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Shane McCoy, Project Manager
U.S. Army Corps of Engineers
P.O. Box 6898
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June 29, 2018

Re: Scoping Comments of United Tribes of Bristol Bay and Nondalton Tribal Council in response to U.S. Army Corps of Engineers, Alaska District, Public Notice POA-2017-271

Mr. McCoy:

Enclosed are comments submitted by the United Tribes of Bristol Bay (UTBB) and the Nondalton Tribal Council (Tribe) in response to the Army Corps of Engineers Alaska District's (Corps) March 29, 2018, Public Notice for the proposed Pebble Mine project. These comments are contained in a report prepared by Ridolfi Environmental, *Proposed Pebble Project Environmental Impact Statement: Scoping Comments* (June 2018).

The Corps is the lead federal agency, and the Nondalton Tribe has agreed to be a Cooperating Agency (CA) for all aspects of the NEPA process and development of the Environmental Impact Statement (EIS) for the proposed Pebble Mine project. The project would be located in a relatively pristine area used by tribes for subsistence hunting and fishing in southwest Alaska.

The March 29, 2018, Public Notice invited the public and interested parties to "assist in determining the scope of analysis, significant issues and alternatives to be analyzed in depth in the Draft EIS." A subsequent Public Notice issued on April 6, 2018, extended the public scoping period to June 29, 2018.

We continue to believe that the project proponent's application is *not* complete as defined by the Corps own regulations, policies, and practices of the Corps. The Corps regulations make it clear that the District Commander, or designee, makes the "completeness" determination. However, the information in the Public Notice is vague, sparse, and lacking in the specifics required to enable interested parties to fully understand the proposal and make meaningful comments.

The enclosed report outlines multiple deficiencies regarding the proposed activity. Additionally, the project proponent has indicated it had made "several updates" to the proposed project subsequent to the Public Notice being issued. For these reasons, we consider these comments preliminary. We expect to provide significant additional comments once a clear and complete description of the proposed project is provided.

Thank you for providing the opportunity to participate in the scoping process. If you have any questions, please do not hesitate to contact either of us on behalf of our respective clients.

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Council for United Tribes of Bristol Bay

Wesley James Furlong
Staff Attorney
Council for Nondalton Tribal Council

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Environmental

Proposed Pebble Project
Environmental Impact Statement

Scoping Comments

JUNE 2018

Proposed Pebble Project Environmental Impact Statement
Scoping Comments

Prepared for

Native American Rights Fund

On Behalf of

Nondalton Tribal Council

and

United Tribes of Bristol Bay

Prepared by

RIDOLFI Inc.

June 2018

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Environmental

EXECUTIVE SUMMARY

The draft scoping comments provided in this document were developed based upon "40 CFR 1501.7 Scoping", "A Citizen's Guide to the NEPA, Having Your Voice Heard (Guide)", Appendix B to 33 CFR Part 325, NEPA Implementation Procedures for the Regulatory Program (Appendix B)", and other references. According to -1501.7, "There shall be an early and open process for determining the scope of issues to be addressed and for identifying the significant issues related to a proposed action. This process shall be termed scoping". The Guide (pages 13-14) states that "The scoping process is the best time (and way) to identify issues, determine points of contact, establish project schedules, and provide recommendations to the agency". The scoping comments provided in this document have been developed to clearly identify issue areas and specific issues (tribal consultation and tribal rights, engineering, science, hydrology, economics, historic preservation, etc.) and to identify critical gaps in data and informational requirements for project evaluation and final decision making. We are providing comments in support of achieving robust scoping and a robust NEPA process upon which to base the development of alternatives, descriptions of the baseline conditions, impact assessments by alternative, and ways to avoid and minimize adverse impacts.

More specifically, the comments provided in this document address both the data and information deficiencies of the Pebble Mine and Associated Facilities Project (Pebble Project) Application for Permit dated December 22, 2017 that was submitted by the Pebble Limited Partnership (Pebble Partnership) to the U.S. Army Corps of Engineers (USACE or Corps) and USACE responsibilities under the National Environmental Policy Act (NEPA), and other applicable environmental and historic preservation laws. A complete, clearly written, and informative permit application is required to inform the Environmental Impact Statement (EIS); however, the permit application that was submitted is, in our view, unclear, not very informative regarding details of the proposed project, and therefore, incomplete.

These comments cover a broad range of issues and support actions that must be taken by the USACE to comply with NEPA. These actions include compiling baseline data and other information needed, developing alternatives, and identifying and evaluating potential impacts as required by USACE regulations for the NEPA EIS process.

The EIS must provide a complete and comprehensive description of the baseline conditions and existing conditions of the project study area, which includes the watersheds of the Nushagak

River, Mulchatna River, Kvichak River, Iliamna Lake and environs, Cook Inlet and environs, and Bristol Bay and environs. The EIS must also provide a complete and comprehensive description of the ecosystem services that are provided by the Bristol Bay and Cook Inlet Watersheds. To comply with NEPA, the EIS must include an ecosystem functions and services evaluation for both pre- and post-project scenarios and an evaluation for a No-Action Alternative.

The size and term of the initial mining area are disproportionately small relative to the investment that will be required to design, permit, and construct the infrastructure needed to support mining operations. This fact indicates a high probability that the initial mining area will be expanded to exploit the ore body that exists beyond this initial mining area; therefore, the direct, indirect, and cumulative impacts of mining in the expansions areas and during the extended time periods must be recognized, quantified, and evaluated in the EIS.

The potentially permanent and long-term adverse impacts to the relatively pristine, fully functioning, and highly productive ecosystems that would be adversely affected by this project, if it is permitted, need to be identified, evaluated, and thoroughly described and disclosed to the public and interested parties in the EIS. The proposed project and its associated impacts pose real and substantial threats to the people of the affected region and to all the people who work there or visit the region for recreation.

The EIS must identify, recognize, and evaluate potential impacts on Native people and communities within the region of the proposed projects. Once impacts to natural resources are evaluated with respect to baseline conditions, the EIS must evaluate the subsequent impact to the people of the region. For example, the Dena'ina know of about 80 plants that are or were eaten and/or used for medicinal purposes. There is probably a like amount used for food or medicine by the Yup'ik (Kari, 1987). The EIS must evaluate the potential for the proposed Pebble Project to impact the use of plants for food or medicine by Dena'ina and Yup'ik people.

As they have in the near and distant past, the indigenous people of the Nushagak and Kvichak watershed villages continue to subsist on wild foods and believe that salmon and clean water are essential to life. Degradation of the subsistence fishery through habitat loss or water contamination through mining operations would have an adverse effect on physical, cultural, and spiritual health of the river and lake villages.

Moose and caribou have particular cultural significance, and a young person's first kill is usually marked by a special ceremony. Spruce is of particular significance and is used for firewood (wood fires supplement oil heat in most homes) and log building construction. Saunas, known locally as steams, neli (Dena'ina), or makai (Yup'ik) are heated by wood and taken at least weekly by most residents of the river villages.

The EIS must address direct, indirect, and cumulative effects on the availability of culturally important vegetation and wildlife to people and communities in the project study area, especially Native people and communities.

The EIS needs to acknowledge that subsistence is a chosen cultural lifestyle with a very long history that is largely not monetized, but a legitimate cultural, spiritual, and economic activity. Subsistence including fishing, hunting, wood gathering, plant and berry collecting is a full-time job, not a hobby or casual pastime. Conducting and benefitting from these activities define tribal cultures, forming the basis for their languages and identity. Thus, impacts to any aspect of that lifestyle is a threat to one's physical, emotional, and spiritual well-being and must be considered in both risk assessment and mitigation. It is unclear how the applicant would propose to mitigate the loss of culture, language and ability to conduct spiritual activities.

The EIS must thoroughly describe the connections of the upper watersheds to the middle and lower portions of the watersheds, including the connections to estuary and marine habitats of Bristol Bay and Cook Inlet potentially affected by the proposed project. These watersheds and marine environments combine to create a unique and irreplaceable ecosystem. The EIS must also evaluate the impacts of the project that would irrevocably damage Bristol Bay's world-renowned salmon runs and commercial salmon harvests, clean life-sustaining water, and unique and wild ecosystem. The EIS must evaluate the impacts on sport fishing in the Nushagak and Kvichak watersheds. The EIS must evaluate the impacts of the proposed project on the indigenous people and communities of the Nushagak and Kvichak watersheds in terms of nutritional, social, and spiritual aspects of a chosen subsistence lifestyle.

The EIS must discuss the Corps' Consultation Plan with Alaska Natives, all tribal governments, and communities that could potentially be affected by the proposed project or that might have resources (e.g., traditional cultural properties, groundwater resources, medicinal plants, etc.) that could be affected. The principles for interactions with Indian tribal governments are outlined in a

presidential memorandum dated April 29, 1994, Executive Order 13175 dated November 6, 2000 (Clinton, 2000), and USACE's own tribal consultation guidance provided by the Headquarters in memorandums from 2005 and 2007. The USACE "Tribal Policy Principles" require pre-decisional, government-to-government consultation in recognition of tribal sovereignty and the Federal trust responsibility. It is vitally important that formal government-to-government consultation take place early in the scoping phase of the EIS for the proposed project to ensure that all issues are adequately identified and subsequently addressed in the EIS.

Executive Order 12898 dated February 16, 1994 directs federal agencies to identify and address the disproportionately high and adverse human health and environmental effects of their actions on minority and low-income populations (Clinton, 1994). Executive Order 13007 dated May 24, 1996 directs federal agencies to accommodate access to and ceremonial use of Indian sacred sites and to avoid adversely affecting the physical integrity of sacred sites (Clinton, 1996). The EIS must address the proposed Pebble Project's disproportionate impacts to Alaska Natives and communities and its impacts to the access and integrity of sacred sites.

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LIST OF ABBREVIATIONS AND ACRONYMS

ABOF	Alaska Board of Fisheries
ABOF	Alaska Board of Fisheries
ADEC	Alaska Department of Environmental Conservation
ADFG	Alaska Department of Fish and Game
ADNR	Alaska Department of Natural Resources
ANSCA	Alaska Native Claims Settlement Act
BAT	Best Available Technology
BAP	Best Available/Applicable Practice
BLM	Bureau of Land Management
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
COI	Communities of Interest
CSM	conceptual site model
CWA	Clean Water Act
CZM	Coastal Zone Management
DA	Department of the Army
DPM	diesel particulate matter
DPS	Distinct Population Segment
AKDNR	Alaska Department of Natural Resources
EA	Environmental Assessment
EAP	Emergency Action Plan
EIS	Environmental Impact Statement
ESA	Endangered Species Act
FMEA	Failure Mode Effects Analysis
HAP	hazardous air pollutant
LEDPA	least environmentally damaging practicable alternative
LGO	low-grade ore
MAC	Mining Association of Canada
MIW	Mining Influenced Water
MPO	Mining Plan of Operations
MW	megawatt
NAAQS	National Ambient Air Quality Standards
nda	No date available
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NOAA	National Oceanic Atmospheric Administration
NOx	nitrogen oxides

NRHP	National Register of Historic Places
ODPCP or "C" Plan	Oil Discharge Prevention and Contingency Plan
Pebble Partnership	Pebble Limited Partnership
Pebble Project	Pebble Mine and Associated Facilities Project
PHABSIM	Physical Habitat Simulation System
PSD	Prevention of Significant Deterioration
SPCC	Spill Prevention, Control, and Countermeasure
TCP	Traditional Cultural Property
TEKW	Traditional Ecological Knowledge and Wisdom
TOMS	Tailings Operation Management and Surveillance
TSF	tailings storage facility
USACE or Corps	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
WCIMA	West Cook Inlet Management Area

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1.0 GENERAL COMMENTS

The proposed Pebble Project, if permitted, would permanently alter and industrialize a vast, pristine, remote and fully-functioning wilderness area, as well as discharge billions of gallons of wastewater, annually, into the surrounding environment, with the potential for pollutants to migrate far beyond the project area. It is not sufficient for the EIS to focus only on the areas of the proposed mine in the headwaters of the Nushagak River and Kvichak River, footprints of associated support structures, and the impacts to a few streams and wetlands in the upper watersheds. Nature does not recognize such artificial boundaries, and in fact, USACE should consider whether the applicant must do hydrological or other modeling on the array of alternatives to inform the selection of the applicants preferred alternative, and USACE's least environmentally damaging practicable alternative (LEDPA), which may be the same, or a different alternative.

The EIS must evaluate the direct, indirect, and cumulative impacts to the entire area of each watershed and the region that would occur as a result of altering, excavating, dredging, filling, dewatering, constructing, and discharging waste water to streams, wetlands, estuarine areas, and marine areas, thereby altering the lands and surrounding aquatic habitats permanently or long term. The EIS must thoroughly describe the connections of the upper watersheds to the middle and lower portions of the watersheds, including the connections to the Iliamna watershed and estuary and marine habitats of Bristol Bay and Cook Inlet. These watersheds and marine environments combine to create a unique and irreplaceable ecosystem. The EIS must evaluate the impacts of the project that would permanently damage Bristol Bay's world-renowned salmon runs, wildlife populations, clean water, and unique and wild ecosystems.

Many of the waterbodies in these watersheds are likely to be significantly adversely impacted, wildlife habitat and migratory corridors will be significantly fragmented by this project, and these impacts and resulting fragmentation of the ecosystem will likely continue permanently and be compounded during subsequent phases of mine expansion and additional mine developments. There are 25 additional mining claims in this region that have the potential to be developed once the industrialization of this region begins; therefore, the current conditions of the entire ecosystem of the Bristol Bay Watershed and Cook Inlet, including indigenous subsistence communities, plants, animals, marine and riverine surface waters, groundwater, sediments, soils, and air must be adequately documented in baseline condition studies, and the quality of these natural resources needs to be evaluated, quantified, and properly documented.

The proposed Pebble Project, as described in the permit application, includes at least four major projects, plus several smaller components that are imbedded within the four major projects. These projects cover a massive area of land and several watersheds, including estuaries and marine areas, and collectively pose great potential for significant long-term and permanent direct, indirect, and cumulative impacts on the environment. Although this initial permit application covers an extensive area, it only represents "a foot in the door," since if this project were permitted, it would open the door to mine expansion and additional mine developments throughout the region, and such expansion would greatly increase the cumulative affected area over time. NEPA requires federal agencies to evaluate complete projects, and on the surface, it appears that this applicant may be inappropriately segmenting the project.

A summary of the projects and components that comprise the proposed Pebble Project, as currently described in the permit application, is provided below:

- A 188-mile natural gas pipeline from the Kenai Peninsula across Cook Inlet to the mine site with compressor stations on the Kenai Peninsula and at the Amakdedori Port;

- A 15-square-mile footprint for the mine site including an open pit with ultimate dimensions of 6,500 feet in length, 5,500 feet in width, and 1,350 to 1,750 feet in depth excavated into the natural habitat and undisturbed geology of the area and potentially discharging wastewater into the surrounding wetland habitats and watersheds (waters of the United States);

- An 83-mile transportation corridor from the mine site to a year-round port site located on Cook Inlet near the mouth of Amakdedori Creek that contains:

    - A 30-mile private double-lane road from the mine site to a ferry terminal on the north shore of Iliamna Lake;
    - An 18-mile lake crossing that includes an ice breaking ferry and a ferry terminal on the south shore of Iliamna Lake;
    - A 35-mile private double-lane road from the ferry terminal on the south shore of Iliamna Lake to the Amakdedori Deep Water Port; and
    - Spur roads from the transportation corridor to the communities of Iliamna, Newhalen, and Kokhanok;

- A deep-water port facility (Amakdedori Deep Water Port) on the western shore of Cook Inlet with a jetty with docking for both handysize bulk carriers and supply barges:
    - Bulk carriers with deadweight up to 50,000 tonnes (55,125 tons); and
    - Annual traffic of 25 concentrate vessels and 25 supply barges;

- Operating estimates for the first phase of the proposed Pebble Project include:
    - A lifespan of 20 years;
    - A total of 1.2 billion tons of material mined;
    - A mining rate up to 90 million tons per year;
    - A milling rate up to 58 million tons per year;
    - An annual copper-gold concentrate production of 600,000 tons;
    - An annual percentage of copper-gold to total ore mined is 0.7 percent;
    - An annual molybdenum concentration production of 15,000 tons;
    - A final tailings storage facility (TSF) capacity of 1.1 billion tons;
    - A peak low-grade ore (LGO) storage capacity of 330 million tons;
    - A power plant generating capacity of 230 megawatts (MW);
    - A project operating schedule of two 12-hour shifts per day for 365 days per year; and
    - Employment of 850 to 2,000 personnel for operations and construction, respectively.

The EIS must evaluate each of the four major projects and their components to thoroughly and appropriately assess their potential direct and indirect impacts to aquatic and terrestrial resources in the Bristol Bay and Cook Inlet Watersheds both for initial construction and then for the 20 years of operation. The EIS must also address what will happen at the end of the project life, describe how the landscape be remediated and reclaimed, and identify and describe impacts that can never be remediated or mitigated. Moreover, the EIS must pay careful attention to the proposed projects synergistic cumulative impacts. As discussed below, it is more than probable that permitting the Pebble Mine as now conceived will lead to future mine expansion into ore reserves that are not included in this initial phase of the mine plan and to exploitation of these reserves and other ore deposits in the region by other parties. The pattern of reasonably foreseeable, if not inevitable, cumulative impacts arising from these mine expansions and additional mine developments must be recognized and evaluated carefully in the EIS.

