Recommendation

Date:	27 June 2022
To:	Susan Baas, National Manager Petroleum and Minerals
From:	Tim Journeaux, Principal Minerals Advisor
Application:	Minerals Mining Permit 60785, Subsequent Permit Application

APPLICATION SUMMARY

Permit number	Minerals Mining Permit 60785
Date received	19 June 2021
Permit holder / Operator	TIGA Minerals and Metals Limited (100%) (Operator)
Minerals	All metallic minerals (except uranium) plus garnet and zircon
Operation type	Opencast
Duration	20 years
Permit location	West Coast
Permit area	800.27 ha
Sensitive Areas	The permit area does not overlie any Schedule 4 land, World Heritage sites or any other sensitive areas.
Tier Status	Tier 1
Royalty basis	2013
Subsequent to	Minerals Exploration Permit 51803
Recommendation	Grant
Technical review	Aidan Allan – Senior Minerals Advisor Victoria Wilson – Minerals Advisor Shaun Hayton – Minerals Advisor Laura Brown – Minerals Advisor Stephanie Junior – Minerals Advisor

EXECUTIVE SUMMARY

1. TIGA Minerals and Metals Limited have applied for a subsequent mining permit, MP 60785.01, to mine heavy mineral sands at Barrytown to the north of Greymouth. These sands contain a number of economic minerals with the key minerals being ilmenite (a source of titanium), garnet, zircon, and gold. There is potential for other economic minerals to also be recovered downstream of the mining and primary processing process.
2. The project would initially involve the shallow surface mining of relict heavy mineral sand beach deposits (strandlines) proximal to the current beach. The heavy mineral sand would be pumped as a slurry to a processing plant that would employ the density characteristics of the sands to separate the heavy fraction containing the economic minerals into a heavy sand concentrate. The rejected sand would be sent back to the mining front for combination with background sand to backfill the mining void as it progressed.

3. The heavy sand concentrate would be transported to a port (most likely Westport) for shipping to a number of markets (most likely China). Gold would be separated from the heavy sand at the initial processing point for sale separately.

4. There are options for a mineral separation plant to be incorporated into the process after the project is established to further separate the heavy sand concentrate into higher value product streams, ilmenite, garnet, and zircon.

5. The resource currently comprises s 9(2)(b)(Mt of ilmenite reported to a standard that would meet the requirements of the JORC 2012 code. The work programme proposed for this permit includes plans to bring at least the garnet and zircon up to the same level. For most scenarios this provides for a mine life of around 13 years with significant upside still available from the remaining exploration permit.

6. The applicant has provided a financial model that outlines seven options for mine development. All of the scenarios demonstrate a positive NPV and acceptable IRR.

7. Officials are recommending this application be granted.

ASSESSMENT OF APPLICATION

Background (sections 23A, 29A and Parts 2, 3, 4, 5, 8, 9 & 10)

8. This is an application for a subsequent permit made pursuant to section 32 of the Crown Minerals Act 1991 (the **Act**). The following assessment considers the matters set out in the Act and Minerals Programme for Minerals (Excluding Petroleum) 2013 (the **Minerals Programme**) that the Minister should consider in evaluating an application for a subsequent minerals mining permit (in particular, Parts 2, 3, 4, 5 and 10 of the Minerals Programme). The Minister is not limited to these matters in determining the application.

9. TIGA Minerals and Metals Limited (the **Applicant, TIGA**), formerly Barrytown JV Limited (NZBN:9429042010715), has submitted a subsequent mining permit application, MP 60785.01, over an 800.27 hectare portion of EP 51803, Barrytown Flats, north of Greymouth, West Coast, as shown in Figure 1.

10. Ownership of the underlying exploration permit, EP 51803, as well as a change of operator, was transferred to TIGA in November 2018 from Alloy Resources Limited.

11. The initial application area of 882.33 hectares included some Schedule 4 land. These Schedule 4 areas, namely overlaps with the Paparoa National Park, Punakaiki Marine Reserve and Te Ara Taiko Nature Reserve were removed from the application area and final permit map.

12. The existing exploration permit EP 51803 is for all metallic minerals (other than Uranium) as well as zircon & garnet. The minerals applied for under MP 60785.01 are for the same mineral suite.

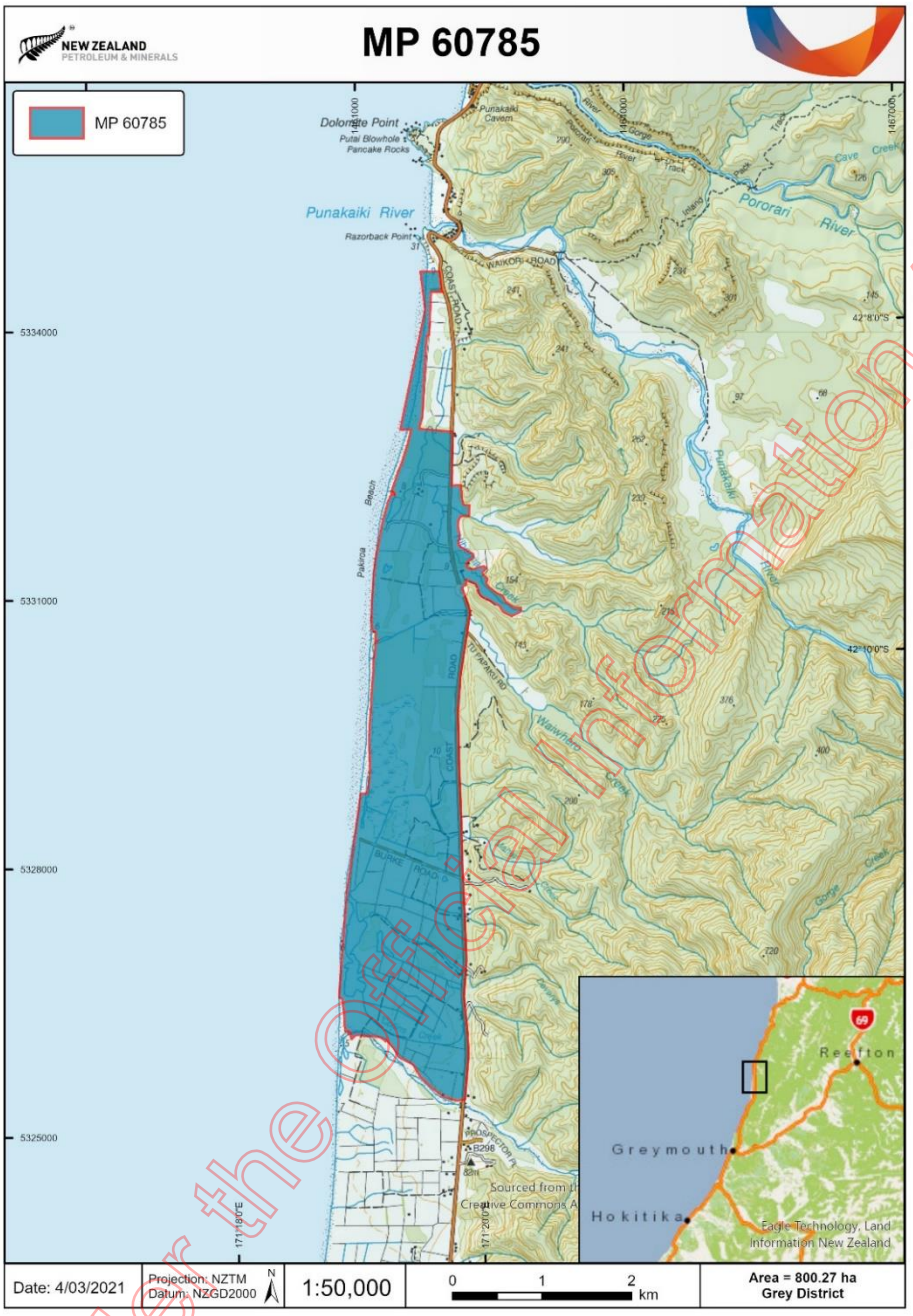

*Figure 1. **Location of mining permit application MP 60785.01.***

13. TIGA has two directors, David Peter Straface and Philip Thick with the principal shareholders being Barrytown Resources Limited (42.48%) and Anniss Trading Company (16.69%; also a significant shareholder of Barrytown Resources Limited) with 23 small holdings (<6%).

14. The immediate aim of MP 60785.01 is to mine the resource and produce a Heavy Mineral Concentrate (**HMC**) onsite with gold produced as a by-product. The HMC will contain the permitted minerals amongst other discrete mineral grains.

15. The precise nature of the HMC will depend upon the processing pathway and parameters. In the application, the applicant recognises that the products will change with a raw HMC produced during the first few years of mining and separate ilmenite, garnet and zircon concentrates being produced from a mineral separation plant (**MSP**) after year 5. It should

be recognised that the products would be further upgraded, or additional product streams produced by the inclusion of additional processing steps.

16. The applicant has no other past or current permit interests in New Zealand other than the underlying exploration permit.

Availability of land area and minerals (section 28A, clauses 1.6, 3.1, 3.2, 4.2, 5.3(8), 5.3(9), 6.1(4), 6.4, 6.10 and Schedule 3)

17. The applicant applied to mine ilmenite, garnet, zircon, and gold . At least initially this will be as contained in an HMC. In the application, the applicant states an intention to introduce further processing steps to upgrade the HMC into higher value products.
18. Officials had concerns with limiting the minerals on the mining permit to ilmenite, garnet, zircon, and gold given the potential for other economic minerals / elements to be contained in a HMC. The applicant agreed on 22/12/2021 for the minerals on the mining permit to align with the underlying exploration permit, that is, all metallic minerals (except uranium) plus garnet and zircon.
19. A new LMS was provided for the area of the mining permit showing the majority of the area contains Crown owned minerals. Two land titles and some roads contain privately owned minerals. The area of Crown owned, and privately owned minerals is shown in Figure 2.
20. MP 60785.01 is a subsequent permit to EP 51803 so is contained within the boundaries of and overlaps part of EP 51803 in accordance with Section 32 of the Act.
21. MP 60785.01 has a small overlap with MP 41913 for which consent has been given.
22. MP 60785.01 does overlap some land administered by the Department of Conservation (DoC). Overlaps with Schedule 4 land in the initial application area have been removed, so that all current overlaps with land administered by DoC are for non-schedule 4 land.
23. The land and minerals have been assessed in accordance with the Act and Minerals Programme and are available for permitting.

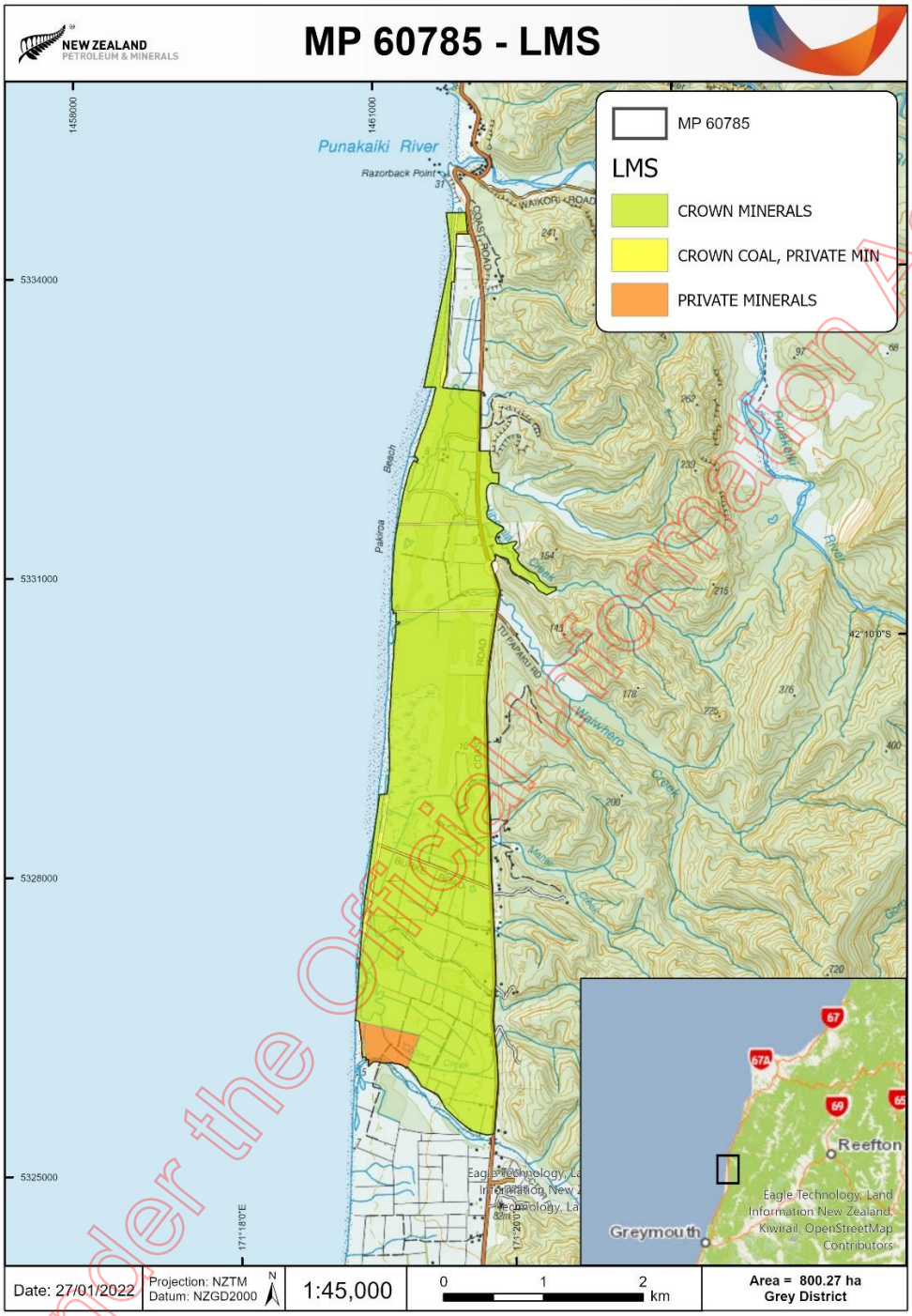

Figure 2.Mining permit application area showing mineral ownership.

Permit area (clauses 4.6, 10.3 and 10.4)

24. In line with clause 4.6 of the Minerals Programme, the proposed permit area covers a single unbroken area of 800.27 ha, shown above in Figure 1.

25. As MP 60785.01 is a Tier 1 application, Clause 10.4 of the Minerals Programme is not applicable.

26. Clause 10.3 sets out the matters the Minister will ordinarily consider when considering whether the land to which a permit application relates is appropriate. These matters are discussed below.

The delineation of the mineral resource (clause 10.3(1)(a))

27. Clause 10.3(1)(a) of the Minerals Programme states that the Minister, when considering whether the land to a permit application relates is appropriate, will ordinarily consider the delineation of the mineral resource.

28. The current EP 51803 has a long history of activities that are tabulated in Table 1. This activity builds upon the previous work since the mid 1960's by numerous companies including Carpentaria, Fletcher Challenge and Westland Ilmenite, aimed at commercialising the significant ilmenite resource that is present with the Barrytown Flats.

29. The cumulative effect of this work means that there is a significant amount of drilling and analytical data, of variable quality, available to support resource estimations for the ilmenite. The most recent estimate for ilmenite was undertaken in 2018 with the classification and reporting was undertaken in accordance to JORC Code (2012). This study included Exploration Target definition of the associated garnet, zircon, and gold.

30. The applicant states that infill drilling of the initial mining area (115 hectare Coates South block) is planned and is designed to upgrade the ilmenite Mineral Resource and establish a garnet, zircon, and gold Mineral Resource over that area.

31. The details of the resource estimation are discussed further in section "*Estimates of mineable mineral resources and inferred mineral resources*" below.

32. Based on the information contained in the application, officials are satisfied that the resource has been sufficiently delineated, for the primary product ilmenite, in line with clause 10.3(1)(a) of the minerals programme.

33. The HMC will contain other significant minerals of value that officials regard as a by-product to the primary ilmenite with the applicant continuing to obtain data to improve the understanding of these minerals.

Company	Period	Mineral	Drillholes	Drill Type	Other
Westland Titanium Ltd	2010–2013	Gold	105	Aircore & hand auger	
BJV	2015	Gold, Ilmenite	31	Aircore	
BJV	2016	Garnet, Ilmenite	154	Aircore	
BJV	2017	Ilmenite, Garnet, Zircon, Gold			Metallurgical testwork
BJV	2018				Resource Estimate, Pre-feasibility Study
BJV	2019-2020				Internal mining studies

Table 1. Summary of work undertaken completed under EP 51803. Table supplied by the applicant.

The proposed work programme and other relevant matters set out in clause 10.2 (clause 10.3(1)(b))

34. Clause 10.3(1)(b) of the Minerals Programme states that the Minister, when considering whether the land to which a permit application relates is appropriate, will ordinarily consider the proposed work programme, and other relevant matters set out in clause 10.2 of the Minerals Programme.

35. With consideration to the work programme agreed to below, officials are satisfied the proposed work programme is suitable in relation to the permit area, in line with clause 10.3(1)(b) of the Minerals Programme.

The extent to which the area of land under application covers the delineated mineral resource (clause 10.3(1)(c))

36. Clause 10.3(1)(c) of the Minerals Programme states the Minister, when considering whether the land to which a permit application relates is appropriate, will ordinarily consider the extent to which the area of land under application covers the delineated mineral resource

37. MP 60785.01 covers all of the non-schedule 4 land within the northern part of EP 51803 across Barrytown Flats. Figure 3(a) shows MP 60785.01 in relation to EP 51803 while Figure 3(b) shows the Schedule 4 overlaps that were removed from the permit application. According to the applicant this area contains s 9(2)(b)(Mt of the s 9(2)(b)(Mt ilmenite resource estimate undertaken in 2018 for the whole of EP 51803. The application area includes almost all the Indicated and Inferred resources.

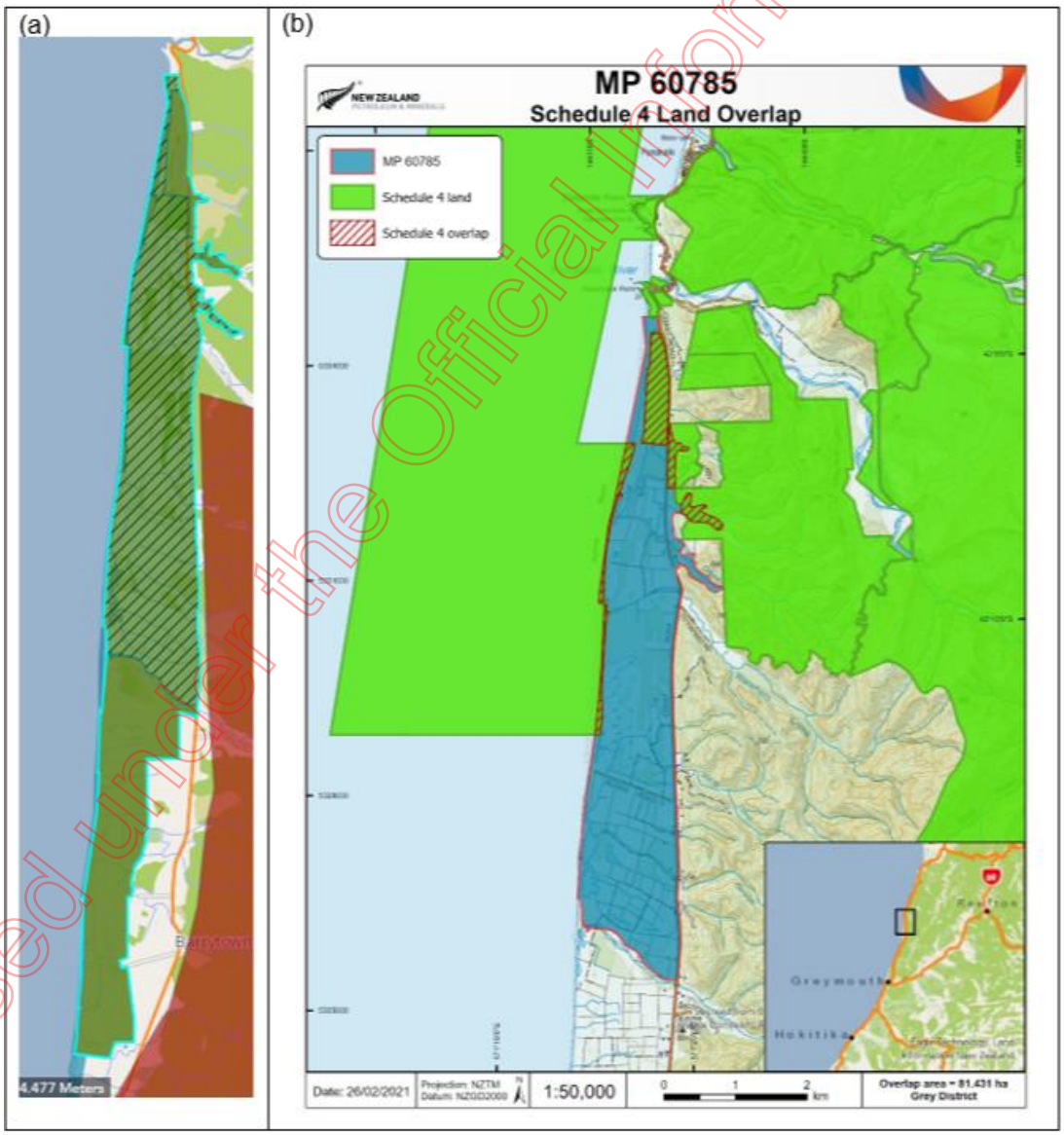

Figure 3. a) relationship between MP 60785.01 – hatched area, and the original permit EP 51803 – dark green and b) location of Schedule 4 land that was removed from MP 60785.01.

38. Officials are satisfied that the area of land under application covers the delineated resource to an adequate extent, in line with clause 10.3(1)(c) of the Minerals Programme.

Duration (section 35(7) and clause 10.6)

39. Section 35(7) enables the Minister to grant a mining permit for up to 40 years.

40. The applicant has applied for a duration of 20 years. The applicant's preliminary mine and process scheduling indicates a life-of-mine (LOM) of 13 years.

41. Officials consider that the proposed mining operations should take less than 40 years and having considered the matters set out in clause 10.6(2) of the Minerals Programme, consider that a duration of 20 years is an appropriate timeframe for the mining operations.

Permit tier (sections 2B and 2C, Schedule 5 and clause 1.7)

42. After a ramp up period of one year the mine plan shows the mining of greater than 1 Mt per annum of metallic mineral ore.

43. This is assessed to be a Tier 1 permit by virtue of section 2B(1)(d) of the Act as this is a mining permit for a mineral specified in Schedule 5 of the Act, as production is expected to exceed the thresholds in Schedule 5 of the Act, based on the resources available and the applicants mine scheduling.

The Work Programme

44. The applicant has proposed a staged work programme aimed at completion of a feasibility study and improved delineation for the secondary minerals, garnet, zircon, and gold.

45. Clause 10.12(1) of the Minerals Programme allows for the consideration of a work programme set out in development stages. Under clause 10.12(2) of the Minerals Programme the applicant is required to demonstrate that the staged development will not unreasonably prejudice the resource's economic recovery.

46. Officials are satisfied that the agreed staged work programme allows for increased confidence in the resources, particularly the accessory minerals garnet, zircon and gold and the completion of a feasibility study and mine plan in parallel with development of the mine infrastructure and plant. Officials do not consider that this will unreasonably delay the commencement of mining and production of HMC.

47. The applicants proposed work programme for the permit is shown in Table 2:

Stage	Months	Obligation
1a	12	A programme of infill resource drilling within the Coats blocks for a minimum of 350 holes;
1b	12	Undertake topographical survey;
1c	12	collect geo-mechanical, metallurgical, geochemical, and environmental data appropriate for informing a Feasibility Study, optimised mine development and safe mine operation;
1d	12	Update geological and resource models
1e	12	update the ilmenite mineral resource for the Coates blocks with the minimum objective of Indicated classification as defined under a recognised resource classification code as per Schedule 1 of the Minerals Programme;
1f	12	complete a mineral resource estimate for garnet, zircon and/or gold within the Coates blocks with the minimum objective of an Inferred

Stage	Months	Obligation
		classification as defined under a recognised resource classification code as per Schedule 1 of the Minerals Programme; and
1g	12	provide the chief executive with a report detailing all work completed during this stage of the work programme, including QA/QC information and data sufficient to demonstrate levels of accuracy and precision to be submitted to the chief executive in accordance with the regulations.
2a	24	complete a Feasibility Study for the Coates South block with detailed extraction planning;
2b	24	complete a Mineral Reserve estimate for Coates South as defined under a recognised resource classification code as per Schedule 1 of the Minerals Programme;
2c	24	undertake a programme of further resource drilling to increase confidence in the resources outside of the initial mining area;
2d	24	complete construction of processing plant and other mine infrastructure to enable processing of first ore; and
2e	24	provide the chief executive with a report detailing all work completed during this stage of the work programme, including QA/QC information and data sufficient to demonstrate levels of accuracy and precision to be submitted to the chief executive in accordance with the regulations
3a	36	commence mining at Coates South at a minimum rate of 1 Mt per annum for the production of heavy mineral concentrate at a minimum rate of 200 kt per annum;
3b	36	unless otherwise approved in the writing by the chief executive, the extraction of sand for the recovery of HMC and gold using earthmoving machinery as necessary; and
3c	36	undertake ongoing rehabilitation in accordance with good industry practice;

Table 2. Minimum work programme proposed by the applicant

48. Based on the applicant's detailed work programme plans, officials proposed the following minimum work programme requirements for the permit:

    1) Within 24 months of the commencement date of the permit, the permit holder shall (to the satisfaction of the chief executive):
        (a) complete a programme of drilling for a minimum of 350 holes;
        (b) complete a programme of geomechanical, metallurgical, geochemical, and environmental data collection appropriate for informing a Feasibility Study, optimised mine development and safe mine operation;
        (c) conduct metallurgical bulk sampling & analysis to support the design of the HMC production units, determination of product specifications and gold mass-balancing;
        (d) update resource estimates for ilmenite, garnet, zircon, and gold, with the objective of elevation of a greater proportion of the ilmenite to an Indicated resource classification and classifying garnet, zircon, and gold to an Inferred resource classification;
        (e) complete a Mineral Reserve estimate in accordance with a recognised resource classification code as per Schedule 1 of the Minerals Programme (Minerals Excluding Petroleum) 2013.

(f) complete a feasibility study and detailed mine plan including a mine schedule; and

(g) provide the chief executive with a report detailing all work completed during this stage and the results of that work, including submission of digital data in conjunction with QAQC information and data sufficient to demonstrate levels of accuracy and precision.

2) Within 36 months of the commencement date of the permit, the permit holder shall (to the satisfaction of the chief executive):

(a) commence mining;

(b) complete construction of a processing plant and associated mine infrastructure sufficient for processing first ore production;

(c) undertake a further programme of resource drilling to increase resource confidence outside the initial mining area; and

(d) provide the chief executive with a report detailing all work completed during this stage and the results of that work, including submission of digital data in conjunction with QAQC information and data sufficient to demonstrate levels of accuracy and precision.

3) The permit holder shall, to the satisfaction of the chief executive, carry out the following work programme:

(a) the stripping of topsoil and overburden and stockpiling, backfilling or other disposal as appropriate using earthmoving machinery as necessary;

(b) from the commencement of mining date specified in condition 2(a), undertake the mining of sand for the recovery of heavy mineral sands at the minimum rate of 1Mt per year (unless otherwise approved in writing by the chief executive) using earthmoving equipment as required;

(c) conduct ongoing resource and mine optimisation activities;

(d) inform the Chief Executive of any changes in the saleable product(s) produced, including compositional details prior to those changes being made; and

(e) undertake rehabilitation as appropriate.

4) This modified work programme was sent to the applicant on 20 May 2022. The applicant suggested alteration to the work programme acceptable to officials and the work programme was accepted on 31 May 2022.

The geology and occurrences of minerals in the permit area and the applicant's knowledge *(clauses 10.2(1)(a) and (b))*

49. Rapid tectonic uplift along the Alpine Fault combined with rapid erosion in a high precipitation environment has created a series of a series of Quaternary terraces between the coast and the Paparoa Ranges with fluvial, shallow marine, lagoon deposits and aeolian dune deposits overlying Tertiary marine deposits.

50. The marine sand deposits include variable concentrations of heavy minerals, including ilmenite, garnet, zircon, and gold preferentially concentrated into strandlines due to lateral drift and wave action in nearshore high energy environments.

51. In the application area contains variably indurated black sands thought to originate from the Alpine Schist. Up to 12 strandlines are identified in the Barrytown area. The westernmost strandlines form en echelon ridges at an angle to the current coastline with the more eastern strandlines forming a series of long parallel ridges. This is demonstrated in Figure 4.

52. The applicant has been involved in the exploration for heavy mineral sands along this section of the West Coast's coastline for several years. Officials are satisfied the applicant has suitable relevant knowledge of the geology and minerals within the permit area.

Figure 4. HMC strandlines within the application area

Estimates of mineable mineral resources and inferred mineral resources *(clauses 10.1(3)(a), 10.2(1)(c) and (d), 10.2(2))*

53. In 2018, TIGA commissioned s 9(2)(a) and H&S Consultants Pty Ltd (H&SC) to prepare a Mineral Resource estimate for the Barrytown deposit. The Mineral Resource was classified and reported in accordance with the JORC Code (2012). The report (MR 5604) estimated an Indicated and Inferred Mineral Resource for ilmenite over most of EP 51803 and quantified Exploration Targets in respect of garnet,

zircon, and gold (since there has been insufficient exploration completed in respect of those minerals to estimate a Mineral Resource).

54. The applicant has used the above study to determine the ilmenite resources within the application area, shown in Table 3. The resource in Table 3 represents the application area prior to the schedule 4 land being excluded. Officials are satisfied that the difference will not be material to the application.

s 9(2)(b)(ii)

Table 3. Reported ilmenite mineral resources within MP 60785.01 by classification using 4% ilmenite cut-off grade.

55. In the same study, an Exploration Target was estimated, which defined the potential zircon and garnet mineralisation based upon the upper and lower ilmenite:zircon ratio (s 9(2)(b)(ii)) and the ilmenite:garnet ratio (s 9(2)(b)(ii)) for the same mineralised sand zone as was used for the ilmenite. The mineralised tonnage ranges for garnet and zircon, shown in Table 4, were determined by applying the minimum and maximum ratios against the ilmenite resource estimate as the maximum and using an arbitrary 50% of that to represent the minimum.

s 9(2)(b)(ii)

Table 4. Exploration Target tonnage ranges for zircon & garnet within MP 60785.01

56. The applicant states that the potential quantity and grade of the gold Exploration Target are conceptual in nature. The minimum and maximum gold potential is in reference to material in the minimum and maximum sand volume. The conceptual gold range for the ilmenite resource provided is shown in Table 5.

s 9(2)(b)(ii)

Table 5. Exploration Target for gold within MP 60785.01 at a 25 mg/m^3 cut-off grade.

57. Officials recognise that garnet, zircon, and gold are by-product minerals and that reaching a classification status under JORC may be unachievable, but the ongoing drilling and analysis will mean that the confidence in the resource of these minerals will improve over time.

58. The applicant states that the planned drilling, in Stage 1 of the work programme, will be sufficient to bring some garnet, zircon and possibly gold up to a classified resource in accordance with the JORC 2012 code for those areas drilled out.

59. Officials are satisfied that the resource estimates presented with the application, both classified resource and exploration meets the reporting guidelines for JORC 2012 for the ilmenite resources and exploration results for garnet, zircon, and gold. Officials are also satisfied that the continuity of mineralisation to the areas of the application not containing classified mineral resources have been demonstrated.

Applicant's mining feasibility studies and project economics *(clauses 10.2(1)(e) and (f))*

60. TIGA has previously completed an internal scoping study and a pre-feasibility study (completed in November 2018) to assess the economic viability of the mineral resources estimated to date. A full feasibility study would be completed in the first stage of the proposed work programme (within 24 months of the commencement date of the mining permit). A LOM of 13 years has been assessed on the basis of the current estimated resources.

61. The studies completed to date have involved assessment of the physical and technical requirements of mining the heavy mineral sands and processing into a saleable product and the economic costs and returns of the mining, processing, and marketing.

Resource Extraction

62. TIGA is planning a staged approach to mining the sand resources. The intention is for mining to commence in the 'Coates South block', which occurs in the southern portion of the permit area were access has been finalised and resource consents applied for, as shown in Figure 5.

63. The area resource consents have been applied for contains the estimated resources discussed in the section above, '*Estimates of mineable mineral resources and inferred mineral resources*'. The mining and economic viability of the project has been assessed on the basis of these resources.

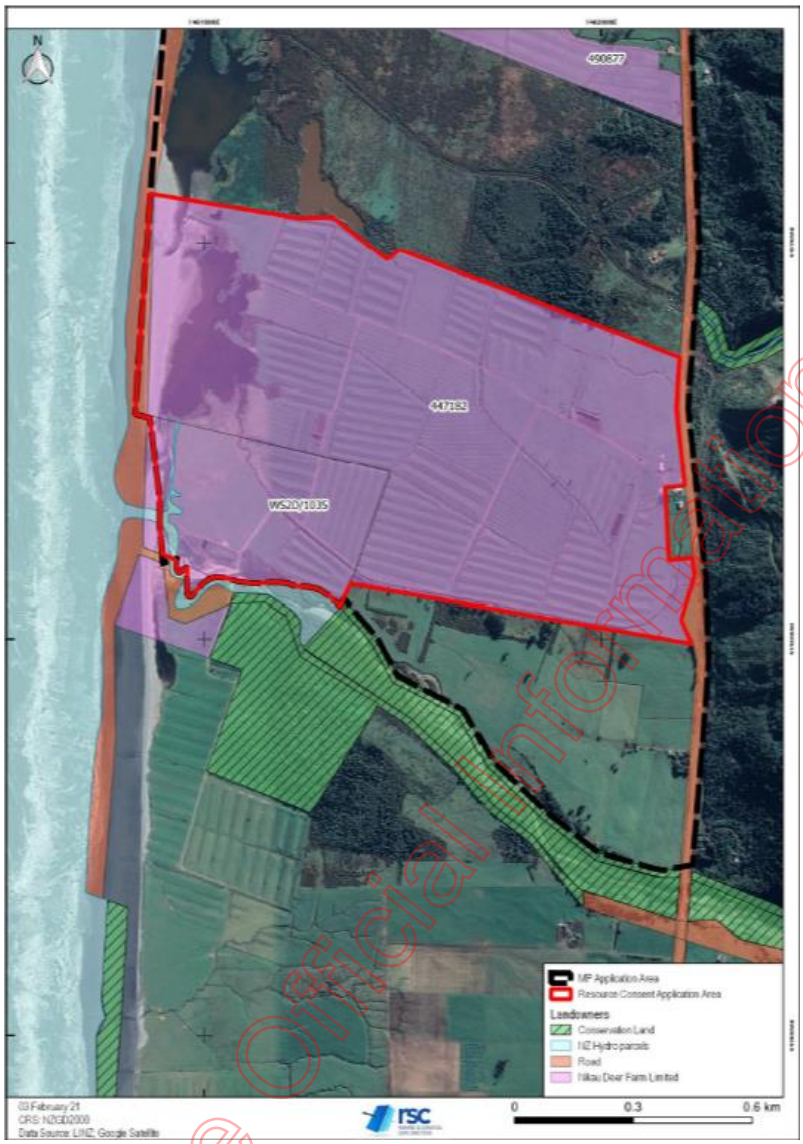

Figure 5. Resource consent application area within MP 60785.

64. A sequential series of activities will be used to uncover the mineralised material, extract it, and send for processing and then rehabilitate the mined area using excavators and trucks for material extraction and movement:

    (a) Remove up to 0.5 m of topsoil and stockpile for later rehabilitation;

    (b) Extract the unconsolidated overburden over the heavy mineral sand strandlines and stockpile for incorporation with process tails for later placement into the mining void;

    (c) Mine the heavy mineral sand strandlines and deposit into a mining field unit (MFU), a skid mounted unit similar to a land based gold screen. The MFU will be used for preliminary screening with material being fed through a grizzly to remove oversize with finer material washed through a trommel;

    (d) Material from the MFU is pumped as a slurry to the processing plant for processing through a spiral plant. Reject tails material will be pumped back to the mining front/slot for backfill;

    (e) The stockpiled overburden will be placed over the tails in the mining void and levelled and contoured;

(f) The topsoil will then be placed over the overburden, with further contouring, and then reseed back to pasture.

65. The plan is to mine in strips from west to east (upslope) to assist with controlling water and drainage.

66. The rationale behind the mine plan was to utilise, a proven methodology for alluvial mining on the West Coast, the relatively low initial capital and operating costs and allow for 'on demand' stripping, which improves stability and environmental impacts. It will also make use of the experienced local labour and locally available equipment.

Mineral Processing

67. The intention is to initially produce a HMC for export sale.

68. The basic process for producing the HMC is:

(a) Screened material pumped to the processing plant;

(b) Material passed through a multi-stage spiral processing plant with the heavy sand fraction separated using gravity;

(c) Lighter sand 'tails' pumped back to the mining area for backfilling the mining void; and

(d) The HMC is pumped to a stockpile area and passed through cyclones to remove moisture. The HMC is then stockpiled prior to loading onto trucks for transport to either rail or port terminals.

69. The gold recovery circuit will be contained within the wet concentrator plant. The conceptual design is for the HMC recovered from the spirals to be passed over either a Wilfrey or Gemini table to separate the fine gold and any nuggets from the HMC. Then the non- gold streams from the tables will then go through Knelson or Falcon concentrators to extract any residual gold. The extracted gold will then be sent to a gold smelter to produce doré. The final design of this circuit is subject to metallurgical test work which is planned for the first half of this year as part of the planned Definitive Feasibility Study

70. A preliminary schedule of mining, processing, and metal recovery for an increasing production model from 1^{+} Mt to 2^{+} Mt to 5^{+} Mt is shown for the current 13 year LOM is given in Table 6 and reflects one of the potential production profiles.

71. Previous workers have demonstrated the possibility for the HMC product to be further upgraded to higher value downstream products. TIGA commissioned further metallurgical testing that looked to isolate potential product streams using conventional separation processes.

72. The earlier work and the test work conducted by TIGA indicates it could be possible to produce higher value zircon, garnet and ilmenite concentrate streams using electrostatic separation and magnetic fractionation on the HMC material.

73. This possibility is covered in the work programme through ongoing resource and mine optimisation studies and the requirement to report to the Chief Executive any changes in the saleable product streams including compositional changes.

s 9(2)(b)(ii)

Table 6. Preliminary schedule of mining and processing (years are assumed)

Project Economics

74. Financial modelling has been based on the value of four key minerals contained in the HMS resource, ilmenite, garnet, zircon, and gold. There is potential for the recovery of other economic minerals from the resource.

75. Initial income would be derived from the sale of a low cost HMC FOB with the buyers of the HMC completing mineral separation to concentrate or refine the ilmenite, garnet, and zircon. Gold, extracted in the initial concentrating process would be sold separately. There are a number of potential markets for the HMC in Europe, North America, and China, with China being the most likely market.

76. A similar, but more advanced, mining operation is proposed north of this application, MP 60825, for effectively the same product. This reinforces the view that mining and processing these HMS resources is an economic prospect.

77. The ilmenite is the source of titanium dioxide (**TiO_2**), which has a variety of industrial uses in products such as paint, plastics, and paper. TIGA states in the application that test work on the Barrytown ilmenite shows a lower than industry average of deleterious elements such as chrome and vanadium making it a more premium product.

78. The TiO2 market is expected to expand over the next few years with a compound annual growth rate (**CAGR**) of 2% up to 2026.

79. Garnets can be used in a variety of industries, primarily related to abrasion activities. The global garnet market is expected to grow at a CAGR of 5.5% through to 2026. India and China form the largest markets but there are significant markets around the world. Part of the growth in demand is down to replacement of silica with garnets for sand blast cleaning with a growing understanding of the issues of silicosis. With an increasing concern around water quality globally the use of garnets in water filters is also driving demand.

80. Zircon products are resistant to corrosion and heat and used in a number of processes and products, from paper whitening to engines to ceramics. As for the TiO_2 the Barrytown zircon is reported to have low inclusions of deleterious elements including TiO_2 and ferric oxide making it a premium grade product. A CAGR in demand of over 5% is anticipated over the next few years.

81. The applicant provided updated in-house financial analyses and models during the evaluation (financial models). Seven scenarios have been modelled based on variation in production volumes and the possible addition of a mineral separation plant (**MSP**) for value added product streams. The scenarios are:

    (a) 1 Mtpa of ore throughput for first 4 years then 2.6Mtpa to end of mine life;

    (b) 1Mtpa of ore throughput for first 1 year then 2.6Mtpa to end of mine life+MSP;

    (c) 1Mtpa of ore throughput for first 4 years then 5Mtpa to end of mine life;

    (d) 1Mtpa of ore throughput end of mine life;

    (e) 0.5Mtpa of ore throughput for first 4 years then 2.6Mtpa to end of mine life+MSP;

    (f) 0.5Mtpa of ore throughput for first 4 years then 5.0Mtpa to end of mine life+MSP; and

    (g) 1Mtpa of ore throughput for resource consent area only.

