ARROWHEAD
BUSINESS AND INVESTMENT DECISIONS

Due Diligence and Valuation Report

Arrowhead Code:	14-06-01
Coverage reinitiated:	January 22, 2024
This document:	January 22, 2024
Fair share value bracket:	AUD 0.16 – AUD 0.46
Share price (January 22, 2023):	AUD 0.047

Analysts

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Company:	Vanadium Resources Limited
Ticker:	ASX: VR8; FRA: TR3
Headquarters:	Australia
Executive Chairman:	Mr. Jurie Wessels
MD & CEO:	Mr. John Ciganek
Website:	https://vr8.global/

Market Data[i]

52-Week Range:	AUD 0.039 – 0.105
Average Daily Volume (3M Avg.):	309,326
Market Cap (January 22, 2023):	AUD 26.3 million (mn)

Company Overview: Vanadium Resources Limited (Vanadium Resources or VR8) is an Australian company based in South Africa that specializes in the production and processing of vanadium. The company is focused on developing its flagship projects – the Steelpoortdrift Project (Steelpoortdrift) and the Tweefontein Project (Tweefontein) (collectively, the Project)– which are strategically located 15 km apart within the Eastern Bushveld Igneous Complex in the Limpopo Province, South Africa. VR8 holds an 86.49% share in Vanadium Resources (Pty) Limited ("VanRes"), which owns the Steelpoortdrift Project and associated Mining Right. It is anticipated that Tweefontein will be wholly owned by VR8 upon completion of a transaction in terms of which the Tweefontein property is acquired by VR8's subsidiary. VR8 intends to produce vanadium rich concentrate from Steelpoortdrift that will be transported to the Salt Roast Leach (SRL) Plant at Tweefontein where it will be processed to produce Vanadium Pentoxide (V_2O_5).

According to the DFS, completed in October 2022, the SRL plant will produce an average of 10,700 tpa of V_2O_5 flake (capacity of ~12ktpa) during phase 1 at the lowest quartile cash cost of USD 3.24 per pound of V_2O_5 (the current European Spot Price for 98% V_2O_5 is USD 6.53/lb V_2O_5 after a recent 3-year low of USD 5.66/lb V_2O_5). Production is scheduled to commence in H2 2026. In phase 2 of operations, the average production rate will increase to 21,000tpa of V_2O_5, which is equivalent to 10% of the global demand in 2022 of 205kt of V_2O_5, with demand expected to grow to 310kt of V_2O_5 by 2035.

The company is listed on the Australian Securities Exchange (ASX: VR8) and the Frankfurt Stock Exchange (FRA: TR3).

Key Highlights: (1) In April 2022, VR8 updated its mineral resource estimate (MRE) to 680 million tonnes (Mt) at an average in-situ grade of 0.70% V_2O_5 at a cut-off grade of 0.45% V_2O_5, including measured mineral resources of 145 Mt, at an average of 0.72% V_2O_5; **(2)** In October 2023, the company increased its interest in Steelpoortdrift to 81.90% by acquiring Obeec's 7.95% interest in VanRes. It further increased its interest in Steelpoortdrift by 4.59% to 86.49% in November 2023, by acquiring Math-Pin's interests; **(3)** VR8 completed the project's definitive feasibility study (DFS) in October 2022, which confirmed Steelpoortdrift as one of the world's largest and highest-grade vanadium deposits with robust economics providing a post-tax Net Present Value (NPV) (at 7.5% discount rate) of USD 1.21 bn, an Internal Rate of Return (IRR) of 42%, 27-month payback based on a pre-production capex of USD 211 mn and an initial 25-year mine life (180+ year life of Mineral Resource); **(4)** In May 2023, VR8 completed an AUD 5.91 mn strategic equity placement, at a 40% premium of AUD 0.11 per share, to Matrix Resources (Zhejiang) Co., Ltd (Matrix), for an interest of 9.99% in VR8; **(5)** In August 2023, VR8 commenced front end engineering and design (FEED) work with the purpose of drawing up tenders for each part of the Project, and seeking to award tenders and finalise contracts in H2 CY2024.

Key Risks: (a) VR8 requires substantial funds for the construction of the Steelpoortdrift mine and concentrator, and the Tweefontein SRL operations; **(b)** The Project's profitability depends mainly on the price of vanadium. Any prolonged unfavorable vanadium price movements could materially reduce cash generation from the project (despite VR8's lowest quartile costs).

Valuation and Assumptions: Based on our due diligence and valuation estimates, Arrowhead believes Vanadium Resources' fair market value per share is AUD 0.16 to AUD 0.46, derived using relative valuation methodology.

See important disclosures on page 37 of this report

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1. Investment Thesis

Arrowhead is initiating coverage of Vanadium Resources Limited (ASX: VR8) with a fair value of AUD 0.16 per share in the low-bracket scenario and AUD 0.46 per share in the high-bracket scenario, derived using relative valuation methodology.

Incorporated in 2017, VR8 is an ASX-listed junior vanadium mining company focused on developing its flagship projects Steelpoortfdrift and Tweefontein (collectively, the Project) located in the Bushveld Complex of Limpopo Province, South Africa, which is home to around 35 mining operations held by major mining companies. The DFS demonstrated excellent economics due to competitive capex and opex metrics. The company has a c. 86.49% holding in this Project, which has one of the highest grades and largest underexplored vanadium deposits globally. The company intends to provide critically needed V_2O_5 supply to the steel and energy storage sectors with this Project, becoming a significant primary producer.

High-grade concentrate to result in strong economics from the Steelpoortdrift Project

The Steelpoortdrift Project is expected to produce high-grade vanadium concentrate of 2.1% V_2O_5, which is one of the highest concentration grades available globally. This will allow for greater recoveries, lower throughput rates and ultimately, lower operating costs than many other vanadium projects globally. The results of the DFS have demonstrated a strong economic outcome for this deposit owing to competitive opex and capex metrics. The DFS model estimated an $NPV_{(7.5\%)}$ or USD 1.21 bn with a post-tax IRR of 42% and life of mine (LOM) EBITDA of USD 5.2 bn, assuming a vanadium flake price of USD 9.5/lb. Due to the increase in the company's stake in the project on November 15, 2023, to 86.49%, the company's share in NPV has increased to USD 1.05 bn. The operating expenditure of production should be USD 3.24/lb, owing to the low strip ratio of 0.88x (waste:ore) and because the mineralization outcrops at the surface and dips shallowly (~10º), it will take less waste to mine. The Project is expected to generate annual free cashflows of USD 152 mn with a short payback period of less than 27 months.

Rising demand in the energy storage sector to drive growth in the vanadium market

The high-grade and high-quality of the vanadiferous titanomagnetite (VTM) present at Steelpoortdrift will enable the production of high-grade vanadium pentoxide (V_2O_5) from Tweefontein for downstream processing. V_2O_5 is appropriate for producing value-added specialist vanadium products suitable for the steel, industrial minerals markets and renewable energy (VRFB battery). Vanadium is a key metal used in VRFBs, which are a viable option for large-scale energy storage. These batteries have a lifespan of over 20 years with no degradation in performance over time. The durable and reusable nature of VRFBs makes for a sustainable energy storage solution, which adds to its value proposition. Further, these batteries are non-inflammable and non-toxic, making them safer than other batteries on the market. With no performance loss in harsh conditions and 100% depth of discharge available, they are more reliable. Generally, the capital cost of installing VRFB is higher than for lithium batteries as shown in Exhibit 1, where the capital cost of VRFB is USD 301 per KWh, compared to USD 253 per KWh for Lithium-ion batteries. However, given that vanadium electrolyte can be fully reused or recycled at the end of battery lifespan, the overall energy cost of vanadium batteries is lower by c. 30%, i.e. (USD 593 vs. USD 405 KWh). Global annual VRFB project deployment revenue is projected to grow from USD 856.4 mn in 2022 to USD 7.76 bn by 2031, registering a strong CAGR of c. 28%. In the long run, new vanadium supplies will be required to meet this rising demand from the VRFB sector.

Exhibit 1: VRFB vs. Lithium-ion Economics[ii]

Head to Head Comparison: Lifetime Costs of a 3 MW, 8 Hour Duration System

Lithium-ion Weaknesses

- Power and energy coupled, creating a linear cost curve
- Experience energy loss with age and every cycle
- Primarily focused on automotive
  i.e. R&D $ toward power not cycles
- Heat causes fires and in extreme cases explosions

	Cost Projections ($ per KWHr)	Li ion	VRFB
CAPEX	DC System (cells, module, racking, BMS)	$199	**$91**
	Vanadium	**$0**	$210
	Containerization and Fire Suppression	$31	**$0**
	Initial Overbuild	$23	**$0**
	TOTAL	**$253**	$301
OPEX (NPV)	Electricity	**$138**	$177
	O&M	$51	**$27**
	Replacement and ongoing augmentation	$106	**$0**
	Liability insurance	$44	**$5**
	End of life disposal (recovery)	$3	**($105)**
	TOTAL	$340	**$104**
	Total CAPEX + OPEX	$593	**$405**

Well-established infrastructure resulting in reduced capital and time to commence production

The Project is in the Bushveld Complex of Limpopo Province in South Africa, which has well-established and well-connected infrastructure facilities such as national roads, railheads, dams, national power grid and so on within 50km of the project area. Proximity to these facilities will provide a competitive advantage to VR8, in the form of lower initial capital expenses to commence production, and fast-pace project commercialization, resulting in shorter payback period. In addition to the existing infrastructure, the company plans to install its own 5 MW photovoltaic (PV) solar farm and 1 MW Vanadium Redox Flow Battery (VRFB) at the Steelpoortdrift mine and concentrator site to help ensure an uninterrupted power supply for smooth operations and mitigate any infrastructure risk. The company is also working with Kadoma Investments (Pty) Limited (Kadoma) on developing a 35MW PV solar plant that will be located adjacent to the Tweefontein SRL site, which will also be paired with a VRFB and will supply power to the SRL site.

Decarbonization: Vanadium to be a critical energy transition metal

Vanadium has been increasingly considered as a critical mineral worldwide, given its utility in key industries such as steel, defense, electronics, energy, technology and renewable energy. About 90% of the world's vanadium production is used in the steel industry for micro-alloying to produce high-strength steel. Adding a relatively small amount of vanadium, typically 0.05%, brings about considerable improvements in yield strength of between 30-100%. It also improves the ductility and seismic performance of steel. Using higher strength steel in the construction sector, such as buildings and power, leads directly to a reduction of steel consumption, resulting in a lower global fossil carbon footprint.

It is estimated that vanadium will lead to the avoidance of an environmental burden totaling 185 mn metric tons of CO_2 on an annual basis. A 0.38% reduction in the global fossil carbon footprint is obtained through using vanadium micro-alloyed rebar steel.[iii] VRFB technology supports the global transition to clean energy and emits less CO_2 than competing storage technologies. Accordingly, vanadium has the potential to become an essential and critical metal to contribute to the United Nations' Sustainable Development Goals to build sustainable cities and communities.

Additional revenue streams

Apart from commercializing V_2O_5, VR8 is considering additional revenue streams through a residual vanadium recovery plant and potential additional products, including vanadium trioxide, ferrovanadium, titanium dioxide and ilmenite. They will also look at recovering titanium (TiO_2) from the SRL tailings. Other opportunities include exploring the VRFB potential by vertical integration, including vanadium electrolyte, battery manufacture and energy generation. This could provide flexibility to maximize sales and profit margins according to market demand.

Experienced management and board instill confidence in stakeholders

A strong and experienced management team is the foundation of any successful company. A case in point is Mr. Jurie Wessels as Executive Chairman, who is a qualified minerals lawyer and notary, and who is known as an experienced explorer-entrepreneur and mine developer of more than 27 years. He was responsible for the acquisition (in 2007) and continued exploration of Steelpoortdrift, and development of the Steelpoortdrift Mineral Resource through private and public funding. Mr. Wessels was also instrumental in the acquisition of VanRes by VR8 in 2018 and in securing funding for the project's feasibility studies. Mr. John Ciganek, MD and CEO, a qualified mining engineer with over 30 years of mining and finance experience. His experience spans mining operations, project development, project finance, offtake agreements, mergers and acquisitions and equity capital markets. He has been involved with successfully raising debt and equity funding in excess of AUD 5 bn for various clients. In August 2023, the company recruited Tim Feather as CFO to assist with offtake, debt funders and EPC contractors, which are key developmental milestones toward construction. Mr. Feather has over 25 years of experience in corporate finance with a strong focus on advising and fundraising for mining and oil and gas companies. In February 2023, the company appointed Mr. Alex Oehman as General Manager Operations with the responsibility for driving the development and operations of the Steelpoortdrift project through the stages of preparation for final investment decision (FID), construction, commissioning, production and marketing. Mr. Oehman is an experienced metallurgical engineer with experience spanning more than 25 years in the production of various Vanadium products from multiple SRL plants, most recently at VanChem (Bushveld Minerals Ltd). His knowledge and experience in the vanadium processing will be a stepping stone in the successful execution of VR8's plan going forward.

Certain risks could impede growth plans

The company is yet to secure financing for the project

The company is in the pre-revenue stage with production scheduled to commence in H2 2026. It will have to raise substantial funds to pursue its business strategy and planned capex i.e. the construction of the Steelpoortdrift mine and concentrator and the Tweefontein SRL operations and to cover pre-production operational expenses. Although the company state that it is strongly progressing toward securing binding offtake and strategic investment agreements to support project financing, it could potentially be unable to raise enough funds to meet its future requirements due to unpredictable circumstances, such as adverse market conditions and economic downturns. This could postpone or hamper the company's growth plans, leading to the delay or cancellation of certain activities or projects.

Need for regulatory approval might impede growth

Once discovered, an economically viable mineral deposit requires various approvals, consents, licenses and permits to be mined. Obtaining necessary permits and licenses can be a complex, time-consuming process. There is no assurance that necessary permits will be obtainable on acceptable terms, in a timely manner or at all. Any delay in regulatory approval or consent might impede the company's operational and financial performance and future growth plans. Future changes in applicable laws, regulations, agreements or changes in their enforcement or regulatory interpretation may create further headwinds and could result in changes to legal requirements or the terms of existing permits and agreements applicable to the group or its properties, which could materially affect project timelines.

Investment thesis conclusion

We think VR8 has a compelling opportunity to cater to the growing yet unmet demand for vanadium globally through its high-grade vanadium resources. The project's location in a region which contains some of the world's largest and highest-grade vanadium deposits and existing primary producers, along with proximity to well-established infrastructural facilities indicates a high possibility of achievement of results demonstrated by the DFS. However, its ability to finance operations and be granted regulatory approval may pose a risk.

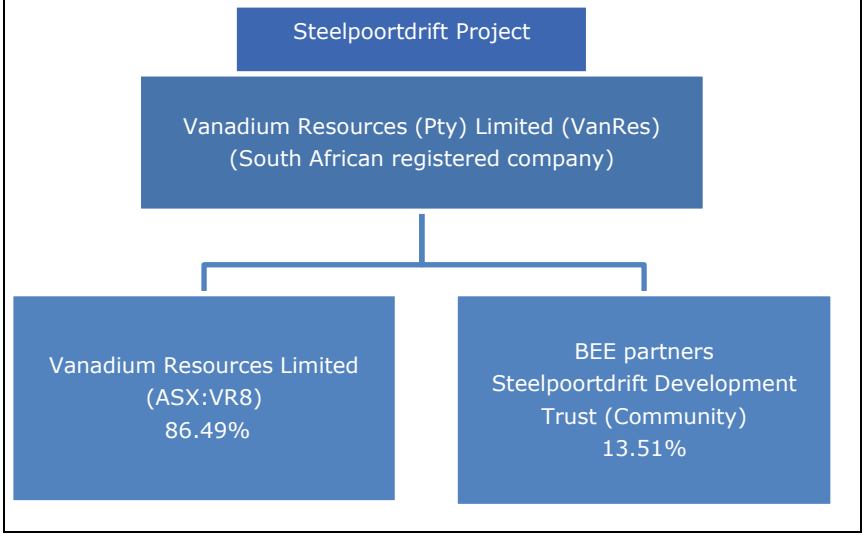
2. Business Overview

2.1 Background[iv]

VR8 is engaged in the development of mineral projects in South Africa. It is primarily focused on the production of vanadium from the Steelpoortdrift and Tweefontein Vanadium Projects, located in Limpopo Province of South Africa

VR8 recently increased its interest in the Steelpoortdrift Project by 7.95% and 4.59% (a 12.54% increase) through completion of transactions with Obeec (Pty) Ltd (Obeec) in October 2023 and with Math-Pin Trust (Math-Pin) in November 2023[v]. Accordingly, the company now holds an 86.49% share in South African registered Vanadium Resources (Pty) Limited (VanRes), beneficial holder of the Steelpoortdrift Project and associated mining right. The balance 13.51% is held by Broad Based Black Economic Empowerment (BBBEE) partners (Steelpoortdrift Development Trust, representing the local community).

