

23 September 2020

## **SCOPING STUDY RESULTS CONFIRM VIABILITY OF VANADIUM PENTOXIDE PRODUCTION AT STEELPOORTDRIFT AT CURRENT PRICES**

### **SCOPING STUDY RESULTS DISCLAIMER:**

The Scoping Study referred to in this announcement is a preliminary technical and economic investigation of the potential viability of producing vanadium pentoxide from the Steelpoortdrift Vanadium Project by constructing an open pit mine, beneficiation plant and processing plant. It is based on lower level technical and preliminary economic assessments ( $\pm$  35% accuracy) and is insufficient to support estimation of Ore Reserves, to provide assurance of an economic development case at this stage or to provide certainty that the conclusions of the Study will be realised. Further evaluation work and appropriate studies are required before the Company will be in a position to estimate any Ore Reserves or to provide any assurance of an economic development case. The Scoping Study is based on the material assumptions outlined in this announcement.

Of the Life-of-Mine (LOM) Production Target 89% is in Measured or Indicated Mineral Resource categories and 11% is in the Inferred Mineral Resource category. The Company has concluded it has reasonable grounds for disclosing a Production Target which includes 11% Inferred Mineral Resources, given that in the first eight years of production 94% of the material mined & processed is classified in the Measured and Indicated Resource categories. 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 additional Measured and Indicated Mineral Resources or that the Production Target itself will be realised. The level of accuracy estimate above includes the uncertainty associated with incorporating Inferred Resources.

The Scoping Study is based on material assumptions outlined elsewhere in this announcement. These include assumptions about the availability of funding. While the Company considers all the material assumptions to be based on reasonable grounds, there is no certainty that they will prove to be correct or that the range of outcomes indicated by the Scoping Study will be achieved.

To achieve the potential development outcomes indicated in the Scoping Study, pre-production funding of at least US\$161 million will likely be required. Investors should note that there is no certainty that the Company will be able to raise funding when needed, however the Company has concluded it has a reasonable basis for providing the forward-looking statements included in this announcement and believes that it has a "reasonable basis" to expect it will be able to fund the development of the Project. It is likely that such funding may only be available on terms that may be dilutive to, or otherwise affect the value of the Company's existing shares. It is also possible that the Company could pursue other strategies to provide alternative funding options. However, the Scoping Study is a project level study and consequently the sources, forms and costs of the capital required to develop the mine have not been accounted for in calculating the financial returns demonstrated by the Scoping Study. Given the uncertainties involved, investors should not make any investment decisions based solely on the results of the Scoping Study.

## HIGHLIGHTS

- ◆ **Scoping Study exhibits globally competitive opex and capex metrics and confirms that production of vanadium pentoxide utilising conventional salt roast-leach processing methods is technically and financially viable**
- ◆ **Financial modelling presents significant potential values and robust returns with attractive payback and a resilience to low price environments**
- ◆ **Low operating and capital expenditures ascribable to the high grade nature of the vanadium mineralisation, along with access to regional infrastructure and local experience in production of vanadium products**
- ◆ **Low operating costs forecast resulting in the project retaining strong margins should prices move to the downside**
- ◆ **VR8 to embark on pre-feasibility study (PFS) immediately as well as focus on attracting strategic partnerships**

Bill Oliver, Managing Director of VR8, said the Company was highly encouraged by the technical and financial results of the study which confirmed low operating costs for the Steelpoortdrift Vanadium Project:

*“The Scoping Study confirms competitive capital and operating costs for Steelpoortdrift that compare favourably with other global vanadium projects. Healthy and robust margins are generated at current vanadium prices, which makes a compelling case for continued development. Importantly, the project still displays a positive NPV at prices equivalent to historical lows.”*

Jurie Wessels, Chairman of VR8 commented:

*“The Scoping Study results confirmed our instincts that Steelpoortdrift contains the required fundamentals to fulfill our aspirations of turning it into the world’s next prominent primary vanadium producer that is to follow in the footsteps of former nearby successful exploitation and processing operations. The persuasive and resilient results returned by the Scoping Study makes it possible for us to confidently progress the project to immediately commence with work towards a pre-feasibility study and to focus on attracting strategic partnerships.”*

## SCOPING STUDY RESULTS

- ◆ **NPV<sub>8%</sub> of US\$401 million** based on current vanadium price of US\$6.95/lb with **forecast opex of US\$3.07/lb V<sub>2</sub>O<sub>5</sub>**
- ◆ Operating costs forecast to be US\$3.07/lb resulting in the project retaining strong margins should prices move to the downside
- ◆ NPV<sub>8%</sub> of US\$359 million achieved with an opex increase of 10% to US\$3.37/lb
- ◆ Payback period between 2 – 3 years
- ◆ Pre-production **capital expenditure of US\$161.5 million**, with sustaining CAPEX of \$15M over the life of mine
- ◆ IRR of 26 - 28% on a post-tax 100% equity basis, which increases to 41 - 45% on a projected 50:50 debt:equity gearing

The Scoping Study has demonstrated the potential for strong financial metrics from the Steelpoortdrift Vanadium Project with a forecast NPV<sub>8%</sub> of between US\$359 million and US\$401 million and costs as low as US\$3.07/lb (Table 1), based on current vanadium prices. The Scoping Study is based on a proposed 1.6Mtpa standalone mining, beneficiation and processing operation to produce between 8,500 and 9,400 tonnes of high purity vanadium flake per annum. Pre-production capital is estimated at between US\$161.5 and US\$187.9 million, based on a 15% contingency.

**Table 1.** Base case key metrics based on opex costs ranging from US\$3.07/lb to US\$3.37/lb

Study Outcomes	
EBITDA LoM (US\$, pre-tax)	1,756 – 1,900 M
EBITDA per annum (US\$, pre-tax)	71.5 – 77.2 M
NPV <sub>8%</sub> (US\$, pre-tax)	359 – 401 M
IRR (US\$, pre-tax, 100% equity)	28.8 – 30.7 %
IRR (US\$, post-tax, 100% equity)	26.3 – 28.2 %
IRR (US\$, post-tax, 50:50 equity:debt)	41.4 – 44.7 %
Payback Period	2 – 3 years
Life of Mine (Study Period)	25 years
Life of Mine (Mining schedule)	30 years
Pre-production CAPEX (US\$, incl. contingency)	161.5 - 187.9 M
Sustaining CAPEX LoM (US\$)	14.9 M
Average cash operating costs (US\$/lb V <sub>2</sub> O <sub>5</sub> ) <sup>1</sup>	3.07 – 3.37
Annual V <sub>2</sub> O <sub>5</sub> production over LoM	18.7 – 20.8 M lb / 8,518 – 9,451 tonnes

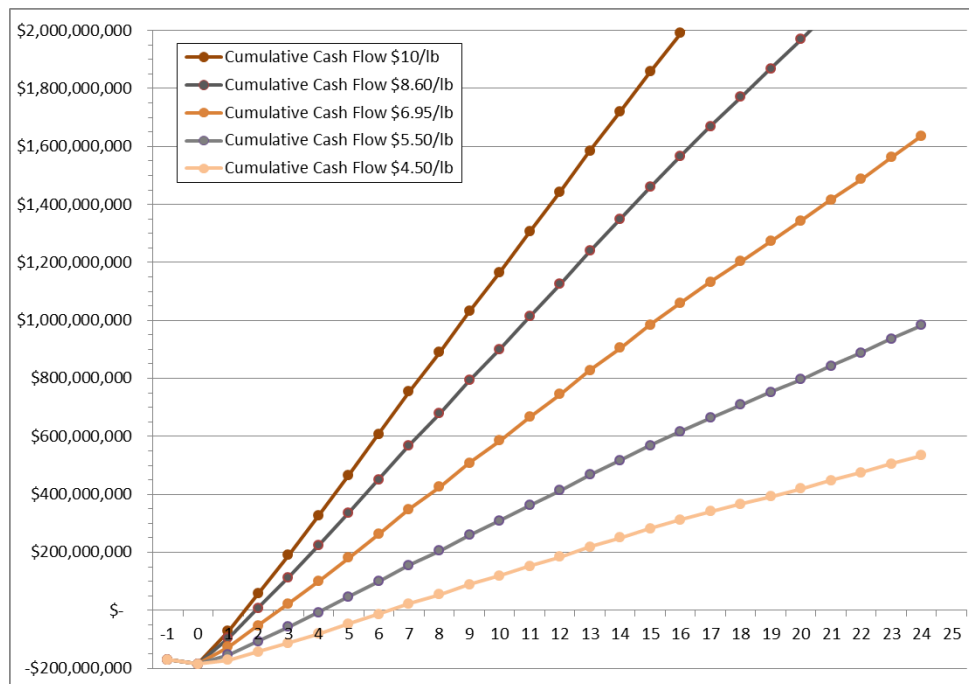
<sup>1</sup>Cash operating costs include all mining, processing, government royalties, marketing, site administration and overhead costs. The ranges are based on a 10% increase to the base case opex of US\$3.07/lb).

The financial results are presented based on the current midpoint price for 98% V2O5 (fob China) of US\$6.95/lb with ranges based on forecast operating costs. Table 2 illustrates the NPV at different vanadium prices selected based on historical significance with Figure 1 illustrating the effect on the forecast project cash flows.

**Table 2.** Sensitivity of NPV<sup>8%</sup> to different vanadium prices based on historical significance

Price (US\$ / lb)	US\$4.50	US\$5.50	US\$6.00	US\$6.95	US\$8.60	US\$10.00
NPV <sup>8%</sup> (OPEX = US\$3.07/lb)	US\$61M	US\$199M	US\$269M	US\$401M	US\$629M	US\$825M
NPV <sup>8%</sup> (OPEX+10% = US\$3.37/lb)	US\$20M	US\$158M	US\$227M	US\$359M	US\$587M	US\$781M

**Figure 1.** Project Cash Flows at vanadium prices shown in Table 2



## SCOPING STUDY PARAMETERS AND ASSUMPTIONS

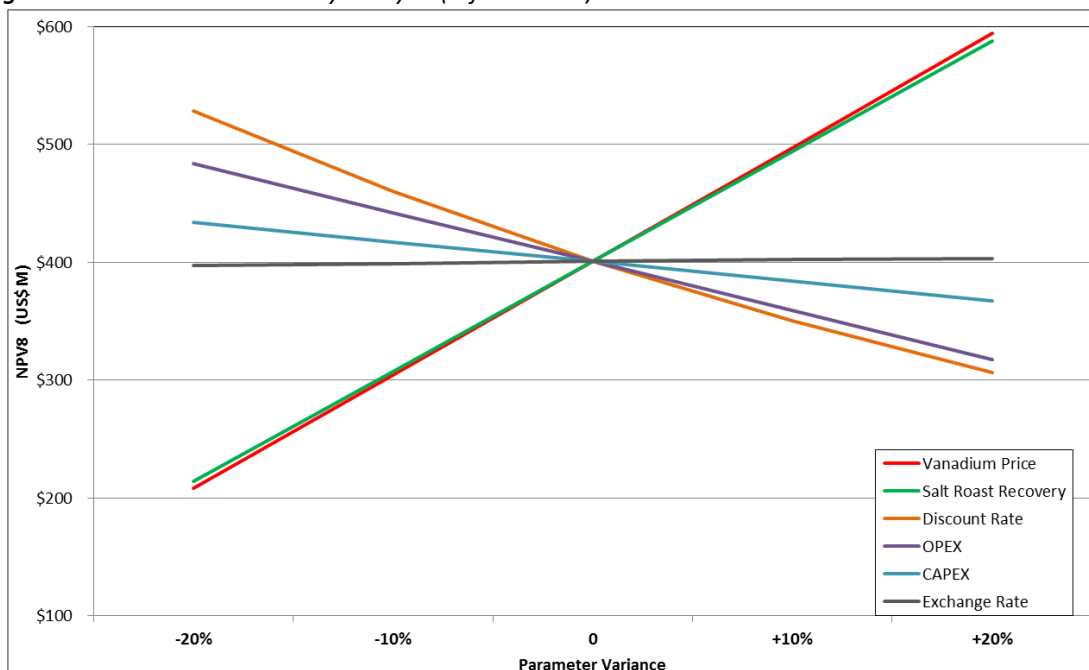
The Scoping Study was completed to an overall +/- 35% accuracy using the key parameters and assumptions set out in Table 3 and as further detailed in Appendix 2. Figure 2 gives an indication of the sensitivities of the project economics to the primary underlying assumptions of CAPEX, OPEX, vanadium price, exchange rate and recoveries (also Table 4). Due to the sensitivity of the project to operating costs the Company has decided to present the results as a range based on the operating cost estimate (OPEX) and OPEX + 10% as this is felt to be an appropriate treatment for the level of study.

The Company considers that the assumptions set out in the below sensitivity analysis are the most relevant assumptions to the results of the scoping study undertaken. These assumptions, as well as all other underlying assumptions, will be further tested during preparation of a pre-feasibility study.

