EPA Comments – Pebble Project Preliminary Draft EIS Section 3.18 – Water and Sediment Quality

Agency	Comment No.	Section, Paragraph, and Page #	Cooperating Agency Comment (and Purpose of Comment)	Proposed Resolution (Additions or Deletion of Text)	Response
EPA	1	3.18 and 4.18 - General	General comment on baseline data, analysis area, and modeling.	The baseline studies are summarized in this section and in Appendix K3.18. We have the following overall recommendations related to section 3.18 and 4.18: • Clearly define the area of analysis for the baseline studies and impact analysis for this resource for all project components and alternatives; and • As recommended in our previous comments submitted to the Corps on 7/5/2018, please describe whether there are data gaps with the existing baseline studies for the proposed action and alternatives. If there are gaps, we recommend discussing whether there will be additional monitoring and when it will be included in the EIS. If no additional monitoring is planned, then describe the extent to which any data gaps affect characterization of the affected environment (section 3.18) and the impact analysis (section 4.18).	• Revised text to provide definition of the analysis area. Clarifying text has been added to distinguish between affected environment discussion relative to various alternatives and variants. Additional detail on affected environment specific to Alternatives 2 and 3 are included in Appendix K3.18. • A data gap analysis was conducted prior to development of the DEIS.
EPA	2	Section 3.18.1.1, page 3.18-2	Samples for geochemical testing were selected from the numerous exploration cores drilled to outline the deposit. A summary of the geochemical testing program is provided in	Per our previous comments submitted to the Corps on 7/5/2018, we continue to recommend that quantitative information be provided to show that the samples used for geochemical testing are	Table added to Appendix K3.18 showing the distribution of rock types tested. The geochemical evaluation presented in Section 3.18 primarily relies on data presented in SRK (2011a,

EPA Comments – Pebble Project Preliminary Draft EIS Section 3.18 – Water and Sediment Quality

Agency	Comment No.	Section, Paragraph, and Page #	Cooperating Agency Comment (and Purpose of Comment)	Proposed Resolution (Additions or Deletion of Text)	Response
			Table K3.18-2.	representative of the composition of the waste rock and tailings materials. For example, information on the % of each ore type and then the % of samples that were used to characterize each ore type can be added to Table K3.18-2. In general, the number of samples used in the characterization should be similar to the % abundance of the particular ore-type. There may be an exception for materials suspected to have more ARD/ML capacity, which may be assessed in a higher proportion than its abundance. Disclosure of this information is important to demonstrate the representativeness of the tested materials that are the basis for water quality predictions.	2018a, 2018b, 2018c, and 2018d). These data were developed using representative overburden, rock cores, and metallurgical waste (tailings) samples from the Pebble east and west zones (PEZ and PWZ), and rock core samples from borings drilled in three proposed construction rock quarry areas. Geochemical characterization includes sample mineralogy and static and kinetic tests including acid base accounting (ABA), metal mobility, humidity cell, subaqueous leach columns, stored bag weathering, and field barrel tests. Based on consistent mineralization style and host rocks between the PEZ and PWZ, a combined dataset was used to fully leverage the data available (SRK 2018f). Characteristics of samples analyzed for geochemical characterization were compared to the complete range of characteristics shown by that lithological group. A visual analysis was performed to ensure that samples were representative across all geochemical variations. Additionally, a gap analysis was performed and additional samples were selected

EPA Comments – Pebble Project Preliminary Draft EIS Section 3.18 – Water and Sediment Quality