Exhibit 2: Vanadium Resources (Pty) Limited Holding Structure

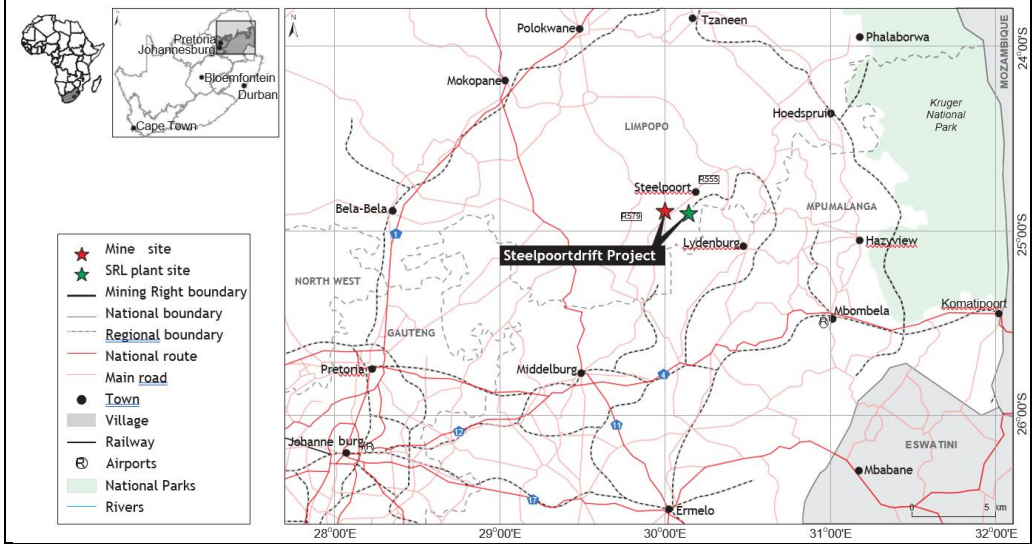


The Project is a Tier 1, licensed mining project located in the Bushveld Geological Complex, in a known mineral and vanadium producing area within reach of proven processing plants, railway and road options, ports and utilities. It is a titaniferous magnetite deposit which is host to one of the world's largest and highest-grade undeveloped vanadium deposits with a Mineral Resource of 680Mt at an average in situ grade of 0.70% V_2O_5 (4.74Mt contained metal) and Ore Reserves of 77Mt at an average grade of 0.72% V_2O_5.

To advance the Project, VR8 has been exploring offtake arrangements with various stakeholders for the supply of vanadium products. For instance, the company recently completed an AUD 5.91 mn strategic equity placement to Matrix Resources (Zhejiang) Co. Ltd (Matrix), a wholly owned subsidiary of Zhejiang Lygend Investment Co. for an interest of 9.99% in Vanadium Resources. Matrix and the company entered a non-binding memorandum of understanding for offtake of up to 40% of phase 1 production.

Vanadium Resources Limited is listed on the Australian Securities Exchange (ASX: VR8) and the Frankfurt Stock Exchange (FRA: TR3).

Exhibit 3: Steelpoortdrift Vanadium Project Location



2.2 Key Projects[vi]

VR8 is focused on developing the Steelpoortdrift and Tweefontein Vanadium Projects in Limpopo Province, South Africa. The company intends to produce a vanadium rich concentrate from Steelpoortdrift, that will be transported to the SRL Plant at Tweefontein where it will be processed to produce an average of 18,000 tonnes of V_2O_5 per annum.

2.2.1 Steelpoortdrift and Tweefontein Vanadium Projects

Overview[vii]

Steelpoortdrift is a Tier 1 project that is 86.49% owned by VanRes, a wholly owned subsidiary of Vanadium Resources Limited. It is an advanced titaniferous magnetite deposit located in Limpopo Province, South Africa. The 25 sq. km property is situated in the Eastern Limb Bushveld Igneous Complex. Most of the technical work related to the Project, such as drilling, metallurgy, hydrogeology and plant design, has already been completed and the necessary development permits for the Project have already been secured.

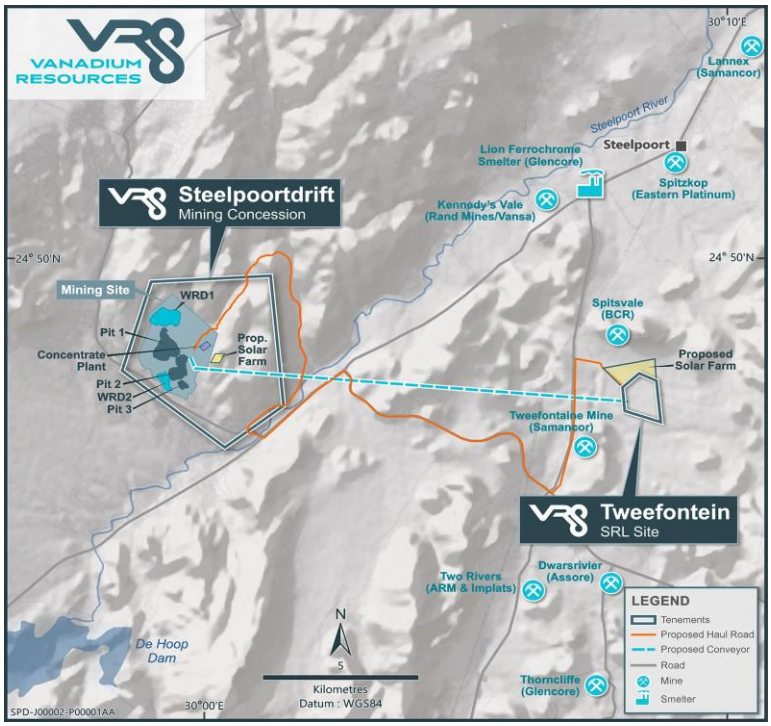
Exhibit 4: Mining Tenement Interests Held at End-June 2023 - Limpopo Region, South Africa

Permit Name	Permit Number	Registered Holder/ Applicant	Area In km²	Permit Status	Permit Expiry	Interest/ Contractual Right
Steelpoortdrift KT365	10095MR	Vanadium Resources (Pty) Ltd	24.6	Granted	04/09/2048	86.49%

Location

The Steelpoortdrift and Tweefontein Projects are located in Limpopo Province of South Africa, approximately 274km by road, northeast of the capital of Pretoria. The Project comprises open pit mining of titaniferous vanadium ore and two separate surface localities, namely the mine and concentrator site for primary treatment of the ore through an onsite concentrator using magnetic separation, and the SRL for the secondary treatment of concentrate through an SRL plant to produce a >98% V_2O_5 flake.

Exhibit 5: Mine and SRL Site Location[viii]

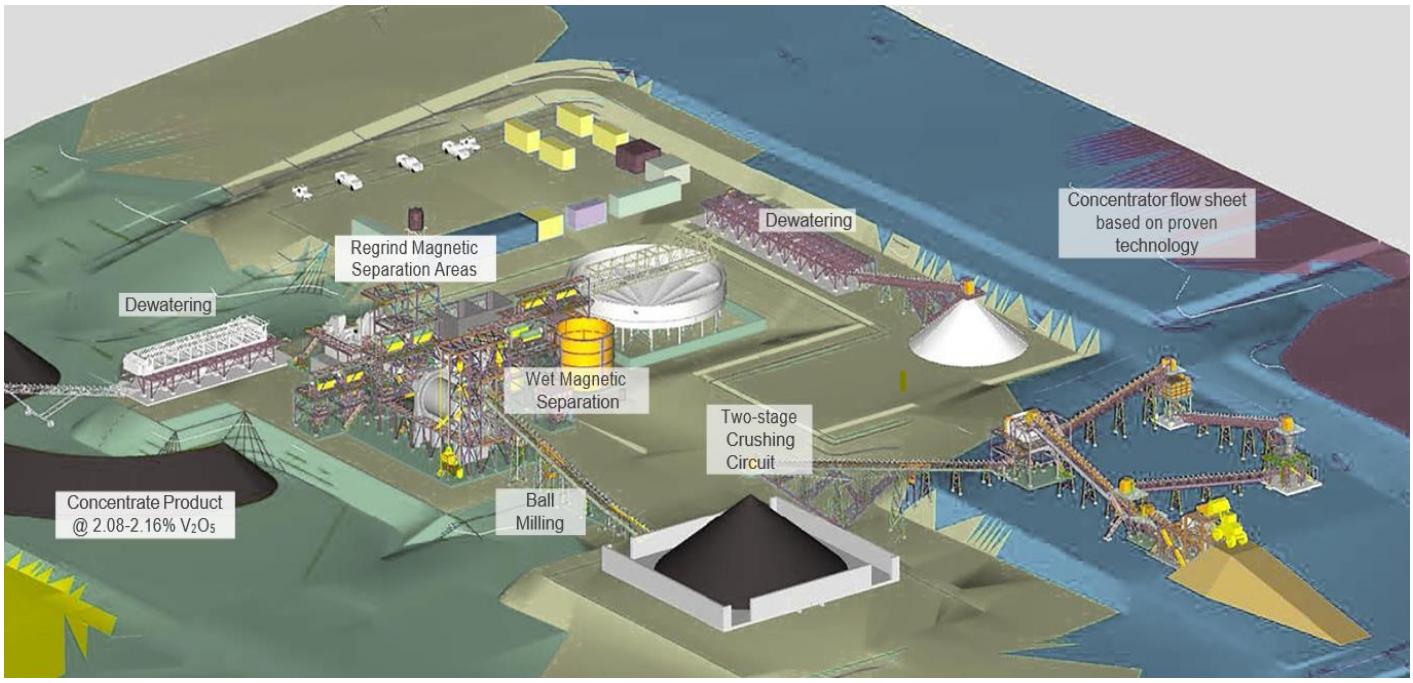


The Steelpoortdrift mine and concentrator site and the Tweefontein SRL site, located approximately 15km apart (23km by road), have been designed using established technology currently in use within the Bushveld region and internationally. Delivery of consumables and construction material to the mine site and daily personnel access, transport of the concentrate from the mine site to the SRL plant and transport of the flake product to market are the three main transport linkages required to successfully operate the Project. The transport of concentrate to the SRL site will be completed by trucks, however, the company is currently investigating the potential to use a rope conveyor to lower operating costs, reduce disruption to local communities and lower Environmental, Social and Governance (ESG) metrics.

Concentrator:

The concentrator plant consists of a two-stage crushing circuit, ball milling, wet magnetic separation, dewatering and re-grind magnetic separation areas. The plant, designed by engineering firm UMS METS SA (Pty) Limited ("UMS METS"), is based on a proven flowsheet. Construction on the concentrator plant at the mine site is scheduled to commence in H2 2024 and will continue for 12 months. The post-commissioning handover is scheduled for H2 2025. The concentrator plant will receive Run of Mine (RoM) ore at a feed rate of 208tph to produce a concentrate of 2.08-2.16% V_2O_5. The concentrator tailings storage facility (TSF) will be located at the mine site to store the concentrator tailings.

Exhibit 6: Steelpoortdrift Concentrator Flow Sheet [ix]



Concentrator water, power and offices: Water requirements, estimated at between 23,100 and 24,200m^3 per month depending on the season, will be fulfilled from the existing De Hoop dam water distribution system. Power for the mining operations and concentrator will be sourced from a 5 MW photovoltaic (PV) solar farm that will include a 1.0MW/4.0MWh vanadium redox flow (VRFB) battery energy storage system (BESS). South Africa's national power utility, ESKOM, will provide any backup power required. Temporary and permanent project offices, administration facilities, workshops, stores, offices, a satellite training facility and laboratory will also be constructed at the mine site.

SRL[x]

In August 2022, the company entered into an option agreement with Kadoma Investments Proprietary Limited (Kadoma) to acquire the 135-hectare SRL Site located within a 15km radius of the Steelpoortdrift Mine Site. This option agreement, which was valid to September 30, 2023, entitled the company to acquire the land for a total consideration of c. AUD 2.74 mn. The company is in discussions with Kadoma on extending the term of the option agreement.

This site is for the secondary treatment of concentrate through an SRL plant, designed by the engineering firm Consulmet Metals (Pty) Limited ("Consulmet"), to produce a >98% V_2O_5 flake. The SRL plant at the Tweeefontein Project will initially produce an average of 10,700t of V_2O_5 flake per annum (capacity of ~12ktpa). Once phase 2 of the operation is completed, the production rate will increase to an average rate of 21,000t of V_2O_5 per annum (capacity increases to ~24ktpa).

By locating it within a well-established mining and processing center, the SRL site reduced trucking distance by more than half as budgeted in the PFS. This should provide the advantage of having two operating sites: one focussed on mining and initial beneficiation and the other on refining and industrial production, thereby achieving optimum operational, environmental, financing and social efficiencies for its planned businesses.

The SRL plant comprises kiln roasting, leaching, desilication, AMV precipitation, flash drying and V_2O_5 flake production. It also includes evaporation and crystallization to recover Na_2SO_4 crystals for recirculation to the kiln.

The construction on the SRL plant will commence in H2 2024 and is scheduled to take 18 months to construct, with post-commissioning handover scheduled for H2 2026.

Exhibit 7: Proposed Mine Site Plan[xi]

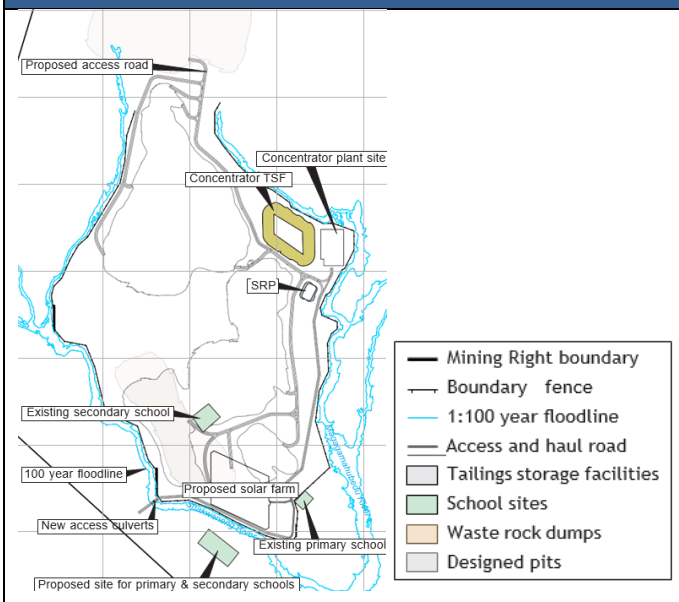
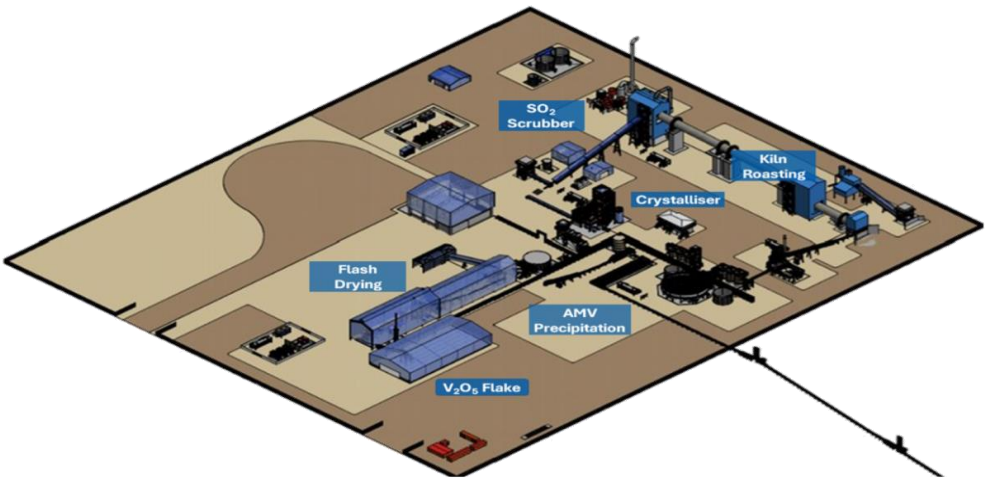


Exhibit 8: Tweefontein SRL Plant Flow Sheet[xii]



SRL Infrastructure: The SRL plant, workshops, stores administration offices, main laboratory and training center will be constructed at the site. The SRL site raw water will be obtained via a dedicated raw water pipeline through the existing Kadoma connection point to the Olifants River Water Management schemes. The required process water, estimated at 19,500 – 24,000m^3 per month depending on the season, is readily available. Power for the SRL plant and offices will be obtained via a combination of ESKOM and a utility-scale PV plant to be developed by Kadoma and its holding company, Freedom Property Fund next to the SRL site.