82. The financial models allow for gold and zircon to be included as separate streams. The intention is to separate gold during the processing to sell as a separate product from the HMC as part of a gold streaming deal with a third party.

83. An application for Ministerial consent for a gold streaming dealing, 51803.13, was received on 2 February 2022. s 9(2)(b)(ii)

s 9(2)(b)(ii)

84. The gold delivery would be reduced by the amount of gold required to pay for the costs of converting the gold ore to gold bullion, all transport costs, all taxes, and all royalties. The application for this dealing has not yet been considered.

85. The financial studies drew on earlier studies and more recent pricing and cost information from contractors and service providers. The three earlier studies were:

    (a) MSP Engineering Barrytown mineral sands project feasibility study;

    (b) Westland Titanium scoping study report; and

    (c) Alloy scoping study report.

86. The analysis gives all assumptions made for physicals (grades, tonnes, and recovery), costs (capital and operating), commodity prices, taxes and royalties and exchange rates used with the analysis expressed in U.S. dollars.

87. The basis of the assumptions are also given in the financial model based on things such as accepted commodity prices, transport rates, New Zealand tax and royalty rates and results from various research projects, contractor rates and parameters taken from the pre-feasibility study. Officials are satisfied the assumptions made are reasonable and representative of what is likely to occur when mining and processing commences.

88. Capital costs (**CAPEX**) are shown as being distributed throughout the 13 year mine life (for scenarios 1 to 13) with more significant capital sums generally in years 1 and 4. The significant sums are shown against the year incurred, against the total estimated capital and the total capital required for each scenario in Table 7. The models show positive cashflows for years not requiring significant capital expenditure other than scenarios 5 and 6 (paragraph 81) where the cashflow becomes positive in year 5.

Scenario	Yr1 Capital (US$ M)	Yr4 Capital (US$ M)	Total Capital (US$ M)
1 Mtpa of ore throughput for first 4 years then 2.6Mtpa	s 9(2)(b)(ii)		
1Mtpa of ore throughput for first 1 year then 2.6Mtpa +MSP			
1Mtpa of ore throughput for first 4 years then 5Mtpa			
1Mtpa of ore throughput			
0.5Mtpa of ore throughput for first 4 years then 2.6Mtpa+MSP			
0.5Mtpa of ore throughput for first 4 years then 5.0Mtpa+MSP			
1Mtpa of ore throughput for resource consent area only.			

Table 7. Years of significant capital costs and total capital costs (Scenario 7 not shown)

89. Operating costs (**OPEX**) are also significant for the scenarios over the estimated 13 year mine life. These are shown in Table 8, in millions of US dollars, broken down into the key

[1] s 9(2)(b)(ii)

cost areas. An error in the spreadsheet did not allow for estimation of transport and shipping costs for scenario 4 (paragraph 81). This is a lower NPV option however, and officials are satisfied the costs will be similar in magnitude to scenario 5.

s 9(2)(b)(ii)

Table 8. Operating costs in millions of US$ by scenario (Scenario 7 not shown)

90. The OPEX costs tend to increase after year 4 or 5 for scenarios where the MSP is added.

91. The NPV, at a 10% discount rate, and IRR results from each scenario to end of mine life, with gold streaming, are shown in Table 8.

Scenario	NPV (USD millions)	IRR (%)
1 Mtpa of ore throughput for first 4 years then 2.6Mtpa	s 9(2)(b)(ii)	
1Mtpa of ore throughput for first 1 years then 2.6Mtpa+MSP		
1Mtpa of ore throughput for first 4 years then 5Mtpa		
1Mtpa of ore throughput		
0.5Mtpa of ore throughput for first 4 years then 2.6Mtpa+MSP		
0.5Mtpa of ore throughput for first 4 years then 5.0Mtpa+MSP		
1Mtpa of ore throughput for resource consent area only		

Table 9. NPV and IRR for each scenario (10% discount rate)

92. The NPV is positive for all scenarios indicating the financial viability of all of the cases assessed. The modelling has been done at a pre-feasibility level and confirmation would be required to further confirm the parameters used in the model, such as the ability to sustain a 5 Mtpa production rate through the processing plant and grade recovery of HMC.

93. Officials note the work programme allows for the completion of a feasibility study where the assumptions would be refined, and the financial model optimised.

94. The applicant also conducted sensitivity analysis on the financial modelling at a plus or minus 25% on the capital cost, the operating cost and commodity grades and prices to test their effect on NPV and IRR. The sensitivity charts for NPV and IRR (for scenario 6) are given in Figures 6 and 7 respectively. They show for NPV the greatest sensitivity is for OPEX and then the garnet price and grade, indicating the importance of the garnet component of the HMC. This is followed by the HMC grade and price.

95. For IRR (Figure 7) the key sensitivities are again OPEX but then the HMC grade and price followed by the CAPEX. This illustrates the importance of the early years of the project to overall profitability.

Figure 6. NPV sensitivity chart for Scenario 6

Figure 7. IRR sensitivity chart for Scenario 6

96. The sensitivity ranges are somewhat different in magnitude for the different scenarios, but the order of sensitivity remain constant.

97. The financial models were also reviewed by Rolly Clavecilla, Senior Royalties Auditor, who has experience in interrogating these types of spreadsheets. Mr Clavecilla found the time period and discount rate to be suitable with the discount rate reasonably conservative. He noted the commodity process used were reasonable but noted the price

used for zircon being higher than current prices but also accepted that the zircon price did not significantly affect the NPV.

98. Mr Clavecilla did not find any material flaws in the spreadsheet calculations but noted the higher OPEX and CAPEX early in the project life and noted those needed to be considered for financial capability.

99. Officials are satisfied that the project economics have been suitably established, for the level of study, over a range of realistic mining, processing, and economic profiles sufficient to establish the economic viability of the project.

100. Officials are also satisfied that the market conditions for the key economic minerals are positive over the next few years through to the long term.

Consistency of proposed mining operations with good industry practice *(section 29A(2)(a)(iii), clauses 1.3(10) & (11), 5.2(4) clause 10.2(1)(g))*

101. Officials consider the methodology's for mining and processing the HMS to be in line with the standard methodologies employed around the world for the mining and recovery of HMC with attention being paid to a proven mining and rehabilitation process used for alluvial mining in New Zealand.

102. Officials also note the intention to continue to optimise the resource and recovery of economic minerals and to deliver higher value products over time.

103. Consequently, officials are satisfied that the proposed mining operations are consistent with good industry practice as required by the purpose and scheme of the Act and Minerals Programme.

Consistency with the purpose of the Act and the purpose of a minerals mining permit *(sections 1A, 29A(2)(a)(i), (ii) and clauses 1.2, 1.3, 5.2, 10.1 and 10.2)*

104. Officials are satisfied that the permit holder has identified and delineated an indicated mineable mineral resource and that the proposed work programme is consistent with the purpose of Act and the permit and has the objective of economically depleting the resource to the maximum extent practicable in accordance with good industry practice.

105. Officials considers the work programme to be structured in a way that allows for optimisation of the mining and processing of the HMS as the knowledge gained through mining and research increases. The intent to move to higher value product streams is entirely in line with the purpose of the Act, in particular offering a fair financial return to the Crown.

Capability

Likelihood of complying with and giving proper effect to the proposed work programme *(section 29A(2)(b) and clause 5.3)*

Technical Capability

106. TIGA will provide the general expertise to develop and manage the mining, processing, and marketing of the mineral sand deposit. They have used, and continue to use, consultants for specialised technical fields and will use contractors where appropriate in the mining, processing, and transportation of the HMC and gold products.

107. A list of key principals involved in the development of the operation and ongoing operations are:

(a) David Straface, Director, who is a corporate advisor and lawyer with over 20 years experience in capital markets;

(b) Richard Pearce, Director, who has over 20 years experience in the mining industry working across the value chain including, exploration, operation management and mining finance;

(c) Phil Thick, Director, with over 30 years senior executive experience in oil and gas, mining, and chemical processing;

(d) Stephen Mann, CEO, a geologist with over 30 years experience in mineral exploration and development;

(e) John Berry, Project Manager, has worked for over 30 years in the mining and construction industries specialising in project development;

(f) s 9(2)(a) , is a mining engineer with over 30 years experience;

(g) s 9(2)(a) , is a contract mine planner with over 20 years experience across several mineral styles and mining methods;

(h) s 9(2)(a) , who has been a geologist for over 40 years with extensive experience in industrial minerals and mineral sands;

(i) IHC Robbins, a multi-discipline technology business with expertise in mineral processing solutions including laboratory test work, plant design and project engineering; and

(j) RSC Mining and Mineral Exploration Limited, who have expertise in permit management and specialised skills in resource estimation and reporting.

108. Given both the conventional nature of the mining and processing plan with understood and demonstrated methodologies along with the level and diversity of technical skills available to the project, officials are satisfied with the technical capability.

Financial Capability

109. The information provided with the application states Martin Place Securities (**MPS**), a Sydney stockbroker and corporate advisory firm was mandated by TIGA to:

(a) raise s 9(2)(b)(ii) in pre-IPO funds; and

(b) take the Company to an Initial Public Offering (IPO) in 2021

110. Since opening in 2000 MSP has raised over A$1.2 billion for resource companies in over 30 IPO's on the ASX and NSX.

111. An IPO was not undertaken in 2021, due largely to delays with the consenting process, with additional information indicating the IPO would now be held in 2023 once resource consents have been granted.

112. The resource consent applications were declined in early February 2022, primarily on the basis of insufficient information to provide confidence in the management of environmental impacts, and TIGA have not appealed that decision. TIGA are however, able to reapply once further work has been completed.

113. TIGA's intention to reapply for the resource consents was confirmed via an email from John Berry, project manager, on 8 March 2022.

114. At the time of application MSP had raised s 9(2)(b)(ii) for development of the project. Additional information provided in March 2022 indicated a further s 9(2)(b)(ii) had been raised in February 2021 from existing shareholders.

115. That additional information stated the IPO would most likely (and sensibly) be undertaken after the resource consent had been granted.

116. As described in paragraph 83 around s 9(2)(b)(ii) would be paid prior to mining commencing as part of the gold streaming arrangement. This funding will be in addition to any pre-IPO and IPO funds raised. The funding and timing of this would be:

s 9(2)(b)(ii)

117. s 9(2)(b)(ii)

118. As discussed in the section on project economics and, as per Mr Clavecilla's comment discussed in paragraph 98, the proposed operation has a significant level of both CAPEX and OPEX at the early stages of the mine development depending on the options chosen. For some scenarios this could be in the area of s 9(2)(b)(ii) through the first few years without the benefit of early positive cash flow.

119. This presents a dichotomy in that significant funds might be required to fully develop the mine and processing options (to its maximum potential), but the mine would need to be fully permitted, consented, with high confidence demonstrated in the feasibility and in development for significant funds to be raised. This is a common issue for greenfield mineral developments.

120. Given the information provided officials are satisfied with the financial capability of the applicant for the following reasons:

(a) TIGA have demonstrated an ability to raise funds internally for the exploration and studies to date sufficient to apply for a subsequent mining permit and apply for resource consents;

(b) TIGA have engaged an experienced stockbroking firm, MPS, with a proven record of raising funds in the resources sector. MPS have raised funds to date and would put in place the IPO once consents were granted;

(c) TIGA have an agreement in place, subject to Ministerial consent, for a gold streaming arrangement with s 9(2)(b)(ii) s 9(2)(b)(ii) subject to consents and building sufficient confidence in the gold resource but prior to mining commencing;

(d) The forecast global market conditions for the key economic products, ilmenite, garnet, zircon, and gold are positive with predicted compound growth in demand. There is also potential for other economic minerals within the HMC to provide additional value; and

(e) TIGA have provided a range of scenarios that demonstrate (convincingly) positive NPV's at solid IRR's. So a worst case scenario, that only the consented area applied for would be mined and processed into a HMC product, would still be a viable profit making operation.

121. Officials are of the view that, assuming the permit and consents are granted and when TIGA are able to market the project on development of the mine and processing, fund raising would allow for development of the most feasible higher value options.

Work Programme Compliance

122. The applicant has been compliant on their work programme for the period they have owned the permit (with the preceding period also showing work programme compliance). There is a current change of conditions application for stage 6 of the exploration work programme (within 132 months) that looks to defer some obligations into the next stage.

123. This application is still under consideration but may result in a decline that would see the applicant non-compliant on a drilling work programme condition (6(a)). Even in that event, officials would not consider there to be material non-compliance against the full extent of the work programme conditions for EP 51803.

Summary

124. Having considered the capability and compliance factors discussed above, officials are satisfied that the permit holder is likely to comply with and give proper effect to the proposed work programme.

Likelihood of complying with reporting obligations and the payment of fees and royalties *(section 29A(2)(c) and clause 5.3)*

125. TIGA operate the underlying exploration permit 51803. They have been compliant with the submission of Annual Summary Reports. They have also complied with technical reporting requirements of the work programme.

126. In the four years TIGA have held the exploration permit all fees have been paid on time.

127. Officials have not identified any material non-compliance by the proposed permit holder (or related companies) in relation to reporting obligations, fees or royalties and are satisfied that the permit holder is likely to comply with the relevant obligations.

Initial assessment of the operator's health and safety and environmental capabilities *(sections 29A(2)(d) & 29A(3) and clause 5.4)*

128. Under section 29A(2)(d) of the Act it is a requirement for an applicant for a Tier 1 mining permit to demonstrate that the proposed operator has, or is highly likely to have, by the time the relevant work is undertaken, the capability and systems likely to be required to meet the health and safety (**H&S**) and environmental requirements of all specified Acts.

129. The relevant information, provided by the applicant, was forwarded to WorkSafe, in respect to the H&S assessment and to SGS New Zealand Limited (**SGS**), in respect to the environmental assessment. WorkSafe and SGS are routinely used for the respective capability assessments by officials.

130. An assessment of the environmental capability was received from SGS on 6 February 2022. The assessment (Enviro A, Enviro B), found the proposed operator has, or is highly likely to have, by the time the relevant work is undertaken, the capability and systems likely to be required to meet the environmental requirements of all specified Acts.

131. An assessment of the H&S capability was received from WorkSafe on 15 February 2022. The assessment (H&S assessment), found the proposed operator has, or is highly likely to have, by the time the relevant work is undertaken, the capability and systems likely to be required to meet the H&S requirements of all specified Acts.

Consultation with iwi and hapū (section 4, clauses 2.2, 2.3, 2.5, 2.7 and 2.8)

132. Iwi that may be affected by the development of the Barrytown minerals sand deposit as a result of this application were consulted on 14 May 2021. The iwi consulted were:

1) Te Rūnanga o Toa Rangatira Inc;
2) Te Rūnanga o Ngāti Rārua;
3) Te Rūnanga o Ngāi Tahu;
4) Te Ao Mārama Inc; and
5) Te Rūnanga o Ngāti Waewae.

133. No submissions were received in respect to application MP 60785.01.

134. Officials were aware that Ngāti Waewae, a sub iwi group within Ngāi Tahu, whose rohe covered the area under application, had submitted in opposition to the granting of a resource consent to TIGA in the consenting process.

135. A phone conversation was held between officials and s 9(2)(a) , a spokesperson for Ngāti Waewae, on 9 August 2021 to gauge Ngati Waewae's views of the Barrytown JV project and any concerns.

136. s 9(2)(ba)(i)

137. s 9(2)(ba)(i)

138. s 9(2)(ba)(i)

139. Officials are aware that Ngati Waewae have subsequently withdrawn their submission against the granting of the resource consent.

140. Based on officials' knowledge, officials do not consider any additional protection is appropriate and that redress to iwi will not be affected should a permit be granted.

141. Of the other groups consulted, as part of the block consultation process, only Ngāti Rārua have a rohe that extends along the West Coast through the application area. Their area of interest, however, is mainly focussed on the northern part of the South Island. Ngāti Rārua are not known to submit on mineral permit applications in this area and Ngati Waewae are the pre-eminent iwi in the application area.

142. Officials are satisfied that the Crown has discharged its responsibilities in relation to iwi consultation as set out in the Act and Chapter 2 of the Minerals Programme and have had regard to the principles of the Treaty of Waitangi (the **Treaty**).

143. Officials consider the principles of the Treaty including: the principle of partnership (dealing with each other reasonably and in good faith); informed decision making by the Crown and Māori; active protection of Māori interests retained under the Treaty; and retaining and implementing processes to aid redress and reconciliation between the Crown and Māori.

144. Officials have consulted reasonably and in good faith with the affected iwi and hapū. This consultation has enabled officials to make an informed decision where iwi might be affected by MP 60785.

Climate Change

145. Section 5ZN of the Climate Change Response Act 2002 (CCRA) states, "If they think fit, a person or body may, in exercising or performing a public function, power, or duty conferred on that person or body by or under law, take into account the Net Zero Factors below;

(a) The 2050 target; or
(b) An emissions budget; or
(c) An emissions reduction plan"

146. Section 5ZO of the CCRA states that the responsible Minister (Minister for Climate Change) may issue guidance for departments on how to take the 2050 target or an emissions budget into account in the performance of their functions, powers, and duties (or classes of those functions, powers, and duties). To date no guidance has been issued.

147. As a permissive consideration, it is open to you, but not required of you, to take these matters into account in making your decision.

The 2050 target

148. The 2050 target is a domestic greenhouse gas emissions reduction target for New Zealand. Section 5Q of the CCRA defines the 2050 target as:

(a) reduce net emissions of all greenhouse gases (except biogenic methane) to zero by 2050; and
(b) reduce emissions of biogenic methane to 24-47% below 2017 levels by 2050, including to 10% below 2017 levels by 2030.

Emissions budgets

149. In order to meet the 2050 target section 5X of the CRRA the Minister for Climate Change must set a series of emissions budgets to act as stepping stones towards the 2050 target. On 9 May 2022 the Minister for Climate Change set the emissions budgets for the first three periods as outlined below and shown in Table 10.

Emissions budget period	**Period 1 (2022-2025)**	**Period 2 (2026-2030)**	**Period 3 (2031-2035)**
Emissions Budget	290MtCO_2e	305MtCO_2e	240MtCO_2e
Average budgeted emissions per annum	72.5MtCO_2e	61.0MtCO_2e	48.0MtCO_2e
Comments	Approximately 2MtCO_2e/yr less than the current 5-year average or 3.1MtCO_2e/yr less than current projections	Approximately 20% less (13.4MtCO_2e) than the 2017-2021 period	Approximately 35% less (26.4MtCO_2e) than the 2017-2021 period

Table 10. Emissions budgets for periods from 2022 to 2035

150. The emissions budgets for the subsequent budget periods will be set at a later date, but not later than 10 years before the emissions budget period commences.

151. The Government has also set sub sector targets to help monitor progress towards the emissions budgets. Officials believe emissions from mineral exploration and mining will be captured in the Transport and Energy & Industry sub-budgets, as shown in Table 11.

Sector	**Period 1 (2022-2025)** (Mt CO_2e)	**Period 2 (2026-2030)** (Mt CO_2e)	**Period 3 (2031-2035)** (Mt CO_2e)
Transport	65.9	76.0	56.8
Energy & Industry	70.1	72.8	63.3
Agriculture	159.4	191.0	183.0
Waste	13.7	14.9	12.7
Fluorinated gases	6.8	7.5	5.9
Forestry	-26.4	-57.2	-81.6
Total	**290.0**	**305.0**	**240.0**

Table 11. Transport and Energy & Industry sub-budgets (2022 to 2035)

Emissions reduction plan

152. On 16 May 2022 the Government released its first emissions reduction plan. The emission reduction plan outlines how it is proposed New Zealand will achieve the first emissions budget and therefore set New Zealand on a path to achieve the 2050 target.

153. The emissions reduction plan does not contain any specific policies related to the activities undertaken in exploration and mining of non-fossil fuels. However, the emission reduction plan does outline policies to reduce the emissions intensity of transport fuel by 10% by 2035 through biofuel mandates and regulation of heavy vehicle emissions.

154. Existing policies to reduce emissions

Emissions trading scheme

155. The CCRA provided for the implementation, operation, and administration of the Emissions Trading Scheme (ETS) which is the Government's main tool for the reduction of emissions in New Zealand. The ETS creates a price on emissions and therefore allows the market to decide on the most economically efficient way to reduce emissions.

156. ETS participants are required to surrender 1 ETS unit for every 1tCO_2e for which they are liable. ETS units are issued to trade exposed industries or those that are undertaking activities that sequester CO_2 (e.g., forestry), otherwise ETS units need to be obtained via Government auctions of units (with a capped and reducing over time amount of units being auctioned) or purchased from companies holding excess units.

Resource Management Act 1991

157. The granting of a permit under the Act does not grant the rights to undertake the exploration or mining activities proposed under the permit. Approval and conditions on the proposed activities are set under the Resource Management Act 1991 (RMA) by the councils through the granting of resource consents.

158. Officials note that on 30 November 2022 there will be changes to the RMA which will repeal the existing limitations on a council's ability to consider the effects of climate change as part of resource consent applications. Therefore, any application for a resource consent or to vary an existing resource consent will be subject to considerations of the proposed activities on climate change. However, this assessment under the RMA process does not eliminate your obligations under 5ZN when considering this application.

Consideration of the Net Zero Factors

159. Officials consider that the proposed activities outlined in this application will likely have a low impact on the Net Zero Factors as the emissions from the proposed operations are only from the combustion of liquid fossil fuels in plant and machinery.

160. Officials note that the emissions from the use of liquid fossil fuels in plant and machinery are currently captured by the emissions trading scheme. Liquid fuel importers are compulsory participants in the ETS. The fuel importers pass the ETS costs on to consumers in the price of the liquid fuels sold.

161. The emissions reduction plan contains policies that are designed to reduce emissions from the transport sector. These policies will ultimately reduce the emissions associated with the consumption of liquid fossil fuels in the minerals exploration and mining industry such as introducing biofuel percentages to fuels and investigating regulating heavy vehicle emissions (e.g., Euro VI standards). However, the implementation of these policies will have no impact on the ability of the permit holder to undertake the proposed activities under this application.

162. In the interests of consistent and transparent decision-making, officials recommend a low weighting is placed on the permissive considerations under s5ZN of the CCRA in the decision on this application. This is because the emissions from the proposed activities

are low and result from the combustion of liquid fossil fuels in plant and machinery. The emissions from the proposed activities are captured by the ETS which is the government's main tool for emission reductions.

Any other relevant factors

163. The point of valuation for the HMC should be set at the permit boundary.

164. On any further processing of the HMC into additional, more refined, product streams the point of valuation would be the boundary of the processing plant producing the refined products.

165. The point of valuation for gold would be set at the point of sale with the value set by the LBMA price for gold at the time of sale.

166. The underlying EP 51803 was subject to the 2008 royalty regime. In line with clause 4.14(4) of the Minerals Programme any subsequent permit, and the minerals listed, would also be subject to the 2008 royalty regime.

167. The exception to this is garnet, which was added to EP 51803 in 2015. Under section 105A(3)(c) of the Act, when a permit is changed to cover a different mineral then royalties in respect of that mineral will be calculated according to the regulations applying at the time.

168. Consequently, all minerals other than garnet will be subject to the 2008 royalty regime while garnet will be subject to the 2013 royalty regime. Where the minerals are sold as a HMC the price received will be based on the proportions of the respective economic minerals contained. The royalty for garnet will be assessed on a prorated basis at the applicable 2013 royalty rate.

CONCLUSION

169. Officials are satisfied that:

1) the permit holder's exploration activities for ilmenite, garnet, zircon, and gold, particularly in the permit area, have resulted in the discovery of a deposit or occurrence of the minerals. Other economic minerals may also occur as further by-products in the HMC;

2) the permit holder has identified and delineated an indicated mineable mineral resource;

3) the objective of the proposed work programme is to economically deplete the resource to the maximum extent practicable in accordance with good industry practice; and

4) the permit area is appropriate.

170. Having considered the relevant provisions in the Act and the Minerals Programme and for the reasons outlined above, it is considered appropriate to grant the application.

RECOMMENDATION

171. It is recommended that you:

1) grant the application and sign the attached Certificate of Permit Grant; and

2) determine that the permit status will be Tier 1.

_____

Tim Journeaux

Principal Minerals Advisor

LEGAL REVIEW

s 9(2)(h)

s 9(2)(h)

[redacted]

Reviewed by:
James Corcoran
Senior Solicitor, 7 June 2022

2021

MINING PERMIT APPLICATION: SUPPLEMENTARY INFORMATION

Application prepared for:	BARRYTOWN JV LIMITED
Distribution:	New Zealand Petroleum & Minerals
Effective Date:	Wednesday, 24 February 2021

Executive Summary

Barrytown JV Limited (BJV) is applying for a Tier 1 mining permit (MP) for ilmenite, garnet, zircon and gold over an approximate 883 ha portion of exploration permit (EP) 51803, located approximately 4 km north of Barrytown, West Coast, New Zealand (Figure 1). This application comes on the back of results from geological studies, drilling, bulk sampling, resource estimations and preliminary technical studies.

The application area contains a series of Quaternary shorelines and local alluvial fan deposits that have developed from coastal progradation as a result of an offshore northerly longshore drift. Deposition of sediment, between the ocean and the inland post-glacial cliff, defines the eastern limit of the deposits. The sediments contain marine placer concentrations of heavy minerals.

In 2018, an Indicated and Inferred Mineral Resource for ilmenite was estimated for the exploration permit, by a Competent Person in accordance with the JORC Code (2012) and guidelines. The total Mineral Resource in EP 51803 was estimated at s 9(2)(b)(ii) ilmenite for a total of s 9(2)(b)(ii) ilmenite, at a 4% ilmenite cut-off grade (consisting of s 9(2)(b)(ii) Indicated Resources and s 9(2)(b)(ii) Inferred Resources). Exploration Targets in respect of garnet, zircon and gold are also estimated, which suggest that the Barrytown deposit may contain grades of up to s 9(2)(b)(ii) garnet, s 9(2)(b)(ii) zircon and s 9(2)(b)(mg/m^3 gold.

Preliminary mining studies have demonstrated that an economically viable project can be established for the Barrytown deposit based on producing ilmenite, garnet and zircon (± gold as a by-product). BJV is opting for a staged approach to mining the deposit. The primary focus of the mining operation will be the recovery of ilmenite, garnet, zircon, initially as a heavy mineral concentrate (HMC) and later as separate product streams using conventional physical separation processes (gravity, electrostatic and magnetic). Gold will be a by-product of the operation and will be separated during the primary processing. Testwork studies have shown that the HMC (product streams of ilmenite, garnet and zircon) can readily be separated using conventional mineral sands and gold processing technology. Further metallurgical characterisation and processing investigations need to be undertaken to refine the separation process before separate product streams can be recovered on site.

A key initial aspect of the staged process will be to conduct phases of exploration, testwork and resource drilling in order to provide higher levels of resource confidence in relation to the ilmenite, as well as seeking to bring the garnet, gold and zircon up to a comparable resource status as the ilmenite. A two-stage drilling program has been designed to assist with the objective of increasing the resource classification and upgrading Exploration Targets to Mineral Resources.

The proposed mine plan involves an initial operation focussed on an approximate 115 ha southern portion of the application area near Canoe Creek, where an access arrangement has been secured and a resource consent application has been submitted. A Feasibility Study, as defined in the JORC Code (2012), will be completed before operations commence. At this stage, it is expected that the operation will proceed northwards once further exploration and studies have been completed that support an extended mineable resource for ilmenite, garnet, zircon and gold to be confirmed for the northern area.

Grant of a mining permit will enable BJV to raise funds and move forward into the development stage of the project.

The application area is easily accessible via State Highway 6. BJV has secured an access agreement over 10 land titles held by Nikau Deer Farm Ltd, being an area of 389 hectares. The accessible land held by Nikau Deer Farm Ltd contains 46% of the ilmenite mineral resources and garnet, zircon and gold exploration targets from EP 51803.

The mining methodology uses a Mining Field Unit (MFU) which is similar in design to a land-based gold screen. The MFU will be portable and skid mounted. The mining process will involve the initial removal of the topsoil and overburden. Both topsoil and overburden will be stockpiled adjacent to mining operations for use in rehabilitation at the completion of mining activities. Run of mine material will be fed through the MFU to remove the oversize and other unwanted materials. Appropriately sized material from the MFU will be pumped to the processing plant for further primary processing before being pumped to the stockpile location. Material will be fed into the MFU via a hydraulic excavator. This will be similar to what frequently occurs within the West Coast gold fields by land-based gold screens.

The processing plant will be a modular spiral separation plant. Mineral sands received from the MFU will be processed through the spiral separation plant where gravity is used to separate the target minerals from the reject material. Multiple passes or multiple stages of spirals will be required. The reject material is then pumped back to the mining void for use in backfilling.

HMC produced from the spirals will be pumped to the storage area in preparation for load out and dewatering. This is proposed to occur via use of a cyclone, with the slurry water then discharged to a water treatment pond for settling prior to discharge. The discharge from this treatment pond will occur via overland flow and seepage. Tailings will be discharged from the separation plant and the mining field unit back to the mining void. Once mining/processing has progressed, the overburden will be trucked into the mining void and placed over the returned tailings from the HMC processing. Once contoured, the overburden will then be covered by the topsoil, which will also be contoured, raked and reseeded with selected pasture grasses and clover.

Rehabilitation works will occur on a progressive basis to minimise the area disturbed at any one time as operations move through the mining area. It is expected that the topography of the land will be altered as the HMC is removed from the site. This provides opportunities for the enhancement of existing natural features through land contouring and drainage patterns.

An initial mining permit tenure of 20 years is sought. It is expected that BJV will apply to extend the duration of the permit as further resource definition and technical studies are completed.

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1 Introduction

BJV Minerals & Metals Limited (BJV) [Company number 5824110] is applying for a mining permit (MP) near Barrytown over a portion of Exploration Permit 51803 currently held by BJV. If granted, BJV will be the sole interest holder in the permit and will carry out the role of operator.

This application is being made to move the project forward to allow the mining of areas subjected to significant historical and recent exploration, where an Indicated and Inferred Mineral Resource has been established for ilmenite. BJV is apply for a mining permit over an area of 883 ha. A GIS shapefile of the application area has been provided with this application.

Preliminary mining studies have demonstrated that an economically viable project can be established based on producing ilmenite, garnet and zircon (± gold) from the MP application area.

BJV is opting for a staged approach to mining the deposit. A key initial aspect of the staged process will be to conduct phases of exploration and resource drilling in order to provide higher levels of resource confidence in relation to the ilmenite, as well as seeking to bring the garnet, gold and zircon up to a comparable resource status as the ilmenite. A two-stage drilling program has been designed with the objective of increasing the resource classification and upgrading Exploration Targets for other minerals to Mineral Resources (that can be reported in accordance with the JORC Code).

The proposed mine plan involves an initial operation focussed on a 115 ha southern portion of the application area near Canoe Creek, where an access arrangement has been finalised and resource consent and land use applications have been submitted. The operation will proceed north once further exploration has finalised a mineable resource for ilmenite, garnet, zircon and gold over those areas.

Tenure of 20 years is sought initially, with the intention to extend the duration of the permit, subject to substantially complying with the permit conditions and expanding the resource potential after completing the exploration detailed in this application.

2 Project General Summary

2.1 Project Description, Location and History

Minerals exploration permit (EP) 51803 was granted to Alloy Resources Ltd (Alloy) on 26th November 2009 for the purpose of exploring for metallic minerals. The mining permit application covers an 883 ha portion EP 51803. The application area is located approximately 4 km north of Barrytown, on the West Coast of the South Island of New Zealand (Figure 1).

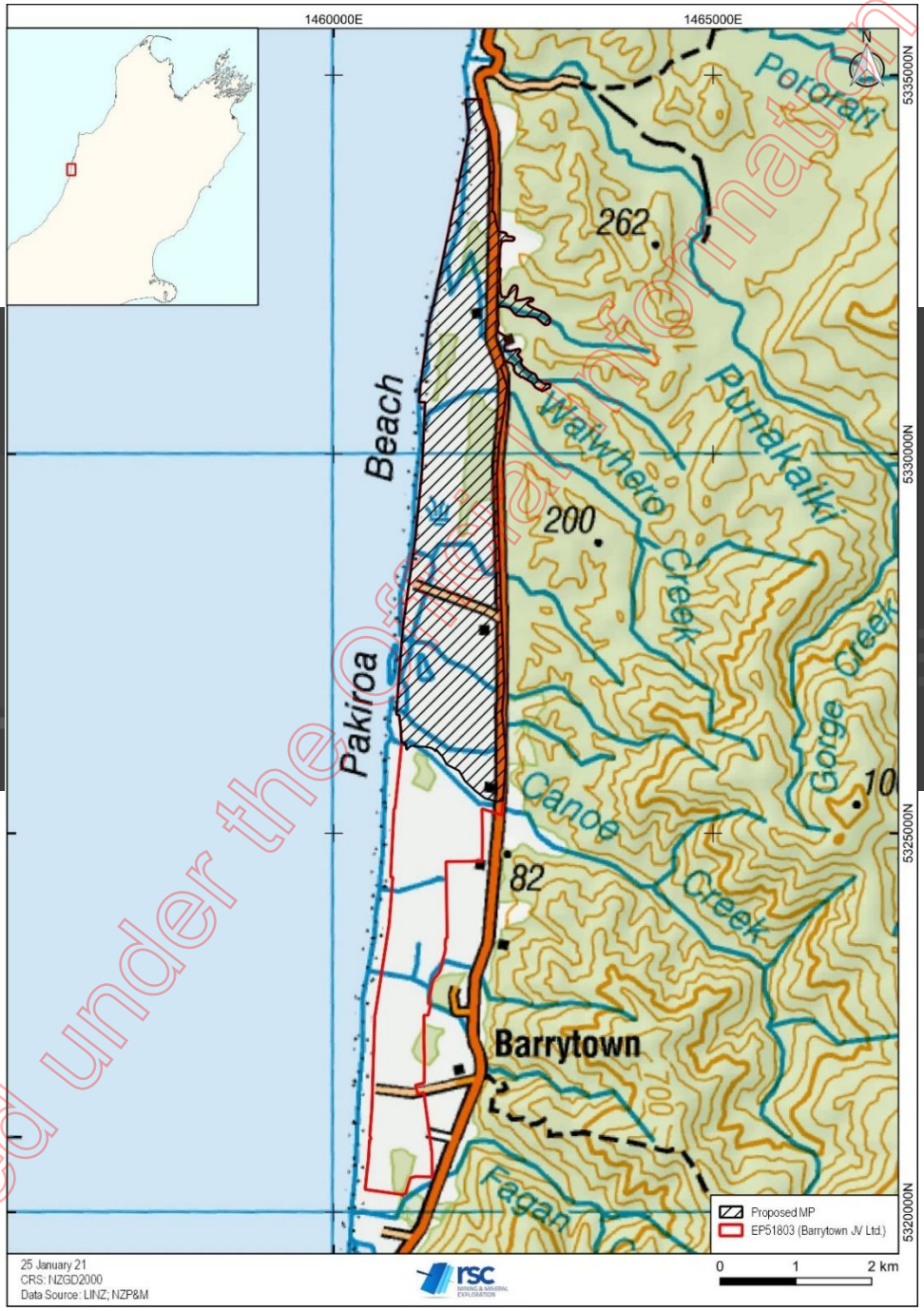

Figure 1: Location of mining permit application near Barrytown, West Coast, New Zealand.

The coastal plain (known as the Barrytown Flats) is an elongate plain approximately 17 km long north-south, by up to 2 km east-west, and is flanked to the east by the Paparoa Ranges and to the west by the Tasman Sea. The Barrytown settlement is a small hamlet located on the south-eastern margin of the flats. The area is predominantly used for deer and dairy farming.

Upon granting of EP 51803 in 2009, Alloy commissioned TZ Minerals International Pty Ltd (TZMI) to complete a scoping study for an ilmenite only project, with credits for zircon and gold. The report was completed in March of 2010 and expanded in November 2011. From 2012, Alloy entered into work agreements with two New Zealand companies to continue the exploration project: Westland Titanium Limited (WTL: 2012 – September 2015), and BJV (October 2015 – 2018). The work programme for EP 51803 has been changed multiple times since and two appraisal extensions have been approved. In 2018, EP 51803 was transferred in its entirety to BJV. The changes to the permit are summarised in Table 1.

Table 1: EP 51803 permit changes.

Date	Company	Event
26 November 2009	Alloy	Granting of EP 51803 to Alloy Resources Limited
17 January 2013	Alloy/WTL	Change to work programme agreement
15 October 2015	Alloy/WTL	Appraisal Extension Granted
18 March 2016	Alloy/ BJV	Change to minerals (inclusion of garnet), change to work programme, and change of tier status from Tier 2 to Tier 1.
25 October 2018	Alloy/ BJV	Transfer of permit to Barrytown JV Limited
26 October 2018	BJV	Appraisal Extension Granted
26 August 2020	BJV	Application to change work programme submitted

2.2 Physiography

The MP application comprises part of a coastal lowland strip up to 1.5 km wide within a coastal embayment that stretches 9 km from Razorback Point in the north to Canoe Creek in the south. Most of the area lies below an elevation of 20 m above sea level and is backed to the east by steep slopes along an old sea cliff. The Barrytown flats are enclosed by the Paparoa Range to the north, east and south with the Tasman Sea to the west.

The application area is drained by significant creeks from the Paparoa Ranges in the east to the Tasman Sea. The flats comprise a series of prograded marine beach strand and sand dune deposits that contain a number of swamp areas.

Much of the land which has been drained is used for dairy farming with at least one deer farm. Some farmland areas to the north are being replanted in natives. The balance consists of small 'lifestyle' blocks and scattered patches of native bush and scrub behind the fore-dunes.

2.3 Climate

The climate in the Barrytown Flats area consists of moist cool temperatures, with cloudy, windy conditions and frequent showers near the coast with an approximate rainfall of 2500 mm per annum. It is also different from much of the West Coast in that it has very few, if any, frost days. Within the area of interest, there are several creeks and streams flowing in general from east to west from the Paparoa Hills to the sea.

Greymouth, further to the south, receives an average of 2431.4 mm of rainfall per year. The driest weather is in February when an average of 139.8 mm of precipitation occurs. The wettest month is October which has an average of 234.8 mm of precipitation.

2.4 Access

The Barrytown Project is adjacent to the sealed and well-maintained State Highway 6. No part of the project is more than 1.5 km from the highway. The highway runs directly to both rail and port terminals.

The MP application consists of private freehold land (a mixture of farming, native bush and lifestyle blocks), conservation land and crown land. The bulk of developed land comprises "Hump and Hollow" farming. A few residences exist along the eastern limits bordering the main coastal highway. An old mining pit and wetlands exist towards the western limits, shoreline side.

BJV has secured a Land Access Agreement (LAA) over the 10 land titles held by Nikau Deer Farm Ltd (owned by George and Caryl Coates), being an area of 389 hectares in the south of the MP application. The land held by Nikau Deer Farm Ltd, the subject of the LAA, contains 46% of the current Mineral Resource Estimate for ilmenite and Exploration Targets for garnet, zircon and gold within EP 51803.

Resource consents and access agreement will need to be in place before BJV can progress with exploration (drilling) and any future mining of the other titles.

