ASX / MEDIA ANNOUNCEMENT **01/12/2021**

HILL 616 MAIDEN INFERRED RESOURCE INCREASES MANGANESE INVENTORY BY 90%

Highlights

- **Maiden Inferred Mineral Resource Estimate at Hill 616 of 57.5mt at 12.2% Mn**
  - Includes a close-to-surface supergene manganese zone of 8.1mt at 17.4% Mn
- **Identification of higher-grade supergene zone at Hill 616 strengthens Firebird's Rapid Development Strategy, which is currently underway and evaluating initial production through DSO via simple beneficiation**
  - Firebird focused on assessing speed to market options to provide early cashflow to fund future manganese sulphate development for the battery market
- **Addition of Hill 616 Mineral Resource to the Oakover Project Mineral Resource increases the Company's total Inferred Mineral Resources by 90% to 121mt:**
  - Oakover Project - Inferred JORC 2012 Mineral Resource Estimate of 64 Mt @ 10% Mn
  - Hill 616 Project - Inferred JORC 2012 Mineral Resource Estimate of 57.5 Mt @ 12.2% Mn
- **Historical drilling of more than 4,900m over 2.2 km of strike was sufficient to establish the Hill 616 Maiden Resource, resulting in a significant and inexpensive uplift in total defined resource**
- **Resource remains open in all lateral directions, as drilling has yet to fully delineate the Hill 616 supergene and manganiferous shale mineralisation**

Firebird Metals Limited (**ASX: FRB**) (**Firebird** or **the Company**) is pleased to announce a Maiden Inferred Mineral Resource Estimate (**MRE**) at Hill 616 of 57.5 million tonnes grading 12.2% Mn, which includes a higher-grade lateritic supergene zone of 8.1 million tonnes grading 17.4% Mn.

The MRE was completed by CSA Global Pty Ltd using historical drill results from a 162 hole, 4,977m program that was completed between 2009-2011 (Figure 2).

The superior grade delineated in the subsection of the defined resource provides Firebird with an additional development option to target Direct Shipping Ore (**DSO**), as part of the Rapid Development Strategy that is underway at the Company's flagship Oakover Manganese Project (**Oakover**).

Hill 616 is located 85km southeast of Newman and 37km from Oakover.

Firebird's Managing Director, Peter Allen, commented: *"We are excited to see such a significant increase in the total resource base across our project portfolio, through the addition of the maiden Inferred Mineral Resource at Hill 616.*

“To deliver a Maiden Resource based on a technical review of historical drilling at Hill 616, without having to complete any further drill holes or exploration work is a truly outstanding result. This has resulted in an inexpensive and rapid uplift in total defined resource for the benefit of our shareholders.

“The Inferred Mineral Resource defined at Hill 616 provides a strong foundation for Firebird to continue to assess development opportunities in combination with our flagship Oakover Project. Mineralisation is open to the south of Hill 616 and remains a prospective target for future extensional drilling.

“Importantly, the work completed by CSA Global has delineated a near surface, higher-grade supergene zone within the Inferred Mineral Resource, which further strengthens development options for the Rapid Development Study, which is evaluating a speed to market strategy, targeting initial production through DSO from supergene zones and simple processing methods, to deliver early production and cash flow. Looking ahead, Firebird is also focused on assessing assay results from drilling recently completed at the Sixty Sixer and Karen deposits to understand the potential to define further supergene manganese zones across the Oakover Project.”

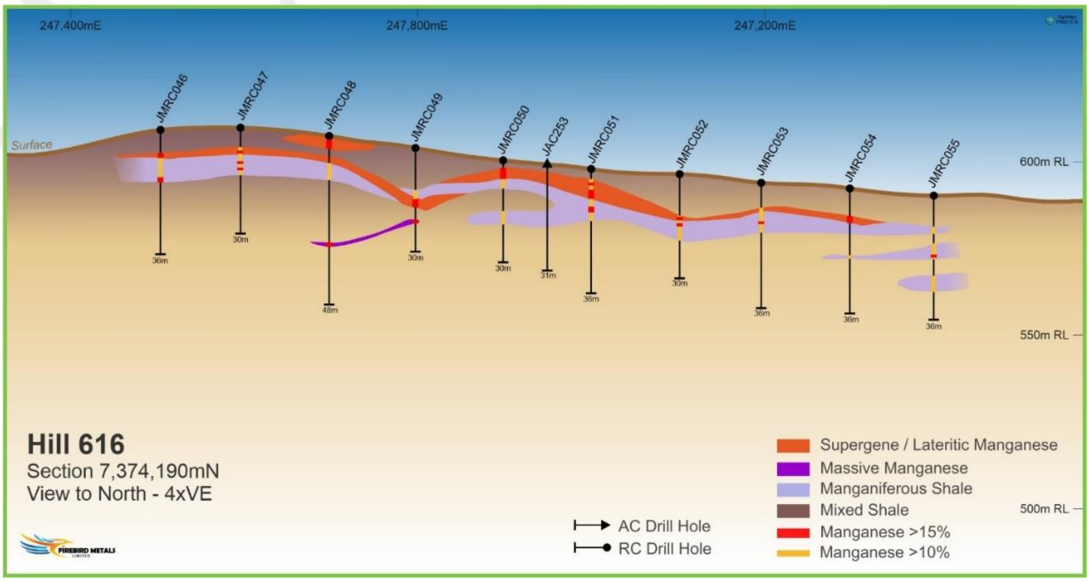

Figure 1: Hill 616 cross section

Mineralisation at Hill 616 extends from surface to a depth of approximately 20m, with good geological continuity in the east-west and north-south directions (Figure 1). The interpreted manganiferous shale and supergene/lateritic units were estimated for resource.

Future infill drilling will allow the investigation of grade continuity and potentially improve the resource classification. The data collection and density of sampling has been deemed appropriate by CSA Global for the Mineral Resource classification of the Hill 616 deposit.

Firebird's Rapid Development Strategy, which is currently underway, was designed to assess early cashflow opportunities to fund future development opportunities and minimise dilution to existing shareholders.

CSA Global believes that it is reasonable to assume that a marketable manganese product may be achievable from the higher-grade supergene manganese via Ore Sorting techniques. Suitable trials are in progress on Firebird's Oakover and Karen deposits, which are of similar geological setting and mineralisation as Hill 616.

It is also reasonable to assume that production of a high purity electrolytic manganese metal and battery grade manganese sulphate may be possible using hydrometallurgy. Further metallurgical test work to determine how the manganiferous and manganese supergene material will be economically extracted will be required to confirm these assumptions.

In combination with the previously estimated 64 million tonnes Inferred Mineral Resource estimate grading 10% Mn at Oakover, this new resource brings the **total Inferred Mineral Resources to 121mt, representing an increase of 90% in tonnes.**

The total Firebird manganese resources include:

- Oakover Project – Inferred JORC 2012 Mineral Resource estimate of 64 Mt @ 10% Mn
- Hill 616 Project - Inferred JORC 2012 Mineral Resource estimate of 57.5 Mt @ 12.2% Mn

Zone	Mineral Resource Classification	Tonnes (Mt)	Mn (%)	Fe (%)	SiO_2 (%)	Al_2O_3 (%)	P (%)	LOI (%)
Manganiferous shale	Inferred	49.3	11.4	17.3	40.0	8.5	0.13	7.6
Supergene manganese	Inferred	8.1	17.4	16.8	30.1	9.4	0.09	9.9
Grand Total	**Inferred**	**57.5**	**12.2**	**17.2**	**38.6**	**8.6**	**0.13**	**8.0**

Table 1: Hill 616 Mineral Resource estimate

**Mineral resources reported at a cut-off grade of 8% Mn*

**Fe_2O_3[1] converted to Fe% using a factor of 0.6994 calculated from atomic mass and molecular weight.*

** P_2O_5[2] converted to P% using a factor of 0.4364 calculated from atomic mass and molecular weight.*

** Due to the effects of rounding, the total may not represent the sum of all components*

[1] Assumption is all the Fe occurs in the form of Fe_2O_3

[2] Assumption is all the P occurs in the form of P_2O_5

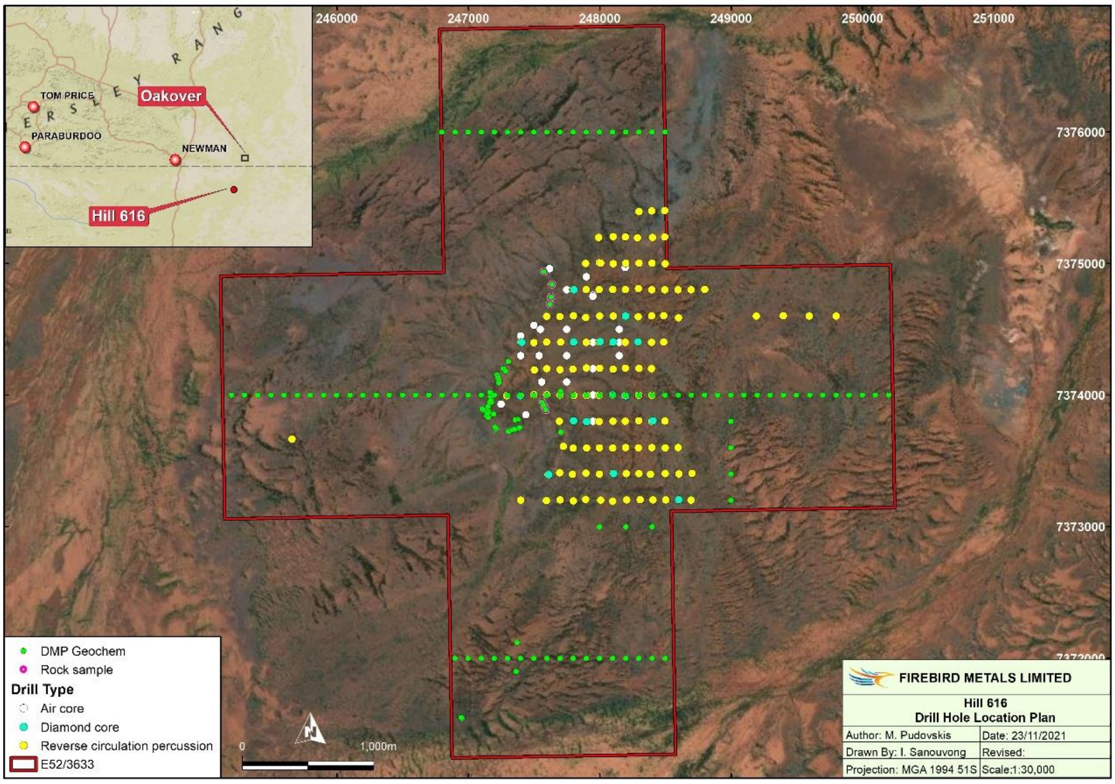

Figure 2: Hill 616 Tenement and drill hole location plan

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About Firebird Metals Limited

Firebird Metals Limited (ASX: FRB) is an exploration and development company that owns 100% of four highly prospective manganese projects in the renowned East Pilbara manganese province of Western Australia:

- Oakover Project – Inferred JORC 2012 Mineral Resource estimate of 64 Mt @ 10% Mn
- Hill 616 Project - Inferred JORC 2012 Mineral Resource estimate of 57.5 Mt @ 12.2% Mn
- Disraeli Manganese Project – potential Woodie Woodie style mineralization
- Raggard Hills - potential Woodie Woodie style mineralization

The Company's primary focus will be on the flagship Oakover Project which is located 85 km east of Newman and covers approximately 360 km^2. Oakover has a JORC 2012 Inferred Mineral Resource estimate of 64Mt at 10% Mn at the Sixty Sixer and JayEye prospects.

The Company's total Inferred Mineral Resources Estimate of 121mt provides a solid technical foundation for further development, with the Company planning to complete additional infill and extensional drilling in conjunction with modern metallurgical test work utilising lower cost DMS and ore sorting techniques to deliver marketable manganese products to the global steel and battery markets.

Competent Persons Statement

The information in this report that relates to the Hill 616 Mineral Resources is based on information compiled by Mr Mark Pudovskis and Mr Aaron Meakin. Mr Mark Pudovskis is a full-time employee of CSA Global Pty Ltd and is a Member of the Australasian Institute of Mining and Metallurgy (AusIMM). Mr Aaron Meakin is a full-time employee of CSA Global Pty Ltd and is a Member and Chartered Professional of the Australasian Institute of Mining and Metallurgy (AusIMM). Mr Mark Pudovskis and Mr Aaron Meakin have sufficient experience relevant to the style of and type of deposit under consideration and to the activity which they are undertaking to qualify as Competent Persons as defined in the 2012 edition of the Australasian Code for the Reporting of Exploration Results, Mineral Resources and Ore Reserves (JORC Code). Mr Mark Pudovskis and Mr Aaron Meakin consent to the disclosure of the information in this report in the form and context in which it appears. Mr Mark Pudovskis assumes responsibility for matters related to Sections 1 and 2 of JORC Table 1, while Mr Aaron Meakin assumes responsibility for matters related to Section 3 of JORC Table 1.

MEMORANDUM

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To: Peter Allen
Date: 30 November 2021
From: Mark Pudovskis, Technical Director
Report Nº: R474.2021
Re: **Mineral Resource Estimate – Hill 616 Project**

EXECUTIVE SUMMARY

CSA Global Pty Ltd (CSA Global), an ERM Group company, was requested by Firebird Metals Limited (Firebird) to complete a Mineral Resource estimate for its Hill 616 Project (the "Project"), on exploration licence E47/3633 located in the south-eastern Pilbara region of Western Australia. The Mineral Resource estimate was required to be reported in accordance with the JORC Code[1].

Drilling at the Hill 616 Project was carried out between 2009 and 2011 and samples were submitted to ALS Chemex Perth for analysis. Drill assay results, historical logging and, where available, diamond drill core photographs were used to assist with completion of the geological interpretation for incorporation into the resource estimation process. Ordinary Kriging was used to interpolate grades into a block model following completion of the interpretation.

The Mineral Resource estimate has been classified as Inferred and is shown by zone in Table 1.

Table 1: Hill 616 Project Mineral Resource estimate

Zone	Mineral Resource classification	Tonnes (Mt)	Mn (%)	Fe(%)	SiO_2 (%)	Al_2O_3 (%)	P (%)	LOI (%)
Manganiferous shale	Inferred	49.3	11.4	17.3	40.0	8.5	0.13	7.6
Supergene manganese	Inferred	8.1	17.4	16.8	30.1	9.4	0.09	9.9
Total	**Inferred**	**57.5**	**12.2**	**17.2**	**38.6**	**8.6**	**0.13**	**8.0**

Notes:

- *Mineral Resources reported at a cut-off grade of 8% Mn.*
- *Fe_2O_3[2] converted to Fe% using a factor of 0.6994 calculated from atomic mass and molecular weight.*
- *P_2O_5 converted to P% using a factor of 0.4364 calculated from atomic mass and molecular weight.*
- *Due to the effects of rounding, the total may not represent the sum of all components.*

JORC Table 1 is included as Attachment 1 to this memorandum. A drill collar summary is provided in Attachment 2.