Agency	Comment No.	Section, Paragraph, and Page #	Cooperating Agency Comment (and Purpose of Comment)	Proposed Resolution (Additions or Deletion of Text)	Response
					manually to ensure a representative sampling pattern was utilized (SRK 2011a). Figure K3.18-1 provides an example distribution of samples selected for analysis compared to the breadth of samples in terms of copper, sulfur, and calcium content (SRK 2011a).
EPA	3	Section 3.18.1.1, page 3.18-2	In addition, almost 60 tailings samples, comprised mostly of angular, pyritic, and gold plant tailings, from test processing of ore composites have also been characterized	Information should be provided on the % of the 60 samples from each of these types of materials. We also recommend this information be compared to the predicted abundance of these types of materials in the tailings.	Additional information is included in Table K3.18-4, to provide detail on the type of material included in tailings samples.
EPA	4	Section 3.18.1.1, Page 3.18-3	[Acid-base accounting] testing has determined that the pre-Tertiary mineralized sedimentary and plutonic rocks at the proposed mine site are predominantly potentially acid generating.	We recommend including information on specifically how PAG is being defined and the basis for the PAG criteria. For example, samples are considered PAG when >X% pyrite, X% sulfur, and % NP.	PLP 2018a indicates that PAG waste rock is any rock with an NP/AP ratio greater than the local criteria of 1.4.
EPA	5	Section 3.18.1.1, Page 3.18-3	The ABA and humidity cell data indicate that PAG and non-PAG rocks can be distinguished using an NP/AP ratio of 1.4 (SRK 2011a), and are applicable to pre-Tertiary, Tertiary, and overburden materials.	SRK 2011a provides a NP/AP ratio value of 1.6 on page 11-53. We recommend providing information in the DEIS to resolve this potential discrepancy and/or correcting anything that may be in error. In general, the distinction at other mine sites between PAG and non-PAG are often much more conservative, with non-PAG material having ratios of >3 or 4. We recommend that the DEIS include	The site-specific criteria was modified to 1.4 in the SEBD (PLP 2018a). Addressed in text. The discrete site-specific PAG criteria of 1.4 was determined though analysis of the molar release rate obtained via humidity cell tests (PLP 2018a). The molar release rate is an equivalent to the NP/AP criteria, and can be examined to determine the site-

EPA Comments – Pebble Project Preliminary Draft EIS Section 3.18 – Water and Sediment Quality

Agency	Comment No.	Section, Paragraph, and Page #	Cooperating Agency Comment (and Purpose of Comment)	Proposed Resolution (Additions or Deletion of Text)	Response
				information acknowledging that NP/AP ratios for other sites are much higher than 1.4 and, per our previous comments submitted to the Corps on 7/5/2018, provide a description of how the 1.4 value was determined to be sufficient.	specific criteria for potential acid generation (Day et al. 1997). If the molar release ratio is greater than the NP/AP ratio, the waste rock has the potential to generate acid (SRK 2011a). PLP (2018a: Figure 11-28) depicts the molar ratio data from humidity cell test used to determine the site-specific criteria of 1.4.
EPA	6	Section 3.18.1.1, Page 3.18-3	SRK 2011a	This SRK document provides the foundation for much of the geochemical characterization of the site. In this document, the data is presented for the East and West zones of the project. In the current proposal, the focus is on the West zone. We recommend ensuring, and explaining in the DEIS, that all of the analysis in section 3.18 only uses data from West zone dataset within the SRK 2011a document, which is currently not clear from the EIS text.	As described in SRK (2018f), the geologic setting, mineralizing system, and host rocks were very similar between the east and west zones. Because of this, a combined more robust east and west data set was utilized. The text has been updated to reflect this information.
EPA		Section 3.18.1.1, Page3.18-3	To develop an understanding of weathering and leaching processes that might affect rocks exposed during mining (e.g., pit walls and stockpiled waste rock and tailings), additional laboratory and field geochemical tests were conducted. Laboratory tests included humidity cell, subaqueous (saturated) column, stored bag, and field barrel tests	Multiple lines of evidence/analysis were used to address the same question regarding predicted impacts to water quality from mine materials. We recommend that the DEIS address the following questions (here or in the appendix): (1) Did the multiple types of samples (e.g. HCTs, barrel tests, etc.) all provide similar and consistent results, or are there notable differences; and (2) Of	Text has been updated to include additional information provided in SRK (2018c) and SRK (2018f). Data analysis from the various geochemical tests performed yielded consistent results. Leaching data from humidity cell test, barrel test, and shake flask tests performed on samples collected in both the east and west zones were used to

EPA Comments – Pebble Project Preliminary Draft EIS Section 3.18 – Water and Sediment Quality

