2018a. Table 11-29 presents the NP/AP values and the percent total sulfur for different samples. Earlier in the DEIS, PAG is defined by a NP/AP ratio of 1.4 and there are several examples where the NP/AP is below this level and yet the %S is lower than 0.2. For example, sample number LCT-35 had a %S of 0.13 and an NP/AP ratio of 1.2; LCT-31 had a %S of 0.15 and a NP/AP of 1.2; LCT-42 had %S of 0.16 and NP/AP of 1.4; KS-LCT1 had %S of 0.15 and NP/AP of 1.4; LCT 50 had a %S of 0.18 and NP/AP of 0.3; and LCT 58 had %S of 0.18 and NP/AP of 0.4. While these

examples may be exceptions to the general trend of non-PAG generally having a low %S, we recommend that it is important that the EIS acknowledge that exceptions to this general trend exist.

In addition, PLP 2018a states, “Figure 11-35 shows the NP/AP ratio plotted as a function of sample sulfide content. As observed previously (EBD, 2010), sulfide content appears a strong control on NP/AP – where NP/AP values below 2 are coincident with sulfide contents above 0.2%.” However, this information is reported in the DEIS with sulfide changed to total sulfur. While sulfide is often a major percentage of the total sulfur, these two measurements are not equivalent, due to the presence of sulfate. The total sulfur numbers will be larger than the sulfide numbers, consequently, there is a potential to underpredict water quality impacts, and we recommend that this be addressed in the EIS.

Chapter 3.18 states that, “Element leaching from the rougher tailings occurred at low rates, and unfiltered process supernatants were found to contain low levels of potential constituents relative to water quality standards” (pg. 3.18-4). We recommend that the EIS provide information to clarify whether this statement is referring to the analysis of fresh, aged, or the combination of both supernatants. The reference, SRK 2011a, shows that the copper concentrations increased by an order of magnitude between the fresh and the aged supernatants. For example, when comparing fresh and aged supernatants, pg. 11-59 of SRK2011a states that copper concentrations increased from 2 to 17 µg/L for one sample, and from 6 to 16 µg/L for another sample. Presumably the aged supernatant results are more representative of actual conditions that will occur in the field. Additionally, based on the values presented in Table K3.18-1, the copper criterion is 2.19 µg/L, so both the fresh and aged samples appear to exceed this criterion. Therefore, we recommend that the discussion of the supernatant concentrations focus on the aged analysis instead of the fresh analysis

Figure K3.18-2: We recommend that the EIS provide additional context for the figure displaying neutralizing potential as a function of acid generating potential, including the type of tailings for the previous data (2004, 2005, and 2008) and the type of tailings examined in the barrel test in 2012. Tailings in the EIS are discussed in terms of bulk and pyritic; bulk tailings are described as non-PAG and pyritic tailings are described as PAG. It appears that a majority of 2011 samples of rougher tailings have a NP/AP < 1, which would suggest they are PAG. We recommend clarifying Figure K3.18-2 and the associated text to specify data representing the mine material that will be stored in the bulk TSF and data representing what will be stored in the pyritic TSF.

Additional Comments Related to Existing Water Quality:

Description of Existing Water Quality Exceedances: The DEIS states that “[w]ater quality data occasionally exceeded the maximum criteria for concentrations of various trace elements in some individual sample measurements” (pg. 3.18-7). We recommend that the EIS provide information on the specific locations where criteria is exceeded to strengthen the characterization of the affected environment. We recommend that hydrological conditions associated with the exceedances; for example, whether they mostly occur during baseflow or high flow conditions, also be provided. The hydrological conditions are an important factor affecting metal/metalloid concentrations.

Transportation Corridor Groundwater Quality: Chapter 3.18 (pg. 3.18-2) states that “[g]roundwater quality beneath the proposed 84-mile transportation corridor under Alternative 1 and the additional segments under Alternatives 2 and 3 can be characterized as similar to that of the mine site and port” (pg. 3.18-20). No supporting data is provided in the DEIS to support this statement, and the DEIS later states that the northern access road crosses a variety of surficial deposits, which can influence

groundwater quality and characteristics. We recommend that the EIS provide additional information to support characterization of groundwater quality beneath the transportation corridor for all alternatives.

Figure 3.18-1: The figure displaying surface water quality sampling locations appears to be missing many seep sites that are identified in Figures 9.1-4 and 9.1-5 of the Environmental Baseline Document. Further, the stream sites shown in Figure 3.18-1 do not match the stream sites shown in Figure 9.1-3 in the EBD (e.g., NK100B does not appear in the same location, NK100D is not included). We recommend verifying and correcting the information in Figure 3.18-1 to provide a more accurate disclosure of existing water quality conditions.

Pg. 3.18-8: The DEIS states that, “Recorded pH values ranged from 3.31 to 9.33 with the lowest pH recorded in the NFK and the highest recorded in UTC. The frequency of this trend in seeps was at least double that of streams, depending on the watershed.” We recommend that the EIS provide additional information to clarify the trend being discussed.

Pg. 3.18-8: The DEIS text states that mean dissolved oxygen concentrations “ranged from 10.2 to 10.5 mg/L;” however, according to Tables K3.18-7 through K3.18-9, mean DO concentrations did not exceed 9.89 in the NFK, SFK, or UTC watersheds. We recommend that the dissolved oxygen concentrations be verified and corrected, or further explained, as appropriate.

Tables K3.18-8 and K3.18-9: The “Range of Detects” for dissolved oxygen in the tables summarizing surface water for the mine site provides a maximum of 18.2 and 18.6 mg/l, respectively. These values appear higher than saturation concentrations, even at zero degrees. We recommend verifying the values and correcting the data assessment and discussions if they are anomalous.

Table K3.18-7 through Table K3.18-12: Appendix K3.18 states that, “Table K3.18-7 through Table K3.18-12 provide the range of detected results, along with the mean and standard deviation” (pg. K3.18-42). The standard deviation is not reported in these tables and we therefore recommend that it be added to the tables. We recommend that the EIS discuss what data are and are not included and why, including why the numbers of samples reported for total and dissolved concentrations vary for many of the elements.

Background surface water quality: We recommend explaining the selection of sites NK119A and SK100F for characterizing background water quality. NK119A is located within the mine footprint, but SK100F is located downstream from Frying Pan Lake, which is outside of the mine footprint. We recommend clarifying in the EIS how these two sites selected for characterizing background will achieve the stated goal of providing predicted concentrations from sources “at the mine site that would be captured onsite, such as waste rock, pit wall runoff, railings, existing streams, and groundwater”, since one of them is not located within the mine site.

Impacts on Sediment Quality

Metals Accumulation: The DEIS states that chemical components in water (such as metals and sulfate) would be absorbed by sediment or adsorbed onto sediment surfaces, and that conversely sediment would be expected to retain chemical constituents and slowly release them back into water. We recommend including a discussion of this cycle of metals accumulation with enough information to clarify the magnitude and extent of these changes, particularly for metals, such as selenium and mercury, that tend to accumulate in sediments and adversely impact sediment and water quality.

Sediment Monitoring for Operational Impacts: The DEIS states that trace elements were detected in the baseline sediment samples, and the highest detected concentrations of arsenic, chromium, copper, and nickel exceeded concentrations that may have an adverse effect on benthic organisms, both the threshold effects level and higher probable effects level (PEL). The mean concentration of arsenic also exceeded the threshold effects level across the study area (Section 3.18.1.3, Substrate/Sediment Quality). We recommend that a monitoring plan be provided in the EIS that explains how these sediment baseline concentrations will be utilized when compared to operational and closure monitoring data to assess whether sediments have been impacted by the mine.

Sediment Quality at Port Locations: The DEIS uses NOAA's freshwater sediment quality guidelines for comparison to baseline freshwater sediment quality information. In the absence of sediment quality guidelines for the State of Alaska, the NOAA values appear to be an appropriately conservative measure to use here and in future freshwater sediment quality monitoring. We recommend also considering Washington State's freshwater standards for selenium (11,000 ppb) and silver (570 ppb), which can be integrated into future sediment monitoring comparisons.

We recommend that marine sediment quality comparison values be provided. The schedule in Geoengineers 2018b indicates that additional sediment fieldwork was to be conducted in 2018 near the marine port proposals. We recommend that sediment characterization from the port locations (especially from Diamond Point Port) be provided in the EIS, as an important component of characterizing the existing environment. We recommend that the EIS also provide appropriate marine sediment quality guidelines, such as those published by NOAA or Washington State. Any future marine dredging and disposal would require additional sediment physical and chemical characterization/review specific to the proposed project at that time.

WETLANDS, AND OTHER WATERS / SPECIAL AQUATIC SITES

The Pebble Project Draft EIS (DEIS) discloses the permanent loss of approximately 3,443 acres of wetlands, 81 miles (50 acres) of stream, 11 acres of marine waters, and 55 acres of lakes and ponds. There are additional temporary and indirect impacts. The key issues regarding impacts to streams, wetlands, lakes, and ponds is that the DEIS likely underestimates the extent, magnitude, and permanence of the adverse effects of the Pebble Project's discharges of dredged or fill material to streams, wetlands, lakes, ponds, and marine waters, and the fisheries resources they support. The DEIS does not fully identify and characterize existing aquatic resources and wetland functions to establish the environmental baseline for the analysis, because the analysis area is limited and the DEIS does not use salient available site-specific data. In addition, the analysis does not fully assess secondary/indirect effects, which is important to compare alternatives and analyze project impacts. These comments and recommendations are described below. Our letter on the CWA 404 Public Notice (see Sections V.A. and V.B.) also reflects these issues and discusses the CWA 404(b)(1) Guidelines.

Baseline Characterization - Defining Extent of Potentially Affected Aquatic Resources

Wetland Mapping: The DEIS (3.22-4-5) identifies that all Action Alternatives include areas that lack field-verified wetland mapping. Action Alternatives 2 and 3 include approximately 3,126 acres where existing National Wetland Inventory (NWI) coverage was used to map wetlands instead of field-verified wetland mapping. In addition, Action Alternative 1 includes approximately 1,300 acres where satellite data was used to map wetlands at 100-meter resolution instead of field-verified wetland mapping. Based

on the EPA's review of the preliminary jurisdictional determination, NWI coverage and satellite data substantially under-identify wetland area relative to field-verified mapping. In addition, the current disparity in the wetland mapping for different alternatives makes it difficult to compare the wetland impacts between the alternatives. According to the Corps, supplemental wetland mapping to fill these gaps is planned for the 2019 field season and this information would be included in the final EIS. Where high resolution information is not currently available, the EPA supports the Corps' decision to conduct additional data collection as greater precision mapping is necessary to accurately identify the impacts in light of the significant and complex nature of the discharge activities in this case.

Geographic Extent of Analysis: The DEIS defines an analysis area that is a fixed width area around the mine site. The DEIS analyzes impacts within this area and does not analyze impacts that are outside it. Section 230.11(h) requires an evaluation of the secondary effects of the discharges of dredged or fill material on the aquatic ecosystem, which include effects of the proposed discharge on the downstream ecosystem. However, the analysis area in the DEIS excludes areas downstream of the mine site where secondary/indirect impacts would occur. In addition, sections 230.11(b), (e), and (g) require an evaluation of the cumulative effects of the discharge of dredged or fill material on the aquatic ecosystem. However, the analysis area in the DEIS does not include the headwaters of UTC where future mining expansion would occur (i.e., the expanded mine scenario evaluated as part of the cumulative effects analysis in the DEIS). The aquatic resources in these additional areas were mapped at high resolution and field-verified between 2004 and 2008 during the collection of the environmental baseline data.⁴ We recommend that the Corps use complete and accurate mapping of the extent of potentially affected aquatic resources (including direct, secondary/indirect and cumulative effects), taking advantage of available field-verified aquatic resource mapping information. Alternatively, the Corps should explain why its existing approach is sufficient in light of the significance and complexity of the discharge activities associated with this project.

Stream Mapping: Regarding streams, the DEIS relies on the National Hydrography Dataset (NHD) mapping of stream networks to identify the streams that will potentially be impacted by the proposed project. The NHD does not capture all stream courses and may underestimate channel sinuosity, resulting in underestimates of affected stream length. We recommend that the EIS acknowledge uncertainties in the use of NHD and, to the extent possible, provide an estimate of the additional stream length for reaches that are not captured by the NHD.

In the DEIS, maps that depict the same areas show different stream channels (Figures 4.16-1, 4.22-2, 4.24-1, relative to NHD coverages for the same area). The DEIS does not explain these discrepancies. We recommend that the EIS: 1) use a consistent, thorough, and transparent "baseline" estimate of stream channel extent throughout the analysis area (i.e., for the mine site, transportation corridor, and all other project components); and 2) ensure that these stream channels are visible on all maps.

Assessing Impacts to Functions Provided by Potentially Affected Aquatic Resources

As discussed below, the DEIS does not assess the functions provided by the potentially affected streams, wetlands, lakes, ponds, and marine waters or the impacts to those functions in sufficient detail to evaluate impacts.

⁴ The 2004-2008 mapping effort assessed over 100,000 acres just in the proposed mine area. The environmental baseline mapping was augmented in 2013 and 2017 to map the newly-proposed southern access route and the Amakdedori Creek and Diamond Point port sites.

Available High-Resolution Data: The DEIS identifies the aquatic resources that will potentially be impacted by the proposed project, including lakes, ponds, and streams, using eight condensed classes. Earlier mapping work conducted by the project proponent used 27 enhanced NWI classes of aquatic resources, including for lakes, ponds, and streams. This kind of enhanced NWI mapping and differentiation among the aquatic resources allows for more accurate assessments of the functions that the potentially affected aquatic resources perform as compared to an approach that uses more general, condensed classes like those used in the DEIS.⁵ The DEIS (Section 3.22.1) does not rely on this more detailed aquatic resource data and does not explain why the greater precision information already existing in the GIS database was not used for analysis. We recommend that the Corps use the greater precision information that was collected to determine the nature and degree of effect that the proposed project discharge will have on the structure and function of the aquatic ecosystem and organisms in light of the significance and complexity of the discharge activities associated with this project. Alternatively, the Corps should explain why this more detailed information was not used and fully explain how a condensed approach allows for a complete and accurate assessment of the functions provided by the resources at issue.

Wetlands Functions: For wetlands, the Corps provides what it calls “a qualitative overview of wetland functions in the EIS analysis area.” (pg 3.22-7). This qualitative overview does not describe the level at which potentially affected wetlands are currently performing each function. This information is important to determine the nature and degree of effect that the proposed discharge will have... on the structure and function of the aquatic ecosystem. In this case, not only are the functional assessment methods available but extensive data was collected, particularly at the mine site, to apply the methods.⁶ We recommend that the EIS characterize the level at which potentially affected wetlands are currently performing each function, taking advantage of available site-specific functional assessment data and where necessary supplementing that data. Alternatively, we recommend that the DEIS explain why its “qualitative overview” of wetland functions is sufficient to assess the nature and degree of effect that the proposed discharge will have on the structure and function of the aquatic ecosystem in light of the significance and complexity of the discharge activities associated with this project.

Scrub and herbaceous wetlands⁷ constitute most of the wetland losses and degradation anticipated by the proposed project.⁸ However, the DEIS does not include the full set of functions provided by these two types of wetlands. Scrub and herbaceous wetlands, depending on their position in the landscape and water regime, provide high-quality habitat for numerous fish species and contribute water, nutrients, organic material, macroinvertebrates, algae, and bacteria downstream to higher-order streams in the

⁵ The additional aquatic resource classes provided by the enhanced NWI reduce within-class variability and make attributing function easier and more meaningful, supporting a more precise and accurate functional assessment.

⁶ During the 2004-2008 mapping/delineation work, wetlands were identified by both enhanced NWI and Hydrogeomorphic (HGM) class, and data was collected to assess wetland function using the Rapid Procedure for Assessing Wetland Functional Capacity, Based on Hydrogeomorphic Classification (Magee, 1998). The performance of eight wetland functions was quantitatively assessed. These are: 1) modification of ground water discharge; 2) modification of ground water recharge; 3) storm and flood water storage; 4) modification of stream flow; 5) modification of water quality; 6) export of detritus; 7) contribution to abundance and diversity of wetland vegetation; and 8) contribution to abundance and diversity of wetland fauna. Two hundred and twenty-eight wetland functional assessments were conducted in the mine area during the 2004 field season alone. The ENWI water regime modifiers and functional data from the earlier mapping were not used for attributing function and evaluating project-related functional loss and is not referenced in the DEIS.

⁷ Classified using NWI.

⁸ This comment also applies to wetlands classified as slope wetlands under the HGM classification because there is extensive overlap between HGM slope wetlands and the wetlands classified as scrub or herbaceous under NWI.

watershed. They also moderate groundwater discharge and surface and subsurface flows to other wetlands and support stream base flows, which all act to support fish habitat, including thermally diverse habitats. The scrub and herbaceous wetlands in the NFK, SFK, and UTC watersheds perform these functions due to the high level of hydrologic connection between streams, wetlands, lakes, and ponds in the area. The DEIS does not attribute these functions to scrub and herbaceous wetlands potentially affected by this project. Without this information, the Corps record would underestimate the anticipated aquatic resource functional losses. We recommend that the EIS characterize the full array of functions currently performed by the potentially affected wetlands. Alternatively, the Corps should explain why its existing description of the potentially affected wetlands is sufficient to analyze the nature and degree of effect that the proposed project discharge will have on the structure and function of the aquatic ecosystem and organisms in light of the significance and complexity of the discharge activities associated with this project.

Regionally Important Wetlands: The DEIS (pg. 3.22-8) identifies certain wetlands as “regionally important”⁹ based on a few general characteristics including whether they provide habitat for regionally important fish (without identification of any specific fish species). The DEIS appears to give more weight to losses of aquatic resources that it identifies as “regionally important.” This list of regionally important wetlands appears to omit the wetland types that are estimated to sustain the greatest level of project induced impacts (i.e., scrub and herbaceous wetlands).¹⁰ In addition, due to the strong hydrologic and ecologic connection, virtually all wetlands in the analysis area appear to meet the Corps’ definition of a “regionally important” wetland because they, either directly or indirectly, support habitat for anadromous and resident fish through flow contribution or moderation, water quality benefit, or organic matter or nutrient contribution. Similarly, the DEIS does not explicitly identify streams as “regionally important,” although all fish-bearing streams (and their tributaries), lakes, and ponds provide habitat support for anadromous and resident fish species. As a result, the DEIS’ approach to filter resources based on a determination of whether they are “regionally important” does not account for the full functions of these resources and results in an underestimation of anticipated aquatic resource functional losses. The EPA recommends that the DEIS not use this “regionally important” approach because the DEIS does not explain how the few characteristics it considered support a conclusion that some aquatic resources are regionally important, and others are not. In addition, the DEIS does not explain how its criteria as applied results in identifying resources that are more “important” than others. The EPA recommends that the Corps conduct a detailed analysis of the functions provided by each of the aquatic resource types as a basis for determining the value of what would be lost due to impacts from the project in light of the significance and complexity of the discharge activities associated with this project.

Streams, Lakes, and Ponds Functions: No functions are attributed to the specific stream reaches, lakes, or ponds that would be lost or degraded by the project. The DEIS does not identify what functions these specific aquatic resources perform or the degree to which they are currently performing each function. This information is important in determining the nature and extent of impacts on the structure and function of the aquatic ecosystem and organisms. We recommend that the Corps characterize the full array of functions currently performed by the potentially affected streams, lakes, and ponds as well as the degree to which they are currently performing each function. Alternatively, we recommend that the EIS explain why the current approach is sufficient in light of the significance and complexity of the

⁹ This is not a term relevant to compliance with NEPA or the Guidelines, and it is unclear how and why the Corps is making this determination.

¹⁰ As previously noted, many of these wetlands were also classified as slope wetlands using HGM.

discharge activities associated with this project. Characterization of fish habitat functions and potential impacts to those functions is discussed in more detail below.

Impacts to Aquatic Resources Functions: The DEIS does not characterize how performance of each function would change as a result of the direct, secondary/indirect, and cumulative effects of the discharge of dredged or fill material associated with the project. Instead, the DEIS only includes general statements such as “[e]xcavation, filling, and clearing of wetlands and other waters would alter or remove their capacity to provide hydrologic, biogeochemical, and biological functions” (pg. 4.22-8). We recommend that the EIS characterize the degree to which each of the functions provided by each of the potentially affected aquatic resources will change as a result of the direct, secondary/indirect, and cumulative effects of the project. Alternatively, we recommend that the EIS explain why the current general approach is sufficient in light of the significance and complexity of the discharge activities associated with this project.

Secondary/Indirect Effects: The scale and location of the direct impacts associated with the Pebble Project’s discharges of dredged or fill material likely will result in numerous secondary/indirect effects. The DEIS (pg. 4.22-4) identifies seven general types of secondary/indirect effects associated with the project: disruption of wetland hydrology; conversion of wetland type; habitat degradation downstream of the mine site; fragmentation of habitats; water quality and quantity changes; erosion and sedimentation; and fugitive dust. However, the DEIS estimates the acreage of wetlands and other waters potentially impacted by three of these types of secondary/indirect effects: habitat fragmentation, fugitive dust, and dewatering. We recommend that the Corps estimate the geographic extent (i.e., area, and for impacts to streams, linear miles also) of all of the types of secondary/indirect effects identified in the DEIS. We recommend that this include the estimated amount (in linear miles and area) of habitat degradation downstream of the mine site, and its potential implications for fish (discussed in more detail in Fish Values comments, below). Alternatively, the EIS explain why the current evaluation of the secondary/indirect effects of the proposed discharges on the aquatic ecosystem is sufficient in light of the significance and complexity of the discharge activities associated with this project.

The attribution of fugitive dust impacts is based on a fixed-width buffer rather than the dust dispersion model developed for the project, which would likely be more accurate than an assumed buffer. We recommend that the EIS explain which method is expected to provide more accurate results for determining the geographic extent of fugitive dust impacts on aquatic resources and utilize that method.

The DEIS indicates that there is uncertainty regarding the extent of the cone of depression and the predicted changes to groundwater and surface water hydrology (pg. 2.2.2.1-2-16 and 4.17.3). Thus, the volume of water produced during pit dewatering could be greater than predicted by the groundwater model, and the capture zone and zone of influence could be larger (4.17.3.1) meaning that additional aquatic resources could be impacted by the groundwater drawdown. We recommend that the EIS explain the uncertainty in the estimates of the geographic extent of dewatering impacts.

Characterization of Impacts: The DEIS does not fully identify the severity or significance of impacts to aquatic resources. For example, the DEIS (4.22-11) identifies that roughly 12 percent of the shrub wetlands and 17 percent of all stream channel length in the 171,000-acre watershed would be directly impacted (i.e., permanently lost), but it does not identify the loss of functions and the severity or significance for those effects (i.e., the relative importance of that loss). Similarly, the DEIS discloses that the proposed natural gas pipeline may impact two weathervane scallop beds, potentially affecting the sustainability of the Kamishak Bay weathervane scallop fishery. The DEIS also discloses that the

Pacific herring sac roe fishery in Kamishak Bay could experience direct or cumulative effects. The specific ecological or economic consequences of these impacts are not evaluated. We recommend that the EIS identify the nature and degree of effect of the proposed project on the aquatic ecosystem, including the severity or significance of those effects.

The DEIS considers impacts to streams, wetlands, lakes, and ponds in terms of Hydrological Unit Code (HUC)-10 watersheds, whereas impacts to fish resources (discussed in more detail below) are considered at a different scale (i.e., the NFK, SFK, and UTC watersheds), even though streams, wetlands, lakes, ponds, and fish are highly inter-related aquatic resources. We recommend that the EIS evaluate effects to streams, wetlands, lakes, ponds and fish at the same scale (i.e., the NFK, SFK, and UTC watersheds). Alternatively, we recommend that the EIS explain why it is appropriate to use different evaluation scales for these inter-related aquatic resources.

FISH VALUES

The physical, chemical, and biological impacts on ecologically important streams, wetlands, lakes, and ponds and the fishery areas they support should be more fully addressed in the EIS. The EPA recommends significant improvements to: habitat characterization, assessment, quantification, and spatial referencing; assessment of linkages between the loss and/or degradation of habitat and impacts to fish species and life stages (i.e., incubating eggs, spawning fish, and rearing juveniles); groundwater and surface water flow characterization at a scale that is more relevant to fish and fish habitat; and analysis of the potential population-level effects and effects on genetic diversity in the context of the Bristol Bay salmon portfolio. Our detailed comments and recommendations are provided in the following subsections and include comments on the draft Essential Fish Habitat (EFH) Assessment (Appendix I) since it is a supporting document to the DEIS. Our letter on the CWA 404 Public Notice (see Section V.C. of the letter) also reflects these comments and discusses the CWA 404(b)(1) Guidelines.

Fish Habitat

The abundance and distribution of different fish species are dictated by availability of the diverse, ecologically important habitats—wetlands, streams, lakes, ponds, off-channel areas, and other habitat types—that each species requires. The sufficiency, spatial arrangement, and proximity of the habitats each species requires throughout its life cycle (e.g., for spawning, rearing, overwintering, feeding) are key factors determining productivity and sustainability of fish populations. For this reason, the Corps should analyze how the project will affect both the amount and the accessibility of the full complement of habitats that each fish species requires to complete their life histories. If spawning and rearing habitats no longer exist at sufficient levels (in terms of quantity or quality), or no longer exist in proximity to each other, the abundance, productivity, and sustainability of fish populations will be compromised. These habitats would need to remain both sufficiently represented and connected, throughout the project area, in order to sustain resiliency and persistence of fish populations.

Habitat Characterization: Table 3.24-1 presents different types of habitats: mainstem reach, riffle, run/glide, pool, beaver pond, and other off-channel habitat types. The DEIS does not explain or provide evidence to support (1) how these habitats were selected and sampled; (2) whether these habitats represent all fish habitats that may be impacted by the project; and (3) how and when these habitats are used by fish [e.g., in terms of species, season, and life history stage (e.g., spawning vs. rearing vs. overwintering habitats)]. The DEIS also does not explain how this habitat information is used to evaluate effects of the project on fish (i.e., DEIS Section 4.24). We recommend that the EIS include

information regarding how and when fish habitats were defined, identified, and sampled; whether they represent all relevant fish habitats in the project area; how and when different fish species use these (and any other) habitats; and how these habitats will be affected by this project. Alternatively, we recommend that the EIS explain why its existing description of fish habitats is sufficient in light of the significance and complexity of the discharge activities associated with this project.

The Draft EFH Assessment discloses that areas of spawning, migration, and rearing are delineated based on the available ADF&G Anadromous Waters Catalog and observations PLP made during project studies. However, it does not explain the repeatable process framework by which habitats were identified or characterized. Representative habitat characterization provides the foundation on which interrelated studies (e.g., fish distribution and abundance studies) can be overlain. A consistent project framework that clearly states criteria used to classify or characterize different habitat types should be a precursor to quantifying pre-existing and post-project fish habitat. We recommend that the EIS include additional information used to support baseline habitat characterizations, including references to baseline habitat studies and the framework used to characterize fish habitats. Alternatively, we recommend that the EIS explain why its existing analysis of fish habitat is sufficient in light of the significance and complexity of the discharge activities associated with this project.

The DEIS does not provide a comprehensive analysis of environmental factors associated with distributions and abundances of fish species throughout the project area watersheds, which is needed to evaluate project-related changes in fish habitat. We recommend that the Corps ensure its analysis is comprehensive, which would include summaries of seasonal fish species' distributions and abundances (with uncertainty estimates), associated environmental conditions, and an assessment of factors potentially limiting distributions and abundances of fish species found within the project area watersheds. We recommend that the EIS discuss how habitat was assessed at both sites where fish were observed and sites where fish were not observed, to evaluate what characteristics (e.g., groundwater upwelling or downwelling, water temperature) were significant predictors of fish occurrence. We recommend that the EIS also include areas that were assessed as overwintering habitat. Inclusion of such information will help validate and support inferred relationships between fish distribution, abundance, and habitat selection. Alternatively, we recommend that the Corps explain why its existing analysis of fish habitat and relevant environmental factors is sufficient in light of the significance and complexity of the discharge activities associated with this project.

The DEIS (pg 4.24-8) states that, “[s]pecies diversity and abundance data indicate there is sufficient available habitat for relocation without impacts to existing populations.” The DEIS does not appear to provide support for this statement, and it does not present information on how available relocation habitats were assessed or what constitutes fish habitat. We recommend that the EIS explain what is meant by “sufficient available habitat that would allow for relocation without impacts to existing populations” and provide information and analyses to support this statement. Alternatively, we recommend that the Corps explain why its existing assessment of fish habitat and population-level effects of the project is sufficient in light of the significance and complexity of the discharge activities associated with this project.

Table 4.24-2, entitled “Average precipitation year spawning habitat for all streams and species in the mine site area pre-mine, during operations, and post-closure,” does not include all species documented to occur at the mine site area.¹¹ Values are reported in terms of stream area for all watersheds combined,

¹¹ Woody and O’Neal 2010.

but both stream area and stream length and breakdowns by watershed are necessary for evaluation purposes. We recommend that the table be revised to include (1) all anadromous and resident fish species (including lamprey) documented to occur in the project area watersheds and (2) values in terms of stream miles in each of the three project area watersheds, in addition to stream acreage. Alternatively, the Corps should explain why its existing analysis is sufficient.

Habitat Function and Connectivity: The DEIS and the Draft EFH Assessment do not analyze habitat function (i.e., how fish species are using the different habitats at risk from project impacts during all life stages). Fish species and populations use different habitats for different functions (e.g., spawning, egg incubation, rearing, refugia, feeding, overwintering, and migration), and this habitat use varies both seasonally and from year to year.¹² We recommend that the EIS describe fish habitat functions and their spatial and temporal variability and explain the consequences of project-related changes to each of those habitats in terms of the different habitat functions (i.e., spawning, egg incubation, rearing, refugia, feeding, overwintering, and migration). This would allow for estimation of the amount of habitat loss (in acres and linear miles) related to different habitat functions, for different fish species. Alternatively, we recommend that the Corps explain why its existing analysis is sufficient in light of the significance and complexity of the discharge activities associated with this project.

The DEIS does not analyze the spatial arrangement or connectivity of different habitat types used by anadromous and resident fish species throughout their life cycles within the project area. We recommend that the EIS analyze the spatial arrangement and connectivity of different fish habitats or explain why the existing analysis is sufficient in light of the significance and complexity of the discharge activities associated with this project.

The DEIS (pg. 4.24-6) states that “[f]ree passage of resident and anadromous fish may be temporarily interrupted but would continue unimpeded after construction is complete. Habitat at the immediate location of culverts would be altered, but fish would continue to use the streams.” The DEIS does not cite evidence to support these statements. We recommend that the EIS include further analysis and explanation to support these statements, or explain why its existing statement is sufficient in light of the significance and complexity of the discharge activities associated with this project.

Habitat Quantification: The DEIS and Draft EFH Assessment lack basic habitat quantifications for streams, lakes, ponds, and marine habitats: stream loss of channel length is not quantified by linear feet and/or miles; habitats assessed to be spawning, incubation, rearing, overwintering, and feeding areas are not quantified in acreage; migratory habitats are not quantified as linear stream miles and acreage; and, there is not sufficient quantification of habitat types and fish usage. We recommend that EIS quantify the geographic extent of potentially affected fish habitats, or explain why its existing analysis is sufficient in light of the significance and complexity of the discharge activities associated with this project. Specific recommendations are included for each of the instances listed below:

1. The Draft EFH Assessment (Table 5-1 p. 68) presents a summary of essential fish habitat for managed fish species that will be lost/destroyed during mine site development. We recommend including a table which quantifies potential habitat losses for all species (including resident and non-managed anadromous species) found in the project impact area. This information will enable

¹² Brennan et al. 2019.

the Corps to quantify impacts to fish species from the current proposal as well as from the potential future expanded mine scenario.

2. The DEIS asserts that “[t]he percentage reductions in habitat would generally decrease in a downstream direction until reaching the confluence of the NFK and the SFK (with a few exceptions). In terms of extent, rainbow trout, chum, sockeye, Dolly Varden, and Arctic grayling would have habitat decreases only in the headwater tributaries” (pg. 4.24-13). We recommend that the EIS include evidence to support this statement.
3. The Draft EFH Assessment and DEIS present miles of spawning and rearing habitats for Chinook, coho, chum, and sockeye salmon, but do not quantify overwintering, incubation, or migratory habitat. The EFH Assessment uses the Anadromous Waters Catalog to calculate spawning and rearing habitat in linear feet and miles. The Anadromous Waters Catalog covers fish spawning or presence (and less frequently migration and rearing), and it does not differentiate other critical habitats, such as overwintering habitat. Therefore, the DEIS provides an incomplete picture of fish habitat use. There is no data provided to verify the accounting of habitat miles (or acreage, by fish species) that will be impacted by the Pebble Project. We recommend that the EIS include a complete table of quantified habitat classifications by fish species documented to occur in the project impact area, to understand the amount of habitat that will be lost because of the project and the functions those habitats provide to each fish species.

Habitat Quality: The DEIS and the Draft EFH Assessment make unsupported conclusions related to habitat quality (see list below). In particular, conclusions related to “low use” and “low quality” fish habitat are not supported by the information provided in the DEIS. As discussed in the recommendations above, we recommend that the EIS conduct additional analyses of habitat characterization, function, quantification, spatial arrangement and connectivity, and the full seasonal distribution of fish species and life stages across multiple years. Once these analyses are done, we recommend that this additional information be supplied to support its conclusions. Alternatively, we recommend that the Corps explain why its existing analysis is sufficient in light of the significance and complexity of the discharge activities associated with this project. The following are specific recommendations:

1. The Draft EFH Assessment (pg. 66) states that construction of the mine site “would discharge fill material into 46,836 linear feet (14,276 linear miles)¹³ of EFH catalogued as anadromous streams in the [Anadromous Waters Catalog] and/or identified by PLP research as EFH” and concludes that impacted reaches “support primarily low levels of use by rearing Chinook salmon and rearing and spawning coho salmon.” The Draft EFH Assessment further states that “the NFK and SFK reaches that would be removed have a low Pacific salmon presence compared to downstream reaches indicating that these habitats are of lower quality EFH.” We recommend detailed analyses or references be provided to support these conclusions regarding “low levels of use” or “low Pacific salmon presence.” This supporting information is particularly important given recent research highlighting the importance of temporally and spatially shifting habitat mosaics for Pacific salmon populations in this region.¹⁴

¹³ There also appears to be a conversion error in these number which come from the Draft EFH Assessment.

¹⁴ Brennan et al. 2019.

2. The Draft EFH Assessment (pg. 67) states that habitats that would be removed exhibited some of the “lowest density use by both coho and sockeye salmon juveniles” within the SFK drainage, suggesting “low overall quality EFH or abundance of quality habitat in unaffected areas.” We recommend that additional information be provided to support these conclusions. Specifically, we recommend that the Corps present fish sampling data as catch-per-unit effort values, rather than as density use; present data on seasonal fish distributions; present data on habitat quality within the project waters; and discuss whether the DEIS and the Draft EFH Assessment evaluated and compared habitat characteristics at sites where fish were and were not observed.
3. The Draft EFH Assessment (pg. 67) asserts that, considering the low use of EFH and direct habitat losses in the SFK-E reach and the NFK 1.190 tributary, “drainage-wide impacts to Pacific salmon populations from these direct habitat losses would be unlikely.” We recommend that evidence be provided that supports this conclusion.
4. The Draft EFH Assessment concludes that the Pebble Project may adversely affect EFH. However, the Assessment also concludes that “...mortalities are unlikely and EFH characteristics would return to normal shortly after the activity ceases, or in the short term” (pg. 120) and that “habitat removed is generally of low biological importance.” We recommend that the Corps should either explain or resolve this apparent discrepancy and include references or documentation to support these assertions.

Geospatial Mapping of Habitat: The DEIS does not include geospatial representation (i.e., the location and spatial arrangement) of assessed baseline fish habitats. Such geo-location of classified habitats, analyzed by their functions for individual species, is needed to understand how the project will affect habitat availability, spatial arrangement, and connectivity, which in turn will determine impacts to fish populations. We recommend that the EIS document the location of existing baseline fish habitats, their proximity to other similar or dissimilar habitats required by those fish, and how the spatial arrangement of these habitats will change as a result of the proposed mine project. Alternatively, we recommend that the Corps explain why its existing analysis is sufficient in light of the significance and complexity of the discharge activities associated with this project.

Headwater Streams: The DEIS and the Draft EFH Assessment do not address the effects of decreased inputs from headwater streams on downstream waters. Headwater streams support numerous fish species and habitats, and the disruption to headwater streams from the mine site has the potential to result in large environmental consequences to fish and aquatic resources at a scale beyond that included in the Mine Site EIS Analysis Area (Figure 3.24-1). We recommend that the EIS include discussion of the extensive body of scientific evidence demonstrating that headwaters are critical aquatic habitats,¹⁵ and evaluate the role and importance of headwater streams in the project area in terms of both direct use of these habitats and their inputs to downstream waters. Alternatively, the Corps should explain why its existing consideration of headwater streams is sufficient in light of the significance and complexity of the discharge activities associated with this project.

Intermittent Stream Reaches: The DEIS does not analyze intermittent stream surface and groundwater flow pathways relevant to fish and fish habitat. Intermittent streams may lack flow during critical summer low flow periods and are often viewed as having limited ecological function for fish habitat or

¹⁵ For example, Section 7.2.3.2 in EPA 2014.

water quality when surface flow ceases. However, hyporheic flow composed of mixed shallow groundwater and surface water under and along the channel bed can continue in these intermittent channels after surface flow has ceased. This hyporheic flow can be thermally moderated (i.e., buffered from the effects of solar heating by the channel substrate),¹⁶ and thus can create thermally distinct fish habitat in isolated pools in intermittent streams.¹⁷ The literature supports the idea that intermittent streams can provide high quality habitat. Subsurface flow can also increase thermal heterogeneity where it emerges at confluence zones with perennial water bodies, such as lakes¹⁸ or streams and rivers,¹⁹ providing patches of cold-water habitat in otherwise warm downstream waters. The functional role of colder tributaries in providing thermally distinct water that supports cold water fish species is a clear example of an ecosystem service provided by the tributaries,²⁰ potentially even after surface flow has ceased in an intermittent stream reach. We recommend that the EIS evaluate the potential importance of intermittent stream reaches, which are seasonally important for fish migration, spawning, and rearing as part of stream-lake networks, in the project impact area or the Corps should explain why its existing consideration of intermittent streams is sufficient in light of the significance and complexity of the discharge activities associated with this project.

The DEIS states that the mainstem SFK has a 10-mile reach, from two miles below Frying Pan Lake to the SFK Tributary 1.19, that frequently exhibits zero or intermittent flow during winter and summer months. The DEIS states that the loss of surface water in this reach transfers an average of 22 cfs from the SFK (Nushagak River headwaters) into the UTC (Kvichak River headwaters) via groundwater exchange, indicating complex hydrological connections. Groundwater remaining in the SFK basin reemerges at the downstream end of the intermittent reach, 20 miles above the NFK confluence. The DEIS states that this reach is not considered “quality” habitat for purposes of environmental review (pg. 3.24-9), but this conclusion is not supported within the DEIS. As discussed above, the scientific literature supports the conclusion that intermittent stream reaches can be seasonally important for fish migration, spawning, and rearing²¹ as part of stream-lake networks. Furthermore, the DEIS states that the highest densities of chum salmon redds occurred in the reach immediately downstream of the dry channel (SFK-C), where accretion of groundwater is most evident.²² The DEIS does not present the data or other information on stream habitat that were analyzed to reach the conclusion that the intermittent stream reach does not represent quality habitat. We recommend that the EIS evaluate the intermittent reach on the mainstem SFK, between SFK Tributary 1.19 and the outlet of Frying Pan Lake, as potential habitat for Chinook, sockeye, and chum salmon and resident fish. Alternatively, we recommend that the Corps explain why its analysis is sufficient in light of the significance and complexity of the discharge activities associated with this project.

Off-Channel Habitat: The DEIS does not quantify off-channel floodplain habitats or disclose models that will be used to account for off-channel habitats, even though off-channel habitats can be an extremely important factor in salmonid distribution.²³ Tables 4.24.2 and 4.24.3 assert that there will be an increase in downstream spawning and rearing habitats, but the DEIS does not provide scientific evidence supporting this claim. We recommend that the EIS document and quantify pre-existing off-

¹⁶ May and Lee 2004, Arrigoni et al. 2008.

¹⁷ Bilby 1984, May and Lee 2004.

¹⁸ Buttle et al. 2001.

¹⁹ Ebersole et al. 2015.

²⁰ Torgersen et al. 2012.

²¹ *Id.*

²² R2 et al 2011a.

²³ For example, Swales and Levins 1989.

channel habitats that may be affected by the project, analyze potential losses of off-channel habitats due to the project, and address the consequences of these habitat losses to fish populations. We recommend that results from the Pebble Project Draft Environmental Baseline Studies 2006 Study Plan be used to help illustrate the mechanics of flow connectivity to the channel from surface flow, groundwater flow, or both combined. For example, Figure 11.1-3 of PLP 2006 includes a map of off-channel habitat transects from the SFK River. Alternatively, the Corps should explain why its existing analysis is sufficient in light of the significance and complexity of the discharge activities associated with this project.

Fish

Distribution and Abundance: The DEIS and the Draft EFH Assessment do not characterize the full seasonal distribution and abundance of resident and anadromous fish or capture interannual variability in these parameters. Because the distribution and abundance of fish can vary substantially both seasonally and interannually, and because the project will affect the area in perpetuity, long-term data on fish distributions and abundances are needed to evaluate impacts of the project. We recommend that the EIS analyze the full seasonal and interannual variability in distributions and abundances of fish species and assemblages that are supported by the diversity of habitats in the Nushagak and Kvichak River watersheds, including habitats in the headwater streams of the SFK, NFK, and UTC over multiple years. Alternatively, the Corps should explain why its existing analysis of spatial and temporal variability in fish abundances and distributions is sufficient in light of the significance and complexity of the discharge activities associated with this project. Specific recommendations include:

1. Fish may be absent from a site during some years or some portions of a single year, but present in high abundances at other times. Low abundance at one point in time does not necessarily equate to low abundance at another point in time, nor does it mean that the habitat is not ecologically important. We recommend that the EIS explain the seasonal and interannual distributions and abundances of fish species in terms of migration, spawning, incubation, rearing, and overwintering habitat within streams affected by the Pebble Project, including those affected by the withdrawal, storage, and discharge of water. When abundance and distribution data are presented, we recommend that the Corps specify how that data was generated (e.g., in terms of sampling frequency).
2. The DEIS includes little data on fish densities (see DEIS Sections 3.24 and 4.24), although density data is available.²⁴ The statements that are included in the DEIS are qualitative and unsupported. We recommend that the Corps include relevant data collected by PLP and supplement their analysis with relevant data collected by others.²⁵
3. The DEIS states (pg. 4.24-3) that rearing Chinook salmon have been documented in the 2.9 miles of NFK Tributary 1.19 in lower densities (0.11 fish/100m²) compared to the mainstem NFK (4.99 fish/100m²) but does not include a citation to support this statement. These estimates appear to conflict with research conducted by ADF&G in the Nushagak River watershed that concludes that juvenile salmon are likely more abundant in the tributaries and headwaters of the

²⁴ For example, Tables 7.1-7.3 in EPA 2014, which show data from PLP's Environmental Baseline Document.

²⁵ For example, Woody and O'Neal 2010.

drainage, where finer scale habitat such as riffles and woody debris are more common.²⁶ We recommend that the EIS consider this ADF&G report and provide supporting information for the above referenced statement.

4. The Draft EFH Assessment states that no adult Pacific salmon were observed within the headwater reach of the SFK River that would be eliminated by the Pebble Project during the 2004-2008 aerial surveys to document adult salmon distribution (pg. 67). Aerial surveys can substantially underestimate salmon abundances in narrow, deep, highly vegetated, or tannic waters.²⁷ Inclusion of supplemental survey methods such as mark-recapture can help identify error and bias in estimates.²⁸ We recommend that the EIS include discussion of the limitations of aerial surveys and how these limitations could impact conclusions made in the EFH Assessment and in the EIS (i.e., by underestimating salmon counts in headwater streams).
5. Fish abundance estimates from the Environmental Baseline Document (Figure 15-1-96; PLP 2011) suggest that over 80,000 returning sockeye salmon were counted during one aerial survey in UTC and Tributary 1.60. This estimate, combined with remaining adult aerial counts, suggest that over 100,000 spawning sockeye salmon were counted in UTC alone in 2008, but this information is not included in the DEIS. We recommend that the EIS include these and other existing project-specific fish abundance estimates in the record

Bristol Bay Salmon Portfolio: The DEIS and the Draft EFH Assessment do not fully analyze population level effects from the potential loss of genetic diversity of the Bristol Bay salmon portfolio.²⁹ The Pebble Project could result in population-level effects on the genetic diversity of salmon stocks in the Nushagak and Kvichak River watersheds, which in turn could impact the salmon portfolio and overall resilience of salmon populations within the Bristol Bay watershed. Thus, additional information on the genetically distinct fish populations in the project area is needed. We recommend that the EIS analyze the relative contribution of genetically distinct spawning populations to determine the significance of population losses or reductions that may result in impacts beyond recovery thresholds of species.³⁰ We recommend that the EIS also analyze and discuss existing scientific information on the Bristol Bay salmon portfolio and the consequences of genetic biodiversity losses for salmon populations. Alternatively, the Corps should explain why its existing discussion of genetic diversity and the portfolio effect in the Bristol Bay region is sufficient in light of the significance and complexity of the discharge activities associated with this project. Specific topics that we recommend the EIS discuss and evaluate include:

1. There are several hundred discrete sockeye salmon populations in Bristol Bay.³¹ It is possible that as many as 200 to 300 discrete sockeye salmon spawning aggregates occupy the Kvichak River system alone.³² The heterogeneity of these Kvichak River populations reduces the

²⁶ For more information about this research see:

http://www.adfg.alaska.gov/index.cfm?adfg=chinookinitiative_nushagak.main#juvenileabundance

²⁷ Bevan 1961.

²⁸ For example, Parken et al. 2003.

²⁹ Schindler et al. 2010.

³⁰ *Id.*

³¹ *Id.*

³² Habicht et al. 2004; Ramsted et al. 2004; Ramstad et al 2009.

variability of sockeye salmon returns in the Bristol Bay region and contributes to the stability and robustness of the resource.

2. ADF&G has built and tested the Bristol Bay salmon genetic baseline over the past 17 years.³³
3. Recent research indicates that sockeye and Chinook salmon productivity vary over space and time in the Nushagak River drainage, and that shifting habitat mosaics throughout the drainage, including streams draining the project area, help stabilize interannual salmon production.³⁴

Population Level Effects: The DEIS Summary for Habitat Loss (Section 4.24.2.1) concludes that modeling indicates that “indirect impacts associated with mine operations would occur at the individual level and be attenuated upstream of the confluence of the NFK and SFK with no measurable impacts to salmon populations” (p. 4.24-6). Standard fisheries management techniques are applied at the population level, not the individual level, and the approach mentioned in the DEIS is inconsistent with ADF&G population/stock management approaches. The DEIS also does not provide fish population estimates or the models used to support the determination that impacts would occur at the individual level rather than at the population level. We recommend the EIS clarify the distinction between individual-level and population-level effects and include supporting information for the conclusion that there would be no measurable impacts to salmon populations. Alternatively, we recommend the Corps explain why its existing analysis is sufficient in light of the significance and complexity of the discharge activities associated with this project.

Temporal Availability of Salmon: The Pebble Project proposes to eliminate, dewater, block, and fragment headwater streams, which could result in the loss of habitats that support headwater spawning and rearing salmonid populations. Headwater stream populations arrive later to their spawning grounds than those downstream in the mainstem and lower tributaries. Later arriving salmon populations are important because they extend the seasonal availability of salmon to terrestrial wildlife (e.g., bears, wolves) and other aquatic biota (e.g., fish and invertebrates) in the NFK, SFK, and UTC, and the overall Nushagak and Kvichak watersheds. Predators and scavengers roam from lakes to mainstems to tributaries in search of food subsidies offered by asynchronous salmon run timings across the landscape. The DEIS does not evaluate the importance of late arriving salmon to the ecology of headwater and downstream areas or of the potential consequences of losses due to the project. We recommend the EIS evaluate the importance of late arriving salmon to the ecology of headwater and downstream areas and the potential consequences of losses of these asynchronous subsidies due to the project or the Corps explain why its existing analysis is sufficient in light of the significance and complexity of the discharge activities associated with this project.

Age Structure: The DEIS acknowledges the presence of multiple age classes of Chinook, coho, and sockeye salmon in the Nushagak and Kvichak River watersheds. As a result, project impacts may result in losses of multiple age classes of multiple species. This loss of age class representation could significantly impact annual production or returns within a few generations. This issue is currently not evaluated in the DEIS. We recommend that the EIS analyze the potential for losses of multiple age classes, including across multiple species, and the potential resulting depletion of annual returns or that the Corps explain why its existing analysis is sufficient in light of the significance and complexity of the discharge activities associated with this project.

³³ For more information see: http://www.adfg.alaska.gov/index.cfm?adfg=fishinggeneconservationlab.bbaysockeye_baseline

³⁴ Brennan et al. 2019.

Egg Incubation: The DEIS and the Draft EFH Assessment do not fully address egg incubation or potential impacts to incubating fish eggs from habitat alterations. While the DEIS analyzes timing of spawning, egg incubation is a different life stage that occurs during a different time period. Table 3.24-4 does not include egg incubation, and thus this table presents an incomplete picture of life-stage periodicities of fish species in the NFK, SFK, and UTC watersheds. In addition, egg incubation could be affected by several project induced physical and chemical alterations, including changes in water temperature, groundwater inputs/flow pathways, surface flows, dissolved oxygen, pH, conductivity, and other water quality parameters. We recommend the EIS add egg incubation to Table 3.24-4, between spawning and emergence periods and that the EIS evaluate potential impacts to incubating eggs from changes in flow (e.g., scour) and other physical and chemical project induced alterations, as well as the consequences of the potential impacts to incubating eggs for fish species and populations. DEIS Table 4.24-1, which presents “Priority species and life stages used to determine habitat flow needs in the mine site area,” should be revised to include the incubation life stage for all species documented to occur in potentially affected waters, including lamprey (resident and anadromous). The analysis of impacts to lamprey are important because lamprey eggs hatch into larvae (ammocoetes) in about two weeks’ time and drift downstream to slow velocity areas, where they reside in the substrate from three to seven years, resulting in multiple age classes in the substrate at once. Lamprey eggs and ammocoetes, as well as eggs of other nest-building fish species, can be impacted by high flows that scour redds during sensitive life stages. We recommend that Table 4.24-3, entitled “Average precipitation year juvenile habitat for all streams and species in the mine site area pre-mine, during operations, and post-closure,” be revised to include all species documented at the mine site area.³⁵ Alternatively, we recommend that the Corps explain why its existing consideration of egg incubation is sufficient in light of the significance and complexity of the discharge activities associated with this project.

Resident and Anadromous Fish: The DEIS discloses that potential direct and indirect (i.e., secondary) effects for aquatic resources are assessed according to the magnitude of impact from the project depending on the specific species sensitivity to the type of disturbance (p. 4-24-1). However, only select species are mentioned and several species that would be impacted are not included. As a result, the DEIS presents an incomplete picture of the number of impacted fish species and underestimates direct, secondary/indirect and cumulative impacts to the diversity of species and assemblages that provide ecological sustainability to the NFK, SFK, and UTC watersheds. We recommend that the EIS analyze impacts for the full diversity of resident and anadromous fish species known to occur in the Nushagak and Kvichak River watersheds or explain why its existing focus on selected species is sufficient in light of the significance and complexity of the discharge activities associated with this project.

DEIS Table 3.24-4 presents periodicity information only for select species. This table is incomplete and does not sufficiently represent periodicity because the length of time between spawning and fry emergence varies with species, population, and water temperature.³⁶ We recommend that the EIS include the complete periodicity of critical life stages of all anadromous and resident species known to occur in the mainstem and tributaries of the Nushagak and Kvichak River watersheds in Table 3.24-4 or explain why its existing focus on selected species is sufficient.

³⁵ Woody and O’Neal 2010.

³⁶ Murray and McPhail 1988, Quinn 2004.

DEIS Figures 3.24-2 and 3.24-3 present the fish distribution and relative contribution of “anadromous salmonids,” “resident salmonids,” “non-salmonid fish,” and “no fish observed.” The DEIS does not clearly define these terms, which differ from the regulatory language of the ADF&G Anadromous Waters Catalog. We recommend that the EIS define the categories used in Figures 3.24-2 and 3.24-3. For comparative purposes, we recommend that the EIS refer to life history strategies as either “anadromous” or “resident,” consistent with the ADF&G Anadromous Waters Catalog. We also recommend that the EIS clarify whether “no fish” means that the reaches were sampled and no fish were found (and if so, when and how frequently these reaches were sampled), or that reaches were not sampled. Alternatively, the Corps should explain why its existing categories are sufficient in light of the significance and complexity of the discharge activities associated with this project.

Life History Strategies: The DEIS does not disclose potential impacts to life history strategies. Some fish species (e.g., rainbow trout, least cisco, Dolly Varden char, three-spine stickleback, lamprey) exhibit both resident and anadromous forms, each with diverse habitat needs for successful completion of life cycles. Resident and anadromous forms of lamprey were documented in the NFK, SFK, and UTC during the 2007 Baseline studies.³⁷ The presence of lamprey has also been documented in these headwater streams.³⁸ Anadromous Dolly Varden have also been documented in Bristol Bay watersheds.³⁹ We recommend that the EIS analyze life history strategies of the fish species documented to occur in the project impact area, consider potential impacts of the project to these life history strategies, and explain whether anadromous populations of these fish are also present within the Nushagak and Kvichak River watersheds. Alternatively, the Corps should explain why its existing analysis is sufficient in light of the significance and complexity of the discharge activities associated with this project.

The DEIS does not analyze potential impacts to diverse fish spawning strategies (e.g., nest builders versus broadcast spawners; spring versus fall spawners). For example, salmonids and lamprey species build redds in the channel substrate. Least cisco are broadcast spawners with eggs that disperse in the water column. Coho salmon are fall/winter spawners, while rainbow trout are spring spawners. Adaptive spawning strategies may not be resilient to the physical and chemical alterations resulting from the project. We recommend that the EIS analyze impacts of the project to the diversity of spawning strategies known to be used by fish species documented in the project area and resulting changes to the overall ecology of fish populations and assemblages or explain why its existing analysis is sufficient in light of the significance and complexity of the discharge activities associated with this project.

Bivalves: The DEIS does not discuss the presence or absence of freshwater mussels in the Bristol Bay region, nor does it analyze project impacts to bivalves. The Pebble Project Draft Environmental Baseline Studies, 2006 Study Plan, Figure 11.5-1, presents a map of the 2005-2006 project freshwater mussel sampling locations for Lake Iliamna. We recommend that the EIS characterize the pre-existing bivalve populations and analyze potential impacts to bivalves from the project or explain why its existing analysis is sufficient in light of the significance and complexity of the discharge activities associated with this project.

Sampling Design: The DEIS does not describe site selection and sampling design for fish habitat, distribution, or relative abundance studies. The DEIS does not explain methodologies used for the

³⁷ Northern Dynasty Minerals 2007.

³⁸ Woody and O’Neal 2010.

³⁹ Lisac and Nelle 2000, Reynolds 2000, Taylor et al. 2008.

selection of habitat transects (i.e., random, systematic) or if there was statistical reasoning behind the study transect selection. In addition, levels of uncertainty and error are not consistently reported for data used in the analysis. Fish counts reported in PLP's Environmental Baseline Document⁴⁰ do not always include estimates of observer efficiency, sampling efficiency, or other factors that affect the proportion of fish present observed. Thus, counts may often underestimate true abundance. The DEIS also includes limited or no information regarding when samples were collected, how many were collected, how often they were collected, and overall sample size on which estimates were based. This information should be included within the DEIS to support its statements. We recommend that the EIS provide information on site selection and study sampling designs and associated levels of uncertainty and error, as well the above-mentioned sample reporting information, for all data included in the DEIS, because this information is necessary to understand and support the presented analysis. Alternatively, the Corps should explain why its existing presentation of sampling design information is sufficient in light of the significance and complexity of the discharge activities associated with this project.

Impacts of Streamflow Alterations: The project proposes to directly alter the natural flow regimes of streams that support resident and anadromous fish. A stream's flow regime—its daily, seasonal, annual, and flood fluctuations—is key to stream structure and function; thus, assessing impacts based only on mean monthly streamflows at large spatial scales does not adequately capture impacts. Numerous case studies in the literature indicate that altering a stream's hydrograph can cause measurable changes in ecosystem structure.⁴¹ Streamflow changes are characterized in the DEIS using changes to monthly and annual mean flows. Fish habitat is created and maintained through daily and seasonal variations (e.g., minimums and maximums) of the natural hydrograph and therefore the time scale used in the DEIS does not capture flow impacts on fish. Reporting mean monthly values alone does not represent the range of flows that occurs each month or during extreme precipitation or drying events. We recommend that the EIS model flow alterations associated with the project on a more conservative basis, such as a daily or diurnal basis, to fully predict potential impacts on fish. We recommend that the EIS also characterize flow alterations such that pre-existing, mine operation, and post-closure hydrographs can be compared in terms of changes in the frequency or magnitude of daily peak and minimum flows. To support this analysis, the EIS could include a table that identifies: stream, reach, length (miles), percent and absolute (cfs) streamflow alteration (in terms of monthly mean, minimum, and maximum flows), and fish species and life stages known to be present. We recommend that the EIS include one or more maps of streams in the mine area that illustrate the specific percent streamflow changes expected along those streams (e.g., see Figure 7-14 in EPA 2014). Alternatively, the Corps should explain why its existing analysis of flow alterations is sufficient in light of the significance and complexity of the discharge activities associated with this project.

The DEIS does not explain how flow alterations may alter ice formation in the Nushagak and Kvichak River watersheds. The DEIS does not include information on locations, thickness, or movement of ice; timing of break up and ice-out; under-ice temperatures; or under-ice spawning and overwintering habitat. We recommend that the EIS evaluate the project's potential impacts on the ice-related factors discussed above or explain why its existing consideration of ice-related factors is sufficient in light of the significance and complexity of the discharge activities associated with this project.

The DEIS asserts that increasing flow will only result in positive benefits by increasing habitat. However, increasing flow can have negative effects as well (e.g., via temperature changes, redd

⁴⁰ PLP 2011.

⁴¹ Richter et al. 2012.

scouring, and changes in channel stability and form), and it is well established that for many species and life stages, increasing flow does not create more habitat. In addition, the timing, frequency, and duration of increased flows should be considered. We recommend that the EIS further evaluate the extent to which increasing flow will result in potential positive benefits for the species and life stages impacted, as well as the potential negative impacts that could result from flow increases, in terms of the magnitude, timing, frequency, and duration of these changes. Alternatively, the Corps should explain why its existing analysis of the impacts of flow increases is sufficient in light of the significance and complexity of the discharge activities associated with this project.

According to Draft EFH Assessment, the net changes to habitat are expected to be negative across species in an average year and even greater in a dry year. The Draft EFH Assessment (Table 5-3) includes a nine percent decrease of spawning habitat for all four salmon species (Chinook, sockeye, coho, chum) in a dry year. We recommend that the EIS revise or provide supporting information for assertions in the DEIS that the Pebble Project will increase habitat, to accurately reflect analyses showing net habitat decreases. Alternatively, the Corps should explain why its existing analysis is sufficient and accurate in light of the significance and complexity of the discharge activities associated with this project.

In considering mine site impacts on fish resources, the DEIS states that the EIS analysis area (the NFK, SFK, and UTC watersheds, plus a 1,000 ft buffer around the mine site) includes “all aquatic habitats potentially impacted by changes in streamflow from the diversion, capture, and release of water associated with the project that result in a modeled reduction of streamflow greater than 2 percent” (pg. 4.24.-1). We recommend that the EIS provide rationale for why this two percent threshold was selected, the spatial or temporal scale at which this two percent value was calculated, how these delineations were supported by modeled streamflow changes, or whether this area also encompassed streamflow increases greater than two percent, and why it is considered a scientifically defensible threshold for considering impacts to fish resources.

The DEIS states that approximately 2.3 miles of the Tributary 1.190 mainstem and sub-tributary stream channels will remain free-flowing between the TSF and the water seepage pond, and that this could be resident species habitat (Section 4.24.2.1 Habitat Loss – North Fork Koktuli). We recommend that the EIS explain how this stream segment will remain free-flowing if it is blocked on both ends by mine structures, the upstream end of which is designed as a flow-through system such that water in this segment would be, in part, mining process water from the TSF.

The DEIS estimates the potential extent of downstream flow-related impacts of the project. The estimate, however, is unsupported. The DEIS states that “[o]nce the mainstem of the Koktuli is reached, flow changes would not be detectable” (pg. 4.24-13). The EPA’s review finds that the DEIS does not contain any support for this conclusion, and that the DEIS does not define ‘detectable.’ We recommend that the information be added to support this statement regarding downstream flow-related impacts and revise or clarify as necessary.

According to the DEIS surface water modeling chapter (Appendix K.17 and RFI 104), the margins of error for flow model results are high; for example, the maximum difference between actual and modeled flows is approximately 20 percent. We recommend that the EIS, both graphically and tabularly, display flow changes (increases and decreases) for all project phases to show the extent (i.e., 3, 5, and 10 percent) and degree of downstream flow. We also recommend that the EIS show how changes in

effluent discharges may result in fish habitat changes, taking into account the 20 percent margins of error in the flow model. Alternatively, the Corps should explain why its existing analysis of flow alteration is sufficient in light of the significance and complexity of the discharge activities associated with this project.

Water Quality Impacts on Fish

Water Chemistry: The DEIS lacks analyses of the potential for fish toxicity from the introduction, relocation, or increase in contaminants in the aquatic environment. Anadromous and resident species are genetically adapted to a relatively narrow and unique range of habitat and water quality parameters within their natal streams.⁴² We recommend that the EIS analyze: 1) potential impacts of increased metal loading to fish; and 2) how increases in loading, especially of copper and selenium, would affect fish downstream of the discharge points. We recommend that the level of chemical alteration and potential consequences to fish and fish habitat be evaluated. Alternatively, the Corps should explain why its existing analysis of metal loading and impacts on fish is sufficient in light of the significance and complexity of the discharge activities associated with this project. Additional technical recommendations include:

1. The Pebble Project proposes to treat all discharges to meet water quality standards. The Corps should analyze the potential for discharges to match the existing water quality of the receiving waters. Discharges that meet standards may still impact fish and fish habitat. For example, small changes, such as increases in dissolved copper concentrations, can be lethal or sublethal.⁴³ In order to improve this analysis, the Corps should predict changes to concentrations in streams due to project impacts (such as treated water discharges, fugitive dust, and uncaptured groundwater) and evaluate the impacts that these changes could have on fish and fish habitat.
2. DEIS Section 3.24.1, Fish Tissue Trace Element Analysis, does not provide summary baseline or existing concentrations of elements (i.e., zinc, copper, arsenic, mercury, methylmercury). The Pebble Project Draft Environmental Baseline Studies 2006 Study Plan (Figure 11.1-1) includes a map of fish tissue sample site locations and the Draft 2007 Environmental Baseline Studies include a table of fish tissue sample locations (Table 11.1-2). We recommend that the EIS include this information to support analysis of potential impacts to fish from elevated elements.
3. Neither the DEIS nor the Draft EFH Assessment include analyses and discussion of potential toxicity impacts to fish. We recommend that the EIS analyze the potential for the following toxicity impacts:
 - Impairment to olfaction and homing capabilities in salmonids;
 - Attraction to very high lethal levels of water contamination;
 - Interference with respiratory function;
 - Reduction in immune efficiency;
 - Disruption to osmoregulation capabilities;
 - Impacts to the sensitivity of the lateral line canals;
 - Impairment of brain function; and

⁴² Woody 2018; Lytle et al. 2004.

⁴³ Eisler 2000, Baldwin et al. 2003, Sandahl et al. 2006, Hecht et al. 2007, Sandahl et al. 2007, Tierney et al. 2010.

- Changes in enzyme activity, blood chemistry, and metabolism.

Water Temperature: The DEIS and the Draft EFH Assessment do not analyze how disruption in groundwater pathways, surface water flow, and aquifers will alter water temperatures and thermal patterns within the NFK, SFK, and UTC watersheds. Fish are at risk from changes in the heterogeneity of thermal patterns, which drive their metabolic energetics. Fish populations rely on groundwater-surface water connectivity, which has a strong influence on stream thermal regimes throughout the Nushagak and Kvichak River watersheds and provides a moderating influence against both summer and winter temperature extremes (Woody 2011). We recommend that the EIS characterize existing baseline heterogeneity of the water temperature regime and what this heterogeneity means for fish and fish habitat, including analyses of the regulating effects of groundwater/surface water connectivity. We recommend that the EIS analyze how flow alterations will affect pre-existing daily thermal regimes, as well as consequences for fish. A color-coded thermal map of the existing water temperature regimes versus those under the project operations would be helpful to show changes that could occur with project implementation. Alternatively, the Corps should explain why its existing analysis of temperature changes and impacts to fish is sufficient, in light of the significance and complexity of the discharge activities associated with this project. Additional technical recommendations regarding water temperature include:

1. The Draft EFH Assessment Table 5-4 presents a range of average stream water temperatures pre-mine and after release of treated surplus water during winter and summer. We recommend that this analysis be revised to include temperature variability (i.e., changes in daily minimum and maximum temperatures). Broadly characterized winter and summer average temperature ranges are not relevant to disclosing changes in thermal patterns to which NFK, SFK and UTC resident and anadromous fish are locally adapted. We also recommend that the EIS analyze potential short-term effects of water temperature increases during dry years.
2. We recommend that the EIS analyze impacts of temperature alteration to critical life history stages of fish species, particularly in terms of changes in incubation conditions and accumulated thermal units necessary to complete egg development. Egg development is a sensitive life stage and water temperature differences of one degree Celsius can impact growth and development.⁴⁴
3. The DEIS assumes that the impacts of the proposed project to average stream water temperatures during the winter will be negligible or beneficial with no supporting evidence. We recommend that the EIS include analysis to support or revise these conclusions.⁴⁵
4. The Draft EFH Assessment asserts that ice and beaver effects on stream morphology would likely minimize potential effects of flow alteration on channel morphology (5.1.1.3 Water Flow, pg. 70). We recommend that the EIS include additional information to support this conclusion.
5. We recommend that Section 3.24.5 of the DEIS be revised to consider how future changes in the regional climate may affect fish populations. We recommend that the EIS analyze long-term management under expected future climate scenarios, particularly in terms of water treatment and management and salmon populations. As discussed earlier, a key feature of salmon populations in the Bristol Bay watershed is their genetic diversity (i.e., the portfolio effect), which serves as an overall buffer for the entire population. Different sub-populations may be more productive in different years, which affords the entire population stability under variable

⁴⁴ Brannon 1987, Beacham and Murray 1990, Hendry et al. 1998, Quinn 2005, Healey 2011, and Martins et al. 2012.

⁴⁵ For example, Sparks 2018.

conditions year-to-year. If this variability increases over time due to changes in temperature and precipitation patterns, this portfolio effect becomes increasingly important in providing the genetic diversity to potentially allow for adaptation; thus, impacting or destroying genetically diverse sub-populations may have a larger effect on the overall population than expected under future climatic conditions.

Nutrient Inputs: The discussion of stream productivity (Section 4.24.2.4) includes unsupported conclusions regarding the importance of marine-derived nutrients, stating “[a]s shown in the baseline data above, marine-derived nutrients do not appear to influence the nutrient availability in the Koptuli or uppermost reaches of the Upper Talarik watersheds in the project area” (pg. 4.24-17). It is not clear what baseline data are referred to in this statement. Further, baseline water quality data are not relevant to supporting such conclusions, as it is likely that marine-derived nutrients in these relatively low-nutrient systems would get taken up quickly by biota rather than remain in the water column. Consideration of whether biotic production differs between anadromous and non-anadromous streams would be of more value in determining the influence of marine-derived nutrients. To evaluate the contribution of marine-derived nutrients to stream productivity, we recommend that the EIS evaluate changes to marine-derived nutrient inputs from the pre-existing condition and the consequences of these changes for stream productivity at multiple trophic levels or explain why its existing analysis of stream productivity is sufficient, in light of the significance and complexity of the discharge activities associated with this project.

The DEIS includes almost no analyses of direct losses of autochthonous and allochthonous inputs from upstream reaches lost and/or disconnected from wetland and other riparian habitats, as well as the incremental reductions in those inputs in downstream segments throughout the stream reaches. We recommend that the EIS analyze these losses of autochthonous and allochthonous inputs and their effects on system-wide primary, secondary, and tertiary production that support fish populations or explain why the existing analysis of these inputs is sufficient, in light of the significance and complexity of the discharge activities associated with this project.

The DEIS similarly includes almost no analyses to address invertebrate transport and production. Invertebrates are a significant source of food for fish. Macroinvertebrate and periphyton data are very spatially and temporally limited in the mine site area, limiting the utility of generalizations about stream productivity. No data on macroinvertebrate exports from headwater streams are presented in the DEIS, despite numerous studies showing these exports can be important in Alaska streams.⁴⁶ We understand that a macroinvertebrate technical working group was convened, and limited data on macroinvertebrates were collected in the mine site area and along the northern transportation corridor as part of the environmental baseline for the project; however, the DEIS does not include this information. We recommend that the EIS analyze invertebrate transport and production, using available site-specific data and where necessary supplementing these data with additional sampling and information. Alternatively, we recommend that the Corps explain why its existing analysis of invertebrate exports is sufficient, in light of the significance and complexity of the discharge activities associated with this project.

⁴⁶ For example, Wipfli and Gregovich 2002, Wipfli et al. 2007.

Modeling of Impacts to Aquatic Resources: The DEIS identifies significant uncertainty in the groundwater model, which affects the water balance and streamflow alteration predictions⁴⁷ (see Groundwater and Surface Water Hydrology comments above). No accuracy or sensitivity analysis was performed on the water quality modeling and predictions (see Water Quality section, above), or the physical habitat simulation modeling (see comments below). The DEIS does not include information about how the uncertainties in modeled predictions (e.g., predictions in flow alterations and sources of water and contaminant contributions) affect predicted impacts to fish and fish habitat. We recommend that the EIS discuss the validity and accuracy of model outputs when assessing project impacts to fish and fish habitat.

The Draft EFH Assessment discloses that a hybrid simulation analysis model (HABSYN) was used to synthesize habitat-flow relationships. According to the document, HABSYN is meant to account for predicted stream flow reductions and treated surplus water discharges from the mine water treatment plants, and its predictions are based on physical habitat simulation system (PHABSIM) modeling at measured transects. PHABSIM forces/assumes a fish-habitat relationship based on water depth and velocity (discharge) alone. We also note that PHABSIM and its subcomponents (habitat suitability curves and wetted usable area) were identified by the Pebble Project Instream Flow Technical Working Group as being problematic and inappropriate for assessing fish habitat in the project area.⁴⁸ The DEIS and supporting documents have not established that there is a relationship between discharge and fish habitat selection, which is of particular import given that the impacted sub-watersheds of the proposed Pebble Project mine site are groundwater-driven systems. We recommend that the EIS fully explain the uncertainties and limitations of the PHABSIM and HABSYN models and describe how the limitations affect the analysis of fish and fish habitat impacts. Additional technical recommendations related to habitat modeling include:

1. PHABSIM and associated preliminary watershed model results presented in the Draft EFH Assessment (Table 5-3) indicate habitat losses in the NFK and SFK Rivers for some species and habitats (e.g., coho and Chinook salmon spawning). The DEIS asserts that there are habitat gains downstream (due to increase discharges), but these are modeled increases in discharge, and no analysis is provided to indicate that there will be resulting habitat increases. Table 5-3 also reports net gains in sockeye salmon. However, PHABSIM likely is not appropriate for capturing habitat for species that key into habitat factors, such as areas of groundwater upwelling (e.g., spawning sockeye), that are unrelated to water depth and discharges. We recommend additional analyses be conducted to support the results reported in EFH Assessment Table 5-3.
2. The Draft EFH Assessment discloses that wetted usable area will be used to identify available habitat; however, the information presented in Table 4.24-2 and Table 4.24-3 appears to be based on the assumption that increases in water depth and/or velocity equate to additional spawning and/or rearing habitat (see discussion above regarding limitations of PHABSIM modeling). While the tables may lead to the conclusion that there will be an increase in habitat due to discharges, discharges also may result in negative impacts (e.g., redd scouring). We recommend

⁴⁷ Monthly average discharges were chosen as inputs in the streamflow model, which do not represent the range of flows that occurs each month or extreme precipitation events, both of which affect stream ecology. Calibration of the stream flow model indicated that cumulative flows were overpredicted during the first two years of the calibration period and underpredicted during the remaining three years. In some cases, measured and calculated flows differed by more than 20 percent. The model may also not be able to predict the lowest flows (RFI 104).

⁴⁸ ISF TWG meeting minutes 2010.

that the Corps evaluate potential impacts of water discharges on all relevant habitat factors, rather than focusing only on increases in water depth and/or velocity.

3. Baseline documents indicate and the Draft EFH Assessment discloses that habitat suitability curves were developed from PHABSIM modeling efforts, but the DEIS does not discuss habitat suitability curves or the appropriateness of their use. We recommend that the EIS include additional data and analyses to demonstrate the validity of this approach.

The DEIS does not include analysis of how the predictive models work together to analyze and quantify the cumulative impacts of potential changes in streamflow or water quality, and the subsequent consequences for fish and fish habitat (e.g., how flow modeling integrates with downstream water temperature modeling to demonstrate lateral and longitudinal changes in the heterogeneity and complexity of side-channel spawning habitat or beaver pond rearing habitat, or how impacts from surface and groundwater flow alterations and corresponding changes in downstream water quality affect distribution and production of benthic macroinvertebrates). We recommend that the EIS analyze and discuss model integration to explain how individual predictive models are combined to assess and quantify project impacts and to identify what consequential outputs mean for fish and fish habitat. Alternatively, the Corps should explain why its existing analysis is sufficient, in light of the significance and complexity of the discharge activities associated with this project.

COMMERCIAL AND RECREATIONAL FISHERIES

The DEIS does not fully describe the value of the Bristol Bay fisheries, which includes the largest sockeye salmon fishery in the world, or the Pebble Project's and project alternatives potential impacts to these fisheries. As a result, many of the conclusions in the DEIS regarding the value of the fisheries lack context to support stated conclusions. Analysis of impacts to commercial fishing "relies on Section 4.24, Fish Values, which estimates that Alternative 1 would not have measurable effects on the number of adult salmon returning to the Kvichak and Nushagak river systems as a result of project operations, due to the limited lineal footage of upper Kuktuli River fish habitat affected by placement" (pg. 4.6-5). The DEIS states that the magnitude, extent, duration, and likelihood of project effects of Alternatives 2 and 3 on commercial fishing would be expected to be the same as Alternative 1, with the exception of increased fishing pressure on freshwater waterbodies under Alternative 3 due to the presence of a continuous road providing access to these waterbodies along the north side of Lake Iliamna. As described in our following comments, we recommend that the EIS fully analyze identified issues and utilize the available scientific literature to support conclusions regarding the value of these fisheries.

The analysis of impacts to commercial and recreational fisheries examines expenditures and number of trips for recreational fisheries as well as revenues for commercial fisheries, which are common features of a typical economic impact analysis. However, the EIS does not appear to acknowledge the existence of additional sources of value that should be considered in the analysis. For example, the assessment places a value of zero on passive use, existence, and bequest values associated with these fisheries. Further, when there are potential conflicts the assessment generally assumes that fishermen (commercial and recreational) will alter their behavior, with little analysis of the real costs of that avoidance behavior. We recommend that the EIS identify and consider additional economic values and acknowledge that those values are likely to be positive. We further recommend that the assessment include welfare theoretic values of willingness-to-pay or consumer surplus for a day of recreational fishing in addition to the cost or expenditure data presented in the assessment.

1. In the description of the Cook Inlet gillnet fishery, the DEIS includes the following evaluation: "... the potential for conflict is low because of the depth of the pipeline on the sea floor, and the specifications of drift gillnet gear" (pg. 3.6-19). No evaluation of potential conflict is made for any of the groundfish species or for shellfish and other species. Regarding Cook Inlet groundfish, the DEIS states (pg. 3.6-22) that harvesters have greater flexibility to avoid fixed assets such as pipelines and undersea cables due to the size of the federal management areas. We recommend that the EIS clarify whether this is an estimate or an evaluation of how these fishermen may change their behavior as a result of the proposed pipeline. We recommend that the EIS include analysis of potential pipeline conflicts for all commercial fisheries in Cook Inlet.
2. We recommend that a change in recreational fishing effort as a function of perceived loss of quality in the fishery be considered as one of the potential impacts of the proposed mine and its construction. Examples exist of a recent discussion of these types of losses after the Gulf of Mexico oil spill (English et al. 2019; Glasgow et al. 2019).
3. The DEIS does not fully analyze impacts to recreational fishing on the Kenai Peninsula. While acknowledging that a new compressor station as well as the eastern terminus of the proposed natural gas pipeline are proposed to be constructed in this area, the document states that: "The facility would not be expected to affect angling in the area; thus, Area P (Kenai Peninsula) is not discussed in further detail in this section" (pg. 3.6-27, footnote to Figure 3.6-15). Given that the project will result in on-the-ground impacts associated with construction and operation of this infrastructure, we recommend that the EIS include additional analysis to support the conclusion that the expected effect to recreational angling in Area P is zero.
4. Regarding effects on salmon populations, the DEIS states "In terms of the magnitude of impacts, construction and operation of the project would not be expected to have measurable effects on the number of adult salmon returning to the area. In terms of the extent of impacts, commercial harvesters may have to change fishing patterns based on the proximity of fishing to port operations, or could experience losses if port operations affected salmon returns" (pg. 4.6-6). We recommend that the EIS define the distinction between "magnitude" and "extent" of impacts in this context and resolve apparent conflicts between the two statements above in terms of acknowledging potential impacts to salmon returns and populations.
5. The DEIS states that there would be "no measurable impacts on sport fish" (pg. 4.9-9). However, potential impacts are described elsewhere in Section 4.6. For example, the DEIS acknowledges the potential for there to be economic impacts borne by recreational fishermen and affiliated guides and lodges, stating that "Affected operators could substitute fishing on different streams, albeit at potentially higher costs to themselves and their consumers" (pg. 4.6-8) and states that "the pipeline itself could disturb traditional halibut concentrations..." (pg. 4.6-9). We recommend the impacts on sport fish be quantified in the EIS, and that statements regarding measurable impacts be revised as appropriate.
6. The DEIS states that "The extent of construction and operations of the projects would be to affect the quality of the fishing experience in the immediate vicinity of the project where project facilities are visible..." (pg. 4.6-9). Fishing in an area with an undisturbed watershed is likely a different perceived experience that fishing in an area with an active mine and its infrastructure, regardless of whether or not those facilities are directly visible. We recommend that the EIS

include analysis to support the assumption that impacts on the fishing experience would occur only where project-related changes are visible.

7. The DEIS states that "...revenues would shift between municipalities and companies but not necessarily change in total..." (pg. 4.6-9). We recommend that the EIS clarify what "not necessarily" means in this context, and that the EIS explain which municipalities are likely to be affected even if overall visitation to the region doesn't change.

Subsistence: Currently the assessment of Bristol Bay fish resources does not include subsistence values. The subsistence fishery is addressed in a separate chapter, which quantifies harvest levels of subsistence fish resources but does not quantify the economic value of the subsistence fisheries. Because the DEIS currently considers the commercial and recreational fisheries independently of subsistence values, the DEIS presents an incomplete picture of the value of Bristol Bay fishery resources. We recommend that the subsistence fishery information be combined with the commercial and recreational aspects to provide a comprehensive assessment of the Bristol Bay fishery resource values.

Weathervane Scallops, Roe Herring, and Salmon: The DEIS discloses that the harvest and long-term productivity of the Kamishak Bay weathervane scallop fishery could be affected by the route of the proposed natural gas pipeline (pg. 4-6.2 and pg. 4.6-6), and that the construction and presence of the pipeline may delay or negate future openings of the fishery due to sea bed floor disturbance. The DEIS does not, however, appear to fully analyze the extent, magnitude, or duration of impacts. We recommend that the EIS include an assessment of the weathervane scallop fishery, including the two weathervane scallop beds that are in the path of the pipeline, and the impacts of the pipeline on this fishery.

The DEIS states that in terms of the magnitude of impacts, construction and operation of the Amakdedori port would not be expected to have measurable effects on the number of adult salmonids returning to the Chenik sub-district of Kamishak Bay fishing district (pg. 4.6-6). This is also the same area as the historic Pacific herring sac roe fishery. The DEIS includes no impact assessment of either of these fisheries. The DEIS discloses that the Pacific herring fishery in Kamishak Bay could experience direct or cumulative effects, but no analyses are presented. We recommend the EIS include analyses of these fisheries and the extent, duration, and magnitude of environmental consequences to these fisheries from project impacts and alternatives.

Value of the Fisheries: The DEIS lacks many specifics of the value of the Bristol Bay, Nushagak and Kvichak watershed fisheries. We recommend that the EIS utilize information from the current ADFG Annual Management Report⁴⁹ as one of the single best sources of summary information for the Bristol Bay fisheries, including the reporting of last year's record setting Sockeye Salmon returns from the Nushagak District. The DEIS further indicates that Bristol Bay salmon fisheries "suffer" from a lack of value, recognition, and branding. This likely underestimates the known and well-documented value of the Bristol Bay salmon fisheries. Bristol Bay Sockeye Salmon are branded and advertised on the global market.^{50,51} We recommend that the EIS either include the best science and information available to support its conclusion or revise the conclusion accordingly. Additional specific comments are below:

⁴⁹ <http://www.adfg.alaska.gov/FedAidPDFs/FMR18-11.pdf>

⁵⁰ <https://bristolbaysockeye.org/>

⁵¹ <https://www.bbrsda.com/history>

1. The DEIS indicates that the Nushagak River does not particularly stand out for the average size of its sockeye salmon run, (pg. 3.6-4) but does not include that the Nushagak River provides an annual average return of 2.3 million sockeye salmon. Further, the 2018 Nushagak District sockeye salmon harvest of 24.1 million fish was the largest single Bristol Bay district harvest on record.⁵² We recommend that the EIS text be revised accordingly.
2. We recommend that the EIS also include that the 2018 Bristol Bay preliminary ex-vessel value of \$281 million of all salmon species ranks first in the history of the fishery and was 242 percent above the 20-year average of \$116 million. It was 39 percent higher than the \$202 million ex-vessel value of the 1990 harvest, which ranks second. The 43.5 million harvest of all species was the second largest in the history of the fishery, after the 45.4 million fish harvest in 1995. The sockeye salmon harvest of 41.3 million ranks second after the 44.2 million fish harvest, also in 1995.⁵³
3. We recommend that the EIS include an assessment of the differing run timing of salmon species returning to each district. Differences in run timing are an important aspect of the Bristol Bay salmon portfolio, ecologically and economically. For example, during 2018 the Naknek-Kvichak, Egegik, and Ugashik districts (east side) observed the latest run timing on record, and, because of the disparity in run timing between the Nushagak and the east side districts, the processing sector was able to keep pace with the run. This suggests that, in addition to the variability in abundance of returns, variability in timing of the returns is key to sustaining the economic stability of the processing sector. We recommend that this chapter include consideration of the salmon portfolio effect that accounts for the resiliency of Bristol Bay salmon fisheries in the region.⁵⁴
4. The Nushagak–Mulchatna rivers drainage produces the largest runs of Coho Salmon in Bristol Bay. Within the drainage, there are 4 areas of concentrated recreational effort: the lower 15 miles of the Nushagak River near the village of Portage Creek; the middle section of the Nushagak River in the vicinity of the village of Ekwok; the section of the Mulchatna River between the Stuyahok and Kaktuli rivers; and, the upper Nushagak River from the outlet of Nuyakuk River upstream to the outlet of the King Salmon River. Of the areas mentioned above, the lower portion of the Nushagak River and the fishery in the immediate vicinity of the Nuyakuk River outlet have long been the most significant.⁵⁵ We recommend the EIS include this information relevant to the value of the fisheries that will be impacted by the project.
5. We recommend that the EIS include all sport fisheries in the project area, including the Sockeye Salmon and Chinook Salmon recreational fisheries or the Rainbow Trout special management areas within the Nushagak and Kvichak watersheds, including the upper Nushagak, Kvichak River and upper Talarik Creek. Additional information on sport fisheries in the project area can be found on the ADFG website.⁵⁶ We recommend this important fishery information be included and impacts analyzed in the EIS.

⁵² <http://www.adfg.alaska.gov/static/applications/dcfnewsrelease/989536277.pdf>

⁵³ <http://www.adfg.alaska.gov/FedAidPDFs/FMR18-11.pdf>

⁵⁴ <https://www.adfg.alaska.gov/index.cfm?adfg=fishingSportFishingInforuntiming.main&chart=runbbk>

⁵⁵ <https://www.arlis.org/docs/vol1/K/934855450.pdf>

⁵⁶ <https://www.adfg.alaska.gov/static/regulations/regprocess/fisheriesboard/pdfs/2018-2019/bb/FMR18-27.pdf>

6. We recommend that the EIS include information on the aesthetic value of the Bristol Bay salmon fisheries or the Upper and Lower Cook Inlet fisheries.
7. Table 3.6-2 Bristol Bay Economic Contribution, 2010 (pg. 3.6-5) cites a 2013 report by Knapp, Guiettabi and Goldsmith. There is a more recent (2018) report on the benefits and economics of Bristol Bay salmon available,⁵⁷ and we recommend that this more recent information be factored into the analysis.

Fisheries Management Regime: The DEIS does not fully characterize the historical and ongoing research and management efforts that are in place to help ensure the sustainability of the Bristol Bay, Nushagak, and Kvichak watershed salmon fisheries. We recommend the EIS include discussion of Bristol Bay and Cook Inlet species management plans and the management regime of the ADFG in the EIS. This is important information to include given the financial investment made annually by the State of Alaska to sustain Bristol Bay fisheries through management efforts. We recommend that the EIS include the ADFG management plans currently in place to help ensure the sustainability of the fisheries, including the *Nushagak-Mulchatna King Salmon Management Plan*,⁵⁸ The Bristol Bay Five Year Strategic Plan: 2018-2023,⁵⁹ the *Nushagak River Coho Salmon Management Plan*,⁶⁰ and the sockeye salmon management plan. All include actions and restrictions that should be taken if the in-river runs fall short of management goals. We recommend that the EIS include a comprehensive analysis of the current Bristol Bay fisheries management regime and the potential for regime shifts as a consequence of project impacts to commercial and recreational fisheries.

Additional information that we recommend incorporating into the EIS analysis, including examples of the resources committed to Bristol Bay salmon fisheries due to their well-recognized value and importance to the local, national and international markets, includes:

1. The Bristol Bay genetic baseline that ADFG has built and tested over the past 17 years, found on page 3 of the 2017 Bristol Bay Area Annual Management Report.⁶¹
2. The Bristol Bay Research Institute sited at Port Moller.
3. The Bristol Bay Regional Seafood Association 2018-2023 Strategic Plan.⁶²
4. The work and research of University of Washington's Alaska Salmon Program provides a wealth of information on regional fish populations with many relevant peer-reviewed journal articles that could be referenced to characterize the fish ecology of the region.⁶³

Visualization Tools: We offer the following recommendations regarding figures provided for Section 3.6, in order to improve the understanding of Commercial and Recreational Fisheries in the project area:

1. We recommend that maps of commercial and recreational fisheries (e.g., Figure 3.6-10 Upper Cook Inlet Drift Net Management Areas, Figure 3.6-11 Cook Inlet Management Area Groundfish Areas and District Boundaries, and Figure 3.6-13, Cook Inlet Management Area and Shellfish Districts) be overlaid with project components, such as the proposed pipeline. Visualization would assist decisionmakers and the public in understanding the proximity of project components to fisheries.

⁵⁷ <http://www.pebblescience.org/pdfs/EconomicBenefitsofBristolBaySalmon-July-2018.pdf>

⁵⁸ 5 AAC 06.361

⁵⁹ <https://www.bbrsda.com/strategic-plan/>

⁶⁰ 5 AAC 06.368

⁶¹ <http://www.adfg.alaska.gov/FedAidPDFs/FMR18-11.pdf>

⁶² <https://www.bbrsda.com/strategic-plan/>

⁶³ <https://sites.uw.edu/aksalmon/>

2. We recommend including the percentage of active permits to permits owned above each bar in Figure 3.6-6 Distribution of Quartiles in the Drift Net Fishery by Area of Residence, to aid understanding of how Figure 3.6-6 relates to Table 3.6-4.
3. Table 3.6-9 & Table 3.6-10 present average angling days and statewide harvest survey information for waterbodies in the project area. We recommend including a map showing the location of these waterbodies/rivers relative to the proposed mine site and proposed infrastructure.

GEOHAZARDS

Key issues associated with geohazards pertain to recommendations that the EIS include additional detail regarding embankment designs and seismic stability to support the DEIS conclusions related to the safety and stability of tailings storage facility and water management pond embankments. Accidents or failures associated with the embankments could have significant adverse impacts on ecologically important streams, wetlands, lakes, and ponds and the fishery areas they support. Our recommendations regarding these key issues are discussed below. Additional comments to improve the geohazards analysis are provided in the following our key comments.

Embankment Designs and Seismic Stability

Conceptual Level of Design to Evaluate Impacts: The DEIS (section 4.15 and Appendix K4.15) describes the tailings and water management dam designs as conceptual and therefore dam design features and the stability analysis are based on many assumptions. Given that stability of tailings was one of the significant issues arising from scoping, we recommend that that design of the tailings and water management dams be advanced beyond the conceptual design stage to at least a preliminary design level so that the EIS analysis is based on information more reflective of what would be constructed, with fewer assumptions and uncertainties. Other recent mining EISs developed by the Corps have included more than conceptual design information (e.g., Donlin and Haile) and we recommend that additional information also be analyzed and included for the Pebble Project. Alternately, we recommend that the EIS further explain why the approach using conceptual level designs is sufficient and how that approach impacts the accuracy of the impact conclusions.

Water and Seepage Management Associated with Embankments: The DEIS states that control of water is an important consideration in achieving a stable tailings deposit and embankment. However, the DEIS does not provide details on: 1) the specific freeboard allowance (feet) for the pyritic and bulk TSF embankments and IDF (see also our comments on surface water hydrology); 2) whether liners “and/or” core/filter/transition zones would be used for the non-flow through TSF embankments (see Table K4.15-1); 3) grout curtain depth and extent in comparison to location-specific bedrock characteristics to demonstrate that it would contain seepage flows; and 4) the design and spacing of basin and embankment underdrains to maintain a reduced phreatic surface. Since water control is important, we recommend that these details be provided in the EIS along with a preliminary design of tailings dams and seepage management systems to support EIS assumptions related to the effectiveness of water control for both seepage collection and stability.

Core Zone Material Types and Quantities: Appendix K4.15 indicates that sufficient quantities of low permeability materials for the bulk TSF main embankment filter and transition zones may not be available on site, so alternatives could be used. We recommend that material quantities be determined,

as was done for other mine site components, so that the need for additional quarries (which would impact the fill used and/or project footprint) is determined and explained in the EIS analysis. If alternatives are used that involve off-site materials this could impact the amount of transportation to the site during construction. We recommend that the EIS evaluate and explain how much material is needed, where it would come from, and the environmental impacts associated with obtaining and transporting it to the mine site.

Static Stability Analysis: Static stability was modeled and predicted for several of the TSF embankments, the WMPs, and the Bulk TSF SCP. Although not described as such in the main text of the DEIS (Section 4.15.2.1), the reference documents supporting the stability analysis state that it was a “preliminary static stability analysis” based on a “simplified concept” and that geotechnical and hydrogeologic data collection is ongoing to confirm assumptions in the preliminary stability analysis. Reference documents also state that embankment designs and stability analysis will be updated accordingly to reflect actual foundation conditions (RFI-008). We recommend completion of the geotechnical and hydrogeologic programs and revision of the stability analysis in the EIS to reflect further developed or actual foundation conditions. We understand that this would be required for ADSP permitting, but we believe that using actual conditions is consistent with ensuring a fair evaluation of potential impacts and risks. This is an important issue since a specific weak foundation condition was a contributing cause of the Mt. Polley TSF breach (Morgenstern et al. 2015).

In addition, as with any model, we recommend that sensitivity and uncertainty be discussed in the EIS so that the accuracy of the static stability model predictions can be assessed. This is particularly important given the conceptual nature of the dam designs and preliminary nature of the stability analysis.

Seismic Hazard Analysis: The DEIS provides a probabilistic and deterministic seismic hazard analysis, however aspects of the analysis in the DEIS are not based on current best practices and data. The DEIS and RFI 008c indicates that the seismic analyses will later be updated to incorporate: 1) current best practices, since the seismic analysis is based on a 2013 Knight Piésold report; 2) New Generation Attenuation (NGA) equations, since the DEIS seismic hazard analysis is based on 2008 NGA equations and revised equations were published in 2014; and, 3) updated United States Geological Survey (USGS) ground motion data. We recommend that the seismic hazard analysis in the EIS be updated to reflect best practices and current information. Alternatively, we recommend that the EIS explain why the approach (which is not based on best practices) is sufficient and explain the level of uncertainty associated with the seismic hazard analysis.

Pseudo-Static Deformation Analyses and Seismic Safety: The DEIS does not fully characterize the stability and performance of the TSF and main WMP embankments in response to a seismic event (earthquake). Pseudo-static deformation analyses are important to determine the embankment safety factors under seismic loading and to evaluate the stability and performance of an embankment during a seismic event. There was no deformation analysis conducted for the pyritic TSF embankment and the Main Water Management Pond embankment. In regard to the bulk TSF embankment, the DEIS relies on pseudo-static deformation analysis from an earlier design of the TSF main embankment (Appendix K4.15) to assess bulk TSF embankment seismic stability and deformation during earthquake loading conditions and does not fully describe whether the deformation analysis on the earlier design is representative of earthquake-induced stability changes and dam deformation that could occur based on the current dam design.

The TSF and Main WMP embankments are significant structures that range in height up to 545 feet and with combined lengths of 7.2 miles (for the TSF dams) and 3.6 miles (for the WMP dams). We recommend that pseudo-static deformation analysis be developed for the current bulk TSF embankments based on the current project plan and for the pyritic TSF and WMP embankments and that safety factors under seismic conditions and the impacts to these embankments in the event of a range of earthquake scenarios be included. If this analysis is not conducted, then we recommend that lack of a representative pseudo-static deformation analysis for the bulk TSF and lack of any pseudo-static deformation analysis for the pyritic TSF and Main WMP embankments be identified in the EIS as a data gap that affects analysis of how these dams would be impacted by an earthquake.

Additional Geohazards Analysis Comments and Recommendations

Following are additional comments and recommendations related to the geohazards analysis.

Foundation Conditions Under the WMPs: The DEIS (Appendix K4.15) mentions weak foundation conditions under the open pit WMP and main WMP and assumes that any potential foundation conditions (glacial clay layers) would be mitigated during design and construction after the collection of additional geotechnical information. We recommend that further detail, including mapping, be provided in the EIS that identifies the areas of weak foundation conditions and that PLPs construction and design documents be updated to identify these conditions and describe how these conditions will be managed. This level of information is important to assess the effectiveness of foundation condition mitigation.

State of Alaska Dam Safety Guidance: The DEIS refers to the Alaska Dam Safety Program (ADSP) guidance (ADNR 2017a) and relies on this guidance to conclude that the dams associated with the TSFs and WMPs will be stable and safe. The ADSP guidance is stamped “draft revision” and the guidance itself contains recommendations (as opposed to requirements) and notes that that dam safety statutes at AS 46.17 and 11 AAC 93 are the legal governance for the ADSP. The ADSP guidance also notes that compliance with the ADSP “is intended to establish a minimum standard of care; however, additional effort by the dam owner may be required to fully understand and manage the associated risks and liabilities of owning a dam.” We recommend that the evaluation of geohazards and dam stability in this section consider the legal requirements as well as the draft guidance. Since the ADSP guidance states that it is the minimum standard of care, we recommend that this section of the DEIS further describe how the specific embankment criteria selected (OBE, MDE, Safety Factors, slopes) are appropriate and conservative for the specific embankments and specific conditions at the site.

AIR QUALITY

The proposed project includes many potential sources of mine pollutant emissions, including from the operation of heavy machinery and equipment, other mobile sources (e.g., vehicles, ships, aircraft), stationary sources (e.g., power plant), and fugitive dust. Key issues include particulate matter impacts from the mine site, which are likely underpredicted in the EIS based on the modeling parameters used, as well as deficiencies in the air quality modeling assessment for the port facilities which, if corrected, may result in potential exceedances of the NAAQS for 1-hour or annual NO₂. Our recommendations regarding these key issues are discussed below. Additional comments and recommendations for improvement to the air quality analysis are provided following the key comments.

Air Quality Modeling

Mine Site Ambient Air Boundary: Air impacts based on dispersion modeling of the mine site are reported only at receptors outside of the ambient air boundary, as those are areas to which the public would have access. The ambient air boundary appears to extend far from the mine operations area, especially on the southeast side where most of the maximum air impacts occur. It is therefore critical to ensure that the correct ambient air boundary has been modeled, so that potential air quality impacts may be reported accurately. According to Appendix K4.20, the ambient air boundary used in the modeling is based on a safety zone that “would be established to ensure that the public would not be exposed to work site safety risks.” We were unable to locate additional information regarding the establishment of this safety zone, including the rationale for determining its extent or the means through which it will be enforced. We recommend that this information be added to the EIS as part of the description of the proposed action. Specifically, additional information should be attached or referenced that provides the details regarding the safety zone and what steps (fencing, posting, patrols, etc.) PLP will take to preclude public access to these areas and confirmation that the land within the boundary is under the full control of PLP. While the State of Alaska will determine whether the ambient air boundary is properly established during the air permitting of the project, the Corps should consider including this information in the EIS, in order to accurately and adequately assess impacts.

Modeling of Mine Site Fugitive Dust Impacts: The modeling parameters used to simulate emissions from the mine pit appear to have resulted in an underprediction of particulate matter emissions from the pit. Modeling for the DEIS has been conducted using AERMOD's OPENPIT algorithm to simulate emissions from the mine pit. Based on the parameters provided in Table 4 of Appendix A, the effective depth of the pit calculated by AERMOD is 580 meters. Given a final central pit depth of 700 meters, the average effective depth of 580 meters represents conditions near the end of the life of the mine. In addition, the release height of the emissions is only 5.0 meters, which effectively results in the release of pollutants at a height 575 meters below the lid of the parameterized pit. These parameters likely result in an underprediction of particulate matter emission from the pit, especially during the early years of the project where the average pit depth is much less than the effective 580 meters depth simulated. We recommend using a more conservative estimate based on pit dimensions nearer to the beginning or middle of the life of the mine, where pit depth is less. Also, given that the pit shape is spherical instead of a box (as assumed in the OPENPIT algorithm), we recommend using an average release height that is more representative of the average height of emissions across a spherical pit, rather than the current assigned 5-meter release height that effectively results in emissions released at the bottom of the center of the pit.

Air Impacts at Amakdedori Port: The modeling analysis of potential air quality impacts of operations at the Amakdedori port was conducted using screening meteorology and a conservative conversion factor to estimate annual emissions. The screening meteorology approach likely results in a significant overprediction of results when emissions are properly simulated. In addition, the modeling assumed 8,760 hours per year use of the emergency engines which is highly conservative. On the other hand, only stationary unit emissions were modeled, despite the fact that the mobile emissions associated with the facility are much greater. Further, emissions from the hoteling ships don't appear to have been included in the analysis. As a result, it is possible that air quality impacts would be substantially higher than what was modeled. We recommend that the modeling analysis be revised provide an accurate estimate of air impacts at the site and support conclusions made in the EIS.

The air quality modeling for Amakdedori port also only addresses the annual NO₂ standard, based on a determination that this is the only modeling that would be required to obtain a minor source permit to construct and operate a stationary source at the port. However, the EIS should evaluate the potential for the proposed project to cause or contribute to a violation of any of the national ambient air quality standards (NAAQS). We recommend that the revised air quality modeling also include analysis of impacts to all NAAQS, including the 1-hour NO₂ standard. Such analysis is particularly important given that the annual NO₂ impacts are shown to be high at the fence line of the port, 90 percent of the NAAQS, indicating a potential for exceedances of the 1-hour standard. Although analysis of 1-hour NO₂ may be exempt from the modeling analysis of a minor-source permit application under state law at 18 AAC 50.540(1), the 1-hour NO₂ impacts are evaluated internally by ADEC. Regardless, the requirements of the State of Alaska's minor-source permit application process are not relevant in the context of NEPA review of ambient air quality impacts. If any exceedances of the 1-hour NO₂ AAAQS are predicted, we recommend that mitigation be evaluated in the EIS.

Air Quality Impacts of Alternatives and Variants

An air quality modeling assessment was performed only for Alternative 1. The DEIS assumes that Alternatives 2 and 3, as well as variants to all alternatives, are similar to Alternative 1 in terms of the air quality impacts. While this assumption may be accurate for the mine site, there are many differences in the proposed transportation corridor, port site, and natural gas pipeline, in terms of both emission rates and locations, which are not considered in the modeling assessment performed. We recommend that the EIS include additional assessment of the potential air quality impacts of Alternatives 2 and 3, and of the variants.

No air quality analysis was conducted for the Diamond Port facility as part of Alternative 2, and the DEIS assumes that the Alternative 1 Amakdedori Port air quality analysis is sufficient to quantify impacts from any of the port alternatives. However, given differences in land-use and terrain between the two sites, we anticipate that there are differences in meteorological conditions that could have a large influence on the maximum air quality impacts. The Diamond Port is also adjacent to much higher and more complex terrain, where plumes could more easily impact the surface. This is significant since the Alternative 1 Amakdedori Port modeling showed NO₂ impacts approaching the annual NAAQS, in addition to the model deficiencies described in the above comment. These issues, if corrected, may result in potential exceedances of the National Ambient Air Quality Standards for 1-hour or annual NO₂. We recommend modeling the Diamond Port facility using the most representative of the Pebble meteorological datasets, as there are three Prevention of Significant Degradation (PSD) quality datasets collected for this project within five miles of the site. We further recommend that this modeling account for related project emissions and include analysis of relevant NAAQS and averaging times. Alternatives 2 and 3 include dredging and recommend that emissions from dredging operations be included in the air quality model. Given the lack of representative meteorological data for the Amakdedori Port area and the more complex terrain at the Diamond Port site, we recommend that the Corps consider whether the Diamond Port modeling results could be used as a more representative and conservative estimate of port impacts for all Alternatives.

Other differences between Alternatives 2 and 3, and the information in Alternative 1 that was used in the air quality analysis, do not appear to be considered in the analysis. For example, Table 2-2 lists the differences in road length between Alternatives 1, 2, and 3. Similarly, there are differences in the length of ferry trips. We recommend that the air quality analysis for Alternatives 2 and 3 address how the change in road miles traveled for concentrate trucks and other vehicles, as well as the differences in

ferry miles traveled, would affect air pollutant emissions and impacts to air quality. In addition, while differences in mileage are discussed, there is no discussion about changes in elevation that different routes might require. An alternate truck route with larger elevation changes could result in greater emissions of criteria pollutants due to the engines working harder. We recommend that these air quality considerations be further analyzed in the EIS.

The DEIS air quality analysis also does not address the potential changes to air quality impacts from the "Summer-Only Ferry Operations" variant. This variant would group all the mobile source emissions caused by transferring concentrate from the mine site to the port into a six-month timeframe. Additionally, since no concentrate vehicles would travel from the site to the port during winter months and fugitive dust emissions from roads would be greater during summer months, the volume of fugitive dust generated by a summer-only variant would be greatly increased over the modeled year-round scenario. This would lead to higher atmospheric concentrations of the various combustion and fugitive emissions. We recommend that these impacts be evaluated in the EIS. Emissions would be concentrated during the growing season, and therefore would be likely to result in increased impacts to vegetation, which we recommend should also be evaluated in the EIS.

The DEIS describes maximum project air quality impacts in terms of a fraction of the standards but does not indicate what air pollutants resulted in the highest impacts nor the location of these impacts. We recommend that the EIS include a table listing the maximum design concentrations compared to the air quality standards, as well as discuss what pollutants resulted in the maximum impact and where these impacts were located. In addition, the text of the DEIS repeatedly refers to the "average" NAAQS value. However, it is not the average value that is of importance, it is the Design Value (DV), which is compared to the NAAQS. Please refer to the EPA's website⁶⁴ for information on appropriate NAAQS levels, averaging times, and form of the standard.

Additional Air Quality Analysis Recommendations

Emissions Inventories: Our review found potential errors in the emissions inventory report based on the use of incorrect emission factors. This includes use of outdated emission factors, use of stationary source emission factors to calculate emissions from mobile sources, use of an engine standard level rather than an emission factor, and failure to use the EPA's latest emissions model, MOtor Vehicle Emission Simulator (MOVES). MOVES is a state-of-the-science emission modeling system that estimates emissions for mobile sources at the national, county, and project level for criteria air pollutants, greenhouse gases, and air toxics.⁶⁵ Because the EPA guidance was not followed in generating the emissions inventory, we do not recommend using this emission inventory in air quality modeling or to otherwise support conclusions regarding the potential air quality impacts of the Pebble Project. We recommend revising the inventory in accordance with published emissions guidance and using the updated emissions in the EIS and offer the following technical comments to assist in this effort. Alternatively, we recommend that the Corps explain the decisions made in selecting emission factors, and provide information to support the accuracy and reliability of the air quality modeling analysis based on the current emissions inventory.

We recommend addressing the following potential errors in the DEIS source document "RFI 007 Emissions Inventory Report" or providing a more-detailed explanation for their retention:

⁶⁴ <https://www.epa.gov/criteria-air-pollutants/naaqs-table>

⁶⁵ <https://www.epa.gov/moves>

1. RFI 007 Appendix A-2:
 - a. We recommend that Table 3 (PDF pg. 56 of 509) use an emission factor for the mobile sources on this table, rather than the actual standard level listed in the regulations;
 - b. We recommend that emission factors for vehicles be developed using the MOVES model rather than using AP-42 Volume II table. The AP-42 web page indicates that Volume II, regarding all mobile sources, is no longer maintained, as non-outdated EFs can be developed using the MOVES model;
 - c. We recommend ensuring that emission factors from stationary sources are not used to calculate emissions from mobile sources. This recommendation also applies to Tables 3 through 7 (regarding criteria pollutants).
2. RFI 007 Appendix A-3: We recommend including additional documentation for calculations and confirming that break and tire wear have been included in the emissions calculations.
3. RFI 007 Appendix B: We recommend the same corrections in Appendix B as described above for Appendix A-2 regarding criteria pollutants from mobile sources and for Appendix A-3 regarding fugitive sources.
4. RFI 007 Appendix C-1. We recommend verifying that appropriate sources were used for emission factors.
5. RFI 007 Appendix C-2. We recommend the same corrections in Appendix C-2 as described above for Appendix A-2 regarding criteria pollutants from mobile sources and for Appendix A-3 regarding fugitive sources.

The emissions inventory tables in the DEIS include a column quantifying “Total HAPs.” This is not a useful metric, as HAPs differ by toxicity, reactivity, etc., and we recommend that HAP emissions be broken out by type.

Background Concentrations: Background concentrations are an important element of an accurate analysis of impacts to ambient air quality, however, Appendix K4.20 does not include information on the background concentration analysis. We recommend that the EIS include the source of the background concentration values used in the air quality analysis. Background annual NO₂ is assumed to be 0 micrograms/cubic meter (µg/m³) in the air quality modeling analysis conducted for Amakdedori Port. We recommend that the EIS provide supporting information that explains such a low background concentration, including addressing whether there are local representative measurements.

PSD Increment Impacts: While we support the inclusion of an impact comparison to PSD increments in the DEIS, there are several potential inaccuracies with the way PSD increments were calculated and disclosed. The DEIS states that a PSD increment consumption analysis is not required for temporary projects (less than 24 months), and therefore, the DEIS does not include a comparison to the particulate matter (PM) increment. However, we note that comparison of impacts to the PSD increments is done in NEPA analyses to gauge the significance of the impacts, recognizing the increment as a measure of significant deterioration, rather than to conduct a regulatory PSD increment analysis. We recommend that all modeled values be compared to the PSD increments, as a comparison measure of temporary degradation. In addition, the RFI 007 Emission Inventory finds that the mine site power generation facility will likely require a PSD permit for both PM10 and PM2.5, and therefore, a PSD increment consumption analysis may be required as part of the state permitting process. We therefore recommend the EIS identify the nearest Class I area and the distance of the Class I area from the project, as well as any minor source baseline dates that may have been established at this Class I area. If the baseline date has been set, we recommend the Corps consider analyzing the likelihood of significant Class I increment consumption from project operation emissions. If this is determined to be significant, 40 CFR Part 51,

Appendix W contains screening procedures to determine if a cumulative Class I increment consumption analysis is warranted.

We recommend that the DEIS text clarify that PSD regulations are not specific to major stationary sources, as is currently stated. Rather, the PSD increment is the allowed maximum increase in air pollutant concentration allowed in an airshed after a baseline date, and analysis of PSD increment consumption is required under New Source Review air permitting of major stationary sources in areas where the baseline dates have been set. Further, in reporting the results on the PSD increment comparison, the document states "Compliance with modeled ... PSD Class II increments is demonstrated" (pg. 4.20-6). We recommend instead stating that the modeling demonstrates that the level of air quality deterioration is lower than the PSD increment, which can be used as a measure of significant deterioration for any given project.

Air Quality Related Values Impacts to Sensitive Areas: The DEIS discusses the potential for impacts to Air Quality Related Values (AQRVs) in Class I areas and concludes that, because the nearest Class I areas are "more than 62 miles from the source," negligible impacts are anticipated. The analysis described in Section K4.20 includes a visibility impacts screening method as well as a comparison to deposition critical loads for Denali National Park. We recommend that the EIS include additional analysis and disclosure of potential visibility and deposition impacts to Tuxedni Wilderness Area, which is the nearest Class I area and is "approximately 50 miles east-northeast of the mine site" according to the DEIS (pg. 3.20-6).

There are numerous other federally or state-managed areas within the potential impact area of the Pebble Project, as described in Section 3.5 of the DEIS. The nearest of these include: Katmai National Park and Preserve, Lake Clark National Park and Preserve, Alaska Maritime National Wildlife Refuge, McNeil River State Game Sanctuary, and the McNeil River State Game Refuge. We recommend that the AQRV analysis address the potential for any adverse impacts, including visibility or deposition impacts, to these protected areas. As an initial step in this analysis, we recommend that it would be appropriate to consult with the relevant land management agencies regarding whether the environment of the federal or state-managed area is considered to be sensitive as related to any AQRVs.

Hazardous Air Pollutants: In discussion of HAPS selected for the analysis, that ethylbenzene and xylene have been omitted from the list of HAPs. Because trucks and nonroad equipment use diesel fuel, we recommend considering all BTEX constituents in the analysis.

ENVIRONMENTAL JUSTICE

Environmental Justice is not among the primary issues summarized in the EPA's cover letter. However, based on our review, we are providing the following recommendations to improve identification and protection of vulnerable populations.

Identification of Vulnerable Populations

The DEIS cites the 1997 CEQ Environmental Justice Guidance under the National Environmental Policy Act (CEQ 1997b) to state that a minority community is "defined as a community with a majority (i.e., 50 percent or greater) minority population" (pg. 3.4-1). The DEIS does not currently acknowledge that the CEQ guidance also indicates that a minority population should be identified where "the minority population percentage of the affected area is meaningfully greater than the minority population

percentage in the general population or other appropriate unit of geographic analysis.” The CEQ guidance provides ample flexibility to methodologically respond to local conditions and population patterns. Furthermore, the EPA Environmental Justice guidance (EPA 1998) states that “[a] factor that should be considered in assessing the presence of a minority community is that a minority group comprising a relatively small percentage of the total population surrounding the project may experience a disproportionately high and adverse effect. This can result due to the group's use of, or dependence on, potentially affected natural resources, or due to the group's daily or cumulative exposure to environmental pollutants as a result of their close proximity to the source.” Additionally, the Federal Interagency Working Group on Environmental Justice⁶⁶ has stated that, “[to] sufficiently identify small concentrations (i.e., pockets) of minority populations, agencies may wish to supplement Census data with local demographic data. Local demographic data and information (including data provided by the community and Tribes) can improve an agency’s decision-making process. Anecdotal data should be validated for accuracy whenever possible. Agencies should disclose, as appropriate, when anecdotal data has not been validated.” (Federal Interagency Working Group on Environmental Justice 2016).

The EPA maintains that the exclusive use of the 50 percent threshold in the CEQ 1997b guidance could result in missing smaller communities, segments, or pockets of low income, minority, or vulnerable populations within larger community settings who might be impacted. For example, in Table 3.4-2, communities within the Kenai Peninsula Borough and Bristol Bay Borough are not identified as EJ communities. Therefore, there may be pockets of minority or low-income populations, or entire communities, that might disproportionately experience cumulative impacts, but these are not acknowledged in the DEIS. We recommend that the EIS provide the rationale for selecting the 50 percent threshold definition of minority community, and not another available methodology. In addition, we recommend that the environmental impact analysis in the EIS also include demographic and locational information on any minority and low-income populations living in communities not identified as EJ areas, due to not meeting the 50 percent threshold, and analyze disproportionate and cumulative impacts to those populations.

Analysis of Potential Environmental Justice Impacts

Potential Impacts to Children: Table 3.3-1 presents the Population Characteristics of Affected Communities. Notable in some of the affected communities are the high percentages of children, a vulnerable population in Environmental Justice terms. Research in recent years has revealed and highlighted the unique vulnerabilities and susceptibilities of children to environmental harms (Barros et al. 2018). Native Alaskan children sometimes experience environmental impacts disproportionately (Sarche and Spicer 2008). We recommend that the DEIS specifically address the short and long-term health and safety of children in the analyses of disproportionate impacts, cumulative effects, and socio-economics, especially in terms of nutritional dislocations and potential exposures environmental contaminants.

Socio-Economic Impacts of Mine Closure: Mine closure will result in loss of jobs and declining economic activity, which, based on the discussion in the DEIS, could potentially be followed by a decline in community infrastructure, with subsequent impacts on the health and welfare of community residents. The DEIS notes the boom and bust cycle that characterizes the Alaskan economy. Community development, sustainability, and revitalization are recognized as essential components of Environmental

⁶⁶ <https://www.epa.gov/environmentaljustice/federal-interagency-working-group-environmental-justice-ej-iwg>

Justice.⁶⁷ However, sustainable economic development can be seen as a model for mitigating the impacts of the bust of mine closure. While extractive industries can disrupt the resources and cultural patterns of economic activity, the lengthy time frame of mine operation and inflows of capital could provide the space for community-based planning efforts to build sustainable economies in the region (EPA 2013). We recommend that economic disruptions in these communities be undertaken delicately with the full participation and informed consent of the people most directly impacted. The Corps may choose to review any locally developed Economic Development Assessments/Plans specific to the communities of the Region. These plans would be an integral component to sustainable, community driven, economic development in the region. Finally, a Community Benefits Agreement or other formal instrument (such as a Memorandum of Understanding or Memorandum of Agreement) could be developed to ensure minimum levels of employment, improvements and enhancements to health facilities, joint planning and consultative opportunities and other elements related to the long-term, sustainable development of impacted communities. This could be in addition to, or an aspect of, the ANCSA village corporation agreements described in Table 5-2.

SUBSISTENCE

Subsistence is not among the primary issues summarized in the EPA's cover letter. However, given the importance of subsistence resources in the project area, we are providing the following recommendations to strengthen the analysis in the EIS.

Age of Subsistence Studies Cited in the EIS: The subsistence information presented in the DEIS is from studies that are almost all over a decade old, and many are based on data collected by the Alaska Department of Fish and Game (ADF&G) in 2004. These studies may show past harvest levels, but they cannot show potential recent changes in resource use due to shifts in animal populations or from ecosystem impacts of exploration activities. Without more recent studies, current consumption levels are uncertain, and it is therefore difficult to tell what the impacts of the mine on subsistence harvest levels will be. We recommend that the EIS incorporate any more recent data available and acknowledge the challenges that the older data present in assessing impacts of the Pebble Project on present harvest levels.

Impacts to Subsistence Practices and Patterns: The DEIS makes many statements that presume adaptation to changes in historical and current subsistence practices and patterns. For example, the DEIS states: "Adaptive strategies for the harvest of resources *would likely maintain harvest levels for affected communities*, but potentially at the cost of additional time and money" (pg. 4.4-5, emphasis added); and "Subsistence users *would likely adjust* the seasonal round, resource use areas, and species composition of harvest resources to target resources that would be less affected by project activities" (pg. 4.4-7, emphasis added). We recommend that the EIS provide additional support for these and other similar statements regarding how likely the adaptation/adjustment is to occur or how effective it would be in maintaining subsistence harvest levels, including addressing the ability, capacity, or cultural willingness to access alternate areas and make dietary substitutions across all sectors of the population (e.g., different dietary needs of children and elderly). Underlying many of these assertions are what appear to be unsubstantiated behavioral assumptions about the value calculations and the resulting actions of individuals with regard to income from outside employment. By presuming adaptation, the EIS may be underestimating the potential impacts of the proposed Pebble Project. We recommend that the document

⁶⁷ <https://www.epa.gov/environmentaljustice/resources-creating-healthy-sustainable-and-equitable-communities>

state the underlying assumptions upon which the analysis, where present, is based, including citing evidence of such adjustments by individuals and communities in similar circumstances.

Replacements Costs: We recommend that the EIS include the total amount of traditional foods used by tribal communities, including the replacement costs for those foods. For example, mining activities may cause caribou to be less accessible if the caribou herd does not return to their traditional range. We recommend considering what it costs a family to replace that protein by shopping at a store. As acknowledged in the DEIS, grocery costs are very high in the region, and replacement of traditional foods could result in a tangible economic impact for communities that still rely on the traditional economy of hunting, trapping, and harvesting. We recommend that replacement costs from reduced subsistence harvest be analyzed in the EIS and included as a potential impact of the proposed Pebble Project.

Harvest Levels if the Mine is Permitted: We recommend that the EIS include a detailed plan for how subsistence harvest levels will be documented during Pebble Project construction and operations, so that potential impacts to subsistence can be monitored and adaptive management strategies can be implemented as needed to support sustainable levels of subsistence harvest.

Impacts of Increased Traveling Distance for Subsistence Harvesters: We recommend that the EIS analyze the potential impacts to harvesters' travel times and distances. With increased distance comes increased cost and risk. If mine activities cause harvesters to travel farther to hunt, this increases the resource commitment to engage in the traditional way of life, including increased fuel costs, increased wear and tear on vehicles, greater risks of accident and injury, and more challenging transportation logistics. In addition, we recommend that the EIS analyze whether the greater distances traveled for hunting may further limit the number of active harvesters, and thus reduce the amount of traditional foods available to the entire community and result in high replacement costs.

Access: The DEIS indicates that subsistence access could be increased by use of the roads and pipeline rights of way (ROW). For example, the DEIS states that “[t]he addition of a pipeline ROW would potentially create an overland route that could be used by Nondalton residents to access additional subsistence resources.” In contrast to this statement, the project description describes the road as being “private.” In order to support the conclusions in the document, we recommend that the EIS discuss the development of a detailed agreement between PLP and the affected communities to provide access to the transportation infrastructure. The EIS would be strengthened by providing the agreement itself. In the alternative, any language referencing increased subsistence access due to the ROW should be removed throughout the EIS. In addition, we recommend that the EIS confirm whether the complete boundary of the mine site safety zone has been considered when determining which areas would be restricted from subsistence access, rather than using the footprint of mine facilities.

Mapping: The DEIS shows the subsistence use areas by community, but to understand potential changes to the region, it would be helpful to have a map that shows overlapping subsistence harvest areas, so that areas of higher value because of their use by multiple communities could be more easily evaluated. We recommend including a map in the EIS that indicates: 1) Areas where all communities harvest; 2) Areas where some communities harvest; 3) Areas where few communities harvest; 4) Areas where one community harvests; and 5) Areas where no community harvests.

Seals: The DEIS does not fully describe the impact of ferry use on seal hunting. Seal is high in omega-3 essential fatty acids, which contribute to human health in a number of ways. These nutrients are difficult

to replace in the western diet, so disruption of seal habitat and reduced opportunities to harvest may have health implications. We recommend that additional information be included in the EIS to clarify the characteristics of the seal population in the lake and their habitat uses, so that the potential impacts of ferry use can be analyzed. We also recommend that the EIS quantify the potential impact of the Pebble Project on seal harvests.

Traveler Safety on Lake Iliamna: Changes to ice integrity from winter ferries and the impacts of these changes on traveler safety do not appear to be fully analyzed and considered in the DEIS. The DEIS mentioned that markings would be put out to alert travelers to the ferry lane, but does not state whether these markers will be effective for winter travel in dark or white out conditions. We recommend that the EIS further consider traveler safety during winter travel on Lake Iliamna.

SPILL RISK

Key issues associated with the spill risk analysis includes recommendations for improvement of the analysis of the environmental fate and behavior of spilled concentrate and tailings including consideration of the role of oxygen in aquatic environments, timing for release of mineral components, and reactivity in porewater. In addition, we recommend that a Bulk TSF failure scenario be developed and potential impacts be evaluated. Our recommendations regarding these key issues are discussed below. Additional detailed recommendations for improvement to the spill risk analysis are provided following the key issues.

Bulk Tailings Release Scenario

The release of tailings from the bulk TSF due to an embankment breach or failure was not evaluated in the EIS based on the conclusions of the EIS-phase Failure Mode Effects Analysis (FMEA) (Section 4.27.6.9). The FMEA indicated that it was based on an early stage conceptual level of embankment designs and did not assess the confidence level of the failure modes and effects as is typically done (AECOM 2018i and Robertson 2003). FMEA can be a valuable tool in identifying potential failure modes, effects, and mitigation. However, it is unclear how the FMEA was used to determine the TSF release scenarios as the FMEA contained limited rationale for how the likelihood of failure risks were determined and did not describe the confidence or uncertainty associated with the release scenarios. Given the conceptual stage of and many assumptions associated with the embankment design and the limited seismic analysis that was not conducted on the current bulk TSF dam design (see our Geohazards comments), we recommend that alternate scenarios, including a breach scenario, be considered. In addition, the FMEA is based on limited information since: 1) it utilizes conceptual embankment designs (as opposed to more advanced designs); 2) there is a lack of a seismic analysis; 3) specific design information on the seepage management systems, underdrain system, and the core and filter/transition zones is not provided; 4) the material sources are not identified; and, 5) it is assumed in the DEIS that embankment raises would be done proactively, however the Project Description and DEIS do not provide a schedule for these embankment raises in comparison to freeboard and tailings placement rates. In addition, due to underestimated open pit groundwater inflows there is significant uncertainty associated with the water balance and one of the adaptive management strategies discussed in the DEIS to maintain the water balance is to transport water to the bulk TSF (pg. 4.16-8). Implementing this strategy would result in mine operations that are different than the conceptual design.

The FMEA risk register identified a number of adverse factors that could occur during engineering, construction, and operations, and the DEIS assumes that they would all be overcome. Yet, a recent study

on tailings dam failures notes that the dominant cause of failures arises from deficiencies in engineering practice associated with the spectrum of activities embraced by design, construction, quality control, and quality assurance (Morgenstern 2018). Therefore, there is credible information highlighting that, even assuming that the tailings dam is adequately designed, dam failure could still happen due to weak engineering associated with construction and operations. We recommend that this possibility be taken into consideration in the FMEA and the EIS by analyzing a breach scenario.

The DEIS states: “In accordance with National Environmental Policy Act (NEPA) guidelines, failure scenarios selected for analysis in the DEIS were of relatively low probability and a comparatively high level of consequence.” Further, the DEIS describes that a catastrophic failure, such as a total embankment breach, was ruled out as an extremely unlikely, “worst-case,” scenario. However, given the occurrence of multiple large-scale tailings dam releases in recent years at modern operating mining facilities, the possibility of a dam breach may not be too remote and speculative. For example, breach and inundation analysis are regularly required for environmental assessments for mining projects in Canada since the Mt. Polley dam failure. We therefore also recommend that the EIS include additional information describing how the agency determined which release scenarios to model.

We recommend that the Corps develop a breach scenario and consider using the following recent approaches for estimating tailings release volumes based on evaluations of tailings facility failures. “Tailings Dam Failures: Updated Statistical Model for Discharge Volume and Runout (Larrauri, P.C. and Lall, U. 2018) and “Floods from Tailings Dam Failures” (Rico, M. , Benitio, G., and A. Diez-Herrero 2008.

Consideration of Water Treatment Plant Residuals

The DEIS does not appear to consider the impacts of WTP residuals in the fate and impacts of the pyritic TSF spill scenario. The Pebble Project proposes that both liquid and solid treatment residuals (precipitates) will be disposed into the pyritic TSF. In water treatment, one of the chemicals noted as being used is sodium hydrosulfide (NaHS), which will dissolve into HS^- and Na^+ ions and the HS^- will sequester metals to form metal sulfide precipitates in the water treatment process where it is used. If there is any residual dissolved HS^- in the water disposed of in the pyritic TSF, and it is released in a spill to surface or groundwater having a pH less than 7 (the pKa), the equilibrium reaction [$\text{H}_2\text{S}(\text{aq}) = \text{HS}^- + \text{H}^+$] will begin to shift to the left and form dissolved hydrogen sulfide, which is highly toxic to fish at very low concentrations (0.002 parts per million maximum acceptable for aquatic life under the EPA’s National Recommended Water Quality Criteria⁶⁸). Depending on pressure and temperature, some $\text{H}_2\text{S}(\text{aq})$ may be converted to H_2S gas. Additionally, oxidized and reduced precipitates and membrane reject from water treatment are going to be placed into the pyritic TSF. Some of these are at high concentrations (see Table 4.18-13). When oxidized precipitates are exposed to anoxic conditions, they undergo reductive-dissolution; when reduced precipitates are exposed to oxic conditions, they undergo oxidative-dissolution. Reactivity of the precipitates will depend on the exact conditions in the TSF at points in time and over time. Therefore, the supernatant and leachate associated with the pyritic TSF may have different water chemistry over time that isn’t reflected in the modeling referenced in the DEIS or the pre-mining leaching tests. Additionally, when introduced to the environment, changes in pH and ionic strength could mobilize any metals/metalloids that are sorbed to the iron precipitates or oxidize elemental selenium to mobile selenite or selenate, for example. We recommend that the discussion of

⁶⁸ <https://www.epa.gov/wqc/national-recommended-water-quality-criteria-aquatic-life-criteria-table>

fate and behavior of released tailings from the pyritic TSF be revised to include analysis and disclosure of the impacts of a spill including both the liquid and solid treatment residuals.

Impacts of Spilled Concentrate and Tailings

We recommend that the EIS analysis of metal leaching and acid production associated with spilled concentrate and tailings be revised to more accurately reflect the anticipated fate and behavior of the concentrate and tailings particles in the environment. The EIS would be strengthened by additional consideration of the role of oxygen in aquatic environments, timing for release of mineral components, and reactivity in porewater, in order to support conclusions regarding the potential environmental impacts of spills of these materials. Based on these revisions, we recommend that discussions of impacts to resources be updated in the EIS. Our specific technical comments regarding the discussions of environmental fate and behavior of spilled concentrate and tailings (Sections 4.27.4.3 and 4.27.6.3), and recommendations to address issues identified, are described below.

Oxygen in Aquatic Environments: Throughout the spill risk chapter, there are many instances where it's stated that solids released from spills (concentrate and tailings) would not generate acid in aquatic environments because the water would "prevent oxidation of the sulfides," that "almost no oxygen gas would be present in still water," and similar statements. However, the DO content of any water body depends on multiple factors, including the depth of the overlying water and the microorganisms present to use up any existing DO. Diffusion of oxygen through a deeper water layer and through tailings porewater limits oxidation of sulfides in a TSF using subaqueous disposal; however, it will not completely stop oxidation unless the water has essentially zero DO and is a reducing environment. Additionally, if ferric iron is present (such as near the reacting surface) from oxidation of chalcopyrite or pyrite, it will catalyze the oxidation of the sulfides.

In a potential spill scenario, concentrate, tailings, or PAG waste rock will have the potential to oxidize unless the particles settle into, and remain in, an anoxic and reducing environment. The DEIS characterizes the baseline surface water resources generally being "well-oxygenated, low in alkalinity..." (pg. 3.18-7). The DEIS states that mean DO concentrations across the analysis area are 10.2 to 10.5 mg/l for streams and 2.6 to 9.1 mg/l for groundwater wells, and the saturation concentration for the altitude of the site and at 4 °C is given as 12.3 mg/l. Based on this information, we recommend that the discussions throughout the spill risk analysis be revised to accurately reflect potential for, and consequences from, oxidation of minerals from concentrate and tailings particles resulting from spills in the aqueous environments.

Time Required for Particles to React: The DEIS includes many statements asserting that timing for acid generation "requires years to decades." Whether this assertion is true with respect to metal leaching and acidity depends on the site-specific water quality parameters (pH, redox, temperature, microbial community, other ions or particulates in the water, etc.), particle size, and specific mineral composition. The DEIS does not provide data to support conclusions related to reaction time and appears to misrepresent information found in the reference materials. For example, the DEIS states that "Geochemical studies on rocks from the proposed mine site indicate that PAG material present in the tailings may require up to 40 years under local conditions to generate acid (SRK 2018a)" (pg. 4.27-68). However, the reference (SRK 2018a) states: "Some PAG components will become acidic as soon as exposed to oxygen but the median on-set period is 10 years (under site conditions). All PAG rock is expected to be acidic after 20 years of exposure unless managed to limit oxygen availability." The Summary Section of the Supplement to the EBD (PLP 2018a) states: "Kinetic testing of the rocks

showed that acidic leachate was produced from rocks with low levels of neutralization potential. Under field conditions, onset of acid generation is expected to be delayed by at least two decades, based on observations from weathering of core on site, laboratory and field based kinetic testing, and information derived from stored bag tests.” The references SRK 2018a and PLP 2018a present different conclusions, both of which differ from what is presented in the EIS. We recommend that the EIS accurately discuss the reference information. We recommend verifying which reference accurately reflects the anticipated onset of acidic conditions in the waste and tailings storage areas that are representative of the current proposed project, and then updating the reference(s) and EIS discussions, including the analysis of fate and behavior of spilled tailings, to reflect that data.

The DEIS also states: “No measurable metals would be leached from deposited tailings solids because the process of ML would require decades (Section 3.18, Water and Sediment Quality)” (pg. 4.27-81 for bulk TSF; pg. 4.27-99 for pyritic TSF). The referred section of the DEIS states: “Paste pH results for aged rock cores stored at the site suggest that acidification may be delayed up to 40 years for 95 percent of the pre-Tertiary mineralized rock (SRK 2011a). Given differences in the test conditions, laboratory and field tests suggest that oxidized pre-Tertiary mineralized rock may take up to several decades for acidification to occur” (pg. 3.18-4). Because paste pH is not a kinetic test, we recommend that the EIS provide additional information to support this conclusion. In addition, rock cores are not the same as tailings that have undergone processing, which will affect reactivity. PAG tailings will weather even more quickly than the larger PAG waste rock materials (the same holds for bulk tailings vs. waste rock), if not kept from oxygen in the air or water when released into the environment, due to having a higher specific surface area for reactivity. A spill of the pyritic TSF could include both pyritic tailings and PAG waste rock, since they will be stored in the same facility. We recommend that the analyses of the fate and behavior of spilled waste materials be revised to reflect these considerations.

The concentrations of ions and acidity released into pore water and surface water, which will depend on the amount of particles not recovered, and the extent of their dilution are what will dictate if there are any short or long-term, local or broad-ranged adverse impacts. While it is true that acid generation and metal leaching from the concentrate and tailings particles will not cause immediate acute impacts, there will be potential for post spill impacts (potentially acute as well as chronic toxicity, given the very low concentration of copper [and other ions, such as mercury, arsenic, and silver] causing toxicity to aquatic and benthic organisms) from leaching of particles not recovered. This is because smaller particles have a larger specific surface area for reactivity to oxidation (in air or water with dissolved oxygen). In areas where flowing water is rapid, if there is only a small mass of particles, acid generation might be diluted quickly and might not be an immediate issue to aquatic organisms; however, in areas of slower flowing water, the acid-forming (and propagating) reactions could be prevalent in shallow pooled water or in pore-water and influence benthic organisms, as well as developing concentrations of metals high enough to influence overlying water and hence fish. We recommend revising all discussions of leaching and acid production in the EIS to more accurately reflect the anticipated behavior of the concentrate and tailings particles in the environment. Based on these revisions, we recommend that discussions of impacts to resources also be updated accordingly.

Three references that might be useful for the topic with respect to post tailings spills are Byrne et al. 2018 (stream quality post Mt. Polley spill), Kossoff et al, 2012, and Kossoff et al. 2014.

Additional Technical Comments on Spill Risk

1. Analysis Area for Tailings and Contact Water Releases: We recommend that the Section 4.27.1.2 discussion of the affected environment for tailings and untreated contact water releases refer to the chapter figures that depict the analysis area discussed.
2. Water Use in Analysis Area: The DEIS states (pg. 4.27-3) that downstream communities use groundwater as a drinking water source. We recommend that the EIS discuss whether there is any connection between groundwater and surface water over the affected environment for bulk and pyritic tailings and untreated contact water releases.
3. Diesel Spill Scenarios: There is significant discussion in the DEIS and reference documents that there are more frequent spills of smaller volumes of diesel than larger volumes. The scenario analyzed in the DEIS uses a spill volume of 3,000 gallons and the conclusion is that there would be an average of 1 spill of this size every 90 years. The reference (AECOM 2019a) presents an additional way to evaluate the potential for spills, but this is not included in the EIS. AECOM 2019a used the total number of smaller volume spills over 6 years from the Dalton Highway (22 spills averaging 400 gallon/spill) to indicate that there could be 5 expected spills over 20 years and 18 over 78 years – an average of 1 spill of about this volume every 4.1 years, which equals a potential cumulative spill volume of 2,000 gallons over the project life. Because small spills are more likely to occur, we recommend that this information be provided in the EIS discussion to provide a broader perspective for potential spill frequency and size.
4. Spills from the Lake Ferry: We recommend that the EIS provide supporting information for the statement that the operation of the ferry would be more secure and regulated than that of marine barges (pg. 4.27-31).
5. Extent of Spilled Tailings and Concentrate Impacts: Many sections discuss transport of tailings (and concentrate) further downstream from flushing but fail to discuss the long-term influence of these particles in the watershed. They will be continually moved around and have potential to be flushed further downstream and influence larger parts of the watershed over longer time due to their continual leaching, and eventually some will be deposited into the lakes at the mouths of the affected streams. We recommend adding discussions considering the longer-term and larger distances that may be influenced by spills of concentrate and tailings.
6. Fate and Behavior of Released Gas: The DEIS states (Section 4.27.3.2) “Natural gas pipeline releases would not be expected to cause contamination of water or soil; therefore, detailed impact assessment of leak scenarios is not included in this section.” While it is true that contamination likely would be short-term (depending on the time before a leak was detected and stopped), and a scenario might not be useful, there still could be impacts to aquatic life from leaks in underwater portions of the pipeline. We recommend that the EIS discuss this potential.
7. Concentrate Pipeline Failure Rates: Regarding the potential for failure of the concentrate pipeline, the DEIS states: “Based on a 20-year operational lifetime of this proposed pipeline, external corrosion leading to failure would be very unlikely” (pg. 4.27-39). We recommend that the EIS include additional data to support this statement. Further, this statement leads to the question of how the potential for failure due to external corrosion would change if the operating life of the mine were extended by 78 to 98 years under the Pebble Mine Expanded Development Scenario. The risk of a

concentrate pipeline spill is not addressed in the Cumulative Impacts Section. To enable accurate understanding of the potential impacts associated with a longer mine life, we recommend that a discussion of this risk, including supporting data as appropriate, be added to the document.

8. Concentrate Pipeline Liner: The DEIS states “EPA (2014) points out that the potentially corrosive nature of the concentrate slurry could increase pipeline failure rates above historic failure rates due to internal corrosion. As described below under Mitigation, the concentrate pipeline would have a full internal liner that would protect against both internal and external corrosion” (pg. 4.27-39). We recommend that the EIS include additional context for the referenced information here, including acknowledging that EPA (2014) stated that the pipelines would follow standards of the American Society of Mechanical Engineers, which include protection against internal corrosion. Further, the failure rates for the copper concentrate in EPA (2014) and in this EIS are based on those from oil and gas pipelines because the failure rate of concentrate pipelines isn’t known. Potential for corrosion of an internal liner (which would decrease its protection of the internal pipe surface) from the concentrate (i.e., rough material) would be higher relative to the potential for corrosion of an internal liner of an oil and gas pipeline reflected in historic failure rates. We recommend that this discussion be revised to more accurately reflect the potential for internal corrosion of the concentrate pipeline, and to explain how an internal liner would protect against both internal and external corrosion.
9. Response Capability to Respond to a Concentrate Spill: The DEIS states “There are currently no organizations in Alaska that specialize in response to spills of ore concentrates. PLP would have a spill response plan in place that would address spills of ore concentrate and other hazardous materials” (pg. 4.26-39). We recommend that a draft spill response plan be included or referenced in the EIS. Such information is important to evaluate the potential impacts of the project associated with an unanticipated spill event. Given the statement that there are no organizations in Alaska that specialize in response to spills of ore concentrates, it is particularly important to have a spill response plan available for review and comment, to ensure its adequacy with regard to response actions and timeframes.
10. Mitigation for Copper Concentrate Transfer to Marine Vessels: The mitigation discussion for copper concentrate transfer to marine bulk vessels includes lids that “would not be opened until the container is within the hold of the marine bulk carriers” (pg. 4.27-40). This is a mitigation measure against dust generation during movement of the concentrate. Please provide mitigation measures for potential loss from the ship if under adverse conditions or an accident. We recommend considering whether leaving the concentrate within 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.
11. Mitigation for Concentrate Pipeline: The DEIS identifies avoidance and mitigation features for the concentrate pipeline including “manual isolation and drain valves would be located at intervals no greater than 20 miles apart” (pg. 4.27-41). We recommend that the DEIS discuss whether the use of automatic valves that can be remotely activated would be a better mitigation measure.
12. Discussion of the Pipeline Rupture: The DEIS states that “[t]he automatic leak detection system would detect the leak, and the surrounding isolation valves would be closed within 5 minutes (PLP 2018-RFI 066)” (pg. 4.27-50). This doesn’t seem to be a reasonable scenario, when using manual shutoff valves. Please clarify how a manual isolation valve would be able to be closed within 5

minutes of leak detection if located farther away than 3-4 miles from a responding individual or revise the scenario to be more realistic.

13. Trucking Concentrate Spill Scenario: The DEIS (Section 4.27.4.4) discusses that there were 18 spills along the Red Dog haul road over 23 years (1995-2018) and approximately 30 between 1989 and 2002. This leads the EPA to understand that there were 0.78 spills per year (based on the 23 years) or 2.3 spills per year (based on the 13 years) associated with Red Dog, without reference to how many miles were driven. However, the DEIS states "...the estimated annual spill rate for a trucking-related concentrate spill in the proposed project is 0.78×10^{-6} , which equates to an average of 0.4 trucking-related concentrate spills per year for the 66 miles of Alternative 1 road transport" (pg. 4.27-42). We recommend that the EIS clarify that the 0.78×10^{-6} is per truck mile, as well as include some detail from the reference for how this number was reached. We also recommend verifying the calculations, as the annual tonnage of concentrate for Pebble used in the reference differs from the PLP project description (Appendix N), as well as demonstration how the 0.78×10^{-6} was calculated from the Red Dog data. Additionally, we recommend discussing any limitations associated with these values.

The diesel spill scenario utilized the maximum spill volume on the Dalton Highway. However, the concentrate spill scenario (Section 4.27.4.7) assumed a spill of 80,000 pounds rather than the maximum reported spill of 145,000 pounds. We recommend that the 145,000-pound spill scenario be evaluated in the EIS.

14. Potential Impacts of a Concentrate Spill to Wetlands: The DEIS states "Although the concentrate is not expected to affect wetlands through acid generation or ML..." We recommend that the EIS clarify that this is in the short-term, as over time these particles will react unless they are buried in anoxic and reducing environments (which is more likely in a wetland than in an open river/stream).
15. Potential Impacts of Concentrate Spill to Lake Iliamna: Regarding potential impacts of the concentrate pipeline rupture, the DEIS states "Depending on the volume and location of the spill, some of the concentrate could be transported downstream into Iliamna Lake or Iliamna Bay, where it would settle out as deltaic deposits" (pg. 4.27-53). We recommend that the EIS include additional details to support the analysis of potential downstream impacts of a concentrate pipeline spill. For example, we recommend analyzing the distance concentrate would travel under various spill scenarios, whether concentrate would be transported into Lake Iliamna or Iliamna Bay, and the potential environmental impacts of concentrate deposition in those waterbodies.
16. Impacts of Concentrate Pipeline Spill vs. Concentrate Truck Spill: The DEIS asserts that impacts of a concentrate spill from a pipeline would be similar to that from a truck spill (pg 4.27-55). This statement is not supported by information provided in the DEIS. We recommend that the analysis be revised to acknowledge that the truck and pipeline spills will differ in that the trucked concentrate will be filtered and relatively dry and the pipeline concentrate will be a slurry and contain process water and chemicals. The concentrate transported via pipeline has an aqueous phase that not only will contain residues of chemical reagents, but will also contain dissolved copper, which is highly toxic to aquatic life. One of the potential chemical residues is hydrogen sulfide from any residual sodium hydrogen sulfide, dissolved H_2S is highly toxic to fish at very low concentrations. We recommend that the EIS include analysis of the potential short and long-term impacts from dissolved copper in the concentrate aqueous phase on all the resources discussed. We also recommend considering the potential effects if dissolved hydrogen sulfide is present in the mixed water source if

pH is less than 7 (background pH ranges indicate that some areas have acidic pH, so would react with the NaHS).

17. Discussion of Chemical Reagents: The DEIS includes the following statements regarding xanthate: 1) “The EPA reports that the presence of xanthate would render the tailings slurries toxic; but that if released in a spill, degradation and dilution would render the downstream waters non-toxic (EPA 2014).” (pg. 4.27-60); 2) “The EPA reports that this type of tailings slurry would be toxic due to the presence of xanthate (a reagent), but that if released in a spill, degradation and dilution would render the downstream waters non-toxic (EPA 2014).” (pg. 4.27-67, discussion of tailings spill); and, 3) “The EPA reports that the tailings slurries would be toxic due to the presence of xanthate (a reagent), but that if released in a spill, degradation and dilution would render the downstream waters non-toxic.” (pg. 4.27-85, residual toxins from tailings spill).

These are not accurate statements, and it appears these statements originate from taking the following statement from the BBWA out of context: “The concentration of sodium ethyl xanthate was not estimated in the receiving streams. Although the aqueous phase of the tailings slurry would be toxic due to xanthate, we expect that xanthate would occur at non-toxic levels in ambient waters below TSFs due to degradation and dilution (Xu et al. 1988).” This statement was made in Chapter 8 of the BBWA (Water Collection, Treatment, and Discharge) and regarded TSF leachate entering ambient water, as is clear from the “in ambient waters below the TSFs.” Additionally, it was qualified (Chapter 8, Uncertainties) by the statement: “If xanthate does not degrade rapidly in the tailings, the estimate that it would not leach into streams at toxic concentrations could be incorrect.” Specific to spills of chemicals, EPA 2014 stated: “Given the liquid form and toxicity of sodium ethyl xanthate (Section 8.2.2.5), it is expected that a spill of this compound into a stream along the transportation corridor would cause a fish kill. Runoff or groundwater transport from a more distant spill would cause effects that would depend on the amount of dilution or degradation occurring before the spilled material entered a stream.” The EPA 2014 reference did not include discussion of sodium ethyl xanthate at all in the TSF failure scenario. Reference to it in Chapter 9 is: “However, those results do not include process chemicals (e.g., xanthates and cyanide) that may be associated with the supernatant but that are not quantified in this assessment.”

We recommend either deleting these statements or revising them to accurately reflect what the EPA reported in the BBWA regarding sodium ethyl xanthate.

18. Discussion of NaHS: The DEIS states “Sodium Hydrogen Sulfide (NaHS) is very soluble, and if spilled into water it would dissolve, and give off nitrogen oxides and sulfur oxides (PLP 2018-RFI 052)” (pg. 4.27-60). The reference document referred to states “The decomposition products include nitrogen oxides and sulfur oxides (Cayman Chemical Company, 2013).” The Cayman reference is a Safety Data Sheet,⁶⁹ which states the decomposition products are sodium oxides and sulfur oxides. Additionally, these are decomposition products, not dissolution products. NaHS will dissolve in water to release HS⁻ and Na⁺ ions. We recommend revising the EIS discussion for clarity.
19. Spill Rates: The EIS notes that the ADEC spill database has no records specific to spills of reagents from trucking, marine, or ferry transport (pg. 4.27-61). With respect to truck transport, we recommend using the spill rate in EPA 2014 (1.9×10^{-7}).

⁶⁹ <https://www.caymanchem.com/msdss/10012555m.pdf>

20. Fate and Behavior of Released Tailings: We recommend that the EIS clarify in Section 4.27.6.3 that it is the low percentage of metal sulfides in the bulk tailings that would cause a lower risk of acid generation, relative to the pyritic tailings. Also, please explain why acid or metals generated would be “produced on such a slow timescale” (pg. 4.27-65) or revise as indicated in other EPA comments on leaching and acid generation.
21. Impact of Stream pH on Tailings: In Chapter 3.18, there is discussion that pH ranged from 3.31 to 9.33 in the stream samples, with the NFK having the lowest pH and UTC having the highest. The bulk tailings pipeline scenario discusses a spill into the NFK. We recommend including discussion of behavior of tailings particles if spilled in (and unrecovered from) reaches having acidic pH, since some areas are naturally acidic.
22. Discussion of Dam Failure Rates: When making the statement that “regarding dam failure rates and height of dams, higher dams have historically *not* failed more than lower dams...” (pg. 4.27-70), we recommend providing a reference to the height being compared, and point out the fact that, historically, the numbers of higher height dams (e.g., > 300 ft) in existence was fewer.

The DEIS also states “A review of ICOLD data reveals a clear trend in the higher probability of dam failure during active dam operations. Ninety percent of tailings dam failures have occurred in active dams during operations, as opposed to dams in closure (ICOLD 2018). Data also show that failures of tailings embankments under dry storage conditions (with no ponded water above tailings) after mine closure is small compared to dams in active operations with ponded water (Donlin Gold EIS 2018). Therefore, the probability of a failure of the bulk TSF in closure would be expected to be even lower than the estimates above (EPA 2014).” (pg. 4.27-71). We recommend that the EIS explain how the EPA 2014 assessment relates to the rest of the paragraph discussing data reviewed from a 2018 reference, or how it could relate to estimates in previous paragraphs for this document.

23. Emergency Action Plan: There are several places in the DEIS where an emergency action plan is mentioned (e.g., pg. 4.27-72). We recommend that a draft emergency action plan be included or referenced in the EIS, to support conclusions regarding what actions would be taken and residual impacts that could remain.
24. Centerline vs. Downstream Dam Construction: The DEIS states that centerline construction was selected for the bulk TSF to “limit the footprint and volume of materials required for construction.” It also states that “Data on dam failures around the world demonstrate that dams designed with downstream construction methods are less likely to fail than dams using centerline construction methods, especially under seismic shaking (ICOLD 2018).” (pg. 4.27-73). Because stability against failure is important, we recommend that the Corps consider this in identifying the LEDPA, since a limited footprint and lower volume of construction materials may not outweigh the inherent increased resilience of a downstream dam in considering potential for failure as compared to centerline construction.
25. Modeling Release Scenarios: The tailings release scenarios were modeled to determine the inundation (Section 4.27.6.9). As with any model, we recommend that the EIS include discussion of uncertainties associated with the modeling and how the uncertainties could impact model results. In addition, we recommend that the further information be supplied to describe how the volume of pyritic tailings released was selected since the volume appears to be less than what would be

expected based on recent studies of tailings failures (see references under Bulk Tailings Release Scenario).

26. Blasting Residuals: The DEIS asserts that bulk tailings and pyritic tailings would not contain residue from blasting agents, and states “This rock would be monitored until explosive residues have been leached (PLP 2018-RFI 021c)” (pg. 4.27-85 and 4.27-104). Such monitoring would be unusual, and the statement does not appear to be accurate as the discussion in the cited reference refers specifically to runoff from embankments. The October PLP project plan also discusses this in context to the rock for embankments. Additionally, nitrate and ammonia are noted in K4.18 as being components in water from both TSFs. We recommend that the EIS discuss the potential for blasting residues to be in the tailings’ supernatant water, and analyze the potential impacts in the spill scenarios.
27. Discussion of Sediments: The DEIS includes contradictory statements with respect to the potential for entrained tailings in existing sediments to release ions (pg. 4.27-85 and 86). We recommend that the EIS clarify why they would behave differently in the situations, or that the discussion be revised.
28. Pyritic TSF Spill Scenario: In order to better understand the extent and magnitude impacts of this scenario, we recommend that the inundation maps included in the reference (Knight Piésold 2018p) be added to the EIS in this section or in an appendix.
29. Water Management Pond Release Probabilities: The probability of release from the WMP isn’t presented because it is stated that “there are no known precedents for such a large lined WMP; therefore, there are no reliable statistics on their failure rates.” (pg. 4.27-115). We recommend that the EIS provide information on known failure rates for ponds that approach the same size (or the largest that is common), either with or without a liner, to support the DEIS analysis.
30. Wetlands Impacts Due to Spill Scenarios: In discussing release from the WMP, wetland vegetation is stated as being impacted through uptake of contaminants because of the scenario being set in early spring. We recommend also discussing this potential with respect to metals in supernatant from the concentrate and tailings spills.
31. Fish Impacts Due to Spill Scenarios: The DEIS states that “the low-level use of the habitat to be impacted (based on the distribution and densities of juvenile and adult salmon observed in the area) indicates that drainage-wide or generational impacts to populations of salmon from direct habitat losses associated with the scenario would not be expected” (pg. 4.27-88). We recommend that the EIS define what losses are expected, and explain, for example, the significance of the loss of a year-class of salmon from the NFK within the context of population diversity.

INDIRECT AND CUMULATIVE IMPACTS

The cumulative nature of project impacts to streams, wetlands, lakes, and ponds and the fishery areas they support in multiple watersheds is an important consideration for both the EIS and the 404(b)(1) Guidelines review. The Guidelines require the prediction of cumulative effects to the extent reasonable and practicable.⁷⁰ Our key issue is a recommendation for further analysis to support the Corps’

⁷⁰ 40 C.F.R § 230.11(g)(2).

conclusions regarding potential cumulative impacts of the Pebble Mine Expanded Development Scenario as explained in greater detail below.

Pebble Expanded Development Scenario

General Recommendations: The evaluation of cumulative impacts in the DEIS presents impacts in general terms, with little or no quantitative evaluation of additional impacts resulting from this scenario. For example, page 4.18-36 states, “The potential for cumulative impacts on surface groundwater, and sediment would increase substantially,” but the DEIS does not attempt to estimate the magnitude, duration, or extent of these impacts. In addition, the DEIS does not recommend mitigation measures to reduce impacts. In our scoping comments, we recommended that the EIS evaluate the expansion and continued operation of the currently proposed project as a reasonably foreseeable indirect effect of the proposed action. We recommend that the EIS include a more robust evaluation of the indirect and cumulative effects of reasonably foreseeable future activities, particularly in terms of the Pebble Mine Expanded Development Scenario.

Description of Expanded Development Scenario: The DEIS provides a summary of the Pebble Project Expansion in Table 4.1-2. While this summary is helpful, more information is recommended to support the subsequent impact assessment. We recommend that the table be expanded to provide the estimated amounts of ore and waste rock that would be mined and the amount of tailings produced. We also recommend that the table include a footnote that summarizes the uncertainty associated with the assumptions in the table (e.g., the first few sentences of the RFI-062 response). In addition, we recommend that the figure in RFI-062 be included in the EIS so that the layout and size of the mine site components can be visualized.

Future impacts of the Pebble Project Expansion will vary depending on which alternative is selected in the Record of Decision for the current proposed action. Assumptions for the Pebble Project Expansion presented in Table 4.1-2 include construction of a concentrate pipeline and diesel pipeline from the mine site to a deepwater loading facility in Iniskin Bay. Under Alternative 1, this would include construction of a second road for pipeline servicing, whereas the project access road could be used for servicing pipelines in Alternative 2 and 3. In addition, assumptions in Table 4.1-2 for the Pebble Project Expansion under Alternative 1 include continued use of the ferry to transport supplies and molybdenum concentrate to Amakdedori Port. However, under Alternative 2, it is assumed that the ferry would be discontinued after 20 years and that a road would be constructed to connect the two ferry terminals to transport supplies and molybdenum concentrate to Diamond Point port. Neither the DEIS nor RFI-062 explain why continued use of the ferry is anticipated under Alternative 1 but not Alternative 2. We recommend that this be clarified in the EIS. In addition, we recommend that the Corps consider the cumulative impacts of future expansion when considering which alternative is currently environmentally preferable.

Pebble East: The project applicant has proposed mining the deeper Pebble East portion of the deposit,⁷¹ potentially during a future phase using surface or underground mining techniques. We recommend that mining this this portion of the deposit (Location Alternative 006) be included as part of the expanded mine scenario or that the EIS explain why evaluating the impacts of mining the deeper Pebble East portion is not reasonable or practical.

⁷¹ Northern Dynasty Minerals, The Pebble Project: The Future of U.S. Mining and Metals, January 2017.

Resource-specific comments: Our comments regarding the analysis of impacts of the Pebble Mine Expanded Development Scenario in specific resource sections are as follows:

1. Surface Water Hydrology: We recommend that the analysis of the cumulative effects of the Pebble Mine Expanded Development Scenario on surface water hydrology (Section 4.16.7.2) include a figure or table that shows the extent of changes to surface water hydrology for the expanded development scenario so that the magnitude and extent of impacts is included. In addition, we recommend that the EIS describe the range of variability associated with the estimates of the changes so that it is clear whether these predictions are average, reasonable worst case, etc.
2. Groundwater Hydrology: We recommend that the analysis of cumulative effects of the Pebble Mine Expanded Development Scenario on groundwater hydrology (Section 4.17.7.2) include a figure that shows the extent of the groundwater zones of influence for the major mine components (TSFs, water management ponds, open pit) so that the magnitude and extent of impacts to groundwater quality and quantity is understood. In addition, we recommend that the EIS describe the range of variability associated with the estimated mine expansion described in this section (Section 4.17.7.2) so that it is clear whether the additional predictions are representative of the expanded development scenario.
3. Water Quality: The potential cumulative effects of the Pebble Mine Expanded Development Scenario on water and sediment quality (Section 4.18) are discussed in terms of the increased footprint and in terms of sedimentation and fill placement. We recommend that the impacts analysis also address the potential impacts associated with increased storage time of waste rock and tailings. Page 4.18-36 of the DEIS states, “[t]he potential for cumulative impacts on surface groundwater, and sediment would increase substantially,” but the DEIS does not fully estimate the extent of these impacts.
4. Wetlands: Section 4-22 of the DEIS does not indicate how many stream miles would be lost due to the expanded mine scenario. While this section does note that an “additional 12,445 acres” of aquatic resources would be “potentially affected” at the mine site, the DEIS does not identify whether this estimate includes both direct losses and functional degradation from secondary/indirect effects, what type of aquatic resources and functions would be lost or degraded, or the severity or significance of these impacts. We recommend the EIS characterize the geographic extent of cumulative direct and secondary/indirect effects (e.g., acreage of wetlands and other aquatic resources impacted, miles of stream impacted – by impact types), the expected change in functions provided by the affected aquatic resources, and the severity or significance of these changes. Given the extensive available information about the expanded mine development scenario it appears reasonable for the Corps to include and evaluate this information. Alternatively, the Corps should explain why its current approach is sufficient in light of the significance and complexity of the discharge activities associated with this project.
5. Spill Risk: In discussion of the potential spill risk impacts associated with the Pebble Expanded Development Scenario, the DEIS states, “In summary, the cumulative effects of unintentional releases associated with Pebble mine expansion would be similar to those discussed previously in this section, but potentially involve larger volumes over a slightly larger geographic area” (4.27-128). We recommend that the analysis of impacts of this scenario be revised to include additional potential impacts not acknowledged in this statement. For example, the pyritic waste

rock (and tailings) will not be able to be placed into the pit after 20 years, will therefore not be submerged, and will be weathering over time. Therefore, a potential future spill from the TSF under the Expanded Development Scenario would be expected to have acidic and metal laden water released. We recommend that the EIS discuss potential cumulative effects from increased time of storage on water quality in the TSFs and potential for increased risk of failure of the WMP and TSFs with increased time of operation.

Potential Future Use of Cyanide: A summary of differences between the proposed project and the reasonably foreseeable expansion of the project notes that the expansion would need additional tailings storage, additional water storage, new waste rock storage facilities, additional processing facilities, a concentrate pipeline, and a deep-water loading facility. This inventory is based on RFI-062, dated August 2018. However, based on recent public statements made by Northern Dynasty Minerals (Doug Allen, Vice President of corporate communications; Vancouver Resource Investment Conference, January 2019), it may also be expected that a cyanide circuit would be proposed in the future. We recommend that the Corps verify with PLP if a future expansion of operations after the currently proposed 20-year project would include a cyanide gold-recovery circuit. If it is to be part of the reasonably foreseeable future action, then we recommend that it be added to the “Description” column of Tables 4.1-1 and 4.1-2 and impacts from that component of the project should be evaluated in the subsequent resource-specific sections.

Additional Comment on Indirect and Cumulative Impacts

Clarification of RFFAs: The DEIS states under the “Timeframe” section of the “Reasonably Foreseeable Future Actions in the EIS Analysis Area” (Section 4.1.1.3) discussion that there would be consideration of other (in addition to PLP’s potential expansion) reasonably foreseeable future activities that may occur “during construction and operation of the proposed project.” Table 4.1-1 presents numerous potential activities and whether they would be “reasonably foreseeable.” For most activities where the table states “No – for development,” meaning that the action was determined not to be reasonably foreseeable for development, there is also a statement reflecting that there is no indication that development would occur “within the operations timeframe of the proposed Pebble Project.” However, for two activities having “Yes – for development” (Donlin and Drift River), there are statements that the projects are considered “reasonably foreseeable in the 78-year timeframe.” It is likely that several of the projects in the table currently noted as “no” for development may actually be “yes” if looked at over a 78-year timeframe. We recommend that the criteria used to support which activities are reasonably foreseeable future actions be clarified in the EIS.

MITIGATION

The conceptual level of key project plans and design features, and some plans that are not developed at all, makes mitigation effectiveness evaluations challenging for these features and, in some cases, unsupported. Further, the draft Compensatory Mitigation Plan contains only a conceptual discussion of compensatory mitigation, does not fully address indirect impacts to waters of the U.S. that may occur, and does not identify any specific mitigation projects; therefore, the availability and effectiveness of compensatory mitigation to offset unavoidable impacts is not disclosed. These key issues are discussed below followed by additional comments and recommendations regarding the Applicant’s Proposed Mitigation, best management practices, and additional mitigation being considered by the Corps.

Applicant's Proposed Mitigation

Conceptual Level of Key Project Plans and Components: Regarding PLP's proposed mitigation and procedures, the DEIS states (Section 5.2.2) "Where there is insufficient detail to determine effectiveness, the measure could not be incorporated into the impact analysis, but serves to inform the public of PLP's commitments...Engineering design and construction, operations, or closure-phase procedures are often preliminary at the time that an EIS is prepared; typically, final engineering designs and construction and operations plans are finalized during the successive state permitting phase." (pg. 5-5). We agree that designs and plans may be preliminary during EIS analysis. However, several key designs and plans proposed by PLP are either not available (Reclamation and Closure Plan, Monitoring Plan, Adaptive Management Plan, Fugitive Dust Control Plan) or at a conceptual or early stage which is less than a preliminary design stage (open pit dewatering system, TSF and WMP embankments, waste rock characterization and management plan, seepage collection/pumpback system, closure water treatment process). We recommend that these components and plans be developed with a reasonable level of detail and discussed in the EIS to support the Corps' review of their effectiveness and potential impacts in a meaningful evaluation. Our specific recommendations related to these project components and plans have been provided in our comments above (see "Conceptual level of design and development of key project features and plans").

Effectiveness and Jurisdiction of Applicant's Proposed Mitigation: The DEIS conducts an assessment of the effectiveness and jurisdiction/enforcement of each of the mitigation measures proposed by the Corps during the EIS process (Table M-1). The DEIS does not appear to include a similar assessment of PLP's proposed mitigation (Table 5-2). We recommend that the EIS conduct this same assessment for PLP-proposed mitigation identified in Chapter 5 and that columns describing effectiveness and jurisdiction/enforcement be added to Table 5-2.

List of Applicant's Proposed Mitigation: Numerous mitigation measures described in the EIS are not fully included in Table 5-2 (Applicants Proposed Mitigation Incorporated into the Project). We recommend that Table 5-2 be revised for completeness, so that a complete listing of all mitigation measures considered is available. Additional detailed comments on Table 5-2 are as follows:

1. Reclamation and Closure Plan: Our comments related to the RCP (pg. 5-6/7) include:
 - The DEIS states, "Where feasible, mine facilities would be reclaimed in such a manner as to create new wetland areas and ponds." In order to analyze impacts to wetlands at reclamation and closure, we recommend a draft RCP be developed that describes what is meant by "where feasible" and that specifically describes reclamation that would occur to create new wetland areas.
 - The DEIS states "The RCP would document the plan for long-term closure of the site in a stable condition...and would serve as the basis for the development of the closure cost estimate and associated bonding." We recommend developing a draft RCP that defines what is meant by a stable condition and documents specific plans for long term closure, or that the EIS provide some other reasonable basis for assessing the impacts at closure.
 - See also our comments regarding the RCP under "Conceptual Project Features and Plans..."
2. Bonding and Financial Assurance: Table 5-2 discusses bonding in the context of the RCP. Financial assurance would also be required by the State of Alaska for the Integrated Waste Management Permit and dam safety certification. We recommend that this be clarified. In addition, we

recommend that a draft financial assurance cost estimate be provided to enable evaluation of the adequacy of financial assurance given the need for long-term water treatment. Please see our comments on “Conceptual Project Features and Plans...” for more information.

3. **Fugitive Dust Control Plan:** According to the DEIS, a fugitive dust control plan would be developed and “methods would be established to control dust from vehicle travel on unpaved roads, material handling, and wind erosion from disturbed areas. Control measures *could* include speed limits, use of approved chemical dust suppressants, and application of water” (pg. 5-8, emphasis added). We recommend that a draft fugitive dust control plan be included in the EIS that specifies the control measures that would be used. This would ensure disclosure of the extent to which fugitive dust releases would be mitigated and any potentially significant remaining environmental and human health impacts. We recommend that the draft fugitive dust control plan consider inclusion of the following:
- Site:
 - Dust control fence/barrier/plantings at perimeter of operations;
 - Establish inspection schedule to verify plan is working;
 - Establish a standard for identifying a dust event (e.g., percent opacity);
 - Processing facility:
 - Minimize ore drop distance as practicable;
 - Inspect equipment and enclosures regularly for physical integrity. Address identified issues as soon as practicable;
 - Storage piles:
 - Minimize drop height as practicable;
 - Define when water/chemicals are needed;
 - Roads:
 - Define when water/chemicals will be used;
 - Identify measures to load and transport material in trucks to minimize dust (drop height into bed, level of fill in the bed, etc.);
 - Establish a level for triggering dust control measures;
 - Drilling:
 - Address whether a wet method will be used for drilling;
 - Set limit on percent opacity;
 - Inspections:
 - Establish a regular schedule for inspection;
 - Establish a routine maintenance schedule;
 - List the schedules for watering, treating and periodic cleaning of roads, trafficable areas and storage piles;
 - Staff
 - List of staff responsible for implementation of plan;
 - All employees report high dust; and,
 - Equipment:
 - List equipment to be used (spray trucks, chemical application systems, etc.).

In addition, we recommend that the EIS include discussion regarding the toxicity of dust suppressants (see, e.g., McTigue et al. 2016), and that this factor be addressed in the draft plan.

4. Aquatic Resources Monitoring Plan: The DEIS suggests that an ARMP would be developed at a later time in consultation with ADFG and ADNR. We recommend that a draft ARMP be included in the EIS to provide support for the conclusion in column 2 of Table 5-2 that it would monitor change to aquatic communities and allow for adaptive management to address any project-related impacts.
5. Spill Response: Table 5-2 states that the project would contract with a Spill Response Organization. As discussed in our comments on Spill Risk (Section 4.27), we recommend that a draft spill response plan be included in the EIS. We recommend that this plan identify organizations contracted to deal with all anticipated types of spills (oil, concentrate, tailings, natural gas, chemicals), as well as discuss spill response actions including actions that would be taken to notify potentially affected communities and plans for spill remediation.
6. Pit Lake: Table 5-2 of the DEIS provides a general discussion of the pit lake being maintained “at a level that promotes hydraulic containment...protecting site groundwater.” And “...providing for additional storage capacity...” (pg. 5-13). It will also be very important that water level be maintained in the pit enough to keep the PAG materials in an anoxic zone (where there is no infiltration of oxygenated water). We recommend that the EIS address how these needs will be balanced, the depth required to satisfy these needs, and plans for monitoring the water level. Additionally, while final storage of the PAG materials in the pit will mitigate the need for treatment in perpetuity of seepage from the pyritic TSF or from a PAG waste rock pile (if one were proposed), the pit will require treatment and release of water, likely in perpetuity, to sustain those conditions. We recommend that this measure acknowledge the likelihood that water treatment for the pit would continue in perpetuity.
7. Waste Rock Management Plan: Table 5-2 of the DEIS identifies PLP’s “primary approach” confirming use of NAG and non-metal leaching materials in construction and that it would “confirm sulfur and element characteristics” (pg. 5-13). As discussed in our comments on Conceptual project Plans and Features and Water Quality, we recommend providing more detail regarding the specific criteria and procedures that would be used to separate PAG/metal-leaching waste from NAG/non-metal leaching wastes in order to evaluate the extent to which these procedures would be effective at reducing the risk of impacts to water and wetlands from ARD and leached metals.
8. Storage of PAG Materials: Two entries in Table 5-2 describe measures that would be taken for storage of PAG Materials during operations and at closure and discuss the impacts that would be mitigated by these measures (pg. 5-15, first and second rows). We recommend revising the text to reflect that the impacts being mitigated include negating the need for perpetual treatment of runoff and seepage and potential failure of the pyritic TSF, but that the measure will result in required monitoring and treatment of the pit in perpetuity. Also, we recommend that the EIS state more accurately that the subaqueous storage will “limit” or “minimize” oxidation and subsequent acid generation, depending on the depth of the water cover and provision of anoxic and reducing conditions, but would not necessarily “eliminate oxidation and acid generation.”
9. Treated Water Discharge: Table 5-2 references the use of “strategic timing” for water release at three separate discharge points, but details on the timing are not provided in the DEIS (Chapter 2 or Appendix N). We recommend that the EIS provide a reasonable description of the plans for treated water discharge, including what is meant by “strategic timing,” how the goal of “minimize, or avoid, impacts to fish habitat” would be achieved, and where treated water would be stored prior to its release if there is need to release smaller amounts than what is being treated at any time. Also related

to this topic is text in 4.24 stating that “treated water would be discharged through buried infiltration chambers designed to provide energy dissipation, erosion control, and freeze protection.”

Presumably these are mitigation measures against damage to the streams (erosion, resuspension of settled solids, etc.) by velocity of discharge, as well as to protect aquatic life from the force of the water. We recommend that this measure be added to Table 5-2.

10. 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). We 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.
11. Road Access: Table 5-2 states “The project would provide for controlled use of the road corridor and ferry for local residents, improving the supply of goods and reducing the cost of importing goods.” However, Chapter 2 describes the road as a “private road.” We recommend that the EIS define what is meant by “controlled use” to confirm general statements made here and elsewhere (e.g., Section 4.9 Subsistence) about positive benefits to community. We also recommend that the allowable use of the road be clarified in the project description.
12. Independent Review of the TSF and WMP dams: We recommend that the mitigation table include an independent review of the TSF and WMP dams proposed for the project. These are significant structures that retain tailings and contaminated water. We recommend that the Corps require independent review of these structures⁷².

Best Management Practices

The DEIS defines Best Management Practices and Industry Standards as “predictable actions necessary to comply with regulations and standard permit requirements that are designed to reduce impacts to the environment. These are typically reflected in the applicant’s design and are analyzed as part of the proposed project.” Where such actions are presumed in the analysis of the proposed project, it is important that the DEIS include the actions that will be taken and how they will be enforced. We recommend the BMPs and other standard actions assumed for the project be compiled in a new table, or that these measures be added to Table 5-2. Consistent with our recommendation for Table 5-2, we recommend that this table include the effectiveness and jurisdiction/enforcement of the measure. Many of the items listed in Section 5.2.1.2 are examples of where BMPs would be required by regulation or are likely to be used, rather than being a description of the action itself, and we recommend providing details on the anticipated measures.

As part of the description of BMPs, the DEIS discusses the Alaska Large Mine Permitting Team (LMPT) process (Section 5.2.1.1). The DEIS states “The goal of the LMPT process is to coordinate the sequencing and intergovernmental review of the numerous permits required of a large, complex, hardrock mine.” However, the DEIS mentions only three of the state permits/approvals: the Plan of Operations approval, Reclamation and Closure Plan approval, and Integrated Waste Management Permit as being part of an application package and subject to public comment. We note that the state also issues air quality permits, Alaska Pollutant Discharge Elimination System permits, dam safety certifications, water rights, and fish habitat permits for mining projects and these permits/approvals are not discussed.

⁷² 33 CFR 325.1(d)(6)

We recommend that this section be revised to clarify whether these other major state permits/approvals are part of the LMPT process or if they are processed separately.

The DEIS provides numerous steps that are conducted for the State LMPT process, but does not explain where the Corps' 404 permitting and the NEPA process factor in to the state's process. Under the section for the Applicant's Proposed Mitigation Incorporated into the Project, there is a statement that designs are often preliminary in the EIS and are "finalized during the successive state permitting phase", which implies that the 404 permitting phase occurs first. We recommend that the EIS clarify the timing of the Corps' 404 permit application and NEPA process in relationship to the state and local processes when discussing the state and local processes.

Compensatory Mitigation

Appendix M contains the applicant's draft conceptual Compensatory Mitigation Plan (CMP). Our primary comments on the CMP is lack of proposed mitigation projects, lack of inclusion of temporary and secondary impacts, and functional assessment is not considered. These issues are discussed below. Our letter on the CWA 404 Public Notice (see Section I.X. of the letter) also reflects these issues and discusses the CWA 404(b)(1) Guidelines.

The CMP provides summary information regarding the compensatory mitigation regulations, the potential impacts, and potentially affected watersheds. It states that PLP proposes to compensate for 3,524 acres of direct permanent losses of waters of the United States. It also states that "PLPs compensatory mitigation approach will focus on opportunities that benefit water quality and fish and their habitat. While the intent is to seek such opportunities within the watershed, if opportunities are not available PLP will reach for similar opportunities outside the watershed." The CMP does not include any proposed compensatory mitigation projects or information regarding type and location of compensatory mitigation under consideration. It states that "[t]his CMP will be amended in the future to include proposed mitigation plans." The DEIS states (pg 5-23) that "[s]pecific mitigation conditions would be determined following completion of the environmental review and would be included in the ROD for any permit that may be issued."

The Corps should provide an opportunity for meaningful public comment on a CMP that includes a level of detail "commensurate with the scope and scale of the impacts" as well as the "amount, type, and location" of compensation they could potentially provide. Alternatively, the Corps should further explain why, considering the scope and scale of the impacts associated with the proposed project, the CMP contains the level of detail and information required by the public notice regulations at 40 C.F.R. § 230.94(b)(1). In addition, the Corps should explain why the information included in the public notice provided the public or other federal agencies with an opportunity to provide meaningful comment or recommendations on the proposed mitigation as contemplated by the regulations. The Corps should further explain why the CMP complies with the requirements under Section 404 discussed above or the NEPA requirements that mitigation measures be discussed in the EIS sections on alternatives and environmental consequences.⁷³ This is particularly important in light of the significance and complexity of the discharge activities associated with this project.

⁷³ 40 C.F.R. § 1502.14(f) and § 1502.16(h).

The Guidelines identify that “[c]ompensatory mitigation requirements must be commensurate with the amount and type of impact that is associated with a particular DA permit.”⁷⁴ They also specify that “the amount of required compensatory mitigation must be, to the extent practicable, sufficient to replace lost aquatic resource functions.”⁷⁵

The CMP indicates that PLP proposes to compensate for 3,524 acres of direct permanent losses of waters of the United States. As discussed in our DEIS comments, the DEIS may not have accounted for and characterized all of the potential direct and secondary/indirect impacts of the discharges of dredged or fill material. In addition, the CMP does not address potential compensatory mitigation for the other impacts acknowledged in the DEIS: the direct impacts to over 80 linear miles of streams, the temporary impacts to 510 acres of wetlands and other waters, and the more than 2,800 acres of secondary/indirect impacts to wetlands, streams and other aquatic resources. We recommend that PLP’s revised CMP explain how the amount of compensation reflects the amount necessary to meet applicable requirements for the full scope of direct and secondary/indirect impacts of the discharge of dredge and fill material. This information is particularly important in light of the significance and complexity of the discharge activities associated with this project.

The factual determinations underlying the Corps’ Guidelines conclusions involve a determination of “the nature and degree of effect that the proposed discharge will have, both individually and cumulatively, on the structure and function of the aquatic ecosystem and organisms.”⁷⁶ “Compensatory mitigation requirements must be commensurate with the amount and type of impact”⁷⁷ identified and “sufficient to replace lost aquatic resource functions.”⁷⁸ The Guidelines state that where functional assessments are available (as they are here), they should be used to determine the amount of compensation that would be sufficient to offset the authorized impacts.⁷⁹ Functional assessments provide a mechanism to quantify the extent of functional loss (debits) and functional gain (credits). Debits represent the loss of function at the impact site, while credits represent the accrual or attainment of aquatic functions at a compensatory mitigation site.

The Corps Alaska District has a Credit Debit Methodology that uses function or condition data to quantify the functional losses or gains between the current and proposed future condition. These functional deltas are used to calculate debits and credits, as recommended by the regulations.

Data was collected that could support development of a functional assessment to identify the amount of functional losses resulting from impacts to wetlands and other aquatic resourced and inform compensatory mitigation decisions. However, this data was not used in the DEIS. As discussed in our DEIS comments on wetland and fish, additional information and analysis is recommended to identify the amount of losses specifically associated with fish-related functions. This information and analysis are important to informing decisions regarding the appropriate type and amount of compensation necessary to offset impacts to fish and fish habitat. We recommend that the Corps should use available data that was collected to support aquatic resource functional assessments and supplement that data where necessary, particularly to identify the amount of losses associated with fish-related functions and use this information to inform decisions regarding the appropriate type and amount of compensatory

⁷⁴ 40 C.F.R. § 230.93(a)(1).

⁷⁵ 40 C.F.R. § 230.93(f)(1).

⁷⁶ 40 C.F.R. Section 230.11(e).

⁷⁷ 40 C.F.R. § 230.93(a)(1).

⁷⁸ 40 C.F.R. § 230.93(f)(1).

⁷⁹ 40 C.F.R. § 230.93(f)(1) and 73 FR 19633 (2008).

mitigation necessary to offset the expected functional losses from the proposed Pebble Project. These analytical steps are particularly important in light of the significance and complexity of the discharge activities associated with this project.

Monitoring and Adaptive Management

The DEIS states that PLP proposes to use monitoring measures through construction, operations, and closure of the proposed project to assess predicted impacts and effectiveness of mitigation. The monitoring would have an adaptive management component to identify, assess, and implement changes to the required mitigation measures. The DEIS does not include or reference any specific monitoring or adaptive management plans. The DEIS states that the monitoring plan would be developed during state permitting. As discussed in our comments under Conceptual-level of Design and Development of Key Project Features and Plans, a reasonably detailed monitoring plan and adaptive management plan(s) is important for the EIS analysis. Otherwise, there is no basis for assuming that the monitoring plan (at unspecified locations, frequencies, parameters, etc.) would be effective at detecting changes and no basis for assuming that unspecified adaptive management would be successful at correcting mitigation measures. We recommend that reasonably detailed draft monitoring and adaptive management plans be included in the EIS.

Additional Comments on Mitigation

Appendix M – Additional Mitigation: We appreciate that the Corps has identified additional mitigation measures (Table M-1) beyond those proposed by PLP. Our specific comments on Table M-1 are as follows.

1. Table M-1 identifies numerous proposed mitigation measures that could “indirectly” be enforced by the Corps. We recommend that the EIS define what is meant by the term “indirectly.”
2. Table M-1 presents some proposed measures having “jurisdiction/enforcement” noted as “not likely to be enforceable due to remoteness of the project area.” Although the project area is remote, and perhaps enforcing compliance couldn’t be done daily, projects such as this may still be monitored and/or audited. We recommend that the EIS clarify why a requirement, if made, would be unenforceable solely because of it being a remote project.
3. Automatic isolation valves for concentrate pipeline variant are listed as a “possible” measure in Table M-1 (pg. M-5). The DEIS evaluates a tailings release scenario from the bulk TSF due to a pipeline rupture (Section 4.27.6.9), and states that it would take six hours to detect the leak and shut off the pumps. We recommend that automatic isolation valves, as well as use of a leak detection system, be further assessed as a mitigation measure since it would enable a quicker response to pipeline incidents and minimize the impacts of a pipeline accident or malfunction.
4. Table M-1 lists a double liner system under the pyritic TSF and main WMP as “possible” (pg M-6), but concludes that a double-liner is not reasonable since these facilities already include a liner and a seepage collection system. Minimal information regarding the design of the seepage collection system is provided in the EIS and therefore, it cannot be assumed that it would be effective in preventing groundwater contamination. We recommend that either a double-liner be considered, or additional information be provided regarding the seepage collection system.

5. We recommend revising the Table M-1 to correctly identify that the discharge of bilge water is not under the jurisdiction of the State of Alaska (pg. M-4) and acknowledge that the EPA Vessel General Permit is currently the mechanism by which treated bilge water discharges are regulated. We also note that in the next few years, this authority will transfer to the US Coast Guard (under the Vessel Incidental Discharge Act of 2018).
6. We recommend that additional air quality mitigation measures be added to Table M-1.
 - Regarding use of dust palliatives to reduce fugitive dust, we recommend including a commitment to implement non-toxic palliatives/dust BMPs;
 - As noted in our comments on air quality, the proposed port facility has very high NOx emissions. We therefore recommend considering using access to natural gas to generate shore power to provide to the vessels while they are in port, rather than having the vessels idle, which would significantly reduce NOx at that location; and,
 - We recommend use of the highest Tiered vehicles available for all mobile sources, to reduce engine emissions.
7. Additional mitigation is suggested in several areas of the DEIS that is not identified in Table M-1. We recommend that this additional mitigation be included in Table M-1, including the following:
 - Appendix K4.15 (Geohazards) identifies concerns related to the possibility of uneven deposition of tailings around the perimeter of the bulk TSF that could lead to smaller tailings beaches and added seepage pressure on the embankments. Deposition of tailings on ice in the winter is mentioned as a possible method to mitigate this effect (Pg. K4.15-9). We recommend that this mitigation be added to Table M-1.
 - An additional concern identified in Appendix K4.15 was the possibility that weak foundation conditions (such as a buried glacial clay layer) could be undetected by geotechnical investigations which could result in a very low to low probability of global instability. The DEIS notes that as a result PLP proposed a design change to remove overburden to competent bedrock (pg. K4.15-20). However, that design change is not included in the Project Description. Therefore, we recommend that this be included in Table M-1.
 - Chapter 4.18 (water quality) and AECOM 2018i noted concern that salt and selenium could build up over time that could lead to increased TDS and selenium concentrations that could not successfully be treated. It was concluded that further investigation and mitigation measures or improved management processes are recommended to ensure that WTP performance will meet treatment goals. We recommend that additional mitigation or treatment system adjustments be identified in Table M-1 with enough detail and added analysis to demonstrate that it would improve WTP performance to meet water treatment goals.

Additional Mitigation: Our DEIS comments have noted significant deficiencies with the level of detail associated with key aspects of the project and the environmental analysis that effects the ability to assess the level of environmental impacts. After these deficiencies are corrected and the impact assessment revised, we may recommend additional mitigation measures be included.

AVAILABILITY AND USE OF DATA

As discussed above, data gaps related to important but conceptually developed project components are a key issue for the EIS. Our recommendations regarding data gaps as well as additional recommendations regarding data use and information disclosure are provided below.

Data Gap Analysis

Our comments regarding the specific data gaps identified in Section 3.1 are as follows:

Reclamation and Closure Plan: The DEIS identifies lack of a detailed reclamation plan as a data gap since “a detailed reclamation plan is potentially essential to a reasoned choice among the alternatives.” We agree and, based on our comments above (see “Description of the Proposed Project”), a reasonably detailed reclamation and closure plan is important in order to determine reasonably foreseeable significant adverse impacts during the reclamation and closure phase of the project.

Subsistence: The DEIS identified lack of current (post-2008) subsistence data as potentially essential to making a reasoned choice among the alternatives. The DEIS states that it is common that current site-specific information on subsistence use are not available during NEPA compliance, although no references are cited for this statement. There are examples where current traditional knowledge and/or subsistence data was gathered for mining EISs where subsistence was determined to be a significant issue (e.g., Red Dog Aqqaluk SEIS, Donlin Gold EIS). We recommend that the Corps consider acquiring more recent data given the importance of the subsistence resources or further explain why the current analysis is sufficient.

Other Data Gaps: The DEIS states there are only 4 data gaps based on data gap analysis; however, as discussed in our comments on other sections of the DEIS, other data and information gaps exist and the extent of data gaps is underestimated. Some of the other data gaps are mentioned throughout the DEIS. We recommend a more complete accounting of relevant data gaps in the DEIS and a discussion regarding how the gaps impact the accuracy of the EIS conclusions (e.g., especially along the transportation corridor and the ferry and port sites). Examples of where other data gaps are mentioned in the DEIS or are otherwise apparent include (see our comments on Chapter 2 and Chapter 4 sections for details) – note these are just examples as more data gaps are apparent:

- Lack of a detailed waste management plan that would include criteria and specific details regarding how metal-leaching vs. non-metal leaching wastes will be separated;
- Lack of a seepage collection and monitoring/pumpback well system design for the TSFs and water management ponds;
- Lack of compensatory mitigation projects;
- No monitoring or adaptive management plans, beyond general statements and several examples that monitoring and adaptive management would occur;
- Embankment designs lack detail to support seismic stability analysis and seismic stability analysis was not conducted on some of the embankments;
- “[N]o existing estimate of recreational use at the mine site...” (pg. 3.5-14). This is also true at the port site and along the transportation corridor;
- No stream gages along mine access road or spur road (Fig 3.16-4);

- “Streamflow information for the other streams crossed by the road is not available at the time of this writing... Drainages in the analysis area south of Iliamna Lake have not been the focus of any known hydrologic studies to date.” (pg. 3.16-26);
- “To date, limited geochemical testing has been performed on the representative concentrate because possible designs for metallurgical processes are still at an investigative stage.” (pg. 3.18-3);
- Surface water quality along port access road;
- Groundwater quality along northern access road (1 sample collected in Pedro Bay); and,
- “No substrate data is available for streams along the southern portion of the mine access road.” (pg. 3.18-21).
- There is incomplete discussion of the importance of headwater streams and wetlands, despite the fact that these are the habitats that will be affected by the mine site. There is an extensive body of evidence supporting the idea that headwaters are critical aquatic habitats (e.g., Schlosser 1995; Wipfli 2007).

Additional Comments on Data Quality and Use

Data quality is generally discussed in the DEIS, which would be strengthened by explaining whether all the data were used, whether any were determined to be anomalous and excluded, or how decisions were made for what data were used. For example, in some cases, one-half of the detection limit was used for data that were below the detection limit, but the DEIS does not acknowledge that the number of samples having measurements below detection will influence the meaning of the mean and may indicate an analyte is present at a value above detection when most of the time it is not. We recommend that the EIS provide discussion of data quality assurance for all types of data (e.g., background surface water quality, sediment quality, and geochemical testing data) including:

- 1) Present all limitations on each type of data;
- 2) Provide the frequency of detection in the tables to assess whether the analyte is commonly present or commonly absent;
- 3) When presenting sample means, provide a measure of dispersion around the mean (i.e., range, standard error, standard deviations, etc.) as well as the sample size associated with generating the mean. This is important for understanding the variability and robustness of the dataset; and,
- 4) Include in discussions of the data how data limitations influence uses of the means determined.

In addition, we recommend that the EIS clearly indicate whether results being discussed in various sections are based on total or filtered (dissolved) samples. Finally, when using qualifiers (e.g., “Relatively high”, “significantly higher”, “high”, “higher”, “slightly higher”, “slightly lower”, “small”), we recommend that the EIS provide the values being compared to justify the statements.

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**UNITED STATES ENVIRONMENTAL PROTECTION
AGENCY
REGION 10**

1200 Sixth Avenue, Suite 155
Seattle, WA 98101-3123

OFFICE OF REGIONAL
ADMINISTRATOR

JUL - 1 2019

Colonel Phillip Borders
Alaska District Engineer
U.S. Army Corps of Engineers
P.O. Box 6898
JBER, Alaska 99506-0898

Dear Colonel Borders:

The U.S. Environmental Protection Agency has reviewed the U.S. Army Corps of Engineers (Corps) Public Notice POA-2017-00271 for a Clean Water Act (CWA) Section 404 permit, dated March 1, 2019 (PN). The PN describes PLP's proposal to produce commodities, including copper, gold, and molybdenum from the Pebble deposit located near Iliamna Lake approximately 200 miles southwest of Anchorage, Alaska. The PN and concurrently released Draft Environmental Impact Statement (DEIS) indicate that the discharge of fill material associated with the proposed project may result in substantial impacts to waters of the United States within the Bristol Bay and Cook Inlet watersheds, including:

- The permanent loss of approximately 3,560 acres of jurisdictional wetlands and other aquatic resources, including 3,443 acres of wetlands, 55 acres of lakes and ponds, 81 miles (50 acres) of stream channels, and 11 acres of marine waters.
- Temporary impacts to approximately 510 acres of jurisdictional wetlands and other aquatic resources from the discharge of fill material for construction-related purposes, including 48 acres of wetlands, 76 acres of lakes and ponds, 4.7 miles (3 acres) of stream channels, and 382 acres of marine waters.
- Degradation of 2,807 acres of jurisdictional wetlands and other aquatic resources including:
 - 1,896 acres of wetlands and other waters that would be indirectly impacted by fugitive dust from the mine site and transportation corridor, including 1,555 acres of wetlands and 340 acres of other waters.
 - 449 acres of wetlands and other waters that would be indirectly impacted by dewatering at the mine site, including 341 acres of wetlands and 108 acres of other waters.
 - 462 acres of wetlands and other waters that would be indirectly impacted by fragmentation, including 449 acres of wetlands and 13 acres of other waters.

Project Description included in the Draft Environmental Impact Statement

The multiple components of the proposed copper-gold-molybdenum mine would have an initial surface disturbance footprint of approximately 8,086 acres. The open pit mined during the initial twenty years of operation would be approximately 609 acres with a maximum depth of 1,970 feet. The mine pit would convert to a pit lake after mining is complete. Discharges from the pit lake would require water treatment in perpetuity. Two tailings storage facilities (TSFs) are proposed, one for the potentially acid-generating (PAG) and metal-leaching (ML) tailings and waste rock, and a second for the non-PAG bulk tailings. The PAG/ML TSF would be approximately 1,071 acres in size and contained by three associated dams with a maximum height of 425 feet. The bulk TSF would be approximately 2,796 acres in size with two dams having a maximum height of 545 feet.

Facilities at the mine site would also include a 955-acre water management pond, 873 acres of quarries to supply rock and gravel for construction, a 270-megawatt generating facility to supply power for ore processing, camp housing, two water treatment plants, two sewage treatment plants, a landfill, and an incinerator.