The EIS must recognize, quantify, and evaluate the direct, indirect and cumulative effects on the environment of shipping of concentrates and the potential impacts of fuel and concentrate spills.

The EIS must identify, quantify, and evaluate the potential impacts to airports and communities affected by increased air traffic and use of airports in the region.

The EIS must also address the synergistic effects of the project, if permitted, with the effects of climate change, sea level rise, seismic activity, extreme weather, culture change, and socioeconomics; and explore whether and how these synergisms could be addressed in the design, construction, and operation of the infrastructure and mine facilities throughout the mining lifecycle and throughout the region.

1.1 Permit Application Technical Completeness

Based on our review of the Application for Department of the Army (DA) Permit (Permit Application POA-2017-271) dated December 22, 2017, the Application is not complete. Until the information required in a complete permit application is provided, the NEPA process associated with the Pebble Project should not proceed.

Our review of the Pebble Project Application for Permit using 33 CFR § 325.1(d)(9) concluded the following:

- The Permit Application is not complete and therefore not adequate to inform an EIS. For example, the description of the proposed activity is lacking in detail and unclear, drawings/sketches are insufficiently detailed for the public to meaningfully comment, and the location and dimensions of the proposed project and appurtenant facilities are evolving without the benefit of a completed scoping process;

- The Permit Application does not address cumulative impacts to the affected watersheds;

- Baseline environmental information provided in the Permit Application is insufficient and inadequate to support identification and evaluation of potential impacts to ecosystems, natural resources, and cultural resources;

- Long-term impacts, losses of natural resources, and mitigation measures to address these impacts are not discussed in the Permit Application; and

- The size and term of the initial mining area are disproportionately small relative to the investment that will be required to design, permit, and construct the infrastructure needed to support mining operations.

Following the submittal of a permit application for any major project that is to undergo an environmental evaluation such as an EIS, it is customary for the application to be reviewed for both technical and administrative completeness. With the Pebble Project permit application, the permit completeness review process ended abruptly, and the Corps did not request supplemental information from the applicant as necessary to make the application more complete.

The Corps could have asked the applicant to provide additional information to assess environmental impacts or resolve public interest concerns. The Corps could have also asked the applicant to modify the project to reduce environmental impacts. With the Pebble Project permit application, no additional information was provided to assess environmental impacts or resolve public interest concerns. In addition, no public notice was issued within 15 days of the USACE receiving the application, to solicit comments from the public, adjacent property owners, interested groups and individuals, local agencies, state agencies, or other Federal agencies.

It's our understanding that federal and state agencies and the public have not been afforded the opportunity to comment on the baseline environmental document that was prepared for the proposed Pebble Project. Until the required baseline information is available to state and federal agencies and the public, and until the body of baseline information is determined technically and administratively complete, an adequate assessment of potential impacts from the proposed Pebble Project cannot be conducted.

Regarding the Pebble Project Permit Application, the USACE published a Public Notice of Application for Permit on January 5, 2018. According to the notice "The Corps has determined and notified the applicant that an EIS level of analysis will be required for the review of the . . . Permit application. As such, the Corps will conduct public scoping after publishing a Notice of Intent to develop an EIS in the federal register." Based on these statements in the Public Notice, it appears the USACE has initiated Step 5, which suggests they have deemed the application to be complete, apparently without requiring any additional information prior to initiating the NEPA EIS process.

The Pebble Project Permit Application is available on the USACE website. What the Pebble Partnership has initially provided to the USACE, at least as reflected on the website, is a bare-bones application with no supporting information or documentation that would typically result in an extensive information request from the permitting agency prior to deeming the application complete. Given the timing between the submission of the application on December 22, 2017 and the Corps Public Notice of Application for Permit dated January 5, 2018, the USACE had very limited time to ensure the completeness of the application prior to proceeding to the NEPA EIS process.

One way to determine the additional documentation that should have been provided and will still need to be provided is to search the application for all mention of supporting materials such as "reports," "plans," and "models." Another is to compare it to a robust technical completeness review conducted by another agency. These comparisons are both performed in the following sections.

The mining industry has typically tended to submit applications with limited information, viewing the approach as not volunteering complete information for regulatory or public review. However, there have been exceptions where companies volunteered substantially complete applications to begin with. In general, the trend has significantly moved towards providing complete documentation prior to initiating environmental analysis, both because it is clearly necessary for the analysis, but also because it expedites the NEPA process. It does require coordination by the proponent and the permitting agency in compiling the necessary information and preparing plans prior to the permit application being submitted, but where it has been done, it usually results in a significantly shortened NEPA process, saving time and costs for taxpayers and the applicant.

Recently there has been a shift back to providing applications with limited, information, study results, or plans, essentially deferring the development of those studies and plans until later in the EIS process. Regulatory agencies have been willing in many cases, although in an inconsistent manner, to allow for applications of that nature to proceed into the NEPA process. This acceptance of incomplete permit applications has been a major factor in leading to the delays that have occurred in many NEPA processes.

Where this becomes particularly problematic is in cases where efforts are being made to expedite the NEPA process, such as is the case with the Pebble Project. If the USACE initiates the NEPA process without a complete permit application, and at the same time expects or is

required to expedite the NEPA process, then the process will be shortchanged, and it will probably detrimentally affect the participation and involvement of Tribes, as well as public stakeholders.

1.1.1 Missing Documents and Materials in the Permit Application

Documents and materials that should have been provided in the permit application are missing from the permit application. The Permit Application is not complete and therefore not adequate to inform an EIS.

A list of reports, models, and plans was developed by searching the Pebble Project permit application. This list is provided below. The Corps should have required this information at the minimum for the permit application to be determined complete, and they should have reviewed the individual supporting documents for completeness as well. Additionally, this list must be considered incomplete, since the project proponent has probably not identified all the reports, plans, field studies, and models needed to fully inform the EIS process.

The completeness review, part of the typical permit application review process, does require a substantial level of effort given the status of the current permit application. This review is typically done by the permitting agency in collaboration with a multi-disciplinary team. The following information should have been requested in a first deficiency review letter from USACE to the project proponent. The USACE's failure to perform a completeness review, identify the deficiencies in the permit application, and request missing information in a deficiency letter is itself a major deficiency in the permitting process that creates a disorderly and incomplete administrative record and has the potential to lead to an inadequate NEPA EIS process.

Some the specific deficiencies that could be readily identified for each area of the permit application as it pertains to these scoping comments include:

<u>Reports</u>

The application refers to The *Pebble Project Environmental Baseline Document 2004 through 2008* (Pebble Partnership, 2011), which is available online at www.pebbleresearch.com.

This reference implies that certain baseline environmental information is available to support the permit application; however, there is very little information available in this document, and the information that is missing results in a technically incomplete and inadequate permit

application. This incomplete permit application cannot support the NEPA EIS process that the USACE initiated on April 1, 2018.

It's our understanding that the *Pebble Project Environmental Baseline Document 2004 through 2008* has not been reviewed by federal or state agencies or the public. A technical work group reviewed the document during development and found that the baseline work was insufficient and conclusions in the document were not adequately supported by fact. This indicates that substantial baseline work needs to be completed, and the resulting baseline information needs to be compiled and documented in the EIS before an adequate assessment can be conducted of potential impacts from the proposed Pebble Project.

The Pebble Project supplemental baseline data reports (2009-2013) is identified but not provided.

Models and Modules

The following models and modules were identified but not provided in the permit application:

- Water Balance Model;
- Instream fish habitat-flow model;
- Surface water temperature model;
- Watershed Module for the North Fork Koktuli, South Fork Koktuli, and Upper Talarik Creek drainages;
- Groundwater Module;
- Mine Plan Module;
- Physical Habitat Simulation System (PHABSIM) Instream-flow Model; and
- Reclamation and closure cost model.

Plans

The following plans were identified but not provided in the permit application:

- Comprehensive water management plan;
- Sediment control plan;
- Stormwater discharge pollution prevention plan;
- Facility response plan;
- Reclamation and Closure plan;
- Spill Prevention, Control, and Countermeasure (SPCC) Plan;
- Waste Management Permit/Plan; and
- Oil Discharge Prevention and Contingency Plan (ODPCP or "C" Plan).

1.1.2 Inadequate Data, Analysis and Information

It is not clear why an incomplete permit application did not result in an extensive information request from USACE to address the deficiencies. It is also not clear why an incomplete permit application would warrant the initiation of the NEPA EIS process.

On December 22, 2017, the Pebble Partnership submitted a bare-bones permit application to the USACE. This permit application is incomplete with several essential reports, modules, models, and plans omitted. Such an incomplete application would typically result in an extensive information request from the permitting agency prior to deeming the application complete and beginning the NEPA EIS process. The USACE should have conducted a thorough completeness review and notified the project proponent in writing that the permit application is incomplete. A deficiency letter from the USACE to the project proponents should have included a listing and description of additional information needed in the permit application. These actions were not taken by USACE, and on January 5, 2018 USACE published the Public Notice of Application for Permit in which they stated, "The Corps has determined and notified the applicant that an EIS level of analysis will be required for the review of the…Permit application. As such, the Corps will conduct public scoping after publishing a Notice of Intent to develop an EIS in the federal register." This indicated that the USACE was prepared to begin the NEPA EIS process with the incomplete permit application as a basis to assess and evaluate potential impacts if the project were to be permitted.

1.1.3 Alternatives Analysis

The EIS must include an alternatives analysis for each component of the proposed Pebble Project and for the project overall. Each alternative should consider both Best Available Technology (BAT) and Best Available or Applicable Practice (BAP). These concepts have most commonly been described for tailings storage facilities, but the same fundamental approach can be used as a measure of risk management for all mining facilities including in this case the waste rock disposal facilities and the open pit mine.

Although these concepts were not introduced in the permit application, such concepts must be included in the EIS and discussed with the affected tribes in government-to-government consultation.

The Mining Association of Canada (MAC) promotes the mining industry internationally and works with governments on policy development. As part of its Toward Sustainable Mining

initiative, MAC has developed guidance for the management of tailings facilities (MAC, 2017). In this guidance, MAC defines BAT and BAP as follows:

"BAT is the site-specific combination of technologies and techniques that is economically achievable and that most effectively reduces the physical, geochemical, ecological, social, financial, and reputational risks associated with tailings management to an acceptable level during all phases of the life cycle, and supports an environmentally and economically viable mining operation.

BAP encompasses management systems, operational procedures, techniques and methodologies that, through experience and demonstrated application, have proven to reliably manage risk and achieve performance objectives in a technically sound and economically efficient manner. BAP is an operating philosophy that embraces continual improvement and operational excellence, and which is applied consistently throughout the life of a facility, including the post-closure period."

For new facilities, performance objectives and the management of potential risks are key drivers at the conceptual planning and early design phases, which coincides with the permit application phase. The selection of the most appropriate waste facility management technology and facility location and using rigorous decision-making tools to assess alternatives, provides the foundation for future risk management and achieving performance objectives. At the design phase, consideration must also be given to BAP that could be applied throughout the life cycle of the facility.

MAC 2017 provides additional information on BAT and BAP in addition to an appendix that provides information on a process to assess alternatives. The process, which must include multiple stakeholders and be conducted outside of the EIS process to ensure participation by stakeholders other than "cooperating agencies. "As an example, specific guidelines for alternatives assessment consistent with MAC 2017 are provided below:

1. Identify performance objectives, describing how the waste disposal facility is expected to perform throughout the entire life cycle, including the long-term closure objectives and post-closure land use;

2. Identify possible (i.e., reasonable, conceivable, and realistic) alternatives, avoiding a priori judgments about the alternatives;

3. Pre-screen possible alternatives to eliminate from further consideration any that would not meet the performance objectives or otherwise have characteristics that would be "show-stoppers." This step is also referred to as fatal-flaw analysis;

4. Assess remaining alternatives using multiple accounts analysis or a similar decision-making tool;

5. Conduct a sensitivity analysis to test the robustness and validity of the outcomes of the detailed assessment of alternatives against various biases and assumptions. Despite efforts to make the assessment of alternatives as objective as possible, there will be biases and perceived biases in the process. For example, the assessment could be re-done without consideration of project costs, to see the impact of removing consideration of costs on the outcome; and

6. Document the results in a comprehensive technical report.

There are several aspects that are important for an effective alternatives assessment:

- The alternatives assessment must consider a wide range of factors and be conducted by an interdisciplinary team consistent with the unique conditions for the proposed Pebble Mine. This team typically includes geologists, geotechnical engineers, fisheries biologists, hydrologists, archaeologists, cultural anthropologists, specialists in cultural resources and Indigenous communities, specialists in traditional ecological knowledge, social scientists, and economists;

- Team members must be objective and open minded, both to each other, and to the outcome of the process. Having a pre-conceived notion of the "right" answer can bias results. The team members need to respect the alternatives assessment process;

- Team members must collect and consider a broad range of information, examples of which are provided in MAC 2017 Appendix 3.1;

- External input is required through the steps described above. Input of Communities of Interest (COI), including regulators, informs the process, and Independent Reviewers must also be engaged;

- Alternatives must be assessed and documented using a rigorous, transparent decision-making tool, such as multiple accounts analysis, as described in MAC 2017; and

- Given the need to select both a location and BAT, the process will require several iterations.

The EIS must rigorously explore and objectively evaluate reasonable alternatives and whether such alternatives fall within the jurisdiction of the USACE. The EIS must provide a clear discussion of the reasons for the elimination of alternatives that were not thoroughly evaluated and supported by a robust and substantive alternatives assessment.

The EIS must discuss potential environmental impacts of the alternatives in comparative form as necessary to clearly define the issues among the alternatives for decision makers and the public. Reasonable alternatives could include, but are not necessarily limited to, alternative siting, designs, or configurations for major mining facilities (such as underground mining rather than open pit), tailings storage facilities, access roads, or storage ponds; a smaller project wherein only some of the proposed actions are approved; and modifications to the proposed reclamation and closure methodologies and timelines. The EIS must discuss the alternatives in the context of the USACE authorities under the Clean Water Act (CWA), the Organic Act, the Federal Land Policy and Management Act, and other relevant statutes and regulations.

1.2 NEPA EIS Requirements

To comply with NEPA (42 U.S.C. § 4332) and Council on Environmental Quality (CEQ) Regulations for Implementing the Procedural Provisions of NEPA (40 CFR §§ 1500 – 1508), the EIS must consider

". . . all factors which may be relevant to the proposal…including the cumulative effects thereof; among those are conservation, economics, aesthetics, general environmental concerns, wetlands, historic properties, fish and wildlife values, flood hazards, floodplain values, land use, navigation, shoreline erosion and accretion, recreation, water supply and conservation, water quality, energy needs, safety, food and fiber production, mineral needs, considerations of property ownership and, in general, the needs and welfare of the people.'' (40 CFR §§ 1500 – 1508)

The EIS must acknowledge that the potential effects of the proposed actions on the quality of the human environment are highly controversial, and involve unique and unknown risks. The EIS must recognize "reasonably foreseeable future action" and acknowledge and evaluate the probability that if the proposed phase-one project is permitted, the initial permitting of a small fraction of the ore reserve will establish a precedent for future mine expansion and additional

mine developments that will proportionally increase and magnify the adverse effects associated with constructing and operating large-scale mines and mine facilities in this region.

1.2.1 Compliance with USACE Regulations and Federal and State Environmental Laws

The USACE regulatory program needs to follow the NEPA implementation process outlined in 33 CFR Part 230, Corps NEPA regulations, and CEQ regulations in 40 CFR §§ 1500-1508.

If the NEPA process for the proposed project proceeds through the EIS, the USACE must adhere to the EIS process guidance, Appendix B of Part 325—NEPA Implementation Procedures for the Regulatory Program.

The Scope of Analysis must consider which other federal agencies are appropriate to engage in reviewing the proposed Pebble Project and take appropriate federal action under the Fish and Wildlife Coordination Act, National Historic Preservation Act (NHPA) of 1966, Endangered Species Act (ESA) of 1973, Executive Order 11990, Protection of Wetlands, and other applicable environmental review laws and executive orders. The NEPA process must capture the ultimate extent of the entire proposed Pebble Project, subprojects, and components to include direct, indirect, and cumulative impacts on all federal interests within the purview of the NEPA statute. The USACE must incorporate by reference and rely upon the reviews of other federal and State agencies.

Scoping must be an open process and follow guidance set forth in 40 CFR § 1501.7 Scoping. Any time limits prescribed on the NEPA process must be consistent with the purposes of NEPA and other essential considerations of national policy.

To the extent that the Corps relies on information provided by the applicant or a consultant employed by the applicant, the Corps must provide an independent evaluation as to the accuracy and adequacy of that information, document in the record the Corps independent evaluation of the information and its accuracy, and include the names of the persons responsible for the independent evaluation in the list of preparers (40 CFR § 1506.5).

