

**Lottah Mining Pty Ltd**  
**EL 25/2009 “Highclere”**  
**Annual Report on Exploration**  
**May 2017 to May 2018**

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**May 2018**

## **Abstract**

Work on EL 25/2009 in the reporting year has consisted of

- Data compilation
- Generation of a JORC (2012) resource for the Highclere deposit.
- Reconnaissance field mapping/sampling at Pet Road.
- Digitisation of 1978 Comalco ground magnetics data covering Pet Road and Buckby's Prospects.

Data compilation is ongoing.

**An Inferred Resource total of 1,288,438m<sup>3</sup> equating to, at an approximated bulk density of 3.5t/m<sup>3</sup>, 4,510,000t @ 42.48% Fe has been estimated.**

**At a cut-off grade of 45% Fe the resource is 378,063m<sup>3</sup> equating to ~1,300,000t (at assumed bulk density of 3.5t/m<sup>3</sup>) @ 50.4% Fe.**

The resource consists of a mixture of highly weathered limonitic clayey material and massive magnetite+/-hematite. It is defined by the nominal 30% Fe iron mineralisation envelope and excludes overlying and underlying low grade calc—silicate skarn intersections. It is only estimated to 5,438,475mN (MGA94).

The complete lack of any bulk density data makes the tonnages estimated only approximate with only tonnages considered accurate.

Reconnaissance mapping at Pet Road did not locate further magnetite mineralisation other than that discovered previously.

Digital images of the 1978 Comalco ground magnetics data have been generated from digitised data.

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## Appendix A - Lottah Mining Pty Ltd - Highclere Iron Deposit Resource Estimation

## **1.0 Introduction**

### **1.1 Location/Access/Land Usage**

EL 25/2009 “Highclere” is located in Tasmania’s northwest approximately 15 to 20km’s south of the port of Burnie. Access to the tenement is ideal with the bitumen Murchison Highway passing through the middle of the licence. Access within the licence is by a series of gravel roads which service farms nearer to the highway and provide access to forestry areas on the eastern and western margins of the licence.

The licence area is used for farming, predominantly grazing, and forestry.

### **1.2 Tenure**

Exploration Licence EL 25/2009 “Highclere” was granted to Blythe River Iron Pty Ltd in 2009. Blythe River Iron Pty Ltd was bought out by Forward Mining who in turn was bought by Lottah Mining Pty Ltd.

EL 25/2009 remains in the name of Blythe River Iron Pty Ltd but is owned and managed by Lottah Mining Pty Ltd.

Blythe River Iron Pty Ltd is relinquishing 14km<sup>2</sup> and seeking to retain the remaining 24km<sup>2</sup> as shown in figure 1.1.

### **1.3 Exploration Rationale**

Lottah Mining Pty Ltd has a JORC compliant magnetite iron resource at its Rogetta North project on ML 1996P/M to the southeast of EL 25/2009. Lottah Mining Pty Ltd also has a JORC compliant hematite iron resource deposit on EL6/2005 to the northeast of EL 25/2009.

Lottah Mining Pty Ltd is targeting further magnetite and/or hematite iron deposits to add to its resource inventory.

Lottah Mining Pty Ltd is also targeting any commodities of commercial interest including but not limited to W<sub>03</sub>, Sn, Bi, Mo, Cu, Pb, Zn, Au, Ag, Li, Ni, REE, wollastonite and facing stone.

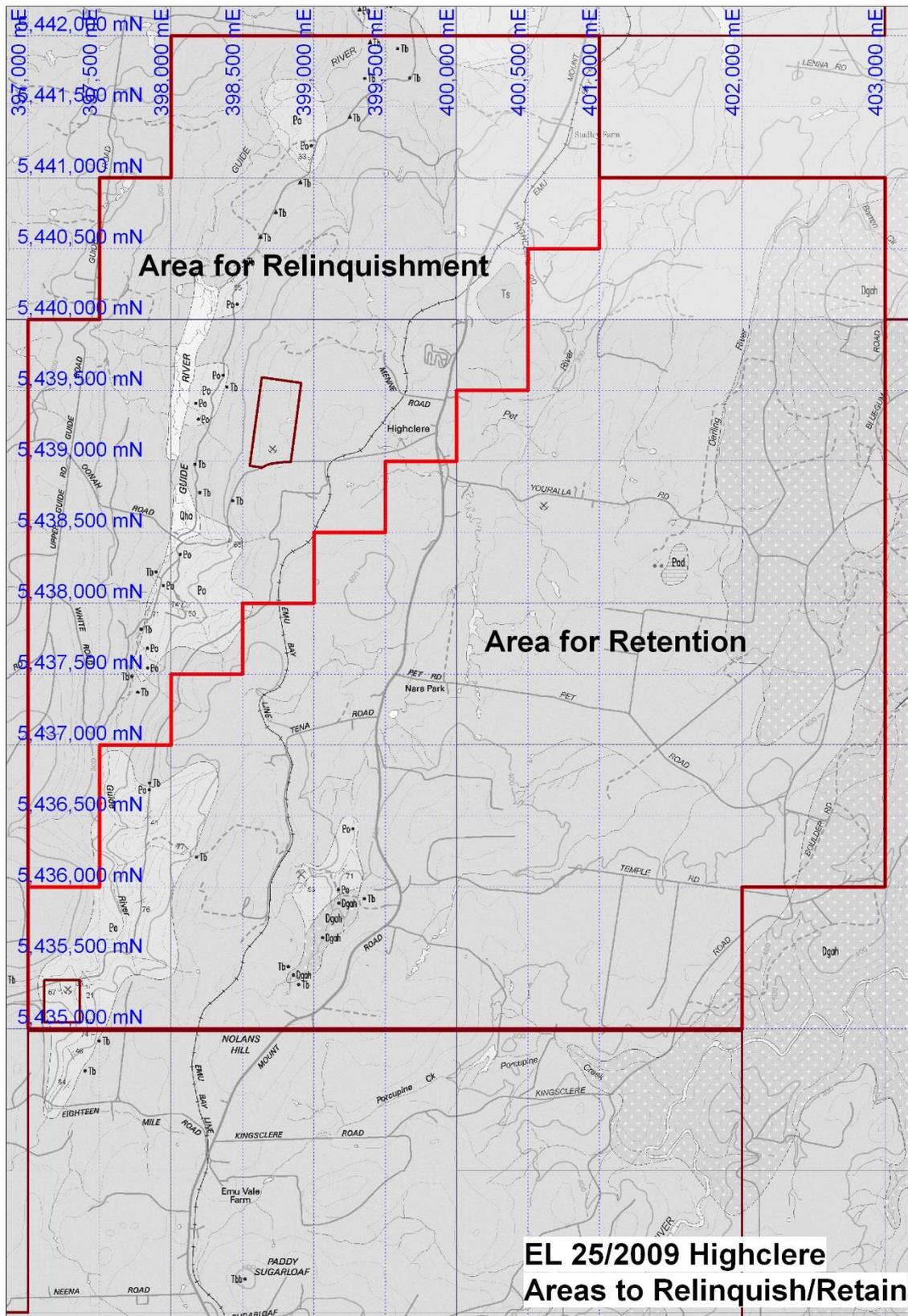


Figure 1.1: EL 25/2009 “Highclere” areas for relinquishment and retention.

## 1.4 Geology

Regionally the geology of the Rogetta Project area is dominated by a basement of Proterozoic metasediments (and minor mafic volcanics) of the Oonah/Burnie Formations unconformably overlain by a sequence of Cambro-Ordovician volcanics and sediments, both intruded by the Devonian Husetop Granite, all obscured by a veneer of Tertiary basalt.

Proterozoic rocks are the host to skarn mineralisation at Buckby's prospect within the tenement, as well as the Natone prospect further to the east. Some workers (Blake, 1928) also attribute the Highclere skarn host rocks to the Proterozoic, though more current interpretations see these rocks to be from the Cambro-Ordovician sequence. The deep weathering superimposed on texturally destructive skarn alteration must make any interpretation of these host rocks uncertain.

The basal unit of the Cambro-Ordovician sequence consists of the Mt Read Volcanics, correlated with the Tyndall Group. These are overlain by the Owen Group sediments.

The basal member of the Owen Group is a quartz pebble conglomerate with local additions of volcanoclastic detritus. The conglomerates are overlain by the Moina Sandstone which has a gradational contact with the overlying Gordon Group Limestone, becoming more calcareous towards the contact.

These calcareous upper Moina Sandstone rocks and the overlying Gordon Group limestones and dolomites are the host to skarn mineralisation at Kara to the south of the licence and most other skarns in the district.

These basement rocks were deformed in the Middle Tabberrabberan Orogeny under a largely east-west compressive stress regime. This resulted in the development of north to north-northeast striking F2 folds superimposed on much broader east-west F1 folding.

Late in the orogeny the I-type Husetop Granite was emplaced passively and underlies most of the Rogetta Project tenements.

Skarn mineralisation was introduced into calcareous rocks by fluids derived from this granite with rarer vein style mineralisation also associated with this intrusive.

In the Tertiary topographic lows were filled by basal sediments followed by thick Tertiary basalt flows which spilled over onto more undulating topography as a thin veneer.

Within EL 25/2009 the basement rocks are obscured for ~90% of the surface area by Tertiary basalt. The exceptions to this are the Proterozoic rocks exposed in a north-south trending series of windows in the Guide River valley near the western boundary of the licence, and the granite outcropping along the eastern boundary of the licence.

## 2.0 Review of Previous Exploration Work on the Area of EL 25/2009

### 2.1 Exploration Prior to Current Tenement

The existence of deposits of magnetite and hematite iron in the northern part of Tasmania has been known since the late 19<sup>th</sup> century.

Modern exploration commenced in the late 1950's with regional geophysical surveys (Keunecke, 1959).

The Tasmanian Mines department assessed the deposit for its iron ore potential in the early 1960's carrying out a ground magnetic survey followed by the drilling 5 (effectively 4 as hole 2B was drilled immediately adjacent to hole 2 in order to resample the upper 13.1m of hole 2 which had been lost) diamond drill holes for 126.8m at the Highclere Prospect in 1964 (Jack, 1965). The drill holes intersected nodules and lenses of hematite-magnetite mineralisation hosted in limonitic/goethitic clays. The Mines Department holes did not appear to extend to the granite basement.

**Table 2.1: Better iron assays from Mines Department holes.**

Hole_ID	From (m)	To (m)	Interval (m)	Fe %
H1	1.8	28.3	26.5	40.71
H2	13.1	26.5	13.4	62.22
H2B	0	13.1	13.1	53.3
H3	0	27.7	27.7	43.48
including	12	23.15	11.15	52.78
H4	0	21.2	21.2	43.14

Iron assays from the Mines Department holes were encouraging however the recoveries were poor suggesting some of the clay may have washed away, biasing the iron analyses.

The area of EL 25/2009 "Highclere" was further explored for its Sn and WO<sub>3</sub> potential by ANZECO in the 1970's (Brandt, 1973, 1974), Comalco in the late 1970's (Askins, 1978 and 1980) and Shell in the 1980's (Lawton, 1982). A focus of this work was the Highclere iron deposit.

ANZECO completed systematic grid based ground magnetics, and mapping surveys over the prospect and re-assayed the Mines Department core for Sn-WO<sub>3</sub> with only minor tungsten mineralisation observed (Brandt, 1974). Most of the drill core was re-logged as limonitic clay. A series of short auger holes were drilled (AH1 to AH25 and AH127 to AH133), most intersecting highly weathered granite with only 6 holes intersecting highly weathered calc-silicate skarn with minor hematite-magnetite mineralisation. The holes were assayed for WO<sub>3</sub> and Sn but not Fe. Minor localised Scheelite mineralisation was described at the prospect (Brandt, 1974).

They concluded that the deposit consists of small roof pendants of highly weathered calc-silicate skarn with minor magnetite mineralisation.

Comalco (Askins, 1978) assessed the potential of the northern part of the Highclere Iron deposit magnetic anomaly with ground based gravity, magnetics and IP. They also re-logged the Mines Department core noting the very low recoveries. They concluded that the discontinuous nature of the magnetic and chargeability - resistivity anomalies suggest there is very limited potential for significant mineralisation in the northern part of the Highclere Iron deposit.

Most of Comalco's work concentrated on Buckby's Prospect located several kilometres southwest of the Highclere Iron deposit. They completed a similar program of ground based magnetic, IP, soil sampling and geological mapping follow up by diamond drilling. The drill holes intersected a thick sequence of dolomitic limestone and calcareous sediments, variable metasomatised to diopside skarn

with minor magnetite and pyrrhotite skarn. All holes ended in granite basement. No significant Sn-WO3 or Fe mineralisation was observed.

Shell/Billiton re-assessed the magnetics of the district, targeting Kara style magnetite skarn mineralisation. They drilled several percussion holes into magnetic anomalies in basalt and one extra hole into the Highclere Iron deposit, HD1, for 102m. They concluded that the magnetic signature of the basalt cover obstructed the delineation of magnetite skarn and discontinued work in the district.

## 2.2 Exploration Work During Current Tenement

Forward Mining targeted the iron potential of the Highclere deposit drilling 4 diamond holes (H5 to H8) totalling 220.2m in early 2012. Better results from their drilling are shown below in table 2.

**Table 2.2: Better Intersections Forward Mining 2012 Drilling**

Hole_ID	From (m)	To (m)	Interval (m)	Fe %
H5	1.4	26	24.6	44.66
including	1.4	8	6.6	56.92
including	12	19	7	51.2
H6	1.5	67	65.5	36.6
H6	1.5	13	11.5	56.51
H6	13	16	3	0
H6	16	17	1	51.5
H6	17	28	11	0
H6	28	37.8	9.8	48.62
including	32	36.5	4.5	61.37
H6	37.8	42	4.2	0
H6	42	67	25	48.77
including	43.5	46	2.5	62.78
H7	1.5	3.6	2.1	59.78
H8	8.7	30	21.3	43.81

Lottah Mining Pty Ltd completed four diamond drill holes (DD14HC010 to DD14HC013) for 206.3m on the Highclere tenement in mid-2014. The drill holes intercepted deeply weathered skarn with varying thicknesses of magnetite and hematite and limonitic/goethitic clays.

**Table 2.3: Better Intersections Lottah Mining 2014 Drilling**

Hole_ID	From (m)	To (m)	Interval (m)	Fe %
DD14HC010	9	41	32	49.59
including	9	35	26	53.63
DD14HC011	1	50	49	46.94
including	1	21	20	62.59
including	33	40	7	56.49
DD14HC012	4	55	51	50.16
including	4	11	7	55.87
including	13	20	7	55.22
including	39	55	16	45.96
DD14HC013	15	50	35	35.9

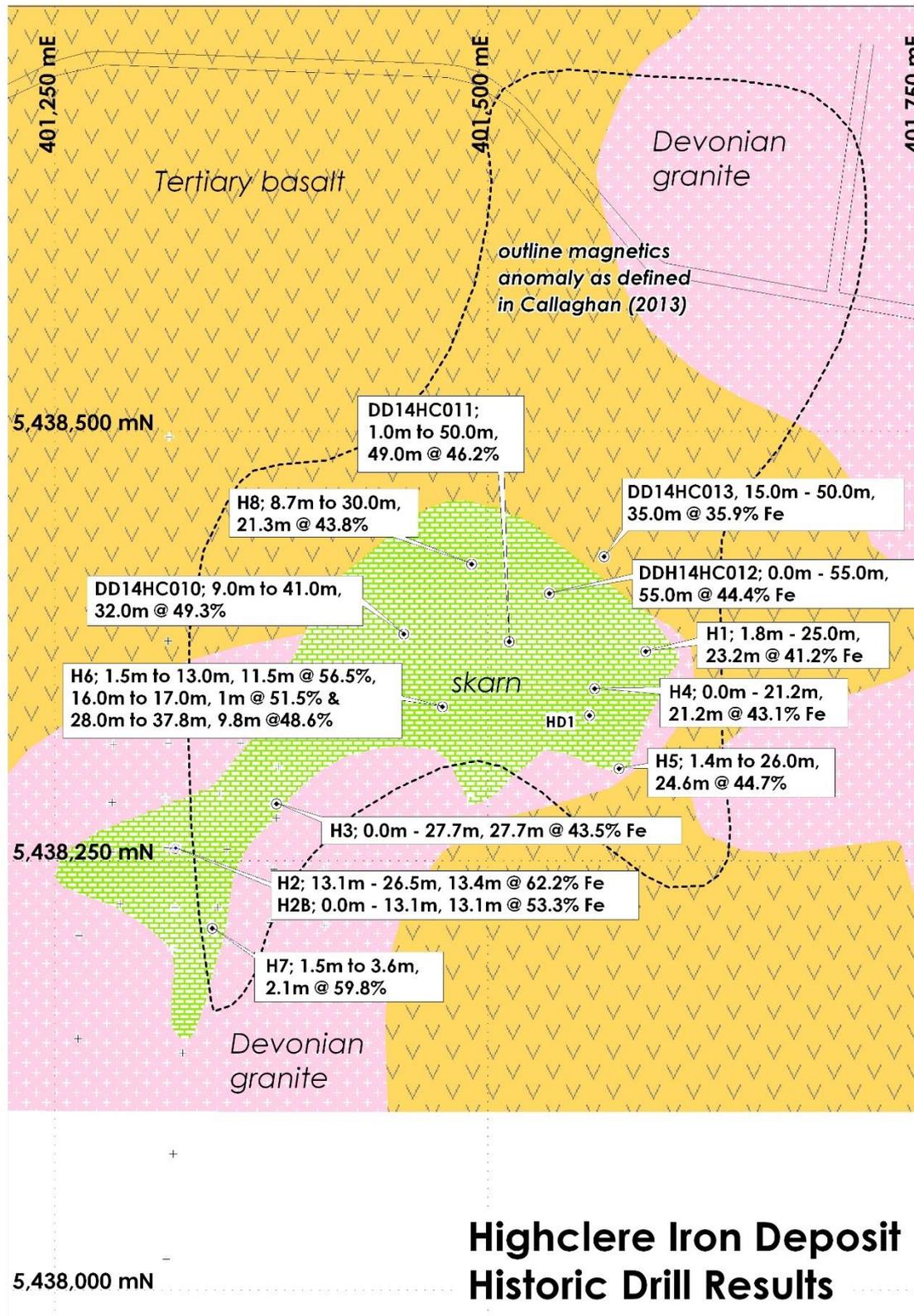


Figure 2.1. Map of Highclere drill holes with Fe intersection assays (+ = ANZECC auger holes).

In the 2016/2017 year exploration completed on EL25/2009 during the reporting period consisted of:

1. Compilation of all historic exploration data with a focus on the Highclere Deposit.
2. Commencement of the generation of a JORC compliant resource estimate for the Highclere Deposit.

### **3.0 Exploration Completed May 2017 to May 2018**

#### **3.1 Introduction**

Work on EL 25/2009 in the reporting year (see figure 3.1) has consisted of

- Data compilation
- Generation of a JORC (2012) resource for the Highclere deposit.
- Reconnaissance field mapping/sampling at Pet Road.
- Digitisation of 1978 Comalco ground magnetics data covering Pet Road and Buckby's Prospects.

#### **3.2 Data compilation**

A thorough approach to compiling historic exploration data and in particular drillhole data, has been implemented with drillhole collars accurately georeferenced and assay and lithological data also input in order to create a comprehensive drillhole database. That work commenced in 2016/17 and is ongoing.

#### **3.3 Highclere Resource Estimation**

An Inferred Resource was estimated for the Highclere deposit over the strike length of the deposit drilled to date i.e. south of 5,438,475mN.

Drill hole data was compiled into an ACCESS database and 3D geological wireframe models and a block model created in SURPAC.

The resource was estimated twice, firstly excluding non-iron mineralised skarn, secondly all skarn including calc-silicates. No bulk density data was available and so tonnages estimated are approximate with only volumes considered accurate. The lack of bulk density data is being rectified.

#### **3.4 Reconnaissance Field Mapping/Sampling at Pet Road Prospect**

Further reconnaissance mapping was undertaken in order to look for further magnetite mineralisation in the Pet Road area.

#### **3.5 1978 Comalco Magnetism Data Digitised**

Existing ground magnetism data from Comalco's 1978 (Askins, 1978) survey on its Kingsclere grid (covering the Kingsclere/Pet Road/Buckby's area) was digitised manually.

Data is presented on two plans showing magnetic data as readings along idealised grid lines. These plans were georeferenced and the magnetism and grid positions were input into a spreadsheet. The data was then gridded and images generated.

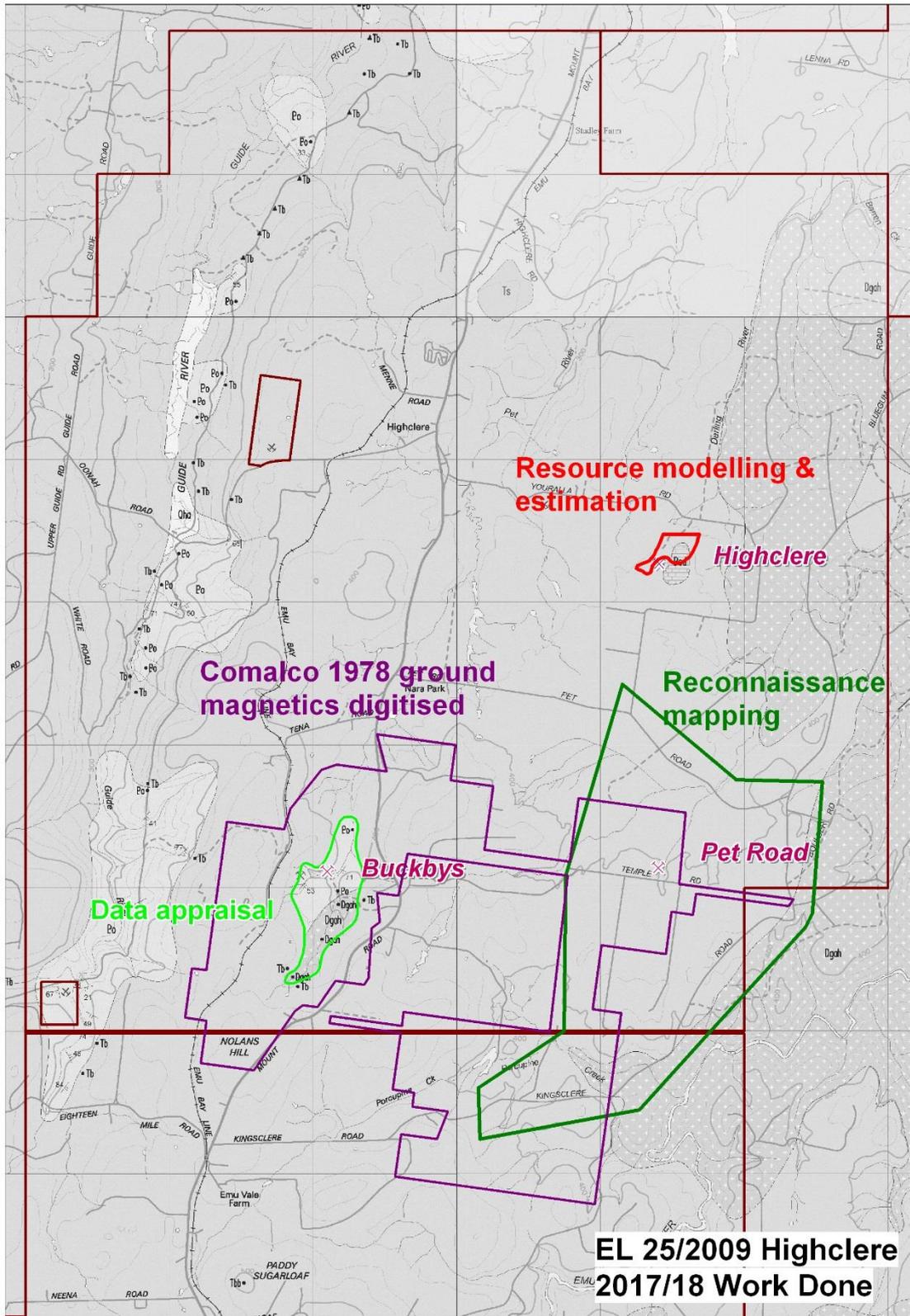


Figure 3.1: EL 25/2009 “Highclere” – work done in 2017/18 reporting year.

## **4.0 Discussion of Results**

### **4.1 Data compilation**

Data compilation is ongoing and largely in-house. An ACCESS database of all drill holes has been constructed and is in use. There is still the need for an audit before the database work is considered complete.

A number of the images generated from that work are included here as figures 4.1 to 4.3.

The gravity image (figure 4.1) clearly shows that magnetite skarn deposits occur on or near to the granite margin in almost all cases.