LOCATION AND TENURE

The Project is situated on exploration licence E52/3633, covering five blocks or approximately 15.7 km^2 situated in the established mineralogical terrain of the south-eastern Pilbara district. The Project is located approximately 85 km southeast of the township of Newman (Figure 1). The tenement was granted on 21 April 2020 and expires on 21 April 2025.

[1] Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves. The JORC Code, 2012 Edition. Prepared by: The Joint Ore Reserves Committee of The Australasian Institute of Mining and Metallurgy, Australian Institute of Geoscientists and Minerals Council of Australia (JORC).

[2] Assumption is all the Fe occurs in the form of Fe_2O_3 and P occurs in the form of P_2O_5

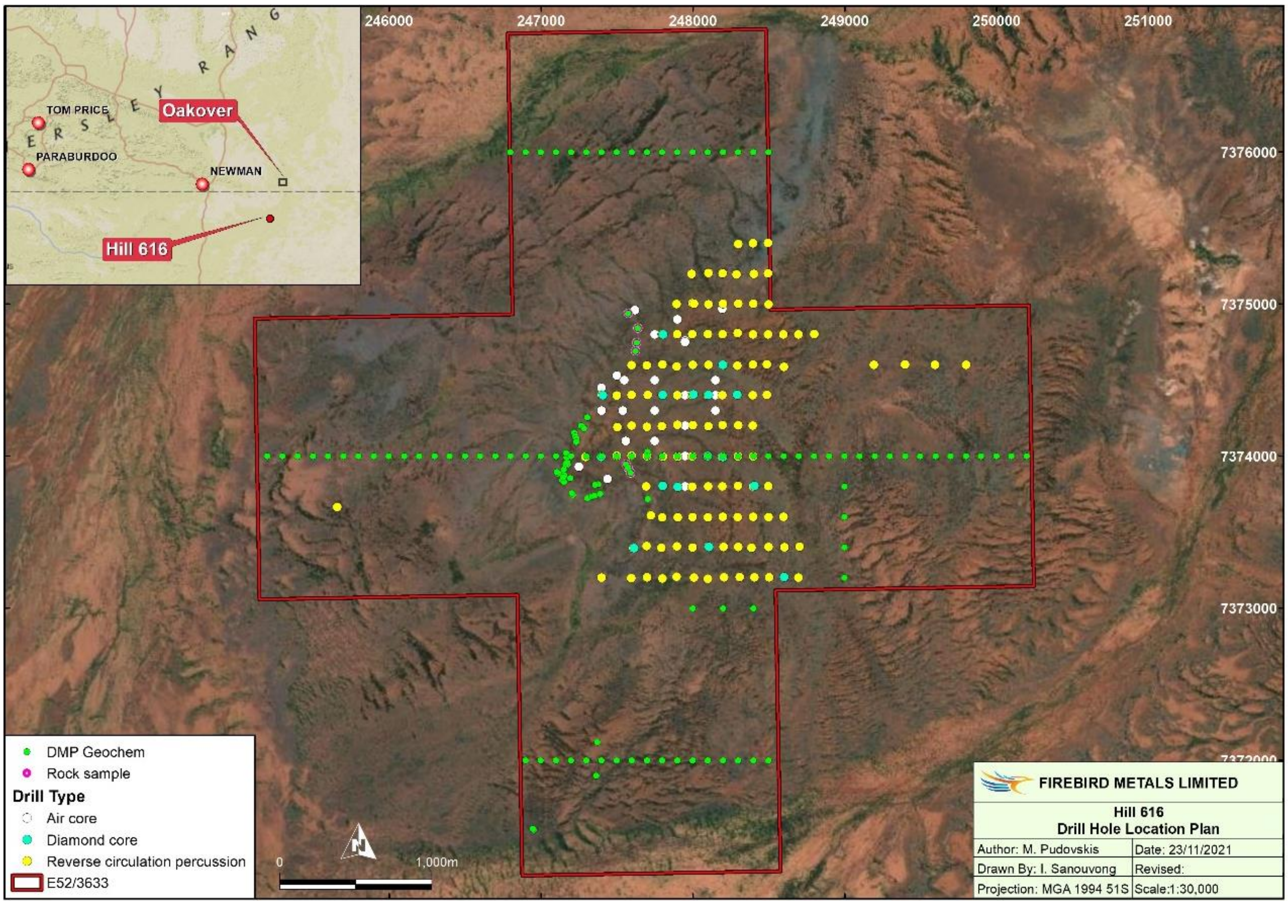

Figure 1: Hill 616 E52/3633 drillhole and tenement location plan

Note: DMP Geochem refers to soil and rock chip sampling.

DATA COLLECTION TECHNIQUES

A total of 163 holes were drilled on the tenement, including 25 aircore (AC), 122 reverse circulation percussion (RCP) and 16 diamond core (DDH) holes. Forty-seven drillholes (six RCP, 16 DDH, 25 AC) without assays and lithological data were excluded from the estimation. The Mineral Resource estimate included 116 reverse circulation (RC) holes for a total of 3,865 m (Table 2). The database supplied by Firebird also contains assays for 31 holes with absent collar information (JMRC170 to JMRC200). The collar elevation for these AC holes had a default value of 500 m, and these were adjusted to the elevation of the topography.

Table 2: Hill 616 Project drilling summary

Category	Drill type	No. of holes	Minimum depth (m)	Maximum depth (m)	Average depth (m)	Total depth (m)
Hill 616 Project	AC	25	7	34	23	578
Hill 616 Project	DDH	16	15	32	26	408
Hill 616 Project	RCP	122	6	160	34	4,151
Total – Project		**163**	**6**	**160**	**32**	**5,137**
Hill 616 Resource*	RC	116	18	54	33	3,865
Total – Resource		**116**	**18**	**54**	**33**	**3,865**

**Used for the Mineral Resource estimate.*

Holes were drilled on an approximate 200 m x 100 m spacing in the northing and easting directions. Samples which inform the Mineral Resource estimate were collected at 1 m intervals using industry-standard practices utilising the RCP drilling method. There are some unsampled intervals in the background domain. The RCP holes were logged for lithology.

DDH hole collars on the tenement were surveyed using a differential global positioning system (GPS) and RCP holes were surveyed using a handheld GPS utilising the GDA94 Zone 51S coordinate system. No survey method was recorded for the AC holes. No downhole survey measurements were taken since the holes were vertical and shallow with hole depths ranging from 18 m to 54 m. Figure 1 and Figure 2 shows the location of all the drillholes on the tenement. The topography wireframe that was used for Mineral Resource estimation was generated using collar points of the RCP and DDH drillholes. The accuracy of the topography and the drill collar positions have been considered adequate at this stage of exploration.

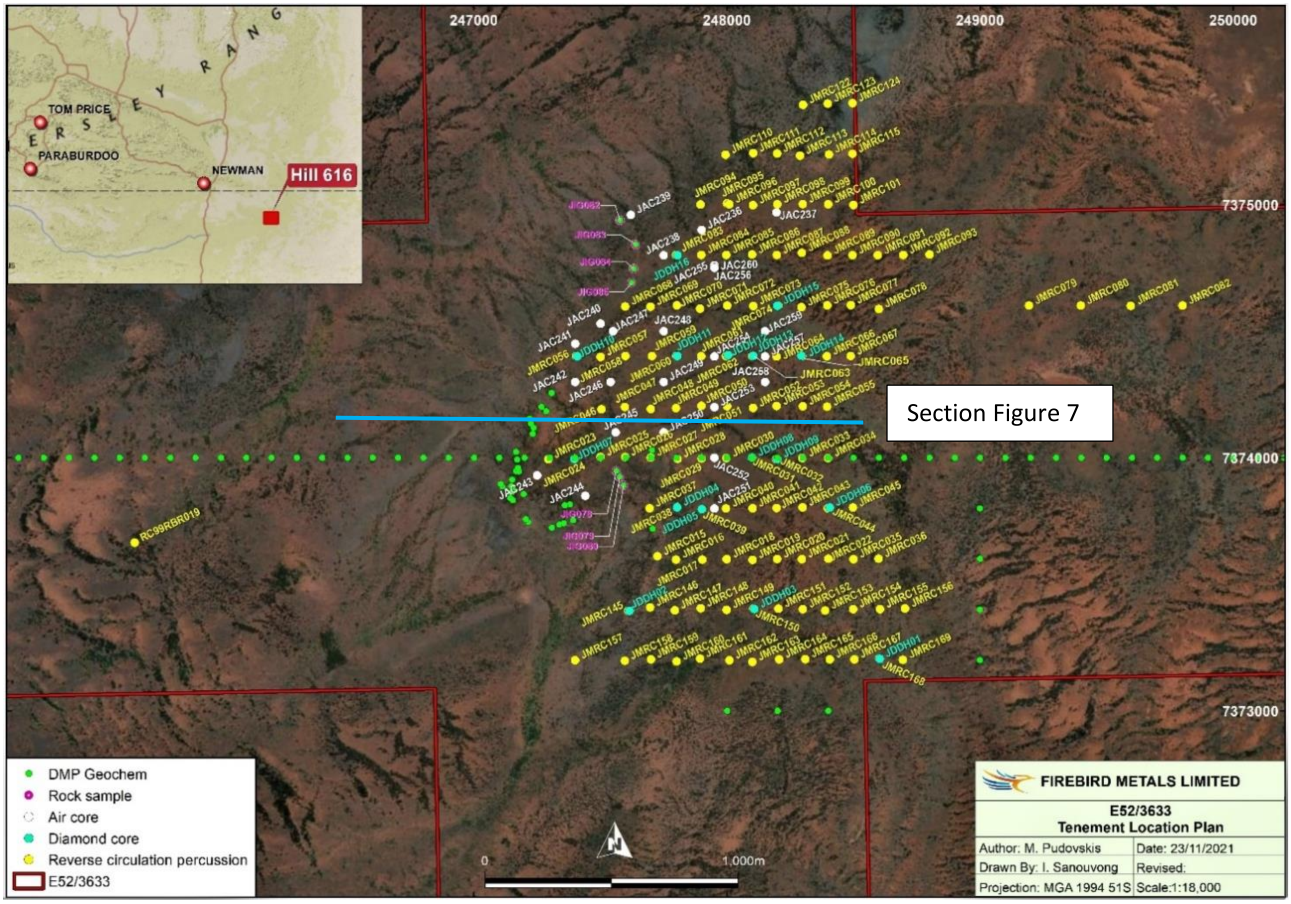

Figure 2: Hill 616 E52/3633 drillhole location plan

Samples received at the laboratory were weighed, pulverised to 3 kg to 85% passing 75 microns and then split using a riffle splitter. Assaying was completed using the ME_XRF12 and OA-GRA05t methods at ALS-Chemex Perth (ALS). Al_2O_3, As, BaO, CaO, Cl, Co, Cr_2O_3, Cu, Fe_2O_3, K_2O, MgO, MnO, Mo, Na_2O, Ni, P_2O_5, Pb, SIO_2, TiO_2, V_2O_5 and Zn were analysed using the x-ray fluorescence (XRF) method. Loss On Ignition (LOI) was determined using the OA-GRA05t method. A furnace or thermogravimetric analyser was used to determine the LOI at 1,000°C using 1 g of sample. The LOI measures the content of a sample lost as gases when subjected to high temperatures, often including water and CO_2. Conversion of MnO to Mn, which has occurred in the database provided to CSA Global, was verified and found to be correct. Fe_2O_3 and P_2O_5 were converted to Fe and P respectively using atomic mass and molecular weights to align with Mn reporting. A negative LOI assay value reported on sample number HR10594 was changed to 0.005, which is half the detection limit for LOI.

ALS included 288 certified reference materials (CRMs), 102 blanks and 182 pulp duplicate samples for quality control checks during their analytical process. The laboratory pulp duplicate results were reviewed and the correlation coefficients for Mn, Al_2O_3, Fe_2O_3, P_2O_5 and SiO_2 were greater than 0.96, giving confidence in analytical precision. A plot of the Mn duplicate assays is shown in Figure 3.

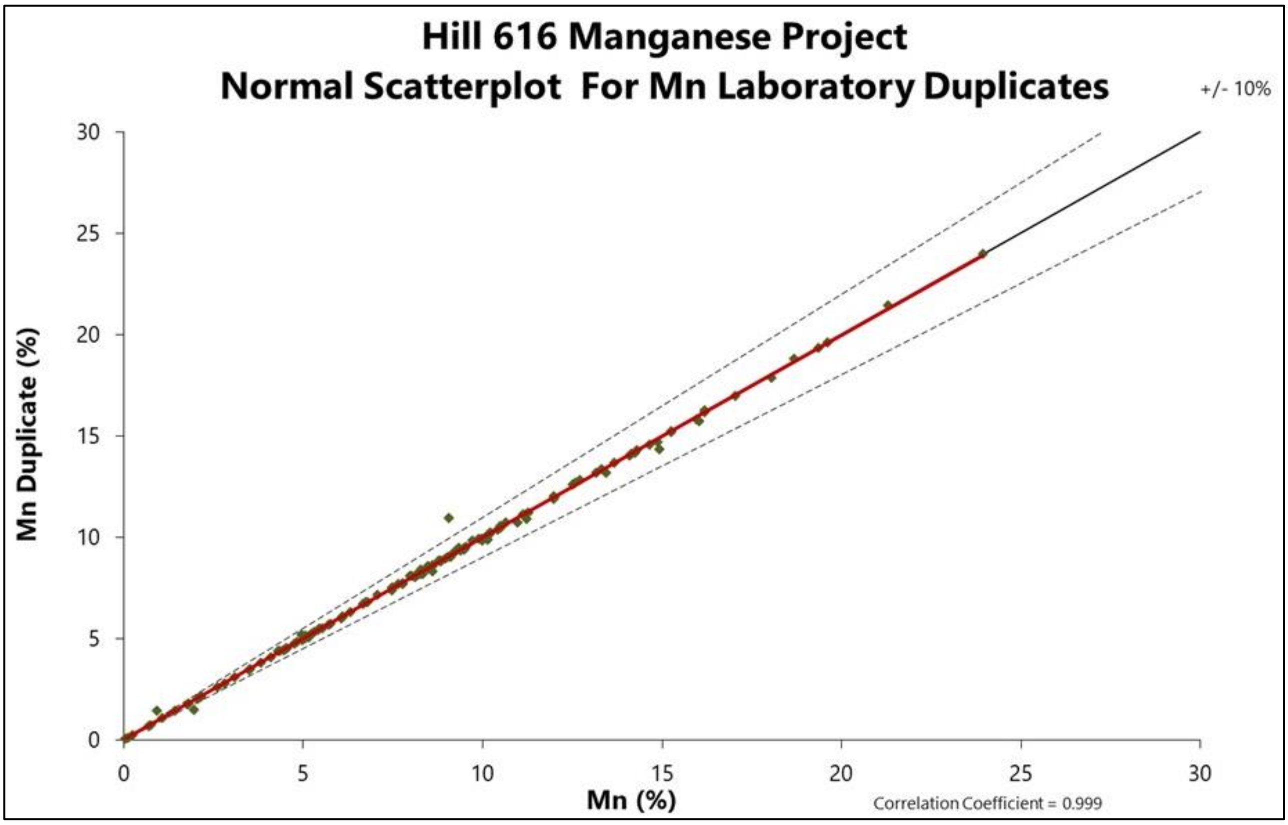

Figure 3: Normal Scatter Plot for Mn Laboratory duplicates

Four types of commercial standards (SARM-16, SARM-39, SARM-45, BCS-381) were used by ALS. The CRM results were within the expected ranges showing the accuracy of analytical process. Figure 4 and Figure 5 show the performance of SARM-16 and SARM-45.

