ASX Announcement

Gabanintha Pre-Feasibility Study and Maiden Ore Reserve

19 December 2018

ASX ANNOUNCEMENT

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Projects:

Gabanintha - Vanadium
Blesberg,South Africa - Lithium/Tantalum
Nowthanna Hill – Uranium/Vanadium
Coates - Vanadium

Highlights:

- **Maiden Ore Reserve of 18.24Mt at 1.04% V_2O_5** comprised of a **Proved Reserve of 9.82Mt at 1.07% V_2O_5** and a **Probable Reserve of 8.42Mt at 1.01% V_2O_5**
- Open pit mining and beneficiation operation producing approximately **900,000 tonnes per annum** of **1.40% V_2O_5** magnetite concentrate at an average yield of **60%**
- Planned vanadium pentoxide (V_2O_5) refinery at Gabanintha site with a production rate of approximately **22.5Mlb V_2O_5 per annum over an initial mine life of 17 years**
- Significant potential to extend operations and mine life along strike for an additional 8km within Mining Lease Application M 51/878
- Average C1** operating expenses estimated at **US$4.15/lb V_2O_5 equivalent** (±25%), competitive with the world's lowest quartile producers
- Capital costs of approximately **US$354 million** (±25%). This includes owner's costs, contingencies and a partial gas pipeline investment.
- Ungeared post-tax $NPV_{8\%}$ ranges between **US$125 million** and **US$1.41 billion**, depending on the pricing assumption, indicating a robust project
- Conservative long-term average V_2O_5 product pricing assumption of US$8.67/lb used for financial modeling. Medium term price assumptions of US$13/lb and US$20/lb are considered and presented
- Current V_2O_5 price trading at US$22/lb (source: Fastmarkets) with anticipated ongoing supply shortfall until at least 2025
- Positive outcomes and strong vanadium market fundamentals support immediate progression to a Definitive Feasibility Study, with further drilling for pilot study scheduled to commence January 2019
- The mine plan includes 21% Inferred Resources. There is a low level of geological confidence associated with Inferred Mineral Resources and there is no certainty that further exploration work will result in the determination of Indicated Mineral Resources or that the production target itself will be realised

** C1 costs are direct costs incurred in mining and processing (labour, power, reagents, maintenance and consumables) including by-product credits.

Overview

Australian Vanadium Limited (ASX: AVL, “the Company” or “AVL”) is pleased to announce the pre-feasibility study (PFS) results and the release of a **Maiden Ore Reserve** for its 100% owned Gabanintha vanadium deposit in Western Australia (“the Project”). The results of the PFS build upon the initial base case (*see ASX announcement 26 September 2018 Gabanintha Presents Robust Base Case for PFS*) and indicate a Project with a well defined resource base, robust economics and utilising an industry standard, low-risk method of beneficiation and refining to produce a vanadium pentoxide (V_2O_5) flake product. Capital and operating cost estimates have been developed to the level of accuracy of ±25% and include mine and processing circuit designs, a detailed financial model and supporting bodies of work. The additional work has indentified a reduction in capital costs and confirmed the low, industry comparative, C1 operating costs with further opportunities identified.

The Project is based on a proposed open pit mine; crushing, milling and beneficiation plant (CMB) and refining plant for final conversion and sale of high quality vanadium pentoxide (V_2O_5) for use in steel, specialty alloys and energy storage markets. The PFS results highlight AVL’s potential to become a new low-cost vanadium producer.

The body of work completed in the PFS will feed into the Definitive Feasibility Study (DFS). Due to the level of detail of many study aspects undertaken in the PFS, several areas are now at an advanced stage and work in 2019 will focus on optimisation and further refinement.

Managing Director Vincent Algar comments, “By completing this PFS on Gabanintha we have taken a major step towards bringing our world class project into production. Announcing a maiden ore reserve is a key milestone and further embeds the Project’s low risk mineral resource and strong economic potential. The PFS includes detail that allows us to understand and design a long-life, low-cost vanadium pentoxide and cobalt concentrate production facility. Given the cyclical nature of the vanadium markets, it’s essential that all technical aspects are well understood and the capital and operating costs minimised.

“Gabanintha’s geology and geometallurgy is emerging as offering a unique opportunity for new vanadium production globally. The Company also holds an extensive strike of Inferred Resource for further definition. We believe that the Project will deliver a world-leading, life of mine mass recovery to concentrate of over 60%. The unique thickness of the Gabanintha high-grade zone adds to its potential.

“AVL shareholders can now have increased confidence in the value of the Company, as we embark immediately onto a diamond drill program to provide feed for pilot scale flowsheet validation testwork and other DFS work packages. The completed PFS will allow us to confidently engage with strategic partners in 2019, at a time when vanadium supplies are very much in demand. Vanadium’s future is bright, with its traditional markets transitioning to higher quality steels and new energy metal markets developing.”

Previously Reported Information

This announcement refers to the following previously reported information:

- Mineral Resources in the announcement dated 28 November 2018 and entitled "Resource Update at Gabanintha Vanadium Deposit Increases Indicated Mineral Resource"
- "Gabanintha Presents Robust Base Case for Pre-Feasibility Study" dated 26 September 2018

The Company confirms that it is not aware of any new information or data which materially affects the information included in these announcements and that all related material assumptions and technical parameters have not materially changed. The Company confirms that the form and context in which the Competent Persons' findings pertaining to the Gabanintha deposit are presented have not been materially modified from the original market announcements.

ASX Chapter 5 Compliance and PFS Cautionary Statement

The Company has concluded that it has a reasonable basis for providing the forward looking statements and forecast financial information included in this announcement. The detailed reasons for that conclusion are outlined throughout this announcement and all material assumptions including the JORC modifying factors, upon which the forecast financial information is based, are disclosed in this announcement. This announcement has been prepared in accordance with JORC Code 2012 and the ASX Listing Rules.

The Project is at the PFS phase and although reasonable care has been taken to ensure that the facts are accurate and/or that the opinions expressed are fair and reasonable, no reliance can be placed for any purpose whatsoever on the information contained in this document or on its completeness. Actual results and development of projects may differ materially from those expressed or implied by these forward looking statements depending on a variety of factors. A key conclusion of the PFS, which is based on forward looking statements, is that the Project is considered to have positive economic potential.

The Company believes it has a reasonable basis to expect to be able to fund and further develop the Project. However, there is no certainty that the Company can raise funding when required.

A Proved and Probable Ore Reserve classified under JORC 2012 Guidelines was used for the PFS and all relevant details are set out in this announcement.

Forward Looking Statements

Some of the statements contained in this announcement are forward looking statements. Forward looking statements include, but are not limited to, statements concerning estimates of tonnages, expected costs, statements relating to the continued advancement of Australian Vanadium Limited's projects and other statements that are not historical facts. When used in this report, and on other published information of Australian Vanadium Limited, words such as 'aim', 'could', 'estimate', 'expect', 'intend', 'may', 'potential', 'should' and similar expressions are forward looking statements.

Although Australian Vanadium Limited believes that the expectations reflected in the forward-looking statements are reasonable, such statements involve risks and uncertainties and no assurance can be given that the actual results will be consistent with these forward-looking statements. Various factors could cause actual results to differ from these forward-looking statements including the potential that Australian Vanadium Limited's Project may experience technical, geological, metallurgical and mechanical problems, changes in vanadium price and other risks not anticipated by Australian Vanadium Limited.

Australian Vanadium Limited is pleased to report this summary of the PFS in a fair and balanced way and believes that it has a reasonable basis for making the forward-looking statements in this announcement, including with respect to any mining of mineralised material, modifying factors, production targets and operating cost estimates. This announcement has been compiled by Australian Vanadium Limited from the information provided by the various contributors to the announcement.

Introduction

As per ASX Listing Rule 5.9 and the 2012 JORC reporting guidelines, a summary of the material information used to estimate the Ore Reserve is presented below (for more detail please refer to Appendix 3 – JORC Code Table 1, Section 4). This announcement also provides a summary of the full PFS report collated by Wood Mining and Metals (Wood), consultants to the Company and members of the AVL technical team.

The Project consists of 11 tenements covering 760 sq km and is held 100% by Australian Vanadium Limited, an Australian listed company. Mining Lease Application M 51/878 is currently awaiting approval and covers about 70% of the mineral resource, with the balance of the Inferred Mineral Resource located on E 51/843, owned 100% by AVL.

The PFS itself comprises 18 sections, each with an appendix and contains intellectual property owned by AVL and sensitive information. The full PFS report will be shared under confidentiality agreements. The PFS has been purposely developed to the high standard required for rigorous external scrutiny by future Project investors and financiers. This announcement provides the market with a summary of the full PFS.

Material Assumptions and PFS Economic Outcomes

All material assumptions used are included in Table 1. This information includes preliminary pit shells, estimated mining and production schedules and metallurgical testing relevant to vanadium and base metals processing and recovery. The process design and layout has been developed by technical experts within the study team and reviewed by external consultants with significant experience in vanadium processing. Capital and operating costs are based on preliminary quotations and database costs and are considered to be at a ±25% level of estimation. Where possible, pricing for reagents was determined through supplier quotations. Labour rates were derived with the aid of an external human resource consultant. Mining costs, pit designs and mine scheduling were performed externally, based on parameters provided by AVL.

Table 1 PFS Material Assumptions

Criteria	Commentary
Mineral Resource Estimate	The most recent Mineral Resource estimate was declared on 28 November 2018 and has been used in the PFS. Refer to the ASX release of 28 November 2018 for material assumptions and further information.
Mining Assumptions and Factors	The mining method will be open pit, selective mining of ore and waste on nominal 2.5m benches using a backhoe excavator. Mining dilution was estimated to be 5%, at zero grade and Ore recovery of 95% has been allowed for. The basis of mining and downstream processing production is 22.5 million pounds of refined V_2O_5 per annum (5,600 MTV[1]), or 900,000 tonnes of magnetic concentrate per annum. Mining is for 14 years at this rate, followed by another 3 years processing stockpiles.
Process Design Criteria	A conventional crushing, milling, and beneficiation (CMB) process has been proposed to produce magnetic concentrate. This concentrate is then further

[1] MTV is metric tonnes vanadium

	processed to produce vanadium oxide using a standard vanadium roast leach and purification circuit. A flotation plant is proposed for base metal concentration using non-magnetic tailings from fresh magnetite ore. The CMB and sulphide recovery circuit designs are based on preliminary annual average mine schedule data, metallurgical testwork and experience or benchmark information where required. The Refinery flowsheet and design is based on the knowledge and experience of the study team and on knowledge of current and historical vanadium processing facilities.
Processing Recoveries	Metallurgical recoveries for the concentrator have been determined from testwork and indicate an average vanadium recovery of 44% for oxides, variable vanadium recovery with depth up to 87.8% for transitional and variable vanadium recovery with grade from 76.7% to an expected maximum of 96% for primary material (for a grade of 1.5% V_2O_5). Metallurgical recoveries for the refinery range from 79.7 to 80.6% and have been determined referencing the study team's experience from similar benchmark operations and support by preliminary roast leach testwork. Relative to the current metallurgical understanding deleterious elements such as silica, alumina and chromium, and their effect on operating cost, recoveries and product quality, have been considered.
Cut-off Grades	Cut-off grades have been calculated as 0.40% V_2O_5 for oxide ore, 0.18% V_2O_5 for transitional and 0.18% V_2O_5 for fresh. However, a cut-off grade of 0.8% V_2O_5 for all materials has been selected based on mine to process optimisation studies and a lack of metallurgical testing on material grading below 0.8% V_2O_5.
Environmental	Studies have been completed on flora, fauna, hydrology, hydrogeology, soil characterisation and waste disposal. Further work is required to quantify the potential impact for some aspects, particularly for subterranean fauna. However, the Project is not likely to have highly significant environmental impacts that are of public interest. The approvals process will include referral and assessment by the EPA but is not expected to be subject to a Public Environmental Review.
Tenements and approvals	The Project consists of 11 tenements covering 760 sq km and is held 100% by AVL. Mining Lease Application M 51/878 is currently awaiting approval and covers about 70% of the mineral resource, with the balance of the Inferred Mineral Resource located on E 51/843, owned 100% by AVL
Social	AVL has signed heritage agreements with the Yugunga-Nya Claimant Group, managed by the Yamatji Marlpa Aboriginal Corporation (4 Feb 2015). AVL has conducted three Aboriginal heritage clearance programs coinciding with drilling activities at Gabanintha. The company is currently negotiating a mining agreement with the Yugunga-Nya Native Title Claimant Group ahead of the granting of M 51/878.

Infrastructure	The Sandstone Meekatharra road passes close to the mine lease area, however an access road will be constructed from the Great Northern Highway, to the west, to the operational area. This road will give access to Meekatharra, which is approximately 55 km away. Other infrastructure required will be constructed for the Project.
Revenue Assumptions	The pit optimisations were carried out using US$8/lb V_2O_5 and base metal sulphide pricing was A$84.01/kg for cobalt, A$16.57 for nickel and A$7.95 for copper. A 65% payability was assumed for base metals. For mining optimisation and design, the exchange rate used was AUD:USD 0.74. The exchange rate used in financial modeling was AUD:USD 0.72. The exchange rate used for capex and opex derivation was set on 8th November 2018 at AUD:USD 0.728, AUD:EUR 0.637 and AUD:GBP 0.555.
Other	The current project development timeline estimates construction to begin in 2021 and production starting in 2022. A number of factors can significantly delay project commencement, including funding constraints, environmental permitting, and construction delays.

Other outputs from the PFS include:

- Average mass yield from the concentrator is estimated at 60% for the life of mine. This is exceptionally high versus other current operating vanadium operations, allowing for a compact and effective crushing and milling operation.
- A base metals circuit will extract an estimated 1,775 t/a mixed sulphide concentrate containing cobalt, nickel, and copper[2] in years 3 to 16. The project viability is not dependent on the mining and sale of base metals contained in the schedule.
- Base metal sales account for ~1% of estimated overall gross revenues for the life of the project.
- Operating expenses (C1 costs) are currently estimated at US$4.15/lb V_2O_5 equivalent[3] (±25%), assuring a low-cost operation that will be healthy throughout the vanadium business cycles.
- Initial indicative capital costs of US$354M (±25%).

The current project scenario utilises 43% Measured resources, 37% Indicated resources and 21% Inferred resources. The Inferred resources are not a determining factor for project viability. See Figure 2, Table 5 and Table 6

The financial outcomes are shown in Table 2 below. NPV and IRR are reported at various V_2O_5 pricing assumptions. Assuming a V_2O_5 price of US$13/lb, pre-tax NPV is US$912M, with an IRR of 27.2%. Using US$8.67/lb V_2O_5, the post-tax NPV of US$125M highlights that the Project is robust and offers attractive returns even at conservative pricing assumptions.

[2] Bryah Resources Limited holds the rights to nickel, copper and gold recovered from any production, however AVL will benefit from this development in processing due to its 14% holding in Bryah (ASX: BYH).
[3] V_2O_5 equivalent pricing is determined by subtracting average base metal credits from average operating expenses through the life of mine.

At market prices of US$20/lb V_2O_5, NPV is US$2.01bn. Current market prices at time of writing are US$22/lb V_2O_5. The Project fully allocated costs (C3[4]) is US$6.05/lb for the life of the project. Project sensitivities are shown in Figure 1 below.

Table 2 Key Financial Outcomes (US$)

	V_2O_5 Product Pricing Scenarios			
Pricing Year 1-5	**$8.67/lb V_2O_5**	**$13/lb V_2O_5**	**$13/lb V_2O_5**	**$20/lb V_2O_5**
Pricing Year 6-17	**$8.67/lb V_2O_5**	**$8.67/lb V_2O_5**	**$13/lb V_2O_5**	**$20/lb V_2O_5**
pre-tax $NPV_{8\%}$	$230M	$444M	$912M	$2,013M
post-tax $NPV_{8\%}$	$125M	$280M	$616M	$1,410M
IRR	12.4%	19.7%	27.2%	47.5%
pre-tax UDCF	$1,232M	$1,634M	$3,166M	$6,292M
post tax UDCF	$867M	$1,148M	$2,221M	$4,409M

Project Sensitivities

The spider diagrams in Figure 1 demonstrate the Project sensitivities to the US$8.67/lb V_2O_5 base case for four key variables of opex, V_2O_5 price, AUD:USD exchange rate, and capex. Operating expenses include reagent pricing, labour, natural gas pricing, and power. IRR and NPV are both sensitive to V_2O_5 price and exchange rate and are relatively insensitive to capex and opex.

A 30% increase in V_2O_5 price results in an increase to NPV of approximately US$295M. Similarly, a 30% improvement (lowering) in the US$ exchange rate results in nearly a US$236M improvement in NPV. A 30% decrease in operating costs and capital costs have a US$108M and US$84M positive impact respectively.

Similar trends can be seen for IRR sensitivity. Exchange rate and V_2O_5 price have the largest impact on the internal rate of return, improving IRR by 12% and 9% respectively. Again, the Project's IRR is relatively insensitive to capital and operating costs.

[4] C3 includes all direct production costs, all capital costs, depreciation and ammortisation, and all other indirect costs including taxes, royalties and estimates for overhead staffing and administrative G&A.

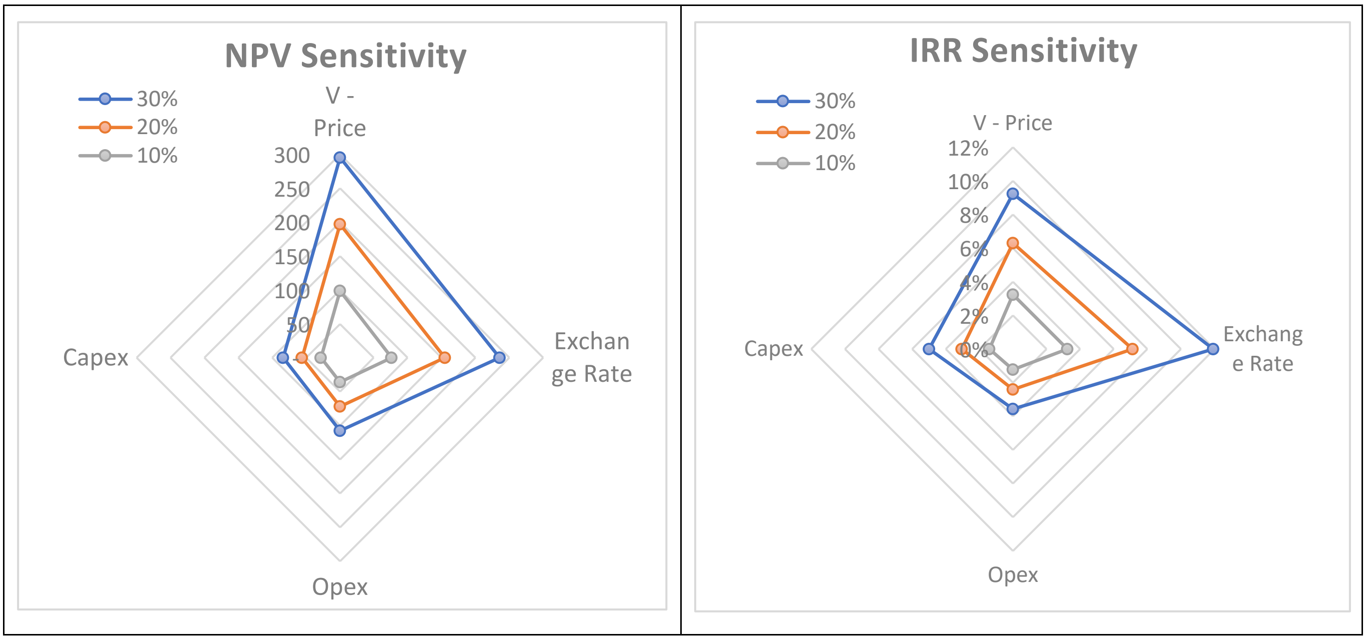

Figure 1 NPV (US$) and IRR(%) Sensitivities

Operating Costs

Direct operating costs (C1) are shown in the Financial Model section below. Life of mine average C1 costs average US$4.15/lb V_2O_5.

The average fully allocated cost (C3) for life of mine is equivalent to US$6.05/lb V_2O_5. This includes production costs (C2), taxes, royalties, and estimates for overhead staffing and general administrative (G&A).

Geology and Mineral Resources

The overall geology of the Gabanintha formation is a layered sequence of granitoids, ultramafic rocks, gabbros and dolerites/amphibolites, felsic tuffs and banded iron and cherts.

The mineral deposit consists of a basal massive magnetite zone (10m - 15m in drilled thickness, >0.7% V_2O_5), overlain by up to five magnetite bearing banded gabbro units between 5 and 30m thick, separated by thin very low-grade mineralisation (<0.3% V_2O_5) waste zones. The westerly dipping sequence is overlain in places by a lateritic domain, a transported domain (occasionally mineralised) and a thin barren surface cover domain. The deposit is affected by a number of regional scale faults which break the deposit into a series of kilometre scale blocks. The larger blocks show relatively little sign of internal deformation, with strong consistency in the layering being visible in drilling and over long distances between drillholes.

The current resource estimate (November 2018) conducted by Trepanier was preceded by a Measured, Indicated and Inferred Resource completed by Trepanier in July 2018 and September 2017. Prior to this was a Measured, Indicated and Inferred Resource undertaken by AMC in August 2015.

The resource model is based on information from 191 drillholes (18 diamond, 173 reverse circulation) for 17,530m drilled by AVL (formerly Yellow Rock Resources) during 2008, 2009, 2015 and 2018. The Measured, Indicated and Inferred Mineral Resource estimate for Gabanintha is shown in Table 3.

Table 3 Gabanintha Project – Mineral Resource estimate at November 2018 by domain and resource classification using a nominal 0.4% V_2O_5 wireframed cut-off for low grade and nominal 0.7% V_2O_5 wireframed cut-off for high grade (total numbers may not add up due to rounding)

Zone	Classification	Mt	V_2O_5 %	Fe %	TiO_2 %	SiO_2 %	Al_2O_3 %	LOI %
HG 10	Measured	10.2	1.11	42.7	12.6	10.2	8.0	3.9
	Indicated	12.1	1.05	43.8	11.9	10.6	7.6	3.5
	Inferred	74.5	0.97	42.1	11.2	11.6	7.6	3.4
	Sub-total	**96.7**	**1.00**	**42.4**	**11.4**	**11.3**	**7.7**	**3.5**
LG 2-5	Measured	-	-	-	-	-	-	-
	Indicated	28.6	0.50	24.6	6.9	27.5	17.9	8.6
	Inferred	53.9	0.49	25.3	6.7	27.5	16.4	7.3
	Sub-total	**82.5**	**0.49**	**25.1**	**6.8**	**27.5**	**16.9**	**7.7**
Transported 6-8	Measured	-	-	-	-	-	-	-
	Indicated	-	-	-	-	-	-	-
	Inferred	4.4	0.65	28.2	7.2	24.7	16.7	8.5
	Sub-total	**4.4**	**0.65**	**28.2**	**7.2**	**24.7**	**16.7**	**8.5**
Total	Measured	10.2	1.11	42.7	12.6	10.2	8.0	3.9
	Indicated	40.7	0.66	30.3	8.3	22.5	14.8	7.1
	Inferred	132.7	0.77	34.8	9.2	18.5	11.5	5.1
	Sub-total	**183.6**	**0.76**	**34.3**	**9.2**	**18.9**	**12.1**	**5.5**

Ore Reserve and Mine Scheduling

AVL's Maiden Ore Reserve has a total of **18.24Mt at 1.04% V_2O_5** comprised of a **Proved Reserve of 9.82Mt at 1.07% V_2O_5** and a **Probable Reserve of 8.42Mt at 1.01% V_2O_5**. See Table 4 for further details.

From the JORC 2012 code an "Ore Reserve" is the economically mineable part of a Measured and/or Indicated mineral resource. It includes diluting materials and allowances for losses, which may occur when the material is mined or extracted and is defined by studies at prefeasibility or feasibility level as appropriate that include application of applicable modifying factors. Such studies demonstrate that, at the time of reporting, extraction could reasonably be justified.

The ore reserve statement in Table 4 is based on the Measured and Indicated mineral resources, included within the final pit design and after taking into account all modifying factors as detailed below or elsewhere in this study report. This ore reserve is based on the November 2018 resource model. This ore reserve is based on the November 2018 resource model. The ore reserve comprises 18.24Mt of the 22.3Mt Measured and Indicated Resources from Zone 10 (See Table 3).

Figure 21 in Appendix 2 from the JORC 2012 code, provides an overview of the general relationship between exploration results, mineral resources and ore reserves, to demonstrate the pathway a deposit can follow as it is studied and is proved from both a technical and economical perspective.

Table 4 Ore Reserve Statement as at November 2018, at a cut-off grade of 0.8% V_2O_5

Reserve classification	t	V_2O_5 %	Co ppm	Ni ppm	Cu ppm	S %	SiO_2 %	Fe_2O_3 %	V_2O_5 produced t
Proved	9, 820 ,000	1.07	172	571	230	0.06	9.47	58.7	65,000
Probable	8 ,420, 000	1.01	175	628	212	0.08	10.07	59.5	56,000
Total	**18, 240, 000**	**1.04**	**173**	**597**	**222**	**0.07**	**9.75**	**59.1**	**121,000**

The cut-off grade is significantly higher than theoretically calculated to reduce metallurgical and economic risk, without resulting in a major decrease in ore tonnes.

The key inputs or modifying factors (See the Mining section of this report and Appendix 3 – JORC Code Table 1 Section 4) include:

- Ore mining recovery of 95%
- Mining dilution of 5%
- A nominal plant throughput of 1.45 Mt/a based on a blend of ore types
- An overall Life of Mine (LOM) V_2O_5 process recovery of 64%. This was based on metallurgical testwork and refinery flowsheet benchmarks.
- Geotechnical parameters based on an independent consultant report by Dempers & Seymour (D&S)
- CMB costs averaging A$17.09/t were used for pit optimisation and are based on preliminary plant design and cost estimates by Wood, including expected power and consumable usage and an overhead cost (general and admin) of A$2.24/t
- Total mining costs averaging A$3.50/t ore and waste mined, for LOM
- Pit designs based on optimal discounted cashflow pit shell using a vanadium pentoxide revenue price of US$8/lb
- Gross Royalty for vanadium sales of 5.0% which includes 2.5% WA Government Royalty and additional royalties

Mining and Scheduling

Mining at the Project will be from an open pit that extends for 3,250m along strike. The mining sequence will include a first stage that extends 1,100m along strike. Due to the length of the pit, mining will be divided into 200 m wide benches along strike which are aimed at delivering a reasonable blend of oxidised, transitional and fresh ore to the processing plant.

The rate of mining will build up to about 550,000 Bank Cubic Metres (BCM)/month, equivalent to two or three excavators working on double shift depending on the size of the excavators. From year 1 to year 9 the mining rate will vary from around 480,000 BCM/month to 580,000 BCM/month, and then gradually reduce to the end of planned mining in year 14. The current estimated production schedule is 17 years, with mining taking place for the first 14 years.

The pit designs contain approximately 23.0Mt of ore at an average grade of 1.03% V_2O_5 and is expected to be mined along with 149Mt of waste for an overall strip ratio of 6.5. The optimisation of the pit shells uses a base vanadium price of US$8/lb. The pit design on which the base case is considered contains 43% Measured Resources, 37% Indicated Resources and 21% Inferred Resources. As shown in Table 6 mining of Inferred Material does not take place in the current schedule until year 4.

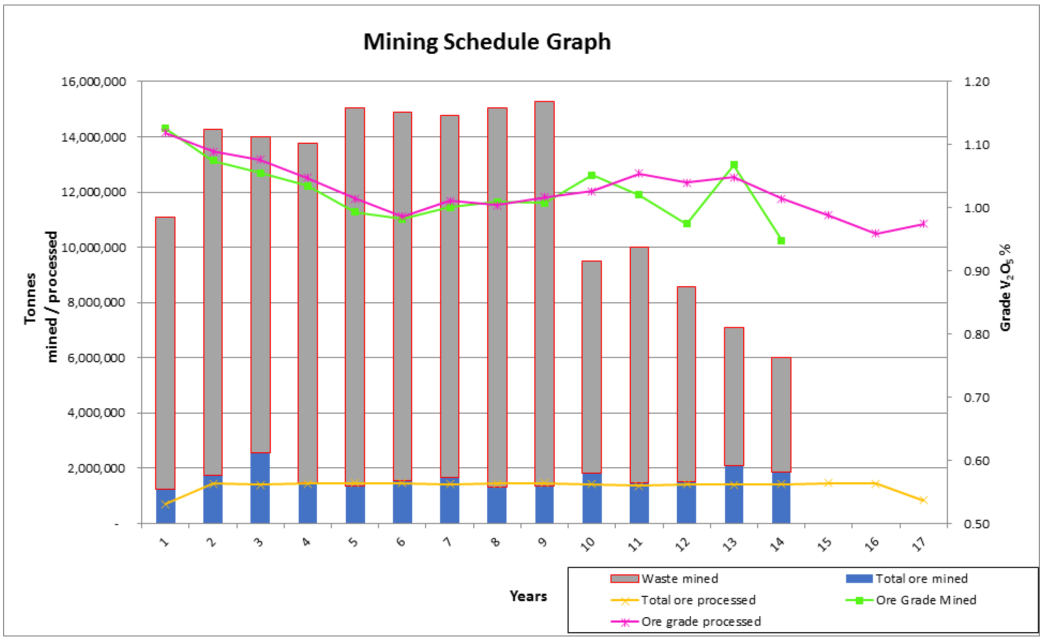

Figure 2 Annualised Mining and Processing Schedule

Table 5 Material Inventory – Pit Design by Resource Classification

Resource classification	t	V_2O_5%	S%	SiO_2%	V_2O_5 production t
Measured	9,820,000	1.07	0.06	9.47	65,000
Indicated	8,420,000	1.01	0.08	10.07	56,000
Inferred	4,810,000	0.98	0.08	11.30	31,000
Total	**23,050,000**	**1.03**	**0.07**	**10.07**	**152,000**
Total Waste	149,234,364				

Table 6 Detailed Mining Schedule by Resource Category

Ore mined		Total	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6	Yr 7	Yr 8	Yr 9	Yr 10	Yr 11	Yr 12	Yr 13	Yr 14
Measured	million tonnes	**9.8**	1.3	1.7	2.5	1.1	0.9	0.4	0.2	0.2	0.3	0.5	0.2	0.1	0.3	0.0
Indicated	million tonnes	**8.4**	0.0	0.0	0.0	0.2	0.2	0.7	0.9	0.8	0.9	0.5	1.2	0.9	1.2	0.8
Inferred	million tonnes	**4.8**	0.0	0.0	0.0	0.2	0.2	0.4	0.6	0.3	0.1	0.8	0.1	0.5	0.6	1.0
Total	**million tonnes**	**23.0**	**1.3**	**1.7**	**2.6**	**1.5**	**1.4**	**1.6**	**1.7**	**1.3**	**1.4**	**1.8**	**1.5**	**1.5**	**2.1**	**1.9**
Measured	%	**43**	100	100	100	74	66	27	11	14	25	30	12	7	16	1
Indicated	%	**37**	0	-	0	12	17	47	51	61	68	29	82	63	57	44
Inferred	%	**21**	-	-	-	14	17	26	38	25	7	42	6	31	27	55
Total	%	**100**	100	100	100	100	100	100	100	100	100	100	100	100	100	100

Mineral Processing

The Gabanintha mineral process facility is designed to treat 1.45 Mt/a of 1.03% V_2O_5 grade ore to generate 10,115 dry metric tonnes of V_2O_5 fused flake (>98.5% w/w) per annum, for export via the Port of Fremantle. The PFS process facility is located directly west of the proposed Gabanintha open pit mine (the mine site).

