A compilation of numerous unsubstantiated or inaccurate statements, and missing information in the Draft Environmental Impact Statement (DEIS)

June 30, 2019

Compiled by
Molly Welker

EXECUTIVE SUMMARY

The DEIS is missing critical information including a reclamation and closure plan, a water monitoring plan, and a wildlife management plan. It does not include an economic or prefeasibility plan to determine if the proposed 20-year mine will be profitable. The proposed mine described in the DEIS is not the mine that will eventually be developed. It is irresponsible to assume that Pebble Limited Partnership, and its parent company, Northern Dynasty Minerals, will only mine 1/8th of the mineral resource and leave the more profitable ore in the ground after investing billions of dollars in the mine's supporting infrastructure. The proposed mine's supporting infrastructure would include a 188-mile long natural gas pipeline to feed a 270 MW power plant, unprecedented and untested water treatment facilities that will need to pump and treat over 6 billion gallons of contaminated water each year and into perpetuity, and several tailings, water storage, and waste rock facilities that will have embankments over 400 feet tall. One tailings storage facility will remain on-site forever, storing over 1 billion tons of toxic tailings in a seismically active area. The DEIS underestimates the risk of a tailings dam failure.

The proposed mine will impact over 5,000 acres of wetlands and streams, yet the DEIS does not include a comprehensive compensatory mitigation plan to offset the lost of this pristine aquatic habitat. The transportation corridor includes an 83-mile road, crossing dozens of rivers and streams in the Kvichak River and Gibraltar Lake watersheds. The proposed transportation corridor also includes an untested ice-breaker ferry crossing Lake Iliamna, which is the world's largest sockeye salmon nursery. This proposed transportation corridor is lacking critical multi-year environmental baseline data regarding the presence and abundance of anadromous and resident fish in the streams, the rearing of juvenile sockeye salmon, outmigrating smolts, and inmigrating spawners in Lake Iliamna. Without this basic data, the DEIS cannot adequately analyze the potential impacts of the mining company's proposal for the design and construct the transportation corridor's bridges and culverts on fish and aquatic life, or fully describe the impacts to the nearshore environments in Lake Iliamna from the ferry terminals or the natural gas pipeline. An industrialized deep-water port is planned at Amakdedori Port in Kamishak Bay on the west side of Cook Inlet. This port site is a navigational nightmare due to intense winter storms, ice conditions, high winds, and shallow reefs and is critical habitat for the endangered Cook Inlet beluga whale. The multitude of potential spills, leaks, and catastrophic failures, are not adequately analyzed, to accurately describe the risk factor of potential impacts associated with the transportation of the ore concentrate along the roads, across Lake Iliamna, or during the complicated proposed lightering operation in Cook Inlet.

The DEIS does not adequately account for climate change. Copper in fugitive dust along the transportation corridor and water temperature changes to headwater streams near the mine site are virtually ignored in the DEIS. **The following comments prove that the DEIS is so inadequate as to preclude any meaningful analysis, and therefore the Army Corps of Engineers should prepare and circulate a revised DEIS.**

The determination of Basic and Overall Project Purposes in the DEIS improperly eliminates consideration of potentially Less Environmentally Damaging Practicable Alternatives

The DEIS has improperly defined the basic and overall purposes of the project as the development and operation of "a copper, gold, and molybdenum mine in Alaska in order to meet current and future demand." This determination defines the basic and overall project purposes so narrowly as to effectively limit consideration of alternatives to the applicant's preferred site. The DEIS should be revised to properly assess and disclose to the public the full range of alternatives that may be practicable and less environmentally damaging in achieving the basic purpose of the proposed project.

Critical information is missing in the DEIS

There is no reclamation and closure plan, no tribal health impact statements, no wildlife management plan, no water quality monitoring plan, and only a conceptual Compensatory Mitigation Plan in the DEIS. The lack of even a conceptual closure plan that addresses all strategic closure components and their interactions is a significant omission in the DEIS. The closure costs of the 20-year mine is likely to exceed a billion dollars.

Some other critical analyses that are missing from the DEIS include: Failure Mode Effects Analysis (FMEA) of the much larger dam that will be required for the second bulk tailings impoundment; and, FMEA for both the impoundments that will be required for the pyritic tailings.

The Compensatory Mitigation Plan proposes no specific compensatory mitigation measures that could even begin to offset the lost acreage or stream miles that the Pebble Project would cause directly or indirectly

The direct and indirect impacts of the applicant's preferred alternative in the DEIS could eliminate wetland and aquatic functions for 5095 acres of pristine habitat at the mine site and along the transportation corridor. This areal extent of impacts to the "waters of the United States" represents what the Corps should consider to be the applicant's minimum compensatory mitigation burden.

The DEIS has not evaluated the impacts of alternative transportation corridors, and cannot because these alternative routes do not have comparable measures of wetland and aquatic impacts

The DEIS was hurried into development and release, rather than requiring the applicant to complete field studies to verify the reach and extent of the "waters of the United States," including wetlands on all of the alternative routes.

The Army Corps of Engineers is obligated to provide alternatives in a DEIS that are both

"reasonable and practical"
The only alternative proposed for the mine alternative in the DEIS is to backfill the open pit with mine waste. Both engineers and investors know that backfilling the pit after 20 years of mining will not happen, so the closure alternative being analyzed in the DEIS is neither reasonable nor practical.

For the transportation corridor alternatives the Pedro Bay Corporation has publicly denied access through their lands to PLP for the proposed road along the north shore of Lake Iliamna in Alternatives 2 and 3. Part of the process of an EIS is eliminating alternatives that are not feasible. Therefore these alternatives cannot happen and should not be an alternative of the DEIS.

Lack of Economic Analysis
The Pebble proposal is the only large mine proposal in Alaska in the last 20 years not to have an economic or pre-feasibility study. The scale of investment required to develop the Pebble deposit will require a major investor to partner with PLP. Given this need for external investment dollars, PLP should provide detailed information on the economic feasibility of the mine proposal so that mine investors and the State of Alaska knows whether or not this mine is profitable. However, PLP has refused to provide these details (RFI-70).

Furthermore, the current mine plan seeks to develop an open pit mine that would extract only ~10% of the total resource, leaving the deeper, richer Pebble East deposit underground along with ~90% of the potential profit. PLP's refusal to divulge the financial viability of their current mine proposal, along with the fact that the vast majority of the resource would be left undeveloped under this proposal, calls into question whether the mine, as currently proposed, is actually a viable long-term vision for the development of the Pebble Mine.

Evidence that this is not the planned mine
PLP has repeatedly described to investors a fundamentally different mine than what they have submitted for permitting. For example, at the Vancouver Resource Investment Conference in January of 2019, Doug Allen, Pebble's VP of corporate communications, made a number of statements that make it clear that the current proposal is not what PLP intends to build. Mr. Allen billed his talk as a "Crash course in the investment case for one of the world's largest undeveloped copper resources and the world's largest undeveloped gold resource." He further stated that "Although we're only trying to permit a 20-year mine, this would be a 200-year mine at this scale" and cited the known reserves and resources, rather than the amount currently being considered for extraction under the 404 permit application, in his investment case for the mine. Finally, Mr. Allen made it clear that PLP has carefully crafted its permit application to maximize their chances of getting a permit, and will then shift to maximizing its profit.