**Table 3. Key Parameters and Assumptions**

Study Outcomes	
<b>General / Economic</b>	
Discount Rate	8%
Vanadium Price (US\$/lb)	6.95
Exchange Rate (ZAR : USD)	16
<b>Mining / Production</b>	
Average LoM Strip Ratio	0.42
Processing Rate	1.6 Mtpa
LoM Production Target	48.5 Mt
Average V <sub>2</sub> O <sub>5</sub> grade mined (diluted)	0.75%
Recovery into concentrate (mass)	32%
Recovery into concentrate (V <sub>2</sub> O <sub>5</sub> )	90%
Recovery from concentrate to V <sub>2</sub> O <sub>5</sub> flake	81.5%
Average concentrate grade (V <sub>2</sub> O <sub>5</sub> )	2.03%
<b>Cost Assumptions</b>	
LoM average mining costs (\$/lb V <sub>2</sub> O <sub>5</sub> produced)	\$0.56
LoM average concentrator costs (\$/lb V <sub>2</sub> O <sub>5</sub> produced)	\$0.52
LoM average salt roast costs (\$/lb V <sub>2</sub> O <sub>5</sub> produced)	\$1.45
General and admin costs (\$/lb V <sub>2</sub> O <sub>5</sub> produced)	\$0.54
Royalty (SA government)	2%
Tax rate (company)	28%

**Figure 2. NPV<sup>8%</sup> Sensitivity Analysis (refer Table 4)**





**Table 4.** Sensitivity Analysis NPV<sup>8%</sup> (US\$M) based on opex range of US\$3.07/lb – US\$3.37/lb

Parameter	-20%	-10%	Base Case	+10%	+20%
<b>Vanadium Price (Base Case US\$6.95)</b>	166 – 208	263 – 304	<b>359 – 401</b>	455 – 497	551 – 594
<b>Operating Costs</b>	451 – 484	405 – 442	<b>359 – 401</b>	313 – 359	267 – 317
<b>Capital Expenditure</b>	393 – 434	376 – 417	<b>359 – 401</b>	342 – 384	325 – 367
<b>Discount Rate</b>	477 – 528	413 – 460	<b>359 – 401</b>	312 – 350	271 - 306
<b>Salt Roast Recovery</b>	173 – 214	266 – 307	<b>359 – 401</b>	452 – 494	545 - 588
<b>Exchange Rate (ZAR:USD)</b>	354 – 397	357 – 399	<b>359 – 401</b>	360 – 402	361 – 403

The Company has added a 15% contingency to the pre production capital expenditure (CAPEX) used in the financial model to accommodate additional unspecified costs as this is deemed to be appropriate for the level of study. The Scoping Study has been compiled by the Company with the assistance of a highly experienced and reputable group of independent consultants under the oversight of Mr Les Ford, a globally recognised expert in the construction and operation of vanadium processing plant. Mr Ford was previously responsible for the development and construction of vanadium operations for Largo Resources in Brazil and for Vantech (formerly Xstrata, now Glencore).

The Scoping Study is based on the latest Mineral Resource Estimate for the Steelpoortdrift Vanadium Project reported on 29 April 2020 (refer Appendix 2), which is 662 million tonnes at an in situ grade of 0.77% V<sub>2</sub>O<sub>5</sub> (defined above an in-situ grade of 0.45% V<sub>2</sub>O<sub>5</sub>) including 188 million tonnes at an in situ grade of 1.23% V<sub>2</sub>O<sub>5</sub> (defined above an in situ resource grade of 1% V<sub>2</sub>O<sub>5</sub>). Both resources are classified as Measured, Indicated and Inferred as detailed in Appendix 2. A sizeable portion of this high grade resource (68Mt at 1.37% V<sub>2</sub>O<sub>5</sub>) is hosted in a discrete, massive magnetite unit which outcrops along 4km of strike within the project area.

Pit optimisation studies were completed on the high grade Mineral Resource within 100m of surface, which comprises 127Mt at a grade of 1.20% (classified as Measured, Indicated and Inferred, Appendix 2). The open pit selected to form the basis of the Scoping Study extracts 48.5Mt of mineralisation from the Mineral Resource of which 43.3Mt is classified as Measured and Indicated (89%).

While 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, as detailed in Appendix 2, the Company

has concluded it has reasonable grounds for disclosing a Production Target which includes 11% Inferred Mineral Resources based on the continuity observed in the Mineral Resource and that in the first seven years of production 94% of the material mined and processed is classified as Measured and Indicated.

The mining schedule extends for 30 years at a rate of 1.6Mtpa, however the financial study was completed on an initial 25 years despite alternative pit shells being generated during the pit study with a significantly longer life of mine. While financial studies have not been completed on these shells the optimisation gave a preliminary indication they may be financially viable. **The Production Target of 48.5Mt is only 7% of the total Measured, Indicated and Inferred Mineral Resource of 662Mt (Appendix 2).** Accordingly it is possible that the project will be able to continue for longer than the 25 years of this study given the size of the Mineral Resource.

Future studies will investigate the economics of these larger pits and longer project timeframes in more detail, with the increased costs based on higher strip ratios and increased sustaining CAPEX to be tested against the sunk capital in the processing plant.

The recovery assumptions for the mass recovery into concentrate and the recovery of vanadium flake from concentrate using the salt roast-leach process are based on the results of the Company's testwork programme detailed in the ASX announcements dated 24 June 2020 and 24 July 2020.

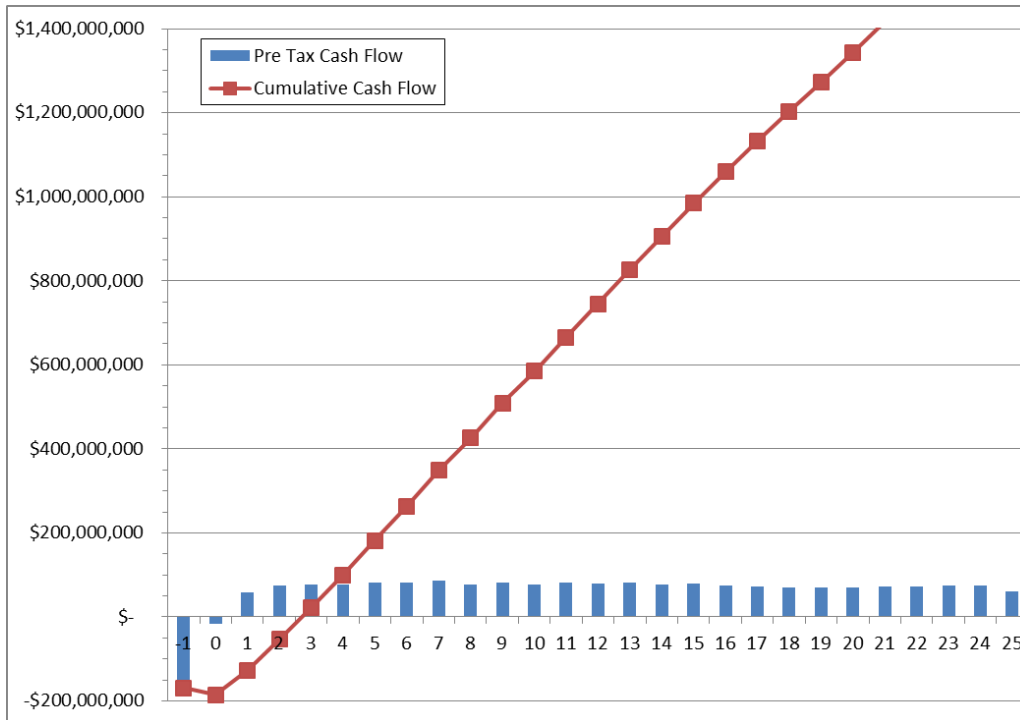
CAPEX and OPEX costs are based on actual quotations received by the Company from mining contractors, reagent and equipment suppliers where possible, otherwise costs were built up from a database of costs from similar operations within South Africa.

Revenue is based on current sale prices for +98% V<sub>2</sub>O<sub>5</sub> flake product which are US\$6.90 -US\$7.00/lb (fob China, US\$15,420/tonne; Fastmarkets Metal Bulletin). The mid point of these prices has been used in the study, along with other key price points including US\$6.90/lb (historical median V<sub>2</sub>O<sub>5</sub> price), US\$8.90/lb (historical mean V<sub>2</sub>O<sub>5</sub> price) and US\$5.50/lb (recent price low). Table 2 and Appendix 2 include the results of these range studies, with the project returning a positive NPV at all price points.

The resultant forecast cashflows for the project are shown in Figure 3, with payback achieved within 3 years of commencement of production of vanadium pentoxide.

Further details on all material assumptions underpinning the Scoping Study and the modifying factors in the JORC Code are detailed in Appendices 2 and 3.

**Figure 3. Forecast Pre-Tax Cashflows for the Steelpoortdrift Vanadium Project**



Consultants and contributors to the Scoping Study include :

- Les Ford - Study Manager
- GEMECS (Pty) Ltd – Geology, Drilling and Sampling
- Mining Plus Pty Ltd – Mineral Resources including the Mineral Resources within the Production Target (refer Competent Person sign off below)
- Mining Plus Pty Ltd – Optimisation and Mining
- Sound Mining (Pty) Ltd – Mining, OPEX
- ENC Minerals (Pty) Ltd – Process Testwork, CAPEX, OPEX
- Mintek – Process Testwork
- METS South Africa (Pty) Ltd – Concentrator CAPEX, OPEX
- Red Kite Consulting (Pty) Ltd – Environmental
- Noboprox (Pty) Ltd – Community and Social
- James Wilson – Financial Modelling
- Rock Wealth Discovery – Review of Study



## NEXT STEPS

Based on its current market capitalisation VR8 does not currently have the financial capacity to internally fund 100% of the construction of the Steelpoortdrift Vanadium Project. External funding in the form of a mix of debt, offtake funding, JV interest, direct project investment and/or equity will be required. The Company recently announced the engagement of Pelagic Resources Group Ltd (**Pelagic**) under a mandate to assist the Company to source a strategic investment in the Company. Such an investment would then see Pelagic granted marketing rights over products from the Project, and additional marketing or offtake agreements could further support the development of the Project.

The Company is moving rapidly to complete a PFS by Q1 2021 to improve the level of accuracy in the CAPEX and OPEX estimates, at a cost of approximately A\$300,000. The Company believes that the compelling results of the Scoping Study and a completion of the PFS will continue to support the sourcing of funding required to develop and construct the Steelpoortdrift Vanadium Project.

Once funding is secured construction of the processing plant will take approximately 24 months from breaking ground until commissioning. The beneficiation plant will be operational after 9 – 12 months, with mining to commence during this time to ensure an adequate stockpile for commissioning and initial production of the salt roasting plant. Long-lead items are likely to be the milling circuit for the beneficiation plant and the kiln for the salt roasting plant.

*This announcement has been authorised for release by the directors of Vanadium Resources Ltd.*

### **For and on behalf of the board:**

Kyla Garic

Company Secretary

## DISCLAIMER

Some of the statements appearing in this announcement may be in the nature of forward looking statements. You should be aware that such statements are only predictions and are subject to inherent risks and uncertainties. Those risks and uncertainties include factors and risks specific to the industries in which the Company operates and proposes to operate as well as general economic conditions, prevailing exchange rates and interest rates and conditions in the financial markets, among other things. Actual events or results may differ materially from the events or results expressed or implied in any forward looking statement. No forward looking statement is a guarantee or representation as to future performance or any other future matters, which will be influenced by a number of factors and subject to various uncertainties and contingencies, many of which will be outside the Company's control.

The Company does not undertake any obligation to update publicly or release any revisions to these forward looking statements to reflect events or circumstances after today's date or to reflect the occurrence of unanticipated events. No representation or warranty, express or implied, is made as to the fairness, accuracy, completeness or correctness of the information, opinions or conclusions contained in this announcement. To the maximum extent permitted by law, none of the Company, its Directors, employees, advisors or agents, nor any other person, accepts any liability for any loss arising from the use of the information contained in this announcement. You are cautioned not to place undue reliance on any forward looking statement. The forward looking statements in this announcement reflect views held only as at the date of this announcement.

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#### **COMPETENT PERSONS STATEMENT**

The information in this announcement that relates to Mineral Resources, including the Mineral Resources contained within the Production Target, complies with the 2012 Edition of the Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves (**JORC Code**) and has been compiled, assessed and created by Mr Kerry Griffin BSc.(Geology), Dip Eng Geol., a Member of the Australian Institute of Geoscientists and a Principal Consultant at Mining Plus Pty Ltd, consultants to the Company. Mr Griffin 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 JORC Code. Mr Griffin is the competent person for the resource estimation and has relied on provided information and data from the Company, including but not limited to the geological model and database. Mr Griffin consents to the inclusion in this announcement of matters based on his information in the form and context in which it appears. Further details on the Mineral Resource can be found detailed in the ASX Announcement of 29 April 2020. The Company confirms that all material assumptions and parameters underpinning the Mineral Resource Estimate reported in the market announcement dated 29 April 2020 continue to apply and have not materially changed and that it is not aware of any new information or data that materially affects the information that has been included in this announcement.

The information in this announcement that relates to Exploration Results and other technical information relating to drilling, sampling and geological interpretations derived from the Exploration Results complies with the JORC Code and has been compiled and assessed under the supervision of Mr Bill Oliver, the Managing Director of Vanadium Resources Ltd. Mr Oliver is a Member of the Australasian Institute of Mining and Metallurgy and the Australasian Institute of Geoscientists. He 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 JORC Code. Mr Oliver consents to the inclusion in this announcement of the matters based on his information in the form and context in which it appears. The Exploration Results are

based on standard industry practises for drilling, logging, sampling, assay methods including quality assurance and quality control measures as detailed in the ASX Announcement of 29 April 2020.