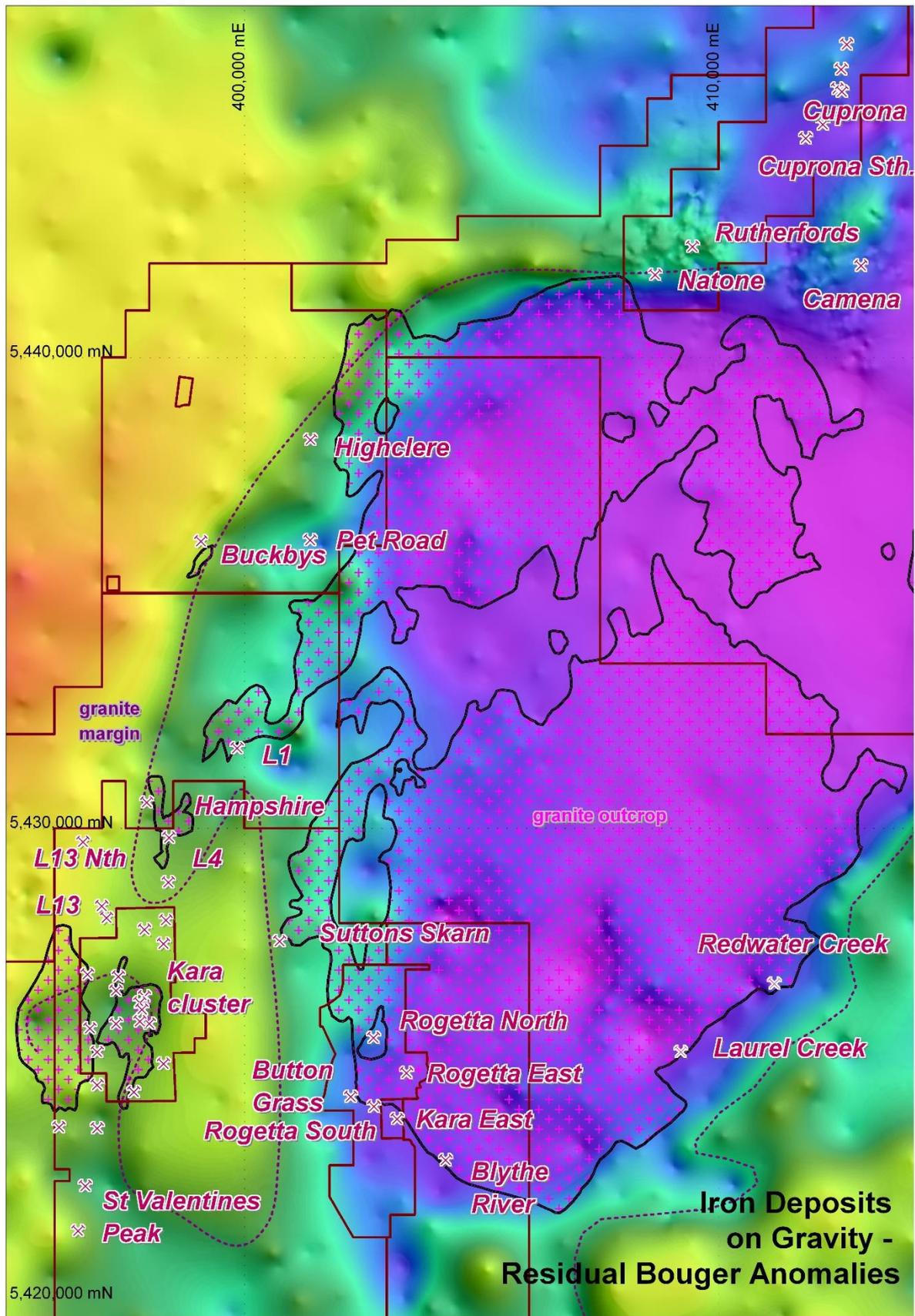


Figure 4.1: Regional gravity image showing iron deposits and tenements. EL 25/2009 is the tenement upper left containing the Highclere, Pet Road and Buckby's Prospects.

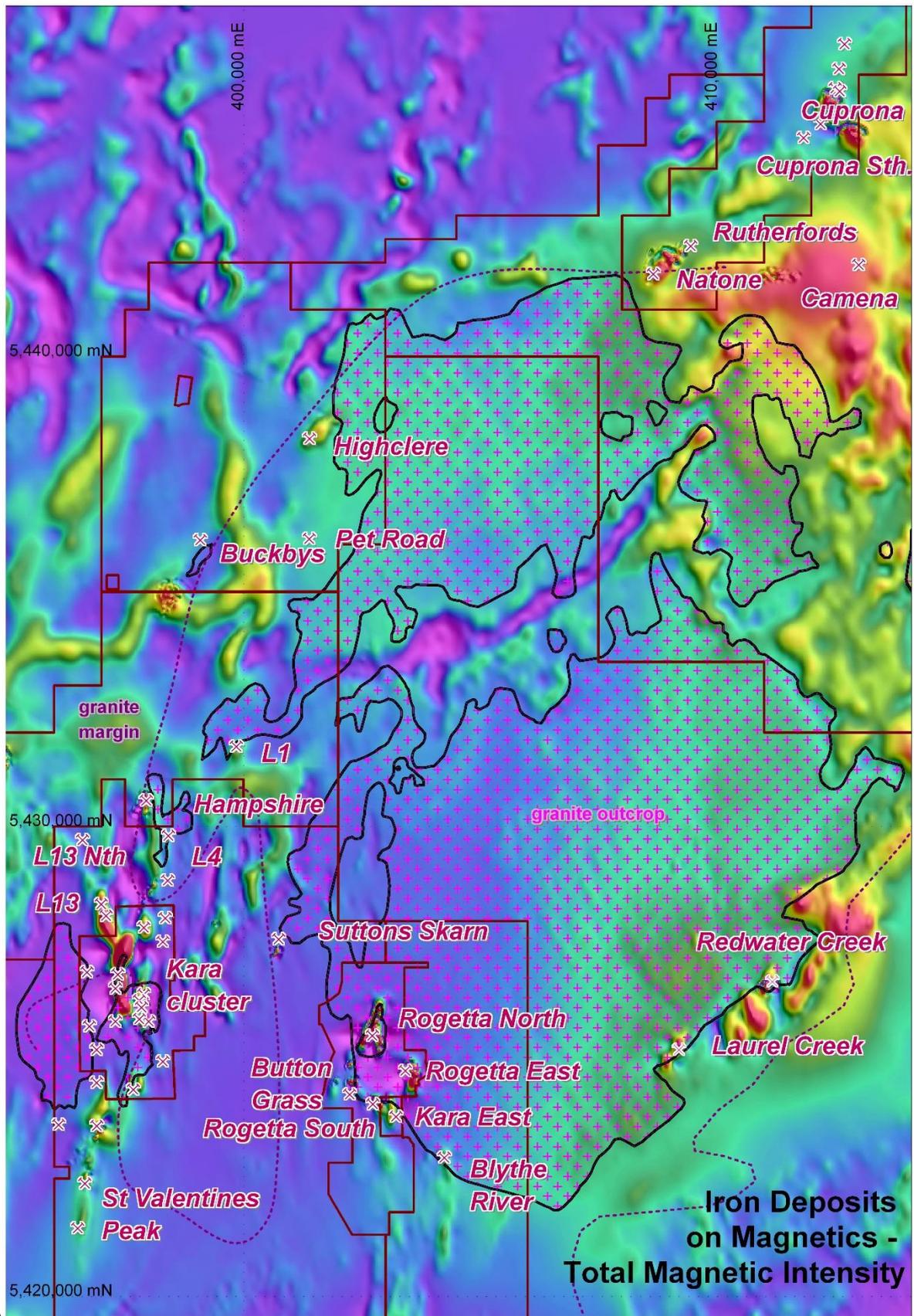


Figure 4.2: Regional total magnetic intensity image showing iron deposits and tenements. EL 25/2009 is the tenement upper left containing the Highclere, Pet Road and Buckby's Prospects.

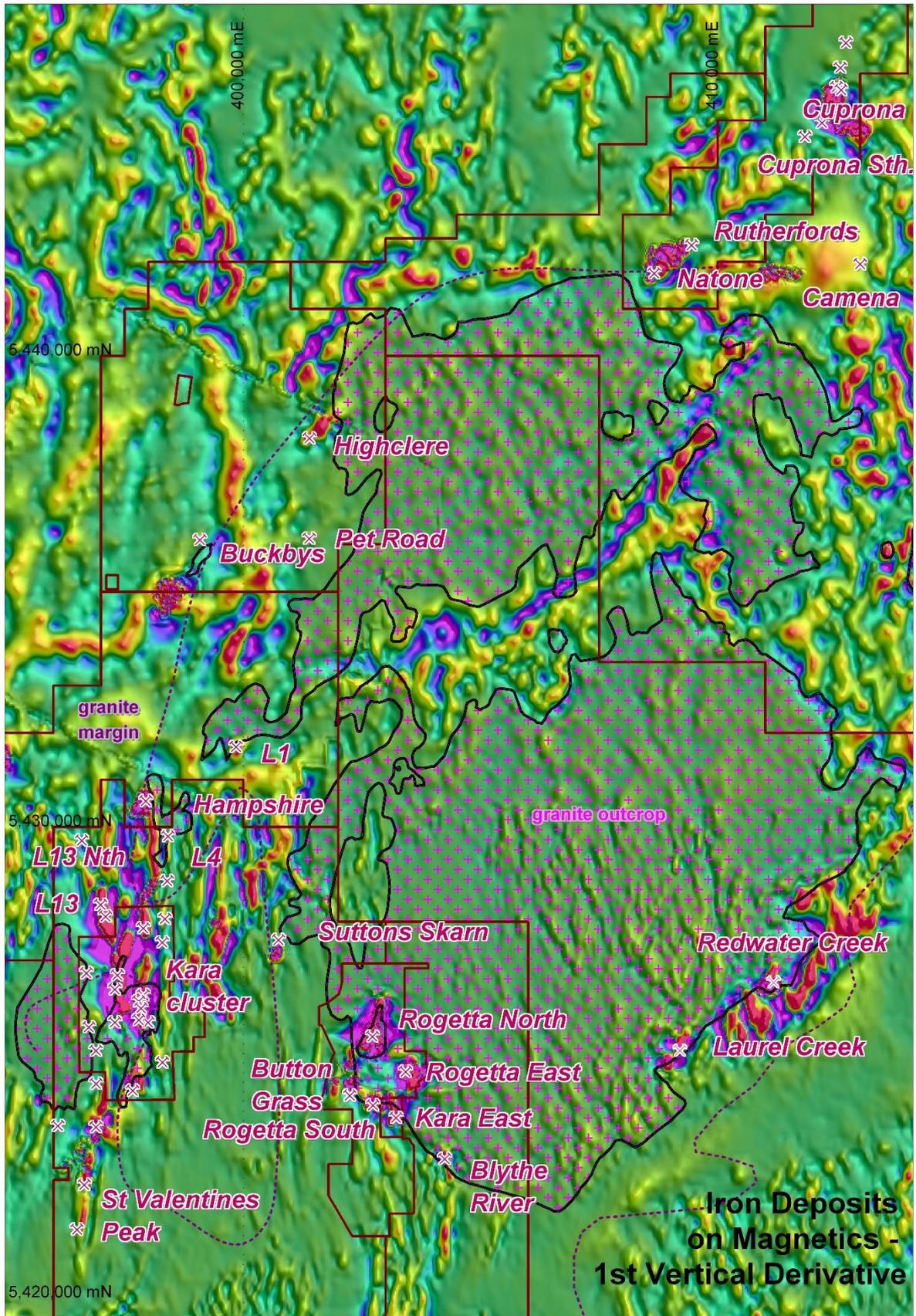


Figure 4.3: Regional 1<sup>st</sup> vertical derivative of magnetic intensity image showing iron deposits and tenements. EL 25/2009 is the tenement upper left containing the Highclere, Pet Road and Buckby's Prospects.

## 4.2 Highclere Resource Estimation

### 4.2.1 Introduction

A resource has been estimated for the Highclere hematite + magnetite + limonite iron deposit in Tasmania’s northwest. The resource is classified as Inferred based on major deficiencies with the data sets used in the estimation. In particular the lack of any bulk density measurements, for an orebody which contains a range of iron species from highly weathered clays to massive magnetite, makes tonnages only approximate being +/- 20%. For this reason the resource is considered preliminary and requires bulk density measurements in order to determine a more precise tonnage. Volumes have been cited in the resource as more precise measure.

### 4.2.2 Resource

**A total resource of 1,288,438m<sup>3</sup> equating to, at an approximated bulk density of 3.5t/m<sup>3</sup>, 4,510,000t @ 42.48% Fe has been estimated.**

The resource is defined by the nominal 30% Fe iron mineralisation envelope and excludes overlying and underlying low grade calc—silicate skarn intersections. It is only estimated to 5,438,475mN (MGA94). The resource consists of a mixture of highly weathered limonitic clayey material and massive magnetite+/-hematite.

Table 4.1: Tons and grade for model excluding non-iron mineralised skarn

Cut Off Grade Fe%	Volume (m3)	Tons	Fe %
0	1288438	4509531	42.48
25	1278906	4476172	42.63
30	1224844	4286953	43.3
35	1157781	4052234	43.95
40	889594	3113578	45.92
45	378063	1323219	50.41
50	152000	532000	55.22
55	87750	307125	57.45

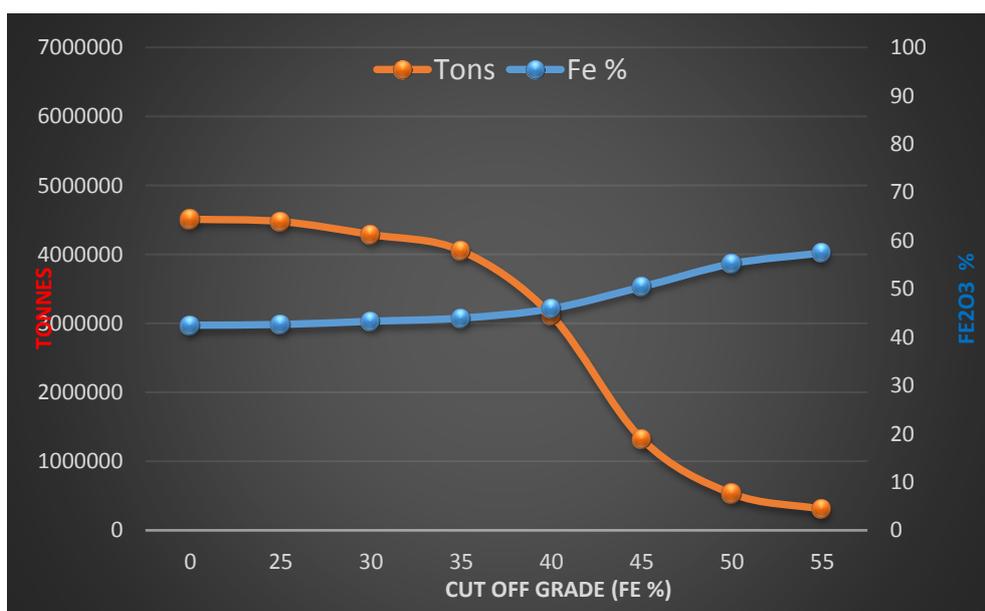
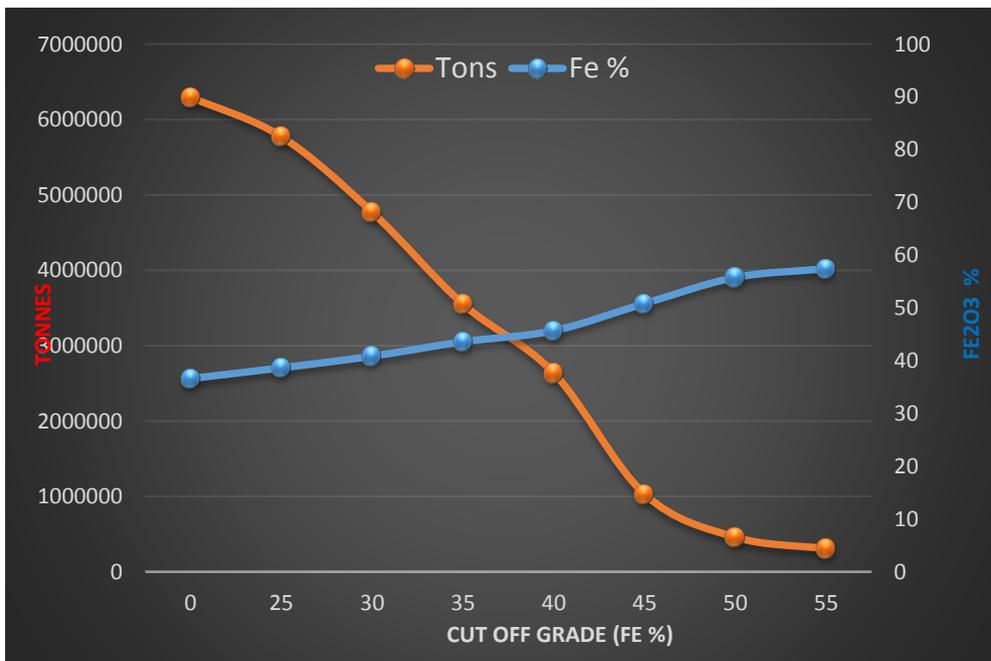


Figure 4.4: Tons and grade curve model excluding non-iron mineralised skarn

The resource was remodelled and re-estimated including all skarn i.e. overlying and underlying calc-silicate rocks, as a check. Similar volumes, tons and grade were calculated in this second estimation at the higher grades though overall the resource is lower grade though with larger volume/tonnage.

**Table 4.2: Tons and grade for model including non-iron mineralised skarn**

Cut Off Grade Fe%	Volume (m3)	Tons	Fe %
0	1799688	6298906	36.64
25	1649750	5774125	38.66
30	1363688	4772906	40.87
35	1015094	3552828	43.61
40	753531	2637359	45.71
45	294063	1029219	50.86
50	131344	459703	55.8
55	87313	305594	57.46



**Figure 4.5: Tons and grade curve model including non-iron mineralised skarn**

#### 4.2.3 Geology

The Highclere iron deposit is an at-surface body of mixed limonitic to goethitic clays, and massive to semi-massive magnetite and/or hematite, formed as skarn in a basin shaped roof pendant in underlying Devonian Housatop granite.

The basin trends northeasterly and apparently extends for 560m's, being drilled in the southwesternmost 350m's, and is up to 200m wide, narrowing to the southwest.

#### 4.2.4 Data

Date was taken from the following drill programmes:

- 1965 Tas. Mines Department, 4 (5) diamond drill holes H1, H2/2B, H3 and H4 for 126.8m, Fe assays and geology
- 1974 Anzeco, 32 auger holes AH1 to AH25 and AH127 to AH133, only geology, no Fe assays
- 1982 Shell, 1 percussion hole PDH1 for 102m, only geology, no Fe assays
- 2012 Forward Mining, 4 diamond drill holes H5, H6, H7 and H8 for 220.2m, Fe assays and geology
- 2014 Lottah Mining, 4 diamond drill holes, DD14HC010, DD14HC011, DD14HC012 and DD14HC013 for 206.3, Fe assays and geology

10m contour topographical data was taken from the Tasmanian Governments theLIST database online.

#### 4.2.5 Resource Modelling

The resource was modelled using SURPAC's block modelling function.

A block model was created with blocks 20m in the X direction, 20m in the Y direction and 5m in the Z direction was created. Sub-blocking to 5mX x 5mY x 1.25mZ was permitted.

The same block model was used for both estimations.

Estimation was by Inverse Distance Squared with three passes;

- pass 1 200m spherical search ellipse, minimum 1 sample, maximum 40
- pass 2 200m spherical search ellipse, minimum 3 samples, maximum 40
- pass 3 100m spherical search ellipse, minimum 10 samples, maximum 40

8 discretisation points per block with points spaced 3X x 3Y x 2Z.

#### 4.2.6 Potential to Add to Resource

The resource was only modelled south of 5,438,475mN (MGA94) where there has been drilling. North of here the resource remains open for ~150m before granite outcrops.

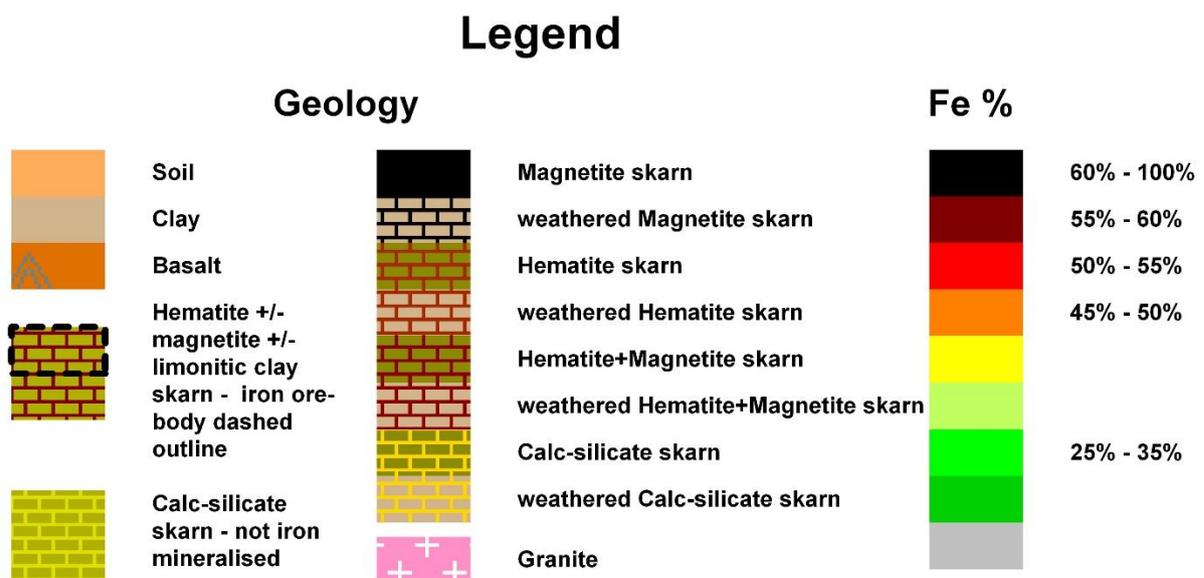


Figure 4.6: Legend for figures 4.7 to 4.14.

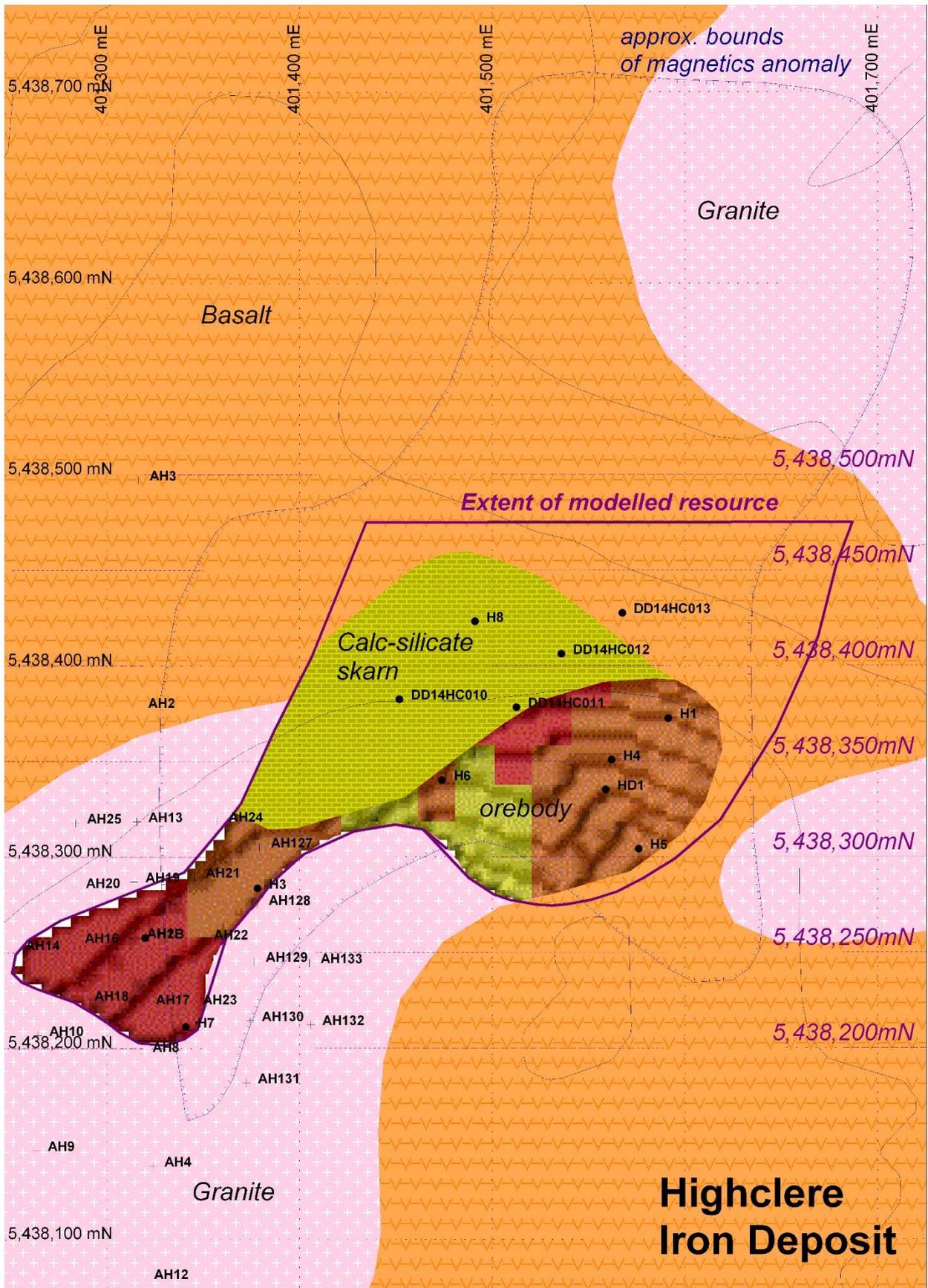


Figure 4.7: Plan view of Highclere resource showing resource block model (grades as per figure 4.6) and drill hole collars.

