

**RFI 055
Pebble Project EIS**

Request for Information

Title/Subject:	PAG-Pyritic Tailings Storage Facility, Construction and Closure
Requestor:	AECOM
Date Transmitted:	7/9/2018
Recipient:	Pebble Limited Partnership
Response Requested by:	7/20/18
Rationale:	Limited information is provided in the 5/11/18 <i>Technical Note on Updates to PLP's Proposed Project</i> and RFI responses received to date on the construction and closure of the PAG waste rock and pyritic tailings storage facility. Such facilities are relatively new in hard rock mining. The information will be used to evaluate overall constructability of this facility, potential impacts to water quality, and spill risk.
Describe the Information Requested and Level of Detail:	<ol style="list-style-type: none"> 1) Describe the method and sequence of waste rock and tailings placement. Would tailings initially be placed on the top and sides of the liner to protect it from puncturing by sharp waste rock? 2) What is the liner life expectancy in the presence of contact with acid-generating materials? Would material compatibility testing be conducted to determine how the liner would be affected? 3) How would the wet mixed material be removed at closure? For example, would it all be trucked, or be moved by a combination of slurry pumping and trucking? 4) Would testing of media (soil/sediment, surface/groundwater) beneath this facility, as well as others slated for removal in post-closure (e.g., water management ponds), occur following removal to confirm whether leakage has occurred through the liner? What is the contingency plan in the event these media are found to be affected by liner leakage?

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:	Response to RFI 055 - Pyritic TSF.pdf
Date Returned to USACE:	Click here to enter text.

AECOM Intake Form

Date Response was Received:	8/14/2018
Received by:	AECOM
Describe any Follow-up Related to this RFI:	See RFI 055a for followup questions/requests on this RFI.

August 14, 2018

Mr. James Fueg
Vice President - Permitting
Pebble Limited Partnership (Anchorage)
3201 C Street, Suite 505
Anchorage, Alaska
USA, 99503

Knight Piésold Ltd.

Suite 1400 - 750 West Pender Street
Vancouver, British Columbia
Canada, V6C 2T8
T +1 604 685 0543
E vancouver@knightpiesold.com
www.knightpiesold.com

Dear James,

Re: Response to RFI 055 – Pyritic Tailings Storage Facility

The letter has been prepared by Knight Piésold Ltd. (KP) in response to the AECOM Request for Information (RFI) 055 for the Environmental Impact Statement (EIS) for the Pebble Project (Pebble).

A summary of RFI 055 is presented below:

Rationale: Limited information is provided in the 5/11/18 Technical Note on Updates to PLP's Proposed Project and RFI responses received to date on the construction and closure of the PAG waste rock and pyritic tailings storage facility. Such facilities are relatively new in hard rock mining. The information will be used to evaluate overall constructability of this facility, potential impacts to water quality, and spill risk.

Information Requested and Level of Detail:

- 1. Describe the method and sequence of waste rock and tailings placement. Would tailings initially be placed on the top and sides of the liner to protect it from puncturing by sharp waste rock?*
- 2. What is the liner life expectancy in the presence of contact with acid-generating materials? Would material compatibility testing be conducted to determine how the liner would be affected?*
- 3. How would the wet mixed material be removed at closure? For example, would it all be trucked, or be moved by a combination of slurry pumping and trucking?*
- 4. Would testing of media (soil/sediment, surface/groundwater) beneath this facility, as well as others slated for removal in post-closure (e.g., water management ponds), occur following removal to confirm whether leakage has occurred through the liner? What is the contingency plan in the event these media are found to be affected by liner leakage?*

1.0 RFI RESPONSE

RFI 055 – 1: “Describe the method and sequence of waste rock and tailings placement. Would tailings initially be placed on the top and sides of the liner to protect it from puncturing by sharp waste rock?”

The Pyritic Tailings and Potentially Acid Generating (PAG) Waste Rock Storage Facility (Pyritic TSF) includes the use of a synthetic liner to retain water in the facility. The liner will be protected with processed materials to protect the liner from punctures or damage during PAG waste rock material placement.

The current working assumption is the PAG waste rock will be placed around the perimeter of the facility to limit the co-mingling of the tailings and waste rock. The waste rock will be end dumped by mine fleet haul

trucks and spread using dozers. Pyritic tailings will be discharged into the interior of the facility, with deposition occurring concurrently with waste rock placement.

