

Waste Characterisation for Mulga Downs

28 April 2023



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1. Introduction

Mine Earth was commissioned by Hancock Prospecting Pty Ltd (HPPL) to undertake waste rock characterisation for the proposed Mulga Downs Iron Ore Project (the Project).

The aim was to determine the environmental geochemical and erosional stability properties of key waste rock units from the Project, to develop a preliminary inventory and to provide associated recommendations for waste rock management. The scope included:

- Conduct a desktop review of the geological database to provide context for the geochemical assessment.
- Select representative samples for detailed geochemical testwork to determine the environmental geochemical properties of key waste rock units including the potential for acidic, metalliferous and / or saline drainage.
- Determine the likely erosional stability of the key waste rock units.
- Develop a preliminary inventory and management recommendations for key waste rock units.

During the initial stages of the assessment, the resource areas were still being refined and pit shells were not available. The drillholes targeted to provide material for detailed geochemical testwork were selected, based on spatial coverage across the Project area and on lithological representation across the key waste rock units.

2. Background

2.1 Operations

The Project is located approximately 210 km south of Port Hedland and 180 km north-west of Newman in the Pilbara region of Western Australia (Figure 1) and lies in the Chichester Range immediately north of the Fortescue River valley (Figure 1).

The current mine plan includes the development of multiple open pits shown in Figure 2, which will be mined both above and below the water table. All pits will be backfilled with waste rock to 2 m above the recovered groundwater level.

2.2 Geology

The Project is located within the Hamersley Province. The Mulga Downs deposit is hosted in the Marra Mamba Iron Formation (MMIF) of the Proterozoic Hamersley Group, conformably overlying the Jeerinah Formation of the Fortescue Group (Figure 3). The Wittenoom Formation (including the West Angela Member shale) overlies the MMIF (Hancock Prospecting 2015).

The MMIF is the basal Formation of the Hamersley Group and is characterised by sedimentary rocks including banded iron formation (BIF), chert and shale. The MMIF is subdivided into three Members:

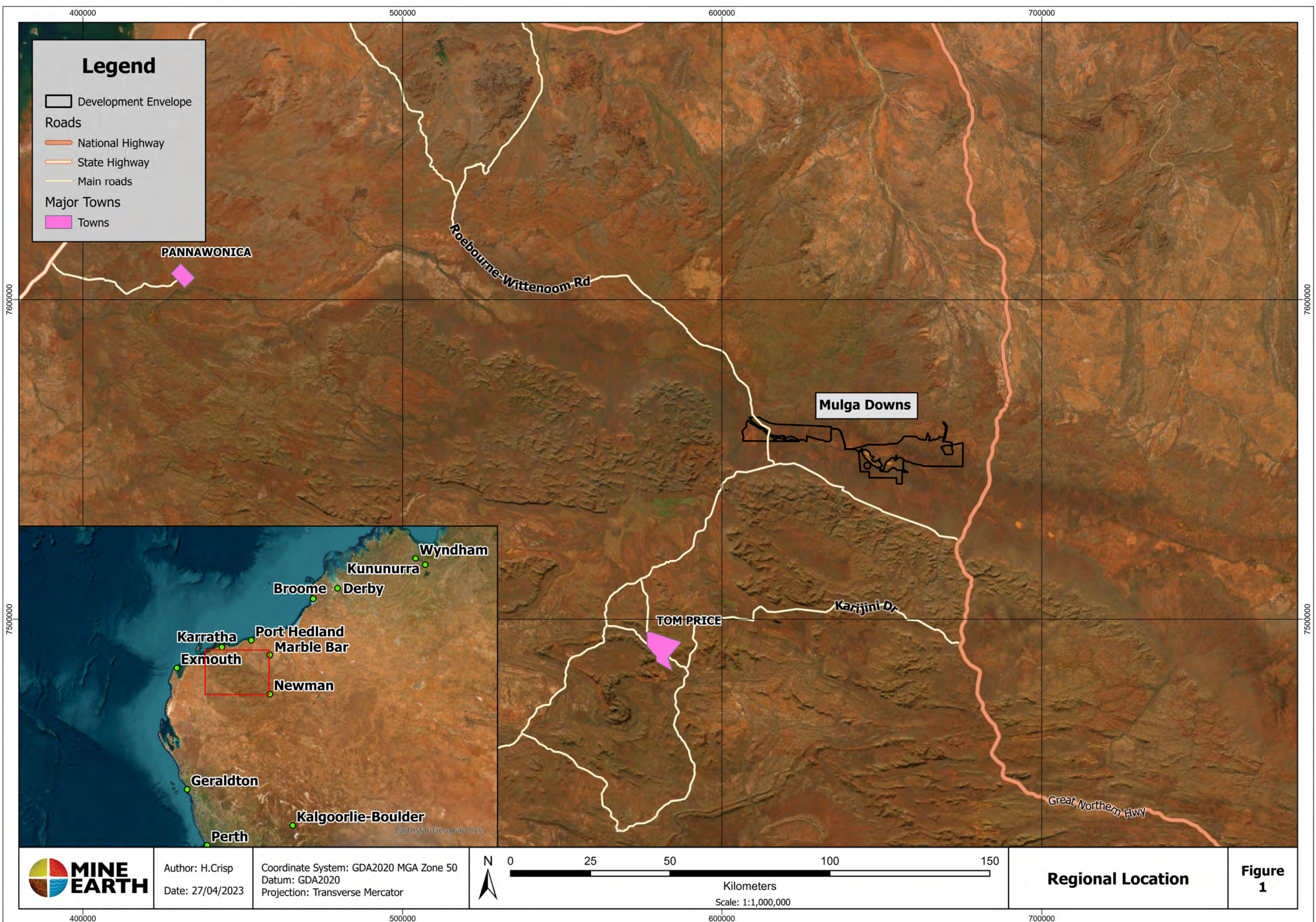
- Mount Newman Member (NEW) comprises BIF with thin shale intervals. It is the predominant host to iron mineralisation in the MMIF and is approximately 60 m thick (Hancock Prospecting 2009).
- MacLeod Member (MAC) consists of shale, BIF and chert as interbedded units. It has an approximate thickness of 45 m (Hancock Prospecting 2009).
- Nammuldi Member (NAM) is the lowermost unit of the Hamersley Group and conformably overlies the Roy Hill Shale member of the Fortescue Group. It is approximately 60 to 100 m thick and consists of BIF, podded chert and shale as alternating mesobands (Hancock Prospecting 2015).

The Jeerinah Formation (JER) comprises volcanics and interbedded sediments including shale, sandstone and carbonaceous pelite and is exposed along the Chichester Range. The upper part of this Formation is composed of mudstone and siltstone with black carbonaceous shale. Within the Project area, the Jeerinah Formation is locally pyritic and dolomitic (Hancock Prospecting 2015).

At the Project, alluvial sediments occur within the Fortescue Valley and consist of unconsolidated silt, sand and gravel of the ephemeral creeks and riverbeds, and clay, silt and sand of the adjacent flood plains (CzD3). Calcrete horizons generally underly the alluvials. Detrital material has formed in places as part of paleo-erosional channels which cut the MMIF.

Channel iron and detrital scree slope deposits have been recognised at the Project (CzD2) and can host secondary mineralisation (Hancock Prospecting 2015).

Mineralisation is characterised by a weathered, hydrated horizon or hardcap with elevated iron in places. Localised patches of manganiferous material occur on outcrops of the MMIF and is closely associated with hardcap and detritals (Hancock Prospecting 2015).



PANNAWONICA

Roebourne-Wittenoom Rd

Mulga Downs

TOM PRICE

Karijini Dr

Great Northern Hwy

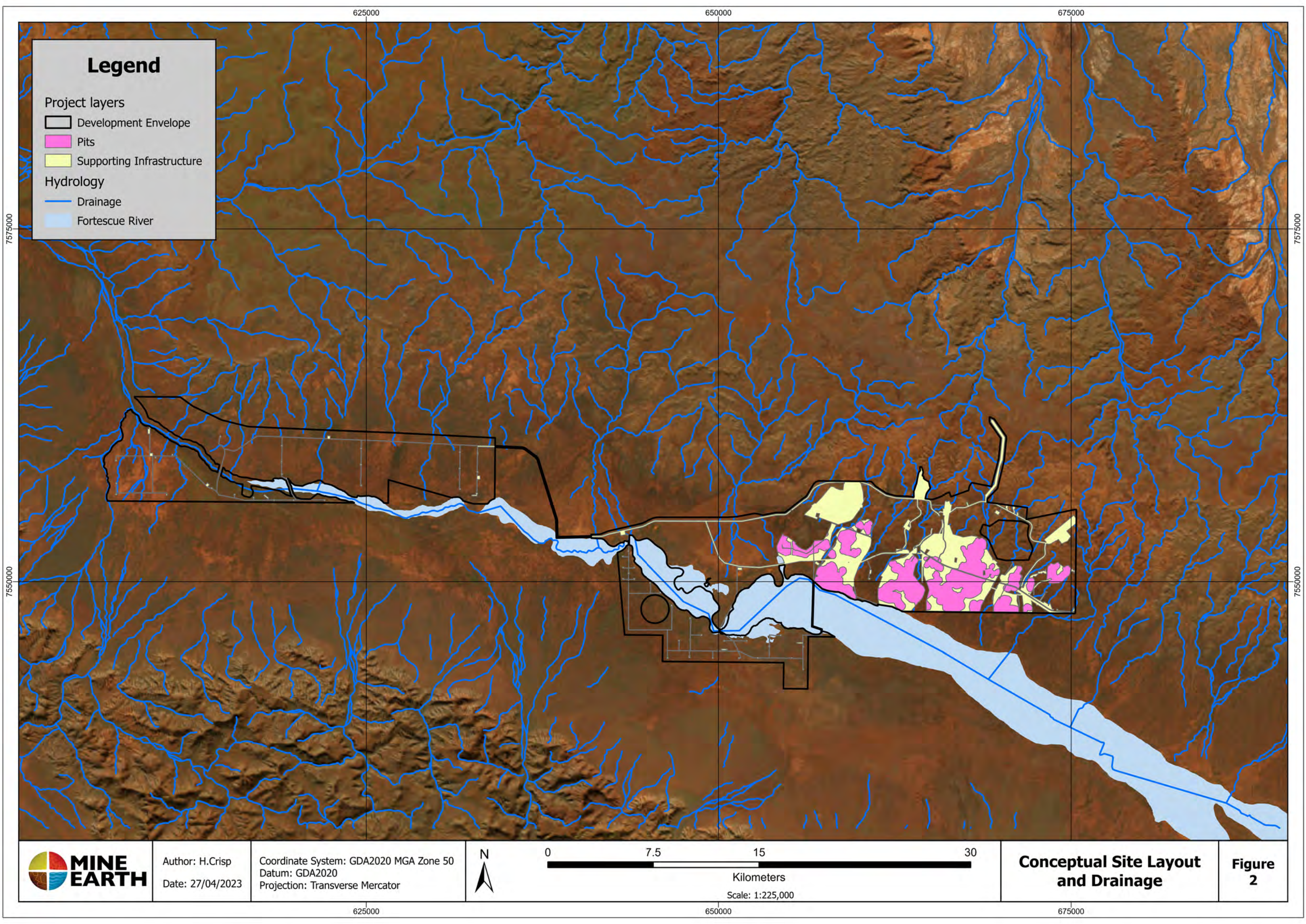
Wyndham
Kununurra
Broome
Derby
Karratha
Port Hedland
Marble Bar
Exmouth
Newman
Geraldton
Perth
Kalgoorlie-Boulder



Author: H.Crisp
Date: 27/04/2023
Coordinate System: GDA2020 MGA Zone 50
Datum: GDA2020
Projection: Transverse Mercator



0 25 50 100 150
Kilometers
Scale: 1:1,000,000



Legend

Project layers

Development Envelope

Pits

Supporting Infrastructure

Hydrology

Drainage

Fortescue River



Author: H.Crisp

Date: 27/04/2023

Coordinate System: GDA2020 MGA Zone 50

Datum: GDA2020

Projection: Transverse Mercator

N

0

7.5

15

30

Kilometers

Scale: 1:225,000

**Conceptual Site Layout
and Drainage**

**Figure
2**

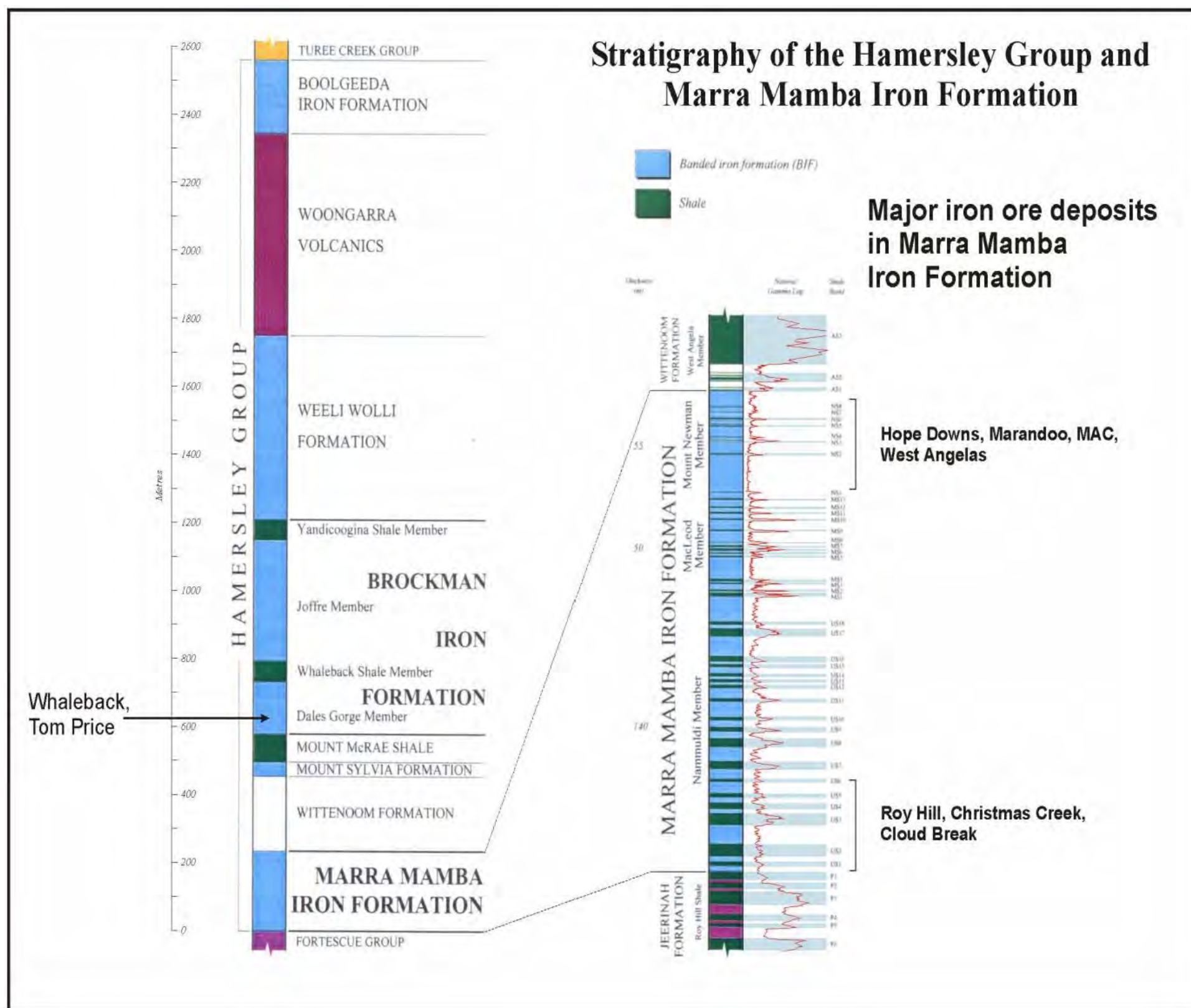


Figure 3: Geological stratigraphy for the Project

2.2.1 Material tonnages

The approximate waste rock tonnages and relative proportions to be mined from the Project are presented in Table 1. Table 1: Estimated Project waste rock tonnages and proportions. Oxide material from CzD3 will be the dominant waste rock type overall (62%) followed by material from CzD2 (12%) and the Mount Newman, MacLeod and Nammuldi Members (26%). Due to the identification of carbonaceous shales within the Jeerinah Member, this stratigraphic unit was deliberately avoided with the design of the pit shells.

Table 1: Estimated Project waste rock tonnages and proportions¹

Strat Unit	Total Mass (t)	Proportion
CzD3	420,034,920	62%
CzD2	82,585,500	12%
Mount Newman (NEW)	44,099,378	7%
MacLeod (MAC)	92,825,092	14%
Nammuldi (NAM)	33,518,709	5%
Jeerinah (JER)	0	0%
Total	673,063,599	100%

2.3 Groundwater

The Fortescue River valley comprises a network of interconnected ephemeral swamps, claypans and floodplains. The Fortescue Marsh is the largest ephemeral wetland in the Pilbara region.

Five main hydrogeological units have been identified the Project area, including a Tertiary / Quaternary Cover and four bedrock units, namely:

- fresh Jeerinah and Marra Mamba formations
- fresh West Angela Member (Wittenoom Formation)
- Altered Marra Mamba Formation and West Angela Member
- Dolomite of the Wittenoom Formation

AQ2 (2022) combined the “dolomitic Nammuldi unit (DNAM)” into the Jeerinah unit due to their lithological similarities (both are carbonaceous black shales).

The water table is shallow and varies from 3 to 5 m below ground level (bgl) in the valley, and up to 45 m bgl in the more elevated areas to the north. Groundwater flows from the topographically higher areas into the valley (in a south-westerly direction) and then in a north-westerly direction along the valley. The hydraulic gradient in the lower laying areas is low, indicating transmissive aquifers, whereas the hydraulic gradient steepens along the northern boundary of the Project area, indicative of the lower permeability units such as the Jeerinah and lower Nammuldi aquitard (AQ2 2022).

Groundwater quality across the Project area generally ranges from slightly acidic to slightly alkaline, and salinity is fresh to saline (180 – 17,000 mg/L total dissolved solids). The saline groundwater conditions are generally found in the upper reaches of the groundwater system in the valley area. In the north-eastern bores and at depth, groundwater pH values were as low as pH 3.6 to 4.4. It is anticipated that these low pH values

¹ Tonnages provided in March 2023 in file “Strat and Strand 20230302”

are associated with sulphide oxidation in the Jeerinah unit, caused by oxygenated groundwater flowing through fractures (AQ2 2022).

Groundwater across the ore body area has no dominant cations or anions, indicative of the potential mixing of several groundwater types. Groundwater downgradient from ore bodies is chloride and sodium dominant which could be attributed to the leaching of salts from claypans in the valley. Bicarbonate dominant groundwater occurs in the vicinity of the alluvial fans between the claypans, while chloride dominant groundwater with no dominant cation occurs in isolated areas that are characterised by clay rich facies or weathered shale (AQ2 2022).

2.4 Climate

The climate is classified as semi-arid, with two distinct seasons characterised by hot summers and mild winters, seasonal periodic rainfall and high evaporation rates. Rainfall is highly variable, but often associated with thunderstorm and cyclone events in the months of December to March (AQ2 2022). Climate data has been collected from the nearby Wittenoom (5026) and Mulga Downs (5015) weather stations, operated by the Bureau of Meteorology (BoM) since 1951 and 1898, respectively. Both weather stations closed in 2019.

Based on the Wittenoom weather station, the mean maximum temperature is highest in December (39.8°C) and lowest in July (24.3°C), while the mean minimum temperature is lowest in July (11.5°C) and highest in January (26.0°C) (BoM 2019).

The Mulga Downs station provides long-term rainfall data which shows three distinct periods:

- A dry period between 1900 and 1950 when the annual average rainfall was 321 mm.
- A wetter period between 1950 and 1995 when the annual average rainfall was 365 mm.
- A wet period between 1995 and 2018 when the annual average rainfall was 480 mm.

The rainfall data collected at the Wittenoom weather station presents a more complete dataset for recent years and thus best reflects the transition towards a wetter period. The long-term average annual rainfall for the Wittenoom weather station is 461.8 mm/year (1951 to 2019) compared to 367 mm (1897 to 2019) for the Mulga Downs weather station. Annual total rainfall values at Wittenoom range from 143.2 to 1,344.6 mm reflecting the variable nature of rainfall in the area driven predominantly by cyclonic events and tropical lows. The largest rainfall events typically occur in January, which averages approximately 115.9 mm rainfall (BoM 2019).

Evaporation rates are at their highest during the summer months, with December recording the highest average daily evaporation of 14.4 mm/day (BoM 2019).

3. Methods

Mine Earth adopts a phased approach for mine waste characterisation that builds upon internationally accepted acid-rock drainage documents and methodologies such as Global Acid Rock Drainage Guide (INAP 2009), Acid Rock Drainage Test Handbook (AMIRA 2002), and Prediction Manual for Drainage Chemistry from Sulphidic Geological Materials (Price 2009).

3.1 Drilling database review

The drilling database for the Project was reviewed to determine the spatial coverage of the drillholes across the deposit and evaluate the available downhole assay data. Where assay data was available, the ranges of sulphur and multi-element results were assessed to provide a preliminary indication of the geochemical character of the key lithology types.

Ore grade was segregated within the database using the following cut-off:

- Ore >54.4% Fe.
- Waste ≤54.4% Fe.

The drilling database contained results for 213,760 samples from 9,755 drillholes.

3.1.1 Preliminary acid-base accounting

The tendency for a sample to generate acid depends on the balance between its acid forming and acid neutralising constituents and can be quantitatively determined through acid-base accounting (ABA).

Sulphur (S) from available assays reported as S% was used as a first-pass indicator for maximum potential acidity (MPA) calculations by assuming the MPA is generated as pyrite (30.6 kg H₂SO₄/t for 1% sulphur). This method can overestimate acidity since sulphur can be present in a variety of forms, generally either as sulphides (including pyrite, pyrrhotite, chalcopyrite etc.), sulphates (including non-acid generating forms such as gypsum and acid-generating forms such as alunite) or organics forms.

To determine a corresponding acid neutralisation capacity (ANC), calcium (Ca) from available assays reported as CaO% was used as a first-pass indicator for calcium carbonates such as dolomite or calcite, once a direct relationship was able to be confirmed via supporting testwork. This method assumes that all Ca is present in the form of calcite for calculating the Ca-ANC (17.5 kg H₂SO₄/t for 1% of CaO). The risk with this assumption is that Ca minerals may be present that do not contain equivalent neutralising potential (e.g. gypsum or silicate minerals such as feldspar) which may lead to overestimating the neutralising potential. Further, other minerals may be present that do not contain Ca in their composition but contribute to the overall neutralising potential (e.g. magnesite, chlorites), thereby underestimating the neutralising potential by their exclusion.

Testwork conducted by Mine Earth on 68 drillhole samples demonstrated that, for this Project, the use of Ca as a proxy for calculated ANC underestimates the neutralising potential in most samples and would be a conservative approach. Additional testwork should be conducted to further confirm the use of Ca for ANC calculations.

For the preliminary ABA assessment, the neutralisation potential ratio (NPR) as described in the MEND guide (Price 2009) was applied and calculated as follows: $NPR = ANC / MPA$.

The preliminary acid formation potential (AFP) classifications were determined as follows:

- Non-acid-forming (NAF) where NPR was ≥2.0.
- Potentially acid-forming (PAF) where NPR was <2.0.

3.1.2 Multi-element assessment

The drilling database contained assay data for 22 elements across 213,760 samples (Table 2). The multi-element assay results were assessed against general background levels, based on a scale derived from the Geochemical Abundance Index method (GAI) (INAP, 2009). This scale was used to compare the multi-element composition of key lithology types with the average crustal abundance (ACA) for each element and identify any elemental enrichments. For simplicity, GAIs of 3 and 6 were used to identify degrees of enrichment in the samples. Enrichment of 12 times the ACA is equivalent to a GAI of 3, and 96 times the ACA is equivalent to a GAI of 6. The ACA values were derived from those typically recorded for soils, regolith and bedrock derived from unmineralised terrain (Bowen 1979, Reimann and Caritat 1998)).