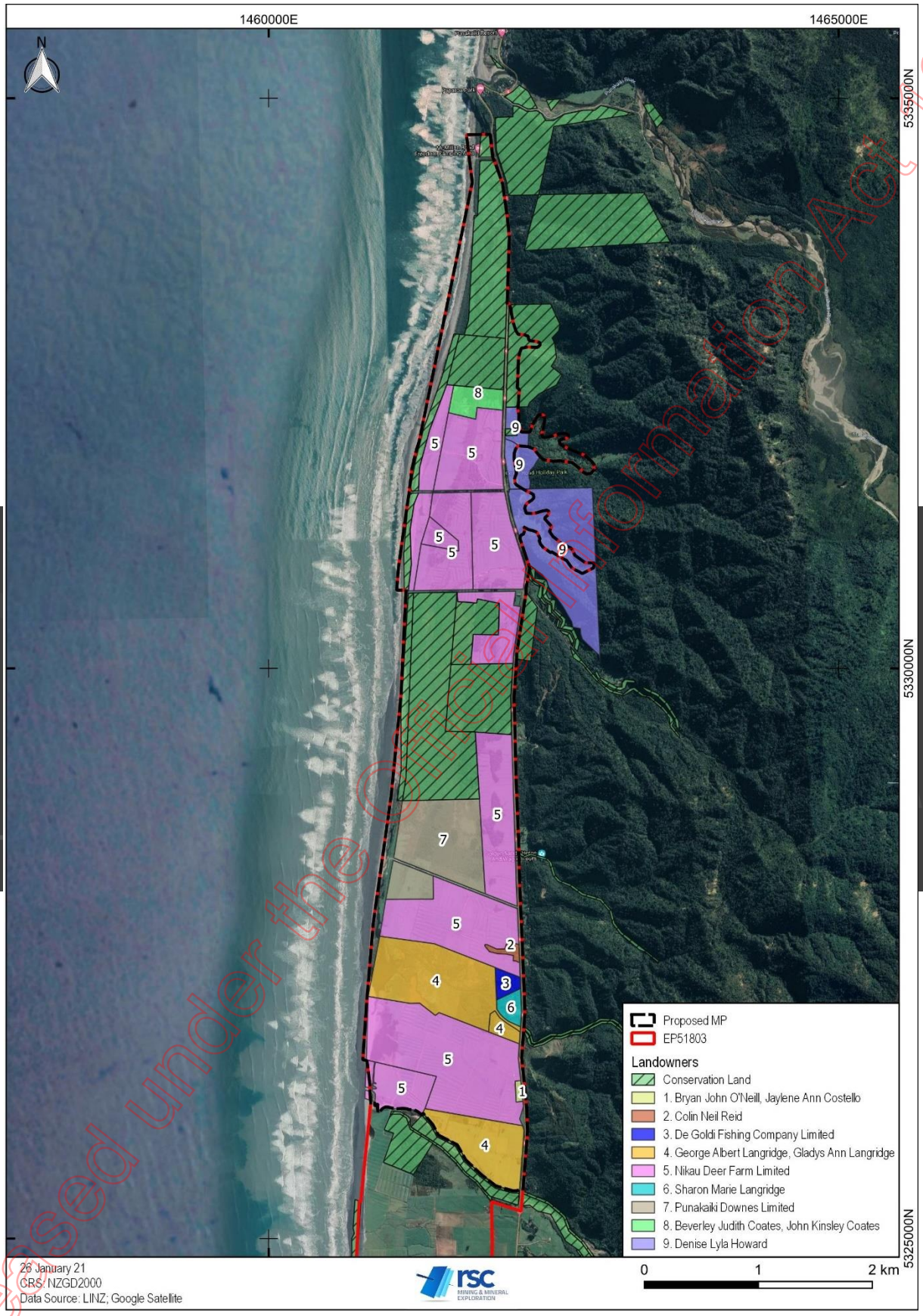

Figure 2: Property ownership within the MP application.

2.5 Infrastructure

The Barrytown deposit is located adjacent to State Highway 6 running north-south along the west coast of New Zealand. State Highway 6 is the national route that provides access to the Westland region and forms the road link between Barrytown and Greymouth to the south and Westport to the north. The road is sealed and has a width of between 6.8 and 7.0 metres except for several sections on the Barrytown flats where the width decreases to between 5.6 and 6.0 metres. The port of Westport can be accessed by travelling along State Highway 6 (55 kilometres) and then along State highway 67 (6 kilometres). Greymouth can be reached by travelling south along State Highway 6 which crosses the rolling topography of the Barrytown flats before skirting steep bluffs in the narrow coastal region. The road then passes through Rapahoe and Runanga before crossing the Grey river and entering Greymouth.

The nearby ports of Greymouth (30 kilometres to the south) and Westport (60 kilometres to the north) have been considered as export routes. Several limitations including water depth, cargo handling and ship capacity have been recognised to exist at both of these ports.

2.6 Resource and Land Use Consents

On 17 December 2020, BJV submitted resource consent applications to the West Coast Regional Council and Grey District Council for an initial mining area of approximately 115 ha of privately owned farmland, situated within this MP application (Figure 3). The resource consent application area consists of two tiles, 447182 and WS22D/1035, held by Nikau Deer Farm Ltd (Coates). The resource consent applications are included in Appendix 1 accompanying this application.

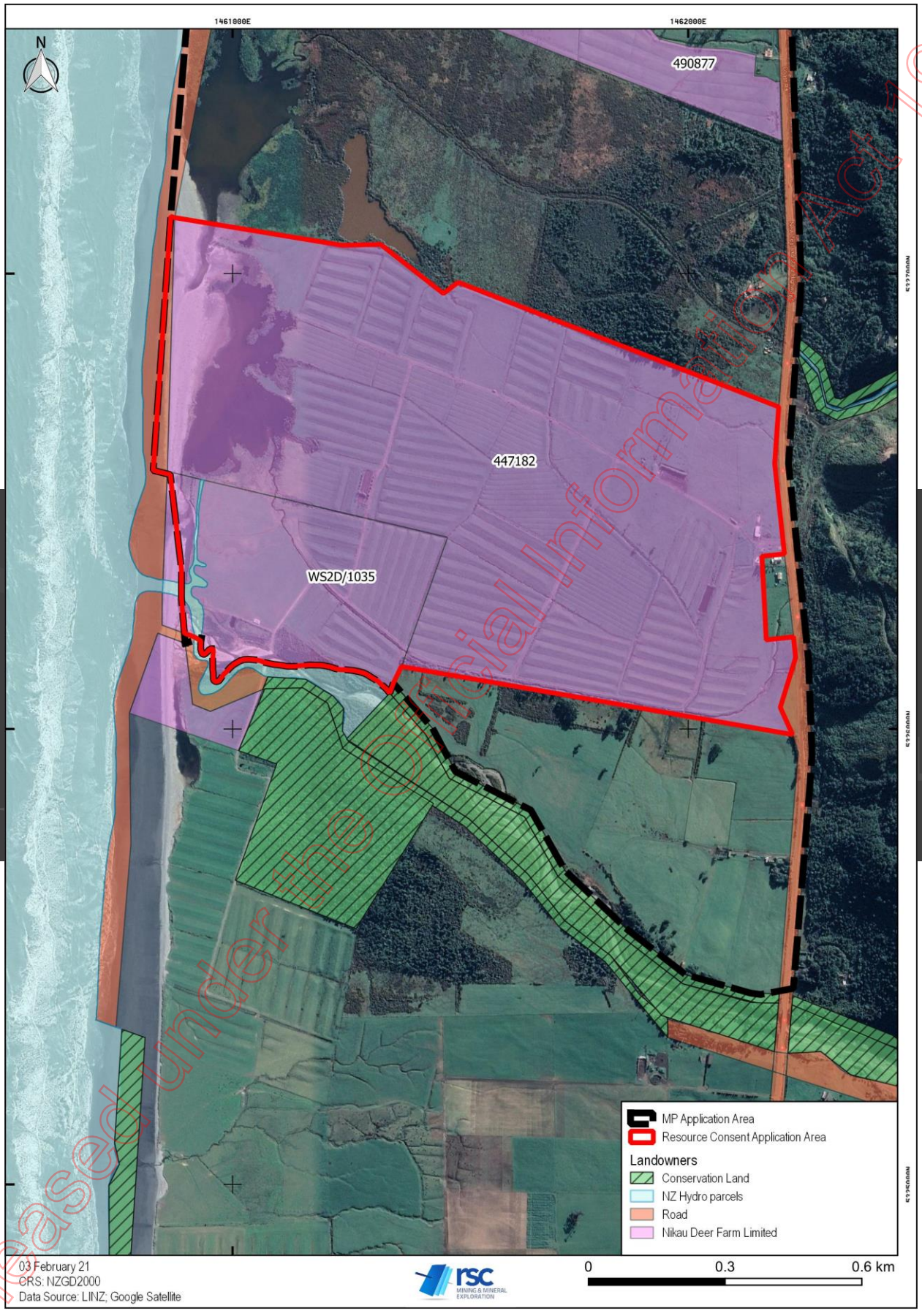

Figure 3: Resource consent application area within MP application.

3 Geological Setting and Mineralisation

3.1 Regional Geological Setting

New Zealand straddles the boundary between the Australian and Pacific crustal plates, the boundary being marked by the Alpine Fault. The northwest of the South Island of New Zealand comprises the West Coast Basin and Range Province, an area of predominantly early Palaeozoic rocks in broad northerly trending belts, which terminate in the southeast against the Alpine Fault (Figure 4).

The dominant tectonic feature in the West Coast region is the Alpine fault, which marks the boundary between the Australian Plate to the west and the Pacific Plate to the east (Suggate and Waight, 1999). The geomorphology of the application area is the product of rapid tectonic uplift along the Alpine Fault and simultaneous rapid erosion in a high-precipitation climate. The Alpine Fault strikes northeast and around Hokitika is located 20–25 km from the coast. The Alpine Fault separates the steep mountains of the Southern Alps from the more gently sloping hills along the coastline. This area between the coast and the fault is dominated by old beaches, river flats and glacial moraine deposits that locally extend to coastal bluffs (Wellman & Willett 1942, 1943). The fault has been active as a right-lateral transcurrent feature since the Miocene.

Following the earliest deposition of Tertiary sediments in the region, there was a hiatus in deposition lasting about 1.5 million years prior to the deposition of the oldest Quaternary sediments. This is considered to represent a period of regional tectonic uplift and the cycle of erosion that has formed the current landscape of Westland. The regional Quaternary sequence is complex, with deposits that record the succession of ice age lower sea levels and intervening interglacial high sea levels.

The regional geology clearly shows the change in basement rock type to the east of the Barrytown flats (Figure 4). To the north of Canoe Fault, the pre-Quaternary hills are composed of soft Tertiary sediments that were easily eroded by high Pleistocene sea levels and remnants of related raised beaches are found at elevations of up to 120 m. Here, lower gradient streams contribute fine sediment to the sea.

South of the Canoe Fault, granitic rocks of the Carboniferous Karamea intrusive suite and metasediments of the late Paleozoic Greenland Group form a more resistant basement with steep hills along the eastern boundary to the beach deposits. Here, local fan deposits form over the coastal deposits as a result of large volumes of more resistant eroded material bought down by the steep streams; these may be up to 30 m in thickness.

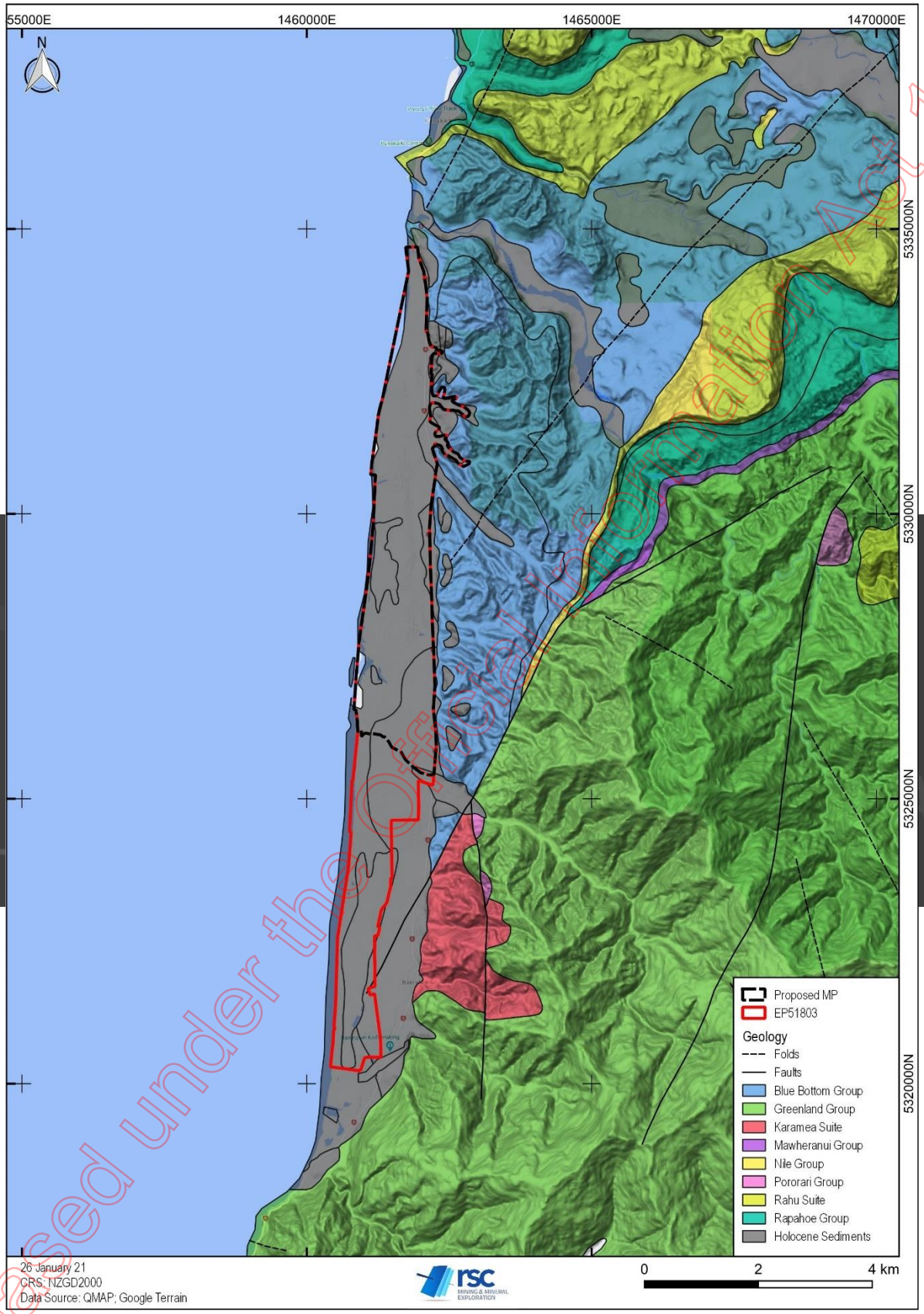

Figure 4: Regional geology of application area (QMAP 250K).

3.2 Local Geological Setting

The Barrytown Flats contain a series of Quaternary shorelines and local alluvial fan deposits that have in places been obscured by historical gold mining activities, particularly in the south. Since 1951, Suggate (1989) documented active shoreline retreats of up to 40 m in the south and advances of 30m in the north and considered that the present shoreline had formed within the past 1000 years.

The Barrytown flats have developed from coastal progradation as a result of an offshore northerly longshore drift with deposition of sediment between the ocean and the inland post-glacial cliff that defines the eastern limit of the deposits. These deposits are recent and are considered to be less than 10,000 years old. They occur as a sequence of pro-grading shorelines, the oldest (easternmost) of which have been preserved as a result of tectonic uplift and now occurs with a ridge crest some 12 m above modern sea level. Laird (1988) mapped the Quaternary geology of the Barrytown area as summarised in Table 2.

Table 2: Quaternary geology at Barrytown (Laird, 1988)

Unit	Age	Description
Nine Mile Formation	Holocene	Deposits of the present-day beaches and rivers comprising unconsolidated ilmenite rich beach sand and gravel, dredge and sluice tailings, river gravel and alluvial fans and swamp deposits.
Waites Formation	Upper Pleistocene	Gravel (mainly gneissic) forming lower level inland river terraces and associated degradational terraces. Sand and fine gravel along the coast forming a 34-36m high terrace.
Addison Formation	Upper Pleistocene	Gravel (mainly gneissic) forming high-level terraces. Partly cemented, brown ilmenite rich sand and fine gravel near the coast forming an 8587m terrace
Caledonian Formation	Upper Pleistocene	Cemented marine sand and fine gravel near the coast forming 105-120m terrace.

Suggate (1989) identified 12 shorelines in a series of three sequences at Barrytown. These were distinguished on the basis of aerial photograph interpretation, topographic maps, and ilmenite sand drilling results (Figure 5):

- An older series of four named Shorelines 1–4. These are developed closely parallel to the post-glacial cliff essentially along its entire length;
- A younger series of six, named Shorelines 5–10, formed after a major event changed the coastal regime with a period of erosion of which Shoreline 5 represents the limit. They represent pauses in stages of coastal advances in the northern part of the area; and
- The modern Shoreline 11, considered to have developed after a period of major erosion along the length of the beach sometime after the formation of Shoreline 10, and with a current pattern of complementary erosion and deposition, cuts off some of the earlier shorelines.

Nathan et al (2002) determined dates of various interglacial shorelines. The oldest shoreline at Barrytown is dated at 220,000 years, and the third oldest at 6,000 years. North of the Canoe Fault, the elevations of the successive older shorelines are about 8.5 m, 7 m, 4 m, and 3.5 m respectively and probably reflect more or less continuous uplift superimposed by the effects of minor sea-level changes. Lee (1990) presented a diagrammatic E-W cross-section illustrating the deposition sequences and age relationships on the Barrytown flats (Figure 6).

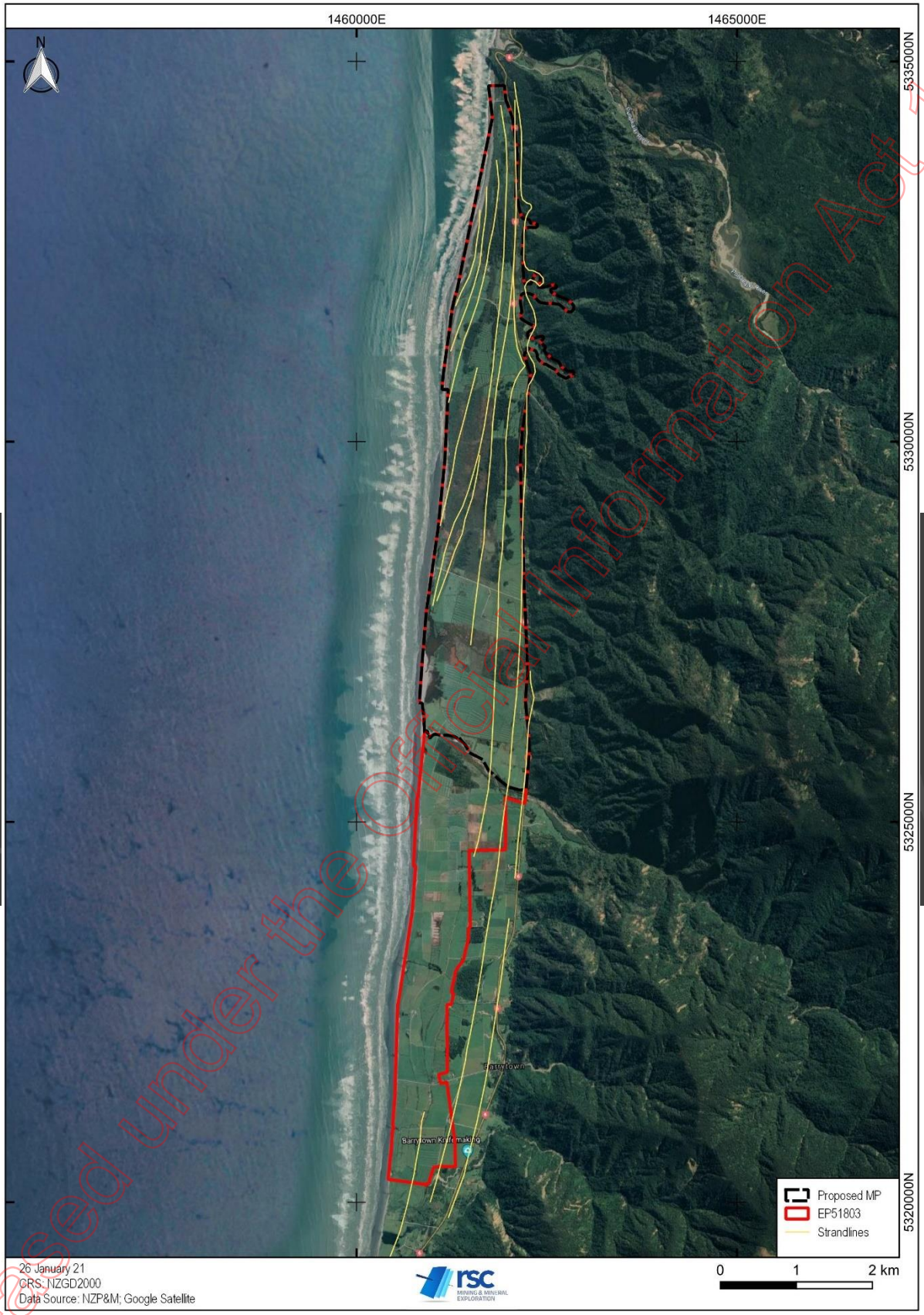

Figure 5: Strandlines imposed on air photo image (modified from Suggate, 1989).

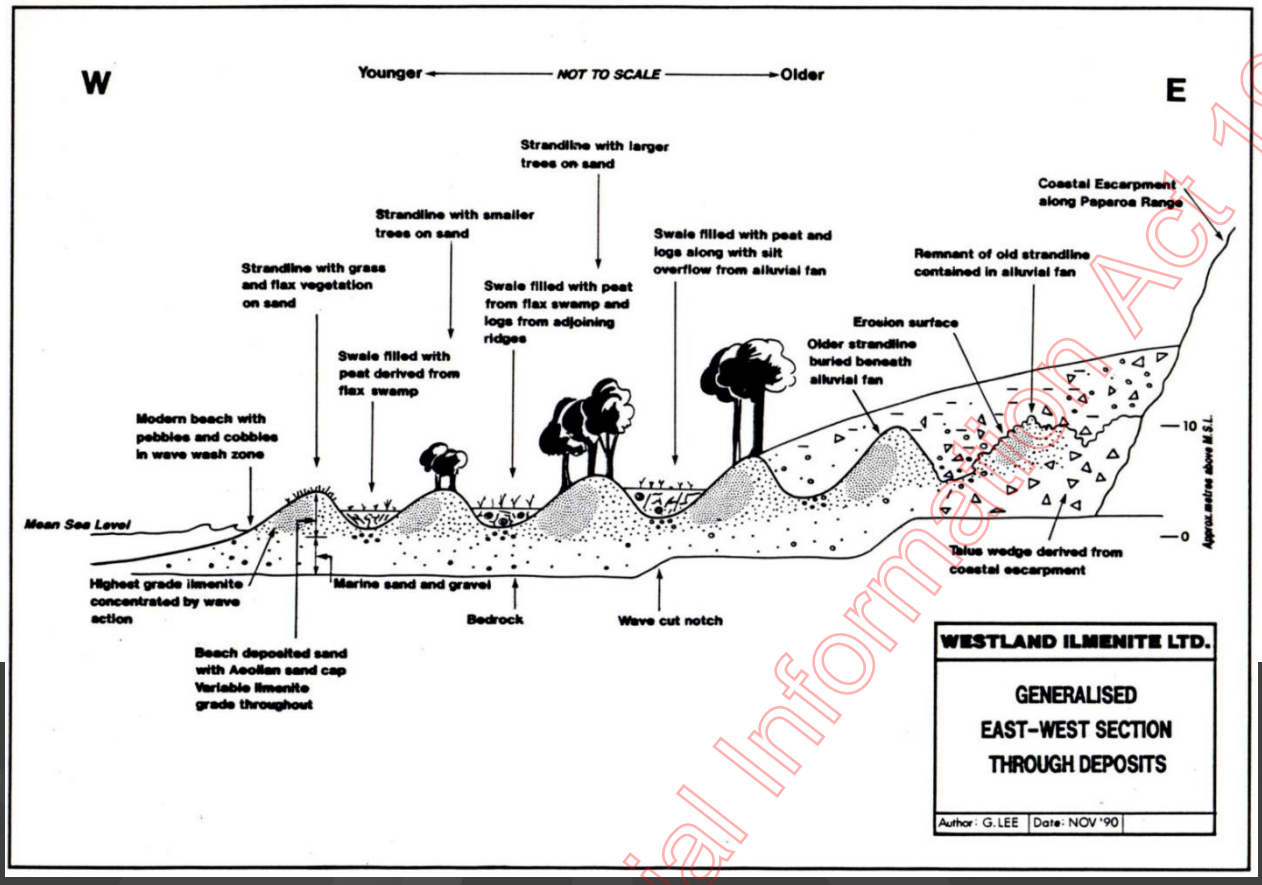

Figure 6: Generalised section prepared by Westland Ilmenite Ltd.

The beach strandline deposits (which overlay marine sands and gravels) are often capped by less mineralised aeolian sand. Both the wave and aeolian deposited mineralised sand is sometimes overlain by younger alluvial fan deposits of gravel and/or silt. The alluvial material is derived from the Paparoa Range to the east and it is particularly concentrated along the toe of the coastal escarpment where streams discharge onto and cut through the coastal plain.

3.3 Controls on Mineralisation

Heavy mineral sand (HMS) deposits form by the physical and mechanical concentration of bedrock minerals freed by weathering (Van Gosen et al., 2014). The key controls on mineralisation of an HMS deposit are:

- the supply of heavy minerals through physical weathering;
- the downstream persistence of the heavy minerals and their availability to the fluvial or marine environment; and
- a depositional sorting process to concentrate the heavy minerals into economic abundance.

Along the coastal areas, waves, tides and wind mechanically sort the mineral grains, naturally segregating high-density minerals from lower-density minerals and forming discrete thin layers and composite intervals of dominantly heavy minerals (Van Gosen et al., 2014). In a study of titanium HMS deposits, Force (1991) identified the foreshore and shoreface as the most significant sites of heavy-mineral accumulation (Figure 7). Aeolian dunes can also be significant sites of HMS accumulation but only after pre-enrichment at the foreshore (Force, 1991).

3.3.1 HMS Enrichment on the Beach Face

According to Force (1991), the upper part of the beach face — the swash zone (foreshore in Figure 7) — forms the principal zone of mineral separation. Breaking waves carry a charge of turbulent sediment-laden water from the lower, submerged beach face onto the swash zone. The wave decelerates and grains are deposited from turbulent suspension and spread across the surface of the swash zone as a function of their settling velocities. Grains with the highest settling velocities drop out first at the bottom of the swash zone. Coarser, light minerals are deposited with finer heavy minerals, resulting in a continuous spectrum of grain sizes for each mineral, with finer grains deposited toward the top of the swash zone. When backwash begins and accelerates downslope, the larger lighter grains are plucked from the bed, while smaller heavier grains are left behind. This process results in 'lag enrichment' of heavy minerals in the upper portion of the swash zone (Force, 1991). Further down on the swash face, a carpet of grains is transported down the swash zone as traction load in the flow. Finer-grained dense minerals travel in the bottom of the carpet and move more slowly than the coarser light minerals above. As a result, the lower part of the swash face commonly contains a thin, shallowly buried heavy-mineral concentration after the return of backwash to the surf zone (Clifton, 1969). This concentration can be traced in the subsurface to the surficial concentration on the upper swash face.

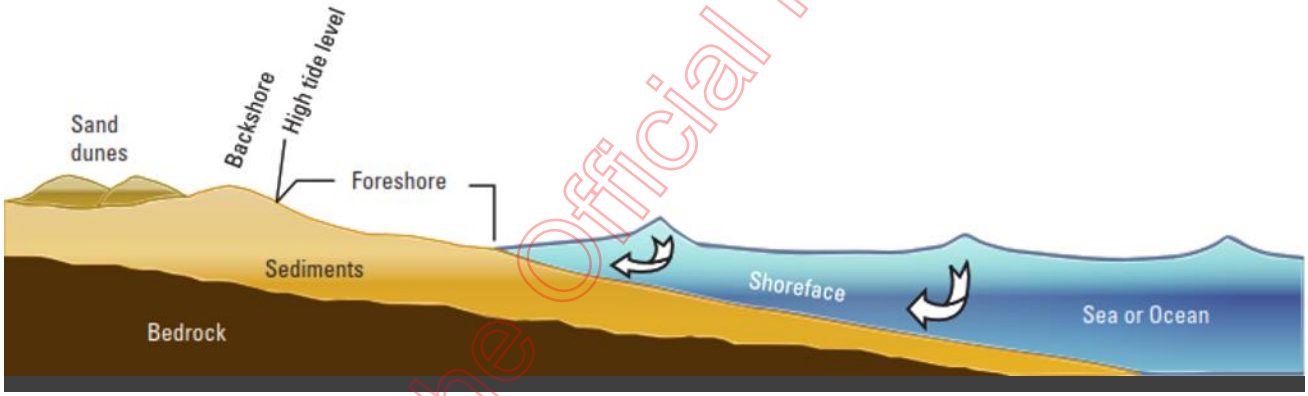

Figure 7: Idealised cross-section of a wave-dominated beach system. (Van Gosen et al., 2014).

Typically, the zone of shore break reworking is about 10–40 cm deep (Gallagher et al., 2016), but thicker and more expansive layers of enrichment form due to episodic variations in the depth and extent of the shore break zone. Climatic and tidal sea level variations cause the shore break to move up and down the beachfront and control the lateral extent of heavy mineral deposition (Figure 8).

Enrichment processes on the beach face operate most effectively during storms or other periods of high wave energy (Force, 1991). Brodie and McNinch (2009) observed that storms are associated with an initial phase of erosion, which gives way after the storm peaks to a phase of sediment redeposition. Gallagher et al. (2016) suggest that sediment accretion may be occurring in the foreshore even while storm waves and surge are working high on the beach, allowing for the accumulation and preservation of the coarser storm layer and HMS. Force (1991) notes that storm periods are optimal for the storage of HMS as onshore winds transport sand from the beach and deposit it in aeolian landforms above the high tide. Heavy minerals are transported preferentially because the upper swash zone, where heavy minerals are exposed, is driest

and least cohesive (Force, 1991 and references therein). Still, heavy mineral contents of aeolian HMS deposits are typically less than those of adjacent beach placers.

Particles left by the backwash of one wave are roughly in equilibrium with the next breaking wave, as the grain population left by each is the same except for the plucking of coarser constituents by backwash. The overburden of the buried heavy-mineral lamination is preferentially exposed to any erosion by succeeding waves. Many in-place enrichments show progradation of swash-face environments at constant sea level. Heavy mineral-rich layers in these deposits show an imbricate arrangement of former shore faces that dip seaward in a progradational succession (Force, 1991). Each layer enriched in heavy minerals represents an erosional change in beach profile to a storm-influenced configuration, and the overlying low-grade layer represents subsequent burial by fair-weather deposits. Where progradation of fair-weather deposits is sufficiently great, they will protect the deposits of one storm from the next storm, and the younger storm profile will be seaward of the older.

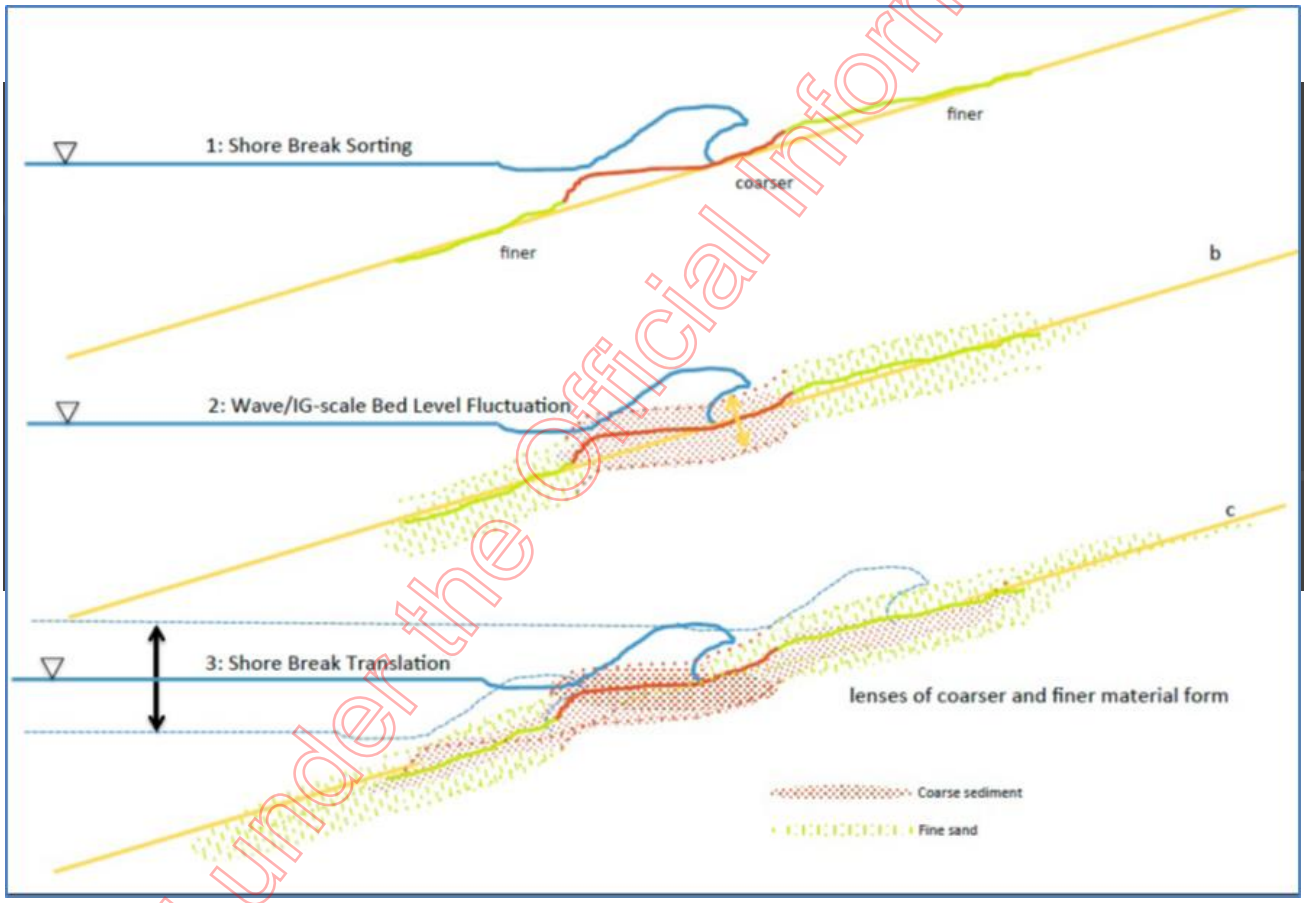

Figure 8: Shore break sorting mechanisms (Gallagher et al., 2016).

3.4 West Coast HMS deposits

HMS deposits are present along a 320 km stretch of the West Coast from the Karamea River in the north to Bruce Bay in the south (Christie and Braithwaite, 1997). The deposits consist of narrow, elongate Holocene beach and dune deposits, generally parallel to and backing the modern storm beaches (e.g. Barrytown, Suggate, 1989). Locally, HMS occur in successions of raised (interglacial) beach deposits that display variable degrees of cementation. The minerals found in the

HMS include garnet, ilmenite, magnetite, zircon, rutile, and traces of gold, monazite, cassiterite, beryl, uranothorite, scheelite, cassiterite, and xenotime (Hutton, 1950; McPherson, 1978; Minehan, 1989).

The heavy minerals are generally thought to originate from the Alpine Schist (Bradley et al., 2002; Ritchie et al., 2018). Between the Main Divide and the Alpine Fault, the metamorphic grade of the Alpine Schist increases from chlorite-greenschist facies near the Divide through biotite-greenschist facies to garnet-oligoclase amphibolite facies near the Alpine Fault. Metamorphic isograds are oriented parallel to the Alpine Fault (Bradley et al., 2002). The protolith of the schist ranges from quartzo-feldspathic to volcanogenic. White (1996) mapped two garnet isograds within the Alpine Schists finding zoned garnets that have grossular-spessartine-rich cores and thin rims of almandine-rich garnet.

3.4.1 Barrytown Mineral Deposits

The Barrytown flats contain marine placer mineral concentrations of heavy minerals (including ilmenite, garnet, zircon and gold) concentrated into a series of strandlines developed along, and behind, the present beachfront in sandy barriers transported by longshore drift and pushed up from the sea by wave action. Suggate (1989) identified 12 shorelines in a series of three sequences at Barrytown. Due to local conditions, many of the western strandlines have formed as en echelon ridges at an angle to the modern coastline rather than a series of long parallel ridges, as is the case with the easternmost ridges (Figure 9). These ridges follow the dip of the beach towards the sea (westwards) at about 5° to 10°.

Ilmenite concentrations occur in two somewhat different beach deposits. The higher, older easternmost deposits form long strands, parallel to the escarpment. Only erosion remnants of the highest beach remain, however long stretches of lower strandlines remain separated by a swale that contains no significant ilmenite mineralisation (Figure 6).

The gold occurring in the Barrytown Flats is typical of the West Coast beach deposits that contain essentially reworked detrital gold being continuously washed downstream by the rivers and reconcentrated in the active surf zone together with the other heavy minerals, such as ilmenite and garnet, in lenticular black sand leads. This form of gold is generally very fine-grained.

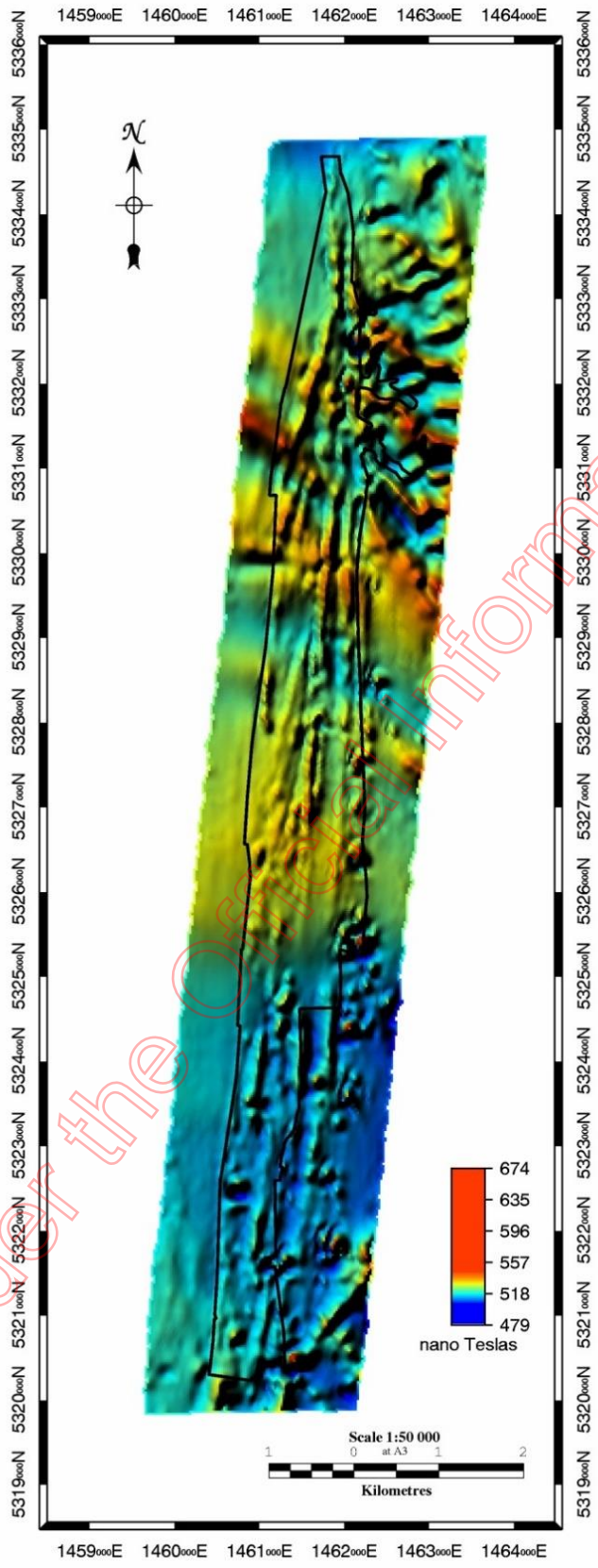

Figure 9: Sun-shaded Total Magnetic Intensity, highlighting the strandlines in the Barrytown deposit (Vidanovich 2008).

3.4.2 Barrytown Mineralogy

Newman (1989) states that the Barrytown sands are characterised by a very wide range of minerals and by mineralogical and textural immaturity which is demonstrated by the lack of chemical weathering. Barrytown sand is best described as a quartz, feldspar, lithic sand with a variable heavy mineral content. The sand is immature, as demonstrated by the large number of composite particles and the presence of minerals which have low resistance to mechanical and chemical breakdown. Apart from quartz, feldspar and lithic particles (mostly grey schist fragments) the sand typically contains ilmenite (s 9(2)(b)(ii)%), garnet (s 9(2)(b)(ii)%), magnetite (s 9(2)(b)(ii)%), zircon (s 9(2)(b)(ii)%), epidote s 9(2)(b)(ii)%, heavy silicates (chlorite, biotite, amphiboles, pyroxenes, actinolite – s 9(2)(b)(ii)%), composite heavy particles (s 9(2)(b)(ii)%), leucoxene (s 9(2)(b)(ii)%), sphene (s 9(2)(b)(ii) s 9(2)(b)(ii)%), rutile (s 9(2)(b)(ii)%) and monazite (s 9(2)(b)(ii)%).

The results presented in Table 3 below are for the 6.4amp magnetic fraction only. The heavy minerals (specific gravity >2.9) listed below were determined by McNulty for the 6.4amp magnetic fraction from composited samples of holes NBHP8 & 9 and holes NBHP12 & 13 and reported in Lee (1989). This fraction will include most of the ilmenite and a substantial amount of the garnet. Some of the garnet will report to the non-magnetic fraction, it may have an economic value depending on the mineralogy (garnet sub-species) and the nature of the grains (whether single mineral or with attachments of other minerals in composite particles).