The proposed access infrastructure includes a 188-mile long 12-inch diameter natural gas pipeline originating near Anchor Point on the Kenai Peninsula and crossing both Cook Inlet and Iliamna Lake; a port facility in Kamishak Bay near Amakdedori Creek; ferry terminals on the north and south shores of Iliamna Lake for use by an ice-breaking ferry; and road and pipeline corridors between the port and the Lake (37 miles) and from the Lake to the mine site (29 miles). There would also be a road connection to the existing road network and airport at the Village of Iliamna.

Overview of Comments and Recommendations

This letter responds to the CWA Section 404 PN and addresses the adequacy of the PN, DEIS, and supporting documents for evaluating compliance with the restrictions on discharge contained in the CWA Section 404(b)(1) Guidelines (Guidelines). Detailed comments and recommendations are contained in the enclosure.

The EPA is separately providing comments on the DEIS pursuant to our responsibilities under the National Environmental Policy Act (NEPA) and Section 309 of the Clean Air Act. The EPA has participated as a cooperating agency in the NEPA process to develop the EIS for the proposed mine. We provided scoping comments and comments on several sections of the Preliminary DEIS.

The Guidelines are the substantive environmental criteria for the evaluation of proposed discharges of dredged or fill material, which cannot be permitted unless compliance with the Guidelines has been demonstrated. The Guidelines recognize that the level of required analysis and documentation are scaled to reflect the significance and complexity of the proposed discharge activity. The proposed project would be more than five times the worldwide median size for a deposit of this type on an undeveloped landscape with dense and highly interconnected

aquatic resources. In addition, the values of the potentially affected aquatic resources in this case are among the highest evaluated under CWA Section 404 and support important commercial, sport, and subsistence fisheries for salmon and other fishes. Because the nature and extent of the proposed discharges reflect some of the most highly significant and complex discharge activities with the potential for serious adverse impact contemplated by the Guidelines, the level of information, evaluation, and documentation necessary for this project to demonstrate compliance with the Guidelines is significant.

Our review finds that the PN, DEIS, and supporting documents do not contain sufficient information to support a reasonable judgment that the proposed discharges will comply with the Guidelines. The EPA's specific recommendations about how the Corps' record can support a Guidelines analysis are described in the enclosure. The final EIS should include sufficient information, evaluation, and documentation to address the requirements of the Guidelines.

Conclusion

The EPA has concerns regarding the extent and magnitude of the substantial proposed impacts to streams, wetlands, and other aquatic resources that may result, particularly in light of the important role these resources play in supporting the region's valuable fishery resources. Pursuant to the field level procedures outlined in Part IV, paragraph 3(a) of the 1992 Memorandum of Agreement (MOA) between EPA and the Department of the Army regarding CWA Section 404(q), Region 10 finds that this project as described in the PN may have substantial and unacceptable adverse impacts on fisheries resources in the project area watersheds, which are aquatic resources of national importance.

The EPA recognizes that the standard set out in the MOA is similar to the Section 404(c) standard. However, Region 10's decision to utilize the coordination procedures under the MOA is not a decision regarding its Section 404(c) action and should not be interpreted as such. The EPA has not made a decision regarding whether to withdraw the 2014 Proposed Determination or leave it in place. Region 10 is coordinating under the MOA at this time to ensure that the EPA can continue to work with the Corps to address concerns raised during the permitting process. The EPA looks forward to continuing to work closely with the Corps on further development of the EIS and other supporting analyses related to this PN.

I appreciate the attention that you and your staff have provided to this project. Should you have any questions about this letter, please do not hesitate to contact me or have your staff contact Matthew LaCroix in our Alaska Operations Office at (907) 271-1480, or by email at lacroix.matthew@epa.gov.

Sincerely,



Chris Hladick
Regional Administrator

Enclosure

Enclosure

The following are detailed comments submitted by the U.S. Environmental Protection Agency (EPA) in response to the U.S. Army Corps of Engineers (Corps) Public Notice POA-2017-00271, the Pebble Limited Partnership (PLP).

Outline of Enclosure

- I. Project Description included in the Draft Environmental Impact Statement
- II. Aquatic Resources of the Bristol Bay Watershed and Sub-watersheds
- III. Aquatic Resource Impacts Documented in the Draft Environmental Impact Statement
- IV. Clean Water Act Section 404(b)(1) Guidelines Analysis
 - A. Four Primary Restrictions on Discharges in the Guidelines
 - B. Level of Information, Evaluation, and Documentation for Guidelines' Determinations
 - C. Factual Determinations in the Guidelines
- V. Evaluating the Potential Effects of the Discharges of Dredged or Fill Material
 - A. Defining Geographic Extent of Potentially Affected Aquatic Resources
 - B. Assessing Impacts to Functions Provided by Potentially Affected Aquatic Resources
 - C. Fish Values
 1. Fish Habitat
 2. Fish
 3. Water Quality Relevant to Fish
 4. Commercial and Recreational Fisheries
 - D. Groundwater and Surface Water Hydrology
 - E. Water Quality
 - F. Wildlife/Sanctuaries and Refuges
- VI. Determination of Least Environmentally Damaging Practicable Alternative (40 C.F.R. § 230.10(a))
- VII. Water Quality (40 C.F.R. § 230.10(b))
- VIII. Significant Degradation (40 C.F.R. § 230.10(c))
- IX. Minimization/Compensatory Mitigation (40 C.F.R. § 230.10(d))
- X. Conclusions

I. Project Description included in the Draft Environmental Impact Statement

PLP proposes to produce commodities -- including copper, gold, and molybdenum -- from the Pebble deposit located near Iliamna Lake in the Bristol Bay watershed in southwest Alaska. The proposed mine site is approximately 17 miles from each of the communities of Iliamna, Newhalen, and Nondalton.

The proposed copper-gold-molybdenum mine includes numerous components and would have an initial surface disturbance footprint of approximately 8,086 acres. The open pit mined during the initial twenty years of operation would be approximately 609 acres with a maximum depth of

1,970 feet. The mine pit would convert to a pit lake after mining is complete requiring perpetual water treatment. Two tailings storage facilities (TSFs) are proposed, one for the potentially acid-generating (PAG) and metal-leaching (ML) tailings and waste rock, and a second for the non-PAG bulk tailings. The PAG/ML TSF would be approximately 1,071 acres in size and contained by three associated dams with a maximum height of 425 feet. The bulk TSF would be approximately 2,796 acres in size with two dams having a maximum height of 545 feet. Facilities at the mine site would also include a 955-acre water management pond, 873 acres of quarries to supply rock and gravel for construction, a 270-megawatt generating facility to supply power for ore processing, camp housing, two water treatment plants, two sewage treatment plants, a landfill, and an incinerator.

The proposed access infrastructure includes: a 188-mile long 12-inch diameter natural gas pipeline originating near Anchor Point on the Kenai Peninsula that crosses both Cook Inlet and Iliamna Lake; a port facility in Kamishak Bay near Amakdedori Creek; ferry terminals on the north and south shores of Iliamna Lake for use by an ice-breaking ferry; road and pipeline corridors between the port and the Lake (37 miles) and from the Lake to the mine site (29 miles). There would also be a road connection to the existing road network and airport at the Village of Iliamna.

II. Aquatic Resources of the Bristol Bay Watershed and Sub-watersheds

The Pebble deposit lies within the Nushagak and Kvichak watersheds, which together account for more than half of the land area in the Bristol Bay watershed. These large watersheds include a diverse array of streams, wetlands, lakes, and ponds that are relatively free from human-induced alteration and provide extensive and heterogeneous habitats for fishery resources. The Kvichak River watershed is the world's largest producer of sockeye salmon, while Chinook salmon returns to the Nushagak River are among the world's largest.¹ The headwaters of the Nushagak River include the South Fork Koktuli River (SFK) and North Fork Koktuli River (NFK), which flow west from the Pebble deposit. Much of the proposed mine infrastructure would be placed within the NFK watershed and most of the losses of streams, wetlands, lakes, and ponds from the proposed project would occur in the NFK and SFK watersheds. The source of the Kvichak River is Iliamna Lake. Tributaries to Iliamna Lake include Upper Talarik Creek (UTC), which flows south from the Pebble deposit and then southwest into Iliamna Lake. Direct impacts to aquatic resources in the UTC watershed would expand dramatically as mining is expanded at the Pebble deposit. The wetlands, streams, and other aquatic resources in the SFK, NFK, and UTC watersheds are productive and support rich species assemblages. Baseline sampling² indicates that most stream habitat is occupied. These aquatic resources also supply water, invertebrates, organic matter, and other resources to larger downstream waters.

The Bristol Bay watershed supports an abundance of genetically diverse wild Pacific salmon populations unrivaled in North America. These salmon populations have significant economic, nutritional, cultural, and recreational value, both within and beyond the Bristol Bay region.

¹ http://www.adfg.alaska.gov/index.cfm?adfg=chinookinitiative_nushagak.main.

² This includes sampling conducted by PLP, ADF&G, and Woody and O'Neil 2010. All survey results are available via ADF&G's web-based mapper at: <https://www.adfg.alaska.gov/sf/SARR/AWC/index.cfm?ADFG=main.interactive>.

The streams, wetlands, and other aquatic resources within the Bristol Bay watershed support important commercial and sport fisheries for salmon and other fishes, as well as a more than 4,000-year-old subsistence-based way of life for Alaska Natives. The aquatic resources within the watershed produce the world's largest wild sockeye salmon runs, comprising approximately 51 percent of world commercial harvest³ (The Kvichak and Nushagak Rivers together produce over 40 percent of the total Bristol Bay sockeye salmon.⁴). Bristol Bay's Chinook salmon runs are frequently at or near the world's largest, and the region also supports significant coho, chum, and pink salmon populations. These salmon populations help to maintain the productivity of the entire ecosystem, including numerous other fish and wildlife species. For example, Iliamna Lake supports the only freshwater seal population in the United States, which depends on the fishery resources of the watershed.

The Bristol Bay watershed supports the most valuable wild salmon fishery in the world and three of the top 10 United States commercial fishing ports. The value of the over 2,800 Bristol Bay fishing permits account for 41 percent of total salmon permit value in Alaska. Average data from 2013-2017 indicate that the Bristol Bay salmon industry directly employs approximately 14,800 people, most of whom work in the industry on a seasonal basis. Including multiplier effects, the fishery creates an estimated \$1.2 billion in economic output and \$658 million in labor income per year, resulting in 12,537 average jobs.⁵

Preliminary data released by the Alaska Department of Fish and Game (ADF&G)⁶ indicate that the 2018 inshore Bristol Bay sockeye salmon run of 62.3 million fish was the largest on record dating back to 1893 and was 69 percent above the 36.9 million average run for the latest 20-year period. It was the fourth consecutive year that inshore sockeye salmon runs exceeded 50 million fish.

The 2018 Bristol Bay preliminary ex-vessel value of \$281 million of all salmon species ranks first in the history of the fishery and was 242 percent above the 20-year average of \$116 million. It was 39 percent higher than the \$202 million ex-vessel value of the 1990 harvest, which ranks second. The 43.5 million harvest of all species was the second largest in the history of the fishery, after the 45.4 million fish harvest in 1995.⁷

Subsistence fisheries are a critical resource for residents of the Bristol Bay region. Communities are not connected to the road system and commercial food prices reflect the costs of shipping by barge or airplane. ADF&G data indicate that 1,128 subsistence permits were issued to residents in the Bristol Bay region in 2017. Subsistence harvesters collected an estimated 116,537 salmon.⁸ Based on average weights of salmon caught in the commercial fisheries, this volume of fish was equal to approximately 743,700 pounds of salmon, or 99 pounds per capita for regional residents.

³ Pinsky et al. 2009; Ruggerone et al. 2010.

⁴ ADF&G 2011.

⁵ Wink Research & Consulting, 2018.

⁶ ADF&G Press Release 9/18/2018.

⁷ *Id.*

⁸ ADF&G, 2017 Annual Management Report.

Sport fisheries for Bristol Bay salmon create additional economic benefits for the region. In 2016, a total of 102 sport fish guiding businesses, employing 563 guides, completed 16,041 sportfishing trips for salmon in the Bristol Bay area. Sportfishing clients caught a total of 85,353 salmon (retaining 28,366). Nonresidents accounted for 90 percent of the days fished, meaning that most of the money generated by guided sportfishing for Bristol Bay salmon came from outside Alaska.⁹

In addition, ADF&G estimates that approximately 43,800 salmon were harvested and retained by unguided anglers in the Bristol Bay region during 2016. Most anglers target Chinook and coho salmon.

III. Aquatic Resource Impacts Documented in the Draft Environmental Impact Statement

EPA has reviewed Corps Public Notice POA-2017-00271, dated March 1, 2019 (PN), which identifies discharges of dredged or fill material associated with mining the Pebble deposit into streams, wetlands, lakes, ponds, and marine waters. This Clean Water Act (CWA) Section 404 permitting action triggered preparation of the draft Environmental Impact Statement (DEIS), which was released concurrently with the PN.

The PN and concurrently released Draft Environmental Impact Statement (DEIS) indicate that the discharge of fill material associated with the proposed project may result in substantial impacts to waters of the United States within the Bristol Bay and Cook Inlet watersheds, including:

- The permanent loss of approximately 3,560 acres of jurisdictional wetlands and other aquatic resources, including 3,443 acres of wetlands, 55 acres of lakes and ponds, 81 miles (50 acres) of stream channels, and 11 acres of marine waters.
- Temporary impacts to approximately 510 acres of jurisdictional wetlands and other aquatic resources from the discharge of fill material for construction-related purposes, including 48 acres of wetlands, 76 acres of lakes and ponds, 4.7 miles (3 acres) of stream channels, and 382 acres of marine waters.
- Degradation of 2,807 acres of jurisdictional wetlands and other aquatic resources including:
 - 1,896 acres of wetlands and other waters that would be indirectly impacted by fugitive dust from the mine site and transportation corridor, including 1,555 acres of wetlands and 340 acres of other waters.
 - 449 acres of wetlands and other waters that would be indirectly impacted by dewatering at the mine site, including 341 acres of wetlands, and 108 acres of other waters.
 - 462 acres of wetlands and other waters that would be indirectly impacted by fragmentation, including 449 acres of wetlands and 13 acres of other waters.

⁹ Wink Research & Consulting, 2018.

Much of the proposed mine infrastructure would be placed within the NFK watershed and most of the aquatic resource losses would occur here. The DEIS¹⁰ documents that the proposed project would directly impact:

- 17 percent of all stream channel length in the 171,000-acre Headwaters Koktuli River Hydrologic Unit Code (HUC);
- 12 percent of all shrub wetlands in the HUC;
- 7 percent of all herbaceous wetlands in the HUC;
- 6 percent of all bogs and fens in the HUC;
- 5 percent of all riverine wetlands in the HUC;
- 4 percent of all rivers and streams in the HUC; and
- 1 percent of all lakes and ponds in the HUC.

Though few impacts to fish are specifically quantified, the draft Essential Fish Habitat (EFH) Assessment discloses a 9 percent loss of salmon spawning habitat under modeled “dry year” conditions.¹¹ The proposed bulk TSF and seepage collection system alone would fill multiple NFK tributaries, eliminating approximately ten miles of streams and 7.5 miles of anadromous habitat. Nearly the entire length of Tributary 1.190,¹² approximately six miles, would be filled. Tributary 1.190 is used by coho salmon for spawning and rearing, and by Chinook salmon for rearing. This tributary also supports rainbow trout, Dolly Varden, Arctic grayling, and sculpin. Two specified tributaries to 1.190¹³ are used by coho salmon for rearing and would also be eliminated by the proposed bulk TSF.

The proposed NFK treated water discharge point would be to the remaining short reach of tributary 5215 at the confluence with tributary 4083. This discharge point is immediately upstream of a stream reach specified by ADF&G as important for Chinook salmon spawning.

The main water management pond would eliminate the upper reaches of the specified NFK tributaries 4083-5217 (used by coho salmon), 5215-6001, and 5215-6001-7012 (used by Chinook and coho salmon). The upper 2.5 miles of this latter tributary would be eliminated by mine infrastructure including the pyritic tailings facility and water management pond. In total, approximately twenty miles of fish-bearing streams would be blocked or filled by mine components in the NFK drainage, including approximately 8.2 miles of anadromous waters.¹⁴

The second phase of mine development would require expansion of the pit, power plant, and mill, as well as the construction of additional bulk and pyritic TSFs and two waste rock facilities. The DEIS¹⁵ indicates that future expansion would “potentially affect” an additional 12,445 acres of aquatic resources at the mine site but does not characterize these resources. Section 4-22 also does not identify whether this figure includes functional degradation from secondary effects. The DEIS identifies that an additional 35 miles of streams documented to support salmon will be

¹⁰ DEIS 4.22-11.

¹¹ Draft EFH Assessment Table 5-3.

¹² Anadromous Waters Catalog number 325-30-10100-2202-3080-4083-5215.

¹³ Anadromous Waters Catalog numbers 5215-6006 and 5215-6007.

¹⁴ DEIS 4.24-3.

¹⁵ DEIS Section 4-22.

eliminated due to mine expansion but does not quantify the total miles of stream that would be lost.

The acreage of wetlands and miles of stream affected by aquifer drawdown will increase substantially under the expanded development scenario. Mine expansion would require “roughly a five-fold increase in the size of the pit capture zone straddling the SFK and UTC drainages. There would be a similar increase in the amount of groundwater needing to be dewatered and treated during operations, and the amount pumped and treated throughout post-closure to maintain hydraulic containment of the pit lake.”¹⁶

IV. Clean Water Act Section 404(b)(1) Guidelines Analysis

The CWA Section 404(b)(1) Guidelines (Guidelines) are the substantive environmental criteria used to evaluate the proposed discharges of dredged or fill material.¹⁷ The Guidelines require the Corps to make written factual determinations of the potential short-term or long-term effects of a proposed discharge on the physical, chemical, and biological components of the aquatic environment and “[s]uch factual determinations shall be used in § 230.12 in making findings of compliance or non-compliance with the restrictions in § 230.10.”¹⁸

A. Four Primary Restrictions on Discharges in the Guidelines

The Guidelines contain four primary restrictions on discharge that must be satisfied:

1. Section 230.10(a): “no discharge of dredged or fill material shall be permitted if there is a practicable alternative to the proposed discharge which would have less adverse impact on the aquatic ecosystem, so long as the alternative does not have other significant adverse environmental consequences.”;
2. Section 230.10(b): “[n]o discharge of dredged or fill material shall be permitted if it:
(1) Causes or contributes, after consideration of disposal site dilution and dispersion, to violations of any applicable State water quality standard; (2) Violates any applicable toxic effluent standard or prohibition under section 307 of the [CWA] Act;
(3) Jeopardizes the continued existence of species listed as endangered or threatened under the Endangered Species Act...or results in likelihood of the destruction or adverse modification of...critical habitat...; (4) Violates any requirement imposed by the Secretary of Commerce to protect any marine sanctuary designated under title III of the Marine Protection, Research, and Sanctuaries Act.”;
3. Section 230.10(c): “no discharge of dredged or fill material shall be permitted which will cause or contribute to significant degradation of the waters of the United States. Findings of significant degradation related to the proposed discharge shall be based upon appropriate factual determinations, evaluations, and tests required by subparts B

¹⁶ DEIS Executive Summary 3.2.2.2.

¹⁷ 40 C.F.R. § 230.10; 40 C.F.R. § 230.12.

¹⁸ 40 C.F.R. §230.11.

and G, after consideration of subparts C through F, with special emphasis on the persistence and permanence of the effects outlined in those subparts.”; and

4. Section 230.10(d): “no discharge of dredged or fill material shall be permitted unless appropriate and practicable steps have been taken which will minimize potential adverse impacts of the discharge on the aquatic ecosystem.”¹⁹

Each of these restrictions is discussed separately in further detail below in sections VI-IX.

B. Level of Information, Evaluation, and Documentation for Guidelines’ Determinations

The Guidelines recognize that the level of required information, evaluation, and documentation are scaled to reflect the significance and complexity of the proposed discharge activity. The Guidelines provide that “the compliance evaluation procedures will vary to reflect the seriousness of the potential for adverse impacts on the aquatic ecosystems posed by specific dredged or fill material discharge activities.”²⁰ In accordance with 40 C.F.R. § 230.6, the lead agency, here the Corps, “must recognize the different levels of effort that should be associated with varying degrees of impact and require or prepare commensurate documentation.”²¹ The evaluation under the Guidelines “depends on the physical, biological, and chemical nature of the proposed extraction site, the material to be discharged, and the candidate disposal site, including any other important components of the ecosystem being evaluated.”²² For routine cases, a finding of compliance will likely not require extensive testing, evaluation, or analysis.²³

Appropriate documentation of the analysis required is an important aspect of application of the Guidelines.²⁴ Specifically, “the level of documentation should reflect the significance and complexity of the discharge activity.”²⁵ The purpose of the required documentation is to provide “a record of actions taken that can be evaluated for adequacy and accuracy and ensures considerations of all important impacts in the evaluation of proposed dredged or fill material.”²⁶

With respect to the proposed permit for the Pebble Project, the level of information, evaluation, and documentation necessary are significant given the potential permanent losses of aquatic resources, and, as discussed above (Section II), the values of the potentially affected aquatic resources are among the highest evaluated under CWA Section 404.

The nature of the disposal site make this project distinguishable from other comparable projects. The currently proposed Pebble Project would mine approximately 1.3 billion tons of ore;²⁷ at this size, the proposal would be more than five times the worldwide median size for a deposit of this

¹⁹ This includes compensatory mitigation.

²⁰ 40 C.F.R. § 230.10.

²¹ 40 C.F.R. §230.6(b).

²² 40 C.F.R. § 230.6.

²³ 40 C.F.R. §230.6(b).

²⁴ 45 Fed. Reg. 85336, 85434 (December 24, 1980).

²⁵ *Id.*

²⁶ 45 Fed. Reg. 85336, 85434 (December 24, 1980).

²⁷ PLP 2018.

type.²⁸ As it stands now, the proposed project represents a relatively large mine for its type. It also has the potential to expand to one of the, if not the, largest of its type in the world. The project proponent has developed preliminary plans to mine as much as 6.5 billion tons of ore at the Pebble deposit;²⁹ at this size it would be 26 times larger than the worldwide median size for a deposit of this type. The project proponent asserts that total mineral resources at the Pebble deposit are approximately 12 billion tons of ore.³⁰

While other large-scale porphyry copper mines in the United States tend to be located in relatively arid regions (e.g., Bingham Canyon Mine, Utah), the Pebble deposit is situated within a landscape covered by a dense network of streams, wetlands, lakes, and ponds with a complex and highly interconnected surface and subsurface hydrology. This means that construction and operation of such a large-scale open pit mine would result in the permanent loss and degradation of streams, wetlands, and other aquatic resources because they overlay and surround the deposit itself. Development of the mine pit, two TSFs, water management pond, and other infrastructure reflect a highly significant and complex discharge activity. The development would permanently alter the contours of the landscape. In addition, dewatering of the mine pit would alter regional groundwater flow. These changes, coupled with the loss of wetland, lake, and pond acreage and streams, would cause permanent streamflow alternations to the NFK, SFK, and UTC. The consequence would be permanent modification of the hydrology, chemistry, and aquatic habitat of the three streams. These changes and their potential effects on the aquatic ecosystem should also be carefully and thoroughly evaluated.

Further, the area's complex and highly interconnected surface and subsurface hydrology amplifies the risk that acid generating mine waste and other contaminants typically produced by a mine of this type could escape into the aquatic ecosystem during construction and operation as well as into perpetuity as mine wastes continue to be managed, treated, and contained after any mine at the site is closed. These challenges should be evaluated in the context of a region subject to climate extremes as well as seismic risks.

The complexities and potential for a high degree of impact associated with the discharges of dredged and fill material related to construction and operation of a mine at the Pebble deposit are further magnified by the fact that the network of streams, wetlands, lakes, and ponds potentially eliminated or degraded are situated at the headwaters of the Nushagak River which, as discussed above, often has the world's larger returns of Chinook salmon, and the headwaters of the Kvichak River whose watershed, as discussed above, is the world's larger producer of sockeye salmon.

The productivity of the Bristol Bay fisheries is tied to a diverse portfolio of aquatic habitats. The complex habitat mosaic supports multiple locally adapted fish populations and plays a critical role in protecting the genetic diversity of Bristol Bay's salmon populations.³¹ Losing and

²⁸ According to Singer et al. (2008), the worldwide median size porphyry copper deposit is approximately 0.25 billion tons.

²⁹ Ghaffari et al. (2011) call the 6.5 billion-ton mine scenario the "Resource Case," which is based on 78 years of open pit production and seeks to assess the long-term value of the project in current dollars.

³⁰ Ghaffari et al. 2011.

³¹ Griffiths et al. 2014; Schindler et al. 2010; Brennan et al. 2019.

degrading these fish habitats and populations would erode the genetic diversity that is crucial to the stability of the overall Bristol Bay salmon fisheries. Eliminating and degrading the headwater habitats within the NFK, SFK, and UTC watersheds could reduce the diversity, productivity, and stability of the remaining habitats, and the species they support. As a result, these effects and their consequences for the aquatic ecosystem should also be carefully and thoroughly evaluated and documented. Recent Alaska-specific Section 404 guidance issued by EPA and the Department of the Army underscores this point, noting that when “anadromous fish habitat may be harmed [as is contemplated with the Pebble Project], it is likely that a more detailed Guidelines analysis will be necessary.”³²

Given all of these factors, the extent and magnitude of the proposed impacts to streams, wetlands, and other aquatic resources should be carefully and thoroughly evaluated, particularly in light of the important role these resources play in supporting the region’s fishery resources. The degree to which these aquatic resource impacts would reverberate downstream, potentially depriving downstream habitats of nutrients, groundwater inputs, and other subsidies should also be carefully and thoroughly evaluated. Similarly, the degree to which water withdrawal and capture, storage, treatment, and discharge would alter the hydrographs and chemical, physical, and biological characteristics of downstream aquatic resources should be carefully and thoroughly evaluated.

As discussed in this letter, the nature and extent of the proposed discharges acknowledged in the DEIS reflect some of the most highly significant and complex discharge activities with the potential for serious adverse impact contemplated by the Guidelines. For these reasons, the level of information, evaluation, and documentation necessary for this project to demonstrate compliance with the Guidelines is significant.³³

C. Factual Determinations in the Guidelines

To make the requisite finding of compliance or non-compliance with the four primary restrictions on discharge contained in 40 C.F.R. § 230.10 pursuant to 40 C.F.R. § 230.12, the Corps “shall include the factual determinations required by [40 C.F.R.] § 230.11.”³⁴ Pursuant to 40 C.F.R. § 230.11, the Corps “shall determine in writing the potential short-term or long-term effects of a proposed discharge of dredged or fill material on the physical, chemical, and biological components of the aquatic environment.” 40 C.F.R. § 230.11 contains a list of factual determinations that the Corps “shall include.” The following factual determinations are particularly relevant in this case and are referenced in our comments and recommendations below.

- **Section 230.11(b) *Water circulation, fluctuation, and salinity determinations.***
Determine the nature and degree of effect that the proposed discharge will have individually and cumulatively on water, current patterns, circulation including downstream flows, and normal water fluctuation. Consideration shall be given to water

³² Memorandum of Agreement between the Department of the Army and the Environmental Protection Agency concerning the Mitigation Sequence for Wetlands in Alaska under Section 404 of the Clean Water Act, dated June 15, 2018 (2018 Army/EPA Alaska Mitigation MOA).

³³ 40 C.F.R. § 230.6(b).

³⁴ 40 C.F.R. § 230.12(b); see also 40 C.F.R. § 230.11.

chemistry, salinity, clarity, color, odor, taste, dissolved gas levels, temperature, nutrients, and eutrophication plus other appropriate characteristics. Consideration shall also be given to the potential diversion or obstruction of flow, alterations of bottom contours, or other significant changes in the hydrologic regime. Additional consideration of the possible loss of environmental values (§§ 230.23 through 230.25) and actions to minimize impacts (subpart H), shall be used in making these determinations. Potential significant effects on the current patterns, water circulation, normal water fluctuation and salinity shall be evaluated on the basis of the proposed method, volume, location, and rate of discharge.

- **Section 230.11(d) Contaminant determinations.** Determine the degree to which the material proposed for discharge will introduce, relocate, or increase contaminants. This determination shall consider the material to be discharged, the aquatic environment at the proposed disposal site, and the availability of contaminants.
- **Section 230.11(e) Aquatic ecosystem and organism determinations.** Determine the nature and degree of effect that the proposed discharge will have, both individually and cumulatively, on the structure and function of the aquatic ecosystem and organisms. Consideration shall be given to the effect at the proposed disposal site of potential changes in substrate characteristics and elevation, water or substrate chemistry, nutrients, currents, circulation, fluctuation, and salinity, on the recolonization and existence of indigenous aquatic organisms or communities. Possible loss of environmental values (§ 230.31), and actions to minimize impacts (subpart H) shall be examined. Tests as described in § 230.61 (Evaluation and Testing), may be required to provide information on the effect of the discharge material on communities or populations of organisms expected to be exposed to it.
- **Section 230.11(g) Determination of cumulative effects on the aquatic ecosystem.**
(1) Cumulative impacts are the changes in an aquatic ecosystem that are attributable to the collective effect of a number of individual discharges of dredged or fill material. Although the impact of a particular discharge may constitute a minor change in itself, the cumulative effect of numerous such piecemeal changes can result in a major impairment of the water resources and interfere with the productivity and water quality of existing aquatic ecosystems. (2) Cumulative effects attributable to the discharge of dredged or fill material in waters of the United States should be predicted to the extent reasonable and practical. The permitting authority shall collect information and solicit information from other sources about the cumulative impacts on the aquatic ecosystem. This information shall be documented and considered during the decision-making process concerning the evaluation of individual permit applications, the issuance of a General permit, and monitoring and enforcement of existing permits.
- **Section 230.11(h) Determination of secondary effects³⁵ on the aquatic ecosystem.**
(1) Secondary effects are effects on an aquatic ecosystem that are associated with a discharge of dredged or fill materials, but do not result from the actual placement of the dredged or fill material. Information about secondary effects on aquatic ecosystems shall

³⁵ The National Environmental Policy Act (NEPA) uses the term "indirect" to describe these types of effects.

be considered prior to the time final section 404 action is taken by permitting authorities. (2) Some examples of secondary effects on an aquatic ecosystem are fluctuating water levels in an impoundment and downstream associated with the operation of a dam, septic tank leaching and surface runoff from residential or commercial developments on fill, and leachate and runoff from a sanitary landfill located in waters of the U.S. Activities to be conducted on fast land created by the discharge of dredged or fill material in waters of the United States may have secondary impacts within those waters which should be considered in evaluating the impact of creating those fast lands.

The Corps makes the factual determinations required by 40 C.F.R. § 230.11 “in light of Subparts C through F [of the Guidelines],”³⁶ which identify different categories of potential impacts of the discharge of dredged or fill material:

- Subpart C: Potential Impacts on Physical and Chemical Characteristics of the Aquatic Ecosystem³⁷
 - Substrate³⁸
 - Suspended particulates/turbidity³⁹
 - Water⁴⁰
 - Current patterns and water circulation⁴¹
 - Normal water fluctuations⁴²
 - Salinity gradients⁴³
- Subpart D: Potential Impacts on Biological Characteristics of the Aquatic Ecosystem⁴⁴
 - Threatened and endangered species⁴⁵
 - Fish, crustaceans, mollusks, and other aquatic organisms in the food web⁴⁶
 - Other wildlife⁴⁷
- Subpart E: Potential Impacts on Special Aquatic Sites⁴⁸
 - Sanctuaries and refuges⁴⁹
 - Wetlands⁵⁰
 - Mud flats⁵¹

³⁶ 40 C.F.R. § 230.11.

³⁷ 40 C.F.R. Part 230, Subpart C.

³⁸ 40 C.F.R. § 230.20.

³⁹ 40 C.F.R. § 230.21.

⁴⁰ 40 C.F.R. § 230.22.

⁴¹ 40 C.F.R. § 230.23.

⁴² 40 C.F.R. § 230.24.

⁴³ 40 C.F.R. § 230.25.

⁴⁴ 40 C.F.R. Part 230, Subpart D.

⁴⁵ 40 C.F.R. § 230.30.

⁴⁶ 40 C.F.R. § 230.31.

⁴⁷ 40 C.F.R. § 230.32.

⁴⁸ 40 C.F.R. Part 230, Subpart E.

⁴⁹ 40 C.F.R. § 230.40.

⁵⁰ 40 C.F.R. § 230.41.

⁵¹ 40 C.F.R. § 230.42.

- Vegetated shallows⁵²
- Coral Reefs⁵³
- Riffle and pool complexes⁵⁴
- Subpart F: Potential Effects on Human Use Characteristics⁵⁵
 - Municipal and private water supplies⁵⁶
 - Recreational and commercial fisheries⁵⁷
 - Water-related recreation⁵⁸
 - Aesthetics⁵⁹
 - Parks, national and historical monuments, national seashores, wilderness areas, research sites, and similar preserves⁶⁰

Our review finds that the PN, DEIS, and supporting documents do not contain sufficient information to address the factual determinations required by 40 C.F.R. § 230.11 and to make a reasonable judgment that the proposed discharges will comply with the Guidelines under 40 C.F.R. § 230.12.⁶¹ Sections V-IX provide our comments regarding information and evaluation relevant to each requirement, and our recommendations regarding how the Corps' record can support a Guidelines analysis for this project.⁶² As a general matter, this information and evaluation should be documented in the record.⁶³

V. Evaluating the Potential Effects of the Discharges of Dredged or Fill Material

As discussed above, the nature and extent of the proposed discharges for the Pebble Project acknowledged in the DEIS reflect highly significant and complex discharge activities with the potential for serious adverse impact, and thus require an extensive information and evaluation and a greater level of documentation to demonstrate compliance with the Guidelines.⁶⁴ As discussed in our DEIS comment letter⁶⁵ and below, the current record likely underestimates the extent, magnitude, and permanence of the adverse effects of the Pebble Project's discharges of

⁵² 40 C.F.R. § 230.43.

⁵³ 40 C.F.R. § 230.44.

⁵⁴ 40 C.F.R. § 230.45.

⁵⁵ 40 C.F.R. Part 230, Subpart F.

⁵⁶ 40 C.F.R. § 230.50.

⁵⁷ 40 C.F.R. § 230.51.

⁵⁸ 40 C.F.R. § 230.52.

⁵⁹ 40 C.F.R. § 230.53.

⁶⁰ 40 C.F.R. § 230.54.

⁶¹ 40 C.F.R. § 230.12(a)(3)(iv); *see also* 230.6(c)(explaining that even in the case of short form evaluations "there must still be sufficient information (including consideration of both individual and cumulative impacts) to support the decision of whether to specify the site for disposal of dredged or fill material")

⁶² Determining the potential effects of the discharges on certain categories of resources identified above (coral reefs, municipal water supplies) are not applicable in this case.

⁶³ 40 C.F.R. § 230.6(b); 40 C.F.R. § 230.11; and 40 C.F.R. § 230.12(b).

⁶⁴ 40 C.F.R. § 230.6(b).

⁶⁵ The EPA is separately providing comments on the DEIS pursuant to our responsibilities under NEPA and Section 309 of the Clean Air Act and that letter is relevant here since the EIS is being prepared to support the Corps' Section 404 permit action.

dredged or fill material to streams, wetlands, lakes, ponds, and marine waters, and the fisheries resources they support.

A. Defining Geographic Extent of Potentially Affected Aquatic Resources

According to the Guidelines, the Corps “shall determine in writing the potential short-term or long-term effects of a proposed discharge of dredged or fill material on the physical, chemical, and biological components of the aquatic environment” by making the factual determinations listed in 40 C.F.R. § 230.11. The factual determinations relevant to defining the geographic extent of potentially affected aquatic resources are the water circulation, fluctuation, and salinity determinations (40 C.F.R. § 230.11(b)); contaminant determinations (40 C.F.R. § 230.11(d)); aquatic ecosystem and organism determinations (40 C.F.R. § 230.11(e)); determination of cumulative effects on the aquatic ecosystem (40 C.F.R. § 230.11(g)); and the determination of secondary effects on the aquatic ecosystem (40 C.F.R. § 230.11(h)).

Comment: The DEIS⁶⁶ identifies that all Action Alternatives include areas that lack field-verified wetland mapping. Action Alternatives 2 and 3 include approximately 3,126 acres where existing National Wetland Inventory (NWI) coverage was used to map wetlands instead of field-verified wetland mapping. In addition, Action Alternative 1 includes approximately 1,300 acres where satellite data was used to map wetlands at 100-meter resolution instead of field-verified wetland mapping. Based on EPA’s review of the preliminary jurisdictional determination, NWI coverage and satellite data substantially under-identify wetland area relative to field-verified mapping. In addition, the current disparity in the wetland mapping for different alternatives makes it difficult to compare the wetland impacts between the alternatives. According to the Corps, supplemental wetland mapping to fill these gaps is planned for the 2019 field season and this information would be included in the final EIS.

- Recommendation: Where high resolution information is not currently available, EPA supports the Corps’ decision to conduct additional data collection as greater precision mapping is necessary to accurately identify the impacts in light of the significant and complex nature of the discharge activities in this case.⁶⁷

Comment: The DEIS defines an analysis area that is a fixed width area around the mine site. The DEIS analyzes impacts within this area and does not analyze impacts that are outside it. Section 230.11(h) requires an evaluation of the secondary effects of the discharges of dredged or fill material on the aquatic ecosystem, which include effects of the proposed discharge on the downstream ecosystem. However, the analysis area in the DEIS excludes areas downstream of the mine site where secondary/indirect impacts would occur. In addition, sections 230.11(b), (e), and (g) require an evaluation of the cumulative effects of the discharge of dredged or fill material on the aquatic ecosystem. However, the analysis area in the DEIS does not include the headwaters of UTC where future mining expansion would occur (i.e., the expanded mine scenario evaluated as part of the cumulative effects analysis in the DEIS). The aquatic resources

⁶⁶ DEIS 3.22-4-5.

⁶⁷ 40 C.F.R. § 230.6(b).

in these additional areas were mapped at high resolution and field-verified between 2004 and 2008 during the collection of the environmental baseline data.⁶⁸

- Recommendation: The Corps should use complete and accurate mapping of the extent of potentially affected aquatic resources (including direct, secondary/indirect and cumulative effects), taking advantage of available field-verified aquatic resource mapping information. Alternatively, the Corps should explain why its existing approach is sufficient in light of the significance and complexity of the discharge activities associated with this project.

Comment: Regarding streams, the DEIS relies on the National Hydrography Dataset (NHD) mapping of stream networks to identify the streams that will potentially be impacted by the proposed project. The NHD does not capture all stream courses and may underestimate channel sinuosity, resulting in underestimates of affected stream length.

- Recommendation: The Corps should acknowledge uncertainties in the use of NHD and, to the extent possible, provide an estimate of the additional stream length for reaches that are not captured by the NHD.

Comment: In the DEIS, maps that depict the same areas show different stream channels.⁶⁹ The DEIS does not explain these discrepancies.

- Recommendation: The Corps should 1) use a consistent, thorough, and transparent “baseline” estimate of stream channel extent throughout the analysis area (i.e., for the mine site, transportation corridor, and all other project components); and 2) ensure that these stream channels are visible on all maps.

B. Assessing Impacts to Functions Provided by Potentially Affected Aquatic Resources

According to the Guidelines, the Corps “shall determine in writing the potential short-term or long-term effects of a proposed discharge of dredged or fill material on the physical, chemical, and biological components of the aquatic environment” by making the factual determinations listed in 40 C.F.R. § 230.11. The factual determinations relevant to assessing impacts to functions provided by potentially affected aquatic resources are the water circulation, fluctuation, and salinity determinations (40 C.F.R. § 230.11(b)); contaminant determinations (40 C.F.R. § 230.11(d)); aquatic ecosystem and organism determinations (40 C.F.R. § 230.11(e)); determination of cumulative effects on the aquatic ecosystem (40 C.F.R. § 230.11(g)); and the determination of secondary effects on the aquatic ecosystem (40 C.F.R. § 230.11(h)).

Comment: Section 230.11(e) requires the Corps to determine “the nature and degree of effect that the proposed discharge will have...on the structure and function of the aquatic ecosystem and organisms.” The DEIS identifies the aquatic resources that will potentially be impacted by the proposed project, including lakes, ponds, and streams, using eight condensed classes. Earlier mapping work conducted by the project proponent used 27 enhanced NWI classes of aquatic

⁶⁸ The 2004-2008 mapping effort assessed over 100,000 acres just in the proposed mine area. The environmental baseline mapping was augmented in 2013 and 2017 to map the newly-proposed southern access route and the Amakdedori Creek and Diamond Point port sites.

⁶⁹ For example, Figures 4.16-1, 4.22-2, 4.24-1, relative to NHD coverages for the same area.

resources, including for lakes, ponds, and streams. This kind of enhanced NWI mapping and differentiation among the aquatic resources allows for more accurate assessments of the functions that the potentially affected aquatic resources perform as compared to an approach that uses more general, condensed classes like those used in the DEIS.⁷⁰ The DEIS⁷¹ does not rely on this more detailed aquatic resource data and does not explain why the greater precision information already existing in the GIS database was not used for analysis.

- Recommendation: The Corps should use the greater precision information that was collected to determine the nature and degree of effect that the proposed discharge will have on the structure and function of the aquatic ecosystem and organisms in light of the significance and complexity of the discharge activities associated with this project. Alternatively, the Corps should explain why this more detailed information was not used and fully explain how a condensed approach allows for a complete and accurate assessment of the functions provided by the resources at issue.

Comment: For wetlands, the Corps provides what it calls “a qualitative overview of wetland functions in the EIS analysis area.”⁷² This qualitative overview does not describe the level at which potentially affected wetlands are currently performing each function. This information is important to determine “the nature and degree of effect that the proposed discharge will have...on the structure and function of the aquatic ecosystem and organisms.”⁷³ In this case, not only are the functional assessment methods available but extensive data was collected, particularly at the mine site, to apply the methods.⁷⁴

- Recommendation: The Corps should characterize the level at which potentially affected wetlands are currently performing each function, taking advantage of available site-specific functional assessment data and where necessary supplementing that data.⁷⁵ Alternatively, the Corps should explain why its “qualitative overview” of wetland functions is sufficient to make a factual determination regarding the nature and degree of effect that the proposed discharge will have on the structure and function of the aquatic ecosystem in light of the significance and complexity of the discharge activities associated with this project.

⁷⁰ The additional aquatic resource classes provided by the enhanced NWI reduce within-class variability and make attributing function easier and more meaningful, supporting a more precise and accurate functional assessment.

⁷¹ DEIS 3.22.1.

⁷² DEIS 3.22-7.

⁷³ 40 C.F.R. § 230.11(e).

⁷⁴ During the 2004-2008 mapping/delineation work, wetlands were identified by both enhanced NWI and Hydrogeomorphic (HGM) class, and data was collected to assess wetland function using the Rapid Procedure for Assessing Wetland Functional Capacity, Based on Hydrogeomorphic Classification (Magee, 1998). The performance of eight wetland functions was quantitatively assessed. These are: 1) modification of ground water discharge; 2) modification of ground water recharge; 3) storm and flood water storage; 4) modification of stream flow; 5) modification of water quality; 6) export of detritus; 7) contribution to abundance and diversity of wetland vegetation; and 8) contribution to abundance and diversity of wetland fauna. Two hundred and twenty-eight wetland functional assessments were conducted in the mine area during the 2004 field season alone. The ENWI water regime modifiers and functional data from the earlier mapping were not used for attributing function and evaluating project-related functional loss and is not referenced in the DEIS.

⁷⁵ 40 C.F.R. § 230.6(b).

Comment: Section 230.11(e) requires the Corps to determine “the nature and degree of effect that the proposed discharge will have...on the structure and function of the aquatic ecosystem and organisms.” Scrub and herbaceous wetlands⁷⁶ constitute most of the wetland losses and degradation anticipated by the proposed project.⁷⁷ However, the DEIS does not include the full set of functions provided by these two types of wetlands. Scrub and herbaceous wetlands, depending on their position in the landscape and water regime, provide high-quality habitat for numerous fish species and contribute water, nutrients, organic material, macroinvertebrates, algae, and bacteria downstream to higher-order streams in the watershed. They also moderate groundwater discharge and surface and subsurface flows to other wetlands and support stream base flows, which all act to support fish habitat, including thermally diverse habitats. The scrub and herbaceous wetlands in the NFK, SFK, and UTC watersheds perform these functions due to the high level of hydrologic connection between streams, wetlands, lakes, and ponds in the area. The DEIS does not attribute these functions to scrub and herbaceous wetlands potentially affected by this project. Without this information, the Corps record would underestimate the anticipated aquatic resource functional losses.

- Recommendation: The Corps should characterize the full array of functions currently performed by the potentially affected wetlands. Alternatively, the Corps should explain why its existing description of the potentially affected wetlands is sufficient to make a factual determination regarding the nature and degree of effect that the proposed discharge will have on the structure and function of the aquatic ecosystem and organisms in light of the significance and complexity of the discharge activities associated with this project.

Comment: The DEIS⁷⁸ identifies certain wetlands as “regionally important”⁷⁹ based on a few general characteristics including whether they provide habitat for regionally important fish (without identification of any specific fish species). The DEIS appears to give more weight to losses of aquatic resources that it identifies as “regionally important.” This list of regionally important wetlands appears to omit the wetland types that are estimated to sustain the greatest level of project induced impacts (i.e., scrub and herbaceous wetlands).⁸⁰ In addition, due to the strong hydrologic and ecologic connection, virtually all wetlands in the analysis area appear to meet the Corps’ definition of a “regionally important” wetland because they, either directly or indirectly, support habitat for anadromous and resident fish through flow contribution or moderation, water quality benefit, or organic matter or nutrient contribution. Similarly, the DEIS does not explicitly identify streams as “regionally important,” although all fish-bearing streams (and their tributaries), lakes, and ponds provide habitat support for anadromous and resident fish species. As a result, EPA is concerned that the DEIS’ approach to filter resources based on a determination of whether they are “regionally important” does not account for the full functions of these resources and results in an underestimation of anticipated aquatic resource functional losses.

⁷⁶ Classified using NWI.

⁷⁷ This comment also applies to wetlands classified as slope wetlands under the HGM classification because there is extensive overlap between HGM slope wetlands and the wetlands classified as scrub or herbaceous under NWI.

⁷⁸ DEIS 3.22-8.

⁷⁹ This is not a term relevant to compliance with the Guidelines, and it is unclear how and why the Corps is making this determination.

⁸⁰ As previously noted, many of these wetlands were also classified as slope wetlands using HGM.

- **Recommendation:** EPA recommends that the Corps not use this “regionally important” approach when making determinations of compliance with the Guidelines because the Corps does not explain how the few characteristics it considered support a conclusion that some aquatic resources are regionally important, and others are not. In addition, the Corps does not explain how its criteria as applied results in identifying resources that are more “important” than others. EPA recommends that the Corps conduct a detailed analysis of the functions provided by each of the aquatic resource types as a basis for determining the value of what would be lost due to impacts from the project in light of the significance and complexity of the discharge activities associated with this project.

Comment: No functions are attributed to the specific stream reaches, lakes, or ponds that would be lost or degraded by the project. The DEIS does not identify what functions these specific aquatic resources perform or the degree to which they are currently performing each function. This information is important in determining “the nature and degree of effect that the proposed discharge will have...on the structure and function of the aquatic ecosystem and organisms.”⁸¹

- **Recommendation:** The Corps should characterize the full array of functions currently performed by the potentially affected streams, lakes, and ponds as well as the degree to which they are currently performing each function. Alternatively, the Corps should explain why its current approach is sufficient in light of the significance and complexity of the discharge activities associated with this project. Characterization of fish habitat functions and potential impacts to those functions is discussed in more detail below.

Comment: The DEIS does not characterize how performance of each function would change as a result of the direct, secondary/indirect, and cumulative effects of the discharge of dredged or fill material associated with the project. Instead, the DEIS only includes general statements such as “[e]xcavation, filling, and clearing of wetlands and other waters would alter or remove their capacity to provide hydrologic, biogeochemical, and biological functions.”⁸²

- **Recommendation:** The Corps should characterize the degree to which each of the functions provided by each of the potentially affected aquatic resources will change as a result of the direct, secondary/indirect, and cumulative effects of the discharges (see factual determinations listed above). Alternatively, the Corps should explain why its current general approach is sufficient in light of the significance and complexity of the discharge activities associated with this project.

Comment: Section 230.11(h) requires an evaluation of the secondary/indirect effects of the proposed discharges on the aquatic ecosystem. The scale and location of the direct impacts associated with the Pebble Project’s discharges of dredged or fill material will result in numerous secondary/indirect effects. The DEIS⁸³ identifies seven general types of secondary/indirect effects associated with the project: disruption of wetland hydrology; conversion of wetland type; habitat degradation downstream of the mine site; fragmentation of habitats; water quality and quantity changes; erosion and sedimentation; and fugitive dust. However, the DEIS only

⁸¹ 40 C.F.R. § 230.11(e).

⁸² DEIS 4.22-8.

⁸³ DEIS 4.22-4.

estimates the acreage of wetlands and other waters potentially impacted by three of these types of secondary/indirect effects: habitat fragmentation, fugitive dust, and dewatering.

- **Recommendation:** The Corps should estimate the geographic extent (i.e., area, and for impacts to streams, linear miles also) of all of the types of secondary/indirect effects identified in the DEIS. Of particular importance in this case is the omission of the estimated amount (in linear miles and area) of habitat degradation downstream of the mine site, and its potential implications for fish (discussed in more detail in Section V.C. below). Alternatively, the Corps should explain why its evaluation of the secondary/indirect effects of the proposed discharges on the aquatic ecosystem is sufficient in light of the significance and complexity of the discharge activities associated with this project.

Comment: The attribution of fugitive dust impacts is based on a fixed-width buffer rather than the dust dispersion model developed for the project, which would likely be more accurate than an assumed buffer.

- **Recommendation:** The Corps should explain which method is expected to provide more accurate results for determining the geographic extent of fugitive dust impacts on aquatic resources and utilize that method. The Corps should explain why the method it selected is sufficient to make a factual determination regarding fugitive dust impacts in light of the significance and complexity of the discharge activities associated with this project.

Comment: The DEIS indicates that there is uncertainty regarding the extent of the cone of depression and the predicted changes to groundwater and surface water hydrology.⁸⁴ Thus, the volume of water produced during pit dewatering could be greater than predicted by the groundwater model, and the capture zone and zone of influence could be larger,⁸⁵ meaning that additional aquatic resources could be impacted by the groundwater drawdown.

- **Recommendation:** The Corps should disclose the uncertainty in the estimates of the geographic extent of dewatering impacts and what effect this uncertainty has on the Corps' factual determinations made pursuant to the Guidelines.

Comment: As discussed in more detail in Section VIII, the Guidelines require a factual determination of the severity or significance of the adverse effects of the proposed discharges on the aquatic ecosystem. However, the DEIS does not identify the severity or significance of these effects. For example, the DEIS identifies that roughly 12 percent of the shrub wetlands and 17 percent of all stream channel length⁸⁶ in the 171,000-acre watershed would be directly impacted (i.e., permanently lost), but it does not identify the loss of functions and the severity or significance for those effects (i.e., the relative importance of that loss). Similarly, the DEIS discloses that the proposed natural gas pipeline may impact two weathervane scallop beds, potentially affecting the sustainability of the Kamishak Bay weathervane scallop fishery. The DEIS also discloses that the Pacific herring sac roe fishery in Kamishak Bay could experience direct or cumulative effects. The specific ecological or economic consequences of these impacts are not evaluated.

⁸⁴ DEIS 2.2.2.1-2-16 and 4.17-3.

⁸⁵ DEIS 4.17.3.1.

⁸⁶ DEIS 4.22-11.

- Recommendation: The Corps should identify the “nature and degree of effect” of the proposed discharge on the aquatic ecosystem, including the severity or significance of those effects.

Comment: The Guidelines require the prediction of cumulative effects to the extent reasonable and practical.⁸⁷ The DEIS considers mine expansion as a cumulative effect but does not include reasonable and practical predictions. In addition, the Corps must make a determination under 230.11(e) of the nature and degree that the proposed discharge will have individually and *cumulatively* on the aquatic ecosystem. Potential cumulative effects are mentioned in general terms (e.g., page 4.16-46), with little or no evaluation of these impacts. Page 4.18-36 of the DEIS states, “[t]he potential for cumulative impacts on surface water, groundwater, and sediment would increase substantially,” but the DEIS does not estimate the extent of these impacts. Section 4-22 of the DEIS does not indicate how many stream miles would be lost due to the expanded mine scenario. While this section does note that an “additional 12,445 acres” of aquatic resources would be “potentially affected” at the mine site, the DEIS does not identify whether this estimate includes both direct losses and functional degradation from secondary/indirect effects, what type of aquatic resources and functions would be lost or degraded, or the severity or significance of these impacts.

- Recommendation: The Corps should characterize the geographic extent of cumulative direct and secondary/indirect effects (e.g., acreage of wetlands and other aquatic resources impacted, miles of stream impacted – by impact types), the expected change in functions provided by the affected aquatic resources, and the severity or significance of these changes. Given the extensive available information about the expanded mine development scenario it appears both reasonable and practical for the Corps to include and evaluate this information. Alternatively, the Corps should explain why its current approach is sufficient in light of the significance and complexity of the discharge activities associated with this project.

Comment: The project applicant has proposed mining the deeper Pebble East portion of the deposit,⁸⁸ potentially during a future phase using surface or underground mining techniques.

- Recommendation: The Corps should evaluate the aquatic resource impacts associated with mining this portion of the deposit (Location Alternative 006) as part of the expanded mine scenario or explain why evaluating the impacts of mining the deeper Pebble East portion is not reasonable or practical.

Comment: The DEIS considers impacts to streams, wetlands, lakes, and ponds in terms of Hydrological Unit Code (HUC)-10 watersheds, whereas impacts to fish resources (discussed in more detail below) are considered at a different scale (i.e., the NFK, SFK, and UTC watersheds), even though streams, wetlands, lakes, ponds, and fish are highly inter-related aquatic resources.

- Recommendation: The Corps should evaluate effects to streams, wetlands, lakes, ponds and fish at the same scale (i.e., the NFK, SFK, and UTC watersheds) to make the required factual determinations. Alternatively, the Corps should explain why it is

⁸⁷ 40 C.F.R § 230.11(g)(2).

⁸⁸ Northern Dynasty Minerals, *The Pebble Project: The Future of U.S. Mining and Metals*, January 2017.

appropriate to use different evaluation scales for these inter-related aquatic resources and make factual determinations that satisfy the Guidelines.

C. Fish Values

According to the Guidelines, the Corps “shall determine in writing the potential short-term or long-term effects of a proposed discharge of dredged or fill material on the physical, chemical, and biological components of the aquatic environment” by making the factual determinations listed in 40 C.F.R. § 230.11. The factual determinations relevant to fish values are the water circulation, fluctuation, and salinity determinations (40 C.F.R. § 230.11(b)); contaminant determinations (40 C.F.R. § 230.11(d)); aquatic ecosystem and organism determinations (40 C.F.R. § 230.11(e)); determination of cumulative effects on the aquatic ecosystem (40 C.F.R. § 230.11(g)); and the determination of secondary effects on the aquatic ecosystem (40 C.F.R. § 230.11(h)).

1. Fish Habitat

The abundance and distribution of different fish species are dictated by availability of the diverse, ecologically important habitats—wetlands, streams, lakes, ponds, off-channel areas, and other habitat types—that each species requires. The sufficiency, spatial arrangement, and proximity of the habitats each species requires throughout its life cycle (e.g., for spawning, rearing, overwintering, feeding) are key factors determining productivity and sustainability of fish populations. For this reason, the Corps should analyze how the project will affect both the amount and the accessibility of the full complement of habitats that each fish species requires to complete their life histories. If spawning and rearing habitats no longer exist at sufficient levels (in terms of quantity or quality), or no longer exist in proximity to each other, the abundance, productivity, and sustainability of fish populations will be compromised. These habitats need to remain both sufficiently represented and connected, throughout the project area, to sustain resiliency and persistence of fish populations.

Habitat Characterization

Comment: Table 3.24-1 presents different types of habitats: mainstem reach, riffle, run/glide, pool, beaver pond, and other off-channel habitat types. The DEIS does not explain or provide evidence to support (1) how these habitats were selected and sampled; (2) whether these habitats represent all fish habitats that may be impacted by the project; and (3) how and when these habitats are used by fish [e.g., in terms of species, season, and life history stage (e.g., spawning vs. rearing vs. overwintering habitats)]. The DEIS also does not explain how this habitat information is used to evaluate effects of the project on fish (i.e., DEIS Section 4.24).

- Recommendation: The Corps should include information regarding how and when fish habitats were defined, identified, and sampled; whether they represent all relevant fish habitats in the project area; how and when different fish species use these (and any other) habitats; and how these habitats will be affected by this project. Alternatively, the Corps should explain why its existing description of fish habitats is sufficient in light of the significance and complexity of the discharge activities associated with this project.

Comment: The Draft Essential Fish Habitat (EFH) Assessment discloses that areas of spawning, migration, and rearing are delineated based on the available ADF&G Anadromous Waters Catalog and observations PLP made during project studies. However, it does not explain the repeatable process framework by which habitats were identified or characterized. Representative habitat characterization provides the foundation on which interrelated studies (e.g., fish distribution and abundance studies) can be overlain. A consistent project framework that clearly states criteria used to classify or characterize different habitat types should be a precursor to quantifying pre-existing and post-project fish habitat.

- Recommendation: The Corps should include additional information used to support baseline habitat characterizations, including references to baseline habitat studies and the framework used to characterize fish habitats. Alternatively, the Corps should explain why its existing analysis of fish habitat is sufficient in light of the significance and complexity of the discharge activities associated with this project.

Comment: The DEIS does not provide a comprehensive analysis of environmental factors associated with distributions and abundances of fish species throughout the project area watersheds, which is needed to evaluate project-related changes in fish habitat.

- Recommendation: The Corps should ensure its analysis is comprehensive—which would include summaries of seasonal fish species’ distributions and abundances (with uncertainty estimates), associated environmental conditions, and an assessment of factors potentially limiting distributions and abundances of fish species found within the project area watersheds. The Corps should discuss how habitat was assessed at both sites where fish were observed and sites where fish were not observed, to evaluate what characteristics (e.g., groundwater upwelling or downwelling, water temperature) were significant predictors of fish occurrence. The Corps also should disclose areas that were assessed as overwintering habitat. Inclusion of such information will help validate and support inferred relationships between fish distribution, abundance, and habitat selection. Alternatively, the Corps should explain why its existing analysis of fish habitat and relevant environmental factors is sufficient in light of the significance and complexity of the discharge activities associated with this project.

Comment: The DEIS states that, “[s]pecies diversity and abundance data indicate there is sufficient available habitat for relocation without impacts to existing populations.”⁸⁹ EPA’s review finds that the DEIS does not provide support for this statement, and that it does not present information on how available relocation habitats were assessed or what constitutes fish habitat.

- Recommendation: The Corps should explain what is meant by “sufficient available habitat that would allow for relocation without impacts to existing populations” and provide information and analyses to support this statement. Alternatively, the Corps should explain why its existing assessment of fish habitat and population-level effects of the project is sufficient in light of the significance and complexity of the discharge activities associated with this project.

⁸⁹ DEIS pg. 4.24-8.

Comment: Table 4.24-2, entitled “Average precipitation year spawning habitat for all streams and species in the mine site area pre-mine, during operations, and post-closure,” does not include all species documented to occur at the mine site area.⁹⁰ Values are reported in terms of stream area for all watersheds combined, but both stream area and stream length and breakdowns by watershed are necessary for evaluation purposes.

- Recommendation: The Corps should revise this table to include (1) all anadromous and resident fish species (including lamprey) documented to occur in the project area watersheds and (2) values in terms of stream miles in each of the three project area watersheds, in addition to stream acreage. Alternatively, the Corps should explain why its existing analysis is sufficient in light of the significance and complexity of the discharge activities associated with this project.

Habitat Function and Connectivity

Comment: The DEIS and the Draft EFH Assessment do not analyze habitat function (i.e., how fish species are using the different habitats at risk from project impacts during all life stages). Fish species and populations use different habitats for different functions (e.g., spawning, egg incubation, rearing, refugia, feeding, overwintering, and migration), and this habitat use varies both seasonally and from year to year.⁹¹

- Recommendation: The Corps should describe fish habitat functions and their spatial and temporal variability and disclose the consequences of project-related changes to each of those habitats in terms of the different habitat functions (i.e., spawning, egg incubation, rearing, refugia, feeding, overwintering, and migration). This would allow for estimation of the amount of habitat loss (in acres and linear miles) related to different habitat functions, for different fish species. Alternatively, the Corps should explain why its existing analysis is sufficient in light of the significance and complexity of the discharge activities associated with this project.

Comment: The DEIS does not analyze the spatial arrangement or connectivity of different habitat types used by anadromous and resident fish species throughout their life cycles within the project area.

- Recommendation: The Corps should analyze the spatial arrangement and connectivity of different fish habitats. Alternatively, the Corps should explain why its existing analysis is sufficient in light of the significance and complexity of the discharge activities associated with this project.

Comment: The DEIS states that “[f]ree passage of resident and anadromous fish may be temporarily interrupted but would continue unimpeded after construction is complete. Habitat at the immediate location of culverts would be altered, but fish would continue to use the streams.”⁹² The DEIS does not cite evidence to support these statements.

- Recommendation: The Corps should include justification and analysis to support these statements or should explain why its existing statement is sufficient in light of the significance and complexity of the discharge activities associated with this project.

⁹⁰ Woody and O’Neal 2010.

⁹¹ Brennan et al. 2019.

⁹² DEIS pg. 4.24-6.

Habitat Quantification

Comment: The DEIS and Draft EFH Assessment lack basic habitat quantifications for streams, lakes, ponds, and marine habitats: stream loss of channel length is not quantified by linear feet and/or miles; habitats assessed to be spawning, incubation, rearing, overwintering, and feeding areas are not quantified in acreage; migratory habitats are not quantified as linear stream miles and acreage; and, there is not sufficient quantification of habitat types and fish usage.

- Recommendation: The Corps should quantify the geographic extent of potentially affected fish habitats, or should explain why its existing analysis is sufficient in light of the significance and complexity of the discharge activities associated with this project. Specific recommendations are included for each of the instances listed below:
 1. The Draft EFH Assessment (Table 5-1 p. 68) presents a summary of essential fish habitat for managed fish species that will be lost/destroyed during mine site development. The Corps also should include a table which quantifies potential habitat losses for all species (including resident and non-managed anadromous species) found in the project impact area. This information will enable the Corps to quantify impacts to fish species from the current proposal as well as from the potential future expanded mine scenario.
 2. The DEIS asserts that “[t]he percentage reductions in habitat would generally decrease in a downstream direction until reaching the confluence of the NFK and the SFK (with a few exceptions). In terms of extent, rainbow trout, chum, sockeye, Dolly Varden, and Arctic grayling would have habitat decreases only in the headwater tributaries” (pg. 4.24-13). The Corps should provide evidence to support this statement.
 3. The Draft EFH Assessment and DEIS present miles of spawning and rearing habitats for Chinook, coho, chum, and sockeye salmon, but do not quantify overwintering, incubation, or migratory habitat. The EFH Assessment uses the Anadromous Waters Catalog to calculate spawning and rearing habitat in linear feet and miles. The Anadromous Waters Catalog covers fish spawning or presence (and less frequently migration and rearing), and it does not differentiate other critical habitats, such as overwintering habitat. Therefore, the DEIS provides an incomplete picture of fish habitat use. There is no data provided to verify the accounting of habitat miles (or acreage, by fish species) that will be impacted by the Pebble Project. The Corps should include a complete table of quantified habitat classifications by fish species documented to occur in the project impact area, to understand the amount of habitat that will be lost because of the project and the functions those habitats provide to each fish species.

Habitat Quality

Comment: EPA’s review finds that the DEIS and the Draft EFH Assessment make unsupported conclusions related to habitat quality (see list below). In particular, conclusions related to “low use” and “low quality” fish habitat are not supported by the information provided in the DEIS.

- Recommendation: As discussed in the recommendations above, the Corps should conduct additional analyses of habitat characterization, function, quantification, spatial

arrangement and connectivity, and the full seasonal distribution of fish species and life stages across multiple years. Once these analyses are done, the Corps should provide this additional information to support its conclusions. Alternatively, the Corps should explain why its existing analysis is sufficient in light of the significance and complexity of the discharge activities associated with this project. The following are specific recommendations:

1. The Draft EFH Assessment (pg. 66) states that construction of the mine site “would discharge fill material into 46,836 linear feet (14,276 linear miles)⁹³ of EFH catalogued as anadromous streams in the [Anadromous Waters Catalog] and/or identified by PLP research as EFH” and concludes that impacted reaches “support primarily low levels of use by rearing Chinook salmon and rearing and spawning coho salmon.” The Draft EFH Assessment further states that “the NFK and SFK reaches that would be removed have a low Pacific salmon presence compared to downstream reaches indicating that these habitats are of lower quality EFH.” The Corps should provide detailed analyses or references to support these conclusions regarding “low levels of use” or “low Pacific salmon presence.” This supporting information is particularly important given recent research highlighting the importance of temporally and spatially shifting habitat mosaics for Pacific salmon populations in this region.⁹⁴
2. The Draft EFH Assessment (pg. 67) states that habitats that would be removed exhibited some of the “lowest density use by both coho and sockeye salmon juveniles” within the SFK drainage, suggesting “low overall quality EFH or abundance of quality habitat in unaffected areas.” The Corps should provide additional information to support these conclusions. Specifically, the Corps should present fish sampling data as catch-per-unit effort values, rather than as density use; present data on seasonal fish distributions; present data on habitat quality within the project waters; and discuss whether the DEIS and the Draft EFH Assessment evaluated and compared habitat characteristics at sites where fish were and were not observed.
3. The Draft EFH Assessment (pg. 67) asserts that, considering the low use of EFH and direct habitat losses in the SFK-E reach and the NFK 1.190 tributary, “drainage-wide impacts to Pacific salmon populations from these direct habitat losses would be unlikely.” The Corps should include evidence that supports this conclusion.
4. The Draft EFH Assessment concludes that the Pebble Project may adversely affect EFH. However, the Assessment also concludes that “...mortalities are unlikely and EFH characteristics would return to normal shortly after the activity ceases, or in the short term” (pg. 120) and that “habitat removed is generally of low biological importance.” The Corps should either explain or resolve this apparent discrepancy and include references or documentation to support these assertions.

⁹³ There also appears to be a conversion error in these number which come from the Draft EFH Assessment.

⁹⁴ Brennan et al. 2019.

Geospatial mapping of habitat

Comment: The DEIS does not include geospatial representation (i.e., the location and spatial arrangement) of assessed baseline fish habitats. Such geo-location of classified habitats, analyzed by their functions for individual species, is needed to understand how the project will affect habitat availability, spatial arrangement, and connectivity, which in turn will determine impacts to fish populations.

- Recommendation: The Corps should document the location of existing baseline fish habitats, their proximity to other similar or dissimilar habitats required by those fish, and how the spatial arrangement of these habitats will change as a result of the proposed mine project. Alternatively, the Corps should explain why its existing analysis is sufficient in light of the significance and complexity of the discharge activities associated with this project.

Headwater streams

Comment: The DEIS and the Draft EFH Assessment do not address the effects of decreased inputs from headwater streams on downstream waters. Headwater streams support numerous fish species and habitats, and the disruption to headwater streams from the mine site has the potential to result in large environmental consequences to fish and aquatic resources at a scale beyond that included in the Mine Site EIS Analysis Area (Figure 3.24-1).

- Recommendation: The Corps should include discussion of the extensive body of scientific evidence demonstrating that headwaters are critical aquatic habitats,⁹⁵ and evaluate the role and importance of headwater streams in the project area in terms of both direct use of these habitats and their inputs to downstream waters. Alternatively, the Corps should explain why its existing consideration of headwater streams is sufficient in light of the significance and complexity of the discharge activities associated with this project.

Intermittent stream reaches.

Comment: The DEIS does not analyze intermittent stream surface and groundwater flow pathways relevant to fish and fish habitat. Intermittent streams may lack flow during critical summer low flow periods and are often viewed as having limited ecological function for fish habitat or water quality when surface flow ceases. However, hyporheic flow composed of mixed shallow groundwater and surface water under and along the channel bed can continue in these intermittent channels after surface flow has ceased. This hyporheic flow can be thermally moderated (i.e., buffered from the effects of solar heating by the channel substrate),⁹⁶ and thus can create thermally distinct fish habitat in isolated pools in intermittent streams.⁹⁷ The literature supports the idea that intermittent streams can provide high quality habitat. Subsurface flow can also increase thermal heterogeneity where it emerges at confluence zones with perennial water bodies, such as lakes⁹⁸ or streams and rivers,⁹⁹ providing patches of cold-water habitat in

⁹⁵ For example, Schlosser, I. J. 1995; Wipfli, M.S. J.S. Richardson, and R.J. Naiman. 2007.

⁹⁶ May and Lee 2004, Arrigoni et al. 2008.

⁹⁷ Bilby 1984, May and Lee 2004.

⁹⁸ Buttle et al. 2001.

⁹⁹ Ebersole et al. 2015.

otherwise warm downstream waters. The functional role of colder tributaries in providing thermally distinct water that supports cold water fish species is a clear example of an ecosystem service provided by the tributaries,¹⁰⁰ potentially even after surface flow has ceased in an intermittent stream reach.

- Recommendation: The Corps should evaluate the potential importance of intermittent stream reaches, which are seasonally important for fish migration, spawning, and rearing¹⁰¹ as part of stream-lake networks, in the project impact area. Alternatively, the Corps should explain why its existing consideration of intermittent streams is sufficient in light of the significance and complexity of the discharge activities associated with this project.

Comment: The DEIS states that the mainstem SFK has a 10-mile reach, from two miles below Frying Pan Lake to the SFK Tributary 1.19, that frequently exhibits zero or intermittent flow during winter and summer months. The DEIS states that the loss of surface water in this reach transfers an average of 22 cfs from the SFK (Nushagak River headwaters) into the UTC (Kvichak River headwaters) via groundwater exchange, indicating complex hydrological connections. Groundwater remaining in the SFK basin reemerges at the downstream end of the intermittent reach, 20 miles above the NFK confluence. The DEIS states that this reach is not considered “quality” habitat for purposes of environmental review (pg. 3.24-9), but this conclusion is not adequately supported within the DEIS. As discussed above, scientific literature supports the conclusion that intermittent stream reaches can be seasonally important for fish migration, spawning, and rearing¹⁰² as part of stream-lake networks. Furthermore, the DEIS states that the highest densities of chum salmon redds occurred in the reach immediately downstream of the dry channel (SFK-C), where accretion of groundwater is most evident.¹⁰³ The DEIS does not present the data or other information on stream habitat that were analyzed to reach the conclusion that the intermittent stream reach does not represent quality habitat.

- Recommendation: The Corps should evaluate the intermittent reach on the mainstem SFK, between SFK Tributary 1.19 and the outlet of Frying Pan Lake, as potential habitat for Chinook, sockeye, and chum salmon and resident fish. Alternatively, the Corps should explain why its analysis is sufficient in light of the significance and complexity of the discharge activities associated with this project.

Off-channel habitat

Comment: The DEIS does not quantify off-channel floodplain habitats or disclose models that will be used to account for off-channel habitats, even though off-channel habitats can be an extremely important factor in salmonid distribution.¹⁰⁴ Tables 4.24.2 and 4.24.3 assert that there will be an increase in downstream spawning and rearing habitats, but the DEIS does not provide scientific evidence supporting this claim.

- Recommendation: The Corps should document and quantify pre-existing off-channel habitats that may be affected by the project, analyze potential losses of off-channel habitats due to the project, and address the consequences of these habitat losses to fish

¹⁰⁰ Torgersen et al. 2012.

¹⁰¹ Heim et al 2018; Ebersole et al. 2015; Ray et al. 2015.

¹⁰² *Id.*

¹⁰³ R2 et al 2011a.

¹⁰⁴ For example, Swales and Levins 1989.

populations. The Corps should use results from the Pebble Project Draft Environmental Baseline Studies 2006 Study Plan to help illustrate the mechanics of flow connectivity to the channel from surface flow, groundwater flow, or both combined. For example, Figure 11.1-3 of PLP 2006 includes a map of off-channel habitat transects from the SFK River. Alternatively, the Corps should explain why its existing analysis is sufficient in light of the significance and complexity of the discharge activities associated with this project.

2. Fish

Distribution and Abundance

Comment: The DEIS and the Draft EFH Assessment do not characterize the full seasonal distribution and abundance of resident and anadromous fish or capture interannual variability in these parameters. Because the distribution and abundance of fish can vary substantially both seasonally and interannually, and because the project will affect the area in perpetuity, long-term data on fish distributions and abundances are needed to evaluate impacts of the project.

- Recommendation: The Corps should analyze the full seasonal and interannual variability in distributions and abundances of fish species and assemblages that are supported by the diversity of habitats in the Nushagak and Kvichak River watersheds, including habitats in the headwater streams of the SFK, NFK, and UTC over multiple years. Alternatively, the Corps should explain why its existing analysis of spatial and temporal variability in fish abundances and distributions is sufficient in light of the significance and complexity of the discharge activities associated with this project. Specific recommendations include:
 1. Fish may be absent from a site during some years or some portions of a single year, but present in high abundances at other times. Low abundance at one point in time does not necessarily equate to low abundance at another point in time, nor does it mean that the habitat is not ecologically important. The Corps should disclose the seasonal and interannual distributions and abundances of fish species in terms of migration, spawning, incubation, rearing, and overwintering habitat within streams affected by the Pebble Project, including those affected by the withdrawal, storage, and discharge of water. When abundance and distribution data are presented, the Corps should specify how that data was generated (e.g., in terms of sampling frequency).
 2. The DEIS includes little data on fish densities (see DEIS Sections 3.24 and 4.24), although density data is available.¹⁰⁵ The statements that are included in the DEIS are qualitative and unsupported. The Corps should include relevant data collected by PLP and should supplement their analysis with relevant data collected by others.¹⁰⁶
 3. The DEIS states (pg. 4.24-3) that rearing Chinook salmon have been documented in the 2.9 miles of NFK Tributary 1.19 in lower densities (0.11 fish/100m²) compared to the mainstem NFK (4.99 fish/100m²) but does not include a citation to support this statement. These estimates appear to conflict with research conducted by ADF&G in

¹⁰⁵ For example, Tables 7.1-7.3 in EPA 2014, which show data from PLP's Environmental Baseline Document.

¹⁰⁶ For example, Woody and O'Neal 2010.

the Nushagak River watershed that concludes that juvenile salmon are likely more abundant in the tributaries and headwaters of the drainage, where finer scale habitat such as riffles and woody debris are more common.¹⁰⁷ The Corps should consider this ADF&G report and provide supporting information for the above referenced statement in the DEIS.

4. The Draft EFH Assessment states that no adult Pacific salmon were observed within the headwater reach of the SFK River that would be eliminated by the Pebble Project during the 2004-2008 aerial surveys to document adult salmon distribution (pg. 67). Aerial surveys can substantially underestimate salmon abundances in narrow, deep, highly vegetated, or tannic waters.¹⁰⁸ Inclusion of supplemental survey methods such as mark-recapture can help identify error and bias in estimates.¹⁰⁹ The Corps should include discussion of the limitations of aerial surveys and how these limitations could impact conclusions made in the EFH Assessment and in the DEIS (i.e., by underestimating salmon counts in headwater streams).
5. Fish abundance estimates from the Environmental Baseline Document (Figure 15-1-96; PLP 2011) suggest that over 80,000 returning sockeye salmon were counted during one aerial survey in UTC and Tributary 1.60. This estimate, combined with remaining adult aerial counts, suggest that over 100,000 spawning sockeye salmon were counted in UTC alone in 2008, but this information is not included in the DEIS. The Corps should include these and other existing project-specific fish abundance estimates in the record.

Bristol Bay salmon portfolio

Comment: The DEIS and the Draft EFH Assessment do not fully analyze population level effects from the potential loss of genetic diversity of the Bristol Bay salmon portfolio.¹¹⁰ The Pebble Project could result in population-level effects on the genetic diversity of salmon stocks in the Nushagak and Kvichak River watersheds, which in turn could impact the salmon portfolio and overall resilience of salmon populations within the Bristol Bay watershed. Thus, additional information on the genetically distinct fish populations in the project area is needed.

- Recommendation: The Corps should analyze the relative contribution of genetically distinct spawning populations to determine the significance of population losses or reductions that may result in impacts beyond recovery thresholds of species.¹¹¹ The Corps should also analyze and discuss existing scientific information on the Bristol Bay salmon portfolio and the consequences of genetic biodiversity losses for salmon populations. Alternatively, the Corps should explain why its existing discussion of genetic diversity and the portfolio effect in the Bristol Bay region is sufficient in light of the significance

¹⁰⁷ For more information about this research see:

http://www.adfg.alaska.gov/index.cfm?adfg=chinookinitiative_nushagak.main#juvenileabundance.

¹⁰⁸ Bevan 1961.

¹⁰⁹ For example, Parken et al. 2003.

¹¹⁰ Schindler et al. 2010.

¹¹¹ *Id.*

and complexity of the discharge activities associated with this project. Specific topics the Corps should discuss and evaluate include:

1. There are several hundred discrete sockeye salmon populations in Bristol Bay.¹¹² It is possible that as many as 200 to 300 discrete sockeye salmon spawning aggregates occupy the Kvichak River system alone.¹¹³ The heterogeneity of these Kvichak River populations reduces the variability of sockeye salmon returns in the Bristol Bay region and contributes to the stability and robustness of the resource.
2. ADF&G has built and tested the Bristol Bay salmon genetic baseline over the past 17 years.¹¹⁴
3. Recent research indicates that sockeye and Chinook salmon productivity vary over space and time in the Nushagak River drainage, and that shifting habitat mosaics throughout the drainage, including streams draining the project area, help stabilize interannual salmon production.¹¹⁵

Population-level effects

Comment: The DEIS Summary for Habitat Loss (Section 4.24.2.1) concludes that modeling indicates that “indirect impacts associated with mine operations would occur at the individual level and be attenuated upstream of the confluence of the NFK and SFK with no measurable impacts to salmon populations” (p. 4.24-6). Standard fisheries management techniques are applied at the population level, not the individual level, and the approach mentioned in the DEIS is inconsistent with ADF&G population/stock management approaches. The DEIS also does not provide fish population estimates or the models used to support the determination that impacts would occur at the individual level rather than at the population level.

- Recommendation: The Corps should clarify their distinction between individual-level and population-level effects and include supporting information for the conclusion that there would be no measurable impacts to salmon populations in the DEIS. Alternatively, the Corps should explain why its existing analysis is sufficient in light of the significance and complexity of the discharge activities associated with this project.

Comment: The Draft EFH Assessment asserts that “population effects within the context of the NFK river, SFK river and UT creek are not anticipated” (pg. 68), that population-level effects to the local watersheds are unlikely, and that population-level effects at the Bristol Bay watershed level would be undetectable (pg. 78). No evidence was provided in the Draft EFH Assessment to support these conclusions.

- Recommendation: The Corps should include data and analyses that support its conclusions regarding population-level effects of the project (i.e., well-supported and documented analyses of population-level effects to demonstrate the validity of these statements).

Temporal availability of salmon

¹¹² *Id.*

¹¹³ Habicht et al. 2004; Ramsted et al. 2004; Ramstad et al 2009.

¹¹⁴ For more information see:

http://www.adfg.alaska.gov/index.cfm?adfg=fishinggeneconservationlab.bbaysockeye_baseline.

¹¹⁵ Brennan et al. 2019.

Comment: The Pebble Project proposes to eliminate, dewater, block, and fragment headwater streams, which could result in the loss of habitats that support headwater spawning and rearing salmonid populations. Headwater stream populations arrive later to their spawning grounds than those downstream in the mainstem and lower tributaries. Later arriving salmon populations are important because they extend the seasonal availability of salmon to terrestrial wildlife (e.g., bears, wolves) and other aquatic biota (e.g., fish and invertebrates) in the NFK, SFK, and UTC, and the overall Nushagak and Kvichak watersheds. Predators and scavengers roam from lakes to mainstems to tributaries in search of food subsidies offered by asynchronous salmon run timings across the landscape. The DEIS does not evaluate the importance of late arriving salmon to the ecology of headwater and downstream areas or of the potential consequences of losses due to the project.

- Recommendation: The Corps should evaluate the importance of late arriving salmon to the ecology of headwater and downstream areas and the potential consequences of losses of these asynchronous subsidies due to the project. Alternatively, the Corps should explain why its existing analysis is sufficient in light of the significance and complexity of the discharge activities associated with this project.

Age structure

Comment: The DEIS acknowledges the presence of multiple age classes of Chinook, coho, and sockeye salmon in the Nushagak and Kvichak River watersheds. As a result, project impacts may result in losses of multiple age classes of multiple species. This loss of age class representation could significantly impact annual production or returns within a few generations. This issue is currently not evaluated in the DEIS.

- Recommendation: The Corps should analyze and disclose the potential for losses of multiple age classes, including across multiple species, and the potential resulting depletion of annual returns. Alternatively, the Corps should explain why its existing analysis is sufficient in light of the significance and complexity of the discharge activities associated with this project.

Egg Incubation

Comment: The DEIS and the Draft EFH Assessment do not fully address egg incubation or potential impacts to incubating fish eggs from habitat alterations. While the DEIS analyzes timing of spawning, egg incubation is a different life stage that occurs during a different time period. Table 3.24-4 does not include egg incubation, and thus this table presents an incomplete picture of life-stage periodicities of fish species in the NFK, SFK, and UTC watersheds. In addition, egg incubation could be affected by several project induced physical and chemical alterations, including changes in water temperature, groundwater inputs/flow pathways, surface flows, dissolved oxygen, pH, conductivity, and other water quality parameters.

- Recommendation: The Corps should add egg incubation to Table 3.24-4, between spawning and emergence periods. The Corps also should evaluate potential impacts to incubating eggs from changes in flow (e.g., scour) and other physical and chemical project induced alterations, as well as the consequences of the potential impacts to incubating eggs for fish species and populations. DEIS Table 4.24-1, which presents "Priority species and life stages used to determine habitat flow needs in the mine site area," should be revised to include the incubation life stage for all species documented to occur in potentially affected waters, including lamprey (resident and anadromous). The

analysis of impacts to lamprey are important because lamprey eggs hatch into larvae (ammocoetes) in about two weeks' time and drift downstream to slow velocity areas, where they reside in the substrate from three to seven years, resulting in multiple age classes in the substrate at once. Lamprey eggs and ammocoetes, as well as eggs of other nest-building fish species, can be impacted by high flows that scour redds during sensitive life stages. Table 4.24-3, entitled "Average precipitation year juvenile habitat for all streams and species in the mine site area pre-mine, during operations, and post-closure," also should be revised to include all species documented at the mine site area.¹¹⁶ Alternatively, the Corps should explain why its existing consideration of egg incubation is sufficient in light of the significance and complexity of the discharge activities associated with this project.

Resident and Anadromous Fish

Comment: The DEIS discloses that potential direct and indirect (i.e., secondary) effects for aquatic resources are assessed according to the magnitude of impact from the project depending on the specific species sensitivity to the type of disturbance (p. 4-24-1). However, only select species are mentioned and several species that would be impacted are not included. As a result, the DEIS presents an incomplete picture of the number of impacted fish species and underestimates direct, secondary/indirect and cumulative impacts to the diversity of species and assemblages that provide ecological sustainability to the NFK, SFK, and UTC watersheds.

- Recommendation: The Corps should analyze impacts for the full diversity of resident and anadromous fish species known to occur in the Nushagak and Kvichak River watersheds. Alternatively, the Corps should explain why its existing focus on selected species is sufficient in light of the significance and complexity of the discharge activities associated with this project.

Comment: DEIS Table 3.24-4 presents periodicity information only for select species. This table is incomplete and does not sufficiently represent periodicity because the length of time between spawning and fry emergence varies with species, population, and water temperature.¹¹⁷

- Recommendation: The Corps should include the complete periodicity of critical life stages of all anadromous and resident species known to occur in the mainstem and tributaries of the Nushagak and Kvichak River watersheds in Table 3.24-4. Alternatively, the Corps should explain why its existing focus on selected species is sufficient in light of the significance and complexity of the discharge activities associated with this project.

Comment: DEIS Figures 3.24-2 and 3.24-3 present the fish distribution and relative contribution of "anadromous salmonids," "resident salmonids," "non-salmonid fish," and "no fish observed." The DEIS does not clearly define these terms, which differ from the regulatory language of the ADF&G Anadromous Waters Catalog.

- Recommendation: The Corps should clearly define the categories used in Figures 3.24-2 and 3.24-3. For comparative purposes, the Corps should refer to life history strategies as either "anadromous" or "resident," consistent with the ADF&G Anadromous Waters

¹¹⁶ Woody and O'Neal 2010.

¹¹⁷ Murray and McPhail 1988, Quinn 2004.

Catalog. The Corps also should clarify whether “no fish” means that the reaches were sampled and no fish were found (and if so, when and how frequently these reaches were sampled), or that reaches were not sampled. Alternatively, the Corps should explain why its existing categories are sufficient in light of the significance and complexity of the discharge activities associated with this project.

Life history strategies

Comment: The DEIS does not disclose potential impacts to life history strategies. Some fish species (e.g., rainbow trout, least cisco, Dolly Varden char, three-spine stickleback, lamprey) exhibit both resident and anadromous forms, each with diverse habitat needs for successful completion of life cycles. Resident and anadromous forms of lamprey were documented in the NFK, SFK, and UTC during the 2007 Baseline studies.¹¹⁸ The presence of lamprey has also been documented in these headwater streams.¹¹⁹ Anadromous Dolly Varden have also been documented in Bristol Bay watersheds.¹²⁰

- Recommendation: The Corps should analyze life history strategies of the fish species documented to occur in the project impact area, consider potential impacts of the project to these life history strategies, and disclose whether anadromous populations of these fish are also present within the Nushagak and Kvichak River watersheds. Alternatively, the Corps should explain why its existing analysis is sufficient in light of the significance and complexity of the discharge activities associated with this project.

Comment: The DEIS does not analyze potential impacts to diverse fish spawning strategies (e.g., nest builders versus broadcast spawners; spring versus fall spawners). For example, salmonids and lamprey species build redds in the channel substrate. Least cisco are broadcast spawners with eggs that disperse in the water column. Coho salmon are fall/winter spawners, while rainbow trout are spring spawners. Adaptive spawning strategies may not be resilient to the physical and chemical alterations resulting from the project.

- Recommendation: The Corps should analyze impacts of the project to the diversity of spawning strategies known to be used by fish species documented in the project area and resulting changes to the overall ecology of fish populations and assemblages. Alternatively, the Corps should explain why its existing analysis is sufficient in light of the significance and complexity of the discharge activities associated with this project.

Bivalves

Comment: The DEIS does not discuss the presence or absence of freshwater mussels in the Bristol Bay region, nor does it analyze project impacts to bivalves. The Pebble Project Draft Environmental Baseline Studies, 2006 Study Plan, Figure 11.5-1, presents a map of the 2005-2006 project freshwater mussel sampling locations for Lake Iliamna.

- Recommendation: The Corps should characterize the pre-existing bivalve populations and analyze and disclose potential impacts to bivalves from the project. Alternatively, the Corps should explain why its existing analysis is sufficient in light of the significance and complexity of the discharge activities associated with this project.

¹¹⁸ Northern Dynasty Minerals 2007.

¹¹⁹ Woody and O’Neal 2010.

¹²⁰ Lisac and Nelle 2000, Reynolds 2000, Taylor et al. 2008.

Sampling design and reporting

Comment: The DEIS does not describe site selection and sampling design for fish habitat, distribution, or relative abundance studies. The DEIS does not disclose methodologies used for the selection of habitat transects (i.e., random, systematic) or if there was statistical reasoning behind the study transect selection. In addition, levels of uncertainty and error are not consistently reported for data used in the analysis. Fish counts reported in PLP's Environmental Baseline Document¹²¹ do not always include estimates of observer efficiency, sampling efficiency, or other factors that affect the proportion of fish present observed. Thus, counts may often underestimate true abundance. The DEIS also includes limited or no information regarding when samples were collected, how many were collected, how often they were collected, and overall sample size on which estimates were based. This information should be included within the DEIS to support its statements.

- Recommendation: The Corps should provide information on site selection and study sampling designs and associated levels of uncertainty and error, as well the above-mentioned sample reporting information, for all data included in the DEIS, because this information is necessary to understand and support the presented analysis. Alternatively, the Corps should explain why its existing presentation of sampling design information is sufficient in light of the significance and complexity of the discharge activities associated with this project.

Impacts of Streamflow Alterations

Comment: The project proposes to directly alter the natural flow regimes of streams that support resident and anadromous fish. A stream's flow regime—its daily, seasonal, annual, and flood fluctuations—is key to stream structure and function; thus, assessing impacts based only on mean monthly streamflows at large spatial scales does not adequately capture impacts. Numerous case studies in the literature indicate that altering a stream's hydrograph can cause measurable changes in ecosystem structure.¹²² Streamflow changes are characterized in the DEIS using changes to monthly and annual mean flows. Fish habitat is created and maintained through daily and seasonal variations (e.g., minimums and maximums) of the natural hydrograph and therefore the time scale used in the DEIS does not capture flow impacts on fish. Reporting mean monthly values alone does not represent the range of flows that occurs each month or during extreme precipitation or drying events.

- Recommendation: The Corps should model flow alterations associated with the project on a more conservative basis, such as a daily or diurnal basis, to adequately predict potential impacts on fish. The Corps should also characterize flow alterations such that pre-existing, mine operation, and post-closure hydrographs can be compared in terms of changes in the frequency or magnitude of daily peak and minimum flows. To support this analysis, the Corps should include a table that identifies: stream, reach, length (miles), percent and absolute (cfs) streamflow alteration (in terms of monthly mean, minimum, and maximum flows), and fish species and life stages known to be present. The Corps also should consider including one or more maps of streams in the mine area that illustrate the specific percent streamflow changes expected along those streams (e.g., see

¹²¹ PLP 2011.

¹²² Richter et al. 2012.

Figure 7-14 in EPA 2014). Alternatively, the Corps should explain why its existing analysis of flow alterations is sufficient in light of the significance and complexity of the discharge activities associated with this project.

Comment: The DEIS does not disclose how flow alterations may alter ice formation in the Nushagak and Kvichak River watersheds. The DEIS does not include information on locations, thickness, or movement of ice; timing of break up and ice-out; under-ice temperatures; or under-ice spawning and overwintering habitat.

- **Recommendation:** The Corps should evaluate the project's potential impacts on the ice-related factors discussed above. Alternatively, the Corps should explain why its existing consideration of ice-related factors is sufficient in light of the significance and complexity of the discharge activities associated with this project.

Comment: The DEIS asserts that increasing flow will only result in positive benefits by increasing habitat. However, increasing flow can have negative effects as well (e.g., via temperature changes, redd scouring, and changes in channel stability and form), and it is well established that for many species and life stages, increasing flow does not create more habitat. In addition, the timing, frequency, and duration of increased flows should be considered.

- **Recommendation:** The Corps should further evaluate the extent to which increasing flow will result in potential positive benefits for the species and life stages impacted, as well as the potential negative impacts that could result from flow increases, in terms of the magnitude, timing, frequency, and duration of these changes. Alternatively, the Corps should explain why its existing analysis of the impacts of flow increases is sufficient in light of the significance and complexity of the discharge activities associated with this project.

Comment: According to Draft EFH Assessment, the net changes to habitat are expected to be negative across species in an average year and even greater in a dry year. The Draft EFH Assessment (Table 5-3) discloses a 9 percent decrease of spawning habitat for all four salmon species (Chinook, sockeye, coho, chum) in a dry year.

- **Recommendation:** The Corps should revise the record, including assertions in the DEIS that the Pebble Project will increase habitat, to accurately reflect analyses showing net habitat decreases. Alternatively, the Corps should explain why its existing analysis is sufficient and accurate in light of the significance and complexity of the discharge activities associated with this project.

Comment: In considering mine site impacts on fish resources, the DEIS states that the EIS analysis area (the NFK, SFK, and UTC watersheds, plus a 1,000 ft buffer around the mine site) includes "all aquatic habitats potentially impacted by changes in streamflow from the diversion, capture, and release of water associated with the project that result in a modeled reduction of streamflow greater than 2 percent" (pg. 4.24.-1). No rationale is provided for why this two percent threshold was selected, the spatial or temporal scale at which this two percent value was calculated, how these delineations were supported by modeled streamflow changes, or whether this area also encompassed streamflow increases greater than 2 percent.

- Recommendation: The Corps should explain what the 2 percent threshold represents and why it is considered a scientifically defensible threshold for considering impacts to fish resources.

Comment: The DEIS states that approximately 2.3 miles of the Tributary 1.190 mainstem and sub-tributary stream channels will remain free-flowing between the TSF and the water seepage pond, and that this could be resident species habitat (Section 4.24.2.1 Habitat Loss – North Fork Kaktuli). The DEIS does not explain how this stream segment will remain free-flowing if it is blocked on both ends by mine structures, the upstream end of which is designed as a flow-through system such that water in this segment would be, in part, mining process water from the TSF.

- Recommendation: The Corps should revise or clarify this statement.

Comment: The DEIS estimates the potential extent of downstream flow-related impacts of the project. The estimate, however, is unsupported. The DEIS states that “[o]nce the mainstem of the Kaktuli is reached, flow changes would not be detectable” (pg. 4.24-13). EPA’s review finds that the DEIS does not contain any support for this conclusion, and that the DEIS does not define ‘detectable.’

- Recommendation: The Corps should support this statement regarding downstream flow-related impacts and revise or clarify as necessary.

Comment: According to the DEIS surface water modeling chapter (Appendix K.17 and RFI 104), the margins of error for flow model results are high; for example, the maximum difference between actual and modeled flows is approximately 20 percent.

- Recommendation: The Corps should, both graphically and tabularly, display flow changes (increases and decreases) for all project phases to show the extent (i.e., 3, 5, and 10 percent) and degree of downstream flow. The Corps also should show how changes in effluent discharges will result in fish habitat changes, taking into account the 20 percent margins of error in the flow model. Alternatively, the Corps should explain why its existing analysis of flow alteration is sufficient in light of the significance and complexity of the discharge activities associated with this project.

3. Water Quality Relevant to Fish

Water Chemistry

Comment: The DEIS lacks analyses of the potential for fish toxicity from the introduction, relocation, or increase in contaminants in the aquatic environment. This is a concern because anadromous and resident species are genetically adapted to a relatively narrow and unique range of habitat and water quality parameters within their natal streams.¹²³

- Recommendation: The Corps should analyze: 1) potential impacts of increased metal loading to fish; and 2) how increases in loading, especially of copper and selenium, would affect fish downstream of the discharge points. The Corps should evaluate both the level of chemical alteration and potential consequences to fish and fish habitat. Alternatively, the Corps should explain why its existing analysis of metal loading and

¹²³ Woody 2018; Lytle et al. 2004.

impacts on fish is sufficient in light of the significance and complexity of the discharge activities associated with this project. Additional technical recommendations include:

1. The Pebble Project proposes to treat all discharges to meet water quality standards. The Corps should analyze the potential for discharges to match the existing water quality of the receiving waters. Discharges that meet standards may still impact fish and fish habitat. For example, small changes, such as increases in dissolved copper concentrations, can be lethal or sublethal.¹²⁴ In order to improve this analysis, the Corps should predict changes to concentrations in streams due to project impacts (such as treated water discharges, fugitive dust, and uncaptured groundwater) and evaluate the impacts that these changes could have on fish and fish habitat.
2. DEIS Section 3.24.1, Fish Tissue Trace Element Analysis, does not provide summary baseline or existing concentrations of elements (i.e., zinc, copper, arsenic, mercury, methylmercury). The Pebble Project Draft Environmental Baseline Studies 2006 Study Plan (Figure 11.1-1) includes a map of fish tissue sample site locations and the Draft 2007 Environmental Baseline Studies include a table of fish tissue sample locations (Table 11.1-2). The Corps should include this information to support analysis of potential impacts to fish from elevated elements.
3. Neither the DEIS nor the Draft EFH Assessment include analyses and discussion of potential toxicity impacts to fish. The Corps should analyze the potential for the following toxicity impacts:
 - Impairment to olfaction and homing capabilities in salmonids;
 - Attraction to very high lethal levels of water contamination;
 - Interference with respiratory function;
 - Reduction in immune efficiency;
 - Disruption to osmoregulation capabilities;
 - Impacts to the sensitivity of the lateral line canals;
 - Impairment of brain function; and
 - Changes in enzyme activity, blood chemistry, and metabolism.

Water Temperature

Comment: The DEIS and the Draft EFH Assessment do not analyze how disruption in groundwater pathways, surface water flow, and aquifers will alter water temperatures and thermal patterns within the NFK, SFK, and UTC watersheds. The alteration of water temperatures is a concern because fish are at risk from changes in the heterogeneity of thermal patterns, which drive their metabolic energetics. Fish populations rely on groundwater-surface water connectivity, which has a strong influence on stream thermal regimes throughout the Nushagak and Kvichak River watersheds and provides a moderating influence against both summer and winter temperature extremes.¹²⁵

- Recommendation: The Corps should characterize existing baseline heterogeneity of the water temperature regime and what this heterogeneity means for fish and fish habitat, including analyses of the regulating effects of groundwater/surface water connectivity.

¹²⁴ Eisler 2000, Baldwin et al. 2003, Sandahl et al. 2006, Hecht et al. 2007, Sandahl et al. 2007, Tierney et al. 2010.

¹²⁵ C.A. Woody and B. Higman. 2011.

The Corps also should analyze how flow alterations will affect pre-existing daily thermal regimes, as well as consequences for fish. A color-coded thermal map of the existing water temperature regimes versus those under the project operations would be helpful to show changes that could occur with project implementation. Alternatively, the Corps should explain why its existing analysis of temperature changes and impacts to fish is sufficient, in light of the significance and complexity of the discharge activities associated with this project. Additional technical recommendations regarding water temperature include:

1. The Draft EFH Assessment Table 5-4 presents a range of average stream water temperatures pre-mine and after release of treated surplus water during winter and summer. The Corps should revise this analysis to include temperature variability (i.e., changes in daily minimum and maximum temperatures). Broadly characterized winter and summer average temperature ranges are not relevant to disclosing changes in thermal patterns to which NFK, SFK and UTC resident and anadromous fish are locally adapted. The Corps also should analyze potential short-term effects of water temperature increases during dry years.
2. The Corps should analyze impacts of temperature alteration to critical life history stages of fish species, particularly in terms of changes in incubation conditions and accumulated thermal units necessary to complete egg development. Egg development is a sensitive life stage and water temperature differences of one degree Celsius can impact growth and development.¹²⁶
3. The DEIS assumes that the impacts of the proposed project to average stream water temperatures during the winter will be negligible or beneficial with no supporting evidence. The Corps should present analysis to support or revise these conclusions.¹²⁷
4. The Draft EFH Assessment asserts that ice and beaver effects on stream morphology would likely minimize potential effects of flow alteration on channel morphology (5.1.1.3 Water Flow, pg. 70). The Corps should provide additional information to support this conclusion.
5. The Corps should revise Section 3.24.5 of the DEIS to consider how future changes in the regional climate may affect fish populations. The Corps should analyze long-term management under expected future climate scenarios, particularly in terms of water treatment and management and salmon populations. As discussed earlier, a key feature of salmon populations in the Bristol Bay watershed is their genetic diversity (i.e., the portfolio effect), which serves as an overall buffer for the entire population. Different sub-populations may be more productive in different years, which affords the entire population stability under variable conditions year-to-year. If this variability increases over time due to changes in temperature and precipitation patterns, this portfolio effect becomes increasingly important in providing the genetic diversity to potentially allow for adaptation; thus, impacting or destroying genetically

¹²⁶ Brannon 1987, Beacham and Murray 1990, Hendry et al. 1998, Quinn 2005, Healey 2011, and Martins et al. 2012.

¹²⁷ For example, Sparks 2018.

diverse sub-populations may have a larger effect on the overall population than expected under future climatic conditions.

Nutrient Inputs

Comment: The discussion of stream productivity (Section 4.24.2.4) includes unsupported conclusions regarding the importance of marine-derived nutrients, stating “[a]s shown in the baseline data above, marine-derived nutrients do not appear to influence the nutrient availability in the Koktuli or uppermost reaches of the Upper Talarik watersheds in the project area” (pg. 4.24-17). It is not clear what baseline data are referred to in this statement. Further, baseline water quality data are not relevant to supporting such conclusions, as it is likely that marine-derived nutrients in these relatively low-nutrient systems would get taken up quickly by biota rather than remain in the water column. Consideration of whether biotic production differs between anadromous and non-anadromous streams would be of more value in determining the influence of marine-derived nutrients.

- Recommendation: To evaluate the contribution of marine-derived nutrients to stream productivity, the Corps should evaluate changes to marine-derived nutrient inputs from the pre-existing condition and the consequences of these changes for stream productivity at multiple trophic levels. Alternatively, the Corps should explain why its existing analysis of stream productivity is sufficient, in light of the significance and complexity of the discharge activities associated with this project.

Comment: The DEIS includes almost no analyses of direct losses of autochthonous and allochthonous inputs from upstream reaches lost and/or disconnected from wetland and other riparian habitats, as well as the incremental reductions in those inputs in downstream segments throughout the stream reaches.

- Recommendation: The Corps should analyze these losses of autochthonous and allochthonous inputs and their effects on system-wide primary, secondary, and tertiary production that support fish populations. Alternatively, the Corps should explain why its existing analysis of these inputs is sufficient, in light of the significance and complexity of the discharge activities associated with this project.

Comment: The DEIS similarly includes almost no analyses to address invertebrate transport and production. Invertebrates are a significant source of food for fish. Macroinvertebrate and periphyton data are very spatially and temporally limited in the mine site area, limiting the utility of generalizations about stream productivity. No data on macroinvertebrate exports from headwater streams are presented in the DEIS, despite numerous studies showing these exports can be important in Alaska streams.¹²⁸ We understand that a macroinvertebrate technical working group was convened, and limited data on macroinvertebrates were collected in the mine site area and along the northern transportation corridor as part of the environmental baseline for the project; however, the DEIS does not include this information.

- Recommendation: The Corps should analyze invertebrate transport and production, using available site-specific data and where necessary supplementing these data with additional sampling and information. Alternatively, the Corps should explain why its existing

¹²⁸ For example, Wipfli and Gregovich 2002, Wipfli et al. 2007.

analysis of invertebrate exports is sufficient, in light of the significance and complexity of the discharge activities associated with this project.

Modeling of Impacts to Aquatic Resources

Comment: The DEIS identifies significant uncertainty in the groundwater model, which affects the water balance and streamflow alteration predictions¹²⁹ (see Groundwater and Surface Water section of EPA's DEIS comment letter). No accuracy or sensitivity analysis was performed on the water quality modeling and predictions (see Water Quality section of EPA's DEIS comment letter), or the physical habitat simulation modeling (see comments below). The DEIS does not disclose information about how the uncertainties in modeled predictions (e.g., predictions in flow alterations and sources of water and contaminant contributions) affect predicted impacts to fish and fish habitat.

- Recommendation: The Corps should disclose and discuss the validity and accuracy of model outputs when assessing project impacts to fish and fish habitat. Alternatively, the Corps should explain why its existing analysis of model results is sufficient, in light of the significance and complexity of the discharge activities associated with this project.

Comment: The Draft EFH Assessment discloses that a hybrid simulation analysis model (HABSYN) was used to synthesize habitat-flow relationships. According to the document, HABSYN is meant to account for predicted stream flow reductions and treated surplus water discharges from the mine water treatment plants, and its predictions are based on physical habitat simulation system (PHABSIM) modeling at measured transects. PHABSIM forces/assumes a fish-habitat relationship based on water depth and velocity (discharge) alone. We also note that PHABSIM and its subcomponents (habitat suitability curves and wetted usable area) were identified by the Pebble Project Instream Flow Technical Working Group as being problematic and inappropriate for assessing fish habitat in the project area.¹³⁰ The DEIS and supporting documents have not established that there is a relationship between discharge and fish habitat selection, which is of particular concern given that the impacted sub-watersheds of the proposed Pebble Project mine site are groundwater-driven systems.

- Recommendation: The Corps should fully disclose the uncertainties and limitations of the PHABSIM and HABSYN models and describe how the limitations affect the analysis of fish and fish habitat impacts. Alternatively, the Corps should explain why its existing use and discussion of the PHABSIM and HABSYN models is sufficient, in light of the significance and complexity of the discharge activities associated with this project.

Additional technical recommendations related to habitat modeling include:

1. PHABSIM and associated preliminary watershed model results presented in the Draft EFH Assessment (Table 5-3) indicate habitat losses in the NFK and SFK Rivers for some species and habitats (e.g., coho and Chinook salmon spawning). The DEIS asserts that there are habitat gains downstream (due to increase discharges), but these are modeled increases in discharge, and no analysis is provided to indicate that there

¹²⁹ Monthly average discharges were chosen as inputs in the streamflow model, which do not represent the range of flows that occurs each month or extreme precipitation events, both of which affect stream ecology. Calibration of the stream flow model indicated that cumulative flows were overpredicted during the first two years of the calibration period and underpredicted during the remaining three years. In some cases, measured and calculated flows differed by more than 20 percent. The model may also not be able to predict the lowest flows (RFI 104).

¹³⁰ ISF TWG meeting minutes 2010.

will be resulting habitat increases. Table 5-3 also reports net gains in sockeye salmon. We are also concerned that PHABSIM is not appropriate for capturing habitat for species that key into habitat factors, such as areas of groundwater upwelling (e.g., spawning sockeye), that are unrelated to water depth and discharges. The Corps should include additional analyses to support the results reported in EFH Assessment Table 5-3.

2. The Draft EFH Assessment discloses that wetted usable area will be used to identify available habitat; however, the information presented in Table 4.24-2 and Table 4.24-3 appears to be based on the assumption that increases in water depth and/or velocity equate to additional spawning and/or rearing habitat (see discussion above regarding limitations of PHABSIM modeling). While the tables may lead to the conclusion that there will be an increase in habitat due to discharges, discharges also may result in negative impacts (e.g., redd scouring). The Corps should evaluate potential impacts of water discharges on all relevant habitat factors, rather than focusing only on increases in water depth and/or velocity.
3. Baseline documents indicate and the Draft EFH Assessment discloses that habitat suitability curves were developed from PHABSIM modeling efforts, but the DEIS does not discuss habitat suitability curves or the appropriateness of their use. The Corps should include additional data and analyses to demonstrate the validity of this approach.

Comment: The DEIS does not include analysis of how the predictive models work together to analyze and quantify the cumulative impacts of potential changes in streamflow or water quality, and the subsequent consequences for fish and fish habitat (e.g., how flow modeling integrates with downstream water temperature modeling to demonstrate lateral and longitudinal changes in the heterogeneity and complexity of side-channel spawning habitat or beaver pond rearing habitat, or how impacts from surface and groundwater flow alterations and corresponding changes in downstream water quality affect distribution and production of benthic macroinvertebrates).

- **Recommendation:** The Corps should analyze and discuss model integration to explain how individual predictive models are combined to assess and quantify project impacts and to identify what consequential outputs mean for fish and fish habitat. Alternatively, the Corps should explain why its existing analysis is sufficient, in light of the significance and complexity of the discharge activities associated with this project.

4. Commercial and Recreational Fisheries

Comment: The DEIS does not fully describe the value of the Bristol Bay fisheries, which includes the largest sockeye salmon fishery in the world, or the Pebble Project's potential impacts to these fisheries. The Commercial and Recreational Fisheries section of EPA's DEIS comment letter provides specific comments regarding deficiencies in the DEIS's evaluation of potential impacts to commercial and recreational fisheries, as well as specific recommendations on how to address these deficiencies.

- **Recommendation:** The Corps should address the specific comments provided in the Commercial and Recreational Fisheries section of EPA's DEIS comment letter, or alternatively explain why its existing analysis is sufficient in light of the significance and complexity of the discharge activities associated with this project.

D. Groundwater and Surface Water Hydrology

According to the Guidelines, the Corps "shall determine in writing the potential short-term or long-term effects of a proposed discharge of dredged or fill material on the physical, chemical, and biological components of the aquatic environment" by making the factual determinations listed in 40 C.F.R. § 230.11. The factual determinations relevant to groundwater and surface water hydrology are the water circulation, fluctuation, and salinity determinations (40 C.F.R. § 230.11(b)); aquatic ecosystem and organism determinations (40 C.F.R. § 230.11(e)); the determination of cumulative effects on the aquatic ecosystem (40 C.F.R. § 230.11(g)); and the determination of secondary effects on the aquatic ecosystem (40 C.F.R. § 230.11(h)).

Comment: The DEIS relies on watershed, groundwater, and water balance models to predict how mine site activities will change groundwater conditions and impact surface water and aquatic resources. The uncertainty analysis for the groundwater model, however, concludes that the model may underpredict the amount of water produced during mine pit dewatering. The DEIS discloses that this could result in the groundwater zone of influence being larger than predicted and NFK, SFK, UTC, and tributary stream flows being reduced to a greater extent than is currently predicted in the DEIS. Significant adverse impacts to wetlands and to streams with documented anadromous fish occurrence (and tributaries of those streams) may result from such stream flow reductions.

- **Recommendation:** The Corps should revise the groundwater model to reduce this uncertainty and provide more accurate predictions associated with open pit dewatering. The Corps should also fully analyze the potential adverse impacts to groundwater, wetlands, and streams with documented anadromous fish occurrence (and tributaries of those streams) based on the results of the revised modeling. The Groundwater and Surface Water Hydrology section of EPA's DEIS comment letter provides additional specific comments regarding issues in the DEIS' evaluation of potential impacts to groundwater and surface water hydrology as well as specific recommendations on how to address these issues. Alternatively, the Corps should explain why its existing analysis is sufficient in light of the significance and complexity of the discharge activities associated with this project.

E. Water Quality

According to the Guidelines, the Corps "shall determine in writing the potential short-term or long-term effects of a proposed discharge of dredged or fill material on the physical, chemical, and biological components of the aquatic environment" by making the factual determinations listed in 40 C.F.R. § 230.11. The factual determinations relevant to water quality are the contaminant determinations (40 C.F.R. § 230.11(d)); aquatic ecosystem and organism determinations (40 C.F.R. § 230.11(e)); the determination of cumulative effects on the aquatic

ecosystem (40 C.F.R. § 230.11(g)); and the determination of secondary effects on the aquatic ecosystem (40 C.F.R. § 230.11(h)).

Comment: The DEIS may substantially underpredict potentially significant impacts to water quality. Our key comments are:

- The DEIS provides inadequate support for several assumptions regarding the behavior of leachate and relies on limited sample representativeness for prediction of acid rock drainage and metal leaching. This may result in unanticipated leaching of metals/metalloids at elevated concentrations;
- The DEIS lacks important details regarding the design and operation of the water treatment plants, particularly at closure. The DEIS reference material states that there is insufficient available information to evaluate the effectiveness of the closure water treatment plant to meet water quality criteria. This may prevent meaningful analysis and disclosure of potential water quality impacts related to water treatment;
- As a result of groundwater model uncertainty, the DEIS states that the water treatment plants may need to treat and discharge more mining process water than that for which the plants are currently designed. Significant impacts to water quality could occur if that is the case; and
- Use of conceptual drainage and seepage containment systems for the TSFs and water management pond do not fully support the DEIS's assumption that 100% of the seepage would be captured.

The DEIS also does not include: a data quality assessment for background water quality data, a modeling sensitivity analysis of the water quality modeling and inputs, a reasonably complete analysis of water quality impacts in the closure and post-closure phases, and monitoring and adaptive management plans.

- Recommendation: The Corps should provide a water quality analysis that accurately identifies potential significant adverse impacts to water quality and monitoring and adaptive management plans sufficient to detect and prevent unanticipated impacts to water quality. The Water Quality section of EPA's DEIS comment letter provides additional specific comments regarding issues in the DEIS' evaluation of potential water quality impacts as well as specific recommendations on how to address these issues. Alternatively, the Corps should explain why its existing analysis is sufficient in light of the significance and complexity of the discharge activities associated with this project.

F. Wildlife/Sanctuaries and Refuges

According to the Guidelines, the Corps "shall determine in writing the potential short-term or long-term effects of a proposed discharge of dredged or fill material on the physical, chemical, and biological components of the aquatic environment" by making the factual determinations listed in 40 C.F.R. § 230.11. The factual determinations relevant to evaluating potential impacts of discharges on wildlife¹³¹ and sanctuaries and refuges¹³² are the aquatic ecosystem and organism determinations (40 C.F.R. § 230.11(e)); determination of cumulative effects on the

¹³¹ 40 C.F.R. § 230.32.

¹³² 40 C.F.R. § 230.40.

aquatic ecosystem (40 C.F.R. § 230.11(g)); and the determination of secondary effects on the aquatic ecosystem (40 C.F.R. § 230.11(h)).

Comment: The proposed Amakdedori port and southern access road would be constructed adjacent to the northern boundary of McNeil River State Game Refuge (“MRSGR”). The Refuge and contiguous McNeil River State Game Sanctuary (“MRSGS”) were established by the Alaska legislature to protect the world's largest concentration of wild brown bears and the unique viewing opportunities this provides. According to the ADF&G, as many as 144 individual bears have been observed at McNeil River in a single summer¹³³ and the long-term (1976–2018) average number of individual bears annually identified is 94.4.¹³⁴

Many brown bears have large home ranges and travel seasonally between the Refuge and Sanctuary and adjacent lands to take advantage of food resources, especially salmon. ADF&G has documented that bears seen at McNeil Falls use habitat north of the Refuge where the port, access road, and pipeline are proposed.¹³⁵

The McNeil River State Game Sanctuary Annual Management Report for 2018 states that “The recently applied for Pebble Mine project has the potential for impacts to wildlife resources, management and public uses within the MRSGR and MRSGS. ADF&G staff are working within the Army Corps of Engineers (ACOE) process to identify and address MRSGS/SGR issues and concerns.”

The 2008 McNeil River State Game Refuge and State Game Sanctuary Management Plan states that activities will be restricted as necessary to prevent disturbance to or displacement of bears and other fish and wildlife. Policies in the Management Plan prohibit the construction of new permanent roads and restrict the construction of pipelines, utilities, and docks. The potential for these activities to damage fish and wildlife and to disturb fish and wildlife populations, especially brown bears that seasonally use the Refuge or Sanctuary, is incompatible with the statutory purposes for which the Sanctuary and Refuge were established.

Construction of the proposed access road would fragment high-use brown bear habitat and bisect a travel corridor. Traffic noise and disturbance may deter bears from utilizing McNeil Refuge and Sanctuary. Bears actively move along the coast and use intertidal habitats. Noise and activity at the proposed port may deter bears from using the coastal habitats at and near Amakdedori beach.

Disturbance and displacement of bears from increased noise or perturbation of food resources in the areas surrounding McNeil River could reduce the number of bears using McNeil River and prevent access to a critical natural food source. Interactions with humans or facilities at the port may affect bear behavior through food conditioning of bears or reduced tolerance of humans. Both could lead to direct mortality of bears by humans. Impacts to these Sanctuaries/Refuges and wildlife from the discharge of dredged or fill material receive limited evaluation in the record.

¹³³ <http://www.adfg.alaska.gov/index.cfm?adfg=mneilriver.main>; original data in Table A6, McNeil River State Game Refuge and State Game Sanctuary Management Plan, ADF&G 2008.

¹³⁴ 2019 ADF&G. McNeil State Game Sanctuary Annual Management Report 2018.

¹³⁵ *Id.*

- Recommendation: The Corps should evaluate possible loss of values associated with the discharge of dredged or fill material, by considering loss or change of wildlife travel corridors, disruption of migratory movements or other critical life requirements of resident or transient fish or wildlife resources, as well as the creation of incompatible human access. Alternatively, the Corps should explain why its existing analysis is sufficient in light of the significance and complexity of the discharge activities associated with this project.

VI. Determination of Least Environmentally Damaging Practicable Alternative (40 C.F.R. § 230.10(a))

The Guidelines only allow authorization of the Least Environmentally Damaging Practicable Alternative (LEDPA). The Guidelines¹³⁶ identify that, “no discharge of dredged or fill material shall be permitted if there is a practicable alternative to the proposed discharge which would have less adverse impact on the aquatic ecosystem, so long as the alternative does not have other significant adverse environmental consequences.” Identification of the LEDPA is achieved by performing an alternatives analysis that evaluates the direct, secondary/indirect, and cumulative impacts to jurisdictional waters resulting from each alternative considered. Project alternatives that are not practicable and do not meet the project purpose are eliminated.

The Guidelines recognize that the alternatives analysis developed under NEPA may provide the information needed to evaluate alternatives under the Guidelines. The Guidelines acknowledge that there may be instances where “NEPA documents may address a broader range of alternatives than required to be considered under this paragraph or may not have considered the alternatives in sufficient detail to respond to the requirements of these Guidelines. In the latter case, it may be necessary to supplement these NEPA documents with this additional information.”¹³⁷

According to the Guidelines, an alternative is practicable if it is available and capable of being done after taking into consideration cost, existing technology, and logistics in light of the overall project purposes.¹³⁸ Where the activity associated with a discharge is not “water dependent,” practicable alternatives that do not involve a discharge to wetlands and other special aquatic sites “are presumed to be available, unless clearly demonstrated otherwise.”¹³⁹

The following comments highlight information relevant to the LEDPA analysis that the Corps should consider.

Mine site component locations

Comment: The DEIS evaluates one location for each of the tailings storage facilities (TSFs), both of which involve a discharge to wetlands or other special aquatic sites. TSFs are not water dependent, and as a result, practicable alternatives that do not involve a discharge to wetlands and other special aquatic sites “are presumed to be available, unless clearly demonstrated

¹³⁶ 40 C.F.R. § 230.10(a).

¹³⁷ 40 C.F.R. § 230.10(a)(4).

¹³⁸ 40 C.F.R. § 230.10(a)(2).

¹³⁹ 40 C.F.R. § 230.10(a)(3).

otherwise.” DEIS Appendix B (TSF-025, pg B-80) indicates that the Corps considered 26 different locations for the TSFs that were not evaluated as alternatives. The DEIS identifies the location of three of these 26 options in Figure B-3 and the locations of the other 23 options are found in RFI 098. RFI 098 identifies TSF location options assessed by PLP that have less impacts to streams with anadromous fish than the proposed action. The DEIS does not fully explain why these 26 options are not practicable.

- Recommendation: Consistent with the requirements of 40 C.F.R. § 230.10(a), the Corps should include all 26 TSF options on Figure B-3 and explain why each of the 26 TSF locations are not practicable. In the alternative, EPA recommends that the Corps further explain why its existing description of the 26 TSF options is sufficient to satisfy the requirements of 40 C.F.R. § 230.10(a). This information is particularly important in light of the significance and complexity of the discharge activities associated with this project.

Comment: The location proposed for the main WMP involves a discharge to wetlands or other aquatic sites. WMPs are not water dependent, and as a result, practicable alternatives that do not involve a discharge to wetlands and other special aquatic sites “are presumed to be available, unless clearly demonstrated otherwise.” The options screening analysis in DEIS Appendix B does not appear to consider any alternative locations for the main WMP. The DEIS does not explain why the main WMP location is the only practicable alternative or explain how the WMP location was optimized to avoid and minimize impacts to aquatic resources.

- Recommendation: Consistent with the requirements of 40 C.F.R. § 230.10(a), the Corps should describe why the proposed location for the main WMP is the only practicable alternative and explain the extent to which the proposed WMP location was optimized to avoid and minimize impacts to aquatic resources. In the alternative, EPA recommends that the Corps further explain why its existing description of the main WMP is sufficient to satisfy the requirements of 40 C.F.R. § 230.10(a). This information is particularly important in light of the significance and complexity of the discharge activities associated with this project.

Comment: According to RFI 098, the 26 TSF layouts were compared to several attributes, including minimizing managed water volume, impacts to fish-bearing streams, and impacts to wetlands and stream miles. None of the attributes consider downstream impacts in the event of a tailings dam failure. In light of the value of fisheries resources in the potentially affected watersheds (see Section II), downstream impacts in the event of a tailings dam failure should be one of the attributes included in the comparison. EPA notes that the current best practice for evaluating the different tradeoffs between TSF location, dam type, and impacts is a Multiple Accounts Analysis (MAA).

- Recommendation: Consistent with the requirements of 40 C.F.R. § 230.10(a), the Corps should evaluate and document the potential downstream impacts in the event of a tailings dam failure to support its LEDPA determination and conclusions that there are not alternate location(s) that would have less impacts in the event of a tailings dam failure. The Corps should explain whether a MAA was performed for the TSFs. In the alternative, the Corps should further explain why its existing description of the alternatives analysis for the TSFs is sufficient to satisfy the requirements of 40 C.F.R. §

230.10(a). This information is particularly important in light of the significance and complexity of the discharge activities associated with this project.

Bulk TSF liner

Comment: The DEIS predicts that groundwater contamination will occur under and beyond the bulk TSF. The DEIS assumes that all contaminated groundwater will be collected by the seepage management system. As explained in more detail in the Water Quality section of EPA's DEIS comment letter, EPA's review finds that this assumption is not supported by the information provided.¹⁴⁰ EPA recommends consideration of additional measures to mitigate the predicted groundwater contamination. A liner is a typical management practice for TSFs that minimizes groundwater contamination, and such an alternative could be part of the LEDPA. We note that the Corps has recently permitted two fully lined tailings facilities at the Donlin and Haile mines and that a liner is currently being included for the pyritic TSF for the Pebble Project. The Corps' documentation does not fully explain why a liner for the bulk TSF is not practicable.

- Recommendation: Consistent with the requirements of 40 C.F.R. § 230.10(a), the Corps should evaluate use of a liner or further explain why a liner is not a practicable alternative to mitigate the predicted groundwater contamination.¹⁴¹ This information is particularly important in light of the significance and complexity of the discharge activities associated with this project.

Concentrate Pipeline:

Comment: A variant of Alternative 3 (North Road and Concentrate Pipeline) includes the discharge of treated concentrate filtrate water at the port site. As discussed in the Alternatives section of EPA's DEIS comment letter, the discharge of that process wastewater is prohibited under the CWA and the effluent limitations guidelines and new source performance standards which have been in place since 1982.¹⁴² Thus, to the extent this aspect of the variant would involve the discharge of process wastewater subject to the discharge prohibition in EPA's new source performance standards, that aspect of the variant is not practicable.

- Recommendation: Consistent with the requirements of 40 C.F.R. § 230.10(a), the Corps should remove the aspect of the variant of Alternative 3 (North Road and Concentrate Pipeline) that would involve the discharge of process wastewater subject to the discharge prohibition in EPA's new source performance standards from the alternatives analysis because it is not practicable.

Transportation Corridors

Comment: The DEIS presents alternatives for the proposed transportation corridor, each of which involves discharges to wetlands and other special aquatic sites. The road and pipeline alignments are not water dependent, and as a result, practicable alternatives that do not involve

¹⁴⁰ See the Conceptual-Level of Design and Development of Key Project Features and Plans section of EPA's DEIS comment letter for EPA's recommendations on additional information necessary to evaluate effectiveness of seepage control, support seepage rate estimates in groundwater modeling, and determine environmental impacts. The Corps should also consider whether there are other appropriate and practicable mitigation measures to address these issues consistent with 40 C.F.R. §230.10(d).

¹⁴¹ The alternative also should consider overdrains on top of the liner and pumping tailings supernatant to the main WMP, which could be an additional mitigation measure to enhance stability by further removing water from a lined tailings storage facility.

¹⁴² See 40 C.F.R. § 440.104(b)(1).

the discharge to wetlands and other special aquatic sites “are presumed to be available, unless clearly demonstrated otherwise.” The DEIS does not fully explain the information it considered when selecting which alternative road alignments to evaluate and in particular how this information relates to impacts on the aquatic ecosystem. In addition, the figures presented in K4.22 only provide information on wetlands and other aquatic resources inside the proposed corridors and do not indicate the status of areas outside the corridors. As a result, it is unclear whether impacts to aquatic resources in the proposed transportation corridors could have been avoided and minimized.

- Recommendation: Consistent with the requirements of 40 C.F.R. § 230.10(a), the Corps should clearly explain and document the information it considered for the transportation corridor alternatives to demonstrate that there are not practicable alternatives to the transportation corridors analyzed that would have less adverse impact on the aquatic ecosystem. In addition, the record should include information about how wetlands and other aquatic resources were avoided and minimized to the extent practicable. In the alternative, the Corps should further explain why its existing description of the alternatives analysis for the transportation corridor is sufficient to satisfy the requirements of 40 C.F.R. § 230.10(a). This information is particularly important in light of the significance and complexity of the discharge activities associated with this project.

Comment: Alternatives 2 and 3 include a port at Diamond Point, which is currently being developed as a rock quarry. Development of the Diamond Point rock quarry involves construction of an access road, breakwater, barge landing, and a solid-fill dock. It also involves 11.42 acres of intertidal fill and dredging in Iliamna Bay. The DEIS does not consider the Diamond Point alternative in light of this rock quarry. Specifically, the DEIS does not explain whether and how the rock quarry and Diamond Point alternative will cause impacts to the same aquatic resources. The DEIS would be strengthened by a discussion of whether and how the dredging for the rock quarry would reduce the 58 acres of dredging and 16 acres of onshore dredge materials storage proposed for Alternatives 2 and 3. In addition, the DEIS does not consider whether and how the two projects will be integrated, if at all. As a result, the DEIS does not fully explain whether there is a practicable alternative to the Diamond Port alternative that would have less adverse impact on the aquatic ecosystem.

- Recommendation: Consistent with the requirements of 40 C.F.R. § 230.10(a), the record should document whether and how the rock quarry and proposed Diamond Point port infrastructure, dredging, and vessel operations will cause impacts to the same aquatic resources. In addition, the Corps should explain whether and how the two projects will be integrated, if at all. In the alternative, the Corps should further explain why its existing description of the alternatives analysis for the Diamond Port alternative is sufficient to satisfy the requirements of 40 C.F.R. § 230.10(a). This information is particularly important in light of the significance and complexity of the discharge activities associated with this project.

Potential Additional Transportation Corridor – Terminating at Iniskin Bay

Comment: The DEIS indicates that expanded surface mining would require construction of the north access road and concentrate pipeline as described in Action Alternative 3. However, the concentrate pipeline would terminate at a new deepwater port facility constructed in Iniskin

Bay¹⁴³ rather than at Diamond Point. A diesel pipeline following the road route and a diesel terminal at the Iniskin Bay port would also be required.¹⁴⁴ The Iniskin Bay port and diesel pipeline are not, however, being evaluated as alternatives for the currently proposed project, and the DEIS does not explain this decision. These components may be practicable now and it is possible that they could be part of the LEDPA. In evaluating whether the Iniskin Bay Port and diesel pipeline are part of the LEDPA, the Corps must evaluate the direct, secondary/indirect, and cumulative impacts to jurisdictional waters resulting from each alternative considered. One potential advantage of the Iniskin Bay port and diesel pipeline is that constructing this infrastructure now may avoid redundant infrastructure for expanded surface mining. Specifically, when the cumulative impacts of expanded mine development are considered, infrastructure such as the southern access route and ferry would appear to be redundant and therefore involve avoidable impacts.

- Recommendation: Consistent with the requirements of 40 C.F.R. § 230.10(a), the Corps should evaluate this additional transportation corridor alternative terminating in Iniskin Bay or explain why it is not practicable. This information is particularly important in light of the significance and complexity of the discharge activities associated with this project.

VII. Water Quality (40 C.F.R. § 230.10(b))

The Guidelines prohibit discharges that will cause or contribute to violations of any applicable state water quality standard.¹⁴⁵ The following comments highlight information relevant to water quality that the Corps should consider.

Comment: As included above (see Section V.E) and in more detail in our DEIS comment letter (see Water Quality section of EPA's DEIS comment), the DEIS may substantially underpredict potentially significant impacts to water quality.

- Recommendation: Consistent with the requirements of 40 C.F.R. § 230.10(b), the Corps should provide a water quality analysis that accurately identifies potential significant adverse impacts to water quality and monitoring and adaptive management plans sufficient to detect and prevent unanticipated impacts to water quality. The Water Quality section of EPA's DEIS comment letter provides additional specific comments regarding issues in the DEIS' evaluation of potential water quality impacts as well as specific recommendations on how the Corps should address these issues. In the alternative, the Corps should further explain why its existing description of water quality impacts is sufficient to satisfy the requirements of 40 C.F.R. § 230.10(b). This information is particularly important in light of the significance and complexity of the discharge activities associated with this project.

¹⁴³ The project proponent previously evaluated Iniskin Bay as a potential port site and we understand that multiple years of baseline data were collected.

¹⁴⁴ DEIS Table 4.1-2.

¹⁴⁵ 40 C.F.R. § 230.10(b).

VIII. Significant Degradation (40 C.F.R. § 230.10(c))

The Guidelines prohibit authorization of a proposed discharge that causes or contributes to significant degradation of the aquatic ecosystem.¹⁴⁶ The evaluation of the potential for significant degradation “shall be based upon appropriate factual determinations, evaluations, and tests” as described in 40 C.F.R. § 230.11 after consideration of potential impacts and effects identified in the Guidelines “with special emphasis on the persistence and permanence of the effects.”¹⁴⁷ According to the Guidelines, effects contributing to significant degradation considered individually or collectively, include:

1. Significantly adverse effects of the discharge of pollutants on human health or welfare, including but not limited to effects on municipal water supplies, plankton, fish, shellfish, wildlife, and special aquatic sites.
2. Significantly adverse effects of the discharge of pollutants on life stages of aquatic life and other wildlife dependent on aquatic ecosystems, including the transfer, concentration, and spread of pollutants or their byproducts outside of the disposal site through biological, physical, and chemical processes;
3. Significantly adverse effects of the discharge of pollutants on aquatic ecosystem diversity, productivity, and stability. Such effects may include, but are not limited to, loss of fish and wildlife habitat or loss of the capacity of a wetland to assimilate nutrients, purify water, or reduce wave energy; or
4. Significantly adverse effects of discharge of pollutants on recreational, aesthetic, and economic values.¹⁴⁸

The impacts identified in the DEIS (see Section III above) suggest that the proposed discharges may have the potential to cause or contribute to significant degradation. However, as discussed in detail in Sections V and VII, the current record lacks sufficient information necessary to make a reasonable judgment that the discharges of dredged or fill material will not cause or contribute to significant degradation of the aquatic ecosystem. The level of information supporting the Corps’ factual determinations and documentation explaining the basis for its ultimate conclusions regarding significant degradation should be commensurate with the significance and complexity of the discharge activities associated with this project.

Consistent with EPA’s recommendation in Section V.A. and V.B., the analysis should include sufficient information that characterizes:

- the extent of streams, wetlands, lakes, ponds and other aquatic resources that are potentially affected;
 - the array of functions currently provided by these aquatic resources and the degree to which each function is currently being performed by each aquatic resource type;
 - the degree to which performance of these functions would change as a result of the direct, secondary/indirect, and cumulative impacts of the discharges if they were implemented;
- and

¹⁴⁶ 40 C.F.R. § 230.10(c).

¹⁴⁷ *Id.*

¹⁴⁸ *Id.*

- the significance or severity of those changes.

Sections V and VII describe the types of information and analysis that are relevant to determining the proposed project's potential impacts on fishery resources. The factual determinations should address the impacts to fish and fish habitat including:

- habitat characterization, assessment, quantification, and spatial referencing;
- mechanistic linkages of how the loss and/or degradation of habitat will impact fish species and life stages (i.e., incubating eggs, spawning fish and rearing juveniles);
- groundwater and surface water flow characterization that is relevant to fish and fish habitat;
- population-level effects and genetic diversity within the context of the Bristol Bay salmon portfolio; and
- uncertainties associated with habitat and impact assessments (e.g., in terms of sampling, data, and modeling limitations).

While we are placing focus on evaluation of the potential adverse effects of the discharges on fish, Section 230.10(c) requires the evaluation of the potential for significant adverse effects of the discharges on a broader suite of factors associated with the aquatic ecosystem as well as human health and welfare (which in this case includes potential adverse effects on subsistence resources) and recreational, aesthetic, and economic values.¹⁴⁹

IX. Minimization/Compensatory Mitigation (40 C.F.R. § 230.10(d))

The Guidelines prohibit discharges that do not include all appropriate and practicable measures to minimize potential harm to the aquatic ecosystem.¹⁵⁰ This requirement includes appropriate and practicable compensatory mitigation to offset unavoidable environmental impacts associated with discharges permitted under CWA Section 404.

Conceptual Plans Relevant to Minimization

Comment: The DEIS and supporting reference information acknowledges that critical aspects of the Pebble Project are at a conceptual level (i.e., early or initial stage) of design and development. Critical but conceptually developed project components include: the open pit mine dewatering system; the dams retaining the mine's tailings and main water management pond; the collection, pumpback, and monitoring systems for managing seepage from the TSFs and main water management pond; and the closure water treatment plant. Critical plans that are missing from or only conceptually described in the DEIS include plans for: mine reclamation and closure; environmental monitoring; adaptive management; tailings and waste rock characterization and management; fugitive dust control; and strategic timing of water discharges. Our DEIS comment letter provides detailed descriptions of the critical information currently missing from these project components and plans, see section entitled Conceptual-Level of Design and Development of Key Project Features and Plans. The DEIS states that these designs and plans will be developed during the state of Alaska permitting process and, because PLP has not started the State permitting process, the detailed designs and plans are not currently available.

¹⁴⁹ *Id.*

¹⁵⁰ 40 C.F.R. § 230.10(d) and § 230.12(a)(3)(iii).

These project components and plans include information regarding critical aspects of the project relevant to the evaluation of minimization of environmental impacts and often serve as a record basis supporting a determination that all appropriate and practicable steps have been taken which will minimize potential adverse impacts of the discharge. As discussed above, there is insufficient information to make a reasonable judgment regarding the severity of environmental impacts that the plans are meant to prevent or minimize. The DEIS assumes without justification that they all will be completely effective and therefore, EPA is unable to independently determine the effectiveness of each plan.

- Recommendation: Consistent with 40 C.F.R. § 230.10(d), critical project information or plans should be developed beyond the conceptual stage with a reasonable level of detail to support a determination that the project complies with the minimization requirements in the Guidelines. Specific recommendations can be found in our DEIS comment letter, see section entitled Conceptual-Level of Design and Development of Key Project Features and Plans. Alternatively, the Corps could explain why information or plans at the conceptual stage provide sufficient information to make a reasonable judgment that the proposed discharge will comply with the Guidelines in light of the significance and complexity of the discharge activities associated with this project.

Comment: The DEIS does not include information to demonstrate that that all appropriate and practicable steps will be taken to minimize potential adverse impacts on the aquatic ecosystem associated with the impoundment structure. The DEIS only includes conceptual design information on this issue but does not include information demonstrating that the impoundment complies with dam safety criteria. The Corps can require an independent review during the application process pursuant to 33 C.F.R. § 325.1(d)(6), which states:

If the activity would involve the construction of an impoundment structure, the applicant may be required to demonstrate that the structure complies with established state dam safety criteria or that the structure has been designed by qualified persons and, in appropriate cases, independently reviewed (and modified as the review would indicate) by similarly qualified persons.

- Recommendation: Given the size and nature of the tailings and water management pond impoundments and embankments, the significance and complexity of the discharge activities associated with this project, and the importance of downstream aquatic resources, the Corps should require an independent review of the structures.¹⁵¹ At a minimum, the Corps should require PLP to demonstrate that the impoundment structures would comply with state dam safety criteria. This information is critical to make a reasonable judgment that all appropriate and practicable steps have been taken to minimize impacts on the aquatic ecosystem associated with the construction and operation of the impoundments. The information generated through this process may be relevant to both minimization and the LEDPA determination.

¹⁵¹ We note that other recent mining EISs developed by the Corps have included more than conceptual design information (i.e., Donlin and Haile).

Compensatory Mitigation

The Corps must include appropriate and practicable compensatory mitigation to offset unavoidable impacts.¹⁵² Compensatory mitigation is defined as the restoration, establishment, enhancement, and/or in certain circumstances preservation of aquatic resources for the purposes of offsetting unavoidable adverse impacts which remain after all appropriate and practicable avoidance and minimization has been achieved.¹⁵³

Comment: To be considered complete, CWA Section 404 permit applications must include a statement describing how impacts to waters of the United States are to be compensated for or a statement explaining why compensatory mitigation should not be required.¹⁵⁴ EPA acknowledges that the final rule preamble explains that the statement in 33 C.F.R. § 325.1(d)(7) “should be brief, because the permit evaluation process is iterative and district engineers often require additional avoidance and minimization as they evaluate permit applications.”¹⁵⁵ PLP’s Section 404 permit application materials published to the Corps’ website include the following statement regarding compensatory mitigation:

The 2008 Compensatory Mitigation for Losses of Aquatic Resources: Final Rule established mechanisms to provide compensatory mitigation for unavoidable impacts to WOUS, and mitigation will be considered in detail throughout the permitting and NEPA processes. PLP will work with USACE throughout the process to identify and implement a compensatory mitigation plan that is appropriate for the final Project.¹⁵⁶

Corps and EPA regulations state that “the public notice for the proposed activity must contain a statement explaining how impacts associated with the proposed activity are to be avoided, minimized, and compensated for. This explanation shall address, to the extent that such information is provided in the mitigation statement required by 33 C.F.R. § 325.1(d)(7) . . . the amount, type, and location of any proposed compensatory mitigation, including any out-of-kind compensation, or indicate an intention to use an approved mitigation bank or in-lieu fee program.”¹⁵⁷

Importantly, the regulations require that “[t]he level of detail provided in the public notice must be commensurate with the scope and scale of the impacts.”¹⁵⁸ The purposes of the public notice requirements are to allow for an opportunity for meaningful input and comment by the public and federal agencies on the proposed mitigation, even at this initial stage.¹⁵⁹

¹⁵² 40 C.F.R. § 230.10(d).

¹⁵³ 40 C.F.R. § 230.92.

¹⁵⁴ 33 C.F.R. § 325.1(d)(7).

¹⁵⁵ 70 Fed. Reg. at 19617 (2008).

¹⁵⁶ Pebble Project Department of the Army Application for Permit, POA-2017-271, January 2019, page 37.

¹⁵⁷ 33 C.F.R. § 332.4(b)(1)/ 40 C.F.R. § 230.94(b)(1).

¹⁵⁸ 33 C.F.R. § 332.4(b)(1)/ 40 C.F.R. § 230.94(b)(1).

¹⁵⁹ 33 C.F.R. § 332.4(b)(1)/ 40 C.F.R. § 230.94(b)(1) (discussing that the “notice must still provide enough information to enable the public to provide meaningful comment on the proposed mitigation” even where the permittee asserts Confidential Business Information claims). 33 C.F.R. § 332.4(b)(2)/ 40 C.F.R. § 230.94(b)(2) requires that the District Engineer consider timely comments and recommendations from other federal agencies; tribal; state or local governments; and the public.”

PLP's mitigation statement in POA-2017-00271 included per 33 C.F.R. § 325.1(d)(7) does not include information regarding specific compensatory mitigation projects (i.e., the amount, type and location) and does not address compensatory mitigation for all of the impacts identified in the DEIS. Like the mitigation statement included in the permit application, the public notice for the permit does not include the types of information discussed in 40 C.F.R. § 230.94(b)(1).

PN POA-2017-00271 states that PLP has proposed mitigation measures to avoid, minimize, and compensate for impacts to waters of the United States in DEIS Chapter 5 and Appendix M. Appendix M contains the applicant's draft conceptual Compensatory Mitigation Plan (CMP). The CMP provides summary information regarding the compensatory mitigation regulations, the potential impacts, and potentially affected watersheds. It states that PLP proposes to compensate for 3,524 acres of direct permanent losses of waters of the United States. It also states that "PLP's compensatory mitigation approach will focus on opportunities that benefit water quality and fish and their habitat. While the intent is to seek such opportunities within the watershed, if opportunities are not available PLP will reach for similar opportunities outside the watershed." The CMP does not include any proposed compensatory mitigation projects or information regarding type and location of compensatory mitigation under consideration. It states that "[t]his CMP will be amended in the future to include proposed mitigation plans." The DEIS states that "[s]pecific mitigation conditions would be determined following completion of the environmental review and would be included in the ROD for any permit that may be issued."¹⁶⁰

- Recommendation: The Corps should provide an opportunity for meaningful public comment on a CMP that includes a level of detail "commensurate with the scope and scale of the impacts" as well as the "amount, type, and location" of compensation they could potentially provide. Alternatively, the Corps should further explain why, considering the scope and scale of the impacts associated with the proposed project, the CMP contains the level of detail and information required by the public notice regulations at 40 C.F.R. § 230.94(b)(1). In addition, the Corps should explain why the information included in the public notice provided the public or other federal agencies with an opportunity to provide meaningful comment or recommendations on the proposed mitigation as contemplated by the regulations. The Corps should further explain why the CMP complies with the requirements under Section 404 discussed above or the NEPA requirements that mitigation measures be discussed in the EIS sections on alternatives and environmental consequences.¹⁶¹ This is particularly important in light of the significance and complexity of the discharge activities associated with this project.

Comment: The Guidelines identify that "[c]ompensatory mitigation requirements must be commensurate with the amount and type of impact that is associated with a particular DA permit."¹⁶² They also specify that "the amount of required compensatory mitigation must be, to the extent practicable, sufficient to replace lost aquatic resource functions."¹⁶³

¹⁶⁰ DEIS 5-23.

¹⁶¹ 40 C.F.R. § 1502.14(f) and § 1502.16(h).

¹⁶² 40 C.F.R. § 230.93(a)(1).

¹⁶³ 40 C.F.R. § 230.93(f)(1).

The CMP indicates that PLP proposes to compensate for 3,524 acres of direct permanent losses of waters of the United States. As discussed above in Section V, the DEIS may not have accounted for and characterized all of the potential direct and secondary/indirect impacts of the discharges of dredged or fill material. In addition, the CMP does not address potential compensatory mitigation for the other impacts acknowledged in the DEIS: the direct impacts to over 80 linear miles of streams, the temporary impacts to 510 acres of wetlands and other waters, and the more than 2,800 acres of secondary/indirect impacts to wetlands, streams and other aquatic resources.

- Recommendation: PLP's revised CMP should explain how the amount of compensation reflects the amount necessary to meet applicable requirements for the full scope of direct and secondary/indirect impacts of the discharge of dredge and fill material (see Section V). This information is particularly important in light of the significance and complexity of the discharge activities associated with this project.

Comment: The factual determinations underlying the Corps' Guidelines compliance involves a determination of "the nature and degree of effect that the proposed discharge will have, both individually and cumulatively, on the structure and function of the aquatic ecosystem and organisms."¹⁶⁴ "Compensatory mitigation requirements must be commensurate with the amount and type of impact"¹⁶⁵ identified and "sufficient to replace lost aquatic resource functions."¹⁶⁶ The Guidelines state that where functional assessments are available (as they are here), they should be used to determine the amount of compensation that would be sufficient to offset the authorized impacts.¹⁶⁷ Functional assessments provide a mechanism to quantify the extent of functional loss (debits) and functional gain (credits). Debits represent the loss of function at the impact site, while credits represent the accrual or attainment of aquatic functions at a compensatory mitigation site.

The Corps Alaska District has a Credit Debit Methodology that uses function or condition data to quantify the functional losses or gains between the current and proposed future condition. These functional deltas are used to calculate debits and credits, as recommended by the regulations.

As discussed in Section V.B., data was collected that could support development of a functional assessment to identify the amount of functional losses resulting from impacts to wetlands and other aquatic resourced and inform compensatory mitigation decisions. However, this data was not used in the DEIS. As discussed in Section V.C., additional information and analysis is needed to identify the amount of losses specifically associated with fish-related functions. This information and analysis are critical to informing decisions regarding the appropriate type and amount of compensation necessary to offset impacts to fish and fish habitat.

- Recommendation: The Corps should use available data that was collected to support aquatic resource functional assessments and supplement that data where necessary, particularly to identify the amount of losses associated with fish-related functions and use this information to inform decisions regarding the appropriate type and amount of compensatory mitigation necessary to offset the expected functional losses from the

¹⁶⁴ 40 C.F.R Section 230.11(e).

¹⁶⁵ 40 C.F.R. § 230.93(a)(1).

¹⁶⁶ 40 C.F.R. § 230.93(f)(1).

¹⁶⁷ 40 C.F.R. § 230.93(f)(1) and 73 FR 19633 (2008).

proposed Pebble Project. These analytical steps are particularly important in light of the significance and complexity of the discharge activities associated with this project.

X. Conclusions

The EPA has concerns regarding the extent and magnitude of the substantial proposed impacts to streams, wetlands, and other aquatic resources that may result, particularly in light of the important role these resources play in supporting the region's valuable fishery resources. Pursuant to the field level procedures outlined in Part IV, paragraph 3(a) of the 1992 Memorandum of Agreement (MOA) between EPA and the Department of the Army regarding CWA Section 404(q), Region 10 finds that this project as described in the PN may have substantial and unacceptable adverse impacts on fisheries resources in the project area watersheds, which are aquatic resources of national importance.

The EPA recognizes that the standard set out in the MOA is similar to the Section 404(c) standard. However, Region 10's decision to utilize the coordination procedures under the MOA is not a decision regarding its Section 404(c) action and should not be interpreted as such. The EPA has not made a decision regarding whether to withdraw the 2014 Proposed Determination or leave it in place. Region 10 is coordinating under the MOA at this time to ensure that the EPA can continue to work with the Corps to address concerns raised during the permitting process. The EPA looks forward to continuing to work closely with the Corps on further development of the EIS and other supporting analyses related to this PN.



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
Washington, D.C. 20460

OFFICE OF
GENERAL COUNSEL

July 25, 2019

The Honorable R.D. James
Assistant Secretary of the Army (Civil Works)
U.S. Department of the Army
108 Army Pentagon
Washington, DC 20310-0108

Dear Mr. James:

I am writing in regard to EPA Region 10's July 26, 2019 deadline to provide notice under Part IV, paragraph 3(b) of the 1992 Memorandum of Agreement to implement CWA Section 404(q) (hereinafter referred to as the "MOA").

As you know, the U.S. Environmental Protection Agency (EPA) Region 10 submitted comments on July 1, 2019 to the U.S. Army Corps of Engineers, Alaska District on Public Notice POA-2017-00271 for a Clean Water Act (CWA) Section 404 permit dated March 1, 2019 (PN). In addition to the CWA Section 404 comment letter, EPA Region 10 also submitted comment letter under the National Environmental Policy Act and Section 309 of the Clean Air Act on the Alaska District's February 2019 Draft Environmental Impact Statement for the Pebble Project (CEQ Number 20190018; EPA Region 10 Project Number 18-0002-CUE). We understand that the Alaska District received over 100,000 comments on its Draft Environmental Impact Statement alone.

In the July 1, 2019 comment letter, Region 10 initiated the procedure outlined in Part IV, paragraph 3(a) of the 404(q) MOA. Pursuant to the MOA, once a letter is sent under paragraph 3(a), the Regional Administrator has 25 calendar days after the end of the public comment period to notify the District Engineer by letter that "the discharge will have substantial and unacceptable impact on aquatic resources of national importance." This 25-day period can provide an opportunity for the Corps District to better understand and consult with the EPA Region about the issues raised or provide additional information.

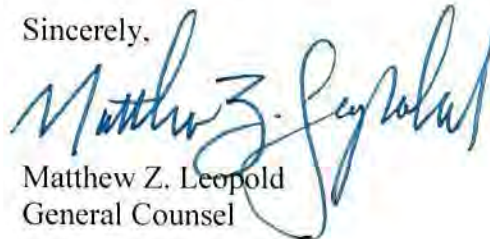
The overall timelines provided in the 404(q) MOA were developed to implement CWA section 404(q). Section 404(q) provides that "such agreements shall be developed to assure that, to the maximum extent practicable, a decision with respect to an application for a permit under subsection (a) of this section will be made not later than the ninetieth day after the date the notice for such application is published under subsection (a) of this section." 33 U.S.C. § 1344(q). While the timelines in 404(q) MOA are generally important to meet to facilitate efficiency and timeliness in the permitting process, the 404(b)(1) Guidelines recognize that the Guidelines

analyses and documentation depend on the significance and complexity of the discharge activity. 40 C.F.R. § 230.6(b).

Under the current timeline provided in the MOA, EPA would need to make a decision about whether to send a letter under paragraph 3(b) on or before July 26, 2019. Given the significance of the project, substantive issues raised in EPA's comment letters on the Alaska District's DEIS and 404 PN as well as the number of other comments received by the District which the Corps must devote resources to considering, EPA recognizes that it is not practicable for the Corps to engage in the activities described above in the 25 calendar days contemplated by MOA. As a result, we request your acknowledgement that under the particular circumstances here, fulfilling each of our agency's roles under the statute, regulations and MOA warrants taking more time for additional engagement in the 404(q) process.

The MOA was entered into by the Assistant Secretary of the Army for Civil Works and the Acting Assistant Administrator of Water. I have been delegated the authority to perform all functions and responsibilities retained by the Administrator or previously delegated to the Assistant Administrator for Water related to the Pebble Deposit Area. I am requesting, for purposes of this particular permitting proceeding, that we memorialize through an exchange of letters our agreement on or before July 26, 2019 to extend the deadline described in paragraph 3(b) beyond the 25 days contemplated in 404(q) MOA for this project.¹ Specifically, I am seeking an extension of the deadline to send a letter under paragraph 3(b) of the 404(q) MOA to 30 days after the Corps provides EPA with the preliminary drafts of decision documents, draft permit and Record of Decision, for its consideration. This agreement is an important step in EPA's continued efforts to work with the Corps on the CWA Section 404 permitting process, to appropriately address impacts from the proposed mine consistent with applicable law.

Sincerely,



Matthew Z. Leopold
General Counsel

¹ This letter and the Corps' response letter reflect a voluntary agreement that expresses the good-faith intentions of the Parties. Neither these letters nor the MOA referenced herein are intended to be legally binding, do not create any contractual obligations, or are not enforceable by any party. In addition, the letters and the MOA referenced herein do not create any right or benefit, substantive or procedural, enforceable by law or equity, by persons who are not party to this agreement, against the U.S. Army Corps or EPA, their officers or employees, or any other person.



DEPARTMENT OF THE ARMY
ASSISTANT SECRETARY OF THE ARMY
CIVIL WORKS
108 ARMY PENTAGON
WASHINGTON DC 20310-0110

Mr. Matthew Z. Leopold
General Counsel
U.S. Environmental Protection Agency
Washington, D.C. 20460

Dear Mr. Leopold,

I am in receipt of your letter dated July 25, 2019, regarding the Pebble Limited Partnership (PLP) application for a permit under Section 404 of the Clean Water Act (33 USC 1344).

On July 1, 2019, the United States Environmental Protection Agency (EPA) Region 10 submitted comments on the United States Army Corps of Engineers (USACE) February 2019 Draft National Environmental Policy Act Environmental Impact Statement for the PLP project, and in separate correspondence also provided comments on the Public Notice POA-2017-00271 (PN) for the draft Clean Water Act permit.

The July 1, 2019 EPA PN letter indicated that the discharge of fill material associated with the PLP project *may* result in substantial impacts to waters of the United States within the Bristol Bay and Cook Inlets. This determination initiated the procedure outlined in the Part IV paragraph 3(a) of the 1992 Memorandum of Agreement (MOA) between the Army and EPA to implement Section 404(q) of the Clean Water Act. Upon initiation of the Part IV 3(a) MOA procedures, under MOA Section 3(b), the EPA has twenty-five (25) calendar days from July 1st to provide letter notification to the USACE Alaska District Engineer on whether discharges from the PLP project *will* have substantial and unacceptable impacts to aquatic resources of national importance.

In your July 25, 2019 letter to this office, you requested an extension of the timeframes for EPA to make a Paragraph 3(b) determination. Based on this request, I am agreeing to a ninety (90) calendar day extension. I anticipate that EPA will work closely with the USACE Alaska District throughout this extension period, and I encourage such continued coordination.

The Army looks forward to continuing to work with EPA on this important project.

Sincerely,

A handwritten signature in blue ink that reads "R.D. James".

R.D. James
Assistant Secretary of the Army
(Civil Works)



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
Washington, D.C. 20460

OFFICE OF
GENERAL COUNSEL

October 22, 2019

The Honorable R.D. James
Assistant Secretary of the Army (Civil Works)
U.S. Department of the Army
108 Army Pentagon
Washington, DC 20310-0108

Dear Mr. James:

I am writing regarding EPA's October 24, 2019 deadline to provide notice under Part IV, paragraph 3(b) of the 1992 Memorandum of Agreement to implement CWA Section 404(q) (hereinafter referred to as the "404(q) MOA") discussed in your letter dated July 26, 2019.

Since my prior request for an extension, staff from EPA and Army Corps have discussed the status of the Alaska District's process to consider and evaluate EPA's July 1, 2019 comment letters. EPA and Army Corps officials from the Alaska District in Seattle, Washington met on September 24, 2019 to discuss the status of the Alaska District's process regarding the Pebble Mine project.

I understand that the Alaska District is currently evaluating the NEPA comments it received from the cooperating agencies, including EPA's comments, and expects to provide the agencies a response to their comments and a preliminary Final Environmental Impact Statement in the coming months. I understand that the Alaska District will also prepare its CWA Section 404(b)(1) Guidelines analysis, principally focusing on the NEPA related comments.

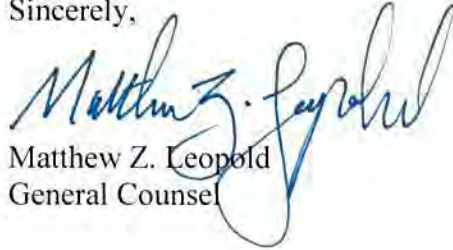
Given this projected timeline, I am requesting an extension of the October 24, 2019 deadline for EPA to provide notice under paragraph 3(b) of the 404(q) MOA to allow enough time for the Alaska District to conduct its work and confer with EPA on its CWA Section 404 comments. Specifically, I am requesting an extension of the deadline for a letter under paragraph 3(b) of the 404(q) MOA to 30 business days after the Army Corps provides the EPA with the preliminary drafts of decision documents, including the preliminary draft permit and preliminary draft Record of Decision.

In addition, in order to facilitate resolution of issues raised in the EPA's July 1, 2019 CWA Section 404 comment letter, I am also requesting that the Alaska District staff meet with the EPA staff during this extension time-period to discuss the issues raised in the comment letter. EPA is requesting these meetings to provide an opportunity for more detailed discussions regarding how the issues raised by EPA will be addressed in the context of compliance with the

CWA Section 404(b)(1) Guidelines. EPA also recognizes that new information regarding some of these topics has been added to the project's Environmental Impact Statement website since the EPA submitted its Section 404 comment letter. These meetings would also provide an opportunity for the EPA and the Army Corps to discuss plans to incorporate this new information into the Army Corps' CWA Section 404 decision-making and NEPA decision-making.

We appreciate your continued efforts to work with EPA on this important matter.

Sincerely,

A handwritten signature in blue ink that reads "Matthew Z. Leopold". The signature is fluid and cursive, with the first name "Matthew" and last name "Leopold" clearly legible, and "Z." as a middle initial.

Matthew Z. Leopold
General Counsel



DEPARTMENT OF THE ARMY
OFFICE OF THE ASSISTANT SECRETARY
CIVIL WORKS
108 ARMY PENTAGON
WASHINGTON DC 20310-0108

OCT 24 2019

Mr. Matthew Z. Leopold
General Counsel
U.S. Environmental Protection Agency
Washington, DC 20460

Dear Mr. Leopold:

I have reviewed your October 22, 2019 letter regarding the Pebble Limited Partnership (PLP) application for a permit (POA-2017-00271) under Section 404 of the Clean Water Act (CWA). You are requesting another time extension for the Environmental Protection Agency (EPA) to make a determination under Part IV paragraph 3(b) of the 1992 Memorandum of Agreement (MOA) between the Army and EPA implementing Section 404 (q) of the CWA.

In response to your July 26, 2019 letter regarding this permit application, I authorized a ninety (90) calendar day extension to allow the U.S. Army Corps of Engineers (Corps), Alaska District, EPA and other cooperating agencies to resolve outstanding comments on the application. The extension was granted in part due to the overall complexity of the project and number of comments received during the public notice and comment process.

Since that time, the Corps has continued to work with EPA and other stakeholders on this project. In the coming weeks, I understand there will be a series of technical meetings between the Corps, EPA and other cooperating agencies to resolve outstanding comments. Those meetings will allow the Corps to complete a preliminary final environmental impact statement and other related documents. The Corps will also open a 30-45 day cooperating agency review period currently anticipated to conclude mid-February 2020. I believe this significant open and transparent review period will afford EPA the opportunity to make any further and necessary determinations regarding the project under the above-referenced MOA. Accordingly, I am authorizing a second extension until February 28, 2020. During this additional extension period, I encourage EPA and the Corps to resolve all remaining issues.

As always, I appreciate EPA's continued involvement and evident willingness to engage meaningfully with the Army in reviewing this significant project.

Sincerely,

A handwritten signature in blue ink, appearing to read "R. James", is positioned above the typed name.

R.D. James
Assistant Secretary of the Army
(Civil Works)

Department of the Interior Correspondence with the US Army Corps of Engineers



Department
of the
Interior

1. June 29, 2018 Letter from DOI-BIA to Army Corps on NEPA scoping
2. July 1, 2019 letter from DOI to Army Corps on Draft EIS

Excerpts from Correspondence

Pebble poses significant risk to the Bristol Bay salmon fishery

The DOI is concerned that developing an open pit mine and associated infrastructure at the headwaters of critical salmon habitat could cause permanent, adverse impacts to the ecologically and economically important Bristol Bay watershed, its world-class fisheries, and the commercial, recreational, and subsistence users who depend on them.

at pg. 2-9

See also, examples on pages 2-9

Significant deficiencies with the salmon impact analysis

The DEIS, as prepared, does not follow NEPA requirements and conventions for data inclusion or analysis for an activity of this scope and scale. The DEIS precludes meaningful analysis

at pg. 2-7

the DEIS does not fully discuss the potential impacts of the proposed mining activity on DOI-managed resources and lacks a number of important analyses that are necessary to adequately assess the project.

at pg. 2-13

The DEIS does not acknowledge the importance of the Bristol Bay river system in supporting roughly half of the world's sockeye salmon population, and potential impacts to these fishery resources are underestimated.

at pg. 2-9

See also, examples on pages 2-18 2-22

Remedies to bring the Corps' process back on track

Due to the substantial deficiencies and data gaps identified in the document and as a department with multiple cooperating agencies, the DOI recommends that the USACE prepare a revised or supplemental DEIS.

at pg. 2-7

See also, examples on pages 2-9

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United States Department of the Interior

BUREAU OF INDIAN AFFAIRS
Alaska Regional Office
3601 C Street, Suite 1200
Anchorage, AK 99503



IN REPLY REFER TO:
BIA Department of Natural Resources

JUN 28 2018

Memorandum

To: U.S. Army Corps of Engineers, Alaska District

From: Acting Regional Director, Alaska Region

Subject: **USDO I BIA Alaska Region Comments for USA CE PRE-EIS SCOPING: DA Permit Application 2017-271, Pebble Mine Limited Partnership (PLP)**

The Alaska Region Bureau of Indian Affairs (BIA AK Region) would like to provide the following perspectives pertaining to the U.S. Army Corps of Engineers (USACE) pre-Environmental Impact Statement (EIS) scoping effort for the Department of the Army's Permit Application POA-2017-271 for the proposed mineral extraction development in the Bristol Bay region of southwest Alaska (submitted by the Pebble Mine Limited Partnership). Our comments will focus on the Department of Interior's trust responsibilities for Alaska Tribes and their members, with attention to issues that might affect their abilities to continue their long-standing subsistence traditions -- which constitute the important foundation for their cultures -- as well potential impacts to Native allotments, and the tribal socio-economic opportunities that are based on the valuable natural resources found in this remote region.

For the DEIS, we would like the USACE to address how the proposed development activities might directly, indirectly, and/or cumulatively affect vital aquatic and terrestrial resources used by Tribes, and/or the habitats which are important to the fish, wildlife, and plants that tribal members utilize for their subsistence traditions and livelihoods; in particular, impacts from:

- A. The extraction, transport, and/or chemical treatment of mined ore
- B. The infrastructure development needed to support mining and post-mining activities, and the potential time frame for these activities and structures

These include (but are not limited to) the following:

- 1) Spills/releases of chemicals associated with ore extraction, transport, and processing (including those released/leached from facilities used for storage of mined potential acid producing tailings), which might contaminate surface waters and/or groundwater sources

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- 2) Disturbance on habitats and associated biota, from mining/infrastructure development and operations (including habitat loss due to hydrological drawdown zones in and around the mine)
- 3) Changes in the spatial-temporal distributions and/or abundance of fish, wildlife, and other resources, from mining/infrastructure development and operations
- 4) Changes in tribal socio-economic opportunities (by sector)

Specific watersheds located within the Nushagak and Kvichak that could affect Tribal members from the proposed development include:

- South Fork Koktuli River
- North Fork Koktuli River
- Upper Talarik Creek.

Additional concerns exist regarding the potential impacts to the hundreds of allotments owned by Alaska Natives, which dot the landscape within the watersheds most likely affected by the proposed mining activities. (As an example, our BIA AK Region data records indicate that 138 allotments exist on the shores of the Koktuli River.) These holdings were selected primarily for their importance as subsistence harvesting locations and traditional family holdings, with many of them found along streams, rivers, lakes or other sources of fresh water (providing sources of freshwater used by tribal members, within and/or downstream of their allotments); each allotment is located in watersheds also contains high-quality, diverse aquatic habitats with complex ecosystems that are important for subsistence resources.

We also urge the USACE to conduct and continue with formal government-to-government consultation with the Federally-recognized Tribes who could be affected by the proposed development activities, as per the [Executive Memorandum Government-to-Government Relationship with Tribal Governments \(2004\)](#), and [Executive Order 13175 Consultation and Coordination with Indian Tribal Governments \(2000\)](#). These Executive Order s recognize Tribal rights of self-government and Tribal sovereignty, and affirm/commit the federal government to work with Native American Tribal governments, on a government-to-government basis.

It is important to note that the area's tribal members depend upon natural resources throughout Bristol Bay for their economy, food, culture and jobs (e.g. commercial fishing, guiding sport fishers/hunters, tourism, etc.). The Bristol Bay watershed supports the largest salmon fisheries in the world, along with an abundance of other fish and game animals. Because of this abundance other Tribes in Alaska subsistence harvest, commercial fish and have allotment ownership in the area. Thus, potential socio-economic impacts from the proposed development are likely to extend beyond the boundaries of these watersheds, affecting Tribes throughout the Alaska region.

The Federally-recognized Tribes (served by the Bristol Bay Native Association [BBNA], the Tribal Compact organization for this region) who might be affected by the proposed mine development activities within these watersheds include:

- Pedro Bay Village, Nondalton Village, Village of Iliamna, Newhalen Village, Kokhanok Village, Levelock Village, Igiugig Village, Naknek Native Village, King Salmon Tribe, South Naknek Village, Egegik Village, New Koliganek Village Council, New Stuyahok Village, Native Village of Ekwok, Portage Creek Village (aka. Ohgsenakale), Curyung Tribal

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Council, Native Village of Ekuk, Village of Clarks Point, Native Village of Aleknagik, and the Manokotak Village

Specific information about Tribal subsistence uses and livelihoods can be obtained from research conducted in the Village of Clarks Point, Ivanof Bay Tribe, Manakotak Village, Native Village of Kanatak, Native Village of Perryville, Native Village of Pilot Point, Native Village of Port Heiden, Traditional Village of Togiak, Twin Hills Village, Ugashik Village, and others. If you need assistance in obtaining these studies, please contact our office, or the Natural Resources Department at BBNA (via Ms. Gayla Hoseth, BBNA NR Director, 907-842-6252, ghoseth@bbna.com).

Please note that our agency's contact for this matter will be Mr. Lynn Polacca, Deputy Regional Director for Trust Services (Lynn.Polacca@bia.gov, telephone # 907-271-1572), who will be leading the BIA AK Region efforts to review and comment on your DEIS and EIS.



United States Department of the Interior

OFFICE OF THE SECRETARY
Office of Environmental Policy and Compliance
1689 C Street, Suite 119
Anchorage, Alaska 99501-5126

VIA ELECTRONIC MAIL, NO HARD COPY TO FOLLOW

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July 1, 2019

Mr. Shane McCoy
Program Manager, Regulatory Division
U.S. Army Corps of Engineers, Alaska District
645 G Street
Suite 100-921
Anchorage, AK 99501

Subject: Draft Environmental Impact Statement for Pebble Limited Partnership's Proposed Pebble Mine Project, Alaska

Dear Mr. McCoy:

The U.S. Department of the Interior (DOI) has reviewed the U.S. Army Corps of Engineers' (USACE) Draft Environmental Impact Statement (DEIS) on the proposed Pebble Mine Project (project). The DOI appreciates the opportunity to provide comments and recommendations, which are submitted in accordance with the Endangered Species Act (16 U.S.C. 1531-1544; ESA), Marine Mammal Protection Act (16 U.S.C. 1361-1407), Migratory Bird Treaty Act (16 U.S.C. 703-712), Bald and Golden Eagle Protection Act (16 U.S.C. 668-668c), Clean Water Act (33 U.S.C. 1344), Fish and Wildlife Coordination Act (16 U.S.C. 661-667e), Alaska National Interest Lands Conservation Act (16 U.S.C. 3101-3233), National Invasive Species Act (16 U.S.C. 4701 et seq.), National Park Service Organic Act (16 U.S.C. § 1 et seq.), Outer Continental Shelf Lands Act (43 U.S.C. 1331 – 1356), and National Environmental Policy Act (42 U.S.C. 4321 et seq.; NEPA) with implementing regulations.

The DOI's U.S. Fish and Wildlife Service (FWS), National Park Service (NPS), and Bureau of Safety and Environmental Enforcement (BSEE) are participating as cooperating agencies for this project. We appreciate the opportunity for the FWS, NPS, and BSEE to serve as cooperators. However, we must note that, despite being cooperators, they were only provided certain sections of the Administrative DEIS to review as it was prepared and were not able to access the entire document until after it was released for public comment. As planning for this project progresses, the bureaus look forward to working more closely with the USACE to address the concerns and recommendations noted below and in the attached enclosures.

Background

The Pebble Limited Partnership proposes to develop an open-pit surface mine, along with associated infrastructure, at the Pebble copper-gold-molybdenum porphyry deposit (Pebble Deposit), located in the Iliamna region of southwest Alaska and within the Bristol Bay watershed, approximately 200 miles southwest of Anchorage and 60 miles west of Cook Inlet. The Pebble Deposit is located at the headwaters of the South Fork Koktuli River, the North Fork Koktuli River, and Upper Talarik Creek, tributaries to the Nushagak and Kvichak Rivers which flow into Bristol Bay. The closest communities are the villages of Iliamna, Newhalen, and Nondalton, each approximately 17 miles from the Pebble Deposit.

The proposed project would consist of four primary project elements: 1) a mine site, 2) a transportation corridor, 3) a marine port, and 4) a natural gas pipeline. Additional details of these four primary project components include:

1. The mine site would include construction of an open pit, a tailings storage facility, a low grade ore stockpile, overburden stockpiles, material sites, water management ponds, milling and processing facilities, and supporting infrastructure such as a power plant, water treatment plants, camp facilities, and storage facilities.
2. The 83-mile transportation corridor would connect the mine site to a year-round port constructed for the project. The transportation corridor would have three main components: a private, double-lane road extending 30 miles south from the mine site to a ferry terminal on the north shore of Iliamna Lake; an ice-breaking ferry to transport materials, equipment, and concentrate 18 miles across Iliamna Lake to another ferry terminal on the south shore near the village of Kokhanok; and a private, double-lane road extending 35 miles southeast from the South Ferry Terminal to the selected port on Cook Inlet. There is also a road-only alternative under consideration that would not use an ice-breaking ferry to cross Lake Iliamna, but instead would route a road north of the lake and continue to the mine site.
3. A port would be constructed either near the mouth of Amakdedori Creek (Amakdedori Port) or at Diamond Point (Diamond Point Port) in Kamishak Bay and would include shore-based and marine facilities for the shipment of concentrate, freight, and fuel for the project. Other port facilities would include fuel storage and transfer facilities, power generation and distribution facilities, maintenance facilities, employee accommodations, and offices. Off-shore lightering locations would be used to transfer fuel and concentrate from large vessels to smaller vessels.
4. The approximately 188-mile natural gas pipeline would start on the Kenai Peninsula, cross Cook Inlet, and terminate at the mine site, with compressor stations located near Anchor Point and the Amakdedori Port. The 12-inch pipeline would follow the transportation corridor from the port to the mine site, crossing Iliamna Lake on the lake bed or following the north road on the road-only alternative.

General Comments

In our review of the DEIS, we identified several substantial deficiencies and areas for improvement, which are identified below. More specifically, the DEIS does not fully analyze and disclose potential effects to DOI-managed resources in many sections throughout the document. We offer recommendations, clarifications, and corrections that would address these issues. Please see the attached enclosures for detailed and complete comments, recommendations, and references to support a more robust impact analysis in the DEIS. To strengthen the document and its analyses, we also recommend the USACE more effectively and directly address prior comments submitted by the NPS and FWS. For example, responses to previous comments often cited conclusions from other sections of the DEIS to resolve concerns, but these citations did not sufficiently address the issues that were originally raised.

The DEIS, as prepared, does not follow NEPA requirements and conventions for data inclusion or analysis for an activity of this scope and scale. The DEIS precludes meaningful analysis (40 CFR 1502.9(a)).¹ It also lacks an index for cross-referencing (required by 40 CFR 1502.10(j)) and a robust discussion of cumulative effects (40 CFR 1502.10(g); 40 CFR 1502.16; 40 CFR 1508.7; 40 CFR 1508.25), including other "past, present, and reasonably foreseeable actions" (40 CFR 1508.7 and 1508.8).

Due to the substantial deficiencies and data gaps identified in the document and as a department with multiple cooperating agencies, the DOI recommends that the USACE prepare a revised or supplemental DEIS. We suggest the supplemental DEIS incorporate an index to facilitate public review, so that potential impacts are adequately disclosed to the public and also to aid agency reviewers. We also recommend that the DEIS include a more robust discussion of cumulative effects and additional past, present, and reasonably foreseeable actions. We welcome the opportunity to work with the USACE to improve these analyses.

Subsistence

Subsistence resources and continuation of subsistence practices are extremely important to the subsistence communities in the vicinity of lands managed by our bureaus. The subsistence sections in the DEIS do not properly portray important considerations for subsistence activities by Alaskans. The analysis is insufficient and does not fully disclose potential impacts to subsistence resources and the communities that depend on them.

¹ **§1502.9 Draft, final, and supplemental statements.**

Except for proposals for legislation as provided in §1506.8 environmental impact statements shall be prepared in two stages and may be supplemented.

(a) Draft environmental impact statements shall be prepared in accordance with the scope decided upon in the scoping process. The lead agency shall work with the cooperating agencies and shall obtain comments as required in part 1503 of this chapter. The draft statement must fulfill and satisfy to the fullest extent possible the requirements established for final statements in section 102(2)(C) of the Act. If a draft statement is so inadequate as to preclude meaningful analysis, the agency shall prepare and circulate a revised draft of the appropriate portion. The agency shall make every effort to disclose and discuss at appropriate points in the draft statement all major points of view on the environmental impacts of the alternatives including the proposed action.

For example, the document states subsistence is a chosen lifestyle, rather than acknowledging subsistence is an integral component of local cultures. The analysis assumes that subsistence locations are readily interchangeable if impacts displace subsistence activities from traditional areas. Displacement could occur through physical displacement (development of infrastructure), visual impacts (change in setting or sense of place), or from real or perceived contamination of resources. The document only minimally acknowledges the potential causes of displacement of subsistence users and does not acknowledge or analyze the potential for displacement due to actual contamination of resources, particularly due to fugitive dust and potential impacts to water quality. The DEIS fails to consider the total direct and indirect effects of the actions on subsistence. For example, the combination of the impacts on water quality and thermal regimes could have a substantial impact to fish species availability and distribution. Water quality, chemistry, and temperature are extremely relevant to impacts on subsistence fisheries resources.

We recommend working with NPS and FWS to more robustly incorporate important Alaska subsistence constructs to fully analyze and disclose potential impacts to subsistence resources and communities in the supplemental DEIS.

Fish and Wildlife Resources

The DOI's trust resources include natural resources that we have been entrusted to protect for the benefit of the American people; these resources include federally-listed threatened and endangered species and their designated critical habitats, migratory birds, bald and golden eagles, certain marine mammals, interjurisdictional fish, and the habitats upon which they depend. The Bristol Bay watershed, including the Nushagak and Kvichak Rivers, supports all five species of Pacific salmon (King, Sockeye, Coho, Pink, and Chum), and several other commercially, recreationally, and ecologically important fish species. The Bristol Bay watershed is also home to brown bear, black bear, moose, caribou, wolves, waterfowl, and many other species of mammals and birds (Brna and Verbrugge 2013). Federally-threatened northern sea otters and Steller's eiders occur in the waters of Cook Inlet, including Kamishak Bay (where they occur in relatively high abundance). Bald eagles nest and feed along the coast and along all of the major salmon spawning rivers in the Bristol Bay and Cook Inlet regions. A relatively high number of golden eagles are also found throughout the mine site and transportation corridor. Migratory birds, including waterfowl, shorebirds, and land birds, are abundant throughout the potentially affected area of the proposed project.

Responding to local concerns, the U.S. Environmental Protection Agency published the Bristol Bay Watershed Assessment (USEPA 2014), a rigorous, peer-reviewed, scientific document designed to understand Bristol Bay's resources and evaluate the impacts development of a large-scale mine would have on fisheries in the area. According to the USEPA assessment, the Bristol Bay watershed "supports the largest sockeye salmon fishery in the world, is home to 25 federally recognized tribal governments, and contains significant mineral resources. The potential for large-scale mining activities in the watershed has raised concerns about the impact of mining on the sustainability of Bristol Bay's world-class commercial, recreational, and subsistence fisheries and the future of Alaska Native tribes in the watershed, who have maintained a salmon-based culture and subsistence-based way of life for at least 4,000 years (USEPA 2014)." The watershed assessment concluded that destruction of streams and wetlands, along with water

withdrawals from a hypothetical mine, would result in the decline of local populations of salmonids (USEPA 2014).

The DOI is concerned that developing an open pit mine and associated infrastructure at the headwaters of critical salmon habitat could cause permanent, adverse impacts to the ecologically and economically important Bristol Bay watershed, its world-class fisheries, and the commercial, recreational, and subsistence users who depend on them. The DEIS does not acknowledge the importance of the Bristol Bay river system in supporting roughly half of the world's sockeye salmon population, and potential impacts to these fishery resources are underestimated. We recommend that the USACE incorporate the USEPA assessment into the discussion of the project's potential impacts on the Bristol Bay fish resources in the supplemental DEIS.

Because activities associated with the proposed project are expected to occur over an approximately 25-year period, the DOI recommends including a discussion of predicted environmental changes over that timeframe in the DEIS. For example, warming trends in the region are well documented; additional alterations of natural temperature regimes would likely further stress fish populations, alter distribution, and decrease abundance and availability of fish for recreation and subsistence uses.

Further, contaminants, including selenium, may pose substantial risks to aquatic life and subsistence resources and has the potential to decrease fish populations and limit the availability of fish resources for subsistence and recreation purposes, possibly for generations. Water quality changes that could occur due to proposed development are estimated to change natural water quality concentrations, sometimes by orders of magnitudes. This could have effects on salmonid homing ability and long-term productivity, yet these effects are not evaluated, nor are cumulative effects fully analyzed. Prior comments and references submitted by the NPS and FWS on this topic provide specific context. The DOI recommends that these comments be used to more effectively address this issue, particularly regarding Section 4.24 Fish Values and Section 4.9 Subsistence.

At the time the DEIS was released, the USACE had not engaged the FWS in consultation pursuant to section 7 of the ESA. Therefore, discussions of the ESA compliance are preliminary in nature. While the FWS conducted a cursory review of the draft biological assessment as part of their NEPA review of the DEIS (see Enclosure 1), their comments should not be misconstrued as a thorough review of the biological assessment or as meeting consultation or compliance requirements.

Moreover, we recommend the USACE revisit the analysis in the DEIS and the draft biological assessment for federally-listed northern sea otters and their designated critical habitat. The information presented in these documents inadequately analyzes and significantly minimizes the potential effects the project may have on northern sea otters and their designated critical habitat. Based upon the available information, the DOI does not agree with the conclusions drawn in the draft biological assessment for sea otters and sea otter critical habitat. We encourage the USACE to engage the FWS in consultation pursuant to section 7 of the ESA, in order to discuss the necessary analysis. FWS is available to assist the USACE in meeting the joint responsibilities under the ESA.

Additional comments provided in the enclosures of this letter cite numerous peer-reviewed resources that can be used to strengthen the analyses in the DEIS. The DOI has bureau staff with substantial expertise in this area who can work with USACE to fully address the underlying fisheries analysis and the subsequent evaluation of potential impacts to subsistence resources, subsistence communities, recreation resources, and many recreation entities (commercial recreation, Alaska residents, and independent non-resident recreation).

Aesthetics and Recreation

The impact analysis in the DEIS for visual resources/aesthetic values is incomplete and does not include an analysis of the light diffusion of the mine site and proposed transportation routes or efforts to mitigate the light diffusion. In particular, a more complete analysis would include a lighting plan and consideration of light impacts from key observation points located/analyzed in Lake Clark National Park and Preserve. To more completely estimate night sky impacts, NPS conducted an analysis of potential impacts in the vicinity of Lake Clark National Park and Preserve and Katmai National Park and Preserve. This analysis evaluated four scenarios contrasting potential impacts from lights—with and without shielding and with and without snow cover. The NPS will provide this report and associated map to the USACE under separate cover. Because there is minimal artificial lighting in the region, the night sky is essentially unaffected at this time. The potential effects of the proposed mine lighting would substantially change the nighttime viewsheds within both parks.

We also offer recommendations to better estimate impacts to these resources in Enclosure 2. Our comments include an analysis of potential impacts to night skies in the vicinity of the proposed project area, and NPS is happy to work with the USACE to more fully incorporate potential impacts to visual resources, including night skies.

Additionally, the potential decrease in recreation use due to aesthetic impacts has been overlooked. Guided fishing and hunting, sport hunting and fishing, as well as the previously mentioned subsistence uses could be substantially displaced due to effects on visual resources in the area. Scenic resources, hunting and fishing opportunities are the primary draws for recreation in this area. Development of roads, port facilities, and substantial infrastructure associated with the mine site would alter scenic resources in the area, potentially displacing recreation users. We recommend working with NPS to resolve these issues and discuss responses to prior comments submitted on this topic.

Spills and Contamination

The analysis of spill risks and potential impacts needs to be bolstered considerably. The DEIS failed to adequately assess the risk of spills and contamination, and it does not convey the magnitude of the threats posed by reasonably foreseeable incidents, which could occur during construction and mine site operations. Various mine-related activities, including transportation, port, and lightering operations, could potentially result in diesel fuel spills from fuel tanker truck rollovers, marine tanker vessel collisions, ferry incidents, and fuel storage tanks/tank farms operations; these activities could also potentially lead to concentrate slurry spills, spills associated with the transport and lightering of copper-gold concentrate, and the release of tailings. Such incidents could have significant impacts to marine, coastal, and terrestrial

resources. For more extensive comments and recommendations, please see the attached enclosures.

We recommend the USACE revisit the analysis conducted for Section 4.27 Spill Risk in the DEIS. The scenarios analyzed in the section do not fully disclose the potential effects of the proposed project. The limited spill scenarios and the analysis on the effects on the natural, economic, and cultural values of multiple downstream natural resources, particularly salmon, is not well supported with data. The impacts of spills are minimized or dismissed as not being “measurable,” but no measurement types or measurable variability (as would be generated in a power analysis or detection limits) are given. Considering the absence of specific, measurable criteria regarding effects, the conclusions presented in the DEIS that there would be “no measurable effects” are unsupported and do not allow the public, USACE, DOI, or other regulatory agencies to evaluate the consequences of any spill scenario or distinguish among alternatives.

The DEIS does not fully consider the potential for contamination due to fugitive dust from the mine site, transportation corridors, and during transfers for water-based shipping. Enclosed containers for transport of products is an accepted standard to reduce fugitive dust propagation. Assuming enclosed containers would be used, most of the contaminant-bearing fugitive dusts would likely be dispersed via vehicles tracking onto road surfaces. Mitigation measures to reduce fugitive dust would include year-round vehicle washing stations at the exit of the mine site, strong dust palliatives, and bag house containment for concentrate loading and unloading facilities. We recommend monitoring soils, vegetation, and water quality in the vicinity of the mine site, transportation corridors, and transfer facilities. We have provided numerous peer-reviewed references to strengthen the analysis in Enclosure 2 and have bureau staff with substantial expertise in this area.

The DEIS would also benefit from an analysis of the full range of consequences from potential spills or inadvertent releases at the mine site and along the transportation routes. Although potential effects may be readily dispersed or diluted, contamination has the potential to affect the marine environment as well as associated terrestrial wildlife, whether the contamination source is incremental deposition of fugitive dust over time or from a low probability, but high consequence event, such as a concentrate release in the freshwater Iliamna Lake or in the marine environment. Clams and other bivalves can accumulate toxins, particularly metals and petroleum compounds. Animals that feed on them, including brown bears in Lake Clark National Park and Preserve, could be exposed to these toxins via bivalve prey that were contaminated from spills, inadvertent releases, or fugitive dust from the mine or transportation sites. For these reasons, we believe the potential for incremental impacts to bears and other terrestrial species, as well as marine species is also high. While the potential for a large-scale spill may be low, the consequences would be high. We recommend disclosing the full range of potential effects in the supplemental DEIS.

Pipeline

Although the DEIS contained information regarding the potential environmental effects of placing a pipeline in Cook Inlet, it does not include the detailed hazards data that Pebble Limited

Partnership is still in the process of collecting to ensure that the proposed corridor has no unanticipated risks that would affect the pipeline's safe operation. The DOI does not expect this additional data to appreciably change the assessment in the DEIS; however, if the data does alter the analysis after the current comment period closes, the public would have a limited opportunity to comment on a revised assessment. As a cooperator, BSEE will continue its review of the proposed pipeline corridor and assess potential hazards prior to approving a right-of-way permit for the pipeline.

Invasive Species

While the DEIS discusses the current state of invasive species in the project area, it does not adequately address potential impacts from the reasonably foreseeable introduction of invasive species nor how they would be detected and remediated. Invasive species are among the greatest threats to native biodiversity, and Alaska is particularly vulnerable to the expansion of invasive species because of rapidly changing habitat caused by shifting weather conditions, altered hydrologic regimes, and increasing urban and natural resource development. We recommend the DEIS analyze the potential introduction of invasive species during construction and shipping activities, as well as incorporate prevention, early detection, and remediation plans for invasive species in the supplemental DEIS. Additional specific recommendations are provided in Enclosures 1 and 2.

Cumulative Impacts

The cumulative effects analysis in the DEIS is incomplete. We recommend the USACE conduct additional analysis to assess cumulative environmental impacts that could reasonably be expected to occur following development of the described mine plan, including full buildout of the Pebble Deposit in the reasonable and foreseeable future and development of additional mining claims in the region that would become economically feasible if infrastructure for the proposed project, including port facilities and a road system, is constructed.

The DEIS takes the view that the elimination and degradation of salmon habitat will have incremental and linear (yet undetectable) effects on salmon populations, but collapses and extirpation of salmon populations from both coasts of the U.S. (and around the world) have shown that habitat loss and degradation from multiple sources can add up in ways that eventually lead to the demise of productive, self-sustaining salmon populations (Nehlsen et al. 1991, Lichatowich 1999, Montgomery 2003). The need for a thorough assessment of cumulative impacts from past, present, and reasonably foreseeable future actions is particularly acute given that the Nushagak and Kvichak watersheds are integral components of one of the world's few remaining wild-salmon-based ecosystems and major contributors to the world's largest wild salmon fishery. These fisheries are also vitally important for subsistence users and provide recreational opportunities for park visitors.

Mitigation, Management, and Reclamation

We recommend the USACE (and/or the applicant) fully develop the proposed mitigation, management, and reclamation plans currently referenced in the DEIS and then re-analyze the

project's impacts on area resources. The public, the USACE, and resource agencies cannot fully evaluate the proposed project's impacts without knowledge of specific details included in these plans. Please note that the Council on Environmental Quality's NEPA Regulations and Appropriate Use of Mitigation Memo (40 CFR 1502.16(h), CEQ 2011) states an EIS must contain an analysis of environmental consequences of the action, alternatives, and the means to mitigate adverse environmental effects. We have included recommended habitat mitigation measures in Enclosure 3 for USACE use and request the opportunity to review mitigation, management, and reclamation plans as they are developed.

In summary, the DEIS does not fully discuss the potential impacts of the proposed mining activity on DOI-managed resources and lacks a number of important analyses that are necessary to adequately assess the project. Therefore, we recommend that the USACE prepare a revised or supplemental DEIS to resolve the significant gaps in the current document. The FWS, NPS, and BSEE look forward to working with the USACE on improving this important analysis.

Thank you again for the opportunity to collaborate and provide comments on this project. If you have any questions regarding FWS comments, please contact Douglass Cooper, Ecological Services Branch Chief, (907-271-1467 or douglass_cooper@fws.gov) or Catherine Yeargan, Senior Fish and Wildlife Biologist, (907-271-2066 or catherine_yeargan@fws.gov). For questions regarding NPS comments, please contact Joan Kluwe, Environmental Protection Specialist, at joan_kluwe@nps.gov or 907-644-3535. For comments pertaining to the BSEE, please contact John McCall, Engineer, at 907-334-5308 or john.mccall@bsee.gov.

Sincerely,



Philip Johnson
Regional Environmental Officer – Alaska

Enclosure 1: U.S. Fish and Wildlife Service Public Comment Review, Pebble Limited Partnership Draft Environmental Impact Statement

Enclosure 2: National Park Service Comments on Pebble Draft EIS

Enclosure 3: U.S. Fish and Wildlife Service Recommended Mitigation Measures for Inclusion in the Pebble Limited Partnership Draft Environmental Impact Statement and Management Plans

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Enclosure 1: U.S. Fish and Wildlife Service Public Comment Review, Pebble Limited Partnership Draft Environmental Impact Statement

General Comments and Recommendations

The U.S. Fish and Wildlife Service (Service) offers the following comments on the U.S. Army Corps of Engineers' (USACE) Draft Environmental Impact Statement (DEIS) for the Pebble Limited Partnership's (PLP) proposed development of an open-pit surface mine, along with associated infrastructure, at the Pebble copper-gold-molybdenum porphyry deposit (Pebble Deposit), located in the Iliamna region of southwest Alaska and within the Bristol Bay watershed.

After thorough review, we believe the DEIS has major outstanding issues related to an overreliance on qualitative, subjective, and unsupported conclusions. There are also instances where the USACE failed to conduct or include important analyses and where effects are minimized or dismissed as not being "measurable" without providing the measurement types or measurable variability used. Based on these identified deficiencies, the DEIS is so inadequate that it precludes meaningful analysis 40 CFR 1502.9(a)^[1]. The Service recommends the USACE develop a revised DEIS that expands the scope and detail of the environmental analysis conducted to ensure the public, the USACE, the Service, and other regulatory agencies are fully informed of the potential impacts of the proposed project and are able to evaluate and compare the proposed alternatives. Specifically, the Service recommends the USACE prepare and circulate revised analysis on the following sections: Spill Risk, Fishery Resources, and Threatened and Endangered Species.

Whenever possible, our comments are quantitative and specific (e.g., incorporate a relevant data set or more recent report into an analysis, run a specific spill scenario, etc.). However, in many instances the general nature of the inadequate or incomplete analysis contained in the DEIS resulted in us only being able to provide qualitative comments. Below, we provide comments and recommendations that are solution focused and intended to improve the overall environmental analysis of the proposed project.

DEIS Format and Structure

- The DEIS, as prepared, does not follow the National Environmental Policy Act (NEPA) requirements and conventions for data inclusion or analysis for an activity of this scope and scale. The DEIS lacks an index for cross-referencing (required by 40 CFR

¹ **§1502.9 Draft, final, and supplemental statements.**

Except for proposals for legislation as provided in §1506.8 environmental impact statements shall be prepared in two stages and may be supplemented.