The information in this announcement that relates to metallurgical testwork results has been compiled and assessed under the supervision of Mr Eugene Nel, a Professional Engineer of the Engineering Council of South Africa and a Member of the South African Institute of Mining and Metallurgy (both Recognised Professional Organisations as defined in the JORC Code). Mr Nel is the Principal Consultant at ENC Minerals (Pty) Ltd, consultants to the Company, and 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 JORC Code. Mr Nel consents to the inclusion in this announcement of matters based on his information in the form and context in which it appears

## **BACKGROUND ON VANADIUM**

Current day demand for vanadium arises from its established use in strengthening steel via various alloys. Consumption is currently increasing with the recent implementation of stricter standards on the strength of steel to be used in construction (specifically rebar). The use of vanadium in steel making accounts for over 90% of current vanadium demand in today's market.

The most commonly traded vanadium product is 98% V<sub>2</sub>O<sub>5</sub> flake, as it can be used directly in steel making or converted to ferrovandium for additional uses in steel making. Higher purity vanadium products are either produced by a modern plant (such as being planned by VR8) or are further processed from 98% V<sub>2</sub>O<sub>5</sub> flake for speciality uses in chemical industries, energy storage and high performance alloying technologies.

Such speciality uses are expected to provide additional longer term demand for vanadium. Vanadium redox flow battery (VRFB) technology was developed in Australia and has a number of advantages in industrial and small town sized energy storage requirements. The global move towards renewable energy solutions will require a vast increase in energy storage installations, which in turn is forecast to result in an increase in the amount of VRFBs being manufactured and installed around the world.

Another emerging use of vanadium is in high-performance light-weight alloys. Supply of such alloys is increasing in the aerospace industry, with aeroplanes such as the Boeing Dreamliner 787 and the Airbus A350 now incorporating up to 100 tons of vanadium per aircraft.

During August 98% V<sub>2</sub>O<sub>5</sub> flake product continues to trade between US\$6.90 - \$7.00/lb (US\$15,420/tonne; Fastmarkets Metal Bulletin). Trade remains quiet globally with supply of product largely restored and buyers having re stocked in recent months, with any excess material being sold on Chinese markets due to higher prices versus European buyers.

## BACKGROUND ON THE STEELPOORTDRIFT VANADIUM PROJECT

The Steelpoortdrift titaniferous magnetite deposit is located in the prolific Bushveld Geological Complex surrounded by known mineral and vanadium production facilities within reach of proven processing plants, railway and road options and ports.

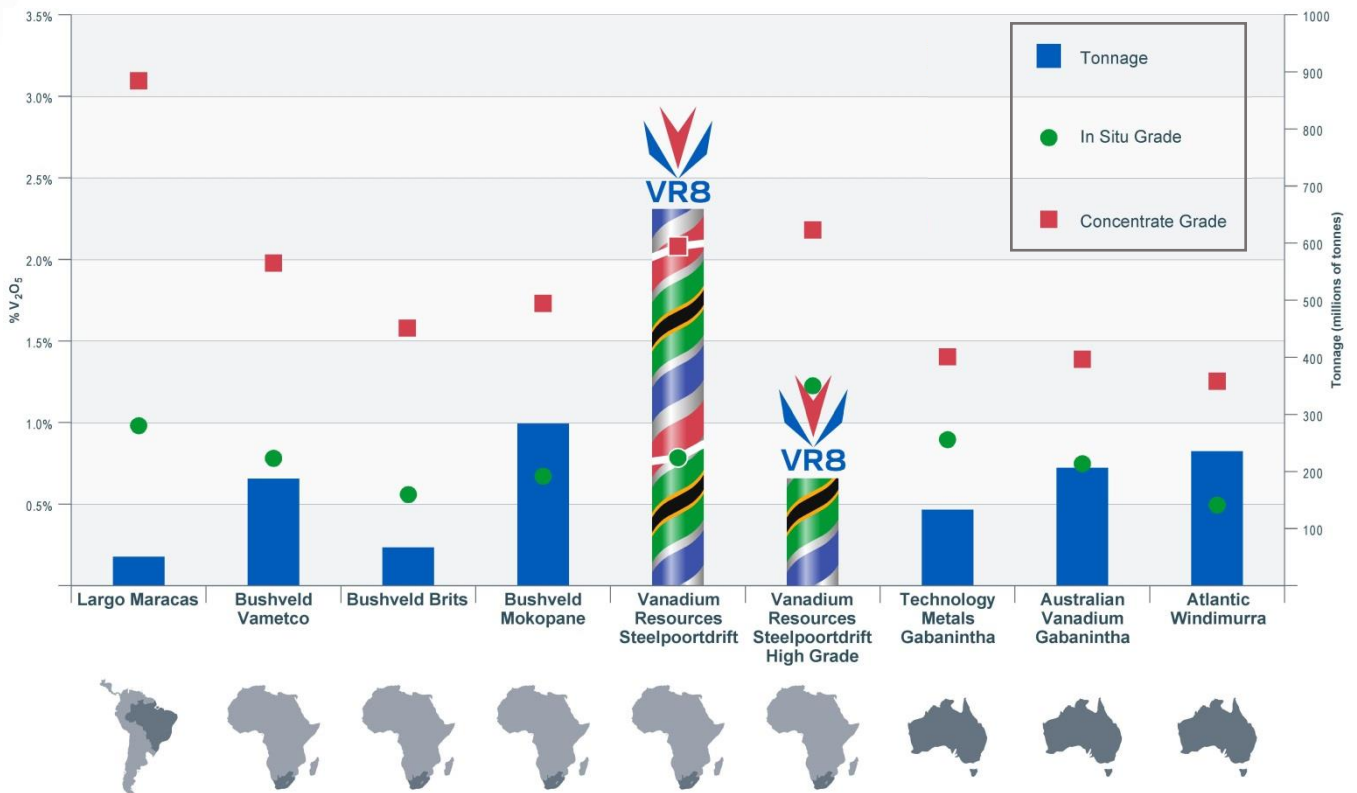
The Steelpoortdrift Vanadium project is licensed with a mining right and the Company is in the process of conducting work towards becoming fully permitted (such as acquiring a water use license) for production and towards studies to verify a pathway of options to produce high purity  $V_2O_5$  flake and other niche products from the suite of elements present in the Titano-magnetite (V, Ti and Fe). The current Scoping Study aims to demonstrate the viability of producing high purity  $V_2O_5$  flake from the Project.

The Steelpoortdrift Vanadium Project compares highly favourably to other vanadium deposits globally (Figure 1), as **the largest published global undeveloped Mineral Resource** (662 million tonnes at an in situ grade of 0.77%  $V_2O_5$ , defined above an in-situ grade of 0.45%  $V_2O_5$ ), as well as **the largest published high grade undeveloped resource** (188 million tonnes at an in situ grade of 1.23%  $V_2O_5$ , defined above an in situ resource grade of 1%  $V_2O_5$ , Appendix 3). A sizeable portion of this high grade resource (68Mt at 1.37%  $V_2O_5$ , Appendix 3) is hosted in a discrete, massive magnetite unit which outcrops along 4km of strike within the project area. Refer to announcement of 29 April 2020 for further detail with respect to the Mineral Resource estimated in respect of the Steelpoortdrift Vanadium Project. The Company confirms that all material assumptions and parameters underpinning the Mineral Resource Estimate reported in the market announcement dated 29 April 2020 continue to apply and have not materially changed, and that it is not aware of any new information or data that materially affects the information that has been included in this announcement.

The Steelpoortdrift Vanadium Project produces a high-quality concentrate containing approximately 2.2%  $V_2O_5$ , 12%  $TiO_2$  and 58% Fe (ASX Announcements 18 March 2019 and 24 June 2020). Studies into downstream processing of this concentrate are in progress to confirm its ability to create high value products suitable for the steel, renewable energy (VRFB battery) and industrial minerals markets. Initial roasting testwork return outstanding recoveries of almost 90% vanadium using the established salt roasting – leaching process (ASX Announcement 24 July 2020) which is used to extract vanadium in processing plants within South Africa and globally. The Study detailed in this announcement confirms the viability of producing high purity vanadium pentoxide flake from the Steelpoortdrift Vanadium Project.

**Figure 2.** Global vanadium projects categorised by resource grade and grade in concentrate.

Chart compares resources reported under different codes and companies at different stages of development as detailed in Appendix 1. Only resources with a quoted in situ grade > 0.45% V<sub>2</sub>O<sub>5</sub> are shown in figure.



## APPENDIX 1: DATA AND SOURCES FOR PEER COMPARISON (FIGURE 2)

Company	Project	Stage	Resource Category	Resource Tonnes	Resource Grade	Concentrate Grade	Information Source
<b>Largo LGO.TSX</b>	Maracas	Production	Measured, Indicated & Inferred (43-101)	49.25	0.99	3.10	43-101 Technical Report dated 26/10/2017 <a href="http://www.largoresources.com/operations/maracas-menchen-mine">http://www.largoresources.com/operations/maracas-menchen-mine</a>
<b>Bushveld BMN.LSE</b>	Vametco	Production	Indicated & Inferred	186	0.78	1.98	Competent Persons' Report on the Vametco Vanadium Mine Jan 2020 <a href="https://www.bushveldminerals.com/technical-reports/">https://www.bushveldminerals.com/technical-reports/</a>
	Brits	Development	Indicated & Inferred	66.8	0.56	1.58	Competent Persons' Report on the Brits Vanadium Project Jan 2020 <a href="https://www.bushveldminerals.com/technical-reports/">https://www.bushveldminerals.com/technical-reports/</a>
	Mokopane	Development	Indicated & Inferred	285	0.68	1.75	Mokopane PFS Study Report Jan 2016 <a href="https://www.bushveldminerals.com/technical-reports/">https://www.bushveldminerals.com/technical-reports/</a>
<b>TNG TNG.ASX</b>	Mt Peake	Development	Measured, Indicated & Inferred	160	0.28	1.20	ASX Announcement 26/03/2013
<b>King River KRR.ASX</b>	Speewah	Development	Measured, Indicated & Inferred	4,712	0.30	2.11	ASX Announcement 01/04/2019 06/11/2019
<b>Pursuit Minerals PUR.ASX</b>	Koitelainen Vosa	Development	Inferred	116.4	0.11	2.25	ASX Announcement 06/02/2019
	Airijoki	Development	Inferred	44.3	0.23	1.70	ASX Announcement 08/03/2019
<b>Australian Vanadium AVL.ASX</b>	Gabanintha	Development	Measured, Indicated & Inferred	208.2	0.74	1.39	ASX Announcement 04/03/2020, 17/03/2020
<b>Technology Metals TMT.ASX</b>	Gabaninth	Development	Indicated & Inferred	131	0.90	1.36	ASX Announcement 29/03/2019



## APPENDIX 2 – SCOPING STUDY TECHNICAL SUMMARY

### Geology and Mineral Resources

The SPD Project is located on the Eastern Limb of the Bushveld Igneous Complex (BIC), a Proterozoic aged layered igneous intrusion which is one of the largest intrusive masses remaining in the earth's crust. Vanadium mineralisation is hosted in a series of magnetite bearing layers near the contact between the Upper and Main Zone of the BIC. The Company's consultant geologists have defined a local stratigraphy for the project in which these layers have been grouped into Upper, Intermediate and Lower Zones with average thicknesses of 19, 14 and 12m respectively. At the base of the Lower Layer there is a marker horizon of massive magnetite denoted LM1A which is 1 – 2m thick.

The Mineral Resources for the Steelpoortdrift Vanadium Project are detailed in Tables A1 – A5.