Table 3: 6.4 Amp Magnetic Fraction Mineralogy

s 9(2)(b)(ii)

* *Silicates are mainly pyroxenes, amphiboles, biotite, and chlorite*

3.4.2.1 Ilmenite Properties

Ilmenite ($FeTiO_3$) at Barrytown is generally located within sands and gravelly sands that are between 3–4 m thick and underlain by gravels with a low ilmenite content. The surface layers of clay and swamp peat ('overburden') may be up to 2.5 m thick. Burgess (1989) described the characteristics of the ilmenite deposit to include:

- low TiO_2 levels (47%);
- high Ferrous (FeO): Ferric (Fe_2O_3) ratios;
- high SiO_2, Al_2O_3, CaO, and P_2O_5 levels; and
- composite nature of the ilmenite due to its metamorphic origin.

The average ilmenite analysis from Burgess (1989) is presented in Table 4. The ilmenite is of 150 µm average grain size and it contains abundant inclusions of albite, garnet, quartz, and apatite. The ilmenite chromium (Cr_2O_3 = 0.02%) and vanadium contents (V_2O_5 = 0.02%) are low. A significant portion of the ilmenite occurs as composite or aggregated grains with attachments of other minerals, mainly quartz and feldspars.

Table 4: Average Barrytown ilmenite analysis from Burgess (1989).

Oxide	Wt%
TiO_2	46.8
Fe_2O_3	4.80
FeO	36.7
MnO	1.64
Al_2O_3	2.33
SiO_2	5.87
V_2O_5	0.04
MgO	0.25
CaO	0.99
Cr_2O_3	0.03
P_2O_5	0.24

3.4.2.2 Garnet Properties

The key industrial properties of garnet are density and hardness, making almandine is the most superior variety. It has a hardness of 7.5 (the hardest of all garnets) and a specific gravity of 3.9–4.2. Almandine is formed in schists as a result of high-grade regional metamorphism and has a better-formed crystal structure than does almandine formed in gneisses which can be more brittle.

It is the almandine sub-species that occurs in the greatest abundance in the Barrytown deposit, and this is the garnet most frequently used for industrial applications.

3.4.2.3 Zircon Properties

The Barrytown zircon can be classified as a premium grade product based on the low Fe_2O_3 and TiO_2 levels.

3.4.2.4 Gold Properties

At Barrytown, gold occurs as fine-grained flakes. It is to be noted that the project will remain financially viable without recovering any gold.

4 Historical Mining and Exploration

The project history has been described in detail in previous reports submitted to NZP&M (e.g. MR5604) and in BJV's appraisal application in 2018. A summary of previous exploration work is provided in Table 7.

The project area has been historically of interest for gold and more recently ilmenite. The earliest mining records date back to 1867, when the first goldrush occurred in the Canoe Creek area. Historical prospecting in the 1870s involved small sluice operations that worked the terraces along the Barrytown Flats for gold. Gold dredging operations were active in the southern portion of the tenement area during the 1930s and 1940s.

Further exploration was conducted by NZ Gold Options (1931–32), NZ Prospecting and Mining Ltd (1935–37), Whites Electric Dredging Company (1936–41), and Barrytown Dredging Company Ltd (1937–45). NZ Prospecting & Mining drilled 450 holes (5–10 m depth) for gold exploration in the late 1930s, concentrating on the central and northern parts of the tenement area.

In later years, investigation of ilmenite potential has been the objective of exploration and mining proposals with Carpentaria Exploration Company (a subsidiary of Mt Isa Mines Ltd), Mineral Resources (NZ) Ltd and Amax Exploration NZ Ltd, Fletcher Challenge (Grampian Mining Company Ltd and Fletcher Titanium Products Ltd), and North Broken Hill Peko Limited (North Ltd, and Westland Ilmenite Ltd), having completed assessment work. Rio Tinto Ltd acquired North Ltd and all its assets world-wide, including the Barrytown project and the company Westland Ilmenite Ltd, in August 2000.

Table 5: Summary of historical exploration at Barrytown.

COMPANY	PERIOD	MINERAL	DRILL HOLES	DRILL TYPE	BULK TEST PITS
NZ Gold Options	1931–1932	Gold	40		
NZ Prospecting & Mining Ltd	1935–1937	Gold	570	5' x 6.5" diam Keystone	
Whites Electric Dredging Company	1936–1941	Gold	11		12 shafts
Barrytown Dredging Company	1937–1945	Gold	229		
Carpentaria Exploration Company	1966–1976	Ilmenite	531	100mm & 150mm churn	
Mineral Resources (NZ) Ltd	1980–	Gold & Ilmenite			
Amax Exploration NZ Ltd	1984	Gold & Ilmenite			
Fletcher Challenge (Grampian Mining Company Ltd)	1985–1988	Ilmenite	136	150mm churn, & 50mm hand auger	
North Limited (Westland Ilmenite Ltd)	1989–2000	Ilmenite	95 & 715	Hand auger Aircore	26
Rio Tinto Ltd	2000–2005	Ilmenite	Nil	Nil	Nil
NZ Gold Ltd	2005–2009	Gold & Ilmenite	19	Auger	

5 Recent Exploration under Exploration Permit 51803

Earlier exploration has been fully described in technical reports previously provided to NZP&M (e.g., MR5604) and in the appraisal extension of duration application submitted in 2018. Hence, detailed reporting on the 2015 drilling progamme, 2016-2017 drilling programme, metallurgical testwork, preliminary garnet studies, initial resource estimation and preliminary technical studies is not repeated here. A summary of previous exploration completed under EP 51803 is provided in Table 6.

The February 2018 Mineral Resource report is included in this application as Appendix 2 (Lee & Burlet, 2018a) (and has been previously provided to NZP&M). That report includes a detailed summary of the previous exploration and describes augmentation of the project database.

In 2020, BJV completed internal mining studies which involved input from local mining and mine planning engineers (s 9(2)(a)). This has resulted in BJV applying for resource consents and this mining permit application. Results from the mining study are detailed further in section 7.1.1.2.

Table 6: Summary of recent exploration completed under EP 51803.

Company	Period	Mineral	Drillholes	Drill Type	Other
Westland Titanium Ltd	2010–2013	Gold	105	Aircore & hand auger	
BJV	2015	Gold, Ilmenite	31	Aircore	
BJV	2016	Garnet, Ilmenite	154	Aircore	
BJV	2017	Ilmenite, Garnet, Zircon, Gold			Metallurgical testwork
BJV	2018				Resource Estimate, Pre-feasibility Study
BJV	2019-2020				Internal mining studies

6 Mineral Resources within Mining Permit Application

In 2018, BJV commissioned s 9(2)(a) and H&S Consultants Pty Ltd (H&SC) to prepare a Mineral Resource estimate for the Barrytown deposit. The Mineral Resource was classified and reported in accordance with the JORC Code (2012). The mine plan detailed in this application has been based on the outcomes of that estimation.

The report by s 9(2)(a)H&SC (see Lee & Burlet, 2018a) estimated an Indicated and Inferred Mineral Resource for ilmenite over most of EP 51803 and quantified Exploration Targets in respect of garnet, zircon and gold (since there has been insufficient exploration completed in respect of those minerals to estimate a Mineral Resource). The Mineral Resource and Exploration Targets prepared by s 9(2)(a)H&SC were classified and reported in accordance with the JORC Code (2012) and its accompanying guidelines. The Exploration Targets are conceptual in nature and are represented using ranges. The Mineral Resources and Exploration Targets for EP 51803 have been reported to NZP&M in MR5604. The Mineral Resource report is also included here as Appendix 2 and details the input data, methodology, quality control, and validation of the resource or deposit and a statement of the criteria used to determine and classify the estimates. The resource model has also been provided as part of this application.

The concept of 'eventual economic extraction' must be applied to resource estimates to make them reportable as Mineral Resources under the JORC 2012 Code. In this case, estimated maximum (deepest) block bottoms are within ~12–15 m of the surface, which s 9(2)(a)H&SC considered to be a reasonable depth for a potential mineral sand mining operation.

6.1 Total Mineral Resources within MP Application

NZP&M typically require a tier 1 mining permit application to be supported by a mineral resource of at least an Indicated classification that has been defined in accordance with a recognised code. BJV's Barrytown Indicated Resource only covers ilmenite mineralisation in some discrete sections of the mining permit application area. However, BJV has estimated Inferred Resources for ilmenite over the entire application and has planned a resource drilling programme with the objective of obtaining sufficient data that will allow BJV to increase the confidence and classification of the ilmenite Mineral Resources. The proposed drilling will also evaluate the garnet, zircon and gold to obtain sufficient data for the estimation of garnet, zircon and gold Mineral Resources that can be classified and reported in accordance with the JORC Code (2012). These are currently evaluated as being at Exploration Target level.

It is expected that BJV will be able to complete the first stage of the proposed drilling program on EP 51803, namely high-density infill drilling of the initial mining area, totalling approximately 115 ha (known as the Coates South block – see Section 6.2), while this application is under assessment. The objective of the drilling is to upgrade the ilmenite Mineral Resource and establish a garnet, zircon and gold Mineral Resource over that area. These will underpin a Feasibility Study for the initial mine development at Coates South.

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6.1.1 Ilmenite Mineral Resources

In support of this application, BJV has tabulated the Mineral Resources (reported in accordance with the JORC Code) for ilmenite within the application area. Note that the below tabulations are not standalone; they must be taken in conjunction within the scope and boundaries as reported in Lee & Burlet (2018a). BJV intends for these figures to be considered as the total in-ground resources within the permit area (irrespective of the reporting limitations of any resource reporting or classification code), as all previous estimations of the deposit size have been smaller than that determined in the 2018 estimation.

Table 7: Mineral Resources within MP application, breakdown by classification, 4% Ilmenite Cut-off Grade.

s 9(2)(b)(ii)	

6.1.2 Exploration Targets – Garnet, Zircon

There has been limited sampling and quantification of zircon and garnet during the exploration of the Barrytown mineral sand deposit. The level of information and data quantifying the zircon and garnet is lacking to the extent that Mineral Resources cannot be estimated. However, in accordance with the JORC Code (2012), it has been possible to discuss the zircon and garnet in terms of target size and type as an Exploration Target (Table 8). The basis for the Exploration Target over EP 51803 was originally detailed in Lee & Burlet (2018a) (see Appendix 2). BJV intends for the maximum figures to be considered as the total in-ground resources for garnet and zircon within the permit area (which is determined irrespective of the reporting limitations of any resource reporting or classification code).

The limited data available for garnet and zircon indicate that the ratios of

- ilmenite:zircon range between a minimum of s 9(2)(b)(ii) and max of s 9(2)(b)(ii)
- ilmenite:garnet range between a minimum of s 9(2)(b)(ii) and max of s 9(2)(b)(ii)

The Exploration Target zircon and garnet grade ranges were determined using the lower and upper ratios of ilmenite:zircon and ilmenite:garnet (within the same zone of mineralised sand that the ilmenite was modelled – using a 4% ilmenite Cut-off Grade). The mineralised tonnage range was determined using the estimated ilmenite tonnage as the maximum (at 4% ilmenite cut-off as in the resource estimate) and using an arbitrary 50% of that as the minimum (e.g., for a situation where the estimated ilmenite mineralisation contains low-grade, sub-economic garnet and zircon).

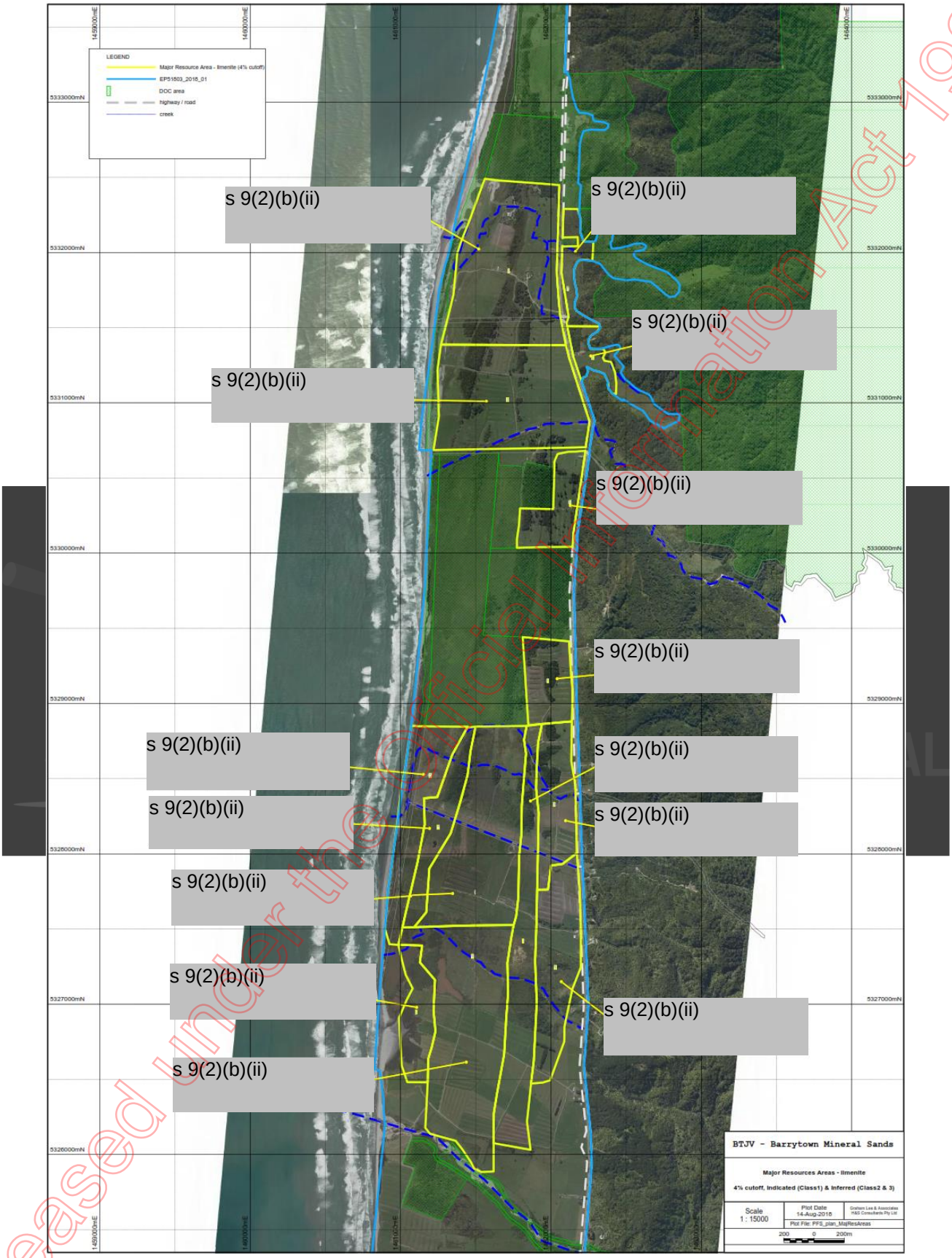

Figure 10: Major Mineral Resource Areas (Ilmenite) within MP application (excluding DoC land).

Table 8: Exploration Target of Zircon and Garnet with MP Application

s 9(2)(b)(ii)

6.1.3 Exploration Target – Gold

Similar to the limitations on zircon and garnet, the amount of information and data quantifying gold at Barrytown is insufficient for the estimation of a Mineral Resource. In accordance with the JORC Code (2012), it has been possible to discuss the gold in terms of target size and type as an Exploration Target (Table 9). The basis for the Exploration Target over EP 51803 was originally detailed in an August 2018 supplementary report (see Appendix 2 - Lee & Burlet, 2018b). The potential quantity and grade of the gold Exploration Target are conceptual in nature. There has been insufficient exploration to determine a mineral resource for the gold at Barrytown and it is uncertain if further exploration work will result in the estimation of a Mineral Resource for gold.

Table 9: Exploration Target of Gold within MP application at 25 mg/m^3 Cut-off Grade

s 9(2)(b)(ii)

The reporting of the gold as only an Exploration Target (and not a Mineral Resource) was based on the following reasoning:

- Issues with the Fletcher Titanium's BHH and BPR holes were identified. These issues resulted in the holes not being used.
- Hence, the only gold information relied on is that from MR1349 (Hancock, 1980). Although that report explains the historical gold sampling and collates that data, there are issues with the gold data that preclude it from being used to develop a mineral resource estimate under JORC Code (2012) including:
    - use of collated gold data (derived from MR13498, Hancock (1980)) wherein a lot of detail on the gold data is lost/not available in detail;
    - sampling of entire hole for gold i.e. one sample per hole;
    - likely issues with the sampling due to rising sands but not documented/scantly documented compared to the ilmenite sample logging;

- sampling that included overburden material in the sample for a large part of the data, i.e. no sample break on lithology changes;
- lack of sampling QAQC and other sampling technique details; and
- Hancock's (1980) issues with the quality of the New Zealand Gold Options and Carpentaria gold data.

The grades shown in Table 9 do vary from location to location within the deposit; the grades will change according to many factors controlling the original deposition of the gold, plus other heavy minerals (ilmenite/garnet/zircon) in the beach shoreline environment.

6.2 Coates Blocks - Ilmenite Mineral Resources

An estimate of the Mineral Resources for ilmenite confined to the Coates blocks (Nikau Deer Farm Ltd - Figure 2) is provided in Table 10. Coates South refers to the 115 ha initial mine area covered in the recent resource consent applications (Figure 3). Coates North refers to a northern block (57 ha) also covered by the access arrangement. Infill drilling has been planned for both Coates' blocks (see section 9.1.5.2.). Note that the below tabulations are not standalone; they must be taken in conjunction within the scope and boundaries as reported in Lee & Burlet (2018a) (Appendix 2).

The material is ranked in order of relative confidence, with Class 2 being more confident than Class 3 in the Inferred category.

Table 10: Mineral Resources within Coates blocks, breakdown by classification, 4% Ilmenite Cut-off Grade.

s 9(2)(b)(ii)

7 Mine Feasibility

BJV has previously completed an internal scoping study and a pre-feasibility study (November 2018) to determine whether the estimated Mineral Resources in EP 51803 are likely to support a viable mining project at Barrytown. These studies have assessed the preliminary mine planning and engineering evaluations based on the likely conversion of the mineral resource into possible mining reserves. These studies have identified the critical issues and risks to be resolved during final feasibility.

There is no guidance in the Crown Minerals Act or the Minerals Programme on how NZP&M considers the different levels of feasibility study, or how they are applied to good industry practice. This contrasts with the JORC Code which provides broad definitions for technical studies.

Studies completed by BJV to date do not meet the definitions from the JORC Code (2012). It is noted that BJV has not yet estimated a Mineral Reserve for the project. BJV plans to undertake a Feasibility Study upon completion of the drilling and testing program which is anticipated to be completed within the next 12 months. The drilling programme and Feasibility Study have been included in the proposed work programme for this mining permit application.

On 17 December 2020, BJV submitted resource consent applications to the West Coast Regional and Grey District Councils to mine the Coates South block.

7.1 Resource Extraction Approach, Methodology and Work Plan

7.1.1 Mining Methodology and Design

BJV is opting for a staged approach to mining the deposit. The first stage is to mine heavy mineral sands from the Coates South block, located in the south near Canoe Creek, where an access arrangement has been finalised and a resource consent application has been submitted. The operation at Coates South will operate in tandem with resource drilling over the northern part of the mining permit application.

The mining method selected for the operation includes conventional mineral sands mining methodology that has been employed for many years worldwide. The mining method proposed is similar in nature to surface-mining (or contour-mining), which is commonly used to mine material that lies in a narrow bed relatively close to the surface. The bed of material can be removed and the surface restored such that, when done properly, the site can resemble what it was prior to mining. This mining process is suitable for fairly flat, shallow bedded deposits and is similar to what frequently occurs within the West Coast alluvial gold projects.

At Barrytown, the mineralised layer is covered by an even thickness of overburden composed of topsoil and unconsolidated beach sand. The proposed mining operation includes the use of a contract fleet of excavators and conventional dump trucks.

A sequential series of activities will be carried out involving clearing the area to be mined, mining, and rehabilitating the area that has been mined (Figure 11):

1. **Topsoil Removal** – Up to 0.5 m of topsoil will be removed by hydraulic excavator and dump trucks prior to mining. This material will be stockpiled adjacent to mining operations for use in rehabilitation at the completion of mining

activities. In areas where potential contamination with noxious/pest plants could occur (e.g., gorse seed or other material), it may be undesirable to recover such contaminated material for later use.

2. **Overburden Removal** – The unconsolidated beach sands covering the stand lines of heavy minerals will be removed by hydraulic excavator and articulated dump trucks and deposited and mixed with the tailings from the wet concentrator plant.
3. **Heavy Mineral Mining** – The strand lines will be mined by an excavator and deposited into the MFU which is similar in design to a land-based gold screen. The land-based MFU will be used to complete a primary screening of the mineral sands. This screening will occur via excavated material being fed through a 'grizzly' screen to remove the oversized material. The finer material will then be washed through a rotary trommel to further reduce the particle size.
4. **Processing -** Material from the MFU will be pumped to the processing plant where it will be stored in a tank before being processed through a spiral plant. Reject material from the spiral will be captured in a tank and pumped back to the mining void for use in backfilling.
5. **Overburden and Tailings replacement** – Tailings will be discharged from the separation plant and the mining field unit back to the mining void. The overburden which is removed in phase two will be placed over the tailings from the separation plant and returned to the mining void. The dumped material will be levelled and contoured.
6. **Topsoil Replacement** – After the overburden has been dumped and contoured, topsoil which has been stockpiled or windrowed will be spread across the area.
7. **Rehabilitation** – the topsoil will be contoured (Figure 12) and raked prior to reseeding with appropriate grass species for pasture development in time for the next growing season. Fertiliser may be required to ensure that appropriate pasture cover is achieved.

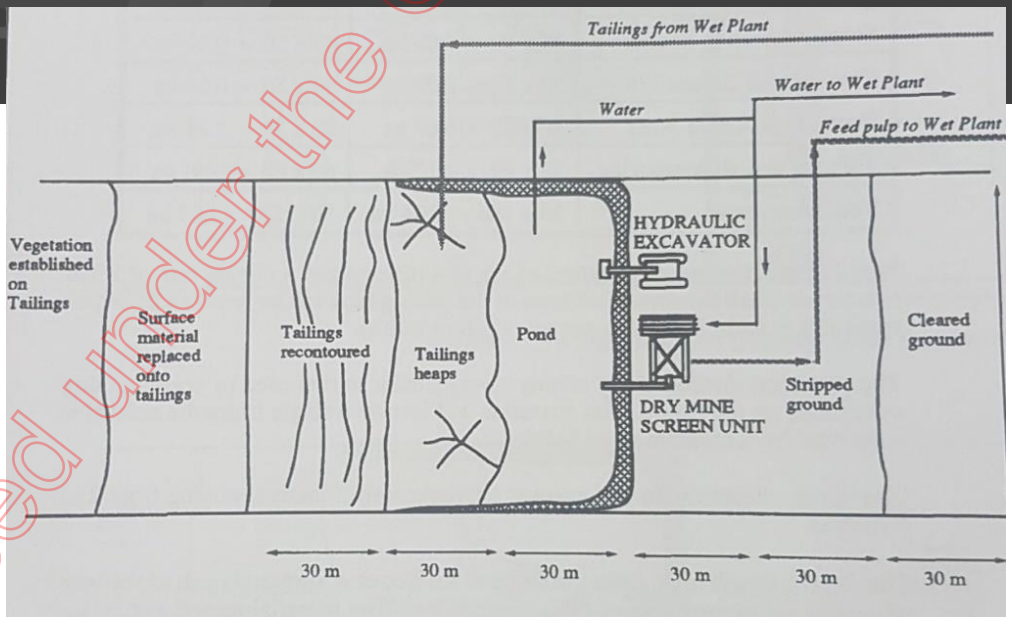

Figure 11: Generic schematic of proposed mining methodology and rehabilitation.

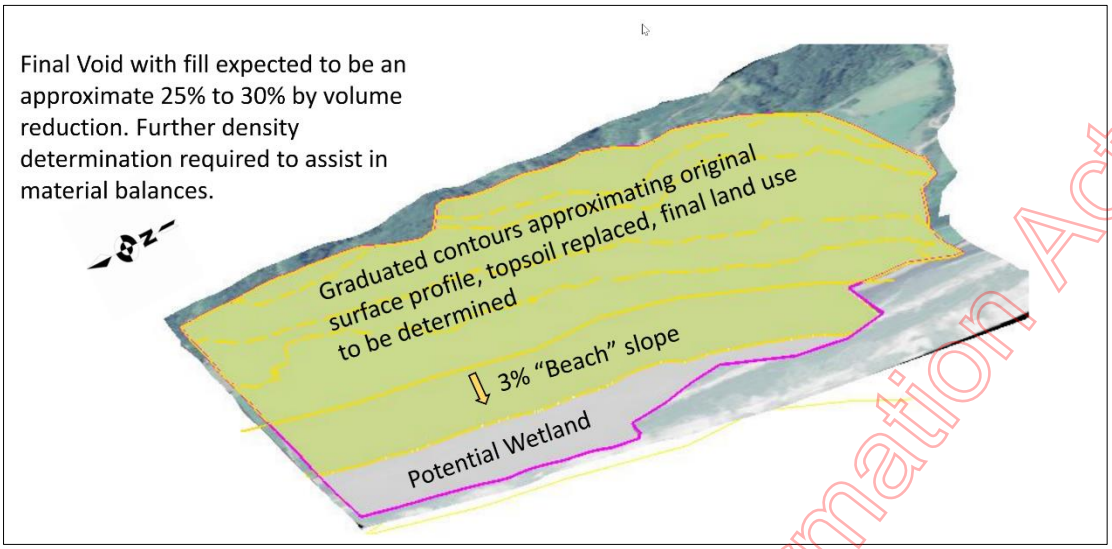

Figure 12: Schematic of rehabilitation contouring

7.1.1.1 Mine Commencement, Operation and Progression

A starter pit will be excavated to create a void within which the MFU will be placed to start mining and for which tailings can then be placed upon commencement of processing. This will occur in the south-western corner of the application area. The start-up activities will also involve the construction of the access and internal roads.

In general, mining will be undertaken in a west to east progression (up gradient), as this will help with controlling water within the mining void. This will involve lineal mining of 100 m wide strips advancing west to east and south to north. The process will be on-demand to maintain one block of exposed mineralised zone at a time.

An initial life of mine (LOM) of 13 years is anticipated.

7.1.1.2 Mining Method Rationale

In 2020, BJV completed an internal mining study which involved input from experienced local mining and mine planning engineers. The study investigated three possible mining options. BJV requested evaluation of the mineable resource, development of a scheduled mine plan and proposal of mining options to produce a HMC and gold circuit.

The assessment highlighted several potential issues, and possible solutions were suggested. After evaluating the options, BJV determined that the best option was to operate in a similar manner to a traditional West Coast alluvial gold mining operation; mining material with a hydraulic excavator, feeding into the MFU for primary screening (similar in design to a land-based gold screen) to remove unwanted/oversize material and subsequent pumping to a spiral processing plant for primary processing only (see Section 7.1.1). This methodology will result in initial low capital costs, and relatively low operating costs, whilst employing local labour and equipment during the early stages of the operation.

BJV's reasons for selecting the chosen method described in this application include:

- ability to achieve a 1 MT excavation operation per annum, with 250 Kt of HMC produced from that run of mine (ROM) volume;
- option minimises the Capex and Opex by employing proven and accepted techniques common in New Zealand alluvial mining;
- uses "on demand" stripping to maintain one block of exposed mineralised zone;
- developed a schedule to illustrate complete extraction of grade zone;
- reduced large annual grade fluctuations;
- uses natural drainage to mined out area when operating west to east;
- the proposed low strip ratio assists in rapid mineral exposure, which can be enhanced by start-stop contract mining of overburden.

Table 11: Summary Design Criteria

Parameter	Value
Annual throughput (tpa)	1,000,000
ROM Ore Analysis	s 9(2)(b)(ii)
Garnet (wt%)	
Ilmenite (wt%)	
Zircon (wt%)	
Slimes: minus 32 microns (wt%)	
Gold (mg/t)	
Annual HMC production rate (tpa)	250,000
Grade of HMC	
HMC: Total (VHM+Trash) (%)	s 9(2)(b)(ii)
Ilmenite/Zircon/Rutile (%)	
Garnet (%)	
Recovery to Product	
Ilmenite/Zircon/Rutile (%)	
Garnet (%)	

7.1.2 Mineral Processing

The initial project plan is to produce a Heavy Mineral Concentrate (HMC) for export sale.

Previous trial mining and processing work in the 1990s and recent work by BJV (specifically the AML testwork reported in MR5499 and included as Appendix 3) has demonstrated that the HMC can readily be separated and upgraded to higher value, downstream products using conventional mineral sands and gold processing technology. It is of note that the 2017 test studies did investigate downstream processing to isolate the components of the HMC.

The purpose of the (primary) processing plant is to receive the screened material from the MFU and separate it to a final product of HMC (containing predominantly three commodities: ilmenite, garnet and zircon). Alluvial gold will also be separately extracted as part of the process.

The processing plant will be a modular spiral separation plant. Mineral sands received from the MFU will be processed through the spiral separation plant where gravity is used to separate the target minerals from the reject material. Multiple passes or multiple stages of spirals will be required. This material will be partially saturated. Reject material from the spiral will be captured in a tank and pumped back to the mining void for use in backfilling.

HMC produced from the spirals will be pumped to the storage area in preparation for load out.

The HMC that is pumped to the Minerals Handling and Stockpiling Area will be required to be dewatered. This is proposed to occur via use of a cyclone. With the slurry water then discharged to a water treatment pond for settling prior to discharge.

7.1.2.1 Downstream Processing

As noted above, the initial project plan is to produce a Heavy Mineral Concentrate (HMC) for export sale. However, previous trial mining and processing work in the 1990s demonstrated that the mineral resources in Barrytown can be upgraded to higher value, downstream products. In 2017, BJV commissioned two metallurgical testwork studies that sought to isolate potential product streams using conventional physical separation processes. AML's processing of the HMC was able to isolate both clean ilmenite and garnet products through a simple circuit utilising electrostatics and magnetics.

Further metallurgical characterisation and processing investigations will be undertaken to refine the separation process. This has been included as an activity in the proposed minimum work programme (see Section 9.1.5.5).

7.1.2.1.1 *AML Testwork Summary*

The AML 2017 testwork was conducted on four composite samples prepared from sub splits of individual drill samples (See Appendix 3). The composition of the testwork composites were defined by the client to represent four lateral zones of different strata across the ore body.

The process flowsheet was established processing the highest-grade composite (representing the upper strata) and was found to be suitable for processing of the remaining composite samples (Figure 13). The results of the gravity processing indicated that a high grade HMC could be produced through a simple circuit. The high prevalence of trash mineral, principally para-magnetic aluminosilicates, in the ore necessitated the sacrifice of recovery of TiO_2, and likely garnet, to ensure that product grades could be achieved in the downstream separations. The processing of the HMC was able to isolate both clean ilmenite and garnet products through a simple circuit utilising electrostatics and magnets.

The grades of the ilmenite products produced in the processing of the composites were highly comparable regardless of feed grade. The grades of TiO_2 varied between s 9(2)(b)(ii) and s 9(2)(b)(ii) (Table 12). The Fe_2O_3 by XRF in the ilmenites were approximately s 9(2)(b)(ii) respectively for the four composites. The FeO by titration indicated close to s 9(2)(b)(ii) for all products. The grades of Al_2O_3 and SiO_2 in the ilmenites were approximately s 9(2)(b)(ii) and s 9(2)(b) respectively for all three composites. A visual assessment of the ilmenites indicated that this was associated with surface coatings and joined grains rather than discreet

contaminant mineral. It is unlikely that the grades of these contaminants could be further reduced through conventional processing without considerable loss of TiO_2 and mass.

Yields to garnet products varied between the four composites (Table 13). Calculating the recoveries of garnet to product was not possible with the data captured in the testwork due to sample size. All garnet products had free silica of less than s 9(2)(b)(ii) based on HLS. All garnet products were visually similar, predominantly classic rose-coloured almandine but with numerous black translucent and opaque grains identified by SEM as grossular and spessartite.

Table 12: Ranges of grades and recoveries of ilmenite products produced in the processing of tested composites.

s 9(2)(b)(ii)

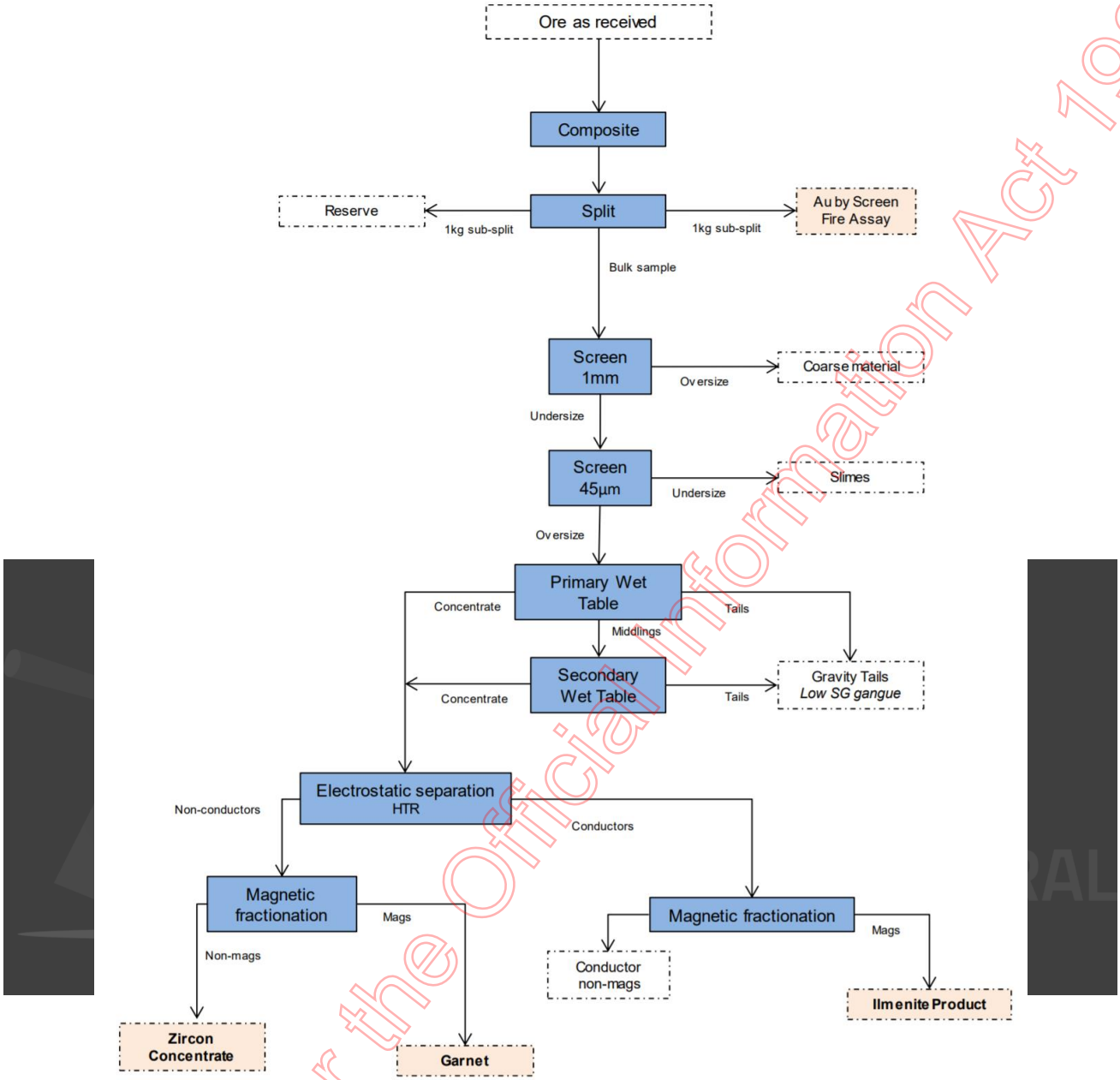

Figure 13: AML process flowsheet incorporating stages of screening, gravity, electrostatic and magnetic separations.

The grade of ZrO_2 in the composites varied between s 9(2)(b)(ii) and s 9(2)(b)(ii). While some concentration of the zircon was achieved in the processing the yields to concentrates and the grade of the concentrates were low. The highest-grade concentrate had a ZrO_2 grade of s 9(2)(b)(ii) equating to a zircon content of approximately s 9(2)(b)(ii). The recovery of ZrO_2 was only s 9(2)(b)(ii) and the yield s 9(2)(b)(ii) of the gravity feed mass.

The particle size distributions indicated the products had narrow size ranges and were fine with p80s (80% passing size) of s 9(2)(b)(ii) or below and D50s (50% of the rocks by weight have an equivalent spherical diameter greater than or equal to) s 9(2)(b)(ii) or below.

Table 13: Ranges of grades and recoveries of garnet products produced in the processing of tested composites

s 9(2)(b)(ii)

7.1.2.2 Process Flow Description

Processing will entail a modular spiral separation plant using industry proven and standard unit processes including screening and slurry pumping and gravity separation. The aim is to achieve 1 MT excavation per annum. The plant design throughput is 150 tonnes run of mine (ROM) per hour. Water is the transport medium for the sand and no major reagents or chemicals are required for the process.

The processing facilities are made up of the following key components:

1. MFU;
2. spiral processing plant;
3. tailings disposal system;
4. HMC;

7.1.2.2.1 *Mining*

The run of mine (ROM) ore will be extracted by a hydraulic excavator and fed into the MFU.

7.1.2.2.2 *Mining Field Unit*

The MFU will be used to complete a primary screening of the mineral sands. The land-based MFU will be portable and skid-mounted and located adjacent to the mining area. The skid-mount will allow it to be moved as the mining progresses. It consists of a feed bin with a grizzly that feeds a belt feeder that in turn feeds the rotary trommel.

The screening will occur via excavated material being fed through a 'grizzly' screen to remove the oversized rocks and stones. The finer material will then be washed through a rotary trommel to further reduce the particle size.

The target particle size will then be directed to a slurry tank and will be then be pumped to the spiral processing plant for primary processing of the HMC concentrate.

7.1.2.2.3 *Spiral Processing Plant*

Material from the MFU will be pumped to the (primary) processing plant. Here it will be stored in a tank before being processed through the spiral plant. The spiral processing plant uses gravity to separate the target minerals from the reject material. Multiple passes or multiple stages of spirals will be required.

HMC produced from the spirals will be pumped (as a slurry) to the storage area in preparation for load out. Reject material from the spiral will be captured in a tank and pumped back to the mining void for use in back filling.

7.1.2.2.4 *Tailings Disposal System*

Reject material from the spiral plant and the MFU will be captured in a tank and pumped back to the mining void for use in backfilling. This will be undertaken on a progressive basis to ensure that the disturbed area remains as low as possible, with contingency built into the consent conditions to ensure that the extended periods of wet weather do not impact on compliance

The operational pond will supply process water and will be returned to the same, minus the water required to slurry the HMC to the minerals handling and stockpile area.

7.1.2.2.5 *Heavy Mineral Concentrate*

Following the processing that occurs at the MFU and processing plant, the HMC will be pumped to a stockpile area for dewatering. Dewatering will occur via cyclones, this process water will be discharged into short-term settling ponds prior to being discharged via overland flow.

The then dry HMC will be stockpiled in concrete bins that will be covered to ensure the material remains protected from moisture.

Loading of the material will occur via a front-end loader to road trucks for transport to market.

Table 14: HMC parameters for 24/7 processing shift.

s 9(2)(b)(ii)

s 9(2)(b)(ii)

7.1.3 Conceptual Scheduling

BJV has prepared a preliminary schedule for the LOM (13 years) of the proposed initial mining operation. This schedule is conceptual in nature and is subject to change following planned drilling and further technical studies.

Table 15: Preliminary schedule of mining and processing using presumed start date of production from May 2021 (will be subject to change and included for information purposes).

s 9(2)(b)(ii)

7.1.4 Site Plan

As previously noted, the MFU will be portable and skid mounted. Approximately 1 ha of ground will be prepared ahead of the mining plant in order to allow production to be continuous. No mining will occur within 200 m of the dwelling located at 3261 Coast Road. This is due to mineral grades, depth of overburden and environmental considerations.

The processing plant will be located such that any noise from its operation will have no impact on any of the affected parties. Due to the nature of the processing plant and the actual and potential effects on neighbouring property owners in relation to noise and water use, the plant will not operate any closer than 700 m to the dwelling located at 3261 Coast Road, State Highway 6 Barrytown.

The HMC produced from the processing plant will be pumped to a drying storage area ready for load out. A suitable location was found opposite the present Cowans logging site sheltered by the standing trees some 100 meters off SH 6 (see Mine Plan).

It is anticipated that there will be a portacom or similar building to accommodate staff amenities at the site. The details of this have not been confirmed. There will be sufficient gravelled surface at the site to accommodate the 45 staff cars and loading of trucks. Proposed access to the site from SH6 is shown in Figure 14.