The richest part of the Pebble deposit is at depth and not part of the Pebble Project application
In order to mine the deeper, more profitable ore in the Pebble East Zone and become financially viable, PLP will need to gain access by first mining the shallower open pit in the Pebble West Zone that is currently proposed in the DEIS, and then developing either a larger open pit or an underground mine starting from the bottom of that pit. If mining this deeper ore is required to make the project profitable, then PLP cannot place the pyritic tailings and waste rock back into the pit after 20 years, as described in the DEIS. Thus, one of the key assumptions in the DEIS affecting environmental risk is that "pyritic

tailings and potentially acid generating (PAG) waste rock would be placed into the open pit for long-term storage below the pit lake water level" (DEIS, p. 2-39) – is invalid. The PAG tailings must instead be kept in ever-growing surface impoundments while PLP mines the deeper ore, and these tailings will therefore remain an environmental liability much longer than assumed in the DEIS.

The cumulative impacts of the 78-year mine need to be discussed in the DEIS

The impacts related to the reasonably foreseeable 78-year mine will be significantly different than for the proposed project, and some level of quantification is needed for the 78-year mine for potential water quality and quantity impacts. Infrastructure such as tailing storage facilities and waste rock facilities will be enlarged in a 78-yr mine, and water treatment requirements will also significantly increase, and by how much needs to be discussed in the DEIS.

PLP is promoting a smaller mine plan and has scrapped the use cyanide to recover more gold

Smaller is relative. The site would include an open pit mine more than a mile across and deeper than Lake Iliamna, a 188-mile natural gas pipeline, an on-site power plant, two ferry terminals and a ferry to carry mined ore across nearby Lake Iliamna to the deep water port in Cook Inlet, and over 70 miles of road through a pristine roadless area. What they're proposing right now is about four times what the EPA thought would be an acceptable level of risk.

"Because cyanide has such a bad word in the environmental community, in an effort to show responsiveness and to enhance the probability of us getting a permit, we have taken the secondary gold recovery cert out of this…About 12% of our gold would be affected by that, and we hope at a later date to get permission to…to potentially add a secondary circuit " (Allen, January 2019). In contrast to Mr. Allen's comments regarding the future use of cyanide, the DEIS does not mention the potential that PLP might use cyanide for secondary recovery. If PLP in fact intends to do this, as noted by Mr. Allen, then there will need to be additional facilities to undertake this secondary recovery, and/or additional shipments of materials to accomplish secondary recovery elsewhere. Either of these would have associated environmental risks and impacts that are not currently evaluated in the DEIS.

Despite PLP claims, project impacts are not limited to the Nushagak drainage, but extend significantly into the Kvichak drainage

The DEIS states "The only mine site features in the Upper Talarik Creek watershed would be the Water Treatment Plant #1 east discharge location and a short section of the mine access road." (DEIS, ES-35). The Pebble Project simply does not limit major impacts to the Nushagak (i.e., North and South Fork Koktuli Rivers). Impacts extend to the Kvichak drainage (Upper Talarik Creek and Lake Iliamna) via inter-basin transfer through groundwater connections which will cause both water withdrawals (habitat removal) and potential for contamination (habitat degradation); treated wastewater discharge into Upper Talarik Creek which will change the temperature, chemistry, and seasonal flow regime (habitat degradation); a road crossing multiple tributaries to Upper Talarik Creek; and the two ferry terminals and the ice-breaker ferry crossing the Lake Iliamna will impact both the juvenile outmigration and the adult spawning migration. Also the 78-yr mine build-out will include half of the enlarged open pit and all of the large North Waste Rock Facility being constructed in the Upper Talarik Creek.

To meet the aggressive 4-year construction schedule, work would have to continue year round

There is no information in the DEIS regarding winter construction in remote, rural Alaska and how it would impact the environment and the quality of work. Cold weather earthwork, including mining of materials and compaction of engineered fill, will be critical to the successful construction of the dam embankments. But frozen, ice-rich material does not compact well and saturated wet soil is difficult to work in, and more difficult to place with optimum compaction in cold weather. The winter construction timeline and methods should be addressed in the DEIS.

The extreme complexity and difficulty of constructing such large HDPE liners for the huge footprint of the pyritic tailings pond and the main water storage pond will be difficult to construct during any season. The long-term durability of containments systems are to date unproven as landfill liner systems have only been used for about 30 years. Consequently, failure modes of liners need to be quantified and analyzed in the DEIS.

The DEIS underestimates the potential impact to fishes, their habitat, and their overall sustainability

To predict potential impacts, the DEIS relies heavily on the Pebble Limited Partnership's (PLP's) Environmental Baseline Document (EBD; PLP 2011). While the PLP EBD is extensive and does include some valuable information (e.g., that regarding water quality, rainbow trout movement), it poorly characterizes salmon spawning, rearing, and habitat data. The methodology used to estimate escapement by R2 et al. (PLP 2011) is not standardly accepted; is not presented in a manner with which it could be reproduced; and resulting data are imprecise, biased, and incomparable to methods used in Bristol Bay rivers by Alaska Department of Fish and Game. Consequently, escapement was underestimated in the PLP EBD. Methods for estimating juvenile abundance were similarly unrepeatable and interpretable from their presentation in the EBD. Because they were conducted only from 2004-2008—limited indices and underestimates of spawner and juvenile abundance in PLP's EBD ignore the variability in population abundance inherent to salmon populations in general, which ultimately lead to their overall sustainability.

There is virtually no consideration in the DEIS of genetic diversity of salmon stocks

Best available science clearly describes genetic and (related) life history diversity is amongst the most critical factors contributing to the overall sustainability of the Bristol Bay salmon fishery. The hundreds of discrete spawning populations of sockeye salmon in Bristol Bay display local adaptations to highly variable spawning and rearing habitats (i.e., life history diversity). Distinct stocks can occur at fine spatial scales and collectively create a 'portfolio effect' which dampens overall variability in the fishery by more than two times. Consequently, characterization of the genetic composition of potential impacted stocks is essential to understanding and predicting project impacts. The omission of genetic information in the DEIS is glaring in light of the potential for elimination of some streams, and underestimation of habitat impacts in a multitude of surrounding streams.