Infrastructure:

The concentrator/mine site and SRL sites are located within a substantial mining jurisdiction, with well-established and comprehensive infrastructure with a number of current mining and beneficiation operations. The Bushveld complex is also rich in platinum group metals (PGMs), including platinum, palladium, rhodium and chromium.[xv]

Bushveld Complex – a host to major mining companies with well-established infrastructure:

Several international mining companies such as Bushveld Minerals, Glencore, Samancor, Anglo American, Lonmin, African Rainbow Minerals and Implants, are active in the area and near existing infrastructure. The proximity of crucial infrastructure in the region, such as high-voltage power lines and sub-stations operated by the state provider ESKOM, water resources including the recently completed De Hoop Dam 10km south of the project, rail sidings and established links, sealed roads around the project area, will accelerate the production. The company will source suitable skills from the local community to support the mining, processing, engineering, and administrative functions. All these facilities and services will reduce the time and the initial capital required for production to commence.

Geology

The geology of the Bushveld complex is unique and complex. The Bushveld complex is the world's largest saucer-shaped layered igneous intrusion, which means it was a massive body of molten rock that solidified underground and formed different layers of minerals. It covers around 450km in width and 66,000km^2 in area. The complex varies in thickness, sometimes reaching 9 km.

It consists of three intrusive suites – Rustenburg Layered Suite (RLS); Rashoop Granophyre Suite; and Lebowa Granite Suite.

Exhibit 9: Proposed SRL Site Plan[xiii]

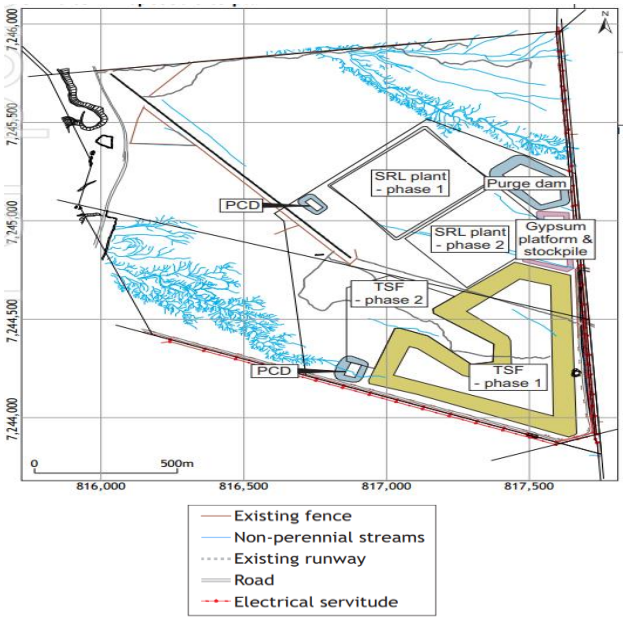
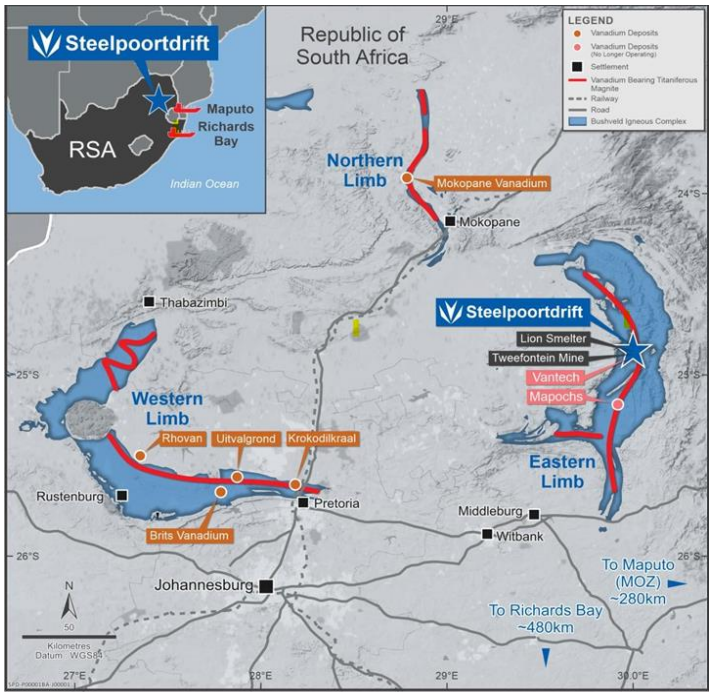


Exhibit 10: Bushveld Complex[xiv]



The RLS is the most important part for mining, as it hosts the mafic layers rich in platinum group elements (PGEs), nickel, copper, chromium and vanadium. The RLS is divided into four zones – Main Zone, Critical Zone, Lower Zone, and Upper Zone. Upper Zone is relevant to the Steelpoortdrift Project and comprises a layered succession of ferrogabbros, troctolites, anorthosites and magnetite layers.

Vast quantities of molten rock from the Earth's mantle were brought to the surface through long vertical cracks in the Earth's crust, creating this geological intrusion. Combined with the crystal fractionation of the magmas into immiscible silicates and sulfides, this formed the layering. PGEs and other metals from the melt deposited into the sulfide layers or reefs are usually gently dipping and can be traced for hundreds of kilometers.

Mineralization

Vanadium mineralization at the Steelpoortdrift Project is higher grade than most of its global peers. It is located close to the contact between the Upper Zone and Main Zone and adjacent to the Steelpoort Fault. Mineralization is hosted in VTM layers which occur at the same stratigraphic level across the entire complex and can be traced for almost 400 km. Mineralization is hosted in the following three zones, which dip shallowly (10-12 deg) to the west, which is favorable as it can be mined by open-pit techniques and requires less waste to be mined:

- the Upper Mineralized Zone (UMZ), with average thicknesses of 19m;

- the Intermediate Mineralized Zone (IMZ), with average thicknesses of 14m; and

- the Lower Mineralized Zone (LMZ), with average thicknesses of 12m.

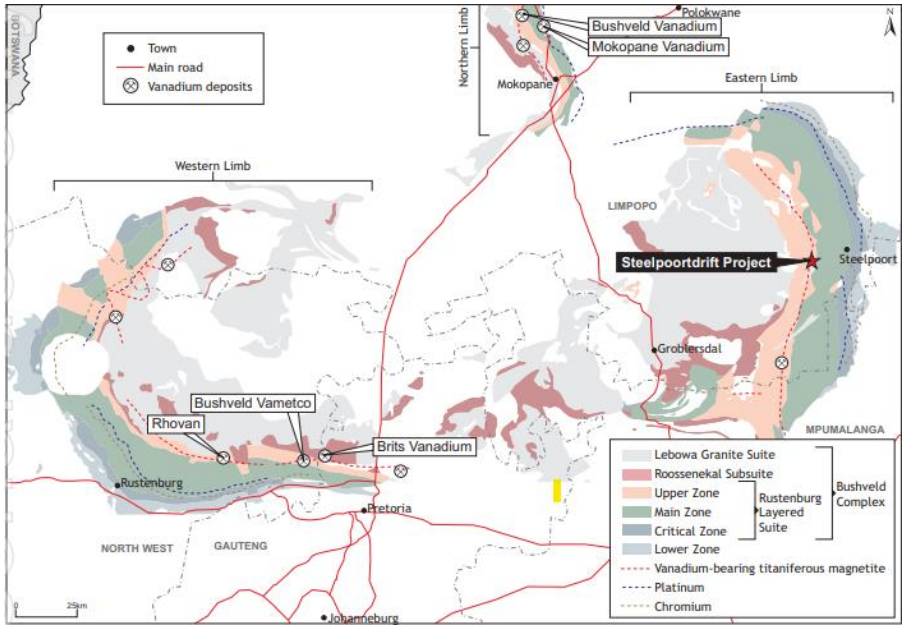
Vanadium mineralization is present to varying degrees within all zones and across all mafic lithologies.

Any material with a grade >0.45% V_2O_5 may be classed as mineralized material, with waste still carrying vanadium grade but below the economic cut off.

Drilling history

- **1996-2006**: Vanadium Technology (Pty) Limited (VanTech) conducted historical exploration and drilling on Steelpoortdrift farm, mapped the area, surveyed the magnetism, drilled 23 holes and estimated indicated mineral resources of 71Mt at 2.16% V_2O_5 grade.
- **2007-2017**: VanRes obtained prospecting rights, drilled 25 holes and estimated inferred mineral resources of 513Mt at 0.78% V_2O_5 grade.
- **2018-2022**: VanRes conducted recent exploration and drilling, used remote sensing and magnetic surveys, drilled 133 holes, added 10 holes from an interested party and estimated current mineral resources and ore reserves using best practices and analytical results.

Exhibit 11: Rustenburg Layered Suite Zones



Mineral Resource Estimation

Total Mineral Resources amount to 680Mt, averaging 0.70% V_2O_5 at a cut-off grade of 0.45% V_2O_5. The Mineral Resource has been classified in the Measured, Indicated, and Inferred categories, in

accordance with the 2012 Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves (JORC Code, 2012). The Measured Mineral Resources amount to 145Mt, averaging 0.72% V_2O_5. Indicated and Inferred amount to 327 Mt, averaging 0.70% V_2O_5, and 207Mt, averaging 0.68% V_2O_5, respectively.

Exhibit 12: Mineral Resource Estimate (JORC 2012) as of April 30, 2022: 100% Basis

Classification	Volume (M m3)	Quantity (Mt)	Quality (% V2O5 In situ)	Contained V2O5 (Mt)	Quality (% Fe2O In Situ)	Contained Fe2O (Mt)
Measured	43.77	145.46	0.72	1.05	22.47	32.68
Indicated	98.75	327.29	0.70	2.29	22.80	74.62
Inferred	63.41	207.38	0.68	1.40	22.90	47.49
Total Mineral Resource	**205.93**	**680.13**	**0.70**	**4.74**	**22.76**	**154.80**

Mineral resources are inclusive of ore reserves

Ore reserves

The Ore Reserves for the Steelpoortdrift Project amount to 77Mt at an average grade of 0.72% V_2O_5 with 30Mt proved ore reserves at an average grade of 0.70% V_2O_5 and 47Mt of probable ore reserves at an average grade of 0.72% V_2O_5.

Exhibit 13: Steelpoortdrift Project Ore Reserve (JORC 2012) as of September 30, 2022: 100% Basis

Classification	Quantity (Mt)	Quality (% V_2O_5 RoM)	Contained V_2O_5 (Mt)
Proved Ore Reserves	30.23	0.70%	0.21
Probable Ore Reserves	46.62	0.72%	0.34
Total Ore Reserves	**76.86**	**0.72%**	**0.55**

Notes: The LOM was restricted to a production forecast of 25 years, after which the mining license will need to be renewed;
39% of the ore reserves are in the proved category and no inferred mineral resources are included in the ore reserve estimate.

Project Economics[xvi]

The DFS completed in October 2022 confirmed Steelpoortdrift's potential to be a world-class, large-scale and low-cost vanadium producer with competitive opex and capex metrics. The DFS indicated a post-tax $NPV_{(7.5\%)}$ of USD 1.212 bn (attributable share of USD 1.05 bn at 86.49% ownership) with a post-tax IRR of 42% and LOM EBITDA of USD 5.2 bn. The operating expenditure of production will be USD 3.24/lb (current V_2O_5 Price = USD 7/lb).

Phase 2 or expansion capex (planned during years 3-5 of operation) of USD 188 mn will be funded through free cash flow. Due to the high-grade nature of the mineralization and the low capex requirement of USD 211 mn, the Project is forecast to generate annual free cashflows of USD 152 mn with a short payback period of less than 27 months.

The Project has the potential to sustain a lengthy LOM as the mineral resource can sustain a 183-year LOM at current design capacity.

The Project will be built in two phases, which should produce a total of 484,000t of V_2O_5 flake over a 25-year period:

Phase 1 (Years 1-4): This initial phase will have a pre-production capex of USD 211 mn and operate for the first four years based on a mining rate of 1.6Mt of vanadium ore per year at an average in situ grade of 0.83% V_2O_5, which will be processed through the concentrator and SRL plant to produce c. 12ktpa of V_2O_5 flake.

Phase 2 (Years 5-25): An additional USD 188 mn will then be funded using a combination of free cash flows and available cash to expand the plant and increase the mining rate to 3.5Mtpa of ore at an average grade of 0.71% V_2O_5 with production increasing substantially to c. 21ktpa of flake.

Exhibit 14: Summary of Discounted Cash Flow (DCF) Result			
		Inferred Mineral Resources	
Description	**Unit**	**Including**	**Excluding**
>98% V_2O_5 flake	USD/lb	9.50	9.50
$NPV_{7.5\%}$	USD mn	1,212	1,143
IRR	%	41.7	41.0
MCNCF*	USD mn	-210	-210
Payback	Months	27	27

**Maximum cumulative negative cash flow (or indicative funding requirement)*

Exhibit 15: Key Parameters and Financial Results				
			Annual Average	
Description	**Unit**	**Total LOM (25 years)**	**Phase 1 (Years 1-4)**	**Phase 2 (Years 5 - 25)**
Production				
Total ore tonnes	ROM kt	80,324	1,646	3,511
Total waste tonnes	ROM kt	70,539	456	3,272
Strip ratio	t/t	0.88	0.28	0.93
Average V_2O_5 grade	%	0.71%	0.83%	0.70%
Total V_2O_5 content	Kt	573	14	25
Total concentrate produced	Kt	29,083	724	1,247
Flake produced[1]	Kt	484.0	10.7	21.0
Financial				
Gross revenue (including payment delay)	000 USD	10,138,924	215,363	441,784
Net revenue	000 USD	9,138,065	197,085	397,606
Operating costs	000 USD	3,456,897	73,321	150,648
Operating margin	%	62%	59%	62%
Total capex	000 USD	481,677	240,971	240,705
Cumulative free cashflows after tax	000 USD	3,795,629	49,154	3,746,474
NPV 7.5%	**000 USD**	**1,212,321**		
IRR	**%**	**42**		

[1]Average flake production for four years, including the first year of production build-up

Latest developments: FY 2023

Increased project interest in Steelpoortdrift to 86.49%: In October 2023, the company increased its interest in Steelpoortdrift by 7.95% to 81.90% by acquiring Obeec's interests in VanRes. In November 2023, the company increased its interest in Steelpoortdrift by a further 4.59% to 86.49% through completion of a transaction with Math-Pin. This transaction with Math-Pin resulted in an increase in the company's share in Post Tax $NPV_{7.5\%}$ to USD 1.05 bn.

Offtake Agreements

- **Strategic placement to Matrix Resources:** In May 2023, the company completed an AUD 5.91 mn strategic placement to Matrix in addition to a four-month exclusivity, which ended in September 2023, granted to Matrix to negotiate an offtake, aimed at the Asian markets, of 40% of vanadium products produced from the Phase 1 operations of the Steelpoort Project over a 10-year term. After the expiry of the exclusivity period, VR8 and Matrix reaffirmed their commitment to seek to enter into agency and offtake agreements to achieve the outcomes envisioned in the original memorandum of understanding.

- **Other offtake agreements in progress**: The company has received multiple non-binding indicative term-sheets from North American and European groups in FY 2023. It aims to secure an agency or offtake agreement, together with a strategic equity investment for which it has entered into negotiations.

Appointment of chief financial officer and general manager operations: In August 2023, Vanadium Resources recruited Tim Feather as CFO to assist with offtake, debt funders and engineering, procurement and construction (EPC) contractors, which are key developmental milestones towards construction. Mr. Feather has over 25 years of experience in corporate finance with a strong focus on advising and fundraising for mining and oil and gas companies. In February 2023, the company appointed Mr. Alex Oehman as GM Operations with the responsibility for driving the development and operations of the Steelpoordrift Project through the stages of preparation for final investment decision (FID), construction, commissioning, production and marketing.

Project development workstreams: In FY 2023, VR8 continued to progress on various project development workstreams. For instance, the company engaged Kadoma to assist with the development of a 35MW PV solar plant adjacent to the Tweefontein/SRL site and design of the 5MW PV solar farm and 1MW VRFB at the Steelpoortdrift/concentrator site. It also commissioned an environmental impact assessment (EIA) for the proposed route of the rope conveyor with a pre-feasibility study to be launched. Front-end engineering design (FEED) commenced with design and tender packages to be finalized ahead of the FID. The project implementation plan has been updated to include a revised target for FID of H2 CY2024, with the first production in H1 CY2026.

2.2.2 Quartz Bore Cu-Zn-Pb Project

The Quartz Bore Cu-Zn-Pb Project is located in West Pilbara province, 80 km east of Roebourne in Western Australia. The project aims to discover and develop new deposits of copper, zinc, lead and other metals, as well as potential gold mineralization. The project covers a 15 km^2 area and has three main prospects: Balla Balla, East Balla and West Balla.