Table 2: Available multi-element suite in database

Parameter	Elements
Multi-element composition	Al, As, Ba, Ca, Co, Cr, Cu, Fe, K, Mg, Mn, Ni, P, Pb, S, Si, Sn, Sr, Ti, V, Zn, Zr

3.2 Sample selection

Following the preliminary review of the drilling database, 71 drillholes were selected for full downhole multi-element assaying (59 elements via four-acid digest) to generate an additional dataset of 3,013 samples (Table 3). These drillholes also provided the samples for detailed geochemical testwork (Section 3.3).

The wider elemental suite and full downhole analysis helps inform representative sample selection and is presented in Appendix A.

Project pit shells had not yet been determined at the time that the 71 drillholes were selected. The drillholes were chosen based on broad resource boundaries and lithological coverage.

Table 3: Multi-element suite for additional drillholes

Parameters	Details
Multi-element composition	Ag, Al, As, Ba, Be, Bi, Ca, Cd, Ce, Co, Cr, Cs, Cu, Dy, Er, Eu, Fe, Ga, Gd, Hf, Ho, In, La, Li, Lu, K, Mg, Mn, Mo, Na, Nb, Nd, Ni, P, Pb, Pr, Rb, Re, S, Sb, Sc, Se, Sm, Sn, Sr, Ta, Tb, Te, Th, Ti, Tl, Tm, U, V, W, Y, Yb, Zn, Zr

3.3 Geochemical assessment

Downhole multi-element assays were used to inform the selection of 68 (mostly 4 m downhole) composite samples, representative of the key lithology types. These samples were subjected to detailed geochemical testwork (Table 4) to determine their acid-forming and metalliferous drainage characteristics. Intertek Genalysis (Intertek), Environmental Analysis Laboratory (EAL), ALS Metallurgy (ALS), Microanalysis and Graeme Campbell and Associates (GCA) conducted detailed testwork.

Table 4: Detailed geochemical testwork

Characteristic	Parameters and specific tests	Laboratory
Mineralogy	Structural identification of component minerals	ALS Microanalysis
Natural pH and salinity	pH, EC	Intertek
Sulphur / carbon forms	Total-S	Intertek
	Chromium-reducible sulphur (CRS)	EAL
	Total-C	Intertek
	Carbonate-carbon (CO ₃ -C)	Intertek
Acid generation	MPA (calculation)	-
	Net acid generation (NAG) and NAG-pH	Intertek
Acid neutralisation	ANC (testwork and calculation)	Intertek
	pH buffering curves via auto-titration	Intertek
Sulphide intrinsic reactivity	Direct measurement of rate of oxygen consumption (OCR _{30°C})	GCA
Multi-element composition	Wider suite than for the database and subset drillholes, with lower detection limits for selected elements	Intertek
Element solubility	Water extraction testwork	Intertek

3.3.1 Mineralogy

Thirty-two samples were analysed for their mineralogical composition via semi-quantitative powder X-ray diffraction (XRD).

3.3.2 Acid-base accounting

Sample pH and salinity provide an important indication of current drainage quality. ABA aims to predict the potential for future acidic drainage. ABA for the 68 samples was assessed as-per the method described in Section 3.1.1 with the following adjustments.

Chromium-reducible sulphur (CRS) was determined on all samples with total-S $\geq 0.1\%$. Where available, the CRS result was used to calculate the MPA as it reflects the sulphide-S content and thus the effective MPA. Net acid generation (NAG) testwork was also conducted on all samples with total-S $\geq 0.1\%$ and aims to measure the net acidity produced under oxidising conditions by the addition of hydrogen peroxide. Under ideal test conditions, acid generation and acid neutralising reactions occur simultaneously, and the net acidity produced can be reported in kg H₂SO₄/t.

Total-C, CO₃-C and ANC analyses were determined on all detailed geochemical samples. The ANC analysis was performed with a slight modification to the method described in the AMIRA handbook (2002). Instead of

using a pulped (<75 µm nominal) sample, a coarser sample fraction (<2 mm nominal) was used to avoid an artificial increase in the effective surface area under laboratory conditions. Secondly, the final pH allowance range was widened (pH range 0.8 to 4.0) to reduce the dissolution of aluminosilicates unavailable for circum-neutral buffering. Both testwork modifications aimed to focus on the contribution of carbonates to the ANC and provided a more conservative approach. The CO₃-C ANC was calculated assuming the neutralising capacity was generated identical to calcite (81.7 kg H₂SO₄/t for 1% of CO₃-C). A comparison between measured ANC values, calculated Ca-ANC values and calculated CO₃-C ANC values, in combination with interpretation of the shapes of the pH buffering curves determined via auto-titration, facilitated the assessment of alkalinity forms effective in circum-neutral buffering during mine waste weathering.

The AFP was determined based on the NPR as described in MEND (2009) and Section 3.1.1 and compared to the net acid production potential (NAPP) and NAG as described in AMIRA (2002). The NAPP was calculated as follows and expressed in kg H₂SO₄/t:

- $NAPP = MPA - ANC$.

Due to the availability of NAGpH in the detailed geochemical testwork, more information could be used in defining the AFP classification, as follows:

- NAF, where NAPP was <0 and NAGpH was ≥4.5.
- PAF, where NAPP was ≥0 and NAGpH was <4.5.

Samples that fell between these two categories were classified as Uncertain. When there were apparent conflicts between the NAPP and the NAG results, and / or between the ratio method and the AMIRA classification, other site-specific factors or additional testwork results were taken into consideration (e.g. sulphur forms, mineralogy, pH buffering curves) to resolve the discrepancy where possible.

In terms of PAF classification, low capacity PAF (PAF-LC) variants were defined as (LPSPD 2016):

- PAF-LC, where NAPP was less than 10 kg H₂SO₄/tonne.

The use of NAG has been excluded from the above criteria as it did not apply for all samples.

3.3.3 Sulphide reactivity

Sulphide reactivity was determined through oxygen consumption rate (OCR) measurements. The testing was performed on the dry-sieved -4.75mm fractions which were moisture conditioned and aged to equilibrate prior to testing. The oxygen consumption was then measured over a known period of time (hours) to determine OCRs in kg O₂/kg/s. The OCR is an indicator for sulphide reactivity and generally the higher the OCR, the higher the sulphide reactivity.

3.3.4 Total element composition

Multi-element assays were conducted via four-acid-digestion (hydrochloric acid, nitric acid, hydrofluoric acid and perchloric acid) with an inductively coupled plasma with optical emission spectrometry finish for the major elements, and with a mass spectrometry finish for minor elements. Four acid digestion provides near complete dissolution of rock minerals.

The multi-element assay results were assessed against general background levels using the method outlined in Section 3.1.2.

3.3.5 Element solubility

Element solubility was assessed via water extraction testwork. An 18-hour bottle roll was conducted by employing a 1:2 solid:liquid ratio using the -2 mm sample fraction and deionised water. Water extraction

provides an indication of the leachability of metals under laboratory conditions and for the current weathering state of samples, which might differ vastly to concentrations experienced under field conditions.

To assess the potential for saline and/or metalliferous drainage, the leachate results were assessed against local groundwater quality. Provisional surface and groundwater quality site specific trigger values have been established for the Project (Burgers 2023). The results from water extraction testwork can be compared against the provisional groundwater quality trigger values (80th percentile), though this should be updated once more information becomes available when more water quality analysis have been undertaken to complement the dataset.

3.3.6 LEAF testing

Further testing of element solubility behaviour under varying conditions is being undertaken on a subset of samples. This analysis will involve the testing of samples at varying solid:liquid ratios and pH conditions, assessing the potential for saline and/or metalliferous drainage using the method described by the United States Environmental Protection Agency (US EPA) Leaching Environmental Assessment Framework (LEAF).

3.4 Erosional stability

The susceptibility of waste rock types to weathering and erosion was inferred by reviewing the geological characteristics of the key waste rock lithologies. The drilling database was used to source geological information on lithology, mineralogy, alteration, structure and oxidation extent. The mineral composition of key lithology types was assessed to provide an indication of potential durability, susceptibility to dissolution and overall erodibility. Useful information that was derived from the assessment of rock types and their mineral composition included:

- Rock hardness (physical durability) and susceptibility to fragmentation during mechanical disturbance. This was assessed from the Deere (1988) Rock Quality Designation (RQD) scale (degree of fracturing in core), and the relative abundance of component minerals and their hardness (using Mohs mineral hardness scale). The RQD scale is presented in Table 5.
- Susceptibility of a rock type to degradation via dissolution during weathering. This is based upon an assessment of the relative abundance of component minerals and their dissolution rates (using a modified Goldich scale (White and Brantley 1995)).
- Susceptibility to fragmentation during mechanical disturbance based upon degree of structural deformation and consolidation.
- Likely mineralogical products of the weathering process, to identify the potential for low stability derivatives from parent rock types including, but not limited to shrink-swell clays.

Based on the characteristics observed for each lithology type, the following stability categories were applied:

- **High stability** rock is likely to demonstrate high erosion resistance and should be suitable for placement on final landform slopes. High stability waste rock should provide a useful source of durable rock armour.
- **Moderate stability** rock is likely to demonstrate moderate erosion resistance. The suitability of moderate stability rock for use on final landform slopes should be verified during mining and will depend upon the as-dumped properties of the rock, the geometry of and the associated drainage configuration for the landform slopes.
- **Low stability** rock is likely to demonstrate low erosion resistance and should not be placed on final landform slopes. Low stability rock will require the application of rock armour if exposed on final landform slopes.

Table 5: Rock Quality Designation

RQD	Description of Rock Quality
0 – 25%	Very Poor
25 – 50%	Poor
50 – 75%	Fair
75 – 90%	Good
90 – 100%	Excellent

3.4.1 Exchangeable cations and Emerson Aggregate Test classifications

The potential for dispersion of the clay fraction of selected oxide samples was assessed to complement the erosional stability assessment.

The physical stability of oxidised rock and its susceptibility to structural decline is dependent on the degree of weathering, amount and type of clays present, chemical composition, and the degree of disturbance. The Emerson Dispersion Test (EDT), exchangeable cations, exchangeable sodium percentage (ESP) and cation exchange capacity (eCEC) were assessed to provide an indication of the potential for clay dispersion and resulting physical stability. Mine Earth and CSBP conducted the physical testwork.

Materials with a dispersive clay fraction can have a weak structure that is easily degraded upon saturation (resulting in low physical stability). If Na cations (Na^+) are dominant on clay exchange surfaces and the exchangeable sodium percentage (ESP) exceeds 6% of the total exchangeable cations, then the material is classified as 'sodic', which can lead to poor physical properties (i.e. clay dispersion, hard-setting and erosion in clay-rich materials). ESP values over 15% are classified as 'highly sodic'.

The EDT identifies the potential for breakdown (slaking) and dispersive properties of soil / regolith aggregates in water. This test identifies the characteristics under a worst-case scenario where severe stress is applied. Generally, samples allocated into Emerson Classes 1 and 2 are those most likely to exhibit dispersion of the clay sized fraction and therefore be the most problematic. The EDT was assessed using the <2 mm fraction of the samples.

4. Results

4.1 Drilling database review

4.1.1 Preliminary acid-base accounting

The waste rock sulphur results are presented in Preliminary ABA was conducted on the drilling database to provide an indication of the character of acid forming and neutralising components for the stratigraphic units. Figure 5 displays the distribution of results for MPA and ANC. The following observations can be made:

- Most JER samples and approximately half the NAM samples were classified as PAF. Should these units occur within the planned pits, the acid-forming nature of these stratigraphically deeper units should be verified via testwork, due to the conservative classification given by using S and Ca for the calculation of MPA and ANC respectively.
- CzD2 samples were almost entirely classified as NAF.
- NEW samples were either classified as NAF or as PAF with <0.1% S.
- The majority of the CzD3 and MAC samples were classified as NAF, with lesser proportions classified as PAF.
- For the PAF samples where the NPR was <2.0 but S was <0.1%, the use of S% from assays is an overestimation of sulphides and it is only due to the negligible amounts of Ca present that they lie within this category. The AFP of these samples should be verified by more detailed testwork.

Table 6. Histograms of sulphur concentration for the key stratigraphic units are presented in Figure 4 for waste rock.

Results were available for 213,760 samples from 9,755 drillholes and are summarised below:

- Oxide, calcrete, silcrete, BIF, chert, shale, quartz and mineralised waste lithologies were observed within the stratigraphic units.
- The CzD2, NEW and MAC units each displayed >96% of assays below 0.1% S.
- The CzD3 unit displayed 85% of assays below 0.1% S and 98% of assays below 0.3% S.
- The NAM unit displayed 89% of assays below 0.1 S and 94% of assays below 0.3% S. Three percent of the assays were above 1% S.
- The JER unit displayed 37% of assays below 0.1% and 29% above 1% S.

Preliminary ABA was conducted on the drilling database to provide an indication of the character of acid forming and neutralising components for the stratigraphic units. Figure 5 displays the distribution of results for MPA and ANC. The following observations can be made:

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- For the PAF samples where the NPR was <2.0 but S was <0.1%, the use of S% from assays is an overestimation of sulphides and it is only due to the negligible amounts of Ca present that they lie within this category. The AFP of these samples should be verified by more detailed testwork.

Table 6: Sulphur results for waste rock by stratigraphic unit

Strat Unit	Strat Proportion ² (%)	Assays Total	Average S%	Maximum S%
CzD3	62%	79,921	0.06%	5.13%
Oxide		64,140	0.06%	5.13%
Calcrete/Silcrete		668	0.13%	2.92%
BIF/Chert		7,498	0.09%	0.91%
Shale		940	0.07%	2.63%
Quartz		11	0.02%	0.07%
Dolerite		24	0.13%	0.30%
Mineralised Waste		6,640	0.03%	1.45%
CzD2	12%	31,961	0.04%	11.50%
Oxide		13,476	0.03%	3.97%
Calcrete/Silcrete		375	0.01%	0.10%
BIF/Chert		297	0.03%	0.22%
Shale		2,389	0.05%	11.50%
Quartz		4	0.01%	0.05%
Mineralised Waste		15,420	0.04%	0.84%
NEW	7%	7,900	0.03%	7.04%
Oxide		101	0.03%	0.11%
Calcrete/Silcrete		3	0.01%	0.02%
BIF/Chert		4,618	0.02%	1.19%
Dolomite		18	0.14%	0.27%
Shale		566	0.08%	7.04%
Quartz		3	0.01%	0.01%
Mineralised Waste		2,591	0.03%	0.32%
MAC	14%	21,444	0.04%	17.60%
Oxide		223	0.03%	0.40%
Calcrete/Silcrete		3	0.03%	0.07%
BIF/Chert		10,554	0.03%	6.78%
Dolomite		96	0.32%	3.11%
Shale		4,029	0.08%	17.60%
Quartz		5	0.02%	0.03%
Mineralised Waste		6,534	0.03%	0.79%
NAM	5%	64,995	0.13%	18.40%
Oxide		1,195	0.04%	1.83%
Calcrete/Silcrete		13	0.10%	0.65%
BIF/Chert		28,266	0.07%	8.30%
Dolomite		881	0.97%	7.68%
Shale		22,069	0.23%	18.40%
Quartz		8	0.01%	0.01%
Mineralised Waste		12,563	0.04%	5.80%
JER	0%	7,539	1.66%	21.40%
Oxide		179	0.23%	8.99%
Calcrete/Silcrete		6	0.03%	0.04%
BIF/Chert		555	0.94%	10.70%
Dolomite		99	2.69%	9.77%
Shale		6,611	1.76%	21.40%
Mineralised Waste		89	0.80%	6.90%
Total	100%	213,760	0.13%	21.40%

² Based on waste tonnages provided in March 2023 in file “Strat and Strand 20230302”

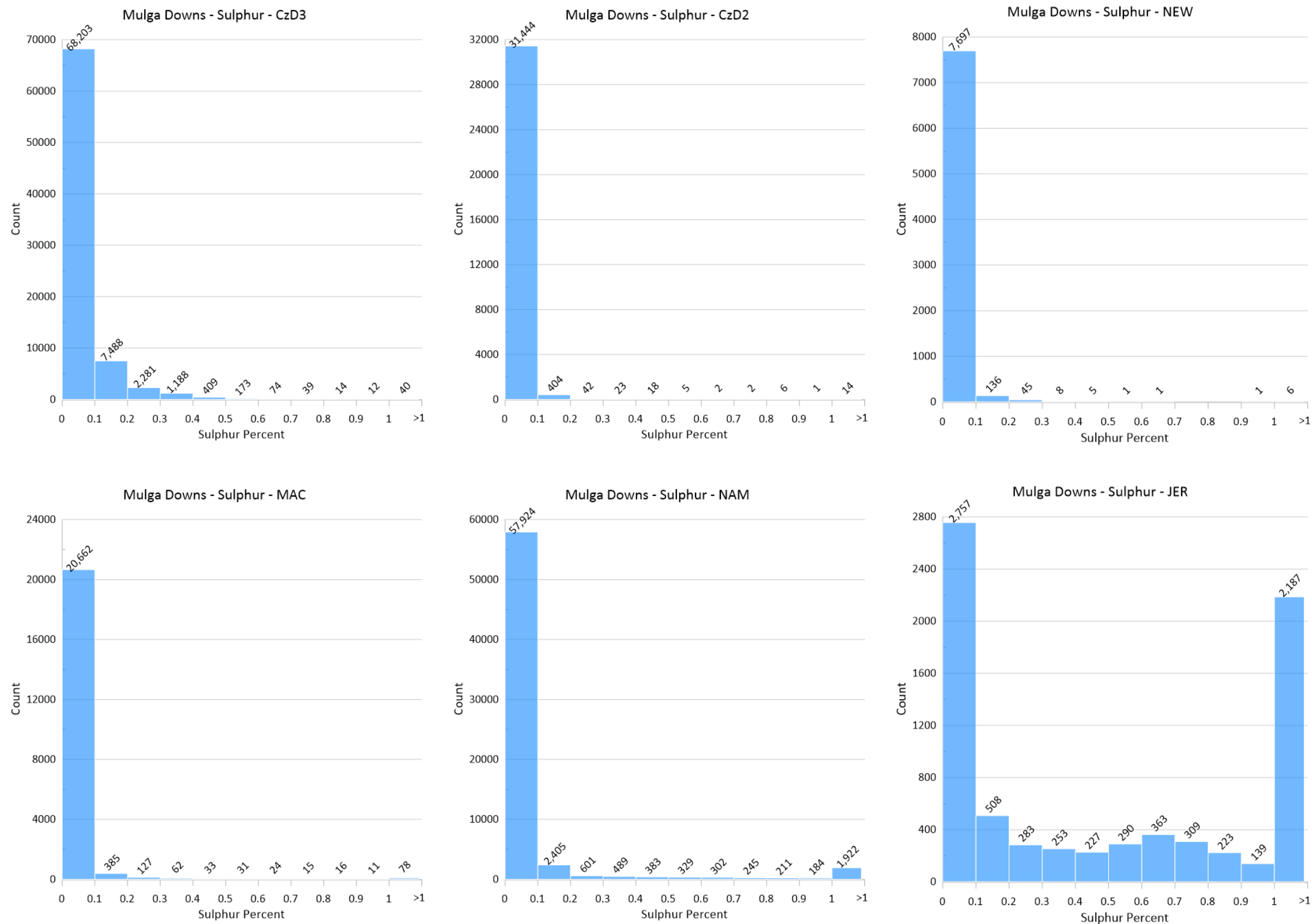


Figure 4: Histograms of sulphur distribution for waste rock by stratigraphic unit

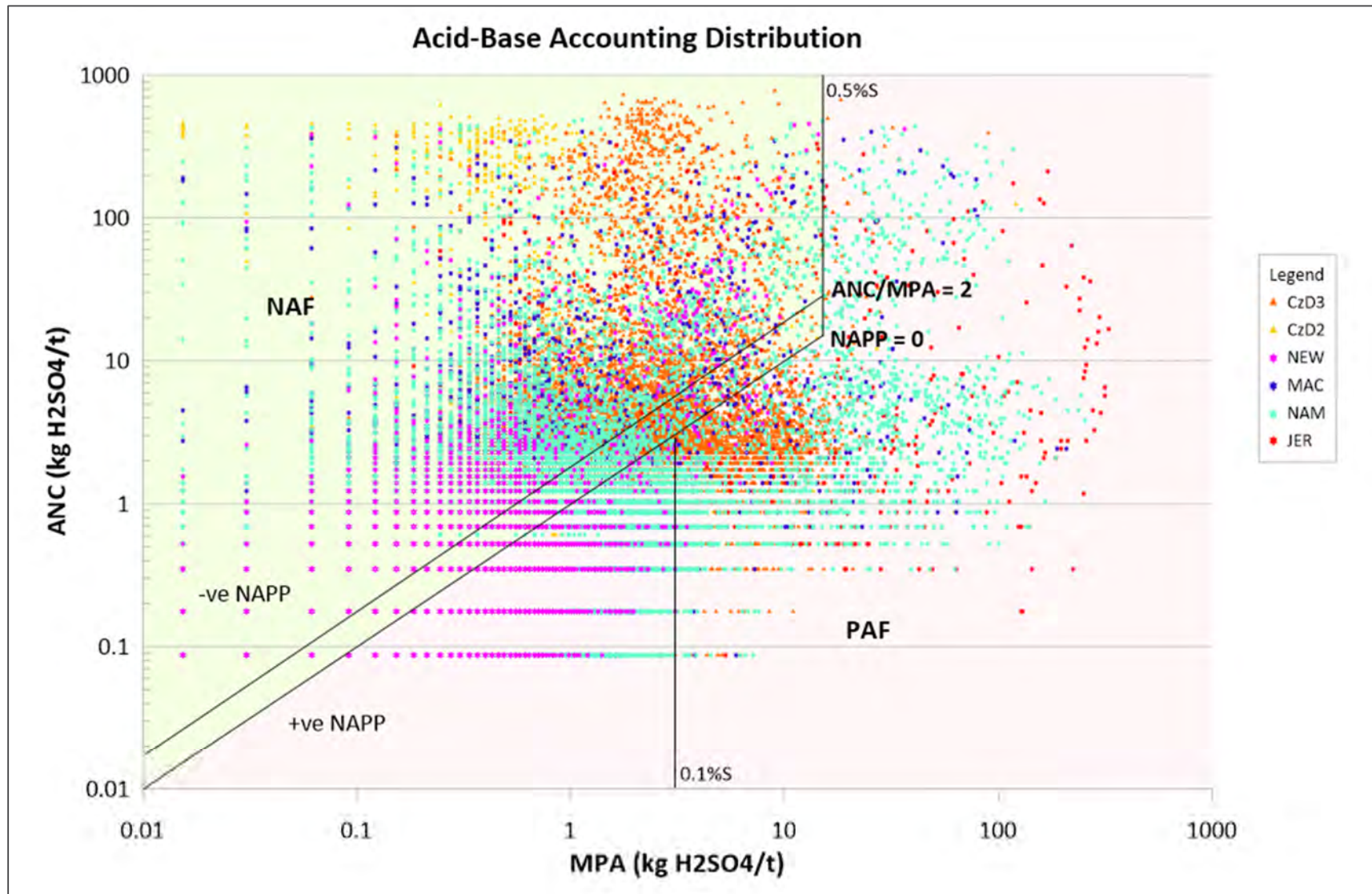


Figure 5: Acid-base accounting results for waste rock by stratigraphic unit

4.1.2 Multi-element assessment

The waste rock multi-element results from the drilling database are presented Table 7 to Table 12 for the key stratigraphic units and lithology types. Values in “light grey” denote the number of samples that are between GAI 3 and 6 (i.e. between 12 and 96 times the ACA). Values in “light orange” are greater than GAI 6 (i.e. exceed 96 times the ACA).

4.1.2.1 CzD3

The elemental enrichment results for CzD3 are presented in Table 7:

- Enrichment between GAI 3 and 6 was variably observed for As, Ca, Co, Cr, Cu, Fe, Mg, Mn, Ni, V and Zn in oxide, calcrete/silcrete, BIF, chert, shale and mineralised waste.
- Quartz and dolerite samples did not show enrichment above GAI 3.
- Enrichment greater than GAI 6 was observed for As, Co and Mn in oxide, BIF, shale and mineralised waste.
- For As, 10% of samples were between GAI 3 and 6, and only 0.01% of samples exceeded GAI 6.
- For Co, 0.2% of samples were between GAI 3 and 6, and only 1 sample exceeded GAI 6.
- For Mn, 2.5% of samples were between GAI 3 and 6, and only 0.5% of samples exceeded GAI 6.

