RFI 092
Pebble Project EIS

Request for Information

Title/Subject:	**Tailings Treatment Options**
Requestor:	**AECOM**
Date Transmitted:	**10/9/2018**
Recipient:	**Pebble Limited Partnership (PLP)**
Response Requested by:	**10/16/2018**
Rationale:	Cooperating agency comments on draft Appendix B distributed in September 2018 request additional analysis of options to treat the proposed tailings: ***TSF-006:*** *Part of this discusses treatment of the pyritic tailings, but the option is dismissed. The reason for dismissing addition of limestone (discussed under the Environmental Impact test) is that it would require transport of very large volumes of materials and that it "provides no environmental benefits over the Proposed Action" (in the "Why Dismissed" explanation). While it is true that large volumes of neutralizing material would need to be transported and stored, it is not clear how the pyritic tailings will be managed when disturbed for placement into the pit, or how the pit will be managed in perpetuity. Production of acidity and metals in leachate from infiltration of precipitation or interaction with water already in the TSF would be retained within the lined system (presumably with backup leachate monitoring wells in case of inefficient or damaged liner), so perhaps there wouldn't be any environmental benefit over the proposed action during operations, but there could be an environmental benefit after the tailings are placed in the pit. The addition of neutralizing agents with pyritic tailings placement (or even with the PAG waste rock) that are then carried over into the pit could serve two purposes: that of a shorter-term precautionary measure for the pyritic TSF and a longer-term management measure for the pit and potential for reduced water treatment needs at closure. We recommend that the discussion consider these factors.* ***TSF-013:*** *We recommend that further evaluation occur before dismissing the Blended Pyritic and Bulk Tails option. We recommend disclosing the relative amounts of bulk and pyritic tailings and the management options for blending in order to substantiate the statement that the pyritic tailings would contaminate the bulk tailings. For example, we recommend considering whether the opposite could be true – that the bulk tailings could neutralize the pyritic tailings. In addition, the document states that a blended facility would need to be lined, which would hinder the flow-through design concept of the bulk TSF, and thereby prevent the bulk tailings from dewatering over time and becoming a stable landform. Give that the entire facility is to be managed in perpetuity as a wet storage facility (under this option), it is not clear why it is necessary for the bulk tailings to dewater to become a landform. We recommend that this be clarified and that this option further describe why a lined, blended tailings TSF could not be dewatered and covered at closure.* ***Option TSF-006*** *should be included as an option in this alternatives development process. The assessment in Draft Appendix B indicates that methods to make tailings non-acid generating or inert to metals leaching are not practicable; however, methods such as the addition of lime to tailings to address acid drainage and metal leaching have been proposed and accepted at other mine sites. Those methods are identified and discussed in the Global Acid Rock Drainage (GARD) Guide Section 6.6.4 Additions and Amendment Methods.1 In particular, the addition of lime to tailings, including the pyrite tailings, should be included as an option and potentially considered as an alternative in the EIS.*

Describe the Information Requested and Level of Detail:	Please describe the process and materials that would be required to make the pyritic tailings "inert." The following topics should be discussed, at a minimum:
	• Proposed Action
	  o How will pyritic tailings be managed when disturbed for excavation, stockpiling, loading, transportation, and placement into the pit?
	  o How will water from precipitation be managed in the TSF basin during tailings and waste rock removal to decrease production of contact water?
	  o How will PAG waste rock above the liner be excavated to minimize liner damage and prevent contact water from escaping from the TSF basin?
	  o How will the liner be cut up and removed in order to prevent contact water from entering the native subsurface soil and rock?
	  o How will tailings and waste rock in the pit be managed in perpetuity?
	• TSF-006 – Treatment of Pyritic Tailings
	  o Could treated pyritic tailings provide environmental benefits after the tailings are placed in the pit?
	  o Could the addition of neutralizing agents to tailings and/or waste rock provide shorter-term precautionary measures for the pyritic TSF?
	  o Could the addition of neutralizing agents to tailings and/or waste rock provide a longer-term management measure for the pit?
	  o Could the addition of neutralizing agents to tailings and/or waste rock provide potential for reduced water treatment needs at closure?
	  o Could lime be added to the pyritic tailings to mitigate acid drainage and metal leaching?
	• TSF-013 – Blending of Pyritic and Bulk Tailings
	  o How much pyritic tailings could be added to the bulk tailings in order to retain the proposed "inert" nature of the bulk tailings?
	  o What could be management options for blending in order to retain the proposed "inert" nature of the bulk tailings?
	  o Could the bulk tailings be blended with the pyritic tailings to neutralize the pyritic tailings?
	  o Clarify why it is necessary for the bulk tailings to be dewatered to ultimately become a landform?
	  o Describe why a lined, blended bulk tailings TSF could not be dewatered and covered at closure.