If the Corps elects to assign preparation of all or parts of the EIS to a contractor that also provides services to project proponents, the Corps must consult with cooperating agencies to avoid any conflict of interest. Such a conflict of interest leads to a draft EIS that is biased in support of the proposed project, rather than a draft EIS that thoroughly and objectively

identifies, recognizes, and evaluates all potential impacts associated with the intense land use that a large mine and its support facilities pose.

1.2.2 Bonding, Financial Assurance, and Economic Information

Financial assurance and bonding required for the proposed Pebble Project must be adequate to address mine reclamation and closure activities and mitigate potential cumulative impacts from the initial phase-one project and the probable mine expansion and additional mine developments that would result from the initial phase of mining. The plans and estimates developed to support the reclamation bonds and financial assurance must assume that the operator will be unable to fulfill its responsibilities for mine reclamation, mine closure, long-term maintenance, long-term monitoring, and long-term water treatment at the end of the project. Consequently, financial provisions must be made for the State of Alaska to assume this responsibility and conduct mine reclamation; mine closure; and long-term maintenance, monitoring, and water treatment. Therefore, cost estimates, funding mechanisms, and financing options must be conservative, more secure, and lower risk to ensure that adequate resources will be available to meet post-mining requirements.

Adequate attention must be given to secure adequate financial assurance for the proposed Pebble Project. This is extremely important for such a large-scale and likely environmentally damaging project. Funding for this project, if permitted, must be conservative and on the scale to address the large-scale environmental issues, reclamation, mine closure activities, and unforeseen environmental accidents or releases that may result from the project.

1.3 Mitigation Plans and Effectiveness

To comply with NEPA, the EIS must identify, recognize, and thoroughly evaluate each potential impact and describe proposed mitigation measures associated with that impact. Furthermore, the EIS must address how each mitigation measure would specifically address the targeted impact, provide substantial detail on the means of implementing each mitigation measure, identify who would be responsible for implementing the measure in both the short-term and long-term, indicate whether the measure is enforceable, and describe its anticipated effectiveness.

Regarding roles and responsibilities, the EIS should confirm that USACE will review and approve or disapprove the applicant's mitigation plan, the applicant will implement the plan, and USACE will monitor and enforce the requirements of the plan.

For some impacts, there may be multiple appropriate and effective measures. Conversely, some measures may turn out to be less effective than anticipated; therefore, implementation and effectiveness monitoring must be conducted, and contingency measures must be included and described in the EIS. For each affected area and potential impact, the EIS must describe the specific mitigation implementation thresholds, any mitigation implementation and effectiveness monitoring deemed necessary, and the criteria by which success would be determined once mitigation is fully implemented. Furthermore, for some mitigation measures, it may be necessary to describe the contingency planning and adaptive management options in place in the event that mitigation is found to be less than fully successful.

Although it should always be considered, mitigation measures for impacts to subsistence communities are not always planned for in these types of projects. Mitigation measures and planning documents must consider measures to address the impacts on subsistence communities with respect to their nutritional dependence on wild salmon and other wild species when these traditional subsistence foods or sacred waters are impacted. The impacts to traditional and cultural food and water sources will have social, cultural, and spiritual impacts on people living a subsistence lifestyle.

1.4 2014 USEPA Section 404(c) of the Clean Water Act Determination

In 2014, the U.S. Environmental Protection Agency (USEPA) issued a proposed determination pursuant to Section 404(c) of the CWA for the Pebble Deposit Area, Southwest Alaska (USEPA, 2014b) to restrict the use of certain waters in the Bristol Bay watershed for disposal of dredged or fill material associated with mining the Pebble deposit. The proposed determination was based on USEPA authorities under the CWA and peer-reviewed scientific and technical information. The proposed determination was issued because of the high ecological and economic value of the Bristol Bay watershed and the assessed unacceptable environmental effects that would result from mining activities such as those proposed in the Pebble Deposit Area. The findings of this proposed determination have not changed and should be fully considered in the EIS for the proposed Pebble Project.

1.5 Effect of the Proposed Project on Native People and Communities

The EIS must identify, recognize, and evaluate potential impacts on Native people and communities within the region of the proposed projects. Once impacts to natural resources are evaluated with respect to baseline conditions, the EIS much evaluate the subsequent impact to

the people of the region. For example, the Dena'ina know of about 80 plants that are or were eaten and/or used for medicinal purposes. There is probably a like amount used for food or medicine by the Yup'ik (Kari, 1987). The EIS must evaluate the potential for the proposed Pebble Project to impact the use of plants for food or medicine by Dena'ina and Yup'ik people.

2.0 CUMMULATIVE IMPACTS

One of the primary goals of NEPA is to foster informed decision making by ensuring that the permitting agency, in reaching its decision, will have available and will carefully consider detailed information concerning environmental impacts. This interdisciplinary review must include a systematic and thorough evaluation of the direct, indirect, and cumulative effects of each potential impact. This evaluation must include ecological, aesthetic, historical, cultural, economic, social, and health effects.

The NEPA process requires that an agency discuss the environmental effects of a proposed action in the EIS. The implementing regulations under NEPA define environmental effects to include both direct and indirect effects of a proposed action, as well as cumulative effects. The "direct effects" of a proposed action are those that are caused by the action and occur at the same time and place. The "indirect effects" are caused by the action at a later time or at a greater distance, but these indirect effects are still reasonably foreseeable. The indirect effects must 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, water, and other natural systems, including ecosystems. A cumulative impact results from the incremental impact of the project when added to other past, present, and reasonably foreseeable future actions regardless of the agency, person, or entity that undertakes such other actions.

A cumulative impact analysis must include the information listed below; however, the analysis must be tailored to the project, and it need not be limited to these areas of concern:

- Areas in which the effects of the proposed Pebble Project would be felt;
- Impacts that are expected in the project area from the proposed Pebble Project;
- Other actions—past, present, proposed, and reasonably foreseeable—that have had or are expected to have impacts in the same areas as the project;
- Impacts or expected impacts from these other actions; and
- Overall impact that can be expected if the individual impacts are allowed to accumulate.

Actions or conditions that must be included in this analysis include climate change effects and the impacts of global climate change. Specifically, the NEPA process must include: (1) the potential for federal actions to influence global climate change (e.g., increased emissions of greenhouse gases); and (2) the potential for global climatic changes to affect federal actions

(e.g., feasibility of coastal projects in areas affected by greater sea level rise and greater storm surges or changes in precipitation patterns which might affect water management).

Understanding cumulative impacts can illuminate opportunities to reduce the threats posed by these impacts. The EIS must describe the potential cumulative impacts associated with the proposed project and each alternative, as well as the methodology used to assess these impacts. This description would include consideration of project impacts in the cumulative context of any and all impacts associated with the proposed Pebble Project, including impacts related to mine expansion, additional mine developments, and associated infrastructure development in the affected areas.

2.1 Areal Scope of Analysis for the EIS

The areal scope of analysis for the EIS must embrace the entire Bristol Bay region as well as all areas within the Cook Inlet region potentially affected by the proposed project. The EIS must consider not only the predictable direct and indirect effects of the current proposal but the potential effects of mine expansion and spin-off mine developments. The study area should not be characterized in the passive language proposed by the USACE ("Project Setting, etc."), but as what it actually is: the area within which impacts can be predicted, and hence the area within which such impacts must be identified, recognized, and evaluated.

The watersheds of the Nushagak, Mulchatna, and Kvichak Rivers are currently relatively pristine, providing sustenance to the plants, fish, terrestrial fauna, and human populations of the Bristol Bay region. Although the initial mining area of the proposed Pebble Project has been reduced in scale relative to previous proposals, it is highly predictable that if permitted, the initial mining area will expand over time to exploit the entire ore deposit that is contiguous to this initial mining area. This first phase of mine development will more than likely spawn additional mining projects – mines, processing facilities, waste dumps, roads, power plants, worker communities, and so on in the region. Each new permit application (where permits are required) may be justified in part by the fact that the environment has already been adversely impacted by previous mining projects. Many of these mining developments that spin-off from the initial phase of the proposed Pebble Project may not even require substantive environmental review, either because federal law will not apply to them or because they are categorically excluded from such review by the NEPA procedures of the USACE and other federal agencies.

2.2 "Foot-in-the-Door" Approach to Mine Permitting

The initial mining area of the proposed Pebble Project has been scaled-down relative to past proposals. If this scaled-down version is permitted, constructed, and operated; the mine will probably be expanded in the future to exploit the much larger ore deposit that lies just beyond the initial permit area.

The current permit application for the proposed Pebble Project is a "foot-in-the-door" approach to mine permitting and development of this region. However controllable the Pebble Project's direct effects may be, these direct impacts will inexorably lead to further mining-related development within the Nushagak, Mulchatna, and Kvichak watersheds, and result in additional impacts on the natural and sociocultural environments of the entire Bristol Bay region. These impacts will be "essentially products of the USACE permit action" (33 CFR § 325 Appendix B § 7(b)(2)).

The EIS must address impacts of: (a) this proposed phase-one mine; and (b) expanded mining to exploit the entire complex of ore-producing geological bodies within the watersheds of the Nushagak River, Mulchatna River, Kvichak River, Iliamna Lake and environs, Cook Inlet and environs, and Bristol Bay and environs.

The EIS process for the proposed Pebble Project must thoroughly identify and evaluate all the direct, indirect, and cumulative impacts from the proposed phase-one mine and the logical, predictable, and very likely inevitable expansion of mining on the entire Bristol Bay study area.

2.3 Industrialization of the Bristol Bay Study Area

The currently proposed permitting decision must not be analyzed as though it is a one-off event; it must be recognized as the first of a series of linked actions that, once permitted to begin, would thoroughly transform and adversely affect the environment within which this series of actions takes place. The decision whether to issue a permit must be based on a thorough evaluation of the probable impacts, including cumulative impacts, of the proposed activity on the public interest (33 CFR § 325.3(c)).

The proposed Pebble Project is a textbook example of the fact that – in the words of the CEQ: "The most devastating environmental effects may result not from the direct effects of a particular action, but from the combination of individually minor effects of multiple actions over time" (CEQ, 1997). The "multiple actions over time" that are likely to cascade from a decision to

permit the proposed Pebble Project are not necessarily "minor" in terms of their likely effects, but the CEQ's point is still very relevant.

2.4 Proposed Road System

This project and its combined components cover a large area from the headwaters to the marine environments of several major watersheds including the Nushagak and Kvichak watersheds and Cook Inlet. The project area is larger than the area of the project that the USEPA has already determined poses unacceptable impacts to the Bristol Bay watershed and the natural resources it supports (USEPA, 2014b). The road system alone has the potential to devastate the existing fisheries and the habitats on which fish rely. Heavily roaded, bridged, and culverted watersheds in the lower 48 states provide a good example of how this type of development can negatively impact salmonids and aquatic resources. Based on the permit application, the road system needed for the proposed Pebble Project includes eight bridges, crosses two major rivers, and calls for 222 culverts crossing fish bearing and non-fish bearing streams. Given the nature of the wetlands and stream-filled watersheds, it's highly probable that the road system will require substantially more of this infrastructure than this preliminary estimate indicates.

The road system, gas pipeline, and fiber optics network needed for the proposed Pebble Project will require horizontal directional drilling under and along waterbodies. This type of drilling generally requires compliance with regulatory and permitting conditions for work in and around waterbodies. Information regarding the work needed to install this infrastructure and the permitting and regulatory requirements must be provided in the EIS, and the EIS must evaluate the direct, indirect, and cumulative impacts of these construction activities. The EIS must also provide well-documented information about the impacts of roads and infrastructure on salmonids and other aquatic and terrestrial resources and habitats including migratory corridors and flyways. The construction operation of these roads will result in significant long-term impacts and permanent impacts on wildlife, especially brown bears, through habitat fragmentation and increase interaction with humans. These potential direct, indirect, and cumulative impacts on these aquatic and terrestrial resources and migration routes must then be evaluated with respect to the resulting impacts on the people and communities that depend on these resources for subsistence and to sustain their way of life.

To the extent that the impacts from the road systems adversely affect fish and wildlife, the resulting sociocultural-economic impact on the communities and people of the region must be recognized, quantified, and evaluated in the EIS.

3.0 ENERGY AND POWER GENERATION

3.1 Natural Gas Availability and Economics

The project's demand for natural gas and other fuels needed to power the project must be quantified, and the potential socio-economic impact on the communities and people of the region must be evaluated.

The project's demand for natural gas to power its operations must be compared to the existing supply of and infrastructure for natural gas in the region. The EIS must consider the impact to natural gas availability regarding the potential high demand of natural gas for the Donlin Gold mine in the Kuskokwim River drainage where a 315-mile long 14-inch steel pipeline is proposed to transport gas from the Cook Inlet region to the project site (NOVAGOLD, 2015). The EIS must also consider the impact to natural gas availability with respect to the Nutrien (formerly Agrium) North Kenai urea fertilizer facility (Cashman, 2018). Projections of future demand, both peak demand and long-term base needs, must be quantified, and the economics (cost and financing) of providing this long-term supply must be quantified and evaluated. In addition to the new pipelines, the location and specifics of the pumping and compressing stations that will be needed must be provided in the EIS. The financial resources needed to operate and maintain the natural gas supply system and proposed 230 MW power plant must be provided, and the potential socio-economic impacts of this new power-generating system on the region must be evaluated.

3.1.1 Environmental Impacts

The potential impacts to the environment and people of the region from the construction, operation, and maintenance of the new natural gas pipelines, pumping and compressing stations, and associated infrastructure must be identified and evaluated in the EIS.

New natural gas sources might need to be developed to meet the increased demand of the proposed project. The demand and potential need for new sources needs to be acknowledged, quantified, and evaluated in the EIS, the potential impacts of developing new natural gas sources must be evaluated in the EIS.

Such potential impacts include, but are not limited to, ecological impacts during construction, impacts of system failures (cracks, breaks, leaks, corrosion, etc.) during operation, and impacts from transportation to access the pipelines and pump stations for inspections and maintenance.

3.1.1.1 Water Quality

The 230-MW power plant, pumping and compressing stations, and associated infrastructure will generate excess heat and will be cooled with surface water. This water will be returned to the environment. The impacts of releasing this excessive heat to surface waters must be quantified and evaluated.

The potential environmental impacts to salmon, other salmonids, and wildlife must be identified and evaluated. The demand for cooling water must be quantified. The water rights that Pebble Partnership will need to take this water must be identified. The permits that Pebble Partnership will need to release cooling water into the environment must be identified. The potential impacts of taking water from the natural system and discharging water of higher temperature must be quantified and evaluated.

3.1.1.2 Air Quality

The new 230-MW power plant and natural gas supply system will result in increased emissions to the atmosphere. These emissions must be identified and quantified, and the potential impacts to air quality must be evaluated.

Evaluation of the emissions from natural gas combustion must include carbon dioxide emissions and the type of power plant used and its efficiency. Combustion of natural gas also produces nitrogen oxides (NOx) and contributes to smog, acidification of precipitation, and tropospheric ozone. These emissions must be considered along with other "criteria pollutants." Leakage and loss of natural gas must be included in the EIS evaluation. Climate change impacts due to natural gas emissions (including leakage and burning) from the Pebble Project must be quantified and evaluated in the EIS.

3.1.2 Increased Power Demand

The proposed 230-MW gas-fired power plant would greatly increase the total demand for electric power in the region. The impacts from the increased power demand must be quantified and evaluated.

The existing electrical grid probably does not have the capacity to support increased generation to meet the additional demand of the proposed project; therefore, the EIS must recognize, quantify, and evaluate generation capacity and increase demand for electrical power. The

potential impacts that would result for changes to the electrical system must be quantified and evaluated in the EIS.

This additional electrical power would probably feed into the grid and go back out as needed to power the proposed Pebble Project. The base load and peak load for the project must be quantified, and the potential impacts of pulling this power off the grid must be evaluated.

In addition to increased demand on the electrical grid, sourcing additional natural gas from the Kenai Peninsula will also have added impacts associated with its extraction and transport. These impacts must be recognized, quantified, and evaluated in the EIS.

3.2 Diesel Fuel Backup Power Systems

Although natural gas is the preferred fuel for power generation, diesel fuel backup power systems would probably be required. The impacts from backup power systems must be recognized, quantified, and evaluated in the EIS.

Diesel fuel backup power systems must be described and the projected diesel fuel demand and usage must be quantified. Potential impacts from diesel handling, storage, and burning must be identified, quantified, and evaluated. The requirements for and cost of fuel storage, spill response, transportation, and maintenance to support diesel generators must be quantified and evaluated.

4.0 WATER RESOURCES

The EIS must provide a complete and comprehensive description of the baseline and existing conditions of Bristol Bay and Cook Inlet watersheds. The EIS must also provide a complete and comprehensive description of the ecosystem services that are provided by the Bristol Bay and Cook Inlet watersheds, including an ecosystem functions and services valuation for both pre- and post-project conditions and for a No Action Alternative. The EIS must identify and quantify functional losses and function replacement of the affected watersheds and ecosystems.