4.1.2.2 CzD2

The elemental enrichment results for CzD2 are presented in Table 8:

- Enrichment between GAI 3 and 6 was variably observed for As, Ba, Ca, Co, Cr, Cu, Fe, Mg, Mn, Ni, Pb, Sn, Ti, V and Zn in all lithology types.
- Enrichment greater than GAI 6 was observed for As, Co, Mn and Sn in oxide, chert, shale and mineralised waste.
- For As, 12.7% of samples were between GAI 3 and 6, and only 0.3% of samples exceeded GAI 6.
- For Co, 2.3% of samples were between GAI 3 and 6, and only 0.01% of samples exceeded GAI 6.
- For Mn, 9.8% of samples were between GAI 3 and 6, and 3.5% of samples exceeded GAI 6.
- For Sn, 17.9% of samples were between GAI 3 and 6, and only 2 samples exceeded GAI 6.

4.1.2.3 NEW

The elemental enrichment results for NEW are presented in Table 9.

- Enrichment between GAI 3 and 6 was variably observed for As, Ca, Co, Cu, Fe, Mg, Mn, Ni, Sn and Zn in mainly oxide, BIF, chert, shale and mineralised waste.
- Enrichment greater than GAI 6 was observed for Mn in oxide, shale and mineralised waste.
- For Mn, 7.5% of samples were between GAI 3 and 6, and 2.4% of samples exceeded GAI 6.

4.1.2.4 MAC

The elemental enrichment results for MAC are presented in Table 10.

- Enrichment between GAI 3 and 6 was variably observed for As, Ca, Co, Cr, Cu, Fe, Mg, Mn, Ni, Sn, V and Zn in mainly oxide, BIF, chert, dolomite, shale and mineralised waste.

- Enrichment greater than GAI 6 was observed for As and Mn in oxide, chert, shale and mineralised waste.
- For As, 2.9% of samples were between GAI 3 and 6, and only 0.1% of samples exceeded GAI 6.
- For Mn, 8.9% of samples were between GAI 3 and 6, and 1.7% of samples exceeded GAI 6.

4.1.2.5 NAM

The elemental enrichment results for NAM are presented in Table 11.

- Enrichment between GAI 3 and 6 was variably observed for As, Ca, Co, Cr, Cu, Fe, Mg, Mn, Ni, P, Pb, Sn, V and Zn in mainly oxide, BIF, chert, dolomite, shale and mineralised waste.
- Enrichment greater than GAI 6 was observed for As, Co, Cu, Mn, Sn and Zn, in oxide, BIF, chert, shale and mineralised waste.
- For Cu, Sn and Zn, only 1 to 3 samples exceeded GAI 6 (out of 64,995 samples).
- For As, 8.3% of samples were between GAI 3 and 6, and only 0.2% of samples exceeded GAI 6.
- For Co, 3.8% of samples were between GAI 3 and 6, and only 0.02% of samples exceeded GAI 6.
- For Mn, 9% of samples were between GAI 3 and 6, and only 0.9% of samples exceeded GAI 6.

4.1.2.6 JER

The elemental enrichment results for JER are presented in Table 12.

- Enrichment between GAI 3 and 6 was variably observed for As, Ca, Co, Cr, Cu, Fe, Mg, Mn, Pb, Sn, V and Zn in mainly oxide, BIF, chert, dolomite, shale and mineralised waste.
- Enrichment greater than GAI 6 was observed for As, Co, Cu, Mn and Zn in chert and shale.
- For As, Co, Cu, Mn and Zn, only 1 to 5 samples exceeded GAI 6 (out of 7,539 samples).

Table 7: Elemental enrichments for CzD3 waste samples

Group	GAI	Al	As	Ba	Ca	Co	Cr	Cu	Fe	K	Mg	Mn	Ni	P	Pb	Sn	Sr	Ti	V	Zn	Zr
Oxide	0	64140	57755	64138	64076	64038	64132	64137	63673	64138	64123	62860	64136	64140	64138	0	64138	64140	64138	64130	64138
	3	0	6379	0	64	100	6	1	467	0	17	1207	2	0	0	0	0	0	0	8	0
	6	0	4	0	0	0	0	0	0	0	0	73	0	0	0	0	0	0	0	0	0
Oxide Total		64140	64138	64138	64140	64138	64138	64138	64140	64138	64140	64140	64138	64140	64138	0	64138	64140	64138	64138	64138
Calcrete/silcrete	0	668	665	668	585	668	668	668	668	668	657	664	668	668	668	0	668	668	668	668	668
	3	0	3	0	83	0	0	0	0	0	11	4	0	0	0	0	0	0	0	0	0
	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Calcrete/silcrete Total		668	668	668	668	668	668	668	668	668	668	668	668	668	668	0	668	668	668	668	668
BIF	0	170	162	170	170	170	170	170	170	170	170	163	170	170	170	160	170	170	170	170	170
	3	0	8	0	0	0	0	0	0	0	0	6	0	0	0	0	0	0	0	0	0
	6	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
BIF Total		170	170	170	170	170	170	170	170	170	170	170	170	170	170	160	170	170	170	170	170
Chert	0	7328	6580	7328	7324	7326	7328	7328	7324	7328	7326	7295	7328	7328	7328	0	7328	7328	7328	7328	7328
	3	0	748	0	4	2	0	0	4	0	2	33	0	0	0	0	0	0	0	0	0
	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chert Total		7328	7328	7328	7328	7328	7328	7328	7328	7328	7328	7328	7328	7328	7328	0	7328	7328	7328	7328	7328
Shale	0	940	784	940	938	934	940	940	925	940	940	879	940	940	940	0	940	940	940	937	940
	3	0	154	0	2	6	0	0	15	0	0	35	0	0	0	0	0	0	0	3	0
	6	0	2	0	0	0	0	0	0	0	0	26	0	0	0	0	0	0	0	0	0
Shale Total		940	940	940	940	940	940	940	940	940	940	940	940	940	940	0	940	940	940	940	940
Quartz	0	11	11	11	11	11	11	11	11	11	11	11	11	11	11	0	11	11	11	11	11
	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Quartz Total		11	11	11	11	11	11	11	11	11	11	11	11	11	11	0	11	11	11	11	11
Dolerite	0	24	24	24	24	24	24	24	24	24	24	24	24	24	24	0	24	24	24	24	24
	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dolerite Total		24	24	24	24	24	24	24	24	24	24	24	24	24	24	0	24	24	24	24	24
Mineralised Waste	0	6640	5681	6640	6640	6540	6640	6640	6072	6640	6639	5552	6639	6640	6640	0	6640	6640	6639	6637	6640
	3	0	958	0	0	99	0	0	568	0	1	793	1	0	0	0	0	0	1	3	0
	6	0	1	0	0	1	0	0	0	0	0	295	0	0	0	0	0	0	0	0	0
Mineralised Waste Total		6640	6640	6640	6640	6640	6640	6640	6640	6640	6640	6640	6640	6640	6640	0	6640	6640	6640	6640	6640
Grand Total		79921	79919	79919	79921	79919	79919	79919	79921	79919	79921	79921	79919	79921	79919	160	79919	79921	79919	79919	79919

enrichment between GAI 3 and 6

enrichment greater than GAI 6

Table 8: Elemental enrichments for CzD2 waste samples

Group	GAI	Al	As	Ba	Ca	Co	Cr	Cu	Fe	K	Mg	Mn	Ni	P	Pb	Sn	Sr	Ti	V	Zn	Zr
Oxide	0	13476	11610	13468	13461	13122	13452	13448	12142	13468	13383	12015	13455	13476	13468	11351	13468	13470	13468	13399	13468
	3	0	1812	0	15	343	16	20	1334	0	93	1173	13	0	0	2117	0	6	0	69	0
	6	0	46	0	0	3	0	0	0	0	0	288	0	0	0	0	0	0	0	0	0
Oxide Total		13476	13468	13468	13476	13468	13468	13468	13476	13468	13476	13476	13468	13476	13468	13468	13468	13476	13468	13468	13468
Calcrete/silcrete	0	375	372	375	350	371	375	375	374	375	244	355	375	375	375	194	375	375	375	375	375
	3	0	3	0	25	4	0	0	1	0	131	20	0	0	0	181	0	0	0	0	0
	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Calcrete/silcrete Total		375	375	375	375	375	375	375	375	375	375	375	375	375	375	375	375	375	375	375	375
BIF	0	33	14	21	33	31	33	32	24	23	33	28	21	33	33	32	33	33	33	33	33
	3	0	7	0	0	2	0	1	9	0	0	5	0	0	0	1	0	0	0	0	0
	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BIF Total		33	21	21	33	33	33	33	33	23	33	33	21	33	33	33	33	33	33	33	33
Chert	0	264	235	264	263	261	264	264	248	264	262	250	264	264	264	219	264	264	264	261	264
	3	0	29	0	1	3	0	0	16	0	2	12	0	0	0	45	0	0	0	3	0
	6	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0
Chert Total		264	264	264	264	264	264	264	264	264	264	264	264	264	264	264	264	264	264	264	264
Shale	0	2389	1914	2315	2381	2318	2386	2387	2159	2389	2353	2064	2306	2389	2383	1773	2389	2389	2389	2363	2389
	3	0	380	0	8	71	3	2	230	0	36	263	3	0	0	610	0	0	0	26	0
	6	0	21	0	0	0	0	0	0	0	0	62	0	0	0	0	0	0	0	0	0
Shale Total		2389	2315	2315	2389	2389	2389	2389	2389	2389	2389	2389	2309	2389	2383	2383	2389	2389	2389	2389	2389
Quartz	0	4	4	4	4	4	4	4	3	4	4	4	4	4	4	1	4	4	4	4	4
	3	0	0	0	0	0	0	0	1	0	0	0	0	0	0	3	0	0	0	0	0
	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Quartz Total		4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Mineralised Waste	0	15420	13563	15419	15420	15105	15416	15417	9426	15420	15418	12973	15409	15420	15417	12661	15420	15420	15412	15373	15420
	3	0	1823	1	0	315	4	3	5994	0	2	1672	9	0	3	2757	0	0	8	47	0
	6	0	34	0	0	0	0	0	0	0	0	775	0	0	0	2	0	0	0	0	0
Mineralised Waste Total		15420	15420	15420	15420	15420	15420	15420	15420	15420	15420	15420	15418	15420	15420	15420	15420	15420	15420	15420	15420
Grand Total		31961	31867	31867	31961	31953	31953	31953	31961	31943	31961	31961	31859	31961	31947	31947	31953	31961	31953	31953	31953

 enrichment between GAI 3 and 6

 enrichment greater than GAI 6

Table 9: Elemental enrichments for NEW waste samples

Group	GAI	Al	As	Ba	Ca	Co	Cr	Cu	Fe	K	Mg	Mn	Ni	P	Pb	Sn	Sr	Ti	V	Zn	Zr
Oxide	0	101	91	101	101	99	101	101	65	101	101	86	101	101	101	86	101	101	101	101	101
	3	0	10	0	0	2	0	0	36	0	0	10	0	0	0	15	0	0	0	0	0
	6	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0
Oxide Total		101	101	101	101	101	101	101	101	101	101	101	101	101	101	101	101	101	101	101	101
Calcrete/silcrete	0	3	3	3	3	3	3	3	3	3	2	2	3	3	3	3	3	3	3	3	3
	3	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0
	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Calcrete/silcrete Total		3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
BIF	0	69	69	69	69	69	69	69	67	69	69	64	69	69	69	26	69	69	69	69	69
	3	0	0	0	0	0	0	0	2	0	0	5	0	0	0	43	0	0	0	0	0
	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BIF Total		69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69
Chert	0	4549	4543	4549	4547	4532	4549	4549	4522	4549	4534	4483	4549	4549	4549	4038	4549	4549	4549	4549	4549
	3	0	6	0	2	17	0	0	27	0	15	66	0	0	0	511	0	0	0	0	0
	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chert Total		4549	4549	4549	4549	4549	4549	4549	4549	4549	4549	4549	4549	4549	4549	4549	4549	4549	4549	4549	4549
Dolomite	0	18	18	18	18	18	18	18	17	18	18	18	18	18	18	16	18	18	18	18	18
	3	0	0	0	0	0	0	0	1	0	0	0	0	0	0	2	0	0	0	0	0
	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dolomite Total		18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18
Shale	0	566	538	566	566	553	566	566	468	566	553	483	566	566	566	445	566	566	566	560	566
	3	0	28	0	0	13	0	0	98	0	13	66	0	0	0	121	0	0	0	6	0
	6	0	0	0	0	0	0	0	0	0	0	17	0	0	0	0	0	0	0	0	0
Shale Total		566	566	566	566	566	566	566	566	566	566	566	566	566	566	566	566	566	566	566	566
Quartz	0	3	3	3	3	3	3	3	3	3	3	3	3	3	3	0	3	3	3	3	3
	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0
	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Quartz Total		3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Mineralised Waste	0	2591	2513	2591	2591	2537	2591	2590	1284	2591	2590	1982	2590	2591	2591	2182	2591	2591	2591	2591	2591
	3	0	78	0	0	54	0	1	1307	0	1	444	1	0	0	409	0	0	0	0	0
	6	0	0	0	0	0	0	0	0	0	0	165	0	0	0	0	0	0	0	0	0
Mineralised Waste Total		2591	2591	2591	2591	2591	2591	2591	2591	2591	2591	2591	2591	2591	2591	2591	2591	2591	2591	2591	2591
Grand Total		7900	7900	7900	7900	7900	7900	7900	7900	7900	7900	7900	7900	7900	7900	7900	7900	7900	7900	7900	7900

enrichment between GAI 3 and 6

enrichment greater than GAI 6

Table 10: Elemental enrichments for MAC waste samples

Group	GAI	Al	As	Ba	Ca	Co	Cr	Cu	Fe	K	Mg	Mn	Ni	P	Pb	Sn	Sr	Ti	V	Zn	Zr
Oxide	0	223	209	223	223	222	223	223	172	223	220	199	223	223	223	196	223	223	223	222	223
	3	0	13	0	0	1	0	0	51	0	3	20	0	0	0	27	0	0	0	1	0
	6	0	1	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0
Oxide Total		223	223	223	223	223	223	223	223	223	223	223	223	223	223	223	223	223	223	223	223
Calcrete/silcrete	0	3	3	3	3	3	3	3	3	3	2	3	3	3	3	3	3	3	3	3	3
	3	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Calcrete/silcrete Total		3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
BIF	0	109	109	109	109	109	109	109	109	109	109	101	109	109	109	51	109	109	109	109	109
	3	0	0	0	0	0	0	0	0	0	0	8	0	0	0	58	0	0	0	0	0
	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BIF Total		109	109	109	109	109	109	109	109	109	109	109	109	109	109	109	109	109	109	109	109
Chert	0	10445	10399	10445	10445	10387	10445	10440	10396	10445	10388	10251	10442	10445	10445	9317	10445	10445	10445	10441	10445
	3	0	44	0	0	58	0	5	49	0	57	193	3	0	0	1128	0	0	0	4	0
	6	0	2	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Chert Total		10445	10445	10445	10445	10445	10445	10445	10445	10445	10445	10445	10445	10445	10445	10445	10445	10445	10445	10445	10445
Dolomite	0	96	95	96	95	94	96	96	96	96	76	93	96	96	96	79	96	96	96	96	96
	3	0	1	0	1	2	0	0	0	0	20	3	0	0	0	17	0	0	0	0	0
	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dolomite Total		96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96
Shale	0	4029	3756	4029	4029	3915	4029	4022	3538	4029	3955	3458	4022	4029	4029	3476	4029	4029	4029	4006	4029
	3	0	263	0	0	114	0	7	491	0	74	516	7	0	0	553	0	0	0	23	0
	6	0	10	0	0	0	0	0	0	0	0	55	0	0	0	0	0	0	0	0	0
Shale Total		4029	4029	4029	4029	4029	4029	4029	4029	4029	4029	4029	4029	4029	4029	4029	4029	4029	4029	4029	4029
Quartz	0	5	5	5	5	5	5	5	3	5	5	5	5	5	5	4	5	5	5	5	5
	3	0	0	0	0	0	0	0	2	0	0	0	0	0	0	1	0	0	0	0	0
	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Quartz Total		5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Mineralised Waste	0	6534	6213	6534	6534	6361	6532	6530	3309	6534	6532	5049	6528	6534	6534	5440	6534	6534	6532	6498	6534
	3	0	312	0	0	173	2	4	3225	0	2	1180	6	0	0	1094	0	0	2	36	0
	6	0	9	0	0	0	0	0	0	0	0	305	0	0	0	0	0	0	0	0	0
Mineralised Waste Total		6534	6534	6534	6534	6534	6534	6534	6534	6534	6534	6534	6534	6534	6534	6534	6534	6534	6534	6534	6534
Grand Total		21444	21444	21444	21444	21444	21444	21444	21444	21444	21444	21444	21444	21444	21444	21444	21444	21444	21444	21444	21444

 enrichment between GAI 3 and 6

 enrichment greater than GAI 6

Table 11: Elemental enrichments for NAM waste samples

Group	GAI	Al	As	Ba	Ca	Co	Cr	Cu	Fe	K	Mg	Mn	Ni	P	Pb	Sn	Sr	Ti	V	Zn	Zr
Oxide	0	1195	1009	1193	1195	1128	1193	1192	1025	1193	1189	1079	1189	1194	1193	1139	1193	1195	1191	1165	1193
	3	0	177	0	0	64	0	1	170	0	6	110	4	1	0	54	0	0	2	28	0
	6	0	7	0	0	1	0	0	0	0	0	6	0	0	0	0	0	0	0	0	0
Oxide Total		1195	1193	1193	1195	1193	1193	1193	1195	1193	1195	1195	1193	1195	1193	1193	1193	1195	1193	1193	1193
Calcrete/silcrete	0	13	13	13	13	13	13	13	12	13	11	13	13	13	13	12	13	13	13	13	13
	3	0	0	0	0	0	0	0	1	0	2	0	0	0	0	1	0	0	0	0	0
	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Calcrete/silcrete Total		13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13
BIF	0	2210	2174	2210	2210	2180	2210	2209	2185	2210	2210	2166	1870	2210	2210	2041	2210	2210	2210	2198	2210
	3	0	36	0	0	30	0	1	25	0	0	43	1	0	0	169	0	0	0	12	0
	6	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
BIF Total		2210	2210	2210	2210	2210	2210	2210	2210	2210	2210	2210	1871	2210	2210	2210	2210	2210	2210	2210	2210
Chert	0	26056	25407	26056	26051	25439	26052	26034	25931	26056	25890	25099	26039	26056	26056	23485	26056	26056	26055	25804	26056
	3	0	647	0	5	614	4	22	125	0	166	953	16	0	0	2571	0	0	1	252	0
	6	0	2	0	0	3	0	0	0	0	0	4	1	0	0	0	0	0	0	0	0
Chert Total		26056	26056	26056	26056	26056	26056	26056	26056	26056	26056	26056	26056	26056	26056	26056	26056	26056	26056	26056	26056
Dolomite	0	881	855	881	876	878	881	881	879	881	658	832	880	881	881	758	881	881	881	869	881
	3	0	26	0	5	3	0	0	2	0	223	49	1	0	0	123	0	0	0	12	0
	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dolomite Total		881	881	881	881	881	881	881	881	881	881	881	881	881	881	881	881	881	881	881	881
Shale	0	22064	19273	22064	22059	20859	22060	21951	20355	22064	21434	19791	21997	22064	22064	19267	22064	22064	22057	21593	22064
	3	0	2724	0	5	1200	4	113	1709	0	630	2170	67	0	0	2797	0	0	7	470	0
	6	0	67	0	0	5	0	0	0	0	0	103	0	0	0	0	0	0	0	1	0
Shale Total		22064	22064	22064	22064	22064	22064	22064	22064	22064	22064	22064	22064	22064	22064	22064	22064	22064	22064	22064	22064
Quartz	0	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Quartz Total		8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
Mineralised Waste	0	12568	10746	12566	12568	11992	12567	12553	6547	12568	12549	9559	12545	12568	12566	11154	12568	12568	12555	12370	12568
	3	0	1775	2	0	570	1	14	6021	0	19	2548	23	0	2	1411	0	0	13	198	0
	6	0	47	0	0	6	0	1	0	0	0	461	0	0	0	3	0	0	0	0	0
Mineralised Waste Total		12568	12568	12568	12568	12568	12568	12568	12568	12568	12568	12568	12568	12568	12568	12568	12568	12568	12568	12568	12568
Grand Total		64995	64993	64993	64995	64993	64993	64993	64995	64993	64995	64995	64654	64995	64993	64993	64993	64995	64993	64993	64993

 enrichment between GAI 3 and 6

 enrichment greater than GAI 6

Table 12: Elemental enrichments for JER waste samples

Group	GAI	Al	As	Ba	Ca	Co	Cr	Cu	Fe	K	Mg	Mn	Ni	P	Pb	Sn	Sr	Ti	V	Zn	Zr
Oxide	0	179	103	179	179	173	179	172	179	179	179	172	0	179	179	166	179	179	179	177	179
	3	0	76	0	0	6	0	7	0	0	0	7	0	0	0	13	0	0	0	2	0
	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Oxide Total		179	179	179	179	179	179	179	179	179	179	179	0	179	179	179	179	179	179	179	179
Calcrete/silcrete	0	6	4	6	6	6	6	6	6	6	6	6	0	6	6	5	6	6	6	6	6
	3	0	2	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Calcrete/silcrete Total		6	6	6	6	6	6	6	6	6	6	6	0	6	6	6	6	6	6	6	6
BIF	0	63	60	63	63	59	63	63	63	63	63	61	51	63	63	62	63	63	63	59	63
	3	0	3	0	0	4	0	0	0	0	0	2	0	0	0	1	0	0	0	4	0
	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BIF Total		63	63	63	63	63	63	63	63	63	63	63	51	63	63	63	63	63	63	63	63
Chert	0	492	441	492	492	445	492	481	490	492	482	437	0	492	492	450	492	492	492	440	492
	3	0	51	0	0	47	0	11	2	0	10	54	0	0	0	42	0	0	0	51	0
	6	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0
Chert Total		492	492	492	492	492	492	492	492	492	492	492	0	492	492	492	492	492	492	492	492
Dolomite	0	99	89	99	98	99	99	99	99	99	87	96	0	99	99	73	99	99	99	97	99
	3	0	10	0	1	0	0	0	0	0	12	3	0	0	0	26	0	0	0	2	0
	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dolomite Total		99	99	99	99	99	99	99	99	99	99	99	0	99	99	99	99	99	99	99	99
Shale	0	6611	5311	6611	6611	6224	6605	6360	6600	6611	6512	6478	0	6611	6610	5561	6611	6611	6610	6263	6611
	3	0	1295	0	0	383	6	250	11	0	99	133	0	0	1	1050	0	0	1	345	0
	6	0	5	0	0	4	0	1	0	0	0	0	0	0	0	0	0	0	0	3	0
Shale Total		6611	6611	6611	6611	6611	6611	6611	6611	6611	6611	6611	0	6611	6611	6611	6611	6611	6611	6611	6611
Mineralised Waste	0	89	66	89	89	86	89	85	81	89	89	87	0	89	89	84	89	89	89	85	89
	3	0	23	0	0	3	0	4	8	0	0	2	0	0	0	5	0	0	0	4	0
	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mineralised Waste Total		89	89	89	89	89	89	89	89	89	89	89	0	89	89	89	89	89	89	89	89
Grand Total		7539	7539	7539	7539	7539	7539	7539	7539	7539	7539	7539	51	7539	7539	7539	7539	7539	7539	7539	7539

enrichment between GAI 3 and 6
 enrichment greater than GAI 6

4.2 Sample selection

The 71 drillholes selected for geochemical analysis across the resource areas are displayed in Figure 6.

The lithological distribution of the 68 composite, downhole samples selected for geochemical testwork is displayed in Table 13. Samples were selected based on prevalence within their stratigraphic unit, as well as any notable geochemical characteristics (e.g. sulphur enrichment). The full downhole multi-element assays from the 71 drillholes are presented in Appendix A.

Six ore samples from the MAC and NAM units were selected for testwork, for comparison with the various waste rock samples.

