Before the Hearing Commissioners
appointed by the Grey District Council and
West Coast Regional Council

Under	the Resource Management Act 1991
In the matter of	Resource consent applications by TiGa Minerals and Metals Ltd to establish and operate a mineral sands mine on State Highway 6, Barrytown (RC-2023-0046; LUN3154/23)

Statement of evidence of Mitchell Robert Ryan

19 January 2023

Applicant's solicitors:
Alex Booker/Alex Hansby
Anderson Lloyd
Level 3, 70 Gloucester Street, Christchurch 8013
PO Box 13831, Christchurch 8140
p + 64 27 656 2647
alex.booker@al.nz

anderson lloyd.

Qualifications and Experience

1 My full name is Mitchell Robert Ryan.

2 I have a Bachelor Degree in Chemical & Metallurgical Engineering and a Bachelor Degree in Geological Sciences from the University of Queensland, Australia. I have worked in the Mineral Sands mining and processing industry since 2016, conducting test work and engineering studies. I am Competent Person in this field as recognised by the Australian Institute of Mining and Metallurgy. I am also a qualified Radiation Safety Officer within Queensland, Australia.

3 I am currently employed as Senior Metallurgist and have held that position since 2016. I also fulfil the role of Radiation Safety Officer for IHC Mining's facility in Queensland, Australia.

4 My previous work experience includes Research Officer at the School of Earth Sciences, University of Queensland.

5 My role in relation to TiGa Minerals and Metals Limited's (**TiGa**) application to establish and operate a mineral sands mine (**Application and Application Site**) has been primarily to conduct metallurgical test work on the Barrytown ore in order to develop the metallurgical process flow sheets, evaluate the expected products and waste streams, and provide process engineering inputs into the Barrytown Feasibility Studies.

6 While my professional experience has been primarily based in Australia, I have made myself familiar with the relevant local legislation pertaining to the Barrytown Sands Project in my area of expertise.

7 My assessment is based upon the proposal description attached to the evidence of Ms Katherine McKenzie as Appendix 1.

8 In preparing this statement of evidence I have considered the following documents:

(a) the AEE accompanying the Application;

(b) submissions relevant to my area of expertise;

(c) Radiation Safety Act 2016;

(d) IAEA Transport Regulations (IAEA SSR6);

(e) RSC drill sample chain of custody statement '*240112 TiGa RSC chain of custody*' (attached);

(f) NZIMMR drill sample and bulk sample chain of custody statement (attached);

(g) SGS radiological analysis report '*ME341180 Rev 0'* (attached);

(h) Peer Review of Radiological Assessment conducted by IHC Mining titled "Radioactivity of BJV Material Tested Project 2019";

(i) ESR radiological analysis reports (attached):

- TR23-263 2339 Tails SN23-0944;
- TR23-298 2339 ROM SN23-0945;
- TR23-299 2339 Slimes SN23-0946;
- TR23-300 Concentrate (HMC) SN23-0947.

9 I became actively involved in the Barrytown project in June 2022. My involvement has been in the completion of drill sample characterisation, bulk sample process development test work, assessment of ore, products and reject streams and process engineering design studies.

10 IHC Mining was engaged by Mr John Berry of TiGa Minerals and Metals Ltd to complete a metallurgical test work programme to support an engineering feasibility study for the Barrytown Sands Project. I have provided periodic updates of results and advice in these areas since this time.

Code of Conduct for Expert Witnesses

11 While this is not a hearing before the Environment Court, I confirm that I have read the Code of Conduct for expert witnesses contained in the Environment Court of New Zealand Practice Note 2023 and that I have complied with it when preparing my evidence. Other than when I state I am relying on the advice of another person, this evidence is within my area of expertise. I have not omitted to consider material facts known to me that might alter or detract from the opinions that I express.

Scope of Evidence

12 I have prepared evidence in relation to:

(a) the metallurgical test work conducted and the validity of each sample tested with respect to representation of typical Barrytown ore throughout the planned mine life;

(b) the processing of these samples into heavy mineral concentrates, and beyond;

(c) a radiological assessment of the in-situ ore, the produced HMC, the 'slimes' stream and tailings material to be produced; and

(d) a conclusion that these materials are well below the relevant "acceptable levels" of radioactivity as specified by the Radiation Safety Act 2016 and International Atomic Energy Agency "IAEA" Regulations for the Safe Transport of Radioactive Material.

Metallurgical Test Work Summary – Conducted by IHC Mining

13 Recently, IHC Mining have conducted three recent test work programmes as part of the current Barrytown feasibility studies: drill sample characterisation test work (see paragraphs 14-15, below), metallurgical process development test work utilising a bulk sample of high grade Barrytown ore (see paragraph 16, below), and process confirmation test work utilising a bulk sample of average grade Barrytown ore (see paragraph, below).

14 The purpose of the drill sample characterisation test work was to support the geological and geographical definition of the orebody and to understand the heavy mineral grade distribution throughout. Between March and August of 2022, approximately 1,500 aircore drill samples, each representing 1m depth intervals from within the Barrytown resource, were extracted and weighed by Alton Drilling. See Figure 1 for drill hole locations. RSC then logged, split, packaged and supplied sub-samples of each 1m interval to New Zealand Institute of Minerals to Materials Research "NZIMMR" to conduct drill sample characterisation studies. RSC's General Manager – Exploration completed an on-site audit of the in-field efforts of Alton Drilling and RSC to ensure Standard Operating Procedures were adhered to and also to provide a QAQC of logged data. The audit concluded that the work was of a good standard and that the data and sub-samples generated were appropriate.