The water resources of Bristol Bay and Cook Inlet watersheds are essential to the way of life for every person who lives in this region. During a public hearing in Anchorage, Alaska on April 19, 2018, Rick Delkittie of the Native Village of Nondalton shared his traditional knowledge about the essential and timeless nature of water and salmon in his homeland (Delkittie, 2018):

> *I'm a tribal member from Nondalton. I've lived there all my life . . . We have a lot of water over there, wetlands. We all understand that everything living over there needs to have fresh water to survive. People have been here for over 10,000 years. Salmon have been coming over there for that long too, along with all the other fish.*

The project will alter and industrialize a vast, wild, remote, and intact area as well as annually discharge billions of gallons of wastewater to the area. It is not sufficient to only focus on the areas of the proposed footprint of the mine and associated support structures. The EIS cannot just focus on impacts to a few streams in the upper watershed. The EIS must evaluate the direct, indirect, and cumulative impacts to the entire complex of fully functioning watersheds that would occur as a result of altering, dredging, filling, dewatering, and discharging to streams and wetlands and mining through and removing these aquatic habitats. The EIS must evaluate the impact of altering instream flows and water quality. The proposed project would leave a large footprint in the estuarine and marine habitats of the watersheds; therefore, the EIS must evaluate the impacts to these habitats. The EIS must thoroughly describe the connections of the upper watersheds to the middle and lower portions of those watersheds, including the estuary and marine habitats, as well as the connections between both the Bristol Bay and Cook Inlet Watersheds, that combined create a unique and irreplaceable ecosystem. The EIS must evaluate the impacts of the project irrevocably damaging Bristol Bay's world-renowned salmon runs, clean water, and unique and wild ecosystems.

The EIS must provide baseline information for and evaluate direct, indirect, and cumulative impacts for not only Bristol Bay Watershed and Cook Inlet but for the many subbasins, rivers, tributaries, lakes, and wetlands that lie within the following areas:

- Watershed of Nushagak/Mulchatna River;
- Watershed of the Kvichak River;
- Iliamna Lake and environs;
- Cook Inlet and environs; and
- Bristol Bay and environs.

The EIS must address the potential negative impacts of the proposed project and the highly probable subsequent phases of mine expansion and additional mine developments on all the affected watersheds, fish and wildlife habitat, and migratory corridors that would be severely fragmented by the initial phase of this project and further exacerbated by the highly probable subsequent phases that would follow. There are 25 other mining claims in the region that have the potential to become projects; therefore, the cumulative impacts to the entire ecosystem of the Bristol Bay Watershed and Cook Inlet, including surface water, groundwater, sediment, soil and air, needs to be evaluated in the EIS.

The project description included with the permit application states that "*The ultimate Project design will incorporate a detailed analysis of water collection and management, including quantity and quality estimates, water treatment options, water management facility design, and strategic discharge of treated water*." (Pebble Partnership, 2017). This analysis must be completed as part of and during the EIS process, and it must be described in the draft and final EISs. . To develop a defensible EIS, it is necessary to have reliable estimates of the quantity of water required, the amount of water storage required, the anticipated characteristics of discharged wastewater, and the locations and timing of discharges. This information has not been provided as part of the project description or permit application and has apparently not yet been developed. It will be impossible to properly assess and evaluate the impacts to water resources without the requisite baseline water quality information and the analysis, estimates, options, designs, and plan identified above. Also, because of rapidly changing climate conditions, predictions related to precipitation and water storage and treatment must be based on models for future conditions over the life of the project and not just on past data.

The project description indicates that the foundation of the water management program for the proposed mine is the water balance (Pebble Partnership, 2017). This water balance is evaluated

using three primary modules: The Watershed Module, the Groundwater Module, and the Mine Plan Module. The Watershed Module and the Groundwater Module are described in the Environmental Baseline Document. The Mine Plan Module is not described in the Environmental Baseline Document or in the permit application.

The Watershed Module described in the Environmental Baseline Document does not include even the most basic and minimally required components for evaluating physical or ecological impacts to surface water features. It is a lumped-parameter model that does not include the physics necessary to evaluate mining alternatives, future impacts of mining activities, or mitigation options. A physically based hydrologic model must be developed prior to initiation of the EIS. This model must be developed and calibrated with appropriate data and must provide predictions at time and space scales that are ecologically relevant. An analysis of the potential effects of the mining activities on stream flows and stream water quality must be developed prior to initiation of the EIS.

The Groundwater Module described in the Environmental Baseline Document does not include the necessary spatial resolution to evaluate impacts from the mining activities on nearby streams, wetlands, and lakes. The existing groundwater model is a relatively coarse regional-scale model with the area of each grid cell approximately 23 acres. This model is not sufficiently detailed to provide the information necessary to evaluate the potential impacts of the proposed mining activities or to develop reliable estimates of the local water balance. A smaller-scale groundwater model with appropriate spatial and temporal resolution must be developed prior to initiating the EIS. This model must be calibrated with data collected specifically to evaluate local-scale impacts and water balances. A more detailed and reliable evaluation of the local-scale groundwater impacts of the mining activities is needed to provide reliable estimates of larger-scale impacts and to develop reasonable estimates of the amount of water that will require storage and treatment.

A more detailed and reliable evaluation of the local-scale groundwater impacts of the mining activities is also needed to provide reliable estimates of the long-term or permanent impacts of the proposed mining activities on baseflow to streams and wetlands. The mining activities will permanently change the groundwater recharge and groundwater storage characteristics of the site. A local-scale groundwater model with appropriate spatial resolution and geologic detail is needed to evaluate the effects of these changes on baseflow to streams and wetland hydroperiods. This groundwater analysis must be required prior to initiation of the EIS.

The Permit Application refers to a PHABSIM Instream-Flow Model (Pebble Partnership, 2017). This model is not included in the Permit Application or in the Environmental Baseline Document. It's our understanding that ADF&G and USFWS have previous determined that a normal PHABSIM model is not sufficient due to the complexity of the stream systems and groundwater input. An appropriate model must be developed and reviewed prior to initiation of the EIS.

4.1 Water Quality

The EIS must include a complete hydrologic characterization of the project areas and the cumulative impact area, describing all existing water resources and baseline groundwater and surface water quality, quantity, flow regimes, and groundwater/surface water interactions for the watersheds of the Nushagak River, Mulchatna River, Kvichak River, Iliamna Lake and environs, Cook Inlet and environs, and Bristol Bay and environs.

Specific information on groundwater properties and groundwater/surface water connections (e.g., springs, seeps, interception of the water table by existing or proposed mine pits or other project activities or infrastructure) are needed to identify and assess potential impacts to water resources and risks to receptors of contaminants. Adequate baseline information and data, collected using current and appropriate methodologies, are critical to understanding the project's potential environmental impacts and must be described and evaluated in the EIS rather than being included by reference.

The EIS must include a complete description of the current drainage patterns in the areas proposed for mine facilities and throughout the project area. The EIS must also describe how drainage patterns would change (including post-closure drainage patterns) under each alternative developed for the permit application and EIS.

The EIS must include topographic, geologic, and hydrologic maps of the project area and cumulative impact area. It must identify any components of the proposed project that would fall within 25-, 100-, and 500-year flood plains, as well as any "critical actions" and their flood risk. The EIS must discuss the potential for runoff to transport sediment or contaminants from disturbed areas at the mine to any surface waters, as well as any potential receptors outside the mine boundaries. The EIS must quantify and evaluate the impacts of sediments and contaminants from roadways and other disturbed areas.

The EIS must specifically address potential direct, indirect, and cumulative impacts within all areas in which products or supplies would be handled, transferred, or stored including operations areas, transportation corridors, ferry docks on Iliamna Lake, and docking and transfer facilities proposed for the lower Cook Inlet bay. Potential contamination from spills of hazardous materials or spillage of treated products must be expected, and the impacts to surface water and groundwater resources must be quantified and evaluated in the EIS.

The potential impacts of contamination by spills of products being shipped out and processing materials being shipped in, such as cyanide for floatation processing, must be addressed.

4.2 Water Requirements for Plant Life

The EIS must characterize the water requirements of plant communities in the study area including the watersheds of the Nushagak River, Mulchatna River, Kvichak River, Iliamna Lake and environs, Cook Inlet and environs, and Bristol Bay and environs.

Plant life is essential both to non-human faunal populations and to human communities. Water is also necessary to the health of plant communities. Accordingly, the EIS must characterize the water requirements of plant communities in each of the subareas of the study area, and evaluate potential direct, indirect, and cumulative impacts with respect to the ability of each subarea to meet water requirements for plant life.

The Dena'ina know of about 80 plants that are or were eaten and/or used for medicinal purposes. There is probably a like amount used for food or medicine by the Yup'ik (Kari, 1987). The EIS must evaluate the potential for the proposed Pebble Project to impact the use of plants for food or medicine by Dena'ina and Yup'ik people.

4.3 Water Requirements for Fish Life

The EIS must address potential direct, indirect, and cumulative impacts on the water needed by fish populations and their prey resources in each subarea of the project study area (the watersheds of the Nushagak River, Mulchatna River, Kvichak River, Iliamna Lake and environs, Cook Inlet and environs, and Bristol Bay and environs).

Fish and their prey resources (including periphyton and aquatic macroinvertebrates) are dependent on the quantity and quality of water available to them in the rivers, creeks, lakes,

wetlands, and other water bodies that these animals inhabit during spawning and throughout their lifecycle (Chambers et al., 2012).

4.4 Water Requirements of Terrestrial Fauna

The EIS must address potential direct, indirect, and cumulative effects on the water needed to sustain terrestrial fauna in each subarea of the project study area.

4.5 Water Requirements of Human Communities

Human communities, including but not limited to Native communities in which individuals that self-identify as Yup'ik or Dena'ina are the dominant population, are as dependent on water as are other terrestrial faunal populations. Native and some non-Native communities are particularly sensitive to changes in water quality and quantity because of their dependence on salmon and other fish resources.

At a minimum, the EIS needs to address potential direct, indirect, and cumulative impacts on the categories described below of water used by human communities.

4.5.1 Drinking Water

The potential direct, indirect, and cumulative effects of the proposed Pebble Project, including potential mine expansions and spin-off mine developments, on the quality and quantity of drinking water must be addressed in the EIS.

Most villages have multiple sources of drinking water including treated municipal water, individual wells, and water hauled from rivers and lakes. Koliganek and New Stuyahok haul water from rivers and lakes and are downstream from the proposed mine. Igiugig hauls water from rivers and lakes and is downstream from the proposed mine. There are other villages downstream on the Kvichak River from Igiugig and downstream of the mine, and there are many hunting and fishing camps and seasonal uses of all the rivers in the region. People take water from the rivers throughout the region. The EIS must identify and evaluate potential impacts on drinking water quality and quantity.

4.5.2 Other Household Use of Water

The EIS needs to identify, quantity, and evaluate potential direct, indirect, and cumulative effects of the proposed mine, including potential mine expansions and spin-off mine developments, on

water needed by human communities for household purposes such as bathing, clothes washing, support of domestic animals, and other household uses within the study area.

4.5.3 Plants, Fish, and Animals Needed for Subsistence

The potential direct, indirect, and cumulative effects of the proposed Pebble Project, including probable mine expansions and spin-off mine developments, on the waters upon which the subsistence livelihoods of human communities depend needs to be fully addressed in the EIS.

Human subsistence in the study area is largely dependent upon plants, fish, animals, marine mammals, and other natural resources that themselves are water-dependent. The potential impacts of the proposed project, including potential mine expansions and spin-off mine developments, on the water resources for which other natural resources depend, needs to be fully evaluated in the EIS.

4.5.4 Cultural and Spiritual Considerations

The EIS must identify and describe the cultural and spiritual uses of water by the human communities of the region. The EIS must then identify and evaluate potential cumulative, direct, and indirect effects of the proposed Pebble Project, including probable expansion of the mining area and spin-off mine developments, on water needed by human communities for cultural and spiritual purposes within the study area.

Water plays important roles in the cultural lives of human communities in the study area, including their spiritual lives. For example, most of the Kvichak and Nushagak watershed communities predominantly practice Russian Orthodoxy. The third most important event of their religious calendar year is The Great Blessing of the Water. The water is spiritually sanctified to prepare it for the return of salmon and for medicinal purposes. Potential mine-derived contamination or the perception of contamination would have a detrimental effect on the spiritual lives of the people. The EIS must address potential impacts on the spiritual aspect of sacred water as these aspects are understood by the people of the local communities. The best way to obtain the necessary information is through government-to-government consultation with tribal leaders, and subsequently designated tribal elders, healers, or others. This kind of information cannot be obtained from literature, it requires meaningful consultation.

Another cultural and spiritual ritual is the First Salmon Ceremony, a world renewal ceremony that pays homage to continuing reliance on salmon as a keystone subsistence species. Potential

impacts on salmon due to industrial mining activities that would affect this ceremony must be addressed in the EIS. Ceremonies of these types raise to the spiritual that which is most important in the cultural lives of the indigenous villagers and represent core cultural values of salmon subsistence and clean water.

These are only examples of the kinds of cultural and spiritual aspects of the environment that must be identified and addressed in the EIS.

4.6 Water Resources and Environmental Justice

The EIS must acknowledge and evaluate the environmental justice implications of the proposed Pebble Project and its potential direct, indirect, and cumulative effects on water quality and quantity. This acknowledgement and evaluation must be conducted in consultation with the Native communities. The EIS must also evaluate social justice in these communities in terms of norms valuing wild food harvest, community and family social interactions, and the freedom to live a lifestyle derived from traditional values as opposed to a Western materialist value system.

Impacts on water quality and quantity and impacts on fish, terrestrial fauna, vegetation, and human communities that rely on water and other natural resources will fall disproportionately upon the study area's Native communities, primarily those residing in the villages of the Nushagak and Kvichak watersheds. Such communities are more dependent on subsistence fishing, hunting, and gathering than most non-Native communities, and they maintain a robust cultural and spiritual relationship with the subsistence lifestyle and with the water-dependent natural world.

4.7 Potential Impacts to Water Resources

The EIS must identify, discuss, and evaluate all direct, indirect, and cumulative impacts to surface water and groundwater quality and quantity from the proposed project and alternatives from the time of exploration and pre-development baseline studies through mine development, construction of the mine and other facilities, operation of the mine and other facilities, post-mining decommissioning, reclamation, and long-term maintenance and monitoring. All potential project discharges and releases, seepage, temporary ponding, surface water diversions, and groundwater pumping and handling must be described. For each of these activities and facilities, the potential effects on water rights, water quality, seasonal flow rates, beneficial uses, fisheries, and wildlife must be evaluated in the EIS.

For each potential water resource impact, the EIS must, at a minimum, include the following:

- A discussion of the potential for contamination of meteoric water that contacts existing and proposed pit wall rock, waste rock, tailings, roads, and other mine facilities. The EIS must analyze the fate and transport of any such water and discuss the impacts to fisheries and wildlife from exposure to mine-influenced waters;

- A discussion of the potential impacts to groundwater, surface water, and wildlife resulting from the formation of pit lakes following mine closure. This analysis must include a thorough geochemical analysis of pit wall and groundwater chemistries, a comprehensive ecological risk assessment, a comprehensive human health risk assessment, and hydrogeological modeling demonstrating whether the pit lake would likely represent a perpetual sink, or whether through-flow might occur;

- A discussion regarding the potential for and effects of movement of contaminated surface water to the subsurface, including but not limited to, through the pit bottom and through land subsidence fissures within the study area;

- A description of the projected chemical and physical character of water in tailings ponds and other open ponds that would be located at the mine site or associated with mining and ore processing. An evaluation of the potential for such waters to enter external surface water features must also be included;

- A description of the designs of the proposed run-on/run-off channels, seepage collection systems, run-off collection and sedimentation ponds, pump back systems, and any necessary treatment or disposal systems associated with these drainage control systems. This description must include a depiction of these facilities on maps and describe all required monitoring and maintenance necessary to ensure proper functioning;

- A discussion regarding potential for surface and groundwater contamination from slurry and fuel pipelines, runoff from roads, and vehicle accidents;

- A description of all other mitigation measures to prevent contamination of water and sediment within the study area;

- A discussion of how accidental releases of hazardous materials would be handled including accidental cyanide release in the transport, storage, or use of the chemical if it is used in gold aggregate leaching;

- Identification and a discussion of the potential impacts of solution containment system failure, methods for discovering such failures, and the degree to which impacts would be reversible;

- A description of the proposed Pebble Project petroleum-contaminated soil management plan for each project area or facility; and

- A description of surface water and groundwater quantity sufficient to support habitat forming flows and levels, including sufficient quantity to support a functioning hyporheic zone.

4.8 Monitoring of Water Resources

The EIS must discuss existing and proposed surface water, hyporheic zone, and groundwater monitoring programs including plans, monitoring results, trends, frequency of monitoring, screening intervals, and parameters to be monitored during all phases of the proposed project, including mine and facilities construction, operation, mine closure and reclamation, and post-closure.

The EIS must provide past and current monitoring results and trend analysis for surface water and groundwater quality in the project area. The EIS must discuss all ongoing and proposed monitoring plans and their relevance in predicting the potential for, and protecting against, contaminated drainage from existing and future mine facilities.