The Pyritic TSF starter embankments and the upstream waste rock zone will be constructed prior to the deposition of tailings into the facility. The waste rock zone will be maintained several feet higher than the tailings material to provide a dry, stable surface for haul truck traffic and the tailings discharge pipelines. The waste rock will be progressively placed in staged lifts to limit the waste rock exposure to a maximum of approximately 1 year. The waste rock placement locations will vary annually based on material availability and will be planned to maintain containment of the pyritic tailings within the center of the facility.

The current mine schedule allows for this placement methodology to continue throughout the duration of the mine life and the initial PAG waste rock volumes provide sufficient material to construct the initial waste rock zone around the interior of the facility.

A conceptual plan view layout of the final Pyritic TSF (Year 20) is provided on Figure 1.1. The operating pond has not been shown for clarity.

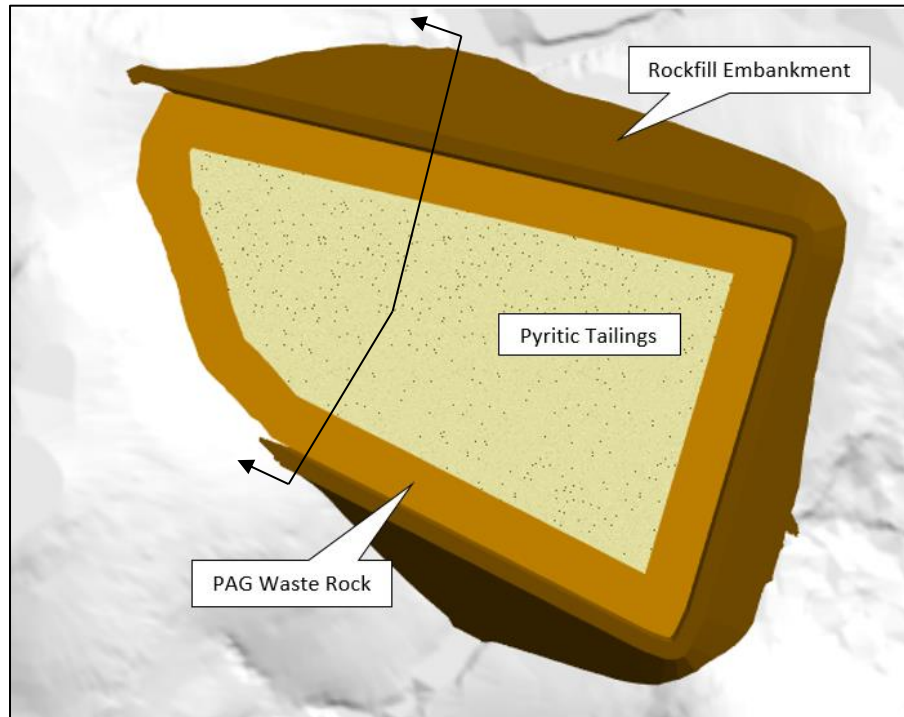


Figure 1.1 Conceptual Pyritic TSF Layout – Final

A simplified conceptual cross section through the Pyritic TSF is shown on Figure 1.2. The operating pond has not been shown for clarity.

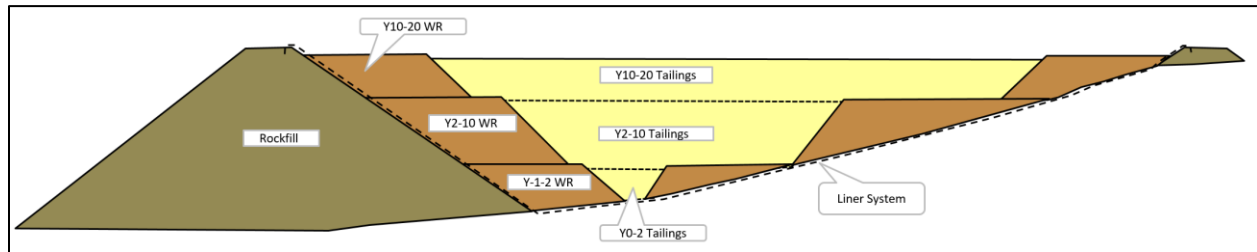


Figure 1.2 Conceptual Pyritic TSF Layout – Final Cross Section

RFI 055 – 2: “What is the liner life expectancy in the presence of contact with acid-generating materials? Would material compatibility testing be conducted to determine how the liner would be affected?”