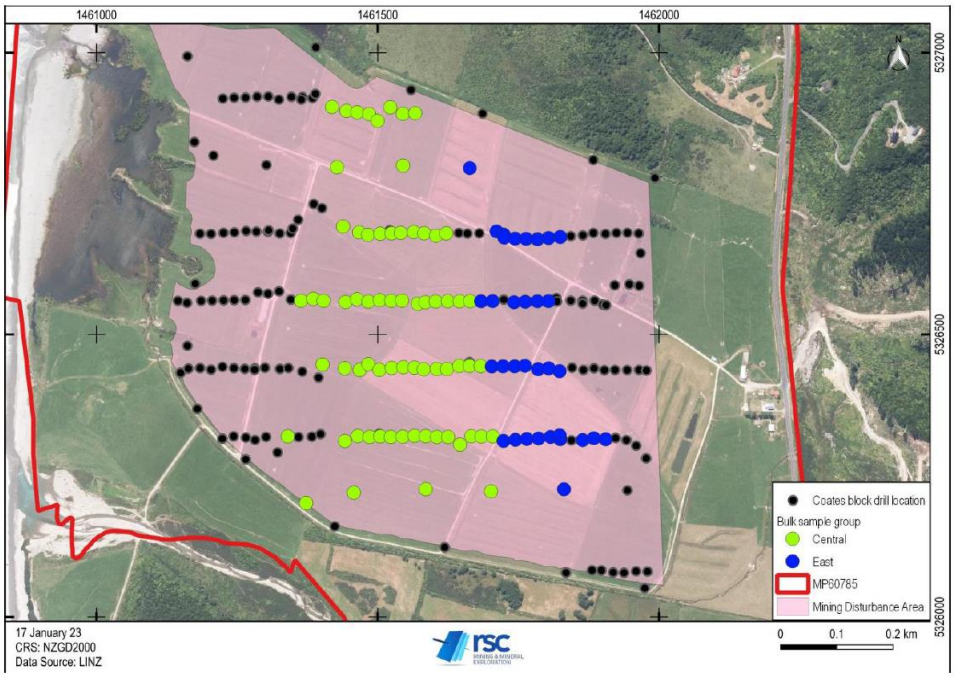

Figure 1 – 2022 Drill hole locations

15 At NZIMMR's facility in Dunollie, New Zealand, the as-received drill samples were dried, crushed (for de-agglomeration post-drying), and screened to remove >2.0mm particles. The <2.0mm crush rejects were split into sub-samples for various test work endeavours. One set of samples were sent to IHC Mining's metallurgical test facility in Queensland, Australia. Both IHC Mining and NZIMMR each used a set of sub-samples to conduct parallel drill sample characterisation test work. The results from the parallel drill sample characterisation programmes were compiled and processed by NZIMMR, and were concluded to produce agreeing results. The key metallurgical outcome being that typical high, average and low grade zones within the Barrytown resource are in the order of 45%, 19% and 8% 'heavy mineral' content, respectively. 'Heavy mineral' is defined as particles with a specific gravity of >2.85. The heavy mineral includes the targeted minerals garnet and ilmenite. Garnet grades were determined to be approximately 16%, 10% and 3% for typical high, average and low grade ore, respectively. Ilmenite grades were determined to be approximately 11%, 7% and 2% for typical high, average and low grade ore, respectively. The drill programme also identified three mineralisation domains: West, Central and East/NE.

16 An additional 2.5 tonne sample representing high grade Barrytown ore was excavated from the West domain in May 2022, as indicted in Figure 2, at near-surface depths. This sample was delivered to IHC Mining in Queensland, Australia. The material was characterised to contain approximately 56% heavy mineral content, inclusive of 20% garnet and 14% ilmenite. This is within a suitable range to be considered representative of typical Barrytown high grade ore, as determined by the parallel drill sample characterisation programmes. This sample of ore is calculated to contain an indicative specific radioactivity of 0.28 Bq/g in-situ (undisturbed, in-ground) based on Uranium and Thorium "U+Th" assay. This high grade bulk sample was used to develop the Barrytown metallurgical process flowsheet. The process concentrates the heavy mineral content through gravity separation to produce a heavy mineral concentrate "HMC", containing ~92% heavy mineral content, inclusive of 38% garnet and 27% ilmenite. The high grade HMC material was calculated to contain an indicative specific radioactivity of 0.66 Bq/g based on U+Th content.

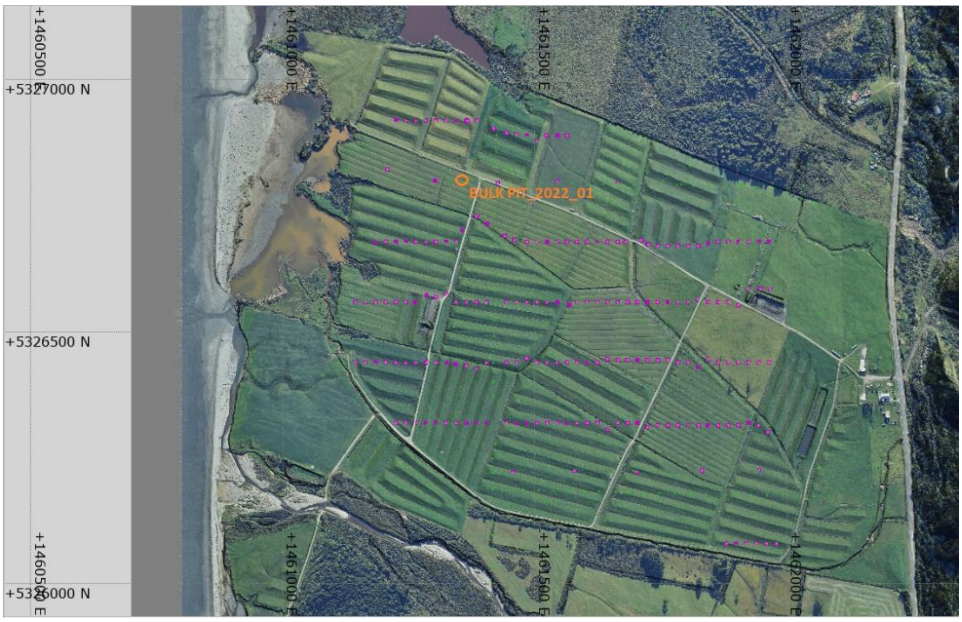

Figure 2 - Orange marker indicating 2.5 tonne high grade sample extraction location

17 In September 2022, a second bulk sample totalling 1.4 tonnes and representing average grade Barrytown ore, was composited by NZIMMR. The composite comprised of approximately 338 of the aforementioned drill sub-samples, as selected by RSC geologists from the campaign summarised in Figure 1. The composite samples spanned the West and Central domains within the Barrytown project site. This bulk composite was delivered to IHC Mining in Queensland, Australia. The material was characterised to contain approximately 19% heavy mineral content, inclusive of 6% garnet and 3% ilmenite. While slightly lower than the resource definition's average grade, this is within a suitable range to be considered representative of typical Barrytown high grade ore for metallurgical processing purposes. This sample of ore is calculated contain an indicative specific radioactivity of approximately 0.16 Bq/g in-situ based on U+Th assay. The dust-prone material from the ore (i.e. <53µm particles, also referred to as 'slimes') is calculated contain an indicative specific radioactivity of 0.22 Bq/g in-situ based on U+Th assay. This average grade bulk sample was used to confirm and where necessary, modify the Barrytown metallurgical process flowsheet to accommodate for the expected average to low grade ore. The produced intermediate HMC contained ~91% heavy mineral content – consistent with the HMC produced from the high grade sample. The average grade HMC material was calculated to contain an indicative specific radioactivity of 0.72 Bq/g based on U+Th content.