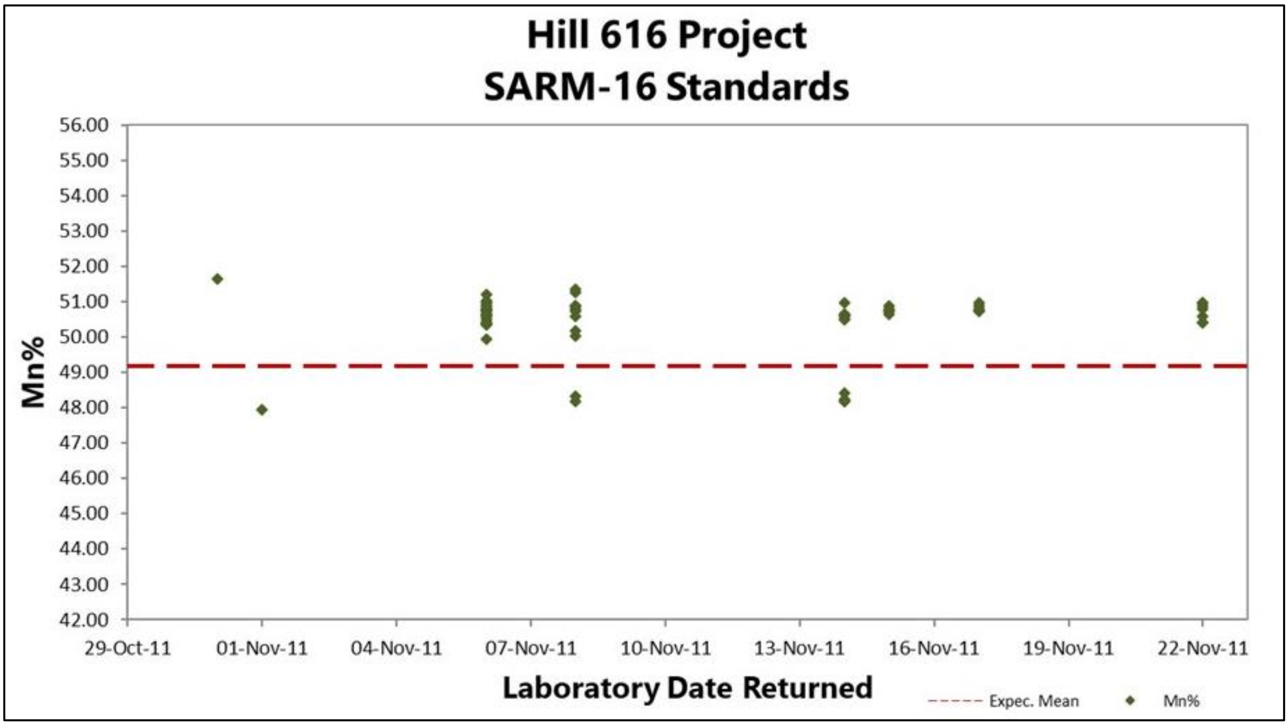

Figure 4: Performance of Mn in SARM-16 CRM

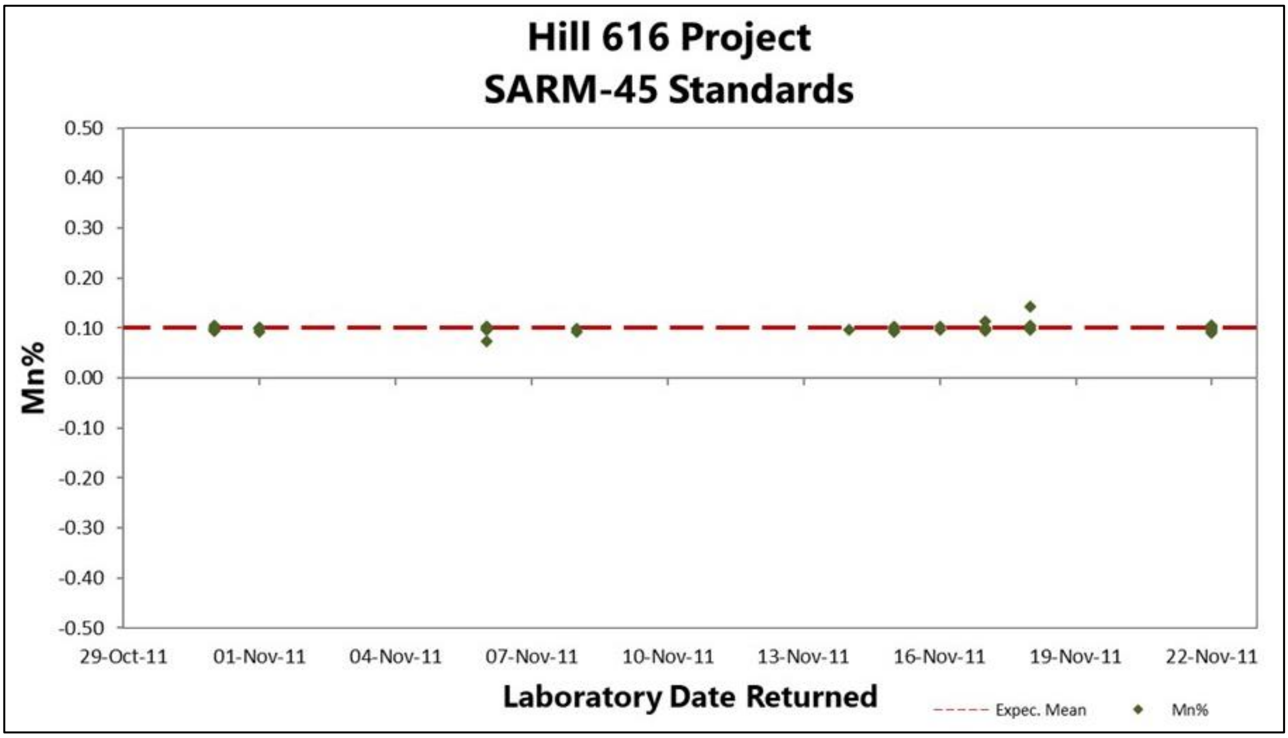

Figure 5: Performance of Mn in SARM-45 CRM

The results of the blanks assays did not show any evidence of contamination during the analytical process (Figure 6).

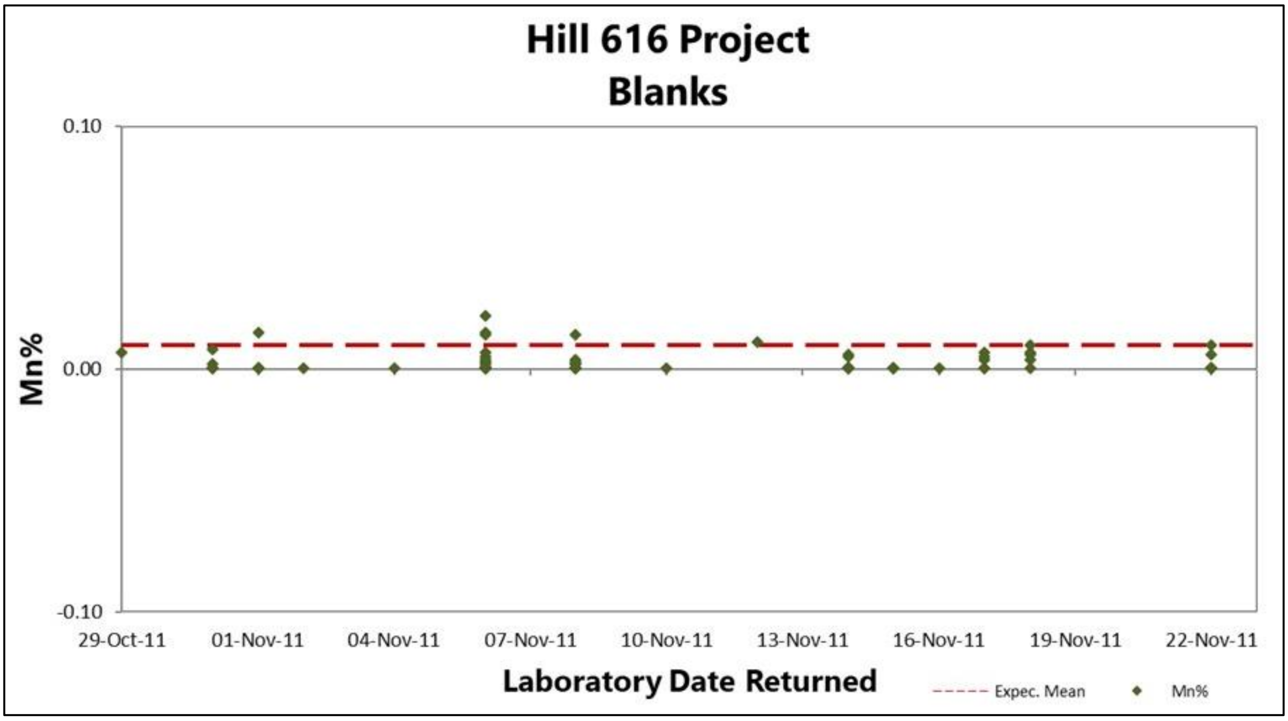

Figure 6: Performance of Mn in Blanks

The data for Hill 616 Project has been collected according to industry good practice and, in CSA Global's opinion, is suitable to prepare a Mineral Resource estimate to be publicly reported in accordance with the JORC Code. CSA Global notes that only internal laboratory quality control data is available at this stage of exploration. This has been considered when classifying the Mineral Resource estimate.

DEPOSIT GEOLOGY AND MINERALISATION CONTROLS

The manganese mineralisation occurs as multiple seams or bands of varying thickness within a highly weathered shale (Balfour Formation). Significant zones of manganese were still being intersected at both the northwest and southeast extents of the drilling program by previous explorers, indicating that mineralisation is open along strike in both directions.

The mineralisation at Hill 616 is generally shallow (mostly within 20 m of the surface), gently dipping and laterally extensive across the target area. The lateritic profile and subsequent manganese mineralisation show the zonation within the regolith and distribution of manganese mineralisation. The mineralisation is hosted within the manganiferous shale and the supergene/lateritic manganese units.

The higher-grade (or nearer surface supergene/lateritic) manganese material is generally located within the upper portion of the regolith profile at shallow depths (0–15 m) and can be a massive, brecciated, dull to bright manganiferous material hosted in completely oxidised clay zones (estimated as supergene manganese) while the medium-grade manganese mineralisation exists as thicker seams of dull manganiferous material in highly weathered shales and clays (estimated as manganiferous shale).

The manganese mineralisation demonstrates geological continuity along and across strike.

A schematic representative cross section illustrating the manganese mineralisation through Hill 616 is included as Figure 7. The position of the cross section in plan view is shown in Figure 2.

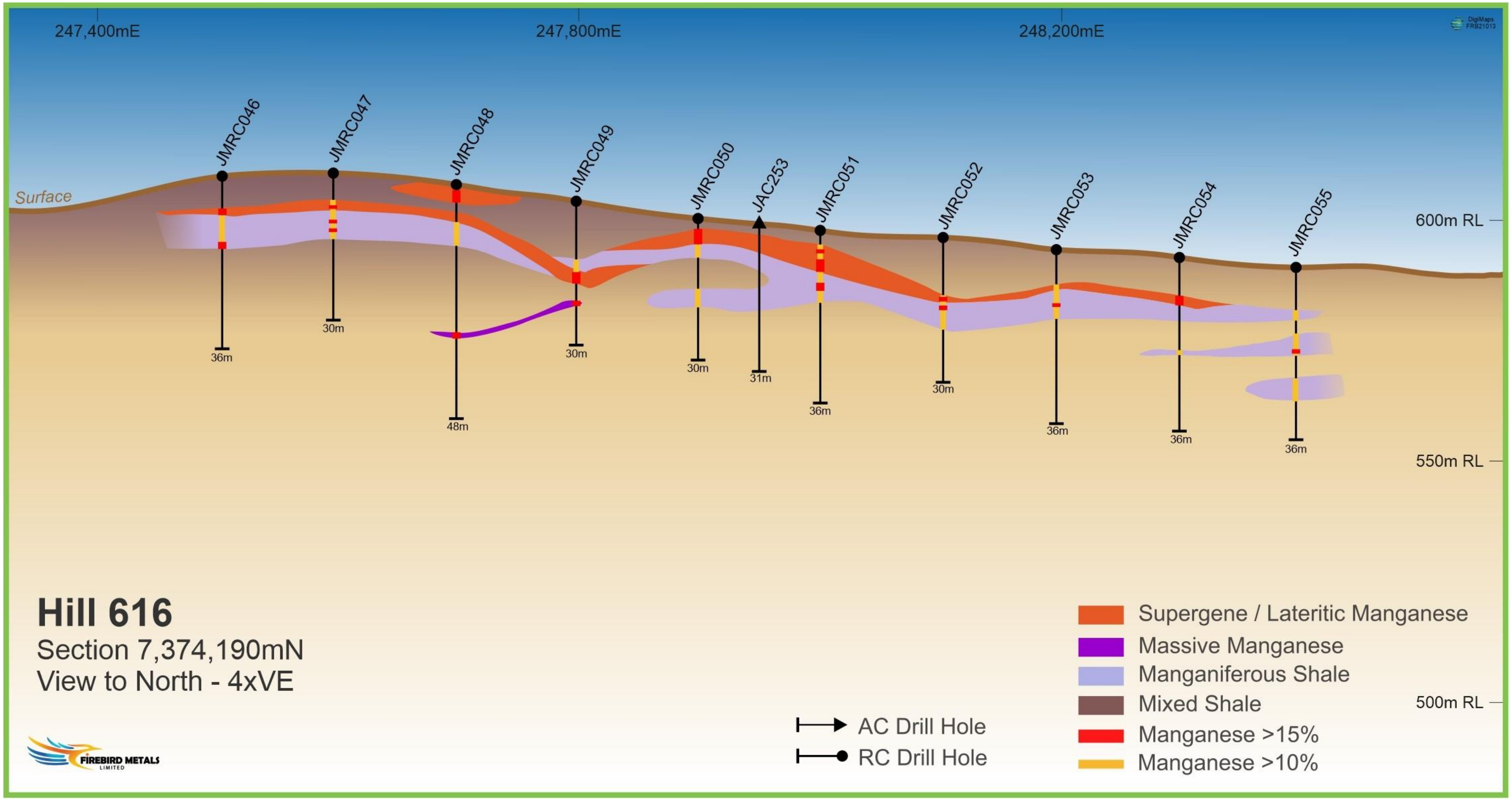

Figure 7: Schematic Hill 616 cross section through 7374190N

GEOLOGICAL MODELLING AND RESOURCE ESTIMATION

The Hill 616 deposit has been modelled as three geological and mineralisation domains (domain 1, 2 and 3). Domain 1 is the background zone comprising the mixed shale, ferruginous manganese shale, shale chert and shale lithologies. There are random elevated manganese grades within the background unit, and this is supported by the histogram for the background domain which shows a bi-modal distribution. Domain 2 is the lower-grade basal manganiferous shale unit. This unit is reasonably continuous across strike and varies in thickness (1–17 m) between sections and averaging approximately 5.7 m. Domain 3 is the supergene/lateritic manganese near-surface unit with lenticular shale plaquettes with manganese grades up to 30%. The supergene unit averages approximately 3.1 m in thickness and varies between 1 m and 11 m.

