Mining and Processing **Breakthrough at Panton** 

13 February 2023



# **Highlights**

- Flotation repeatability established with consistent metallurgical PGM recoveries averaging 78% at concentrate grades averaging 286g/t PGM<sub>3E</sub> from the high-grade PGM chromitite ore which makes up 2.9Moz of the 5.0Moz PGM<sub>3E</sub> contained in the JORC Resource at Panton
- Achieved through conventional crushing, grinding and flotation processing techniques
- Results from bulk ore sorting test work demonstrate 97% recovery of high-grade PGM bearing ore and rejection of low-grade material and waste, improving mill feed grade by 11% and reducing mass by 13%
- Amenability to ore sorting and consistency of flotation performance significantly de-risk Panton's future development
- Scoping Study well advanced and to be expanded to incorporate the positive impacts of the ore sorting results which include:
  - Mitigation of the impact of mining dilution 0
  - Increases in the processed head grade, reducing capital and operating costs 0
  - Improves consistency of processed ore, enhancing flotation performance 0
- Expanded Scoping Study to include concentrate production along with potential value add through downstream processing as an option, to produce high payability, low emission upgraded metal products, with test work demonstrating +99% metal recoveries
- Panton contains the highest grade PGM resource in Australia allowing for a low-capital, high margin operation to be progressed, with expansion potential
- Recent drilling and analysis have shown the potential for multiple mineralisation styles within the high-grade reef and improved the geological understanding of the deposit
- Targeting completion of Scoping Study in H2 2023 to enable all recent positive developments to be incorporated

Future Metals NL ("Future Metals" or the "Company", ASX | AIM: FME), is pleased to announce the results of its bulk ore sorting and flotation optimisation and repeatability test work for its Panton Project ("Panton" or the "Project"). The results demonstrate a significant de-risking for the future mining and processing of the Company's 6.9Moz PdEq JORC Resource and provide a credible path towards developing a low capital, high margin PGM-Ni operation.

The Company has also commenced scoping study and test work evaluation with PGM downstream processing technology providers. Previous test work on Panton concentrate has demonstrated recoveries of 99%+ for a majority of metals contained in the concentrate. These processes produce upgraded metals products for direct sale to refineries, or refining on site, improving payabilities, reducing logistics costs and reducing emissions relative to the smelting process route. Initial assessment of the Lifezone Metals Ltd ("Lifezone") hydrometallurgy ("hydromet") technology suggests that this would be a low capital flow sheet addition with significant operating and economic benefits.

Mr Robert Mosig

Dr Jon Hronsky

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Shane Hibbird

Future Metals NL Level 1, 33 Richardson Street, West Perth, WA, 6005

Share Price

7.4c 10 Feb 2023

Mr Jardee Kininmonth

**CAPITAL STRUCTURE** 

Market Cap

\$30.0m

Mr Allan Mulligan

Mr Tom O'Rourke

ABN: 99 124 734 961

Enterprise Value

\$24.2m

Ms Flizabeth Henson

Mr Andrew Shepherd

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Cash

\$5.8 31 Dec 2023

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# **Project Delivery Strategy**

Supplying sustainable Platinum-Group-Metals from a stable mining jurisdiction





## Mr Jardee Kininmonth, Managing Director of Future Metals, commented:

"We have now demonstrated a credible metallurgical solution which places Panton firmly on the development pathway. Panton is the highest grade PGM deposit in Australia, enabling us to progress a low capital and high margin operation with significant growth upside.

Optimisation and variability flotation test work has demonstrated highly repeatable results with strong recoveries at high concentrate grades. The ore sorting results are significant, as it is the key to increasing mineable tonnes while ensuring the ore reporting to the mill is high grade. This allows for increased economies of scale within the mine, utilising conventional underground mining methods, while decreasing processing plant capital costs by increasing the grade of the mill feed, with negligible losses of high-grade ore.

Additionally, we have been progressing discussions with potential technology partners to assess a lowcapital downstream integration option at Panton. Downstream integration enables the production of high margin metals products while also significantly decreasing the emissions profile associated with those products, thereby differentiating Panton from the majority of South African and Russia producers which use coal-fired power and generate other emissions such as sulphur dioxide. Downstream processing also closely aligns Panton with the Australian Government's critical minerals strategy which incentivises onshore upgrading and development of strategically important deposits such as Panton."

### **Pre-concentration via Ore Sorting**

Future Metals has been investigating options to de-risk and improve the Panton development economics through innovation and recent technological improvements. One such pathway is the rejection of waste early in the comminution process via ore sorting. Ore sorting technology has been used in the PGM and chromite mining industry for over ten years. The technology classifies and separates individual rocks by their physical and chemical properties. By removing gangue and low-grade ore, the size of the crushing, milling and flotation equipment can be optimised. Reducing the process plant throughput rate while increasing grade provides direct savings in capital and operating costs. Ore sorting also reduces the impact of dilution allowing for the use of conventional mining equipment, further driving down operating costs. Reductions in mining & process operating costs allows the mining cut-off grade to be optimised and the viable mining inventory to be potentially increased.