Table 13: Lithological distribution of the detailed geochemical samples

Lithology type	CzD3	CzD2	NEW	MAC	NAM	JER
Oxide	14	-	-	-	-	-
Calcrete/silcrete	1	2	-	-	-	-
BIF/chert	2	-	1	7	5	-
Dolomite	-	-	-	-	1	-
Shale	-	1	-	2	16	3
Mineralised waste	1	3	-	-	3	-
Ore	-	-	-	2	4	-
Total	18	6	1	11	29	3

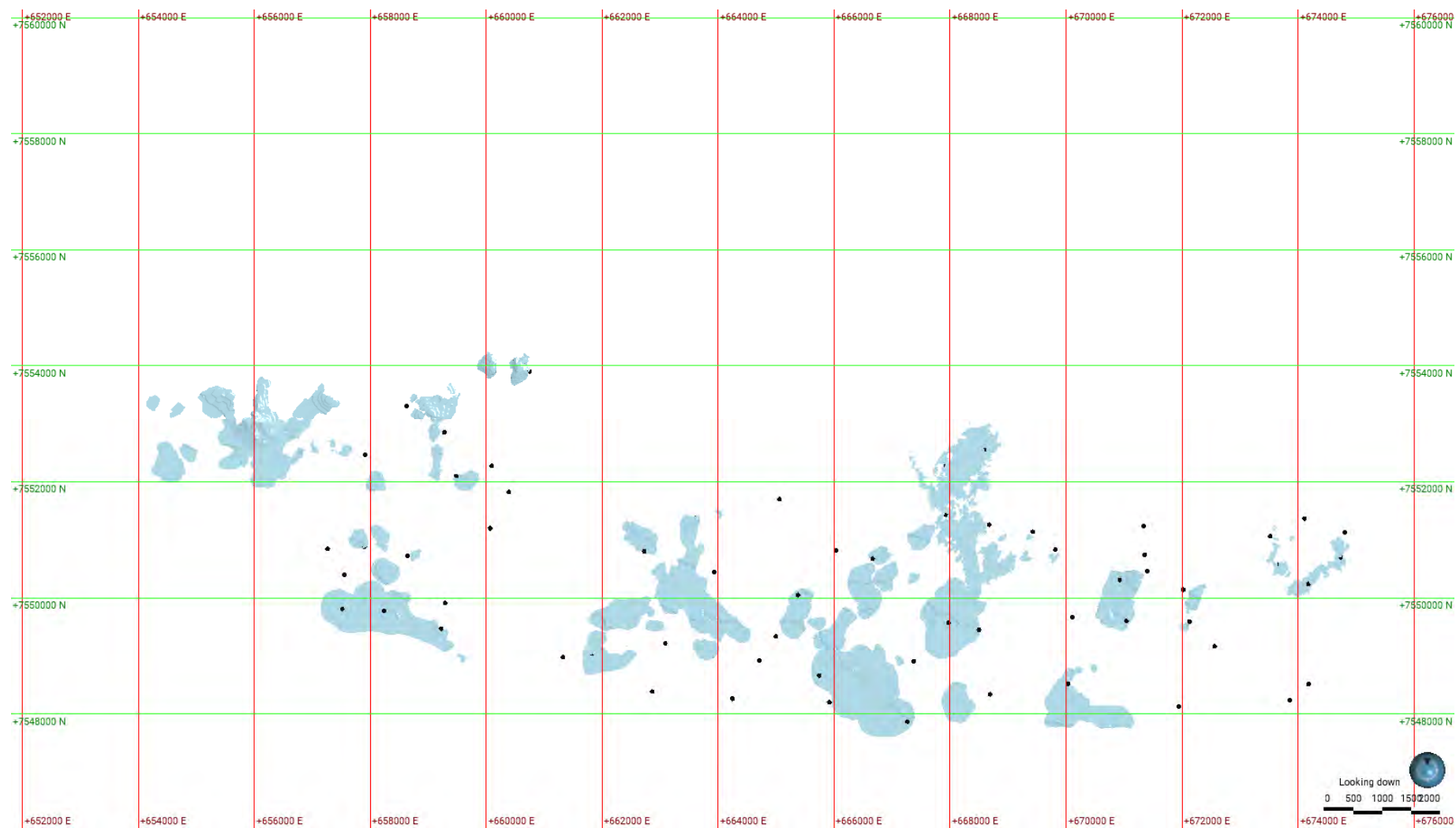


Figure 6: Distribution of the 71 drillholes across the Project.

4.3 Geochemical assessment

Tabulated results are presented in Appendix B and laboratory reports are presented in Appendix C.

4.3.1 Mineralogy

4.3.1.1 CzD3

Initially, six oxide clay samples, one calcrete sample and one hematite/goethite sample were assessed for mineralogy. The key findings are:

- The clay samples were dominated by quartz with minor to major kaolinite and hematite, trace to accessory hematite, goethite, alunite, muscovite, serpentine, K-feldspar, anatase, annite-biotite-phlogopite, and plagioclase. Two samples reported accessory alunite, while one sample reported trace gypsum. Another clay sample contained accessory calcite.
- The calcrete sample was dominated by calcite with accessory hematite, goethite, kaolinite, annite-biotite-phlogopite, K-feldspar, muscovite, dolomite-ankerite and quartz.
- The hematite/goethite sample was dominated by goethite with minor hematite and kaolinite and accessory serpentine, quartz, anatase, gibbsite and calcite.
- To further investigate sulphur speciation, 11 samples (ten clay samples and one chert sample) with sulphur $\geq 0.1\%$ were assessed for mineralogy. For the clay samples, alunite ($\text{KAl}_3(\text{SO}_4)_2(\text{OH})_6$) was detected in nine out of ten samples ranging from trace to accessory levels (1-4%) while accessory (2%) gypsum ($\text{CaSO}_4 \cdot 2 \text{H}_2\text{O}$) was detected in the other sample (158056). Other minerals included dominant quartz, minor kaolinite and hematite and accessory goethite, muscovite, microcline and magnetite. One sample contained accessory calcite.

4.3.1.2 CzD2

Two samples were assessed for mineralogy which included one hematite sample and one goethite sample. Both samples included major hematite and goethite with minor kaolinite and accessory serpentine, K-feldspar, quartz and anatase. One sample contained accessory pyrolusite.

4.3.1.3 MAC

Three samples were assessed from the MAC stratigraphic unit. All three samples were logged as chert. The samples were dominated by quartz with minor hematite and goethite and accessory kaolinite. One sample reported trace muscovite.

4.3.1.4 NAM

Four samples were assessed from the NAM stratigraphic unit which included one chert sample, three shale samples and one hematite sample. The key findings are:

- The chert sample included dominant quartz, major hematite, minor goethite, accessory magnetite and kaolinite.
- The two shale samples were both dominated by quartz. While sample 152409 reported major hematite and accessory kaolinite and serpentine, sample 119988 reported a broad range of accessory minerals such as hematite, serpentine, annite-biotite-phlogopite, anatase, alunite, muscovite and kaolinite. The third shale sample (150088) reported major kaolinite and hematite, minor quartz and goethite with accessory gypsum, muscovite and magnetite.

- The hematite sample reported dominant hematite, major goethite, minor kaolinite and accessory serpentine, quartz and anatase.

4.3.1.5 JER

Two samples were assessed from the JER stratigraphic unit, both were logged as shale. Both samples were dominated by quartz and contained a wide range of accessory minerals including hematite, goethite, illite-smectite, kaolinite, annite-biotite-phlogopite, muscovite, anatase, alunite and jarosite. Although not detected in the mineralogical assessment, the presence of accessory pyrite is inferred from the multi-percent CRS reported for the two samples.

4.3.2 Acid-base accounting

The results are presented in Table B1 in Appendix B.

4.3.2.1 CzD3

Eighteen samples were assessed from the CzD3 stratigraphic unit including 14 clay samples (ALU strand), two chert samples (ALU strand), one calcrete sample (CC strand) and one mineralised waste – hematite/goethite (SCR strand). Sampling depths ranged from surface to a downhole depth of approximately 32 m.

Oxide

- The clay samples were circum-neutral (pH_{1:2} values of 6.4-8.1) and mostly low salinity (EC_{1:2} values up to 0.56 mS/cm), except for one sample (158056) which reported moderate salinity (EC_{1:2} value of 3.3 mS/cm).
- Although the total-S values ranged up to 0.5% the sulphide contents in the samples were negligible (equal or less than 0.01% CRS).
- A mineralogical assessment (Section 4.3.1) found that in most samples with total-S greater than 0.1%, alunite was the dominant sulphate and was present in nine out of fourteen samples, whilst trace gypsum was identified in sample 158056.
- The CO₃-C values of the clay samples indicated that this unit typically contained low carbonate contents with a maximum of 0.17% CO₃-C recorded for the gypsiferous sample 158056. The calculated CO₃-C ANC values were in the range of 1-14 kg H₂SO₄/t. Laboratory reported that ANC values ranged from 2 to 22 kg H₂SO₄/t, indicating that not only carbonates contributed to the laboratory reported ANC.
- Ten samples were analysed for NAG and reported NAGpH ≥ 6.9.
- All clay samples were classified as NAF when the NPR was determined using CRS for the MPA calculation. Six samples were classified as Uncertain when using the AMIRA method and total-S. All six samples reported accessory alunite in the mineralogical assessment. The potential for acidity generation from alunite should be further assessed which is further discussed in Section 5.1.1.

Calcrete

- The calcrete sample was alkaline (pH_{1:2} value of 9.4) and reported moderate salinity (EC_{1:2} value of 1.92 mS/cm).
- The total-S value was 0.07%, indicating a negligible sulphide content.
- The CO₃-C value was 6.63% (calculated CO₃-C ANC of 542 kg H₂SO₄/t), indicating a large surplus of neutralising capacity as expected for calcrete, which was confirmed by the reported ANC value of 573 kg H₂SO₄/t and dominant levels of calcite in the mineralogical assessment.

- The calcrete sample was classified as NAF.

Chert

- The two chert samples were circum-neutral (pH_{1:2} values of 7.2 and 7.5) and reported low salinity (EC_{1:2} values up to 0.10 mS/cm).
- The total-S values were <0.02% (sample 158063) and 0.31% (sample 151274). The CRS value of 0.008% for sample 151274 indicates negligible sulphide contents and the mineralogical assessment found that alunite is the dominant sulphate.
- The CO₃-C values (0.02%) indicate negligible carbonates with a calculated CO₃-C ANC of 2 kg H₂SO₄/t and reported ANC values of up to 5 kg H₂SO₄/t.
- The NAGpH for sample 151274 was pH 6.9.
- Sample 158063 was classified as NAF, while sample 151274 was classified as NAF when CRS was used for the MPA calculation, but showed some uncertainty when total-S was used for the MPA calculation in for the AFP classification as per AMIRA. Accessory alunite has been detected in the mineralogical assessment. This is further discussed in Section 5.1.1.

Mineralised waste

- The sample was circum-neutral (pH_{1:2} value of 8.0) and reported low salinity (EC_{1:2} value of 0.19 mS/cm).
- The total-S value was 0.03% indicating a negligible sulphide content.
- The CO₃-C value was 0.19% with a calculated CO₃-C ANC of 16 kg H₂SO₄/t and laboratory reported ANC value of 13 kg H₂SO₄/t.
- The sample was classified as NAF.

4.3.2.2 CzD2

Six samples from the CzD2 unit were assessed including a silcrete sample (DCL strand), a calcrete sample (CC strand), a shale sample (DCL strand), and three mineralised waste samples – hematite, goethite and manganese (CIDW strand).

Silcrete

- The silcrete sample was mildly alkaline (pH_{1:2} value of 8.3) and reported low salinity (EC_{1:2} value of 0.21 mS/cm).
- The total-S value was <0.01% indicating a negligible sulphide content.
- The CO₃-C value was 0.28% with a respective calculated CO₃-C ANC of 23 kg H₂SO₄/t and a laboratory reported ANC of 26 kg H₂SO₄/t.
- The sample was classified as NAF.

Calcrete

- The calcrete sample was mildly alkaline (pH_{1:2} value of 8.1) and reported low salinity (EC_{1:2} value of 0.23 mS/cm).
- The total-S value was 0.02% indicating a negligible sulphide content.
- The CO₃-C value was 3.16% with a respective calculated CO₃-C ANC of 258 kg H₂SO₄/t and a laboratory reported ANC of 264 kg H₂SO₄/t.
- The sample was classified as NAF.

Shale

- The shale sample was circum-neutral (pH_{1:2} value of 7.3) and reported low salinity (EC_{1:2} value of 0.22 mS/cm).
- The total-S value was <0.01% indicating a negligible sulphide content.
- The CO₃-C value was 0.01% indicating a negligible carbonate content.
- The sample was classified as NAF.

Mineralised Waste

- The three mineralised waste samples were circum-neutral to mildly alkaline (pH_{1:2} values of 7.2-8.1) and reported low salinity (EC_{1:2} values up to 0.35 mS/cm).
- The total-S values ranged from 0.02% to 0.04% indicating negligible sulphide contents.
- The total CO₃-C values ranged from 0.04% to 0.08% indicating negligible carbonate contents with calculated CO₃-C ANC values up to 7 kg H₂SO₄/t. The laboratory reported ANC values were between 5 and 8 kg H₂SO₄/t.
- All three samples were classified as NAF.

4.3.2.3 NEW

One chert sample was assessed from the NEW stratigraphic unit (NEW strand). The sample was collected at 28 to 32 m downhole depth.

Chert

- The chert sample was circum-neutral (pH_{1:2} value of 7.6) and reported low salinity (EC_{1:2} value of 0.10 mS/cm).
- The total-S value was 0.02% indicating a negligible sulphide content.
- The CO₃-C value was 0.02% indicating a negligible carbonate content with a calculated CO₃-C ANC of 2 kg H₂SO₄/t and a laboratory reported ANC of 1 kg H₂SO₄/t.
- The sample was classified as NAF.

4.3.2.4 MAC

Nine samples were assessed from the MAC stratigraphic unit including seven chert samples, one shale/dolomite sample and one shale/chert sample (all from the MAC strand).

Chert

- The seven chert samples included six shallow chert samples collected between 8-46 m downhole depth and one deep chert sample (114686) collected at 92 to 96 m downhole depth.
- The seven samples were circum-neutral (pH_{1:2} values of 6.7 to 8.0) and reported low salinity (EC_{1:2} values of 0.08 to 0.55 mS/cm).
- The total-S values were <0.01 to 0.02% for the six shallow chert samples, indicating negligible sulphide contents. The deeper chert sample reported a total-S value of 0.17% and a CRS value of 0.15% indicating trace sulphides.
- The CO₃-C values were between 0.02 and 0.05% for the shallow chert samples indicating negligible carbonate contents which the laboratory reported ANC values of up to 6 kg H₂SO₄/t confirmed. The deeper chert sample reported a CO₃-C value of 1.96%, which equates to a calculated CO₃-C ANC of 160 kg

H₂SO₄/t, though the laboratory reported ANC was only 30 kg H₂SO₄/t indicating that the calculated CO₃-C ANC overestimates the available ANC.

- The NAG test was undertaken for the deeper chert sample which reported a NAGpH of 7.6.
- All samples were classified as NAF.

Shale

- The shale/dolomite sample (127348) was collected from 86 to 90 m downhole depth while the shale/chert sample (125353) was collected from 78 to 82 m downhole depth.
- Sample 127348 was mildly alkaline (pH_{1:2} value of 8.7) and sample 125353 was circum-neutral (pH_{1:2} value of 7.1). Both samples reported low salinity (EC_{1:2} values up to 0.69 mS/cm).
- The total-S values were 0.25% (sample 127348) and 0.34% (sample 125353) with respective CRS values of 0.24% and 0.29% indicating that trace sulphides are present and account for over 85% of the total-S.
- Sample 127348 reported a CO₃-C value of 5.05% which equates to a calculated CO₃-C ANC of 413 kg H₂SO₄/t. Although the laboratory reported ANC of 274 kg H₂SO₄/t is notably lower, a surplus of buffering capacity is available reflective of the dolomite. Although sample 125353 also reported a high CO₃-C value (3.33%) and associated calculated CO₃-C ANC (272 kg H₂SO₄/t), the laboratory reported ANC was only 7 kg H₂SO₄/t indicating that the calculated CO₃-C ANC overestimated the available ANC.
- The NAGpH values reported were pH 8.5 (sample 127348) and pH 7.5 (sample 125353).
- Sample 127348 was classified as NAF while sample 125353 was classified as PAF-LC. Using the NPR resulted in a PAF classification for sample 125353, while the AMIRA classification would produce an uncertain outcome. Conservatively a PAF-LC classification was adopted based on the NAPP value of 3.4 kg H₂SO₄/t.

4.3.2.5 NAM

Twenty-five samples were assessed from the NAM stratigraphic unit which included five chert samples (NAM strand), 16 shale samples (NAM and DNAM strands), one dolomite sample (DNAM strand) and three mineralised waste samples (NAM and HNAM strands).

Chert

- The five chert samples varied in sample depth ranging from 20 to 78 m downhole depth.
- The samples were circum-neutral (pH_{1:2} values of 6.9 to 7.7) and reported low to moderate salinity (EC_{1:2} values of 0.11 to 1.69 mS/cm).
- Three samples reported negligible total-S values ranging from below the detection limit (0.01%) to 0.02%. Two samples reported total-S values of 0.38% and 0.43% and were analysed for CRS. The respective CRS values of 0.31% and 0.33% indicate that sulphides account for approximately 80% of total-S.
- The CO₃-C values varied notably between the five samples. The three samples with negligible total-S values also reported negligible CO₃-C values of up to 0.06% which equates to calculated CO₃-C values of 1 to 5 kg H₂SO₄/t. The laboratory reported ANC values were slightly higher, ranging from 1 to 8 kg H₂SO₄/t. The other two samples reported CO₃-C values of 1.6% and 3.58% with calculated CO₃-C ANC values of 131 and 292 kg H₂SO₄/t respectively. While for sample 140137 the calculated CO₃-C ANC and the laboratory reported ANC was in a similar range (131 and 114 kg H₂SO₄/t respectively), the difference between those two values was notable for sample 117123 (292 and 150 kg H₂SO₄/t respectively) indicating that the calculated CO₃-C ANC overestimates the available ANC.
- All samples were classified as NAF.

Dolomite

- The dolomite sample was collected at 96 to 100 m downhole depth.
- The dolomite sample was circum-neutral (pH_{1:2} value of 7.9) and highly saline (EC_{1:2} value of 4.01 mS/cm).
- The total-S value was 1.19%. The CRS value of 1.00% indicated that most of the sulphur was present in the form of sulphides.
- The CO₃-C value was 5.72% with a calculated CO₃-C ANC of 467 kg H₂SO₄/t. The laboratory reported ANC of 302 kg H₂SO₄/t indicated that although the calculated CO₃-C ANC overestimates the available ANC based on the difference between the calculated and measured ANC values, there is a surplus of neutralising capacity.
- The dolomite sample was classified as NAF.

Shale

- The sixteen shale samples varied in depth ranging from surficial samples (0-4 m) up to 106 m downhole depth.
- The samples varied between mildly alkaline (pH_{1:2} value of 8.6 – one sample), circum-neutral (pH_{1:2} values of 6.0-7.6 – 11 samples), mildly acidic (pH_{1:2} value of 5.3 – one sample) and acidic (pH_{1:2} values of 2.8 to 3.5 – three samples). The salinity was low for nine samples (EC_{1:2} values of up to 0.96 mS/cm), moderate for five samples (EC_{1:2} values of 1.70 to 3.69 mS/cm) and high for two samples (EC_{1:2} values of 5.51 and 6.06 mS/cm) one of which reported an acidic pH value (sample 143363).
- Total-S values ranged from less than the detection limit (<0.01%) to multi-percent (3.46%), though most total-S values were in the range of 0.01-1.00%.
- In the shale sampled from the surface down to approximately 50 m depth, the proportion of sulphides was low, as indicated by the CRS values (up to 0.005%), even though total-S was reported up to 0.83%. The mineralogical assessment (Section 4.3.1.4) found that sulphur forms may include gypsum and alunite. All of the shallow samples were collected from the NAM strand.
- The deeper shale samples from greater than 50 m downhole depth reported total-S in the range of 0.49-3.46% and respective CRS values from 0.28-2.55% indicating that sulphides account for 28-90% of the total-S except for one sample (145933) which only reported a total-S value of 0.02%. These samples included shale from the NAM and DNAM strands.
- As has been observed for the chert, where the CRS values indicate negligible sulphide contents as for the shallow shale samples, the CO₃-C values were often also low ranging from <0.01% to 0.11% indicating negligible carbonate contents. The CO₃-C calculated ANC was between <1 to 9 kg H₂SO₄/t while the laboratory reported ANC was between 1 and 16 kg H₂SO₄/t. For the samples with trace to accessory sulphide contents, the CO₃-C values varied from 0.05% (sample 151575) to 7.17% (sample 143199) with calculated CO₃-C ANC values of 4 to 586 kg H₂SO₄/t, respectively. The laboratory reported ANC values were notably lower than the CO₃-C ANC values and in the range of -4 and 71 kg H₂SO₄/t. The negative ANC values were associated with the samples that reported an acidic pH in water indicating that all neutralising capacity had been used in this sample. For the other samples, the low laboratory reported ANC when compared to the calculated CO₃-C ANC indicated that the calculated CO₃-C ANC overestimated the available ANC.
- For a number of shale samples, the difference between total-C and CO₃-C was notable and up to 4.31%.
- Of the eight shallow shale samples, the four samples with the highest total-S were tested for NAG and reported NAGpH values in the range of pH 6.6 to 7.3. Of the eight deep shale samples, seven samples were tested for NAG. For five samples the NAGpH was below pH 4.5, ranging from pH 2.5 to 4.0. For two samples the NAGpH was above pH 4.5 with pH values of 4.7 and 6.4.

- Based on the ratio method using CRS for the MPA calculations, the eight shallow shale samples with depths between 0 to 50 m downhole depth were classified as NAF, though when the AMIRA classification and the use of total-S was applied, four of these samples would classify as Uncertain. Three of these four samples were assessed for mineralogy with one sample reporting accessory alunite and one sample reporting accessory gypsum as the detectable sulphur mineral (Section 4.3.1.4). The potential for acidity from alunite should be further assessed which is further described in Section 5.1.1.
- Of the eight deep shale samples, one (145933) was classified as NAF. Three samples were classified as PAF based on the acidic pH_{1:2} values and further potential to produce acid based on the remaining CRS values and applying the ratio method. The remaining four samples were classified as PAF based on the ratio method when using CRS. As per the AMIRA classification, three of these samples would be classified as PAF while two would be classified as NAF. Conservatively, the four samples were classified as PAF, with sample 114213 classified as PAF-LC.

Mineralised waste

- The mineralised waste samples included two shallow goethite samples collected from 2 to 6 m (sample 119975) and 4 to 8 m downhole depth (sample 161028) and a magnetite sample collected from 90 to 94 m downhole depth (sample 122710).
- The three samples were circum-neutral (pH_{1:2} values of 6.9-7.6) and reported low to moderate salinity (EC_{1:2} values of 0.11 to 1.67 mS/cm).
- The total-S values were ranging from 0.03 to 0.09% indicating negligible sulphide contents.
- The CO₃-C values were between 0.03% for the two goethite samples and 0.12% for the magnetite sample with calculated CO₃-C ANC of 2 and 10 kg H₂SO₄/t respectively. The laboratory reported ANCs were between 3 and 33 kg H₂SO₄/t.
- All three samples were classified as NAF.

4.3.2.6 JER

Three shale samples from the JER stratigraphic unit were assessed. Sample depths varied from 14 to 18 m (sample 150095), 34 to 38 m (sample 119991) to 62 to 66 m downhole depth (sample 151578).

Shale

- Two of the samples were acidic (pH_{1:2} values of 2.2 and 2.3) and reported high to very high salinity (EC_{1:2} values of 8.66 and 11.21 mS/cm), while the shallowest sample reported a mildly alkaline pH (pH_{1:2} value of 8.1) and moderate salinity (EC_{1:2} value of 1.89 mS/cm).
- The total-S values were 0.97% for the shallow sample and 4.21% and 7.65% for the deeper two shale samples. The CRS value for the shallow sample was 0.002% indicating that the sulphide content was negligible for this sample. The other two samples reported CRS values of 2.788% and 4.686%, respectively, indicating that over 60% of the total-S was present in the form of sulphides.
- The CO₃-C value of the shallow shale sample was 0.70% and the calculated CO₃-C ANC was 57 kg H₂SO₄/t which is consistent with the laboratory reported ANC of 59 kg H₂SO₄/t. The CO₃-C values of the two deeper samples were 0.03% and 0.18% with calculated carbonate ANC values of 15 and 57 kg H₂SO₄/t respectively. The laboratory reported ANC values were negative indicating that no buffering capacity was available which is also shown by the acidic pH_{1:2} values.
- The two deeper shale samples reported total-C in the range of 4.62 to 4.78% but relatively low CO₃-C indicating that these shale samples were graphitic/carbonaceous similar to some of the NAM shale samples.