(a) Draft environmental impact statements shall be prepared in accordance with the scope decided upon in the scoping process. The lead agency shall work with the cooperating agencies and shall obtain comments as required in part 1503 of this chapter. The draft statement must fulfill and satisfy to the fullest extent possible the requirements established for final statements in section 102(2)(C) of the Act. If a draft statement is so inadequate as to preclude meaningful analysis, the agency shall prepare and circulate a revised draft of the appropriate portion. The agency shall make every effort to disclose and discuss at appropriate points in the draft statement all major points of view on the environmental impacts of the alternatives including the proposed action.

1502.10(j)) and a robust discussion of cumulative effects (40 CFR 1502.10(g); 40 CFR 1502.16; 40 CFR 1508.7; 40 CFR 1508.25), including "irreversible and irretrievable commitment of resources" and other "past, present, and reasonably foreseeable actions" (40 CFR 1508.7 and 1508.8). The Service recommends including an index and a more robust discussion of cumulative effects and additional past, present, and reasonably foreseeable actions in the DEIS.

- An analysis of the incremental impacts of the proposed action is missing. Direct and indirect effects are stated in each resource section, but the analysis of overlapping effects is missing. The Service recommends adding a summary of project related effects to the end of each resource section listed in Chapter 4, or adding a summary to the beginning of each Cumulative Effects section. According to 40 CFR 1508.7, a cumulative impact includes the incremental impacts of the action (this is the overlap of direct and indirect impacts) together with the effects of other reasonable and foreseeable actions. Table 4.23-3, for example, states the effects associated with the three parts of the project (the mine, pipeline, and transportation corridor), but does not state the cumulative effects of direct and indirect impacts upon the resource. According to the NEPA regulations, "Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time" (40 CFR 1508.7). We recommend the DEIS include a summary of project related effects for each chapter, such as found in the wildlife chapter.

DEIS Analysis of Biological Impacts

- The DEIS does not adequately address the project's potential impacts on the Bristol Bay commercial, recreational, and subsistence salmon fishery. We recommend the USACE revisit the analysis for the project's impacts to the fishery and fish resources, and incorporate additional information and analysis into Chapter 4.24 Fish Values and Chapter 4.27 Spill Risk. The *U. S. Environmental Protection Agency's Bristol Bay Watershed Assessment* (Watershed Assessment) (USEPA 2014) was developed to provide information on the potential impacts that a proposed surface mine and associated infrastructure may have on area fish and wildlife resources; the USACE should incorporate this assessment into the discussion of the project's potential impacts on the Bristol Bay fishery and fish resources.
- The DEIS should analyze the cumulative effects on biological resources (such as fish and wildlife) caused by 1) incremental impacts on physical resources (such as soil, water, air, and vegetation), 2) changes in flow regime and changes in water temperature, and 3) human disturbance, noise, degradation of habitat, and potential contamination. Cumulative effects from incremental impacts associated with the proposed action could result in loss of habitat and displacement of fish and wildlife, including injury and mortality that would be irretrievable. According to the NEPA regulations (40 CFR 1502.16), the environmental consequences section should include a discussion of the loss of these resources. In addition, the incremental impacts of the action should be analyzed with the impacts for existing and reasonably foreseeable future actions.
- The reasonably foreseeable future action for the Pebble Mine buildout scenario analyzed 55 percent of the resource, but did not analyze the cumulative effects of additional dewatering in the project area. Similarly, not all of the infrastructure that would be

associated with complete build out was considered, as stated on Page 4.1-8. A similar expansion concept was analyzed as Pebble 6.5 in the Watershed Assessment (USEPA 2014). We suggest summarizing analysis from the Watershed Assessment in this section of a revised DEIS.

Finally, because activities associated with the proposed project are expected to occur over an approximately 25-year period, the Service recommends including additional discussion of ways predicted changes in environmental conditions over that timeframe could alter human use, wildlife resources, and vegetation in the project area. This discussion is an important component of analyzing the project's cumulative effects.

Invasive Species Comments and Recommendations

The DEIS does not adequately address potential impacts that could occur through the introduction of invasive species, or how invasive species would be detected and remediated, through all aspects of the project. Invasive species are one of the greatest threats to native biodiversity and are a significant driver of native species loss worldwide. Alaska is particularly vulnerable to the expansion of invasive species because of rapidly changing habitat caused by shifting weather conditions, altered hydrologic regimes, and increasing urban and natural resource development.

The DEIS does not address how operations would include prevention, early detection (surveys), and rapid treatment response in the event invasive species are introduced as a result of project activities. We recommend adding additional details about the potential introduction of invasive species during construction and shipping activities, along with prevention, early detection, and remediation plans for invasive species. We recommend these plans address:

- The potential introduction of invasive terrestrial plants. Additional information about certified weed-free gravel and supplies for road corridor construction (hay bales, wattles, blankets) and pipeline construction should be discussed.
- The threat and prevention of introduced submerged aquatic vegetation (e.g., *Elodea*) and the transfer of aquatic plants from other infested waterbodies in the state.
- The potential introduction of invasive terrestrial invertebrates that may be brought in on construction supplies and equipment and how their transfer would be prevented.
- The prevention of and response to the introduction of invasive terrestrial vertebrates (e.g., rodents). Rats and mice have significant impacts on native birds and mammals when introduced into an area. The project site is immediately adjacent to multiple islands managed by the Alaska Maritime National Wildlife Refuge to sustain seabirds. The project could pose a risk for the introduction of rodents through normal operation of marine vessels, or in the event a vessel becomes adrift and stranded on the mainland or on an island. One example of important seabird habitat in the area is the Barren Islands, islands on the south end of the Kenai Peninsula.
- The potential for the introduction of marine invasive species.
- The impacts of various invasive species treatments methods such as, but not limited to, herbicides or rodenticides.

Invasive species are the second greatest driver, behind habitat loss, of human-caused extinctions (Grosholz 2005; Sax & Gaines 2008). Wildlife could be directly and indirectly affected by the spread of terrestrial and marine invasive species (i.e., vertebrates, plants, and invertebrates) throughout all phases of the project, with impacts to the terrestrial system beyond the life of the project, if not prevented, surveyed for, and rapidly addressed when found (Hulme 2009). The construction and use of project infrastructure (e.g., roads, platforms, ports, lightering stations) are the most likely vector sources for the introduction of these species. For example, barges and marine vessels are vectors of invasive mammals such as rats, which eat eggs, nestlings, and adult birds (e.g., waterfowl, shorebirds, and seabirds; Ebbert and Byrd 2002). As such, near-shore and on-shore project operations could pose a threat to birds and their coastal habitats. Furthermore, the construction and use of the proposed road system(s) and ports along Lake Iliamna can facilitate invasions of terrestrial plants from outside of the project area.

The DEIS states there are currently no known invasive plants in the project area; however, significant amounts of construction equipment and materials would be brought into the site(s). Without adequate protections in place, the equipment and materials would serve as a vector for new invasions. Across North America, invasive plants have replaced native vegetation, resulting in ecological impacts (e.g., soil erosion, loss of wildlife forage) as well as economic losses to agricultural production and wildlife-associated recreation (Duncan et. al 2004). The introduction of invasive species could lead to reduced water quality, loss of habitat for native species, increased mortality rates of native species, collapse to food-web dynamics, and infrastructure failure (Carey et al. 2016, Herbert et al. 2016, Simpson et al. 2016).

Commercial and Recreational Fisheries

The Service has significant concerns about the project's potential impacts to the Bristol Bay commercial, recreational, and subsistence salmon fishery. The Kvichak River system has historically been the largest contributor to the Bristol Bay fishery, the largest producer of sockeye salmon in the world (Fair 2000). Sockeye salmon are a valuable cultural, subsistence, economic, and ecological resource and have comprised over 50 percent of the total subsistence harvest in nearly all of the Kvichak River watershed communities of southwest Alaska (Fall et al. 2001). Schindler et al. (2010) further states, "[t]he total economic value of this fishery is considerably higher when considering the retail, cultural and recreational value of these fish. Income from sockeye salmon in the Bristol Bay is the major source of personal income for most Bristol Bay communities, and landing taxes provide the major funding for local school districts. Thus, the interannual reliability of this fishery has critical and direct consequences for the livelihoods of people in this region." An economic study of the Bristol Bay salmon industry found the output value of the fishery to be worth \$1.5 billion annually, supporting an average annual employment of approximately 10,000 jobs (Knapp et al. 2013). The DEIS does not acknowledge the importance of the Bristol Bay watershed supporting roughly half of the world's sockeye salmon. The current analysis and accompanying discussion contained in the DEIS do not accurately identify and analyze the project's potential impacts to the Bristol Bay fishery. We recommend a more thorough analysis and disclosure of the full range of potential effects to salmon and their habitat from groundwater contamination, potential spills, or a tailings dam failure.

Chapter 4.6: Environmental Consequences

- The Service recommends the revised DEIS consider the impacts of landscape-scale industrialization on the region’s multimillion dollar sport fishing industry. While the Kvichak and Nushagak watersheds attract anglers from around the world to pursue abundant, trophy-sized, wild Rainbow Trout, anglers (who pay up to \$10,000 for a week of guided, lodge-based angling) consistently rated attributes related to the wilderness setting and natural beauty of the area as important in choosing this destination (Duffield et al. 2006). Viewing mining infrastructure during airplane or boat trips to fishing streams – or merely knowing that such infrastructure is present – may diminish the quality of the experience and may make anglers less willing to bear the high cost of trips to this area.

Subsistence

Chapter 3.9: Affected Environment

We recommend the USACE include additional information related to the discussion of Affected Environment, as detailed below:

- Section 3.9 of the DEIS delineates the importance of fishing and hunting for communities (materially and socially) and adequately describes subsistence harvest and practices based on a few key studies. However, in describing the social, cultural, and traditional values associated with subsistence activities, the DEIS asserts, “for many, subsistence is a chosen lifestyle.” For most Alaska Native people and many other non-Native rural residents, subsistence is a way of life and exceeds the framework of “choice.”
- On Page 3.9-2, the DEIS discusses the regulation of subsistence activities by the Federal government through Title VIII of the Alaska National Interest Lands Conservation Act (ANILCA) and a rural Alaskan subsistence priority on federal public lands. The DEIS asserts that no project components are proposed on federal lands and thus ANILCA would not apply. However, federal fisheries regulations do apply in the Kvichak/Iliamna-Lake Clark drainage, and federal hunting regulations apply on the National Park Service and the Bureau of Land Management lands in Units 9 and 17. While project activities would take place on state lands, fish and wildlife do not recognize jurisdiction. Therefore, although the Pebble development would not take place on federal lands, it has the potential to significantly impact federally qualified subsistence users and the resources on which they rely; this potential should be acknowledged in the DEIS.

Chapter 4.9: Environmental Consequences

We recommend the USACE include additional information and discussion of subsistence user perceptions related to the proposed project, as detailed below:

- The DEIS does not adequately attend to the very real potential impact of perceptions of contamination on continued subsistence access. The description of anticipated possible

impacts on subsistence practice in Section 4.9 does not acknowledge the role that understandings, beliefs, and perceptions of contamination and ecosystem compromise could have on hunting and fishing in practice. Due to subsistence users' historical experiences with lack of transparency from government and industry, the presence of mining is likely to lead to at least some avoidance of, and reduction in, use of fish and other subsistence resources, even in the absence of a specific contamination event. Furthermore, if there is a contamination event, the complications of habitat restoration in an interconnected hydrologic and ecological system means there may be difficulty in achieving closure (i.e., the belief that the environment has been healed and it is safe and healthy to once again practice subsistence). "Voluntary" reduction of use of salmon, other fish, and resources (as well as caribou, moose, brown bears, berries, and greens) due to concerns about unknown or unknowable contamination could prevent subsistence users from hunting, fishing, and gathering. There is potential to significantly impact mental, spiritual, and community health if core resources are perceived to be contaminated and detrimental to human health. This could in turn interrupt transmission of customary and traditional knowledge and practices, resulting in irreversible change to the local cultural and subsistence way of life.

Transportation and Navigation

Chapter 4.12: Environmental Consequences

- Marine shipping is a vector for the introduction of marine invasive species, which can have direct and indirect impacts to commercial and recreational fishing. Marine invasive species are spread through hull fouling and ballast water discharge. As such, ports in Alaska receiving vessels from outside of Alaska are susceptible to receiving invasive species that are transported by fouling/ballast water from all over the world (Reimer et al. 2017). The DEIS discusses using barges to move concentrate to bulk carriers in deeper water in the Gulf of Alaska, but does not discuss the impacts that ballast water/biofouling from these marine vessels may have on native species. The Service recommends including a discussion of impacts the introduction of invasive marine species could have on native species; the Service also recommends developing prevention, detection, and response plans for marine invasive species, and incorporating these plans into a revised DEIS. The Service is available to assist the USACE and PLP in the development of these recommended plans.

Air Quality

Chapter 4.20: Environmental Consequences

- The Service recommends including a discussion of the potential impacts of the project on the Tuxedni Wilderness. The Tuxedni Wilderness was established as a refuge for seabirds, bald eagles, and peregrine falcons; and it contains large colonies of black-legged kittiwakes, horned puffins, common murrelets, pigeon guillemots, and glaucous-winged gulls. The 5,566-acre Tuxedni Wilderness (including the Chisik and Duck Islands), designated in 1970, is a Class 1 air quality area under the Clean Air Act (FLM

2010; MOU 2011). It is administered by the Alaska Maritime National Wildlife Refuge, and the Service is responsible for protecting the air quality and air quality related values of the area from man-made air pollution. Despite this protection, many sources of man-made air pollution have the potential to affect the Tuxedni Wilderness, including oil and gas development in the Cook Inlet and long-range transport of air pollutants from other sources. The potential for increases in air pollution from the proposed project to impact the Tuxedni Wilderness and surrounding area should be addressed in the revised DEIS.

Wildlife Values

Chapter 4.23: Environmental Consequences

We recommend the USACE include additional information and discussion of the potential effects the project may have on wildlife, specifically birds, as detailed below:

- Please add additional details on the effects to waterbirds (seabirds, waterfowl, loons, shorebirds, etc.) from a spill event or water quality incident within the shipping lanes between the western and eastern coasts of the Cook Inlet. The analysis should consider a full range of the possible effects considering a variety of factors, such as weather and/or life cycle events of birds, particularly nesting or staging for migration.
- Please discuss how increased shipping traffic, or any future incremental increase, would increase the risks of water quality-spill incidents to the Cook Inlet islands/islets that may include the Barren Islands, a major seabird and sea lion use area (about 60 miles south of Anchor Point; about 75 miles southeast of the proposed Amakdedori Port or Diamond Point Port).
- Please add additional discussion of how new lighting for potential port facilities could prove disorienting for migratory seabirds or for daily foraging flights (Longcore and Rich 2004; Gaston et al. 2012; Rodriguez et al. 2017).
- Please use updated/current eagle survey data for the revised DEIS. Due to the lack of current eagle survey data (much of the eagle data for the project are 10 or more years old), the Service is unable to assess the full impact of project activities on bald and golden eagles; the Service considers eagle survey data to be accurate for 2 years following survey completion. The data that is available, although old, does indicate that bald and golden eagles are abundant throughout the proposed project area (including the area surrounding the mine site and the various transportation corridor alternatives), we believe there may likely be levels of disturbance, specifically during project construction but also during the operation and maintenance phases of the project, that would warrant a permit pursuant to the Bald and Golden Eagle Protection Act. The Service recommends the applicant coordinate with contacts at the Anchorage Fish and Wildlife Conservation Office to develop an appropriate survey protocol for the site (including timing and number of surveys needed, search area, and search techniques). The data collected from the new surveys would then be used to inform the eagle permitting process for the applicant and would help ensure the necessary permits. Permits are issued through our Migratory Bird Management program, and proper coordination during survey development helps ensure permits can be issued in a timely fashion.

Fish Values

The Service is concerned that the DEIS, as prepared, does not provide a complete or accurate analysis or disclosure of the project's potential impacts to the Bristol Bay fishery and associated fish resources from the proposed project. The DEIS should avoid subjective and qualitative language that creates a perception of minimizing the project's potential effects. As discussed in our comments for Chapter 4.27 Spill Risk, we recommend incorporating additional information and analysis of how a spill or tailings dam failure could impact fish in the Bristol Bay watershed into the revised DEIS.

The DEIS acknowledges that Iliamna Lake and its tributaries provide spawning and rearing habitat for all five species of Pacific salmon but fails to convey the enormous numbers of juvenile salmon that rear in the lake, or the importance of these fish to the Bristol Bay salmon fishery. Iliamna Lake is the primary Sockeye Salmon nursery lake for the Kvichak River system, where annual runs regularly exceed 10 million fish and are, on average, the largest among all of Bristol Bay's river systems (Erickson et al. 2018). After hatching, most of the Kvichak River's Sockeye Salmon spend one or two full years rearing in Iliamna Lake before migrating to the ocean; thus, on any given day, Iliamna Lake supports tens to hundreds of millions of Sockeye Salmon fry from three or more brood years. Given the complex age structure of Sockeye Salmon, even short-term impacts to rearing conditions in Iliamna Lake could affect salmon runs over multiple years. We recommend adding additional, clarifying information on the importance of Lake Iliamna to juvenile salmon and the Bristol Bay salmon fishery and incorporating it into the analysis of potential effects the project may have on these resources.

Because activities associated with the proposed project are expected to occur over an approximately 25-year period, the Service recommends including a discussion of predicted environmental changes over that timeframe and the potential additive impacts construction and operation of the proposed project could have on fish and their habitats. A large and growing body of research documents ongoing changes in aquatic habitats associated with global environmental change. For streams affected by the proposed mine, model projections through 2100 include greatly increased winter streamflow (including unprecedented high flow events), loss of high spring flows that typify the current hydrograph (due to decreasing winter snowpack), and increasing water temperature (Wobus et al. 2015). The fact that the DEIS does not account for such changes in hydrologic and thermal regimes, potentially invalidates the document's estimates of impacts to aquatic habitats and fish. For example, distributions of fish species and life stages within stream networks would likely change in response to these climatic shifts, potentially creating a situation where actual patterns of habitat use no longer align with those assessed in the DEIS. Additionally, the DEIS estimates changes in the extent of suitable spawning and rearing habitats for various species and life stages based on mine-related changes in streamflow (as measured by weighted usable area) without regard for the potential that mine-related impacts could be exacerbated by environmental-related changes in streamflow. Lastly, changing environmental conditions and projections should be considered when designing road culverts to avoid velocity barriers from increased winter streamflow, and changes in the timing of life history events should be considered when formulating timing windows to protect sensitive

life stages. These analyses are important components of analyzing the proposed project's cumulative effects.

Chapter 3.24: Affected Environment

- The Service recommends rewording text on Page 3.24-4, paragraph 1, “*Beaver ponds and other features are widely distributed in off-channel habitats...*” to reflect a more accurate description of the occurrence of beaver ponds and other off-channel habitats or, modifying the table contents to show spatial relationships of off-channel habitats to mainstem reaches. Table 3.24-1 does not present distribution information of beaver ponds and other features as suggested by the text. Beaver Pond and Other Off-Channel habitats within Table 3.24-1 are quantified as a relative composition of all off-Channel habitats occurring within the North Fork Koktuli (NFK), South Fork Koktuli (SFK), and Upper Talarik Creek (UTC) tributaries. There is no spatial reference to infer distribution of these habitat types within each of the tributaries.
- Figure 3.24-2 shows a tributary draining from the mine site and entering the NFK within Reach D. This occurs where the Main Water Management Pond is located. Table 3.24-1, footnote 1, identifies the Mine Site Analysis Area as “mileage from mainstem reaches adjacent to and downstream of the mine site and tributaries draining the mine site.” Habitat type information is not included in the DEIS for Reach D. The Service recommends providing frequency of habitat type information within Table 3.24-1 for Reach D within the NFK, as this reach contains waters that are “adjacent to and downstream of the mine site and tributaries draining the mine site...”
- Please clarify if King Salmon exist within reach NFK-F. The pie chart depicting relative composition for reach NFK-F shows King Salmon comprising 4 percent of the fish species present. However, segments throughout reach NFK-F are highlighted as yellow (resident, non-anadromous salmonids) and green (non-salmonid fish).
- Please clarify the inconsistency within Figure 3.24-3, which shows two reaches within the SFK identified as SFK-D. The two reaches occur at River Mile 51.7 and 54.7. Table 3.24-1 includes habitat type information for a single reach identified as SFK-D. If reach SFK-E exists as suggested by Figure 3.24-3, modify Table 3.24-1 with habitat type values for consistency of information. If a single SFK-D exists, please modify Figure 3.24-3.

Chapter 4.24: Environmental Consequences

- In this DEIS section, short-term recovery is identified as less than 3 years, and long-term recovery is identified as less than 3 years to less than 20 years. Please clarify whether this was a typographical error or if there is a need to re-work these definitions.
- The DEIS quantifies habitat in terms of linear miles of stream/river. The use of a single linear measure does not take into account the relative value or importance of unique areas of the affected streams in terms of species-specific life stage requirements (e.g., spawning, rearing, overwintering). The Service recommends using a measure that quantifies area of habitat, categorized by species-specific life stage requirements, as a better metric of habitat availability and impact. Linear extent is a useful measure in some

instances, but it is an incomplete quantification of habitat without understanding an associated measure of area and oversimplifies and understates the total extent of habitat.

- The DEIS quantifies the loss of species-specific habitat (by life stage) and uses this value in calculating and reporting the percentage of loss among all anadromous habitats. This comparative approach is made at multiple spatial scales (e.g., local - NFK, SFK; and regional - Bristol Bay) throughout Section 4.24. Please note, anadromous habitat identified within the Anadromous Waters Catalog (AWC) does not necessarily support all life stages for all salmon. The DEIS understates habitat impacts by simply analyzing the proportion of total anadromous waters affected rather than considering habitat in terms of species-specific life stage requirements. The Service recommends describing permanently removed anadromous habitat in the context of species-specific life stage needs rather than generalizing to “all anadromous habitat.”
- In summarizing the relative contribution Tributary 1.190 and 1.200 make to the total amount of anadromous habitat within the NFK, it is unclear if the USACE used the total amount of available anadromous habitat identified in the AWC or the total amount of habitat assigned to a species-specific life stage (spawning or rearing habitat). Discussing the importance of anadromous habitat without attributing this importance to a species-specific life stage could be misleading. For example, Page 4.24-5 states, “The 8.2 miles of anadromous habitat permanently removed within tributaries 1.190 and 1.200 represent 11 percent of the total documented 72.7 miles of anadromous habitat in the NFK River.” It is unclear from the text what species and life stages would be impacted by removal of this habitat. Coho Salmon were found spawning and rearing in Tributary 1.190 as were rearing juvenile Chinook Salmon. Rearing juvenile Coho and Chinook Salmon, as well as other resident species, were found in Tributary 1.200. We recommend clarifying the species and life stages impacted by permanent removal of anadromous habitat.
- Table 4.24-3 does not appear to indicate changes in habitat quantity by stream reach, as referenced within the text. For example, Page 4.24-15 states, “Sockeye juvenile habitat increases would generally be associated with the SFK-C reach (Table 4.24-3).” Further, “The largest changes in habitat in the SFK area are associated with Rainbow Trout habitat, which increased in the SFK-C reach.” If changes of species-specific life stage habitat quantities for pre-mine, operational, and post-closure conditions at the reach scale are known, inclusion of this information is essential for an understanding of the full scope of Environmental Consequences. The Service recommends including a table or discussion of these values at the stream reach spatial scale, for each of the waterbodies identified within the mine site (i.e., NFK, SFK, UTC).
- It is unclear how the DEIS incorporates and analyzes data on species-specific life stage habitat types. The DEIS states that changes in habitat for juvenile fishes would be reach-specific and is more dependent on reach-specific habitat features than the stream reach location within the river network. While this is generally true, it is unclear how “juvenile Coho Salmon habitat would alternate between increases and decreases in habitat within each reach (NFK-190, NFK=C, NFK-B, and NFK-A).” This same general assertion is made later as “However, in a downstream direction, reaches would alternate between habitat gains and losses for several species.” The Service recommends clarifying and more clearly quantifying the assessment of Coho Salmon and Rainbow Trout habitat in terms of “alternating” between “increases and decreases,” or “gains and losses” within

reaches occurring in a downstream manner; this clarification would provide better detail on the anticipated impacts of the project.

Threatened and Endangered Species

Chapter 3.25: Affected Environment

- The Service recommends revising the following sentence on Page 3.25-1, to more accurately describe the Endangered Species Act (ESA): “The ESA provides for conservation of fish, wildlife, and plant species considered to be at risk of extinction (threatened or endangered) in all or a substantial portion of their ranges; and to conserve the ecosystems and habitats on which they depend.”
- Please note, the purpose of the ESA is to protect and recover imperiled species and the ecosystems upon which they depend. The ESA is administered by the Service and the National Marine Fisheries Service (NMFS). The Service has primary responsibility for terrestrial and freshwater organisms, while the responsibilities of the NMFS are mainly marine wildlife such as whales and anadromous fish such as salmon. Under the ESA, species may be listed as either endangered or threatened. "Endangered" means a species is in danger of extinction throughout all or a significant portion of its range. "Threatened" means a species is likely to become endangered within the foreseeable future.

Chapter 4.25: Environmental Consequences

We recommend the USACE include additional information and discussion of the potential effects the project may have on threatened and endangered species, as detailed below:

- Discussion on Page 4.25-3 states, “Impacts to TES [threatened and endangered species] would be minimized or mitigated by implementation of mitigation measures that would be developed through the permitting process, in consultation with the Service and the NMFS. Proposed mitigation measures are detailed in the specific biological assessments in Appendices G and H. The PLP’s proposed mitigation incorporated into the project includes development of a WMP [Wildlife Management Plan]. The plan would be developed for the project prior to commencement of construction.” We recommend prioritizing development of these measures, working cooperatively with the Service and the NMFS, then reanalyzing the project for its anticipated effects and impacts to listed species and appending this analysis to the revised DEIS. Please note, development of avoidance and minimization measures will also be essential to the ESA section 7 consultation(s).
- The DEIS states on Page 4.25-17, “although the western side of the Kamishak Bay has a high density of sea otters, they are fairly tolerant of vessel noise and would likely habituate to the regular presence of vessels at these locations.” This statement is not supported; the Kamishak Bay sea otter population is not regularly subjected to the same type and level of disturbances as the Kachemak Bay sea otters (which are part of the stock that is not listed under the ESA). The Service believes sea otters found in the Kamishak Bay are more naïve and, thus, are likely to be more sensitive to disturbance

than those found elsewhere in the Cook Inlet. Please review this entire section and remove these types of unsupported statements that serve to minimize the proposed project's anticipated effects to listed species.

- The DEIS discusses projects impacts to sea otters in terms of “population-level” effects or impacts: 1) from Page 4.25-17, “...underwater or airborne noise on sea otters would be limited [to] the analysis area, and would not result in population-level effects...” and 2) from Page 4.25-18, “...these effects would be expected to be short term, limited to the immediate area of the port, and would have no population-level impact.” The revised DEIS needs to analyze effects first on individual sea otters and then consider the resulting impact at the stock level, both for the MMPA and the ESA. Analysis of “population-level effects” or “population-level impacts” has the effect of minimizing the effects and impacts on individual sea otters from the listed population. The Service recommends simply identifying and analyzing the anticipated effects and impacts (i.e., harassment, injury, death) to listed sea otters that would result from construction and operation of the project.
- The DEIS discusses increased turbidity in the water column resulting from project construction as potentially limiting Steller's sea lion foraging ability (Page 4.25-16), but does not include a similar discussion for Northern sea otters. The Service recommends including a discussion of the project's potential to increase water turbidity and sedimentation on the seafloor in sea otter habitat, including critical habitat, and the resulting impacts on sea otters foraging in the area.

Appendix G: ESA Biological Assessment - USFWS

- At the time the DEIS was released, the USACE had not engaged the Service in consultation (either informal or formal) pursuant to section 7 of the ESA. Therefore, discussions of the ESA compliance are preliminary in nature. The Service conducted a cursory review of the draft biological assessment as part of our NEPA review of the DEIS; our comments should not be construed by the USACE, in whole or part, as a thorough review of the biological assessment, or as meeting their ESA section 7 consultation or the Marine Mammal Protection Act (MMPA) compliance requirements.
- The potential impacts and effects detailed in the DEIS and the draft biological assessment are not consistent. Several impacts listed in the DEIS are not analyzed in the biological assessment. For example, the DEIS lists increased vessel traffic from construction and operation of the project; the biological assessment only discusses increased vessel traffic from construction of the project. The DEIS discusses aircraft traffic to and from a newly constructed airstrip; the biological assessment does not mention aircraft traffic or an airstrip. In fact, the biological assessment, in general, appears to focus solely on effects to listed species from construction activities, with project operations (vessel traffic, lightering, aircraft, etc.) largely ignored. The Service recommends reviewing the DEIS and the biological assessment, and ensuring discussions about listed species are consistent. Additionally, the Service recommends including analysis and discussion of project operations into the biological assessment. Ensuring consistency in the analysis and discussion of impacts and effects to listed species between the two documents will ensure the project's potential impacts are fully disclosed, as well as facilitate the endangered species section 7 consultation(s).

- The draft biological assessment appears to dismiss effects to Steller’s eiders by failing to address the potential effects from the proposed project’s operational phase. The biological assessment contains numerous references to eiders not being affected because they would not be present in the summer months during construction activities. The Service recommends the USACE review the effects determination for Steller’s eiders and reanalyze all phases of the project for potential effects to Steller’s eiders.
- The biological assessment makes several unsupported and incorrect statements when discussing the project’s potential effects on Northern sea otters and Steller’s eiders. These include statements such as “hearing loss in sea otters is not a concern from the proposed continuous noise activities” (Page 15); “[n]oise harassment due to thruster use during pipeline construction does not rise to the level of take (and is discountable)” (Page 17); and “the amount of petroleum that could potentially be spilled during construction activities would be very small (a few gallons at most), and unlikely to lead to impairment of local sea otters” (Page 19). The DEIS should describe and analyze the impacts to listed species without making determinations as to what rises to the level of take. Through the section 7 consultation process, a determination will be made as to what effects constitute take under the ESA. The Service recommends review and revision of the biological assessment to more clearly and factually identify and analyze the anticipated effects to listed species and their critical habitat.
- The Service recommends including a more robust discussion of the pipeline installation in the biological assessment. Vessels that employ dynamic positioning during pipeline installation could have effects to sea otters from noise cavitation.
- Finally, the Service recommends the USACE revisit the analysis for listed Northern sea otters and their designated critical habitat in the draft biological assessment. Analysis contained in this document appears to minimize the potential effects the project may have on sea otters and their critical habitat. Based upon the available information, the Service does not agree with the conclusions drawn in the draft biological assessment for sea otters and sea otter critical habitat.

Appendix K 4.25: Threatened and Endangered Species

We recommend the USACE update descriptions of potential noise impacts resulting from the project and affecting marine mammals, including listed species, as detailed below:

- The numbers presented in Appendix K are for underwater sound only and do not address the above-water noise effects from aircraft. Sea otters spend a significant amount of time with their heads above water and so, for aircraft noise, the airborne sound levels are just as relevant as the levels of sound below the surface of the water. Some aircraft at low altitude can produce sounds that would exceed the thresholds for acoustic disturbance. Additionally, it is likely there would be behavioral reactions at sound levels below the acoustic thresholds that could result in negative impacts to foraging success, and separation of females and dependent young. The Service recommends including these potential impacts in Appendix K and updating the discussion of potential impacts in the DEIS and biological assessment.
- Numbers quoted from Illingworth and Rodkin (2007) are accurately cited; however, the high end of the range quoted for impact pile driving, 210 decibels (dB) at 10 meters, was

for a 60-inch pile driven in less than 5 meters of water. The lack of water surrounding the pile would inhibit noise transmission into the water column, so this is not a truly representative noise measurement for a pile of this size; the same source level was reported for a much smaller (36-inch) pile in deeper water. The reported source level for the next-size-up pile in deeper water was 220 dB at 10 meters for a 96-inch pile, a number that should be included in the data presented in Appendix K. The transmission of sound underwater is such that a 10 dB difference in source level makes a difference in the distance from the source at which the MMPA Level B threshold is exceeded. The Service recommends updating the discussion of pile driving in Appendix K, taking water depth and pile size into consideration.

- Data from Ireland et al. (2016), Table 5.15 on Page 5-48, indicate the range of model-based curve source levels for dynamic positioning is 169 to 198 dB at 1 meter. Values from empirical curve models applied to measurements from vessels during the sound source characterization are 162.2, 191.7, and 200.0 dB at 1 meter. These are substantially higher levels than the vessel source levels reported in Appendix K. Although it is possible the suggested sound levels may be produced by some vessels operating under certain conditions, they do not represent the upper end (or, arguably, even the middle) of the range of sound levels generated during thruster use for dynamic positioning or the manipulation of barges and other vessels. Please update Appendix K to reflect the range of sound source levels likely to occur from dynamic positioning, as discussed in Ireland et al. (2016).

Spill Risk

Chapter 4.27 Environmental Consequences

Much of this chapter does not provide adequate data or analysis for the limited spill scenarios presented (with the exception of the Pyritic Tailings South Embankment Release scenario), or effects on the natural, economic, and cultural values of multiple downstream natural resources, particularly salmon. Throughout the chapter, effects are minimized or dismissed as not being “measurable,” but no measurement types or measurable variability (as would be generated in a power analysis or detection limits) are given. Unless specific, measurable criteria indicating effects are provided, conclusions that there would be “no measurable effects” are speculative and do not allow the public, the USACE, the Service, or other regulatory agencies to evaluate the consequences of any spill scenario or distinguish among alternatives. These deficiencies should be addressed throughout the chapter. The Service recommends the USACE incorporate the following recommendations into the Spill Risk chapter and re-analyze the environmental consequences of the project as appropriate.

Section 4.27.2: Diesel Spills

- Overall, this section does not provide sufficient information to facilitate a comparison of the DEIS project alternatives with respect to the potential environmental consequences associated with oil spills. The magnitude/degree of potential impacts from the scenarios, including all affected natural resources, is not provided. Scenarios evaluated do not apply to all project alternatives. For example, a spill from a tug-barge collision was only

evaluated as occurring in the Kamishak Bay (Alternative 1), and the analysis may not be relevant to the same spill occurring under Alternatives 2 and 3.

- This Chapter identifies the “overflow of tanks” as a common cause of diesel spills but does not analyze the risk of such spills or the potential environmental consequences at all locations where overfilling of tanks could occur (e.g., filling of fuel storage tanks and International Organization for Standardization (ISO) containers at the Amakdedori/Diamond Point ports, and filling fuel tanks in the ferry on Lake Iliamna). No historical data on diesel spills from tank overfilling is described. There is a brief evaluation of spills that occur within a tank farm’s secondary containment system, which presumed that all spilled fuel would be successfully contained within the secondary containment system. However, secondary containment systems are sometimes not successful in containing all released fuel, and notable fuel spills into the environment do occur from such overfilling events. In addition, filling of large tanks often requires that fuel is moved outside of a storage tank’s secondary containment systems, providing another opportunity for diesel spills to the environment. We recommend the Chapter analyze the risk of “overflow of tanks” and the potential environmental consequences at the locations where overfilling of tanks could occur.
- This Chapter focuses on a relatively large diesel spill from marine tug-barge collision as the scenario for marine vessel incidents, although there are other potential vessel oil spill sources and scenarios that may have a higher probability of occurrence. Although a 300,000-gallon tug-barge collision spill would be catastrophic, diesel-hauling tug-barges are proposed to only be in operation 12 days per year, so the likelihood of any spill is relatively low. Conversely, handysize bulk carrier ships are proposed to be in operation 108 days per year to transport the concentrate, and the lightering vessels are proposed to be in use for 270 vessel traffic days. The risk of a vessel incident increases with increasing time in operation, and spills do not have to be “large” to cause severe environmental impacts. Handysize bulk carriers can carry several hundred thousand gallons of heavy fuel oil and a lesser amount of diesel for use in its propulsion. Bulk cargo ships are at an added risk of capsizing due to cargo liquefaction/instability. From Owl Ridge (2018c), “The risk of a moderate spill (10-1,000 gallons) is greatest for non-tank vessels [includes handysize bulk cargo ships] (1 spill in 579 years), followed by workboats (1 spill in 1,162 years), and tank barges which have the lowest risk (1 spill in 4,118 years).” We recommend the discussion in this Chapter be expanded to cover a full suite of potential vessel oil spill sources and scenarios.
- The Spill Risk assessment is inadequate for comparing differences between proposed sites because spill trajectory models were run for Amakdedori Port, but not for the Diamond Point Port or any of the lightering locations associated with either action alternative. The marine vessel scenario is based on tug-barge collision near the Amakdedori Port. If the scenario was associated with the Diamond Point Port, which can be considered more ecologically important in some aspects (e.g., seabird colonies, waterbird staging areas), the potential impacts could be larger than associated with the Amakdedori Port. Spill trajectory modeling was not performed for the Diamond Point Port, so it is unknown how a 300,000-gallon tug-barge collision spill at the two locations would compare. The tug-barge collision scenario provided does not facilitate a comparison of the three DEIS project alternatives. We recommend adding spill trajectory modeling for the Diamond Point Port so the differences in project alternatives can be

fully assessed; the currently included analysis does not allow resource agencies or the public to adequately evaluate the potential effects of spill occurrence(s) or to compare between alternatives.

- Spill response supplies should be staged at the Amakdedori/Diamond Point Port where offloading of double-hulled fuel barges would take place, in addition to the locations identified in this Chapter.
- The discussion of existing response capacity (i.e., for spills not large enough to bring in Alaska Chadux) mentions recovery procedures for on-land, marine, and shoreside environments. We recommend expanding the response capacity to include spills that occur at/on Lake Iliamna and in riverine environments, especially since tanker truck spills (an evaluated scenario in this Chapter) could affect one or more of these environments.
- The information contained in the Cook Inlet Maritime Risk Assessment (Glosten 2012) was primarily derived from incidents that occurred outside of the proposed study area and included all maritime activities, many of which were objectively less risky than the activities proposed in this DEIS. As such, the spill rate projections calculated from the baseline incident and vessel traffic data from the greater Cook Inlet Region do not adequately address the risks associated with the potential development of the Amakdedori/Diamond Point Ports. The Service recommends more fully acknowledging the Cook Inlet Maritime Risk Assessment's limitations in the DEIS and updating the analysis with more appropriate data.
- The baseline incident rates calculated for the Cook Inlet Maritime Risk Assessment were derived from the greater Cook Inlet Region where maritime activities are more routine along established shipping routes, which are less risky than the proposed Amakdedori/Diamond Point Ports, with their shallow waters, rocky shoals, strong currents, and extreme tides. The potential discrepancy between the calculated baseline incident rates and potential actual incident rates that may occur as a result of the more extreme conditions in the project area should be disclosed.
- Incident data used in this assessment was primarily derived from areas where emergency tugs were able to respond to vessels in distress. The proposed Amakdedori/Diamond Point Port would occur in a much more remote and logistically challenging area, which is currently designated as a "no go zone" for emergency tugs. Without emergency assistance, the number and/or magnitude of potential incidents in the Amakdedori/Diamond Point Port area would likely be greater than the baseline incident rates presented in the Spill Risk assessment, which were derived from Glosten (2012). This information should be disclosed. We recommend that each of the action alternatives incorporate emergency tug services to help mitigate the spill risk in this critically important area.
- Baseline incident rates derived from Glosten (2012) do not adequately represent the level of risk involved in activities proposed in this DEIS. Because Glosten (2012) did not focus on vessels involved in riskier activities, their incident rates are likely lower than what would be expected at the proposed Amakdedori/Diamond Point Port, where vessels would be required to moor at off-shore sites, conduct frequent lightering activities, and navigate to shallow port facilities often under adverse conditions. Statistically invalid inferences about spill risk are being made based on data that were collected outside of the proposed project area and from situations involving lower risk activities.

- Because activities at the Red Dog Mine are similar to the proposed activities in this DEIS, we recommend data from this site be incorporated into the risk assessment. The Red Dog Mine utilizes a shallow port with offshore mooring sites, lightering boats, and challenging conditions.
- Spillage projections (2015 to 2020) in the Cook Inlet Maritime Risk Assessment are based on the use of double-hull tankers, which are not being proposed in this DEIS. Spillage estimates for single-hull tankers are two to three times higher. We recommend that all fuel tank barges be double hulled. If this recommendation is not adopted, then the analysis should be reassessed based on the risks associated with use of single-hull barges.
- Glosten (2012) states, “risk is the product of probability and consequence.” The most recent summary memorandum by Owl Ridge (2018c) does not attempt to address the consequences of a potential spill. Proposed port facilities would be constructed in areas where a spill would result in very high consequences. The Service recommends adding an analysis of consequences of a potential spill.
- Spill trajectory models indicate that 50th and 95th percentile spills would directly affect the Kamishak Bay and Lower Cook Inlet as far off as Kodiak Island, which would negatively impact many important populations of seabirds, shorebirds, and waterfowl, including thousands of federally threatened Steller’s eiders, and many important populations of marine mammals, including federally threatened Northern sea otters.
- The Spill Risk assessment does not address spills along the proposed road corridors or the Iliamna Lake barge. We recommend that the Spill Risk assessment be expanded to address spills along the proposed road corridors and from the barge.
- The spill rate projections presented in the Spill Risk assessment for the Lower Cook Inlet Region contain high levels of variance, as they are based on limited data, approximations, and assumptions (Glosten 2012). Estimates for workboats in particular contain high level of error that have introduced additional uncertainty (Owl Ridge 2018c). Due to this uncertainty, the spill rate projections for workboats (i.e., lightering activities) and vessel traffic in the Lower Cook Inlet Region contain low levels of confidence. Low levels of confidence equate to high levels of uncertainty and, thus, high levels of risk. Given the potential catastrophic consequences of a 50th or 95th percentile spill in this area, we recommend integrating additional data on similar activities from appropriate sites (e.g., The Red Dog Mine) into this Spill Risk model to produce more statistically sound estimates that provide greater levels of confidence.

Tanker Truck Rollover

Several factors suggest that the evaluation of potential impacts from a tanker truck rollover is underestimated. Such factors are described below both generally and in specific detail as impacts related to specific trust resources.

- The risk of a tanker truck diesel spill was quantified using historic data from the Dalton Highway, on which trucks pull single, 10,000-gallon trailers. The proposed project intends to use a three-trailer configuration per truckload, with each trailer carrying 6,350 gallons (19,050 total). Physics suggests that longer and heavier tanker trucks are likely to require longer distances to stop and may be less stable in quick stop or quick turn

scenarios, such as would likely be needed to avoid an accident. These factors are not recognized in the discussion of the risk of tanker truck spills under the proposed project.

- The truck rollover scenario considers a 3,000-gallon spill, which is the “largest diesel spill volume reported on the Dalton Highway” where single trailer, 10,000-gallon trucks operate. Thus, the risk of a spill from a tanker truck rollover was related to the risk of damaging a single trailer. The 3,000-gallon scenario volume would represent roughly half of the volume of one of the proposed ISO containers in a proposed three-container truckload. Given the higher momentum of the heavier three-trailer configuration, it is possible that more than one ISO container could be compromised during a vehicle mishap. Therefore, the volume of a potential spill in this analysis is underestimated.
- The evaluation of potential impacts to natural resources uses subjective and qualitative language, which appears to minimize or dismiss the potential effects. Given the large number of stream crossings along the proposed transportation corridors, we recommend that the scenario evaluation include modeling of downstream fate and transport of spilled diesel in a typical stream, producing estimates of water column concentrations of diesel components throughout the extent of the potentially impacted stream, similar to the analyses done for the evaluation of tailings spills. This would allow other than qualitative evaluation of diesel spill impacts to aquatic natural resources, particularly fish. Such modeling would also provide support for (or against) several of the described potential impacts, which are currently dismissed without basis because “impacts would likely not be measurable.”
- Toxic components of diesel can be entrained in the water column of turbulent water (e.g., wave action, stream riffles, and river rapids). We recommend that the impacts described to surface water, shallow sediments, and fish be expanded to account for entrainment.
- The scenario only considered ice-free and completely frozen stream conditions and fails to consider partially frozen scenarios or accidents that cause breaks in ice. We recommend that the scenario consider the possibility that a truck accident at a frozen stream crossing may break the ice and allow spilled diesel to travel downstream under ice, greatly complicating any response efforts and preventing evaporation of the volatile components into the air. Similarly, spilled diesel could enter a partially frozen stream, such as during the transition seasons between the ice-free and completely frozen conditions. The evaluation claims that diesel spilled onto frozen streams “would pool up” on top of the ice and would be relatively easy to remove; however, streams do not always freeze completely, making this assumption inaccurate.
- The scenario relies, in part, on the truck driver not being injured by the accident that caused the spill, so that the driver can report the spill immediately and begin to implement spill control activities. If the truck accident is serious enough to crack an ISO container, it is likely that the driver would be injured as well, delaying spill response.
- The discussion of potential impacts states that the “duration of impacts would likely be a few days to a few weeks” (for surface water) and “impacted vegetation may recover within one or two growing seasons” (for vegetated wetlands) without providing support for such conclusions. We recommend the analysis consider that impacts may indeed continue longer if soils along the banks of the waterbody are leaching spilled diesel or if spilled diesel is trapped under ice.
- The analysis states that groundwater would not be impacted because cleanup efforts would successfully remove all spilled diesel before it could percolate into the soil fast or

deep enough to contaminate groundwater, an assumption that may be true for some spills, but is not true in all scenarios (e.g., a large spill in an area with shallow groundwater).

- We recommend that the analysis consider the possibility of a tanker truck accident along the port access road for the Diamond Point Port under Alternatives 2 and 3, particularly the stretch along the shoreline of Iliamna Bay. Whereas tanker truck spills onto terrestrial habitats may have relatively localized effects, a spill into an inland stream or Kamishak Bay would rapidly spread on the water surface, would be harder to contain (if able to be contained at all), and would place relatively more natural resources (i.e., more species, higher numbers, and including threatened and endangered species) at risk of diesel exposure.
- The analysis of impacts to fish dismisses the ability of diesel to entrain into turbulent waters (e.g., at stream riffles), discounts the toxicity of diesel in the water column to fish, and overstates that most fish should be able to detect and avoid diesel contamination (see “Fish” section below for details.) The Service recommends the USACE revisit the analysis for project impacts to this important resource.

Water / Sediment / Groundwater Quality

- The analysis erroneously suggests that groundwater contamination, if it occurred, would not travel far from the site of the spill because “most aquifers in the project area are discrete and discontinuous.” The groundwater hydrology in most of the areas along the transportation corridor has not been well studied, but Chapter 3.17 Groundwater Hydrology does indicate that the groundwater hydrology characteristics along the transportation corridor are likely similar to those found in and adjacent to the mine site. Additionally, the impact analysis found in Chapter 4.27.2.5 Scenario: Diesel Spill from Tanker Truck Rollover, Wildlife, states that a diesel spill in terrestrial environments would have “most of the diesel evaporating or seeping into the soil before being removed.” Chapter 3.17 does not describe aquifers in the project area as “discrete and discontinuous” and instead suggests that shallow aquifers are present, groundwater contamination could travel ecologically relevant distances, and groundwater often discharges to surface water with “significant groundwater/surface water interactions.” Groundwater contamination released to surface waters can be a hazard for fish and aquatic ecosystems.

Wetlands

- Vegetated wetlands are ecosystems composed of many natural resources in addition to vegetation. While the impacts of a diesel spill from a tanker rollover are discussed in the “Wildlife,” “Birds,” and “Fish” sections of the Tanker Rollover scenario, there is no consideration of the impacts to components of wetland ecosystems other than vegetation (e.g., aquatic and terrestrial invertebrates, which can form a major component of the food web in vegetated wetlands, and soil microorganisms).
- Plant mortality could result from the depletion of oxygen and micronutrients around the roots caused by the biodegradation of diesel by soil microorganisms. We recommend that the analysis of potential wetland vegetation impacts analyze this potential.

Wildlife

- In the analysis of impacts to terrestrial mammals, USFWS (2010) was referenced out of context. While the impact analysis spoke of terrestrial vegetation, the USFWS reference is relevant to marine plants.
- The analysis incorrectly dismisses the vulnerability of beaver and river otter to diesel spills. These animals rely on the integrity of their fur for warmth in cold aquatic environments, and diesel sheens on water can easily contaminate fur, creating risks of hypothermia and/or dermal absorption. Oiled fur also poses an ingestion risk as the animals try to groom the diesel out of their fur. Much is known about the effects of oil spills on sea otters, and this information would be largely relevant to beaver and river otter despite differences in marine and freshwater environments.
- The analysis does not mention the possibility of dermal absorption of diesel through direct exposure of Iliamna Lake seals to diesel spills that enter Iliamna Lake from a tanker truck spill in a tributary of the Lake, particularly before spill responders arrive on scene and effectively haze seals.

Birds

- The evaluation does not mention the risk of inhalation toxicity in birds. The Service recommends including an analysis of this risk in the revised DEIS.
- While the analysis is generally accurate for the impacts on non-rare birds from truck spills in terrestrial or inland stream/wetland environments, it did not recognize the relatively higher severity of impacts to birds from truck spills that may reach Kamishak Bay or Iliamna Bay. A truck spill into a stream that flows downstream to Kamishak Bay could affect relatively large numbers of rock sandpipers overwintering in the area and many other coastal/marine bird species likely present during the summer and migratory seasons. A truck spill into Iliamna Bay (e.g., from a truck sliding off the shoreline road) could also threaten relatively large numbers of coastal/marine birds as well as their prey in tidal mud flats and estuarine marshes. The Service recommends that the revised DEIS include these additional analyses.

Fish

- Reference cited as “NOAA 2006” is not available on the Pebble Project EIS website. Please provide access to this reference on the project website.
- The analysis does not recognize that diesel spilled into a typical stream within the project site is likely to be entrained into the water column via water turbulence (e.g., at stream riffles). We recommend the revised DEIS acknowledge and analyze this scenario.
- Components of diesel, when entrained into the water column, are known to be highly toxic, particularly to early life stages of fish, such as eggs and sac-fry. From NOAA (2018i) (as used in the DEIS): “In terms of toxicity to water-column organisms, diesel is considered to be one of the most acutely toxic oil types.” Diesel exposure can cause sublethal effects such as decreased feeding rates, which can lead to the early demise of individuals (Gregg et al. 1997, Schein et al. 2009).

- While it has been found that a few species of fish (mostly fish adapted to highly variable estuarine environments) are able to detect and avoid diesel contamination in water or sediments, avoidance is only possible if: 1) fish are self-mobile and 2) there is clean habitat into which to retreat. Fish eggs and small/young fish that are not strong enough to navigate against stream currents would not be able to avoid diesel contamination. When spilled diesel is thoroughly mixed in the water column, the only safe habitat may be located upstream of the spill or in a clean tributary to the contaminated stream. A fish trying to avoid diesel is not likely to swim toward the spill source to reach the clean area upstream. A fish drifting or swimming downstream would not likely be able to outswim the movement of the diesel contamination downstream. The diesel contamination is not likely to resemble a bolus of diesel moving downstream; rather, the diesel is likely to be absorbed into or pooled along the stream banks, providing a source of leaching diesel for several days to weeks, depending on the success of response efforts, and prolonged exposure to diesel increases the risk of harm to fish.
- Modeling of diesel entrainment into the stream and diesel concentration dissipation as diesel moves downstream is necessary to effectively and meaningfully characterize the risk and the geographic extent of potential harm to fish from diesel spills into streams. We recommend that modeling to analyze and characterize the impacts from a diesel spill be done similar to the modeling that was done for the impacts analysis of tailings spills.
- The analysis does not evaluate the risk to fish from diesel spilled into waterways during the winter, when diesel may become trapped under ice either because the tanker truck accident cracked the ice or the waterbody was incompletely frozen over. Diesel trapped under ice cannot evaporate into the air, possibly increasing the toxic water-soluble concentrations under the ice. We recommend the revised DEIS include an evaluation of risk to fish from diesel spilled into waterways during the winter.

Threatened and Endangered Species and Marine Mammals

- The evaluation of a tanker truck diesel spill on species protected by the ESA and the MMPA erroneously focuses entirely on spills in terrestrial habitats only, despite the analysis of truck spills into streams done for other natural resource categories. A spill into a stream could discharge diesel into the marine environment. The evaluation also ignores the possibility of a tanker truck accident along the port access road for the Diamond Point port under Alternatives 2 and 3, particularly the stretch along the shoreline of Iliamna Bay. The analysis should evaluate the impact of a truck spill that discharged diesel onto the shoreline or into the marine waters of Iliamna Bay would have on Northern sea otters and Steller's eiders, in addition to other rare species.

Commercial and Recreational Fishing

- It may be true that a tanker truck diesel spill may not have significant long-term effects on recreational fishing, but the statement, "adult and juvenile fish are relatively mobile" and can avoid diesel spills (see comments for diesel spill fish impacts) is inaccurate and unsupported. While a diesel spill into a stream may significantly affect the fish populations in that stream (depending on the time of year) due to the high acute toxicity of diesel entrained into the water column, the stream receiving the spill is not likely to

comprise the majority of its watershed, and the clean portions of the watershed may continue to provide recreational fishing opportunities. Nearby unimpacted waterbodies may provide alternative recreational use sites. We recommend correcting the presentation of this information.

Marine Tanker Vessel Collision

- We recommend strengthening the discussion of mitigation-related design features of the marine tug-barges described in Section 4.27.2.4. For instance, marine radar is mentioned as a tool to be used to prevent collisions. Would state of the art technology be used (e.g., electronic chart display and information system or automatic identification system), which can enhance collision/collision prevention? See the first paragraph under “Design Features of Iliamna Lake Ferry” for examples of additional mitigation measures that should be applicable to tug-barges as well.
- We recommend that the tug-barge carry emergency tow gear.
- “Design Features of Marine Tug-Barges” should contain descriptions of the typical causes for tug-barge incidents, like is described for “Design Features of Iliamna Lake Ferry.”
- We recommend that the revised DEIS identify whether the transportation of diesel to the Amakdedori/Diamond Point Port would occur through tug-barges owned and operated by PLP or through the contracted services of a fuel distribution company. If PLP intends to operate the tug-barges, additional description of PLP’s mitigation measures regarding the safe operation of the vessel are warranted.
- The impact analysis accurately acknowledges that more than half of spilled diesel would evaporate relatively quickly, but we recommend that it also should acknowledge the environmental threat of the relatively more persistent components of diesel. For example, the impact analysis fails to describe the geographic extent of the area potentially impacted by a 300,000-gallon diesel spill (e.g., maximum expanse of sheen). The greater the geographic extent, the greater the likelihood that birds, marine mammals, threatened and endangered species, etc. would come in contact with the diesel. The spill trajectory modeling depicted in Owl Ridge (2018c) indicates that even a small spill (500 gallons) originating from near Augustine Island could have a significant portion (38 percent) travel more than 55 miles within 3 days to reach shorelines at Afognak Island.
- The spill response capacity for the tug-barge spill scenario does not describe wildlife capture and rehabilitation efforts (i.e., for birds, marine mammals, threatened and endangered species, and other animals). What would be the capability to capture and rehabilitate the various types of animals that are likely to be oiled during the 300,000-gallon spill scenario? What would be the capacity (e.g., how many Steller’s eider may be held in rehabilitation facilities at one time)? We recommend providing these details in the revised DEIS.

Water and Sediment Quality

- The DEIS does not include discussion of impacts to shoreline/intertidal sediments from the portion of a 300,000-gallon diesel spill that persists to make landfall. Trajectory modeling (Owl Ridge 2018c) suggests that significant shoreline contamination is very

likely with a 300,000-gallon diesel spill. We recommend adding an analysis of discussion of the potential impacts to the shoreline/intertidal zone.

- The Spill Response capacity described for the 300,000-gallon tug-barge collision scenario did not include any shoreline cleanup. We recommend adding an analysis or discussion of shoreline cleanup in the tug-barge collision scenario.

Wildlife

- Terrestrial mammals that eat diesel-contaminated prey (live or carrion) may suffer sublethal effects of oil ingestion (e.g., hematological changes, organ damage) that could contribute to the animals' early demise (USEPA 1999, USFWS 2004, Patrick-Iwuanyanwu et al. 2010). These findings should be discussed in the DEIS.

Birds

- The description of the potential impacts of the tug-barge collision scenario on birds does not include any quantitative evaluation except for the rock sandpiper. Thus, it was not possible to evaluate the potential magnitude of the impact to birds. The current analysis seems to lack data on the numbers of birds of different species present in Kamishak Bay during different seasons; it also lacks trajectory modeling results that provide an idea of the geographic extent and duration of diesel in the environment for 3 or 4 days after the spill. We recommend generating quantitative estimates (e.g., total number of birds oiled) using realistic assumptions and identified caveats.
- The analysis uses qualitative, subjective, and unsupported language that appears to downplay the potential impacts to birds resulting from a 300,000-gallon tug-barge collision spill. For additional clarification, we provide the following comments and recommendations:
 - With respect to the analysis of potential bird impacts, it is irrelevant that “diesel is not very adhesive to substrates.” Diesel can foul bird feathers as severely and as easily as crude oil, destroying the insulation and/or buoyancy that feathers provide coastal birds. From USFWS (2004b): “Light oils [e.g., diesel] leave a film on intertidal resources and have the potential to cause long-term contamination.” Birds that use the intertidal zone to rest or forage can be exposed to these diesel residues.
 - The analysis states that “impacts from ULSD would have components similar to impacts from heavy oils, but at a reduced magnitude,” suggesting the severity of the impact to birds would be less than for heavy oils; however, the analysis does not provide references to scientific literature to support such a claim. The presence of toxic diesel in the environment may be of shorter duration than heavy oils, but while diesel remains in the environment, the risk to birds (from physical fouling, acute toxicity, and sublethal toxicity) is probably very similar to that of heavy oil, given the presence of toxic polycyclic aromatic hydrocarbons in both. In addition, as was found with the 1996 North Cape oil spill, large spills of highly acutely toxic light oils in rough surf can destroy intertidal food sources for birds for at least 6 months, adversely affecting bird reproductive success (NOAA et al. 1999).

- Information on the effects of heavy oil on birds should not be characterized as representing “worst-case scenario.” Severity of oil spills to birds relies more heavily on whether birds are present in the spill area and likely to come in contact with the spilled oil than on the oil type.
- The analysis references how “several hundred small diesel spills in Alaska...has resulted in few birds directly affected by diesel spills from fishing vessels,” but goes on to mention that small spills in locations of high bird density can result in “more serious” impacts. In this analysis of a 300,000-gallon diesel spill scenario, the mention of the supposedly innocuous small spills is irrelevant, and we recommend that more discussion be provided regarding the scenario’s potential impacts.
- “During most oil spills (which are generally heavier compared with diesel), seabirds are harmed and killed in greater numbers...” The phrase written in parentheses is not necessary, and its inclusion appears to be an attempt at minimizing the reader’s perception of the potential impacts to birds, as if (incorrectly) the impacts discussed later in that paragraph are less likely to occur with a diesel spill.
- The analysis suggests that spill response actions for the 300,000-gallon spill scenario would be limited to the vicinity of the spill origination, and therefore bird disturbance would be limited to that area as well. We believe this is unsupported and inaccurate. Trajectory modeling (Owl Ridge 2018c) indicates that within 3 or 4 days a 300,000-gallon spill can travel over 50 miles, with as much as approximately 100,000 gallons either still floating on water or stranded on shorelines. Thus, response actions and bird disturbance could occur in a much larger area than just in the vicinity of the tug-barge. We recommend this analysis be corrected.

Fish

- This analysis for fish starts by pointing out that “floating diesel tends to evaporate...with no or very little visible sheen remaining within 3 days.” This is not true of a 300,000-gallon diesel spill, as shown by the trajectory analysis and maps found in Owl Ridge 2018c. Therefore, we recommend removing this language.
- Impacts to important planktonic and weak-swimming nektonic organisms, such as tanner crab larvae and pacific herring eggs/larvae, are not mentioned. We recommend including impacts to these important organisms in the analysis.

Northern Sea Otter

- This section generally describes the susceptibility of sea otters to oil exposure and describes the factors that can affect the magnitude of impacts; however, this section does not describe the potential impacts that may result from 300,000-gallon diesel spill scenario.
- The statement that the “duration of direct impacts would be short (10 to 20 days)” is misleading. A 300,000-gallon spill in an area with high sea otter use (e.g., Kamishak Bay) could kill a significant number of sea otters, and this acute loss within the local

ecosystem could be felt for several years due to the demographic lag hindering recovery (Esler et al. 2018). The statement also fails to recognize the potential time it could take for sea otter prey to recover after being impacted by the 300,000-gallon spill. We recommend revising this section to more completely and accurately analyze and disclose the potential effects of a 300-gallon spill.

Steller's Eider

- The analysis appears to conclude that, despite the relatively high numbers of Steller's eiders in Kamishak Bay during some times of the year, a 300,000-gallon diesel spill originating in Kamishak Bay during the time of year when eiders are present would not "result in a large number of eider mortalities" because oil spill response efforts would be successful in capturing most/all of the oiled eiders and rehabilitating them. We believe this conclusion is unsupported and incorrect for the following reasons:
 - Searching for and finding live, oiled seabirds/seaducks is difficult and is never 100 percent effective. The manpower that would be needed to find and capture all of the oiled Steller's eider would be impractical.
 - Once they are discovered, capturing oiled seabirds/seaducks in the wild is difficult and usually only possible after the bird has been notably weakened by its exposure to the oil. Physiologically compromised birds such as this are not always able to be rehabilitated.
 - The successful rehabilitation of oiled seabirds/seaducks is reliant on the number of seabirds that rehabilitation facilities can handle at any one time. A 300,000-gallon diesel spill in Kamishak Bay during the time when Steller's eiders are present is not only likely to oil significant numbers of eiders but also significant numbers of several other bird species, all of which would be targets for capture and rehabilitation. A spill of this magnitude would likely overwhelm seabird rehabilitation facilities.
 - It would not be possible to focus capture and rehabilitation efforts for Steller's eider on just the eider that are the Alaska-breeding population, since they are indistinguishable while in Kamishak Bay.
- The statement that "most impacts would have a short duration (1 to 12 months)," is unsupported and incorrect and should be removed. While it may be true that diesel may cease to cause new environmental harm in 1 to 12 months, the impacts from a 300,000-gallon diesel spill on the Steller's eider of Kamishak Bay may last for several years until the impacted eider populations have recovered, similar to the Exxon Valdez harlequin ducks (Esler et al. 2002).

Subsistence

- The analysis states that "impacts would last for a short period of time" without providing support for such a statement. We recommend providing a citation or additional support for this statement, or amending the statement to reflect a more likely scenario for the duration of potential impacts.

Ferry Incident

- The project proposes to place the diesel-hauling ISO tanks in a secondary containment system during transport via ferry. No description of this secondary containment system is provided, so the system's potential to prevent spills from the ISO tanks cannot be evaluated. The revised DEIS should describe the secondary containment system and analyze its impact on spill potential.
- In Section 4.27.2.4, ferry incident mitigation measures describe a propulsion system that can withstand 100 to 150 mph winds. We recommend developing a PLP ferry operations policy that prohibits ferry operations under certain extreme weather conditions.
- An analysis of impacts from a potential diesel spill associated with ferry operation was not performed because "a large-volume release of diesel from the Iliamna Lake ferries was considered to be so improbable as to have negligible risk." As recognized in Section 4.27.2.2, common causes of diesel spills in Alaska include overfilling of tanks. A spill associated with the refueling the ferries may be the type of ferry-related spill that has the highest probability of occurrence. A diesel spill does not have to involve a "large-volume release" to cause significant impacts to natural resources in the relatively enclosed Lake Iliamna. Therefore, an evaluation of the potential impacts from a diesel spill associated with refueling ferries is relevant and appropriate and should be conducted.

Fuel Storage Tanks / Tank Farms

- Section 4.27.2.4 does not describe mitigation measures (nor does Chapter 5) for preventing spills at tank farms, other than the use of secondary containment systems. This is inconsistent with the inclusion of discussion of design-based mitigation measures for the ferries even though ferry incidents are not being considered for an analysis of environmental consequences. Please include mitigation measures throughout the document as appropriate, for preventing spills at tank farms.
- As recognized in Section 4.27.2.2, common causes of diesel spills in Alaska include overfilling of tanks. These include large fuel storage tanks. Secondary containment systems are not always successful in containing the entirety of spilled fuel. We recommend the USACE include this risk in the DEIS analyses.

Section 4.27.3: Natural Gas Releases from Pipeline

- Section 4.27.3.1 should describe, at a minimum by simply listing, pipeline design and engineering features that would reduce the risk of pipeline rupture from seismic hazards (e.g., double-walled pipelines, leak monitoring systems).
- Section 4.27.3.2 inadequately describes the fate and behavior of released gas. We recommend this section include:
 - Information on the fate and behavior of leaked natural gas under ice. Such an event occurred in Cook Inlet in December 2016 from the Hilcorp pipeline gas release, which was a seafloor pipeline - as is the proposed project pipeline - that was damaged by a rock. Given the recent example of such an event, analysis of the potential effects is appropriate and should be added.

- Information on the solubility of methane in seawater at temperatures and salinities of Cook Inlet and Lake Iliamna. This would affect the rate and degree to which the gas would “rise buoyantly up to the surface” in the event of a leak.

Section 4.27.3.3: Spill Response

This section, as currently drafted, is incomplete and inadequate. Although true that the project applicant would be required to follow regulatory requirements for a natural gas spill response plan, the DEIS should at a minimum:

- Outline basic plan elements. Without spill response details, it is not possible to evaluate possible environmental consequences outside of a no-response scenario.
- Specifically discuss Cook Inlet and Lake Iliamna scenarios and consequences for release of gas under ice, as occurred in Cook Inlet in December 2016 from the Hilcorp pipeline gas release, which was a seafloor pipeline, as is the proposed project pipeline, which was damaged by a rock. Leaked natural gas from the referenced pipeline gas release accumulated under the ice and resulted in delayed repair of the pipeline, due to dangerous ice conditions and the presence of accumulated and potentially explosive methane bubbles under ice.

Sections 4.27.4 and 4.27.5: Concentrate Spills and Slurry Spills

These sections suffer from lack of specificity, in particular acknowledgement of highly variable water flows in the project area, and therefore minimize potential effects of concentrate and slurry spills. Because of the lack of existing response capacity (Page 4.27-39), the potentially “decades-long” effects of concentrate spills (from potentially acid-generating (PAG) and metal-leaching (ML) characteristics of ore concentrates, Page 4.27-33), the significant volumes (e.g., 2400 wet tons of copper-gold concentrate daily, Page 4.27-33) proposed for transport over multiple project areas and habitats, and the potential for transfer/lightering of ore concentrates, Sections 4.27.4 and 4.27.5 should be significantly expanded in scope and detail to fully inform the public and allow the project proponent, the USACE, the Service, and other regulatory and response agencies to fully evaluate the effects of concentrate spills to all Affected Environment categories and differentiate among the Alternatives. In particular:

- The timeframes for effects should explicitly incorporate seasonal and annual variation in water flow. Spills in low-flow seasons or years may result in less flushing of sediments and water from spills downstream than presented in the DEIS.
- Similarly, water flow variability should be explicitly incorporated into analyses for potential acid generation.
- More accurate acid-generation estimates, including explicitly incorporated water flow variability and high oxygen saturation in flowing waters (as acknowledged in the Tailings Spill section, Page 4.27-68), could determine whether acid generation from concentrate is greater than is accounted for in the DEIS.
- Increased acid generation can lead to increased metals leaching. Because these chemistries are co-located at a molecular level, (highly variable) water flows may not

“dilute” the acid before metals leaching occurs - there may be greater concentrations of metals leaching than is currently accounted for.

- Because acid generation and metals leaching occur over years to decades, so can the effects. This needs to be explicitly stated in concert with any time frame given for acid generation and metals leaching.
- Because there may be greater metals leaching than is currently stated, a full examination of toxic effects of metals on affected resources, particularly copper on salmon, should be included in this section (as it is in the Tailings Spills section).
- Please use correct terminology throughout the DEIS by changing “Acid Rock Drainage (ARD),” which implies a natural condition based solely on geology, to “Acid Mine Drainage (AMD),” which accurately describes acid generation due to mineral extraction activities (mining), from which all of the acid generation described in the DEIS would stem.

Section 4.27.4.1: Copper-Gold Concentrate

Additional information is necessary on the design of the concentrate shipping containers. Specifically, we request USACE provide additional details on the following:

- If a full, lidded container was to accidentally fall into marine waters during lightering to cargo ships, would the lid remain in place, preventing the discharge of mineral concentrate to the marine environment?
- Are the container lids strong enough to remain sealed in the event of a concentrate-hauling truck rollover?
- Verify that sufficient free space within a cargo hold *as it is being filled* would remain to allow the containers to be “lowered deep within the hold of the bulk vessel before being overturned, and the lids released” (Page 4.27-34).
- Bulk cargo ships, particularly those carrying mineral concentrate, are at an added risk of capsizing due to possible cargo liquefaction/instability. Proper distribution of concentrate into the cargo holds and preventing the exceedance of the maximum moisture content in the dry concentrate are important to ship stability. The DEIS does not demonstrate that the proposed method of tipping concentrate containers while lowered into the ship cargo hold would not incidentally increase the likelihood of capsizing, which could result in the release of concentrate.

Section 4.27.4.3: Fate and Behavior of Spilled Concentrate

- The introductory paragraph notes that the fate and behavior of spilled concentrate occurs, “over the long-term, over several years to decades depending on conditions.” We recommend listing those conditions (e.g., spill volume and the receiving environment - terrestrial or aquatic) and clarifying the impact of those conditions on the fate and behavior of spilled concentrate. The paragraph continues, “...spilled concentrates would have the potential to produce acid and leach metals into the environment,” and the Service agrees with this statement. The introductory paragraph needs to acknowledge that the potential acid-generating and metals-leaching *effects* of a concentrate spill on

soils, waterbodies, vegetation, air quality, and the biological resources that depend on those, would also occur over the timespan of years to decades.

Section 4.27.4.4: Historical Data on Concentrate Spills/Spill Frequency and Volume

- The estimated risk of a concentrate truck rollover is based on data from the Red Dog Mine, which uses two trailers per truckload, and therefore may be an underestimate of the spill risk for the PLP project. The PLP project proposes to use three trailers per truckload. Heavier and longer truckloads, with their greater momentum, would be harder to control, and therefore the risk of a spill from three-trailer trucks may be higher. The DEIS should acknowledge the difference in the number of trailers per truckload and evaluate the related impact of that difference in spill frequency and volume.

Section 4.27.4.5: Existing Response Capacity

- There are very few details provided regarding the proposed spill response capacity or actions for concentrate spills. Spill response efforts can prevent or ameliorate environmental harm. Without spill response details, it is not possible to evaluate the potential for cleanup success or the possible environmental consequences outside of a worst-case (no response) scenario. Nevertheless, this Chapter's evaluation of potential impacts from concentrate spills often claims minimal environmental impact due to successful concentrate cleanup. We believe it is inaccurate to assume successful spill mitigation without the supporting details of a developed spill response plan. We recommend either supporting the assumption by providing details on the response plan or revising the analysis to reflect a no response scenario.

Section 4.27.4.7: Concentrate Spill Scenarios

- The revised DEIS should include an Impact Analysis for a concentrate spill from the Iliamna Lake ferry. Because the ferry is completely untested, it would be prudent to conduct this analysis.

Scenario: Concentrate Spill from a Truck Rollover

- Greens Creek Mine on Admiralty Island in southeast Alaska also trucks ore concentrate from the mine site to a port conveyor belt. Spill statistics from Greens Creek Mine should be mentioned and evaluated as a comparison.
- Amend the second paragraph to read, "A total of 80,000 pounds of concentrate is released onto roadside terrestrial or into aquatic habitats, including streams or rivers."
- The Spill Response description is accurate; a concentrate spill into a stream would be nearly impossible to clean up. However, the Potential Impacts section (beginning on Page 4.27-43) dismisses the likelihood of acid generation, metals leaching, and other effects from concentrate spilled into streams by assuming that spills would be cleaned up. These two conclusions are inconsistent and are carried throughout the Concentrate Spill section. Please revise the impact analysis to evaluate the most likely scenario that no spills are cleaned up.

- No quantitative modeling was performed for spilled concentrate fate and transport in “high-energy” (Page 4.27-43) streams (as was performed for tailings spills). Claims that stream flow would dilute any acid/metals sufficiently so that changes in water quality could not be measured are without support in the absence of modeling that specifically relates existing and predicted hydrological regimes (e.g., stream velocity and fluctuations from rainfall or runoff) to the proportion of concentrate that would be “flushed downstream.” Further, concentrate may be deposited in stream areas that are intermittently wet as the stream water level fluctuates, and this would facilitate acid generation and metals leaching.
- The revised DEIS should evaluate the potential for a truck rollover to break through the ice, allowing spilled concentrate to enter the waterbody and increasing the difficulty of removing the spilled concentrate.
- Because final road design, including proposed grades, has not yet been determined, the differential probabilities of ore concentrate spills from truck rollovers among alternatives cannot be determined or evaluated. The revised DEIS should include an evaluation of a range of grades and associated spill probabilities.
- The first sentence of *Water and Sediment Quality* should be revised for clarification. If spilled concentrate does not enter surface water, then there would be no impacts to surface water quality. The second sentence in this section is not applicable; the DEIS acknowledges that no spill response capacity exists and provides no details as to how concentrate would be recovered “promptly and thoroughly.” Therefore, the Service assumes that impacts would occur.
- Total Suspended Solids (TSS) and Turbidity: We recommend the analysis consider that impacts could actually occur over weeks to months to years, depending on seasonal and annual variation in stream flows.
- Acid Generation and Metals Leaching: The entirely descriptive analyses contained in this section are qualitative, subjective, and inadequate to inform the public, the USACE, the Service, and other regulatory agencies about the impacts of an ore concentrate spill or to evaluate differences among alternatives.
 - For example, subjective wording in the DEIS (Page 4.27-44) downplays the risks of acid generation, particularly in flowing waters. It is incorrect to say that acid generation would not occur under water, particularly under flowing water or lakes or ponds that have seasonal turnover, as these types of waterbodies have relatively high dissolved oxygen sufficient to generate acid, albeit not as quickly as in air. Further, the seasonal and annual water level fluctuations of streams and rivers in southwest Alaska may actually expose concentrate spills to air, which would also result in acid generation.
 - Similarly, metal leaching into water and subsequent bioavailability is dependent upon pH, alkalinity or conductivity, the valence state of metals in the ore, availability of non-biotic organic substrates, and other water quality variables, which are not mentioned or modeled in the DEIS for different types of receiving aquatic habitats.
 - Similarly, there is no analysis presented to support the conclusion that “fugitive dust would likely not have measurable impacts on water quality.”
 - Please amend this section with robust modeling of the range of all site-specific impacts for TSS and turbidity, acid generation, metals leaching (from the mine

site and in the event of a concentrate spill), and fugitive dust from a concentrate spill on land.

- Under Air Quality, the assumption that spill response would result in no measurable impacts of fugitive dust is unclear. The subjective “prompt and thorough” qualitative description is unsupported by any spill response capacity or plans.
- The description of impacts under Wetlands and other Water/Special Aquatic Sites, and Vegetation is inadequate. There are no data nor any analyses to support the assertion that the concentrate would not affect wetlands through acid generation. There is no analysis to support the estimate of recovery time of several growing seasons for wetland vegetation recovery.
- Under Wildlife, there are no data or analyses to support the conclusion that a concentrate spill into a stream “would impact a small fraction of the total salmonid eggs in a stream,” that there would be no measurable impacts on salmon populations, and that the duration of potential impacts would be “days to weeks” for wildlife and “will not extend longer than 1 year” for fish. The conclusions in the summary paragraph for this section (Page 4.27-46) are unsupported. Please either provide support for this conclusion or amend the conclusion.
- Under Fish, the Service disagrees that duration of impacts would not extend longer than 1 year (Page 4.27-47), as cleanup of a spill to aquatic habitats was previously acknowledged as being difficult or impossible to conduct. Therefore, impacts would likely occur over the years to decades during which acid generation and metals leaching would occur, or impacts would occur permanently via sediment “modification” of the benthic habitat that could significantly impair spawning habitat, depending upon the amount, thickness, and compaction of spilled concentrate as well as water flow. We recommend that the revised DEIS include a complete list of fish habitats that may be affected by an unrecoverable in-water concentrate spill (e.g., salmon spawning, rearing, and feeding habitats; and resident freshwater and marine fish habitats in rivers, streams, wetlands, Iliamna Lake, and Cook Inlet).
- While the Service agrees there would be no measurable toxicity impacts to fish from metals if the spill is promptly removed, the DEIS previously acknowledges concentrate spill cleanup in water as being difficult or impossible to conduct. Therefore, impacts would likely occur. In particular, copper is highly toxic to fish. Given the ecological, economic, and cultural importance of salmon in the project area, we recommend that the DEIS thoroughly explain and analyze the potential effects of copper and other potentially leached metals from an unrecoverable concentrate spill to fish in this section, similar to the explanation of toxicity in the Tailings Spill section, including:
 - Clear and thorough explanations of the potential toxic effects of copper and other metals to fish, such as those cited in the Pyritic Tailings Spill scenario (e.g., for fish, Page 4.27-107).
 - Clear and thorough discussions of chemical factors affecting toxicity (e.g., valence state, pH - which may be lowered in the vicinity of the acid-generating concentrate, and concentration of dissolved and particulate organic carbon; and buffering capacity, which is variable across the project area (Appendix K3.18)).
 - Commonly accepted and scientifically sound modeling to predict bioavailable copper concentrations in water and fish from an unrecovered concentrate spill

(e.g., U.S. Environmental Protection Agency's Biotic Ligand Model) in streams, lakes, wetlands, Lake Iliamna, and Cook Inlet.

- The DEIS should not assume that a concentrate spill on ice would be recovered, as even one container or bag of concentrate would weigh many tons and could easily break through the ice. We recommend that the revised DEIS examine the potential for such an incident to occur as informed by an assessment of Alaska trucking accidents where trucks or cargo have gone through ice.
- We recommend that the DEIS acknowledge the potential for cumulative effects from single and multiple unrecoverable concentrate spills into water over the approximately 25-year life of the project, including the potential for impacts to salmon populations plus the ecosystem elements that rely on them for nutrients (e.g., marine-derived nutrients), food (e.g., bears, humans), and economic benefits (e.g., commercial and recreational fishing). For example, under Commercial and Recreational Fishing (Page 4.27-49), the DEIS first states that a spill could smother salmon eggs, but because it may occur upstream of commercial salmon locations, there would be no impact. This conclusion is logically inconsistent, as fish eggs become adult (harvestable) fish.
- Under Subsistence (Page 4.27-50), the DEIS minimizes impacts by assuming that a concentrate spill would be cleaned up.

Scenario: Concentrate Slurry Spill from a Pipeline Rupture

- If an earthquake is severe enough to cause a pipeline rupture (Page 4.27-50), it may also damage the automated leak detection system and the isolation valves. Please amend the scenario to include a range of possible volumes of lost slurry to account for this possibility.
- Non-specific Best management Practices (BMPs) are mentioned under Spill Response (Page 4.27-51). Please provide information on these BMPs and how their implementation would minimize impacts from spills.
- The Potential Impacts to Water and Sediment Quality section (beginning Page 4.27-52) is incomplete, similar to the same section for the truck rollover concentrate spill scenario. In particular:
 - TSS and Turbidity: Please remove the statement beginning, “With effective cleanup...”
 - Sedimentation: Concentrate slurry that filled in “void spaces between gravel glasts” would permanently, not temporarily, impact salmon habitat.
 - Acid Generation and Metals Leaching: Please refer to our comments for the same sections under the truck rollover scenario and our comment regarding non-specific BMPs reducing erosion.
- There are no data or analyses to support the conclusion that “there would be no measurable impacts to air quality” from fugitive dust from dried slurry (Page 4.27-54, under Air Quality). Please either add data and analysis or remove the conclusion.
- The description of impacts under Wetlands and other Water/Special Aquatic Sites, and Vegetation (Page 4.27-54) is inadequate. There are no data nor any analyses to support the assertion that the concentrate would not affect wetlands through acid generation. There is no analysis to support the estimate of recovery time of several growing seasons for wetland vegetation recovery.

- The conclusions based on the minimized area of impacted Wildlife for the proposed scenario would not apply to larger spills.
- Our comments under Fish, Commercial and Recreational Fishing, and Subsistence for the concentrate spill scenario apply to the slurry spill scenario; the Service believes that impacts are likely. Given the ecological, economic, and cultural importance of salmon in the project area, the DEIS should thoroughly explain and analyze the potential effects of copper and other potentially leached metals from an unrecoverable concentrate slurry spill to fish and the ecosystem, commercial, recreational, and subsistence activities and values that those fish support.

Section 4.27.4.10

- Please include an Impact Analysis for Section 4.27.4.10 Iliamna Lake Ferry Rupture. Impacts to benthic habitats would occur in the event of a spill from this vessel, which has yet to be designed, built, or tested.

Section 4.27.5

- Please include an Impact Analysis for Section 4.27.5, Reagent Spills. Although relative spill probability is low due to lower volume and hazmat shipping methods used for reagents, the acute toxicity to fish and aquatic life, the hazards to responders and wildlife in the vicinity of a spill, and the lack of existing spill response capacity as noted in Section 4.27.5.3 mean that any reagent spill would have measurable impacts.

Section 4.27.6: Tailings Release

- We appreciate the specificity and analyses that were conducted to inform this section.

Section 4.27.6.3: Fate and Behavior of Released Tailings

- Under “2. Types of Tailings,” please amend last sentence to read, “...bulk and pyritic tailings would cause elevated TSS, turbidity, sedimentation, and metals concentrations if released...”
- Under “3. Water Content within the TSF,” please remove the imprecise and unnecessary phrase, “not capable of flowing great distances.” The previous sentence describes the viscosity, and the following sentence describes modeling results.
- Under Tailings Fluid Release, we do not believe the modeled result is accurate, which assumes that released fluids would be immediately diluted by stream water, especially in the case of large-volume release into smaller headwater streams. Please remove this phrase.
- Under Tailings Solids Release, please amend the last sentence to read, “... downstream sedimentation, elevated TSS/turbidity, and elevated metals concentrations...”
- Under Acid, Tailings Solids, please amend the first paragraph to acknowledge the reality that tailings in aquatic environments are difficult to clean up, by amending the last sentence to read, “Acid would be generated in amounts inversely proportional to tailing recovered.”

- Under Metals, Tailings Solids, please acknowledge the reality that tailings in aquatic environments are difficult to clean up by removing the second sentence of the first paragraph, which reads, “However, timely and effective recovery of spilled tailings would prevent such impacts.”
- Under Metals, Tailings Solids, no data or analyses are presented to support the conclusion that “no single body of water would likely become acidic enough to accelerate ML from spilled tailings.” The revised DEIS should either provide data to support this conclusion or change the conclusion.

Section 4.27.6.9: Tailings Release Scenarios, Bulk Tailings Delivery Pipeline Rupture

- Under Metals Contamination, please define “measurable metals,” especially as ML may be accelerated by acid generation.
- Under Water and Sediment Quality, Surface Water Quality, TSS (Page 4.27-82), please amend the last sentence to include a more realistic timeframe based on the difficulty of cleanup: “...after that for weeks to months to years...”
- Under Water and Sediment Quality, Surface Water Quality, Metals (Page 4.27-85), please amend the timeframe for metals leaching into the water to include acceleration from acid generation.
- Under Wildlife (Page 4.27.87), we recommend amending the last sentence of the first paragraph to include the possibility of tailings spilled through ice or during broken-ice periods, which would be nearly impossible to clean up.
- Under Wildlife, please add at the end of the second paragraph, “Moose may forage on vegetation that regrows or is planted on tailings; willows in particular preferentially accumulate metals (Ohlson and Staaland 2001).”
- Under Wildlife, please amend the third paragraph to say that tailings may eliminate, not “reduce the quality of,” spawning habitat. We disagree that no population-level impacts may be anticipated from the proposed scenario; we anticipate that permanent alteration of salmon spawning areas from difficult-to-clean-up tailings, or from the excavation of streambeds required to clean up tailing spills, would indeed impact NFK salmon populations.
- Under Fish (Page 4.27.89), we disagree that the duration of impacts on salmon would be limited to 1 year (see previous comment).
- Under Fish, we disagree that “any acid produced would be diluted...and reduction in pH would not be measurable,” even for this specific scenario. This would be entirely dependent upon the volume of tailings spilled in water and the water flow regime.
- Under Fish, the conclusion that even a small amount of tailings would not result in measurable toxic and bioaccumulative effects due to metals leaching is not supported by data or analysis.
- We appreciate the toxicity testing (Nautilus Environmental 2012) undertaken in support of the PLP project. However, the testing is insufficient to determine anything besides relatively gross effects on survival in salmonids and growth and survival in an unrelated fish (i.e., fathead minnow) that is a well-used test species, but is not present in the project area. The toxicology literature is replete with salmonid-specific studies on the toxicity of all the metals in the PLP ore to multiple life stages and species. Given the importance of salmon in the Bristol Bay watershed, the DEIS should at a minimum include a thorough

literature review and assessment of sub-lethal, developmental, chronic, and acute effects, including mortality.

- Further, we disagree that long-term persistent population-level impacts to fish would not occur; see our previous comments and notations within the DEIS regarding the inability to clean up fine tailings from aquatic environments.
- Under Marine Mammals, we agree that salmon prey of marine mammals may be reduced and request acknowledgement of the same effect for terrestrial wildlife and human consumers.

Section 4.27.7.9: Potential Impacts of Contact Water Release from the Main WMP [Water Management Pond]

- The Service appreciates the specificity and accuracy of the effects to wildlife and fish outlined in this scenario. On Page 4.27-123, please note that swans were poisoned by lead from sediment and grass ingestion (Blus et al. 1991), and raptors were exposed to lead (Henny et al. 1994) 30 to 40 years after mining operations at the Coeur d'Alene River mining site from ingestion of sediments and grass contaminated with lead; zinc and lead poisoning also occurred in wild birds from the Tri-State (Oklahoma, Kansas, and Missouri) Mining District (Beyer et al. 2004). We recommend the revised DEIS include these as relevant comparisons for estimating effects in the event of a PLP tailings or contact water spill.

Chapter 5: Mitigation

- The Service provides the following comments and recommendations to address mitigation of Diesel Spills:
 - Mitigation measures that would assist in preventing diesel spills only describe three structural design measures (i.e., the use of double-hulled fuel barges, secondary containment systems, and ISO containers); no operational measures are described. Notably lacking in this Chapter, as well as in Chapter 4.27.2, is a description of the precautionary operational measures that would be taken during offloading of the double-hulled fuel barges at the Amakdedori/Diamond Point Ports. For instance, because fuel barge offloading is proposed to occur only four times per year, what measures would be taken to ensure that personnel are adequately trained and experienced (not “rusty”) in port-specific fuel offloading procedures?
 - We recommend consideration of an automated tracking system for trucks hauling oil or hazardous materials to facilitate the identification of truck accidents and expedite response activities.
 - Additional comments on mitigation measures related to diesel spills are provided in association with our Chapter 4.27.2 comments above.
 - We recommend adding a description of operational measures that would be employed to reduce spill risk and to respond to spill events.
 - If no operational measures are proposed, then the analysis of spill risk and spill fate in the DEIS should factor in the increased probability of accidental spills and the resulting environmental consequences.

- Table 5-1: Terminology Used in the EIS - The Service recommends the DEIS analyze agency suggested mitigation. Table 5-1 states agency suggested mitigation measure are not considered part of the proposed project and are not considered in the impact assessments in Chapter 4, Environmental Consequences. However, according to the CEQ in the NEPA Regulations and Appropriate Use of Mitigation Memo (40 CFR 1502.16(h), CEQ 2011), an EIS must contain analysis of environmental consequences of the action, alternatives, and the means to mitigate adverse environmental effects.
- Section 5.2.1.2 Best Management Practices - The description of the BMPs that would be utilized to prevent and manage invasive species is insufficient. There are a wide array of BMPs that are used by industry, and they vary greatly in effectiveness and across the environments. Based on the information provided, a reviewer cannot adequately judge the merits of the techniques the project would use. We recommend adding detailed descriptions of the proposed measures or providing references for proposed BMPs for plants (aquatic and terrestrial), vertebrates, invertebrates, and marine organisms.
- Table 5-2, Page 5-9: We recommend adding discussion/recognition of marine invasive species that may be introduced through the marine port and lightering activities.
- The DEIS refers to the 27 plans (listed below) that may contain measures to avoid and minimize potential impacts of the proposed project, but were not available for review and comment when the DEIS was published:
 - Adaptive Management Plan
 - Aquatic Resources Monitoring Plan (ARMP)
 - Blasting Plan
 - Compensatory Mitigation Plan (CMP)
 - Construction Plan
 - Cultural Resources Management Plan (CRMP)
 - Emergency Action Plan
 - Erosion and Sediment Control Plan (ECSCP)
 - Facility Response Plans (FRPs)
 - Fugitive Dust Control Plan (FDCP)
 - Horizontal Directional Drilling Plan (HDDP)
 - Integrated Waste Management Plan (IWMP)
 - Long Term Management Plan
 - Maintenance Plan
 - Noise Monitoring and Mitigation Plan
 - Marine Mammal Monitoring and Mitigation Plan
 - Mitigation Work Plan
 - Oil Discharge Prevention and Contingency Plans (ODPCPs)
 - Project Communications Plan (PCP)
 - Reclamation and Closure Plan (RCP)
 - Restoration Plan
 - Sediment Control Plan
 - Sewage Treatment Plan
 - Spill Prevention, Control and Countermeasure (SPCC) Plans
 - Storm-Water Pollution Prevention Plan (SWPPP)
 - Tailings Storage Management Plan
 - Wildlife Management Plan

- In the absence of these proposed plans, evaluating the project’s impacts on resources is difficult. For example, in reference to the Wildlife Management Plan (Page 4.32-3.), the DEIS states that the proposed mitigation includes development of a Wildlife Management Plan, and the Wildlife Management Plan would be developed for the project prior to commencement of construction, would use best management practices, and would describe techniques that would be used to minimize the potential for wildlife interaction with project activities and to minimize impacts to wildlife in the project area. It is clear that a Wildlife Management Plan has not yet been developed; therefore, the means to mitigate effects to wildlife have not been developed and are not analyzed in the DEIS.
- Absent details on the proposed management plans, the public, the USACE, the Service, and other resource agencies cannot adequately analyze the ability of these plans to avoid, minimize, or mitigate the effects of the proposed action. Absent these details, the analysis included in the DEIS should not assume successful avoidance, minimization, or mitigation. Impacts should be analyzed and disclosed in accordance within this context. Therefore, we recommend that drafts of the plans listed above be appended to the revised DEIS.
- We recommend including the Service’s Recommended Mitigation Measures (Enclosure 3) in the Wildlife Management Plan that is under development to avoid and reduce direct, indirect, and cumulative effects from project related impacts on fish, wildlife, habitat, and subsistence resources.
- The Service is available to provide technical assistance in developing the various management and mitigation plans. We also request an opportunity to review and comment on the adequacy of the plans in avoiding, minimizing, and mitigating effects to our trust resources.

Appendix E: Laws, Permits, Approvals, and Consultations Required

The Service recommends this appendix provide additional clarity on laws and regulations related to the control and spread of noxious weeds, including for the following:

- Please note, Executive Order (EO) 13751 amended EO 13112 and directs actions to continue coordinated federal prevention and control efforts related to invasive species. EO 13751 applies to the USACE as well as other listed federal agencies. The EO states that federal agencies should refrain from authorizing “actions that are likely to cause or promote the introduction, establishment, or spread of invasive species in the United States unless, pursuant to guidelines that it has prescribed, the agency has determined and made public its determination that the benefits of such actions clearly outweigh the potential harm caused by invasive species; and that all feasible and prudent measures to minimize risk of harm will be taken in conjunction with the actions.”

Additional language related to the proposed project includes: Sec. 3. Federal Agency Duties. Section 2 of EO 13112 is amended to read as follows:

1. "Sec. 2. Federal Agency Duties. (a) Each Federal agency for which that agency’s actions may affect the introduction, establishment, or spread of invasive species shall, to the extent practicable and permitted by law, (1)

identify such agency actions; (2) subject to the availability of appropriations, and within administrative, budgetary, and jurisdictional limits, use relevant agency programs and authorities to: (i) prevent the introduction, establishment, and spread of invasive species; (ii) detect and respond rapidly to eradicate or control populations of invasive species in a manner that is cost-effective and minimizes human, animal, plant, and environmental health risks; (iii) monitor invasive species populations accurately and reliably; (iv) provide for the restoration of native species, ecosystems, and other assets that have been impacted by invasive species; (v) conduct research on invasive species and develop and apply technologies to prevent their introduction, and provide for environmentally sound methods of eradication and control of invasive species; (vi) promote public education and action on invasive species, their pathways, and ways to address them, with an emphasis on prevention, and early detection and rapid response; (vii) assess and strengthen, as appropriate, policy and regulatory frameworks pertaining to the prevention, eradication, and control of invasive species and address regulatory gaps, inconsistencies, and conflicts; (viii) coordinate with and complement similar efforts of States, territories, federally recognized American Indian tribes, Alaska Native Corporations, Native Hawaiians, local governments, nongovernmental organizations, and the private sector; and (ix) in consultation with the Department of State and with other agencies as appropriate, coordinate with foreign governments to prevent the movement and minimize the impacts of invasive species; i) and (3) refrain from authorizing, funding, or implementing actions that are likely to cause or promote the introduction, establishment, or spread of invasive species in the United States unless, pursuant to guidelines that it has prescribed, the agency has determined and made public its determination that the benefits of such actions clearly outweigh the potential harm caused by invasive species; and that all feasible and prudent measures to minimize risk of harm will be taken in conjunction with the actions.”

- We recommend that the USACE add additional clarifying information on the National Invasive Species Act (NISA) of 1996, which amended the Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990. The 1990 Act established the Aquatic Nuisance Species (ANS) Task Force to coordinate nationwide ANS activities. The ANS Task Force is co-chaired by the Service’s Assistant Director for Fisheries and Habitat Conservation and the Undersecretary of Commerce/NOAA. The USACE is one of the federal members to the ANS Task Force. Activities related to the proposed project that members of the ANS Task Force are charged with include: preventing the introduction and dispersal of ANS and monitoring/controlling ANS. The NISA furthered ANS activities by calling for ballast water regulations.

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1	Sectn	Page	Parag	Original Text	Suggested Text	Comment	Additional References
2	1.5	1-4	All	The USACE has determined that the overall project purpose is to develop and operate a copper, gold, and molybdenum mine in Alaska in order to meet current and future demand.	The USACE has determined that the overall project purpose is to evaluate whether to develop and operate a copper, gold, and molybdenum mine in Alaska, if needed to meet current and future demand, and if so, how to do so in a way that reflects the public interest in economic development broadly, while meeting USACE mandates to protect water resources.	The purpose is overly narrow, adopting the applicant's purpose for the project while silent on the agency's purpose and the public interest. The needs and goals of the parties involved in the application or permit may be described as background information. However, it is the agency's purpose and need for action that will determine the range of alternatives and provide a basis for the selection of an alternative in a decision. The purpose should perhaps be to evaluate whether to develop and operate a mine in Alaska, consistent with USACE mandates to protect water quality, wetlands, etc. (CWA 404(b)(1)). Currently, USACE's mandate to protect water quality is not mentioned, only one mining site is considered, and the public interest is only defined by the economic benefits of mining, not the economic benefits of preserving the area - including the economic benefits to commercial fisheries. As currently defined, an alternative recognizing that existing mining is sufficient to meet demand could not be included in the range of alternatives.	
3	2.2	2-2	All			Section 1.5 states that "The USACE has determined that the applicant's stated purpose is made too narrow by limiting the proposed development to the Pebble deposit." However, no alternative is considered for mining sites outside of the Pebble deposit, aside from the no action alternative.	
4	2.2	2.1			Alternative descriptions, table 2.1, and figure 2.1 should be amended to reflect vessel routes in Cook Inlet to and from port sites.	Alternatives do not identify vessel routes to and from the Amakdedori Port Facilities site. While the document indicates some rocky outcrops, they are extensive in the area, and can be seen on NOAA nautical charts. Without further identification of the routes it is impossible to determine the potential risk associated with navigating to and from the Amakdedori port site facilities. This is a crucial component of the development process, as knowing intended approach and departure routes of vessels is also crucial to fully evaluating the potential impact of a proposed project, and where risks to coastal resources may be indicated. This is particularly concerning as some of the reef environments adjacent to Katmai National Park, are extensive and at low tides can extend several kilometers from the coast.	
5	2.2.2 Action Alternative 1 – Applicant's Proposed Preferred Alternative and App. N pg 3	Preferred alternative and App. N pg 3	See preferred alternative	"UPDATES TO THE PROJECT DESCRIPTION" ... 3. The pyritic tailings (and PAG waste rock) would now be placed into the pit lake (i.e., the water that would accumulate in the open pit as a lake at closure).		Section needs further justification. This alternative does not appear viable from either a mining or environmental standpoint (based on Gaffari et al 2011; Chambers 2019, review of US and Canadian Cu mining practices, and attached references). Rendering approximately 88% of a world-class metals resource inaccessible by burying it under acidic waste and more than a million tons of waste rock in the pit, is unlikely and unprecedented. Proposal is likely to avoid managing wastewater at the lined pyritic waste TSF into perpetuity. Recommend providing empirical evidence that the remainder of the ore body would not be "sterilized" (Chambers 2019) by this alternative, provide evidence that the pit can and will actually contain the highly acidic metal laden waste into perpetuity from area waterways. See comments and attached references particularly vendor studies by Smith and Cathcart 2008. Returning PAG tailings and waste rock to the pit after mining just 12% of a known resource (Ghaffari et al. 2011) is an unprecedented scenario for a preferred mine alternative, particularly since the majority (88%) of the ore can be rendered un-mineable afterward (Chambers 2019). Proposed perpetual storage of highly acidic, metal laden water in the pit is problematic from an environmental standpoint, because: soil layers in the region are highly conductive; aquifers under and near the pit supply area waterways; groundwater connections are documented between Nushagak and Kvichak watersheds (Smith and Cathcart 2008 attached); geologic faults at the site remain undocumented; bedrock fractures are known to occur. Such conditions raise questions as to whether the pit is the best perpetual storage site for the highly toxic pyritic waste stream. How would contaminated water from the pit be prevented from migrating to groundwater and area waterways? How and why would this alternative be better environmentally versus storing and treating the PAG waste in a lined impermeable system perpetually?	
6	2.2.2.2	2-60	closure	road system would be retained as long as required		This statement conflicts with 4.9.2.2, page 4.9-5, paragraph 2. It seems much more probable that this road system will be abandoned in place for the associated villages to choose to maintain or use. If the road system is likely to be a change that persists into the future, the impacts of that road system should be evaluated in terms of that longer term reality.	
7	2.2.2.2	2-59	3	a pioneer road would be established		The plan does not specify the location of origin for materials to initiate the road system prior to development of the first material site. If any material is to be brought from off-site, it is important that the mechanism to ensure the material is free of invasives is considered and reviewed.	

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8	2.2.2.3	2-66	3	all		The statement is that the beachhead and permanent port site airstrip would be established during the initial construction effort. This construction would be accomplished prior to any access to material sites, but there is no indication of where the material would come from to establish this airstrip. Invasive plants are usually transported into projects like this either on the heavy equipment, or in bulk materials used to establish such sites. The specific plan for where this material is coming from, and if it originates off-site, how it would be ensured to be free of invasive plants, should be addressed in the document.	
9	3.1.4	3.1-6, 1-7	All			USACE obtained relevant TEK from scoping comments, the EPA Watershed Assessment, the Pebble Environmental Baseline Document chapter on Subsistence (if it can be attributed to an individual or organization) and meeting notes from government to government meetings. Among other items, they were especially interested in information on surface and groundwater hydrology and water quality; natural hazards such as avalanches and rockslides, observations of trends, patterns, or changes in weather and climate; and information on fish, wildlife, birds and marine mammals, including distribution, seasonal presence, population trends, migration patterns, habitat areas, behavior, and changes over time; and culturally important areas in the project area from a historic and contemporary perspective. The EIS sees TEK as a body of knowledge about climate, landscapes, and subsistence resources, and including a historical perspective, but this characterization does not capture its cultural significance. Because TEK is an accumulation of data acquired over thousands of years, the depth and breadth of this knowledge is vast. Comments compiled from public meetings and consultations do not adequately document TEK.	
10	3.2.2.5	3.2-15	4	The National Park Service manages.... These transportation corridor and mine site components would occur in the vicinity of, but not on, these lands. These project components would therefore not be subject to the NPS's land management jurisdiction.	These transportation corridor and mine site components would occur in the vicinity of, but not on, these lands. However, as a major conservation stakeholder in the immediate vicinity, NPS is concerned about impacts to its managed resources from contaminant-enriched fugitive dusts and impacts to fisheries and aquatic resources. Both pollutants and resources are mobile and the mine therefore has the capacity to affect conditions in NPS conservation units.	All stakeholders need to be involved in these discussions, as pollutants and aquatic resources impacts don't respect lines drawn on a map. Same comment for other land managers in the vicinity.	
11	3.9.1	3.9-2	5			Section 3.9.1, Traditional Knowledge, of the EIS states that TEK, and the cultural value of subsistence as a chosen lifestyle, as described by Boraas and Knott (2013) were reviewed during development of the subsistence section and incorporated into the subsistence section. The EIS says that in this way, TEK regarding areas of subsistence use and harvest data, processing and sharing, and how information is transmitted over generations are incorporated into the analysis of Section 4.9, Subsistence. Boraas and Knott's report painstakingly documents, through oral history interviews, research in communities, and other sources, Yup'ik and Dena'ina people's connections to the land and resources over time in the Nushagak and Kvichak watersheds. Although the EIS has added this reference to the section on subsistence, there is still not adequate recognition of the cultural and spiritual importance of subsistence over many generations within a specific ecosystem.	
12	3.11.2.3	3.11.4		This section identifies key observation points representing common and/or sensitive viewer locations within the EIS area. It should include a location within Lake Clark National Park.	Add an additional key observation point that is area-based for NPS lands	A Key Observation Point should be in Lake Clark National Park and Preserve. One of the founding features of LACL is the scenic value, so it should not be excluded.	
13	3.11.2.4 and 4.11.1.1	3.11-4 and 4.11-4	4 and 1	... the National Park Service (NPS 2013b) monitoring report includes photographs that depict artificial night glow;	Replace "artificial night glow" with "natural airglow."	The cited NPS report describes "moderate airglow," which is naturally occurring, and states that "There are no visible lights (or domes) anywhere along the horizon that can be seen with the naked eye."	

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14	3.12.3.3	3.12-10	all			The lightering operation proposed for Alternative 1 (figure 2.26) places the point of transfer to the large bulk carrier in an area identified as having high wave potential (figures 3.16-11 and 3.16-12). This is of concern as it increases the potential for a spill incident as it requires much smaller vessels to transit and maneuver in higher wave potential areas for the lightering process to initiate. It also places the vessels in a very different location within Cook Inlet with different currents and spill fate scenarios.	
15	3.12-2	3.12-5	Table 3.12-2	This table omits the second runway in Port Alsworth, the Wilder/Natwick Runway	Add this runway to the table as it sees equal or maybe greater use to the Port Alsworth (TPO) runway		
16	3.14	3.14-2	5	Further evaluation of limited upland soil chemistry baseline data for the transportation corridor...was not conducted because neither of these components is considered to have mechanisms or chemical sources that could result in adverse impacts to soil.		A great deal of heavy metal enriched dust was released along the Red Dog Mine Haul Road by vehicular traffic (Hasselbach et al. 2005, Neitlich et al. 2017). While some of the contaminants come from the concentrate haul trucks, much is dispersed from mine site mud that is tracked out along the transportation corridor. Even passenger vehicles at Red Dog have mud containing thousands of ppm of Pb, Cd, Zn. In Pebble's case, the outside of all vehicles and containers are likely to become sources of heavy metal pollution. To address this issue proactively, PLP and stakeholders should hire an independent environmental consulting firm to obtain baseline samples from the entire transportation corridor out to a distance of 10 km and including inside of Lake Clark National Park. Based on Appendix 3.14, it appears that levels of Ar, Cd, Cr, Cu, Pb and Hg are considerably elevated in mine site soils above Alaskan baselines. It is essential that soils along the transportation corridor also have baselines. If operations are able to minimize spread of contaminants, this will also be to the mine operator's benefit to be able to prove they were not responsible for pollution in excess of natural conditions.	Neitlich, P.N., Ver Hoef, J.M., Berryman, S.D., Mines, A., Geiser, L.H., Hasselbach, L.M. and A. E. Shiel. 2017. Trends in spatial patterns of heavy metal deposition on National Park Service lands along the Red Dog Mine haul road, Alaska, 2001–2006. PLoS ONE 12(5): e0177936. https://doi.org/10.1371/journal.pone.0177936 . Hasselbach, L., J.M. Ver Hoef, J. Ford, P. Neitlich, E. Creclius, S. Berryman, B. Wolk, and T. Bohleel et al. (2005). Spatial patterns of cadmium and lead deposition on and adjacent to National Park Service lands in the vicinity of Red Dog Mine, Alaska. Sci. Total Environ. 348:211–230.
17	3.15.2.1	3.15-8	1	Bulk TSF South.	A failure of any of the Tailings Storage Facility dams would be likely to send a highly toxic slurry into the Koktuli River or possibly into Iliamna Lake.		
18	3.16.33		all			There is a distinct lack of information in general in the 1 paragraph Marine Water Dynamics – Tides, Currents, and Storm Surge (Page 3.16.33) section. There is no information about currents to enable any review of the potential downstream timing, impacts, and effects of a spill of any type at the marine port facility or in the lightering operation. This is a significant concern because of the potential for copper in extremely small quantities to have significant deleterious effects on marine invertebrates and the marine lower trophic system. It is recommended to included currents in the analysis.	
19	3.17	3.17-1	1	This section describes the distribution and movement of groundwater in soil, sediment, and rock beneath the ground surface that could be impacted by the project.	This section describes the potential for connectivity of contaminated waters with groundwater at a variety of scales.	The main issue here is not depletion of groundwater. Rather it is how contaminants might be contained in such a wet environment with high water movement and high seismic activity. This chapter never discusses the high likelihood of at least local contamination of the groundwater from mining operations.	
20	3.25.1.5	3.25-8	Habitat Use and Distribution			The DEIS cites the recent FWS report on sea otter abundance and distribution (Garlich-Miller et al. 2018) but fails to provide an accurate figure that shows the results from that survey. The DEIS includes a figure of designated critical habitat (Figure 3.25-1) from 2011. The species distribution portrayed in this figure is not representative of current sea otter abundance or distribution in neither the southwestern population (currently listed as Threatened under ESA) nor the southcentral population. The DEIS states "Very few otters from the Southcentral Alaska Stock occur north of Anchor Point (Rugh et al. 2005; Gill et al. 2009), especially during winter months (USFWS 2014d)." However, more recent information would say the contrary (see attached Figure). Large numbers of sea otters were observed between Anchor Point and Clam Gulch. Also not included in the T&E section were abundance estimates from recent surveys of lower Cook Inlet. These figures are readily available and should be included in the DEIS.	

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21	3.25.1.6	3.25-9	Habitat Use and Distribution			Unrecognized in the DEIS is the recent recovery of sea otters along the coast of Katmai National Park and Preserve. Sea otters were hunted to near-extinction during the fur harvest and as late as 1989, the population along the Katmai coast numbered less than 1000. Recent aerial surveys suggest the population has reached an equilibrium density of around 8600 (Coletti et al. 2016). This population is part of the ESA listed population of sea otters and would be at risk from any 'downstream' contamination incidents due to port activities. The sea otter is also a keystone predator in the North Pacific nearshore food web and an important component of nearshore marine ecosystems in the north Pacific (Estes and Duggins 1995).	
22	3.26.1	3.26-1	5	Mine Site--The analysis area for the mine site includes a 330-foot buffer around the direct disturbance footprint and potential drawdown zone from the open pit.	The analysis area for the mine site includes a 3 km analysis area around the direct disturbance footprint and potential drawdown zone from the open pit. This buffer is designed to account for mortality and injury of plants sensitive to fugitive dusts from the mine site (e.g., lichens, bryophytes).	At Red Dog Mine, the zone of effect from the haul road on lichens and bryophytes extended out to 3 km from the road (Exponent 2007, Neitlich et al. 2019). There is no data from the mine site, but since it's considerably more contaminated than the haul road it is likely that the impact zone extends further. Cu is a potent phytotoxin, thus the zone of impact is likely to be larger than that at Red Dog.	
23	3.26.1	3.26-1	6	Transportation Corridor and Ports – The analysis area for the transportation corridor and ports includes a 330-foot buffer around the direct disturbance footprint.	Transportation Corridor and Ports – The analysis area for the transportation corridor and ports includes a 3 km analysis area around the direct disturbance footprint. This buffer is designed to account for mortality and injury of plants sensitive to fugitive dusts from the haul roads (e.g., lichens, bryophytes).	At Red Dog Mine, the zone of effect from the haul road on lichens and bryophytes extended out to 3 km from the road (Exponent 2007, Neitlich et al. 2019). Cu is a potent phytotoxin, thus the zone of impact is likely to be larger than that at Red Dog.	
24	3.26.2	3.26-2	4	To compare vegetation types between the three action alternatives in the analysis area for all four components, detailed ACCS land cover types were dominant growth forms (tree, shrub, or herb), vegetation density (open or closed canopy), and average height (tall, low, or dwarf) from each classification system.		In a 6 mile buffer around the Open Pit, the ACCS landcover maps shows the majority of habitat as "Lichen", "Dwarf Shrub-Lichen", "Bareground", and "Dwarf Shrub" habitat types. These types are all high in lichen cover and would be the most sensitive to fugitive dusts enriched with Cu and other heavy metals. We recommend reworking this section only with the detailed habitat types actually present in the mine site and the transportation corridors. Aggregating to higher levels named by vascular plants (which are less sensitive to contaminants) omits the classes above that are highly at risk from fugitive dusts and essentially negates the risk to this nonvascular plant-rich ecosystem. As drafted, this chapter does not accurately depict the nature of the vegetation at risk.	
25	3.26.4.1	3.26-5		Mine Site- The mine site is characterized by a predominance of shrub types...	Mine Site--The mine site is characterized by a mix of habitats including Lichen, Dwarf Shrub-Lichen, Bareground, and Dwarf Shrub habitats...	Same comment as above: by aggregating into vascular plant-dominated groups, the DEIS have understated the risks to sensitive community types dominated by nonvascular plants.	
26	3.26.8	3.26-15	1			The invasive species description only considers invasive species already established in or near the project area, and is only developed in reference to the effect of climate change on invasives in the section that follows. The real threat of this project in terms of invasive species is in the delivery to the project transportation corridor and mine site in soils adhering to heavy equipment that is brought in for the purposes of this project. In order to address this primary vector, the location, cleaning process, and inspection process for all equipment coming to the site, including all of the transport containers, needs to be addressed.	
27	4.1.2	4.1-25	1	Biological Science Topics	Add discussion of effects of contaminants on sensitive vegetation within the Vegetation and ecosystems topic.		

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28	4.1.2	4.1-25	1	Physical Science Topics	Add fugitive dust (spatial patterns of heavy metal-enriched fugitive dust deposition) as a topic under Physical Science		
29	4.1.2	4.1-25	1	Physical Science Topics	Add Stability of Tailings Storage Facilities as a topic under Physical Science		
30	4.9	4.9-1	1	“The magnitude of impact from the project depends on the past and current level of subsistence use that would be impacted, the extent to which opportunities to harvest and experiences are altered, as well as the ability of subsistence users to relocate to another area with similar opportunities and experiences.”	The magnitude of impact from the project depends on the past and current level of subsistence use that would be impacted, and the extent to which opportunities to harvest and experiences are altered.	The statement as written focuses on the levels of subsistence uses and numbers of opportunities, but does not consider the connections of subsistence users to a specific ecosystem through direct contact with the environment. Relocation to another area with similar harvest opportunities may present many difficulties and would disrupt the transmission of TEK over generations.	
31	4.9.2.4.	4.9-9	All			The EIS states that the project would result in both beneficial and adverse effects on sociocultural dimensions of subsistence. The beneficial effects are economic: Increase in cash income for local residents would lead to more money to use for subsistence equipment, supplies and operating costs. An adverse effect is that project-related employment may reduce the time available for subsistence hunting. The report also acknowledges that project-related employment may reduce the time available for passing on skills and knowledge to the next generation, including traditional knowledge about subsistence. The analysis recognizes that an important potential adverse effect of the project is interruptions and discontinuations in the process of transmission of TEK. The suggested response to reduce those effects is for the company to offer flexible leave options for traditional subsistence practices. This might provide flexibility to some employees but would not address the community as a whole. The DEIS also acknowledges that the project may result in lasting cultural perceptions of resources as contaminated or polluted, but does not address the possibility that such perceptions may be accurate observations of damages to resources.	
32	4.11.1.1	4.11-3	Table 4.11-1	Description of Effects column, at 1% above natural conditions: "Values of solitude and the absence of visual intrusion of human development begin to occur. Attention should be given to protect the site from future increase in light pollution."	"In areas protected for scenic or wilderness character, a significant impact on the values of solitude and the absence of visual intrusion of human development occurs. Attention should be given to protect the site from future increase in light pollution."	We appreciate the addition of light pollution impact assessments estimated from Falchi, et al. 2016 in this draft of the EIS. However, the description of effects at 1% above natural conditions does not adequately reflect the authors' statement regarding impacts to areas that are protected for scenic or wilderness character, such as Katmai NP&P and Lake Clark NP&P. Falchi, et al. assert that horizon glow has a significant impact on values of solitude and the absence of visual intrusion of human development in the direction of artificial light sources when zenith artificial sky brightness is 1% above natural conditions.	
33	4.11.3.1	4.11-7	2	The magnitude of the impact would be seven low-elevation flightpaths (lower than 14,000 feet) between these two locations that cross sensitive receptors at Lake Clark National Park and Preserve and communities. If these routes are used frequently for the project, there could be additional impacts to the soundscape from these flights.		Please provide a map showing these seven flight routes between Anchorage and Iliamna. They will assist the NPS monitor the potential impacts to Lake Clark National Park and Preserve mentioned in this passage.	

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34	4.11.3.1	4.11-6	2	(impacts on night sky in areas 15 to 40 miles from the mine site)	Add predicted night sky brightness impacts that were modeled for the 2013 monitoring site in Lake Clark NP&P. The monitoring location, Keyes Point, is 24 miles from the proposed mine site.	In the absence of a draft project lighting plan in the DEIS, NPS contracted Dark Sky Partners, LLC to conduct an impact assessment of the proposed Pebble Project on night sky brightness at Keyes Point under two potential lighting design conditions, with and without snow cover (see attached report). Using an approximation of project lighting parameters as described in the DEIS, the model predicts that in the direction of the proposed mine, maximum night sky luminance would increase over existing conditions by 886% when snow is on the ground, if the light fixtures are unshielded. Fully shielded light fixtures would increase the maximum sky luminance over existing conditions by 570% with snow on the ground, and 103% with no snow on the ground. When averaged over the entire night sky, brightness (average sky luminance) would increase 4% to 15% over existing conditions, depending on shielding and snow cover conditions.	
35	4.11.3.2	4.11-8	4	Less than 1 percent of Katmai would be affected		The analysis of the mine and road corridor on aesthetic resources of the area focuses on the area of land base where the impacts would be visible. However, unlike many regions of the country, southwest Alaska is largely accessed by air. The visual impact of development is substantial in that it would be seen by visitors to any lodge or land area that is accessed by small plane passing over the area. Katmai Preserve has many visitors that access it from lodges around Lake Clark and Lake Iliamna, as well as from Anchorage and Homer. Areas as far south as Brooks Camp within Katmai also have daily small plane arrivals from the same locations, all of which would pass within view of either the mine site or the transportation corridor or both. The aesthetic nature of the flight experience of all these visitors would be impacted by the developments. This should be considered and addressed, and where feasible, mitigated, because this tourism is a very substantial portion of the Bristol Bay economic base.	
36	4.11.6	4.11-24	Table 4.11-7			In the row "All Components", please add text describing the expected noise impact from transportation flights expected from each alternative.	
37	4.14.2	4.14-2	1	Soil quality is also evaluated for the mine site due to potential fugitive dust impacts from sources of concern.	Soil quality is also evaluated for the mine site and the transportation corridors due to potential fugitive dust impacts from sources of concern.	As is the case at Red Dog Mine, fugitive dust impacts are to be expected along all transportation corridors (Neitlich et al. 2017)	
38	Table 4.14-1	4.14-4				Cu, Zn and total S should be included in this table as they have profound environmental consequences. In addition, the concentrations of contaminants in soil is inherently a spatial issue, with greatest concentrations closest to centers of concentrate handling. To where in the mine site do these estimates pertain? Because of the amount of tracking of concentrates and ore around the road surfaces of the mine site, these numbers seem to capture only a minute fragment of the contamination likely. At the Red Dog mine site, values of Pb, Zn and Cd above 10,000 mg/kg are common (Exponent 2007). The numbers in this table fail to account for the widespread tracking of contaminants by vehicles.	

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39	4.14.2.2	4.14-9	5	<p>The most probable source/activity of soil quality impairment would be concentrate handling. Sealed bulk containers would be emptied offshore in the hold of bulk carriers (i.e., ship), at a depth of no less than 20 feet below the hatch (PLP 2018-RFI 007). The calculated magnitude of total fugitive particulate matter generated on a yearly basis during offshore transfers is 0.002 ton per year (4 pounds). For these reasons, the magnitude and potential of soil quality impact from project activities at the port are considered negligible, and unlikely to impact soil quality in upland conditions. The geographic extent of soil quality impacts (if any) would be confined to the immediate port footprint, of which the duration would be predominantly limited to the construction and operations phases.</p>		<p>Would the outer surfaces of the containers be pressure washed following emptying into the ship? If not, then introducing dirty containers onto the roadway would track additional contaminants onto the roadbed to be dispersed by vehicles. In addition, would the containers be washed at the mine site prior to being loaded with concentrate? Again, if not, this is an additional vector for the spread of concentrate through fugitive dusts. If the containers would not be washed, then the comment that project activities at the port are unlikely to impact soil quality in upland conditions is not likely to be true.</p>	
40	4.16.3.3	4.16-32				<p>In general, DEIS failed to accurately assess the risk and potential damage to marine and coastal resources during Amakdedori Port activities as well as any activities (including lightering operations) within Cook Inlet. An obvious risk would be some sort of contaminant spill in marine waters during transport activities. Diesel fuel was the focus of the DEIS; however, the fate of diesel fuel is not completely analyzed in the spill sections. Diesel is a moderately volatile oil that may be persistent in the coastal environment. While it is true that a significant portion of the diesel fuel may evaporate, there is still a portion of persistent residue that may remain and is not addressed in the DEIS. The amount of oil persistence should be made clear in relation to potential diesel fuel spills. As referenced in previous comments, water dynamics (currents, tides, storms, etc.) have also not been thoroughly addressed. The incomplete analysis of contaminant persistence in marine environments coupled with poor accounting of the fate of those contaminants leads to under-estimating impacts to the biological habitats and species that exist not only within a given radius of the proposed marine activities but also 'downstream' of any port-related activities.</p>	

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41	4.16.3	4.16-32				<p>Marine ecosystems are experiencing a variety of environmental stressors (increased water temperatures, OA, cascading effects of shifts in food webs due to changing ocean conditions, etc.) that recovery from added stressors, such as contamination from fuel spills, will likely be exacerbated and protracted. For example, the 2015-16 common murre mass mortality event in the northeast Pacific exceeded previously described seabird mass mortalities in spatial extent, duration and magnitude. Conservative estimates for mortality in the Gulf of Alaska are 225,000 to potentially exceeding 1 million birds. The mass mortality, coupled with some colony failures during the die-off, collectively suggest a shift in the marine ecosystem of the north Pacific (Piatt et al. In Prep) due to the marine heatwave experience throughout the Gulf of Alaska. The recent marine heatwave likely contributed to sea star declines across the Gulf of Alaska through the increased transmission of pathogens (termed "Sea Star Wasting Disease" or SSWD). As with the common murre die-off, the spatial extent, magnitude and number of species affected are several times greater than described during previous die-offs (Menge et al., 2016). Temperature has been correlated with SSWD and the recent marine heatwave in the Gulf of Alaska is likely a large-scale environmental stressor proliferating the disease (Harvell et al. 2019 Eisenlord et al., 2016; Hewson et al., 2018; Miner et al., 2018). Many sea star species are considered 'keystone' species (Paine, 1966) and the loss of stars likely has drastic consequences to the nearshore marine ecosystem and recovery has not yet been observed across study sites in the Gulf of Alaska, including two national parks (Katmai and Kenai Fjords) (Mitchell et al. In Prep).</p>	
42	4.17.3.1	2	All			<p>The information in the Environmental Baseline documents indicated that at least one of the deep boreholes (completed to the general maximum mine depth) was not able to be used effectively for testing. The DEIS states that three deep wells were used to develop the groundwater models for the deeper aquifer system. In addition to the recommended model analysis suggested by the State, the models and model parameters should be tested by experts at the USGS to evaluate both the results and limitations of the model.</p>	
43	4.18	4.18-4	last	<p>Based on an independent review of the WTP source terms and processes (Appendix K4.18;AECOM 2018i), discharge water from both WTPs is currently expected to meet ADEC criteria)</p>	<p>Although In the fish values section no effect was indicated from WTP effluent into the three rivers, the data review suggest otherwise. See comments.</p>	<p>Based on review of Knight Piesold benchmark studies, predicted water quality from Waste Treatment Plants (see Knight Piesold 2018a DEIS documents at ACE site; Table B1-3 pg Outflow concentrations from Water Treatment Plant) treated effluent from WTPs will significantly differ from natural waters (PLP EBD) in a number of potentially toxic constituents. For example, the amount of aluminum proposed for discharge is above the chronic and acute Water Quality Standards depending on the site's pH, total hardness, and DOC; the amount of Hg (mercury) proposed for discharge is about 8 x more than the chronic toxicity level (4-d ave.) and is 4.4 x more than the acute toxicity level (1-h ave.); and the amount of sulfate to be discharged to the environment is of concern since it increases methylmercury (MeHg) production in aquatic environments, which can impact aquatic resources, including fish and plants, as well as terrestrial piscivorous predators, and human subsistence users (see Paranjape and Hall 2017 attached). Selenium is naturally very low in these systems (PLP EBD), and increased planned discharges from the WTP as well as the potential accidental releases of mine water waste due to failures could lead to bioaccumulation of Se and ultimately cause physical deformities, reproductive failure, and even death in aquatic organisms (see attached Tan et al. 2016, EPA 2016). These potential direct and indirect impacts also need to be addressed in the Fish Values section.</p>	<p>EPA 2016. Aquatic Life Ambient Water Quality Criterion for Selenium in Freshwater 2016 - Fact Sheet. EPA 822-F-16-005. www.wpa.gov; EPA 2018. Fact Sheet: final 2018 Aquatic Life Ambient Water Quality Criteria for Aluminum in Freshwaters. EPA 8222-F-18-003. www.epa.gov; Paranjape, A.R. and B.D. Hall. 2017. Recent advances in the study of mercury methylation in aquatic systems. FACETS 2: 85-119. DOI: 10.1139/FACETS-2016-0027; Schiavon, M., A. Ertaini, S. Parrasia, F.D. Vecchia. 2017. Selenium accumulation and metabolism in algae. Aquat Toxicol. Aug 189: 1-8; Zhu, Y.G., E.A. Pilon-Smits, F.J. Zhao, P.N. Williams, A.A. Meharg. 2009. Selenium in higher plants: understanding mechanisms for biofortification and phytoremediation. Trends Plant Sci. Aug, 14 (8): 436-42; Tan et al 2016. Selenium: environmental significance, pollution, and biological treatment technologies. Biotechnology Advances 34 (2016) 886-907.</p>

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44	4.23	4.23-16 to 4.23-18				The high frequency of traffic with no periods of reduced activity would make the roads essentially barriers to wildlife. Considering the effects of roads/traffic on bears in the literature cited in this section and known high quality bear habitats in the areas in which the roads would be constructed, it would be expected that localized population effects could occur due to large scale habitat fragmentation. Local TEK and radio collar data indicate movements from areas north of the mine site and north road in alternative 3 to areas south as salmon enter the system.	
45	4.23.2.2	4.23-14-20	all			The section regarding impacts to terrestrial animals notes accurately that impacts to wildlife often include exclusion from roaded areas. However, there are some shortcomings of the analysis. First, it implies that caribou impacts would not be important since the larger body of the Mulchatna Herd is located elsewhere. In reality, the caribou at the fringes of the Mulchatna Herd habitat, which include the caribou that have been using the Amakdedori area, seem to be less subject to the large fluctuations of the herd as a whole, and may be important for the future growth of the herd. Therefore, the impacts to these animals should be clearly disclosed. Further, since roads and traffic activity are known to be impactful to a broad array of wildlife, especially, in this case, to caribou and to bear, the analysis should consider mitigations of having a road closure for a consistent 8 hour period of time in each day. A transportation corridor so close to McNeil River and to Katmai Preserve would have important implications for movement and dispersal patterns of bears, and a predictable period without transportation activity would facilitate animal access across this zone and promote the continuation of natural dispersal and migration throughout the region.	
46	4.24	Habitat Loss	All sections pertaining to habitat loss and salmon abundance	all sections pertaining to habitat loss and salmon abundance	Authors should consider incorporating the widely recognized concept of salmon stocks and the "portfolio effect" in this DEIS. The Bristol Bay salmon stock portfolio performs much like a diversified financial portfolio, all the smaller spawning populations contribute to the stability over time of the whole. Last year, Bristol Bay produced an estimated 62 million wild sockeye salmon. However, reductions in stock diversity, e.g., removing various small populations that contribute to the overall productivity, such as SFK, NFK, etc. can impact overall productivity through time.	<p>The portfolio concept in ecology and evolution By: Schindler, Daniel E.; Armstrong, Jonathan B.; Reed, Thomas E. FRONTIERS IN ECOLOGY AND THE ENVIRONMENT Volume: 13 Issue: 5 Pages: 257-263 Published: JUN 2015 Performance of salmon fishery portfolios across western North America By: Griffiths, Jennifer R.; Schindler, Daniel E.; Armstrong, Jonathan B.; et al. JOURNAL OF APPLIED ECOLOGY Volume: 51 Issue: 6 Pages: 1554-1563 Published: DEC 2014 Synchronization and portfolio performance of threatened salmon By: Moore, Jonathan W.; McClure, Michelle; Rogers, Lauren A.; et al. CONSERVATION LETTERS Volume: 3 Issue: 5 Pages: 340-348 Published: SEP 2010</p> <p>Population diversity and the portfolio effect in an exploited species By: Schindler, Daniel E.; Hilborn, Ray; Chasco, Brandon; et al. NATURE Volume: 465 Issue: 7298 Pages: 609-612 Published: JUN 3 2010</p>	

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47	4.24.		all	entire section	<p>Revise and add section that discusses past and future predicted impact of climate change on stream thermal regimes and precipitation in the region</p>	<p>Climate change is already affecting the Bristol Bay region and should not be ignored in the DEIS relative to stream thermal and hydrologic regimes. The baseline conditions measured during the 2000s and presented in the DEIS are higher than historic levels. For example From 1949-2012, the Bristol Bay region's average winter temperature (Dec / Jan / Feb) increased by a total 7.56 F (4.2 C) (a statistically significant increase at the 95% level); the average spring temperature (March/ Apr/ May) increased by 3.96 F (2.2 C) (a statistically significant increase at the 95% level); the average summer temperature (June/ July/ August) increased 1.44 F (0.8 C) (a statistically significant increase at the 95% level); The average fall temperature (Sept / Oct / Nov) increased 0.72 F (0.4 C) (not statistically significant at the 95% level) (Bieniek et al. 2014). The mean accumulated spring precip decreased by 8.3 mm during that same time period. All three of those trends are significant at 95% level (see Fig 14 Bieniek et al. 2014). Note: these are not future projections, they are the trends from the 're-analyzed' observation record. These warming trends are projected to continue (Chapin III et al. 2014), with winter extreme temperatures expected to continue warming much faster than other climate extremes (such as summer maximum temperatures) (Lader et al. 2017). In conjunction with the greatly increased precipitation expected throughout Alaska, freezing temperatures and frozen precipitation are expected to be "... increasingly less frequent by late century" (ibid, page 2407). Projections are for a greatly increasing trend for greater extreme precipitation in the Bristol Bay area from 2041 to 2070 (Lader et al. 2017). That work's projections are for an annual total precip at King Salmon to increase from an average annual total of 772.03 mm for 1981-2010 up to an average annual total of 1050.73 mm for 2041-2070 and to 1139.54 mm from 2071-2100 (ibid, Table 3). This could lead to increasing warm-season flash flooding.... Recent work by Littell et al. (2018, and in review) project that for the Pebble deposit region, by 2040-2069, there will no longer be any months with reliable snow cover (Figure 2, Littell et al. in review). In conjunction with the projected increase in precipitation, the projections suggest a shift in streamflows to a more transitional hydrograph (ibid).</p>	<p>Bieniek, P.A., and Coauthors 2012. Climate divisions for Alaska based on objective methods. J. Appl. Meteorology and Climatology. 51, 1276-1289. Bieniek, P. A., J. E. Walsh, R. L. Thoman, U. S. Bhatt. 2014. Using climate divisions to analyze variations and trends in Alaska temperature and precipitation. Journal of Climate 27, 2800-2818. Chapin, F. S., III, S. F. Trainor, P. Cochran, H. Huntington, C. Markon, M. McCammon, A. D. McGuire, and M. Serreze, 2014: Ch. 22: Alaska. Climate Change Impacts in the United States: The Third National Climate Assessment, J. M. Melillo, Terese (T.C.) Richmond, and G. W. Yohe, Eds., U.S. Global Change Research Program, 514-536. doi:10.7930/J00Z7150. http://nca2014.globalchange.gov/report/regions/alaska Lader, R., J. E. Walsh, U. S. Bhatt, P. A. Bieniek. 2017. Projections of Twenty-First-Century Climate Extremes for Alaska via Dynamical Downscaling and Quantile Mapping. Journal of Applied Meteorology and Climatology 56, 2393-2409.</p>
48	4.24..2.3		Tables of fish species should include all fish in assemblage.	<p>Only select fish species are considered in the DEIS. The entire fish assemblage is indicative of the health and biodiversity of the aquatic system that supports subsistence fisheries, yet this is not included nor considered. In fact, the health and productivity of the selected priority species depends on the very species omitted, such as sculpin, please include all species since they all matter. Please revise Tables to include all known occurring fish species in assemblages. For example, Slimy Sculpin, Northern Pike, Lamprey, Three-spine stickleback, ... occur in the impact area yet are not included.</p>	<p>Entire fish assemblage should be considered since changes in composition relative to development can be indication of potential impacts. For example, studies of a hard rock mining impacted region in Idaho showed sculpin missing from impacted assemblages indicating they are a sensitive indicator to metal mining. Sculpin are an important abundant forage fish in the Bristol Bay region and are considered more sensitive indicators of metal impacts to freshwater. Sculpin should be included in all these analysis since they are the most abundant species in the area, are sessile, provide food for predators such as Coho, Chinook, Rainbows etc. Northern Pike occur in the mine region and should also be included in the EIS since they are resident long lived and serve as good bioindicators. See: Use of small forage fish for regional streams wildlife risk assessment: Relative bioaccumulation of contaminants By: Yearley, RB. 2000. ENVIRONMENTAL MONITORING AND ASSESSMENT Volume: 65 Issue: 3 Pages: 559-585 Published: DEC 2000 Maret & MacCoy. Fish Assemblages and Environmental Variables Associated with Hard-Rock Mining in the Coeur d'Alene River Basin, Idaho. Transactions of the American Fisheries Society 131:865-884. Cooper et al. 2015. Identifying indicators and quantifying large-scale effects of dams on fishes. Ecological Indicators Volume 61, Part 2, February 2016, Pages 646-657 Cooper et al. 2017. Assessment of dam effects on streams and fish assemblages of the conterminous USA. Science of The Total Environment Volume 586, 15 May 2017, Pages 879-889. Esselman et al. 2013. Regional fish community indicators of landscape disturbance to catchments of the conterminous United States Ecological Indicators Volume 26, March 2013, Pages 163-173</p>		

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49	4.24.2.1	pgs. 2-6 Habitat Loss	All paragraphs pertaining to estimates of impact on salmon abundance due to habitat loss from development.	For example, summary section on page 6 indicates "low use of coho and chinook rearing habitat,..., low level of spawning in NFK Tributary 1.190...measureable impacts unlikely" Similar sections follow.	Further analysis/clarification needed. Specifically, exactly how fish density estimates were calculated in the recently submitted draft study (Owl Ridge 2019) using PLP EBD aerial escapement data for spawning adult salmon and for juvenile salmon: snorkel, minnow trap, gill net, dip nets, tangle net data ... is unclear. Assumptions, methods, calculations, exactly what data were used, parameters, etc. are unavailable. This should be made clear to the public; this current format of fish density, is unclear and potentially misleading.	The assessment that direct loss of habitat will have low impact on select subsistence salmon populations is based, in part, on analysis of aerial escapement data for adult salmon and on juvenile salmon surveys that use a diverse array of unstandardized methods. This data is then converted in a non-transparent manner to fish density estimates, using unknown methods, unknown data selection, assumptions are not presented, and therefore, it is potentially misleading. Using intermittent, adult salmon, aerial escapement counts to then, "where possible" (pg. 11 Owl Ridge Natural Resource Consultants, Inc. 2019. Draft Essential Fish Habitat Assessment Pebble Project) estimate large scale fish densities by stream segment length, and from that provide an estimate of potential level of impact, is unprecedented and not a scientifically defensible method for determining population level effects from proposed development. Impacts are discussed at the "individual level", which is in itself unclear. Conclusions drawn from the density information are essentially that no impact to salmon populations, but upon what data and analysis is this actually based? Please clarify.	
50	4.24.2.2	8	Section on Transportation Corridor Ferry Operation	No section on accidents or spills included in this section.	Consider including a section that includes an accident scenario and effects where a ferry transporting ore sinks or has some mishap and the ore ends up in Iliamna Lake. How might such an accident impact the rearing, migrating, incubating salmon and resident species? It is unclear exactly how much ore and exactly what concentrate levels will be on each barge, what the risk of such and occurrence are etc.	The concern is that copper/Zn ore will be released into Iliamna Lake. The lake is extremely dilute and has a low buffering capacity. Copper is highly toxic to fish and since the lake is the world's most important sockeye salmon nursery lake, potential impacts from an accidental spill or barge accident should be considered and analyzed for this DEIS. McIntyre et al 2012 Low-level copper exposures increase visibility and vulnerability of juvenile coho salmon to cutthroat trout predators Ecological Applications, 22(5), 2012, pp. 1460–1471 COPPER HAZARDS TO FISH, WILDLIFE, AND INVERTEBRATES:A SYNOPTIC REVIEW Ronald Eisler Patuxent Wildlife Research Center U.S. Geological Survey Laurel, MD 20708 Olfactory toxicity in fishes Aquatic Toxicology 96 (2010) 2–26	
51	4.24.2.7	23-25	all paragraphs pertaining to temperature monitoring exceeding DEC criteria	This section indicates mining will increase thermal regimes and that PLP monitoring during 2004-2009 showed that ADEC fish protection standards for water temperature criteria are already exceeded.	This section needs to be reanalyzed and rewritten taking into account the warming trends already documented in the Bristol Bay region (see citations), predicted future trends, as well as mine alternatives. Because thermal regimes in streams are already increasing due to climate change, increases from proposed development can exacerbate impacts to fish important to subsistence. The fact that thermal regimes are documented as increased already should be acknowledged and incorporated into section 4.24.2.7	The fact that climate has already warmed considerably in the region should be considered and noted in this section relative to the reported "exceedances." A recently published study indicates: From 1949-2012, the Bristol Bay region's average winter temperature (Dec / Jan / Feb) increased by a total 7.56 F (4.2 C) (Bieniek et al. 2014); the average spring temperature (March/ Apr/ May) increased by 3.96 F (2.2 C) (ibid). Mean accumulated precipitation decreased by 8.3 mm during that same time period. All three of those trends are significant at 95% level (see Fig 14 Bieniek et al. 2014). Note: these are not future projections, they are the trends from the 're-analyzed' observation record. These warming trends are projected to continue (Chapin III et al. 2014), with winter extreme temperatures expected to continue warming much faster than other climate extremes (such as summer maximum temperatures) (Lader et al. 2017). In conjunction with the greatly increased precipitation expected throughout Alaska, freezing temperatures and frozen precipitation are expected to be "... increasingly less frequent by late century" (ibid, page 2407).	

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52	4.24.2.7	23	Last section paragraph h 1	"In each year of study, the daily maximum water temperature in the NFK immediately upstream of the mine site exceeded the 20C criteria on about 29 percent of all instantaneous readings during the summer months. The lower ..."	The presentation of thermal exceedances presented as percentages of instantaneous readings is inadequate for any evaluation of potential impact of additional thermal increases from development relative to subsistence fishery resources. Please provide basic statistical summaries of thermal data in text or in a Table, suggest standard seasonal annual maximum and minima (Tmax, Tmin), seasonal mean (Tmean) seasonal median (Tmed), the annual maximum of a seven-day running average of mean daily stream temperature (MWAT) and the annual maximum of a seven-day running average of maximum daily temperature (MWMAT) and ranges by season; not percentages of instantaneous thermal maxima over 20C. What matters, relative to fish, is how long such temperatures persist, not that they occur for an instant or an hour each day.	Presenting daily maxima temperature data as a percent of all instantaneous readings relative to fishery resources in this manner is misrepresentative. What is more appropriate and useful from a fish resources perspective are standard basic statistical summaries, or better yet, a figure. Fish move when it gets too warm and stream temperatures can change rapidly throughout the day. What matters relative to potential stress levels fish are experiencing are how long warm stressful thermal regimes persist in an area (one hour vs. one week). The frequency and duration of such temperatures can easily be presented in a graph, with max, min median and mean in one nice picture which a biologist can rapidly process. Relative to fish, understanding thermal regime patterns is crucial particularly when proposals to increase stream thermal regimes are presented.	
53	4.24.2.7	section	all	All discussion regarding "optimal temperatures" for spawning, rearing, incubation, migration etc. are based on a 1991 unpublished, non-peer reviewed literature review by Weber Scannell.	Section needs reanalysis based on an updated literature review focused more on studies of Northern Latitude thermally adapted populations versus Southern ones.	Because temperature affects all physiological, biochemical and life history activity of fishes, it should be carefully considered in this DEIS because this development would increase stream thermal regimes which has implications for subsistence fisheries. The section focuses, in part, on fish "optimal temperatures", but presentation of "optimal temperatures" is based on a single, outdated, unpublished literature review from 1991 wherein the author indicates (pg. 5) that the information is primarily focused on more southern populations of fish and the information may not be pertinent to AK (because salmon adapt to stream thermal regimes). A more thorough, updated literature review focused on thermal studies of Northern Latitude populations (versus Southern) should be conducted and integrated into this section. A quick literature review of the academic "Web of Science" indicated numerous recent pertinent references more applicable to discussions of fish thermal tolerance ranges and optimums in this section than this single outdated review, for example: Temperature tolerances of North American freshwater fishes exposed to dynamic changes in temperature. Beitinger et al. 2000. Environmental Biology of Fishes 58:237-275; And Konecki and Woody. 1995. Critical Thermal Maxima of coho salmon under field and laboratory acclimation regimes. Can. J. Zool. 73:993-996. Review of the peer reviewed published literature on thermal optimums should be done, then applied, and integrated into this DEIS.	

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54	4.24.2.7	section	all	all presentations of "instantaneous temperature" percentages. For example, 1st para, second to last sentence "...in the NFK immediately upstream of the mine site exceeded the 20C criteria on about 28 percent of all instantaneous readings during the summer months."	Revise presentation of empirical data. Instantaneous reading percentages over a year is non-standard presentation of thermal data for aquatic systems. Data from temperature probes relative to exceedances of ADEC standards (e.g. exceedances of 20C, 15C, 13C) needs to be presented in a manner that is biologically meaningful from a subsistence fisheries standpoint, not as instantaneous reading percentages over a year.	Empirical stream temperature data should be presented in a manner relevant to biologists/agencies evaluating potential impacts of development on fish. What matters to fish, and therefore fish managers, is the frequency, duration and extent of high temperatures as well as availability and accessibility of cooler thermal refuges, such as springs- which abound in that region due to upwelling groundwater. Stream temperature data from all area thermistors can be presented as thermal maps (see fs.fed.us/rm/boise/AWAE/projects/NorWesT/images/ThermalscapeWesternUS_StreamTemperaturesFinal.jpeg) or in an easy to understand and interpret figure showing daily mean, median, standard deviation, max, and min. Or replace instantaneous references in text with annual maximum of a seven-day running average of mean daily water temperature (MWAT), Seasonal Means, Seasonal Medians, Maximum Hourly temperature along with Standard Deviations. The manner in which data are presented is misleading. For example, the second to last sentence of the first paragraph indicates that the daily maximum water temperature criteria established by ADEC was exceeded 28 % of all instantaneous readings in the NFK. Which, for those not familiar with stream temperature data, fish behavior, or that region, could lead them to the conclusion that the NFK above the mine site is already too warm for fish. A review of publically available stream temperature data for 5 long term probes run by UAA on the Kaktuli collected 2013-2017 do not show similar exceedances. See: https://knb.ecoinformatics.org which raises questions regarding exactly how probes were installed, where, and what QA/QC was conducted on the data?	
55	4.24.2.7	All sections referring to "optimum temperatures"	23-25		Recommend to revise all statements that imply predicted thermal changes to streams from mine development will be more "optimum" for the Pacific salmon species that spawn, incubate, rear and migrate there unless substantive proof can be provided that such alterations of natural temperatures regimes would actually prove optimal for these Northern adapted populations.	The published "optimums" that are used in this section are not pertinent to Bristol Bay populations because of the more recent and abundant evidence that salmonid populations adapt to local thermal regimes. The optima cited in the DEIS are based on a single unpublished non-peer reviewed paper from 1991 focused on populations from primarily southern areas. The "optimas" cited in the DEIS are only relevant to the geographic region and the particular populations upon which studies were conducted.	Whitney et al. 2013. Provenance matters: thermal reaction norms for embryo survival among sockeye salmon populations J. Fish Biol.82:1159-1176. Whitney et al. 2014. Population origin and water temperature affect development timing in embryonic sockeye salmon. Trans. Am. Fish. Soc.143:1316-1329; Woody et al. 2000. Temporal variation in phenotypic and genotypic traits in two sockeye salmon populations, Tustumena Lake, Alaska. Trans. Am. Fish. Soc.129:1031-1043; Sparks et al. 2017. Thermal adaptation and phenotypic plasticity in a warming world: insights from a common garden experiment on Alaskan sockeye salmon, Glob Change Biol. 23:5203-5217).
56	4.26.1	4.26-1	2	Mine Site--The analysis area for the mine site includes a 330-foot buffer around the direct disturbance footprint and potential drawdown zone from the open pit.	The analysis area for the mine site includes a 10 km buffer around the direct disturbance footprint and potential drawdown zone from the open pit. This buffer is designed to account for mortality and injury of plants sensitive to fugitive dusts from the mine site (e.g., lichens, bryophytes).	At Red Dog Mine, the zone of effect from the haul road on lichens and bryophytes extended out to 3 km from the road (Exponent 2007, Neitlich et al. 2019). There is no data from the mine site, but since it's considerably more polluted than the haul road it is likely that the impact zone extends further. Cu is a potent phytotoxin, thus the zone of impact is likely to be larger than that at Red Dog.	Neitlich, P. N., VerHoef, J. M., Berryman, S. B., Mines, A., Geiser, L.H. 2019. Impacts to lichens and tundra vegetation from heavy metals on National Park Service lands along the Red Dog Mine haul road, Alaska. In prep. Exponent. 2007. DMTS Fugitive Dust Risk Assessment Volume I – Report. November. Prepared for Teck Cominco Alaska Incorporated, 3105 Lakeshore Drive, Building A, Suite 101, Anchorage, AK 99517. Exponent, 15375 SE 30th Place, Suite 250, Bellevue, WA 98007. November 2007.

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57	4.26.1	4.26-1	2	Transportation Corridor and Ports – The analysis area for the transportation corridor and ports includes a 330-foot buffer around the direct disturbance footprint.	Transportation Corridor and Ports – The analysis area for the transportation corridor and ports includes a 6 km buffer around the direct disturbance footprint. This buffer is designed to account for mortality and injury of plants sensitive to fugitive dusts from the haul roads (e.g., lichens, bryophytes).	At Red Dog Mine, the zone of effect from the haul road on lichens and bryophytes extended out to 3 km from the road (Exponent 2007, Neitlich et al. 2019). Cu is a potent phytotoxin, thus the zone of impact is likely to be larger than that at Red Dog.	
58	4.26.3	4.26-2	4	The duration of impacts would be considered permanent in locations where removal or disturbance to vegetation would occur during construction and remain free of vegetation through closure.	The duration of impacts would be considered permanent in locations where removal or disturbance to vegetation would occur during construction and remain free of vegetation through closure, as well as in areas where recovery could take decades (e.g., lichen, dwarf shrub-lichen, barrens and other habitats dominated or co-dominated by the extremely slow growing nonvascular components.)	Lichens are extremely slow growing and take decades to over a century to recover following catastrophic disturbance such as wildfire (Joly et al. 2010). Indeed, although former lichen habitat following fire has tended to be rich in graminoids, it has stayed low in lichen cover for more than 55 years, and is generally avoided by caribou for winter forage. Full recovery is estimated to take as long as 160 years (Black and Bliss 1978). There is a great deal of lichen habitat in the mine site area.	Joly, K., Chapin, F. S., and D. R. Klein. 2010. Winter habitat selection by caribou in relation to lichen abundance, wildfires, grazing, and landscape characteristics in northwest Alaska. <i>Ecoscience</i> 17(3):321-333. Black, R.A., Bliss, L.C., 1978. Recovery sequence of <i>Picea mariana</i> – <i>Vaccinium uliginosum</i> forests after burning near Inuvik, Northwest Territories, Canada. <i>Can. J. Bot.</i> 56, 2020–2030.
59	4.26.3	4.26-2		Reclaimed areas would be expected to return to the vegetative functions that were lost temporarily as a result of vegetation removal. Natural succession would be expected to take place in reclaimed areas. Vegetation reestablishment time varies; trees and shrubs would be expected to begin to re-establish almost immediately in disturbed areas after construction activities cease, and during and after reclamation activities. Alders (<i>Alnus</i> spp.), willows (<i>Salix</i> spp.), and birch (<i>Betula</i> spp.) are generally the first trees and shrubs to re-establish.	Reclaimed areas would be expected to return to the vegetative functions that were lost temporarily as a result of vegetation removal. Natural succession would be expected to take place in reclaimed areas. Vegetation reestablishment time varies; trees and shrubs would be expected to begin to re-establish almost immediately in disturbed areas after construction activities cease, and during and after reclamation activities. Alders (<i>Alnus</i> spp.), willows (<i>Salix</i> spp.), and birch (<i>Betula</i> spp.) are generally the first trees and shrubs to re-establish. Lichens may take decades to over a century to recover.	Lichens are extremely slow growing and take decades to over a century to recover following catastrophic disturbance such as wildfire (Joly et al. 2010). Indeed, although former lichen habitat following fire has tended to be rich in graminoids, it has stayed low in lichen cover for more than 55 years, and is generally avoided by caribou for winter forage. Full recovery is estimated to take as long as 160 years (Black and Bliss 1978). There is a great deal of lichen habitat in the mine site area.	
60	4.26.3	4.26-3	3	Fugitive dust emissions are a by-product of construction activities.	Fugitive dust emissions of both crustal and heavy metal fractions are expected to occur widely in the mine site and along all transportation corridors.	This is a major topic that receives only scant attention in this EIS compared to the large impact that has occurred at analogous mines such as Red Dog. At Red Dog, fugitive dusts bearing Cd, Pb and Zn dispersed for tens of kilometers from the mine site and haul roads and mosses showed elevated levels of heavy metals up to 40 km away from the sources (Neitlich et al. 2017, Hasselbach et al. 2005). To state that the dusts are only related to construction is to miss the key issue of impacts from operations, as demonstrated at Red Dog Mine for the last 30 years.	

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61	4.26.3	4.26-3	3	Windblown dust would potentially affect vegetation well beyond the source, but the effect diminishes with distance and is affected by prevailing winds and topography.	Windblown dust is likely to kill sensitive vegetation close to the emissions source and to reduce lichen cover and diversity out to at least 3000 m from the source. At greater distances, the effect diminishes and is affected by prevailing winds and topography.	At Red Dog, Exponent (2007) reports losses of lichen cover out to 2000m from the Red Dog Mine haul road due to Zn, Pb and Cd in fugitive dusts. NPS studies (Neitlich et al. 2019, DiMeglio et al. 2019) show effects out to at least 3000 m from the source including reduction of cover and diversity.	
62	4.26.3	4.26-3	4	Decreases in sphagnum and other mosses and lichens	Add: Elimination or drastic reduction of lichen cover, lichen diversity and bryophyte cover out to several kilometers from the sources.	At Red Dog, Exponent (2007) reports losses of lichen cover out to 2000m from the Red Dog Mine haul road due to Zn, Pb and Cd in fugitive dusts. NPS studies (Neitlich et al. 2019, DiMeglio et al. 2019) show effects out to at least 3000 m from the source including reduction of cover and diversity.	DiMeglio, E., McCune, B., Neitlich, P. N., and A. E. Shiel. 2019. Impacts of Heavy Metal Dust on Arctic Tundra Vegetation and Lichen Community Over Time. In prep.
63	4.26.3	4.26-3	6	The duration of impacts from fugitive dust is typically seasonal for the life of the project because dust is washed off of the vegetation surrounding the project during winter months (or when deciduous species lose leaves), or can occur throughout the duration of project activities.	The duration of impacts from fugitive dust is expected to last beyond the closure of the mine as service vehicles will continue to disperse dust over the long term.	While the levels of contaminants in fugitive dusts are likely to drop post closure, there will be continuing deposition from service vehicles and continuing effects due to the contaminants already present in the soil (Neitlich et al. 2017).	
64	4.26.3	4.26-3	7	The extent of fugitive dust is limited to areas adjacent to roads with vehicle traffic or in unpaved surface areas, with the highest concentrations of dust closest to the source.	The sources of fugitive dust are primarily roads, concentrate loading and unloading facilities, and blasting activities. The dust is likely to travel for many miles and in this case is likely to enter Lake Clark National Park and Preserve, and McNeil River State Park, though concentrations of dust will be highest closest to the source.	The current phrasing is inaccurate. Fugitive dusts have dispersed contaminants out to at least 40 km from mine sources (Hasselbach et al. 2005, Neitlich et al. 2017).	
65	4.26.3	4.26-3	7	For example, vegetation directly along an access road would receive more dust than vegetation 15 feet away from the road when a vehicle drives by, because the dust would settle as it disperses from the road.	For example, vegetation directly along an access road would receive more dust than vegetation 1 mile away from the road when a vehicle drives by, because the dust would settle as it disperses from the road.	The current phrasing understates the extent of the problem. Fugitive dusts have dispersed contaminants out to at least 40 km from mine sources (Hasselbach et al. 2005, Neitlich et al. 2017).	
66	4.26.3	4.26-4	3	Pebble Limited Partnership (PLP) proposes to use covered containers to transport concentrate, essentially eliminating potential for concentrate dust.	Delete	At Red Dog Mine, the use of hydraulically covered trucks has reduced the contamination of the surrounding tundra from that of older tarp-covered trucks. However, dispersal of contaminants is ongoing. (Neitlich et al. 2017, Hasselbach et al. 2005). Vehicles of all kinds track ore concentrates up and down the roads continuously, and even passenger vehicles bear Pb levels of 10,000 mg/kg and 23,000 mg/kg Zn on their undersurfaces (Brumbaugh and May 2008). Over time, the road itself becomes contaminated and a source of ongoing emission (Brumbaugh et al. 2011). Containerizing the concentrate may help reduce spills, but will not address the problem of dust emissions.	Brumbaugh, W.G., and May, T.W., 2008, Elements in mud and snow in the vicinity of the DeLong Mountain Regional Transportation System Road, Red Dog Mine, and Cape Krusenstern National Monument, Alaska, 2005–06, U.S. Geological Survey Scientific Investigations Report 2008–5040, 30 p.
67	4.26.5.1	4.26-5	3	Table 4.26-1 lists acreages by vegetation type in the mine site area that would be affected by clearing, grading, and removal activities during construction.	Rework analysis.	Similar to comments in Affected Environment-Vegetation, this section (and all those following in the chapter) should be reworked to account for greater levels of specificity to sensitive habitats such as: Lichen, Dwarf Shrub-Lichen, Bareground, Dwarf Shrub. These are available in the same GIS layer as the aggregated classes used, however the more specific classes will give an indication of the nature of the impact on sensitive habitats that are most affected by fugitive dusts (Neitlich et al. 2017, Neitlich et al. 2019, DiMeglio et al. 2019).	

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68	4.26.5.1	4.26-6	1	Fugitive dust emissions are a by-product of construction activities.	Fugitive dust emissions are likely to occur from all roads or other areas of vehicle traffic, concentrate loading and unloading facilities, tailings storage facilities, waste rock dumps, and blasting activities.	This statement is true but misses the point that the dusts responsible for the majority of impacts are those generated by mine operations.	
69	4.26.5.2	4.26-6	4	The heaviest dust deposition would be anticipated to occur within 35 feet of the road (Walker and Everett 1987); however, dust has been documented at distances of 330 feet from the most heavily traveled roads in Prudhoe Bay (Walker et al. 1987).	The heaviest dust deposition would be within 100 m of the road (Neitlich et al. 2017), but elevated levels of contaminants are likely to be found out to 40 km from the roadway. The effects on vegetation are likely to be limited to 2000-3000 m from the road based on similar fugitive dust deposition at Red Dog Mine.	As drafted, this entire chapter under-estimates impacts because it analyzes a distance for crustal road dust dispersal--rather than heavy metal bearing dust. At Red Dog, background contaminant levels were not reached until 42 km from the haul road, and effects on vegetation extended out to approximately 3000 m. The analysis only captures about 4% of the actual area likely to be affected.	
70	Table 4.26-2	4.26-6	1	During construction, the magnitude and extent of fugitive dust impacts would be the deposition of dust from the mine over 3,007 acres of vegetation.	During mine operation, the magnitude and extent of fugitive dust impacts would be likely to extend out to 3000 m from all roadways and potentially 5000 m from the mine site, totaling XXXX acres.	The number of acres in the DEIS is severely underestimated for two reasons: 1) the analysis only includes the construction phase, which is of limited consequence to vegetation, and 2) the analysis limits the dispersal to 330 ft, rather than the 2000 m or 3000 m impact distances found at Red Dog mine (Exponent 2007, Neitlich et al. 2017, Neitlich et al. 2019, DiMeglio et al. 2019). This entire chapter needs to be reanalyzed with the new distances incorporated. As currently drafted, this analysis captures only about 4% of the actual acreage affected.	
71	Table 4.26-2	4.26-6	1		Vegetation Type should be reworked to account for types sensitive to impact from fugitive dusts.	As explained above.	
72	4.26.5.3	4.26-10	5	Fugitive dust emissions are a by-product of construction activities. No current development exists at the Amakdedori port site. Fugitive dust at this location would mostly be attributed to construction of the terminal. Because no construction would be required during operations, subsequent indirect impacts to vegetation from fugitive dust would likely be limited. With the exception of necessary infrastructure to support shallow-draft tug and barge access to the dock, onshore port facilities would be removed during closure.		Fugitive dust at Amakdedori port site will continue to be an issue after construction of the terminal. While the containerization of concentrate will help reduce the spread of contamination of the sort that occurs by handling of concentrate at the Red Dog port, this area will still receive contaminant inputs via vehicle traffic. These inputs will be emitted as fugitive dusts. (See Brumbaugh and May 2008 and Brumbaugh et al. 2011).	
73	4.26.5.3	4.26-10	6	In terms of magnitude and extent, during construction, a total of 84 acres of vegetation would potentially be affected by dust deposition from the Amakdedori port. The dominant vegetation types in this area are dwarf shrub and low shrub.	Needs reanalysis.	Same comments as for 4.26.5.2 in terms of affected area and habitat cover classes used.	

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74	4.26.6.2	4.26-12	3	For Alternative 2, magnitude and extent would be that 4,315 acres of vegetation would potentially be indirectly impacted by dust in the transportation and natural gas corridors.	Needs reanalysis.	Same comments as for 4.26.5.2 in terms of affected area and habitat cover classes used.	
75	4.26.6.3	4.26-14		In terms of magnitude and extent, during construction, a total of 45 acres of vegetation would potentially be affected by dust deposition from the Diamond Point port. The dominant vegetation types in this area are tall shrub and low shrub.	Needs reanalysis.	Same comments as for 4.26.5.2 in terms of affected area and habitat cover classes used.	
76	4.26.7.2	4.26-16		In terms of magnitude and extent, a total of 6,733 acres of vegetation would be indirectly impacted by dust in the transportation and natural gas corridors.	Needs reanalysis.	Same comments as for 4.26.5.2 in terms of affected area and habitat cover classes used. In addition, the terminus of the concentrate pipeline would result in additional contamination through the loading and unloading of uncontained bulk concentrate. This is likely to produce mine site-like conditions at this port site, leading to additional metals release both at the port and along the transportation corridor. The Red Dog port site is a highly contaminated facility due to the handling of bulk concentrate (Exponent 2007), and this has led to additional contamination of roadbed surfaces all around the port and on the haul road.	
77	4.26.8			Depending on the alternative, the magnitude and extent of impacts from project construction, operations, and closure at the mine site would be the removal of between 9,823 to 10,409 acres of vegetation	Needs reanalysis.	Same comments as 4.26.5.2	
78	4.26.9.2, 4.26.9.3, 4.26.9.4, 4.26.9.5, 4.26.9.6	4.26-20 to 4.26-22				As with the rest of this chapter, these sections should be reworked using dust dispersal distances from other mines (e.g., Neitlich et al. 2017, Hasselbach et al. 2005) rather than from Dalton Highway studies.	
79	Table 4.26-17				Needs reanalysis.	Same comment as 4.26.8	
80	4.27					The lack of marine current information prevents the proposal from adequately identifying potential marine downstream effects of the port facility development, general operations, or spill consequences to marine larval transport and development. It is recommended to included currents in the analysis.	
81	4.27					The DEIS lacks species and biological community assessments for any habitats and assemblages 'downstream' of port-related activities in lower Cook Inlet. The DEIS should address the duration and location of potential spills to allow for a full analysis of potential ecological consequences of contamination.	
82	4.27.2.2	4.27-7	Marine Tanker Vessels			The referenced Cook Inlet Studies of oil spill risk from tank barges release to be very small (Nuka and Pearson 2015) was not focused on the type of operation proposed in this DEIS.	

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83	4.27.4	4.27-33	Concentrate Spills	N/A	N/A	<p>Katmai National Park and Preserve's northeastern boundary is located in close proximity to the proposed Amakdedori port location in Action Alternative 1. The port operations at this site include the transportation of concentrated ore materials by barge to lightering locations located off-coast. The method for transferring the concentrated ore materials from the barge containers into shipping freighters is concerning to the park. Containers will be opened at sea by having their tops removed, and then moved into position over the ship's cargo hold and dumped in. This process would allow for the fine concentrated materials to spill during high wind or high sea events. The amount of lost materials anticipated through the transfer process does not appear to have been included in the DEIS. With each container anticipated to hold 76,000 pounds of concentrates, even small amounts of materials spilled or lost during each transfer event would amount to a significant amount of pollutants being consistently deposited over time.</p> <p>Once these concentrated materials are introduced into Kamishak Bay, the prevailing ocean currents would bring contaminants directly on to the Katmai coast at the south end of Kamishak Bay, and dispersed pollutants would continue along the Katmai coast down the Shelikof Strait. The coast along Katmai National Park and Preserve is home to many ecologically sensitive areas including tidal marshes; which provide critical feeding opportunities for coastal brown bears, a species of significance for Katmai National Park and Preserve. Marine mammals that exist within the Kamishak Bay travel down Shelikof Strait and the Katmai coast and would be vectors that would distribute pollutants much further south than is estimated in the DEIS section on Spill Risk. Katmai requests that the effects of concentrate spills that occur as part of the transfer process during lighterings analyzed more fully in the EIS for this project.</p>	
84	4.27.4.7 Concentrate Spill Scenarios; including Iliamna Lake Ferry Rupture, pipeline break, and Tailings Slurry Release etc.	PAGE 4.27-43, PAGE 4.27-57 and PAGE 4.27-67 and	All stmts indicating ore spills into area waters would not result in acid generation, metals would not be mobilized, if there were impacts to aquatic life they would be short term, and sulfides would not oxidize in water.	"If spilled concentrate is promptly removed from impacted waterbody there will be no measureable leaching of metals" (pg 4.27-53) and similar optimistic statements throughout.		<p>This section fails to consider actual risks to the world's most valuable subsistence, commercial and recreational sockeye salmon fisheries and the aquatic foodchains they rely on for survival from spills that can and do occur due to mining accidents. It also does not acknowledge: the low natural buffering capacity and high dissolved oxygen levels of area waters, which will facilitate acid formation and metals mobilization from spilled ore into the region's aquatic systems (see provided references). For example, Copper (Cu), the primary ore component, is highly toxic to aquatic life at levels just above that needed for life. Slight increases in dissolved Cu levels of just 2-10 ppb above natural baselines can impair salmonids ability to smell (e.g., home to natal stream for spawning), avoid predators, find food, identify kin or mates; it can also increase their susceptibility to disease, and increases of just 10- 20 ppb above baseline can be lethal. It can impact productivity of the entire food chain they rely on. Additional evidence should be provided to support the claim of no impact. Natural Cu levels in area waters are extremely low; Ore payload will likely be over 40% Cu and sulfides will be present, it is Potentially Acid Generating material. Combined with Zn which will be a component, Cu can act synergistically to be more toxic than either alone. Please consider references provided and integrate probable impacts- both lethal and chronic- to not just select fish, but to all subsistence species and their food chains. Additional empirical evidence via peer-reviewed scientific literature should be provided to support any conclusions indicating no impact, no downstream effect, no population level effect, or only localized effect. Suggest the analysis address the fact that Iliamna Lake turns over twice yearly (dimictic); thus if a spill goes into the lake, resuspension of metals can and will likely occur during that period. The lake is oxygenated, is neutral and not well buffered; therefore if an ore spill occurred in the lake or Newhalen River or Upper Talarik Creek, then significant potential lethal and long-term chronic effects on all the stocks that spawn and rear and migrate through those systems can be impacted. If a spill occurs in area running waters, it can cause immediate fatal impacts to the entire aquatic food chain in that system and far downstream depending on conditions, and then potentially cause long term chronic impacts from metals that will remain in the sediments, get passed up the food chain, and that can also be resuspended and moved further downstream during spring and fall floods from riparian zones and sediments. See list of appropriate references provided. Authors also suggest there is no oxygen in water and therefore sulfides would not oxidize resulting in metals dissolving and leaching from the ore to aquatic systems.</p>	<p>A quantitative analysis of potential risks regarding spills vs. a qualitative one, would be more appropriate. Consider existing empirical data of US/Canadian mines that have experienced spills, dam accidents, pipeline breaks and other failures into aquatic systems. Since that breach at Mt. Polley was caused, in large part, by "dislocation of the embankment due to foundation failure" (Mount Polley Independent Expert Engineering and Review Panel https://www.mountpolleyreviewpanel.ca/). What if spill concentrate can't be "immediately cleaned up" as claimed? Consider evaluating incidents in the Great Lakes for comparative purposes. Revised analysis and full disclosure of potential spill risks and impacts is warranted, considering both acute and chronic long term impacts.</p>

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85	5.2.1.2	5-4	5	Using BMPs, such as revegetation planning, watering, and using dust suppressants to control fugitive dust.	Add: Conduct baseline sampling of moss tissue and soils in 50 mi radius of mine site (including in Lake Clark National Park). Conduct regular follow up monitoring.		
86	5.2.1.2	5-4		Applying industry-standard BMPs relating to invasive species prevention and management		The invasive species mitigations describes only the use of BMPs. Industry standards for preventing spread of invasive species have not been particularly successful. The DEIS should address how invasive species could arrive in the project area or how the project itself could potentially increase or facilitate their arrival or spread. This section should address the role disturbed colonizing surfaces have on providing opportunity for the spread of invasives, and how the road corridor, material sites, and all disturbed surfaces created by the project will be managed to prevent growth of invasives. The DEIS also does not address the substantial role that heavy equipment has in providing a vector for the movement of invasive species. The location of cleaning before any equipment is brought to the site should be identified, as should the required cleaning procedures and the inspection procedures. These procedures should be designed to ensure the project does not bring invasives into the project area or transportation corridor through transport of soil on the undercarriage of heavy equipment. Finally, the document should describe how the project will prevent the expansion of invasive species that do arrive, with special attention to how the open, colonizable surfaces in the transportation corridor and mine area will be managed to prevent invasives from taking hold.	
87	Table 5-2	Page 5-8	3	Implementing a fugitive dust plan would reduce the potential for releases of construction-related dust that degrade air and water quality and impact human health.	Implementing a fugitive dust plan would reduce the potential for releases of heavy metal-enriched dust that degrade air, soil and water quality, kill sensitive biota and impact human health.	Construction-related dust is not the primary issue with fugitive dusts. The key issue is the effects of the contaminant-bearing dusts released from mining operations.	
88	Table 5.2	5-19	2	Use of closed containers to transport concentrate reduces spill potential while trucking, barging, loading, and on the ferry; and eliminates potential for concentrate dust.	Use of closed containers to transport concentrate reduces spill potential while trucking, barging, loading, and on the ferry. Use of year-round vehicle washing stations at the exit of the mine site and any other heavily contaminated areas, strong dust palliatives, and bag house containment for concentrate loading and unloading facilities will help reduce the emission of contaminant-bearing fugitive dusts.	The use of containers is a good spill prevention method, but it does little to prevent the spread of contaminants via fugitive dusts unless one is comparing containers to open haul trucks. Most of the contaminant-bearing fugitive dusts are dispersed via vehicle tracking onto road surfaces. Actions to reduce dust emissions include: year-round vehicle washing stations at the exit of the mine site, strong dust palliatives, and bag house containment for concentrate loading and unloading facilities (Exponent 2007, Neitlich et al. 2017)	
89	Table 5.2	5-19	2		Add: 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.	If a supply of seeds and cuttings is arranged in advance, it will avoid the inevitable scramble for materials after a spill requires excavation and restoration.	

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90	Table 5-2	Page 5-8	3	A Fugitive Dust Control Plan (FDCP) would be developed for the project and BMPs would be implemented for fugitive dust management.	Add: Heavy investment in operational controls for contaminant emissions at the outset will reduce the need to address a mushrooming problem of biological effects. Operational controls may include: Use of year-round vehicle washing stations at the exit of the mine site and any other areas with bulk ore and concentrate contact, pressure washing of concentrate shipping containers prior to trucking to the port and following emptying into the ship, strong dust palliatives on all road surfaces and TSF beaches, and bag house containment for concentrate loading and unloading facilities.	It is essential to get ahead of the fugitive dust-contaminants problem before it affects the ecosystem and/or subsistence foods and becomes a public relations issue. While funding is often scarce at the beginning of the project--before minerals are being sold--it is precisely at the beginning of the project that these controls are most needed. Once the dust issue gets away from the mine operator, the costs skyrocket and the public relations suffer terribly. This DEIS has greatly minimized the fugitive dust issue.	
91	All					<p>Lake Clark National Park and Preserve protects a tapestry of cultural places woven from 10,000 years of human occupancy that is vital to the cultural and spiritual continuance of the people who live there. The people of the Lake Clark and Lake Iliamna region have lived there for centuries. They have developed a unique culture that evolved from the environment. This way of life supports health and well-being and is directly and completely dependent on an intact ecosystem. The entire ecosystem is cumulative and interconnected; what happens to one part will affect all others. Therefore, the impact of a large open pit mine, possibly the world's largest, is much more than a footprint. Land animals, birds, and fish do not stay in one place; they interact at multiple levels influenced by seasons, time and space. For example, the caribou migration route, calving grounds and habitat loss will be directly affected. These changes causing "adaptive approaches" will affect the environment and a way of life.</p> <p>Project proponents need a clear understanding of the subsistence dependent lifestyle of the local people. Their knowledge base dates back centuries and has evolved through a system of learned experience, through direct observations and through trial and error. This is no different than a scientist conducting a study by collecting data and measuring the outcome. The primary difference is the latter is written down, is determined as factual, and has a much shorter study period. To understand and comprehend these impacts more effectively it is necessary to address this at multiple levels. Working directly with local communities and looking at case studies relating to the lifeway and connection to the environment and food sources and understanding what Traditional Ecological Knowledge means can provide a more solid and tangible starting point. Social and environmental impacts pose a direct threat to a cultural people's way of life, livelihoods and to key cultural and spiritual sites.</p> <p>No matter how much the potential damage is minimized in the development of an open pit mine, there is no guarantee that the damage will not affect the region nor the traditional way of life of the people. The traditional cultural values, worldview, and way of life does not align with the proposed mining development.</p>	
92	Appendices			The draft project lighting plan was not included in the DEIS.		Please submit a draft lighting plan for comment. Modeled impacts to natural lightscapes in Lake Clark NP&P and Katmai NP&P are significant in the DEIS and in the Dark Sky Partners, LLC 2019 report. Project lighting impacts can be reduced substantially if mitigation elements are incorporated into the lighting design. Lighting impact mitigation techniques, which have the added benefit of reducing energy costs, are described on the NPS Night Skies website at www.nps.gov/subjects/nightskies/practices.htm , and in the Dark Sky Partners report.	Dark Sky Partners LLC 2019 (provided to USACE)

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93	K 3.1	K3.1-1 - 1-5	All			In Appendix K of the EIS, Section K3.1, offers some examples of TEK regarding subsistence uses in the study area. These are taken from the Environmental Baseline Document done in 2011, which included tables, charts and maps derived from surveys and interviews, or from an EPA study of TEK in the EPA watershed assessment (2014) based on interviews in the region in 2013. Other information said to qualify as TEK was taken from review by cooperating agencies or from tribal consultation. The examples are statements about fish, animals and other resources on the lands proposed for development. There is little cultural context and in many cases seem more like recent observations than TEK passed down over generations. If the EIS intends to recognize all the impacts of the proposed project on sociocultural dimensions of subsistence, it must more fully incorporate possible interruptions and discontinuities in implementation and transmission of TEK.	
94	K4	4.1.3	All			The DEIS states that it includes consideration of reasonably foreseeable future actions including exploration and development of prospects outside of the immediate study area were included in the analysis. However, that analysis includes cumulative impacts solely to the watershed already directly impacted by the proposed mine. Improved access to some of these remote deposits may make them more economically viable and even though some are beyond the currently evaluated watershed, the cumulative impact analysis should include reasonable foreseeable impacts to these associated watersheds with regards to both surface water and groundwater. The limitation of reasonably foreseeable actions to only include those with existing development plans or are in the permitting process does not adequately capture the RFFAs.	
95	K4.18.2	entire section		At issue are predicted water volumes for treatment and constituents that must be removed to ensure life is protected.	Needs further documentation, references, study.	The DEIS discusses the verly large volumes of water that will need treatment, up to 30 cfs or up to 14,363 gallons per minute, and the volume of potentially toxic elements that will need to be removed (Hg, Pb, Cl, Zn, Se, etc.). Please provide references, documented empirical studies, example mines, where this volume of mine wastewater capture and treatment has been successfully attained.	
96	Appendix N		Section on treatment and removal of selenium			Selenium (Se) is a necessary nutrient, but at very low levels, above that needed for life, it becomes toxic. It can cause deformities in fish and is passed up the food chain and bio-concentrated from algae to insects to fish, etc.; it is also passed on from females to their offspring via eggs. Selenium would present a significant risk to aquatic life and subsistence resources across a potentially wide area if not controlled. The DEIS presents various methods for treating Se; however, none have ever been shown to be effective in Alaska's cold climates or for such large predicted volumes of water as will occur at Pebble. SRK predictions for Se concentrations in water discharged to the mine water treatment plant from various sources are often orders of magnitude above protective aquatic water quality criteria of 5 ug/L; for example: open pit wall run-off (acid generating) are predicted to be 130 ug/L; tertiary waste rock is predicted at 22 ug/L; and total load from just the potentially acid generating waste rock, which is about 41% of the facility area, is estimated to be 41 kg/yr (all data from SRK 2018 Geochemical source terms for water treatment planning, Pebble Project. SRK for Table 4 see pg. 20). The modeled outflow concentration of Se is 5 ug/L, which leaves little room for error, as the predicted discharge concentrations are equal to the ambient water quality standard. The predicted Se pretreatment concentrations described above are orders of magnitude higher than naturally occurring levels documented in the Koktuli Rivers and Upper Talarik Creek (Se median=0.31 ug/L; PLP EBD Water Quality data 2004- 2009). Red Dog Mine has had difficulty controlling selenium, and the issue at Pebble could potentially be larger. More information is needed on exactly how the orders of magnitude higher levels of Se will be treated and removed prior to release; we recommend including this information in the revised DEIS. Given the lack of proven methods for treating Se, the NPS notes that if the treatment methods used are not sufficiently effective, output would exceed water quality standards.	

Enclosure 3: U.S. Fish and Wildlife Service Recommended Mitigation Measures for Inclusion in the Pebble Limited Partnership Draft Environmental Impact Statement and Management Plans

Recommended Mitigation Measures

Avian Species and Habitat Measures

- Avoid fragmenting large, contiguous tracts of intact habitat, especially if habitat cannot be fully restored after construction.
- Co-locate activities into disturbed areas to the maximum extent practicable to reduce disturbance of migratory bird habitat.
- 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>).
- Minimize prolonged human presence near nesting birds during construction and maintenance actions.
- Instruct all employees, contractors, and/or site visitors of relevant rules and regulations that protect wildlife. See the Service webpage on regulations and policies (<https://www.fws.gov/birds/policies-and-regulations.php>).
- Prior to removal of an inactive nest, ensure that the nest is not protected under the ESA or the Bald and Golden Eagle Protection Act (BGEPA). Nests protected under ESA or BGEPA should not be removed without a valid permit.
- Do not collect birds (live or dead), their parts (e.g., feathers), or nests without a valid permit. Further information on permits and permit applications may be found on the Service permits page.
(<https://www.fws.gov/permits/applicationforms/ApplicationLM.html#MBTA>).
- Report any intentional take of non-game migratory birds to the local Service Office of Law Enforcement (<https://www.fws.gov/alaska/law/index.htm>). Direct, intentional take of migratory birds is not allowed under the Migratory Bird Treaty Act; the Service recommends project proponents voluntarily minimize incidental take associated with their projects.
- To reduce bird collisions, place transmission lines associated with the development underground, where possible.
- If overhead lines 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 power lines 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 powers are sited in migratory bird habitat, attach bird flight diverters (flappers) or related deterrent devices that are durable and visible to reduce collision risk.
- Lights should be down-shielded and of a minimum intensity to reduce nighttime bird attraction and eliminate constant nighttime illumination while still allowing safe

nighttime access to the site. Security lighting for on-ground facilities and infrastructure should be motion detective or heat-sensitive types of lighting.

Fish and Aquatic Resources Measures

- In order to not constrict the natural channel and to allow connectivity of the floodplain, at minimum, stream crossings should meet the Service and U.S. Forest Service Guidelines, which can be found at: <https://www.akfishhabitat.org/> and https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/fsm91_054564.pdf.
- We recommend that stream crossing designs 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. Culverted stream crossings should be composed of an arch or oversized culvert at minimum of 120 percent of the channel width measured at ordinary high water mark.
- 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.
- 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).
- 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.
- 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.
- 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 (lakes, streams, wetlands, coastal waters, temporary diversion channels, etc.).
- We recommend that streambank restoration incorporate bioengineering techniques (e.g., root wads, bundled water tolerant willows), where possible, to maintain natural velocities, prevent bank erosion, and promote healthy riparian system functions that are important to aquatic species.
- Use screened intakes for water withdrawals to avoid suction entrapment and entrainment injury to small and juvenile fish that may be present. For additional information on screening criteria for various species and life stages of fish as well as methods for design and fabrication of cylindrical water intakes, see Alaska Department of Fish and Game (ADF&G) Habitat Division Technical Report No. 97-8 (PDF 2,558 kB). http://www.adfg.alaska.gov/static/license/uselicense/pdfs/97_08.pdf
- Where possible, avoid disturbance in areas of eelgrass and kelp growth, which provide rearing and refugia habitat for a wide variety of species.
- 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.

- Use piling-supported structures, rather than fill, for shoreline developments such as dock approaches, building surfaces, or marine storage areas. Piling-supported structures allow continued use of marine habitat by a variety of fish as well as invertebrates, birds, and mammals, including scavengers and predators.

Spill Avoidance Measures

- 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 (i.e., containment booms) adjacent to vulnerable fish-bearing wetlands, streams, and rivers during major construction activities.
- Ensure that secondary containment is provided for the storage of fuel or hazardous substances and sized as appropriate to container type and according to governing regulatory requirements in 18 AAC 75 and 40 CFR 112.
- During fuel or hazardous substance transfer, ensure that a secondary containment is placed under all inlet and outlet points, hose connections, and hose ends.

Invasive Species Measures

Terrestrial

- Identify locations of known invasive plant infestations. Plan activities accordingly to avoid infestations.
- 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.
- Revegetate bare soils with native plants as soon as feasible to minimize the possible establishment of invasive plant species.
- 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.
- Avoid cleaning equipment in or near waterways or wetlands, which are particularly sensitive to invasion and which could result in changes to aquatic organism habitat/function.
- If working in infested areas, time disturbance activities so that they occur prior to the plants setting seed. Contact UAF Cooperative Extension Service or the Department of Agriculture (<http://plants.alaska.gov>) for timing information if you are unsure.
- Coordinate with local village or other groups in the project area to identify locations and opportunities to collaborate efforts to minimize invasive infestations.

Aquatic

- Use control measures to reduce the potential for spreading invasive organisms. Hull fouling organisms like 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 within that bioregion.

- Inspect boats, trailers, and other boating equipment and remove any visible plants, animals, or mud before leaving any waters or boat-launching facilities.
- Clean, drain, and dry everything that comes into contact with water (boats, trailers, equipment, clothing, boots, waders, etc.) before transporting it to new waters; rinse, if practicable, with hot clean water.
- Drain water from motor, live well, bilge, and transom wells while on land before leaving the vicinity.
- 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.

Floatplanes, if 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. 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. Upon 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.

Habitat Protection Measures

- 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).
- Plan to sequence construction activities such 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.
- Salvage the maximum amount of organic material and topsoil (henceforth, 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 (DNR 2009).
- 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.

- 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.
- 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.
- If topsoil would not be spread for use in interim reclamation and would not be used within 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 (DOT&PF 2016).
- Interim seeding, using native plant seed, may be necessary to keep topsoil viable, control erosion, reduce surface runoff, and maintain other habitat characteristics.
- Slopes should be contoured to blend with surrounding topography; consider using waterbars or contour furrowing on steeper slopes (DOT&PF 2016).
- 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).
- During final reclamation, after final grading and before replacing topsoil and other segregated materials, the regraded land should be ripped to promote root penetration.
- Create surface roughness to help control surface water runoff and reduce sedimentation (DOT&PF 2016).
- 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 (DNR 2018a).
- 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 (DOT&PF 2016).
- 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 proposed 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 which are blown or washed into waterways creating a toxic ingestion hazard for aquatic wildlife for many years.

Monitoring Measures

- Baseline water quality and biological surveys should be conducted before the project begins. We recommend establishing these baseline levels 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 Lake Iliamna both at the proposed ferry port locations and at the outflow from Tularik Creek, and along a sample of the streams that would be crossed by the transportation corridor.

- To detect changes to water quality and its effects to fish and wildlife, water quality should continue to be monitored until the mine reclamation is complete. We recommend conducting annual water sampling at all of the same locations as listed for baseline monitoring above. An annual report detailing the results of this sampling should be provided to the USACE and resource agencies.
- We recommend that reclamation plans 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 no cover (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 (forage fish, juvenile, nursery, piscivorous).
 - Measurement of erosion control success (evidence of rilling, gullies, rutting, slumping, etc.).
 - Evidence of wildlife use, tracks, scat, nests, etc.
 - Photo documentation.
- We recommend that reclamation monitoring be conducted for all phases of development during construction, operations, and final reclamation.
- We recommend that reclamation monitoring plans include nearby reference sites to provide ongoing information through data collection and photographic stations (DNR 2018b). 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).
- 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 (DNR 2013). 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.

References

- [DNR] Alaska Department of Natural Resources. 2009. Alaska surface coal mining program. Regulations governing coal mining. [September 9, 2018]. http://dnr.alaska.gov/mlw/mining/coal/wishbone/pdf/coalreg_apr09.pdf
- [DNR]. 2013. Alaska coastal revegetation and erosion control guide. Plant Materials Center. Palmer Alaska. [September 9, 2018]. http://plants.alaska.gov/pdf/Coastal-Reveg_web_2013_v2.pdf
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- [DOT&PF] Alaska Department of Transportation and Public Facilities. 2016. Stormwater prevention plans; design considerations. [September 9, 2018]. http://www.dot.alaska.gov/stwddes/desenviron/assets/pdf/bmp/bmp_52_53_00.pdf

US Fish and Wildlife Service Correspondence with the US Army Corps of Engineers



US Fish &
Wildlife
Service

1. June 29, 2018 letter from USFWS to Army Corps on NEPA scoping
2. July 13, 2018 letter from USFWS to Army Corps on preliminary Draft EIS
3. August 31, 2018 letter from USFWS to Army Corps on preliminary Draft EIS
4. October 1, 2018 letter from USFWS to Army Corps on Draft EIS schedule
5. Dec. 21, 2018 letter from USFWS to Army Corps on preliminary Draft EIS
6. July 1, 2019 letter from USFWS to Army Corps elevating under 404(q)
7. July 25, 2019 letter from USFWS to Army Corps elevating under 404(q)

Excerpts from Correspondence

Pebble poses significant risk to the Bristol Bay salmon fishery

The Service is concerned that developing an open pit mine and associated infrastructure at the headwaters of critical salmon habitat could cause permanent adverse impacts to the ecologically important Bristol Bay watershed and its world-class fisheries, and the commercial, recreational, and subsistence users that depend on them. at pg. 3-62

See also, examples on pages 3-60 3-61

Significant deficiencies with the salmon impact analysis

Much of the [Draft EIS fish values] chapter uses old data and sampling analyses. Environmental Baseline Data (2008) used for analysis at the Mine Site and the North Fork Kottuli River is outdated. [...] Changes in fish distribution may also occur as individuals and populations seek out thermal conditions most suitable for completion of their life stages. Understanding how fish species are responding to these changes is critical for analyses of effects to populations occurring in the affected project area. at pg. 3-44

See also, examples on pages 3-46

Remedies to bring the Corps' process back on track

we recommend that a permit not be issued for the project as currently proposed. at pg. 3-62

the proposed work may result in substantial and unacceptable impacts to aquatic resources of national importance. [...] We recommend more robust analysis be conducted to thoroughly identify, analyze, and reduce risks to these resources. at pg. 3-62

We recommend more robust analysis be conducted to thoroughly identify, analyze, and reduce risks to these resources, and the USACE fully engage the resource agencies in mitigation and reclamation planning for the proposed mine. In addition, we recommend an adaptive management plan be fully developed with stakeholder input to ensure monitoring, thresholds, and corrective measures adequately account for all project impacts, and any resulting adjustments in mitigation measures and reclamation plans are sufficient to offset anticipated project impacts. at pg. 3-67

See also, examples on pages 3-46



United States Department of the Interior



U.S. FISH AND WILDLIFE SERVICE
1011 East Tudor Road
Anchorage, Alaska 99503-6199

IN REPLY REFER TO:

FWS/R7/FES

JUN 29 2018

Mr. Shane McCoy
Program Manager, Regulatory Division
U.S. Army Corps of Engineers, Alaska District
P.O. Box 6898
Joint Base Elmendorf-Richardson, Alaska 99506-0898

Dear Mr. McCoy:

The U.S. Fish and Wildlife Service (Service) has reviewed the U.S. Army Corps of Engineers' (USACE) Notice of Intent to Prepare an Environmental Impact Statement (EIS) and Notice of Scoping for the Pebble Limited Partnership Project. Pebble Limited Partnership proposes to develop an open-pit surface mine, along with associated infrastructure, at the Pebble copper-gold-molybdenum porphyry deposit (Pebble Deposit), located in the Iliamna region of southwest Alaska and within the Bristol Bay watershed, approximately 200 miles southwest of Anchorage and 60 miles west of Cook Inlet. The Pebble Deposit is located at the headwaters of the South Fork Koktuli River, the North Fork Koktuli River, and Upper Talarik Creek, tributaries to the Nushagak and Kvichak Rivers which flow into Bristol Bay. The closest communities are the villages of Iliamna, Newhalen, and Nondalton, each approximately 17 miles from the Pebble Deposit.

The proposed project would consist of four primary project elements: a mine site, a transportation corridor, a port at Amakdedori, and a natural gas pipeline. The mine site would include an open pit, a tailings storage facility, a low grade ore stockpile, overburden stockpiles, material sites, water management ponds, milling and processing facilities, and supporting infrastructure such as a power plant, water treatment plants, camp facilities, and storage facilities. The 83-mile transportation corridor would connect the mine site to a year-round port (Amakdedori Port) on Cook Inlet, near the mouth of Amakdedori Creek in Kamishak Bay. The transportation corridor would have three main components: a private, double-lane road extending 30 miles south from the mine site to a ferry terminal on the north shore of Iliamna Lake; an ice-breaking ferry to transport materials, equipment, and concentrate 18 miles across Iliamna Lake to a ferry terminal on the south shore near the village of Kokhanok; and a private, double-lane road extending 35 miles southeast from the South Ferry Terminal to the port at Amakdedori on Cook Inlet. The Amakdedori Port site would include shore-based and marine facilities for the shipment of concentrate, freight, and fuel for the project. Other port facilities

would include fuel storage and transfer facilities, power generation and distribution facilities, maintenance facilities, employee accommodations, and offices. The 188-mile natural gas pipeline would start on the Kenai Peninsula, cross Cook Inlet, and terminate at the mine site, with compressor stations located near Anchor Point and the Amakdedori Port. The 12-inch pipeline would follow the transportation corridor from the port to the mine site, crossing Iliamna Lake on the lake bed.

Our comments and recommendations are provided in accordance with the Endangered Species Act (16 U.S.C. 1531-1544), Marine Mammal Protection Act (16 U.S.C. 1361-1407), Migratory Bird Treaty Act (16 U.S.C. 703-712), Bald and Golden Eagle Protection Act (16 U.S.C. 668-668c), Clean Water Act (33 U.S.C. 1344), Fish and Wildlife Coordination Act (16 U.S.C. 661-667e), and the National Environmental Policy Act (42 U.S.C. 4321 et seq.), with implementing regulations. The Service is participating as a cooperating agency in the preparation of the EIS pursuant to the National Environmental Policy Act.

Potentially Affected Fish and Wildlife Trust Resources

Service trust resources are natural resources we have been entrusted to protect for the benefit of the American people, and include federally listed threatened and endangered species and their critical habitats, migratory birds, certain marine mammals, interjurisdictional fish, and the habitats upon which they depend.

The Bristol Bay watershed, including the Nushagak and Kvichak Rivers, supports all five species of salmon (King, Sockeye, Coho, Pink, and Chum), and several other commercially, recreationally, and ecologically important fish species. The Bristol Bay watershed is home to brown bear, black bear, moose, caribou, wolves, waterfowl, and many other species of mammals and birds (Brna and Verbrugge 2013). Federally-listed threatened northern sea otters and Steller's eiders occur in the waters of Cook Inlet, including Kamishak Bay. Bald eagles nest and feed along the coast and along all of the major salmon spawning rivers in the Bristol Bay and Cook Inlet regions, with a relatively high number of golden eagles also found here. Migratory birds, including waterfowl, shorebirds and landbirds, are abundant throughout the potentially affected area of the proposed project.

Recommendations

The EIS should analyze potential direct, indirect, and cumulative impacts of the proposed project and all associated infrastructure on fish and wildlife including: endangered species or their designated critical habitat; marine mammals; anadromous and resident fish; migratory birds; bald and golden eagles; and fish, wildlife and plant species important to local subsistence users. Specifically, the Service recommends:

- Full analysis of the potential impacts the proposed mine and associated infrastructure could have on salmon and their habitats. Conservation of salmon spawning and rearing habitats within and downstream of the proposed mine and tailings storage areas are essential to maintaining the overall productivity of the Bristol Bay region. Nutrients imported by salmon from the marine environment into freshwater and terrestrial systems

support and enhance all levels of the complex food web, including microorganisms, invertebrates, plants, fish, birds, and mammals. The EIS should evaluate potential impacts to salmon from direct habitat loss or degradation of water quality.