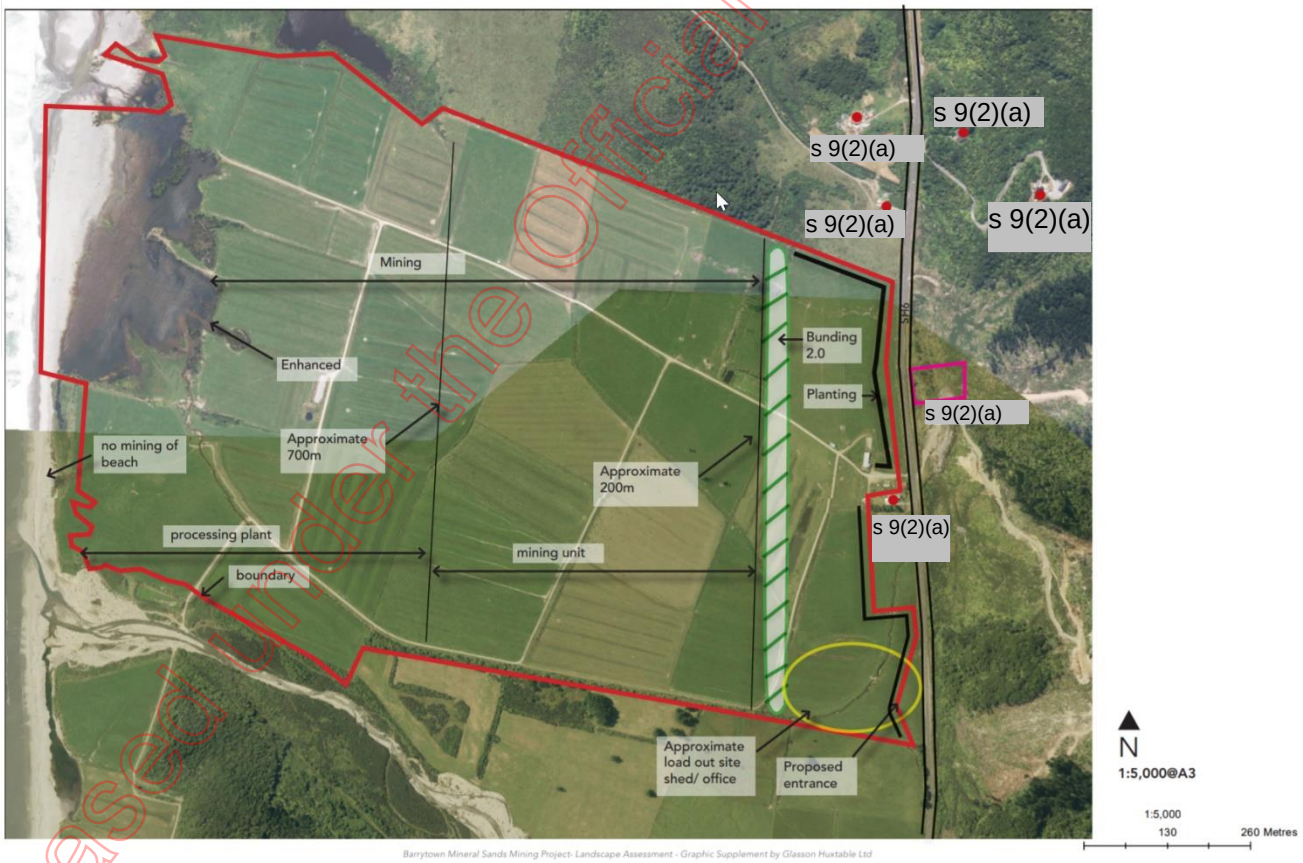

Figure 14: Proposed site plan, subject to change after updated drilling and mining studies.

7.2 Transport & Logistics

BJV commissioned Novo Group to prepare an Integrated Transport Assessment (ITA) for the project. This report is included in Appendix 1. As previously mentioned, the project is located adjacent to the sealed and well-maintained State Highway 6. No part of the tenement is more than 1.5 km from the highway. The highway runs directly to both rail and port terminals. A change in alignment of SH6 has been proposed to accommodate a right turn bay into the site.

The trucking of material from the site will also occur 24 hours per day, seven days per week. The weekly amount of material taken from the site is anticipated to be in the order of 5,000 tonnes.

The proposed activity will generate approximately 200 truck and trailer movements per week, which is 40 truck and trailer movements per day. Light vehicle generation has been estimated at 45 vehicles per hour in the peaks and 135 vehicles per day. Overall, the site will generate 335 Equivalent Car Movements per day.

Hence, only limited work is envisaged concerning road development to connect the operation to the Highway. The current project concept assumes the use of Westport Port, with capability to handle vessels up to a deadweight of 16,000 tonnes. A range of transport and logistic possibilities have been examined, on the basis that the destination of the saleable product will be predominantly overseas. This option requires trucking transport, and most likely unloading/loading equipment and storage facilities at the port.

This MP application and the economic considerations included herein are based on a Free on Board (FOB – Transport to port) option. BJV would be responsible for transporting the HMC product onto the client's ships at the designated port. This would involve multiple steps including transport to a port, offloading and storage at the port and loading of the product on to the ship. Ownership of the cargo exchanges at the point of loading.

7.3 Environmental and Community Issues Considered

A detailed overview of the relevant environmental issues was provided in the 2018 Prefeasibility Study Report (See Appendix 4) and updated as part of the resource consent applications submitted to the West Coast Regional Council and the Grey District Council for an initial mining area of approximately 115 hectares of privately owned farmland. Previous operators in the area have completed numerous environmental studies all of which have remained relevant to this day, as the land use and environment have altered little.

The application area has previously been subject to mining operations, with various forms of farming both before and after those mining operations. Cattle and deer are the main livestock farming activities in the area. There are no known significant sites within the application area. The area has been heavily modified through modern farming and land development practice.

7.3.1 Environment

7.3.1.1 Stripping /disturbance of vegetation / topsoil

The proposed activity does require the disturbance and stripping of topsoil. Productive topsoil and other growing materials are recognised as an important resource within the West Coast region and as an important aspect of this activity in relation to the required rehabilitation works.

This material will be removed prior to mining and stockpiled adjacent to the mining area ready for use in rehabilitation works. Following the completion of mining and backfilling, levelling and contouring of these areas, the topsoil will be respread across this rehabilitated ground. This will then be sown in grass species suitable for pasture development.

The locations of the topsoil stockpiles will be chosen to ensure that they are not subject to stormwater flows or other influences that may result in the loss of topsoil from the stockpiles. During the dryer months, these stockpiles will be wetted to ensure that there is no wind-blown loss. The duration of stockpiling will be minimised to ensure the topsoil health is maintained.

7.3.1.2 Erosion of Stream Banks or Lakesides

The proposed activity will involve the diversion of Collins Creek around the mining operations. This flows through the south-western portion of the proposed initial mining area.

It is not yet known at what stage the diversion works will be required to be undertaken, nor whether it will be temporary or permanent, however broadly the following methodology will be applied:

- A diversion channel will be constructed to reflect the natural morphology of the existing stream bed. This will include an assessment of the depth, width and channel characteristics.
- Where necessary this new channel will be lined with material that will provide habitat for macro-invertebrates and other fish species.
- Following the construction of the diversion channel, water from the original channel will be slowly diverted into the new channel.
- The old channel will then be checked regularly for fish and other aquatic life. If there are fish or other aquatic species found, these will be relocated into the new channel.

This methodology will be followed to provide measures that will avoid the erosion of the stream banks during and after the diversion of this water body. Stream diversions will be undertaken in a manner that achieves a channel width and flood carrying capacity that is not less than the original channel. Bank material will be chosen to ensure stability and ability to withstand erosion processes.

Stormwater is planned to be diverted around the active mining area (this includes the mine preparation and rehabilitation areas). The diversion of stormwater flows has the potential to cause erosion of stream banks if the location at which the stormwater enters the water body is either new or the bank material is not able to withstand additional water flows.

The location of stormwater diversions and the associated points where this water enters the receiving water bodies will be identified in the resource consent annual work programme documentation to the local authorities. These locations will be chosen to ensure that the potential for erosion is avoided.

7.3.1.3 Sedimentation of stream water

BJV has considered measures to manage land use activities and water as controls to protect the receiving environment against sedimentation. Mining processes that involve the washing of materials to separate the larger sediments, sands and gravels from the targeted smaller particles of mineral sands generate a volume of sediment laden water as a result of these processes. The land disturbance, earthworks and other site works including water (stream and storm) diversions have the potential to cause sedimentation of stream water if not managed appropriately.

7.3.1.4 Reduction of downstream water quality for aquatic life and plants

Water quality downstream of the proposed mining could be affected by water abstraction and sediment discharges. Measures to manage the land disturbance and water management activities associated with this activity, will protect against these type of effects occurring.

7.3.2 Wetland Areas

There are several wetlands within EP 51803 including Maher Swamp, Barrytown Flats and Razorback Point. Maher Swamp is protected as public conservation land and is also listed as a Schedule 1 and Schedule 2 wetland under the West Coast Regional Council Land and Water Plan. Both Barrytown Flats and Razorback Point are listed as Schedule 2 wetlands under the West Coast Regional Council Land and Water Plan. There are also several wetlands which have been designated as Significant Natural Areas (SNAs) under the Grey District Plan.

7.3.2.1 Coates South Block

North of the Coates South block is a parcel of privately owned land that has been identified by the Grey District Council as a potential Significant Natural Area (SNA) (PUN-W034), which extends to the 'Canoe Creek Lagoon' that lies within the Coates South block.

The wetland area, Canoe Creek riparian strip, a wetland and the coastline are the current notable features of the site. These will be left alone and not used for mining purposes. Mitigation measures of planting along SH6, progressive rehabilitation, and wetland enhancement planting will be the key measures to reduce the landscape and visual impact. Wetland vegetation will be planted as a buffer for the Canoe Creek lagoon.

The natural character and landscape of the Paparoa Range coastline and amenity of the Barrytown plain will only be adversely affected in a minor way, given the progressive rehabilitation of the site and restoration of the wetland area.

7.3.3 Community

Consultation has shown the community to be largely engaged with and supportive of the project, however Maher Swamp and the Westland Petrels have been consistently highlighted as being of primary importance to the community. Public concerns and some environmental interest groups opposition to mining Maher swamp exist. Local Iwi are supportive of the project and have not highlighted any concerns to date. There are a number of areas of historical interest located within the area of which the Historic Places Trust has identified. The community have also indicated an interest in being involved with any rehabilitation plans, especially in relation the areas of concern i.e. wetlands and/or promoting connectivity between wetland and other ecologically significant areas. This highlights the potential to involve the local school and community in any rehabilitation project which would bestow an 'ownership' and a 'positive vested interest' in the project to the community. There is also the potential to add value to the current protected areas in the northern areas through active management of pests etc., this would be particularly important for the Westland Petrel and in promoting connectivity from the Paparoa Ranges to the coastal lagoons and wetlands, a sequence which is unique in the west coast. Mitigation of the effects on Maher swamp through rehabilitation of the swamp area and reinstatement of a coastal lagoon system are seen as important mitigation measures for the project.

8 Mine Economics

8.1 Financial Viability

Industrial minerals are consumed in a wide variety of applications, and as such there is no single economic driver. However, the major economic driver for the consumption of industrial minerals is the growth in demand for consumer goods, and expenditure in housing related costs such as painting and decorating. Increasingly, demand in industrial markets, specifically in the clean tech industries is driving new growth for specific products. Demand for industrial minerals is driven by a combination of the stable markets of North America and Europe, and the growth markets in Asia, mainly China. As growth continues in demand, feedstocks for many industrial minerals are constrained in near to medium term. The risks arising to the project and the company, therefore, relate to global supply and demand patterns for industrial minerals. The company's aim is to be a low-cost producer, with low capital requirements, allowing BJV flexibility to be able to be a profitable producer in both low margin and high margin economic environments.

A more comprehensive assessment is planned as part of the Feasibility Study to be undertaken within the next 12 months.

8.1.1 Market Overview

The Mineral Sands industry is focused primarily on the supply of titanium raw materials for manufacture of titanium dioxide (TiO_2) pigments and titanium metal. Mineral sands are typically concentrations of minerals including titanium minerals including ilmenite and rutile. Other minerals of significance typically found in these deposits include zircon, garnet and gold. The global TiO_2 pigment market accounts for around 90% of all titanium feedstock demand, with titanium metal manufacture as the secondary driver of demand. Zircon is used primarily in ceramic applications, accounting for approximately 50% of demand. The main application (80%) of industrial garnets is sandblasting and related purposes (abrasives). The size of the Barrytown garnet makes it well placed in the market for high pressure water jet cutting use.

8.1.2 Strategy Overview

Initially, BJV intends to produce a low-cost HMC containing ilmenite, garnet and zircon for sale as FOB. Buyers of the concentrate will complete minerals separation themselves to obtain the ilmenite and other minerals for further processing and/or marketing. Depending upon the buyer, the ilmenite may be processed by the same company, or on-sold to other TiO_2 pigment manufacturers. BJV will undertake a feasibility study as to the timing and scale to upgrade its processing to full minerals separation. TiO_2 is the standard white pigment used principally in paints, paper, and plastics. It is the most important pigment in the world, accounting for approximately 70% of total pigment volume. Titanium dioxide is made by processing a variety of titanium-containing minerals such as ilmenite and rutile. Ilmenite is plentiful, but has a titanium dioxide content of 45–60%, so it is usually upgraded, or beneficiated, to a higher titanium dioxide content. Two processes typically used to upgrade the ilmenite and recover the TiO_2 - sulfate and chloride processes.

8.1.3 Target Markets For HMC

The BJV HMC is not targeting a single market, but rather can supply multiple customers whose end market will most likely be in China, North America or Europe. The limiting factors on the number of customers will be the scale of production, and the size of shipments.

BJV assumes the main, but not only, target markets would be China, where the ilmenite recovered from the HMC could be used either for direct use in anatase production or as a blend feedstock for wider use in rutile pigment production. At s 9(2)(b)(ii)%, s 9(2)(b)(ii)

As garnet is not processed or beneficiated in the same way as ilmenite, the target markets are focused on the end-user markets. These are widely distributed globally, and relate to most OECD countries.

8.1.4 Supply and Demand Overview

8.1.4.1 Titanium Dioxide

The major consuming industries for TiO_2 pigments are paints and surface coatings, plastics, and paper and paperboard. Consumption tends to parallel general economic trends for these end-use applications.

TiO_2 pigment manufacturing is concentrated in five companies:

- Tronox (17.3%) with facilities in North America and Europe
- Chemours (17%) with production in North America, Japan and China
- Venator (10.2%) formerly Huntsman, with production predominantly in Europe
- Lom Billions (8.2%) with a focus in China
- Kronos (7.2%) with facilities in North America and Europe

The global titanium dioxide (TiO_2) market size was valued at around USD 15 billion in 2017. The market is expected to witness growth at a CAGR of over 2.0% from 2021 to 2026, owing to increasing demand from end-user industries. Usage of the product as pigments in paints & coatings formulation is expected to fuel industry growth over the next few years. Annual production of 7.7mtpa is expected to grow 8.8mtpa by 2025.

The TiO_2 industry expects to have attractive margins for the foreseeable future. The development of new feedstock mines can take five to ten years and new grassroots pigment plants take four to five years to complete, especially when permitting and infrastructure needs must be addressed. With demand forecast to rise by 4–5% annually, the industry needs 200,000–300,000 metric tons of new capacity every year (discounting capacity in China, which generally does not make high-quality pigment).

The Barrytown ilmenite is suitable as a feed for the production of sulfate grade slag, with a s 9(2)% TiO_2 slag product possible based on computer simulations. The high alkali content of the ilmenite will preclude the production of a chloride grade slag product. The sulfate slag product will have elevated levels of SiO_2 and Al_2O_3 compared to traditional products in the market and would require blending to satisfy the quality requirements for a number of customers.

Chrome and vanadium are the two most important elements that impact on pigment colour. The accepted industry maximum threshold for Cr_2O_3 content is 0.05%, although for some producers as high as 0.1% can be acceptable. The Barrytown ilmenite has a low content of just s 9(2)(b)(ii)% and should be viewed favourably by customers. It would allow blending with higher Cr content feedstocks. Similarly, the V_2O_5 content is also low relative to competing products.

8.1.4.2 Garnet

Garnets are gemstone composed of deep red vitric silicate minerals used by a wide range of industries and for commercial applications. The key industrial properties of garnet are density and hardness. Garnet is chemically inert and does not form polluting products upon breakdown. The leading product types of industrial garnets in the market are almandine, andradite, grossular, pyrope, spessartine, and uvarovite, among others. Almandine is anticipated to dominate the global garnet market over the next six years owing to its infrastructure and manufacturing sector applications, followed by pyrope for its ease of availability and versatile application over abrasive products.

Garnet product finds wide applications in the following:

- Water-Jet Cutting
- Abrasive Blasting
- Water Filtration
- Abrasive Powders
- Others (e.g., jewellery)

The main application (80%) of industrial garnets is sandblasting and related purposes (abrasives). The properties which make garnet useful for abrasive applications is its high melting point (1250°C), sharp sub-rounded to sub-angular chisel edge fracture, low free silica content, and the high resistance to physical and chemical attack.

Globally approximately 50–55 % of the traded industrial garnets are used as abrasives (blasting agent) for shot blasting or sandblasting of plane components, bridges, railroad cars and containers, on offshore-platforms and in industrial plant manufacturing (removal of rubber, paint, adhesives, bitumen and grease), in shipbuilding (removal of salt, rust, algae and shell incrustations), in the petrochemical industry for pipeline, tank and boiler cleaning (removal of incrustations of all kinds), in power station development as well as for finishing jeans (gentle removal of the dyestuff). To this end, garnet is the main substitute of quartz sand, which is used rarely now for blasting because of the silicosis risk.

Approximately 16% of industrial garnets are used as additives for water-jet cutting in the US. For this method, which is gaining in importance, water at pressures of up to >4,100 bar (410 Mpa) is forced through a small nozzle (diameter 0.07 – 0.4 mm) attaining exit velocities of 3,200 km/h. This process can be used to cut materials such as steel, titanium, aluminium, logs and boards, laminate, plastics, fabric, paper rolls, circuit boards, fibre optic cables, mixed materials, glass, stone, tiles and ceramics with average thicknesses of 0.5–5.

The major players in the industry are GMA Garnet Group, Trimex Sands Private Limited, Barton International, Rizhao Garnet Ltd, Indian Ocean Garnet Sands Company Ltd., and V.V. Mineral, among others.

The makers of industrial garnet are concentrating on the production of high-grade garnet ores. Growing competition amongst the key players is also boosting the growth of the industry. Furthermore, garnet is also seeing a rise in applications in various end-use industries. In the blast cleaning industry, silica is being replaced by garnet, which is likely to contribute to the growth of the market during the forecast period. Industrial garnet is seeing increased consumption of aluminium aircraft and the shipbuilding industry. In addition, the governments of the various nations are investing in the development of water treatment plants. This increasing number of water treatment plants is expected to improve the growth of the industry.

The global industrial garnet market is expected to grow at a CAGR of 5.5% in the forecast period of 2021-2026 to reach a value of around USD 775 million by 2026 (https://www.expertmarketresearch.com/). The regional markets for industrial garnet can be divided into North America, Europe, the Asia Pacific, Latin America, and the Middle East and Africa. Garnet imports from India and China are rapidly growing, and both countries have a large share in the United States export market. In the meantime, the highest consumption of garnet can be witnessed in the United States petroleum industry.

Silica is being replaced by garnet, specifically in the blast cleaning industry. Industrial garnet is also witnessing increased demand from the aluminium aircraft and shipbuilding industries for metal surface finishing and blast cleaning. With the growing number of water treatment plants worldwide, the demand for garnets used in the water filtration industry is also rising. With technological advancements, many small and large players are focusing on offering garnet for a specific application with better quality and reliability.

The major market drivers include rising population, growing disposable income, intense competition among the key players, and the rising use of the product in the end-use industries. Rising investment by governments in wastewater treatment plants is an important industrial trend that is informing the growth of the market.

Barrytown garnet is a fine garnet as tested by SGS and AML. The Barrytown product sits in the ideal range for the water-jet cutting market.

8.1.4.3 Zircon

Zircon is used as an opacifier, whitening agent, and pigment in glazes and stains used on ceramics and pottery. Zircon's hardness makes it useful as an abrasive. It is also used in the steel industry to line blast furnaces. Because zircon products are resistant to corrosion and heat, they are used in engines, electronics, spacecraft and the ceramics industry. It is uncertain where future supply will come from to meet ongoing demand, driven by China and India.

The Barrytown zircon can be classified as a premium grade product based on the low Fe_2O_3 and TiO_2 levels. Hence, it should be suitable for ceramic applications, although this would be subject to confirmation from consumer tile tests for appropriate whiteness. There should be no impediment to selling zircon product at market-related prices to virtually all of the normal end-use market segments.

8.2 Financial Analysis

BJV has completed an in-house financial analysis and financial modelling that includes estimates for capital and operating costs. Two financial models were prepared for the LOM, both with initial HMC production and full separation commencing

at year 5. The first model represents ROM 1 Mtpa for the entire LOM and the second represents ROM 1 Mtpa for the first five years followed by ROM 2.6 Mtpa for years 5-8 and ROM 5Mtpa thereafter. Full details of both models have been provided in Appendix 5. Figures included in the following sections are based on the model that increases to 2.6 Mtpa ROM at year 5.

Reference was made to three earlier studies and more recent information received from contractors and service providers:

- MSP Engineering Barrytown mineral sands project prefeasibility study
- Westland Titanium scoping study report
- Alloy scoping study report

Pricing data was collected and collated in various currencies but was then ultimately converted to USD for consistency.

8.3 Capital Costs/ Expenditure

The capital costs for the 13-year LOM are estimated to be USD s 9(2)(b)(ii)M. The BJV Capital Cost Summary is shown in Table 16. Full detail on the costs is provided in Appendix 5.

s 9(2)(b)(ii)

8.4 Operating Costs

BJV has prepared operating cost estimates for the process plant over the LOM (including MSP from year 5).

Table 17: Summary of Operating Costs

s 9(2)(b)(ii)

Operating costs that covered the mining by a contractor were added, based on budget rates provided by New Zealand contractors.

The mining contractor would be responsible for:

- Defoliation and vegetation clearing and stockpiling.
- Topsoil removal and stockpiling.
- Pre-stripping.
- Mining.
- Overburden and topsoil return.

Mining supervision and on-going sampling and grade control costs were included. The cost for leasing the mine area and the process plant, environmental rehabilitation and trucking and shipping costs were also allowed.

Table 18: Mining Contractor OPEX.

s 9(2)(b)(ii)

The following table provides further detail on the summarised operating costs. Full details and calculations are available in Appendix 5.

Table 19: Detail of Operating Costs.

s 9(2)(b)(ii)

s 9(2)(b)(ii)

8.5 Cash Flow

The post-tax cash flow is USD s 9(2)(b)(ii)M with an IRR of s 9(2)%. The summary is shown in Table 20 below with full detail included in Appendix 5.

Table 20: Post-Tax Cashflow and IRR.

s 9(2)(b)(ii)

s 9(2)(b)(ii)

8.6 Sensitivity Analysis

A sensitivity analysis was carried out by BJV to assess the impact of changes in total capital expenditure (Capex), operating costs (Opex) and metal prices (garnet, ilmenite, zircon, gold, HMC) on the project's NPV at 10% (Figure 15) and IRR Figure 16).

Figure 15: Post-Tax NPV sensitivity.

Figure 16: Post-Tax IRR sensitivity.

8.7 Technical Constraints

BJV will complete a Feasibility Study within the next 12 months. This study is expected to identify and resolve any technical constraints. Since the project will operate in a similar manner to a traditional West Coast alluvial gold mining operation using proven processes, BJV has not identified any major technical constraints of the operation.

8.8 Community Economic Benefits

To operate the project, BJV will need to employ an estimated 60–80 people directly in the mining operation. This includes the full range of skills and qualifications from qualified engineers, geologists and metallurgists; financial and administrative staff; skilled tradesmen like electricians, mechanics and welders; transport and machinery operators; as well as labourers requiring specialist training in mining and mineral processing. BJV is confident that the majority of personnel can be found within commuting distance of the mine.

9 Work Programme

Following on from the resource and preliminary mining studies completed to date, BJV proposes to move towards mining in a staged process. Preliminary mining studies have anticipated that an economically viable project could be established based on producing ilmenite, garnet and zircon (± gold) from the MP application area.

A key initial aspect of the staged process will be to conduct phases of exploration and resource drilling in order to provide higher levels of resource confidence in relation to the ilmenite, as well as seeking to bring the garnet, zircon and gold up to a comparable resource status as the ilmenite. Initially, this will involve immediate drilling of the Coates South and Coates North blocks, where more than 400 drillholes have been planned. This activity is expected to be undertaken during the assessment phase of the mining permit application, with further drilling to continue during the initial year post approval of a mining permit as access arrangements are finalised.

Updated mineral resource estimates and technical reporting, in accordance with the JORC Code (2012), will be completed once adequate data have been obtained. As noted in Section 6.1, these will underpin a Feasibility Study for the initial HMC mine development at Coates South.

9.1.1 Size, Nature, Extent, and Siting of the Proposed Mining Operation

The mining operation at Barrytown is being proposed in stages, and once commenced will operate in tandem with resource-development exploration activities. As detailed in previous sections, preliminary mining studies have indicated that the operation can achieve an annual recovery of 250 kt of HMC.

BJV has anticipated an initial mine life of 13 years, initially extracting the mineable resource from an area of approximately 115 ha (Coates South) and then proceeding northwards. The recovery of approximately 8.8 Mt HMC is expected from the initial proposed mine life, however, this is subject to change following further drilling and technical studies.

Mining is planned to initially commence in the Coates South area (115 ha) using lineal mining of 100 m blocks advancing from west to east and south to north (Figure 14) (see Section 7). This will minimise pumping distances between the MFU and the processing plant. The plant will be located such that any noise from its operation will have no significant impact on any of the affected parties. The HMC produced from the plant will be pumped to a drying storage area ready for trucking.

9.1.2 Mining and Production Schedule

9.1.2.1 Expected Production and Long-Term Mining Scheme for the Mineable Resource

Mine planning and scheduling have been outlined in section 7, however, these will be refined after updated mineral resource estimates are prepared, including those for the gold, garnet and zircon. BJV will continue with mine planning development under the mining permit in order to determine the most suitable option for future mining.

9.1.3 Proposed Start Date and Mine Life

The anticipated start date of production is unknown at this stage but is expected to be within the next two years. This will depend on the outcome of the resource consent application. Additionally, global uncertainty around COVID-19 could cause potential delays to the proposed start date of mining.

This timeframe will allow for the planned resource definition drilling at Coates South, to complete an updated resource estimate and Feasibility Study, update the mine design, scheduling and considering secondary processing options and mine development.

An initial life of mine (LOM) of 13 years is anticipated. This timeframe is expected to be reviewed after updated resources and feasibility studies are completed.

9.1.4 Point of Valuation

The point of valuation for the HMC (containing ilmenite, zircon, garnet) and gold recovered under this permit is at the exit point of the dry storage facility (where the material is loaded to trucks for transport to market).

9.1.5 Proposed prospecting or exploration work in relation to the permit area

More investigation is required in order to quantify the grade and distribution of the target minerals throughout the Barrytown deposit. BJV has prepared a detailed exploration plan for EP 51803 (and the MP application area). This is largely focussed on resource definition drilling. The programme has the following objectives:

- increasing the confidence and classification of the ilmenite Mineral Resources;
- estimating initial Mineral Resources for garnet, zircon and gold; and
- completing a Feasibility Study to be used as the basis for the estimation of Mineral Reserves.

The resource classification could be upgraded in several possible ways; additional accounting for fluidised sand issues in the current database, updating the DEM, collection of more direct bulk density measurements, a reasonable amount of infill drilling, 'replacement' drilling to replace historical holes recording fluidised sand and other drilling issues.

9.1.5.1 Topographic Survey

Good up-to-date topographic detail will be given top priority ahead of any other investigations since all future work will be based on this information.

BJV will contact relevant local authorities to determine if LiDAR data of sufficient quality is available over the area of proposed drilling. Should suitable data not be available from the local authorities then a drone/UAV survey will be completed.

The data will be collected to an accuracy that will enable the appropriate level of utility in future geological and resource modelling.

9.1.5.2 Drilling Programme

BJV commissioned RSC to design a resource drilling programme that aims to achieve the required resource classification objectives for the initial mine area (Coates South) and the Coates North block. RSC completed a drill hole spacing analysis using Snowden Supervisor and the s 9(2)(a)H&SC resource model to determine appropriate grid spacing to achieve the resource classification objectives. Based on the drill hole spacing study, it was determined that the next stage of drilling for the initial mine area should proceed on a line spacing of 120 m along the north-south direction and a hole spacing of 20 m along the east-west direction.

A total of 446 holes have been proposed at this stage across the two Coates' blocks (Table 21). The programme proposed here is idealised and has been planned without considering physical site access and related logistics on a hole-by-hole basis. It is anticipated that drillhole pad locations will need to be adjusted to accommodate for site issues.

Rising sand issues were recorded in the Carpentaria Exploration Company (a subsidiary of Mt Isa Mines Ltd) and Fletcher Challenge (Grampian Mining Company Ltd and Fletcher Titanium Products Ltd) drill holes, which may have caused grade smearing. The proposed drill plan includes 18 twins of historical drillholes to investigate the veracity of those data. The twin holes are mostly sited beside historical churn holes and are planned at a nominal distance of ~ 5 m along the major axis of continuity (north-south).

The drill depths proposed range from 8–16 m but can be extended or reduced if warranted (e.g., if holes have not been drilled to the bottom of the mineralisation). Lee & Burlet (2018a) noted that the bottom of mineralised sand in the existing model is interpreted to be the possible lower limit of where mineralised sand could occur and was generally defined as the bottom limits of the two or three deepest drillholes on the MR4287 drill section lines (maximum depth of 32 m). Therefore, some drillholes may need to be deeper to provide more confidence in modelling the bottom surface.

Table 21: Summary of proposed drilling programme

Block	Total # of drillholes	# of twin drillholes	Total m
Coates South	252	10	2,729
Coates North	194	8	1,743
Total	**446**	**18**	**4,472**

A total of 252 vertical drill holes have been planned for Coates South with a total meterage of 2,729 m (Figure 17, Figure 18, Figure 19). This includes 10 twins of historical churn holes (e.g., Figure 20).

A total of 194 vertical drill holes have been planned for Coates North with a total meterage of 1,743 m (Figure 21, Figure 22, Figure 24). This includes eight twins of historical holes (e.g., Figure 23).

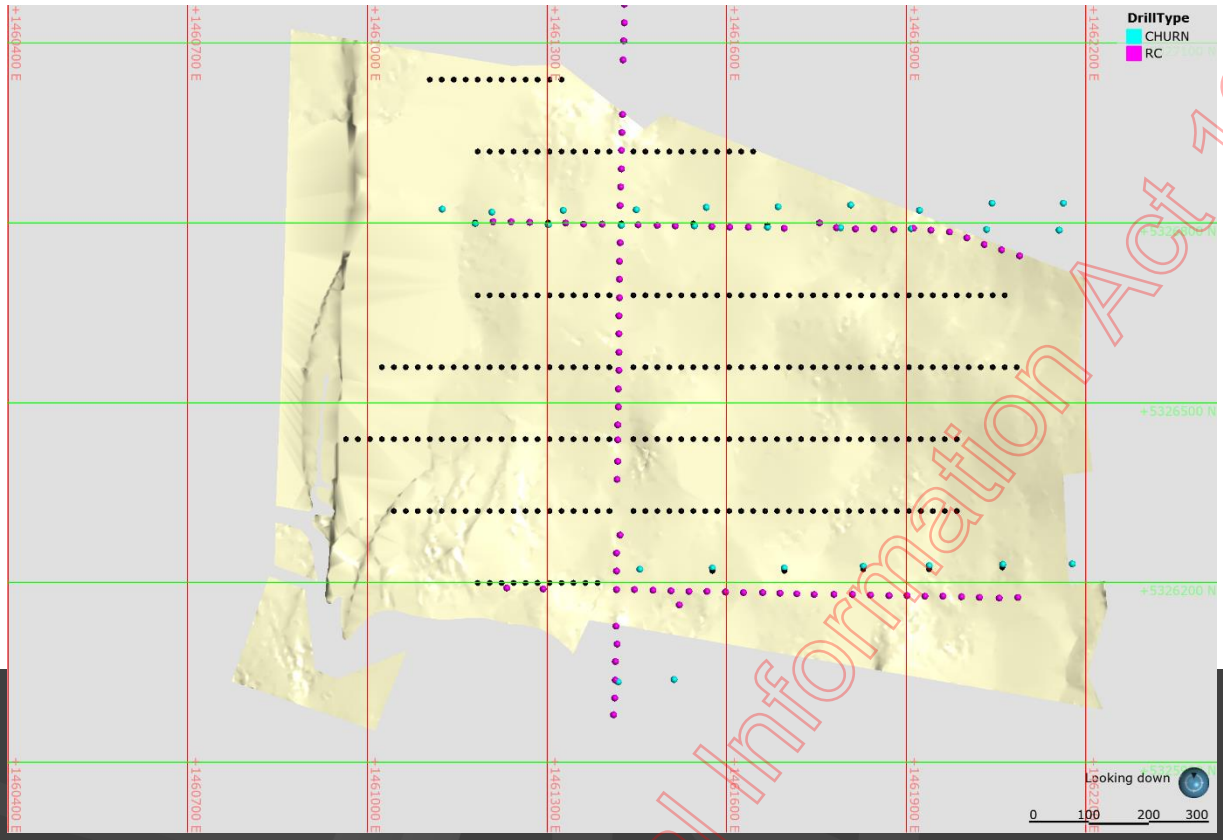

Figure 17: Planned drillhole collars (black) and historical drill collars with ilmenite data (blue/pink) in Coates South block (yellow).

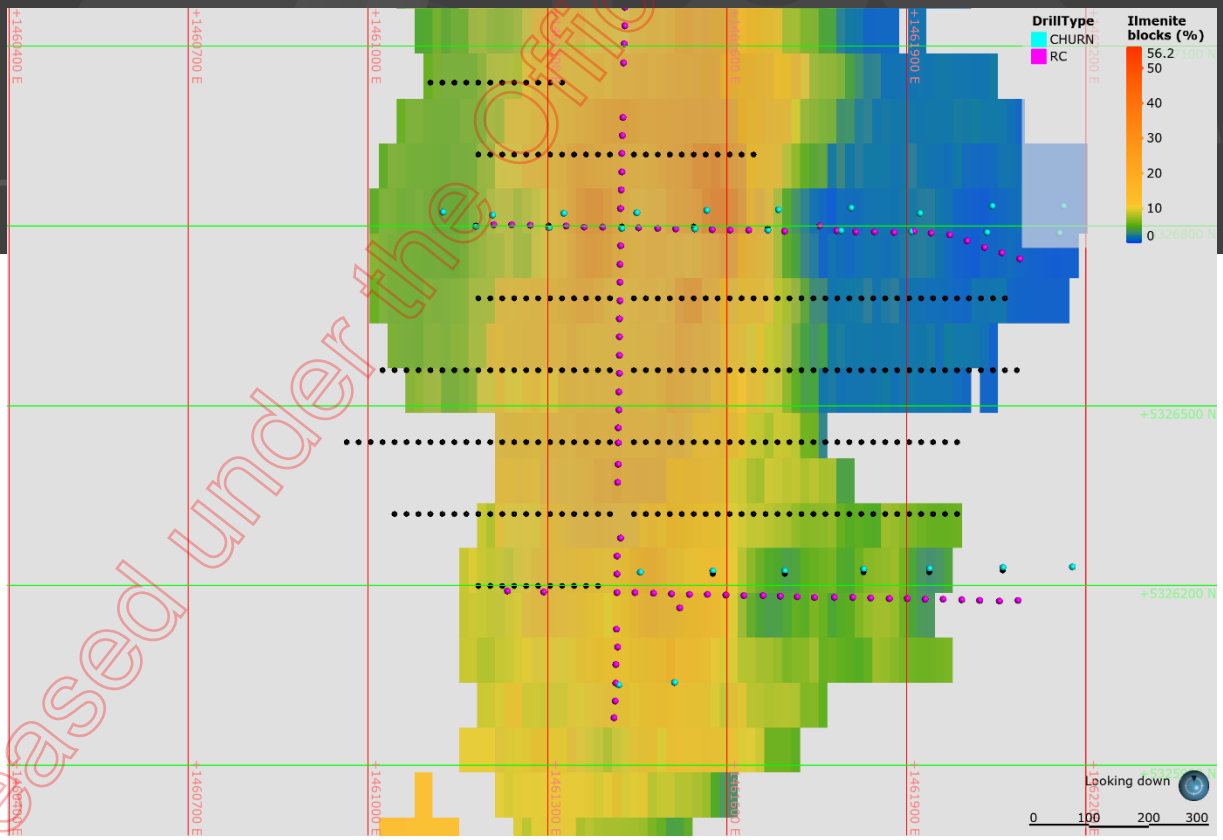

Figure 18: Planned drillhole collars (black), historical drill collars with ilmenite data (blue/pink) and ilmenite block model in Coates South block.

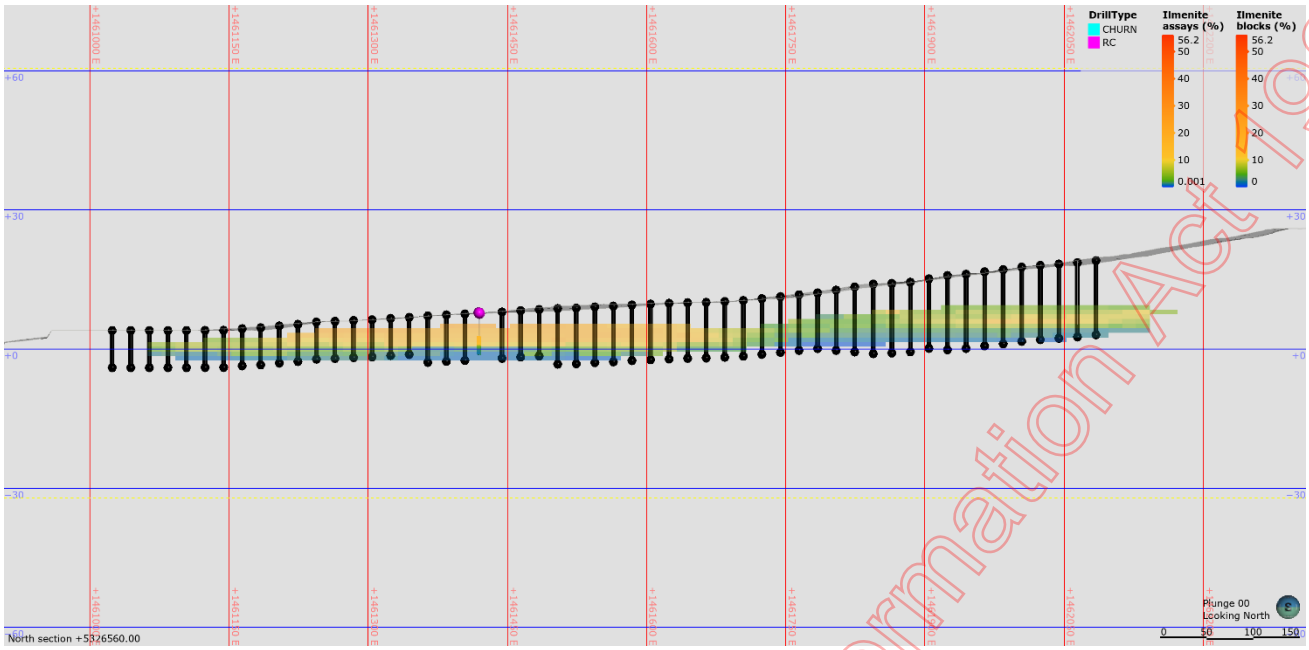

Figure 19: Cross-section of planned drillholes (black) in Coates South (5326560 N) with historical ilmenite assays and block model, looking north (5 x vertical exaggeration).