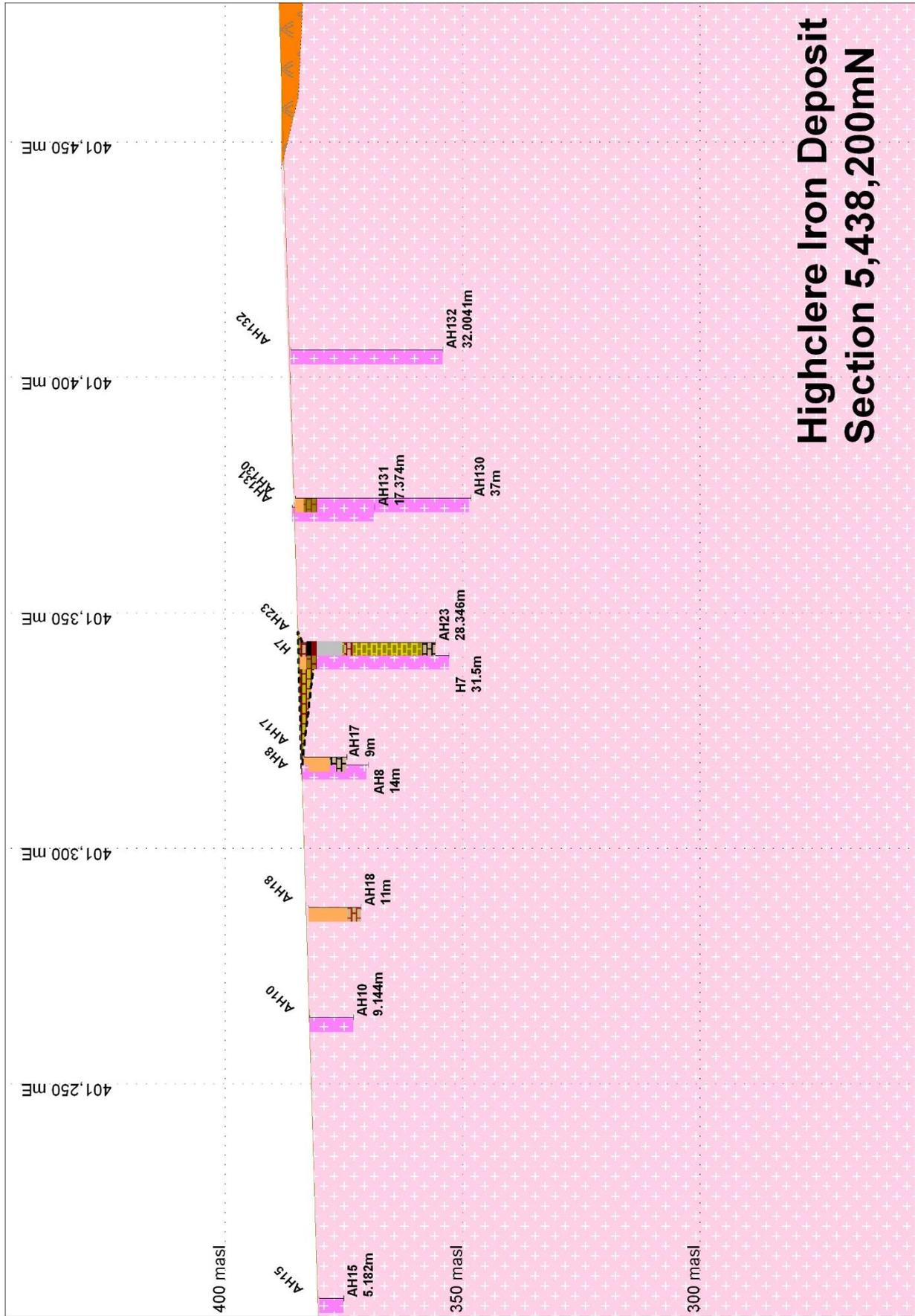


Figure 4.8: Highclere drill section 5,438,200mN.

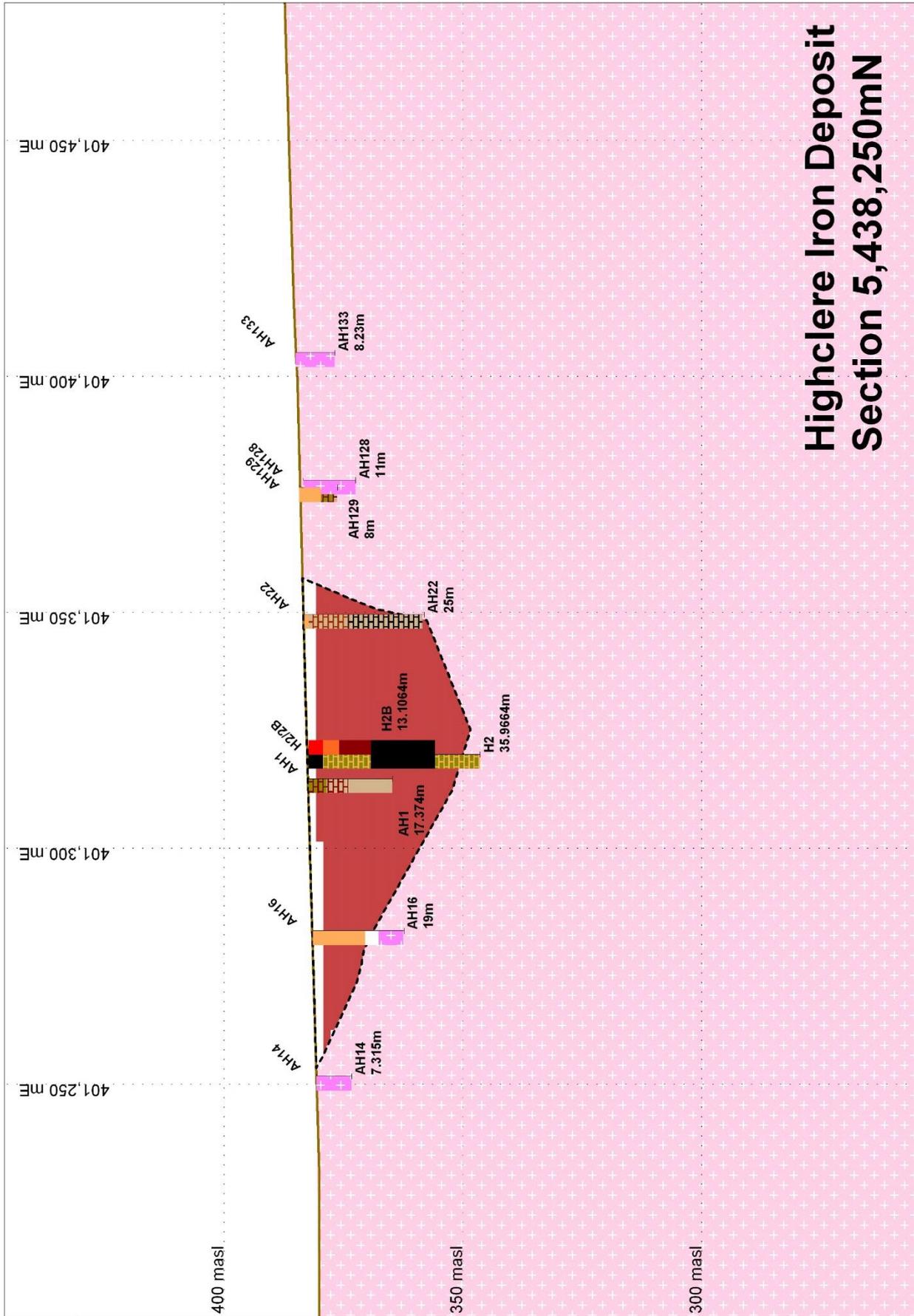


Figure 4.9: Highclere drill section 5,438,250mN.

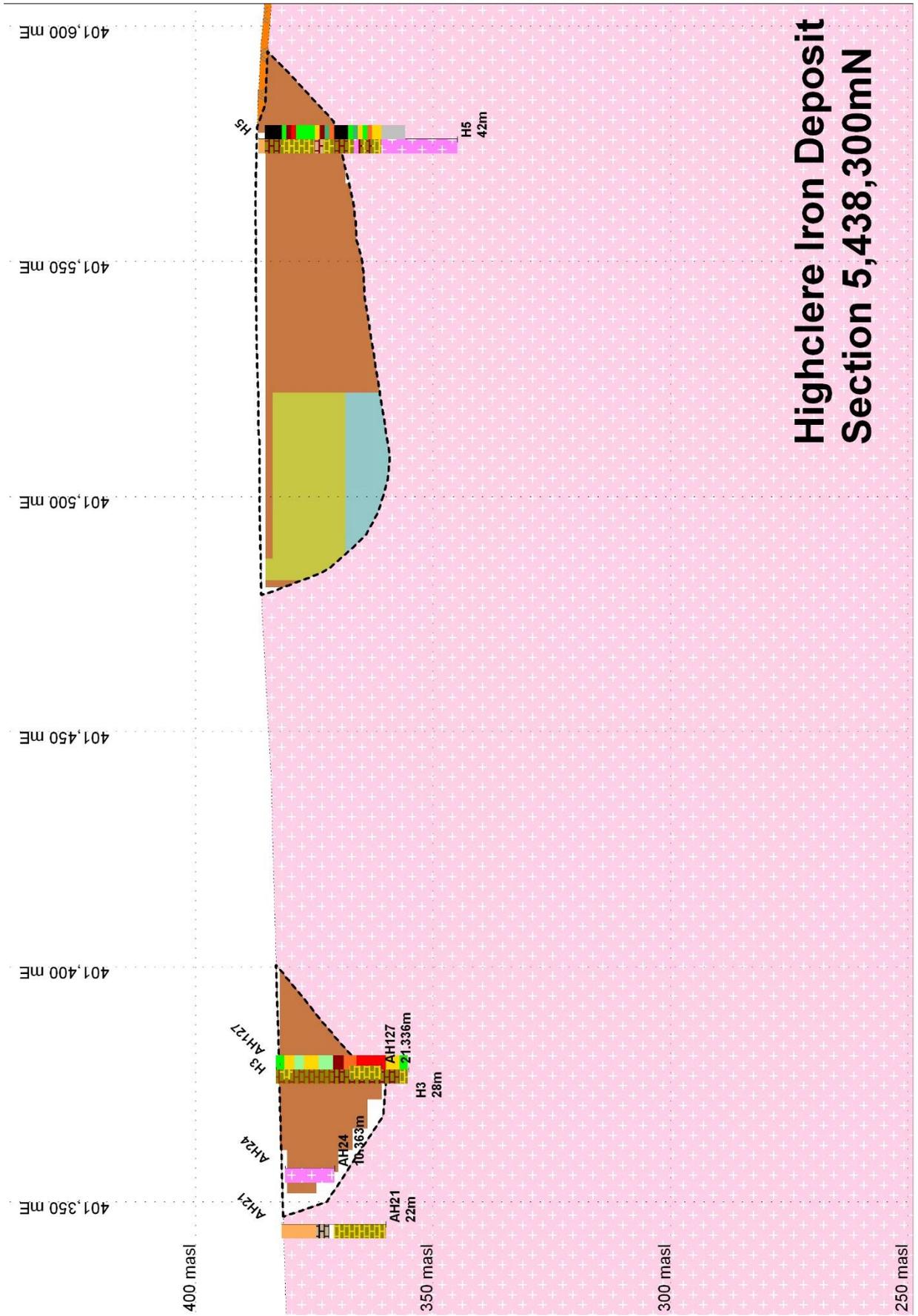
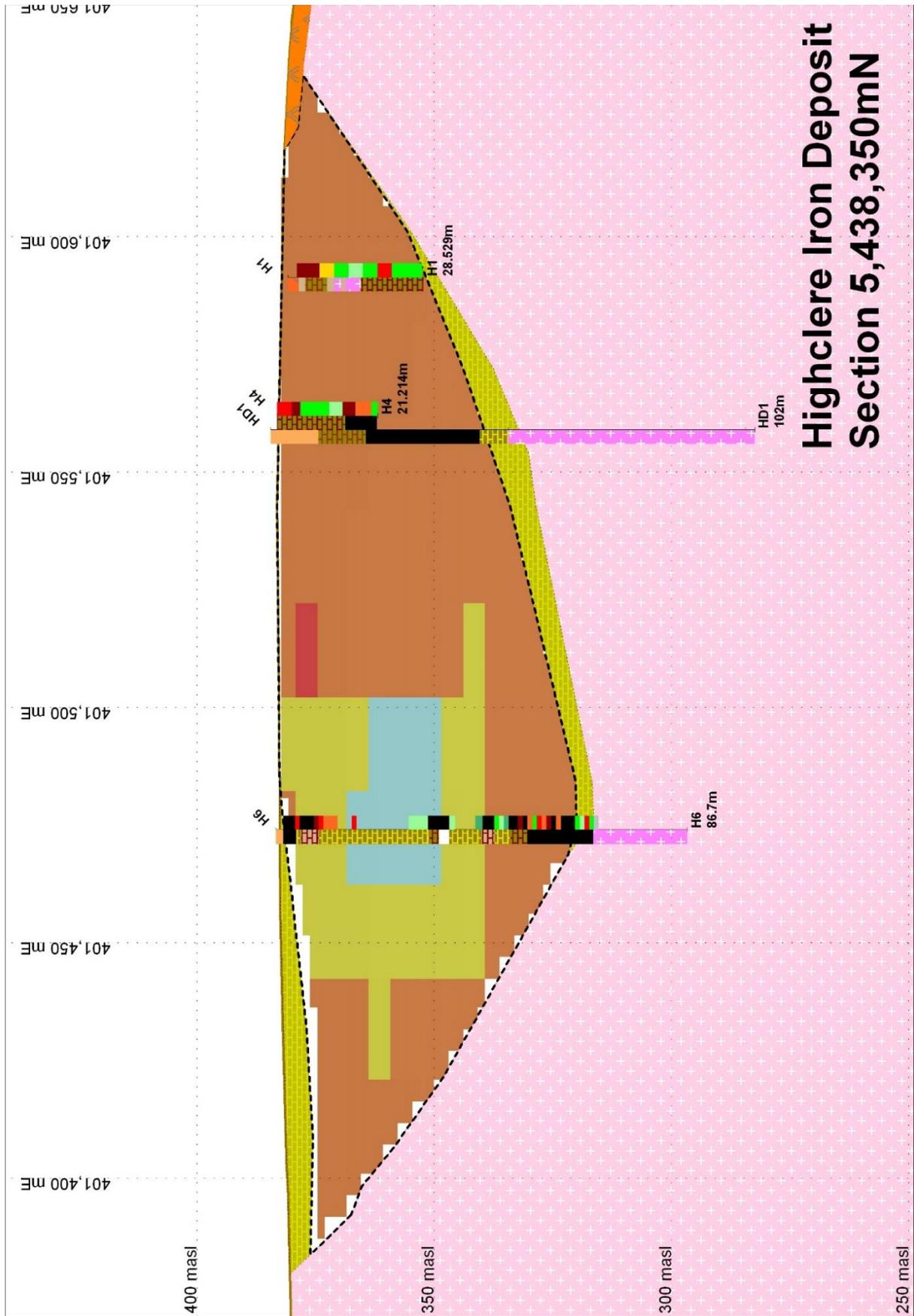
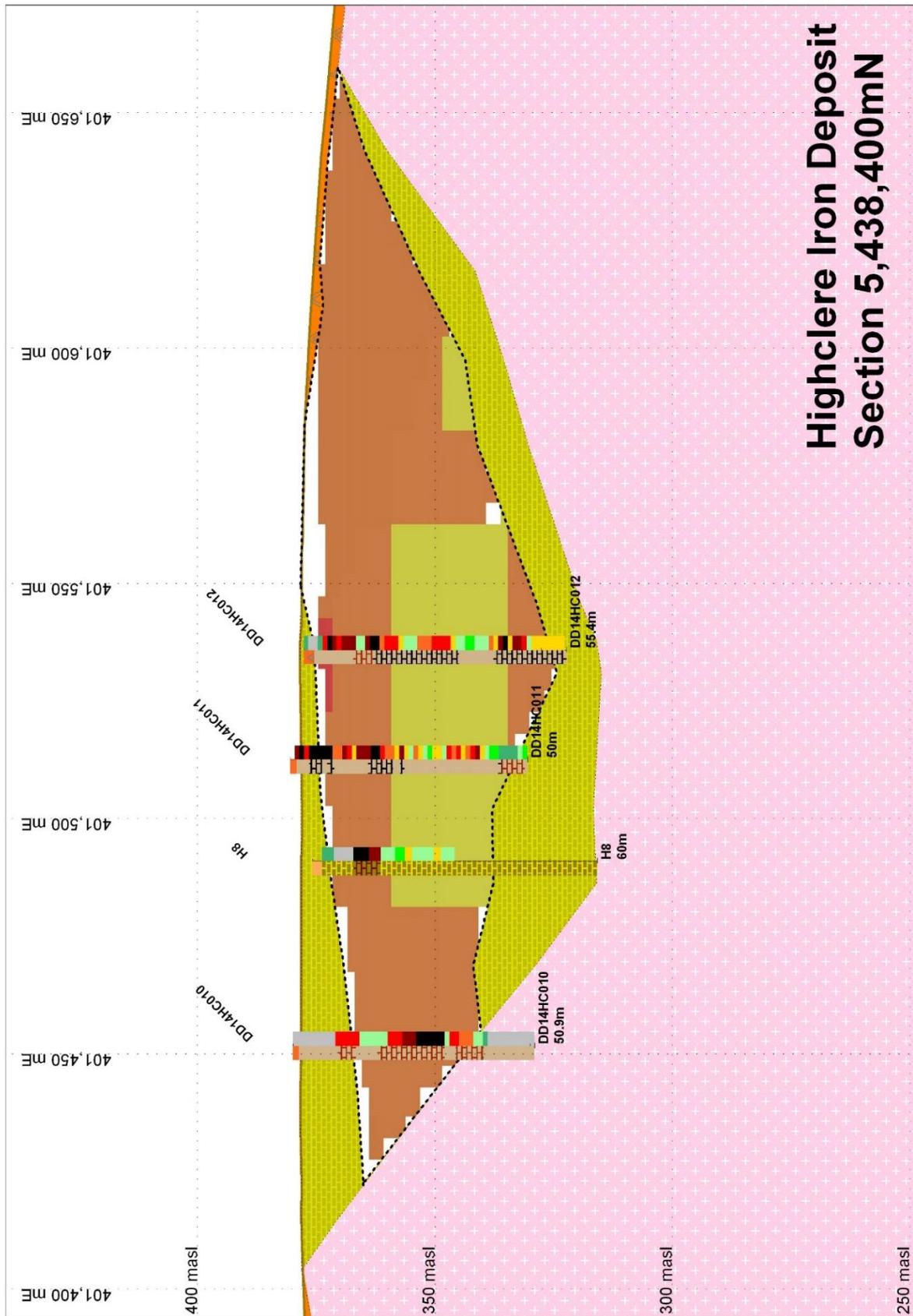


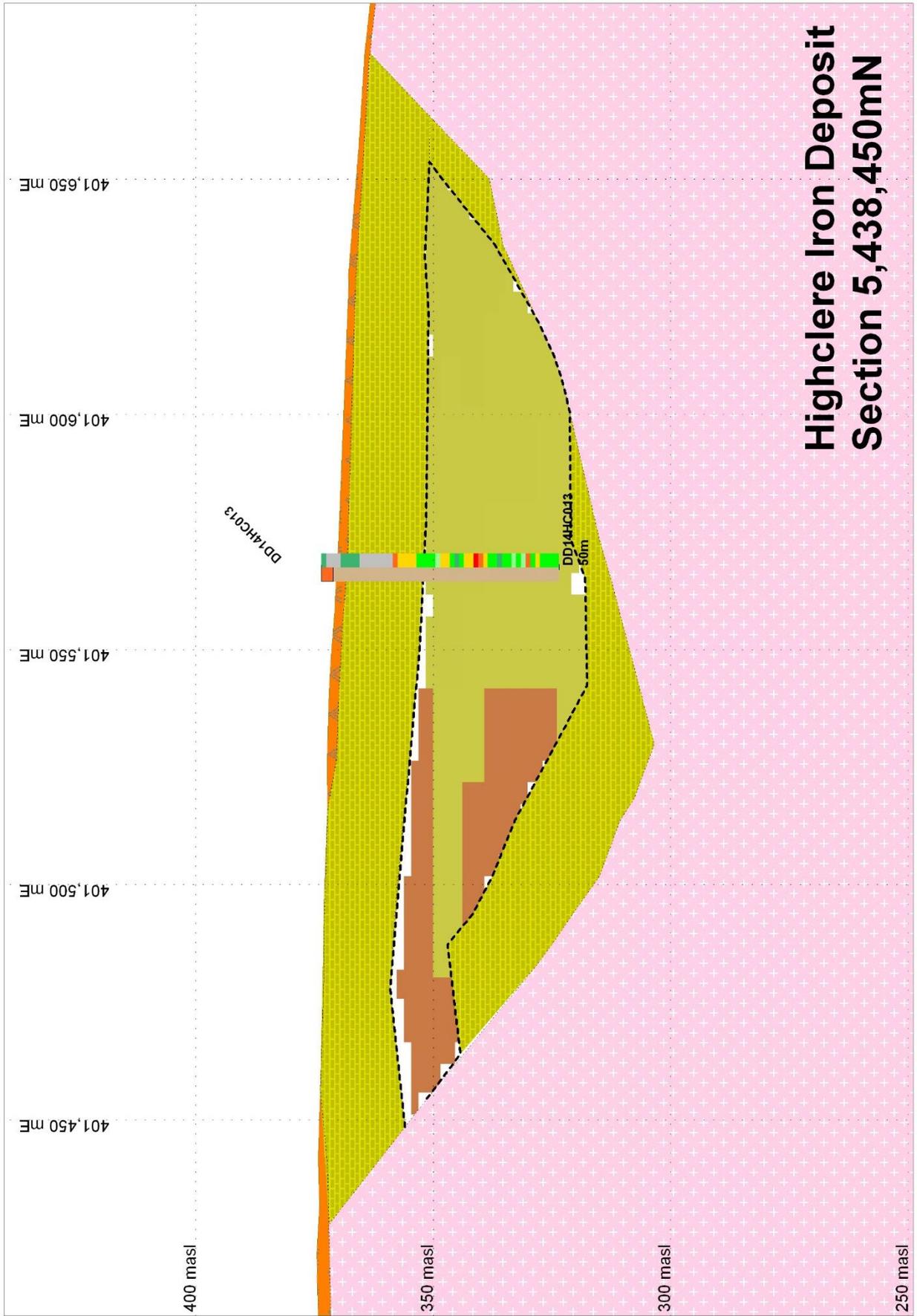
Figure 4.10: Highclere drill section 5,438,300mN.



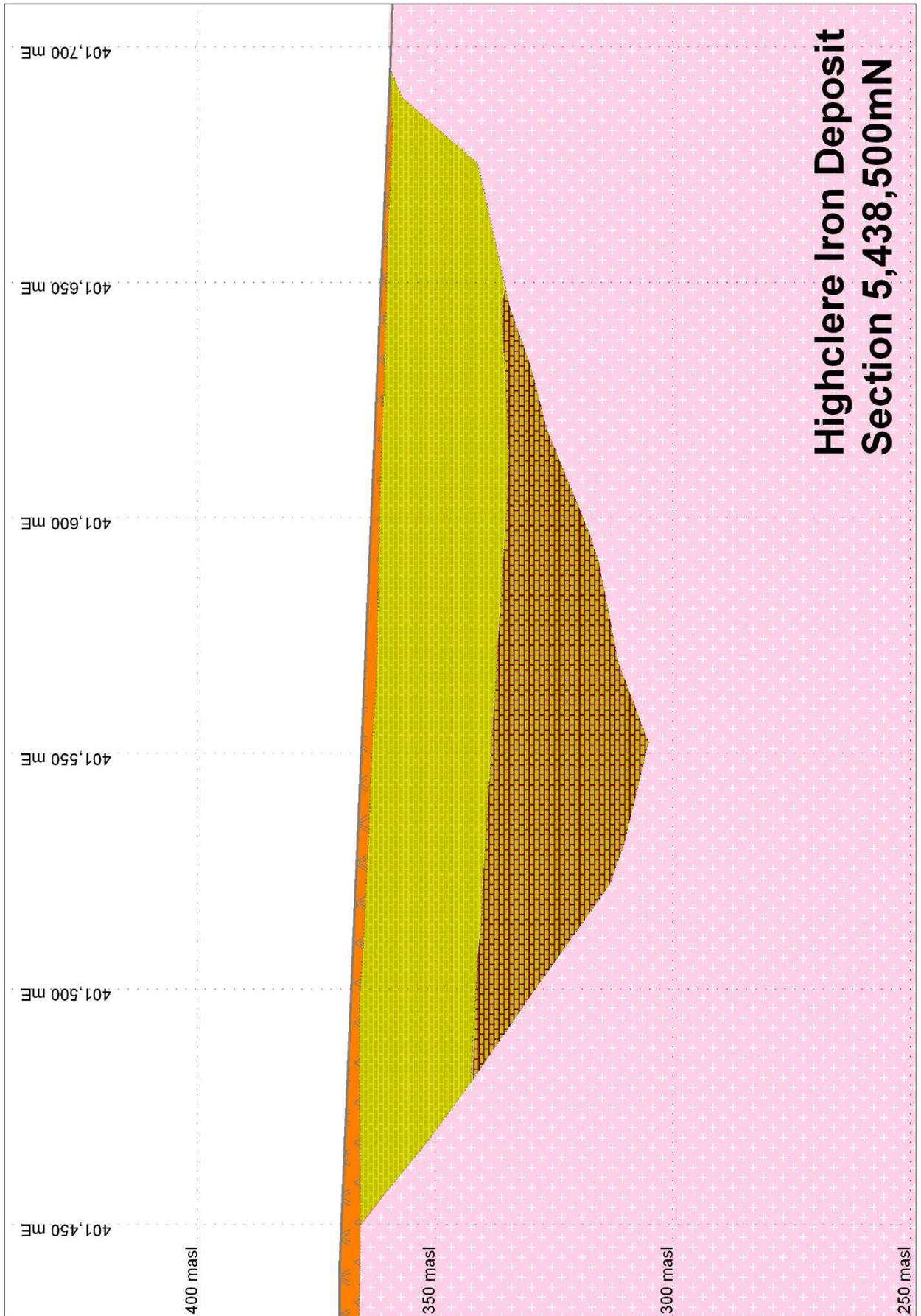
**Figure 4.11: Highclere drill section 5,438,350mN. Note unassayed skarn in H8 from was assigned a 0% Fe assay.**



**Figure 4.12: Highclere drill section 5,438,400mN. Note unassayed skarn in H8 from was assigned a 0% Fe assay.**



**Figure 4.13: Highclere drill section 5,438,450mN.**



**Figure 4.14: Highclere drill section 5,438,500mN.**

### **4.3 Reconnaissance Field Mapping/Sampling at Pet Road Prospect**

Further field reconnaissance (looking) for magnetite was undertaken in the Pet Road/Temple Road/Kingsclere Road area. No further magnetite was located though the searching was not exhaustive and was carried out before existing magnetics data was digitised and images generated.