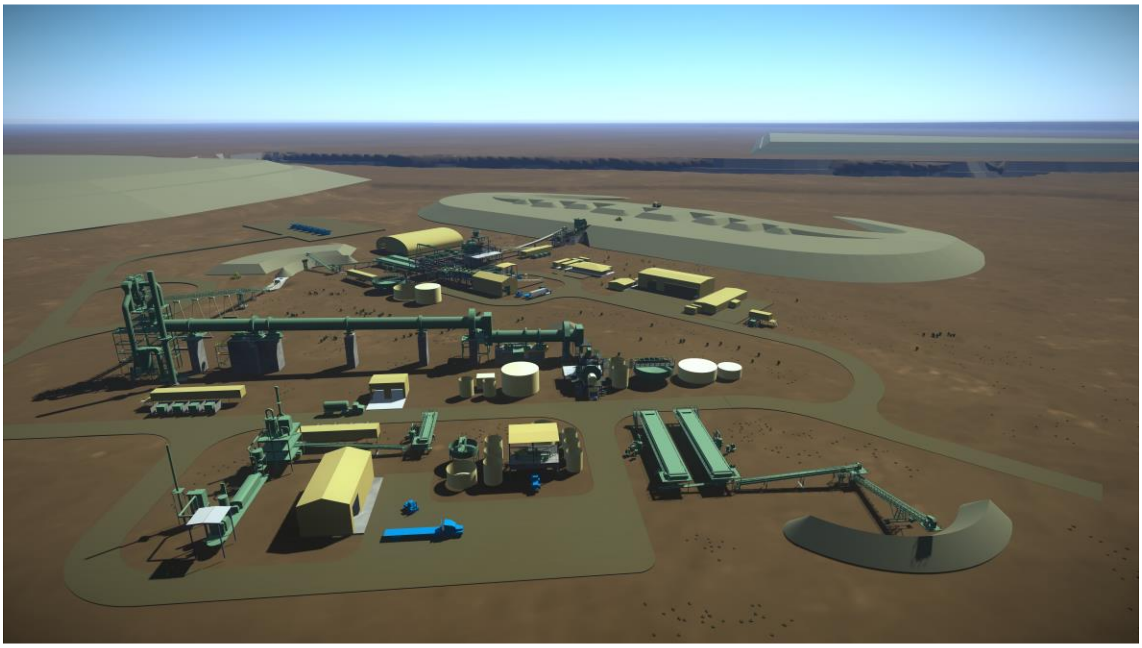

Figure 3 Plant Layout (Aerial view looking east. Processing plant in the foreground, IWL to the left (north). The ROM blending stockpiles are visible behind the plant and the Gabanintha open cut (3.2 km long) is in the background. A second waste dump is located east of the pit.

The PFS flowsheet is based on standard industry proven processes and includes a magnetic beneficiation flowsheet (concentrator) and an alkaline roast leach and AMV extract refinery flowsheet (see Figure 15 and Figure 16). A notable difference for the Gabanintha PFS flowsheet design to other similar global vanadium projects is that the average LOM vanadium ore grade to the concentrator (1.03% V_2O_5) is high relative to the concentrate grade (1.4% V_2O_5), thereby realising a high concentrate mass yield; possibly the highest of all current operations worldwide. Average vanadium yield to concentrate over the mine schedule is 79.8%. Average refinery recovery of V_2O_5 from concentrate is 80.4%, giving an overall average LOM recovery of 64.1%. The other unique features are the elevated base metals sulphides associated with the main titaniferous magnetite horizon.

Infrastructure

The remote and greenfields nature of the Project requires all infrastructure will need to be constructed. The major non-process infrastructure required for the Project includes:

- Natural gas supply via pipeline
- Power supply and distribution via island power station
- Water supply via a borefield
- Regional road access
- Personnel accommodation

See the Infrastructure section for more details.

Social and Environmental Sustainability, Community, Heritage & External Relations

AVL is proactively managing sustainability of the Project through the prefeasibility phase, with consideration of potential risks and benefits relating to people (social), planet (environmental) and profit (economic) aspects.

Outcomes from the study show that the proposed Project has a low likelihood of significant impacts to the social surroundings.

The proposed Project area is subject to the Yugunga-Nya native title claim (WC1999/46). A draft mining agreement has been developed between AVL and the Yugunga-Nya Native Title Claim Group and discussions are ongoing.

Key environmental baseline studies have been undertaken for the Project, including two-season detailed ecological surveys. There were no conservation-significant flora or vertebrate fauna species detected in the proposed Project area. Locations of potential short-range endemic (SRE) terrestrial invertebrates will be avoided by selective placement of infrastructure.

Potential SRE subterranean fauna (troglofauna and stygofauna) were detected within the study area. If these species are determined to be restricted in distribution and if the Project will significantly impact on their known habitat, the Project will require assessment by the Environmental Protection Authority (EPA).

Work programs have been undertaken regarding social surroundings and impact; Aboriginal heritage; external engagement; landforms; soil quality; inland waters; flora and vegetation; fauna – both terrestrial and sub-terranean verterbrates, inverterbrates, troglofauna and stygofauna; air quality; energy use and greenhouse gas emissions and closure planning.

See the Social and Environmental Sustainability, Community, Heritage & External Relations' section for more details.

Project Funding

The Company has funding in place to start the DFS. This includes Cash at Bank of $5.3M at time of reporting.

Funding for pilot plant test work and initial stages of the DFS is expected to be provided by existing working capital and through funds raised by the exercise of listed options (AVLO, strike price 2c per share, ex 31 Dec 2018). These options are "in the money" and currently represent potential funds of $5.5M for the Company. Budget estimates for the completion of the DFS phase are not yet completed.

The Board believes that there are "reasonable grounds" to assume that future funding will be available for the completion of the DFS, including pilot scale testwork and pre-production capital as envisaged in this announcement, on the following basis:

a) AVL's Board has a financing track record and experience in developing projects. Daniel Harris, Technical Director of the Company has over 40 years' corporate and operational experience in vanadium companies and operations. Mr Harris most recently oversaw the closure and sale process of the Windimurra vanadium mine (subsidiary of Atlantic Limited), served as an interim Managing Director of Atlas Iron Limited and is Non-Executive Director of Paladin Ltd. Directors Vincent Algar and Leslie Ingraham have both been active in capital markets for over 10 years and have raised well over $50M each while managing junior resource companies.

b) AVL is confident that it can continue to increase the quantity and quality of the mineral resources at the Project, extending the mine life beyond what is contemplated in the PFS. The Company holds a total of 11.5km of known vanadium bearing titano-magnetite (VTM) mineralisation (identified through drilling) and of this, 9.5km is located on the mining licence application M 51/878. The Gabanintha VTM deposit has been well drilled along its length, sufficient to confirm continuity of mineralisation. The deposit has been drilled to depths of 300m below surface and mineralisation appears to continue at depth.

c) The Project is located in the Meekatharra region of Western Australia. The region is well serviced by road infrastructure and has a long history of mining operations. Western Australia is considered one of the world's top mining jurisdictions and a low risk investment destination. Australia is home to significant sources of equity and debt capital and has very active resource focused capital markets.

   The vanadium price recently traded above 10-year highs of US$28/lb V_2O_5 (V_2O_5 spot price source: Fastmarkets). Long term pricing of US$8.67/lb V_2O_5 is the approximate 15-year average of the traded vanadium pentoxide price based on London Metals Bulletin/Fastmarkets' historical data. The strong price increase has been driven by growth in Chinese steel production and enforced increases to specific vanadium consumption per tonne of steel produced. Short term supply disruption precipitated by the shutdown of several vanadium production facilities, which has drawn down vanadium inventories, has also influenced recent prices. The improvements to the market conditions and an encouraging future outlook for demand for vanadium products enhances the Company's view of securing successful funding for the project. The Company is also able to pursue other methods of value realisation to assist funding the project, such as a partial sale of the asset, long term offtake and joint venture arrangements.

d) AVL has been listed continuously since 2007. During that time, the Company has held the Gabanintha asset, but the project has not always been the primary focus of the Company's activities. The Company has successfully raised $13.5 million from listing until 2014. Since early 2014 and developments in the energy storage market for vanadium, AVL has renewed its focus on Gabanintha and has raised additional capital between 2014 and 2018 totalling $15.3M to advance the asset. A total of 5 capital raisings on Gabanintha have been successfully completed at successively higher share prices since 2014. The Company has previously demonstrated and is confident in the ability of the Board and management to raise suitable amounts of equity from existing and new retail and institutional investors to fund the project requirements.

e) The strong production and economic outcomes delivered by the PFS are considered by the Board to be sufficiently robust to provide confidence in the Company's ability to fund pre-production capital through conventional debt and equity financing. The Company has been active in seeking out partners in key markets such as China. In June 2018 AVL announced that it had signed a Non-Binding Memorandum of Understanding (MOU) with the Win-Win Development Group (Win-Win), a private steel and alloy producer based in Chengdu, China. Win-Win is currently building a 5,000t/a vanadium carbon nitride (VCN) production line which requires approximately 7,000-8,000t/a of 98% V_2O_5. The first stage will require 2,000-3,000t/a and be operational in 2019 and the second stage is planned for the following year. Win-Win has a shareholding in an operating production line currently producing 2,400t/a of VCN products for existing steel companies.

The MOU focuses co-operation in the following areas;

i. Finance and investment in the Gabanintha Project
ii. Offtake and supply of vanadium products (specifically vanadium pentoxide - V_2O_5) to Win-Win related production facilities in China, and
iii. General collaboration on marketing of vanadium products inside China.

Win-Win Development Group was founded in April 2017 as a subsidiary of the Sichuan Zhongyi Liankong Group. It was created to integrate the steel market supply chain from raw materials to end products, finance, investments and other operations.

In August 2018 AVL and its 100% owned subsidiary VSUN Energy Pty Ltd, announced that they had signed Letters of Intent with German vanadium redox flow battery manufacturer SCHMID, to explore potential supply of vanadium pentoxide and/or electrolyte and to supply SCHMID's vanadium redox flow batteries to potential clients.

f) The Board of AVL is considering other suitable long-term investors to enable:
   i. access to institutional investors globally;
   ii. access to debt funding relationships;
   iii. provide additional human resources to maximise the value of the Company;
   iv. help define and extend vanadium and cobalt resources at Gabanintha, and
   v. develop long term business relationships.

Next steps and project timelines

The Project is recommended to move forward into a DFS phase. The PFS has however highlighted significant opportunities to improve the economics of the Project, requiring further testwork, with other sections requiring more refinement prior to detailed DFS engineering and costing commences. As such, the final project timeline is being revised, but AVL remains confident that the Project will advance quickly towards implementation.

Work across the various disciplines includes:

- Further refinement and optimisation of the mine schedule
- Further metallurgical testwork
- Investigations into the risks and opportunities outlined in the PFS
- The use of renewable energy options for the camp and water pumps
- Drilling and testing to confirm dewatering estimates and confirm groundwater source
- Ongoing work to identify and assess any environmental impacts and assure environmental approvals are achieved by the project
- Ongoing social and heritage works to meet the Project timeline

During January 2019 a diamond drilling program will take place to provide material for pilot scale testwork to support the DFS, with the objectives of the pilot testwork being;

- To validate the flowsheet and optimise where practical;
- To provide greater confidence in the process mass balance and design criteria;

- To provide a firm basis to support process prediction (recovery and opex) relative to a process feed schedule;
- To update the process parameters used as inputs for mine optimisation;
- And to provide product samples of V_2O_5, calcine, evaporation feed solution and concentrator tails for marketing samples and downstream testwork/design.

Drilling will involve extracting ≥1,400m of core taken from several holes along the strike of the deposit, amounting to ≥30 tonnes of material. A program of works (POW) has been approved by the Department of Mines Industry Regulation and Safety (DMIRS) and tendering for the contract is at an advanced stage.

Pre-Feasibility Study Outcomes Summary Report

Contents

Introduction

This announcement provides a summary of the full PFS report produced by Wood, consultants to the Company and members of the AVL technical team. It describes the mineral resources and reserves, production scenario, and economic analyses to a (±25%) level of accuracy for the Gabanintha project ("the Project") which is located 740km northeast of Perth and 42km south-southeast of Meekatharra in the Murchison District, Western Australia. Gabanintha consists of 11 tenements covering 760 sq km. The Project is held 100% by Australian Vanadium Limited, an Australian listed company. Mining Lease Application M 51/878 is currently awaiting approval and covers about 70% of the mineral resource, with the balance of the Inferred Mineral Resource located on E 51/843, owned 100% by AVL, see Table 17.

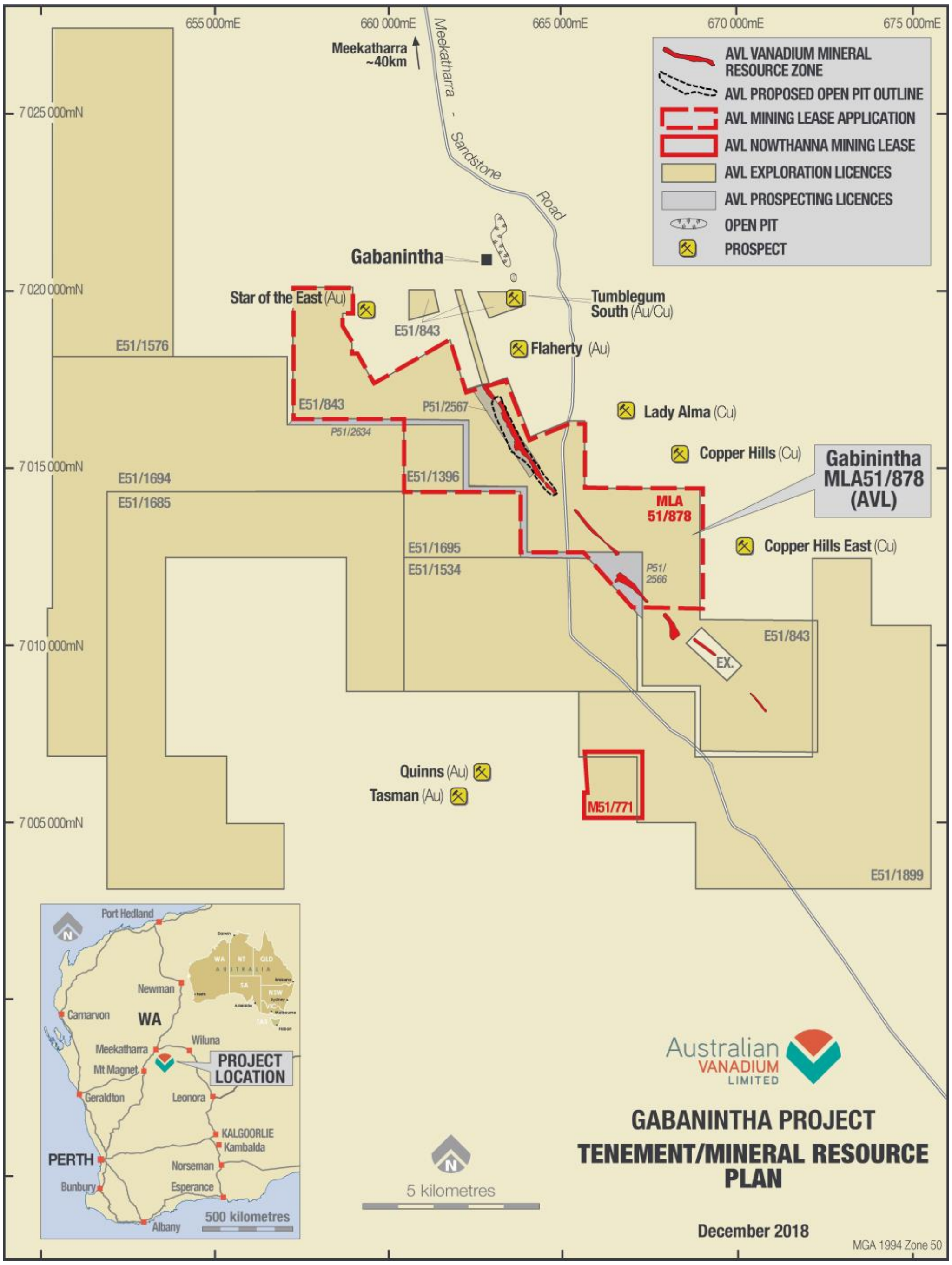

Figure 4 Location and Tenure of the Gabanintha Vanadium Project

The overall geology of the Gabanintha Formation is a layered sequence of granitoids, ultramafic rocks, gabbros and dolerites/amphibolites, felsic tuffs and banded iron and cherts.

The mineral deposit consists of a basal massive magnetite zone (10m - 15m in drilled thickness, >0.7% V_2O_5), overlain by up to five magnetite banded gabbro units between 5 and 30m thick separated by thin low-grade mineralisation (<0.3% V_2O_5) waste zones. The westerly dipping sequence is overlain in places by a lateritic domain, a transported domain (occasionally mineralised) and a thin barren surface cover domain. The deposit is affected by a number of regional scale faults which break the deposit into a series of kilometre scale blocks. The larger blocks show relatively little signs of internal deformation, with strong consistency in the layering being visible in drilling and over long distances between drillholes.

The current resource estimate (November 2018), conducted by Trepanier, was preceded by a Measured, Indicated and Inferred Resource completed by Trepanier in July 2018 and September 2017. The maiden Measured, Indicated and Inferred Resource was undertaken by AMC in August 2015.

The resource model is based on information from 191 drillholes (18 diamond, 173 reverse circulation) for 17,530 m drilled by AVL (formerly Yellow Rock Resources) during 2008, 2009, 2015 and 2018.

AVL hosts a declared Mineral Resource at Gabanintha comprising 183.6Mt at 0.76% vanadium pentoxide (V_2O_5), made up of a Measured Mineral Resource of 10.2Mt at 1.11% V_2O_5, an Indicated Mineral Resource of 40.7Mt at 0.66% V_2O_5 and an Inferred Mineral Resource of 132.7Mt at 0.77% V_2O_5.

The Mineral Resource includes a distinct and globally significant, massive magnetite high-grade zone of 96.7 Mt at 1.00% V_2O_5 consisting of a Measured Mineral Resource of 10.2Mt at 1.11% V_2O_5, an Indicated Mineral Resource of 12.1Mt at 1.05% V_2O_5 and an Inferred Mineral Resource of 74.5Mt at 0.97% V_2O_5.

The internal AVL team has unique expertise in process design, start-up and operation of vanadium operations throughout the world. AVL has partnered with a similar team of outstanding professionals across multiple disciplines to assure that the Project studies are of the highest quality. The external team includes input and services from:

Wood Mining and Metals	Plant Design and Costing, Options Study and overall compilation of the PFS
Mike Woolery	Vanadium Process Design Consulting
Andre Breytenbach	Vanadium Process Design Consulting
Trepanier Pty Ltd	Geology and Resources
Croeser Pty Ltd	Pit Design, Optimisation, Mine Scheduling
Dempers & Seymour	Geotechnical Consulting
Umwelt	Environmental and Heritage Consulting
Geologica Pty Ltd	Geology and Resources
Biologic	Flora and Fauna Level 2 Surveys and Consulting
AQ2	Hydrogeology
Golder	Preliminary Tailings Location, Tailings Storage Facility (TSF) Design

Adaman	Energy and Logistics
Clean Energy Fuels	Energy Market Supply and Delivery
Just HR	Human Resources Planning
Bureau Veritas (BV)	Assaying, Mineralogy and Metallurgical Testing
SGS	Assaying and Metallurgical Testing
Micronanalysis	Materials Characterisation Consulting

The Gabanintha PFS consists of:

- A vanadium pentoxide (V_2O_5) refinery at the Gabanintha site with an annual production rate of approximately 22.5 million pounds of V_2O_5 per annum (5,600 MTV) with an initial mine life of 17 years based on existing Measured, Indicated and a portion of the Inferred Mineral Resources.
- An open pit mining and beneficiation operation producing an estimated 900,000t of magnetic concentrate at a planned grade of 1.4% V_2O_5 and a low 1.75% SiO_2 content.
- Average mass yield from the concentrator is estimated at 60% for the life of mine. This is exceptionally high versus other current operating vanadium operations, allowing for a compact and effective crushing and milling operation.
- Vanadium recovery from the refinery is 80.4% for an overall V_2O_5 recovery of 64.1%.
- A base metals circuit installed in year 3 will recover an estimated 1,775t/a sulphide concentrate containing cobalt, nickel, and copper[5] in years 3-17. The Project viability is not dependent on the mining and sale of base metals contained in the schedule.
- Base metal sales account for less than 1% of estimated overall gross revenues for the life of the project.
- C1 operating expenses are currently estimated at US$4.15/lb V_2O_5 (±25%), assuring a low-cost operation that will be healthy throughout the vanadium business cycles.
- Initial indicative capital costs of US$354M (±25%) includes an investment in a natural gas pipeline to the site, that will be partially owned by AVL.
- The current Project scenario utilises 43% Measured Resources, 37% Indicated Resources, and 21% Inferred Resources. The Inferred Resources are not a determining factor for project viability.

In Table 2, NPV and IRR are reported at various V_2O_5 pricing assumptions. Assuming a V_2O_5 price of US$13/lb, post-tax NPV is US$616M, with an IRR of 27.2%. Using US$8.67/lb V_2O_5 , the current 15 year long-term average price, the post-tax NPV of US$125M highlights that the Project is robust and offers returns even at conservative pricing assumptions. The projects fully allocated cost (C3) is US$6.05/lb V_2O_5 over the life of the project.

At current market prices of US$22/lb at time of writing, post tax NPV is US$1.64bn.

[5] Bryah Resources Limited holds the rights to nickel, copper and gold recovered from any production, however AVL will benefit from this development in processing due to its 14% holding in Bryah (ASX: BYH).

Strategy

The Company and its engineering partners are committed to build a well-designed, low-cost, viable project at Gabanintha. The internal team at AVL has many years of international experience in vanadium processing design and operation. This expertise is essential for the best project outcome.
The Company is focused on the development of the Project. Its objective is to achieve this by operating safely within its stated value system and for the benefit of shareholders and all other stakeholders.

AVL and its employees, contractors and directors believe in operating safely and encouraging personal responsibility in an open and responsive culture. The Company's primary objective is the development of the Project to production to become a world class, low operating cost vanadium supplier.

Strategies specific to the Project are to deliver and maintain operations at lowest operating cost by diligent design, testing and construction. The Company aims to extend the mine life progressively to maximise opportunities for all stakeholders. To minimise project execution risk, the Company has active plans around:

- Access to natural gas
- Water supply
- Permitting and environmental approval
- Labour supply and cost
- Geometallurgical and processing certainty (via metallurgical testwork including pilot scale validation of the flowsheet)

AVL's intention is to develop the Project to supply high value vanadium products for sale into the ferro-alloy markets and other global specialty markets including the battery market. Specifically, AVL is targeting the production of 22.5Mlbs of V_2O_5 per annum for export free on board (FoB) from Port of Fremantle directly to global users of vanadium.

The product mixture is most likely to include:

- vanadium pentoxide flake (min 98.5%)
- vanadium pentoxide high purity powder (min 99.6%)
- base metal concentrate containing Co-Ni-Cu as a sulphide concentrate, (commencing from year 3 of production)

The Company is targeting sales customers ranging from steel producers, intermediary product producers such as slag producers, ferro-vanadium conversion facilities, chemical plants (including vanadium redox flow battery (VRFB) electrolyte producers) and metal trading companies.

AVL will engage with vanadium users to establish Memoranda-of-Understanding (MOUs) and where and when appropriate, offtake contracts for the sale of products. AVL has already signed one such agreement with Chinese corporation Win-Win to contemplate the supply of V_2O_5 to Win-Win's planned Vanadium Carbo-Nitride (VCN) production facility based in Chengdu. A separate MOU has been signed with German VRFB producer Schmid Energy, which has expressed interest in high purity vanadium supply for use in large scale VRFB installations.

Marketing

Although vanadium use in steel dominates vanadium demand, AVL believes that new technologies such as the VRFB will have a large impact in renewable energy management and storage and has the potential to impact vanadium markets in the medium to long term. As such, AVL is active in developing the market for VRFB technologies and has included the option to produce high purity vanadium oxide in the options analysis section of the PFS. High purity production would also give AVL the option to supply specialty markets such as chemicals, catalyst and high-specification alloy markets.

Vanadium demand is driven by several factors. Critical among these are worldwide steel demand, in particular from China, as well as new emerging technologies and markets. Over 45% of all vanadium units world-wide were consumed by China in 2017. Specific usage of vanadium in steel highlights that China's specific consumption at 0.05kg V/tonne steel is less than half that of North America at 0.108kg V/tonne of steel. If China were to increase from 0.05 to 0.06, this would be equivalent to 8,000 MTV of extra consumption per year, a 10% increase in global consumption, and new rebar standards issued in February 2018 are likely to drive more specific vanadium usage in the Chinese market.

Demand for vanadium has outstripped supply since mid-2015, corresponding to Evraz Group's Highveld Steel and Vanadium's (South Africa) closure and the follow-on closure of Vanchem Vanadium Products due to closure of the mine shared with Highveld. Swing production from Chinese stone coal producers started to wind down in 2010 when the V_2O_5 price dropped below $10.00/lb and in 2015 more strict environmental regulations caused shutdown of most remaining stone coal producers and other high environmental impact producers. Since then, supply and demand have not been in balance. In 2017, there was approximately 8,000 MTV of demand that was not met by production, or the approximate yearly output of one and a half plants the size of AVL's proposed Gabanintha project.

VRFB technology uptake could have a large impact on medium to long term vanadium demand. If VRFBs capture even a small piece of the renewable energy storage demand, it could require thousands of MTV that are not currently available.

Production of Vanadium

Two production routes are utilised for vanadium extraction from vanadium bearing titano-magnetite (VTM), primary and coproduct to iron. The primary route involves extraction of vanadium directly from ore concentrates through roasting and leaching. In the coproduct route, vanadium slag is produced as a byproduct of steelmaking that utilises VTM as iron ore feed. This concentrated vanadium slag is then refined to final products using both pyrometallurgical and hydrometallurgical routes. Primary production accounts for approximately 15-20% of total worldwide production and coproduct steel slag production accounts for nearly 70%. The remaining 10-15% is supplied by secondary sources from a variety of smaller specialty operations.

Vanadium slag production is concentrated in a small number of specialised steel works in Russia, China, and New Zealand. Evraz Group's Highveld Steel and Vanadium in South Africa, which once produced 7,000 MTV of vanadium slag, was shut in 2015 and there are no plans for a restart as much of the plant has been dismantled and scrapped.

The cyclical nature of the vanadium market is illustrated in Figure 5. Imbalances in supply have driven prices up above US$30/lb twice during this time, and there was a prolonged period where prices hovered around US$5/lb from 2012 to 2017. However, the average price for the 15-year period was well above this, at US$8.67/lb in 2018 adjusted numbers. AVL has used various vanadium price assumptions in NPV and IRR calculations to highlight that this project can be profitable even at prices well below the 15-year average price. For mine modelling and optimisation at the proposed Project, US$8/lb was assumed.

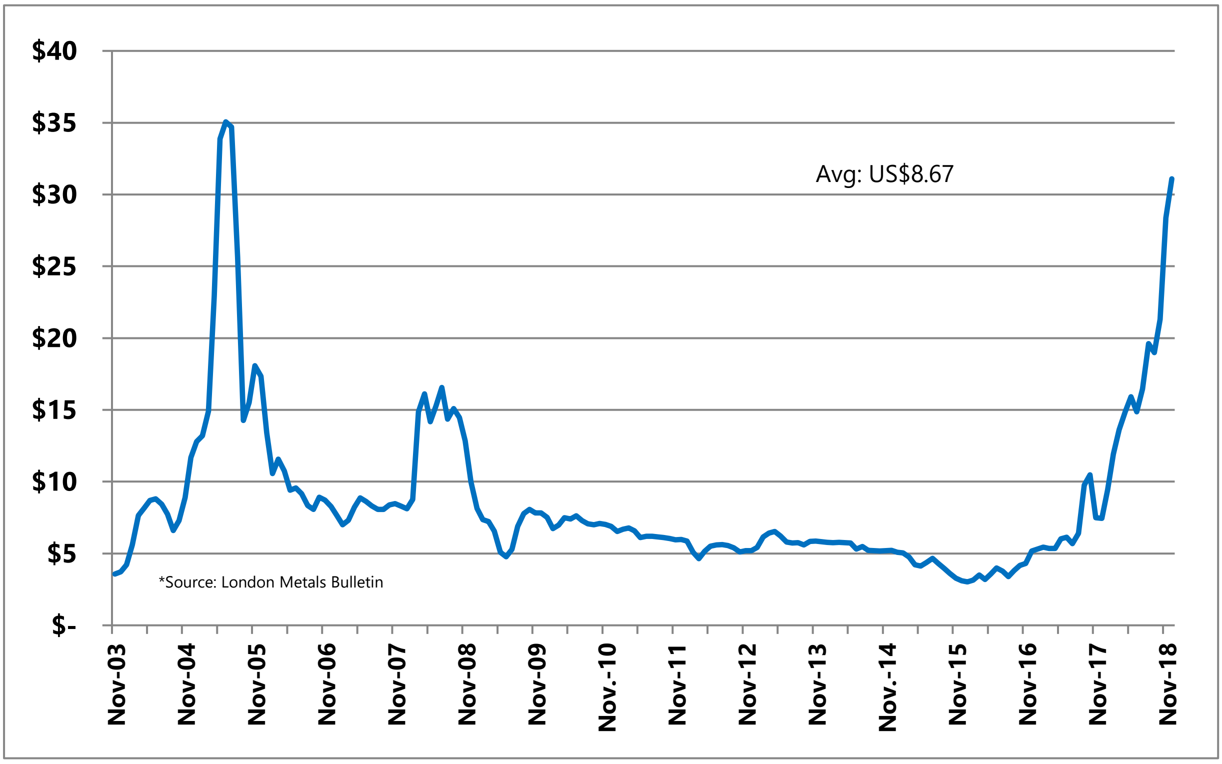

Figure 5 - 15 Year V_2O_5 commodity price per pound – Inflated to 2018 US $

Geology & Resource Estimate

The overall geology of the Gabanintha formation is a layered sequence of granitoids, ultramafics, gabbros and dolerites/amphibolites, felsic tuffs and banded iron and cherts. The sequence above is from stratigraphic low to high.