The drill assay results, historical logging and where available diamond drill core photographs were used to complete the sectional interpretations manually on paper. The sectional interpretations were then digitised and then linked to form solids or surfaces wireframes utilising Datamine Studio RM Version 1.10.69.0 software. Figure 8 shows the domains on Section 7,373,200 mN.

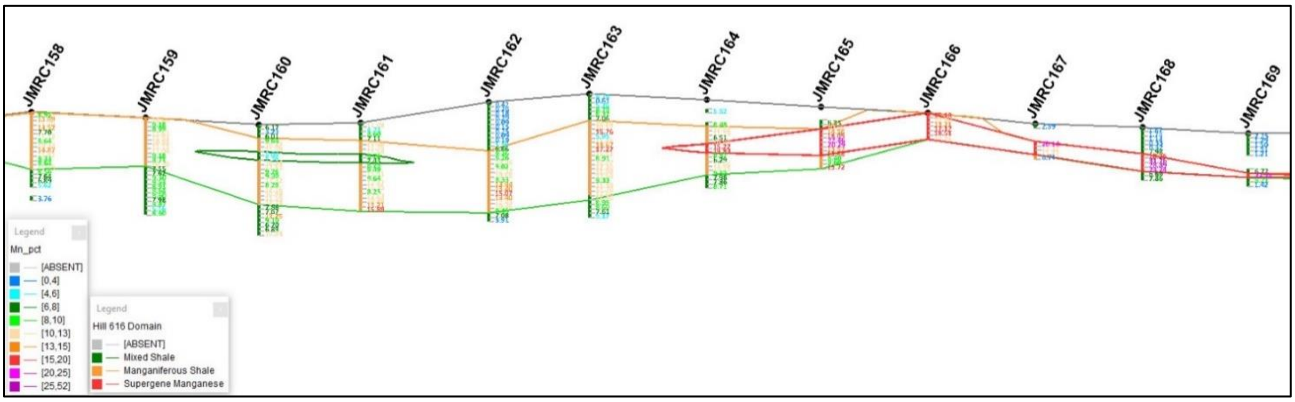

Figure 8: Hill 616 Section 7,373,200 mN showing domains and drillholes (vertical exaggeration=4)

Statistical analysis was completed for Mn, Fe_2O_3, Al_2O_3, LOI, P_2O_5, and SiO_2. The global histogram for Mn shows an inflexion point around 7% Mn. The coefficient of variation values (CV) for Fe_2O_3, Al_2O_3, LOI, P_2O_5 and SiO_2 were very low, ranging from 0.12 to 0.63, and no top cuts were considered. Although the CV for Mn in domain 1 showed low variability with a CV of 0.59, there were two very high-grade Mn values (>50%) within the background mineralisation. These were trimmed to 18.51% Mn (99.9 percentile) to stop high-grade values smearing in the low-grade unit.

Variography was completed for Mn, Fe_2O_3, Al_2O_3, LOI, P_2O_5 and SiO_2 and using Datamine Supervisor software. The variogram models generally show long range structures typical for deposits displaying good geological continuity. However, there is a limited number of points to confidently define the short-range structures. Infill drilling is recommended to improve the variograms especially the supergene manganese domain.

The drillholes were generally spaced on 200 m sections in the northing, 100 m apart in the easting, and sampling was completed at 1 m intervals. No compositing was completed as all the samples were 1 m in length. A parent cell dimension of 50 m x 25 m x 1 m in northing, easting and elevation and sub-cells of 25 m x 12.5 m x 0.5 m were used for block model generation. A smaller block size was chosen to give a better estimation of the volume of the deposit considering the wireframe boundaries and the variable domain widths. Ordinary Kriging was used to interpolate grades into the block model. The parameters that were used for the estimation are shown in Table 3 to Table 5.

Table 3: Hill 616 Project Domain 1 estimation parameters

Domain 1	**Search volume**	**1**	**2**	**3**
Search ellipse radius (m)	**Major**	165	170	340
	Semi-major	125	230	580

	Minor	10	14	20
Samples numbers	**Minimum**	4	4	4
	Maximum	16	16	12
	Maximum per drillhole	2	2	2
Block discretisation		4 x 4 x 2		

Table 4: Hill 616 Project Domain 2 estimation parameters

Domain 2	**Search volume**	**1**	**2**	**3**
Search ellipse radius (m)	**Major**	226	417	575
	Semi-major	118	296	495
	Minor	1	2	3
Samples numbers	**Minimum**	4	4	4
	Maximum	16	16	12
	Maximum per drillhole	2	2	2
Block discretisation		4 x 4 x 2		

Table 5: Hill 616 Project Domain 3 estimation parameters

Domain 3	**Search volume**	**1**	**2**	**3**
Search ellipse radius (m)	**Major**	465	520	550
	Semi-major	440	495	530
	Minor	1	2	6
Samples numbers	**Minimum**	4	4	4
	Maximum	16	16	12
	Maximum per drillhole	2	2	2
Block discretisation		4 x 4 x 2		

No density measurements have been collected at the Project. A density value of 2.5 g/cm^3 was assigned to the supergene unit, while a value of 2.4 g/cm^3 was assigned to the manganiferous unit and 2.3 g/cm^3 to the background shale domain. Density values were selected based on similar densities applied to the 2012 Oakover Mineral Resource estimate. The Oakover project and the Hill 616 deposit have a similar geological setting and style of mineralisation.

The block model was validated on screen against the geological wireframes to check that the domain allocation was concurrent with the drillhole lithology. The model grades were also visually compared with the coded drillhole grades in section (Figure 9).

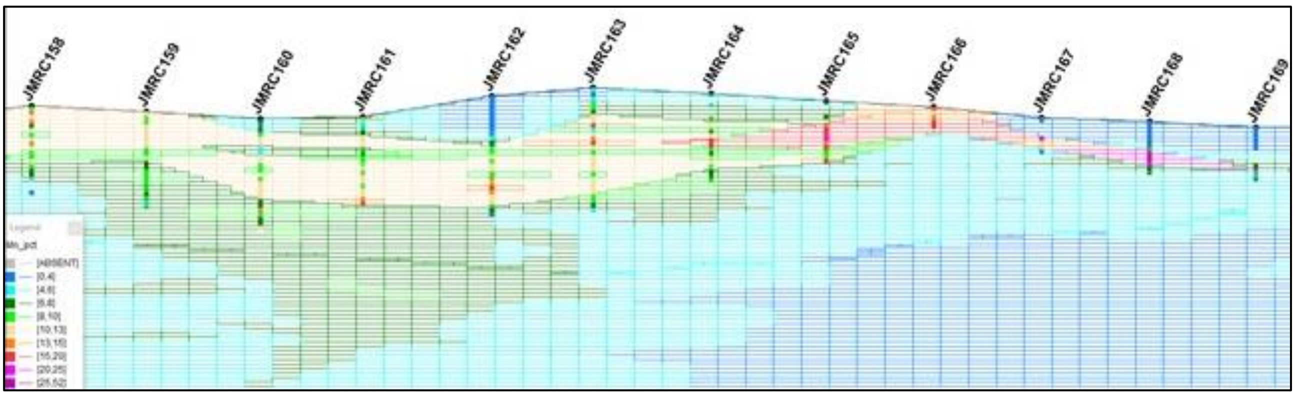

Figure 9: Hill 616 Section 7,373,200 mN showing block and drillhole Mn grades (vertical exaggeration=4)

Another validation stage involved a comparison of the drillhole and the model statistics (Table 6). Swath plots comparing the drillhole average grades and the block model grades in slices were generated for all the estimated variables within their respective domains. The block model and drillhole grades for all domains show trends consistent with effective grade interpolation. Areas with low sample numbers generally show higher variance between model and drillhole mean grades (Figure 10 to Figure 12).

Table 6: Comparison of drillhole and block model global statistics for the manganiferous and supergene domains

Statistic	Manganiferous shale domain			Manganese supergene domain		
	Sample data	Block data (tonnage weighted)	Block data vs Sample (% difference)	Sample data	Block data (tonnage weighted)	Block data vs Sample (% difference)
Points	812	39,208	4,729	197	6,636	3,269
Mean	11.30	11.40	0.87	17.21	17.39	1.06
Standard deviation	2.58	0.88	-65.72	4.75	2.10	-55.84
Variance	6.66	0.78	-88.25	22.55	4.40	-80.50
CV	0.23	0.08	-66.02	0.28	0.12	-56.30
Skewness	0.07	0.20	188.48	0.39	0.34	-13.10
Kurtosis	1.19	0.97	-18.74	1.16	0.97	-17.06
Log mean	2.39	2.43	1.56	2.80	2.85	1.62
Log variance	0.08	0.01	-92.25	0.09	0.01	-84.16
Geom. mean	10.95	11.37	3.81	16.50	17.26	4.63
Log-est. mean	11.39	11.40	0.14	17.28	17.39	0.65
Maximum	20.68	16.35	-20.95	33.23	26.27	-20.93
75%	12.78	11.95	-6.53	19.97	18.60	-6.84
50%	11.12	11.40	2.54	16.73	17.40	3.98
25%	9.80	10.83	10.50	14.32	16.06	12.16
Minimum	0.71	6.40	805.41	4.59	11.10	141.56

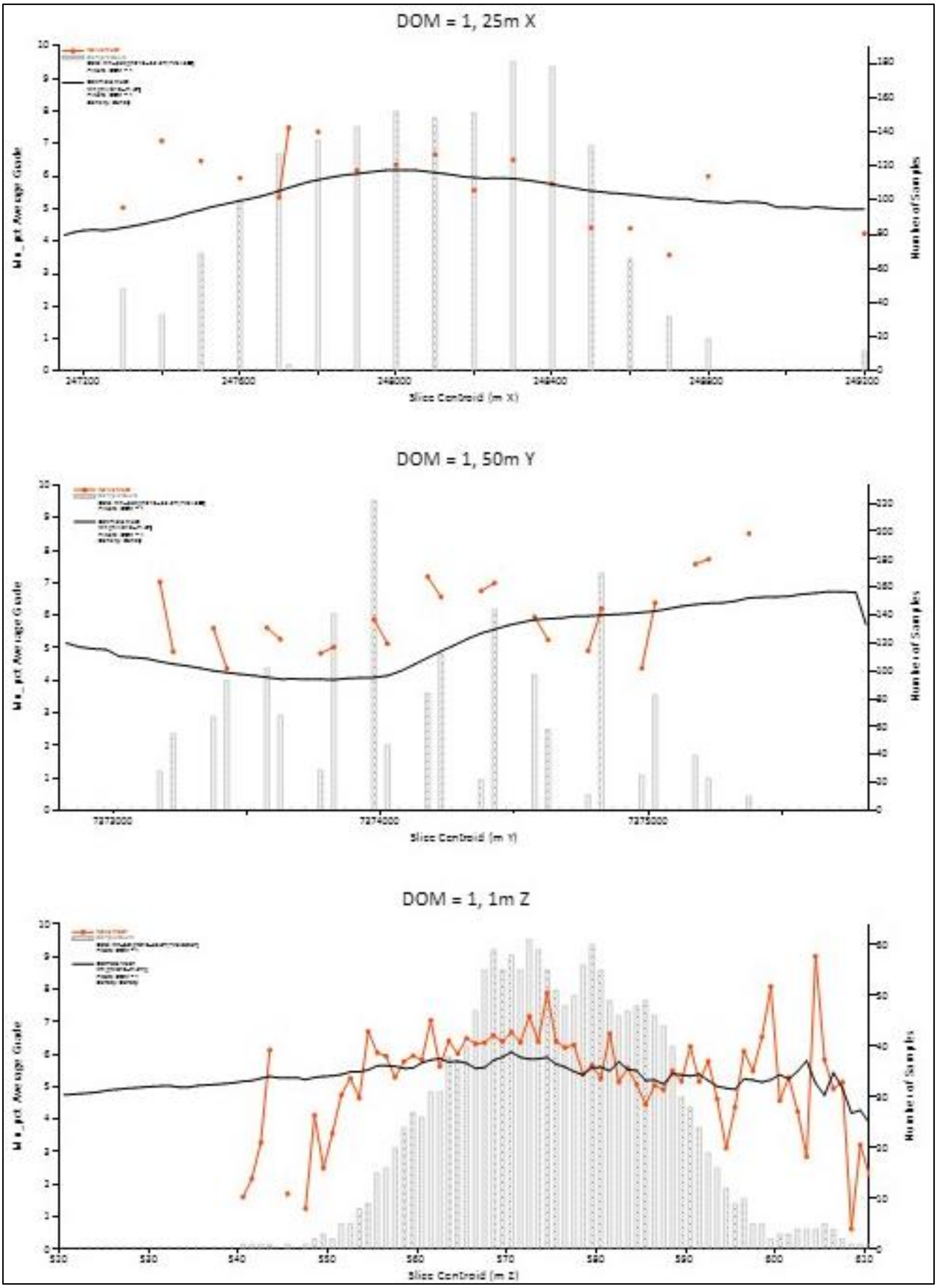

Figure 10: Comparison of the background domain (Domain 1) Mn grades along northing, easting and elevation