### **4.4 1978 Comalco Magnetics Data Digitised**

The Comalco ground magnetics data was digitised and images generated.

The data is presented on two sheets in Askins (1978) on an idealized grid drafted onto a graph background. The actual grid as surveyed on the ground is shown separately on figure TAS-78-216 in Askins (1978) and indicates that wing lines varied in direction by some degrees. Further, errors apparent in georeferencing introduce further inaccuracies.

The digitised data points are shown as crosses on figure 4.15 superimposed on TAS-78-216. They approximate the grid reasonably well at this scale. Positioning of anomalies precisely will require the data points to be more accurately georeferenced or alternatively a new drone magnetics survey flown.

However, the data positioning is of sufficient quality at a larger scale and concurs with the regional aeromagnetic images when superimposed (see figure 4.17).

An inverse distance squared image generated is shown on figure 4.16 and superimposed on the regional 1VD image in figure 4.17.

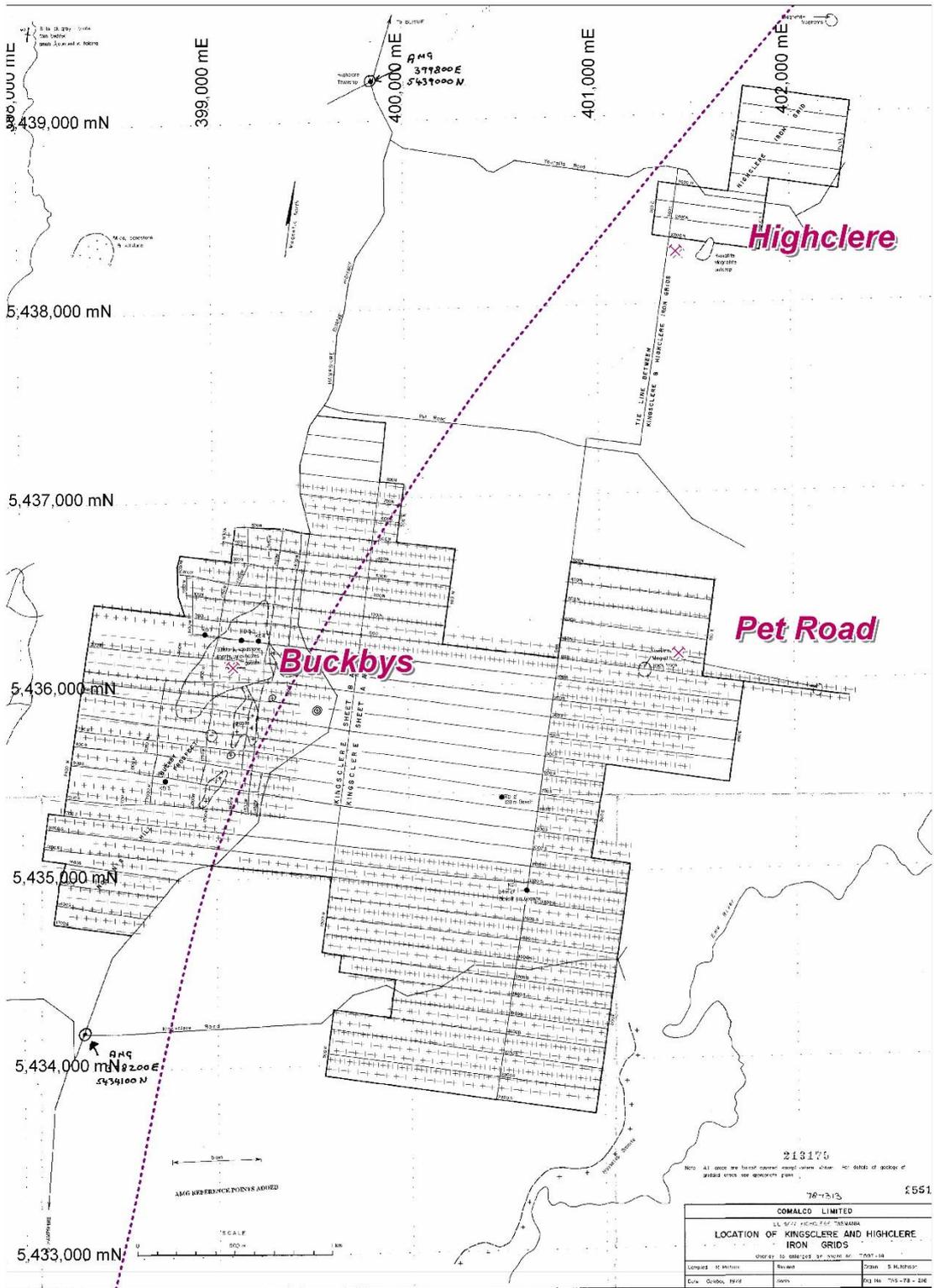
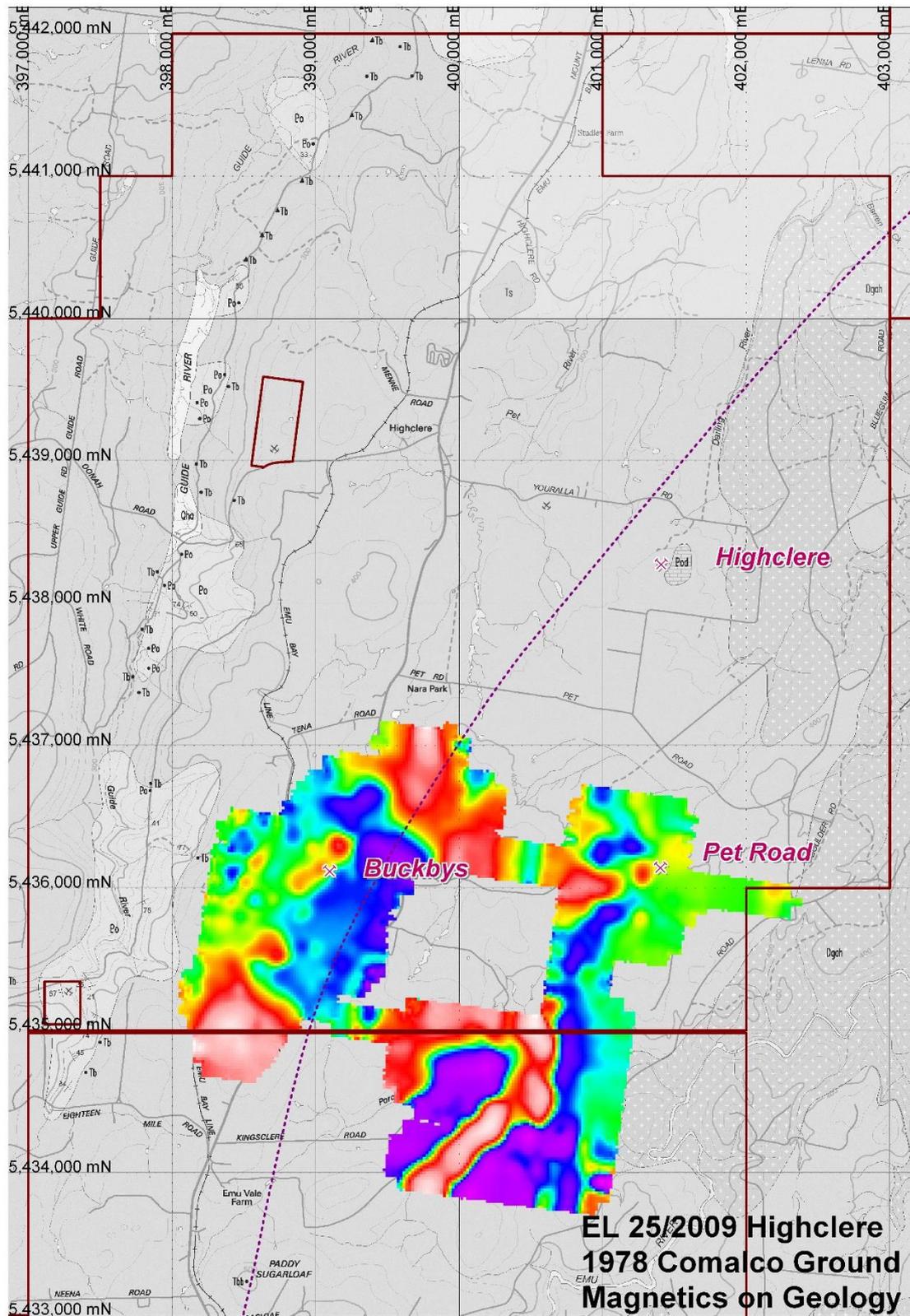
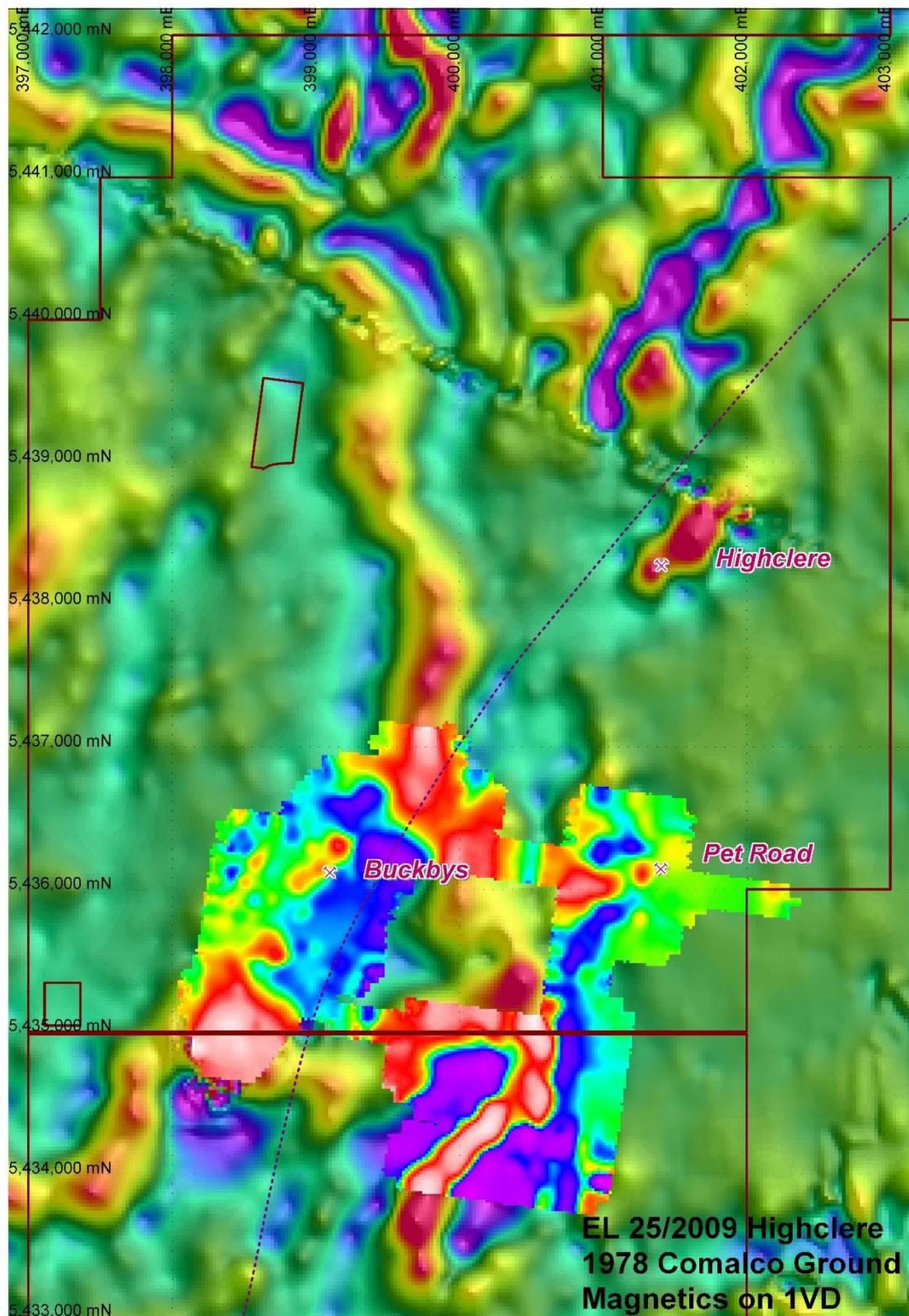


Figure 4.15: Digitised 1978 Comalco ground magnetics data points (small crosses) shown superimposed on georeferenced plan TAS-78-216 of historical grid from Askins (1978).



**Figure 4.16:** Image generated from digitised Comalco ground magnetics data superimposed on 1:25,000 geology. Image is generated by inverse distance approximation.



**Figure 4.17:** Image generated from digitised Comalco ground magnetism data superimposed on 1VD aeromagnetic image. Image is generated by inverse distance approximation.

## **5.0 Conclusions**

### **5.1 Highclere Deposit**

The resource modelled and estimated is highly deficient due to the lack of bulk density data. This needs to be rectified and the resource remodelled using this new data. Given the range in styles of iron mineralisation present as large a number of readings as possible should be taken and the bulk density data should be estimated into the block model rather than using a mean value.

The estimation work has also revealed deficiencies in the geological logging and all available core should be relogged.

Further drilling is justified in the part of the deposit (as defined by magnetics) north of 5,438,475mN.

### **5.2 Pet Road Prospect**

The Pet Road prospect consists of outcropping magnetite with no drilling to date. The digitised magnetics data suggests the occurrence may be small but it appears to be on surface and would be a low cost resource to mine.

Further work is warranted on this prospect with the drone magnetics ideally completed before a small drilling programme.

### **5.3 Buckby's Prospect**

Buckby's Prospect bears many similarities to the Natone skarn prospect to the east. The extent of magnetite mineralisation here is unclear and warrants further work to aid in delineating its potential before drilling is recommended.

## **6.0 Proposed Work**

### **6.1 Highclere deposit**

Further work will be carried out on the Highclere resource towards the end of either applying for a mine lease or a retention licence during the coming year. In particular the following work is needed:

1. The Highclere resource is deficient due to the lack of bulk density data. Bulk density measurements will be made on existing drill core held by Lottah Mining and the resource re-estimated using this new data.
2. Existing available core will be relogged where possible
3. Consideration will be given to the metallurgical aspects of the Highclere resource. In particular proportions of magnetically separable magnetite will be quantified. Testwork on rock sorting technology and methodologies to separate hematite and clays etc. will be tested.
4. The resource is open north of 5,438,475mN. Consideration will be given to further drilling to extend the Highclere resource. At this stage a small programme of 4 – 6 holes for 200 – 350m is proposed

### **6.2 Pet Road area**

The Pet Road area warrants further attention. In particular the following work is needed:

1. In spite of the successful digitisation of the 1978 Comalco data a precisely located new generation drone magnetics survey is still warranted over the Pet Road area.
2. Regardless of results a small drilling programme is warranted over the known magnetite outcrop at the least. A small programme of 2 – 3 holes for 50 – 100m is proposed.

### **6.3 Buckby's Prospect**

Ongoing modelling and assessment of the Buckby's prospect is warranted and will be completed in the coming year.

## **7.0 Environmental Management**

There are no outstanding environmental issues from previous work. None of the work carried out in the 2017/18 reporting year has had any environmental impact.

## 8.0 Expenditure

	\$
Geology	7,500
Geochemistry	0
Geophysics	2,000
Remote Sensing	0
Drilling	0
Gridding	0
Land Access	0
Rehabilitation	0
Feasibility Studies	8,000
Other	0
<u>Administration</u>	<u>1,750</u>
Total	19,250

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## **Appendix A: Lottah Mining Pty Ltd - Highclere Iron Deposit Resource Estimation**

**Lottah Mining Pty Ltd  
Highclere Iron Deposit  
Resource Estimation**

**Grant MacDonald**

**May 2018**

**Disclaimer**

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## Abstract

### Resource

A resource has been estimated for the Highclere hematite + magnetite + limonite iron deposit in Tasmania's northwest. The resource is classified as Inferred based on deficiencies with the data sets used in the estimation, in particular the lack of any bulk density measurements, for an orebody which contains a range of iron species from highly weathered clays to massive magnetite, makes tonnages only approximate being +/- 20%. For this reason the resource is considered preliminary and requires bulk density measurements in order to determine a more precise tonnage. Volumes have been cited in the resource as more precise measure.

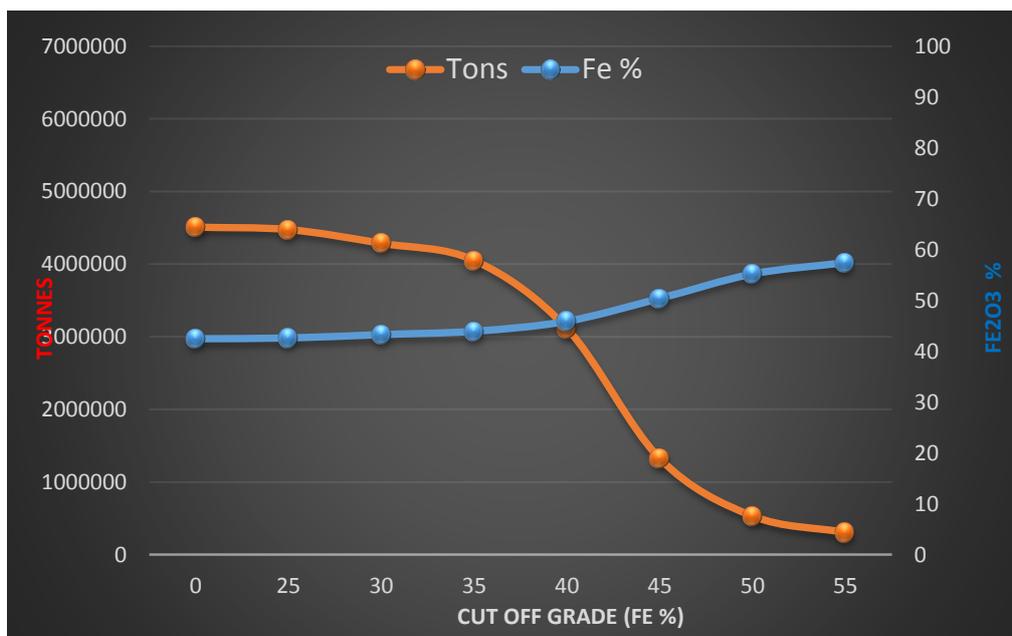
**A total resource of 1,288,438m<sup>3</sup> equating to, at an approximated bulk density of 3.5t/m<sup>3</sup>, 4,510,000t @ 42.48% Fe has been estimated.**

The resource is defined by the nominal 30% Fe iron mineralisation envelope and excludes overlying and underlying low grade calc—silicate skarn intersections. It is only estimated to 5,438,475mN (MGA94). The resource consists of a mixture of highly weathered limonitic clayey material and massive magnetite+/-hematite.

### Tons and grade for model excluding non-iron mineralised skarn

Cut Off Grade Fe%	Volume (m3)	Tons	Fe %
0	1288438	4509531	42.48
25	1278906	4476172	42.63
30	1224844	4286953	43.3
35	1157781	4052234	43.95
40	889594	3113578	45.92
45	378063	1323219	50.41
50	152000	532000	55.22
55	87750	307125	57.45

### Tons and grade curve model excluding non-iron mineralised skarn

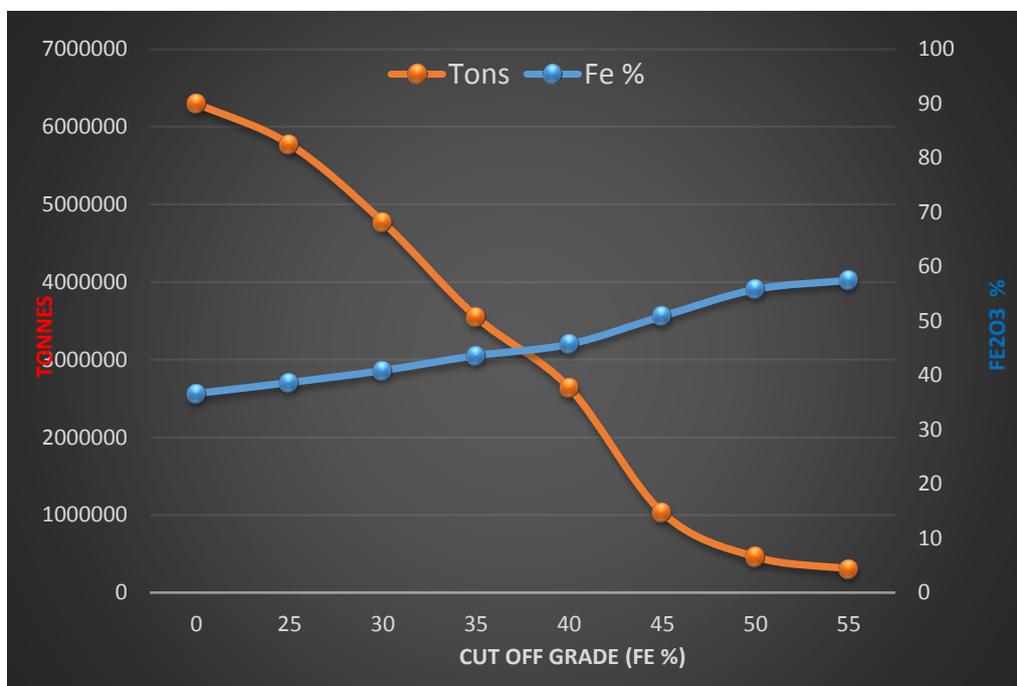


The resource was remodelled and re-estimated including all skarn i.e. overlying and underlying calc-silicate rocks, as a check. Similar volumes, tons and grade were in this second estimation at the higher grades though overall the resource is lower grade though larger volume/tonnage.

**Tons and grade for model including non-iron mineralised skarn**

Cut Off Grade Fe%	Volume (m3)	Tons	Fe %
0	1799688	6298906	36.64
25	1649750	5774125	38.66
30	1363688	4772906	40.87
35	1015094	3552828	43.61
40	753531	2637359	45.71
45	294063	1029219	50.86
50	131344	459703	55.8
55	87313	305594	57.46

**Tons and grade curve model including non-iron mineralised skarn.**



**Geology**

The Highclere iron deposit is an at-surface body of mixed limonitic to goethitic clays, and massive to semi-massive magnetite and/or hematite, formed as skarn in a basin shaped roof pendant in underlying Devonian Housatop granite.

The basin trends northeasterly and apparently extends for 560m's, being drilled in the southwesternmost 350m's, and is up to 200m wide, narrowing to the southwest.

**Data**

Date was taken from the following drill programmes:

- 1965 Tas. Mines Department, 4 (5) diamond drill holes H1, H2/2B, H3 and H4 for 126.8m, Fe assays and geology

- 1974 Anzeco, 32 auger holes AH1 to AH25 and AH127 to AH133, only geology, no Fe assays
- 1982 Shell, 1 percussion hole PDH1 for 102m, only geology, no Fe assays
- 2012 Forward Mining, 4 diamond drill holes H5, H6, H7 and H8 for 220.2m, Fe assays and geology
- 2014 Lottah Mining, 4 diamond drill holes, DD14HC010, DD14HC011, DD14HC012 and DD14HC013 for 206.3, Fe assays and geology

10m contour topographical data was taken from the Tasmanian Governments theLIST database online.

### **Resource Modelling**

The resource was modelled using SURPAC's block modelling function.

A block model was created with blocks 20m in the X direction, 20m in the Y direction and 5m in the Z direction was created. Sub-blocking to 5mX x 5mY x 1.25mZ was permitted.

The same block model was used for both estimations.

Estimation was by Inverse Distance Squared with three passes;

- pass 1 200m spherical search ellipse, minimum 1 sample, maximum 40
- pass 2 200m spherical search ellipse, minimum 3 samples, maximum 40
- pass 3 100m spherical search ellipse, minimum 10 samples, maximum 40

8 discretisation points per block with points spaced 3X x 3Y x 2Z.

### ***Potential to Add to Resource***

The resource was only modelled south of 5,438,475mN (MGA94) where there has been drilling. North of here the resource remains open for ~150m before granite outcrops.

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## **1.0 Introduction**

This report details the estimation of a JORC resource for that portion of the Highclere iron deposit.

The Highclere iron deposit lies approximately 17 kilometres inland from Burnie and 1.5 kilometres to the immediate east of the Emu Bay Railway and Murchison Highway.

The deposit lies wholly on tenement EL 25/2009 "Highclere" held by Blythe River Iron Pty Ltd, a subsidiary of Lottah Mining Pty Ltd who manage work on the tenement.

The land on which the deposit both outcrops and beneath which it underlies is privately owned by Mr Boland, and utilised for farming.