The Company has performed sighter and bulk test work with Steinert Sorting Solutions ("Steinert"). The sighter test work involved a three-stage separation process applied to a mixed feed of chromitite, magnesite and dunite. Greater than 95% chromitite recovery was achieved during the first pass, using an x-ray transmission ("XRT") 3D-laser combination sort programme, due to the chromitite being substantially higher in atomic density. 100% of the magnesite was recovered during the second pass, using both an XRT-3D combination (due to the lower atomic density of magnesite) and laser brightness (due to the high colour contrast between magnesite and the other materials).

Following the success of the sighter test work, a bulk test was completed. The bulk test work involved compositing separate chromitite and dunite samples to replicate the expected feed mix from a mine stope. The chromitite and dunite were crushed and screened into to three size fractions; +25mm, +10mm, and -10mm. Each of these size fractions were assayed prior to preparation of two composites; -75mm to +25mm & -25mm to +10mm, which were processed using the same XRT 3D-laser combination sort program used in the sighter test work. The fine -10 mm fraction is considered to be below the capability of the ore sorting units and was not tested.

The bulk ore sort test work validated the sighter test work on multiple size fractions, demonstrating 96.7% recovery of high-grade ore and rejection of low-grade and waste, increasing the PGM grade of the potential mill feed by 10.7% and reducing the throughput volume by 12.7%. This is a very positive result early into the test work process. Further information on the bulk ore sort test work can be found in Appendix 1.



The Company is currently planning follow up work which will involve further optimisation, variability, and repeatability testing.

Ore Sorting Products			Pt		Pd		Au	Pt,	Pd & Au
	Weight (%)	g/t	Recovery (%)	g/t	Recovery (%)	g/t	Recovery (%)	g/t	Recovery (%)
Calculated Head Grade (Ore Sorter Feed)		3.49		4.00		0.38		7.87	
Total Ore Sorter Accepts	87.3	3.88	96.9	4.44	96.8	0.40	92.5	8.72	96.7
Total Ore Sorter Rejects	12.7	0.85	3.09	1.00	3.18	0.22	7.5	1.86	3.4

### **Table 1: Bulk Ore Sorting Test Results**







#### Figure 2: Ore Sorting Schema





Waste Material

[11] M. M. Charles, M. Landar, K. M. Katalan, K. K. Katalan, and K. Katalan, "Interface of the structure of the structure

\*Dimensions and grades are for illustrative purposes only



# **Flotation Test Work Results**

As previously noted in the Company's announcement on 7 July 2021 '*Above 80% PGM Recovery to High Grade PGM Concentrate'*, flotation test work carried out in 2015 on Panton chromitite ore achieved a technical breakthrough for the Panton Project. It was shown that a combination of fine grinding (P<sub>80</sub> 38µm), conditioning with sodium dithionite as a reducing agent, and use of nitrogen gas improved flotation results significantly. The best result achieved (test HL1279) was 81.4% recovery (PGM<sub>3E</sub>) at a 2.5% mass pull for a 272 g/t PGM<sub>3E</sub> concentrate grade with a rapid 14 minutes of flotation time. Whilst the 2015 test work achieved dramatic improvements in the flotation performance, repeatability of HL1279 was not established and there was minimal follow up optimisation work.

As detailed in the Company's announcement on 21 June 2022 'Independent Resource Estimate of 6.9Moz PdEq', Future Metals undertook further flotation test work in early 2022 on both low-grade composites ( $\sim$ 2.3g/t PGM<sub>3E</sub>) and high-grade composites ( $\sim$ 7.6g/t PGM<sub>3E</sub>), using a single stage rougher-scavenger test. Results yielded PGM<sub>3E</sub> recoveries of up to 68% and 71% respectively (with higher Pd recovery relative to the Pt recovery) with concentrate grades of  $\sim$ 130g/t PGM<sub>3E</sub> for the high-grade composite and up to 17g/t PGM<sub>3E</sub> for the low-grade composite.

Following this initial test work the Company embarked on a systematic programme of optimisation and variability test work with Independent Metallurgical Operations Pty Ltd ("IMO").

New flotation results from this latest programme of optimisation and variability test work yielded positive results on the high-grade chromitite samples with  $PGM_{3E}$  recoveries of 75.7% to 81.4% with concentrate grades from 167 g/t to 387 g/t  $PGM_{3E}$  with an average of 286g/t  $PGM_{3E}$ . These results were achieved over six consecutive tests, demonstrating strong repeatability of the flotation regime. A key factor to these consistent results is controlling potential through the flotation cycle and ensuring a reducing environment is maintained. Other physical parameters have also been optimised such as froth collection rates, number of flotation stages and flotation retention time. Table 2 details these latest flotation results.