The DEIS does not adequately address how proposed activities would impact life history diversity and uniquely differentiated populations of sockeye salmon in the Kvichak watershed

The DEIS does not evaluate impacts to life history diversity among spawning populations, such as spawn timing or ecotype (river vs. stream vs. beach spawners)--except for a brief acknowledgment of 'stillwater' spawning salmon. Additionally, populations on small spatial scales vary dramatically across years (the "portfolio" effect), and while the DEIS does cite evidence to this effect for stream locations (e.g., the

Morstad 2003 spawning survey report), it relies on a single year of May-August data for nearshore habitat use by juveniles and adults. This is insufficient to capture the use of this habitat by salmon and other fishes, as it does not reflect the potential for variable use across years.

Faculty, undergraduate, and graduate students from the University of Washington's College of the Environment have been collecting data for more than 50 years on everything from salmon DNA to the impacts of climate change in Bristol Bay, but the DEIS does not cite their reports related to sockeye salmon production in the Lake Iliamna and the Kvichak watershed.

The DEIS does not address any impacts on Lake Iliamna zooplankton, an essential component of sockeye salmon production

These small, pelagic invertebrates are essential prey for juvenile sockeye salmon. Zooplankton are susceptible to heavy metals (e.g., cadmium, copper, mercury), and populations of cladocerans, favored by juvenile sockeye salmon, are particularly susceptible to population declines at low concentrations of heavy metals. Therefore potential spills could have great consequences for juvenile sockeye salmon prey availability and overwinter survival.

The impacts from the transportation corridor are vastly underestimated in the DEIS

In particular, data regarding fish use and habitat characterization along the newly proposed, preferred transportation corridor is lacking. Data characterizing fish presence and habitat were collected only one summer, are generally insufficient, and ultimately result in underestimates of potential impacts to fish habitat. Along the southern access road corridor in particular, only very cursory presence studies were conducted in 76 of an estimated (in all likelihood underestimated given inadequacies of the National Hydrology Dataset) 173 stream crossings along the 35-mile portion of the road. Thus, surveys conducted to date along the southern access road are simply insufficient for determining fish presence.

The preferred alternative transportation corridor would virtually bisect the Kvichak watershed including Lake Iliamna, the world's largest sockeye salmon nursery

The ice-breaking ferry crossing the lake and the natural gas pipeline paralleling it would carry potential for spills and leaks which could impact rearing juvenile sockeye salmon, outmigrating smolts, or inmigrating spawners. Approximately 80% or more of successful spawners that use the lake will have to cross the corridor pathway at least twice during their lifetime. Collectively, the sockeye that spawn upstream of the proposed transportation corridor through Lake Iliamna comprise nearly 20 genetically unique populations. Consequently, a major ferry or pipeline accident has the potential to dramatically erode the diverse salmon stock portfolio—and thus overall sustainability—of Kvichak River sockeye. Although they are not in the current DEIS, potential spills, leaks, and catastrophic failures must be robustly analyzed as a risk factor for a reasonable consideration of potential impacts of mining.

The DEIS does not evaluate cumulative effects on salmon from lifetime exposure to disturbances

A major concern is that ferry terminals and ferry passage routes in Lake Iliamna intersect the migration corridors for the great majority of sockeye salmon production in the Kvichak watershed. Most Lake Iliamna spawning tributaries are located east of the proposed ferry corridor, documented beach-spawning locations are in the east region of the lake, and all Lake Clark populations are also upstream of the ferry corridor. Salmon would encounter these impacts at multiple life stages: during juvenile rearing

for Iliamna tributary or beach spawners (1-2 years), during juvenile outmigration (all), and during adult spawning migrations (all).

Data establishing fish distribution and thus appropriate water withdrawals are lacking particularly for southern road corridor

The DEIS states the magnitude and duration of the maximum projected surface water use along the transportation corridor during the 4-year construction phase would be a total of 49 million gallons: 19 million gallons along the mine access road, 6 million gallons along the Iliamna spur road, and 24 million gallons along the port access road. Estimated average extraction rates would range from 500 to 1,000 gpm, depending on the streamflow/volume of the waterbody (PLP 2018-RFI 022 and Section 4.16-32). According to the DEIS the duration of streamflow reductions would also be long term, beginning during project construction, and would continue through operations and post-closure (Section 4.24-12).

Extractions of extremely large volumes of water from presumably small streams for which insufficient fish and discharge data have been collected could potentially vastly underestimate fish impacts of water withdrawals along the transportation corridor. Cursory fish surveys were conducted during the 2018 summer season, but they fail to characterize seasonal, inter-annual, and spatial variability inherent to fish (and particularly anadromous salmon) populations. Given that impacts are treated in isolation in the DEIS, longstanding reductions in flow should be considered alongside impacts to physical habitat, water temperature and chemistry, and biota. A revised draft EIS should incorporate these cumulative effects.

Baseline data are insufficient for proper culvert design, and culvert impacts are vastly underestimated

Eighty-six culverts are proposed for the preferred transportation corridor alternative, a little less than half of which will be "designed for fish passage". Given known issues with culverts, such as erosion, sedimentation, and prevention of channel migration PLP's environmental baseline data are insufficient to support informed culvert design. The level of effort to identify fish-bearing streams is deficient, particularly along the southern road corridor from the Lake Iliamna to Amakdedori. Furthermore, the hydrology and bed characteristics of streams that will be crossed are largely unstudied, making appropriate culvert design impossible.

The DEIS consistently fails to consider the importance of wetlands and headwater streams in forming downstream habitat which accommodate anadromous and other fishes, resulting in vast underestimates of the impacts from mining

Headwater streams comprise the majority of all stream networks and strongly influence the ecological functions and biota in receiving waters. They are sources of organic matter and energy inputs essential to the productivity of downstream communities. Headwaters also provide refugia for threatened and endangered species, refugia from invasive species, are culturally, commercially, and recreationally important, and are at high risk of impairment. The impacts to downstream receiving waters from the mine and the infrastructure development is vastly underestimated in the DEIS.

Percentage estimates of habitat loss in the DEIS overly simplify freshwater ecosystems spatially and temporally

Estimates in the DEIS reduce habitat loss to linear distances of headwater streams and the percentages of stream distance within each basin, which vastly underestimates actual impact. The DEIS ignores downstream, integrated impacts of changes in streamflow, groundwater-surface water exchange, water temperatures, water quality, and food-web effects. Predictions of habitat loss in the DEIS also assume low densities of fish in these habitats, but those assumptions are based on poorly collected and impossible to interpret spawning and rearing data. Estimates of habitat loss rely on a Physical Habitat Simulation (PHABSIM) model, which focuses primarily on salmon habitat (in spite of the subsistence, sport-fishing, and ecological importance of other fishes), and the water depth and velocities.

PHABSIM model is outdated and has multiple known deficiencies

Primarily it uses only main channel depth and velocity to quantify habitat despite countless evidence that temperature, off-channel habitat, groundwater influence, instream structure and cover, seasonal variability, and many other factors all combine in unique combinations to produce the diversity of habitats that support Bristol Bay salmon. Moreover the environmental baseline data used to build the model incorporates mixed (incomparable) methodology, uses insufficient site selection and replication, and fails to validate or verify the model. Sampling for PHABSIM to predict habitat loss was not conducted in or near the mine footprint in either the North Fork Koktuli or the South Fork Koktuli where sampling began miles downstream of the proposed project footprint. These limitations of the model assumptions and data inputs result in vast underestimates of habitat impacts. More accurate techniques should be required in a revised draft EIS.