The EIS must describe procedures for water quality and quantity monitoring and reporting, including procedures for monitoring the function of the waste rock dumps, tailings storage facilities, and pit lakes and flow through waters. The EIS must describe the measures proposed for controlling contact between mine rock, waste rock, and tailings and meteoric waters.

A monitoring and maintenance plan must be provided that describes procedures for maintenance of run on/runoff channels, liners, underdrains, seepage collection areas, growth medium covers, and ponding on top of facilities.

The EIS must show all monitoring locations for surface water, ponded water, and collected seepage; groundwater monitoring wells; and points of compliance on the site.

4.9 Applicable Permitting and Regulatory Requirements

The EIS must include a summary, usually a table, of the applicable environmental compliance actions, permits and regulatory requirements that apply to water bodies within the study area. The EIS must list and describe applicable permits and state-adopted, USEPA-approved water quality standards, including beneficial uses that apply to waters in the study area, and discuss each alternative's compliance with the standards and permits.

The EIS must provide the most up to date information regarding any remediation activities requested or required by the Alaska Department of Environmental Conservation (ADEC), USACE, Alaska Department of Natural Resources (ADNR), or other applicable regulatory authority with jurisdiction over water quality and water quantity management.

The EIS must include a discussion of the applicability to the proposed project of Alaska's Multi-Sector General Permit for Stormwater Discharges Associated with Industrial Activity from Metal Mining Activities.

Details of the storm water pollution prevention plan must be included along with a discussion of specific mitigation measures that may be necessary during mine and facilities construction, operations, closure, and post-closure. The EIS must include a description of the measures that would be employed to ensure that the proposed Pebble Project achieves and maintains a zero-discharge status to surface waters and groundwater for all phases of the project.

4.10 Water Quantity and Supply Needed

The permit application (Pebble, 2017) did not contain information about the water quantity and supply needed for the proposed Pebble Project. A substantial supply of water will be needed for the mining operation and facilities for dust control, milling and ore processing, equipment washing, and other such uses. The EIS must identify all potential water sources and quantify the amount of water needed for the proposed Pebble Project. The EIS must describe the potential impacts associated with using water from each of these sources.

The EIS must evaluate potential water sources with respect to the amount of water needed for the proposed project. The evaluation must include hydrogeologic modeling describing and

graphically depicting the cone of depression likely to result from both dewatering of the mine pit and well field pumping from supplemental water supply sources.

The EIS must identify direct, indirect, and cumulative impacts to surface water flow, hyporheic zone, groundwater flow, water supply wells, wetlands, springs and seeps, vegetation, wildlife, and other groundwater-dependent resources that could result from groundwater pumping associated with the proposed project. This evaluation of impacts must describe and graphically depict post-closure groundwater elevations and recovery. The evaluation must include a discussion of evaporative water losses from all surface water features.

5.0 AIR QUALITY

5.1 Ambient Air Quality

The EIS must include a robust analysis of the proposed Pebble Project's potential to affect ambient air quality. The EIS must:

- Describe existing air quality in the project study area;
- Discuss the National Ambient Air Quality Standards (NAAQS) and Prevention of Significant Deterioration (PSD) increments applicable to air quality in the study area;
- Discuss PSD applicability and whether a PSD permit might be required; and
- Explain impacts to the NAAQS and PSD increments from projected emissions of the project and each alternative considering the effects from all aspects of mine exploration, excavation during mine development, construction of the mine and mine support facilities, mining operations, support activities (such as vehicle traffic), and cumulative emissions from all other sources in the project area.

The USACE must closely coordinate with ADEC regarding regulatory requirements and controls for air quality. The EIS must include an inventory of project emissions from all facilities and roads related to mine operations, including any off-site processing and support activities such as vehicle traffic and delivery trucks for fuel, maintenance supplies, and other supplies and materials.

The EIS must include an inventory of cumulative emissions from other facilities and sources in the project study area. This inventory of cumulative emissions must include the emissions resulting from the construction and operation of these facilities, including those resulting from right-of-way disturbance and road construction and use.

Air quality modeling must be conducted to determine concentrations of criteria air pollutants, and the results of this modeling must be compared to NAAQS. The EIS must provide this comparison and a discussion of the modeling and comparison as necessary to evaluate the potential impacts from the proposed project on ambient air quality.

PSD increments are highly protective of air quality in Class I areas, such as wilderness areas and national parks. The EIS must identify all Class I PSD areas located within 100 kilometers of the

outer boundaries of the project study area. Class I areas even farther than 100 kilometers away could be affected as well; therefore, USACE must consult with the Bureau of Land Management (BLM) and National Park Service (NPS) for a determination of which areas could be adversely affected by the proposed action. Potential impacts to Class I PSD areas, including visibility impacts, must be identified and discussed in the EIS.

The EIS must identify and discuss mitigation measures to minimize air pollutant emissions from the mine and measures to address potential impacts to nearby residents, including sensitive receptors. Diesel particulate matter (DPM) and other criteria pollutants from fugitive sources at the mine can be reduced by evaluating and implementing appropriate mitigation measures:

- Use of particle traps and other controls to reduce emissions of DPM and other air pollutants. Evaluate and compare different technologies to mitigate DPM. This evaluation must include traps and specialized catalytic converters (oxidation catalysts) to address DPM, carbon monoxide emissions, and hydrocarbon emission;
- Reduce construction-related trips of workers and equipment, including trucks and heavy equipment;
- Evaluate the impact of leasing or buying newer, cleaner equipment (1996 or newer models); and
- Assess the use of periodic, unscheduled inspections to ensure that construction equipment is properly maintained at all times, does not unnecessarily idle, is tuned to manufacturer's specifications, and is not modified to increase horsepower except in accordance with established specifications.

The EIS must discuss how air quality monitoring would be implemented to ensure project compliance with all applicable air quality standards and permits.

5.2 Hazardous Air Pollutants

The EIS must include and inventory of all possible sources of hazardous air pollutants (HAPs) and the unit processes that could generate these HAPs. The EIS must evaluate and discuss how each HAP would be controlled to reduce their emissions as much as possible. This discussion must identify measures and equipment that would be used to condense, capture, and treat HAPs, including mercury. The EIS must describe the monitoring program and include specific

information about monitoring frequency, locations, reporting requirements, and other relevant aspects of the monitoring program.

The EIS must include a discussion about and estimate of releases of HAPs, including mercury, from the proposed project study area to air, soil, and water resources. The EIS must include a discussion about and estimate of releases of HAPs from all off-site facilities instrumental to mine operations (i.e. offsite ore processing). The EIS must include information about the means and methods proposed to control and reduce emissions of HAPs. The discussion in the EIS must explain how these measures would be effective in removing HAPs and making it unavailable for release into the environment and indicate how captured mercury and other hazardous compounds would be disposed of.

The EIS must discuss the probable fate and transport of mercury and other HAP emissions from the proposed Pebble Project and describe the cumulative amount of mercury and other HAPs that would be annually emitted to the air.

5.3 Air Quality and Environmental Justice

Reduced air quality resulting from mining operations and associated activities will almost certainly result in disproportionate adverse effects upon the environments of Native communities in the area. The proposed project involves large-scale mining and material handling that would generate dust, diesel emissions, and HAPs. The EIS must identify all the emissions expected and the hazardous constituents of each emission type. The EIS must acknowledge degradation of air quality that would occur and address such disproportionate impacts on the environments of Native communities carefully, in consultation with the Native communities.

6.0 NOISE IMPACTS

The EIS must include an inventory of noise-related impacts to residents, wildlife, and other receptors from the mine site, transfer terminals on lake and marine waters, roads and other corridors, and off-site facilities. All noise impacts must be identified and evaluated in the EIS.

6.1 Noise Impacts and Environmental Justice

Increased noise from drilling, heavy equipment operation, helicopters ferrying workers and materials, and other mining and transportation noise may cause adverse effects on movements of land mammals, particularly migratory caribou, and fresh-water seals in Iliamna Lake that are important for subsistence hunting. The EIS must acknowledge that subsistence hunters may be disproportionally burdened by these impacts, and address such impacts carefully in consultation with Native communities.

Direct, indirect and cumulative noise impacts from construction, operation of the mine, port facilities, roads and shipping must be assessed for the terrestrial, freshwater, estuarine, and marine environments of Bristol Bay Watershed and Cook Inlet.

7.0 AQUATIC RESOURCES

Constructing and operating a mine of this size with its associated infrastructure, combined with altering, filling, dredging, disposal of wastewater, and discharging into streams, tributaries, wetlands, and ponds in watersheds for over 20 years will impact, irrevocably damage, and will probably eradicate distinct anadromous and resident fish populations found in the smaller tributaries. These smaller and unique stocks are important to the overall health of fisheries because they provide genetic diversity that improves resiliency throughout the watershed. The proposed project would cover and otherwise adversely impact large areas of the upper watersheds, resulting in severe fragmentation of habitat that's vitally important to salmon, and other anadromous and resident fish. The EIS must evaluate direct, indirect, and cumulative impacts to all aquatic species. The EIS must also evaluate direct, indirect, and cumulative impacts to the prey resources that fish rely on during all life history phases. A robust evaluation of this type needs to be based on statistically sound scientific baseline data and existing conditions information as well as the Traditional Ecological Knowledge and Wisdom (TEKW) of Native communities.

The EIS must provide sufficient baseline data and existing conditions information. The permit application suggests that the baseline data collected by the project proponent and presented in the 2004-2008 environmental baseline report and the 2009-2013 supplemental baseline data reports will accompany permit applications as appropriate. It is not clear that these reports provide adequate information to establish baseline conditions for the area to evaluate direct, indirect, and cumulative impacts to natural resources. The EIS must incorporate information from other sources such as those listed above, new data collected to support EIS evaluations and from models that evaluate species, habitat, and biological and physical watershed processes. The EIS must incorporate TEKW in all evaluations and when developing the information for baseline and existing conditions.

We recommend that the Corps review the draft document dated March 16, 2009 titled "Pebble Project Freshwater, Marine Fish and Instream Flow Technical Working Groups: Development of Study Objectives and Agency Recommendations." This document was the work of State and Federal agency representatives and was intended to make recommendations to Pebble Limited Partnership about development of scientifically sound study objectives related to freshwater fish and instream flows. Review of these draft study objectives should be the basis for determining if baseline data related to fish and instream flows is sufficient for preparation of an EIS, including a sufficient cumulative effects analysis, and for development of long-term environmental

monitoring. Pebble Limited Partnership should be required to provide sufficient baseline monitoring prior to further preparation of an EIS.

The EIS and monitoring plan for the proposed Pebble Project must include at a minimum the following pre-, during-, and post-project monitoring studies for aquatic and terrestrial resources for all seasons and life history phases covering at a minimum one full generational cycle:

- Water quality and quantity (groundwater, hyporheic zone, and surface water);
- Sediment and soil quality;
- Air quality;
- Freshwater, estuarine and marine aquatic and terrestrial biomass and food webs;
- Quantification of marine derived nutrient inputs from decaying salmonid carcasses;
- Water balance, hydrology and hyporheic floodplain connection;
- Aquatic habitat forming flow regimes, circulation patterns, currents, tides, bank erosion rates;
- Ecological risk assessments for aquatic and terrestrial species;
- Habitat and migratory corridor assessments and mapping;
- Wetland delineation and mapping;
- Riparian corridor delineation and mapping;
- Geomorphic studies of river bank and lake and marine shoreline structure;
- Wake studies and ice breaking impacts related to ferry and ships;
- Ambient noise level and disturbance studies;
- Human disturbance of habitat and migratory corridors studies (for critical life history phases like spawning/breeding, birthing, rearing, foraging, migration, sleeping, roosting, hibernating, etc.);

- Habitat and migratory continuity and fragmentation studies;
- Fish, plant, and wildlife population studies (presence/absence, abundance, productivity, diversity and spatial structure) through all seasons and over multiple years to include full life histories;
- Invasive fish, plants, and wildlife studies;
- Fish and wildlife habitat use and migratory corridors studies (through all seasons and over multiple years);
- Plant community distribution and fragmentation studies;
- Prey abundance studies; and
- Climate change and sea level rise studies.

In addition to those listed above, the EIS must include a robust habitat assessment to assess existing conditions, including conditions related to climate change and sea level rise. Extensive aquatic habitat modeling tools exist to conduct watershed assessments. These methods must be used to evaluate the direct, indirect, and cumulative impacts of the proposed project.

Baseline studies conducted for this project in 2004-2008, including the methods used to collect and analyze data for fish use and presence were not sufficient to answer questions related to fish or develop an understanding of fish and fish habitat. The EIS must use up-to-date methods to adequately evaluate aquatic and terrestrial resources. These methods must be used to further evaluate the direct, indirect, and cumulative impacts of the proposed project to aquatic resources and fish and fish productivity in the watersheds.

Additionally, extensive habitat models exist using resource selection functions to evaluate the effect of development on brown bears on the Kenai Peninsula. The EIS must use these methods within the Bristol Bay region to further evaluate the direct, indirect, and cumulative impacts of the proposed project to wildlife and terrestrial resources. Of particular concern is how wildlife species will be impacted as a result of project induced changes to fish numbers (especially salmon) and fish habitat.

All models and associated inputs to those models must be thoroughly reviewed and vetted to ensure the appropriate species, limiting factors, and other inputs are used and properly evaluated.

The EIS must include and present all the waters documented in the Alaska Department of Fish and Game (ADFG) Anadromous Waters Catalog (AWC) at a minimum; however, it should be recognized that the AWC under represents waters that actually support anadromous fish on the order of 20 to 40 percent. Information must be provided discussing when, where, and how additional locations will be chosen to gather additional fish surveys in the area to provide more robust data on areas not in the ADFG Anadromous Waters Catalog. To further evaluate direct, indirect, and cumulative impacts to habitat, fish, and fish productivity, the EIS must provide information on whether instream flow reservations or other water rights exist in these watersheds.

Impacts to the entire watershed of Bristol Bay as well as Cook Inlet and outside waters that provide critical and migratory habitat for aquatic and terrestrial species must be assessed in the EIS.

The State of Alaska is no longer part of the National Coastal Zone Management (CZM) Program that would provide additional tools for evaluating and protecting the shoreline and nearshore areas from project impacts. Because this proposed project poses far-reaching direct, indirect, and cumulative impacts to fisheries and aquatic and terrestrial resources that influence national and international economies, the EIS must discuss the implications of impacts and provide the pertinent information that would be covered in NEPA documents if the area was part of the CZM Program.

7.1 Salmon

Bristol Bay and Cook Inlet support important salmonid species that will be irrevocably impacted by the proposed project including Chinook salmon, coho salmon, chum salmon, pink salmon, sockeye salmon, and steelhead trout (Chambers et al., 2012; USEPA, 2014a). Other important fish species that are used by local people include rainbow trout, arctic char, Dolly Varden, grayling, and whitefish. Important non-salmonid species, like pike and suckers, are also used by local people.

All communities in the project study area, Native and non-Native alike, interact with salmon as parts of their subsistence lifestyles and economies. For Native communities, salmon have deep cultural and spiritual significance (Chambers et al., 2012; USEPA, 2014a). The EIS must recognize and address these aspects of cultural and spiritual significance, and evaluate potential direct, indirect, and cumulative impacts on these important aspects.

The EIS must evaluate the potential long-term and permanent impacts to one of the largest, most-productive salmon fisheries in the world and the repercussions these impacts would have on Bristol Bay, including the lost economy and the pressure that would be shifted to other salmon fisheries in the immediate area and beyond.

Given the importance of Bristol Bay and Cook Inlet salmon stocks to sport, commercial, and subsistence fishery groups in this area and beyond, and the severe impacts to both watersheds from a project of this scale, the EIS must evaluate direct, indirect, and cumulative impacts to fisheries beyond and in addition to the Bristol Bay and Cook Inlet fisheries.

These fisheries are an integral part of the aquatic food web and provide an abundant biomass and prey resource for several aquatic and terrestrial species in the freshwater and marine areas of Bristol Bay and Cook Inlet watersheds as well as in the other waters including the Pacific Ocean. The EIS must quantify and evaluate the impacts related to the loss of this large prey resource that sustains aquatic and terrestrial species within the project area and across all areas of their adult migratory routes.

The EIS must evaluate the direct, indirect, and cumulative impacts to the ecotourism economy, particularly the robust bear viewing tourism, that occurs in and adjacent to Bristol Bay Watershed and Cook Inlet.

7.2 Other Aquatic Resources

In addition to the well-known salmon runs that characterize the area, Bristol Bay Watershed and Cook Inlet provide important and intact habitat for a vast array of aquatic species including, but not limited to, trout, Dolly Varden/Arctic char, northern pike, whitefish, Northern sea otter, Beluga whale, and Iliamna seals. The table below provides a general list of aquatic species that are supported by Bristol Bay Watershed and Cook Inlet. Many of these species are listed under the ESA, and many are considered state special status species. The EIS must evaluate direct,

indirect, and cumulative impacts to these aquatic species including direct, indirect, and cumulative impacts to the habitats they require to survive each phase of their life history.