Radioactivity Assessment – Conducted by IHC Mining

18 Irrespective of the varying heavy mineral grade across the Barrytown resource, the heavy mineral content throughout the tested regions of the orebody is consistent with respect to Uranium and Thorium content. The high grade samples produced HMC calculated at approximately 0.66 Bq/g (indicative, based on U+Th assay).

The average grade samples produced HMC calculated at approximately 0.72 Bq/g (indicative, based on U+Th).

19 ESR conducted a peer review of IHC Mining's above preliminary radiological assessment of the produced Barrytown HMC. ESR concluded that the evaluation of radioactivity based on U+Th assay alone may not be sufficient. As such, following ESR's recommendation, a sample of the produced HMC from the high grade sample test work and the low grade sample test work were submitted for radiological analysis at by SGS laboratories in Melbourne, Australia. SGS analyses the samples for the specific activity levels of their full radiological decay chain, rather than just the U+Th content commonly used as a preliminary activity level assessment, as above. The SGS analytical report is attached with this submission. The sum of the average measured activities for each decay chain (heads of chain: U^{238}, Th^{232}, U^{235}, K^{40}) are 0.66 ± 0.06 Bq/g for the high grade sample's HMC and 0.70 ± 0.11 Bq/g for the average grade sample's HMC. These values are in-line with the indicative values calculated based on U+Th assay.

20 Based on the above specific activity levels, these concentrated HMC samples are well below the "acceptable level" of radionuclides as specified by Schedule 2 of the Radiation Safety Act 2016. These acceptable levels of radionuclides are stated to be 10 Bq/g for all measured uranium and thorium radionuclides. The Barrytown HMC has been measured to contain <1 Bq/g for these decay chains. As such, this material is not considered to be radioactive by the Radiation Safety Act 2016 and is therefore exempt from its provisions.

21 Table 2 of the International Atomic Energy Agency "IAEA" Regulations for the Safe Transport of Radioactive Material (IAEA SSR6 Rev. 1) lists the same "acceptable levels" of individual radionuclides as that of Schedule 2 of the Radiation Safety Act 2016. Additionally, paragraph 107(f) of IAEA SSR6 Rev. 1 dictates that "ores containing naturally occurring radionuclides, which may have been processed", such as the Barrytown material, are exempt from these transport regulations "provided the activity concentration of the material does not exceed 10 times the values specified in Table 2". The acceptable levels for these radionuclides (natural U and Th) are listed in Table 2 as 1 Bq/g. As such, the Barrytown HMC must satisfy <10 Bq/g for natural U and natural Th. The Barrytown HMC natural U and Th levels are measured at <1 Bq/g. As such, this material is not considered to be radioactive by IAEA SSR6 Rev. 1, and is therefore exempt from its transport regulations.

22 While some degree of fluctuation will occur due to ore body variation and potential process plant operational influence, these variations will not be significant, as exemplified by the similar results between the two HMC samples from different origins within the Barrytown resource. Based on my experience, these natural fluctuations in HMC activity level will not put the material at risk of exceeding the aforementioned 10 Bq/g "acceptable level".

Radioactivity Assessment – Conducted by NZIMMR

23 Further to the above metallurgical test work, NZIMMR also conducted a test work programme to assess the radioactivity of typical Barrytown ore, HMC, tailings and slimes streams. A 188kg sample of unprocessed ore composited, comprising of 111 samples from 35 drill holes from the 2022 drill programme campaign. The 35 selected drill hole locations are shown in Figure 3. The 188kg bulk composite was processed in a manner similar to the standard commercial process utilising screening and spiral separators to produce an indicative sample of ore, slimes, HMC and tailings for radiological assessment by ESR. For these samples, the sum of the average measured activities for each decay chain (heads of chain: U^{238}, Th^{232}, U^{235}, K^{40}) were as follows: **Ore = 0.66 ± 0.06 Bq/g; Slimes = 1.17 ± 0.15 Bq/g; HMC = 0.87 ± 0.13 Bq/g; Tailings = 0.51 ± 0.05 Bq/g**. These raw results files are attached.