Recipient Response Form

Date Received from USACE:	Click here to enter text.
Response from Recipient (Describe Information Requested to the Level of Detail Requested; Provide Attachments as Needed):	Click here to enter text.
List Number and Type of Response Attachments:	**RFI092 Tailings Treatment Options.pdf**
Date Returned to USACE:	Click here to enter text.

AECOM Intake Form

Date Response was Received:	**10/12/2018**
Received by:	**AECOM**
Describe any Follow-up Related to this RFI:	**None at this time.**

From: James Fueg, Pebble Limited Partnership

To: Shane McCoy, US Army Corps of Engineers

Date: October 12th, 2018

Response to RFI-092 Blend or Treat Tailings

This technical note is response to RFI-092 as listed below:

Please describe the process and materials that would be required to make the pyritic tailings "inert." The following topics should be discussed, at a minimum:

- *Proposed Action*
  - *How will pyritic tailings be managed when disturbed for excavation, stockpiling, loading, transportation, and placement into the pit?*
    - The pyritic tailings will be pumped from the Pyritic TSF as a slurry and transported by pipeline into the open pit at closure. Water stored within the Pyritic TSF, including the supernatant pond accumulated during operations, water trapped within the tailings and waste rock voids, direct pond precipitation, and surface runoff during the closure phase, will be used to re-slurry the tailings. Additional water will be reclaimed from the open pit to support the re-slurring activities as required.
  - *How will water from precipitation be managed in the TSF basin during tailings and waste rock removal to decrease production of contact water?*
    - All precipitation falling within the Pyritic TSF basin will be considered contact water. Precipitation that lands within the Pyritic TSF will be used in the re-slurrying process of the pyritic tailings. Additional water required for re-slurrying the pyritic tailings will be reclaimed from the open pit. Surplus water not required for the re-slurrying of the tailings will be pumped to the Main WMP for treatment and release.
  - *How will PAG waste rock above the liner be excavated to minimize liner damage and prevent contact water from escaping from the TSF basin?*
    - The PAG waste rock will be carefully removed from the Pyritic TSF using excavators and haul trucks to limit the potential for liner damage. The PAG waste rock will be progressively removed as the tailings in the TSF are drawn down to expose additional materials. Seepage collection and recycle ponds located downstream of the Pyritic TSF to the north, south and east will remain active while the PAG waste rock and pyritic tailings are being transferred to the open pit. Any contact water that escapes the basin through damaged liner will be collected at these locations and pumped back to the TSF or to the Main WMP.
  - *How will the liner be cut up and removed in order to prevent contact water from entering the native subsurface soil and rock?*
    - Following removal of the pyritic tailings and waste rock, the liner will be washed to remove any residual materials. The liner will then be dismantled, from higher elevations downward, to continually collect precipitation at a low point at the northern end of the basin. The collected water will be pumped to the open pit or to a water treatment plant for treatment and discharge.

- *How will tailings and waste rock in the pit be managed in perpetuity?*
  - Tailings will be discharged into the open pit and submerged by water.
  - Waste rock will be progressively backhauled to the lowest accessible dry location in the open pit. As the pit lake level rises, the waste rock will be submerged. The rate of backhauling waste rock will result in the rock being submerged within 2 years of being placed.
  - The open pit will fill with water to a defined management level that maintains the pit lake as a groundwater sink (groundwater flows inward to the pit lake, not outward). This will prevent any movement of pit lake water towards the surrounding groundwater.