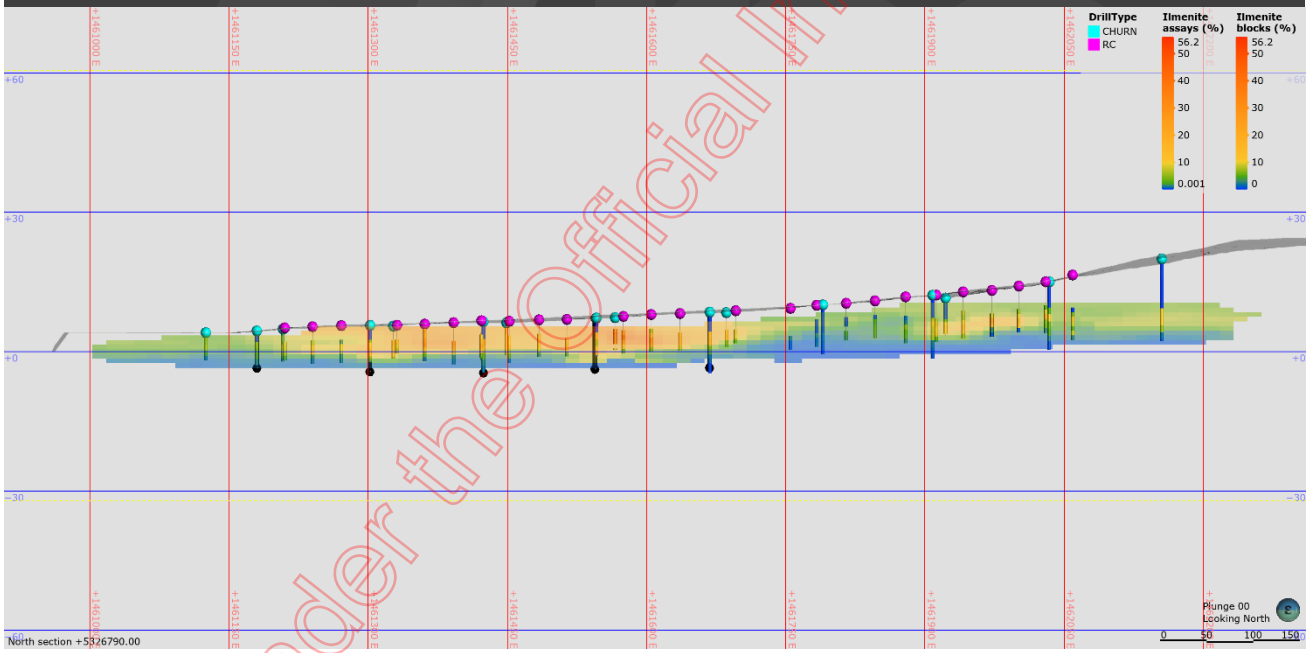

Figure 20: Cross-section of planned drillholes (black) including five twin holes in Coates South (5326790N) with historical ilmenite assays and block model, looking north (5 x vertical exaggeration).

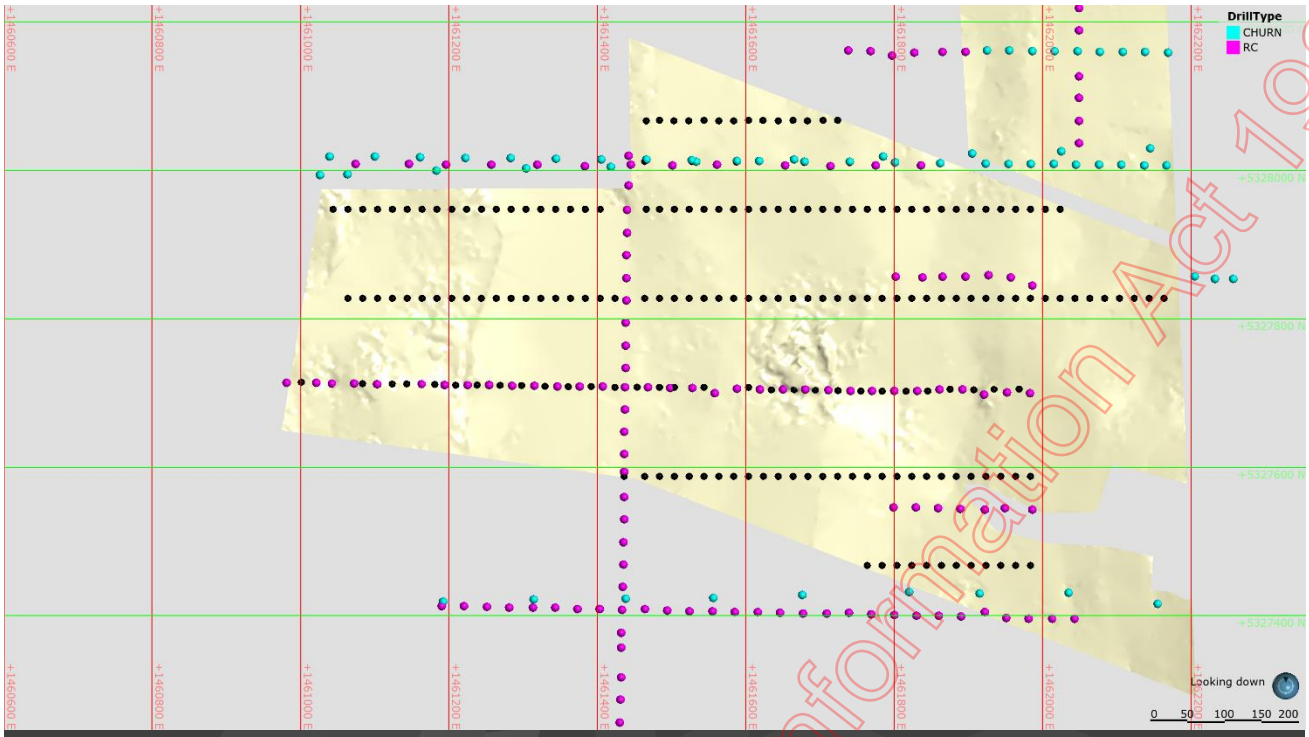

Figure 21: Planned drillhole collars (black) and historical drill collars with ilmenite data (blue/pink) in Coates North block (yellow).

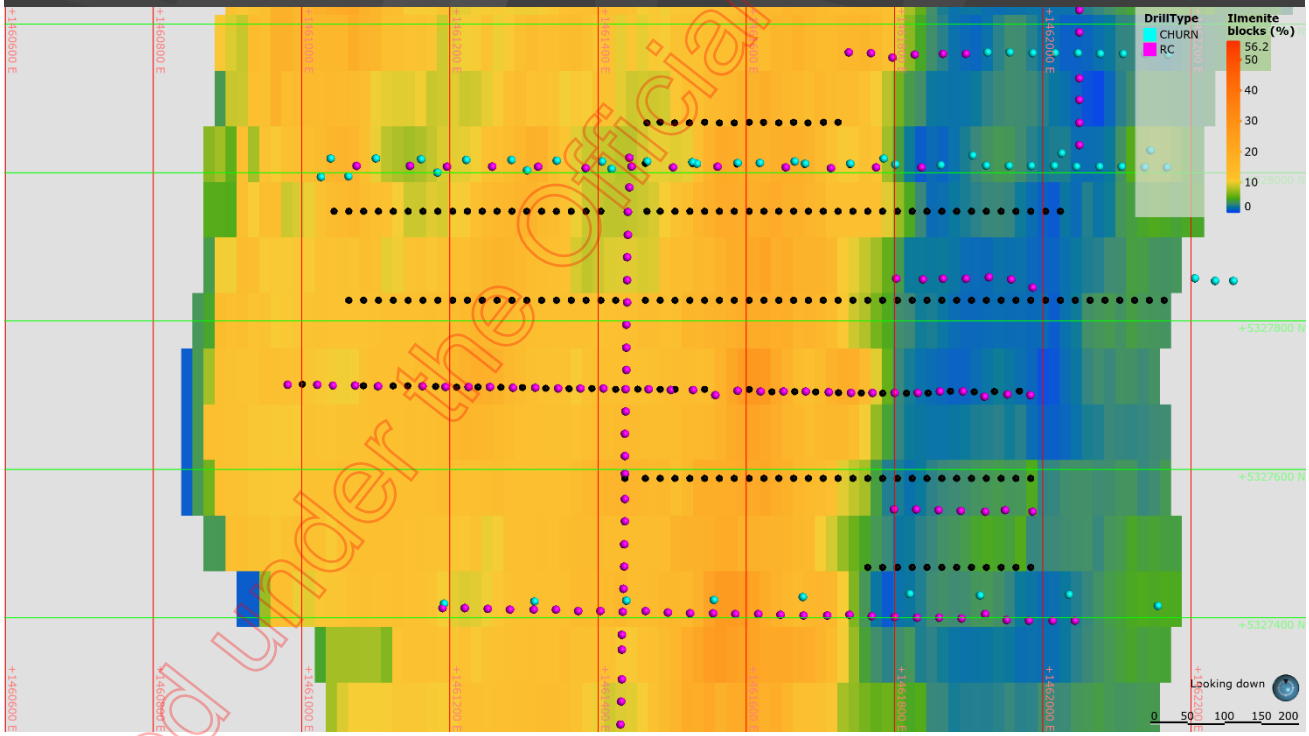

Figure 22: Planned drillhole collars (black), historical drill collars with ilmenite data (blue/pink) and ilmenite block model in Coates North block with.

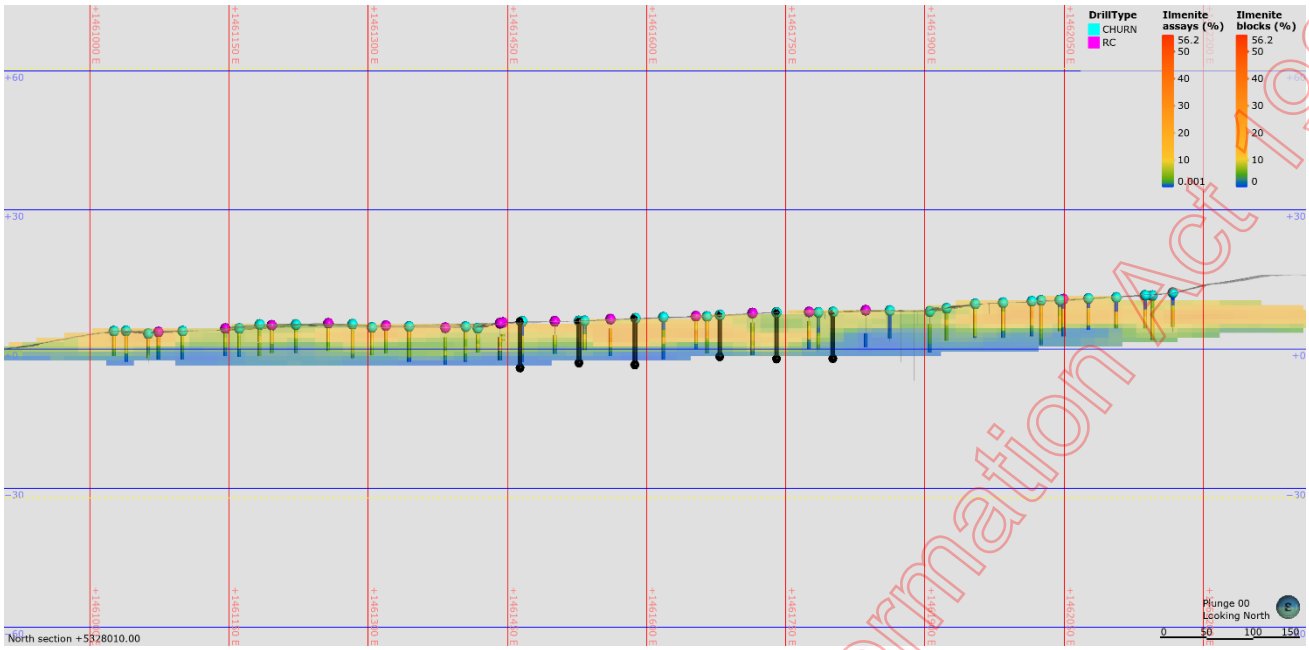

Figure 23: Cross-section of six planned twin drillholes (black collars) in Coates North (N 5328010) with historical ilmenite assays and block model, looking north (5 x vertical exaggeration).

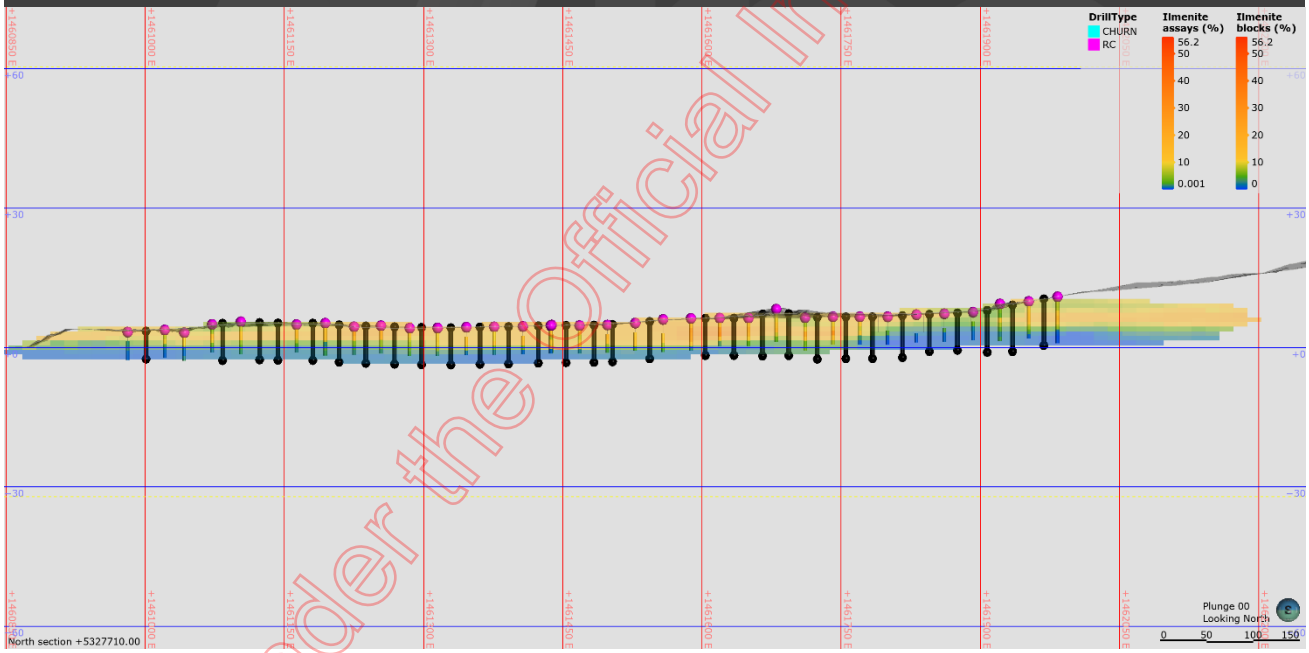

Figure 24: Cross-section of planned drillholes (black) in Coates North (N 5327710) with historical ilmenite assays and block model, looking north (5 x vertical exaggeration).

BJV has engaged RSC to manage and undertake the drilling programme with appropriate quality assurance (QA) and quality control (QC). This programme is likely to commence in the second half of 2021.

Subsequent resource drilling programmes are expected to advance northwards as the project progresses and access arrangements are finalised. These programmes will be planned in detail when required.

9.1.5.3 Data Quality

At Barrytown, there are limited records of QA protocols and QC procedures. Going forward, a detailed QAQC protocol will be initiated. BJV has accepted recommendations from RSC on how to achieve appropriate QA and QC to support high-confidence resource estimation.

The drilling programme will be managed following detailed standard operating procedures (SOPs) to prevent errors and establish processes that are repeatable and self-checking. BJV and its technical staff will have access to clear, step-by-step standard operating procedures (SOP), supported by images and based on best practice for each relevant part of the process. This also requires access to SOPs from any third-party contractors so that BJV staff understand what actions its contractors make that affect the quality of the final data.

Quality control of all the relevant data will be undertaken during the drilling campaign to ensure that the data used for resource estimation are fit for purpose. The purpose is to demonstrate that the processes were always in control and that errors were fixed as they were identified. The key processes and components that are relevant for the quality of mineral resource estimation are location of data points, density data and grade data.

Poor primary sample recovery is expected to be one of the biggest issue affecting the representativity of the sampling results. Recovery issues are expected to be caused by the soft character of the sediment. Hence, monitoring of sample recovery will occur at the drill site. Should aircore drilling be undertaken, then bag weights will be monitored and recorded during the drilling. If sonic drilling is undertaken, core recovery will be monitored and recorded during the drilling.

Quality control procedures will also include the insertion of check samples (i.e. standards and duplicates) into the sample stream.

BJV will complete quality testing prior to undertaking any resource estimation. Quality testing is where a final judgement on the quality of the data is made. This is done by assessing accuracy and precision of the data for those periods where the process was demonstrated to be in control, and separately for those periods where the process was demonstrated to be *not* in control.

9.1.5.4 Bulk Density Determination

Further density determination is required to assist in material balances and is necessary to increase confidence in the resource model. Further detailed bulk density evaluations will be undertaken during the proposed drilling programme, but little variation outside the ranges already identified is expected.

9.1.5.5 Testwork

Further mineral separation testwork is required to confirm the proposed process flowsheet and selected processing technologies to ensure heavy mineral (ilmenite, garnet and zircon) and gold recovery is maximised. Each of the tested samples should then have grade data for both garnet and ilmenite (and zircon where necessary).

Garnet test work will likely use the 'interval' method, previously used by Fletcher Titanium and Westland Ilmenite, with some additional stages included. The garnet work will be carried out on the 6.4amp magnetic concentrate, split into two fractions:

- one fraction to be analysed in a laboratory by pulverising followed by XRF for TiO_2, and from which the ilmenite content will be calculated in the same manner that it has historically been calculated; and
- the second fraction will be used for garnet quantification.

Ideally, the garnet quantification test method will utilise as much processing which allows gravimetric recording, as possible (i.e., weighing fractions). Trials using a Frantz Isodynamic magnetic separator may be completed in an attempt to further enrich the garnet into a 0.5amp Frantz magnetics fraction, followed by microscopic point count. This approach follows from work conducted in 1989 by Applied Petrographic Services for North Broken Hill Peko. The Frantz Isodynamic magnetic separator uses both magnetic field and gravity to achieve separations on a thin stream of grains travelling down the chute.

BJV has extensive zircon data determined on composited samples from the Westland Ilmenite investigations during the 1989 to 1991 period. The proposed resource drilling programme (see 9.1.5.2) will provide additional samples and data. Sample test work for zircon will likely comprise heavy liquid separation at 2.9 t/m^3 followed by point count of the zircon grains in the heavy fraction. An alternative is also being considered to analyse the pulverised heavy fraction for ZrO_2 using XRF, and then calculate the zircon content; this is an option for the Barrytown deposit since the only mineral contributing ZrO_2 will be zircon. Initially, both methods may be used to allow a comparison between results and costs.

9.1.5.6 Mineral Resource Upgrade

BJV has engaged RSC to undertake an updated mineral resource estimation. RSC's approach to MREs is based on the fundamental principles of good-practice resource estimation. Emphasis is given to those aspects which have a strong bearing on the eventual quality of the model, such as the quality of the input data (to be addressed through the data validation/audit phase), and domaining (geological controls).

After completion of the proposed drilling, all new data and any existing undigitised data for ilmenite, garnet, zircon and gold will be incorporated into estimation software. A review of the most suitable domaining and estimation techniques will be completed prior to any resource update. A preliminary pit-optimisation will be applied to assist with cut-off grade determination and classification of the resource.

A technical report, prepared in accordance with the JORC Code (2012), will be provided in a format that is standard to the industry. The report will be prepared by a Competent Person (who will have visited the site), who has the experience and expertise relevant to the work undertaken and to the type of deposit. The report will include a JORC Table 1.

9.1.5.7 Feasibility Studies

The feasibility study phase is likely to become a series of iterative evaluations that are progressively updated and modified as exploration and engineering design proceeds. This has been accounted for in the proposed programme. BJV has engaged IHC Robbins to undertake the feasibility studies for the project. As noted in Section 7.1, a Feasibility Study will be prepared within the next 12 months for the HMC mine development at Coates South.

9.2 Proposed Minimum Work Programme

Based on the above sections, BJV has proposed the following minimum work programme (Table 22).

Table 22: Proposed Minimum Work Programme.

Stage	Timeframe	Work Programme Obligation	Proposed Expenditure
1a	12 months	undertake a programme of infill resource drilling within the Coates blocks for a minimum of 350 holes;	s 9(2)(b)(ii)
1b	12 months	Undertake topographical survey;	
1c	12 months	collect geo-mechanical, metallurgical, geochemical and environmental data appropriate for informing a Feasibility Study, optimised mine development and safe mine operation;	
1d	12 months	update the geological and resource models;	
1e	12 months	update the ilmenite mineral resource for the Coates blocks with the minimum objective of Indicated classification as defined under a recognised resource classification code as per Schedule 1 of the Minerals Programme;	
1f	12 months	complete a mineral resource estimates for garnet, zircon and/or gold within the Coates blocks with the minimum objective of an Inferred classification as defined under a recognised resource classification code as per Schedule 1 of the Minerals Programme; and	
1g	12 months	provide the chief executive with a report detailing all work completed during this stage of the work programme, including QA/QC information and data sufficient to demonstrate levels of accuracy and precision to be submitted to the chief executive in accordance with the regulations.	
		STAGE 1 TOTAL EXPENDITURE	
2a	24 months	complete a Feasibility Study for the Coates South block with detailed extraction planning;	s 9(2)(b)(ii)
2b	24 months	complete a Mineral Reserve estimate for Coates South as defined under a recognised resource classification code as per Schedule 1 of the Minerals Programme;	
2c	24 months	undertake a programme of further resource drilling to increase confidence in the resources outside of the initial mining area;	
2d	24 months	complete construction of processing plant and other mine infrastructure to enable processing of first ore; and	
2e	24 months	provide the chief executive with a report detailing all work completed during this stage of the work programme, including QA/QC information and data sufficient to demonstrate levels of accuracy and precision to be submitted to the chief executive in accordance with the regulations.	
		STAGE 2 TOTAL EXPENDITURE	
3a	36 months	commence mining at Coates South at a minimum rate of 1 Mt per annum for the production of heavy mineral concentrate at a minimum rate of 200 kt per annum;	n/a

3b	36 months	unless otherwise approved in the writing by the chief executive, the extraction of sand for the recovery of HMC and gold using earthmoving machinery as necessary; and	n/a
3c	36 months	undertake ongoing rehabilitation in accordance with good industry practice;	n/a

9.3 Good Industry Practice

BJV will carry out all activities in accordance with good industry practice. This will largely be achieved by using technically competent industry experts (consultants) who have the skills, training and expertise to carry out the exploration (acquisition of data) and mining operations in a competent, safe and effective manner. BJV management will be responsible for undertaking appropriate risk management and provide key guidance on health and safety.

9.3.1 Mining

The proposed mine development and mining operation has been designed to maximise economic recovery from the initial mine area (Coates South). This was described in section 7. The staggered mine development and ongoing appraisal of the deposit will be completed in sufficient detail to plan and execute the most suitable mine development and mining operation as it expands.

9.3.2 Exploration

The exploration methods proposed herein are suitable for the required purpose and will be technically effective at achieving the objectives (mineral resource estimation to a high confidence level/classification). A series of steps will be taken throughout the work programme to maintain the integrity of the work and that the results are in line with good exploration practice. Exploration/appraisal will be conducted so as to ensure that sufficient good-quality, objective data is acquired, within reasonable technical and economic constraints.

As previously noted, BJV has engaged RSC to manage the proposed resource drilling programme(s). RSC will implement industry best practice SOPs when running the drilling programme. The following points are relevant to this discussion (note this is not an exhaustive list):

- drillhole collar locations to be picked up using a GPS to ensure accurate drill hole locations then once complete surveyed accurately by a registered surveyor;
- drillhole geological log sufficient to identify geological units with 'from' and 'to' intervals to be recorded;
- grade data and methodology for sampled intervals with 'from' and 'to' intervals to be recorded; and
- appropriate checks and balances to be applied to any measuring or sampling process to ensure that the system is always in control (drilling, laboratory) and that the data are fit-for-purpose, with appropriate accuracy and precision.

Completion of technical studies will include the acquisition of sufficient data to understand the mineral development cost and the timeline for developing the project, which will consider the relevant uncertainties that may affect economic mineral

recovery. IHC Robbins is a leading service provider to the heavy mining and processing sector and has the ability to advise on industry best practice and integrated solution in geology, metallurgy, engineering, plant and equipment.

9.3.3 Health and Safety Statement

Barrytown JV Limited understands Occupational Safety and Health is an integral part of its business operations.

BJV confirms it has the capability and systems required to meet health and safety requirements for the types of activities (exploration drilling, mine development as detailed above) proposed under the permit. Appendix 6 includes a zipped folder of BJV's H&S policies, procedures and guidelines.

BJV is committed to having a proactive attitude to Health and Safety (H&S) and to meeting all standards set out in the Health and Safety at Work Act (2015) (HSWA), as well as the strengthened Health and Safety in Employment (Mining Operations and Quarrying Operations) Regulations 2013 which brought Health and Safety in New Zealand into line with international best practice. BJV's H&S Management system has been developed based on Australian guidelines. ASNZS 4801 and IS 5001.

Key consultants working for BJV have considerable experience in the implementation of Health and Safety practices in exploration and mining and have input to ensure BJV's ongoing adherence to industry-standard Health and Safety practices.

Exploration, mine development and mining activities will be conducted according to Standard Operating Procedures that will be systematically reviewed to achieve ongoing improvement for health and wellbeing, with risk assessments and safer practices being adopted wherever possible.

BJV will review Health and Safety documentation and plan for activities in advance of undertaking them, including Standard Operating Procedures and Site Safety Plans that are written individually to include site-specific detail and provided to all relevant employees and contractors.

9.4 Environment Statement

BJV confirms it has the capability and systems required to meet all environmental requirements for the types of activities (exploration drilling, mine development as detailed above) as proposed under the permit. BJV has included its Environmental Policy as Appendix 6.

As noted in section 7.3.1, previous operators have completed several environmental studies analysing the potential environmental impact of the project.

As part of its land use consent application to the Grey District Council, BJV provided an assessment of the proposed initial mining activity's effects on the environment.

9.4.1 Specific Responsibilities for Environmental Requirements

The project operational management is the role of Mr John Berry. Mr Berry will primarily provide the technical expertise and day to day management of operations of BJV. Mr Berry is responsible for ensuring all contract staff are well informed and

involved in the management of operational risk across the business. As required, BJV will employ contractors for technical and specialty environmental needs.

Table 23: Summary of responsibilities for environmental requirements.

Personnel	Management of	Specific responsibilities for environmental requirements
BJV board	Environmental Policy	Provide overall guidance and policy for environmental standards
John Berry	Overall management of operations in a manner that meets environmental requirements.	Put in place framework and systems to meet required environmental policy and standards. Ensure that: - operations are undertaken to meet environmental requirements. - suitable consultants and contractors are engaged, trained and informed appropriately to meet environmental requirements.
Environmental Consultants	Preparation of a project specific report on the natural environment and undertake an assessment of effects	Site visits to describe the biological environment and identification environmental risks. Develop environmental operating procedures that provide for work to be undertaken in a way that meets environmental requirements.
Contractors	Identifying environmental hazards and avoiding, minimising and mitigating environmental effects of work undertaken.	Undertake work in a manner that meets the required environmental standards. Identification and reporting of observed environmental risks. Personal responsibility for ensuring environmental operating procedures are adhered to. Reporting of changes required to environmental operating procedures in order to meet environmental requirements.

9.4.2 Environmental Management Systems

BJV aims to ensure that environmental effects generated by its operations are eliminated, minimised or appropriately mitigated. BJV aim to meet regulatory requirements under Environmental Protection Legislation and effectively manage energy and water, whilst minimising waste and reducing our environmental footprint.

The proposed exploration activities are not considered to be of significant impact. The net effects of the proposed activities on conservation values, the land and other activities on the land will be minor. After the exploration programme is completed, there will be no lasting impacts or effects.

The development and operation of the mining activity will include the disturbance of land through removal of topsoil, excavation and processing of mineral sands, and rehabilitation requires specific management to ensure that actual and potential adverse effects are appropriately avoided, remedied or mitigated. There are a number of aspects associated with the management of land-based activities that require management, these include:

- Removal of vegetation and topsoil, and associated stockpiling of this material.
- Excavation and stockpiling of overburden.
- Excavation and processing of mineral sands.
- Replacement of the mining tailings, overburden and topsoil

The temporary nature of the proposed mining activity, previous modification and progressive rehabilitation practices means that the natural character of the coastal environment, wetlands and rivers will be preserved during the course of the proposed activity.

The measures that are proposed to avoid, remedy or mitigate the effects of the initial mine are set out in Appendices G and H. These largely relate to:

- Minimisation of the total land area disturbed by mining at any one time.
- Progressive rehabilitation of mined ground during the course of the wider mining activity
- Preservation and protection of the topsoil resource.
- Augmentation of the Canoe Creek Lagoon via planting and through rehabilitation works.

Planting will be completed adjacent to State Highway 6. This planting will include fast growing and colonising plants like coprosma, mahoe, lemonwood, wineberry, cabbage tree, flax and kohuhu. This planting will occur at 2 m intervals to form a dense coverage and be more than one row deep. Planting will also be undertaken as a buffer between the lagoon and mining operation / pastoral land to maintain the integrity of the coastal lagoon.

9.4.3 Environmental Management Experience

BJV has engaged Mr John Berry as Project Manager for the Barrytown project. John has a sound history in the mining and construction industries, contract management and has worked in a number of senior roles in both project management and commercial positions. His responsibilities have covered all aspects of the project development including developing DFS, Exploration, Environmental, Permitting, Land Access, and Contract Management, manning up the team and delivering the necessary corporate objectives.

BJV engaged Resource Solutions West Coast (RSWC) to assist with preparing the recently lodged resource consent applications for the Barrytown project. This involved RSWC completing various assessments to assess the existing values of the natural environment and assess the effects on the environment of exploration and mining by BJV. RSWC has significant experience in environmental monitoring, flora and fauna assessment, water sampling, and incident investigations. BJV also engaged Kōmanawa Solutions Ltd (KSL) to review the hydrological impact of a mining operation at Coates South. The assessments by RSWC and KSL have informed the resource consent application and future work/studies by expert consultants will continue to inform BJV on how to offset the environmental impacts when developing the Barrytown project.

10 Technical Capability

BJV is a New Zealand company that was incorporated to focus on the exploration and development of heavy mineral sand deposits at Barrytown. The directors of the company, Richard Pearce and David Straface, are based out of Perth, Australia.

BJV holds no other licences or permits outside of EP 51803 at Barrytown in New Zealand and this project is the single investment focus at present.

BJV will provide the general expertise required to develop the project into a mining operation and to manage the day-to-day running of the operation. BJV will also be supported by experienced industry consultants in exploration and developing the project. The project overall management will be undertaken by Mr John Berry, who was appointed as the Project Manager in November 2020 and has significant mining industry experience. Mr Berry will primarily provide the technical expertise and day-to-day management of development and operations for BJV.

BJV expects to bring in technical expertise and skills by contracting work out to various professional and independent consultants, including, but not limited to:

- RSC Consulting Ltd.
- IHC Robbins Pty Ltd.
- Resource Solutions West Coast Ltd.
- s 9(2)(a)
- H&S Consultants Pty Ltd.
- Novo Group Ltd.
- Glasson Huxtable Landscape Architects Ltd
- Kōmanawa Solutions Ltd
- JH Rekker Consulting Ltd.
- s 9(2)(a)

David Straface, Director, BSc, MBA, JD, Grad. Dip. Corporate Finance, Fellow FINSIA

David is a corporate advisor and lawyer with over 20 year's experience in the capital markets. David has worked in senior positions for Australian Defence Industries Limited (now Thales Australia), PricewaterhouseCoopers, CSC Limited (now DXC Technology), Montagu Stockbrokers and Aspermont Limited. David is a founding director of Barrytown JV Ltd and was instrumental in creating the original joint venture as well as managing the ventures Prefeasibility Study and its first Resource Consent application.

Richard Pearce, Director, BSc(Hons), MBA, FAIM, FGIA, MAICD

Richard Pearce is an experienced professional in the mining and mining technology industries. Mr Pearce's experience in the mining industry spans the value chain, including board directorships, exploration, operation management, mining

finance, M&A, business strategy, and operation improvement. With a career of over 20 years, Richard has Mr Pearce has worked for Rio Tinto, Hamersley Iron, Nova Energy (now Toro); Wildhorse Energy (now Salt Lake Potash), KPMG and Accenture and has worked in multiple commodities including mineral sands, iron ore, uranium, coal, gold and copper.

Phil Thick, Executive Chair Nominee, BEng(Hons), FAICD, FIEAust

Phil Thick has over 30 years senior executive experience in oil and gas, mining and chemical processing in large multinational companies, smaller ASX listed companies and privately owned companies. In addition, Phil has extensive experience on many boards in Non-Executive Director roles and has chaired many of those boards for extended periods. Phil had a 20 year career with Shell in Australia and overseas and for the last 3 years was Downstream Director on the Board of Shell Australia. This was followed by 5 years as a director and CEO of Coogee Chemicals and then 4 years as CEO of New Standard Energy. For the past 4.5 years Phil headed up Tianqi Lithium Australia, a subsidiary of Tianqi Lithium Corp out of China, one of the world's largest lithium companies. Tianqi owns 51% of the Greenbushes mine in Western Australia, the world's best hard-rock lithium resource, and Phil was charged with building the world's largest lithium hydroxide plant in Kwinana south of Perth, an investment of nearly A$1billion.

John Berry, Project Manager

John has been working in the mining and construction industries for over 30 years. He has extensive commercial and project development background in mining operations in Australia and overseas. He has worked in a number of senior roles in both project management and commercial positions. His responsibilities have covered all aspects of the project development including developing DFS, Exploration, Environmental, Permitting, Land Access, and Contract Management, manning up the team and delivering the necessary corporate objectives.

John was recently employed by Robust Resources as Chief Operating Officer for the subsidiary and operating company PT Gemala Borneo Utama which is developing the Romang Gold Silver project, in East Maluku province of Indonesia. The project aimed to process 750,000 tons of gold silver ore per annum as well as mine and prepare 500,000 Manganese ore for sale or processing. The bankable feasibility study was completed with positive returns but due to social, political and the downturn in commodity pricing the project was placed on hold.

A full CV for John is provided in Appendix 6.

s 9(2)(a), BMT, MAusIMM

s 9(2)(a) is a mining engineer with over 38 years of continuous employment in industry. Prior to that he worked in underground metal mines. s 9(2)(a) completed a Bachelor of Mineral Technology (Mining Engineering) at University of Otago in 1980. He has held engineering, project management, general management and marketing roles in quarrying, construction, contract mining and alluvial gold mining business units. Since 1997, he has operated as a consultant to miners,

contractors, quarry owners and as a contract project and mine manager. He has also acted as expert witness and advisor in several arbitration and mediation cases.

s 9(2)(a) , BSc(Eng)

s 9(2)(a) is a contract mine planner with over 20 years of experience in the industry including exposure to several mineral groups and mining methods. His experience has covered operational requirements of design, scheduling and reconciliation. s 9(2)(a) initially trained as a mine surveyor before completing a BSc(Eng) in Mineral Resource Management at the University of the Witwatersrand in 1993. The curriculum included a hybrid of Mine Engineering, Mine Survey and geostatistical evaluation. s 9(2)(a) was a senior mining engineer with Solid Energy NZ from 2010 to 2017 where he was instrumental in progressing a new mining project through feasibility and into production status within tight resource/legal constraints.

s 9(2)(a) , BSc

s 9(2)(a) is a geologist with more than 40 years of experience in non-metallic minerals, industrial minerals, mineral sands, and quarry industries. s 9(2)(a) has extensive experience working with mineral sands in Australia and New Zealand, including the Barrytown project during the 1990s.

s 9(2)(a) was established as a specialised consultancy for the industrial minerals, mineral sands, and quarry industries. While in the past 20 years the primary focus has been geological studies, resource investigations, evaluation and appraisal of various projects; s 9(2)(a) brings considerable hands-on experience in laboratory testing and metallurgical knowledge. s 9(2)(a) is a Fellow of AusIMM, a Member of the Australian Institute of Geoscientists, the Geological Society of Australia, and the Royal Society of NSW.

s 9(2)(a) **(of H&S Consultants Pty Ltd),** BSc (Hons), MAIG, PGeol APEGA, PGeo BCPEG

s 9(2)(a) is a consulting geologist and works from H&SC's Sydney office. He has worked with Uranerz, B.P. Selco, Placer Dome, Trigg Woollett Olson Consulting and FSSI Consultants Canada. He has over thirty years experience on a wide variety of mining and exploration projects in Australia, Canada, USA, South America, China and South East Asia.

s 9(2)(a) **(of Kōmanawa Solutions Ltd),** BSc MSc

s 9(2)(a) , Principal Water Resource Scientist and founder of Kōmanawa Solutions and Adjunct Senior Fellow at the University of Canterbury, has 20 years' experience in water resource science and management, spanning contamination and water quality, surface water and groundwater resources, numerical modelling, groundwater source protection, managed

aquifer recharge, ground-source energy systems, water supply engineering, climate change impact assessment and mine water management.

IHC Robbins

IHC Robbins is a multi-discipline technology business, operating from Brisbane and Perth, specialising in providing services to the mineral sands industry. IHC Robbins was formed following a merger between Robbins Technology Group and Royal IHC in late 2015. As a leading mining equipment supplier, IHC Robbins deliver and support a specialist range of cost-efficient mineral processing solutions for mining projects (dry and wet). This includes lab test work, plant design, project engineering, equipment supply and complete plants. IHC Robbins has the ability to service customers from the start of mining projects with integrated solutions in geology, metallurgy, engineering, plant and equipment provides clients with metallurgical testwork, practical engineering and specialized equipment at competitive prices.

RSC Mining & Mineral Exploration Ltd.

RSC is assisting BJV with permit management, exploration planning and resource estimation.

RSC has a significant presence consulting to the global minerals sector being widely active in many exploration projects worldwide. These projects encompass all stages of the mineral project evaluation process from early stage reconnaissance to delineation drilling, resource modelling and mine planning. RSC has significant specific experience evaluating alluvial mineral deposits for economic potential.

RSC has substantial experience with the operating environment in New Zealand and is currently engaged in providing exploration management and exploration programme implementation for several projects. Recent heavy mineral sand projects that RSC has been involved with include the Hokitika South garnet project (NZ Garnet) and the South Taranaki titano-magnetite sand project (Pan NZ Resources). In addition to these, RSC has provided technical support on a number of alluvial gold exploration campaigns in the Otago and West Coast regions of New Zealand. Internationally, RSC has provided consulting support to BlueJay Mining (Greenland) and Image Resources (Western Australia) and a private explorer (Guinea) in regard to heavy mineral sand projects.

RSC typically reports Exploration Targets, Exploration Results, Mineral Resources or Ore Reserves in accordance with internationally recognised codes such as the JORC Code (2012) and the Canadian NI 43-101. RSC has experience in alluvial deposits in varied geological settings, including colluvial, fluvial, beach sands and offshore environments.

11 Financial Capability

BJV's commercial focus is currently on the development of the Barrytown heavy mineral project.

BJV has mandated Martin Place Securities (MPS), a Sydney stockbroker and corporate advisory firm specialising in the resources sector, to:

1. raise A$2.0 million in pre-IPO funds; and
2. take the Company to an Initial Public Offering (IPO) in 2021

MPS is pleased to note that over s 9(2)(b)(ii) has been raised and expended over the past few months in developing the Barrytown project.

MPS was established in 2000 as a stockbroker and corporate advisor to the resources industry. Since opening MPS has raised over A$1.1 billion for resource companies and completed over 30 IPOs on ASX and NSX over the past 15 years.

The Principal of Martin Place Securities is s 9(2)(a) , who is also a geologist. s 9(2)(a) was formerly the Manager of the Resource Portfolio for BT Australia, and the head of resource research for Macquarie Bank and Deutsche Bank in Australia.

MPS considers that Indicated and Inferred Resources with the mix of ilmenite and garnet offers a potentially high margin project that will be attractive to resources sector investors. The Project should gain community support in Barrytown through appropriate consultation and provide local employment opportunities and support for local businesses.

BJV has included a letter from MPS in Appendix 7 to support of this application.

12 Compliance Record

BJV's compliance history on EP 51803 has in general been sound. BJV engages the services of RSC to ensure the company meets work programme obligations, reporting obligations and submits any required change applications within the required timeframe. RSC are experienced permit management practitioners responsible for managing permits for a range of permit holders, including completing annual summary obligations and technical reporting. BJV has filed all reports and paid all fees within the required timeframes. BJV has recently applied for a Change of Conditions to postpone the upcoming obligations of EP 51803 (stage 6 - Table 24) due to Covid-19, Overseas Investment (Urgent Measures) Act 2020, Resource Consent Application, and planning for an extended drilling programme (see section 9.1.5.2). This application was submitted within the required timeframe and is currently under evaluation by NZP&M.

Table 24: EP 51803 Stage 6 minimum work programme.

#	Work Programme Obligation	Due Date
6(a)	complete a programme of resource definition drilling for a minimum of 2,000 metres	25/11/2020
6(b)	carry out analysis of un-tested samples collected	25/11/2020
6(c)	carry out metallurgical test work;	25/11/2020
6(d)	update the resource estimate to include garnet and zircon where appropriate;	25/11/2020
6(e)	complete a pre-feasibility study	25/11/2020
6(f)	prepare a technical report detailing all work completed during this stage of the work programme in conjunction with QAQC information and data sufficient to demonstrate levels of accuracy and precision to be submitted to the chief executive in accordance with the regulations	25/11/2020

BJV confirms that it has not had any permit(s) in an overseas jurisdiction that has been revoked in the past 10 years.

13 Land and Mineral Status Report

BJV has not provided an LMS report as part of this application as it is presumed that one has been provided to NZP&M in relation to EP 51803. Unfortunately, BJV does not have a copy of the LMS report as it was not provided to BJV by Alloy Resources when the exploration permit was transferred to BJV in 2018.