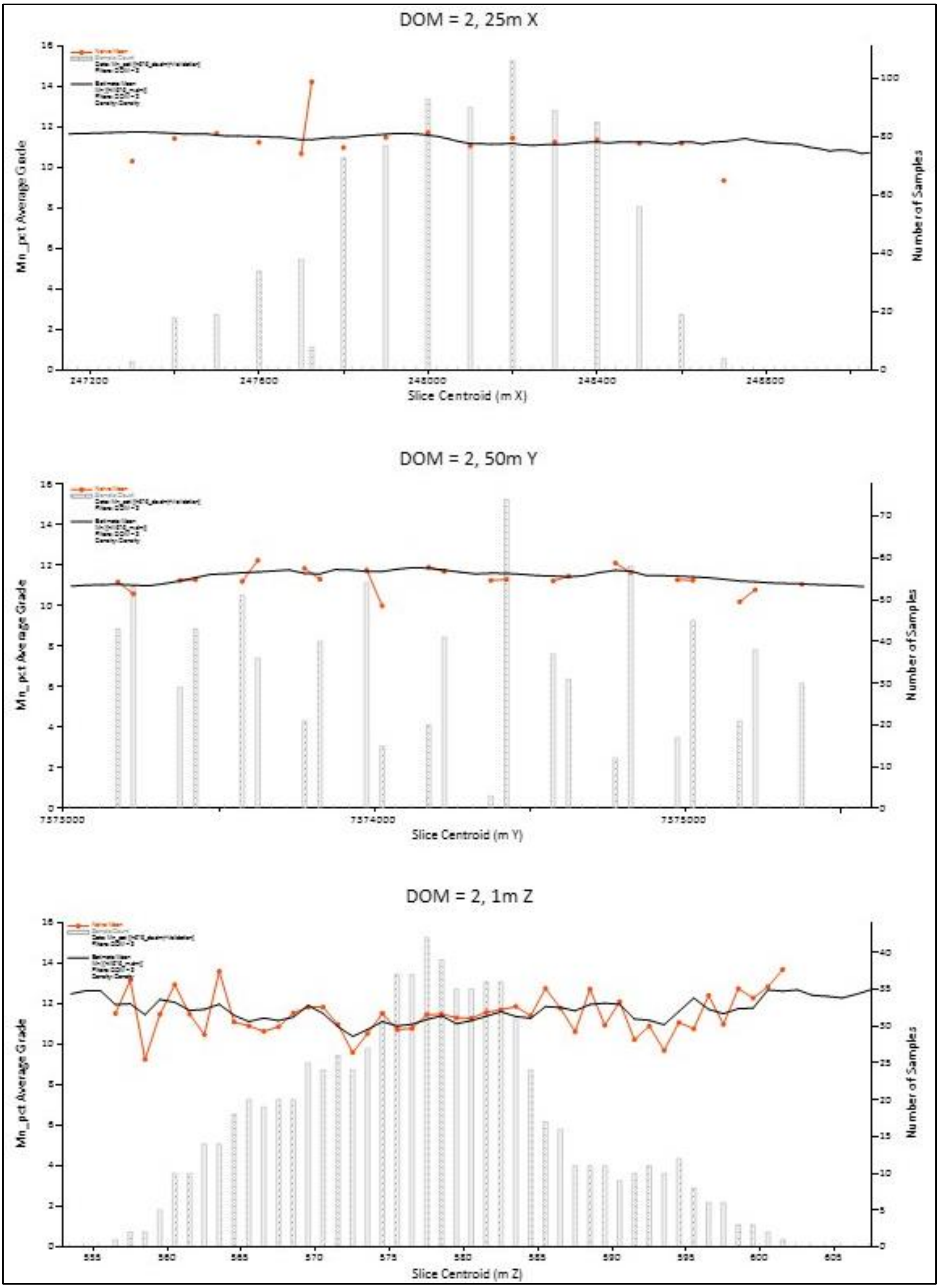

Figure 11: Comparison of the manganiferous shale (Domain 2) Mn grades along northing, easting and elevation

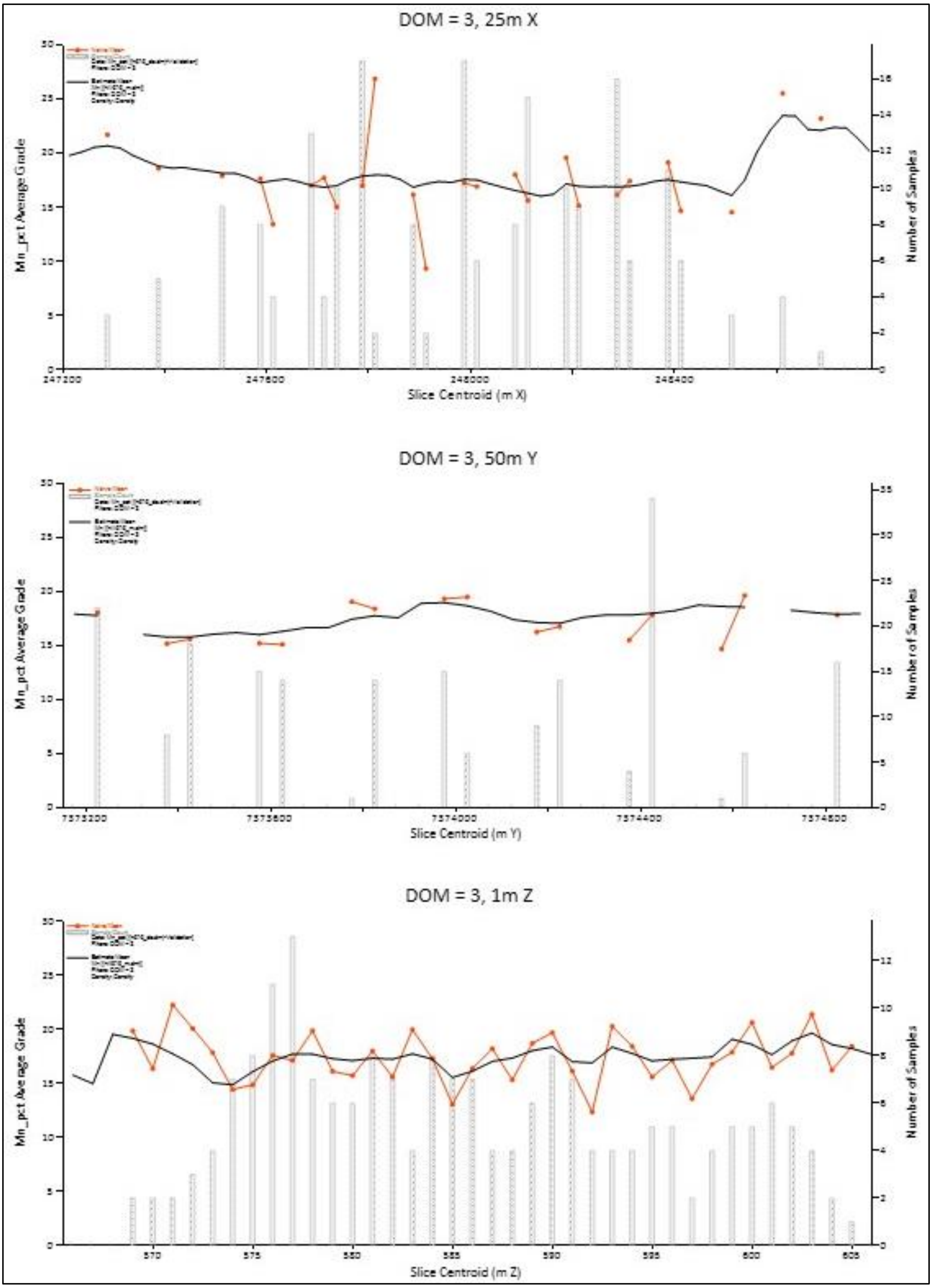

Figure 12: Comparison of the supergene manganese (Domain 3) Mn grades along northing, easting and elevation

METALLURGY

A preliminary metallurgical testwork program completed between 2008 and 2009 showed that the Hill 616 mineralisation was of a high quality and whilst a lump product was not viable, a fines product could be achieved. Further testwork was completed in by CSIRO in 2013 with Errawarra using the Wet High Intensity Magnetic Separation (WHIMS) achieved a final product with a grade of 23% Mn.

REASONABLE PROSPECT HURDLE

Clause 20 of the JORC Code (2012) requires that all reports of Mineral Resources must have reasonable prospects for eventual economic extraction, regardless of the classification of the Mineral Resource. The Competent Person believes there are reasonable prospects for eventual economic extraction of the Mineral Resources based on the following:

- Hill 616 mineralisation is continuous and has been delineated by drilling on a strike of 2.2 km
- The mineralisation occurs at shallow depths and remains open to the south of the current drilling and may be suitable for open pit conventional mining.

Further, two streams of metallurgical processing are being considered by Firebird, both having been proven from similar and analogous deposits to be economically reasonable as a means of extracting a marketable manganese product.

Higher-grade supergene/lateritic manganese:

- It is reasonable to assume that a marketable manganese concentrate is achievable via ore sorting techniques. Current trials are in progress on Firebird's neighbouring Oakover and Karen deposits which are of the geological setting and mineralisation as Hill 616.

Lower-grade basal manganiferous shale:

- It is reasonable to assume that a high purity electrolytic manganese metal and battery grade manganese sulphate may be produced through hydrometallurgy. This has been reported as achievable by (Element 25, Butcherbird ASX announcement 28 November 2018[3]) which is of similar geological and mineralisation setting as Hill 616.
- Another example of a project utilising a lower-grade manganese resource to produce electrolytic manganese metal or high-purity manganese sulphate monohydrate is the Euro Manganese Inc. Chvaletice manganese project in the Czech Republic which grades approximately 7.3% Mn.[4]

Metallurgical testwork is required and should be completed as part of any forward work program.

MINERAL RESOURCE CLASSIFICATION

The Mineral Resource of the Hill 616 deposit has been classified using the JORC Code guidelines. The Mineral Resource was classified as Inferred where the drill spacing was on a 200 m x 100 m grid. The variography showed long ranges confirming geological continuity along and across strike. Though the laboratory used blanks, CRMs and repeats during the analytical process, externally submitted quality control results were not available.

Grade-tonnage curves for the manganiferous shale unit and the supergene unit were generated (Figure 13, Figure 14). A cut-off grade of 8% Mn was used to report material within the mineralised manganiferous shale and the supergene domains. An 8% Mn reporting cut-off grade has been selected following preliminary high-level assessment of the likely mining and processing methods. CSA Global considers that the Mineral Resource as reported fulfills the reasonable prospects for eventual economic extraction requirement for reporting Mineral Resources in accordance with the JORC Code.

[3] Source: https://www.element25.com.au/site/PDF/a456d29c-cc67-453f-8489-1365501c22e8/FirstHighPurityElectrolyticManganeseMetalProduced
[4] Source: https://www.mn25.ca/chvaletice-project

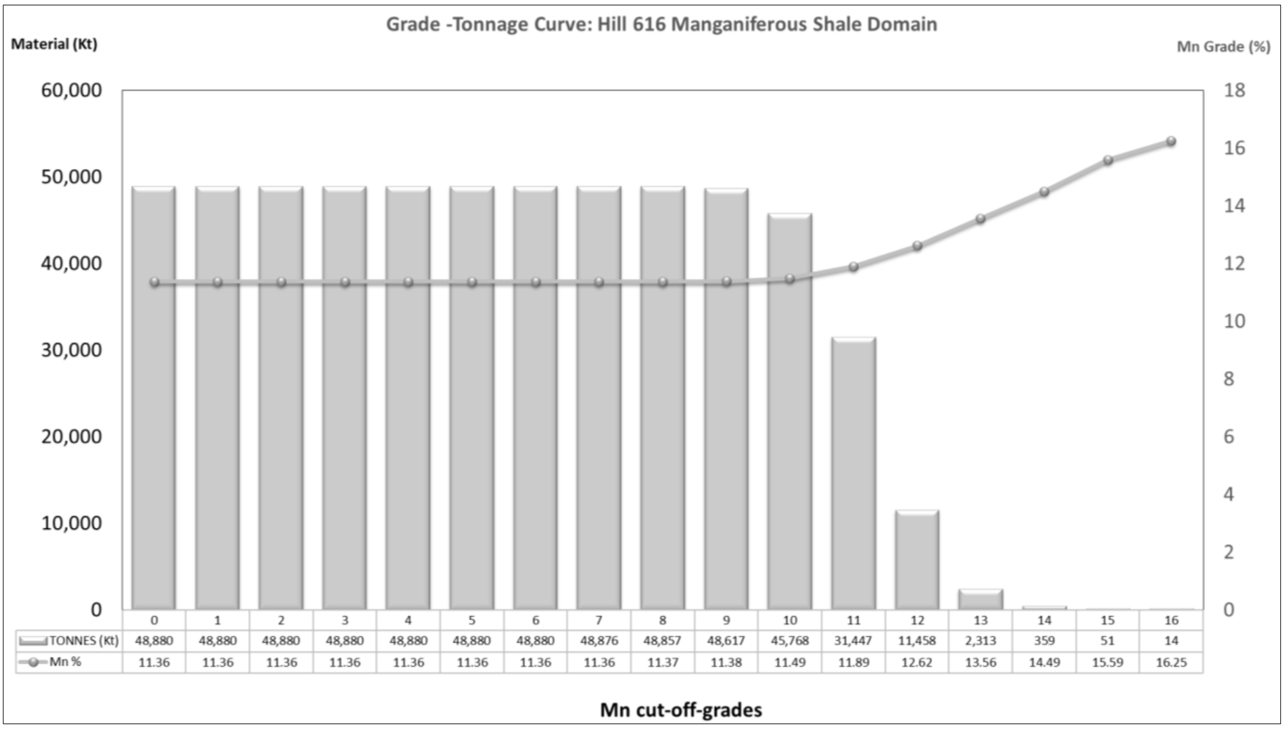

Figure 13: Grade-tonnage curve for Hill 616 manganiferous shale domain

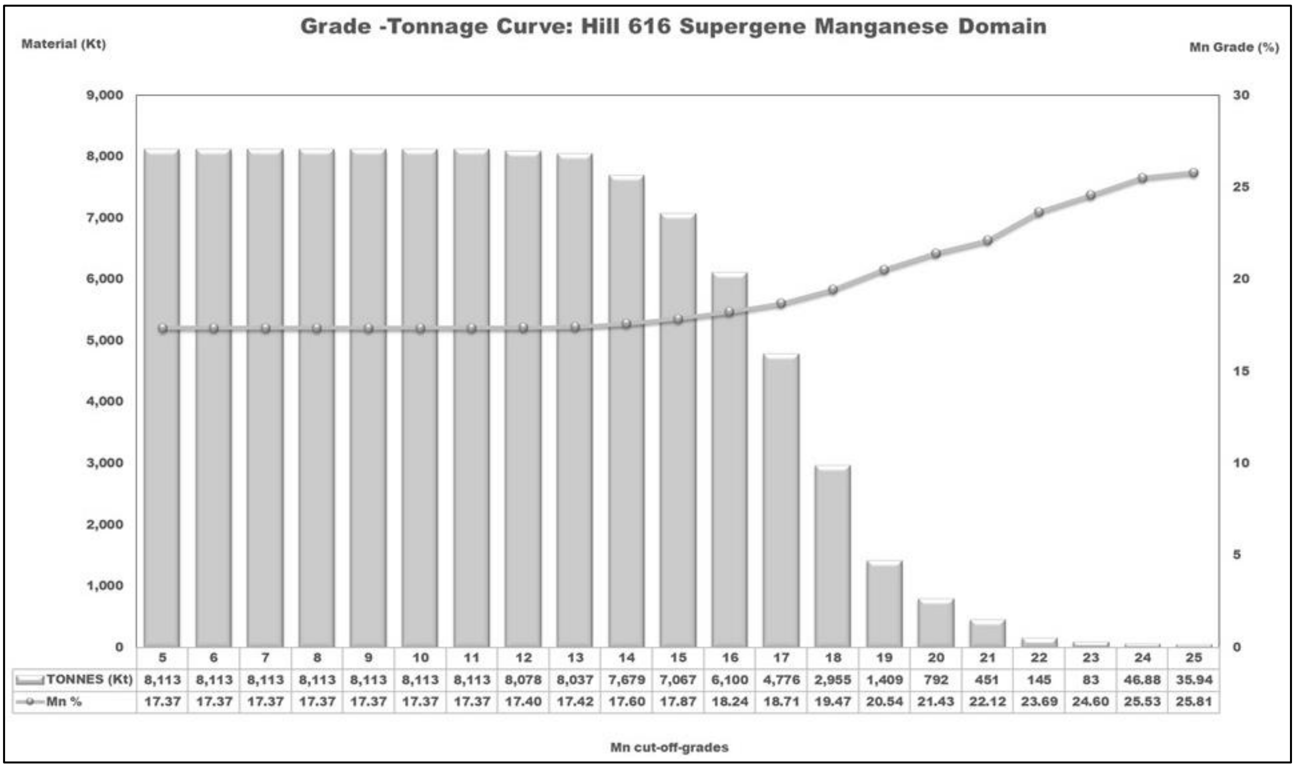

Figure 14: Grade-tonnage curve for Hill 616 supergene manganese domain

CONCLUSIONS AND RECOMMENDATIONS

Drilling completed between 2009 and 2011 on the Hill 616 deposit was used to generate a potentially exploitable resource. The mineralisation extends from surface to a depth of approximately 20 m. The manganiferous shale and the supergene/lateritic unit host the mineralisation. The variography has demonstrated there is good geological continuity in the east-west and north-south directions. However, infill drilling will allow the investigation of grade continuity and potentially increase the resource classification.