**Table A1.** *Steelpoortdrift Vanadium Project Global Mineral Resource by Resource Category.*

Category	V <sub>2</sub> O <sub>5</sub> Cutoff	SG	Tonnes (Mt)	Whole Rock V <sub>2</sub> O <sub>5</sub> %	Tonnes V <sub>2</sub> O <sub>5</sub> in magnetite (kt)
<b>Measured</b>	0.45%	3.35	92	0.77	711
<b>Indicated</b>	0.45%	3.37	284	0.78	2,219
<b>Inferred</b>	0.45%	3.38	285	0.77	2,197
<b>Total</b>			<b>662</b>	<b>0.77</b>	<b>5,098</b>

**Table A2.** *Steelpoortdrift Vanadium Project Mineral Resource by Zone (Measured, Indicated & Inferred).*

Layer	V <sub>2</sub> O <sub>5</sub> Cutoff	SG	Tonnes (Mt)	Whole Rock V <sub>2</sub> O <sub>5</sub> %	Tonnes V <sub>2</sub> O <sub>5</sub> in magnetite (kt)
<b>Upper Zone</b>	0.45%	3.40	244	0.75	1,830
<b>Intermediate Zone</b>	0.45%	3.23	158	0.57	898
<b>Lower Zone (all)</b>	0.45%	3.43	260	0.94	2,414
<b>Lower Zone (LM1A only)</b>	0.45%	3.73	68	1.37	928
<b>Total</b>			<b>662</b>	<b>0.77</b>	<b>5,098</b>

**Table A3.** *Steelpoortdrift Vanadium Project Mineral Resource by Grade*

V <sub>2</sub> O <sub>5</sub> Range	Category	SG	Tonnes (Mt)	Whole Rock V <sub>2</sub> O <sub>5</sub> %	Tonnes V <sub>2</sub> O <sub>5</sub> in magnetite (kt)
> 0.90%	Measured	3.65	26	1.22	321
> 0.90%	Indicated	3.67	83	1.24	1,032
> 0.90%	Inferred	3.67	78	1.22	957
<b>Sub Total</b>	<b>&gt; 0.90%</b>		<b>188</b>	<b>1.23</b>	<b>2,309</b>
0.45% - 0.90%	Measured	3.25	66	0.59	389
0.45% - 0.90%	Indicated	3.26	201	0.59	1,187
0.45% - 0.90%	Inferred	3.28	207	0.60	1,241
<b>Sub Total</b>	<b>0.45% - 0.90%</b>		<b>474</b>	<b>0.59</b>	<b>2,818</b>
<b>Total</b>			<b>662</b>	<b>0.78</b>	<b>5,098</b>

**Table A4.** *Steelpoortdrift Vanadium Project Mineral Resource within 100m of surface by Grade*

V <sub>2</sub> O <sub>5</sub> Range	Category	SG	Tonnes (Mt)	Whole Rock V <sub>2</sub> O <sub>5</sub> %	Tonnes V <sub>2</sub> O <sub>5</sub> in magnetite (kt)
> 0.90%	Measured	3.65	22	1.22	268
> 0.90%	Indicated	3.66	53	1.19	635
> 0.90%	Inferred	3.67	52	1.19	614
<b>Sub Total</b>	<b>&gt; 0.90%</b>		<b>127</b>	<b>1.20</b>	<b>1,518</b>
0.45% - 0.90%	Measured	3.25	60	0.59	353
0.45% - 0.90%	Indicated	3.26	159	0.60	953
0.45% - 0.90%	Inferred	3.29	113	0.60	677
<b>Sub Total</b>	<b>0.45% - 0.90%</b>		<b>332</b>	<b>0.60</b>	<b>1,984</b>
<b>Total</b>			<b>459</b>	<b>0.76</b>	<b>3,486</b>

**Notes to Tables A1 – A4:** The Mineral Resource Estimate was completed using the following parameters:

- The Steelpoortdrift Vanadium Resource extends over a strike length of 4000m and has been drilled up to 150m vertically below surface (1100m down-dip);
- Mineralisation is hosted in a series of magnetite bearing layers near the contact between the Upper and Main Zone of the Bushveld Igneous Complex. These layers have been denoted the Upper, Intermediate and Lower Zones with average thicknesses of 19, 14 and 12m respectively. At the base of the Lower Layer there is a marker horizon of massive magnetite which is 2 – 3m thick and is denoted LM1A in modelling.
- 120 drillholes (79 RC and 41 diamond core holes) were used in the resource estimate representing a total of 8,762.1m of drilling. Drillholes are shown on Figure 2.4 and detailed in Appendix 2 as well as ASX Announcements of 16 April 2019 and 19 November 2019.
- 59 RC holes and 27 diamond core holes drilled by VR8 were included along with 20 RC holes and 1 diamond core hole drilled previously by Vanadium Resources (Pty) Ltd (**Vanres**) and 13 DD holes drilled by Vanadium Technology (Pty) Ltd, a subsidiary of Xstrata (**Vantech**). Drilling in the core of the deposit has been carried out at a 90m spacing with the remainder of the deposit drilled on sections spaced 150m – 200m apart, with mineralisation intersected at 150m intervals on section.
- RC drilling by VR8 and Vanres was sampled via face sampling hammer, collected by a rig mounted cyclone and split using a riffle. Diamond core drilling by VR8 sampled NQ core by splitting the core in half. Historical drilling also sampled diamond core, predominantly BQ size, by sawing in half.
- Samples were analysed at commercial laboratories (SGS, ALS) using pressed disc XRF.
- Quality control protocols for all drilling included the use of certified reference materials (CRMs), blanks and duplicates as detailed in the ASX Announcement of 29 April 2020.
- All drillholes were surveyed in both South Africa LO29 grid (WGS84 projection) and UTM Zone 35S.
- All except 2 holes were vertical. Downhole surveys have been carried to confirm no excessive deviation.
- Geological domains were constructed using the interpreted stratigraphy.
- Wireframe surfaces were constructed based on the geological interpretation. Samples within the wireframe were composited to 1m intervals.

- Block grades were estimated using interpolation of the 1m composite data by the Ordinary Kriging method. Search ellipses were set based on geostatistics with search distances ranging from 120 to 950m along strike.
- A Surpac block model was used for the estimate with a block size of 40m X by 40m Y by 5m Z, with sub-blocking to 5mX by 5m Y by 1.25m Z.
- Bulk density values used for mineralisation are detailed in the tables above. These were sourced from SG data measurements on core.
- The numbers tabulated may not sum correctly as a result of rounding.
- Diagrams of the Mineral Resource are shown below.
- The Mineral Resource has been classified as Measured, Indicated and Inferred based on data quality, sample spacing, geological understanding and geostatistical analysis as detailed below.
- Further infill drilling will increase geological and grade data quality and possibly upgrade resource categories and supply data required for higher level mining studies.

These tables and notes should be read in conjunction with the supporting information detailed in the ASX Announcement of 29 April 2020 including representative diagrams of the resource model. The Company confirms that all material assumptions and parameters underpinning the Mineral Resource Estimate reported in the market announcement dated 29 April 2020 continue to apply and have not materially changed, and that it is not aware of any new information or data that materially affects the information that has been included in this announcement.

### Mining and Production

Mining Plus Pty Ltd (Mining Plus) carried out an open pit optimisation and mining schedule study on the Mineral Resource using mining cost parameters collated by Sound Mining (Pty) Ltd from its own database. A Request For Quotation process will be run as part of the PFS to estimate mining costs with a higher degree of certainty. Non-mining costs were sourced from the expert consultants working on the study with each consultant putting forward costs relating to their own specialist discipline.

The optimisation returned a number of conceptual pit shells and while several pit shells were economically viable it was decided to select the most economically robust pit (RF2) for further pit design and mining scheduling studies (Table A5). For the mining studies a “skin” of 0.5m of waste material was added to the resource model to account for dilution due to waste or sub grade material being excavated along with mineralised material during mining. The classification of Mineral Resources within RF2 is detailed in Table A6.

**Table A5.** Detail of shell returned from open pit optimisation studies

Conceptual Shell ID	Tonnes Mineralisation (Mt)	Tonnes Waste (Mt)	Strip Ratio	LoM at 1.6Mtpa (yrs)	Contained Tonnes V <sub>2</sub> O <sub>5</sub> (kt)
RF2	85	25	0.30	53	439

**Table A6.** Mineral Resource within RF2 by Resource Category.

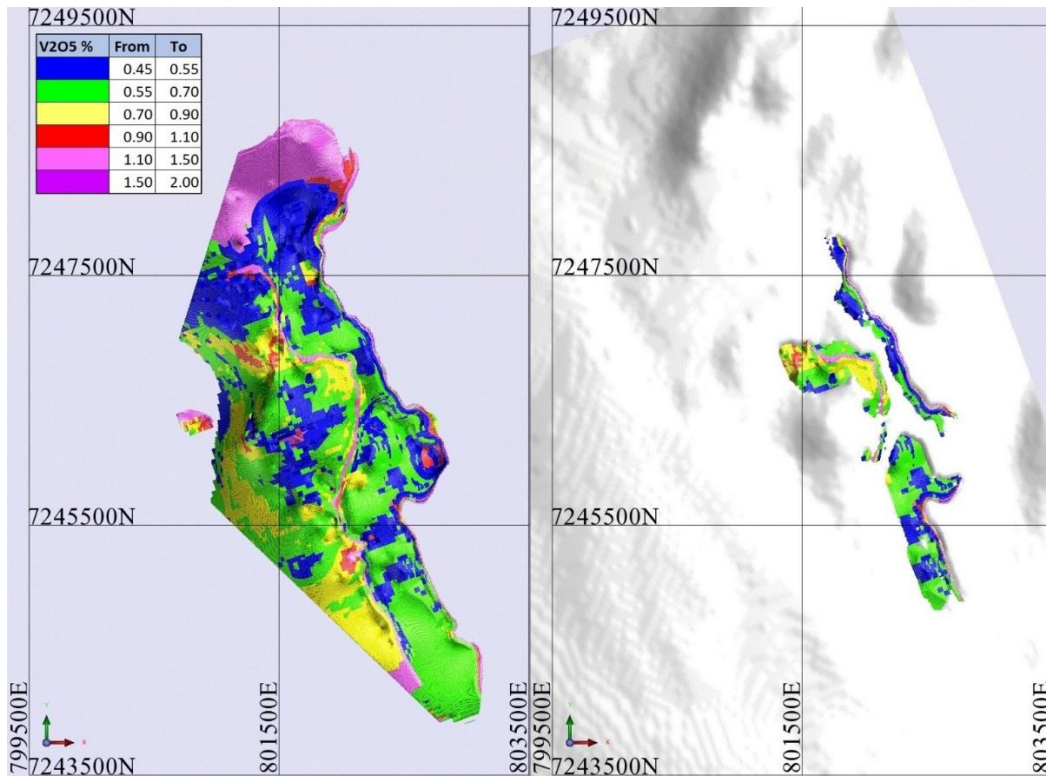
Category	V <sub>2</sub> O <sub>5</sub> Cutoff	Tonnes (Mt)	Diluted V <sub>2</sub> O <sub>5</sub> % Grade	Tonnes V <sub>2</sub> O <sub>5</sub> in magnetite (kt)
<b>Measured</b>	0.45%	18	0.78	140
<b>Indicated</b>	0.45%	30	0.75	225
<b>Inferred</b>	0.45%	4	0.66	26
<b>Total</b>		<b>53</b>	<b>0.75</b>	<b>391</b>

Overall slope design parameters were based on a preliminary review of geological structure and rock mass and pit design parameters are in keeping with established mining practice. These will be refined in the PFS and future studies.

A conceptual pit design is shown as Figure A1 and a conceptual site layout as Figure A2. The open pit design for Phase 1 contains a total of 48.5Mt of mineralisation and 18.3Mt of waste material resulting in a strip ratio of 0.47 : 1 (waste : ore) over the life of mine. Note that the material proposed to be extracted is less than that reported in the optimisation process, which is common when creating a mine design from a conceptual pit shell.

Of the 48.5Mt of potential mill feed 43.3Mt is obtained from resource material classified as Measured and Indicated. It should be noted that 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 additional Indicated Mineral Resources or that the Production Target itself will be realised. When determining the expected level of accuracy for this Study the proportion of Inferred to Measured and Indicated Resources has been taken into consideration. The Company has concluded it has reasonable grounds for disclosing a Production Target which includes 11% Inferred Mineral Resources, given the continuity observed in the Mineral Resource and that in the first seven years of production 94% of the material mined and processed is classified as Measured and Indicated.

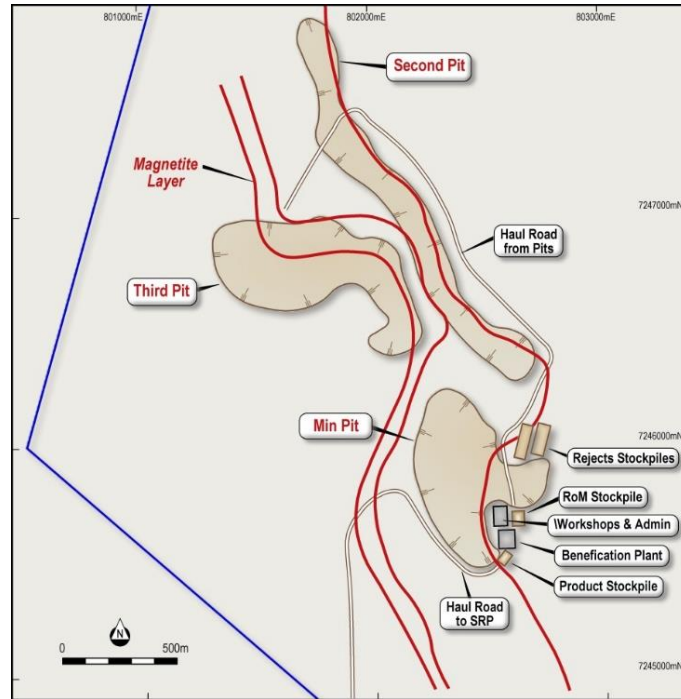
The Production Target of 48.5Mt is only 7% of the total Measured, Indicated and Inferred Mineral Resource of 662Mt. Accordingly given the size of the Mineral Resource and the tonnage which remains after mining of the Production Target it is possible that the project will be able to continue for longer than the 30 year life of mine detailed in this study. As mentioned above a number of larger pit shells were returned during the optimisation process and future studies will investigate the economics of these, and the resultant longer project timeframes in more detail, with the increased costs based on higher strip ratios and increased sustaining CAPEX to be tested against the sunk capital in the processing plant.