The DEIS relies on the sufficiency of Alaska water quality criteria for the protection of aquatic life, and the reliability of treatment to achieve criteria

The vast majority of Alaska water quality criteria exceed current ambient conditions by 2 to over 2000 times in the headwater streams near the mine site. And given that water treatment at the Pebble Mine will be required in perpetuity and in a remote and extremely wet environment, occasional failures are to be expected which will exceed water quality criteria and may have lethal, sublethal, and indirect impacts on fish and other aquatic life. With respect to mining, one study showed that water quality criteria were exceeded in groundwater in 77% of U.S. mines, and in surface water in 60% of mines (Kuipers and Maest 2006).

The ability to withdraw and release water strategically is not explained in the DEIS

Three separate discharge points are proposed for the release of treated water with strategic timing of the water release to minimize, or avoid, impacts to fish habitat (Section 5-16). Yet the ability to release water strategically is not explained in the DEIS and the DEIS ignores differences in water temperature and chemistry in discharge water relative to baseline conditions.

Impacts from water temperature changes are virtually ignored

Temperature changes are predicted from 0.1 to 3.5 ^{o}C at the three discharge locations. Impacts to fish from altered temperature regimes is minimized in the DEIS yet temperature is the driving factor contributing to fish metabolism and growth. And the reported change in winter water temperatures in the DEIS are likely to have significant not "negligible to potentially positive" effects to salmon in the affected

rivers and streams near the mine site. The DEIS contention that increases in water temperature will be beneficial to the affected salmon and aquatic invertebrate is not supported by the scientific literature.

The DEIS states treated water discharges to the North Fork Koktuli, the South Fork Koktuli and Upper Talarik Creek have the potential to alter the water temperature of receiving waterbodies
Changes in water temperature could potentially alter spawning timing and egg incubation periods of managed species, alter productivity of receiving water streams, and alter aquatic invertebrate community structure. Treated water discharged at the 3 discharge locations from the water treatment plants is expected to be 41°F (5°C) from December through April (winter) and 51.8°F (11°C) during May through October (summer).

Temperature is amongst the primary factors driving egg incubation and emergence, juvenile metabolism and growth, and smoltification. Even slight changes in temperature can impact the timing of these life history stages—timing which has evolved over millennia for individual stocks to adapt to very specific habitat conditions. The impacts of temperature changes are virtually ignored in the DEIS. The DEIS fails to consider the interactions between groundwater and surface waters, treatment plant discharges, temperature changes due to changes in flow level, and general interactions between temperature and other physical, chemical, and biological impacts of proposed mining. Failure to adequately consider temperature impacts results in a vast underestimate of potential impacts in general.

The DEIS states that impacts from incidental spills to essential fish habitat (EFH) are expected to be negligible
The DEIS states that incidental spills of petroleum lubricants and fuels during road construction have the potential to affect fish and aquatic resources, including EFH. Potential causes of incidental spills include equipment failure, fuel transfers, accidents, and human error. And based upon regulatory compliance and implementation of control measures, impacts on EFH (coho salmon, Chinook salmon, sockeye salmon, spawning and rearing; chum salmon spawning; and pink salmon spawning) from contaminant releases during construction are expected to be negligible (p. 90).

The conclusion of negligible impacts is unsupported by the DEIS, particularly without some consideration for spill rates in other Alaska mine sites in addition to road use involving extremely heavy traffic transporting toxic concentrate in addition to petroleum lubricants, fuels, and other mining related contaminants. Failure to consider contaminant release during project operation is a gross omission resulting in another vast underestimate of potential impacts.

The DEIS provides estimates of direct dispersion of road dust based on an arbitrary 100-meter boundary placed around roads.
An arbitrary 100-meter boundary results in impacts to 892 acres of "wetlands and other waters" including 648 acres of wetland, 205 acres of lakes and ponds, and 37 acres of rivers and streams (DEIS Chapter 4.22). An additional 6,100 acres of vegetation would be impacted by road dust (DEIS Chapter 4.26). All in all, including contributions from mine site dust, 10,000 acres of wetlands, vegetation, and water bodies could be impacted by fugitive dust based on the current dust plume assessments. Much of this area would receive repeated inputs of thousands of tons of dust annually (RFI 007). However, the nature of the

impact that this deposited dust might have on aquatic ecosystems is not considered or analyzed in the DEIS.

The environmental consequences, including toxicological effects, of fugitive dust once it enters freshwater ecosystems are not addressed in the DEIS

Fugitive dust chemistry as reported in the DEIS does not include metals from vehicle wear as a component, therefore environmental consequences to aquatic life cannot be assessed. And there is no baseline soil chemistry for roads, therefore future impacts cannot be assessed. Baseline chemistry needs to include trace elements and salt or petroleum components that could be in chemical dust suppressants. There is also no ecological analysis that considers the cascading physico-chemical effects of fugitive dust on the environment, including bioaccumulation of metals and polycyclic aromatic hydrocarbons, and the resulting potential impacts on fish and aquatic resources. There is no analysis of impacts to wetlands or water bodies, only the number of acres directly impacted by dust deposition according to the grossly inadequate model employed in the DEIS. The transport of dust and associated contaminants away from the site of deposition by water flow and biological processes is completely ignored. And critical assumptions underlying the dust deposition model are buried in an RFI and not provided in the DEIS.

The DEIS acknowledges the potential for elevated mercury in road dust, tailings, and other mining related contact waters, but fails to fully consider its potential impact to both the aquatic food-web and to important subsistence species, and ultimately to human health

Mercury is a metal, which is non-essential to physiologic functions of life. While mercury occurs naturally at low levels in the environment, anthropogenic actions including mining have increased background mercury levels by two to four times in the aquatic environment even in remote places due to atmospheric deposition. While mercury can be acutely toxic, its toxicity to wild fish is more commonly related to chronic exposure to methylmercury (a bioavailable form of mercury) via diet. Methylmercury bioaccumulates up aquatic foodwebs, with the highest concentrations occurring in largest, oldest, piscivorous fish (e.g., Northern pike, Arctic grayling, Dolly Varden). Highest concentrations of methylmercury in fish tissue are also associated with rivers influenced by wetlands and acidification—both of which could compound impacts from Pebble Mine and associate infrastructure development. Chronic methylmercury exposure has impacts at very low levels (muscle or whole-body concentrations of 0.5-1.2 μg/g), including: neurotoxicity causing brain lesions and organ damage that impairs abilities to locate and capture prey and avoid predation; inhibition of reproductive success and growth; damage to intestines, digestion, cellular metabolism, organs; and alter stress hormones. Because of the lack of consideration for potential aquatic and human impacts of increased mercury concentrations associated with mining activities and bioaccumulation up the food-web, the DEIS vastly underestimates potential impacts of the proposed alternatives.