The mineral deposit consists of a basal massive magnetite zone (10m - 15m in drilled thickness), overlain by up to five magnetite banded gabbro units between 5 and 30m thick separated by thin, low-grade mineralisation (<0.3% V_2O_5) waste zones. The westerly dipping sequence is overlain in places by a lateritic domain, a transported domain (occasionally mineralised) and a thin barren surface cover domain. The deposit is affected by a number of regional scale faults which break the deposit into a series of kilometre scale blocks. The larger blocks show relatively little signs of internal deformation, with strong consistency in the layering being visible in drilling and over long distances between drillholes.

The current resource estimate (November 2018) conducted by Trepanier was immediately preceded by a Measured, Indicated and Inferred Resource completed by Trepanier in July 2018 and September 2017. Prior to this was a Measured, Indicated and Inferred Resource undertaken by AMC in August 2015.

Table 7 Gabanintha Project – Mineral Resource estimate at November 2018 by domain and resource classification using a nominal 0.4% V_2O_5 wireframed cut-off for low grade and nominal 0.7% V_2O_5 wireframed cut-off for high grade (total numbers may not add up due to rounding

Zone	Classification	Mt	V_2O_5 %	Fe %	TiO_2 %	SiO_2 %	Al_2O_3 %	LOI %
HG 10	Measured	10.2	1.11	42.7	12.6	10.2	8.0	3.9
	Indicated	12.1	1.05	43.8	11.9	10.6	7.6	3.5
	Inferred	74.5	0.97	42.1	11.2	11.6	7.6	3.4
	Sub-total	**96.7**	**1.00**	**42.4**	**11.4**	**11.3**	**7.7**	**3.5**
LG 2-5	Measured	-	-	-	-	-	-	-
	Indicated	28.6	0.50	24.6	6.9	27.5	17.9	8.6
	Inferred	53.9	0.49	25.3	6.7	27.5	16.4	7.3
	Sub-total	**82.5**	**0.49**	**25.1**	**6.8**	**27.5**	**16.9**	**7.7**
Transported 6-8	Measured	-	-	-	-	-	-	-
	Indicated	-	-	-	-	-	-	-
	Inferred	4.4	0.65	28.2	7.2	24.7	16.7	8.5
	Sub-total	**4.4**	**0.65**	**28.2**	**7.2**	**24.7**	**16.7**	**8.5**
Total	Measured	10.2	1.11	42.7	12.6	10.2	8.0	3.9
	Indicated	40.7	0.66	30.3	8.3	22.5	14.8	7.1
	Inferred	132.7	0.77	34.8	9.2	18.5	11.5	5.1
	Sub-total	**183.6**	**0.76**	**34.3**	**9.2**	**18.9**	**12.1**	**5.5**

The resource model is based on information from 191 drillholes (18 diamond, 173 reverse circulation) for 17,530m drilled by AVL (formerly Yellow Rock Resources) during 2008, 2009, 2015 and 2018.

A total of 313 bulk density measurements were used to calculate average densities. Samples were subdivided according to their position in relation to the ore zones and the oxidation surface. 100 bulk density samples were assayed by XRF, the remainder were assigned an assay according to the nearest sample. Correlation charts were created for each element, with a very strong positive correlation defined for bulk density and Fe_2O_3 content. From this analysis a regression was assigned based on the Fe_2O_3 grade of each block dependent on oxide code. 13 additional samples taken from fresh material in the massive magnetite high grade domain of hole 18GEDH003m were checked and found to support current regressions.

Variography was undertaken for the high-grade domain and on the combined low-grade domains. Two structure spherical models were applied to the experimental variograms in all cases. Grade estimation was completed using Ordinary Kriging (OK). The OK estimate was constrained within the discrete domains and generated with multiple estimation passes completed with expanded sample searches.

The Measured, Indicated and Inferred Mineral Resource estimate for Gabanintha is shown in Table 7 and Figure 6 illustrates the block model coloured by classification code for the area of closest spaced drilling. Figure 7 shows the position of the modelled fault planes and the numbered fault blocks.

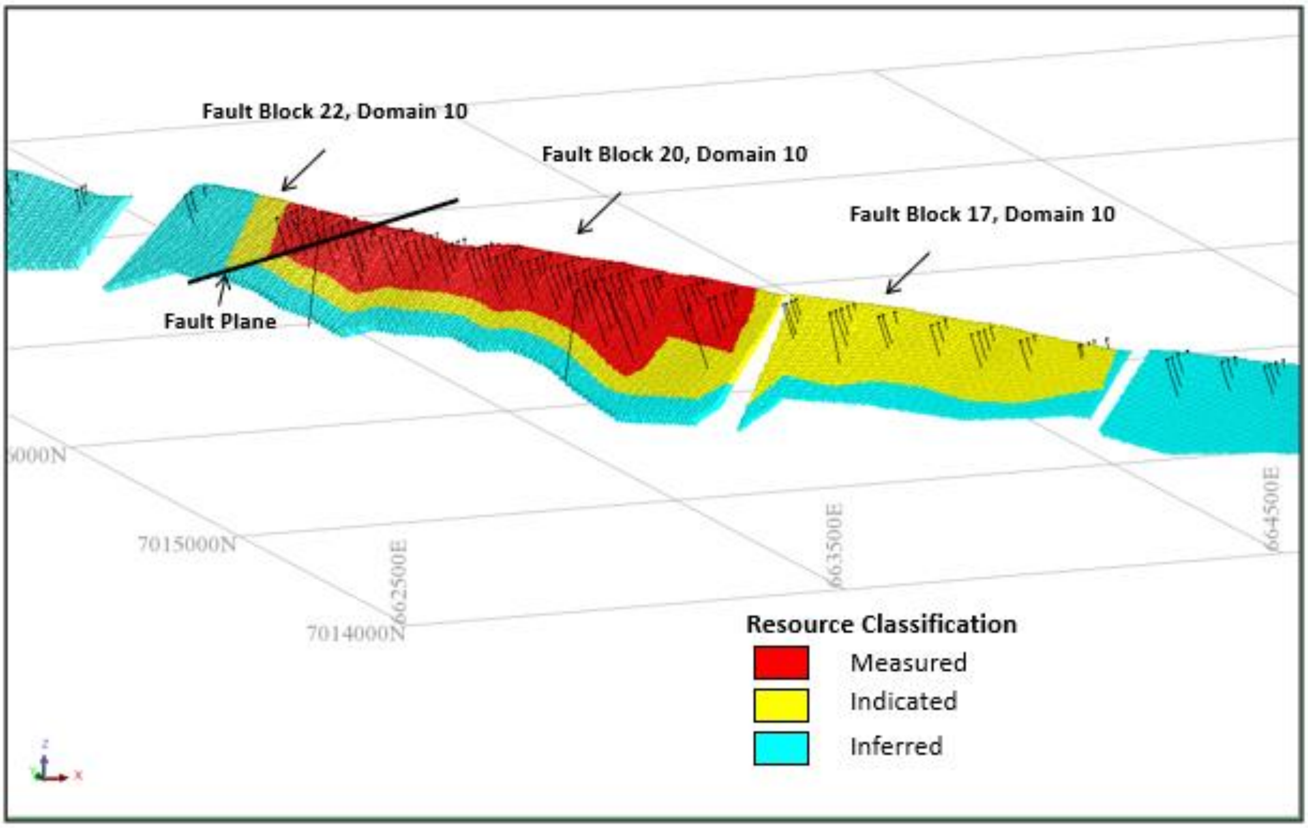

Figure 6 Resource Classification Gabanintha Deposit

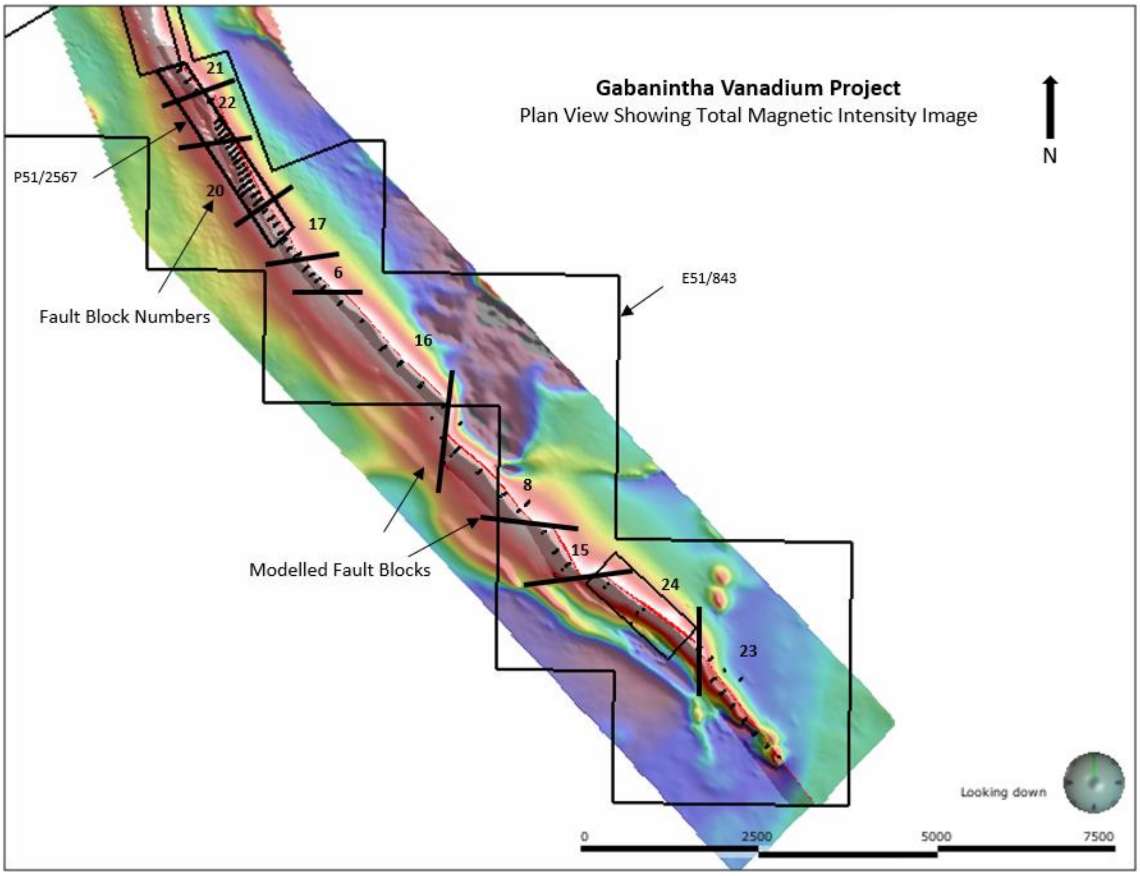

Figure 7 Plan View showing Fault Block Locations at Gabanintha

The geological interpretation is considered robust and is supported by quality-controlled drilling and assay results. The drill density is considered adequate to confidently predict continuity of the magnetite zones.

The surface expression of the high-grade massive magnetite/martite mineralisation (Domain 10) at the Gabanintha vanadium deposit, outcrops in discontinuous sections for almost 14km in the Company held lease area. Detailed mapping and mineralogical studies have been completed by Company personnel and contracted specialists between 2000 and 2018, as well as five separate drilling programs to test the mineralisation and continuity of the mineralised zones. These data and the relatively closely spaced drilling has led to a clear understanding of the host layered mafic intrusion and associated mineralisation controls.

Fresh gabbro hosts some base metal credits in both the high-grade zone and in the stratiform hangingwall and footwall gabbro. Elevated cobalt (Co), nickel (Ni) and copper (Cu) are present in association with sulphur. The host minerals for these elements are pyrite, chalcopyrite (with minor covellite as a weathering product) and siegenite that are sulphide minerals situated within the silicate minerals of the gabbro. Due to this deportment, the base metals within sulphides report to the tailings when the VTM rocks are magnetically beneficiated.

A nominal cut-off of 0.7% V_2O_5 was used to define the high grade basal massive zone (Domain 10), with a nominal 0.4% V_2O_5 cutoff used for the overlying lower grade domains. The high grade mineralised domain has a clear and sharp boundary and has been tightly constrained by the interpreted wireframe shapes. The lower grade mineralisation is also constrained within wireframes, which are defined and guided by visual mineralisation contacts (from core) and grade boundaries from assay results. The lower grade mineralisation has been defined as four sub-domains (Domains 2 to 5), which strike sub-parallel to the high-grade domain. In addition, there is a sub-horizontal laterite zone (Domain 6) and two transported zones above the top of bedrock surface (Domains 7 and 8). There is a less well-defined layer of low-grade mineralisation that sits below the high-grade zone towards the north west of the deposit. This zone was flagged as Domain 1, but has not been estimated or reported in the resource model. Furthermore, in fault block 17, Domain 2 which sits just above the massive magnetite zone of Domain 10, splits into two distinct sub layers, the smaller of which is flagged as Domain 9 in the model but for consistency is referred to in this report as Zone 2A. Figure 8 shows a typical cross section of the geology model (with the exception of low-grade domain 2A that is only present in fault block 17 and transported domains 6,7 and 8 that are localised units).

The resource estimate is constrained by these wireframes.

Surfaces were also used for coding the block model for oxide, transitional and fresh, as well as above and below the alluvial and bedrock surfaces.

The oxidation interpretation has been updated since the 2015 resource estimation by AMC. During 2018 the interpretation was amended to include a base of complete oxidation and base of partial oxidation surface, marking the boundary between oxide and transition and transition and fresh material respectively (see Figure 8). This interpretation was based on loss on ignition (LOI), magnetic susceptibility, SATMAGAN[6] and geological logging data. A dataset of 979 SATMAGAN measurements was collected on archived pulp samples from 2015 RC drilling from the high-grade domain, ranging from oxide to fresh material.

[6] SATMAGAN (Saturation Magnetic Analyser) is a laboratory method to determine the proportion of magnetic iron oxide (Fe_3O_4) present

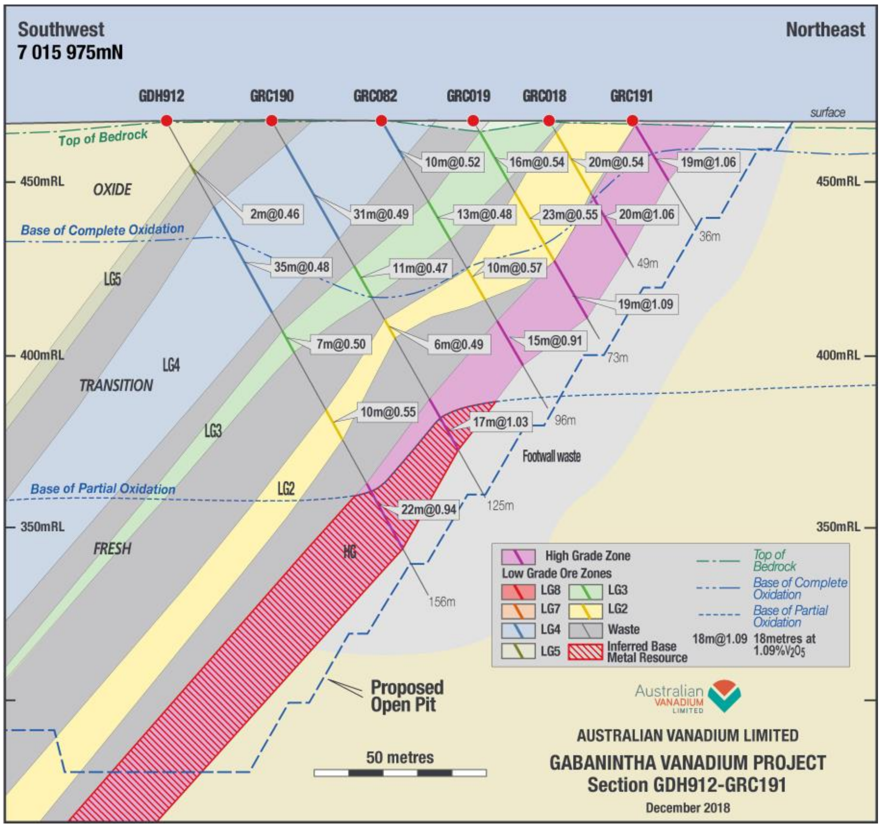

Figure 8 Gabanintha Schematic Cross Section Showing All Domains and Surfaces Modelled

The coded drillhole database was composited to 1m composites within mineralised and waste domains in GEOVIA Surpac™. All RC sampling was undertaken at a 1m sample interval. This, along with consideration of the typical dimensions of the mineralised domains combined to deem a 1m composite length appropriate.

Residual intervals less than 0.5m in length were excluded from the estimation process. The mineralised and waste domain interpretation has been coded to the composite data.

The Mineral Resources estimate for the Gabanintha deposit has been classified in accordance with the criteria laid out in the 2012 JORC code. Measured, Indicated and Inferred Mineral Resources have been defined using definitive criteria determined during the validation of the grade estimates, with detailed consideration of the classification guidelines.

The factors considered for the resource classification for this deposit included:

- Drill spacing
- Confidence in geological interpretation
- Confidence in mineralised zone interpretation
- Sample and geochemical analysis quality
- Availability of bulk density data

In applying the classification, Measured Mineral Resource has generally been restricted to the oxide, transition and fresh portion of the high-grade domain where the drillhole spacing is less than 80 mN to 100 mN.

Indicated Mineral Resource is generally restricted to the oxide, transition and fresh high-grade and low-grade in the same area of relatively closely-spaced drilling. The remainder of the modelled zones to the north and south of the Measured and Indicated Resource with supporting drilling, mapping and geophysical data have been classified as Inferred Mineral Resource. The classification applied relates to the global estimate of V_2O_5 and at the reported cut-off grades only. At different V_2O_5 grade cut-offs, the applied classification scheme may not be valid.

An Inferred base metal Mineral Resource of 14.3Mt at 208ppm Co, 666ppm Ni and 217ppm Cu has been defined at Gabanintha for sulphide-hosted cobalt, nickel and copper, contained exclusively in the fresh massive high-grade magnetite zone (model zone HG10) in Fault Block 20. The sulphide hosted base metal material is Inferred due to a lower number of informing samples for the fresh zone.

Mining

Mining at the Project will be from an open pit that extends for 3,250m along strike. The three stages covering 14 years are shown in Figure 9. The mining sequence will include a first stage that extends 1,100m along strike. Due to the length of the pit, mining will be divided into 200m wide benches along strike which are aimed at delivering a blend of oxidised, transitional and fresh ore to the processing plant.

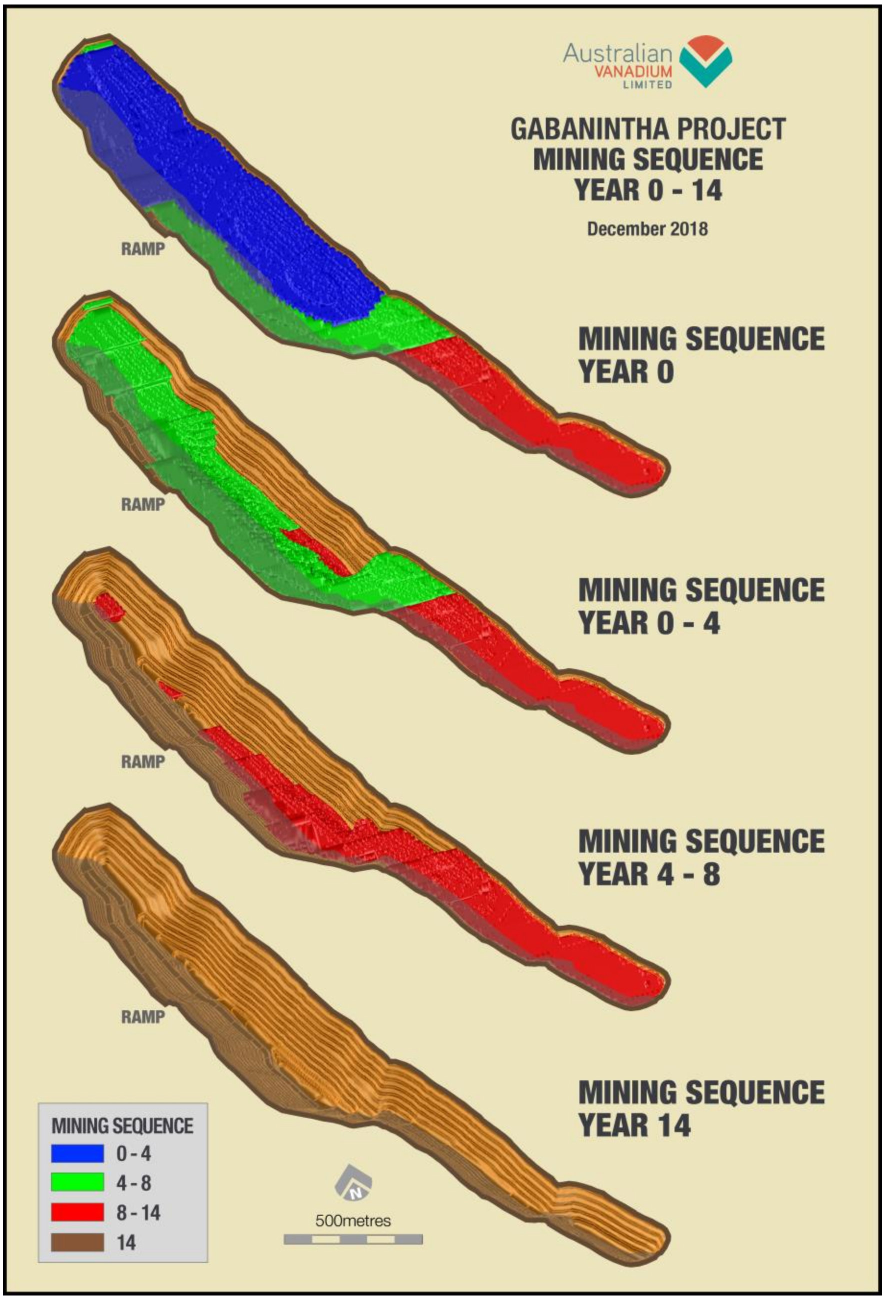

Figure 9 Mining Sequence Year 0-14

Selective mining techniques will be employed to minimise ore loss and dilution of ore by waste. The selective mining unit (SMU) used in the resource models was 20m (x), 40m (y) and 5m (z).

Ore will be hauled to the run-of-mine (ROM) pad and to a long-term stockpile where excess oxidised ore will be kept until later in the mine life. Waste will be hauled to two waste dumps to the north west and south east of the open pit area.

Conventional open pit contract mining with backhoe excavators and rigid frame dump trucks will be used. AVL will supply fuel to the mining contractor and manage and supervise the mining and grade control.

The rate of mining will build up to about 550,000 BCM/month, equivalent to two or three excavators working on double shift, depending on the size of the excavators. From year 1 to year 9 the mining rate will vary from around 480,000 BCM/month to 580,000 BCM/month, and then gradually reduce to the end of the planned mining in year 14. Most of the material to be mined will require blasting.

The mining method is intimately linked to geology/grade control and planned drilling and blasting practices as for any hard rock open pit.

- The mining of the ore zone is planned at a nominal 5m bench height using a back-hoe excavator mining on two nominal 2.5m flitches. This will allow selective mining between ROM grade ore, potential low-grade ore and waste boundaries.
- Waste will be mined on 5m benches or on 10m benches where appropriate, typically in continuous waste zones from the west of the pit to the HW edge of the ore zone.
- Grade control will be a combination of angled RC grade control holes and blast holes.
- All ore will be excavated from HW (west) to FW (east) across the bench face in “slices” so that it should be possible to separate some internal blocks of waste and low grade without excessive dilution of ore or loss of ore to waste.

Pit optimisations were based on Measured, Indicated and Inferred Resources. The updated resource model within the selected pit shell is Measured and Indicated to 79%, and 21% remains as Inferred. The mine schedule prioritised Measured and Indicated Resources in the early life of the project.

While the resource model is extensive and covers an overall strike length of 9.3km and includes 8 kilometre scale fault blocks identified from drilling and geophysics, the final pit optimisation was based only on northern fault blocks 20, 22, 17 and 6. The resource model extends further to the south, but this extension was not included in this study due to lower drill density and hence resource classification.

The highest average discounted cashflow was used as a guide towards selecting the optimum pit shell. As the cost of production is a key driver, pit shell 6 was selected for pit design, with a lower average cost of production while still offering a substantial 17-year mine life.

Minimum pit floor width was approximately 20m. Batter and berm configurations follow the geotechnical guidelines. The batter angles are 65° in transitional and fresh rock with varying berm widths ranging from 8.5m to 6.5m depending on the area. In oxide the batter angles are 50° with berm widths ranging from 10.5m to 5.5m wide.

A three-dimensional view of the final pit and waste dump design is shown in Figure 10. The Stage 1 pit shell is shown in green. The western larger waste dump design incorporates a two-cell TSF.

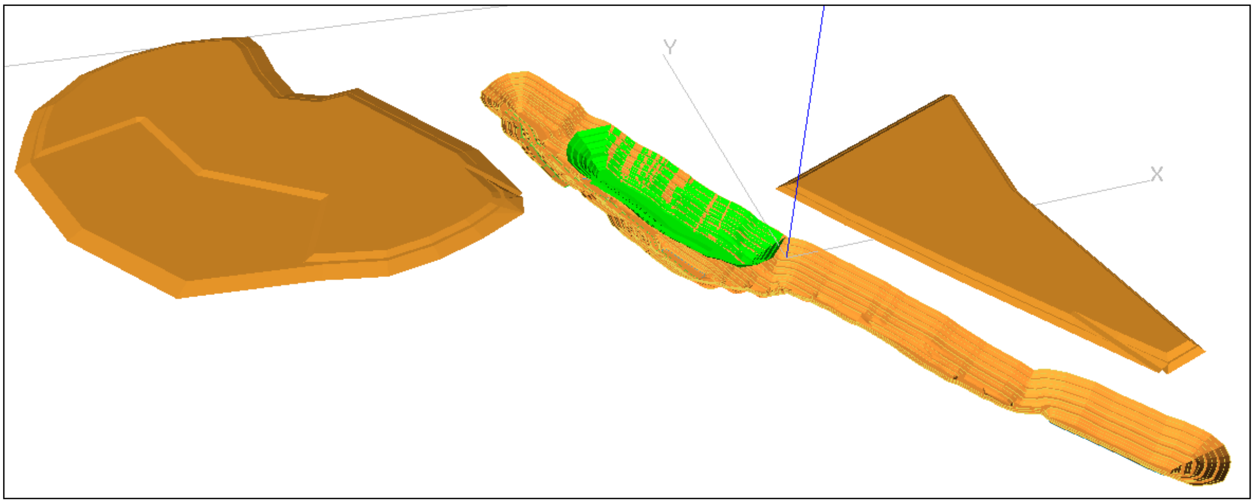

Figure 10 View of Final Limits Pit Design and Waste Dumps

Ore reserve

The determination of whether a mineralised rock is ore or waste is made on economic criteria. Simplistically, ore can be defined as mineralised rock where the net revenue from the recoverable metal is greater than the costs required to extract that metal.

For this project the revenue is based on the expected or assumed vanadium price. The small additional contribution (~1% over the LOM) from the cobalt, nickel and copper produced from the sulphide circuit was ignored for cut-off grade calculations.

The costs considered in the cut-off grade calculation are the processing cost to produce the product, including any mining costs specific to ore only, transport cost of the product, plus the site processing costs associated with the operation. In this way the cut-off grade can be calculated on recoverable product, as shown below:

$$\text{Cut-off grade} = \frac{(process + transport + overhead\ cost)\ x\ (1 + mining\ dilution\ (\%))}{payable\ product\ price\ x\ process\ recovery\ (\%)}$$

Based on this approach and the formula above the calculated cut-off grades are:

- Oxide 0.40% V_2O_5
- Transition 0.18% V_2O_5
- Primary or fresh 0.18% V_2O_5.

However the cut-off grades selected for all weathering types 0.8% V_2O_5 because the metallurgical testing indicated that it was difficult to recover reliable amounts of metal below this. The difference between the theoretical cut-offs and the 0.80% V_2O_5 value was quantified and resulted in a 5.7% drop in tonnes at a higher grade and significant reduction in metallurgical and economic risk.

From the JORC 2012 code an "Ore Reserve" is the economically mineable part of a Measured and/or Indicated mineral resource. It includes diluting materials and allowances for losses, which may occur when the material is mined or extracted and is defined by studies at prefeasibility or feasibility level as appropriate that include application of applicable modifying factors. Such studies demonstrate that, at the time of reporting, extraction could reasonably be justified.

The ore reserve statement in Table 8 is based on the Measured and Indicated Mineral Resources included within the final pit design and after taking into account all modifying factors. This ore reserve is based on the November 2018 resource model.

Table 8 Ore Reserves

Reserve classification	Tonnes	V_2O_5 %	V_2O_5 produced t
Proved	9,820,000	1.07	65,000
Probable	8,420,000	1.01	56,000
Total	**18,240,000**	**1.04**	**121,000**

The key inputs or modifying factors include:

- Ore mining recovery of 95%.
- Mining dilution of 5%.
- A nominal plant throughput of 1.45 Mt/a based on a blend of ore types.
- An overall Life of Mine (LOM) V_2O_5 process recovery of 64%. This was based on metallurgical testwork and refinery flowsheet benchmarks
- Geotechnical parameters based on an independent consultant report by Dempers & Seymour (D&S)
- CMB costs averaging A$17.09/t were used for pit optimisation and is based on preliminary plant design and cost estimates by Wood, including expected power and consumable usage and an overhead cost (general and admin) of A$2.24/t
- Total mining costs averaging $3.50/t ore and waste mined (LOM).
- Pit designs based on optimal discounted cash flow pit shell using a vanadium pentoxide revenue price of US$8/lb.
- Gross royalty of 5.0% which includes 2.5% WA Government Royalty and additional royalties.