Aquatic Species (General List)

Chinook salmon	Northern Sea Otter
Coho salmon	River otter
Chum salmon	Beaver
Pink salmon	Freshwater seal
Sockeye salmon	Sea lions
Steelhead trout/Rainbow trout	Pacific walrus
Dolly Varden char	Harbor seal
Sculpin	Beluga whale
Stickleback	Humpback whale
Suckers	Right whale
Lake char (lake trout)	Fin Whale
Humpback whitefish	Blue whale
Northern pike	Bowhead whale
Arctic char	Sperm whale
Burbot	Steller's eider
Arctic grayling	Marine birds
Cisco	Waterfowl
Lamprey	Shorebirds
Smelt	Freshwater macroinvertebrates and diatoms
Herring	Marine invertebrates
Scallops	Freshwater plants
Crab	Estuarine and marine plants
Razor clam	

7.3 Threatened and Endangered Species

The federal ESA requires that federal agencies "ensure that any actions they fund, authorize, or carry out are not likely to jeopardize the survival of any endangered or threatened species, or to destroy or adversely modify its designated critical habitat" (USFWS, 2018).

There are a variety of federally listed threatened or endangered species in and around the project area including Beluga whale, blue whale, bowhead whale, sperm whale, humpback whale, fin whale, North Pacific right Whale, Steller's sea lion, Northern sea otter, and Steller's eider (NOAA Fisheries, 2018b; USFWS, 2015; Woody, 2018).

Critical habitat for the federally threatened Beluga whale and threatened Northern sea otter is located in portions of the Cook Inlet that are within the project area (NOAA Fisheries, 2018b; USFWS, nda). Critical habitat for the federally endangered Western Distinct Population Segment (DPS) of the Steller's sea lion is located in portions of Bristol Bay and the Gulf of Alaska, which could potentially be impacted by the proposed project (USFWS, n.d.b).

Under Alaska State Law, the Commissioners of the Alaska Departments of Fish and Game and Natural Resources must take measures to preserve the natural habitat of fish and wildlife species that are recognized as threatened with extinction (ADFG, 2018).

State of Alaska Special Status Species in Bristol Bay and Cook Inlet include the following species listed as endangered by ADFG: blue whale, humpback whale and right whale (ADFG, 2018). The Alaska Special Status Species also includes Fish Stocks of Concern which were discussed above in Section 7.1.

The EIS must identify and evaluate impacts to the federally or state listed species or those that are being proposed for listing and designated or proposed critical habitat of any listed or endangered and threatened or proposed for listing species in and around the project area.

Under the ESA Section 7, the EIS must include or incorporate by reference Biological Assessments for federally and state listed species and their critical habitats including descriptions of the outcomes of consultations with the federal services and tribes. The EIS must also quantify and disclose the amount of incidental and direct take regarding ESA listed and resident species due to the impacts of this proposed project. The EIS must include similar evaluations for state listed fish stocks of concern.

7.4 Essential Fish Habitat

The Magnuson-Stevens Fishery Conservation and Management Act of 1996 as amended in 2007, mandates the identification of Essential Fish Habitat for federally managed species and the consideration of recommendations to conserve and enhance the habitat necessary for these species to carry out their life cycles. According to National Oceanic Atmospheric Administration (NOAA) Fisheries, Essential Fish Habitat includes those waters and substrates necessary to fish for spawning, breeding, feeding or growing to maturity. "Waters' include aquatic areas and their associated physical, chemical, and biological properties. 'Substrate' includes sediment underlying the waters. 'Necessary' means the habitat required to support a sustainable fishery

and the contributions of 'managed species' to a healthy ecosystem. 'Spawning, breeding, feeding, or growing to maturity' includes all habitat types utilized by a species throughout its lifecycle (NOAA Fisheries, 2018a).

According to the NOAA Fisheries, a consultation with NOAA Fisheries is required whenever a federal agency, including the military, works in an area that will affect Essential Fish Habitat. A consultation is also triggered when a federal agency, or its designee, determines that an action to be authorized, funded, or undertaken by the agency may adversely affect Essential Fish Habitat. According to NOAA Fisheries, an 'adverse effect' is any impact that reduces the quality and/or quantity of Essential Fish Habitat. 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 Essential Fish Habitat. Adverse effects to Essential Fish Habitat may result from actions occurring within or outside of Essential Fish Habitat and may include site-specific or habitat-wide impacts, including individual, cumulative, or synergistic consequences of actions. Through the consultation process, the agency and NOAA determine how best to conduct coastal development while supporting fish habitat and minimizing or avoiding environmental damage. (NOAA Fisheries, 2018a).

The EIS must include an Essential Fish Habitat assessment and consultation for both the Bristol Bay Watershed and Cook Inlet for freshwater salmonid habitat and estuarine and marine habitat for salmonids, groundfish, forage fish, and other resident and migratory fish species as well as scallops and crabs. Habitat Areas of Particular Concern, which are subsets of Essential Fish Habitat, must also be identified.

7.5 Aquatic Resources and Environmental Justice

Because of their millennia-old relationships with the study area's aquatic resources, impacts on such resources will certainly fall disproportionately upon the area's Native communities. The EIS must acknowledge this disproportionality, and address it in careful, culturally appropriate consultation with the Native communities.

If the proposed Pebble Project is permitted, and port facilities are constructed and operated in marine waters, adverse impacts to beluga whale are expected. The potential impacts include noise and other disturbances from construction; increased vessel traffic to, from, and around the port facilities, and increased incidences of vessels striking and injuring beluga whales and other

marine animals. The potential impacts from project facilities and activities on beluga whales must be identified, quantified, and evaluated in the EIS. Furthermore, the resulting impacts to Native people and communities that maintain a cultural relationship with beluga whales, and the disproportionality of such impacts, must be recognized and addressed in the EIS through culturally appropriate consultation with the Native communities.

The EIS must identify and recognize the traditional, cultural, and spiritual relationships between animals and Native people and communities in the project study area. The potential impacts of the proposed project on these relationships must be recognized and evaluated in the EIS.

8.0 VEGETATION AND WILDLIFE

The EIS must provide adequate baseline information for and evaluate direct, indirect, and cumulative impacts, to vegetation and wildlife resources in Bristol Bay and Cook Inlet including known federally protected endangered, threatened, and species of concern and state special status species. The EIS must also provide adequate baseline information for and evaluate direct, indirect, and cumulative impacts, to designated critical habitats, Essential Fish Habitat, and protected migratory routes.

The EIS must also provide adequate baseline information to evaluate direct, indirect, and cumulative impacts to vegetation and wildlife in State Parks, State Game Refuge and Sanctuaries, National Parks, National Wildlife Refuges and areas that are within and adjacent to Bristol Bay and Cook Inlet and in which species may be migrating to and from and may be impacted by the proposed project.

The EIS must present information for how the project will comply with the following wildlife conservation laws which cover aquatic and terrestrial resources:

- National Environmental Policy Act
- Endangered Species Act of 1973 and Critical Habitat
- Magnuson-Stevens Fishery Conservation and Management Act of 2006 and Essential Fish Habitat
- Marine Mammal Protection Act of 1972
- Migratory Bird Treaty Act
- Bald and Golden Eagle Protection Act
- National Wildlife Refuge System Administration Act
- Clean Water Act
- Clean Air Act
- State of Alaska Anadromous Fish Act
- State of Alaska Fishway Act
- State of Alaska habitat, water and air quality laws

The EIS must provide adequate baseline information for and evaluate direct and indirect impacts, and cumulative impacts for an extensive list of terrestrial plant and wildlife species, including known federally protected endangered, threatened, and species of concern and state special status species and all habitat and migratory routes required to complete full life history phases for both Bristol Bay and Cook Inlet that includes but is not limited to the following wildlife species listed in the table below.

Baseline Data Needed for Selected Species Life History Phases

Aquatic	**Aquatic (continued)**
Chinook salmon	Harbor seal
Coho salmon	Pacific walrus
Chum salmon	Humpback whale
Pink salmon	Right whale
Sockeye salmon	Fin whale
Steelhead trout/Rainbow trout	Blue whale
Dolly Varden trout	Bowhead whale
Sculpin	Sperm whale
Stickleback	Beluga whale
Suckers	Steller's eider
Lake char (lake trout)	Waterfowl
Humpback whitefish	Marine birds
Northern pike	Shorebirds
Arctic char	Freshwater macroinvertebrates and diatoms
Burbot	Marine invertebrates
Arctic grayling	Freshwater plants
Cisco	Estuarine and marine plants
Lamprey	
Smelt	**Terrestrial**
Herring	Wolf
Scallops	Moose
Crab	Caribou
Razor clam	Black bear
Northern Sea otter	Brown bear
River otter	Lesser sandhill crane
Beaver	Bald eagle
Freshwater seal	Terrestrial invertebrates
Sea lions	Terrestrial plants

8.1 Vegetation and Wildlife Important in Local Subsistence

Over 80 edible and medicinal plants grow and are harvested in the project area including several species of berries, wild peas, wild onions, ferns, cow parsnip, rosehips, and many others (Kari, 1987). In addition to salmon and other freshwater fish, seven species of marine mammals are harvested including beluga whales and at least 21 species of land mammals including moose, caribou, beaver, and hare. The EIS must address direct, indirect, and cumulative effects on the availability of these species to people and communities in the project study area, especially Native people and communities.

8.2 Vegetation and Wildlife Having Cultural Significance

Moose and caribou are of particular cultural significance, and a young person's first kill is usually marked by a special ceremony. Spruce is of particular significance and is used for firewood (wood fires supplement oil heat in most homes) and log building construction. Saunas, known locally as steams, neli (Dena'ina), or makai (Yup'ik) are heated by wood and taken at least weekly by most residents of the river villages.

The EIS must address direct, indirect, and cumulative effects on the availability of culturally important vegetation and wildlife to people and communities in the project study area, especially Native people and communities. To address these potential impacts, not only is government-to-government consultation with Tribes required, but extensive coordination between the Corps' staff and tribal staff, members, and elders will be required. The Corps should develop a consultation plan, consultation agreements, and protocols in collaboration with affected tribes. The Corps should plan and schedule visits to each tribal community to discuss issues related to the proposed project and to the extent possible see the resources involved in the field.

8.3 Special Status Species

The USACE must work closely with the U.S. Fish and Wildlife Service (USFWS), NOAA Fisheries, and ADFG to determine potential impacts of the project on plant and wildlife species, especially species classified rare, threatened, or endangered on either state or federal lists. The EIS must provide the most up-to-date information available from consultation with the USFWS and the potential for impacts to special status species. The following list also applies to the aquatic species and critical habitats discussed in Section 7.3. The EIS must:

- Identify all petitioned and listed threatened and endangered species and critical habitat, as well as sensitive species, that might occur within the project area.
- Identify all species or critical habitat that could potentially be directly, indirectly, or cumulatively affected by each alternative.
- Discuss how surveys were conducted for each species, their findings, and all follow-up surveys and monitoring that would be conducted before, during, and after mining occurs.
- Discuss the project's consistency with existing resource management plans applicable to the proposed project area including the goals, objectives, land use allocations, and management decisions and actions prescribed in such plans.
- Include the biological assessment by reference or as an appendix, if one is prepared.
- Summarize, or include as an appendix in the EIS, biological opinions from NOAA and USFWS.
- Demonstrate that the preferred alternative is consistent with the biological opinion, if applicable.

The EIS must discuss the mitigation measures necessary to minimize impacts to special status species and prevent exposure of migratory waterfowl and other wildlife to any toxic solutions, spills, or mine influenced waters, including the pit lake. The EIS will need to discuss the effectiveness of mitigation measures to protect wildlife and indicate how they would be implemented and enforced, as well as describe maintenance requirements and monitoring to ensure their effectiveness.

Impacts to BLM Sensitive Species and Watch-listed Species in the project setting, including those in the Bristol Bay watershed (*Botrychium ascendens, Primula tschuktschorum, Smelowskia pyriformis, Micranthes porsildiana, and Plagiobothrys orientalis (L.)),* must be quantified and described (Woody, 2018). Impacts to Sensistive Species in the project study area, including those in the Bristol Bay watershed (*Romanzoffia unalaschcensis),* must be quantified and described. Impacts to all plant species considered to be rare at the state, federal, or global level must be quantified and decribed.

There are a variety of other federally threatened or endangered species in and around the project area including the Steller's Eider, the Eskimo curlew, the Short-tailed albatross, and the Wood Bison (USFWS, 2015). USACE must work with the USFWS to identify and evaluate impacts to the endangered and threatened species in and around the project area. The ESA requires that federal agencies "ensure that any actions they fund, authorize, or carry out are not likely to jeopardize the survival of any endangered or threatened species, or to destroy or adversely modify its designated critical habitat" (USFWS, 2018).

The proposed Pebble Project calls for the establishment of a road, gas line, and the port facility within 10 to 15 miles of the McNeil River State Game Sanctuary and Refuge, the location of one of the world's largest concentrations of brown bears. This industrialization would be in the middle of a critical corridor used by many bears as they travel along western Cook Inlet and back and forth through passes into Bristol Bay. This would disrupt their movements and potentially cause human-bear conflicts. In addition to brown bears, many other species use the Sanctuary including salmon, red fox, arctic ground squirrels, harbor seals, bald eagles, moose, caribou, wolves, wolverines, waterfowl, and seabirds (ADFG, n.d.; Sherwonit, 2018). The EIS must address impacts to the McNeil River State Game Sanctuary and Refuge and the flora and fauna that use this refuge and the land around it, including brown bears.

8.4 Rights of Indigenous Peoples and Cultural Relationships with Nature

Nature is considered to be sensate and willful, and both the Dena'ina and Yup'ik have a culturally defined relationship with nature in terms of correct actions and attitudes. For example, one would never step on or dirty a caught fish, as doing so is a sign of disrespect that the animal could be aware of. Hook and release sport fishing is universally unacceptable to both Dena'ina and Yup'ik people because it implies disrespectful playing with a sensate animal.

The NEPA process generally acknowledges the animals and plants of nature as living, but not sensate and willful, and water as inanimate. The traditional Dena'ina and Yup'ik of the region understand nature as sensate and willful and, if not treated correctly, capable of withdrawing as a food source or taking other detrimental actions. The EIS must acknowledge the indigenous peoples' right to construe nature in a culturally defined way and further acknowledge cultural and spiritual impacts on the people and their world view should the proposed Pebble Project cause contamination detrimental to salmon, other wild foods or medicines, or to clean water. Were this to happen the human impact would be to individual spiritual belief systems.

The EIS must address the potential direct, indirect, and cumulative effects of the proposed project, probable mine expansion, and spin-off mine developments on the sensate environment as understood by Dena'ina and Yup'ik people, in careful consultation with the local Native communities.

8.5 Waters of the State

The EIS must identify any non-jurisdictional wetland or riparian habitats adjacent to or within the project study area. The EIS must describe how these waters have already been affected by existing operations, the extent to which the functions of these waters have been degraded, and the extent to which each action alternative might further degrade or contribute to an improvement in the quality of these resources. The EIS must describe measures for the avoidance, minimization, and mitigation of losses, and address strategies for improving the quality and quantity of these areas. If important habitat would be adversely affected by the proposed project, the EIS must include a detailed mitigation plan for habitat replacement that includes the following information:

- Acreage and habitat type that would be created or restored;
- Resources needed to maintain the mitigation area;
- The revegetation plans including the numbers and age of each species to be planted;
- Maintenance and monitoring plans, including performance standards to determine mitigation success;
- The size and location of mitigation zones;
- The parties that would be ultimately responsible for the plan's success; and
- Contingency plans that would be implemented if the original plan fails.

8.6 Vegetation and Wildlife and Environmental Justice

Because of their intimate relationships with the study area's vegetation and wildlife, impacts on such resources will certainly fall disproportionately upon the area's Native communities. The EIS must acknowledge this disproportionality, and address it in careful, culturally appropriate consultation with the Native communities.

9.0 HYDROLOGY

The project description indicates that the foundation of the water management program for the proposed mine is the water balance (Pebble Partnership, 2017). This water balance is evaluated using three primary modules (Watershed Module, Groundwater Module, and Mine Plan Module). The Watershed Module and the Groundwater Module are described in the Environmental Baseline Document. The Mine Plan Module is not described in the Environmental Baseline Document or in the permit application.

9.1 Surface Water Hydrology

The Watershed Module described in the Environmental Baseline Document does not include even the most basic and minimally required components for evaluating physical or ecological impacts to surface water features. It is a lumped-parameter model that does not include the physics necessary to evaluate mining alternatives, future impacts of mining activities, or mitigation options. A physically-based hydrologic model should have been developed prior to initiation of the EIS. Since this model is needed to inform the evaluation of potential impacts to surface water resources, it must be developed during the EIS process.

This model should be developed and calibrated with appropriate data and should provide predictions at time and space scales that are ecologically relevant. An analysis of the potential effects of the mining activities on stream flows and stream water quality and impacts and interactions with groundwater must be developed prior to initiation of the EIS. The model must also consider the effects of climate change on surface water hydrology.

The Permit Application refers to a PHABSIM Instream-flow Model (Pebble Partnership, 2017). This model is not included in the Permit Application or in the Environmental Baseline Document. It should be developed and reviewed prior to initiation of the EIS.