Test		Concentrate Grade							Head Grade				
No.	Mass Pull	Р	t	Po	ł	A	\u	Pt, Pd	l & Au	Pt	Pd	Au	Pt, Pd & Au
	%	g/t	Rec	g/t	Rec	g/t	Rec	g/t	Rec		g/	t	
FT014	2.46	136	77.7	154	74.9	11	65.3	301	75.7	4.31	5.06	0.42	9.79
FT015	2.90	121	80.3	139	78.1	11	68.9	271	78.6	4.38	5.18	0.45	10.01
FT016	1.85	175	78.9	197	75.9	15	68.3	387	76.9	4.09	4.79	0.41	9.29
FT017	2.36	136	78.8	154	75.7	12	67.9	302	76.7	4.08	4.78	0.43	9.29
FT018	3.34	127	82.3	151	81.2	11	74.6	289	81.4	5.13	6.21	0.50	11.84
FT019	4.51	71	78.3	89	77.2	7	70.9	167	77.4	4.11	5.19	0.43	9.73
Average	2.90	128	79.4	147	77.2	11	69.3	286	77.8	4.35	5.20	0.44	9.99

The Company considers the head grade of the flotation tests to be within an acceptable range of potential mill feed grade when factoring mined grade of the Upper Reef following upgrading through ore sorting.



Table 3 sets out the range of achieved recoveries, concentrate grades and head grades for by-products in the flotation tests on chromitite ore samples:

Panton	Ni	Cu	Co*	Rh	Ir	Os
	(%)	(%)	(%)	(g/t)	(g/t)	(g/t)
Head Grade	0.27 – 0.28	0.04	0.03	0.09 - 0.10	0.09 - 0.11	0.12 – 0.13
Recovery (%)	37 - 45	56 - 62	8 – 9	38 - 44	50 - 55	29 - 34
Concentrate Grade	3.8 – 5.5	0.9 – 1.3	0.06 - 0.07	1.4 – 2.0	1.9 – 2.6	1.4 – 2.1

**Table 3: By-product Recoveries** 

\*Only FT017 was assayed for Co

In addition, the Company has completed multiple flotation tests on a low-grade (~1 g/t PGM<sub>3E</sub>) dunite sample. The flotation regime utilised is similar to that used on the chromitite sample. The Company has been able to achieve recoveries >75%, however it has not yet been able to achieve concentrate grades which would support direct sale to the global smelter market. Additional ongoing test work and analysis is examining how to improve flotation results, as well as the potential to utilise flotation and physical separation as an intermediate step to onsite hydrometallurgical processing. The Company is additionally looking at various leaching methods to extract metals directly from both high-grade and low-grade ore, without flotation.

### **Ongoing Test Work**

The results to date indicate that a very high grade  $PGM_{3E}$  concentrate is achievable from Panton chromitite ore feed. Now that a consistent baseline flotation regime has been established, there is significant potential for further optimisation through the study process. This includes introducing a cleaner circuit, concentrate regrind, and further exploratory testing of reagents to improve recoveries, including the recoveries of base metals in feed. The Company will continue to test for further improvements, as well as testing the variability of flotation response from samples throughout the Panton orebody.

Panton's concentrate will likely be marketed as a bulk Ni-PGM<sub>3E</sub> concentrate. Additional optimisation, planning and marketing work is required in relation to the chrome content of the concentrate, given it is a deleterious element. However, the very high  $PGM_{3E}$  grade of the concentrate is expected make the Panton Ni-PGM<sub>3E</sub> concentrate attractive to smelters despite the chrome content. Mine planning and blending strategies will also be utilised to ensure a consistent, valuable Ni-PGM<sub>3E</sub> concentrate is produced.

Furthermore, test work has demonstrated that a metallurgical grade chromite concentrate can be produced from the Panton flotation tails (from chromitite ore) through Wet High Intensity Magnetic Separation ("WHIMS"). Chromite concentrate represents a potentially valuable co-product, which is sold into the ferrochrome industry, an input into stainless steel. The Company will continue optimisation and marketing work and assess the inclusion of a WHIMS circuit in the Scoping Study.

### **Downstream Processing - Hydrometallurgy**

In addition to the flotation test work, the Company is also exploring the potential to further process the high-grade concentrate utilising a hydrometallurgical process to produce upgraded metal products. The potential benefits from hydrometallurgical processing including improved payabilities, reduced logistics costs, and significantly less sensitivity to many elements deleterious to smelters, such as chrome. These benefits have resultant benefits in mine planning and mine inventory.