Further detail is included in Appendix 3 – JORC Code Table 1.

The mine plan assumes that stockpiles will be maintained to manage the ore blend at the crusher ROM pad. At the start of the mining operation a significant stockpile of more than 500,000t will be created. This is necessary to smooth out the process plant feed rate over the following 12-month period and to allow the mining operation to access transitional and fresh ore for blending purposes. The current ramp up does not meet planned process feed requirements to achieve an average 60% concentrator mass yield in the first two years of the operation. This affects the production schedule by limiting the amount of vanadium produced until target blending ratios are achieved. Further work is underway to define alternate strategies but the PFS schedule represents the most conservative case.

The mining schedule takes into account the following:

- The open pit extends over a long strike length of around 3,250m, with another 8,000m of Inferred ore extending the strike to 11km. This provides opportunities to develop the orebody in different ways, depending on the distribution of grades and other factors such as oxidation profile.
- The oxidation profile is shallower in the southern end of the pit and deeper in the northern end of the pit.
- The ore grades are highest in the central part of the pit.
- Confidence in the resource is higher in the central and northern areas of the pit compared to the southern end.

The mine schedule was derived with a spreadsheet using inventories based on bench averages for each stage and bench area. Ore stockpiles are tracked in terms of oxide, transitional and fresh (low sulphur and high sulphur/base metals feed) materials. A simple cashflow was built into this spread sheet based on the pit optimisation inputs to assist in comparing scheduling options.

The final mine schedule was run during October 2018 and has been updated with the latest resource model.

- The preproduction mining period is 6 months. This allows for pit development and building of an ore stockpile including a significant volume of transitional material.
- The mining schedule is limited by vertical advance rates to allow for the normal operational process of drilling, blasting, grade control and finally load and haul.
- Assuming 120t backhoe excavators will be used, the operation will require three of these working on double, 12-hour shifts, for most of the mine life. Towards the end of the mine life this will reduce to two.

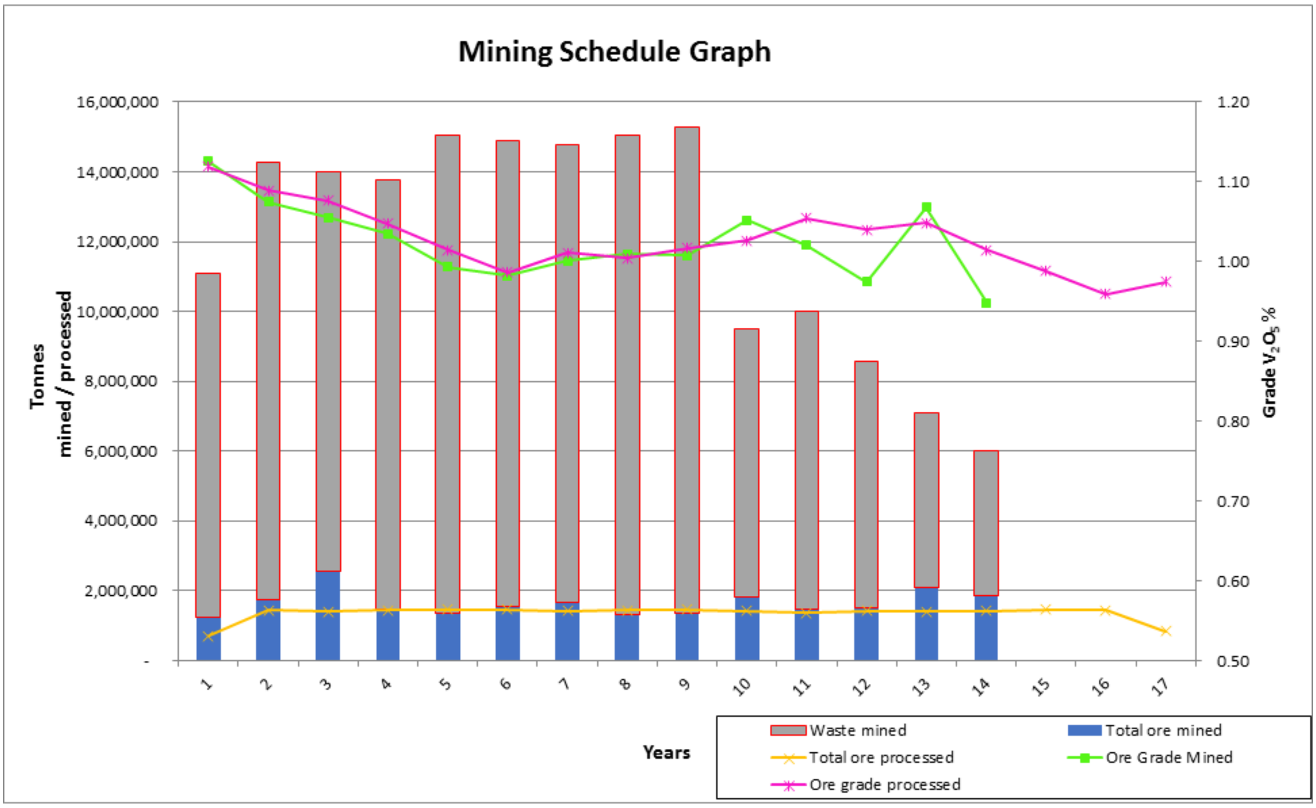

Figure 11 Annualised Mine and Processing Schedule

Table 9 Annualised Mining Schedule by Resource Category

Ore mined		Total	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6	Yr 7	Yr 8	Yr 9	Yr 10	Yr 11	Yr 12	Yr 13	Yr 14
Measured	million tonnes	**9.8**	1.3	1.7	2.5	1.1	0.9	0.4	0.2	0.2	0.3	0.5	0.2	0.1	0.3	0.0
Indicated	million tonnes	**8.4**	0.0	0.0	0.0	0.2	0.2	0.7	0.9	0.8	0.9	0.5	1.2	0.9	1.2	0.8
Inferred	million tonnes	**4.8**	0.0	0.0	0.0	0.2	0.2	0.4	0.6	0.3	0.1	0.8	0.1	0.5	0.6	1.0
Total	**million tonnes**	**23.0**	**1.3**	**1.7**	**2.6**	**1.5**	**1.4**	**1.6**	**1.7**	**1.3**	**1.4**	**1.8**	**1.5**	**1.5**	**2.1**	**1.9**
Measured	%	**43**	100	100	100	74	66	27	11	14	25	30	12	7	16	1
Indicated	%	**37**	0	-	0	12	17	47	51	61	68	29	82	63	57	44
Inferred	%	**21**	-	-	-	14	17	26	38	25	7	42	6	31	27	55
Total	%	**100**	100	100	100	100	100	100	100	100	100	100	100	100	100	100

Metallurgical Interpretation

Introduction

A significant body of metallurgical testwork has been undertaken on the project, particularly over the past 3 years. Testwork commenced in 2015 with RC drill sample material (*see ASX announcement 7 December 2015*) and continued with PFS related testwork on diamond drill core samples in 2017/2018 (*see ASX announcements: 20 February 2018, 24 April 2018, 22 May 2018 and 5 July 2018*).

Summary of Metallurgical Testwork

Historical Testwork

Testwork undertaken prior to the start of the PFS (2017) is considered historic testwork and has been summarised within metallurgical testwork programs reported in 2004, 2005 and 2015.

A review of historical testwork showed:

- Magnetic separation of high-grade massive magnetite (HG zone 10) feed material, in comparison to low-grade magnetite gabbro feed material (LG zones), overall, resulted in higher vanadium recovery and improved concentrate quality
- For high vanadium grade material there was a strong association between vanadium, titanium and iron grades and recoveries to magnetic concentrates.
- Magnetic separation was effective at beneficiating high-grade fresh, transitional and oxide material.
- Mass and vanadium yield to concentrate increases with coarser grind size and increasing magnetic intensities for all material types.
- Gangue element concentration to magnetic concentrates increases with magnetic intensity and to a lesser degree finer grinding.
- All magnetic concentrates resulting from the testing of material from low-grade magnetite gabbro horizons require further beneficiation testwork, as they did not produce a high quality of magnetic concentrate.

The historical testwork guided the PFS evaluation to focus on recovery of vanadium from high-grade (zone 10) material.

PFS Testwork

The aim of the PFS testwork was to better understand the influence of weathering on metallurgical behaviour and support a concentrator flowsheet design to process material from the high vanadium grade domain (Domain 10). The concept flowsheet was based on grinding to P_{80} 106 µm and magnetically separating a concentrate of approximately 1.4% V_2O_5 and less than 2% SiO_2. Testwork was undertaken by Bureau Veritas Pty Ltd between November 2017 and October 2018 to investigate oxide, transitional and fresh core samples from the high vanadium grade mineralisation (massive VTM geological domain).

The PFS metallurgical testwork was based on 24 massive titano-magnetite samples derived from contiguous intervals of Gabanintha diamond drill core. The metallurgical samples were selected at discrete intervals within 10 diamond drill holes. Depth of samples ranged from 14m from surface to 187m below surface across 915m of Northing, thereby representing a significant portion of the current Measured and Indicated Resource area.

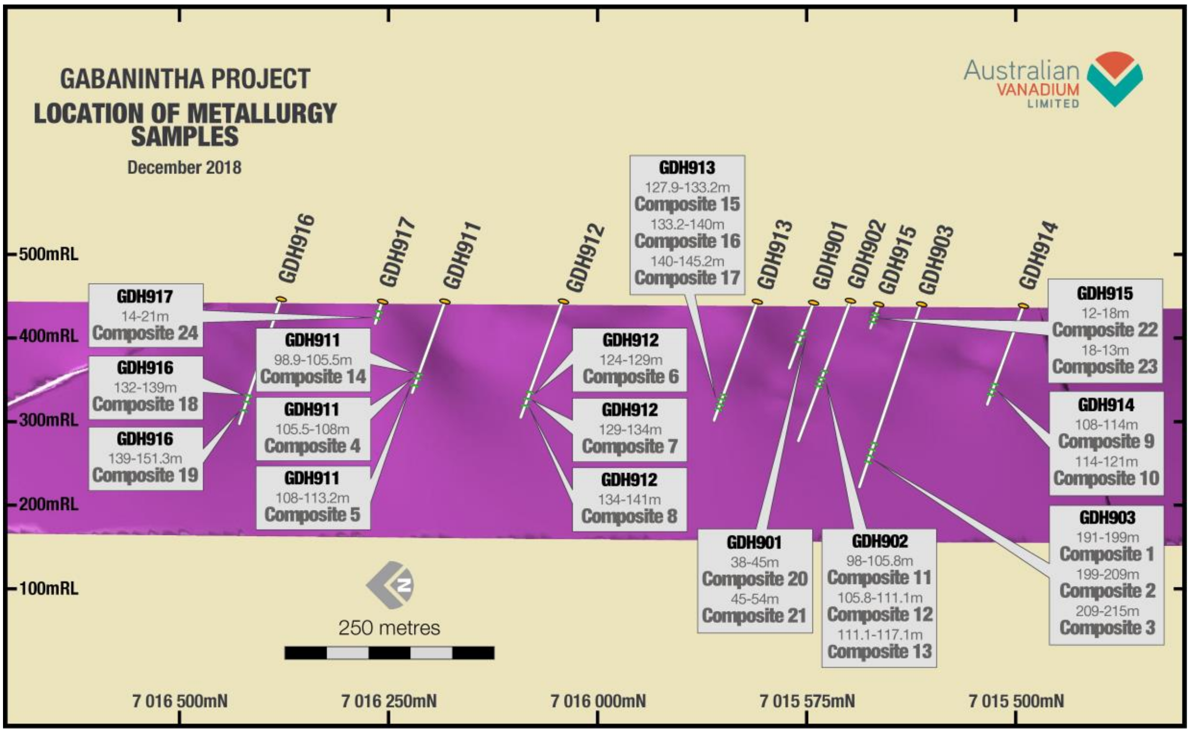

Figure 12 Metallurgical Composite location (long section)

Gabanintha's massive fresh VTM zone exhibits extremely well developed coarse crystalline igneous textures and with a high rock density offers unique processing attributes. The PFS testwork included feed characterisation, benchscale comminution testwork and testing various beneficiation processes. A summary of testwork results pertaining to the PFS flowsheet follows.

Comminution testing

Ore comminution properties were characterised by SMC Testing, Bond Ball Mill Work Index (BWi) Testing and Abrasion Index (Ai) Testing. The average comminution properties for the fresh, transitional and oxide samples tested are presented in Table 10.

Table 10 Average comminution properties by material type

Material Type	SCSE [kWh/t]	S.G	Ai	BWi [kWh/t]
Fresh (5 samples)	7.66	3.88	0.28	17.58
Transitional (5 samples)	6.48	3.37	0.17	14.48
Oxide (5 samples)	6.40	3.65	0.12	17.44

The results indicate similar comminution properties for the three oxidation types with moderate rock competency and average ball mill work indices. The consistent comminution properties and high SG of these iron rich samples is viewed favorably for the AG or SAG milling.

Low rates of media consumption and liner wear in the comminution circuit are expected based on these results.

Magnetic separation

The PFS testwork confirmed that magnetic separation was a viable method for concentration of vanadium. Grinding to P_{80} 106 microns and magnetically separating the 24 test samples showed average metallurgical vanadium recoveries to magnetic concentrate of 92%, 85% and 42% for fresh, transitional and oxide samples respectively. A summary of testwork results is shown in Table 11.

Table 11 Weighted average magnetic separation characteristics by material type

Material Type	Stream	Fe [%]	SiO_2 [%]	Al_2O_3 [%]	V_2O_5 [%]	V_2O_5 Recovery
Fresh	Calc.Head Grade	47.65	7.27	5.67	1.13	
(10 Samples)	**Mag Con Grade**	**57.28**	**0.55**	**2.27**	**1.42**	**92%**
Transitional	Calc. Head Grade	41.86	11.16	7.64	1.13	
(9 Samples)	**Mag Con Grade**	**52.32**	**1.68**	**3.18**	**1.45**	**85%**
Oxide	Calc. Head Grade	47.04	6.13	6.41	1.23	
(5 Samples)	**Mag Con Grade**	**52.68**	**1.70**	**3.28**	**1.38**	**42%**

Low silica and alumina concentrate grades have been demonstrated in all oxidation zones with V_2O_5 grades of approximately 1.4%. The fresh concentrates are consistently less than 1% SiO_2 with potential to blend out higher silica and alumina in the transitional and oxide concentrates.

The metallurgical and mineralogical investigations to date indicate a reasonable potential to improve the vanadium recovery from oxide material. Testwork is now underway as part of a post-PFS metallurgical testwork program to further define and improve oxide recoveries.

Sulphide Flotation

Sulphide minerals have been identified within interstitial silicates of the fresh massive VTM. Upon grinding and magnetically separating samples of fresh material, the majority of contained silicates report to the non-magnetic fraction. The process of magnetically upgrading the vanadium therefore upgrades sulphides in the non-magnetic stream.

Preliminary benchscale flotation tests on samples of the non-magnetic tails have demonstrated recovery of a sulphide concentrate potentially payable in cobalt, nickel and copper. The upgrade and concentrate quality are indicated to be more pronounced with higher grade vanadium feed material.

Sighter flotation results demonstrated the potential to generate a sulphide concentrate containing 4 to 6% combined cobalt, nickel and copper from massive magnetite material proposed as feed to the Gabanintha vanadium recovery process. Subsequent to the sighter flotation tests, further testwork was performed on a larger sample of non-magnetic tails denoted “Bulk Float Feed” with composition outlined in Table 12.

Table 12 Bulk Float Feed Head Assay Characteristics (w.t%)

Analyte (w.t%)	Fe	SiO_2	Al_2O_3	S^{2-}	V_2O_5	Co	Ni	Zn	Cu	MgO
Calculated Head Assay	20.5	25.3	15.9	0.74	0.266	0.07	0.119	0.017	0.05	11.1
Assay Head	21.0	24.6	15.9	0.90	0.277	0.07	0.116	0.016	0.04	11.2

Table 13 shows the cleaner flotation product mass and grades achieved in the testwork. Total sulphide sulphur recovery to the rougher concentrates was more than 90%.

Table 13 Bulk Float Product Assays

Products	Mass	Fe	SiO_2	Al_2O_3	S^{2-}	V_2O_5	Co	Ni	Zn	Cu	MgO
Units	%	%	%	%	%	%	%	%	%	%	%
2nd Cleaner Concentrate 1	0.62	35.85	8.46	0.79	37.30	0.02	2.47	2.35	0.04	1.64	3.85
2nd Cleaner Concentrate 2	0.82	34.38	11.51	1.20	35.55	0.03	2.27	2.00	0.03	1.36	5.10
2nd Cleaner Concentrate 3	0.25	28.70	18.60	2.59	28.10	0.04	1.75	1.45	0.01	1.07	8.72
2nd Cleaner Concentrate 4	0.13	24.63	23.40	4.33	21.50	0.06	1.54	1.18	0.02	0.99	10.70
2nd Cleaner Concentrate 5	0.08	21.52	26.87	6.56	14.60	0.10	1.13	1.00	0.03	1.02	12.20
Combined Tailings	98.09	20.22	25.56	16.20	0.18	0.27	0.03	0.08	0.02	0.03	11.20

Roasting Testwork

Three roast leach tests were performed on magnetic concentrate derived from fresh core. Tests 1 to 3 compared soda ash (Na_2CO_3) addition rates of 2.45, 3.67 and 4.90% by mass respectively. A standard roast and leach procedure was applied with results summarised in Table 14.

Table 14 Preliminary Roast Leach Testwork Results

Sample ID	Stream	Fe %	SiO_2 %	Al_2O_3 %	TiO_2 %	V_2O_5 %
Test 1, 2 and 3	Magnetic concentrate grade (%)	57.8	0.49	2.53	13.96	1.45
Test 1	Roasted Product grade (%)	55.3	0.73	2.49	13.28	1.34
	Final leach residue grade (%)	56.3	0.51	2.38	13.49	0.29
	Calculated recovery to filtrate (%)	**2**	**32**	**8**	**2**	**79**
Test 2	Roasted Product grade (%)	54.7	0.66	2.40	13.09	1.34
	Final leach residue grade (%)	56.3	0.45	2.27	13.36	0.20
	Calculated recovery to filtrate (%)	**1**	**35**	**9**	**2**	**86**
Test 3	Roasted Product grade (%)	54.4	0.66	2.38	13.04	1.34
	Final leach residue grade (%)	55.8	0.45	2.27	13.29	0.29
	Calculated recovery to filtrate (%)	**1**	**35**	**8**	**2**	**79**

These preliminary roast leach results are considered encouraging and will be used as a reference for ongoing optimisation and variability testwork.

Further work

Further metallurgical testwork is currently underway to optimise the flowsheet design and further improve vanadium recoveries and rejection of deleterious minerals. This will include a series of bench scale test programs, followed by pilot scale testwork. Piloting will include crushing, milling and beneficiation as well as concentrate roasting and hydrometallurgical circuit optimisation. Testwork has been designed to verify grind size and mass recoveries, reagent addition rates, vanadium recoveries and vanadium final product quality.

Process Plant & Utilities

The Gabanintha mineral process facility is designed to treat 1.45 Mt/a of 1.03% V_2O_5 grade ore to generate 5,600 MTV as V_2O_5 fused flake (>98.5% w/w) per annum, for export via the Port of Fremantle. The process plant design capacity is governed by the forecast supply and demand for V_2O_5 flake (as outlined in the Marketing section) and AVL's view on an acceptable market entry position.

The PFS process facility is designed for a 17-year processing schedule and is located directly west of the proposed Gabanintha open pit mine (the mine site). The process facility is illustrated in Figure 13 and includes a concentrator (back ground) and adjacent refinery (foreground). Other associated areas (outside the view in Figure 13) are set aside for calcine storage, concentrator tailings storage and a lined evaporation pond for the refinery bleed stream.

The flowsheet is based on standard industry proven processes and includes a magnetic beneficiation flowsheet (concentrator) and an alkaline roast leach and ammonium vanadate (AMV) extract refinery flowsheet. A notable difference for the Gabanintha PFS flowsheet design to other similar global vanadium projects is that the average life of mine feed vanadium grade to the concentrator (1.03% V_2O_5) is high relative to the concentrate grade (1.4% V_2O_5), thereby realising a high concentrate mass yield; possibly the highest of all current operations worldwide. The other unique features are the elevated base metals sulphides associated with the main titaniferous magnetite horizon and higher than typical chromium in concentrate grades.

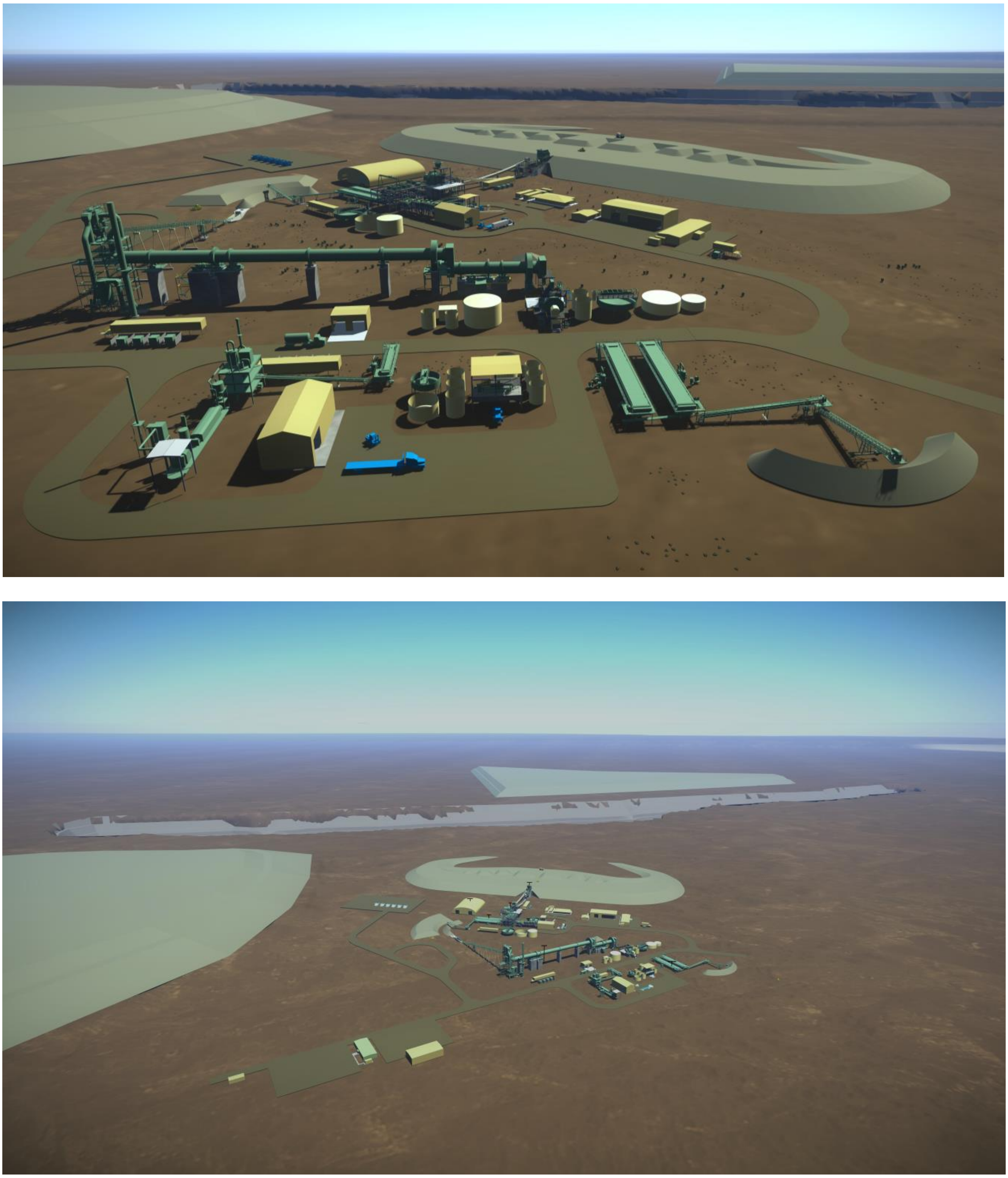

Figure 13 Gabanintha Process Facilities

The overall process layout (see Figure 14) has been considered with the objective to provide adequate accessibility for major reagent deliveries, maintenance functions and minimise traffic interfaces where possible. Further development of the process layout and detail will occur in the next phase of study when the refinery location is finalised.

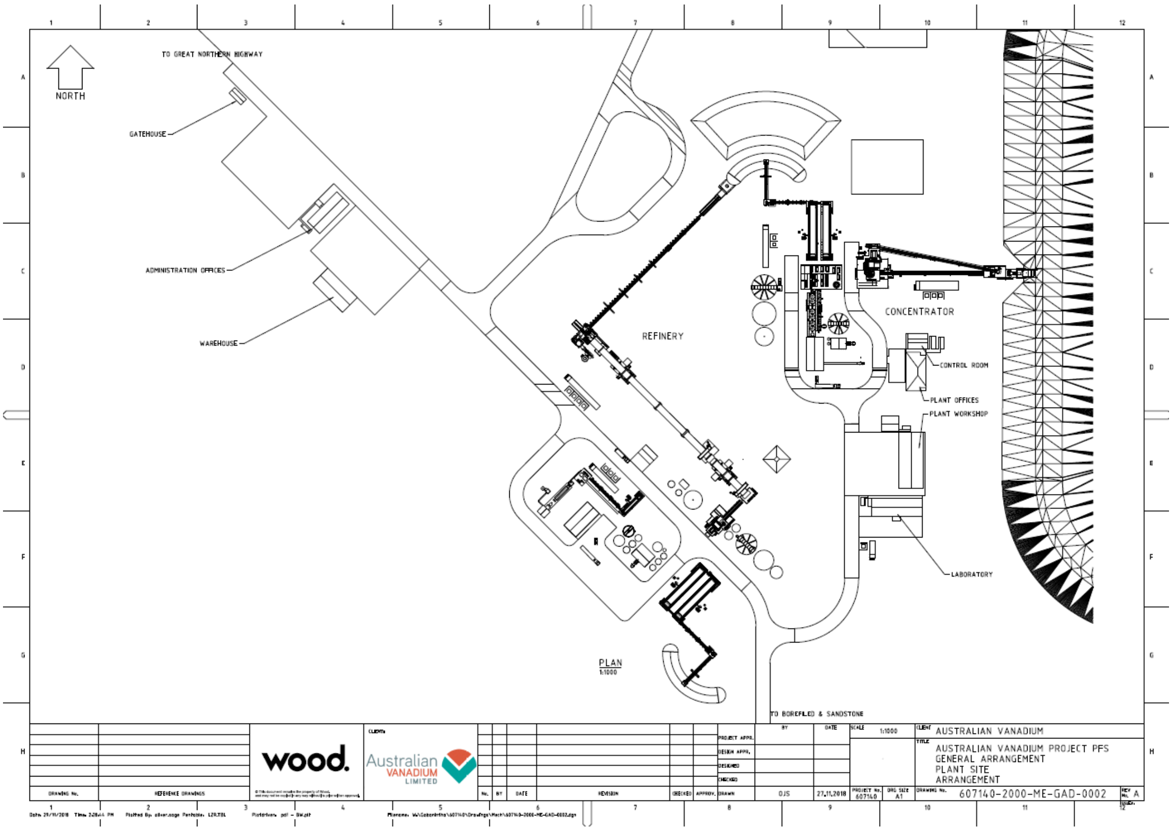

Figure 14 Process Plant Area General Arrangement Drawing

Concentrator

The concentrator is designed to operate 8053 h/a and consistently generate 900,000 tonnes of magnetic concentrate per annum to feed the refinery. The study assumes all base metal sulphide sales are free on board from the Port of Fremantle.

In the concentrator the blended run-of-mine (ROM) ore is crushed, ground and concentrated to produce a magnetic concentrate of nominally 1.4% vanadium pentoxide (V_2O_5) which is stockpiled as filter cake prior to refining. The concentrator also includes a flotation circuit for periodic treatment of fresh ore containing recoverable cobalt, nickel and copper in sulphide minerals.

A schematic illustration of the concentrator flowsheet is shown in Figure 15.

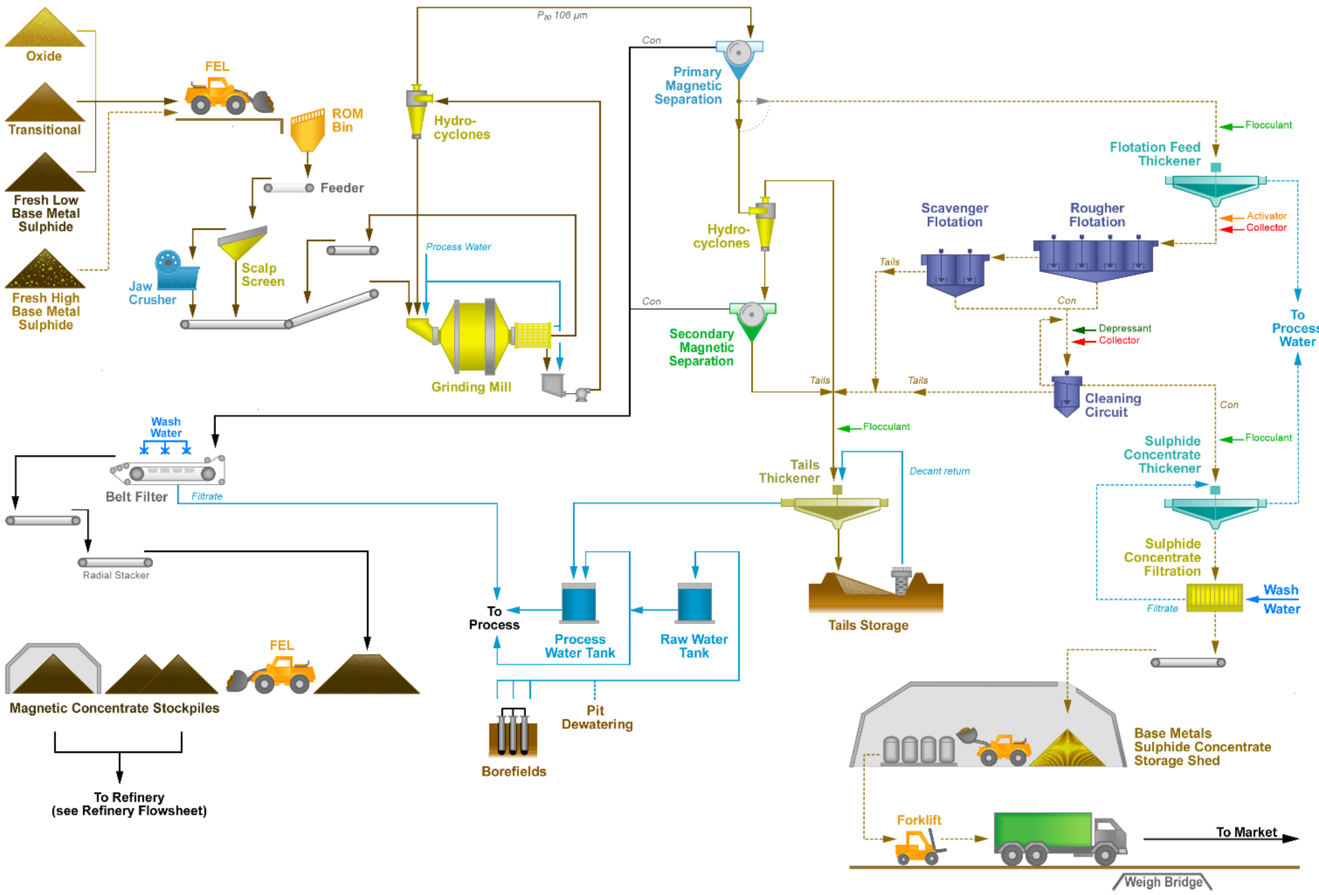

Figure 15 Concentrator Flowsheet Schematic

Refinery

The refinery is designed to operate 7,500 h/a and consistently generate 10,115 tonnes of V_2O_5 flake per annum (5,600 MTV) for sale to external parties overseas. The study assumes all vanadium sales are free on board from the Port of Fremantle.