The data collection and density of sampling has been deemed appropriate for the Mineral Resource classification of the Hill 616 deposit at this stage.

The following recommendations are made based on the work completed for this Mineral Resource estimate:

- Infill drilling to improve the resource confidence. Infill drilling will also help in defining the mineralisation wireframes which seem to vary in thickness and shape between sections.
- Extensional drilling is recommended south of Hill 616 where mineralisation remains open.
- Firebird is encouraged to include CRMs, field duplicates and blanks in its sampling process to enhance the quality of their sampling and check on the laboratory analytical process and performance.
- Bulk density measurements for the Hill 616 Project, which will provide an accurate estimate of the tonnage and can be used for Ore Reserve and mine planning studies.
- No holes have been twinned for the Project; it is recommended that twin drilling be carried out for future drill programs to check on grade variability.
- A high-resolution topographic survey is recommended for future Mineral Resource estimation. The topography developed from collar points is only sufficient at this stage of exploration.
- Further metallurgical testwork to determine how the manganiferous and manganese supergene material will be economically extracted is recommended for the Project.

COMPETENT PERSONS STATEMENT

The information in this report that relates to Mineral Resources is based on information compiled by Mr Mark Pudovskis and Mr Aaron Meakin. Mr Mark Pudovskis is a full-time employee of CSA Global and is a Member of the Australasian Institute of Mining and Metallurgy. Mr Aaron Meakin is a full-time employee of CSA Global and is a Member and Chartered Professional of the Australasian Institute of Mining and Metallurgy. Mr Mark Pudovskis and Mr Aaron Meakin have sufficient experience relevant to the style of mineralisation and type of deposit under consideration and to the activity which they are undertaking to qualify as Competent Persons as defined in the 2012 Edition of the Australasian Code for the Reporting of Exploration Results, Mineral Resources and Ore Reserves (JORC Code). Mr Mark Pudovskis and Mr Aaron Meakin consent to the disclosure of the information in this report in the form and context in which it appears. Mr Mark Pudovskis assumes responsibility for matters related to Sections 1 and 2 of JORC Table 1, while Mr Aaron Meakin assumes responsibility for matters related to Section 3 of JORC Table 1.

ATTACHMENT 1: JORC TABLE 1

Section 1: Sampling Techniques and Data

Criteria	JORC Code explanation	Commentary
Sampling techniques	*Nature and quality of sampling (e.g. cut channels, random chips, or specific specialised industry standard measurement tools appropriate to the minerals under investigation, such as downhole gamma sondes, or handheld XRF instruments, etc.). These examples should not be taken as limiting the broad meaning of sampling.*	Samples used in reporting the Mineral Resource were obtained through reverse circulation (RC) drill methods. Drilling was completed by Hannans Reward Ltd between 2009 and 2011. A total of 122 RC drillholes for 4,151 m were completed on the tenement but only 116 holes (3,865 m) were used for the Mineral Resource estimate. Holes without assays were excluded from the estimation so that no bias is introduced during estimation. Samples for preliminary metallurgical testwork were collected by diamond coring methods (total of 16 drillholes for (408.4 m). The Competent Person considers that the sample techniques adopted were appropriate for the style of mineralisation and for reporting a Mineral Resource.
	Include reference to measures taken to ensure sample representivity and the appropriate calibration of any measurement tools or systems used.	RC samples were collected on 1 m intervals using a cyclone splitter.
	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 (e.g. "RC 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 (e.g., submarine nodules) may warrant disclosure of detailed information.	Samples received at the laboratory were weighed, pulverised to 3 kg to 85% passing 75 microns and then split using a riffle splitter. Assaying was completed using the ME_XRF12 and OA-GRA05t methods at ALS-Chemex Perth (ALS).
Drilling techniques	*Drill type (e.g. core, RC, open-hole hammer, rotary air blast, auger, Bangka, sonic, etc.) and details (e.g. core diameter, triple or standard tube, depth of diamond tails, face-sampling bit or other type, whether core is oriented and if so, by what method, etc.).*	The RC drilling method was used to collect samples used for the estimation. The drilling undertaken been vertical which is appropriate given the relatively shallow dip of the geology. Diamond drilling was used to collect samples that were used for the preliminary metallurgical testwork. Details of bit sizes are not available. The Competent Person considers that the drilling techniques adopted were appropriate for the style of mineralisation and for reporting a Mineral Resource.
Drill sample recovery	*Method of recording and assessing core and chip sample recoveries and results assessed.*	Given the historical nature of the drilling, no information is available about sample recoveries for specific drill programs, although there was no reported evidence of poor sample recoveries.
	Measures taken to maximise sample recovery and ensure representative nature of the samples.	No information is available regarding sample recoveries.
	Whether a relationship exists between sample recovery and grade and whether sample bias may have occurred due to preferential loss/gain of fine/coarse material.	There was no reported evidence of sample bias due to loss of sample.

Criteria	JORC Code explanation	Commentary
Logging	*Whether core and chip samples have been geologically and geotechnically logged to a level of detail to support appropriate Mineral Resource estimation, mining studies and metallurgical studies.*	All RC drillhole logging was qualitative with lithology, alteration, mineralisation, regolith, and veining recorded. RC drillholes were fully logged. There was no downhole geophysical logging. The Competent Person considers logging appropriate for the reporting of the Mineral Resource.
	Whether logging is qualitative or quantitative in nature. Core (or costean, channel, etc.) photography.	No RC photos are present although the diamond core was photographed and provided visual evidence of the presence of manganese.
	The total length and percentage of the relevant intersections logged.	2,739 m of RC samples used in the Mineral Resource estimate have logging records representing 71% of the 3,816 m.
Subsampling techniques and sample preparation	*If core, whether cut or sawn and whether quarter, half or all core taken.*	Core samples were not used in preparing the Mineral Resource estimate.
	If non-core, whether riffled, tube sampled, rotary split, etc. and whether sampled wet or dry.	RC samples were collected on 1 m intervals using a cyclone splitter.
	For all sample types, the nature, quality and appropriateness of the sample preparation technique.	Samples received at the laboratory were weighed, pulverised to 3 kg to 85% passing 75 microns and then split using a riffle splitter. The pulp was then submitted for ME-XRF12 and OA-GRA05t analysis.
	Quality control procedures adopted for all subsampling stages to maximise representivity of samples.	Subsampling is performed during the sample preparation stage in line with ALS-Chemex internal protocol.
	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.	Field duplicate samples were not available.
	Whether sample sizes are appropriate to the grain size of the material being sampled.	Sample sizes are considered appropriate to the grain size of the material being sampled.
Quality of assay data and laboratory tests	*The nature, quality and appropriateness of the assaying and laboratory procedures used and whether the technique is considered partial or total.*	Selected samples were sent to ALS-Chemex in Perth for whole-rock ME-XRF12 analysis (Fusion/XRF) of analytes Al_2O_3, As, BaO, CaO, Cl, Co, Cr_2O_3, Cu, Fe_2O_3, K_2O, MgO, MnO, Mo, Na_2O, Ni, P_2O_5, Pb, SO_3, SiO_2, TiO_2, V_2O_5, and Zn. Loss on Ignition (LOI) was analysed using the OA-GRA05t method. A furnace or thermogravimetric analyser was used to determine the LOI at 1,000°C using 1 g of sample. The analytical techniques are industry standard for manganese.
	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.	No geophysical tools have been used in the preparation of this Mineral Resource estimate.
	Nature of quality control procedures adopted (e.g. standards, blanks, duplicates, external laboratory checks) and whether acceptable levels of accuracy (i.e. lack of bias) and precision have been established.	Firebird Metals Limited (Firebird) retrieved all original laboratory certificates from ALS Perth. CSA Global Pty Ltd (CSA Global) compiled the laboratory certified reference material (CRM), blank and pulp duplicate results. 288 CRMs, 102 blanks and 182 pulp duplicate samples were used for quality control checks during the analytical process. The results can be summarised as follows: • The correlation coefficient values for Mn, Al_2O_3, Fe_2O_3, $P2O_5$ and SiO_2 duplicates were greater than 0.96

Criteria	JORC Code explanation	Commentary
		• The blanks did not show any evidence of contamination • The CRMs were within expected ranges. The Competent Person considers the nature and quality of assaying and laboratory procedures appropriate for reporting a Mineral Resource.
Verification of sampling and assaying	*The verification of significant intersections by either independent or alternative company personnel.*	The sampling and assaying have not been verified by an independent third party.
	The use of twinned holes.	There has been no twin drilling which is normal practice for the style of mineralisation.
	Documentation of primary data, data entry procedures, data verification, data storage (physical and electronic) protocols.	CSA Global has randomly checked the laboratory raw data against the database assays and found no issues.
	Discuss any adjustment to assay data.	Mn assays has been converted from the assayed MnO. The conversion of MnO to Mn assays was verified by CSA Global and found to be correct.
Location of data points	*Accuracy and quality of surveys used to locate drillholes (collar and downhole surveys), trenches, mine workings and other locations used in Mineral Resource estimation.*	All RC drill collars were surveyed by a handheld global positioning system (GPS) and all diamond drillholes were surveyed by a differential GPS. No field validation for the collars was completed although the drill locations are evident from satellite imagery (Google Earth). The topography is flat and collar positions were used to generate a digital terrain model. Downhole deviation was not completed but given the relatively flat nature of the stratigraphy and the shallow drillholes any deviation is not considered material. The Competent Person considers a relatively high level of confidence can be placed in the location of data points.
	Specification of the grid system used.	The project utilised the GDA94 Zone 51 coordinate system.
	Quality and adequacy of topographic control.	The topography used for Mineral Resource estimation was generated using the collar points for the RC and diamond drillholes. The Competent Person considers the topography to be adequate at this stage of exploration.
Data spacing and distribution	*Data spacing for reporting of Exploration Results.*	Drilling on Hill 616 has been completed on an approximate 200 m x 100 m grid.
	Whether the data spacing, and distribution is sufficient to establish the degree of geological and grade continuity appropriate for the Mineral Resource and Ore Reserve estimation procedure(s) and classifications applied.	The Competent Person considers the drill spacing appropriate for reporting a Mineral Resource.
	Whether sample compositing has been applied.	No sample compositing was applied for the Mineral Resource estimation since all the sample intervals were 1 m in length.
Orientation of data in relation to geological structure	*Whether the orientation of sampling achieves unbiased sampling of possible structures and the extent to which this is known, considering the deposit type.*	The deposit is a relatively shallow and gently dipping sequence of supergene mineralised manganiferous shale. There is no evidence of major structures disrupting the continuity of the mineralisation. The Competent Person considers the vertical drilling and spacing as appropriate for reporting a Mineral Resource.

Criteria	JORC Code explanation	Commentary
	If the relationship between the drilling orientation and the orientation of key mineralised structures is considered to have introduced a sampling bias, this should be assessed and reported if material.	The relationship between the drilling orientation and the orientation of key mineralised structures is unlikely to have introduced a sampling bias.
Sample security	*The measures taken to ensure sample security.*	Details of measures taken for the chain of custody of samples is unknown for the previous explorers' activities. However, Firebird did access and retrieve original laboratory assay certificates.
Audits or reviews	*The results of any audits or reviews of sampling techniques and data.*	No independent field audits or reviews have been undertaken. CSA Global completed an office-based project review in October 2021 and considered the level of exploration completed appropriate for reporting a Mineral Resource.

Section 2: Reporting of Exploration Results

Criteria	JORC Code explanation	Commentary
Mineral tenement and land tenure status	*Type, reference name/number, location and ownership including agreements or material issues with third parties such as joint ventures, partnerships, overriding royalties, native title interests, historical sites, wilderness or national park and environmental settings.*	Exploration licence E52/3633 forms the Hill 616 Project covering five blocks or approximately 15.7 km^2 and is held by Firebird. The Hill 616 Project is located within the established mineralogical terrain of in the South-eastern Pilbara Mining District and is located approximately 85 km southeast of Newman. The tenement is located in the Jigalong Aboriginal Reserve (41265). A tenement and drillhole location plan is included as Figure 1 and Figure 2.
	The security of the tenure held at the time of reporting along with any known impediments to obtaining a licence to operate in the area.	E52/3633 was granted on 21 April 2020 with an expiry date of 21 April 2025. The Competent Person can confirm that according to Department of Mines, Industry Regulation and Safety (DMIRS) Mineral Titles Online that all rents and rates have been paid and that the tenement is in good standing. The Competent Person has not verified any potential social or environmental pediments to progressing the Project.

Exploration done by other parties	*Acknowledgment and appraisal of exploration by other parties.*	The most meaningful manganese work was completed by Errawarra Pty Ltd (Errawarra), operating as Hannans Reward Limited between 2007 and 2012. This work is summarised below:
		• 2007 to 2008:
		  ○ Significant manganese mineralisation was first identified at the Burranbar project in April 2008 during a reconnaissance field mapping program, where rock chips collected returned results of 34.4% Mn (JIG017) and 34.3% Mn (JIG018). These samples came from a ≥3,000 m-long, broad mesa belonging to the Balfour Formation. The mesa was named Hill 616.
		• 2008 to 2009:
		  ○ Rock chip sampling (19 samples) was completed.