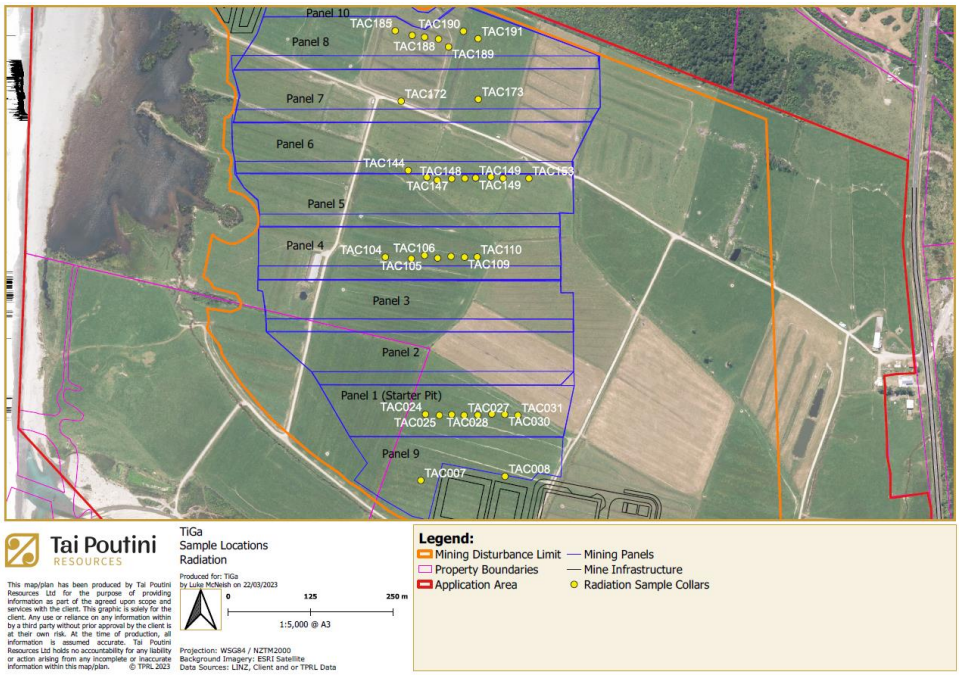

Figure 3 – Drill hole locations for NZIMMR's radiological assessment

24 The HMC was slightly elevated as compared to that of the IHC-produced HMC, however this is still within the range of expected natural variation and well below the “acceptable levels” of radioactivity as specified by Schedule 2 of the Radiation Safety Act 2016 and by Table 2 of IAEA SSR6 Rev. 1 (referencing paragraph 107(f)). As such, these results conclude that the expected Barrytown HMC is not considered to be radioactive by the Radiation Safety Act 2016 or by the Transport Regulations and are therefore exempt from their provisions and regulations. This is in-line with IHC Mining’s radiological assessment.

25 The expected Barrytown ore, slimes and tailings material measure well below the “acceptable level” of radioactivity as specified Schedule 2 of the Radiation Safety

Act 2016. As such, these results conclude that the expected Barrytown ore, slimes and tailings are not considered to be radioactive by the Radiation Safety Act 2016 and are therefore exempt from its provisions. The ore, slimes and tailings material will not be transported off-site and so the IAEA Regulations for the Safe Transport of Radioactive Material do not apply.

Proposed Consent Conditions

26 Section 8.5 of the TiGa Minerals and Metals Ltd Proposed Conditions of Consent states "the Consent Holder must undertake quarterly systematic testing of the heavy minerals concentrate from within the active mining area to confirm that the concentrate remains below the acceptable level of radioactivity concentration limits as specified in Schedule 2 of the Radiation Safety Act 2016."

27 This proposal is in line with ESR's peer review recommendation for "an ongoing radiological monitoring and reporting programme" post-commissioning.

28 Given the low levels of specific activity of the HMC, and the negligible levels of variance exhibited between the two HMC samples which were concentrated ore from different mineralogical domains within the Barrytown resource, it is also my opinion that quarterly testing and reporting to the Consent Authority will be sufficient.

29 It is also noted that through routine assay analysis of the produced HMC, as is typical of a processing operation, the Consent Holder will have access to frequent U+Th assay data, which provides an indicative specific activity value for the HMC. This would alert the operation to any unlikely spike in HMC radioactivity levels.

Conclusions

30 The samples used by IHC Mining to generate Heavy Mineral Concentrate were representative of typical high grade and average grade ore from the Barrytown resource. The two HMC samples were consistent in terms of mineral content and specific activity, measuring at 0.66 ± 0.06 Bq/g for the high grade sample's HMC and 0.70 ± 0.11 Bq/g for the average grade sample's HMC. The HMC sample produced by NZIMMR measured at 0.87 ± 0.13 Bq/g. This is in-line with the IHC-produced HMC samples. These values are notably lower than the relevant "acceptable levels" of radioactivity. As such, the material is exempt from the provisions of the Radiation Safety Act 2016, and the IAEA Transport Regulations (IAEA SSR6) do not apply.

31 The expected Barrytown ore, slimes, HMC and tailings material as produced by NZIMMR measured at 0.66 ± 0.06 Bq/g, 1.17 ± 0.15 Bq/g and 0.51 ± 0.05 Bq/g, respectively. These values are notably lower than the "acceptable level" of 10 Bq/g for radioactive material. As such, the material is exempt from the provisions of the

Radiation Safety Act 2016. As the ore, slimes and tailings material will not be transported off-site, the IAEA Transport Regulations (IAEA SSR6) do not apply.

32 While some degree of natural variation is expected within the produced HMC throughout the Barrytown mine life, the effect on specific activity level is expected to be negligible. Notwithstanding this, TiGa Minerals and Metals Ltd have proposed quarterly testing and reporting of HMC specific activity level to the Consent Authority. It is my opinion that this is sufficient.

Mitch Ryan

Dated this 19th day of January 2023

John Berry
Project Manager
TiGa Minerals & Metals Limited
4 Blake Street, Surfdale,
Waiheke Island, 1081,
New Zealand

12 January 2024

Dear John

Re: Coates South Bulk Samples

The 2022 drilling campaign at Barrytown Coates South Block was planned and managed by RSC between March–August 2022. From this, 338 samples from Coates Block South were selected for metallurgical test work, to be representative of two mineralised zones that lie parallel to the shoreline, namely, the Central and East zones (Figure 1). The sample intervals selected (Figure 2) were chosen on the basis of preliminary Leapfrog modelling of geological logging information and estimated Heavy Mineral percentages. The laboratory coarse crush rejects of the samples were composited, comprising approximately 1.4 tonnes of material, and dispatched to IHC Mining Robbins, Queensland, for analysis.

The sample collection process is outlined in Chapter 6 of the RSC Coates South MRE Report. A standard operating procedures (SOP) was in place for the process of collecting geological data and information from the aircore samples, which included appropriate sections on quality control and objectives. The batch handling process is also explained in the report.

- All aircore drilling was undertaken by Alton Drilling using an ADL Manufactured Multipurpose Rig mounted on an MST-600VD crawler using a 3-inch hammer (~76 mm) and a 200 psi (400 cfpm) compressor.
- The aircore samples were collected at 1-m intervals from the cyclone into labelled plastic bags, and were weighed by Alton Drilling's field-assistants using spring scales.
- RSC geologists then logged each sample using a logging board for visual representation, and a small portion of each sample was placed into chip trays. Groups of ~40–60 samples were packed into large polyweave bulk bags by the field-assistants.
- Samples were regularly collected and dispatched to the the New Zealand Institute of Metals and Minerals Research preparation lab (NZIMMR, Dunollie, Greymouth) after each batch was packaged.