Exhibit 16: Mining Tenement Interests Held at the End of June 2023 - Pilbara Region, Western Australia

Permit Name	Permit Number	Registered Holder / Applicant	Area In km^2	Permit Status	Permit Expiry	Interest / Contractual Right
Quartz Bore	E47/3352	VMS Resources Pty Ltd	15	Granted	21/12/2026	100%

The project targets a type of mineral deposit called volcanogenic massive sulfide (VMS), which is formed by the accumulation of metal-rich sulfide minerals on the seafloor near volcanic vents. VMS deposits are typically associated with felsic volcanic rocks, such as dacite, and can contain significant amounts of copper, zinc, lead, gold and silver. A strike length of around four kilometers had been defined.

The most advanced prospect in the project is Balla Balla, where drilling has intersected widespread zones of zinc-lead-copper mineralization along a 600-meter strike length and down to a depth of 250 meters below surface.

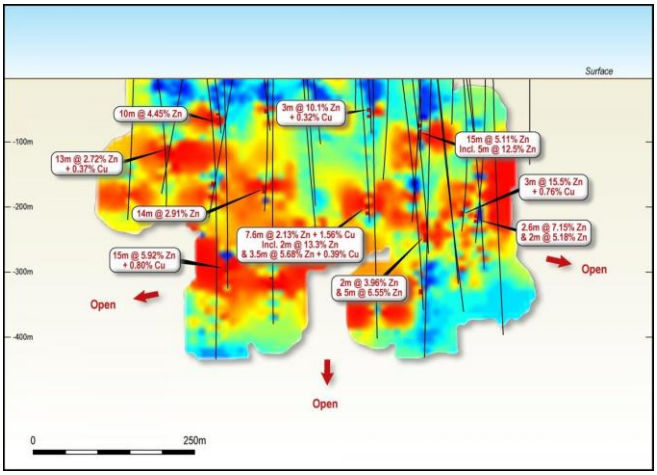
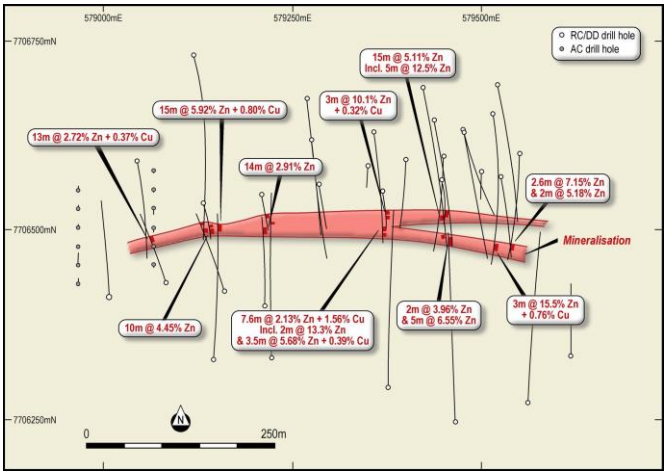
Notable intercepts at Balla Balla include:

- 15m @ 5.11% Zn, 0.12% Cu and 1.89% Pb, including 5m @ 12.56% Zn
- 5m @ 7.2% Zn, 1.14% Cu and 2.34% Pb, including 2m @ 13.71% Zn
- 3m @ 15.5% Zn, 0.76% Cu and 4.90% Pb
- 10m @ 4.45% Zn, 0.22% Cu and 2.54% Pb, including 2m @ 9.74% Zn

The East Balla Prospect was identified by rock chip sampling, which returned 18.35% copper, 1.02% lead and 0.75% zinc from an outcrop of massive chalcocite-malachite in a small gossan. Drilling has confirmed the presence of high-grade copper and zinc mineralization, such as 0.8 meters at 17.15% copper and 2.30% zinc.

The West Balla prospect has a strike length of 800 meters. It has also shown significant zinc-lead-copper mineralization in drilling, and significant drilling intercepts include:

- 7m @ 9.72% Zn, 0.05% Cu and 2.82% Pb
- 7m @ 9.72% Zn, 0.05% Cu and 2.82% Pb

Exhibit 17: Long Section Through the Balla Balla Prospect	Exhibit 18: Plan Showing 2017 Drilling with Historical Drilling and Intersections
	

2.3 Business Strategy[xvii]

The company's proposed business model centers on the development of the Steelpoortdrift Project. The company is currently in the development phase, with several key objectives:

- It aims to become a producer of vanadium pentoxide to serve the global steel and energy storage markets.
- The company continues to focus on development activities for the project, including a review of flowsheets, equipment and designs for the concentrator and SRL plant, environmental authorization and water use license applications, social and labor plan and community engagement, building a solar plant and a proposal for implementing a rope conveyor.
- As a primary producer, the company would be strategically positioned to be resilient to low-price environment. The cost of primary production of vanadium is lower than the co-production and the secondary production of vanadium.[xviii]
- The location of the Steelpoortdrift project is highly advantageous, with well-established water, power and transport infrastructure. The Bushveld Complex has some of the richest vanadium deposits in the world.
- The company has a strong in-house team with experience in constructing, developing and producing vanadium projects, providing a strong foundation for its work. It is building a project development and execution team for multiple EPC contracts over core elements of the operation, with oversight by experienced project managers to mitigate interface risks. The project management team will be expanded to include a concentrate manager, SRL manager, infrastructure (power & water) manager, contracts manager, mine manager and human resources (HR).

2.4 Outlook[xix]

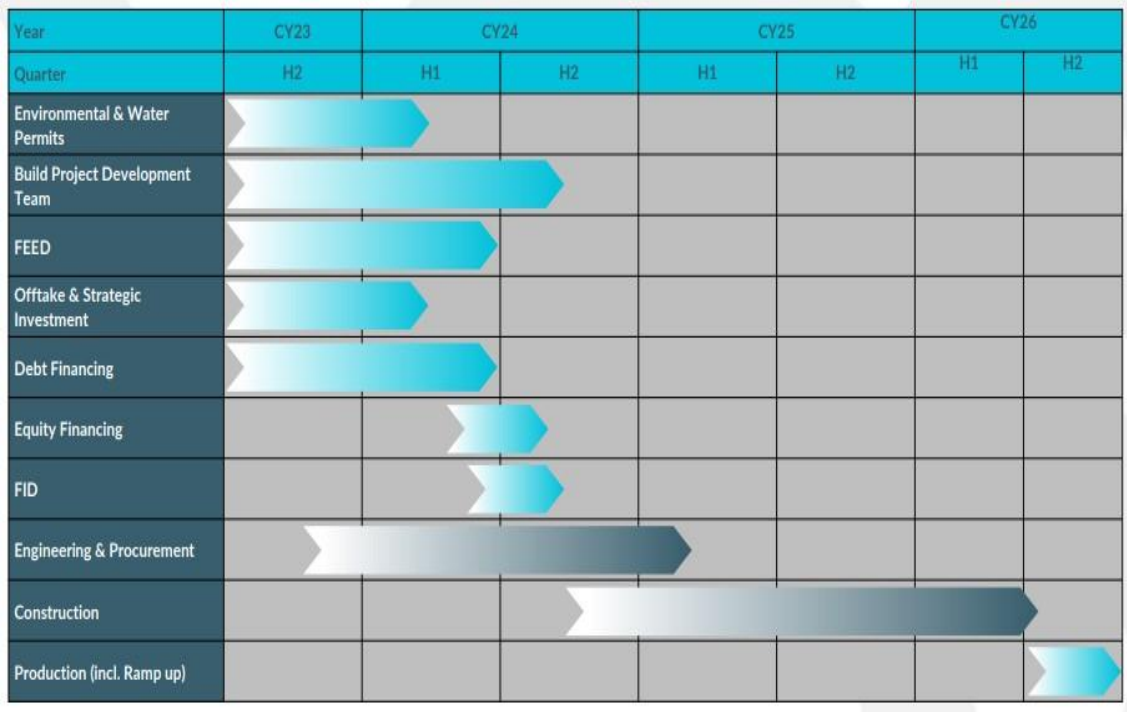
The company's primary objective is to become one of the world's leading producers of vanadium pentoxide. It is targeting annual production of 10,700-21,000 tons at a cost of USD 3.24/lb. The production volume will be influenced by market demand and supply conditions at the time. VR8 is focusing on the following aspects:

1. It anticipates rising demand for vanadium for the energy industry. Given the uses of vanadium, the market drivers would typically be determined by the alloy market, in particular the steel sector (with the steel market closely linked to China and global economic growth), as well as the construction, aerospace, and chemical industries and the energy storage market.
2. The company is progressing toward funding and offtake process with several groups indicating their interest in the Project. In addition to the MOU for an offtake agreement with Matrix, the company has significantly progressed in discussions with other potential offtake parties and strategic equity investors and is evaluating their proposals. It has also received several non-binding indicative term sheets from commercial banks, export credit agencies (ECAs),

development banks and non-bank financiers. The company is focusing on evaluating the offtake agreements with the aim of securing the funding to finance the project.

3. The company is focusing on project development with a target of commencing production in H2 2026. Management plans to continue developing the project to the stage where a final investment decision (with a H2 CY2024 target) can be made on construction of a mine and concentrator facility at Steelpoortdrift and an SRL facility at Tweefontein.
4. The company is also considering additional revenue streams that include a residual vanadium recovery plant and potential additional products V_2O_3, ferrovanadium, ilmenite and titanium (TiO2) in SRL tailings recovery.

Exhibit 19: Steelpoortdrift Project Timeline



2.5 Company Milestones

Exhibit 20: Company Milestones

Year/ Period	Events
2017	• The company was incorporated on January 1, 2017 • Listed on ASX on November 1, 2017 (ASX:VR8) • Acquired an option over E45/4621 located in the Pilbara region of Western Australia to strengthen its gold portfolio • Completed drill programme at the Quartz Bore Project
2018	• Tando Resources signed binding agreement to acquire 74% of the Steelpoortdrift Vanadium Project • Metallurgical test work indicates successful separation of vanadiferous titanomagnetite can be achieved with a low intensity magnetic separation • Mining rights granted at Steelpoortdrift Vanadium Project; drilling starting from August 2018 • Discovered massive maiden high-grade inferred JORC resource at Steelpoortdrift vanadium of 588Mt at 0.78% V_2O_5
2019	• Received firm commitments from domestic investors and UK institutions for AUD 1.7 mn via a share placement at 8.5c, representing a 15% discount to the last sale price • Jurie Wessels appointed as director and Non-Executive Chairman

	• Completed acquisition of the company's interest in the Steelpoortdrift Vanadium project • Changed company name to Vanadium Resources Limited, with a new ASX code, VR8
2020	• Appointed Kyla Garic as company secretary • Appointed global vanadium expert to lead V_2O_5 scoping study • Concluded a marketing and investment mandate with Palegic Resources Group Ltd, expanding customer base in China, Europe, Russia, India, and the US • Entered an insurance policy with Guardrisk (a subsidiary of Momentum Metropolitan Holdings Limited, a South Africa-based financial services group) to provide an environmental rehabilitation guarantee on behalf of Vanadium Resources • Scoping study confirms viability of vanadium pentoxide production at Steelpoortdrift • Jurie Wessels appointed as Executive Chairman • Funding successfully received from cash environmental guarantee, releasing ZAR5,000,000 (c. AUD 442,900 after costs), including cash reserves (as of September 30, 2020); the company has c. AUD 1,050,000 to advance its Steelpoortdrift vanadium project
2021	• Received commitments to raise AUD 2 mn and has entered into agreement with TCM Research Ltd to acquire up to a 74% interest via an earn-in, allowing it to pursue ESG integrated processing technology • Appointed Sound Mining Solutions (Pty) Ltd for bulk sampling, geotechnical drilling and ore reserve estimation • Entered into a joint development agreement via associate Vanadium Resources (Pty) Ltd with Senergy Africa (Pty) Ltd, a subsidiary of DRA Global, to develop a renewable energy supply solution for its Steelpoortdrift mine and concentrator site • Adopted ESG framework with 21 core metrics and disclosures created by the World Economic Forum • Entered into a subscription agreement with Raubex Pty Ltd to place AUD 4.6 mn at AUD 0.104c per share, representing a significant premium to the company's 15- and 30-day VWAP
2022	• Received approval from the South African government to receive transfer of an interest of 23.95% in the project, thereby increasing the company's interest in Steelpoortdrift to 73.95% • Appointed Foster Stockbroking Pty Ltd as a corporate advisor to the company • Won the "Battery and Energy Metals Pitch Battle", hosted online by Mines & Money on April 6, 2022 • Dual-listed on the Frankfurt Stock Exchange under the Ticker code TR3 • Presentations on its battery metal prospects at the Kalkine Media ASX Battery Metals Invest Nest Webinar and the Dr Eva Reuter IR Live web conference • Entered into an option agreement to acquire 135 hectares of property to locate the planned salt roast plant • Appointed Mr John Ciganek as managing director and chief executive officer
2023	• Appointed Mr. Alex Oehmen as general manager operations • Increased interest in Vanadium Resources from 73.95% to 86.49% by executing conditional sale and option agreement • Completed AUD 5.91 million equity placement to Matrix Resources (Zhejiang) Co Ltd • Appointed Mr Tim Feather as chief financial officer • Increased project interest in Steelpoortdrift by 7.95% to 81.90% by acquiring Obeec's interests in VanRes • Increased its interest in Steelpoortdrift by 4.59% to 86.49% through the completion of a transaction with Math-Pin resulting in an increase in the company's share in Post Tax $NPV_{7.5\%}$ to USD 1.05 bn.

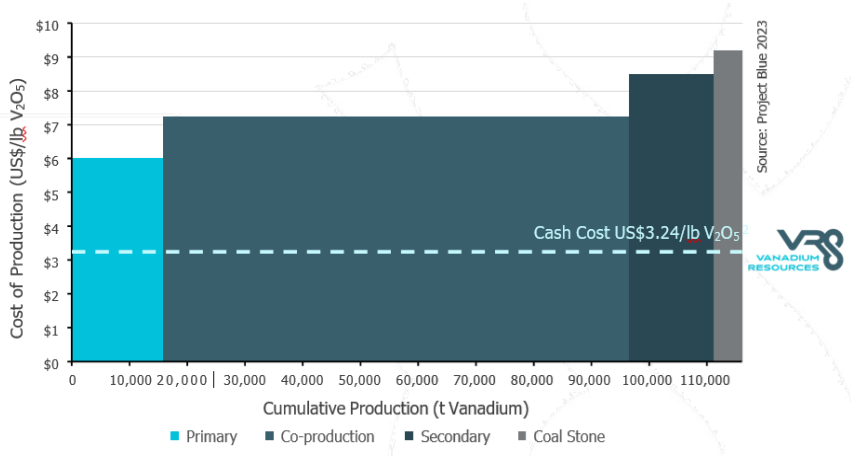
2.6 Company Premiums

a) Expansion of VRFB capacity and rising use in the steel industry: Vanadium demand is dominated by steel market consumption, accounting for 90% of total demand. It is used in the steel industry to improve the strength and hardness of products. Vanadium consumption in the industry has increased because global steel production and consumption has risen. In addition, there is an increased use of vanadium in steel since some regulations in developed economies such as Europe, North America and parts of Asia (Japan and South Korea) have mandated the use of high-quality steels in construction. Vanadium use has also been increasing is energy storage applications, specifically in VRFB, which has seen rapid commercial and industrial deployment over the last decade. Annual VRFB project deployment revenue is projected to grow from USD 856.4 mn in 2022 to USD 7.76 bn by 2031.[xx]

b) Cost efficiency: The mineralization dips shallowly (~10º), which means it will involve less waste to mine. The mine has a low strip ratio of 0.88x (waste:ore) resulting in a cheaper mining cost.

c) **Access to excellent regional infrastructure:** The Project is covered by a granted Mining Right, which is in force until September 2048 and can be extended. The Steelpoortdrift project is located within a special economic zone around Steelpoort in the Bushveld Igneous Complex with access to well-established infrastructure within 50km of the project area. Proximity to national roads, railheads, dams, the national power grid, a skilled workforce within the local community and mining service companies and support businesses, reduces the initial capital required for production to commence. The company believes the project is well-placed to be fast-tracked into production.