- The shallow shale sample (150095) was classified as NAF while the two deeper shale samples (119991, 151578) were classified as PAF and were already acidic.

4.3.2.7 Ore

Six ore samples were assessed including one sample from the MAC stratigraphic unit logged as hematite (SOMAC strand), one sample from the MAC/NAM stratigraphic units logged as goethite (HMAC/MNAM strands), and four samples from the NAM stratigraphic unit logged as shale, goethite and hematite (ONAM, TNAM and HNAM strands).

- The ore samples were circum-neutral ($\text{pH}_{1:2}$ values of 6.8 to 7.3) and reported low salinity ($\text{EC}_{1:2}$ values of up to 0.11 mS/cm).
- The total-S values were very low ranging from <0.01% to 0.04% except for one sample (sample 150700) that reported 0.15%. Sample 150700 reported a CRS value of 0.001% indicating a negligible sulphide content.
- The $\text{CO}_3\text{-C}$ values were in the range of 0.02 to 0.07% indicating negligible carbonate contents with calculated $\text{CO}_3\text{-C}$ ANC values up to 6 kg $\text{H}_2\text{SO}_4/\text{t}$, which is consistent with the laboratory reported ANC values that reached up to 7 kg $\text{H}_2\text{SO}_4/\text{t}$.
- All ore samples were classified as NAF.

4.3.3 Sulphide reactivity

Oxygen consumption testwork ($\text{OCR}_{30^\circ\text{C}}$) was undertaken on one NAM dolomite sample, six NAM shale samples and two JER shale samples:

- The oxygen consumption rate ($\text{OCR}_{30^\circ\text{C}}$) for the NAM dolomite sample (143201) was 0.0063 $\mu\text{g O}_2/\text{kg/s}$ reflective of a modest intrinsic sulphide reactivity.
- The NAM shale samples showed elevated intrinsic pyrite reactivity, a common characteristic of black carbonaceous shales. The highest $\text{OCR}_{30^\circ\text{C}}$ value of 0.094 $\mu\text{g O}_2/\text{kg/s}$ was recorded for the circum-neutral NAM shale sample 109481 with a CRS value of 1.87%, indicating an elevated intrinsic pyrite reactivity generally characteristic of pyrite in Pilbara black shales (Salmon et al. 2018, Dr Graeme Campbell Unpublished results). The remaining PAF shale samples displayed $\text{OCR}_{30^\circ\text{C}}$ values ranging up to 0.016 $\mu\text{g O}_2/\text{kg/s}$. Given the acidic $\text{pH}_{1:2}$ and CRS values of these samples, such $\text{OCR}_{30^\circ\text{C}}$ values suggest a degree of surface armouring (e.g. by jarosites) has affected these samples, limiting the intrinsic reactivity of the contained pyrite.
- The two JER samples behaved like the NAM shale samples with $\text{OCR}_{30^\circ\text{C}}$ values ranging up to 0.037 $\mu\text{g O}_2/\text{kg/s}$. Given the acidic $\text{pH}_{1:2}$ and CRS values of these samples, such $\text{OCR}_{30^\circ\text{C}}$ values suggest a degree of surface armouring (e.g. by jarosites) has affected these samples, limiting the intrinsic reactivity of the contained pyrite.

4.3.4 Total element composition

The tabulated multi-element results are presented in Table B2a (Appendix B), whilst Hg and Se results are presented in Table B2b (Appendix B).

4.3.4.1 CdD3

Ten clay samples and one calcrete sample were assayed for multi-elements:

- Seven clay samples reported a GAI between 3 and 6 for Sb.
- One clay sample reported a GAI between 3 and 6 for As.

- Four clay samples reported a GAI between 3 and 6 for Bi.

Eighteen samples were assayed for low level Hg and Se including clay, chert calcrete and hematite/goethite samples. All samples, except the calcrete samples, reported a GAI between 3 and 6 for Se.

4.3.4.2 Czd2

One hematite sample was assayed for multi-elements and reported a GAI between 3 and 6 for Mn.

Six samples were assayed for low level Hg and Se including silcrete, calcrete, shale and mineralised waste. The three mineralised waste samples reported a GAI between 3 and 6 for Se while the manganese sample reported a GAI between 3 and 6 for Hg.

4.3.4.3 NEW

One chert sample was assayed for low level Hg and Se and did not report enrichments greater than a GAI 3.

4.3.4.4 MAC

One shale/dolomite sample was assayed for multi-elements and did not report enrichments greater than a GAI of 3.

Nine samples were assayed for low level Hg and Se including chert, shale/dolomite and shale/chert samples. No enrichments greater than a GAI of 3 were reported.

4.3.4.5 NAM

Nine samples were assayed for multi-elements and including chert, shale dolomite and mineralised waste samples. One shale sample reported a GAI between 3 and 6 for As, Bi, Cu, and F while two shale samples reported a GAI between 3 and 6 for Sb.

Twenty-five samples were assayed for low level Hg and Se and included chert, shale dolomite and mineralised waste samples. Seventeen samples reported a GAI between 3 and 6 for Se, and two samples (both shale) reported a GAI between 3 and 6 for Hg.

4.3.4.6 JER

Two shale samples were assayed for multi-elements and one sample reported a GAI between 3 and 6 for Sb and Bi.

Three samples were assayed for low level Hg and Se. All three samples reported a GAI between 3 and 6 for Se, while two samples reported a GAI between 3 and 6 for Hg.

4.3.4.7 Ore

Two samples were assayed for multi-elements and no GAI values above 3 were reported.

Six samples were assayed for low level Hg and Se and three samples reported a GAI between 3 and 6 for Se.

4.3.5 Element solubility

The tabulated water extraction results compared against the groundwater baseline 80th percentile are presented in Table B3 in Appendix B.

4.3.5.1 CzD3

Water extraction testwork was conducted on ten clay samples and one calcrete sample:

- A number of minor elements occurred above the detection limit for the ten clay samples. Between four and eight samples exceeded the groundwater baseline for the following elements: Al concentrations of up to 1.05 mg/L (baseline Al concentration 0.05 mg/L), As concentrations of up to 0.00575 mg/L (baseline concentration 0.0025 mg/L), Ba concentrations of up to 0.07007 mg/L (baseline concentration 0.033 mg/L), Co concentrations of up to 0.0097 mg/L (baseline concentration 0.001 mg/L), Fe concentrations of up to 0.3 mg/L (baseline concentration 0.013 mg/L), Mo concentrations of up to 0.01649 mg/L (baseline 0.002 mg/L). For a small number of analytes (Ca, Cd, F, Mn, SO₄), one or two samples exceeded the baseline, though these exceedances were either only marginal or occurred as outliers. Two clay samples reported a pH value (pH 6.4 and 6.6) below the baseline (pH 7.1 to 7.9).
- The calcrete sample reported a small number of analytes above the baseline including: As concentration of 0.04508 mg/L (baseline concentration 0.0025 mg/L), B concentration of 2.92 mg/L (baseline 1.4 mg/L), Mo concentration of 0.03354 mg/L (baseline 0.002 mg/L), Se concentration of 0.0346 mg/L (baseline concentration 0.008 mg/L), V concentration of 0.144 mg/L (baseline 0.007 mg/L). The calcrete sample reported a pH value of 9.4, which is above the baseline (pH 7.1 to 7.9).

4.3.5.2 CzD2

Water extraction testwork was conducted on one hematite sample. A number of soluble minor elements occurred above the detection limit, though only Al (0.07 mg/L) and Fe (0.3 mg/L) concentrations were higher than the groundwater baseline with respective baseline conditions of 0.05 mg/L and 0.013 mg/L.

4.3.5.3 MAC

Water extraction testwork was conducted on one shale/dolomite sample. A small number of analytes were reported above the detection limit, with only the Mo concentration of 0.03831 mg/L above the baseline of 0.002 mg/L. The pH value of 8.7 was above the baseline (pH 7.1 to 7.9).

4.3.5.4 NAM

Water extraction testwork was conducted on two chert samples, four shale samples, one dolomite sample and two goethite samples:

- The two chert samples reported a number of soluble elements with the following elements marginally above the baseline: Ba concentration of 0.05068 mg/L (baseline 0.033 mg/L), Cd concentration of 0.00002 mg/L (0.00002 mg/L), Co concentration of 0.001 mg/L (baseline 0.001 mg/L), Fe concentration of 0.03 mg/L (baseline 0.013 mg/L), Mn concentration of 0.10 mg/L (baseline 0.079 mg/L), Mo concentration of 0.00471 mg/L (baseline 0.002 mg/L), Se concentration of 0.0215 mg/L (baseline 0.008 mg/L).
- One of the shale samples was acidic, with a pH value of 3.3 below the baseline (pH 7.1 to 7.9) and is described separately due to its elevated element concentrations. Most element concentrations were above the detection limit with the following elements exceeding the baseline: Al concentration of 176.6 mg/L (baseline 0.05 mg/L), As concentration of 0.00432 mg/L (baseline 0.0025 mg/L), Cd concentration of 0.00959 mg/L (baseline 0.00002 mg/L), Co concentration of 4.1938 mg/L (baseline 0.001 mg/L), Cr concentration of 0.182 mg/L (baseline 0.006 mg/L), Cu concentration of 0.054 mg/L (baseline 0.001 mg/L), Fe concentration of 142 mg/L (baseline 0.03 mg/L), Mn concentration of 471.7 mg/L (baseline 0.079 mg/L), Ni concentration of 31.624 mg/L (baseline 0.0025 mg/L), Pb concentration of 0.0569 mg/L (baseline 0.001 mg/L), SO₄ concentration of 5,015 mg/L (baseline 1100 mg/L), Se

concentration of 0.0344 mg/L (baseline 0.008 mg/L), Zn concentration of 85.826 mg/L (baseline 0.013 mg/L).

- The remaining three shale samples were circum-neutral, though two samples reported pH values (pH 6.0 and 7.0) below the baseline (pH 7.1 to 7.9). The shale samples reported similar soluble elements to the NAM chert samples with the following elements above the baseline for one to three samples: As concentration of 0.00753 mg/L (baseline 0.0025 mg/L), Cd concentration of up to 0.00006 mg/L (baseline 0.00002 mg/L), Co concentration of up to 0.0063 mg/L (baseline 0.001 mg/L), Mn concentrations of up to 5.42 mg/L (baseline 0.079 mg/L), Ni concentration of 0.026 mg/L (baseline 0.0025 mg/L), Zn concentration of 0.02 mg/L (baseline 0.013 mg/L).
- The dolomite sample reported a number of soluble elements above the detection limit, though only a small number of elements above the baseline: Al concentration of 0.08 mg/L (baseline 0.05 mg/L), Mn concentration of 0.14 mg/L (baseline 0.079 mg/L), Mo concentration of 0.00481 mg/L (baseline 0.002 mg/L), SO₄ concentration of 1,742 mg/L (baseline 1,100 mg/L), Se concentration of 0.0316 mg/L (baseline 0.008 mg/L).
- Of the two goethite samples, only one sample reported elemental concentrations above the baseline including the following elements: Al concentration of 1.27 mg/L (baseline 0.05 mg/L), As concentration of 0.00253 mg/L (baseline 0.0025 mg/L), Ba concentration of 0.09307 mg/L (baseline 0.033 mg/L), Co concentration of 0.0069 mg/L (baseline 0.001 mg/L), Fe concentration of 1.7 mg/L (baseline 0.01 mg/L). One goethite sample reported a pH value of 6.9 below the baseline (7.1 to 7.9).

4.3.5.5 JER

Water extraction testwork was conducted on two JER shale samples. Both samples were acidic (pH 2.2 and 2.3) with pH values below the baseline (7.1 to 7.9) and reported elevated analyte concentrations including a large number of analytes exceeding the baseline:

- EC values of up to 11.21 mS/cm (baseline 8.00 mS/cm), calculated TDS concentrations of up to 7,511 mg/L (baseline 5,200 mg/L), Al concentrations of up to 914.39 mg/L (baseline 0.05 mg/L), As concentrations of up to 2.02066 mg/L (baseline 0.0025 mg/L), Cd concentrations of up to 0.04002 mg/L (baseline 0.00002 mg/L), Co concentrations of up to 10.2792 mg/L (baseline 0.001 mg/L), Cr concentrations of up to 2.350 mg/L (baseline 0.006 mg/L), Cu concentrations of up to 58.299 mg/L (baseline 0.001 mg/L), Fe concentrations of up to 3,990 mg/L (baseline 0.013 mg/L), Mn concentrations of up to 107.6 mg/L (baseline 0.079 mg/L), Mo concentrations of up to 0.00507 mg/L (baseline 0.002 mg/L), Ni concentrations of up to 17.228 mg/L (baseline 0.0025 mg/L), P concentrations of up to 3.371 mg/L (baseline 0.01 mg/L), Pb concentrations of up to 0.0261 mg/L (baseline 0.001 mg/L), SO₄ concentrations of up to 15,043 mg/L (baseline 1100 mg/L), Se concentrations of up to 0.1337 mg/L (baseline 0.008 mg/L), V concentrations of up to 1.998 mg/L (0.007 mg/L), Zn concentrations of up to 24.265 mg/L (baseline 0.013 mg/L).

4.3.5.6 Ore

Water extraction testwork was conducted on two ore samples both of which reported pH values (6.8 and 7.0) marginally below the baseline (7.1 to 7.9). Most minor element concentrations were below the detection limit with all minor element concentrations below the baseline.

4.4 Erosional stability

The likely erosional stability classifications are described below for the key lithology types. These classifications are based upon fresh rock composition, with the stability classifications for the highly weathered (oxide) to moderately weathered (transitional) components inferred for each lithology type. Weathering processes modify the mineralogical microstructure and composition of fresh rock, influencing its durability, potentially resulting in reduced erosional stability.

Erosional stability is tied closely to lithology and, since a number of these lithology types occur across multiple stratigraphic units, the erosion stability will be discussed in terms of these lithologies.

This assessment was conducted from pre-mining drill data for key waste rock units over the broad Project area. The as-mined properties of the key waste rock units should be verified during mining.

4.4.1 Oxide

The oxide zone (dominantly within the CzD3 stratigraphic unit) represents the strongly weathered portion of the lithological profile. Weathering processes modify and degrade fresh rock and can result in a disaggregated mix of clays and resistant lithic particles (e.g. quartz, oxides). The oxide profile generally grades from transported overburden material at the surface, to caprock, clay and detritals in the saprolite zone (Scott and Pain 2009).

Oxide clay samples 146309, 143161, 158056, 153018, 161151 and 148774 were assessed for mineralogy and contained dominant quartz, major to accessory kaolinite, minor to accessory hematite and goethite and accessory serpentine, micas, K-feldspar, anatase, alunite and calcite.

Drill core photographs of oxide are displayed in Figure 7 and demonstrate poor RQD (Deere and Deere 1988), with high fracturing, plastic deformation and disaggregation into fine sediments.

Oxide (overburden, transported sediments and saprolite) is expected to display low erosional stability due to its generally unconsolidated character and high proportion of clays and other soft minerals.

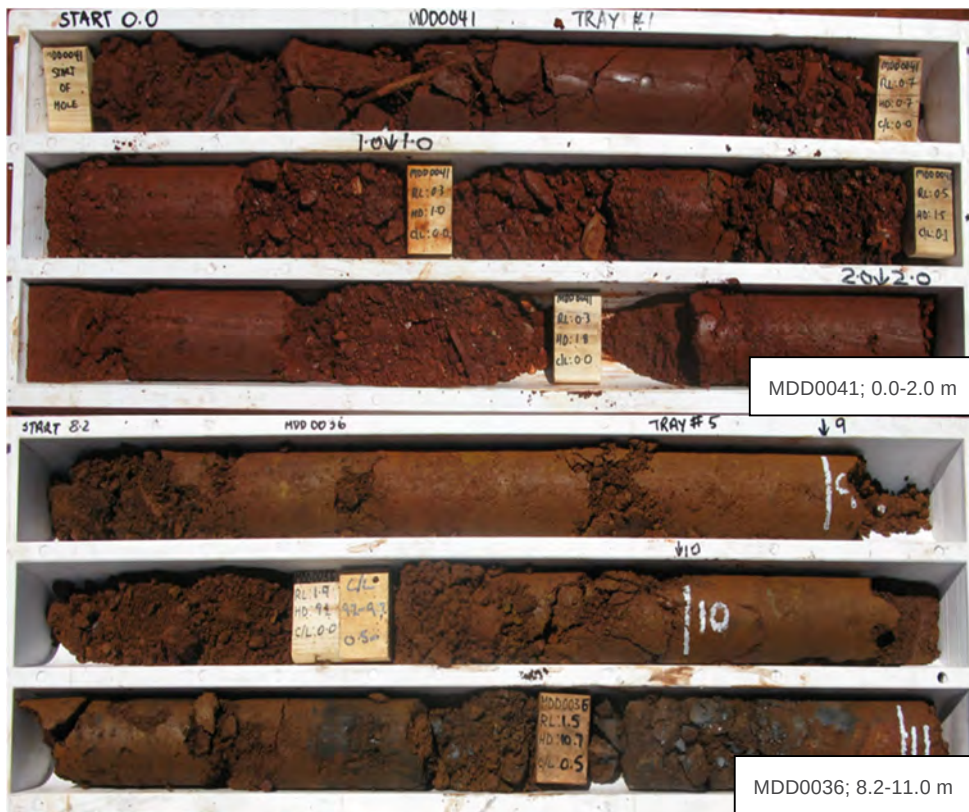


Figure 7: Oxide from drillholes MDD0041 and MDD0036

4.4.2 Calcrete / Silcrete

The chemical weathering of silicates and carbonates releases Si and C into solution, where, in arid climates, they can be precipitated into microcrystalline aggregates and form silcrete and calcrete respectively. Stratigraphic unit CzD2 (and to a lesser extent, CzD3) typically hosts calcrete and silcrete lithologies at the Project.

These chemically stable (and, in the case of silcrete, physically stable) materials can harden to form a duricrust that can protect this zone of the regolith from erosion and further major chemical alteration (Scott and Pain 2009).

The silica within silcrete displays high physical and chemical stability, whilst the calcite within calcrete displays low physical and chemical stability.

Calcrete sample 141544 was assessed for mineralogy and contained dominant calcite and accessory hematite, goethite, kaolinite, micas, K-feldspar, dolomite-ankerite and quartz.

A drill core photograph of calcrete / silcrete material is displayed in Figure 8 and demonstrates good RQD (Deere and Deere 1988), with low fracturing.

Calcrete / silcrete waste rock types should display moderate to moderate-high erosional stability.



Figure 8: Calcrete / silcrete from drillhole MDD0095

4.4.3 Chert / BIF

4.4.3.1 Chert

Chert rocks are dominated by microcrystalline silica and are therefore quartz-rich. Quartz typically exhibits high physical and chemical stability (Scott and Pain 2009).

Chert samples 117105, 149702, 161162 and 147597 were assessed for mineralogy and contained dominant quartz, minor hematite and goethite, and accessory kaolinite and magnetite.

No drill core photographs of chert were available for review to determine RQD and fracturing frequency.

The dominance of quartz indicates that fresh chert waste rock types should display moderate-high erosional stability. Transitional chert should display moderate erosional stability whilst oxide chert should display low erosional stability.

4.4.3.2 BIF

Where unmineralised BIF rocks are encountered at the Project, they will typically contain high proportions of quartz, hematite and goethite (Bonewitz 2012). Quartz displays high physical and chemical stability, whilst hematite and goethite display moderate physical and high chemical stability (Scott and Pain 2009).

A drill core photograph of BIF is displayed in Figure 9 and demonstrates moderate RQD (Deere and Deere 1988), with moderate fracturing.



Figure 9: Transitional BIF from drillhole MDD0003

The dominance of quartz indicates that fresh BIF waste rock types should display moderate-high erosional stability. Transitional BIF should display moderate erosional stability whilst oxide BIF should display low erosional stability.

4.4.4 Dolomite

Dolomite generally forms through the secondary replacement of calcite with dolomite in precursor limestones and lime muds, possibly by percolating magnesium-rich watery solutions (Bishop, Woolley and Hamilton 2007). The dolomite beds observed within the Jeerinah Formation are tabular to nodular, recrystallised and show wavy stylolitic laminations with some relict textures (GSWA 1997).

Mineral dolomite is typically the dominant mineral within dolomite rock, with lesser proportions of detrital minerals and secondary silica (Bishop, Woolley and Hamilton 2007). Whilst mineral dolomite is slightly harder and less soluble than calcite, it will still typically exhibit low-moderate physical and chemical stability.

No drill core photographs of dolomite were available for review to determine RQD and fracturing frequency.

If the proportion of silica within the dolomite rock is low, fresh dolomite waste rock should display moderate erosional stability. Transitional dolomite should display low-moderate erosional stability whilst oxide dolomite should display low erosional stability.

4.4.5 Shale

Shale rocks are very fine-grained, micro-laminated and rich in clay and quartz minerals (Bishop, Woolley and Hamilton 2007). Black (carbonaceous) shales have been observed particularly in the Jeerinah stratigraphy at the Project. The clay minerals will generally display low physical and high chemical stability, whilst the quartz will display high physical and high chemical stability (Scott and Pain 2009). Whilst the chemical stability of the constituent minerals is generally high, the micro-laminations within the rock structure may act as fluid pathways, increasing water-mineral interaction. The weathering of shales can therefore be expected to commence along cleavage planes, with disaggregation commencing via the expansion and contraction of sheet-silicates during wetting/drying cycles (Scott and Pain 2009).

Shale samples 152409, 1149988, 119991 and 151578 were assessed for mineralogy and contained dominant quartz, occasional major hematite, minor pyrite and accessory kaolinite, serpentine, micas, illite-smectite, anatase, alunite and jarosite.

Drill core photographs of shale are displayed in Figure 10 and demonstrate moderate RQD (Deere and Deere 1988), with moderate fracturing and moderate grain cohesion.

The fresh, transitional and oxide shale waste rock should display low erosional stability.



Figure 10: Shale from drillhole MDD0032

4.4.6 Mineralised Waste

Hematite, goethite, magnetite, maghemite and manganese dominated mineralised waste has been recorded from the drillhole logging.

The supergene enrichment process that created the mineralised waste within the host BIF units typically displays porosity; resulting in the mineralised lithotypes being affected by weathering processes more readily than unmineralised rocks. The porosity was inferred to be formed by the leaching of the goethite mineralisation that had pseudomorphed silicates and carbonates within the host BIF (Blockley, et al. 1993).

As a result of the leaching of the goethite, Blockley, et al. (1993) describes the ore formed within the Mount Newman Member as being typically softer and more friable than what is seen within Brockman Iron Formation at other sites.

Hematite and goethite mineralised waste samples 150700, 141551, 140111 and 147748 were assessed for mineralogy and contained dominant to major goethite and hematite, minor kaolinite, and accessory serpentine, quartz anatase, gibbsite, calcite, K-feldspar and pyrolusite.

A drill core photograph of mineralised waste is displayed in Figure 11. This photograph shows that mineralised waste demonstrates moderate-good RQD (Deere and Deere 1988), with moderate-low fracturing.

Fresh mineralised waste rock types should display moderate-high erosional stability. Transitional mineralisation should display moderate erosional stability whilst oxide mineralised waste should display low erosional stability.



Figure 11: Mineralised waste from drillhole MDD0040

4.4.7 Exchangeable cations and Emerson Aggregate Test classifications

Materials with a dispersive clay fraction can have a weak structure that is easily degraded upon saturation (i.e. low physical stability). If Na cations (Na^+) are dominant on clay exchange surfaces and the ESP exceeds 6% of the total exchangeable cations, then the material is classified as 'sodic', which can lead to poor physical properties (i.e. clay dispersion, hard-setting and erosion in clay-rich materials). ESP values over 15% are classified as 'highly sodic'.