- *TSF-006 – Treatment of Pyritic Tailings*
  - *Could treated pyritic tailings provide environmental benefits after the tailings are placed in the pit?*
    - Submerging the pyritic tailings prevents the oxidation of pyrite and generation of acid rock drainage. Without the generation of ARD, there are no benefits of treating pyritic tailings in advance of placing in the open pit.
  - *Could the addition of neutralizing agents to tailings and/or waste rock provide shorter-term precautionary measures for the pyritic TSF?*
    - Submerging pyritic tailings and waste rock is the best industry standard for preventing ARD. In addition, the Pyritic TSF is lined to minimize seepage from the facility. The pit filling schedule includes submergence of the pyritic tailings and PAG waste rock before acid generation occurs. The addition of neutralizing agents would not provide a benefit. The pyritic TSF supernatant pond is expected to have a pH of approximately 8.
  - *Could the addition of neutralizing agents to tailings and/or waste rock provide a longer-term management measure for the pit?*
    - The tailings will be discharged subaqueously into the open pit for immediate submergence and the PAG waste rock will be submerged within 2 years. Further, the potential for acid generation prior to submergence is very low. Once placed in a saturated environment, sulfide mineral oxidation will cease. Therefore, adding neutralizing agents to the submerged tailings or waste rock is not predicted to affect their long-term behaviour with respect to acid generation or metal leaching, or to provide a long-term management benefit.
    - Long term pit lake management may utilize lime addition directly to the lake surface if required.
  - *Could the addition of neutralizing agents to tailings and/or waste rock provide potential for reduced water treatment needs at closure?*
    - The tailings will be discharged subaqueously into the open pit for immediate submergence and the PAG waste rock will be submerged within 2 years. Further, the potential for acid generation prior to submergence is very low. Once placed in a saturated environment, sulfide mineral oxidation will cease. Therefore, adding neutralizing agents to the submerged tailings or waste rock is not predicted to affect their long-term behaviour with respect to acid generation or metal leaching, or to provide a long-term management benefit.
    - Long term pit lake management may utilize lime addition directly to the lake surface if required.
  - *Could lime be added to the pyritic tailings to mitigate acid drainage and metal leaching?*
    - Lime would not be appropriate because it is very soluble and will leach out ahead of neutralizing acid generated by sulfide oxidation. The pyritic tailings will be submerged during operations and thus the exclusion of oxygen will prevent the generation of ARD and metal leaching.

- *TSF-013 – Blending of Pyritic and Bulk Tailings*
  - *How much pyritic tailings could be added to the bulk tailings in order to retain the proposed "inert" nature of the bulk tailings?*
    - The current concept for the bulk TSF includes a flow through main embankment which will lower the phreatic surface within the tailings mass. The bulk tailings do not contain sufficient neutralizing capacity to allow a blended tailings option to be non-acid generating (remain "inert") unless submerged, which is inconsistent with the current concept for the bulk TSF. Blended pyritic/bulk tailings that is stored above the phreatic surface will continue to oxidize and will generate acid and ML.

- *What could be management options for blending in order to retain the proposed "inert" nature of the bulk tailings?*
  - Retaining the proposed "inert" nature of the bulk tailings for a blended tailings would require submergence within the bulk TSF. The current concept for the bulk TSF includes a flow through main embankment which will lower the phreatic surface within the tailings mass. Complete submergence of a blended tailings in the bulk TSF during operations and post closure, would require a water retaining structure which is inconsistent with the current concept for the bulk TSF.
- *Could the bulk tailings be blended with the pyritic tailings to neutralize the pyritic tailings?*
  - The bulk tailings have insufficient neutralizing capacity to prevent ARD/ML of the pyritic tailings. Complete submergence during operations and post closure would be required.
- *Clarify why it is necessary for the bulk tailings to be dewatered to ultimately become a landform?*
  - Allowing the bulk TSF to drain and create a dry landform will enhance long term stability by reducing the moisture content of the tailings and reduce the potential for/impacts of a TSF failure.
- *Describe why a lined, blended bulk tailings TSF could not be dewatered and covered at closure*
  - The pyritic tailings would need to be saturated in the TSF to prevent oxygen from causing ARD/ML thus dewatering is not an option to avoid the need for long term treatment of water from the TSF. Lining the facility further prevents dewatering. The surface of the facility could be drained of runoff but the phreatic surface within the tailings mass would still need to be above the pyritic tailings since the bulk tailings have insufficient neutralizing capacity.