The DEIS applies inappropriate methodology to determining the percent of aquatic resources impacted.

The EPA requested that an analysis of the percentages of various aquatic resources that will be unavoidably impacted by the mine infrastructure be conducted on a more localized scale rather than a large-scale watershed in the DEIS. The response from the USACE was that an analysis at a scale of 12-digit Hydrologic Unit Code (HUC) would greatly multiply the amount of data to convey, without providing benefit to the reader.

Mike Gracz analyzed the amount of developed land in the single 12-digit HUC, where most of the unavoidable impacts due to the mine footprint will be located. This conservative analysis showed that this 12-digit HUC contains 31% of the length of headwater anadromous streams in the Nushagak Basin that support four species of Pacific salmon. Therefore this high proportion of proposed impacts to aquatic resources should be used to support a conclusion of significant degradation in a 404(b)1 analysis and for the No Action alternative.

The hydrologic modeling approach used in the DEIS impact analysis is inappropriate

The DEIS does not analyze the volume of water or water quality that would need to be treated if the full deposit were mined (i.e., the 78-year mine alternative). Mining the full deposit would require substantially more pumping and water management in order to keep the pit and/or underground workings dry – and will require perpetual treatment averaging ~100 cubic feet per second (~50,000 gallons per minute) to prevent the pit from overflowing after mine operations have ceased. This is likely to be more water than can be reasonably managed in perpetuity.

The DEIS does not adequately account for climate change

For a mine that might be expected to operate for many decades, The DEIS assumption that past climate variability is a reasonable proxy for expected future variability – an assumption that is at odds with the scientific community – could be quite risky. At the end of the mine operations the fraction of winter storms falling as rain rather than snow is projected to more than double. This change would fundamentally influence the DEIS assumptions regarding mine impacts to site hydrology, including the amount and timing of water requiring treatment, the impacts of treatment discharges on downstream hydrology, and the magnitude of extreme precipitation events. The design of water management facilities at the Pebble Mine, as described in the DEIS, is based only on extreme precipitation events that currently occur during 'non-winter' months. As a result, because the DEIS dismisses the impacts of climate change, it also potentially underestimates hydrologic risks associated with development of the Pebble Mine.

The proposed water treatment system is a giant and expensive experiment

No mine has ever operated water treatment plants as large and as complex as those proposed at the Pebble Mine. These systems were not designed using a conservative design philosophy, have never been tested, appear likely to be non-compliant for selenium, and are proposed to treat water in perpetuity. In short, this is a giant experiment being conducted in an ecologically sensitive part of Alaska. The complexity of the water treatment system and the requirement that it operate forever should cause considerable concern and be discussed in the DEIS.

The proposed project estimates that it will generate an average of 6.8 billion gallons per year of wastewater during operations and 11.8 billion gallons per year during closure, requiring capture and treatment. The wastewater will contain metals and other pollution harmful to fish and public health. This is unprecedented. There is no other U.S. hardrock mining operations that capture and treat such a large volume of contaminated mine water.

This estimated volume of water is more than three to six times the amount of contaminated mine water treated at the nation's largest Superfund mining sites (e.g., the Berkeley Pit and Upper Coeur d'Alene

Basin) and two to four times the volume treated at the largest operating open pit mine in the U.S. (i.e., Bingham Canyon).

The DEIS presumes the wastewater treatment plants can remove selenium to 5 µg/L

The DEIS does not use any evidence from actual mining operations that are currently treating water for selenium to validate the claim that the wastewater treatment plants can meet Alaska state water quality criteria of 5 µg/L. The DEIS states that the water treatment plant can remove selenium from 6,300 to 22,000 gallons per minute (gpm) of mine-water, when water treatment plants currently don't treat more than 2,000 gpm for selenium.

The DEIS does not analyze likely impacts of selenium on aquatic and avian life

In order to treat selenium in mine water, the incoming water will need to be heated and therefore the effluent will be warmer than receiving waters, and may negatively impact the fish downstream of the discharge locations.

Selenium in mine discharge water will almost certainly be toxic to aquatic life. Personal communications with plant operators have not turned up any examples of mining water treatment plants that can meet the 92-94% selenium removal the DEIS relies on. The wastewater treatment plants will have to treat very high volumes of water, making it even more difficult to achieve the 5 µg/L goal. And the State of Alaska water quality criteria is based on old science, using EPA guidance from 1999. There is a much greater understanding now of how selenium becomes toxic through the food chain, and EPA guidance was updated in 2016. The levels that will be discharged from the proposed water treatment plants will be toxic to aquatic life and birds, affecting reproductive success.

The DEIS underestimates the risk of a tailings dam failure

The probability of a full breach of the bulk or pyritic tailing storage embankments was assessed to be extremely low (DEIS, p. 4.27-72). Although a full breach is a low probability event, it has very high consequences and should be evaluated in the DEIS. There are 3 separate earthen dams retaining over 1 billion tons of toxic waste, which is more than 70% of all the ore that will be mined in the proposed 20-yr mine. There is also a proposed 2-sided dam containing recycled water for water management. The highest dam embankment is taller than a 50-story building.

The northern embankment of the bulk tailing storage facility (TSF) will be built using the centerline construction method. The DEIS states that "dams designed with downstream construction methods are less likely to fail than dams using centerline construction methods, especially under seismic shaking" (DEIS, p. 4.27-73). Thus, despite the acknowledged risks from a failure, PLP is not proposing the most stable dam design for the bulk TSF. The DEIS states the centerline construction method was selected for the bulk TSF north embankment to limit the footprint and volume of materials required for construction (PLP 2018-RFI 075), in other words centerline method in Action Alternative 1 was selected to 'save material and money'.

Data on tailing dam failures around the world demonstrate that downstream construction method dams are less likely to fail than those using centerline construction methods, especially under seismic shaking. Furthermore, the DEIS does not provide enough detail on the tailings dam designs to allow for a reasoned

analysis of the risk of a complete tailings dam failure, but the DEIS as written nonetheless dismisses the possibility of such an event. A more credible design that includes rigorous dynamic analysis for seismic design of the embankments needs to be provided in the DEIS for the public to review.

Rather than acknowledging that the dam designs are incomplete, and do not have sufficient information to fully evaluate the risk of a TSF failure (as required by 40 C.F.R. § 1502.22), the DEIS dismisses the risk of a full TSF breach, and proceeds with unrealistic scenarios of a pipeline failure at the bulk TSF and a partial dam failure in the potentially acid generating TSF dam.

On page 4.27-89 of the DEIS it states "The spill impact would extend from the spill location about 230 river miles downstream of the mine site. The duration of impacts would not extend longer than 1 year, or until the tailings are cleaned up or incorporated into the bedload." It is hard to believe that the Koktuli fishery would not be impacted for more than a year. And any cleanup effort will most likely cause as much damage, or more than the spill.