The potential for dispersion of the clay fraction upon saturation (Emerson Test) and the ESP was assessed on the <2 mm fraction of 15 moderately to strongly oxidised waste samples from the CzD2 and CzD3 stratigraphies (Table 14). Three of the samples were classified as sodic, with ESP values over 6%. The remaining samples were classified as non-sodic. The relatively low sodicity values recorded for the majority of the samples indicates that exchangeable Na (i.e. the ESP) is unlikely to have a strong dispersive influence on the clay fraction. This was exhibited in the Emerson test results where only minor dispersion of the clay fraction

was observed. All samples were classified as Emerson Class 5 (Aggregate slakes but does not disperse, no dispersion of remoulded soil, soil:water suspension remains dispersed) (Table 14).

These results indicate that, while the potential for clay dispersion is low, care should be taken to minimise handling of these materials, as repeated handling / disturbance will likely increase the potential for clay dispersion and structural decline.

Table 14: Emerson Test classifications and ESP results for oxide samples

Sample reference	Strat unit	Lithology	ESP (%) and sodicity rating	Emerson class
146309	CzD3	Clay	3% non-sodic	Class 5 (no dispersion of remoulded material, dispersion of a 1:5 soil:water suspension)
158056		Clay	3% non-sodic	
148774		Clay	2% non-sodic	
125317		Clay	1% non-sodic	
159185		Clay	2% non-sodic	
141544		Calcrete	8% sodic	
143161		Clay	4% non-sodic	
161151		Clay	5% non-sodic	
147748		Hematite / Goethite	1% non-sodic	
141551	CzD2	Goethite	4% non-sodic	
140111		Hematite	6% sodic	
114667		Calcrete	0% non-sodic	
122694		Silcrete	2% non-sodic	
154912		Manganese	7% sodic	
158501		Shale	1% non-sodic	

5. Discussion

5.1 Acid drainage potential

5.1.1 Calcium for calculating ANC

For ABA calculations based on assay results in the drilling database, S has been used as an indicator for potential generation of acidity while Ca has been used as an indicator for neutralising capacity. For the ANC calculation it is assumed that all Ca is present in the form of calcite (calcium-carbonate CaCO_3).

Ca is also a common element in a number of minerals that do not contribute appreciably to neutralising capacity. Verification of how representative the Ca content is of calcite needs to be verified for each rock type. Where Ca is associated with minerals other than calcite, the use of Ca as a proxy for ANC could lead to an overestimation of the available ANC. Depending on which other minerals may contribute to the neutralising potential, the use of Ca as a proxy for ANC could also lead to an underestimation of the available ANC.

Mineralogical assessments are useful to identify Ca-bearing minerals, or other minerals that contribute to the neutralising potential, though at trace amounts minerals are often not identified. In this study, only four samples reported calcite in the mineralogical assessment. Two of these samples were clay samples from CzD3. A different clay sample from the CzD3 reported gypsum (calcium-sulphate dihydrate), which means that the Ca is not associated with neutralising potential.

To further investigate the relationship between Ca and available ANC, the Ca content of the 68 samples was used to calculate Ca-ANC (by assuming all Ca is in the form of calcite with a factor of 24.5 kg $\text{H}_2\text{SO}_4/\text{t}$ for 1% of Ca) which was then compared against the calculated $\text{CO}_3\text{-C}$ ANC (which is assuming that all carbonates are present in the form of calcite with a factor of 81.7 kg $\text{H}_2\text{SO}_4/\text{t}$ for 1% of $\text{CO}_3\text{-C}$) and the laboratory reported ANC. This comparison has shown that for most of the samples the Ca-ANC was slightly less than the laboratory reported ANC (55 out of 68 samples) while when compared to the $\text{CO}_3\text{-C}$ calculated ANC it was slightly lower in only 45 samples indicating that the use of Ca is over-representing the amount of calcite in at least 23 samples.

Overall, the calculated Ca-ANC values were in the same range as both the laboratory reported ANC and the calculated $\text{CO}_3\text{-C}$ ANC except for a small number of samples, in particular the deeper NAM and JER shales.

Preliminarily, the use of Ca as a proxy for ANC can be used, except for the carbonaceous shale of the NAM and JER units. For most samples, the use of Ca-ANC presents an underestimation of the available ANC, thus would be a conservative measure. For all units, it is recommended to verify the relationship between Ca and ANC through further testing e.g. ANC testing.

Generally, the Ca contents reported for the 68 samples were relatively low with a median value of 0.11% which equates to a Ca-ANC of 2 kg $\text{H}_2\text{SO}_4/\text{t}$. While the use of Ca is conservative, it may be too conservative for a number of samples such as the dolomitic shale and chert where the Ca-ANC is orders of magnitudes lower than the laboratory reported and $\text{CO}_3\text{-C}$ calculated ANC. Other contributors to the neutralising potential such as the use of Mg may be useful for future assessments for certain lithologies.

The use of $\text{CO}_3\text{-C}$ for calculating the ANC has shown to over-estimate the available ANC in shale and chert samples from MAC, NAM and JER stratigraphic units due to potential occurrences of organic carbon or carbonates with reduced neutralising potential such as ferroan carbonates and is unsuitable for these units. The use of calculated $\text{CO}_3\text{-C}$ ANC might be useful in the surficial detrital units such as the CzD3 and CzD2.

5.1.2 Prediction of acid generation

The use of S assay results / total S for the prediction of acid generation is a conservative approach which often overestimates the potential acidity as it assumes that all sulphur is present in the form of pyrite for MPA calculations (30.6 kg H₂SO₄/t for 1% S). As sulphur is the only available indicator of potential acidity in the drilling database, sulphur speciation was conducted for selected samples to provide better insight into the S forms present.

These results have shown that the use of total-S is overly conservative as the amounts of sulphides for a large number of samples is negligible, based on the CRS values. Where only CRS is used to determine MPA, most of the samples would classify as NAF, with the exception of a number of shale samples that were classified as PAF.

Although sulphates such as gypsum are often non-acid forming, the mineralogical assessment confirmed the presence of alunite, an Al hydroxy sulphate mineral which can be acid generating (Plumlee 1999). Alunite has been found in most of the samples from the CzD3 stratigraphic unit (nine out of the ten samples investigated) along with a number of samples from other units such as NAM and JER. Most of these samples reported an Uncertain classification when total-S was used which is a conservative measure to reflect the presence of alunite.

Alunite can generate acidity when in contact with water and when hydrous aluminium oxides precipitate:

- $\text{KAl}_3(\text{SO}_4)_2(\text{OH})_6 + 3\text{H}_2\text{O} = 3\text{Al}(\text{OH})_3 + 2\text{SO}_4^{2-} + 3\text{H}^+ + \text{K}^+$ (Plumlee 1999).

While alunite generally has a low solubility (Price 2009), the risk of acidity should be further investigated since this material is intended to be stored below the water table and reported an uncertain AFP. Where reaction rates are slow, it could result in negligible acid generation (Price 2009).

A study on acid generation from alunite and jarosite bearing materials by Linklater et al (2012) investigated the leachate quality of four different alunite and jarosite-bearing materials from the Pilbara via the AMIRA free draining kinetic leach test method (AMIRA 2002). The results showed that although the initial pH may be circum-neutral, most samples reached a leachate of around pH 4 after time. After week 20, the average dissolved SO₄ concentration was approximately 18-35 mg/L indicating limited sulphate dissolution following an initial flush of more soluble sulphates (Linklater et al. 2012).

Similar SO₄ concentrations of 13 to 62 mg/L were reported in the water extraction results for a number of samples from CzD3 indicating the presence of a sulphate with low solubility. These samples reported alunite in the mineralogical assessment. Although the pH of the water extract was circum-neutral, these samples might acidify should they be leached further. Due to the low solubility, only a small proportion could have dissolved during the water extraction testwork. As this waste material is planned to be disposed of in-pit below the groundwater table, a more detailed assessment is required. This may include water extraction testwork at higher solid:liquid ratios or a sequential leach test. The leachate behaviour of waste rock containing alunite should be assessed by using groundwater as the leachate medium for further water extraction testwork.

Based on the ABA of the detailed geochemical analysis and the ABA of the drilling database, some material from the NAM and JER and to a lesser extent from the MAC stratigraphic units may be PAF. The PAF classification is linked to deeper shale and chert units with increased sulphide-S contents. HPPL have advised that the current pit design aims to exclude black carbonaceous shale from the NAM and JER stratigraphic units. The potential impacts of PAF to be exposed in country rock during dewatering should be considered.

The risk of PAF material in the CzD2 and NEW stratigraphic units is low.

5.2 Saline drainage potential

INAP (2009) defines saline drainage as the drainage that occurs when sufficient base minerals are present to neutralise acid and metalliferous drainage (AMD) generation in a high salinity environment during oxidation. Factors that may be present include neutral to alkaline pH, moderate sulphate, magnesium and calcium concentrations, and low metals. INAP (2009) uses the following thresholds to define the domain of saline drainage:

- Above pH 6.
- Sulphate concentration greater than 1,000 mg/L.

Of the 25 geochemical samples tested for water extracts, only two samples were above pH 6 and 1,000 mg/L SO₄ (158056 [CzD3 clay] and 143201 [NAM dolomite]). Trace metals and metalloids were ≤0.1 mg/L for the two samples.

The EC and calculated TDS of all 68 samples was compared against the groundwater quality results (Burgers 2023) and showed that the reported EC and calculated TDS values from the 68 samples were below the 80th percentile of groundwater EC and TDS values in all samples except two JER shale samples.

These results indicate that saline drainage is not likely to be a risk at the Project.

5.3 Metalliferous drainage potential

Metalliferous drainage can occur as acidic metalliferous drainage (AMD) or neutral metalliferous drainage (NMD).

AMD is often associated with high Fe and Al concentrations that can range from 1,000 to >10,000 mg/L. Trace metals such as Cu, Pb, Zn, Cd, Mn, Co and Ni can also achieve elevated concentrations from 100 to >1,000 mg/L. The pH for AMD is below pH 6.0 (INAP 2009).

Of the 25 geochemical samples tested for water extracts, 3 samples were below pH 6. All three samples were shale samples from the NAM and JER units. Concentrations for Al reached up to 914 mg/L and for Fe up to 3,990 mg/L. A number of trace metals and metalloids reported elevated concentrations exceeding the groundwater quality trigger values (Burgers 2023) by multiple orders of magnitude.

These results indicate that AMD is presenting a risk for the deeper lying NAM and JER shale which was classified as PAF, though this material is not intended to be mined. Overall, AMD is not likely to be a risk at the Project based on the initial water extraction testwork.

In NMD trace metal concentrations are often lower associated with formation of secondary mineral phases or sorption processes. With increased pH some trace metals (e.g. Cd, Cr, Mn, Mo and Zn) and metalloids such as As, Se and Sb remain in solution. The pH for NMD is above pH 6.0 (INAP 2009).

Of the 25 geochemical samples tested for water extracts, 22 samples were equal or above pH 6. For these samples, concentrations of trace metals and metalloids were generally orders of magnitude lower than for the three samples with pH less than pH 6.0, though exceeded the groundwater quality trigger values (Burgers 2023) in a number of analytes.

Water extraction testwork with a 1:2 soil:liquid ratio represents a first flush event and is often associated with elevated soluble element concentrations. A number of analytes in the water extraction testwork exceeded the respective groundwater baseline values (Burgers 2023). Testwork at more dilute solid:liquid ratios (e.g. 1:10 or 1:20) is therefore recommended to represent longer-term conditions when the waste material is disposed of in pit and submerged in groundwater. LEAF testwork to address this gap is currently planned.

5.4 Sodic / dispersive potential

Sodicity and clay dispersion are used to identify whether the clay fraction of oxidised waste rock samples is prone to dispersion and structural decline. Fifteen samples across the CzD3 and CzD2 stratigraphic units were analysed for exchangeable cations and EDT. Three samples were classed as sodic, whilst the remaining twelve were non-sodic. All samples were categorised as Class 5 (EDT), meaning that there was no observed clay dispersion of the remoulded material, however there was dispersion in a 1:5 soil/water suspension. The potential for clay dispersion is therefore considered low, however care should be taken to minimise handling of these materials, as repeated handling / disturbance will likely increase the potential for clay dispersion and structural decline.

5.5 Acid sulphate soils potential

Acid sulphate soils (ASS) are naturally occurring soils and sediments that contain iron sulphides, predominantly in the form of pyrite. The disturbance of ASS and exposure to oxygen results in sulphuric acid being formed, which can lead to the release of metals, nutrients and acidity into the soil and groundwater system (DER 2015).

ASS includes potential acid sulphate soils (PASS) and actual acid sulphate soils (AASS). PASS are soils or sediments which contain sulphides that have not been oxidised, and AASS are soils or sediments which contain sulphides that have undergone some oxidation (DER 2015).

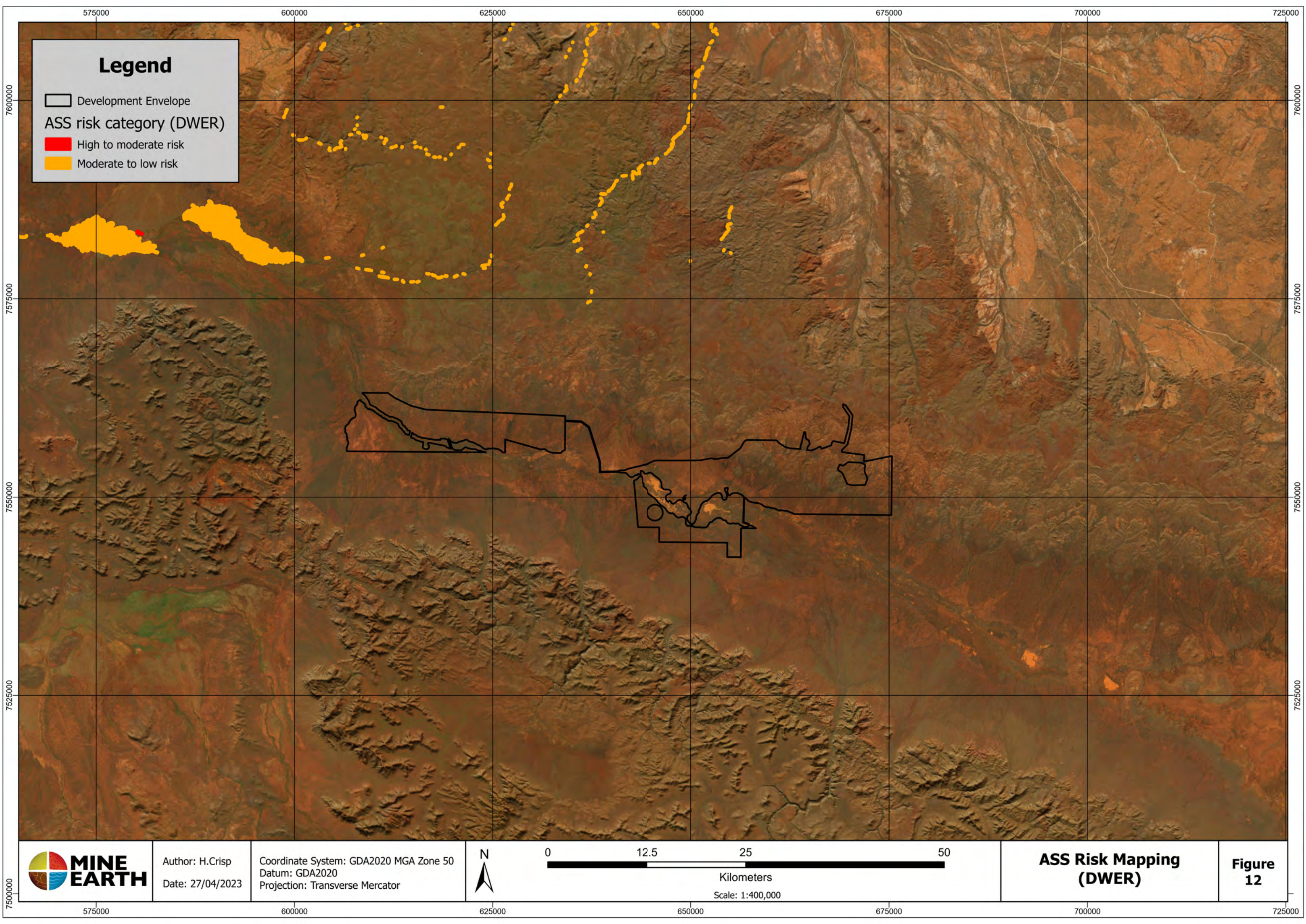
ASS risk mapping has been developed by the Department of Water and Environmental Regulation (DWER) and is available for the Pilbara coastline and other limited areas within the Pilbara. The Project area is not located within an area that is delineated as having ASS risk from this DWER mapping dataset (Figure 12). It is noted however, that this risk mapping does not provide a comprehensive overview of ASS risk within the Project area.

Additional ASS probability mapping is available from the CSIRO Atlas of Australian Acid Sulphate Soils (Fitzpatrick, Powell and Marvanek 2011). This mapping is a provisional ASS classification inferred from national and state soils, hydrography, vegetation and landscape coverages, mapped at a base scale of 1:2.5 million. The CSIRO mapping is very broad scale and has not involved any ground-truthing. This mapping indicates that there is a low or extremely low probability of occurrence of ASS across most of the Project area, with some minor areas where there is a high probability of occurrence (Figure 13).

There are certain areas where ASS are generally found in WA, as described in the ASS investigation guidelines (DER 2015). Of those areas, the following are present within the Project area:

- Floodplains.
- Wetland-dependent vegetation such as reeds and paperbarks.
- Areas where the highest known watertable level is within three metres of the surface.
- Any areas where a combination of all the following pre-disposing factors exist;
 - Organic matter.
 - Iron minerals.
 - Waterlogged conditions or a high watertable.
 - Sulphidic minerals.

Given that the Project area is within areas that have an elevated risk of ASS, it is recommended that an acid sulphate soil investigation is undertaken in accordance with the guidelines (DER 2015).



Legend

Development Envelope

ASS risk category (DWER)

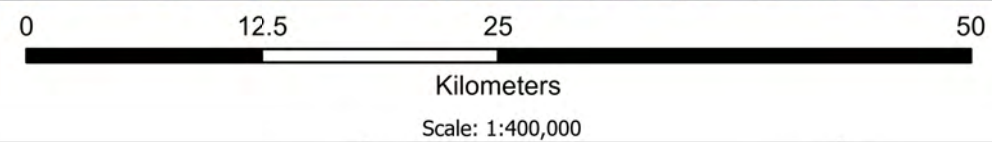
High to moderate risk

Moderate to low risk



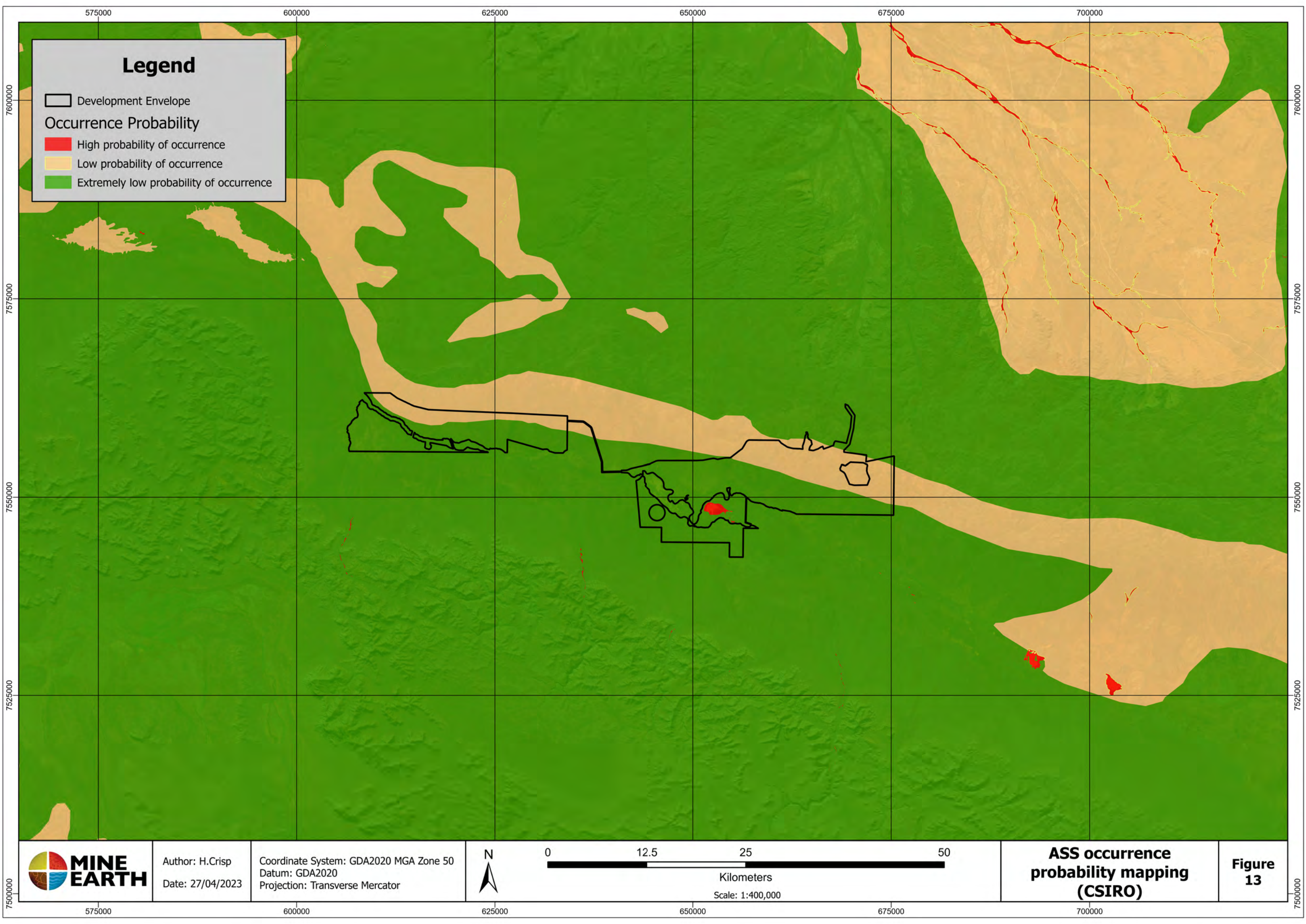
Author: H.Crisp
Date: 27/04/2023

Coordinate System: GDA2020 MGA Zone 50
Datum: GDA2020
Projection: Transverse Mercator



**ASS Risk Mapping
(DWER)**

**Figure
12**



Author: H.Crisp
Date: 27/04/2023

Coordinate System: GDA2020 MGA Zone 50
Datum: GDA2020
Projection: Transverse Mercator



0 12.5 25 50
Kilometers
Scale: 1:400,000

**ASS occurrence
probability mapping
(CSIRO)**

**Figure
13**

5.6 Fibrous mineral potential

Fibrous hydrated silicate (asbestiform) minerals are naturally occurring minerals that can display a fibrous form and have the potential to affect human health upon inhalation. Widely distributed in Western Australia, most fibrous minerals belong to the serpentine and amphibole groups and can be major components in mafic and ultramafic rocks hosting gold and base metal deposits and may also be encountered in banded iron formations in the Hamersley Basin (DMIRS 2023). Fibrous minerals include:

- Serpentine Group
 - Chrysotile.
- Amphibole Group
 - Crocidolite (asbestiform Riebeckite).
 - Actinolite.
 - Amosite (asbestiform Grunerite).
 - Anthophyllite (asbestiform Cummingtonite).
 - Tremolite.

For the Project, 32 samples across clay, calcrete, chert, shale and mineralised waste were tested for mineralogy. Trace serpentine was observed in 11 samples (across clay, shale and mineralised waste); however, the specific mineral form was not differentiated.

One instance of (non-asbestiform) pyrolusite was identified in a mineralised waste sample. Certain non-asbestiform minerals can display a fibrous form of similar dimensions to asbestiform minerals.

5.7 Radioactive potential

ARPANSA (2008) states that:

“Naturally occurring radioactive materials (NORM) are ubiquitous in the environment. NORM is widespread in sands, clays, soils and rocks, and many ores and minerals (e.g. coal, oil and gas, bauxite, phosphate rock, ores containing tin, tantalum, niobium, rare earths, and some copper and gold deposits)...Whilst the concentration of NORM in most natural substances is low, any operation in which material is extracted from the earth and processed can potentially concentrate NORM in product, by-product or waste (residue) streams. The generation of products, by-products, residues and wastes containing NORM has potential to lead to exposures to both workers and members of the public, along with environmental impacts.”