9.2 Groundwater Hydrology

The Groundwater Module described in the Environmental Baseline Document does not include the necessary spatial resolution to evaluate impacts from the mining activities on nearby streams, wetlands, and lakes. The existing groundwater model is a relatively coarse regional-scale model with the area of each grid cell approximately 23 acres. This model is not sufficiently detailed to provide the information necessary to evaluate the potential impacts of the proposed mining activities or to develop reliable estimates of the local water balance. A smaller-scale

groundwater model with appropriate spatial and temporal resolution should have been developed prior to initiating the EIS. This model should be calibrated with data collected specifically to evaluate local-scale impacts and water balances. A more detailed and reliable evaluation of the local-scale groundwater impacts of the mining activities is needed to provide reliable estimates of larger-scale impacts and to develop reasonable estimates of the amount of water that will require storage and treatment.

A more detailed and reliable evaluation of the local-scale groundwater impacts of the mining activities is also needed to provide reliable estimates of the long-term or permanent impacts of the proposed mining activities on surface water baseflow in streams and wetlands. The mining activities will permanently change the groundwater recharge and groundwater storage characteristics of the site. A local-scale groundwater model with appropriate spatial resolution and geologic detail is needed to evaluate the effects of these changes on surface water baseflow in streams and wetland hydroperiods. This analysis should have been developed prior to initiation of the EIS.

The EIS document must evaluate where there are any groundwater connections among the potentially impacted drainage systems including the Talarik, Koktuli, and other area streams.

10.0 GEOLOGY AND SOILS

The combined Pebble ore deposits are described by the mine proponent as the largest known undeveloped copper resource and largest known undeveloped gold resource in the world. The proposed project exploits less than a fifth of the measured and indicated ore reserves. The EIS must describe the geologic and soil conditions (including hazard areas) in the vicinity of the project areas. It must identify potential significant adverse impacts of project alternatives on these conditions. Additionally, it must identify potential impacts on geologic and soil conditions from project construction and operation through closure. Industrialization of the Bristol Bay Watershed will increase the probability that this mineral resource will be fully exploited in the future.

10.1 Geology

At a minimum, the EIS must describe the regional and local physiography, bedrock geology, surficial geology, ore deposits, and their properties (geotechnical nature, mineralogy, petrology, etc.) for the region and areas affected by the project components (mine site, transportation corridor, deep-water port, natural gas pipeline, etc.).

The EIS must describe and evaluate the expected effects and potential for direct construction and operations impacts on identified geologic resources and conditions for all project alternatives, including the "no-action" alternative option. Potential impacts to mineral resources should also be evaluated. The results of the analysis should be directly captured in the EIS documentation, including supporting information and proposed mitigation and monitoring activities.

The analysis must also describe the potential for identified geologic hazards to impact project alternatives. Mitigation measures, commitments, and monitoring procedures associated with geologic hazards must be described. If no geologic hazards or potential impacts are anticipated, the conclusion should be stated in the EIS documents.

The results of this analysis must be incorporated into the EIS with supporting information included.

10.2 Soils

At a minimum, the EIS must include a description of soil types, structure, character, and composition, including geotechnical nature. Soil types must be tied to the regional and local landforms and geology of the project study area. Distribution of soils within the region should be described, and the areas affected by the project components (mine site, transportation corridor, deep-water port, natural gas pipeline) should be described in the EIS. Existing and potential material source areas for borrow, aggregate, and topsoil should be identified.

The EIS analysis must describe and evaluate the expected effects and potential for direct construction and operations impacts on identified soil resources and conditions for all project alternatives, including the "no-action" alternative. The results of the analysis should be directly captured in the EIS documentation, including supporting information and proposed mitigation and monitoring activities.

The results of this analysis must be incorporated into the EIS with supporting information included.

11.0 GEOLOGIC HAZARDS

The EIS must identify and describe known geologic hazards within the project study area. Geologic hazards include such things as highly erodible soils, landslides, debris flows, seismic hazards (e.g. faults, areas subject to liquefaction, tsunami zones, other earthquake triggered phenomena), avalanches, volcanic hazards, subsidence, rockfalls or slides, wild fires, torrents and flash floods, ice jams, shoreline erosion (marine and riverine), and other critical or sensitive areas susceptible to damage or loss of property and life from adverse geologic conditions.

The EIS should describe and evaluate the potential for identified geologic hazards to impact project alternatives. The EIS must identify and evaluate potential impacts to the proposed project from geologic hazards and subsequent impacts to people and natural resources. Mitigation measures, commitments, and monitoring procedures associated with geologic hazards should be described. If no geologic hazards or potential impacts are anticipated, the conclusion should be stated in the EIS with supporting information.

11.1 Seismic Considerations

The proposed Pebble Project is in one of the most tectonically active regions in the world, which presents the potential for multiple geological and related hazards to impact project components, and potentially impact natural resources in the affected areas.

During a public hearing in Anchorage, Alaska on April 19, 2018, Rick Delkittie of the Native Village of Nondalton shared first-hand experience about the effects of a high-intensity earthquake (Delkittie, 2018):

> *I'm a tribal member from Nondalton. I've lived there all my life. We're on a ring of fire. We also are on a fault line. I remember 1964, March 27th. We were 170 miles from the epicenter. That earthquake broke over 6 feet of ice. The ground was moving like waves.*

The EIS must provide a complete characterization of the local and regional geology including geological materials, geophysical processes (seismicity and volcanism), geomorphological hazards (landslides and avalanches), coastal hazards (flooding, erosion, and tsunamis), and climatological process for the areas potentially affected by the project components. For example, the above-listed natural processes could cause pipeline breaks/leaks, leaking of wastewater treatment areas, erosion or flooding and the uncontrolled release of contaminants

across a large geographic area. The freeze-thaw cycle must be considered. The EIS must also describe and evaluate the expected effects and potential impacts from geohazards for each project alternative.

The EIS must analyze the potential for geohazards over geomorphic time (the time period in which the landscape may change) and with respect to the potential for those hazards to impact mine operations, facilities, long-term maintenance, and long-term operations. The USACE must consider the resources of the project study area with a long-term view towards stewardship of the resources realizing that sooner or later, particularly in geological time, there will no longer be a liable party or financial assurance. In the event of an act of nature, the EIS must identify who will be responsible to address the situation.

12.0 GEOCHEMISTRY

12.1 Geochemistry and Environmental Impacts

The following supporting information for the geochemistry of the materials to be mined or otherwise used in the construction of the project should have been included with the Pebble Project permit application to ensure that the application contained the information necessary to describe and evaluate the potential impacts of the project.

The EIS must include a detailed characterization for each facility that includes:

- A detailed description of the mine facility, geology, hydrology, all potential sources of Mining Influenced Water (MIW), and other physical and/or chemical elements that could reasonably affect design specifications with respect to stability, safety and environmental integrity.
- Source material characterization, using industry best practice that includes:
    - Analysis of petrology, mineralogy, and mineralization;
    - Identification of geochemical test units;
    - Estimation of an appropriate number of samples for each geochemical test unit; and
    - Performance of geochemical testing on all samples from each geochemical test unit.
- Water and chemistry mass balance models for each facility.
- A conceptual site model (CSM) that describes what is known about release, transport and fate of contaminants, and includes all sources, pathways, and receptors for each facility.
- Identification of the contaminants of concern for the facility/source materials, using the results from the characterization.
- A demonstration, by the project proponent, that the source characterization, prediction tools, and models used for the facility characterization have been performed appropriately with current industry standards of best practice and will be continually revised and updated over the life of the mine as site characterization data and operational monitoring data are collected.

Accurate characterization of the mine's geochemistry is critical for properly identifying the project's potential impacts and addressing them through facility design and mitigation measures. The mine's geochemistry, including the mineralogy and lithology, metals leaching potential, and neutralization/acid generation potential and non-acidic chemical leaching potential of the pit wall rock, waste rock, old and new tailings, and historic/existing mine workings must be discussed. The EIS must describe the static and humidity cell tests and the statistical adequacy of the tests that have been conducted on waste rock and tailings to characterize them and provide a summary of the test results. The EIS must explain how the geochemical testing procedures were designed to comply with all applicable guidance and instructional memoranda.

In addition to characterization, the EIS must describe how waste rock would be handled, disposed, and reclaimed at the mine. The EIS must describe any waste rock management plan together with criteria for waste rock handling and proposed mitigation measures to minimize or collect leachate. The EIS must discuss facility designs and control measures that would be implemented to ensure against leaching and release of contaminants under both acidic and non-acidic conditions, and degradation of surface water and groundwater quality. This discussion must be supported with both with geochemical testing data and on-site current or historic monitoring data (recent monitoring results, pan evaporation rates, etc.).

12.2 Geochemistry and Environmental Justice

Metal leaching and acid rock drainage will very likely result in disproportionate adverse effects on Native communities in the area, because of the intimate relationships between these communities and the affected environment. Examples include the Assiniboine and Gros Ventre Tribes and the Zortman and Landusky Mines in Montana, the Spokane Tribe and the Midnite Mine in Washington, and the Yerington Paiute Band and the Anaconda Copper Mine in Nevada. The EIS must acknowledge the likelihood of such disproportionate adverse effects and address them carefully, in consultation with Native communities.

13.0 TAILINGS AND WASTE ROCK STORAGE FACILITIES STABILITY

Considering recent catastrophic events at Mount Polley Mine in British Columbia in 2014, and Samarco in Brazil in 2015, the EIS must thoroughly evaluate the public safety and environmental impacts, including impacts of catastrophic failure, of tailings storage facilities, as well as measures to prevent and respond to such failures. The EIS must identify and describe all tailings storage facilities in the proposed project. The EIS must include discussion of the following in the EIS and consider them as potential conditions for approval of the Mining Plan of Operations (MPO):

- Use of a Failure Mode Effects Analysis (FMEA) to identify all potential failure modes and effects, as well as appropriate design and mitigation measures for all alternatives. Include consideration of overtopping, static liquefaction, earthquake-induced slope failures, piping and cracking.

- Seepage modeling and fluid controls to inform and support selection of appropriate design and fluid management requirements.

- Alternative methods of tailings disposal that can improve stability as well as reduce risks of unintended spills and water management requirements. Consider methods such as dry stack and in-pit tailings storage.

- A formal Tailings Operation Management and Surveillance (TOMS) plan together with a formal Emergency Action Plan (EAP) for the proposed tailings storage facilities. A TOMS serves to document the procedures to be undertaken to properly operate, maintain, and monitor a tailings storage facility, while an EAP serves to document the procedures to be undertaken in the event of an emergency. In the case of tailings storage facilities, an EAP can help to prevent the occurrence or exacerbation of a failure.

- Include information in the EIS on how project operators would respond to an accidental spill event such as a pipeline rupture.

- Identify any changes to monitoring and inspection requirements for tailings facilities in all phases of the mine, including in post-closure. For phases with significant uncertainty, consider an adaptive management approach to design and operations with the goal of reducing failure risk.

13.1 Effects of Tailings and of Potential Storage Failure Scenarios

The tailings storage facility will be an earthen and rockfill dam much like the dam that failed in the Mount Polley Mine disaster. The potential for a Pebble Mine dam failure and resulting impacts that will dwarf the Mount Polley dam failure must be analyzed and addressed in the EIS. In the event of such a failure, the open pit will be allowed to flood and become a lake that will contain acidic waters and appropriate precautions must be taken to manage wildlife activity on the lake. It is unclear what these precautions will be and how effective they will be given the nature of extreme weather and the abundance of waterfowl and other wildlife that use and migrate through the area. The EIS must consider information from other open pits with acidic waters that have negatively impacted and killed large numbers of birds, such as those in Montana and Wyoming.

13.2 Tailings and Waste Rock Storage Facilities and Environmental Justice

Because any tailings and waste rock storage facilities will lie within areas traditionally used by Native communities for hunting and gathering, the simple existence of such tailings and facilities will have disproportionate adverse effects on these communities. Any instability leading to facility failure will have even greater downstream impacts. The EIS must acknowledge this disproportionality, and address it in careful, culturally appropriate consultation with the Native communities.

14.0 MINE RECLAMATION, CLOSURE, AND POST-CLOSURE

Understanding reclamation, closure, and post-closure of the mine and associated facilities is critical to an understanding of the potentially significant environmental impacts of this project. Therefore, the EIS analysis must describe in detail the reclamation, closure and post-closure management of the proposed project, including the following:

- A detailed account of measures that would be taken to decommission mine operations and stabilize and revegetate pit slopes, waste rock facilities, heap leach pads, tailings impoundments, roads and other areas;
- Identification (including estimated acreage) of the areas targeted for reclamation, and description of the intended degree of treatment in each area;
- Timing of reclamation relative to mining operations, procedures for concurrent reclamation activities, and duration of reclamation treatment;
- Standards for determining, and means of assuring, reclamation success; and
- Means of assuring that all maintenance required for reclaimed areas would continue after operations cease or while operations are suspended.

The EIS must describe all closure and post-closure activities associated with the open pits, waste rock piles, tailings facility, groundwater management, surface water management, water treatment and other facilities, including commitments by the mine company and agencies regarding operation and maintenance of caps/covers, drain-down systems, water treatment, fencing and wildlife protection measures, diversion channels, underdrain systems, wells, etc. The EIS must describe implementation, performance, and effectiveness monitoring, and follow up actions that would be taken should destabilization or contamination be detected.

The EIS must explain in detail how drain-down fluids from the tailings storage facility would be captured, treated and controlled over the closure and post-closure period.

14.1 Pit Lake

The EIS must address the formation of a post-mining pit lake and the potential for both short-term and long-term impacts from a pit lake. The EIS must address the potential hydrology and

geochemistry and provide for an estimate of the time required to reach hydrologic and chemical equilibrium, which are typically not the same. The EIS must address the potential for adverse water quality and potential impacts to the environment, such as to wildlife including migrating waterfowl during the period of pit filling (e.g. hydrologic equilibrium), until chemical equilibrium is reached, and over the long-term. The analysis must utilize best current methods and be performed in a conservative manner together with a sensitivity analysis that recognizes the inherent uncertainty in pit lake water quality estimates.

14.2 Underground Workings

Although underground mining is not being proposed for the initial phase of mining, it is probable that underground mining methods will be used in subsequent phases of mining to recover the deeper ore reserves to the east of the initial mining area. The Pebble Partnership has referred to this future mining area as "the Far East." Consequently, the EIS must identify and evaluate all potential impacts from underground mining in the expansion area to east of the initial mining area. These potential impacts must be included in the evaluation of cumulative impacts from the project.

14.3 Tailings Storage

The EIS must describe the reclamation and closure of the tailings storage facilities, including capping and covers, drain-down facilities, chemistry and fate of drain down fluids, and projected drain-down times. The EIS must assess the effectiveness of various cap/cover systems in reducing meteoric water flow through the tailings. The EIS must discuss in detail how drain-down fluids from the tailings would be captured, treated, and controlled during mining and milling operations and over the closure and post-closure period. It must include a description of the capacity of water treatment, the likelihood that this capacity will be sufficient and the contingency in the event of insufficient capacity. It must discuss the implementation, performance, and effectiveness monitoring, and follow up actions that would be taken should destabilization or contamination be detected. The EIS must examine the potential for long-term or perpetual drain down of the tailings and how this water would be treated and discharged.

14.4 Growth Media and Covers

Reclamation and closure of the backfilled open pit areas, tailings, and waste rock disposal areas typically involves placing growth media over rock material to provide store-and-release covers for the purpose of reducing infiltration of meteoric water. The EIS must describe the availability, properties, and sources of cover material and/or growth media, discuss how it would be applied to disturbed areas, and identify any additional measures (e.g. soil amendments) that may be

needed to ensure successful reclamation and revegetation of the project site. It must explain whether a synthetic geomembrane will be required to prevent interstitial water infiltration into mine facilities. Cover design must be described in detail with supporting data to demonstrate anticipated effectiveness.

The EIS must identify the permeability standard that growth media or other cover material would be designed to achieve, provide the basis for infiltration rates and cover/growth media thickness estimates, and discuss their effectiveness in minimizing exposure of mined material to meteoric water that could mobilize contaminants.

14.5 Reclamation and Closure Financial Assurance

The EIS must include and explain the mine reclamation and closure financial assurance requirements and provide estimated amounts for the proposed project and alternatives. The USACE should be aware that other parties are capable of providing reasonably accurate estimates of those requirements and could make those estimates public as part of the EIS process, so it would benefit all parties if the USACE would provide and consider this information in the EIS.

The viability of the financial assurance can be a critical factor in whether a project is environmentally acceptable; therefore, this information must be disclosed in the EIS. The EIS must describe financial assurance requirements and other measures that USACE and State regulators have in place to ensure funds would be immediately available should the mine operator or its insurer be unable to fund the required reclamation or closure activities. The EIS must explain how existing, or a lack of existing guidance and requirements for financial assurance from both USACE and ADNR will be addressed to ensure adequate financial assurance, particularly for long-term in perpetuity water treatment and site operations and maintenance.