The refinery treats the magnetic concentrate by roasting with a sodium carbonate salt followed by leaching and purification of the leach liquor to precipitate a high purity ammonium metavanadate (AMV) solid for conversion to V_2O_5 flake. A schematic illustration of the refinery flowsheet is shown in Figure 16 and a brief process description of the main unit process areas within the refinery follows:

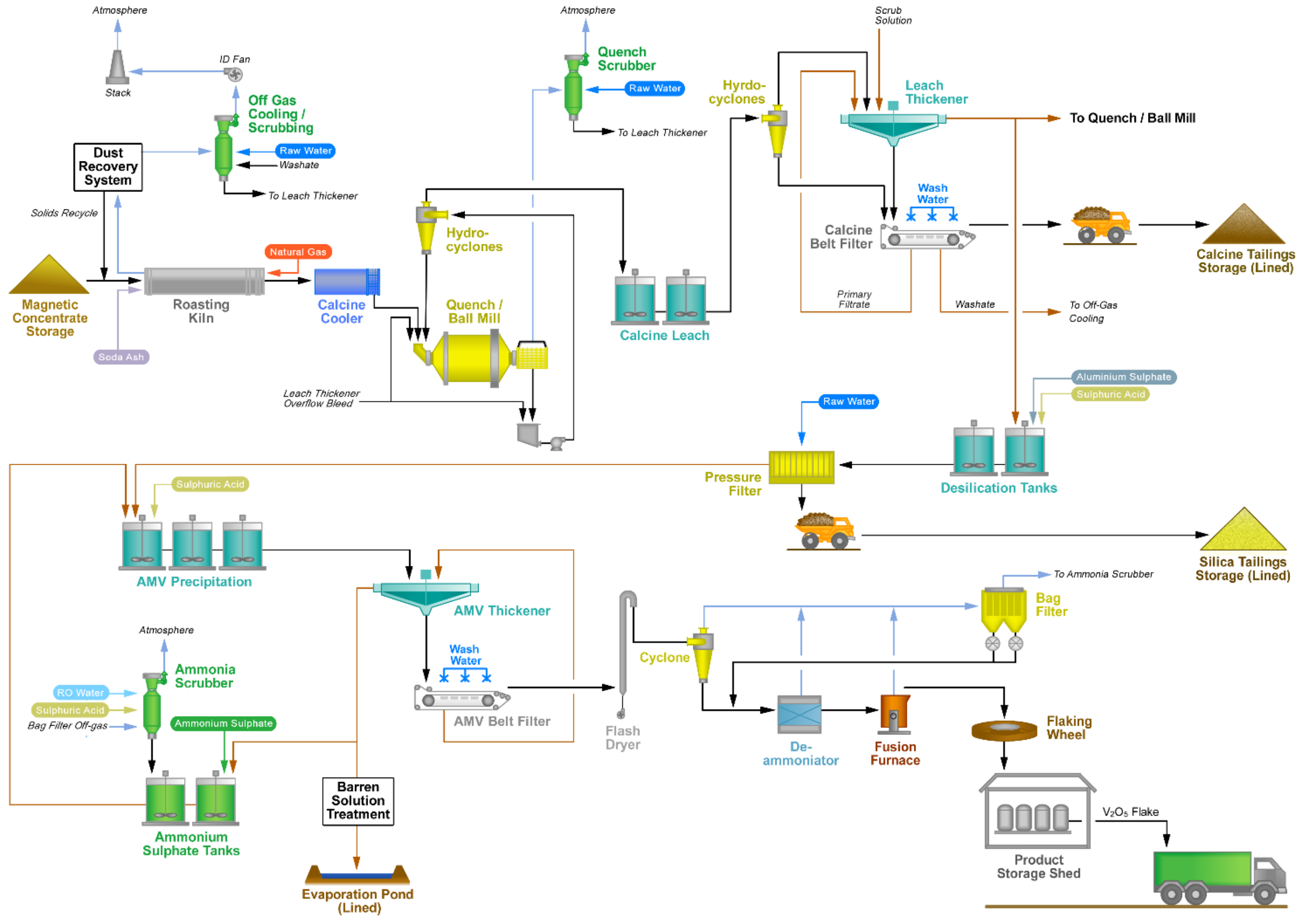

Figure 16 Refinery Flowsheet Schematic

The blended magnetic concentrate is reclaimed from the blending stockpiles and loaded into the magnetic concentrate feed bin. Ore is fed from the bin onto the magnetic concentrate conveyor. The magnetic concentrate feed rate to the kiln circuit is approximately 120 dmt/h and is measured by a weightometer.

Magnetic concentrate is fed into the natural gas fired rotary kiln by the kiln screw feeder where it is roasted under oxidising conditions for 120 minutes at 1,050 to 1,150°C in the hot zone. In the kiln, vanadium is converted to a water-soluble sodium metavanadate.

The calcine from the kiln discharges into the calcine cooler where it is cooled to approximately 450°C via contact with ambient air. Cooled calcine is quenched with recycled dirty pregnant liquor to less than 100°C in the quench mill, where any large agglomerates formed inside the kiln are broken up.

The quenched calcine is leached for two hours in two leaching tanks operating in series. During leaching approximately 93 to 95% of the water-soluble vanadium is leached into solution as sodium vanadate. Significant amounts of silicate and chromium are also solubilised.

During the calcination and leaching steps, a considerable amount of sodium silicate is solubilised which requires removal prior to subsequent vanadium recovery steps. Aluminium sulphate and sulphuric acid are added to the dirty pregnant liquor in agitated reactors, producing a sodium-aluminium silicate precipitate.

Cooled clean pregnant liquor is transferred to AMV precipitation where vanadium is precipitated with ammonium sulphate forming AMV. The AMV precipitate is filtered using vacuum belt filtration and a bleed stream of the vanadium barren liquor is treated and transferred to evaporation ponds.

The AMV filter cake is fed to a natural gas fired flash dryer to drive off moisture. The deammoniator thermally decomposes the AMV to vanadium pentoxide (V_2O_5). The deammoniator discharge solids are fed to the fusion furnace where the vanadium pentoxide is melted. The fusion furnace discharges molten material onto the water cooled flaking wheel where it hardens and is broken up into flakes which are then packaged into 1 m^3 FIBCs (bulk bags) for transport to market.

On site Laboratory

Over the LOM the operation will generate a significant number of mine grade control, geology and process samples, requiring sample preparation, chemical analysis and for some metallurgical test work.

The PFS includes an onsite laboratory managed and operated by AVL staff and fully fitted out for routine mine exploration, grade control, process sample analysis and some metallurgical testing capability.

HAZID (Hazard Identification) Workshop

As part of the PFS a HAZID (Hazard Identification) workshop was undertaken to allow early identification of any high-level hazards that could occur during plant construction, operation and after closure.

A total of 59 hazards were identified and logged in the HAZID Study. As the process design/design basis and layout is considered preliminary, the hazards identified were not specifically assessed. This activity and the definition of specific actions required to implement effective engineering controls is proposed for future evaluation, when the mine schedule, process flowsheet, layout and design criteria become more certain. 56 of the hazards identified are proposed to be assessed and addressed in the DFS with the remaining 3 addressed prior to the commencement of operations.

Some of the more significant hazards identified included:

- Traffic interfaces
- Dust control
- Thermal burn risks associated with the kilns within the flowsheet
- Design and management of calcine diverted to the kiln discharge bunker
- Personnel and environment exposure to oxidised Cr and V compounds
- Heat sources and potentially explosive gasses/chemicals (e.g. potassium amyl xanthate and ammonia).

Infrastructure

The remote and greenfields nature of the Project requires all infrastructure will need to be constructed. The major non-process infrastructure required for the Project includes:

- Natural gas supply via pipeline
- Power supply and distribution via island power station
- Water supply via a borefield
- Regional road access
- Personnel accommodation

Figure 17 provides an overview of the proposed site and main infrastructure areas.

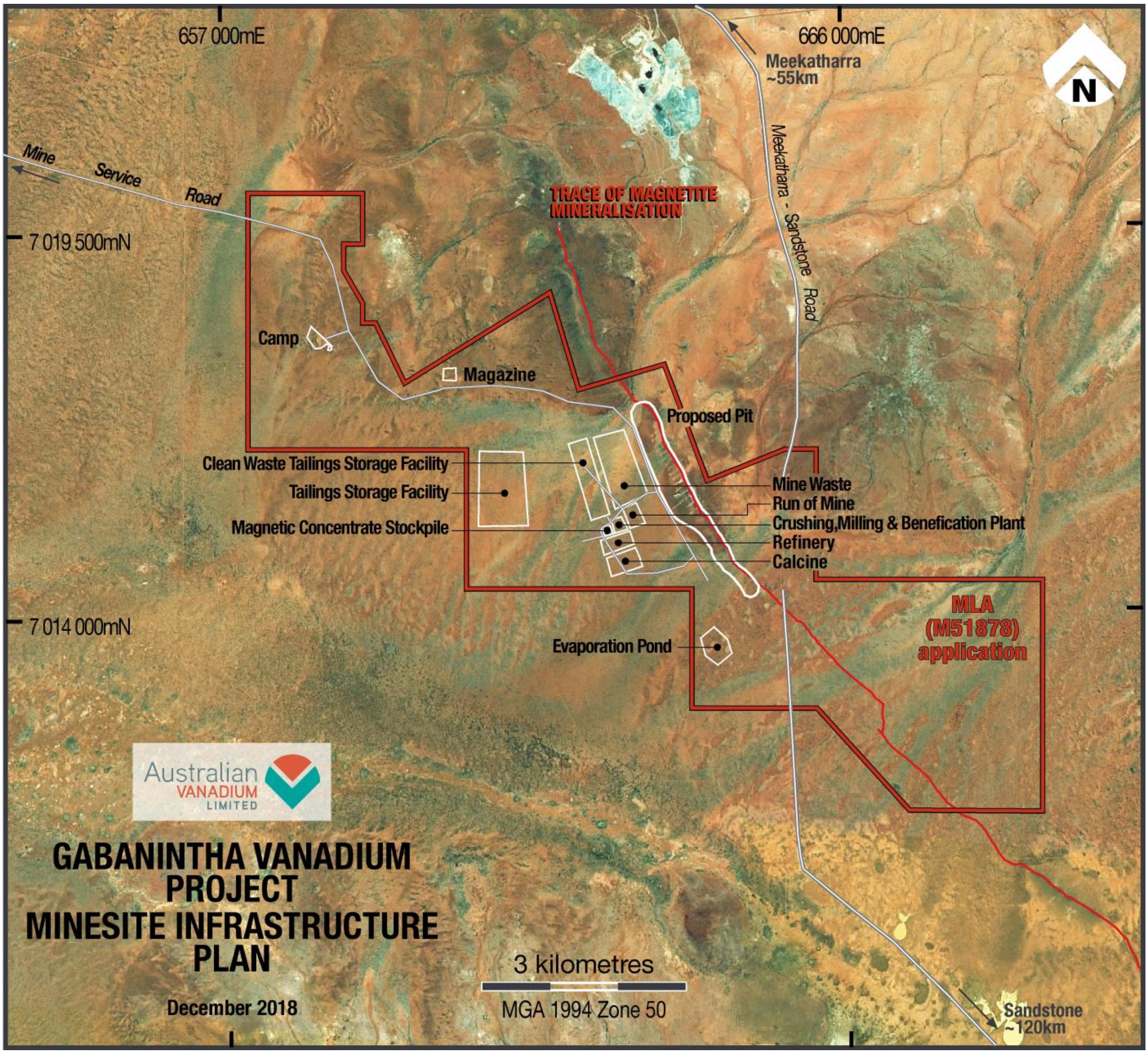

Figure 17 Infrastructure Location Diagram (Initial Proposed) Gabanintha Project

Gas

The Project consumes a significant quantity of energy in the roasting of vanadium with sodium salts which takes place at ~1,200°C. Typically, the kiln is fired with natural gas as this is the cheapest source of heating fuel when available for this duty. The estimated project consumption of natural gas is in the order of 6TJ/day including supplying a build own operate (BOO) natural gas power plant generating electricity for the operation.

Natural gas is readily available within Western Australia (WA) and is currently being actively produced from wells located off the Pilbara and Kimberley coasts. WA has legislation in place ensuring a portion of the gas produced must be made available to local consumers in WA.

AVL commissioned Adaman Resources to compile a desktop study of potential natural gas supply options to the project

Given the Project is remote and not located near any major towns, the Adaman study reviewed supply options comprising a "virtual pipeline" where gas is transported to site as compressed natural gas (CNG) or liquified natural gas (LNG) against the traditional pipeline option. The conclusion of these options presented highlighted additional cost and management issues and therefore the pipeline option was selected as the base case for the PFS.

Electrical

Wood developed an electrical load list which included the main Gabanintha processing plant, accommodation village, borefields, buildings/NPI, water treatment and associated infrastructure to allow for power transmission and distribution from the proposed power station.

It is anticipated that the new proposed gas supply line will allow for installation of a build own operate (BOO) gas-fired power plant, allowing for an operating load of up to 14MW. Pricing was solicited from several experienced Pilbara and goldfields operators for inclusion in the operating plant.

Alternative power supply options identified for investigation in future study phases include diesel, solar photovoltaic (PV) installation, combination diesel with solar PV, and combination gas with solar PV.

A potentially viable option could include for a portion of the power requirement being provided by solar PV, providing corresponding savings can be achieved in the reduction in consumption of gas or diesel fuel, during times when the solar farm is generating at optimum output, in ideal solar/weather conditions. The PV cost can also be offset against the value of applicable Renewable Energy Certificates (RECs).

Communications

Communications will be facilitated from the nearest fibre interconnect access point at the existing Meekatharra radio tower, via a microwave link to a new 10m tower located between Meekatharra and a 'Midpoint' tower. The midpoint tower would facilitate onward microwave connectivity to roof mounted antennas at the processing plant, mine area and the accommodation camp, with pole mounted antennas located at the borefields.

Telstra, Optus and Vodafone mobile connectivity will be facilitated via Mobile Calling over WIFI, providing a cost-effective solution, and allow calls to be made and received as if connected to a traditional global system for mobile communication (GSM) tower.

WIFI connectivity will be provided across plant site and accommodation camp areas as required. Handheld radio handsets will be utilised to provide communications between construction crews, operations, and mine-site management.

Water

The Project will involve open-cut mining to a depth of approximately 210 meters below ground level (mbgl). Static water levels across the orebody are in the order of 10 mbgl and therefore dewatering of at least 200m will be required. Additionally, the Project will involve crushing and processing of ore and a process water supply will be required. The estimated average water demand is 1.72 GL/a (5,340 kL/d).

The main regional aquifer in the Gabanintha area occurs in a paleochannel comprising calcrete and alluvium between 50m and 100m thick. Groundwater flow converges on this paleochannel and then flows along the channel to the west and north (towards Lake Annean). The paleochannel aquifer is the prime target to develop a water supply borefield.

There are aquifers within the Gabanintha orebody associated with both fractured rock and weathered saprock. Some of these local aquifers are likely to contribute to groundwater inflow to the pits. The extent or connectivity between these local aquifer zones is unknown.

Groundwater levels range between 470 mRL northeast of the deposit to 450 mRL in the paleochannel aquifer. On average, groundwater on the deposit occurs at 455 mRL which is between 10 and 15 mbgl. Dewatering will be required when mining below this depth.

Groundwater quality on the deposit is brackish to saline, generally ranging between 1,380 and 18,000 mg/L TDS.

Further drilling and testing to confirm dewatering estimates will be performed post PFS, alongside confirmation of aquifer potential in the paleochannel adjacent to the project (in the area of the conceptual borefield). Hydrogeological exploration drilling will be undertaken on these transects to confirm the sedimentary characteristics and aquifer potential. Preliminary design of the water supply scheme has been undertaken based on the number of bores, operational water levels and preferences for reticulated power, local gensets or renewable energy.

Generally, as part of the approvals process, the Department of Water and Environmental Regulation (DWER) will require a life of mine water supply to have been identified and investigated to confirm sustainability and that impacts to both the environment and existing users, can be appropriately managed.

Roads

Primary access to the process plant will be from the Great Northern highway, through existing roads and pastoral tracks. Sections of the proposed route are indicated in Figure 18 and have different surface conditions, as summarised below based on site observations by the Company's representative:

- Green section (approximately 8.85m length) – well maintained gravel road (state or shire road)
- Yellow section (approximately 12.5m length) – well maintained farm track
- Pink section (approximately 4.75m length) – somewhat well-maintained track along a fence line, but not travelled often

A new section of road will be required from the existing track to the proposed plant site location, as indicated by the red section (approximately 17.5m length). The new road includes access into borefields.

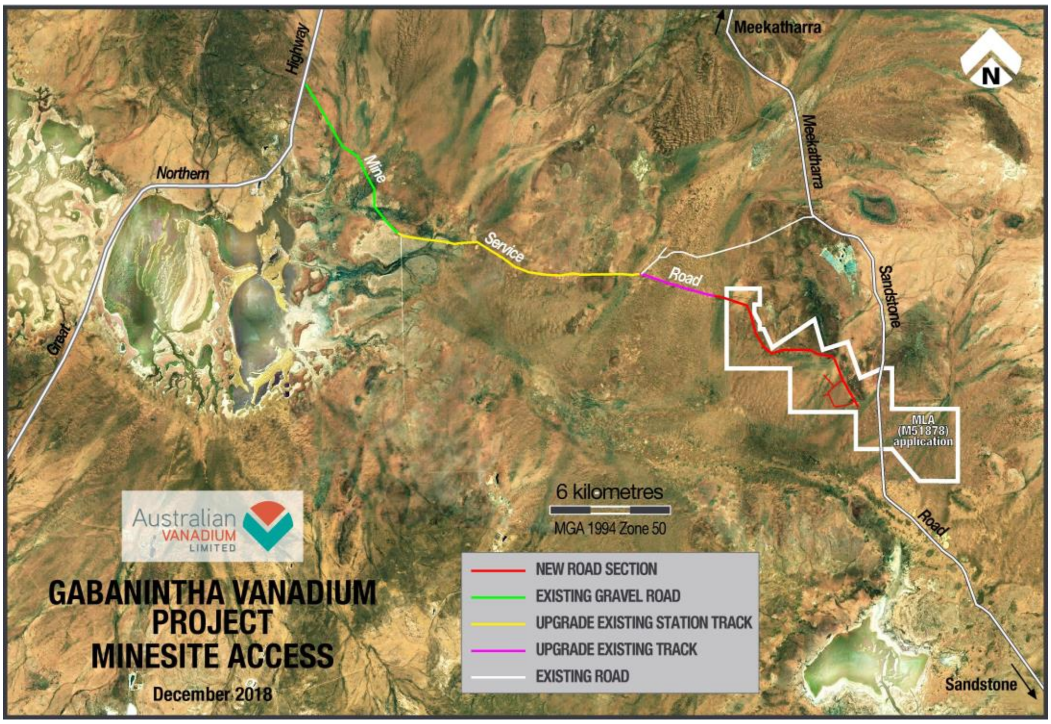

Figure 18 Regional Roads layout

Bulk Earthworks

Due to the flat terrain of approximately 0.25% across the plant site, sloping in the south western direction, site grading and shaping will be raised compared to the surrounding elevations to ensure the proposed plant site be protected from flood. Local cut to fill will be utilised from site run-off ponds with additional imported fill be required including capping layer allowance for hardstand. Local detailed earthworks will be formed such that the runoff will be drained away from the buildings into planned open drainage swales.

Personnel Accommodation

The Project manning level indicates the requirement to house up to 500 construction workers and 240 permanent workers. The permanent village will be required to accommodate 240 personnel including casuals. This village will be utilised initially to part accommodate the construction workforce. A temporary camp expansion will be required to cater for the construction workforce peak of 500 personnel. As the project definition continues AVL will review if the construction camp will be built on a hire/return, tear-out basis.

The camp is to be located approximately 5km north and upwind of the mining operation. Workers will be bussed to the operations daily.

Tailings Management

Tailings storage for the Project has been designed by Golder Associates Pty Ltd (Golder). The Project will generate 550,000t/a of tailings.

Tailings will be deposited as a thickened slurry, at approximately 53% solids by mass, into one of two cells created within the North-West Waste Rock Dump, forming an integrated waste landform (IWL). The two cells will be progressively raised in a downstream direction over the life of mine using mine waste. The TSF will have a final height of approximately 17m and occupy approximately 48 hectares within the waste dump. See Figure 19.

Cell 1 will be constructed first, with sufficient capacity to store approximately the first year of tailings. Cell 2 will be constructed during the first year of operation, in preparation to receive tailings in year 2. Thereafter, tailings deposition will rotate between the two cells every one to two years over the remaining life of the TSF.

The starter embankments for each cell will be constructed using low-permeability overburden materials excavated from the pit, which will be moisture-conditioned, spread, and compacted in layers. Thereafter, each cell will be progressively raised in a downstream direction using non-acid forming (NAF) waste rock and utilising the mine fleet. During operations, a portion of the NAF waste rock will be identified and diverted directly to the containment embankments where it will be paddock dumped and spread in layers to maintain sufficient freeboard above the level of the tailings.

The mining fleet will be separated from tailings operations by windrows. Once a tailings cell is full and the pipes have been removed, civil earthmoving equipment will be used to place select oxide overburden against the upstream face of the waste rock shell. The oxide overburden will form a transition/filter zone between the tailings and waste rock. It will be necessary to selectively stockpile the oxide overburden separate from other mine waste materials for this purpose.

The crest elevation of the tailings cells at the end of the mine life (17 years) is approximately 480m (17m height). The north-west Waste Rock Dump could accommodate tailings up to elevation 490m, if required. This provides potential to store an additional 4.8 Mm^3 of tailings, or approximately 13 years of storage.

During operations, tailings will be deposited sub-aerially into a single active cell while construction activities are carried out to raise the adjacent cell. Tailings will be deposited in thin layers from spigots located along the crest of the embankment with discharge rotated around the perimeter of the active cell to maintain a centrally located decant pond in each cell. Ponded water will be pumped back to the process plant from a central decant tower, comprising slotted concrete rings surrounded by a rockfill filter. The quantity of water returned from the TSF will vary over the operational life but is estimated to average approximately 17% to 25% of the tailings slurry water annually.

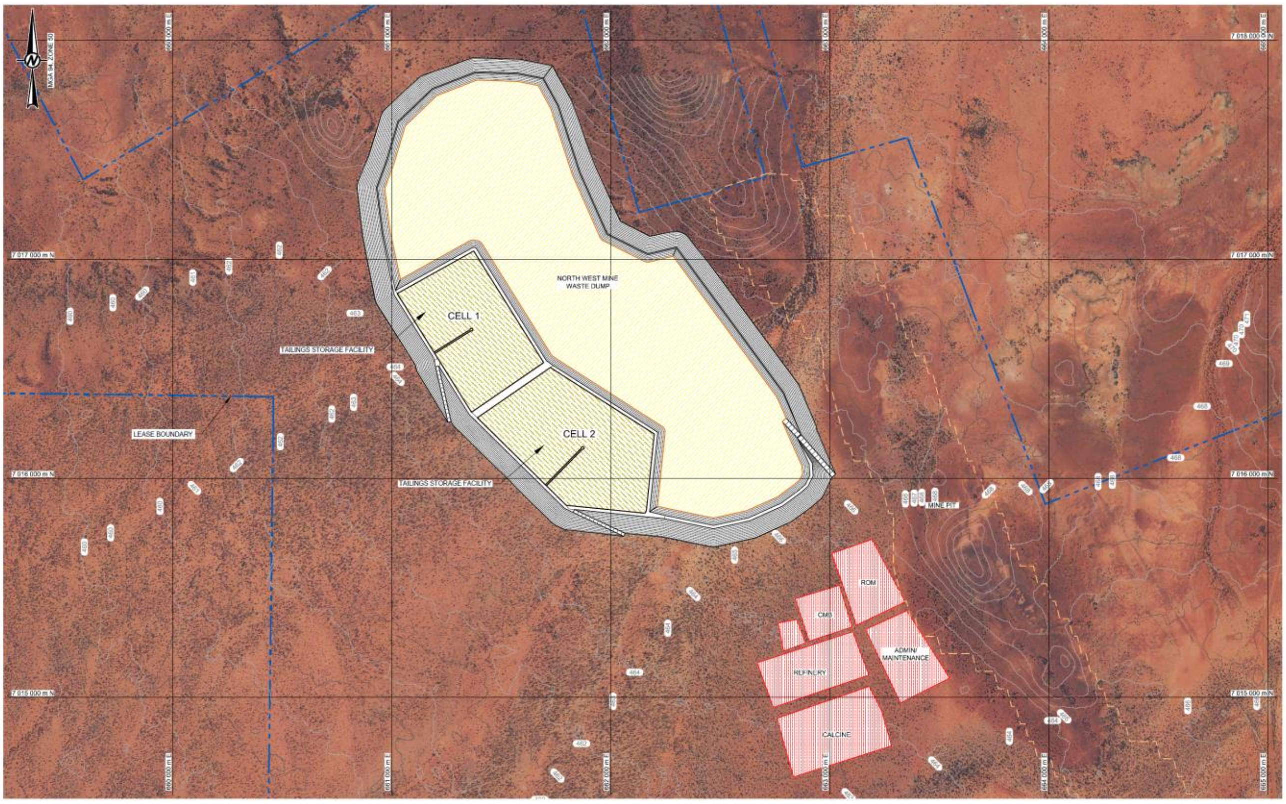

Figure 19 General Arrangement of IWL

At the end of operation, the tailings distribution and return water pipes will be removed, the decant tower backfilled with waste rock and the IWL decommissioned. The closure design will address geotechnical and erosional stability, limit environmental impact to water resources and support cattle grazing as a final land use.

The current level of information and engineering supports a Class 4 cost estimate (level of project definition 1% to 15%) intended to support the Project's PFS cost estimate. A summary appears in Table 15.

Table 15 Tailings Storage Cost Estimate

Item	Initial Construction (Year -1) (A$ M)	Operations (Years 1 to 17)* (A$ M)	Closure (Year 18) (A$ M)
Total Capital Cost	1.5	20.4	4.9
Operations costs	-	11.9	-
Total Sustaining Capital and Operating Cost	-	32.3	-

Notes: *capital costs incurred in Year 1, remaining sustaining capital and operating costs spread across Years 1 to 17.

Financial Model

A detailed financial model has been developed for the Project. This model has been constructed with a view to accurately represent the Project economics. The model is required for detailed external scrutiny by investors, strategic partners and project finance groups.

Assumptions

Macroeconomic and project specific assumptions include the following:

- AUD:US Exchange Rate – 0.72
- Australian Corporate Tax – 30%
- Discount rate – 8%
- 30 day accounts receivable
- Equity financing
- Selling cost – 1%
- 18 month construction to production timeline including mining ramp up
- Royalties and associated costs for V_2O_5 sales – 2.75%
- Royalties for base metal sulphide sales – 5.5%
- Owners contingency – $A40M
- Staffing numbers and salaries based on Perth market rates and operations experience of the study team

Operating Costs

Mining costs vary substantially during the Project life, falling off after year 14 as remaining stockpiles are processed. See Figure 20 for the detailed yearly C1 costs. Several cutbacks are anticipated including in years 6, 7 and 8 to maintain the design feed blend. Opportunity exists to improve the overall mine schedule and will be a focus of the DFS work.

The average C1 direct costs for the life of mine are US$4.15/lb V_2O_5. The average C3 fully allocated cost is US$6.05/lb V_2O_5.