Exhibit 21: V_2O_5 Production Costs and VR8's Cash Cost, 2022[xxi]



d) **Largest and highest-grade vanadium deposits:** The Bushveld complex is one of the most studied geological provinces and home to some of the richest deposits worldwide. The Project is host to one of the world's largest undeveloped vanadium deposits with a Mineral Resource of 680Mt at an average in situ grade of 0.70% V_2O_5 (4.74Mt contained metal). VR8's high-grade concentrate of greater than 2% V_2O_5 is one of the highest globally and provides the company with a competitive edge over its peers.

e) **Low expenditure and strong margins:** The Project has competitive capex and opex metrics, resulting in a post-tax $NPV_{(7.5\%)}$ amounting to USD 1.05 bn and a post-tax IRR of 42% with an attractive payback of 27 months. The pre-production and expansion capex amounts to USD 211 mn. The opex of USD 3.24/lb of V_2O_5 places the Project within the lowest quartile of the international cost curve for vanadium pentoxide. The average price of European V_2O_5 98% for September 2023 was USD 7.98/lb.[xxii]

2.7 Company Risks [xxiii]

a) **Fluctuations in vanadium prices:** The price of vanadium and the terms of any offtake agreements into which the company enters will affect the future earnings and viability of the Project. Commodity factor prices are affected by external issues such as world demand, forward selling by producers and production cost levels in major mineral-producing regions, macroeconomic factors such as global economic conditions and conflicts and expectations regarding inflation and interest rates. Historically, vanadium prices have been volatile. They have featured sustained periods of both oversupply and undersupply over the past decade with the highest and lowest price of V_2O_5 at USD 28.42 in November 2018 and USD 2.38 in January 2016.[xxiv] Some price fluctuation risk might be mitigated due to a comparatively low cost of production, which results from processing the assets close to mine sites by primary producers like VR8.

b) **Financial risk:** The company is currently in the pre-revenue phase with production scheduled to commence in H2 2026. Substantial funds will be required, particularly for construction of the Steelpoortdrift mine and concentrator and the Tweefontein SRL operations and to cover pre-production operational expenses. Various internal and macro-level factors may restrict fund availability, potentially causing project timeline delays. Although the company claims that it is strongly progressing toward securing binding offtake and strategic investment agreements to support project financing, no information is available regarding progress in financing activities.

c) **Sufficient water and power supply:** The DFS mentions that securing water and power connections within the planned timetable is one of the significant risks relating to the project's development. Locally, supply has been hampered by load shedding, leading to a production decline at mines in South Africa.[xxv] The reliability of Eskom's supply has been decreasing, significantly impacting mining operations and cost. While the company has ensured

access to power and water supply from the existing infrastructure, it is also in process of developing its own PV solar farm to ensure an uninterrupted supply for smooth operations and mitigate the infrastructure risk.

d) Mineral reserves risk: There is a degree of uncertainty attributable to the estimation of mineral reserves and resources. As mineral reserves and resources are mined and processed, the quantity of metal and grades must be considered only as estimates, and there can be no assurance that the indicated levels of metals will be produced. The company must rely upon estimated calculations for the mineral reserves and mineral resources, and grades of mineralization on its properties may significantly change when new information becomes available. Therefore, it is possible that the company might not generate the estimated revenue from the project or might even opt out of the project if the resources do not indicate economic feasibility.

e) Key personnel risk: The performance of any company is dependent on the experience, skills and knowledge of its senior management and key employees for the implementation of its growth strategy. The loss of any senior management, or the inability to recruit relevant staff, could lead to disruption and adversely affect the business, cash flows and financial condition of the company.

2.8 Shareholding Pattern[xxvi]

The company had 560,300,204 shares of common stock issued and outstanding on January 22, 2024. The shareholding pattern is as follows:

Exhibit 22: Shareholding Pattern (January 22, 2024)

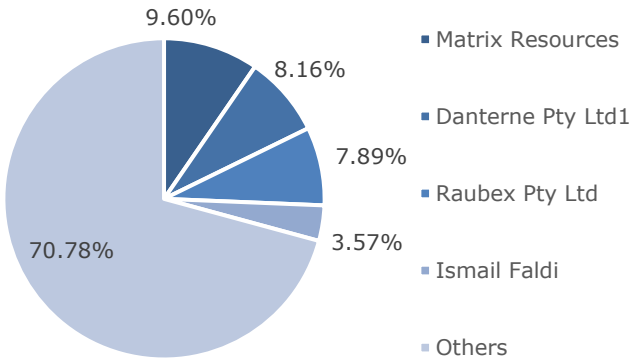


Exhibit 23: Top Shareholding Pattern (January 22, 2024)

Shareholders	Shares outstanding
Matrix Resources	53,763,800
Danterne Pty Ltd[1]	45,721,437
Raubex Pty Ltd	44,230,769
Ismail Felida	20,000,000
Others	396,584,198
Total	**560,300,204**

2.9 Listing and Contact Details[xxvii]

The company is publicly listed on the ASX and is traded under the symbol 'VR8'.

Company Contacts

Home Office

Address: Suite 7, 63 Shepperton Road, Victoria Park, WA 6100 Australia

Contact No: 08 6158 9990

Website: https://vr8.global/

Email Id: contact@vr8.global

3. News

- **Further increase in project interest in Steelpoortdrift by 4.59% to 86.49%:** On November 15, 2023, the company increased its interest in Steelpoortdrift by a further 4.59% to 86.49% through completion of transaction with Math-Pin. In terms of which, Math-Pin sold its interests in subsidiary VanRes to VR8. This transaction had resulted in an increase in the company's share in post-tax $NPV_{7.5\%}$ to USD 1.05 bn. The consideration for the transaction comprises a combination of cash (ZAR 2,930) and 8,092,810 share options to acquire VR8 shares, which on exercise, will represent 1.48% of the issued share capital of VR8.
- **Increase in project interest in Steelpoortdrift to 82%:** On October 19, 2023, the company increased its interest in Steelpoortdrift by 7.95% to 81.90% through completion of transaction with Obeec (Pty) Ltd (Obeec). Under the deal's terms, Obeec sold its interests in subsidiary VanRes to VR8. The consideration for the transaction comprises a combination of cash (ZAR 5,800) and 14,031,220 share options to acquire VR8 shares, which on exercise, will represent 2.54% of the issued share capital of VR8. The VR8 shares acquired by Obeec are subject to a voluntary escrow of 12 months and are also subject to a block trade arrangement to be managed by VR8.
- **Project update of Steelpoortdrift and Tweefontein:** On October 4, 2023, the company provided an update on the Steelpoortdrift and Tweefontein Projects. The report highlighted progress on the development, construction, offtake and financing of the project. Highlights included environmental authorizations and water use license approval expected in H1 CY2024, and social and labor plan amendments submitted to regulators. Front-end engineering design had commenced with designs and tender packages to be finalized. VR8 and Matrix reaffirmed their commitment to enter into an agency agreement as envisioned in the MoU. The company's engineering and support team will be expanded, various power and water solutions are under investigation and the revised target for FID is H2 CY2024 with first production in H1 CY2026.
- **New chief financial officer appointed:** On August 22, 2023, the company announced it has recruited Tim Feather as CFO. Mr. Feather studied law at the University of Nottingham and qualified as a chartered accountant with Deloitte in the UK. He has over 25 years of experience in corporate finance. He moved to London in 1995 by joining Brown Shipley before leaving to co-found Westhouse Securities, where he headed corporate finance and specialized in advising and fundraising for mining and oil and gas companies. In 2012, he joined WH Ireland, and in 2019, he joined Sumner Group as a Business Development Director. He is also a non-executive director of Orcadian Energy plc, a North Sea oil development company.
- **Equity placement to Matrix Resources:** On May 26, 2023, the company announced completion of an AUD 5.91 mn equity placement to Matrix Resources (Zhejiang) Co Ltd, a wholly subsidiary of Zhejiang Lygend Investments Co Ltd. Under the agreement, the company issued 53,763,800 fully paid ordinary shares to Matrix at an issue price of AUD 0.11 per share for a 9.99% stake in VR8, which represented a c. 40% premium to the 30-day VWAP on 3rd May 2023.
- **Agreement with Steelpoortdrift to increase its interest:** On May 3, 2023, the developer of the Tier 1 Steelpoortdrift Vanadium Project in Limpopo, South Africa, announced that it had executed conditional sale and option agreements to increase its interest up to 86.49% in VR8. It acquired 12.54% in return for ZAR 8,730 (AUD 707) in cash and 22,124,030 share options to acquire shares equal to 4.37% of the current issued share capital of VR8.
- **Appoints highly experienced general manager operations:** On February 20, 2023, the company announced the appointment of Mr. Alex Oehman as General Manager Operations with the responsibility for driving the development and operations of the Steelpoortdrift Project. Mr. Oehmen has over 40 years of industry experience across the resources, mineral processing, and engineering sectors. His qualifications include a Bachelor of Engineering (Metallurgical) degree from Pretoria University in 1982 and a Master of Business Leadership from UNISA in 2000.
- **Appoints highly experienced managing director and CEO**: On December 5, 2022, the company announced the appointment of Mr. John Ciganek as managing director and chief executive officer, effective January 9, 2023. He is a highly experienced mining executive and financier.
- **Independent definitive feasibility study completed:** On October 4, 2022, the company announced the completion of its independently prepared definitive feasibility study on the 73.95% held Steelpoortdrift project. The project involves the open pit mining of an initial 1.60Mtpa (year 1-4) of vanadium ore at an average head grade of

0.83% V_2O_5, primary treatment of ROM through an onsite concentrator, secondary treatment of 0.72Mtpa of concentrate through an SRL plant and final sale of c. 12ktpa vanadium (V_2O_5) flake at a grade of greater than 98%. In year 5, and the remaining LOM, the mining rate should increase to 3.5Mtpa at an average head grade of 0.71% V_2O_5, with increased processing capacity almost doubling production rates to 1.25Mtpa concentrate and 21ktpa flake.

- **Update on the mineral reserve and ore reserve estimates:** On October 4, 2022, the company updated the mineral resource and ore reserve estimates for the Steelpoortdrift Project following completion of the definitive feasibility study. The mineral resources amounted to 680Mt (2.7% increase) averaging 0.7% vanadium pentoxide for a cut-off grade of 0.45% V_2O_5. The measured mineral resources increased by 58% to 145Mt averaging 0.72% V_2O_5. The Ore reserve total 76.86Mt at an average grade of 0.72% V_2O_5 with 30.23Mt of proved ore reserves at an average grade of 0.70% V_2O_5 and 46.62Mt of probable ore reserves at an average grade of 0.72% V_2O_5.
- **Appointed leading global finance group as advisor:** On August 22, 2022, the company appointed HCF International Advisers as consultants on the project to assist with debt/offtake evaluation and arranging debt finance HCF has extensive experience in providing structured finance advisory and raising substantial amounts of capital for the global mining sector, having raised over USD 12 bn in project financing since 2003.
- **Acquisition of property to locate salt roast facility:** On August 19, 2022, the company entered into an option agreement to acquire 135 hectares of property to locate a planned salt roast plant. The option was open for exercise until September 30, 2023. The proposed SRL site is located 15km from Steelpoortdrift Mine within a well-established mining and processing center.
- **Superior grade and recoveries confirmed at pilot plant test work:** On June 22, 2022, the company confirmed that the pilot test work indicated elevated overall recoveries of 84.4%, suggesting a 4% increase in the metrics used for the prefeasibility study (PFS). The magnetic separation concentrate indicated a reduction of reagent consumption compared to metrics used for the PFS, due to lower-than-expected silica content. The test work also indicated V_2O_5 recoveries more than 96% achievable at concentrate grades above 2.10% V_2O_5.
- **Dual listing on Frankfurt Stock Exchange:** On April 26, 2022, the company confirmed its dual listing on the Frankfurt Stock Exchange, under the ticker code TR3. The company planned to broaden its exposure to the European investment community, given that vanadium is a globally strategic metal.
- **Won Mines & Money's "Battery and Energy Metals Pitch Battle":** On April 20, 2022, the company announced that it had won the "Battery and Energy Metals Pitch Battle", hosted online by Mines & Money on April 6, 2022. In the competition, each company had three minutes to pitch their project to a panel of experienced investors, followed by a Q&A session. The investors then selected the company in which they would invest a hypothetical sum of USD 1 million.
- **Changes made to the board:** On April 8, 2022, the company announced that Mr. Van der Hoven, non-executive director, would retire from the board and the company's subsidiary VanRes It also confirmed the transition of Mr. Jurie Wessels from non-executive chairman to executive chairman of the company.
- **Completed bulk sampling and pilot plant test work commenced:** On March 24, 2022, the company stated that bulk sampling from trial mining had been completed and pilot test work had commenced. The magnetic testing of sample bags demonstrated ore to be highly magnetic, a positive indicator for the magnetic separation process. Geotechnical drilling was completed with no major concerns and the DFS progress was on time and within budget.
- **Appointed corporate advisor to the company:** On February 2, 2022, the company appointed Foster Stockbroking Pty Ltd as a corporate advisor. FSB specializes in providing emerging companies with access to equity capital markets, together with providing institutional clients with access to high-quality research product and investment opportunities. In calendar year 2021, FSB raised more than AUD 500 mn of capital in over 26 transactions in the natural resources and other sectors.
- **Received approval from South African government for transfer of an interest:** On January 19, 2022, the company announced approval from the South African government to receive transfer of an interest of 23.95% in the Project, thereby increasing the company's interest in the Steelpoortdrift project to 73.95% This increase of ownership came at no cost, as all consideration shares for the asset's acquisition were issued in September 2019.

4. Management and Governance

Exhibit 24: Management and Governance

Name	Position	Experience
Jurie Wessels	Executive Chairman	• Mr. Jurie Wessels has 27 years of experience in the exploration industry and has co-founded many exploration and mining companies including Bauba Resources Ltd., GoldStone Resources Ltd., Arcadia Minerals Ltd. and Vanadium Resources Ltd. • Significant experience in the sourcing and assessment of exploration and exploitation projects and the governance, funding and management of resources companies • Explored for various minerals in Africa, South America, the Indian sub-continent and Europe and has explored and developed several mining projects to successful conclusion
John Ciganek	Managing Director & Chief Executive Officer	• Mr. John Ciganek is a qualified mining engineer, holds an MBA, and has over 30 years of experience in mining operations, project development, project finance, offtake agreements, M&A and equity capital markets • Successfully raised debt and equity funding worth more than ~AUD 5 bn for various clients • Worked as Principal/Director of Euclase Capital, Executive Director of BurnVoir Corporate Finance, General Manger Corporate Development at PMI Gold, Senior Banks Engineer and Risk Executive at Commonwealth Bank, and senior mining engineering positions with Hargraves Resources, Reynolds Yilgarn Gold and Comalco/Rio Tinto (CRA) • A non-executive director of Calidus Resources Limited and Ookami Limited
Tim Feather	Chief Financial Officer	• Mr. Tim Feather has a law degree from the University of Nottingham and is a qualified chartered accountant, with over 25 years of experience in corporate finance • Co-founded Westhouse Securities heading corporate finance and specializing in advertising and fundraising for mining and oil and gas companies. • Joined Summer Group, a privately held company with interest in mining, healthcare and defense, where he was business development director • A non-executive director of Orcadian Energy plc, a North Sea oil development company
Michael Davy	Non-Executive Director	• Mr. Michael Davy is an Australian executive and accountant with over 18 years of experience across a range of industries • Held various positions including a senior management role in Australia for Songa Offshore (listed Norwegian oil and gas drilling company) and worked in finance in London and Australia for major firms • Owner and director of several private businesses under his personal management; Non-executive chairman of Haranga Resources Ltd and non-executive director of Arcadia Minerals Ltd.

5. Industry Overview

5.1 Market Overview

5.1.1 What is Vanadium?

Vanadium is a high-value metal, which is grey, soft and ductile with several other unique characteristics. It is represented by the symbol V and is at the head of Group 5 of the Periodic Table with atomic number 23. It is the 19th most abundant element in the Earth's crust. It is capable of oxidation states of +2, +3, +4 and +5, each state having a different color: purple (II), green (III), blue (IV) and yellow (V).[xxviii] Protected by a thin layer of oxide on its surface, vanadium is extremely resistant to corrosion. Vanadium ranks 10/40 in Project Blue's Critical Materials Risk Index (CMRI) 2022.[xxix]

It is primarily used in the steel industry for the production of alloys and in the chemical industry. In recent times, demand has tremendously increased, mainly driven by steel consumption and its use in energy storage, especially in VRFBs. The use of vanadium depends on growth of the alloy market, the construction industry, the aerospace industry, the chemical industry and the energy storage market.

5.1.2 Vanadium Market Size

As per Project Blue, the vanadium market was valued at USD 4 bn in 2022 and is expected to grow at a CAGR of 3.7% in 2022-32. [xxx]

Top vanadium producing countries

China, Russia, South Africa, Brazil and the US are the top five vanadium producers. The United States Geological Survey estimates that total world resources exceed 63 mn tons.

Exhibit 25: Vanadium World Reserves[xxxi]

Country	Mine production (Mt)		Reserves (thousand Mt) in 2022	Reserve Share (%)
	2021	2022[e]		
China	70,300	70,000	9,500	37%
Australia			7,400	28%
Russia	20,100	17,000	5,000	19%
South Africa	8,800	9,100	3,500	13%
Brazil	5,780	6,200	120	0.5%
US			45	0.2%
Others			435	2%
World (rounded)	105,000	100,000	26,000	100%

[e] *Estimated*

MT: metric tonnes

Note: Since the bulk of vanadium production occurs as a co-product or by-product, reserves are likely underestimated.