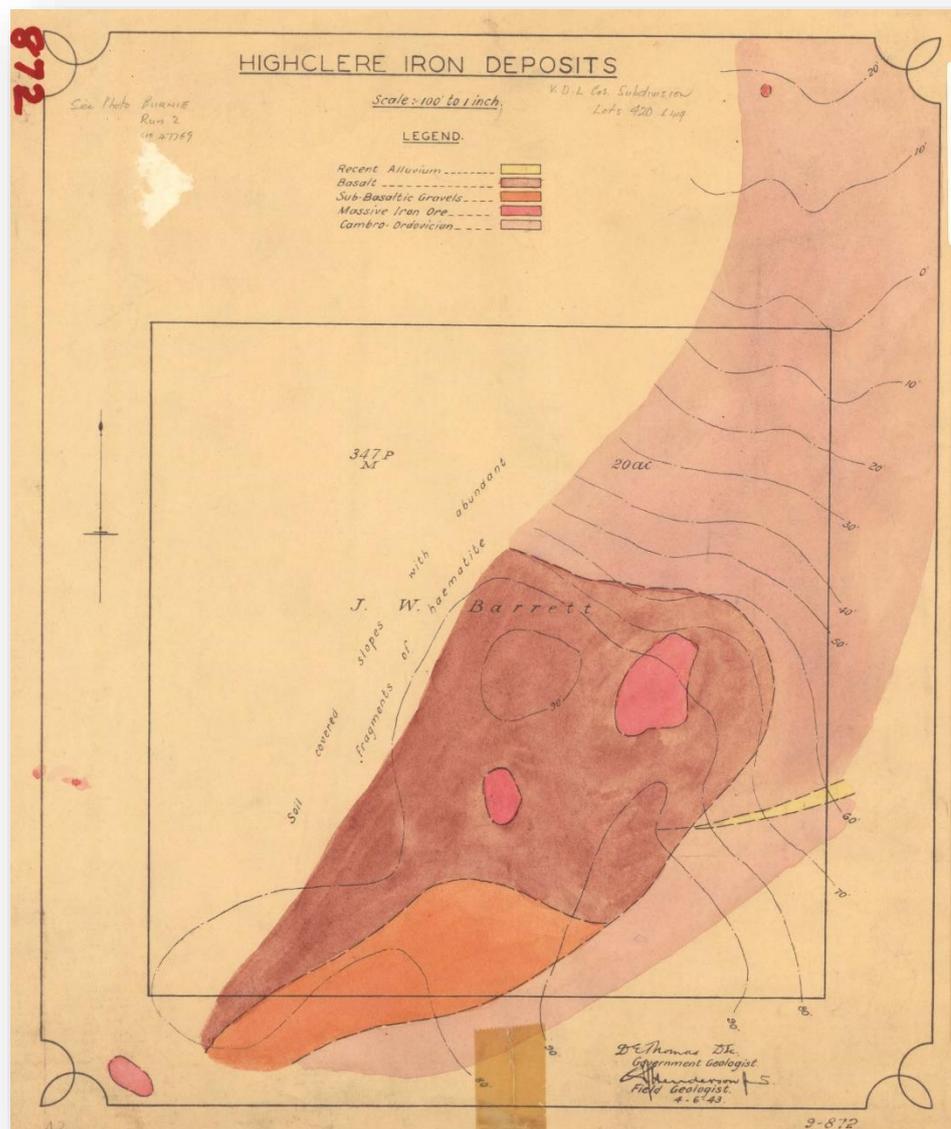
## 2.0 Project background

### 2.1 Prospecting, Mining, Exploration History

Iron ore deposits have been known about in the hinterland to Burnie since the late 19<sup>th</sup> century. The Hampshire area is apparently first referred to in the 1920's by Reid and Nye (1923), Reid (1924) and Blake (1928) though these references are to magnetite deposits in the general Hampshire Hills area.

The first specific reference to the Highclere deposit itself is believed to be that of Henderson (1936) who visited the iron deposit on behalf of the landowners.

Thomas and Henderson (1943) is their discussion of a number of iron deposits in the region produced the first geological map of the deposit (figure 2.1).



**Figure 2.1: Thomas and Henderson (1943): Geological plan of the Highclere iron deposit.**

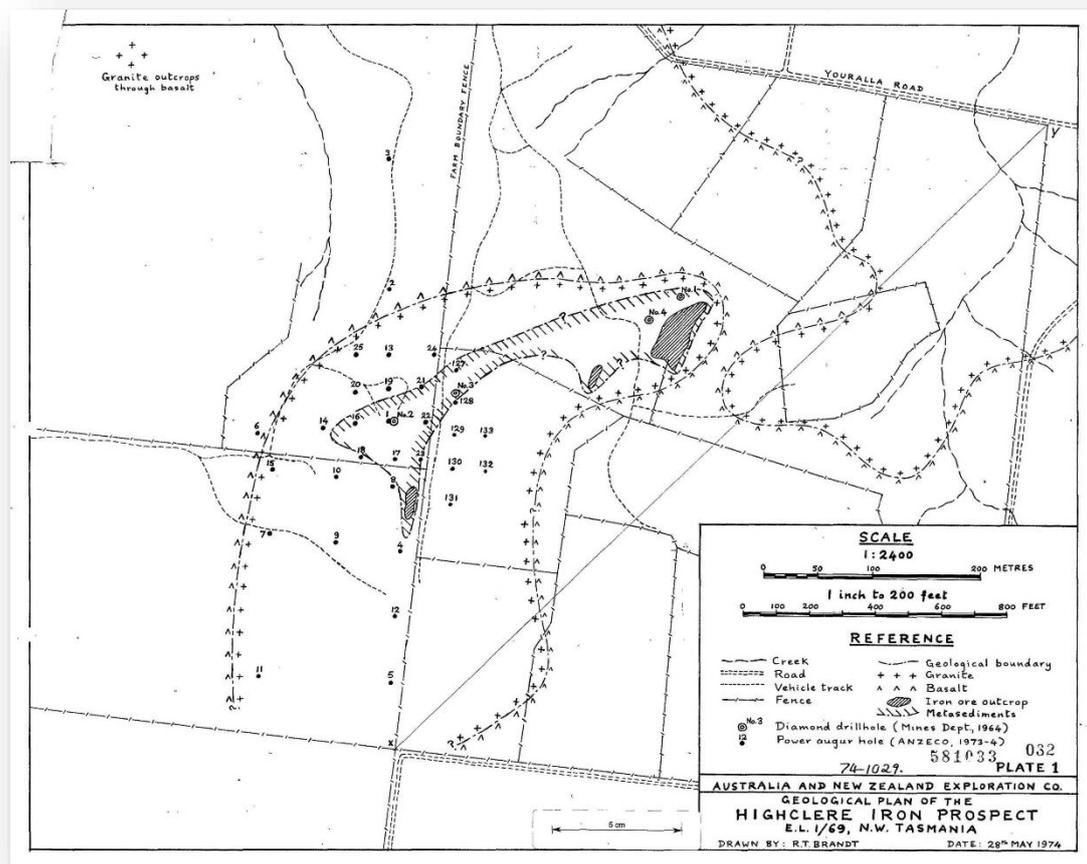
In 1959 the prospect was included in a number of ground magnetic surveys undertaken by the BMR (Keunecke, 1959).

Further more detailed ground magnetics was carried out by the Tasmanian Mines Department in 1965 (Jack, 1965) which was followed up by the drilling of 4 diamond drill holes, H1, H2/2B, H3 and H4 (Jack, 1965). Drill holes H2/2B and H3 were drilled into the southwestern tail of the deposit, holes H1 and H4 into the centre. All holes were assayed for Fe, however, recoveries were poor and it is quite possible that grades have been enhanced by the core loss.

Jack (1965) also attempted the first estimation of a possible resource describing two smaller higher grade orebodies of 14,000t and 13,000t each at grades of 55%-60% Fe surrounded by a lower grade material constituting ~250,000t at ~30% Fe.

There does not appear to have been any further work on the deposit until 1974 when ANZECO (Brandt, 1974) carried out a GEMCO power auger sampling programme looking for WO3 mineralisation in the skarn. 33 holes were drilled for 1252' (126.8m) in total. Holes are named AH1 to AH26 and AH127 to AH133. Holes were drilled to refusal with the deepest 37m.

Between 1972 and 1974 ANZECO/Tasminex gridded the northern part (~150m) of the deposit carrying out geological mapping, soil sampling (for WO3 predominantly) and ground magnetics. Drill logs describe the presence (or otherwise) of magnetite.

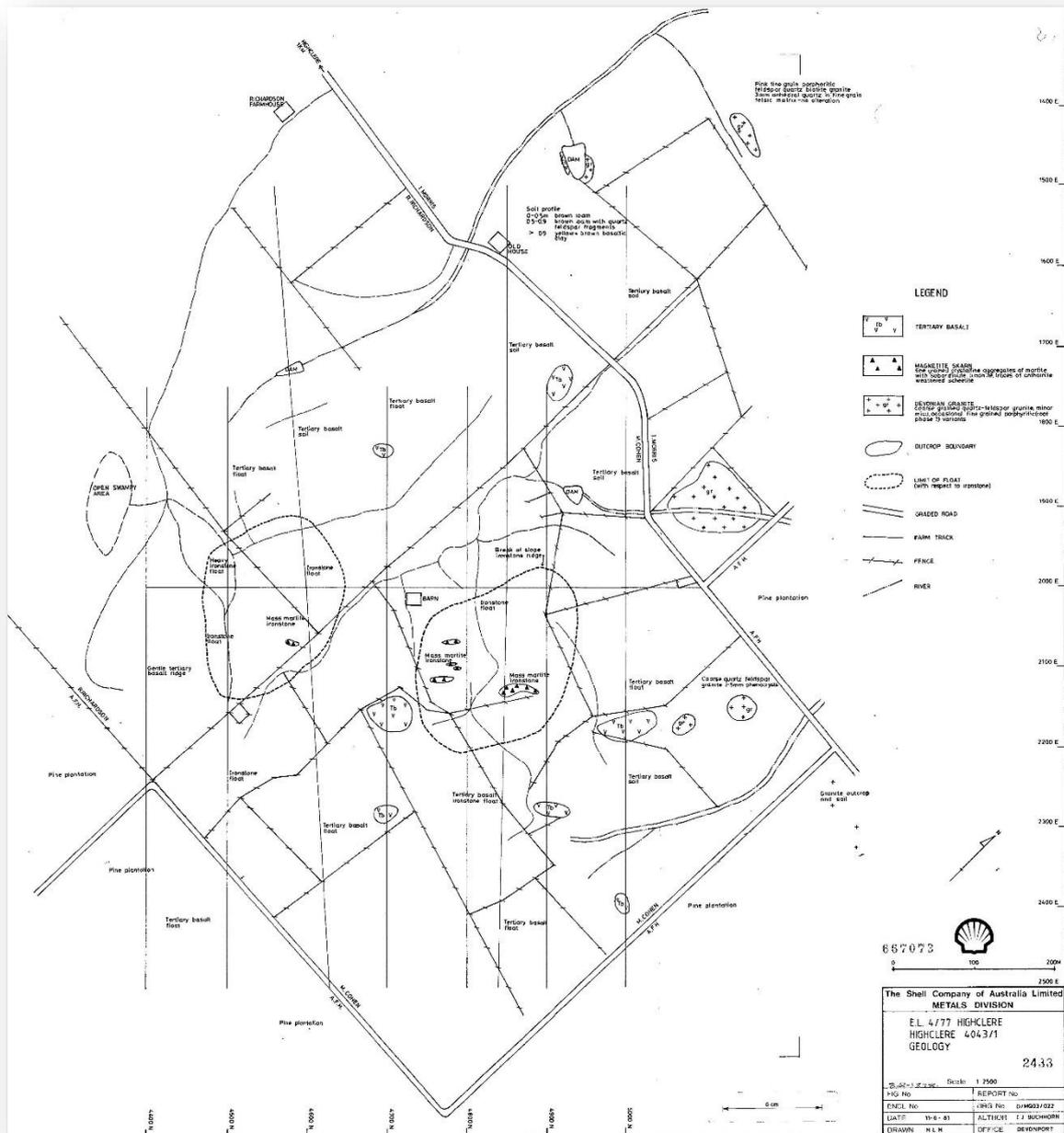


**Figure 2.2: Brandt (1974): Geology plan of Highclere prospect.**

Comalco (Askins, 1978) explored the northern part of the deposit for WO3 and F carrying out gridding, mapping, ground magnetics, gradient array IP and some gravity surveying. They concluded there was limited potential for WO3 and F.

In 1982 Shell (Lawton, 1982) in JV with Comalco carried out a similar programme of gridding, ground magnetics, mapping and rock and soil sampling looking for Sn and WO3. They drilled a

single percussion hole PDH H1 at the best coincident magnetics, soil (Sn, WO<sub>3</sub>), gravity and chargeability anomaly. The, drilled into the centre of the deposit (as defined by magnetics) was not assayed for Fe.



**Figure 2.3: Lawton (1982): Geology plan of Highclere prospect.**

In 2012 Forward Mining Pty Ltd (Callaghan, 2012), exploring the region for iron mineralisation (magnetite and hematite) carried out a programme of geological mapping of the deposit followed by the drilling of 4 diamond holes (H5, H6, H7 & H8) for 220.2m. Work was recommended but not carried out. H5, H6 and H8 were drilled just north of the crest of the hill in the centre of the deposit. Hole H7 was drilled on the eastern side of the hill over the shallow southwestern tail of the deposit.

In 2014 Lottah Mining Pty Ltd drilled 4 further diamond drill holes into the deposit (DDHC010, DDHC011, DDHC012 & DDHC013) for a total of 206.3m. The 4 holes were drilled into the northern side of the hill in the centre of the deposit.

## **2.2 Previous resource estimates**

The only previous resource estimate is that of Jack (1965) but is of only a very general nature.

### **3.0 Geology**

#### **3.1 Regional Geology**

Regionally the geology of the Rogetta Project area is dominated Tertiary basalt covering around 95% of the tenement with basement geology seen in windows and drill holes.

The basement geology is characterised by Proterozoic metasediments (and minor mafic volcanics) including carbonates of the Oonah/Burnie Formations unconformably overlain by a sequence of Cambro-Ordovician volcanics and sediments, both intruded by the Devonian Husetop Granite.

Regionally this package of rocks is unconformably overlain by Permo-Triassic sediments. These are seen in a window through the basalt in the northwest corner of that part of the licence being relinquished but are not known within the area being retained.

The basal unit of the Cambro-Ordovician sequence consists of Mt Read Volcanics, correlated with Tyndall Group. These are overlain by the Owen Group sediments.

The basal member of the Owen Group is a quartz pebble conglomerate with local additions of volcanoclastic detritus. The conglomerates are overlain by siliciclastic sands and silts of the Moina Sandstone which has a gradational contact with the overlying Gordon Group Limestone, becoming more calcareous towards the contact.

The calcareous units in the upper Moina Sandstone and the Gordon Group limestones and dolomites are the host to most skarn mineralisation though skarned Proterozoic carbonates also occur at Buckbys and Natone on adjacent EL's.

These basement rocks were deformed in the Middle Tabberrabberan Orogeny. This resulted in the development of north to north-northeast striking F2 folds superimposed on much broader east-west F1 folding.

Late in the orogeny the I-type Husetop Granite was emplaced passively and underlies most of the Rogetta Project tenements.

Skarn mineralisation was introduced into calcareous rocks by fluids derived from this granite with rarer vein style mineralisation also associated with this intrusive. Whilst previously considered to be a single body more recent work (McKeown, 1994) suggests that the granite consists of a number of phases often intruding as dykes as opposed to a large rounded batholith geometry.

In the Tertiary topographic lows were filled by basal sediments followed by thick Tertiary basalt flows which eventually spilled over onto more elevated topography as a thin veneer.

The mapped geology of EL 25/2009 shows basalt extending over 90% of the area with Proterozoic and Palaeozoic rocks outcropping in a number of small windows in the western part of the licence, Devonian granite along the eastern part.

#### **3.2 Highclere deposit geology**

The following description of the geology of the Highclere deposit is taken verbatim from Callaghan (2012).

"The prospect consists of outcropping magnetite-hematite mineralisation associated with metasomatised calcareous sediments occurring as a shallow, remnant roof pendant overlying Devonian granite intrusions.

The geology of the prospect is dominated by late Tertiary basalt flows which cover much of the underlying Palaeozoic lithologies (Figure 1). The basement consists of the Husetop Granite batholith and metasomatised remnants of Gordon Group calcareous sediments variably

metasomatised to calc-silicate and magnetite skarn. Outcropping hematite and magnetite mineralisation occurs on several ridge tops as rubble outcrop and boulder deposits over an area of about 250-300m. The deposits are highly weathered with depth of weathering in excess of 50m. The host rock is composed entirely of indeterminate red and yellow clays presumably after calc-silicate skarn. Most of the Hematite-Magnetite mineralisation consists of a surficial lag of boulders and nodules within a red-orange limonitic clay matrix. The surface iron deposits can extend to over 10m depth. Only one recent drillhole H6 intersected fresh magnetite mineralisation hosted in actinolite skarn in direct contact with un-weathered granite. Iron mineralisation consists of multiple iron oxide species including magnetite, hematite, limonite and goethite.”

The presence of hematite associated with the magnetite raises the question of whether the former is primary and co-genetic with the magnetite skarn, or a weathering product derived from the magnetite. The author has seen core from DDH’s HC010-013 and leans towards a secondary origin due to weathering though not with certainty given the deeply weather nature of the material.

The thickness of the basalt cover over the northern part of the deposit is undefined. Re-logging of DDH’s HC010, HC011, HC012 and HC013 suggest a 2-2.5m thick thin veneer.

The upper parts of holes DD14HC010, DD14HC012 and DD14HC013 consists of ~2-2.5m of basalt derived clay and basalt kernels before passing into a unit of clay after calc-silicate overlying variably magnetite, hematite, limonite and goethite mineralised skarn. The base of this calc-silicate unit defines a plane dipping due north at -20° and is considered to represent the upper bound to the orebody and has been modelled accordingly. Callaghan (2012) refers to a northerly dip of -45° to the magnetite skarn but his sections show a more shallowly dip consistent with this.

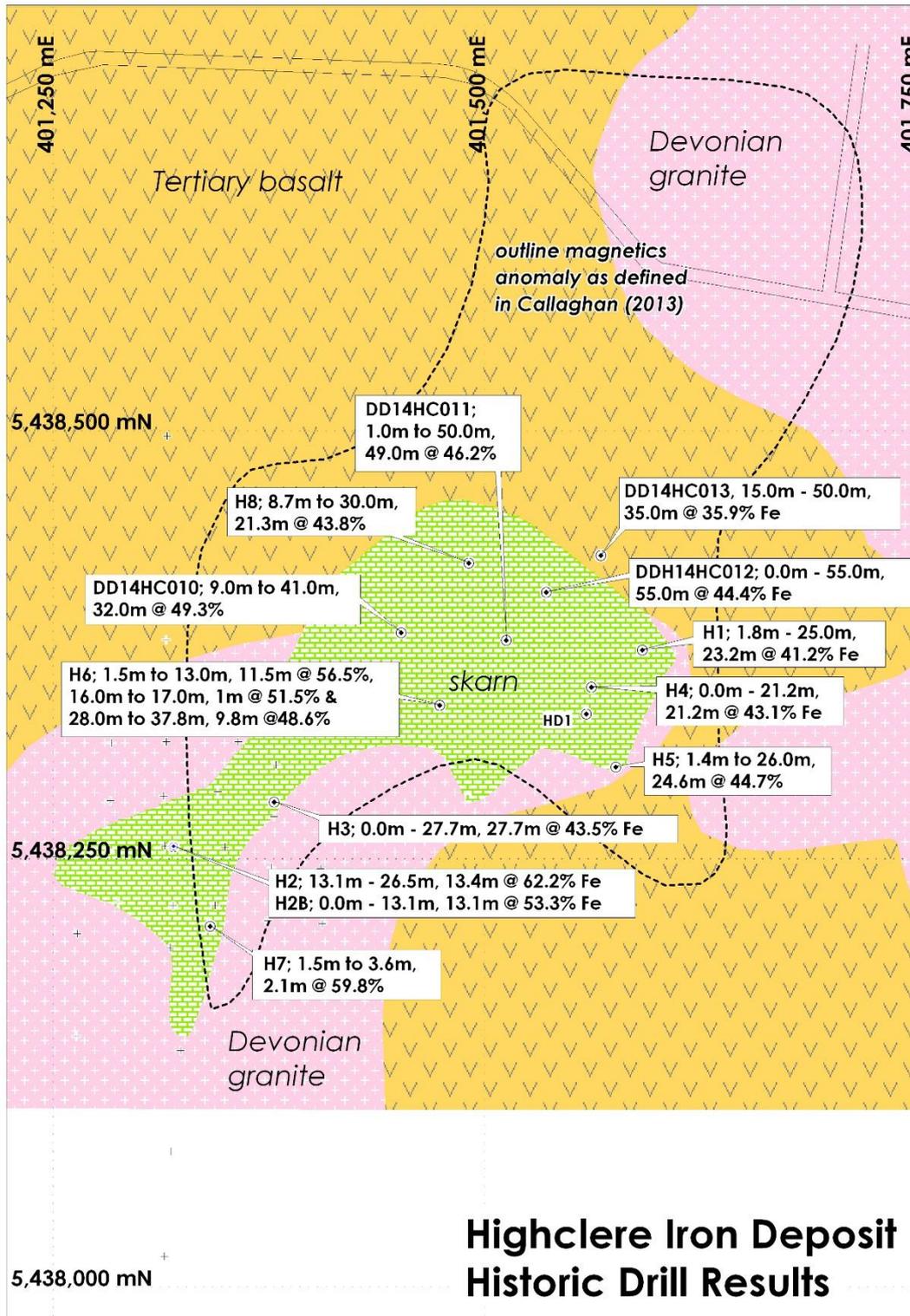


Figure 3.1: Geology of the Highclere deposit (modified after Brandt, 1974 and Callaghan, 2012) with significant historic drill hole intersections shown.

## 4.0 Data

The sample data used in this estimation is based on the three drilling programmes in which Fe has been analysed for;

1. 1964 Mines Department diamond drilling programme of 5 but effectively 4 holes for 126.8m. Holes H1, H2/2B (redrill), H3 and H4. Hole 2B was drilled to resample the upper section of H2 which suffered nearly complete core loss.
2. 2012 Forward Mining diamond drilling programme of 4 holes for 220.2m. Holes H5, H6, H7 and H8.
3. 2014 Lottah Mining Pty Ltd diamond drilling programme of 4 holes for 206.3m. Holes DD14HC010, DDHC011, DDHC012 and DDHC013.

In addition the 1974 auger holes AH1 to AH25 and AH127 to AH133 provide geological information in the southwestern part of the deposit, as does 102m deep 1982 percussion hole HD1 drilled by Shell but not assayed for Fe.

Drill hole collar positions for the 1964 and 1974 holes have been georeferenced from plate 1 in Brandt (1974) (included herein as figure 2.2) with some confidence regarding accuracy (+/-5m).

The 2012 and 2014 drill hole collar positions were surveyed at the time by hand held GPS (typically expected to be +/-3-5m).

All holes are vertical and there is no down hole survey data.

Surface topographic used is 10m contour data downloaded from the Tasmanian government's LISTmap source. Drill hole collar RL's were measured from the topographic surface. Height accuracy expected +/-3m.

There are no bulk density calculations for the Highclere deposit which is problematic given the highly weathered and clayey nature contrasting with massive magnetite in part.

Whitehead (1990) used 4.08g/cm<sup>3</sup> for his work on Hampshire massive magnetite skarn which was derived from his experience on the Kara deposits. Goethite (s.g. 3.3 – 4.3) and limonite (s.g. 2.7 – 4.3) make up significant portions of the deposit. It is uncertain as to the proportion of these iron species from the logs with a systematic relog and programme of bulk density measurements warranted before a more accurate resource can be estimated.

An average bulk density of 3.5 has been assumed, however, due to its imprecision volumes are reported, noting the risk of significant water (unknown) in this porous material.

Intervals of unassayed skarn were attributed Fe assays of 0% Fe. This was done for H6 from 13.0m to 16.0m, 17.0m to 28.0m and 37.8m to 42.0m and H8 from 30.0m to 60.0m.