- RSC's General Manger—Exploration completed a site visit during the drilling programme, whereby the drilling and sampling procedures on-site at the Coates South Block and the sample preparation procedures at the NZIMMR facility were observed. RSC checked whether all processes conformed to SOPs and checked core trays and chip trays against the database and logging sheets. Overall, RSC confirmed that the work underpinning the resource estimate at the Barrytown Project is of a good standard, and the sample and data quality are appropriate with respect to the data quality objectives.
- At the NZIMMR facility, laboratory-crush rejects from the 338 selected samples were composited into a bulk sample of approximately 1.4 tonnes, where it was dispatched to IHC Mining Robbins, Queensland, for analysis.

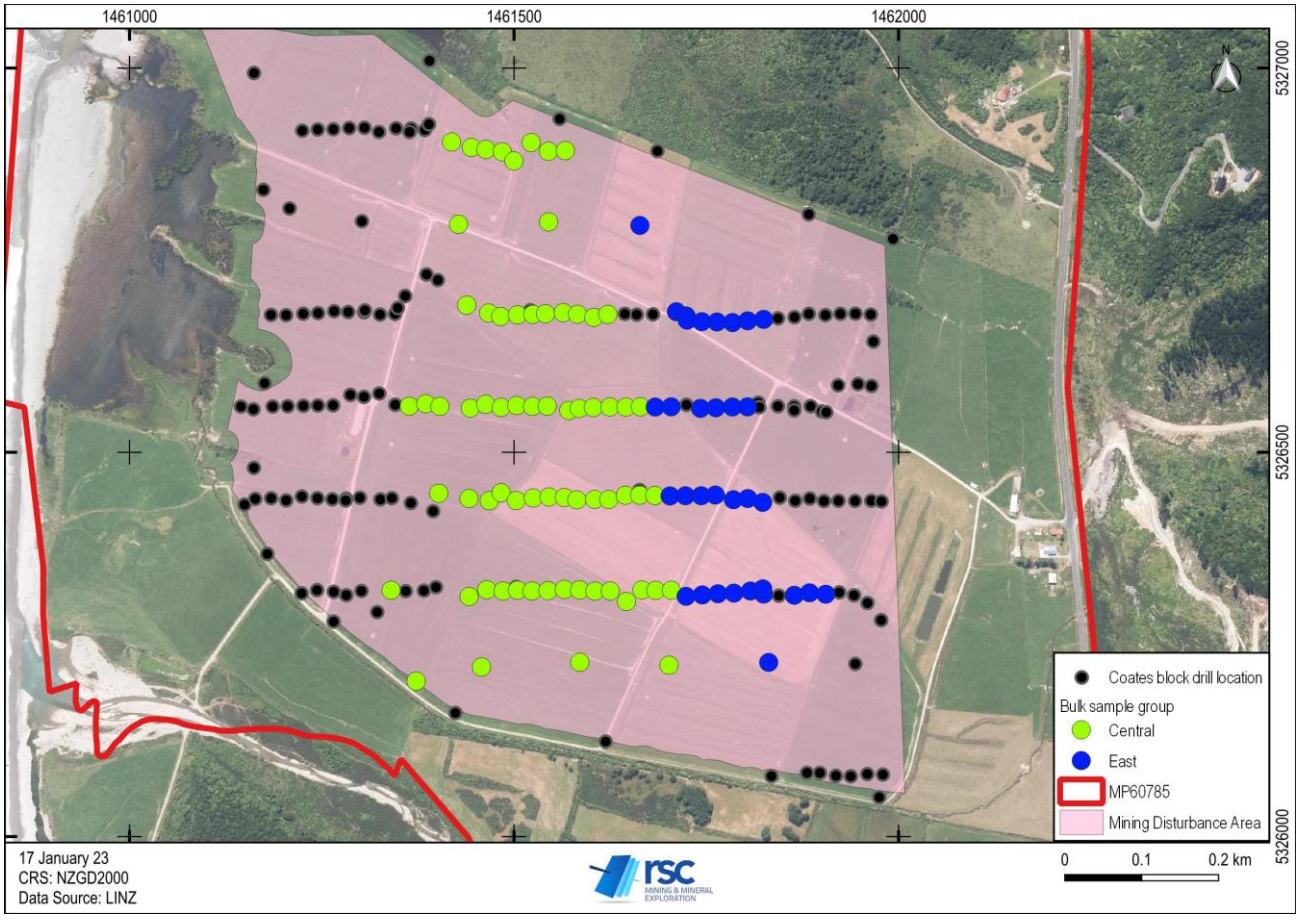

Figure 1: Distribution of drillholes selected for the bulk sample.