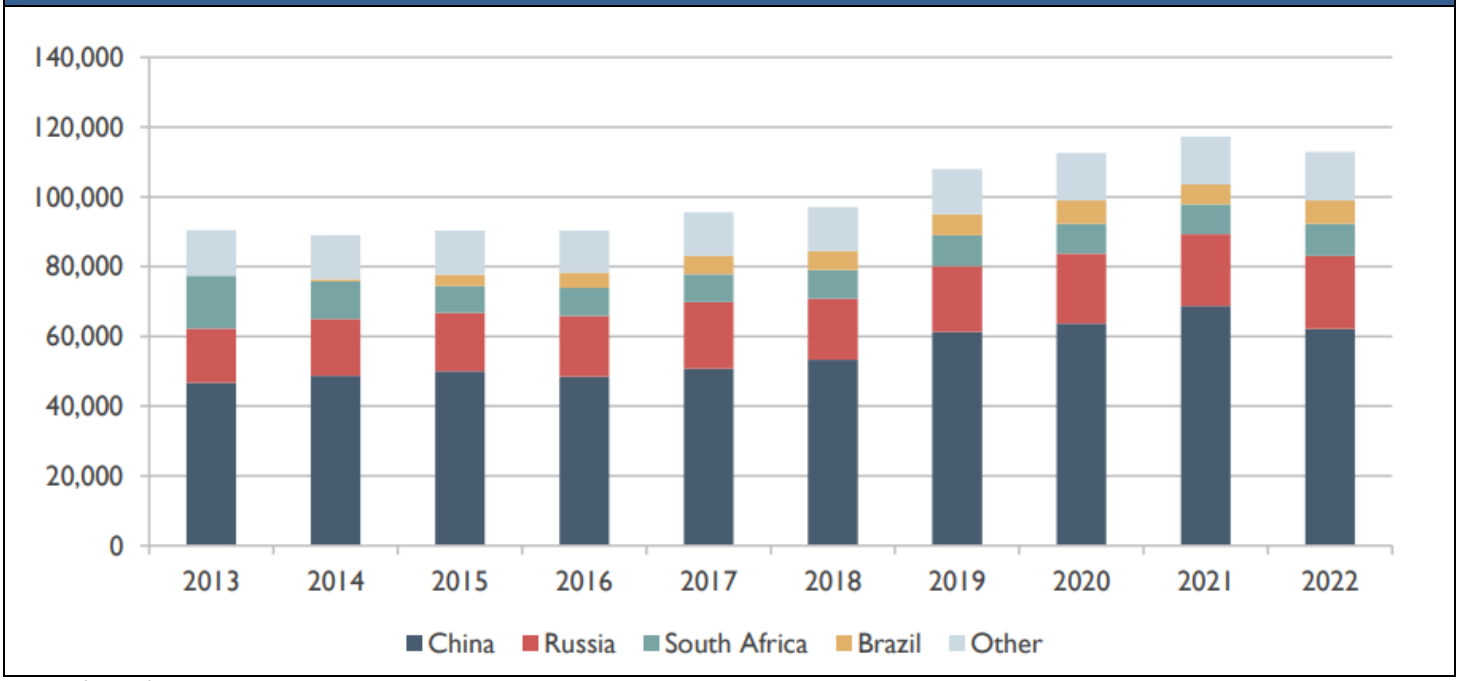
China: China was the world's top vanadium producer in 2022 with an output of 70,000Mt. Vanadium feedstock there comes mainly through the co-production route, where the iron is produced in a blast furnace. China has the world's largest reserves standing at 9.5 mn metric tons. Key players include Pangang Group, HBIS Chengsteel, Chengde Jianlong, Sichuan Tranvic and Sichuan Deshang. An important primary source of vanadium is 'coal stone' (a carbonaceous shale), which has high economic and environmental costs. Producers using the method increase output when prices are high, thereby acting as the market's swing producers.

Russia: Russia was the second-largest vanadium producer with an output of 17,000Mt in 2022, down by 3,100Mt from 2021. Most of Russia's vanadium comes from EVRAZ KGOK, which is a vertically integrated steel, mining and vanadium business. Russia's vanadium reserves are the third-largest in the world.

South Africa: South Africa's output in 2022 was 9,100Mt, making it the world's third-biggest producer of vanadium feedstock. The primary production from Bushveld Minerals and Glencore accounts for South Africa's contribution to the vanadium market.

Brazil: Output reached 6,200Mt in 2022. Largo Resources is the only pure-play primary vanadium producer, turning out the highest-grade vanadium through its Maracus Manchen Vanadium project.

Exhibit 26: Vanadium Feedstock Production by Country (t V contained)



t V: total vanadium

Australia holds the third-largest reserves of vanadium (c. 29%) globally, although there is currently no production. It has a potentially enormous opportunity to supply to the world with this 'new-economy mineral'. There are seven vanadium mines in pre-operation phases around the country: four in western Australia, two in northwest Queensland and one in the Northern Territory.

5.2 Vanadium Feedstock Supply Routes

Vanadium feedstock supply comes from three sources: primary production, secondary production and co-production.

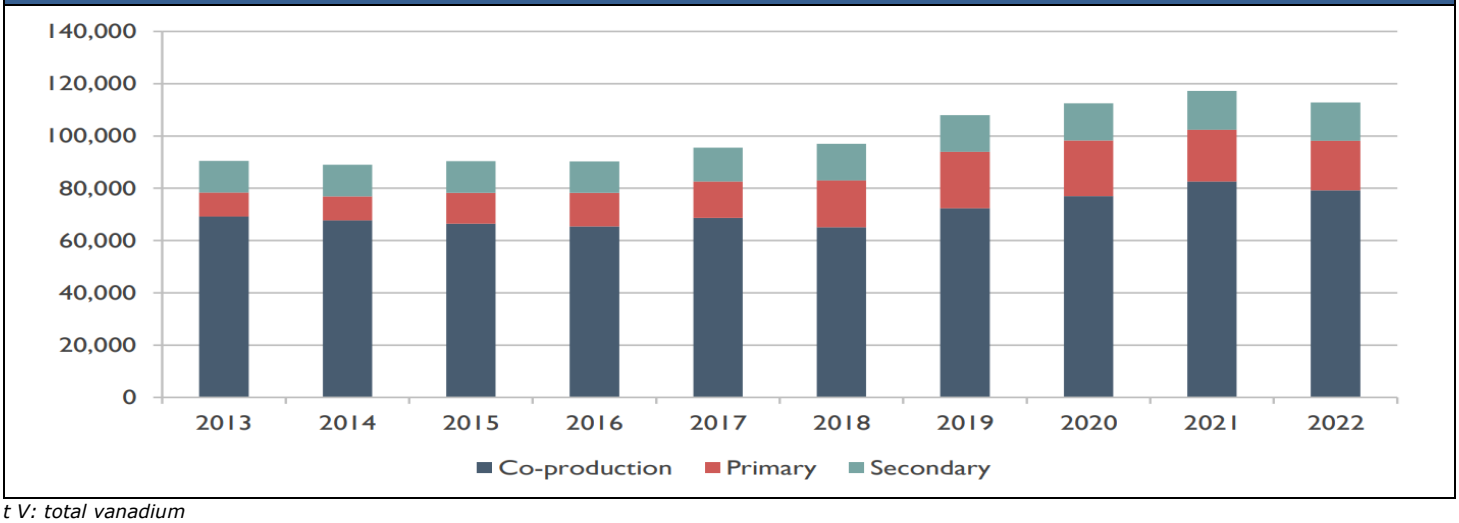
Exhibit 27: Vanadium Production by Type

	Method of Production		
	Primary Production	**Secondary Production**	**Co-production**
Extraction Process	The mineral deposits are exploited for vanadium	Vanadium is produced from the recycling of catalysts that acquired it during crude oil refining, residues from alumina or uranium production or ash derived from burning vanadium-bearing coal or petroleum	During the steelmaking process, VTM is used and vanadium-rich slag is yielded in a duplex basic oxygen furnace that can be converted into V2O5 via further processing
Source	Ores of vanadium	Residues and waste materials	VTM, which is a form of iron ore
Countries	Brazil, China and South Africa	US and South Korea	China and Russia
Major Players	Largo, Bushveld Minerals, Glencore	AMG vanadium, US Vanadium	Pangang Group, HBIS Chengsteel, Chengde Jianlong, Sichuan Tranvic and Sichuan Deshang in China and EVRAZ in Russia
Share of Total Global Supply in 2022	17%	13%	70%
Production Cost	Bottom quartile of the cost curve (USD 4.50- 6.00/lb of V_2O_5)	Upper quartile of the cost curve	Middle quartile of the cost curve (USD 7/lb)
Grade	Low, 1.0%-0.5% V_2O_5	Low, 1-2% V_2O_5	High, the grade depends on feed and process and can range from 14% to 25%

Note: Production costs can fluctuate depending on inflation, currency exchange rates or any operational issues in a given year.

The vanadium obtained from all the routes is converted into vanadates and vanadium oxides, which are mainly used as the feedstock to produce the ferroalloys ferrovanadium (FeV) and vanadium nitride (VN).

Exhibit 28: Vanadium Production by Type (t V Contained)

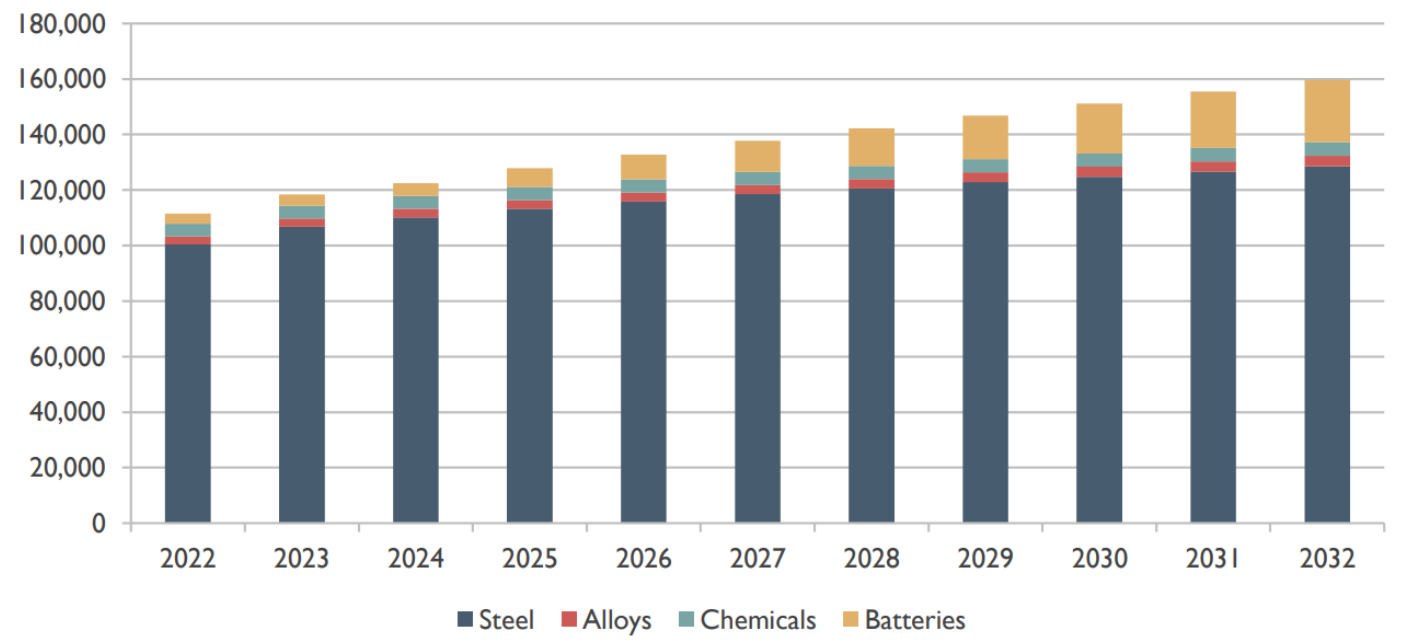


t V: total vanadium

5.3 Vanadium consumption

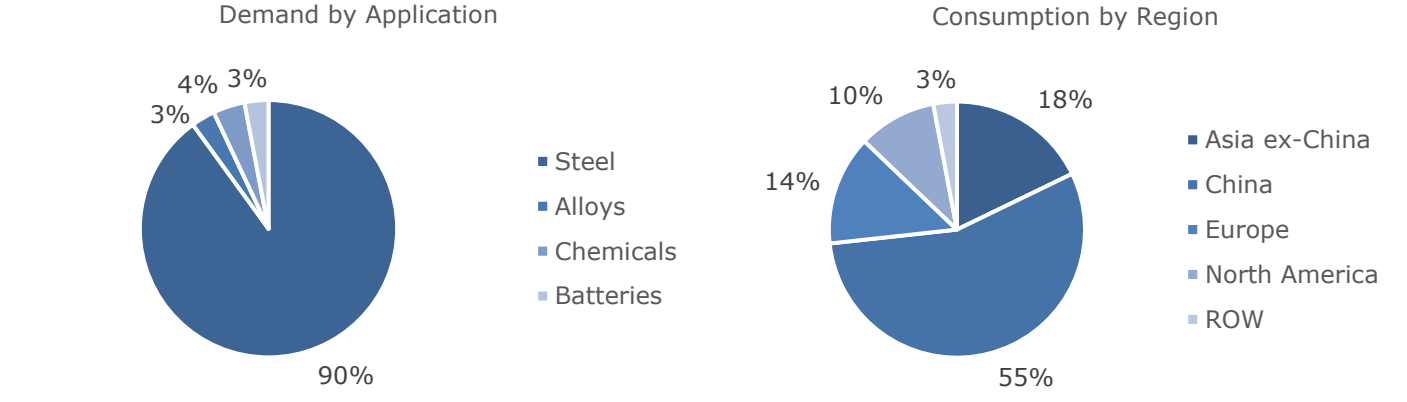
In 2022, global vanadium consumption dropped by around 5% to 115.2 kt from 120.8 kt in 2021.[xxxii] Consumption can be attributed to four sectors: steel (90%), batteries (c. 4.5%), chemicals (4%) and alloys (2.4%). The decrease in demand and consumption can be mainly attributed to the impact of Covid-19, the Russia-Ukraine conflict and rising inflation and interest rates. Total demand/consumption for vanadium is expected to reach c. 160 kt by 2032.

Exhibit 29: Vanadium Consumption Forecast by Application[xxxiii]



The largest producer, China, is also the largest consumer, accounting for more than half of global vanadium consumption in 2022, followed by Europe (c. 14%) and North America (c. 12%). A giant steel industry, new construction regulations and increasing VRFB deployments in China contribute to this consumption.

Exhibit 30: Vanadium Demand and Consumption in 2022[xxxiv]



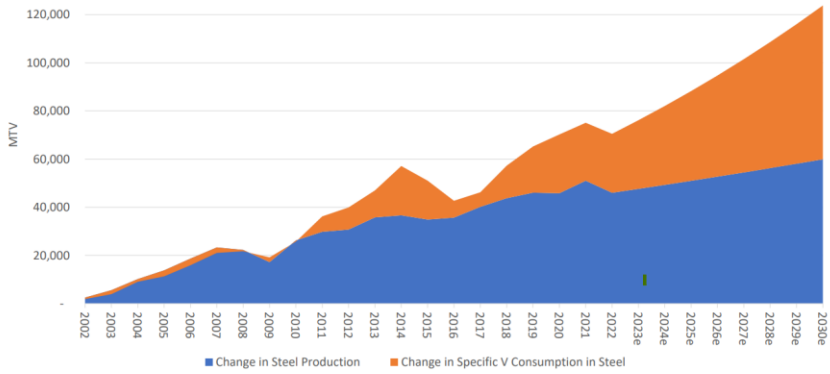
5.4 Application Areas/Market Drivers

Vanadium demand is driven by its use in the steel, battery, alloys and chemical industries.

5.4.1 Steel

Vanadium consumption has been growing since 2015 with the steel industry consistently dominating the market. This increase comes for two reasons: rising steel production and consumption and an increased intensity in the use of vanadium in steel production. Over the past two decades, steel production in China rose at an 11% CAGR, driven by industrialization and urbanization. More than 90% of vanadium is consumed in steel applications. Due to regulations on the use of high-quality steels in construction, the intensity of use of vanadium in steel has been higher in developed economies such as Europe, North America, Japan and Korea. In China, new construction regulations mandating the use of higher quality rebar that requires vanadium came in force in 2018, but the country is still lagging in its vanadium intensity usage. In 2022, the total vanadium consumed in steel dropped by about 7% to 102kt compared to 110kt in 2021, owing to weak demand from the steel industry, which stood at c. 1,885.4 mn tonnes in 2022, versus 1,962.3 mn tonnes in 2021.