**Table 4.1: Drill hole details for holes used in estimation**

hole_id	MGA94_north	MGA94_east	RL (masl)	Depth	date
DD14HC010	5438382	401452	379.905	50.9	2014
DD14HC011	5438378	401513	380.512	50.0	2014
DD14HC012	5438406	401536	377.656	55.4	2014
DD14HC013	5438427	401568	373.513	50.0	2014
H1	5438372	401591		28.5	1965
H2	5438258	401320	382.319	36.0	1965
H2B	5438258	401320	382.319	13.1	1965
H3	5438283	401378	383.101	28.0	1965
H4	5438351	401562	383.044	21.2	1965
H5	5438304	401576	386.824	42.0	2012
H6	5438340	401474	383.311	86.7	2012
H7	5438211	401341	384.3	31.5	2012

H8	5438423	401491	375.802	60.0	2012
<b>Holes providing only geological information</b>					
HD1	5438335	401559	384.391	102.00	1982
AH1	5438258	401315	382.171	17.37	1974
AH2	5438378	401315	377.689	3.35	1974
AH3	5438497	401316	371.874	2.00	1974
AH4	5438138	401324	385.352	14.00	1974
AH5	5438018	401314	387.623	5.18	1974
AH6	5438246	401190	380	3.35	1974
AH7	5438154	401201	381.418	5.18	1974
AH8	5438198	401318	383.896	14.00	1974
AH9	5438147	401263	383.395	8.23	1974
AH10	5438207	401264	382.109	9.14	1974
AH11	5438023	401189	383.395	2.44	1974
AH12	5438079	401318	386.443	5.00	1974
AH13	5438318	401316	379.961	6.40	1974
AH14	5438252	401252	380.586	7.32	1974
AH15	5438213	401204	380.191	5.18	1974
AH16	5438255	401282	381.351	19.00	1974
AH17	5438223	401319	383.38	9.00	1974
AH18	5438225	401287	382.388	11.00	1974
AH19	5438287	401314	381.01	5.18	1974
AH20	5438284	401283	380.331	6.00	1974
AH21	5438289	401345	381.892	22.00	1974
AH22	5438257	401350	352.742	25.00	1974
AH23	5438223	401344	384.079	28.35	1974
AH24	5438319	401357	381.105	10.36	1974
AH25	5438318	401284	378.999	6.00	1974
AH127	5438305	401379	382.25	21.34	1974
AH128	5438275	401378	383.396	11.00	1974
AH129	5438245	401376	384.258	8.00	1974
AH130	5438214	401374	385.221	37.00	1974
AH131	5438182	401372	385.856	17.37	1974
AH132	5438212	401406	386.183	32.00	1974
AH133	5438244	401405	385.024	8.23	1974

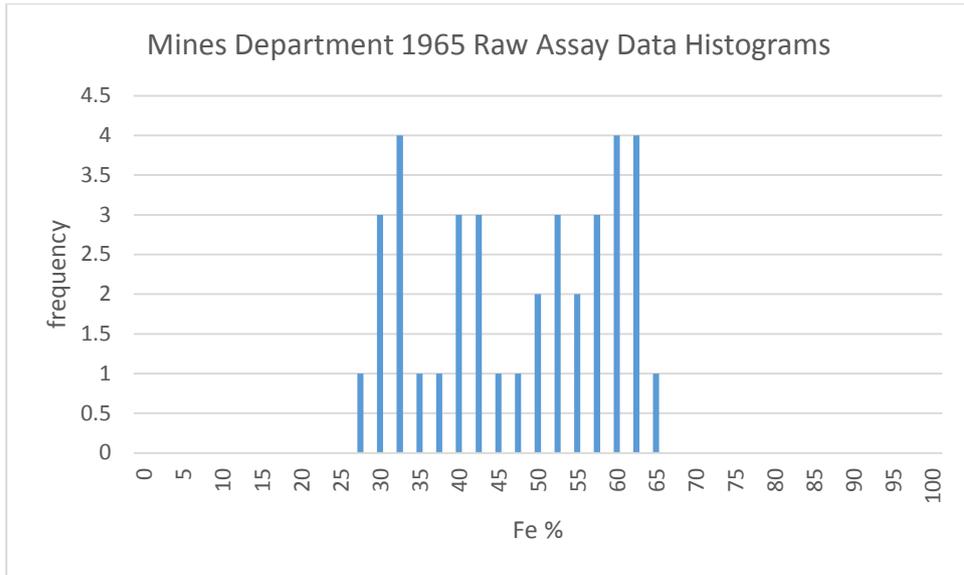
**Table 4.2: Drill hole intersections used in estimation**

Hole_ID	From (m)	To (m)	Interval (m)	Fe %
<b>intersections included in primary model of iron mineralised skarn</b>				
H1	1.8	28.3	26.5	40.71
H2	13.1	26.5	13.4	62.22
H2B	0	13.1	13.1	53.3
H3	0	27.7	27.7	43.48
including	12	23.15	11.15	52.78
H4	0	21.2	21.2	43.14
H5	1.4	26	24.6	44.66
including	1.4	8	6.6	56.92
including	12	19	7	51.2
H6	1.5	67	65.5	36.6
H6	1.5	13	11.5	56.51

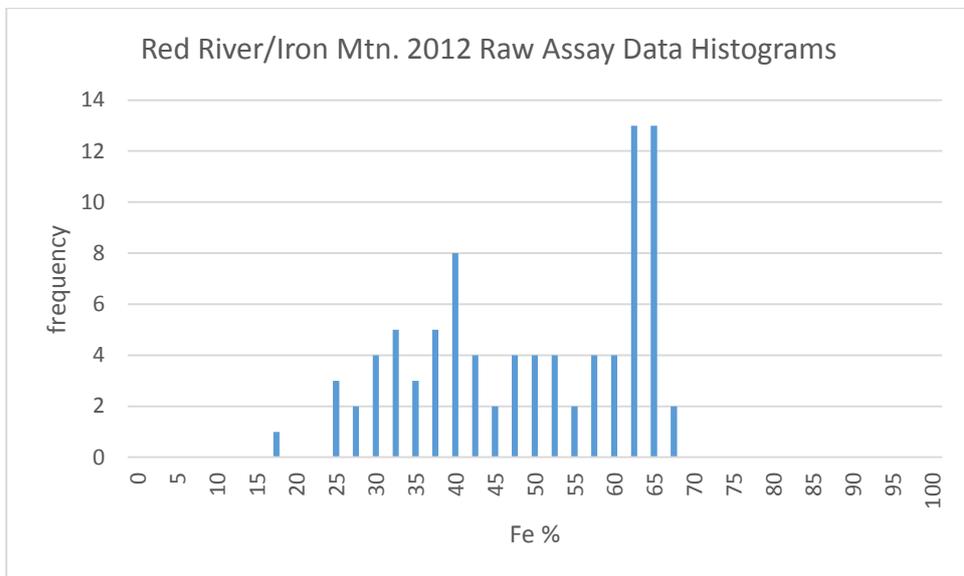
H6	13	16	3	0
H6	16	17	1	51.5
H6	17	28	11	0
H6	28	37.8	9.8	48.62
including	32	36.5	4.5	61.37
H6	37.8	42	4.2	0
H6	42	67	25	48.77
including	43.5	46	2.5	62.78
H7	1.5	3.6	2.1	59.78
H8	8.7	30	21.3	43.81
including	8.7	14.4	5.7	59.55
DD14HC010	9	41	32	49.59
including	9	35	26	53.63
DD14HC011	1	50	49	46.94
including	1	21	20	62.59
including	33	40	7	56.49
DD14HC012	4	55	51	50.16
including	4	11	7	55.87
including	13	20	7	55.22
including	39	55	16	45.96
DD14HC013	15	50	35	35.9
<b>calc_silicate intersections included in secondary model of all skarn</b>				
H8	2	8.7	6.7	11.57
H8	30	60	30	0
DD14HC010	0	9	9	10.92
DD14HC010	41	50.9	9.9	8.91
DD14HC012	0	4	4	14.52
DD14HC013	0	15	15	15.65

**Table 4.3: Raw Assay Statistics**

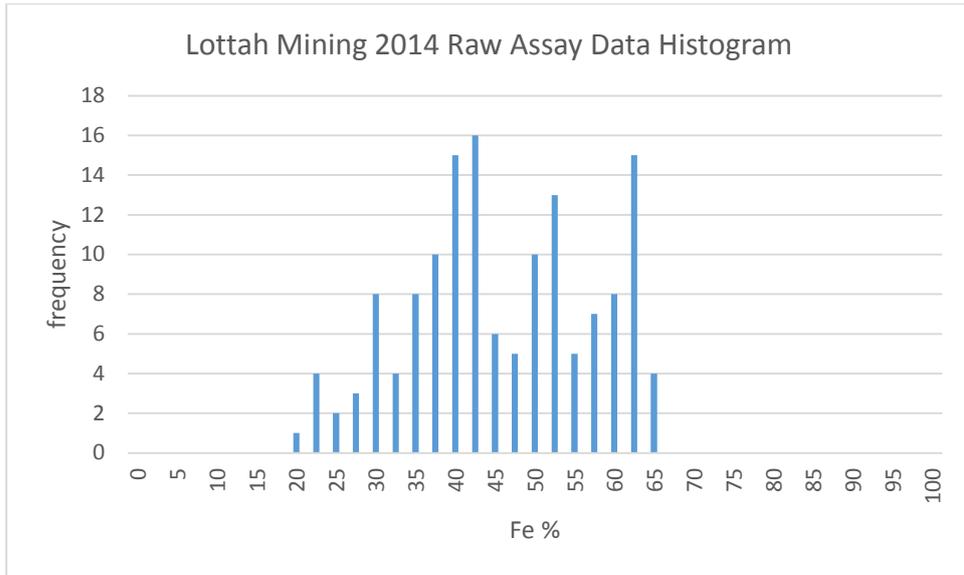
Drill Programme	Number of Samples	Mean	Standard Deviation
1990 Mines Department	38	46.16	11.99
2012 Red River/Iron Mtn.	88	48.01	13.54
2014 Lottah Mining Pty Ltd	145	44.47	11.49



**Figure 4.1: 1965 Mines Department drilling raw assay histogram.**



**Figure 4.2: 2012 Red River/Iron Mtn. drilling raw assay histogram.**



**Figure 4.3: 2014 Lottah Mining drilling raw assay histogram.**

Drill hole data is stored in an ACCESS database included in appendix A as *EL252009\_201805\_04\_AppendixA\_Highclere\_mga94*

## 5.0 Data Quality and Verification

The data used in this estimation is of moderate quality.

The lack of directly measured bulk density data is of major concern as it directly affects tonnages, particularly given the contrast between the highly weathered clays and massive magnetite sections. The number 3.5 is potentially +/- 0.3. This issue can be partly resolved by drilling new holes, undertaking direct measurements, and applying the new data to the volumes estimated herein. It has been partially addressed by including volumes in the tons and grade tables though this will still only allow usage of a new average bulk density rather than modelling the variation inherent in the orebody.

The drilling methodology (diamond drilling) used to generate the three drill sample data sets are of essentially the same quality though core loss has varied between drill programmes possibly as a result of different drillers and different drill rigs.

Drill hole locations are of similar only moderate quality with collar positions accuracy of +/- 3-5m and similar error for RL's.

There is no QA/QC data reported for any of the drill programmes programmes. There have also been no drill holes which may have acted as field duplicates.

The relatively poor data quality, i.e.

- poor drilling recoveries
- moderate to poor logging
- moderate quality collar surveys
- lack of QA/QC
- lack of bulk density data

all mean the estimated resource must be considered as Inferred.

## **6.0 Geological interpretation and modelling**

### **6.1 Introduction**

Modelling was undertaken using SURPAC's 3D modelling software. Drill hole sample data was stored in an ACCESS database. Wireframing was done by snapping to drillhole intersections in 3D.

As opposed to the authors usual methodology of creating a solid wireframe incorporating all bounding surfaces, in this instance a series of DTM's defining these bounding surfaces was created and used to constrain the shape of the orebody in the block model. As such there are no actual 3DM's of the final orebody shapes.

DTM's were constructed of

- topography
- basalt lower contact
- upper calc-silicate unit lower contact
- granite upper contact with skarn

### **6.2 Topography**

The surface topography surface was created from the 10m LISTmap contour data.

### **6.3 Basalt Lower Contact**

Tertiary basalt overlies the skarned sequence in the northern part of the deposit with 2.0 – 2.5m thick basalt, represented by basalt derived clay with kernels of fresh basalt, intersected in the upper parts of DD14HC010, DD14HC011, DD14HC012 and DD14HC013 and possibly H8 (the latter not verified).

A 2.5m thick veneer was modelled over the northern area where basalt has been mapped by previous workers (Brandt, 1974 and Callaghan, 2012)

### **6.4 Upper Calc-silicate Lower Contact**

As noted earlier the upper parts of holes DD14HC010, DD14HC012 and DD14HC013 consists of ~2-2.5m of basalt derived clay and basalt kernels before passing into a unit of clay after calc-silicate overlying variably magnetite, hematite, limonite and goethite mineralised skarn. The base of this calc-silicate unit defines a plane dipping due north at -20° and is considered to represent the upper bound to the orebody and has been modelled accordingly.

### **6.5 Granite Upper Contact with Skarn**

The contact between the granite and overlying skarn was modelled where known. This shape was projected northwards and connected with the surface expression of this contact defining a northwest tending elongate bowl shape.

### **6.6 Orebody Model**

As noted in the introduction no final 3DM shape was generated for the orebody with the block model recording its constrained shape. However, in generating two partial orebody shapes were created.

The first model excludes non-iron mineralised skarn overlying the iron mineralised skarn (though including calc-silicate skarn sections in H6 which lie between iron mineralised zones.

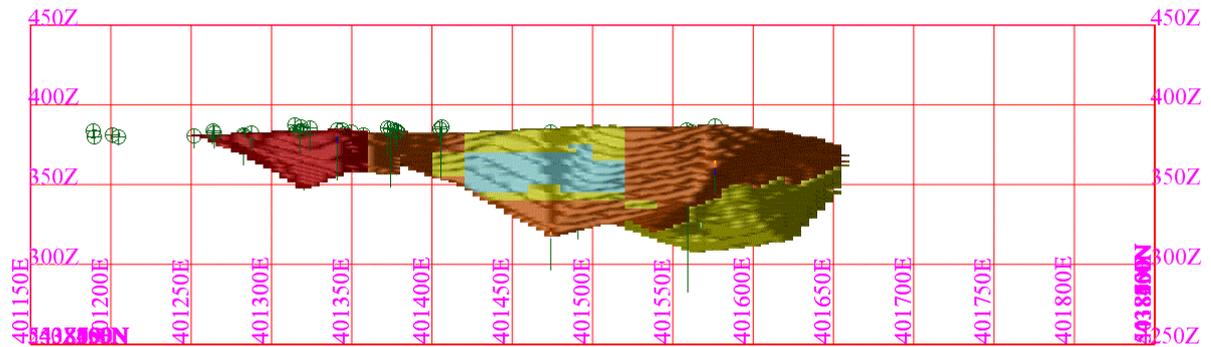
A second model including all skarn was also created.

## 6.7 Orebody Shapes as Recorded in Constrained Block Model

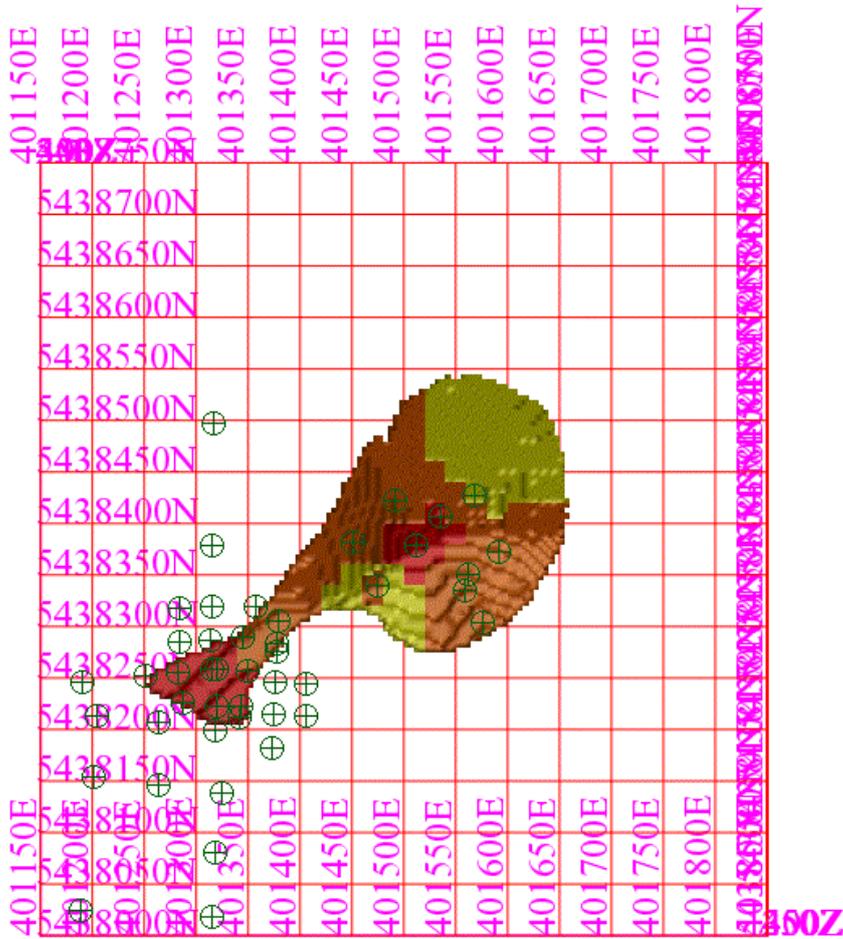
The model excluding non-mineralised skarn is constrained by *rock\_type\_exc\_calcsil* = 1 in the block model. It appears as shown in figures 6.1 and 6.2.

The model including non-mineralised skarn is constrained by *rock\_type\_inc\_calcsil* = 1 in the block model. It appears as shown in figures 6.3 and 6.4.

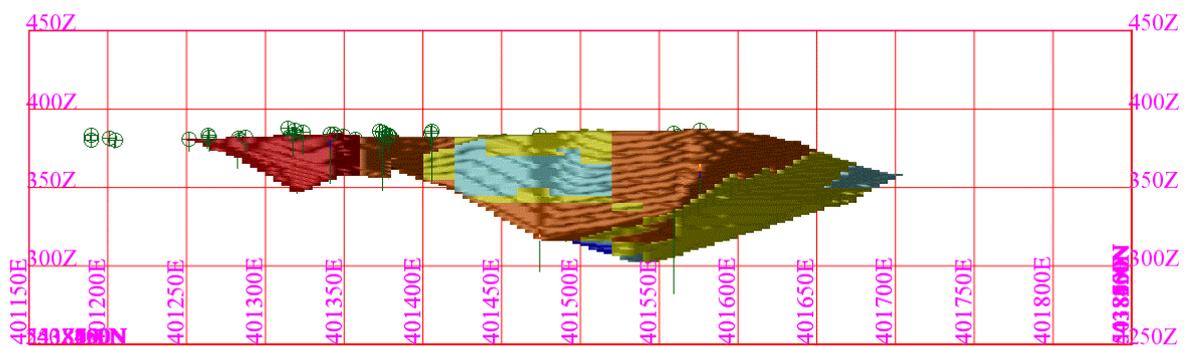
Constraint files which also generate the two orebody shapes are included in appendix A as *EL252009\_201805\_07\_AppendixA\_highclere\_orebody.con* and *EL252009\_201805\_08\_AppendixA\_highclere\_orebody\_inc\_calcsilicate.con* respectively.



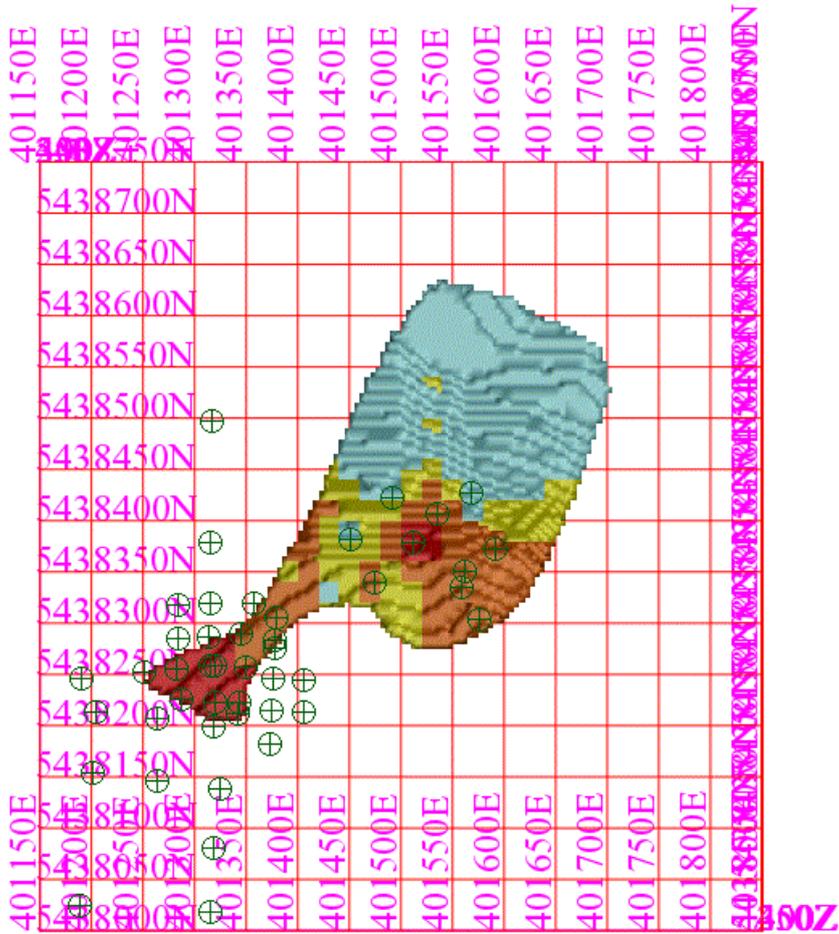
**Figure 6.1: Block model (coloured by Fe%) showing shape of modelled body excluding non iron mineralised skarn, looking west. Note that tons and grade figures for the resource were from that part of the body south of 5,438,475mN with the area north of this not classifiable given lack of data.**



**Figure 6.2:** Block model (coloured by Fe%) showing shape of modelled body excluding non iron mineralised skarn, looking down. Note that tons and grade figures for the resource were from that part of the body south of 5,438,475mN with the area north of this not classifiable given lack of data.



**Figure 6.3:** Block model (coloured by Fe%) showing shape of modelled body including non iron mineralised skarn, looking west. Note that tons and grade figures for the resource were from that part of the body south of 5,438,475mN with the area north of this not classifiable given lack of data.



**Figure 6.4: Block model (coloured by Fe%) showing shape of modelled body including non iron mineralised skarn, looking down. Note that tons and grade figures for the resource were from that part of the body south of 5,438,475mN with the area north of this not classifiable given lack of data.**

## **7.0 Statistical analysis**

Limited statistical analysis was performed on the data as there are clear deficiencies in the data set (collar positions, assaying QA/QC) which would make any results inconclusive.

The resource has been given Inferred Status in part on the basis of these deficiencies.

Downhole composite files are included in appendix A as *EL252009\_201805\_05\_AppendixA\_1m\_comps1.str* for the iron mineralised skarn modelling/estimation, and *EL252009\_201805\_06\_AppendixA\_1m\_comps1\_inc\_calcsilicate.str* for the check modelling/estimation including all skarn including calc-silicate skarn.

## **8.0 Block modelling**

The resource was estimated using SURPAC's block modelling function.

A block model with blocks oriented north-south was created with blocks 20m in the X direction, 20m in the Y direction and 5m in the Z direction.

Sub-blocking to 5mX x 5mY x 1.25mZ was allowed.

Attributes assigned are:

- rock\_type\_exc\_calcsil (rocktype = 1 for orebody)
- rock\_type\_inc\_calcsil (rocktype = 1 for orebody)
- fe\_grade\_exc\_calcsil (grades as Fe %)
- fe\_grade\_inc\_calcsil (grades as Fe %)

The block model is included in Appendix A as *EL252009\_201805\_03\_AppendixA\_highclere.mdl*

## 9.0 Grade estimation

### 9.1 Introduction

The resource was estimated using SURPAC's block modelling function. The estimation was done twice, once for the model excluding non-iron mineralised skarn (using the appropriate composite file), and a second time for the model including non-iron mineralised skarn (again using the relevant composite file).

### 9.2 Inverse Distance Squared

The estimation method utilised was Inverse Distance Squared. Three passes were employed in both estimations. A first pass using a 200m diameter spherical search ellipse and allowing minimum 1 sample and max 40 was followed by a 2<sup>nd</sup> pass utilising the same 200m search ellipse but requiring a minimum of 3 samples (maximum 40), in turn followed by a third pass utilising a 100m diameter search ellipse and a minimum of 10 samples (maximum 40).

In each case 3X x 3Y x 2Z discretisation points were used.

### 9.3 Validation

The first model, that excluding non-iron mineralised skarn, has been verified visually against drill sections in figures 9.3 to 9.9. It has also been verified by comparing tons and grade figures for the medium to higher grade cut-off's (at the lower grade cut-off's the influence of the lower grade calc-silicate skarn means the two aren't comparable).

### 9.4 Resource reporting

Tons and grade calculated from both estimations are detailed below.

Only the resource south of 5,438,475mN is considered classifiable and has been classified as Inferred. The lack of data north of 5,438,475mN makes this part of the modelled shape unclassifiable.

**A resource of 1,288,438m<sup>3</sup> equating to, at an approximated bulk density of 3.5t/m<sup>3</sup>, 4,510,000t @ 42.48% Fe has been estimated.**

**Table 9.1: Tons and grade for model excluding non-iron mineralised skarn**

Cut Off Grade Fe%	Volume (m3)	Tons	Fe %
0	1288438	4509531	42.48
25	1278906	4476172	42.63
30	1224844	4286953	43.3
35	1157781	4052234	43.95
40	889594	3113578	45.92
45	378063	1323219	50.41
50	152000	532000	55.22
55	87750	307125	57.45

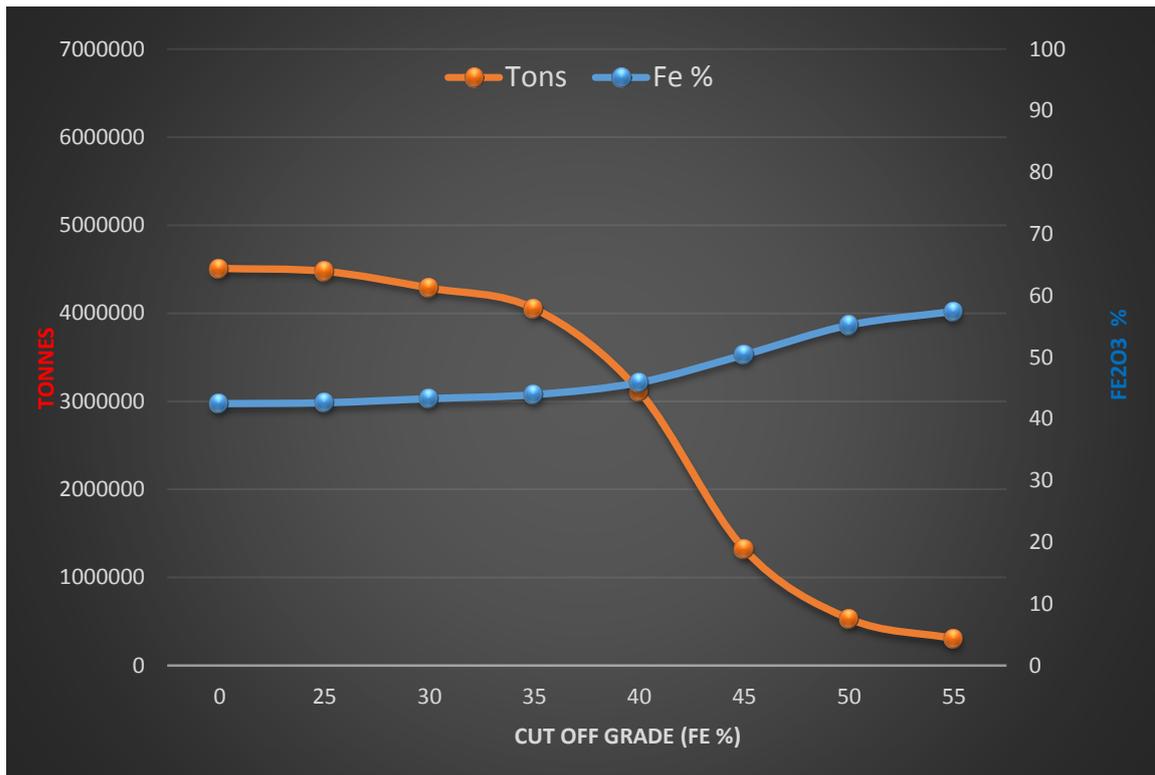


Figure 9.1: Tons and grade curve model excluding non-iron mineralised skarn.