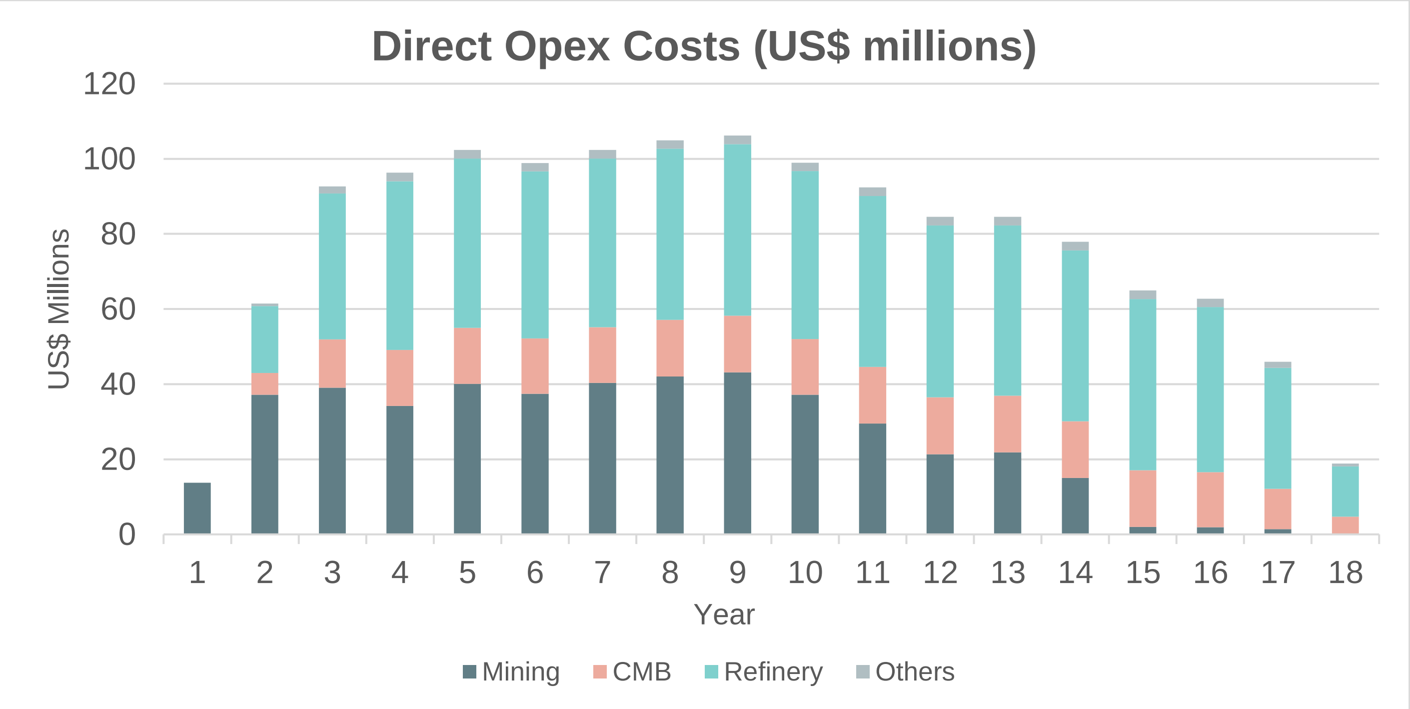

Figure 20 Annualised Direct Operating Costs (US$ millions)

Capital Costs

The estimated capital costs for mining, the processing plant and associated plant and area infrastructure is US$298M (A$414M) as built up in Table 16. Other capital items included in the financial model include estimates for:

- Capital contribution to natural gas pipeline
- Pre-strip mining
- Owner's contingency
- Owner's team and DFS costs

Total project capital costs are estimated at US$354M.

Table 16 Capital Estimate Summary

Capital Cost	A$ Million
Mining	25
Process Plant	194
Sulphide recovery circuit (Y3)	11
Plant Infrastructure	36
Area Infrastructure	36
Regional Infrastructure	10
Miscellaneous	22
Indirects	33
Growth	47
Total	414

Project value related sensitivities are covered in the introductory section.

Social and Environmental Sustainability, Community, Heritage & External Relations

AVL is proactively managing sustainability of the Project through the prefeasibility phase, with consideration of potential risks and benefits relating to people (social), planet (environmental) and profit (economic) aspects.

Outcomes from the study show that the proposed Project has a low likelihood of significant impacts to the social surroundings. It is expected that any potential impacts will be effectively managed using conventional mining environmental practices.

The proposed Project area is subject to the Yugunga-Nya native title claim (WC1999/46). A draft mining agreement has been developed between AVL and the Yugunga-Nya Native Title Claim Group and discussions are progressing.

The proposed Project has a low likelihood of impacts to significant landforms. Site specific soil chemical and physical characterisation is required to be undertaken to provide baseline information for the mining approvals. This is a relatively short lead time study.

Lake Annean is the closest environmentally significant surface water body to the Project. As the surface water flow pathway to Lake Annean is over 25km long, it is unlikely that the Project would have any significant impact on water quality or flow rates at Lake Annean.

Further work is required to confirm the groundwater source target for the Project. Quarterly sampling and analysis of groundwater quality and standing water levels will be required throughout operations.

There are unlikely to be any direct or indirect impacts on conservation significant vegetation or flora as a result of the proposed Project, therefore this aspect will not trigger referral to the Environmental Protection Authority (EPA) of WA. Nevertheless, the Project will require clearing of native vegetation, which will require approval either through the EPA or a native vegetation clearing permit application. If the Project is assessed by the EPA, a separate native vegetation clearing permit will not be required.

There is unlikely to be a significant direct or indirect impact on terrestrial vertebrate fauna due to the proposed Project. Therefore, this aspect will not trigger referral to the EPA.

The northern extent of the proposed pit envelope may impact on potential short range endemic (SRE) invertebrate fauna. This potential impact will be discussed in a referral under the Environmental Protection Act 1986. However, the potential impact is unlikely to be considered a significant impact that would require assessment by the EPA as a key environmental factor.

There are several avenues of work that are planned to further understand the potential significance of troglofauna and stygofauna recorded in two-season environmental studies. Provision of the additional work programme results to the EPA is likely to facilitate a faster assessment timeline.

The Project is not likely to be at variance to the EPA objectives for maintenance of air quality.

The preliminary work undertaken indicates that the PFS case is not likely to result in State significant greenhouse gas emissions.

Umwelt has prepared an indicative mine closure provision (cost estimate to implement mine closure), based on the prefeasibility site layout total disturbance area of 360ha. The closure cost provision is approximately $35M. The item with the largest uncertainty and highest individual values is demolition of all areas of the plant and refinery (circa $10M).

Legal, Ownership and Statutory Approvals

Table 17 lists the tenements held by AVL for the Project.

Table 17 Australian Vanadium Limited Tenements

Tenement ID	Area (Ha)	Status
E 51/843	4,665.00	Live
E 51/1396	305.51	Live
E 51/1534	2,335.92	Live
E 51/1576	2,940.56	Live
E 51/1685	4,580.39	Live
E 51/1694	4,179.99	Live
E 51/1695	610.94	Live
ELA 51/1899	4,885.37	Pending
M 51/771	300.75	Live
MLA 51/878	3,563.00	Pending
P 51/2566	147.6644	Live
P 51/2567	111.6638	Live
P 51/2634	98.8765	Live

The proposed Project will be located within mining lease M 51/878, which is currently pending, due to native title processes. The native title claimant is the Yugunga-Nya Native Title Claim Group. A draft mining agreement between AVL and the Yugunga-Nya Native Title Claim Group was prepared in November 2017. This agreement remains in draft form as the negotiations have not yet been finalised.

Land ownership underlying tenement M 51/878 at the Project is listed below, with the proportion of the tenement area indicated in brackets:

- Pastoral leases – Hillview (1240ha) and Polelle (48.5ha)
- "C" Class Reserve (Purpose: Common) R 10597, vested in the Department for Planning and Infrastructure [Area of Crown Land reserved for public purposes] (2253ha)
- Meekatharra-Sandstone Rd runs through the tenement, oriented north-south.

The current land use is pastoral (cattle grazing).

The timeframes for assessment of an environmental assessment proposal vary depending on the level of assessment set by the Environmental Protection Authority (EPA), the amount of consultation undertaken prior to referral and how quickly the proponent can compile the information required by the EPA. Recent examples to demonstrate timelines are summarised in Table 18 below.

Table 18 Examples of Environmental Assessment Timeframes

Project	Level of Assessment	Timeline	Summary
Albemarle Lithium Refinery, 17 km northeast of Bunbury	Assessment on Referral Information (ARI)	Nov 2017: Referral to EPA. Feb 2018: EPA set assessment level. Apr 2018: Additional information provided to EPA. June 2018: EPA Report. Oct 2018: Ministerial Statement.	One year from referral to EPA to Environmental Approval, at ARI assessment level. This timeline is considered a best-case scenario.
Barrambie Vanadium Project, 116 km southeast of Meekatharra	Public Environmental Review (PER)	Feb 2009: Scoping document issued. Jun 2010: Environmental Review finalised. Aug 2012: EPA Report. Oct 2012: Ministerial Statement.	Three years from Environmental Scoping Document to Environmental Approval, at PER assessment level. This timeline is considered a worst-case scenario.

To demonstrate the low likelihood of a significant environmental impact, further work is required to quantify the potential impact for the following environmental factors:

- Subterranean fauna
- Air quality (air emissions and greenhouse gas emissions)
- Terrestrial environmental quality
- Inland waters (groundwater).

Table 19 lists the other key environmental licenses and authorisations that will be needed for construction and operation of the Project. These environmental authorisations require specific design details of the mining and processing facilities; as such, they would commence when this level of detail is available. This is likely to follow the outcomes of the detailed feasibility study (DFS).

Table 19 Other Project Environmental Licenses and Authorisations

Application	Legislation and Guidelines	Reason for Application	Key Inputs Needed	Summary of Application Information	Indicative Timeframe
Mining Proposal	Mining Act 1978 Mining Proposal Guidelines 2016	Required prior to the commencement of ground disturbance activities	Disturbance envelope. Indicative site layout plan, including area (ha) for each activity/feature (e.g. TSF, waste rock dump (WRD), dam, etc.). Broad design details for mining features (max height/depth, design approach/characteristics for WRD, open pit, dams, plant). Design report(s) for TSF(s). Stakeholder engagement. Soil, waste rock and tailings materials characterisation. Surface water management. Groundwater characterisation.	Disturbance envelope, area of disturbance per category, design details, environmental approvals review, stakeholder engagement outcomes, baseline environmental data, materials characterisation, environmental risk assessment (specific format), environmental outcomes and performance criteria (specific format), environmental management system (specific requirements).	Commencing post-DFS. 6 to 9 months to prepare. 3 to 6 months assessment timeframe.
Mine Closure Plan	Mining Act 1978 Mine Closure Plan Guidelines 2015	Required to be submitted with Mining Proposal, prior to the commencement of ground disturbance activities	Site layout plan Post-mining land use Soil characterisation, waste rock and tailings characterisation Mining landform design (WRD, TSFs, open pit). Management of closure issues: • Modelling of post-mining open pit – groundwater interactions, pit lake management. • Acid mine drainage. Dispersive materials, topsoil sources and requirements, rehabilitation methods.	Closure obligations and commitments, post-mining land use and landform, stakeholder engagement, closure objectives, completion criteria, closure risk assessment and issues, closure implementation, closure monitoring, closure cost estimate, management of information and data.	Commencing pre-DFS to support EPA referral. 6 to 9 months to prepare. 3 to 6 months assessment timeframe.
Works Approval	Environmental Protection Act 1986 Part V Environmental Protection Regulations 1978	Construction of beneficiation and processing plant and tailings storage facility, mine dewatering, electric power generation (>10 MW), sewage treatment facility, landfill, reverse osmosis treatment plant (>0.5 GL/yr)	Design details for all infrastructure, specifically production capacity, construction and commissioning information, calculated waste volumes and types (including air emissions), and waste discharge locations.	Site layout plan, premises boundary; process flow chart and description of equipment; maximum production/design capacity for each category, estimated throughput per year for each category, emissions and discharge source, type, volume, location and proposed controls, capital cost of works (for fee calculation).	Commencing post-DFS when design work is completed. 1 month to prepare, assuming all details available. 3 to 6 months assessment timeframe.
Licence 26D to construct wells	Rights in Water and Irrigation Act 1914	Installation of groundwater abstraction bores – for dewatering and groundwater production NOTE: a licence is not required for installation of monitoring wells within the	Groundwater studies – dewatering and groundwater abstraction volumes and locations. Final/maximum water use requirements. Aquifer depths for abstraction. Well construction details.	Volume of water to be used, groundwater bore locations, applicant details.	Commencing post-DFS. 1 month to prepare. 1-2 months assessment timeframe.

		non-artesian aquifer			
Licence 5C to take groundwater	Rights in Water and Irrigation Act 1914	Groundwater abstraction and dewatering	Groundwater studies – dewatering and groundwater abstraction volumes and locations. Final/maximum water use requirements.	Volume of water to be used, groundwater bore locations, applicant details. Indicative water volume per water use (e.g. dewatering, dust suppression, processing, etc.), water salinity.	Commencing post-DFS. 2 months to prepare. 2 months assessment timeframe.
Shire / Health Department Approval	Health (Treatment of Sewage and Disposal of Effluent and Liquid Waste) Regulations 1974	Construction of wastewater treatment plant (WWTP)	WWTP detailed design, including treated wastewater disposal site.	Detailed plan of camp and WWTP layout, including locations of WWTP components, detailed design of WWTP, description of treatment process, maximum occupancy rate, WWTP flow rate, daily volume, effluent quality, treated wastewater disposal location. For irrigation: size of area, soil assessment.	3 to 6 months to prepare. 1 to 2 months assessment timeframe (estimate).

Project Opportunities and Risks

Project opportunities and risks have been drawn from the various sections of the PFS and collated here for further evaluation in future project stages. The section focuses primarily on the early opportunities and risks to the project, but several opportunities and risks have been identified for future operations.

Of 21 opportunities arising from an opportunity and risk workshop, the ones with the highest NPV impact and lowest level of technical difficulty or capital outlay were:

- Optimising the feed blend to the plant
- Processing surface scree or low-grade material
- Evaluating new mining technologies.

A programme of works will be established to target the selected opportunities prior to the start of the DFS.

The risk context focused on the following key areas:

- Health, safety and environmental (HSE) including organisational management, human resources and industrial relations
- External to operations including regulatory, approvals and community relations
- Technical including process, technology, scope of work, schedule and estimates
- Execution including engineering, procurement, construction, commissioning, ramp-up and operation
- Opportunities

The two highest risks both fall under the external, regulatory or approvals and community relations focus area. The first is the uncertainty of the vanadium price (product value) at the time the project would start-up, with the vanadium price having had historical low lows of <US$4/lb. This risk will be mitigated by:

- Maintaining AVL's objective of being a low-cost producer.
- Continually monitor market developments
- Investigating the potential for long term contracts
- Diversifying product mix by looking at alternate products (e.g. high purity vanadium flake)
- Developing vertical integration opportunities i.e. VSUN Energy and the battery market

The second is funding the Project which remains challenging in the current market. Finalising funding could delay the Project schedule. Potential funding sources could be attracted to other mining projects with potential higher returns. AVL's current strategy involves the early engagement of potential partners, producing a high quality PFS to assist in framing the project and maintaining an attractive position as a low-cost producer. Potential mitigation strategies should the above not meet target is to look at lower capex start-up options.

Vincent Algar, Managing Director, +61 8 9321 5594

Appendix 1 – Competent Person Statements

Competent Person Statement — Mineral Resource Estimation

The information in this announcement that relates to Mineral Resources is based on and fairly represents information compiled by Mr Lauritz Barnes, (Consultant with Trepanier Pty Ltd) and Mr Brian Davis (Consultant with Geologica Pty Ltd). Mr Davis is a shareholder of Australian Vanadium Limited. Mr Barnes is a member of the Australasian Institute of Mining and Metallurgy and Mr Davis is a member of the Australian Institute of Geoscientists and both have sufficient experience of relevance to the styles of mineralisation and types of deposits under consideration, and to the activities undertaken to qualify as Competent Persons as defined in the 2012 Edition of the Joint Ore Reserves Committee (JORC) Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves. Specifically, Mr Barnes is the Competent Person for the estimation and Mr Davis is the Competent Person for the database, geological model and site visits. Mr Barnes and Mr Davis consent to the inclusion in this announcement of the matters based on their information in the form and context in which they appear.

Competent Person Statement — Ore Reserves

The scientific and technical information in this announcement that relates to ore reserves estimates for the Project is based on information compiled by Mr Roselt Croeser, an independent consultant to AVL. Mr Croeser is a member of the Australasian Institute of Mining and Metallurgy. Mr Croeser has sufficient experience that is relevant to the style of mineralisation and type of deposit under consideration and to the activity being undertaken to qualify as a competent person as defined in the 2012 Edition of the Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves. Mr Croeser consents to the inclusion in the announcement of the matters related to the ore reserve estimate in the form and context in which it appears.

Competent Person Statement – Metallurgical Results

The information in this announcement that relates to Metallurgical Results is based on information compiled by independent consulting metallurgist Brian McNab (CP. B.Sc Extractive Metallurgy), Mr McNab is a Member of The Australasian Institute of Mining and Metallurgy. Brian McNab is employed by Wood Mining and Metals. Mr McNab has sufficient experience which is relevant to the style of mineralisation and type of deposit under consideration and to the activity which is undertaken, to qualify as a Competent Person as defined in the 2012 Edition of the 'Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves'.

Mr McNab consents to the inclusion in the announcement of the matters based on the information made available to him, in the form and context in which it appears.

Appendix 2 – Exploration Results, Mineral Resources and Ore Reserves relationship

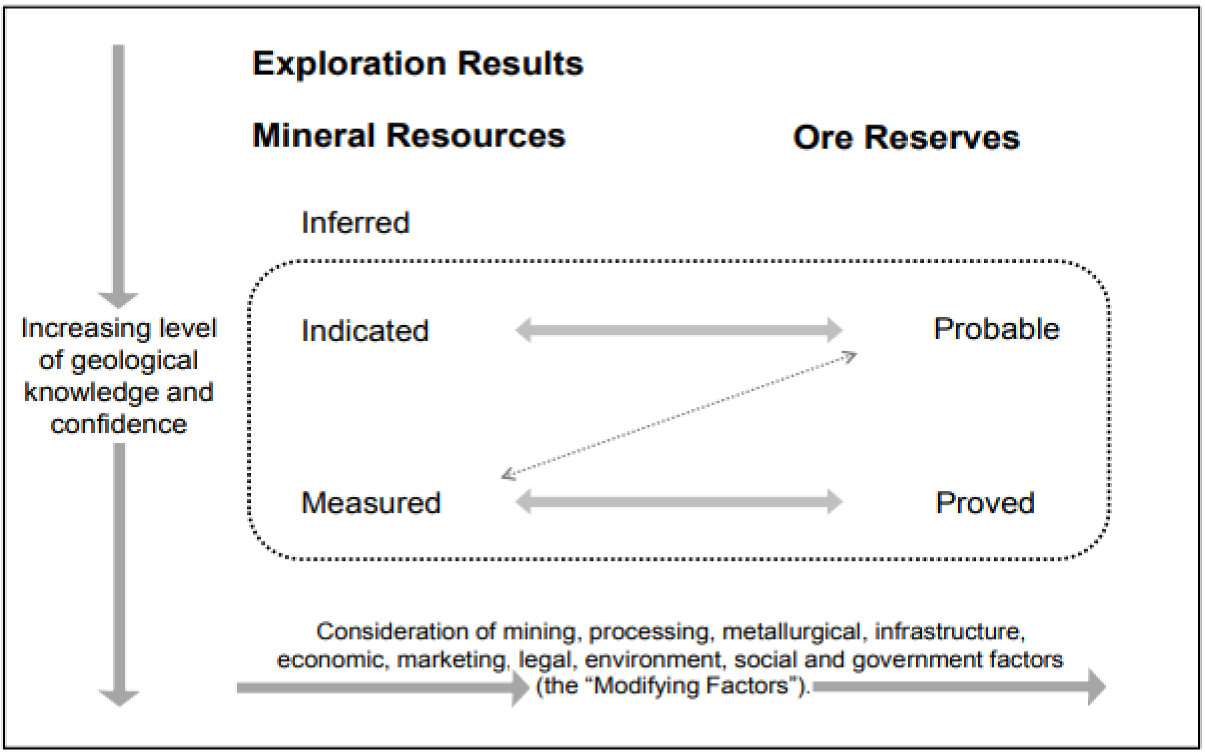

Figure 21 General relationship between Exploration Results, Mineral Resources and Ore Reserves, from the JORC code 2012

2018 Gabanintha Mineral Resource Estimate (2012 JORC Code – Table 1)

Section 1: Sampling Techniques and Data

Criteria	JORC Code Explanation	Commentary
Sampling techniques	Nature and quality of sampling (e.g. cut channels, random chips, or specific specialised industry standard measurement tools appropriate to the minerals under investigation, such as down hole gamma sondes, or handheld XRF instruments, etc). These examples should not be taken as limiting the broad meaning of sampling.	The Gabanintha deposit was sampled using diamond core and reverse circulation (RC) percussion drilling from surface. At the time of the latest Mineral Resource estimation, a total of 250 RC holes and 20 diamond holes (6 of which are diamond tails) were drilled into the deposit. 59 of the 251 holes were either too far north or east of the main mineralisation trend, or excised due to being on another tenancy. One section in the southern part of the deposit (holes GRC0156, GRC0074, GRC0037 and GRC0038) was blocked out and excluded from the resource due to what appeared to be an intrusion which affected the mineralised zones in this area. Of the remaining 191 drillholes, one had geological logging but no assays and one was excluded due to poor sample return causing poor representation of the mineralised zones. Two diamond holes drilled during 2018 were not part of the resource estimate, as they were drilled into the western wall for geotechnical purposes. The total metres of drilling available for use in the interpretation and grade estimation was 17,530m at the date of the most recent resource estimate. The initial 17 RC drillholes were drilled by Intermin Resources NL (IRC) in 1998. These holes were not used in the 2015 and 2017 estimates due to very long unequal sample lengths and a different grade profile from subsequent drilling. 31 RC drillholes were drilled by Greater Pacific NL in 2000 and the remaining holes for the project were drilled by AVL Australian Vanadium Ltd (Previously YRR) between 2007 and 2018. This drilling includes 20diamond holes (6 of which are diamond tails) and 76 RC holes, for a total of 20,974m drilled. All of the drilling sampled both high and low-grade material and were sampled for assaying of a typical iron ore suite, including vanadium and titanium plus base metals and sulphur.
	Include reference to measures taken to ensure sample representivity and the appropriate calibration of any measurement tools or systems used.	In 2015, the drillhole collars were originally set out using hand held GPS and on completion the collars were surveyed by survey contractors using high precision digital GPS. The earlier drilling programmes were retrospectively surveyed using DGPS at the remaining collar PVC pipe positions. Only a few of the very earliest drilled holes (1998) were not able to have their collars accurately surveyed, as they had been rehabilitated and their position was not completely clear. Downhole surveys were completed for all diamond holes, using gyro surveying equipment, as well as the RC holes drilled in 2015 (from GRC0159). Some RC drillholes from the 2018 campaign do not have gyro survey as the hole closed before the survey could be done. These holes have single shot camera surveys, from which the dip readings were used with an interpreted azimuth (nominal hole setup azimuth). The holes with interpreted azimuth are all less than 120m depth. All other RC holes were given a nominal -60º dip measurement. These older RC holes were almost all 120m or less in depth. Diamond core was quarter-core sampled at regular intervals (usually one metre) and constrained to geological boundaries where appropriate. Most of the RC drilling was sampled at one metre intervals, apart from the very earliest programme in 1998. The 2018 diamond core was half-core sampled at regular intervals (usually one metre) and constrained to geological boundaries where appropriate. The RC drilling was sampled at one metre intervals using a cone splitter on the rig to obtain a 2.5 – 3.5 kg sample of each metre. Field duplicates were collected for every 50th drill metre to

Criteria	JORC Code Explanation	Commentary
		check sample representativity from the drill rig splitter.
	Aspects of the determination of mineralisation that are Material to the Public Report.	RC drilling samples were collected at one metre intervals and passed through a cone splitter to obtain a nominal 2-5kg sample at an approximate 10% split ratio. These split samples were collected in pre-numbered calico sample bags. The sample was dried, crushed and pulverised to produce a sub sample (~200g) for laboratory analysis using XRF and total LOI by thermo-gravimetric analysis. Diamond core was drilled predominantly at HQ size for the earlier drilling (2009) and entirely HQ for the 2018 program, with the 2015 drilling at PQ3 size. Field duplicates, standards and blanks have been inserted into the sampling stream at a rate of nominally 1:20 for blanks, 1:20 for standards (including internal laboratory), 1:40 for field duplicates, 1:20 for laboratory checks and 1:74 for umpire assays.
Drilling techniques	Drill type (e.g. core, reverse circulation, open-hole hammer, rotary air blast, auger, Bangka, sonic, etc.) and details (e.g. core diameter, triple or standard tube, depth of diamond tails, face- sampling bit or other type, whether core is oriented and if so, by what method, etc.).	Diamond drillholes account for 14% of the drill metres and comprises HQ and PQ3 sized core. RC drilling (generally 135 mm to 140 mm face-sampling hammer) accounts for the remaining 86% of the drilled metres. Six of the diamond holes have RC pre-collars (GDH911, GDH913 & GDH916, 18GEDH001, 002 and 003), otherwise all holes are drilled from surface. No core orientation data has been recorded in the database. 17 RC holes were drilled during the 2018 program and three HQ diamond tails were drilled on RC pre-collars for resource and geotechnical purposes. The core was not orientated but all diamond holes were logged by OTV and ATV televiewer. Six RC holes from the 2018 campaign are not used in the resource estimate due to results pending at the time of the latest update, and two diamond holes drilled during 2018 were not used as they are for geotechnical purposes and do not intersect the mineralised zones.
Drill sample recovery	Method of recording and assessing core and chip sample recoveries and results assessed.	Diamond core recovery is measured when the core is recovered from the drill string. The length of core in the tray is compared with the expected drilled length and is recorded in the database. For the 2018 and 2015 drilling, RC chip sample recovery was gauged by how much of the sample was returned from the cone splitter. This was recorded as good, fair, poor or no sample. The older drilling programmes used a different splitter, but still compared and recorded how much sample was returned for the drilled intervals. All of the RC sample bags (non-split portion) from the 2018 programme were weighed as an additional check on recovery. An experienced AVL geologist was present during drilling and any issues noticed were immediately rectified. No significant sample recovery issues were encountered in the RC drilling.
	Measures taken to maximize sample recovery and ensure representative nature of the samples.	Core depths are checked against the depth given on the core blocks and rod counts are routinely carried out by the drillers. Recovered core was measured and compared against driller's blocks. RC chip samples were actively monitored by the geologist whilst drilling. All drillholes are collared with PVC pipe for the first metre or two, to ensure the hole stays open and clean from debris.

Criteria	JORC Code Explanation	Commentary
	Whether a relationship exists between sample recovery and grade and whether sample bias may have occurred due to preferential loss/gain of fine/coarse material.	No relationship between sample recovery and grade has been demonstrated. Two shallow diamond drillholes drilled to twin RC have been completed to assess sample bias due to preferential loss/gain of fine/coarse material. Geologica Pty Ltd is satisfied that the RC holes have taken a sufficiently representative sample of the mineralisation and minimal loss of fines has occurred in the RC drilling resulting in minimal sample bias.
Logging	Whether core and chip samples have been geologically and geotechnically logged to a level of detail to support appropriate Mineral Resource estimation, mining studies and metallurgical studies.	All diamond core and RC chips from holes included in the latest resource estimate were geologically logged. Diamond core was geologically logged using predefined lithological, mineralogical and physical characteristics (such as colour, weathering, fabric, texture) logging codes and the logged intervals were based on lithological intervals. RQD and recoveries were also recorded. Minimal structural measurements were recorded (bedding to core angle measurements) but have not yet been saved to the database. The logging was completed on site by the responsible geologist. All of the drilling was logged onto paper and was transferred to a SQL Server drillhole database using DataShedTM database management software. The database is managed by Mitchell River Group (MRG). The data was checked for accuracy when transferred to ensure that correct information was recorded. Any discrepancies were referred back to field personnel for checking and editing. All core trays were photographed wet and dry. RC chips were logged generally on metre intervals, with the abundance/proportions of specific minerals, material types, lithologies, weathering and colour recorded. Physical hardness for RC holes is estimated by chip recovery and properties (friability, angularity) and in diamond holes by scratch testing. From 2015, drilling also had magnetic susceptibility recorded, with the first nine diamond holes (GDH901-GDH909) having readings taken on the core every 30 cm or so downhole. Holes GDH910 to GDH917 had readings every 50 cm and RC holes GRC0159 to GRC0221 had readings for every one metre green sample bag. 2018 RC drill holes also have magnetic susceptibility data for each one metre of drilling. All resource (vs geotechnical) diamond core and RC samples have been logged to a level of detail to support Mineral Resource estimation to and classification to Measured Mineral Resource at best. Geotechnical logging and OTV/ATV data was collected on three diamond drillholes from the 2018 campaign, by consultant company Dempers and Seymour, adding to an existing dataset of geotechnical logging on 8 of the 2015 diamond drillholes and televiewer data for four of the same drillholes. In addition, during 2018 televiewer data was collected on a further 15 RC drillholes from various drill campaigns at the project.
	Whether logging is qualitative or quantitative in nature. Core (or costean, channel, etc.) photography.	Logging was both qualitative and quantitative in nature, with general lithology information recorded as qualitative and most mineralisation records and geotechnical records being quantitative. Core photos were collected for all diamond drilling.
	The total length and percentage of the relevant intersections logged.	All recovered intervals were geologically logged.

Criteria	JORC Code Explanation	Commentary
Sub-sampling techniques and sample preparation	If core, whether cut or sawn and whether quarter, half or all core taken.	The 2018 and 2009 HQ diamond core was cut in half and the half core samples were sent to the laboratories for assaying. Sample intervals were marked on the core by the responsible geologist considering lithological and structural features. No core was selected for duplicate analysis. The 2015 PQ diamond core was cut in half and then the right hand side of the core (facing downhole) was halved again using a powered core saw. Quarter core samples were sent to the laboratories for assaying. Sample intervals were marked on the core by the responsible geologist considering lithological and structural features. No core was selected for duplicate analysis.
	If non-core, whether riffled, tube sampled, rotary split, etc. and whether sampled wet or dry.	RC drilling was sampled by use of an automatic cone splitter for the 2018 and 2015 drilling programmes; drilling was generally dry with a few damp samples. Older drilling programmes employed riffle splitters to produce the required sample splits for assaying. One in 40 to 50 RC samples was resampled as field duplicates for QAQC assaying.
	For all sample types, the nature, quality and appropriateness of the sample preparation technique.	The sample preparation techniques employed for the diamond core samples follow standard industry best practice. All samples were crushed by jaw and Boyd crushers and split if required to produce a standardised ~3kg sample for pulverising. The 2015 programme RC chips were split to produce the same sized sample. All samples were pulverised to a nominal 90% passing 75 micron sizing and sub sampled for assaying and LOI determination tests. The remaining pulps are stored at an AVL facility. The sample preparation techniques are of industry standard and are appropriate for the sample types and proposed assaying methods.
	Quality control procedures adopted for all sub-sampling stages to maximize representivity of samples.	Field duplicates, standards and blanks have been inserted into the sampling stream at a rate of nominally 1:20 for blanks, 1:20 for standards (including internal laboratory), 1:40 for field duplicates, 1:20 for laboratory checks and 1:74 for umpire assays. Also for the recent sampling at BV, 1 in 20 samples were tested to check for pulp grind size.
	Measures taken to ensure that the sampling is representative of the in situ material collected, including for instance results for field duplicate/second-half sampling.	To ensure the samples collected are representative of the in-situ material, a 140mm diameter RC hammer was used to collect one metre samples and either HQ or PQ3 sized core was taken from the diamond holes. Given that the mineralisation at Gabanintha is either massive or disseminated magnetite/martite hosted vanadium, which shows good consistency in interpretation between sections and occurs as percentage values in the samples, Geologica Pty Ltd considers the sample sizes to be representative. Core is not split for duplicates, but RC samples are split at the collection stage to get representative (2-3kg) duplicate samples. The entire core sample and all the RC chips are crushed and /or mixed before splitting to smaller sub-samples for assaying.
	Whether sample sizes are appropriate to the grain size of the material being sampled.	As all of the variables being tested occur as moderate to high percentage values and generally have very low variances (apart from Cr_2O_3), the chosen sample sizes are deemed appropriate.