Exhibit 31: Projected Demand Due to Steel Production and Consumption of Vanadium in Steel[xxxv]



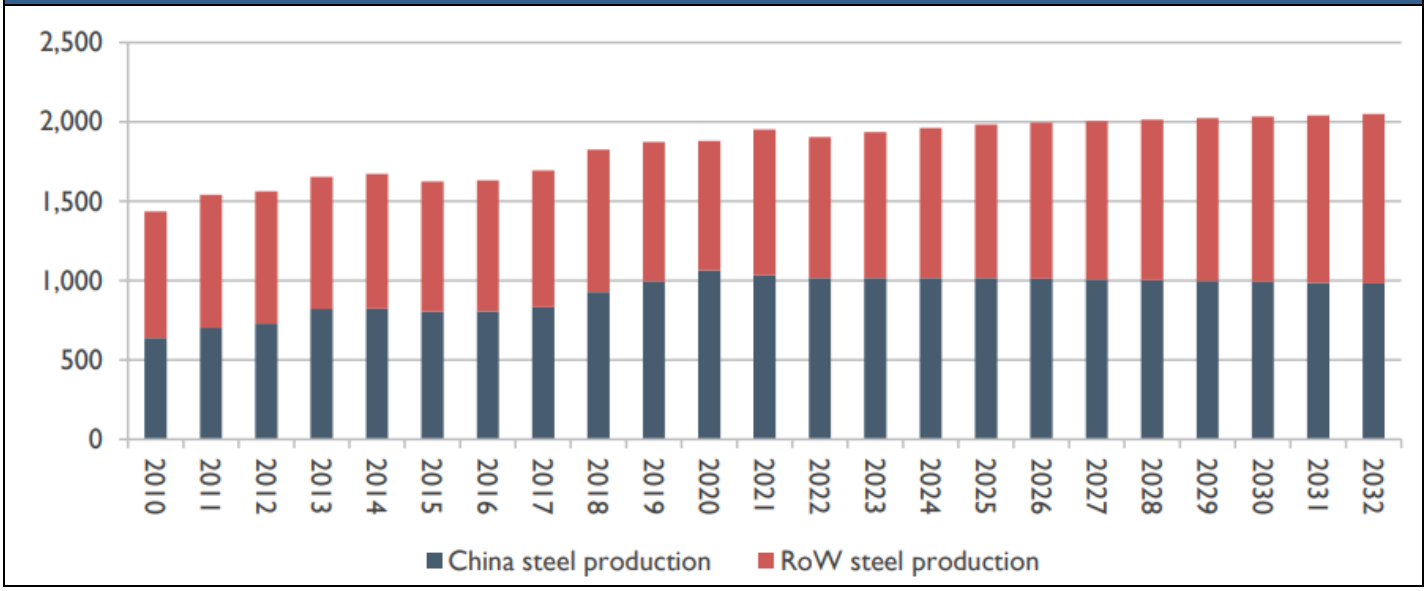
Outlook

Steel demand is expected to double by 2050.[xxxvi] There might be short-term fluctuations, but steel production in China is forecasted to plateau. In the rest of the world, steel production should see diverging trends. Environmental restrictions will likely downsize the European Union's steel industry. However, concepts such as "green steel" to tackle climate change are seen as a positive sign for steel demand. Increases in steel production will probably come from India (the second-largest producer), Iran, Indonesia, Vietnam, Turkey and Brazil.

Rebar

China accounts for about 75% of world rebar production and the sector uses about 85% of the vanadium consumed by the domestic steel industry. In 2020, rebar production reached 266Mt in China, which marked the peak and was driven by infrastructure development. Rebar production is set to decline relatively faster than other steel output. Rebar production could decline to c. 217 Mt by 2032. The different grades of rebar have different levels of vanadium content: in Grade lll it is 0.03%, Grade lV has 0.06% and Grade V has 0.1%. There is a gradual shift in the industry from Grade lll to Grade lV rebar, which should increase vanadium consumption.

Exhibit 32: Current and Forecasted Steel Production[xxxvii]



5.4.2 VRFBs

Vanadium is also used for energy storage applications in the form of VRFBs. This technology is a leading energy storage option due to its safe operation, reduced operating costs and low environmental impact in manufacturing and recycling. To reduce greenhouse gas emissions and decarbonize the global energy system, energy storage is becoming vital. Electro-mechanical storage is the most common storage technology. Batteries are becoming essential due to their scalability, durability, recyclability and long life-span.

VRFBs have applications in utility services, renewable energy, integration, uninterruptible power supply (UPS), the wind power industry, and others. In recent years, efforts to optimize technology and use renewable energy have increased. Hence, demand for VRFB has increased and it has become the most appealing alternative for large utility-scale energy storage.

The annual demand for VRFBs was approximately 9kt V_2O_5 in 2022 and is expected to reach between 50kt and 100kt of V_2O_5 by 2033.

VRFB was the main growth sector in 2022, accounting for c. 5% of global vanadium consumption and offsetting weak consumption from the steel sector. In 2022, vanadium consumption in the battery sector rose by c. 76% from 2.9kt to 5.1kt, mainly driven by new installations in China requiring 4kt of incremental vanadium demand.

Market Size

Global annual VRFB project deployment revenue is projected to grow from USD 856.4 mn in 2022 to USD 7.76 bn by 2031, registering a CAGR of c. 28%.

The global market size for vanadium electrolyte, which is a key component for VRFBs, is forecasted to grow at a CAGR of 9.9% from 2023 to 2033, expanding from its current size of USD 221.9 mn to USD 570 mn by the end of 2033.[xxxviii]

Various VRFB Deployments[xxxix]

Recently, the deployments of a number of VRFB projects have been announced. In China, Dalian Energy Storage Power Station, which was completed in November 2022, has a battery storage capacity of 100MW/400MWh. This is expected to double, bringing capacity to 200MW/800MWh. In Japan, Sumitomo Electric installed a 15MW/60MWh VRFB demonstration project in 2015, showing a 75MWh discharge capacity.

Globally, battery projects are being deployed, such as a 50MW/200MWh flow battery in Australia. The Pangea Storage Project plans to invest USD 200 mn and use technology by CellCube by guaranteeing use for 25 years.

Asia Pacific, North America and Western Europe lead the VRFB market in terms of revenue. Annual VRFB energy capacity is expected to reach 14.5 GWh in APAC, 5.8 GWh in North America and 9.3 GWh in Western Europe by 2031.

Exhibit 33: VRFB Market Projection

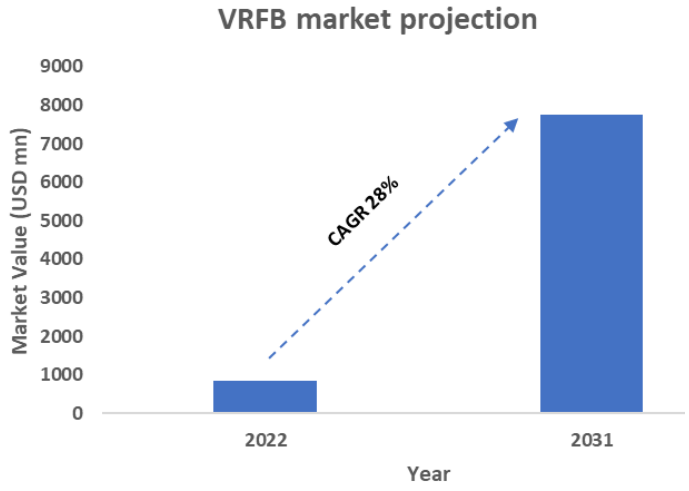
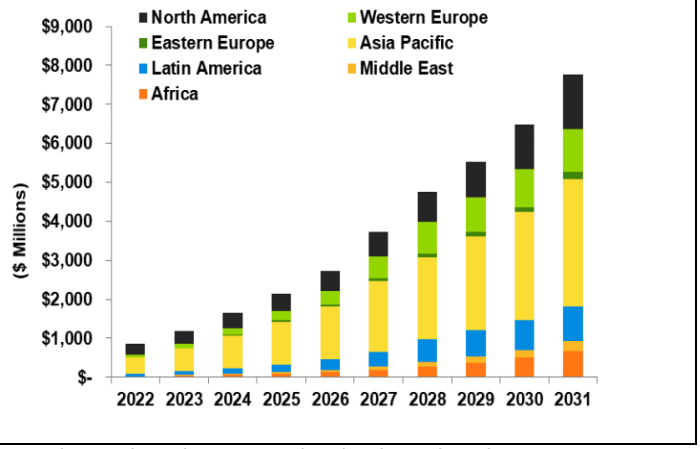
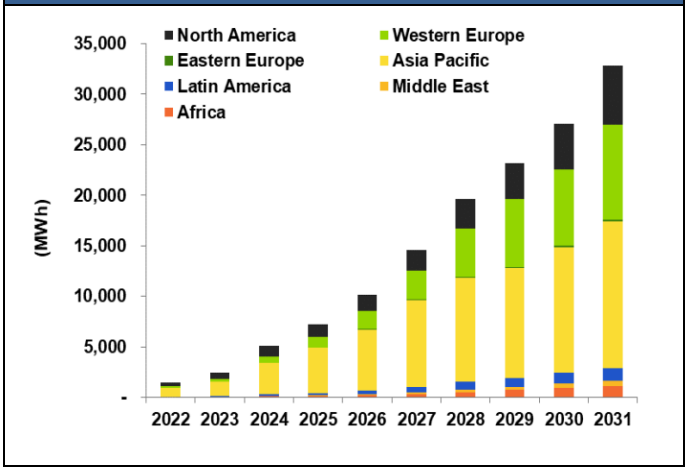


Exhibit 34: Annual Installed1 VRFB Revenue by Region[xl]



Note: Utility-Scale and Commercial and Industrial Deployment

Exhibit 35: Annual Installed1 VRFB Energy Capacity by Region



5.4.3 Chemicals

Project Blue 2023 indicates that the chemical market accounts for c. 4% of vanadium demand. In the chemical industry, vanadium is used in catalysts, including catalysts for sulfuric acid production, chemical and environmental catalysts, polyethylene production catalysts and desulfurization and denitrification catalysts. It is also used in gas processing, coloring compounds, batteries, dye fixants and vitamins. The demand for chemicals will only grow a little, because there are no novel uses that will increase the demand.

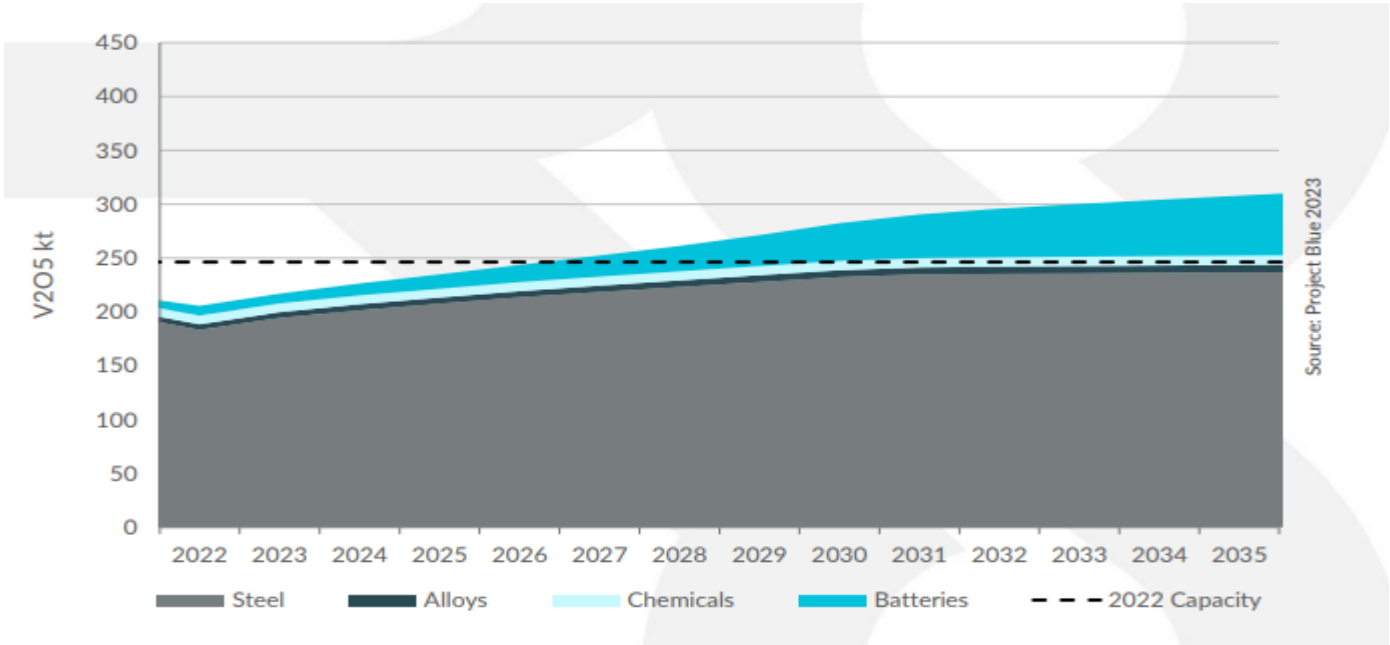
5.4.4 Alloys

As per Project Blue 2023, alloys account for 2.4% of vanadium demand. There is a sizeable market for vanadium in the alloy industry. Vanadium alloys are generally used in fusion reactors because of their low activation properties, high

thermal stress factors and radiation resistance. One application of vanadium-aluminum master alloys is to improve the physical properties of titanium alloys used in jet engines, airframes, etc. Overall, the aerospace industry has high usage of vanadium-based raw materials.

Alloys and chemicals markets are the first-use sectors for vanadium consumption, which are stable and mature in nature.

Exhibit 36: V_2O_5 Demand by Sector & Production Capacity[xli]



5.5 Historical Price Trend and Future Outlook[xlii]

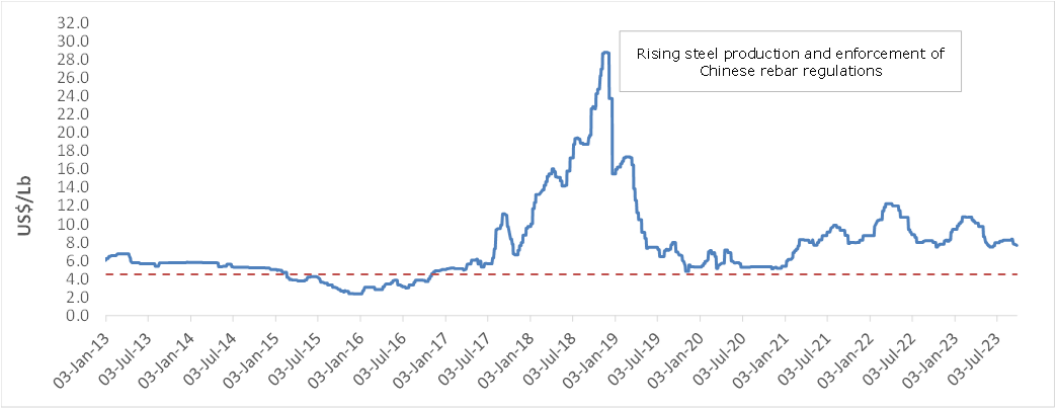
The vanadium market has seen several dramatic shifts in price over the past 20 years. The market has grown considerably, shaped by producers, consumers, governments and traders. The trend of the historical movements in the price of vanadium is as given below:

- **2004/2005:** High demand from steel producers in China and the introduction of more stringent construction regulations requiring the use of vanadium-bearing steel rebar led to a price spike.
- **2006:** Despite strong demand, a supply response led by South African producers led to a price setback.
- **2008:** High prices of vanadium, owing to a production suspension in South Africa and China.
- **2009:** Decreased demand for steel and vanadium due to the global financial crisis and increased supply led to price hike.
- **2010 to 2015:** Due to adequate supply and recovery from the prolonged recession, vanadium prices remained stable.
- **2016 to 2018:** Prices peaked in November 2018 at over USD 125/kg on a ferrovanadium basis after a sustained rise in 2016. In 2015, the global supply for vanadium became constrained due to the closing of a major producer, South Africa's Evraz Highveld, which accounted for 10-15% of global feedstock output. Shutdowns in China, Russia and South Africa also affected the availability of vanadium. China's ban on importing vanadium-bearing slag from

abroad added to the difficulties. However, prices rose due to regulatory changes in China mandating the use of higher-quality rebar, leading to consumer restocking.