A major discrepancy exists in the DEIS and associated documents regarding the amount of PAG waste rock that will be stored in the pyritic tailing storage facility (PTSF).

The DEIS claims that 50 million tons will be stored (DEIS p. 2-12 and Appendix. N, p. 1), while Knight Piésold (2018d, p. 18) states that the amount will be three times as high, or approximately 160 million tons. 160 million tons will take up more space than 50 million tons in the pit upon closure and will leach more solutes into the open pit. This discrepancy needs to be resolved and a correction made in a revised DEIS.

Submerging PAG wastes won't prevent acid formation

The DEIS predicts acid drainage will not affect water quality (DEIS, p. 2021, 2-28) and the only proposed scheme for managing the PAG wastes is to place it under water in the pyritic tailings storage facility during operation and in the pit during closure. However, PLP's leachate test results show that once PAG wastes start producing acid and leaching metals they will continue to do so even if submerged.

The time of the onset of acidic conditions in the DEIS, or the lag time, was calculated using a flawed set of assumptions that underestimate environmental risk. Although SRK Consulting (2018a, p. 5) acknowledges that oxygenated PAG rock will generate acid, they state that the onset of acid conditions is delayed by the presence of acid-neutralizing carbonate minerals, which are found in higher proportions in the Pebble East Zone (PEZ) rocks. Pebble West Zone (PWZ) rock contains very low percentages (≤2%) of carbonate minerals. The DEIS combined the results from PWZ and PEZ rocks, possibly to produce lower overall leaching rates. The current proposal is only to mine the PWZ, and therefore the PWZ samples should be the only ones used to predict water quality and the environmental behavior of the 20-year project.

There are only a few samples of critical wastes for 20-year mine plan

The DEIS contains no new geochemical data after 2012, yet the project submitted to the US Army Corps of Engineers was not envisioned in 2012. Major engineering changes to the project are proposed in the DEIS, but the DEIS does not have the foundational geochemical characterization information to support these changes. The primary concern is the paucity of pyritic tailings samples. It appears that only two

samples of pyritic tailings have been tested for over 100 million tons of material. More samples are needed to understand the contaminant leaching potential of pyritic tailings.

Non-PAG wastes used to construct impoundments will leach contaminants
The DEIS uses a possibly unprotective neutralization potential to acid potential (NP:AP) ratio to segregate PAG from non-PAG waste. And no method is proposed in the DEIS to separate metal-leaching (ML) from non-ML wastes. The DEIS (Appendix N, p. 71) states that quarried rock and waste rock will be tested before it is used to construct embankments to avoid the potential for creation of contaminated drainage.

Choosing which wastes are PAG and non-PAG based on their NP:AP ratio alone will allow metal-leaching wastes to be misused on the site as construction fill. No method is proposed for distinguishing non-PAG wastes with and without metal leaching potential. The construction fill would be used to build embankments, which are generally unlined, for the mine water management ponds and waste impoundments. Inadequately characterized and managed construction fill has caused long-lasting water quality impacts at other mines. This potential source of groundwater and surface water impact has not been evaluated in the DEIS.

And leachate tests done for some of the non-PAG, metal-leaching wastes have some of the highest predicted selenium concentrations on site. The DEIS needs to address this inadequacy and determine if additional waste management approaches and storage facilities will be needed to properly handle non-PAG, metal-leaching wastes.

Impacts from uncaptured mine water are ignored or downplayed
The potential impacts from uncaptured mine water are either completely ignored or seriously underestimated in the DEIS. It is not realistic to assume that the mine will be able to capture 100% of all mine-influenced water – especially in the fractured and faulted bedrock setting that exists at the Pebble mine site. Additional failure scenarios should be included in the DEIS that examine the water quality consequences of mine water leaking from tailings facilities, the mine water management ponds, the seepage collection ponds, and the open pit.

Dewatering water will not have baseline groundwater quality
The DEIS wrongly assumes that dewatering water will have the same composition as background groundwater throughout the proposed 20 years of mining and during the early closure period. This underestimation of dewatering water concentrations will greatly affect influent water quality for Water Treatment Plant #1, which is nearly 100% derived from the open pit dewatering wells.

Potential direct and indirect effects considered in the DEIS do not appear to consider impacts of reduced surface flows on downstream groundwater levels (DEIS Page 4.17-1)
For example, reductions in downstream flow will change stage, which in turn can affect groundwater flow magnitude and vertical direction of flow in critical wetland and fish habitat areas.

The DEIS hydrology modeling tools are unable to simulate either baseline or predicted mine-impacted strongly coupled surface-water/groundwater dynamics

The DEIS sections related to hydrology (Sections 3.16, 3.17, 4.16 and 4.17) show that the primary tools used to estimate mine water balance and associated impacts include use of a single-process groundwater flow model and a separate surface water 'spreadsheet' proprietary tool. As a result, these tools are unable to simulate either baseline or predicted mine-impacted strongly coupled surface-water/groundwater dynamics. This is critical to fully understand the impacts of the mine during post-closure on the surrounding groundwater-surface water system.

Some contaminants of concern are underestimated or ignored

Although SRK Consulting (2018a) and other documents discuss the use of blasting agents, the final tables for predicted water quality do not include measurements for nitrate or ammonia, which is expected in elevated concentrations in mine materials and waters affected by blasting, including waste rock, tailings, concentrate, ore, dewatering water, walls of the open pit, open pit water, and all water management and seepage collection ponds on the site. Predicted nitrate and ammonia concentrations directly affect water treatment plant influent concentrations predictions, and if these values are used, the water treatment plants will be poorly prepared to remove nitrate, nitrite, and ammonia.

The DEIS inappropriately assumes watering will control dust

The DEIS assumes the greatest dust will occur in summer and can be controlled with watering. Experience at Red Dog Mine and generally in Alaska suggests dust deposition may be greatest in winter, due to high winds, low humidity, and limited options for suppressing dust in winter. The DEIS needs to provide examples of where road systems in similar climates have controlled dust to a high degree through watering alone, and to support the assumption in the DEIS that dust control is not needed in winter. Chemical dust palliatives may be required, and are a toxic component of dust and runoff not considered in the DEIS.

The DEIS recognizes fugitive dust will come from in-pit drilling and blasting, material handling (transport, storage, processing) and the tailings beach (DEIS Chapter 4.14-3). However, there is virtually no discussion about dust from the road system

Sources contributing to dust chemistry such as road material geochemistry, vehicle fuels and exhaust, lubricants, wear of tires and other components, chronic leakage or spills of hauled material (including ore concentrates and rock and soil for road construction and maintenance), and fugitive dust transported on the exterior of vehicles were ignored in the DEIS. Information has not been pulled from RFIs into the DEIS in any meaningful way that would allow the reader to understand sources, volumes, and chemical make-up of dust.