However, given that this MP application is subsequent to, and fully contained within, EP 51803 (which applied to aluminium, antimony, bismuth, copper, gold, ilmenite, iron, ironsand, lead, magnesium, molybdenum, nickel, PGMs, rutile, silver, tantalum, tin, titanium, tungsten, zinc, zircon and garnet), the mineral ownership for ilmenite, garnet, zircon and gold within this application should already be confirmed and recorded as crown-owned by NZP&M.

Nevertheless, BJV is happy to request a new LMS report be prepared by Milton Smith of Land information Services Ltd should NZP&M request this.

14 Application Fee

BJV has paid the Tier 1 mining permit application fee of $16,675.00 to NZP&M and the confirmation of the payment is attached to this application.

15 References

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16 Appendices

APPENDIX 1: BJV Resource Consent Applications

- Resource Consent Application to West Coast Regional Council – Mineral Sand Mining & Associated Activities
- Resource Consent Application to Grey District Council – Mineral Sand Mining & Associated Activities – Non-Rural Activity
- Integrated Transport Assessment Prepared for BJV
- Barrytown Mineral Sands Mining Project Landscape Assessment.
- Barrytown Mineral Sand Mine Assessment of Noise Effects
- Barrytown Hydrological Impact Assessment for Mineral Sands Extraction

APPENDIX 2: Barrytown Mineral Resource and Exploration Target Reports

- Lee & Burlet (2018a) - Barrytown Ilmenite Mineral Resource Estimate – February 2018
- Lee & Burlet (2018b) Barrytown Ilmenite Mineral Resource Estimate – Supplementary Report: Barrytown Gold Exploration Target - August 2018
- Lee & Burlet (2018c) Barrytown Ilmenite Mineral Resource Estimate – Supplementary Report: Barrytown Valuable Heavy Minerals – August 2018

APPENDIX 3: BJV Composite sample sighter separation – ALLIED MINERAL LABORATORIES

APPENDIX 4: Prefeasibility Study Barrytown Mineral Sands Project, New Zealand –November 2018

APPENDIX 5: BJV Financial Models

- Financial Model – ROM 1Mtpa for LOM
- Financial Model – ROM 1Mtpa (years 1-5), 2.6 Mtpa (years 5-8), 5 Mtpa (thereafter)

APPENDIX 6: Health, Safety, Environmental and Technical Capability

- BJV Health & Safety Management Systems
- BJV Environmental Policy
- Curriculum Vitae John Berry – Project Manager

APPENDIX 7: MPS Letter - Equity Capital Raising for Barrytown JV Limited

Jeannette Walker, Tim Journeaux, Aidan Allen
New Zealand Petroleum & Minerals
PO Box 1473
Wellington 6140
New Zealand

Dunedin, 13 January 2022

Dear Jeannette, Tim and Aidan

Re: Update on Barrytown Project EP51803

It has been some time since I have had an update from NZP&M on the Change of Conditions (CoC) application (51803.10) on Barrytown JV Limited's (BJV) Exploration Permit (EP51803) submitted in August 2020. I am writing to provide an update on the positioning of the Barrytown Project

In August 2021, prior to the tier 1 annual review meeting that you attended, I responded to Jeannette's queries on application 51803.10 and highlighted concerns with the timing BJV had originally put forward in August 2020 change of conditions application. Significant and ongoing issues related to Covid-19 and consequent delays with the Company's resource consent application have impacted BJV commercially in terms of capital raising for funding exploration in the short term. Hence, I requested in August 2021 that some of the Stage 6 obligation's due dates now be postponed from November 2021 to November 2022 (into Stage 7). I did not receive a response on whether this request would be processed under the existing CoC application. The November 2021 due date has now passed, and I am preparing a technical report on the work completed between 2018 and 2021, including obligation 6b, due to be submitted by mid-February.

BJV is also considering whether a second appraisal extension is going to be required for EP51803.10, given that drilling of Coates South, subsequent resource estimation and updated studies for the remaining EP area have been further delayed. An appraisal would need to be submitted in May 2022 and it is likely that BJV will also apply for another change of conditions at the same time. This seems somewhat counterintuitive if application 51803.10 will still be under evaluation at that time.

While BJV hope that drilling will commence at Coates North shortly (MPA60785.01), followed by drilling of Coates South and elsewhere within EP51803, it seems increasingly unlikely that the drilling, mineral resource estimate, ore reserve estimate and mining studies for the southern area will all be completed in the coming year as this is currently dependent on the resource consent being granted, providing confidence for investors to fund the exploration.

BJV originally lodged the Resource Consent application on 17th December 2020. Following a number of delays, two separate hearings were then held, the first between 22nd to 24th September 2021, and the second on 26th November 2021. BJV is yet

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Zimbabwe: +263 73 342 09416, Mattie Road, Burnside, Bulawayo
Turkey: +90 312 945 15 67, Next Level, Block A, No: 81, Söğütözü, Çankaya, Ankara

RSC Mining & Mineral Exploration
info@rscmme.com www.rscmme.com

to receive a decision from the commissioners, but now hopes for a positive decision on the resource consent application before mid-February, allowing the Company to plan the timing of the next steps and determine how work programmes can be achieved. However, as of today, the resource consent hearing has not been officially closed by the chair. It is not until the hearing is officially closed that the 15 working days for a decision commence. The Company has spent in the order of s 9(2)(b)(ii) in the process to date.

In anticipation of an earlier resource consent decision, the Company has planned its drilling programmes, sought tenders for the drilling, and programme management, and notified the successful drilling company its intention to commence work once resource consent is granted and associated funding is in place. The Company has also commissioned an external party to undertake engineering and metallurgical studies as soon as possible in 2022.

We query whether a call between NZP&M and BJV may be helpful after the resource consent decision to discuss steps for permitting going forward given the pending CoC application, MPA60785 application and possible upcoming appraisal extension and CoC applications.

Sincerely,

s 9(2)(a)

s 9(2)(a)
Permit Administrator on behalf of Barrytown JV Limited
RSC Global Pty Ltd t/as RSC Mining and Mineral Exploration
s 9(2)(a)

ASSESSMENT OF ENVIRONMENTAL CAPABILITY OF A PROPOSED OPERATOR OF A TIER 1 EXPLORATION OR MINING PERMIT

SECTION 29A & 32 – SUBSEQUENT PERMIT

Background

1. The regulatory framework for the allocation and management of rights to prospect, explore for and mine for petroleum and minerals in New Zealand has recently undergone a review.

2. A key part of the changes introduced to the Crown Minerals Act 1991 (**CMA**) and associated regulations and minerals programmes in May 2013, is the introduction of a high-level health, safety and environmental capability assessment at the permit grant stage. This is not intended to remove or pre-determine or affect any requirements that the holder of a permit under the CMA will need to meet under the relevant health and safety or environmental legislation relating to the activities under the permit.

3. The capability review is intended to ensure that Tier 1 exploration and mining permits are granted to those who are likely to have the capability to meet the relevant health, safety and environmental regulatory requirements associated with the permit activities, at the time the activities are to be undertaken.

Assessment of environmental capability under the CMA

4. Sections 29A and 29B of the CMA require the Minister to be satisfied of certain capabilities of a proposed operator of a Tier 1 exploration or mining permit.

5. Before granting a new Tier 1 exploration or mining permit, the Minister must be satisfied that the proposed permit operator **has, or is highly likely to have,** by the time the relevant work in any granted permit is undertaken, the **capability and systems** that are likely to be required to meet the environmental requirements of all specified Acts for the types of activities proposed under the permit (**environmental capability**).

6. In satisfying herself of the proposed operator's environmental capability, section 29A(3) of the CMA provides that the Minister:

   a. is only required to undertake a high-level preliminary assessment;

   b. may (but is not required to) seek the views of regulatory agencies (being the EPA, DOC, a consent authority or MNZ, as appropriate) and if she seeks the views of any of those agencies, may (but is not required to) rely on those views;

   c. is not required to duplicate any assessment process that a regulatory agency may be required to undertake under a specified Act (such as the Exclusive Economic Zone and Continental Shelf (Environmental Effects) Act 2012 or the Resource Management Act 1991).

7. The CMA provides that satisfaction of the proposed operator's environmental capability for the purposes of the CMA does not limit or have any effect or bearing on the requirements of the relevant environmental legislation in relation to the activities (section 29A(4)).

Application

Barrytown JV Limited (Barrytown JV) is identified as the proposed operator of Mining Permit 60758.01 (Barrytown) pursuant to an application under section 29A of the CMA and work conducted would be in line with their processes and systems..

The underlying exploration permit is owned by Barrytown JV who have worked the project up to its current stage.

The work programme for the permit comprises broadly the following activities:

- Ongoing shallow drilling and sampling to improve and optimise the mineral resource;
- Completion of a Feasibility Study, mine and processing optimisation and production scheduling; and
- Opencast mining of sand deposits and processing to a heavy mineral concentrate (HMC).
- Barrytown JV has provided the information detailed in Schedule 1 in relation to its environmental capability and the information it submitted to NZP&M.

Assessment

Clause 5.4 of the Minerals Programme for Petroleum 2013 and the Minerals Programme for Minerals (Excluding Petroleum) 2013 contain further guidance on the considerations that the Minister will take into account in satisfying himself of environmental capability. This envisages an assessment process as set out in **Schedule 2**.

A template assessment form based on these considerations is attached at **Schedule 3** should you wish to respond in this format.

We would be grateful if we could receive your response within 20 working days.

Tim Journeaux

Principal Minerals Advisor

New Zealand Petroleum & Minerals

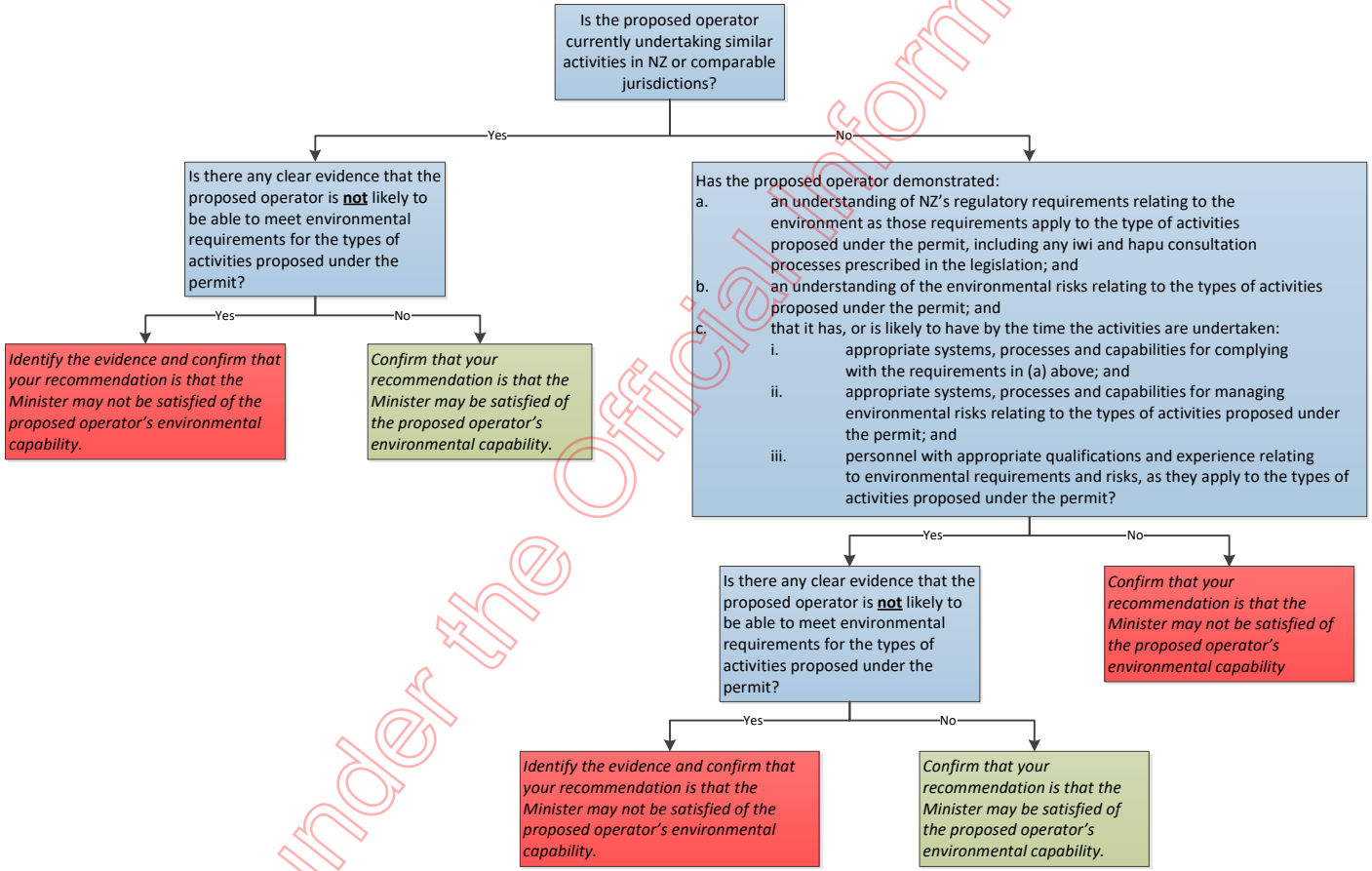
Schedule 1

INFORMATION REQUESTED FROM THE PROPOSED OPERATOR TO EVIDENCE ENVIRONMENTAL CAPABILITY

Information provided within and with the application relevant to consideration of environmental capability. Additional information to supplement the application has been sought and is attached.

Schedule 2

Environmental Capability Assessment Flowchart



Schedule 3

TEMPLATE HIGH-LEVEL ENVIRONMENTAL CAPABILITY ASSESSMENT FORM

Section 1 – Application Details		
Permit	60785.01	
Proposed Operator	Barrytown JV Limited	
Key permit activities	Resource development, mine optimisation and scheduling and subsequent mining and processing of heavy mineral sands.	
Section 2 – Assessment		
Q1	Is the proposed operator currently undertaking similar activities in New Zealand or comparable jurisdictions?	[yes] The applicant's management have undertaken similar activities in NZ and holds current permits in NZ for similar activities. ~~[no]~~
Current Operator in NZ or a comparable jurisdiction		
Q2	Is there clear evidence to suggest the proposed operator is **not** likely to be able to meet environmental requirements?	~~[yes][detail the evidence here] [go to Section 3]~~ [no] Evidence provided supports the position that the applicant is likely to be able to meet environmental requirements
Not a Current Operator in NZ or a comparable jurisdiction		
Q3	Has the proposed operator demonstrated: 1. an understanding of NZ's regulatory requirements relating to the environment as those requirements apply to the type of activities proposed under the permit, including any iwi and hapu consultation processes prescribed in the legislation; and 2. an understanding of the environmental risks relating to the types of activities proposed under the permit; and 3. that it has, or is likely to have by the time the activities are undertaken: a. appropriate systems, processes and capabilities for complying with the requirements in 1. above; and b. appropriate systems, processes and capabilities for managing environmental risks relating to the types of activities proposed under the permit; and c. personnel with appropriate qualifications and experience relating to environmental	~~[no][insert comments as appropriate] [go to Q4]~~ [yes] The applicant has undertaken similar activities in NZ and management of current permits in NZ for similar activities. [go to Section 3]

	requirements and risks, as they apply to the types of activities proposed under the permit?	
Q4	Is there clear evidence to suggest the proposed operator is **not** likely to be able to meet environmental requirements?	~~[yes][detail the evidence here] [go to Section 3]~~ ~~[no] [insert comments as appropriate] [go to Section 3]~~ Not Applicable

Section 3 - Recommendation

[Satisfied] Based on the information provided, I am satisfied that the proposed operator has, or is likely to have, by the time the relevant work in the permit is undertaken, the capability and systems that are required to meet the environmental requirements of all specified Acts for the types of activities proposed under the permit.

~~[Not Satisfied] Based on the information provided, I am not satisfied that the proposed operator has, or is likely to have, by the time the relevant work in the permit is undertaken, the capability and systems that are required to meet the environmental requirements of all specified Acts for the types of activities proposed under the permit.~~

Notes:

1. *If you seek further information from NZP&M or the applicant to reach a view on environmental capability of the applicant, please contact NZP&M (tim.journeaux@mbie.govt.nz).*
2. *Satisfaction of the proposed operator's environmental capability for the purposes of the CMA does not limit or have any effect or bearing on the requirements of the relevant environmental legislation in relation to the activities.*

Signed	s 9(2)(a)
Print Name	s 9(2)(a)
Position	Senior Environmental Management Systems Auditor SGS Knowledge
Date	05 Feb 2021

Appendix

INFORMATION SUPPLIED BY THE PROPOSED OPERATOR TO EVIDENCE ENVIRONMENTAL CAPABILITY

Provided separately but includes:

- Environment Policy;
- Resource consent application reports and documentation..

From: s 9(2)(a)
Sent: Wednesday, January 26, 2022 9:04 AM
To: Tim Journeaux
Subject: RE: 60758.01 Barrytown JV additional information [UNCLASSIFIED]

Thanks Tim.

BJV have the additional environmental information largely in hand already and are happy to provide this before you pass it on for assessment. Let's stick with the 8 February deadline for now. Hopefully we will have this back to you earlier than that.

Thanks,
s 9(2)(a)

s 9(2)(a)
Mobile (NZ) s 9(2)(a)

From: Tim Journeaux <Tim.Journeaux@mbie.govt.nz>
Sent: Tuesday, 25 January 2022 4:06 pm
To: s 9(2)(a)
Subject: RE: 60758.01 Barrytown JV additional information [UNCLASSIFIED]

Thanks s 9(2)(a)

I do have that and will submit with the policy as well as John Berry's CV for the assessment. With the recent change to 'highly likely' in the legislation I think there will be a bit more scrutiny on what is available. The supporting information section you have pointed out states a plan to develop the environmental framework and systems but it would be helpful if we could put a bit more meat on those bones. I have just spoken with David Straface and he indicated they expect the consenting decision around 10 February and also said Steven Mann is being put in place as CEO. Steven may have some useful information he could provide and any consent conditions may give guidance on key issues.

I will forward the information to hand to the company we use to conduct the environmental assessment and they may be satisfied with what is available. However, if that can be supplemented by additional documentation that would be helpful.

Cheers
Tim

From: s 9(2)(a)
Sent: Tuesday, 25 January 2022 3:45 pm
To: Tim Journeaux <Tim.Journeaux@mbie.govt.nz>
Subject: RE: 60758.01 Barrytown JV additional information [UNCLASSIFIED]

Hi Tim,

In addition to that appended policy, there are some comments on environmental capability on pages 71–73 (section 9.4) of the large information supplement. Was this also reviewed? Please confirm and if needed I will go back to BJV to provide additional documents on environmental standards, management plans, procedures and/or reporting standards.

I should also have the LMS report for you tomorrow.

Cheers,
s 9(2)(a)

s 9(2)(a)
Mobile (NZ) s 9(2)(a)

From: Tim Journeaux <Tim.Journeaux@mbie.govt.nz>
Sent: Tuesday, 25 January 2022 3:25 pm
To: s 9(2)(a)
Subject: 60758.01 Barrytown JV additional information [UNCLASSIFIED]

Hi s 9(2)(a)

In evaluating the Barrytown JV subsequent mining permit application I am in the process of getting assessments done for their H&S and environmental capability in accordance with section 29A(2)(d) of the Crown Minerals Act 1991 (CMA), which requires an operator to have, or be highly likely to have, the capability and systems required meet the requirements of the relevant legislation.

I think we have ample information to allow for the H&S assessment to be conducted but the application appears to be limited to a single, simple, environmental policy statement. Notwithstanding the information submitted for the resource consenting process, I think it would benefit the process if any environmental standards, management plans, procedures and/or reporting standards could be provided. The consenting information demonstrates environmental studies that have been done but do not then demonstrate the environmental capability, as outlined in the CMA. I do not think the current information will be sufficient to meet the capability test for environmental capability

I would appreciate any additional information in the areas outlined by the end of 8 February 2022, providing 10 working days. Always happy to discuss.

Kind Regards

Tim Journeaux PRINCIPAL MINERALS ADVISOR

New Zealand Petroleum & Minerals - Energy & Resource Markets Branch
Ministry of Business, Innovation & Employment

tim.journeaux@mbie.govt.nz | Telephone: +64 (4) 897 7638 |
15 Stout St, PO Box 1473, Wellington 6140
www.nzpam.govt.nz

From: s 9(2)(a)
Sent: Tuesday, February 1, 2022 1:47 PM
To: Tim Journeaux
Subject: Re: [EXTERNAL] Fwd: Environmental assessment for Barrytown JV 60758.01 [UNCLASSIFIED]

Hi Tim,

Received. Thanks. Will review over the next few days.

Kind regards,

s 9(2)(a)

Kind regards,

s 9(2)(a)

s 9(2)(a)
Knowledge
Senior Environmental Management Systems Auditor

SGS New Zealand Limited
22 Vestey Drive, Mt Wellington
Auckland 1060
New Zealand
Mobile: s 9(2)(a)
E-mail:
Web: https://www.sgs.com/en/knowledge-solutions

From: Tim Journeaux <Tim.Journeaux@mbie.govt.nz>
Sent: Tuesday, 1 February 2022 9:33 am
To: s 9(2)(a)
Subject: RE: [EXTERNAL] Fwd: Environmental assessment for Barrytown JV 60758.01 [UNCLASSIFIED]

Final email

From: s 9(2)(a)
Sent: Monday, 31 January 2022 3:10 pm
To: Tim Journeaux <Tim.Journeaux@mbie.govt.nz>
Subject: Re: [EXTERNAL] Fwd: Environmental assessment for Barrytown JV 60758.01 [UNCLASSIFIED]

Hi Tim,

I've completed a preliminary review of the information supplied with this application and yes, I do need further information on Barrytown JV's management / risk management systems.

The information provides a very broad outlined but is short on some details that we need to complete the ECA. Specifically, there are a couple of questions / requests for further information:

1. Can you please just confirm that the Applicant's experience in undertaking similar mining activities in NZ? I'm assuming that BJV hold / have been undertaking activities under Permit Number 60758, is that correct? I appreciate that Section 10 refers to technical capabilities of the Directors and Management but I'm just wondering about the entity's background.
2. Section 9.4 of the Application (Environmental Capability) makes reference to Appendix G and H, however the Appendices are numbered 1-7. Is this an unintentional error, or is there some information (other Appendices)?
3. Appendix 6 makes reference to 3 documents. I have the policy but don't appear to have received the other 2 documents i.e. BJV Health & Safety (and Environmental?) Management Systems and John Berry's CV. Can these please be sent through.

Please find attached a copy of the preliminary Environmental Capability Assessment Worksheet and a screen shot of the pages of the application referred to above (for ease of reference).

If there are any questions, please let me know.

Kind regards,

s 9(2)(a)

s 9(2)(a)
Knowledge
Senor Environmental Management Systems Auditor

SGS New Zealand Limited
22 Vestey Drive, Mt Wellington
Auckland 1060
New Zealand
Mobile: s 9(2)(a)
E-mail:
Web: https://www.sgs.com/en/knowledge-solutions

From: Tim Journeaux <Tim.Journeaux@mbie.govt.nz>
Sent: Friday, 28 January 2022 3:35 pm
To: s 9(2)(a)
Subject: RE: [EXTERNAL] Fwd: Environmental assessment for Barrytown JV 60758.01 [UNCLASSIFIED]

Thanks s 9(2)(a)

Appreciate your getting back to me. I have asked if they have more in the way of standards or procedures, which I think are being out together to submit. I'll send anything I get through. If what you have is enough however, that would be fine.

Cheers
Tim

From: s 9(2)(a)
Sent: Friday, 28 January 2022 3:09 pm

To: Tim Journeaux <Tim.Journeaux@mbie.govt.nz>
Subject: Fw: [EXTERNAL] Fwd: Environmental assessment for Barrytown JV 60758.01 [UNCLASSIFIED]

Hi Tim,

Just acknowledging receipt of the documents for this Environmental Capability Assessment.

My apologies for the delay in responding, I was away on business

I'll be able to undertake my evaluation and aim to have the assessment to you mid next week (Monday being a holiday up here).

Kind regards,

s 9(2)(a)

s 9(2)(a)
Knowledge
Senior HSE Auditor

SGS New Zealand Limited
22 Vestey Drive, Mt Wellington
Auckland 1060
New Zealand
Mobile: s 9(2)(a)
E-mail:
Web: https://www.sgs.com/en/knowledge-solutions

From: s 9(2)(a)
Sent: Thursday, 27 January 2022 8:02 pm
To: s 9(2)(a)
Subject: [EXTERNAL] Fwd: Environmental assessment for Barrytown JV 60758.01 [UNCLASSIFIED]

*** WARNING: this message is from an EXTERNAL SENDER. Please be cautious, particularly with links and attachments. ***

Begin forwarded message:

From: Tim Journeaux <Tim.Journeaux@mbie.govt.nz>
Subject: Environmental assessment for Barrytown JV 60758.01 [UNCLASSIFIED]
Date: 26 January 2022 at 8:24:47 AM NZDT
To: s 9(2)(a)

Hi s 9(2)(a)

I am working on the Barrytown JV mining permit application for a heavy mineral sand mine for Barrytown on the West Coast. It will be a Tier 1 mine due to the proposed minimum production rate of 1 Mt per annum.

Consequently, we require the usual high level assessment of whether the applicant has, or is highly likely to have, the capability and systems likely to be required to meet the environmental requirements. To this end I have attached

the assessment template as well as the information provided to us by the applicant. The permit evaluation is likely to take me some time so I have provided for 20 working days for the assessment to be done.

The information provided includes a section in the supporting information section 9.4 (pages 71-73), their environmental policy statement, some zip files dealing with their resource consent application and environmental reports done in support of the consent application and the CV of John berry who will be overseeing and developing their environmental standards and procedures etc. The files are quite large (with some sections that won't be relevant) so I will send as a series of emails to get them through.

I have asked them to provide any standards or procedures that have been developed and will forward them on if received.

Always happy to discuss

Cheers
Tim

Tim Journeaux PRINCIPAL MINERALS ADVISOR

New Zealand Petroleum & Minerals - Energy & Resource Markets Branch
Ministry of Business, Innovation & Employment

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From: Tim Journeaux
Sent: Tuesday, February 1, 2022 9:30 AM
To: s 9(2)(a)
Subject: RE: [EXTERNAL] Fwd: Environmental assessment for Barrytown JV 60758.01 [UNCLASSIFIED]
Attachments: CV John Berry.pdf; Health and Safety Documentation.zip

Hi s 9(2)(a)

I'm not sure what the 'appendices H and G' are so will chase them up. I had sent several emails to you the other day with zip files attached containing the documents from appendix 6. The zip files were large so I had sent individually. Is there a delivery limit on file size? I will try and send them again, let me know if no further emails arrive. I have attached the John Berry CV. I have requested any additional relevant standards and/or procedures so will send them on if received.

Barrytown JV hold the underlying exploration permit 51803 but don't hold any other permits. They have been undertaking exploration activities but do not have any NZ based mining experience. Section 10 in the supporting information you have gives a precis of the senior staff and consultants involved in terms of technical capability.

Cheers
Tim

From: s 9(2)(a)
Sent: Monday, 31 January 2022 3:10 pm
To: Tim Journeaux <Tim.Journeaux@mbie.govt.nz>
Subject: Re: [EXTERNAL] Fwd: Environmental assessment for Barrytown JV 60758.01 [UNCLASSIFIED]

Hi Tim,

I've completed a preliminary review of the information supplied with this application and yes, I do need further information on Barrytown JV's management / risk management systems.

The information provides a very broad outlined but is short on some details that we need to complete the ECA. Specifically, there are a couple of questions / requests for further information:

1. Can you please just confirm that the Applicant's experience in undertaking similar mining activities in NZ? I'm assuming that BJV hold / have been undertaking activities under Permit Number 60758, is that correct? I appreciate that Section 10 refers to technical capabilities of the Directors and Management but I'm just wondering about the entity's background.
2. Section 9.4 of the Application (Environmental Capability) makes reference to Appendix G and H, however the Appendices are numbered 1-7. Is this an unintentional error, or is there some information (other Appendices)?
3. Appendix 6 makes reference to 3 documents. I have the policy but don't appear to have received the other 2 documents i.e. BJV Health & Safety (and Environmental?) Management Systems and John Berry's CV. Can these please be sent through.

Please find attached a copy of the preliminary Environmental Capability Assessment Worksheet and a screen shot of the pages of the application referred to above (for ease of reference).

If there are any questions, please let me know.

Kind regards,

s 9(2)(a)

s 9(2)(a)

Knowledge

Senor Environmental Management Systems Auditor

SGS New Zealand Limited

22 Vestey Drive, Mt Wellington

Auckland 1060

New Zealand

Mobile: s 9(2)(a)

E-mail: s 9(2)(a)

Web: https://www.sgs.com/en/knowledge-solutions

From: Tim Journeaux <Tim.Journeaux@mbie.govt.nz>
Sent: Friday, 28 January 2022 3:35 pm
To: s 9(2)(a)
Subject: RE: [EXTERNAL] Fwd: Environmental assessment for Barrytown JV 60758.01 [UNCLASSIFIED]

Thanks s 9(2)(a)

Appreciate your getting back to me. I have asked if they have more in the way of standards or procedures, which I think are being out together to submit. I'll send anything I get through. If what you have is enough however, that would be fine.

Cheers
Tim

From: s 9(2)(a)
Sent: Friday, 28 January 2022 3:09 pm
To: Tim Journeaux <Tim.Journeaux@mbie.govt.nz>
Subject: Fw: [EXTERNAL] Fwd: Environmental assessment for Barrytown JV 60758.01 [UNCLASSIFIED]

Hi Tim,

Just acknowledging receipt of the documents for this Environmental Capability Assessment.

My apologies for the delay in responding, I was away on business

I'll be able to undertake my evaluation and aim to have the assessment to you mid next week (Monday being a holiday up here).

Kind regards,

s 9(2)(a)

s 9(2)(a)

Knowledge

Senior HSE Auditor

SGS New Zealand Limited

22 Vestey Drive, Mt Wellington

Auckland 1060

New Zealand

Mobile: s 9(2)(a)

E-mail: s 9(2)(a)

Web: https://www.sgs.com/en/knowledge-solutions

From: s 9(2)(a)
Sent: Thursday, 27 January 2022 8:02 pm
To: s 9(2)(a)
Subject: [EXTERNAL] Fwd: Environmental assessment for Barrytown JV 60758.01 [UNCLASSIFIED]

*** WARNING: this message is from an EXTERNAL SENDER. Please be cautious, particularly with links and attachments. ***

Begin forwarded message:

From: Tim Journeaux <Tim.Journeaux@mbie.govt.nz>
Subject: Environmental assessment for Barrytown JV 60758.01 [UNCLASSIFIED]
Date: 26 January 2022 at 8:24:47 AM NZDT
To: s 9(2)(a)

Hi s 9(2)(a)

I am working on the Barrytown JV mining permit application for a heavy mineral sand mine for Barrytown on the West Coast. It will be a Tier 1 mine due to the proposed minimum production rate of 1 Mt per annum.

Consequently, we require the usual high level assessment of whether the applicant has, or is highly likely to have, the capability and systems likely to be required to meet the environmental requirements. To this end I have attached the assessment template as well as the information provided to us by the applicant. The permit evaluation is likely to take me some time so I have provided for 20 working days for the assessment to be done.

The information provided includes a section in the supporting information section 9.4 (pages 71-73), their environmental policy statement, some zip files dealing with their resource consent application and environmental reports done in support of the consent application and the CV of John berry who will be overseeing and developing their environmental standards and procedures etc. The files are quite large (with some sections that won't be relevant) so I will send as a series of emails to get them through.

I have asked them to provide any standards or procedures that have been developed and will forward them on if received.

Always happy to discuss

Cheers
Tim

Tim Journeaux PRINCIPAL MINERALS ADVISOR

New Zealand Petroleum & Minerals - Energy & Resource Markets Branch
Ministry of Business, Innovation & Employment

tim.journeaux@mbie.govt.nz | Telephone: +64 (4) 897 7638 |
15 Stout St, PO Box 1473, Wellington 6140
www.nzpam.govt.nz

From: s 9(2)(a)
Sent: Sunday, February 6, 2022 9:41 AM
To: Tim Journeaux
Subject: Environmental Capability Assessment (ECA) - Permit Application 60758.01
Attachments: *MBIE P&M ECA WORKSHEET Tier 1 WKP Mining Permit 60758.01 Barrytown JV Jan-Feb 2022.pdf; *Environmental Capability 60758.01 request.docx completed SGS 05022022.docx

Hi Tim,

Attached a is copy of the completed Assessment and Assessor's Worksheet for the Environmental Capability Assessment of Permit Application 60758.01.

Based on the original and additional information provided, the applicant has provided sufficient information to be **satisfied** that they have, or are likely to have, by the time the relevant work in the permit is undertaken, the capability and systems that are required to meet the environmental requirements for the types of activities proposed under this permit application.

If you have any queries / need any further clarification, please contact me.

Regards,

s 9(2)(a)

Knowledge
Senior Environmental Management Systems Auditor

SGS New Zealand Limited
22 Vestey Drive, Mt Wellington
Auckland 1060
New Zealand
Mobile: s 9(2)(a)
E-mail:
Web: https://www.sgs.com/en/knowledge-solutions

Assessment Worksheet

Environmental Capability Assessment (ECA)

MBIE – NZ Petroleum & Minerals

Permit Application No.:	MBIE P&M ECA WORKSHEET Tier 1 Exploration or Mining Permit **Subsequent Permit 60758.01** – Jan-Feb 2022 pursuant to an application under section 29A & 32 of the CMA
Applicant / Bid:	Barrytown JV Limited
Completed By:	s 9(2)(a), Senior Environmental Management Systems Auditor – SGS Knowledge, NZ
Permit Application Scope:	Barrytown JV Limited (Barrytown JV) is identified as the proposed operator of Mining Permit 60758.01 (Barrytown) pursuant to an application under section 29A of the CMA and work conducted would be in line with their processes and systems.. The underlying exploration permit is owned by Barrytown JV who have worked the project up to its current stage. The works to be undertaken under this permit is broadly described as being: Resource development, mine optimisation and scheduling and subsequent mining and processing of heavy mineral sands'. The work programme for the permit comprises broadly the following activities: • Ongoing shallow drilling and sampling to improve and optimise the mineral resource; • Completion of a Feasibility Study, mine and processing optimisation and production scheduling; and • Opencast mining of sand deposits and processing to a heavy mineral concentrate (HMC).
Documents Submitted:	The following supporting document(s) were provided and reviewed in conducting a preliminary assessment: ○ Mining Permit Application – Supplementary Information (RSCMME: 24/02/2021) ○ Landscape Assessment (GLHA: Dec 2020)
Overall Submission:	Initial: Moderate / ~~Detailed / Very Detailed~~ Resubmitted: ~~Moderate~~ / ~~Detailed~~ / Very Detailed
Date Completed Preliminary Assessment (if applicable):	31/01/2022
Date Completed Final Assessment:	5/02/2022
Summary	

1. *General: Details of other activities of a similar kind to those proposed in the work programme that the proposed operator is currently undertaking in New Zealand or in comparable jurisdictions*

   This is a subsequent application, to an existing permit. The Directors and management of Barrytown JV Limited have indicated they have experience in undertaking exploration and mining activities in NZ for a number of years of a similar nature to those proposed in the work

programme, has previously undertaken activities in NZ and manage activities in relation to a current permit to undertake mining activities.

2. *If the proposed operator is not currently undertaking activities in New Zealand or in comparable jurisdictions similar to those proposed in the proposed work programme:*

   (a) details of the proposed operator's understanding of New Zealand's regulatory requirements relating to HSE as those requirements apply to the type of activities proposed in the work programme, including any iwi consultation processes prescribed in the relevant legislation (Requirements);

   (b) a description of the HSE risks (and proposed management of those risks) relating to the activities proposed in the proposed work programme (Risks);

   (c) description of the systems, processes and capabilities it currently has to meet the Requirements and manage the Risks; and

   (d) a list of its key personnel who have appropriate qualifications and experience to enable the operator to meet the Requirements and manage the Risks. If it does not currently employ personnel in these roles it must set out the steps it will take to engage those persons prior to the activities being undertaken.

   (e) *If the proposed operator does not currently have the appropriate systems, processes, capabilities or personnel that are likely to be required to comply with the Requirements and manage the Risks it must set out the process and timeframe by which the appropriate systems, processes, capabilities will be put in place or suitable personnel employed prior to the activities being undertaken*

   Not Applicable (N/A) – the information supplied for evaluation indicates that the Applicant is currently and has previously undertaken and is currently undertaking similar activities in NZ.

3. *A description of the company's management structure (directors/managers/personnel) identifying specific responsibilities for process safety and environmental requirements, up to and including board level.*

   The roles, responsibilities and accountabilities of the directors, management and/or other personnel in respect to environmental requirements have been defined in the submission. An Environmental Policy statement of commitment has been provided..

4. *An outline of the company's safety and environmental management systems, including the approach to hazard identification and control*

   The initially provided information, while stating a commitment to the environment, did not provide any detail in respect to the establishment of environmental aspect / impact and risk assessment and management processes, including (where applicable) management plans.

5. *An outline of the company's experience working in: (a) New Zealand or similar conditions to New Zealand and (b) other relevant operations*

   The Applicant, Barrytown JV Limited, is currently undertaking similar permitted activities in NZ and has illustrated experience in respect to environmental management activities in relation to the proposed mining activities.

CONCLUSION
~~SATISFIED - with no potential area(s) of any concern, based on high-level assessment of information supplied by the applicant.~~ **NOT SATISFIED** – Further Information is Requested
SUMMARY OF FURTHER INFORMATION REQUESTED: ○ Further information requested on environmental impact and risk assessment and management processes, including (where applicable) management plans.
RE-ASSESSMENT (As Applicable)
The following additional supporting document(s) were provided and reviewed in conducting the second assessment: ○ Water Management Plan & Monitoring and Mitigation Plan (Z20014: Dated 14/10/2021) ○ Wetland and Riparian Planting Plan - Barrytown JV Limited Mineral Sand Mine (Draft: 13/10/2021 ○ BJV GDC RC Application – Mineral Sand Mining & Associated Activities (12/12/2020) ○ BJV Assessment of Noise Affects (Rp 001 R04 20191310 : R04: 17/12/2020) ○ Integrated Transport Assessment (Ref. 746-001: Revision E: 18/12/2021) ○ Hydrological Impact Assessment for Mineral Sands ○ Avian Management Plan (2/08/2021) ○ Extraction (Report No: 20014_01_R2: 17/12/2020) ○ Dust Management Plan (Rev. 0: 4/10/2021).
Notes / Comments: Further information was provided included Management Plans, which have been developed with input from external consultants. These plans outline the management, mitigation and monitoring programs in relation to identified environmental aspects and potential environmental impacts (refer list of additional information supplied with the submission, above). External specialist consultant input has been obtained in respect to the development of these plans. Reference is made in these documents to the proposed implementation of environmental impact / risk management systems.
CONCLUSION – RE-ASSESSMENT
Not Applicable **SATISFIED** - with no potential area(s) of any concern, based on high-level assessment of information supplied by the applicant. ~~**NOT SATISFIED** – Further Information is Requested~~
Disclaimer
While every care has been taken in the undertaking of this assessment activity, the findings contained in this worksheet and the associated Environmental Capability Assessment Form are based on the desktop review (only) of documented information provided. No assessment has been undertaken, or is able to be undertaken, in respect to the implementation and/or effectiveness of environmental management or operational practices. The findings of this high-level review are provided to assist the MBIE in making their decision in respect to determining if the organisational has environmental management systems and practices and personnel with the relevant experience that would suggest that they are potentially capable of implementing these management systems and practices. While pertinent regulatory requirements have been taken into consideration in undertaking this assessment, the findings in this or any other associated report(s) or communications are not, and are not intended to be: exhaustive or conclusive; covering every hazard or risk potential; nor to guarantee or imply an absolute assurance of compliance with any statute or regulation. In any matter pertaining to the interpretation of legislative requirements and/or compliance. SGS and the assigned SGS Assessor are not accountable for any regulatory sanctions nor can they be held

accountable, directly or indirectly, for matters outside their control, including (but not limited to); activities, conditions, operations, decisions, actions or failure of actions by MBIE or the permit applicant's management and/or or operational practices that may occur or not occur subsequent to this assessment.

From: Dave Bellett
Sent: Monday, January 31, 2022 2:25 PM
To: Tim Journeaux
Cc: Priscilla Page
Subject: RE: Barrytown JV H&S capability assessment. [UNCLASSIFIED]

Thanks Tim

Having no reference to NZ legislation is consistent with historical request for additional information.

We are not seeking detail on compliance with every regulatory provision however H&S management systems at a basic level need to align with the framework of our legislation.

We wish to see that they understand what legislation applies and what CoC holders may be needed and how they plan to train/recruit these role. Historically overseas operations bring in staff then "beg for forgiveness" when no CoC holders are in place.