Criteria	JORC Code Explanation	Commentary
Quality of assay data and laboratory tests	The nature, quality and appropriateness of the assaying and laboratory procedures used and whether the technique is considered partial or total.	All samples for Gabanintha were assayed for the full iron ore suite by XRF (24 elements) and for total LOI by thermo-gravimetric technique. The method used is designed to measure the total amount of each element in the sample. Some 2015 RC samples in the oxide profile were also selected for SATMAGAN analysis that is a measure of the amount of total iron that is present as magnetite (or other magnetic iron spinel phases, such as maghemite or kenomagnetite). SATMAGAN analysis was conducted at Bureau Veritas (BV) Laboratory in early 2018. Analysis results of the relevant portions of the RC holes by Satmagan are pending, but underway. Although the laboratories changed over time for different drilling programmes, the laboratory procedures all appear to be in line with industry standards and appropriate for iron ore deposits, and the commercial laboratories have been industry recognized and certified Samples are dried at 105ºC in gas fired ovens for 18-24 hours before RC samples being split 50:50. One portion is retained for future testing, while the other is then crushed and pulverised. Sub-samples are collected to produce a 66g sample that is used to produce a fused bead for XRF based analysing and reporting. Certified and non-certified Reference Material standards, field duplicates and umpire laboratory analysis are used for quality control. The standards inserted by AVL during the 2015 drill campaign were designed to test the V_2O_5 grades around 1.94%, 0.95% and 0.47%. The internal laboratory standards used have varied grade ranges, but do cover these three grades as well. During 2018, three Certified Reference Materials (CRMs) were used by AVL as field standards. These covered the V_2O_5 grade ranges around 0.327%, 0.790% and 1.233%. These CRMs are also certified for other relevant major element and oxide values, including Fe, TiO_2, Al_2O_3, SiO_2, Co, Ni and Cu (amongst others). Most of the laboratory standards used show an apparent underestimation of V_2O_5, with the results plotting below the expected value lines; however the results generally fall within ± 5-10% ranges of the expected values. The other elements show no obvious material bias. Standards used by AVL generally showed good precision, falling within 3-5% of the mean value in any batch. The standards were not certified, but compared with the internal laboratory standards (certified) they appear to show good accuracy as well. Field duplicate results from the 2015 drilling all fall within 10% of their original values. The BV laboratory XRF machine calibrations are checked once per shift using calibration beads made using exact weights and they performed repeat analyses of sample pulps at a rate of 1:20 (5% of all samples). The lab repeats compare very closely with the original analysis for all elements.
	For geophysical tools, spectrometers, handheld XRF instruments, etc, the parameters used in determining the analysis including instrument make and model, reading times, calibrations factors applied and their derivation, etc.	The only geophysical readings taken for the Gabanintha core and RC samples and recorded in the database were magnetic susceptibility. This was undertaken using an RT1 hand magnetic susceptibility meter (CorMaGeo/Fugro) with a sensitivity of 1 x 10^{-5} (dimensionless units). The first nine diamond holes (GDH901 – GDH909) were sampled at approximately 0.3m intervals, the last eight (GDH910 – GDH917) at 0.5m intervals and the RC chip bags for every green bagged sample (one metre). Four completed diamond drillholes were down hole surveyed by acoustic televiewer (GDH911, 912, 914 and 915) as a prequel to geotechnical logging during the 2015 drill campaign. A further six holes from the 2018 campaign have been down hole surveyed using acoustic televiewer and optical televiewer (18GEDH001, 002 and 003 and partial surveys of 18GERC005, 008 and 011) for 627 metres of data. Televiewer data was also collected during 2018 on some of the holes drilled in 2015 and prior. The holes surveyed were GRC0019, 0024, 0168, 0169, 0173, 0178, 0180, 0183, 0200 and Na253, Na258 and Na376 for a further 286.75 m of data.

Criteria	JORC Code Explanation	Commentary
	Nature of quality control procedures adopted (e.g. standards, blanks, duplicates, external laboratory checks) and whether acceptable levels of accuracy (i.e. lack of bias) and precision have been established.	QAQC results from both the primary and secondary assay laboratories show no material issues with the main variables of interest for the recent assaying programmes.
Verification of sampling and assaying	The verification of significant intersections by either independent or alternative company personnel.	Diamond drill core photographs have been reviewed for the recorded sample intervals. Geologica Pty Ltd Consultant, Brian Davis, visited the Gabanintha project site and the BV core shed and assay laboratories in September 2015 and on multiple occasions over a 10 year period. Whilst on site, the drillhole collars and remaining RC chip samples were inspected. All of the core was inspected in the BV facilities in Perth and selected sections of drillholes were examined in detail in conjunction with the geological logging and assaying. Resource consultants from Trepainier have visited the company core storage facility in Bayswtare and reviewed the core trays for select diamond holes.
	The use of twinned holes.	Two diamond drillholes (GDH915 and GDH917) were drilled to twin the RC drillholes GRC0105 and GRC0162 respectively. The results show excellent reproducibility in both geology and assayed grade for each pair.
	Documentation of primary data, data entry procedures, data verification, data storage (physical and electronic) protocols.	All primary geological data has been collected using paper logs and transferred into Excel spreadsheets and ultimately a SQL Server Database. The data were checked on import. Assay results were returned from the laboratories as electronic data which were imported directly into the SQL Server database. Survey and collar location data were received as electronic data and imported directly to the SQL database. All of the primary data have been collated and imported into a Microsoft SQL Server relational database, keyed on borehole identifiers and assay sample numbers. The database is managed using DataShed™ database management software. The data was verified as it was entered and checked by the database administrator (MRG) and AVL personnel
	Discuss any adjustment to assay data.	No adjustments or calibrations were made to any assay data, apart from resetting below detection limit values to half positive detection values.
Location of data points	Accuracy and quality of surveys used to locate drillholes (collar and down-hole surveys), trenches, mine workings and other locations used in Mineral Resource estimation.	For the 2018 drilling, all collars were set out using a handheld GPS. After drilling they were surveyed using a Trimble real-time Kinematic (RTK) GPS system. The base station accuracy on site was improved during the 2015 survey campaign and a global accuracy improvement was applied to all drillholes in the Company database. For the 2015 drilling, all of the collars were set out using a Trimble RTK GPS system. After completion of drilling all new collars were re- surveyed using the same tool. Historical drill holes were surveyed with RTK GPS and DGPS from 2008 to 2015, using the remaining visible collar location positions where necessary. Only five of the early drillholes, drilled prior to 2000, had no obvious collar position when surveyed and a best estimate of their position was used based on planned position data.
	Specification of the grid system used.	The grid projection used for Gabanintha is MGA_GDA94, Zone 50. All reported coordinates are referenced to this grid.

Criteria	JORC Code Explanation	Commentary
	Quality and adequacy of topographic control.	High resolution Digital Elevation Data was captured by Arvista for the Company in June 2018 over the MLA51/878 tenement area using fixed wing aircraft, with survey captured at 12 cm GSD using an UltraCam camera system operated by Aerometrex. The data has been used to create a high-resolution Digital Elevation Model on a grid spacing of 5m x 5m, which is within 20 cm of all surveyed drill collar heights, once the database collar positions were corrected for the improved ground control survey, that was also used in this topography survey. The vertical accuracy that could be achieved with the 12 cm GSD is +/- 0.10 m and the horizontal accuracy is +/- 0.24m. 0.5m contour data has also been generated over the mining lease application. High quality orthophotography was also acquired during the survey at 12cm per pixel for the full lease area, and visual examination of the imagery shows excellent alignment with the drill collar positions. The November 2018 Mineral Resource used this surface for topographic control within the Mining Lease Application area (MLA51/878). For the entire 2017 and July 2018 Mineral Resource estimates, and the November 2018 Mineral Resource estimate outside the MLA area, high resolution Digital Elevation Data was supplied by Landgate. The northern two thirds of the elevation data is derived from ADS80 imagery flown September 2014. The data has a spacing of 5M and is the most accurate available. The southern third is film camera derived 2005 10M grid, resampled to match it with the 2014 DEM. Filtering was applied and height changes are generally within 0.5M. Some height errors in the 2005 data may be +/- 1.5M when measured against AHD but within the whole area of interest any relative errors will mostly be no more than +/- 1M. In 2015 a DGPS survey of hole collars and additional points was taken at conclusion of the drill program. Trepanier compared the elevations the drillholes with the supplied DEM surface and found them to be within 1m accuracy. An improved ground control point has been established at the Gabanintha project by professional surveyors. This accurate ground control point was used during the acquisition of high quality elevation data. As such, a correction to align previous surveys with the improved ground control was applied to all drill collars from pre-2018 in the Company drill database. Collars that were picked up during 2018 were already calibrated against the new ground control.
Data spacing and distribution	Data spacing for reporting of Exploration Results.	The 2018 RC drilling in Fault Block 17 has infilled areas of 260 m spaced drill lines to about 130m spaced drill lines, with holes on 30 m centres on each line. The closer spaced drilled areas of the deposit now have approximately 80m to 100m spacing by northing and 25m to 30m spacing by easting. Occasionally these spacings are closer for some pairs of drillholes. Outside of the main area of relatively close spaced drilling (approximately 7015400mN to 7016600mN), the drillhole spacing increases to several hundred metres in the northing direction, but maintains roughly the same easting separation as the closer spaced drilled area.
	Whether the data spacing and distribution is sufficient to establish the degree of geological and grade continuity appropriate for the Mineral Resource and Ore Reserve estimation procedure(s) and classifications applied.	The degree of geological and grade continuity demonstrated by the data density is sufficient to support the definition of Mineral Resources and the associated classifications applied to the Mineral Resource estimate as defined under the 2012 JORC Code. Variography studies have shown very little variance in the data for most of the estimated variables and primary ranges in the order of several hundred metres.
	Whether sample compositing has been applied.	All assay results have been composited to one metre lengths before being used in the Mineral Resource estimate. This was by far the most common sample interval for the diamond drillhole and RC drillhole data.

Criteria	JORC Code Explanation	Commentary
Orientation of data in relation to geological structure	Whether the orientation of sampling achieves unbiased sampling of possible structures and the extent to which this is known, considering the deposit type.	The grid rotation is approximately 45º to 50º magnetic to the west, with the holes dipping approximately 60º to the east. The drill fences are arranged along the average strike of the high grade mineralised horizon, which strikes approximately 310º to 315º magnetic south of a line at 7015000mN and approximately 330º magnetic north of that line. The mineralisation is interpreted to be moderate to steeply dipping, approximately tabular, with stratiform bedding striking approximately north-south and dipping to the west. The drilling is exclusively conducted perpendicular to the strike of the main mineralisation trend and dipping approximately 60º to the east, producing approximate true thickness sample intervals through the mineralisation.
	If the relationship between the drilling orientation and the orientation of key mineralised structures is considered to have introduced a sampling bias, this should be assessed and reported if material.	The orientation of drilling with respect to mineralisation is not expected to introduce any sampling bias. Drillholes intersect the mineralisation at an angle of approximately 90 degrees.
Sample security	The measures taken to ensure sample security.	Samples were collected onsite under supervision of a responsible geologist. The samples were then stored in lidded core trays and closed with straps before being transported by road to the BV core shed in Perth (or other laboratories for the historical data). RC chip samples were transported in bulk bags to the assay laboratory and the remaining green bags are either still at site or stored in Perth. RC and core samples were transported using only registered public transport companies. Sample dispatch sheets were compared against received samples and any discrepancies reported and corrected.
Audits or reviews	The results of any audits or reviews of sampling techniques and data.	A review of the sampling techniques and data was completed by Mining Assets Pty Ltd (MASS) and Schwann Consulting Pty Ltd (Schwann) in 2008 and by CSA in 2011. Neither found any material error. AMC also reviewed the data in the course of preparing a Mineral Resource estimate in 2015. The database has been audited and rebuilt by AVL and MRG in 2015. In 2017 geological data was revised after missing lithological data was sourced. Geologica Pty Ltd concludes that the data integrity and consistency of the drillhole database shows sufficient quality to support resource estimation.

Section 2: Reporting of Exploration Results

Criteria	JORC Code Explanation	Commentary
Mineral tenement and land tenure status	Type, reference name/number, location and ownership including agreements or material issues with third parties such as joint ventures, partnerships, overriding royalties, native title interests, historical sites, wilderness or national park and environmental settings.	Exploration Prospects are located wholly within Lease P51/2567 and E 51/843. The tenements are 100% owned by Australian Vanadium Ltd. The tenements lie within the Yugunga Nya Native Title Claim (WC1999/046). A Heritage survey was undertaken prior to commencing drilling which only located isolated artefacts but no archaeological sites *per se.* Mining Lease Application MLA51/878 covering most of E 51/1843 and the vanadium project is currently under consideration by the Department of Mines and Petroleum. AVL has no joint venture, environmental, national park or other ownership agreements on the lease area. A Mineral Rights Agreement has been signed with Bryah Resources Ltd for copper and gold exploration on the AVL Gabanintha tenements.
	The security of the tenure held at the time of reporting along with any known impediments to obtaining a licence to operate in the area.	At the time of reporting, there are no known impediments to obtaining a licence to operate in the area and the tenement is in good standing.
Exploration done by other parties	Acknowledgment and appraisal of exploration by other parties.	The Gabanintha deposit was identified in the 1960's by Mangore P/L and investigated with shallow drilling, surface sampling and mapping. In 1998, Drilling by Intermin Resources confirmed the down dip extent and strike continuation under cover between outcrops of the vanadium bearing horizons. Additional RC and initial diamond drilling was conducted by Greater Pacific NL and then AVL up until 2018. Previous Mineral Resource estimates have been completed for the deposit in 2001 (Mineral Engineering Technical Services Pty Ltd (METS) and Bryan Smith Geosciences Pty Ltd. (BSG)), 2007 (Schwann), 2008 (MASS & Schwann), 2011 (CSA), 2015 (AMC), 2017 (Trepanier) and 2018 (Trepanier).
Geology	Deposit type, geological setting and style of mineralisation.	The Gabanintha Project is located approximately 40kms south of Meekatharra in Western Australia and approximately 100kms along strike (north) of the Windimurra Vanadium Mine. The mineralisation is hosted in the same geological unit as Windimurra, which is part of the northern Murchison granite greenstone terrane in the north west Yilgarn Craton. The project lies within the Gabanintha and Porlell Archaean greenstone sequence oriented approximately NW-SE and is adjacent to the Meekatharra greenstone belt. Locally the mineralisation is massive or bands of disseminated vanadiferous titano-magnetite hosted within the gabbro. The mineralised package dips moderately to steeply to the west and is capped by Archaean acid volcanics and metasediments. The footwall is a talc carbonate altered ultramafic unit. The host sequence is disrupted by late stage dolerite and granite dykes and occasional east and

Criteria	JORC Code Explanation	Commentary
		northeast -southwest trending faults with apparent minor offsets. The mineralisation ranges in thickness from several metres to up to 20 to 30m in thickness. The oxidized and partially oxidised weathering surface extends 50 to 80m below surface and the magnetite in the oxide zone is usually altered to Martite.
Drillhole Information	A summary of all information material to the understanding of the exploration results including a tabulation of the following information for all Material drillholes: easting and northing of the drillhole collar elevation or RL (Reduced Level – elevation above sea level in metres) of the drillhole collar dip and azimuth of the hole down hole length and interception depth hole length.	All drill results relevant to the mineral resource updates were disclosed at the time of the resource publication.
Data aggregation methods	In reporting Exploration Results, weighting averaging techniques, maximum and/or minimum grade truncations (e.g. cutting of high grades) and cut-off grades are usually Material and should be stated.	Length weighed averages used for exploration results are reported in spatial context when exploration results are reported. Cutting of high grades was not applied in the reporting of intercepts.
	Where aggregate intercepts incorporate short lengths of high grade results and longer lengths of low grade results, the procedure used for such aggregation should be stated and some typical examples of such aggregations should be shown in detail.	There were negligible residual composite lengths, and where present these were excluded from the estimate.
	The assumptions used for any reporting of metal equivalent values should be clearly stated.	No metal equivalent values have been used.

Criteria	JORC Code Explanation	Commentary
Relationship between mineralisation widths and intercept lengths	If the geometry of the mineralisation with respect to the drillhole angle is known, its nature should be reported.	Drillholes intersect the mineralisation at an angle of approximately 90 degrees.
Diagrams	Appropriate maps and sections (with scales) and tabulations of intercepts should be included for any significant discovery being reported These should include, but not be limited to a plan view of drillhole collar locations and appropriate sectional views.	See Figures 9, 10, 17 of this release.
Balanced reporting	Where comprehensive reporting of all Exploration Results is not practicable, representative reporting of both low and high grades and/or widths should be practiced to avoid misleading reporting of Exploration Results.	Comprehensive reporting of drilling details has been provided in the body of this announcement.
Other substantive exploration data	Other exploration data, if meaningful and material, should be reported including (but not limited to): geological observations; geophysical survey results; geochemical survey results; bulk samples – size and method of treatment; metallurgical test results; bulk density, groundwater, geotechnical and rock characteristics; potential deleterious or contaminating substances.	All meaningful & material exploration data has been reported
Further work	The nature and scale of planned further work (e.g. tests for lateral extensions or depth extensions or large-scale step-out drilling).	Further drilling is planned as to provide bulk sample material for a pilot study with further metallurgical test-work following completion of this Pre-feasibilty study. Extensional resource drilling is under consideration for the additional 8 km of mineralisation that is currently drilled at broad spacing.

Criteria	JORC Code Explanation	Commentary
	Diagrams clearly highlighting the areas of possible extensions, including the main geological interpretations and future drilling areas, provided this information is not commercially sensitive.	The decision as to the necessity for further exploration at Gabanintha is pending completion of mining technical studies on the currently available resource.

Section 3: Estimation and Reporting of Mineral Resources

Criteria	JORC Code Explanation	Commentary
Database integrity	Measures taken to ensure that data has not been corrupted by, for example, transcription or keying errors, between its initial collection and its use for Mineral Resource estimation purposes.	All the drilling was logged onto paper and has been transferred to a digital form and loaded into a Microsoft SQL Server relational drillhole database using DataShed^{TM} management software. Logging information was reviewed by the responsible geologist and database administrator prior to final load into the database. All assay results were received as digital files, as well as the collar and survey data. These data were transferred directly from the received files into the database. All other data collected for Gabanintha were recorded as Excel spreadsheets prior to loading into SQL Server. The data have been periodically checked by AVL personnel, the database administrator as well as the personnel involved in all previous Mineral Resource estimates.
	Data validation procedures used.	The data validation was initially completed by the responsible geologist logging the core and marking up the drillhole for assaying. The paper geological logs were transferred to Excel spreadsheets and compared with the originals for error. Assay dispatch sheets were compared with the record of samples received by the assay laboratories. Normal data validation checks were completed on import to the SQL database. Data has also been checked back against hard copy results and previous mines department reports to verify assays and logging intervals. Both internal (AVL) and external (Schwann, MASS, CSA and AMC) validations were completed when data was loaded into spatial software for geological interpretation and resource estimation. All data have been checked for overlapping intervals, missing samples, FROM values greater than TO values, missing stratigraphy or rock type codes, downhole survey deviations of ±10° in azimuth and ±5° in dip, assay values greater than or less than expected values and several other possible error types. QAQC data and reports have also been checked by the personnel listed above.
Site visits	Comment on any site visits undertaken by the Competent Person and the outcome of those visits.	The drill location was inspected by John Tyrrell of AMC in 2015 for the initial 2012 JORC resource estimation. Consulting Geologist Brian Davis of Geologica Pty Ltd has visited all the Gabanintha project drilling sites since 2015 and has been familiar with the Gabanintha project since 2006. The geology, sampling, sample preparation and transport, data collection and storage procedures were all discussed and reviewed with the responsible geologist for the 2015 and 2018 drilling. Visits to the BV laboratory and core shed in Perth were used to add knowledge in the preparation of this Mineral Resource Estimate.
	If no site visits have been undertaken indicate why this is the case.	N/A

Criteria	JORC Code Explanation	Commentary
Geological interpretation	Confidence in (or conversely, the uncertainty of) the geological interpretation of the mineral deposit.	The Gabanintha Vanadium mineralisation lies along strike from the Windimurra Vanadium Mine and the oxidised portion of the high-grade massive magnetite/martite mineralisation outcrops for almost 14km in the company held lease area. Detailed mapping and mineralogical studies have been completed by company personnel and contracted specialists between 2000 and 2015, as well as four separate drilling programmes to test the mineralisation and continuity of the structures. These data and the relatively closely- spaced drilling has led to a good understanding of the mineralisation controls. The mineralisation is hosted within altered gabbros and is easy to visually identify by the magnetite/martite content. The main high-grade unit shows consistent thickness and grade along strike and down dip and has a clearly defined sharp boundary. The lower grade disseminated bands also show good continuity, but their boundaries are occasionally less easy to identify visually as they are more diffuse over a metre or so.
	Nature of the data used and of any assumptions made.	No assumptions are made regarding the input data.
	The effect, if any, of alternative interpretations on Mineral Resource estimation.	Previous interpretations were considered in the current estimation and close comparison with the 2015 resource model was made to see the effect of the new density data and revised geology model. The continuity of the low-grade units, more closely defined from lithology logs is now better understood and the resulting interpretation is more effective as a potential mining model. The near-surface alluvial and transported material has also been more accurately modelled in this estimation. The impact of the current interpretation as compared to the previous interpretation would be a greater volume of low grade mineralisation and a higher overall V_2O_5 grade for that mineralisation in the current estimate.
	The use of geology in guiding and controlling Mineral Resource estimation.	Geological observation has underpinned the resource estimation and geological model. The high grade mineralisation domain has a clear and sharp boundary and has been tightly constrained by the interpreted wireframe shapes. The low grade mineralisation is also constrained within wireframes, which are defined and guided by visual (from core) and grade boundaries from assay results. The low grade mineralisation has been defined as four sub-domains, which strike sub-parallel to the high-grade domain. In addition there is a sub parallel laterite zone and two transported zones above the top of bedrock surface. The resource estimate is constrained by these wireframes. Domains were also coded for oxide, transition and fresh, as well as above and below the alluvial and bedrock surfaces. The extents of the geological model were constrained by fault block boundaries. Geological boundaries were extrapolated to the edges of these fault blocks, as indicated by geological continuity in the logging and the magnetic geophysical data.

Criteria	JORC Code Explanation	Commentary
	The factors affecting continuity both of grade and geology.	Key factors that are likely to affect the continuity of grade are: • The thickness and presence of the high-grade massive magnetite/martite unit, which has been very consistent in both structural continuity and grade continuity. • The low-grade sub-domains are less consistent in their thickness along strike and down dip with more pinching and swelling than for the high-grade domain. • SW-NE oriented faulting occurs at a deposit scale and offsets the main orientation of the mineralisation. These regional faults divide the deposit along strike into kilometer scale blocks. Internally the mineralised blocks show very few signs of structural disturbance at the level of drilling.
Dimensions	The extent and variability of the Mineral Resource expressed as length (along strike or otherwise), plan width, and depth below surface to the upper and lower limits of the Mineral Resource.	The massive magnetite/martite unit strikes approximately 14 km, is stratiform and ranges in thickness from less than 10m to over 20m true thickness. The low grade mineralised units are sub-parallel to the high-grade zone, and also vary in thickness from less than 10m to over 20m. All of the units dip moderately to steeply towards the west, with the exception of two predominantly alluvial units (domains 7and 8) and a laterite unit (domain 6) which are flat lying. All units outcrop at surface, but the low grade units are difficult to locate as they are more weathered and have a less prominent surface expression than the high grade unit. The high- and low-grade units are currently interpreted to have a depth extent of approximately 200m below surface. Mineralisation is currently open along strike and at depth.
Estimation and modelling techniques	The nature and appropriateness of the estimation technique(s) applied and key assumptions, including treatment of extreme grade values, domaining, interpolation parameters and maximum distance of extrapolation from data points. If a computer assisted estimation method was chosen include a description of computer software and parameters used.	Grade estimation was completed using ordinary kriging (OK) for the Mineral Resource estimate. Surpac™ software was used to estimate grades for V_2O_5, TiO_2, Fe_2O_3, SiO_2, Al_2O_3, Cr_2O_3, Co, Cu, Ni, S and loss on ignition (LOI) using parameters derived from statistical and variography studies. The majority of the variables estimated have coefficients of variation of significantly less than 1.0, with Cr_2O_3 being the exception. Drillhole spacing varies from approximately 80 m to 100 m along strike by 25 m to 30 m down dip, to 500 m along by 25 m to 30 m down dip. Drillhole sample data was flagged with numeric domain codes unique to each mineralisation domain. Sample data was composited to 1 m downhole length and composites were terminated by a change in domain or oxidation state coding. No grade top cuts were applied to any of the estimated variables as statistical studies showed that there were no extreme outliers present within any of the domain groupings. Grade was estimated into separate mineralisation domains including a high-grade bedrock domain, four low grade bedrock domains and low grade alluvial and laterite domains. Each domain was further subdivided into a fault block, and each fault block was assigned its own orientation ellipse for grade interpolation. Downhole variography and directional variography were performed for all estimated variables for the high-grade domain and the grouped low grade domains. Grade continuity varied from hundreds of metres in the along strike directions to sub-two hundred metres in the down-dip direction although the down-dip limitation is likely related to the extent of drilling to date.

Criteria	JORC Code Explanation	Commentary
	The availability of check estimates, previous estimates and/or mine production records and whether the Mineral Resource estimate takes appropriate account of such data.	Prior to 2017, there had been five Mineral Resource estimates for the Gabanintha deposit. The first, in 2001 was a polygonal sectional estimate completed by METS & BSG. The subsequent models by Schwann (2007), MASS & Schwann (2008) and CSA (2011) are kriged estimates. AMC (2015) reviewed the geological interpretation of the most recent previous model (CSA 2011), but used a new interpretation based on additional new drilling for the 2015 estimate. In 2017 a complete review of the geological data, weathering profiles, magnetic intensity and topographic data as well as incorporation of additional density data and more accurate modelling techniques resulted in a re-interpreted mineral resource. No mining has occurred to date at Gabanintha, so there are no production records. Additional infill drilling and a single extensional diamond core holes have resulted in minor adjustments to the interpretation.
	The assumptions made regarding recovery of by-products.	Test work conducted by the company in 2015 identified the presence of sulphide hosted cobalt, nickel and copper, specifically partitioned into the silicate phases of the massive titaniferous vanadiferous iron oxides which make up the vanadium mineralization at Gabanintha. Subsequent test work has shown the ability to recover a sulphide flotation concentrate containing between 3.8 % and 6.3% of combined base metals treating the non-magnetic tailings produced as a result of the magnetic separation of a vanadium iron concentrate from fresh massive magnetite. Further work is underway to evaluate the economic value of the concentrate by-product. See ASX Announcements dated 22 May 2018 and 5 July 2018.
	Estimation of deleterious elements or other non-grade variables of economic significance (e.g. sulphur for acid mine drainage characterization).	Estimates were undertaken for Fe_2O_3, SiO_2, TiO_2, Al_2O_3, and LOI, which are non-commodity variables, but are useful for determining recoveries and metallurgical performance of the treated material. Estimated Fe_2O_3% grades were converted to Fe% grades in the block model for reporting (Fe% = Fe_2O_3/1.4297). Estimates were also undertaken for Cr_2O_3 which is a potential deleterious element. The estimated Cr_2O_3% grades were converted to Cr ppm grades (Cr ppm = (Cr_2O_3*10000)/1.4615).

Criteria	JORC Code Explanation	Commentary
	In the case of block model interpolation, the block size in relation to the average sample spacing and the search employed. Any assumptions behind modelling of selective mining units.	The Gabanintha block model uses a parent cell size of 40 m in northing, 10 m in easting and 5 m in RL. This corresponds to approximately half the distance between drillholes in the northing and easting directions and matches an assumed mining bench height in the RL direction. Accurate volume representation of the interpretation was achieved. Grade was estimated into parent cells, with all sub-cells receiving the same grade as their relevant parent cell. Search ellipse dimensions and directions were adjusted for each fault block. Three search passes were used for each estimate in each domain. The first search was 120m and allowed a minimum of 8 composites and a maximum of 24 composites. For the second pass, the first pass search ranges were expanded by 2 times. The third pass search ellipse dimensions were extended to a large distance to allow remaining unfilled blocks to be estimated. A limit of 5 composites from a single drillhole was permitted on each pass. In domains of limited data, these parameters were adjusted appropriately. No selective mining units were considered in this estimate apart from an assumed five metre bench height for open pit mining. Model block sizes were determined primarily by drillhole spacing and statistical analysis of the effect of changing block sizes on the final estimates.
	Any assumptions about correlation between variables.	All elements within a domain used the same sample selection routine for block grade estimation. No co-kriging was performed at Gabanintha, but correlation studies on the composite data showed very good correlation (0.8 or above) between most variables, apart from Cr which has a correlation coefficient of 0.65 with V_2O_5.
	Description of how the geological interpretation was used to control the resource estimates.	The geological interpretation is used to define the mineralisation, oxidation/transition/fresh and alluvial domains. All of the domains are used as hard boundaries to select sample populations for variography and grade estimation.
	Discussion of basis for using or not using grade cutting or capping.	Analysis showed that none of the domains had statistical outlier values that required top-cut values to be applied.
	The process of validation, the checking process used, the comparison of model data to drillhole data, and use of reconciliation data if available.	Validation of the block model consisted of: • Volumetric comparison of the mineralisation wireframes to the block model volumes. • Visual comparison of estimated grades against composite grades. • Comparison of block model grades to the input data using swathe plots. As no mining has taken place at Gabanintha there is no reconciliation data .
Moisture	Whether the tonnages are estimated on a dry basis or with natural moisture, and the method of determination of the moisture content.	All mineralisation tonnages are estimated on a dry basis. The moisture content in mineralisation is considered very low.