Criteria	JORC Code explanation	Commentary
		○ An initial metallurgical testwork program was also completed to determine the beneficiation potential of the detrital and near-surface, medium-grade manganese mineralisation. The work was on 10 bulk samples totalling approximately 4 kg and included size fraction, head assay and heavy liquid separation analysis. ○ Hannans Reward Ltd initiated a reconnaissance aircore program at Hill 616 to determine the depth extent of the manganese mineralisation encountered at surface. ○ Aerial photography was completed. ○ Aeromagnetic interpretations were completed over E52/1819-I (now E52/3633, although E52/366 is smaller in size) by Southern Geoscience Consulting with multi-commodity targets identified. • 2009 to 2010: ○ 58 aircore drillholes for 1,372 m (866 samples) on E52/1819-I. This included 25 drillholes for 578 m on the E52/3633 tenement area. ○ The aircore drilling on Hill 616 confirmed that manganese mineralisation is present below the surface expression, with an average downhole width of 4 m. Better results included: ▪ 4 m at 20.99% Mn (JAC238, 3–7 m) ▪ 4 m at 24.16% Mn (JAC241, 2–6 m) ▪ 4 m at 24.05% Mn (JAC254, 1–5 m). • 2010 to 2011: ○ Work on E52/1819-I included 13 rock chip samples, a manganese geophysical and project review. ○ Southern Geoscience Consultants undertook a review of previous geophysical data with reference to possible manganese potential and target generation across the Burranbar project area. ○ A manganese targeting exercise was completed which confirmed Hill 616 as a high-priority target for manganese. • 2011 to 2012: ○ A total of 16 diamond core holes for 408.4 m (three metallurgical samples) and 121 reverse circulation percussion (RCP) drillholes for 3,991m on Hill 616 were completed. Drilling was on an approximate 100 m x 200 m spacing along a strike length of 2.6 km. ○ The mineralisation at Hill 616 was generally found to be shallow (mostly within 20 m of the surface), gently dipping and laterally extensive across the target area. Significant widths of manganiferous mineralisation were intersected over the entire 2.6 km of strike covered by the drilling program.

Criteria	JORC Code explanation	Commentary
Geology	*Deposit type, geological setting and style of mineralisation.*	The manganese mineralisation occurs as multiple seams or bands of varying thickness within a highly weathered shale (Balfour Formation). Significant zones of manganese were still being intersected at both the northwest and southeast extents of the drilling program by previous explorers, indicating that mineralisation is open along strike in both directions. The mineralisation at Hill 616 was generally found to be shallow (mostly within 20 m of the surface), gently dipping and laterally extensive across the target area. The lateritic profile and subsequent manganese mineralisation show the zonation within the regolith and distribution of manganese mineralisation. The higher-grade (or nearer-surface supergene/lateritic) manganese material is generally located within the upper portion of the regolith profile at shallow depths (0–15 m). The Competent Person is of the opinion that the understanding of the Project's geology is detailed and well established.
Drillhole information	*A summary of all information material to the understanding of the Exploration Results including a tabulation of the following information for all Material drillholes:* • *Easting and northing of the drillhole collar* • *Elevation or RL (Reduced Level – Elevation above sea level in metres) of the drillhole collar* • *Dip and azimuth of the hole* • *Downhole length and interception depth* • *Hole length.*	The collar summary of RC drillholes completed over Hill 616 which were used in the Mineral Resource estimate is presented in Attachment 2. This includes the diamond drillholes which were used to guide mineralisation trends. A drillhole location plan is included as Figure 1 and Figure 2.
	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.	Exploration Results are not being reported.
Data aggregation methods	*In reporting Exploration Results, weighting averaging techniques, maximum and/or minimum grade truncations (e.g. cutting of high grades) and cut-off grades are usually Material and should be stated.*	Exploration Results are not being reported.
	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.	Exploration Results are not being reported.
	The assumptions used for any reporting of metal equivalent values should be clearly stated.	Exploration Results are not being reported.
Relationship between mineralisation widths and intercept lengths	*These relationships are particularly important in the reporting of Exploration Results.*	Exploration Results are not being reported.
	If the geometry of the mineralisation with respect to the drillhole angle is known, its nature should be reported.	The manganiferous horizons are relatively flat lying. Drilling has intersected the manganese generally at a high angle.
	If it is not known and only the down hole lengths are reported, there should be a clear statement to this effect (e.g. "downhole length, true width not known").	Exploration Results are not being reported.

Criteria	JORC Code explanation	Commentary
Diagrams	*Appropriate maps and sections (with scales) and tabulations of intercepts should be included for any significant discovery being reported These should include, but not be limited to a plan view of drillhole collar locations and appropriate sectional views.*	A project, tenement and drillhole location plan are included as Figure 1 and Figure 2Selected representative grade cross sections are included as Figure 7.
Balanced reporting	*Where comprehensive reporting of all Exploration Results is not practicable, representative reporting of both low and high grades and/or widths should be practiced to avoid misleading reporting of Exploration Results.*	Exploration Results are not being reported.
Other substantive exploration data	*Other exploration data, if meaningful and material, should be reported including (but not limited to): geological observations; geophysical survey results; geochemical survey results; bulk samples – size and method of treatment; metallurgical test results; bulk density, groundwater, geotechnical and rock characteristics; potential deleterious or contaminating substances.*	Other exploration work completed is described above in "Exploration done by other parties".
Further work	*The nature and scale of planned further work (e.g. tests for lateral extensions or depth extensions or large-scale step-out drilling).*	The Competent Person recommends infill drilling to an approximate 100 m x 100 m grid to improve the confidence in the Mineral Resource. Extensional drilling is recommended south of Hill 616 where mineralisation remains open. All drilling should be supported by downhole geophysics to collect high-quality density measurements and all drillholes should be surveyed by differential GPS. A high-resolution topographic survey is recommended.
	Diagrams clearly highlighting the areas of possible extensions, including the main geological interpretations and future drilling areas, provided this information is not commercially sensitive.	Diagrams showing the location of the drilled holes and tenement have been included in this report.

Section 3: Estimation and Reporting of Mineral Resources

Criteria	JORC Code explanation	Commentary
Database integrity	*Measures taken to ensure that data has not been corrupted by, for example, transcription or keying errors, between its initial collection and its use for Mineral Resource estimation purposes.*	A Microsoft Access digital database was provided by the previous project owner. All drillhole data required for the Mineral Resource was collated from a Sinohydro PDF report translated from Mandarin to English into a Microsoft Access database. Data validation included checks for incorrect hole depths, overlapping intervals, missing survey data, missing data. Cross checks were made between the original assay certificates and the final Microsoft Access database. The data was inspected in three-dimensional software to ensure there are no issues with database mapping.
	Data validation procedures used.	Data was checked for duplicate intervals, missing assays, and that the sample intervals did not extend below end of hole depth. All holes were displayed in Datamine and collar elevations for the aircore holes (JAC236 to JAC260) were adjusted to the elevation of the topography.

Criteria	JORC Code explanation	Commentary
		Random assays values were checked against the original laboratory assay certificate. A negative LOI value reported on sample number HR10594 was changed to 0.005 (half the detection limit). The conversion of MnO to Mn was also checked and found to correct. No significant errors were found with the data.
Site visits	*Comment on any site visits undertaken by the Competent Person and the outcome of those visits.*	The Competent Person did not visit the Hill 616 Project.
	If no site visits have been undertaken indicate why this is the case.	The Competent Person has spent time visiting the Firebird Oakover and Karan projects which are of similar geological setting and mineralisation style to Hill 616 deposit.
Geological interpretation	*Confidence in (or conversely, the uncertainty of) the geological interpretation of the mineral deposit.*	The geological interpretation was based on drill assay results and historical logging supported by, where available, diamond core photos. Hardcopy cross sections were initially drafted and interpreted to include a near-surface higher-grade supergene/ lateritic geological domain and a manganiferous shale geological domain which were both estimated. A background domain comprising mixed shale, ferruginous manganiferous shale, chert shale and shale was identified.
	Nature of the data used and of any assumptions made.	Geological data used for interpretation was gathered from drilling with detailed geological core logging and assay data.
	The effect, if any, of alternative interpretations on Mineral Resource estimation.	Additional infill drilling will be used to refine the current interpretation; however, this is unlikely to result in any significant changes.
	The use of geology in guiding and controlling Mineral Resource estimation. *The factors affecting continuity both of grade and geology.*	Geological domaining using a combination of historical logging, assays and diamond core photos was used to guide the Mineral Resource estimation. The mineralisation is reasonably continuous along and across strike.
Dimensions	*The extent and variability of the Mineral Resource expressed as length (along strike or otherwise), plan width, and depth below surface to the upper and lower limits of the Mineral Resource.*	The Hill 616 deposit has been drilled to approximately 2 km in a north-south direction and about 1 km in an east-west direction. The mineralisation extends to about 20 m below surface and varies in thickness from section to section. The average thickness of the higher-grade supergene/lateritic manganese and lower grade basal manganiferous shale were 3 m and 6 m, respectively.
Estimation and modelling techniques	*The nature and appropriateness of the estimation technique(s) applied and key assumptions, including treatment of extreme grade values, domaining, interpolation parameters and maximum distance of extrapolation from data points. If a computer assisted estimation method was chosen include a description of computer software and parameters used.*	The Mineral Resource estimation process is summarised below: • Surfaces and solid wireframes were used generate three geological domains for Hill 616 Project. • Drillhole data was flagged with domain wireframes. Domain interpretations were created using geological logging, assays, and surface mapping. • No downhole compositing was used as all sample intervals were 1 m in length.

Criteria	JORC Code explanation	Commentary
		• No top cuts were applied to Fe_2O_3, Al_2O_3, LOI, P_2O_5 and SiO_2 data in all domains since the coefficient of variation (CV) was low ranging between 0.12 and 0.63. A top cut equivalent to 99.9 percentile was applied to the Mn assays in background shale domain (domain 1) since there were two values with assays greater than 50% Mn. • Variograms for Mn, Fe_2O_3, Al_2O_3, LOI, P_2O_5 and SiO_2 were created for each domain. • Variogram models and search ellipses were used for grade interpolation. • Three search passes were employed to ensure most block cells were estimated. • Grades for Mn, Fe_2O_3, Al_2O_3, LOI, P_2O_5 and SiO_2 were estimated using Ordinary Kriging into 25 mE x 50 mN x 1 mRL blocks with a sub-cells of 12.5 mE x 25 mN x 0.5 mRL. A block discretisation of 4 x 4 x 2 was used for the parent cell array. • Fe_2O_3% and P_2O_5% were converted to Fe% and P% respectively using 0.6994 and 0.4364 factors calculated from atomic mass molecular weights to align with Mn reporting.
	The availability of check estimates, previous estimates and/or mine production records and whether the Mineral Resource estimate takes appropriate account of such data.	No previous estimates have been completed for the Hill 616 Project.
	The assumptions made regarding recovery of by-products.	No assumptions have been made regarding by-products.
	Estimation of deleterious elements or other non-grade variables of economic significance (e.g. sulphur for acid mine drainage characterisation).	No other elements were estimated at this stage.
	In the case of block model interpolation, the block size in relation to the average sample spacing and the search employed.	A parent block size of 25 mE x 50 mN x 1 mRL with sub-cells of 12.5 mE x 25 mN x 0.5 mRL were selected in a consideration of the drillhole spacing and geometry of the orebody.
	Any assumptions behind modelling of selective mining units.	No assumptions have been made regarding modelling of selective mining unit.
	Any assumptions about correlation between variables	Mn, Fe_2O_3, Al_2O_3, LOI, P_2O_5 and SiO_2 were estimated, and a check of the drillhole data showed: • Mn and Al_2O_3 are negative correlated (-0.51) • Mn and SiO_2 are negative correlated (-0.54) • SiO_2 and Fe_2O_3 are strongly negative correlated (-0.70) • SiO_2 and LOI are strongly negative correlated (-0.71).
	Description of how the geological interpretation was used to control the resource estimates.	Estimation was confined to geological domains.
	Discussion of basis for using or not using grade cutting or capping.	No top cuts were applied to Fe_2O_3, Al_2O_3, LOI, P_2O_5 and SiO_2 data in all domains since the CV was low, ranging between 0.12 and 0.63. A top cut equivalent to 99.9 percentile was applied to Mn assays in background shale domain (domain 1) since there were two values with assays greater than 50% Mn.

Criteria	JORC Code explanation	Commentary
	The process of validation, the checking process used, the comparison of model data to drillhole data, and use of reconciliation data if available.	The block model grades were visually compared with the coded drillhole grades in section. The block model was also validated on screen against the geological wireframes and drillholes to check that the domain allocation was concurrent with the drillhole lithology. Another validation stage involved a comparison of the drillhole and the model statistics. Swath plots comparing the drillhole average grades and the block model grades in slices were generated for all the estimated variables within their respective domains. The block model and drillhole grades for all domains show trends consistent with effective grade interpolation. Areas with low sample numbers generally show higher variance between model and drillhole mean grades. As no mining has taken place at Hill 616, there is no reconciliation data available.
Moisture	*Whether the tonnages are estimated on a dry basis or with natural moisture, and the method of determination of the moisture content.*	Moisture has not been measured. Tonnage was estimated on a dry basis.
Cut-off parameters	*The basis of the adopted cut-off grade(s) or quality parameters applied.*	An 8% Mn reporting cut-off grade has been selected following preliminary high-level assessment of what cut-off grade may be adopted in an open cut mining environment. CSA Global considers that the Mineral Resource as reported fulfills the reasonable prospects for eventual economic extraction requirement for reporting Mineral Resources in accordance with the JORC Code.
Mining factors or assumptions	*Assumptions made regarding possible mining methods, minimum mining dimensions and internal (or, if applicable, external) mining dilution. It is always necessary as part of the process of determining reasonable prospects for eventual economic extraction to consider potential mining methods, but the assumptions made regarding mining methods and parameters when estimating Mineral Resources may not always be rigorous. Where this is the case, this should be reported with an , explanation of the basis of the mining assumptions made.*	It is assumed that the mining method for Hill 616 will be shallow open pit conventional mining.
Metallurgical factors or assumptions	*The basis for assumptions or predictions regarding metallurgical amenability. It is always necessary as part of the process of determining reasonable prospects for eventual economic extraction to consider potential metallurgical methods, but the assumptions regarding metallurgical treatment processes and parameters made when reporting Mineral Resources may not always be rigorous. Where this is the case, this should be reported with an explanation of the basis of the metallurgical assumptions made.*	A preliminary metallurgical testwork program completed between 2008 and 2009 showed the Hill 616 mineralisation was of a high quality and whilst a lump product was not viable, a fines product could be achieved. Further testwork was completed in by CSIRO in 2013 with Errawarra using the Wet High Intensity Magnetic Separation (WHIMS) achieved a final product with a grade of 23% Mn. Two streams of metallurgical processing are being considered, both having been proven from similar and analogous deposits to be economically reasonable as a means of extracting a marketable manganese product. Higher-grade supergene/lateritic manganese. It is reasonable to assume that a marketable manganese concentrate is achievable via ore sorting techniques. Current trials are in progress on Firebird's neighbouring Oakover and Karen deposits which are of the geological setting and mineralisation as Hill 616.