Agency	Comment No.	Section, Paragraph, and Page #	Cooperating Agency Comment (and Purpose of Comment)	Proposed Resolution (Additions or Deletion of Text)	Response
				these different types of tests conducted, which of the tests were used for the purposes of predictive water quality modeling?	develop geochemical source terms for predictive water quality.
EPA	7	Section 3.18.1.1, page 3.18-4	Paste pH results for aged rock cores stored at the site suggest that acidification may be delayed up to 40 years.	We recommend providing additional data or a citation to support this statement.	Citation added (SRK 2011a) and text updated based on information from page 11-33 of SRK 2011a.
EPA	8	Section 3.18.1.1, Page 3.18-4	Element release rates determined from kinetic tests were mainly a function of leachate pH rather than the element content of the samples.	We recommend providing a reference or a description of the statistical test that was used to identify which co-variate (i.e. pH, elemental composition) had a larger influence on the resulting release rates. In addition, please clarify whether the release rates are based on whole water or filtered concentrations of metals.	Citation added and text updated to include information from SRK (2011a: pages 11-56 and 11-57). Tests were done on filtered and unfiltered samples (SRK 2011a: page 11-41, leachate data).
EPA	9	Section 3.18.1.1, Page 3.18-4	The ARD potential for the bulk tailings is lower than that of mineralized rock because most of the sulfur is removed to recover the economic minerals and separate out the pyritic tails while concentrating neutralizing minerals in the bulk tailings.	We recommend that the DEIS address the issue of grain size in this statement. While the sulfur content would be lower in the tailings, the grain size would also be much smaller and may result in an increase in ARD compared to a scenario where only sulfur content is considered.	Added clarification to statement in question to address grain size issues related to ARD potential.
EPA	10	Section 3.18.1.1, Page 3.18-4	Element leaching from the rougher tailings occurred at low rates, and unfiltered process supernatants were found to contain low levels of potential constituents relative to water quality standards.	For mercury (Hg), the applicable water quality criteria is 12 ng/L (see K3.18 Table 1); however much if not all of the analysis performed in SRK 2011a had detection limits for Hg between 50 and 100 ng/L. As such, there is no relevant information with regard to Hg concentrations as	Addressed; text updated to resolve. 1. Regarding Table K3.18-4 (Tailings Supernatants): a. 74 supernatant samples have been analyzed. b. 51 (69%) of the samples

EPA Comments – Pebble Project Preliminary Draft EIS Section 3.18 – Water and Sediment Quality

Agency	Comment No.	Section, Paragraph, and Page #	Cooperating Agency Comment (and Purpose of Comment)	Proposed Resolution (Additions or Deletion of Text)	Response
				compared to water quality standards. We recommend that the DEIS discuss the mercury detection limits used in the SRK testing in comparison to the State of Alaska water quality standards. We recommend that it also discuss whether adequate information is available in order to determine the extent to which mercury would leach from the tailings, given the reported high mercury detection limits. We note that later in the document, water quality predictions are shown to exceed WQS for Hg in several instances. Please clarify whether this is a function of using the reporting limit in the calculations in lieu of having actual concentration data. The EPA also recommends that an explanation of how these values were calculated be included in the DEIS.	were not detected at a detection limit of 10 ng/L which is below the standard of 12 ng/L. c. 10 (14%) of the samples were not detected with elevated detection limits as described below: i. 2 samples were not detected, but had an elevated detection limit of 50 ng/L as sample had to be diluted to be analyzed. ii. 6 samples were not detect, but had an elevated detection limit of 100 ng/L as sample had to be diluted to be analyzed. iii. 2 samples were not detect, but had an elevated detection limit of 500 ng/L as sample had to be diluted to be analyzed. d. 13 (18%) samples were reported as detected, ranging in concentration from 12 to 450 mg/L; the highest value looks like an outlier as the next lower value is 80 ng/L. e. The mean of the detected Hg values is 57 ng/L and the median is 17 ng/L. f. The 50th percentile Hg value is 10 ng/L, which is what appears to have been used in Table K4.18-2 (Predicted Water Quality from Sources) for the supernatant. g. Most of the supernatant

EPA Comments – Pebble Project Preliminary Draft EIS Section 3.18 – Water and Sediment Quality