Future Metals has engaged with Lifezone as a technology partner to further explore the amenability of utilising their hydrometallurgical technology for further upgrading of Panton concentrate. The Lifezone hydromet process replaces the smelting process, extracting contained metals in concentrate through hydrometallurgical processes to produce a suite of metals products suitable for direct sale to refiners. Hydrometallurgical processing has a range of benefits relative to smelting including<sup>1</sup>:

- 65-80% lower capital costs
- 35-50% lower operating costs
- 50-85% lower electricity consumption
- Up to 80% lower CO<sub>2</sub> emissions and no SO<sub>2</sub> emissions
- Fewer constraints on concentrate quality than smelting

The upgrading of concentrate to metals products also materially increases revenue per tonne as payabilities for these products is much higher relative to smelters payment terms for metals in concentrate.

The Company's view is that a low emission upgraded PGM product from Australia will be highly sought after by potential customers in the hydrogen and automotive industry, who are sensitive to accumulated emissions through the supply chain, as well as other ESG considerations.

Lifezone's hydromet technology is at various stages of development globally.

Panton's very high grade  $PGM_{3E}$  concentrate would allow for a small, low-capital process plant employing Lifezone's hydromet technology, which would potentially significantly enhance the economics of the Panton project.

Test work has previously been undertaken on the Panton concentrate utilising Lifezone's hydromet process with concentrate specifications and metal recoveries shown below.

Sample	Pt (g/t)	Pd (g/t)	Au (g/t)	Ni (%)	Cu (%)	Co (g/t)	Fe (%)	S (%)
Concentrate Grade	55.6	65.9	5.6	3.3	0.9	916.0	12.9	4.4
Recovery	99.3	99.3	92.2	99.0	99.4	93.2	60.7	96.6

**Table 4: Panton Concentrate Head Assays and Metal Recoveries** 

The Company is also undertaking test work with SGS Canada Inc., utilising their Platsol process.

### **Scoping Study Update**

The Company is pleased with the progress made to date, with ore sorting and flotation test work significantly de-risking the development of Panton. The ore sorting results have a material impact on mine design and enable a reduction in the size of milling and flotation equipment, tailings storage, electricity requirements and water consumption which will therefore reduce estimated capital and operating costs. These have positive flow-on effects to cut-off grades used for mine design, improving mineable inventory. Following positive pre-scoping assessment and prior test work of the Lifezone's hydromet process, the Company is also assessing the potential of downstream integration as part of its scoping study. Additionally, Company has an improved geological model for Panton which will be used to inform an updated JORC Mineral Resource estimate to be incorporated into the Scoping Study. Lastly, the Company continues to progress potential processing pathways for its significant low-grade Resource and will incorporate this into study activities once a metallurgical solution is in place.

Consequently, the Company expects an updated Scoping Study, incorporating these improvements, to be completed in H2 2023.

<sup>&</sup>lt;sup>1</sup> Kell hydrometallurgical extraction of precious and base metals from flotation concentrates – Piloting, engineering and implementation advances. June 2019. K Liddell, M Adams, L Smith



# For further information, please contact:

## Enquiries:

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### **Competent Person's Statement**

The information in this announcement that relates to metallurgical test work managed by Independent Metallurgical Operations Pty Ltd ("IMO") is based on, and fairly represents, information and supporting documentation reviewed by Mr Peter Adamini, BSc (Mineral Science and Chemistry), who is a Member of The Australasian Institute of Mining and Metallurgy (AusIMM). Mr Adamini is a full-time employee of IMO, who has been engaged by Future Metals NL to provide metallurgical consulting services. Mr Adamini has approved and consented to the inclusion in this announcement of the matters based on his information in the form and context in which it appears.

The information contained within this announcement is deemed by the Company to constitute inside information as stipulated under the Market Abuse Regulation (EU) No. 596/2014 as it forms part of United Kingdom domestic law pursuant to the European Union (Withdrawal) Act 2018, as amended by virtue of the Market Abuse (Amendment) (EU Exit) Regulations 2019.



### **Notes to Editors:**

### About the Panton PGM-Ni Project

The 100% owned Panton PGM-Ni Project is located 60kms north of the town of Halls Creek in the eastern Kimberly region of Western Australia, a tier one mining jurisdiction. The project is located on three granted mining licences and situated just 1km off the Great North Highway which accesses the Port of Wyndham (refer to Figure Three).

The Project hosts an independent JORC Code (2012) MRE had increased to 129Mt @ 1.20g/t PGM3E1, 0.19% Ni, 0.04% Cu and 154ppm Co (1.66g/t PdEq2) at a cut-off grade of 0.90g/t PdEq2 for contained metal of 5.0Moz PGM3E1, 239kt Ni, 48kt Cu and 20kt Co (6.9Moz PdEq2). The MRE includes a high-grade reef of 25Mt @ 3.57g/t PGM3E1, 0.24% Ni, 0.07% Cu and 192ppm Co (3.86g/t PdEq2) for contained metal of 2.9Moz PGM3E1, 60kt Ni, 18kt Cu and 5kt Co (3.2Moz PdEq2).