The environmental consequences, including toxicological effects, of dust once it enters freshwater ecosystems are not addressed in the DEIS

An ecological risk assessment should be included in the DEIS to understand the potential biological impacts of dust deposition. Because the mine is certain to expand from a 20-year mine to a 78-year mine, the cumulative effects of both the quantity of dust on vegetation, wetlands, and water bodies needs to be assessed, the cumulative effects of increased concentration of metals in the dust as they leach out into

underlying vegetation, wetlands, and water bodies, as well as the increasing physical effects (e.g. early snowmelt, increased soil temperatures) as they link to biogeochemical cycling and biological impacts.

Copper in fugitive dust is ignored in DEIS

Copper will be the most abundant ecotoxic contaminant in fugitive dust from the mine, but there is no analysis of the copper content in an estimated 8,300 tons of fugitive dust that will blow off the mine site annually. The volume of dust from the mine site is estimated but there is no analysis of whether, or under what conditions, copper in dust would enter waterways where fish could be exposed. Nearly 10,000 tons of dust will carry copper across wetlands and streams at the mine site and along the road corridor, where copper will leach into waters where fish could be exposed to it, potentially causing them to behave erratically and in ways that affect reproductive success.

Lack of spill risk analysis

In other DEISs, large spills of crude or refined petroleum products and hazardous materials are defined as those greater than 1,000 gallons. In the Pebble DEIS diesel spills estimates of risks are based on spills >300,000 gallons from marine barges, spills >300,000 gallons from ferries, and spills >3,000 gallons from tanker trucks. Those are the only diesel spill rates used in the DEIS for the transportation corridor, which means any spills smaller than the specific volumes shown for those specific transportation modes are not considered.

The DEIS ignores possible diesel spills from storage facilities at the port, the ferry, the mine site, or any of the transfers between all the transportation modes and storage facilities because they are too small. Therefore the DEIS therefore seriously underestimates the number of diesel spills that can occur along the transportation corridor.

The DEIS does not adequately evaluate the risks of spills associated with ferry operations

The risk is stated as "negligible", but this does not address the *cumulative* spill or contamination exposure of continuous operations at ferry terminals and along the passage route. The DEIS lacks an assessment of probabilities of a large-scale event (e.g., oil spill), as well as the risks associated with smaller, high-frequency events such as leaks associated with vehicles or heavy metals in brake pad erosion. Currently no resources exist in Lake Iliamna to assist a vessel in distress, or respond to a spill. Lake Iliamna is an isolated water body, which is not reachable by oil spill response vessels located in Alaska marine waters.

On page 4.27-38 the DEIS states “There are no historical data available on ore concentrate spills from ferries.” There have been many ferries worldwide that have overturned due to weather, loading or human factors. Ferries and other vessels have been known to lose power and steering and drift onto rocks. This data should be evaluated in the DEIS, as the events would likely cause a concentrate spill in Lake Iliamna.

The DEIS provides information on a geohazard assessment and mitigation, however there are key assumptions that are very optimistic, and no substantial modeling of tsunami or earthquake scenarios

The lack of sophistication in the geohazards analysis in the DEIS is a critical concern, and the revised DEIS needs to include completed paleoseismic studies, site-specific modeling of earthquake shaking that quantifies topographic and other factors leading to seismic focusing. More detail is needed for induced

and triggered seismicity, pitwall stability, and site-specific tsunami modeling for both Cook Inlet and Lake Iliamna.

The DEIS lacks any seismic geotechnical analysis (pseudo-static) on the current embankment designs and for the fully flooded open pit. The DEIS also lacks of a seiche wave failure analysis for the fully flooded pit lake. These are glaring deficiencies given how seismically active the area is.

The seismic hazard assessment for the proposed Pebble Mine does not consider earthquakes on the Lake Clark Fault closer than the limit of geologic mapping, 15 miles away. Recent fieldwork by Bretwood Higman provides compelling evidence that there likely are very strong earthquakes near the Pebble Prospect, and that these might reasonably be on an extension of the mapped Lake Clark Fault. The Lake Clark Fault almost certainly extends closer to the mine, and may even pass through the open pit, explaining the mineralization and faulting there. The Lake Clark Fault may be active and therefore additional seismic hazard assessments are vital to designing mine facilities so that they can withstand future seismic events.

Tsunami hazards facing potential port sites on Lake Iliamna and Cook Inlet are not quantitatively assessed in the DEIS

Tsunamis are completely unmentioned in Lake Iliamna, apparently because the authors thought that only harmonic seiche waves could form in lakes. In Cook Inlet, no site-specific modeling is shown. It is critical that modern tsunami models with well-validated runup be used, with accurate bathymetry and topography that includes proposed facilities. In particular, the proposed long short-perpendicular piers may actually focus tsunami energy onto vulnerable shore facilities like fuel storage tanks at Amakdedori port.

Kamishak Bay is a dangerous environment for marine vessels, and the DEIS has not adequately analyzed that environment and the risks it poses

Kamishak Bay is an exceptionally difficult operating environment, even by Alaska standards, and is subject to worse weather than the areas of Cook Inlet where shipping is currently prevalent. In the DEIS there's no information on wave height, wave period, bathymetry, ice movement, or wave shoaling. No mention was made of how waves would affect port operations, or whether the port could operate year-round. The proposed causeway would be close to overtopping at a combination high tide-storm surge-wave run-up event and 2 ft. below water in a predicted tsunami run-up. This would also put the camp, generators and stored concentrate containers 5 to 7 ft. below water in the extreme event. The facilities must be designed for occasional flooding and structural integrity for a tsunami event. The civil engineering design for the Ferry Terminal tank farms and the at Amakdedori port need to be provided in the DEIS. These facilities will likely be in place for more than 100 years should the project proceed. The DEIS states that specific analysis of tsunami hazard will be analyzed, possibly leading to moving or redesigning port facilities, which will be "expected to remain intact with proposed mitigation in design." The DEIS needs to provide this "final design". The DEIS states that specific analysis of tsunami hazard will be analyzed, possibly leading to moving or redesigning port facilities, which will be "expected to remain intact with proposed mitigation in final design." The EIS needs to provide this "final design".

Multiple experts and groups have expressed concern over the safety of shipping operations at Amakdedori, and have requested more information and the analysis of meteorology and oceanography

conditions. The DEIS must analyze the shoaling and transformation of waves based on specific local bathymetry, the impact of winds, tidal currents, rip currents, visibility, and the potential for superstructure icing at all proposed port and lightering sites in Cook Inlet.

PLP must provide port-specific information that quantifies the conditions that may be encountered by its ships, and safe operating criteria for lightering and loading/unloading

This DEIS is grossly lacking in key information regarding navigational risks, spill risks, and tsunami hazards for the two proposed ocean port sites of Amakdedori and Diamond Point, as well as Lake Iliamna. The required analyses are technologically practical, and have been done for many other waterways and industrial projects in Alaska and elsewhere. Without this information it is impossible to determine the environmental impact of shipping operations, and impossible to evaluate the relative impact of the two proposed port sites. The proposed shipping activity poses significant hazards to humans and the environment but are not addressed in the DEIS.