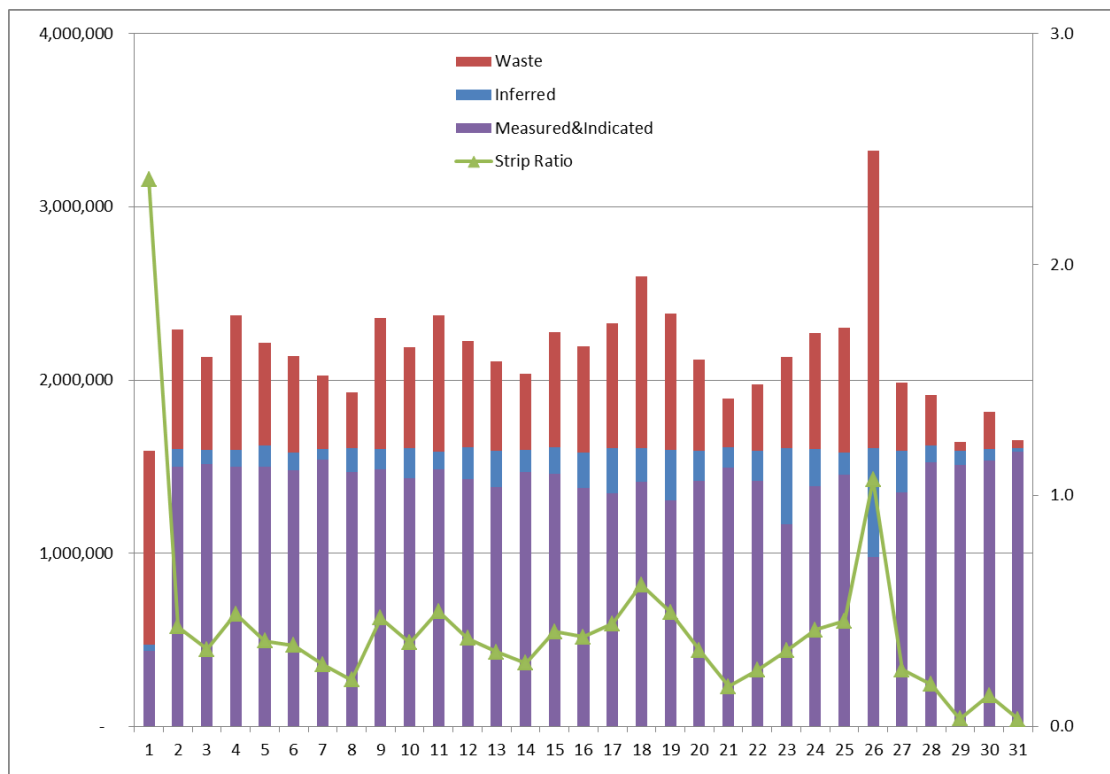
**Figure A1.** Plan view of Mineral Resource (LH) and Conceptual Pit Shell (RH)

The conceptual mine schedule for Phase 1 is shown below in Figure A3. It is assumed that the open pit mining will be completed by a mining contractor, with on-site supervision by an owners team and these inputs have been used for the financial evaluation of the project. Due to the outcropping nature of mineralisation mineralised material is mined during the first year of mining. In the financial model it is planned that mining starts during the construction of the processing plant, as soon as the beneficiation plant is operational but before the salt roasting plant is constructed and operational. This will ensure adequate stockpiles of both mineralised material and concentrate are available for commissioning and production. These pre-production mining costs are included in the financial model.





**Figure A2. Provisional Site Layout**



**Figure A3. Conceptual Mining Schedule and Strip Ratio**



## Geotechnical

No geotechnical work has been completed to date; however, based on inspection of the drill core the consultants anticipate the ground is expected to be competent and no allowance has been made to cover the risk of poor ground conditions. A geotechnical study is one of the studies to be completed as part of the PFS.

## Metallurgy and Process Design

### Metallurgical Testwork

Initial testwork focussed on achieving the highest V<sub>2</sub>O<sub>5</sub> grade into concentrate using simple beneficiation processes. Testwork was carried out by SGS and Multotec and successfully yielded concentrate grading 2.2% V<sub>2</sub>O<sub>5</sub> (Table 3.1, ASX Announcement March 2019). As part of the second phase of testwork investigations into optimising both the vanadium content and reducing the silica and alumina contents were completed. Three cleaning options using different intensities of magnetic separation were tested with best results arising from a further remilling stage followed by a final “cleaning” pass by wet low-intensity magnetic separation (LIMS). The resultant concentrate maintained a 2.2% V<sub>2</sub>O<sub>5</sub> grade but importantly both silica and alumina contents had been lowered to within acceptable tolerances. A Phase 2 concentrate sample was then submitted to Mintek to test the amenability of the Steelpoortdrift concentrate to the established salt roast – leach method for extracting vanadium.

**Table A6.** Concentrate results from cleaner trials

Trial Process	V <sub>2</sub> O <sub>5</sub> %	TiO <sub>2</sub> %	SiO <sub>2</sub> %	Al <sub>2</sub> O <sub>3</sub> %	Fe %
Concentrate Phase 1	<b>2.19</b>	12.0	<b>3.25</b>	4.82	<b>54.6</b>
Concentrate Phase 2	<b>2.16</b>	12.3	<b>1.18</b>	3.44	<b>58.3</b>

The concentrate was roasted in the presence of Na<sub>2</sub>CO<sub>3</sub> and Na<sub>2</sub>SO<sub>4</sub> to convert the vanadium in the concentrate into a water soluble sodium metavanadate (NaVO<sub>3</sub>). A total of three baseline tests were conducted in duplicate; thus, six tests were completed. The duplicate, A and B, results for each test were averaged to provide the expected vanadium extraction for each set of roasting conditions. Method 3 was selected for use in this study due to the use of Na<sub>2</sub>SO<sub>4</sub>, which is able to be recovered elsewhere in the process and returned to the kiln, thereby reducing reagent costs. The average vanadium extraction / recovery via roasting is therefore 87.3%. The process for impurity rejection (Si and Al), AMV/ APV precipitation and V<sub>2</sub>O<sub>5</sub> flake production post roasting is well established in peer reviewed extractive metallurgy literature (for example Goso et. al., 2016<sup>1</sup>). Accordingly for recovery of 87.3% V recovery in the leaching stage, a cumulative recovery of 81.5% is modelled for the entire salt roast and leaching process from concentrate to production of V<sub>2</sub>O<sub>5</sub> flakes.

<sup>1</sup> XC Goso, H Lagendijk, M Erwee and G Khosa, “Indicative vanadium department in the processing of titaniferous magnetite by the roast-leach and electric furnace smelting processes”, Proceedings of the Hydrometallurgy Conference 2016, Cape Town, South Africa, 2016, pp 69-80

**Table A7.** Extraction results from roasting trials

	Salt Dosage (wt%)		Roasting Temperature (°C)	Vanadium Extraction (%)
	Na <sub>2</sub> CO <sub>3</sub>	Na <sub>2</sub> SO <sub>4</sub>		
<b>Method 1</b>	6.0		1100	<b>89.1</b>
<b>Method 2</b>	6.0		1150	<b>88.4</b>
<b>Method 3</b>	5.1	1.2	1150	<b>87.3</b>

*NB: 2 trials completed for each method, average extraction results presented.*

### **Process Design and Costing**

The processing facility for the Steelpoortdrift Vanadium Project consists of a mineral concentrator with associated services and utilities, and a separate processing plant to carry out the roasting, leaching and production of V<sub>2</sub>O<sub>5</sub> flake. This method is used in other vanadium operations in South Africa and globally.

METS South Africa (Pty) Ltd designed the concentrator facility in detail using its experience in design and construction of similar facilities in South Africa resulting in the CAPEX being able to be costed at a robust level. The facility comprises three stage crushing followed by dry magnetic separation to reject coarse waste material, then ball milling of the upgraded material with wet magnetic separation to produce a refined concentrate.

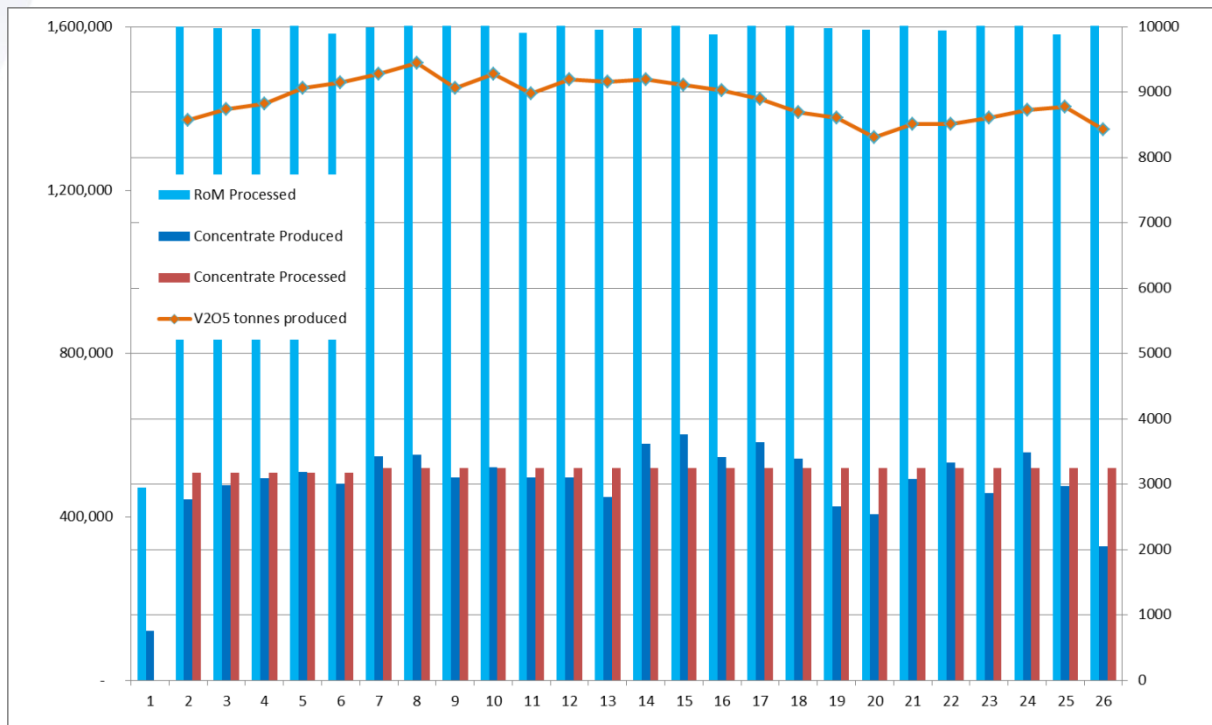
The beneficiation plant is anticipated to take 9 – 12 months to construct with the milling circuit the longest lead item.

To estimate the capital required for the salt roasting plant quotes for the key items of equipment were sourced directly from the equipment suppliers and manufacturers (OEMs). Costs for minor equipment, civil and earthworks, structural steel, piping and pipework and other services were built up by ENC Minerals from a database of costs derived from design and construction of similar facilities in South Africa in consultation with METS and Les Ford. The costs sourced from direct quotes make up approximately 55% of the total construction and installation cost estimate.

The salt roasting plant is anticipated to take 24 months to construct before commissioning with the kiln being the longest lead item.

On top of these construction and installation costs an EPCM cost of 12% for project management and supervision was added, and then a further 15% contingency was added on to the total given the level of the study. The resultant costs were incorporated into the financial model for the Scoping Study.

Figure A4 shows the processing physicals and resultant V<sub>2</sub>O<sub>5</sub> production.



**Figure A4.** Conceptual Processing Schedule and V<sub>2</sub>O<sub>5</sub> production

## Location and Infrastructure

### Freight

The Steelpoortdrift Vanadium Project is located near the town of Steelpoort in the Limpopo Province of South Africa. The project area is well served with national highways providing access to the region and numerous sealed roads in the area of the project. Established unsealed roads provide access into and across the Project area and these roads will be upgraded in width, water run-off channels and improved surface area to provide access from the open pit to the plant site. The Company will construct a short, 1km long-haul road to connect the concentrator site with the closest sealed road. This will enable haulage of product to the plant site or to customer, railhead, or port. The sites being considered for the salt roast plant are all located on sealed roads.

Rail infrastructure is present near the project area with sidings at Steelpoort, Burgersfort (Apiesdoring) and Roosenekal. Initial discussions were held with Transnet in 2019 regarding all three locations.

A preliminary 'expression of interest' Request for Quotation (RFQ) was sent to a number of transport companies during 2019 who returned comprehensive combinations of road and rail solutions to the various export ports (Maputo, Durban and Richards Bay) as well as details to enable robust estimations of transport costs to other locations. There are many highly competent and reputable local transport and logistics businesses capable of delivering these services.

### **Power**

The Scoping Study assumes that the process plant will be run by grid power and includes estimates of the cost to connect the mine site and the process plant to the grid. Grid power in the area of the Steelpoortdrift Vanadium Project is provided by the state electricity supplier Eskom. The Company has communicated with Eskom representatives in the area and understands the process and protocols of obtaining the requisite power to site. There is an established Eskom process of obtaining an application for power take-off which includes scoping and costing of the work to be undertaken (by Eskom). The actual works can be undertaken by the company once Eskom have confirmed the requirements. There are alternative power solutions under consideration should the application and construction process take longer than forecast. These will continue to be investigated in future studies into the Project.

### **Water**

The De Hoop dam is located 15km from the project area and raw water pipelines run adjacent to the project. The Company has also applied for a Water Usage License to enable it to abstract water from boreholes in the Project area as an alternative source of water. The process plant design incorporates a dewatering facility to remove water from residues for re-use as process water. The cost of this facility is included in the CAPEX estimate, as well as the costs of connecting to available water sources.

