To:	John Berry
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Date:	6 April 2023
From:	Tom Lawson
Subject:	Radiation Activity of BJV Material at the Mine Site
Job No.	2019

Overview

IHC Mining received sample of ore from the Barrytown site currently being developed by TiGa Minerals. This included a "high grade" sample with a 55% Heavy Mineral (HM) content in 2002 which was utilised in laboratory work at the IHC facility, Darlington Road, Yatala, Qld, Australia. This test work is reported in the IHC provided report 2192-PM-REP-0000-8001 Rev 0 released 24th March, 2023. A further sample of "Average Grade" ore was received with approximately 19%HM which was also characterized for ore properties at the IHC facility.

This memo speaks specifically to the activity level of the material in relation to radioactive elements in the Run of Mine (ROM) received, the portion of ROM that becomes product transported from the mine site after processing, and the portion of the ROM that is returned to the ground after the mineral products are extracted.

Outcomes of Test Work

The sample received is mixed, subsamples are extracted through splitting of the sample as per lab procedures and a subsample is submitted to an approved analysis laboratory for characterisation of the material. One of the tests done is XRF (x-ray fluorescence) to achieve an elemental composition of the sample which provides a measure of radioactive elements such as Uranium and Thorium typically shown as ppm (parts per million) or effectively grams per tonne of these elements in the ROM.

The calculation for activity concentration (Bq/g) is based on the measured assay for U and Th as follows:

$$Activity\ Concentration\ of\ Material\ (Bq/g) = Specific\ Activity\ of\ U^{238} \times \frac{U(ppm)}{1{,}000{,}000ppm} + Specific\ Activity\ of\ Th^{232} \times \frac{Th(ppm)}{1{,}000{,}000ppm}$$

where the specific activity of U^{238} and Th^{232} are 12,440 Bq/g and 4,200 Bq/g, respectively.

The table below is the summary of the XRF assay levels for the various streams in the ROM and the processes developed for the TiGa Minerals Barrytown site and the calculated activity concentration of the material.

Stream:	Assay - High Grade		Activity Concentra	Assay - Av. Grade		Activity Concentra
	U	Th		U	Th	
	ppm	ppm	Bq/g	ppm	ppm	Bq/g
ROM						
Total	0	66	0.28	2	31	0.16
MUP						
Underflow**	0	72	0.30			
Oversize***	0	0	0.00			
Slimes***	0	53	0.22			
WCP						
HMC	14	116	0.66			
WCP Tails***	1	19	0.09			
** Underflow of MUP is the feed to the WCP						
*** Identifies Tails Streams combined and returned to the mined area						

The ROM value of activity level is very low for both the high grade sample tested fully through to Heavy Mineral Concentrate (HMC) and tailing streams. For the Average grade sample the activity level of 0.16Bq/g is lower than the high grade sample which is expected as there is less HM content and the radioactive elements are contained within the HM.

The Mining Unit Plant (MUP), sometimes called the FPP or Feed Preparation Plant, removes material greater than 2mm and smaller than 53micron and returns it to the mine void. The line marked Underflow is the remainder of the ROM, which feeds the Wet Concentrator Plant (WCP).

The WCP receives this material and uses gravity separation to concentrate the HM into what is called the HMC (Heavy Mineral Concentrate) which as shown is typically higher in Bq/g as the radioactive elements are part of the HM. That process is not perfect separation so a low residual level of 0.09Bq/g is in the tailings also returned to the mine void.

The HMC is transported using trucks to transport sites for delivery to clients of this mine facility.

Conclusions

Ultimately, the processes developed are conventional mineral sand processing techniques and manage the separation, concentration and post process return of tailings, oversize and slimes to the mine void.

The radiation activity level in the ore is low with the data above for the highest grade of heavy mineral in the ground. The results of the Average Grade characterisation completed indicates that concentrations of radioactive elements will be lower than the High Grade test results due to less radioactive elements in the ROM.

The concentrated HMC produced at the mine has a value of 0.66Bq/g for the high grade sample processed. This will be lower for the average across the mine life and is estimated at <0.45Bq/g given the Average grade sample characterisation.

The streams returning to the mine void after extraction, processing and removing the HM are at a lower level of radiation activity than the ROM extracted. For the high grade sample, this ROM of 0.26Bq/g is reduced to <0.14Bq/g average across the tailings streams. This is as expected.

Based on these results, the ore, tailings and HMC produced are not a radioactive material for the purposes of the New Zealand Radiation Safety Act 2016. In accordance with section 4 of the New Zealand Radiation Safety Act 2016, the provisions of the Act do not apply. Further, the IAEA Transport Regulations (IAEA SSR6) also do not apply as the results are well below the limit.

For any further clarifications or concerns, please contact Tom Lawson at IHC Mining at your convenience.