Table 9.2: Tons and grade for model including non-iron mineralised skarn

Cut Off Grade Fe%	Volume (m3)	Tons	Fe %
0	1799688	6298906	36.64
25	1649750	5774125	38.66
30	1363688	4772906	40.87
35	1015094	3552828	43.61
40	753531	2637359	45.71
45	294063	1029219	50.86
50	131344	459703	55.8
55	87313	305594	57.46

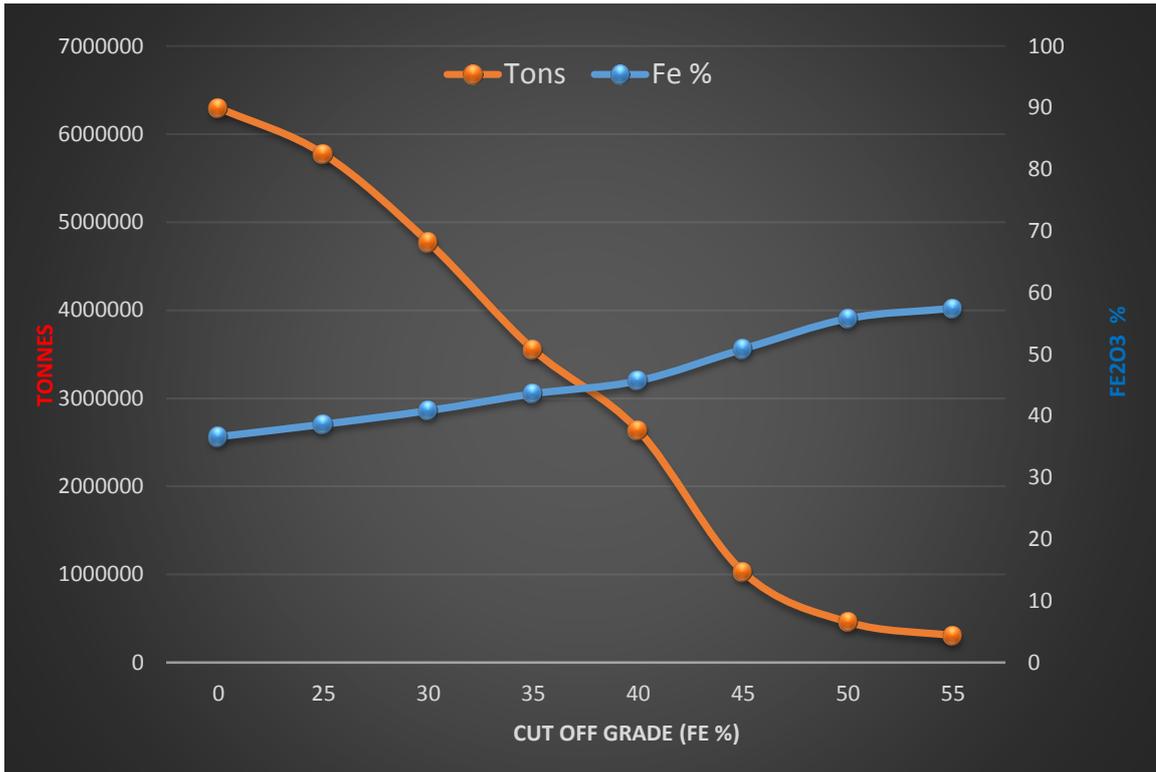


Figure 9.2: Tons and grade curve model including non-iron mineralised skarn.

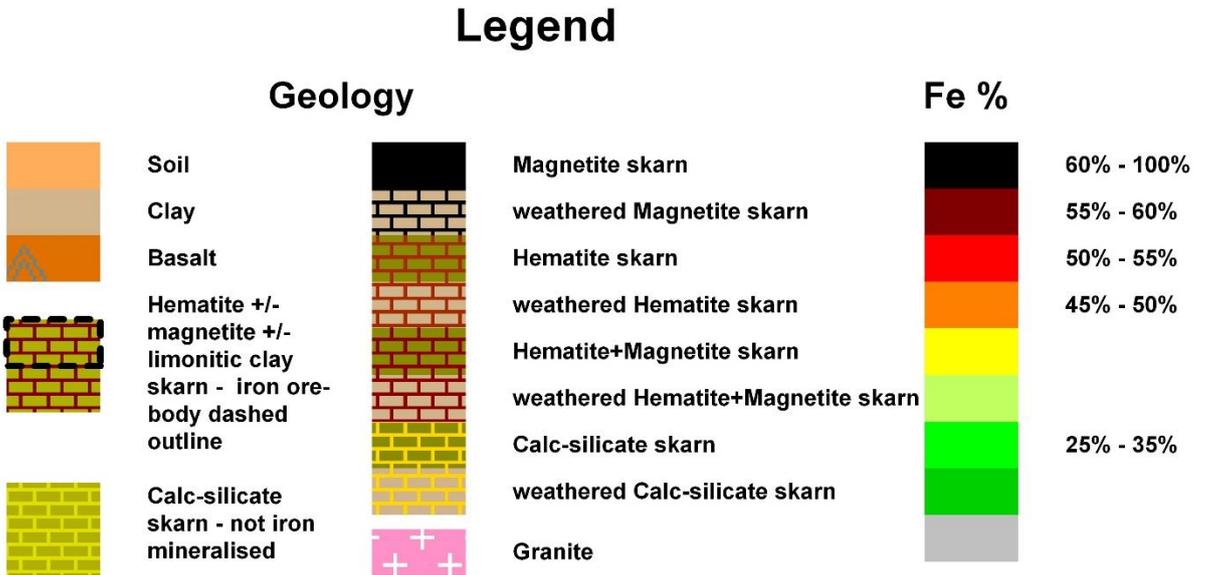


Figure 9.3: Legend for figures 9.4 to 9.9.

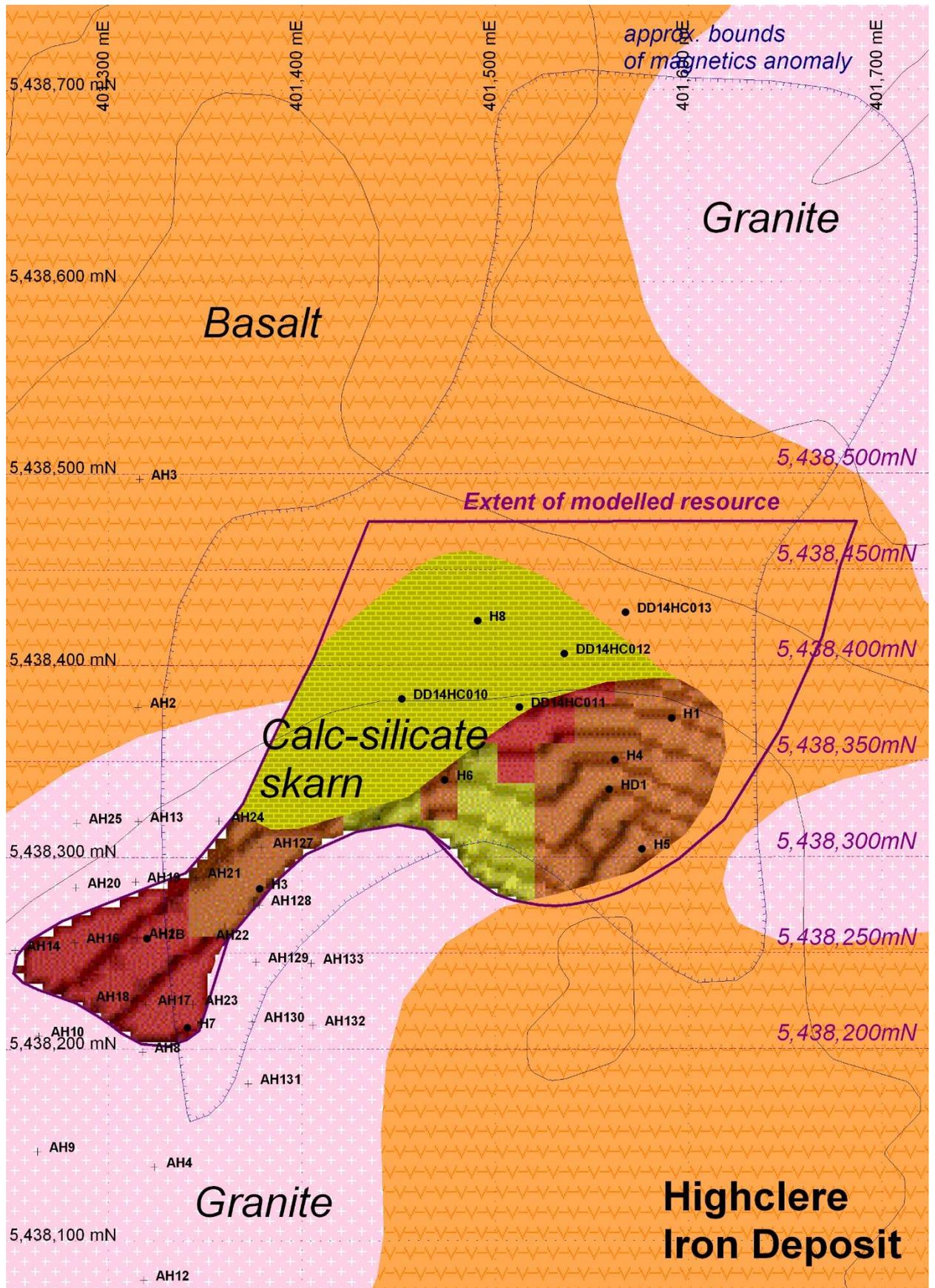


Figure 9.4: Plan view of Highclere resource showing resource block model (grades as per figure 9.2) and drill hole collars.

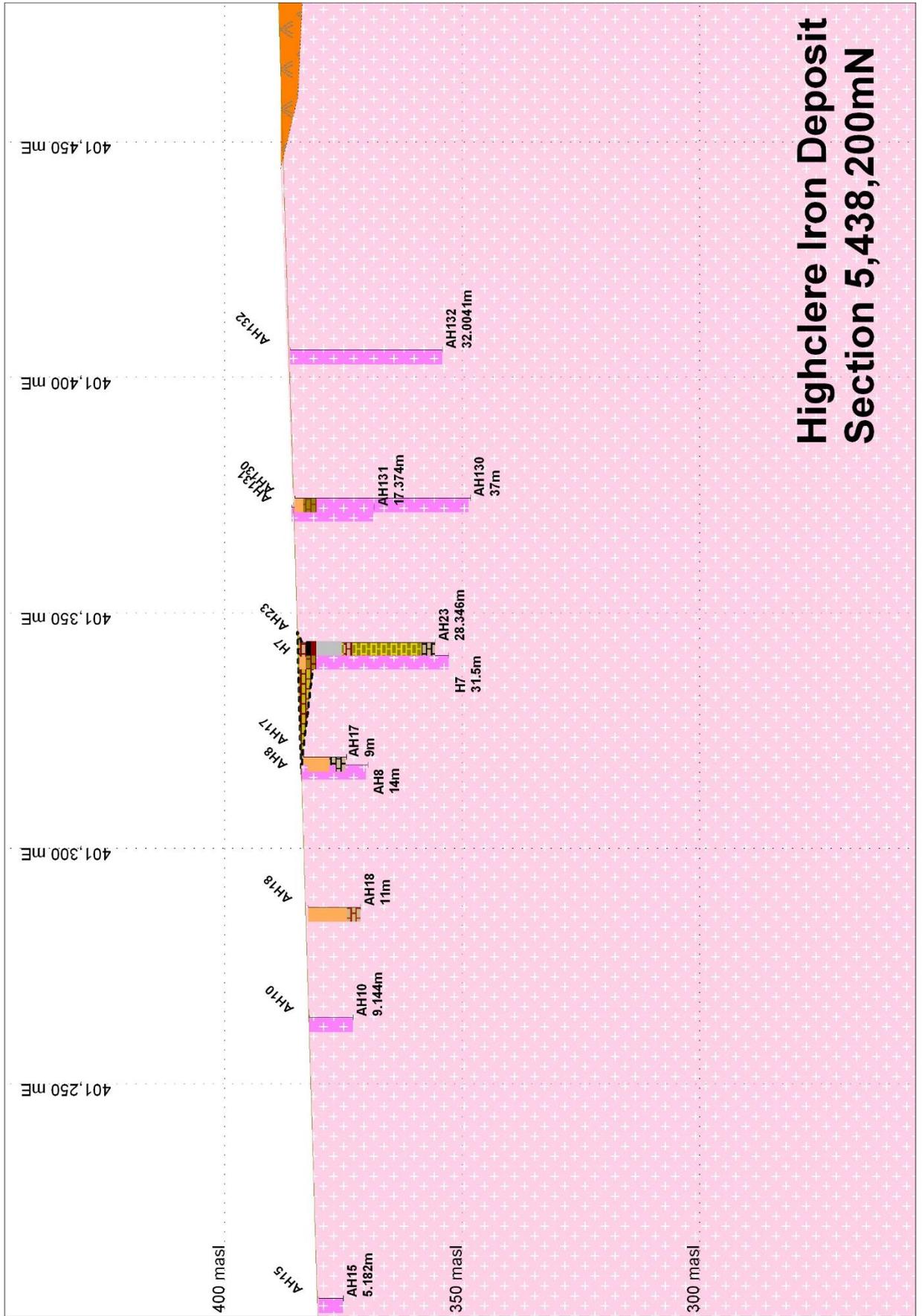


Figure 9.5: Highclere drill section 5,438,200mN.

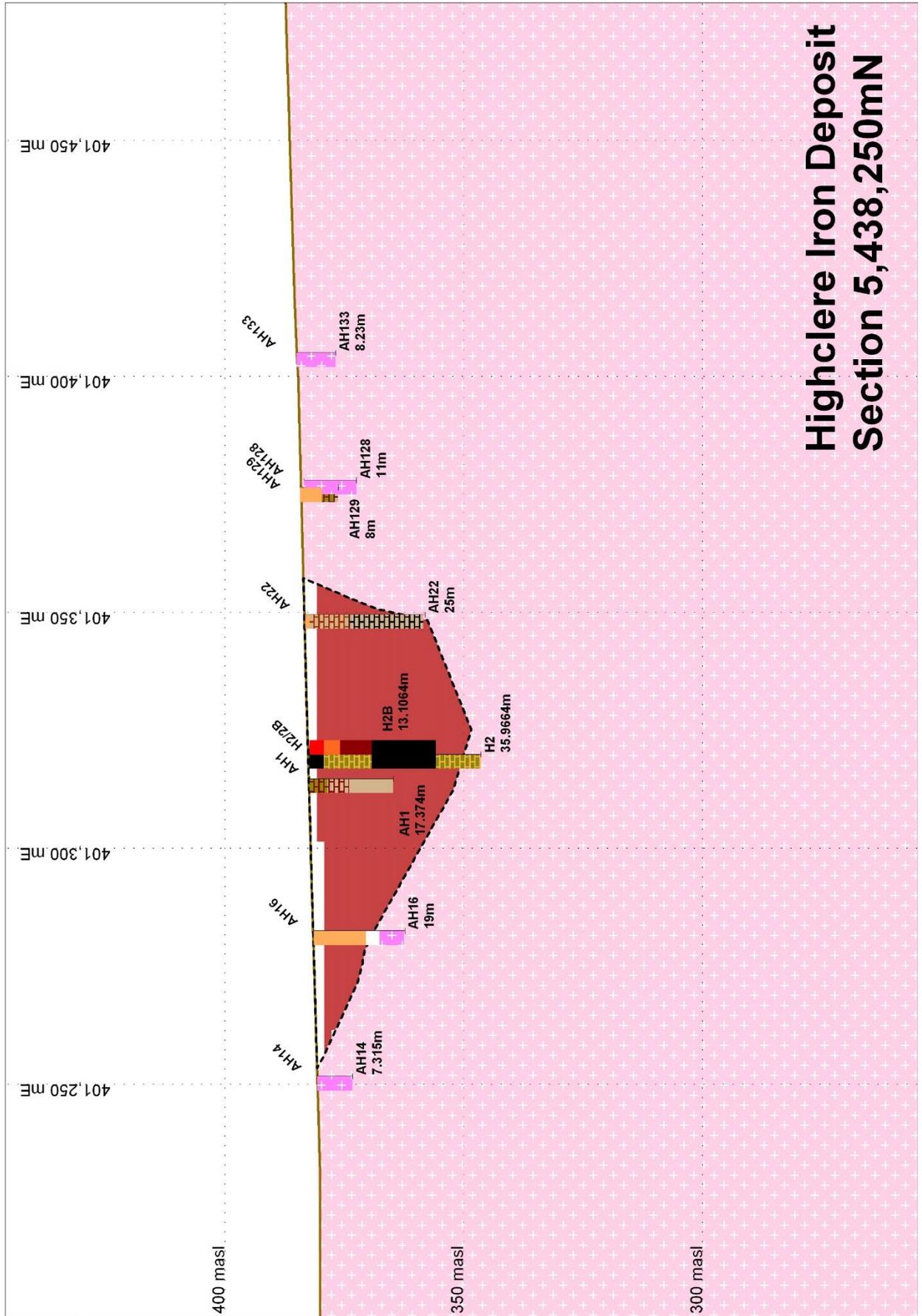


Figure 9.6: Highclere drill section 5,438,250mN.

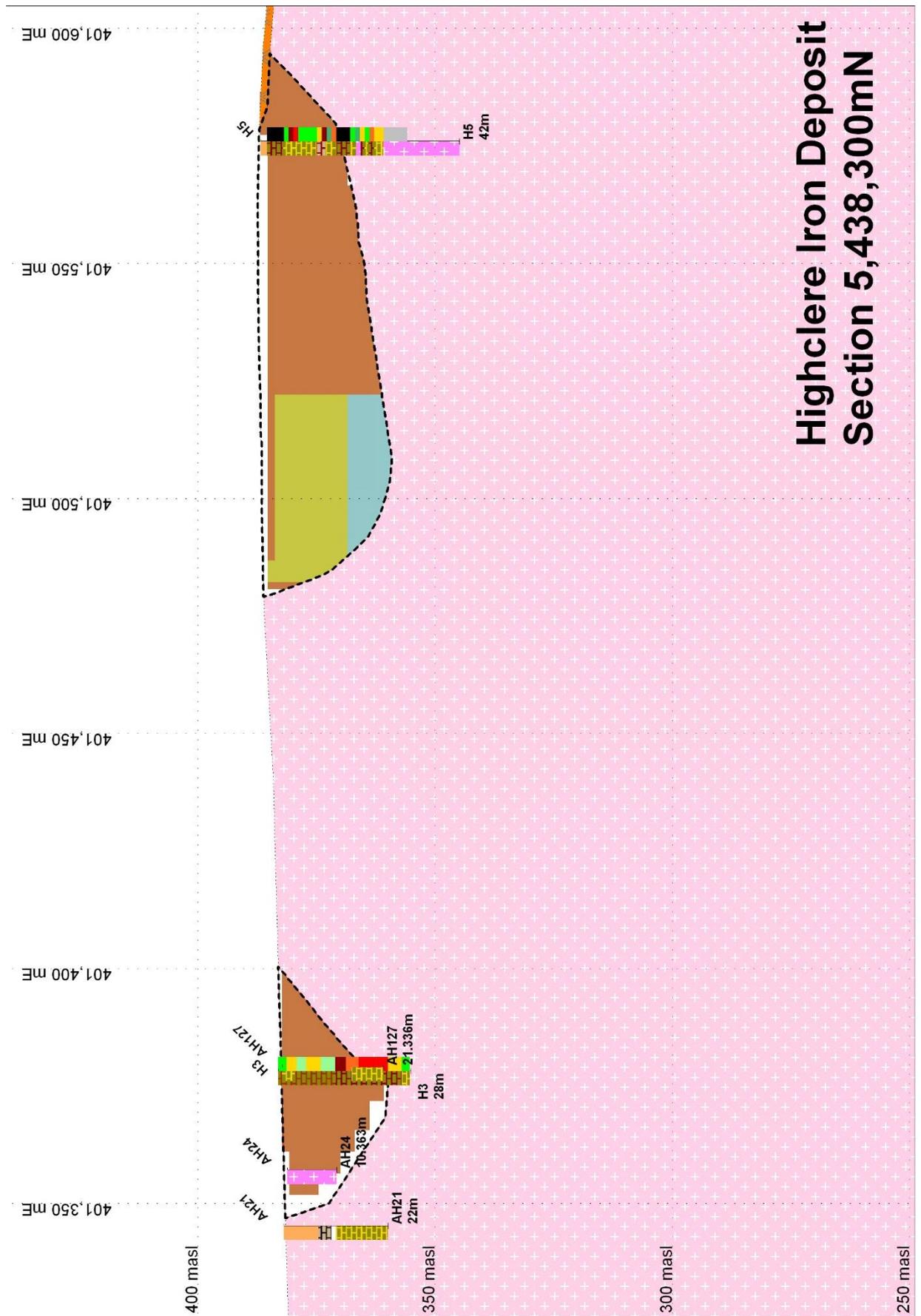


Figure 9.7: Highclere drill section 5,438,300mN.

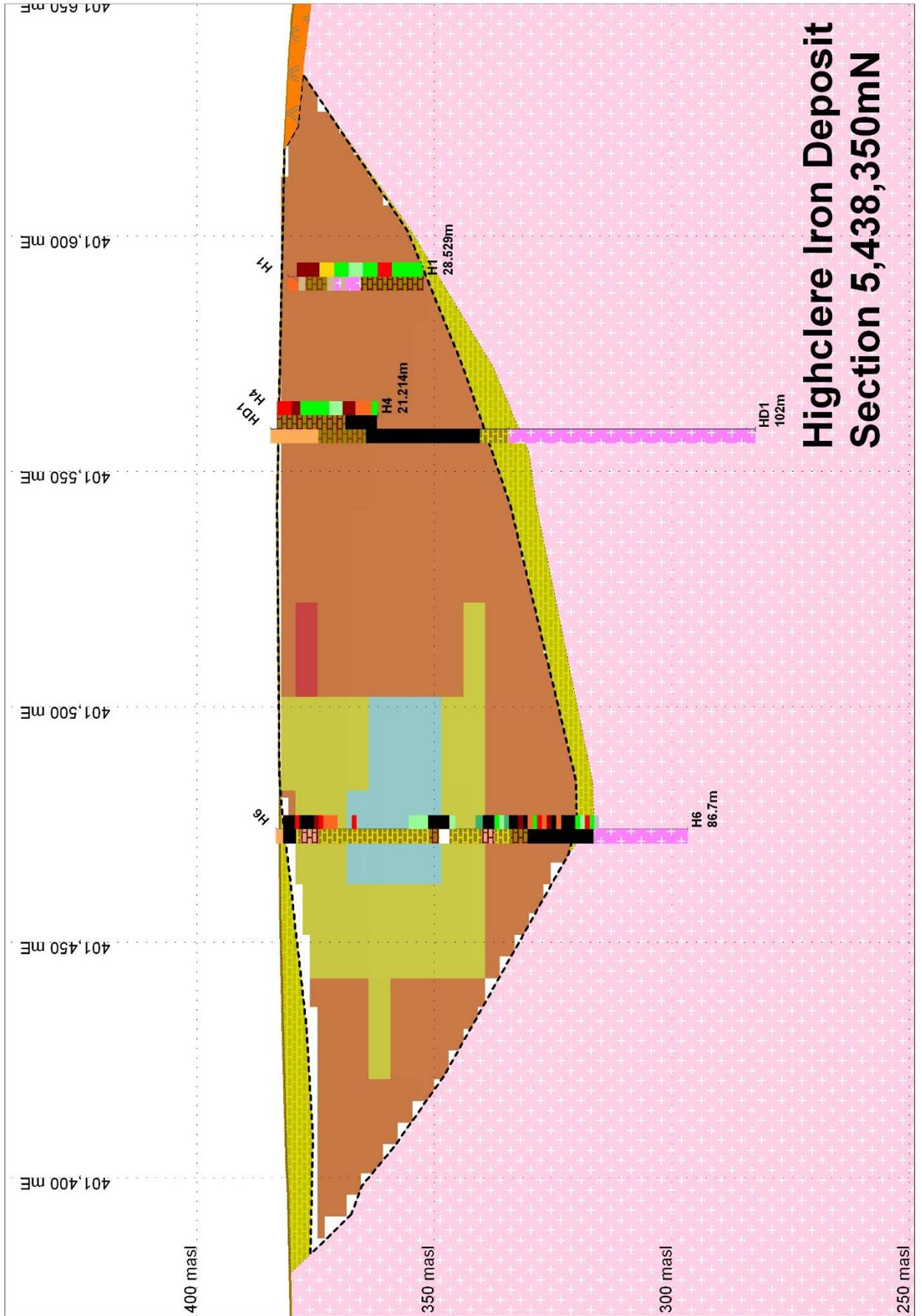


Figure 9.8: Highclere drill section 5,438,350mN.