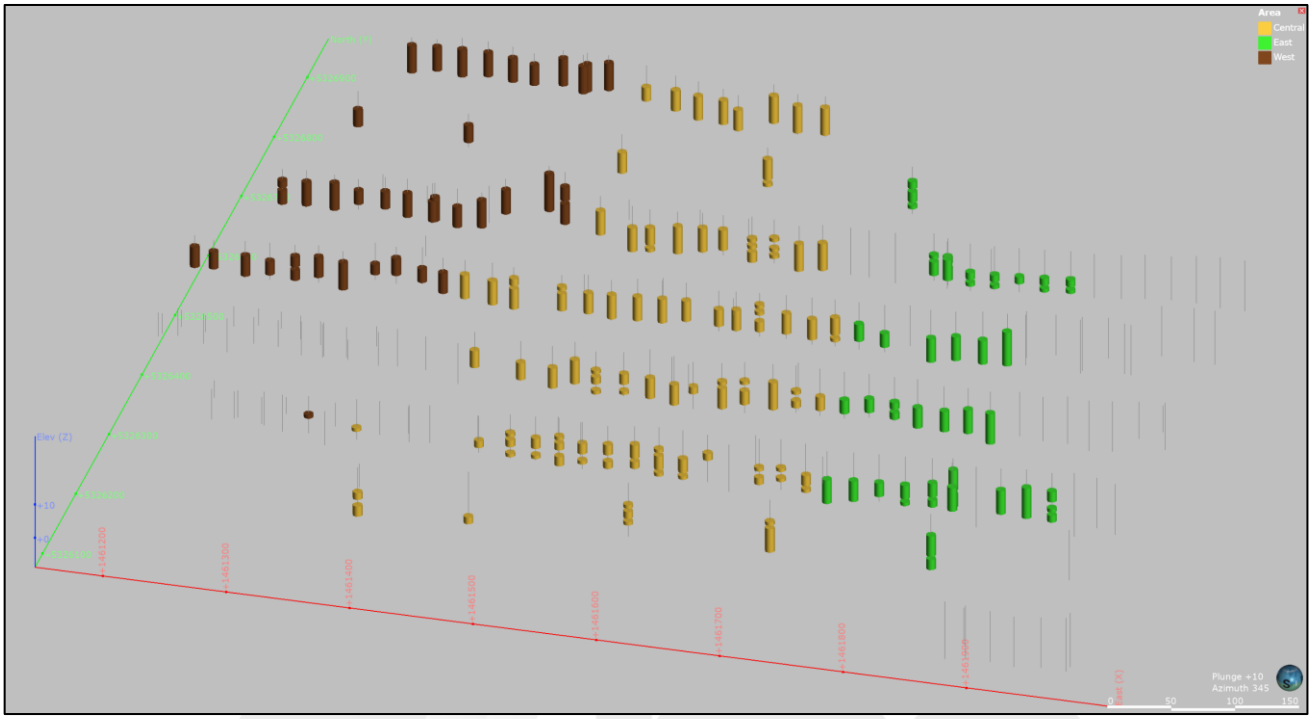

Figure 2: Distribution of drillhole intervals from the central and east zones, as composited in the bulk sample.

Sincerely,

Craig Wright,
Acting General Manager — Exploration
RSC Consulting Limited
PO Box 5647, Dunedin 9054, New Zealand
c.wright@rscmme.com

ANALYTICAL REPORT

Accreditation No. 2562

CLIENT DETAILS		LABORATORY DETAILS	
Contact	Dale Killeen	Manager	Adam Atkinson
Client	IHC ROBBINS PTY LTD	Laboratory	SGS Melbourne EH&S
Address	BUILDING 2, 112 DARLINGTON DRIVE YATALA QLD 4207	Address	10/585 Blackburn Road Notting Hill Victoria 3168
Telephone	(Not specified)	Telephone	+61395743200
Facsimile	(Not specified)	Facsimile	+61395743399
Email	d.killeen@royalihc.com	Email	Au.SampleReceipt.Melbourne@sgs.com
Project	**2330 Barrytown**	SGS Reference	**ME341180 R0**
Order Number	**COD**	Date Received	24 Oct 2023
Samples	2	Date Reported	22 Nov 2023

COMMENTS

Accredited for compliance with ISO/IEC 17025 - Testing. NATA accredited laboratory 2562 (14420/22793/24472).

Elemental Thorium and Uranium analysis subcontracted to SGS Minerals Services, 28 Reid Road Perth Airport WA 6105, not NATA Accredited, WM214894.

SIGNATORIES

Shane CLOUGH
Senior Laboratory Technician

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name ME341180.001 Other 23 Oct 2023 2192/2440	ME341180.002 Other 23 Oct 2023 2330
Uranium 238 and Thorium 232 in Soil by Activity Conversion from Elemental Concentrations Method: AS106 Tested: 21/11/2023				
Thorium-232*	Bq/kg	-	**370 ±40**	**410 ±44**
Uranium-238*	Bq/kg	-	**140 ±22**	**140 ±22**
Total Recoverable Metals in Soil by ICPMS Method: AN045/IMS84V Tested: 21/11/2023				
Thorium, Th*	mg/kg	0.5	**92 ±10**	**100 ±11**
Uranium, U*	mg/kg	0.1	**11 ±2**	**12 ±2**
Radionuclides by Gamma Ray Spectrometry in solids Method: AS303/AS406 Tested: 25/10/2023				
Thorium-234	Bq/kg	-	**170 ±20**	**220 ±47**
Radium-226	Bq/kg	-	**150 ±11**	**170 ±13**
Lead-210	Bq/kg	-	**180 ±24**	**210 ±29**
Radium-228	Bq/kg	-	**320 ±23**	**430 ±31**
Thorium-228	Bq/kg	-	**320 ±29**	**440 ±39**
Potassium-40	Bq/kg	-	**110 ±17**	**41 ±18**
Thorium-230	Bq/kg	-	<430	**410 ±160**

MB blank results are compared to the Limit of Reporting
LCS and MS spike recoveries are measured as the percentage of analyte recovered from the sample compared the the amount of analyte spiked into the sample.
DUP and MSD relative percent differences are measured against their original counterpart samples according to the formula : *the absolute difference of the two results divided by the average of the two results as a percentage.* Where the DUP RPD is 'NA' , the results are less than the LOR and thus the RPD is not applicable.

No QC samples were reported for this job.

METHOD	METHODOLOGY SUMMARY
AN045/IMS84V	Determination of elements at trace level in soil digest by ICP-MS technique, Digest analysis performed by SGS Minerals division, method IMS84V.
ARS-SOP-AS106	Uranium-238 activity concentration is calculated from the uranium mass concentration using a conversion factor of 12.3474 Bq/mg.
ARS-SOP-AS106	Thorium-232 activity concentration is calculated from the thorium mass concentration using a conversion factor of 4.0711 Bq/mg.
ARS-SOP-AS106	The uranium-235 activity concentration is calculated from the uranium mass concentration using a conversion factor of 0.5688 Bq/mg
ARS-SOP-AS106	The potassium-40 activity concentration is calculated from the potassium mass concentration using a conversion factor of 31.72 Bq/g.
AS303/406	Analysis of radionuclides in solid samples by high resolution gamma ray spectrometry after preparation to meet standard calibrated geometries. Preparation involves drying, crushing and sieving, and setting in an epoxy resin where necessary.

FOOTNOTES

IS	Insufficient sample for analysis.	LOR	Limit of Reporting
LNR	Sample listed, but not received.	↑↓	Raised or Lowered Limit of Reporting
*	NATA accreditation does not cover the performance of this service.	QFH	QC result is above the upper tolerance
		QFL	QC result is below the lower tolerance
**	Indicative data, theoretical holding time exceeded.	-	The sample was not analysed for this analyte
***	Indicates that both * and ** apply.	NVL	Not Validated

Unless it is reported that sampling has been performed by SGS, the samples have been analysed as received.
Solid samples expressed on a dry weight basis.