### **Services and Accommodation**

It is anticipated that the open-pit mining will be carried out by a mining contractor. The contractor will require workshops and administration buildings to be constructed on site along with the haul roads. It is considered that these buildings will be temporary installations rather than permanent structures and costing has been estimated on that basis. The cost of establishing these structures has been included in the CAPEX estimate.

The Study intends that the mining and beneficiation (crushing, milling and magnetic separation) activities occur on site with the processing and refining (salt roasting and leaching) to be carried out at another site near to the mine and in a more suitable location for processing activities and tailings storage. It is anticipated that administration, finance and HR functions will be run out of offices at the process plant. For the minesite the intention is to construct these G&A facilities as temporary installations initially.

Several potential sites of sufficient size for the plant, tailings infrastructure and supporting facilities have been identified within a 20km radius of the minesite. Discussions have been held with the owners of the two sites, both of which are ideally situated and optimally suited for the location of the salt roasting plant.

Labour, services and accommodation are all available in the communities adjacent to the Steelpoortdrift Vanadium Project. Support services are also established in Steelpoort, 10km from the project, which provides support services to established chrome and platinum mines in the Steelpoort area.

### Tailings and Waste Management

Due to the simple beneficiation process the residues from the concentrator contain solely waste rock and no reagents or harmful materials. The process plant design incorporates a dewatering facility to remove water from residues for re-use as process water. The residues will then be stockpiled in accordance with environmental best practise away from drainage systems. The cost of creating these stockpiles has been included in the operating expenditure for the processing facility as detailed below.

For the salt roasting plant, the leach and calcine tailings will need to be stored in an appropriate facility managed under the appropriate regulations. An initial estimate of the cost of establishing such a facility has been included in the pre-production Capital Expenditure for the project. The Company has obtained quotes from reputable environmental engineering consultants to complete detailed design and costing for this facility which will form part of the PFS.

### Water Management

The site will be managed in accordance with the existing Environmental Management Plan to ensure that mining activities do not interfere with drainage systems, and no materials, residues or run-off from mine infrastructure is released into the drainage systems. As detailed above, the Company will use available resources to supply water as much as possible and minimise new extraction of water. Water will be re-used and recycled at all stages of the processing flowsheets.

### Environmental, Community and Permitting

Tenure over the Project comprises a single, granted Mining Right over the farm Steelpoortdrift KT365 which expires on 4th September 2048. The Company has the right to acquire 73.95% of the Project via acquisition of interest in Vanadium Resources (Pty) Ltd (**VanRes**), the holder of the Mining Right (refer ASX Announcements 22 March 2018 and 18 July 2018). The Company currently owns 50% of the Project, with an entitlement to move to 73.95% upon receipt of approval for a change in control of VanRes upon receipt of approval from the Department of Mineral Resources under section 11 of the Mineral and Petroleum Resources Development Act. VanRes is in the process of applying for the approval and anticipates that it will be received within 6 months.

As part of the Mining Right application Vanadium Resources (Pty) Ltd submitted an Environmental Management Plan and Social & Labour Plan to ensure local communities and other stakeholders benefit from the project, as well as protecting sites of environmental and cultural significance. As part of the grant of the Mining Right these plans were approved by the Department of Mineral Resources. Vanadium Resources, as the operator of the project, is working under both of these Plans and will continue to do so in the construction and operation of the various aspects of the Steelpoortdrift Vanadium Project. The Company will also regularly review and update these plans in line with current best practise.

The Company will need to complete its application for a Water Usage License to enable the use of water in processing and mining as well as the creation of stockpiles on the project area. The Company completed the requisite studies and community consultation for this application in 2019 and will submit the application once detailed site layout plans are completed.

## Financial Evaluation

A financial evaluation for Phase 1 was completed using the Production Target of 48.5Mt of potential mill feed at a strip ratio of 0.47 : 1 (waste : ore) over a study period of 25 years.

### Life of Mine Financials

The forecast financial results for the 25 years of operation are summarised in Table A8 and detailed in subsequent sections.

**Table A8.** Key Financial Results (within +/- 35% accuracy)

Study Outcomes	US\$M
Revenues	US\$ 3,335 M
Operating Costs	US\$ 1,435 – 1,579 M
CAPEX : pre-production	US\$ 161 - 188M
: sustaining	US\$ 1.5M / 2yrs
<b>LoM Project Cash Flow (pre-tax)</b>	<b>US\$ 1,554 – 1,697M</b>
Royalties at 2% ( <i>actual royalties calculated on EBIT</i> )	US\$ 68M
Company tax ( <i>estimated</i> )	US\$368 - 401
<b>LoM Project Free Cash Flow</b>	<b>US\$ 1,186 – 1,295 M</b>

### Capital Expenditure

The pre-production capital expenditure for Phase 1 is detailed in Table A9.

The capital cost estimate for the processing plant was completed as discussed reflecting the assumptions and parameters outlined in the Scoping Study and inclusive of costs associated with EPCM contractors, residue stockpiles, waste management and access to power and water. The estimate for the capital cost relating to the mining operation was based on quotes received by the Company. The Company has added a 15% contingency to cover unforeseen capital items and cost overruns / escalations.

Sustaining capital is estimated at US\$1.5M every second year of operation with the maintenance of plant facilities being included in the Operating Cost Estimate, resulting in a total estimated cost of US\$14.9 million over the life of mine.



**Table A9.** Pre Production Capital Expenditure Estimate

Area	US\$M	Proportion
Mine Site, Pre-Strip and Stockpile	14.0	9 %
Processing Plant	80.6	50 %
Tailings Dam	30.0	19 %
Site Infrastructure, utilities and services	14.7	9 %
Construction/Support/Equipment/Consumables	18.2	11 %
Financing costs	4.0	3 %
<b>Sub Total</b>	<b>US\$ 161.5 M</b>	
<b>Contingency (15%)</b>	<b>US\$ 24.2</b>	
<b>Total</b>	<b>US\$ 185.7 M</b>	
<b>Sustaining CAPEX (LoM)</b>	<b>14.9</b>	

### Operating Cost Estimate

The Project has an estimated C1 cash cost based on mine gate sales of US\$3.07 per lb V<sub>2</sub>O<sub>5</sub> produced as detailed in Table A10 and in subsequent sections. As discussed the operating costs have been presented as a range to provide an appropriate level of accuracy for the study. Costs include both fixed and variable costs.

**Table A10.** Operating Cost Estimate

Area	US\$ / RoM t	US\$ / lb V <sub>2</sub> O <sub>5</sub>	Proportion
Mining	5.2 – 5.7	0.42 – 0.46	14 %
Beneficiation	6.4 – 7.0	0.52 – 0.57	18 %
Salt Roasting Plant	17.8 – 19.6	1.45 – 1.60	50 %
G & A, Environmental, Social	6.6 – 7.2	0.54 – 0.59	18 %
<b>Sub Total</b>	<b>35.9 – 39.5</b>	<b>2.93 – 3.22</b>	
<b>Royalties</b>	<b>0.3</b>	<b>0.14</b>	
<b>Total</b>	<b>US\$ 36.2 – 39.8 / t</b>	<b>US\$ 3.07 – 3.37/ lb</b>	

### **Mining Cost Estimate**

Mining costs were based on contractor mining at prevailing rates in South Africa as provided by Sound Mining (Pty) Ltd (in ZAR) and include waste rock movement as well as haulage between beneficiation plant and salt roasting plant. Prices were separated into fixed (cost per annum) and variable (cost per tonne material mined) with a ratio of 32% fixed costs to 68% variable.

### **Processing Cost Estimate**

Process plant operating costs were provided in ZAR by ENC Minerals (Pty) Ltd based on the specifications of the beneficiation plant designed by Mets SA (Pty) Ltd, the specifications of the salt roasting plant supplied by Les Ford and costs sourced from other, similar, projects in South Africa. Reagent costs were sourced from suppliers where possible. The costs are based on a designed throughput rate of 1.6Mtpa for the beneficiation plant and 520,000tpa for the salt roasting plant with the plant operation being 16 hours per day, 360 days per year. Prices

were separated into fixed (cost per annum) and variable (cost per tonne material processed) with a ratio of 12% fixed costs to 88% variable. The process plant operation costs include costs for the dewatering and stockpiling of residues as detailed in the Tailings Management section above.

#### ***Environmental, Social, General and Administration Costs***

General and Administration costs included marketing costs, nominally estimated at 2.5% of gross revenue, along with other costs such as administration, logistics, freight and insurances estimated at US\$0.2/lb of V<sub>2</sub>O<sub>5</sub> produced. This level of detail is considered appropriate for a scoping level study. For the Environmental and Social areas costs include programmes contemplated in the Social & Labour Plan along with monitoring and management costs for the Environmental Management and Social & Labour plans as detailed in the Environmental Access & Community sections. Preliminary estimates conducted by consultants totalled US\$2.65 million per annum for these areas.

#### **Exchange Rate, Taxation and Royalties**

All capital and operating costs are presented here in US dollars. The majority of operating costs associated with the project will be levied in South African Rand whilst the capital costs are likely to be split between Rand and US dollars. A long term exchange rate of ZAR16 to US\$1 has been assumed based on long term forecasts in recent public domain analyst reports. This exchange rate is believed to be conservative as the prevailing mid market rate in mid August 2020 was 17.3 : 1. The rand traded in a range between 16.5 and 17.5 ZAR to 1 USD during the period this study was undertaken (June – August 2020) and is forecast to remain in a similar range.

It should be noted that estimated rand prices in both OPEX and CAPEX tend to reflect equivalent US dollar prices, so that changes in the exchange rates are usually accompanied by a proportional increase in the ZAR price of the required goods or services, albeit with a variable time lag. For this reason, the model has been compiled in US dollars, to minimise exchange rate volatility. It also explains why the model NPV demonstrates relative insensitivity to exchange rate variations.

In South Africa mining companies pay corporate income tax at the same rate as other companies, being 28% on taxable profit. Capital expenditure is allowed to be 100% deducted against mining profits for the year, limited to those profits, with the balance being carried forward to the following tax year. A 4 year tax holiday, as outlined in the relevant legislation, has been used in the current cash flow model for the project.

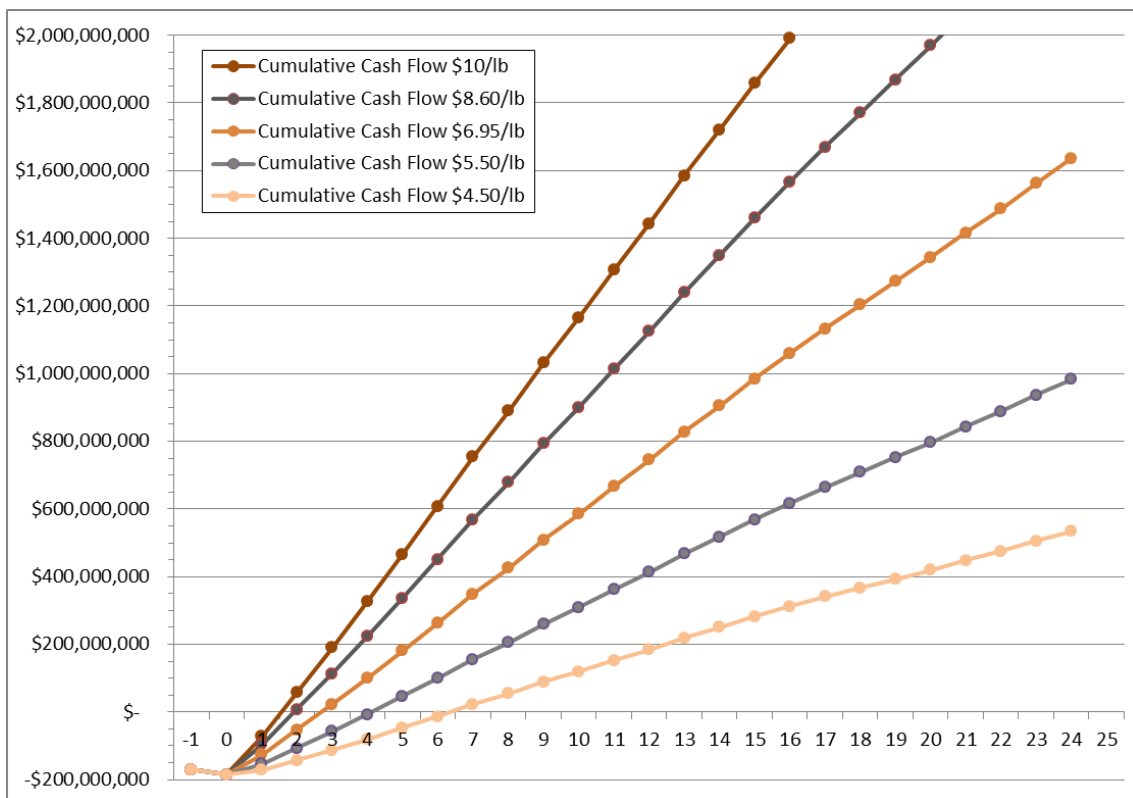
In terms of the Mineral and Petroleum Resources Royalty Act of 2008, a royalty is payable on the gross sales during a year of assessment in accordance with a formula. In respect of vanadium pentoxide the formula is  $0.5 + \text{EBIT} / (\text{gross sales} \times 12.5) \times 100$ . Earnings before interest and taxes for vanadium pentoxide are defined as the aggregate of gross sales during a year of assessment and the recoupment amount allowed to be deducted from income in respect of the use of assets or expenditure incurred to recover and develop mineral resources to a refined condition less amounts deductible (or that would have been deductible) from income in respect of assets used or expenditure incurred to win, recover and develop refined mineral resources. For the purposes of the scoping study model, a royalty of 2% over gross earnings was used over the study period.