14.6 Long-Term Site Management and Financial Assurance

The EIS must specify all necessary long-term monitoring and management of the mine, as well as the enforcement mechanisms by either USACE or other regulators should the mine operator fail to properly follow the long-term post-closure plan. The EIS must define the time frame over which long term management activities would occur or whether they might be necessary into perpetuity. It must include projected costs for any post-closure activities, and discuss whether USACE or ADNR would impose on the mine operator a requirement to establish a trust fund or

other funding mechanism to ensure post-closure care. If a long-term funding mechanism is deemed necessary by the USACE or ADNR, the EIS must include a general description of the funding mechanism. Any financial assurance must be kept current as conditions change at the mine. The terms of the trust fund or other funding mechanism are critical to determining whether sufficient funds would be available to implement the post-closure plan and reduce the possibility of long-term contamination problems. The discussion in the EIS must include the following information:

- Requirements for timing of payments into the trust fund;
- How to ensure the trust fund would be bankruptcy remote;
- Acceptable financial instruments;
- Tax status of the trust fund;
- Identity of the trust fund beneficiaries; and
- Identity of the operator with responsibility/liability for financial assurance at this site.

If the potential impacts of the project would necessitate a long-term trust fund, this information is essential in the EIS because it could make the difference between a project sufficiently managed over the long-term by the site operator, or an unfunded or under-funded contaminated site that becomes a liability for the federal or State governments. In the absence of an appropriate guarantee, the USACE must consider a project unacceptable if it could result in unmitigated impacts exceeding environmental standards on a long-term basis.

14.7 Mine Reclamation, Closure, and Post-Closure and Environmental Justice

The local Native communities will have to live with the long-term effects of mining and related operations long after any mine is closed. Because these effects will occur in the environment of which the Native communities have been a part since time immemorial, the effects will fall disproportionately upon the Native communities. The EIS must acknowledge this disproportionality, and address it in careful, culturally appropriate consultation with the Native communities.

15.0 SOCIAL, CULTURAL, AND ECONOMIC IMPACTS

15.1 Impacts on Subsistence Fishing

Federal Subsistence legislation began with the 1971 Alaska Native Claims Settlement Act (ANSCA Public Law 92-203). In addition to land claims settlements, ANCSA (Section 4(b)) extinguished aboriginal hunting and fishing rights stating: "All aboriginal titles, if any, and claims of aboriginal title in Alaska based on use and occupancy, ... including any aboriginal hunting and fishing rights that may exist, are hereby extinguished. (43 U.S.C. § 1601(b); see also NARF Legal Review, 1995). However, the intent of congress was to maintain subsistence rights. The ANCSA Conference Report states: "The Conference Committee expects both the Secretary and the State to take any action necessary to protect the subsistence needs of the Natives." (H. Conf. Rep. No. 92-476, 92 Cong. 1st Sess. 37, reprinted in 1971 U, S, Code Cong. & Ad. News 2247, 2250; see also NARF Legal Review, 1995). This was clarified in Title VIII of the 1980 Alaska National Interest Lands Conservation Act (ANILCA, Public Law 96-487 with amendments) that recognized the cultural aspects of subsistence stating: "the opportunity for subsistence uses by rural residents of Alaska . . . is essential to Native physical, economic, traditional, and cultural existence" (USFWS, 1992). By law the EIS must acknowledge and provide for continued subsistence activities by Natives of the Nushagak and Kvichak watersheds and Cook Inlet.

The EIS must acknowledge that the subsistence villages of the Nushagak and Kvichak watersheds have successfully made the transition from prehistory to the present with nutritional reliance on the same keystone species—salmon. This reliance has shaped aspects of the social (e.g. sharing) and spiritual (e.g. Great Blessing of the Water, sharing to ancestors) culture that continue from the past to the present day. Further, the EIS must evaluate the potential impacts of this project on the continuance of this subsistence-nutrient-cultural interaction.

Downstream impacts on salmon and other fish species would affect Native communities disproportionally. The EIS must acknowledge this disproportionality, and address it in careful, culturally appropriate consultation with the Native communities. Mitigation proposals must include a strategy that provides for the same genetically adapted salmon genomes to the Nushagak and Kvichak drainages. Mitigation strategies must include mitigation of social and spiritual impacts to the village in consultation with Native populations. Because social and spiritual impacts can be very landscape and resource specific (and therefore difficult or impossible to compensate for) the USACE should prioritize avoidance of impacts as the first step in the mitigation sequence.

15.2 Impacts on Subsistence Hunting and Gathering

Impacts on hunting of land mammals and gathering of plants would affect Native communities disproportionally. The EIS must acknowledge this disproportionality, and address it in careful, culturally appropriate consultation with the Native communities.

15.3 Impacts on Cultural Aspects of the Environment

The EIS must include an inventory of cultural resources that are important to the people and communities of the study area. Potential impacts from the proposed project to these cultural resources must then be identified, recognized, and evaluated in the EIS. Such resources include not only specific land and water areas, sites and structures, but plants and animals, fish and water, and human cultural, spiritual, and other relationships with nature and the environment.

15.3.1 As Perceived by Local Affected Communities

Sharing wild caught food resources is a critical aspect of defining community in the Nushagak and Kvichak villages. If salmon are impacted by industrial mining, a critical mechanism of community definition would be impacted and the EIS needs to address this potential loss in consultation with Native communities.

The EIS needs to acknowledge the dichotomous standards defining wealth and economics between mainstream American culture and mainstream Indigenous American culture and its role in decision-making. The former generally defines wealth as monetized wealth while the latter measures wealth in non-monetized terms such as freezers full of salmon and other subsistence foods, large immediate extended family, or freedom to express and act on traditional culture practices without excessive government or corporate restrictions.

The EIS needs to acknowledge that subsistence is a chosen cultural way of life with a very long history that is largely not monetized, but a legitimate cultural, spiritual, and economic activity. Subsistence activities including fishing, hunting, wood gathering, plant and berry collecting is a full-time job, not a hobby or casual pastime. Conducting and benefitting from these activities define tribal cultures, and form the basis for their languages and identity. Thus, impacts to any aspect of that way of life is a threat to one's physical, emotional, and spiritual well-being and must be considered in both risk assessment and mitigation, although how the applicant would propose to mitigate the loss of culture, language and ability to conduct spiritual activities.
The EIS needs to address the potential loss of anadromous wild salmon on the diet of residents of the Nushagak and Kvichak and its impact on health (Aslibekyan et al., 2014).

The EIS needs to acknowledge that the Dena'ina and Yup'ik of the Kvichak and Nushagak watersheds have traditionally understood nature as conscious, willful, and sensate and an equal to interact with rather than a non-conscious, non-willful, non-sensate entity as portrayed by Western science. In the Kvichak and Nushagak watersheds, Western religions such as Orthodoxy have absorbed much of the traditional indigenous views. Consequently, "environmental impact" is understood differently among most indigenous Alaskans of this region and mitigation must be scaled accordingly. Yup'ik and Dena'ina of the Nushagak and Kvichak watersheds are keen observers of nature and the source of traditional ecological knowledge. Many Yup'ik and Dena'ina also contextualize their interaction with nature through willful spirits which may be good or bad depending on recent events. One example is the Hairy Man, a frightening and ominous spirit that represents an imperiled nature. While allegorical, these entities are an indigenous barometer of the ecological health of the natural world. Social justice requires that the EIS recognize the potential role of industrial mining in producing these entities and their impact on the mental and spiritual health of indigenous communities.

The EIS must recognize and identify the existence of sacred sites, culturally identified as places where bad or good events occurred and are detectable to spiritually aware Dena'ina or Yup'ik, or burial or cremation places. Many have not been identified or mapped. While this information is needed for the NEPA and permit evaluation processes, care must be taken to keep locational information confidential for spiritual reasons, and to prevent looting and vandalism. Identification needs to be done in consultation with and at the direction of appropriate tribal entities.

Archaeological sites with the project area, surrounding area, and downstream areas must be identified and quantified in the EIS. The EIS must also acknowledge and describe sacred sites, burial sites, and cremation within the project area and surrounding areas potentially affected by the proposed project.

The EIS must recognize that water is considered sacred among most of the indigenous people of the Kvichak and Nushagak watersheds (Boraas and Peter 2008; Boraas 2009). Should water of the drainages become contaminated by mine activities is not only a biochemical problem to be avoided or mitigated, but an issue affecting spiritual and psychological well-being to be avoided or mitigated.

A scenario proposed by the project proponent is that many residents of the Nushagak and Kvichak watersheds would receive jobs at the Pebble Mine or associated facilities. The EIS needs to address potential depopulation of the villages as residents move to more populated areas since subsistence activities would no longer be done by those people.

In addition, mine jobs would likely be week-on, week-off or similar schedule putting enormous pressure on child-rearing and other family activities. The EIS needs to address social dysfunction as a result of mine jobs.

The EIS needs to consider the psychologically damaging, long term anxiety of living downstream from a toxic waste site. This effect needs to be taken seriously and mitigation measures need to be developed and evaluated.

15.3.2 Regarding Federal and State Law

The EIS must reflect USACE compliance with Sections 101(d)(6) and 106 of the National Historic Preservation Act, which require the USACE to identify historic properties within the area of potential effect, including historic properties of religious and cultural significance to Tribes. In consultation with Tribes, the USACE must identify these properties, evaluate the potential effects of the undertaking on the historic properties, and then develop a plan to avoid, minimize, and mitigate adverse effects. The USACE shall ensure that the Section 106 process is initiated early in the undertaking's planning, so that a broad range of alternatives may be considered. The USACE must consult early and often with Tribes during this process, and the USACE cannot rely solely on archaeological surveys to identify historic properties.

Executive Order 12898 dated February 16, 1994 directs federal agencies to identify and address the disproportionately high and adverse human health and environmental effects of their actions on minority and low-income populations (Clinton, 1994). Executive Order 13007 dated May 24, 1996 directs federal agencies to accommodate access to and ceremonial use of Indian sacred sites and to avoid adversely affecting the physical integrity of sacred sites (Clinton, 1996). The EIS must address the proposed Pebble Project's disproportionate impacts to Alaska Natives and communities and its impacts to the access and integrity of sacred sites. The UNDRIP was endorsed by the United States in 2010 (UN, 2008). The EIS must address each of the Articles in UNDRIP and evaluate how the proposed Pebble Project will uphold the declaration.

15.4 Impacts on Commercial Fisheries

Bristol Bay Watershed and Cook Inlet support several important salmonid species that will be irrevocably impacted by the proposed mine including Chinook salmon, coho salmon, chum salmon, pink salmon, and sockeye salmon. All salmon species, particularly sockeye salmon, form a world-renowned commercial fishery and economic engine. Cook Inlet supports commercial herring and halibut fisheries. The region also supports a robust crab and groundfish commercial fishery.

Given the importance of Bristol Bay and Cook Inlet salmon stocks to sport, commercial, and subsistence fishery groups in the area and beyond, and the severe impacts to both watersheds from a mine of this scale, the EIS must evaluate direct, indirect, and cumulative impacts to the Bristol Bay and Cook Inlet fisheries.

The EIS must quantify the economic value and benefits of the existing industries and identify, quantify, and evaluate potential impacts to these industries and their values and benefits.

The EIS must evaluate the potential to permanently damage one of the largest salmon fisheries in the world and the repercussions it would have on Bristol Bay region including the lost economy and the pressure that would be put on other salmon fisheries in the immediate area and beyond.

15.5 Impacts on Sport Fisheries

Sport fishing lodges and guided operations have existed in the Nushagak and Kvichak watersheds since the early to mid-twentieth century. These often attracted the wealthy and famous (the country singer Marty Robbins, for example, was guided on Lake Iliamna by Albert Balluta, Dena'ina from Nondalton). Guiding operations on Iliamna Lake are centered on the villages of Iliamna and Igiugig. With the establishment of Lake Clark National Park, a guided sport and hiking industry has grown in the Port Alsworth area. A guided sport salmon fishery has grown on the Nushagak watershed including efforts by the Bristol Bay Native Association to create a guide industry. The EIS needs to consider the potential downstream impacts industrial mining may have on the sport fishing economy in the Nushagak and Kvichak watershed.

15.6 Impacts on Tourism

Tourism is often associated with sport fishing but also includes hiking, remote cabin stays, and kayaking remote rivers such as the Mulchatna and its tributary rivers. The State Park accessed

from Aleknagik north of Dillingham or by small plane is a significant tourist destination. Tourists come to see unspoiled wilderness or have a wilderness experience, not to view industrial mining. The EIS needs to consider the impact mining may have on the visitor industry.

The proposed Pebble Project would see the establishment of a road, gas line, and Amakdedori port within 10 to 15 miles of the McNeil River State Game Sanctuary and Refuge, the location of one of the world's largest concentrations of brown bears. Visitation to the Sanctuary is primarily through its brown bear viewing program from June 7 to August 25, which allows the public to view and photograph bears while minimizing impacts to the bears and their habitat. The Sanctuary strictly manages human behavior during its brown bear viewing program in order to ensure that people aren't a threat to the bears nor a source of food. The industrialization of the Pebble Project will cause human-bear conflicts, causing different bear behavior at the Sanctuary and compromising the brown bear viewing program (ADFG, n.d.; Sherwonit, 2018). The EIS must evaluate impacts to the McNeil River State Game Sanctuary and Refuge brown bear viewing program.

There is are growing bear viewing operations on rivers of the region, especially Moraine Creek with Katmai National Park. These bears might be impacted by the road. Sport hunting is also important in the region for moose, caribou and brown bears.

The EIS must quantify the economic value and benefits of the existing industries and identify, quantify, and evaluate potential impacts to these industries and their values and benefits.

15.7 Environmental Justice

Executive Order 12898 on Environmental Justice addresses disproportionate adverse impacts of federal actions on minority and low-income populations. The EIS must identify minority and low-income populations potentially affected by the project, and address whether any of the alternatives would cause any disproportionate adverse impact, such as displacement, changes in existing resources or access, or community disruption. The document must also explore potential mitigation measures for any adverse environmental justice effects. It must describe the measures taken by the USACE to: (1) fully analyze the environmental effects of the proposed Federal action on minority communities and low-income populations; (2) present opportunities for affected communities to provide input into the NEPA process; and (3) establish the means for such input to be respectfully attended to.

As to Native communities, the CEQ instructs: "Where environments of Indian tribes may be affected, agencies must consider pertinent treaty, statutory, or executive order rights and consult with tribal governments in a manner consistent with the government-to-government relationship" (CEQ, 1997:14). The CEQ further instructs that "Agencies should recognize the interrelated cultural, social, occupational, historical, or economic factors that may amplify the nature and physical environmental effects of the proposed agency action" (CEQ, 1997:9).

15.8 Evaluate Economic Benefit Claims

The EIS must evaluate the project's claim that the product from mining this deposit can supply important mineral resources for alternative energy and other purposes of strategic national significance. More information and justification needs to be provided for this claim, particularly given the expected devastation of existing ecosystem services and the existing economic resource provided by the salmon fisheries, sport hunting, and ecotourism. The project proponents claim that this project will be good for isolated villages that have no work and a high cost of living. The EIS must evaluate this assumption and the potential for the project to devastate the subsistence, commercial, sport, and cultural resources that the tribes and others rely on in the Bristol Bay and Cook Inlet Watersheds, including the economic engine provided by the world class commercial, sport, and subsistence salmon fisheries, intact wilderness, and clean water and other culturally important species including but not limited to moose, caribou, porcupine, beaver, and berries. The EIS must also evaluate the direct, indirect, and cumulative impacts to ecotourism that is supported by Bristol Bay Watershed and Cook Inlet. This area is renowned for sport fishing and bear viewing throughout the area. Evaluation of economic benefit claims must be performed independently of any influence by the permit applicant or the USACE.

15.9 Government-to-Government Consultation

The EIS must discuss USACE's consultation with all Alaska Native tribal governments that could potentially be affected by the proposed project or that might have resources (e.g., traditional cultural properties, groundwater resources, medicinal plants, etc.) that could be affected. The principles for interactions with tribal governments are outlined in a presidential memorandum dated April 29, 1994 and Executive Order 13175 dated November 6, 2000 (Clinton, 2000), the Corps Tribal Policy Principles (1998, 2010). The Corps also has published regulatory program guidance from 2005 and 2007 that requires full consideration of tribal rights and concern, and pre-decisional government-to-government consultation. It is vitally important that formal government-to-government consultation take place early in the scoping phase of the EIS for the

proposed project to ensure that all issues are adequately identified and subsequently addressed in the EIS, and that consultation continues as the NEPA and permitting process proceed.

16.0 PROCESS CHEMICALS AND SUPPLIES

The EIS must address the potential for contamination by spills of chemicals, solvents, fuels and other potentially toxic or harmful substances that will be transported by various means including air, ground and water transport to the project site including docking and transfer facilities proposed for lower Cook Inlet bay.

The EIS must also address the potential for contamination by spills of product being shipped out, such as concentrates, and toxic materials, such as laboratory or refinery wastes. The potential impacts of shipping must be evaluated over the entire length of the shipping routes.

The EIS must clarify the use of cyanide for the proposed project including as either a leaching agent or flotation reagent and address the potential for spills to and from the site as well as at the site.

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