Criteria	JORC Code explanation	Commentary
		Lower-grade basal manganiferous shale: It is reasonable to assume that a high purity electrolytic manganese metal and battery grade manganese sulphate may be produced through hydrometallurgy. This has been reported as achievable by (Element 25, Butcherbird ASX announcement 28 November 2018) which is of similar geological and mineralisation setting as Hill 616. https://www.element25.com.au/site/PDF/a456d29c-cc67-453f-8489-1365501c22e8/FirstHighPurityElectrolyticManganeseMetalProduced Another example of a project utilising a lower grade Mn resource to produce electrolytic manganese metal or high purity manganese sulphate monohydrate is the Euro Manganese Inc. Chvaletice manganese project in the Czech Republic which grades approximately 7.3% Mn. https://www.mn25.ca/chvaletice-project Metallurgical testwork is required and should be completed as part of any forward work program.
Environmental factors or assumptions	*Assumptions made regarding possible waste and process residue disposal options. It is always necessary as part of the process of determining reasonable prospects for eventual economic extraction to consider the potential environmental impacts of the mining and processing operation. While at this stage the determination of potential environmental impacts, particularly for a greenfields project, may not always be well advanced, the status of early consideration of these potential environmental impacts should be reported. Where these aspects have not been considered this should be reported with an explanation of the environmental assumptions made.*	The Project is at early stages and environmental impacts have not been considered. It is assumed that waste will be disposed according to a mine plan.
Bulk density	*Whether assumed or determined. If assumed, the basis for the assumptions. If determined, the method used, whether wet or dry, the frequency of the measurements, the nature, size and representativeness of the samples.*	Bulk density has been assumed for the supergene/ lateritic manganese (density 2.5), the basal manganiferous shale domains (density 2.4) and the background shale (density 2.3). The Competent Person considers the applied densities reasonable for an Inferred Mineral Resource. Downhole geophysics is recommended to acquire high-quality in-situ density measurements.
	The bulk density for bulk material must have been measured by methods that adequately account for void spaces (vugs, porosity, etc.), moisture and differences between rock and alteration zones within the deposit.	Not applicable.
	Discuss assumptions for bulk density estimates used in the evaluation process of the different materials.	The assumption was based on similar densities applied to the 2012 Oakover Mineral Resource estimate. There is a similarity in geology and mineralisation style between Hill 616 and the Oakover project.
Classification	*The basis for the classification of the Mineral Resources into varying confidence categories.*	The Mineral Resource was classified as Inferred where the drill spacing was on a 200 m x 100 m grid.

Criteria	JORC Code explanation	Commentary
	Whether appropriate account has been taken of all relevant factors (i.e. relative confidence in tonnage/grade estimations, reliability of input data, confidence in continuity of geology and metal values, quality, quantity and distribution of the data).	The classification was also supported by the data quality, variography, geological and grade continuity.
	Whether the result appropriately reflects the Competent Person's view of the deposit.	CSA Global believes that the classification appropriately reflects its confidence in the quality of the grade estimates
Audits or reviews	*The results of any audits or reviews of MREs.*	There has been no independent audit of the Mineral Resource. The Mineral Resource methodology and reporting has been subjected to internal peer review at CSA Global.
Discussion of relative accuracy/ confidence	*Where appropriate a statement of the relative accuracy and confidence level in the MRE using an approach or procedure deemed appropriate by the Competent Person. For example, the application of statistical or geostatistical procedures to quantify the relative accuracy of the resource within stated confidence limits, or, if such an approach is not deemed appropriate, a qualitative discussion of the factors that could affect the relative accuracy and confidence of the estimate.*	The available data supports an Inferred Mineral Resource in accordance with the JORC Code (2012 Edition). All factors that have been considered when classifying the Mineral Resource are discussed in Sections 1, 2 and 3 of this Table.
	The statement should specify whether it relates to global or local estimates, and, if local, state the relevant tonnages, which should be relevant to technical and economic evaluation. Documentation should include assumptions made and the procedures used.	The statement refers to global estimates for the deposit and grade was estimated for each block in the block model.
	These statements of relative accuracy and confidence of the estimate should be compared with production data, where available.	No production has occurred, and no mining data is available.

ATTACHMENT 2: DRILL COLLAR SUMMARY

Deposit	Hole ID	Drill type	Easting	Northing	Date	RL	Depth (m)
Hill 616	JMRC015	RCP	247726	7373611	17/09/2011	593	30
Hill 616	JMRC016	RCP	247799	7373598	17/09/2011	589	30
Hill 616	JMRC017	RCP	247902	7373597	17/09/2011	587	30
Hill 616	JMRC018	RCP	247999	7373599	18/09/2011	591	36
Hill 616	JMRC019	RCP	248101	7373597	18/09/2011	589	37
Hill 616	JMRC020	RCP	248198	7373600	18/09/2011	587	36
Hill 616	JMRC021	RCP	248295	7373600	18/09/2011	586	36
Hill 616	JMRC022	RCP	248400	7373601	18/09/2011	584	36
Hill 616	JMRC023	RCP	247294	7373994	18/09/2011	611	54
Hill 616	JMRC024	RCP	247398	7373997	19/09/2011	611	36
Hill 616	JMRC025	RCP	247501	7374003	19/09/2011	610	48
Hill 616	JMRC026	RCP	247597	7374003	19/09/2011	609	30
Hill 616	JMRC027	RCP	247699	7374001	19/09/2011	604	36
Hill 616	JMRC028	RCP	247805	7373996	19/09/2011	598	36
Hill 616	JMRC029	RCP	247900	7373997	19/09/2011	597	36
Hill 616	JMRC030	RCP	247997	7373999	19/09/2011	595	30
Hill 616	JMRC031	RCP	248098	7374000	19/09/2011	592	36
Hill 616	JMRC032	RCP	248194	7373994	19/09/2011	590	36
Hill 616	JMRC033	RCP	248298	7373999	20/09/2011	588	36
Hill 616	JMRC034	RCP	248399	7373999	20/09/2011	587	42
Hill 616	JMRC035	RCP	248500	7373600	21/09/2011	583	42
Hill 616	JMRC036	RCP	248599	7373602	21/09/2011	581	30
Hill 616	JMRC037	RCP	247694	7373801	20/09/2011	599	36
Hill 616	JMRC038	RCP	247804	7373806	20/09/2011	592	30
Hill 616	JMRC039	RCP	247903	7373796	20/09/2011	595	30
Hill 616	JMRC040	RCP	247996	7373800	20/09/2011	593	30
Hill 616	JMRC041	RCP	248101	7373801	20/09/2011	591	30
Hill 616	JMRC042	RCP	248196	7373801	21/09/2011	589	30
Hill 616	JMRC043	RCP	248298	7373804	21/09/2011	587	36
Hill 616	JMRC044	RCP	248398	7373800	21/09/2011	585	36
Hill 616	JMRC045	RCP	248498	7373803	21/09/2011	584	36
Hill 616	JMRC046	RCP	247504	7374192	21/09/2011	606	36
Hill 616	JMRC047	RCP	247596	7374201	21/09/2011	608	30
Hill 616	JMRC048	RCP	247699	7374193	21/09/2011	605	48
Hill 616	JMRC049	RCP	247798	7374196	23/09/2011	603	30
Hill 616	JMRC050	RCP	247899	7374206	23/09/2011	599	30
Hill 616	JMRC051	RCP	248001	7374204	23/09/2011	597	36
Hill 616	JMRC052	RCP	248103	7374197	23/09/2011	594	30
Hill 616	JMRC053	RCP	248196	7374204	23/09/2011	591	36
Hill 616	JMRC054	RCP	248299	7374203	23/09/2011	589	36
Hill 616	JMRC055	RCP	248395	7374201	23/09/2011	588	36
Hill 616	JMRC056	RCP	247404	7374402	23/09/2011	603	30
Hill 616	JMRC057	RCP	247500	7374398	23/09/2011	602	30
Hill 616	JMRC058	RCP	247598	7374402	24/09/2011	603	30
Hill 616	JMRC059	RCP	247704	7374402	24/09/2011	601	30

Deposit	Hole ID	Drill type	Easting	Northing	Date	RL	Depth (m)
Hill 616	JMRC060	RCP	247800	7374402	24/09/2011	599	36
Hill 616	JMRC061	RCP	247898	7374401	24/09/2011	597	30
Hill 616	JMRC062	RCP	247996	7374402	24/09/2011	595	30
Hill 616	JMRC063	RCP	248099	7374402	24/09/2011	593	36
Hill 616	JMRC064	RCP	248196	7374400	25/09/2011	591	30
Hill 616	JMRC065	RCP	248296	7374402	25/09/2011	590	36
Hill 616	JMRC066	RCP	248394	7374401	25/09/2011	589	36
Hill 616	JMRC067	RCP	248489	7374402	25/09/2011	588	36
Hill 616	JMRC068	RCP	247597	7374598	25/09/2011	599	30
Hill 616	JMRC069	RCP	247698	7374597	25/09/2011	598	30
Hill 616	JMRC070	RCP	247802	7374602	25/09/2011	596	30
Hill 616	JMRC071	RCP	247893	7374590	26/09/2011	595	36
Hill 616	JMRC072	RCP	248000	7374601	26/09/2011	593	30
Hill 616	JMRC073	RCP	248103	7374600	26/09/2011	593	36
Hill 616	JMRC074	RCP	248202	7374601	26/09/2011	592	36
Hill 616	JMRC075	RCP	248293	7374595	26/09/2011	591	36
Hill 616	JMRC076	RCP	248396	7374602	26/09/2011	590	36
Hill 616	JMRC077	RCP	248489	7374603	26/09/2011	589	36
Hill 616	JMRC078	RCP	248600	7374588	27/09/2011	588	36
Hill 616	JMRC079	RCP	249193	7374601	27/09/2011	589	42
Hill 616	JMRC080	RCP	249398	7374601	27/09/2011	591	30
Hill 616	JMRC081	RCP	249596	7374600	27/09/2011	587	30
Hill 616	JMRC082	RCP	249801	7374601	27/09/2011	589	30
Hill 616	JMRC083	RCP	247799	7374801	27/09/2011	598	36
Hill 616	JMRC084	RCP	247898	7374802	27/09/2011	597	36
Hill 616	JMRC085	RCP	247997	7374801	27/09/2011	595	36
Hill 616	JMRC086	RCP	248099	7374803	27/09/2011	594	36
Hill 616	JMRC087	RCP	248197	7374802	28/09/2011	593	36
Hill 616	JMRC088	RCP	248296	7374810	28/09/2011	593	30
Hill 616	JMRC089	RCP	248398	7374800	28/09/2011	593	30
Hill 616	JMRC090	RCP	248496	7374800	28/09/2011	592	30
Hill 616	JMRC091	RCP	248596	7374800	28/09/2011	591	30
Hill 616	JMRC092	RCP	248696	7374801	28/09/2011	590	42
Hill 616	JMRC093	RCP	248800	7374803	28/09/2011	589	42
Hill 616	JMRC094	RCP	247895	7375001	28/09/2011	595	30
Hill 616	JMRC095	RCP	247999	7375005	28/09/2011	598	6
Hill 616	JMRC096	RCP	248008	7375002	28/09/2011	598	36
Hill 616	JMRC097	RCP	248103	7374998	29/09/2011	596	30
Hill 616	JMRC098	RCP	248199	7375002	29/09/2011	596	36
Hill 616	JMRC099	RCP	248299	7375003	29/09/2011	596	30
Hill 616	JMRC100	RCP	248400	7375002	29/09/2011	595	30
Hill 616	JMRC101	RCP	248500	7374999	29/09/2011	594	30
Hill 616	JMRC110	RCP	247994	7375198	30/09/2011	589	36
Hill 616	JMRC111	RCP	248104	7375203	30/09/2011	590	30
Hill 616	JMRC112	RCP	248198	7375202	30/09/2011	593	30
Hill 616	JMRC113	RCP	248289	7375194	30/09/2011	594	30
Hill 616	JMRC114	RCP	248402	7375199	30/09/2011	595	30

Deposit	Hole ID	Drill type	Easting	Northing	Date	RL	Depth (m)
Hill 616	JMRC115	RCP	248495	7375201	30/09/2011	593	30
Hill 616	JMRC122	RCP	248300	7375394	2/10/2011	587	30
Hill 616	JMRC123	RCP	248398	7375399	2/10/2011	587	24
Hill 616	JMRC124	RCP	248496	7375401	2/10/2011	589	30
Hill 616	JMRC145	RCP	247609	7373395	5/10/2011	591	48
Hill 616	JMRC146	RCP	247696	7373409	5/10/2011	590	30
Hill 616	JMRC147	RCP	247794	7373398	5/10/2011	586	24
Hill 616	JMRC148	RCP	247896	7373406	5/10/2011	583	24
Hill 616	JMRC149	RCP	247999	7373399	5/10/2011	586	30
Hill 616	JMRC150	RCP	248104	7373404	6/10/2011	587	36
Hill 616	JMRC151	RCP	248203	7373403	6/10/2011	586	36
Hill 616	JMRC152	RCP	248300	7373402	6/10/2011	584	42
Hill 616	JMRC153	RCP	248388	7373396	6/10/2011	583	36
Hill 616	JMRC154	RCP	248499	7373402	6/10/2011	581	48
Hill 616	JMRC155	RCP	248605	7373402	7/10/2011	580	36
Hill 616	JMRC156	RCP	248704	7373404	7/10/2011	579	18
Hill 616	JMRC157	RCP	247400	7373200	7/10/2011	577	18
Hill 616	JMRC158	RCP	247596	7373198	7/10/2011	583	30
Hill 616	JMRC159	RCP	247699	7373203	7/10/2011	582	30
Hill 616	JMRC160	RCP	247802	7373196	7/10/2011	580	30
Hill 616	JMRC161	RCP	247893	7373206	8/10/2011	580	24
Hill 616	JMRC162	RCP	248009	7373200	8/10/2011	585	30
Hill 616	JMRC163	RCP	248100	7373193	8/10/2011	587	42
Hill 616	JMRC164	RCP	248206	7373203	8/10/2011	586	30
Hill 616	JMRC165	RCP	248310	7373205	8/10/2011	584	36
Hill 616	JMRC166	RCP	248406	7373203	9/10/2011	583	30
Hill 616	JMRC167	RCP	248503	7373203	9/10/2011	580	24
Hill 616	JMRC168	RCP	248600	7373206	9/10/2011	579	24
Hill 616	JMRC169	RCP	248696	7373202	9/10/2011	578	18
Hill 616	JDDH01	DDH	248603	7373206	20/10/2011	579	15
Hill 616	JDDH02	DDH	247615	7373396	21/10/2011	591	29
Hill 616	JDDH03	DDH	248108	7373403	22/10/2011	587	31.7
Hill 616	JDDH04	DDH	247803	7373804	17/10/2011	592	31.6
Hill 616	JDDH05	DDH	247901	7373797	18/10/2011	595	30.5
Hill 616	JDDH06	DDH	248406	7373804	20/10/2011	585	14.8
Hill 616	JDDH07	DDH	247397	7373995	23/10/2011	611	25.7
Hill 616	JDDH08	DDH	248099	7374001	24/10/2011	592	25.5
Hill 616	JDDH09	DDH	248199	7373995	25/10/2011	590	28.3
Hill 616	JDDH10	DDH	247408	7374401	26/10/2011	603	27
Hill 616	JDDH11	DDH	247804	7374402	28/10/2011	599	32.2
Hill 616	JDDH12	DDH	248004	7374405	29/10/2011	595	24
Hill 616	JDDH13	DDH	248104	7374402	30/10/2011	593	28
Hill 616	JDDH14	DDH	248293	7374404	30/10/2011	590	32
Hill 616	JDDH15	DDH	248198	7374601	1/11/2011	592	16.1
Hill 616	JDDH16	DDH	247805	7374800	2/11/2011	598	17