RFI 010
Pebble Project EIS

Request for Information

Title/Subject:	**Tailings Characteristics**
Requestor:	**Nancy Darigo/Cecil Urlich, AECOM**
Date Transmitted:	**4/26/18**
Recipient:	**Pebble Limited Partnership**
Response Requested by:	**5/17/18**
Rationale:	**The Project Description and EBD Chapter 11 (Geochemical Characterization) provide limited details on 1) the planned bulk and pyritic tailings split of 88%-12% that determines the size of their respective TSF impoundments, and the location and size of the TSF Internal Embankment; and 2) the tailings thickening process to achieve 55% solids slurry. Additional information is needed to evaluate the overall constructability of the TSF, and potential risks to embankment stability and seepage chemistry from changed conditions during operations.**
Describe the Information Requested and Level of Detail:	**1) Describe how the 88%-12% split between bulk and pyritic tailings was determined and the confidence level in achieving the split during operations.** **2) Describe how much flexibility there is in the split percentage that would still allow the TSF Internal Embankment and impoundments to be constructed as planned.** **3) Describe contingency plans to adjust process operations and/or modify the TSF cell configurations if the planned split cannot be achieved. Explain if and how the TSF Internal Embankment design and construction would be impacted or adjusted.** **4) If higher than expected pyritic tails are produced from the process plant, would they be directed to the bulk tails impoundment? If so, how would that change the geochemistry of the bulk tailings?** **5) Describe the steps taken to reach the concept of a thickened 55%-solids slurry for the bulk tailings, versus a lower %-solids aqueous slurry.** **6) Provide examples of successful thickened TSFs in cold regions.** **7) Describe water balance mitigations if 55% thickening cannot be achieved.** **8) Provide any additional geochemical test work (e.g., acid-base accounting, net acid generation tests, humidity cell tests, etc.) on bulk or pyritic tailings conducted since 2010.**

Recipient Response Form

Date Received from USACE:	**4/27/2018**
Response from Recipient (Describe Information Requested to the Level of Detail Requested; Provide Attachments as Needed):	**6**. Kidd Mine: The Kid Mine is located in northern Ontario, Canada, and is believed to be the first site to use thickened tailings disposal. The Kid Mine is a copper-zinc-silver ore deposit and as of 2016 had been in operation for 50 years with over 150,000 million tonnes (165,000 million short tons) of ore mined (Kidd, 2016). The flotation tailings are thickened to a solids content of 60 to 65% by weight (Tailings.info, 2012) and deposited into the TSF. Siilinjärvi, Finland (Fitton, 2018): The Siilinjärvi apatite mine is located in the Eastern Province of Finland, near the Arctic Circle with cold winter operating conditions of around -30^{o}C. The mine has been in operation for 38 years, with an annual tailings production rate of 10 million tonnes (11 million short tons) which is approximately 30,000 tpd. Conventional tailings slurry was historically deposited with the Musti storage facility, however the tailings deposition strategy was modified

	in 2017 to thicken the tailings based on storage restrictions. Pilot and demonstration-scale operations were undertaken prior to the implementation of the new tailings thickeners and central TSF discharge using positive displacement pumps. The thickener underflow has been successfully deposited in the TSF with an average solids content of 67.5% solids by weight since 2017. Malarctic Mine: The Malarctic Gold mine is located in Quebec, Canada, and began operations in 2011. Temperature records based on regional data provide the mean annual temperature of 1.2^{o}C, and annual precipitation of 36 in. Snow typically falls between October and May (Malartic, 2014). The mine throughput is approximately 50,000 tonnes per day (~55,000 short tons), and the tailings slurry is thickened to approximately 60% solids by weight (Malartic, 2014). Minto Mine: The Minto Mine is located north of Whitehorse in the Yukon, Canada. The open pit copper mine has a throughput of 3,900 tonnes per day (~4,400 short tpd) with an average summer temperature of 10^{o}C and average winter temperature of -20 ^{o}C (Minto, 2012). The average precipitation is ~10 in. Tailings were previously stored in a dry stack facility, and in 2012 the mine began to discharge thickened tailings in the Main Pit. The tailings are thickened to 58% solids and pumped to discharge in the pit. (Minto, 2012). Oyu Tolgoi Mine: The Oyu Tolgoi copper-gold mine is located in the South Gobi Region of Mongolia. The mine was commissioned in 2012 with an original throughput of 90,000 tpd, with planned expansion to 150,000 tpd. (Klohn, 2018). The mine is located in a semi-desert climate with temperature averages ranging from -13 to 25^{o}C and the average site precipitation is 2.2". The slurry tailings are thickened using two thickeners to a solids content of 58 to 60% by weight, and stored in a celled TSF. References: Fitton, TG, 2018. *Designing the Siilinjärvi thickened tailings storage facility*. Paste 2018 – 2018 Australian Centre for Geomechanics, Perth, Australia Klohn, 2018. *Oyu Tolgoi Mine*. Available at: https://www.klohn.com/projects/sector/oyu-tolgoi-mine. Accessed May 2018. Kidd Operations, 2018. *Kidd Operations, Celebrating 50 years of excellence*. Available at: http://www.kiddoperations.ca/en/about-us/Pages/celebrating-50-years-of-excellence.aspx. Accessed May 2018. Malartic, 2014. *Technical Report on the Mineral Resource and Mineral Reserve Estimates For The Canadian Malartic Property*. Mine Canadian Malartic., Quebec, Canada, 2014 Minto, 2012. *Minto Phase VI Preliminary Feasibility Study Technical Report*. Minto Explorations Ltd., Yukon, Canada Minto, 2017. *Tailings Management Plan*. Minto Explorations Ltd., Yukon, Canada, February 2017 Tailings.info, 2012. *Xstrata - Kidd Creek Met Site, Timmins, Ontario, Canada*. Available at: http://www.tailings.info/casestudies/kiddmet.htm. Accessed May 2018. Turquoise Hill, 2016. *2016 Oyu Tolgoi Technical Report*. Turquoise Hill Resources Ltd., October 2016 8. See attached SRK report
List Number and Type of Response Attachments:	**SRK Report Additional geochemistry Data.pdf**
Date Returned to USACE:	**5/30/2018**

AECOM Intake Form

Date Response was Received:	**5/30/2018**
Received by:	**Bill Craig, AECOM**
Describe any Follow-up Related to this RFI:	**None at this time**