PGM-Ni mineralisation occurs within a layered, differentiated mafic-ultramafic intrusion referred to as the Panton intrusive which is a 12km long and 3km wide, south-west plunging synclinal intrusion. PGM mineralisation is hosted within a series of stratiform chromitite reefs as well as a surrounding zone of mineralised dunite within the ultramafic package.



Figure Three | Panton PGM Project Location

# About Platinum Group Metals (PGMs)

PGMs are a group of six precious metals being Platinum (Pt), palladium (Pd), iridium (Ir), osmium (Os), rhodium (Rh), and ruthenium (Ru). Exceptionally rare, they have similar physical and chemical properties and tend to occur, in varying proportions, together in the same geological deposit. The usefulness of PGMs is determined by their unique and specific shared chemical and physical properties.

PGMs have many desirable properties and as such have a wide variety of applications. Most notably, they are used as auto-catalysts (pollution control devices for ICE vehicles), but are also used in jewellery, electronics, hydrogen production / purification and in hydrogen fuel cells. The unique properties of PGMs help convert harmful exhaust pollutant emissions to harmless compounds, improving air quality and thereby enhancing health and wellbeing.



# JORC Code (2012) Edition Table 1

### Section 1 Sampling Techniques and Data

Criteria	JORC Code explanation	Commentary
Sampling techniques	<ul> <li>Nature and quality of sampling (eg cut channels, random chips, or specific specialised industry standard measurement tools appropriate to the minerals under investigation, such as down hole gamma sondes, or handheld XRF instruments, etc). These examples should not be taken as limiting the broad meaning of sampling.</li> <li>Include reference to measures taken to ensure sample representivity and the appropriate calibration of any measurement tools or systems used.</li> <li>Aspects of the determination of mineralisation that are Material to the Public Report. In cases where 'industry standard' work has been done this would be relatively simple (eg 'reverse circulation drilling was used to obtain 1 m samples from which 3 kg was pulverised to produce a 30 g charge for fire assay). In other cases more explanation may be required, such as where there is coarse gold that has inherent sampling problems. Unusual commodities or mineralisation types (eg submarine nodules) may warrant disclosure of detailed information.</li> </ul>	<ul> <li>Sampling methods used for samples used in the metallurgical test work in this announcement were sourced from both PQ3 Diamond drill core and Chromitite reef mineralisation mined from the underground decline in 2007. PQ3 Diamond Core which was cut in half, and one half further cut into a quarter. One quarter is sent for assay, one quarter is retained for reference and the remaining half is used as a metallurgical test sample. Sample intervals were generally 1 m in length but modified to honor geological changes such as lithology contacts. Minimum sample length was 30cm.</li> <li>Coarsely crushed (&gt;100mm) chromitite reef and dunite material from the underground workings was collected by Panoramic Resources in 2007 and stored in sealed drums. This material was utilized in the bulk ore sorting test work program. Approximately 540kg of 'chromite reef and 290kg of 'dunite' was utilized. This material was categorized by an experienced geologist based on visual inspection. This material was crushed and screened into three size fractions; -10mm, +10mm / -25mm and +25mm / -75mm. Each size fraction of both chromite reef and dunite was sampled for assay and subsequently blended. The first pass of the ore sorting was calibrated based on previous sighter test work which utilized chromite and dunite material with significantly different densities. It was discovered in the bulk ore sort that a significant amount of the material being rejected. A decision was made to do a second pass through the ore sorter products were subsequently assayed, and it was found that a significant amount of material the a significant amount of material that initially been classified as lower density still contained significantly higher grade PGM material. Thus further optimisation testwork at different density cut-offs should confirm that only a single pass will be required to achieve the same results as the two pass recovery.</li> <li>All sampling was either supervised by, or undertaken by, qualified geologists.</li> <li>T</li></ul>
techniques	hammer, rotary air blast, auger, Bangka, sonic, etc) and details (eg core diameter, triple or standard tube, depth	diameter) Core is orientated using a BLY TruCore UPIX Orientation Tool



Criteria	JORC Code explanation
	of diamond tails, fa core is oriented ar
Drill san recover	Method of recordi recoveries and res
	<ul> <li>Measures taken to representative nat</li> </ul>
	<ul> <li>Whether a relatio and grade and wh due to preferentia</li> </ul>
Logging	<ul> <li>Whether core and and geotechnically appropriate Miner and metallurgical</li> </ul>
	<ul> <li>Whether logging Core (or costean, or</li> </ul>
5	<ul> <li>The total length intersections logge</li> </ul>
Sub-san techniqu	If core, whether cu all core taken.
and sam prepara	tion If non-core, wheth and whether same
$\cup$	<ul> <li>For all sample appropriateness o</li> </ul>
	<ul> <li>Quality control prostages to maximise</li> </ul>
	<ul> <li>Measures taken representative of t for instance res sampling.</li> </ul>
	<ul> <li>Whether sample si the material being</li> </ul>
Quality assay da and	of • The nature, qualit ta and laboratory technique is consi
laborato tests	<ul> <li>For geophysical instruments, etc, tl analysis including times, calibrations etc.</li> </ul>
	<ul> <li>Nature of quality standards, blanks, and whether accept and precision have</li> </ul>
Verifica	tion • The verification of
and assa	nuependent of all