- Evaluation of the potential impacts of the mine and associated infrastructure on water quality as it relates to supporting healthy and viable salmonids at all life stages. In particular, water quality alteration or degradation and potential copper exposure of downstream fish populations, including salmonids in Lake Iliamna, should be fully analyzed.
- Evaluation of the potential for acid mine drainage as a result of the project should be fully analyzed, and ways to prevent, minimize and mitigate acid mine drainage should be identified in the EIS. Emphasis should be placed on the prevention of acid mine drainage, since it is especially difficult to remediate once it has occurred on a large scale (Jennings et al. 2008).
- Conduct a rigorous analysis of the potential effects the project may have on northern sea otters and sea otter critical habitat. This analysis should focus on the proposed Amakdedori Port facility, the proposed pipeline, the proposed lightering of concentrate using barges to transport concentrate to bulk carriers moored in deeper water, and include the risks of fuel and hazardous materials spills on sea otters and sea otter critical habitat. Endangered Species Act section 7 consultation and Marine Mammal Protection Act authorizations should be considered in the EIS.
- Analysis of the potential impacts the proposed mine, transportation corridor (roads and ferry terminals), and Amakdedori Port facility may have on bald and golden eagles. In addition, the EIS should evaluate the likelihood that eagles and their nests may be displaced by the proposed project.
- Development of spill contingency plans for fuel and hazardous waste spills. Lightering of materials, currently proposed for transfer of mineral concentrate, increases the risk of spills. Any lightering of fuel or hazardous materials would result in a higher risk of spills than shoreside transfer of these materials, and spills are a particular concern for listed sea otters and sea otter critical habitat near the proposed port and mooring facility.
- Evaluation of the effects the proposed mine and associated infrastructure could have on traditional subsistence users and nearby villages.
- Development of a detailed reclamation and restoration plan for mine closure and post-mine closure. The Service would like to assist the USACE in reclamation, restoration, and mitigation planning to offset the effects of constructing and operating the proposed surface mine, and to ensure fish, wildlife, plants, and their habitats are conserved for the continuing benefit of the American people.

Mr. Shane McCoy

4

Finally, the Service recommends the USACE revisit the *U. S. Environmental Protection Agency's Bristol Bay Watershed Assessment (2014)* to ensure that previously identified concerns regarding impacts a proposed surface mine and associated infrastructure may have on area fish and wildlife resources are adequately evaluated in the EIS.

The Service understands the USACE will initiate Endangered Species Act section 7 consultations for the project, and the Service recommends the Pebble Limited Partnership apply for Marine Mammal Protection Act authorization, as appropriate.

Thank you for the opportunity to provide scoping comments for this project. If you have any questions, please contact Ecological Services Branch Chief, Mr. Douglass Cooper, Anchorage Fish and Wildlife Conservation Office, at (907) 271-1467 or email douglass_cooper@fws.gov.

Sincerely,



Mary Colligan
Assistant Regional Director,
Fisheries and Ecological Services

Literature Cited:

Brna, P.J., and L.A. Verbrugge, eds. 2013. Wildlife resources of the Nushagak and Kvichak River watersheds, Alaska. Final Report. Anchorage Fish and Wildlife Field Office, U.S. Fish and Wildlife Service, Anchorage, Alaska. 177 pp.

Jennings, S.R., D. R. Neuman, and P.S. Blicker. 2008. Acid mine drainage and effects on fish health and ecology: a review. Reclamation Research Group Publication, Bozeman, Montana. 26 pp.

USEPA (U.S. Environmental Protection Agency). 2014. An assessment of potential mining impacts on salmon ecosystems of Bristol Bay, Alaska. Region 10, Seattle, Washington. EPA 910-R-14-001.



United States Department of the Interior

U.S. FISH AND WILDLIFE SERVICE
Anchorage Fish and Wildlife Conservation Office
4700 BLM Road
Anchorage, Alaska 99507



IN REPLY REFER TO:
FWS/AFES/AFWCO

July 13, 2018

Mr. Shane McCoy
Program Manager, Regulatory Division
U.S. Army Corps of Engineers, Alaska District
P.O. Box 6898
Joint Base Elmendorf-Richardson, Alaska 99506-0898

Subject: Cooperating Agency Review of Pre-draft Chapter 3 Sections

Dear Mr. McCoy:

Thank you for the opportunity to review pre-drafts of the affected environment chapters the U.S. Army Corps of Engineers is developing for the Pebble Limited Partnership Project Environmental Impact Statement (EIS). Our comments and recommendations are provided in accordance with the National Environmental Policy Act (42 U.S.C. 4321 et seq.), with implementing regulations. The U.S. Fish and Wildlife Service (USFWS) is participating as a cooperating agency in the preparation of the EIS pursuant to the National Environmental Policy Act.

Enclosed, please find the USFWS reviews of the pre-draft Fish (Chapter 3.24) and pre-draft Threatened and Endangered Species (Chapter 3.25) sections (Enclosure 1). In addition, the USFWS offers the following comments and recommendations:

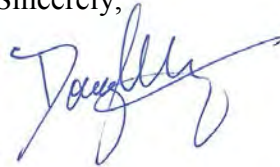
- Most maps provided for this initial review used 2004 and 2005 survey data. The USFWS recommends updating all chapters and exhibits with current survey information to the greatest extent possible. This includes the following maps:

3_23_02_Staging_Waterbird_Locations_Spring05.pdf
3_23_03_Staging_Waterbird_Locations_Fall05.pdf
3_23_04_Mulchatna_Caribou_Seasonal.pdf
3_23_05_Caribou_Group_Locations.pdf
3_23_06_Mulchatna_Caribou_Calving.pdf

- The raptor nests map shows raptor nests (including bald and golden eagles) based upon survey data from 2004 and 2005. Given this data is more than 13 years old, the USFWS recommends using updated information to the greatest extent practicable. This is especially important for bald and golden eagle nests, because activities that may disturb nests could require an eagle nest permit.
- The USFWS has no comment at this time on the northern sea otter critical habitat or Steller's eider maps.
- The USFWS defers to the National Park Service (NPS) on the pre-draft recreation chapter, and agrees with the NPS' comments on the pre-draft subsistence chapter.
- The USFWS defers to the National Marine Fisheries Service for all listed species under their jurisdiction (e.g., beluga and other whales, seals, and sea lions).

If you have any questions or need additional information, please contact me at (907) 271-1467 or douglass_cooper@fws.gov.

Sincerely,

A handwritten signature in blue ink, appearing to read "Douglass M. Cooper". The signature is stylized and cursive, with a long horizontal stroke extending to the right.

Douglass M. Cooper
Ecological Services Branch Chief

Enclosure

Enclosure 1: USFWS Comments, Pebble Limited Partnership Pre-draft DEIS, Affected Environment, Chapters 3.24 and 3.25

We recommend that the Draft Environmental Impact Statement (DEIS) Affected Environment chapter be developed to streamline the National Environmental Policy Act (NEPA) review process. We recommend structuring the chapter to identify clearly the potentially impacted resources so the mechanism of the impact can be characterized and analyzed under the Environmental Consequences. The Affected Environment chapter should provide adequate baseline for each identified resource to allow for robust analyses of project impacts to each identified resource.

Chapter 3.24: Fish Values

Note: Many chapter sections were noted as being “under development” (e.g., Marine Habitat, Aquatic Ecotoxicology) and could not be reviewed at this time.

General Recommendations

Consistent with the chapter’s intent, USFWS recommends the following:

- Change chapter title to “Fishery Resources and Habitat”.
- Make a clear distinction between Fishery Resources and Fish Habitat within the chapter. For each section, the authors should describe the current conditions as the basis for later analysis of potential impacts under the Environmental Consequences/Cumulative Effects that would result from the proposed project and any alternatives. A clear distinction should be made between baseline fishery resources and baseline fish habitat. Currently, in Chapter 3, related to “Fish Values” the authors lump together fishery resources and habitat amongst discussions of individual streams by major project component. This approach makes it difficult to relate resources back to Environmental Consequences in a meaningful way.
- Include discussion and later analyses of identified resources at scales relevant to fish populations, impacted sub-watersheds (i.e., North Fork Kotuli, South Fork Kotktuli, and Upper Talarik Creek) and within the context of the entire Bristol Bay watershed. The Bristol Bay watershed is considered the most productive salmon fishery in the world. The proposed project could impact fishery resources and habitats within this watershed that are locally, nationally, and internationally important.
- Update resource datasets to reflect the new project proposal. Existing datasets may not be representative of the current baseline conditions. For example, the aquatic invertebrate study data cited in the DEIS was collected from 2004 to 2008, making the data a minimum of 10 years old.

- Include climate change discussion under the life of the mine. Due to climate change predictions, the waterscape in the Project area is expected to change on a continuum over the life of the mine and beyond. We recommend a discussion and future analyses of impacts using a changing climate scenario. The scenario should consider the full contribution of project impacts to fishery resources and fish habitat that may be exacerbated by climate change.

Specific Recommendations

We recommend the Affected Environment chapter include thorough baseline information on the following resident and anadromous fish species, habitats, and ecological relationships for later analyses under project impacts.

Fishery Resources

- Coho Salmon (*Oncorhynchus kisutch*)
- Chinook Salmon (*O. tshawytscha*)
- Sockeye Salmon (*O. nerka*)
- Chum Salmon (*O. keta*)
- Pink Salmon (*O. gorbuscha*)
- Rainbow Trout (*O. mykiss*)
- Dolly Varden (*Salvelinus malma*)
- Lamprey (*Lampetra* spp.)
- Brook Lamprey (*P. planeri*)
- Arctic Grayling (*Thymallus arcticus*)
- Three-Spine Stickleback (*Gasterosteus aculeatus*)
- Nine-Spine Stickleback (*Pungitius pungitius*)
- Sculpins (*Cottus* spp.)
- Slimy Sculpin (*C. cognatus*)
- Coastrange Sculpin (*C. aleuticus*)
- Northern Pike (*Esox lucius*)
- Round Whitefish (*Prosopium cylindraceum*)
- Humpback Whitefish (*Coregonus pidschian*)
- Least Cisco (*C. sardinella*)

Fish Habitat

- Wetlands – Include a separate discussion of baseline functions and values of wetlands that may be impacted by the project. For example, quantified baseline wetland habitat functions and values relevant to fish habitat (e.g., rearing, overwintering, refugia) should be presented to streamline future analysis of losses from project impacts.
- Surface water – Include a discussion of water quality (including temperature and chemistry) that can be analyzed with respect to mine discharge receiving waters. Include

a discussion of watershed hydrography, including the seasonal hydrograph, for later use to determine potential project impacts to water quantity and availability for fishery resources. Include a discussion of surface flow pathways.

- Stream Channel – Include a robust discussion of the miles of stream channel habitat used by resident fish and anadromous fish.
- Groundwater – Near the proposed mine site, porous glacial till allows a direct connection between ground and surface waters. Include a separate discussion of baseline groundwater habitat conditions and functions that may be impacted by the project. Groundwater habitat resources must be discussed and later analyzed in context of relevance to fish habitat (e.g., spawning, rearing, refugia). This discussion should include: vertical, horizontal, and diagonal (3D) groundwater pathways and surface-groundwater exchange, which dictates the quality and quantity of fish habitat; water quality including temperature and chemistry; and groundwater seasonal hydrograph, because seasonal groundwater availability may influence spawning and rearing fish habitat.

Freshwater Ecology

We recommend inclusion of the following processes and relationships:

- Relative contributions of marine-derived nutrient input and transport from anadromous fish carcasses brought into the freshwater environment from the marine environment; this should include timing, extent, distribution, delivery, and location.
- Food web ecology, which can later be analyzed for the potential for interruption of trophic processes caused by the project.
- Fish species diversity and assemblages (e.g., potential effects of the project on species diversity, shifts in competition, and change in species assemblages).

Chapter 3.25: Threatened and Endangered Species

Note: The USFWS defers to the National Marine Fisheries Service (NMFS) on all listed species under the NMFS' jurisdiction (i.e., whales and seals).

General Recommendations

Consistent with the chapter's intent, USFWS recommends the following:

- Begin the chapter with a discussion of the Endangered Species Act (ESA) and section 7 consultations; the U.S. Army Corp of Engineers (USACE) is required to consider the effects a Federal action will have on all listed species in a project's action area.

USFWS Comments, DEIS Pre-draft Chapters 3.24 and 3.25

- Include a separate discussion of marine mammals, and the Marine Mammal Protection Act (MMPA). All of the ESA-listed marine mammals discussed here are also MMPA-protected marine mammals.
- References to preparation of the Biological Assessment (BA) and Biological Opinion (BO) are incorrectly defined in the chapter. We suggest reviewing the Endangered Species Consultation Handbook, available at https://www.fws.gov/endangered/esa-library/pdf/esa_section7_handbook.pdf.
 - The BA is prepared by the Federal action agency or their designated non-federal representative, and is used to support the agency's effects determination (no effect; may affect, not likely to adversely affect (NLAA); or may affect, likely to adversely affect). If the USACE determines the project "may affect, is likely to adversely affect" listed species, they should request initiation of formal section 7 consultation under the ESA. An agency's designated non-federal representative may prepare documents for consultations, and initiate and conduct "informal" consultations (i.e., determinations of "No effect" or "May affect, NLAA"), but only a Federal agency can initiate and conduct formal section 7 consultations.
 - A BO is prepared by the USFWS (or NMFS) as part of a formal section 7 consultation on the action, and delivers the USFWS' or NMFS' opinion on whether a Federal action is likely to jeopardize the continued existence of listed species, or result in the destruction or adverse modification of designated critical habitat.

Specific Recommendations

Cook Inlet Beluga Whale

- We suggest discussing critical habitat in a separate sub-heading, rather than in Habitat Use and Distribution. This will allow a more thorough analysis of impacts to critical habitat, and streamline any section 7 consultation.
- This section references two studies of beluga whales that had limited sample sizes (i.e., 14 and 20 whales, respectively). These small sample sizes should be explicitly acknowledged in the paragraph, and findings from these studies should be used carefully, as it would be difficult to extrapolate the findings from such a small number of animals to the population as a whole.

Northern Sea Otter

- We suggest discussing critical habitat in a separate sub-heading, rather than in Habitat Use and Distribution. This would allow a more thorough analysis of impacts to critical habitat, and would streamline the section 7 consultation.

USFWS Comments, DEIS Pre-draft Chapters 3.24 and 3.25

- Additional and specific information on how sea otters currently use the action area (the area near the proposed port, along the pipeline route, near the area where larger vessels would be moored and lightering would occur) should be included in the Affected Environment chapter. This will be helpful when later evaluating the project's potential impacts for the Environmental Consequences chapter, and the potential effects for the section 7 consultation. The more detailed information found in the Steller's eider section is a good example of an evaluation of habitat use and life history. This type of information is important to evaluate fully the impacts and effects the proposed project may have on listed species.

Steller's Eider

- The following sentence should be reworded: "The primary constituent elements for Steller's eider marine habitat includes marine waters up to 30 feet deep." References to "primary constituent elements" or "physical and biological features" are used to describe designated critical habitat. However, there is no Steller's eider designated critical habitat in the project area. Suggest re-wording to "important habitat" or perhaps "preferred habitat" to avoid confusion.



United States Department of the Interior

U.S. FISH AND WILDLIFE SERVICE
Anchorage Fish and Wildlife Conservation Office
4700 BLM Road
Anchorage, Alaska 99507



IN REPLY REFER TO:
FWS/AFES/AFWCO

August 31, 2018

Mr. Shane McCoy
Program Manager, Regulatory Division
U.S. Army Corps of Engineers, Alaska District
P.O. Box 6898
Joint Base Elmendorf-Richardson, Alaska 99506-0898

Subject: Additional Cooperating Agency Review of Pre-draft Chapter 3 and Chapter 4 Sections

Dear Mr. McCoy:

Thank you for the opportunity to review additional pre-draft sections of U.S. Army Corps of Engineers' Pebble Limited Partnership Project Environmental Impact Statement (EIS). Our comments and recommendations are provided as a cooperating agency in accordance with the National Environmental Policy Act (42 U.S.C. 4321 et seq.), with implementing regulations.

The U.S. Fish and Wildlife Service (USFWS) comments for the affected environment chapter (Chapter 3), pre-draft sections on Commercial and Recreational Fishing (Chapter 3.6), and Wildlife Values (Chapter 3.23) are summarized in Enclosure 1. The USFWS comments for the environmental consequences chapter (Chapter 4), pre-draft sections on Commercial and Recreational Fishing (Chapter 4.6), Wildlife Values (Chapter 4.23), Fish Values (Chapter 4.24), and Threatened and Endangered Species (Chapter 4.25) are summarized in Enclosure 2. Please note, the USFWS provided additional pre-draft Chapter 3 comments by letter dated July 13, 2018.

The USFWS defers to the National Park Service on the pre-draft recreation chapter, and agrees with the National Park Service's comments on the pre-draft subsistence chapter. The USFWS defers to the National Marine Fisheries Service for all listed species under their jurisdiction (e.g., beluga and other whales, seals, and sea lions).

If you have any questions or need additional information, please contact me at (907) 271-1467 or douglass_cooper@fws.gov.

Sincerely,

Douglass M. Cooper
Ecological Services Branch Chief

Enclosures

Enclosure 1: USFWS Comments, Pebble Limited Partnership Pre-draft DEIS, Affected Environment, Chapters 3.6 and 3.23

The U.S. Fish and Wildlife Service (USFWS) recommends the Draft Environmental Impact Statement (DEIS) Affected Environment chapter streamline the National Environmental Policy Act review process. We recommend structuring the chapter to identify clearly the potentially impacted resources, so the mechanism of the impact can be characterized and analyzed under Environmental Consequences. The Affected Environment chapter should provide adequate baseline for each identified resource to allow for robust analyses of project impacts to each identified resource.

Chapter 3.6: Commercial and Recreational Fishing

General Recommendations

- The U.S. Army Corps of Engineers requested the USFWS review and comment on the analysis of potential impacts to commercial fishing. Because our expertise is in biological resources, we limit our comments to the biological impacts on commercial fishing and will not comment on the economic impacts.
- At times, the DEIS distinguishes between the Mulchatna River system and the Nushagak River, and other times it does not, despite the Mulchatna River (and its tributaries) being a tributary to the Nushagak River. We recommend more clearly distinguishing between the two to avoid potential confusion. Actions that affect the Mulchatna River system may also affect the lower reaches of the Nushagak River. The USFWS recommends revisiting this section and clearly describing the river system(s) and connected tributaries found in the action area.
- Please provide an assessment of King Salmon productivity in the Mulchatna River system.
- Please provide a summary of the extent of the project area located within each of the watersheds described in this section. Even if this information is detailed in another section of the DEIS, this information would allow the reader to more clearly understand the affected environment in this section.
- It is difficult to evaluate the information presented (and its relevance) given the lack of a literature cited/reference list. For subsequent reviews and drafts, please submit a reference list containing the full citation for all literature referenced within the body of the document.

Specific Recommendations

- From page 3.6-25, Paragraph 1, Sentence 1, “The inflation-adjusted collective...” This appears to reference the wrong table in the text. Should this read as Table 3.6-18 instead of 3.6-17?

- From page 3.6-25, Paragraph 1, Sentence 2, “The inflation-adjusted estimate...” The cited expenditure \$69.32 million does not appear in Table 3.6-18.

Chapter 3.23: Wildlife Values

Note: The USFWS defers to the National Marine Fisheries Service (NMFS) on all protected marine mammals under the NMFS’ jurisdiction (i.e., whales and seals).

General Recommendations

- The bird survey data discussed in this chapter is 10 to 14 years old. The USFWS recommends using current data and biological information. This is especially important for bald and golden eagles, because activities that could disturb nests might require an eagle nest permit.
- The USFWS recommends including a discussion of the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act in this section.
- The marine mammals sub-section should include a discussion of the Marine Mammal Protection Act, and prohibited actions under the law. It should also explicitly state additional information on marine mammals listed under the Endangered Species Act is found in Chapter 3.25.

Enclosure 2: USFWS Comments, Pebble Limited Partnership Pre-draft DEIS, Environmental Consequences, Chapters 4.6, 4.23, 4.24 and 4.25

The U.S. Fish and Wildlife Service (USFWS) recommends that the Draft Environmental Impact Statement (DEIS) Environmental Consequences chapter streamline the National Environmental Policy Act review process. We recommend structuring the chapter to provide clear analysis of the potentially impacted resources identified in the Affected Environment chapter, and characterizing the mechanism of all potential impacts to each identified resource.

Chapter 4.6: Commercial and Recreational Fishing

General Recommendations

- This section is difficult to assess given the limited amount of information provided. We recommend providing additional details in this section to improve clarity of the document.
- For subsequent reviews and drafts, please submit a reference list containing the full citation for all literature referenced within the body of the document.

Chapter 4.23: Wildlife Values

Note: The USFWS defers to the National Marine Fisheries Service (NMFS) on all protected marine mammals under the NMFS' jurisdiction (i.e., whales and seals).

General Recommendations

- Similar to the recommendation provided for Chapter 3.23, the USFWS recommends using updated survey data to discuss environmental consequences in this chapter. Please use project, location, and species-specific information to evaluate the project's potential impacts on important wildlife resources. This is especially important for bald and golden eagles, because activities that could disturb nests might necessitate an eagle nest permit.
- The USFWS recommends carefully quantifying the number of bald and golden eagles and their nests that may be affected by the project, and discussing the potential need for an eagle nest permit.
- The marine mammals sub-section should include an analysis and discussion of the anticipated project impacts to non-listed marine mammals during exploration, construction, operations, and reclamation activities. Please make clear that additional information on marine mammals listed under the Endangered Species Act is in Chapter 3.25.

- The marine mammals sub-section should detail all impacts to marine mammals that could be defined as harm or harassment under the Marine Mammal Protection Act (MMPA), and discuss any recommendations to seek authorization under the MMPA for impacts to protected marine mammals directly related to project activities.
- The potential for water quality impacts at the mine site, along the transportation corridor, and at the Amakdedori Port should be clearly discussed in terms of how wildlife species and protected marine mammals could be affected. This should include the potential for water quality alteration or degradation to be carried from the mine site to Lake Iliamna and Cook Inlet, and ways that water quality changes could affect wildlife and/or protected marine mammals.

Chapter 4.24: Fish Values

General Recommendations

- Similar to the recommendation provided for Chapter 3.24, the USFWS recommends changing the chapter title to “Fishery Resources and Habitat.”
- Due to both the ecological and economic importance of fishery resources in the Bristol Bay watershed, we believe it is critical to analyze the project’s potential impacts on all facets of fishery resources and fish habitat. In addition, because fishery resources in the area directly relate to many of the other sections in Chapter 4 (e.g., Threatened and Endangered Species, Wildlife, Subsistence, Commercial and Recreational Fishing), those sections should also address the potential ways fishery resources impacts could affect other resources and activities in the action area and larger Bristol Bay watershed.
- Project fishery information should be quantified, summarized, and presented in terms of potential direct, indirect, and cumulative impacts to baselines for individual biological resources. The chapter should summarize and compare each individual resource and environmental consequence to those resources across project-site, local watershed, and Bristol Bay regional scales. The chapter should then put these same environmental consequences within the greater context of state, national, and international fishery resource perspectives. The USFWS recommends these analyses to identify the significance of impacts under the proposed project and any alternatives. Currently, the chapter does not adequately summarize the values and significance of fishery and fish habitat resources in order to evaluate reasonably anticipated/foreseeable significant adverse effects to those resources.
- The chapter should separately identify impacts that are temporary and those that are permanent.
- Environmental consequences should be addressed in proportion to their significance (40 C.F.R. § 1502.2(b)), meaning that severe impacts should be described in more detail than less consequential impacts. Each analysis of an environmental consequence (i.e., direct, indirect, and cumulative) should be presented in the order of significance so the reader

can readily identify the most substantial impacts. The fishery resources impact analyses should include the associated significance for loss of individual fish species and populations. Impacts to fish habitats should be identified and analyzed independently from impacts to fishery resources.

- The geographic scope of the analyses for project impacts to fishery and fish habitat resources should include the immediate project-site (i.e., north and south fork Kotuli River and upper Talarik Creek), local watersheds (i.e., Newhalen River, Gibraltar Lake, Lake Iliamna), and regional scale (i.e., Bristol Bay, Cook Inlet), and should include analysis related to the global importance of the Bristol Bay fishery.
- The scope of environmental consequences considered in the chapter should include analyses of the quantified impacts to physical, biological, and social aspects to the region's sport, commercial, and subsistence user groups from identified losses to the fishery and fish habitat resources. If detailed information is available on these topics in other sections of the DEIS, please direct the reader to that information.
- The chapter should describe how impacts are or are not consistent with existing and previously planned uses of the fisheries resources, including Bristol Bay fisheries area management plans, and the Bristol Bay Fishery Reserve.
- GIS location maps should accompany quantified information to give a visual scope of analyses.
- Potential impacts to fishery and fish habitat resources from individual project components should be fully described to provide a complete evaluation of the potential impacts during critical life history phases (e.g., spawning, incubation, rearing, migration, overwintering) to fish survival, production, run timing, homing capabilities, prey-species availability, respiratory capabilities, and other biological and ecological factors. Quantitative analyses should be based on sound scientific methods, including adequate sample sizes, and clearly explained for both the expert and lay reader. Impacts to fish habitats should be analyzed independently from the fisheries analyses.
- Several of the fishery resource baseline datasets are 10 years old or older and should be updated to reflect current conditions. We do not believe an analysis of environmental consequences compared to baseline conditions will be meaningful absent current data. The DEIS should use baseline information specific to the current, revised proposal for all qualitative and quantitative analyses.
- Please present environmental consequences to individual fish species. For example, the Bristol Bay region provides 51 percent of the commercial catch of the world's Sockeye Salmon. We recommend a detailed analysis of the potential short- and long-term environmental consequences of the project to this internationally important resource. The chapter should analyze the potential for environmental consequences to destabilize the existing Bristol Bay salmon portfolio represented by numerous individual stocks. It should identify the potential for additional fishing closures due to losses to fisheries and

fish habitat. Different species are targeted in commercial, sport, and subsistence fisheries supported by the region. We recommend analyzing the impacts to individual species, distribution, abundance, and availability to the different fishery user groups that rely on these resources.

- The section related to “Habitat Loss” currently has a placeholder for estimated losses, stating it will be updated based on the new project footprint. Fish habitat information should be quantified, summarized, and presented in terms of potential impacts (direct, indirect, and cumulative) to baseline physical habitats, with the impacts broken down by each component of the proposed project. These analyses should be independent of those for biological fishery resources. The chapter should summarize and compare individual habitat types and associated environmental consequence across geographic scopes. For example, habitat loss should be calculated in terms of anadromous, resident, and total habitat miles or acres for streams, rivers, lakes, and wetlands. Baseline and project impacts to habitat types should be further characterized by the function the habitat provides (i.e., spawning, incubation, rearing). Designing the analyses in this structure provides context to the magnitude of habitat impact relative to species and population fitness and the carrying capacity of the habitat.
- The proposed mine would require billions of gallons of water each year of operation. Water management (quality, quantity, and chemistry) is a significant environmental concern for fishery and fish habitat resources. The level of detail in environmental consequences should be commensurate with the significant concern for downstream water quality degradation that has been expressed by both stakeholders and the project proponents. The potential for the project to result in significant degradation to waters of the U.S. should be specifically discussed in the DEIS. Analyses of alterations to receiving waters from both source and non-point sources should be presented.
- Water analyses should include a comprehensive evaluation of the potential for acute, chronic, sub-lethal, and lethal effects of metal toxicity to fishery resources and associated potential fishery resource losses. Impacts to both surface and groundwater and associated transport pathways should be analyzed. For example, the chapter should include an analysis of mine tailings and acid rock drainage leaching potential into both surface and groundwater.
- Certain metals that are essential to fish health at low concentrations may become toxic with relatively small increases in concentration; such metals include copper (Cu), zinc (Zn), selenium (Se), and molybdenum (Mo). Copper is specifically toxic to anadromous salmon. These same metals have a narrow window of non-toxicity before becoming toxic. Non-essential metals are more likely to be toxic even at low concentrations (e.g., gold (Au), lead (Pb), arsenic (As) and mercury (Hg)). Please analyze the environmental consequences from point and non-point process discharges, for different species and at different scales.
- Please analyze the effects of altered water quality parameters on exposure and toxicity. Important water quality parameters include, but are not limited to temperature, pH,

dissolved oxygen, and suspended and dissolved solids. Water quantity impacts from flow alterations, dewatering, and rerouting of water should be fully analyzed. The DEIS should clearly describe how the hydrograph would be altered and how that could impact habitat. The DEIS should clearly indicate the implications of these impacts to the fitness of fish individuals, species, populations, and the potential impact to carrying capacity of the altered habitat.

- The project proposes a transportation corridor across Lake Iliamna, which supports Chinook, Sockeye, and Coho Salmon, Northern Pike, Lake Trout, and Dolly Varden. The DEIS should evaluate potential impacts to Lake Iliamna, downstream watersheds, Bristol Bay fishery stocks and their habitats, and terrestrial and marine species that rely on Lake Iliamna and the Kvichak River resources.
- There appear to be data gaps for some project components; for example, fishery and fish habitat resources associated with Iliamna Lake are not presented in sufficient detail. Marine-derived nitrogen nutrient inputs from spawning salmon in Lake Iliamna are the largest contributor of nutrients in the watershed (Kline et al. 1993). These lake nutrients support critical fish life history phases including rearing, feeding, and overwintering. Potential alterations to Lake Iliamna's nutrient cycling from the proposed mine and transportation corridor should be fully analyzed.
- The DEIS should include an analysis of the impacts of the ferry terminal and ice-breaking ferry on seasonal ice development and break-up and on water quality (including toxics, nutrients, and fuels spills). The chapter should analyze the project's potential impacts to the fisheries and habitats of Lake Iliamna.
- The project proposes a new tailings storage facility (TSF) design that includes two separate facilities: an unlined facility in North Fork Kotktuli west and a lined facility in South Fork Kotuli east. The DEIS should include a thorough analysis of the new TSF design and its potential biological, chemical, and physical risks to fishery resources and habitats, particularly in the context of potential leaks or failures of the individual TSFs.
- The project proposes 30 miles of industrial road from the north side of Lake Iliamna to the mine site, and 95 miles of pipeline across the Cook Inlet sea floor from Anchor Point to a deepwater port at Amakdedori west of Augustine Island volcano. The DEIS should include an analysis of the potential impacts to fishery resources and fish habitat along the freshwater/terrestrial, wetland, and marine alignments of the proposed natural gas pipeline and road.
- The DEIS should include analyses of impacts to nearby marine and anadromous fisheries from the Amakdedori Port and the proposed concentrate transfer locations, including impacts to marine invertebrates and benthic fish.
- Methods to mitigate adverse environmental consequences to fisheries, fish habitat, and their functions should be individually addressed. The DEIS should spell out the proposed

mitigation, including the associated risk of failure for each proposed mitigation effort. Project impacts that can and cannot be mitigated should be clearly identified.

Chapter 4.25: Threatened and Endangered Species

Note: The USFWS defers to the NMFS on all listed species under the NMFS' jurisdiction.

General Recommendation

- Similar to the recommendation provided for Chapter 3.25, the USFWS recommends including a separate discussion of protected marine mammals and impacts under the MMPA. All marine mammals listed under the Endangered Species Act and discussed in this chapter are also MMPA-protected marine mammals, and there should be a robust analysis of the project's potential to cause harassment of these species as defined by the MMPA. If non-listed marine mammals are discussed in a different section of the chapter, include a reference indicating where this analysis can be found.
- Similar to the recommendation provided for Chapter 3.25, the USFWS recommends discussing critical habitat in a separate sub-heading, rather than in Habitat Changes. This will allow a more thorough analysis of impacts to critical habitat, and streamline any section 7 consultation. For the purposes of section 7 consultation, critical habitat is treated as a stand-alone entity, and effects to critical habitat evaluated separately from effects to the associated listed species.

Specific Recommendations

- “The analysis area for Threatened and Endangered Species (TES) includes the Natural Gas Pipeline Corridor across Cook Inlet, the Amakdedori Port and concentrate loading facility, and the Transportation Corridor across Lake Iliamna.” The mine site should be included in all discussions of the analysis area and of anticipated impacts. The potential for water quality impacts at the mine site, along the transportation corridor, and at the Amakdedori Port should be clearly discussed in terms of how listed species and protected marine mammals could be impacted. This should include the potential for water quality alteration or degradation to be carried from the mine site to Lake Iliamna and Cook Inlet, and ways water quality changes could affect listed species or protected marine mammals.
- The background information on potential impacts to listed species is very general. Please use additional and specific information on listed species in the action area (the area near the proposed port, along the pipeline route, near the area where larger vessels would be moored and lightering would occur) to perform robust analyses of the project's potential impacts on listed species in the Environmental Consequences chapter. All impacts and effects of the proposed project on listed species should be fully analyzed, and should be based upon each species' specific needs and habitat use, in and near the action area.

References:

Kline, T.C., Jr., J.J. Goering, O.A. Mathisen, and P.H. Poe. 1993. Recycling of elements transported upstream by runs of Pacific salmon: II. $\delta^{15}\text{N}$ and $\delta^{13}\text{C}$ evidence in the Kvichak River Watershed, Bristol Bay, southwestern Alaska. *Canadian Journal of Fish and Aquatic Science* 50:2350-65.



United States Department of the Interior



U.S. FISH AND WILDLIFE SERVICE
1011 East Tudor Road
Anchorage, Alaska 99503-6199

IN REPLY REFER TO:

FWS/R7/FES

OCT 01 2018

Mr. Shane McCoy
Program Manager, Regulatory Division
U.S. Army Corps of Engineers, Alaska District
P.O. Box 6898
Joint Base Elmendorf-Richardson, Alaska 99506-0898

Subject: Pebble Mine Project Draft Environmental Impact Statement Schedule

Dear Mr. McCoy:

The U.S. Army Corps of Engineers (USACE) is currently evaluating a Department of the Army permit application (POA-2017-271), pursuant to Section 404 of the Clean Water Act, from the Pebble Limited Partnership, to develop existing State of Alaska-owned mine claims at the Pebble deposit. The U.S. Fish and Wildlife Service (Service) is participating as a cooperating agency, pursuant to the National Environmental Policy Act (42 U.S.C. 4321-4347, with implementing regulations; NEPA), in the development of an Environmental Impact Statement (EIS) to inform the USACE's decision of whether or not to issue a permit for the proposed project.

The USACE proposed an accelerated schedule for development of the EIS, anticipating a final EIS by the end of 2019, with a Record of Decision by April 2020. The project as proposed is complex, and the natural resource concerns under consideration are controversial. Since the USACE's original schedule was announced, there have been several project schedule changes, including:

- The comment period for the USACE's Notice of Intent to prepare an EIS was extended from 30 days (April 1 to April 30, 2018) to 90 days (April 1 to June 29, 2018), based on public input.
- Due to the comment period extension, the Scoping Summary Report, originally scheduled for release June 2018, was released on August 31, 2018.
- Cooperating Agency Coordination Meetings, originally anticipated to occur monthly from May 2018 to March 2020, have been sporadic to-date.
- The Service is not aware if Data Adequacy and Gaps Analysis, originally scheduled to occur from February to July 2018, and with an adjusted due date of September 2018, has been completed.
- The most recent schedule calls for cooperating agencies to participate in impact analyses and development of chapter 4 of the draft EIS from October 2 to October 30, 2018, and the Service has made staff available for this purpose. However, we have received no additional details on how or when this participation would occur.

- The original schedule, dated January 2018, anticipated a preliminary draft EIS by October 26, 2018, with a draft EIS available for public review by January 16, 2019. In spite of schedule changes, the current schedule dated July 2018, retains the January 16, 2019, date for public review of a draft EIS.

In its role as a cooperating agency for the project, and to facilitate our staffing and workload planning, the Service requests a project schedule update. In particular, we are interested in:

- The USACE's new projected completion date for the EIS in light of schedule changes.
- Any significant milestones the USACE has set for the preliminary draft, draft, and final EIS development.
- How the USACE will incorporate the cooperating agencies' concerns and contributions into the EIS and larger NEPA process.

The Service appreciates the opportunity to participate as a cooperating agency for this project. If you have any questions, please contact Ecological Services Branch Chief, Mr. Douglass Cooper, Anchorage Fish and Wildlife Conservation Office (907-271-1467 or douglass_cooper@fws.gov).

Sincerely,



Mary Colligan
Assistant Regional Director
Fisheries and Ecological Services



IN REPLY REFER TO:
FWS/R7/11/S

United States Department of the Interior

U.S. FISH AND WILDLIFE SERVICE
1011 East Tudor Road
Anchorage, Alaska 99503-6199



DEC 21 2018

Mr. Shane McCoy
Program Manager, Regulatory Division
U.S. Army Corps of Engineers, Alaska District
P.O. Box 6898
Joint Base Elmendorf-Richardson, Alaska 99506-0898

Dear Mr. McCoy:

The United States Fish and Wildlife Service (Service) appreciates the opportunity to review chapters of the U.S. Army Corps of Engineers' (USACE) preliminary Draft Environmental Impact Statement (DEIS), evaluating the Pebble Limited Partnership Project, which proposes to develop existing State of Alaska-owned mine claims at the Pebble deposit. Our preliminary comments are provided in the enclosure, *U.S. Fish and Wildlife Service Cooperating Agency Review, Pebble Limited Partnership Project Draft Environmental Impact Statement*, and are limited to the following chapters and appendices:

- Commercial and Recreational Fisheries (Chapter 3.6, Chapter 4.6, Appendix K 3.6)
- Subsistence (Chapter 3.9, Chapter 4.9, Appendix K 3.9)
- Wildlife Values (Chapter 3.23, Chapter 4.23)
- Fish Values (Chapter 3.24, Chapter 4.24)
- Threatened and Endangered Species (Chapter 3.25, 4.25, Appendix K 4.25)
- Mitigation (Chapter 5.0)
- Appendix E – Laws, Permits, Approvals, and Consultations Required

The Service is participating as a cooperating agency in the preparation of the subject Environmental Impact Statement (EIS) pursuant to the National Environmental Policy Act (NEPA) (42 U.S.C. 4321 et seq., with implementing regulations). Our comments and recommendations are provided in accordance with the NEPA, Endangered Species Act (16 U.S.C. 1531 et seq., as amended), Marine Mammal Protection Act (16 U.S.C. 31), Bald and Golden Eagle Protection Act (16 U.S.C. 668), Migratory Bird Treaty Act (16 U.S.C. 703-712), and Fish and Wildlife Coordination Act (16 U.S.C. 661-667e, et seq., as amended).

The Service conducted a limited review of specific sections of the DEIS provided by the USACE in staggered releases in November 2018. The process employed by the USACE to facilitate cooperating agency review made it challenging to assess the DEIS for sufficient baseline information in the Affected Environment (Chapter 3) and sufficient analysis and discussion of impacts in the Environmental Consequences (Chapter 4); further complicating the review was the incomplete nature of the chapters. Many of the chapter sections contain notations that 2018 and 2019 field data are pending, and an analysis of those data will be added to the EIS when available. Due to a lack of current data for the affected environment, the Service is not able to provide comprehensive analysis of the environmental consequences of the proposed project on fish and wildlife resources.

Additionally, several of the chapter sections referenced documents or chapters that were not available for our review. Therefore, our comments on the DEIS are preliminary and we look forward to reviewing the DEIS in its entirety, after the field data referenced in the document have been incorporated and the environmental consequences rigorously analyzed.

If you have any questions, please contact Ecological Services Branch Chief, Mr. Douglass Cooper, Anchorage Fish and Wildlife Conservation Office, at 907-271-1467 or via e-mail at douglass_cooper@fws.gov.

Sincerely,



Mary Colligan
Assistant Regional Director
Fisheries and Ecological Services

Enclosure

U.S. Fish and Wildlife Service Cooperating Agency Review, Pebble Limited Partnership Project Draft Environmental Impact Statement

The U.S. Fish and Wildlife Service (Service) defers to the National Marine Fisheries Service (NMFS) for all listed species and marine mammals under their jurisdiction, defers to the National Park Service for the Recreation section, and defers to the Environmental Protection Agency for the Wetlands section.

General Comments

The Service submitted comments on preliminary draft chapters of the U.S. Army Corps of Engineers' (USACE) Draft Environmental Impact Statement (DEIS) on July 13, 2018, and August 31, 2018. There were no subsequent responses from the USACE indicating how or if our comments were addressed. Consequently, the Service is unable to discern which of our previous comments were incorporated into the current draft. Our review highlights instances where our previous comments were not adequately addressed, or the analyses remain unclear.

The Service recommends structuring each of the sections of Chapter 4 of the DEIS to thoroughly analyze the environmental consequences of the proposed project for each of the four main project components, as described in Chapter 2, Alternatives: the Mine Site, the Transportation Corridor, the Amakdedori Port and Lightering Locations, and the Natural Gas Pipeline. Structuring the analysis and discussion in this way will ensure full disclosure of the proposed project's environmental consequences in the DEIS. We recommend each of the sections of Chapter 4 adequately address the full scope of the potential direct, indirect, and cumulative environmental impacts from the proposed action or action alternatives; contain sufficient information to adequately assess the magnitude or intensity of the impacts; and evaluate the overall significance of these impacts to resources in the project area and surrounding region.

The Service has management authority for the conservation of a variety of trust resources including migratory birds, inter-jurisdictional fish, threatened and endangered species, and their habitats. Invasive species have the potential to negatively impact these resources. Therefore, we recommend initial site evaluations be conducted to determine what appropriate control and management actions should be taken to avoid and minimize adverse impacts associated with invasive species and encourage the development of an invasive species control plan for all phases of the proposed project.

Specific Comments

Commercial and Recreational Fisheries

Chapter 3.6: Affected Environment

The Service provided comments on this pre-draft chapter section, by letter dated August 31, 2018. We have no additional comments on this section at this time.

Chapter 4.6: Environmental Consequences

- Please specify which section or sections this statement refers to: “*Section 4.24, Fish Values indicate Alternative 1 would not reduce the returning adult salmon to the Kvichak and Nushagak river systems as a result of the project operations.*” It is unclear where the numbers of returning adult King Salmon under different conditions are discussed in Section 4.24 Fish Values. Rather, Section 4.24 provides information describing changes to the quantity of King Salmon spawning and rearing habitat occurring within the project area. Please provide a citation or documentation that correlates the quantity and quality of existing, and future, King Salmon habitat within the project area to numbers of returning King Salmon adults.
- Several Service comments provided on the pre-draft chapter by letter dated August 31, 2018, were not addressed by the USACE in this version. We continue to recommend incorporation of the following information into the DEIS:
 - An assessment of King Salmon productivity in the Mulchatna River system.
 - The extent of the project area located within each of the watersheds described within this section. Even if detailed in another section of the DEIS, this information would allow the reader to more clearly understand the affected environment in this section.
- The pre-draft chapters previously reviewed for this section had placeholders for discussion on the economic contribution of lodges by drainages. No new information on the economic contribution from lodges by drainages is included in the most recent chapter of the DEIS. We recommend future versions include this information.
- The pre-draft chapters previously reviewed for this section had placeholders for additional discussion on the response of consumers to industrial accidents near fishery resources, and the general consumer awareness (or lack of awareness) of Bristol Bay salmon. No new information on these topics is included in the latest version of the DEIS. We recommend future versions include this information.

Appendix K 3.6: Commercial and Recreational Fisheries

The Service has no comment at this time on Appendix K 3.6 Commercial and Recreational Fisheries.

Subsistence

Chapter 3.9: Affected Environment

The Service appreciates the amount of detail provided in the Affected Environment chapter and has no comment at this time.

Chapter 4.9: Environmental Consequences

The Service offers the following specific recommendations for this chapter:

- Include more detail on the potential cumulative impacts for all alternatives, and the magnitude of such impacts. Specifically, provide detailed information on the cumulative and additive impacts each action alternative would have on the water, subsistence, and cultural resources which the people living in the area depend on for survival. In particular, this chapter should describe how anticipated impacts to the river system, water quality, fish habitat, and wildlife habitat would affect subsistence users that rely on these resources. If some of this information is available in one or more other chapters of the DEIS, please also refer to those chapters here.
- Discuss and provide more detail on how construction and operation of a large commercial enterprise, an open pit copper and gold mine, in a relatively remote part of Alaska could permanently impact the environment, fish, wildlife, habitats, and the subsequent effects on indigenous people and their culture, including subsistence use.

Appendix K 4.9: Subsistence

The Service has no comment at this time on Appendix K 4.9 Subsistence.

Wildlife Values

Chapter 3.23: Affected Environment

Thank you for incorporating most of the Service recommendations for the pre-draft chapter, provided by letter dated August 31, 2018, into the DEIS. The Service offers the following additional comments for this chapter:

- Many important avian resources outside the mine site could be impacted by the proposed development, including those along the Kaktuli, Nushagak, and Mulchatna Rivers. Nushagak Bay supports an estimated 60,000 shorebirds within the Nushagak Bay Western Hemisphere Shorebird Reserve Network (<https://www.whsrn.org/nushagak-bay>). Bird communities along the mine access road, on Iliamna Lake, and the Upper Talarik Creek drainage could be affected by the proposed action. Impacts could occur to bird populations as far away as Kvichak Bay, including tens of thousands of long-tailed ducks and black scoters, over 100,000 king eiders (Larned 2002, 2003, 2004, 2005), and more than 20,000 shorebirds in the Kvichak Bay Western Hemisphere Shorebird Reserve Network site (<https://www.whsrn.org/kvichack-bay>).
- Both the Nushagak and Kvichak Bays are recognized by Audubon as areas of global importance. Up to 89 percent of the king eiders and black scoters recorded during spring migration surveys along the coast of southwestern Alaska were documented in Kvichak Bay (Larned 2002, 2003, 2004, 2005), making it among the most important sites in the region for those species.

- The DEIS should incorporate updated information from the Alaska Department of Fish and Game on sensitive breeding populations of Aleutian terns in both the Nushagak and Kvichak Bays. Contact Kelly Nesvacil (kelly.nesvacil@alaska.gov) for additional information.
- The Service recommends the addition of the Kittlitz's murrelet, marbled murrelet, Aleutian tern, and pigeon guillemot to the Species of Concern list.
- Water quality is important to wildlife, including birds and fish. The withdrawal, capture, storage, and release of treated and untreated water could impact raptors, shorebirds, and waterbird species inhabiting downstream locations, and should be discussed in this section of the DEIS.
- We were unable to evaluate wildlife resources for the North Access Road in Alternative 3, because no road is present in Alternatives 1 and 2 where wildlife resources are predominantly discussed, and no discussion of this proposed road is presented in this chapter. We recommend including a more detailed analysis of the North Access Road in Alternative 3 so potential impacts to wildlife resources can be evaluated across the Alternatives.
- The proposed project has a direct footprint in marine areas and could potentially impact the Lower Cook Inlet (and possibly Shelikof Strait), yet the DEIS does not address these habitats nor the potential impacts of spills, accidents, and disturbance in marine waters. The same is true for the marine waters of Bristol Bay. We recommend the DEIS include a discussion of the marine areas potentially affected by the proposed project, as well as the potential impacts of spill, accidents, or disturbance in marine waters.
- Summaries of species present within the proposed site focus only on the most common species. Therefore, it is unknown if less common species, including species of high conservation concern, are present. The conservation status of species detected within the proposed site is not included in the chapter section, and the chapter references the Alaska Biological Resources (ABR) reports, which were not available for our review. The information provided does not contain sufficient detail to evaluate the potential environmental impacts of the proposed action, or its alternatives. Information for this review was summarized, and no references were provided, so it was difficult to evaluate the scope and intensity of potential environmental impacts. We recommend providing additional details on wildlife species that occur for each of the four main project components: the Mine Site, the Transportation Corridor, the Amakdedori Port and Lightering Locations, and the Natural Gas Pipeline.
- Data on the marine distribution of seabirds, or seabird population estimates, are largely lacking in the DEIS. The document references seabird colony sites in the region and provides an estimated number of birds at "*many colonies*," but it is unclear how many colonies are included in this estimate, and what methodology was used to collect colony data. We recommend expanding the seabird colony information to better quantify the

number of birds and species at each colony site, and providing a map showing all colony locations in the region. The seabird colony database is available online via <http://axiom.seabirds.net/portal.php>. We note, however, that some of the colony data contained therein is decades old, and should be updated to accurately reflect current seabird populations at risk.

- On the Bristol Bay side, the outer regions of this bay have been identified as molting and foraging areas for marbled murrelets and other species during fall migration from coastal breeding sites. Murrelets may be flightless for periods in the fall, and would be susceptible to oil spills or disturbance.
- The DEIS should incorporate updated information from the U.S. Geological Survey investigators from their Cook Inlet marine bird and forage fish surveys for 2016-2018. Lead investigators are Dr. John Piatt (Jpiatt@usgs.gov) and Mr. Dan Ruthrauff (druthrauff@usgs.gov); reports may be available to update seabird colony data for selected study sites and offshore distribution of non-colonial species such as murrelets.
- Classification of habitat use for each species into value classes (i.e., high, moderate, low, or negligible) appears to be very subjective. More information on this classification method should be incorporated into this chapter.
- Wording about survey methodology is unclear. “*The second survey for each year was timed to coincide with peak nesting of cliff-nesting raptors...*” What is “*peak nesting*”? The species listed as examples (e.g., golden eagle, gyrfalcon, rough-legged hawk) have slightly different nesting phenologies, so there might be different timing among the species. Determining nesting success and productivity for multiple species is difficult with a single survey due to differences in phenology. For example, most gyrfalcons will have fledged before golden eagles can be surveyed for nest success. Please clarify the survey methodology used to assess peak nesting.
- Some raptor species (e.g., Northern harrier, ground-nesting species including short-eared owl) are not well surveyed by the aerial methods used; thus negative nest survey results at the mine site may be misleading. Additional ground surveys for these species would clarify their presence or absence at the mine site. We recommend clearly disclosing the limitations of the survey methods used to evaluate wildlife presence and impacts in the project area.
- It is unclear if raptor studies were conducted in the same or different areas during the 2004 and 2005 periods. For example, was the entire site and buffer area surveyed both years, or were forested areas surveyed in 2004 and cliff habitats in 2005? Please clarify the timing and locality of the raptor surveys.
- Both active and inactive bald and golden eagle nests are protected under the Bald and Golden Eagle Act.

- Eagle surveys identified golden eagle and bald eagle nests within 0.8 and 4 miles of the project footprint, respectively. Please note that eagle nests are dynamic and locations frequently change from year to year (due to blow-down, new construction, etc.). Additionally, raptor breeding productivity may undergo large inter-annual fluctuations related to changing densities of prey availability. A nest that is unoccupied during a period of low prey density may be occupied when prey levels increase. Therefore, a subsequent eagle nest survey is recommended in the year prior to construction to locate previously unidentified nests or unoccupied nests. If bald or golden eagle nests occur within 0.5 mile of project activities, the Service recommends project proponents consult with the Service's Migratory Bird Management permit office regarding potential disturbance/take and the subsequent need for an eagle or eagle nest take permit.
- One golden eagle nest was identified 0.2 miles north of the south access road. The nest is sufficiently close to warrant consultation with the Service regarding potential disturbance and the need for an eagle take (including disturbance) permit. Although the nest was identified as inactive in 2018, the nest could be active in subsequent years, triggering the need for an eagle take permit to conduct activities within 0.5 mile of the nest.
- The Service highly recommends that any potential eagle or eagle nest permit applications be submitted as far in advance of the project start date as practicable. Once issued, the permit may be updated with the most recent survey data (gathered within 1 year of the start of construction activities). This will help avoid any delays to the project that may be associated with eagles and their take, and help ensure legal coverage of any previously unidentified eagle nest or eagles potentially taken by project activities.
- It is unclear why shorebirds are included in the definition of waterbirds, but then included independently in their own section. Many of the methods used to survey waterbirds (e.g., aerial surveys) are not appropriate for shorebirds. Supporting documentation of shorebird use of Amakdedulia Cove and Kamishak Bay does not include shorebird use of these areas during autumn migration. In addition, supporting documentation is 20 to 40 years old and thus likely outdated. We recommend shorebirds and waterbirds be analyzed as two different categories. Additionally, we recommend using the most current data available or collecting new information where possible.
- Analyses should incorporate all available data, not just the most recent surveys. Ground based surveys do not necessarily indicate higher-quality data, especially if they were poorly timed, utilized inappropriate methodology, or were based on a non-statistical sampling design, etc. It is not clear what data were included in this assessment. No figures were available and few references were provided, and of those that were, no documents or reports were made available (e.g., reference ABR 2011a, NDM 2004, 2005).
- The DEIS contained a comparison between the North Fork Koktuli and Upper Talarik Creek drainages, both of which support a large number of waterbirds. Only information on scaup and "broods" are presented. Please describe what other migratory bird species occur in these drainages. The document fails to describe the resources that are at risk.

For example, what are the anticipated impacts to black scoters in the Pebble Mine study area, including the mine site and transportation corridor where they occur in relatively high abundance (Stehn 2009, 2010)?

- The Service provides the following comments for survey methods used to evaluate bird resources in the project area:
 - A variable circular-plot point count method was used to survey breeding landbirds and shorebirds; this method is not appropriate to survey many breeding shorebirds.
 - Information describing the locations and numbers of breeding landbird and shorebird survey points is insufficient. This information is needed to evaluate whether sampling effort is adequate to make inferences of species densities and distributions across larger spatial scales.
 - Point-count surveys were conducted between 4:30 a.m. and 4:00 p.m. Breeding landbird surveys should begin 30 minutes after sunrise (sunrise in Anchorage, Alaska on June 15 is approximately 4:30 a.m.) and end no later than 5 hours after sunrise, to account for declining song rate and detectability (ALMS 2004 available online at: <https://ecos.fws.gov/ServCat/DownloadFile/111623?Reference=70866>).
 - Survey timing often does not include migration or staging periods, a time period that is important for shorebirds in this region.
 - Survey timing may not be appropriate for all species, as timing of nesting is variable among species. Timing of nesting is also impacted by annual weather conditions. More information is needed to determine if surveys were indeed conducted during what the DEIS refers to as “*peak*” breeding periods.
 - Landbird and shorebird survey information is only provided for the Iliamna Spur Road. Fifteen point-count surveys were conducted in 2005 in proximity to the Newhalen River. Instead of conducting surveys for the majority of the proposed transportation corridor, the authors make comparisons to montane surveys conducted in Katmai National Park and Preserve and Lake Clark National Park and Preserve (Ruthrauff et al. 2007). Such comparisons are potentially inappropriate based on differing survey methods used or real differences in species assemblages in the two areas.
 - Survey data presented in the document appears to be based on aerial surveys (fixed-winged aircraft and helicopter). Aerial surveys are not an ideal method to census seabird species, because smaller birds (e.g., murrelets) can be missed or not identified to species, or their numbers underestimated. In addition, the report documents that the majority of the ABR surveys were only conducted over land or at the mouth of bays. The survey data do not account for the offshore component of the seabird population in the region of Kamishak Bay and the Lower Cook Inlet.
 - No surveys were performed (aside from aerial raptor nesting platform surveys) pertaining to the natural gas pipeline corridor from Ursus Cove to Diamond Point, and Diamond Port is not discussed separately. It is difficult to assess impact without information for the entire impacted area. This chapter does not

adequately assess the potential direct and indirect impacts of either action alternative in this area because no wildlife studies were conducted or no substantive information for the area is available for review.

- This chapter section uses minimizing language, such as, “*No shorebirds were considered common breeders.*” It is not clear how “*common breeder*” is defined. Additionally, the DEIS states, “*In summary, the majority of the mine site supports landbird species that are common in similar vegetation communities across Alaska. Shorebird species are not particularly numerous as breeding residents in the mine site.*” The DEIS does not include data describing how these conclusions were reached.
- If bird densities were calculated from point-count data collected by ABR, then how many birds are estimated to be directly impacted due to loss of habitat at the mine site? How many are estimated to be directly impacted due to the construction of 75 miles of new road? How many birds would be indirectly impacted due to the loss of home range or territory in adjacent areas? How long are these impacts anticipated to last? This information should be included in the DEIS.
- The construction of the proposed road corridor would destroy approximately 110 hectares of waterbird breeding habitat. Because no waterbird, shorebird, or landbird surveys were completed in this area, the magnitude and scope of the potential impacts to migratory birds in this area are unknown. Survey data are lacking within the majority of the transportation and natural gas pipeline corridors. As the transportation and natural gas pipeline corridors traverses a variety of habitats, the avian community is likely different throughout the region. Without data throughout the entire region, the relative impact on the bird community cannot be assessed. Because “*waterbird data were only collected north of Iliamna Lake,*” additional data should be collected outside of the mine site, including the proposed road corridors, power-generating station, wastewater treatment plant, administrative offices, housing and support services, port facilities, gas pipeline corridor, as well as other associated infrastructure.
- Because “*no project-specific waterbird surveys have been conducted to date for areas south of Iliamna Lake,*” insufficient information is available to adequately evaluate the environmental consequences of the proposed action to migratory birds or understand potential differences in the affected environment among the various alternatives.
- The proposed port, lightering facilities, and gas pipeline from Anchor Point to Kamishak Bay would pass through an area of high-quality habitat supporting high bird densities. Kamishak Bay is known to support thousands of waterbirds, seabirds, and shorebirds (*Pebble Project Environmental Baseline Studies, 2004-2008, Technical Summary*), comprising some of the highest marine-oriented waterbird densities in Cook Inlet. The marine waters in the vicinity of Anchor Point provide important habitat to multiple waterbird species, including thousands of Steller’s eiders, common eiders, king eiders, black scoters, and long-tailed ducks (Larned 2004, 2005, 2006a, 2006b, 2006c). We recommend these data be considered and included in the analysis.

- The DEIS should evaluate the impacts of benthic disturbance due to pipeline construction on seabirds and waterbirds that use the area. In addition, it should evaluate behavioral disturbance to shorebirds (e.g., phalaropes), seabirds, and waterbirds due to increased shipping activity and potential impacts from accidents and spills.
- On Page 3.23-23, the last paragraph addresses seabirds and should be moved to the waterbird section to remain consistent in the document.
- The Pebble Partnership contracted ABR to conduct boat-, airplane-, and helicopter-based surveys for birds and mammals in Cook Inlet near Kamishak Bay in 2004 and 2005, recording 69 species of marine-associated birds. The document fails to incorporate survey data as summarized in *Pebble Project Environmental Baseline Studies, 2004-2008, Technical Summary* into this assessment.
- Waterfowl and seabirds comprised the majority of observations recorded by ABR; however, in May tens of thousands of shorebirds also occupied the extensive mudflats in the region. Bird densities were greatest in the near-shore zone (*Pebble Project Environmental Baseline Studies, 2004-2008, Technical Summary*), which would be most affected by the proposed gas pipeline, port terminal, lightering barge activities, mooring sites, and handsize bulk carriers weighing up to 60,000 tons. Bird densities were generally greatest in the fall, winter, and spring; however, more than 4,100 birds of 8 species were estimated to be breeding in the study area. Please revise the analyses using all available data.
- Kamishak Bay supports thousands of sea ducks, including common eider, king eider, long-tailed duck, scoter species, harlequin duck, and the federally-threatened Steller's eider. Large numbers of Steller's eiders were recorded in Kamishak Bay during the months of January, February, March, April, September, and December, with a high count of 4,284 birds (Larned 2004, 2005, 2006a, 2006b, 2006c). Kamishak Bay had an average monthly count of 1,713 Steller's eiders, while Anchor Point supported an average monthly count of 134 Steller's eiders.
- If Steller's eiders were impacted in Kamishak Bay, the effects could be seen in surrounding areas such as Kodiak Island, due to the movement of birds between Kamishak Bay and Chiniak Bay (Rosenberg 2007). The proposed port facility, lightering locations, and pipeline corridor could impact waterbirds throughout the surrounding area.
- Lightering cargo, fuel, and supplies between the port facility and the offshore mooring sites would require cargo to be off-loaded and transferred multiple times, likely increasing the chance of an accident or spill.
- The DEIS should include a description of the nesting seabird colonies at Amakdedulia Cove, Nordyke Islands, Paint River, McNeil Cove, McNeil Islet, and McNeil Head in the vicinity where proposed and alternative lightering activities are planned (southwest and west of Augustine Island, respectively), along with potential avian impacts at these sites

(http://axiom.seabirds.net/maps/js/seabirds.php?app=north_pacific#z=10&ll=59.16355,-154.10553).

- The DEIS should include a description of seabird colony census methods used to estimate seabird population declines (e.g., 1,264 and 1,585 breeding birds in 2004 and 2006 respectively, compared to 4,172 breeding birds in 1976 and 1978). There do appear to be population declines of seabirds from the Lower Cook Inlet area (e.g., tufted puffin). However, documenting numbers of breeding birds for nocturnal burrowing species will require on-site re-census of the colonies within the affected area. The Service recommends cooperation and collaboration with the Alaska Maritime National Wildlife Refuge to conduct land-based counts using their accepted methodologies at these colony sites.
- In Section 3.23.4 Climate Change and Wildlife, it is incorrect to say waterbird and shorebird species may experience an increase in habitat due to increased thawing. The habitat will simply become available sooner; no additional habitat will be created.
- The DEIS should evaluate the impact the Amakdedori Port facility would have on bears. This facility would be located between Bruin Bay and McNeil Cove (near the McNeil River State Game Sanctuary and Refuge), where bears congregate each spring, sometimes by the hundreds, attracted by the high-quality emergent green vegetation found in the coastal meadows near the site.

Chapter 4.23: Environmental Consequences

- This DEIS focuses on the direct impacts within the footprint of the proposed mine site, with little consideration given to potential direct and indirect impacts from the gas pipeline, transportation corridor, power plant, ports, and other facilities. Wildlife resources within Cook Inlet are generally not included in the description of the environmental consequences. The scope should be broadened to adequately capture the direct and indirect impacts of the proposed project, as is required by the NEPA.
- The *Wildlife Management Plan* referenced on Page 4-23-1 has not been completed; therefore, the Service is unable to evaluate the proposed impact avoidance and mitigation measures.
- The Service was unable to evaluate the direct effects of wildlife contact with contaminants (including acid generating tailings and dissolved heavy metals), because “*analysis of risk to wildlife from pit lake water is pending*” (Page 4-23-4). The DEIS should evaluate and disclose these potential impacts.
- The mine is expected to emit air-borne pollutants including particulates and heavy metals (e.g., mercury) as a result of burning large amounts of natural gas and diesel fuel. What are the potential effects of pollutants on water and air quality? What are the associated adverse effects on wildlife and human health? The DEIS should evaluate and disclose the potential impacts from air-borne pollutants.

- The DEIS should include a discussion about the potential of new infrastructure and human waste (garbage, landfills) to attract avian predators (Powell and Backensto 2018). https://www.researchgate.net/publication/237228506_Common_ravens_Corvus_corax_nesting_on_Alaska's_North_Slope_Oil_Fields.
- The DEIS should include a discussion of any transmission lines that would be built along roadways. Electrical transmission lines are known to cause bird strikes and electrocution of raptors. Transmission lines and poles are also known to provide artificial perch sites for avian predators, which may lead to increased mortality of prey species, including birds. Facility lighting can also significantly affect avian migration behaviors, as well as inland flights of nocturnal seabirds during the breeding season. Lighting can result in disorientation or injury and death of nesting seabirds. The Service can provide specific recommendations on both the type and location of lighting to reduce these effects.
- The environmental impacts associated with constructing and operating the proposed 270-megawatt power plant should be discussed. A comparable plant, the 248-megawatt gas-fired River Road Generating Plant in Vancouver, Washington, was among the biggest greenhouse gas emitters in the Pacific Northwest, producing greater than 100,000 metric tons of carbon dioxide equivalent (CO₂e) per year from 2012 to 2016 (<https://ecology.wa.gov/DOE/files/2d/2d41cf1e-8947-4a80-9a66-e412a051e45b.pdf>). What are the anticipated impacts of the proposed power plant on wildlife? What measures would be in place to reduce and mitigate these emissions?
- These other significant sources of injury and mortality should be discussed in this chapter:
 - Increased raptor mortality associated with roadkill. Raptors often scavenge heavily on roadkill. Subsequent gutpiling reduces their ability to take off quickly when vehicles approach, increasing collisions and raptor mortality. Roadkill removal programs are recommended to ameliorate these problems; and
 - Ingestion of toxins and poisons from the project site (e.g., raptors may consume rodenticide poisoned animals around the facility if rodent control measures are implemented).
- Analyses of potential spill impacts to migratory birds, listed species, and other wildlife and their habitats outside the immediate mine site and within transportation corridors are not included in the DEIS. The DEIS should address the potential for vessel groundings and oil spills in the region given the varied and complex bathymetry of Kamishak Bay. The potential for spills and accidents that might result from lightering at two offshore locations (Figure 1-5) should also be evaluated. Kamishak Bay and the waters around Augustine are known to be frequented by both marbled and Kittlitz's murrelets and listed Northern sea otters.
- Potential disturbance of seabird colony sites is not included in the DEIS. Seabirds could be disturbed at breeding colonies by the noise generated by port construction, and by

helicopter overflights in the region. Disturbance could also impact non-colonial birds such as marbled murrelet and Kittlitz's murrelet, both of which nest inland and are relatively abundant in the Lower Cook Inlet. The most recent at-sea surveys indicate that in the Lower Cook Inlet, the more abundant marbled murrelet has an estimated population of approximately 30,000 birds, which is approximately 7 percent of Alaska's total population (Piatt et al. 2007), whereas the Kittlitz's murrelet has a minimum estimated population of approximately 3,000 birds, which could be 9 percent of the world population (Kuletz et al. 2011). Additionally, the southwestern, outer portion of Kachemak Bay is known to be a "nursery" area for newly fledged murrelet juveniles (Kuletz and Piatt 1999).

- No effort is made to quantify the number of animals of any species that might be affected by the individual project components, and/or different project alternatives. Impacts to wildlife are unlikely to be the same across the different alternatives; simply saying "*same as alternative 1*" is not sufficient.
- Chapter 4.23.6 Cumulative Effects is inadequate. The document talks about Reasonable and Foreseeable Alternatives identified in Section 4.1 being carried forward for analysis; however, the analysis presented is one paragraph that provides general statements of effects. More details should be included based on impacts documented at other development sites (e.g., the Prudhoe Bay oil field, Red Dog Mine).

Fish Values

Chapter 3.24: Affected Environment

- The chapter does not clearly describe how mainstem reaches are defined. Points on maps provided in the text are labeled A, B, C, D, etc. Does "A" begin at the point "A" on the map and extend upstream to point "B"? If so, to where does the uppermost designation, that is the upstream terminus for Reach "D", extend on the stream and map in the figure? The Service suggests clarifying the definition of mainstem reaches throughout this chapter.
- According to Table 3.24-1, beaver ponds are referenced as occurring within the upper reaches of area rivers and are also included in the definition of "other off-channel" habitats. The text indicates off-channel habitats include "*side channels, percolation channels, alcoves, isolated pools, riverine wetlands, and beaver ponds...*" Please clarify the distinction between beaver ponds occurring in upper reaches versus beaver ponds occurring in off-channel habitats.
- Descriptions of the upper river mainstem (in areas above the mine site) suggest a greater quantity of sand and silt substrate particles. Are these substrates from beaver ponds in the upper reaches, rather than from riffle, run, glide, and pool habitats?
- There are several instances of information in tables and figures without supporting information in the text. Examples include:

- Table 3.24-2 titled “*Estimated Mileage of Habitat for Pacific Salmon and Rainbow Trout in Tributaries Draining the Mining Site*” would be strengthened if we knew what percent of total stream length each of the values represented. That is, of the total area, what portion of it “represents” spawning or rearing habitat? The text makes frequent references to this table in support of “distribution” of a given species within a river.
 - Table 3.24-2 suggests that habitat of a given quantity (square miles) for a particular fish species is present but does not provide a spatial relationship or scale to suggest distribution of the habitat or the fish within a given stream. Distribution is relative to scale and needs to be better quantified by watershed, stream, reach, etc. For example, Pink Salmon are widely distributed in Alaska, but they do not occur within every river or waterbody that supports Pacific Salmon. Similarly, a tributary river may be 75 miles in length yet has only 5 miles of suitable spawning or rearing habitat.
 - Table 3.24-2 does not have spatial relational information. It lists only a total number of miles of a given habitat type by fish species, by sub-basin.
 - Figure 3.24-3 only reports Reach A-E and does not indicate habitat use type (spawning or rearing). Figure 3.24-3 is titled “*Fish Distribution and Relative Abundance.*” Please double-check figure and table numbers in the text to the corresponding figure and table number for consistency of use and meaning.
 - Figure 3.24-5 “*Transportation and Natural Gas Pipeline Corridors*” does not define the analyses area of impacts from road and pipeline construction and operations. No defined area or boundary is outlined in the referenced figure.
 - “*Chum spawning habitat is limited to the lower 20 miles of the river, downstream of the seasonally dry channel (Table 3.24-2).*” There is no spatial reference within the table to indicate if these miles occur within the upper, middle, or lower river segments. Without citations to lend support to ground verified occurrences of spawning, this assertion is misleading.
 - Table 3.24-3 titled “*Estimated Mileage of Habitat for Pacific Salmon and Rainbow Trout within Streams Crossed by the Transportation and Natural Gas Pipeline Corridor*” does not include any information on Rainbow Trout. Please include Rainbow Trout information or remove the species from the title.
 - Figure 3.24-3 “*South Fork Koktuli Fish Distribution and Relative Abundance*” does not show stream crossings for the South Access Road, as referenced in the text on Page 3.24-13 under South Access Road. Similarly, the South Access Road as referenced in the text does not appear labeled as such within Figure 3.24-5 “*Transportation Corridor Fish Stream Crossings.*”
 - As referenced within the text, there are no unique streams identified within Table 3.24-3.
 - Table 3.24-5 as referenced on Page 3.24-14 does not provide stream miles for life stage of fish species found within the North Fork Koktuli as stated in the text.
- There are insufficient literature citations to support assertions made within Chapter 3.24 Fish Values. For example, Page 3.24-5 Paragraph 4, Lines 6-8 states, “*The low-gradient*

and gravel-dominated substrate of the mainstem South Fork Koktuli below the mine site provides spawning and rearing habitat for resident and anadromous salmonids.” What literature or study supports this claim?

- In-text citations are not consistent with citations within the works cited list. As examples:
 - In text citation, R2 et al. (2011) does not appear in the works cited list. However, R2 et al. 2011a and R2 et al. 2011b may be found.
 - The full citation for NMFS (1977), as first appears in Section 3.24 on Page 3.24-13, does not appear in the provided works cited list.
 - ADFG 2018. Chinook Salmon Research Initiative citation within the works cited list contains a link to a webpage that is only a summary of the project and not specific findings to support the assertion within the text.
 - ADFG 2018i does not appear in the Works Cited list; however, ADFG 2018h and ADFG 2018j are present.
 - SEBD (2018) does not appear within the works cited list.
- There does not appear to be a discussion of geospatial scale most relevant to fish populations. The USACE does indicate within this latest draft the proportion of the affected watershed(s) (e.g., the South Fork Koktuli River) as related to the total watershed area that contributes to Bristol Bay. However, there is no discussion of this in either Affected Environment or Environmental Consequences. Please see Service comment submitted by letter dated July 13, 2018: *“Include discussion and later analyses of identified resources at scales relevant to fish populations, impacted sub-watersheds (i.e., North Fork Koktuli, South Fork Koktuli, and Upper Talarik Creek) and within the context of the entire Bristol Bay watershed.”*
- Sections within the Affected Environment chapter remain missing, which makes it difficult review to review the Environmental Consequences. For example, fish distribution data is pending review of 2018 field data, and will be included in the DEIS.
- Much of the chapter uses old data and sampling analyses. Environmental Baseline Data (2008) used for analysis at the Mine Site and the North Fork Koktuli River is outdated. Given a changing climate and warming temperatures occurring at higher latitudes, organism response appears to be causing some flowers to bloom earlier than usual and seems to be altering some wildlife migration and hibernation patterns. Changes in fish distribution may also occur as individuals and populations seek out thermal conditions most suitable for completion of their life stages. Understanding how fish species are responding to these changes is critical for analyses of effects to populations occurring in the affected project area. Examples include:
 - Periphyton samples collection occurred in 2005 and 2007, more than 10 years ago. Current information is needed for further evaluation.
 - Beach seining results were published in 2005; these results are more than 13 years old.

- We recommend more clearly defining how available habitat is quantified for fish. The DEIS refers to miles of spawning or rearing habitat; however it is unclear how habitat miles were determined or calculated. Text frequently refers to the Anadromous Waters Catalog (AWC) in reference to available habitat; however, using miles of habitat reported in the AWC as a metric of total suitable habitat will likely result in inaccurate estimates of available habitat for critical stages of salmon life history. The AWC calculates miles of habitat by identifying the upper most point within a stream segment based on the extent of fish surveys or known anadromous fish use in a particular waterbody, rather than the actual limit of anadromous fish occurrence or habitat use. The resultant “miles of habitat” is not reflective of the extent of suitable spawning or rearing habitat that exists throughout the waterbody below the uppermost point documented in the AWC. Discrete habitat units used by fish for completion of their life history are typically distributed in a fragmented and patchy manner within a river system. Furthermore, reporting “Stream miles” is an inadequate measure to quantify fish habitat in a biological meaningful manner. We recommend that fish habitat be quantified as a measure of area (e.g., meters square, square miles). For an example elsewhere in Alaska, the 17-mile stretch of the Kenai River between Kenai Lake and Skilak Lake has more substrate area, and thus more available spawning and rearing habitat, than the lowest 17 miles of Eagle River. To accurately assess the habitat available in the project area and then assess the potential impacts of the project, the analyses should be based on a more robust unit of measure of habitat than simply miles of river.

- We request adding a discussion of baseline surface flow pathways. Please provide citations for the hydrographic components when referencing specific data in the context of temperature and water chemistry effects. Water quality parameters discussed would be easier to understand within table format in addition to where it is written within the text.

- Chapter sections are missing, precluding our ability to evaluate all of the information. Examples include:
 - Page 3.24-22 and Page 3.24-28: Kokhanok East Ferry Terminal
 - Page 3.24-30 Transportation Corridor and Natural Gas Pipeline Corridor
 - Page 3.24-36 Table 3.24-8 Fish Stream Summary Table

- The DEIS should include a discussion on the physical properties of Iliamna Lake, including vertical profile analysis of temperature and dissolved oxygen by season, and lake turnover rates (timeline) and stratification. These are important factors affecting diel vertical migrations by juvenile salmonids (e.g., Sockeye Salmon) rearing in Iliamna Lake.

- The DEIS should include a table that summarizes information for all anadromous streams crossed or affected by the proposed action for each alternative. The current format does not allow review of at-a-glance information. Rather, the reader must skip through to various sections and subsections of the chapter to gather this information.

- The DEIS should describe how fish values (e.g., spawning, rearing) are assigned to a proposed stream crossing. Many figures indicate fish information comes from the AWC, but it is unclear how fish values are assigned at a particular proposed road crossing. Please provide clarification.
- The DEIS should describe how the USACE has addressed the following comments, submitted in our letter dated July 13, 2018:
 - *“Include a separate discussion of baseline functions and values of wetlands that may be impacted by the project. For example, quantified baseline wetland habitat functions and values relevant to fish habitat (e.g., rearing, overwintering, refugia) should be presented to streamline future analysis of losses from project impacts.”*
 - *“Include a discussion of water quality (including temperature and chemistry) that can be analyzed with respect to mine discharge receiving waters. Include a discussion of watershed hydrography, including the seasonal hydrograph, for later use to determine potential project impacts to water quantity and availability for fishery resources. Include a discussion of surface flow pathways.”*
 - Please analyze *“relative contributions of marine-derived nutrient input and transport from anadromous fish carcasses brought into the freshwater environment from the marine environment; this should include timing, extent, distribution, delivery, and location.”*

Chapter 4.24: Environmental Consequences

- Within the document, stream miles are reported as “spawning” or “rearing” values based on the AWC observations of spawning or rearing fish. These stream miles are then designated as “number of miles” of spawning or rearing habitat. However, using a single linear value (i.e., stream miles) does not take into account the relative value or importance of unique areas of the affected streams that support spawning or rearing. Spawning or rearing activities may be limited to portions of a stream and typically do not occur throughout the stream’s longitudinal distance. It is well documented that fish will occupy and use areas of a stream disproportionately for rearing and spawning (Tilman 1982; Frissell et al. 1986; Dunning et al. 1992; Foley 2018). A more useful metric of spawning or rearing habitat is a unit of measure associated with area (e.g., average stream reach width x length of stream reach), and not a linear distance (see previous comment on this subject). It is worth discussing this point within the context of describing habitat types. We recommend quantifying using a measure of area, not simplifying as “stream miles”.
- The DEIS should include a discussion on the productivity of Tributary 1.19 contributing to aquatic and terrestrial invertebrate food inputs to fishes downstream. Aquatic and terrestrial food inputs to the system should be discussed within this chapter in terms of the annual food resource budget available to fish. Fish presence and density may be directly related to food sources within a stream network, and a discussion of

environmental consequences is not complete without a discussion of annual food inputs within a system and the affected area.

- The document includes use of vague language (e.g., [Best Management Practices] BMPs *may* be considered...) when discussing BMPs in the context of describing “temporary” or “minimal” effects. Including a discussion on BMPs or including a complete list of BMPs which may be considered is necessary to allow for an assessment of potential environmental consequences.
- Greater detail is needed to quantify the effects of displacement of fish captured out of the mine site and into relocation areas. Resident non-anadromous species displaced from the project area will have an effect upon fish resources in locations up- and downstream of the release site, where they may displace (through competition or predation) anadromous fish.
- Tracking between Chapter 3.24 and 4.24 is difficult due to inconsistencies with headings of major and minor chapter section and sub-sections. We suggest revising chapter formatting to ensure sections in each chapter (Chapter 3, Affected Environment and Chapter 4, Environmental Consequences) match. For example, 4.24.2.3 Streamflow is difficult to follow because of organizational structure.
- When applicable, please include references to other chapters as needed. For example, within Chapter 4.24.2.2 Fish Displacement, Injury, and Mortality, the Transportation Corridor section discusses bridges and culverts, but does not refer to the loss of habitat due to potential sedimentation associated with these activities, as discussed in Chapter 4.24.6 Cumulative Effects. Reference to the impacts of sedimentation in this section would help alleviate reader confusion. See earlier comment on difficulty following chapter sections and subsections. As an example, reference the Surface and Groundwater section within the Mine Site subsection of 4.24.2.3 Stream Flow.
- The document contains vague or undefined language, and does not always quantify impacts resulting from the action within the Environmental Consequences chapter. For example, Page 4.24-3 Ferry Terminal/Iliamna Lake Pipeline does not quantify the area of substrate, or types of “impacts” that may be permanently or temporarily caused by horizontal directional drilling. However, the document does detail specific impacts as part of Fish Displacement, Injury, and Mortality that may occur as part of the Amakdedori Port, Page 4-24-6. Impacts are often described as both short- and long-term, without a clear definition of the temporal scales associated with short- and long-term. Examples include:
 - Consequences are not adequately quantified, and vague language descriptors are used to characterize conditions (e.g., Page 4.24-7 Paragraph 4, sentence 1 “in general, a larger percentage...”).
 - Quantify the area that is decreased in the downstream direction (as in spawning habitat decreased because of decreased flows). As written it is vague and lacking the necessary detail, for example: “*The percentage reductions in habitat would*

generally decrease in a downstream direction until reaching the confluence of the NFK and SFK (with a few exceptions)."

- Specify the directionality of change, e.g., from Page 4.24-9 Paragraph 2 Sentence 4 "*Habitat changes are less than 1%...*" It is unclear if this change is an increase or decrease of habitat.
- The source of the increase in habitat identified within Table 4.24-3, "*Average precipitation year, spawning habitat for all streams and species in the mine site area pre-mine, during operations, and post closure,*" is unclear. This information is not included in the discussion, and is important information for understanding the full scope of Environmental Consequences. Please provide discussion on the additional available habitat post closure.
- The DEIS should provide an analysis of how flow is expected to change with future climate change projections for wet and dry rainfall years. There is currently no discussion of the future impacts of the project under different environmental adaption scenarios, and future climate conditions are not discussed within subsection 4.24.2.7 Water Temperature.
- Juvenile habitat subsection within Section 4.24.2.3 Stream Flow indicates, "*Sockeye juvenile habitat increases would generally be associated with the SFK-C reach, where habitat would be increased by 0.76 acres (44 percent) during mining operations...*" Please provide citations for these data or further clarification in the text. An increase of 0.76 acre resulting in a 44 percent increase in Sockeye Salmon juvenile habitat suggests 1.73 acres of juvenile habitat within the South Fork Kaktuli-C reach. The table presented (Table 4.24-4) in the text does not include the quantity of juvenile habitat per stream, but rather presents data in aggregate for all streams. As such, the table indicates a value of 41.85 acres of available habitat for juvenile Sockeye Salmon during operations. Please assign units of measure associated with the values in Table 4.24-4 (and others).
- The DEIS should discuss and specify the types and magnitude of impacts to fishery resources from increased sediment input from the mine site (and its associated facilities). The consequences of increased sediment loads and inputs are well documented in the literature. Please discuss the potential impacts in the context of all species and life stages occurring in the project area. There is discussion on specific impacts within the Transportation Corridor subsection that could be expanded to include all subsections within Section 4.24.2.5 Stream Sedimentation and Turbidity.
- The DEIS should analyze and discuss the effects of increased water temperatures on growth and development of juvenile salmon eggs. Increased water temperatures correlates with an increase of development rates and earlier emergence (degree days) of juveniles. There is no discussion on the effects of early emergence and population level effects.

- Please identify how the USACE has addressed the following comments, submitted in our letter dated August 31, 2018:
 - *“Please present environmental consequences to individual fish species. For example, the Bristol Bay region provides 51 percent of the commercial catch of the world’s Sockeye Salmon. We recommend a detailed analysis of the potential short- and long-term environmental consequences of the project to this internationally important resource. The chapter should analyze the potential for environmental consequences to destabilize the existing Bristol Bay salmon portfolio represented by numerous individual stocks. It should identify the potential for additional fishing closures due to losses to fisheries and fish habitat. Different species are targeted in commercial, sport, and subsistence fisheries supported by the region. We recommend analyzing the impacts to individual species, distribution, abundance, and availability to the different fishery user groups that rely on these resources.”*
 - *“The geographic scope of the analyses for project impacts to fishery and fish habitat resources should include the immediate project-site (i.e., north and south fork Koktuli River and upper Talarik Creek), local watersheds (i.e., Newhalen River, Gibraltar Lake, Lake Iliamna), and regional scale (i.e., Bristol Bay, Cook Inlet), and should include analysis related to the global importance of the Bristol Bay fishery.”*
 - *“Certain metals that are essential to fish health at low concentrations may become toxic with relatively small increases in concentration; such metals include copper (Cu), zinc (Zn), selenium (Se), and molybdenum (Mo). Copper is specifically toxic to anadromous salmon. These same metals have a narrow window of non-toxicity before becoming toxic. Non-essential metals are more likely to be toxic even at low concentrations (e.g., gold (Au), lead (Pb), arsenic (As) and mercury (Hg)). Please analyze the environmental consequences from point and non-point process discharges, for different species and at different scales.”*

Threatened and Endangered Species

Chapter 3.25: Affected Environment

Thank you for incorporating most of the Service recommendations for pre-draft Chapter 3.25 Threatened and Endangered Species, provided by letter dated July 13, 2018, into the DEIS. The Service offers the following additional recommendations for this chapter:

- Currently, this chapter uses a mixture of Federal Register notices (i.e., humpback whale, fin whale), and Service and NMFS documents cited as “USFWS (Year)” or “NMFS (Year)” (i.e., Cook Inlet beluga, Steller sea lion, Northern sea otter, Steller’s eider) to discuss listing of species under the Endangered Species Act. Some of the references seem incongruous. For example, discussion of the Northern sea otter uses a NMFS reference (NMFS 2005) for a Service managed species, and discussion of the Steller’s eider uses a 2011 document (USFWS 2011) to reference a species listed by the Service in

1997. Please review the literature cited in this chapter to ensure reference of original source material whenever possible rather than secondary references, such as reports or biological opinions.

- We recommend citing the Service or the NMFS listing of species and critical habitat using the associated Federal Register notice published in support of listing. As an example of citing the Federal Register notice to discuss listed species, “The Service listed the Southwest Alaska Distinct Population Segment of the Northern sea otter as threatened under the Endangered Species Act on August 9, 2005 (70 FR 46366), with critical habitat designated on October 8, 2009 (74 FR 51988).”

Chapter 4.25: Environmental Consequences

Thank you for incorporating into the DEIS most of the Service recommendations for pre-draft Chapter 4.25 Threatened and Endangered Species, provided by letter dated August 31, 2018. The Service offers the following additional recommendations for this chapter:

- Rework and expand the action area, as described in the second paragraph, fourth and fifth sentences, to include discussion of the entire project. As currently written, these sentences state: *“The action area encompasses all marine components (all proposed port locations, lightering locations, and natural gas pipeline routes), plus a surrounding 5-mile buffer in the marine environment. No terrestrial components of the project (e.g., the mine site, ferry terminals, terrestrial portion of the transportation and natural gas pipeline corridors, and compressor station on the Kenai Peninsula) are included in the action area, because TES do not occur in the area; only marine components of the project are included in the action area.”* We recommend the action area in each of the sections of Chapter 4 be described the same way, and include the four main project components, as described in Chapter 2, Alternatives: the Mine Site, the Transportation Corridor, the Amakdedori Port and Lightering Locations, and the Natural Gas Pipeline. Standardizing the action area, and evaluating each of the four main project components for potential impacts to resources of concern, would ensure impacts of the proposed project are fully analyzed and disclosed in the final Environmental Impact Statement (EIS) and documented in the record of decision.
- Include analysis of potential water quality impacts at the mine site, along the transportation corridor, and at the Amakdedori Port for discussion in this section, with a focus on impacts to listed species and protected marine mammals. This should include the potential for water quality alteration or degradation to originate at the mine site, then move downstream to Lake Iliamna and Cook Inlet, and impact or affect listed species and protected marine mammals. Please note this recommended water quality analysis differs from analysis referenced in Chapter 4.27 Spill Risk.
- Some of the language in this section appears to minimize the environmental consequences the project may have on listed species. Chapter 3.25 Threatened and Endangered Species notes that 2018 environmental field survey results will be incorporated into the DEIS, when available. Until a full analysis of the project’s impacts

and effects on listed species is complete and included in the environmental consequences chapter, reference to effects as minimal, localized, limited, negligible, etc. are premature. The Service recommends review of the entire section, and removal of minimizing language.

- Include a rigorous analysis of the impacts and effects of the proposed port facility, the proposed pipeline, the proposed lightering of concentrate using barges to transport concentrate to bulk carriers moored in deeper water, including the risks of fuel and hazardous materials spills, on sea otters and sea otter critical habitat through all phases of the project. For example, currently no analysis of fuel or hazardous materials spills is included in this section. In addition, there is no meaningful analysis or quantification of anticipated impacts to sea otters or sea otter critical habitat for the construction and operation of the two port facilities under consideration. Additional details on the anticipated impacts of each alternative during construction and operation of the proposed port facility, the proposed pipeline, the proposed lightering of concentrate using barges to transport concentrate to bulk carriers moored in deeper water, is essential to compare the effects and impacts of each alternative. Simply saying, “*All impacts are anticipated to be the same for the two alternatives...*” is not sufficient.
- Discussion of the environmental consequences on Northern sea otter critical habitat, as found in Section 4.25.2.5 Northern Sea Otter, Critical Habitat, is lacking specificity. This section states, “*all sea otter critical habitat primary constituent elements...would be directly affected,*” but does not detail how. This section does not fully analyze the proposed project’s impacts and effects on each primary constituent element, and does not analyze the impacts and effects of fuel or hazardous materials spills on sea otter critical habitat.
- The Steller’s eider section is a good example of analyzing and disclosing potential environmental consequences of the project on listed species. The information and discussion in this section is thorough, based upon the biology of the species, and does not use minimizing or qualifying language. Similar rigorous analysis and discussion should be conducted for all listed species in this chapter.
- The Service recommends the following sentence in Section 4.25.4.1 Summary of Key Impacts be removed or rephrased: “*For all TES, it is not possible to quantify the exact number of individuals that may be impacted by vessel collisions or strikes; therefore, the number is considered less than significant.*” Please note being unable to quantify an impact in terms of numbers of individuals is not the same as the impact being “*less than significant*”. It would be more correct to state the impact of vessel collisions or strikes is “unquantifiable” or “unknown.”
- The Service has no comment at this time on Figure 4.25-1: Federally Listed Marine Mammal Critical Habitat and Location within the Action Area, or Figure 4.25-2: Steller’s Eider Molting and Wintering Locations within the Action Area.

Appendix K 3.25: Threatened and Endangered Species

The Service has no comment at this time on Appendix K 3.25 Threatened and Endangered Species. Please continue to coordinate any required Marine Mammal Protection Act Incidental Harassment Authorization or Incidental Take Regulations with the Service's Marine Mammals Management program.

Chapter 5.0 Mitigation

The Service provides the following specific recommendations for Chapter 5.0 Mitigation:

Chapter 5.1 Introduction

- The Service recommends this section incorporate information found in Section 5.1.3. Because this Federal document analyzes the environmental impacts of a Federal action, it is important to lay the foundation of how the NEPA and its guiding regulations drive the analysis of mitigation as well as environmental impacts.
- The Service recommends adding the following text to the introduction section: *“The primary purpose of an environmental impact statement is to insure the goals defined in the National Environmental Policy Act are incorporated in the actions of the federal government, to provide full and fair discussion of significant environmental impacts, and to inform decision makers and the public of the reasonable alternatives, which would avoid or minimize adverse impacts and enhance the quality of the human environment (40 CFR 1502.01).”*

Chapter 5.1.2 Definitions and Processes

- The Service recommends the definition of the term “mitigation” be moved from Section 5.1.3 to this section on definitions. This would help clarify that this DEIS will be using the terms and processes defined in the NEPA Regulations (40 CFR 1508.20). “Mitigation” includes the following:
 - Avoiding the impact altogether by not taking a certain action or parts of an action;
 - Minimizing impacts by limiting the degree or magnitude of the action and its implementation;
 - Rectifying the impact by repairing, rehabilitating, or restoring the affected environment;
 - Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action; and
 - Compensating for the impact by replacing or providing substitute resources or environments.

Table 5-1. Common Mitigation Terms

- The Service recommends Table 5.1 either describe the common mitigation terms as listed above and in 40 CFR 1508.20, or the title of the Table should be changed to “Terms Used in the EIS” as is currently labeled in the first column.
- The Service recommends revising the language used to describe Agency Considered Mitigation. Currently the focus of the definition is related to permit conditions. Since this is an environmental impact analysis required under the NEPA, and not a permitting document, we recommend that the text disclose the responsibility of Federal agencies to consider and include appropriate mitigation measures not already included in the proposed action or alternatives to prevent or eliminate damage to the “human environment” (defined below; 40 CFR 1508.20, 40 CFR 1502.14, and CEQ 2011).
- The Service recommends using the NEPA Regulations (40 CFR 1508.14) to define “human environment,” which comprehensively includes, “*the natural and physical environment and the relationship of people with that environment.*” It is particularly important to define “human environment” for this project due the relationship of Native Alaskans with subsistence, cultural, and socio-economic resources in this area.

Chapter 5.2.1 Avoidance and Minimization Measures under the NEPA

- The Service suggests moving the discussion about the Department of Natural Resources’ Permitting for Large Mine Projects in Alaska from under the NEPA title. Although the information presented is good, it describes a State process, not one required by the NEPA. Another solution would be to remove the term “NEPA” from the heading of Section 5.2.1.

Table 5-2. Applicant’s Proposed Mitigation

- The Service recommends relocating and providing a reference to the information in Table 5-2. Given that all of the actions listed in Table 5-2 are design features of the proposed action, and many are standard operating procedures that will be analyzed under the proposed alternative, this could be moved with just a reference to where it can be found, to reduce redundancy. Mitigation actions listed in Table 5.2 that are beyond those required by law could be added to the additional analysis of mitigation measures that were not included in the proposed action (as suggested below in our comments on Chapter 5.2.3 Additional Mitigation). Footnotes could be used to indicate it is mitigation included in the proposed action.

Chapter 5.2.3 Additional Mitigation

- The Service recommends the USACE collaborate with the cooperating agencies to develop appropriate mitigation measures to avoid and minimize impacts to the human environment. The Service is available to provide this technical assistance.
- We recommend this section include all reasonable mitigation measures. According to the Council for Environmental Quality (CEQ), *“All relevant, reasonable mitigation measures that could improve the project are to be identified, even if they are outside the jurisdiction of the lead agency or the cooperating agencies, and thus would not be committed as part of the RODs of these agencies (1981).”* The CEQ (1981) further explains, *“This will serve to alert agencies or officials who can implement these extra measures, and will encourage them to do so...”* In conclusion, the CEQ (1981) points out, this is *“because the EIS is the most comprehensive environmental document, it is an ideal vehicle in which to lay out not only the full range of environmental impacts but also the full spectrum of appropriate mitigation.”*

Table 5-3. Mitigation and Monitoring Assessed as Likely to be Implemented

- The Service recommends replacing Table 5-3 with additional mitigation measures that have not already been included in the proposed action or alternatives. This will allow the environmental impacts of the proposed action and the alternatives to be analyzed in comparative form, to more sharply define the issues and provide a clear basis for choice among options by the decision maker and the public (40 CFR 1502.14).
- We recommend removal of the term *“Likely to be Implemented”* from the Table 5-3 title and making the likelihood that mitigation and monitoring will be implemented a column instead, so the full spectrum of appropriate mitigation may be considered in the EIS (CEQ 1981).

Appendix E – Laws, Permits, Approvals, and Consultations Required

The Service recommends this appendix address laws and regulations related to the control and spread of noxious weeds, including the following:

- Executive Order 11987 (1977): Requires Federal agencies, to the extent permitted by law, to:
 - Restrict the introduction of exotic species into the natural ecosystems on lands and waters owned or leased by the U.S.;
 - Encourage States, local governments, and private citizens to prevent the introduction of exotic species into natural ecosystems of the U.S.; and
 - Restrict the importation and introduction of exotic species into any natural U.S. ecosystems as a result of activities they undertake, fund, or authorize; and restrict the use of Federal funds, programs, or authorities to export native species for introduction into ecosystems outside the U.S., where they do not occur naturally.

- Executive Order 13112 (1999): Intended to prevent the introduction of invasive species and provide for their control and to minimize the economic, ecological, and human health impacts that invasive species cause.
- National Invasive Species Act (NISA): Intended to prevent invasive species from entering waters of the U.S. (marine and freshwater) through ballast water carried by ships. The NISA reauthorized and amended a previous measure, the Non-indigenous Aquatic Nuisance Prevention and Control Act of 1990.

We recommend adding clarification on the depth of the Service involvement under the Clean Water Act. Also, consider adding a summary of this information in Table E-1 as provided below:

- Clean Water Act (CWA, 33 U.S.C 1344): Section 1344(m) authorizes fish and wildlife comments from the Department of Interior to be made through the U.S. Fish and Wildlife Service. The U.S. Fish and Wildlife Service has extensive involvement with the Environmental Protection Agency under provisions of the CWA, section 404, which deals with discharge of dredge and fill. Section 404 of the CWA requires a permit to be obtained before dredged or fill material may be discharged into waters of the U.S. The basic premise is the U.S. Fish and Wildlife Service will provide recommendations on potential methods to avoid and minimize impacts to fish and wildlife, as well as provide recommendations for compensation that will be necessary for any remaining unavoidable impacts.

We recommend reflecting the dual involvement of both the Service and the NMFS under the Fish and Wildlife Coordination Act (FWCA). The FWCA requires consultation with the Service, the State wildlife resources agency, and, if applicable, the NMFS. State involvement may result in a separate report.

The Service recommends clarifying the summary statement in Table E-1, Bald and Golden Eagle Protection Act. The Service works with permitting agencies and project proponents to develop mitigation measures to avoid and reduce impacts to eagles, and assists in developing methods for compensatory mitigation for impacts that are unavoidable. The Service may provide limited take permits of eagles or nests where avoidance and minimization measures have been incorporated into project design.

Literature Cited

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United States Department of the Interior



U.S. FISH AND WILDLIFE SERVICE
1011 East Tudor Road
Anchorage, Alaska 99503-6199

IN REPLY REFER TO:

FWS/AFES/AFWCO

JUL 0 1 2019

Colonel Phillip Borders
U.S. Army Corps of Engineers, Alaska District
Attention: Regulatory Branch, Mr. Shane McCoy
Post Office Box 22270
Juneau, Alaska 99802-2270

Subject: POA-2017-271, Pebble Mine Project, U.S. Fish and Wildlife Service Comments
Pursuant to the 404(q) Memorandum of Agreement

Dear Colonel Borders:

We have reviewed the Public Notice for Department of the Army Permit POA-2017-271, dated March 1, 2019. The U.S. Army Corps of Engineers (USACE) received a Department of the Army permit application pursuant to the provisions of Section 404 of the Clean Water Act (33 U.S.C 1344 et seq.) from the Pebble Limited Partnership (PLP). **We believe the project as proposed may have significant adverse impacts on important fish, wildlife, and aquatic habitats.** We are advising the U.S. Army Corps of Engineers in accordance with the procedural requirements of the 1992 404(q) Memorandum of Agreement (MOA), Part IV.3(a), that **the proposed work may result in substantial and unacceptable impacts to aquatic resources of national importance.**

The PLP is proposing to develop an open-pit surface mine, along with associated infrastructure, at the Pebble copper-gold-molybdenum porphyry deposit (Pebble Deposit), located in the Iliamna region of southwest Alaska and within the Bristol Bay watershed, approximately 200 miles southwest of Anchorage and 60 miles west of Cook Inlet. The Pebble Deposit is located at the headwaters of the South Fork Koktuli River, the North Fork Koktuli River, and Upper Talarik Creek, tributaries to the Nushagak and Kvichak Rivers which flow into the Bristol Bay. The closest communities are the villages of Iliamna, Newhalen, and Nondalton, each approximately 17 miles from the Pebble Deposit.

Our comments are submitted in accordance with provisions of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended: 16 U.S.C. 661 et seq.) and constitute the report of the Department of the Interior. Species potentially affected by the proposed project, for which the U.S. Fish and Wildlife Service (Service) has trust responsibility, include anadromous fish (Anadromous Fish Conservation Act; 16 U.S.C. 757a-757g), endangered species (Endangered Species Act; 16 U.S.C. 1531-1544), migratory birds (Migratory Bird Treaty Act; 16 U.S.C. 703-

712), bald and golden eagles (Bald and Golden Eagle Protection Act; 16 U.S.C. 668-668c), and resources related to subsistence needs (Alaska National Interest Lands Conservation Act; 16 USC 410hh-3233, 43 USC 1602-1784). These comments are also for your use in determination of the Clean Water Act Section 404(b)(1) guidelines compliance (40 CFR 230), and in the public interest review (33 CFR 320.4) relating to the protection of fish and wildlife resources.

The applicant is proposing to develop an open-pit mine with a conventional drill, blast, truck, and shovel operation. The total size of the proposed mine area would be 8 miles long by 4.8 miles wide, covering an area of 8,086 acres. The mine site is located in the headwaters of the greater Bristol Bay watershed, with drainage into the Nushagak and Kvichak River systems and Lake Iliamna. A transportation corridor would be constructed from the mine site to Amakdedori Port in Kamishak Bay. A private road would run from the mine site approximately 30 miles south to the north shore of Lake Iliamna. Ferry terminals and a daily ferry crossing are proposed on the lake. Between the south ferry terminal on Lake Iliamna and Amakdedori Port the proposed transportation corridor would be approximately 40 miles long. The road corridor is expected to be up to 300 feet wide. Amakdedori Port and ancillary facilities would be up to 40 acres in size.

Service trust resources are natural resources we have been entrusted to protect for the benefit of the American people, and include Federally-listed threatened and endangered species and their designated critical habitats, migratory birds, bald and golden eagles, certain marine mammals, interjurisdictional fish, and the habitats upon which they depend. The Bristol Bay watershed, including the Nushagak and Kvichak Rivers, supports all five species of Pacific salmon (King, Sockeye, Coho, Pink, and Chum), and several other commercially, recreationally, and ecologically important fish species. The Bristol Bay watershed is also home to brown bear, black bear, moose, caribou, wolves, waterfowl, and many other species of mammals and birds (Brna and Verbrugge 2013). Federally-threatened northern sea otters and Steller's eiders occur in the waters of the Cook Inlet, including Kamishak Bay (where they occur in relatively high abundance). Bald eagles nest and feed along the coast and along all of the major salmon spawning rivers in the Bristol Bay and Cook Inlet regions, and a relatively high number of golden eagles are also found in the proposed project area. Migratory birds, including waterfowl, shorebirds, and landbirds, are abundant throughout the proposed project area.

We are concerned about the potential impacts of the proposed mine on the Bristol Bay watershed, including the Nushagak and Kvichak River systems and Lake Iliamna. The Bristol Bay watershed "supports the largest sockeye salmon fishery in the world, is home to 25 Federally recognized Tribal governments, and contains significant mineral resources. The potential for large-scale mining activities in the watershed has raised concerns about the impact of mining on the sustainability of the Bristol Bay's world-class commercial, recreational, and subsistence fisheries and the future of Alaska Native tribes in the watershed, who have maintained a salmon-based culture and subsistence-based way of life for at least 4,000 years (USEPA 2014)." Responding to local concerns, the U.S. Environmental Protection Agency Published the Bristol Bay Watershed Assessment (USEPA 2014), a rigorous, peer-reviewed, and scientific document designed to better understand the Bristol Bay's resources, and evaluate the

impacts developing a large-scale mine would have on the fisheries in the area. The watershed assessment concluded that the destruction of streams and wetlands, along with water withdrawals from a hypothetical mine, would result in the decline of local populations of salmonids (USEPA 2014). The Service is concerned that developing an open pit mine and associated infrastructure at the headwaters of critical salmon habitat could cause permanent adverse impacts to the ecologically important Bristol Bay watershed and its world-class fisheries, and the commercial, recreational, and subsistence users that depend on them.

The Kamishak Bay provides important foraging and sheltering habitat for northern sea otters. Approximately 20 percent of the southwest stock use the bay. The shoals located in the southern portion of Kamishak Bay provide important wintering habitat for the Alaska-breeding population of Steller's eiders. Spills in Kamishak Bay may affect these otters and eiders, both of which are listed as threatened under the authority of the Endangered Species Act. A significant spill would also likely impact many other species of migratory birds, and their habitat in Kamishak Bay, including lands managed by the Alaska Maritime National Wildlife Refuge. Because of these ecological and economic values, both the Bristol Bay watershed and Kamishak Bay are aquatic resources of national importance.

We believe the project as proposed may have significant adverse impacts on important fish, wildlife, and aquatic habitats. We are advising the U.S. Army Corps of Engineers in accordance with the procedural requirements of the 1992 404(q) Memorandum of Agreement (MOA), Part IV.3(a), that the proposed work may result in substantial and unacceptable impacts to aquatic resources of national importance. Consequently, we recommend that a permit not be issued for the project as currently proposed. We recommend more robust analysis be conducted to thoroughly identify, analyze, and reduce risks to these resources. If you intend not to accept this recommendation, please advise us before permit issuance in accordance with the MOA between our Departments.

Thank you for the opportunity to review and provide comments on the permit notice. If you have any questions or need additional information, please contact Ecological Services Branch Chief, Mr. Douglass Cooper, 907-271-1467 or via email douglass_cooper@fws.gov) or Senior Fish and Wildlife Biologist, Ms. Catherine Yeargan 907-271-2066 or via email catherine_yeargan@fws.gov.

Sincerely,



Regional Director

Enclosure 2. Department of the Interior comments on the U.S. Army Corps of Engineers Draft Environmental Impact Statement for the Pebble Mine Project, POA-2017-271



United States Department of the Interior



U.S. FISH AND WILDLIFE SERVICE
1011 East Tudor Road
Anchorage, Alaska 99503-6199

IN REPLY REFER TO:

FWS/AFES/AFWCO

JUL 25 2019

Colonel Phillip Borders
U.S. Army Corps of Engineers, Alaska District
Attention: Regulatory Branch, Mr. Shane McCoy
645 G Street, Suite 100-921
Anchorage, Alaska 99501

Dear Colonel Borders:

The U.S. Army Corps of Engineers (USACE) issued a Public Notice (POA-2017-271, dated March 1, 2019) requesting comments on the Pebble Limited Partnership's Department of the Army permit application, pursuant to Section 404 of the Clean Water Act (33 U.S.C 1344 et seq.). The Pebble Limited Partnership is proposing to develop an open-pit surface mine, along with associated infrastructure, at the Pebble copper-gold-molybdenum porphyry deposit (Pebble Deposit), located in the Iliamna region of southwest Alaska and within the Bristol Bay watershed, approximately 200 miles southwest of Anchorage and 60 miles west of Cook Inlet. The Pebble Deposit is located at the headwaters of the South Fork Koktuli River, the North Fork Koktuli River, and Upper Talarik Creek, tributaries to the Nushagak and Kvichak Rivers which flow into the Bristol Bay. The closest communities are the villages of Iliamna, Newhalen, and Nondalton, each approximately 17 miles from the Pebble Deposit.

The U.S. Fish and Wildlife Service (Service) advised the USACE in accordance with the procedural requirements of the 1992 404(q) Memorandum of Agreement (MOA), Part IV.3(a), by letter dated July 1, 2019 (Enclosure), that **the project as proposed may have significant adverse impacts on important fish, wildlife, and aquatic habitats, and may result in substantial and unacceptable impacts to aquatic resources of national importance.**

In accordance with the procedural requirements of the 1992 404(q) MOA, Part IV.3(b), the Service believes the proposed permanent placement of dredged or fill material into approximately 3,555 acres of waters of the U.S., including wetlands, and the temporary placement of dredged or fill material into 518.3 acres of waters of the U.S., including wetlands, for the purpose of developing a surface mine and associated infrastructure in the Bristol Bay watershed, **will have an unacceptable and substantial impact on aquatic resources of national importance.**

Our comments are submitted in accordance with provisions of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended: 16 U.S.C. 661 et seq.) and constitute the report of the Department of the Interior. Species potentially affected by the proposed project, for which

the Service has trust responsibility, include anadromous fish (Anadromous Fish Conservation Act; 16 U.S.C. 757a-757g), species listed under the Endangered Species Act and their designated critical habitat (Endangered Species Act; 16 U.S.C. 1531-1544), marine mammals (Marine Mammal Protection Act; 16 U.S.C. 31), migratory birds (Migratory Bird Treaty Act; 16 U.S.C. 703-712), bald and golden eagles (Bald and Golden Eagle Protection Act; 16 U.S.C. 668-668c), and resources related to subsistence needs (Alaska National Interest Lands Conservation Act; 16 USC 410hh-3233, 43 USC 1602-1784). These comments are also provided for your use in determination of the Clean Water Act Section 404(b)(1) guidelines compliance (40 CFR 230), and in the public interest review (33 CFR 320.4) relating to the protection of fish and wildlife resources.

The Bristol Bay watershed, including the Nushagak and Kvichak Rivers, supports all five species of Pacific salmon (Chinook, Sockeye, Coho, Pink, and Chum), and several other commercially, recreationally, and ecologically important fish species. The Bristol Bay watershed is also home to brown bear, black bear, moose, caribou, wolves, waterfowl, and many other species of mammals and birds (Brna and Verbrugge 2013). Federally-threatened northern sea otters and Steller's eiders occur in the waters of the Cook Inlet, including Kamishak Bay (where they occur in relatively high abundance). Bald eagles nest and feed along the coast and along all of the major salmon spawning rivers in the Bristol Bay and Cook Inlet regions, and a relatively high number of golden eagles are also found in the proposed project area. Migratory birds, including waterfowl, shorebirds, and landbirds, are abundant throughout the proposed project area.

We remain concerned about the potential impacts of the proposed mine on the Bristol Bay watershed, including the Nushagak and Kvichak River systems and Lake Iliamna. The Bristol Bay watershed "supports the largest sockeye salmon fishery in the world, is home to 25 federally recognized tribal governments, and contains significant mineral resources. The potential for large-scale mining activities in the watershed has raised concerns about the impact of mining on the sustainability of the Bristol Bay's world-class commercial, recreational, and subsistence fisheries and the future of Alaska Native tribes in the watershed, who have maintained a salmon-based culture and subsistence-based way of life for at least 4,000 years (USEPA 2014)."

Responding to local concerns, the U.S. Environmental Protection Agency published the Bristol Bay Watershed Assessment (USEPA 2014), a rigorous, peer-reviewed, scientific document designed to better understand the Bristol Bay's resources, and evaluate the impacts developing a large-scale mine would have on the fisheries in the area. The watershed assessment concluded that the destruction of streams and wetlands, along with water withdrawals from a hypothetical mine, would result in the decline of local populations of salmonids (USEPA 2014). The Service is concerned that developing an open pit mine and associated infrastructure at the headwaters of critical salmon habitat could cause permanent adverse impacts to the ecologically important Bristol Bay watershed and its world-class fisheries, and the commercial, recreational, and subsistence users that depend on them.

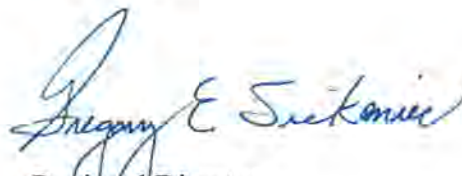
We have enclosed a copy of our comments submitted to the USACE on their Draft Environmental Impact Statement (DEIS) for Pebble Limited Partnership's proposed surface mine. Although these comments were developed pursuant to the National Environmental Policy

Act (42 U.S.C. 4321 et seq., with implementing regulations) to inform development of the USACE's DEIS, many of our specific concerns also apply to the Department of the Army's Section 404 permit. We recommend the USACE review these comments for applicability to the Department of the Army permit, and consider revisions to the proposed permit.

We believe the project as proposed will have significant adverse impacts on important fish, wildlife, and aquatic habitats. We are advising the USACE in accordance with the procedural requirements of the 1992 404(q) MOA, Part IV.3(b), that the proposed work will result in substantial and unacceptable impacts to aquatic resources of national importance. Consequently, we recommend that a permit not be issued for the project as currently proposed. We recommend more robust analysis be conducted to thoroughly identify, analyze, and reduce risks to these resources, and the USACE fully engage the resource agencies in mitigation and reclamation planning for the proposed mine. In addition, we recommend an adaptive management plan¹ be fully developed with stakeholder input to ensure monitoring, thresholds, and corrective measures adequately account for all project impacts, and any resulting adjustments in mitigation measures and reclamation plans are sufficient to offset anticipated project impacts. If you do not intend to accept these recommendations, please advise us before permit issuance in accordance with the MOA between our Departments.

Thank you for the opportunity to review and provide comments on the permit notice. If you have any questions or need additional information, please contact Ecological Services Branch Chief, Mr. Douglass Cooper (907-271-1467 or douglass_cooper@fws.gov) or Senior Fish and Wildlife Biologist, Ms. Catherine Yeargan (907-271-2066 or catherine_yeargan@fws.gov).

Sincerely,



Gregory E. Szeles
Regional Director

Enclosures

¹ Adaptive management is a defined process that identifies metrics that will be monitored, thresholds at which additional steps will be taken, and exactly what those additional steps will be. Recent court decisions have made clear that active adaptive management and scientific rigor are required when agencies make official decisions based upon adaptive management. Fischman and Ruhl (2015) found "three shortcomings in [adaptive management] implementation recur in judicial cases overturning agency decisions: (1) failure to establish objectives or failure to describe monitoring protocols for a plan or project; (2) failure to define decision thresholds in monitoring; and (3) failure to identify specific actions that will be triggered when thresholds are crossed."

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Enclosure 1. U.S. Fish and Wildlife Service comments on the Public Notice for Pebble Limited Partnership's application for a Department of the Army Permit, POA-2017-271

State of Alaska, Dept. of Fish & Game Correspondence with the US Army Corps of Engineers



State
of
Alaska

1. June 29, 2018 Letter from State of Alaska to Army Corps on NEPA scoping
2. Dec. 28, 2018 Email from ADF&G to Army Corps on preliminary Draft EIS
3. June 28, 2019 letter from State of Alaska to Army Corps on Draft EIS

Excerpts from Correspondence

Pebble poses significant risk to the Bristol Bay salmon fishery

the project has the potential to impact a biologically productive and sensitive part of Alaska . . . at pg. 4-4

See also, examples on pages 4-4

Significant deficiencies with the salmon impact analysis

only about half of the streams along the transportation corridor have been surveyed and the number of anadromous streams may increase when surveys are completed. at pg. 4-66

Limited baseline studies make the production potential in these streams uncertain and therefore the actual salmon populations in these streams may not be precise enough to determine if measurable impacts are occurring to the system. [...] More surveys would undoubtedly demonstrate even more variability. DEIS should acknowledge the uncertainty of salmon production from, and population of, these streams as they contribute to the overall aggregate production in the system. at pg. 4-65

See also, examples on pages 4-65

Remedies to bring the Corps' process back on track

further work is necessary to ensure potential effects to the human environment from each alternative are adequately evaluated and described in the FEIS. at pg. 4-60

Fish studies should be conducted to determine anadromous and resident fish presence or absence in all potentially affected streams, ponds, and connected wetlands. at pg. 4-6

Additional baseline data is likely to be needed to further inform the USACE and the public about the entire project, and new data collection and reference sites should be established to fully evaluate any new project components. at pg. 4-5

See also, examples on pages 4-5 4-6



THE STATE
of **ALASKA**
GOVERNOR BILL WALKER

Department of Natural Resources
OFFICE OF PROJECT MANAGEMENT & PERMITTING
400 Willoughby Ave, Suite 400
Juneau, AK 99801
Main: 907-465-6849
Email: kyle.moselle@alaska.gov

June 29, 2018

U.S. Army Corps of Engineers, Alaska District
Program Manager, Regulatory Division
ATTN: DA Permit Application 2017-271, Pebble Limited Partnership
P.O. Box 6898
Joint Base Elmendorf-Richardson, Alaska 99506-0898
Submitted via email to Shane McCoy at poaspecialprojects@usace.army.mil

Dear Mr. McCoy:

The Office of Project Management and Permitting (OPMP) has coordinated with the Alaska Departments of Natural Resources (DNR), Environmental Conservation (DEC), Fish and Game (ADF&G), and Transportation and Public Facilities (DOT&PF), to develop the following consolidated scoping comments in response to the Notice of Intent (NOI) to prepare an Environmental Impact Statement (EIS) for the Pebble Project published by the U.S. Army Corps of Engineers (USACE) in the Federal Register (Vol. 83, No. 61, P. 13483, March 29, 2018). Please consider these comments during preparation of the Draft EIS.

The purpose of scoping is to determine what should be included in an EIS ("scope" of the EIS). Key areas of information in scoping include potential impacts to be considered, alternatives, and potential mitigation. Scope includes "the range of actions, alternatives, and impacts to be considered in an environmental impact statement."¹ Impacts may be direct, indirect, and cumulative. Alternatives should include a "no action" alternative, reasonable alternatives, and mitigation measures. Therefore, these comments highlight issues that should be included or addressed in a Draft EIS (Draft EIS statements are put out to notice and comment before a final EIS).

ALASKA AS A COOPERATING AGENCY

On March 30, 2018, DNR Commissioner Mack accepted an invitation by USACE Colonel Brooks to participate as a cooperating agency, in accordance with Title 40 Chapter V Part 1501.6, for the review and evaluation of the Pebble Limited Partnership's (PLP or applicant) Department of the Army permit application (POA-2017-271) proposing discharge and fill material into waters of the United States in connection with the development of the Pebble copper-gold-molybdenum porphyry deposit as a surface mine. The State of Alaska's (State) participation in the National Environmental Policy Act (NEPA) process as a cooperating agency is not at all determinative or pre-determinative of any final positions that the State may take on the final EIS or any federal or state authorization that might be required for the proposed project. The State often participates in the NEPA process as a cooperating agency on resource development projects proposed in Alaska to provide special expertise to the lead federal agency based on the respective regulatory authorities of individual state agencies. As outlined in the

¹ 40 C.F.R. § 1508.25.
Binder Page 4-1

sections below, in addition to the Clean Water Act Section 404 Permit, which PLP has applied for from the USACE and which triggered the need for review under NEPA, there are numerous state statutory and regulatory requirements and authorizations that are also required for a proposed large mine project. The State's participation in this NEPA process is not pre-determinative of the outcome of those authorizations, which must be reviewed and assessed under relevant state laws.

SCOPE OF THE DRAFT EIS

The Draft EIS should evaluate the potential short and long-term effects to the human environment within the Nushagak and Kvichak watersheds and appropriate areas of Cook Inlet and Kenai Peninsula, with emphasis on potential impacts to fish and wildlife, their habitats, and human uses of fish and wildlife. All activities necessary for operating the proposed Pebble Mine should be considered in the Draft EIS, including the mine site and all associated facilities (including the mine pit; mineral processing facilities; tailings storage facility; low grade ore stock pile; waste rock usage; overburden stockpile; water supply, management, and treatment; personnel camps; and power generation), the Amakdedori Port site (including ore carrying vessels, access causeway, access channel and turning basin, shore-based facilities, and fuel storage), the transportation corridor (including the road system connecting Amakdedori Port to the south ferry terminal, the ferry crossing routes, and the road connecting the north ferry terminal to the mine site, and secondary roads to Iliamna and Kokhanok), and the natural gas pipeline system (including the pipeline, compressor stations and fiber optic cable). All phases of the project should be considered in the EIS, including pre-project activities, construction, operations, closure, and post-closure, with specific evaluations of water management during each project phase.

The project record should include “An Assessment of Potential Mining Impacts on Salmon Ecosystems of Bristol Bay, Alaska”² published by the U.S. Environmental Protection Agency (Report 910-R-14-001, 2014), with appropriate references and considerations in the Draft EIS.

SECTION 401 WATER QUALITY CERTIFICATION

DEC conducts a review of the USACE application at the same time as federal agency review and issues a Clean Water Act Section 401 Water Quality Certification (401 Certification). The Draft EIS should recognize the 401 Certification requirement in its description of applicable laws. In this process, DEC will certify whether the activity complies with all applicable water quality standards, limitations, and restrictions. If DEC denies certification, the 404 Permit cannot be issued.

STATE AREA AND MANAGEMENT PLANS

DNR has primary management responsibilities for state lands (including land, water, tidelands, and shore lands of navigable waters within Alaska). This authority can include navigable waters, tidelands, and shore lands within and adjacent to the boundaries of federal lands, including conservation system units created under the Alaska National Interest Lands Conservation Act (ANILCA). There is no presumption of use of state lands without appropriate authorizations. All proposed activities are subject to public process for authorizations for activities on state lands (as well as any other state authorizations required). The Draft EIS should recognize DNR's regulatory and management authorities on state lands in the project area. The State is open to consultation on ANILCA and other matters.

² Also referred to as the “Bristol Bay Watershed Assessment”
Binder Page 4-2

The USACE should carefully review DNR area and management plans applicable to the proposed activities, as these plans are used by DNR to manage state lands and resources within a given area and to guide DNR regulatory decisions. All DNR area and management plans are available on the following DNR website: <http://dnr.alaska.gov/mlw/planning/index.cfm>

DNR has taken recent steps to reestablish the Bristol Bay Advisory Group, originally created to provide input on the 1984 Bristol Bay Area Plan. By reestablishing the group, DNR intends to foster dialogue on land use, resource management, and regulatory matters under state purview in the Bristol Bay region. DNR anticipates the Bristol Bay Advisory Group will review and may recommend changes to the Bristol Bay Area Plan.

BRISTOL BAY FISHERIES RESERVE

Alaska Statute (AS) 38.05.142(a) (added by Ballot Measure 4 in 2014) states that:

In addition to permits and authorizations otherwise required by law, a final authorization must be obtained from the legislature for a large-scale metallic sulfide mining operation located within the watershed of the Bristol Bay Fisheries Reserve designated in AS 38.05.140(f). This authorization shall take the form of a duly enacted law finding that the proposed large-scale metallic sulfide mining operation³ will not constitute danger to the fishery within the Bristol Bay Fisheries Reserve.

STATE PERMITTING

For activities on state lands that are not Generally Allowed Uses the applicant will require authorizations from DNR and other state regulatory agencies. For DNR, these will likely include easements for the transportation corridors, leases for the port facilities and pipeline components, and permits for activities that are more temporary in nature. The attached Fact Sheet summarizes regulations at 11 AAC 96.020 and 96.025 into a clear and practical format and can facilitate a better understanding of the “Generally Allowed Uses”, if referenced in the Draft EIS.

For information on state management authorities, and language that can be incorporated into the Draft EIS, please see the enclosed “Select State Tools” document. This document summarizes many jurisdictional issues that are often overlooked and which may be relevant within the Draft EIS, such as: a) The Departments of Fish and Game and Natural Resources should both be consulted regarding management of all water bodies within the planning area for issues related to state authorities, including fish stream crossings, diversions, public use, placer mining, and dam construction; b) When lands are conveyed to private entities, under provisions of the Alaska Constitution, management of fish and wildlife are retained by the State for the common good of all residents; and c) DEC has numerous regulations used to monitor and mitigate impacts to resources within the state, including human waste disposal, air and water quality standards.

Construction of the pipeline is expected to result in discharges that may require Alaska Pollutant Discharge Elimination System Permits for the following: inadvertent releases of drilling fluids from Horizontal Directional Drilling (HDD), domestic wastewater from mobile camps, gravel pit dewatering, excavation dewatering, hydrostatic test water, construction storm water, and mobile spill response. DEC authorizes these discharges to freshwater under general permit AKG320000 – Statewide Oil and Gas Pipelines (Pipeline General Permit). The Pipeline General Permit is currently effective and terminates December 31, 2023. For discharges of excavation dewatering

³ “large-scale metallic sulfide mining operation” means a specific mining proposal to extract metals, including gold and copper, from sulfide-bearing rock and that would directly disturb 640 or more acres of land (AS 38.05.142(c)).

and hydrostatic test water to marine water, existing general permit AKG002000 – Excavation Dewatering and AKG003000 – Hydrostatic Test and Aquifer Pump Test Water is available. In addition, the AKR060000 Multi-Sector General Permit and the AKR100000 Construction General Permit are available for storm water discharges for areas other than the pipeline construction; AKG003000 Hydrostatic and Aquifer Pump Testing General Permit provides discharge authorization to entities conducting aquifer pump testing in support of mineral mining development and exploration.

AS 27.19.020, Reclamation Standard, states “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.” Large lode mine operations require DNR approval of a reclamation plan for the mining operation,⁴ and individual financial assurance (i.e. bond) in an amount reasonably necessary to ensure the faithful performance of the requirements of the approved reclamation plan⁵. Other relevant authorities typically required for large mine operations include AS 46.15, 11 AAC 93, 11 AAC 86, 11 AAC 96, 11 AAC 97, and other authorities.

An Integrated Waste Management Permit is required under AS 46.03.100 for disposal of tailings, waste rock, and wastewater that are not discharged into waters of the United States. This permit is administered by DEC and usually requires pre-operational, operational and post-closure monitoring. It also requires proof of financial responsibility (i.e. bonding) to assure compliance with applicable closure standards and post-closure monitoring requirements.

Please ensure that state oversight is sufficiently referenced, particularly in the effects analysis in the Draft EIS. Oftentimes, the possible effects stated within an EIS may already be mitigated by regulations and/or permitting by state resource agencies, which can mischaracterize the overall extent of impacts from the alternatives.

BASELINE DATA

The proposed Pebble Project, specifically the mine pit, and associated ore processing and tailings storage areas straddle the headwaters⁶ of two major drainages that support highly productive and valuable fishery resources. Upper Talarik Creek flows into Iliamna Lake, one of the most productive sockeye salmon nursery lakes in the world. The South and North Fork Koktuli Rivers flow into the Nushagak River, one of the largest Chinook salmon producing rivers in the world. There are sport fisheries for all five species of Pacific salmon, rainbow trout, Dolly Varden, Arctic grayling, and northern pike. Additionally, 18 communities depend on the fish and wildlife resources of the area for subsistence uses. The southern road corridor and Amakdedori Port are proposed near the McNeil River State Game Sanctuary and McNeil River State Game Refuge (MRSISR), which hosts the largest known gathering of brown bears in the world.

Because the project has the potential to impact a biologically productive and sensitive part of Alaska, the scientific information used to evaluate the project should be of sufficient quality and detail to allow the USACE to assess project-related changes to the environment and inform their decisions.

Baseline studies conducted in the project area previously should be considered by the USACE in the Draft EIS; however, the current proposal being evaluated by the USACE includes a new road

⁴ AS 27.19.030(a)

⁵ AS 27.19.040(a)

⁶ Headwaters are the upper reaches of tributaries in a drainage basin.

corridor, ferry terminals and ferry operations in Iliamna Lake, a proposed port at Amakdedori Creek/Kamishak Bay, and a natural gas pipeline extending from the Kenai Peninsula through Cook Inlet and along the proposed transportation corridor to the mine site. Additional baseline data is likely to be needed to further inform the USACE and the public about the entire project, and new data collection and reference sites should be established to fully evaluate any new project components.

MONITORING

The Draft EIS should discuss potential monitoring programs that may be required as a condition of federal permits. Please consider requiring comprehensive monitoring programs related to water quality, water quantity and aquatic resources that are implemented prior to construction and continued through mine development, operations, closure, and post-closure phases of the project.

Fish and wildlife populations fluctuate naturally over time due to dynamic environmental conditions. To distinguish between natural variability and project effects, the Draft EIS should consider the need to establish and monitor reference sites outside the influence of potentially impacted areas (e.g., Before-After, Control-Impact [BACI] studies) over a sufficient time period. Studies should be able to detect spatial and temporal interactions and include the spatial scale of potential environmental impacts. A monitoring program should be developed to address both pre- and post-development. The pre-development portion of the program should encompass a sufficient time period to present a reliable picture of the environment prior to potential project influence. As such, the monitoring program should be conducted over at least one life cycle of the longest-lived fish species present. Monitoring should continue throughout the duration of the project life and following closure to detect long-term direct, indirect, and cumulative impacts so that corrective actions can be taken.

MINE SITE AND FACILITIES

Dam Safety and Design

The Dam Safety and Construction Unit of DNR suggests that the scope of the pending EIS should include consideration of the hazard potential classification of all proposed tailings and water storage dams in accordance with 11 AAC 93.157, Hazard Potential Classification, and the requirements of 11 AAC 93.171(f)(1)(E), Dam Construction, Repair, or Modification, which reads “for new construction of Class I and II dams, an analysis of project alternatives including a feasibility study and a site study that justifies the location, type, and configuration of the proposed dam over other alternative locations, types, and configurations of dams or other projects.” The Draft EIS should include an alternative to whole tailings, such as a dry stack or paste dewatering method.

Water Quality

DEC administers the Alaska Pollutant Discharge Elimination System (APDES) Program, in compliance with the Clean Water Act (CWA), 33 U.S.C §1251 et seq., as amended by the Water Quality Act of 1987, P.L. 100-4, Alaska Statute (AS) 46.03, and the Alaska Administrative Code (AAC), as amended, and other applicable state laws and regulation, to authorize and set conditions on discharges of pollutants from facilities to waters of the United States. To ensure protection of water quality and human health, APDES permits place limits on the types and amounts of pollutants that can be discharged from a facility and outlines best management practices to which a facility must adhere. The Draft EIS should describe all point source

discharge locations and evaluate potential impacts from those discharges over appropriate spatial and temporal scales.

Air Quality

It is not clear from the project description whether there will be air emissions from laboratories located at the mine site. Similar mines have required mercury abatement systems and other specialized equipment to comply with the Clean Air Act maximum achievable control technology regulations at 40 C.F.R. 63. The Draft EIS should describe known baseline air quality data relevant to the project area and discuss potential impacts from all air emission sources associated with the proposed activities (e.g. laboratories, incinerator, power plant, etc.), as well as methods for minimizing and mitigating air quality impacts.

Fish and Habitat

Construction of the mine site and facilities propose removal and fill of wetlands, headwater streams, and ponds. Fish studies should be conducted to determine anadromous and resident fish presence or absence in all potentially affected streams, ponds, and connected wetlands. The fish bearing waters directly and indirectly affected should be quantified and mitigation options explored. Loss of connectivity and headwater contribution to larger streams within the system should be assessed; specifically, the impacts of habitat loss on productivity of the Koktuli River and Upper Talarik Creek should be evaluated in the Draft EIS. Headwater streams export considerable amounts of invertebrates and detritus downstream, and typically provide most of the primary nutrient processing in a given watershed. These are important factors in overall stream production.

Fish and Hydrology

Groundwater inputs to streams are critical to salmon life histories (e.g., maintaining base flows during winter when eggs are incubating in the gravels). Groundwater is an important component of river habitats and can influence the distribution, reproductive success, biomass and productivity, behavior and movements of fishes, and is important throughout the year.

Local geology and stream hydrographs in the area are indicative of systems that are largely driven by groundwater. Disruptions or changes to the groundwater flow paths, particularly in the mine footprint area, have the potential to impact aquatic resources. Clearing vegetation and hardening surfaces in headwater areas, large impoundments, roads, altered hydrographs, landscape modification, groundwater pumping, and other mine operations, all have potential to alter groundwater.

Surface and ground water studies in the project areas are needed to characterize hydrology. Characterization of baseline hydrologic conditions should be of a sufficient extent and density to estimate relative hydrologic contributions at scales relative to potential project changes. Studies and monitoring should include tributaries and the mainstems of rivers in potentially impacted areas. Stream flow characteristics can vary greatly in seasonal timing, intensity, and duration from year to year in a watershed. Therefore, continuous data should be collected for a duration sufficient enough to capture intra- and inter-annual stream flow variations. Potential changes should be assessed at a watershed scale to include potential changes downstream, upstream, and in habitats adjacent to proposed activities. An assessment of lateral hydrologic connectivity between river channels and floodplain waterbodies would assist in evaluating the degree to which lateral connectivity might be influenced by project development. This includes identifying areas of groundwater upwelling and sinks within the project affected areas.

To evaluate the effects of any proposed flow modification and subsequent changes to aquatic resources, instream flow relationships (i.e. the relationship between flows and fish habitat) should be considered for all fish species and life stages inhabiting potentially affected water bodies. The Draft EIS should include a description by reach and habitat type of the use by fish species and their life history stages (i.e. spawning, incubation, juvenile/adult rearing and overwintering, and adult and smolt migration).

Habitat data should be collected from the wide variety of aquatic habitat types found within the lateral and longitudinal dimensions of each stream to account for the full distribution of fish and the full range of aquatic habitats available. Additional data should be collected from all major variables known to influence the distributions of fish at these latitudes. This not only includes surface water dynamics and substrate data but also groundwater characteristics, baseflow conditions (e.g. upwelling), and water temperature at a minimum.

The Instream Flow Incremental Methodology (IFIM) is one of the most commonly used frameworks for evaluating alternative water management options. An important component of the IFIM framework is often an analysis of the relationship between stream flows and fish habitat. This requires site-specific flow and habitat data to be collected and analyzed using a Physical Habitat Simulation System (PHABSIM) model to determine how fish habitat may be impacted. Environmental analysis should evaluate both the short and long-term effects on fish and their habitats. Habitat suitability criteria should be developed from site-specific data collected over a sufficient range of seasonal hydraulic conditions for each fish species and life stage.

Additionally, potential impacts from the use of explosives during mine construction and operations on ground water and aquatic resources should be examined and described (e.g., pathways altered by changes to bedrock fractures) in the Draft EIS.

Fish and Water Quality

The potential impacts to downstream water quantity and quality and aquatic resources from construction, mining, and closure should be addressed in the Draft EIS. Copper, even at relatively low concentrations, is toxic to many freshwater organisms and can affect the olfactory sense and predatory response of salmonids. In addition to copper, mining can generate potentially acid generating rock. Fugitive dust containing copper and other potential contaminants can enter the freshwater environment via air or waterborne transport, whereas impacts from acid generating rock are primarily waterborne. Given the mine's proposed location at the headwaters of major fish-producing drainages, and the need for containment structures to function long-term following mine closure, waterborne and air contaminates impacting aquatic resources should be considered in the Draft EIS.

Moving large quantities of gold-copper/molybdenum ore concentrate from the mine site to the port daily, and storing and transferring those mineralized materials at both locations, provides multiple opportunities for copper and other contaminants to enter the environment. The applicant proposes to use enclosed containers when transporting concentrates, but mineralized dust may be released to some degree during the life of operations. The strong wind common to this relatively low-lying area adjoining the Bristol Bay and Cook Inlet basins is referred to by meteorologists as the "Kamishak Gap Wind" (Fett 1993). These strong winds could easily facilitate copper-laden dust being blown into the many waterbodies adjoining the mine site, transportation corridor, and port facility. The impact of copper contamination (through runoff and/or wind-blown dust) should be evaluated in the Draft EIS for the mine site, along the transportation corridor, and at the port facility. Mitigation options to be considered should include fugitive dust control at the

mine site, the port site, and along the transportation corridor and vehicle wash plants to minimize mechanical transfer of contaminants.

Many fish species have life history adaptations that can compensate for natural seasonal and geographic gradients of temperature but do not protect them from short-term unnatural changes in their normal temperature regime. The Draft EIS should identify and evaluate project components with the potential to alter stream temperature as well as assess the cumulative effects of the project on stream temperatures under several climate change scenarios.

The proposed location for Pebble Mine straddles two major drainages that support highly productive and valuable fishery resources. Although ADF&G monitors the escapement of major stocks targeted by commercial fisheries, many gaps in knowledge exist regarding the abundance, diversity, and productivity of freshwater resources in this area and how they might be impacted by the construction and operation of a copper-gold-molybdenum mine. Given the scope and scale of the proposed mine project, the Draft EIS should be informed by high-quality baseline data sets for all aquatic resources and habitats potentially affected by the proposed activities. There should be studies that evaluate the abundance and distribution of adult salmon species in water bodies that could be affected by development of the Pebble Mine. Specifically, studies to delineate important spawning reaches and determine the proportion of reaches that may be inundated by the mine or thought to be at risk from mining activities should be described in the Draft EIS. A combination of adult and juvenile studies should be conducted to document the use and productivity of anadromous species in the project area. Juvenile fish studies should be used to estimate freshwater productivity of anadromous fish species, a component especially important with regard to mining.

Wildlife and Habitat

Numerous wildlife species use the proposed project area, including brown bear, black bear, moose, caribou, wolves, multiple small game and furbearer species, and migratory birds. Loss of habitat, impacts to surrounding habitat (noise, pollutants, etc.), and the presence of garbage are all issues that should be evaluated in the Draft EIS.

Impacts of noise disturbance from construction, blasting operations and increased air traffic has the potential to directly impact wildlife. The Draft EIS should include an assessment of noise disturbances to marine mammals, bears, and other wildlife from construction, blasting, daily operations, and air traffic. Assessments should include impacts on abandonment of surrounding habitats, the ability to communicate or locate prey, and denning of animals. Timing of blasting operations can disturb denning bears and disruptions to bear congregations can affect feeding, energy use, survival, and safety at viewing programs within MRS GSR. There are harbor seal haulouts in Iliamna Lake and Kamishak Bay where important life events, such as pupping activity and molting activity occur. Harbor seals are susceptible to overhead disturbances.

The Bristol Bay uplands are used by the Mulchatna caribou herd as rangeland, calving grounds and as a migration corridor. The size and distribution of caribou herds in the project area have undergone profound changes since the 1970's, with the herd size increasing rapidly, expanding its range and using other areas. Herd use of habitat in the project area shifts regularly and areas not currently used are likely to be used again in the future as range and herd conditions change. The Draft EIS should analyze the impacts to range and calving areas currently and historically used, with emphasis on habitat that would be permanently taken out of range rotation due to construction of project infrastructure.

Recently the Board of Game reduced the season and bag limit for Alaska hare due to concerns of low abundance. The Draft EIS should evaluate the potential loss of breeding, brood rearing,

nesting, and overwintering habitat for small game species, including Alaska hare, rock and willow ptarmigan and ground nesting birds. Baseline studies documenting movement and habitat use, as well as before/after impacts study of predator-prey species should be conducted.

Domestic refuse is proposed to be disposed of in an on-site landfill according to the project description. This has the potential to attract bears and other wildlife. The Draft EIS should examine and describe the potential to create nuisance wildlife and evaluate the alternative of incineration of all putrescible materials and burial of that material into a waste rock stock pile. This comment applies to all locations where refuse is stored, transferred, and disposed of including the port and transportation corridor.

Bristol Bay provides important habitat for numerous species of waterfowl, seabirds, and shorebirds many of which are listed as Species of Conservation Concern, as well as numerous marine mammal species which provide an important subsistence food source for communities in the area. Hundreds of thousands sea ducks breed in the area and congregate annually for molting and pre- and post-breeding. Also, there are over fifty seabird colonies in northern Bristol Bay which provide breeding habitat for species such as black-legged kittiwake, horned puffins, and common murre as well as many other species of conservation concern. Bristol Bay provides feeding habitat for these species during the breeding season. Hundreds of thousands of shorebirds also either breed in or refuel in Bristol Bay during migrations. The Draft EIS should evaluate the impacts to species that may use the tailings pond including migratory birds, such as waterfowl and shorebirds that have the potential to be exposed directly to contaminants from using the tailings pond, as well as indirectly through feeding on vegetation and invertebrates that may be in the tailings pond. Additionally, the Draft EIS should evaluate a potential tailings spill and the downstream effects on aquatic environments, benthic prey species, intertidal and marine food web, and potential impacts to waterfowl, shorebirds and seabirds, and marine mammals. Baseline data should include surveys of abundance, composition and distribution of seasonal bird use throughout the year and surveys of associated benthic prey. The use of deterrents for migratory birds should be considered.

There is potential for contaminants and toxins from mine pit dust, the tailings storage area, fuel, oil, anti-freeze, de-icing compounds, explosives, chemicals, and road dust to affect terrestrial and aquatic habitats in and downstream of the project area. The Draft EIS should assess potential impacts to wildlife, wildlife prey, and marine mammals from exposure to contaminants and toxins. Trace elements analysis of select herbivores, carnivores and vegetation within the project area and road corridor should be conducted. Studies should gather baseline trace element data from select herbivores, carnivores, and vegetation in the project area and continue monitoring throughout the project life.

The potential for mine discharge into the rivers and streams, which flow into Cook Inlet and impact marine mammal species should be included in the Draft EIS. Marine mammals in the project area could be indirectly affected if a fuel spill or mine discharge was to contaminate prey resources. Further indirect impacts to marine mammals could include reduction of sources of prey due to loss of anadromous fish habitat. Some prey such as salmon and eulachon are short-lived and would not likely be able to accumulate mine-related toxins to concentrations of concern; however, marine mammals who ingest contaminated prey species or contaminated water and sediment can be impacted. Toxins can bioaccumulate into the tissues of upper trophic level wildlife having a permanent impact to individuals and possibly local populations.

Access by User Groups

The project area is used extensively by hunters, fishers, and other recreationalists and subsistence users. The proposed infrastructure and proposed private road can greatly impact public access along historic routes, stream corridors and to various fish and wildlife or subsistence resources. The Draft EIS should analyze the impacts of the project infrastructure and access corridors on public access and use of public lands, including existing trails, easements (e.g., section-line easements, RS 2477 rights-of-way, 17(b) site and trail easements), navigable and public waters, as well as overland access to fish and wildlife or recreational areas. The Draft EIS should address how mine access routes (roads, airstrips, ferry routes, docks/barge landings), utility and/or pipeline corridors, camp facilities and the mine facility itself may affect public access through state, federal, and private land as well as use of public land and waters within the mine-affected area. Conflicts or impediments to access and other uses should be avoided or mitigated.

Additionally, the Draft EIS should clearly describe the intended uses of the proposed access road and how uses are planned to be managed, especially given that the applicant proposes to connect to existing public road systems servicing the communities of Kokhanok, Iliamna and Newhalen.

Please consider using the following language in the Draft EIS to describe RS 2477 routes identified by the State of Alaska:

Under Revised Statute (RS) 2477, Congress granted a right-of-way for the construction of highways over unreserved public land. Under Alaska and Federal law, the grant could be accepted by either a positive act by the appropriate public authorities or by public use. "Highways" under state law include roads, trails, paths, and other common routes open to the public. Although RS 2477 was repealed in 1976, a savings clause preserved any existing RS 2477 right-of-way. The State of Alaska claims numerous rights-of-way across the subject lands under RS 2477, including rights-of-way identified in AS 19.30.400.

Please consider using the following language in the Draft EIS to describe 17(b) easements:

Section 17(b) of ANCSA provided for the United States to reserve easements across Native Village and Regional Corporation lands for public access to publicly owned lands (including waters) for the purpose of recreation, hunting, transportation, utilities, docks, and other similar public uses. The BLM is responsible for identifying and reserving these easements during the conveyance process. The BLM has management authority for the United States for these easements unless that authority has been otherwise delegated.

While BLM has management authority for all 17(b) easements it has a largely undefined management policy that fails to provide the public a mechanism to address the concerns of land owners and easement users. Current problems include poorly or inaccurately placed easements, trails that allow for ORV use being aligned through wetlands, discontinuous easements, and lack of easement marking.

Also note that, in accordance with ANCSA 17(b) and regulations implementing the statute, an easement may not be terminated simply due to lack of use. We suggest the following language address termination/relocation of 17(b) easements:

Easement relocation and termination would be subject to State of Alaska and public involvement.

The Draft EIS should be especially clear that where a water body is navigable-in-fact and was not reserved (Congress expressly intended to defeat State title) prior to statehood the submerged

lands that lay between the outermost ordinary high-water mark on the left bank and the right bank are owned by the State of Alaska.

The mine proposal may result in loss of hunting areas and lowered quality of hunting and the overall outdoor experience due to sound and visual pollution, dust along road corridors, increased competition, decreased bag limits, and decreased opportunity. This has the potential to impacts hunters, game guides, transporters and eco-tourism industries. The Draft EIS should include an analysis of public comments, historic hunting and harvest reports, subsistence harvest records, guide camp records, ADNR Commercial Day Use Registration records, and public use records.

Subsistence Use

The following 18 communities use fish and wildlife resources near the proposed mine for subsistence purposes: Aleknagik, Clarks Point, Dillingham, Ekwok, Igiugig, Iliamna, King Salmon, Kokhanok, Koliganek, Levelock, Manokotak, Naknek (including South Naknek), Newhalen, New Stuyahok, Nondalton, Pedro Bay, Portage Creek, and Port Alsworth. The Draft EIS should evaluate potential direct and indirect impacts of the mine on subsistence resources, including direct impacts on fish and wildlife health, abundance and movements, as well as indirect impacts on habitat and food sources. The Draft EIS should also evaluate potential impacts of the mine on subsistence users and their ability to access subsistence resources. ADF&G has conducted research in many of these communities and has published and unpublished data describing the various modes of transportation and social mobilization used by subsistence users in the project area. These include transportation by boat, snow machine, ATV, airplane, and on foot. Social mobilization strategies include organizing groups by kinship, by age, by skill or knowledge specialty.

The potential impacts on work schedules, wages, local tax revenue, outmigration, and technical training and educational opportunities may potentially alter the social and economic environment of area communities. ADF&G research has collected local community input on perceived potential impacts of mine infrastructure to subsistence hunting and fishing activities. ADF&G research has also collected baseline demographic data describing household composition, wage and employment characteristics including seasonality of work and employment by industry.

The Draft EIS should evaluate the effect of potentially harmful or disruptive interactions between wildlife and ground-disturbing activities in the project area, as well interactions that may occur downstream and downwind. Possibilities include interactions between wildlife and mine structures such as tailings, quarries, sediment ponds, seepage ponds, stockpiles, and the open pit. ADF&G has conducted household surveys documenting subsistence use patterns in the project area intermittently between the years 1980 and 2016. For many of these studies maps are available that identify the geographic locations where community residents search for and harvest subsistence resources during the study year.

Salmon and non-salmon fish live in the waters near the mine site, and like wildlife species, the mine's impact to land, air and aquatic habitats may result in disturbance to fish health, movement, and abundance, which may in turn affect subsistence harvests. Possible points of interaction between the proposed activities and fish include industrial wastewater discharge sites, subterranean disturbance of aquifers, alteration of natural water flow rates and temperatures, disturbance to surface wetland ecology and insect prey habitat at the mine site, and stream crossings of the road to the southeast of the mine site. ADF&G has conducted surveys documenting subsistence harvest, use, and distribution of fishery resources in the project area for intermittent years ranging from 1980 to 2016.

In addition to impacts on animal species and their habitats, the Draft EIS should also focus on potential direct impacts to the human communities in the region. Physical, chemical and atmospheric changes to the environment caused by the proposed activities may impact the movement, abundance, and health of fish and wildlife resources, resulting in a disturbance to the schedules and strategies local people use to access those resources for subsistence. Local knowledge of the ecological system may become ineffective, and residents may be forced to adjust to a new environmental configuration. In anticipation, the Draft EIS should document traditional ecological knowledge of local people regarding interactions with subsistence resources, including the strategies taught to young people. ADF&G has conducted interviews and surveys with residents of communities near the project area, documenting traditional knowledge of subsistence resources in social and environmental contexts.

Traditional knowledge and access to subsistence resources is integrated with the socioeconomic character of each community. The Draft EIS should document potential economic and demographic changes caused by the mine, both during development, over the course of operation, and during mine closure. Household demographic, employment and wage data collected during ADF&G household surveys, in addition to other data sets, may be used to help evaluate socioeconomic impacts on communities.

ROAD CORRIDOR

Fish Habitat

The project description states a two-lane dirt road would connect the Amakdedori Port to the south ferry terminal on Iliamna Lake and the mine site to the north ferry terminal. The Draft EIS should assess potential impacts to freshwater resources in Amakdedori Creek, Newhalen River, Upper Talarik Creek, and Gibraltar River drainages stemming from construction and use of the road corridor, including appropriate use of bridges to maintain the ability of anadromous and resident fish species to continue accessing available habitats; roadbed construction interrupting hyporheic flow into adjacent streams; and sedimentation of aquatic habitats, especially spawning habitats, deriving from dust and increased erosion and run-off caused by road construction and use.

Field studies documenting anadromous and resident fish presence and absence along the road corridor route should be considered in the Draft EIS. The southern portion of the road corridor, from the south ferry terminal outside of Kokhanok to the port at Amakdedori Creek is unstudied in terms of fish presence in streams where road crossings are currently proposed. In addition to fish presence and absence data, hydrology and geomorphology data should be collected to properly design drainage structures. The project description indicates that 222 culverts will be needed, but only 73 will require fish passage and 149 will be on non-fish bearing waters. Under state authorities, ADF&G may require fish sampling be conducted before determining which structures will require fish passage and which structures will require permits. Eight bridges are currently proposed, and ADF&G plans to assess how many more fish stream crossings may require bridges to minimize habitat alteration, assure fish passage, and decrease long term maintenance. This information may be used to inform ADF&G Habitat Title 16 permitting decisions associated with the proposed stream crossings.

Per state law (Title 16), uses and activities occurring below the ordinary high-water mark for waterbodies containing fish requires a Fish Habitat permit issued by ADF&G, including water withdrawals, dams, ferry terminals and facilities, geotechnical drilling, installation of stream gages, stream crossings with equipment, material removal or disposal, and any alterations of stream habitats or connected wetlands (if documented in the Anadromous Waters Catalog).

Fish and Water Quality

In addition to considering potential impacts to aquatic resources from waterborne and air contaminants (see Fish and Water Quality comments under Mine Site and Facilities section above), the Draft EIS should evaluate possible effects of spills on fish from the proposed transportation of fuel, ore concentrate, reagents and consumables, across numerous streams and rivers, as well as Iliamna Lake, as well as potential fuel spill mitigation and containment measures. The proposed 35 round trips per day (including three loads of fuel per day) creates potential for accidents to occur over the life of the project. Impacts to aquatic resources could be significant in the event of a storage tank failure or from accidents involving trucks and ferries transporting fuel, concentrate, and backhauled waste between the mine site and the port. The Draft EIS should consider spill prevention, impacts, and mitigation plans, and include a detailed analysis of how major spills would be contained and affected areas cleaned up. Appropriate consideration of the area's seismic activity (e.g., landslides) should be included in the accident/spill risk analysis and the design/engineering/placement of roads and bridges. Environmentally sensitive areas along the transportation corridor should be identified and containment/mitigation plans should be developed to quickly and effectively respond if a spill occurs.

Sport Fisheries

The road corridor has the potential to impact sport fishing in the area, both by impacting fish resources and impacting the aesthetic value of recreating in "wild" and undeveloped river systems. Numerous sport fisheries exist in the project area:

- The Nushagak River drainage (including the Koktuli River drainage) supports significant guided and unguided sport fisheries for all five species of Pacific salmon, rainbow trout, Dolly Varden, Arctic grayling, and northern pike. The king salmon sport fishery is the largest of these and accounts for the highest levels of sport fishing effort in the Bristol Bay Management Area. The drainage also supports Arctic char, lake trout, burbot, whitefish spp., stickleback spp., and sculpin spp.
- The Newhalen River supports a significant, mostly unguided, sockeye salmon fishery and a smaller guided and unguided sport fishery for rainbow trout. The drainage also supports Chinook and coho salmon, anadromous Dolly Varden, Arctic grayling, northern pike, whitefish spp., stickleback spp., and sculpin spp.
- Upper Talarik Creek supports guided and unguided coho salmon and rainbow trout sport fishery. The drainage also supports populations of all five species of Pacific salmon, anadromous Dolly Varden, Arctic grayling, northern pike, whitefish spp., stickleback spp., and sculpin.
- The Gibraltar River supports a well know fly-fishery for rainbow trout and sport fishery for sockeye salmon. The Gibraltar River watershed is a particularly productive watershed for sockeye salmon. The drainage also supports populations of chum and coho salmon, anadromous Dolly Varden, Arctic grayling, northern pike, whitefish spp., stickleback spp., and sculpin spp.

Due to the significant fish resources and sport fisheries in the vicinity of the road corridor, baseline size, abundance, and distribution information should be collected on adult and juvenile resident species, particularly rainbow trout and Arctic grayling, prior to the start of construction. Seasonal fish use and critical habitat areas for juvenile and adult resident and anadromous species should be identified and documented in the Draft EIS, as these drainages are utilized for

spawning, rearing, migration, feeding, and overwintering. The Draft EIS should evaluate potential impacts to the sport fisheries in the area, both from direct impacts to fish and indirect impacts from increased access and loss of pristine wilderness due to presence of roads and bridges.

Wildlife

The development of the road corridor has the potential to cause wildlife habitat fragmentation and disruption of wildlife movement corridors. This is of particular concern along southern road corridor and at the Amakdedori Port site as brown bears using these areas also utilize MRSGSR. Species of particular concern include brown and black bear, moose, caribou, harbor seal, sea otter, furbearers, wolves, Alaska hare, and rock and willow ptarmigan. The Draft EIS should include research and analysis of the project impacts on wildlife movements, important habitats, and species use of and movements within and across the project area.

Focused research, both before and after construction, should be conducted to determine brown bear use areas, landscape use patterns, movements, degree of relatedness among bears in area and fidelity to MRSGSR, southern road corridor, Amakdedori beach site, and Chenik Head areas.

The development of the road corridor (as well as other project components) has the potential to impact the wildlife viewing programs, public safety, and management at MRSGSR and other viewing areas along the Kamishak coast and Katmai National Park and Preserve. Behavioral changes of bears or other wildlife due to project infrastructure or operations; garbage and food conditioning of bears; disruption of movement corridors; deconditioning of human habituated bears by project operations; increased disturbance and traffic; and increased harvest, road kills, Defense of Life and Property kills and hazing; all have major public safety, management and economic consequences for these programs. The Draft EIS should describe high value brown bear habitat use areas, wildlife movements within and across project areas, anticipated levels of mine project use, impacts of those uses or operations on wildlife movements, important habitats and the socio-economic impacts to viewing programs at MRSGSR. Moreover, the Draft EIS should also consider brown bear fidelity to MRSGSR and project areas, the degree of relatedness amongst bears in the area and the potential effect of the project on landscape use by bears (particularly for brown bear within and surrounding MRSGSR, Amakdedori Port site, Chenik Cove and the road corridor).

The road corridor, along with other project components, has strong potential to impact a number of wildlife populations and wildlife related socio-economic aspects. Potential impacts to wildlife populations, hunters, game guides, subsistence users, transporters and eco-tourism industries should be evaluated, and avoidance measures developed. Food conditioning of bears or other wildlife from garbage and other industrial attractants at facilities and along roadways should be evaluated and avoidance measures developed. This is particularly problematic along the southern road corridor and at the Amakdedori Port site as brown bears using these areas also utilize MRSGSR. Food conditioning of bears that utilize MRSGSR can cause substantial public safety problems. Changes in harvest, road kills, Defense of Life and Property kills, and wildlife behavior as a result of infrastructure, operations and increased accessibility are a concern and should be addressed in the Draft EIS.

Potential loss of hunting areas and quality of hunting and other outdoor recreation experiences due to increased competition, decreased opportunity and bag limits, "sound and visual pollution", and dust along road corridors should also be considered in the Draft EIS. In addition to brown bears, these considerations should also apply to the following species: black bear,

moose, caribou, wolves, furbearers, small game, waterfowl, avian scavengers/predators and marine mammals. The Draft EIS should include research and analysis of potential sources of food, garbage, or other wildlife attractants at each facility and along new road corridors; and relate this to wildlife movement corridors, accessibility, mortality threat, and food conditioning risks to public safety. Analysis should consider existing harvest and mortality rates and projected post development rates based on increased access into low use areas; how that may impact existing populations, hunting opportunities and the bear viewing programs at MRSGSR and other locations along the coast or within Katmai National Park and Preserve. Analysis should include public comments, historic hunting and harvest reports, subsistence harvest records, guide camp records, ADNR Commercial Day Use Registration records and public use records and expected impacts on hunters, commercial guides, transporters, and other recreational users. During construction, the project plans include using the Williamsport-Pile Bay Road. An alternative to consider in the Draft EIS is use of that route as the permanent transportation corridor, which would eliminate the need for the 35-mile southern road corridor through undeveloped land. This alternative could reduce potential impacts to the MRSGSR.

Subsistence

Similar to subsistence concerns under the Mine and Facilities section, possible impacts to wildlife may occur along the transportation routes and in associated noise zones. The Draft EIS should also include recommended measures to deter wildlife from undue exposure in these locations, reducing disruption to the existing patterns of movement and abundance that subsistence users rely on.

IILAMNA LAKE FERRY ACTIVITY and TERMINALS

Fish Habitat and Water Quality

Iliamna Lake supports populations of all five species of Pacific salmon, anadromous Dolly Varden, rainbow trout, Arctic char, lake trout, Arctic grayling, northern pike, whitefish spp., stickleback spp. and sculpin spp. Due to the size and depth of Iliamna Lake, it is possible that other undocumented species of fish inhabit the lake. Iliamna Lake provides critical habitat for the unique migratory resident rainbow trout population and is one of the most productive sockeye nursery lakes in the world. Adult sockeye salmon spawn at many locations around the lake, as well as at the lake outlet and in several inlet streams.

The project proposes operating an all-season icebreaking ferry to transport fuel, supplies, outbound concentrates, and backhauled waste and empty containers across Iliamna Lake daily. The Draft EIS should evaluate if the construction/operation of the north and south ferry terminals may impact habitats used by beach spawning adult sockeye salmon and/or rearing juvenile sockeye salmon, and if ice breaking ferry operations may impact the aquatic resources and/or limnology of Iliamna Lake. The Draft EIS should consider identifying alternative ferry terminal locations if the proposed sites are found to contain valuable spawning and/or rearing habitats for sockeye salmon. Additionally, the Draft EIS should quantify and evaluate the amount of rearing habitat that would be impacted by the construction and operation of the ferry terminals.

Storage and containment of concentrates and back hauled waste may result in unforeseen discharge of pollutants into Iliamna Lake. Water quality models should be developed to predict the magnitude of potential toxicity to the aquatic community of Iliamna Lake that could result from containment failures at the ferry terminal facilities or while transiting Iliamna Lake. Copper is highly toxic to freshwater organisms, as described in previous comments. Specifically, the Draft EIS should include water quality modeling to understand the magnitude of copper

toxicity (and impact to aquatic organisms) in Iliamna Lake, should the contents of one or more copper ore concentrate containers spill into the lake during a ferry accident.

Wildlife and Subsistence

Construction and operation of the Iliamna Lake ferry terminals have the potential to impact Iliamna Lake's resident population of about 400 harbor seals. Pile driving and other construction activities can generate noise and hauled-out harbor seals are very susceptible to human disturbances including noise and vessel traffic. Disturbances to seals during pupping activities (mid- May through early July) could cause permanent separation of mom/pup pairs and lead to injury or death. Disturbances to hauled-out seals during the molting period (about May 1 – October 1) could lead to loss of energy, interruption of hair growth, and prolongation of the molting period.

The harbor seals in Iliamna Lake overwinter in the lake and the Draft EIS should assess the impacts of creating a permanent open water channel and interactions that may occur between the ice-breaking ferries and seals. It is possible that seals will be attracted to the open water channel. The Draft EIS should include measures that can be taken to deter seals from undue exposure to the ferries. Additionally, impacts to traditional winter travel routes and subsistence activities of communities around the lake (Kokhanok, Iliamna, Newhalen, Pedro Bay, and Igiugig), as a result of the creation of an open water channel, should be included in the Draft EIS. On average, 20 seals are harvested each year, which matches the reproductive rate keeping the population numbers in balance.

AMAKDEDORI PORT

Dredging

Kamishak Bay is relatively shallow and has extensive reefs and strong tidal currents. The port may require dredging to support its use and thus potential impacts from dredging should be addressed in the Draft EIS. Geotechnical information on the sub-bottom profile throughout the dredge area was not provided in the project description; however, the applicant surmised that it was comprised of soft sediments. Kamishak Bay in this area is characterized by abundant rocky reefs, some of which are exposed at low tide and others not. A thorough geotechnical evaluation should be conducted to determine if the proposed port facilities can be constructed by dredging soft sediment or whether more aggressive methods (e.g., drilling, explosives) may be needed to excavate hard rock sections of the access channel. Due to the strong tidal currents and high sediment loads common to Cook Inlet, and particularly its lower west side, regular dredging may be needed to maintain 50-foot channel depth throughout the life of the project. Because of the important marine resources in the bay, including multiple finfish, shellfish, groundfish species, and marine mammal species, and the extent of dredging that may be required, the Draft EIS should evaluate the potential impacts to marine resources from construction and maintenance of the port and turning basin.

The estimated initial volume of dredge material from port construction is 10 million cubic yards with an additional 10 million cubic yards in maintenance dredging. This material is proposed to be contained within an onshore disposal area, but the application does not specify the quantity or composition of the liquids associated with dredging activities, where those liquids may be discharged, or how they may be treated. The Draft EIS should assess the whole breadth of dredging activities when determining the possible impacts to aquatic organisms and consider practicable alternatives that would avoid and minimize impacts.

Water Quality

Construction and operation of the Amakdedori Port has the potential to impact important aquatic resources. The proposed location for the port site is prone to frequent high winds from two sources: the “Kamishak Gap winds” and a regular onshore “day breeze” that occurs most afternoons during summer months due to convection air currents. The Draft EIS should evaluate the potential impact of contaminants, such as copper, being introduced into the environment through runoff and wind-blown dust (see Fish and Water Quality under the Mine Site and Facilities Section above).

Although a lined/bermed area is specified for the fuel storage tanks at the port site, impacts to aquatic resources in Amakdedori Creek and surrounding wetlands and marine waters could occur in the event of a storage tank failure or from accidents involving trucks transporting fuel from the port to the mine site. Spill prevention, impacts, and mitigation plans should be addressed in the Draft EIS, to include detailed analysis of how a major spill outside the lined/bermed area would be contained and affected areas cleaned up. Analysis of the area’s seismic/volcanic activity should be included in the spill risk analysis and the design/engineering of fuel tanks, containment structures, and fuel transport along the road corridor. Along with seismic events, the Draft EIS should assess the risk of a major volcanic eruption producing a landslide on Augustine Island significant enough to generate a tsunami wave capable of rupturing fuel storage tanks at the port site, potentially releasing diesel fuel into the surrounding freshwater and marine environments.

In addition to onshore fuel spills, the draft EIS should address potential for impact of fuel and lubricants entering the marine environment, either through periodic minor events typical of heavy marine vessel traffic (e.g., bilge water discharge), or through major acute events such as vessel groundings. Strong tidal currents and frequent high winds (particularly during fall/winter months) are common to this area of Cook Inlet. Especially prevalent in the Amakdedori Beach area are the high winds associated with the Kamishak Gap, a low-lying area in the mountains of the Alaska Peninsula located between Iliamna Lake and Kamishak Bay, which coincides with the proposed port location. Gap winds and drainage winds occur year-round here but are most prevalent in winter months where they can reach 99 knots. This area is also subject to high levels of snow fall, which in conjunction with strong winds, result in a high frequency of restricted visibility events. Sea ice occurs in the proposed port location in winter months and can extend to and beyond Augustine Island. These conditions, coupled with the fact that the narrow-dredged access channel to the port is surrounded by shallow water (<6 fathom) and nearby rocky reefs, increase the likelihood of one or more major incidents (e.g., vessel grounding) occurring over the life of this project. The Draft EIS should include a risk analysis of a major vessel grounding incident occurring and the potential impacts and mitigation of the event, should one occur.

Commercial Fisheries

Construction and operation of the Amakdedori Port has the potential to conflict with commercial salmon fishing activities in this area. The proposed Amakdedori Port is located at the outlet of Amakdedori Creek. Typically, commercial fishing for sockeye and pink salmon occurs 500 yards away from the stream mouth. However, commercial fishing may occur closer than 500 yards from the stream mouth in years when escapement goals have been achieved for this system. Much of this near shore (500 yards) area may be inaccessible to commercial fishermen due to the construction and operation of the Amakdedori Port site. The port site may also present a variety of fishing hazards to the commercial fishing fleet, including port related marine traffic, the natural gas pipeline landfall, navigational markers, the 2,000-foot earthen causeway, as well as ore loading infrastructure. Potential changes in this fishing area could result in loss of revenue

for fishermen in some years for sockeye salmon in Amakdedori Creek. Such changes and potential impacts should be assessed in the Draft EIS.

Although the commercial sac-roe herring fishery is closed due to low abundance, the currently undisturbed habitats of Kamishak Bay can support similar levels of productivity in the future as environmental conditions shift to those experienced during previous periods of high abundance. As the herring population builds and the threshold for a fishery is attained, commercial herring fishing may return to Kamishak Bay. The proposed location for the Amakdedori Port is in an area that historically received considerable fishing effort, and it is immediately north of one of the principal herring spawning areas in Kamishak Bay (i.e., Chenik Head). The Draft EIS should assess potential impacts to this fishery and consider alternate port sites.

Construction and operation of the Amakdedori Port could also affect commercial groundfish and halibut fisheries as a result of impacts to the marine environment and marine resources described above. The project has the potential to hinder the recovery of populations that are depressed such as Tanner, red king, and Dungeness crab species, and to impact crab and weathervane scallop habitats that are necessary to support the fisheries depending on these resources. Additionally, the Draft EIS should assess potential impacts due to marine traffic into and out of the port that may affect access to fishing grounds, impede fishing operations, and jeopardize fishing gear for some species, including pot fishing for Pacific cod, longline fishing for halibut, and noncommercial fishing with pot gear for Tanner crab.

Coastal Wildlife and Marine Mammals

Numerous species use the intertidal, shoreline, and nearshore habitat of Kamishak Bay, including waterfowl, seabirds, shorebirds, brown bears, and marine mammal species. The Draft EIS should evaluate potential impacts to the wildlife whose range includes the Amakdedori Creek drainage, Kamishak Bay, and Cook Inlet.

Construction and operation of the port and associated infrastructure has the potential to impact brown bears that use the coastal habitat of Amakdedori Creek and Kamishak Bay. The development of the port site (as well as other project components; see Wildlife comments under the Road Corridor section above) has the potential to impact the wildlife viewing programs, public safety, and management at MRSGSR and other viewing areas along the Kamishak coast and Katmai National Park and Preserve.

Construction, dredging and port operations area likely to impact shoreline habitats, intertidal and offshore resources. Many species of waterfowl, shorebirds and seabirds use the coastal habitat near the proposed port. Cook Inlet is an important area for migrating shorebirds due to its proximity to breeding sites and high-quality foraging habitat. Kamishak Bay provides important breeding habitat for several seabird species of conservation concern and is one of several molting sites for Stellar's eiders, which also overwinter in Cook Inlet. Baseline studies of abundance, composition, and distribution of seasonal bird use throughout the year may be helpful to understand the potential impacts from port construction and operation. The Draft EIS should assess the direct and indirect impacts of the proposed project to the waterfowl, shorebirds, and seabirds using this area.

Construction and dredging of the port site has the potential to impact numerous marine mammal species. The Draft EIS should include an evaluation of impacts to marine mammals ranging in the project area, with emphasis on Endangered Species Act listed species and the National Oceanic and Atmospheric Administration's Biologically Important Area's within the vicinity of the proposed port site and Gulf of Alaska locations with increased vessel traffic resulting from the project. Direct impacts to species such as Northern sea otters and harbor seals utilizing the

shoreline and intertidal habitat are likely and should be evaluated in the Draft EIS. Additionally, harbor porpoises and Cook Inlet beluga whales are very sensitive to disturbance (construction, dredging, noise, increased vessel traffic) and their use of the bay will likely be impacted and should be evaluated in the Draft EIS. Potential impacts to the foraging habitat and range of the marine mammals, such as whales, porpoises, otters, seals, and sea lions that use the area should be evaluated in the Draft EIS. Increased vessel traffic and associated noise have the potential to affect marine mammals, particularly the harbor porpoise and Pacific white sided dolphin as they are especially sensitive to boat traffic and should be evaluated. Haul out areas should be identified and evaluated in the Draft EIS, as marine mammals that are using haul outs are sensitive to noise and other disturbances.

Water quality and contaminant concerns associated with the port site and operations were previously discussed. Any impacts to water quality and contamination have the potential to affect coastal wildlife, including marine mammals. In addition to addressing potential water quality and contaminant impacts, the Draft EIS should also include potential impacts such as the introduction of invasive species deriving from ballast water discharge by vessels utilizing the Amakdedori port site.

The Draft EIS should evaluate whether potential alternative port site locations exist that would serve the project's needs, while reducing the anticipated impacts to marine mammals and commercial fisheries resources in the Amakdedori Creek/Kamishak Bay location. An alternative port site would also reduce potential impacts to management and public viewing programs at MRSGSR.

NATURAL GAS PIPELINE

Pipeline designs should account for tidal stresses in the Cook Inlet, proximity to volcanoes (Mt Augustine, etc.), and seismic activity in the region. The Draft EIS should review potential alternative alignments for the pipeline route, such as an alignment north of Augustine Island.

Based on recent pipeline installations in Cook Inlet, it may be wise to consider the possibility of trenched installation from uplands to subsea areas as a potential technique. Tyonek pipeline was installed via trenching after consultation with Kenai Peninsula Borough.

Sterling Highway Right-of-Way

The Draft EIS should evaluate practicable alternatives for reducing the amount of natural gas pipeline that is installed in the Sterling Highway right-of-way, which is managed by the DOT&PF. For example, it may be possible to make modifications to the current gas pipeline system on the Kenai Peninsula and relocate the connection point for the proposed Pebble Project system, reducing the amount of pipeline proposed parallel to the Sterling Highway. If it is not practicable to eliminate the entire segment of gas pipeline proposed by the applicant parallel to the Sterling Highway, the DOT&PF recommends proposing the gas pipeline on the opposite side of the highway, so the highway does not get "pinned" between two gas pipelines on opposite sides of the road.

Installation Methods

The project description indicates the proposed pipeline will enter Cook Inlet on the Kenai Peninsula side via HDD. However, there is no mention of how the pipeline is proposed to come out on the Amakdedori Port side. The Draft EIS should describe how the proposed pipeline may make the transition on the west side of Cook Inlet, as well as potential impacts to fish, marine mammals and intertidal species for the entire crossing.

The Draft EIS and the project description should also clarify whether the pipeline is proposed to be pinned or otherwise weighted or secured to the seafloor where it crosses Cook Inlet and Iliamna Lake, and describe design methods to protect the pipeline from subsea hazards.

Further details regarding proposed power sources (e.g. gas or electric) for the proposed compressor stations would be useful in the Draft EIS, along with information regarding whether security structures such as fencing may be installed around the above ground facilities associated with the pipeline (e.g. compressor stations, block valves) to restrict public access.

The Kenai Peninsula portion of the gas pipeline would cross Stariski Creek, which supports spawning, rearing, and migration habitat for Chinook, coho, and pink salmon, Dolly Varden, and steelhead trout. The Amakdedori Creek drainage supports coho, sockeye, pink and chum salmon. The EIS should evaluate ways to avoid and minimize damage to streambank habitat and spawning gravels, as well as disruption to salmon movement, from pipeline installation.

For the proposed crossing of Iliamna Lake, the project description indicates that methods will be similar to the Cook Inlet crossing. The Draft EIS should describe how the lake crossing, burial and transition may take place, as well as potential impacts to fish and marine mammals.

In some cases, HDD drilling muds have been known to propagate into a waterbody (frac-out) because of excessive drilling pressures and site-specific geology. An HDD drilling mud management plan should be developed to minimize the potential for frac-out, as well as to have a plan in place to both detect drilling muds entering waterbodies and to trigger an appropriate course of action. The Draft EIS should also describe any geotechnical work used to determine the proper location and depth of an HDD.

A large amount of water may potentially be needed for pipeline hydrostatic testing, as well as a multitude of other uses. Water sources, methods of retrieval as well as potential disposal methods and sites should be evaluated in the Draft EIS.

Ditching and pipe stringing operations should consider wildlife movements. Extensive lengths of ditch or pipe either awaiting welding or laying, can deflect or form barriers to wildlife movement (moose migration between summer and winter range; caribou seasonal migrations). In the worst case, open ditch could result in animal entrapment. Cross-right-of-way access should be maintained for resident animals during non-migratory periods. Similarly, ditching and pipe installation across some fish streams may need to be scheduled to minimize impacts to the aquatic system.

High-resolution bottom mapping (bathymetric, bottom type, and geotechnical information on the sub-bottom profile) of the marine environment within and adjacent to the proposed natural gas pipeline corridor should be used to guide placement of the pipeline so it avoids sensitive habitats and/or places with hard bottom where the pipeline could not be covered, and abrasion could occur. Sea floor maps can also be used to quantify impacted habitats by type and to select appropriate locations and methods for baseline fishery surveys described below.

Commercial Fisheries

The proposed Pebble Mine includes the construction of a natural gas pipeline from the eastern to the western shore of Lower Cook Inlet, then along the road corridor out to the mine site. The subsea section spanning Cook Inlet is expected to be about 94 miles long and laid either in a shallow trench or directly on the sea floor where water depth exceeds 200 feet. This component of the project falls almost entirely within the Lower Cook Inlet (LCI) Management Area for salmon and herring species and entirely within the Cook Inlet Management Area for groundfish and shellfish species. While ADF&G bottom trawl and weathervane scallop surveys occur

directly in the path of the proposed gas pipeline in Kamishak Bay, relatively few fishery-independent research surveys have been conducted between the eastern extent of these surveys and the proposed pipeline route to Whiskey Gulch. However, fisheries for halibut and Pacific cod do occur over the entire extent of the pipeline, and for scallops on the western portion near Augustine Island. Additional baseline studies to address this data gap may be necessary for the Draft EIS to effectively evaluate potential impacts.

The Draft EIS should evaluate the potential for the natural gas pipeline to conflict with commercial salmon fisheries in LCI, especially in Kamishak Bay where fishing effort is higher and marine waters shallower. Legal purse seine gear used in LCI can be up to 325 meshes in depth, which equates to nets potentially touching bottom in waters 95-feet or less deep, given typical mesh size (3.5 inches). At depths less than 200 feet, the development plan specifies that the natural gas pipeline would be buried in a shallow trench. However, the pipeline could be exposed in areas where hard bottom occurs or where strong tidal currents erode sediment around the pipe, creating the potential for fishing gear to hang up on the structure. The Draft EIS should also evaluate the impacts to commercial salmon fishing if fishing exclusion zones are necessary around the natural gas pipeline.

The proposed gas pipeline route traverses roughly through the center and highest density of the Kamishak Bay weathervane scallop North Bed. The Draft EIS should evaluate the effects of the pipeline on Kamishak Bay weathervane scallop North Bed as well as the potential of direct scallop mortality. The Draft EIS should also evaluate any potential conflicts with the Kamishak Bay commercial scallop fishery. The commercial scallop fishery uses hard on-bottom steel dredges that can weigh more than 1000 pounds. The Draft EIS should evaluate the effects of a potential collision of a scallop dredge with the gas pipeline and determine if this could cause a rupture of the pipeline. The Draft EIS should consider alternate routes for the pipeline that wouldn't impact the scallop resource or the fishery. The Draft EIS should specify the details of the depth of burial and evaluate the potential of the pipeline becoming exposed due to erosional currents. The Draft EIS should evaluate the impacts if scallop fishing closures are necessary around the natural gas pipeline and examine available options to mitigate such closures.

The proposed gas pipeline route also traverses roughly through the center of the historical Kamishak Bay Tanner crab fishing grounds. Though the commercial Tanner crab fishery is currently closed due to low abundance, the undisturbed habitats of Kamishak Bay can support similar levels of productivity in the future as environmental conditions shift to those experienced during periods of high abundance. As the Tanner crab population builds and thresholds are attained, commercial fishing may return at the location of the gas pipeline. The Draft EIS should evaluate the effects of the pipeline on a potential commercial Tanner crab fishery in the vicinity. The Draft EIS should consider alternate routes for the pipeline that wouldn't impact the Tanner crab resource or the fishery. The Draft EIS should evaluate the impacts if a closure area is necessary around a Tanner crab fishery. The Draft EIS should also evaluate the effects and or conflicts of a natural gas pipeline to current ADF&G Tanner crab research in the area. The ADF&G bottom trawl surveys utilize historical tow paths that may intersect the proposed pipeline. If these must be changed to avoid project activities, it may lead to a potential loss of precision and accuracy of the Tanner crab assessment.

Though the population of legal-size Tanner crab is currently depressed, Kamishak Bay, Kachemak Bay, and likely lower Cook Inlet in general continue to experience high levels of juvenile recruitment, as detected in bottom trawl and dredge surveys. Installation of the gas pipeline could result in direct mortality of juvenile Tanner crab. The Draft EIS should consider

alternatives to laying the pipeline directly on the bottom (unburied) or evaluate the effects of an unburied pipeline's impact on crab movements, access to important habitat, and direct mortality.

The Draft EIS should evaluate the effects of the pipeline on commercial halibut and Pacific cod fisheries as well as any sport and subsistence fisheries in the vicinity. Currently, considerable halibut longline and Pacific cod pot fishing occurs along the proposed gas pipeline route, including in water depths greater than 200 feet where the pipeline would be exposed. The Draft EIS should evaluate the potential for direct mortality to weathervane scallops, Tanner crab, and razor clams from pipeline installation. The pipeline may also impede fishing operations and jeopardize the security of fishing gear including dredging for weathervane scallops, pot fishing for Pacific cod, and longline and jig fishing for both Pacific cod and halibut, as well as noncommercial fishing with pot gear for Tanner crab and should be evaluated.

The Draft EIS should document what marine species (and life stages) use the habitat within and adjacent to the proposed natural gas pipeline corridor. The Draft EIS should also evaluate the potential impacts to marine life resulting from a pipeline failure. The Draft EIS should include an analysis of the risk of natural gas entering the marine environment, the impact it would have on marine resources, and how gas line leaks or ruptures would be contained. It should also consider alternative methods for delivering natural gas to the project area.

CUMULATIVE EFFECTS

Development of the Pebble Mine and associated infrastructure, such as a port, roads, and natural gas pipeline, may increase the likelihood other future development occurs in the area and human use increases. The concerns and potential impacts described above would increase in scale, commensurate with the reasonably expected increase in development in this area due to the presence of infrastructure associated with this project. The Draft EIS should consider the potential cumulative effects resulting from all past, present, and reasonably foreseeable future development activities in the areas associated with this project. As appropriate under the NEPA, the USACE may also consider cumulative environmental effects at broader scales, such as global climate change or ocean acidification.

CONCLUSION

In concert with the above comments, the Draft EIS should thoroughly evaluate and describe current environmental, social, and economic conditions found in the analysis area to provide a basis for comparing potential changes resulting from all reasonable alternatives, including the No Action Alternative. The USACE should consider reasonability, feasibility, and practicability when developing action alternatives to be evaluated in detail in the Draft EIS. For example, a full feasibility study should be part of the USACE's evaluation which considers among other things the economics of the proposed project itself as well as economic impacts to the region. The USACE should also consider mitigation measures for potential impacts, including acid rock drainage, tailings, and potential metal leaching, during operation and post-closure. Treatment of waste rock and contaminated water should be addressed, and impacts on fish, water quality, groundwater, surface water, subsistence resources, and public health should be evaluated. Direct, indirect, and cumulative impacts on air and water quality should be addressed. Archeological and cultural resources should be addressed, and the Alaska State Historic Preservation Officer should be consulted regarding archeological and cultural resources in the proposed project area.

As the Pebble Project and evaluation of the project evolves, the principles outlined in this letter should continue to apply.

Thank you for this opportunity to provide scoping comments to inform the Draft EIS. If you have any questions or to discuss any of the above comments in more detail, please contact me.

Sincerely,



Kyle Moselle
Associate Director

Enclosures: Generally Allowed Uses on State Land (August 2011); and
Select State Tools for Managing State Land/Water and Related Public, Activities
involving Fish and Wildlife Resources, Version # 8 (updated December 13, 2010)

cc: Andy Mack, Commissioner, DNR
Larry Hartig, Commissioner, DEC
Sam Cotten, Commissioner, ADF&G

From: [Moselle, Kyle W \(DNR\)](#)
To: [POA Special Projects](#)
Cc: [Moselle, Kyle W \(DNR\)](#); [Craig, Bill](#)
Subject: RE: Pebble: State cooperating agency comments
Date: Friday, December 28, 2018 10:57:08 AM
Attachments: [Pebble EIS Final CA Review ADFG Comments rev1.xlsx](#)

Shane,

I've attached the remainder of the State's cooperating agency technical comments related to the Pebble Project pDEIS for your consideration. The attached workbook is organized into individual worksheets for each division of ADF&G. Please contact me if you or AECOM have any questions or would like to discuss any of ADF&G's comments in more detail. Thank you for providing additional time for ADF&G to complete their review and submit their technical comments following the Anchorage earthquake.

Take care,
Kyle Moselle
Associate Director
Alaska Department of Natural Resources
Office of Project Management and Permitting
907-465-6849
Kyle.moselle@alaska.gov

From: Moselle, Kyle W (DNR)
Sent: Friday, December 21, 2018 1:30 PM
To: POA Special Projects <poaspecialprojects@usace.army.mil>
Cc: Moselle, Kyle W (DNR) <kyle.moselle@alaska.gov>
Subject: Pebble: State cooperating agency comments

Shane,

I've coordinated with various state agencies on the review of the preliminary DEIS for the proposed Pebble Project. The attached spreadsheet contains the State's cooperating agency technical comments and recommendations related to the pDEIS for your consideration. The attached workbook is organized into individual worksheets for each state agency. ADF&G comments are not included in this submission, per your prior approval. I will submit ADF&G's comments by next Friday (12/28/18). Please contact me if you or AECOM has any questions or would like to discuss any of our comments in more detail. Thank you for providing additional time for the State and other cooperating agencies to review the pDEIS. I wish you and your team a Happy & Safe Holidays and I hope you all are able to take a couple days off, you've earned it!

Take care,
Kyle Moselle
Associate Director
Alaska Department of Natural Resources
Office of Project Management and Permitting
907-465-6849

**Pebble Project EIS
Consolidated Comments Table**

Department/Division/Section	Document Name	Section/Fig./Table	Page #	Comment/Issue	Recommendation/Action
ADF&G/Comm. Fish/Homer	Draft EIS	General	General	From a general perspective, the DEIS does not adequately incorporate risk into the assessment of potential impacts. Both the complexity of the project, sensitivity of the habitat/connectivity of the watershed, and long operational timeline of the project should warrant more consideration of potential operational issues, spills, accidents, etc. that may occur over the life span of the project.	Reevaluate how risk is handled and incorporated into the DEIS. If no revisions are made, then provide an explanation about why the risk of spills, accidents, operational issues, etc. was not incorporated.
ADF&G/Comm. Fish/Homer	Chapter 1: Purpose and Need	1.2	1-1	Description of timeframe needed for mine closure and monitoring activities should be estimated/proposed. Saying "many years" is not the appropriate level of detail.	Change description of post-closure timeline from "many years" to specific amount of time required by laws and regulations.
ADF&G/Comm. Fish/Homer	Chapter 2: Alternatives	2.1.2	2-2	States: "Appendix B details each step of the alternatives development process for the Pebble Project EIS." Appendix B was not provided with the draft EIS for agency review.	Provide Appendix B and allow sufficient time for review by Cooperating Agencies.
ADF&G/Comm. Fish/Homer	Chapter 2: Alternatives	2.2.2.1	2-7 Fig. 2-5	The Mining Methods and Phasing section describes the mine site and references Figure 2-5 to illustrate details of the open pit design. Figure 2-5 was not provided for this review.	Provide Figures 2-5 (and all other missing figures) and allow sufficient time for review by Cooperating Agencies.
ADF&G/Comm. Fish/Homer	Chapter 2: Alternatives	2.2.2	2-7	The Closure/Post-Closure Phase Water Management Plan includes a defined timeline for each phase [e.g., Year 20 until bulk TSF consolidation is complete (approx. Year 50)]	Recommend the EIS/Water Management Plan explicitly state that post-closure water management must continue to fullest extent required by regulations and law.
ADF&G/Comm. Fish/Homer	Chapter 2: Alternatives	Tables 2-4, 2-6, and 2-8	2-30, 2-56, and 2-69	Tables lists water extraction site quantity estimates for various project components. However, site descriptions (e.g., site=WES-01, water body type=stream) do not allow reviewers to determine the actual source of water being used. This information is needed to evaluate if the proposed extractions may impact aquatic resources around that site and to determine if adequate baseline data have been collected in that area to make an informed determination of potential impacts.	Please provide accurate water body sources and quantities to be used
ADF&G/Comm. Fish/Homer	Chapter 2: Alternatives	2.2.2.3	2-34	In the Lightering Locations section, the EIS proposes two locations for mooring bulk transport vessels within 12-18 miles from the port. The EIS states the alternate location between Augustine Island and the mainland would offer more protection from waves during poor weather. This may be true for easterly storms, which can be severe. However, the EIS fails to address impacts to port activities generated by the very strong westerly winds that frequently blow straight offshore from Amakdedori Beach. These are called "Kamishak Gap" winds (Fett 1993) because they funnel through the lowest lying portion of the mountains separating the Cook Inlet and Bristol Bay basins. These gap winds hit Cook Inlet at Amakdedori Beach, right where PLP is proposing to locate their port. This issue was also pointed out in ADF&G scoping comments submitted in June 2018, but it has not been addressed in this EIS. Likewise, winter ice conditions in this area can fill the gap between Augustine Island and the mainland, but this issue is not adequately addressed in the EIS, despite it being included in ADF&G's scoping comments.	The EIS should consider the vulnerability of the port and lightering operations due to "Kamishak Gap" winds blowing offshore at Amakdedori Beach. The EIS should also address how port/lightering operations would be impacted by fixed and drifting ice conditions in this area during winter operations.
ADF&G/Comm. Fish/Homer	Chapter 2 Alternatives	2.2.2.3	2-41	In the Port Operations and Materials Transport section, it states that ore-concentrate will be loaded into bulk cargo carrier vessels offshore and that dust generation will be managed by dumping the previously lidded ore containers "as close as possible to the bottom of the hold". How will this help when the ship is nearing capacity and the dumping of concentrate occurs closer to the open hold of the receiving ship? Will operations be halted if wind conditions at lightering sites are sufficient to result in dust not being retained in the hold? ADF&G scoping comments included concerns over copper dust emissions to the environment during loading operations. When dissolved in water, copper is highly toxic to aquatic organisms. The cumulative impact of frequent "minor" dust spills during loading operations at lightering sites should be addressed in the EIS.	As illustrated above (and initially during scoping), high winds are common to the port area and this may lead to copper dust containment issues during lightering/loading operations. The EIS needs to assess the potential impacts from copper dust entering marine waters around lightering sites over the lifetime of the project. An alternative ore concentrate loading method should also be developed and evaluated.
ADF&G/Comm. Fish/Homer	Chapter 2: Alternatives	2.2.2.3	2.41	The EIS indicates up to 27 Handysize ships would be required annually to transport concentrate, and that it would take 4-5 days to fill them while moored at lightering sites. That comes out to ~ 108-135 "loading days" required per year to keep up with ore concentrate production. The EIS should provide baseline weather data (e.g., average and max daily wind speed/direction, sea state, etc.) for the port and lightering sites so agencies can assess the feasibility of safely conducting that volume of loading operations at the proposed and alternate port sites.	Baseline weather data (e.g., average and max daily wind speed/direction, sea state, etc.) for the port and lightering sites should be reviewed along with the proposed number of "loading days" to determining the feasibility of ore loading operations at lightering sites without risking accidental spilling of ore concentrate containers and/or wind driven copper dust emissions. Mitigation measures should include threshold wind levels above which ore transfer operations at lightering sites would be suspended.

ADF&G/Comm. Fish/Homer	Chapter 2: Alternatives	2.2.3.4	2-71	The inset image in figure 2-50 illustrates the primary and secondary lightering sites for the Diamond Point port site (alternative 2). The primary lightering site is in the mouth of Iniskin Bay, where water depths are up to 12 fa (72 ft). However, between this lightering site and similarly deep water offshore there is approximately 10 km of shallower water, including a 5 km stretch that averages closer to 6 fa (36 ft) deep at MLLW. This EIS states that "Handysize" bulk container vessels will be used to transport ore concentrate off site from the lighter locations. However, they do not specify the draft required by a fully laden vessel leaving the lightering site. That information is needed to evaluate the feasibility of safely operating vessels of this size in this area, and the probability of a major incident (e.g., vessel grounding) occurring over the life of this project. It should be noted that Table 2-18 indicates 50 foot water depth is needed to accommodate the bulk carriers. If that is the case then the EIS should describe how PLP plans to get vessels that size in/out of the Iniskin Bay lightering site.	Provide the exact location of the access routes bulk carriers will take to get to each of the lightering stations, the depth of the water along the route (and a reasonable distance on either side to account for vessels blown off course), the bottom type along and alongside the route (e.g., hard rock, soft mud), and the tide windows that will be needed to safely transit those areas when empty and when fully laden. The EIS is incomplete without that information as it is impossible to assess how appropriate the proposed lightering sites are, nor the probability of a major incident occurring and the potential impact of such an incident.
ADF&G/Comm. Fish/Homer		2.2.2.3	2-41	"Two ice-breaking tug boats would be used to support marine facility operations." This area, due to very high tidal current flow does not typically form thick sheet ice, as may be the case in the Bering sea and Arctic ocean. Therefore, "breaking ice" with the intent of forming a navigable channel behind the tug may not work as intended. In addition, this dynamic ice flow may present scouring and impact problems for vessels transiting this area when ice floes are present and dense.	Take into account pack-ice in this unique and high current environment.
ADF&G/Comm. Fish/Homer	Chapter 2: Alternatives	2.2.3.4	2-71	Figure 2-50 illustrates the alternative port site at Diamond Point, including the shoreside facilities, which appear to be located directly over a creek and within the floodplain created during high flow events draining the basin directly above the shoreside facilities, which includes 4 fuel tanks storing up to 5 million gallons of diesel fuel. Figure 2-51 also illustrates the slope of surrounding terrain and the potential for landslides and avalanches to impact shoreside facilities at this location. However, the EIS does not adequately address the risks associated with siting the port/shoreside facilities at this location, nor does it discuss how the site will be engineered to mitigate these problems.	EIS needs to provide key engineering design details for the shoreside facilities associated with the Diamond Point port site. It should also assess the risks associated with locating these facilities over a creek and within floodplain and avalanche zones, and what mitigation measures may be needed to manage those risks.
ADF&G/Comm. Fish/Homer	Chapter 2: Alternatives	2.2.3.4	2-74	The Natural Gas pipeline alternative that comes ashore at Ursus Cove and then runs overland to Cottonwood Bay appears to require a right of way (ROW) through the Brown's Peak Creek drainage (see Fig 2-52). Brown's Peak Creek is an anadromous stream with an escapement goal for pink salmon and runs of sockeye, coho, and Chinook salmon and Dolly Varden. The draft EIS provides no engineering details on how the NG pipeline would be sited/constructed through this drainage to minimize impacts to aquatic resources in this stream.	EIS should provide key siting and engineering details re: the location and construction of the Natural Gas pipeline route from Ursus Cove to Cottonwood Creek and how it will avoid impacts to Brown's Peak Creek, an anadromous stream.
ADF&G/CF/Homer	Chapter 2: Alternatives	2.2.4.2 Table 2-10	2-85	Table 2-10 lists water extraction site quantity estimates for various project components under Alternative 3. However, site descriptions (e.g., site=WES-N05, water body type=stream) do not allow reviewers to determine the actual source of water being used. This information is needed to evaluate if the proposed extractions (500-1000 GPM, year round) may impact aquatic resources around that site and to determine if adequate baseline data have been collected in that area to make an informed determination of potential impacts.	Identify specific water sources to be used.
ADF&G/Comm. Fish/Homer	Chapter 2: Alternatives	2.2.4.5	2-92	In the Diamond Point Port section under the Concentrate Pipeline Variant of Alternative 3, it states that conveyor belts would be used to move dewatered ore concentrate from the dewatering plant to the bulk carrier barges at the dock and that "appropriate controls" will be used to address the potential for fugitive dust emissions. Figure 2-63 shows the conveyor terminating at a "barge loader on fixed pivot" where it appears ore concentrate would be dropped into open containers on barges, creating the potential for fugitive dust emissions.	EIS should provide more detail on how concentrate dust emissions will be managed during bulk loading operations under this alternative.
ADF&G/Comm. Fish/Homer	Chapter 2: Alternatives	2.3	2-97	Section 2.3 discusses alternatives that were eliminated from further consideration and references Appendix B for details on all 70 proposed alternatives and the rationale for their dismissal. Appendix B was not provided to agencies for review. Table 2-12 provides a list of proposed alternatives that were dismissed, but it does not include USACE rationale for dismissal of each alternative.	Provide Appendix B and allow sufficient time for review by Cooperating Agencies.
ADF&G/Comm. Fish/Homer	Chapter 2: Alternatives	2.2.2	2-3	This section summarizes the proposed action (Alternative 1) for the project and references Appendix N for detailed information on engineered facilities and operations for the project from initial construction through closure and reclamation. Appendix N was not provided to agencies for review.	Provide Appendix N and allow sufficient time for review by Cooperating Agencies.