**Commodity Pricing**

Independent concentrate pricing forecasts have not been obtained for this scoping level study. The price of +98% V2O5 is published regularly by commodity traders and industry research groups and the Company has maintained a subscription to Fast Markets Metal Bulletin to monitor prices. Pricing forecasts have also been sourced from reputable industry commentators such as Terry Perles from TTP Squared. Based on these the Company has used a price of US\$6.95 / lb in this study, being the mid point of the current 98% V2O5 price quoted on an fob China basis (US\$6.90 – US\$7.00 / lb). This price is also consistent with the long term median V2O5 price (US\$6.90). Table A11 below shows the resultant project NPVs at the long term mean vanadium price (US\$8.61/lb) as well as recent price lows of US\$5.50 and US\$6/lb. Figure A5 shows the effects of price on the forecast project cash flows (on a cumulative basis). It is encouraging to note the project remains profitable across this range of prices.

**Table A11.** Sensitivity of NPV<sub>8%</sub> to different vanadium prices

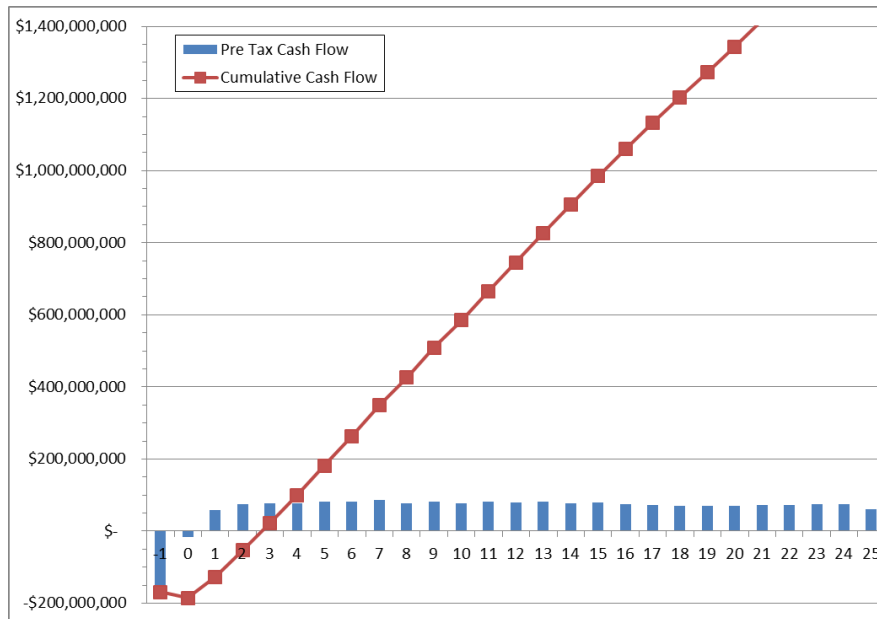
Price (US\$ / lb)	US\$4.50	US\$5.50	US\$6.00	US\$6.95	US\$8.60	US\$10.0
NPV <sup>8%</sup> (OPEX = US\$3.07/lb)	US\$61M	US\$199M	US\$269M	US\$401M	US\$629M	US\$825M
NPV <sup>8%</sup> (OPEX+10% = US\$3.37/lb)	US\$20M	US\$158M	US\$227M	US\$359M	US\$587M	US\$781M



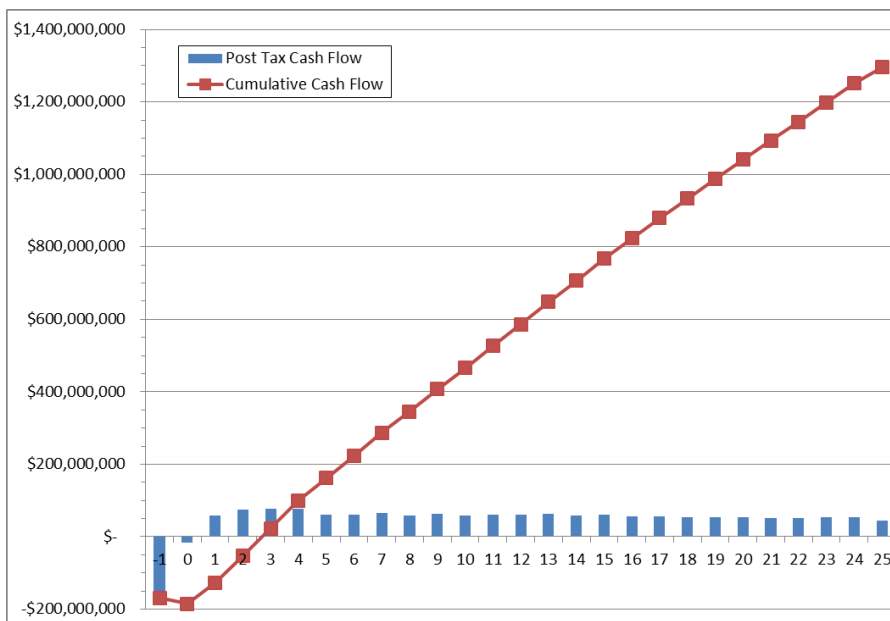
**Figure A5.** Forecast project cash flows at different vanadium prices (cumulative)

**Life of Mine Cashflows**

Figures A6 and A7 show the forecast pre- and post-tax cashflows based on the financial model.



**Figure A6.** Forecast Pre-Tax Cashflows for the Steelpoortdrift Vanadium Project



**Figure A7.** Forecast Post-Tax Cashflows for the Steelpoortdrift Vanadium Project

## Project Funding

Based on the Scoping Study results and forecast future demand for vanadium, there are reasonable grounds to believe that the Steelpoortdrift Vanadium Project can be financed in future. It is most likely that any financing would be undertaken via a combination of debt and equity.

Under current conditions, debt may be secured from several sources including banks with appetite for project financings in South Africa, resource credit funds, offtaker prepayment / debt financing, Nordic Bonds, and/or export credit agency (ECA) financing. It is difficult to finance metals that cannot be easily hedged with banks and for this reason, along with the size and volatility of the vanadium market, debt financiers will require the Project to secure long term offtake agreements for the majority of production together with a floor price or agreed price path. On this basis, it is likely that the Steelpoortdrift Vanadium Project will require appropriate long term offtake agreements to enable it to engage with a range of potential debt and strategic equity financiers to provide funding.

On this basis the Company has recently engaged Pelagic Resources Group Ltd (Pelagic) under a mandate to assist the Company to source a strategic investment in the Company. Such an investment would then see Pelagic granted marketing rights over products from the Project. The willingness of Pelagic to enter into this agreement has given the Company grounds to believe that such an investor can be identified.

There are several factors that will influence the ability of the Company to secure funding including (but not limited to) a requirement to have completed feasibility studies to a higher level of confidence (ie PFS or DFS), a requirement to have entered into “bankable” offtake agreements and favourable prevailing market conditions (being both the vanadium market and the wider equity and debt market). It may also be necessary and/or desirable to have an offtake partner invest directly in the Company or the Project.

It is likely that funding may be dilutive to, or otherwise affect the value of the Company’s existing shares.

It is possible that the Company could pursue other strategies to provide alternative funding options including undertaking a corporate transaction, seeking a joint venture partner or asset sales.

The Scoping Study is a project level study and consequently the sources, forms and costs of the capital required to develop the mine have not been accounted for in calculating the financial returns demonstrated by the Scoping Study. As a result, the Company does not consider it appropriate to report a value per share in connection with the scoping study. An indicative IRR has been shown to give an idea of how gearing may change the returns from the project; however this is for illustrative purposes only.

### **Implementation and Schedule**

The Company is currently pursuing binding offtake agreements with a number of interested parties. In concert with securing offtake it will seek and evaluate potential options for financing for the pre-production capital expenditure. While the Company believes that financing and offtake negotiations will be completed within 12 months, it cautions that these negotiations are by their nature unpredictable and their duration may be longer than expected especially if there are adverse changes to the vanadium price and equity markets or other unforeseen circumstances.

Once construction commences, it is anticipated that the initial concentrate can be produced from the Project within 12 months following purchase and installation of the beneficiation plant. Production of vanadium flake is anticipated to occur within 2 years of commencement of construction of the salt roast plant. The above timeframes are based on current equipment availability and construction timeframes for similar projects in the region.



### APPENDIX 3.

The following Table sourced and modified from the JORC Code (2012) is provided as advised in the ASX Scoping Study Interim Guidelines.

#### Section 4 Estimation and Reporting of Ore Reserves modified for a Scoping Study which includes an approximate Production Target and/or Forecast Financial Information.

#### No JORC Code (2012) Ore Reserves are being reported.

(Criteria listed in the preceding sections, contained in the ASX Announcement of 29 April 2020, also apply to this section)

Criteria	JORC Code explanation	Commentary
<b>Mineral Resource estimate for conversion to Ore Reserves</b>	<ul style="list-style-type: none"> <li>• <i>Description of the Mineral Resource estimate used as a basis for the conversion to an Ore Reserve.</i></li> <li>• <i>Clear statement as to whether the Mineral Resources are reported additional to, or inclusive of, the Ore Reserves.</i></li> </ul>	<ul style="list-style-type: none"> <li>• No JORC (2012) Ore Reserve estimate has been classified or reported.</li> <li>• The preliminary production target is based on the Mineral Resource for the Steelpoortdrift Vanadium Project of 662Mt at 0.77% V<sub>2</sub>O<sub>5</sub>, classified in the Measured, Indicated and Inferred categories and reported in the ASX Announcement of 29 April 2020.</li> <li>• The Competent Person for the Mineral Resources is Mr Kerry Griffin of Mining Plus Pty Ltd.</li> </ul>
<b>Site visits</b>	<ul style="list-style-type: none"> <li>• <i>Comment on any site visits undertaken by the Competent Person and the outcome of those visits.</i></li> <li>• <i>If no site visits have been undertaken indicate why this is the case.</i></li> </ul>	<ul style="list-style-type: none"> <li>• No JORC (2012) Ore Reserve estimate has been classified or reported.</li> <li>• The following persons have contributed to the Scoping Study: <ul style="list-style-type: none"> <li>➤ Mr Bill Oliver (Vanadium Resources) – Mr Oliver has visited site and understand details associated with the site setting and location.</li> <li>➤ Mr Jurie Wessels (Vanadium Resources) – Mr Wessels has visited site and understand details associated with the site setting and location.</li> <li>➤ Mr Nico Denner (GEMECS) – Mr Denner is responsible for the drilling, sampling, has visited site and understand details associated with the site setting and location.</li> <li>➤ Mr Kerry Griffin (Mining Plus) – Mr Griffin is the Principal Resource Consultant responsible for the estimation and classification of Mineral Resources. Mr Griffin has visited site and understand details associated with the site setting and location.</li> <li>➤ Mr John Battista (Mining Plus) – Mr Griffin is the Principal Mining Consultant who has coordinated the mining and resource optimisation work associated with the Scoping Study. Mr Battista has not visited site and has completed work based on information provided by VR8 and other consultants.</li> <li>➤ Mr Eugene Nel (ENC Minerals) – Mr Nel is the Metallurgical Consultant who has supervised the</li> </ul> </li> </ul>

Criteria	JORC Code explanation	Commentary
		<p>metallurgical study testwork and process flow design completed as part of this Scoping Study. Mr Nel has visited site and understand details associated with the site setting and location.</p> <ul style="list-style-type: none"> <li>➤ Mr Les Ford – Mr Ford is the Study Manager who has coordinated the design and capital and operating cost estimates for the processing facility deemed to be required as part of this Scoping Study. Mr Ford is familiar with the site and understand details associated with the site setting and location.</li> <li>➤ Mr James Wilson – Mr Wilson is a geologist who formerly worked as Technical Director for a resources investment fund. Mr Wilson has built the financial model for the Scoping Study based on inputs supplied by the Consultants listed above. Mr Wilson has not visited site and has completed work based on information provided by VR8 and other consultants.</li> </ul>
<b>Study Status</b>	<ul style="list-style-type: none"> <li>• <i>The type and level of study to enable Mineral Resources to be converted to Ore Reserves.</i></li> </ul>	<ul style="list-style-type: none"> <li>• The study presented is a Scoping Study and accordingly an Ore Reserve is not being reported.</li> <li>• The Scoping Study has been prepared to an accuracy of +/- 35% using Measured, Indicated and Inferred Mineral Resources, appropriate mine planning and modifying factors have been applied commensurate to a Scoping Study level of accuracy and are deemed to have reasonable prospects of being technically achievable and economically viable.</li> <li>• Section 4 of the JORC Code (2012)'s Table 1 is being completed for this announcement to enable material modifying factors and assumptions underpinning the conceptual Production Target and their link to the forecast financial information to be disclosed in an appropriate manner for investors.</li> <li>•</li> </ul>
<b>Cut-off parameters</b>	<ul style="list-style-type: none"> <li>• <i>The basis of the cut-off grade(s) or quality parameters applied.</i></li> </ul>	<ul style="list-style-type: none"> <li>• The breakeven cut-off grade was used. This was calculated internally by NPV Scheduler for each individual block model cell. Material is classified as ore if revenue exceeds processing costs. Processing costs in NPV Scheduler are inclusive of all additional ore mining costs.</li> </ul>
<b>Mining factors or assumptions</b>	<ul style="list-style-type: none"> <li>• <i>The method and assumptions used as reported in the Study (i.e. either by application of appropriate factors by optimisation or by preliminary or detailed design).</i></li> <li>• <i>The choice, nature and appropriateness of the selected mining method(s) and other mining parameters including associated</i></li> </ul>	<ul style="list-style-type: none"> <li>• No JORC (2012) Ore Reserve estimate has been classified or reported.</li> <li>• The SPD Vanadium Project outcrops at surface therefore open pit mining was chosen as the mining method.</li> <li>• Datamine mining software and NPV Pit Scheduler was used to generate a series of potentially viable open pit shells based on the Mineral Resource, preliminary cost inputs for mining and processing and recovery and sale price of concentrate.</li> </ul>