Agency	Comment No.	Section, Paragraph, and Page #	Cooperating Agency Comment (and Purpose of Comment)	Proposed Resolution (Additions or Deletion of Text)	Response
					mercury results (69%) were not detected at a detection limit (10 ng/L) less than the applicable standard (12 ng/L). Several samples (14%) were diluted for analysis, which resulted in elevated detection limits ranging from 50 to 500 ng/L. Mercury was only detected in 18% of the samples analyzed ranging in concentration from 12 to 450 ng/L. 2. Comparison of the supernatant mercury results with the supernatant mercury source term in Table K4.18-2 indicates that a mercury concentration of 10 ng/L was used for the supernatant source term. This value is consistent with the 50th percentile mercury concentration (10 ng/L) found for the supernatant results. The 95th percentile supernatant mercury concentration is calculated as 100 ng/L. It is noted that the supernatant value specified in SRK's (2018) Source Term Report Table 4 is < 10 ng/L; however, review of Table 5 in the SRK (2018) Source Term Report does not list the probability used to assign the value. It appears that the mercury value used is not the 95th percentile, but the 50th percentile, which is equal

EPA Comments – Pebble Project Preliminary Draft EIS Section 3.18 – Water and Sediment Quality

Agency	Comment No.	Section, Paragraph, and Page #	Cooperating Agency Comment (and Purpose of Comment)	Proposed Resolution (Additions or Deletion of Text)	Response
					to the detection limit and likely represents a reasonable value given that most of the results are not detected (<10 ng/L). 3. It appears that the mercury concentration used for the bulk tailings water was the 50th percentile value (median); thus, any mercury concentrations predicted to exceed standard would not be considered conservative if only the bulk tailings water is considered, since it appears to be the 50th percentile value. All other inputs are 95th percentiles which would be conservative. SRK (2018f) indicates that "For non-contact terms, median values were used as an appropriate indicator of central tendency in datasets. Due to the low chemical loads provided by these sources, the overall model outcomes are not sensitive to this assumption."
EPA	11	Section 3.18.1.1, Page 3.18-4	However, for some elements (e.g., arsenic, molybdenum, and selenium), release can be environmentally significant under neutral pH conditions.	This statement provides very important information, particularly because later in the document it discusses sorting material differently depending on whether it is PAG or NAG. Per our previous comments submitted to the Corps, for the NAG materials, we continue to recommend that the DEIS provide a list of all the elements that can be	Addressed; text has been updated to include additional information.

EPA Comments – Pebble Project Preliminary Draft EIS Section 3.18 – Water and Sediment Quality

Agency	Comment No.	Section, Paragraph, and Page #	Cooperating Agency Comment (and Purpose of Comment)	Proposed Resolution (Additions or Deletion of Text)	Response
				released at significant concentrations under neutral pH conditions, instead of providing an example of three elements. Furthermore, we recommend providing additional information on which NAG materials have the potential to release these elements.	
EPA	12	Section 3.18.1.2, Page 3.18-7	Higher concentrations of copper, molybdenum, nickel, zinc, and sulfate were present in SFK than in NFK, consistent with SFK's proximity to the Pebble deposit area Total dissolved solids (TDS), pH, sodium, alkalinity, hardness, nitrogen (nitrate+nitrite), and nickel concentrations were greatest in the UTC drainage. TSS, potassium, chloride, iron, and arsenic concentrations were highest in KC, while cadmium and lead concentrations were highest in the NFK drainage	We recommend providing a description of the statistical test used to make this determination and the associated p-value for each constituent.	Comment noted. The characterizations presented in Section 3.18 are comparisons of reported concentrations of various constituents in potentially affected watersheds. These comparisons are not supported by statistical analysis.
EPA	13	Section 3.18.1.2, Page 3.18-7	Alkalinity was the parameter that was most frequently detected outside the range of the most stringent ADEC criterion. In all, 43 percent of all surface water samples were below this value.	We recommend that the text specify that the alkalinity criterion is a minimum.	Clarified in text. Text updated to indicate the ADEC criterion is a minimum value.
EPA	14	Section 3.18.1.3, Page 3.18-11	mean concentrations of trace elements above the most stringent ADEC water quality maximum criteria for several constituents (aluminum, copper,	We recommend that the DEIS specify whether these constituents were analyzed for whole water (total recoverable metals) or dissolved metals.	Addressed in text. Text has been updated to specify that constituents were analyzed for dissolved metals.