# Highclere Iron Deposit Section 5,438,400mN

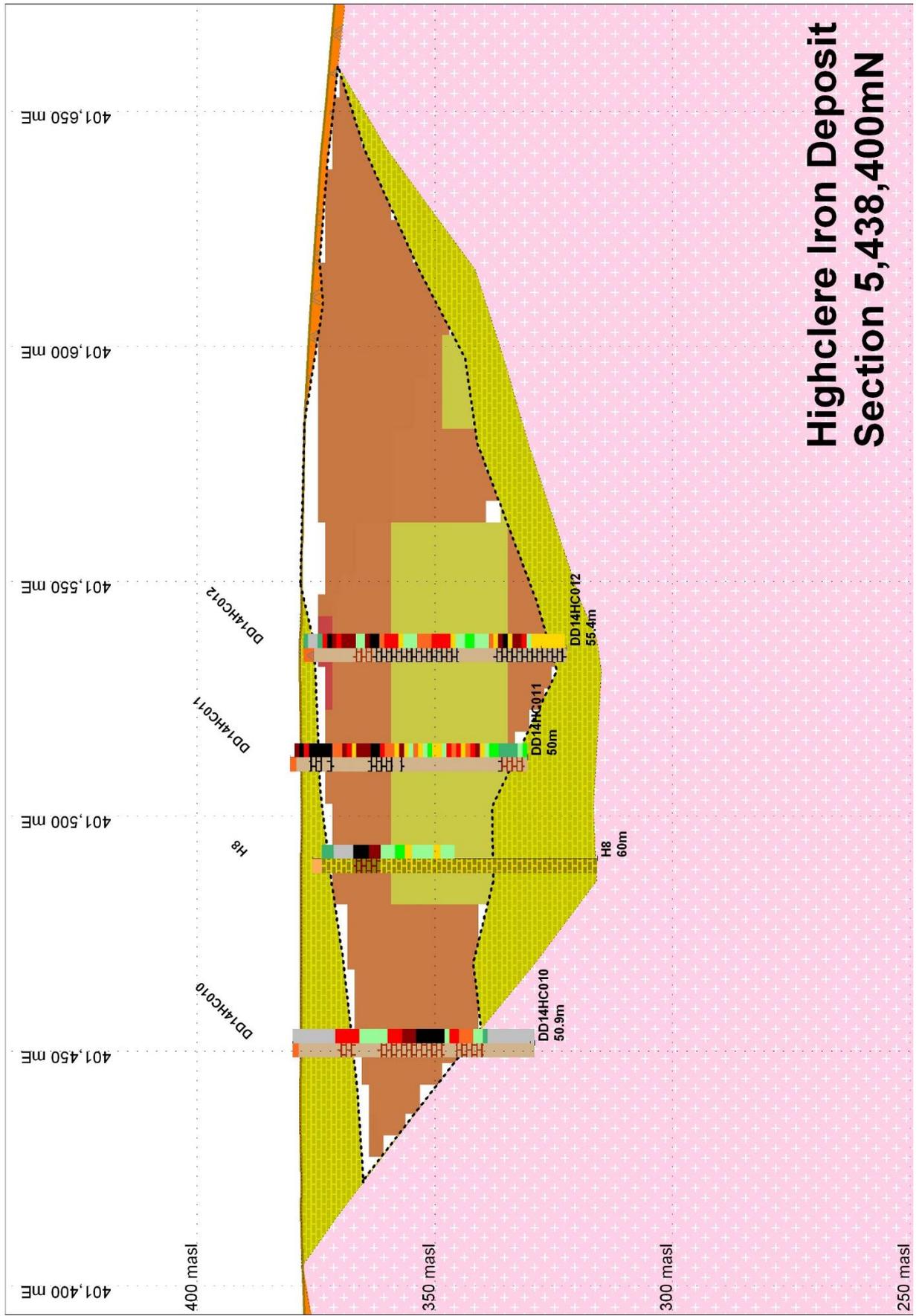


Figure 9.9: Highclere drill section 5,438,400mN.

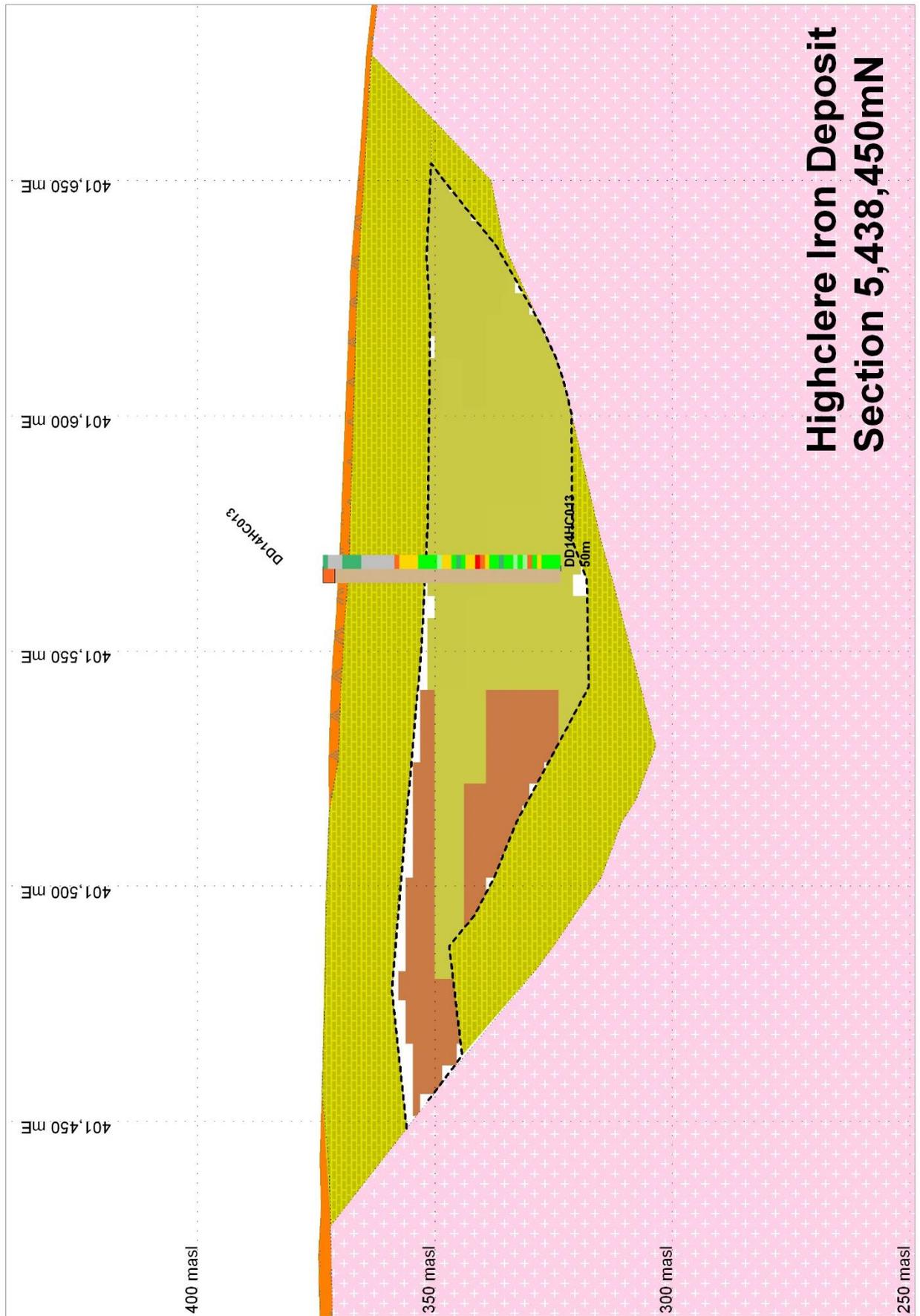
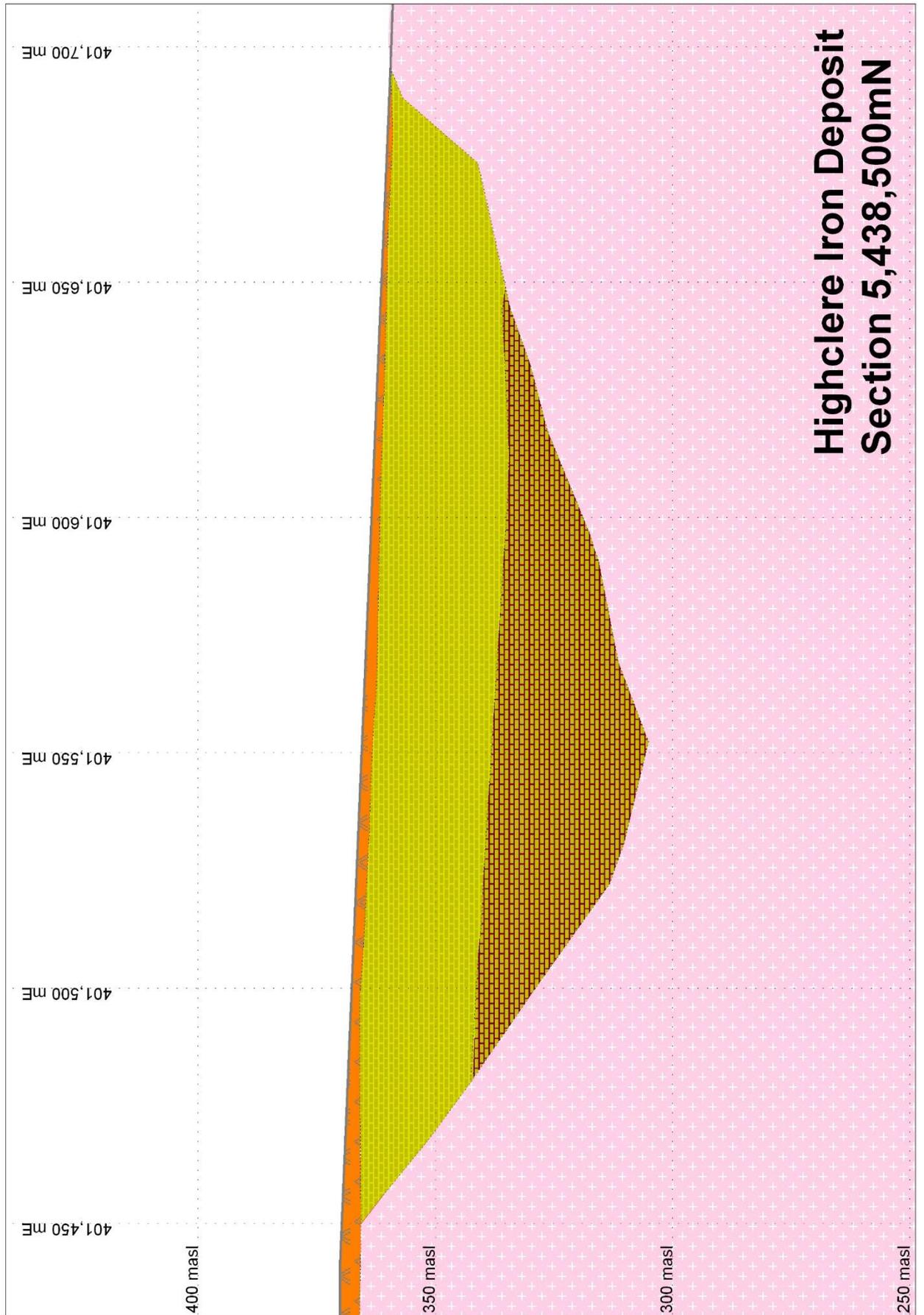


Figure 9.10: Highclere drill section 5,438,450mN.



**Figure 9.11: Highclere drill section 5,438,500mN.**

## **10.0 Potential to Extend or Add to Resource Base**

The Highclere iron deposit was discovered and defined initially by air and ground magnetics. Air and ground magnetic anomalism continues north of the current drilled area at Highclere.

This resource estimate only extends to 5,438,475mN. There is a further ~150m further north of this until the granite outcrops again with coincident anomalous magnetism.

## 11.0 References

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## JORC Code, 2012 Edition – Table 1 report template

### Section 1 Sampling Techniques and Data

(Criteria in this section apply to all succeeding sections.)

Criteria	JORC Code explanation	Commentary
Sampling techniques	<ul style="list-style-type: none"> <li>• <i>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.</i></li> <li>• <i>Include reference to measures taken to ensure sample representivity and the appropriate calibration of any measurement tools or systems used.</i></li> <li>• <i>Aspects of the determination of mineralisation that are Material to the Public Report.</i></li> <li>• <i>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.</i></li> </ul>	<p>2 historic assay data sets and 1 in-house data set,</p> <ul style="list-style-type: none"> <li>• Tasmania Mines Department 1964 (Jack, 1965) – 5 drill holes – H1, H2, H2B, H3 and H4 (effectively 4 with hole 2B drilled to replicate the core lost in upper part of hole 2).</li> <li>• Forward Mining 2012 (Callaghan, 2012) – 4 drill holes – H5, H6, H7 and H8.</li> <li>• Lottah Mining 2014 – 4 drill holes – DD14HC010, DD14HC011, DD14HC012 and DD14HC013.</li> </ul> <p>No reference to sampling methods for 1964 drilling though half core is the default sampling methodology.</p> <p>2012 and 2014 drilling programmes sampling was half core.</p> <p>Also 2 historical geological data sets (no assaying for Fe)</p> <ul style="list-style-type: none"> <li>• 1974 Anzeco auger holes – AH1 to AH25 and AH127 to AH133.</li> <li>• 1982 Shell percussion hole – HD1</li> </ul>
Drilling techniques	<ul style="list-style-type: none"> <li>• <i>Drill type (eg core, reverse circulation, open-hole hammer, rotary air blast, auger, Bangka, sonic, etc) and details (eg 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).</i></li> </ul>	<p>The 3 assay data sets are all from diamond drill core</p> <p>The other 2 geological data sets</p> <ul style="list-style-type: none"> <li>• 1974 AH1 to AH25 and AH127 to AH133 are auger holes</li> <li>• 1982 HD1 is percussion hole</li> </ul>

Criteria	JORC Code explanation	Commentary
<i>Drill sample recovery</i>	<ul style="list-style-type: none"> <li>• <i>Method of recording and assessing core and chip sample recoveries and results assessed.</i></li> <li>• <i>Measures taken to maximise sample recovery and ensure representative nature of the samples.</i></li> <li>• <i>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.</i></li> </ul>	Recoveries generally poor to moderate with potential for sampling bias.
<i>Logging</i>	<ul style="list-style-type: none"> <li>• <i>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.</i></li> <li>• <i>Whether logging is qualitative or quantitative in nature. Core (or costean, channel, etc) photography.</i></li> <li>• <i>The total length and percentage of the relevant intersections logged.</i></li> </ul>	<ul style="list-style-type: none"> <li>• Drill logs from 1964 programme unsited. Drill logs from 2012 drilling satisfactory. Drill logs from 2014 programme poor. Drill logs from 1982 percussion hole good. Drill logs from 1974 auger holes adequate.</li> </ul>
<i>Sub-sampling techniques and sample preparation</i>	<ul style="list-style-type: none"> <li>• <i>If core, whether cut or sawn and whether quarter, half or all core taken.</i></li> <li>• <i>If non-core, whether riffled, tube sampled, rotary split, etc and whether sampled wet or dry.</i></li> <li>• <i>For all sample types, the nature, quality and appropriateness of the sample preparation technique.</i></li> <li>• <i>Quality control procedures adopted for all sub-sampling stages to maximise representivity of samples.</i></li> <li>• <i>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.</i></li> <li>• <i>Whether sample sizes are appropriate to the grain size of the material being</i></li> </ul>	<ul style="list-style-type: none"> <li>• Half core sampling for 2012 and 2014 programmes, uncertain regarding 1964 drilling but expect half-core was used..</li> <li>• No QA/QC reported</li> </ul>

Criteria	JORC Code explanation	Commentary
	<i>sampled.</i>	
<i>Quality of assay data and laboratory tests</i>	<ul style="list-style-type: none"> <li><i>The nature, quality and appropriateness of the assaying and laboratory procedures used and whether the technique is considered partial or total.</i></li> <li><i>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.</i></li> <li><i>Nature of quality control procedures adopted (eg standards, blanks, duplicates, external laboratory checks) and whether acceptable levels of accuracy (ie lack of bias) and precision have been established.</i></li> </ul>	<ul style="list-style-type: none"> <li>1964 drill samples analysed by Tasmania Mines Dept. laboratories.</li> <li>2012 and 2014 samples analysed by Burnie Research Laboratories/ALS in Burnie</li> </ul>
<i>Verification of sampling and assaying</i>	<ul style="list-style-type: none"> <li><i>The verification of significant intersections by either independent or alternative company personnel.</i></li> <li><i>The use of twinned holes.</i></li> <li><i>Documentation of primary data, data entry procedures, data verification, data storage (physical and electronic) protocols.</i></li> <li><i>Discuss any adjustment to assay data.</i></li> </ul>	<ul style="list-style-type: none"> <li>There has been no independent verification by resampling or twinning.</li> <li>Data was hand entered for each drilling programme.</li> </ul>
<i>Location of data points</i>	<ul style="list-style-type: none"> <li><i>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.</i></li> <li><i>Specification of the grid system used.</i></li> <li><i>Quality and adequacy of topographic control.</i></li> </ul>	<ul style="list-style-type: none"> <li>Collar positions determined by hand held GPS for 2012 and 2014 drilling i.e. +/- 3-5m.</li> <li>Collar positions determined by georeferencing for 1964 drilling i.e. +/-3-5m</li> <li>Topography based largely on 10m contours with the 1989 collars also. No issues with use of coarse topographic surface as orebody subsurface for the most part, surfaces near 1989 holes.</li> <li>The grid used is MGA94 zone 55.</li> </ul>
<i>Data spacing and distribution</i>	<ul style="list-style-type: none"> <li><i>Data spacing for reporting of Exploration Results.</i></li> <li><i>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</i></li> </ul>	<ul style="list-style-type: none"> <li>Data spacing sufficient to establish continuity of geology and grade</li> <li>Nominally 50m spaced drill holes.</li> </ul>

Criteria	JORC Code explanation	Commentary
	<p><i>procedure(s) and classifications applied.</i></p> <ul style="list-style-type: none"> <li>• <i>Whether sample compositing has been applied.</i></li> </ul>	
<i>Orientation of data in relation to geological structure</i>	<ul style="list-style-type: none"> <li>• <i>Whether the orientation of sampling achieves unbiased sampling of possible structures and the extent to which this is known, considering the deposit type.</i></li> <li>• <i>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.</i></li> </ul>	<ul style="list-style-type: none"> <li>• All holes drilled vertical into shallowly dipping body.</li> </ul>
<i>Sample security</i>	<ul style="list-style-type: none"> <li>• <i>The measures taken to ensure sample security.</i></li> </ul>	<ul style="list-style-type: none"> <li>• None known of</li> </ul>
<i>Audits or reviews</i>	<ul style="list-style-type: none"> <li>• <i>The results of any audits or reviews of sampling techniques and data.</i></li> </ul>	<ul style="list-style-type: none"> <li>• The database was audited by separate geologist</li> </ul>

### Section 3 Estimation and Reporting of Mineral Resources

(Criteria listed in section 1, and where relevant in section 2, also apply to this section.)

Criteria	JORC Code explanation	Commentary
<i>Database integrity</i>	<ul style="list-style-type: none"> <li>• <i>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.</i></li> <li>• <i>Data validation procedures used.</i></li> </ul>	<ul style="list-style-type: none"> <li>• Visual data appraisal by author is only check on database other than sorting excel spreadsheets to locate outliers.</li> </ul>
<i>Site visits</i>	<ul style="list-style-type: none"> <li>• <i>Comment on any site visits undertaken by the Competent Person and the outcome of those visits.</i></li> <li>• <i>If no site visits have been undertaken indicate why this is the case.</i></li> </ul>	<ul style="list-style-type: none"> <li>• Site visits have been made</li> </ul>
<i>Geological interpretation</i>	<ul style="list-style-type: none"> <li>• <i>Confidence in (or conversely, the uncertainty of) the geological interpretation of the mineral deposit.</i></li> <li>• <i>Nature of the data used and of any assumptions made.</i></li> <li>• <i>The effect, if any, of alternative interpretations on Mineral Resource estimation.</i></li> <li>• <i>The use of geology in guiding and controlling Mineral Resource estimation.</i></li> <li>• <i>The factors affecting continuity</i></li> </ul>	<ul style="list-style-type: none"> <li>• Confidence in overall skarn body shape but less so distribution of iron types within deposit.</li> </ul>

Criteria	JORC Code explanation	Commentary
	<i>both of grade and geology.</i>	
<i>Dimensions</i>	<ul style="list-style-type: none"> <li><i>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.</i></li> </ul>	<ul style="list-style-type: none"> <li>350m long, up to 200m wide, from surface 65m deep.</li> </ul>
<i>Estimation and modelling techniques</i>	<ul style="list-style-type: none"> <li><i>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.</i></li> <li><i>The availability of check estimates, previous estimates and/or mine production records and whether the Mineral Resource estimate takes appropriate account of such data.</i></li> <li><i>The assumptions made regarding recovery of by-products.</i></li> <li><i>Estimation of deleterious elements or other non-grade variables of economic significance (eg sulphur for acid mine drainage characterisation).</i></li> <li><i>In the case of block model interpolation, the block size in relation to the average sample spacing and the search employed.</i></li> <li><i>Any assumptions behind modelling of selective mining units.</i></li> <li><i>Any assumptions about correlation between variables.</i></li> <li><i>Description of how the geological interpretation was used to control the resource estimates.</i></li> <li><i>Discussion of basis for using or not using grade cutting or capping.</i></li> <li><i>The process of validation, the checking process used, the comparison of model data to drill hole data, and use of reconciliation data if available.</i></li> </ul>	<ul style="list-style-type: none"> <li>Inverse Distance Squared with 3 passes (1) 200m diameter spherical search with minimum 1 sample maximum 40, (2) 200m diameter spherical search with minimum 3 samples maximum 40 samples (3) 100m diameter spherical search with minimum 10 samples and maximum 40.</li> <li>No consideration of deleterious elements though indications are none present.</li> <li>Grade cutting not required in bulk commodity ore type.</li> <li>Block size 20mY + 20mX + 5m Z to match ~1/2 drill section separation (Y) and drill hole separation on section (X).</li> </ul>

Criteria	JORC Code explanation	Commentary
Moisture	<ul style="list-style-type: none"> <li>Whether the tonnages are estimated on a dry basis or with natural moisture, and the method of determination of the moisture content.</li> </ul>	<ul style="list-style-type: none"> <li>Tons are dry tons but are +/-20% due to lack of bulk density measurements.</li> </ul>
Cut-off parameters	<ul style="list-style-type: none"> <li>The basis of the adopted cut-off grade(s) or quality parameters applied.</li> </ul>	<ul style="list-style-type: none"> <li>A nominal figure of 30% was chosen in wireframing as it visually defines bound between iron mineralised skarn and calc-silicate skarn types.</li> </ul>
Mining factors or assumptions	<ul style="list-style-type: none"> <li>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.</li> </ul>	<ul style="list-style-type: none"> <li>Assumed deposit will be mined by open cut.</li> </ul>
Metallurgical factors or assumptions	<ul style="list-style-type: none"> <li>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.</li> </ul>	<ul style="list-style-type: none"> <li>No consideration of metallurgy at all. The author has been asked to model the total iron resource without consideration of metallurgy. The widely variable nature of mineralisation from limonitic/goethitic clays to massive hematite and massive magnetite means that this will require work.</li> </ul>
Environmental factors or assumptions	<ul style="list-style-type: none"> <li>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</li> </ul>	<ul style="list-style-type: none"> <li>No consideration of waste though waste is essentially benign being likely to be mildly alkaline.</li> </ul>

Criteria	JORC Code explanation	Commentary
	<p><i>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.</i></p>	
Bulk density	<ul style="list-style-type: none"> <li>• <i>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.</i></li> <li>• <i>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.</i></li> <li>• <i>Discuss assumptions for bulk density estimates used in the evaluation process of the different materials.</i></li> </ul>	<ul style="list-style-type: none"> <li>• No measurements of bulk density have been made. The figure 3.5t/m<sup>3</sup> was selected as approximating a mixture of limonitic/goethitic clays and massive hematite/magnetite.</li> </ul>
Classification	<ul style="list-style-type: none"> <li>• <i>The basis for the classification of the Mineral Resources into varying confidence categories.</i></li> <li>• <i>Whether appropriate account has been taken of all relevant factors (ie 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).</i></li> <li>• <i>Whether the result appropriately reflects the Competent Person's view of the deposit.</i></li> </ul>	Classified as Inferred on basis of deficiencies in the data sets – see below.
Audits or reviews	<ul style="list-style-type: none"> <li>•</li> </ul>	<ul style="list-style-type: none"> <li>• No audits or reviews undertaken.</li> </ul>
Discussion of relative accuracy/	<ul style="list-style-type: none"> <li>• <i>Where appropriate a statement of the relative accuracy and confidence level in the Mineral Resource estimate using an approach or procedure deemed appropriate by the Competent</i></li> </ul>	<p>Whilst classifiable as an Inferred Resource the author has only a moderate confidence in the resource. Major deficiencies are:</p> <ul style="list-style-type: none"> <li>• Complete lack of bulk density data to allow conversion of volumes into tonnages.</li> </ul>

Criteria	JORC Code explanation	Commentary
confidence	<p><i>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.</i></p> <ul style="list-style-type: none"> <li><i>The statement should specify whether it relates to global or local estimates, and, if local, state the relevant tonnages, which should be relevant to technical and economic evaluation. Documentation should include assumptions made and the procedures used.</i></li> <li><i>These statements of relative accuracy and confidence of the estimate should be compared with production data, where available.</i></li> </ul>	<ul style="list-style-type: none"> <li>• Significant core loss removing clayey material at the expense of more massive hematite/magnetite potentially biasing Fe assays upwards.</li> <li>• Moderate quality of drill hole collar positions.</li> <li>• Moderate to poor geological logging.</li> <li>• Lack of QA/QC</li> </ul>