Criteria	JORC Code explanation	Commentary
	of diamond tails, face-sampling bit or other type, whether core is oriented and if so, by what method, etc.).	<ul> <li>The drilling contractor was Terra Drilling. Triple tubes are utilised in the weathered horizon (less than 10m) and standard tubes for the remainder of the drill hole.</li> </ul>
Drill sample recovery	<ul> <li>Method of recording and assessing core and chip sample recoveries and results assessed.</li> <li>Measures taken to maximise sample recovery and ensure representative nature of the samples.</li> <li>Whether a relationship exists between sample recovery.</li> </ul>	<ul> <li>Each core run is measured and checked against the drillers core blocks. Any core loss is noted. To date core recoveries have been excellent with very little core loss reported.</li> <li>The drilled widths of mineralisation in these drill</li> </ul>
	and grade and whether sample bias may have occurred due to preferential loss/gain of fine/coarse material.	<ul><li>holes are larger than the true widths.</li><li>No relationship between recovery and grade has been identified.</li></ul>
Logging	<ul> <li>Whether core and chip samples have been geologically and geotechnically logged to a level of detail to support appropriate Mineral Resource estimation, mining studies and metallurgical studies.</li> </ul>	<ul> <li>All drill core has been logged onsite by geologists to a level of detail to support appropriate Mineral Resource estimation, mining studies and metallurgical studies.</li> </ul>
	Whether logging is qualitative or quantitative in nature. Core (or costean, channel, etc.) photography.	<ul> <li>Logging is qualitative and records lithology, grain size, texture, weathering, structure, alteration, veining and subbides. Core is dividably photographed</li> </ul>
	<ul> <li>The total length and percentage of the relevant intersections logged.</li> </ul>	<ul> <li>All holes are logged in full.</li> </ul>
Sub-sampling techniques	<ul> <li>If core, whether cut or sawn and whether quarter, half or all core taken.</li> </ul>	<ul> <li>All core that is sampled is cut using a diamond saw.</li> <li>PQ3 core is cut in half, and then one half cut again</li> </ul>
and sample preparation	<ul> <li>If non-core, whether riffled, tube sampled, rotary split, etc and whether sampled wet or dry.</li> </ul>	laboratory for assay, and the remaining core is kept as a reference
	<ul> <li>For all sample types, the nature, quality and appropriateness of the sample preparation technique.</li> </ul>	Generally, core samples are 1 metre in length, with a
	<ul> <li>Quality control procedures adopted for all sub-sampling stages to maximise representivity of samples.</li> </ul>	minimum sample length of 30 centimetres. Sample lengths are altered from the usual 1 metre due to geological contacts, particularly around the
	<ul> <li>Measures taken to ensure that the sampling is representative of the in-situ material collected, including for instance results for field duplicate/second-half sampling.</li> </ul>	<ul><li>chromitite reefs.</li><li>The sample size is considered appropriate for the material being sampled.</li></ul>
	<ul> <li>Whether sample sizes are appropriate to the grain size of the material being sampled.</li> </ul>	
Quality of assay data	<ul> <li>The nature, quality and appropriateness of the assaying and laboratory procedures used and whether the technique is provident of a state.</li> </ul>	<ul> <li>For Future Metals NL drill holes <sup>1</sup>/<sub>2</sub> core samples were sent, Bureau Veritas, Canning Vale, Western Australia.</li> </ul>
and laboratory tests	<ul> <li>For geophysical tools, spectrometers, handheld XRF instruments, etc, the parameters used in determining the analysis including instrument make and model, reading times, calibrations factors applied and their derivation, etc.</li> <li>Nature of quality control procedures adopted (e.g.</li> </ul>	<ul> <li>Future Metal NL analysis of samples had Pt, Pd and Au determined by lead collection fire assay with a 40 gram charge with ICP-MS finish providing a lower detection limit of 1ppb. Determination of As, Co, Cr, Cu, Ni and S was by Inductively Coupled Plasma following a mixed acid digest. Both ICP and fire assay analytical methods are total.</li> </ul>
	standards, blanks, duplicates, external laboratory checks) and whether acceptable levels of accuracy (ie lack of bias) and precision have been established.	<ul> <li>No geophysical tools were used.</li> <li>Laboratory repeat analysis is completed on 10% of the samples submitted for assay.</li> </ul>
Verification of sampling and assaying	<ul> <li>The verification of significant intersections by either independent or alternative company personnel.</li> <li>The use of twinned holes.</li> <li>Documentation of primary data, data entry procedures, data verification, data storage (physical and electronic)</li> </ul>	<ul> <li>Intersections are not reported in this release.</li> <li>No adjustments were made to the data other than converting ppm to % by dividing by 10,000.</li> </ul>
	<ul> <li>protocols.</li> <li>Discuss any adjustment to assay data</li> </ul>	
Location of data points	<ul> <li>Accuracy and quality of surveys used to locate drill holes (collar and down-hole surveys), trenches, mine workings and other locations used in Mineral Resource estimation.</li> <li>Specification of the grid system used.</li> </ul>	<ul> <li>Drill hole collars are located using a hand-held GPS.</li> <li>Down hole surveys are taken with a north seeking gyroscope at regular intervals of 30m down hole.</li> </ul>