EPA Comments – Pebble Project Preliminary Draft EIS Section 3.18 – Water and Sediment Quality

Agency	Comment No.	Section, Paragraph, and Page #	Cooperating Agency Comment (and Purpose of Comment)	Proposed Resolution (Additions or Deletion of Text)	Response
			iron, lead, and manganese).		
EPA	15	Section 3.18.2.1, Page 3.18-16	However, only a few ions (copper, lead, aluminum, iron, manganese, and alkalinity) had concentrations outside benchmarks established by ADEC for freshwater.	We recommend that this text be revised to clarify that DEC establishes water quality standards rather than benchmarks.	Addressed in text. Word "benchmark" has been replaced with "water quality standard."
EPA	16	Section 3.18.2.1, Page 3.18-16	Past water system violations in these communities reported by ADEC (between 1995 and 2018) are mostly monitoring violations that represent failure to collect a sample. Water quality constituent exceedances are rare and have included coliform, iron, manganese, arsenic, lead and copper (ADEC 2018).	We recommend that the DEIS clarify whether the exceedances were only of the drinking water standards, or whether there were also exceedances of surface water standards for each of these parameters.	Text updated; clarified that reference is to exceedances of drinking water standards only.
EPA	17	Section 3.18.2.3, Page 3.18-20	Of 12 pond substrate samples analyzed by NURE within approximately 20 miles of the mine access road, none showed evidence of contamination (Grossman 1998).	We recommend including what parameters (e.g. metals, hydrocarbons) were analyzed by NURE.	Text updated to include additional relevant information from Grossman (1998), which indicates that data for 11 elements, including Na, Ti, Fe, Cu, Zn, As, Ce, Hf, Pb, Th, and U, were analyzed.
EPA	18	Section 3.18.3.1, Pages 3.18-21	More than 10 percent of the basin is covered by glaciers, and suspended sediment loading in glacier-fed rivers without lakes is significant, leading to generally high suspended sediment load in some portions of Cook Inlet.	We recommend that the DEIS clarify that the portions of Cook Inlet affected by glacier fed streams is in the upper Inlet and not in the vicinity of the project area.	Text clarified.
EPA		Section 3.18.3.1, Pages 3.18-22	Inorganics analyzed in both surface water and bottom water at a depth of about 50 ft in	We recommend that the comparison of constituents in both surface and bottom water be made to the	Noted. Alaska WQS are used as primary baseline comparison. Text clarified.

EPA Comments – Pebble Project Preliminary Draft EIS Section 3.18 – Water and Sediment Quality

Agency	Comment No.	Section, Paragraph, and Page #	Cooperating Agency Comment (and Purpose of Comment)	Proposed Resolution (Additions or Deletion of Text)	Response
			northern Kamishak Bay (Hart Crowser 2015: Table 34-8, Station MRC20) showed that none exceeded National Recommended Water Quality Criteria (USEPA 2009).	numeric criteria in the State of Alaska WQS, and that the EPA National Recommended Water Quality Criteria be used as a starting guideline if a constituent is absent from the Alaska WQS.	
EPA	19	Section 3.18, Page 3.18-23	A combination of shallow water, high tidal fluctuations, and strong currents constantly mobilize seafloor sediments in the inlet, keeping sediments in suspension, resulting in highly turbid water, and inhibiting deposition of fine-grained sediments (Rember and Trefry 2005). Fine sediments introduced by major rivers feeding into upper Cook Inlet are carried in suspension and have been shown to be deposited as far as 150 miles south in lower Cook Inlet (ADL 2001).	We recommend review of Distribution of Hydrocarbons and Microbial Populations Related to Sedimentation Processes in Lower Cook Inlet and Norton Sound, Alaska (Atlas et.al, 1983), which indicates that Kamishak Bay is a depositional area with natural inputs of hydrocarbons that are not mentioned in this text. This is also discussed in the 2000 MMS Final Report entitled Sediment Quality in Depositional Areas of Shelikof Strait and Outermost Cook Inlet.	Atlas et al. (1983) has been reviewed and additional text has been added describing Kamishak Bay as a natural depositional area for fine sediments and hydrocarbons.
EPA	20	Section 3.18.4.3, Page 3.18-24	Water depths in the center of Cook Inlet range from about 50 to over 500 feet (NOAA nautical chart #16660). Numerous oil and natural gas pipelines currently span the bottom of Cook Inlet.	We recommend that the DEIS clarify that all of the current pipelines are in the upper Inlet and none are in the vicinity of the proposed project.	Addressed in text. Text updated to include relevant information from ADNR (2018d) specifying that current pipelines are located in the northern part of the Cook Inlet.