ADF&G/Comm. Fish/Homer	Chapter 2: Alternatives	2.2.2.3	2-34	Design specifications are lacking. Though patio elevation is given in subsequent sections, a through description of dimensions of the facility in text and drawings should be included. Given the 78-year projection considering the RFFAs included in the DEIS, the exposure of the port to tsunamis is great and the predicted ground acceleration from earthquakes is high. Therefore risks to the large capacity fuel tanks and other chemicals storage should be considered. Figure 2-28 shows a "curb" for perimeter containment and doesn't seem adequate.	EIS should provide more details, such as the containment capacity of the tank storage and the snow removal plan. The EIS should include safety measures being considered should a maximum estimated seismic or debris avalanche generated tsunamis occur.
ADF&G/Comm. Fish/Homer	Chapter 2: Alternatives	2.2.2.3	2-34	There is no mention of the magnitude 7.1 earthquake that occurred on 1/24/2016, at 01:30AM with an epicenter in Iniskin Bay. This is within a few miles of Williamsport and approximately 30 miles north of the Amakdedori River. This could have significant implications that may need to be considered for both the Amakdedori access as well as the Williamsport access options.	Include discussion regarding the January 24, 2016 earthquake. It had a magnitude of 7.1 and was centered in the Diamond Point area. Provide explanation regarding why earthquakes of this magnitude centered near the project site and corridor will not be an issue for project infrastructure. Consider impacts to this project from earthquake activity.
ADF&G/Comm. Fish/Homer	Chapter 2: Alternatives	2.2.4	2-78	"Alternative 3-North Road Only (Alternative 3) is being considered as an alternative that addresses alternative transportation corridor and natural gas pipeline routes that were carried forward from screening, and eliminates the need for ferry transportation across Iliamna Lake." Not all benefits for Alternative 3 are stated- for example, the upgrade of an existing/utilized road that could be left in place for long term use.	The DEIS should consider the benefits (eg., upgrade existing road for long-term use) of this alternative as it further develops the Williamsport area, which has already incurred some impacts, while eliminating impacts to the undeveloped Amakdedori watershed/Kamishak Bay area.
ADF&G/Comm. Fish/Homer	Chapter 3: Affected Environment	3.1.4.2	3.1-4	Climate and Meteorology does not include a description of weather conditions at the Amakdedori Port area or in Kamishak Bay and lower Cook Inlet. The SOA provided scoping comments on weather conditions in the Amakdedori Port area and Kamishak Bay that appear to have been ignored in the DEIS. Sea ice conditions, tidal currents, and Kamishak Gap winds have been completely ignored or understated. Weather and sea conditions will not effect operations individually but in concert.	Recommend that monthly significant wave height and wind speed, and icing conditions summary be included for marine waters. Sea ice conditions should also be included for Kamishak Bay. Other known weather phenomena such as gap and drainage winds at the Amakdedori Port area and transportation corridor should be acknowledged.
ADF&G/Comm. Fish/Homer	Chapter 3: Affected Environment	3.2.2.1	3.2-6	Narrative under the NOAA section incorrectly states that the Kachemak Bay National Estuarine Research Reserve (NERR) is a state/federal partnership between NOAA and ADF&G. That was originally the case, but no longer. The State partner is now the University of Alaska (not ADF&G).	Revise paragraph for accuracy. More information can be found at http://accs.uaa.alaska.edu/kbnerr/
ADF&G/Comm. Fish/Homer	Chapter 3: Affected Environment	3.6.1.1	3.6-8	The DEIS presents data on the price of Bristol Bay sockeye compared to other fisheries. While the reasons given are mostly factual they only reflect the past and current market pressures and the trends in how the fish are processed.	Historic average prices should be adjusted to reflect present day values.
ADF&G/Comm. Fish/Homer	Chapter 3: Affected Environment	3.2.2.3	3.2-9	Kenai Peninsula Borough (KPB) section states that the KPB regulates floodplain development near certain anadromous streams, including Amakdedori Creek, adjacent to the port site.	KPB Comprehensive Plan should be reviewed to see how the referenced regulations addressing development near anadromous streams would affect constructing large fuel storage tanks adjacent to Amakdedori Creek.
ADF&G/Comm. Fish/Homer	Chapter 3: Affected Environment	3.6.2	3.6-21 through 3.6-23	The overall tone of this section down plays the value of commercial fisheries in lower Cook Inlet	Present the data and a more objective assessment of the commercial fisheries in the area.
ADF&G/Comm. Fish/Homer	Chapter 3: Affected Environment	3.6.2	3.6-22	Description of LCI groundfish species targeted in commercial fisheries in state waters should include lingcod and non-targeted commercial harvest should include octopus. Also, the paragraph focusing on groundfish fisheries uses generic "Rockfish" as opposed to listing the various species of rockfish harvested.	Add lingcod and octopus to the list of species commercially harvested in state marine waters of Lower Cook Inlet. Also, list rockfish by species rather than lumping them under "rockfish".
ADF&G/Comm. Fish/Homer	Chapter 3: Affected Environment	3.6.2	3.6-22	There is no mention of Tanner crab, red king crab, or weathervane scallop fisheries. Though crab fisheries are currently closed due to low stock abundance (due to funding cuts, no surveys are conducted in Kamishak Bay so the population status is currently unknown) these used to be very valuable fisheries. There is a commercial weathervane scallop fishery within the pipeline corridor. Development could result in a direct loss of fishing opportunity since the dredge gear is hard on bottom. These suggestions were previously included in ADF&G's scoping comments.	Revise section to include additional fisheries and provide historical harvest levels and the potential to impact stocks that are currently closed to fishing, but could be opened in the future.
ADF&G/Comm. Fish/Homer	Chapter 3: Affected Environment	3.6	3.6-22 & 3.6-23	Two paragraphs referencing groundfish and halibut are poorly organized and include inaccuracies, such as "Limited fishing occurs near the pipeline's western terminus" (not true for halibut fishery), inaccurate summarization of management of the commercial halibut fishery, and minimizing the amount of harvest that occurs in the area of the proposed pipeline. Scoping comments provided by ADF&G previously summarized these fisheries.	Revise text to include the following information: The Pacific cod fishery is the largest commercial groundfish fishery in the Cook Inlet Area with about half of the total harvest occurring in the Cook Inlet District (waters of Cook Inlet north of a line from Cape Douglas to Point Adam). For combined federal and state waters of the Cook Inlet District over the recent 20 years, annual Pacific cod harvest has averaged ~2.7 million lb with a high of ~4.4 million lb, about 40% of which typically occurs in the federal waters between Kamishak and Kachemak Bays. The exvessel value of the fishery in the Cook Inlet District in 2017 was just under \$1 million with 37 vessels harvesting Pacific cod. The federally managed commercial Pacific halibut fishery in the Cook Inlet District had an average annual harvest of ~437,000 lb of halibut over the recent 10 years, with 66% of that harvest occurring in the federal waters between Kamishak and Kachemak Bays. In 2017, 42 vessels participated in the halibut fishery. Other commercially important species harvested in the Cook Inlet District include lingcod, rockfish, sablefish, walleye pollock, spiny dogfish, and skate species.

ADF&G/Comm. Fish/Homer	Chapter 3: Affected Environment	3.6.2	3.6-22 & 3.6-23	Commercial shellfish fisheries are completely omitted from this chapter. Extensive comments on shellfish fisheries in Cook Inlet that could be impacted by the proposed pipeline were provided in scoping comments. In particular, the weathervane scallop fishery and the scallop resource (bed) would be impacted, and there exists the potential for gear conflicts from scallop dredge interaction with the pipeline.	Revise text to include the following information: Weathervane scallops are found throughout the Kamishak Bay District and commercial harvest of this resource began in 1983. The fished component of the population is aggregated in two areas, or scallop beds, located east (North bed) and southeast (South bed) of Augustine Island in depths ranging from 30 to 90 m. Population biomass of whole scallops estimated from ADF&G dredge surveys conducted since 1996 has averaged ~5.7 million lbs. in the North bed and ~2.5 million lbs. in the South bed peaking at ~12.9 million lbs. in the North bed and ~6.8 million in the South bed. This biomass has supported a commercial fishery of up to 5 vessels harvesting ~28,000 lbs. of shucked scallop meats. Commercial harvest of Tanner crab in Kamishak Bay began in the mid-1960s but has been closed since 1991 due to low stock abundance. Harvest over this period for the Kamishak Bay and Barren Islands districts averaged ~1.6 million lb to over 4.6 million lb. Although the commercial fishery is currently closed, the noncommercial fishery was reopened to harvest in 2017 after being closed since 2012 due to low stock abundance. A commercial red king crab fishery occurred in the Kamishak Bay and Barren Islands districts from 1960 until 1984 when it was closed due to low stock abundance. Harvest over this period averaged ~2 million lb of king crab and peaked at ~5.5 million lb. The current population status of king crab in Kamishak Bay is unknown due to lack of assessment data, although it is considered a depressed stock. An active commercial razor clam fishery occurs around Polly Creek in Upper Cook Inlet, where the average annual harvest over the past 10 years was 314,000 lbs (in the shell). Other commercially important crab and shellfish species occur in Kamishak Bay including Dungeness crab, red sea cucumber, octopus, and many species of Pandalid shrimp.
ADF&G/Comm. Fish/Homer	Chapter 3: Affected Environment	3.6.2	3.6-23	Statement that "halibut fishermen...can fish anywhere in the 3A managed area" is an opinion that does not take into account travel time, weather, location of halibut resource, home port of fishermen, vessel size limiting ability to fish offshore, fuel costs being cost prohibitive to long trips for some fishermen, etc. Also, stating that "fishermen have...flexibility to avoid... pipelines and... cables" is minimizing the potential impact and gear impacts as well as making assumptions about fisheries and resources without providing facts to back up these statements.	The DEIS should refrain from irresponsible opinions implying that it doesn't matter if the resource is adversely affected in that area or if the project might displace fishermen. The document should maintain professional integrity and provide information on current fishing practices and potential impacts from the project.
ADF&G/Comm. Fish/Homer	Chapter 3: Affected Environment	3.6.3	3.6-23	No mention of recreational marine fisheries including Pacific halibut, multiple groundfish species, and Tanner crab, along with the potential for additional shellfish species if populations were to recover.	Include information on sport fisheries for halibut, groundfish, and Tanner crab, which are an important resource for the communities of Cook Inlet.
ADF&G/Comm. Fish/Homer	Chapter 3: Affected Environment	3.6.2	3.6-23	The following statement " Federal management areas are much larger than state management areas; thus, fishermen have greater flexibility to avoid fixed assets such as buried pipelines and undersea cables. For example, the statement, "halibut fishermen holding halibut quota for international Pacific Halibut Commission 3.6-23Area 3A, which includes Cook Inlet, can fish anywhere in the 3A managed area." implies that a takings is ok. Many halibut IFQ holders are small boat fishermen that salmon fish in the summer. To assume a small boat fishermen can go anywhere in 3A in the fall and winter months is not realistic. The loss of fishing opportunity is also cumulative, as this would not represent the first displacement of the fishing industry in the area.	The EIS should not determine what the value of one resource is over another. The EIS should instead state what the possible losses would be to existing activities should the development go forward. Delete quoted text and referenced map and replace with a statement that there would be a loss of fishing opportunity if these activities proceeded. Provide a surveyed map of the pipeline installation and state what if any buffer would be required for on bottom fishing gear and vessel anchoring to avoid conflict with the pipeline.
ADF&G/Comm.Fish/Homer	Chapter 3: Affected Environment	3.6.3.1	3.6-28	No mention of the Cook Inlet communities that benefit from sport fisheries, particularly as it relates to charter vessel businesses and tourism, as well as sport harvests that are important food source of Alaskan residents that put up fish for freezing and canning in these communities as well as Anchorage.	Include information on economic benefit to livelihood of residents and visitors to the Kenai Peninsula who fish in Cook Inlet.
ADF&G/Comm. Fish/Homer	Chapter 3: Affected Environment	3.12.3.3	3.12-5 through 3.12-6	Lacking data on wind speed. Lacking data on the exact location of navigational hazards between the port and lightering sites.	include information on wind speed and navigation hazards
ADF&G/Comm. Fish/Homer	Chapter 3: Affected Environment	3.13	All	The section appears to be written from the perspective of what contributed to the formation of the Pebble deposit and what contributed to the formation of other resources in the area that could be developed. There is no mention of the geology and its contribution to the fish population.	This section should be rewritten. The DEIS geology section should present the geological setting for the region, without sole focus being on the deposit. Though faults and volcanos are addressed in section 3.15 they should be acknowledged here as well.
ADF&G/Comm. Fish/Homer	Chapter 3: Affected Environment	3.15.5	3.15-12	The tsunamis inundation model cited (Crawford 1978) is out of date. The DEIS states that "Tsunami wave height predictions for 100- to 500-year return period events (combined with high tide) in lower Cook Inlet are estimated to be 12 to 23 feet above mean sea level (AMSL) in the Amakdedori area of Kamishak Bay" This same report reported similar estimates for Homer (Gage # 246) of 13.5 – 21.3 ft. New inundation maps were just completed for Homer and Seldovia and report a maximum predicted wave height of 33 – 40 ft. above MHHW for Homer (Suleimani et al 2018). Likewise, the DEIS cites recent tsunami modeling that predicts a higher elevation (28.5 ft. run-up elevation above MHW). I don't see this in the ASCE 2017 report they cite, however. Having the actual study report would be needed to confirm this estimate. Based on the updated inundation map for Homer, this estimate seems low.	The report citing the recent tsunami modeling needs to be provided. These data are not contained within the cited report.
ADF&G/Comm. Fish/Bristol Bay	Chapter 3: Affected Environment	3.24.1.1	3.24-1	First paragraph describes the Kvichak River as 50 miles long. It is 70 miles long.	Change 50 miles to 70 miles.

ADF&G/Comm. Fish/Homer	Chapter 3: Affected Environment	3.24.1.1	3.24-13	The gas pipeline has the potential to affect more than what has been stated. The substrates are much more complex in Kamishak Bay than stated and there is no mention of the hard substrate communities. Additionally, no mention of substrate composition on the east side beaches that support clams.	Revise section to include recommended information. If baseline studies exist, include them and if not the studies should be completed prior to finalizing the DEIS.
ADF&G/Comm. Fish/Homer	Chapter 3: Affected Environment	3.24.1.1	3.24-14	There is no mention of kelp in the description of Amakdedori Port.	Describe the kelp species and extent there and the fact that this is spawning substrate for Pacific herring.
ADF&G/Comm. Fish/Bristol Bay	Chapter 3: Affected Environment	3.24.1.2	3.24-14 through 3.24-19	The Nushagak River Chinook salmon run is one of the largest Chinook salmon runs in the state.	Provide a description of the size and value of the Nushagak River Chinook salmon run.
ADF&G/Comm. Fish/Bristol Bay	Chapter 3: Affected Environment	3.24.1.2	3.24-22	The discussion on abundance of spawning sockeye in the eastern part of Iliamna lake should be expanded. Aerial surveys indicate highly variable escapements to these habitats, with aerial survey estimates ranging from tens of thousands to over 2 million spawning sockeye salmon (Morstad 2003).	Expand the discussion/context of the sockeye spawning in Iliamna Lake.
ADF&G/Comm. Fish/Homer	Chapter 3: Affected Environment	3.24.1.2	3.24-22	Section describing species found in the Cook Inlet Portion of the Natural Gas Pipeline Corridor does not include the following important forage fish: sand lance, eulachon	Add sand lance and eulachon to the list of species found Cook Inlet along the pipeline corridor.
ADF&G/Comm. Fish/Homer	Chapter 3: Affected Environment	3.24	3.24-22 & 3.24-23	Note that information included here on species occurrence for groundfish and shellfish species is actually complete and further confounds the exclusion of these species in the earlier sections mentioned.	Utilize information provided in the section to expand fishery resources information in 3.6. Ensure DEIS is consistent.
ADF&G/Comm. Fish/Homer	Chapter 3: Affected Environment	3.24.1.2	3.24-23	The information provided on fisheries in the immediate area of the Amakdedori River is incomplete. There is no reference to the Kirschner Lake sockeye remote release site, (established 1985) that is 10 miles away, or the Paint River salmon ladder that is 8 miles to the south of the proposed Amekdadori port complex. In addition, Chenik Lake is only 4 miles south of the Amakdedori site and information is limited. All of these are major salmon producers that are fished commercially in the summer. Commercial harvest also occurs in Iniskin and Iliamna Bay. Both of these bays are associated with the Diamond Point alternate site. Further to the south is the McNeil River which is in the McNeil River Wildlife sanctuary. Further south is Kamishak Bay where significant numbers of chum, coho, and pink salmon are regularly harvested by commercial permit holders. Purse seine gear is operated seasonally in the immediate area of the mouth of the Amakdedori River. Information about alternate sites should be included also (eg. Iliamna and Cottonwood bays are fished commercially for pink and chum salmon.)	Include more information on, and evaluation of potential impacts to, commercial salmon fisheries in the area of the proposed Amakdedori and Diamond Point port locations.
ADF&G/Comm. Fish/Homer	Chapter 3: Affected Environment	3.24.1.2	3.24-23	Description of hardshell clam abundance in Lower Cook Inlet should be updated. Hardshell clams are no longer "prolific" in Kachemak Bay. Likewise, Red and Golden king crab are likely no longer found in Cook Inlet.	Update this section with more accurate narrative on LCI shellfish populations.
ADF&G/Comm. Fish/Homer	Ch. 3 Affected Environment	3.24.1.2	3.24-23	Description of salmon and herring resources in Kamishak Bay marine and freshwaters should be updated. The recent 10-yr average escapement of pink salmon to Amakdedori Creek was 7.5 thousand (Hollowell et al. 2017). McNeil River and Ursus Cove should be added as major chum salmon producers. The Kamishak Bay sac roe herring fishery has been closed to commercial fishing since 2000 (Hollowell et al. 2017)	Update this section with more accurate narrative.
ADF&G/Comm. Fish/Homer	Chapter 3: Affected Environment	3.24.1.2	3.24-23	The DEIS states that the proposed port site will be <u>near</u> Amakdedori Creek which the DEIS identifies as having an abundant sockeye salmon population. The proposed port is actually located at the mouth of Amakdedori Creek in the historic floodplain of this river and in neighboring wetlands. Commercial fishing which normally occurs offshore of the river mouth will be impossible for the life of this project. There is no mention of Kirschner Lake which is a sockeye enhancement project that has operated since 1985 and is only 10 miles from the port. In addition, while the report mentions three chum salmon systems by name, (Big Kamishak River, Little Kamishak River, and Cottonwood Creek) there are four other chum salmon index systems in close proximity to the proposed Amakdedori Port. These are the McNeil River, Bruin River, Ursus Cove, and the Iniskin River. Note that the Iniskin River is approximately 5 miles east of the Diamond Point quarry and salmon runs to the Iniskin River (and Cottonwood Creek) could be potentially impacted if development occurs there.	The DEIS should properly state that the proposed port is at the mouth of Amakdedori Creek. Additional waterbodies mentioned above [in this comment] should be included in the description and analysis of the DEIS.
ADF&G/Comm. Fish/Bristol Bay	Chapter 3: Affected Environment	Table 3.24-6	3.24-29	Anadromous stream crossings have an "n/a" in the feature column. This table appears to have incorrect streams or is incomplete depending on what it is intended to show. Alternative 2 text states that 23 anadromous fish streams would be crossed, but only 9 streams are listed in the table. The Iliamna River is east of Eagle Bay and is not on the road corridor for this alternative.	

ADF&G/Comm. Fish/Bristol Bay	Chapter 3: Affected Environment	3.24.2.2	3.24-30 & 3.24-31	This section is lacking descriptions of the diversity of sockeye salmon habitat in the Kvichak drainage.	Revise section: There are 22 genetically distinct populations of sockeye salmon in the Kvichak drainage that make up four sub-stocks of the greater Kvichak River stock (T. Dann, Fisheries Geneticist, ADF&G, Anchorage, personal communication).
ADF&G/Comm. Fish/Homer	Chapter 3: Affected Environment	3.24.1.2	3.24-24	In the Transportation and Natural Gas Pipeline Corridors section it describes two macroinvertebrate sampling sites, one in Y Valley Creek and another at an "unnamed creek site" and then references Figure 3.24-6, presumably so we can see the locations of those sites (especially the unnamed one since no lat/longs are provided). However, in the materials we were provided, Figure 3.24-6 depicts "Iliamna Lake Alternatives", not Cook Inlet Aquatic invertebrate sampling sites. So we have no idea where this "unnamed creek" site is and how relevant it may be towards characterizing macroinvertebrate and periphyton communities near the proposed port site at Amakdedori Creek.	Provide lat/longs for study sites and label their locations on Figure 3.24-6 or provide a new figure with that information.
ADF&G/Comm. Fish/Homer	Chapter 3: Affected Environment	3.24.1.3	3.24-26	Description of macroinvertebrates commercially harvested in Lower Cook Inlet (in the Cook Inlet Portion of the Natural Gas Pipeline Corridor section) needs to be updated. Crabs, butter and little neck clams, and shrimp are no longer commercially harvested. However, scallops are targeted in a commercial fishery in LCI but they are not included in the DEIS list.	Update this section with more accurate narrative.
ADF&G/Comm. Fish/Homer	Chapter 3: Affected Environment	3.24.1.3	3.24-26	The Amakdedori Port section simply states "Available information is included in the Cook Inlet Portion of the NG Pipeline section". However, the referenced section contains no information whatsoever on aquatic resources (marine or freshwater) in the immediate vicinity of Amakdedori Creek. Question: How can an EIS effectively review potential impacts from proposed activities when it doesn't include baseline studies focused in the immediate vicinity of a proposed major port/fuel storage facility?	include more data to establish a baseline
ADF&G/Comm. Fish/Homer	Chapter 3: Affected Environment	3.24.1.3	3.24-26	Aquatic invertebrates for CI portion of gas pipeline corridor is incomplete.	Should include sessile invertebrates such as coral, sponges, sea whips, and sea pens. These are all known to be important habitat for groundfish and crab and shrimp species. All of these occur in Kamishak Bay. There are extensive sea whip and sea pens colonies in the corridor and these are known to increase survival of early settled weathervane scallops and Tanner crab. Pacific halibut and Pacific cod, two of the most important groundfish species in LCI consume a diverse diet of marine invertebrates many of which are not commercially fished. These should be included.
ADF&G/Comm. Fish/Homer	Chapter 3: Affected Environment	Fig. 3.24-6	3.24-27	Figure 3.24-6: Cook Inlet Aquatic Invertebrates Sampling Sites. The actual figure does not show any CI sampling sites.	Update figure and provide data sources.
ADF&G/Comm. Fish/Homer	Chapter 3: Affected Environment	3.24.1.4	3.24-28	This section on Fish Tissue Trace Element Analysis only includes samples from the mine site and none from Amakdedori Creek, the applicant's preferred location for the port site (Alternative 1). The applicant proposes to store 5 million gallons of fuel, store concentrate (potential source of dust drift), and operate equipment next to Amakdedori Creek (an anadromous stream with significant sockeye and pink salmon runs), but chose not to include it as a sample site for fish tissues. This baseline data is needed to assess potential impacts in the future.	The missing baseline data (tissue samples from resident and anadromous species in Amakdedori Creek to characterize baseline metals concentrations) should be collected to accurately establish a preproject baseline.
ADF&G/Comm. Fish/Bristol Bay	Chapter 3: Affected Environment	3.24.2.2	3.24-31	The Iliamna Lake section describes the route and references previous sections, but does not address fish resources.	Suggest adding: "This route is immediately adjacent to sockeye salmon spawning beaches on the south side of Pile Bay (Southeast Beaches and Finger Beaches) and the along the islands important to spawning sockeye salmon (Porcupine Island, Flat Island, Ross Island, Triangle Island, and Eagle Island; Morstad 2003)."
ADF&G/Comm. Fish/Bristol Bay	Chapter 3: Affected Environment	3.24.2.2	3.24-31	Access Corridor section does not sufficiently address fish resources.	Suggest adding: "Iliamna River and Chinkleyes Creek are important habitat spawning habitat for sockeye salmon. Aerial survey estimates indicate that hundreds of thousands of spawning sockeye salmon use the system in some years (Morstad 2003).
ADF&G/Comm. Fish/Bristol Bay	Chapter 3: Affected Environment	3.24.3.2	3.24-34	Very limited site visits are used to describe fish resources in these watershed groups. There are significant populations of sockeye salmon that spawn in these watersheds.	Include adequate fish surveys in these drainages and expand on the description of fish resources.
ADF&G/Comm. Fish/Homer	Chapter 3: Affected Environment	3.24.3.3	3.24-35	The Infauna section references Figure 3.24-6 to identify intertidal sites sampled between 2004-08. However that figure depicts Iliamna Lake alternatives and has no details on intertidal sampling sites or habitats.	Create a new figure that provides the intended information on sampling sites and habitats. Note that this same figure has been incorrectly referenced multiple times to illustrate various Cook Inlet coastal sampling sites (e.g., macroinvertebrate/periphyton, epibiota, and infauna).
ADF&G/Comm. Fish/Homer	Chapter 3: Affected Environment	Fig. 3.26-6	Figure provided separately and reference in the text doesn't match up	It is unclear if this vegetation map is complete, as there are a lot of "other" segments in the map.	Define "other" and clarify what the vegetation map is showing. Also, another Figure 3.26-6 (pie graph) is included in the DEIS creating confusion.
ADF&G/Comm. Fish/Homer	Chapter 3: Affected Environment	3.26-6	3.26-9	There is no vegetation mapping on this figure. See previous comment.	Update figure and provide data sources.
ADF&G/Comm. Fish/Homer	Chapter 3: Affected Environment	3.9	All	Although Cook Inlet communities of Ninihchik and Seldovia are referenced, the native villages of Nanwalek and Port Graham and their residents' use of subsistence resources is omitted.	Include specific information on use of subsistence resources by Cook Inlet communities, and include sections by community, particularly for Nanwalek and Port Graham (similar to information provided for Bristol Bay native communities).

ADF&G/Comm. Fish/Homer	Chapter 4: Environmental Consequences	All	All	There are some rather sweeping statements made about how the different parts of the project would not affect the different land uses.	There are many activities and types of infrastructure associated with each part of the proposed project. The statements should be parsed out and made more specific to support claims of "would not affect". Quantifying the acreage that would shift from one use to another would be informative.
ADF&G/Comm. Fish/Homer	Chapter 4: Environmental Consequences	4.1.1	4.1-1	The magnitude, duration, geographic extent and potential for impacts are minimized throughout Chapter 4. As stated above, it is concerning that the DEIS does not include risk assessments with likelihoods and probabilities for normal activities and for accidents. As defined in this section, the "intensity of the impact" can only be estimated if the likelihood and probability of a normal activity or a failure is evaluated. Likewise, the duration of the impact can only be estimated under the same criteria. The same goes for the geographic extent. Iliamna Lake is the largest sockeye salmon rearing lake in the world and just down stream from the mine site. The potential impacts evaluated throughout Chapter 4 are mostly compartmentalized. Individual effects on surface water or groundwater contamination can cascade in the event of infrastructure failures (mining and processing facilities, drainage management structures, storage and disposal facilities, and other operational infrastructure). The consequences can increase the geographic extent of the event (e.g. surface water contamination in Iliamna Lake). Indeed, in section 4.1.1, "Potential" is defined as "How LIKELY the impact is to occur". This can only be evaluated in a risk assessment framework where the likelihood and probabilities can be estimated.	Risk needs to be included in all Chapter 4 sections. This whole chapter is written as if over the 78 year life span of the project, everything will go as planned and there will be NO accidents or failures.
ADF&G/CF/Homer	Ch. 4	4.1.2	4.1-2	The operations phase is confounded by the 78-year buildout identified in the RFFAs.	Reconcile the time periods.
ADF&G/Comm. Fish/Homer	Ch. 4	4.1.3	4.1-2	The RFFAs are understated. One week before Pebble's announcement of its new mine plans, the CEO of Pebble's parent company, Ron Thiessen, gave a presentation to investors where he outlined plans for a much larger mine than the one currently proposed by Pebble . http://www.denvergoldforum.org/dgf17/company-webcast/NDM:CN/ Overall, Thiessen talked about expanding the currently planned mine pit by building the pit out to the east and north to mine up to 10 billion tons of material as well as developing potentially up to 12 additional mines within Pebble's 417 square mile mine claim block. He also acknowledges that the highest grade ore they have found in exploration drill holes is located to the east of and adjacent to the current plans and that these resources are not included in the 10 billion tons and that he sees this project as "multi-generational." The 78-year buildout is considered an RFFA in the DEIS. This, however is for a 6.5 B tons. In Ron Thiessens words, Pebble is planning for a 10 B ton mine.	Expand the narrow definition of RFFAs. At the least, RFFAs should include mining claims held by and stated by Northern Dynasty as part of the overall strategy for development.
ADF&G/Comm. Fish/Homer	Chapter 4: Environmental Consequences	4.1.3.2	4.1-7	In Table 4.1-1 the Big Chunk North project is deemed "reasonably foreseeable" for further exploration, but NOT for development within the 78-year time span USACE is considering for the Pebble Project. I don't know how they can draw that conclusion. NDM acquired these claims in 2014, EPA's 2014 Watershed Assessment considered this project under their cumulative effects analysis, and USACE's own note in Table 4.1.6 acknowledges that if future exploration by NDM (who owns the Big Chunk North claims) is completed and indicate viability then that project could be facilitated by access to the Pebble project's transportation infrastructure.	Recommend check with USACE to make sure they are correctly assessing Big Chunk North
ADF&G/Comm. Fish/Homer	Chapter 4: Environmental Consequences	4.1.3.2	4.1-7-8	In Table 4.1.1 the Fog Lake project is deemed "reasonably foreseeable" for further exploration, but NOT for development within the 78-year time span USACE is considering for the Pebble Project. EPA's 2014 Watershed Assessment considered this project under their cumulative effects analysis, and USACE's own note in Table 4.1.6 acknowledges that if future exploration by the claim holder is completed and indicates viability then that project could be facilitated by access to the Pebble project's transportation infrastructure if an arrangement is reached with PLP.	Recommend check with USACE to make sure they are correctly assessing Fog Lake
ADF&G/Comm. Fish/Homer	Chapter 4: Environmental Consequences	4.1.3.2	4.1-8	In Table 4.1-1 the Groundhog Project is deemed "reasonably foreseeable" for further exploration, but NOT for development within the 78-year time span USACE is considering for the Pebble Project. It is unclear what this assessment is based on. This claim is just 6km from the Pebble Project area and ADNR issued the claim holder an exploratory permit in 2017. EPA's 2014 Watershed Assessment considered this project under their cumulative effects analysis. Given it's close proximity to the Pebble mine, it is not unreasonable to anticipate this mine will be developed once resource delineation has been completed and the claim holder works out an agreement with PLP to access their transportation infrastructure.	Recommend check with USACE to make sure they are correctly assessing Groundhog

ADF&G/Comm. Fish/Homer	Chapter 4: Environmental Consequences	4.2.2.2	4.2-2	The Mine Site section states that "The habitat resources of the North and South Fork Kottuli stream corridors that traverse this unit are managed for protection" The mine site is within units R06-23 and R06-24 of the Bristol Bay Area Plan. This statement refers to unit R06-24 but is incomplete in it's interpretation.	The full definition of the defined "Management Intent" for unit R06-23 as defined in the BBAP (2013) is: "The habitat resources of the two stream corridors that traverse this unit (R06-24) are to be protected. (See management intent for R06-24.)" And is defined for unit R06-24 as: "Mineral development within R06-24 should be performed in such a manner as to ensure that impacts to the anadromous and high value resident fish streams are avoided or reduced to levels deemed appropriate in the state/federal permitting processes related to mineral deposit development. Specifically, such development is to ensure the protection of the streams affected by MCO 393 and their associated riverine habitats, which includes the area within 100' of OHW. Mineral entry and location within the two streams is not allowed pursuant to MCO 393." This needs to be in the DEIS along with a map of the DNR Region/units overlaid on the mine site and all related infrastructure.
ADF&G/CF/Homer	Chapter 4: Environmental Consequences	4.2.2.2	4.2-2	The above statement in the Mine Site section of the EIS goes on to say that ".....in addition, the area is managed for moose wintering habitat. Active management for fish and wildlife protection would be modified as necessary in the immediate area as a result of the project. There would not be a conflict with management plans but may require permit conditions to accommodate additional plan direction related to fish and wildlife management".	Active management and Affected area need to be defined/described better.
ADF&G/Comm. Fish/Homer	Chapter 4: Environmental Consequences	4.2.3.3	4.2-6	There is currently no active resource extraction at Diamond Point.	Correct said statement.
ADF&G/Comm. Fish/Homer	Chapter 4: Environmental Consequences	4.6	4.6-1	List of management areas incomplete - at least it references only salmon area, and if using letter designations document should also include the names of the management areas, specifically Bristol Bay Area (Area T) and COOK INLET AREA, which is not specifically discussed except to list Area H.	Instead of "Commercial Salmon Fishery Area", reference the Bristol Bay Area and associated salmon fisheries, the Cook Inlet Area and associated salmon, groundfish, and shellfish fisheries (Pacific halibut is not managed as a groundfish under state regulations), Federal Central Gulf of Alaska Regulatory Area (CGOA; Area 630) and associated Pacific cod fisheries, and the International Pacific Halibut Commission 3-A Reglatory Area and associated commercial and charter Pacific halibut fisheries.
ADF&G/Comm. Fish/Homer	Chapter 4: Environmental Consequences	4.6	4.6-1	The list of management areas that comprise the study area is incomplete.	For those managed by ADF&G, it should include; Commercial shellfish Area H (Southern District and Kamishak Bay District) and the commercial groundfish Cook Inlet Management Area (Cook Inlet District). The reporting areas for IPHC area 3A should be included as well as area 630 for the NMFS.
ADF&G/Comm. Fish/Homer	Chapter 4: Environmental Consequences	4.6	4.6-1	There are many more potential impacts then the 4 in the list.	Change "Long-term" to "short or long-term". Short-term losses could occur with catastrophic events such as dam failures. Other short-term (and long-term) losses could occur though the release of contaminates. Cook Inlet salmon fisheries were closed in 1989 due to the Exxon Valdez Oil Spill, though the spill did not affect some of the salmon streams the returning adults swam though contaminated waters. Should consider the potential loss of a unique lifestyle as a commercial salmon fisherman. Along with a potential reduction in recreational fishing effect, there could be a potential reduction in revenue to businesses and of loss of business that rely on that: lodge owners, flight operators, guides, outfitters, etc. The potential loss of fishing opportunity due to infrastructure installations or the privatization (temporary or permanent) of properties (see additions below).
ADF&G/Comm. Fish/Homer	Chapter 4: Environmental Consequences	4.6	4.6-1	Making the statement that Bristol Bay salmon is a "price-taker" is formal fallacy. This statement has nothing to do with the actual dollars that could be lost to fishermen; comparison to the Copper River fishery seems included specifically to attempt to diminish the value of the existing fishery.	This line of reasoning is not relevant or valid and should be removed.
ADF&G/Comm. Fish/Homer	Chapter 4: Environmental Consequences	4.6	4.6-1	There is no discussion of potential impacts to Cook Inlet groundfish, shellfish, or Pacific halibut fisheries in the bulleted list and does not include specific mention of Cook Inlet salmon fisheries.	Include the Cook Inlet fisheries mentioned in the column to the left and potential impacts - "Long-term changes in groundfish, shellfish, and Pacific halibut marine populations that reduce the number of animals available for harvest by commercial permit holders and thus reduce"... (list same as that provided for salmon). Include same populations in bullet number two (reduction of consumer purchase due to perceived loss...)
ADF&G/Comm. Fish/Homer	Chapter 4: Environmental Consequences	4.6	4.6-1	Description of ADF&G Commercial fishery boundaries within the study area reference salmon (Area T and H) and SF SWHS areas S, T, N, and P, but there is no reference to the applicable Commercial Groundfish Fishery Area (H for Cook Inlet)	Add reference to Commercial Groundfish Fishery Area H (Cook Inlet) to this section.
ADF&G/Comm. Fish/Homer	Chapter 4: Environmental Consequences	4.6	4.6-1	Similar to above issue, the "Commercial Fisheries" discussion on this page fails to include Cook Inlet groundfish, shellfish, Pacific halibut, and salmon fisheries.	Include Cook Inlet groundfish, shellfish, Pacific halibut, and salmon fisheries in this discussion of potential effects on these sectors of commercial fisheries.
ADF&G/Comm. Fish/Homer	Chapter 4: Environmental Consequences	4.6	4.6-2	Similar to above issue, the "Recreational Fisheries" discussion on this page fails to include Cook Inlet groundfish, shellfish, Pacific halibut, and salmon sport fisheries.	Include Cook Inlet groundfish, shellfish, Pacific halibut, and salmon sport fisheries in this discussion of potential effects on these recreational fisheries by both private anglers and charter vessels (economy affected).

ADF&G/Comm. Fish/Homer	Chapter 4: Environmental Consequences	4.6.1.1	4.6-2	Only Bristol Bay salmon fishery is mentioned under Commercial Fishing section and associated subheadings here - same issue as previous that there is no mention of Cook Inlet groundfish, shellfish, Pacific halibut, and salmon fisheries. No mention of commercial fish buyers/processors in Homer and Kenai, where majority of fish harvested in Cook Inlet is delivered.	Include Cook Inlet groundfish, shellfish, Pacific halibut, and salmon fisheries, and associated infrastructure and economy where appropriate, in all discussions of commercial fisheries as affected by the proposed project.
ADF&G/Comm. Fish/Homer	Chapter 4: Environmental Consequences	4.6	4.6-2	Recreational Fisheries impacts are incomplete.	The second bullet should read "if the project reduces fish populations or the quality of opportunities".
ADF&G/Comm. Fish/Homer	Chapter 4: Environmental Consequences	4.6.1.1	4.6-2-3	Under the Commercial Fishing section, only the Bristol Bay salmon fishery is discussed as being potentially impacted by the project. No mention is made of salmon/groundfish/shellfish commercial fisheries in Cook Inlet, where major project components (port and NG pipeline) occur and which therefore may potentially be impacted.	Include potentially impacted commercial and sport fisheries in Cook Inlet in this section <u>and subsequent related sections (e.g., permit holders and crew, processors, Recreation and Tourism based Fishing, etc.)</u> , which also only discuss impacts to Bristol Bay.
ADF&G/Comm. Fish/Homer	Chapter 4: Environmental Consequences	4.6.1.2	4.6-3	No mention of recreational fishing in Cook Inlet marine waters.	Include Cook Inlet marine sport fisheries in discussion.
ADF&G/Comm. Fish/Homer	Chapter 4: Environmental Consequences	4.6.2.1	4.6-3	There is no mention of Amakdedori commercial landings (sockeye, coho, pink and chum). These numbers are substantial and significant to Alaskan commercial fishermen.	Include number of salmon harvested from Amakdedori and Chenik Subdistrict (249-55): year sockeye coho pink chum 1985 46,833 1986 387,997 210 757 1987 380,990 102 533 1,739 1988 749,825 73 1,303 7,426 1989 154,015 4 54 8 1990 283,988 34 639 1,649 1991 248,244 6 1,768 501 1992 55,296 62 220 1993 106,611 4 110 68 2004 127,921 2005 183,964 2006 38,809 3,216 21 2007 593,172 19 1,633 6 2008 750,037 46 65 2009 289,079 1,571 2010 24,626 2011 294,307 648 2012 258,465 2013 157,625 314 1,673 2014 25,453 50 2016 32,060 34 217 2017 386,932 189 7 2018 110,643 69 184
ADF&G/Comm. Fish/Homer	Chapter 4: Environmental Consequences	4.6.2.1	4.6-3	Document refers to Optimal Escapement Goals (OEGs). ADF&G may restrict or liberalize run is projected to exceed or not meet the escapement goal whether it is an OEG, Sustainable Escapement Goal (SEG), Biological Escapement Goal (BEG), or inriver goal. OEGs are not typically based on carrying capacity.	Update to reflect all types of escapement goals.
ADF&G/Comm. Fish/Homer	Chapter 4: Environmental Consequences	4.6.2.1	4.6-3 & 4.6.4	The Board of Fish (BOF) may adjust an OEG. The last sentence regarding OEG adjustment is not how ADF&G develops and modifies SEGs, BEGs and, inriver goals.	Clarify that BOF sets and modifies OEGs. Modify paragraph to include how BOF and ADF&G develop escapement goals. A measurable reduction in productivity could result in lower goals and reduced opportunity for subsistence, sport and commercial users.
ADF&G/Comm. Fish/Homer	Chapter 4: Environmental Consequences	4.6.2.1	4.6-3 through 4.6.5	States that Amakdedori port site would not be located near substantial commercial fishery resources and makes assertion that increased vessel traffic should not affect fishing effort. This conclusion should be explained and supported. It seems that increased vessel traffic could directly affect fishing activity in the area, especially if large vessels are moving through the area to and from the proposed port site in the transportation corridor. Cook Inlet commercial shellfish (scallop and razor clam) and Pacific halibut fisheries are omitted from this discussion, and need to be included in the paragraph discussing interactions with the natural gas pipeline. The pipeline is slated to be located directly through one of two scallop beds in Kamishak Bay, therefore an impact to the resource would be expected as well as potential conflict with commercial scallop fishery vessels and dredge gear employed, which could come in contact with pipeline and cause damage. Statement that commercial fishermen may need to adjust gear placement assumes "they would have flexibility to do so" - how is this concluded? Similarly, concluding that there would be no impact to permit holder revenues and associated metrics seems opinion based and inaccurate - if fishery resources declined, it would be expected that revenues would also decrease. Also, Processing Sector and Fishery Fiscal Contributions under Alternative 1 again does not include Cook Inlet fisheries.	Include Cook Inlet commercial groundfish, halibut, and shellfish fisheries in discussion, particularly the potential scallop fishery interactions as described. Groundfish and Pacific halibut longline gear could also interact with the pipeline and this gear type can be quite long and cover a lot of ground, therefore interaction is very possible. Opinions without fact should be omitted from this document - it appears that research into these potential interactions and impacts has not been completed and broad assumptions are being made that seem to dismiss the importance of these fishery resources to fishermen in this area.

ADF&G/Comm. Fish/Bristol Bay	Chapter 4: Environmental Consequences	4.6.2.1	4.6-4	"This section relies on Section 4.24, Fish Values, which estimates that Alternative 1 would not reduce returning adult salmon to the Kvichak and Nushagak river systems as a result of project operations." However, Section 4.24 describes loss of anadromous habitat; potential for direct mortality from construction work at stream crossings; reduced production of spawning habitat from increased sedimentation; and increased metal concentrations due to fugitive dust deposition. While these impacts may seem small, they lead us to conclude that the project could potentially result in reduced returns of adult salmon to the Kvichak and Nushagak River systems.	Reconcile discrepancy or provide supporting information for the conclusion reached for Alternative 1 (i.e., would not reduce returning adult salmon to the Kvichak and Nushagak river systems).
ADF&G/Comm. Fish/Homer	Chapter 4: Environmental Consequences	4.6.2.1	4.6-4 & 4.6-5	The statement "This section relies on Section 4.24, Fish Values, which estimates that Alternative 1 would not reduce returning adult salmon to the Kvichak and Nushagak river systems as a result of project operations." ignores any potential for accidents. The same applies for cascading impacts that would be felt in the Fish Processing Sector and Fishery Fiscal Contributions.	As stated before: the DEIS does not include risk assessments with probabilities for accidents. It instead assumes that everything will go as planned during all phases of the project over decades and hundreds of years. It is imperative that the DEIS contain likelihoods throughout the document. There are a multitude of points along the way from the pit to the transfer of material to ships where potential accidents can occur both large and small. These can in turn have both large or small potential impacts on the commercial and recreational fisheries. They should be addressed in the DEIS.
ADF&G/Comm. Fish/Homer	Chapter 4: Environmental Consequences	4.6.2.1	4.6-5	The comparison with the Kennecott Copper Mine is questionable, as it was a much different type of mine than the proposed Pebble mine. For example, it was an underground mine as opposed to an open pit, the Kennecott mine produced ~ 1 million tons of waste rock where as the Pebble mine at the 78+ year stage would produce > 15 billion tons.	The DEIS should look for more similar projects for comparison purposes and if none exist clearly state the limitations of the comparison.
ADF&G/Comm. Fish/Homer	Chapter 4: Environmental Consequences	4.6.2.1	4.6-5	Amakdedori Port is located where Pacific herring fisheries occur.	This fishery is currently closed due to low stock abundance but will open again once commercial thresholds are attained. The likelihood this will occur is great given the proposed longevity of the project.
ADF&G/Comm. Fish/Homer	Chapter 4: Environmental Consequences	4.6.2.1	4.6-5	There is no mention of commercial Tanner crab or weathervane scallop fisheries. The scallop fishery would be directly impacted since the pipeline would traverse directly through one of two scallop beds in Kamishak Bay. This fishery drags 1000+ lb steel dredges that could severely damage or rupture the gas pipeline or could result in the loss of gear. The scallops beds in this area are relatively small, so the potential loss of opportunity could be significant. There will potentially be some level of direct mortality to weathervane scallops, Tanner crab, and other commercial and non-commercial fauna from the burial of the gas pipeline. As stated in comments for section 3.6.2, the DEIS implies that a takings is ok when saying the fisherman can just move to avoided the gas pipeline. Though Tanner crab fisheries are currently closed due to low stock abundance, the likelihood this will reopen is great given the proposed longevity of the project.	Address commercial shellfish and groundfish fisheries along the gas pipeline corridor. This should include quantifying the potential loss of resources to direct impacts of pipeline installation and the loss of fishing opportunity due to necessary avoidance of the pipeline.
ADF&G/Comm. Fish/Homer	Chapter 4: Environmental Consequences	4.6.2.2	4.6-5	As with the commercial fishing section above, the DEIS implies that a "takings" is ok with regard to recreational fishing opportunities. The authors suggest that fishermen and businesses just move to another location. Further the "takings" is very likely going to be greater than implied, as fishermen looking for a wilderness experience are not going to want to fish near an industrial site.	This analysis should include survey data from fishermen, lodges, and outfitters, to obtain a realistic estimate of the river miles of alternative fishing areas and what percentage the loss of river miles makes up of the total. Additionally, competition is high in this recreational fishery and potentially reduced opportunity will increase that competition. This should be addressed.
ADF&G/Comm. Fish/Homer	Chapter 4: Environmental Consequences	4.6.2.1	4.6-5	In the 2nd paragraph on this page, it states that the Amakdedori port site would not be located near substantial commercial fishery resources and would therefore not affect fishing effort. This statement ignores the reasonable possibility that the Kamishak sac roe herring fishery, while currently closed due to low abundance, will reopen once the population recovers and thresholds in the management plan are reached. Effort and harvest during that fishery historically occurred in southern Kamishak Bay from the Douglas Reef complex north to Bruin Bay, including the proposed Amakdedori port site. Purse seine gear interacts with the bottom in waters shallower than ~95' and may create a conflict with the NG pipeline and with port activities.	Recommend that this EIS consider potential impacts to the Kamishak Bay sac roe herring fishery. Since the marine habitat in this area is currently pristine, it is reasonable to assume that the Kamishak herring stock will recover to levels allowing a commercial fishery within USACE's 78-year time span of consideration for the Pebble project. This comment/action also applies to Table 4.6.1 where it references effects to commercial fisheries for the Amakdedori port site alternative.
ADF&G/Comm. Fish/Homer	Chapter 4: Environmental Consequences	4.6.2.1	4.6-5 & 4.6-6	Statements in this section regarding sport fishing is concerning because it seems to acknowledge potential impacts and displacement of users, although with little concern. Similar to other sections, Cook Inlet Area fisheries are not addressed - the Amakdedori port site is located near recreational Pacific halibut fisheries, particularly utilized by charter vessels, salmon resources, as well as razor clam beaches on the west side of Cook Inlet so the statement that "there would be no direct or indirect impacts expected" is untrue.	Address potential impacts to Cook Inlet sport fisheries as noted in column to the left under Alternative 1.
ADF&G/Comm. Fish/Homer	Ch. 4	4.6.3 & 4.6.4	4.6-7	Alternatives 2 and 3 and summary table (Table 4.6-1) do not reflect needed comments made above. Nor do they address risk, likelihood, and probabilities of impacts from accidents	Alternatives 2 and 3 and the summary table need to be updated with regard to comments above.

ADF&G/Comm. Fish/Homer	Chapter 4: Environmental Consequences	4.6.3.1	4.6-7	This statement is inaccurate: "The Diamond Point port site is not located near substantial commercial fishery resources." Additionally, there is no mention of Amakdedori harvests (see comment below). At right are the annual pink and chum harvest numbers from 1986-2017. These numbers are substantial and significant to Alaskan commercial fishermen.	Include numbers of chum and pink salmon commercially harvested from Iliamna and Iniskin Bays by year. year chum pink 1986 8,830 159 1987 9,695 246 1988 39,240 1,335 1991 1,031 1992 208 8 2002 17,036 146 2003 29,679 2004 161,887 6,446 2005 74,109 4,733 2006 36,174 13,055 2008 7,341 125 2009 1,540 2010 17,919 2011 285 2017 4,034 9,582
ADF&G/Comm. Fish/Homer	Chapter 4: Environmental Consequences	4.6.3.1	4.6-7	It is presumptive to state there will be no effects on health or value of BB salmon fishery - need information to back up this conclusion. Again, Cook Inlet fisheries are omitted. Similar comments for Diamond Point Port as Amakdedori Port site - there are potential impacts with commercial fisheries - those impacts are not detailed in the DEIS.	Include data to substantiate claim that there would be no measurable effect from Alternative 2. From previous recommendations listed here, there are similar concerns as with the Amakdedori port site - the Diamond Point site would have similar effects with vessel traffic and the pipeline route could still impact fisheries, although direct impact on scallop beds would likely be reduced with further north route (might be able to avoid northern scallop bed).
ADF&G/Comm. Fish/Homer	Chapter 4: Environmental Consequences	4.6.4.1	4.6-7 & 4.6-8	Same comment as above. Also, under 4.6.4 intro, again states the transportation corridor would not be expected to affect long-term fish populations - need data to understand how this is concluded.	Include data to substantiate claim that there would be no measurable effect from Alternative 3. See above comments for Diamond Point Port site.
ADF&G/Comm. Fish/Homer	Chapter 4: Environmental Consequences	4.6.5	4.6-8	Broad statement on alternatives not expected to result in a long-term change - seems unlikely there would be no impact.	DEIS needs to provide data to back up these claims - there are a lot of potential environmental impacts from the project and many are detailed here and in other staff's comments - DEIS is ignoring the likelihood of incidents that could include (but not limited to) fuel spills, vessel accidents, pipeline damage, or containment breach in addition to interactions stated in previous comments here.
ADF&G/Comm. Fish/Homer	Chapter 4: Environmental Consequences	4.6.4.1	4.6-8	The Commercial Fishing section here states that "The Diamond Point port site is not located near substantial commercial fishery resources". That is not accurate. Cottonwood creek is adjacent to Diamond Point and it is a significant producer of chum salmon (Esc. Goal is 5,200-12,200). While harvest of this stock does not occur every year, it is significant in some years (e.g., over 160,000 chum salmon were harvested from this subdistrict in 2004; see Hammarstrom and Ford 2008, Appendix A22). Also, when the Kamishak sac roe herring fishery was active, harvests did occur in this area and may again when the stock recovers and the fishery reopens.	Include assessment of impacts to the sac roe herring fishery and the purse seine fishery targeting chum salmon returning to Cottonwood Creek. The location of the Diamond Point quarry was a concern for area fisherman at the time it was permitted because seiners targeting Cottonwood chums fish Diamond Point at certain stages of the tide. Operation of a major port at this location would at least disrupt if not preclude seining activity in this general area, and especially at Diamond Point. This comment/action also applies to Table 4.6.1 where it references effects to commercial fisheries for the Diamond Point port site alternatives.
ADF&G/Comm. Fish/Homer	Chapter 4: Environmental Consequences	4.6.5	4.6-8 Table 4.6-1	Table 4.6.1 includes references to impacts to commercial fisheries that could be associated with various project components. The Pipeline route section of the table suggests there will be no conflicts with commercial fisheries, regardless of the route selected, because the salmon fishery occurs in the top 30 feet of the water column. That may be true for drift gillnet gear in UCI, but not seine gear in LCI, which can contact the bottom in depths <95'. It also states that on-bottom groundfish fisheries (e.g., longline, pot, scallop dredge) can avoid conflicts by not setting gear near the pipeline. However, the applicant has not conducted baseline studies to characterize the shellfish/groundfish resources that are present along the proposed gasline route(s). It is therefore difficult to effectively judge the potential impact to these resources or the users who target them.	Include potential impacts to the purse seine (salmon and herring) fisheries in Lower Cook Inlet that may occur from the pipeline. Recommend applicant include baseline studies necessary to characterize shellfish/groundfish resources along the pipeline routes so agencies can effectively evaluate potential impacts to those resources or users. Specify why LCI commercial fisheries in the Amakdedori area, as well as Iliamna and Iniskin bays will not be impacted if this project is developed.
ADF&G/Comm. Fish/Homer	Chapter 4: Environmental Consequences	4.6.6	4.6-10	The first paragraph of this section references Section 4.1 and then lists Pebble South and Shotgun as two reasonably foreseeable future <u>developments</u> during the 78-year RFFA timespan. However, Section 4.1 (Table 4.1.1) indicates that <u>development</u> of Pebble South is NOT considered an RFFA (only continued exploration was considered an RFFA).	Resolve the discrepancy between sections, preferably by acknowledging that Pebble South is an RFFA and then considering potential cumulative impacts from that development in this EIS (as was recommended in an earlier comment).
ADF&G/Comm. Fish/Homer	Chapter 4: Environmental Consequences	4.6.2.2	4.6-11	Same issue as with previous comment. Again, it is suggested that fishermen and all the businesses that support them, can just move to other areas. If the Pebble development forces them to move to another area, and then the other exploration and development projects that are listed in the RFFAs do the same, the options for fishing get more and more reduced and the "takings" becomes much larger.	The reduction in fishing opportunities needs to be quantified in this section. Maps needs to be included for all potential exploration and developments identified in the RFFA. This analysis should include survey data from fishermen, lodges, and outfitters, to obtain a realistic estimate of the river miles of alternative fishing areas and what percentage the loss of river miles makes up of the total. The survey should include the proposed Pebble project area and all applicable RFFAs.
ADF&G/Comm. Fish/Homer	Chapter 4: Environmental Consequences	4.6.6.1	4.6-11	There are no data on the number of commercial fishing related jobs. With regard to Cumulative Effects, as defined in Section 4.1.3 of this DEIS, "Proximity is based on natural geographic boundaries of potentially affected resources and the period of time that the projects impacts would persist." There appears to be no analysis in the associated mining claims that meet the "proximity" definition.	Reevaluate which RFFAs meet the "proximity" definition and consider cumulative impacts.

ADF&G/Comm. Fish/Region II	Chapter 4: Environmental Consequences	4.6.6.1	4.6-11	Example of a decline in 1,000,000 fish is overly simplistic and does not address lost future returns resulting from lost production.	Update text to reflect future loss in production.
ADF&G/Comm. Fish/Homer	Chapter 4: Environmental Consequences	Table 4.6-1	4.6-8	Table does not fully address potential impacts to commercial and recreational fisheries from the port site and pipeline route.	Similar comments as previously mentioned to address potential impacts from these two aspects of the project, particularly the scallop resource for the pipeline route in alternative 1 and the fact that the row is combined is not differentiating this effect. Groundfish fishermen needing to adjust their gear and having flexibility again minimizes impact. All Cook Inlet shellfish fisheries are again omitted - in addition to scallops, should include razor clam fishery, and impact to recovery of Tanner crab resource as potential impacts. Discussion in text should be consistent throughout document in regards to potential impacts. It is a broad statement to say "Cook Inlet and Anchor River fishing opportunities should be unaffected" under Alternative 3 Pipeline Route for recreational fisheries. Need data to substantiate claims.
ADF&G/Comm. Fish/Homer	Chapter 4: Environmental Consequences	4.15		In various locations throughout this Geohazards chapter, it refers the reader to the "Spill Risk" section, which is sometimes referenced as being Section 4.21 and sometimes Section 4.27. Section 4.21 is a 2-page "Food and Fiber" section with no mention of spill risk and Section 4.27 was not provided for agencies to review. Access to this section is needed to review how the DEIS assesses the risk of spills associated with various project components and proposed mitigation measures.	Provide Section 4.27 and allow sufficient time for Cooperating Agencies to review.
ADF&G/Comm. Fish/Homer	Chapter 4: Environmental Consequences	4.15.2.3	4.15-10 & 4.15-11	Given the uncertainty in the predicted run-up elevation estimate of 34.8 MHW (see comment for section 3.) it is difficult to conclude if the 28 ft. MHW design height of the terminal patio is adequate. Even if the run up elevation estimate were accurate, it would still be ~ 7 ft. above the terminal patio. Given the amount of infrastructure, volume of fuel storage, size of concentrate storage, etc. the proposed port facility should have an additional safety factor built into the design to accommodate for tsunami events. The selection of 100 - 500 vs 2,500 time horizons is arbitrary.	Designing for maximum inundation elevations should be done and include additional elevation as a safety factor given the level of risk.
ADF&G/Comm. Fish/Homer	Chapter 4: Environmental Consequences	4.15.2.3 (with references to section 3.15.5)	4.15-10 & 4.15-11	In the Tsunami section, it discusses the runup elevations that would be expected under various size earthquake events and indicates that the elevation of shore facilities associated with the port (including diesel storage tanks) would be sufficient (28' above mean sea level [amsl]) to withstand a medium-large earthquakes (~15-23' amsl) but not a very large earthquake (35' amsl). The potential for damage to infrastructure (including fuel tanks) stemming from tsunami events greater than 28' amsl is acknowledged, but the risk is rated very low over the life of this project (which they did not specify as 20 or 78 years) and Section 4.27 (the Spill Risk section) was not available for review. Also, in Section 3.15.5 (Tsunamis, Seiches, and Coastal Hazards) of the previous chapter, it indicated that the 1883 eruption of Augustine Volcano produced a wave that affected areas up to 55' above high tide. Given that the port pad will be only 28' amsl, a similar event would very likely destroy the fuel tanks at the port, releasing up to 5 million gallons of fuel into the environment.	Provide Section 4.27 and allow sufficient time for Cooperating Agencies to review. Also, recommend design change to increase the elevation of the port pad to 55' above high tide so there's a better chance of the fuel tanks withstanding a tsunami wave generated by a major landslide on Augustine volcano.
ADF&G/Comm. Fish/Homer	Chapter 4	4.15.2.3	4.15-11	Augustine volcano is said to be the most historically active volcano in the Cook Inlet region (Miller et al 1998) and it's estimated that as many as 12-14 debris avalanches have reached the sea in the last 2000 years (Waythomas et al 2006). Known flow paths of historical debris avalanches extend in all directions around Augustine volcano including toward Amakdedori Port and the 2 proposed lightering locations (Waitt et al 1996). One of the avalanches that occurred 300 - 500 year ago on the western side, generated a wave with maximum amplitude of up to 49.2 ft. that struck the mainland shore. This same wave generated a secondary wave with maximum amplitude of 62 ft. This happens to be at proposed lightering location 1. The DEIS dismisses these risks as unlikely to occur in the project's life given that the estimated historical occurrence has been every 150 to 200 years on average.	Given the 78-year projection (RFFAs), a thorough analysis should be undertaken of this assessment due to the amount of infrastructure, volume of fuel storage, size of concentrate storage, etc. the proposed port facility. Amakdedori Port should be engineered to an elevation above the historical estimates of maximum wave heights from debris avalanches at Augustine volcano and include an additional elevation safety factor given the level of risk. Specifics on how lightering and cargo ship operations would be engineered to withstand these effects should be included.
ADF&G/Comm. Fish/Homer	Chapter 4: Environmental Consequences	4.16.2.1	4.16-1	Water management plan...based on historic temperature and precipitation data. Climate changes, specifically significantly warmer winters resulting in precipitation no longer being stored as ice and snow at historic levels. How will this impact mine operation and safeguards?	Address climate change in water management plan.
ADF&G/Comm. Fish/Homer	Chapter 4: Environmental Consequences	4.24	4.24-1	List of potential impacts is incomplete.	Additional impacts such as changes to estuarine and marine water quality such as turbidity, dissolved oxygen, metal, hydrocarbon, or other chemical contaminants, potential spills. The 6th bullet should include lakes and other fish bearing water bodies, not just streams (instream water quality).

ADF&G/Comm. Fish/Bristol Bay	Chapter 4: Environmental Consequences	4.24.2.1	4.24-2	"In the context of the entire Bristol Bay drainage, with its 9,816 miles of currently documented anadromous waters, the loss of Tributary 1.19 represents a 0.002 percent reduction in miles of anadromous stream habitat, or a 0.03 percent decrease in accessible drainage area." Not all anadromous habitat is equal. Some anadromous waters are designated so because they are used for migration, however they may have limited or poor spawning habitat. Other anadromous waters are designated so because they are spawning habitat; spawning habitat is often limiting in Bristol Bay. To say a loss of x miles of spawning habitat represents x percent loss of anadromous habitat is misleading.	Provide context for the statements about percentage reduction in anadromous fish habitat, preferably by identifying specific percentages for spawning and noting that spawning habitat is often the limiting factor in Bristol Bay.
ADF&G/Comm. Fish/Homer	Chapter 4: Environmental Consequences	4.24.2.1	4.24-3	Road/Pipeline does not include impact to scallop bed caused from crossing directly through it. Impacts from building Amakdedori port is incomplete. In Ch 5 that there will be lightering in lieu of dredging a deep water channel. To say that "There would be a permanent, direct loss of benthic habitat beneath the pipeline footprint on the bottom of Cook Inlet." and then state "Habitat alteration would be limited over time, and would not have quantifiable effects to populations of fish and shellfish." seems to understatement what may be a significant impact to the scallop bed.	Address potential impact to scallop bed by loss of habitat. Also include additional impacts on survival and recruitment of shellfish from building Amakdedori port.
ADF&G/Comm. Fish/Homer	Chapter 4: Environmental Consequences	4.24.2.1	4.24-3	The habitat loss section pertaining to the Natural Gas pipeline states that: "Habitat alteration would be limited over time, and would not have quantifiable effects to populations of fish or shellfish." There is no baseline data for the Natural Gas pipeline route so it is unclear what data or analysis supports this conclusion.	Baseline studies to characterize habitats and marine fauna along the proposed or alternate Natural Gas pipeline corridors should be completed and provided for review before conclusions about potential impacts can be made.
ADF&G/Comm. Fish/Bristol Bay	Chapter 4: Environmental Consequences	4.24.2.2	4.24-4	"Sockeye salmon are known to use shoreline habitat for spawning, and therefore could be potentially affected; however, documented spawning areas are more than 0.5 mile from the ferry terminals and primary entry points of the pipeline into the lake (EPA 2014)."	The mouth of Upper Talarik Creek is less than a mile from the North Ferry Terminal. Adult sockeye salmon likely use the shoreline near the ferry terminal for staging before entering streams nearby. Ferry operations could potentially delay fish migration into spawning streams. This should be described in the DEIS.
ADF&G/Comm. Fish/Homer	Chapter 4: Environmental Consequences	4.24.2.2	4.24-3-6	The sections pertaining to the gas pipeline across Cook Inlet (and Iliamna Lake) do not consider the potential gas leaks that could occur over the life of this project and how they will displace, injure, or kill fish. The EIS should provide an ecotoxicological assessment of the impact gas leaks may have on various life stages of freshwater (Iliamna Lake) and marine (Cook Inlet) organisms commonly found along the pipeline corridor.	additional baseline environmental studies associated with the gas pipeline portion of this project should be conducted or included.
ADF&G/Comm. Fish/Homer	Chapter 4: Environmental Consequences	4.24.2.2	4.24-6	There may be direct and indirect mortality to razor clams, weathervane scallops or other marine life during gas pipeline installation in Cook Inlet due to burial and displacement.	Baseline studies to characterize habitats and marine fauna along the proposed or alternate Natural Gas pipeline corridors should be completed and provided for review before conclusions about potential impacts can be made.
ADF&G/Comm. Fish/Homer	Chapter 4: Environmental Consequences	4.24.2.2	4.24-6	Amakdedori Port sub-section, should include text about the potential for injury and mortality to shellfish, in addition to fish species, from construction (direct and indirect impacts); similar to comment above, natural gas pipeline discussion should include potential mortality and injury to scallops and other shellfish, which could impact the resource, particularly with presence of equipment required for ditching and to place the pipeline which will increase the overall footprint of the impact and associated water quality issues. Scallop beds are in a finite area in Kamishak Bay and are not widespread and do not adapt and move to different areas, therefore, the impact could be significant and long-lasting, resulting in a direct decrease in the commercial fishery resource.	Revise section to more accurately present potential impacts.
ADF&G/Comm. Fish/Bristol Bay	Chapter 4: Environmental Consequences	Table 4.24-4	4.24-9	Table does not include units for available habitat and some species are missing.	Include units in table. Expand to include all fish species in the mine site area.
ADF&G/Comm. Fish/Homer	Chapter 4: Environmental Consequences	4.24.2.4	4.24-13	Statement that Amakdedori port would impact 14 acres of benthic habitat but "there would be no anticipated impacts to the overall benthic productivity in Cook Inlet" is not acknowledging potential impacts to localized scallop beds and crab populations.	Account for potential impacts to benthic productivity in relation to shellfish populations, specifically scallop, Tanner crab, and Dungeness crab in Kamishak Bay.
ADF&G/Comm. Fish/Homer	Chapter 4: Environmental Consequences	4.24.2.5	4.24-15	For Amakdedori port, turbidity could also affect shellfish.	Include effects on shellfish from turbidity during construction of Amakdedori port - see comments above.
ADF&G/Comm. Fish/Homer	Chapter 4: Environmental Consequences	4.24.2.6	4.24-16	To state that there are no anticipated impacts to fish migration from the port is presumptuous, since the physical barriers from the dock as well as increased sound from equipment and vessel traffic associated with the port could affect fish migration due to disruption and displacement; there could also be water quality effects. The port jetty will extend some distance feet offshore with no breach at it's connection to the coast to facilitate ease of movement by organisms traveling along the shore. Also, assumptions that, while the pipeline has the potential to hinder migrations of crab, the impacts are expected to be minimal, is presumptuous.	Address potential impacts to fish migration from construction of Amakdedori port. Assess fish and shellfish migration corridors as part of the DEIS. If USACE goes with alternative 1 port design (solid jetty), recommend that the project consider adding a raised piling section.

ADF&G/Comm. Fish/Homer	Chapter 4: Environmental Consequences	4.24.2.8	4.24-18	EFH section is not complete.	Provide a complete EFH section to Cooperating Agencies for review prior to finalizing DEIS.
ADF&G/Comm. Fish/Bristol Bay	Chapter 4: Environmental Consequences	4.24.2.8	4.24-18	"Potential impacts associated with the ferry terminal location on Iliamna Lake would be similar to those described under Alternative 1." This statement is a leap since resources at this site are not fully described or are unknown (no project surveys in this area).	There are several productive sockeye salmon spawning streams in this area and adult sockeye salmon are frequently observed staging in the near shore areas of this portion of the lake. Site specific studies should be conducted for this area so the extent of resources and potential impacts can be described.
ADF&G/Comm. Fish/Homer	Chapter 4: Environmental Consequences	4.24.3.3	4.24-19	For Diamond Point Port impacts from Alternative 2, specific organisms impacted is not detailed.	For Diamond Point Port impacts from Alternative 2, provide specific information on marine invertebrates impacted (e.g. shellfish - crab).
ADF&G/Comm. Fish/Homer	Chapter 4: Environmental Consequences	4.24.6	4.24-25	Page 4.6-8 of Chapter 4.6 lists Pebble South as a RFFA for development. Here it says it's only an RFFA for continued exploration.	Reconcile the discrepancy between sections, preferably by acknowledging that Pebble South is a RFFA for development during the 78-year RFFA timespan of the EIS.
ADF&G/Comm. Fish/Homer	Chapter 5: Mitigation	Table 5.3	5-16	Table 5-3 lists "Mitigation and Monitoring Measures Assessed as Likely to be Implemented". There are only 4 items on this list and some are <u>exceedingly simplistic and</u> required by existing laws (e.g., treat bilge water before discharge) for a project of this scope and scale. Given all of the wetlands that will potentially be impacted by construction of this project and the likely loss of aquatic habitat (including water quality) and subsequent potential decline in productive capacity (e.g., for fisheries), the list of mitigation and monitoring measures should be much more comprehensive. For instance, there is no mention of the timeline that water quality monitoring and management will be required during post-closure and what mitigation actions may be necessary if containment of mine waste is not 100% successful <u>in perpetuity</u> following mine closure.	Recommend USACE and PLP further develop the monitoring and mitigation measures needed to minimize and compensate for impacts from each component of this development (e.g., mine, transportation corridor, port, gas pipeline corridor). Recommend that USACE and PLP pay particular attention to monitoring and mitigation measures addressing mine waste containment that will be needed indefinitely following mine closure.
ADF&G/Comm. Fish/Homer	Chapter 6: Consultation and Coordination	6.1.2	6-1	Draft EFH Assessment is not complete. Additionally, the list of species regulated under FMP that could be potentially impacted is not complete - only includes salmon, no groundfish or shellfish species.	Provide a complete EFH section to Cooperating Agencies for review prior to finalizing DEIS. Include groundfish and shellfish species under GOA FMP when complete EFH Assessment (salmon is only FMP species listed in DEIS). There is an FMP for weathervane scallops; and also an FMP for groundfish species that includes Pacific cod, sablefish, walleye pollock, rockfish (3 assemblages - demersal shelf, pelagic shelf, and slope), flatfish (5 groups: arrowtooth flounder, flathead sole, rex sole, deep water complex, and shallow water complex), and Pacific halibut; all of these species occur in Cook Inlet marine waters. EFH is defined as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity" and EFH for groundfish species is determined to be the general distribution of a species described by life stage.
ADF&G/Comm. Fish/Homer	Chapter 6: Consultation and Coordination	6.1.2	6-2	The list of species regulated under an FMP is inadequate.	Include other species under FMPs that could potentially be impacted occur within the pipeline corridor. Species known to occur in the area from ADF&G surveys include: Species specific FMP species include; Weathervane scallops, Pacific cod, Walleye Pollock, rex sole, arrowtooth flounder, flathead sole, octopus, and northern rock sole. Species within FMP complexes include; Shallow-water flatfish (yellowfin sole, starry flounder, butter sole, English sole, Alaska plaice, and sand sole), Skates (big skate, longnose skate, Bering skate, Aleutian skate, and Alaska skate), Sharks (spiny dogfish), Scuplins (many species documented in ADF&G surveys), demersal shelf rockfish (yelloweye rockfish, quillback rockfish, copper rockfish). There are others as well.
ADF&G/Comm. Fish/Homer	Chapter 6: Consultation and Coordination	6.3	6-3	"The complete scoping effort for the Pebble EIS is described in Appendix A". "A summary of issues received during scoping is provided in Appendix A". Appendix A was not provided to us for this review.	Provide Appendix for Cooperating Agencies to review.
ADF&G/Comm. Fish/Homer	Chapter 6: Consultation and Coordination	6.4	6-3	Under Ongoing Coordination Efforts it states: "Consultation with USFWS and NMFS will continue for ESA and EFH assessments. However, on pages 6-1 and 6-2, it states that informal consultation with these agencies for ESA and EFH has not been initiated.	Resolve the discrepancy. If a consultation has not yet been initiated, that should be stated on pages 6-1 and 6-2 instead of saying the consultation will continue (eg., something can not be continued if it hasn't yet started).
ADF&G/Comm. Fish/Homer	Appendix M: Mitigation Screening	General	Multiple including 5-17	The DEIS references Appendix M for details on mitigation measures that were proposed during the NEPA process. Appendix M is also said to contain PLP's Compensatory Mitigation Plan (CMP). However, Appendix M was provided very late for this review and was incomplete. Appendix M did not contain any component of the CMP.	Provide a completed version of Appendix M, including the CMP, and allow Cooperating Agencies sufficient time to review.

**Pebble Project EIS
Consolidated Comments Table**

Department/Division/Section	Document Name	Section/Fig./Table	Page #	Comment/Issue	Recommendation/Action
ADF&G/Habitat/SPCS	10_10_2018 Updated Project Description	Figure 1-1	6	Map does not include the proposed pipeline on the Kenai Peninsula.	Include the proposed pipeline route on the Kenai Peninsula in the figure.
ADF&G/Habitat/SPCS	10_10_2018 Updated Project Description	Sec 3.1	51	"The pipeline will be buried in a trench adjacent to the road prism"	EIS should describe how the pipeline will be buried, particularly if blasting will be necessary as well as associated mitigation.
ADF&G/Habitat/SPCS	10_10_2018 Updated Project Description	Sec 3.1	51	"A fiber optic cable will be ploughed in, or buried in a shallow trench, adjacent to the pipeline"	EIS should indicate if the fiber optic line will be buried in the same trench as the pipeline or a separate trench. Also if it will be buried concurrently with the pipeline or if it will be plowed in at a different time.
ADF&G/Habitat/SPCS	10_10_2018 Updated Project Description	Sec 3.1	51	There is no indication in Project description on how the pipeline will cross fish streams.	EIS project description should describe how the pipeline will cross fish streams.
ADF&G/Habitat/SPCS	10_10_2018 Updated Project Description	Sec 3.1	51	The project description says that the pipeline will use HDD to enter Cook Inlet but does not indicate how it will leave Cook Inlet.	EIS project description should describe how the pipeline will leave the West Side of Cook Inlet.
ADF&G/Habitat/SPCS	10_10_2018 Updated Project Description	Sec 3.1	52	The project description says that the pipeline transitions and burial through Illiamna Lake will be similar to the Cook Inlet Crossing but only describes the transition on the east side of Cook Inlet.	EIS project description should describe how the pipeline will leave the West Side of Cook Inlet as well as specifically describe the transition and burial through Lake Illiamna.
ADF&G/Habitat/SPCS	10_10_2018 Updated Project Description	Sec 5.4.3.1	70	Environmental Construction Windows section only reference ADF&G and USFWS specific authorities.	This section should also reference the environmental authorities from the ADNR ROW lease.
ADF&G/Habitat/SPCS	10_10_2018 Updated Project Description	Table 7.1	77	"Fish collection permits for monitoring" "May be necessary for long term monitoring"	ADF&G Fish Collection Permits are now called Aquatic Resource Permits (ARP's) and will be needed anytime fish will need to be captured or transported, may be necessary for several aspects of construction and studies, not just monitoring.
ADF&G/Habitat/SPCS	10_10_2018 Updated Project Description	Table 7.1	77	Fish Habitat Permit- only indicates it is only necessary for "Water withdrawal in an anadromous fish waterbody, stream diversion, installation of culverts and bridges."	ADF&G Fish Habitat Permits will be necessary for most work in anadromous streams as well as for work in resident fish streams that might affect fish passage. Include additional activities that will require fish habitat permits such as pipeline installation across streams, dams that impact fish bearing waters, ferry docks/boat ramps on the lake, dredging, blasting, stream crossings, and fill in anadromous waters.
ADF&G/Habitat	Chapter 1 Purpose and Need	Sec 1.2	1-1	Acreage of fill is not listed.	Add acreage of fill material into Waters of the U.S.
ADF&G/Habitat	Chapter 2 Alternatives	Sec 2.2.2.1	2-4	A Mine Site Water Management Plan (WMP) is mentioned with reference to strategic water discharges to area streams. The WMP is not included with the DEIS and no details for the amounts, locations, temperatures, or timing are included in the DEIS. There is not enough information to review and determine if/to what degree aquatic habitats may be affected by water management.	Include water management details in the DEIS including, volumes, timing, temperature, and methods for water discharged to area streams so that a thorough review can be conducted and potential impacts to aquatic habitats and fish be identified.
ADF&G/Habitat	Chapter 2 Alternatives	Sec 2.2.2.1 Figure 2-5	2-10	Figure 2-5 is not included in review material.	Include Figure 2-5 in draft EIS.
ADF&G/Habitat	Chapter 2 Alternatives	Sec 2.2.2.2	2-12	The DEIS states that a total of 97 streams would be crossed by the road system. The Pebble Project 404 application submitted to USACE lists 222 streams crossed by the main road system. Additionally, field surveys by ADF&G in 2018 identified undocumented streams to be crossed by the transportation corridor.	Update the number of stream crossings on the proposed road system to accurately depict the project components and the affected environment and reconcile the discrepancies.

ADF&G/Habitat	Chapter 2 Alternatives	Sec 2.2.2.2	2-12	The DEIS states that 35 culverts designed for fish passage would be installed along the road system. The Pebble Project 404 application states that 73 fish passage culverts will be installed along the road system. Additionally, fish sampling along the south portion of the access road was just initiated in 2018 and surveys should continue in 2019.	Update the number of fish passage culverts to accurately depict the project components and the affected environment and reconcile the discrepancy. Additionally, state that the actual number of fish bearing streams to be crossed is currently unknown. An estimate could be provided with a statement about future surveys to be completed. Presently, ADF&G does not have enough information to determine how many fish passage culverts are required.
ADF&G/Habitat	Chapter 2 Alternatives	Sec 2.2.2.1 Figure 2-9	2-17	Figure 2-9 is not included in review material.	Include Figure 2-9 in draft EIS.
ADF&G/Habitat/SPCS	Chapter 2 Alternatives	Figure 2-16	2-18	There is no attached pipeline on the bridge typical.	There should be a bridge typical drawing that includes the natural gas pipeline.
ADF&G/Habitat	Chapter 2 Alternatives	Sec 2.2.2.2	2-30	The DEIS states that, 'if PAG is identified at a site,' in relation to material sites and road fill adjacent to and over streams.	In order to determine potential impacts to aquatic resources, the DEIS should detail how material sites will be tested for PAG prior to being used as fill in creeks and wetlands. Testing may take time and the details provided do not allow for an assessment of the potential impact to streams and wetlands if PAG is used as fill.
ADF&G/Habitat	Chapter 2 Alternatives	Sec 2.2.2.2	2-30	Water extraction sites are not identified in the DEIS. No screening specifications are mentioned or given for the water extractions.	The location of proposed water withdrawals should be added and is needed to assess potential impacts. Additionally, pump screening and other specifications should be stated.
ADF&G/Habitat	Chapter 2 Alternatives	Sec 2.2.2.2	2-31	Pioneer road construction details are lacking and should be provided to determine potential impacts.	Provide details on pioneer road construction, especially as it relates to stream crossings. Will fords be requested or will temporary bridges be used? Will work occur during frozen or unfrozen conditions? More details are needed.
ADF&G/Habitat/SPCS	Chapter 2 Alternatives	Sec 2.2.2.4	2-43	"The pipeline will be buried in a trench adjacent to the road prism"	EIS should describe how the pipeline will be buried, particularly if blasting will be necessary as well as associated mitigation.
ADF&G/Habitat/SPCS	Chapter 2 Alternatives	Sec 2.2.2.4	2-43	The project description says that the pipeline will use HDD to enter Cook Inlet but does not indicate how it will leave Cook Inlet.	EIS project description should describe how the pipeline will leave the West Side of Cook Inlet.
ADF&G/Habitat/SPCS	Chapter 2 Alternatives	Sec 2.2.2.4	2-44	For river crossings, the pipeline would either use HDD or be attached to the bridge structures. Does not mention open-cut for pipeline stream crossings yet Figure 2-35 references an open-cut typical.	If project intends to use open-cut to cross stream, they should indicate it in the EIS.
ADF&G/Habitat/SPCS	Chapter 2 Alternatives	Sec 2.2.2.4	2-44	There are no detailed figures on the proposed pipeline infrastructure on the Kenai Peninsula.	EIS should include a figure or figures on the proposed pipeline and associated infrastructure on the Kenai Peninsula.
ADF&G/Habitat/SPCS	Chapter 2 Alternatives	Sec 2.2.2.4	2-44	The project description says that the pipeline transitions and burial through Illiamna Lake will be similar to the Cook Inlet Crossing but only describes the transition on the east side of Cook Inlet.	EIS project description should describe how the pipeline will leave the West Side of Cook Inlet as well as specifically describe the transition and burial through Lake Illiamna.
ADF&G/Habitat/SPCS	Chapter 2 Alternatives	Sec 2.2.2.4	2-74	From Diamond Point port, the pipeline would be buried in a trench that follows the general Alternative 3 north access road alignment with minor.	Unclear what "with minor" refers to. EIS should finish the sentence.
ADF&G/Habitat/SPCS	Chapter 2 Alternatives	Sec 2.2.2.4	2-74	Section does not describe how the proposed pipeline will cross streams.	EIS should include language in this section on how the proposed pipeline will cross streams.
ADF&G/Habitat	Chapter 2 Alternatives	Sec 2.2.2.4	2-44	Not enough detail is provided for stream crossings by the natural gas pipeline and fiber optic cable to determine potential impacts. Limited information is provided for major river crossings, but not for other streams and waterbodies. Typical figures for crossings are not included.	Details on stream crossing methods and relative locations for the natural gas pipeline and fiber optic cable should be included in order to properly assess impacts to aquatic environments from streambank disturbance, erosion, temporary diversion, etc.
ADF&G/Habitat	Chapter 2 Alternatives	Sec 2.2.2.6	2-56	Water extraction sites are not identified in the DEIS. No screening specifications are mentioned or given for the water extractions.	The location of proposed water withdrawals should be added and is needed to assess potential impacts. Additionally, pump screening and other specifications should be stated.
ADF&G/Habitat	Chapter 2 Alternatives	Sec 2.2.3.1	2-57	The DEIS describes a change to the embankment construction methods for the TSF under this alternative, which increases the fill area. Why does changing the transportation route necessitate changes to the TSF embankment?	Rationale should be included for this alteration in order to properly assess trade offs and impacts from different alternatives.
ADF&G/Habitat	Chapter 2 Alternatives	Sec 2.2.3.2	2-66	Stream crossing information is not included and there is not enough information to assess potential impacts to aquatic resources from road construction and operation for this alternative.	Include road crossing information to allow for a thorough review and assessment of potential impacts to aquatic resources.
ADF&G/Habitat	Chapter 2 Alternatives	Sec 2.2.3.2	2-68	Water extraction locations are not identified and information on material sites is lacking making assessment of potential impacts to aquatic resources difficult.	Provide details on water extraction sites and material sites to allow for a thorough review and assessment of potential impacts to aquatic resources.

ADF&G/Habitat	Chapter 2 Alternatives	Sec 2.2.4.2	2-84	Not enough information provided to assess potential impacts on aquatic resources.	Include details on stream crossings, material sites, and water withdrawal locations to allow for a review and assessment of potential impacts.
ADF&G/Habitat	Chapter 3 Affected Environment	Sec 3.5.1.2	3.5-6	The sub-section, Sport Fishing, states that sport fishing is managed by the ADF&G through a permit system. This is incorrect. Sport fish guides are required to have a permit, but in general sport fishing is regulated by regulations and the board process.	Rewrite section for accuracy.
ADF&G/Habitat	Chapter 3 Affected Environment	Sec 3.5.1.2	3.5-6	The Sport Hunting and Trapping subsection states that hunting is allowed in the MRSGR. It should be noted that brown bear hunting is not allowed in order to protect McNeil River bears.	Correct the text in the DEIS to state that MRSGR is open to hunting, except it is closed to brown bear hunting in order to provide additional protections to bears using the McNeil River Sanctuary and the State of Alaska's public bear viewing program there.
ADF&G/Habitat	Chapter 3 Affected Environment	Sec 3.5.2.6	3.5-13	This section states that, "There are no visible ATV trails along the access road corridor nearing the mine site or along the access road nearing Amakdedori Port." This statement is incorrect as there are ATV trails near the mouth of and along UTC, as well as ATV trails in the immediate vicinity of the corridor south of Kokhanok.	Update/correct section to include ATV trails near the project.
ADF&G/Habitat/SPCS	Chapter 3 Affected Environment	Sec 3.5	3.5-13	Existing recreational use along the pipeline alignment in Cook Inlet and on the Kenai Peninsula consists of boating on Cook Inlet and recreational use at the state park sites on the Kenai Peninsula. Sentence implies that recreational use along the pipeline on the Cook Inlet and Kenai Peninsula are limited to boating and state park use.	EIS should include the multitude of other recreational uses around the pipeline corridor on the Kenai Peninsula such as hunting and stream fishing, clamming etc. in the vicinity of the pipeline.
ADF&G/Habitat/SPCS	Chapter 3 Affected Environment	Sec 3.5	3.5-13	Section only attempts to describe recreational use on the Kenai Peninsula and Cook Inlet with respect to the natural gas pipeline but ignores the recreational use on the west side of Cook Inlet and Iliamna Lake.	Include a description of recreational use for the rest of the natural gas pipeline including the west side of Cook Inlet.
ADF&G/Habitat/SPCS	Chapter 3 Affected Environment	Sec 3.5	3.5-14	"...though given the presence of <u>ledges</u> and communities around northern Iliamna Lake.."	Change "ledges" to "lodges"
ADF&G/Habitat/SPCS	Chapter 3 Affected Environment	Sec. 3.6.2	3.6-21	Section only addresses current salmon, herring and ground fisheries near the proposed pipeline but does not describe current scallop and historic crab fisheries that are temporarily closed due to low abundance.	Include current scallop and historic crab fisheries near the proposed pipeline that are temporarily closed due to low abundance.
ADF&G/Habitat	Chapter 3 Affected Environment	Sec 3.7.1	3.7-2	Data Gap Summary states that some cultural resource assessments have not yet been completed but will occur in 2019 with the information included in the Final EIS.	Suggest treating fish survey information for the road corridor in the same fashion. Additional surveys should be conducted in 2019 with the results included in the Final EIS.
ADF&G/Habitat	Chapter 3 Affected Environment	Sec 3.11 Figure 3.11-1	3.11-9	This figures shows KOP #2 (Base Camp) as located in MRSGR, but it is actually located in MRSGS.	Correct Base Camp reference as located in MRSGS.
ADF&G/Habitat	Chapter 3 Affected Environment	Sec 3.21.1.1	3.24-2	Section states that sockeye salmon run extends to the vicinity of Big Wiggly Lake.	Sockeye salmon have been documented spawning and rearing in Big Wiggly Lake. The DEIS should accurately state that the sockeye salmon spawn and rear in Big Wiggly Lake.
ADF&G/Habitat	Chapter 3 Affected Environment	Sec 3.22.5.1	3.22-7	Map of Wetlands and Waterbodies at the Mine Site is not included in DEIS review material and was therefore unavailable to review for potential impacts.	Include a map of wetlands and waterbodies in the DEIS.
ADF&G/Habitat	Chapter 3 Affected Environment	Sec 3.23.1.1	3.23-3	The text states that no peregrine falcon nests were detected during surveys, but Figure 3.23-1 shows a peregrine falcon nest close to the Iliamna Spur Road.	Correct or reconcile the discrepancy between figure and text concerning peregrine falcon nests.
ADF&G/Habitat	Chapter 3 Affected Environment	Sec 3.23.1.1	3.23-5	Second paragraph in water birds sub-section states that thousands of ducks stage around Nikabuna and Long Lakes in the fall. This contradicts what is depicted on Figure 3.23-3 which shows 25-100 birds at Long Lake and 251-500 birds near Nikabuna Lakes. Only data for 2005 is depicted in figures. Tundra swan surveys were conducted in 2006 but no results are reported. The inconsistencies, discrepancies, and possible errors make it difficult to determine what the affected environment is for water birds.	Reconcile discrepancy between text and figure for accuracy. Include 2004 and 2006 data in figures. Include tundra swan survey data from 2006 or explain why it is excluded. Make section consistent across sub-sections.

ADF&G/Habitat	Chapter 3 Affected Environment	Sec 3.23.1.1	3.23-5	Last paragraph highlights and details areas with the largest numbers of birds including Nikabuna and Long Lakes. However, Figure 3.23-3 shows the highest concentration of birds as overlapping and adjacent to a mine stockpile and the main water management pond. Stating in the text that the largest numbers of water birds are found 20 km north of the mine site while the figures show the largest fall concentration directly over mine facilities creates confusion for reviewers. The general condition of this section does not lend confidence in regard to accuracy and ability to assess the affected environment.	Reconcile discrepancies in this section so that assessment of the affected environment can be completed. Historical data would improve this section and give greater confidence for bird resources potentially affected.
ADF&G/Habitat	Chapter 3 Affected Environment	Sec 3.23.1.1	3.23-12	Caribou sub-section references Figure 3.23-5 for historical caribou trails to illustrate caribou activity as primarily west of the mine site. The referenced figure provided for DEIS review does not depict caribou trails, nor does any other figure provided.	Figures should depict information for which they are referenced in DEIS.
ADF&G/Habitat	Chapter 3 Affected Environment	Sec 3.23.1.1	3.23-16	Figure 3.23-7 is referenced in the text on p. 3.23-13 but was not provided for review.	Include referenced figures in DEIS.
ADF&G/Habitat	Chapter 3 Affected Environment	Sec 3.23.1.2	3.23-19	The Raptors sub-section states that raptor data for the transportation corridor was collected in 2004 and 2005, but also references raptor surveys in 2018. Figure 3.23-8 is referenced, but was not provided for review. This sub-section is confusing and it is unclear what data was collected and when it was collected.	Revise text to make clear what data was collected and over what years, provide the referenced figure.
ADF&G/Habitat/SPCS	Chapter 3 Affected Environment	Sec 3.23.1.2	3.23-19	Section only describes bird and wildlife species on the west side of Cook Inlet and ignores species on the east side where a compressor station as well as some natural gas pipeline will be located.	Include a description of bird and wildlife species on the east side of Cook Inlet around proposed infrastructure.
ADF&G/Habitat	Chapter 3 Affected Environment	Sec 3.23.1.2	3.23-25	Only bald eagles are discussed for the port in Raptors sub-section.	Other raptors utilize the port area and should be included for a comprehensive description of the affected environment.
ADF&G/Habitat	Chapter 3 Affected Environment	Sec 3.24.1.1	3.24-1	NFK sub-section states that 15 miles of mainstem channel are upstream of the mine site footprint. It is unclear what is meant by upstream of the mine and how the 15 miles were calculated. Mainstem habitat upstream of Tributary 1.19 appears closer to 9 miles of anadromous stream length and there are mine components upstream of this tributary (e.g., water management pond, water well field).	Define what is upstream of the mine and identify what the 15 miles refers to or how it was calculated. Where is the break point of what is considered upstream of the mine. This is referred to throughout this section and it is important to understand how it was derived. For example, 'preferred coho spawning habitat appears to be in the 10 miles of mainstem immediately downstream of the mine site.'
ADF&G/Habitat	Chapter 3 Affected Environment	Sec 3.24.1.1 Figures 3.24-2 to 3.24-4	3.24-8 to 3.24-10	These figures contain inaccurate or misleading information. Segments of stream that were never sampled are listed as "no fish present." See especially Fig. 3.24-3 (near mine site and Trib. 1.19).	Only streams with comprehensive surveys resulting in no fish observed, or where habitat is unsuitable, should be identified as "no fish present." Lakes should be included in these figures for fish distribution.
ADF&G/Habitat	Chapter 3 Affected Environment	Sec 3.24.1.1	3.24-5	This section refers to a reach of SFK as "going dry during summer," or "dry reach" and "dry channel." The way the section is written implies the reach is dry on an annual basis. Some years it contains water at the surface during all seasons and 4 years of surveys may not be representative of frequency trends.	It would be more accurate to describe this reach as intermittently going subsurface. It should also be noted that fry and eggs may still find suitable habitat beneath the gravels when the stream appears dry, unless this was researched and found not to be occurring.
ADF&G/Habitat	Chapter 3 Affected Environment	Sec 3.24.1.1	3.24-11	The Transportation Corridor sub-section contains errors or omissions and appears incomplete for review. Fish surveys along the transpiration corridor are not yet completed.	The DEIS should properly state that the number of fish streams crossed by the transportation corridor is currently unknown or data could be identified as incomplete.
ADF&G/Habitat	Chapter 3 Affected Environment	Sec 3.24.1.1 Figure 3.24-5	3.24-16	Figure 3.24-5 only depicts 2 anadromous fish streams crossed by the corridor south of Iliamna Lake. Preliminary results from sampling conducted in 2018 report at least 10 anadromous fish streams and not all of the streams have been surveyed. Three streams with documented sockeye salmon spawning in Section 11 (T 9 S/R 33 W) near Kokhanok are not depicted.	Figure should be updated to accurately depict the affected environment and streams that have not been surveyed should be identified.
ADF&G/Habitat	Chapter 3 Affected Environment	Sec 3.24.1.1 Table 3.24-12	3.24-11	The last paragraph on the page states that a total of 7 anadromous streams would be crossed by the transportation corridor. This is inaccurate and misleading to report results for something that is not yet fully investigated. There are 10 anadromous fish streams crossed by the southern portion alone and surveys are not yet completed.	Accurately report the number of anadromous fish streams affected by the project and note where surveys are incomplete.

ADF&G/Habitat	Chapter 3 Affected Environment	Sec 3.24.1.1	3.24-12	Sub-section states that 32 waterbodies will be crossed by the north access road. This contradicts information submitted to the USACE in Pebble's 404 application which lists 55 waterbodies crossed by the northern portion of the access road.	The DEIS should be updated to accurately report the number of waterbodies crossed and correct number of fish bearing streams. Preliminary data show that at least 11 fish bearing streams are crossed by the north portion of the access road and future surveys may increase this number.
ADF&G/Habitat	Chapter 3 Affected Environment	Sec 3.24.1.1	3.24-13	Sub-section states that 65 water bodies would be crossed by the south access road, of which 2 are anadromous. Preliminary results indicate that there are at least 10 anadromous fish streams crossed by the south access road. The applicant's 404 application lists 173 waterbodies crossed by the south access road.	The DEIS should be correct to accurately depict the number and type of stream crossings.
ADF&G/Habitat	Chapter 3 Affected Environment	Sec 3.24.1.2	3.24-14	Stream mileage captured or blocked by mine facilities is not listed like in SFK subsection.	Include paragraph like that in SFK sub-section that states the stream mileage captured or blocked by mine facilities for the sake of consistency and to completely depict the affected environment.
ADF&G/Habitat	Chapter 3 Affected Environment	Sec 3.24.1.2	3.24-15	Last paragraph states that other resident fish are distributed in low abundance in the <u>lower reaches</u> of the NFK.... This sentence is misleading and should be revised. Many of the resident fish species are found throughout the drainage, including headwaters.	Include information on headwater distribution of fish species.
ADF&G/Habitat	Chapter 3 Affected Environment	Sec 3.24.1.2 Table 3.24-5	3.24-19	Section states that stream mileage for species is given in Table 3.24-5, but the table does not contain that information.	Update table or correct reference for accuracy.
ADF&G/Habitat	Chapter 3 Affected Environment	Sec 3.24.1.2	3.24-21	The first sentence of the last paragraph says that DV, SS, and AG are the <u>only</u> resident fishes documented in the headwater reaches near the mine site. The next sentence states that juvenile rainbow trout were observed in the headwater reaches near the mine site.	The two sentences contradict one another and should be corrected for consistency and accuracy.
ADF&G/Habitat	Chapter 3 Affected Environment	Sec 3.24.1.2	3.24-22	The Iliamna Lake sub-section begins by stating that 11 fish species have been reported from Iliamna Lake and then lists 14 species as documented using the lake. This is another contradiction and inconsistency in this section which is difficult to review overall because of how it is written.	Include all species that have been reported in Iliamna Lake, such as pond smelt, least cisco, 3-spine stickleback, AK blackfish, round whitefish, burbot, lamprey sp..... (26 species in total by my quick research).
ADF&G/Habitat	Chapter 3 Affected Environment	Sec 3.24.1.3	3.24-25	Figure 3.24-6 is referenced for macroinvertebrate sampling sites, but the figure does not contain any depiction of such locations. Additionally, data from Y Valley Creek and an unnamed creek are referenced here but those sites are located more than 40 miles away and were sampled when the transportation corridor was proposed further north.	Sampling results should be listed from creeks along the transportation corridor or at the port to properly depict the affected environment.
ADF&G/Habitat/SPCS	Chapter 4 Environmental Consequences	Sec 4.1.3.2	4.1-4	Section lists several activities that were considered for cumulative effects analyses but does not include the proposed natural gas pipeline.	EIS should include a thorough cumulative effects analysis for the natural gas pipeline.
ADF&G/Habitat/SPCS	Chapter 4 Environmental Consequences	Sec 4.5	4.5-6	"Noise and activities during project construction and closure may also temporarily adversely affect recreation experiences for visitors to the Stariski State Recreation Site" Only describes noise impacts to users of the State Recreation Site.	EIS should describe impacts from noise and activities for the entire pipeline corridor on the Kenai Peninsula including hunting and fishing outside of the State Recreation Area.
ADF&G/Habitat/SPCS	Chapter 4 Environmental Consequences	Sec. 4.13.2.4	4.13-5	Section indicates that the pipeline will use HDD to enter Cook Inlet but does not indicate how it will leave Cook Inlet.	Section should describe in detail how the pipeline will leave the West Side of Cook Inlet.
ADF&G/Habitat/SPCS	Chapter 4 Environmental Consequences	Sec. 4.13.2.4	4.13-6	Section only indicates that the pipeline will be buried nearshore to lake Iliamna but does not indicate how . .	Section should describe in detail how the pipeline will be buried under the nearshore areas of Iliamna Lake.
ADF&G/Habitat/SPCS	Chapter 4 Environmental Consequences	Sec. 4.14.2.4	4.14-11	Chapter does not address environmental consequences of erosion and resultant stream sedimentation from trenching through thaw unstable ice-rich slopes.	Project should identify all areas of permafrost along the proposed natural gas pipeline in the EIS particularly any thaw unstable slopes that will need to be trenched. This is necessary due to likelihood of erosion and subsequent stream sedimentation once permafrost is trenched. Environmental consequences should be described, and mitigation measures should also be identified to monitor and stabilize these post-construction.

ADF&G/Habitat/SPCS	Chapter 4 Environmental Consequences	Sec. 4.14.2.5	4.14-11	Chapter does not address environmental consequences from erosion and subsequent stream sedimentation from overland flows intercepting the pipeline ditch.	Chapter should address environmental consequences of erosion from surface waters intercepting the pipeline ditch and describe how the ditch will be stabilized and monitored for erosion.
ADF&G/Habitat/SPCS	Chapter 4 Environmental Consequences	Sec 4.16.2.5	4.16-23	Section only states impacts would be similar to transportation corridor but does not describe actual impacts or consequences	Section should describe sources of erosion/scour and consequences from all aspects of pipeline installation at stream crossings including direct pipeline trenching, HDD, inadequate bank protection, ditch maintenance, blasting, erosion and channelization from surface water intercepting the pipeline ditch, etc.
ADF&G/Habitat/SPCS	Chapter 4 Environmental Consequences	Sec. 4.18.2.3	4.18-16	Section only addresses impacts on surface water from the Amakdedori Port and not the ports on Illiamna Lake.	EIS should describe impacts on surface water quality from the Illiamna Lake ports.
ADF&G/Habitat/SPCS	Chapter 4 Environmental Consequences	Sec. 4.18.2.4	4.18-18	Surface water quality at pipeline stream crossings is expected to be within water quality standards for turbidity during construction.	EIS should describe how they will maintain within water quality standards for turbidity during pipeline trenching operations through streams as well as monitoring and mitigation plans.
ADF&G/Habitat/SPCS	Chapter 4 Environmental Consequences	Sec. 4.18.2.4	4.18-18	Chapter does not address likely erosion and resultant stream sedimentation from trenching through thaw unstable ice-rich slopes.	Project should identify all areas of permafrost along the proposed natural gas pipeline in the EIS particularly any thaw unstable slopes that will need to be trenched. This is necessary due to likelihood of erosion and subsequent stream sedimentation once permafrost is trenched. Mitigation measures should also be identified to monitor and stabilize these post-construction.
ADF&G/Habitat/SPCS	Chapter 4 Environmental Consequences	Sec. 4.18.2.4	4.18-18	Chapter does not address erosion and subsequent stream sedimentation from overland flows intercepting the pipeline ditch.	Chapter should address erosion from surface waters intercepting the pipeline ditch and describe how the ditch will be stabilized and monitored for erosion.
ADF&G/Habitat/SPCS	Chapter 4 Environmental Consequences	Sec 4.18.2.4	4.18-18	"Impacts on surface water quality within the natural gas pipeline corridor would be associated with installation of the pipeline at water crossings and the use of local water sources for hydrostatic testing. Impacts at material sites and stream crossings would be the same as those described above for the transportation corridor." Section only describes two sources of impacts to surface water from the proposed pipeline.	In addition to stream crossings and hydrostatic testing, EIS should describe impacts and consequences from overland flows intercepting the pipeline ditch causing erosion, sedimentation and channelization especially on thaw unstable slopes. EIS should also describe the impacts and consequences of HDD and inadequate bank protection/restoration.
ADF&G/Habitat/SPCS	Chapter 4 Environmental Consequences	Sec. 4.18.2.4	4.18-18	Chapter does not address impacts from turbid water from within the pipeline ditch migrating to streams and streambank and streambed restoration.	Chapter should address how waters within the pipeline ditch will be handled as well as plans for streambed and streambank restoration.
ADF&G/Habitat/SPCS	Chapter 4 Environmental Consequences	Sec. 4.18.2.4	4.18-19	"Horizontal Directional Drilling (HDD) operations would be required only for the natural gas pipeline at the Kenai shore approach near Anchor Point. "	Pipeline HDD may be a requirement of Title 16 Fish Habitat Permits for high value fish lakes and streams. Chapter should describe potential impacts of HDD on areas other than just the east side of Cook Inlet. Section 4.24.2.1 indicates that HDD will be used in Illiamna Lake as well.
ADF&G/Habitat/SPCS	Chapter 4 Environmental Consequences	Sec 4.19	4.19-13	"Noise impacts associated with the mainline would occur mainly during construction. Construction-related noise sources would be generated by helicopter traffic, diesel-powered mobile equipment, pipe installation equipment, equipment operating at material sites, and blasting (in the event it would be necessary)." Statement does not include any noise associated with Horizontal Directional Drilling (HDD)	The EIS section on noise impacts from construction of a natural gas pipeline should also list noise associated with HDD.
ADF&G/Habitat/SPCS	Chapter 4 Environmental Consequences	Sec 4.23	4.23-2	Chapter does not address the unique behavioral disturbance to birds and wildlife due to the presence of remote field camps.	Chapter should address the potential effects of remote field camps on birds and wildlife. A plan addressing specifics on temporary and permanent camps should be developed and reviewed by appropriate agencies.
ADF&G/Habitat/SPCS	Chapter 4 Environmental Consequences	Sec 4.23	4.23-2 and 4.23-5	Chapter does not address the behavioral or physical disturbance to birds and wildlife associated with waste both (putrescible and non) generated during construction and operations.	Chapter should address the potential effects of improper disposal of waste on birds and wildlife. A Comprehensive Waste Management Plan should be developed and reviewed by the appropriate agencies.
ADF&G/Habitat/SPCS	Chapter 4 Environmental Consequences	Sec 4.23	4.23-2 and 4.23-5	Chapter does not address the potential behavioral or physical disturbance to birds and wildlife due to human interaction such as feeding and defense of life and property.	Chapter should address the potential effects on birds and wildlife from human wildlife interaction. A Wildlife Avoidance and Human/Interaction Plan should be developed and reviewed by appropriate agencies as well.
ADF&G/Habitat/SPCS	Chapter 4 Environmental Consequences	Sec 4.23	4.23-2 and 4.23-5	Chapter does not address the behavioral or physical disturbance to birds and wildlife associated with waste both (putrescible and non) generated during construction and operations.	Chapter should address potential impacts to wildlife from wastes generated during construction and operations

ADF&G/Habitat/SPCS	Chapter 4 Environmental Consequences	Sec 4.23.2.2	4.23-5	Chapter does not address the potential behavioral or physical disturbance to wildlife due to pipeline stringing.	Chapter should address the potential effects on wildlife movements as a result of pipeline stringing both for prolonged periods of time and length. EIS should also describe applicant's plan to minimize animal entrapment in open ditches as well as barriers to animal movement created by pipe stringing operations.
ADF&G/Habitat/SPCS	Chapter 4 Environmental Consequences	Sec 4.23.2.2	4.23-5	Chapter does not address the potential behavioral or physical disturbance to wildlife due to an exposed open trench during pipeline installation.	Chapter should address the potential effects on wildlife from the exposed open trench during pipeline installation.
ADF&G/Habitat/SPCS	Chapter 4 Environmental Consequences	Sec 4.23.2.2	4.23-6	"The Amakdedori port would also be a source of long-term disturbance due to vessel traffic, loading and unloading activities, and the presence of workers and vehicles. The disturbance zone around the port site would likely be much smaller than the area around the mine site due to a lack of explosives, smaller vehicles, and less frequent human presence." Chapter does not list the Lake Iliamna ports as a source of long-term disturbance.	Chapter should also address the Lake Iliamna ports as a source of long-term disturbance.
ADF&G/Habitat/SPCS	Chapter 4 Environmental Consequences	Sec 4.24	4.24-1	Chapter does not list any indirect effects on fish from the proposed project.	Chapter should describe indirect effects on fish such as increased fishing pressure due to increased access.
ADF&G/Habitat/SPCS	Chapter 4 Environmental Consequences	Sec 4.24.2.1	4.24-3	Section only describes the fish habitat loss from the proposed pipeline in the waters of Cook Inlet.	Section should describe all potential sources of fish habitat loss from the installation of the pipeline including placement in Lake Iliamna as well as inadequate bank restoration/protection.
ADF&G/Habitat/SPCS	Chapter 4 Environmental Consequences	Sec 4.24.2.5	4.24-4	Section only lists two potential sources of fish displacement, injury, and mortality from the proposed pipeline-stranding from water diversions and impingement from water pumping.	This section should describe the sources of and all impacts from stream sedimentation on all life stages of fish. Sedimentation sources include trenching, improper use of BMPs, inadequate bank restoration and stabilization, channelization of backfilled trench, and HDD frac-out. Additional examples of impacts include direct mortality to eggs (both directly from trenching, blasting and piledriving as well as blocking the O2 intake from filling in interstitial spaces in stream gravel from sedimentation) and displacement and mortality of adults and juveniles from blasting, piledriving, and sedimentation.
ADF&G/Habitat	Chapter 4 Environmental Consequences	Sec 4.24.2.7	4.24-17	NFK sub-section states that a 2.8 C rise in temperature during winter months will alter incubation times of salmon eggs.	Impacts from temperature changes in the streams should be weighed against other measures and not just the ADEC guidance. A nearly 3 degree rise in winter stream temperatures will have some effect on incubating eggs even if below the ADEC threshold.
ADF&G/Habitat	Chapter 4 Environmental Consequences	Sec 4.24.2.7	4.24-17	This section states that any water chemistry impacts to fish would not be measurable, but this assumes that operations are conducted exactly as planned with no operational issues. Potential impacts due to pump breakdowns, frozen pipes, operator error, or other disruptions to the water distribution system could have impacts on fish and should be included in the assessment. In general, unplanned events should also be considered for impacts (e.g., breakdown of water management system, AMD - testing and predictions are not 100%, large rain events, road washouts, unplanned fuel releases...).	Expand the scope of potential impacts to more accurately include the range of potential operational issues that may occur over the life of the project.
ADF&G/Habitat/SPCS	Appendix E- Laws, Permits, Etc.	Table E-1	E-15	Table lists ADF&G's only role from the Anadromous Fish Act is Fish Passage permits.	Should change to ADF&G Title 16 Fish Habitat Permits
ADF&G/Habitat/SPCS	Appendix E- Laws, Permits, Etc.	Table E-1	E-15	Table lists "Fish Habitat Permits" under FWCA authority.	Should remove Fish Habitat Permits as authority under FWCA
ADF&G/Habitat/SPCS	Appendix E- Laws, Permits, Etc.	Table E-1	E-15	Table lists role of Fishway Act AS 16.05.841 only as "Fish Passage sufficiency determinations"	Should change to ADF&G Title 16 Fish Passage Permits
ADF&G/Habitat	Appendix E- Laws, Permits, Etc.	Table E-1	E-15	Activities Requiring a Special Area Permit lists the requirement for Special Area Permits in state game refuges, state recreation areas, across designated wild and scenic rivers, or through state parks. This is incorrect.	Special Area Permit requirements issued under 5 AAC 95 only pertain to activities occurring in state game refuges, state game sanctuaries, and critical habitat areas.

ADF&G/Habitat	Appendix E- Laws, Permits, Etc.	Table E-1	E-15	License, Permit, and Tag Fees; Surcharge: Miscellaneous Permits to Take Fish and Game (AS 16.05.340). This refers to hunting and fishing licenses and is not applicable to the project since they have declared that no employees will be hunting or fishing.	Remove row or reconcile discrepancy.
ADF&G/Habitat/SPCS	Appendix E- Laws, Permits, Etc.	Table E-1	E-15	Permit for Scientific, Education, Propagative, or Public Safety Purposes (5 AAC 92.033). Role is referred to as Fish collection permits for field studies which is not entirely accurate. This reference is confusing and it is unclear what is intended.	Fish collection permits for field studies are actually referred to as Aquatic Resource Permits under 5 AAC 41. Clarify intended reference or reconcile discrepancies.
ADF&G/Habitat/SPCS	Appendix K- Technical Appendices	Sec 3.14 Soils	K3.14-3	"Isolated permafrost varies from 0 to 10 percent of the landscape subsurface."	Project should identify all areas of permafrost along the proposed natural gas pipeline in the EIS particularly any thaw unstable slopes that will need to be trenched. This is necessary due to likelihood of erosion and subsequent stream sedimentation once permafrost is trenched. Mitigation measures should also be identified to monitor and stabilize these post-construction.
ADF&G/Habitat/SPCS	Appendix K- Technical Appendices	Sec 3.1 Intro Affected Enviro.	K.3.1-1	Scoping comments refer to "underwater" streams in the headwaters that are important to small fish fry and fingerlings.	Further clarification would be helpful on what is meant by underwater streams.

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ADF&G/ Sport Fish/ISF Program	Draft EIS	General	General	In general, this document is incomplete, missing sections, references etc.	Further information may be needed to assess the ability to sustain fish and wildlife production when provided with more project details, specifically regarding the transportation corridors.
ADF&G/Sport Fish	Chapter 2 Alternatives	Sec 2.2.2.4	2-43	The description of HDD is not sufficient enough to understand impacts to coastal bluff, sandy intertidal, rivers, and nearshore waters	Better describe activities.
ADF&G/Sport Fish	Chapter 3 Affected Environment	Sec 3.5.2.1	3.5-6	Sport fishing is not managed through a permit system.	Sport fishing is managed using numerous tools (effort, catch, and harvest information <Statewide Harvest Survey, logbooks>; abundance; size composition etc.) which are mentioned but there is no permit system used to manage the sport fishery.
ADF&G/Sport Fish	Chapter 3: Affected Environment	Sec 3.6.3	3.6-23 and 3.6-24	The sport fisheries at the eastern terminus of the pipeline and along the pipeline corridor in Cook Inlet salt waters are not accurately represented and there should be a complete discussion for these fisheries.	The Lower Cook Inlet Sport Fish Management Area supports roughly 10% of the total sport fishing effort in AK. Most of that effort is focused on salt water opportunities including halibut, nearshore Chinook salmon, and intertidal razor clams. All three of these fisheries may be impacted with the proposed activities. Halibut fisherman routinely anchor and fish on the bottom along the pipeline corridor.
ADF&G/Sport Fish	Chapter 3 Affected Environment	Sec 3.6.3	3.6-27	Guided angler-days for the Newhalen do not appear to be correct. The 2012-2016 average should be 288 not "fewer than 200".	Review and update the data and text for this section.
ADF&G/ Sport Fish/ISF Program	Chapter 3 Affected Environment	Fig. 3.16-4	3.16-6	Figure 3.16-4 does not show Stream Gaging Stations as cited in the text, it only depicts Meteorological Stations. Map lacks basic elements such as scale and north arrow.	Replace with correct map with standard map elements
ADF&G/ Sport Fish/ISF Program	Chapter 3 Affected Environment	Fig. 3.16-5	3.16-7	Figure 3.16-5- resolution of figure is too poor to read some labels.	Provide map with higher resolution
ADF&G/ Sport Fish/ISF Program	Chapter 3 Affected Environment	Fig. 3.16-2	3.16-8	Figure 3.16-2 does NOT "depict all gaging station locations in the three watersheds" as stated in text.	Replace with Figure 3.16-3
ADF&G/ Sport Fish/ISF Program	Chapter 3 Affected Environment	Fig. 3.16-3	3.16-8	Figure 3.16-3 lacks basic standard map information such as north arrow and scale. Very poor resolution, difficult to read labels.	Provide high resolution map with standard map elements
ADF&G/ Sport Fish/ISF Program	Chapter 3 Affected Environment	Fig. 3.16-4	3.16-9	Figure 3.16-4 is incorrectly referenced under heading North Fork Koktuli River. Figure does NOT show stream gaging stations. Map lacks basic elements such as scale and north arrow.	Replace with correct map with standard map elements
ADF&G/ Sport Fish/ISF Program	Chapter 3 Affected Environment	Fig. 3.16-3	3.16-9	Figure 3.16-3 is incorrectly referenced in last paragraph.	Reference Figure 3.16-2
ADF&G/ Sport Fish/ISF Program	Chapter 3 Affected Environment	Sec 3.16.1.1	3.16-18	Meteorological Inputs- references Knight Piesold 2018a and 2018d. These references are not included in references sections and document could not be located.	Provide required reference documentation for all Knight Piesold 2018 documents
ADF&G/ Sport Fish/ISF Program	Chapter 3 Affected Environment	Sec 3.16.1.2	3.16-19	Lack of data or surface water investigations for southern segment of mine access road from ferry terminal to Amakdedori.	Conduct detailed surface water investigations to assess impacts from this alternative
ADF&G/ Sport Fish/ISF Program	Chapter 3 Affected Environment	Sec 3.16.1.2	3.16-21	Lack of data or surface water investigations for southern segment of mine access road.	Conduct detailed surface water investigations to assess impacts for this alternative. Ideally, a minimum of 5 years of continuous flow records are desired; however, shorter periods can be agreed upon and used when field data are combined with synthetic data and mutually agreed-upon analyses.
ADF&G/ Sport Fish/ISF Program	Chapter 3 Affected Environment	Sec 3.16.1.2	3.16-22	Many surface water extraction sites along road routes are likely very small streams. But no information is provided about hydrology along south access road corridor. Hydrology data will be needed to size culverts along this corridor and assess impacts to fish habitat.	Provide information on how water extraction from small streams may impact fish habitat.
ADF&G/ Sport Fish/ISF Program	Chapter 3 Affected Environment	Sec 3.16.1.2	3.16-22	ADF&G requires sufficient seasonal instream flows be maintained in all waterbodies supporting fish and wildlife resources.	Provide information on how water extraction from small streams may impact fish habitat.
ADF&G/ Sport Fish/ISF Program	Chapter 3 Affected Environment	Sec 3.16.1.2	3.16-22	ADF&G holds Certificates for Reservations of Water on Lower Talarik Creek, Newhalen River, and Kvichak River. A Reservation of Water is on file for the Iliamna River.	Surface water extraction will not be permitted if extraction may have impacts to senior water right/water reservations
ADF&G/Sport Fish	Chapter 3 Affected Environment	Sec 3.24	3.24-13	The description of the Cook Inlet area most likely to be affected is not accurate.	Include Upper Cook Inlet for the pipeline corridor and eastern terminus
ADF&G/Sport Fish	Chapter 3 Affected Environment	Sec 3.24.1.2	3.24-14 through 3.24-19	The Nushagak River Chinook salmon run is one of the largest and most consistent Chinook salmon runs in the state and supports one of the largest sport fisheries in Southwest Alaska.	Provide some description of the size, utilization, and value of the Nushagak River Chinook salmon run.
ADF&G/Sport Fish	Chapter 3 Affected Environment	Table 3.24-5	3.24-17	Cook Inlet salt waters commercial and sport fisheries are not included in this section. There is potential for this project to affect both fisheries.	Create separate periodicity table for all salmon species and steelhead trout in Cook Inlet salt waters.
ADF&G/Sport Fish	Chapter 3 Affected Environment	Sec 3.24.1.2	3.24-20	It should be mentioned during discussion of pink salmon abundance that they are on a 2-year cycle. It is also unclear which year is being referenced when 2 years are listed as a range (i.e. "zero in 2004-2005 and 2008-2009").	Expand discussion of pink salmon life cycle and specify which year of data is being referenced.
ADF&G/Sport Fish	Chapter 4 Environmental Consequences	Sec 4.6	Table 4.6-1	Cook Inlet salt waters are not included in the table. These waters are an important migratory corridor for both smolt and returning adult salmon.	Include Cook Inlet commercial and sport fisheries.
ADF&G/ Sport Fish/ISF Program	Chapter 4 Environmental Consequences	Sec 4.16.2.1	4.16-2	Streamflow Effects- seasonality/seasonal flow distributions must be maintained. How will excess water from dewatering operations be seasonally managed? Concern regarding water releases during typical low flow periods in headwater streams.	Further explain timing/seasonality (not only net water balances) in text. Include Water Management Plan.
ADF&G/ Sport Fish/ISF Program	Chapter 4 Environmental Consequences	Sec 4.16.2.1	4.16-2	References Knight Piesold 2018a. This reference is not included in references sections and cannot locate document.	Provide required reference documentation for all Knight Piesold 2018 documents
ADF&G/ Sport Fish/ISF Program	Chapter 4 Environmental Consequences	Sec 4.16.2.1	4.16-3 & 4.16-6	Water Management- "Water not diverted before becoming contact water would be ... or treated and released to environment." Management of surplus water...	Instream flow shifts and variations can affect riparian habitat. ADF&G recommends streamflow regimes similar to the magnitude and timing of the natural streamflows to maintain seasonal use of fish habitat. Provide magnitude and timing of flow augmentation anticipated from release of surplus water
ADF&G/ Sport Fish/ISF Program	Chapter 4 Environmental Consequences	Sec 4.16.2.1	4.16-15	"Flows from the fresh water diversions and reclaimed facilities are expected to vary according to natural flow patterns, which are also linked to seasonal climate variability.	Provide appropriate documentation where hydrographs which are "expected to vary according to natural flow patterns" can be reviewed
ADF&G/ Sport Fish/ISF Program	Chapter 4 Environmental Consequences	Sec 4.16.2.1	4.16-18	Bridge Crossings- "Instream channel work, including installation of bridge footings and embankments, would occur year-round during the first 2 years of construction."	Instream work will be limited to dates specified in Fish Habitat Permits
ADF&G/ Sport Fish/ISF Program	Chapter 4 Environmental Consequences	Sec 4.16.2.1	4.16-19	"Before the extraction of water from anadromous streams along the road and pipeline corridors, sufficient streamflow would need to be demonstrated to permit summer/winter extraction."	Demonstration of sufficient streamflow/monitoring will be the onus of the applicant
ADF&G/ Sport Fish/ISF Program	Chapter 4 Environmental Consequences	Sec 4.24.2.3	4.24-7	"The magnitude and extent of impact would vary among the three principal tributaries, according to the degree of surface water and groundwater capture, the location of impacts in the basin, the proximity and size of downstream tributaries, and the magnitude of flow augmentation at the water release facilities."	Provide further analysis of these impacts, since a detailed water management plan is proposed, the information should be available to assess the estimated magnitude and extent of impacts

ADF&G/Sport Fish	Chapter 4 Environmental Consequences	Sec 4.24.2.6	4.24-16	In the Natural Gas Pipeline section there is no mention to disrupting important fish stocks such as Pacific halibut and salmon.	A thorough review of important fish stocks migration through Cook Inlet salt waters should be reviewed. The nearshore waters near the compression station location is an important staging area for Kenai Peninsula salmon stocks as they return to spawn.
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ADF&G/Subsistence	Chapter 3 Environment Affected	Sec 3.9.3	3.9-4	Effects are minimized.	Document states small effects on resources in the watershed as a whole; impacts would be localized to the vicinity of the project area. Adverse impacts on salmon populations would be felt by all communities in the watershed.
ADF&G/Subsistence	Chapter 3 Environment Affected	Sec 3.9.3	3.9-5	Incorrect statement that data available through the ADF&G Community Subsistence Information System are not as recent as the technical paper database.	Either give a different explanation for relying on the technical papers or delete what comes after "reviewed and incorporated into this analysis..." Data in the CSIS is the most current source of data.
ADF&G/Subsistence	Chapter 3 Environment Affected	Sec 3.9.3	3.9-7	Would be helpful to have the communities in the immediate vicinity delineated in this table	Highlight those communities, move Port Alsworth since it is not discussed with the other nearby communities.
ADF&G/Subsistence	Chapter 3 Environment Affected	Sec 3.9.3	3.9-9	More recent salmon and nonsalmon harvest data is available	Salmon harvest data for 2007-2008 (Tech Paper No 352) nonsalmon harvest data from 2013 (TP #411).
ADF&G/Subsistence	Chapter 3 Environment Affected	Sec 3.9.3	3.9-12	More recent salmon and nonsalmon harvest data is available	Salmon harvest data for 2007-2008 (Tech Paper No 352) nonsalmon harvest data from 2013 (TP #411).
ADF&G/Subsistence	Chapter 3 Environment Affected	Sec 3.9.3	3.9-15	More recent nonsalmon harvest data is available	Nonsalmon harvest data 2012-2013, ADF&G TP 411
ADF&G/Subsistence	Chapter 3 Environment Affected	Sec 3.9.3	3.9-18	More recent salmon and nonsalmon harvest data is available	Salmon harvest data for 2007-2008 (Tech Paper No 352) nonsalmon harvest data from 2013 (TP #411).
ADF&G/Subsistence	Chapter 3 Environment Affected	Sec 3.9.3	3.9-21	More recent nonsalmon harvest data is available	Nonsalmon harvest data 2012-2013, ADF&G TP 411
ADF&G/Subsistence	Chapter 3 Environment Affected	Sec 3.9.3	3.9-12	Why are only marine mammals singled out as a species group "a smaller proportion of households harvest"? Nonsalmon fish and large land mammals, migratory birds and bird eggs, as well as vegetation are all used and/or harvested by greater percentages of households.	Specify why marine mammals are singled out or include other resource categories.
ADF&G/Subsistence	Chapter 3 Environment Affected	Sec 3.9.3	3.9-15	Why are only marine mammals singled out as a species group "a smaller proportion of households harvest"? Nonsalmon fish and large land mammals, bird eggs, as well as vegetation are all used and/or harvested by greater percentages of households.	Specify why marine mammals are singled out or include other resource categories.
ADF&G/Subsistence	Chapter 3 Environment Affected	Sec 3.9.3.4	3.9-18	Why are only marine mammals singled out as a species group "a smaller proportion of households harvest"? Nonsalmon fish and large land mammals, small land mammals, as well as vegetation are all used and/or harvested by greater percentages of households.	Specify why marine mammals are singled out or include other resource categories.
ADF&G/Subsistence	Chapter 3 Environment Affected	Sec 3.9.3.5	3.9-21	Why are only marine mammals singled out as a species group "a smaller proportion of households harvest"? All other resource categories are used and/or harvested by equal or greater percentages of households.	Specify why marine mammals are singled out or include other resource categories.
ADF&G/Subsistence	Chapter 3 Environment Affected	Sec 3.9.3.5	3.9-22	Singling out two reasons that were not given for changes in harvest and use is of limited value. These were open-ended questions, so lots of reasons were not given, not just these two.	Provide reasons that were given or provide more context about reasons for changes in harvests and uses.
ADF&G/Subsistence	Chapter 3 Environment Affected	Sec 3.9.3.5	3.9-22	This is the only community for which reasons given, or not, for changes in households' harvests and uses was given.	Provide similar data for the other communities.
ADF&G/Subsistence	Chapter 3 Environment Affected	Sec 3.9.3.6	3.9-24	It isn't stated to what Kokhanok's economy is being compared to. Explain that it has "comparatively little industrial or tourist based economic development."	Explain what it is being compared to - other communities in the region, in the state?
ADF&G/Subsistence	Chapter 4 Environmental Consequences	Sec 4.9.2.2	4.9-4	Use area maps depict all the places that people use for harvesting wild resources in any given year, but not all areas are equally productive any given year. Although communities may have access to other areas for resource harvest outside of proposed areas with likely disrupted access, those areas may not be an equal substitute.	Include some discussion to this effect, similar to what was included in Chapter 3.
ADF&G/Subsistence	Chapter 4 Environmental Consequences	Sec 4.9.2.2	4.9-4	End of 2nd paragraph, crossing at designated points may add travel time and expense for subsistence users, not just travel time.	Add in that expense may increase with the use of designated crossing points.
ADF&G/Subsistence	Chapter 4 Environmental Consequences	Sec 4.9.2.3	4.9-7	"visit for recreational trips" could include sport hunting or fishing.	Recreation trips to nearby destinations, including for the purposes of sport hunting or fishing.
ADF&G/Subsistence	Chapter 4 Environmental Consequences	Sec 4.9.2.4	4.9-9	If there are adverse impacts on salmon runs, the communities affected would not be limited to those closest to the project's infrastructure and transportation activities. Downriver communities would be impacted by reduced salmon runs and would not just have "perceived concerns"	Change the second to last paragraph to recognize the movement of resources, such as of salmon runs, and the potential impact that could have on subsistence practices of downstream communities.
ADF&G/Subsistence	Chapter 4 Environmental Consequences	Secs 4.4.2, 4.4.3, 4.4.4	4.4-5, 4.4-6, and 4.4-9	Mapped subsistence resource harvest areas do not represent just one year of use, but areas that have been used over some period of time. Because an area has been used in one year, does not mean it's always used or vice versa. Stating that the impacts of access to subsistence harvest areas would not be high and adverse neglects the unpredictable nature of subsistence resources. If large land mammals are not present in an area that has been hunted in years past, then the availability of this alternate area does not mitigate the loss of access to the areas around the mine and transportation corridors.	Acknowledge in the assessment the variable nature of subsistence resources in terms of location and abundance and qualify the statement that impacts would not be high and adverse.
ADF&G/Subsistence	Chapter 9 References	N/A	9-43	Incorrect citation year	Wolfe et al 2005 should have a date of 2010, not 2005.

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Department/Division/Section	Document Name	Section/Fig/ Table	Page #	Comment/Issue	Recommendation/Action
ADF&G/Wildlife/Refuges	Draft EIS	General	General	Throughout the documents a common theme is to refer the reader to previous or other chapters or sections for information on the subject that is currently being read. For example, it is common to say impacts or resources for one alternative are the same or similar as another alternative or site. Or to say as described in Alternative X, when discussing another alternative or variant. This is confusing and does not give the reader any good idea of the importance of resources or the impacts involved in any particular section or alternative. The affected resources and impacts for each alternative, variant and project site should explain in detail within the section that is being discussed.	Explain the affected resources and impacts for each alternative, variant and project site in detail within the section that is being discussed and avoid constantly referring to other sections for the information.
ADF&G/Wildlife/Refuges	Draft EIS	General	General	Garbage, other industrial attractants and food conditioning of bears or other wildlife caused by operations at facilities and increased access along roadways will cause conflicts and management issues. Project infrastructure, the WMP and any mitigation measures need to assess potential sources of food, garbage, or other wildlife attractants at each facility and along transportation corridors. Incorporate wildlife movement corridors, accessibility, mortality threats, and risks of food conditioning to public safety. Particularly problematic along south road corridor and Amakdedori site as brown bears using these areas utilize McNeil River State Game Sanctuary and McNeil River State Game Refuge. And food conditioning of these bears can cause substantial problems for the State and public safety.	Incorporate requested analysis and information into revised sections of EIS.
ADF&G/Wildlife/Refuges	Chapter 2 Alternatives	Sec 2	2-17 through the end of sec	Page numbering is off. Section starts with page 2-1 and goes through 2-17; then restarts at 2-1 (part way through the mine site description) and goes through 2-103.	Correct Chapter 2 page numbering.
ADF&G/Wildlife/Refuges	Chapter 2 Alternatives	Sec 2.2.2.2, 2.2.2.6, and 2.2.3.2	2-29	"NOTE TO REVIEWERS: REQUESTED AN UPDATED DATA SET FOR MATERIAL SITES FOR ALL ACTION ALTERNATIVES." The updated data is needed in order to comment on this section as well as other sections that material source locations and sizes impact. In addition to direct impacts to habitat and species these sites have noise, water quality, aesthetic, and other impacts on nearby resources.	Provide updated information, including visibility and noise impacts to KOP's
ADF&G/Wildlife/Refuges	Chapter 2 Alternatives	General	General	Vegetation mapping for each project alternative and segment needs to be completed and data presented in order to characterize the effected environment and assess impacts.	Complete vegetation mapping and habitat analysis for effected environments and impacts.
ADF&G/Wildlife/Refuges	Chapter 3 Affected Environment	Sec 3.2.2.2	3.2-7	"The proposed natural gas pipeline and Amakdedori port would be within 2 miles of the boundary of (but would not occupy) the McNeil River State Game Refuge and Sanctuary, which is managed by the ADF&G in accordance with the McNeil River State Game Refuge and Sanctuary Management Plan (ADF&G 2008)." The proposed port site and gas pipeline landfall are about 2 miles from the MRSR Game Refuge border. However, the road corridor and collocated pipeline also run adjacent to the northern edge of the MRSR Game Refuge border. In this area the road and pipeline are within 1 mile and skirts the Refuge boundary at less than a 1,500 feet in a number of locations and only about 250 feet at its closest point.	Accurately depict the project feature locations in relation to the McNeil River State Game Refuge and McNeil River State Game Sanctuary.
ADF&G/Wildlife/Reg IV	Chapter 3 Affected Environment	Sec 3.5	3.5-1	"Sport and trophy hunting"	Change to "sport hunting". Trophy hunting is a type of sport hunting.
ADF&G/Wildlife/Refuges	Chapter 3 Affected Environment	Sec 3.5.1.2	3.5-4	"The boundary of the refuge portion would be within 1 mile of the transportation corridor." As noted above the proposed road corridor skirts the Refuge boundary at less than a 1,500 feet in a number of locations and only about 250 feet at its closest point.	Accurately describe and depict the project feature locations in relation to Parks and Sanctuaries. In particular the McNeil River State Game Refuge and McNeil River State Game Sanctuary.
ADF&G/Wildlife/Refuges	Chapter 3 Affected Environment	Sec 3.5.1.2	3.5-4	"Under Alaska Statute (AS) 16.20.162, access permits are required for entry into the McNeil River State Game Sanctuary. Permits are required for bear viewing, special access to the sanctuary (e.g., for scientific, educational and media purposes), transporters, and activities in the sanctuary other than viewing bears (non-viewing permits) (ADFG 2018e)." An ADF&G Special Area Permit may also be required for activities within the Sanctuary or Refuge, under AS 16.05.	Revise to include underlined text: "Under Alaska Statute (AS) 16.20.162, <u>ADF&G Sanctuary Access</u> permits are required for entry into the McNeil River State Game Sanctuary. <u>Access permits are required for any access to the sanctuary including bear viewing, special access to the sanctuary (e.g., for scientific, educational and media purposes), transporters, and activities in the sanctuary other than viewing bears (non-viewing permits)</u> (ADFG 2018e)." An ADF&G Special Area Permit may also be required for activities within the Sanctuary or Refuge, under AS 16.05.
ADF&G/Wildlife/Refuges	Chapter 3 Affected Environment	Sec 3.5.1.2	3.5-4	Text under Kenai Area Plan misidentifies the KAP units the project occurs in. The Amakdedori Port and portions of the pipeline occurs in Unit 19 Bruin Bay Uplands, not Unit 592. Unit 592, are eelgrass tidelands from Bruin Bay northward. The discussion also mentions the project occurring in KAP Region 7, but gives no details.	Revise and correct section as noted.
ADF&G/Wildlife/Refuges	Chapter 3 Affected Environment	Sec 3.5.1.2	3.5-4	Section on McNeil River State Game Refuge and Sanctuary needs revision and corrections. Inaccurate and incomplete information is contained in this section regarding McNeil River State Game Sanctuary (MRSRGS) and Refuge (MRSR) and references aren't provided to cross check the information. Permit requirements are listed for the MRSRGS but not the MRSR which is actually closer to the project.	SUGGESTED REWRITE: The McNeil River State Game Sanctuary (MRSRGS) and Refuge (MRSR) lay immediately south of the Amakdedori Port site and south transportation route / gas line. They extend north and east from Katmai National Park and Preserve to the shores of Kamishak Bay. The refuge portion is located north of the sanctuary. Both areas were established by the Alaska State Legislature (AS 16.20.041 and AS 16.20.162) for the permanent protection of brown bear, and other fish and wildlife populations and their habitats, for scientific, aesthetic and educational purposes. The Legislature provided additional direction for ADF&G to manage human use and activities in a way that is compatible with the primary purpose and maintains and enhances bear-viewing opportunities. The McNeil River State Game Sanctuary was created over 50 years ago in recognition of the unique and exceptional brown bear feeding congregation area and viewing opportunities at McNeil Falls. The McNeil River State Game Refuge was created adjacent to the MRSRGS in the early 1990s to provide additional protection to the McNeil brown bears. The MRSRGS hosts visitor facilities (i.e., campground, visitor support buildings, trails) and a world class brown bear viewing program which primarily occurs at McNeil River, Milkik Creek, and along the coast. The MRSRGS does not contain yet have any visitor facilities and is located north of the MRSRGS. The MRSRGS includes most of the Paint River drainage and the Chenik Creek drainage. ; most bear-viewing activities within the refuge occur near Chenik Creek. Smaller numbers of brown bear congregate at Chenik Creek within Chenik Lagoon during late June - late July depending on timing of the sockeye run there. Guided bear viewing and private visitor bear viewing occurs during the month of July. The boundary of the refuge portion would be within 1 mile of the transportation corridor and as close as several hundred feet in some locations. And it is within 2 miles of the Amakdedori port site. The MRSRGS is closed to all hunting and trapping under statute, while the MRSR is closed to brown bear hunting, but open to other hunting and trapping under Board of Game regulations. Fishing is allowed in portions of the refuge and sanctuary, consistent with current Board of Fisheries regulations. Under Alaska Statute (AS) 16.20.162, access permits are required for entry into the McNeil River State Game Sanctuary. <u>Permits are required for bear viewing, special access to the sanctuary for scientific</u>
ADF&G/Wildlife/Refuges	Chapter 3 Affected Environment	Sec 3.5.1.2	3.5-6	Sportfishing section does not include information on Kamishak River, Little Kamishak River and Strike Creek fisheries. Nor other sportfishing opportunities on the West side of Cook Inlet in the project area.	Revise and correct section to include Sportfishing opportunities on West Side Cook Inlet and Kamishak Bay.
ADF&G/Wildlife/Reg IV	Chapter 3 Affected Environment	Sec 3.5	3.5-6	"brown/grizzly bear" change to brown bear.	
ADF&G/Wildlife/Reg IV	Chapter 3 Affected Environment	Table 3.5-1	3.5-7	"brown/grizzly bear" change to brown bear.	
ADF&G/Wildlife/Refuges	Chapter 3 Affected Environment	Sec 3.5	3.5-8	"McNeil State Game Refuge and Sanctuary was designated a wildlife sanctuary in 1967 to protect the world's largest concentration of wild brown bears. McNeil River Falls are located about a mile from the mouth of McNeil River; the falls slow the movement of salmon heading upstream to spawning grounds, causing salmon to congregate. Large numbers of brown bears can be seen at McNeil State Game Refuge and Sanctuary in early July through mid-August (ADFG 2018b)." The text in this section contains errors and does not adequately explain the import of recreational opportunities at McNeil River State Game Sanctuary or McNeil River State Game Refuge.	SUGGESTED REWRITE: "The McNeil State Game Sanctuary was created in 1967 to protect the world's largest concentration of wild brown bears. Legislation to expand the Sanctuary and create the McNeil River State Game Refuge took effect in 1993. Both were established for the permanent protection of brown bear and other fish and wildlife populations and their habitats. Brown bears congregate and can be seen at McNeil State Game Refuge and Sanctuary from early June through late-August (ADFG 2018b)."

ADF&G/Wildlife/Refuges	Chapter 3 Affected Environment	Sec 3.5	3.5-9	Section on Camping/Backpacking/Hiking is largely written in respect to activities occurring on the National Park Units. These activities occur throughout the area on State of Alaska general lands as well as the McNeil River State Game Refuge. The section on Other Opportunities underrepresents the skiing, snowshoeing, trekking and snowmachining that may be occurring in the region. The EIS incorrectly estimates and reports on the sportfishing use and importance of streams on the west side of lower Cook Inlet; significantly underestimating the use and importance of sport fisheries in the project area. The SWHS data is based on user responses which may under report actual use. For instance they note the Kamishak River has only 276 average annual use days and only 1 mention in 20 years of SWHS data (Table 3.6-16); and no streams of importance in area N (Table 3.6-17).	Revise section to more fully account for recreational opportunities in the affected environments in the area of the Amakdedori Port site, Diamond Point Port site and both Transportation routes.
ADF&G/Wildlife/Refuges	Ch. 3 Affected Environment	Sec 3.6.3	3.6-23 through 28	ADF&G McNeil River Sanctuary data reporting and Alaska Guide Logbook Program reporting clearly show that this system is used annually (particularly for guided fishing) and from 2006 -2016 sport fish guides made about 111 trips (mean 93.6 MRSGS data, 128.6 SF Guide data) per year (about a 3 month season) to these Kamishak streams. Spending an average of 340 angler days (334 and 346 respectively). Angling an annual average of 4,358 fish of four species, with a harvest average of 489 fish, primarily Coho salmon. Even the EIS Appendix K3.6 notes that the Kamishak River has an average of 8 companies, 133 trips per annum, and 356 user or client days. As such Table 3.6-17 would reflect the Kamishak River, as well as, others in Area N that may have sport fishing value.	Consider all data sources and accurately report on sportfishing use and importance in all project areas.
ADF&G/Wildlife/Refuges	Chapter 3 Affected Environment	Sec 3.6.3	3.6-26	"Angler effort is concentrated north of the project area for all the named sites, with the exception of the Kamishak River located north of Tuxedni Bay. The Kamishak River, which appears once as a named site in 20 years' worth of data, is located south of the project area near the McNeil River State Game Sanctuary and roughly 25 to 30 air miles from the potential Amakdedori port site (see Table 3.6-16)." Descriptions are incorrect and in conflict with one another. The Kamishak River is well south of Tuxedni Bay, and only 18 miles south of the Amakdedori site. Tuxedni Bay is approximately 80 miles northeast of the Amakdedori site and about 96 miles north of the Kamishak River. As noted above the SWHS does not accurately depict all sportfishing in the project area. There are significant resources in the vicinity of the Amakdedori port site that are not being identified and represented in the EIS.	Correct geographical errors in descriptions and accurately report on sportfishing use and importance in all project areas.
ADF&G/Wildlife/Refuges	Chapter 3 Affected Environment	Sec 3.11	3.11-2	"Soundscape was evaluated using a noise receptor analysis from 10 miles around the mine site infrastructure, and from 0.5 miles around the pipeline work area at Happy Valley, the transportation corridor (proposed new access roads), the north and south ferry terminals, and Amakdedori port infrastructure (See Section 3.19, Noise)." It is unclear of the distance that soundscape was evaluated around the transportation corridor and Amakdedori Port infrastructure. If 0.5 miles this is not enough. Noise from the port as well as vessels coming and going will travel farther across the water, especially under some atmospheric conditions such as warm, still days. These noises will impact users to the south and west in McNeil River State Game Refuge and McNeil River State Game Sanctuary.	Revise section to incorporate noted issues.
ADF&G/Wildlife/Refuges	Chapter 3 Affected Environment	Table 3.6-17	3.6-28	"Sources: Sigurdsson and Powers 2012; Sigurdsson and Powers 2013; Sigurdsson and Powers 2014; Powers and Sigurdsson, 2016." Source noted at bottom of Table not included in References Chapter 9.	Provide citation/references
ADF&G/Wildlife/Refuges	Chapter 3 Affected Environment and Chapter 4 Environmental Consequences	Sec 3.11 and 4.11	General	The southern road and pipeline corridor would be visible in the immediate foreground of the landscape along much of the northern refuge and from elevated locations within the refuge. Material sites MS-A06, MS-A07, MS-A08, are 19- 22 acre sites on southern aspects facing the McNeil River State Game Sanctuary. They are in the immediate foreground (0.5 to 3 miles) of the Refuge border and would be visible along much of the northern refuge and from many elevated locations within the refuge. Blasting would be occurring at these sites as well. And the Amakdedori Port site would be highly visible in the foreground of the landscape along much of the northeastern refuge, elevated locations within the refuge and from the Chenik Lagoon area.	Analyze and characterize visibility, noise and aesthetic issues of the material sites, southern road and pipeline corridor and Amakdedori Port site on McNeil River State Game Refuge and include in Aesthetics and Noise sections of Chap. 3 Affected Environment and Chap. 4 Environmental Consequences.
ADF&G/Wildlife/Refuges	Chapter 3 Affected Environment	Sec 3.11.4.2	3.11-4	"As described in Section 3.5, Recreation, the McNeil State Game Refuge and Sanctuary is a premier destination for bear viewing and is home to one of the largest bear populations in Alaska. McNeil River Falls, which is located about a mile from the mouth of the McNeil River, slows the movement of salmon. Large numbers of brown bears can be seen at McNeil State Game Refuge and Sanctuary in early July through mid-August (ADF&G 2018b)." Text incorrectly characterizes resources within refuge and sanctuary and has several errors. McNeil hosts one of largest congregations of brown bear, not population. The population ranges across the Alaska Peninsula and bears using McNeil River have been noted as far away as Iliamna Lake, Hallo Bay, north of Amakdedori Creek, and west towards Kukaklek and Nonvianuk Lakes. Additionally, the statement regarding the falls slowing salmon movement is out of place. And the dates noted for brown bear viewing is wrong. Also this section (as well as others) needs to incorporate visitor use and bear viewing occurring at Chenik Lagoon within the McNeil River State Game Refuge, as that occurs in the immediate foreground of the Amakdedori Port. Revise section.	Suggested revised text. "As described in Section 3.5, Recreation, the McNeil State Game Refuge and Sanctuary is a premier destination for bear viewing and is home to one of the largest congregations of brown bears in Alaska. Large numbers of brown bears come to McNeil River to feed on sockeye, chum, and Coho salmon. Brown bears are present in the McNeil State Game Refuge and Sanctuary throughout the year, and congregate at McNeil River late May through the end of August. ADF&G operates a visitor bear viewing program at McNeil River early June through late August. Smaller numbers of brown bear congregate at Chenik Creek within Chenik Lagoon during late June - late July depending on timing of the sockeye run there. Guided bear viewing and private visitor bear viewing occurs during the month of July."
ADF&G/Wildlife/Refuges	Chapter 3 Affected Environment	Sec 3.11.4.2	3.11-4	TYPO: "Viewer positions take into account..."	Correct to positions.
ADF&G/Wildlife/Refuges	Chapter 3 Affected Environment	Sec 3.11.4.2	3.11-5	"Single day adventure tours are offered from as far away as Anchorage, and as close as Dillingham." As placed within the Amakdedori Port section it is unclear that this is correct or that it presents a complete scope of the visitor use occurring in the area. Single day adventure tours, bear viewing tours etc. are offered from many communities in the project area that may be closer than Dillingham. Including: Homer, Kenai, King Salmon, Dillingham, Iliamna, ; as well as from a number of remote lodges in the project area.	
ADF&G/Wildlife/Refuges	Chapter 3 Affected Environment	Sec 3.11.4.2	3.11-5	"...Single day tours are almost exclusively accessed via aircraft. Visitors are flown into the park over the proposed project area to access bear viewing locations along the coastline, in the estuaries and up the stream corridors and over the glaciers of Four Peaks Mountain. Multi-day commercial tours either stage outside the park on large boats in Kamishak Bay, or at lodges in the park." As written this appears to only apply to activities occurring within Katmai NP. These activities in fact occur up and down the east coast of the Alaska Peninsula on State of AK lands, as well as Katmai NP, Lake Clark NPP and private lands. There are numerous recreation, bear viewing, hunting and fishing destinations between Tuxedni Bay and Cane Dnunpas.	Revise text to fully depict visitor use and recreation sites in affected environment.
ADF&G/Wildlife/Refuges	Chapter 3 Affected Environment	Sec 3.11.4.2	3.11-4	This section should include text explaining the importance and significance of the Talarik Creek, and Koptuli Rivers to sport fishers, guides, and others; similar to the detail given to the Alagnak River under the Transportation Corridor section.	Revise section to reflect importance and significance of the Talarik Creek, and Koptuli Rivers to sport fishers, guides, and others;
ADF&G/Wildlife/Refuges	Chapter 3 Affected Environment	Sec 3.11.4.2	3.11-6	The pipeline would interface with the entire physiographic unit system tying the Cook Inlet-Sustina Lowlands to the Nushagak-Big River Hills. Unit not described with other regional landscape characterization units.	Include unit descriptions in regional landscape characterizations page 3.11-3.
ADF&G/Wildlife/Refuges	Chapter 3 Affected Environment	Sec 3.11.4.2	3.11-5	"The Alagnak River is located about 30 miles west of the proposed mine site and 10 miles from Iliamna Lake." Statement is in error. The Alagnak River is located over 60 miles south and somewhat west of the mine site. Since this is under the Transportation Corridor section this may be a typo and Transportation Corridor needs to be substituted here. The Alagnak is much closer and more westerly to the transportation corridor.	Correct section text regarding location of Alagnak in relation to project features.

ADF&G/Wildlife/Refuges	Chapter 3 Affected Environment	Sec 3.11.4.2	3.11-5	This section contains no discussion of the McNeil River State Game Refuge, nor its affected resources. The transportation corridor skirts along the northern border of the McNeil River State Game Refuge and aesthetic and noise impacts from the corridor and material sites will be in the foreground from many places within the northern portion of the refuge.	Update section to include affected environment as it relates to McNeil River State Game Sanctuary and resources there.
ADF&G/Wildlife/Refuges	Chapter 3 Affected Environment	Sec 3.11.5	3.11-6	Section does not discuss the numerous bear viewing operations along the west side of Cook Inlet. "Recreation Areas. Recreation extends..."	Update text to include discussion of the numerous bear viewing operations and locations along west side Cook Inlet from Tuxedini Bay south to Cape Douglas
ADF&G/Wildlife/Refuges	Chapter 3 Affected Environment	Sec 3.11.5	3.11-6	Section does not discuss McNeil River State Game Sanctuary or McNeil River State Game Refuge in recreation areas.	Include McNeil River State Game Sanctuary or McNeil River State Game Refuge in discussion.
ADF&G/Wildlife/Refuges	Chapter 3 Affected Environment	Sec 3.11.5	3.11-6	Transportation Routes.	Include a figure with existing air, land and sea transportation routes and reference here.
ADF&G/Wildlife/Refuges	Chapter 3 Affected Environment	Sec 3.11.7	3.11-7	Text only notes receptors in vicinity of mine site. Discussion needs to include affected soundscape environment for other project components: Transportation corridor, both port sites, ferry terminals, and variants.	Include a figure with existing air, land and sea transportation routes and reference here.
ADF&G/Wildlife/Refuges	Chapter 3 Affected Environment	Table 3.11.1	3.11-8	Table contains KOP location for MRSR Refuge base camp. This should be McNeil River State Game Sanctuary as the base camp is located within the sanctuary. But does not include a KOP for Chenik lagoon within and MRSR Refuge. Chenik lagoon is a bear viewing / guiding area used by private citizens and a few commercial operators. Commercial filming outfits also film in this area.	Correct "refuge" to Sanctuary. Add additional KOP of Chenik lagoon to Table and assess, Amakdedori Port would be in the foreground-middle ground of Chenik lagoon (3-5 mi) include these analysis in the textual portions of the chapter.
ADF&G/Wildlife/Refuges	Chapter 3 Affected Environment	Sec 3.12.2	3.12-2	Improve discussion of important affected air transportation. There are a number of destinations (such as McNeil River SGS and SGR), Katmai NPP, Lake Clark NP, bear viewing sites and sportfishing / hunting destinations) and air pathways through passes throughout the project area that need to be considered in the discussion of affected air transportation environment.	Expand discussion of air transport affected resources.
ADF&G/Wildlife/Refuges	Chapter 3 Affected Environment Chapter 4 Environmental Consequences	Sec 3.19 and 4.19	General	Noise sections need to consider public uses (KOP's) at Chenik Lagoon within McNeil River SGR and vessel noise over the water of shipping traffic past both McNeil River SGR and the bear viewing camp at McNeil River SGS.	Update and revise section to consider noise impacts to McNeil River SGR and McNeil River SGS users.
ADF&G/Wildlife/Refuges	Chapter 3 Affected Environment	Sec 3.23	General	In a number of locations there are NOTES TO REVIEWERS that specify missing data or information that will be generated.	The missing information and data is needed in order to provide comments on this section as well as other sections.
ADF&G/Wildlife/Refuges	Chapter 3 Affected Environment	Sec 3.23 and 4.23	3.23-7 4.23	"Therefore, while the project transportation corridor is primarily east of the main use area of the Mulchatna caribou herd, ..." "The Mulchatna caribou herd currently does not typically range in the area of the transportation and natural gas pipeline corridors. Caribou move between calving grounds (May to June), insect relief areas (June to July), and seasonal foraging areas (fall and winter months); however, none of these movements are through the transportation and natural gas pipeline corridors. Therefore, no behavioral disturbance impacts on the population (such as shifting migration routes or patterns) are expected to occur." There is no reference to a smaller portion of caribou, likely associated with the Mulchatna herd, that is known to spend most of the year in the area south from Kokhanok in the higher country around Kukaklek and Nonvianuk Lakes east to Paint River. Not much is known about them, but they are a permanent resident of this area. These smaller localized herds that do inhabit parts of the transportation corridor and port site, such as the herd in the area south and east of Kokhanok, in the higher country around Kukaklek and Nonvianuk Lakes, and east to the coast. In 2018, ADF&G observed caribou at Chenik Lake, about 5.5 miles from the proposed port site; and historically caribou have occasionally been observed within the McNeil River State Game Sanctuary south of there.	Update and revise Chapter 3 and Chapter 4 sections to include caribou herd use along north and south road corridors. Information on these herds should be presented and habitat evaluated. Additional surveys through all seasons should be conducted and integrated into analysis.
ADF&G/Wildlife/Refuges	Ch. 3. Affected Environment	Figure 3.23.1.1	3.23-13	"Historical surveys by the ADF&G of the various GMUs around the mine site have yielded varying population estimates, but the focus of these surveys has been in areas not specifically related to the mine site. Therefore, those data are not included." "...Overall, brown bears were not common in the mine site footprint itself, but were distributed throughout the mine analysis area, primarily along streams and waterways." While historical surveys may not focus on the mine site, they do represent data that can be used to characterize the importance of the brown bear resources in the region or area and should be included. One time or one season surveys of the mine site or other project components for brown bear resources is not sufficient to correctly characterize the affected resource, nor complete accurate analysis of impacts.	Compile all existing bear population and survey data from various agencies, for all project areas. Complete additional multi-season surveys to determine use patterns at project components. This information is necessary in order to accurately characterize affected brown bear resources, determine impacts and develop avoidance, minimization and mitigation measures.
ADF&G/Wildlife/Refuges	Ch. 3. Affected Environment	Figure 3.23-7	3.23-16	Figure 3.23-7 is noted in multiple places throughout Chapters 3 & 4	Provide figures for review
ADF&G/Wildlife/Refuges	Chapter 3 Affected Environment	Figures 3.23-7 through 3.23-11	3.23-16 through 3.23-35	Figures 3.23-7 through 3.23-11 were not provided for review, which makes review of the textual sections these figures refer to incomplete.	Provide figures for review
ADF&G/Wildlife/Reg IV	Chapter 3 Affected Environment	Sec 3.23	3.23-17	"The ADF&G actively removes wolves in a large portion of GMU 17B/C in the range of the Mulchatna Caribou Herd, west of Iliamna Lake, which does not overlap with the mine site." This is not correct. The ADF&G is not actively "removing wolves". The IM program authorizes permitted hunters who are private pilots to take wolves by additional means within the IM area in order to increase caribou calf survival and meet Mulchatna caribou IM objectives for abundance and harvest. It is also unclear if it is the IM management area or the Mulchatna caribou herd that does not overlap with the mine site. Explain how this addition is relevant.	Either remove the language or rephrase as indicated.
ADF&G/Wildlife/Reg IV	Chapter 3 Affected Environment	Sec 3.23	3.23-18	"Population information for these species is limited, and is provided by trapper questionnaires (Parr 2018). Table 3.23-1 lists species with their relative abundance, if known, based on trapper questionnaires for GMU 17B, where the mine site facilities are located, and for GMU 9, where the transportation and natural gas pipeline corridors exist (west of Cook Inlet)(Parr 2018)." Wording is misleading suggesting data is more accurate and more specific in geographical context than it really is. Population information for furbearer and small mammal species for the project area is not available. The relative abundance information provided by the Alaska Trapper Surveys is only an index of relative abundance throughout the entire region, based on the perceptions and responses of relatively few trappers (n=8 for the data noted) for all of GMU 17 (most of Bristol Bay), not the smaller unit 17B. And is not specific to the mine site.	Project specific species abundance data and information on the effected small game and furbearer resources should be provided by the applicant; revise wording to reflect broad regional classification of information, entailing all of GMU's 17 & 9, Bristol Bay; include map of area with GMU's to show full extent of GMU's; look into additional data sources from sealing records for nearby communities of Iliamna, Igluigig, Nondalton, etc. For species that requiring sealing these might provide more specific information ion about area specific furbearer harvest.
ADF&G/DWC/Refuges	Chapter 3 Affected Environment	Sec 3.23	3.23-18	"There are additional mammal species that are not considered "furbearers," and are known to occur in the mine analysis area. These include hoary marmot (Marmota caligata), arctic ground squirrel (Spermophilus parryii), snowshoe hare (Lepus americanus), tundra hare (Lepus othus), collared pika (Ochotona collaris), and various species of mice, lemmings, shrews, and voles. These species are generally common to abundant, depending on their population cycles."	Provide complete list of furbearers and other effected species in Table or appendices. Correct tundra hare to Alaska hare.
ADF&G/Wildlife/Refuges	Chapter 3 Affected Environment	Sec 3.23.1.2 and 3.23.1.3	3.23-20, 3.23-23, 3.23-26	"No project-specific waterbird surveys have been conducted to date for areas south of Iliamna Lake." And at the end of the Waterbirds subsection there is a place holder note from USACE - "Note: 2018 field data for the south access road will be incorporated into the analysis of the Draft EIS." The results of the 2018 bird surveys have not been incorporated into the report.	Incorporate 2018 South Access Road and Amakdedori Port site survey data, as well as other available survey data, to fully identify affected resources and impacts and so that comments can be provided.
ADF&G/Wildlife/TED	Chapter 3 Affected Environment	Sec 3.23.1.2	3.23-23	The term "conservation species" is vague. Also common names of birds need to be capitalized.	Please replace "conservation species" with "species of greatest conservation need (SGCN) in Alaska" throughout this section, and the waterbirds section. A list of these species can be found here: https://www.adfg.alaska.gov/static/species/wildlife_action_plan/2015_alaska_wildlife_action_plan.pdf . Please also capitalize common names of birds as is customary (American Ornithological Society http://www.bioone.org/doi/full/10.1642/AUK-18-62.1)
ADF&G/Wildlife/Refuges	Chapter 3 Affected Environment	Sec 3.23	3.23-24	EIS presents information and concludes that disturbance to brown bears from road construction and operation is probable. DFG concurs, however, the applicant needs to supply data and information on movement patterns and habitat use areas within the project area. Brown bear densities along the southern road corridor and in the vicinity of Amakdedori port are high and this species is of high value in this area. Information on movement patterns and use areas is critical to being able to avoid, minimize or mitigate impacts to brown bear and the McNeil River State Game Refuge and McNeil River State Game Sanctuary.	Provide long term data and information on brown bear movement patterns and habitat use areas in order to avoid, minimize or mitigate adverse impacts to brown bear and the McNeil River State Game Sanctuary and Refuge.

ADF&G/Wildlife/Reg IV	Chapter 3 Affected Environment	Sec 3.23	3.23-24	"Per ADF&G area management biologist Dave Crowley, for GMUs 9 and 10, there are approximately 0.19 moose per square kilometer or less for most of the Alaska Peninsula due to limited habitat (Lill 2017)."	Should be moose per square mile, not kilometer. Cited literature (Lill 2017) does not appear in References.
ADF&G/Wildlife/Refuges	Chapter 3 Affected Environment	Sec 3.23.1.2	3.23-24	Surveys conducted in May 2018 documented a concentration of brown bear dens on both sides of the south access road and around Amakdedori port (Figure 3.23-7). Surveys documented bear dens throughout the length of the south access road, with the majority observed near Cook Inlet north of Amakdedori Creek. Additional Dens were located around the outflow to Gibraltar Lake near the south shore of Iliamna Lake. Several of the dens were close to the south access road, with the closest one around 300 feet north of the road. <u>Additional surveys for bears around salmon streams were conducted in mid-August 2018.</u> Bears were primarily located near the south shore of Iliamna Lake, at the east end of Gibraltar Lake, and fishing in the river flowing into Bruin Bay, with a few individuals upstream in Amakdedori Creek.	Text references studies that are not documented or cited. Provide citations and data details. the stream surveys for bears were conducted mid July, mid August and early September 2018 according to the ABR field summary report. The surveys likely significantly underestimate the number of bears using these areas. Bear use of streams is highly dependent upon species of fish, run size, fish run timing, bear gender, bear age, and access to fish. Three surveys throughout one summer are not likely to capture accurate bear and habitat use patterns. There were bears noted in Amakdedori Creek at the port site that should be noted here also. Amakdedori Creek supports chum Coho, pink and sockeye salmon. And likely has higher bear use throughout the season, than the two bears noted. This area is also likely a travel corridor for bears along the coast and heading inland
ADF&G/Wildlife/Refuges	Chapter 3 Affected Environment	Sec 3.23.1.3	3.23-24	"Amakdedori port would be north of the McNeil River State Game Refuge and Sanctuary, which is a world-famous brown bear viewing location. During bear surveys in May 2009 for the mine site, black bears were more commonly documented east of Iliamna Lake and in some areas near the Cook Inlet. Brown bears were also common on the southern side of Iliamna Lake near Gibraltar Lake. Surveys for bears around salmon-spawning streams in summer 2018 documented a few brown bears fishing upstream in Amakdedori Creek, approximately 1 to 1.5 miles west of the port (Figure 3.23-7)." The text substantially underrepresents the brown bear resources in the area of the Amakdedori Port site and road / gas line corridor. Brown bear are very common in the area and have seasonally high concentrations at area salmon streams. Stream surveys are highly dependent upon fish run size, bear gender, bear age, and access to fish. The single survey noted in late August 2018 is not adequate to characterize bear resources in the proposed Amakdedori Port and south road / gas line corridor. The survey was not repeated regularly nor timed correctly to capture congregations on Amakdedori Creek, or other coastal streams in the area. Nor along the road / gas line corridor. Regular brown bear surveys at McNeil River, and incidental surveys at other streams in the area such as Chenik Creek and Inskin Bay place high numbers of bears on these streams during the peak of salmon runs and lower numbers throughout the season. This very likely holds true for Amakdedori Creek as well. And as fish runs dwindle at the coast bears move inland to higher berry resources or streams at the upper reaches of Bristol Bay streams. In addition to the seasonal timing, the daily timing will make a difference to. Bears are more likely to be fishing the intertidal reaches of Amakdedori Creek adjacent the port site during low tide periods as fish move up through the shallows. And then move upstream above the tidal zone as the tide rises. Generally, stream surveys for bears are not a good way to gauge resource use unless they can be repeated regularly and over time.	Collect and present data on brown bear use at Amakdedori site and along southern transportation / pipeline corridor during entirety of season at appropriate timing. This section should highlight the high densities of brown bears along the Kamishak Coast, not just bears observed in Amakdedori Creek during one survey. For example, the coast is used in general as a migration corridor, the mudflats are used for feeding, the beach is used for early season foraging, streams are used for feeding, breeding occurs in the area, etc. Figure 3.23-7 is referenced in this and other sections for brown bear den locations yet it was not provided for review.
ADF&G/Wildlife/Refuges	Ch. 3. Affected Environment - Wildlife Values	Sec 3.23.1.3	3.23-25	"The terrestrial habitat around the Amakdedori port generally lacks large waterbodies where waterbirds may breed and stage. Habitat is composed primarily of upland vegetation communities that drain east toward Cook Inlet and do not form extensive wetland areas." Statement is incorrect and misleading. In addition to large backwatered portions of Amakdedori Creek, there are over 45 small wetland pothole type waterbodies in the immediate vicinity of the Amakdedori Port site, ranging in size from .01 to ~4 acres. Typically these waterbodies would provide excellent nesting, rearing and staging habitat for a number of waterbirds and shorebirds. Additionally, there are a number of larger waterbodies to the west within 5 miles of the port site.	Update characterization of Amakdedori Port site to accurately portray waterbird habitats present, and update Chapter 4 environmental consequences accordingly.
ADF&G/Wildlife/Refuges	Ch. 3. Affected Environment	Sec 3.23.1.3	3.23-26	For the subsection, Waterbirds, in 3.23.1.3 Amakdedori Port, there is a place-holder note regarding important baseline data: "Note: 2018 field data for the Amakdedori port is being synthesized and will be provided in a later EIS draft."	Incorporate 2018 South Access Road and Amakdedori Port site survey data, as well as other available survey data, to fully identify affected resources and impacts and so that comments can be provided.
ADF&G/Wildlife/TED	Chapter 3 Affected Environment	Sec 3.23.1.3	3.23-26	"Therefore, although the Amakdedori port footprint may not support large numbers of breeding waterbirds, it is flanked by two nearby IBAs, and is situated in a global IBA (Smith et al. 2017)." If no surveys have been conducted at the port itself, how is it possible to discern whether it has large numbers of breeding waterbirds or not?	Please replace this sentence with "The Amakdedori port is flanked by two nearby IBAs and is situated in a global IBA (Smith et al. 2017). Provide breeding bird data specific to the port site on the numbers of waterbirds using the area throughout the year (both winter and summer bird surveys are recommended).
ADF&G/Wildlife/Refuges	Chapter 3 Affected Environment	Sec 3.23.1.3	3.23-27	The section on "Large Mammals" for the Amakdedori Port site lacks significant explanation of the Amakdedori Port Affected Environment with respect to the brown bears utilizing McNeil River SGR and severely under represents the significance of the brown bear resources in this area and brown bear resources in the McNeil River State Game Refuge and Sanctuary. Information regarding bear numbers utilizing the area, movement patterns, and habitat use areas around the proposed port site and transportation corridor cannot be ascertained from the survey presented. Brown bear densities along the southern road corridor and in the vicinity of Amakdedori port are high and this species is of high value in this area. The applicant needs to supply baseline data and information on brown bear movement patterns and habitat use areas within the project area. Information on movement patterns and use areas is critical to being able to avoid, minimize or mitigate impacts to brown bear and the McNeil River State Game Refuge and McNeil River State Game Sanctuary is required to understand how the port infrastructure would affect the high concentration of brown bears in the area.	Provide long term data and information on brown bear movement patterns and habitat use areas in order to avoid, minimize or mitigate adverse impacts to brown bear and the McNeil River State Game Sanctuary and Refuge. Revise and expand text to fully account for affected environment in relation to the proximity of the proposed Amakdedori port to McNeil River SGR and SGR, the large number of bears in the area and the movement of these bears along the coast and their use of the MRS GS and MRS GR.
ADF&G/Wildlife/Reg IV	Chapter 3 Affected Environment	Sec 3.23	3.23-31	"The peak date of births in Iliamna Lake was based on the peak percentage of pups found in aerial surveys of the lake during May through August of 2010 to 2013 (excluding 2012), compared to those in Navak Bay."	Correction: Navak Bay
ADF&G/Wildlife/Reg IV	Chapter 3 Affected Environment	Sec 3.25	3.25-9	Paragraph 2. 2004-2006 satellite tagged elders should be cited Rosenberg et al. 2016 right away instead of several sentences later.	revise citation location as appropriate
ADF&G/Wildlife/Refuges	Chapter 4 Environmental Consequences	Sec 4.2.2.2	4.2-2	"Active management for fish and wildlife protection would necessarily be modified in the immediate area through the life of the mine and into post-closure as a result of the project." text is misleading. Revise text to more accurately depict that management changes and impacts would be needed as a result of project.	SUGGESTED REWRITE: "Modification of active management for fish and wildlife protection would be necessary as a result of the project, in the immediate area through the life of the mine and into post-closure."
ADF&G/Wildlife/Refuges	Chapter 4 Environmental Consequences	Sec 4.2.2.2	4.2-2	Section contains no discussion of extremely close proximity of the Amakdedori Port site and Transportation corridor to McNeil River SGR or SGR with regard to management intents for the refuge and sanctuary, as well as the general DNR habitat lands the project is sited on.	Revise section to include proximity of McNeil River SGR and SGR and management intents that may be affected by proposed project components on nearby lands.
ADF&G/Wildlife/Refuges	Chapter 4 Environmental Consequences	Sec 4.2.5 Table 4.2-1	4.2-7 through 4.2-9	No mention of key management issues for MRS GS and MRS GR in Chapter.	Update information in key issues summaries to include information on McNeil River SGR/ McNeil River SGR management issues as noted throughout comments.
ADF&G/DWC/Refuges	Chapter 4 Environmental Consequences	Section 4.2.6	4.2-9 and 4.2-10	Cumulative Effects section of Chapter 4, Section 2 is brief and incomplete. While the section identifies a number of reasonably-foreseeable future actions it does not present any information on the actual cumulative effects of the proposed action in relation to these RFEA's.	Revise cumulative effects sections to include analysis of cumulative nature of project impacts.
ADF&G/Wildlife/Refuges	Chapter 4 Environmental Consequences	Section 4.3.3.2	4.3-9	Document states: "Note to Reviewers: Land owners for ROW acquisition will be inserted here for the Draft EIS." Incomplete section, material required for adequate review.	provide needed text and data.
ADF&G/Wildlife/Refuges	Chapter 4 Environmental Consequences	Sec 4.5.2.2 and 4.5.2.3	4.5-2 through 4.5-5	Sections on transport corridor and proposed Amakdedori port site need to be updated and more complete regarding the bear resources and public and commercial bear viewing programs within McNeil River SGR / SGR and Katmai NPP. The transport corridor and proposed Amakdedori port site components are in an area of high bear densities along the borders of McNeil River SGR / SGR and Katmai NPP. These public lands protect bear populations and habitats and have public bear viewing programs in close proximity of the project infrastructure. The Affected Environment and Environmental Consequences chapters do not even present information on a number of the bear viewing opportunities in close proximity to the project features; such as those at Chenik Lagoon within the McNeil River SGR and those at Funnel Moraine Creeks within Katmai National Preserve. Environmental consequence analysis needs to consider a number of factors including identifying important habitats, acreages and movement corridors; behavioral, mortality and public safety impacts of neutrally and negatively habituated and food conditioned bears; impacts to bears, populations, and programs within the adjacent parklands as a result of behavioral, mortality and habitat changes within the project area.	Provide long term data and information on brown bear movement patterns, important habitat use areas and movement corridors along the transportation corridors and port sites; in order to address impacts to brown bear habitats, behaviors, mortality, and bear viewing and recreation programs. Revise analysis given comments. This analysis should also consider functional loss of habitats due to behavior changes and avoidance, as well as the public safety and program quality and revenue losses within the McNeil River State Game Sanctuary and Refuge as a result of avoidance behaviors, altered behaviors and fragmentation due to infrastructure. Revise and expand text to fully account for bear and land management impacts in relation to the proposed Amakdedori port and transportation corridors proximity to McNeil River SGR/SGS and Katmai NPP, the large number of bears in the area and the movement of these bears along the coast and their use of the MRS GS and MRS GR.

	Chapter 4 Environmental Consequences	Section 4.5.2.3	4.5-5	<p>The project may affect incidental wildlife viewing, hunting, and fishing opportunities at the port site, to the extent that they occur. Noise and activities would displace wildlife and fish from the immediate area, thus adversely affecting wildlife viewing, hunting, and fishing opportunities and experiences by reducing the likelihood of seeing wildlife or catching fish. In addition, project-related noise and activities during construction, operations, and closure at Amakdedori Port would adversely affect the recreational experiences of visitors within visual and auditory distance of the port site because of the change from a quiet, undeveloped area to a developed site with visible facilities, generators, and in-water facilities. The adverse effects would displace from this area those visitors who prefer a quiet, undisturbed recreation setting, or who participate in recreation opportunities such as wildlife viewing, hunting, and fishing, which typically require a quiet, undisturbed recreation setting. Overall, because recreational use of the Amakdedori Port site is likely low, project-related wildlife and fish displacement, noise, and activities would result in minimal displacement of wildlife viewing and fishing uses to other nearby shoreline areas."</p> <p>This mischaracterizes the nature of the impacts to recreation that the Amakdedori Port site. These disturbances would apply southward to Chenik Lagoon within the McNeil River SGR. In addition the Amakdedori site has been selected for various guide camp applications over the years in addition to beach combing occurring along the seven mile Amakdedori beach. These activities are all occurring at a low dispersed level as intended through the DNR land management plan. Conversion of this area to an industrial port would unavoidably change the uses and character of this area, both physically and in</p>	Both Chapters 3 & 4 need to fully identify and account for affected recreational activities at Amakdedori Creek and beach; and then provide avoidance, minimization and mitigation measures to avoid or reduce these impacts.
ADF&G/Wildlife/Refuges	Ch. 4 Environmental Consequences	Table 4.5-1	4.5-9 and 4.5-10	The Summary of Key Issues for Recreation table is incomplete with respect to potential adverse effects on Recreation at McNeil River SGS and SGR. Key Impacts need to include impacts to Recreation Experience, as well as, impacts to experience, setting and activities related to uses at Chenik Lagoon and along the northern border of the McNeil Refuge.	Gather baseline data on McNeil River SGS and SGR Recreational bear viewing and other uses along northern border and thoroughly and accurately summarize potential adverse impacts of the transportation corridor and port site in text and table 4.5-1
ADF&G/Wildlife/Refuges	Ch. 4 Environmental Consequences	Section 4.5.6	4.5-10 and 4.5-11	The Cumulative Effects section of this Draft EIS is incomplete and relies on previously collected information that does not accurately relate to the current mine/infrastructure plans.	Accurately assess and gather baseline data regarding Cumulative Effects on Recreation and wait until this is provided to review the Draft EIS.
ADF&G/Wildlife/Reg IV	Chapter 4 Environmental Consequences	Sec 4.9.2.2	4.9-4	<p>The statement... "Once constructed, the transportation corridor roads and the natural gas pipeline corridor ROW could have a positive effect on access to subsistence resources (depending on the level of access agreed to between the State, PLP, and the Lake and Peninsula Borough [LPB]) because these cleared routes could facilitate some overland travel by ATVs and snow machines."</p> <p>Positive effect on access to subsistence resources cannot be supported without further detail and analysis. There is just as likely to be a net negative effect depending on how access to the road and surrounding land is managed, and management of the subsistence resources. Increased access, while opening other areas, is likely to also increase harvests by both subsistence and non-subsistence users and may have a negative effect on subsistence opportunity</p>	Analyze and present the potential negative effects to subsistence resources of increased access, as well as benefits.
ADF&G/Wildlife/Refuges	Chapter 4 Environmental Consequences	Sec 4.11	4.11-1	TYPO: "Aesthetic impacts include those that could..."	Delete extra word "in"
ADF&G/Wildlife/Refuges	Chapter 4 Environmental Consequences	Sec 4.11.3.2	4.11-4	<p>"Impacts of the transportation corridor perceived from residents, recreationists, or subsistence users in the EIS analysis area would be of low to medium magnitude and localized geographic extent due to screening of the road corridor by vegetation..."</p> <p>This logic is used in a few places. While this may be the case below tree line, this is not the case in tundra areas above tree line, such as those along the south road corridor.</p>	Revise analysis and text throughout alternatives to account for areas of low vegetation not screening visibility and noises.
ADF&G/Wildlife/Refuges	Chapter 4 Environmental Consequences	Sec 4.11.3.2	4.11-5	"Season-specific impacts...at the ferry terminals. " First six lines of this section belong in previous sections on Alternative one. This discusses impacts associated with the Illiamna lake ferry crossing; not the summer only variant.	Revise section as noted
ADF&G/Wildlife/Refuges	Chapter 4 Environmental Consequences	Sec 4.11.3.3	4.11-5	Visual impacts section and subsequent sections on soundscapes and all components do not adequately address impacts to the McNeil River State Game Refuge and bear viewing and visitor aesthetic impacts at Chenik Lagoon. The proposed Amakdedori Port would be in the immediate foreground of operations and visitation at Chenik Lagoon and needs to be addressed throughout the document.	Revise section and remainder of EIS document to accurately portray resources and impacts to Chenik Lagoon public uses within the McNeil River State Game Refuge.
ADF&G/Wildlife/Refuges	Chapter 4 Environmental Consequences	Sec 4.11.3.3	4.11-5	"The port would not be visible from the mouth of McNeil River at the edge of McNeil State Game Refuge; however, vessel traffic including lightering at the southern location, would be evident and could be a dominant part of the viewers' experience."	Revise section as noted
ADF&G/Wildlife/Refuges	Chapter 4 Environmental Consequences	Sec 4.11.3.3	4.11-5	"Visual impacts <u>could</u> impact viewers located in areas identified by special designations, including the McNeil River State Game Refuge..."	Revise language to "would".
ADF&G/Wildlife/Refuges	Chapter 4 Environmental Consequences	Sec 4.11.3.3	4.11-5	"The duration of direct impacts would be long term, as an agreement with the landowner would leave the port facilities in place for use as an industrial port."	It seems that this agreement should be contingent on the review of the project and that if the intent is to leave the port in place in perpetuity then the EIS and analysis should be updated to include that, as well as, those proposed long term activities.
ADF&G/Wildlife/Refuges	Chapter 4 Environmental Consequences	Sec 4.11.3.3	4.11-5	<p>"The anticipated noise effects within the two latter above-stated distance buffers would last as long as the port operates during concentrate loading."</p> <p>The anticipated noise impacts would last as long as the port operates. If noise levels during concentrate loading are significantly different from the industrial port loading that would occur after the port transfers to the landowner then those distinctions should be made</p>	Document long term anticipated noise levels for port operations beyond life of project.
ADF&G/Wildlife/Refuges	Chapter 3 Affected Environment Chapter 4 Environmental Consequences	Sec 4.11.7	4.11-11	TYPO: "mining <u>clams</u> "	Change to <u>claims</u>
ADF&G/Wildlife/Refuges	Chapter 4 Environmental Consequences	Sec 4.13.2.3 Table 4.16-5	4.13-4 and 4.16-28	Text of section and Table describe direct fill impacts of the earthen access causeway constructed in the nearshore waters of Kamishak Bay. However, they do not discuss the significant impacts this permanent solid fill modification would have to the shoreline processes along Amakdedori Beach. This solid fill causeway would be expected to interrupt longshore movement of shoreline sediments that feed Amakdedori beach, erosion and sedimentation patterns in the area, as well as the fish and wildlife habitats at Amakdedori Creek and in the shallow offshore waters of Amakdedori Beach. Depending on circulation and sediment transport mechanisms and patterns these impacts may extend southward into the McNeil River State Game Sanctuary. Data collection, analysis and documentation need to be made on these impacts along Amakdedori beach and the mouth of Amakdedori Creek.	Update and complete these sections to fully address the impacts of the solid fill causeway, sheet pile armor, and any "...project design features and mitigation measures..." incorporated to avoid or reduce erosion and sedimentation; on longshore movement of sediments, erosion processes and coastal habitats. It also needs to consider disruptions to movement and migratory patterns of fish and wildlife the tidelands and beach area.
ADF&G/Wildlife/Refuges	Ch. 4 Environmental Consequences	Sec 4.23	4.23-1	<p>Draft EIS refers to the development of a Wildlife Management Plan to mitigate impacts to wildlife: "Specific mitigation measures to minimize impacts are currently being developed. Impacts to wildlife species would be minimized or mitigated by development of a Wildlife Management Plan (WMP), which would detail management measures to minimize impacts to wildlife species."</p> <p>WMP is needed for review before the environmental consequences of the project can be fully reviewed and evaluated. While a final WMP would be contingent on completion of the EIS and final conditions on any agency permits and landowner agreements issued, the project proponent should work with agencies and interested parties to develop a draft WMP for agency review and inclusion in DEIS.</p>	Develop Wildlife Management Plan for inclusion in Draft EIS.

ADF&G/Wildlife/Refuges	Chapter 4 Environmental Consequences	Sec 4.2.3	4.23-1	<p>"Specific mitigation measures to minimize impacts are currently being developed. Impacts to wildlife species would be minimized or mitigated by development of a Wildlife Management Plan (WMP), which would detail management measures to minimize impacts to wildlife species. The WMP would describe the equipment, methodology, training, and assessment techniques that would be used to minimize the potential for wildlife interaction and minimize impacts to species from all aspects of the project."</p> <p>Impacts to wildlife resources cannot be simply dealt with using an as yet to be developed Wildlife Management Plan. The project proponent needs to collect species use and movement data and work with agencies to incorporate features into the project design that will avoid or minimize wildlife impacts. Specific features that may be needed are special waste management systems, wildlife underpasses or overpasses, relocating road sections or other facilities to avoid important habitats or use areas, or other changes to infrastructure. Data needs to be provided on species use and movements and important habitat areas and these data combined with project plans to develop infrastructure that avoids or reduces impacts to wildlife species. Thus far these data, analysis and infrastructure changes have not been done.</p>	The project proponent needs to collect species use and movement data and work with agencies to incorporate features into the DEIS project design that will avoid or minimize wildlife impacts. More data is required with respect to brown bears movements up and down the coast and through the transportation corridors and the proposed port site, especially with respect to McNeil River SGR and SGS. WMP and BMP's will mitigate for other impacts that cannot be addressed through project design.
ADF&G/DWC/TED	Chapter 4 Environmental Consequences	Sec 4.23.2.1	4.23-1-4.23-2	It is difficult for the reader to gauge the impact of vessel traffic and the level of habitation without information on current and future vessel traffic in the area.	Please provide information on the approximate number of vessels per day that use the port site at present versus how many vessels will be expected during the construction phase operation phase and post-closeout.
ADF&G/DWC/TED	Chapter 4 Environmental Consequences	Sec 4.23.2.1	4.23-2	The paragraph starting with "Some birds may habituate to noise from continuous sources." contains no references to support statements regarding bird habitation to noise. There is abundant research on birds, noise, and habitation and it should be cited here (see above suggestions for references).	Please provide evidence for each statement pertaining to bird habitation to noise. Also, please provide information on anticipated vessel activity levels at the Diamond Point port for Alternative 2.
ADF&G/Wildlife/Refuges	Chapter 4 Environmental Consequences	Sec 4.23.2.1	4.23-3	<p>"Pipeline installation is anticipated to occur during summer months, when breeding birds are nesting. There are no nearby seabird colonies that could be disturbed (e.g., by being flushed off the nest or avoiding foraging areas) during pipeline installation."</p> <p>This statement is unsupported and incorrect. There are a number of seabird colonies in lower Kamishak Bay in the vicinity of the Amakdedori Port site and pipeline installation; including at Nordyke Island, Amakdedulla Islands, Amakdedulla Cove, McNeil Head and Islet, Contact Point, Chenik Head, and Kamishak Islands. In addition, to the potential disturbance at these nest colonies, adults will be feeding in offshore waters supporting nesting mates and chicks. Information on colonies and BA's in 3.23.1.3 clearly shows that there are seabird colonies in the area and during sensitive nesting and molting life stages.</p>	Correct section to present impacts to seabird nesting and molting.
ADF&G/Wildlife/TED	Chapter 4 Environmental Consequences	Sec 4.23.2.1	4.23-3	<p>Paragraph 3: "Additionally, there is a high level of summer vessel traffic in Cook Inlet, and additional boats associated with pipeline installation are not anticipated to contribute in a measurable manner to avian disturbance due to increased vessel traffic."</p> <p>This statement is highly speculative, given that nearshore and offshore activity associated with the construction of the pipeline will be different from existing vessel patterns (mostly shipping traffic) in Cook Inlet and may increase vessel traffic to levels that will result in cumulative negative impacts to birds. Additionally, vessel traffic on the west side of Cook Inlet is much less than it is off shore of the Kenai Peninsula</p>	Please delete this sentence and provide more quantitative information on current and anticipated numbers of vessels associated with activities (see comment above). Distinguish between differences on east side Cook Inlet where there are fewer seabird colonies and higher vessel traffic and West Cook Inlet where there are more seabird colonies and less traffic. Also, surveys during the breeding and non-breeding seasons should be conducted so that they hypothesis of no impact of vessel traffic can be tested using a BACI (before-after-control-impact) design.
ADF&G/Wildlife/TED	Chapter 4 Environmental Consequences	Sec 4.23.2.1	4.23-3	There is a large body of research on bird responses to noise that has not been referenced in this section.	Please provide more detail on known bird responses to industrial noise. Good places to start are 1) Shannon et al. 2015, Biological Reviews 91: 982-1005 and 2) a compilation of papers on noise published in Ornithological Monographs, Volume 74, 2012.
ADF&G/Wildlife/Refuges	Chapter 4 Environmental Consequences	Sec 4.23.2.1	4.23-4	<p>"Wildlife management around the pit lake will be addressed in the WMP. Note: Analysis of risk to wildlife from pit lake water is pending."</p> <p>Analysis of risk to wildlife from pit lake water and Wildlife Management Plan are needed in order to review and comment on this section.</p>	Complete analysis of risk to wildlife from pit lake water and Wildlife Management Plan; revise and complete section; then submit for agency review.
ADF&G/Wildlife/Reg IV	Chapter 4 Environmental Consequences	Sec 4.23	4.23-5	Not sure if this is the best spot to mention this, but if salt will be used on the roads in winter, it could be an attractant to moose, caribou, porcupines, hares, etc. which could be problematic.	Address issue of salt use related to wildlife attractant and potential for road kills.
ADF&G/Wildlife/Refuges	Chapter 4 Environmental Consequences	Sec 4.23.2.2	4.23-5	Page 4.23-19. "Wildlife would be anticipated to avoid the transportation and natural gas pipeline corridors as a result of vehicular traffic in an area that currently has no established roads ..."	This statement and conclusion would be applicable under the discussion for the south transportation corridor and pipeline ROW 4.23.2.2, Behavioral Disturbance.
ADF&G/Wildlife/Refuges	Chapter 4 Environmental Consequences	Sec 4.23.2.2	4.23-5 and 4.23-10	Bear-human conflict resulting from the Amakdedori Port and Transport Corridor is a big concern especially due to the proximity of McNeil River SGR and McNeil River SGS. While the Behavioral and Bear sections generally recognize disturbance mechanisms and conclude the project will impact bears; the section does not adequately address the connection with McNeil River SGR / SGS, and Katmai NPP and the ramifications to resources in these parklands due to behavioral and other disturbances occurring within the project footprint.	Assess and include Environmental Consequences specific to the brown bears utilizing McNeil River SGR / SGS, and Katmai NPP.
ADF&G/Wildlife/Reg IV	Chapter 4 Environmental Consequences	Sec 4.23.2.2	4.23-7	<p>"...29 years of telemetry data that were analyzed found rare instances of caribou in the area covered by the transportation and natural gas pipeline corridors. Therefore, they are not anticipated to occur in large numbers in this area of the project, and may only be encountered on rare occasions. Therefore, no behavioral disturbance impacts on the population (such as shifting migration routes or patterns) are expected to occur."</p> <p>ADF&G caribou survey and inventory surveys were not designed to evaluate caribou use of and movements through the proposed mine site and transportation corridors. Caribou radio collaring efforts often target the core of the herd and thus track the core of the herd...so, the lack of telemetry locations near the mine site or in the transportation corridor may not be representative of use (or future use) at these sites. It may be more related to data collection methods than a complete lack of caribou presence as this seems to imply. Caribou use in these areas does occur and caribou habitat exists in these areas; and more extensive use by caribou may have occurred in the past or occur in the future. The conclusion that "no behavioral disturbance impacts on the population (such as shifting migration routes or patterns) are expected to occur" is unsupported. Information in the EIS and literature clearly show that disturbance will occur at the mine site, transportation corridor and other project features should caribou try to use the area.</p>	Revise section to qualify statements as suggested in comments, include some of the discussion regarding possible movement of the herd to habitats in the mine vicinity in this section as well.
ADF&G/Wildlife/Refuges	Ch. 4 Environmental Consequences	Sec 4.23.2.2	4.23-7 through 13.	"Bear" subsections within the behavioral disturbance, injury and mortality, and habitat change sections misrepresents the habitat use of bears in the areas of the transport corridor and proposed Amakdedori port site. These project components are in an area of high bear densities along the borders of McNeil River SGR / SGS and Katmai NPP which are required to protect bear populations and habitats and have public bear viewing programs in close proximity of the project infrastructure. Brown bears in this area and using the McNeil River SGS/SGR are known to travel over 60 miles. Environmental consequent analysis needs to consider a number of factors including identifying important habitats, acreages and movement corridors; behavioral, mortality and public safety impacts of neutrally and negatively habituated and food conditioned bears; impacts to bears, populations, and programs within the adjacent parklands as a result of behavioral, mortality and habitat changes within the project area. These analysis impacts on these parklands and programs should also be considered in the Recreation sections. Focused research, pre- and post-project construction, is needed to determine brown bear use areas, movements, fidelity to MRS/SGS/SGR complex and mine project areas and to determine effect of project on landscape use by bears. Determine landscape use patterns and degree of relatedness among bears in area. Particularly for brown bear within and surrounding McNeil River SGS/SGR, Amakdedori beach site, Chenik Head area.	Provide long term data and information on brown bear movement patterns, important habitat use areas and movement corridors along the transportation corridors and port sites; in order to address impacts to brown bear habitats, behaviors, mortality, and bear viewing and recreation programs. Revise analysis given comments. This analysis should also consider functional loss of habitats due to behavior changes and avoidance, as well as the public safety and program quality and revenue losses within the McNeil River State Game Sanctuary and Refuge as a result of avoidance behaviors, altered behaviors and fragmentation due to infrastructure. Revise and expand text to fully account for bear and land management impacts in relation to the proposed Amakdedori port and transportation corridors proximity to McNeil River SGR/SGS and Katmai NPP, the large number of bears in the area and the movement of these bears along the coast and their use of the MRS/SGS and MRS/GR.