“For normal exposure situations, it is usually unnecessary to regulate materials with radionuclides of natural origin below 1 Bq/g. Under these conditions, it can be anticipated that doses to members of the public are unlikely to exceed about 1 mSv/a.”

A becquerel (Bq) is defined as the rate of radioactive decay equal to 1 disintegration per second (USNRC 2023). ARPANSA (2008) considers uranium-238 and thorium-232 as the two most important naturally occurring decay series³, with 1 Bq/g converting to 81 ppm of U-238 and 245 ppm of Th-232 (Medusa 2023).

³ Other isotopes of interest include uranium-235, potassium-40, rubidium-87 and indium-115.

Uranium and thorium concentrations (as ppm) were assessed within the wider multi-element suite conducted on 3,013 samples, across all stratigraphic units for the Project. Table 15 displays the concentrations and calculated specific activities of uranium-238 and thorium-232.

The uranium and thorium contents were generally low, with calculated U-238 activities ranging from <0.001 to 0.974 Bq/g and calculated Th-232 activities ranging from <0.001 to 0.136 Bq/g. The combined maximum activities of U-238 + Th-232 ranged from <0.001 to 1.035 Bq/g. Only one sample from CzD2 (out of 3,013 samples) exceeded 1 Bq/g for the combined maximum activity of U-238 + Th-232.

Table 15: Uranium and Thorium maximums converted to Becquerels per gram

Strat	Max. U (ppm)	Max. U (Bq/g)	Max. Th (ppm)	Max. Th (Bq/g)	Combined Max. U+Th (Bq/g)
CzD3	21.3	0.26	31.4	0.13	0.29
CzD2	78.9	0.97	28.9	0.12	1.03
NEW	25.2	0.31	11.2	0.05	0.32
MAC	26.9	0.33	14.6	0.06	0.34
NAM	37.7	0.47	33.4	0.14	0.47
JER	4.9	0.06	12.4	0.05	0.10

6. Summary

The aim of the assessment was to determine the environmental geochemical and erosional stability properties of key waste rock units from the Project and develop a preliminary inventory and associated management recommendations. The assessment focussed on the characteristics of key waste rock units across the Project rather than on specific pit areas, as these had not been finalised at the time that the samples were collected.

Mining at the Project will extend below the water table and the current plan is that all pits will be backfilled with waste rock to 2 m above the recovered groundwater table.

The key waste rock lithologies to be mined from the pits include oxide and detritals (including calcrete and silcrete), mineralised waste (including goethite, hematite, maghemite, magnetite and manganese), chert, dolomite and shale. These lithologies are distributed across a number of major stratigraphic units (CzD3, CzD2, NEW, MAC, NAM, JER).

Summary findings from the assessment are presented below for geochemistry and erosional stability (Table 16).

6.1 Geochemistry

Summary findings are presented below for the key stratigraphic units.

6.1.1 CzD3 (recent cover)

- The CzD3 stratigraphic unit represents approximately 62% of the planned waste rock volume.
- Oxide clay and chert were classified as NAF but can contain alunite above the water table. This should be further investigated.
- Calcrete/silcrete and mineralised waste (including hematite, goethite, magnetite and manganese) were classified as NAF.
- In the drilling database for CzD3, enrichment greater than GAI 6 was recorded for As, Co and Mn.
- In the CzD3 geochemical samples, enrichment between GAI 3 and 6 was recorded for As, Bi, Sb and Se.
- Contact waters generated from the clay, calcrete/silcrete, chert and mineralised waste units during weathering will be mostly circum-neutral to mildly alkaline, predominantly non-saline with low concentrations⁴ of soluble metals/metalloids.

6.1.2 CzD2 (Detritals)

- The CzD2 stratigraphic unit represents approximately 12% of the planned waste rock volume.
- Oxide, calcrete/silcrete and mineralised waste (including hematite, goethite, magnetite and manganese) was classified as NAF.
- In the drilling database for CzD2, enrichment greater than GAI 6 was recorded for As, Co, Mn and Sn.
- In CzD2 geochemical samples, enrichment between GAI 3 and 6 was recorded for Hg, Mn and Se.
- Contact waters generated from the oxide and calcrete/silcrete units during weathering will be mostly circum-neutral, predominantly non-saline with low concentrations⁵ of soluble metals/metalloids.

⁴ Typically below, or close to, the respective detection limits (generally within 0.1-10 µg/L).

⁵ Typically below, or close to, the respective detection limits (generally within 0.1-10 µg/L).

- Contact waters generated from the mineralised waste units during weathering will be circum-neutral to mildly alkaline and predominantly non-saline, with low concentrations of soluble metals/metalloids.

6.1.3 NEW (Mount Newman Member)

- The NEW stratigraphic unit represents approximately 7% of the planned waste rock volume.
- In the drilling database for NEW, enrichment greater than GAI 6 was recorded for Mn.
- Contact waters generated from the chert units during weathering will be circum-neutral, predominantly non-saline, with low concentrations of soluble metals/metalloids.

6.1.4 MAC (MacLeod Member)

- The MAC stratigraphic unit represents approximately 14% of the planned waste rock volume.
- Chert was classified as NAF. Trace sulphides were however observed in chert interbedded with shale at depth.
- Shale above the pre-mining water table is NAF. This oxidised shale should be further investigated as it may contain alunite.
- The shale may contain trace sulphides, however it occurs over narrow intervals and was interbedded with chert and dolomite.
- In the drilling database for MAC, enrichment greater than GAI 6 was recorded for As and Mn.
- Contact waters generated from the chert units during weathering will be circum-neutral, predominantly non-saline, with low concentrations of soluble metals/metalloids.
- Contact waters generated from the NAF shale units during weathering will be mildly acidic to mildly alkaline, non-saline to saline, with low concentrations of soluble metals/metalloids.

6.1.5 NAM (Nammuldi Member)

- The NAM stratigraphic unit represents approximately 5% of the planned waste rock volume.
- Chert was classified as NAF, though increasing sulphide-S contents at depth mean that deeper chert may be PAF though this might be below the pit floor. The occurrence, distribution and proportion of PAF should be investigated.
- Dolomite was classified as NAF, comprising predominantly carbonates and accessory sulphides.
- Oxygen consumption testwork for dolomite indicated modest intrinsic sulphide reactivity (6.3E-11 kg O₂/kg/s).
- Shale above the pre-mining water table was NAF. This oxidised shale should be further investigated as it may contain alunite.
- NAF shale also occurred below the water table. With increasing sulphide-S contents at depth, deeper shale might be PAF. Further work should delineate PAF shale at depth. The sulphur forms of the shale were variable throughout the profile.
- The shale is often pyritic when calcareous, especially when close to the Jeerinah Formation, and should be treated as PAF. The PAF shale has the potential to be short-lag or acidic in-situ, and prone to leaching metals.
- OCR_{30C} testwork indicated elevated intrinsic pyrite reactivity, a common characteristic of black shale in the Pilbara.
- Mineralised waste (including hematite, goethite, magnetite and manganese) has been classified as NAF.

- In the drilling database for NAM, enrichment greater than GAI 6 was recorded for As, Co, Cu, Mn, Sn and Zn.
- In NAM geochemical samples, enrichment between GAI 3 and 6 was recorded for As, Bi, Cu, F, Hg and Sb.
- Water extraction testwork on a shale sample showed acidic, saline leachate with high concentrations of soluble metals⁶.
- Contact waters generated from the chert, dolomite and mineralised waste units during weathering will be circum-neutral to mildly alkaline, non-saline to saline, with low concentrations of soluble metals/metalloids.
- Contact waters generated from the NAF shale units during weathering will be mildly acidic to mildly alkaline, non-saline to saline, with low concentrations of soluble metals/metalloids.
- Contact waters from the PAF shale units during weathering will be acidic and saline, with high concentrations of soluble metals/metalloids.

6.1.6 JER (Jeerinah Formation)

- The JER stratigraphic unit represents 0% of the planned waste rock as it has deliberately been excluded from the pit shells.
- Shale above the pre-mining water table is NAF.
- NAF shale may also occur below the water table when further work can delineate S-bearing NAF shale at depth. The sulphur forms of the shale were variable throughout the profile.
- The PAF shale has the potential to be short-lag or acidic in-situ and prone to leaching metals.
- OCR_{30C} testwork indicated elevated intrinsic pyrite reactivity.
- In the drilling database for JER, enrichment greater than GAI 6 was recorded for As, Co, Cu, Mn and Zn.
- Water extraction testwork on shale samples showed acidic, saline leachate with high concentrations of soluble metals⁷.
- In JER geochemical samples, enrichment between GAI 3 and 6 in Bi, Hg, Sb and Se was recorded.
- Contact waters generated from the dolomite units during weathering will be circum-neutral and saline with low concentrations of soluble metals/metalloids.

⁶ When compared to results from similar NAF samples tested from this Project.

⁷ When compared to results from similar NAF samples tested from this Project.

6.1.7 Ore

- Ore from the MAC and NAM units was classified as NAF.
- In ore samples, modest enrichment in Se was recorded.
- Contact waters generated from ore during weathering will be circum-neutral and non-saline, with low concentrations of soluble metals/metalloids.

6.2 Erosional stability

Summary findings from the assessment of erosional stability include (Table 16):

- Fresh chert, BIF and mineralised waste rock should display moderate-high erosional stability and should be suitable for placement on final landform slopes. Moderate-high stability waste rock may provide a useful source of durable rock armour.
- Calcrete and silcrete waste rock should display moderate to moderate-high erosional stability and should be suitable for placement on final landform slopes.
- Fresh dolomite and transitional chert, BIF and mineralised waste rock should display moderate erosional stability. These rock types may not be suitable for placement on final landform slopes (to be verified during mining).
- Fresh shale and transitional dolomite and shale waste rock should display low-moderate to low erosional stability and should not be placed on final landform slopes.
- The oxide component of all rock types can be expected to low erosional stability and should not be placed on final landform slopes.

This assessment was conducted from pre-mining drill data for key waste rock units over the broad Project area. The as-mined properties of the key waste rock units should be verified during mining.

Table 16: Summary findings for key waste rock units

Strat Unit	Lithology	Acid formation potential	Erosional stability
CzD3	Oxide	NAF	Low
	Alunitic Clay / Chert	UC / Alunite acidity	Low
	Calcrete/Silcrete	NAF	Moderate to Moderate-High
	Chert/BIF	NAF	Moderate-High
	Mineralised Waste	NAF	Moderate-High
CzD2	Calcrete/Silcrete	NAF	Moderate to Moderate-High
	Mineralised Waste	NAF	Moderate-High
NEW	Chert/BIF	NAF	Moderate-High
MAC	Chert/BIF	NAF	Moderate-High
	Shale	NAF	Low
NAM	Alunitic shale	UC / Alunite acidity	Low
	Chert/BIF	NAF PAF ⁸	Moderate-High
	Dolomite	NAF	Moderate
	Shale	NAF PAF ⁹	Low
	Mineralised Waste	NAF	Moderate-High
JER	Dolomite	NAF	Moderate
	Shale	NAF PAF ¹⁰	Low

⁸ The distribution and proportion of PAF waste rock should be determined.

⁹ The distribution and proportion of PAF waste rock should be determined.

¹⁰ No waste rock from the JER unit is expected to be mined, though might be exposed in country rock by dewatering.

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Appendix A

Extended multi-element results

MRB29	W415609	64	66	CD3	DCL	Waste	Clay	KL3	0.03	2.34	0.25	18.3	6	42	0.7	0.7	1.01	0.25	382	20	130	0.5	6	1.35	0.8	0.75	38.8	2	4	0.26	0.08	0.05	271	177	0.14	0.73	2050	0.25	0.09	12	68	84	250	124	30	12	0.08	0.8	13	25	465	3	29	1	0.22	0.1	7.9	0.53	0.05	0.12	1	55	2.5	7.8	0.85	146	111	DCL	Clay		
MRB29	W415610	66	68	CD2	DCL	Waste	Clay	KL3	0.03	5.34	0.26	14.1	17	89	1.8	0.8	0.46	0.25	344	25	210	0.4	14	2.95	1.8	1.85	32.2	4.4	6	0.6	0.1	0.08	0.08	0.05	271	177	0.14	0.73	2050	0.25	0.09	12	68	84	250	124	30	12	0.08	0.8	13	25	465	3	29	1	0.22	0.1	7.9	0.53	0.05	0.12	1	55	2.5	7.8	0.85	146	111	DCL	Clay
MRB29	W415611	68	70	CD2	DCL	Waste	Clay	KL3	0.03	5.34	0.26	14.1	17	89	1.8	0.8	0.46	0.25	344	25	210	0.4	14	2.95	1.8	1.85	32.2	4.4	6	0.6	0.1	0.08	0.08	0.05	271	177	0.14	0.73	2050	0.25	0.09	12	68	84	250	124	30	12	0.08	0.8	13	25	465	3	29	1	0.22	0.1	7.9	0.53	0.05	0.12	1	55	2.5	7.8	0.85	146	111	DCL	Clay
MRB29	W415612	70	72	CD2	DCL	Waste	Clay	KL3	0.03	5.34	0.26	14.1	17	89	1.8	0.8	0.46	0.25	344	25	210	0.4	14	2.95	1.8	1.85	32.2	4.4	6	0.6	0.1	0.08	0.08	0.05	271	177	0.14	0.73	2050	0.25	0.09	12	68	84	250	124	30	12	0.08	0.8	13	25	465	3	29	1	0.22	0.1	7.9	0.53	0.05	0.12	1	55	2.5	7.8	0.85	146	111	DCL	Clay
MRB29	W415613	72	74	CD2	DCL	Waste	Clay	KL3	0.03	5.34	0.26	14.1	17	89	1.8	0.8	0.46	0.25	344	25	210	0.4	14	2.95	1.8	1.85	32.2	4.4	6	0.6	0.1	0.08	0.08	0.05	271	177	0.14	0.73	2050	0.25	0.09	12	68	84	250	124	30	12	0.08	0.8	13	25	465	3	29	1	0.22	0.1	7.9	0.53	0.05	0.12	1	55	2.5	7.8	0.85	146	111	DCL	Clay
MRB29	W415614	74	76	CD2	DCL	Waste	Clay	KL3	0.03	5.34	0.26	14.1	17	89	1.8	0.8	0.46	0.25	344	25	210	0.4	14	2.95	1.8	1.85	32.2	4.4	6	0.6	0.1	0.08	0.08	0.05	271	177	0.14	0.73	2050	0.25	0.09	12	68	84	250	124	30	12	0.08	0.8	13	25	465	3	29	1	0.22	0.1	7.9	0.53	0.05	0.12	1	55	2.5	7.8	0.85	146	111	DCL	Clay
MRB29	W415615	76	78	CD2	DCL	Waste	Clay	KL3	0.03	5.34	0.26	14.1	17	89	1.8	0.8	0.46	0.25	344	25	210	0.4	14	2.95	1.8	1.85	32.2	4.4	6	0.6	0.1	0.08	0.08	0.05	271	177	0.14	0.73	2050	0.25	0.09	12	68	84	250	124	30	12	0.08	0.8	13	25	465	3	29	1	0.22	0.1	7.9	0.53	0.05	0.12	1	55	2.5	7.8	0.85	146	111	DCL	Clay
MRB29	W415616	78	80	CD2	DCL	Waste	Clay	KL3	0.03	5.34	0.26	14.1	17	89	1.8	0.8	0.46	0.25	344	25	210	0.4	14	2.95	1.8	1.85	32.2	4.4	6	0.6	0.1	0.08	0.08	0.05	271	177	0.14	0.73	2050	0.25	0.09	12	68	84	250	124	30	12	0.08	0.8	13	25	465	3	29	1	0.22	0.1	7.9	0.53	0.05	0.12	1	55	2.5	7.8	0.85	146	111	DCL	Clay
MRB29	W415617	80	82	CD2	DCL	Waste	Shale	GS2	0.02	0.8	0.46	0.25	5.75	101	51	5.8	0.4	0.21	0.25	522	40	170	1.8	14	515	3.25	1.35	142	4.8	24	1.08	0.08	0.11	258	53.5	48	149	2290	3	0.06	5	24	228	30	17	6.36	0.25	14	25	54	1	14.5	0.4	0.82	0.4	8.6	0.25	0.8	0.48	47	110	2	31	33	778	91	81	NEW	MAC		
MRB29	W415618	82	84	CD2	DCL	Waste	Shale	GS2	0.02	0.8	0.46	0.25	5.75	101	51	5.8	0.4	0.21	0.25	522	40	170	1.8	14	515	3.25	1.35	142	4.8	24	1.08	0.08	0.11	258	53.5	48	149	2290	3	0.06	5	24	228	30	17	6.36	0.25	14	25	54	1	14.5	0.4	0.82	0.4	8.6	0.25	0.8	0.48	47	110	2	31	33	778	91	81	NEW	MAC		
MRB29	W415619	84	86	CD2	DCL	Waste	Shale	GS2	0.02	0.8	0.46	0.25	5.75	101	51	5.8	0.4	0.21	0.25	522	40	170	1.8	14	515	3.25	1.35	142	4.8	24	1.08	0.08	0.11	258	53.5	48	149	2290	3	0.06	5	24	228	30	17	6.36	0.25	14	25	54	1	14.5	0.4	0.82	0.4	8.6	0.25	0.8	0.48	47	110	2	31	33	778	91	81	NEW	MAC		
MRB29	W415620	86	88	CD2	DCL	Waste	Shale	GS2	0.02	0.8	0.46	0.25	5.75	101	51	5.8	0.4	0.21	0.25	522	40	170	1.8	14	515	3.25	1.35	142	4.8	24	1.08	0.08	0.11	258	53.5	48	149	2290	3	0.06	5	24	228	30	17	6.36	0.25	14	25	54	1	14.5	0.4	0.82	0.4	8.6	0.25	0.8	0.48	47	110	2	31	33	778	91	81	NEW	MAC		
MRB29	W415621	88	90	CD2	DCL	Waste	Shale	GS2	0.02	0.8	0.46	0.25	5.75	101	51	5.8	0.4	0.21	0.25	522	40	170	1.8	14	515	3.25	1.35	142	4.8	24	1.08	0.08	0.11	258	53.5	48	149	2290	3	0.06	5	24	228	30	17	6.36	0.25	14	25	54	1	14.5	0.4	0.82	0.4	8.6	0.25	0.8	0.48	47	110	2	31	33	778	91	81	NEW	MAC		
MRB29	W415622	90	92	CD2	DCL	Waste	Shale	GS2	0.02	0.8	0.46	0.25	5.75	101	51	5.8	0.4	0.21	0.25	522	40	170	1.8	14	515	3.25	1.35	142	4.8	24	1.08	0.08	0.11	258	53.5	48	149	2290	3	0.06	5	24	228	30	17	6.36	0.25	14	25	54	1	14.5	0.4	0.82	0.4	8.6	0.25	0.8	0.48	47	110	2	31	33	778	91	81	NEW	MAC		
MRB29	W415623	92	94	CD2	DCL	Waste	Shale	GS2	0.02	0.8	0.46	0.25	5.75	101	51	5.8	0.4	0.21	0.25	522	40	170	1.8	14	515	3.25	1.35	142	4.8	24	1.08	0.08	0.11	258	53.5	48	149	2290	3	0.06	5	24	228	30	17	6.36	0.25	14	25	54	1	14.5	0.4	0.82	0.4	8.6	0.25	0.8	0.48	47	110	2	31	33	778	91	81	NEW	MAC		
MRB29	W415624	94	96	CD2	DCL	Waste	Shale	GS2	0.02	0.8	0.46	0.25	5.75	101	51	5.8	0.4	0.21	0.25	522	40	170	1.8	14	515	3.25	1.35	142	4.8	24	1.08	0.08	0.11	258	53.5	48	149	2290	3	0.06	5	24	228	30	17	6.36	0.25	14	25	54	1	14.5	0.4	0.82	0.4	8.6	0.25	0.8	0.48	47	110	2	31	33	778	91	81	NEW	MAC		
MRB29	W415625	96	98	CD2	DCL	Waste	Shale	GS2	0.02	0.8	0.46	0.25	5.75	101	51	5.8	0.4	0.21	0.25	522	40	170	1.8	14	515	3.25	1.35	142	4.8	24	1.08	0.08	0.11	258	53.5	48	149	2290	3	0.06	5	24	228	30	17	6.36	0.25	14	25	54	1	14.5	0.4	0.82	0.4	8.6	0.25	0.8	0.48	47	110	2	31	33	778	91	81	NEW	MAC		
MRB29	W415626	98	100	CD2	DCL	Waste	Shale	GS2	0.02	0.8	0.46	0.25	5.75	101	51	5.8	0.4	0.21	0.25	522	40	170	1.8	14	515	3.25	1.35	142	4.8	24	1.08	0.08	0.11	258	53.5	48	149	2290	3	0.06	5	24	228	30	17	6.36	0.25	14	25	54	1	14.5	0.4	0.82	0.4	8.6	0.25	0.8	0.48	47	110	2	31	33	778	91	81	NEW	MAC		
MRB29	W415627	100	102	CD2	DCL	Waste	Shale	GS2	0.02	0.8	0.46	0.25	5.75	101	51	5.8	0.4	0.21	0.25	522	40	170	1.8	14	515	3.25	1.35	142	4.8	24	1.08	0.08	0.11	258	53.5	48	149	2290	3	0.06	5	24	228	30	17	6.36	0.25	14	25	54	1	14.5	0.4	0.82	0.4	8.6	0.25	0.8	0.48	47	110	2	31	33	778	91	81	NEW	MAC		
MRB29	W415628	102	104	CD2	DCL	Waste	Shale	GS2	0.02	0.8	0.46	0.25	5.75	101	51	5.8	0.4	0.21	0.25	522	40	170	1.8	14	515	3.25	1.35	142	4.8	24	1.08	0.08	0.11	258	53.5	48	149	2290	3	0.06	5	24	228	30	17	6.36	0.25	14	25	54	1	14.5	0.4	0.82	0.4	8.6	0.25	0.8	0.48	47	110	2	31	33	778	91	81	NEW	MAC		
MRB29	W415629	104	106	CD2	DCL	Waste	Shale	GS2	0.02	0.8	0.46	0.25	5.75	101	51	5.8	0.4	0.21	0.25	522	40	170	1.8	14	515	3.25	1.35	142	4.8	24	1.08	0.08	0.11	258	53.5	48	149	2290	3	0.06	5	24	228	30	17	6.36	0.25	14	25	54	1	14.5	0.4	0.82	0.4	8.6	0.25	0.8	0.48	47	110	2	31	33	778	91	81	NEW	MAC		
MRB29	W415630	106	108	CD2	DCL	Waste	Shale	GS2	0.02	0.8	0.46	0.25	5.75	101	51	5.8	0.4	0.21	0.25	522	40	170	1.8	14	515	3.25	1.35	142	4.8	24	1.08	0.08	0.11	258	53.5	48	149	2290	3	0.06	5	24	228	30	17	6.36	0.25	14	25	54	1	14.5	0.4	0.82	0.4	8.6	0.25	0.8	0.48	47	110	2	31	33	778	91	81	NEW	MAC		
MRB29	W415631	108	110	CD2																																																																			