- **2019/2020:** In 2019, prices fell after reaching a record high. Prices were affected because there was lower demand, steel mills released inventories and the substitution of ferrovanadium for ferroniobium helped to soften vanadium demand. In 2020, China reported its highest steel production level before the global lockdown.
- **2021/2022:** Prices were high in 2021 due to the post-pandemic recovery. In March 2022, the price rose even higher due to the Russia-Ukraine war. Prices then retreated due to demand-side concerns over the health of the global economy, particularly China.

Exhibit 37: European Vanadium Pentoxide (98%) Market Price (2013-23)[xliii]



Future Price Outlook

Vanadium prices have been very volatile historically. The current market price of V_2O_5 is c. USD 7/lb. Project Blue estimates that European vanadium pentoxide prices should reach USD 10.10/lb., USD 8.09/lb. and USD 7/lb. in the high, base and low case scenarios, respectively, by 2032.

Exhibit 38: Scenarios for Vanadium Pentoxide Prices (Europe) (USD/lb)

	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
High	9.00	9.50	9.80	10.00	10.10	10.10	10.10	10.10	10.10	10.10
Base	7.50	8.20	8.15	8.09	8.09	8.09	8.09	8.09	8.09	8.09
Low	9.00	7.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00

5.6 Market Segmentation by Type

Vanadium pentoxide (V_2O_5): Mainly used as feedstock for ferrovanadium and vanadium nitride production. It is used in catalysis for the manufacturing of sulfuric acid and many other high-purity applications. It is also used in dye, paint and varnish drying, glass and ink manufacture and production of photographic chemicals. China, Russia, South Africa, and Brazil and Austria are the leading producers.

Exhibit 39: Vanadium oxide production by country (t V contained)

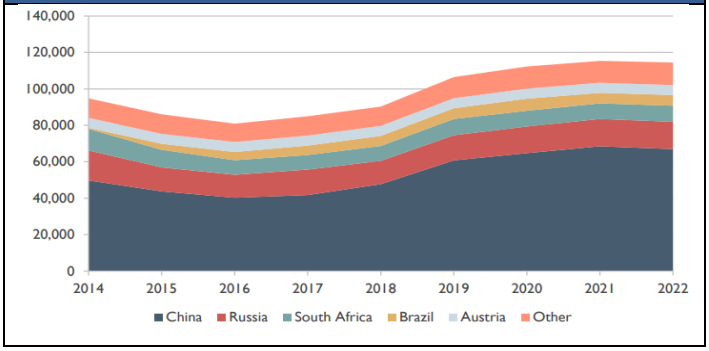
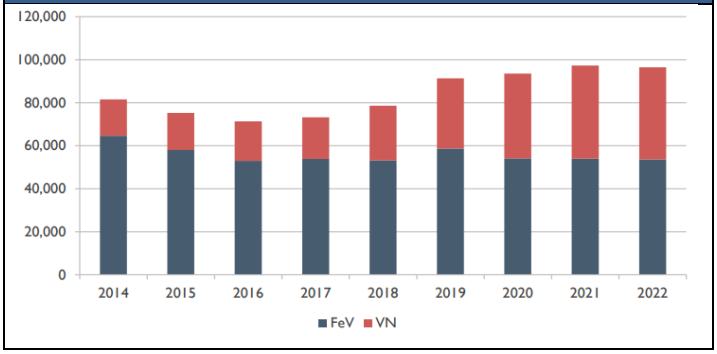


Exhibit 40: Ferrovanadium and VN production (t V contained)



t V: total vanadium

Ferrovanadium (FeV): Used in many steel products in a variety of applications, such as structural alloy steels and micro-alloy steel. Demand strongly depends on the growth of steel production, as it is widely consumed in steel alloys supplied to automotive and aerospace. The construction industry uses considerable steel in infrastructure developments, commercial buildings, production units and others, increasing demand for ferrovanadium. In 2022, China, South Korea, South Africa, Austria and Czechia were the largest FeV producers.

Vanadium ingots: These have an excellent strength-to-weight ratio, so they are used in the aerospace industry, defense industry and the manufacturing of specialized components in the automotive and chemical sectors.

Vanadium Carbon Nitride: This is a high-performance catalyst used in various chemical reactions, including ammonia production and the hydrodesulfurization process. Its unique properties make it an essential component in the petrochemical industry. China and South Africa are the top producers.

5.7 Market Outlook

1. **Short term**: In the short term, China's steel market could potentially see an expansion if the trillion-dollar infrastructure stimulus declared in 2022 and a strong recovery take effect. The announcement of multiple VRFB deployments is a good sign for the market. However, continuously rising interest rates and high inflation might negatively affect demand. The ongoing Russia-Ukraine war and other geopolitical conflicts could restrict supply chains, limiting any price rises.
2. **Medium term**: In the medium term, the consistent and strict implementation of China's rebar standards designed to promote the use of high-quality construction materials could have a positive impact on vanadium demand. The VRFB sector is expected to expand due to rising demand for carbon-neutral electricity, energy storage systems for renewable energy and rechargeable electric batteries in the automotive space. However, misconceptions about cost comparisons, which are based purely on capital rather than cost of energy, and an already established lithium market might restrain the VRFB market in the medium term, leading to volatile demand.
3. **Long term:** In the long term, the market size of the steel industry is expected to double by 2050. More and more countries are expected to mandate the use of high-quality construction material, potentially affecting the intensity of vanadium use in steel. Also, better understanding of the economic benefits of using vanadium batteries over lithium batteries could lead to fairly high growth of the VRFB sector. All these factors together should to translate into high demand for vanadium.

5.8 Vanadium Could Play a Key Role in the Energy Transition[xliv]

Vanadium could play a key role in decarbonizing global construction by serving as a microalloying element and enable the energy transition as the primary component of flow batteries used for grid-level storage.

Green steel with vanadium is essential to meet the world's carbon reduction goals

About 90% of the world's vanadium production is used in the steel industry in high-strength, low-alloy (HSLA) steel, where it imparts toughness, strength, wear resistance, anti-corrosion and anti-oxidation properties.

A relatively small amount of added vanadium, typically 0.05%, brings considerable improvements in yield strength of between 30-100%. It also improves the ductility and seismic performance of steel. Using higher-strength steels in the construction sector, such as buildings and power, directly reduces steel consumption, resulting in a lower global fossil carbon footprint. It is estimated that vanadium has enabled the avoidance of an environmental burden totaling 185 mn metric tons of CO_2 on an annual basis. A 0.38% reduction in the global fossil carbon footprint is obtained from using vanadium micro-alloyed rebar steel, using the total global fossil carbon footprint of 36,800 MT in 2019. [xlv] Hence, green steel with vanadium holds several economic and environmental benefits in building a greener and more sustainable world.

The key element in VRFBs enabling the future of green energy

Vanadium is being used in a type of rechargeable battery called VRFB, which has seen increasing commercial deployment over the past decade. Vanadium's application in stationary energy storage, through VRFBs, promotes the integration of renewable energy sources while increasing the efficiency of electricity grids. VRFB technology supports the global transition to clean energy by producing 27% to 37% less cradle-to-grave CO2 emissions compared to lithium-ion technologies. The electrolyte is water-based, eliminating the risk of fire or release of harmful gases into the environment. Recycling the vanadium electrolyte can reduce carbon emissions by up to 78% per MWh.

6. Valuation

The fair enterprise value for Vanadium Resources stood between AUD 92.4 mn and AUD mn on January 22, 2024. The fair enterprise value per publicly traded share stood between AUD 0.16 and AUD 0.46 on January 22, 2024. The valuation approach followed is the Relative Valuation Method.

6.1 Relative Valuation Method

Company Name	Ticker	Market Capitalization (AUD mn)	Total Enterprise Value (AUD mn)	Total Mineral Resource (Mt)	EV/Total Mineral Resource
Australian Vanadium Limited*	ASX:AVL	99.4	74.4	392.7	0.2
Bushveld Minerals Limited **	AIM:BMN	62.5	299.7	248.5	1.2
Largo Inc.	TSX:LGO	206.1	261.4	79.2	3.3
Phenom Resources Corp.	TSXV:PHNM	18.8	17.9	31.8	0.6
QEM Limited	ASX:QEM	30.3	28.4	2,850.0	0.0
Richmond Vanadium Technology Limited	ASX:RVT	69.9	51.1	1,838.0	0.0
Tivan Limited	ASX:TVN	91.2	90.1	160.0	0.6
Vanadian Energy Corp.	TSXV:VEC.H	0.7	1.1	49.5	0.0
Vanadiumcorp Resource Inc.	TSXV:VRB	6.1	5.9	301.8	0.0
Surefire Resources NL	ASX:SRN	17.7	16.4	321.0	0.1
Neometals Ltd	ASX:NMT	99.6	76.1	64.9	1.2
Ferro-Alloy Resources Limited	LSE:FAR	39.9	38.8	32.9	1.2
Median					**0.38**

**AVL and Technology Metals have announced a merger in September 2023, whereby AVL will continue to be the holding entity of the combined assets; hence the combined assets have been included*
*** Bushveld Minerals has entered into an agreement to sell its Mokopane assets to Southern Point Resources in September 2023; hence the resource base has not been included*

Median EV/Total Mineral Resource Multiple

Summary	Units	High Case	Low Case
Median EV/Total Mineral Resource Multiple		0.38	0.38
VR8's Total Mineral Resource	Mt	680.0	680.0
VR8's EV	AUD mn	**255.6**	**92.4**
VR8's EV/share	AUD	0.46	0.16
Upside	%	871%	251%

Sensitivity Table - VR8's Enterprise Value						
	Total Mineral Resource (in Mt)					
Median EV/ Total Mineral Resource (Comparable)	255.6	610.0	630.0	680.0	700.0	720.0
	0.1	82.9	85.6	92.4	95.1	97.9
	0.3	156.1	161.2	174.0	179.1	184.3
	0.4	229.3	236.8	**255.6**	263.1	270.7
	0.5	290.3	299.8	323.6	333.1	342.7
	0.6	351.3	362.8	391.6	403.1	414.7
	0.7	412.3	425.8	459.6	473.1	486.7

Important information on Arrowhead methodology

The principles of the valuation methodology employed by Arrowhead BID are variable to a certain extent depending on the subsectors in which the research is conducted, but all Arrowhead valuation research possesses an underlying set of common principles and a generally common quantitative process.

With Arrowhead Commercial and Technical Due Diligence, Arrowhead extensively researches the fundamentals, assets, and liabilities of a company, and builds solid estimates for revenue and expenditure over a coherently determined forecast period.

Elements of past performance, such as price/earnings ratios, indicated as applicable, are present mainly for reference purposes. Still, elements of real-world past performance enter the valuation through their impact on the commercial and technical due diligence.

Elements of comparison, such as multiple analyses, may be to some limited extent integrated in the valuation on a project-by-project or asset-by-asset basis. In the case of this Vanadium Resources Limited report, there are no multiple analyses integrated in the valuation.

Arrowhead BID Fair Market Value Bracket

The Arrowhead Fair Market Value is given as a bracket. This is based on quantitative key variable analysis, such as key price analysis for revenue and cost drivers or analysis and discounts on revenue estimates for projects and is especially relevant to those projects estimated to provide revenue near the end of the chosen forecast period. Low and high estimates for key variables are produced as a tool for valuation. The high bracket valuation is derived from the high bracket key variables, while the low bracket valuation is based on the low bracket key variables.

In principle, an investor who is comfortable with the high brackets of our key variable analysis will align with the high bracket in the Arrowhead Fair Value Bracket, and likewise in terms of low estimates. The investor will also consider the company intangibles, as presented in the first few pages of this document in the analysis on strengths and weaknesses and other essential company information. These intangibles serve as supplementary decision factors for adding or subtracting a premium in the investor's own analysis.

The bracket should be understood as a tool provided by Arrowhead BID for the reader of this report, and the reader should not solely rely on this information to make a decision on any particular security. The reader must also understand that, on the one hand, global capital markets contain inefficiencies, especially in terms of information, and that on the other hand, corporations and their commercial and technical positions evolve rapidly: this present edition of the Arrowhead valuation is for a short- to medium-term alignment analysis (1-12 months). The reader should refer to important disclosures on page 37 of this report.

7. Appendix

Exhibit 40: Summary of Total Capex Estimate for Phase 1 and Phase 2 Stages			
		By phase (USD mn)	
Description	**Total LOM (USD mn)**	**Phase 1 (Yr 1-4)**	**Phase 2 (Yr 5-25)**
Construction capex			
Mining	3.93	1.69	2.24
Concentrator	61.16	30.58	30.58
SRL Plant	256.37	130.36	126.01
Tsf	27.95	14.92	13.03
Total contingency	20.91	20.91	0.00
Site overheads	23.16	12.29	10.88
Total construction capex	**393.48**	**210.73**	**182.74**
Capitalized opex			
Pre-revenue opex	27.21	27.21	0.00
Critical spares	2.54	1.27	1.27
Operation and maintenance spares (2yrs)	3.53	1.77	1.77
Subtotal capitalized opex	**33.27**	**30.25**	**3.04**

8. Analyst Certifications

I, Ayushi Saraswat, certify that all the views expressed in this research report accurately reflect my personal views about the subject security and the subject company, based on the collection and analysis of public information and public company disclosures.

I, Sumit Wadhwa, certify that all the views expressed in this research report accurately reflect my personal views about the subject security and the subject company, based on the collection and analysis of public information and public company disclosures.

Important disclosures

Arrowhead Business and Investment Decisions, LLC has received fees in 2023 and will receive fees in 2024 from Vanadium Resources Limited for researching and drafting this report and for a series of other services to Vanadium Resources Limited, including distribution of this report and networking services. Neither Arrowhead BID nor any of its principals or employees own any long or short positions in Vanadium Resources Limited. Arrowhead BID's principals intend to seek a mandate for investment banking services from Vanadium Resources Limited 2023 or beyond and expect to receive compensation for investment banking activities from Vanadium Resources Limited in 2024 or beyond.

Aside from certain reports published on a periodic basis, the large majority of reports are published by Arrowhead BID at irregular intervals as appropriate in the analyst's judgment.

Any opinions expressed in this report are statements of Arrowhead BID's judgment to this date and are subject to change without notice.

This report was prepared for general circulation and does not provide investment recommendations specific to individual investors. As such, any of the financial or other money-management instruments linked to the company and company valuation described in this report, hereafter referred to as "the securities," may not be suitable for all investors.

Investors must make their own investment decisions based upon their specific investment objectives and financial situation utilizing their own financial advisors as they deem necessary.

Investors are advised to gather and consult multiple sources of information while preparing their investment decisions. Recipients of this report are strongly advised to read the Information on Arrowhead Methodology section of this report to understand if and how the Arrowhead Due Diligence and Arrowhead Fair Value Bracket integrate alongside the rest of their stream of information and within their decision-making process.

Past performance of securities described directly or indirectly in this report should not be taken as an indication or guarantee of future results. The price, value of, and income from any of the financial securities described in this report may rise as well as fall and may be affected by simple and complex changes in economic, financial and political factors.

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Arrowhead Business and Investment Decisions, LLC is not responsible for any loss, financial or other, directly or indirectly linked to any price movement or absence of price movement of the securities described in this report.

9. Notes and References

[i] Source: Bloomberg as on January 22, 2024
[ii] Source: Vanadium Market Fundamentals, Feb 2023
[iii] Source: Science Direct
[iv] Source: Company website and ASX announcements
[v] Source: Company Announcement
[vi] Source: Prospectus, Company website
[vii] Source: Prospectus
[viii] Source: DFS
[ix] Source: Corporate Presentation October 2023
[x] Source: DFS, Corporate Presentation October 2023 and Annual Report 2023
[xi] Source: Corporate Presentation October 2023
[xii] Source: Corporate Presentation October 2023
[xiii] Source: Corporate Presentation October 2023
[xiv] Source: Corporate Presentation October 2023
[xv] Source: SFA Oxford
[xvi] Source: Website and DFS
[xvii] Source: Annual Report
[xviii] Source: Project Blue
[xix] Source: Annual Report for 2023, Corporate Presentaion
[xx] Source: TTP Square Inc Vanadium Market 2023
[xxi] Source: Corporate Presentation November 2023
[xxii] Source: www.ferroalloynet.com
[xxiii] Source: Company website and Annual Report
[xxiv] Source: TTP Squared Inc.
[xxv] Source: PWC SA Mine 2023
[xxvi] Source: Bloomberg as on November 03, 2023
[xxvii] Source: https://vr8.global/contact/
[xxviii] Source: Chem Libre
[xxix] Source: Project Blue CMRI 2022
[xxx] Source: Project Blue May 2023, Project Blue News Article
[xxxi] Source: USGS
[xxxii] Source: Project Blue May 2023
[xxxiii] Source: Project Blue
[xxxiv] Source: Project Blue December 2022
[xxxv] Source: TTP Squared Inc
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[xliv] Source: Vanitec
[xlv] Source: Science Direct