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Criteria	JORC Code explanation	Commentary
	Quality and adequacy of topographic control.	<ul> <li>Grid system used is Map Grid of Australia 1994, Zone 52.</li> <li>The topographic control is considered better than &lt;3m and is considered adequate.</li> </ul>
Data spacing and distribution	<ul> <li>Data spacing for reporting of Exploration Results.</li> <li>Whether the data spacing and distribution is sufficient to establish the degree of geological and grade continuity appropriate for the Mineral Resource and Ore Reserve estimation procedure(s) and classifications applied.</li> <li>Whether sample compositing has been applied.</li> </ul>	<ul> <li>Data spacing down hole is considered appropriate at between 0.3 and 1m intervals.</li> <li>Samples have not been composited.</li> </ul>
Orientation of data in relation to geological structure	<ul> <li>Whether sample compositing has been applied.</li> <li>Whether the orientation of sampling achieves unbiased sampling of possible structures and the extent to which this is known, considering the deposit type.</li> <li>If the relationship between the drilling orientation and the orientation of key mineralised structures is considered to have introduced a sampling bias, this should be assessed and reported if material.</li> </ul>	<ul> <li>The orientation of the drill hole relative to the geological target is as orthogonal as practicable however drilled intersections will be larger than true widths.</li> </ul>
Sample security	The measures taken to ensure sample security.	<ul> <li>All core sample intervals are labelled in the core boxes, recoded digitally and captured with the core photography. Cut core samples are collected in bags labelled with the sample number. Samples are delivered to the Company's transport contractor in Halls Creek directly by Company personnel. Samples are then delivered to the laboratory by the transport contractor.</li> </ul>
Audits or reviews	<ul> <li>The results of any audits or reviews of sampling techniques and data.</li> </ul>	<ul> <li>The Company employed industry-standard protocols. No independent audit has been conducted.</li> </ul>

# oration Results

Criteria	JORC Code explanation	Commentary
Mineral tenement and land tenure status	<ul> <li>Type, reference name/number, location and ownership including agreements or material issues with third parties such as joint ventures, partnerships, overriding royalties, native title interests, historical sites, wilderness or national park and environmental settings.</li> </ul>	<ul> <li>The Panton PGM Project is located on three granted mining licenses M80/103, M80/104 and M80/105 ('MLs'). The MLs are held 100% by Panton Sill Pty Ltd which is a 100% owned subsidiary of Future Metals NL.</li> </ul>
	• The security of the tenure held at the time of reporting along with any known impediments to obtaining a	<ul> <li>The MLs were granted on 17 March 1986 and are currently valid until 16 March 2028.</li> </ul>
	licence to operate in the area.	<ul> <li>A 0.5% net smelter return royalty is payable to Elemental Royalties Australia Pty Ltd in respect of any future production of chrome, cobalt, copper, gold, iridium, palladium, platinum, nickel, rhodium and ruthenium.</li> </ul>
		<ul> <li>A 2.0% net smelter return royalty is payable to Maverix Metals (Australia) Pty Ltd on any PGMs produced from the MLs.</li> </ul>
		• There are no impediments to working in the area.
Exploration done by other parties	<ul> <li>Acknowledgment and appraisal of exploration by other parties.</li> </ul>	<ul> <li>The Panton deposit was discovered by the Geological Survey of Western Australia from surface mapping conducted in the early 1960s.</li> </ul>
		<ul> <li>Pickland Mather and Co. drilled the first hole to test the mafic-ultramafic complex in 1970, followed by Minsaco Resources which drilled 30 diamond holes between 1976 and 1987.</li> </ul>