Criteria	JORC Code Explanation	Commentary
Cut-off parameters	The basis of the adopted cut-off grade(s) or quality parameters applied.	A nominal 0.4% V_2O_5 wireframed cut off for low grade and a nominal 0.7% V_2O_5 wireframed cut off for high grade has been used to report the Mineral Resource at Gabanintha. Consideration of previous estimates, as well as the current mining, metallurgical and pricing assumptions, suggest that the currently interpreted mineralised material has a reasonable prospect for eventual economic extraction at these cut off grades.
Mining factors or assumptions	Assumptions made regarding possible mining methods, minimum mining dimensions and internal (or, if applicable, external) mining dilution. It is always necessary as part of the process of determining reasonable prospects for eventual economic extraction to consider potential mining methods, but the assumptions made regarding mining methods and parameters when estimating Mineral Resources may not always be rigorous. Where this is the case, this should be reported with an explanation of the basis of the mining assumptions made.	AVL completed a mining Scoping Study in October 2016 for Gabanintha. The primary mining scenario being considered is conventional open pit mining. Based on initial concept study work and the nearby presence of a similar project (Windimurra mine site), the Gabanintha deposit is amenable to economic extraction by open-pit mining methods. The vanadium bearing massive magnetite horizons at Gabanintha are of significant width compared to similar deposit types. Test work has indicated excellent vanadium recovery from conventional processing methods. Preliminary economics, reviewed in a public release on 26 September by the Company, supported a robust case for an economic operation. In September 2018, AVL released a base case PFS which included key assumptions supporting a planned open pit vanadium mining operation at Gabanintha. This release contains details of mining factors and assumptions . Section 4 of this JORC Table 1 contains details of the assumptions that are also included in the body of this report in Table 1

<table>
<tr><th>Criteria</th><th>JORC Code Explanation</th><th>Commentary</th></tr>
<tr>
<td>Metallurgical factors or assumptions</td>
<td>The basis for assumptions or predictions regarding metallurgical amenability. It is always necessary as part of the process of determining reasonable prospects for eventual economic extraction to consider potential metallurgical methods, but the assumptions regarding metallurgical treatment processes and parameters made when reporting Mineral Resources may not always be rigorous. Where this is the case, this should be reported with an explanation of the basis of the metallurgical assumptions made.</td>
<td>
Metallurgical studies have focused on bench-scale comminution and magnetic separation test work on 24 contiguous drill core intervals from the high-grade vanadium domain. These samples included 10 off from the “fresh” rock zone, 9 off from the zone defined as “transitional” and 5 off from the near surface oxidised horizon, “oxide”.
<table>
<tr><th>Metallurgical Sample</th><th>Drillhole origin</th><th>From (m)</th><th>To (m)</th><th>Interval (m)</th><th>Mass (kg)</th></tr>
<tr><td>1 Fr</td><td>GDH903</td><td>191</td><td>199</td><td>8</td><td>33</td></tr>
<tr><td>2 Fr</td><td>GDH903</td><td>199</td><td>209</td><td>10</td><td>47</td></tr>
<tr><td>3 Fr</td><td>GDH903</td><td>209</td><td>215.2</td><td>6.2</td><td>25</td></tr>
<tr><td>4 Fr</td><td>GDH911</td><td>98.9</td><td>105.5</td><td>6.6</td><td>59</td></tr>
<tr><td>5 Fr</td><td>GDH911</td><td>108</td><td>113.2</td><td>5.2</td><td>54</td></tr>
<tr><td>6 Fr</td><td>GDH912</td><td>124</td><td>129</td><td>5</td><td>52</td></tr>
<tr><td>7 Fr</td><td>GDH912</td><td>129</td><td>134.2</td><td>5.2</td><td>54</td></tr>
<tr><td>8 Fr</td><td>GDH912</td><td>134.3</td><td>141</td><td>6.7</td><td>69</td></tr>
<tr><td>9 Fr</td><td>GDH914</td><td>108</td><td>114</td><td>6</td><td>58</td></tr>
<tr><td>10 Fr</td><td>GDH914</td><td>114</td><td>121</td><td>7</td><td>75</td></tr>
<tr><td>11 Tr</td><td>GDH902</td><td>98</td><td>105.8</td><td>7.8</td><td>34</td></tr>
<tr><td>12 Tr</td><td>GDH902</td><td>105.8</td><td>111.1</td><td>5.3</td><td>31</td></tr>
<tr><td>13 Tr</td><td>GDH902</td><td>111.1</td><td>117.1</td><td>6</td><td>27</td></tr>
<tr><td>14 Tr</td><td>GDH911</td><td>105.5</td><td>108</td><td>2.5</td><td>27</td></tr>
<tr><td>15 Tr</td><td>GDH913</td><td>127.9</td><td>133.2</td><td>5.3</td><td>26</td></tr>
<tr><td>16 Tr</td><td>GDH913</td><td>133.2</td><td>140</td><td>6.8</td><td>47</td></tr>
<tr><td>17 Tr</td><td>GDH913</td><td>140</td><td>145.2</td><td>5.2</td><td>45</td></tr>
<tr><td>18 Tr</td><td>GDH916</td><td>132</td><td>139</td><td>7</td><td>32</td></tr>
<tr><td>19 Tr</td><td>GDH916</td><td>139</td><td>151.3</td><td>12.3</td><td>101</td></tr>
<tr><td>20 Ox</td><td>GDH901</td><td>38</td><td>45</td><td>7</td><td>29</td></tr>
<tr><td>21 Ox</td><td>GDH901</td><td>45</td><td>54</td><td>9</td><td>44</td></tr>
<tr><td>22 Ox</td><td>GDH915</td><td>12</td><td>18</td><td>6</td><td>44</td></tr>
<tr><td>23 Ox</td><td>GDH915</td><td>18</td><td>23</td><td>5</td><td>35</td></tr>
<tr><td>24 Ox</td><td>GDH917</td><td>14.1</td><td>21.1</td><td>7</td><td>44</td></tr>
</table>
The comminution test work has included SMC, Bond ball mill work index and Bond abrasion index testing.
Bench-scale magnetic separation test work has included Davis tube testing (1500 gauss) and a customised two stage separation using a hand held rare earth magnetic rod (2600 gauss at surface). 21 element XRF and LOI analysis has been carried out on the magnetic and non-magnetic products and selected magnetic concentrates underwent QXRD to determine the contained minerals and or QEMScan analysis to gain an understanding of the mineral associations, grains size, locking and liberation.
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</table>

Criteria	JORC Code Explanation	Commentary
		Some preliminary sulphide concentrate recovery testing has been undertaken on selected 25kg fresh samples and a 90kg fresh composite sample. These samples were ground to a P_{80} of 106 µm and underwent wet magnetic separation using a low intensity (1500 Gauss) magnetic separation drum. The non-magnetic stream was dried, sub split and provided feed for sulphide flotation testwork. The flotation testing has been carried out at benchscale using a scheme of typical sulphide flotation reagents. Rougher, scavenger and cleaner flotation has been tested with one concentrate (test BC 4113/2) reground prior to cleaning. The preliminary metallurgical investigation has demonstrated: - The oxide, transitional and fresh materials are similar in comminution behavior and exhibit a moderate rock competency and ball milling energy demand. - The abrasiveness is considered low to moderate. - A positive and predictable response to magnetic separation can be demonstrated from the fresh and transitional material within the high-grade domain. The majority of vanadium exists within magnetic minerals which when separated at a grind size P_{80} of approximately 106 µm, generates a consistently high V_2O_5 grade, low silica and low alumina grade concentrate. - Oxidised material responds to magnetic separation, albeit at lower vanadium recovery and concentrate quality. At this stage of metallurgical understanding a primary mill grinding to P_{80} 106 µm and application of magnetic drum separation is considered a reasonable flowsheet to produce a vanadium rich concentrate (approximately 1.4% V_2O_5) from material classified as oxide, transitional and fresh within the high-grade domain. Preliminary benchscale roast leach testwork has been undertaken using magnetic concentrate from metallurgical sample Fr 2. Vanadium leach extractions of 79 to 86% have been determined in roasting for 110 minutes at approximately 1050ºC testing a range of sodium carbonate addition rates (3 to 6%). Further benchscale roast leach optimization testwork is in progress in preparation for pilot scale testing planned for 2019. Given the indicated quality of the concentrate and the preliminary benchscale roast leach testwork results, it is reasonable to assume that production of a saleable V_2O_5 product would be achieved via a traditional roast, leach and ammonium meta vanadate (AMV) flowsheet path. Similar flowsheets were applied in the treatment of magnetic concentrate in Xstrata's Windimurra refinery flowsheet in Western Australia and at Largo Resources Maracas vanadium project in Bahia, Brazil. A pilot scale testwork program is planned for 2019 aimed at validating the flowsheet and finalising engineering design criteria.

Criteria	JORC Code Explanation	Commentary
Environmental factors or assumptions	Assumptions made regarding possible waste and process residue disposal options. It is always necessary as part of the process of determining reasonable prospects for eventual economic extraction to consider the potential environmental impacts of the mining and processing operation. While at this stage the determination of potential environmental impacts, particularly for a greenfield project, may not always be well advanced, the status of early consideration of these potential environmental impacts should be reported. Where these aspects have not been considered this should be reported with an explanation of the environmental assumptions made.	Waste rock dumps have been designed as part of the mining studies and the tailings are planned to be deposited in a conventional manner and to be contained within one of the waste dumps as an integrated waste landform. Studies have been completed on flora, fauna, hydrology, hydrogeology, soil characterisation and waste disposal. Further work is required to quantify the potential impact for some aspects, particularly for subterranean fauna. However, the Project is not likely to have highly significant environmental impacts that are of public interest. The approvals process will include referral and assessment by the EPA but is not expected to be subject to a Public Environmental Review. Refer to Section 4 of this document for more details of environmental work completed.
Bulk density	Whether assumed or determined. If assumed, the basis for the assumptions. If determined, the method used, whether wet or dry, the frequency of the measurements, the nature, size and representativeness of the samples.	Bulk density determinations (using the Archimedes' method) were made on samples from 15 diamond drillholes. Bulk density data from 313 direct core measurements were used to determine average densities for each of the mineralisation and oxide/transition/fresh domains. Bulk Density was estimated for HG, LG, Alluvial and waste material in Core taken to represent the main lithological units.
	The bulk density for bulk material must have been measured by methods that adequately account for void spaces (vugs, porosity, etc.), moisture and differences between rock and alteration zones within the deposit.	The water immersion method was used for direct core measurements. All 313 of the latest measurements have been done using sealed core, the previous 97 measurements were not wrapped. AMC's observation of the core indicates that observable porosity was not likely to be significant.

Criteria	JORC Code Explanation	Commentary
	Discuss assumptions for bulk density estimates used in the evaluation process of the different materials.	The average dry bulk density values for at Gabanintha are:
		Domain / **Oxidation State** / **Bulk Density**
		10 (high grade) / Oxide / 3.39
		10 (high grade) / Transition / 3.71
		10 (high grade) / Fresh / 3.67
		2-8 (low grade) / Oxide / 2.13
		2-8 (low grade) / Transition / 2.20
		2-8 (low grade) / Fresh / 2.62
		Alluvial / Oxide / 2.63
		(waste) / Oxide / 2.02
		(waste) / Fresh / 2.45
		All values are in t/m^3.
		Regressions used to determine bulk density based on iron content are as follows: • Oxide: BD = (0.0344 x Fe_2O_3 %) + 0.9707 • Transition: BD = (0.0472 x Fe_2O_3 %) + 0.3701 • Fresh: BD = (0.0325 x Fe_2O_3 %) + 1.4716 The bulk density used for reporting of the Gabanintha Mineral Resource is based on the regression as it provides a more reliable local estimated bulk density.
Classification	The basis for the classification of the Mineral Resources into varying confidence categories.	Classification is based upon continuity of geology, mineralisation and grade, consideration of drillhole and density data spacing and quality, variography and estimation statistics (number of samples used and estimation pass). The current classification is considered valid for the global resource and applicable for the nominated grade cut-offs.
	Whether appropriate account has been taken of all relevant factors (i.e. relative confidence in tonnage/grade estimations, reliability of input data, confidence in continuity of geology and metal values, quality, quantity and distribution of the data).	At Gabanintha, the central portion of the deposit is well drilled for a vanadium deposit, having a drillhole spacing from a nominal 80 m to 100 m x 25 m to 30 m in northing and easting. The lower confidence areas of the deposit have drillhole spacings ranging up to 500 m x 25 m to 30 m in northing and easting directions. In general, the estimate has been classified as Measured Mineral Resource in an area restricted to the fresh portion of the high-grade domain where the drillhole spacings are less than 80 to 100m in northing. Indicated Mineral Resource material is generally restricted to the oxide high grade and oxide and fresh low grade in the same area of relatively closely spaced drilling. Inferred Mineral Resource has been restricted to any other material within the interpreted mineralisation wireframe volumes.

Criteria	JORC Code Explanation	Commentary
	Whether the result appropriately reflects the Competent Person's view of the deposit.	Geologica Pty Ltd and Trepanier Pty Ltd believe that the classification appropriately reflects their confidence in the grade estimates and robustness of the interpretations.
Audits or reviews	The results of any audits or reviews of Mineral Resource estimates.	The current Mineral Resource estimate has not been audited.
Discussion of Relative accuracy/ confidence	Where appropriate a statement of the relative accuracy and confidence level in the Mineral Resource estimate using an approach or procedure deemed appropriate by the Competent Person. For example, the application of statistical or geostatistical procedures to quantify the relative accuracy of the resource within stated confidence limits, or, if such an approach is not deemed appropriate, a qualitative discussion of the factors that could affect the relative accuracy and confidence of the estimate.	The resource classification represents the relative confidence in the resource estimate as determined by the Competent Persons. Issues contributing to or detracting from that confidence are discussed above. No quantitative approach has been conducted to determine the relative accuracy of the resource estimate. The Ordinary Kriged estimate is considered to be a global estimate with no further adjustments for Selective Mining Unit (SMU) dimensions. No production data is available for comparison to the estimate. The local accuracy of the resource is adequate for the use of the model in the mining studies. Further investigation into bulk density determination as well as infill drilling will be required to further raise the level of resource in the Inferred mineral resources category.
	The statement should specify whether it relates to global or local estimates, and, if local, state the relevant tonnages, which should be relevant to technical and economic evaluation. Documentation should include assumptions made and the procedures used.	These levels of confidence and accuracy relate to the global estimates of grade and tonnes for the deposit.
	These statements of relative accuracy and confidence of the estimate should be compared with production data, where available.	There has been no production from the Gabanintha deposit to date.

Section 4: Estimation and Reporting of Ore Reserves

Criteria	JORC Code Explanation	Commentary
Mineral Resource estimate for conversion to Ore Reserves	Description of the Mineral Resource estimate used as a basis for the conversion to an Ore Reserve. Clear statement as to whether the Mineral Resources are reported additional to, or inclusive of, the Ore Reserves.	The most recent Mineral Resource estimate was declared on 28 November 2018 and has been used in the PFS. Refer to the ASX release of 28 November 2018 for material assumptions and further information. The Measured and Indicated Resources from Section 3 have been used as the basis for conversion to the Ore Reserve. The Mineral Resources are inclusive of the Ore Reserve.
Site visits	Comment on any site visits undertaken by the Competent Person and the outcome of those visits. If no site visits have been undertaken indicate why this is the case.	No site visit was undertaken by the Competent Person. There are no current facilities at the project site.
Study status	The type and level of study undertaken to enable Mineral Resources to be converted to Ore Reserves. The Code requires that a study to at least Pre-Feasibility Study level has been undertaken to convert Mineral Resources to Ore Reserves. Such studies will have been carried out and will have determined a mine plan that is technically achievable and economically viable, and that material Modifying Factors have been considered.	A Pre-Feasibility Study has been prepared.
Cut-off parameters	The basis of the cut-off grade(s) or quality parameters applied.	The break-even cut-off grade has been calculated based on the pit optimisation inputs. The basis for calculation of cut-off is: $Cut\ off\ grade = \frac{(process + overhead\ cost) \times (1 + Mining\ Dilution(\%))}{Payable\ Vanadium\ Price\ \times Process\ Recovery\ (\%)}$ Cut-off grades have been calculated as 0.40% V_2O_5 for oxide ore, 0.18% V_2O_5 for transitional and 0.18% V_2O_5 for fresh. The selected cut-off grade of 0.8% V_2O_5 is higher than the calculated values as metallurgical testing suggests unpredictable recoveries below this chosen value.

Criteria	JORC Code Explanation	Commentary
Mining factors or assumptions	The method and assumptions used as reported in the Pre-Feasibility or Feasibility Study to convert the Mineral Resource to an Ore Reserve (i.e. either by application of appropriate factors by optimisation or by preliminary or detailed design).	The Mineral Resources have been optimised using Whittle software followed by detailed final pit design. The Ore Reserve is the Measured and Indicated Resources within the pit design, after allowing for ore loss and mining dilution. In selecting the optimised pit shell used for pit designs the conservative pit shell with a revenue factor of 0.675 was selected.
	The choice, nature and appropriateness of the selected mining method(s) and other mining parameters including associated design issues such as pre-strip, access, etc.	The mining method selected is open pit, selective mining of ore and waste on nominal 2.5 m benches using a backhoe excavator. Pit ramps are designed at a 10% gradient and 23 m wide, except for lower pit levels where the ramp reduces to 18 m wide and then 15 m.
	The assumptions made regarding geotechnical parameters (eg pit slopes, stope sizes, etc), grade control and pre-production drilling.	A Pre-Feasibility Study level geotechnical study has been completed by Dempers and Seymour. The pit design parameters from this study have been used for the pit design and the overall pit slope angle was estimated for the preceding pit optimisations. Grade control will be based on additional RC drilling, pit mapping and sampling from production drilling where necessary. A RC drilling pattern of 12.5 m along strike and 6.25 m across strike pattern has been allowed for.
	The major assumptions made and Mineral Resource model used for pit and stope optimisation (if appropriate).	
	The mining dilution factors used.	Mining dilution was estimated to be 5%, at zero grade. This was based on consideration of the width, continuity and orientation of the orebody and the planned mining method.
	The mining recovery factors used.	Ore recovery of 95% has been estimated to allow for losses from blasting and grade control.
	Any minimum mining widths used.	A minimum mining width was set at 20 m.
	The manner in which Inferred Mineral Resources are utilised in mining studies and the sensitivity of the outcome to their inclusion.	Inferred Resources within the pit design make up 21% of the total Mineral Resources and have not been considered for Ore Reserve estimates.
	The infrastructure requirements of the selected mining methods.	Infrastructure required for the open pit mining operation includes mining contractor workshop, heavy equipment washpad, mining offices, water storage dam, ROM pad, fuel and explosives storage.

Criteria	JORC Code Explanation	Commentary
Metallurgical factors or assumptions	The metallurgical process proposed and the appropriateness of that process to the style of mineralisation. Whether the metallurgical process is well-tested technology or novel in nature. The nature, amount and representativeness of metallurgical test work undertaken, the nature of the metallurgical domaining applied and the corresponding metallurgical recovery factors applied. Any assumptions or allowances made for deleterious elements. The existence of any bulk sample or pilot scale test work and the degree to which such samples are considered representative of the orebody as a whole. For minerals that are defined by a specification, has the ore reserve estimation been based on the appropriate mineralogy to meet the specifications?	The metallurgical process proposed includes beneficiation and refining of the vanadium product and an additional sulphide flotation circuit for base metals recovery, as discussed in Section 3. Metallurgical processes proposed are all well-tested technology and appropriate for the styles of mineralisation. Extensive benchscale metallurgical testwork has been undertaken under the direction of Wood Mining and Metals, as detailed in Section 3 and included: • Comminution • Magnetic separation • Sulphide flotation • Preliminary roast leaching of concentrate Metallurgical domaining has been categorised into weathering stages including oxide, transitional and primary mineralisation with and without recoverable base metals, as defined in the Mineral Resource models. Metallurgical recoveries for the concentrator have been determined from testwork and indicate vanadium recoveries of 44% for oxides, variable with depth up to 87.8% for transitional and variable with grade from 76.7% to an expected maximum of 96% for primary material (for a grade of 1.5% V_2O_5). Base metals recovery to a sulphide concentrate has been based on benchscale testwork outcomes up to a primary flotation concentrate and an assumed 90% cleaner flotation recovery. Vanadium recovery in the refinery flowsheet ranges from 79.7% (oxide concentrate) to 80.6% (fresh concentrate) and is based on operating benchmarks and experience from other similar flowsheets and is supported by preliminary benchscale roast leach testwork. Recoveries for the Ore Reserves were applied according to the recovery equations. Deleterious elements are discussed in Section 3. Not applicable.

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Environmen-tal	The status of studies of potential environmental impacts of the mining and processing operation. Details of waste rock characterisation and the consideration of potential sites, status of design options considered and, where applicable, the status of approvals for process residue storage and waste dumps should be reported.	Environmental studies have been completed by AQ2. This included studies into: • Flora. • Fauna. • Surface Hydrology. • Sub-surface Hydrology. • Soil, Waste Rock and Groundwater analysis. All potential environmental and social impacts associated with the Project have been considered and no issue has been identified that cannot be mitigated or managed to an acceptable degree. Further work is required to quantify the potential impact for some aspects, particularly for subterranean fauna. The approvals process will include referral and assessment by the EPA but is not expected to be subject to a Public Environmental Review. Waste geochemistry investigations have been undertaken by interpretation of the geological database indicating that none of the waste rock samples tested were potentially acid generating. Management of surface runoff and seepage from the waste dumps and pit walls during operation will need to be managed and final waste dumps capped with suitable materials to minimise water infiltration.
Infrastructure	The existence of appropriate infrastructure: availability of land for plant development, power, water, transportation (particularly for bulk commodities), labour, accommodation; or the ease with which the infrastructure can be provided, or accessed.	The Sandstone to Meekatharra Road passes close to the mine lease area, however an access road will be constructed from the Northern Highway to the west to the operational area. This road will give access to Meekatharra, which is approximately 55 km away. Power will be generated on site using a gas fired power station using gas from a new gas pipeline. Water will be sourced from onsite pit dewatering and water supply bores. The mining lease is sufficiently extensive to accommodate all the required infrastructure. A communications tower and related equipment will be installed on site for phone and data communications. Accommodation will be constructed on site adjacent to the Project.

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Costs	The derivation of, or assumptions made, regarding projected capital costs in the study. The methodology used to estimate operating costs. Allowances made for the content of deleterious elements. The source of exchange rates used in the study. Derivation of transportation charges. The basis for forecasting or source of treatment and refining charges, penalties for failure to meet specification, etc. The allowances made for royalties payable, both Government and private.	Capital costs for the plant and most of the rest of the infrastructure were estimated by Wood Mining and Metals. Mining capital costs for heavy equipment workshop and washpad will be part of the mining contract and have been estimated from a contractor quotation. Mining operating costs have been based on contractor rates for similar projects in Western Australia and a quotation from a mining contractor that broadly supported the benchmarked mining costs. The average mining costs are $3.50/t mined. General and administration costs were estimated based on experience with similar projects and make up $2.24 /t of ore feed. Processing costs have been estimated based on the plant design and detailed costings derived by Wood Mining and Metals. Not applicable For mining optimisation and design, the exchange rate used was AUD:USD 0.74. The exchange rate used in financial modeling was AUD:USD 0.72. The exchange rate used for capex and opex derivation was set on 8th November 2018 at AUD:USD 0.728, AUD:EUR 0.637 and AUD:GBP 0.555. The exchange rates were sourced from publicly available data produced by banks. The transport cost related to haulage of the product to the port of Fremantle has been estimated by Wood Mining and Metals. This has been estimated based on a rate A$50t of V_2O_5 product sold FOB Fremantle. Backhaul rates after delivery of consumables to site have been assumed. Processing and refining costs have been derived by Wood Mining and Metals based on their design of the processing plant and refinery. The royalty paid to the West Australian government will be 2.5% of revenue.

Criteria	JORC Code Explanation	Commentary
Revenue factors	The derivation of, or assumptions made regarding revenue factors including head grade, metal or commodity price(s) exchange rates, transportation and treatment charges, penalties, net smelter returns, etc. The derivation of assumptions made of metal or commodity price(s), for the principal metals, minerals and co-products.	Revenue for pit optimisation assumes a V_2O_5 sale price of US$8/lb. This is based on a FOB price for the V_2O_5 flake product. The sales price used for base case financial analysis was US$8.67/lb V_2O_5. A table of alternative prices is calculated and presented as upside sensitivity, given the conservative long-term price selected. Revenues from Cobalt, Nickel and Copper are based on LME prices for 13 September 2018 of AUD 84.01/kg, A$ 16.57/kg and A$ 7.95/kg respectively. A 65% payability has been assumed for these base metals that make up approximately 1.3% of the total revenue. The cyclical nature of the vanadium market is illustrated in 6 of the report summary above. Imbalances in supply have driven prices up above US$30/lb twice during this time, and there was a prolonged period where prices hovered around US$5/lb from 2012 to 2017. However, the average price for the 15-year period was well above this, at US$8.67/lb in 2018 adjusted numbers.
Market assessment	The demand, supply and stock situation for the particular commodity, consumption trends and factors likely to affect supply and demand into the future. A customer and competitor analysis along with the identification of likely market windows for the product. Price and volume forecasts and the basis for these forecasts. For industrial minerals the customer specification, testing and acceptance requirements prior to a supply contract.	The market for Vanadium Pentoxide is substantially based on its use in steel alloys and now also in batteries. In the last few years the vanadium price slumped to below US$5/lb leading to cutbacks in production. The price has now recovered, reaching over US$30/lb in November 2018. Reasons for the price rise are based on continued low supply from reduced capacity and recent increase in demand from China. Demand for vanadium has outstripped supply since mid-2015, corresponding to Evraz Group's Highveld Steel and Vanadium's (South Africa) closure. In late 2015, Chinese stone coal producers began to shut down due to Chinese environmental regulations, further reducing supply. Since then, supply and demand have not been in balance. In 2017, there was approximately 8,000 MTV of demand that was not met by production, or the approximate yearly output of one and a half plants the size of AVL's proposed Gabanintha project. Vanadium Redox Flow Battery (VRFB) technology uptake could have a large impact on medium to long term vanadium demand. If VRFBs capture even a small piece of the renewable energy storage demand, it could require thousands of MTV that are not currently available. A market assessment analysis has been completed internally with information supplied by Daniel Harris (Technical Director AVL). Vanadium products include various oxides of Vanadium, that are converted to Ferro Vanadium or Vanadium Carbo-Nitride products for use in steelmaking. Refined Vanadium pentoxide, V_2O_5 produced as a powder is supplied as a chemical, and can be used in the production of vanadium electrolyte solutions for VRFB.

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Economic	The inputs to the economic analysis to produce the net present value (NPV) in the study, the source and confidence of these economic inputs including estimated inflation, discount rate, etc. NPV ranges and sensitivity to variations in the significant assumptions and inputs.	The December 2018 Pre-Feasibility Study includes the revenue and cost inputs discussed above and cash flows were discounted by an 8% rate. The post-tax NPV 8% of the project using the long-term historical pricing was estimated to be US$125M. The mine life is significant but the current benign outlook for inflation does not justify an allowance for inflation. Sensitivity analysis has been completed based on different product price, other revenue related items such as grade and metallurgical recovery and costs. The project is most sensitive to the product price, metallurgical recovery, the mining cost and the processing cost, in decreasing order.
Social	The status of agreements with key stakeholders and matters leading to social licence to operate.	The proposed Project will be located within mining lease application M 51/878, which is currently pending, due to native title processes. The native title claimant is the Yugunga-Nya Native Title Claim Group. A draft mining agreement between AVL and the Yugunga-Nya Native Title Claim Group was prepared in November 2017. A standard Heritage agreement is in place with the Yugunga-Nya Native Title Claim Group. No land use agreements are in place with other local landowners but good relations are maintained.
Other	To the extent relevant, the impact of the following on the project and/or on the estimation and classification of the Ore Reserves: Any identified material naturally occurring risks. The status of material legal agreements and marketing arrangements. The status of governmental agreements and approvals critical to the viability of the project, such as mineral tenement status, and government and statutory approvals. There must be reasonable grounds to expect that all necessary Government approvals will be received within the timeframes anticipated in the Pre-Feasibility or Feasibility study. Highlight and discuss the materiality of any unresolved matter that is dependent on a third party on which extraction of the reserve is contingent.	No material naturally occurring risks have been identified. No material legal or marketing agreements have been entered into. The Mining Lease Application MLA51/878 over the tenement that contains the Ore Reserves has not yet been granted. . Application for the mining approval has not started but there are no impediments expected to this process. The timeframes for assessment of an environmental assessment proposal vary depending on the level of assessment set by the Environmental Protection Authority (EPA), the amount of consultation undertaken prior to referral and how quickly the proponent can compile the information required by the EPA

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Classification	The basis for the classification of the Ore Reserves into varying confidence categories. Whether the result appropriately reflects the Competent Person's view of the deposit. The proportion of Probable Ore Reserves that have been derived from Measured Mineral Resources (if any).	Measured Resources have been converted to Proved Reserves. Indicated Resources have been converted to Probable Reserves. The estimated Ore Reserves are, in the opinion of the Competent Person, appropriate for these deposits. Not applicable
Audits or reviews	The results of any audits or reviews of Ore Reserve estimates.	No audits have been undertaken.

Criteria	JORC Code Explanation	Commentary
Discussion of relative accuracy/ confidence	Where appropriate a statement of the relative accuracy and confidence level in the Ore Reserve estimate using an approach or procedure deemed appropriate by the Competent Person. For example, the application of statistical or geostatistical procedures to quantify the relative accuracy of the reserve within stated confidence limits, or, if such an approach is not deemed appropriate, a qualitative discussion of the factors which could affect the relative accuracy and confidence of the estimate. The statement should specify whether it relates to global or local estimates, and, if local, state the relevant tonnages, which should be relevant to technical and economic evaluation. Documentation should include assumptions made and the procedures used. Accuracy and confidence discussions should extend to specific discussions of any applied Modifying Factors that may have a material impact on Ore Reserve viability, or for which there are remaining areas of uncertainty at the current study stage. It is recognised that this may not be possible or appropriate in all circumstances. These statements of relative accuracy and confidence of the estimate should be compared with production data, where available.	The Ore Reserve estimate have been completed to Pre-Feasibility Study with ±25 confidence. The Ore Reserve is a global estimate in line with the Mineral Resource Statement The AVL management and board has extensive experience in managing VTM sources and vanadium operations allowing comparison of operation of other plants in South Africa, Australia, USA and Russia to be drawn upon during the study process.

Australian VANADIUM LIMITED

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