Where "Total" analyte groups are reported (for example, Total PAHs, Total OC Pesticides) the total will be calculated as the sum of the individual analytes, with those analytes that are reported as <LOR being assumed to be zero. The summed (Total) limit of reporting is calcuated by summing the individual analyte LORs and dividing by two. For example, where 16 individual analytes are being summed and each has an LOR of 0.1 mg/kg, the "Totals" LOR will be 1.6 / 2 (0.8 mg/kg). Where only 2 analytes are being summed, the " Total" LOR will be the sum of those two LORs.

Some totals may not appear to add up because the total is rounded after adding up the raw values.

If reported, measurement uncertainty follow the ± sign after the analytical result and is expressed as the expanded uncertainty calculated using a coverage factor of 2, providing a level of confidence of approximately 95%, unless stated otherwise in the comments section of this report.

Results reported for samples tested under test methods with codes starting with ARS-SOP, radionuclide or gross radioactivity concentrations are expressed in becquerel (Bq) per unit of mass or volume or per wipe as stated on the report. Becquerel is the SI unit for activity and equals one nuclear transformation per second.
Note that in terms of units of radioactivity:

a. 1 Bq is equivalent to 27 pCi
b. 37 MBq is equivalent to 1 mCi

For results reported for samples tested under test methods with codes starting with ARS-SOP, less than (<) values indicate the detection limit for each radionuclide or parameter for the measurement system used. The respective detection limits have been calculated in accordance with ISO 11929.

The QC and MU criteria are subject to internal review according to the SGS QAQC plan and may be provided on request or alternatively can be found here: www.sgs.com.au/en-gb/environment-health-and-safety.

NEW ZEALAND INSTITUTE FOR
Minerals to Materials Research
Te Kahuōpapa

NZIMMR
100 Mackay Street
Greymouth 7805
New Zealand

Brad Scott

Email: brad.scott@nzimmr.co.nz
Web: http://www.nzimmr.co.nz

January 16, 2024

To whom it may concern,

The purpose of this letter is to address the chain of custody of drill samples from Tiga's drilling campaign on the Coates south property managed by RSC Geologists between March and August 2022. This property is now the subject of an application of resource consent

Further to this, this letter also addresses samples collected, combined and processed at NZIMMR facilities to create a ROM, HMC, tailings and slimes sample for radiation sampling.

Tiga Drilling Campaign March to August 2022

1 Following logging and labelling of samples on site by RSC geologists. Samples were regularly delivered to NZIMMR labs in Dunollie.

2 Samples were then individually dried, crushed and had the plus 2mm fraction removed then split into three samples.

3 To create the 1.4 tonne bulk sample for further processing by IHC, RSC geologists selected the samples and then gave NZIMMR a list of the samples to be compile into the bulk sample.

4 One of the three splits from each sample was then used in the bulk composite sample. The remaining two splits were then stored at Tiga's storage facility in Greymouth.

5 Once all the samples had been compiled this bulk sample was shipped to IHC in Australia.

Radiation Sample February 2023

6 NZIMMR obtained a 188 kg unprocessed mineral sand sample from TiGa's resource consent area. This sample was an amalgamation of 111 samples from 35 drill holes from recent onsite resource drilling completed during 2022.

7 The sample was made up from the remaining samples in Tiga's Greymouth storage facility from list of samples provided by Tiga.

8 The attached spreadsheet shows the samples and intervals from each sample which were used to create the 188 kg of unprocessed mineral sand and the attached map shows the location of these sample within the deposit.

9 We separated the lighter minerals from the heavy minerals to produce a heavy mineral concentrate (**HMC**).

10 The Sample was processed in a manner similar to the standard commercial manner of producing a heavy mineral concentrate from unprocessed mineral sands, specifically:

(a) Drying the unprocessed mineral sand in a commercial dryer;

(b) Sieving the unprocessed mineral sand to remove oversized materials to produce sub 1.8 mm sand;

(c) Feeding the sub 1.8 mm sand through a water spiral to separate the heavy minerals and lighter minerals to produce a HMC; and

(d) Draining and drying the HMC, Tails and Slimes.

11 Then a small representative sample (500 gram) of the HMC, Tails, Slimes and ROM were then couriered by a commercial courier company to ESR for natural occurring radionucleotide testing.

Yours truly,

C.B Scott.

Brad Scott

Technical Services Coordinator

New Zealand Institute for Minerals to Materials Research Ltd.

Science for Communities
He Pūtaiao, He Tāngata

TEST REPORT

Test report number:	TR23-263	**Report date:**	8/05/2023
Client name:	NZIMMR	**Order number:**	N/A
Client's address:	100 MacKay Street, Greymouth 7805		
Samples submitted by:	N/A	**Date received:**	29/03/2023
Samples analysed by:	Vicky Gao	**Analysis start date:**	29/03/2023
Customer supplied description:	Heavy mineral sands		
Sample received as:	Sand samples		
Analyses requested:	NORMs and any man-made gamma emitters if found present		
Analytical methods:	Gamma Spectrometry		

Concentration: If the measured value is above background at a level of confidence of 95%, then the concentration of the radionuclide is reported. The reported uncertainty is based on the combined standard uncertainty (u_c) multiplied by a coverage factor (k) = 2 (providing a level of confidence of 95%) as described by International Organization for Standardization, Guide to the expression of uncertainty in measurement, ISO, Geneva (1995).

Minimal Detectable Concentration: Reporting of a 'less than' result means that the measured value was consistent with a background measurement. The minimal detectable concentration with a level of confidence of 95% for both errors of the first and second kind is calculated according to ISO standard 11929 "Determination of the characteristic limits (decision threshold, detection limit and limits of confidence interval) for measurements of ionizing radiation – Fundamentals and application".

Traceability: Traceability to appropriate national or international standards is maintained. Details are available on request.

Quality Statement: The Environmental Laboratory has been accredited by International Accreditation New Zealand to ISO 17025. Test methods used in determining results for this report do not fall within the scope of accreditation, however.