ADF&G/Wildlife/Reg IV	Ch. 4. Environmental Consequences	Sec 4.23	4.23-8	Information on the timing and spacing of vehicles on the road being as frequent as every 5 minutes or every 12 minutes depending on whether it was just a summer activity or year around is appropriately presented in the bear section on page 4.23-8. This is very important information and it seems this should also be noted at the beginning of this section under "Behavioral Disturbance" to give the reader a better sense of just how much traffic is going to occur and the potential impact of this activity on the other species. Having this under each species is fine too, but it should be stated right up front as well.	Consider adding language re: vehicle activity to the beginning of the section under "Behavioral Disturbance".
ADF&G/Wildlife/Reg IV	Chapter 4 Environmental Consequences	Sec 4.23	4.23-8	"...As detailed in Chapter 3.23, Wildlife Values, <u>low numbers of wolves were incidentally detected, and no wolf dens were detected in the mine site.</u> Wolf behavior in the transportation corridor may be affected, either by avoiding the roadways or using them for travel (especially during the winter when roads are plowed/maintained). Overall, <u>impacts to gray wolves would be anticipated to be low, due to overall low numbers of wolves in the area and their general avoidance of humans.</u> " "Incidental" surveys for wolves (and wolf sign) is an inadequate method for evaluating wolf occurrence, density, and use of an area. Especially if these surveys were conducted when there was not adequate snow cover. Wolf dens are also often difficult or impossible to observe from aircraft, so lack of detected dens is a poor predictor of den occurrence. Further, the noted general avoidance of humans would be a "disturbance" impact in relation to mine activities and operations.	Revise section to quality statements as suggested in comments.
ADF&G/Wildlife/Refuges	Chapter 4 Environmental Consequences	Sec 4.23	4.23-9	"While the WMP will outline ways to reduce the potential for wildlife mortality along the road, varying weather and seasonal conditions would likely cause periods of increased mortality for some species (such as increased moose mortality during winter months, and reduced bear mortality during hibernation)."	As noted above, project applicant and EIS should collect species use and movement data, information on travel corridors and work with agencies to incorporate features into the project design that will avoid or minimize wildlife impacts along the transportation corridor.
ADF&G/Wildlife/Refuges	Ch. 4. Environmental Consequences	Sec 4.23.2	General	Text of sections needs to be updated to describe impacts of the earthen access causeway constructed in the nearshore waters of Kamishak Bay poses significant impacts to the shoreline processes along Amakdedori Beach as well as fish and wildlife habitats at Amakdedori Creek / beach. This solid fill causeway would be expected to interrupt longshore movement of shoreline sediments that feed Amakdedori beach, erosion and sedimentation patterns in the area, as well as the fish and wildlife habitats and movements along Amakdedori Beach, the shallow waters offshore of Amakdedori Beach and at Amakdedori Creek. Depending on circulation and sediment transport mechanisms and wildlife use patterns these impacts may extend southward into the McNeil River State Game Sanctuary. Data collection, analysis and documentation need to be made on the impacts as a result of the causeway alternatives along Amakdedori beach and the mouth of Amakdedori Creek.	Update and complete these sections to fully address the impacts of the solid fill causeway, sheet pile armoring, and any "...project design features and mitigation measures..." incorporated to avoid or reduce erosion and sedimentation; on longshore movement of sediments, erosion processes and coastal habitats. It also needs to consider disruptions to movement and migratory patterns of fish and wildlife the tidelands and beach area.
ADF&G/Wildlife/Refuges	Chapter 4 Environmental Consequences	Sec 4.23.2.2	4.23-10	"Bears are at risk of vehicular collisions during construction and operations; and to a lesser extent after closure, because the transportation corridor would remain open, <u>but the traffic level would be reduced.</u> The south mine access road would remain in place for Kokhanok residents to travel to Amakdedori port." Not enough information is provided in the DEIS to support the traffic level being reduced. Various parts of the DEIS note the road corridor and port remaining in place as an industrial port and open for access. Depending on the level of those industrial uses and access the traffic levels may less or may be greater.	Revise conclusion to accurately reflect potential for vehicular collision beyond project life.
ADF&G/Wildlife/Refuges	Chapter 4 Environmental Consequences	Sec 4.23.2.2	4.23-10	"The south mine access road is located in an area with high brown bear densities and occurs between Katmai National Park and Preserve and Lake Clark National Park and Preserve. Brown bears are common in the area, especially along coastal plains in the early summer, and then along salmon-spawning streams later in the summer and fall. Thus, bears are moving around in relation to available food resources. Bears would likely cross the south mine access road as part of their regular movement patterns, and would experience increased traffic with the summer-only ferry variant." Section needs to be revised and clarified. Unsure of area and road segments being discussed. South "mine" access road or south transportation corridor. The south transportation corridor, north transportation corridor and Amakdedori port are in an area of high brown bear densities and involve coastal plains, etc. The mine access roads however, may be in areas of lower bear numbers on the north side of Iliamna and don't fit the description. Bears along the south transportation corridor would experience increased traffic under all scenarios as there currently is little to none.	Revise section per comments.
ADF&G/Wildlife/Refuges	Ch. 4. Environmental Consequences	Sec 4.23.2.2	4.23-10	"There is a potential for bear mortality due to defense of life and property. Bears that become habituated and frequent the mine site, ferry terminal vicinity, Amakdedori port, or other project locations, may become a safety risk. Implementation of a WMP is anticipated to minimize the potential for conflict between wildlife and humans. Additionally, the project will have a no hunting policy for non-local employees." This section needs to be expanded upon and related to the numerous public bear viewing areas and potential for bears that are neutrally habituated to human presence being placed in danger at project locations; as well as, bears that are negatively habituated by the PLP project and WMP actions, or food conditioned by poor food and waste management, becoming a danger to the public at bear viewing areas.	Fully document potential behavioral, mortality and public safety impacts of project design and operations as it relates to nearby public bear viewing venues, and bear resources in neighboring parks, sanctuaries and preserves.
ADF&G/Wildlife/Refuges	Chapter 4 Environmental Consequences	Sec 4.23.2.2	4.23-11	"Implementation of a WMP is anticipated to minimize the potential for conflict between wildlife and humans." The Wildlife Management Plan needs to be included, as well as, plans for other project infrastructure (such as waste management systems) in order to adequately address ADF&G concerns regarding bear-human conflicts in the area of the transportation corridor and the proposed Amakdedori port site.	This Wildlife Management Plan and other baseline data on bear habitat use areas and movement patterns is required before we can accurately assess impacts to brown bear resources, public safety and management issues at McNeil River SGR and SGS.
ADF&G/Wildlife/Refuges	Chapter 4 Environmental Consequences	Sec 4.23.2.2	4.23-11	Habitat Changes, "Bear" subsection, misrepresents the habitat use of bears in the areas of the transport corridor and proposed Amakdedori port site. Reporting a net loss of vegetation or habitat acreage without taking into account the relative importance of these habitats and knowing travel corridors is insufficient.	Provide long term data and information on brown bear movement patterns, important habitat use areas and movement corridors in order to address impacts to brown bear habitats along the transportation corridors and port sites. This analysis should also consider functional loss of habitats within the McNeil River State Game Sanctuary and Refuge as a result of avoidance behaviors, altered behaviors and fragmentation due to infrastructure. Revise and expand text to fully account for habitat impacts in relation to the proximity of the proposed Amakdedori port to McNeil River SGR and SGS, the large number of bears in the area and the movement of these bears along the coast and their use of the MRSRGS and MRSRGR.
ADF&G/Wildlife/Refuges	Chapter 4 Environmental Consequences	Sec 4.23.2.2	4.23-12	"Given the brown bear density estimate and the acreage of habitat that would be removed by the project, <u>habitat would be lost for a few brown bears.</u> This estimate is based entirely on direct habitat removal, and additional brown bears would likely avoid areas around the project." As noted in other sections there would be loss of habitat from behavioral changes and avoidance, in addition to the direct habitat losses. Avoidance acreages should be calculated for bears similar to caribou estimates; and figures depicting these losses provided.	Revise section to include loss of habitat from behavioral changes and avoidance, in addition to the direct habitat losses. Avoidance acreages should be calculated for bears similar to caribou estimates; and figures depicting these losses provided.
ADF&G/Wildlife/Refuges	Chapter 4 Environmental Consequences	Sec 4.23.2.2	4.23-12	Impacts to gray wolves is minimized or under represented. Discussion centers on use in the mine area and does not discuss losses to wolf habitat throughout the project components. <u>Should also include discussion of loss from avoidance and acreages.</u>	Revise text to incorporate noted comments.
ADF&G/Wildlife/Refuges	Chapter 4 Environmental Consequences	Sec 4.23.2.2	4.23-12	"Brown bears are not evenly distributed throughout the landscape and are concentrated around resources such as high quality vegetation sources (sedges, grasses, berry sources) and salmon-spawning streams."	More Accurate to say: "Brown bears are not evenly distributed throughout the landscape and are <u>seasonally</u> concentrated around resources such as high quality vegetation sources (sedges, grasses, berry sources) and salmon-spawning streams."

ADF&G/Wildlife/Refuges	Chapter 4 Environmental Consequences	Sec 4.23.2.2	General	Injury and Mortality sections within chapter need to document and evaluate the impacts to increase mortality due to increased access and harvest pressure. Sections that specifically evade this include gray wolf, bear, caribou, moose.	Revise and update sections to include discussion of increased mortality due to increased access and harvest pressure.
ADF&G/Wildlife/TED	Chapter 4 Environmental Consequences	Sec 4.23.3.1	4.23-18	"Since vessel speeds would be low in the bays, birds would likely avoid approaching vessels and the impact would be anticipated to be low." Again, this statement is speculative and overly optimistic. The impact of vessel traffic, even at low speeds, on seabirds can be substantial (Agness et al. 2008, Schwemmer et al. 2011)	Delete this sentence and cite research by Schwemmer et al (2011), Agness et al. (2008) and others on the known effects of vessel traffic on waterbirds. Here are the citations: Agness, A.M., Pilaatt, J.F., Ha, J.C., and VanBlaricom, G.R. 2008. Effects of vessel activity on the near-shore ecology of Kittitz's Murrelets in Glacier Bay, Alaska. The Auk 123: 346-353. Schwemmer, P., Mendel, B. Sonntag, N., Dierchke, V. and Garthe, S. 2011. Effects of ship traffic on seabirds in offshore waters: implications for marine conservation and spatial planning. Ecological Applications 21: 1851-1860.
ADF&G/Wildlife/Refuges	Chapter 4 Environmental Consequences	Sec 4.23.3.2	4.23-19	"Impacts to terrestrial wildlife from the mine site under Action <u>Alternative 1</u> would be similar and not repeated here." Error in sentence structure or typo. As this is under the section for Action Alternative 2; this may mean impacts under Alternative 2 are same as Alternative 1 at the mine site. But that is not clear from the current wording.	Correct sentence.
ADF&G/Wildlife/Refuges	Chapter 4 Environmental Consequences	Table 4.23.1	4.23-21	Column heading "Impact <u>Causin</u> g Project Component" makes no sense.	Rephrase column heading. "Impact <u>from</u> Project Component" may be appropriate.
ADF&G/Wildlife/Refuges	Chapter 4 Environmental Consequences	Sec 4.23.6	4.23-23	The Cumulative Effects section is incomplete and cursory and requires additional analysis and detail regarding the cumulative effects of the other RFFA's in relation to the proposed project.	Revise and update section to completely describe the reasonably foreseeable cumulative effects.
ADF&G/Wildlife/Refuges	Ch. 4 Environmental Consequences	Sec 4.25	4.25-1	"Note: data from 2018 baseline field surveys will be included in the DEIS." Need this in order to review sections.	Provide completed section including pertinent baseline data.
ADF&G/Wildlife/Refuges	Chapter 4 Environmental Consequences	Sec 4.25	4.25-1 and 4.25-2	The document refers to mitigation measures for Threatened and Endangered Species that are under development. Prior to developing and implementing mitigation measures, the project applicant needs to provide information on avoidance and minimization actions in terms of project design by identifying infrastructure conflicts with T&E species and then modifying project design in order to avoid or minimize those impacts. This information is needed in order to adequately review environmental consequences of the proposed actions.	Provide avoidance and minimization design actions as well as mitigation measures. Then revise section on environmental consequences.
ADF&G/Wildlife/Refuges	Chapter 3 Affected Environment and Chapter 4 Environmental Consequences	General	General	"Movement and distribution of bears and other terrestrial mammals through the transportation corridor to the McNeil River State Game Refuge and Katmai National Park and Preserve may be disrupted; therefore, construction and operations activities in the south access corridor may have some adverse impacts on wildlife viewing in both of those recreation areas. See Section 4.23, Wildlife Values, for more information on impacts to bear movement and distribution." The DEIS Chapter 3 & 4 sections on Recreation mischaracterize and under evaluate the potential adverse impacts to Recreational opportunities at McNeil River SGS and SGR. Impacts to McNeil River SGS and SGR, and hunting and recreation at the Amakdedori Port site are minimized in this Recreation section. Given its proximity, infrastructure at Amakdedori beach and the southern transportation corridor have the potential for significant impacts to the "Recreation" at McNeil River SGS. The bear-viewing program at the sanctuary has relied on the predictable, consistent behavior of humans for 50 years to maintain safe viewing practices. The transportation corridor and port site would expose bears using the refuge and sanctuary to a number of anthropogenic disturbances and actions, inconsistent human behaviors, and industrial, food and waste attractants which would have an adverse and potentially dangerous impact on bear behavior, with respect to viewing programs at McNeil River, Chenik Lagoon, and the Funnel-Moraine Creek areas. Avoidance of these impacts are critical to these bear viewing programs and public safety.	Provide complete identification of Affected Resources and complete analysis and identification of Environmental Consequences in regard to recreational bear viewing at McNeil River SGS/SGR, Katmai Preserve, and other locations along the coast of Cook Inlet / Kamishak Bay. In addition to items listed in comments, when addressing avoidance, minimization and mitigation; include project design and relocation options of infrastructure as well as the WMP. Include waste management systems, processes, industrial and personal attractants, and sources of behavioral modification from operations or WMP actions.
ADF&G/Wildlife/Refuges	Chapter 5 Mitigation and Appendix M - Mitigation Screening	General	General	The mitigation chapter seems to underestimate what would be required from a project of this magnitude and doesn't specify any compensatory mitigation. Additionally, Appendix M-Mitigation Screening was provided very late in the review process and therefore wasn't reviewed.	Further develop mitigation section and include compensatory mitigation being proposed by applicant and allow sufficient time for review.
ADF&G/Wildlife/Refuges	Appendix K	Table K3.6-1:	K3.6-3	"Sources: Sigurdsson and Powers 2012; Sigurdsson and Powers 2013; Sigurdsson and Powers 2014; Powers and Sigurdsson, 2016." Source noted at bottom of Table not included in References Chapter 9.	Provide citation/references.
ADF&G/Wildlife/Refuges	Appendix K	Section K4.11	General	While the Viewshed Analysis figures are helpful in visualizing aesthetic impact areas; the analysis needs to contain more than just figures. Summaries on the acreages of impacted areas, and textual explanation of the findings in each figure should be provided. Additionally, the southern road corridor and materials sites should be included as KOP's and included in the viewshed analysis. Rough calculations show that the road, port and material sites will all be visible in northern portions of the McNeil River State Game Refuge.	Update aesthetic and viewshed analysis to include the southern road corridor and materials sites as KOP's and included. Provide summaries on the acreages of impacted areas, and textual explanation of the findings in each figure of the analysis.



THE STATE
of **ALASKA**

GOVERNOR MICHAEL J. DUNLEAVY

Department of Natural Resources

OFFICE OF PROJECT MANAGEMENT & PERMITTING

Po Box 111030
Juneau, Alaska 99811-1030
Main: 907.465.6849
Email: kyle.moselle@alaska.gov

June 28, 2019

Shane McCoy
Program Manager
US Army Corps of Engineers
645 G St.
Suite 100-921
Anchorage, AK 99501
Submitted via email to Shane McCoy at drafteis@comments.pebbleprojecteis.com

Dear Mr. McCoy,

The Office of Project Management and Permitting (OPMP) has coordinated with the Alaska Departments of Natural Resources (DNR), Environmental Conservation (DEC), Fish and Game (ADF&G), Transportation and Public Facilities (DOT&PF), Health and Social Services (DHSS), Labor and Workforce Development (DOL), and Commerce, Community and Economic Development (DCCED) to review the Pebble Project Draft Environmental Impact Statement (DEIS) published by the U.S. Army Corps of Engineers (USACE)¹. The State of Alaska's consolidated comments are enclosed for your consideration in preparing the Final EIS (FEIS) and your Record of Decision (ROD).

Thank you for inviting the State of Alaska (State) to participate as a cooperating agency in the federal environmental review process for the proposed Pebble Mine. Although much of the information the State has provided the USACE previously has been incorporated into the DEIS, **further work is necessary to ensure potential effects to the human environment from each alternative are adequately evaluated and described in the FEIS.** The State review team will participate fully in the technical working group meetings the USACE has scheduled with the cooperating agencies following close of the public comment period on the DEIS.

Please contact me if you have any questions regarding the enclosed comments and to organize follow-up meetings, as necessary, with the State review team.

Sincerely,

A handwritten signature in black ink, appearing to read "Kyle W. Moselle".

Kyle Moselle
Associate Director

Enclosure: Consolidated State of Alaska Comments (MS Excel file)

Cc: Corri Feige, Commissioner, ADNRR
Doug Vincent-Lang, Commissioner, ADF&G
Jason Brune, Commissioner, ADEC
Kip Knudson, Director State and Federal Relations, Office of the Governor

¹ Notice of Availability published in the Federal Register (Vol. 84, No. 41, Friday, March 1, 2019)

**Pebble Project: DEIS Review
State of Alaska Consolidated Comments Table**

Department/Division	Document Name	Section/Fig./Table	Page #	Comment/Issue	Recommendation/Action
ADF&G/Habitat/SPCS	Chapter 2 Alternatives 2.2.2.4	2.2.2.4		Drilling mud containment is straightforward for Horizontal Directional Drilling (HDD) operations under streams since the bore begins and ends aboveground. It is unclear how total containment and proper disposal can take place for HDD operations where one end begins aboveground and the other end comes out underwater.	EIS should describe how pressurized drilling muds will be contained for HDD operations into Cook Inlet or into Lake Iliamna. If drilling muds cannot be totally contained, then the EIS should describe the contents of these fluids, amounts that will be discharged into these waterbodies and describe any related effects on the environment.
ADF&G/Habitat/SPCS	Chapter 2 Alternatives 2.2.2.4	2.2.2.4		The DEIS indicates that the pipeline will either be trenched or use HDD to transition out of the western shore of Cook Inlet.	The EIS should go into further detail on specifics of nearshore pipeline trenching and installation activities as the pipeline transitions onshore in tidally influenced areas of Cook Inlet in order to better assess potential impacts.
ADF&G/Habitat/SPCS	Chapter 2 Alternatives 2.2.2.4	2.2.2.4		The DEIS indicates that the pipeline will either be trenched or use HDD to transition into or out of Lake Iliamna.	Since trenching is a described option, the EIS should describe in further detail how the pipeline would be trenched and installed in order to better assess potential impacts.
ADF&G/Habitat/SPCS	Chapter 2 Alternatives 2.2.2.4	2.2.2.4	page 2-75	DEIS indicates that the applicant would only need a 30-foot temporary construction area to install the pipeline in Cook Inlet and Lake Iliamna yet in other sections the DEIS indicates a 150-foot ROW for pipeline construction.	Since trenching is being proposed as a possible pipeline onshore transition in the tidally influenced western portion of Cook Inlet and Lake Iliamna, suggest clarifying if this transition could be accomplished in a 30-foot construction area or if a larger construction area would be necessary for these transitional areas.
ADF&G/Habitat/SPCS	Chapter 2 Alternatives 2.2.2.4	2.2.2.4	page 2-78	DEIS states "Material sites and extraction sites for road and pipeline construction are discussed above." Yet they are not.	EIS should describe material sites and water extraction sites for pipeline construction in order to better assess potential impacts
ADF&G/Habitat/SPCS	Section 4.14 Soils	4.14.2.3- Transportation Corridor-Erosion	page 4.14- 11-13	Section only describes construction induced erosion due to access road construction, material sites and terminal facilities.	Section should also describe construction induced erosion from all aspects of pipeline installation and operations including open-cut stream crossings, trenching in Cook Inlet and Lake Iliamna, exposed trench spoils, overland flow interception of pipeline trench and overburden, pipeline hydrostatic testing water disposal and potential frost heaving post construction. In addition, EIS should describe methods on preventing, minimizing and mitigating erosion for Alternatives 1, 2 and 3 in order to fully assess potential impacts.
ADF&G/Habitat/SPCS	Section 4.14 Soils			Section 4.14_Soils does not adequately describe methods on preventing, minimizing and mitigating erosion for Alternatives 1, 2 and 3.	EIS should describe methods on preventing, minimizing and mitigating erosion for Alternatives 1, 2 and 3 in order to fully assess potential impacts.
ADF&G/Habitat/SPCS	Section 4.14 Soils	4.14.2.4 Natural Gas Pipeline	page 4.14- 13	Section only describes effects on soils from pipeline infrastructure on the eastern side of Cook Inlet.	EIS should also describe the effects on soils from the rest of the proposed natural gas pipeline installation and operations on the west side of Cook Inlet and within Cook Inlet itself.
ADF&G/Habitat/SPCS	Section 4.14 Soils	4.14.3.4 Natural Gas Pipeline	page 4.14- 20	Section indicates BMPs would be used to address erosion and stormwater runoff but does not describe sources of pipeline induced erosion.	Section for Alternative 2 should also describe construction induced erosion from all aspects of pipeline installation and operations including open-cut stream crossings, marine crossing of Cottonwood Bay, exposed trench spoils, overland flow interception of pipeline trench and overburden, pipeline hydrostatic testing water disposal and potential frost heaving post construction.
ADF&G/Habitat/SPCS	Section 4.16-Surface Water Hydrology	4.16.3.2 Transportation Corridor	page 4.16- 26	Section identifies waterbody crossings in the transportation corridor including the natural gas pipeline but only addresses erosion from road culverts and bridges.	Section should also address erosion and potential changes in surface hydrology and erosion from pipeline installation.

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ADF&G/Habitat/SPCS	Section 4.16-Surface Water Hydrology	4.16.3.2 Transportation Corridor-Surface Extraction	page 4.16-30	Last paragraph on page states that "Permit compliance (ADF&G Habitat Permits) <u>would avoid the potential for impacts</u> from water withdrawal at streams."	ADF&G Habitat Biologists must balance many factors before issuing Title 16 Fish Habitat Permits and sometimes impacts are still unavoidable. Suggest changing text to "Permit compliance (ADF&G Habitat Permits) <u>would avoid or minimize</u> the potential for impacts from water withdrawal at streams."
ADF&G/Habitat/SPCS	Section 4.16-Surface Water Hydrology	4.16.3.5 Marine Water-Kenai Peninsula to Kamishak Bay	page 4.16-34	Section states that suspended sediment concentrations from either trenching or HDD would not be larger than the maximum concentrations that would occur under severe storm conditions.	This statement is not supported by any citation. If claim is to be made, EIS should estimate and quantify the localized sedimentation likely to be encountered from both trenching and HDD and compare it to storm suspended sedimentation data and cite the source.
ADF&G/Habitat/SPCS	Section 4.16-Surface Water Hydrology	4.16.3.5 Iliamna Lake	page 4.16-35	Section states that pipeline construction at the north and south ferry terminal would only cause short-term suspended sedimentation limited to the immediate vicinity of the construction and would only persist for a few days. DEIS does not go into specifics on either nearshore trenching nor HDD into Lake Iliamna yet describes specifics on impacts.	EIS should describe in much greater detail both proposed trenching and HDD activities so impacts can be properly evaluated.
ADF&G/Habitat/SPCS	Section 4.16-Surface Water Hydrology	4.16.3.5 Pipeline	page 4.16-35	Section describes the impacts for a frac-out of drilling muds from HDD stream crossings but does not address how drilling muds would be contained and disposed for HDD operations where one end begins aboveground and the other end comes out underwater. EIS should describe how pressurized drilling muds will be contained for HDD operations into Cook Inlet or into Lake Iliamna.	EIS should describe impacts of HDD operations into Cook Inlet and Iliamna Lake. If drilling muds cannot be contained, then the EIS should describe the contents of these fluids, including possible frac-out additives, and amounts that will be discharged into these waterbodies and describe any related effects on the environment.
ADF&G/Habitat/SPCS	Section 4.16-Surface Water Hydrology	4.16.3.5 Pipeline	page 4.16-36	First sentence of page states "Typically, geotechnical investigations would be conducted at HDD stream crossings to evaluate the risk of frac-out during drilling at each crossing."	Standalone sentence/paragraph does not offer any commitments to doing any Geotech work nor avoiding HDD activities where a frac out risk is high. If Geotech work is not available for impact analysis prior to the issuance of an EIS, then a commitment should be made to do Geotech work at HDD sites and avoid areas that have a high risk of frac-out.
ADF&G/Habitat/SPCS	Section 4.18 Water and Sediment Quality	4.18.3.4 Natural Gas Pipeline Corridor-Surface Water Quality	page 4.18-25	Section states "The magnitude, extent, duration, and likelihood of impacts to surface water quality within the natural gas pipeline corridor would be associated with installation of the pipeline at water crossings and the use of local water sources for hydrostatic testing."	The magnitude (extent) of surface water quality impacts from the natural gas pipeline would be associated with more than just these two aspects of pipeline construction. The EIS should identify and evaluate all potential impacts on surface water quality including: trenching and HDD into Cook Inlet and Lake Iliamna, interception of overland surface flows by the pipeline ditch, monitoring and mitigation until the disturbed areas have been stabilized, release of hydrostatic waters into fish bearing waterbodies, erosion and sedimentation from exposed trench spoils and frost heaving.
ADF&G/Habitat/SPCS	Section 4.18 Water and Sediment Quality	4.18.3.4 Natural Gas Pipeline Corridor-Surface Water Quality	page 4.18-25	Section states "Impacts (pipeline) at material sites and stream crossings would be the same as those described above for the transportation corridor."	Stream crossing impacts will be very different for many aspects of pipeline construction such as from HDD or open cut trenching that are not needed for road construction. Also, it is unclear why "material site" impacts are included in pipeline section. Consider re-wording this sentence in the pipeline section.
ADF&G/Habitat/SPCS	Section 4.23 Wildlife Values			Section does not address the potential behavioral changes nor physical disturbance to wildlife movement due to pipeline stringing.	Section should address the effects on wildlife movements due to pipeline stringing both for prolonged periods of time and length.

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ADF&G/Habitat/SPCS	Section 4.23 Wildlife Values			Section does not address the potential injury, entrapment and disruption of wildlife movement due to excessive and prolonged open ditches from pipeline construction.	EIS should address the potential wildlife impacts of open pipeline ditches and describe applicant's plan to minimize animal entrapment as well as potential barriers to animal movement.
ADF&G/Habitat/SPCS	Section 4.24 Fish Values	4.24.2.1, Natural Gas Pipeline	page 4.24-7	"The magnitude and extent of impacts from project construction, operations, and closure of the natural gas pipeline would have a footprint of 40 acres, of which 6 acres are wetlands or other waters." This statement ignores downstream effects from currents in the case of streams, wind driven currents (Lake Iliamna) and tidal currents in Cook Inlet.	Extent of impacts from pipeline construction will not be limited to just the footprint of project construction and will be carried in some instances a significant distance from the point of disturbance. Consider re-wording.
ADF&G/Habitat/SPCS	Section 4.24 Fish Values	4.24.2.2, Fish Displacement, Injury, and Mortality	page 4.24-8	Section states "The magnitude of direct impacts from installation of bridges, culverts, and the natural gas pipeline would be that mortality of fish could occur from construction activities at stream crossings and the ferry terminals." Vague statement that does not address the direct impacts of displacement or injury to fish as the section title suggests. It does not even address the direct impacts of fish mortality except by stating that they "could" occur.	This section should describe the potential causes of fish displacement, injury or mortality for all aspects of the transportation corridor and pipeline construction to all fish species and life stage consistent with the title of the section. Examples of causes of displacement, injury and mortality include sedimentation from trenching, improper use of BMPs, inadequate bank restoration and stabilization, channelization of backfilled trench, and HDD frac-out. Additional examples of impacts include direct mortality to eggs (both directly from trenching, blasting and piledriving as well as blocking the O2 intake from filling in interstitial spaces in stream gravel from sedimentation) and displacement and mortality of adults and juveniles from blasting, piledriving, and sedimentation.
ADF&G/Habitat/SPCS	Section 4.24 Fish Values	4.24.2.2, Fish Displacement, Injury, and Mortality	page 4.24-8	Section states "The magnitude of impacts from fish entrainment or impingement at screens during pumping would be potential direct mortality or injury. The duration of impacts would be that fish passage may be temporarily impeded during construction."	Confusing statement that acknowledges that fish may be killed or injured from pumping operations but that the duration of the impacts would only be a temporary impedance during construction. Clearly if fish are injured or killed the impacts to the fish would be more than just impedance during construction. Suggest re-wording.
ADF&G/Habitat/SPCS	Section 4.24 Fish Values	4.24.2.2, Fish Displacement, Injury, and Mortality	page 4.24-9	Section states "The capture/relocation program would be conducted according to established ADF&G practices, and permit stipulations could include seasonal restrictions on instream activities to reduce or avoid impacts during species critical life stages (e.g., spawning and egg development periods)."	The EIS should describe the applicant's capture/relocation program and indicate when, where, and under what conditions it would be necessary in order to better evaluate the direct impacts to fish from the transportation corridor construction activities. Further, simply stating that ADF&G "could" implement permit stipulations to reduce or avoid impacts does not provide an adequate description of what the likely impacts to fish will be nor the steps the applicant will take to avoid, minimize or mitigate these impacts.
ADF&G/Habitat/SPCS	Section 4.24 Fish Values	4.24.2.2, Fish Displacement, Injury, and Mortality	page 4.24-9	Last paragraph in "Bridge, Culvert, and Natural Gas Pipeline Installation" section combines ADF&G water pump screen criteria and HDD frac-out impacts.	These are two separate and unrelated topics and should be separated out. Consider rewording.
ADF&G/Habitat/SPCS	Section 4.24 Fish Values	4.24.2.2, Iliamna Lake Pipeline	page 4.24-9	Section states "The magnitude of impacts is such that these activities would displace 1.3 acres of substrate material along with the associated organisms".	Magnitude (extent) of impacts would not be limited to just the footprint of the pipeline during construction. EIS should describe the impacts from nearshore trenching and resulting turbidity and sedimentation that will likely be dispersed from wind driven currents.

Department/Division	Document Name	Section/Fig./Table	Page #	Comment/Issue	Recommendation/Action
ADF&G/Habitat/SPCS	Section 4.24 Fish Values	4.24.2.2, Iliamna Lake Pipeline	page 4.24-9	Section only describes effects of Iliamna Lake pipeline on benthic organism displacement and sockeye salmon disturbance.	Section should describe potential effects on all species of fish in Lake Iliamna from pipeline construction, including turbidity from trenching.
ADF&G/Habitat/SPCS	Section 4.24 Fish Values	4.24.2.2, Natural Gas Pipeline	page 4.24-11	Section only describes effects of the pipeline in Cook Inlet.	Consider rewording section title to "Cook Inlet Pipeline" instead of "Natural Gas Pipeline" to be consistent with previous "Iliamna Lake Pipeline" section.
ADF&G/Habitat/SPCS	Section 4.24 Fish Values	4.24.2.2, Natural Gas Pipeline	page 4.24-11	Section only describes effects of the pipeline in Cook Inlet to Weathervane scallops from the laying of pipe and benthic fauna mortality from the placement of anchors.	Section should describe potential impacts to all marine fish and benthic fauna and from all aspects of the installation of the natural gas pipeline, including the impacts from trenching in the nearshore zone.
ADF&G/Habitat/SPCS	Section 4.24 Fish Values	4.24.2.3,-Stream Flow- Natural Gas Pipeline	page 4.24-16	Section states "The magnitude and extent of potential impacts to groundwater and surface water during pipeline construction would involve interception of shallow groundwater and surface water during trenching activities, which would be captured and locally flow along the trench backfill."	Clearly the magnitude (extent) of potential impacts to surface water is not limited to just the capture of flow along the trench backfill. EIS should describe all of the potential impacts to surface flow from the installation of the natural gas pipeline including sedimentation and erosion from open cut stream pipeline stream crossings. Section should also describe the potential effects on fish consistent with the Chapter title (Fish Values).
ADF&G/Habitat/SPCS	Section 4.24 Fish Values	4.24.2.4, Stream Productivity-Iliamna Lake Pipeline	page 4.24-18	Section states "HDD would be used to install the natural gas pipeline segments from the lakeshore into waters deep enough to avoid navigational hazards, then laid and secured on the lake bottom."	Other sections indicate that either HDD or trenching would be used to install the natural gas pipeline into Iliamna Lake. EIS should evaluate and describe the impacts to fish of both methods in this section.
ADF&G/Habitat/SPCS	Section 4.24 Fish Values	4.24.2.4, Stream Productivity-Cook Inlet Natural Gas Pipeline	page 4.24-19	Section only discusses the impact on weathervane scallops in northern Kamishak Bay.	Section should describe the impacts of all fish species and benthic organisms as a result of the natural gas pipeline.
ADF&G/Habitat/SPCS	Section 4.24 Fish Values	Section 4.24.2.6 Fish Migration-Access Roads and Pipeline	page 4.24-22	Section only indicates that fish passage may be disrupted during bridge construction.	Section should identify all potential impacts to fish passage from pipeline construction including construction induced turbidity, culvert installation and open ditch stream crossings as well as the duration of the disruption.
ADF&G/Habitat/SPCS	Section 4.24 Fish Values	Section 4.24.2.6 Natural Gas Pipeline	page 4.24-23	Section only describes impacts on the migration of macroinvertebrates in Cook Inlet.	Suggest renaming section 4.24.2.6 to "Cook Inlet Pipeline" instead of "Natural Gas Pipeline" to be consistent with previous sections such as "Iliamna Lake Pipeline".
ADF&G/Habitat/SPCS	Section 4.24 Fish Values	Section 4.24.2.7 Water Temperature and Quality	page 4.24-23	Section only addresses effect of water temperature and quality on fish from the construction and operation of the mine.	Section should also address the potential effects from the transportation corridor including the natural gas pipeline construction and operations.
ADF&G/Habitat	DEIS	Overall		While the DEIS does attempt to describe direct impacts to fish and fish habitat, it minimizes or ignores indirect, long-term impacts on downstream resources and habitat.	DEIS should consider and describe all potential impacts, including indirect impacts, to downstream resources and habitat.
ADF&G/Habitat	DEIS	Overall		Wildlife crossings are not included in mitigation.	Wildlife crossings under or over the Transportation Corridor road could mitigate impacts to wildlife movement.

Department/Division	Document Name	Section/Fig./Table	Page #	Comment/Issue	Recommendation/Action
ADF&G/Habitat	DEIS	Overall		<p>DEIS states in multiple places that there will be no measurable impacts to salmon populations, but the limited baseline studies may not have captured the true salmon populations of these systems. Long-term population levels in these streams or the watershed's true production potential vary over time and space. A watershed acts as a system with fish production moving between tributaries over time. Stream reaches in a watershed may experience low production for long-periods of time alternating with periods of high productivity. The aggregate of the system as a complete and undisturbed watershed should be considered as being impacted when individual tributaries are removed or impacted that lower the potential production of the watershed as a whole.</p>	<p>Limited baseline studies make the production potential in these streams uncertain and therefore the actual salmon populations in these streams may not be precise enough to determine if measurable impacts are occurring to the system. For example, in 2008 the chinook salmon count in the North Fork Kuktuli was 434 fish and in 2005 it was 2,889 fish. More surveys would undoubtedly demonstrate even more variability. DEIS should acknowledge the uncertainty of salmon production from, and population of, these streams as they contribute to the overall aggregate production in the system.</p>
ADF&G/Habitat	DEIS	Overall		<p>In multiple places the DEIS states that impacts will last through the life of the project and then assigns the duration as long term. The DEIS criteria for permanent duration apply if recovery takes greater than 20 years. If impacts last through the life of the project then they will certainly be lasting for more than 20 years (construction = 4 years, operation = 20 years, post-closure = 20 years) and should be categorized as permanent.</p>	<p>The DEIS should further define/clarify how impacts are categorized and explain why certain impacts are listed as long-term instead of permanent. Currently, it appears a number of the impacts would more accurately be described as permanent (lasting longer than 20 years).</p>
ADF&G/Habitat		Overall		<p>Uncertainty exists in the long-term predictions of acid generation from geologic materials found in mining environments. Evaluation of Environmental Impact Statements from 25 mines performed by Kuipers and others (2006) showed 15 of 25 mines (60%) exceeded surface water quality standards for metals and pH after permitting. Of 56 mines evaluated by Skousen and others (2002) 11% did not conform to the expected results based on NP:AP ratios, including four sites with ratios > 2: these sites eventually produced acidic drainage. The standard protocols for evaluating geologic materials for their ability to produce AMD are generally agreed upon within the scientific community, yet uncertainty remains in the ability of scientists and engineers to predict the ultimate drainage quality years in the future, as many complex variables influence acid generation and neutralization. There is inherent uncertainty involved with distinguishing PAG from NPAG waste and combined with less than 100% testing, short-term testing, human error, and potential breakdown in controls during operations, there is potential for PAG waste to be mischaracterized or misplaced and used in road fill, embankments, or other areas where it will be exposed to the elements with the potential to release acid and metals into the aquatic environment. This may be localized (e.g., used as fill around a culvert at a stream crossing) or widespread (e.g., along a road that parallels a stream) and it may take years to begin producing acid and having impacts to the aquatic environment</p>	<p>The DEIS should consider and describe the potential impacts from mischaracterization and/or misplacement of PAG rock on aquatic resources, including what corrective measure could be taken, for example, if it is later determined that PAG is included in the tailing embankments or a quarry is found to contain PAG or produces acid years in the future. Historically, small changes in contaminants, sediment, turbidity, stream-flow, and pH have resulted in decreases in salmon populations and macroinvertebrates (Hughes, 1985).</p>

Department/Division	Document Name	Section/Fig./Table	Page #	Comment/Issue	Recommendation/Action
ADF&G/Habitat		Overall		Risks and potential impacts on surface water resources are incompletely described in the DEIS. Direct and indirect impacts to surface waters from groundwater reductions, diversions, water treatment releases, and other mine operations are discussed under normal operating conditions, but not under compromised conditions. The proposed project relies on a complex water management system, with a network of controls and point releases (infiltration chambers) to mitigate the reduced streamflows created by the project. The system is subject to unplanned failures including human error, pump failures, uncertainty, miscalculations, frozen pipes, or other disruptions/breakdowns. A temporary breakdown of this system and disruption of point releases could have significant impacts to fish populations. For example, an upset to the system in December, even for 24-hours, could mean the desiccation and freezing of incubating eggs as well as strand juvenile fish during the critical overwintering period. For example, a new \$120 million water treatment facility at a British Columbia coal mine was recently constructed to remove selenium but instead released a more toxic form of the element. This was unforeseen/unplanned, fish kills resulted, and the plant has been offline for years now while the challenges are resolved with water quality exceedances ongoing.	DEIS acknowledges that water balance predictions may be subject to significant uncertainty and adaptive water management strategies during operations would include the ability to provide expansion of the WTP. Pebble is proposing a costly and complex multistage water treatment process which is unproven on the scale proposed and in this type of setting (e.g., high volumes of water, sub-arctic environment, sensitive receiving environment). Potential impacts to aquatic resources from compromises, miscalculations, or upsets to the water management system and point releases on aquatic resources and fish need to be described. This is an example where risks are minimized based on assumptions which may not be valid.
ADF&G/Habitat			p. 3.24-15, Table 3.24-3	Table 3.24-3 is incomplete.	Two of the three tributaries listed in the table should have sockeye salmon spawning added to the Species/Life stage column. The tributaries listed as "trib to Gibraltar River" contained spawning sockeye salmon during a site visit in August 2018. This information was provided to PLP by ADF&G on September 19, 2018. It should also be noted that only about half of the streams along the transportation corridor have been surveyed and the number of anadromous streams may increase when surveys are completed.
ADF&G/Habitat		Sec. 3.24.1.3 Aquatic Invertebrates	3.24-29	The DEIS states that locations for macroinvertebrate and periphyton studies were selected to characterize conditions in the project area, but no macroinvertebrate or periphyton samples were collected anywhere along the transportation corridor. The DEIS states that sampling was conducted at only two sites for the Transportation Corridor because a relatively small portion of the corridor would be in Cook Inlet drainages, but other drainages (e.g., Iliamna Lake) that include the majority of the transportation corridor are not described in this section.	The DEIS should more accurately state that macroinvertebrate and periphyton data have not been collected in the vicinity of the project's transportation corridor (see Figure 3.24-6). The USACE Comment Response Matrix received by ADF&G states that "Macroinvertebrate baseline data is unavailable for the Action Alternative 1", and the DEIS should also accurately state as much. This is especially applicable to the segment of the transportation corridor south of Iliamna Lake.
ADF&G/Habitat		4.1	Table 4.1-1	The list of RFFAs is incomplete. The Knutson Creek hydroelectric project (Pedro Bay) has been in the planning stages for years and is currently developing material for permit applications.	The Knutson Creek hydroelectric project should be considered as an RFFA.

Department/Division	Document Name	Section/Fig./Table	Page #	Comment/Issue	Recommendation/Action
ADF&G/Habitat		4.16-23	4.16.3.1	The DEIS minimizes or does not fully describe potential impacts from erosion on aquatic resources during the closure phases and beyond. The DEIS simply states that surface disturbance during rehabilitation may increase erosion for a limited time. Tundra and stream habitat take years or decades to recover from disturbance and the mine site could contribute sedimentation to the streams due to erosion from recovering habitat for the duration of rehabilitation.	The DEIS should fully describe the potential impacts to stream habitat from increased erosion during closure before tundra and riparian habitat has fully recovered.
ADF&G/Habitat		4.24.2.1	4.24-2	Habitat loss at the mine site is listed as long-term, lasting throughout the life of the project. Recovery lasting greater than 20 years is considered permanent. If impacts last the life of the project they will certainly last more than 20 years. Impacts begin before operations (4 years), operations last 20 years, and recovery will take many years after operations and some recovery will not begin until after post-closure phases.	Impacts lasting the life of the project should be considered permanent since recovery will take an unknown number of years after operations (>20 years).
ADF&G/Habitat		4.24.2.1	4.24-3	The DEIS states that 1.4 miles of stream channel (NFK - Tributary 1.190) will be converted to reservoir habitat (seepage collection pond). It would be more accurate to state that the stream channel habitat is being removed.	The DEIS should state that 1.4 miles of stream habitat will be removed in NFK - Tributary 1.19.
ADF&G/Habitat		4.24.2.1	4.24-5	The DEIS states that, "No aquatic habitat would be directly lost in the UTC..." - Multiple road crossings with culverts are proposed in the UTC drainage, requiring fill placement in the streams and removing habitat, especially where cuts or deep valleys require larger road prisms. Wetlands with connections to streams will be filled and covered. For example, at Stream Crossing 520, where the Iliamna Spur Road crosses a braided, anadromous stream, riparian wetlands and side channels are proposed for fill placement approximately 700 feet long and 100 feet wide. This will result in direct loss of some side channel and riparian wetland channel habitat, which is important fish habitat, especially during high water. Downstream from this crossing where the Mine Access Road crosses (Stream Crossing 414 and 413) the same anadromous and braided stream, fill (approx. 200 feet long by 100 feet wide) will be placed directly in riparian and side-channel habitat.	The DEIS should correctly state that some aquatic habitat will be directly lost in the UTC.
ADF&G/Habitat		4.24.2.1	4.24-5	The DEIS states that "Changes in riparian wetlands would likely not be detectable downstream from the mine site." No rationale or explanation are provided to support this statement.	The DEIS acknowledges that water balance predictions may be subject to significant uncertainty, streamflows will be altered, water temperature will change, floodplain connectivity will be impacted, headwater functions will be lost, erosion could increase, groundwater flow will be altered, and stream productivity and riparian vegetation will be impacted. All of this seem contrary to the statement that changes in riparian wetlands would likely not be detectable. The DEIS should provide support for this statement or otherwise reconcile differences with statements in other sections.

Department/Division	Document Name	Section/Fig./Table	Page #	Comment/Issue	Recommendation/Action
ADF&G/Habitat		4.24.2.1	4.24-5	Habitat impacts from the Transportation Corridor are understated from a magnitude, extent, and duration perspective. Only temporary disturbance and impacts during construction are considered. Roads can have long-term and lasting impacts on streams and riparian habitat that will last the life of the road at a minimum. Some crossings will require large amounts of fill with a wide road prism across flood plains, side channels, and off-channel habitat. These large amounts of fill will very likely contribute sediment to the streams over the life of the road. The roads will change runoff characteristics and alter channel morphology. Pollutants from accumulated debris and runoff and accidental releases will be discharged into streams. Roads can affect drainage, change the hydrograph and intercept subsurface flows. Some of the proposed culverts are 200 feet in length and even if designed for fish passage, culverts of this length can cause migration delays or be partial barriers to some fish. Culverts can fail or become blocked for periods of time before maintenance can be performed.	The roads will have impacts on aquatic and riparian habitat and stream productivity for the life of their existence and therefore the duration should be permanent and not only during construction. Other watersheds with fill placement in riparian areas and in side channels should be considered also.
ADF&G/Habitat		4.24.2.1	4.24-6	The duration of impacts from the Transportation Corridor are listed as long term. Impacts from the road will begin 4 years before operations (starting with pioneer road), last for 20 years during operations, and at least 20 more years during post-closure. The DEIS does not explicitly state that the road will be removed and the habitat rehabilitated.	Impacts from the Transportation Corridor will last more than 20 years and should be considered permanent.
ADF&G/Habitat		4.24.2.3	4.24-12	The duration of streamflow reductions are considered long term, beginning during project construction, and would continue through operations and post-closure. Impacts lasting more than 20 years should be considered permanent based on the categories listed in the DEIS.	The duration of streamflow reductions and the impacts to aquatic resources and fish should be considered permanent.
ADF&G/Habitat		Sec. 4.24 Natural Gas Pipeline subsection	4.24-23	In Section 4.24, subsection Natural Gas Pipeline, it is stated that ADF&G permit conditions would likely stipulate timing windows for construction to avoid impacting migrating anadromous fish in Cook Inlet.	ADF&G does not have any regulatory authority to set timing windows in the marine environment.
ADF&G/Habitat		4.24.2.3	4.24-16	The DEIS states that construction activities in anadromous waters would occur from May 15 to June 15 in accordance with ADF&G criteria. ADF&G does not have specific, statewide criteria or a set period of dates that work will occur in anadromous waters. Rather, streams are considered individually, or regionally, with consideration for the life history of fish populations in the area and fish species present in the stream. The outmigration of smolt in the Bristol Bay region peaks in late May and would be a primary consideration for in-stream timing windows.	The dates of in water work for anadromous waters should not be stated as May 15-June 15 in the DEIS. An appropriate inwater work window will be determined and stipulated during ADF&G's Title 16 permitting process, which has not yet started.

Department/Division	Document Name	Section/Fig./Table	Page #	Comment/Issue	Recommendation/Action
ADF&G/Habitat		4.24.2.6	4.24-22	<p>Potential impacts to fish migration from ferry terminal operations are not fully described. Ferry operations could delay adult sockeye salmon migration, especially near the mouth of Upper Talarik Creek where fish would stage prior to entering the river. Ferry terminal construction and operations could potentially delay fish migration into spawning streams; increased turbidity, noise, vessel traffic, small diesel/oil releases, and/or an altered shoreline could delay fish because of the physical disturbance or changes to the scent of the area are some examples that could contribute to delayed migration and potentially reduced spawning success.</p>	<p>The DEIS should describe the potential impacts to migrating salmon and the timing of spawning near the ferry terminals due to standard operations and unplanned events.</p>
ADF&G/Habitat		Sec. 4.24.2.7	4.24-23	<p>In the NFK it is predicted that the average winter water temperature will increase by 2.8°C downstream of the water discharge location for ½ mile (could be as high as 3.6°C). This increase will continue further downstream, but to a lesser degree. The DEIS concludes that with this increase the stream temperature will be well below the ADEC threshold and would not be expected to impact incubating eggs. Small (1-5°C) changes in water temperature may have consequential effects on fish. Under conditions found in the NFK an increase of even 1°C or 2°C will shorten hatching for most salmonid fishes by about 80-100 days (Weber-Scannell, 1991). An increase of nearly 3°C would shorten the time to hatching even further. The 10 miles of river downstream of the mine has the highest concentration of coho salmon spawning habitat in the NFK according to the DEIS. Fry emergence in this reach could change from April/May to late Jan/Feb with the proposed increases to water temperatures in the winter. This could have a very significant impact on fry survival and reach production since it is not known if sufficient invertebrate food sources would yet be available. Fry will be foraging for food under low light conditions and may be more susceptible to icing conditions. Additionally, warmer water shortens alevin development time and increases energy requirements for growth and development. Alevin reared at higher temperatures can resorb body tissue during the final stages of alevin development if their yolk sac is depleted too quickly affecting overall fitness and survival.</p>	<p>There is an abundance of peer reviewed literature available regarding the effects of temperature changes on salmonids that could be used to help inform the conclusions stated in the DEIS. Significant negative impacts to eggs can occur from changes in water temperature even if water quality standards are not exceeded. The conclusion that altered temperatures will not impact incubating eggs is based on limited criteria and is in error considering other factors. This same comment applies to the other watersheds as well where changes are also expected to occur but to a lesser degree. This comment was submitted during the pre-draft review but was inadequately addressed by not considering the impacts from early emergence during winter conditions.</p>

Department/Division	Document Name	Section/Fig./Table	Page #	Comment/Issue	Recommendation/Action
ADF&G/Habitat		Sec. 4.24	4.24-31 and other pages in this section	The impacts of lost productivity from tributaries disconnected from their mainstems is minimized and Table 4.24-4 does not list any downstream impacts from lost headwater production or other watershed impacts from the mine site. Especially in the NFK, the lost production from headwater streams covered by the TSF and the WMP could potentially have significant downstream impacts on rearing salmon, especially coho salmon fry emerging from spawning grounds immediately downstream of the WTP. These headwater tributaries contribute nutrients and macroinvertebrates directly to a mainstem reach documented as having the heaviest spawning by coho salmon in the NFK. Freshly emerging coho fry will depend on the nutrients and macroinvertebrates from these tributaries in the early critical stages of their life. Additionally, these tributaries likely provide refugia for rearing salmon during periods of high water in the mainstem and the loss of that refugia should be considered.	The EIS should consider the impacts of lost headwater function and an altered landscape, which will have cascading trophic impacts to downstream habitat. Downstream impacts from the lost production of headwater areas, altered landscape, changes to groundwater inflow, and other alterations in the watershed should be included with long-term, compounding impacts.
ADF&G/Habitat		Sec. 4.24	4.24-31 and other pages in this section	Sedimentation and turbidity impacts from the mine site are only considered during construction. Table 4.24-4 lists sedimentation and turbidity impacts from the mine site as temporary and only during construction. Even with BMPs and collection ponds in place, mine site facilities (including mine roads) will still produce sediment and increase turbidity in streams. Some mine facility roads are located downstream of the sediment collection ponds. All roads and landscape changes have some effect on streams. In Section 4.18 the DEIS concludes that APDES permit violations (including turbidity) are expected as part of normal operations. However, permit violations and WQC exceedances are not addressed as impacts to water quality or aquatic organisms. Turbidity impacts beyond construction are not considered.	The impacts from unplanned events and permit violations at the mine site like operational upsets, inadequate maintenance, breakdowns, unusual climatic conditions, improper BMPs, or human error, should be considered in the DEIS. These impacts will be present throughout the life of the mine and turbidity in streams should be expected through the operational phase and beyond (especially during decommissioning) of a large mine. No BMPs or operational controls are 100% all of the time yet the DEIS presumes that is the case. APDES permit violations and WQC exceedances during all phases of the project should be considered. Rates of exceedances from existing mines could be used as a guide.
ADF&G/Habitat		4.24.2.4 and 4.24.5	p. 4.24-18, Table 4.24-4, p. 4.32-32, and others	Table 4.24-4 has multiple discrepancies with what is stated in the related sections. For example, in the table, under Transportation Corridor, Stream Productivity, it is stated there will be <u>temporary</u> impacts to stream productivity during bridge and culvert installation, with no mention of impacts to stream productivity during operations or post-closure. In Section 4.24.2.4, Stream Productivity, Transportation Corridor, it is stated that impacts from the road could result in increased erosion and stream sedimentation altering productivity and road fill would impact riparian vegetation and floodplain connectivity reducing terrestrial inputs and downstream productivity. It further states that the duration of the impact would be for the life of the project (permanent).	The table and the text should agree with each other and the impacts on stream productivity from the construction and operation of the road corridor should be considered permanent.

Department/Division	Document Name	Section/Fig./Table	Page #	Comment/Issue	Recommendation/Action
ADF&G/Habitat		4.27.4.3	4.27-37	When discussing potential impacts from spilled concentrate, under Acid Generation, the DEIS states that 'concentrate released to the land could oxidize and produce sulfuric acid, however, acid generations will take years and generated acid will be diluted by precipitation and surface water recharge.' This statement is not referenced, and no evidence is provided that demonstrates the environment can dilute and eliminate the impacts from acid generation. In fact, multiple studies show the opposite, that long-term acid generation and release into the aquatic environment have detrimental effects on fish and aquatic organisms. Small increases in contaminants, sediment, and turbidity have resulted in decreases in salmon and macroinvertebrates (Maret et al., 2003).	The DEIS should describe the potential impacts from long-term releases of small amounts of acid and metals to the aquatic environment.
ADF&G/Habitat		Sec. 4.27.4.7	4.27-42, 4.27-49 and more	Impacts from concentrate spills to aquatic environments are not fully described. The DEIS acknowledges that most concentrate to streams will not be recovered. Concentrate spills are left to flush out of the system in these scenarios where they are assumed to deposit as deltaic deposits in Iliamna Lake. Large amounts of acid generating concentrate at the mouth of a stream could deter fish in the future from migrating into that stream. The lake experiences large fluctuations in water levels and these sediments will be exposed to the air annually, which could produce acid and increase metals potentially causing the stream to have a different smell unfamiliar to fish populations.	The DEIS should consider the potential impacts from PAG, metal-laden sediment at the delta (mouth) of tributary streams, that is annually exposed to open air, on migrating salmon populations.
ADF&G/Habitat		Sec. 4.27.4.7	4.27-47 and 4.27- 55	Potential effects to fish from a concentrate spill into an enclosed waterbody are minimized and not fully described. The DEIS contends that impacts will be low magnitude, with temporary duration, and have no population-level impacts. Temporary is defined as recovery in days to weeks. The distance of downstream impacts from the truck concentrate spill are not described, but the pipeline concentrate scenario (which is a smaller spill by volume) states that elevated turbidity will extend several miles. A concentrate spill to waters containing salmon spawning habitat could have impacts for many years and could affect the salmon population of a given stream. The DEIS acknowledges that most concentrate to streams will not be recovered. Incubating eggs in gravels are very sensitive and sedimentation, pH changes, and metals could eliminate productive incubation and emergence for miles of spawning habitat. Attempting to remove this sediment will likely cause an equal degree of impacts. Macroinvertebrate populations could also experience large impacts.	The DEIS should fully describe the potential impacts from a concentrate spill into a waterbody, especially on fish. Suffocation by metal laden sediment of incubating eggs could have impacts lasting more than one year and could have population level impacts on a tributary stream, even if salmon production from spawning habitat were lost for only one year. Impacts should be anticipated to have a higher magnitude and duration and salmon populations could be impacted, especially in smaller tributaries.

Department/Division	Document Name	Section/Fig./Table	Page #	Comment/Issue	Recommendation/Action
ADF&G/Habitat		Sec. 4.27.4.7	4.27-47 and 4.27-55	Spill scenarios are contradictory to each other or assume best case scenario. In the concentrate spill from a tanker, the DEIS states that no measurable impacts would occur on fish and aquatic invertebrates, if spilled concentrate is promptly removed from the impacted waterbody. The scenario minimizes potential impacts to resources based on this assumption that the concentrate is removed. In the concentrate spill from a pipeline rupture the recovery of concentrate is considered difficult to impossible, because it would be difficult to determine which sediment is concentrate and which is natural; dredging may not be justified because it could be more damaging, and concentrate suspended in water would be impossible to recover.	The DEIS should be consistent with assumptions in spill scenarios and not minimize impacts with unrealistic spill response. One concentrate spill to water scenario assumes the concentrate would be recoverable and the other assumes recovery wouldn't be feasible and the concentrate would be left to naturally flush out of the system. Recovery of concentrate in streams will be difficult to impossible and if it covered spawning habitat could eliminate production from a tributary stream.
ADF&G/Habitat		Sec. 4.27.6	4.27-67	A large release of sediment laden water to a waterbody would erode streambanks, destroy riparian vegetation, and could cause channel evulsion. The effects from large, unplanned releases (e.g., pyritic tailings release) on stream productivity are minimized without consideration for long-term habitat losses from erosion and sedimentation. It could take decades for streambanks to stabilize and the impacts from chronic erosion and sedimentation will occur for tens of miles downstream. For the most part, the DEIS only considers localized and short-term impacts from a large-scale flooding event, such as an unplanned tailings release (with high sediment loads and increased erosive potential).	The DEIS should consider the long-term population and production impacts from chronic sedimentation due to destabilized banks caused by a large, unnatural flood event. Recovery could potentially take decades.
ADF&G/Habitat		4.27.6	4.27-68	The DEIS makes assumptions that downplay impacts, or assume no affect when potential impacts are uncertain. For example, the DEIS states that, ' <i>sub-lethal impacts (from a pyritic tailings release) on fish is unknown, especially because these sub-lethal impacts, would occur at the longer time frame beyond a week.</i> ' Further uncertainties (e.g., " <i>WQC exceedances for metals would be for an unknown length of time and an unknown distance</i> ") are listed. The DEIS then concludes that long-term persistent population-level impacts to fish would not occur. If long-term sub-lethal impacts to fish from chronic exposure to metals in the Kuktuli are unknown, how can the conclusion be reached that no population-level impacts would occur? Low-levels of cadmium can affect all life stages of salmon but emerging fry and developing eggs are especially sensitive.	The DEIS should objectively consider uncertainties from an unplanned release, for example, elevated levels of cadmium that could persist in stream sediments for decades and potentially affect stream productivity and salmon development and populations. Spill response usually does not go as planned and recovery objectives are rarely met.
ADF&G/Habitat		4.27.7	4.27-113	The TSF relies on an underdrain system to provide drainage paths for seepage flows and ultimately water treatment. The DEIS doe not fully consider the potential impacts from failures to this system which could cause contact water and TSF seepage to enter the aquatic environment.	The DEIS should consider potential impacts from a failure to the TSF basin underdrain system. Drainage systems are prone to failure which could cause the release of contaminated water to the environment. Drainage pipelines are susceptible to freezing, crushing, plugging, and breaks, causing overflow.

Department/Division	Document Name	Section/Fig./Table	Page #	Comment/Issue	Recommendation/Action
ADF&G/Habitat		Sec. 3.27.7.9	4.27-123	The impacts from bioaccumulation of metals released to the environment is minimized and not completely described. Bioaccumulation is only considered under the contact water release scenario and only for mercury. Metal-laden sediments that are not recovered would persist for many years in the aquatic environment and be available for uptake for decades. Cadmium is acutely lethal to aquatic organisms (including salmon) and chronically detrimental, with very low concentrations reducing growth, metabolism, and development. It is an endocrine disruptor that can bioaccumulate with negative health effects on humans. The pyritic tailings release scenario describes cadmium levels exceeding water quality criteria all the way to the mouth of the Nushagak River. Emerging fry are especially sensitive to cadmium and a release in late spring/early summer could have population level impacts.	Bioaccumulation of metals should be considered under all scenarios, especially the bulk and pyritic tailings release scenarios. Bioaccumulation of metals other than mercury metals, especially cadmium, should be considered in the analysis. The potential impacts to aquatic organisms from acute and chronic exposure to elevated cadmium levels should be considered, including corollary human impacts such as the closure of fisheries and health effects of eating fish with bioaccumulated metals and long-term prey reductions from depressed macroinvertebrate populations.
ADF&G/Habitat		Appendix M		About 50 acres of riverine habitat will be impacted by fill placement. The DEIS does not describe mitigation to offset these impacts and a determination of the adequacy of mitigation could not be made. The DEIS states that overall, Chinook and coho spawning habitat would decrease throughout the NFK and SFK drainages.	The DEIS should list specific mitigation measures proposed to offset impacts. How will lost spawning habitat be mitigated?

References

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ADF&G/Comm Fish/Bristol Bay	Alternatives	2.2.3.2	93	Where is the Pile Bay Ferry Terminal located in relation to the mouth of Iliamna River, Pile River, and Lonesome Bay Beach?	Describe the actual distance.
ADF&G/Comm Fish/Bristol Bay	Alternatives	2.2.2.6	80	Where is the East Kokhanok Ferry Terminal located in relation to the mouths of anadromous streams in Intricate Bay? On Figure 2-1 it appears to be less than 1 mile of Nick N. Creek.	Describe the actual distance.
ADF&G/Comm Fish/Bristol Bay	Alternatives	2.2.3 and Fig. K2-2a	2-92 and K2-16	How close is the Eagle Bay Ferry Terminal to Eagle Bay creeks and Eagle Bay Island? It should be noted that these are sockeye salmon spawning areas.	Describe the actual distance.
ADF&G/Comm. Fish/Homer	Chapter 3: Affected Environment	3.6.2	3.6-25	It is incorrect that the Kamishak fishery has been closed since 2013 – it was closed in 2013 and 2014 and then reopened in 2015; the fishery closed again in 2018 (there was no effort in 2017) due to low abundance and biomass.	For the most recent published information, please reference the 2018 Scallop SAFE Report: https://www.npfmc.org/safe-stock-assessment-and-fishery-evaluation-reports/ , Table 4-8.
ADF&G/Comm. Fish/Homer	Chapter 3: Affected Environment	3.6.2.3	3.6-24	There is no mention of the Tanner crab and red king crab fisheries that are located within this area.	Revise section to include additional fisheries and provide historical harvest levels and the potential to impact stocks that are currently closed to fishing, but could be opened in the future. See the following for additional information: Rumble, J., Wessel, M., Russ, E., Goldman, K. Gustafson, R. and Chris Russ, 2014. Cook Inlet and Prince William Sound Report for Tanner and King Crab fisheries through 2014, Fisheries Management Report No. 14-08. Alaska Department of Fish and Game.
ADF&G/Comm. Fish/Homer	Chapter 3: Affected Environment	3.24.1.2	3.24-26	There are many fish species missing from the section describing species found in the Cook Inlet Portion of the Natural Gas Pipeline Corridor. ADF&G and NMFS bottom trawl surveys have occurred within the affected area for decades and have documented many species than are mentioned	Update section with most comprehensive species accounts. See following comment regarding the need for baseline studies.
ADF&G/Comm. Fish/Homer	Chapter 3: Affected Environment	3.24.1.2	3.24-26	Species List is incomplete.	Provide a more comprehensive species list
ADF&G/Comm. Fish/Homer	Chapter 3: Affected Environment	3.24.1.2	3.24-26	Amakdedori Environmental Studies lack enough detail at this point to analyze for biological impact.	Evidence needs to be provided that the results of the Amakdedori Environmental Baseline Studies are biologically and statistically meaningful.
ADF&G/Comm. Fish/Homer	Chapter 3: Affected Environment	3.24.1.2	3.24-27	Results from the Pacific herring spawn deposition study needs more data than just what was conducted in 2018. For a comprehensive understanding of the biomass include more ADF&G historical data for quantifying herring spawn.	Rewrite section and include historical herring spawn data.
ADF&G/Comm. Fish/Homer	Chapter 3: Affected Environment	3.24.1.4	3.24-33	The Fish Tissue Trace Element Analysis appears incomplete. There are no sample sizes presented and no variance estimates. There were very few sampling sites for these studies and there were no control sites.	More sampling should be done to develop a fish tissue contaminant baseline. Broader spatial coverage within and outside of the affected area, control sites, and replicate sampling all need to be completed. Additionally, more fish species need to be included especially those that are consumed by humans. Consideration should be given to where fish feed at different trophic levels to address bioaccumulation.

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ADF&G/Comm. Fish/Homer	Chapter 3: Affected Environment	3.24.1.4	3.24-33	There was no fish tissue trace element sampling for the Alternative 1 Transportation Corridor.	Baseline fish tissue trace element studies should be completed for Alternative 1 Transportation Corridor following suggestions above.
ADF&G/Comm. Fish/Homer	Chapter 3: Affected Environment	3.24.2	3.24-34	There was no fish tissue trace element sampling for the Alternatives 2 and 3 Transportation Corridor.	Baseline fish tissue trace element studies should be completed for Alternatives 2 and 3 Transportation Corridor following suggestions above.
ADF&G/Comm. Fish/Homer	Chapter 3: Affected Environment	3.24.2	3.24-34	There was no fish tissue trace element sampling for resident freshwater and anadromous fish in the freshwaters or in marine waters for the Diamond Point port in Alternatives 2 and 3.	Baseline fish tissue trace element studies should be completed for Alternatives 2 and 3 Diamond Point port following suggestions above.
ADF&G/Comm. Fish/Homer	Chapter 4: Environmental Consequences	4.6	4.6-2	Other real potential changes to productivity would include heavy metal contamination of water bodies. Copper contamination may reduce homing ability and thus salmon's ability to make it to spawning grounds. Tissue contamination (fish and invertebrates like weathervane scallops) may exceed safe human consumption levels and thus reduce the sale of product.	Include heavy metal contamination as a source of loss of productivity and tissue contamination as a reduction in marketability
ADF&G/Comm. Fish/Homer	Chapter 4: Environmental Consequences	4.6	4.6-2	Need to consider Tanner and red king crab fisheries in Kamishak Bay. There will potentially be some level of direct mortality to Tanner crab, and other commercial and non-commercial fauna from the burial of the gas pipeline. Though Tanner crab fisheries are currently closed due to low stock abundance, the likelihood this will reopen is great given the proposed longevity of the project.	Reword ((e.g., the Kamishak Bay scallop beds or the recovery of Pacific herring and Tanner and red king crab populations).
ADF&G/Comm. Fish/Homer	Chapter 4: Environmental Consequences	4.6.6	4.6-16	It is suggested that fishermen and all the businesses that support them, can just move to other areas and " <i>select substitute experiences</i> ". If the Pebble development forces them to move to another area, and then the other exploration and development projects that are listed in the RFFAs do the same, the options for fishing get more and more reduced and the "takings" becomes much larger.	The reduction in fishing opportunities needs to be quantified in this section.
ADF&G/Comm. Fish/Homer	Chapter 4: Environmental Consequences	4.6.5	Table 4.6-1	The following comments were not addressed in the agency review. Table 4.6.1 includes references to impacts to commercial fisheries that could be associated with various project components. The Pipeline route section of the table suggests there will be no conflicts with commercial fisheries, regardless of the route selected, because the salmon fishery occurs in the top 30 feet of the water column. That may be true for drift gillnet gear in UCI, but not seine gear in LCI, which can contact the bottom in depths <95'. It also states that on-bottom groundfish fisheries (e.g., longline, pot) can avoid conflicts by not setting gear near the pipeline. However, the applicant has not conducted baseline studies to characterize the shellfish/groundfish resources that are present along the proposed gas line route(s). It is therefore difficult to effectively judge the potential impact to these resources or the users who target them.	Include potential impacts to the purse seine (salmon and herring) fisheries in Lower Cook Inlet that may occur from the pipeline. Recommend applicant include baseline studies necessary to characterize shellfish/groundfish resources along the pipeline routes so agencies can effectively evaluate potential impacts to those resources or users. Specify why LCI commercial fisheries in the Amakdedori area, as well as Iliamna and Iniskin bays will not be impacted if this project is developed.

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ADF&G/Comm. Fish/Homer	Chapter 4: Environmental Consequences	4.24.2.1	4.24-3	There is no baseline data for the natural gas pipeline route.	Baseline studies to characterize habitats and marine fauna along the proposed or alternate Natural Gas pipeline corridors should be completed and provided for review before conclusions about potential impacts can be made.
ADF&G/Comm. Fish/Homer	Chapter 4: Environmental Consequences	4.24.2.2	4.24-3-6	There is no consideration for how potential gas leaks pertaining to the gas pipeline across Cook Inlet and Iliamna Lake would impact fish populations.	Additional baseline environmental studies associated with the gas pipeline portion of this project should be conducted or included. This is not addressed the section 4.27, Spill Risk.
ADF&G/Comm. Fish/Homer	Chapter 4: Environmental Consequences	4.24.3.2	4.24-29	Fish Migration. The proposed dock would extend out into Iliamna Bay and Cottonwood Bay. Construction (e.g. sheet pile driving) could disrupt the migration of returning salmon.	Construction timing should consider adult salmon migration timing.
ADF&G/Comm. Fish/Homer	Chapter 4: Environmental Consequences	4.24.6	4.24-37	In the Cumulative Effects section, the RFFA's that are considered for exploration and development under the DEIS are examined. Under the Alternative 1, the Pebble Mine Expanded Development Scenario is discussed. The stated potential impacts and habitat losses would be significantly larger. Of particular concern for Kamishak Bay would be in addition to the Amakdedori Port there would be an Iniskin Bay Port (presumably Diamond Point) and the associated infrastructure associated with the transportation corridors including concentrate and diesel fuel pipelines. There would be construction and operation of a deep-water port in Iniskin Bay which would involve extensive dredging and impacts to local aquatic resources.	Consideration of the cumulative effects by inclusion of the RFFA's is recommended. USACE should consider the proposed additions to PLP's development when including the mine buildout in it's review of the DEIS. By inclusion, the DEIS should estimate effects (e.g. habitat loss, loss in fish productivity, risk, etc.).
ADF&G/Comm Fish/Bristol Bay	Spill Risk	4.27	31-32	Two questions regarding Iliamna Lake Ferry Release. 1) What kind of spill response can be expected if the lake is ice covered? 2) Does or will Chadux oil response group have resources for oil response located on Iliamna Lake?	Incorporate more detail in the DEIS regarding a spill response effort in Iliamna Lake, particularly in winter when ice covered or when rotten ice present.
ADF&G/Comm Fish/Bristol Bay	Spill Risk	4.27	36	What are in-water recovery efforts?	Provide more detail in the DEIS regarding in-water recover efforts that can be expected.
ADF&G/Comm. Fish/Homer	Chapter 4: Environmental Consequences	4.27.4.6	4.27-40	While PLP proposes mitigation measure to reduce the likelihood of the release of fugitive dust during the emptying of container into the bulk carrier hold (PLP 2018-RFI 045; PLP 2018c), there was no modeling was done for this. It would be beneficial for PLP to acquire the necessary meteorological data to be able to model the effects of fugitive dust releases during the lightering operations. The cumulative impact of even frequent "minor" dust spills during loading operations at lightering sites could be harmful to the marine environment.	Recommend that the applicant collect necessary baseline data weather data including wind speed, temperature, sea state and atmospheric pressure, for the proposed Amakdedori Port and lightering locations. Develop mitigation metrics base on these data to minimize the release of fugitive dust.
ADF&G/Comm Fish/Bristol Bay	Spill Risk	4.27	43 and 47	Likelihood of a spill from a truck is high (1 every 2.5 years), spill response in flowing waters is "impossible/impractical" and "No measurable impacts via metals toxicity would occur on fish and aquatic invertebrates, if spilled concentrate is promptly removed from the impacted waterbody."	Reconcile these contradictory statements in the DEIS. The high likelihood of a spill combined with the difficulty with cleanup, doesn't seem to support the conclusion in the DEIS that there would be no measurable impacts.

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ADF&G/Comm Fish/Bristol Bay	Spill Risk	4.27	47	This scenario assumes that spilled concentrate would be promptly removed and that the waterbody would have sufficient volume to flush the system. It also does not provide references or support on metal toxicity, acid generation rates, or the water volume needed to dilute 80,000 pound of copper-gold concentrate.	Provide analysis of the scenario if concentrate is spilled into a smaller flowing stream and the concentrate is not removed because it would be impossible or impractical. Provide references or descriptions on metal toxicity, acid generation rates, and the volume of water needed to dilute to levels that are non-toxic for fish and aquatic organisms.
ADF&G/Comm Fish/Bristol Bay	Spill Risk	4.27	49	"Depending on the timing and magnitude of a rollover and spill event, the event could result in the smothering of salmon eggs and reduced feeding success within a limited geographic area. Because salmon impacts are anticipated to be of low magnitude, in a localized area, and of a limited duration with no population-level impacts, the study expects similarly limited effects on commercial salmon harvest values."	This document downplays the risk to salmon from a spill event in multiple places. It is recognized that recovery of concentrate from flowing waters is "impossible/impractical", however, the analysis continually assumes that the concentrate would be quickly contained and therefore concludes that there would be "no population level impacts." Based on the lack of description for recovery of concentrates from flowing water, it seems that if a truck rolled over into a creek and spilled 80,000 pound of concentrate (e.g. the upstream crossing on Upper Talarik Creek) then there would be a population level impact on the Upper Talarik Creek population due to the processes already described (e.g. smothered eggs). Provide analysis of impacts based on realistic expectations of cleanup success for a worst case scenario so that the full range of risks to resources can be evaluated.
ADF&G/Comm Fish/Bristol Bay	Spill Risk	4.27	56	"Any reduction in the value of the fishery is expected to be extremely limited under this scenario, given the presumption of cleanup or spill incorporation into the bedload."	This scenario assumes that there would not be successful cleanup as described on page 51. The impacts should not be evaluated based on the "presumption of cleanup" because that is not the scenario being analyzed. This same comment applies to the Commercial and Recreational Fishing section and the Subsistence section.
ADF&G/Comm Fish/Bristol Bay	Spill Risk	4.27	109	"Therefore, long-term persistent population level impacts to fish would not occur."	This section describes many ways in which this scenario would impact fish and aquatic invertebrates and acknowledges that population level impacts are uncertain, then makes definitive statement that long term impact would not occur. This statement is unsupported by the presented information. Impacts to fish and aquatic invertebrates from TSS, which would range from 470 to 12,000 times of the maximum WQC of 20 mg/L for a distance of 230 miles, are ignored in this analysis. While the impacts are uncertain the potential for population level impacts are likely high in this scenario and could negatively impact salmon production for many years.
ADF&G/Comm Fish/Bristol Bay	Spill Risk	4.27	111	"Under this scenario, the productivity of the Nushagak, Wood, Snake, and Nuyakuk rivers would not be affected."	Delete Nushagak from this sentence. The analysis does not demonstrate that the Nushagak River salmon production would not be impacted.

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ADF&G/Comm. Fish/Homer	Chapter 5: Mitigation	Table 5.2	5-8	Given that even small quantities of copper can have adverse effects on homing salmon, a more complete analysis of the possible quantities and spatial extent of fugitive dust (especially quantifying copper) over the watershed and marine waters of Kamishak Bay under normal operations and from accidental releases is recommended.	A Fugitive Dust Control Pane needs be included in the DEIS.
ADF&G/Comm. Fish/Homer	Chapter 5: Mitigation	Table 5.2	5-9	PLP's proposed mitigation plan states that "The project would propose fish habitat mitigation measures to enhance or create new habitat outside of the immediate project footprint." PLP acknowledges that there will be direct loss of habitat in the headwaters of the mine site (section 4-24), though the acreage and miles of stream do not include losses due to spills, failures, cumulative impacts, or those from RFFAs (see above comments). PLP proposed offsite compensatory mitigation since the habitat losses due to the project will be larger than that available for restoration, enhancement, and preservation within the watershed (page 5-25). All salmon rivers and streams have a carrying capacity limited by among other factors the amount of spawning and/or rearing habitat. Loss of spawning or rearing habitat therefore reduces carrying capacity. Salmon have evolved over thousands of years in the Bristol Bay watershed to take advantage of a range freshwater habitat and in doing so retain high levels of within stock genetic diversity. Headwater streams such as those within the mine site make the majority of the cumulative stream length. Salmon returning to these streams are an essential component of the genetic portfolio of the larger salmon populations. Offsite mitigation fails to replace the loss of genetic diversity to salmon stocks from the loss of habitat.	Require that compensatory mitigation occur within the affected area and not the more broadly defined watershed areas as proposed by PLP (i.e.: HUC 8, HUC 6, and HUC 4)

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ADF&G- Sport Fish	Pebble DEIS	General Comment	General Comment	There are numerous minor issues regarding how sport fish and sport fisheries have been handled throughout the Pebble DEIS. The significance of the sport fisheries in the area, particularly in the Nushagak River and Lower Talarik Creek, has not been made particularly clear. Although, these drainages are not within the mine footprint, there is potential for both drainages to be impacted by the proposed mine. The Nushagak River supports one of the largest and most consistent Chinook salmon runs in the state and a large associated sport fishery. Additionally, although overall sport fishing effort in Lower Talarik Creek is comparatively low, it is a very well-known and renowned rainbow trout sport fishery, as evidenced by the successful effort to create the Lower Talarik Creek Special Use Area. Finally, the Pebble DEIS should clearly state that Bristol Bay salmon and resident species populations are currently comprised entirely of wild fish (i.e. no stocking or enhancement).	
ADF&G - Sport Fish	Chapter 3 Affected Environment	Sec 3.5	3.5-4	Lack of background on why and how the Lower Talarik Creek Special Use Area was created.	Add background as it will be informative and should be included in the Final EIS.
ADF&G - Sport Fish	Chapter 3 Affected Environment	Sec 3.5	3.5-7	Lower Talarik Creek and Kaktuli River should be included on the list of rivers that support sport fishing, as they may also be impacted by the proposed mine.	Add Lower Talarik Creek and Kaktuli River to the list.
ADF&G - Sport Fish	Chapter 3 Affected Environment	Sec 3.5	3.5-8	A permit system is not used for guides - it is a registration.	Change permit to registration.
ADF&G - Sport Fish	Chapter 3 Affected Environment	Sec 3.5	3.5-8	Not sure why the Newhalen is singled out for a description of effort. Additionally, while effort has decreased most years from historical numbers, it has recently been relatively stable with some higher effort years mixed in - effort in the Newhalen is heavily based on run strength and can be variable.	Consider deleting.
ADF&G - Sport Fish	Chapter 3 Affected Environment	Sec 3.5	3.5-11	There are also "clusters" of lodges in the Wood River and Tikchik lake systems.	Add Wood River and Tikchik lake systems.
ADF&G - Sport Fish	Chapter 3 Affected Environment	Sec 3.24/Table 3.24-4	3.24-19	Adult migration for Chinook salmon should include June.	Add June to Chinook adult migration in periodicity table.
ADF&G - Sport Fish	Chapter 3 Affected Environment	Sec 3.24/Table 3.24-4	3.24-20	Spawning for Dolly Varden should include October.	Add October to Dolly Varden spawning in periodicity table.
ADF&G - Sport Fish	Chapter 3 Affected Environment	Sec 3.6	3.26-28	Mulchatna River is in Area T (not S as stated in document).	Change to Area T.

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ADF&G - Sport Fish	Chapter 3 Affected Environment	Sec 3.6	3.26-28	It seems a summary of Nushagak effort would be appropriate in the text of the area T description.	Add Nushagak effort summary.
ADF&G - Sport Fish	Chapter 3 Affected Environment	Sec 3.6	3.26-29	The Nushagak River should be included as a water body in the Statewide Harvest Survey that could be impacted.	Add Nushagak River to list.
ADF&G- Sport Fish/ISFP	Pebble DEIS	General Comment	General Comment	The Pebble Project Environmental Baseline Document 2004 through 2008 referenced in the DEIS describes that instream flow habitat studies were completed using the Instream Flow Incremental Methodology (IFIM). The underpinning philosophy of the IFIM process dictates stakeholder engagement and incremental problem solving which would indicate technical working groups. Although an instream flow technical working group was initiated by PLP in 2008 -2009 , the working groups were disbanded prior to completion of the effort. Therefore, key elements of agency consultation were limited or did not occur. This included study design formulation and modification, transect selection/placement and weighting criteria, habitat suitability criteria development, data aggregation, and model calibration/simulations. In addition, due to the dissolution of the technical working group process, dialogue between agencies and consultants did not occur as would be expect on a large development project.	
ADF&G- Sport Fish/ISFP	Pebble DEIS	General Comment	General Comment	Pebble Project Instream Flow Technical Report 2018 Instream Flow Studies in the Upper North Fork Koktuli River April 11, 2019 is not included or referenced in the Pebble DEIS, however it was cited in the USACE's response to the last round of cooperating agency comments. The study plan was not developed under guidance or review of ADF&G. We were unaware that field data collection occurred in 2018 and received the study results late in our review. There was a limited description of why only two field visits were chosen, which occurred during similar flow levels so that only one data calibration point is available for analysis of study results. In this report Habitat Suitability Curves (HSCs) are only provided in table format which is not suitable for agency interpretation. HSCs should also be provided in graphical format.	
ADF&G- Sport Fish/ISFP	Pebble DEIS	General Comment	General Comment	Technical Memorandum Streamflow Change Resulting from Development of Proposed Pebble Mine by Arctic Hydrologic Consultants should be summarized or referenced in the DEIS. This technical memorandum, which is on the USACE's Pebble Project website, contains a valuable detailed summary of the magnitude of change in streamflow that are not included in the DEIS.	Please summarize and reference the Technical Memorandum Streamflow Change Resulting from Development of Proposed Pebble Mine by Arctic Hydrologic Consultants in the FEIS.

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ADF&G- Sport Fish/ISFP	Pebble DEIS	General Comment	General Comment	Streams in the project area and off channel habitats are important fish habitat that should to be maintained, avoiding adverse flow conditions (e.g. extreme high or low flows). It is unclear how discharges in receiving water bodies will be monitored to ensure compliance with permitting requirements. Section 4.24-12 describes "Treated water in excess of process requirements will be released to the environment at three points downstream of the mine footprint, one each in the NFK River, SFK River, and UT Creek watersheds". Among other inflow impact issues, ADF&G is concerned that surplus flows released during traditionally naturally low flow periods (e.g. winter months) will disrupt ecological processes downstream of the mine site. Additionally, more work is needed to determine if multiple discharge points are needed, as one discharge point may be preferable.	
ADF&G- Sport Fish/ISFP	Pebble DEIS	General Comment	General Comment	Overall, it appears most elements of an instream flow assessment were completed, except for the following items: <ul style="list-style-type: none"> • Better description of habitat suitability criteria development and selections. The descriptions were limited, and we could not find graphs of the selected criteria • We could not find any information on an effective spawning habitat analysis; and • The methods used to aggregate study results from three different watersheds and study efforts was difficult to follow and comprehend. 	
ADF&G- Sport Fish/ISFP	Chapter 3 Affected Environment	Sec. 3.16	3.16-9	Figure 3.16-2 does not "depict all gaging station locations in the three watersheds" as stated in text. This was also pointed out during the last CA review.	Replace with correct figure reference (Figure 3.16-4)
ADF&G- Sport Fish/ISFP	Chapter 3 Affected Environment	Sec. 3.16	3.16-9	Figure 3.16-3 does not "provide a focused view of gaging station with regard to the mine site" as stated in text. This was also pointed out during the last CA review.	Replace with correct figure reference (Figure 3.16-5)

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ADFG/DWC/Region IV	Chapter 3 Affected Environment	3.24	14 - 18	Suggest, "It is our concern that the bears that use the sanctuary that we manage for viewing at McNeil may leave and return with altered behavioral patterns.	We recommend the DEIS disclose these data limitations and consider additional ways to evaluate the potential impacts to caribou from the proposed project. The limitations of the data need to be clearly recognized and not interpreted or extrapolated beyond what the data was collected and intended for.
ADFG/DWC/Region IV	Chapter 3 Affected Environment	3.24-14	14	The most recent population estimate for the Mulchatna herd is incorrectly reported as 26,275 (2014).	Population estimate should be 27,242 (2016)
ADFG/DWC/Region IV	Chapter 3 Affected Environment	3.23-15 & Figure 3.23-5	15	Mulchatna caribou herd seasonal range maps depicts density of caribou in calving areas based on 29 years of telemetry data that is being interpreted out of context and doesn't note the limitations of the data.	This figure is important and should better reflect the limited nature of the telemetry data that was used to depict the calving areas.
ADFG/DWC/Region IV	Chapter 3 Affected Environment	3.24-15	15	The word "majority" is used in several locations in the DEIS, and in the context of being dismissive regarding the importance of the mine site to caribou. "Currently the mine does not appear to be used by the majority of the Mulchatna herd for calving"....	Word choice is misleading and should be changed. The use of majority here seems to be an arbitrary benchmark suggesting to the reader that less than the majority equates to lower importance of the mine site to caribou. Rangeland and calving habitat impacts at the mine site and other affected areas need to be analyzed based on the value of the range and possible use of that range in the future.
ADFG/DWC/Region IV	Chapter 3 Affected Environment	3.23-15 & Figure 3.23-7	15, 18	On page 3.23-15, middle paragraph, last sentence, references figure 3.23-7 that depicts density of caribou in calving areas based on radio telemetry data...again, this figure is important. The radio collar data that has been collected from Mulchatna caribou studies was not based on studies that expressly looked at habitat use, and specifically habitat use of the Pebble mine site. Rather the purpose of most of the radio collaring efforts was to have focal animals on the air, that we could then use to locate caribou during survey and inventory studies (i.e. photo census, captures, parturition surveys, and fall composition surveys).	This figure is important and should better reflect the limited nature of the telemetry data that was used to depict the calving areas. Inadequately addressed from previous comment period; Should have to footnote their range maps or at least incorporate a section within the document that explicitly deals with this data limitation issue rather than just a subtle sentence that many people would not even see or realize the implications.
ADFG/DWC/Region IV	Chapter 4 Environmental Consequences	4.23	7	29 years of telemetry data that suggests caribou use of the Pebble area is limited during calving etc. and their range maps for calving etc. without ever again mentioning the potential bias of the collars representing these core groups which are not likely representative of the range of the herd as a whole or when population is at higher levels and expands range.	The radio collar data that has been collected from Mulchatna caribou studies was not based on studies that expressly looked at habitat use, and specifically habitat use of the Pebble mine site. Rather the purpose of most of the radio collaring efforts was to have focal animals on the air, that we could then use to locate caribou during survey and inventory studies (i.e. photo census, captures, parturition surveys, and fall composition surveys). This issue was inadequately addressed since the previous comment period. Limitations of the data need to be more clearly presented and explained so as not to mislead the reader.
ADFG/DWC/Region IV	Chapter 3 Affected Environment	Figure 3.23.5 & 3.23	16, 31	These figures show the seasonal range maps of the Mulchatna herd, that are based on the radio telemetry data but the data is being interpreted out of context.	These are important figures that should be qualified by a footnote or some reference to inform the reader of the limited scope of the telemetry data.

Department/Division	Document Name	Section/Fig./Table	Page #	Comment/Issue	Recommendation/Action
ADFG/DWC/Region IV	Chapter 3 Affected Environment	3.23	15	The radio collar data that has been collected from Mulchatna caribou studies was not based on studies that expressly looked at habitat use, let alone habitat use of the Pebble mine site. Rather the purpose of most of the radio collaring efforts was to have focal animals on the air, that we could then use to locate caribou during survey and inventory studies (i.e., photo census, captures, parturition surveys, and fall composition surveys).	Identify and qualify the limitations of the data and do not extrapolate beyond how the data was intended to be used
ADFG/DWC/Region IV	Chapter 4 Environmental Consequences	4.23	16	Another reference to 29 years of telemetry data that should be qualified	Identify and qualify the limitations of the data and do not extrapolate beyond how the data was intended to be used
ADFG/DWC/Region IV	Chapter 4 Environmental Consequences	4.23-23 Caribou	23	There is acknowledgement in this section that caribou may shift back to the mine site at some period in the future. This appears to be in response to our previous comment where we pointed this out. However, it is a very subtle mention, and should probably occur early on in the document. This is very similar to the telemetry data issue and fails to recognize that caribou are highly mobile and their range changes with density of animals, snow pack, forage availability, etc. For example the main calving areas has changed dramatically in the last five years and historical data that shows how the range of the Mulchatna herd has changed over time, so emphasizing the nature of caribou herds should be more pronounced in this document.	This should be clarified perhaps in its own paragraph early on in this document. Suggest on page 3.24-14 that caribou may shift back to the mine site at some period in the future to due a number of reasons stated.
ADFG/DWC/Region IV	Chapter 4 Environmental Consequences	4.23	23	Although the mine site does not appear to be used for calving currently...not sure in this case if the data being used is the telemetry data or ABR surveys	Please clarify data source.
ADFG/DWC/Region IV	Chapter 2 Alternatives	2.2.3.2 Transportation Corridor	2-96	Material sites (up to 422 acres) could represent a substantial loss of wildlife habitat if not reclaimed appropriately.	If Material Sites are established by excavating the sides of hills, we recommend a natural contour 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, we recommend they be contoured to form emergent wetlands along the edges rather than deep steep sided pits.
ADFG/DWC/Region IV	Chapter 2 Alternatives	2.2.4.2 Transportation Corridor	2-111	Material sites (up to 717 acres) could represent a substantial loss of wildlife habitat if not reclaimed appropriately.	If Material Sites are established by excavating the sides of hills, we recommend a natural contour 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, we recommend they be contoured to form emergent wetlands along the edges rather than deep steep sided pits.

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ADFG/DWC/Region IV	Chapter 3 Affected Environment	Figure 3.23-8	20	The den survey was flown in conditions of no snow or mottled snow. Bear dens are quite difficult to detect without snow and tracks (which can point the way to den sites), even from a helicopter. The 35 dens observed on the 50 km road corridor from Iliamna Lake to the coast represents a minimum number and does not adequately represent the higher density of dens in areas of steep terrain and higher elevation.	Acknowledge that due to poor timing and difficult sightability during this survey(s), the resulting estimate is conservative and should be seen as a minimum. This is used as a model input and has limitations.
ADFG/DWC/Region IV	Chapter 3 Affected Environment	3.23/4.23		Information on brown bear occupancy, abundance, denning and movement is very limited and likely inadequate to assess conservation concerns for brown bears.	Recognize the limitations of the data and don't interpret or extrapolate beyond what it says.
ADFG/DWC/Region IV	Chapter 3 Affected Environment	3.23/4.23		Concerned with impacts to denning areas, disturbance and other road impacts (e.g. roadkilled bears, susceptibility, impeded movements) that would occur outside the sanctuary.	Densities of bear dens in this area is high and proposed road is in close proximity to refuge. Can existing roads be used?
ADFG/DWC/Region IV				Providing access to locals only for hunting and fishing along the road corridor was stated as a means to limit activity, but how would that be enforced? How will residents identify themselves as local?	Clarify how local access is going to be enforced and who is going to enforce.
ADFG/DWC/Region IV	Chapter 3 Affected Environment	3.3		While recreational hunting and fishing were addressed, the guiding and lodging industries were largely ignored. Transportation corridors and ferry terminals will permanently end pristine hunting and fishing opportunities for guides within sight or hearing distance of the developments.	Suggest performing additional analysis on the impact to guiding and lodging.
ADFG/DWC/Region IV	Chapter 3 Affected Environment	3.23-52	52	States caribou "rarely" occur along the northern shore of Iliamna Lake. This data has limitations in describing the range of MCH because radio collars invariably are put out near the core of the groups year after year. Thus, the collars track these core groups and are not likely representative of the range of the herd as a whole or when population is at higher levels and expands range. The radio collar data that has been collected from Mulchatna caribou studies was not based on studies that expressly looked at habitat use, let alone habitat use of the Pebble mine site. Rather the purpose of most of the radio collaring efforts was to have focal animals on the air, that we could then use to locate caribou during survey and inventory studies (i.e. photo census, captures, parturition surveys, and fall composition surveys).	The use of this data should be qualified and data limitations clearly stated.
ADFG/DWC/Region IV	Chapter 4 Environmental Consequences	4.23-16	16	Another reference to 29 years of data that should be qualified.	The use of this data should be qualified recognizing the limitations.
ADFG/DWC/Region IV	Chapter 3 Affected Environment	Figure 3.23-6	6	Confusion over map and legend; not sure the legend is correct. Some polygons appear to represent groups of caribou of 70-100K, and 30-70K?	Verify and clarify that the legend and polygons are correct.

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ADFG/DWC/TED	Chapter 4 Environmental Consequences	Section 4.23 Wildlife Values		The DEIS does not adequately address what measures will be used to minimize potential impacts to raptors.	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).
ADFG/DWC/TED	Chapter 4 Environmental Consequences	Section 4.12 Transportation and Navigation		The DEIS does not adequately address what measures will be used to minimize vehicular collisions with wildlife.	Include measures to minimize vehicular collisions with wildlife on proposed roads and better describe measures to minimize access to anthropogenic food sources for all wildlife.
ADFG/DWC/TED	Chapter 4 Environmental Consequences	Section 4.23.2.1 Birds/Section 3.23		Marine birds- Lower Cook Inlet has multiple important Bird Areas (IBA's) that support large numbers of breeding seabirds, including three species of cormorant, Common Murres, Pigeon Guillemots, Glaucous-winged Gulls, Tufted Puffins, Horned Puffins. The two puffin species are currently in decline and are SGCN in the state of Alaska (ADFG 2015, Warnock 2017). The inlet also provides year-round habitat for murrelets, hosting 4% of the world's population of Marbled Murrelets and 5-9% of Kittlitz's Murrelets. Marbled and Kittlitz's Murrelets are also SGCN and populations have recently stabilized from historical declines (Warnock 2017). Historical surveys indicate that in addition to the above-mentioned birds, Common Murres, Black-legged Kittiwakes, Red-necked Phalaropes, and Sooty Shearwaters use marine habitats at the proposed port site (Alternative 1 – Kamishak Bay) and pipeline corridor. Marine birds may be directly affected by construction and operation activities at the port and gas pipeline corridor via disturbance by vessels, habitat loss, and collisions with vessels. During summer pipeline construction, birds may be displaced from their foraging grounds by vessel traffic, causing evasive flight behavior and increased energy expenditure (Schwemmer et al. 2007, Agness et al. 2013). Low-flying aircraft supporting construction activities at the port (5-10 flights per week) pose an additional threat; flight paths will be positioned over the water and therefore may result in collisions and/or scattering of seabirds using nearshore waters. Additional mortalities may occur if migrating seabirds collide with lights, powerlines, and other structures associated with the port. The presence of diesel fuel barges traversing lower Cook Inlet increases the risk of a spill into the marine environment. Such a spill could harm seabirds through the ingestion of toxic oil, oiling of feathers causing reduced thermoregulation and locomotion, and contamination of the prey base.	Despite the known importance of the area to seabirds and recent surveys of the proposed area by ABR, the DEIS does not provide adequate detail on the birds that were detected during these surveys. A table showing how many individuals of each species were detected during 2018 surveys would be helpful. Furthermore, Figure 3.23-10 should be updated to better depict breeding colonies and bird densities. Iliamna Bay (Alternatives 2/3) and the adjacent Iniskin Bay host the highest densities of wintering birds in western Cook Inlet. Iliamna Bay is particularly important for over-wintering seabirds; tens of thousands of Surf and White-winged Scoters use the bay each fall. The bay also hosts several seabird nesting colonies including Common Eiders, Double-crested Cormorants, Pelagic Cormorants, Black Oystercatchers, Glaucous-winged Gulls, Pigeon Guillemots, Horned Puffins, and Tufted Puffins. Additionally, measures to avoid or minimize the above mentioned threats should be included in the DEIS.

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ADFG/DWC/Region II	Executive Summary	Section 3 Affected Environment	All	This section is currently missing any review of impacts to wildlife.	Identify how each alternative will impact wildlife resources. For example, all alternatives that propose the north road option and eliminate the South Ferry Terminal/ Amakdedori Port/ road will have a lower impact on brown bears as roads will be removed from known denning areas and travel corridors to McNeil State Game Refuge and Katmai National Park and Preserve, 2) alternatives that increase road traffic rates are likely to increase roadkill levels of terrestrial wildlife, 3)alternatives that eliminate the South Ferry Terminal/Amakdedori Port/road will reduce the chance of food conditioned bears showing up at the adjacent bear viewing areas and causing human wildlife conflicts.
ADFG/DWC/Region II	Executive Summary	Section 2	Pg. 8.	There is currently no discussion in the document about landfill construction requirements and methods that will be used to minimize wildlife conflicts. The document currently states “A landfill and incinerator would be constructed and operated at the mine site for domestic waste handling”.	Include methods to minimize wildlife conflicts during construction.
				<p>The Pebble Mine site currently supports high densities of nesting raptors due to structural features providing nest sites and abundant prey resources. Raptor species detected at the 2004-2005 mine survey area (mine site and surrounding area, 246-293 km²) and transportation corridor (4.8 km buffer around proposed road) include several species of greatest conservation need (SGCN) listed in Alaska’s Wildlife Action Plan including Golden Eagles, Bald Eagles, Rough-legged Hawks, Peregrine Falcons, Gyrfalcons, Northern Harriers, and Short-eared Owls (ADFG 2015). The mine is likely to impact raptors through a number of different pathways including disturbance, habitat loss, vehicle collisions, reduced prey abundance, and anthropogenic food subsidies resulting in increased numbers of competitors such as red foxes. The response of the raptor community to disturbance is likely to vary by species. For example, Rough-legged Hawks are very sensitive and will flush in response to human presence at great distances (T. Booms, personal communication). Repeated disturbance of sensitive raptor species may result in nest abandonment. Adjacent territories are likely saturated and opportunities for displaced raptors to find unoccupied territories would be minimal.</p>	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).

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				<p>Surveys of shorebirds during migration were not conducted for the DEIS, so the abundance and species composition of shorebirds using intertidal areas of Kamishak and Iliamna Bays is unknown. A total of 28 landbird and 14 shorebird species were detected at the Pebble Mine site, many of which are SGCN (e.g. Gray-cheeked Thrush, Blackpoll Warbler, American Golden-Plover, Whimbrel, Hudsonian Godwit, Surf-bird, and Short-billed Dowitcher). Additional SGCN detected in the transportation corridor include the Olive-sided Flycatcher, Black-backed Woodpecker, Varied Thrush, Rusty Blackbird, and Solitary Sandpiper. Olive-sided Flycatchers, Blackpoll Warblers, and Rusty Blackbirds have been in steep decline across their range and the mine and associated transportation corridors could result in removal or fragmentation of important breeding habitat for these species. Cook Inlet supports large numbers of migrating shorebirds, many of which are known to forage on the mudflats of Kamishak (Alternative 1 port site) and Iliamna Bays (Alternative 2 port site) during spring migration. A large proportion of the Pacific Flyway population of Western Sandpipers (20-47%) and Dunlin (11-21%) congregate in the bays of Lower Cook Inlet (Gill and Tibbits 1999). Rock Sandpipers over-winter in Cook Inlet and forage in the mudflats of western Cook Inlet year-round. Potential impacts of the construction and operation of Pebble Mine to landbirds and shorebirds include habitat loss, disturbance, increased nest predation by ravens and red foxes, vehicle collisions, collisions with lights and other infrastructure, and contamination of food resources via oil spills. Ground and shrub-foraging species such as Willow Ptarmigan will be most susceptible to vehicle collisions. Migrating birds will be most vulnerable to collisions with tall infrastructure. Furthermore, night-time lighting of the mine site 24 hours a day, 365 days a year may also pose a risk to migrating birds by interfering with their ability to navigate by the stars.</p>	<p>Spring and winter surveys of shorebirds are recommended to fully understand how the proposed mine and transportation corridor will affect shorebird populations. Measures to reduce the chance of collisions include modifying roadside vegetation and reducing traffic speeds (Gunsen et al. 2011) and should be considered. Reduced night-time lighting should be considered to minimize interference with bird migration during the spring and fall. To reduce the chance of subsidizing red fox and raven populations at the mine site, care should be taken to minimize access to anthropogenic food sources, and bear-proof dumpsters should be designed to also exclude smaller wildlife.</p>
ADFG/DWC/Region II	Chapter 4 Environmental Consequences	Table 4.23-3	Pg. 4.23-39	The table does not discuss the impact of the proposed road between the South Ferry Terminal and the Amakdedori Port to denning bears.	Include impact of the proposed road between the South Ferry Terminal and the Amakdedori Port to denning bears.
ADFG/DWC/TED	Chapter 3 - Affected Environment	3.25 - Threatened and Endangered Species	3.25-1	Analysis area: "[t]he EIS analysis area for TES includes all marine components of the project in Cook Inlet plus a surrounding buffer." The buffers, which range from 33 feet to 11.3 miles, do not change among the alternatives.	Consider developing specific boundaries for the EIS analysis areas for Alternatives 2 and 3 as each alternative has unique geographic, geological and environmental features. Many species that occur in the project area are quite mobile and most (except sea otters) travel extensively in the Inlet. Impacts due to increased vessel traffic, pollution, oil spills, ongoing sedimentation of benthic habitat, and other impacts will not be limited solely to the construction period. For comparison, a BiOp done by BOEM/BSEE for Cook Inlet Lease Sale 244, to the north of the Amakdedori port area, evaluated impacts to the same list of species across a project area that extended well beyond the active project footprint

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ADFG/DWC/TED	Appendices G & H	Appendices G & H	3.25-1, footnote 1	"The radial distances for TES were determined based on direct and indirect impacts, and the justification for the distances is defined in Appendices G and H."	Appendix G and H are incomplete and conclusions are contain inaccuracies, such as labeling the Western DPS of Steller sea lion and the Cook Inlet "Stock" (should be DPS) of beluga whale as Threatened, when both are listed as Endangered (see page 7). The logic behind conclusions in these appendices is also unclear. For example, the BiOp for the Harvest Alaska LLC Cook Inlet Pipeline Cross-Inlet Extension Project, located in upper Cook Inlet, NMFS found that the project would "adversely affect" listed species, even the Mexico DPS of humpback whales, which would rarely be found in the project area. In contrast, the draft EA overall finding for all TES species is "likely to adversely affect," but the finding for each individual threat to species is "no effect," which does not seem to be a supported conclusion.
ADFG/DWC/TED	Appendix G USFWS Biological Assessment	4.2 Steller's eider		Throughout Appendix G the DEIS discounts possible impacts of construction at the Amakdedori Port site to Steller's eiders, because construction would only occur during the summer, whereas Steller's eiders are only expected to be present during the winter.	As noted on pages 3.25-10 and 3.25-12, ADF&G biologists identified Kamishak Bay as a molting location for Stellers eiders, based on birds fitted with telemetry transmitters and followed from 2004 to 2006. Rosenberg et al. (2016) noted that approximately 20% of the birds used the bay, "which had not been previously described as a molt location." Appendix G should acknowledge the information in Section 3.25 and consider impacts to Steller's eiders and describe methods of minimizing impacts during molting for late summer/early fall near the shore and reefs near Douglas River in Kamishak Bay. For example, as an avoidance/minimization method, construction activities that may deter the eiders from using the area for molting should be halted from August through October .
ADFG/DWC/TED	Appendix G USFWS Biological Assessment	Section 6		Section 6 of Appendix G discusses multiple mitigation measures to avoid or limit impacts to sea otter critical habitat (e.g., sediment control) and to mitigate for noise impacts to sea otters and other marine mammals (e.g., a "Marine Mammal Monitoring and Mitigation Plan (4MP)"). Although substantial detail is provided regarding this plan, neither of these measures appear in Table 5.2 of the DEIS, "Applicant's Proposed Mitigation Incorporated into the Project." The only mitigation measure for TES mentioned in Table 5.2 is "Tug and barge speeds in sea otter critical habitat would be controlled to minimize the potential for impacts with sea otters."	It is unclear on which measures will be formally implemented. Please clarify. Suggest reviewing previous BiOps as they may serve as good examples of mitigation that could be included to avoid or minimize impacts to listed species. In particular, the BiOp for Lease Sale 244, just to the north of the Amakdedori Port portion of the Pebble project area, contains a fairly comprehensive list of mitigation measures to protect marine mammals.
ADFG/DWC/TED	Appendix H NMFS Biological Assessment	Section 5.3.1	23	The last sentence has a spelling error.	The last sentence should be corrected: "all anchor chains and cable will be taut [not taught] . . ."
ADFG/DWC/TED	Chapter 3 Affected Environment	Section 3.25.1.4	3.25-6	The last sentence at the bottom of page 3.25-6 reads "[t]he Eastern DPS (listed as federally threatened) consists of sea lions breeding ..."	Listing status of Eastern DPS requires correction. The Eastern DPS was delisted by NMFS in 2013.
ADFG/DWC/MM & TED	Appendix G USFWS Biological Assessment	Introduction	1	Activities of the proposed project that could affect the listed species include: noise from construction vessel propulsion, pile driving, and placement of fill.	Add comma to text, "Activities of the proposed project that could affect the listed species include: noise from construction, vessel propulsion, pile driving, and placement of fill..."

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ADFG/DWC/MM & TED	Appendix G USFWS Biological Assessment	Section 5.1 Disturbance	14	The first paragraph notes potential impacts to sea otters and Steller's eiders from construction but does not mention impacts from long term operation of the mine.	The BA should consider impacts from operation of the mine, not just impacts from construction. For example -disturbance from construction and operation of Amakdedori Port... and vessel maneuvering associated with construction and operation , construction and operation vessel strike of sea otters- especially pups and ill adults, eider collision with structures...and foraging habitat (and prey) loss from the Amakdedori Port causeway and wharf construction and operation .
ADFG/DWC/MM & TED	Appendix G USFWS Biological Assessment	Section 5.1 Disturbance	14	The BA states that disturbance concerns are limited to sea otters, as Steller's eiders are absent from the Action Area during the summer construction season and there are no records for short-tailed albatrosses in the Action Area. However, text on pages 3.25-10 and 3.25-12 acknowledges ADF&G biologists identified Kamishak Bay as a molting location for Stellers eiders (Rosenburg et al. 2016).	The BA should consider the year-round operation of the Amakdedori Port (the lightening of vessels, bulk carriers, and barges) and resultant disturbances to Steller's eiders. The BA should also consider that construction during the summer will cause disturbances during critical life periods for NMFS management marine mammals (i.e. harbor seal pupping and molting seasons, May-Oct 1).
ADFG/DWC/MM & TED	Appendix G USFWS Biological Assessment	Section 5.1.3. Chronic Disturbance	16	Long-term anthropogenic impacts and chronic disturbance which will occur to ESA species during the operation of the mine, including the maintenance dredging activities of the Amakdedori Port channel and vessel activity (the lightening of vessels, bulk carriers, and barges), are not adequately addressed in the DEIS.	Please address long-term anthropogenic impacts and chronic disturbances on ESA listed species during entire construction, operation and closure of the mine and associated activities.
ADFG/DWC/MM & TED	Appendix G USFWS Biological Assessment	Section 5.1.4 Relevance to the Pebble Project	17	Long-term anthropogenic impacts and chronic disturbance which will occur to ESA species during the operation of the mine, including the maintenance dredging activities of the Amakdedori Port channel and vessel activity (the lightening of vessels, bulk carriers, and barges), are not adequately addressed in the DEIS.	Please address long-term anthropogenic impacts and chronic disturbances on ESA listed species during entire construction, operation and closure of the mine and associated activities.
ADFG/DWC/MM & TED	Appendix G USFWS Biological Assessment	Section 5.2	17	The DEIS uses mortality data collected by the Marine Wildlife Veterinary Care and Research Center in California which compares anthropogenic mortality to natural mortality.	It would be preferable to find and use a study of anthropogenic mortality in a marine environment, more closely related to proposed site and activity.
ADFG/DWC/MM & TED	Appendix G USFWS Biological Assessment	Section 5.2	17	The text states "A foraging mother would probably be aware of a slow approaching vessel soon enough to suspend feeding and retrieve her pup away from the vessel pathway" but does not cite a source for this claim.	Please provide citation for this claim, otherwise suggest removing it from the BA.
ADFG/DWC/MM & TED	Appendix G USFWS Biological Assessment	Section 5.2.1	18	The text states that for Steller's eiders, collision is not a risk during summer construction periods, as eiders are not present. However, this fails to acknowledge that collision is a risk year-round due to operation of the Amakdedori Port.	The year-round operation of the Amakdedori Port (the lightening of vessels, bulk carriers, and barges) should be included in the assessment of vessel strike risks and therefore vessel-Steller eider collisions should be accounted for.
ADFG/DWC/MM & TED	Appendix G USFWS Biological Assessment	Section 5.3.1	19	Text does not comprehensively address the ways sea otters can be exposed to oil. Instead it states that oil sheen settles on the bottom sediment, allowing the oil to get on the fur of an otter feeding on the bottom.	Update text to note that sea otters can be exposed to oil by (1) ingestion, (2) inhalation, and (3) dermal absorption. The first contact with oil spills, where injury to sea otters occurs, is from oil floating on the surface. (Davis 2012). Correct the definition of oil sheen and how otters may get in contact with oil.

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ADFG/DWC/MM & TED	Appendix G USFWS Biological Assessment	Section 5.3.1	19	The text states that construction would not occur when eiders are present (November–April), and the amount of petroleum that could potentially be spilled during construction activities would be very small (a few gallons at most), and unlikely to lead to impairment of local sea otters.	Add impacts to Steller's eiders and remove "a few gallons at most". The year-round operation of the Amakdedori Port (the lightering of vessels, bulk carriers, and barges) should be considered during incidental spills; therefore-Steller's eiders should be accounted for in the DEIS and the number of gallons needs to be adjusted.
ADFG/DWC/MM & TED	Appendix G USFWS Biological Assessment	Section 5.4 Effects to Foraging Habitat and Prey	19	The text states that approximately 10.7 acres (4.3 hectares) of benthic feeding habitat will be buried during the earthen causeway and wharf construction. This represents a very small fraction (<1 percent) of the approximately 580,000 acres (235,000 hectares) comprising Kamishak Bay.	This section only includes the buried habitat during the causeway and wharf construction. The habitat lost due to regular channel dredging maintenance and the area where vessels will be lightered should also be considered in the assessment.
ADFG/DWC/MM & TED	Appendix G USFWS Biological Assessment	Section 6 Avoidance and Minimization	20	Only the construction phase of the mine is included.	Direct effects during the operation, closure and post-closure of the mine should be included.
ADFG/DWC/MM & TED	Appendix G USFWS Biological Assessment	Section 7 Direct Effects	25	Only the construction phase of the mine is included.	Direct effects during the operation, closure and post-closure of the mine should be included.
ADFG/DWC/MM & TED	Appendix G USFWS Biological Assessment	Section 7.1.4 Effects to Critical Habitat	26	There is great potential to adversely affect sea otter critical habitat when considering it will be within and adjacent to the operation and dredging of the Amakdedori Port. The number of vessels and activity in Kamishak Bay will alter this critical habitat in this area.	The determination for the project is May Affect northern sea otter critical habitat. The "Not Likely to Adversely Affect" should be removed.
ADFG/DWC/MM & TED	Appendix G USFWS Biological Assessment	Sections 7.2.1 Disturbance, 7.2.2 Vessel/Structure Collision, 7.2.3 Incidental Spill, 7.2.4 Effects to Critical Habitat. 7.3. Short-tailed Albatross	27	The Biological Assessment (BA) that the DEIS is based on fails to analyze the long-term anthropogenic impacts to ESA species from operations.	The BA and DEIS need to be updated to include analysis of operational impacts on Short tailed albatross. No determinations can be assigned until the operation of the Amakdedori Port and increased shipping traffic in Cook Inlet, is assessed. The BA and DEIS should include analysis of the long-term anthropogenic impacts from year-round operation of the mine and facilities on ESA species. Long term impacts that need to be considered include: operation of the ports, vessel activity (the lightering of vessels, bulk carriers, and barges), and any maintenance dredging activities.

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ADFG/DWC/MM & TED	Appendix G USFWS Biological Assessment	Section 8 Indirect Effects	28	Other indirect effects should be evaluated.	<p>Other indirect effects to consider:</p> <ul style="list-style-type: none"> -Increased air traffic utilizing the permanent port site airstrip and impacts to listed species for >20 years (construction, mine operation). -Increased vessel traffic within Kamishak Bay and in the Gulf of Alaska and impacts to listed species for >20 years (construction, mine operation). -Disruption of habitat during the dredging to a -20 feet MLLW of Amakdedori Port and required maintenance including moving what isn't used in dock construction on an onshore fill. -Increased human presence in the area will alter the landscape (increases in marine debris; illegal hunting/shooting wildlife; recreational activities; marine species entanglement in anchor lines/mooring buoys/mooring at lightering location/marine debris generated by the project).
ADFG/DWC/MM & TED	Appendix H NMFS Biological Assessment	Table 2: NMFS-listed species occurring within the project Action Area	7	<p>The text states the status of the Beluga Whale and Stellar sea lion is threatened, however the current status is endangered. https://www.fisheries.noaa.gov/alaska/endangered-species-conservation/endangered-threatened-and-candidate-species-alaska</p>	<p>Correct status as follows: Beluga Whale <i>Delphinapterus leucas</i> Threatened Endangered Cook Inlet Stock Steller sea lion <i>Eumetopias jubatus</i> Threatened Endangered Western DPS</p>

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ADFG/DWC/MM & TED	Appendix H NMFS Biological Assessment	Section 4 Status of Endangered Species	8	The following text is not accurate: "On September 8, 2016, NMFS publish a rule, effective October 11, 2016, stating that ESA protection for the Hawaii DPS (Central North Pacific stock) is no longer warranted, while the Mexico DPS (California/Oregon/Washington stock) was down-listed to threatened status. The small Western North Pacific DPS (Western North Pacific stock) remains endangered. There is no designated critical habitat, but a recovery plan was finalized in 1991."	Suggest updating text by referring to National Marine Fisheries Service, Alaska Region, Occurrence of Endangered Species Act (ESA) Listed Humpback Whales off Alaska revised December 12, 2016. On September 8, 2016, NMFS published a final decision changing the status of humpback whales under the ESA (81 FR 62259), effective October 11, 2016. Previously, humpback whales were listed under the ESA as an endangered species worldwide. In the 2016 decision, NMFS recognized the existence of 14 DPSs, classified four of those as endangered and one as threatened, and determined that the remaining nine DPSs do not warrant protection under the ESA. Three DPSs of humpback whales occur in waters off the coast of Alaska: the Western North Pacific DPS, which is an endangered species under the ESA, the Mexico DPS, which is a threatened species, and Hawaii DPS, which is not protected under the ESA. Whales from these three DPSs overlap to some extent on feeding grounds off Alaska. The NMFS will designate critical habitat for the humpback whale and finalized boundaries by 2020 ¹ . The timeline for designation of CH for humpbacks was established in a Settlement Agreement, dated 8/24/18: "1. On or before June 28, 2019, NMFS shall submit to the Federal Register for publication a proposed determination concerning the designation of critical habitat for the Western North Pacific, Mexico, and Central America DPSs of humpback whale;" 2. On or before June 30, 2020, to the extent NMFS has published a proposed rule to designate critical habitat, NMFS shall submit to the Federal Register for publication a final determination concerning the designation of critical habitat for the Western North Pacific, Mexico, and Central America DPSs of humpback whale;" STIPULATED SETTLEMENT AGREEMENT AND PROPOSED ORDER Ctr. for Biological Diversity., et al. v. Nat'l Marine Fisheries Serv. and Ross, Case No. 3:18-cv-01628-EDL
ADFG/DWC/MM & TED	Appendix H NMFS Biological Assessment	Section 4.1.3 Species Use of the Action Area	10	Humpback Whales	Include Cook Inlet in the Diamond Point Port alternative. This area could see an increase in shipping traffic if the mine is permitted. Impacts from vessel strikes and displacement should be included.
ADFG/DWC/MM & TED	Appendix H NMFS Biological Assessment	Section 4.2.3 Species Use of the Action Area	12	Fin Whales	Include Cook Inlet in the Diamond Point Port alternative. This area could see an increase in shipping traffic if the mine is permitted. Impacts from vessel strikes and displacement should be included.
ADFG/DWC/MM & TED	Appendix H NMFS Biological Assessment	Section 4.3 Beluga Whale	12	The following number of individuals and the citation is incorrect "The current abundance estimate (based on the 2016 survey) for the Cook Inlet stock of beluga whale is 327 individuals (Muto et al. 2018). Since 2006, the population has continued to decline at a rate of about 0.5 percent annually (Muto et al. 2018)".	The 2016 estimate was not yet available in Muto et al. 2018. The final number for 2016 surveys was 328 whales. Suggest revising text as follows: "The current abundance estimate (based on the 2016 survey) for the Cook Inlet stock of beluga whale is 327 328 individuals (Muto et al. 2018). Since 2006, the population has continued to decline at a rate of about 0.5 percent annually." https://www.fisheries.noaa.gov/species/beluga-whale (accessed 4.21.19)

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ADFG/DWC/MM & TED	Appendix H NMFS Biological Assessment	Section 4.3 Beluga Whale	12	The follow text is incorrect- "Prior to the decline, this DPS was believed to range throughout Cook Inlet and occasionally into Prince William Sound and Yakutat (Nemeth et al. 2007)."	Remove incorrect text. There is no evidence of interaction between Cook Inlet belugas and belugas found in other areas of the Gulf of Alaska, including the Yakutat Bay area and Prince William Sound. (NMFS 2016).
ADFG/DWC/MM & TED	Appendix H NMFS Biological Assessment	Section 4.3 Beluga Whale	13	The following text is incorrect, because as stated it indicates that Area 1 is the extent of beluga whale summer habitat - "Critical Habitat Area 1 (Figure 12) reflects this summer distribution."	Suggested replacement text: Critical Habitat Area 1 represents the high use areas in the summer where large groups of belugas congregate, and areas which are important to reproduction and foraging activities. Generally, CI belugas spend the ice-free months in the upper Inlet (often at discrete high-use areas), then expand their distribution south and into more offshore waters of the middle Inlet in winter (Hobbs et al. 2005), although they may be found throughout the Inlet at any time of year (NMFS 2016).
ADFG/DWC/MM & TED	Appendix H NMFS Biological Assessment	Section 4.3 Beluga Whale	12	As written, the following text suggests there are no whales using lower Cook Inlet which is inaccurate -"Historically, beluga whales were recorded in lower Cook Inlet during June and July, but only three whales have been sighted in the lower inlet during NMFS summer biannual aerial surveys since 1996 (Sheldon et al. 2017)." The draft BA in Appendix H states (page 7) that "The threatened [sic] Cook Inlet beluga whale summers in upper Cook Inlet with a portion of the population wintering in lower Cook Inlet venturing as far south as Kamishak Bay."	Suggested revised text: Historically, beluga whales were recorded in lower Cook Inlet during June and July, but only three whales have been sighted in the lower inlet during NMFS summer biannual aerial surveys since 1996 (Sheldon et al. 2017) until 2012 when a group of at least seven belugas was observed headed toward West Foreland on 31 May. However, Castellote et al. (2016) obtained information on the seasonal distribution and foraging behavior of belugas in Cook Inlet through passive acoustic monitoring of beluga social calls and echolocation activity at 3 locations in lower Cook Inlet (Homer, Tuxedni Bay, and Kenai River); belugas were detect in all locations except at Homer Spit (the most southern site monitored).
ADFG/DWC/MM & TED	Appendix H NMFS Biological Assessment	Section 4.3 Beluga Whale	13	Issue with the following text- "Some whales may also winter in and near Kachemak Bay. However, beluga whale tagging studies conducted from 1999 to 2003 found that only a few whales explored waters as far south as Chinitna Bay (Hobbs et al. 2005). Kamishak Bay may no longer be important to beluga whales regardless of season. "	The bolded/strike through next needs to be removed. Concluding Kamishak Bay may no longer be important to beluga whales based on the 1999-2003 tagging study is over-reaching and omitting more recent findings. Based on scientific data Kamishak Bay was designated as a Critical Habitat for the Cook Inlet beluga whale in 2011. (Federal Register). The nearshore area of Kamishak Bay was included as Critical Habitat for Cook Inlet beluga whales as an area important for conservation and recovery.

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ADFG/DWC/MM & TED	Appendix H NMFS Biological Assessment	Section 4.3 Beluga Whale	14	Issue with the following text- "Only occasionally are these whales observed in the lower Cook Inlet, and there have been no sightings of beluga whales within Kamishak Bay within recent years (Rugh et al. 2010, Sheldon et al. 2017)."	Suggested revised text: Historically, beluga whales were recorded in lower Cook Inlet during June and July, but only three whales have been sighted in the lower inlet during NMFS summer biannual aerial surveys since 1996 (Sheldon et al. 2017) until 2012 when a group of at least seven belugas was observed headed toward West Foreland on 31 May. However, Castellote et al. (2016) obtained information on the seasonal distribution and foraging behavior of belugas in Cook Inlet through passive acoustic monitoring of beluga social calls and echolocation activity at 3 locations in lower Cook Inlet (Homer, Tuxedni Bay, and Kenai River); belugas were detected in all locations except at Homer Spit (the most southern site monitored).
ADFG/DWC/MM & TED	Appendix H NMFS Biological Assessment	Section 4.3 Beluga Whale	14	Issue with the following text - "A portion of the Action Area (Kamishak Bay) falls within Designated Critical Habitat Area 2, or portions of Cook Inlet where beluga whales typically occur during the fall and winter. although, as mentioned above, beluga whale use of Area 2 habitat as far south as the Action Area has not occurred in recent years (Rugh et al. 2010, Sheldon et al. 2017). "	The bolded/strike through text should be removed. Concluding Kamishak Bay may no longer be important to beluga whales based on the 1999-2003 tagging study is over-reaching and omitting more recent findings. Based on scientific data Kamishak Bay was designated as a Critical Habitat for the Cook Inlet beluga whale in 2011. (Federal Register). The nearshore area of Kamishak Bay was included as Critical Habitat for Cook Inlet beluga whales as an area important for conservation and recovery.
ADFG/DWC/MM & TED	Appendix H NMFS Biological Assessment	Section 4.3 Beluga Whale	15	Issue with the following text - "The potential effect the proposed project might have on these PCEs is difficult to discern given the current lack of beluga whale use in the Action Area, and the construction activity occurring during the summer months when beluga whale populations are concentrated in northern Cook Inlet."	Revise or remove this text. There isn't any scientific basis for this conclusion which downplays the impact to an endangered species if the project is permitted and constructed. Based on scientific data Kamishak Bay was designated as a Critical Habitat for the Cook Inlet beluga whale in 2011. (Federal Register). Further, only the construction activity is considered; the year-round disturbance for >20 years in Kamishak bay as a result of port operations (including dredging and airstrip activity) needs to be considered. Additionally, Cook Inlet beluga whales may use lower Cook Inlet year-round though it is less concentrated spring and summer use. Portions of Kamishak Bay were included as Critical Habitat due to its role as probable fall feeding area (Federal Register) which may be important for the recovery of the species.
ADFG/DWC/MM & TED	Appendix H NMFS Biological Assessment	Section 4.4 Steller Sea Lion	16	Table 3: Distances of Steller sea lion rookeries and haulout sites to the Action area lists 3 locations: Usahgat Island, Sud Island, Nagahut Rocks. It is unclear why these 3 Steller sea lion locations were chosen as there are closer locations to the project area. In order of distance they include: Shaw, Cape Douglas, Ushagat, Latax Rocks, Sud Island, Flat Island, West Amatuli, Elizabeth/Cape Elizabeth, Sugarloaf, Nagahut Rocks, Perl Rocks, Perl.	Text and analysis should be updated accordingly.

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ADFG/DWC/MM & TED	Appendix H NMFS Biological Assessment	Section 4.4 Steller Sea Lion	17	Incorrect text- "There are no major haulouts within Cook Inlet, although NMFS may soon recognize Shaw Island on the eastern edge of Kamishak Bay as a major haulout site , as 70 sea lions were recorded near there in 2016 during beluga whale surveys conducted by NMFS (Shelden et al. 2017)."	Shaw Island is included as one of the Steller sea lion haulout and rookery locations in the U.S. (Fritz et al. 2015). Please update with current information.
ADFG/DWC/MM & TED	Appendix H NMFS Biological Assessment	Section 4.4 Steller Sea Lion	17	Issue with text- "Given the number of years of survey (1993-2016) conducted by NMFS in Cook Inlet, relatively low numbers of Steller sea lions have been recorded in Cook Inlet and most south of the Action Area (Figure 14). However, ABR did record several sea lions within Kamishak Bay during incidental surveys conducted in 2018 (Figure 15), and their seasonal presence in the Action Area might be higher than the limited survey data suggest."	This text does not accurately depict the number of Steller sea lions present in the Action Area. Steller sea lions have been seen in Kamishak Bay incidentally during Cook Inlet beluga whale aerial surveys. Incorporate incidental Steller sea lion sighting data in Kamishak Bay during Cook Inlet beluga whale surveys (1993-2012, 2014, 2016). See https://www.fisheries.noaa.gov/alaska/cook-inlet-beluga-aerial-surveys
ADFG/DWC/MM & TED	Appendix H NMFS Biological Assessment	Section 5 Consequences of Proposed Action	18	Text refers only to disturbance from construction of the Amakdedori Port.	Revise text as disturbance from construction , dredging, and operation of the Amakdedori Port, including aircraft should be considered.
ADFG/DWC/MM & TED	Appendix H NMFS Biological Assessment	Section 5 Consequences of Proposed Action	19	Issue with text - "PLP's planned pipeline construction, port construction, and vessel traffic will have some limited, additive effect to the overall anthropogenic noise budget."	Revise text and analysis. Anthropogenic noise is currently limited in the Action Area; the project will -increase anthropogenic noise. Include port construction/operation/dredging, and vessel traffic in list of additive effects to the overall anthropogenic noise budget.
ADFG/DWC/MM & TED	Appendix H NMFS Biological Assessment	Section 5.1.2 Masking	20	Issue with bolded text - "The extent of masking associated with PLP's marine program is a function of the duration a noise source is within hearing proximity of a marine mammal, and the additive noise from PLP's activity to overall anthropogenic noise levels in lower Cook Inlet. Working with killer whales, Crystal et al. (2011) found masking effects from vessels are eliminated at speeds less than 10 knots (kt) (18.5 km/hr). Whether this would apply also to other odontocetes such as harbor porpoises is unknown. "	Remove bold text, suggested substitute text: Foreny et al. 2017 indicates harbor porpoises use echolocation for foraging, navigation, communication, and spatial orientation and are highly sensitive to a wide variety of anthropogenic sounds and have been documented to avoid areas with vessel traffic.
ADFG/DWC/MM & TED	Appendix H NMFS Biological Assessment	Section 5.1.2 Masking	20	Issue with text - "Given the ability for pinnipeds to hear well in noisy backgrounds (Southall et al. 2000), combined with the short duration of exposure from a moving vessel, masking concerns due to vessel noise are not particularly significant for these marine mammals."	Provide citation for conclusion that vessel noise is not particularly significant. Erbe et al. 2014 indicates animals with the least hearing sensitivity below 20 kHz (Steller sea lions and Pacific white-sided dolphins) are expected to perceive the least amount of acoustic energy. Animals with better hearing sensitivity at low-to-mid frequencies (50–300 Hz) experience the most ship noise (baleen whales and true (phocid) seals). Harbor seals (phocids) are in high numbers in the Action Area.
ADFG/DWC/MM & TED	Appendix H NMFS Biological Assessment	Section 5.1.3 Chronic Disturbance	20, 21	Issue with text - "Finally, NMFS has recently published that harassment associated with construction vessel noise (83 FR 7655) is discountable."	Provide reference, the citation for 83 FR 7655 is not included in Ch 9 references. Also, it is unclear for what project NMFS made the determination that harassment associated with construction vessel noise is discountable.

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ADFG/DWC/MM & TED	Appendix H NMFS Biological Assessment	Section 5.1.3 Chronic Disturbance	21	The following text only addresses construction - "PLP's construction (e.g., pile driving) will have some additive effect to the overall anthropogenic noise budget, especially since there is limited anthropogenic noise within Kamishak Bay to begin with (as compared to other locations in Cook Inlet)."	Suggested revision: PLP's construction (e.g., pile driving) and port activities (e.g., dredging and aircraft use) will have some additive effect to the overall anthropogenic noise budget, especially since there is limited anthropogenic noise within Kamishak Bay to begin with (as compared to other locations in Cook Inlet).
ADFG/DWC/MM & TED	Appendix H NMFS Biological Assessment	Section 5.1.4. Relevance to the Pebble Project	21	Issue with the following text- "Intermittent noise from pile driving will occur over 90 days during port construction. The impacts are limited to a radius of a 11.3 mi (18.2 km) and will not occur in the winter when beluga whales are potentially present. Impacts would be temporary for a small number of humpback whales, fin whales, and Steller's sea lions, and will be mitigated by monitoring shut down safety zones to avoid Level A injury take (see Section 6.2).	Only the construction activity is considered for port activities; the year-round disturbance > 20 years in Kamishak bay as a result of the Amakdedori Port operations (including dredging and airstrip activity) needs to be considered. Text should be revised accordingly.
ADFG/DWC/MM & TED	Appendix H NMFS Biological Assessment	Section 5.2 Vessel Strikes	21	Only Alaska ship strikes from 1978 to 2011 are considered.	Obtain current ship strike information.
ADFG/DWC/MM & TED	Appendix H NMFS Biological Assessment	Section 5.5 Effects of Prey	25	Only the construction activity is considered for port activities.	The year-round disturbance over >20 year in Kamishak bay as a result of the Amakdedori Port operations (including dredging) needs to be considered.
ADFG/DWC/MM & TED	Appendix H NMFS Biological Assessment	Section 6 Avoidance and Minimization	26	Only the construction activity is considered for port activities.	The year-round disturbance over >20 year in Kamishak bay as a result of the Amakdedori Port operations (including dredging) needs to be considered.
ADFG/DWC/MM & TED	Appendix H NMFS Biological Assessment	Section 7 Direct Effects	31-35	Only the construction activity is considered for port activities	The year-round disturbance over >20 year in Kamishak bay as a result of the Amakdedori Port operations (including dredging) needs to be considered for all direct effects.
ADFG/DWC/MM & TED	Appendix H NMFS Biological Assessment	Section 7.1.3 Entanglement	31	Issue with the following text- "None of the proposed anchoring systems involves rope, which is the primary cause of marine mammal entanglement. The exact risk of entanglement is unknown but is considered discountable given no rope will be used. Therefore, the determination is No Effect."	Citation for conclusion should be provided. Additionally, assessment and conclusion should be updates as the NOAA Fisheries West Coast Region includes cable and chains along with rope as entanglement risks to large whales. https://www.westcoast.fisheries.noaa.gov/protected_species/marine_mammals/entanglement_faq.html (accessed 4.21.19)

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ADFG/DWC/MM & TED	Appendix H NMFS Biological Assessment	Section 4.1.3/Figure 9	32	Issue with the following text - "Humpback whales are not found in shallow-water harbors (Amakdedori Port) where incidental spills are most likely to occur."	Suggest revising based on the following information or removing the current text. Humpback whales have been observed in Kamishak Bay incidental to Cook Inlet beluga whale aerial surveys. Additionally, on page 10 in App H section 4.1.3 humpback whales are included within the Action Area. Also Figure 9 of Appendix H, the NMFS Biological Assessment, shows a humpback sighting very close to shore in the same depth contour as the proposed port, as well as six sightings in shallow water around Augustine Island, about 10 miles offshore from the port. Humpback whales were also reported by FOMR staff offshore of Amakdedori in 2018.
ADFG/DWC/MM & TED	Appendix H NMFS Biological Assessment	Section 7.2.3 Entanglement	32	Issue with the text -"The risk of fin whale entanglement in construction anchor chains or cables is the same discountable risk as mentioned for humpback whales in Section 7.1.3. Therefore, the determination is No Effect."	Citation for conclusion should be provided. Additionally, assessment and conclusion should be updates as the NOAA Fisheries West Coast Region includes cable and chains along with rope as entanglement risks to large whales. https://www.westcoast.fisheries.noaa.gov/protected_species/marine_mammals/entanglement_faq.html (accessed 4.21.19)
ADFG/DWC/MM & TED	Appendix H NMFS Biological Assessment	Section 7.3.5 Effects on Critical Habitat	34	Issue with the finding - "No Effect for Cook Inlet beluga whale critical habitat".	Suggest revising text and analysis. A "No Effect" finding is not justified with 3 of 5 primary constituent elements being altered within Critical Habitat.
ADFG/DWC/MM & TED	Appendix H NMFS Biological Assessment	Section 8 Indirect Effects	39	Other indirect effects should be evaluated.	Other indirect effects to consider: <ul style="list-style-type: none"> -Increased air traffic utilizing the permanent port site airstrip and impacts to listed species for >20 years (construction, mine operation). -Increased vessel traffic within Kamishak Bay and in the Gulf of Alaska and impacts to listed species for >20 years (construction, mine operation). -Disruption of habitat during the dredging to a -20 feet MLLW of Amakdedori Port and required maintenance including moving what isn't used in dock construction on an onshore fill. -Increased human presence in the area will alter the landscape (increases in marine debris; illegal hunting/shooting wildlife; recreational activities; marine species entanglement in anchor lines/mooring buoys/mooring at lightering location/marine debris generated by the project).
ADFG/DWC/MM & TED	Appendix H NMFS Biological Assessment	Section 10 Determination of Effects Summary	38	Previous comments noted issues with the analysis and conclusions in Table 4.	The analysis and conclusions summarized in Table 4 should be reassessed based on ADF&G comments on this document.

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ADFG/DWC/MM & TED	Executive summary	Executive summary	67	Issue with the following text - Marine Diesel Spill "Diesel could spread southward to the shores of Shuyak and Afognak islands (north of Kodiak Island) and /or Cape Douglas, depending on sea conditions, and could be washed on shore. Impacts to surface and groundwater on shore would be unlikely. Impacts to onshore wetlands would be unlikely; impacts to terrestrial wildlife would be minimal. Impacts to marine mammals would be of low likelihood and temporary; individuals or groups could potentially be injured or die, but population-level effects are unlikely. "	Provide basis for stating impacts to marine mammals would be of low likelihood and temporary. There are pinniped haulouts in the area described which would be impacted by a spill. Also stating impacts would be low and temporary and in the same line stating individuals or groups could be injured or die is contradictory. The next paragraph down mentions "Potential impacts from a marine diesel spill to Threatened and Endangered Species (TES) could be of high magnitude, depending on the species and the fate of the spilled fuel." Several of these ESA species are marine mammals and could see population-level effects. Suggest these conclusions be reanalyzed and the section text revised.
ADFG/DWC/MM & TED	Executive summary	Executive summary	68	Issue with the following text in the ED that refers to 3.5.4 Natural Gas Release "Impacts from a potential release of natural gas from the proposed pipeline would be limited to short-term air quality degradation and limited release of greenhouse gases (GHG) . Due to the remote nature of the pipeline, no health and safety impacts would be expected."	What is basis for concluding natural gas leak releases would be short-term? Define short-term. A natural gas pipeline leak near Nikiski, Alaska could not be repaired for months (Dec 2016-April 13, 2017). What is the basis for stating there would be no health and safety impacts?
ADFG/DWC/MM & TED	Chapter 3 Affected Environment	Section 3.25 Threatened and Endangered Species	3.25-4	Relevant citation not included in text about Habitat Use and Distribution (Cook Inlet beluga whales).	Add recent acoustic study results. Castellote et al. (2016) obtained information on the seasonal distribution and foraging behavior of belugas in Cook Inlet through passive acoustic monitoring of beluga social calls and echolocation activity at 3 locations in lower Cook Inlet (Homer, Tuxedni Bay, and Kenai River); belugas were detected in all locations except at Homer Spit (the most southern site monitored).
ADFG/DWC/MM & TED	Chapter 3 Affected Environment	Section 3.25 Threatened and Endangered Species	3.25-8	Typo with text- 'Approximately 40 percent of sea otters' daily activity foraging , and they primarily feed on benthic invertebrates, including mussels, crabs, urchins, sea cucumbers, and clams."	Word missing between bold text-"is".
ADFG/DWC/MM & TED	Chapter 3 Affected Environment	Section 3.25 Threatened and Endangered Species	3.25-13	Issue with Beluga whale section	Suggest Including any reports of beluga whales in the area of Alternative 2 which have occurred since 2011.

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ADFG/DWC/MM & TED	Chapter 4 Environmental Consequences	Section 4.23 Wildlife Values	4.23-4	Issue with the following text in bold- "Birds may experience a wide range of impacts from noise sources within the mine site, transportation corridor, at the ferry terminals, at the port, and the natural gas compressor station on the Kenai Peninsula. In terms of duration, some of the noise sources would occur over the short term, (such as noise from construction of the mine facilities, installation of the natural gas pipeline, blasting in the road bed and material sites, and aircraft noise at Amakdedori port, among others), while others would occur during operations (blasting in the pit), and some for the life of the project (vehicle/equipment noise). "	Suggested addition of text: "...while others would occur during operations (blasting in the pit), and some for the life of the project (vehicle/equipment/vessel noise)."
ADFG/DWC/MM & TED	Chapter 4 Environmental Consequences	Section 4.23 Wildlife Values	4.23-25	Issue with bolded text- " Injury and mortality of marine mammals would not be anticipated to be factors as a result of any of the components of the project , because vessels would be traveling at slow speeds across Iliamna Lake, and less than 10 knots when transiting between the port and lightering locations. In addition, other mitigation measures to prevent vessel strikes are discussed in Chapter 5, Mitigation and Monitoring."	It is inaccurate to state that the potential of injury and mortality of marine mammals is not anticipated for any component of the project. Separation of mom/pup harbor seal pairs due to disturbances is possible. Entanglement in mooring lines or other lines in the water (or marine debris generated from the project) is also anticipated. Additionally, chapter 5 on mitigation offers little in the way of marine mammal mitigation measures. Suggest revisiting assessment and text.
ADFG/DWC/MM & TED	Chapter 4 Environmental Consequences	Section 4.23 Wildlife Values	4.23-26	Issue with bolded text -"Anticipated sources of noise include vessels used during installation of the natural gas pipeline in Iliamna Lake and Cook Inlet; anchor handling operations associated with natural gas pipeline construction; construction noise associated with the Amakdedori port and ferry terminals on Iliamna Lake; vessels used in the transportation corridor across Iliamna Lake, which includes the need to break ice during mining operations; and aircraft during construction, and to a lesser extent, operations at Amakdedori port. "	The Amakdedori Port if is of equal concern for the generation of noise as the other project components. Suggest revising text by removing "...to a lesser extent...".
ADFG/DWC/MM & TED	Chapter 4 Environmental Consequences	Section 4.23 Wildlife Values	4.23-26	Issue with the following text- "The duration of time that marine mammals may be exposed to underwater sound would be short term, and lasting only during pipeline installation, dredging, and construction activities, and from vessel traffic during mine operations. " Duration of time may not be short time when you consider underwater sound generated by port activities which will go on for the duration of the project.	Revise text and analysis. Port activities (e.g. lightering, loading/offloading vessels) will generate underwater noise and will not be short term like construction, as the port will be operational for the life of the project. The increased activity of mine staff in Kamishak Bay and surrounding areas may also have impacts to area wildlife.

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ADFG/DWC/MM & TED	Chapter 4 Environmental Consequences	Section 4.23 Wildlife Values	4.23-27	Suggest addition to the following text to include marine mammals that are hauled-out on land. "The physical presence of low-flying aircraft can disturb marine mammals, particularly individuals resting on the sea surface (reviewed in BOEM 2012). Observations made from low-altitude aerial surveys report that the behavioral responses of marine mammals are highly variable, ranging from no observable reaction to diving or rapid changes in swimming speed or direction (Smultea et al. 2008). Helicopter traffic may result in temporary behavioral responses."	Revise text to include bolded text- "The physical presence of low-flying aircraft can disturb marine mammals, particularly individuals resting on the sea surface (reviewed in BOEM 2012) or hauled-out on land (Greig and Allen, Kucey 2005, Born et al 1999) . Observations made from low-altitude aerial surveys report that the behavioral responses of marine mammals are highly variable, ranging from no observable reaction to diving or rapid changes in swimming speed or direction (Smultea et al. 2008). Helicopter traffic may result in temporary behavioral responses."
ADFG/DWC/MM & TED	Chapter 4 Environmental Consequences	Section 4.23 Wildlife Values	4.23-27	Issue with the following text as it is unsupported - "Because there is existing oil and gas infrastructure in Cook Inlet, as well as numerous shipping routes and large amounts of vessel traffic, it is unlikely that the addition of physical presence as part of this project would change marine mammals' behavioral patterns."	Remove or revise text and analysis. Provide research which supports the statement that the physical presence of this project would not change the behavior of marine mammals, or remove it. A large body of literature shows that multiple anthropogenic stressors can impact the welfare of marine mammals. Pinnipeds physiologically require a certain amount of time hauled out to meet their resting needs (Brasseur et al. 1996). They can experience chronic stress if vessel traffic or other anthropogenic disturbances causes them to flush into the water (Cates and Acevedo-Gutierrez 2017) particularly during pupping in cold locations where they endure thermal stress (Jansen et al. 2010).
ADFG/DWC/MM & TED	Chapter 4 Environmental Consequences	Section 4.23 Wildlife Values	4.23-27	The following text is not supported by the reference provided. "However, in Alaska specifically, harbor seals are documented to tolerate fishing vessels with no discernable reactions, and habituation is common (Johnson et al. 1989)."	Provide reference for the statement. Johnson et al. 1989 does not support this statement.
ADFG/DWC/MM & TED	Chapter 4 Environmental Consequences	Section 4.23 Wildlife Values	4.23-27	The following text is not supported- "Cook Inlet has historical and current high use from fishing- and tourism-related vessel traffic, and the incremental addition of vessels associated with the project would be unlikely to result in increased impacts to marine mammals. Likewise, there is a high level of use of Iliamna Lake by recreational and subsistence watercraft."	Provide information that supports the statement that the physical presence of this project would not result in increased impacts to marine mammals of marine mammals.
ADFG/DWC/MM	Chapter 4 Environmental Consequences	Section 4.23 Wildlife Values	4.23-27	The following text is not supported- "Therefore, although long term, occurring throughout the life of the project, impacts would not be expected to have a detrimental effect on harbor seals."	Provide information that supports the statement that the physical presence of this project would not change the behavior of marine mammals.
ADFG/DWC/MM & TED	Chapter 4 Environmental Consequences	Section 4.23 Wildlife Values	4.23-28	Issue with bolded text -"The duration that marine mammals may be exposed to vessel presence would be short term, occurring during pipeline installation and construction activities, but would result in a long-term increase in physical presence from the operations of the ferry across Iliamna Lake, lasting though operation of the mine until closure. "	Revise bolded text for clarity, as it does not read well.

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ADFG/DWC/MM	Chapter 4 Environmental Consequences	Section 4.23 Wildlife Values	4.23-28	The following statement in bold is not supported. "However, vessels associated with activities would have a transitory presence in any specific location with a limited effect on marine mammals, because marine mammals typically avoid known high-vessel areas. The magnitude of impacts would be limited to brief behavioral responses such as reducing surface time, diving, and swimming away. "	Provide information that supports the statement that the physical presence of this project would not change the behavior of marine mammals.
ADFG/DWC/MM & TED	Chapter 4 Environmental Consequences	Section 4.23 Wildlife Values	4.23-28	Issue with the following text - "The duration that marine mammals may be exposed to aircraft presence would be temporary, because aircraft support would be expected to be intermittent and of short duration (2 years); only during construction of the port access road. The extent would primarily include the area around Amakdedori port, and any other locations where aircraft, including helicopters, may occur. Based on the short duration of potential exposure to aircraft-related noise and visual disturbance, effects on marine mammals would be limited to brief behavioral responses (such as diving, swimming away, reducing surfacing time). "	Suggest removing the bolded text or revise text and analysis. As currently writing, the text minimizes the impacts aircraft use could have on individuals especially to pinnipeds during the pupping and molting season. Construction is schedule for summer months which is during the sensitive time for harbor seals. Kamishak Bay is an important area for harbor seal molting and pupping based on the size of the concentration areas.
ADFG/DWC/MM & TED	Chapter 4 Environmental Consequences	Section 4.23 Wildlife Values	4.23-29	"Small" should be defined in the following text -"In terms of magnitude and extent, development of onshore support facilities might displace a small number of harbor seals near the Amakdedori port and the south ferry terminal site (in Iliamna Lake and Kamishak Bay). These impacts, which would be limited to the immediate vicinity of the facilities and short term in nature, would not be expected to affect local populations of harbor seals, because the animals are highly mobile and feed near river mouths. "	Define small number of harbor seals and on what basis are impacts short-term.
ADFG/DWC/MM & TED	Chapter 4 Environmental Consequences	Section 4.23 Wildlife Values	4.23-29	Issue with the bolded strikethrough text. "Potential effects from seafloor disturbance would be expected to limit the foraging quality of the disturbed area during construction. The duration that marine mammals may be exposed to habitat alteration from construction would be temporary, because habitat alteration activities would be of short duration, and possibly for a few years afterward in some locations. The duration that marine mammals may be exposed to habitat loss from development of Amakdedori port and the south ferry terminal would be permanent. Impacts would be likely due to loss of foraging habitat."	Remove bolded strike through text or clarify which components it's referring to. The last sentence indicates habitat loss is permanent; it is not necessary to state habitat loss during construction is temporary when referring to lost habitat at the ports or ferry terminal referred to in following sentence.
ADFG/DWC/MM & TED	Chapter 4 Environmental Consequences	Section 4.23 Wildlife Values	4.23-39	Table 4.23-3, Injury and mortality, transportation corridor- doesn't mention the potential to separate mom/pup pairs (harbor seals and sea otters) which can lead to abandonment and death (to the pup).	Disturbances have the potential to separate mom/pup pairs (harbor seals and sea otters) which can lead to abandonment and death (to the pup). This should be included in the table.
ADFG/DWC/MM & TED	Chapter 4 Environmental Consequences	Section 4.23 Wildlife Values	4.23-40	Table 4.23-3, Injury and mortality, port -doesn't mention the potential to separate mom/pup pairs (harbor seals and sea otters) which can lead to abandonment and death (to the pup).	Disturbances have the potential to separate mom/pup pairs (harbor seals and sea otters) which can lead to abandonment and death (to the pup). This should be included in the table.

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ADFG/DWC/MM & TED	Chapter 4 Environmental Consequences	Section 4.23 Wildlife Values	4.23-44	Text in bold is not supported and conclusion isn't explained clearly. "Noise generated during construction and operations may temporarily disturb some marine mammals, causing them to leave or avoid the area. Such effects would likely be short term , and would not be expected to result in population level effects."	Remove bold text or add a citation and reasoning for not considering that impacts could be permanent.
ADFG/DWC/MM & TED	Chapter 4 Environmental Consequences	Section 4.23 Wildlife Values	4.23-44	Text in bold should be backed up with a citation. "Because of this frequent vessel activity in Cook Inlet, some marine mammals in the area may be at least partially habituated to vessel presence and noise , and impacts from vessel traffic from the project would add incremental effects to marine mammals."	Remove bold text or add supportive reasoning. Please cite basis for this statement or scientific evidence marine mammals in Cook Inlet are habituated to vessel presence and noise.
ADFG/DWC/MM & TED	Chapter 4 Environmental Consequences	Section 4.27 Spill Risk	4.27-110, 4.27-125	No direct impacts to marine mammals are anticipated, because metal concentrations would be diluted to within water quality standards on reaching Nushagak Bay and beyond.	Suggest including beluga whales for direct impacts in Nushagak River. In April 2019 an ADF&G biologist reported seeing hundreds of beluga whales ~18 miles up the Nushagak from Dillingham. It was suspected they were feeding on herring and/or out-migrating salmon smolts. Belugas are known to move up rivers in Bristol Bay during April to consume rainbow smelt and out-migrating salmon (Citta et al. 2016)
ADFG/DWC/MM & TED	Chapter 4 Environmental Consequences	Section 4.25 Threatened and Endangered Species	4.25-1	Action Area for Diamond Point port alternative should be expanded.	Include Cook Inlet in the Action Area for the Diamond Point Port alternative, as there will be an increase in shipping traffic if the mine is permitted. Impacts from vessel strikes and displacement should be included.
ADFG/DWC/MM & TED	Chapter 4 Environmental Consequences	Section 4.25 Threatened and Endangered Species	4.25-1	Update the following text -"Beluga whales are generally observed north of the analysis area during summer months; therefore, noise during the summer construction of Amakdedori port would only be expected to impact the few animals that may be in the construction area at that time."	Cook Inlet beluga whales may use lower Cook Inlet year-round though it is less concentrated spring and summer use. Portions of Kamishak Bay were included as Critical Habitat due to its role as a probable fall feeding area (Federal Register) which may be important for the recovery of the species. Recommend updating the text accordingly.
ADFG/DWC/MM & TED	Chapter 4 Environmental Consequences	Section 4.25 Threatened and Endangered Species	4.25--2	Underwater and Airborne Noise doesn't adequately address year round disturbance from port operations.	The year-round operations disturbance >20 year in Kamishak bay as a result of the Amakdedori Port operations (including dredging and airstrip activity) needs to be considered in further detail. Suggest expanding text accordingly.
ADFG/DWC/MM & TED	Chapter 4 Environmental Consequences	Section 4.25 Threatened and Endangered Species	4.25-5	The following text is appropriate and should be included in many other sections of the DEIS, as pointed out in earlier comments. "The extent of the impacts would be limited to the analysis area, and the duration would be long term lasting from construction through the life of the project."	This is the detail lacking in many other sections of the DEIS. All relevant sections of the DEIS should acknowledge the duration of impacts would be long terms, lasting from construction through the life of the project.

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ADFG/DWC/MM & TED	Chapter 4 Environmental Consequences	Section 4.25 Threatened and Endangered Species	4.25-6	The following bolded text is not supported- " Additionally, vessels associated with activities would have a transitory presence in any specific location, as do beluga whales, so they would likely have a limited effect on beluga whales. Based on the short duration of potential exposure to vessel-related noise and visual disturbance at any given location when vessels and whales are present, it is expected that effects on Cook Inlet beluga whales would be limited to brief behavioral responses, such as reducing surface time and diving."	Provide citation for bold text.
ADFG/DWC/MM & TED	Chapter 4 Environmental Consequences	Section 4.25 Threatened and Endangered Species	4.25-6	The following text is not supported -"Based on the short duration of potential exposure to vessel- or aircraft-related noise and visual disturbance, it is expected that any effects on Cook Inlet beluga whales would be limited to brief behavioral responses such as reducing surface time and diving. Vessel and aircraft presence concurrent with the presence of beluga whales would be short-lived, and only temporary effects on Cook Inlet beluga whales are expected."	Provide citation for this assessment.
ADFG/DWC/MM & TED	Chapter 4 Environmental Consequences	Section 4.25 Threatened and Endangered Species	4.25-6	Several typos in the following text- "When vessels are transiting nearshore areas, speeds would be decreased, and standard marine mammal disturbance guidelines would be followed to avoid vessel strikes (which would be outlined a Wildlife Management Plan , developed by PLP if the project were to be permitted; see Chapter 5, Mitigation, for additional information on mitigation measures). While encounters between beluga whales and project vessels could occur. An encounter would be defined as observing an animal from the vessel but not making contact. Lethal vessel strikes are not expected because vessels would be transiting and lightering locations the port at slow speeds (less than 10 knots) that improve ability to avoid marine mammals."	Correct typos: When vessels are transiting nearshore areas, speeds would be decreased, and standard marine mammal disturbance guidelines would be followed to avoid vessel strikes (which would be outlined in a Wildlife Management Plan, developed by PLP if the project were to be permitted; see Chapter 5, Mitigation, for additional information on mitigation measures). While encounters between beluga whales and project vessels could occur. An encounter would be defined as observing an animal from the vessel but not making contact. Lethal vessel strikes are not expected because vessels would be transiting and lightering locations in the port at slow speeds (less than 10 knots) that improve ability to avoid marine mammals.
ADFG/DWC/MM & TED	Chapter 4 Environmental Consequences	Section 4.25 Threatened and Endangered Species	4.25-6	The following citation does not seem to be appropriate to support the statement. "There is no indication that strikes would become a major source of injury or mortality in the analysis area (NMFS 2017a)."	Correct the citation. Clarification is needed for this assessment provided by the citation NMFS. 2017a. Endangered Species Act—Section 7 Consultation Biological Opinion. Consultation No. SER-2015-15985. Juneau, AK. How is this relevant the Action Area for the Pebble project? The document, SER-2015-15985, is for an assessment with the Southeast Regional Office (Florida, USA) on the continued Authorization of the Fishery Management Plan (FMP) for Coastal Migratory Pelagic (CMP) Resources in the Atlantic and Gulf of Mexico under the Magnuson-Stevens Fishery Management and Conservation Act (MSFMCA).

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ADFG/DWC/MM & TED	Chapter 4 Environmental Consequences	Section 4.25 Threatened and Endangered Species	4.25-7	The following statement is not supported -"The port is not expected to impede anadromous fish from using Amakdedori Creek, because fish already have multiple rocky reefs, shoals, and other areas to negotiate before entering the creek."	Structures such as the solid fill causeway and jettys have been shown to have significant effects on fish migrations and movements. Without detailed analysis of fish movement patterns, water circulation in the area and water velocities and flow around the structures a determination that the port would not impede fish passage is premature. This could also have significant impacts on marine mammals. The statement needs to be supported or revised.
ADFG/DWC/MM & TED	Chapter 4 Environmental Consequences	Section 4.25 Threatened and Endangered Species	4.25-8	Text only addresses construction and not the life of the mine, which includes port operations. "Table 4.25-2: Summary of Key Issues for TES Physical presence of vessels and aircraft (primarily during construction) may temporarily displace marine TES. Wintering Steller's eiders may swim, dive, or fly away from approaching vessels and aircraft."	Suggest addition of text in bold- "Physical presence of vessels and aircraft (primarily during construction however throughout the life of the project) may displace marine TES. Wintering Steller's eiders may swim, dive, or fly away from approaching vessels and aircraft." Also, provide citation for this conclusion.
ADFG/DWC/MM & TED	Chapter 4 Environmental Consequences	Section 4.25 Threatened and Endangered Species	4.25-8	Low potential for TES to collide with port infrastructure (including lights on the causeway and lighted navigation buoys) and vessels."	Remove bolded strikethrough "low". With less than 400 Cook Inlet beluga whales a "low" number of collisions could have population level impacts. The Recovery Plan for the Cook Inlet beluga whale (NMFS 2016) includes ship strikes as an anthropogenic source of injury or mortality. While ship strikes have not been a confirmed source of Cook Inlet (CI) beluga mortality, a CI beluga washed ashore dead in September 2007 with "wide, blunt trauma along the right side of the thorax" that could be the result of ship strike trauma. In October 2012, a necropsy of another CI beluga carcass indicated the most likely cause of death was "blunt trauma such as would occur with a strike with the hull of the boat" (NMFS AKR, unpub. data). Scarring consistent with propeller injuries has also been documented among CI belugas (LGL 2009; McGuire et al. 2011). Further scar analysis would be required to estimate vessel size, and it would be difficult to determine whether the scars resulted from commercial, private, or research vessel interactions.
ADFG/DWC/MM & TED	Appendix N Project Description	Section 1.4.2 Amakdedori Port and Lightering Locations	last page	The following text requires clarification- "Dredging is no longer proposed for the Amakdedori port and concentrate would be lightered into deep water using barges for loading onto anchored bulk carriers. (December 2017)"	Please clarify how Amakdedori port can be constructed and operated without dredging.
ADFG/DWC/MM & TED	Chapter 4 Environmental Consequences	Section 4.25 Threatened and Endangered Species	4.25-8	Issue with the following text- "Habitat changes None, the lightering locations are outside of critical habitat for all TES."	Statement is inaccurate and should be corrected. Habitat for TES species exists outside of the areas designated as Critical Habitat Areas. Changes will likely occur to habitat occupied by TES. The lightering locations may be outside CHA's however they are within TES species habitat and the DEIS should identify this and account for impacts.

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ADFG/DWC/MM & TED	Chapter 4 Environmental Consequences	Section 4.25 Threatened and Endangered Species	4.25-8	The following text doesn't acknowledge the vessel traffic that will occur throughout the life of the project -"Physical presence of vessels and aircraft (primarily during construction) may temporarily displace marine TES."	Suggest adding the bolded text-Physical presence of vessels and aircraft (primarily during construction however throughout the life of the project) may temporarily displace marine TES. Wintering Steller's eiders may swim, dive, or fly away from approaching vessels and aircraft.
ADFG/DWC/MM & TED	Chapter 4 Environmental Consequences	Section 4.25 Threatened and Endangered Species	4.25-8	Low potential for collision for all TES. (Lightering Locations)	Remove bolded strikethrough "low".
ADFG/DWC/MM & TED	Chapter 4 Environmental Consequences	Section 4.25 Threatened and Endangered Species	4.25-8	Low potential for TES to collide with vessels during construction. (Natural Gas Pipeline)	Remove bolded strikethrough "low".
ADFG/DWC/MM & TED	Chapter 4 Environmental Consequences	Section 4.25 Threatened and Endangered Species	4.25-9	Habitat changes. Alternatives 1, 2, and 3-disagree with statement of "temporary disturbance".	Remove "Temporary disturbance". (1) It is unknown whether the effects will be temporary or permanent for the multi-year construction activity. (2) Operations will occur for >20 years and should be included in the assessment. Include Steller's eider in the assessment for operation of the mine if permitted.
ADFG/DWC/MM & TED	Chapter 4 Environmental Consequences	Section 4.25 Threatened and Endangered Species	4.25-8	Issue with the following - Footnote 1 to Permanent Impacts: There are no acreages of temporary impacts associated with construction of Amakdedori port, because any construction equipment outside of the permanent footprint would not impact the benthic marine environment.	Suggest revising statement and analysis. Stating that construction equipment outside the permanent footprint would not impact the benthic marine environment, makes little sense. Presumably any equipment outside the footprint would create a disturbance to the benthic marine environment. Additionally, how will the port depth be maintained with the currents and water flow change around the pilings creating sand/mud drifts?
ADFG/DWC/MM & TED	Chapter 4 Environmental Consequences	Section 4.25 Threatened and Endangered Species	4.25-9	Lower Cook Inlet has a high volume of vessel traffic, especially during the summer months when humpback whales are present. Incremental additional noise from the anticipated few vessels associated with the project per day would not add to the existing levels of noise.	Clarify Lower Cook Inlet vessel activity areas. High volumes likely do occur in the eastern and central portion, however, vessel traffic in the western portion and Kamishak Bay is low. Additionally, the project vessels will be on site and operating for nearly a week at a time during each visit. Even a few vessels per day over >20 years would add to the existing levels of noise in this portion of lower Cook Inlet and especially in Kamishak Bay where there does not appear to be significant vessel activity at present.
ADFG/DWC/MM & TED	Chapter 4 Environmental Consequences	Section 4.25 Threatened and Endangered Species	4.25-10	Issue with the following text -"Pile-driving noise may exceed injury thresholds as defined by NMFS. Underwater sound levels from pile driving vary with size and type of piles, as well as the size and type of hammer, and would be further analyzed in ESA consultation and MMPA consultation (if required). "	This project has the potential to take both ESA animals and marine mammals protected under the MMPA; this project would need to go under an ESA consultation and MMPA incidental harassment authorization (recommend striking "if required").
ADFG/DWC/MM & TED	Chapter 4 Environmental Consequences	Section 4.25 Threatened and Endangered Species	4.25-10	Issue with the following text -" Any potential impacts on humpback whale behavior would occur in the analysis area , and would not result in population-level effects. However, in terms of likelihood, the impacts would be certain to occur if the project is permitted and the port and pipeline are constructed."	Revise sentence and conclusion as it doesn't make sense. Additionally, analysis and summary needs to be revised to incorporate project impacts from increase in shipping traffic, vessel strikes and habitat displacement.

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ADFG/DWC/MM & TED	Chapter 4 Environmental Consequences	Section 4.25 Threatened and Endangered Species	4.25-12	Issue with citation used in the following text - "However, humpback whales rarely feed on benthic fauna, and they are not expected to be impacted by changes in the benthic environment (NMFS 2017a)."	Clarification is needed for this citation NMFS. 2017a. Endangered Species Act—Section 7 Consultation Biological Opinion. Consultation No. SER-2015-15985. Juneau, AK.
ADFG/DWC/MM & TED	Chapter 4 Environmental Consequences	Section 4.25 Threatened and Endangered Species	4.25-12	As noted in multiple other places, the duration of impacts doesn't not include the operational life of the port, and focuses only on construction. "The duration of impacts would be short term, occurring only during construction. The magnitude and duration of potential effects from seafloor disturbance would be a reduction in the foraging quality of the disturbed area for a short time during construction."	Only the construction activity is considered for port activities; the year-round operational disturbance for >20 years in Kamishak bay as a result of the Amakdedori Port operations (including future dredging) needs to be considered for all direct effects. Suggest correcting text.
ADFG/DWC/MM & TED	Chapter 4 Environmental Consequences	Section 4.25 Threatened and Endangered Species	4.25-14	The following text needs revision - "However, because there are no rookeries near project components and most haul-outs are in designated critical habitat far south of the analysis area , these effects are not expected."	Revise the statement for haul-out locations. Most of the haulout areas for Steller sea lions in Alaska are NOT in the designated critical habitat area south of the analysis area (AFSC 2019)
ADFG/DWC/MM & TED	Chapter 4 Environmental Consequences	Section 4.25 Threatened and Endangered Species	4.25-14	Text in sub-section 4.25.2.4 Steller sea lion Underwater and Airborne Noise does not include the operational life of the port, and focuses only on construction.	Only the construction activity is considered; the year-round disturbance over >20 year in Kamishak bay as a result of the Amakdedori Port operations or Diamond Point (including dredging) needs to be considered for all direct effects. Revise section accordingly.
ADFG/DWC/MM & TED	Chapter 4 Environmental Consequences	Section 4.25 Threatened and Endangered Species	4.25-15	Issue with citation used- "If any responses of Steller sea lions associated with aircraft were to occur, they are likely to be short-lived, and therefore are not expected to cause more than a temporary disturbance to Steller sea lions (NMFS 2017a)."	Suggest rechecking the NMFS 2017a reference.
ADFG/DWC/MM & TED	Chapter 4 Environmental Consequences	Section 4.25 Threatened and Endangered Species	4.25-16	The following text is incorrect -"To date, the USFWS has not documented and is not aware of any evidence that serious injury, death, or stranding of sea otters can occur from exposure to industry noise (USFWS 2016b).	Remove text as the conclusion is incorrect. USFWS 2016b referred to airgun noise during oil and gas exploration, not impacts from the mining industry. The text from USFWS 2016b follows: "To date, there is no evidence that serious injury, death, or stranding of sea otters can occur from exposure to airgun pulses, even in the case of large airgun arrays. As a result, the Service does not expect any sea otters to incur serious injury (Level A harassment) or mortality in Cook Inlet or strand as a result of the proposed activities."
ADFG/DWC/MM & TED	Chapter 4 Environmental Consequences	Section 4.25 Threatened and Endangered Species	4.25-16	The following text focuses only on construction and doesn't include the operation life of the port -"Any disturbance to sea otters from underwater noise associated with the project construction would be expected to be temporary and occur only in the immediate vicinity of project activities."	Only the construction activity is considered; the year-round operational disturbances for >20 years in Kamishak bay as a result of the Amakdedori Port or Diamond Point Port(including dredging) needs to be considered for all direct effects. Suggest revising text accordingly.
ADFG/DWC/MM & TED	Chapter 4 Environmental Consequences	Section 4.25 Threatened and Endangered Species	4.25-16	Typo in the following text -"The magnitude of impact of the airborne noise of the heavy equipment sea otters rafting in the immediate vicinity of construction could be a temporary disturbance and departure from the area."	Correct typo- see bolded text for missing word. The magnitude of impact of the airborne noise of the heavy equipment to sea otters rafting in the immediate vicinity of construction could be a temporary disturbance and departure from the area.

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ADFG/DWC/MM & TED	Chapter 4 Environmental Consequences	Section 4.25 Threatened and Endangered Species	4.25-17	Typo in the following text -"The extent of potential impact from underwater or airborne noise on sea otters would be limited the analysis area, and would not result in population-level effects when mitigation measures, detailed in the biological assessment (Appendix G), and measures from the consultation process are implemented."	Correct typo- see bolded text for missing word. The extent of potential impact from underwater or airborne noise on sea otters would be limited to the analysis area, and would not result in population-level effects when mitigation measures, detailed in the biological assessment (Appendix G), and measures from the consultation process are implemented.
ADFG/DWC/MM & TED	Chapter 4 Environmental Consequences	Section 4.25 Threatened and Endangered Species	4.25-17	Issue with the accuracy of the following text-"Although the western side of Kamishak Bay has a high density of sea otters, they are fairly tolerant of vessel noise and would likely habituate to the regular presence of vessels at these locations."	Studies have indicated both sexes of sea otters in Alaska avoid areas of heavy boat traffic (Garshelis and Garshelis 1984). Additionally, the west side of Kamishak Bay has very few vessels normally; so this increased use would be less tolerable and a larger impact. Suggest updating text accordingly.
ADFG/DWC/MM & TED	Chapter 4 Environmental Consequences	Section 4.25 Threatened and Endangered Species	4.25-18	Issues with the clarity and accuracy of the following text- "If impacts to behavior occur at all, these effects would be expected to be short term, limited to the immediate area of the port, and would have no population-level impact. The duration of time that sea otters may be exposed to physical presence of vessel and aircraft would be temporary, because such disturbance is expected to be intermittent, and of short duration. Based on the short duration of potential exposure to physical presence at any given location, it is expected that effects on sea otters would be limited to brief behavioral responses. These impacts would be expected to occur if the project is permitted and the port and pipeline are constructed."	Revise text and summary. The information in the paragraphs above this summary in Chapter 4 details what can happen to sea otters if the project is permitted. Using qualitative descriptions such as short term, no population-level impacts, temporary, intermittent, short duration, and brief distract from the content of this chapter and do not accurately depict impacts.
ADFG/DWC/MM & TED	Chapter 4 Environmental Consequences	Section 4.25 Threatened and Endangered Species	4.25-18	The following text has a typo- "Vessel Collisions - The extent of non-lethal encounters between project vessels and sea lions would range from the Amakdedori port to lightering locations, with the greatest potential for vessel encounters at the alternative lightering location west of Augustine Island due to higher sea otter densities there, compared to around the port."	Correct typo-see bolded text. The extent of non-lethal encounters between project vessels and sea lions sea otters would range from the Amakdedori port to lightering locations, with the greatest potential for vessel encounters at the alternative lightering location west of Augustine Island due to higher sea otter densities there, compared to around the port.
ADFG/DWC/MM & TED	Chapter 4 Environmental Consequences	Section 4.25 Threatened and Endangered Species	4.25-18	Habitat changes - The magnitude of project impacts would be low because sea otters may easily disperse to unaffected habitat nearby.	Suggest removing bolded strike through text. Removing habitat from a threatened species under the Endangered Species Act in an area designated as Critical Habitat for the survival of the species is not a low impact.
ADFG/DWC/MM & TED	Chapter 4 Environmental Consequences	Section 4.25 Threatened and Endangered Species	4.25-19	The following text needs clarification -"Bottom-contact stages of construction, the permanent placement of a causeway, and construction of the natural gas pipeline have potential to temporarily adversely affect critical habitat. All northern sea otter critical habitat primary constituent elements (discussed in detail in Section 3.25, Threatened and Endangered Species) could be directly affected."	Please define 'temporary'.

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ADFG/DWC/MM & TED	Chapter 4 Environmental Consequences	Section 4.25 Threatened and Endangered Species	4.25-28	Disagree with the following text- "Cook Inlet beluga whale- The likelihood of cumulative impacts is low, because beluga whales do not commonly occur in the analysis area."	If the Cook Inlet beluga whale recovered, the analysis area would potentially be utilized by beluga whales and thus the cumulative impacts may not be low.
ADFG/DWC/REFUGES	Chapter 2 Alternatives	Section 2.2.2	2-8 through 85	Action Alternative 1-Applicants Proposed Alternative. The south road corridor, Amakdedori port and ferry terminals may present conflicts with current management of the McNeil River Sanctuary and Refuge. It is our concern that bears managed for viewing at McNeil Sanctuary may leave the sanctuary and return with altered behavioral patterns .	Alternative 1 is carried forward, in order to minimize the possibility of altered bear behavior, we would encourage construction and operations be conducted with the least amount of impact on wildlife, including appropriate protocols such as waste disposal.
ADFG/DWC/REFUGES	Chapter 3 Affected Environment	Section 3.23 - Wildlife Values		Surveys conducted for identification of bears along coastal sedge flats and salmon streams may not have been sufficient to accurately capture brown bear use of area sedge flats and salmon streams. Particularly in the Amakdedori port area. Brown bear use of the Amakdedori Port site may be much higher than indicated considering use in the adjoining area, previous ADF&G observations and the number of den sites that were found adjoining the port site. While the sedge flat surveys were conducted in May and July, brown bear use of coastal sedge flats in this area is typically highest in June as sedge species reach peak protein levels. And run timing of salmon resources in Amakdedori Creek suggest that sockeye run timing (and thus brown bear use) is likely highest during the last half of July, while surveys were done on 14-15 July 2018.	Additional surveys conducted at peak times (e.g. June surveys of sedge flats, late July surveys of Amakdedori Creek) may more thoroughly capture brown bear use of the project area, particularly the Amakdedori port component. Use of existing data and limitations of the data should be included in the text when describing brown bear use of the area.
ADFG/DWC/REFUGES	Chapter 4 Environmental Consequences	Section 4.5 - recreation Section 4.23 - wildlife values	4.5-4	Suggest " may require more data"	Although there are ADF&G regulations regarding the harvest of fish and wildlife in the project area, the department supports the appropriate use of company operational authority to manage and restrict employee and contractor activities regarding fishing, hunting, and trapping in the project area. It is recommended that the project managers also 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 proposed project

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ADFG/DWC/REFUGES	Chapter 4 Environmental Consequences	Section 4.23 - Wildlife Values	4.23-5	Issues with the following text- "A temporary threshold shift in hearing can last from seconds to days depending on the intensity and duration of the noise, with the shift occurring from approximately 93 dBA to 110 dBA for continuous noise. The ability of a bird's call to be heard can be masked by noise at a variety of levels above the ambient dBA (Dooling and Popper 2007). Therefore, understanding the level of noise produced by various project components is necessary to determine buffer thresholds to avoid physical damage to birds' hearing."	This sentence and reference regarding bird call masking appears to be out of place in this discussion of avian hearing loss. The impacts from project noise masking bird calls does need to be included in analysis but this reference and further discussion on the impacts of masking calls may be better in the next paragraph. Suggest revising text accordingly.
ADFG/DWC/REFUGES	Chapter 2 Alternatives	Figure 2-28	2-62	Amakdedori port airstrip is now noted as a permanent airstrip in text, but still labeled temporary on drawings.	The project purpose and need, project plans and impact analysis may need to be updated to describe the need and additional impacts for a permanent airstrip, as opposed to the impact minimization of a temporary airstrip.
ADFG/DWC/REFUGES	Chapter 3 - Affected Environment	Section 3.5.1.1 State Lands	3.5-1	Following discussion of bear viewing activities in McNeil River SGS and SGR text notes: "The McNeil River State Game Refuge and Sanctuary were established for the purpose of preserving wildlife habitats and unique brown bear concentrations. "	Update text and analysis. This statement only points to one of the statutory purposes of the sanctuary and refuge. The Sanctuary was, among other things, primarily established to provide permanent protection to brown bear and their habitat, manage human uses consistent with that goal, and to maintain the unique bear viewing opportunities in the sanctuary and provide for viewing opportunities in the refuge.
ADFG/DWC/REFUGES	Chapter 3 Affected Environment	Section 3.5.2.1 Recreational Opportunities	3.5-10	Following discussion of bear viewing activities in McNeil River SGS and SGR text notes:" McNeil State Game Refuge and Sanctuary was designated a wildlife sanctuary in 1967 to protect the world's largest concentration of wild brown bears".	Update text and analysis. This statement only points to one of the statutory purposes of the sanctuary and refuge. The Sanctuary was, among other things, primarily established to provide permanent protection to brown bear and their habitat, manage human uses consistent with that goal, and to maintain the unique bear viewing opportunities in the sanctuary and provide for viewing opportunities in the refuge.
ADFG/DWC/REFUGES	Chapter 3 Affected Environment	Section 3.5.2.1 Recreational Opportunities	3.5-8	Analysis of recreation impacts from transportation corridor appears flawed or incomplete. In discussion of recreational impacts to hunting, fishing and other recreational activities the analysis concludes that "...effect would be long-term and certain..." and "Magnitude of impacts would be medium due to the limited amount of truck traffic and number of recreationalists impacted."	Suggest revising and completing the analysis. If impact increases, mitigation measures should be employed.
ADFG/DWC/REFUGES	Chapter 3 Affected Environment	Section 3.23 - Wildlife Values		Suggested revision of the following text "...which included all of Iliamna Lake (which overlaps with the transportation and natural gas pipeline corridors)."	Revise text description "...which included all of Iliamna Lake (which overlaps a portion of with the transportation and natural gas pipeline corridors)."

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ADFG/DWC/REFUGES	Chapter 3 Affected Environment	Section 3.23 - Wildlife Values	3.23 - 19 and Figure 3.23 - 12	<p>"...Brown bear density estimates from the bear population survey in May 2009 ranged from 47.7 to 58.3 brown bears per 386 square miles (Becker 2010)."</p> <p>"...estimated that in GMU 9A, the brown bear density was 150 bears per 386 square miles..."</p> <p>Several dens were found from Gibraltar Lake west to Iliamna Lake, and the remaining were clustered near Cook Inlet north of Amakdedori Creek (Figure 3.23-12). Surveys documented a concentration of brown bear dens on each side of the port access road and around Amakdedori port (Figure 3.23-12). Several of the dens were close to the port access road, with the closest approximately 300 feet north of the road (ABR 2018p). Results indicated that bear dens were located at lower elevations, steeper slopes, higher topographic positional indices, higher ruggedness, more north and west-facing aspects, and more often in shrubs (ABR 2018p). This indicates that bears in the Iliamna area are more likely to den in shrubby areas with steep slopes. A model was created to estimate density using the relative probability of detecting a bear den based on resource selection function analysis. The model predicted that the 151-square-mile survey area had an estimated density of 164 dens per 386 square miles (ABR 2018p).</p>	<p>Recommend more conclusive research on bear use be conducted and complete the section. The environmental consequences section on brown bear notes significant bear den resources in the southern road corridor and Amakdedori Port area. As well as high densities of brown bear. It also makes note of bear use on streams and the coast in these areas from the available surveys. Yet the section does not include or make any conclusionary statements regarding the magnitude, duration or extent of these impacts to brown bear. Based on the population and den density calculations there is a considerable disparity between the number of dens which are calculated at 1-3 times the bear population estimates (depending on which pop estimate is used) for the area. Regardless of any survey or modelling issues, given what is presented, it is apparent that the road corridor goes through high quality denning habitat and may need to be relocated</p>

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Independent Expert Engineering Investigation and Review Panel, Report on Mount Polley Tailings Storage Facility Breach, Independent Expert Engineering Investigation and Review Panel, Province of British Columbia, January 30, 2015</p> <p>Federal Register/Vol. 76, No. 69/Monday, April 11, 2011/Rules and Regulations</p> <p>Forney, K. A., B. L. Southall, E. Slooten, S. Dawson, A. J. Read, R. W. Baird, and R. L. Brownell, Jr. 2017. Nowhere to go: noise impact assessments for marine mammal populations with high site fidelity. <i>Endangered species research</i> 32:391-413.</p> <p>Fritz, Lowell; Sweeney, Kathryn; Towell, Rod; Gelatt, Tom (2015). Steller sea lion haulout and rookery locations in the United States for 2016-05-14 (NCEI Accession 0129877). [indicate subset used]. NOAA National Centers for Environmental Information. Dataset. https://doi.org/10.7289/v58c9t7v. Accessed April 21, 2019.</p> <p>Garshelis, David L., and Judith A. 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**Pebble Project: DEIS Review
State of Alaska Consolidated Comments Table**

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ADF&G- Subsistence	Pebble DEIS	Chapter 4: Environmental Consequences, Table 4.4-1: Summary of Key Issues for Environmental Justice, Alternative 1 and Variants,	Page 4.4-14 and 4.4-15	Table states that access impacts are not “high or adverse because of access to alternate subsistence resource harvest areas.” It is unclear what additional resources (fuel, time, transportation modes, personnel) would be needed for a subsistence user to go elsewhere to harvest. In the same section, under Alternatives 2 and 3 and their variances, “the transportation corridor and ferry would cause more disruption of access to subsistence resource areas for residents...” calls to question the degree to which subsistence users would experience new hurdles to hunting, fishing and gathering.	Conducting comprehensive surveys (as described in the accompanying general comments) would provide additional clarity in determining the extent of potential impacts on subsistence related transportation.
ADF&G- Subsistence	Pebble DEIS	General Comment	General Comment	Under Section 4.9 Subsistence, the Pebble Project DEIS states, “The magnitude of impact from the project depends on the past and current level of subsistence use that would be impacted, the extent to which opportunities to harvest and experiences are altered, as well as the ability of subsistence users to relocate to another area with similar harvest opportunities and experiences.” Data cited throughout the DEIS, including Section K 3.9- Subsistence, are from 2004 and 2005. It is likely that changes in subsistence activities have occurred over the past fourteen to fifteen years (see ADF&G Division of Subsistence Technical Paper No. 302, available online at www.adfg.alaska.gov/techpap/tp302.pdf). Current comprehensive subsistence household harvest surveys addressing subsistence uses are needed for the communities of Nondalton, Port Alsworth, Iliamna, Newhalen, Pedro Bay, Igiugig and Kokhanok, at a minimum. The subsistence communities of Seldovia, Port Graham, and Nanwalek may be affected by shipping traffic through their use of Cook Inlet for shellfish and marine mammal harvest. Conducting comprehensive surveys for these communities prior to any planned development and then periodically throughout the life of the proposed Pebble Project is strongly recommended to document change over time and assess how subsistence users are impacted.	Additional subsistence uses research is needed on comprehensive subsistence harvest survey data used to inform plan as proposed

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ADF&G- Subsistence	Pebble DEIS	General Comment	General Comment	<p>While more recent research was done in 2016 and 2018, it was focused on Iliamna Lake seal ecology and the Mulchatna Caribou Herd (MCH), respectively. These studies lack the extensive data derived from comprehensive subsistence harvest surveys. Additionally, in the abstract of ADF&G Division of Subsistence Technical Paper No. 416 Integrating Local Traditional Knowledge and Subsistence Use Patterns with Aerial Surveys to Improve Scientific and Local Understanding of the Iliamna Lake Seals, (available online at www.adfg.alaska.gov/techpap/TP%20416.pdf) reports that interviews with local residents were concerned about the management of the seal population in the lake and advocated for additional research. It is unclear from the Pebble Project DEIS what impacts the various activities would have, especially the ice breaker, ferry ports, and route may have on the Iliamna Lake seal population and related subsistence uses. As found in ADF&G Division of Subsistence Technical Paper No. 441, the annual pattern of the MCH's scattered and concentrated areas and related subsistence hunting areas include the proposed Pebble Project area. Impacts of the proposed project on the caribou herd, fall, winter and spring subsistence hunting, and subsistence uses require additional study (available online at www.adfg.alaska.gov/techpap/TP441.pdf) . Caribou movements may also experience impacts that will require additional study, especially since the MCH travels over ice across Lake Iliamna.</p>	Additional subsistence uses research is needed on comprehensive subsistence harvest survey data used to inform plan as proposed
ADF&G- Subsistence	Pebble DEIS	General Comment	General Comment	<p>While biological research is not the purview of the ADF&G Division of Subsistence, given the extensive list of fish, game, and vegetation used by local residents for subsistence that may be impacted by the project, it is recommend that this proposed project include additional research to provide baseline and longitudinal study on species identified in the DEIS and by the ADF&G Divisions of Wildlife Conservation, Sport Fish, and Commercial Fisheries, in addition to vegetative studies by the State of Alaska Department of Natural Resources or another entity on plants gathered for subsistence. For example, the DEIS reports that ferry-caused seal strikes will "not have a population level effect." Given the small population of Lake Iliamna seals, their use of Seal Island II and the coastline surrounding Kokhanok, the concerns by local subsistence users mentioned above may need further research. Another example from the DEIS, "Subsistence users also may avoid harvesting waterfowl because of concerns about birds becoming contaminated from landing on and using open water at mine site facilities", illuminates the need to study waterfowl health in the area over time.</p>	

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ADF&G- Subsistence	Pebble DEIS	General Comment	General Comment	Key Issues for Subsistence, as outlined under the DEIS Section 4.9- Subsistence, identifies issues without identifying possible mitigation and makes assumptions that may need further consideration. For example, under 4.9.2.3 Changes in Competition for Resources, the DEIS does not fully address the potential increase of non-local Alaska state residents gaining access to hunting and fishing in the area, with a potential increase on pressure on fish and game populations in the area. Page 4.9-8 of this section states that Pebble Project employees will not have access to hunting and fishing and that non-resident sport hunting would be prohibited. It is unclear how Pebble Limited Partnership will ensure that personnel and contractors will follow the guidelines regarding no off-duty hunting and fishing, and what legal vehicles exist to enforce these guidelines. Additionally, the DEIS states that competition for subsistence resources would decrease after closure because of a reduction of non-local employees in the area, however this is a confusing conclusion given that the guideline regarding no off-duty hunting and fishing from project personnel and contractors should have been in place. There is also potential that the increased access created by the project may increase resource competition over time by non-local resident hunters.	
ADF&G- Subsistence	Pebble DEIS	General Comment	General Comment	In 2006, research found that subsistence users have reported increased hunting competition and pressure on the Mulchatna Caribou Herd (Technical Paper No. 302); this may be further impacted with the building and operation of the project. Additionally, caribou migration patterns are influenced by changes in the overall size of the herd (Technical Paper No. 441); this may impact hunting pressure on the herd and the ability of subsistence users to have success in harvesting Mulchatna caribou.	
ADF&G- Subsistence	Pebble DEIS	General Comment	General Comment	Throughout the subsistence-related sections of the DEIS, there are statements that need additional clarification and data, including potential and or perceived impacts on waterfowl or the idea that subsistence hunters can easily hunt elsewhere if wildlife is impacted. Additionally, it is unclear how this project will impact subsistence uses over the long term. The DEIS questions the balance between time spent engaging in subsistence activities, including the teaching of the next generation, and time spent working at the Pebble Project for those who are hired long term. Additional longitudinal research is needed to fully understand the impacts and mitigation strategies of the project on Alaska's subsistence users and subsistence uses of the resources in the area.	

Pebble Project: DEIS Review
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Department/ Division/Section	Document Name	Section/Fig. /Table	Page #	Comment/Issue	Recommendation/Action
DEC/ Commissioner's Office	Draft EIS Executive Summary	Acronyms		ADEC and ADNR do not appear on the list of acronyms	ADEC and ADNR should be added to the acronym list
DEC/ Division of Water, Wastewater Discharge Authorization Program	Draft EIS Executive Summary	1.1	1	Paragraph one on this page discusses the Corp of Engineer's regulatory authority on this project. The paragraph fails to mention a key State authority that must be met. The proposed activity authorized by a Corp 404 permit may result in discharge of pollutants to waters of the U.S. located in the State of Alaska and a state issued water quality certification required under Section 401 of the Clean Water Act. Any conditions imposed by the State of Alaska become conditions of the federal permit. The Corp's 404 permit does not become effective until the state issued water quality certification is finalized.	This important regulatory requirement needs to be mentioned in the executive summary. The antidegradation analysis should be included as the Corp of Engineers analyzes a range of alternatives to ensure that a wide range of management options are considered, consistent with applicable law.
DEC/ Spill Prevention and Response Division	Draft EIS Executive Summary	2	5	NEPA regulations at Title 40, Chapter 5, Part 1502.14 dealing with Alternatives states that "this section is the heart of the environmental impact statement. Based on the information and analysis presented in the sections of the Affected Environment (§1502.15) and the Environmental Consequences (§1502.16), it should present the environmental impacts of the proposal and the alternatives in comparative form, thus sharply defining the issues and providing a clear basis for choice among options by the decisionmakers and the public." This reviewer could not find a clear, concise comparison of the primary and alternative development options that sharply defines the issues or provides a clear basis for choice among options as dictated by law. This section would be clearer if you provided clear citations to Chapter 2, Alternatives and Appendix B, Alternatives Development Process. Otherwise the reader does not know where to find additional details.	Revise paragraph two on the this page to provide a citation to Chapter 2 and Appendix B.
DEC/ Division of Water, Wastewater Discharge Authorization Program	Draft EIS Executive Summary	3.3.1.2: General Comment		Section 3.3.1.2 in the Executive Summary indicates that there is a potential conflict with the pipeline HDD project near Anchor Point. Please note that under AKG315200 - Oil and Gas Exploration, Development, and Production in State Waters in Cook Inlet General Permit the discharge cannot "preclude or limit established processing activities or commercial, sport, personal use, or subsistence fish and shellfish harvesting" as noted in the regulations at 18 AAC 70.250(b)(3), approved by the EPA in 2003.	Revise paragraph two on the this page to provide a citation to Chapter 2 and Appendix B.
DEC/ Commissioner's Office	Draft EIS Executive Summary	3.2.1.3	37	This section purports to cover water and sediment quality. Groundwater and sediment samples are discussed, but there is no discussion of surface water samples.	Please include a discussion of surface water samples.

Department/ Division/Section	Document Name	Section/Fig. /Table	Page #	Comment/Issue	Recommendation/Action
DEC/ Commissioner's Office	Draft EIS Executive Summary	3.2.2.3	43	Paragraph one on this page includes a discussion of temperature effects. It discusses the amount of change, but does not provide the actual temperatures anticipated to occur, or discuss whether temperatures will exceed regulatory standards or exceed site-specific requirements needed to preserve normal species diversity or prevent the appearance of nuisance organisms as required by ADEC regulations at 18 AAC 70.020(b)(10).	Please provide the range of temperatures that are anticipated to occur or provide a citation to Chapter 3, Section 3.20 and Chapter 4 where the information can be found in the EIS document. Please discuss whether temperature effects will exceed regulatory standards.
DEC/ Commissioner's Office	Draft EIS Executive Summary	3.2.2.3	44	Paragraph three and four on this page notes that "The Pebble Mine expanded development project would impact approximately three times the area proposed under Action Alternative 1, with an expansion into the UTC watershed that Action Alternative 1 generally minimizes. The magnitude of cumulative impacts to water and sediment quality would generally be increased discharges of treated effluent that would be expected to meet permit limits, but the duration of effects would be increased to approximately 98 years." There are other discussions on pages 31, 33 and other pages regarding the "expanded development scenario", but no explanation of how and why it is being discussed as a reasonably foreseeable future action, but not being discussed as an alternative.	It is not clear why the "expanded development project" or "expanded development scenario" is included in this discussion. There do not appear to be detailed discussion of the expanded scenario in Chapter 2, Alternatives or K2.0 Alternatives. Please cite to Chapter 3 discussions of cumulative effects, so the reader can understand the details better.
DEC/Water Division, Wastewater Discharge Authorization Program	Draft EIS Executive Summary	3.4.2	64	Action Alternative 2 and Variants states "Fragmentation would indirectly impact 462 acres of wetlands and other waters..." It is unclear why fragmentation is discussed for this option but not for other options.	Review the document and add fragmentation to the other alternatives as roads, etc. would create fragmentation and should be discussed in all alternatives.
DEC/ Commissioner's Office	Draft EIS Executive Summary	3.5.2	66	Paragraph four in this section notes that " <i>Based on the historical data, as well as these design and operational features, spills of diesel, concentrate, and reagents from the proposed ferry were determined to be so improbable as to have negligible risk, and were therefore eliminated as scenarios for impact analysis in the EIS.</i> " There is no reference to a screening report or a citation to where this information can be found. There did not appear to be a discussion of this scenario in Appendix B: Alternatives Development.	Provide additional details on alternatives screening or provide a citation to where that information can be found in the EIS document. Low probability, high consequence spills should be discussed.
DEC/ Spill Prevention and Response Division	Draft EIS Executive Summary	3.5.3	67	The "Road Corridor Diesel Spill" and "Marine Diesel Spill" scenarios discussed on this page do not provide information on the proposed volume of diesel spilled. The executive summary should provide sufficient information for the reader to gain a complete understanding of the issues addressed in the body of the EIS. This information is lacking.	Please add information on the volume of diesel spilled to this page or refer the reader to page 66 of the executive summary.