Criteria	JORC Code explanation	Commentary
	<p><i>design issues such as pre-strip, access, etc.</i></p> <ul style="list-style-type: none"> <li><i>The assumptions made regarding geotechnical parameters (e.g. pit slopes, stope sizes, etc.), grade control and pre-production drilling.</i></li> <li><i>The major assumptions made, and Mineral Resource model used for pit and stope optimisation (if appropriate).</i></li> <li><i>The mining dilution factors used.</i></li> <li><i>The mining recovery factors used.</i></li> <li><i>Any minimum mining widths used.</i></li> <li><i>The manner in which Inferred Mineral Resources are utilised in mining studies and the sensitivity of the outcome to their inclusion.</i></li> <li><i>The infrastructure requirements of the selected mining methods.</i></li> </ul>	<ul style="list-style-type: none"> <li>Inter ramp wall angles were set at 40° in oxide and 55° in fresh.</li> <li>Dilution and mining losses were modelled by adding a “skin” of waste to the resource model.</li> <li>The minimum mining width matched the resource block size at 5m.</li> <li>Resource material classified as Inferred makes up 11% of the entire Phase 1 LoM Production Target, with the first eight years containing only 6% Inferred material.</li> <li>The mining method has assumed the use of an open pit mining contractor. The contractor will require workshops and administration buildings to be constructed on site along with haul roads. It is anticipated that these buildings will be temporary installations rather than permanent structures.</li> </ul>
<p><b>Metallurgical factors or assumptions</b></p>	<ul style="list-style-type: none"> <li><i>The metallurgical process proposed and the appropriateness of that process to the style of mineralisation.</i></li> <li><i>Whether the metallurgical process is well-tested technology or novel in nature.</i></li> <li><i>The nature, amount and representativeness of metallurgical test work undertaken, the nature of the metallurgical domaining applied and the corresponding metallurgical recovery factors applied.</i></li> <li><i>Any assumptions or allowances made for deleterious elements.</i></li> <li><i>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.</i></li> <li><i>For minerals that are defined by a specification, has the ore reserve estimation been based on the appropriate mineralogy to meet the specifications?</i></li> </ul>	<ul style="list-style-type: none"> <li>The metallurgical process is illustrated in the body of the ASX release. Conventional crushing, grinding and magnetic separation techniques will be used to produce a mineral concentrate. This concentrate will then be roasted in the presence of salt to form water-soluble sodium metavanadate, from which vanadium pentoxide can be extracted. These methods are appropriate for the mineralisation at the Steelpoortdrift Vanadium Project.</li> <li>The processing techniques are all well tested techniques currently in use in similar operations in South Africa and globally.</li> <li>Metallurgical testwork results were reported in ASX Announcements dated 24 June 2020 and 24 July 2020. These represented bulk sample / plant simulation trials utilising full core samples from wide diameter core drilling.</li> <li>Sighter testwork was previously carried out on full core samples from drilling at the project. Drill core was selected to ensure representative samples of weathered vs fresh, also samples from the different geological zones (UMZ, IMZ, LMZ) were tested. Extensive Davis Tube testwork has been completed on samples from drillholes across the deposit.</li> </ul>
<p><b>Environmental</b></p>	<ul style="list-style-type: none"> <li><i>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</i></li> </ul>	<ul style="list-style-type: none"> <li>The Mining Right which forms the Steelpoortdrift Vanadium Project has an approved Environmental Management Plan which the Company will monitor its activities to ensure compliance with.</li> <li>The Company has applied for a Water Usage License to abstract</li> </ul>

Criteria	JORC Code explanation	Commentary
	<i>considered and, where applicable, the status of approvals for process residue storage and waste dumps should be reported.</i>	ground water if needed for mining and processing operations.
<b>Infrastructure</b>	<ul style="list-style-type: none"> <li><i>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.</i></li> </ul>	<ul style="list-style-type: none"> <li>Infrastructure is discussed in the body of the ASX release.</li> <li>There is a substantial amount of regional infrastructure which can be accessed to assist the commencement of operations at the Steelpoortdrift Vanadium Project.</li> <li>The Company is designing its operations to have minimal impact on the surrounding communities and its activities. No houses or other buildings will need to be moved or disturbed as a result of the Company's activities. Rezoning of certain areas is in progress.</li> <li>The Company has entered into a Land Use Agreement with the relevant community authorities and will pay appropriate compensation for land usage.</li> </ul>
<b>Costs</b>	<ul style="list-style-type: none"> <li><i>The derivation of, or assumptions made, regarding projected capital costs in the study.</i></li> <li><i>The methodology used to estimate operating costs.</i></li> <li><i>Allowances made for the content of deleterious elements. The derivation of assumptions made of metal or commodity price(s), for the principal minerals and co-products.</i></li> <li><i>The source of exchange rates used in the study.</i></li> <li><i>Derivation of transport charges.</i></li> <li><i>The basis for forecasting or source of treatment and refining charges, penalties for failure to meet specification, etc.</i></li> <li><i>The allowances made for royalties payable, both Government and private.</i></li> </ul>	<p><u>Conceptual CAPEX Assumptions:</u></p> <ul style="list-style-type: none"> <li>The CAPEX for the beneficiation plant was costed based on a detailed Mechanical Equipment List. The CAPEX for the salt roast plant (SRP) was based on quotations received from original equipment manufacturers (OEMs) for supply of key equipment, with costs for installation, electrical, piping, pipework, structural steel and other plant construction items based on costs at similar operations in South Africa. Approximately 55% of the CAPEX for the SRP is derived from direct quotes. Mining CAPEX was based on establishment quotes received from open pit mining contractors.</li> <li>Life of Mine of 30 years with financial model created for initial 25 years.</li> <li>Targeted accuracy of +/- 35% inclusive of appropriate contingency.</li> </ul> <p><u>Conceptual OPEX Assumptions:</u></p> <ul style="list-style-type: none"> <li>OPEX costs for the scenario were estimated using a combination of costs built up from first principles, quotations received from contractors and benchmarking against similar activities in mining projects in South Africa.</li> <li>Base currency is South African Rand (ZAR) with an exchange rate of 16 : 1</li> <li>Commodity price assumptions are discussed in "Revenue Factors" below</li> <li>Royalties are based on the formula as defined in the South African Royalties Act (2010) linked to the Minerals and Petroleum Resources Development Act (MPRDA 2002). This is</li> </ul>

Criteria	JORC Code explanation	Commentary
		<p>discussed in the announcement. A 2% royalty has been assumed for the life of the project.</p> <ul style="list-style-type: none"> <li>All estimates presented here are for the total project.</li> </ul>
<b>Revenue Factors</b>	<ul style="list-style-type: none"> <li>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.</li> <li>The derivation of assumptions made of metal or commodity price(s), for the principal metals, minerals and co-products.</li> </ul>	<ul style="list-style-type: none"> <li>The sale price has been based on current prices for vanadium pentoxide (f.o.b. China) as quoted by Fastmarkets Metal Bulletin.</li> <li>The Company has not established any contracts or committed any of its production pursuant to off-take agreements at this time.</li> <li>Prices are in US\$, therefore the ZAR : USD exchange rate assumption of 16 : 1 detailed above is also applicable to this section.</li> </ul>
<b>Market Assessment</b>	<ul style="list-style-type: none"> <li>The demand, supply and stock situation for the particular commodity, consumption trends and factors likely to affect supply and demand into the future.</li> <li>A customer and competitor analysis along with the identification of likely market windows for the product.</li> <li>Price and volume forecasts and the basis for these forecasts.</li> <li>For industrial minerals the customer specification, testing and acceptance requirements prior to a supply contract</li> </ul>	<ul style="list-style-type: none"> <li>Publically available analyst reports continue to forecast a supply deficit for vanadium for the short to medium term future.</li> <li>No formal customer or competitor analysis have been completed at this stage.</li> <li>The Company and its consultants are in contact with a number of potential customers.</li> <li>The specification planned to be produced and sold (98% vanadium pentoxide flake) is a standard industry specification.</li> </ul>
<b>Economic</b>	<ul style="list-style-type: none"> <li>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.</li> <li>NPV ranges and sensitivity to variations in the significant assumptions and inputs.</li> </ul>	<ul style="list-style-type: none"> <li>The inputs to the NPV estimations are tabulated in the body of the ASX release.</li> <li>The NPV has been determined using the Discounted Cash Flow method of valuation. For the Scoping Study a discount rate of 8% was applied. <ul style="list-style-type: none"> <li>The financial model is in real terms.</li> <li>The model was based on yearly increments</li> <li>No escalation was applied.</li> <li>The Project was valued as a single tax entity, being the South African company owning the Mining Right.</li> <li>Royalties were set at the formula applicable for unrefined minerals</li> <li>South Africa corporate tax rate was applied (28%)</li> <li>NPV ranges and sensitivity analysis is presented in the body of the announcement</li> </ul> </li> </ul>



Criteria	JORC Code explanation	Commentary
<b>Social</b>	<ul style="list-style-type: none"> <li>The status of agreements with key stakeholders and matters leading to social licence to operate.</li> </ul>	<ul style="list-style-type: none"> <li>The Company has a social license to operate based on the Social and Labour Plan which was approved as part of the grant of the Mining Right to Vanadium Resources (Pty) Ltd. The Company has a commitment to adhere to this Plan and also continuously review and improve it to ensure best practises are adhered to and stakeholders are receiving benefits both directly and indirectly from the Project.</li> </ul>
<b>Other</b>	<ul style="list-style-type: none"> <li>To the extent relevant, the impact of the following on the project and/or on the estimation and classification of the Ore Reserve</li> <li>Any identified material naturally occurring risks.</li> <li>The status of material legal agreements and marketing agreements.</li> <li>The status of governmental agreements and approval 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 of 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.</li> </ul>	<ul style="list-style-type: none"> <li>Ore Reserves have not been classified and reported .</li> <li>No natural occurring risks have been identified</li> <li>All material legal agreements are current and active, under which VR8 has a right to own 73.95% of the Project. VR8 is awaiting consent under section 11 of the MPRDA to move from 50% to 73.95%.</li> <li>No marketing agreements are in place at this stage.</li> <li>The Mining Right is current and valid. Applications for water usage license and rezoning are in progress and not expected to affect the timelines outlined in the release.</li> </ul>
<b>Classification</b>	<ul style="list-style-type: none"> <li>The basis for the classification of the Ore Reserves into varying confidence categories.</li> <li>Whether the result appropriately reflects the Competent Person's view of the deposit.</li> <li>The proportion of Probable Ore Reserves that have been derived from Measured Mineral Resources (if any).</li> </ul>	<ul style="list-style-type: none"> <li>Ore Reserves have not been classified and reported.</li> <li>Section 4 of Table 1 contained in the JORC Code (2012) is being completed for this announcement as part of the Scoping Study requirements to disclose a conceptual Production Target estimate linked to forecast financial information.</li> </ul>
<b>Audits or reviews</b>	<ul style="list-style-type: none"> <li>The results of any audits or reviews.</li> </ul>	<ul style="list-style-type: none"> <li>No audits or reviews have been conducted.</li> </ul>
<b>Discussion of relative accuracy/ confidence</b>	<ul style="list-style-type: none"> <li>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</li> </ul>	<ul style="list-style-type: none"> <li>Ore Reserves have not been classified and reported.</li> <li>The level of accuracy for the Scoping Study is + / - 35%</li> <li>The level of confidence for the estimates used in the</li> </ul>



Criteria	JORC Code explanation	Commentary
	<p><i>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 that could affect the relative accuracy and confidence of the estimate.</i></p> <ul style="list-style-type: none"> <li><i>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.</i></li> <li><i>Accuracy and confidence discussions should extend to specific discussions of any applied Modifying Factors that may have material impact on viability, or for which there are remaining areas of uncertainty at the current study stage.</i></li> <li><i>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.</i></li> </ul>	<p>conceptual production schedule is below that required for reporting Ore Reserves under the JORC Code (2012).</p> <ul style="list-style-type: none"> <li>The Life-of-Mine (LOM) Production Target used in the Scoping Study comprises 89% in the Indicated Mineral Resource category and 11% in the Inferred Mineral Resource category. The Company believes it is appropriate to use the Inferred Mineral Resource as part of the Production Target given the consistency and continuity of the mineralisation. The level of accuracy above has considered the presence of Inferred material in the Study.</li> <li>More advanced studies are planned as part of the continued development of the project.</li> </ul>