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Results

Sample number		23-0944	
Client sample code		2339 Tails	
	Radionuclide	**Activity (Bq/kg)**	**Uncertainty (Bq/kg)**
Uranium-238 Decay Chain	Bismuth-214	29.6	2.8
	Lead-214	32.1	2.8
	Thorium-234	31.8	4.8
Thorium-232 Decay Chain	Lead-212	60.0	5.1
	Radium-224	57.5	7.9
	Actinium-228	53.7	6.1
Uranium-235 Decay Chain	Thorium-227	< 2.5	N/A
	Uranium-235	1.44	0.86
Other Naturally Occurring Radionuclides	Potassium-40	417	39

Additional Information

Based on above results we estimate all three naturally occurring decay chains are present and in radioactive equilibrium.

Results relate only to the samples as received.

Validity of results is based on true and correct customer supplied description.

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Levi Bourke, Key Technical Person

Date: 8/05/2023

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TEST REPORT

Test report number:	TR23-298	**Report date:**	8/05/2023
Client name:	NZIMMR	**Order number:**	N/A
Client's address:	100 MacKay Street, Greymouth 7805		
Samples submitted by:	N/A	**Date received:**	29/03/2023
Samples analysed by:	Vicky Gao	**Analysis start date:**	29/03/2023
Customer supplied description:	Heavy mineral sands		
Sample received as:	Sand samples		
Analyses requested:	NORMs and any man-made gamma emitters if found present		
Analytical methods:	Gamma Spectrometry		

Concentration: If the measured value is above background at a level of confidence of 95%, then the concentration of the radionuclide is reported. The reported uncertainty is based on the combined standard uncertainty (u_c) multiplied by a coverage factor (k) = 2 (providing a level of confidence of 95%) as described by International Organization for Standardization, Guide to the expression of uncertainty in measurement, ISO, Geneva (1995).

Minimal Detectable Concentration: Reporting of a 'less than' result means that the measured value was consistent with a background measurement. The minimal detectable concentration with a level of confidence of 95% for both errors of the first and second kind is calculated according to ISO standard 11929 "Determination of the characteristic limits (decision threshold, detection limit and limits of confidence interval) for measurements of ionizing radiation – Fundamentals and application".

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Results

Sample number		23-0945	
Client sample code		2339 ROM	
	Radionuclide	**Activity (Bq/kg)**	**Uncertainty (Bq/kg)**
Uranium-238 Decay Chain	Bismuth-214	64.5	5.4
	Lead-214	71.9	5.9
	Thorium-234	75.5	9.0
Thorium-232 Decay Chain	Lead-212	154	13
	Radium-224	160	17
	Actinium-228	148	15
Uranium-235 Decay Chain	Thorium-227	< 3.9	N/A
	Uranium-235	4.5	1.2
Other Naturally Occurring Radionuclides	Potassium-40	432	40

Additional Information

Based on above results we estimate all three naturally occurring decay chains are present and in radioactive equilibrium.

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TEST REPORT

Test report number:	TR23-299	**Report date:**	8/05/2023
Client name:	NZIMMR	**Order number:**	N/A
Client's address:	100 MacKay Street, Greymouth 7805		
Samples submitted by:	N/A	**Date received:**	29/03/2023
Samples analysed by:	Vicky Gao	**Analysis start date:**	29/03/2023
Customer supplied description:	Heavy mineral sands		
Sample received as:	Sand samples		
Analyses requested:	NORMs and any man-made gamma emitters if found present		
Analytical methods:	Gamma Spectrometry		

Concentration: If the measured value is above background at a level of confidence of 95%, then the concentration of the radionuclide is reported. The reported uncertainty is based on the combined standard uncertainty (u_c) multiplied by a coverage factor (k) = 2 (providing a level of confidence of 95%) as described by International Organization for Standardization, Guide to the expression of uncertainty in measurement, ISO, Geneva (1995).

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Results

Sample number		23-0946	
Client sample code		2339 Slimes	
	Radionuclide	**Activity (Bq/kg)**	**Uncertainty (Bq/kg)**
Uranium-238 Decay Chain	Bismuth-214	59.6	7.7
	Lead-214	67.8	8.5
	Thorium-234	69	13
Thorium-232 Decay Chain	Lead-212	92	12
	Radium-224	88	23
	Actinium-228	96	14
Uranium-235 Decay Chain	Thorium-227	< 8.4	N/A
	Uranium-235	< 4.3	N/A
Other Naturally Occurring Radionuclides	Potassium-40	1010	130

Additional Information

Based on above results we estimate all three naturally occurring decay chains are present and in radioactive equilibrium.

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TEST REPORT

Test report number:	TR23-300	**Report date:**	8/05/2023
Client name:	NZIMMR	**Order number:**	N/A
Client's address:	100 MacKay Street, Greymouth 7805		
Samples submitted by:	N/A	**Date received:**	29/03/2023
Samples analysed by:	Vicky Gao	**Analysis start date:**	29/03/2023
Customer supplied description:	Heavy mineral sands		
Sample received as:	Sand samples		
Analyses requested:	NORMs and any man-made gamma emitters if found present		
Analytical methods:	Gamma Spectrometry		

Concentration: If the measured value is above background at a level of confidence of 95%, then the concentration of the radionuclide is reported. The reported uncertainty is based on the combined standard uncertainty (u_c) multiplied by a coverage factor (k) = 2 (providing a level of confidence of 95%) as described by International Organization for Standardization, Guide to the expression of uncertainty in measurement, ISO, Geneva (1995).

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Results

Sample number		23-0947	
Client sample code		Concentrate (HMC)	
	Radionuclide	**Activity (Bq/kg)**	**Uncertainty (Bq/kg)**
Uranium-238 Decay Chain	Bismuth-214	280	34
	Lead-214	304	37
	Thorium-234	258	64
Thorium-232 Decay Chain	Lead-212	471	58
	Radium-224	492	69
	Actinium-228	463	66
Uranium-235 Decay Chain	Thorium-227	17.4	4.4
	Uranium-235	17.2	4.0
Other Naturally Occurring Radionuclides	Potassium-40	101	15

Additional Information

Based on above results we estimate all three naturally occurring decay chains are present and in radioactive equilibrium.

Results relate only to the samples as received.

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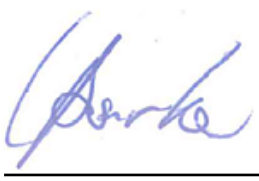

Levi Bourke, Key Technical Person

Date: 8/05/2023

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