Department/ Division/Section	Document Name	Section/Fig. /Table	Page #	Comment/Issue	Recommendation/Action
DEC/ Spill Prevention and Response Division	Draft EIS Executive Summary	3.5.4	68	Paragraph one in this section notes that " <i>Impacts from a potential release of natural gas from the proposed pipeline would be limited to short-term air quality degradation and limited release of greenhouse gases (GHG).</i> " This statement appears to conflict with information released in March 2017 by the federal Pipeline and Hazardous Materials Safety Administration (PHMSA) regarding Hilcorp's natural gas pipeline leak, which noted that their leaking pipeline posed a risk to public safety, property or the environment.	In PHMSA's March 2017 letter they noted concerns from the National Marine Fisheries Service (NMFS) regarding the potential effects of the natural gas discharge on marine mammals, including the critically endangered Cook Inlet beluga whales. Please explain why these impacts were not discussed or why the proposed natural gas pipeline would not be subject to leaks such as those experienced by Hilcorp.
DEC/ Spill Prevention and Response Division	Draft EIS Executive Summary	3.5.5	68	Paragraph two in this section discusses two different hypothetical scenarios for a gold-copper concentrate release, one due to a truck rollover and another due to a spill of concentrate slurry from a concentrate pipeline. The final paragraphs on this page discuss the impacts from a spill of concentrate into flowing water, but it is not clear whether the spill being discussed is from the truck rollover or the pipeline slurry spill. The impacts discussed on the following page is predicated on a specific scenario, so it is important to clarify this information.	Please explain which spill scenario is being described when a spill of concentrate is released into flowing water.
DEC/ Spill Prevention and Response Division	Draft EIS Executive Summary	3.5.6	69	Paragraph one in this section notes that " <i>Any spill of chemical reagents would therefore likely be contained, and not released to the environment, so that full analysis of environmental impacts was determined to be unnecessary in the EIS.</i> " Recent EISs have discussed similar low probability, high consequence spills.	It is not clear what will happen if the likely containment of chemical reagents does not occur. Please address the impacts of chemical reagent spills.
DEC/ Commissioner's Office	Draft EIS Executive Summary	3.5.7	69	Paragraph two in this section discusses the physical impacts of tailings release scenarios. It presumes that spilled tailings are recovered and the small amount of tailings left would be unlikely to have any measurable effect. This conclusion is predicated on the spilled tailings being recovered, but elsewhere in the document the statement is made that tailings would be recovered <u>where practicable</u> . This section does not discuss the impacts when tailings are not fully recovered.	Please provide a discussion of the impacts when tailings are not fully recovered, or provide a citation to Section 4.27.6 where impacts from a tailings release is discussed in greater detail.
DEC/ Commissioner's Office	Chapter 2: Alternatives	2.2.2.3	2-66	Paragraph three on this page notes that a beachhead would be established for access, consisting of a " <i>temporary camp, environmental protection features, the permanent port site airstrip, and service facilities.</i> " It is not clear what environmental protection features are being used at this site.	Please explain what environmental protection features are being constructed at this site or provide a citation to a section of the document where this information is discussed in more detail.
DEC/ Commissioner's Office	Chapter 2: Alternatives	2.2.2.3	2-69	Paragraph one on this page notes that " <i>Incoming supplies such as equipment, reagents, and fuel would be barged to Amakdedori Port, and then transported by truck and ferry to the mine site.</i> " Since this section follows the section describing temporary facilities, it is not clear if these supplies would be barged before or after the port is constructed.	Please clarify if these supplies will be barged before or after the port is constructed.

Department/ Division/Section	Document Name	Section/Fig. /Table	Page #	Comment/Issue	Recommendation/Action
DEC/ Commissioner's Office	Chapter 2: Alternatives	2.2.4.5	2-117	Paragraph four on this page discusses filtered discharges from the concentrate pipeline and notes that " <i>The filtered water would be discharged through an outfall pipe into surrounding marine waters. All discharge water would meet appropriate marine discharge criteria. RFI 066 presents PLP's position that the US Environmental Protection Agency's (EPA's) CWA New Source Performance Standards Effluent Limitation Guidelines do not prohibit the discharge of the concentrate filtrate at the port site.</i> " It is not clear how the statement can be made that "all discharge water would meet appropriate marine discharge criteria" when the sentence that follows appears to say that there may be a question as to whether the discharges meet the appropriate marine discharge criteria.	Please clarify that this discharge would require an APDES permit and must meet Alaska's water quality standards. It is not clear from the statement made if the proposed discharges meet the applicable marine discharge criteria or if this issue remains undecided.
DEC/ Commissioner's Office	Appendix K: Section 4.10 Health and Safety		K4.10-26	Paragraph one, bullet three on this page discusses mitigation measures that would be used to control dust generation at the mine site and along the transportation corridor. It further notes that "PLP has committed to development of a fugitive dust control plan (FDCP) for mitigation and control of project activity related fugitive dust and wind erosion." It is unclear how a commitment by the project applicant to develop a fugitive dust control plan may be considered mitigation for purposes of the 404 permit or NEPA analysis. According to Forty Most Asked Questions Concerning CEQ's NEPA Regulations #19b, "The probability of the mitigation measures being implemented must also be discussed, to ensure that the environmental effects of the proposed action are fairly assessed." .	Please consider providing a written fugitive dust plan so that the reader and decision makers will understand the details.
DEC/ Commissioner's Office	Appendix K: Section 4.10 Health and Safety		K4.10-27	Paragraph three on this page discusses deposition of hazardous air pollutant metals onto soil. Paragraph four proposes that estimated concentrations of arsenic in the future would be expected to have negligible cancer risk and hazard compared to baseline conditions (increased concentration in the future would be indistinguishable from the cancer and noncancer risk associated with the baseline concentration). The paragraph further cites to the fact that the natural occurrence of elevated arsenic concentrations in soils is acknowledged in ADEC Technical Memorandum, Arsenic in Soil, dated March 2009. The citation of this memorandum may be misleading, since that memorandum has been superseded by an August 2018 technical memorandum " <i>Guidance on Evaluating Naturally Occurring Metals at Contaminated Sites</i> ". This 2018 memorandum specifically differentiates between naturally occurring arsenic and arsenic from anthropogenic sources.	The discussion should make it clear that if arsenic from anthropogenic sources exists, then sampling is required and those results need to be compared with the screening level and if the concentrations exceed the background level, those concentrations must be included in a cumulative risk evaluation. Please update the reference to delete the 2009 memo and replace it with the August 2018 technical memorandum.
DEC/ Commissioner's Office	Appendix K: Section 4.10 Health and Safety		K4.10-29	Paragraph four on this page discusses transportation corridor minor releases to surface waterbodies, according to the heading, but only appears to discuss freshwater sediment contamination and marine sediment contamination. Impacts to the waterbodies themselves is not discussed.	Please discuss the impacts to freshwater and marine waterbodies due to minor releases from the transportation corridor or change the heading.

Department/ Division/Section	Document Name	Section/Fig. /Table	Page #	Comment/Issue	Recommendation/Action
DEC/ Commissioner's Office	Appendix K: Section 4.10 Health and Safety		K4.10-30	Paragraph two on this page discusses the estimated sediment HAP concentrations at the end of the mine site operations. Similar to the discussion on page K4.10-27 this discussion proposes that the estimated concentrations of arsenic at the end of the mine life would not be expected to impact the health of the affected communities through direct exposure relative to the baseline conditions. This discussion appears to oversimplify the determination.	The discussion should make it clear that if arsenic from anthropogenic sources exists, then sampling is required and those results need to be compared with the screening level and if the concentrations exceed the background level, those concentrations must be included in a cumulative risk evaluation.
DEC/ Commissioner's Office	Appendix K: Section 4.10 Health and Safety		K4.10-30 thru 31	Paragraph four on this page and the next page discuss mine site fugitive dust deposition to groundwater. The first paragraph on page 31 notes "The closest potentially affected communities to the mine site are Iliamna, Newhalen, and Nondalton, each of which is approximately 17 miles away." It is not clear how mine site fugitive dust will impact existing drinking water protection areas. See http://dec.alaska.gov/eh/dw/dwp/protection-areas-map/	Please explain how mine site fugitive dust will impact existing drinking water protection areas and that health based standards will be met.
DEC/ Commissioner's Office	Appendix K: Section 4.10 Health and Safety	Table K4.10- 8	K4.10-37	The table on this page has a column titled "Impact Rating" and each entry has one or two diamonds, but no explanation of what the diamonds mean.	Please explain the meaning of the diamonds on this table by providing a footnote that refers the reader to Table K4.10-2 on page K4.10-3
DEC/ Commissioner's Office	Appendix K: Section 4.10 Health and Safety	Table K4.10- 9	K4.10-41	The table on this page has a column titled "Impact Rating" and each entry has one or two diamonds, but no explanation of what the diamonds mean.	Please explain the meaning of the diamonds on this table by providing a footnote that refers the reader to Table K4.10-2 on page K4.10-3
DEC/ Commissioner's Office	Appendix K: Section 4.10 Health and Safety	Table K4.10- 10	K4.10-45	The table on this page has a column titled "Impact Rating" and each entry has one or two diamonds, but no explanation of what the diamonds mean.	Please explain the meaning of the diamonds on this table by providing a footnote that refers the reader to Table K4.10-2 on page K4.10-3
DEC/ Commissioner's Office	Appendix K: Section 4.10 Health and Safety	Table K4.10- 11	K4.10-47	The table on this page has a column titled "Impact Rating" and each entry has one or two diamonds, but no explanation of what the diamonds mean.	Please explain the meaning of the diamonds on this table by providing a footnote that refers the reader to Table K4.10-2 on page K4.10-3
DEC/ Commissioner's Office	Appendix K: Section 4.10 Health and Safety	Table K4.10- 12	K4.10-50	The table on this page has a column titled "Impact Rating" and each entry has one or two diamonds, but no explanation of what the diamonds mean.	Please explain the meaning of the diamonds on this table by providing a footnote that refers the reader to Table K4.10-2 on page K4.10-3
DEC/ Commissioner's Office	Appendix K: Section 4.10 Health and Safety	Table K4.10- 13	K4.10-53	The table on this page has a column titled "Impact Rating" and each entry has one or two diamonds, but no explanation of what the diamonds mean.	Please explain the meaning of the diamonds on this table by providing a footnote that refers the reader to Table K4.10-2 on page K4.10-3
DEC/ Commissioner's Office	Appendix K: Section 4.10 Health and Safety	Table K4.10- 14	K4.10-56	The table on this page has a column titled "Impact Rating" and each entry has one or two diamonds, but no explanation of what the diamonds mean.	Please explain the meaning of the diamonds on this table by providing a footnote that refers the reader to Table K4.10-2 on page K4.10-3

Department/ Division/Section	Document Name	Section/Fig. /Table	Page #	Comment/Issue	Recommendation/Action
DEC/ Division of Water, Wastewater Discharge Authorization Program	Chapter 3: Affected Environment	General		Please note that inadvertent releases of drilling fluids and cuttings associated with horizontal directional drilling (HDD) under streams wetlands, and lakes can impact fish habitat. It is not clear whether HDD stream crossings will impact fish habitat. The public and decision makers need to be able to evaluate the potential impacts of pipeline crossings.	The department recommends identifying all HDD locations and evaluating whether fish habitat could be impacted, so the EIS note the limitations on pipeline routings.
DEC/ Division of Water, Wastewater Discharge Authorization Program	Chapter 3: Affected Environment	General		The department's Statewide Oil and Gas Pipeline General Permit does not cover discharges to marine water for horizontal directional drilling (HDD). The department is currently in the process of reissuing General Permit AKG315200 - Oil and Gas Exploration, Development and Production in State Waters in Cook Inlet that includes discharges from HDD boreholes into marine waters of Cook Inlet.	The DEIS should be updated as a appropriate to include this information, as it is critical to the 404 permit.
DEC/ Division of Water, Water Quality Standards	Chapter 3: Affected Environment	3.17	3.17-8	Placement of the TSF seepage collection point on top of a gravel/gravelly sand matrix rather than atop a clay/mud layer is problematic as there is noted potential for seepage and groundwater intrusion due to liner failure (see 4.16). It seems that seepage will be harder to determine and monitor for under this scenario, rather than having a semi-permeable layer below the TSF and then monitoring for lateral flow.	Please include additional information regarding how the collection pond location was determined, how natural geology/ geomorphology was incorporated into the design, and additional information on the number and location of monitoring wells or other monitoring that will be used to ensure that all seepage would be captured.
DEC/ Division of Water, Water Quality Standards	Chapter 3: Affected Environment	3.18.1.2	3.18-8	Paragraph two on this page states that 34% of all surface water samples failed to be in the established water quality standards pH range of 6.5 - 8.5. This could become more problematic with the addition of non-intercepted pit/tailings water or non-point source runoff generated by transportation corridors. It is not clear whether the data being used represents instantaneous results or is a daily mean/max/min value.	Please include additional information regarding how the assessment duration was established. (e.g., instantaneous or daily mean/max/min) of continuous monitoring values.
DEC/ Division of Water, Water Quality Standards	Chapter 3: Affected Environment	3.18	3.18-10	Paragraph three on this page makes multiple references to trace element exceedance, but does not reference whether these are individual grab-sample results or an average of multiple event collection efforts (e.g. 4-day average), chronic or acute exceedances, how the exceedance was determined (e.g., methodology) or degree of actual risk to aquatic life.	Please provide additional clarification on which water quality standards are being used (current state standards or recommended federal standards), magnitude, duration, and frequency values for these standards, and how the sample was determined to be meeting or exceeding state criteria.
DEC/ Air Quality Division	Chapter 3: Affected Environment	3.20.1.3	3.20-6	The final paragraph on this page notes that "When comparing the current visibility at either monitoring station to the estimated natural visibility conditions, both the haziest and clearest days are higher than natural background conditions."	Please add data on natural background visibility conditions to Table 3.20-3.
DEC/ Air Quality Division	Chapter 3: Affected Environment	3.20.1.3	3.20-7	This pages notes that "The effects of acidification through sulfur deposition are not prevalent in Alaska due to lack of sources; and as a result, nitrogen is often the main contributor of acidification in Alaska, if it occurs." This statement may conflict with the levels for wet deposition in Table 3.20-4. Referencing appropriate data to support this statement would be informative.	Please explain. This could be address by adding the natural background concentrations to the documents, as noted above.

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DEC/ Air Quality Division	Chapter 3: Affected Environment	3.20.1.3	3.20-7	Paragraph three on this page notes that "However, given that both SO2 and NOX emissions contribute to both visibility impairment and deposition, and knowing that visibility degradation in Denali National Park is slightly worse than Tuxedni, it is expected that deposition measurements in Denali National Park are conservatively representative of Tuxedni and the analysis area." This statement is questionable due to the lack of a defined fugitive dust control plan.	If fugitive dust control will be considered a mitigation measure, please provide a written plan, including information regarding which agency would be responsible for compliance and enforcement.
DEC/ Air Quality Division	Chapter 4: Environmental Consequences	4.4.2.3	4.4-8	Paragraph three, bullet one on this page discusses Air Exposure Pathways. The final sentence in bullet one states " <i>In addition, with implementation of dust mitigation measures, the potential localized and near-field air quality fugitive dust impacts from the project would be further reduced.</i> " As discussed above, the promise of creating a fugitive plan does not provide mitigation of impacts, so it is not clear how this statement can be true.	If fugitive dust control will be considered a mitigation measure, please provide a written plan, including information regarding which agency would be responsible for compliance and enforcement.
DEC/ Air Quality Division	Chapter 4: Environmental Consequences	4.4.2.3	4.4-9	Paragraphs three and four on this page discuss water exposure pathways. Paragraph four discusses the potential impact to community drinking water wells north of the mine site. There is no discussion of impacts to drinking water protection areas. http://dec.alaska.gov/eh/dw/dwp/protection-areas-map/	Please include a discussion of impacts to drinking water protection areas, not just existing wells.
DEC/ Air Quality Division	Chapter 4: Environmental Consequences	4.9.2.1	4.9-3	Paragraph three on this page discusses the impact of fugitive dust in the roadway corridor and notes that " <i>implementation of dust suppression and enforcement of slow speed limits at all stream crossings would minimize dust-related impacts to aquatic ecosystems.</i> " It is not clear from this discussion which agency would be responsible for dust suppression and enforcement of slow speed limits at all stream crossings.	Please discuss compliance and enforcement of fugitive dust suppression and speed limits in order for the reader to understand how this could be considered a mitigation measure that would minimize impacts.
DEC/ Commissioner's Office	Chapter 4: Environmental Consequences	4.9.2.1	4.9-4	Paragraph two on this page notes that " <i>The pit lake at the mine site would fill during the decades after mine closure. This would introduce a new standing waterbody, and concern about contamination of waterfowl was expressed during scoping. While there would be exceedances of water quality standards for specific metals, during closure, exposure of wildlife and birds from potential contaminant exposure would be limited and short-term.</i> " This conclusion appears to be supported by statements that the pit lake would not support habitat that is attractive to many species of waterfowl and shorebird. This appears to conflict with historical bird deaths at the Berkeley Pit in Butte, Montana. That pit would be considered similar to the pit in questions, but apparently was attractive to the waterfowl in question, resulting in injury and death.	Please provide additional information that would support the conclusion that the pit lake would not be attractive to waterfowl and that the potential contaminant exposure would be limited and short-term.

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DEC/ Commissioner's Office	Chapter 4: Environmental Consequences	4.10.7.2	4.10-14	Paragraph five on this page proposes that direct exposure of the affected communities to hazardous materials may not be noticeably altered by the expansion scenario as long as the cumulative magnitude of all emissions and releases to air, soil and water continue to be less than the appropriate screening levels for human health. It further notes that " <i>It would be expected that mitigation measures would be used to minimize or mitigate exposure.</i> " Both of these conclusions are predicated on future actions. As noted earlier with the fugitive dust plan, more detail must be provided to support these conclusions or provide a citation to where the information is available.	Please provide additional information that would support the conclusion that cumulative emissions and releases would be less than the appropriate screening levels and additional information on actual mitigation measure that will reduce impacts, not promises of future mitigation efforts.
DEC/ Commissioner's Office	Chapter 4: Environmental Consequences	4.12.2.3	4.12-7	Paragraph three on this page discusses the environmental hazards (winds and reefs) regarding the use of the Amakdedori Port. It is not clear why this information was not provided in the section describing lightering for the Amakdedori Port, since these conditions would impact the safety of the lightering operations and the risk of spills.	Please add the information on winds and reefs in this paragraph to the discussion of lightering in Chapter 2, Section 2.2.2.3.
DEC/Spill Prevention and Response Division	Chapter 4: Environmental Consequences	4.15.2.3	4.15-11	Second sentence states " <i>The port would be designed to an appropriate seismic design code (Knight Piesold, 2013).</i> " The referenced report was located and reviewed. Please note that this report is still in DRAFT form even though the report later states the " <i>revised seismic hazard maps for Alaska have been published more recently by the USGS (Wesson et al., 2007)</i> "; and " <i>the peak ground accelerations presented in this report for the probabilistic hazard analysis have not been revised to account for the recent revision.</i> "	Please update the basis for risk analysis pertaining to earthquakes using current information (updated in 2015).
DEC/ Division of Water, Water Quality Standards	Chapter 4: Environmental Consequences	4.16	4.16-8	General comment: The text on this page notes that the water balance predictions are subject to "significant uncertainty" and this makes it likely that the wastewater treatment plant could have to discharge more water than anticipated in the groundwater modeling. This has the potential to eliminate much of the natural variability present in the current system and potentially affect the biota present. Alaska regulations at 18 AAC 70.020 requires consideration of the impact on growth and propagation of fish, shellfish, other aquatic life, and wildlife.	Please provide additional information pertaining to natural variability in the flow regime and the potential consequences if variability is removed from the system due to production needs and storage capacity, including the effect on aquatic life.
DEC/ Division of Water, Water Quality Standards	Chapter 4: Environmental Consequences	4.16	4.16-9	General comment: The discussion of streamflow does not provide flow information to compare with water quality data (e.g., sample results during low/high streamflow conditions), which makes it difficult to determine what the critical conditions for aquatic life may be. Alaska regulations at 18 AAC 70.020 requires consideration of the impact on growth and propagation of fish, shellfish, other aquatic life, and wildlife.	Please provide additional information on the relationship between water sample results/stream flow/seasonal conditions.

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DEC/ Division of Water, Water Quality Standards	Chapter 4: Environmental Consequences	4.18.3.1	4.18-4	Paragraph one on this page mentions that " <i>Some or all of the stormwater discharges may require authorization from the Alaska Department of Environmental Conservation (ADEC) under the Alaska Pollutant Discharge Elimination System (APDES) Mine Site General Permit for stormwater.</i> The is the incorrect name for the permit. Please note that it appears correctly on page 4.18-7	Please refer to the Multi-Sector General Permit for Stormwater Discharges Associated with Industrial Activity, Permit Number AKR06000.
DEC/ Division of Water, Water Quality Standards	Chapter 4: Environmental Consequences	4.18.3.1	4.18-4	Paragraph two on this page discusses Water Treatment during Operations. The text notes that supplemental heating could be necessary during cooler periods to achieve minimum temperature levels for biological selenium removal to be effective. It is not clear how it will affect the temperature of the discharge or if the supplemental heating will impact aquatic resources.	Please provide additional information regarding the potential risk to aquatic resources should supplemental heating be required.
DEC/ Division of Water, Water Quality Standards	Chapter 4: Environmental Consequences	4.18.3.1	4.18-4	Discussions on this page specifically notes two water treatment plants (WTP#1 and WTP#2), but there are also references to three water treatment plants on the site plans (North, East, South).	Please revise the text and map(s) to accurately label the three plants and discharge locations, even if these may change based on operator-specific conditions. Provide additional labeling in all figures and clarity in the text regarding the timing of when each will be constructed, key roles in the project, and additional geotechnical information regarding the point of discharge (size, depth, mitigation technology proposed (e.g., diffuser)).
DEC/ Division of Water, Water Quality Standards	Chapter 4: Environmental Consequences	4.18.3.1	4.18-4	Discussions on this page regarding discharges for water treatment plants are unclear. It is unclear where the outfall discharge locations will be for all WTP Discharges (North, East, and South). Of particular concern is the discharge for WTP Discharge South, as it appears to be discharging either into Frying Plan Lake or very near to it.	Please provide additional clarification as to the discharge locations and the potential receiving waters that might be impacted.
DEC/ Division of Water, Water Quality Standards	Chapter 4: Environmental Consequences	4.18.3.1	4.18-4	The discussion at the bottom of this page notes that " <i>Based on an independent review of the WTP source terms and processes (Appendix K4.18; AECOM 2018i), discharge water from both WTPs is currently expected to meet ADEC criteria.</i> " It is further noted in discussions on page 4.18-7 that " <i>For constituents that exceed criteria in background surface water and groundwater (see Section 3.18, Water and Sediment Quality, and Appendix K3.18), there are currently no plans to incorporate site-specific background levels of constituents into discharge limits (ADEC 2018-RFI 064a).</i> " Such statements are predicated on the willingness of a potential permittee to meet current water quality standards (WQS) without consideration of those currently recommended by EPA and that the state will be required to adopt, the degree of treatment that would be required to meet state/federal WQS, and the willingness of a permittee to engage in a rulemaking effort to develop site-specific criteria.	Please consider striking or modifying this statement to clarify that a potential permittee may choose to seek site-specific criteria per 18 AAC 70 rather than implement the required water quality treatment technology to meet existing criteria.

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DEC/ Division of Water, Water Quality Standards	Chapter 4: Environmental Consequences	4.18.3.1	4.18-4 and 4.18- 5	The last paragraph on this page notes that " <i>there is some concern that salt and selenium could build up over time in the pyritic TSF, which has the potential to lead to increased total dissolved solids (TDS) concentrations that would require treatment in the main WTP. This may require further investigation as design progresses, and/or a long-term adaptive management strategy.</i> " It is not clear what the salts are comprised of and their anticipated solubilities. It is also not clear how the salts and selenium are going to be prevented from re-mobilizing and entering the system within the pyritic TSF if water quality conditions change.	Please explain what the salts are comprised of and their anticipated solubilities. Please describe how salt and selenium are going to be prevented from re-mobilizing and entering the system within the pyritic TSF if water quality conditions change. Please also outline what would happen at closure when the tailings are re-located and submerged in the main pit. Please consider additional studies (modeling and laboratory testing) to determine the composition of the salts, their corresponding solubilities, and the potential for remobilization within the pyritic TSF, transfer to the open pit at closure, and at final closure when the deposited sub-aqueously into the open pit.
DEC/ Division of Water, Water Quality Standards	Chapter 4: Environmental Consequences	4.18.3.1	4.18-4	General comment: Much of the assessment work conducted appears to be using current state water quality standards rather than those that are required by states to adopt under Clean Water Act Section 304(a). This includes pollutants such as acrolein, aluminum, ammonia, cadmium, carbaryl, copper, diazinon, nonylphenol, selenium, and the majority of pollutants with human health criteria. Use of the criteria other than those recognized by the EPA will not utilize the most recent advances in science behind determining risk to aquatic life. Regardless of Alaska's progress in the adoption process, and EPA's approval of those adopted standards, it would be prudent to anticipate the adoption of the federal standards given the length of time for the NEPA and permitting process. While it is not unusual for a certain amount of time to pass between publication of EPA-updated 304(a) criteria in the federal register and adoption by states, the project should consider the most stringent federally-applicable assessment methodology. In addition, recognition of the federal standards would allow the permittee to accurately determine the degree of treatment that would be required to operate a wastewater treatment plant (WTP) in perpetuity.	Since copper is a 304(a) pollutant, Alaska is expected to adopt its use when deriving water quality criteria for water quality assessments and pollutants prior to issuing discharge permits (EPA 2014 8-3). The EPA's 2007 aquatic life freshwater quality criteria for copper is based on the Biotic Ligand Model (BLM). This BLM is a metal bioavailability model that uses receiving water body characteristics and monitoring data to develop site-specific water quality criteria. Without application of the BLM for copper, the criteria used in this document may under-represent the existing toxicity present and any assimilative capacity that various waters would have if seepage/non-point sources of pollutants were introduced into various waters. Please analyze using the most stringent federal standards and methodology to improve regulatory certainty.
DEC/ Division of Water, Water Quality Standards	Chapter 4: Environmental Consequences	4.18.3.1	4.18-4	General comment: It appears that little to no water quality or habitat data has been provided specific to Frying Pan Lake. Also, the text of the document does not clearly state whether discharge from the southern most wastewater treatment plant (WTP-3?) discharges directly into Frying Pan Lake.	Please provide water quality data specific to Frying Pan Lake and clarify the location of the specific discharge point of the southern most wastewater treatment plant.
DEC/ Commissioner's Office	Chapter 4: Environmental Consequences	4.18.3.1	4.18-8	Paragraph one on this page notes that discharges from the open pit water treatment plant (WTP) is currently subject to an engineering analysis. It should be further noted that in addition to a reclamation and closure plan, this discharge would be subject to an APDES permit.	Please note that the post-closure discharges from the open pit WTP would be subject to an APDES permit.

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DEC/ Division of Water, Water Quality Standards	Chapter 4: Environmental Consequences	4.18.3.1	4.18-10	Paragraph two on this page notes that "A water surplus is anticipated during operations under normal and wetter than normal climactic condition." According to Section 4.16, page 4.16-8 note that "In reviewing the water balance estimates, it should be noted that predictions may be subject to significant uncertainty, due in part to uncertainty associated with the input from the groundwater module.(See Section 4.17, Groundwater Hydrology and Appendix K4.17)." It is not clear how the mine operations will ensure that downstream flow does not experience significant fluctuations (>10%) when groundwater modeling is anticipated to be biased low and that more discharges than currently anticipated will be required. Section 4.16 notes that around 22-28cfs would be lost due to mine operations, but <u>up to 29 cfs</u> would ultimately be available. Those general assertions do not answer the question of whether the downstream flow will experience significant fluctuations.	Please provide additional information pertaining to groundwater/surface water interactions/flow modeling/ and the potential risks to aquatic life. Additionally, please explain what specific actions or mitigation measures would be taken to ensure that increased or decreased flow would not result in an adverse impact to aquatic life.
DEC/ Commissioner's Office	Chapter 4: Environmental Consequences	4.18.3.1	4.18-11	Bullet one at the top of this page discusses changes in water temperature due to discharges. It only discusses the amount of change but does not discuss whether temperatures will exceed regulatory standards or exceed site-specific requirements needed to preserve normal species diversity or prevent the appearance of nuisance organisms as required by ADEC regulations at 18 AAC 70.020(b)(10).	Discuss whether temperature effects will exceed regulatory standards.
DEC/ Division of Water, Water Quality Standards	Chapter 4: Environmental Consequences	4.18.3.1	4.18-11	Paragraph one on this page discusses the effect of treated water discharges on spatial trends. It notes that "The magnitude of changes in water condition that occur at each discharge point would also be expected to be diluted through natural flow over a relatively short distance, and to return to background, or near-background conditions." This text could be interpreted as allowing for a mixing zone to be available for this project. It should be noted that mixing zones are not allowed in anadromous waters under 18 AAC 70.240.	Please clarify text and make sure that the reader understands the fact that all discharges will be subject to water quality standards-based effluent limits.

Department/ Division/Section	Document Name	Section/Fig. /Table	Page #	Comment/Issue	Recommendation/Action
DEC/ Division of Water, Water Quality Standards	Chapter 4: Environmental Consequences	4.18.3.1	4.18-11	Paragraph two on this page discusses the effects from deposition of fugitive dust and notes that " <i>the calculations indicate an expected increase in the concentration of metals in surface water as a result of dust deposition, ranging from 0.1 to 0.7 percent, which would not result in exceedances of the most stringent water quality criteria.</i> " It not clear how these calculations were made, as results elsewhere appear to conflict with this conclusion. Pullen Creek, Alaska currently has a Total Maximum Daily Load (TMDL) for metals (cadmium, copper, lead, and zinc). The source of the pollutant is attributed to fugitive dust from historic mining related activities. Such concerns are not limited to historic mines, as multiple current mines are revising their best management practices (BMPs) or taking active measures to address water quality issues associated with fugitive dust. There should be additional consideration of how "higher than anticipated" discharges of mineral-rich groundwater combined with higher than anticipated impacts from fugitive dust could contribute to water quality/sediment quality impacts.	Please provide additional analysis of the risk from fugitive dust to surface waters, including the potential of metal concentrations in the water column and sediment contributing to increased toxicity to aquatic life based on available models (e.g., biotic ligand model (BLM)). Information should also be provided regarding how the cumulative effects of permitted air emissions and the higher than anticipated impacts of fugitive dust could increase concentrations of pollutants in surface waters and the additional risk of toxicity to aquatic life.
DEC/ Commissioner's Office	Chapter 4: Environmental Consequences	4.18.3.1	4.18-11	Paragraph two on this page discusses the effects from deposition of fugitive dust and notes that PLP is developing a plan for mitigation purposes.	If fugitive dust control is to be considered a mitigation measure, the applicant must provide a written plan, including information regarding which agency would be responsible for compliance and enforcement. Promising to develop a plan does not qualify as mitigation.
DEC/ Commissioner's Office	Chapter 4: Environmental Consequences	4.18.3.1	4.18-13	Paragraph three on this page summarizes mine site effects on surface water quality. The final sentence notes " <i>The magnitude of temperature effects ranging from about -1 to 3.6 ° C would occur up to 0.5 to 3 miles downstream of the mine site.</i> " This sentence only discusses the amount of change but does not discuss whether temperatures will exceed regulatory standards or exceed site-specific requirements needed to preserve normal species diversity or prevent the appearance of nuisance organisms as required by ADEC regulations at 18 AAC 70.020(b)(10).	Discuss whether temperature effects will exceed regulatory standards.
DEC/ Division of Water, Water Quality Standards	Chapter 4: Environmental Consequences	4.18.3.1	4.18-15	Paragraph two on this page discusses the effects from water management pond (WMP) leakage. It notes that " <i>Water in these ponds is anticipated to contain total dissolved solids (TDS), sulfate, and number of metals exceeding discharge water quality criteria. Pond water leaking through the pond liners would be intercepted by underdrain systems included in the design of those facilities, and subsequently pumped back to the respective WMP; however, in terms of impacts, some water could bypass the underdrain system and seep into underlying shallow groundwater.</i> " Without intervention, this water would be expected to mix with groundwater and discharge into the North Fork Kaktuli River watershed. It is not clear what the extent of these impact would be.	Please describe how leakage/seepage from the surface ponds could increase the toxicity in surface waters to aquatic life and how long any elevated toxicity would take to occur. Please also describe how such a risk would be determined during operations and what measures would be taken to mitigate the risk.

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DEC/ Division of Water, Water Quality Standards	Chapter 4: Environmental Consequences	4.18.3.1	4.18-15	Paragraph three on this page further discusses the effects from water management pond (WMP) leakage. It notes that " <i>Based on the current mine plan, it is possible that gaps exist along the main WMP embankment that would allow potentially affected groundwater to flow through areas where wells are limited.</i> " This would imply that should monitoring demonstrate liner leakage, interception wells would be required to recycle shallow groundwater back to the main WMP. It is not clear if the resolution in the existing hydrogeological modeling is sufficient to calculate the impacts of liner leakage in these areas. There is also little discussion about the risk this liner leakage poses to aquatic resources.	Please provide additional information on the potential for liner leakage to impact aquatic life due to groundwater/surface water pollution. Please also provide additional information regarding potential mitigation measures should it be determined that increased toxicity is occurring.
DEC/ Division of Water, Water Quality Standards	Chapter 4: Environmental Consequences	4.18.3.1	4.18-17	Paragraph one on this page discusses impacts to groundwater levels following pit lake closure. It notes " <i>To maintain the 890 feet amsl management level, the maximum anticipated flow through the WTP is estimated to be approximately 1,300 gallons per minute or 2.9cfs, although this rate could be higher than predicted under the current groundwater model based on model uncertainties.</i> " The groundwater mobility question is a significant issue that needs to be addressed in a more comprehensive manner. It is not clear from the discussion what the degree of uncertainty is in the groundwater modeling. There are numerous assumptions that the pit capture component will work according to the models, which the author admits has an undefined degree of uncertainty associated with it.	Please provide additional information regarding the potential risk to aquatic resources should the groundwater modeling assumptions be flawed.
DEC/ Division of Water, Water Quality Standards	Chapter 4: Environmental Consequences	4.18.3.1	4.18-18	Paragraph two on the this page summarizes the effects on mine site groundwater quality. It notes " <i>In terms of duration, groundwater quality beneath the NFK west and NFK east drainages in the immediate vicinity of the mine site would be impacted during operations, but would be expected to improve in the decades after mine closure.</i> " This assertion that the groundwater quality would improve in the NFK drainages over time appears to conflict with the previous text in this section which suggests degradation or uncertainty. In addition, potential remedies to groundwater impacts and whether they would be practical are not discussed.	Please provide information in support of the conclusion that groundwater quality will improve over time and discuss potential remedies if groundwater quality does not improve.
DEC/ Commissioner's Office	Chapter 4: Environmental Consequences	4.18.3.1	4.18-17	Paragraph four on this page discusses effects on drinking water wells. The final sentence in the paragraph notes " <i>Therefore, groundwater that would be potentially affected by mine site facilities would not be expected to affect drinking water sources used by on-site workers. Similarly, no effect would be expected on drinking water wells outside of the mine site area.</i> " It is not clear from this statement if groundwater is protected as a current and future potential drinking water source.	Please explain if groundwater is being protected as a current and future potential drinking water source.

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DEC/ Division of Water, Water Quality Standards	Chapter 4: Environmental Consequences	4.18.3.1	4.18-18	There is a concern that the module water management pond WMP will not have the capacity to treat groundwater with high mineral content prior to discharge into the SFK catchment in the time period before a permanent WMP is being constructed and capacity demonstrated.	The EIS should further explore the potential phasing or similar project modification efforts to allow for environmental controls (e.g., water treatment plant) to be constructed prior to large scale operation.
DEC/ Division of Water, Water Quality Standards	Chapter 4: Environmental Consequences	4.18.3.1	4.18-18	The section on this page that discusses Substrate/Sediment Quality notes that <i>"the downstream sediment supply to the North Fork Koktuli River would be cut off, depleting the natural supply of sediment to downstream gravels, and potentially affecting aquatic habitats (see Section 4.24, Fish Values). A decrease in water flow from fill placement would also lower the natural level of course sediment transport, potentially allowing more fine particles to accumulate within the streambed. These impacts of placement of fill would be permanent, and certain to occur if the project is permitted and constructed."</i> This statement appears to conflict with the Clean Water Act and would appear to be a violation of the water quality standards sediment criteria.	Please provide additional information regarding the potential for changes in sediment supply to negatively affect water quality and aquatic life as required by 18 AAC 70.020.
DEC/ Division of Water, Water Quality Standards	Chapter 4: Environmental Consequences	4.18.3.2	4.18-20	Based on the discussion in paragraph two of the surface water quality discussion, it appears that minimal geological investigations have occurred along the proposed road corridor(s) and additional investigations may be warranted to ensure that potentially acid generating (PAG) rock is not widespread in the region. Incorporating PAG rock into the road materials could create additional water quality impacts. In addition, there is minimal information on the potential for leaching of constituents, including metals, from non-PAG rocks which could also impact water quality.	Please provide additional information pertaining to the potential for PAG rock in the transportation corridor and the potential for metals leaching in the transportation corridor that could impact water quality.
DEC/ Office of the Commissioner	Chapter 4: Environmental Consequences	4.18.3.2	4.18-22	Paragraph one on this page discusses placement of fill material in the transportation corridor. It is not clear from the discussion whether there is naturally occurring asbestos in the material proposed as fill material.	Please confirm that fill material for the transportation corridor would not contain naturally occurring asbestos. If the substance may appear in rock source materials, please explain how water quality and air quality impacts would be mitigated.

Department/ Division/Section	Document Name	Section/Fig. /Table	Page #	Comment/Issue	Recommendation/Action
DEC/ Air Quality Division	Chapter 4: Environmental Consequences	4.20		Chapter 4.20 discusses air quality and contains emission calculation summaries and references Appendix K4.20 Air Quality, which in turn further discusses the impacts of the project. Appendix K4.20 then refers to PLP 2018-RFI 007, where the actual calculation and emission factors can be found. The Mobile and nonroad emissions estimates used in assessing air quality impacts in PLP 2018-RFI 007 are not based on the current EPA-approved estimation models. The mobile emissions analysis must be completely redone to use the correct model or emissions factors. Appendix A-2 references 40 CFR Part 1039 Tier F. Please note this is a standard, not an "in-use" emission factor for the specific piece of equipment expected to be used. It should also be noted that the reference table 6.1.1, AP42, Vol 2, is retired and should not be used for calculating emissions for a new project. These calculations also assume the use of ultra low sulfur diesel (ULSD), but there is no discussion regarding the use of ULSD in the air quality section. The EPA has a number of statements on their web pages that expressly states that Vol 2 should not be used. Please also note that 40 CFR Part 89, Tier 3 may also not be a correct emission factor reference. In addition, all on-road and off-road mobile emissions are required to use the MOVES model, which isn't referenced at all within the document.	Please use the correct models and emission factors and revise the summaries. Please discuss the use of ULSD in the air quality section.
DEC/ Air Quality Division, Air Permitting Program	Chapter 4: Environmental Consequences	4.20	General	General comment: The Project proposes a natural gas pipeline for gas-fired power plant and mill at the mine site, so it would appear that natural gas in sufficient quantity is planned to be available. However no additional use of natural gas is proposed: ore-concentrate ferries on Lake Iliamna; gas-fired reciprocating engines at most stationary source locations; any other use considered under a "good neighbor-best practices" policy.	The use of natural gas and especially LNG is growing worldwide as an effort to be better stewards of our natural resources and air emissions in general becomes more stringent. While not legally required, the Applicant could propose additional applications or uses of cleaner burning natural gas instead of liquid fossil fuels.
DEC/ Air Quality Division	Appendix K4.20	K4.20.1.1 Table 40.20- 1	KA. 20-2	The listed value for the Alaska Ambient Air Quality Standard (AAAQS) for annual PM2.5 is incorrect.	Please correct the value for the annual PM2.5 AAAQS to read: 12.0µg/m3.
DEC/ Air Quality Division	Appendix K4.20	K4.20.2.1 Tables K4.20-4, K4.20-5 and Figures K4.20-3, K4.20-4	KA.20-8 thru KA.20- 10	The table values are not consistent and the two figures appear to be the same (duplicated). It appears that the Maximum Project-Only Predicted Concentration columns should have consistent values in Tables K4.20-4 and K4.20-5. However the PM2.5 24 hour values differ (3.2 and 8, respectively) and the PM10 annual values differ (0.5 and 1.4, respectively). In addition, the maximum values for PM2.5 annual (1.4) in Table K4.20-5 does not seem to match any of the values in the two figures. The maximum value for 24 hour PM2.5 in Table K4.20-4 (3.2) also does not appear to match the outputs in the figures. In addition the two figures K4.20-3 and -4 appear to be identical. It is not clear why they are duplicated.	This section should be reviewed for consistency to ensure the data presented is correct.

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DEC/ Air Quality Division, Air Permitting Program	Appendix K4.20	K4.20.2.2	K4.20-12	Paragraph 2 suggests that demonstration of compliance with the AAAQS/Increment for the mine site, evaluated alone, implies that the transportation corridor (also evaluated alone) would not cause or contribute to a violation of the AAAQS/Increment due to its lower emissions. This is not a representative approach. The transportation corridor has different emission units, ambient air boundary configuration (if any boundary at all), etc. Therefore comparing the mine site to the corridor is "apples and oranges". Also, the two components are geographically adjacent and will emit pollution contemporaneously, resulting in overlapping impacts. Analyzing both components in isolation will underestimate the cumulative ambient air impacts and is not an appropriate approach.	Conduct a new ambient air quality analysis that includes all sources in the project area that emit pollutants concurrently; or, if already performed, revise this paragraph to better describe the approach.
DEC/ Air Quality Division, Air Permitting Program	Appendix K4.20	K4.20.2.3	K4.20-12	If the Amakdedori Port operations will emit air pollution at the same time as the other project components, an approach that does not include other sources of emissions in the modeling domain is not a valid representation of the impacts, for the reasons stated above in regard to the transportation corridor.	Conduct a new ambient air quality analysis that includes all sources in the project area that emit pollutants concurrently; or, if already performed, revise this paragraph to better describe the approach.
DEC/ Air Quality Division, Air Permitting Program	Appendix K4.20	K4.20.2.3	K4.20-12	Similar to the approach to the other component phases, considering the construction of the pipeline corridor impacts in isolation of other emission sources of air pollution that operate concurrently is not an appropriate approach, and will underestimate the cumulative ambient air impacts.	Conduct a new ambient air quality analysis that includes all sources in the project area that emit pollutants concurrently; or, if already performed, revise this paragraph to better describe the approach.
DEC/ Air Quality Division	Chapter 4: Environmental Consequences	4.20	4.20-1 thru 4.20-6	Given the concerns about the emission estimation methods for mobile and non-road equipment listed in the comments above, the emission summaries may not accurately reflect air quality emissions from the proposed project.	Emission summaries and conclusions should be revised as needed to reflect updated emission estimates using appropriate estimation techniques and emission factors.
DEC/ Commissioner's Office	Chapter 4: Environmental Consequences	4.20.1	4.20-1	The description of emission sources outlined in the bullets at the bottom of the page does not include a description of how rock crushers and mine mill operations are categorized in the three categories outlined.	Please explain which category would include rock crushers and mine mill operations.
DEC/ Commissioner's Office	Chapter 4: Environmental Consequences	4.20.1	4.20-2	Bullet one on this page discusses the duration of impacts to air quality. Sub-bullet one notes that " <i>the air quality impacts would only remain while the project's activity is ongoing, returning to the baseline conditions once the activity is complete; this would be short-term is occurring only during construction...</i> " It is not clear how four years of construction activity can be considered "short-term" in the context of air emissions.	Please explain how four years can be considered "short-term" or change the characterization to "medium-term" to reflect the duration of the air emissions.
DEC/ Air Quality Division, Air Permitting Program	Chapter 4: Environmental Consequences	4.20.3.1	4.20-4	The paragraph discussing construction on this page uses 500 hours as the maximum allowable hours per year for emergency fire pumps. 500 hours is an EPA figure used to calculate Potential to Emit (PTE) and is not an operating hour limitation. Emergency units can operate to the maximum extent needed	Please revise the discussion to simply focus on 500 hours as a PTE estimate, nothing more. The ability to estimate actual emergency use data may be gathered from similar sources and facilities.

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DEC/ Air Quality Division, Air Permitting Program	Chapter 4: Environmental Consequences	4.20.3.1	4.20-6	The paragraph at the top of this page discusses emissions inventory to include "back-up generator". EPA no longer uses this term, a unit is either prime power/normal source or an emergency source. Emergency sources have different PTE calculations based on assumed limitations.	Please remove all references to "backup" generator; a unit is either normal-source prime power or an emergency unit. Each type of the two have differing air quality applicable requirements.
DEC/ Commissioner's Office	Chapter 4: Environmental Consequences	4.20.1	4.20-7	Paragraph three on this page discusses air emissions related to project closure. The paragraph notes " <i>If near-field impacts were to occur, they would be minimal in magnitude, localized in extent, and of short-term duration, occurring while closure activities are ongoing.</i> " It is not clear how twenty years of closure activity can be considered short-term.	Please explain how twenty years can be considered "short-term" or change the characterization to "medium-term" to reflect the duration of the air emissions.
DEC/ Air Quality Division	Chapter 4: Environmental Consequences	4.20	4.20-10	The conclusion to the "Construction" section on this page refers to a "return to baseline conditions". It is not clear what "baseline conditions" are. Once construction is complete, the construction emissions would end, but this may not mean that emissions will return to "baseline", since operation of the constructed facility would continue along with other air emission impacts (transportation, operations) presumably above "baseline".	This conclusion should be reworded to reflect the end of the construction phase emissions without suggesting a "return to baseline" or provide a definition of baseline that will provide more clarity.
DEC/ Air Quality Division	Chapter 4: Environmental Consequences	4.20	4.20-10	A fugitive dust control plan from road traffic is not discussed in this section regarding the operations phase of the road corridor. A statement is made " <i>once construction is complete, air quality would return to baseline conditions.</i> " This is not true of any unpaved road in continual operation.	Fugitive dust from unpaved roads is of grave concern, especially considering wind conditions near the construction zone. A robust fugitive dust control plan is needed.
DEC/ Commissioner's Office	Chapter 4: Environmental Consequences	4.20.3.2	4.20-11	Paragraph one on this pages discusses air emissions during mine operations. The paragraph notes " <i>As discussed in the mine site impact analysis, air quality near-field and far-field impacts would be minimal in magnitude, localized in extent and short-term in duration, only occurring during the activity.</i> " It is not clear how twenty years of operations activity can be considered short-term.	Please explain how twenty years can be considered "short-term" or change the characterization to "medium-term" to reflect the duration of the air emissions.
DEC/ Commissioner's Office	Chapter 4: Environmental Consequences	4.20.3.2	4.20-11	Paragraph two on this page discusses air emissions during the closure/post-closure period. The paragraph notes " <i>If near-field impacts did occur, they would be minimal in magnitude, localized in extent, and of short-term duration, only occurring during closure/post-closure activities.</i> " It is not clear how twenty-plus years of closure/post closure activity can be considered short-term.	Please explain how twenty-plus years can be considered "short-term" or change the characterization to "medium-term" to reflect the duration of the air emissions.
DEC/ Air Quality Division	Chapter 4: Environmental Consequences	4.20	4.20-12	The conclusion to the "Construction" section on this page refers to a "return to baseline conditions". It is not clear what "baseline conditions" are. Once construction is complete, the construction emissions would end, but this may not mean that emissions will return to "baseline", since operation of the constructed facility would continue along with other air emission impacts (transportation, operations) presumably above "baseline".	This conclusion should be reworded to reflect the end of the construction phase emissions without suggesting a "return to baseline" or provide a definition of baseline that will provide more clarity.

Department/ Division/Section	Document Name	Section/Fig. /Table	Page #	Comment/Issue	Recommendation/Action
DEC/ Commissioner's Office	Chapter 4: Environmental Consequences	4.20.3.3	4.20-12	Paragraph three on this page discusses air emissions related to construction of the Amakdedori Port. The paragraph states " <i>Based on that similarity, the magnitude, extent and duration of air quality impacts would be minimal, localized, and short-term, only occurring during construction activities.</i> " It is not clear how four years of construction activity can be considered short-term.	Please explain how four years can be considered "short-term" or change the characterization to "medium-term" to reflect the duration of the air emissions.
DEC/ Commissioner's Office	Chapter 4: Environmental Consequences	4.20.3.3	4.20-14	Paragraph one on this page discusses the near-field impacts from port operation emissions. The paragraph states " <i>Near-field air quality impacts from port operations emissions have been demonstrated to be in compliance with modeled AAAQS and PSD Class II Increments.</i> " This sentence appears to be misleading as modeling cannot directly demonstrate compliance.	You may want to consider re-writing the sentence to read " <i>Near-field air quality impacts from port operations have been modeled to be in compliance with AAAQS and PSD Class II Increments.</i> "
DEC/ Air Quality Division, Air Permitting Program	Chapter 4: Environmental Consequences	4.20	4.20-15	The conclusion to the "Construction" section on this page refers to a "return to baseline conditions". It is not clear what "baseline conditions" are. Once construction is complete, the construction emissions would end, but this may not mean that emissions will return to "baseline", since operation of the constructed facility would continue along with other air emission impacts (transportation, operations) presumably above "baseline".	This conclusion should be reworded to reflect the end of the construction phase emissions without suggesting a "return to baseline" or provide a definition of baseline that will provide more clarity.
DEC/ Commissioner's Office	Chapter 4: Environmental Consequences	4.20.3.3	4.20-17	Paragraph one on this page discusses the near-field impacts from the compressor station. The paragraph states " <i>Near-field air quality impacts from the compressor station have been demonstrated to be in compliance with AAAQS and PDS Class II increments.</i> " This sentence appears to be misleading as modeling cannot directly demonstrate compliance.	You may want to consider re-writing the sentence to read " <i>Near-field air quality impacts from the compressor station have been modeled to be in compliance with AAAQS and PSD Class II Increments .</i> "
DEC/ Air Quality Division	Chapter 4: Environmental Consequences	4.20.3.5	4.20-18	The summer-only variant on this page proposes storing an additional 6-months of ore concentrate on-site and contends there will be no additional impact from fugitive dust. This is not a defensible argument considering the increased size of ore concentrate stockpiles and known wind/weather conditions at the mine site. Storing additional 6-months of ore concentrates at the mine site implies significant additional road traffic throughout the shipping season to get the additional ore containers to the port. It is also not clear if the ore concentrate stockpiles will be covered to prevent fugitive dust. More road traffic implies more fugitive road dust generation.	An enhanced fugitive road dust control plan is needed for this variant and is not provided. If ore concentrate is stockpiled for 6 months, please explain how fugitive dust will be controlled on these stockpiles.
DEC/ Air Quality Division	Chapter 4: Environmental Consequences	4.20.7 Table 4.20-10	4.20-21 thru 23	In several places in this table under construction and operations phases there are statements "Impacts would return to baseline conditions once the construction/mine operation was complete". This is imprecise as there will be air impacts above baseline presumably until site closure is complete.	This section should be re-worded in a manner to reflect the end of construction/operational phase emissions without suggesting a "return to baseline" or ensure that baseline is defined within the chapter for clarity.
DEC/ Air Quality Division, Air Permitting Program	RFI 0009 (document referred to in EIS)	Kenai compressor station	22-23	It does not appear that the analysis for the Kenai compressor station included impacts from off-site sources, such as the nearby Bluecrest Cosmopolitan facility.	Please address impacts of off-site sources in updated modeling, or address the issue of overlapping concentration gradients qualitatively.

Department/ Division/Section	Document Name	Section/Fig. /Table	Page #	Comment/Issue	Recommendation/Action
DEC/ Air Quality Division, Air Permitting Program	RFI 0009 (document referred to in EIS)	Kenai compressor station	22	Text on this page states that modeling analysis was performed "consistent with ADEC minor air quality permitting requirements". Please note that ADEC Air Permits Program has not evaluated or approved PLP's modeling analysis for use in support of permitting. This statement may imply endorsement or pre-approval of the modeling by ADEC.	Clarify that the modeling is consistent with ADEC requirements in the author's judgment, and that it has not been reviewed or approved by ADEC.
DEC/ Air Quality Division, Air Permitting Program	Chapter 4: Environmental Consequences	4.20, Chapter K4.20, RFI009	General	Section 4.20 does not disclose the potential air quality impacts of mobile source NOx emissions -- up to 4,321 tpy for the mine site during the operations phase; by far the largest potential source of NOx emissions during the construction and several other phases. The supporting modeling analysis focuses solely on sources regulated under Title I of the clean air act, and therefore only addresses the NOx impacts of the much smaller (in this case) emissions from stationary and fugitive sources. However, the potential NOx impacts from mobile sources may significantly affect the air quality and should be addressed	Please provide additional analysis that addresses the potential impacts to air quality from mobile source NOx emissions.
DEC/ Air Quality Division, Air Permitting Program	Appendix K4.20	K4.20.1.1	K4.20-2	Text on this page states that " <i>Evaluation of PSD Class I increments are not included, because it is anticipated that the closest Federal Class I areas are too far from the project to be impacted by the project.</i> " It should be noted that in other areas the EPA has interpreted the "may affect" clause to include all sources within 100km, and some large facilities beyond 100km , from a Class I areas. The proposed project is approximately 130km from Tuxedni National Wildlife Refuge (distance between the two closest boundaries), a Class I area, and will potentially be a large source of emissions. Therefore, the project may impact air quality in a Class I area.	Please perform a Class I increment analysis, or address the issue of potential impacts more explicitly (if appropriate).
DEC/ Air Quality Division, Air Permitting Program	Appendix K4.20	K4.20.1.2	K4.20-3 and 4	The distance between the project area and the nearest Class I area is approximately 130 km. As stated above, the NOx impacts of the project may be understated due to the omission of mobile source emissions. Therefore, a criteria pollutant impact analysis may be warranted.	Perform Class I Increment analysis, or address the issue of potential impacts more explicitly (if appropriate).
DEC/ Air Quality Division, Air Permitting Program	Appendix K4.20	K4.20.2.1; K4.20.2.3; K4.20.2.4	K4.20-7; K4.20- 12; K4.20-14	Text on these pages states that modeling analysis was performed "consistent with ADEC minor air quality permitting requirements". Please note that ADEC Air Permits Program has not evaluated or approved PLP's modeling analysis for use in support of permitting. This statement may imply endorsement or pre-approval of the modeling by ADEC.	Clarify that the modeling is consistent with ADEC requirements in the author's judgment, and that it has not been reviewed or approved by ADEC.

Department/ Division/Section	Document Name	Section/Fig. /Table	Page #	Comment/Issue	Recommendation/Action
DEC/ Commissioner's Office	Chapter 4: Environmental Consequences	4.20.6	4.20-21	Paragraph one on this page discusses the impact of climate change on the project. Sentence one notes that " <i>it is projected that the project area will see an overall increase in temperatures, with an increase in precipitation during the winter months, and a slight decrease of precipitation during the summer months.</i> " It is not clear what is meant by an increase in precipitation during the winter months. Precipitation covers both snow and rain. Does this mean an increase in the water equivalent of overall precipitation or is it meant to imply that there will be an increase in rainfall during the winter months?	Please explain what is meant by an increase in precipitation during the winter months.
DEC/ Commissioner's Office	Chapter 4: Environmental Consequences	4.20.8	4.20-24	Paragraph one on this page discusses cumulative effects on air quality from this project. It is not clear why there is no discussion of the cumulative impacts of the transportation, mine and port operations happening at the same time and the impacts those operations have on air quality.	Please provide a discussion of the cumulative impacts of the three project components.
DEC/ Division of Water, Water Quality Standards	Chapter 4: Environmental Consequences	4.24.2.3	4.24 -12	Paragraph five on this page notes that " <i>Treated water releases from mine site facilities would be optimized to benefit priority species and life stages for each month and stream.</i> " This appears to imply that water treatment plant discharge timing will try to simulate natural flow patterns. It is not clear from the discussion if there is a plan for using remote sensing or continuous flow monitoring data to correlate discharge with optimum stream flow. It is also not clear how this discharge timing system would operate.	Please provide additional information regarding the timing of water discharge and efforts to simulate natural flow patterns, as well as the potential risk to aquatic life should natural flow patterns be altered. This information should include the timeframe during which adverse impacts would occur, the specific means of measuring adverse impacts, and proposed mitigation measures.
DEC/ Division of Water, Water Quality Standards	Chapter 4: Environmental Consequences	4.24.2.5	4.24 -20	Paragraph four on this page discusses mine site turbidity and sedimentation. It is not clear what modeling of stormwater generation has occurred so that treatment can be appropriately sized within the proposed footprint to accommodate the predicted treatment need. A snow management plan is not referenced and snow piles can be a source of turbidity in the spring. Similarly, there is no mention of snow management plans for the transportation corridors.	Please provide additional information on the magnitude of stormwater generation assumed at the mine site and how treatment systems will be accommodated within the existing footprint. Please also provide additional information pertaining to the maintenance of the transportation corridor and the potential impacts to aquatic life from snow management. Please include specific monitoring that would occur to identify and mitigate negative impacts to aquatic life.

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DEC/ Division of Water, Water Quality Standards	Chapter 4: Environmental Consequences	4.24.2.7	4.24 -23	Paragraph three on this page notes that " <i>In each year of the study, the daily maximum water temperature in the NFK immediately upstream of the mine site exceeded the 20 °C criteria on about 28 percent of all instantaneous readings during the summer months. The lower temperature thresholds for migration and rearing (15 °C) were exceeded on 78 percent of summer readings; and the spawning and egg incubation criteria (13 °C) were exceeded on 89 percent of summer readings.</i> " It is not clear what time period and duration was used to come to this conclusion, since timing of the measurements is critical. Further discussion on page 4.24-24 noted that " <i>Although the water temperature regimes in the project area frequently exceeded the ADEC criteria during the 2004-2009 sampling period, adult and juvenile salmon and resident trout remained abundant.</i> " This appears to imply that the temperature of the discharge water would not affect the spawning and rearing process since the discharge temperature would be >2.5C different than ambient. The project applicant would not be allowed a mixing zone and it would be expected that temperature increases would not create a situation in which fish are attracted to the end of the pipe - essentially becoming a nuisance condition.	Please provide additional information on the metrics used in temperature measurement, the rationale for their use, and potential risk of increased temperature to aquatic life from temperature modifications. Such information should be provided on a geographic scale to determine which stream reaches would see increased risk and temporal periods in which risk would be increased/decreased as a result of TMP discharge and mine operation.
DEC/ Division of Water, Water Quality Standards	Chapter 4: Environmental Consequences	4.24.6	4.24 -37	Paragraph three on this page notes that " <i>At the mine site, an additional 35 miles of anadromous stream habitat would be lost in the SFK and UTC watersheds, including the entire footprint of Frying Pan Lake, which would be inundated by the south collection pond, affecting sockeye, coho, chum, and potentially Chinook salmon.</i> " It does not appear that the role of Frying Plan Lake on existing or future fish populations has been adequately addressed. If this lake serves as a refugia for existing stocks, it would be problematic to suggest modifications, much less complete removal.	Please provide additional information on the geomorphology of Frying Plan Lake, the specific role of the lake including salmonid habitat, the potential for the lake to act as temperature refugia for anadromous species, the relationship with stream flow, and the affect on anadromous species populations should this habitat be lost due to mine expansion.
DEC/ Commissioner's Office	Chapter 4: Environmental Consequences	4.27.1.2	4.27-3	Paragraph three on this page discusses water use/drinking water. The second sentence in the paragraph states " <i>No downstream communities have been documented as using surface water from the waterways described herein as a drinking water source (ADEC 2018).</i> " It is not clear why this paragraph does not discuss whether private users are using surface waters as a drinking water source.	Please provide a discussion of whether private users are using surface waters as a drinking water source. Please also note that the surface waters still need to be protected for drinking water use.

Department/ Division/Section	Document Name	Section/Fig. /Table	Page #	Comment/Issue	Recommendation/Action
DEC/Spill Prevention and Response Division	Chapter 4: Environmental Consequences	4.27.1.2	4.27-5	<p>This section provides significant details about an Owl Ridge risk assessment (Owl Ridge, 2018c) and an AECOM (AECOM, 2018n) risk assessment to explain the basis for various spill scenarios. 18 AAC 75.425(1) prescribes content to be included in response action plans, to include spill scenarios. Further, spill scenarios are developed by determining and planning to clean up the response planning standard within 72 hours as dictated by regulation. For example, the response planning standard for tank farms in Alaska require response plans for the full capacity of the largest tank at the facility. It appears that federal response planning standards are being used here, which are less stringent than Alaska's spill response standards. Scenarios and responses that meet the federal response planning standards are insufficient to meet Alaska's planning standards in this regard since they do not account for seasonality or many other factors, such as ice coverage or temporal benchmarks for immediate response actions. The assertion that the risk of marine tanker vessel spills would be <i>"between 42,000 and 420,000 gallons is 2.5×10^{-4} per year"</i> is not supported by actual spill rate data in Alaska. The same paragraph goes on to state, <i>"This equates to an average recurrence rate of 4,000 years, or a probability of occurrences of 0.62 percent in 25 years, or 1.9 percent in 78 years,"</i> which also contrasts with spill rate data for similar facilities in Alaska.</p>	<p>Please revise spill response scenarios to include required components described in 18 AAC 75.425(1). Revised scenarios should include appropriate response planning standard volumes described in 18 AAC 75.432 - 442.</p>
DEC/Spill Prevention and Response Division	Chapter 4: Environmental Consequences	4.27.2.1	4.27-5	<p>Paragraph seven on this page states <i>"For spills in marine waters, evaporation and dispersion are the dominant weathering processes. Over 90 percent of diesel from a small spill (less than 5,000 gallons) will evaporate or naturally disperse within hours to days of a spill; therefore, oil from such small spills is generally not recoverable (NOAA, (2018))."</i> This statement appears to be taken out of context and is over simplified. Experience in Alaska shows that various habitats and environmental conditions may cause spilled diesel fuel to linger for weeks to months in the environment. Spilled fuel that reaches hypoxic groundwater conditions has been shown to linger for up to decades in Alaska. This page also notes that diesel fuel will pool in snow, suggesting that this would make cleanup easier. Yet, diesel may also act as an antifreeze and melt ice and snow before entering soil and other environments.</p>	<p>The description of fate and behavior for spilled diesel does not accurately reflect environmental damages that can occur as the result of these spills. Species found within the intertidal areas such as clams or bivalves are not mentioned except as forage species. Please include a broader and more representative analysis of diesel fuel fate and effects in environmentally relevant conditions for Alaska.</p>

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DEC/Spill Prevention and Response Division	Chapter 4: Environmental Consequences	4.27.2.1	4.27-5	Paragraph seven on this page further discusses spill scenarios where diesel spills would evaporate and disperse after four days or after a maximum of 10 to 20 days. This appears to imply that this would be acceptable. As noted earlier, Alaska's spill response standards are more stringent than federal standards. Alaska regulations at 18 AAC 75.432(a)(1) states that the responsible party should " <i>contain or control and clean up within 72 hours that portion of the response planning standard volume that enters open water</i> "; and 18 AAC 75.432(2) states " <i>contain or control within 72 , and clean up within shortest possible time consistent with minimizing damage to the environmental, that portion of the response planning standard volume that enters a receiving environment other than open water.</i> "	Please review Alaska regulations at 18 AAC 75.432 to determine the response planning standard for the scenarios and revise the spill response scenarios to show how those standards would be met.
DEC/Spill Prevention and Response Division	Chapter 4: Environmental Consequences	4.27.2.5	4.27-10	The section states " <i>significant diesel spills from the Iliamna Lake ferry and tank farm were ruled out as not realistic probabilities of occurrence and were not selected for impacts analysis.</i> " This statement conflicts with Alaska spill response planning standard requirements for fuel handling operations, described in 18 AAC 75.425, and 18 AAC 75.432.	Please revise response planning scenarios to show how the standards outlined in 18 AAC 75.425 and 18 AAC 75.442 will be met.
DEC/ Commissioner's Office	Chapter 4: Environmental Consequences	4.27.2.5	4.27-11	Paragraphs three and four on this page discuss a potential diesel spill during the winter. Both appear to downplay the likelihood of diesel permeating soil surfaces or dispersing in frozen water bodies during frozen conditions. These conclusions conflict with the department's recent experience with diesel spills from a March 16, 2018 tanker truck rollover on the Richardson Highway. These statements also conflict with discussions in paragraph two on page 4.27-12.	Please rewrite these paragraphs to acknowledge the risk of diesel spills in the winter impacting the environment.
DEC/ Commissioner's Office	Chapter 4: Environmental Consequences	4.27.2.5	4.27-13	Paragraph nine on this page discusses the potential impacts of a diesel spill during the winter. This discussion appears to downplay the likelihood of diesel permeating soil surfaces or dispersing in frozen water bodies during frozen conditions. These conclusions conflict with the department's recent experience with a diesel spill from a March 16, 2018 tanker truck rollovers on the Richardson Highway. These statements also conflict with discussions in paragraph two on page 4.27-12.	Please rewrite these paragraphs to acknowledge the risk of diesel spills in the winter impacting the environment.
DEC/ Commissioner's Office	Chapter 4: Environmental Consequences	4.27.2.5	4.27-14	Paragraph two on this page discusses the use of in situ burning as a spill response strategy and appears to downplay the impacts to air quality. Please note that the department has Alaska-specific in situ burning guidelines that should be followed, including determining the impact on local populations.	Please note that in situ burning will need to meet the department's in situ burning guidelines at https://dec.alaska.gov/media/8436/in-situ-burning.pdf
DEC/Spill Prevention and Response Division	Chapter 4: Environmental Consequences	4.27.2.5	4.27-19	Paragraph three on this page discusses spill trajectory modeling for a diesel spill. The discussion switches to a discussion of oil spills partway through the discussion.	Please be consistent and discuss the <u>diesel</u> spill.

Department/ Division/Section	Document Name	Section/Fig. /Table	Page #	Comment/Issue	Recommendation/Action
DEC/Spill Prevention and Response Division	Chapter 4: Environmental Consequences	4.27.2.5	4.27-19	Paragraph four on this page states " <i>Other oil products (such as bunker, lube oil, hydraulic fluid) are used in much smaller volumes by marine vessels, and are not being analyzed.</i> " This sentence is misleading. Spill response scenarios should account for all types of fuels and lubricants on a vessel. Bunker fuel, lube oil, and hydraulic oils respond differently than diesel.	ADEC records and accounts for all types of fuels on vessels when it grounds, spills, or sinks and can be located at ADEC's website (http://dec.alaska.gov/spar/ppr/spill-information/response/). Please remove the sentence quoted and include these products in the spill analysis.
DEC/ Commissioner's Office	Chapter 4: Environmental Consequences	4.27.2.5	4.27-18	Paragraph five on this page discusses spill response involving a barge. The discussion states that spill response times are unknown and that spill response efforts could be delayed by adverse environmental conditions. This appears to conflict with Alaska Statutes and regulations which require spill response within very specific deadlines and a discussion of how adverse conditions will be addressed. This paragraph also switches back and forth between describing <u>oil</u> spill response and <u>diesel</u> spill response.	Please note in the discussion that department statutes and regulation require spill response to meet specific deadlines found at AS 46.04 and 18 AAC 75. Please be consistent and discuss the <u>diesel</u> spill. Please explain how spill response activities will meet these standards.
DEC/ Commissioner's Office	Chapter 4: Environmental Consequences	4.27.3.2	4.27-33	Paragraphs one and two in this section discuss the environmental impacts of a potential natural gas leak from the proposed submarine pipeline. These paragraphs appear to downplay the impacts to the environment. This appears to conflict with the Pipeline and Hazardous Materials Administration's March 3, 2017 <i>Notice of Proposed Safety Order</i> issued to Hilcorp Alaska LLC concerning a leaking gas pipeline in Cook Inlet.	Please discuss the impacts to the environment in more detail in light of what has been learned regarding the environmental impacts of the Hilcorp pipeline leak in Cook Inlet.
DEC/Spill Prevention and Response Division	Chapter 4: Environmental Consequences	4.27.3.2	4.27-33	The last paragraph on this page states " <i>Due to its buoyancy, natural gas does not accumulate in water, and would not have an impact on water quality.</i> " This misrepresents actual experience where portions of natural gas dissolve into the water column, and the smallest bubbles ($\leq 70\mu\text{m}$) may stay suspended within the water column. The book, "Environmental Impact of the offshore oil and gas industry" by Stanislav Patin, PhD (published in 2001) describes the gas behavior in water in more detail. Patin, in Chapter 5, states the following: "A catastrophic pipeline failure would result in the sudden release of a large volume of natural gas from the pipeline that would likely result in displacing sediment immediately in the vicinity of the release. Studies of large-scale natural gas releases suggest that methane and its derivatives can stay in the marine environment for a long period of time and spread over distances greater than 1,500 feet from the release location (Patin, 2001). Marine fish in the Sea of Asov, Russia, developed significant pathological changes after an accidental large-scale release of natural gas from a gas well. Marine fish experienced impaired movement coordination, weakened muscle tone, damaged cell membranes, disturbed blood formation, and other anomalies typical of acute poisoning (Patin, 2001). Similar observations were made at a large-scale accidental release of natural gas from wells in the Gulf of Mexico (Patin, 2001)."	Scientific research describes methane fate and effects when released into aquatic environments. These findings contradict assertions in this DEIS. Update this section with information from Patin (2001) or similar studies, noting the fate and effects of methane in the environment.

Department/ Division/Section	Document Name	Section/Fig. /Table	Page #	Comment/Issue	Recommendation/Action
DEC/ Commissioner's Office	Chapter 4: Environmental Consequences	4.27.4.5	4.27-39	The last paragraph on this page discusses spill response capacity and notes that PLP would have a spill response plan in place that would address spills of ore concentrate and other hazardous materials. This appears to conflict with the title of the section header "Existing Response Capacity". A spill response plan that will be developed in the future cannot be considered "existing response capacity."	Please clarify that the promised spill response plan would not qualify as "existing response capacity." Please summarize what a spill response plan would include.
DEC/ Commissioner's Office	Chapter 4: Environmental Consequences	4.27.4.7	4.27-42	Paragraph three on this page discusses a concentrate spill from a truck rollover. The discussion offers historical spill data from transport of ore concentrate on the haul road used by the Red Dog Mine. It is not clear from the discussion whether the truck -related spills involved a truck hauling three trailers as is proposed for the Pebble Mine project.	Please clarify whether the Red Dog Haul Road data involves trucks hauling three trailers. If not, please explain how the probability of a spill is still valid in this context.
DEC/ Spill Prevention and Response Division	Chapter 4: Environmental Consequences	4.27.4.7	4.27-42	Paragraphs five through seven on this page discuss response to spills of concentrate and other hazardous materials. Paragraph two states " <i>If the spill were to occur on dry land, the concentrate would simply accumulate on the roadside. Recovery efforts would be straightforward.....</i> " It is not clear how recovery efforts would be straightforward if there was any wind that spread fugitive dust from the concentrate spill.	Please clarify how the concentrate spill response would be handled in adverse environmental conditions such as high winds, heavy rain, or when the roadside is covered in snow.
DEC/ Spill Prevention and Response Division	Chapter 4: Environmental Consequences	4.27.4.7	4.27-43	Paragraph six on this page discusses concentrate spilled onto soils. The paragraph states that " <i>Historical data from Red Dog Mine show that most concentrate spills that impact land only and do not enter surface water have a nearly 100 percent recovery (ADEC 2018h).</i> " It is not clear how this conclusion was reached by querying the department's spills database. Prior studies have identified that spills prior to 1995 are not included in the DEC database and a number of lead and zinc concentrate spills occurred prior to 1995. See https://dec.alaska.gov/media/15455/rev-workplan.pdf	Please explain how the conclusion was reached that concentrate spills have nearly 100 percent recovery at the Red Dog Mine.
DEC/ Air Quality Division	Chapter 4: Environmental Consequences	4.27.4.7	4.27-45	Paragraphs one and two on this page discuss the impacts of concentrate spills and fugitive dust on air quality. Paragraph two notes " <i>Concentrations of particulate matter could temporarily exceed the NAAQS concentrations; but over time, the air quality would return to pre-activity levels at the completion of the activity. The extent of impacts would be limited to discrete portions of the project area, where the spill took place.</i> " This statement appears to conflict with the department's experience with concentrate spills and fugitive dust at the Red Dog Mine and Delong Mountain Transportation System road, given that concentrate transport will not be "temporary" in any sense.	Please explain how the conclusion was reached that the impacts would be temporary and limited to discrete areas in the project area.

Department/ Division/Section	Document Name	Section/Fig. /Table	Page #	Comment/Issue	Recommendation/Action
DEC/ Commissioner's Office	Chapter 4: Environmental Consequences	4.27.4.7	4.27-54	Paragraphs one on this page discusses the impacts of concentrate spills and fugitive dust on air quality. Paragraph two notes " <i>Concentrations of particulate matter could temporarily exceed the NAAQS concentrations; but over time, the air quality would return to pre-activity levels at the completion of the activity. The extent of impacts would be limited to discrete portions of the project area, where the spill took place.</i> " This statement appears to conflict with the department's experience with concentrate spills and fugitive dust at the Red Dog Mine and Delong Mountain Transportation System road, given that concentrate transport will not be "temporary" in any sense.	Please explain how the conclusion was reached that the impacts would be temporary and limited to discrete areas in the project area.
DEC/ Commissioner's Office	Chapter 4: Environmental Consequences	4.27.5.3	4.27-62	The last paragraph on this page discusses spill response capacity and notes that PLP would have a spill response plan in place that would address spills of ore concentrate and other hazardous materials. This appears to conflict with the title of the section header "Existing Response Capacity". A spill response plan that will be developed in the future cannot be considered "existing response capacity." If there are gaps in response capacity, coverage of those gaps would need to be planned for and new plans created for the project.	Please clarify that the promised spill response plan would not qualify as "existing response capacity."
DEC/ Division of Water, Water Quality Standards	Chapter 4: Environmental Consequences	4.27.5.3	4.27-104	The last two paragraphs on this page discuss groundwater quality and the impacts from contamination by pyritic supernatant fluid. Paragraph one notes that " <i>Elevated metals in groundwater close to the release site could exceed ADEC groundwater cleanup levels. No measurable impacts to groundwater would be expected beyond several miles downstream of the mine site.</i> " It is not clear what is being said by this statement. If there are impacts to groundwater, they must be addressed. In the Donlin EIS Chapter 3.7, Water Quality, the mitigation discussions on pages 3.7-208 through 3.7-211 discuss a wide variety of monitoring and mitigation measures under consideration to ensure that groundwater resource are protected. It is also not clear why these mitigation and monitoring discussions are missing from this document.	Please include discussions of groundwater monitoring and mitigation measures.
DEC/ Commissioner's Office	Chapter 4: Environmental Consequences	4.27.7.6	4.27-115	This section appears to discuss existing response capacity in the event of a failure of the bulk tailing storage facility (TSF). It discusses the requirement for an Emergency Action Plan (EAP), but goes on to note that " <i>Recovery of spilled contact water once it enters the NFK would not be possible.</i> " This appears to conflict with the title of the section header "Existing Response Capacity". If no response capacity exists it should be stated clearly that there is no existing response capacity. If there are gaps in response capacity, coverage of those gaps would need to be planned for and new plans created for the project. It is also not clear if the impacts and response capacity would differ if the spill of contact water occurred during the winter months versus the summer months.	Please state the situation clearly if there is no existing response capacity. Please discuss if there would be a difference in response capacity and impacts between a contact water spill during the winter and summer months.

Department/ Division/Section	Document Name	Section/Fig. /Table	Page #	Comment/Issue	Recommendation/Action
DEC/ Commissioner's Office	Chapter 4: Environmental Consequences	4.27.7.9	4.27-119	Paragraph one in this section discusses metals contamination in soils. The final sentence notes that " <i>Where metals in soils exceed ADEC soil cleanup level guidelines, soil could be excavated to the extent practicable and the impacted habitats could be restored.</i> " This section does not discuss what would happen if the soil is not fully excavated and the impacted habitats are not fully restored.	Please provide a discussion of the impacts when contaminated soils are not fully recovered.
DEC/ Commissioner's Office	Chapter 4: Environmental Consequences	4.27.7.9	4.27-120	Paragraph six on this page discusses groundwater quality and the potential for contamination with elevated levels of metals from a release of untreated contact water. The section further notes that " <i>Metals present in the released contact water could potentially permeate through soils and sediments into shallow groundwater during the months-long release. However, due to the strong dilution of surface water and groundwater that would occur, it is likely that metals would be diluted to below ADEC groundwater cleanup levels. Measurable impacts to groundwater quality are not likely from this scenario.</i> " This does not discuss what would happen if the metals are not diluted to below ADEC groundwater cleanup levels. The Environmental Consequences section of an EIS is important because it is predicting effects. These predictions are based on (1) assumptions used in the effects analysis (2) the data used and the quality of the data, (3) the methods and models used and (4) a discussion of the cause-effect logic. These statements do not appear to take that approach. General statements about environmental effects and cumulative effects are not considered adequate. see <i>Neighbors of Cuddy Mountain v. U.S. Forest Service, 137 F.3d 1372, 1379 (9th Cir. 1998)</i>	Please provide a discussion of the assumptions, data, methods and models and the cause-effect logic used to reach these conclusion that metals would be diluted to below ADEC groundwater cleanup levels. Please provide a discussion of the impacts when contaminated groundwater levels exceed ADEC groundwater cleanup levels.
DEC/ Commissioner's Office	Chapter 4: Environmental Consequences	4.27.8.2	4.27-127 and 128	This section discusses the reasonably foreseeable impacts of spills. Paragraphs three and four on page 4.27-127 discuss the potential impacts from the "Pebble Mine Expanded Development Scenario" alternative. Page 4.27-128 further notes that " <i>In summary, the cumulative effects of unintentional releases associated with Pebble Mine expansion would be similar to those discussed previously in this section, but potentially involve larger volumes over a slightly larger geographic area.</i> " It is not clear how the potential impacts can summarized without discussing quantities or magnitudes of potential impacts.	Please provide additional details on spill quantities and magnitudes of impacts so that cause-effect relationships and interpretation of impacts are consistent with good science.
DEC/ Commissioner's Office	Chapter 5: Mitigation	5.2.1.1	5-3	This section discusses permitting for large mine projects in Alaska. Information on the ADEC Certificate of Reasonable Assurance is an integral part of the Corp 404 permit process and that information is missing from this section. Summary information on ADEC APDES permits should also be added to this section.	Please include a discussion of the ADEC Certificate of Reasonable Assurance (401 Cert) and APDES permits to this section.

Department/ Division/Section	Document Name	Section/Fig. /Table	Page #	Comment/Issue	Recommendation/Action
DEC/ Division of Water, Water Quality Standards	Chapter 5: Mitigation	Table 5-2	General	This table discusses proposed mitigation measures that the applicant has incorporated into the project. It is not clear which agency will be responsible for compliance and enforcement of these mitigation measures. According to Forty Most Asked Questions Concerning CEQ's NEPA Regulations #19b, The probability of the mitigation measures being implemented must also be discussed, to ensure that the environmental effects of the proposed action are fairly assessed.	Please discuss which agency will be responsible for compliance and enforcement of these mitigation measures so the reader can determine the probability of the mitigation measures being implemented.
DEC/ Commissioner's Office	Chapter 5: Mitigation	Table 5-2	5-8	Item three on this page discusses a Fugitive Dust Control Plan (FDCP) as a propose mitigation measure. It is not clear how the promise of future development of a plan can be considered mitigation. This type of "paper mitigation" does not solve the environmental problems disclosed in the NEPA document. According to Forty Most Asked Questions Concerning CEQ's NEPA Regulations #19b, The probability of the mitigation measures being implemented must also be discussed, to ensure that the environmental effects of the proposed action are fairly assessed. As this statement does not provide actual mitigation and also does not make clear what agency would be responsible for compliance and enforcement, it cannot be considered mitigation.	If fugitive dust control will be considered a mitigation measure, please provide a written plan, including information regarding which agency would be responsible for compliance and enforcement.
DEC/ Commissioner's Office	Chapter 7: Cooperating Agencies and Preparers	Table 7-1		It is not clear why federal agencies have multiple representatives listed, but state agencies only have one.	Please list state agency reviewers.
DEC/Division of Water Wastewater Discharge Authorization Program	Appendix E	E1.2		In general, the DEIS lacks specificity and understanding of the available permitting mechanisms for the Clean Water Act under the Alaska Pollutant Discharge Elimination System (APDES) Program. While Section E1.2 correctly identifies the ability to obtain stormwater coverage under the Alaska Construction Stormwater Permit, it fails to acknowledge requirements for a host of other discharges associated with construction and operation. Without an adequate understanding of these permits, the applicant, decision makers and the public may not be able to foresee conflicts that could be avoided otherwise or cause project delays during implementation. It should be noted that the department's two general permits specifically address issues specific to the construction and operation of gas pipelines for the Pebble Project.	Please review the general permits issued by the department's ADPES program and summarize that regulatory authority in the EIS. General permits provide streamlined permitting procedures, but also offer regulatory consistency.

Department/ Division/Section	Document Name	Section/Fig. /Table	Page #	Comment/Issue	Recommendation/Action
DEC/Environmental Health Division, Solid Waste Program	Appendix N	3.7	46-47	Solid waste disposal will require construction and closure design for landfills that meet the requirements of Alaska regulations at 18 AAC 60. In order to determine the impact of solid waste disposal on the environment and public health, the DEIS should include a detailed list of disposal locations for the various types of waste. This list, along with a final plan for construction and closure of these landfills will also be required for the Integrated Solid Waste Management Permit (ISWMP), which is a joint effort between the Department of Environmental Conservation and the Department of Natural Resources.	The department recommends reviewing the general permit issued by the Solid Waste program and summarizing that regulatory authority in the EIS. General permits can offer streamlined permitting procedures, but also offer regulatory consistency.
DEC/Environmental Health Division, Solid Waste Program	Appendix N	3.7.8	47	The solid waste incinerator noted here should be included in the application for the Title V Air Quality Permit, as the Environmental Protection Agency (EPA) is currently reviewing previously adopted Commercial/Industrial Solid Waste Incinerator (CISWI) regulations which may apply to the facility. Compliance with these regulations has been difficult for other facilities, so an alternative waste disposal option that does not include incineration should be considered.	Please consider an alternative waste disposal option if it appears that waste incineration will not be able to meet the EPA requirements.
DEC/Environmental Health Division, Solid Waste Program	Appendix N	3.7.9	48	It is not clear from the information provided whether the sludge from water treatment will meet the disposal requirements of Alaska regulations at 18 AAC 60.	Please provide additional information on the disposal of water treatment sludge meeting solid waste disposal requirements.
DEC/Environmental Health Division, Solid Waste Program	Appendix N	3.9	50	It is not clear from the information provided that the solid waste management at the Amakdedori Port will meeting the requirements of Alaska regulations at 18 AAC 60.	Please provide additional information on solid waste management at the Amakdedori Port.
DEC/Environmental Health Division, Solid Waste Program	Appendix N	6	71-73	The department's Solid Waste Program has concerns regarding final disposal of the potentially acid generating (PAG) and metal leaching (ML) waste in the open pit lake. While the understanding of the mitigation of PAG is clear, the impacts of additional metals (Al, As, Cd, Cu, Fe, Hg, Mn,Mo, Ni, Pb, Sb, Se and Zn, and others) have not been clearly addressed.	Please address metal leaching waste in the pit lake and explain the potential impacts.
DEC/Environmental Health Division, Solid Waste Program	Appendix N	6.1	72	Details on the closure of the on-site monofill need to be included in the discussion on this page.	Discuss closure of the on-site monofill when discussing closure and reclamation.
DEC/Environmental Health Division, Solid Waste Program	Appendix N	6.1	72	It is not clear if the reclamation and closure plan for the bulk tailings includes detailed static and seismic stability analyses.	Please provide static and seismic stability analysis for the bulk tailings reclamation and closure.
DEC/ Division of Water, Water Quality Standards	Appendix N		73	The first paragraph on this page discusses post-closure management of the pit lake. It notes " <i>The pit lake is expected to stratify during the closure period with surface waters retaining a neutral to slightly basic pH over time.</i> " It is not clear how this conclusion was reached.	Please explain what modeling has been done to make this conclusion. Also, please address the scenario and mitigation measures needed if the pit lake does not stratify and in fact turns over.

Department/ Division/Section	Document Name	Section/Fig. /Table	Page #	Comment/Issue	Recommendation/Action
DEC/ Division of Water, Wastewater Discharge Authorization Program	GENERAL COMMENT			General comment: The DEIS lacks sufficient details regarding the impacts and mitigation of construction and operation of a large scale natural gas pipeline under Alaska's environmental permitting authority. The State of Alaska has authority over discharges to freshwater and land for domestic wastewater, inadvertent releases from horizontal directional drilling (HDD), gravel pit dewatering, excavation dewatering, hydrostatic test water, construction stormwater, and mobile spill response. The Department of Environmental Conservation's Wastewater Discharge Authorization Program has issued a general permit AKG320000 - Statewide Oil and Gas Pipelines that provides holistic coverage for wastewater discharges from pipeline construction and operations.	The department recommends integrating the Alaska Pollutant Discharge Elimination System (APDES) permit requirements into the applicable DEIS sections that relate to protecting land and water resources during construction and operation of the pipeline.
DEC/ Division of Water, Water Quality Standards	Supplemental Environmental Baseline Document: 9.1 Surface Water Quality (March 2018)	9.0.8	9-3	The final paragraph on this page notes that " <i>The results of the surface water and groundwater sampling were compared with the most stringent benchmark water quality criteria based primarily on Alaska Department of Environmental Conservation's water quality criteria (ADEC, 2008) and EPA's National Recommended Water Quality Criteria (EPA, 2009a, see EBD 2012, Tables 9.02 and 9.03).</i> " This baseline report provides little information regarding the metrics used to establish benchmark criteria, potential toxicity to aquatic life in ambient water, and the assimilative capacity of a waterbody to mitigate discharge effluent and non-point pollution before aquatic life would be threatened in a substantive manner.	If this baseline document is going to be cited as a source for conclusions in the EIS, please provide additional clarification on which water quality criteria are being used (current state standards or recommended federal standards), the magnitude, duration and frequency values of those standards, and how the sample was determined to be meeting or exceeding state water quality criteria. Please also provide a rationale for the use of state versus federally-recommended criteria, as well as the potential to increase toxicity to aquatic life in receiving waters as a result of mining effluent combined with potential nonpoint source pollutants.
DEC/ Division of Water, Water Quality Standards	Supplemental Environmental Baseline Document: 9.1 Surface Water Quality (March 2018)	9.1.4	9.1-2	General Comment: It is not clear why arsenic and selenium sampling was discontinued in 2009 at multiple sampling locations, when these pollutants are likely to be present in concentrations that could potentially affect aquatic life.	Please provide additional information specific to arsenic and selenium monitoring in the project area and how discontinuing sampling was justified.
DEC/ Division of Water, Water Quality Standards	Supplemental Environmental Baseline Document: 9.1 Surface Water Quality (March 2018)	9.1.4	9.1-2	General comment: It is not clear why the project proponent did not collect data on dissolved organic carbon (DOC) for all waters. Current science clearly indicates that dissolved organic carbon is a mitigating factor in regards to the bioavailability of metals.	Please provide additional information pertaining to the collection of water quality data and the metrics used for comparison if site specific DOC data is to be used as representative of the entire project area.
DEC/ Division of Water, Water Quality Standards	Supplemental Environmental Baseline Document: 9.1 Surface Water Quality (March 2018)	9.1.6.3	9.1-8	General comment: If this report is being used to support conclusions in the EIS regarding temporal trend analysis, the description of conventional pollutants (e.g., pH, and temperature) and total/dissolved trace elements generally would be better represented with summary tables of some form rather than text and references to various appendices. In addition, there is virtually no discussion about the potential relationship between analytes and stream flow/potential groundwater influence.	Please revise, modify or summarize the data in the report to more clearly provide the data. Also, please revise, modify or summarize the report to more accurately depict the relationship between flow characteristics and potential toxicity to aquatic life due to increased concentration of pollutants.

Department/ Division/Section	Document Name	Section/Fig. /Table	Page #	Comment/Issue	Recommendation/Action
DEC/ Division of Water, Water Quality Standards	Supplemental Environmental Baseline Document: 9.1 Surface Water Quality (March 2018)	9.1.6.3	9.1-6 thru 9.1- 12	It does not appear that samples were collected and analyzed for methyl mercury (MeHg). The EPA updated the nationally recommended criteria for human health to include the application of methyl mercury criteria in 2001.	If this report is being used to support conclusions in the EIS, it would be helpful to identify other data that included methyl mercury. Also, the discussion of that data should also include an explanation that there are discrepancies between the federally-recommended criteria for the protection of human health and those currently adopted by Alaska and used in state permitting practices.
DEC/ Division of Water, Water Quality Standards	Supplemental Environmental Baseline Document: 9.1 Surface Water Quality (March 2018)	9.1.6.3	9.1-4	The water quality criteria in this report are based on the 2008 version of the department's <i>Alaska Water Quality Criteria Manual for Toxic and Other Deleterious Organic and Inorganic Substances</i> . It is not clear whether the aquatic life water quality criteria for copper has been updated. The EPA's approved use of the biotic ligand model (BLM) in 2007, to predict lethal and nonlethal effects to aquatic life, but it is not clear from the report whether the biotic ligand model was considered in the sampling and analysis.	If this report is being used to support conclusions in the EIS, it would be helpful to explain whether the EPA's 2007 aquatic life water quality criteria for copper was considered in the sampling and analysis. Also, the discussion of that data should include an explanation that there are discrepancies between the federally-recommended criteria for the protection of human health and those currently adopted by Alaska and used in state permitting practices. The department is considering the development of guidance pertaining to the BLM in upcoming Triennial Review cycles.
DEC/ Division of Water, Water Quality Standards	Supplemental Environmental Baseline Document: 9.1 Surface Water Quality (March 2018)	9.1.6.3	9.1-6 thru 9.1- 12	It does not appear that samples were collected and analyzed for methyl mercury (MeHg). The EPA updated the nationally recommended criteria for human health to include the application of methyl mercury criteria in 2001.	If this report is being used to support conclusions in the EIS, it would be helpful to identify other data that included methyl mercury. Also, the discussion of that data should include an explanation that there are discrepancies between the federally-recommended criteria for the protection of human health and those currently adopted by Alaska and used in state permitting practices.
DEC/ Division of Water, Water Quality Standards	Supplemental Environmental Baseline Document: 9.1 Surface Water Quality (March 2018)	9.1.6.3	9.1-7	The water quality criteria in this report are based on the 2008 version of the department's <i>Alaska Water Quality Criteria Manual for Toxic and Other Deleterious Organic and Inorganic Substances</i> . It is not clear whether the aquatic life water quality criteria for ammonia has been updated. The text did not describe any consideration of the 2013 federal update to the ammonia criteria during the assessment or any work to determine whether freshwater mussels (the most sensitive species under certain conditions) are present or absent. This information could affect the assessment of the degree of risk present to aquatic life.	If this report is being used to support conclusions in the EIS, it would be helpful to explain whether the EPA's 2013 aquatic life water quality criteria for ammonia was considered in the sampling and analysis. Also, the discussion should include information regarding the metrics used for assessment and potential risk to aquatic life (e.g., freshwater mussels) as a result of ammonia discharges.
DEC/ Division of Water, Water Quality Standards	Supplemental Environmental Baseline Document: 9.1 Surface Water Quality (March 2018)	9.1.7.2	9.1-16	Paragraph three on this page notes that " <i>In all cases, pH was below the minimum criteria , indicating locations with acidic water occur in the South Fork Kaktuli River throughout the year.</i> " This appears to conflict with the statement in Section 9.1.7.1 which states " <i>The mean pH (6.63) is very close to neutral (pH 7) in the South Fork Kaktuli River.</i> "	If this report is being used to support conclusions in the EIS, there will need to be clarifications regarding the measurement of pH and the conclusions regarding the toxicity of certain pH levels.

Department/ Division/Section	Document Name	Section/Fig. /Table	Page #	Comment/Issue	Recommendation/Action
DEC/ Division of Water, Water Quality Standards	Supplemental Environmental Baseline Document: 9.1 Surface Water Quality (March 2018)	9.1.7.2	9.1-19	The discussion on this page notes that the median pH was 6.65, but prior discussion noted a level of 6.63.	If this report is being used to support conclusions in the EIS, there will need to be consistency regarding the pH values cited.
DEC/ Division of Water, Water Quality Standards	Supplemental Environmental Baseline Document: 9.1 Surface Water Quality (March 2018)	9.1	Table 9.1 -24 (PDF page 123)	The data in this table does not indicate a time and date when the samples exceeded water quality criteria, so the reader cannot determine how the exceedance compares with data on streamflow or other influencing characteristics.	If this report is being used to support conclusions in the EIS, please provide additional documentation regarding the timing of collection of water quality data in table form that would allow for comparison of applicable water quality criteria, sample results and flow characteristics.

**Pebble Project: DEIS Review
State of Alaska Consolidated Comments Table**

Department/ Division/Section	Document Name	Section/Fig./ Table	Page #	Comment/Issue	Recommendation/Action
DNR/DMLW/ Mining	Appendix E	Appendix E: Laws, Permits, Approvals & Consultation Required	E-18	The Legal Authority Section is missing the relevant Statutes for Upland Mining Leases (AS 38.05.205) & Millsite Leases (AS 38.05.255)	Please include these state statute references in the Appendix E.
DNR/DMLW/ Mining	Appendix E	Appendix E: Laws, Permits, Approvals & Consultation Required	E-18	The Mining License is issued by the Department of Revenue, not DNR.	Please correct this reference.
DNR/DMLW/ Mining	Appendix E	Appendix E: Laws, Permits, Approvals & Consultation Required	E-18	Upland Mining Leases are not mentioned in this section but PLP lists them as a required authorization on Page 78 of Appendix N.	Please include these state statute references in the Appendix E.
DNR/DMLW/ SCRO		General		<p>The DNR Division of Mining, Land and Water, Southcentral Regional Land Office wishes to note that it may require applications from the Pebble Limited Partnership or associated contractors for authorization of project activities and/or facilities where proposed for location on State owned, DNR-DMLW managed lands. It is likely that easements, leases, and permits will be required for various aspects of the project.</p> <p>As there have been no applications received by the Southcentral Regional Land Office, commenting on specific details of the proposed project could be deemed predecisional. Issues and concerns will be evaluated and addressed with each application and subsequent adjudication process.</p>	
DNR/DMLW/ Water/Dam Safety		General		The Pebble DEIS describes large dams at the proposed mine for two tailings storage facilities and a large geomembrane-lined water dam. A number of smaller dams and reservoirs such as seepage collection ponds are indicated but not described. The DEIS includes descriptions and design criteria from various engineering analyses and risk assessments. These facilities are subject to regulation by ADNR under AS 46.17 and Article 3 of 11 AAC 93. ADNR will evaluate these facilities after the respective applications for state authorizations required under 11 AAC 93.171 are received.	

**Pebble Project: DEIS Review
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Department/ Division/Section	Document Name	Section/ Fig./Table	Page #	Comment/Issue	Recommendation/Action
DNR/DOG/SPCS	all			Expanded Development Scenario	The references to the Expanded Development Scenario in all documents are insufficient for an EIS review. There are no maps and the few details presented are incomplete. The impression is that these actions are being considered and would be used to authorize the expansion 20 years from now. Either the expansion should be presented as an alternative and clearly defined and researched, or it should be clearly stated that the expansion would need an additional review.
DNR/DOG/SPCS	4.16 Surface Water	4.16.7.2	4.16-46	Pebble Mine Expanded Development Scenario	This is the first place the expansion is better defined. If this scenario is intended to be reviewed as part of this EIS, it should be discussed in more detail throughout, from project description, through all sections, with impacts to resources more clearly called out. The expansion is not included in the Chapter 2 Alternatives text.
DNR/DOG/SPCS	Executive Summary	3.1.2.3 Cumulative Effects	31	Expanded Development Scenario	Is introduced in this document on page 31 - well past the alternatives and project descriptions, tucked into the cumulative impacts to subsistence. This is the first reference to a diesel pipeline, and simply says "A new deep-water port and condensate and diesel pipelines would be constructed" with no explanation of why these additions are needed rather than relying on the port and fuel pipelines already constructed for the project.
DNR/DOG/SPCS	4.22 Wetlands	Table 4.22-12	4.22-39	estimates of acreage for potential development expansion (Alt 1, column 2)	It is not clear from this table or other sections of the EIS what is included in the acreage calculations for the estimated expansion footprint (diesel fuel pipeline, concentrate pipeline, port footprint). A diesel line would require additional land disturbance for spill response locations and valves at waterbody crossings, which are not necessary for natural gas pipelines. Additionally, it is not clear why an additional compressor station would be needed at Amakdedori port in addition to the diesel pipeline to a new Iniskin Bay port.
	4.22 Wetlands	Table 4.22-12	4.22-39	estimates of acreage for potential development expansion (Alt 2, column 2)	No acreages are listed in this column, unlike remainder of the table. Update to include information.
DNR/DOG/SPCS	4.22 Wetlands	4.22.9.4	4.22-41	"... a diesel pipeline from the mine site to Iniskin Bay would be constructed as discussed under cumulative effects for Alternative 1."	The additional pipelines, road, and facilities proposed as part of expanded mine development are NOT discussed under the cumulative effects of Alternative 1. These developments require additional land uses, impact additional resources, and require additional authorizations beyond the Alternative 1 proposed plan. Among other things, spill risks exist for a diesel pipeline that require different designs and protections from natural gas pipelines.
DNR/DOG/SPCS	4.17 Groundwater	4.17.7.2	4.17-27	"The effects of the project on groundwater..."	If a diesel pipeline is constructed for the expanded mine development, the EIS will need to include the risk of spilled fuel into shallow groundwater and waterbodies.

Department/ Division/Section	Document Name	Section/ Fig./Table	Page #	Comment/Issue	Recommendation/Action
DNR/DOG/SPCS	Ch 1 Purpose and Need	1.2 Applic. Description	page 1-1	"...an 187-mile gas pipeline..."	Most of the EIS, including project description (Appendix N), describes a 188-mile pipeline.
DNR/DOG/SPCS	Ch 2 Alternatives	2.2.2	page 2- 13	"...an 187-mile gas pipeline..."	Most of the EIS, including project description (Appendix N), describes a 188-mile pipeline.
DNR/DOG/SPCS	4.14 Soils	4.14.2 Alternative 1	4.14-2	"Other agencies that may require... (ADNR) for an Approved Pipeline Right-of-Way (ROW) Permit; ..."	ADNR requires a Pipeline Right-of-Way Lease, not an "Approved Pipeline Right-of-Way Permit"; please correct terminology from permit to lease, and lowercase the "Approved", as it is not part of the name of the authorization.
DNR/DOG/SPCS	Multiple; example from 4.14 Soils	4.14.6.2	4.14-28	re: "unlikely to result in any appreciable impact... or actions outside of the cumulative effects analysis area..." and the list that follows "Past, present, and RFFAs that could contribute..."	This text, and similar text in 4.13, are good examples of well-focused cumulative effects for the relevant resource. This focused approach is preferable to, but inconsistent with, the approach in 4.3, 4.7, 4.20, others. Suggest updating those other sections to a more focused style such as 4.14, if updates include Cumulative Effects descriptions.
DNR/DOG/SPCS	4.13 Geology	4.13.6	4.13-17	"...or actions outside of the cumulative effects analysis area (e.g., Donlin Gold, Shotgun...)"	This is a good example of acknowledging the list from 4.1 but making it applicable to the resource in question (here, geology). Much better than 4.7, 4.20, and others, which contain full lists including projects not reasonably related to the reviewed resource in the Pebble Project area.
DNR/DOG/SPCS	4.9 Subsistence	4.9.6	4.9-16	bulleted list includes Donlin Gold, Alaska Stand Alone Pipeline, Alaska LNG, and Drift River Oil Pipeline	Donlin Gold is geographically separate from Pebble - it is unclear why it is included in this list of RFFA's. Alaska LNG & ASAP - of which only one is likely to be built - both share possible impacts to Cook Inlet subsistence resources, but that is not well explained. Furthermore, "Drift River Oil Pipeline" is already changed. Hilcorp constructed Tyonek pipeline and modified CIGGS-A pipeline to divert oil from Drift River terminal during the summer of 2018. Decommissioning of Drift River may be complete before Pebble, if approved, could begin construction.
DNR/DOG/SPCS	4.9 Subsistence	4.9.6.2	4.9-18	"Since the other mineral exploration RFFAs are generally close to the Pebble Project, subsistence use areas..."	As the Donlin Gold mine is roughly 170 miles away, it is hard to consider it as "generally close" to the Pebble Project.
DNR/DOG/SPCS	4.3 Socioeconomic	4.3.6 Cumulative Impacts	4.3-15 to 16	"RFFAs identified... that could contribute to the regional and state socioeconomic cumulative effects..."	Section does not address how Donlin Gold, Alaska Stand Alone Pipeline, Drift River Oil Pipeline, and Alaska LNG relate to RFFA for the Pebble Project for this resource. Revisions from PDEIS to DEIS did not expand on the relation between Pebble and these projects' impacts. Please elaborate.
	4.7 Cultural Resources	4.7.7	4.7-9	"The following RFFAs... apply to the consideration of cumulative effects on cultural resources"	This bulleted list includes projects geographically distinct from Pebble Project, such as Donlin Gold and Alaska Stand Alone Pipeline, and their cumulative effects on cultural resources with Pebble are not well expressed.
DNR/DOG/SPCS	4.1 Environmental Consequences	Table 4.1-1	4.1-17	Donlin Gold project is listed	If Donlin Gold is being included as a RFFA, then it should be displayed with the other RFFA's on Fig 4.1-1, to illustrate proximity to/distance from Pebble Project resources (Figure 4.1-1, page 4.1-22)

Department/ Division/Section	Document Name	Section/ Fig./Table	Page #	Comment/Issue	Recommendation/Action
DNR/DOG/SPCS	4.1 Environmental Consequences	Figure 4.1-1	4.1-22	Donlin Gold project is not shown	If Donlin Gold is included as a RFFA and will continue to be listed in table 4.1-1, it should be added to the map in Figure 4.1-1
DNR/DOG/SPCS	4.12 Transportation	4.12.2.3, Natural Gas Pipeline Corridor	4.12-7	"The magnitude and extent... would be 94 miles of pipeline crossing the Cook Inlet seabed..."	The 94-mile distance is inconsistent with the 104-mile distance noted in the project description and other sections of the DEIS.
DNR/DOG/SPCS	4.1 Environmental Consequences	Table 4.1-2	4.1-24	Alt 1 - after 20 years, an additional natural gas compressor would be built at Amakdedori less truck traffic with concentrate and diesel transported via pipeline from Iniskin	No explanation is given for why an additional gas compressor is needed in addition to the construction of the ill-defined diesel pipeline at Iniskin
DNR/DOG/SPCS	4.1 Environmental Consequences	Table 4.1-2	4.1-24	Alt 2 and Alt 3- after 20 years, an additional natural gas compressor would be built at Diamond Port less truck traffic with concentrate and diesel transported via pipeline from Iniskin	No explanation is given for why an additional gas compressor is needed in addition to the construction of the ill-defined diesel pipeline at Iniskin
DNR/DOG/SPCS	4.1 Environmental Consequences	4.1.3.3	4.1-26 to 27	"...a compressor station on the Kenai Peninsula side, and a second compressor station located at a Cook Inlet port site."	Project description update list calls for one compressor station, on the Kenai Peninsula side (see Appendix N, unnumbered intro page), rather than the two compressors described here. The two-compressor reference here is inconsistent with the remainder of the EIS review (see 4.20-16 or 4.19-17 for examples), with the exception of references to possible mine site expansion which would include construction of a second compressor station.
DNR/DOG/SPCS	4.1 Environmental Consequences	Table 4.1-1	4.1-18	Drift River: "proposes to repurpose an existing natural gas pipeline crossing Cook Inlet to an oil pipeline. Involves the installation of 9 miles of new cross-inlet between Beluga and Nikiski."; Status - Decommissioning of Drift River initiated in 2017...	New gas pipeline from Beluga to Tyonek platform is complete (fall 2018). Converted gas pipeline is now transporting oil eastward across Cook Inlet (fall 2018), which will allow for the decommissioning of Drift River Terminal.
DNR/DOG/SPCS	Ch 4, multiple sections	Natural Gas Pipeline	4.24-7 (also p 4.24-9 and 4.24- 18)	"HDD would be used to install the pipeline segments from the shoreline into waters deep enough to avoid navigational hazards"	Note that the transitions are inconsistently described in Chapter 4. Section 4.24 says Iliamna and the shore transitions are all HDD, but other locations such as 4.16-35 say "construction of the pipeline (by HDD or trenching)". Executive Summary (page 13) says "by HDD or trenching". Please clarify the apparent inconsistencies.
DNR/DOG/SPCS	Appendix E	Table E-1	Page E-18	"ROW leases for road, pipeline, and, and fiber optic cable on state lands and waters"	Roads and AS 38.05 pipeline authorizations are proposed to be issued as easements, not leases. Please reference the correct authorization type.
DNR/DOG/SPCS	Appendix E	Table E-1	Page E-18	"(under Right-of-Way Leasing Act) AS 38.35.020"	Suggest listing the statutory reference as AS 38.35 because leasing conditions are addressed throughout the chapter.
DNR/DOG/SPCS	Appendix I	6.8	Owl Ridge p 118	"Inactive pipelines that remain in place, will be properly pigged, purged, filled with seawater, and capped"	This does not specify that it is intended for the subsea pipeline components; suggest clarifying that uplands buried pipeline would not be filled with seawater when/if abandoned in place.

Department/ Division/Section	Document Name	Section/ Fig./Table	Page #	Comment/Issue	Recommendation/Action
DNR/DOG/SPCS	Appendix N	2.4	19	"... which is located on private land owned by the University of Alaska..."	UA land is not listed in Table 2-4 but was mentioned in preceding paragraph; Kenai Peninsula pipeline component not clearly stated in table. How much land is involved on that eastern Cook Inlet section, and who are the land owners?
DNR/DOG/SPCS	Chapter 3	Table 3.2-4	3.2-11	ADL 218329 & ADL 232949: "obsolete" noted by these authorizations	DNR still considers these authorizations as active. Uncertain why they are listed as "obsolete" in this table.
DNR/DOG/SPCS	Chapter 3	3.2.2	3.2-11	No reference is made to University land management	Appendix N (page 19, section 2.4) references a tie-in to compressor station on University of Alaska land. Please resolve the inconsistency
DNR/DOG/SPCS	Chapter 4		4.2-5	"One state public access easement exists... (see Section 3.2)"	The State of Alaska still recognizes all three easements listed in Table 3.2-4, not just one. Uncertain why others were considered "obsolete" and excluded from review.
DNR/DOG/SPCS	Chapter 4	4.12.2.1	4.12-4	"During construction of the pipeline on the Kenai Peninsula ... traffic on the Sterling Highway would be affected by vehicles transporting materials to the site. The magnitude and extent of the effect would be delays and disruption of traffic due to construction of the project components. However these traffic delays are expected to be less than the usual delays experienced on Sterling Highway during the summer months when tourist traffic at its highest and road construction is most active (PLP 2018-RFI 037). Disruption of traffic may include lane closures and slow vehicles in the immediate vicinity of the construction site. This disruption would be short-term, only occurring during pipeline construction, but the likelihood of occurrence is certain under Alternative 1."	This traffic may be less than summer construction traffic, but would be cumulative with road maintenance traffic, so the impact should not be disregarded. Additional traffic on the only major local road is not an insignificant impact to local transportation.
DNR/DOG/SPCS	Ch 2 Alternatives	2.2.4.5	2-113	The pipeline would consist of a single, approximately 6.25-inch-diameter API 5L X60 grade (or similar) steel pipeline with an internal high-density polyethylene (HDPE) liner to prevent corrosion.	DNR pipeline engineers raised concerns with maintenance of plastic-lined steel pipelines: repairs to plastic cannot be made during operations without cutting through steel; steel casing cannot be welded without causing damage to the lining; and abrasions or damage to the lining can expose the steel to water and internal corrosion but cannot be reached for repair or replacement short of removing full sections of lined pipe at some type of joining flange. Final design of concentrate pipeline would need to consider these issues.
DNR/DOG/SPCS	Ch 2 Alternatives	2.2.4.5-Alt 3, Transportati on Corridor	2-113	The pipeline would transport a mixture of 55 percent concentrate and 45 percent water by mass	No discussion exists on how slurry in concentrate pipeline would be kept from freezing during months of winter operation; likewise, no discussion exists how the water in the return water pipeline variant would be kept in liquid state during sub-zero temperatures. This is not insurmountable, but may require additional facilities to heat the slurry or water, or may require the addition of salt or chemicals to the water to prevent freezing, which would increase overall project footprint.

Department/ Division/Section	Document Name	Section/ Fig./Table	Page #	Comment/Issue	Recommendation/Action
DNR/DOG/SPCS	Ch 2 Alternatives	2.2.4.5-Alt 3, Transportati on Corridor	2-113	Lined concentrate pipelines cannot be built as a continuous welded segment over the entire length, because the tight-fitting HDPE liner would need to be pulled through the inside of the steel pipe. Welded segments can be up to 2,000 to 2,500 feet in length, typically allowing for river crossings that do not include flange connections.	What considerations have been made to allow for repair of damaged sections of pipe or lining? What plans are proposed to detect scour damage in the HDPE liner which could allow corrosion of the steel casing pipe?
DNR/DOG/SPCS	Ch 2 Alternatives	2.2.4.5-Alt 3, Concentrate Pipeline Operations	2-119	The return water pipeline would be placed in the same trench as the slurry and natural gas lines, adjacent to the road, so the trench would be widened by a few feet (see Figure 2-64). This pipeline would need to be sized to accommodate water from flushing operations, resulting in a return water size of approximately 8 inches. This would also be an HDPE-lined steel pipeline with appropriate corrosion protection and other controls, as discussed above.	Concerns about the optional return water pipeline are similar to the concerns with the concentrate pipeline. How will the water be kept liquid in winter? How will damaged pipe be repaired? For the water pipeline specifically, was non-steel pipe considered? In-Alaska example of an alternative is the North Fork natural gas pipeline, which is successfully operating and was constructed of FiberSpar fiber-reinforced composite pipe.
DNR/DOG/SPCS	Ch 2 Alternatives	Table 2-2	2-126	187 miles (pipeline length)	Most of the EIS, including project description (Appendix N), describes a 188-mile pipeline.

**Pebble Project: DEIS Review
State of Alaska Consolidated Comments Table**

Department/ Division/ Section	Document Name	Section/Fig./ Table	Page #	Comment/Issue	Recommendation/Action
DNR/DPOR/ OHA	3.7 Cultural Resources	3.7.2.1	3.7-5	The Previous Cultural Resource Research section should mention the creation and composition of the archaeological site location model since it will be used in later analyses.	Include a brief summary of the archaeological site location model and its limitations.
DNR/DPOR/ OHA	3.7 Cultural Resources	3.7.3.1	3.7-6	Discussion of the site location model states that low potential areas do not need to be surveyed. This issue still needs to be discussed regarding appropriate level of effort.	Rephrase: "...low potential for sites,...have been surveyed or may not need to be surveyed,..."
DNR/DPOR/ OHA	3.8 Historic Properties	3.8	3.8-1	The introduction to the National Historic Preservation Act and the purpose of this section is unclear.	If the Pebble EIS needs to introduce the National Historic Preservation Act then it needs to make clear what the requirements of the statute are, that 36 CFR 800 are the ACHP's implementing regulations, and that Appendix C is the alternative process developed by the USACE, which has not been approved by the Advisory Council on Historic Preservation - the only authority designated under the National Historic Preservation Act to propagate implementing regulations for NHPA.
DNR/DPOR/ OHA	3.8 Historic Properties	3.8	3.8-1	The second paragraph implies that consultation is only required under 36 CFR 800, when it is also required under Appendix C.	Please also reference Appendix C when discussing consultation requirements.
DNR/DPOR/ OHA	3.8 Historic Properties	3.8	3.8-1	Third Paragraph - Historic properties are determined eligible through consultation between parties. Consultation was gathering information about potential historic properties.	Revise sentence: "...gather input on potential historic properties."
DNR/DPOR/ OHA	3.8 Historic Properties	3.8	3.8-1	Third Paragraph - The role of the programmatic agreement is unclear.	Add language: USACE has chosen to exercise phased identification and evaluation of historic properties under 36 CFR 800.4(b)(2) through the execution of a Programmatic Agreement pursuant to 36 CFR 800.14(b).
DNR/DPOR/ OHA	3.8 Historic Properties	3.8.1	3.8-2	Third bullet - the model is focused on archaeological resources.	Add language: "GIS modeling used to delineate areas of low potential for archaeological resources... "
DNR/DPOR/ OHA	4.8 Historic Properties	4.8	4.8-2	2nd para, 5th line - unnecessary reference.	36 CFR 800.6 can be deleted since it refers to the use of a memorandum of agreement and does not pertain to this project.
DNR/DPOR/ OHA	3.8 Historic Properties	3.8		Discussion and use of various terms referring to the geographic area under consideration (permit area, APE, and analysis area) is confusing and may be inconsistent.	Recommend revising language for clarity.
DNR/DPOR/ OHA	4.8 Historic Properties	4.8		Discussion and use of various terms referring to the geographic area under consideration (permit area, APE, and analysis area) is confusing and may be inconsistent.	Recommend revising language for clarity.

**Pebble Project: DEIS Review
State of Alaska Consolidated Comments Table**

Department/Division/ Section	Section/Fig./ Table	Page #	Comment/Issue	Recommendation/Action
DNR/DGGS/Engineering Geology	3.14.2.3	3.14-4	Under "Erosion" heading, soils are described as having "a 'slight' water erosion hazard." What is the basis of this determination? Fine-grained soils such as those described (silt and sand mixtures) are commonly (very) susceptible to water erosion.	Provide more detail as to basis of determination of "slight" water erosion hazard, or reword so as to more fully express/acknowledge the potential hazard.
DNR/DGGS/Engineering Geology	4.14.2.4	4.14-4	Under "Erosion" heading, silty loam soils are "considered not (to) be susceptible to erosion by water." Despite low slopes, soils with a loamy texture (consisting of fine sand and silt particles) have moderate to high erodibility and should be considered at least somewhat susceptible to erosion by water, especially where vegetation has been disturbed. Even with slight variability along slopes, sheet flows begin to accumulate and can create concentrated flow under conditions of natural topography or human activities (for example, ditches and berms).	Reword to more fully express/acknowledge the potential hazard.
DNR/DGGS/Engineering Geology	4.15.2.3	4.15-12	Under "Tsunamis" heading: Debris avalanches from Augustine Volcano have reached the sea about every 150-200 years and can generate waves up to 60 feet, yet the tsunami modeling (and mitigation design) are predicated on seismic events with 2500-year and 100- to 500-year return periods and lower inundation (42 feet and 19-30 feet, respectively). For 70-year life of port (including closure), the probability of a debris-avalanche tsunami occurring may be as high as 1 in 2, and the potential impacts are greater than the seismic tsunamis.	The hazard from a local tsunami generated by an Augustine debris avalanche should explicitly be included as part of the detailed tsunami analysis prior to final port design, and should be so stated in the third paragraph in this section. Sentence "The port diesel fuel facility would be designed to withstand the 2,500-year event" should be revised to reflect that a volcano-generated tsunami may be the largest design event.
DNR/DGGS/Engineering Geology	4.15.2.3	4.15-14	Under "Volcanoes" heading, the likelihood of a volcanic debris avalanche occurring during the project's life is characterized as "low." See previous comment--the probability of such an event is on the order of 1 in 2, which is not low. The potential for such a flow to reach the pipeline of port facilities is indeed low, but the chief hazard is a tsunami.	Reword to more fully express/acknowledge the potential hazard.
DNR/DGGS/Engineering Geology	4.15.2.4	4.15-20	Coastal Hazards - Seafloor scour and ice gouging are potential issues.	If seafloor scour and ice gouging have been considered, it should be so noted in text.
DNR/DGGS/Engineering Geology	4.15.2.4	4.15-20	Coastal Hazards - Seafloor scour and ice gouging are potential issues.	If seafloor scour and ice gouging have been considered, it should be so noted in text.
DNR/DGGS/Engineering Geology	4.15.6.2	4.15-24	Third paragraph of "Pebble Mine Expanded Development Scenario" section: The example given for potential increase in the likelihood of impacts assumes the largest tsunami will be generated by an earthquake; see earlier comments regarding likelihood and magnitude of a potential tsunami generated by a volcanic debris avalanche from Augustine Volcano.	Reword to include possibility of a debris-avalanche tsunami.
DNR/DGGS/Engineering Geology	3.15.1.1	3.15-1	second paragraph in section, third sentence: recurrence intervals/return periods are long-term statistical averages	use "average" or "mean" as a clarifier when referring to recurrence intervals or return periods
DNR/DGGS/Engineering Geology	3.15.1.3	3.15-4	second paragraph in section, second sentence: the lateral spread of liquified soil up to a "few feet" is ambiguous/arbitrary. In Sulawesi, Indonesia, for example, a large earthquake triggered several hundred hectares of ground to fail as a result of liquefaction.	either remove "a few feet" or reword to emphasize that the extent of liquefaction and resulting ground failures are dependent on pre-existing soil conditions and earthquake characteristics and are difficult to anticipate

Department/Division/ Section	Section/Fig./ Table	Page #	Comment/Issue	Recommendation/Action
DNR/DGGS/Engineering Geology	4.15.2.1	4-15.5	in the "Seismic Stability Analysis" section, second sentence. I would argue that the Alaska-Aleutian megathrust is the most significant active geologic structure near the mine site. Also, there is no evidence of Holocent activity on the Bruin Bay fault, and by the standards defined in 3.15 is not technically active. This phrase is repeated verbatim in K4.15 pg K4 15-23 in the "Analyses of Seismic Hazards Deformation"	If you do not designate the Alaska-Aleutian megathrust as the most significant active structure "near the mine site," then perhaps stipulate a distance threshold across which you are considering active faults or a particular type of fault you are considering (e.g., plate boundary vs intraplate vs upper crustal) that leads you to exclude the Alaska-Aleutian megathrust here.
DNR/DGGS/Engineering Geology	4.15.2.1	4.15-6	the 30 November 2018 Anchorage earthquake magnitude has officially been changed to Mw 7.1 by the Alaska Earthquake Center at UAF	update magnitude to 7.1
DNR/DGGS/Engineering Geology	4.15.2.1	4.15-8	footnote #8 - while the Usibelli coal mine is near the strike-slip Denali fault, it is not "situated in a strike-slip regime." The Usibelli coal mine is in a regime of north-south shortening and uplift within the Northern Alaska Range Quaternary fold and thrust belt. Also, the phrase "due to the tectonic forces that created Denali" is ambiguous. The Denali fault? or Denali the mountain?	rephrase summary description of how the Usibelli Coal Mine and the Pebble mine site are in similar seismically active areas or change the last sentence on the page to have a different meaning.

National Marine Fisheries Service Correspondence with the US Army Corps of Engineers

National Marine
Fisheries
Service

1. April 19, 2018 letter from NMFS to Army Corps on NEPA scoping
2. June 18, 2019 letter from NMFS to Army Corps on Draft EIS
3. July 15, 2019 letter from Army Corps to NMFS on scope of review
4. July 26, 2019 letter from NMFS to Army Corps on scope of review
5. August 13, 2019 email from NMFS to Army Corps on detailed criticisms

Excerpts from Correspondence

Pebble poses significant risk to the Bristol Bay salmon fishery

Indefinite pumping of a toxic pit lake upstream of Lake Iliamna salmon habitat is a problematic environmental closure. [...] The project proponent thinks it will take a long time for these extremely destructive impacts to take hold. This idea of a toxic lake pit slowly becoming diluted and inert isn't working at the Berkeley Pit in Montana, which was closed in 1982, and it will not work in the Bristol Bay Watersheds. at pg. 5-28

An area as rich in salmon habitat as the Kaktuli Watershed, should not be used as a test case for a type of liner that has never undergone long-term testing. at pg. 5-30

Significant deficiencies with the salmon impact analysis

NMFS acknowledges the applicant's study efforts, but concludes these efforts are limited, sparse, lack scientific rigor, and do not fully assess all salmon life stages. at pg. 5-38

NMFS finds it difficult to assess the methods, usefulness of the sparse data, and the periodic use sampling events. Also, the data sets are now more than 12 years old. Off-channel reaches play an important role to the rearing of juvenile salmon. NMFS recommends the project proponent utilize sampling observations and locations that are repeatable and represent all-seasons. at pg. 5-38

Remedies to bring the Corps' process back on track

NMFS recommends having an independent third party (academia) review the fish survey information and state its accuracy and precision both for determining distribution of adults and juvenile life stages. at pg. 5-21

NMFS recommends the project proponent perform standardized, repeatable, year-round studies at specific locations and these studies be made readily available for review. Without more detailed and thoughtfully collected data about the salmon use in the project area, NMFS will continue to find it difficult to assess the potential loss of salmon as a sustainable stock and local resource. at pg. 5-38

the level of detail in an EFH Assessment should be commensurate with the potential impacts to EFH [...] For anadromous salmon, EFH consists of the aquatic habitat and substrates necessary to allow salmon production needed to support a long-term sustainable salmon fishery and salmon contributions to healthy ecosystems. This also includes adequate water quality and adequate water levels to provide fish passage and migratory corridors, and support spawning and rearing life stages. at pg. 5-2



UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
P.O. Box 21668
Juneau, Alaska 99802-1668

April 19, 2018

Colonel Michael S. Brooks
U.S. Army Corps of Engineers
P.O. Box 6898
JBER, Alaska, 99506-0898

Re: POA-2017-271
Pebble Mine

Dear Colonel Brooks:

The National Marine Fisheries Service (NMFS) Habitat Conservation Division has received notice that the Alaska District of the U.S. Army Corps of Engineers (the Corps) intends to prepare an Environmental Impact Statement (EIS) to assess potential impacts associated with the proposed development of the Pebble Mine Prospect. NMFS appreciates the opportunity to provide comment during this scoping period. NMFS may provide more detailed comments during the National Environmental Policy Act (NEPA) review of the draft and final EIS, and during the associated EFH Consultation.

In accordance with Section 305(b)(2) and (b)(4)(A) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA), the Corps is required to consult with NMFS on activities that may adversely affect EFH. If an action may adversely affect EFH, the action agency is required to submit an EFH Assessment to NMFS [50 CFR 600.920(e)]. For detailed EFH consultation information, please visit the EFH section on our website site. NMFS also suggests reviewing the report *Impacts to EFH from Non-fishing Activities in Alaska* (2017), specifically the sections regarding ecosystem processes that support EFH and fisheries in wetlands, streams and rivers, and marine nearshore zones. These sections may provide insight on potential impacts of the proposed project on EFH or give rise to possible mitigation measures.

EFH Requirements

The EFH Assessment is to be completed by the action agency. An action that may adversely affect EFH requires a clearly referenced EFH Assessment [50 CFR Part 600.920(e)]¹. The mandatory contents of an EFH Assessment should be labelled accordingly and include: (i) a description of the action, (ii) an analysis of the potential adverse effects of the action on EFH and

¹ An adverse effect is any impact that reduces quality and/or quantity of EFH and may include direct or indirect physical, chemical, or biological alterations of the waters or substrate and loss of, or injury to benthic organisms, prey species and their habitat, and other ecosystem components.




the managed species, (iii) the Federal agency's conclusions regarding the effects of the action on EFH, and (iv) proposed mitigation, if applicable. The four requirements of an EFH Assessment are import for NMFS to understand the federal agency's determination as to the level of effect on EFH. Also, the level of detail in an EFH Assessment should be commensurate with the potential impacts to EFH [50 CFR 600.920(e)(2)]. Lastly, contents of an EFH Assessment can be incorporated by reference in an action agency's prepared environmental review document, such as an EIS, or be submitted to NMFS in a stand-alone EFH Assessment.

EFH is defined for federally managed groundfish and anadromous salmon in areas potentially impacted by the proposed project. For anadromous salmon, EFH consists of the aquatic habitat and substrates necessary to allow salmon production needed to support a long-term sustainable salmon fishery and salmon contributions to healthy ecosystems. This also includes adequate water quality and adequate water levels to provide fish passage and migratory corridors, and support spawning and rearing life stages. Groundfish species are present throughout the Gulf of Alaska and seasonally occur in Cook Inlet nearshore zones at different life history stages. Further information on EFH and federally managed species within Alaska is available at <http://www.fakr.noaa.gov/habitat/efh.htm>.

NMFS hopes this information is useful in fulfilling the Corps EFH requirements under the MSA. If you have any questions regarding this project, please contact Doug Limpinsel of my staff at Doug.Limpinsel@noaa.gov or (907)271-6379.

Sincerely,


for James W. Balsiger, Ph.D.
Administrator, Alaska Region

Attachment: Essential Fish Habitat – Alaska Fact Sheet

Cc:Newman, Sheila Sheila.M.Newman@usace.army.mil
Worby-Miller, Angela Angela.N.Worby-Miller@usace.army.mil

Citations: Limpinsel, D. E., Eagleton, M. P., and Hanson, J. L, 2017. Impacts to Essential Fish Habitat from Non-Fishing Activities in Alaska. EFH 5 Year Review: 2010 through 2015. U.S. Dep. Commer., NOAA Tech. Memo. NMFS-F/AKR-14, 229p. doi:10.7289/V5/TM-F/AKR-14 ftp://ftp.library.noaa.gov/noaa_documents.lib/NMFS/TM_NMFS_AFKR/TM_NMFS_FAKR_14.pdf



UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration

National Marine Fisheries Service

P.O. Box 21668

Juneau, Alaska 99802-1668

June 18, 2019

Col. Phillip Borders
US Army Corps of Engineers, Alaska District
Regulatory Division
PO Box 6898
JBER, Alaska 99506-0898

Dear Colonel Borders:

The National Marine Fisheries Service (NMFS) has reviewed the Draft Endangered Species Act (ESA) Biological Assessment (BA) and Draft Essential Fish Habitat (EFH) Assessment for the proposed Pebble Mine (Appendices H and I of the Draft Environmental Impact Statement, or DEIS), as well as sections of the DEIS relevant to NMFS's trust resources. The project involves the construction and operation of an open pit mine and ancillary facilities, a port facility, access roads, ferry terminals on Iliamna Lake, and a natural gas pipeline. The mine would be located in the Bristol Bay watershed and the port would be in Cook Inlet, with a road and pipeline connecting the two.

At NMFS's request, the U.S. Army Corps of Engineers (Corps) convened a meeting with NMFS and the Pebble Limited Partnership (Pebble) on May 21, 2019, to discuss the forthcoming consultations between our agencies for the Pebble project under section 7 of the ESA and section 305 of the Magnuson-Stevens Fishery Conservation and Management Act. During that meeting, NMFS noted additional information and analysis that will be necessary to support the ESA and EFH consultations, and agreed to summarize these information needs in a letter to the Corps. NMFS also anticipates that Pebble will apply to NMFS for incidental take authorization under section 101(a)(5) of the Marine Mammal Protection Act (MMPA) for those activities that have the potential to "take" marine mammals, so this letter includes comments related to information in the DEIS that could inform that process as well. NMFS anticipates providing more specific comments to the Corps as the interagency review process continues.

ESA Consultation

The draft BA is too narrow in scope to support consultation on the effects of the proposed action on threatened and endangered species under NMFS's jurisdiction, as required by section 7 of the ESA. The draft BA focuses exclusively on effects from the construction of the proposed port facility and pipeline in Cook Inlet, and is silent on potential effects from the construction, operation, and post-closure phase of the Pebble mine, including indirect, interrelated, and interdependent effects. Indirect effects include consequences for ESA-listed species from increased shipping activity associated with the port and from potentially diminished salmon runs (prey for ESA-listed species in Bristol Bay and the eastern Bering Sea) due to either the mine development itself or a breach of the tailings dam. Although the Corps does not have regulatory jurisdiction over shipping, but for the Corps' authorization of mine infrastructure construction,



this increase in shipping would not occur. Likewise, the Corps does not have jurisdiction over the continuing stability of a tailings dam, but a low-probability, high consequence event such as a tailings dam failure would not occur but for the Corps' authorization.

ESA section 7 consultations must assess the effects of all components of a proposed action, including indirect, interrelated, and interdependent effects, to develop a proper analysis of the effects of the action on threatened and endangered species. This approach is consistent with our practice for consultations on other major actions. For example, for actions that require the mobilization of significant amounts of equipment, section 7 consultations routinely consider the risks to endangered marine mammals from vessel strikes by ships and barges travelling to and from the project location. Similarly, section 7 consultations for oil and gas exploration and development routinely consider the risks to listed species from well blowouts or other spills. Thus, the Corps and Pebble should expand the draft BA to consider all reasonably foreseeable effects of the proposed action. For low-probability events, the analysis should discuss the probability and consequences based on the best available information. We suggest that you take a similarly broader view of effects to ESA-listed marine mammals in your final EIS as well.

In addition to broadening the scope of the BA in accordance with section 7 of the ESA, the Corps and Pebble should revisit each of the draft BA's determinations of effects to listed species. The existing draft BA confuses the threshold for a determination of "no effect" versus "not likely to adversely affect" listed species, a determination that is appropriate only when all effects of the proposed action are discountable, insignificant, or beneficial. For example, section 7.1.2 (page 31) of the draft BA states: "*While it is important to note that humpback whales comprise most vessel strike records in Alaska (Neilson et al. 2012), the risk of strike in the Action Area is low to the point of discountable because of the low (<10 kt [18.5 km/hr]) travel speed of the vessels involved. Therefore, the determination is No Effect.*" Effects to listed species from vessel strikes near the port facility might be extremely unlikely to occur, but such effects cannot be ruled out with a "no effect" determination, and should more properly be considered "not likely to adversely affect" listed species. Likewise, page 32 of the draft BA states: "*The required operation safeguards would minimize the occurrence of spills, size, and extent. Potential incidental spills in Kamishak Bay and Cook Inlet would quickly dissipate in the water due to the high flushing rate of Cook Inlet waters. The determination is No Effect.*" Effects from spills near the port facility may be reduced by rapid dissipation reducing the exposure risk to listed species, but this does not remove the effects, and again a determination of "not likely to adversely affect" would be more appropriate. We would be happy to discuss these sorts of distinctions with the Corps and Pebble as needed to help in your revisions of the BA.

EFH Consultation

The draft EFH Assessment generally understates the value of EFH that would be affected by the proposed action and the seriousness of likely adverse effects to EFH and federally managed fish species from the proposed action, and should be revised accordingly. As defined at 50 CFR 600.910, "*Adverse effect means any impact that reduces quality and/or quantity of EFH. Adverse effects may include direct or indirect physical, chemical, or biological alterations of the waters or substrate and loss of, or injury to, benthic organisms, prey species and their habitat, and other ecosystem components, if such modifications reduce the quality and/or quantity of EFH.*"

Adverse effects to EFH may result from actions occurring within EFH or outside of EFH and may include site-specific or habitat-wide impacts, including individual, cumulative, or synergistic consequences of actions.”

The draft EFH Assessment and related sections of the DEIS do not adequately describe the current condition of the ground and surface water regimes in the vicinity of the proposed mine and the role that complex hydrologic processes play in supporting salmon populations. Accurately presenting the current baseline condition is necessary for a thorough analysis of the direct and cumulative impacts from dewatering the project site and adjacent areas while allowing discharges to the downstream waters.

The DEIS and draft EFH Assessment’s descriptions of the Pebble project are inconsistent, highly variable, and lack a complete portrayal of the entire foreseeable project over the life of the proposed mine and post-mine closure operations. The project descriptions range from a simplified 20-year mine plan with immediate mine closure and restoration to a 78-year mine plan with much larger pit dimensions. The analysis is silent on the impacts to EFH of larger mine expansion scenarios, although some such scenario seems likely if the initial mine and associated infrastructure are built. Without a complete and accurate description of the entire project scale and scope, including reasonably foreseeable mine expansion, it will not be possible to adequately analyze potential adverse effects to EFH and consider appropriate mitigation measures.

The draft EFH Assessment and DEIS do not clearly identify the geographic extent and impacts of dewatering and re-watering activities that are anticipated for mine construction and operation. Predictions of how far downstream water withdrawals will impact freshwater life stages of salmon remain highly uncertain and not well modeled or predicted for expanded mine scenarios. We would expect the interaction between ground and surface water, upwelling, and lateral inflow to influence salmon spawning site selection and the ability of habitat to support winter egg and larval survival and rearing well beyond the mine footprint. To accurately assess impacts to EFH, the analysis needs to address how far downstream such hydrologic processes are likely to be affected for the initial mine development and future expansion scenarios.

The draft EFH Assessment also does not clearly evaluate expected effects to EFH associated with mine tailings. Although the draft EFH Assessment describes plans to install a lining under the pyritic tailings impoundment to reduce the introduction of acid mine drainage into groundwater, the proposed management methods for water quality, treatment, and discharge are not clear, and thus we cannot determine whether these methods will prevent chronic or catastrophic contaminant release in perpetuity. Exposing porphyry deposits and unwanted and unprocessed ores to oxygen and water inevitably will initiate oxidation-reduction reactions generating some form of mine drainage (alkaline or acidic). The EFH Assessment should fully discuss the magnitude and type of different reactions from three sources: 1) pyritic tailings impoundment; 2) waste rock impoundment; and 3) the eventually water-filled open pit. It should also describe the type of liner to be used and its expected longevity under stressful environmental conditions, such as earthquakes and harsh freeze-thaw cycles, as well as details regarding the design and long-term stability of the proposed earthen tailings impoundment and its ability to contain seepage.

Finally, we urge the Corps and Pebble to revise or further substantiate conclusions in the draft EFH Assessment that portray likely effects to EFH as inconsequential. Section 7.1 on page 120 sums up the effects by saying they “would result in a low degree of impact,” “loss of EFH is minimal relative to area that would remain undisturbed,” and “habitat removed is generally of low biological importance.” The EFH Assessment should objectively describe the loss and degradation of EFH that would occur due to the initial mine project and foreseeable expansion, including potential long-term consequences for water quality and hydrology following mine closure.

MMPA

The MMPA prohibits, with certain exceptions, the “take”¹ of marine mammals in U.S. waters by U.S. citizens. However, the MMPA allows, upon request, the incidental, but not intentional, taking of small numbers of marine mammals by U.S. citizens who engage in a specified activity within a specified geographic region. For authorization to take marine mammals incidental to a specified activity other than commercial fishing, a U.S. citizen/entity must apply to NMFS for an incidental take authorization (ITA) under section 101(a)(5)(A or D) of the MMPA. More information on this process can be found at <https://www.fisheries.noaa.gov/permit/incidental-take-authorizations-under-marine-mammal-protection-act>. All incidental take authorizations prescribe the permissible methods of taking and other means of effecting the least practicable adverse impact on a species or stock and its habitat, paying particular attention to rookeries, mating grounds, and other areas of similar significance. Issuance of an ITA constitutes a federal action thereby requiring NMFS to make determinations under the National Environmental Policy Act (NEPA) and other applicable environmental laws. Pebble has no active ITA applications in process or authorizations in place; however, NMFS reviewed the DEIS anticipating the need for the final EIS to cover such a request.

Section 3 of the DEIS includes a brief introduction to marine mammal species potentially found within Cook Inlet and Iliamna Lake. NMFS recommends that you add California sea lions (CSL, *Zalophus californianus*) in the final EIS. Although lower Cook Inlet is not historically part of the CSL range, increased sightings of this species in recent years warrant inclusion of this species (Maniscalco *et al.*, 2004; Lomac-MacNair *et al.*, 2013). The final EIS should also include distinct population segments (DPSs) as some species are incorrectly categorized as non-listed and/or listed under the ESA. The DEIS incorrectly refers to the eastern DPS of Steller sea lions (*Eumetopias jubatus*) as endangered but the eastern DPS was delisted in 2013 (78 FR 66140, November 4, 2013). A similar situation is found with humpback whales (*Megaptera novaeangliae*). While humpback whales are listed as one stock under the MMPA, 14 DPSs have been designated under the ESA (81 FR 62260, September 8, 2016). Both the Mexico DPS

¹ “Take” means to harass, hunt, capture, or kill, or attempt to harass, hunt, capture, or kill any marine mammal. “Harassment” is statutorily defined as, any act of pursuit, torment, or annoyance which--

- (*Level A Harassment*) has the potential to injure a marine mammal or marine mammal stock in the wild; or,
- (*Level B Harassment*) has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering but which does not have the potential to injure a marine mammal or marine mammal stock in the wild.

(threatened) and the Hawaii DPS (not listed) may occur in lower Cook Inlet. These important distinctions under both the MMPA and ESA should be corrected. While the DEIS identifies species presence, it does not address abundance, density, or seasonality for all of the marine mammal stocks likely to be affected by the project. For example, the DEIS indicates minke whales (*Balaenoptera acutorostrata*) have been observed by NMFS aerial surveys in the action area but does not include an evaluation of how many or how often. These population parameters are critical to evaluating the potential impacts of the project. We also note that the NMFS survey data referenced and used in the DEIS appear to be limited to 2006 for many species, yet more recent data are available. All NMFS survey reports through 2016 are available at <https://www.fisheries.noaa.gov/alaska/endangered-species-conservation/research-reports-and-publications-cook-inlet-beluga-whales>. Little information beyond presence/absence information from ABR's dedicated research studies is included. NMFS recommends including sighting details such as number of marine mammals observed by species, location, group size, age/sex class, seasonality, behavior, etc. Finally, Chapter 3 provides very broad habitat use descriptions for select species but again is lacking detail. Chapter 3 could be improved by better describing habitat use (e.g., spatio-temporal preferences, foraging, reproduction, haul-outs, etc.) and importance compared to the species' home ranges.


Chapter 4 provides a very high-level overview of potential direct impacts to marine mammals from various components of the project but does not provide the information necessary to determine if those impacts are significant under NEPA, nor does it address any indirect effects from the project. For example, the DEIS project area, as described in Table 4.25-1, only includes the area directly associated with marine components of the project and does not consider indirect effects from mine construction and operations, including those habitat and prey concerns described above. For the construction analysis, Chapter 4 in the DEIS limits its marine mammal injury assessment to vessel strikes and does not consider that permanent threshold shift (PTS), which is auditory injury, could occur. It also does not use the best available data to identify marine mammal hearing capabilities (e.g., the Cook Inlet beluga whale section does not cite NMFS (2018), which is necessary to assess the impacts of acoustic exposure on hearing), nor does it include any acoustic modeling or analyses. The DEIS indicates that piles up to 96 inches in diameter could be driven. Driving piles of this size typically results in Level B harassment areas spanning tens of kilometers. Because there is no acoustic analysis, it is unclear how the potential (or lack thereof) for PTS or the potential degree of hearing threshold shifts from the proposed activities was determined. Page 4.25-4 indicates: "*The extent of potential impacts would be within 1.6 to 2.9 miles from the port site, depending on type of hammer used. The method of calculation is detailed in Appendix K4.25.*" However, K4.25 only includes estimated source levels with no calculations or modeling results used to identify the aforementioned distances. We note the DEIS also cites Appendix H (the BA) several times in Chapter 4; however, there is no corresponding information in those documents. This approach of referencing the BA in general for purposes of identifying potential impacts is questionable, since the DEIS should include information in the body of the document for determining the impacts to the human environment under NEPA. Finally, the DEIS does not appear to discuss how effective the proposed mitigation will be at minimizing impacts to marine mammal populations.

Regarding the Spill Risk chapter (4.27), several statements are concerning. For example, page 4.27-23 of the DEIS asserts that any impacts to marine mammals from an oil spill would be temporary, lasting only until the oil has evaporated or broken down, and that marine mammals would be deterred from the area. No references are provided to support these statements in the DEIS, and it is unclear if the Corps believes marine mammals would be deterred from the area on their own accord or if Pebble would take action to deter animals. NOAA and its partners have conducted extensive research on the impacts of oil exposure on marine mammals and it is well documented that health impacts from oil spills can be long lasting and that marine mammals do not actively avoid oil spills (e.g., Loughlin, 1994; Deepwater Trustees, 2016). Actively deterring marine mammals from an oiled area is an extremely complex undertaking and can be unsuccessful. Any plans to undertake such deterrence should be developed in close coordination with NMFS. The DEIS makes similar assumptions should mining products be leaked from vessels and pipelines in that any impacts would be temporary and marine mammals would avoid areas of impact. As with other sources of impacts to marine mammals, this section limits its effects analysis to direct impacts and does not consider impacts to marine mammal prey. A small section (page 4.27-90) discusses impacts to salmon as marine mammal prey but the analysis is unsupported by models or scientific literature. In general, the marine mammal risk assessment from oil and mine products exposure is limited in scope and should be more comprehensive based on the best available science.

Conclusion

In summary, additional information and analysis will be necessary to describe the effects of the Pebble project on ESA-listed species and EFH, and we are highlighting those gaps so the Corps and Pebble can compile the needed information prior to formally requesting that NMFS initiate the required consultations. Similarly, NMFS anticipates that Pebble will seek MMPA incidental take authorization for the project, and we are providing comments to better inform that process. Should you have questions regarding our comments, please contact Greg Balogh regarding ESA issues at greg.balogh@noaa.gov or 907-271-3023; Doug Limpinsel regarding EFH issues at doug.limpinsel@noaa.gov or 907-271-5006; or Jolie Harrison regarding MMPA issues at jolie.harrison@noaa.gov or 301-427-8420.

Sincerely,


for

James W. Balsiger, Ph.D.
Administrator, Alaska Region

References

- T.R. Loughlin, Ed., Marine Mammals and the “Exxon Valdez” (Academic Press, San Diego, 1994).
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- Lomac-MacNair, K.S., L.S. Kendall, and S. Wisdom. 2013. Marine Mammal Monitoring and Mitigation, 90-Day Report, May 6- September 30, 2012, Alaska Apache Corporation 3D Seismic Program, Cook Inlet, Alaska. Prepared by SAExploration 8240 Sandlewood Pl. Suite 102 Anchorage, AK and Fairweather Science 9525 King Street, Anchorage, AK. Prepared for Apache Alaska Corporation and National Marine Fisheries Service. 87 p.
- Maniscalco, J.M., K. Wynne, K.W. Pitcher, M.B. Hanson, S.R. Melin, and S. Atkinson. 2004. The occurrence of California sea lions in Alaska. *Aquatic Mammals* 30(3):427-433.
- NMFS. 2018. 2018 revision to: Technical guidance for assessing the effects of anthropogenic sound on marine mammal hearing (Version 2.0). NOAA Technical Memorandum NMFS-OPR-59, National Marine Fisheries Service: 178.



DEPARTMENT OF THE ARMY
ALASKA DISTRICT, U.S. ARMY CORPS OF ENGINEERS
P.O. BOX 6898
JBER, AK 99506-0898

JUL 15 2019

Regulatory Division
POA-2017-00271

James W. Balsiger, Administrator Alaska Region
NOAA Fisheries' National Marine Fisheries Service
Post Office Box 21668
Juneau, Alaska 99802-1668

Dear Dr. Balsiger:

This is in response to your letter dated June 18, 2019, providing your agency's comments on the draft Endangered Species Act (ESA) Biological Assessment (BA) and the draft Essential Fish Habitat (EFH) Assessment appended to the draft Environmental Impact Statement (EIS) for the Department of the Army permit application submitted by the Pebble Limited Partnership (PLP). Requirements under the Marine Mammal Protection Act (MMPA) and general comments on the scope of the draft EIS are also included in your letter.

The United States Army Corps of Engineers (USACE), the National Marine Fisheries Service (NMFS), and PLP met on May 21, 2019 to discuss the forthcoming consultations. In that meeting and your June 18, 2019, letter, you assert that the analysis of the impacts to marine mammals, which are under NMFS's authority, in the draft EIS (dEIS) is not sufficient to support your NEPA analysis for MMPA. As you may recall, on January 9, 2018, USACE invited NMFS to participate as a cooperating agency for the development of the EIS level of analysis for PLP's proposed project. NMFS declined USACE's cooperating agency invitation by a letter dated February 9, 2018. That letter also stated that your agency would, "work with the applicant to meet our obligations under NEPA and the MMPA".

Your June 18, 2019, letter acknowledges the jurisdiction of USACE is limited to those activities associated with the discharge of fill into waters of the U.S. (WOTUS) and work or structures that may affect navigable waters. However, you ask that USACE expand its action area for consultation(s) and scope for the EIS beyond the federal action and the interrelated or interdependent activities of the federal action. Your letter asserts the action area should include mine operations, closure and spill scenarios and any secondary effects of those activities.

USACE is conducting Endangered Species Act Section 7 consultation for actions that it authorizes, in accordance with 50 CFR 402.01(a). Through a permit action, USACE would authorize the placement of fill into WOTUS and the placement of structures and work in navigable waters. As such, USACE will define the ESA action area for purposes of consultation in the BA based on the federal action.

In this instance, issuance of a USACE permit (if granted) would not authorize operation or reclamation of the Pebble project. Operation (including response to potential spills) and closure activities are authorized under laws pertaining to and administered by the State of Alaska. USACE has presented information in the dEIS to the extent required by NEPA regarding operations, reclamation and spill scenarios and is currently reviewing public and agency comments in this regard.

Your letter also states that the dEIS "understates the value of Essential Fish Habitat (EFH)". USACE requests that NMFS identify any existing relevant study not included in our current evaluation for consideration in revising the draft EIS and/or the EFH Assessment, if appropriate. Please provide any relevant study to us as soon as practicable, but no later than August 20, 2019 for consideration.

Please contact my staff, Mr. Shane McCoy via email at poaspecialprojects@usace.army.mil, by mail at the address above, by phone at (907) 753-2715, or toll free from within Alaska at (800) 478-2712, if you have questions. For additional information about our Regulatory Program, visit our website at <http://www.poa.usace.army.mil/Missions/Regulatory.aspx>.

Sincerely,


for David S. Hobbie
Regional Regulatory Division Chief

CF:

NMFS: jon.kurland@noaa.gov



UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
P.O. Box 21668
Juneau, Alaska 99802-1668

July 26, 2019

Col. Phillip Borders
US Army Corps of Engineers, Alaska District
PO Box 6898
JBER, Alaska 99506-0898

Dear Colonel Borders:

The National Marine Fisheries Service (NMFS) has reviewed the July 15, 2019, letter from your Regulatory Division regarding the forthcoming Endangered Species Act (ESA) and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat (EFH) consultations for the proposed Pebble Mine (POA-2017-00271). In that letter, the Corps of Engineers noted that NMFS's June 18, 2019, letter advised the Corps to expand the scope of the ESA and EFH consultations beyond the narrow approach reflected in Appendices H and I to the Corps' Draft Environmental Impact Statement (DEIS), and include the full effects of the proposed project on threatened and endangered species and EFH under NMFS's jurisdiction. The July 15 letter indicates that the Corps instead intends to limit the scope to effects directly associated with the discharge of dredged or fill material in waters of the United States and the placement of structures and work in navigable waters..

Please note that under the ESA, per 50 CFR §402.02, the effects of the action on listed species and their critical habitat refer "to the direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated or interdependent with that action, that will be added to the environmental baseline." Such effects are not limited to the Corps' jurisdictional boundaries. Rather, they extend to "all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action."

Likewise for EFH, per 50 CFR §600.910(a), "*Adverse effect* means any impact that reduces quality and/or quantity of EFH. Adverse effects may include direct or indirect physical, chemical, or biological alterations of the waters or substrate and loss of, or injury to, benthic organisms, prey species and their habitat, and other ecosystem components, if such modifications reduce the quality and/or quantity of EFH. Adverse effects to EFH may result from actions occurring within EFH or outside of EFH and may include site-specific or habitat-wide impacts, including individual, cumulative, or synergistic consequences of actions."



Effects associated with the operation and closure of the proposed Pebble mine would not occur but for the Corps' permitting action. Hence, we urge you to include such effects within the ESA Biological Assessment and the EFH Assessment to help ensure the legal sufficiency of these consultations. NMFS will respond separately to your request that we elaborate on our comment that the DEIS understates the value of EFH.

Sincerely,

for Robert O. McEwan

James W. Balsiger, Ph.D.
Administrator, Alaska Region

From: [Gretchen Harrington - NOAA Federal](#)
To: [McCoy, Shane M CIV USARMY CEPOA \(USA\)](#); [Jon Kurland - NOAA Federal](#); [POA Special Projects](#)
Subject: [Non-DoD Source] NMFS's detailed comments on the DEIS, EFH Assessment, and ESA Biological Assessment, POA-2017-00271
Date: Tuesday, August 13, 2019 5:30:22 PM
Attachments: [Final Pebble Comments spreadsheet.xlsx](#)
[Bibliography to Spreadsheet.docx](#)

Hello Shane,

Please see the attached spreadsheet for detailed comments on the subject documents. The intent of these comments is to provide more detailed and specific comments, on specific sections of the documents, that support our overarching comments from our comment letter, dated June 18, 2019.

In response to USACE's request that NMFS identify relevant studies not already included, I've attached a bibliography for the references cited in the spreadsheet. As our comments indicate, our bigger concern is how the documents analyze and represent the data, analysis, and conclusions in the studies cited in the DEIS and EFH Assessment. Many of our comments point out relevant information in existing appendices and supporting documents that we recommend be analyzed in greater detail in the DEIS and EFH Assessment.

Regards,
Gretchen

--

Gretchen Harrington
ARA, Habitat Conservation Division
NEPA Coordinator
NOAA Fisheries, Alaska Region
907-586-7824

Topic	Document & Chapter	Section # Section Title	Page # Figure #	Author's Original Language or Description of Citation	NMFS Recommendations for USACE/Project Proponent.
DRAFT Essential Fish Habitat (EFH) Assessment					
Fed. Regulations	Draft EFH Chapter 1	1.0 Purpose/Scope	Pg. 1	"Federal agencies must provide NMFS with an EFH Assessment if the federal action may adversely affect EFH. The EFH assessment is required to include the following: 1) a description of the action, 2) an analysis of the potential effects of the action on EFH and managed species, 3) the federal agency's view of the effects of the action, and 4) proposed mitigation, if necessary 50 CFR 600.920(e)."	The language used here does not accurately represent the Code of Federal Regulations (50 CFR 600.920(e)(3)). NMFS recommends using the exact regulatory language regarding preparation of an Essential Fish Habitat Assessment: (e) (3) Mandatory contents. The assessment must contain: (i) A description of the action. (ii) An analysis of the potential adverse effects of the action on EFH and the managed species. (iii) The Federal agency's conclusions regarding the effects of the action on EFH. (iv) Proposed mitigation, if applicable. NMFS suggests citing 50 CFR 600.910 Definitions and 600.920 Federal agency consultation with the Secretary, as well. The process begins with the action agency's determination that the action may adverse effect EFH (see 600.920(a)(1)). Also, the level of detail in an EFH Assessment should be commensurate with the complexity and magnitude of the potential adverse effects of the action (see 600.920(e)(2)).
EFH Assessment - Chapter 3 - Proposed Action					
Fed. Regulations	Draft EFH Chapter 3	1.0 Purpose/Scope	Pg. 3	This EFH Assessment does not define "Adverse Effect"	Adverse Effect (600.910(a)) - "Adverse effect means any impact that reduces quality and/or quantity of EFH. Adverse effects may include direct or indirect physical, chemical, or biological alterations of the waters or substrate and loss of, or injury to, benthic organisms, prey species and their habitat, and other ecosystem components, if such modifications reduce the quality and/or quantity of EFH. Adverse effects to EFH may result from actions occurring within EFH or outside of EFH and may include site-specific or habitat-wide impacts, including individual, cumulative, or synergistic consequences of actions." NMFS recommends USACE clearly define "adverse effect" as defined in Federal regulations.
Mine Description	Draft EFH Chapter 3	1.0 Purpose/Scope	Pg. 3	"The total size of the proposed mine area would be 42,300 ft (12,893 m) long by 25,600 ft (7,802.9 m) wide, covering an area of 8,085.8 ac (3,272.2 ha)."	NMFS recommends USACE state the pit's depth, width and other pertinent pit information in the EFH Assessment as these are important for understanding the mines effects on groundwater, upwelling, and spawning habitat. It is stated in other documents, but the depth and width are inconsistent.
Project Scope	Draft EFH Chapter 3	3.0 Proposed Action	Pg. 3	"PLP's proposed action includes activities that require DA authorization under Section 404 of the CWA and Section 10 of the RHA."	This proposed action sections implies the action being evaluated in the EFH Assessment is only the four years of construction necessary to begin mining. The proposed action should encompass the 4 years of construction, at least 20 years of mining, and the several hundred years water treatment that must continue once active mining finishes. Each of these three parts will have significant impacts on EFH. NMFS recommends USACE/project proponents have the EFH assessment cover all actions associated with constructing, operating, and closing the Pebble Mine. As one reads through the hundreds of documents put forward over the last 14 years, it becomes clear that the 78-year mine makes more economic sense and is probably the end goal of the project proponent. NMFS recommends the project proponent evaluate the expanded 78-year mine scenario now to meet the requirements of the EFH regulations at 50 CFR subpart K - EFH Coordination, Consultation, and Recommendations.
Insufficient detail	Draft EFH Chapter 3	3.0 Proposed Action	Pg. 3	"For this project (Figure 3-1), activities that require DA authorization under Section 404 of the CWA include: the permanent discharge of dredged or fill material into 3,555.4 acres (ac) (1,438.8 ha) of waters of the U.S."	The largest effects to EFH will result from changes to groundwater flow, surface water flow, and both surface and groundwater chemistry. The EFH Assessment should therefore provided detailed descriptions of actions that will affect these four physical properties in a very wide circle around the mine footprint. The current proposed action seems written primarily towards section 404 of the CWA and fill in freshwater; and Section 10 of Rivers and Harbors Act. The vast majority of the proposed action is how much fill is being put where. Furthermore the description is focused on the transportation corridor and the LNG pipe rather than the mine site itself. The adverse effects on EFH from the USACE's permitting these activities must include an analysis of the impacts of the mine itself (see 600.910(a)).
Insufficient detail	Draft EFH Chapter 3	3.0 Proposed Action	Pg. 3	Author does not address, Insufficient	NMFS recommends USACE/project proponent include details on the depth and water level in the pit, the pyritic tailings storage facility (PTF), the bulk tailing facility (BTF) at different time frames and the dewatering plan around the mine pit.
Extend to Impacts	Draft EFH Chapter 3	3.4 Action Area	Pg. 7	"The Action Area for the mine site is defined as EFH that is impacted by the placement of fill in waters of the U.S., including wetlands, sedimentation associated with the placement of fill in waters of the U.S., dewatering of the open pit, and blasting, all of which are captured by a 1,000 ft (305 m) buffer around the mine site facilities. It also includes EFH that is impacted by changes in stream flow resulting from the diversion, capture, and release of water associated with the project that results in a modeled reduction in streamflow of more than 2 percent."	This "action area" definition does not seem very relevant to evaluating effects to EFH. While the "action" may happen in the 1,000 ft buffer that does not limit the effects to that 1000 ft buffer. If you blast daily for 20 years, nitrate and ammonia will get in the groundwater. NMFS recommends the EFH Assessment cover the entire area where mine altered water might move. As stated in 50 CFR 600.910(a), adverse effects to EFH may result from actions occurring within EFH or outside of EFH and may include sitespecific or habitat-wide impacts, including individual, cumulative, or synergistic consequences of actions.
Water Quality	Draft EFH Chapter 3	3.4 Action Area	Pg. 7	Authors do not acknowledge that water with high concentrations of metals will escape the mine footprint.	NMFS recommends USACE/project proponent describe how far from the mine perimeter the analysis expects a 0.5 pH unit change, 0.1 pH unit change, and 0.03 pH unit change in each of the three drainages in the winter upwelling flows that nourish salmon eggs. Quantify these pH levels after 10 years of mine operation, end of 25 years, and after 100 years. Cite literature as to how salmon egg development is affected by pH change. Without this analysis, NMFS is concerned that the groundwater chemistry will change and water with extremely high metal concentrations and acid mine drainage will escape the approx. 10 mile square mine footprint. Salmon spawn in areas with upwelling groundwater, and the eggs rely on this water. NMFS cannot accurately predict effects on incubating eggs or juvenile salmon until we know the approximate level of pH change in each reach. Please provide this information about pH change based on data from other porphyry mines in the U.S. or Canada.
EFH Assessment - Chapter 4 - Managed Fish Species and EFH					
Salmon Distribution	Draft EFH Chapter 4	4.1 Pacific Salmon	Pg. 11 Table.4.2	footnote #1: "Pacific salmon life stages present within the primary drainages within the Action Area."	NMFS recommends USACE/project proponent include all water bodies that might be effected within the reasonably foreseeable cumulative effects. This should include at least Koktuli River, Mulchatna River, Kvichak River and Lake Iliamna. These waterbodies will likely experience the effects of mining over the life of the mine.
Upwelling	Draft EFH Chapter 4	4.1 Pacific Salmon	Pg. 11	"The majority of adult fish and spawning observations for all adult Pacific salmon occurred downstream of waters directly affected by proposed mine facilities (Table 4-4, Table 4-5)."	NMFS recommends USACE/project proponent describe effects to upwelling in each drainage in February and March during a dry, cold weather (in the 30th percentile years from watershed module for both dry and cold). Cold and dry often happen simultaneous in Alaska and that stresses salmon eggs. Changes to total annual streamflow may be small but monthly changes may be large. Upwelling may not be so important mid summer, but may be critical in March to keep eggs alive.
UTC	Draft EFH Chapter 4	4.1 Pacific Salmon	Pp. 15 Table 4-5: also reported in EBD Tables 15.1-16, 15.1-29, 15.1-42.	1) Upper Talarik Creek - Sockeye Salmon (2008) 177,642 individuals	NMFS recommends USACE/project proponent provide population estimates based on standard repeatable fish inventory methods stating how many of each species of salmon returned to the Upper Talarik River in three or more of the last 10 years. Explain why/how you selected those three years. Helicopter overflights at varying timesteps with differing visibility are not a rigorous method of calculating population estimates.

Water Temperature	Draft EFH Chapter 4	4.1.2 Coho Salmon	Pg. 23	"Although small numbers of adult fish were observed throughout the NFK River and in the SFK River up to river km 51.2 more than 90 percent of spawning observations were downstream of river km 36.6 in the NFK River ..."	Just because a larger portion of spawning is happening lower in the main stem, that does not mean the mine's impacts on the upper tributary are not important. Water quality, water temperature, and water quantity changes upstream affect the downstream reaches. Less upwelling at the top of the watershed means the whole river freezes deeper and has less winter flow. NMFS recommends USACE/project proponent explain how they predicted how far downstream more gravels would freeze. Though recognizing altering temperatures will have cumulative impacts on early salmon life histories, there is little description of how the USACE/Project Proponents intend to mitigate these impacts. An analysis should be conducted to address the cumulative impacts of water temperature changes such as timing, size at emergence and changes in food chain dynamics in these watersheds. Then real mitigation measures should be designed to reduce these cumulative impacts in the tributary reaches where water and salmon are still present.
Groundwater; Upwelling	Draft EFH Chapter 4	4.1.2 Coho Salmon	Pg. 24	"They were found year-round within all three drainages and length-frequency data indicate there are at least four age classes of early freshwater juveniles (0+, 1+, 2+, 3+) within the mine Action Area (PLP 2011)."	NMFS recommends USACE/project proponent state how many age cohorts of coho salmon are expected to die if each reach of stream is dewatered for even 12 hours. Please also state the number of cohorts that are expected to be lost to dewatering a reach for sockeye, chum, and Chinook salmon. NMFS also recommends USACE /project proponent explain how they will really know how far away a dewatering pump is having an effect. PLP models might be fairly robust, but it is still logical to monitor and physically measure the effects. If a stream reach is dewatered by pumping designed to tilt the groundwater table toward the pit, there is the potential to kill 3 or 4 age classes of coho. While the applicant plans to pump and treat water aggressively, the only way to know which stream sections will be dewatered is by visually monitoring the small streams and the effects of dewatering on those salmon cohorts will be irreversible.
Amakdedori	Draft EFH Chapter 4	4.5 Amakdedori Port Habitat Mapping	Pg. 64	"The backshore of Amakdedori Beach is composed of a storm berm formed by large woody debris with a broad flat riparian upland ..."	NMFS recommends USACE/project proponent state how high Amakdedori beach berm is and the height of waves that would have been required to put that large woody debris in place. Tie this to the species of fish you expect to be present during the stormy fall sea conditions.
EFH	Draft EFH Chapter 4	Diamond Point/Insikin Bay section doesn't exist	Pg. 64	No Discussion of EFH at either alternative port location.	NMFS recommends USACE/project proponent state which species have EFH and how the project will effect that EFH, for all port options mentioned in the project alternatives (DEIS chapter 2).
EFH Assessment - Chapter 5 - Evaluation of Potential Effects on EFH					
EFH Attributes	Draft EFH Chapter 5	5.0 Evaluation of Potential Effects on EFH	Pg. 65	There was no Author Language	A discussion of the current regional condition of EFH is missing. NMFS recommends USACE/project proponent describe the specific EFH attributes that make streams in Bristol Bay watershed have extremely productive salmon spawning habitat. NMFS recommends including a quantitative analysis of various EFH attributes by species and life stage and explain the relative importance of each EFH attribute.
Duration of Impacts	Draft EFH Chapter 5	5.0 Evaluation of Potential Effects on EFH	Pg. 65	"This EFH analysis considers four categories of duration: temporary, short-term, long-term, and permanent. • Temporary – days to weeks • Short-term – < 3 years • Long-term – > 3 years to < 20 years • Permanent – > 20 years or no recovery"	NMFS recommends adding •Very Long-term – > 20 years to < 200 years between long term and permanent as this projects has lots of effects that fit in this timespan.
Not Clear	Draft EFH Chapter 5	5.1.1.1 Loss of Habitat	Pg. 66	"Construction at the mine site would discharge fill material into 46,836 LF (14,276 LM) of EFH"	NMFS recommends for all linear numbers greater than 1,000 feet, please express them to the nearest 1/10 of a mile or kilometer. This makes it easier for everyone to understand.
EFH Attributes groundwater Upwelling	Draft EFH Chapter 5	5.1.1.7 Summary of Mine Site Potential Effects to Freshwater Ecosystem EFH	Pg. 82 Table 5-5	Water Flow - Predicted stream flow changes - Permanent - "The degree of impact is low: - Overall, changes would be permanent and range from low to slightly positive for some specie in terms of both spawning and rearing habitats. -NFK River – up to low level of impact to Chinook salmon EFH quantity and quality. -SFK River – up to low level effect on EFH quantity and quality. -Generally positive effect on sockeye salmon spawning and rearing habitat."	This quote relates impacts to water flow and effects on EFH, but these are distinct impacts. In many reaches the flow will be different during mine operation, but perhaps not drastically changed once the process water is returned to the stream and post-mine, the total stream flow may be similar. But there will likely be less upwelling or upwelling in fewer locations, and upwelling is the EFH attribute that is most important to juvenile rearing and survivability of salmon. In terms of effects to EFH, NMFS recommends the USACE/project proponents redo their analysis, especially incorporating analysis of effects to upwelling (see comment about pgs 66 & 67). Upwelling through gravel and water chemistry are very important to EFH. Upwelling will decrease and the waters will have more metals and likely lower pH as a result of the mine. Both of these impacts will drastically decrease quality and quantity of EFH in the tributaries closest to the mine. In the mainstem of the NFK and SFK, it is difficult to ascertain the level of effect. The most likely scenario is the water quality effects will start out minor, but increase with each passing decade as the tailing piles become acidic and the liner and other barriers become less effective.
Loss of Habitat	Draft EFH Chapter 5	5.1.1.1 Loss of Habitat	Pg. 66	"Construction of the mine site (September Y2 – October Y4) would remove 46,836 LF (14,277 LM) (13.6 percent of EFH within Action Area) of designated EFH within the NFK and SFK tributaries of the Koktuli River; no EFH would be removed in UT Creek (Table 5-1). The total loss of EFH represents a 3 percent loss of the 1,573,510 LF (479,606 LM) of EFH in the Koktuli River drainage (Table 5-1)."	Mine construction includes removal of overburden, which will affect Upper Talank Creek (UTC) EFH. Flow through the overburden at the edge of the pit feeds upwelling areas in UTC. NMFS recommends USACE clarify both how many miles of stream will be buried (that is complete), and how many miles will be effected in lesser ways. One cut off might be to assume any reach with 10% of its watershed falling in the zone of influence (not just drawdown cone) would likely see altered flows. Water quality problems could affect an even larger area. 97% of the Koktuli EFH streams miles may appear visually similar during mining, however their value as EFH will be greatly compromised as this mine operation changes water quantity, chemistry and temperature.

Loss of Habitat	Draft EFH Chapter 5	5.1.1.1 Loss of Habitat	Pgs. 66 & 67	<p><i>"The magnitude of the potential mortality to Pacific salmon in streams directly impacted by construction activities will depend on construction timing and presence of Pacific salmon life stages, including eggs, juveniles, and adults. Juveniles and embryonic life stages would be more susceptible to mortality than adult Pacific salmon. The NFK and SFK reaches that would be removed have a low Pacific salmon presence compared to downstream reaches indicating that these habitats are of lower quality EFH or not limited in abundance in the remainder of each drainage."</i></p> <p>"The physical loss of habitat would be low overall and juvenile salmon densities observed within the reach to be eliminated indicate the loss would have negligible consequences to managed species."</p> <p>"Direct impacts of EFH removal would be permanent. However, considering the low use of EFH to be removed (based on densities of juvenile Chinook, coho and sockeye salmon captured within these habitats), the lack of spawning in SFK-E reaches to be removed and the low level of spawning in the NFK 1.190 tributary to be removed, indicates that drainage-wide impacts to Pacific salmon populations from these direct habitat losses would be unlikely."</p>	<p>The approach to determining fish species distribution did not follow standard fishery science methods and although Habitat Suitability Curves (HSC) are an excellent tool, the project proponent did not correctly apply that tool. Below are five recommendations to partially remedy many years of looking for fish without having a peer reviewed study design.</p> <ol style="list-style-type: none"> 1) While NMFS knew fish surveys were being conducted, NMFS was not provided information on survey objectives, statistical design, and supporting sampling methods used to inform the analysis or that conclusion. There is no evidence that survey designs and results were vetted or peer reviewed. NMFS recommends having an independent third party (academia) review the fish survey information and state its accuracy and precision both for determining distribution of adults and juvenile life stages. 2) Aerial surveys are a qualitative method not a quantitative method. The full range and distribution of each of the five Pacific salmon, in each of their fresh water phases was never truly established. NMFS recommends project proponent vet survey methods with the resource agencies and apply them to all the small tributaries during the 2020 summer. Since we all agree the larger streams are teaming with salmon, these are a lower priority. 3) Regarding Habitat Suitability Curves, robust HSCs should not be based solely on instream flow levels and/or velocities. NMFS recommends creating new habitat suitability curves where EFH attributes are initially tested for (substrate, upwelling, velocity, depth, presence of food source, cover, etc) and the scientific approach is used to determine the most important attributes. These should be based on field work done in Alaska, and preferably near the Pebble site. 4) To the best of our knowledge only main stem channels were surveyed for adults, and data was only collected where the adult salmon were located. There was no data collected where the adult salmon were not located. Though this may seem counterintuitive to accurately assess habitat suitability based on habitat variabilities, analysis needs to be completed on why salmon were not in specific stream reaches for specific conditions. NMFS recommends applying the Habitat Suitability Curves as they were designed to be used and compare 5 - 6 attributes across where fish are and are not present. 5) HSC variables were not collected for off channel, secondary and tertiary streams that provide rearing habitat to fry and juveniles. NMFS recommends HSC curves be developed for all life stages after detailed on-the-ground surveys determine where fry and juveniles are rearing. This should also be done in adjacent areas without 1,000 drill holes, as contamination from leaking holes could have already made these areas unappealing to juvenile fish. <p>The survey methods and analysis used to determine salmon presence in these stream reaches closest to the mine site, do not defensibly support the conclusion made that these stream reaches are of "low biological importance". These comments are also reflected in comments for Section 7 conclusions and are expanded in the Fish Distribution and EFH Attributes spread sheet.</p>
Water Quality	Draft EFH Chapter 5	5.1.1.1 Loss of Habitat	Pg. 67	<p><i>"Approximately 39,524 LF (12,047 LM) of NFK-C, primarily within NFK 1.190, would be removed, 22,938 LF (6,992 LM) of which are documented as low-use spawning habitat for coho salmon" (Table 4-4, Table 5-1, Figure 4-4).</i></p>	<p>NMFS recommends that USACE/project proponent acknowledge that when an applicant uses approximately four square miles of the headwater valleys of NFK 1.19 and NFK 1.2 for pyritic and bulk tailings piles respectively, there will be downstream effects. Mine water can be treated to meet federal and state clean water standards (EFH, pg 83) and returned to the creek, but that does not mean it will create the same incubation environment for salmon eggs. NMFS is concerned that not 100% of mine drainage will be captured and treated and that the water treatment plants may not always meet the standards. The analysis should acknowledge these possibilities.</p>
Loss of Habitat	Draft EFH Chapter 5	5.1.1.1 Loss of Habitat	Pg. 68	<p><i>"The Kottull River and the Upper Talarik Creek drainages include 2,033,856 LF (619,919 LM) of stream." ... "Overall, the degree of habitat loss impact is moderate"</i></p>	<p>The analysis indicates that the cumulative effects of processing even 75% of the projected ore body (Graffari 2011) would severely degrade most of the 47 miles identified. It is not clear how degrading approximately 47 miles of stream would result in a moderate degree of habitat loss. NMFS recommends USACE compare this loss of habitat to the miles of sockeye and Chinook salmon habitat eliminated or compromised by other development projects in Alaska. NMFS also recommends USACE/project proponent state how many fewer juvenile salmon will outmigrate over the first 100 years. Present these numbers both for the 25-year plan and the 78-year plan described in the cumulative effects portion of the DEIS Executive Summary. NMFS recommends USACE/project proponent present this quantitative loss of outmigrating juveniles to the Alaskan public so they can have an informed opinion.</p>
Blasting	Draft EFH Chapter 5	5.1.1.2 Blasting	Pg. 69	<p><i>"Occasionally, blasting could occur within the Action Area near fish-bearing waters along EFH tributaries"</i></p>	<p>Blasting leaves an ammonia and nitrate residue on the surrounding rocks/ground which compromises water quality and degrades fish habitat. This project proposes 25 years of daily to weekly blasting as the pit is deepened. NMFS recommends USACE explain the fate of the ammonia and nitrate residue from thousands of blasts. NMFS recommends USACE/project proponent explain why rainwater will not mix the ammonia and nitrate into the groundwater.</p>
Blasting	Draft EFH Chapter 5	5.1.1.1 Loss of Habitat	Pg. 69	<p><i>"Occasionally, blasting could occur within the Action Area near fish-bearing waters along EFH tributaries of NFK River and the headwaters of SFK River north of Frying Pan Lake (Figure 3-10). The use of explosives near occupied fish habitat can produce in-water overpressures and in-gravel particle velocities that could injure or result in mortality to fish and fish eggs in spawning gravels."</i></p>	<p>Blasting produces byproducts of nitrates and ammonia which promote algae growth and lower the dissolved oxygen if they enter the water. While each blast only creates a few ounces of these byproducts, thousands of blasts over 20 years could create a problem. Explosives can create in-water overpressures in gravel containing fish eggs and kill those fish eggs. Without knowledge of the size of the blasts or exactly which tributaries have spawning fish the effects to EFH are hard to evaluate. NMFS recommends the project proponents consult an acoustician to determine how far from the blasting area eggs could be compromised in gravels.</p>
Water Temperature; upwelling	Draft EFH Chapter 5	5.1.1.3 Water Flow	Pg. 72	<p><i>"Mine infrastructure within the UT Creek drainage would be limited to roads and water treatment plant discharge facilities. Changes to mean annual surface water flows in UT Creek could be affected by pit dewatering activities, however the net result of pit dewatering and treated water discharge from water treatment would be an estimated increase of 1 percent at site UT100D, nearest the discharge facilities. Mean annual surface water flows for sites downstream from UT100D are predicted to remain the same as premine flows (Table 5-2)."</i></p>	<p>NMFS recommends USACE/project proponent substantiate why water quantity in UTC will increase by 1%. In earlier documents, PLP has said up to a third of water in UTC comes from groundwater transfers from SFK. Mid-winter flow in the UTC tributaries used to be sustained by the 100-foot thick overburden slowly discharging water to these tributaries both as upwelling and through springs. NMFS recommends USACE explain what percent of the contributing overburden will be removed and how that lack of groundwater will affect flows and mid-winter temperatures in the UTC tributaries? As presented earlier</p>
Project Scope	Draft EFH Chapter 5	5.1.1.3 Water Flow	Pg. 72	<p><i>"Changes in streamflow described above can affect EFH quantity and quality, however, because net reductions in flow are relatively small, changes in available Pacific salmon spawning and rearing habitat are expected to be equally small. Potential impacts to spawning and rearing habitats for Pacific salmon were modelled for wet, dry and average precipitation years post-construction with treated water discharge."</i></p>	<p>Since the 78-year mine plan appears executable by the project proponents and makes economic sense, NMFS recommends USACE/project proponent also analyze that plan. NMFS recommends an analysis of the effects of dewatering wells necessary to keep the 78-year mine pit dry for the life of the mine.</p>
Project Scope	Draft EFH Chapter 5	5.1.1.3 Water Flow	Pg. 72	<p><i>"Mine infrastructure within the UT Creek drainage would be limited to roads and water treatment plant discharge facilities. Changes to mean annual surface water flows in UT Creek could be affected by pit dewatering activities, however the net result of pit dewatering and treated water discharge from water treatment would be an estimated increase of 1 percent at site UT100D, nearest the discharge facilities. Mean annual surface water flows for sites downstream from UT100D are predicted to remain the same as premine flows (Table 5-2)."</i></p>	<p>Based on 15 years of mine plans focused on the pebble deposit and the cost of developing the infrastructure to get the ore to market, NMFS questions whether the 20-year plan is the intent of the applicant. NMFS recommends all analysis be done consistently on both the 25-year plan and the 78-year plan.</p>

Surface Water	Draft EFH Chapter 5	5.1.1.3 Water Flow	Pg. 72	<i>"Changes in streamflow described above can affect EFH quantity and quality, however, because net reductions in flow are relatively small, changes in available Pacific salmon spawning and rearing habitat are expected to be equally small. Potential impacts to spawning and rearing habitats for Pacific salmon were modelled for wet, dry and average precipitation years post-construction with treated water discharge."</i>	NMFS recommends USACE/project proponent focus particular attention on low flow time periods like February/March and perhaps other dry periods as the climate changes. It is true that during spring melt and during rainy months these small changes will have minor effect. Even a 1 cfs decrease in a small stream at the driest time of year can desiccate and kill salmon eggs.
Water Quality	Draft EFH Chapter 5	5.1.1.5 Water Quality	Pg. 80	<i>"The introduction of this metal and mineral rich runoff or acid mine drainage (AMD) into the aquatic ecosystem can have adverse impacts on the ecology of entire watersheds. AMD can also lower pH that can negatively impact Pacific salmon populations by acute and chronic exposure. Pacific salmon are vulnerable to low pH when undergoing the physiological changes that occur during smolts' transition from freshwater to salt water and adult spawners' transition from saltwater to freshwater (Chambers et al. 2012)."</i>	There is an understanding, based on the nature of hardrock mining, that eventually these tailings and the pit will become reactive in the presence of oxygen and water. Though that reaction starts slowly in different places, it gradually builds and increases over time eventually overwhelming water management systems that were designed to retain, control, mitigate and buffer the reaction. Mining operations in Alaska and the Northwest that process higher quality ores (lower stripping ratio), in regions with less seasonal precipitation and less ground and surface water interaction (drier regions with different geology), have exceeded permitted discharges of metals leaching from "waste rock facilities" (metals such as selenium, cadmium, chromium, lead and mercury, mobile dissolved metals, etc). The applicant's operations plans basically says they will use the same methods and processes used by most other modern porphyry mining operations in the U.S. and Canada, except on a larger scale. This would suggest that sooner or later similar water quality issues will arise. NMFS recommends USACE/project proponent expand this section to explain how each of the water quality problems (pH, selenium, cadmium, chromium, lead and mercury, mobile dissolved metals, etc) present in the Berkeley pit and other large porphyry mines will be avoided for Pebble. The project proponent needs to do better than slow down or delay the reactive process by submerging toxic tailings at the bottom of the mine pit lake. If they are only delaying the reactive process, this whole discussion is about when the SFK, NFK and UTC will become fishless, rather than if they will become fishless.
EFH Assessment	Draft EFH Chapter 5	5.1.1.6	Pg. 81	<i>"Studies have shown that salmonids exposed to sublethal levels of metals are susceptible to increasing levels of fish pathogens due to stressed immune responses and metabolisms (Jacobson et al. 2003, Sromberg and Meador 2005)."</i>	The project proponents claims that all discharges will meet federal standards. These federal maximum metal concentrations can still be much higher than natural levels, however, they would probably not affect spawning adults. For a coho and sockeye whose eggs, fry and juveniles will be bathed in this metallic water for 18 to 42 months, those juvenile fish may experience effects of metal accumulation, outmigrate smaller and have lower ocean survival, even if water quality standards for metals are met most of the time. NMFS recommends the project proponent provide background data that shows juvenile salmon raised in waters at the federal metal limits do not show decreased growth or other problems.
Mine Site	Draft EFH Chapter 5	5.1.1.7 Summary of Mine Site Potential Effects to Freshwater Ecosystem EFH	Pg. 82 Table 5-5	<i>Water Quality: The degree of impact is low - Wastewater would be treated and tested for compliance with federal and state clean water standards prior to discharge to streams.</i>	Every copper mine in the world sooner or later degrades water quality in the local streams. The vast majority of copper mines degrade it so far as to extirpate fish species for several miles. NMFS finds this mitigation that "wastewater would be treated and tested for compliance with federal and state clean water standards" insufficient as some water will seep into the ground without being treated. Secondly, most mine water treatment plants have track records that suggest on many days they do not meet standards for at least one parameter. NMFS recommends the project proponent expand its EFH analysis using clear assumptions of the percentage of water bypassing treatment altogether and the percentage of days treatment plants violate one or more standards. This mine site will have miles of large diameter pipe moving water around. Pipes will leak, and occasionally they will rupture. NMFS recommends the project proponent explain how they will recapture this untreated water once it seeps into the dirt.
Water Quality	Draft EFH Chapter 5	5.1.1.7	Pg. 83 Table 5.5	<i>Table 5.5 Summary of potential impacts to freshwater ecosystem EFH in the mine site area - Potential metals increase in water quality as a result of acid mine drainage. - The degree of impact is low</i>	NMFS disagrees that the degree of impact is low. In most porphyry mines the impact starts out appearing "low" but decade after decade more miles of streams become fishless and sterile. Watersheds, like individual organisms, bio-accumulate metals and acidity, but over longer timeframes. NMFS recommends USACE/project proponent list this impact as high. Further it is safe to assume Pebble will follow the trajectory of other mines constructed in similar rock and of similar size. NMFS recommends the project proponent do a literature search of five similar mines (salmon watersheds with similar groundwater dynamics) and briefly explain the data showing their track record as to whether the surrounding streams exhibited lowered pH or higher concentrations of metals.
Transport Corridor	Draft EFH Chapter 5	5.1.2.1.1 Fish Passage and Habitat Loss	Pg. 84	<i>"Culvert design and construction will meet guidelines contained in the ADF&G and the ADOT&PF Fish Passage Memorandum of Agreement (ADF&G and ADOT&PF 2001)."</i>	NMFS recommends the project proponent design and cost-out each waterbody crossing following the guidelines in U.S.F.S Aquatic Organism Passage at Road-Stream Crossings, 2018. Using this newer guidance will significantly reduce adverse effects on EFH.
Water Quality	Draft EFH Chapter 6	6.4 Water Use	Pg. 116	<i>"Water quality necessary to support fish populations will be maintained by monitoring and adjusting water temperature, sediment loads, and pollution levels in compliance with APDES."</i>	A more exacting statement might be "During active mining and when the mine is making money, the operator will do everything within their power to maintain water quality in compliance with APDES." The metals and acid mine drainage problems could grow to a magnitude where there are no technical fixes that can be employed on this scale in this remote location. NMFS recommends the project proponent provide a detailed plan for the annual cost of post closure water treatment, what entity will actually do the work, and where the operators of the water treatment plant will dispose of the metals they remove.
Closure	Draft EFH Chapter 6	6.10 Compensatory Mitigation Plan	Pg. 118	<i>PLP has prepared a Draft Compensatory Mitigation Plan (CMP) to fulfill the requirements established by the USACE regulations (33 CFR 320.4(r) and 40 CFR 230). The plan includes a framework for selecting resources mitigation projects that will primarily aquatic focus on opportunities that benefit water quality and enhance or restore fish habitat.</i>	How does this "draft" plan provide assurances that resources mitigations projects will happen? At closure there will still be no clear knowledge of how many miles of stream habitat have been destroyed. This CMP plan is not listed in the references for the EFH Assessment or on the USACE Pebble site. NMFS recommends the project proponent provide their CMP to the public and explain how they will mitigate damages that may not even be understood or seen in our lifetimes.
Conclusions	Draft EFH Chapter 7	7 Conclusions	Pg 119	<i>"Habitat removed is generally of low biological importance"</i>	Project Proponents did conduct an array of fisheries related surveys (relative abundance and index surveys using aerial methods for adults). However, these methods, types of surveys, and lack of consistent systematic application do not provide the statistical precision and accuracy to support the conclusions of "Moderate, Low, and Negligible" impacts to salmon (Section 7, Conclusions Table 7-1). Independent surveys conducted recently by ADFG, found salmon juveniles in tributary reaches beyond reaches identified by project proponent contractors. NMFS recommends the USACE include recently established fish surveys data, implement defensible surveys to identify the range and distribution of salmon in these headwater reaches (see Fish Distribution spread sheet), or change the conclusions in Section 7.
Water Quality	Draft EFH		Global	The word "metals" appears in the EFH assessment, but rarely.	The draft EFH Assessment states the first four years of construction can be done with only a low chance of introducing significant metals into the environment; NMFS agrees. NMFS recommends USACE/project proponent focus on pathways for metals getting into the UTC, SFK and NFK during the 20 years of active mining, during closure, and during the hundreds of years the pit lake will sit there. Specifically focus on how those elevated metal levels will affect salmon EFH.
DRAFT ENVIRONMENTAL IMPACT STATEMENT					
Project Scope	Draft EIS (DEIS) Executive Summary	1.3 Project Overview	Pg. 2	<i>"The operations phase would last 20 years."</i>	Though the Executive Summary (ES) suggests a 20-Year operations phase, other sections of the ES and D-EIS identify and discuss an expanded 78-year mine plan. NMFS recommends USACE/project proponent thoroughly analyze the cumulative impacts of the 78-year plan at this same Pebble deposit by this same mining group. Other sections of the ES address Reasonable Foreseeable Future Actions (RFFA's), clearly identify 6 other mines in the immediate region that would all be supported by this projects infrastructure. NMFS recommends USACE/project proponent broadly analyze the likely scenario that once the ports, road, and LNG pipeline open up Kvichak and Nushagak watersheds to mining, several ore deposits similar to Pebble will likely be mined in the next 200 years.

Water Quality/Extent	DEIS Executive Summary Maest et. al 2005 Morin et. al 1995 Kempton and Atkins 2000		Pg. 7	<i>"The pyritic TSF would also be used to store potentially acid-generating (PAG) waste rock during operations."</i>	The DEIS acknowledges the potential for Potentially Acid Generating (PAG) waste rock; the project therefore includes a pyritic tailings pit. It does not estimate how long that PAG material will remain in the environment, and this information is necessary for NMFS to assess the effects of the PAG on EFH. The length of time over which a mine site will deviate from baseline or pre-mining conditions will be on the order of centuries to tens of thousands of years, as a result of potential delays in the generation or appearance of acid drainage (e.g., Morin et al., 1995; Kempton and Atkins, 2000). It is very unlikely for the tailings pit to completely contain the PAG for its entire lifetime and not release any into the surrounding environment. At 1,500 feet below the surface near the pit, there is at least one known area of very high hydraulic conductivity. Any area of high hydraulic conductivity is very likely to allow for release of acid mine drainage. NMFS advises the project proponent assess the potential lifetime of the PAG and its effects on the environment.
Water quality	DEIS Executive Summary	2.2 Action Alt 1 - Applicant's Proposed Alternative Mine Site	Pg. 7	<i>"...pyritic tailings (approximately 1,071 acres) would be located primarily in the North Fork Koktuli (NFK) watershed". Footnote # 2 "Pyritic tailings are composed of potentially acid-generating finely ground rock material containing the naturally occurring mineral pyrite that remains after economic minerals have been extracted through mineral processing at the mine site."</i>	Pyritic tailings have the potential to become acidic by definition. This facility is estimated to be 1,071 acres and will contain approximately 150,000 acre feet of pyritic tailings by year 20. NMFS recommends the USACE/project proponent clearly acknowledge that the Pebble mine is likely to create acid mine drainage rather than putting it in footnotes. Acid mine drainage adversely impacts EFH.
Fish Passage	DEIS Executive Summary Chapter 2	2.2 Action Alt 1 - Applicant's Proposed Alternative Transportation Corridor	Pg. 9	<i>"culverts at streams with fish would be designed and sized for fish passage in accordance with regulatory standards."</i>	Considering this is referring to over 150 culverts and bridges, NMFS can not evaluate an EFH Assessment without more detail on the designs. The U.S.F.S. Aquatic Organism Passage at Road-Stream Crossings, 2018, is some of the strongest guidance for protecting EFH. NMFS requests that the project proponent provide the exact standards they intend to follow and then complete the EFH assessment using those standards.
Site Closure	DEIS Executive Summary Chapter 2	2.2 Action Alt 1 - Applicant's Proposed Alternative Mine Site	Pg. 8	<i>"Physical site closure work would commence as operations end. At that time, the Amakdedori port facilities would be removed, except for those required to support shallow draft tug and barge access to the dock for the transfer of bulk supplies."</i>	NMFS recommends USACE require some financial mechanism to make sure funds are set aside for closure and that proper closure actually happens. Nobody currently in the federal or state workforce is likely to be around when closure happens. If they go with the 78-year operating plan, then working on this issue today will still be alive. Considering the majority of plans drawn up concerning the Pebble Project since 2004 have stated a longer mine life, NMFS has reason to be skeptical.
Site Closure	DEIS Executive Summary Chapter 2	2.2 Action Alt 1 - Applicant's Proposed Alternative Natural Gas Pipeline	Pg. 13	<i>"The natural gas pipeline would be maintained through operations to provide energy to the project site. If no longer required at closure, the pipeline would be cleaned; and either abandoned in place or removed, subject to state and federal regulatory review and approval at the decommissioning stage of the project."</i>	NMFS recommends USACE require some financial mechanism to make sure funds are set aside to remove the LNG pipeline once the LNG supply is exhausted.
Amakdedori; EFH	DEIS Executive Summary Chapter 2	2.3 Action Alt 2 - North Road and Ferry with Downstream Dams Action Alt 2 - Pile-Supported Dock Variant	Pg. 20	<i>"The conceptual structure would consist of 44 trestle piles and 474 dock piles, for a total of 518 piles. All piles would be 48 inches in diameter, with a 1.5 inch wall thickness. The piles would be vibrated into place and then driven to refusal with an impact hammer."</i>	Five hundred and eighteen 48-inch piles is more 48-inch piles than have been driven in Alaska in the last 20 years. When each is set with an impact hammer, juvenile fish in the immediate vicinity will die from the sound pressure waves. NMFS recommends USACE/project proponent provide the mitigation measures and timing they plan to employ to mitigate these effects to EFH. This is the same information NMFS requests from any other USACE permit applicant requesting to construct a dock.
Project Scope	DEIS Executive Summary Chapter 3	3.0 Environmental Analysis	Pg. 25	<i>"Cumulative effects are interactive, synergistic, or additive effects that would result from the incremental impact of the proposed alternative when added to other past, present, and reasonably foreseeable future actions (RFFAs) regardless of what agency (federal or non-federal) or person were to undertake such other actions. A summary of existing environment and potential..."</i>	NMFS recommends the USACE/project proponent address "cumulative effects" as defined here. This is the appropriate level of analysis, not only in the EIS, but also in the ground and surface water hydrology, water quality and quantity, fisheries, and invertebrates sections of the EFH assessment. These items are all EFH attributes.
Groundwater	DEIS Executive Summary Chapter 3	3.2.1.2 Groundwater Hydrology	Pg. 36	<i>"Below the weathered bedrock, bedrock permeability generally decreases with depth, but includes some higher-permeability zones associated with faults. Some faults act as flow barriers, while others appear as flow conduits, resulting in the potential for compartmentalized groundwater flow with the bedrock at depth."</i>	NMFS recommends that USACE/project proponent thoroughly map and characterize every fault, fracture and joint within five miles of the 78-year mine pit. Water finds the path of least resistance. If four of five faults or fractures are flow barriers, but just one is a flow conduit, the water will quickly move away from the mine site. The faults are the biggest factor in how far water quality impacts will spread and the project proponent hasn't expended the effort to characterize them individually. Schlumberger 2011a and Schlumberger 2015a do identify a few faults, but the EIS preparers do not bring this information forward.
Project Scope	DEIS Executive Summary Chapter 3	3.2.2.1 Surface Water Hydrology Cumulative Effects	Pg. 40	<i>"The Pebble mine expanded development scenario project footprint would impact a much larger area than the proposed Action Alternative 1; with an expansion into the UTC watershed."</i> <i>"The expanded development would contribute to cumulative effects on surface water hydrology through increased capture of surface water flow, increased groundwater pumping to facilitate required pit dewatering, and an extended duration of these effects during operations. The magnitude of the cumulative impacts would vary from temporary to permanent, increasing potential streamflow reductions in the NFK, SFK and UTC watersheds beyond those described for Action Alternative 1." (the first sentence is in three spots)</i>	NMFS recommends that USACE/project proponent focus their analysis on how the expanded mine scenario will affect UTC watershed and the EFH in Lake Iliamna and Kvichak River. A careful examination of the mine proposal shows that the applicant has worked diligently to move both known impacts and known risk elements out of UTC watershed and mostly into NFK watershed. The mine proponents have responded to public concern about protecting Lake Iliamna and the Kvichak River. If the expanded mine scenario goes forward, 90% of the impacts carefully moved north will also need to take place in UTC watershed.
Project Scope Groundwater Modeling	DEIS Executive Summary Chapter 3	3.2.2.2 Groundwater Hydrogeology Cumulative Effects	Pg. 40	<i>"The Pebble mine expanded development scenario would correspond to roughly a five-fold increase in the size of the pit capture zone straddling the SFK and UTC drainages. There would be a similar increase in the amount of groundwater needing to be dewatered and treated during operations, and the amount pumped and treated throughout post-closure to maintain hydraulic containment in the pit lake. Streamflow reductions in SFK and UTC due to the expanded pit capture zone are expected to be somewhat mitigated by treated water being returned to these watersheds."</i>	A fivefold increase in the size of the capture zone would create and even larger increase in the "zone of influence" where the water table is altered. A deepening of the pit past 3,000 feet would penetrate rock stratum and fracture zones where the project proponents have too little information to build an effective model. NMFS recommends that before USACE/project proponent starts to analyze this expanded development scenario, they first collect a lot more aquifer/fault information and use that information to calibrate and validate the groundwater model.