Bulk carriers of the type PLP would use to carry ore are almost absent from Cook Inlet. The specific operation proposed (multi-day lightering operations from a causeway to a moored vessel) is also unlike anything currently occurring in Cook Inlet.

The DEIS states that marine mammals tend to avoid areas of high vessel traffic. Kamishak Bay is currently an area of low vessel traffic, which would be converted to an area of high vessel traffic. The impacts of pushing sensitive marine mammals and seabirds out of this region need to be analyzed in the DEIS.

The DEIS has not sufficiently analyzed all the reasonably probable and impactful marine spills

The DEIS does almost nothing to discuss response capabilities in Cook Inlet and the DEIS states that "oil spill response efforts could be delayed by adverse sea conditions." And the only marine scenario carried forward for analysis was a 300,000-gallon spill of diesel due to a collision of a fuel barge. Oil spills may occur from ore carriers, supply barges, lightering vessels, and during fuel transfers at the port. A potential spills analysis should consider, at minimum, all vessel types, age, construction (including the use of double hulls), and flag state. Current tug resources in Cook Inlet would be unlikely to assist a deep draft vessel before it grounded in Kamishak Bay based on the Cook Inlet Risk Assessment analysis.

The DEIS states that if there is a concentrate spill that the metals in the concentrate could leach out over years to decades, but that that the dilution in Cook Inlet would prevent measurable impacts. The DEIS also states that no acid will be generated from the sulfide minerals due to lack of oxygenation. However, in the nearshore and intertidal environments near the port, surf oxygenates the entire water column. Therefore acid generation can be expected. The intertidal reefs on either side of Amakdedori port are exceptionally biologically rich areas, and metal leaching and sedimentation may have significant impacts in that localized environment and these impacts need to be included in the DEIS.

Environmental impacts of vessel traffic must include intentional discharges from vessels, both waste and ballast

The risk of invasive species introduction should be analyzed based on the amount of ballast water to be discharged and the likely ports of origin of the many different vessels that will be part of the Pebble

Project. Expected discharges of sewage, greywater, garbage, or other residues should be evaluated for their quantity, and the likelihood of introducing contaminants to Cook Inlet needs to be discussed in the DEIS.

Environmental impacts to wildlife and nearshore ecosystems at the deep-water port need to be adequately analyzed

The DEIS states that PLP has not analyzed the potential for sediment scouring at its berthing sites. This should be analyzed, including potential impacts on benthic organisms. The DEIS must analyze the potential for the dock to impact the behavior and population of both juvenile and adult salmon. Salmon frequently move along the shore, and man-made structures such as the Amakdedori port causeway or the Lake Iliamna ferry terminals can impede that movement and influence salmon behavior.

Negative impacts of a port at Amakdedori and a road corridor along the McNeil Refuge and Katmai Preserve could be wide reaching due to the large home ranges bears utilize. The proposed road, resulting traffic and human presence would fragment the habitat and cut off a travel corridor for bears, keeping bears from accessing the Refuge and Sanctuary.

The DEIS must analyze the impacts of a pipeline leak into Cook Inlet or Lake Iliamna

Pipeline leaks are reasonably probable events in the difficult Cook Inlet operating environment. This also makes them difficult to repair. In 2017, a pipeline leaked gas into Cook Inlet for approximately 4 months before it was stopped.

Proposed lightering operations in Cook Inlet are not safe or economically sensible

The Amakdedori port site is known for fierce winds, extreme weather, high tides, uncharted off shore reefs, ice-scour and the natural outflowing currents from upper Cook Inlet which cause an extreme westward drift toward the Amakdedori shoreline. Therefore meteorological, oceanography, and climate data need to be collected for at least a year and included in the DEIS to better understand the issues related to building a port at this location and selecting safe lightering locations.

The DEIS states that at the lightering sites the 38-ton shipping containers with the copper-gold concentrate will be lowered into the vessel's hold before being tipped over to release concentrate into the cargo ship to reduce dust emissions (discussed in RFI 007 and RFI 009 but not in the DEIS). This plan implies that PLP will send ships off to the smelters only half-full, which seems an unrealistic economic choice.

Molly Welker is an environmental scientist that has lived in Alaska since 2004. As an environmental consultant Ms. Welker lead a team of environmental scientists for 2 years in the collection of the water quality environmental baseline data at the mine site and became very aware of how pristine and unaltered the aquatic and terrestrial ecosystems of Bristol Bay are. She collected samples from streams, lakes, and ponds and learned about the uniqueness of the groundwater-surface water interactions, including interbasin transfer of water that is critical to sustain the world's largest sockeye salmon fishery. Ms. Welker helped develop Pebble Watch for Bristol Bay Native Corporation, which is a tool to inform their shareholders and the public about the Pebble Project and the permitting process in an impartial, educational and fact-based manner.

Ms. Welker compiled the comments in this document from the following 2019 technical review reports of the Pebble Project Draft EIS. The complete technical reports with all the references supporting these comments will be submitted to the USACE during the DEIS comment period.

Chambers, D., Ph.D: Alternatives and Tailings Dam Review.
Frissell, C., Ph.D: Failure to Address Cumulative and Long-Term Effects of Bioaccumulation and Biomagnification of Contaminants including Trace Metals and Hydrocarbons.
Frissell, C., Ph.D and O'Neal, S: Fugitive Dust on Road System.
Gracz, M., Ph.D: Significant Degradation, Compensatory Mitigation, and Carbon Sequestration Reports.
Higman, B., Ph.D and N. Riordan, PhD: Geohazards Review.
Hovell, R., Ph.D. Impacts to Lake Iliamna Fishery.
Lubetkin, S., Ph.D: Transportation Corridor Spill Risk Critique.
Maest, A., Ph.D: Pebble Project Mine Water Quality Predictions and Implications for Environmental Risk.
Nuka Research and Planning Group, LLC: Shipping Hazards and Spill Risks in Cook Inlet.
O'Neal, S.: Technical Comments Regarding Fish and Aquatic Habitat.
Prucha, B., Ph.D: Review of Groundwater Impacts of the Proposed Pebble Mine and Evaluation of Potential Impacts on the Coupled Hydrologic System.
Reeves, G., Ph.D and S. Mauger: Review of Water Temperature Changes.
Schweisberg, M., Ph.D: Anticipated Adverse Impacts to Wetlands and other Waters.
Sobolewski, A., Ph.D: Review of Water Treatment Plants Proposed for Pebble Project.
Wobus, C. Ph.D: Review of Surface Water and Groundwater Hydrology, Climate Change, and Spill Risk Analysis.
Yokum, T., Ph.D: Alternatives Analysis, Basic and Overall Project Purposes and Mitigation Reports.
Zamzow, K., Ph.D et al.: Selenium Issues in the Pebble Project Draft EIS Position Paper.