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Geology	Deposit 1     mineralisat
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	<ul> <li>If the exclusion of the report explain who is a second to the report explain to the report</li></ul>
Data aggregation methods	<ul> <li>In reportin techniques truncations grades are</li> </ul>
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Criteria	JORC Code explanation	Commentary
		<ul> <li>In 1989, Pancontinental Mining Limited and Degussa Exploration drilled a further 32 drill holes and defined a non-JORC compliant resource.</li> <li>Platinum Australia Ltd acquired the project in 2000 and conducted the majority of the drilling, comprising 166 holes for 34,410 metres, leading to the delineation of a maiden JORC Mineral Resource Estimate.</li> <li>Panoramic Resources Ltd subsequently purchased the Panton PGM Project from Platinum Australia Ltd in May 2012 and conducted a wide range of metallurgical test work programmes on the Panton ore.</li> </ul>
Geology	<ul> <li>Deposit type, geological setting and style of mineralisation.</li> </ul>	<ul> <li>The Panton intrusive is a layered, differentiated mafic to ultramafic body that has been intruded into the sediments of the Proterozoic Lamboo Complex in the Kimberley Region of Western Australia. The Panton intrusion has undergone several folding and faulting events that have resulted in a south westerly plunging synclinal structure some 10km long and 3km wide.</li> <li>PGM mineralisation is associated with several thin cumulate Chromitite reefs within the ultramafic sequence. In all there are three chromite horizons, the Upper group Chromitite (situated within the ultramafic cumulate sequence), the Middle group Chromitite (situated in the upper portion of the ultramafic cumulate sequence) and the Lower group Chromitite (situated toward the base of the ultramafic cumulate sequence). The top reef mineralised zone has been mapped over approximately 12km.</li> </ul>
Drill hole Information	<ul> <li>A summary of all information material to the understanding of the exploration results including a tabulation of the following information for all Material drill holes:         <ul> <li>easting and northing of the drill hole collar</li> <li>elevation or RL (Reduced Level elevation above sea level in metres) of the drill hole collar</li> <li>dip and azimuth of the hole</li> <li>down hole length and interception depth</li> <li>hole length.</li> </ul> </li> <li>If the exclusion of this information is justified on the basis that the information is not Material and this exclusion does not detract from the understanding of the report, the Competent Person should clearly explain why this is the case.</li> </ul>	<ul> <li>Drillhole locations and diagrams are presented above in this announcement and are also detailed in the relevant previous ASX announcements related to the exploration results.</li> </ul>
Data aggregation methods	<ul> <li>In reporting Exploration Results, weighting averaging techniques, maximum and/or minimum grade truncations (e.g. cutting of high grades) and cut-off grades are usually Material and should be stated.</li> <li>Where aggregate intercepts incorporate short lengths of high grade results and longer lengths of low-grade results, the procedure used for such aggregation should be stated and some typical examples of such aggregations should be shown in detail.</li> <li>The assumptions used for any reporting of metal equivalent values should be clearly stated.</li> </ul>	No intercepts are being reported.
Relationship between	<ul> <li>These relationships are particularly important in the reporting of Exploration Results.</li> </ul>	<ul> <li>No exploration results are being reported.</li> </ul>



Criteria	JORC Code explanation	Commentary
mineralisation widths and intercept lengths	<ul> <li>If the geometry of the mineralisation with respect to the drill hole angle is known, its nature should be reported.</li> <li>If it is not known and only the down hole lengths are reported, there should be a clear statement to this effect (e.g. 'down hole length, true width not known').</li> </ul>	<ul> <li>Metallurgical drill holes have been deliberate orientated at a low angle to the dip of th mineralised chromitite reefs to maximise th amount of material recovered for metallurgical te work. The drilled thickness is considerably greate than the true thickness in these drill holes as result.</li> </ul>
Diagrams	<ul> <li>Appropriate maps and sections (with scales) and tabulations of intercepts should be included for any significant discovery being reported These should include, but not be limited to a plan view of drill hole collar locations and appropriate sectional views.</li> </ul>	<ul> <li>Drillhole locations and diagrams are presente above in this announcement and are also detaile in the relevant previous ASX announcemen related to the exploration results.</li> </ul>
Balanced reporting	<ul> <li>Where comprehensive reporting of all Exploration Results is not practicable, representative reporting of both low and high grades and/or widths should be practiced to avoid misleading reporting of Exploration Results.</li> </ul>	<ul> <li>All results at hand at the time of this announcement have been reported.</li> </ul>
Other substantive exploration data	<ul> <li>Other exploration data, if meaningful and material, should be reported including (but not limited to): geological observations; geophysical survey results; geochemical survey results; bulk samples size and method of treatment; metallurgical test results; bulk density, groundwater, geotechnical and rock characteristics; potential deleterious or contaminating substances.</li> </ul>	<ul> <li>All exploration results received by the Company t date are included in this or previous releases to th ASX. No exploration results are being reported this specific announcement.</li> <li>No other exploration data is relevant.</li> </ul>
Further work	<ul> <li>The nature and scale of planned further work (eg tests for lateral extensions or depth extensions or large-scale step-out drilling).</li> <li>Diagrams clearly highlighting the areas of possible extensions, including the main geological interpretations and future drilling areas, provided this information is not commercially sensitive.</li> </ul>	<ul> <li>Next stage of work will consist of addition mineralogical and metallurgical test work. Th Company plans to undertake infill drilling t upgrade the current chromitite hosted PGI resource and is undertaking mining and econom studies.</li> </ul>