Groundwater Water quality	DEIS Executive Summary Chapter 3	3.2.2.3 Water and Sediment Quality Action Alternative 1 and Variants	Pg. 43	<i>"It is estimated it would take 20 years for the groundwater in the pit to reach the maximum management (MM) level (890 feet above mean sea level [amsll]). The groundwater level in the pit would be maintained during closure and post closure to create a permanent groundwater sink to prevent pit lake contact water from discharging to the environment. This would result in a permanent pit lake that would be pumped to maintain the MM level."</i>	The pit is 15 miles from Lake Iliamna but will have a permanent head of up to 500 feet of water at an elevation of 890 feet a.m.s.l. Lake Iliamna is at 46 feet a.m.s.l. At some point in the next 200 years there will be an earthquake and new fractures will open up. NMFS recommends USACE/project proponent explain in the EFH assessment what steps would be taken to staunch such a flow towards Lake Iliamna or South Fork Koktuli, and how many months would it take to implement this staunching action? Most large surface water bodies interact with the surrounding groundwater. This analysis suggests that this interaction between the pit lake and the groundwater can be completely severed or at least controlled by the dewater wells which are not yet designed. NMFS recommends that USACE/project proponent provide examples of other large mine pit lakes where this complete isolation has been successful.
EFH	DEIS Executive Summary Chapter 3	3.3.1.1 Fish and Aquatic Habitat North Fork Koktuli River	Pg. 45	<i>"Upstream of the mine site, the NFK contains equal proportions of riffle and run/ glide habitats, with increasing frequency of beaver-formed pools. Off-channel habitats, which include side channels, percolation channels, alcoves, isolated ponds, riverine wetlands, and beaver ponds, are hydrologically connected to the NFK via surface flows or groundwater upwelling."</i>	NMFS recommends that USACE/project proponent provide a detailed quantitative description of EFH habitat upstream of the mine site (upstream of NFK 1.2) and make a determination of whether adult salmon will still arrive at this area. As the chemical scent of the upper reaches of the NFK-C and NFK-D change, will fish learn to recognize a new water scent and still migrate to these streams?
Project Scope	DEIS Executive Summary Chapter 3	3.1.2.2 Cultural Resources - Cumulative Effects Ghaffari 2011 pg 277	Pg. 40 Fig 18.1.5 Fig 18.1.6	<i>"The Pebble mine expanded development scenario project footprint would impact a much larger area than the proposed Action Alternative 1; with an expansion into the UTC watershed."</i> <i>The Northern Dynasty Report (Ghaffari, 2011) includes expansion into Upper Talarik as a natural next step. Graffari 2011, pg 277, Fig 18.1.5 shows the riches deposit (>1% cuEQ) will not be reached in the first 25 years.</i>	National Environmental Policy Act (NEPA) does not dictate what development should or should not happen, nor what natural resource tradeoffs are acceptable. It does require the applicant to honestly describe the tradeoff necessary and the true scope of the project. The project proponent will not halt mining operations just when they arrive at the richest ore deposits. NMFS recommends USACE/project proponent analyze the mining scenario most likely to play out. The valuable ore did not move between 2011 and 2019; it is still under the headwaters between UTC and SFK. The EIS and EFH Assessment should be based on the mining scenario most likely to happen.
Spilled reagents	DEIS Executive Summary Chapter 3	3.5.1 Spill Impacts Analysis	Pg. 66	<i>"Potential spills of natural gas and chemical reagents were deemed to be highly unlikely and of low consequence, and are addressed briefly."</i>	There will be thousands of gallons of various chemical reagents on the mine site, and over the life of the mine some will spill. If the mine operator is paying attention, the contaminated soil will be excavated and probably dumped in the pyritic tailings storage facility. While this may be a logical mitigation, it greatly complicates determining chemistry in the pyritic tailings facility. NMFS recommends the project proponent list all chemicals with over one drum on site and explain the steps that will be taken to mitigate the effects of a spill. Are there any chemical spills where the contaminated soil would be transferred off site?
Spilled Reagents	DEIS Chapter 4	4.27.5.1 Fate and Behavior of Spilled Reagents	Pg. 4.27-59	<i>Spill Risk 4.27.5.1 reviews the function and general properties of each reagent, and describes the general fate and behavior of spilled reagents.</i> <i>"Detailed impact analyses of potential scenarios for reagent spills are not included because this is effective secondary containment for reagents, so that the probability of a reagent being released into the environment would be extremely unlikely."</i> <i>"Soluble reagents would dissolve if spilled into water, and could become bioavailable for a limited time, and potentially toxic to aquatic resources. Reagents that are insoluble or not immediately soluble could have long-term impacts to aquatic resources if not removed from water (PIP 2018-RFI 052)."</i>	Soluble reagents could quickly become bioavailable and potentially toxic to aquatic resources. This being Alaska, the spills will happen when it is raining. NMFS recommends the project proponent list the soluble reagents, the volumes stored on site, and the mitigation procedures should a spill happen.
Draft Environmental Impact Statement - Chapter 2 - Alternatives					
Water Quality Climate Change	DEIS Chapter 2	2.2.2.1 Mine Site - Physical Reclamation and Closure	Pg. 2-39	<i>"The mill, pyritic TSF, main WMP, and other infrastructure not required for post closure would be removed from the site, and/or reclaimed as part of the site closure and reclamation."</i>	The 24-hour max precipitation value for a 100-year return period is likely to become the 25-year return period before the pit is filled (40 years) due to more intense storms. That suggests that for a 10-square mile mine footprint, the project would need to deal with 7 inches of rain spread over 6,400 acres in 24 hours (Knight Piesold 2018g). This is approximately 3,733 acre feet of water storage that needs to be constantly available. The design 44 cfs capacity for water treatment only allows treatment of 88 acre feet a day. NMFS recommends USACE/project proponent explain where is this storage capacity once the main WMP is closed and reclaimed? If they can't store it, this mine contact water will flow into the groundwater aquifer and diminish EFH when it surfaces in upwelling and springs.
Surface Water	DEIS Chapter 2	2.2.2.1 Mine Site - Post Closure Management	Pg. 2-41	<i>"Once the level of the pit lake has risen to the control elevation (about 890 feet), water would be pumped from the open pit, treated as required, and discharged to the environment."</i>	The pit lake will be maintained at about 890 feet a.m.s.l. NMFS recommends USACE/project proponent provide a map that shows all springs, lakes, tarns, and creeks above this elevation that will lose water towards the pit. Describe which ones you expect to be dry the majority of the year in perpetuity. Provide a similar map for the 78-year pit.
Site Closure Water Quality	DEIS Chapter 2	2.2.2.1 Mine Site - Financial Assurance	Pg. 2-41	<i>"A detailed reclamation and closure cost model would 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"</i>	The details of reclamation and closure costs should be known before the Record of Decision (ROD) is signed. If the cost of closure and treating water in perpetuity is unknown, how can the resource agencies be asked to believe reclamation will happen? Knowing whether the contact water is/is not treated in perpetuity is crucial to completing an EFH assessment. Without forever treatment, the pit would discharge the majority of AMD down the SFK where would collect in the large gravel aquifer. Approximately 1/3 could move through groundwater transfer over to the Upper Talarik watershed. AMD will kill fish in either drainage. NMFS recommends USACE require a detailed reclamation plan and a logical explanation of how water treatment in perpetuity is funded before the EFH assessment is finalized.
Project Scope Important	DEIS Chapter 2	2.2.2.2 Mine Site	Pg. 2-42	<i>"The road system would include nine bridges, six of which would be single-span, two-lane bridges that range in length from approximately 30 to 125 feet. There would be three multi-span, two-lane bridges at Newhalen River (575 feet), Gibraltar River (470 feet), and Sid Larsen Creek (160 feet)."</i>	Twenty massive pieces of infrastructure are needed to begin mining: 3 new ports; 187 miles of LNG pipeline; 78 miles of new road; 3 multi-span bridges (525 ft., 470 ft. and 160 ft.); 1 or 2 lightering locations; 1 ice breaking ferry (tonnage not stated); 5 tailing embankments, each from 300 - 500 feet tall; 2 water treatment plants with 44 cfs total capability; 270-MW power plant; a camp for 1,700 people; two ice-breaking tugs, compressor station at Anchor Port; and finally build the largest ore processing plant in America. How is this financially possible for ore averaging 0.5% cuEQ? How will the applicant finance water treatment in perpetuity? What happens if gold and copper prices decline mid-project?
Water Quality EFH Spills	DEIS Chapter 2	2.2.2.2 Transportation Corridor - Transportation Corridor Operations and Materials/ Personnel Transport	Pg. 2-59	<i>"Copper-gold concentrate would be loaded into specialized bulk cargo containers, each containing about 38 tons of concentrate, with removable locking lids."</i>	As is required for FERC hydropower projects, USACE should require a financial statement of viability that proves the financing for the twenty infrastructure projects and water treatment in perpetuity actually exists. Until the finances are explained, NMFS will assume water treatment stops once the mine is no longer profitable and view the EFH assessment under that assumption. If the project proponent goes bankrupt mid project, NMFS is concerned that all EFH in the UTC, SFK and NFK will cease to exist and salmon will likely be extirpated from those three rivers. If the ferry carrying these 38-ton transport containers filled with copper/gold ore sinks to the bottom of Lake Iliamna, NMFS recommends USACE/project proponent explain how that event would affect Lake Iliamna's pH, metal concentrations in the lake water, and the juvenile salmon that rear there. Will metals accumulate in the Sockeye? If so, to what level? For how many decades will elevated metals be detectable in Sockeye? Will the juvenile fish with high metal concentrations in their tissues be able to smoltify and survive in the ocean? Will the adult sockeye salmon meet Food and Drug Administration (FDA) standards for human consumption? If some containers remained closed initially, how many months or years would it take to retrieve them?

Water Quality EFH Spills	DEIS Chapter 2	2.2.2.3 Amakdedori Port and Lightering Locations - Port Operations and Materials Transport	Pg. 2-69	"Once inside the hold, the container lid would be opened, and the container turned upside down to unload the concentrate into the ship's hold. The container would be lowered as close as possible to the bottom of the hold to minimize the drop distance and the potential for dust generation during ship loading."	Since the containers are 40 feet long, some ore would fall 50+ feet into the ship hull. After 20 years of dumping 38-ton sea containers into the belly of cargo ships at one lightering location, some fugitive dust will accumulate on the ocean floor. NMFS recommends USACE/project proponent explain how large an area of seafloor that will likely contain elevated levels of metals and an abnormal pH. Four metals may start at 100 times the APDES permitted levels for discharge. Once a treatment plant removes these metals from the slurry, what will be the final fate of the metals?
Spills	DEIS Chapter 2	2.2.2.5 Action Alt 1. - Summer-Only Ferry Operations Variant	Pg. 2-78	Action Alternative 1 – Summer-Only Ferry Operations Variant	This makes it less likely to have spills in Lake Iliamna and more likely for leakage at the Amakdedori or other port storage facilities. NMFS recommends USACE/project proponent present a risk/consequences analysis to help all parties weigh the environmental risks.
Diamond Point with Ferry Alt	DEIS Chapter 2	2.2.3.3 Diamond Point Port and Lightering Locations	Pg. 2-98 Fig 2-57	Diamond Point/Pile Bay/ Eagle Bay transportation route	This location, at the base of steep cliffs, looks prone to avalanches and rockfall and is within the river floodplain. NMFS requests USACE/project proponent explain how much ore will be present here on an average day and what would be the effects on the local environment if that spilled due to a rockslide. There are large steep barren areas just above the site on Google Earth and DEIS Fig 2-57; in wet portions of Alaska, only areas that slide frequently are barren. Alternatively, Diamond Point is a more naturally protected dock area and could lead to a safer lightering operation less likely to spill ore onto the shallow seafloor. NMFS recommends USACE/project proponent develop a risk/consequences analysis to help all parties weigh the environmental risks, and NMFS can weigh risk to EFH. NMFS is concerned that these important route decisions will be based solely on costs.
Diamond Point- only road Alt	DEIS Chapter 2	2.2.4 Action Alt. 3. - North Road Only	Pg. 2-106	No ferry; 82 miles of road:17 bridges; 3 multispans bridges (625, 245, 205'). 37 culverts at fish crossings. 8.8 million gallons fill for roads quarried from 26 sites. 121 million gallons water needed. NGL would follow road and 1 mile longer. 39 round trip truck trips.	This alternative removes the risk of a ferry full of ore sinking in Lake Iliamna and deserves careful consideration. NMFS recommends USACE/project proponent analyze the risks/consequences this alternative presents to EFH, both in the Lake Iliamna and in the streams the longer road must cross.
Alternative	DEIS 2	2.2.4.5 Alt 3 Concentrate Pipeline Variant - Transportation Corridor	Pg. 2-117	"Construction of the concentrate pipeline adjacent to the north access road corridor would increase the road corridor width by less than 10 percent under most construction conditions. Construction of the concentrate pipeline and the optional return water pipeline would increase the average width of the road corridor by approximately 3 feet (PLP 2018-RFI 066). " "Daily truck traffic would be reduced to 18 round trips per day for transportation of molybdenum concentrate, fuel, reagents, and consumables (PLP 2018-RFI 065)."	NMFS recommends USACE/project proponent include in the EFH Assessment how the EFH of species in Iniskin Bay might change due to this new 0.8 cfs source of non salt water which will likely contain elevated levels of metals and an abnormal pH. Four metals may start at 100 times the APDES permitted levels for discharge. Once a treatment plant removes these metals from the slurry, what will be the final fate of the metals?
Draft Environmental Impact Statement - Affected Environment - Chapter 3 - Groundwater					
Scope of Project	DEIS Chapter 3-13 Affected Environment Geology	3.13.4.1 Mine Site	Pg. 3.13-6 Table 3.13-1 and PLP 2018a	"The proposed project would mine approximately 10 percent of the total estimated Pebble deposit resource."	NMFS recommends USACE/project proponent explain why a mining entity that has already invested 1/2 billion dollars, and need to invest at least 10 times that in infrastructure before the first ore shipment leaves Alaska, would mine 10% of the estimated deposit and then suspend operations. Before USACE asks NMFS to review the Final EFH Assessment, please present a convincing argument that the project described in the EFH Assessment is what the USACE permit applicant plans to construct.
Scope of Project	DEIS Chapter 3-13 Affected Environment Geology	3.13.4.1 Mine Site	Pg. 3.13-6 Table 3.13-1	"20-year Open Pit"	The Northern Dynasty plan was 25, 45 or 78-year mine life. The December 2017 USACE permit application, it says 16 years of operations. A year later the DEIS (December, 2018) says 20 years of actual mining. NMFS recommends USACE/project proponent give an accurate description of the entire mine footprint and timespan in the project description chapter of the EFH Assessment. It is not reasonable to ask NMFS to guess whether the USACE permit application, or the water rights application, or the DEIS is the correct project description. The EFH assessment should not spend 80% of the project description pages on the transportation corridor, the LNG line, and a few ports, and only dedicate 3 - 4 pages describing the single project element that will affect EFH for centuries, the mine.
Groundwater Model	DEIS Chapter 3-13 Affected Environment Geology	3.13.4.1 Mine Site	Pg. 3.13-5 Fig 3.13-3	The mineralization that formed the Pebble deposit was likely caused by these diverse magma intrusions that comprise the rock in the open pit area (Knight Piésold et al. 2011a).	The same processes that make this pit ore rich (diverse magma intrusions) will make modeling water movement surrounding the pit difficult. Does the project proponent expect all magma types to respond to the removal pressure the same way? As pressure is removed by unburial, won't these different magna expand at slightly different rates and open up cracks? NMFS recommends USACE/project proponent analyze whether the contact zones between these diverse magma intrusions may open up and become a conduits for ground water movement. Until USACE/project proponent understands how far the pyritic mine water will move through the ground it is impossible to predict effects to EFH in the nearby streams.
Mine Description Groundwater Upwelling Extent of Impacts	DEIS Chapter 3-13 Affected Environment Geology Hamilton 2010	3.13.4.1 Mine Site	Pg. 3.13-3 Fig. 3.13-2	"Unconsolidated sediments (overburden) cover a large portion of the mine site. These sediments consist of glacial till, outwash, alluvium, alluvial fan and deltaic deposits, and glaciolacustrine (glacial lake) deposits (Figure 3.13-2). Sediment grain sizes vary from silt, sands, and gravels to boulders. Overburden ranges in thickness from a few feet to about 165 feet." Composition of the overburden material varies both laterally and with depth, typical of areas where material has been transported and deposited by both ice and water, with interbedding and gradations between types of material. (Hamilton 2010)	There is an understanding, based on the nature of hardrock mining, that eventually these tailings and the pit will become reactive in the presence of oxygen and water. Though that reaction starts slowly in different places, it gradually builds and increases over time eventually overwhelming water management systems that were designed to retain, control, mitigate and buffer the reaction. Mining operations in Alaska and the Northwest that process higher quality ores (lower stripping ratio), in regions with less seasonal precipitation and less ground and surface water interaction (drier regions with different geology), have exceeded permitted discharges of metals leaching from "waste rock facilities" (metals such as selenium, cadmium, chromium, lead and mercury, mobile dissolved metals, etc). The applicant's operations plans basically says they will use the same methods and processes used by most other modern porphyry mining operations in the U.S. and Canada, except on a larger scale. This would suggest that sooner or later similar water quality issues will arise. NMFS recommends USACE/project proponent expand this section to explain how each of the water quality problems (pH, selenium, cadmium, chromium, lead and mercury, mobile dissolved metals, etc) present in the Berkeley pit and other large porphyry mines will be avoided for Pebble. The project proponent needs to do better than slow down or delay the reactive process by submerging toxic tailings at the bottom of the mine pit lake. If they are only delaying the reactive process, this whole discussion is about when the SFK, NFK and UTC will become fishless, rather than if they will become fishless.
Water Quality Mine Description SFK Extent of Impacts	DEIS Chapter 3.13 Geology	3.13.4.1 Mine Site	Pg. 3.13-4 Fig. 3.13-2	This figure shows a wide ancient 1- mile drainage channel (a2) flowing in a north to south direction, from just south of the pyritic TSF toward South Fork Koktuli.	NMFS recommends USACE/project proponent explain how the ancient glacier outwash/drainage channel would interact with leakage from the pyritic tailing facility.

Groundwater Model Extent of Impacts	DEIS Chapter 3.17 Groundwater Hydrology Ghaffari et. al 2011	3.17.1.2 Overview of Hydroecological Characterization of the Area	Pg. 3.17-16 Fig. 3.17-3 Ghaffari Fig. 18.1.5	"Faults function as both conduits and barriers to groundwater flow." Pg. 3.17-16: "Deeper bedrock is both fractured and faulted, yielding areas of both enhanced permeability through fractures and reduced permeability where clay-rich fault gouge is present. Fault gouge is very fine crushed rock (e.g. clay-size) that results from friction caused by movement along a fault plane (between the two sides of a fault)." Fig. 18.1.5 of Ghaffari et.al 2011 shows ZG1 Fault clearly intersecting the mine pit.	There are many faults and other geological features that affect the movement of water in the project area (Gillis 2009). Specifically, the ZG1 Fault bisects the pit on a southwest-to-northeast alignment (Ghaffari 2011, Fig. 18-1-5). In order to properly assess effects on EFH, NMFS needs a better idea of the movement of groundwater around the project area, especially through faults, fractures and joints. NMFS suggests the project proponent individually map and characterize all faults, fractures and joints in a 5 - mile radius of the open pit and how they will affect the movement of groundwater and acid mine drainage. Specifically, the proponent needs to demonstrate that acid mine drainage will not move along the ZG1 fault and end up in the groundwater. Rather than presenting generalized groundwater movement models from geometric mean hydraulic conductivities, the proponent should include the amount of water they expect each fault to transport each year and where that water might surface. This information, when properly combined in a model, will show where most of the acid drainage will likely be and at which elevation it will surface.
Climate Change	DEIS Chapter 3.16 Surface Water Hydrology	3.16.1.1 Mine Site Long Term Climate Change	Pg. 3.16-20	"It is prudent to consider whether the use of historical streamflow and climate records, which are being used to evaluate the hydrology and impacts to hydrology (e.g., water balance, average monthly streamflow, and flood magnitude and frequency), are representative of conditions that may occur over the next several decades."	The project proponent and USACE have recognized that storm intensity and length of droughts might increase in the future. NMFS recommends USACE/project proponent work with UAF climate modelers to use state-of-the-art, downscaled climate models to predict changes at the mine site over the next 40 years. By allowing the project proponent to correctly size their waste water storage and treatment facilities, this will minimize overflows of untreated water from the project and help to protect EFH.
Draft Environmental Impact Statement - Affected Environment - Chapter K3.17 - Groundwater Appendix					
Groundwater	DEIS Appendix K Chapter 3.17 Hydrology	3.17.6 Mine Site Groundwater Model	Pg. K3.17-32 Fig K3.17-13	This figure shows Lake Iliamna approx 90,000 feet from the pit.	When the pit reaches 1,900 feet deep it will be 900 feet farther into the earth than the Lake Iliamna surface. Water leaving Lake Iliamna would flow down a 900/90,000 or 1% slope to the pit if a flow path existed. The presented information is unclear whether there is a fracture perpendicular to the ZG1 fault line, but if there is such a fracture, water from the lake may slowly flow into the pit. Upon closure, when the pit is refilled to 890 feet a.m.s.l. of mine water laced with heavy metals will flow back towards the Lake Iliamna again on a 1% downward slope. It is the project proponents and the federal permitting agency's job to prove the substrate is 100% bedrock with low conductivity and no faults exist that would allow the mine tailing water to move into Lake Iliamna. So far the USACE/project proponent have suggested this will not happen, but that is not the same as proof. If, as the pit deepens and the applicants knowledge of faults/fratures increases, significant water bearing fractures are encountered, what action will be taken to protect the EFH in Lake Iliamna? NMFS recommends USACE/project proponent present an adaptive management plan explaining how they will mitigate new fractures discovered during pit excavation.
Groundwater	DEIS Appendix K Chapter 3.17 Executive Summary	3.17 Groundwater Hydrology	Pg. K3.17-10 Table K3.17-1: Summary of Aquifers at Mine Site Pg. 3.17-16 Fig.3.17-3	"Faults function as both conduits and barriers to groundwater flow" Table K3.17-3:"Deeper bedrock is both fractured and faulted, yielding areas of both enhanced permeability through fractures and reduced permeability where clay-rich fault gouge is present." (DEIS Chapter 3.17.1.2). Figure 3.17-3 depicts 6 faults, but they may just be a generalized schematic. "Some faults act as flow barriers, while others appear as flow conduits, resulting in the potential for compartmentalized groundwater flow with the bedrock at depth" DEIS Executive Summary page 36	NMFS recommends that USACE/project proponent map and characterize all faults, fractures and joints in a 5-mile radius of the 78-year open pit. At depth, these faults, fractures and joints will be the main conduits for moving groundwater and any errant acid mine drainage. NMFS recommends that in addition to presenting generalized groundwater movement models from the geometric mean hydraulic conductivities, include the amount of water you expect each fault to transport each year and where that water might surface. This information, when properly utilized in the groundwater model, will indicate in which drainage most of errant acid drainage will likely show up in and at which elevation it will surface. NMFS suggests tracer dye tests pumped down the bore holes might be an additional way to understand where the faults/fratures/joints move water.
Faults	DEIS Appendix K Chapter 3.17	K3.17.2 Aquifers and Confining Units	Pg. K3.17-13	"Groundwater is controlled in the deeper bedrock by crosscutting fractures and faults. Although fractures and faults are widespread in the deep bedrock, the features are commonly infilled with fine-grained fault gouge 1 that tends to block groundwater flow and are offset relative to one another (cross-cutting)."	NMFS agrees that groundwater in bedrock is controlled by fractures and faults which are widespread. NMFS recommends the project proponent present the data that lead them to believe most are commonly infilled with fine-grained fault gouge? If even 10% are open and move water, how is that depicted in the groundwater model?
Groundwater Upwelling	DEIS Appendix K Chapter 3.17	K3.17.2 Aquifers and Confining Units	Pg. K3.17-14	"During wetter periods, a higher number of deeper aquifers exhibit upward flow, reflecting groundwater discharge to a wider area of lowland waterbodies and wetlands."	NMFS recommends the project proponent explain whether the deeper aquifers (greater than 500 feet) are exhibiting upward flow, or just the deeper sections of the overburden aquifer.
Aquifers	DEIS Appendix K Chapter 3.17	K3.17.2 Aquifers and Confining Units	Pg. K3.17-10 Table K3.17-1	Table K3.17-1: Summary of Aquifers at Mine Site	NMFS recommends the project proponent prepare a similar table for the aquifers in the deep bedrock stating what is known and what remains unknown. Its much simpler to believe there are zero deep aquifers, but your drill log data suggest there are a few, especially below 2,000 ft.
Groundwater Interbasin Water Transfers	DEIS Appendix K Chapter 3.17	K3.17.1 Groundwater Investigation Programs	Pg. K3.17-19	"The results of groundwater level monitoring and a water balance assessment (Schlumberger 2011a) suggests that approximately two-thirds of the groundwater flowing through the deep overburden aquifer downstream of Frying Pan Lake remains in the SFK River drainage, while the remaining one-third of the groundwater crosses the surface water drainage divide and contributes to base flow in tributary UT1.190, and discharges to UTC. Section 3.17, Groundwater Hydrology, Figure 3.17-10 depicts the divergent groundwater flow along SFK River to UTC in the deep groundwater aquifer. The divergent groundwater flow pattern occurs during seasonal low and high water periods.	NMFS recommends the project proponent describe how they would stop this interbasin groundwater exchange, should the SFK groundwater quality start to deteriorate, due to water escaping from the pit or either tailings storage facility. Is it physically possible to stop a groundwater transfer happening at that scale?
Groundwater	DEIS Appendix K Chapter 3.17	K3.17.2 Aquifers and Confining Units	Pg. K3.17-19	"The results of groundwater level monitoring and a water balance assessment (Schlumberger 2011a) suggests that approximately two-thirds of the groundwater flowing through the deep overburden aquifer downstream of Frying Pan Lake remains in the SFK River drainage, while the remaining one-third of the groundwater crosses the surface water drainage divide and contributes to base flow in tributary UT1.190, and discharges to UTC."	This mine layout is an attempt to shift groundwater impacts east away from the UTC watershed and protect Lake Iliamna. The statement that "the remaining one-third of the groundwater crosses the surface water drainage divide and contributes to base flow in tributary UT1.19" shows that while the applicant may succeed some of the time, some mine contact water will end up in the UTC! NMFS requests the project proponent describe what they would do if groundwater contamination starts showing up in the SFK to keep it out of the UTC watershed and Lake Iliamna. How long would that mitigation action need to continue?
Model Integration	DEIS Appendix K Chapter 3.17	K3.17.2 Aquifers and Confining Units	Pg. K3.17-20	"site-wide water balance model (WBM) is 11 inches per year, the lowest rate of the three watersheds in the project area (groundwater recharge in the SFK watershed is estimated at 24 inches per year, and UTC watershed at 16 inches per year).	Is the WBM the watershed model, the groundwater model or something else? Be consistent with the usage of "module" and "model" and the model names. NMFS recommends the project proponent explain how the 3 (or are there others) models function together.
Groundwater	DEIS Appendix K Chapter 3.17	K3.17.3 Aquifer Properties	Table K3.17-2 Pg. K3.17-21	Summary of Hydraulic Conductivity Testing Results from Slug Tests	Even a single hydraulic conductivity reading of 0.0014 m/s (which is 44 km/year) in the bedrock of the pebble deposit is alarming. It does not matter if the other 51 hydraulic conductivity results are all accurate and lower. If 2% or even 0.2% of the mine pit walls have this hydraulic conductivity, NMFS recommends the project proponent explain how do they plan to keep the AMD water in the pit from escaping.

Groundwater Model	DEIS Appendix K Chapter 3.17	K3.17.3 Aquifer Properties	Pg. K3.17-26	"Larger-scale hydraulic conductivity values were also assessed by conducting nine pumping tests, and found that the hydraulic conductivity of overburden was almost 10 times higher than values derived from response tests (Schlumberger 2011a). Pumping rates ranged from approximately 10 to 356 gallons per minute (gpm); although seven of the nine tests reported well yields between 45 and 85 gpm. Water level responses were observed at monitoring wells located up to 760 feet away from the pumping wells, allowing for a more representative analysis of aquifer transmissivity (hydraulic conductivity) and storativity (specific yield) than is possible using response testing and packer testing alone."	Pumping tests are a better way to measure hydraulic conductivity than slug or packer tests because the effects of impermeable well wall created by the drill bit are minimized. These pumping tests yield 10 times higher values. NMFS recommends USACE/project proponent explain how the groundwater model includes these pump test derived values? There are far more slug and packer test values, but the data may be inaccurate. How did the models incorporate these different levels of data precision?
Draft Environmental Impact Statement - Chapter 4-17 - Environmental Consequences - Groundwater					
Ground Water	DEIS Chapter 4.17	4.17.1 Methodology for the Analysis of Groundwater Impacts	Pg. 4.17-2	"or flow effects could be hydraulically connected to areas beyond the EIS analysis area."	Once the pit extends deeper into the earth than Lake Iliamna and the Mulchatna River, the concept that those water bodies bracket the zone of effects may not hold true. While there are over 1 million linear feet of bore holes, the information about water flowpaths from holes deeper than 150 feet is sparse. In the horizontal slice of earth that passes through the lower third of the completed pit (sea level to 400 feet below sea Level), geographically bounded by Lake Iliamna to the Southwest, the Mulchata River to the North, and the Bristol Bay shoreline to the east, NMFS recommends the project proponent detail how many distinct hydraulic conductivities were measured/estimated and the methods used.
Groundwater	DEIS Chapter 4.17	4.17.3.1 Mine Site - Pit Dewatering	Pg. 4.17-6	"It is expected that the amount of water produced during pit dewatering could be larger than simulated, and the capture zone and zone of influence could be larger. Additional details regarding model uncertainty are provided in the Appendix K4.17."	If a specific dewatering design has not been developed, how can the capture zone be known or analyzed? To know the capture zone one needs to know number, locations and depth of dewatering wells, as these wells are what will "capture" the water. NMFS recommends the project proponent present a detailed dewatering plan with increased precision on the Northwest, West and Southwest sides of the pit where water will be captured from UTC and SFK watersheds.
Groundwater	DEIS Chapter 4-17 (Piteau Associates 2018a).	4.17.3.1 Mine Site - Pit Dewatering	Pg. 4.17-3	"The magnitude and extent of impacts would be that groundwater levels would ultimately need to be lowered below the bottom of the final mine pit, which is estimated to be up to 2,200 feet below grade."	This 2,200-foot depth is not the same as the depth stated in the DEIS project description (Dec, 2018) or in the USACE permit application (Dec, 2017). NMFS recommends USACE/project proponent explain why they plan to lower the water table 200 feet below the pit depth.
Groundwater	DEIS Chapter 4-17	4.17.3.1 Mine Site - Pit Dewatering	Pg. 4-17.4 Fig. 4-17-1	Conceptual Groundwater System Around Pit in Late Operations and Post-Closure	During the estimated 20 years of refilling the pit (closure), tributary streams will be the most water stressed. Streams lose groundwater flowing towards the pit and there is little post-process water available to replace their lost groundwater. NMFS recommends the project proponent explain how they propose to keep the streams full during the refilling years. The bottom arrows appear to show lateral flow from the east (maybe) on the Late Operations diagram. Does that arrow represent flow coming 15 miles from Lake Iliamna DOWN the 1% gradient from the Iliamna Lake to the pit bottom during late operations? With the pit full of mine waste water to 890 feet a.m.s.l., the flow arrows should be away from it! NMFS requests the project proponent to explain their logic.
Groundwater	DEIS Chapter 4-17	4.17.3.1 Mine Site - Pit Dewatering	Pg. 4-17.4 Fig. 4-17-1	Conceptual Groundwater System Around Pit in Late Operations and Post-Closure	If water seeps from Lake Iliamna to the pit and necessitates additional pumping, that will not be a major impact on Essential Fish Habitat. The adverse effect to Salmon EFH will commence once the pit is filled to 890 feet at closure +20 years, flow paths reverse, and acid mine drainage flows from the pit towards Lake Iliamna or SFK drainage. Should this situation occur, the only way to protect EFH in Lake Iliamna would be to dewater the pit forever. This, however, would dry out streams and eliminate that fish habitat. Considering future earthquakes are unknown, and these earthquakes could open up fractures that do not currently exist, NMFS recommends USACE/project proponent present their plans to mitigate these possible future scenarios. Since this pit lake containing pyritic tailings exists in perpetuity, the region doesn't only have to go 100 years without new fractures developing, the Bristol Bay region needs to be earthquake free for 1,000+ years. NMFS recommends USACE/project proponents work with a geologist to understand earthquakes in the last 1000 years.
Groundwater Dewatering	DEIS Chapter 4-17 (Knight Piésold 2018e) (Piteau Associates 2018a)	4.17.3.1 Mine Site - Pit Dewatering	Pg. 4-17.3 Piteau and Associates 2018a, pg 9	"The initial dewatering well field during construction is conceptualized to consist of approximately 30 operating wells installed to a depth of 150 feet, and spaced about 200 feet apart around the starter pit perimeter (Knight Piésold 2018e). The wells would initially be pumped at a rate of 50 gallons per minute (gpm), with a total rate of approximately 1,500 gpm. The estimated groundwater inflow to the pit at the end of operations is estimated to be about 2,200 to 2,400 gpm (Piteau Associates 2018a)."	Why are wells needed every 200 feet early in the operation, and then it is acceptable to move the spacing to 500 feet as the pit deepens? NMFS recommends the project proponent provide a plan for how many wells are operating when the mine is at 200, 600, 1200, 1900 feet deep, on what spacing, and how deep are the wells. Effects on EFH in a particular tributary basin cannot be determined if the amount of dewatering wells in the headwaters of those tributaries is not known.
Groundwater Faults Dewater	DEIS Chapter 4-17	4.17.3.1 Mine Site - Pit Dewatering	Pg. 4-17.3	"The well field at the end of mining is expected to include approximately 30 wells at 500-foot spacing around the pit perimeter."	These wells are designed to just drain the overburden. NMFS recommends the project proponent explain how will they will intercept the flow along the ZG1 fault or the fractures connected to that fault.
Climate Change	DEIS Chapter 4-17	4.17.3.1 Mine Site - Pit Dewatering	Pg. 4-17.3	"Potential changes in future precipitation due to climate change that result in more rain and less snow would tend to even out swings in seasonal recharge to the groundwater system ... (AECOM 2018)"	This is based on an assumption that snowstorms change to rain but total annual precip stays the same. A warmer Bering Sea/Gulf of Alaska will produce stronger wind and 12 months of ice free time each year, leading to more intense storms delivering higher 24-hour maximum precipitation events. NMFS request USACE/project proponent work with climate scientist at UAF to understand these storms, and design mine facilities to accommodate these higher rainfall totals.
Habitat Loss	DEIS Chapter 4-17	4.17.3.1 Mine Site - Pit Dewatering	Pg. 4.17-5	"In terms of magnitude and extent, some wetlands, stream segments, ponds, or lakes in the immediate pit area may be eliminated as the water table is lowered, and water leaks out of these water bodies during construction and mining operation."	Until the project proponent states which wetlands, streams segments, ponds and lakes will be eliminated and if they were EFH before exploratory drilling began, no one can predict the mine's effects on EFH. Many of those water bodies currently provide rearing habitat for salmon. Others likely did provide rearing habitat, but now may be contaminated by leaking boreholes. NMFS recommends USACE/project proponent provide a level of information about juvenile fish distribution that will allow their EFH Assessment to be accurate.
Groundwater	DEIS Chapter 4-17	4.17.3.1 Mine Site - Pit Dewatering	Pg. 4.17-5	"The extent of impacts is that pit dewatering may locally impact groundwater flow across the groundwater divide, drawing groundwater from the headwaters of the UTC watershed depending on the extent of the cone of depression around the pit (Piteau Associates 2018a)."	This statement undermines the PLP claim that EFH in the UTC tributary reaches will not be affected. NMFS recommends USACE/project proponent clearly state: 1) How much EFH exists in the UTC tributaries; 2) How many tributary miles will be affected by these dewatering wells; 3) What months of the year will the effects be most detrimental to EFH.
EFH	DEIS Chapter 4-17	4.17.3.1 Mine Site - Pit Dewatering	Pg. 4.17-5	"Impacts to wetlands, ponds and small streams located upstream of the WTP discharge location would not be mitigated by the WTP discharges."	NMFS recommends the project proponent provide a map of every water body upstream of the WTP which may go dry and would not be mitigated so the project proponent can determine how much EFH will be lost.
Groundwater	DEIS Chapter 4-17	4.17.3.1 Mine Site - Pit Dewatering Piteau Associates (2018a)	Pg. 4.17-8	"Piteau Associates (2018a) estimates that the cone of depression at its widest extent at the end of operations would range from a distance of approximately 1,500 feet from the pit crest along its northeastern side, to as much as 14,000 feet along the ridge southeast of the pit, depending on the actual hydraulic characteristics of the affected aquifer (Figure 4.17-3)."	2.8 miles of the cone of depression on the southeast will be split between the SFK and UTC watersheds. However wide the cone of depression is, the "zone of influence" is even wider (See Piteau 2018a). NMFS recommends the project proponent explain how a cone of depression extending 2.8 miles into UTC can fail to affect any UTC streams or EFH in the UTC watershed? Sean is here- noon

Site Closure EFH	DEIS Chapter 4-17	4.17.3.1 Mine Site - Pit Dewatering	Pg. 4.17-8	"This would result in a permanent pit lake that would be pumped to maintain the MM level indefinitely (allowing for 10 feet of freeboard to accommodate the probable maximum flood and still not breach the not-to-exceed level of 900 feet)."	Indefinite pumping of a toxic pit lake upstream of Lake Iliamna salmon habitat is a problematic environmental closure. NMFS recommends the project proponent either develop a different closure strategy, such as locking up the toxic tailings in a paste and eliminating the need for the lake, OR state that EFH in many miles of the UTC and SFK will be either severely impaired or completely destroyed within the next 100 years. The project proponent thinks it will take a long time for these extremely destructive impacts to take hold. This idea of a toxic lake pit slowly becoming diluted and inert isn't working at the Berkeley Pit in Montana, which was closed in 1982, and it will not work in the Bristol Bay Watersheds.
Groundwater	DEIS Chapter 4-17	4.17.3.1 Mine Site - Pit Dewatering	Pg. 4.17-8 Fig. 4.17-3	Piteau Associates (2018a) estimates that the extent of the post-closure cone of depression would range from a distance of about 1,500 feet from the pit crest along its northeastern side, to as much as 13,500 feet from the pit crest to the southeast, depending on the actual hydraulic characteristics of the affected aquifer (Figure 4.17-3).	NMFS recommends the project proponent explain why the 50th percentile lines do not fall at intermediate spots between the 5th and 95th percentile lines. NMFS request a clearer presentation of what these percentiles actually represent. The lines are so similar on so many sides of the mine, it appears the model that produces them is not very precise.
Groundwater	DEIS Chapter 4-17	4.17.3.1 Mine Site - Pit Dewatering	Pg. 4.17-10	"The estimated extent of the capture zone in post-closure would be about 1,800 acres."	NMFS recommends the project proponent present a complete dewatering plan before stating a single number for the capture zone. Also please present a range of values for the capture zone for the 78-year pit.
Tailings	DEIS Chapter 4.17	4.17.3.1 Mine Site - Tailings Storage Facilities - Bulk TSF	Pg. 4.17-14	"With the exception of the upstream face of the bulk TSF south embankment, which would be lined with HDPE, the bulk TSF would be unlined, and the bulk TSF main embankment would operate as a flow-through structure draining towards the north (see Section 4.15, Geohazards)."	NMFS recommends the project proponent present information on similar large mines that let a 500 ft tall embankment flow through and where it stood without issues for decades. If it has not been done before, NMFS requests USACE not allow the Kottull watershed to be used as a test case for this massive flow-through structure.
Tailings	DEIS Chapter 4.17	4.17.3.1 Mine Site - Tailings Storage Facility - Bulk TSF	Pg. 4.17-14	"Construction of the bulk TSF would locally impact surface water features at the site, and potentially impact groundwater/surface water interactions; this impact is expected to be modest in extent (e.g., approximately 8,000 acres [PLP 2019-RF1109b] near the vicinity of the bulk TSF), but permanent."	NMFS recommends the project proponent explain the effects of the TSF in the first 20 - 30 years, as this relatively dry tailings material spread over 2.5 square miles manages to absorb, rather than convey, much of the rainwater. Wouldn't this tend to dry out the surrounding tributary streams as they are deprived of this rainwater?
Project Scope Extent of Impacts	DEIS Chapter 4.17	4.17.7 Cumulative Effects	Pg. 4.17-25	"Pebble Project buildout—development of 55 percent of resource over a 78-year period."	The entirety of the environmental review appears based on the 20-year mine plan. Instances like this that discuss the 78-year plan represent a lot of uncertainty for NMFS as to the adequacy of the EFH Assessment. NMFS recommends a thorough environmental review of the 78-year mine plan.
Project Scope	DEIS Chapter 4.17	4.17.7.2 Reasonably Foreseeable Future Actions - Alt 1 - Applicant's Proposed Alternative	Pg. 4.17-26	"Pebble Mine Expanded Development Scenario. An expanded development scenario for this project, as detailed in Table 4.1-2, would include an additional 58 years of mining and 20 years of additional milling over a substantially larger mine site footprint, and would include increases in port and transportation corridor infrastructure under Alternative 1. The Pebble Project expansion would result in additional development not included under the other alternatives."	NMFS recommends the project proponent evaluate the expanded development scenario in both their EIS and EFH Assessment.
Project Description	DEIS Chapter 4.17	4.17.7.2 Reasonably Foreseeable Future Actions - Alt 1 - Applicant's Proposed Alternative	Pg. 4.17-26	"The buildout would correspond to about a six-fold increase in the footprint of the pit, an increase in pit depth to about 3,500 feet (PLP 2018-RF1 094), and a duration increase of up to 78 years for the operations capture zone."	NMFS recommends the USACE/project proponent explain how many of the additional five square miles of pit development will happen in the Upper Talaric Creek Watershed.
Project Scope Extent of Impacts SFK UTC	DEIS Chapter 4.17	4.17.7.2 Reasonably Foreseeable Future Actions - Alt 1 - Applicant's Proposed Alternative	Pg. 4.17-26	"The estimated capture zone for the expanded dewatered pit during operations would be an irregular circle about 5 miles across (about 20 square miles) straddling the SFK and UTC drainages, although it could extend 1 to 2 miles further south along the ridge between these watersheds, if similar to the modeled capture zone under Alternative 1 (Figure 4.17-2)."	In the groundwater sections of the D-EIS, PLP has implied that very little water moves below the overburden zone. If this is true, NMFS requests the project proponent answers the following questions: 1) Why does a 5 square mile pit have a 20 square mile capture zone? 2) How much bigger does the entire mine footprint become? 3) How much of the capture zone is actually underneath tailing storage facilities?
Site Closure Groundwater	DEIS Chapter 4.17	4.17.7.2 Reasonably Foreseeable Future Actions - Alt 1 - Applicant's Proposed Alternative	Pg. 4.17-26	"It is estimated that the expanded pit would draw about five times more groundwater than under Alternative 1; or about 12,000 gpm (27 cfs) near the end of operations and 6,500 gpm (15 cfs) in post-closure. About half of this inflow would come from the SFK watershed and half from UTC."	NMFS recommends the USACE/project proponent explain how they came to this conclusion. It seems like the number should not be as simple as a 5 times larger hole draws down 5 times the water.
Project Scope Extent of Impacts Groundwater	DEIS Chapter 4.17	4.17.7.2 Reasonably Foreseeable Future Actions - Alt 1 - Applicant's Proposed Alternative	Pg. 4.17-27	"The potential for impacts on shallow groundwater interception along the transportation and pipeline corridors would increase under the expanded mine scenario, because both the north and south access corridors would be used, and the north corridor would eventually be wider and longer to accommodate a diesel pipeline."	There is no description or mention of construction of a diesel pipeline or expansion of road access in any of the Project Description or Purpose/Need documents. NMFS recommends the USACE/project proponent provide full descriptions and environmental reviews of these components if they are a planned part of this project's future.
Draft Environmental Impact Statement - Chapter K4-17- Groundwater Appendix					
Groundwater Model	DEIS Appendix K Chapter 4-17	K4.17.1 Model Development, Calibration, Input Scenarios, and Uncertainty	Pg. K4.17-1	"Miscellaneous information about the 2018 model detailing layers, boundary conditions, input parameters, and calibration results are available (PLP 2018- RFI 019c; Knight Piésold 2018n; PLP 2019-RFI 109, 109a, 109b, and 109c); however, the model is still in the process of being updated and is not fully calibrated" (PLP 2019-RFI 109)."	NMFS understands that no model is perfect, but NMFS does not feel a 10-layer model that lacks a calibration report and has not been validated is reliable enough to be the basis for an EFH Assessment. Groundwater upwelling is the unique attribute making this prime spawning area and the mine's effect on upwelling are not yet understood. NMFS recommends the project proponent calibrate and validate their model using distinct data sets, then run it for the two pit sizes, and then start their EFH assessment. While there is abundant information on the upper model layers, NMFS suspects the project proponent needs to collect more information on the hydraulic conductivity of the lower stratum.

Groundwater Model	DEIS Appendix K Chapter 4-17	K4.17.1 Model Development, Calibration, Input Scenarios, and Uncertainty	Pg. K4.17-1	"Knight Piésold (2018n: Figures 10 and 11, and Table 1) provides the range of hydraulic conductivity and storage values between the 5th and 95th percentile realizations for model layers and zones used in the pit capture zone analysis (shown on Knight Piésold 2018n: Figures 1 through 7)."	The current capture zone predictions and mine contact water spread predictions are based on a 10-level groundwater that has not been calibrated (PLP 2019-RF1 109). For the 20-year mine scenario, NMFS cannot reliably determine where EFH will be compromised because upwelling stops without a finalized, calibrated, validated groundwater model. For the 45 or 78 year mine, the model does not have enough information to predict what happens at depth. Fewer than 1/2 dozen bore holes penetrated deeper than 2,500 feet (or at least they're not publically available). The few that extend below 2,500 ft. present confusing layers, some of which indicate permeability. In a non volcanic area without faults, bedrock generally becomes less permeable at depth. The little data that exists below 2000 feet indicates strangely high hydraulic conductivity layers down deep (Schlumberger 2015a, 2011a) This area was a subduction zone, so unusual findings are not necessarily wrong; however, digging a pit into this unknown could easily compromise Lake Iliamna and the Kivachik River sockeye run. NMFS recommends the project proponent collect and present a much more detailed study of the geology and hydraulic conductivity below 2,000 feet of depth.
Groundwater Model	DEIS Appendix K Chapter 4-17	K4.17.1 Model Development, Calibration, Input Scenarios, and Uncertainty	Pg. K4.17-1 to K4.17-2	"The value of hydraulic conductivity used for layer 4 in the pit area is lower than mean values of hydraulic conductivity determined from response and pump tests in bedrock by about an order of magnitude (Schlumberger 2015a: Tables 8.1-1 through 8.1-6, and Appendix K3.17, Figure K3.17-14)." "Larger-scale hydraulic conductivity values were also assessed by conducting nine pumping tests, and found that the hydraulic conductivity of overburden was almost 10 times higher than values derived from response tests (Schlumberger 2011a)."	NMFS recommends the USACE/project proponent present the logic by which the hydraulic conductivity for layer 4 was lowered by an order of magnitude in the model.
Groundwater Model	DEIS Appendix K Chapter 4-17	K4.17.1 Model Development, Calibration, Input Scenarios, and Uncertainty	Pg. K4.17-2	"Hydraulic conductivity values assigned to deeper bedrock (Knight Piésold 2018n; layers 5-10) appear to be an order of magnitude or more lower than field-measured values (Section 3.17, Groundwater Hydrology, Figure 3.17-7 through Figure 3.17-9, and Appendix K3.17, Figure K3.17-14). Pebble Limited Partnership (PLP) (2019-RF1 109c) noted that the low hydraulic conductivity values used in the model were needed to achieve an adequate calibration, and that field and literature evidence suggests that bulk bedrock values may be lower than indicated by field tests."	This discrepancy between literature-predicted values and field-measured values is possibly caused by a system of fractures and joints not recognized by the model moving the water around, even though the individual stratum seems to have low hydraulic conductivity values. The DEIS's suggestion that the field test gave an atypically high HC value is unlikely. The drill head sometimes clogs porous matrix along the borehole wall lowering, but not raising, measured hydraulic conductivities. This can lead to HC values that are much lower than actual. NMFS recommends the EIS use actual observed field data rather than theoretical numbers in the models.
Groundwater Model Watershed Model	DEIS Appendix K Chapter 4-17	K4.17.1 Model Development, Calibration, Input Scenarios, and Uncertainty	Pg. K4.17-2	"Recharge rates assigned to the groundwater model were the average rates generated by the watershed module (Schlumberger 2011a), which take climate variability into consideration by incorporating long-term precipitation data for the study area (Knight Piésold 2018a)"	NMFS recommends the EIS run the watershed model with at least 3 "wet" years in a row (average 140% of mean precipitation per year), which is becoming more probable. NMFS appreciates that the project proponent "bootstrapped" in climate variability. Variability is important, but a different process than acknowledging that the climate is changing and is likely to get wetter.
Groundwater Model	DEIS Appendix K Chapter 4-17	K4.17.2.1 Operations	Pg. K4.17-2	"Travel time from the outlying areas to the pit associated with the 95th percentile capture zone averages about 80 years, and would likely be longer because the model assumes that the pit is instantaneously full-size at the start of operations."	The capture zone explained in the document averages less than 1 mile wide, and the overburden has decently high hydraulic conductivities. NMFS recommends the EIS explain why it projected an 80-year travel time.
Groundwater Model	DEIS Appendix K Chapter 4-17	K4.17.2.1 Operations	Pg. K4.17-2 to K4.17-3	"Groundwater between the immediate pit capture zone and the outlying ridge areas is predicted to discharge to local streams or seeps as they do currently, and not be affected by the capture zone (Piteau Associates 2018a; Knight Piésold 2018n)."	If there are both contiguous and discontinuous areas of groundwater effect from the cone of depression, doesn't that indicate the model is relying on some deep connection between the two locations? While that is possible, it is difficult to believe seeps between the two areas are completely unaffected. If the seeps are affected, the local EFH would be affected. NMFS recommends that the EIS evaluate the effect of reduced groundwater discharge on these seeps adjacent to the outlying ridge.
Groundwater Model	DEIS Appendix K Chapter 4-17	K4.17.2.1 Operations	Pg. K4.17-3	"Similarly, the model predicts that the rates of groundwater inflow to the pit would be within a relatively narrow range of 2,200 to 2,400 gallons per minute for the 5th to 95th percentile scenarios, respectively (Piteau Associates 2018a). These similar model outcomes may reflect a lack of robustness in the Monte Carlo analysis."	NMFS agrees that something is amiss with the model if the range of outcomes is 2,200 to 2,400 gallons/minute (4.9-5.3 c.f.s.). Considering variable precipitation and unknown storage capacity, the range should be larger. If the model is not credible, the EFH Assessment that relies on it will also be inaccurate.
Groundwater UTC	DEIS Appendix K Chapter 4-17	K4.17.2.1 Operations	Pg. K4.17-3 Fig. K4.17-2	"The reduction in groundwater discharge to the headwaters of UTC was analyzed by the model scenarios for late winter months January-March using a transient model simulation at dynamic equilibrium (Piteau Associates 2018a). Without the addition of water treatment plant (WTP) outflows, groundwater discharge to the upper UTC drainage is predicted to decline 14 to 19 percent at the end of operations for the 5th to 95th percentile model scenarios, respectively (Figure K4.17-2)."	NMFS recommends the EIS explain why there is only a difference of 5% in groundwater percent between very wet assumptions and very dry assumptions. On the UTC mainstem, this could be correct because 2/3 of groundwater could come from the North and East. For UT146A and other tributaries this seems unlikely.
Site Closure Groundwater	DEIS Appendix K Chapter 4-17	K4.17.2.1 Operations	Fig. K4.17-1c	The figure Simulated Drawdown Contours at End of Operations For the Pit Area Model indicates that there will be a significant amount of drawdown in the UTC drainage at the end of operations.	With the amount of drawdown shown in K4.17-1c, effects on juvenile EFH at least in closest 1/2 mile to the pit in the UTC drainage are unavoidable. Additionally, there appears to be 5 - 9 miles of tributary stream that will disappear in SFK. NMFS recommends the project proponent reassess how much EFH exists in these small tributaries close to the pit.
Groundwater	DEIS Appendix K Chapter 4-17	K4.17.2.2 Closure	Pg. K4.17-8	"The exception to these measurements is that three water-level measuring ports between depths of 3,800 and 4,000 feet exhibited heads between 25 and 35.7 feet below land surface between 2009 and 2012."	This observation may indicate a confined aquifer in that deep stratum. If it was solid bedrock, it seems there would be no head at all. NMFS recommends the EIS include an investigation of the deepest stratum to confirm the presence or absence of such a deep aquifer.
Site Closure Groundwater	DEIS Appendix K Chapter 4-17	K4.17.2.2 Closure	Pg. K4.17-8	"The long-term steady-state average annual groundwater inflow to the pit in post-closure is estimated to be about 1,300 gallons per minute (about 3 cubic feet per second [cfs]) (Piteau Associates 2018a)"	In order to accurately assess the post-closure pit's effect on EFH, NMFS recommends the EIS provide the leak rate of the pit; NMFS acknowledges that the pit walls below 890 feet are not completely leakproof. Perimeter drawdown wells could capture leakage in the top 200 feet, but NMFS recommends the EIS describe how they intend to mitigate the potential for water to slowly travel down a fault line, away from the pit, at depths deeper than 200 feet. Even deep dewatering wells on 50' spacing could fail to intersect the fault.
Site Closure Groundwater	DEIS Appendix K Chapter 4-17	K4.17.2.2 Closure	Pg. K4.17-8	"This means that the deeper groundwater levels had a higher head than the lake would have, and that deep groundwater below the pit bottom would flow upwards toward the bottom of the lake."	NMFS recommends that the EIS provide an illustration and the data that supports this logic. How many times did the project proponent measure "heads" in boreholes with depths similar to the pit's final depth?

PERMIT APPLICATION (POA_2017-271) ATTACHMENT D - Dec 2017 / D-EIS ATTACHMENT B - Dec 2018 / APPENDIX N - Feb 2019

Water Quality/Extent of Impacts	Appendix N, Project Description Dec 2018	4.1.3.1 Water Management Plan	Pg. 58	"Water collection, management, and transfer will be accomplished through a system of water management channels, ponds, and pump and pipeline configurations. These systems will be designed to handle the large flows that occur during spring freshet and late summer/fall rains." "Leak detection systems that report to a central control system will be employed, as will monitoring systems to control pump cycling, high and low water-level switches, no-flow (or low-flow) alarms, vibration overheating alarms, and other systems as appropriate to monitor water management systems."	PHABSIM models were developed to predict impacts in terms of water quantity in the main channel. It ignores impacts to all other wetlands and rearing channel types. There is no reference, summary, or discussion of the proposed PHABSIM model or the adequacy of this approach. There is no reference to supporting materials. It is doubtful that impacts to habitat could be comprehensively evaluated as a function of water quantity while ignoring water quality (e.g. water temperature) and other physical attributes and aspects of the habitat. The D-EIS does describe the proposal of engineered drainage networks, but does not address the likely potential for others to develop on their own, especially if the materials are natural. These issues are a concern because the surrounding overburden aquifers are highly connected, unconfined, and support high levels of dissolved oxygen. This leads to concerns over water quality and potential discharge of contaminated groundwaters into surface waters. NMFS advises project proponent to evaluate more thoroughly predictions of water quality in streams as a result of project, with careful considerations to the above physical attributes of this ecosystem.
Water Quality Mine Description Surface Water Extent of Impacts	Appendix N Project Description Dec 2018	4.1.3.2 Water Treatment	Pg. 60	"Reject from the nanofiltration (NF) membranes [in the Main Water Treatment Plant] will have a high concentration of dissolved sulfate and other divalent ions. To prevent overloading the mine water balance with dissolved sulfate, sulfate must be precipitated from the reject before transferring to the pyritic TSF. Sulfate from the NF reject will be precipitated as calcium sulfate with a lime softening process. The calcium sulfate sludge will be transferred to the pyritic TSF. Based on the expected pH in the pyritic TSF, the calcium sulfate sludge is not expected to re-dissolve."	Main Water Treatment Plant (WTP#2) step 5 discusses the placement of the precipitated calcium sulfate solids into the pyritic TSF and notes that modeling indicates that the conditions in this TSF should prevent redissolution of the solids. Mining operations in Alaska and the Northwest that process higher quality ores in regions with less seasonal precipitation and less ground and surface water interaction than this project have exceeded permitted discharges of metals (TDS) leaching from waste rock facilities. At least one other mine in Alaska has issues with TDS chemistry where the conditions indicate that precipitate should form but hasn't. Excess discharge of TDS is typically the result of: 1) models that predict metals can be removed in precipitates, when metals actually remain in solution, 2) project proponents do not properly construct or install equipment or institute protective measures in the manner that is detailed in their Environmental Impact Statement, and/or 3) operating treatment systems are overwhelmed by surpluses of water from multiple sources. While modeling might show that these solids won't be dissolved, NMFS recommends that the USACE/project proponent have a contingency plan detailing how this issue would be handled.
Water Use and Mangement	Surface Water Right Applications dated July 7, 2006 http://dnr.alaska.gov/mlw/mining/large/mine/pebble/water-right-apps/2006/gwufinal.pdf	Water Rights Applications		<i>Upper Talarik Creek.</i> "The current maximum proposed extension of an open pit to mine the West Zone of the Pebble surface deposit extends approximately 3,000 feet into the Upper Talarik Creek drainage.... The company estimates that such a diversion would, on average, decrease the monthly flows of the creek at the USGS flow station 12 miles downstream by between 6% and 9%, depending on the month. The percentage decrease would be smaller further downstream." (LAS 25876) South Fork Koktuli. "The company estimates that such a diversion would, on average, decrease the monthly flows in the South Fork Koktuli River by 15% to 16% approximately 10 miles downstream at the USGS flow station (below the area where the stream dries up in the summer)." (LAS 25874) North Fork Koktuli. "They estimate that this impoundment would reduce the flow of the North Fork Koktuli River by 8% at the USGS flow station approximately 14 miles downstream." (LAS 25871)	The Surface Water Rights Applications suggest instream flows will be reduced several miles downstream of the mine site (UTC 12 miles, SFK 10 miles, NFK 14 miles) as a result of groundwater withdraw from underneath the watersheds. The percent of decrease in the instream flows will increase with closer proximity to the mine site and de-watering wells. This increased range of impact is not represented in the EFH Assessment and do not support the conclusions in the EFH Assessment, Section 7. Given the proposed mine project has changed significantly since 2006, NMFS recommends the project proponent apply for water rights permits that match the amounts of water needed for the current 25-year mine project. If the project proponent chooses to stick with requests for these larger withdrawals, NMFS will assume that they plan to construct the expanded mine, and evaluate the EFH Assessment in this light.
Water Use and Mangement	Surface Water Right Applications dated July 7, 2006, are for the following amounts:			<i>Upper Talarik Creek 28.9 cfs, NF Koktuli River 34 cfs, SF Koktuli River 51 cfs; estimated total water use of 113.9. Additional groundwater applications, with a priority date of September 21, 2006, are for the following amounts: SF Koktuli River 11.78 cfs, and an estimated 20 cfs from Upper Talarik Creek.</i>	Withdrawing these water volumes would dry out many miles of tributary streams in dry periods and kill juvenile salmon and salmon eggs. NMFS recommends the project proponent explain how they will withdraw and use 113.9 cfs, when the current plan only includes treatment capacity for a maximum of 44 cfs. Will the project proponent return the extra 69.9 c.f.s. to the streams untreated?

Topic	Document & Chapter	Section # Section Title	Page # Figure #	Author's Original Language or Description of Citation	NMFS Recommendations for USACE/Project Proponent.
Knight Piesold 2018a - Pebble Mine Site Operations Water Management Plan					
Project Description	Knight Piesold 2018a	1.1 Project overview	Pg. 1 PDF Pg. 6	"The Bulk TSF south embankment is proposed to include a hydraulic barrier, consisting of a HDPE liner or a low permeability core zone, and a grout curtain installed in the weathered bedrock of the foundation."	This sounds like the design of the south embankment is not complete. NMFS recommends USACE/project proponent complete the design of the south embankment and HDPE project liner and then present calculations on the leakage coefficient.
Water Quality	Knight Piesold 2018a	2.2 Climate Characteristics, 2.2.1 Setting	Pg. 5 PDF Pg. 10	"and conditions are quite wet, with mean annual precipitation varying throughout the project area but generally ranging from 45 in. to 55 in."	Catchment and treating 45-55 inches of precipitation annually over 10 square miles is a huge task. NMFS requests USACE/project proponent provide a typical per acre foot cost of removing the level of metals the project needs to remove. Explain how many acre feet will need to be treated in the first 30 years.
Water Quality Watershed Module	Knight Piesold 2018a	2.2.3 Long Term Monthly Temperatures and Precipitation at Pebble 1	Pg. 10 PDF Pg. 15	"The estimated long-term mean annual precipitation at Pebble 1 is 54.6 in."	This average is not possible if either the statement of 45-55 inches of precipitation on page 5 is correct or Figure 2.2 is accurate. While the discrepancy in these estimates sounds small over the years it will vastly change the cost of water treatment. PLP estimates of volumes needing treatment are much more precise than their estimates of pre-processing water chemistry. NMFS recommends USACE/project proponent synthesize their estimates of precipitation, including possible changes due to climate, and present a range of water chemistries, and then explain how the water treatment plants will meet this challenge.
Watershed Module Climate	Knight Piesold 2018a	Drainage Basins and Hydrometeorological Station Locations in the Project Area	Fig. 2.2 PDF Pg. 12	Precipitation map - values derived by SE - The pit itself at approximately 1050 feet will get 50-55 inches annually. The tailings facilities at 1730 feet, will get 65-75 inches annually.	NMFS recommends USACE/project proponent answer the following questions. -Is Fig 2.2 assuming the future climate replicates the past? -If the rate of climate change in central Alaska from 1990-2019 is replicated from 2020 to 2050, then how much precipitation is expected in the 2040-2060 time frame? NMFS recommends USACE/project proponent use several downscaled climate models recognized by IPCC to make these predictions.
Watershed Module Precipitation	Knight Piesold 2018a	2.2.3 Long Term Monthly Temperatures and Precipitation at Pebble 1	Table 2.1 Pg. 11 PDF Pg. 16	Table 2.1 Monthly and Annual Temperature Statistics for Pebble - Statistics of a synthetic temperature series for the Pebble 1 station location, estimated on the basis of the Iliamna Airport record (1942-2017), as described in Memorandum VA18-00250 (KP2018A)	NMFS requests USACE/project proponent explain how many months of the 75-year (900-month) synthetic record at the Pebble site there was no or incomplete precipitation information from the Iliamna Airport meteorological station. For months where they relied on King Salmon meteorological data, NMFS requests USACE/project proponent describe the precision of the precipitation estimate. King Salmon weather may be reliant primarily on moisture from the Bering Sea. The Pebble site is likely more influenced by Gulf of Alaska weather systems.
Peak Storm Events	Knight Piesold 2018a	2.2.6 Extreme Precipitation	Pg. 14 PDF Pg. 19	The IDF curves were generated according to the NOAA Atlas 14 Volume 7: Precipitation-Frequency Atlas of the United States, Alaska (NOAA, 2012), with adjustments for specific location and orographic effects.	NMFS recommends USACE/project proponent incorporate more recent work into these models, including Curran 2016 (https://pubs.er.usgs.gov/publication/sir20160524)
Groundwater Surface Water Interbasin transfers	Knight Piesold 2018a	2.3.3 Streamflow Records	Table 2.3 Pg. 15 PDF Pg. 20	Table 2.3 Mean Seasonal Flow Distribution (2004-2015) - Annual hydrographs of mean monthly discharge for the four gaging stations located closest to the mine site are presented on the following Figures 2.7 to 2.10. Hydrographs are presented for both the measured records (including gaps infilled using regression relationships) and for the long-term estimated streamflow series generated using the watershed module.	UTC is the driest of the three watersheds, with most areas in the 40-50 inch range. If UT119A streamflow gauge averages 98.1 inches/year until discharge, that suggests 1/2 the water is groundwater that crosses the SFK-UTC boundary. SFK100C at 10.8 in/year is also VERY surprising as it drains high amounts of precipitation upland. The numbers presented in this table either indicate huge interbasin groundwater transfers or less than rigorous stream monitoring. Both scenarios suggest the applicant will be dewatering UTC in the best case scenarios and moving acid mine drainage that direction in worst scenario. NMFS recommends USACE/project proponent explain the meaning of the data in this table in more detail.
Precipitation	Knight Piesold 2018a	2.3.3. Streamflow Records	Figure 2.11 Pg. 18 PDF Pg. 23	Daily Discharge Hydrographs of NK119A for Driest Year (2011) and Wettest Year (2013) on Record	NK119A had a one day average discharge above 500 cfs on about Oct 20, 2013. NMFS requests USACE/project proponent explain how the various TSF and WTP would deal with this volume of water. The project's total combined treatment capacity is 44 cfs, and that 500 cfs was not from the whole mine site.
Surface Water	Knight Piesold 2018a	2.3.5 Peak Flows	Figure 2.7 - Pg. 16/PDF Pg. 23 Pg. 20/PDF Pg. 25	"Peak flow curves were generated for mainstem river channels and upland tributaries in the mine study area and presented in the 2012 Hydrometeorology Report (KP, 2012)"	NMFS recommends USACE/project proponent include the 2013 high flow event in the peak flow curves. For however many years the NK119A flow dataset exists, the 2013 high flow should have that number of years as its recurrence interval.
Groundwater	Knight Piesold 2018a	2.4 Groundwater Characteristics	Pg. 20 PDF Pg. 25	"Below the upper bedrock zone (upper 50 feet), the hydraulic conductivity generally decreases with depth but includes some elevated-permeability zones that are typically associated with faults. The available data suggest that many of the faults act as flow barriers perpendicular to their strike, while some of the structures demonstrate an enhanced permeability in the direction of strike."	NMFS requests USACE/project proponent list the structures (faults) data suggest have enhanced permeability. For the areas in the deep stratum where it has been determined that there are no faults, NMFS requests USACE/project proponent present the data that led to this conclusion.
Groundwater	Knight Piesold 2018a	2.4 Groundwater Characteristics	Pg. 20-21 PDF Pg. 25-26	"High rates of water return during air-rotary drilling indicate that the hydraulic conductivity is usually relatively high in the upper bedrock due to weathering and frost disturbance. The weathered and disturbed zone is typically up to about 50-ft thick."	NMFS requests USACE/project proponent explain if the fractured bedrock groundwater model layer is one thickness for the entire area. If not, NMFS requests USACE/project proponent explain how they determined the thickness in different areas.
Groundwater	Knight Piesold 2018a	2.4 Groundwater Characteristics	Pg. 22 PDF Pg. 27	"The groundwater quality within the mine study area was assessed based on the collection of samples from 80 groundwater monitoring wells with depths up to about 200-ft and samples collected at drillhole DH-8417 at depths from 640 to 4,050-ft."	NMFS recommends USACE/project proponent collect water quality samples from more than a single hole (DH-8417) deeper than 200 feet. NMFS recommends having at least a similar amount of sample locations for deep water quality as for shallow water quality (80 sample locations).
Peak Storm Events	Knight Piesold 2018a	3.4 Water Management Facilities	Table 3.1 Pg. 28 PDF Pg. 33	Table 3.1 Design Criteria for the Water Management Structures: This does give capacities for most WMP and TSF.	NMFS recommends USACE/project proponent for providing sizes for the various water treatment facilities. NMFS recommends USACE/project proponent demonstrate how the facilities would deal with an atmospheric river of storms with the first dumping 7 inches in 24 hours, 4 days later another storm dumping 4 inches, and 4 days later a third dumping 4 inches. This total of 15 inches in 9 days is not a far-fetched scenario even under current climate conditions.
Peak Storm Events	Knight Piesold 2018a	3.4.3 Main Water Management Pond	Pg. 29 PDF Pg. 34	"The Main WMP will be a lined facility, with underdrains installed below the liner to direct groundwater drainage under the facility and towards the sediment control pond."	NMFS recommends USACE/project proponent explain how full this pond will be on a regular basis and how high it would get under the 15 inches scenario in 9 days presented above.
Water Quality	Knight Piesold 2018a	3.4.5 Bulk TSF Main Embankment Seepage Collector Pond	Pg. 30 PDF Pg. 35	"An emergency spillway will be set at an elevation above the IDF freeboard and will direct discharges towards the NFK."	When the Inflow Design Flood (IDF) comes, a lot of fish will die in the NFK. While this will be a rare event, NMFS requests USACE/project proponent describe the NFK water quality during the event, and the percentage of fish that are expected to die. How will the water quality of the surface and groundwater be 2 weeks later? NMFS recommends USACE/project proponent show the modeling for whether the untreated mine water remains in the mainstem or washes out to Bristol Bay. In the days after the spill event, what would the water quality be in the mainstem Koktuli?
Water Quality	Knight Piesold 2018a	3.4.6 Pyritic Tailings and PAG Waste Rock Storage Facility	Pg. 31 PDF Pg. 36	"Underdrains will be included below the facility to direct groundwater and seepage to a collection pond downstream of the main Pyritic TSF embankment."	NMFS requests USACE/project proponent provide more detail on how these underdrains are designed and what percentage of the leakage they will catch.
Watershed Module Climate	Knight Piesold 2018a	4.3 Mine Plan Module Water Balance Results - 4.3.1 Annual Average Balance	Pg. 34 PDF Pg. 39	"Realization #10 was selected to represent relatively wet conditions because it contains a period that results in high environmental discharge releases. The average annual precipitation for realization #10 is 57 in., but the annual precipitation for the final year of operations is 93 in."	Based on the data presented in Knight Piesold 2018a fig 2.2, Realization 10 may be closer to average. If the final year is 93 inches and the average is only 57 inches for 3 years, the first two years must be drought years. NMFS recommends USACE/project proponent contract independent climate modelers (NMFS recommends UAF) to come up with the 24 h, 72 1 week, 1 month, 1 year, and 3 years one-in-hundred recurrence interval wettest events for the decades the mine is likely to operate. Once this is done NMFS recommends USACE/project proponent revisit the plan and assess its effectiveness in light of the climate model.
Groundwater	Knight Piesold 2018a	4.3 Mine Plan Module Water Balance Results - 4.3.1 Annual Average Balance	Table 4.1 Pg. 35 PDF Pg. 40	Table 4.1 Average Annual Site Wide Surplus Flow for Individual Realizations Representing Relatively Dry, Average, and Relatively Wet Conditions - "The surplus flow is an indication of the amount of water that is collected and managed within the project mine site. The surplus flow is not directly related to the amount of water treated and released downstream of the project site at any one time since the site surplus does not take into account the change in water stored within the water management ponds."	This table is counterintuitive. NMFS requests USACE/project proponent explain why more water will not move through the overburden and to the pit in wet years.
Water Quality	Knight Piesold 2018a	5.3 Water Quality Model Inputs and Assumptions	Pg. 42 PDF Pg. 47	Complete mixing under steady state conditions (i.e., no reactions or degradation occurs) for all facilities and flow streams except for the concentrations in the tailings slurry leaving the process plant and the concentrations in the Bulk TSF and Pyritic TSF, as directed by SRK and described below:	NMFS does not agree with "Complete mixing under steady state conditions (i.e., no reactions or degradation occurs)." NMFS recommends USACE/project proponent evaluate what is occurring in similar pyritic ponds around the world and assume that will happen here. This is a large task, but this oversimplified "no reactions or degradation" will not allow anyone to model water quality, or understand effects on stream water quality or fish habitat.
Water Quality	Knight Piesold 2018a	5.4 Water Quality Model Results and Discussion	Pg. 43 PDF Pg. 48	"The water treatment plants are being designed by others based on the flow rate results of the water balance model and the water quality predictions from the WQ model."	NMFS recommends USACE/project proponents present details on the water treatment plants which need to treat up to 15-44 cfs continuously.
Groundwater	Knight Piesold 2018a	6.0 Summary	Pg. 44 PDF Pg. 49	"Groundwater plays a prominent role in the flow patterns of all the creeks and rivers in the Project area."	NMFS requests USACE/project proponent explain how piping reclaimed water back to surface streams fixes groundwater fluxes. Most of the treated water should be used to recharge groundwater just outside the zone of influence with groundwater recharge wells.

Inflow Design Flood	Knight Piesold 2018a	6.0 Summary	Pg. 44 PDF Pg. 49	"All water management facilities will have provisions in place to handle IDF flows either through storage or spillways."	Handling IDF flows through spillway designs means the plan is to spill untreated AMD, which is not acceptable. That AMD water may recharge the huge gravel aquifers and then slowly move back into the stream over months. NMFS recommends USACE/project proponent oversize facilities so that an overflow channel will not be needed in the next 1000 years (far past the time period that this project is expected to have any effect on the environment in this area).
Water Quality	Knight Piesold 2018a	Appendix A Water Balance Flow Schematic and Average Annual Flow Balance	Table A.1 Pg. A-1 - A-2 PDF Pg. 54-55	Table A.1 Average Annual Flow Balance	The not yet designed dewatering wells are not in this chart. While perhaps the dewatering well water does not need to be treated, it surely affects groundwater to the pit. Groundwater withdrawn above the pebble deposit may need to be treated. NMFS request USACE/project proponent include all dewatering wells in all analysis of flow balance.
Water Quality	Knight Piesold 2018a	Appendix A Water Balance Flow Schematic and Average Annual Flow Balance	Fig. A.1 Pg. A-3 PDF Pg. 56	Fig. A.1 Water Balance Flow Schematic - Operations	This diagram does not present the concentration that will develop in these facilities or demonstrate that the volume of water can be treated to the listed standards. NMFS recommends USACE/project proponent design a way to detail water qualities in different facilities at different times during the mine life and in different weather scenarios.
Water Quality	Knight Piesold 2018a	Appendix B Water Quality Model Inputs and Results	Table B1.1 Pg. B1-1 PDF Pg. 59	Appendix B1 Water Quality Source Terms and Assumptions Table B1.1 Water Quality Source Terms and Assumptions - 95th Percentile Geochemical Source Terms	Considering the open pit has 5 - 10 identified bodies of ore, NMFS recommends USACE/project proponent explain how they estimated a single source water chemistry. NMFS conjectures that the water chemistry would change as the pit deepens/expands and different ore bodies are encountered. This same concept applies to a single water chemistry being applied to all waste rock. NMFS also requests USACE/project proponent explain if the source water chemistry from tributaries NK119A and SK100F was after most exploratory wells were drilled or before. Does this reported background water chemistry match nearby streams with no drill holes in the watershed?
Water Quality	Knight Piesold 2018a	Appendix B Water Quality Model Inputs and Results	Table B1.2 Pg. B1-2 PDF Pg. 60	Appendix B1 Water Quality Source Terms and Assumptions Table B1.2 Water Quality Source Terms and Assumptions - Source Term Assumptions	NMFS recommends USACE/project proponent select which 10 - 15 water source terms matter most, and provide error bars on accuracy of each identified source term.
Knight Piesold 2018g - Hydrometeorology Report					
Climate Change	Knight Piesold 2018g	3.3.2 Extreme 24-Hour Rainfall	Pg. 42 Fig. 3.7 Table 3.12	3.3.2 Extreme 24-hour Rainfall Estimates; 1977-2017 (in) 10 year 4.38; 25 year - 5.34; 50 year 6.14. 100-year- 7.0	The 24-hour max precipitation value for a 100-year return period is likely to become the 25-year return period before the pit is filled (40 years). That means on a 10-square mile mine footprint the project could need to deal with 7 inches of rain spread over 6,400 acres in 24 hours. This is 3,733 acre feet of water storage that needs to be constantly available. The 44 cfs capacity of treatment is only 88 acre feet a day. NMFS requests USACE/project proponent explain where this 3,733 acre feet of storage is during operations. Once an atmospheric river sets up, it often brings several large storms in a row. Please explain what happens if that large of a storm is followed by one half as big four days later.
Knight Piesold 2018i - Response to RFI 019 Part 2 Estimated Mine-affected Streamflow Values at End of Mine Questions					
Watershed Module Weather data	Knight Piesold 2018i	2.0 Watershed Module Description and Results	Pg. 2 PDF Pg. 2	"The Watershed Module was developed in Microsoft Excel and run on a monthly time-step"	This module is just recasting the monthly numbers from the last 912 months, but that 912 month dataset is synthetic. Most of it was crosswalked from Lake Ilamna airport meteorological station at 187 feet elevation and then projected to the pit level of 1050 feet or the bulk tailing elevation of 1,730 feet. Recasting past data also ignores that the climate has changed. NMFS recommends USACE/project proponent use a more reliable, consistent meteorological model that considers the effects of climate change in their Watershed Module.
Watershed Module Weather data	Knight Piesold 2018i	2.0 Watershed Module Description and Results	Pg. 2 PDF Pg. 2	"The modeling approach uses Microsoft Excel, which precludes the ability to demonstrate spatially the extent of this capture zone."	A project of this size should use a model more sophisticated than an Excel spreadsheet. In order to evaluate effects to EFH, NMFS also needs to know 24-hour, 48-hour, and 72-hour maximum precipitation amounts, which a monthly model does not predict. The mine footprint extends from 950 feet in elevation to about 2,500 feet. NMFS requests USACE/project proponent explain how different amounts of rain were forecasted for different elevation bands. How does the model deal with the fact that the topography will change and the tailing facility will gain several hundred feet of height as the pit is excavated?
Groundwater Surface Water	Knight Piesold 2018i	Estimated Streamflow at Pre-Mine and End of Mine Without Treated Water Discharge	Table 2 PDF Pg. 6	This table shows that only two streams SK100c and NK119A are expected to lose groundwater contributions at End of Mine without treated water discharge.	NMFS request USACE/project proponent explain why they expect SK100C and NK119A to be the only streams to lose groundwater contributions. NMFS recommends USACE/project proponent give a detailed explanation of how they concluded that other streams will not lose groundwater contributions, considering especially the 6 streams to the SE of the pit that flow into the Upper Talarik.
Groundwater Surface Water	Knight Piesold 2018i	Estimated Streamflow at Pre-Mine and End of Mine With Treated Water Discharge	Table 3 PDF Pg. 7	This table shows that six SFK tributaries and 3 NFK tributaries all lose surface water but only one stream (NK119A) loses groundwater at End of Mine with treated water discharge.	Since the project returns some surface water after treatment to streams, but never makes any attempt to restore groundwater, NMFS recommends USACE/project proponent explain why they only expect one stream to lose its groundwater component this water treatment scenario.
Surface Water	Knight Piesold 2018i	General Arrangement Maximum Footprint	Figure 1 PDF Pg. 9	General Arrangement Maximum Footprint	This figure shows flow reduction area to be a very narrow donut around the pit. This seems to conflict with other description. This also implies zero flow reduction in UTC, which is not correct because the zone of influence extends into the UTC. NMFS recommends USACE/project proponent explain how they concluded that there will be no flow reduction in UTC.
Knight Piesold 2018n - Response to RFI 19c Questions					
Closure/Groundwater	Knight Piesold 2018n	Response to RFI questions 2.19	Pg. 8 PDF Pg. 8	Question 19 Response: "The Not to Exceed elevation of 900 ft for the pit lake was specifically designed to prevent groundwater seepage from the pit, i.e. to prevent "flow reversal". Stated another way, the Not to Exceed elevation of 900 ft is intended to maintain the groundwater flow direction toward the pit and to prevent groundwater outflow from the pit."	In Schlumberger 2011, 0.0014 m/s HC value was attributed to one of the ore bodies in the pit. Schlumberger said it was an anomalous condition. Schlumberger does not claim it was erroneous data, just an odd area of bedrock (or more correctly a fault). Response #19 assumes all the flow in and out of the pit is (and will always be) through the overburden. Since a hydraulic conductivity in the bedrock below the pebble deposit was 0.0014 m/s in one location, the response is not logical. NMFS recommends USACE/project proponent explain where the water in that ore body originated.
Groundwater	Knight Piesold 2018n	Response to RFI questions 2.21	Pg. 8 PDF Pg. 8	Question 21 Response: "A monitoring plan will be developed as part of future design work, and will target zones of expected higher permeability between the active mine facilities and the receiving environment that are identified from site investigations and during operations. These areas may include fractured bedrock zones, deeper weathering profiles along streams, and thicker permeable overburden deposits."	NMFS cannot complete our full evaluation of the project's effects on EFH if the plan to monitor water movement has not been developed. Fish need water. NMFS recommends USACE/project proponent fully develop a water monitoring plan.
Pond liner	Knight Piesold 2018n	Response to RFI questions 2.23	Pg. 9 PDF Pg. 9	Question 23 - The Main Water Management Pond will be designed to minimize leakage to the extent possible. A monitoring plan will be developed as part of future design work, and will target zones of expected higher permeability between the TSF and receiving environment that are identified from site investigations.	NMFS recommends USACE/project proponent state the amount of leakage they expect. NMFS recommends basing these estimations on other similarly sized, lined water management ponds in the US and Canada.
Groundwater Model	Knight Piesold 2018n	Hydraulic Conductivity and Storage Zone	Fig. 6 and 7 PDF Pg. 16-17	Hydraulic Conductivity and Storage Zones	Especially in the lower layers, NMFS recommends USACE/project proponent describe the boundary conditions and how they chose not to have the model cover a larger area. For each zone k, ss, and sy are listed. NMFS requests USACE/project proponent detail the well data that went into each number and indicate which layers did not have hydraulic conductivity measurements taken.
Groundwater Model	Knight Piesold 2018n	Steady State Recharge	Fig. 9 PDF Pg. 19	Steady State Recharge	NMFS recommends USACE/project proponent describe how this set of steady state recharge values was derived.
Groundwater Model	Knight Piesold 2018n	Box and Whisker Plots Hydraulic Conductivity	Fig. 10 PDF Pg. 20	Box and Whisker Plots Hydraulic Conductivity	In most of the documents, there is one hydraulic conductivity value derived from a slug or response test. Now it is divided into the kx and ky components that are needed for a model. NMFS requests USACE/project proponent describe how these components were determined.
Groundwater	Knight Piesold 2018n	Shallow Groundwater	Fig. 13 PDF Pg. 35	RFI 19C Question 20 Shallow Ground water	This indicates shallow groundwater has different watershed boundaries than surface water. Should the eastern pit wall not be impermeable, water from the pit will move towards the Upper Talarik. NMFS requests USACE/project proponent describe how the shallow groundwater boundaries were determined.
Knight Piesold 2018p - Response to EIS-FMEA Failure Scenario for Pyritic TSF Questions					
Tailings	Knight Piesold 2018p	2.1 Pyritic TSF Description	Pg. 3	"The Pyritic TSF will sub-aqueously manage approximately 155 million tons of pyritic tailings and 160 million tons of PAG waste rock"	The size of the Pyritic TSF varies between the USACE permit application, the DEIS, and the Draft EFH Assessment. NMFS requests USACE/project proponent to clarify the actual planned size of this extremely important facility in the final EFH Assessment.

Tailings	Knight Piesold 2018p	2.2 EIS-FEMA Failure Scenario for Pyritic TSF	Pg. 4	Overtopping failure results in partial down-cutting to El. 1,704 ft (breach depth of 6 ft.) DRAFT Document. The bottom of the breach for this analysis was determined during the EIS-FMEA workshop and prescribed as 6 ft. therefore, the bottom elevation of the breach was not based on the recommendations from ADS2. (pg 12)	When a 300 ft+ tailings embankment with several hundred acres of standing water behind it breaches, it rarely cuts down 6 feet and stops. There have been dozens of breaches to similar sized tailing facilities in the last few decades (Icold 2001). NMFS recommends the project proponent review these breaches and plan for a breach as deep as the ones in the worst 25%.
Knight Piesold 2018r - Response to Operations Water Balance and Water Quality Model Sensitivity Analysis Questions					
Climate Change	Knight Piesold 2018r	1.0 Introduction	Pg. 1	A sensitivity analysis on the climate inputs (i.e. temperature and precipitation values) was not completed because it is unnecessary since the base model was developed as a climate variability model that utilizes the entire 76-year synthetic time-series of monthly temperature and precipitation values developed for the Pebble Project site (the Project).	This logic that the past 76 years represents the future is not consistent with the DEIS (4.17-3) and will not allow USACE/project proponent to accurately conduct an EFH assessment. The climate will change while this project is operating. Climate variability is important and can be represented by the 76 year data record, however, climate variability is not the same thing as climate change. NMFS recommends the project applicant work with respected climate scientists (NMFS recommends UAF) to better understand an appropriate way to model future climate - especially rainfall.
Lorax Environmental 2018 - Pebble Project Pit Lake Water Quality Predictions					
Water Quality	Lorax Environmental 2018	4. Model Results	Pg.7 Table 3	Table 3: Summary of predicted surface water quality for the Pebble Pit Lake. Data represent mean annual values in uppermost 10 m of the water column (approximate depth of surface mixed layer). Pit lake reaches maximum elevation in Closure Year 21. Seventeen constituents will go into the Water Treatment plant above water quality standards.	NMFS understands that water treatment will remove some metals and high levels of 17 elements is not unusual for a mine but the predicted levels over State of Alaska water quality standards for this mine 20 years after mine closure are as follows: Cadmium:100 times over Lead:10 times over Molybdenum: 60 times over Zinc:10 times over If even a small amount of mine contact water avoids the treatment plant, once mixed, the lower watershed will not meet standards for these 4 constituents. Also this is 232 million cubic meters of water that needs treatment. If one percent avoids treatment, that is 2.3 million cubic meters of water with very high concentrations of metals. Most porphyry mines exceed water quality standards on a regular basis. The groundwater below porphyry mines is usually high in metals once mining begins. NMFS request USACE/project proponent suggest why this mine would be any different.
Piteau Associates 2018 - Groundwater Conditions at End of Mining and Post-Closure					
Dewatering	Piteau 2018	2. Background and Assumptions - Groundwater Model Background	Pg. 3 PDF Pg. 7	"The design of the tailings management and water management facilities is in the process of being finalized"	NMFS cannot complete our full evaluation of the project's effects on EFH if the dewatering plan is not finalized. NMFS requests USACE/project proponent provide a complete pit dewatering plan.
Dewatering	Piteau 2018	3. Scenarios	Pg. 5 PDF Pg. 9	"The zone of influence is often larger than the capture zone because the groundwater elevations can be affected outside the groundwater divide that defines the capture zone"	Especially in the UTC and SFK drainages, NMFS recommends USACE/project proponent explain how much further the "zone of influence" extends past the "capture zone". NMFS recommends USACE/project proponent define the farthest reach of the zone of influence.
Surface Water	Piteau 2018	Figures	Fig. 4 PDF Pg. 22	Comparison of the 50th Percentile and Double Recharge Scenario End of Mining Capture Zones	Five tributaries (each approximately 1 mile long) flow into the UTC from the northeast side of the pit. This model shows two affected and three not affected. NMFS recommends USACE/project proponent explain the detailed level of effect on each of the five streams since part of each of their watershed is in both the "capture zone" and the "zone of influence".
EFH	Piteau 2018	Figures	Fig. 5 PDF Pg. 23	Zones of Influence for Open Pit, Pyritic TSF, and MWM Pond at End of Mining and Post-Closure (Base Case)	This shows all six tributaries affected and four likely to lose most of their winter water. NMFS recommends USACE/project proponent explain how salmon eggs will not freeze if the winter upwelling stops.
Mitigation	Piteau 2018	Figures	Fig. 5 PDF Pg. 23	Zones of Influence for Open Pit, Pyritic TSF, and MWM Pond at End of Mining and Post-Closure (Base Case)	These models and their various scenarios rely on estimated model parameters. NMFS recommends USACE/project proponent explain what steps they will take to reverse the damage if the models prove to be inaccurate when the pit is dug. For example, if one of the three drainages (SFK, NFK or UTC) ends up with a shallow aquifer containing 100,000 acre feet of water with metal concentrations above APDES standards, how will they remove/clean up that water?
Schlumberger 2015a: SUPPLEMENTAL ENVIRONMENTAL BASELINE DATA REPORT 2004 - 2012					
Groundwater Model	Schlumberger 2015a	8.1.6.2 Field Program	Pg. 8-7 PDF Pg. 15	Two holes were drilled in 2011 (DDH-11531 to 2458 ft and DDH-11535 to 2277 ft) and two holes were drilled in 2012 (DDH-12548 to 1106 ft and DDH-12551 to 3006 ft). Based on air lift testing, sufficient yield was not found to justify a long term pump test in any of the four holes.	NMFS recommends USACE/project proponent explain how effective air lift testing is at 2,000 feet of depth, and if other methods were attempted.
Faults	Schlumberger 2015a Chapter 8 - Groundwater Hydrology	8.1.7.3 Summary of Site Subsurface Investigations	Pg. 8-11 PDF Pg. 19	"Faulting was common across the site, which is typical of this type of geologic environment. Although faulting is expected to result in more permeable zones in the vicinity of the fault, the offsets caused by faulting and the fine-grained fault gouge likely contribute to compartmentalization of the bedrock groundwater system."	Since faulting is common across the site, NMFS requests USACE/project proponent detail the method they intend to use to evaluate each of those faults. NMFS requests a clear map showing all faults within 5 miles of the current mine footprint. NMFS recommends USACE/project proponent consider tracer dye test or other means of identifying where water inserts into a dozen fault resurfaces.
Faults	Schlumberger 2015a Chapter 8 - Groundwater Hydrology	8.1.7.4 Response Tests	Pg. 8-12 PDF Pg. 20	"Some of the highest hydraulic conductivity values determined may be within the range of the effective value for the screen and filter pack. In these cases, the actual hydraulic conductivity of the formation might be higher than the calculated value."	NMFS requests USACE/project proponent explain what hydraulic conductivities they fed into the groundwater model considering that "actual hydraulic conductivity of the formation might be higher" for the majority of the tests.
Groundwater	Schlumberger 2015a Chapter 8 - Groundwater Hydrology	8.1.7.4 Response Tests	Pg. 8-12 PDF Pg. 20	"The hydraulic conductivities calculated from the response tests across the whole study area ranged from about 1x10-8 meters per second (m/s) to about 1x10-2 m/s (Figures 8.1-9a, 8.1-9b, and 8.1-9c).	1x10-2 m/s hydraulic conductivity is essentially an underground river. NMFS recommends USACE/project proponent describe the steps they will take to keep all mine contact water out of this stratum. Once contamination enters this stratum, containment will be near impossible.
Groundwater	Schlumberger 2015a Chapter 8 - Groundwater Hydrology	8.1.7.4 Response Tests - Pebble Deposit Area	Pg. 8-13 PDF Pg. 21	Response tests in bedrock in the Pebble Deposit area were performed near the top of rock (shallow bedrock). Hydraulic conductivities ranged from 4x10-7 to 1x10-3 m/s (Table 8.1-1).	USACE/project proponent often provides the geometric mean of a lot of tested HC values. Wouldn't mine contact water follow the path of least resistance? The dozen or so ground strata and faults with high conductivity will move 99% of the groundwater both toward and away from the mine site. NMFS requests USACE/project proponent explain the value of reporting the geometric mean hydraulic conductivity.
Groundwater	Schlumberger 2015a Chapter 8 - Groundwater Hydrology	8.1.7.4 Response Tests - South Fork Koktuli "Flats" Area	Pg. 8-13 PDF Pg. 21	The hydraulic conductivities in shallow bedrock ranged from 1x10-8 to 3x10-3 m/s (Table 8.1-3)	SFK "flats" are a crucial area where water moves between the two drainages. Should SFK aquifer begin to become acidic, NMFS recommends USACE/project proponent describe their plan for keeping the UTC water and Lake Iliamna from also becoming contaminated.
Groundwater	Schlumberger 2015a Chapter 8 - Groundwater Hydrology	8.1.7.4 Response Tests - Upper Talank Area	Pg. 8-14 PDF Pg. 22	"The hydraulic conductivities in overburden ranged from 2x10-6 to 4 x 10-5 m/s (Table 8.1-5)." "The hydraulic conductivities in shallow bedrock ranged from 2x10-7 to 2 x 10-5 m/s (Table 8.1-5)."	Only 12 shallow tests in the UTC watershed have been reported. NMFS's and the Alaskan public's biggest concern is mine contact water moving toward Lake Iliamna. NMFS recommends USACE/project proponent do more HC tests in UTC drainage, including some pumping tests, and target the locations most likely to contain faults or fractures. Since the ore body is under here, weren't response or pump tests done in any of those deep exploratory holes?
Groundwater Model	Schlumberger 2015a Chapter 8 - Groundwater Hydrology	8.1.7.5 Pumping Tests	Pg. 8-14 PDF Pg. 22	"Pumping tests comprise pumping from one well and measuring response to pumping in adjacent wells. A pumping test provides more reliable and representative aquifer parameters than a response test because the pumping rates are relatively high, which increases the radius of influence of the test and minimizes the effects of formation damage that result from drilling and well construction on measured hydraulic conductivity. Pumping tests were completed at nine locations: PW-1, PW-3, PW-4, PW-5, PW-6, PW-7, PW-8, PW-08-9, and PW-08-10 (PW-2 was not drilled)."	NMFS requests USACE/project proponent explain why they rely heavily on response tests when the reports they commissioned suggest these tests are not very precise.
Groundwater Model	Schlumberger 2015a Chapter 8 - Groundwater Hydrology	Pumping Tests 8.1.7.5	Pg. 8.14 - 8.15 PDF Pg. 22-23	"The hydraulic conductivities calculated for overburden pumping tests were almost an order of magnitude higher than the highest values calculated from the response tests, indicating that the response tests in these overburden materials tend to underestimate the hydraulic conductivities of the overburden."	USACE/project proponent relies more heavily on response tests than pumping tests to calibrate the 10-layer groundwater model. NMFS requests an explanation of why it is scientifically defensible to use the lower HC measured during response tests to parameterize the groundwater model. If both types of HC data were used, explain why the modelers chose one or the other.
Groundwater	Schlumberger 2015a Chapter 8 - Groundwater Hydrology	8.1.7.6 Bedrock Testing by Knight Piesold	Pg. 8-15 PDF Pg. 23	Within the Pebble Deposit area, the hydraulic conductivities were measured to depths of up to 4,500 feet but were mostly in the upper 1,000 feet.	NMFS requests USACE/project proponent provide an exact inventory of all hydraulic conductivity tests done below 1,000 feet of depth, the method used, and an estimate of the precision.

Water Quality	Schlumberger 2015a Chapter 8 - Groundwater Hydrology	8.1.7.11 Groundwater Sampling	Pg. 8-22 PDF Pg. 30	"In general, groundwater that has low total dissolved solids (TDS) and high dissolved oxygen (DO) is recharging and moving through the system relatively quickly." *Groundwater within the study area was characterized by very low TDS (median concentrations typically less than 100 milligrams per liter (mg/L)) and high DO (most wells greater than 8.5 mg/L)".	Water with high dissolved oxygen and low TDS almost always fell recently as rain or snow. Depending on the environment, this could mean days or perhaps up to a couple months prior. The fact that this water is being found in the overburden and down deep means there are efficient flow paths to get it there quickly. If rainwater penetrates to 1,000 feet fairly quickly, mine drainage high in metals will do the same. NMFS requests USACE/project proponent describe how this water is going deep fast and how they will manage groundwater knowing that a network of conductivity must exist.
Water Quality	Schlumberger 2015a Chapter 8 - Groundwater Hydrology	8.1.7.11 Groundwater sampling	Pg. 8-23 PDF Pg. 31	"The median concentrations of DO in overburden ranged from 10 to 13 mg/L in the NFK watershed, from 0.5 to 13 mg/L in the SFK watershed, and from 0.2 to 13 in the UT watershed. The consistently high median DO concentrations in the NFK watershed indicated that oxidation processes were limited which suggests partly that recharge rates and groundwater velocities are relatively high"	As presented (Detterman and Reed 1973, Stilwell and Kaufman 1996, Hamilton and Klieforth 2010), this landscape is the result of extensive glacial recession and watershed-wide fluvial processes. The deposits are poorly sorted unconsolidated gravels, pebbles, rocks, and cobble materials. Material overburden of this nature has a high flow and recharge capacity for temporary storage and conveyance (flow through) of groundwater. The depth and porosity (hydrologic conductivity) of these deposits indicate expansive groundwater regimes making accurate water management a priority for this project. This complex layering in the overburden is responsible for the excellent salmon habitat. The complexity of the overburden and abundant volumes of well-oxygenated groundwater suggests water management in excavations at this scale will be challenging through every phase of construction, operation and closure. Furthermore, given the probability of the extended mine plan and deeper excavation (Permit Application Section D, Page 28 (78 year Mine Pit Dimensions)), the project may have to operate a series of deep barrier wells (previously mentioned) to dewater and access the larger excavation. Barrier wells across watersheds will create a series of "depression cones", which will alter hydrologic head gradients further downstream than currently presented or analyzed in this D-EIS or represented in any of the supporting documents or the water rights reservations (Dated July 7, 2006). NMFS requests USACE/project proponent explain how they will restore not just the visual surface vegetation, but all these layers.
Water Quality	Schlumberger 2015a Chapter 8 - Groundwater Hydrology	8.1.7.11 Groundwater sampling	Pg. 8-23 PDF Pg. 31	"In summary, the low concentrations of tritium and Total Dissolved Solids, and high concentrations of Dissolved Oxygen are consistent with relatively high recharge rates and groundwater velocities" (Page 8-23).	NMFS recommends USACE/project proponents have an independent third party of specialists and subject matter experts review and compare the analysis in the water quality data - quickly moving, young groundwater - and the analysis in the DEIS that suggests the little water below the overburden moves slowly and has little to no contact with shallow groundwater.
Groundwater	Schlumberger 2015a Chapter 8 - Groundwater Hydrology	8.1.7.13 Hydrogeologic Characterization of SFK Drainage	Pg. 8-24 PDF Pg. 32	"A deep aquifer identified within a bedrock low on the east side of the deposit (Figure 8.1-3a). Holes collared below about 970 feet on the Upper Talarik side of the divide flowed, some at rates in excess of 300 gpm. A pump test was performed in these materials (PW-08-09). The boundaries of this aquifer have been refined based on investigations since 2008 by SLR, KP and SRK"	The drillholes in the Upper Talarik are within 1/2 mile of the pit wall in the 20-year plan, and perhaps actually in the pit under the 78-year plan. Either way, below 970 feet there is an aquifer that flowed at 300 gpm. When the pit first penetrates this aquifer it might drain it, or it could flow for years; it is very difficult to determine. Once the pit is refilled with mine tailing water, that water will flow into this aquifer. It may surface in SKF or UTC or Lake Ilamma or never surface. NMFS requests USACE/project proponent present precise information about where the water in this aquifer originates and where it goes and how much water that aquifer holds.
Groundwater	Schlumberger 2015a Chapter 8 - Groundwater Hydrology	8.1.7.13 Hydrogeologic Characterization of SFK Drainage	Pg. 8-25 PDF Pg. 33 Pg. 8-24 PDF Pg. 32	"Fault zones provide both conduits and barriers to groundwater flow." "Conduits are provided through fractured ground adjacent to a fault, and barriers are due to fault gouge with the fault itself." (Schlumberger 2015a, 8-25) "These faults probably act as flow conduits parallel to the fault structures and flow barriers perpendicular to the structures so that a compartmentalized groundwater system is developed." (Schlumberger 2011a, 8-39, typed)	Both expansive groundwater reports commissioned by PLP clearly state that faults are a key to moving groundwater around below about approximately 300 feet. NMFS recommends that the EFH Assessment and DEIS clearly acknowledge this and analyze all faults.
Faults	Schlumberger 2015a Chapter 8 - Groundwater Hydrology	8.1.8.1 Overview of Groundwater Baseline Program - Geology	Pg. 8-39 PDF Pg. 47	"Below the upper bedrock zone (upper 50 feet), the hydraulic conductivity generally decreases with depth but includes some elevated-permeability zones that are typically associated with faults. The available data suggest that many of the faults act as flow barriers perpendicular to their strike, while some of the structures demonstrate an enhanced permeability in the direction of strike."	NMFS recommends USACE/project proponent be more specific about the "enhanced permeability in the direction of the strike." State those permeabilities in numbers and include them in the groundwater model.
Groundwater Model	Schlumberger 2015a Chapter 8 - Groundwater Hydrology	8.1.8.1 Overview of Groundwater Baseline Program - Geology	Pg. 8-39 PDF Pg. 47	"High rates of water return during air-rotary drilling indicate that the hydraulic conductivity is usually relatively high in the upper bedrock due to weathering. The zone of weathering is typically up to about 50 feet thick."	NMFS requests USACE/project proponent provide more detailed hydraulic conductivities in the weathered bedrock zone. Also describe how/if the dewatering wells will completely penetrate this weathered bedrock zone.
Groundwater	Schlumberger 2015a Chapter 8 - Groundwater Hydrology	8.1.8.1 Overview of Groundwater Baseline Program - Regional Hydrogeologic Setting	Pg. 8-40 PDF Pg. 48	"most groundwater flow occurs at shallow levels within the overburden and shallow bedrock"	NMFS agrees that the majority of groundwater is in either the overburden or shallow fractured bedrock. This mountainous area receives 50-60 inches of rain a year and if even the minority, say 5 to 10 percent, is in deeper aquifers, that is a substantial amount of water. There have been few hydraulic conductivity tests below 970 feet, but one in the Upper Talarik Creek drainage yielded 300 g.p.m. NMFS recommends USACE/project proponent continue collecting data about the aquifers between 1,000 and 4,000 feet deep until they have sufficient data to both calibrate and validate the groundwater model.
Groundwater	Schlumberger 2015a Appendix 8.1C Response Testing Results	Falling Head Testing Results / Oscillating Response Testing Results	PDF Pg. 375 - 384	Slug Tests: Gh11-291 K= 5.8 km/year slug test (Pg. 50 / PDF 384) Gh11-301 K = 16.8 km/year (Pg. 52 / PDF Pg. 386) Gh11-340 K= 27 km/y (Pg. 54 / PDF Pg. 388) Gh11-341 K=18 km/year (Pg. 56 / PDF Pg. 390) Gh11-346 K=40.1 km/year (Pg. 60 / PDF Pg. 394) Gh11-257 K= 14.6 km/year (Pg. 46 / PDF Pg. 380) Gh11-251 K=45.8 km year (Pg. 44 / PDF Pg. 378) Gh11-349 K= 7.84 km/year (Pg. 41 / PDF Pg. 375)	These hydraulic conductivities are quite high. Sooner or later some water high in concentration of metals will escape the project footprint. After even a month, the area affected by the untreated water would be large. NMFS requests USACE/project proponent explain how long it will take to detect untreated water escaping from each tailings or water storage facility, and detail their cleanup plan.
Schlumberger 2011a: ENVIRONMENTAL BASELINE DOCUMENT 2004-2008 - Chapter 8 - Groundwater Hydrology					
Groundwater Model	Schlumberger 2011a Appendix 8.1J Groundwater Model Results	Figures	Fig. 4.7, 4.8, 4.9 PDF Pg. 2186 - 2188	These figures represent an oversimplified 4 layer model.	The current 10 or 8 layer groundwater model has the potential to be a large improvement, but that is only once it is calibrated and validated. NMFS recommends USACE/Project proponent indicate the two distinct datasets that will be used for these steps. Also provide a publicly accessible document that describes actions taken once those two steps are finalized.
Groundwater Model	Schlumberger 2011a Appendix 8.1K Multi-level Groundwater Monitoring System	1. Introduction	Pg. 1 PDF pg. 2296	"Westbay multipiezometer (MP) system was installed in drillhole 6349 WB-1 to collect hydrogeologic information to a depth of 4000	NMFS does not understand how three deep wells with multi level installations can characterize the deep layers divided into 8 different units. NMFS recommends USACE/project proponent state which model units never had any kind of physical hydraulic response test and yet still are being assigned a value. NMFS recommends that for each unit in each of the 8 layer groundwater model, USACE/project proponent list the dates, types, and results of the hydraulic conductivity tests.
	Schlumberger 2015a	8.1.6.2 Field Program	Pg. 8-6 PDF Pg. 14	"A multi-level piezometer supplied by Westbay Instruments Inc. was installed in the Pebble Deposit area in 2006 in exploration drillhole 6349 (Appendix 8.1K of Chapter 8 of the 2004-2008 EBD). Two additional multi-level installations have been completed."	
Faults	Schlumberger 2011a Appendix 8.1K Multi-Level Groundwater Monitoring System	2.1 Geologic Setting	Pg. 1 PDF Pg. 2297	"DH 8417 intersects two steeply dipping faults ZE and ZEC. These faults strike approximate west to east and dip towards the south"	This information about ZE and ZEC faults did not appear in the DEIS or the EFH Assessment. NMFS recommends USACE/project proponent include a detailed description of both faults in both the EFH Assessment and DEIS. Information about these faults is crucial to determine how far contaminated water might disperse and how it will affect EFH.

Groundwater Model	Schlumberger 2011a Appendix 8.1K Multi-Level Groundwater Monitoring System	2.2 Installation of Westbay Well WB-1	Pg. 2 PDF Pg. 2297	"NDM-6349 was drilled to 4,054 feet"	NMFS recommends USACE/project proponent present all data about the groundwater under 1,500 feet in one place. If these 5 holes (DH 6349, DH 8417, DH 11531, DDH 11535 and DDH 12551) are the sum total of all deep drillhole information, then USACE/project proponent needs to collect more information to properly characterize groundwater under 1,500 feet.
Groundwater	Schlumberger 2011a Appendix 8.1K	2.3 Piezometric Levels	Pg. 4 PDF Pg. 2299	"From 3,700 feet to 4050 ft bgs (below ground surface) the gradient is upwards"	This means there are connections between these lower aquifers. NMFS recommends USACE/project proponent explain the hydrologic properties and extent of these deep aquifers, including identifying whether they are connected to Mulchatna River or Lake Iliamna.
Groundwater Temperature	Schlumberger 2011a Appendix 8.1K	2.4 Temperature Distribution	Pg. 4 PDF Pg. 2299	"The temperature recorded at 1,500 feet depth was approximately 17 degrees Celsius and at 4000 ft was 35 degrees C."	NMFS recommends USACE/project proponent provide a list of temperatures and, when available, DO levels for water at depths greater than 1,000 feet. Explain what this information says about the age of the water. Was any of this water isotoped dated?
Groundwater	Schlumberger 2011a Appendix 8.1K	3.12 Cross Hole Test #9 - Drilling and Flushing	Pg. 21 PDF pg. 2316	"DH 8417 - Below 3,857 feet the recovered core was mostly faulted and broken. Shortly after drilling started, most of the probes showed a pressure increase as shown in Figures 3.33 and 3.34."	USACE/project proponents keep insisting that there is component bedrock down deep and water will not move. DH #8417 is proof that this is a major oversimplification. If the 78-year plan is constructed, mining actions will move into these uncharacterized depths. NMFS recommends USACE/project proponent present a clearer understanding of the aquifers between 1,500 and 3,500 feet so major sources of previously unknown water aren't just stumbled upon. This could quickly present a situation where the water treatment plants are overwhelmed, or where contaminated pit water started moving through these lower layers towards the Mulchatna or the Nushagak.
Faults	Schlumberger 2011a Appendix 8.1K	4.0 Cross Hole Tests Analysis - Introduction	Pg. 23 PDF Pg. 2318	"The flow regime within the bedrock affected by the cross-hole test activities is assumed to be influenced by a network of fractures and/or faults. The majority of the groundwater flows along the fractures."	NMFS agrees the majority of groundwater flows along the fractures. Why is it so difficult to locate information about these fractures? Why in the 9 years since this was published has very little new information been collected about deep faults? NMFS recommends USACE/project proponent provide a chapter focused on any fractures, faults, or joints that would intersect the current designed pit or the deeper pit design in the 78-year plan. NMFS suggests USACE/project proponent collect all further information needed in order to accomplish this task.
Groundwater	Schlumberger 2011a Appendix 8.1K	4.2.8 Multilevel Groundwater Monitoring System	Pg. 26 PDF Pg. 2321	HGU 6 is a relatively permeable unit below fault ZEC and is interpreted to lie between 2,990 and 3350 in WB-1 and 3,240 and 3,600 ft in DH-8417.	NMFS recommends USACE/project proponent determine the spatial extent, tilt, and hydrologic/hydraulic properties of the HGU #6 layer by drilling more deep holes outside the immediate vicinity. The concept that Lake Iliamna and Kvichak Watershed can be protected without understanding this permeable unit is not correct.
Faults	Schlumberger 2011a Appendix 8.1K	4.2.8 Multilevel Groundwater Monitoring System	Pg. 26 PDF Pg. 2321	"At a drill depth of approximately 3,240 feet while the drilling test zone #7 there was a sudden mud loss, then an artesian response. ... This is approximately the depth that DH 8417 passes through the ZEC fault."	Why does the DEIS say the deep faults are barriers to water movement filled with fault grout when fault ZEC had an artesian response? How many other drill holes intersected this fault and what was there an artesian response? How likely is it that there are additional faults that the drill holes simply did not hit? What density of deep holes need to be drilled to even know what faults/fractures exist in an area this size? NMFS recommends USACE/ project proponent present the study design for how they gather knowledge about faults and how confident they are that important water-moving faults have not been overlooked.

Topic	Document & Chapter	Section # Section Title	Page # Figure #	Author's Original Language or Description of Citation	NMFS Recommendations for USACE/Project Proponent.
Environmental Baseline Studies Report (2002 - 2008) 15.1 Fish - Mine Study Area					
Salmon Distribution Survey Methods Upwelling	Environmental Baseline Document (2004-2008) Chapter 15	15.1.5.2 Fish Assemblage Surveys - Fish Distribution and Relative Abundance Surveys	Pg. 15.1-12	"The 2004 through 2008 surveys document patterns of fish distribution, relative fish abundance, and fish density among habitat types (e.g., pool, riffle, run, etc.) within the NFK, SFK, and UT watersheds, and within the upper KR mainstem. Over the 5 years of study, there were 2,850 sampling units (discrete areas where fish were sampled) that were surveyed using a variety of fish sampling methods."	Early-on project adult fish distributions are documented. However, the number of out-migrating juveniles is highly dependent on the habitat and water available to fish for rearing and spawning. Naturally occurring upwelling areas are important to salmon. Upwelling areas lack delineation within the project's footprint and future scenarios. NMFS recommends USACE/project proponent inventory and delineate upwelling areas throughout the foreseeable project effects area.
Salmon Distribution Survey Methods	Environmental Baseline Document (2004-2008) Chapter 15	15.1.5.2 Fish Assemblage Surveys - Fish Distribution and Relative Abundance Surveys	Pg. 15.1-12	"The 2004 through 2008 surveys document patterns of fish distribution, relative fish abundance, and fish density among habitat types (e.g., pool, riffle, run, etc.) within the NFK, SFK, and UT watersheds, and within the upper KR mainstem. Over the 5 years of study, there were 2,850 sampling units (discrete areas where fish were sampled) that were surveyed using a variety of fish sampling methods."	NMFS recommends more consistent and defensible fish survey methods be used to document fish distributions (Johnson 2007, PLP-Technical Working Groups 2009, Parsons 2010).
Salmon Distribution Survey Methods	Environmental Baseline Document (2004-2008) Chapter 15	15.1.5.2 Fish Assemblage Surveys - Fish Distribution and Relative Abundance Surveys, Adult Salmon Surveys	Pg. 15.1-12 Pg. 15.1-14	"The 2004 through 2008 surveys document patterns of fish distribution, relative fish abundance, and fish density among habitat types (e.g., pool, riffle, run, etc.) within the NFK, SFK, and UT watersheds, and within the upper KR mainstem. Over the 5 years of study, there were 2,850 sampling units (discrete areas where fish were sampled) that were surveyed using a variety of fish sampling methods." "For these reasons, a mean index count analysis, rather than an escapement analysis, was used to evaluate adult salmon abundance over the study period and among watersheds. Index counts refer to the number of adult salmon observed on a given survey date. Annual mean index counts were calculated for each species by determining the mean of the index counts across the number of survey dates on which a species was observed. The subset of survey data included in the mean index count analysis was selected to allow for comparison of species-specific counts across watersheds and years. Thus, index counts from river reaches that were most consistently surveyed over the 5-year study period were used in the analysis. In order to maintain rigor in the analysis, it was also important to maximize the number of surveys included therein. Several surveys each year covered extended stream lengths and data within could not be parsed out by location; therefore, some variation in endpoints was allowed when selecting surveys for index counts. Surveys included by watershed are listed below. • NFK—61 complete surveys that started at the confluence with the Kottuli River and ended near Big Wiggly Lake or at River Mile (RM) 34.78 (River Kilometer [RK] 55.98) • SFK—67 complete surveys that started at the confluence with the Kottuli River and ended at the intermittent reach or at Frying Pan Lake • UT—51 complete surveys that started at the mouth of the UT and ended at the confluence of Tributary 1.350 or at the headwaters"	NOAA Fisheries attended meetings from 2004 to 2007 and provided survey suggestions. Those recommendations remain valid today (2019): 1) What is the total adult salmon escapement in headwater tributaries? 2) What is the full range and distribution of emergent salmon fry, young of the year, age 1, and age 2 year old salmon? 3) What are the specific EFH attributes that support these early life history rearing phases? NMFS recommends the project proponent complete or provide the following information: 1) Conduct lower, sonar or weir counts (Parsons 2010, ADFG, Johnson 2007) to determine accurate (total) adult escapement; 2) Design a repeatable series of surveys and sampling protocols to specifically identify YOY and Age-1 salmon distributions; 3) Identify/delineate known habitat areas that support salmon early life history stages in the mainstem rivers and the tributaries.
Salmon Distribution Survey Methods	Environmental Baseline Document (2004-2008) Chapter 15	15.1.5.3 Instream Flow Habitat Studies - Mainstem Channel Flow Habitat Studies	Pg. 15.1-17	"The hydraulic models were subsequently linked with Habitat Suitability Criteria (HSC) curves that represent the suitability parameters (depth, velocity, and substrate/cover) for use by different life stages of the target fish species. The HSC curves for some species and life stages were based on existing literature-derived curves, while for others, field data were collected and site-specific HSC curves developed (Photo 15.1-7). The site-specific data consisted of depth, velocity, and substrate measurements made directly at observed fish locations as noted during snorkel surveys, as well as measurements made at distinct redds that represented spawning areas."	The data listed in this section is not properly cited. At a minimum, NMFS requests USACE/project proponent present data and information sources that reflects the area, or areas, where the data was collected and analyzed.
Salmon Distribution PHABSIMS	Environmental Baseline Document (2004-2008) Chapter 15	15.1.5.3 Instream Flow Habitat Studies - Mainstem Channel Flow Habitat Studies	Pg. 15.1-19	"This approach resulted in the establishment of 92 transects, corresponding to 21 transects in the NFK, 28 in the SFK, 32 in the UT, five in the upper KR mainstem and six in the Tributary UT1.190"	PHABSIM is an older method that has some strengths and some well-documented drawbacks. It appears the project proponent established transects primarily in the 3 mainstem rivers. The 30 transects per mainstem river that were surveyed are in line with general practice sample sizes. However, Pebble mine is likely to impact a dozen or more tributary streams. It appears the project proponent established no transects in tributaries of SFK and NFK and only six studies in the tributary UT1.190. Many of these tributaries are important to fish and PHABSIM should have been applied equally rigorously to these tributaries. NMFS is not suggesting every tributary needed 25 transects, but perhaps 25 per watershed, or divided by other relevant criteria, but habitat in tributaries definitely needs to be characterized. NMFS recommends the USACE/project proponent thoroughly apply the PHABSIMS to the tributary streams and combine this work with Habitat Suitability Curves developed around a range of EFH attributes including upwelling. Without such an analysis, the project proponent's statement in the EFH assessment that there is little/no habitat in tributaries is unsubstantiated.
Salmon Distribution PHABSIMS	Environmental Baseline Document (2004-2008) Chapter 15	15.1.6 Results and Discussion (NFK, SFK, UTC, KRM)	Pg. 15.1-29 Pg. 15.1-33 Pg. 15.1-41	"Surface water expression of groundwater can provide considerable benefits to spawning and rearing fish." "Chum salmon are known to seek spawning areas influenced by groundwater upwelling" "...a direct association between spawning area and areas identified as gaining recharges due to inflow from groundwater seeps and springs was evident."	This section under represents the important role of groundwater expressed through upwelling hyporheic substrates, seeps and springs. The Environmental Baseline Document, Chapter 15, in over 30 places discusses this important EFH Attribute. NMFS requests the USACE reference Chapter 15 and better represent the role groundwater plays to fresh water phase salmon.
Groundwater Upwelling	Environmental Baseline Document (2004-2008) Chapter 15	15.1.1.1 Regional Description - Geology	Pg. 15.1-5	"Moraine and glacial drift deposits are also relatively porous and may contain numerous surface kettle ponds that drain to groundwater. The high storage capacity of the thick surficial materials, and to a lesser extent the surface ponds, in the study area attenuates high flows during wet periods and helps maintain base flows during dry periods."	Adding surface water back into tributary channels is unlikely to restore upwelling, hyporheic flows, or kettle ponds. Upwelling areas are important to salmon spawning. Kettle ponds provide juvenile (fry) habitat if they are connected to streams, even if occasionally during large rainstorm events. The applicants do not offer much discussion on this. NMFS recommends USACE/project proponents document which kettle ponds and tiny intermittent streams provide juvenile or fry habitat.
Environmental Baseline Studies Report (2002 - 2008) Fish and Aquatic Invertebrates North Fork Kottuli Watershed					
NFK	Environmental Baseline Document (2004-2008) Chapter 15	15.1.6.1 Results and Discussion North Fork Kottuli Watershed	Pg. 15.1-30	"Because no data are available to assess the relative contribution of these NFK fish to the fisheries, district-scale data are provided here as an indication of the importance of these fisheries. Based on a 20-year average (1988 through 2007), the annual commercial harvest for the overall Nushagak District was 52,190 Chinook, 476,508 chum, 28,660 coho, and 4,969,524 sockeye salmon (Jones et al., 2009). Over the same period, the average annual subsistence harvest for the overall Nushagak District was 13,047 Chinook, 4,461 chum, 6,420 coho, and 26,424 sockeye salmon."	NMFS suggests USACE/project proponent supply the data necessary to assess the relative abundance of salmon stocks affected within the project area and also downstream.
NFK Upwelling	Environmental Baseline Document (2004-2008) Chapter 15	15.1.6.1 Results and Discussion North Fork Kottuli Watershed	Pg. 15.1-42	"Within the NFK, NFK-C and NFK-D had the most diverse species assemblages, and NFK-C and Tributary NFK 1.190 supported the highest relative abundance of the fishes documented over the study period. The abundance and diversity of fish in NFK-C did not appear to be driven by habitat availability. As predicted by the instream-flow model, NFK-B should provide much more available habitat for all juvenile salmonids except rainbow trout, and the highest estimates of available spawning habitat for four out of seven salmonids was in NFK-A. The habitat quality in NFK-C may be a factor influencing the richness of fish species. NFK-C gained inflow from Tributary 1.190, as well numerous seeps and springs located along the mainstem channel margin (Chapter 9, Section 9.1.1). Tributary 1.190 was also largely influenced by seeps and springs and contributed cooler water to NFK-C, providing an enhanced thermal regime to habitats downstream compared to the other reaches of NFK-C, NFK-E, and NFK-F."	NMFS notes the applicant's acknowledgement that habitat in the NFK-C and Tributary 1.190 are areas of high habitat quality, including upwelling areas (springs). The re-occurring run strengths in all reaches indicate temperatures are adequate to support reproduction and egg incubation. NMFS recommends the project proponent revisit the Habitat Suitability Curves (HSC), because if NFK-C and NFK 1.190 have the most salmon abundance it suggests there is something unique about the habitat. The current HSC does not capture this. The presence of seeps and springs is not a coincidence. As stated in a previous section, though recognizing altering temperatures will have cumulative impacts on early salmon life histories, there is little description of how the USACE/Project Proponents intent to mitigate these impacts. An analysis should be conducted to address the cumulative impacts of water temperature changes such as timing, size at emergence and changes in food chain dynamics in these watersheds. Then real mitigation measures should be designed to reduce these cumulative impacts in the tributary reaches where water and salmon are still present (Beacham and Murray 1990, Webb and McLay 1996, McCullough 1999, Brannon et al. 2002, Neuhemer and Taggart 2007, Fuhrman et al. 2018, Adelfo et al. 2019).

Environmental Baseline Studies Report (2002 - 2008) Fish and Aquatic Invertebrates South Fork Kottuli Watershed					
SFK Upwelling	Environmental Baseline Document (2004-2008) Chapter 15	15.1.6.2 Results and Discussion South Fork Kottuli Watershed	Pg. 15.1-48	"No results are displayed for SFK-D and SFK-E, because transects were not established in those reaches. SFK-D is located directly below Frying Pan Lake and contains comparatively little spawning habitat. SFK-E extends above Frying Pan Lake and there have been relatively few anadromous salmonids found in this reach."	NMFS suggests USACE/project proponent supply upwelling data for the area above Frying Pan Lake. NMFS also recommends the project proponent use minnow traps to quantify the juvenile fish in these reaches.
SFK Salmon Distribution	Environmental Baseline Document (2004-2008) Chapter 15	15.1.6.2 Results and Discussion South Fork Kottuli Watershed	Pg. 15.1-50	"However, limited observations of juvenile coho salmon and sockeye salmon in the lake indicate this habitat may have some potential for rearing. Surface water impoundments like Frying Pan Lake and nearby ponds also provide habitat for other stream-dwelling fishes and provide water storage and extended surface water runoff volumes late in the summer period compared to watersheds without such storage."	Observations seems to be arbitrary; no site specific data or transects are cited. NMFS suggests USACE/project proponent supply this data
SFK Salmon Distribution Groundwater	Environmental Baseline Document (2004-2008) Chapter 15	15.1.6.2 Results and Discussion South Fork Kottuli Watershed	Pg. 15.1-49 Pg. 15.1-50	"Seeps and Springs. A comprehensive survey of seeps and springs in the SFK was performed in 2005 and 2006, and the surface water expression of these features was plotted in Figure 9.1-4 of Chapter 9, Section 9.1. There was a large concentration of seeps and springs upstream of Frying Pan Lake and in the central portion of the SFK, along the upper portion of SFK-B. Seeps and springs add to river flow and moderate stream temperatures in both summer and winter..."	NMFS notes the large number of seeps and springs in and above Frying Pan Lake. However, no salmon investigations in the lake or upstream areas were conducted. Therefore, NMFS finds it difficult to assess salmon presence/absence, rearing, or spawning activities in these areas. NMFS recommends the project conduct juvenile salmon abundance surveys in the lake and areas upstream.
EFH Attribute Surface Water Groundwater	Environmental Baseline Document (2004-2008) Chapter 15	15.1.6.2 Results and Discussion South Fork Kottuli Watershed	Page 15.1-51	"Velocity Shelter. A general lack of mainstem channel pool habitat, instream cover features, and large woody debris in the SFK results in a lack of velocity shelter for rearing fishes. This condition suggests juvenile rearing may need to rely on off-channel habitats, especially for winter refuge when water temperature and stream flow become quite low. The lack of juvenile winter rearing habitat is evident in the instream flow habitat duration curves (Figure 15.1-47)."	NMFS notes winter conditions include low water regimes. Upwelling waters become highly important to ensure water is present for eggs and juveniles. Upwelling may also keep off-channel sloughs from freezing and provide juvenile rearing habitat. Winter habitat does exist, otherwise salmon runs would not. The project cannot mitigate impacts to this habitat if they are not sure where it is. NMFS recommends that the project complete winter surveys (such as trapping) and habitats used by fish, including tributaries and off-channel slough areas.
SFK EFH Attribute Surface Water Groundwater	Environmental Baseline Document (2004-2008) Chapter 15	15.1.6.2 Results and Discussion South Fork Kottuli Watershed	Page 15.1-52	"Surface water expression of groundwater can provide considerable benefits to spawning and rearing fish. The distribution of zones of observable groundwater influence is limited to gaining reaches in SFK-A and throughout most of SFK-B. Fish abundance and productivity might be reduced in other locations with lower input of groundwater. As an example, salmon spawning is restricted upstream of SFK-B (Appendix 15.1B, Figures B.9-10, B.9-11, B.9-12, and B.9-13). This location is upstream of the zone of major groundwater influx to surface waters in the reach."	The dewatering of salmon streams will contribute to the loss of salmon in that reach. Salmon productivity will be eliminated. Salmon stocks historically available to feed the local economy will also endure loss. NMFS recommends USACE/project proponent to update their EFH Assessment to reflect this devastating impact.
Environmental Baseline Studies Report (2002-2008) Appendix 15.1C - Instream Flow: Main Channel Habitat Study					
Groundwater Model Upwelling	Environmental Baseline Document (2004-2008) Appendix 15.1C	1.1.2 Flow Related Effects on Fish Resources	Pg. 3	"Changes in flow magnitude will change the amount of spawning and rearing habitats in a stream... the amounts of habitat will increase with flow up to a certain point, and then begin to decrease as velocities exceed those used by adults for spawning and juveniles and fry for rearing."	NMFS advises the USACE to re-assess water site velocity as the primary condition for salmon. Upwelling and lateral groundwater flow are found to be extremely important factors in salmon rearing and survival. Velocity alone will yield inadequate model results (Reynolds 1997, Winter et al. 1998, Waddle 2001, Stanford et al. 2005, Mouw et al. 2013). There are several scientifically peer reviewed papers that suggest PHABSIM models based on instream flow velocity no longer represent our current understanding of the other EFH attributes that support early freshwater life stage salmon (Macleon 2003, Mouw et al. 2014, Rallsback 2016).
Salmon Distribution Survey Methods	Environmental Baseline Document (2004-2008) Appendix 15.1C	3.4 Habitat Suitability Criteria Curve Development	Pg. 26	"HSC curves are a required element for defining habitat-flow relationships. HSC reflect species and life stage use and preference for selected habitat parameters (depth, velocity, and substrate; Bovee, 1982, 1986). Depending on the extent of data available, HSC curves can be developed from the literature (Category 1 curves), or from physical and hydraulic measurements made in the field over species microhabitats (Category 2 curves). When adjusted for the availability of habitat, the curves may more accurately reflect species preference (Category 3 curves) as described in Bovee (1986)."	This section is erroneous and does not apply to salmon stocks in Alaska. The methods are dated, developed from literature (limited site data used), and is more representative of trout and endangered salmon stocks in the Pacific Northwest. NMFS recommends the project proponent develop habitat suitability criteria based on species that are actually present in the project area.
Salmon Distribution Survey Methods	Environmental Baseline Document (2004-2008) Appendix 15.1C	3.4 Habitat Suitability Criteria Curve Development	Pg. 26	"HSC curves are a required element for defining habitat-flow relationships. HSC reflect species and life stage use and preference for selected habitat parameters (depth, velocity, and substrate; Bovee, 1982, 1986). Depending on the extent of data available, HSC curves can be developed from the literature (Category 1 curves), or from physical and hydraulic measurements made in the field over species microhabitats (Category 2 curves). When adjusted for the availability of habitat, the curves may more accurately reflect species preference (Category 3 curves) as described in Bovee (1986)."	The degree of impact on EFH from an action can only be determined when the importance or the role of the EFH attributes is accurately identified. Data needs to be collected and analyzed from areas of fish presence and absence and state whether salmon are occurring there or not. Questions: Why do fish select a certain site? What were the conditions compared to a site that is not used? How do conditions differ? For example, correlations exist for salmon spawning site selection (temperature, springs, substrates)? Is there a correlation between groundwater upwelling temperature and spawning distribution? If these influences were removed, how would that influence spawning site selection? NMFS recommends the project proponent fully characterize the presence and absence of salmon in areas, whether or not they are frequently used for spawning, rearing or as migration corridors. NMFS recommends the project proponent clarify and describe the role upwelling, temperature and substrates play as important EFH attributes.
Environmental Baseline Studies Report (2002-2008) Appendix 15.1D - OFF-CHANNEL HABITATS					
EFH Attribute Surface Water Groundwater Off-Channel Habitats Extent of Impacts	Environmental Baseline Document (2004-2008) Appendix 15.1D	1.2 Overview of OCH Formation and Fish Habitat Function	Pg. 2	"OCHs in glaciated river valleys are created by the interaction of channel processes, ground and surface water, vegetation, and beaver activity. The continuous interaction of all of these elements, especially channel migration and beaver activity, results in a dynamic floodplain environment within which OCHs are continually being created and destroyed. The locations (connections with mainstem rivers), morphologies (typically slow moving, relatively deep water), and complexities (often contain a mix of woody debris and aquatic vegetation) of many types of OCHs make them especially attractive as refuge and rearing habitats for juvenile salmonids."	NMFS agrees with the assessment that many different environmental elements are needed to contribute healthy habitat, e.g. "the continuous interaction of all of these elements", "connections with mainstem rivers and morphologies", and "complexity, make them especially attractive as refuge and rearing habitats for juvenile salmonids". NMFS advises the project proponent to carefully consider and assess how dewatering the project area will affect complex matrix of environmental factors.
EFH Attribute Groundwater Off-Channel Habitats Extent of Impacts	Environmental Baseline Document (2004-2008) Appendix 15.1D	1.2 Overview of OCH Formation and Fish Habitat Function	Pg. 2	"Groundwater within these systems appears to be important to the generation and maintenance of OCHs and may also affect their potential to function as high quality fish habitat. Groundwater-controlled OCHs include isolated ponds, percolation channels, and beaver ponds. These OCHs contain water year-round and under varying flow conditions; they also may provide a continuous source of water to mainstem habitats. Surface water connectivity between OCHs and the mainstem is the critical element in providing fish access from the mainstem to and from off-channel habitat (Pollock et al., 2004)."	NMFS agrees that groundwater quality and availability are important to fish. NMFS finds no evidence in literature or in the provided reports to support the idea that the extent of groundwater loss would allow for the continued use of these areas for salmon. Technologies may exist to re-introduce water back into dewatered areas. To do so in a manner that returns fish habitat to a state that is conducive to sustain healthy, productive salmon populations is not discussed. If such technologies exist, the project proponent has not suggested they will pursue them. NMFS is skeptical returned water to the streams (or groundwater) will be similar to the pre-project, pristine water quality conditions needed for salmon. NMFS can locate many studies and research that groundwater and upwelling areas are critical to maintain healthy habitat conditions for fish. Dewatering of these areas over the life of the project would be catastrophic to future salmon populations. NMFS recommends the project proponent explain how they intend to return groundwater to the project area in a way that will restore salmon EFH and sustain salmon.
Survey Methods Off-Channel Habitats Salmon Distribution	Environmental Baseline Document (2004-2008) Appendix 15.1D	Section 5.7 Fish Sampling	Pg. 8	"Off-channel sites were sampled between early summer and early fall, with specific sampling months varying between watersheds and years. In the SFK watershed, fish sampling occurred in September 2005, June and August 2006, and July 2007 (Figure 7). The UT sites (Figure 8a and 8b) were sampled in July and October 2007, and the off-channel sites in the NFK (Figure 9) were sampled between late July and mid-August 2008."	NMFS finds it difficult to assess the methods, usefulness of the sparse data, and the periodic use sampling events. Also, the data sets are more than 12 years old. Off-channel reaches play an important role to the rearing of juvenile salmon. NMFS recommends the project proponent utilize sampling observations and locations that are repeatable and represent all-seasons.
Survey Methods Off-Channel Habitats Salmon Distribution	Environmental Baseline Document (2004-2008) Appendix 15.1D	Section 6.6 Fish Sampling	Pg. 11	"...Four species of anadromous salmonids (coho salmon, sockeye salmon, Chinook salmon, and chum salmon)... Juvenile coho densities by OCH type were as high as 234.04 fish/m ² as observed in one alcove area in the NFK. Sockeye salmon fry were the second-most commonly found anadromous species throughout the study area, with densities as high as 4.34 fish/100 m ² calculated for alcove in the NFK. Comparatively few Chinook (0.01 to 7.74 fish/100 m ²) and chum salmon (0.05 fish/100 m ²) were found throughout the study area."	NMFS acknowledges the applicant's study efforts, but concludes these efforts are limited, sparse, lack scientific rigor, and do not fully assess all salmon life stages. NMFS recommends the project proponent perform standardized, repeatable, year-round studies at specific locations and these studies be made readily available for review. Without more detailed and thoughtfully collected data about the salmon use in the project area, NMFS will continue to find it difficult to assess the potential loss of salmon as a sustainable stock and local resource.

TOPIC	CHAPTER	SECTION	PAGE	AUTHORS ORIGINAL LANGUAGE	COMMENT
APPENDIX H - ESA BIOLOGICAL ASSESSMENT - NMFS					BA does not take into account indirect project effects, including increased ship traffic through listed species range and through critical habitat, as well as possible reductions in prey availability, especially reduced availability of salmon to Cook Inlet belugas due to disruption/destruction of intact salmon spawning streams. While we recognise that these issues lie outside of COE authority, examination of all effects of the permitted project (and disclosure of project effects on listed species) is needed in order to conduct an ESA S7 jeopardy analysis.
	2	2.2	4	<i>The Action Area for the causeway and wharf construction is based on in-water construction activities and the underwater acoustical footprint due to in water impact pile driving to the 160-decibel (dB) sound pressure level (SPL) isopleth and vibratory pile driving and fill placement to the 120-dB SPL isopleth.</i>	COE determined action area for those parts of the project over which they have authority, and not for the entire project. This is inconsistent with the definition for Action Area: "Action area" means all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 CFR 402.02). For this reason, the action area is typically larger than the project area and extends out to a point where no measurable effects from the proposed action occur.
	2	2.2	6	<i>The short-term disturbance associated with drilling a few anchor holes does not rise to the level of take.</i>	Unclear whether they are talking about noise or substrate disturbance. If noise, please provide sound source levels for this activity.
	4	4.3.4	14	<i>beluga whale use of Area 2 habitat as far south as the Action Area has not occurred in recent years (Rugh et al. 2010, Shelden et al. 2017)</i>	Misleading. More correct to say beluga use of this area has not been documented. We do not know that such use has not occurred as there is very little observer effort expended in this area.
	5	5	18	<i>Incidental spills of petroleum lubricants and fuels from fueling and operation of construction equipment</i>	Consequences of proposed action does not take into account any activities associated with operation of the mine, only with construction of in-water infrastructure. This is too narrow of a scope of analysis for project effects, and does not account for any indirect effects that would not occur but for these construction activities (such as spills of chemical reagents or non-construction vessel traffic in the future)
	5	5.1.1	19	<i>However, NMFS has recently determined that vessel noise impacts from the operation of tug thrusters and propellers are discountable (83 FR 7655)</i>	83 FR 7655 is an IHA proposal for a wind energy project in New York state. It does not represent NMFS national policy. This information is presented in a misleading way, causing the reader to assume that the citation refers to NMFS policy statements. There are many factors that could result in different conclusions being drawn regarding activities for these two very different projects in very different environments affecting entirely different species. In addition, the project referred to in the application had not undergone ESA section 7 consultation or public comment at the time of publication.
	5				No consideration given to sound associated with Anchor Handling during pipeline construction and other activities
	5	5.1.4	20	<i>Finally, NMFS has recently published that harassment associated with construction vessel noise (83 FR 7655) is discountable</i>	83 FR 7655 is an IHA proposal for a wind energy project in New York state. It does not represent NMFS national policy. This information is presented in a misleading way, causing the reader to assume that the citation refers to NMFS policy statements. There are many factors that could result in different conclusions being drawn regarding activities for these two very different projects in very different environments affecting entirely different species. In addition, the project referred to in the application had not undergone ESA section 7 consultation or public comment at the time of publication.
	5	5.1.4	21	<i>NMFS has recently published (see 83 FR 7655) that these noise levels are similar to those of transiting vessels, rarely result in marine mammal response, and the likelihood of thruster use resulting in harassment take to be low to the point of discountable.</i>	83 FR 7655 is an IHA proposal for a wind energy project in New York state. It does not represent NMFS national policy. This information is presented in a misleading way, causing the reader to assume that the citation refers to NMFS policy statements. There are many factors that could result in different conclusions being drawn regarding activities for these two very different projects in very different environments affecting entirely different species. In addition, the project referred to in the application had not undergone ESA section 7 consultation or public comment at the time of publication.
	5	5.3	23		There is no consideration of entanglement of Cook Inlet beluga whales or Steller sea lions in marine debris. Please include this information.
	6	6.2	26	<i>The plan will include the use of noise attenuating devices as required, such as bubble curtains, ramp up procedures (soft-start), and establishing both shutdown safety zones (to avoid Level A take) and monitoring zones (to document Level B take)</i>	It is incumbent upon the corps to implement measures that not only document level B take of marine mammals, but to minimize any take of ESA listed species (not merely to document such take).
	6	6.2	Measure 6 page 26	<i>Note that during the 1-hour break for a PSO, a crew member can be assigned to be the observer as long as they do not have other duties at that time and they have received instructions and tools to allow them to make marine mammal observations.</i>	Past approved use of crew members as PSO's has been specific to specific activities, and is not intended to be a measure that applies equally to all PSO duties. For example, NMFS would not approve crew to serve as PSOs on a seismic exploration project while air gun arrays are in operation.

pile driving	6	6.2	Measures 18, 20, and 21, page 28	<i>If visibility degrades to less than 984 ft (300 m) during pile driving, pile driving of the section of sheet pile that was being driven when visibility fell below 984 ft (300 m) may continue to the target depth of that sheet pile but will not drive additional sections of piling. If pile driving is suspended (to weld on a new section, for example) when the monitoring zone is not visible, pile driving will not resume until visibility exceeds 984 ft (300 m) and the PSO has indicated that the zone has remained devoid of marine mammals for 30 minutes prior to additional pile driving.</i>	This measure is specific to sheet pile, but should be generalized to include all piles. It is not clear from where the distance 984 ft. (300 m) is derived. This distance should be equal to or greater than the outer limits of the level B zone for each activity.
Take	6	6.2	measure 28, page 29		This measure was block copied from an LOC. Make sure it states what you wish it to state.
Sound	7	7.1.1	31	<i>As mentioned in Section 2.2, harassment-level disturbance (exceeding 160 dB SPL) can extend from a few hundred feet to a couple of miles</i>	the 160 dB sound isopleth for harassment applies only to impulsive sound. The 120 db isopleth applies to non-impulsive sound
Vessel Strike	7	7.1.2	31	<i>While it is important to note that humpback whales comprise most vessel strike records in Alaska (Neilson et al. 2012), the risk of strike in the Action Area is low to the point of discountable because of the low (<10 kt [18.5 km/hr]) travel speed of the vessels involved. Therefore, the determination is No Effect.</i>	discountable probability of effect does not automatically lead to determinations of no effect. More typically, it results in a determination of not likely to adversely affect. This comment carries through to subsequent species in subsequent sections of Direct Effects.
Entanglement	7	7.1.3	31	<i>The exact risk of entanglement is unknown but is considered discountable given no rope will be used. Therefore, the determination is No Effect.</i>	discountable probability of effect does not automatically lead to determinations of no effect.. More typically, it results in a determination of not likely to adversely affect. This comment carries through to subsequent species in subsequent sections of Direct Effects.
Spills	7	7.1.4	32	<i>The required operation safeguards would minimize the occurrence of spills, size, and extent. Potential incidental spills in Kamishak Bay and Cook Inlet would quickly dissipate in the water due to the high flushing rate of Cook Inlet waters. The determination is No Effect.</i>	Rapid dissipation of spilled product does not lead to a determination of no effect. It is unclear how the Corps arrived at this determination. This comment carries through to subsequent species in subsequent sections of Direct Effects.
Spills	8		36		There is no consideration given to the spill risk associated with the transfer of chemical reagents
Effects Determinations	10	Table 4	38		Most or all of the No Effect determinations would be more appropriately labeled Not Likely to Adversely Affect . Some are arguably Likely to adversely affect determinations, such as the effects of noise on beluga whales. Also, Table 4 makes some nonsensical determinations, such as the determination that critical habitat will have no effect upon beluga whales or Steller sea lions.
DEIS EXECUTIVE SUMMARY					
Physical Site Closure	0	1	12		No indication provided regarding safeguards to be put in place to assure that physical site closure occurs.
Physical Site Closure	0	1	13		No indication provided regarding safeguards to be put in place to assure that natural gas pipeline removal/reclamation will occur.
fish passage	0	1	9		A description of fish passage culvert design (beyond "in accordance with regulatory standards) should be provided.
Physical Site Closure	0	1	20		In AA2, pile-supported dock variant, no indication given to the proposed timing of pile driving for the 518 48 inch piles.
Beluga whales	0	1	31	<i>With the exception of past Cook Inlet beluga whale subsistence overharvest effects on population levels, effects of past and present commercial fishing and recreational harvest of fish and wildlife have been minimal.</i>	The Executive Summary mentions beluga whales only once, and does not mention potential project impacts upon this endangered species in decline at all.
Spilled reagents	0	1	66	<i>potential spills of natural gas and chemical reagents were deemed to be ...of low impact</i>	Page 69 (3.5.6) indicates that analysing the environmental impacts of spilled reagents was determined to be unnecessary in the EIS
Steller sea lions	0	1	??	<i>Impacts (of diesel spills) to marine mammals would be of low likelihood and temporary; individuals or groups could potentially be injured or die, but population-level effects are unlikely.</i>	toxicity to SSL pups if rookeries are contaminated.
Draft EIS chapter 4					
4.25 Threatened and Endangered Species			4.25-1-2		Analysis does not seem to include the zone within which vessel noise (e.g. tugs) exceeds 120 dB SPL isopleth for continuous noise.

4.25 Threatened and Endangered Species			4.25-6	<i>Based on the short duration of potential exposure to vessel- or aircraft-related noise and visual disturbance, it is expected that any effects on Cook Inlet beluga whales would be limited to brief behavioral responses such as reducing surface time and diving. Vessel and aircraft presence concurrent with the presence of beluga whales would be short-lived, and only temporary effects on Cook Inlet beluga whales are expected.</i>	At nearly 300 trips per month for lightering vessels transporting concentrate throughout the life of the project, it is hard to reconcile the notion of brief behavioral responses causing only temporary effects. In aggregate, the effects would not seem to be merely temporary.
4.25 Threatened and Endangered Species			4.25-11	<i>There were 93 reports of humpback whale-vessel collisions in Alaska waters between 1978 and 2011, with only one confirmed record in upper Cook Inlet (Neilson et al. 2012). Between 2008 and 2012, the mean minimum annual human-caused mortality and serious injury rate for humpback whales, based on vessel collisions in Alaska, was 0.45 whale per year, as reported in the NMFS Alaska Regional Office stranding database (Allen and Angliss 2015).</i>	This information needs to be updated to reflect best available information.
4.25 Threatened and Endangered Species			4.25-7	<i>The magnitude and extent of permanent direct impacts would be the placement of fill in approximately 10.7 acres of designated Cook Inlet beluga whale critical habitat for construction of the port; 11.5 acres of critical habitat would be temporarily impacted during installation of the natural gas pipeline. Under the Pile-Supported Dock Variant, the magnitude and extent of impacts would be the placement of fill in 0.07 acres of Cook Inlet beluga critical habitat to construct the dock. These acreages were calculated based on the area of critical habitat (derived from USFWS geographic information system layers) that overlaps with project components, and occurs below mean high higher water levels (MHHW).</i>	It is inappropriate to use USFWS' GIS layers for a NMFS-managed species.
4.25 Threatened and Endangered Species		Table 4.25-2	4.25-8	<i>None, the lightering locations are outside of critical habitat for all TES.</i>	Misleading statement and inadequate analysis of lightering upon beluga critical habitat. While it is true that lightering mooring locations are outside of beluga critical habitat, actual lightering activities take place largely within beluga critical habitat.
4.25 Threatened and Endangered Species			4.25-15	<i>If any responses of Steller sea lions associated with aircraft were to occur, they are likely to be short-lived, and therefore are not expected to cause more than a temporary disturbance to Steller sea lions (NMFS 2017a).</i>	This statement ignores the information presented earlier in the document, where it correctly states that disturbed Steller sea lions may stampede, and in so doing, injure or kill pups.

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Academia and Other Expert Comments to the US Army Corps of Engineers on the Pebble Draft EIS

Academia and Other Experts

1. June 13, 2019 letter from North Pacific Fishery Management Council
2. June 13, 2019 letter from American Fisheries Society
3. June 30, 2019 letter from Daniel E. Schindler, PhD University of Washington

Excerpts from Correspondence

Pebble poses significant risk to the Bristol Bay salmon fishery

The potential scope of the project is so vast that it would forever alter the Bristol Bay region and its fisheries resources, including the extraordinarily prolific and all-wild salmon fisheries. - American Fisheries Society at pg. 6-9

The economic and cultural value of these fisheries to Alaska, Washington, Oregon, and other states including domestic and international markets cannot be overstated and must be comprehensively evaluated in any analysis that considers development of a large-scale mine in the area. - North Pacific Fishery Management Council at pg. 6-1

See also, examples on pages 6-18 (Schindler, PhD) 6-5 (American Fisheries Society)

Significant deficiencies with the salmon impact analysis

Based on our review of the DEIS, we find it fails to meet basic standards of scientific rigor in a region that clearly demands the highest level of scrutiny and thoroughness. The DEIS is an inadequate assessment of the potential impacts of the project. Specifically, as described below, we find the DEIS is deficient because 1) impacts and risks to fish and their habitats are underestimated; 2) many conclusions are not supported by the data or analysis provided; and 3) critical information is missing. at pg. 6-4
- American Fisheries Society

the DEIS is not a rigorous scientific assessment of the risks of the Pebble project to the water quality, fisheries, and people of the Nushagak and Kvichak watersheds. at pg. 6-16
- Daniel E. Schindler, PhD

See also, examples on pages 6-18 (Schindler, PhD) 6-19 (Schindler, PhD) 6-5 (American Fisheries Society)

Remedies to bring the Corps' process back on track

the DEIS should be re-written, using a more defensible set of starting assumptions and more rigorous assessment about the risks of this proposed project. - Daniel E. Schindler, PhD at pg. 6-16

See also, examples on pages 6-1 (NPFMC) 6-17 (Schindler, PhD) 6-19 (Schindler, PhD)



North Pacific Fishery Management Council

Simon Kinneen, Chair | David Witherell, Executive Director
605 W. 4th Avenue, Suite 306, Anchorage, AK 99501
Phone 907-271-2809 | www.npfmc.org

June 13, 2019

Program Manager
US Army Corps of Engineers
615 G St, Ste 100-921
Anchorage, AK 99501

To Whom it may concern;

On behalf of the North Pacific Fishery Management Council, I am pleased to submit these comments related to the Pebble Project Draft Environmental Impact Statement. The North Pacific Fishery Management Council (NPFMC) is one of eight regional councils authorized under the Magnuson-Stevens Fishery Conservation and Management Act tasked with conservation and management of our nation's Federal fisheries and fishery resources. The Federal fisheries off of Alaska are our nation's most productive, sustainable, and valuable fisheries, and the NPFMC is resolutely committed to maintaining the resources, value, and quality of North Pacific fisheries and the reputation that these fisheries have earned.

The Pebble project lies between two important large marine ecosystems where the NPFMC manages Federal commercial fisheries, the Bering Sea and the Gulf of Alaska. Bristol Bay is connected to the Pebble project through myriad rivers and streams that provide Essential Fish Habitat (EFH) to salmon stocks that are essential to the livelihood of thousands of commercial and subsistence fishers; it is the source of almost all of the sockeye salmon eaten by US consumers. Cook Inlet, in the Gulf of Alaska, also has large salmon runs and productive halibut fisheries that support thousands of commercial, recreational, subsistence, and personal use fishers. **The economic and cultural value of these fisheries to Alaska, Washington, Oregon, and other states including domestic and international markets cannot be overstated and must be comprehensively evaluated in any analysis that considers development of a large-scale mine in the area.**

The value and reputation of commercial fisheries in Alaska has been earned by consistently providing a superior product to global markets. Both the value and reputation of Bering Sea, Gulf of Alaska, and other Alaska fisheries are dependent on the pristine waters of Alaska's marine ecosystems, and the Alaska Seafood Marketing Institute has worked to ensure that the well-earned reputation is a hallmark of North Pacific fisheries. Any analysis that considers development of a large-scale mine in the area must also consider reasonably foreseeable future actions, including the potential impacts not only on fish populations and habitat, but also on both the value and reputation of North Pacific fisheries.

Essential Fish Habitat for salmon species in Alaska includes the anadromous waters that provide spawning and rearing habitat for all five salmon species in Alaska. The Magnuson-Stevens Fisheries Conservation and Management Act calls for Federal agencies to consider the potential impacts of developments on Essential Fish Habitat, and consult with NOAA Fisheries to identify actions to avoid or mitigate such impacts. **We understand that the USACE is currently working with NOAA Fisheries to schedule the assessment of potential impacts to Essential Fish Habitat, including cumulative impacts. The NPFMC requests that the USACE schedule the assessment to coincide with a NPFMC meeting, and suggests that December 2019 would be an opportune time for the NPFMC to review and comment on the assessment.**

The NPFMC again thanks the USACE for this opportunity to comment on the Pebble Project Draft Environmental Impact Statement.

Sincerely,

A handwritten signature in black ink, appearing to read "D. Witherell".

David Witherell
Executive Director



June 13, 2019

Program Manager
US Army Corps of Engineers
645 G Street, Suite 100-921
Anchorage, AK 99501

Via drafteis@comments.pebbleprojecteis.com

Re: Pebble Mine Draft Environmental Impact Statement

Dear Sir or Madam:

On behalf of the members of the American Fisheries Society (AFS), the Western Division of AFS, and the Alaska Chapter of AFS, we respectfully submit the following comments in response to the Pebble Mine Draft Environmental Impact Statement (DEIS) released by the U.S. Army Corps of Engineers (USACE) for public comment on March 1, 2019.

AFS represents over 7,500 professional fishery scientists and resource managers who work in the private sector, in academic institutions, and in Tribal, state, and federal agencies. Our common mission is to improve the conservation and sustainability of fishery resources and aquatic ecosystems by advancing fisheries and aquatic science and promoting the development of fisheries professionals.

The American Fisheries Society, the Western Division, and Alaska Chapter seek to ensure the best available science is considered throughout the environmental review and permitting for Pebble Mine,

Because of the scope of the proposed Pebble Mine, its probable expansion into a larger mine and mining district (Chambers et al. 2012), and the uniqueness of the Bristol Bay region (Woody 2018), AFS and the Western Division of AFS provided comments in 2014¹ and do so again with the Alaska Chapter of AFS.

¹ AFS Policy Letter 2014 on Pebble Mine and Failure of Mount Polley Dam – Comments to USEPA Region X, 21 August 2014. Available: <https://fisheries.org/wp-content/uploads/2015/05/AFS-POLICY-LETTER-2014-Pebble-Mining-Mount-Polley-Comments-to-USEPA-Region-X.pdf>

Bristol Bay is extraordinary because it produces about half of the world's wild Sockeye Salmon supply with runs averaging 37.5 million fish per year (Chambers et al. 2012; USEPA 2014; Woody 2018). The wild salmon fishery in Bristol Bay has been managed in a sustainable manner since 1884 and was valued at \$1.5 billion in 2010. In addition to Sockeye Salmon, Bristol Bay and the watershed support one of the world's largest remaining wild Chinook Salmon runs and healthy Coho, Chum, and Pink Salmon runs (Johnson and Blossom 2018). These salmon, as well as resident trout, sustain lucrative commercial and recreational fisheries and provide jobs and food security to 25 rural Alaska Native villages and thousands of people. The high salmon production brings huge levels of marine-derived nutrients to the watersheds in which salmon spawn, fueling sustainable populations of grizzly bears, moose, estuarine birds, and indigenous Yup'ik and Dena'ina peoples. The latter peoples represent two of the planet's last salmon-based subsistence cultures, which were once widespread along the entire North American Pacific Coast. These wilderness-compatible economic sectors support 14,000 workers, including 11,500 in commercial fisheries, 850 in sport fisheries, and 1,800 in sport hunting and recreation (Chambers et al. 2012; USEPA 2014; Woody 2018).

Based on our review of the DEIS, we find it fails to meet basic standards of scientific rigor in a region that clearly demands the highest level of scrutiny and thoroughness. The DEIS is an inadequate assessment of the potential impacts of the project. Specifically, as described below, we find the DEIS is deficient because 1) impacts and risks to fish and their habitats are underestimated; 2) many conclusions are not supported by the data or analysis provided; and 3) critical information is missing.

1. Impacts and risks to fish and their habitats are underestimated.

Mine Footprint: We have serious concerns about the limited scope of the DEIS. An environmental impact statement is expected to fully disclose the risks and options for safely advancing or altering a proposed project. The limited scope considered for the mine footprint in the DEIS vastly underestimates the threats to fish, fisheries, and the human populations that rely on them. It is misleading to constrain the DEIS to a mining plan that only extracts 12% of the known resource and to ignore Pebble Limited Partnership's planned expansion and stated purpose to make the mine commercially viable (Chambers et al. 2012).

The DEIS acknowledges that the Pebble Project Expansion—a 55% of known resource mine, which would need additional tailings storage, additional water storage, new waste rock storage facilities, a concentrate pipeline, and a deep-water loading facility—is reasonably foreseeable (Table 4.1-1). This profitable mining plan appears to be a 78 to 98-year mine prior to closure as

opposed to the 20-year mine prior to closure covered in the DEIS (Chambers et al. 2012). Further, it is reasonably foreseeable that the Pebble Project Expansion would begin within the timeframe of the proposed 20-year mine. The DEIS relegates the expansion to “possible future action” status rather than considering it a practicable alternative. As a consequence, this more likely profitable scenario with its much larger mining footprint is not evaluated for direct or indirect effects but more narrowly for cumulative effects only, thus underestimating the impacts on fish, fish habitat, and humans. Since the Pebble Project Expansion would be 1) dependent on the approval of this initial permit, 2) could not proceed unless this permit is approved previously, and 3) is classified as an “expansion” or an interdependent part of the larger Pebble Mine action and thus depends on the larger action for its justification; it should be evaluated as a potential connected action in the indirect impacts analysis (40 CFR 1508.25 (a)(1)(i-iii).)

Diversity of Life History Strategies: The Bristol Bay watershed is pristine with exceptionally high-water quality and habitat diversity, closely connected surface-ground water systems, and an absence of channel fragmentation by roads, pipelines, or dams (Woody 2018). These factors lead to extremely high levels of genetic diversity among hundreds of locally adapted unique salmonid populations, which in turn support high levels of salmon production and system-wide stability. Because of this *portfolio effect*, there is remarkable annual productivity regionally despite considerable fluctuation in any single river system or any single year (Schindler et al. 2010). Similar portfolio conditions have been erased from the salmon rivers of Canada and the USA to the south, by activities associated with resource extraction, human overpopulation, and economic development.

The DEIS fails to consider impacts to fish as they relate to distinct populations and life history diversity. In Table 4.24-4: *Summary of Key Issues for Fish and Aquatics*, the DEIS offers a laundry list of impacts. Although the list is notably long, the table and associated narrative omits how these impacts accumulate and interact over the life history of a particular salmon population. Consequently, there is no way to evaluate how these individual impacts would be amplified biologically and ultimately reflected in the Bristol Bay commercial, recreational, and subsistence fisheries. The importance of a single population and the habitat it uses varies across years. Losses that eliminate local, unique populations would erode the genetic diversity that is crucial to the stability of the overall Bristol Bay salmon fisheries (Hilborn et al. 2003; Schindler et al. 2010; Brennan et al. 2019).

Watershed Connectivity: The DEIS fails to consider the best available science regarding watershed and habitat connectivity. Headwater streams provide numerous services that are essential to ecosystems and are key to the sustainability of fish stocks in both upstream and

downstream waters (Colvin et al. 2019). When the natural flow regimes of headwater streams are altered, downstream water quality is impaired. The headwaters of Bristol Bay provide critical habitat for Pacific Salmon. Alteration and destruction of this pristine habitat would have far reaching implications for recreational and commercial fisheries that are not considered in the DEIS. Stream crossings in the Bristol Bay headwaters attendant to Pebble Mine will significantly impair watershed connectivity. Recent assessments of the potential impacts of the proposed 138 km of access roads with 64 associated stream crossings concludes that salmon spawning migrations will be impeded at 36 of these crossings (Kravitz and Blair 2019). Juvenile salmonid movement will also likely be reduced by culverts (Davis and Davis 2011). Stream crossings and modifications lead to reduced water quality and velocity, spread of fungal diseases, degraded riparian species, altered stream substrates, increased erosion and sedimentation resulting in buried spawning and rearing gravels, channel fragmentation, lost spawning habitat, and decreased egg survival (Trombulak and Frissell 2000; WDFW 2003; Gibson et al. 2005; Kemp and Williams 2008). The DEIS conclusions that salmon passage would be only temporarily affected are not supported by recent research (Kravitz and Blair 2019). Instead, projections indicate that almost 90% of culvert-impeded streams contain restricted upstream habitat, 30% of which will be blocked entirely or partly even after project closure ultimately resulting in reduced or extirpated salmon populations (Kravitz and Blair 2019).

The DEIS also likely underestimates the impacts of altered subsurface flow on salmonids by being inconclusive on whether or not groundwater flows were present in the mine vicinity (see Groundwater PAGE | 3.17-19). Regional ecology and geography suggest otherwise. The Nushagak district, hydrologically connected to the mine project, is responsible for 78% of the commercially harvested Chinook Salmon in Bristol Bay even according to the DEIS. Chinook Salmon, even more so than Sockeye Salmon, establish redds in areas where groundwater mixes with surface discharge (Neumann and Curtis 2016). Their preference for spawning habitat of this type and their affinity for the Nushagak indicates that these habitat conditions have been overlooked or underestimated by the DEIS. The upwelling water protects eggs from freezing and aids in swifter incubation (Curry et al. 1995). Additionally, establishing upwelling in these streams may be a critical (yet unknown) factor in assessing the impact of the proposed mine because evidence suggests waters from an upstream reservoir do travel to downstream waters (Geist et al. 2011).

Focusing only on the rivers and estuaries immediately connected to the proposed mining district and pipeline across Cook Inlet ignores their cumulative impacts on the entire Bristol Bay and Cook Inlet ecosystems. In other words, the DEIS makes a common reductionist engineering error by focusing on a few pieces rather than entire ecosystems (Hansen et al. 1999; Hecht et al. 2007).

Mine Tailings Failures: The DEIS does not account for the very real possibility of a catastrophic mine tailings failure. A tailings storage facility at the Pebble Mine could have as high as a 20% probability of failure over a 100-year life of the mine—and such a failure would release millions of tons of toxic waste into the Nushagak River, its floodplains, and eventually Bristol Bay (Wobus 2019; DeMarban 2019).

The design for the Pebble Mine tailings storage facility provides for a centerline construction method with earthen tailings and a facility made of non-acid generating waste rock. There is no guarantee that the plan will not be altered to use the less safe upstream construction method, steepening of the facility levee slopes, or increasing the use of acid-generating rock or insufficient amounts of coarse material, all changes commonly made elsewhere that have led to catastrophic tailings storage facility failures (Bowker and Chambers 2017; WMTF 2019). Any tailings storage facility associated with the Pebble Mine will be in a geologically and hydrologically sensitive area, the mine waste will contain acid- and selenium-generating rock, and the tailings storage facility may eventually be 226 meters high, making it one of the tallest tailings storage facilities in the world, all characteristics that make the tailings facility more susceptible to failure.

Three recent tailings storage facility failures reinforce the high risk of mining in the Bristol Bay headwaters and the specific risk of attempting to retain tailings and contaminated water behind an unstable earthen tailings storage facility in perpetuity. The Mount Polley Mine in British Columbia and the Fundao, and Feijo mines in Brazil all experienced tailings facility failures in similar mining situations causing impacts such as human deaths, contaminated drinking water, destruction of aquatic life, and fisheries impacts. The frequency and magnitude of tailings storage facility failures has doubled over the last 50 years (Santamarina and Torres-Cruz 2019). These tailings storage facility failures coupled with the sensitivities of salmonids to dissolved copper underscores the need for this possibility to be taken seriously in the DEIS.

2. Impacts to fish and their habitats are not supported by the data or analysis provided.

Water Temperature: We find that the conclusions of likely effects of temperature changes resulting from treated water discharges are not supported by the data and analysis provided.

For example, the analysis ignores the influence of local adaptation, which USEPA (2014) noted was critical to consider. Local adaptation is responsible for much of the variation observed among Pacific Salmon populations in behavior, development and growth rates, physiological and biochemical features, and life history traits (Taylor 1991). The DEIS fails to recognize the significance that small changes in water temperature can have on the time (McCullough 1999)

and size (Beacham and Murray 1990) at emergence of alevins. Additionally, the DEIS does not consider how effects compound over fish life-history by limiting its analysis to a single life-history stage in isolation of the subsequent stages. The DEIS also claims that projected changes in water temperatures are not anticipated to alter aquatic invertebrate assemblages, a major food source for juvenile salmon. This assertion is not supported by any data.

Copper: Dilute copper concentrations can have far-reaching behavioral and pathological effects on fish, especially in low ionic strength waters such as those in southwest Alaska. It impairs salmonid olfactory function (Hansen et al. 1999; Baldwin et al. 2003; Sandahl et al. 2006) making them more susceptible to predation (McIntyre et al. 2012), and reduces their ability to locate their natal streams to spawn. Dilute copper contamination can and does eliminate salmonids by altering migration, fish and macroinvertebrate assemblages, and a threshold shift in the percentage of game fish (Woodward et al. 1997; Daniel et al. 2015). Therefore, we find that the DEIS does not adequately address the potential impacts from uncaptured mine waste water because it is unrealistic to assume that all mine-influenced water will be captured. This is particularly problematic in the seismically active, rich surface-ground water connections, and fractured geology of the project area. Mining, through the release of dilute copper concentrations, promises to degrade streams throughout the basin, affecting the anadromous and resident fish species using those habitats for migration, spawning, and rearing (Chambers et al. 2012; USEPA 2014).

3. Critical information is missing.

It has been difficult to find the actual data upon which the DEIS is based. Apparently those data are buried deep in attachments to appendices of the Pebble Project Environmental Baseline Document, or in an on-line or paper document library that is continually being added to and not clearly referenced in the DEIS. Such data burial does not meet basic scientific standards for scientific peer-review, let alone public review. The inaccessibility of relevant data for a project of this magnitude in a region of global significance is inexcusable.

Based on our limited ability to review, we find critical information lacking in the DEIS, which prevents a full evaluation of the potential impacts of the proposed Pebble Mine. For instance, the DEIS is incomplete in its discussion of numerous topics, including:

- impacts of copper in fugitive dust on aquatic life;
- threats and impacts of aquatic invasive species to the Bristol Bay region due to new transportation corridors into previously undisturbed areas;
- seismic risks and impacts of earthquakes on all built infrastructure and impacts of resulting failures on the natural environment;

- risk assessment of atmospheric river events;
- impacts of urbanization and industrialization of the site; and
- polluted wastewater disposal and monitoring plan in the event of a spill or storage facility failure.

We recommend that these topics be incorporated into the DEIS and made available for public review before USACE finalizes the EIS.

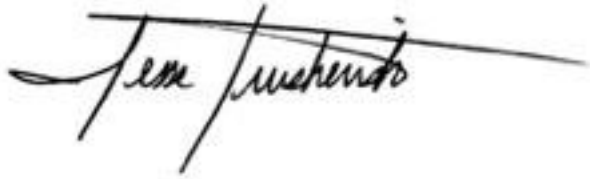
Most importantly, the Pebble Limited Partnership has failed to make available a post-operation reclamation plan, an economic feasibility study, and calculation of surety guarantees to cover the total costs of perpetual waste water, waste rock, and tailings treatments as required by Alaskan law (AS 27.19.040) and responsible investment institutions (Alaska Statutes 2019; Brown 2019; Responsible Investor 2019). It is difficult to assess the long-term and indirect effects of a large mine action such as the Pebble Project without an assessment of the proposed reclamation activities, schedule, materials, planning, and monitoring. The proposed types and methods of reclamation have a huge potential to affect conditions in the watershed both during and after mining ceases. These components should be completed and made available for public review before USACE moves forward with the Record of Decision.

Furthermore, we urge USACE to re-visit the socio-economic and ecological sections in USEPA (2014) and Woody (2018), which provide critical data for decision-makers about the costs, benefits, and risks to public salmon resources from proposed mining activities in Bristol Bay. AFS professionals, with mining experience, participated in the review of both documents in all phases and we believe the authors conducted a comprehensive, rigorous, professional synthesis incorporating the best available science.

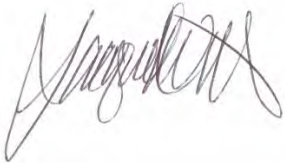
In conclusion, as fishery scientists and resource managers, we are concerned that the DEIS will clear the way for a project whose impacts to highly valued fisheries and the watershed were not adequately evaluated and therefore cannot be adequately considered, reduced, or mitigated. We do not believe the impacts and risks to fish and fish habitat have been fully described and we disagree with many conclusions reached based on the available data and ecological knowledge. Bristol Bay's unimpaired watersheds and sustainable commercial, recreational, and subsistence fisheries represent an exceptionally rare resource of national and global importance. The potential scope of the project is so vast that it would forever alter the Bristol Bay region and its fisheries resources, including the extraordinarily prolific and all-wild salmon fisheries. Consequently, until an acceptable scientific evaluation can be completed and reviewed, we recommend the No Action Alternative as the best path forward.

Thank you for your consideration. If you have any questions, please contact Drue Banta Winters at dwinters@fisheries.org or 301-897-8616 x202 or Joel Markis at president@afs-alaska.org or 907-747-7760.

Sincerely,

A handwritten signature in black ink that reads "Jesse Trushenski". The signature is written in a cursive style with a long horizontal line extending to the right.

Jesse Trushenski, Ph.D.
President
American Fisheries Society

A handwritten signature in black ink that reads "Jackie Watson". The signature is written in a cursive style with a long horizontal line extending to the right.

Jackie Watson
President
Western Division of the American Fisheries Society

A handwritten signature in black ink that reads "Joel Markis". The signature is written in a cursive style with a long horizontal line extending to the right.

Joel Markis
President
Alaska Chapter of the American Fisheries Society

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Concerns of the Draft EIS for the Proposed Pebble Mine

June 30, 2019

Dr. Daniel E. Schindler, Professor, School of Aquatic and Fishery Sciences, University of Washington, Seattle, WA

deschind@uw.edu, 206-616-6724 (Oct-May), 907-842-5380 (June-Sept)

Here I provide a list of my primary concerns about the technical quality of the Draft Environmental Impact Statement (DEIS) released by the US Army Corps of Engineers to assess the environmental risks of the proposed Pebble Mine in Bristol Bay, Alaska. While there are many inconsistencies and inadequacies in the DEIS, I have focused on my primary points of concern here.

I am a professor in the School of Aquatic and Fishery Sciences at the University of Washington in Seattle. I am a Principal Investigator of the UW Alaska Salmon Program, which has studied the ecology of salmon and their watersheds in western Alaska since 1946. I have worked in these ecosystems since 1997 and spend over 3 months of the year in the field in Bristol Bay, performing research on the habitat and ecology of salmon and the species with which they interact. My concerns described here draw on this 75 years of institutional experience and almost 30 years of personal scientific experience working on the ecology of salmon ecosystems along the west coast of North America.

To summarize, the DEIS is not a rigorous scientific assessment of the risks of the Pebble project to the water quality, fisheries, and people of the Nushagak and Kvichak watersheds. Through a series of faulty assumptions and assessment approaches, the DEIS has arrived at the premature conclusion that there are no long-term substantial risks of this project to Bristol Bay ecosystems and the region's human communities. This conclusion is not supported by the science that should be under consideration. It is undeniable, based on the data and information available, that the long-term risks of the Pebble project to the Nushagak and Kvichak watersheds are substantially higher than the DEIS has concluded.

The Pebble DEIS falls distinctly short of the intended rigor of the NEPA assessment process. If this assessment was submitted to the standard scientific peer review process, I believe it would be soundly rejected and found to be unpublishable in the scientific literature.

I believe the DEIS for Pebble Mine should be rejected based on the complete lack of rigor of the science in this assessment. There is too much at stake for Alaska for such a careless assessment to be used in the decision-making process. I believe the DEIS should be re-written, using a more defensible set of starting assumptions and more rigorous assessment about the risks of this proposed project.

My ten primary concerns about the DEIS are listed below.

1. The DEIS assumes too short a time frame over which to evaluate risks

In assessing the risks of the Pebble Mine, the DEIS assumes that the mine can be constructed, the ore removed, and the site decommissioned in about 50 years. The DEIS further assumes that all important risks associated with this project will occur only during this time period. For several reasons, this is the most glaring problem with the DEIS. While boundary conditions need to be established in any risk assessment (e.g., for how long, and over what spatial area the project may have effects), the unrealistically

short time frame assumed in the Pebble DEIS leads inevitably to a conclusion of negligible risk. This is a serious oversight and simply ignores what the existing data on the nature of the mineral deposit, and the ecology of the area, tell us about the risks. Most risks from this mine will not become evident for several decades, or even centuries, after the proposed mine has closed.

Several issues make the assumed time frame a gross underestimate of the time frame that should be considered in a legitimate EIS. First, much of the waste rock material that will be produced from this mine, including both the pyritic and bulk tailings, will generate acid mine drainage (AMD) – a toxic cocktail of sulfuric acid and heavy metals such as residual copper, selenium, and cadmium. The ore to be mined is rich in sulfides which, when exposed to oxygen and water, will produce sulfuric acid which will both make waters acidic and also dissolve residual toxic heavy metals that pose distinct risks to water quality and fish. This is known with almost 100% certainty. But how the wastes will be contained and maintained, over geochemically-relevant time scales (i.e. centuries), is glossed over in the DEIS.

While Pebble Limited Partnership's own data on the composition of the ore deposit show with near certainty that much of the waste will produce AMD, it will likely take more than 2 decades to start doing so. Thus, in the short-term while the Pebble project is initially constructed and actively mined, there may be little indication of the severity of the toxic AMD that will eventually be produced, and will continue to be produced for centuries. A legitimate EIS would explicitly account for the need for perpetual storage and maintenance of these tailings. Risks associated with retaining and maintaining these tailings will extend over centuries – not the 50-year time period assumed by the DEIS. The DEIS should be rejected based on this simple fact alone.

Many of the impacts of the mine and its extended infrastructure (i.e. roads, pipeline, ferry terminal) on fish habitat will also take decades to fully develop. For example, roads will impact the movement of rivers and streams on their floodplains, and will change surface and ground water flows. The impacts of infrastructure on aquatic habitats will likely take decades to fully develop. Thus, the EIS must consider a substantially longer time frame to fully account for effects on fish habitat. The assumed 50-year time frame is distinctly too short, probably by at least an order of magnitude, given what we know about the ecology of this region.

2. The Pebble Mine should be considered a 'gateway mine' in terms of long-term impacts

The current mine plan under consideration for permitting would target a small fraction of the entire Pebble ore deposit. Expansion of this mine into the deeper, more valuable, components of the deposit is highly likely, which means that the most toxic wastes (i.e., those that will produce AMD) cannot be stored in the mine pit as is described in the current mine plan. For the mine to be expanded into the deeper ore deposit, the pit will need to remain open which means that the toxic acid-generating material must be stored above ground, probably behind earthen dams. This puts this waste material at higher likelihood for producing AMD, and further increases the risk that AMD will leak into surface- and groundwater sources.

All EIS under the National Environmental Protection Act (NEPA) must explicitly treat "Reasonably Foreseeable Future Actions" (RFFA) of any project to account for long-term potential effects and their associated risks. While it is true that the current mine plan is the project under consideration for permitting, it is clear that if this plan is permitted, it will enable further mining development of the Pebble deposit and of other deposits in the region. Thus, when accounting for RFFA it is only responsible

to consider the Pebble Mine as a 'gateway mine' whose long-term consequences include 1) expansion of the initial mine to extract the entire Pebble deposit and its associated increase in the time that critical components of its infrastructure (e.g., Pyritic TSF) threaten the ecosystem and downstream human communities, and 2) the opening up of this region to much broader mining activities that would be enabled by construction of the infrastructure serving the initial mine (i.e., roads, pipelines, electricity, etc). The risks of these inevitable additional activities that will be enabled by the initial permitting of the Pebble Mine must be considered in the DEIS as part of the RFFA. The DEIS currently pays little attention to these long-term, but very likely, future developments in the region that will be catalyzed by the initial permitting of the Pebble project. By ignoring these RFFA, the DEIS distinctly and grossly underestimates long-term risks to the ecosystem.

3. The DEIS assumes that there are no interactions among stressors

It is broadly understood in environmental sciences that most development activities produce many possible stressors to ecosystems. In the case of Pebble Mine, this includes dewatering streams, draining wetlands, leakage of toxic materials into water sources, roads preventing streams from moving across floodplains, in addition to the potential for more catastrophic events such as failures of tailings dams. What has become widely appreciated is that these multiple stressors typically amplify the effects of each other when generating risks to the environment, i.e., stressors interact and compound each other's effects (Hodgson et al. 2019). The current DEIS assumes that all stresses associated with the Pebble project occur independently, and do not amplify each other's effects on ecosystems. This assumption ignores decades of research and assessment of the effects of similar projects that show clearly that the effects of mines involve multiple stressors that typically interact with one another and amplify the risks that each individual stressor creates on its own. This oversight of the Pebble DEIS also leads to a serious underestimate of the potential environmental risks of this project. A properly conducted EIS would account for interactions among stressors and how these translate into risks to the ecosystem, which would inevitably be much higher than the Pebble DEIS currently concludes. The current treatment of 'cumulative risks' in the DEIS focused narrowly on the accumulation of stressors through time. It does not include interactions among stressors, and it should.

4. The DEIS relies on inadequate assessment of fish habitat

A major component of the DEIS focusses on estimating the amount of fish habitat that is vulnerable to the development of Pebble Mine. The DEIS concludes that a small fraction of a percent of fish habitat in the Kvichak and Nushagak river watersheds is vulnerable to mining activities. To arrive at this conclusion, the DEIS compares the recent number of fish observed in nearby streams to the aggregate number that returned to the entire watershed. This approach leads inevitably to underestimating the value of habitat that could be impacted by the mining activities.

The reason for this underestimation is that we know from decades of monitoring of salmon, that population abundance varies tremendously through time in any individual component of habitat (Schindler et al. 2010). However, all populations do not boom and bust at the same time, so that the abundance lows in one habitat are offset by abundance highs in other habitats. What this means is that different pieces of habitat are important for producing fish at different points in time. Thus, just because certain habitat currently produces a small number of fish (e.g., as determined from the 2-3 years of monitoring within the DEIS), does not mean it does not have the potential to support higher abundances in the future. In fact, long-term data on Bristol Bay rivers shows that local abundances can vary 100x over

decade-long time scales. Thus, properly functioning watersheds should be viewed as habitat portfolios, whereby the sustainability of the regional resource depends on the diversity of habitats across a river basin (Schindler et al. 2010, Brennan et al. 2019). The DEIS currently does not view the system in this dynamic way, thereby distinctly underestimating the importance of small components of habitat to the long-term sustainability of the ecosystem. The DEIS should be rewritten to account for the dynamic nature of salmon habitat, the fact that intact watersheds operate as shifting habitat mosaics (Brennan et al. 2019), and that the long-term future potential of habitat is assessed (rather than current abundance of fish which assumes a static ecosystem).

5. Groundwater Exchange

The area where the Pebble deposit is located has extremely complex groundwater dynamics that will be fundamentally disturbed by a project the size of Pebble Mine. The area is covered in a thick layer of gravels that was deposited during the last glaciation, producing complex surface and sub-surface water flows across the landscape. The data collected by Pebble LP demonstrate this, illustrating complexities such as the fact that several interacting aquifers are connected via the gravels that will be impacted by the Pebble Mine. For example, one third of the under flow from the South Fork of the Kuktuli Flats Area flows into the Upper Talarik (DEIS 3.17, pg. 20).

The existing mine plan acknowledges that water from the mine pit will need to be pumped out continuously to allow the deposit to be workable. Further, it will be necessary to maintain low water levels in the tailings pond to maintain negative hydrologic head to prevent AMD from spreading across the landscape. This negative hydrologic head will be maintained by pumping water out of the tailings pond, treating it, and then releasing it to downstream surface waters. However, there is essentially no comprehensive assessment of the risks of being able to maintain this negative head while simultaneously treating the effluent water to the point where it does not pose risks to habitats downstream, for time periods much longer than the active mine life. This capacity will need to be maintained forever, not just during the mine life as is currently assumed in the DEIS.

What is also missing from the DEIS is any acknowledgement of the uncertainties associated with understanding how these groundwater connections work under different precipitation regimes (e.g., under climate change) and under different mining excavation scenarios. The DEIS assumes that we know how groundwater exchanges will respond to these disturbances, and that retaining mining wastes can be done effectively to prevent contamination of ground water sources. The DEIS does acknowledge that some contamination is possible, but if detected, the groundwater will be removed and treated and then discharged back to the environment. The DEIS does not sufficiently describe how this will be done, and whether it is even possible to monitor, detect and then treat effluent, in an area as hydrologically complex as where the Pebble deposit is located. We are asked to trust that such post-mining monitoring and treatment will be done effectively, with no empirical evidence provided to back up such assertions. A proper, quantitative analysis of such risks would undoubtedly produce estimates of risks to the environment that are much higher than the DEIS has concluded.

6. Tectonic risks and tailings dam failure are underestimated

The Pebble deposit is located in a region that is tectonically active though the DEIS deems that the risks to the long-term waste storage facilities and related infrastructure are negligible. This conclusion derives from at least two poorly supported assumptions. First, the time frame over which risks to infrastructure

are considered is much too short (see concern #1). Bulk tailings will need to be stored behind an earthen dam on the site forever and therefore risks should be calculated for a more reasonably long time frame. While it is reasonable to assume that the probability of a large tectonic event is very small in any given year, the cumulative probability through time obviously depends on how long a time frame is considered. The current DEIS assumes that the relevant time frame is about 50 years, even though mining wastes will need to be stored safely for centuries. It is not clear what the appropriate time frame to integrate these risks over is, but it is certainly substantially longer than the assumed 50 years, and should probably be assumed to be at least 500 years. This is particularly important given the high likelihood of further expansion of this mine, and development of other mines that would be enabled by an initial permit – a scenario that must be considered a RFFA.

Second, it is not clear that the return intervals for large tectonic events are estimated appropriately. My initial assessment suggests that the probability of a large event was calculated for the immediate vicinity of the proposed mine. However, large tectonic events, particularly in the region associated with megathrust earthquakes are likely to impose ground-shaking even at sites far distant from their epicenter. The assumed recurrence intervals in the DEIS appear to be substantially longer than what is reasonable for the geologic formation and known tectonic activity of this region (Plafker et al. 1992, Mann et al. 1998). Thus, the risks to the earthen dams that would hold back mine wastes appear to be distinctly underestimated.

The DEIS should refer to technical report by Dr. C. Wobus for a full explanation of the inadequacy of this component of the risk assessment, and numerical simulations that demonstrate what the likely downstream impacts on the Nushagak River would be. The EIS should be updated to account for more defensible earthquake scenarios (in terms of magnitude, return interval, and the time horizon over which risks are associated). The current set of parameters considered result in an unrealistically low estimate of risk to infrastructure from tectonic activity.

7. Loss of wetlands and headwater streams are assumed to have no downstream impacts

The DEIS acknowledges that many acres of wetlands and miles of headwater streams will be drained or destroyed in the process of developing and working the Pebble deposit. Loss of these wetlands and streams are acknowledged to have direct effects on aquatic habitats in the area of the Pebble mine (but assumed to be either negligible or that they can be restored). However, the DEIS assumes that there are no downstream effects on water quality and habitat. Wetlands are widely known to have a variety of important effects on downstream ecosystems through processes such as moderating temperatures and flows, intercepting silt, and modifying water chemistry. The American Fisheries Society recently published a review of such widely known effects in the scientific literature (Colvin et al. 2019). The DEIS ignores nearly all of these effects and assumes that the loss of wetlands and headwater streams will result in only trivial impacts to the ecosystems of this region, largely because they don't acknowledge the effects on downstream aquatic habitats. This conclusion is completely incorrect. A proper EIS would account for the landscape scale effects of losses of wetlands and headwater streams on downstream water quality and fish habitat. The current assumptions used in assessing the risks of draining headwater wetlands and streams are fully inappropriate.

8. The DEIS assumes that climate change is not happening

Despite the widespread evidence of warming climate in Alaska and the associated environmental disturbances associated with it, the Pebble DEIS assumes that the effects of climate on mining risks are negligible. Over the last 50 years Alaska has experienced increasingly warmer climates and associated effects on ecosystems, such as shifts in ice break-up dates, less snow and more rain during the winter, and melting permafrost in northern regions of the state. Plausible scenarios for the next 100 years all include further warming, intensifying precipitation, and increasingly less winter snow and ice. These changes in climate pose distinct risks to aquatic ecosystems and to infrastructure. Of particular relevance to the Pebble Mine EIS is that changes in precipitation patterns, particularly during the winter when rain-on-snow events will become more common, pose additional risks to flooding and erosion. Thus, risks of infrastructure failures must include the expected disturbance frequencies and intensities that will occur with changing climate. The DEIS assumes that these will be no different than the historical disturbance patterns observed in Alaska. This assumption is in distinct contrast to the science documenting ongoing climate change effects on Alaska's ecosystems, and leads to reduced estimates of risk of the Pebble project.

Further, estimates of fish habitat loss will likely be exacerbated by climate change. More intense summer droughts, heat waves, and flooding events are expected with climate change. We know that maintaining a diversity of habitat conditions in watersheds is what provides fish and wildlife the 'options' for coping with extreme climate events. By reducing the variety of habitat conditions in these watersheds (i.e., by draining wetlands, dewatering streams, etc.), the Pebble project will undeniably reduce the resilience of these watersheds to future climate change. The current DEIS does not even consider these issues in its assessment of the risks of the Pebble project. Related to discussion point #3 (interacting stressors, above), climate change should be considered one additional and inevitable stressor with which mining-related stresses will interact and be amplified. Assuming climate change is not occurring, as the DEIS does, also leads to conservative estimates of risk to the environment.

9. No concrete plan for long-term monitoring and treatment of the site

The Pebble DEIS acknowledges that there are tangible risks associated with the long-term storage and retention of mining wastes at this site. However, the risks of toxins associated with AMD being released into natural waterways are concluded to be either negligible, or that they can be detected and properly treated before release to the environment. Given that we know with virtually 100% certainty that the mining wastes will produce AMD for many centuries after the mine has closed, it is irresponsible that the DEIS does not propose a defensible plan for the long-term monitoring of the site, identify who will pay for it, how will clean-up of contaminated surface and groundwater be accomplished, and who will pay for the clean-up if an accident or leak occurs. Alaskans will undoubtedly be saddled with these costs, just like taxpayers have in every other place in the world where this type of mine has operated. The states of Maine, New Mexico, Michigan, and Colorado no longer permit new mines that will require perpetual storage and treatment of mining wastes (as Pebble will) because they have realized that they can no longer afford the costs of monitoring and treating the toxic legacies of their existing mines. Pebble Mine would require the same, though substantially larger and more complex, effort to manage and maintain the waste material for centuries after the mine has been decommissioned.

The Pebble DEIS should develop a set of concrete monitoring, treatment, and clean-up scenarios for the wastes and infrastructure that will be left behind, that extends over relevant time scales (i.e., centuries), and estimate the risks to the environment over those time frames. The NEPA process requires that

Reasonably Foreseeable Future Actions (RFFA) be considered as part of the risk assessment of projects under consideration by an EIS. This is yet another RFFA that has been swept under the rug in the Pebble DEIS. A more thorough assessment should be a requirement of a legitimate EIS. Experience from nearly all sulfide-rich deposits demonstrates that problems with contamination mostly arise long after mines have been decommissioned.

10. Assumption that mitigation and restoration are effective and possible

While the DEIS concludes that there are some small-scale risks associated with the Pebble Mine, it assumes that any effects will be effectively detected, and countered by effective mitigation and restoration. However, the DEIS does not explain what will be fixed and how it will be fixed. Again, the DEIS is asking for a lot of trust that all will go well. Experience has shown that habitat restoration and mitigation in other parts of the world are remarkably difficult and expensive, and are often ineffective, because many unanticipated harmful effects of mines eventually express themselves in the ecosystem. The DEIS assumes that effective restoration and mitigation of habitat destroyed or contaminated by Pebble activities is possible and will be 100% effective. However, no details of how this will be accomplished are given. The DEIS should include more detailed and realistic scenarios for what types of environmental damage could be incurred from this project, how and when these effects might be detected, how mitigation and restoration will be implemented, and the likelihood of success is for any restoration or mitigation effort. This analysis should draw on the experience of attempts to restore habitat, water quality, and fisheries in other ecosystems where AMD and extensive infrastructure have impacted large expanses of habitat. This analysis will be sobering, and will highlight yet another reason why the Pebble DEIS has reached a hasty and unsupported set of conclusions regarding the risks to ecosystems and people from the proposed Pebble Mine.

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