The PAG waste rock and pyritic tailings within the Pyritic TSF will be inundated throughout the mine life with a minimum of water cover. It is understood that storing the PAG materials sub-aqueously throughout operations will limit the potential for the materials to turn acidic. The source terms and geochemical characteristics of the PAG materials during placement and inundation has been determined by others.

The use of HDPE or LLDPE geomembrane liners is commonly used for leach pads and associated process ponds that are exposed to lower pH solutions. The liner material specification will be finalized during the detailed design phase and the specification will address any requirements with respect to management of lower pH solutions.

HDPE geomembranes are well understood to be extremely durable products, with design service lives up to several hundreds of years. The service life of an HDPE membrane is typically defined as its half-life, which is the point at which a 50 % reduction in a specific design property is expected to occur. It should be noted that when the liner material reaches its half-life, the liner material still exists and can function, albeit at a decreased performance level and with a factor-of-safety lower than the initial design value (Koerner, 2011). The Pyritic TSF will be deconstructed and removed during the closure phase. The facility life is anticipated to be approximately 40 years, inclusive of operations and the closure phase. This operating life of the HDPE geomembrane is well within the known range of HDPE geomembrane service life.

RFI 055 – 3: “How would the wet mixed material be removed at closure? For example, would it all be trucked, or be moved by a combination of slurry pumping and trucking?”

The pyritic tailings will be removed from the Pyritic TSF as a slurry using floating dredge pumps during closure. The tailings slurry will be pumped to the Open Pit for long-term storage. The PAG waste rock material will be removed using conventional hauling methods (excavators and haul trucks), and trucked into the Open Pit via the pit haul ramps. It is expected that the start of waste rock removal will lag behind tailings removal by approximately one year to allow for the tailings and supernatant pond level to be lowered to dewater the waste rock. The tailings will be deposited sub-aqueously into the Open Pit and the PAG waste rock will be inundated to limit exposure to a maximum of approximately one year. A minimum water cover will be maintained above the PAG waste rock and pyritic tailings throughout long-term closure.

RFI 055 – 4: “Would testing of media (soil/sediment, surface/groundwater) beneath this facility, as well as others slated for removal in post-closure (e.g., water management ponds), occur following removal to

confirm whether leakage has occurred through the liner? What is the contingency plan in the event these media are found to be affected by liner leakage?"

Subgrade soil and sediment materials beneath decommissioned facilities, including the Pyritic TSF and Main Water Management Pond, will be tested for contaminants during the closure and reclamation activities. Impacted materials that exceed applicable regulatory levels will either be treated or removed. All impacted materials required to be removed will to be placed within the Open Pit at closure.


Surface runoff and groundwater will be monitored downstream of the Pyritic TSF and Main Water Management Pond at select water quality monitoring locations during operations and post closure to verify the liner effectiveness. If required, pump back wells will be installed to collect and convey any contaminated groundwater back to their respective facility during operations or to the Open Pit during closure. Surface runoff that does not meet discharge requirements post closure will be managed with drainage structures prior to being routed to the Open Pit. Surface runoff and groundwater quality monitoring will remain in place post closure until the quality of the groundwater and surface water meets discharge criteria.

2.0 REFERENCES

Koerner, Robert M, Hsuan, Y. Grace, Koerner, George R. 2011. *Geomembrane Lifetime Prediction: Unexposed and Exposed Conditions*. Geosynthetic Institute, GRI White Paper #6, Updated February 8, 2011

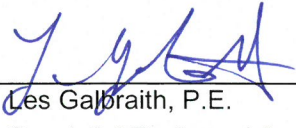
Yours truly,
Knight Piésold Ltd.

Prepared:



Jason Gillespie, P.Eng.
Project Engineer

Reviewed:



Les Galbraith, P.E.
Specialist Engineer | Associate

Alaska P.E. License
129941
Aug 17/18

Approval that this document adheres to Knight Piésold Quality Systems:



Copy To:

Stephen Hodgson, Tanya Yang, Mike Rieser

/jg