Regards

Dave Bellett (he/him)
Matawai Tuarā Huke Matua - Deputy Chief Inspector - Extractives
High Hazard, Energy & Public Safety

Level 2 351 Lincoln Road Christchurch , PO Box 165 Wellington 6140 ,
M s 9(2)(a)
E dave.bellett@worksafe.govt.nz
W www.worksafe.govt.nz

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From: Tim Journeaux <Tim.Journeaux@mbie.govt.nz>
Sent: Monday, 31 January 2022 2:05 pm
To: Dave Bellett <Dave.Bellett@worksafe.govt.nz>
Cc: Priscilla Page <Priscilla.Page@worksafe.govt.nz>
Subject: RE: Barrytown JV H&S capability assessment. [UNCLASSIFIED]

Hi Dave,

Thanks for getting this back to us. I will go back to Barrytown JV to seek further information in line with your comments.

I do have some concern that we appear to be moving away from high level preliminary assessments. I would appreciate some clarity on what you would like to see in regards to any description of the relevant legislation and what certificate of compliance holders would be required. Is that not determined by the legislation?

Regards
Tim

From: Dave Bellett <Dave.Bellett@worksafe.govt.nz>
Sent: Monday, 31 January 2022 1:34 pm
To: Tim Journeaux <Tim.Journeaux@mbie.govt.nz>
Cc: Priscilla Page <Priscilla.Page@worksafe.govt.nz>
Subject: Barrytown JV H&S capability assessment.

Dear Tim
Please find attached the requested capability assessment.

While a considerable amount of information was supplied indicating a knowledge of the application of risk management systems for a mining operation, there was no information supplied to indicate any knowledge of NZ law or systems designed to comply with it. WorkSafe are unaware if the Barrytown JV has worked in a comparable jurisdiction.

WorkSafe would require further information:

- A description of what legislation will apply and how the operator plans to implement the legislation
- What certificate of competence holders are likely to be required to meet the requirements of NZ H&S law

Regards
Dave Bellett (he/him)
Matawai Tuarā Huke Matua - Deputy Chief Inspector - Extractives
High Hazard, Energy & Public Safety

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From: Dave Bellett
Sent: Thursday, February 10, 2022 12:24 PM
To: Tim Journeaux
Subject: RE: Health & Safety Management System IN-CONFIDENCE

Hi Tim
The statement by Mr John Berry is what we were looking for. On that basis, I'll resubmit the capability assessment form as acceptable in a few days.

Regards

Dave Bellett (he/him)
Matawai Tuarā Huke Matua - Deputy Chief Inspector - Extractives
High Hazard, Energy & Public Safety

Level 2 351 Lincoln Road Christchurch , PO Box 165 Wellington 6140 ,
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From: Tim Journeaux <Tim.Journeaux@mbie.govt.nz>
Sent: Thursday, 10 February 2022 9:32 am
To: Dave Bellett <Dave.Bellett@worksafe.govt.nz>
Subject: FW: Health & Safety Management System IN-CONFIDENCE

Hi Dave,

I have this information (below) back from Barrytown JV, now called TIA Minerals and Metals Limited, in respect to the NZ legislation, key positions and CoC's. Hopefully this is what you wanted to see in respect to the capability assessment.

Regards
Tim

Tim Journeaux PRINCIPAL MINERALS ADVISOR

New Zealand Petroleum & Minerals - Energy & Resource Markets Branch
Ministry of Business, Innovation & Employment

tim.journeaux@mbie.govt.nz | Telephone: +64 (4) 897 7638 |
15 Stout St, PO Box 1473, Wellington 6140
www.nzpam.govt.nz

From: John Berry s 9(2)(a)
Sent: Wednesday, 9 February 2022 4:46 pm
To: Tim Journeaux <Tim.Journeaux@mbie.govt.nz>
Subject: Health & Safety Management System

Tim
I noticed that the information supplied to you on the Health & Safety Management(HSM) system only included a couple of Company Policies. The HSM is far more extensive with safe work procedures, OH&s forms, Standards etc. The policies for that have been included as an example.

The current Health & Safety Management Systems (HSM), policies, standards, procedures will be aligned with the requirements of the Health & Safety at Work Act 2015, and in particular the Health & Safety at Work (Mining & Quarrying Operations) Regulations 2016. As the current HSM meets Australian standards it is a reasonable expectation that they would be aligned with the NZ legislation and any adjustment, additions or new policies etc will be developed as required. Tiga accepts that the relevant certificates of competence (CoC), as outlined in Part 2 and section 35 of the regulations would need to be held.

A Senior Site Executive(SSE), the Manager of Mining operations will be recruited in accordance with section 2 of the regulations and will be responsible for the development of the Principal Hazard Management Plan as covered in Part 4 of the regulations, and maintain Principal control plans in accordance with Part 5 of the regulations. The mine manager along with the Health & Safety Superintendent (NZ professionally qualified and holding relevant COC's) would also ensure the development and alignment of the H&S management system in line with Part 3 of the regulations.

The Mine Manger, Health and Safety Superintendent, and Environment Superintendent will be among the first people employed by Tiga.

The operation will also require an Electrical and Mechanical Superintendent's/Supervisors with the relevant CoC's to ensure electrical and mechanical control plans as required. There will also be a Mine Surveyor employed by Tiga and WorkSafe has the ability to prescribe requirements under section 34 of the regulations.

The following is a list of the senior personnel to be employed by the Operation:
Operations Manager
Mine Manger –
Geology Manager
Mine Surveyor
Plant Manager
Maintenance/Mechanical Superintendent
Metallurgical Superintendent
Electrical Supervisor
Mechanical Supervisor
Administration Superintendent
Senior Accountant
Safety Superintendent
Environmental Superintendent

A complete list of the required personnel is contained in the personnel section of the financial model I have sent to you previously. Should you require any further information please do not hesitate to ask.

Thank you

JOHN BERRY
Project Manager

TiGa MINERALS & METALS

M: s 9(2)(a)
Email: s 9(2)(a)

From: Dave Bellett
Sent: Tuesday, February 15, 2022 9:39 AM
To: Tim Journeaux
Cc: Priscilla Page
Subject: HS Capability 60758.01 request V2
Attachments: HS Capability 60758.01 request V2.docx

Good morning Tim
Please see attached, an updated assessment from WorkSafe following receipt of further information from the project.

Regards

Dave

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ASSESSMENT OF HEALTH AND SAFETY CAPABILITY OF A PROPOSED OPERATOR OF A TIER 1 EXPLORATION OR MINING PERMIT

Background

1. The regulatory framework for the allocation and management of rights to prospect, explore for and mine for petroleum and minerals in New Zealand has recently undergone a review.

2. A key part of the changes introduced to the Crown Minerals Act 1991 (**CMA**) and associated regulations and minerals programmes in May 2013, is the introduction of a high-level health, safety and environmental capability assessment at the permit award stage. This is not intended to remove or pre-determine or affect any requirements that the holder of a permit under the CMA will need to meet under the relevant health and safety or environmental legislation relating to the activities under the permit. A capability assessment is also required upon seeking a change of operator under section 41C of the CMA.

3. The capability assessment is intended to ensure that Tier 1 exploration and mining permits are awarded to and operated by those who are likely to have the capability to meet the relevant health, safety and environmental regulatory requirements associated with the permit activities, at the time the activities are to be undertaken.

Assessment of health and safety capability under the CMA

4. Sections 29A, 29B and 41C of the CMA require the Minister to be satisfied of certain capabilities of a proposed operator of a Tier 1 exploration or mining permit.

5. Before granting a new Tier 1 exploration or mining permit, the Minister must be satisfied that the proposed permit operator **has, or is highly likely to have,** by the time the relevant work in any granted permit is undertaken, the **capability and systems** that are likely to be required to meet the health and safety requirements of all specified Acts for the types of activities proposed under the permit (**H&S capability**).

6. In satisfying himself of the proposed operator's H&S capability, section 29A(3) of the CMA provides that the Minister:

   a. is only required to undertake a high-level preliminary assessment;

   b. must seek the views of the Health and Safety Regulator and may (but is not required to) rely on those views;

   c. is not required to duplicate any assessment process that a regulatory agency may be required to undertake under a specified Act (such as the Health and Safety at Work Act 2015).

7. The CMA provides that satisfaction of the proposed operator's H&S capability for the purposes of the CMA does not limit or have any effect or bearing on the requirements of the relevant health and safety legislation in relation to the activities (section 29A(4)).

8. The Minister may consent to a change of operator of a Tier 1 exploration or mining permit only if the Health and Safety Regulator has advised NZP&M that it is satisfied that any requirements of the Health and Safety at Work Act 2015, or regulations made under that Act, that the proposed operator must meet before carrying out day-to-day management of activities under the permit have been, or are likely to be, met.

Application

9. Barrytown JV Limited (Barrytown JV) is identified as the proposed operator of Mining Permit 60758.01 (Barrytown) pursuant to an application under section 29A of the CMA and work conducted would be in accordance with their processes and systems.

10. The underlying exploration permit is owned by Barrytown JV who have worked the project up to its current stage.

11. The work programme for the permit comprises broadly the following activities:

    a. Ongoing shallow drilling and sampling to improve and optimise the mineral resource;

    b. Completion of a Feasibility Study, mine and processing optimisation and production scheduling; and

    c. Opencast mining of sand deposits and processing to a heavy mineral concentrate (HMC).

12. Barrytown JV has provided the information detailed in Schedule 1 in relation to its H&S capability and the information it submitted to NZP&M.

Assessment

13. Clause 5.4 of the Minerals Programme for Petroleum 2013 and the Minerals Programme for Minerals (Excluding Petroleum) 2013 contain further guidance on the considerations that the Minister will take into account in satisfying himself of H&S capability. This envisages an assessment process as set out in **Schedule 2**.

14. A template assessment form based on these considerations is attached at **Schedule 3 should** you wish to respond in this format.

15. We would be grateful to receive your response within 20 working days.

Tim Journeaux

Principal Minerals Advisor

New Zealand Petroleum & Minerals

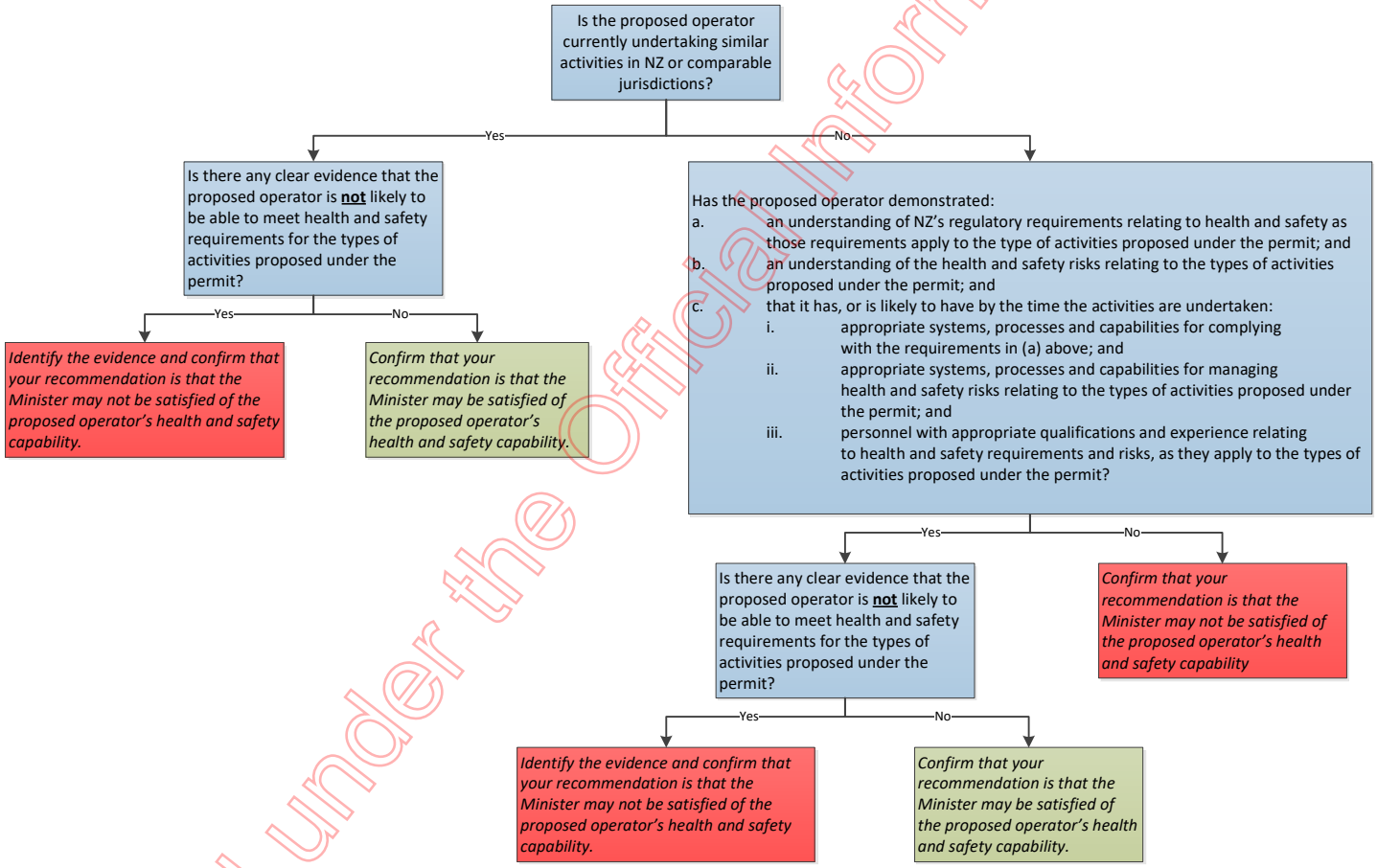
Schedule 1

INFORMATION REQUESTED FROM THE PROPOSED OPERATOR TO EVIDENCE H&S CAPABILITY

Information provided within and with the application relevant to consideration of H&S capability is provided separately. No additional information has been sought to date.

Schedule 2

Health and Safety Capability Assessment Flowchart



Schedule 3

TEMPLATE HIGH-LEVEL HEALTH AND SAFETY CAPABILITY ASSESSMENT FORM

Section 1 – Application Details		
Permit	60758.01	
Proposed Operator	Barrytown JV Limited	
Key permit activities	Resource development, mine optimisation and scheduling and subsequent mining and processing of heavy mineral sands.	
Section 2 – Assessment		
Q1	Is the proposed operator currently undertaking similar activities in New Zealand or comparable jurisdictions?	**No**, the JV appears to have been set up for this project. It appears from the submitted documents that one or more of the JV partners have worked in Australia.
Current Operator in NZ or a comparable jurisdiction		
Q2	Is there clear evidence to suggest the proposed operator is **not** likely to be able to meet health and safety requirements?	N/A
Not a Current Operator in NZ or a comparable jurisdiction		
Q3	Has the proposed operator demonstrated: 1. an understanding of NZ's regulatory requirements relating to health and safety as those requirements apply to the type of activities proposed under the permit; and 2. an understanding of the health and safety risks relating to the types of activities proposed under the permit; and 3. that it has, or is highly likely to have by the time the activities are undertaken: a. appropriate systems, processes and capabilities for complying with the requirements in 1. above; and b. appropriate systems, processes and capabilities for managing health and safety risks relating to the types of activities proposed under the permit; and c. personnel with appropriate qualifications and experience relating to health and safety	**Yes.** NZ legislation referenced following request for further information Appears to have systems to manage risks Health and Safety at Work (Mining Operations and Quarrying Operations) Regulations 2016 referenced

	requirements and risks, as they apply to the types of activities proposed under the permit?	Certificate of Competence holders detailed
Q4	Is there clear evidence to suggest the proposed operator is **not** likely to be able to meet health and safety requirements?	**No.**

Section 3 - Recommendation

S29A/B application for grant of permit:

Based on the information provided, I am **satisfied** that the proposed operator has, or is highly likely to have, by the time the relevant work in the permit is undertaken, the capability and systems that are required to meet the health and safety requirements of all specified Acts for the types of activities proposed under the permit.

Notes:

1. *If you require further information from NZP&M or the applicant to reach a view on health and safety capability of the applicant, please contact NZP&M (tim.journeaux@mbie.govt.nz).*
2. *Satisfaction of the proposed operator's health and safety capability for the purposes of the CMA does not limit or have any effect or bearing on the requirements of the relevant health and safety legislation in relation to the activities.*

Signed	s 9(2)(a)
Print Name	Dave Bellett
Position	Deputy Chief Inspector
Date	15 February 2022

Appendix

INFORMATION SUPPLIED BY THE PROPOSED OPERATOR TO EVIDENCE HEALTH AND SAFETY CAPABILITY

Provided separately but includes:

- Occupational Health and Safety Policy;
- A zipped folder containing additional relevant policies, safety standards, safety management plan, procedures, standards and investigation guidelines.

From: John Berry s 9(2)(a)
Sent: Tuesday, February 1, 2022 2:53 PM
To: Tim Journeaux
Subject: Further Information
Attachments: 211025 Master Model - Scenarios Vs 13 HMC Stocpile.xlsx

Follow Up Flag: Follow up
Flag Status: Flagged

Categories: Priority 1

Good Morning Tim:
Please find attached the latest financial model, with updated pricing assumptions etc. The model is driven from the cover page whereby a change to the scenario number will change the model outputs. The model is in US Dollars.
Transport & Shipping: The model assumes a transport cost of s 9(2)(b)(ii) per ton per kilometer and a shipping charge of s 9(2)(b)(ii) per ton shipped.
Gold:
Given that the nature of the gold will be fine alluvial and some nuggets, the gold recovery circuit will be contained within the wet concentrator plant. The conceptual design is for the HMC recovered from the spirals to be passed over either a Wilfrey or Gemini table to separate the fine gold and any nuggets from the HMC. The with the non-gold streams from the tables will then go through Knelson or Falcon concentrators to extract any residual gold. The extracted gold will then be sent to a gold smelter to produce dore. The final design of this circuit is subject to metallurgical test work which is planned for the first half of this year as part of the planned Definitive Feasibility Study(DFS) to be completed by the end of the year. The DFS will confirm mining methodology, mine plan, recoveries, process flow, engineering design, capital cost, operating costs, infrastructure requirements, transport and logistics, health and safety requirements, environmental requirements etc.

Health & Safety:
Barrytown will operate under a comprehensive Health and Safety Management System consistent with the Australian and New Zealand standards which I understand has been supplied. Barrytown will be employing suitably qualified, competent New Zealand personnel in the roles of Health and Safety Manager and Environmental Manger to ensure the operations and the Health and Safety Management System complies with all relevant New Zealand legislation. These two key roles will be employed as part of the initial operations to ensure compliance and to review the policies, procedures, Standards, forms, safe work practices etc are compliant with NZ.

Should you require any further information please feel free to contact me anytime.

Thank you

JOHN BERRY
Project Manager

TiGa MINERALS & METALS

M: s 9(2)(a)
Email: s 9(2)(a)

From: Rolly Clavecilla
Sent: Wednesday, February 16, 2022 11:51 AM
To: Dean McKay
Subject: RE: 211025 Master Model - Scenarios Vs 14 HMC Stocpile.xlsx IN-CONFIDENCE

Thanks Dean.

From: Dean McKay <Dean.McKay@mbie.govt.nz>
Sent: Wednesday, 16 February 2022 11:49 am
To: Rolly Clavecilla <Rolly.Clavecilla@mbie.govt.nz>
Subject: RE: 211025 Master Model - Scenarios Vs 14 HMC Stocpile.xlsx IN-CONFIDENCE

Thanks Rolly it makes sense for you to review the model. Once you understand it then I would like you to walk me through the main inputs and outputs.

Knowing the production rates for the underlying minerals will help with the discussion on the appropriate royalty rates to be applied to the raw product for Barrytown.

We should have a chat next week, as these next few days I need to be available for the completion and handover of Simons work.

Regards
Dean

From: Rolly Clavecilla <Rolly.Clavecilla@mbie.govt.nz>
Sent: Wednesday, 16 February 2022 10:54 am
To: Dean McKay <Dean.McKay@mbie.govt.nz>
Cc: Simon Korb <Simon.Korb@mbie.govt.nz>
Subject: FW: 211025 Master Model - Scenarios Vs 14 HMC Stocpile.xlsx IN-CONFIDENCE
Hi Dean,

Work coming from TJ…
Happy for me to do this but let me know what level of involvement you want.

Thanks and regards,
Rolly

From: Tim Journeaux <Tim.Journeaux@mbie.govt.nz>
Sent: Wednesday, 16 February 2022 10:44 am
To: Simon Korb <Simon.Korb@mbie.govt.nz>; Rolly Clavecilla <Rolly.Clavecilla@mbie.govt.nz>
Subject: FW: 211025 Master Model - Scenarios Vs 14 HMC Stocpile.xlsx IN-CONFIDENCE

Hi Guys,

I am assessing application 60785.01, a subsequent mining permit application for the Barrytown Sands project. The applicant has provided their latest financial model, which evaluates a range of possible mining and processing scenarios. The modelling has been done to a pre-feasibility level with a feasibility study to be completed as part of a staged work programme. The scenarios look realistic to me (a bit of a question on whether they could sustain a 5 Mtpa production rate through their plant) and the assumptions made also look reasonable (as explained in the

'Cover' worksheet). The modelling also looks well set up and comprehensive. They have used a 10% discount rate to calculate NPV and have used a degree on conservatism in applying costs and revenue.

Could one of you please give it a look over for any particular flaws and give a view on the robustness of the model? I don't want to over explain in the recommendation to Susan, who will make the decision, but she will ask if the modelling is robust and if anyone other than myself think so.

Happy to discuss.

Cheers
TJ

From: John Berry s 9(2)(a)
Sent: Thursday, 10 February 2022 2:56 pm
To: Tim Journeaux <Tim.Journeaux@mbie.govt.nz>
Subject: 211025 Master Model - Scenarios Vs 14 HMC Stocpile.xlsx

Hi Tim
Please see the attached model which does not give an error when looking at scenario 6.

Cheers

John Berry

From: s 9(2)(a)
Sent: Friday, February 18, 2022 12:47 PM
To: Tim Journeaux
Subject: RE: Financial capability Barrytown 60785.01 [UNCLASSIFIED]
Attachments: Barrytown JV 27 January 2021.pdf

Hi Tim,

I'll come back to you with the update on the raising but here is the original letter from MPS from January 2021.

Cheers,
s 9(2)(a)

s 9(2)(a)
Mobile (NZ) s 9(2)(a)

From: Tim Journeaux <Tim.Journeaux@mbie.govt.nz>
Sent: Friday, 18 February 2022 11:13 am
To: s 9(2)(a)
Subject: Financial capability Barrytown 60785.01 [UNCLASSIFIED]

Hi s 9(2)(a)

I am writing up the recommendation section on financial capability for the Barrytown sands project, 60785.01. I notice in the supporting information the key financing would be raised through Martin Place Securities (MSP) with instructions to:

- Raise s 9(2)(b)(ii) in pre-IPO funds; and
- Take the company to an IPO in 2021.

Can you provide an update on this please? Was the full s 9(2)(b)(ii) raised and has the IPO taken place or is it still planned?

There was also mention of a letter of support from MSP in Appendix 7. I cannot find this document so can you please resubmit it to us?

I have included in the financial capability discussion the gold streaming arrangement, which will provide significant funds up front.

Regards

Tim Journeaux PRINCIPAL MINERALS ADVISOR

New Zealand Petroleum & Minerals - Energy & Resource Markets Branch
Ministry of Business, Innovation & Employment

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15 Stout St, PO Box 1473, Wellington 6140
www.nzpam.govt.nz

From: Rolly Clavecilla
Sent: Wednesday, February 23, 2022 9:01 AM
To: Tim Journeaux
Subject: FW: Draft: 60785.01 Financial Model desktop review [UNCLASSIFIED]

Follow Up Flag: Follow up
Flag Status: Flagged

Hi Tim,

As discussed, here is the result of our desktop review of the financial model.
Overall, the model seems robust. However, we have identified that significant capital is required on the first 5 years of the project before it become self-funding.
We recommend that you consider that from your financial capability assessment, on whether or not they have sufficient funding to meet the initial capital requirement.

Happy to discuss if you need to clarify anything.

Thanks and regards,
Rolly

Rolly Clavecilla
SENIOR ROYALTIES AUDITOR

Building Resources and Markets Group
Ministry of Business, Innovation & Employment
rolly.clavecilla@mbie.govt.nz
Waea/Telephone: +64 4 901 1286
Level 12, 25 The Terrace, Te Puāwai o te Aroha – Pastoral House, Wellington

NZBN 9429000106078

From: Dean McKay <Dean.McKay@mbie.govt.nz>
Sent: Tuesday, 22 February 2022 5:19 pm
To: Rolly Clavecilla <Rolly.Clavecilla@mbie.govt.nz>
Subject: RE: Draft: 60785.01 Financial Model desktop review [UNCLASSIFIED]

Thanks Rolly,

I have made a few comments to the side of your table. Generally some conservatism is required with assumptions, but it seems that the venture is highly profitable regardless. An NPV of nil is sufficient because the required profit is within the discount margin, but the NPV in this case is strongly positive in any case. You have correctly identified the initial capital required to establish the project as the main issue in terms of financial capability.

From: Rolly Clavecilla <Rolly.Clavecilla@mbie.govt.nz>
Sent: Tuesday, 22 February 2022 12:43 pm
To: Dean McKay <Dean.McKay@mbie.govt.nz>
Subject: Draft: 60785.01 Financial Model desktop review [UNCLASSIFIED]

Hi Dean,

Here is a summary for discussion.

Regards,
Rolly

Scope of work: The desktop review of the financial model covers the following key assumptions. Sensitivity analysis was performed to account for risk relating to uncertainties involving the assumptions used.

Assumption(s)	What the model used	Observation and Sensitivity Analysis	D McKay - Comments
Period used	The model covers the period from 2023 to 2035 or 13 years.	The shorter the period the better in terms of being conservative. If we change the model to capture a 10 year period, NPV would be s 9(2)(b)(ii) (or average annual profit of s 9(2)(b)(ii)) instead of s 9(2)(b)(ii) (s 9(2)(b)(ii)). Overall, period used is reasonable.	I agree 10 years, is a good test. Project rapidly repays invested capital once production underway. All numbers are in USD
Discount rate	The model used 10% discount rate over 13 years (NPV of s 9(2)(b)(ii)).	The discount rate reflects the time value of money. A lower discount rate would result in a higher NPV. It is more conservative to use a higher discount rate. If we use 8% NPV over 13 years is s 9(2)(b)(ii) (using 10 years - s 9(2)(b)(ii)) If we use 12% NPV over 13 years is s 9(2)(b)(ii) (using 10 years - s 9(2)(b)(ii)) Overall, discount rate used is reasonable.	Agree 10% unlevered discount rate is standard.
Prices of metals	The model used $200/tonne and $1,480/tonne, for ilmenite and Zircon, respectively.	The price directly affects the NPV. A higher price would result in a higher NPV. It is more conservative to use the lowest price based on current market. Base Resources reported (2021) actual prices of $Ilmenite $250/tonne. The assumption used of $200 is more conservative. Base Resources also reported (2021) Zircon price of $1,300/tonne. The assumption used $1,480 and potentially too optimistic under the current market. If we use $1,300/tonne, NPV would go down to s 9(2)(b)(ii) instead of s 9(2)(b)(ii).	Perhaps ask for TJs view on these prices.

		Overall, the prices used is reasonable. The slightly higher price used for Zircon do not significantly affect the NPV.	
Others	The project do not anticipate to generate revenue until 2027.	The model provides an insight into the overall profitability of the project but also about the timing of cash flows. In the model operating and administrative cost of s 9(2)(b)(ii) is expected to be spent between 2023 and 2026 without generating revenue. The project is expected to generate revenue from 2027. This means that the project will not be self-funding until then. Capital expenditure of s 9(2)(b)(ii) is also expected to be spent in 2023 and a further s 9(2)(b)(ii) for a Wet Concentrator Plant (WCP) (s 9(2)(b)(ii)) and Mineral Separator Plant (MSP) (s 9(2)(b)(ii)). Of the s 9(2)(b)(ii), a total of s 9(2)(b)(ii) (or 15% of total cost) was added as a contingency presumably to account for possible price increases. To determine whether the price assumption for the cost of the WCP and MSP, Officials would have to look at any recent purchases in the market. Unfortunately, there are no available information in relation this. However, the fact that a contingency cost was added, indicates a conservative approach. **A note to TJ:** Officials must consider whether the current statement of financial position of the applicant demonstrates that they have available capital funds of a minimum **USD**s 9(2)(b)(ii) (s 9(2)(b)(ii) operating + s 9(2)(b)(ii) capex) to establish the project before it starts earning revenue in 2027.	Main capex is 2026 – see Detail tab FM691. Rolly has highlighted the financial capability hurdle. Being the initial funding of USD s 9(2)(b)(ii)

From: John Berry s 9(2)(a)
Sent: Tuesday, March 8, 2022 3:58 PM
To: Tim Journeaux
Subject: RE: Financial capability Barrytown 60785.01 IN-CONFIDENCE: RELEASE-EXTERNAL

Hi Tim
Thank you for your email below. Needless to say the team was very disappointed in the commissioners decision and has taken the time since receiving the decision to review and decide on the company's future planes.
We have now reviewed the Commissioners' findings in detail. s 9(2)(b)(ii)

Our proposal was to perform the baseline monitoring after consent but before mining development, as is normal practice. However the Commissioners relied on the recent Supreme Court case of Trans-Tasman Resources vs Taranaki1 , where the court ruled, in a split decision, that baseline data must be provided before the consent hearing. Note the Supreme Court decision was released on 30 September 2021, which was after our resource consent submission in December 2020 and our initial three day hearing in mid-September 2021.

The company has no intention of walking away from the project and there will be a press release soon to confirm it is our intention to proceed. The plan moving forward will be to firstly drill the piezometer holes and install monitoring equipment and to commence baseline flora and fauna studies. The resource consent area will then be drilled to establish greater confidence in the resource as well as other areas of the exploration tenement. The company will also complete a bankable feasibility study this year and will be reapply for a new resource consent early next year once baseline data has been collected and other minor issues resolved.

If you have any further questions or would like to discuss any part of the future work please don't hesitate to contact me.
Can you give me an indication of the progress of our mining application and any good news regarding its success or when a decision may be made.

Cherers

JOHN BERRY
Project Manager

TiGa MINERALS & METALS

M: s 9(2)(a)
Email: s 9(2)(a)

From: Tim Journeaux <Tim.Journeaux@mbie.govt.nz>
Sent: Tuesday, March 8, 2022 6:43 AM

To: John Berry <john.berry@tigamm.com>; David Straface s 9(2)(a)
Subject: RE: Financial capability Barrytown 60785.01 IN-CONFIDENCE: RELEASE-EXTERNAL

Hi John and David,

Given some news stories here, e.g. Greymouth Star, regarding the absence of an appeal on the resource consent decision, are you able to say what the plan might be? My understanding is there is nothing to stop TIGA re-applying for consents on the basis of further work.

The mining permit application recommendation continues to be written (and is largely complete) and is separate from access, consenting issues etc from a regulatory standpoint. However, it would be helpful if I could state the intentions in regards to the consents to the mining permit decision maker. As ever any information received would be considered confidential, although subject to the law around Official Information Act requests.

Regards
Tim

From: John Berry s 9(2)(a)
Sent: Wednesday, 2 March 2022 3:28 pm
To: Tim Journeaux <Tim.Journeaux@mbie.govt.nz>
Cc: s 9(2)(a)
Subject: RE: Financial capability Barrytown 60785.01

Hi Tim
Sorry for the delay in responding to your questions on financial capability of TiGa.
The company raised s 9(2)(b)(ii) in February 2021 from existing shareholders.
s 9(2)(b)(ii)

The company envisaged an IPO to be issued after resource consent is granted. As such the planned date for the IPO is in the first half of 2023.

Cheers

JOHN BERRY
Project Manager

TiGa
MINERALS & METALS

M: s 9(2)(a)
Email: s 9(2)(a)

From: Dean McKay
Sent: Thursday, May 19, 2022 8:40 AM
To: Tim Journeaux; Rolly Clavecilla
Subject: RE: Setting the point of valuation for Barrytown IN-CONFIDENCE

Tim and Rolly,

I had to look up what the LBMA was, but this makes sense to me. s 9(2)(b)(ii) [redacted]

Regards
Dean

From: Tim Journeaux <Tim.Journeaux@mbie.govt.nz>
Sent: Wednesday, 18 May 2022 4:52 pm
To: Dean McKay <Dean.McKay@mbie.govt.nz>; Rolly Clavecilla <Rolly.Clavecilla@mbie.govt.nz>
Subject: Setting the point of valuation for Barrytown

Hi Dean and Rolly,

I'm trying to progress the Barrytown MP application. One of the issues will be setting the point of valuation for the products, including gold. I'm happy with the heavy mineral sand products to have a point of valuation at the permit boundary (as is standard). However, given the gold streaming dealing I think we need to be a bit more specific on where the gold is valued and what value will be applied (remembering the gold will be s 9(2)(b)(ii) [redacted]). I am proposing the points of valuation below and would welcome feedback from either of you at your earliest convenience.

1. The point of valuation for the HMC and future further processed HMS products should be set at the permit boundary.
2. Given the gold streaming dealing with for the gold the point of valuation for gold should be set at the point of sale with the value set by the LBMA price at the time of sale.

I will approach the applicant for consent for the points of valuation, as well as the work programme, before pushing the recommendation through for a decision.

Cheers
TJ

From: Tim Journeaux
Sent: Tuesday, May 31, 2022 1:58 PM
To: s 9(2)(a)
Cc: John Berry; David Straface
Subject: RE: Work Programme and points of valuation [UNCLASSIFIED]

Thanks s 9(2)(a)

I will make that change to the work programme. The wording for the points of valuation may be slightly different to suit our format but will have the same precise result.

I'd appreciate that overlap agreement when available but will push the application forward in our workflow regardless in anticipation of it so we can keep things moving.

Appreciate yours and Johns feedback.

Cheers
Tim

From: s 9(2)(a)
Sent: Tuesday, 31 May 2022 1:23 pm
To: Tim Journeaux <Tim.Journeaux@mbie.govt.nz>
Cc: John Berry s 9(2)(a) ; David Straface s 9(2)(a)
Subject: RE: Work Programme and points of valuation

Hi Tim,

Thanks for this. TiGa proposes a handful of changes (as highlighted below and discussed) including moving the processing plant construction to Stage 2 and changing the valuation point when the HMC is further processed by TiGa:

1) Within 24 months of the commencement date of the permit, the permit holder shall (to the satisfaction of the chief executive):
   (a) Complete a programme of drilling for a minimum of 350 holes;
   (b) Complete a topographical survey;
   (c) Complete a programme of geomechanical, metallurgical, geochemical and environmental data collection appropriate for informing a Feasibility Study, optimised mine development and safe mine operation;
   (d) Conduct metallurgical bulk sampling & analysis to support the design of the HMC production units, determination of product specifications and gold mass-balancing;
   (e) Update resource estimates for ilmenite, garnet, zircon and gold, with the objective of elevation of a greater proportion of the ilmenite to an Indicated resource classification and classifying garnet, zircon and gold to an Inferred resource classification;
   (f) Complete a Mineral Reserve estimate in accordance with a recognised resource classification code as per Schedule 1 of the Minerals Programme (Minerals Excluding Petroleum) 2013.
   (g) Complete a feasibility study and detailed mine plan including a mine schedule;
   (h) Provide the chief executive with a report detailing all work completed during this stage and the results of that work, including submission of digital data in conjunction with QAQC information and data sufficient to demonstrate levels of accuracy and precision.

2) Within 36 months of the commencement date of the permit, the permit holder shall (to the satisfaction of the chief executive):

(a) Complete construction of a processing plant and associated mine infrastructure sufficient for processing first ore production;

(b) Commence mining;

(c) Undertake a further programme of resource drilling to increase resource confidence outside the initial mining area; and

(d) Provide the chief executive with a report detailing all work completed during this stage and the results of that work, including submission of digital data in conjunction with QAQC information and data sufficient to demonstrate levels of accuracy and precision.

3) The permit holder shall, to the satisfaction of the chief executive, carry out the following work programme:

(a) the stripping of topsoil and overburden and stockpiling, backfilling or other disposal as appropriate using earthmoving machinery as necessary;

(b) from the commencement of mining date specified in condition 2(a), undertake the mining of sand for the recovery of heavy mineral sands at the minimum rate of 1Mt per year (unless otherwise approved in writing by the chief executive) using earthmoving equipment as required;

(c) conduct ongoing resource and mine optimisation activities;

(d) Inform the Chief Executive of any changes in the saleable product(s) produced, including compositional details prior to those changes being made; and

(e) undertake rehabilitation as appropriate.

The proposed points of valuation and royalty conditions are:

2. For HMC the valuation point would be the permit boundary.
3. Any further processing of the HMC into its component elements the point of valuation would be the processing plant boundary
4. The point of valuation for gold would be set at the point of sale with the value set by the LBMA price at the time of sale.

In terms of the overlap with MP41913, I do have a copy of the original overlap consent from 2016, however, this is currently under review and TiGa are in consultation with the 41913 permit holder. We will advise once this is resolved.

Please let me know if you have any additional questions.

Kind regards,

s 9(2)(a)

Mobile (NZ) s 9(2)(a)

From: Tim Journeaux <Tim.Journeaux@mbie.govt.nz>
Sent: Friday, 20 May 2022 4:50 pm
To: s 9(2)(a)
Cc: John Berry s 9(2)(a) ; David Straface s 9(2)(a)
Subject: Work Programme and points of valuation

Hi s 9(2)(a)

Apologies for sending this late on a Friday afternoon. I have progressed the Barrytown MP application and am looking to get agreement on the proposed work programme and points of valuation for royalty purposes. The work programme proposed follows that proposed with the application as a staged minimum work programme reformatted to suit the format style of our permit certificates and with some alteration and addition to meet our requirements:

1) Within 24 months of the commencement date of the permit, the permit holder shall (to the satisfaction of the chief executive):
   (a) Complete a programme of drilling for a minimum of 350 holes;
   (b) Complete a topographical survey;
   (c) Complete a programme of geomechanical, metallurgical, geochemical and environmental data collection appropriate for informing a Feasibility Study, optimised mine development and safe mine operation;
   (d) Conduct metallurgical bulk sampling & analysis to support the design of the HMC production units, determination of product specifications and gold mass-balancing;
   (e) Update resource estimates for ilmenite, garnet, zircon and gold, with the objective of elevation of a greater proportion of the ilmenite to an Indicated resource classification and classifying garnet, zircon and gold to an Inferred resource classification;
   (f) Complete a Mineral Reserve estimate in accordance with a recognised resource classification code as per Schedule 1 of the Minerals Programme (Minerals Excluding Petroleum) 2013.
   (g) Complete a feasibility study and detailed mine plan including a mine schedule;
   (h) Complete construction of a processing plant and associated mine infrastructure sufficient for processing first ore production; and
   (i) Provide the chief executive with a report detailing all work completed during this stage and the results of that work, including submission of digital data in conjunction with QAQC information and data sufficient to demonstrate levels of accuracy and precision.

2) Within 36 months of the commencement date of the permit, the permit holder shall (to the satisfaction of the chief executive):
   (a) Commence mining;
   (b) Undertake a further programme of resource drilling to increase resource confidence outside the initial mining area; and
   (c) Provide the chief executive with a report detailing all work completed during this stage and the results of that work, including submission of digital data in conjunction with QAQC information and data sufficient to demonstrate levels of accuracy and precision.

3) The permit holder shall, to the satisfaction of the chief executive, carry out the following work programme:
   (a) the stripping of topsoil and overburden and stockpiling, backfilling or other disposal as appropriate using earthmoving machinery as necessary;
   (b) from the commencement of mining date specified in condition 2(a), undertake the mining of sand for the recovery of heavy mineral sands at the minimum rate of 1Mt per year (unless otherwise approved in writing by the chief executive) using earthmoving equipment as required;
   (c) conduct ongoing resource and mine optimisation activities;
   (d) Inform the Chief Executive of any changes in the saleable product(s) produced, including compositional details prior to those changes being made; and
   (e) undertake rehabilitation as appropriate.

There are some differences with this work programme compared to the one proposed with the application. I am happy to discuss any points you would like to raise or proposed amendments.

The proposed points of valuation and royalty conditions are:

1. For HMC and future further processed HMS products the valuation point would be the permit boundary.
2. The point of valuation for gold would be set at the point of sale with the value set by the LBMA price at the time of sale.

As for the work programme we are happy to discuss these valuation points.

My last question is around the very small overlap with MP 41913. Another Mineral Advisor had written that an overlap consent had been given for that permit. I apologise if you have already provided that consent but I cannot find it in our system. Could you please supply that consent for confirmation.

Look forward to hearing from you. Have a good weekend.

Regards
Tim

Tim Journeaux PRINCIPAL MINERALS ADVISOR

New Zealand Petroleum & Minerals - Energy & Resource Markets Branch
Ministry of Business, Innovation & Employment

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