MSB11	W44615	20	22	NEW	NEW	One	GeotHe/Hemite	G03G02	0.05	51.7	0.25	1.99	11	73	0.4	0.2	0.01	0.25	8.7	15	100	0.4	16	18	0.85	0.6	0.25	5.6	12	14	0.2	0.04	0.04	5.3	5	0.1	0.13	492	15	0.02	25	4.05	28	450	10	1.06	24	0.05	12	9	25	0.85	0.5	5	0.2	0.14	0.1	37	0.13	0.05	0.12	1	80	1	63	0.85	64	46	Min-MIN
MSB11	W44615	20	22	NEW	NEW	One	GeotHe/Hemite	G03G02	0.06	149.1	0.5	1.55	11	73	0.4	0.2	0.01	0.25	11.3	20	80	0.4	16	18	0.85	0.6	0.25	5.6	12	14	0.2	0.04	0.04	5.3	5	0.1	0.13	492	15	0.02	25	4.05	28	450	10	1.06	24	0.05	12	9	25	0.85	0.5	5	0.2	0.14	0.1	37	0.13	0.05	0.12	1	80	1	63	0.85	64	46	Min-MIN
MSB11	W44615	20	22	NEW	NEW	One	GeotHe/Hemite	G03G02	0.06	149.1	0.5	1.55	11	73	0.4	0.2	0.01	0.25	11.3	20	80	0.4	16	18	0.85	0.6	0.25	5.6	12	14	0.2	0.04	0.04	5.3	5	0.1	0.13	492	15	0.02	25	4.05	28	450	10	1.06	24	0.05	12	9	25	0.85	0.5	5	0.2	0.14	0.1	37	0.13	0.05	0.12	1	80	1	63	0.85	64	46	Min-MIN
MSB11	W44615	20	22	NEW	NEW	One	GeotHe/Hemite	G03G02	0.06	149.1	0.5	1.55	11	73	0.4	0.2	0.01	0.25	11.3	20	80	0.4	16	18	0.85	0.6	0.25	5.6	12	14	0.2	0.04	0.04	5.3	5	0.1	0.13	492	15	0.02	25	4.05	28	450	10	1.06	24	0.05	12	9	25	0.85	0.5	5	0.2	0.14	0.1	37	0.13	0.05	0.12	1	80	1	63	0.85	64	46	Min-MIN
MSB11	W44615	20	22	NEW	NEW	One	GeotHe/Hemite	G03G02	0.06	149.1	0.5	1.55	11	73	0.4	0.2	0.01	0.25	11.3	20	80	0.4	16	18	0.85	0.6	0.25	5.6	12	14	0.2	0.04	0.04	5.3	5	0.1	0.13	492	15	0.02	25	4.05	28	450	10	1.06	24	0.05	12	9	25	0.85	0.5	5	0.2	0.14	0.1	37	0.13	0.05	0.12	1	80	1	63	0.85	64	46	Min-MIN
MSB11	W44615	20	22	NEW	NEW	One	GeotHe/Hemite	G03G02	0.06	149.1	0.5	1.55	11	73	0.4	0.2	0.01	0.25	11.3	20	80	0.4	16	18	0.85	0.6	0.25	5.6	12	14	0.2	0.04	0.04	5.3	5	0.1	0.13	492	15	0.02	25	4.05	28	450	10	1.06	24	0.05	12	9	25	0.85	0.5	5	0.2	0.14	0.1	37	0.13	0.05	0.12	1	80	1	63	0.85	64	46	Min-MIN
MSB11	W44615	20	22	NEW	NEW	One	GeotHe/Hemite	G03G02	0.06	149.1	0.5	1.55	11	73	0.4	0.2	0.01	0.25	11.3	20	80	0.4	16	18	0.85	0.6	0.25	5.6	12	14	0.2	0.04	0.04	5.3	5	0.1	0.13	492	15	0.02	25	4.05	28	450	10	1.06	24	0.05	12	9	25	0.85	0.5	5	0.2	0.14	0.1	37	0.13	0.05	0.12	1	80	1	63	0.85	64	46	Min-MIN
MSB11	W44615	20	22	NEW	NEW	One	GeotHe/Hemite	G03G02	0.06	149.1	0.5	1.55	11	73	0.4	0.2	0.01	0.25	11.3	20	80	0.4	16	18	0.85	0.6	0.25	5.6	12	14	0.2	0.04	0.04	5.3	5	0.1	0.13	492	15	0.02	25	4.05	28	450	10	1.06	24	0.05	12	9	25	0.85	0.5	5	0.2	0.14	0.1	37	0.13	0.05	0.12	1	80	1	63	0.85	64	46	Min-MIN
MSB11	W44615	20	22	NEW	NEW	One	GeotHe/Hemite	G03G02	0.06	149.1	0.5	1.55	11	73	0.4	0.2	0.01	0.25	11.3	20	80	0.4	16	18	0.85	0.6	0.25	5.6	12	14	0.2	0.04	0.04	5.3	5	0.1	0.13	492	15	0.02	25	4.05	28	450	10	1.06	24	0.05	12	9	25	0.85	0.5	5	0.2	0.14	0.1	37	0.13	0.05	0.12	1	80	1	63	0.85	64	46	Min-MIN
MSB11	W44615	20	22	NEW	NEW	One	GeotHe/Hemite	G03G02	0.06	149.1	0.5	1.55	11	73	0.4	0.2	0.01	0.25	11.3	20	80	0.4	16	18	0.85	0.6	0.25	5.6	12	14	0.2	0.04	0.04	5.3	5	0.1	0.13	492	15	0.02	25	4.05	28	450	10	1.06	24	0.05	12	9	25	0.85	0.5	5	0.2	0.14	0.1	37	0.13	0.05	0.12	1	80	1	63	0.85	64	46	Min-MIN
MSB11	W44615	20	22	NEW	NEW	One	GeotHe/Hemite	G03G02	0.06	149.1	0.5	1.55	11	73	0.4	0.2	0.01	0.25	11.3	20	80	0.4	16	18	0.85	0.6	0.25	5.6	12	14	0.2	0.04	0.04	5.3	5	0.1	0.13	492	15	0.02	25	4.05	28	450	10	1.06	24	0.05	12	9	25	0.85	0.5	5	0.2	0.14	0.1	37	0.13	0.05	0.12	1	80	1	63	0.85	64	46	Min-MIN
MSB11	W44615	20	22	NEW	NEW	One	GeotHe/Hemite	G03G02	0.06	149.1	0.5	1.55	11	73	0.4	0.2	0.01	0.25	11.3	20	80	0.4	16	18	0.85	0.6	0.25	5.6	12	14	0.2	0.04	0.04	5.3	5	0.1	0.13	492	15	0.02	25	4.05	28	450	10	1.06	24	0.05	12	9	25	0.85	0.5	5	0.2	0.14	0.1	37	0.13	0.05	0.12	1	80	1	63	0.85	64	46	Min-MIN
MSB11	W44615	20	22	NEW	NEW	One	GeotHe/Hemite	G03G02	0.06	149.1	0.5	1.55	11	73	0.4	0.2	0.01	0.25	11.3	20	80	0.4	16	18	0.85	0.6	0.25	5.6	12	14	0.2	0.04	0.04	5.3	5	0.1	0.13	492	15	0.02	25	4.05	28	450	10	1.06	24	0.05	12	9	25	0.85	0.5	5	0.2	0.14	0.1	37	0.13	0.05	0.12	1	80	1	63	0.85	64	46	Min-MIN
MSB11	W44615	20	22	NEW	NEW	One	GeotHe/Hemite	G03G02	0.06	149.1	0.5	1.55	11	73	0.4	0.2	0.01	0.25	11.3	20	80	0.4	16	18	0.85	0.6	0.25	5.6	12	14	0.2	0.04	0.04	5.3	5	0.1	0.13	492	15	0.02	25	4.05	28	450	10	1.06	24	0.05	12	9	25	0.85	0.5	5	0.2	0.14	0.1	37	0.13	0.05	0.12	1	80	1	63	0.85	64	46	Min-MIN
MSB11	W44615	20	22	NEW	NEW	One	GeotHe/Hemite	G03G02	0.06	149.1	0.5	1.55	11	73	0.4	0.2	0.01	0.25	11.3	20	80	0.4	16	18	0.85	0.6	0.25	5.6	12	14	0.2	0.04	0.04	5.3	5	0.1	0.13	492	15	0.02	25	4.05	28	450	10	1.06	24	0.05	12	9	25	0.85	0.5	5	0.2	0.14	0.1	37	0.13	0.05	0.12	1	80	1	63	0.85	64	46	Min-MIN
MSB11	W44615	20	22	NEW	NEW	One	GeotHe/Hemite	G03G02	0.06	149.1	0.5	1.55	11	73	0.4	0.2	0.01	0.25	11.3	20	80	0.4	16	18	0.85	0.6	0.25	5.6	12	14	0.2	0.04	0.04	5.3	5	0.1	0.13	492	15	0.02	25	4.05	28	450	10	1.06	24	0.05	12	9	25	0.85	0.5	5	0.2	0.14	0.1	37	0.13	0.05	0.12	1	80	1	63	0.85	64	46	Min-MIN
MSB11	W44615	20	22	NEW	NEW	One	GeotHe/Hemite	G03G02	0.06	149.1	0.5	1.55	11	73	0.4	0.2	0.01	0.25	11.3	20	80	0.4	16	18	0.85	0.6	0.25	5.6	12	14	0.2	0.04	0.04	5.3	5	0.1	0.13	492	15	0.02	25	4.05	28	450	10	1.06	24	0.05	12	9	25	0.85	0.5	5	0.2	0.14	0.1	37	0.13	0.05	0.12	1	80	1	63	0.85	64	46	Min-MIN
MSB11	W44615	20	22	NEW	NEW	One	GeotHe/Hemite	G03G02	0.06	149.1	0.5	1.55	11	73	0.4	0.2	0.01	0.25	11.3	20	80	0.4	16	18	0.85	0.6	0.25	5.6	12	14	0.2	0.04	0.04	5.3	5	0.1	0.13	492	15	0.02	25	4.05	28	450	10	1.06	24	0.05	12	9	25	0.85	0.5	5	0.2	0.14	0.1	37	0.13	0.05	0.12	1	80	1	63	0.85	64	46	Min-MIN
MSB11	W44615	20	22	NEW	NEW	One	GeotHe/Hemite	G03G02	0.06	149.1	0.5	1.55	11	73	0.4	0.2	0.01	0.25	11.3	20	80	0.4	16	18	0.85	0.6	0.25	5.6	12	14	0.2	0.04	0.04	5.3	5	0.1	0.13	492	15	0.02	25	4.05	28	450	10	1.06	24	0.05	12	9	25	0.85	0.5	5	0.2	0.14	0.1	37	0.13	0.05	0.12	1	80	1	63	0.85	64	46	Min-MIN
MSB11	W44615	20	22	NEW	NEW	One	GeotHe/Hemite	G03G02	0.06	149.1	0.5	1.55	11	73	0.4	0.2	0.01	0.25	11.3	20	80	0.4	16	18	0.85	0.6	0.25	5.6	12	14	0.2	0.04	0.04	5.3	5	0.1	0.13	492	15	0.02	25	4.05	28	450	10	1.06	24	0.05	12	9	25	0.85	0.5	5	0.2	0.14	0.1	37	0.13	0.05	0.12	1	80	1	63	0.85	64	46	Min-MIN
MSB11	W44615	20	22	NEW	NEW	One	GeotHe/Hemite	G03G02	0.06	149.1	0.5	1.55	11	73	0.4	0.2	0.01	0.25	11.3	20	80	0.4	16	18	0.85	0.6	0.25	5.6	12	14	0.2	0.04	0.04	5.3	5	0.1	0.13	492	15	0.02	25	4.05	28	450	10	1.06	24	0.05	12	9	25	0.85	0.5	5	0.2	0.14	0.1	37	0.13	0.05	0.12	1	80	1	63	0.85	64	46	Min-MIN
MSB11	W44615	20	22	NEW	NEW	One	GeotHe/Hemite	G03G02	0.06	149.1	0.5	1.55	11	73	0.4	0.2	0.01	0.25	11.3	20	80	0.4	16	18	0.85	0.6	0.25	5.6	12	14	0.2	0.04	0.04	5.3	5	0.1	0.13	492	15	0.02	25	4.05	28	450	10	1.06	24	0.05	12	9	25	0.85	0.5	5	0.2	0.14	0.1	37	0.13	0.05	0.12	1	80	1	63	0.85	64	46	Min-MIN
MSB11	W44615	20	22	NEW	NEW	One	GeotHe/Hemite	G03G02	0.06	149.1	0.5	1.																																																									

M07399	W030301	40	42	NAM	Waste	Chart	CH1	0.01	20.1	0.25	0.3	4	19	2	0.05	0.25	0.25	41	30	20	13	8	11	0.75	0.25	0.8	1	0.1	0.26	0.01	0.03	42	95	0.1	0.08	282	1	0.02	0.25	13	18	250	2	0.78	36	0.05	0.8	2	25	0.75	0.5	3	0.05	0.18	0.1	0.4	0.02	0.05	0.1	0.4	10	1	9.8	0.75	26	5	BF18AM
M07399	W030302	40	42	NAM	Waste	Chart	CH1	0.01	22.7	0.25	2.56	14	4	279	32	0.2	0.21	0.5	255	25	70	41	10	285	18	0.25	0.8	6.4	3.2	1	0.62	0.02	0.1	21.2	85	0.24	0.51	170	15	0.02	9	119	179	150	4	18	2.5	275	0.5	25	0.3	0.46	0.1	3.4	0.15	0.5	0.24	0.8	15	25	155	82	41	BF18AM			
M07399	W030303	40	42	NAM	Waste	Chart	CH1	0.01	20.1	0.25	0.3	4	19	2	0.05	0.25	0.25	41	30	20	13	8	11	0.75	0.25	0.8	1	0.1	0.26	0.01	0.03	42	95	0.1	0.08	282	1	0.02	0.25	13	18	250	2	0.78	36	0.05	0.8	2	25	0.75	0.5	3	0.05	0.18	0.1	0.4	0.02	0.05	0.1	0.4	10	1	9.8	0.75	26	5	BF18AM
M07399	W030304	40	42	NAM	Waste	Chart	CH1	0.01	22.7	0.25	2.56	14	4	279	32	0.2	0.21	0.5	255	25	70	41	10	285	18	0.25	0.8	6.4	3.2	1	0.62	0.02	0.1	21.2	85	0.24	0.51	170	15	0.02	9	119	179	150	4	18	2.5	275	0.5	25	0.3	0.46	0.1	3.4	0.15	0.5	0.24	0.8	15	25	155	82	41	BF18AM			
M07399	W030305	40	42	NAM	Waste	Chart	CH1	0.01	20.1	0.25	0.3	4	19	2	0.05	0.25	0.25	41	30	20	13	8	11	0.75	0.25	0.8	1	0.1	0.26	0.01	0.03	42	95	0.1	0.08	282	1	0.02	0.25	13	18	250	2	0.78	36	0.05	0.8	2	25	0.75	0.5	3	0.05	0.18	0.1	0.4	0.02	0.05	0.1	0.4	10	1	9.8	0.75	26	5	BF18AM
M07399	W030306	40	42	NAM	Waste	Chart	CH1	0.01	22.7	0.25	2.56	14	4	279	32	0.2	0.21	0.5	255	25	70	41	10	285	18	0.25	0.8	6.4	3.2	1	0.62	0.02	0.1	21.2	85	0.24	0.51	170	15	0.02	9	119	179	150	4	18	2.5	275	0.5	25	0.3	0.46	0.1	3.4	0.15	0.5	0.24	0.8	15	25	155	82	41	BF18AM			
M07399	W030307	40	42	NAM	Waste	Chart	CH1	0.01	20.1	0.25	0.3	4	19	2	0.05	0.25	0.25	41	30	20	13	8	11	0.75	0.25	0.8	1	0.1	0.26	0.01	0.03	42	95	0.1	0.08	282	1	0.02	0.25	13	18	250	2	0.78	36	0.05	0.8	2	25	0.75	0.5	3	0.05	0.18	0.1	0.4	0.02	0.05	0.1	0.4	10	1	9.8	0.75	26	5	BF18AM
M07399	W030308	40	42	NAM	Waste	Chart	CH1	0.01	22.7	0.25	2.56	14	4	279	32	0.2	0.21	0.5	255	25	70	41	10	285	18	0.25	0.8	6.4	3.2	1	0.62	0.02	0.1	21.2	85	0.24	0.51	170	15	0.02	9	119	179	150	4	18	2.5	275	0.5	25	0.3	0.46	0.1	3.4	0.15	0.5	0.24	0.8	15	25	155	82	41	BF18AM			
M07399	W030309	40	42	NAM	Waste	Chart	CH1	0.01	20.1	0.25	0.3	4	19	2	0.05	0.25	0.25	41	30	20	13	8	11	0.75	0.25	0.8	1	0.1	0.26	0.01	0.03	42	95	0.1	0.08	282	1	0.02	0.25	13	18	250	2	0.78	36	0.05	0.8	2	25	0.75	0.5	3	0.05	0.18	0.1	0.4	0.02	0.05	0.1	0.4	10	1	9.8	0.75	26	5	BF18AM
M07399	W030310	40	42	NAM	Waste	Chart	CH1	0.01	22.7	0.25	2.56	14	4	279	32	0.2	0.21	0.5	255	25	70	41	10	285	18	0.25	0.8	6.4	3.2	1	0.62	0.02	0.1	21.2	85	0.24	0.51	170	15	0.02	9	119	179	150	4	18	2.5	275	0.5	25	0.3	0.46	0.1	3.4	0.15	0.5	0.24	0.8	15	25	155	82	41	BF18AM			
M07399	W030311	40	42	NAM	Waste	Chart	CH1	0.01	20.1	0.25	0.3	4	19	2	0.05	0.25	0.25	41	30	20	13	8	11	0.75	0.25	0.8	1	0.1	0.26	0.01	0.03	42	95	0.1	0.08	282	1	0.02	0.25	13	18	250	2	0.78	36	0.05	0.8	2	25	0.75	0.5	3	0.05	0.18	0.1	0.4	0.02	0.05	0.1	0.4	10	1	9.8	0.75	26	5	BF18AM
M07399	W030312	40	42	NAM	Waste	Chart	CH1	0.01	22.7	0.25	2.56	14	4	279	32	0.2	0.21	0.5	255	25	70	41	10	285	18	0.25	0.8	6.4	3.2	1	0.62	0.02	0.1	21.2	85	0.24	0.51	170	15	0.02	9	119	179	150	4	18	2.5	275	0.5	25	0.3	0.46	0.1	3.4	0.15	0.5	0.24	0.8	15	25	155	82	41	BF18AM			
M07399	W030313	40	42	NAM	Waste	Chart	CH1	0.01	20.1	0.25	0.3	4	19	2	0.05	0.25	0.25	41	30	20	13	8	11	0.75	0.25	0.8	1	0.1	0.26	0.01	0.03	42	95	0.1	0.08	282	1	0.02	0.25	13	18	250	2	0.78	36	0.05	0.8	2	25	0.75	0.5	3	0.05	0.18	0.1	0.4	0.02	0.05	0.1	0.4	10	1	9.8	0.75	26	5	BF18AM
M07399	W030314	40	42	NAM	Waste	Chart	CH1	0.01	22.7	0.25	2.56	14	4	279	32	0.2	0.21	0.5	255	25	70	41	10	285	18	0.25	0.8	6.4	3.2	1	0.62	0.02	0.1	21.2	85	0.24	0.51	170	15	0.02	9	119	179	150	4	18	2.5	275	0.5	25	0.3	0.46	0.1	3.4	0.15	0.5	0.24	0.8	15	25	155	82	41	BF18AM			
M07399	W030315	40	42	NAM	Waste	Chart	CH1	0.01	20.1	0.25	0.3	4	19	2	0.05	0.25	0.25	41	30	20	13	8	11	0.75	0.25	0.8	1	0.1	0.26	0.01	0.03	42	95	0.1	0.08	282	1	0.02	0.25	13	18	250	2	0.78	36	0.05	0.8	2	25	0.75	0.5	3	0.05	0.18	0.1	0.4	0.02	0.05	0.1	0.4	10	1	9.8	0.75	26	5	BF18AM
M07399	W030316	40	42	NAM	Waste	Chart	CH1	0.01	22.7	0.25	2.56	14	4	279	32	0.2	0.21	0.5	255	25	70	41	10	285	18	0.25	0.8	6.4	3.2	1	0.62	0.02	0.1	21.2	85	0.24	0.51	170	15	0.02	9	119	179	150	4	18	2.5	275	0.5	25	0.3	0.46	0.1	3.4	0.15	0.5	0.24	0.8	15	25	155	82	41	BF18AM			
M07399	W030317	40	42	NAM	Waste	Chart	CH1	0.01	20.1	0.25	0.3	4	19	2	0.05	0.25	0.25	41	30	20	13	8	11	0.75	0.25	0.8	1	0.1	0.26	0.01	0.03	42	95	0.1	0.08	282	1	0.02	0.25	13	18	250	2	0.78	36	0.05	0.8	2	25	0.75	0.5	3	0.05	0.18	0.1	0.4	0.02	0.05	0.1	0.4	10	1	9.8	0.75	26	5	BF18AM
M07399	W030318	40	42	NAM	Waste	Chart	CH1	0.01	22.7	0.25	2.56	14	4	279	32	0.2	0.21	0.5	255	25	70	41	10	285	18	0.25	0.8	6.4	3.2	1	0.62	0.02	0.1	21.2	85	0.24	0.51	170	15	0.02	9	119	179	150	4	18	2.5	275	0.5	25	0.3	0.46	0.1	3.4	0.15	0.5	0.24	0.8	15	25	155	82	41	BF18AM			
M07399	W030319	40	42	NAM	Waste	Chart	CH1	0.01	20.1	0.25	0.3	4	19	2	0.05	0.25	0.25	41	30	20	13	8	11	0.75	0.25	0.8	1	0.1	0.26	0.01	0.03	42	95	0.1	0.08	282	1	0.02	0.25	13	18	250	2	0.78	36	0.05	0.8	2	25	0.75	0.5	3	0.05	0.18	0.1	0.4	0.02	0.05	0.1	0.4	10	1	9.8	0.75	26	5	BF18AM
M07399	W030320	40	42	NAM	Waste	Chart	CH1	0.01	22.7	0.25	2.56	14	4	279	32	0.2	0.21	0.5	255	25	70	41	10	285	18	0.25	0.8	6.4	3.2	1	0.62	0.02	0.1	21.2	85	0.24	0.51	170	15	0.02	9	119	179	150	4	18	2.5	275	0.5	25	0.3	0.46	0.1	3.4	0.15	0.5	0.24	0.8	15	25	155	82	41	BF18AM			
M07399	W030321	40	42	NAM	Waste	Chart	CH1	0.01	20.1	0.25	0.3	4	19	2	0.05	0.25	0.25	41	30	20	13	8	11	0.75	0.25	0.8	1	0.1	0.26	0.01	0.03	42	95	0.1	0.08	282	1	0.02	0.25	13	18	250	2	0.78	36	0.05	0.8	2	25	0.75	0.5	3	0.05	0.18	0.1	0.4	0.02	0.05	0.1	0.4	10	1	9.8	0.75	26	5	BF18AM
M07399	W030322	40	42	NAM	Waste	Chart	CH1	0.01	22.7	0.25	2.56	14	4	279	32	0.2	0.21	0.5	255	25	70	41	10	285	18	0.25	0.8	6.4	3.2	1	0.62	0.02	0.1	21.2	85	0.24	0.51	170	15	0.02	9	119	179	150	4	18	2.5	275	0.5	25	0.3	0.46	0.1	3.4	0.15	0.5	0.24	0.8	15	25	155	82	41	BF18AM			
M07399	W030323	40	42	NAM	Waste	Chart	CH1	0.01	20.1	0.25	0.3	4	19	2	0.05	0.25	0.25	41	30	20	13	8	11	0.75	0.25	0.8	1	0.1	0.26	0.01	0.03	42	95	0.1	0.08	282	1	0.02	0.25	13	18	250	2	0.78	36	0.05	0.8	2	25	0.75	0.5	3	0.05	0.18	0.1	0.4	0.02	0.05	0.1	0.4	10	1	9.8	0.75	26	5	BF18AM
M07399	W030324	40	42	NAM	Waste	Chart	CH1	0.01	22.7	0.25	2.56	14	4	279	32	0.2	0.21	0.5	255	25	70	41	10	285	18	0.25	0.8	6.4	3.2	1	0.62	0.02	0.1	21.2	85	0.24	0																														

MD7578	W51000	36	38	NAM	NAM	One	Goethe/Henriette	MD2	0.07	3.28	0.25	3.41	288	51	3.7	0.1	0.21	0.25	26.5	25	120	0.4	192	104	705	215	5.4	8.8	1.2	22	0.01	0.02	6.6	2	1.22	0.12	1050	4	0.02	25	233	112	500	13	4.24	1	0.05	8.2	43	25	7.4	1	1.5	0.2	1.52	0.1	36	0.11	0.2	1.12	5.9	200	15	4.62	8.15	5.4	41	Min	NAM
MD7578	W51000	36	38	NAM	NAM	One	Goethe/Henriette	MD2	0.07	3.28	0.25	3.41	288	51	3.7	0.1	0.21	0.25	26.5	25	120	0.4	192	104	705	215	5.4	8.8	1.2	22	0.01	0.02	6.6	2	1.22	0.12	1050	4	0.02	25	233	112	500	13	4.24	1	0.05	8.2	43	25	7.4	1	1.5	0.2	1.52	0.1	36	0.11	0.2	1.12	5.9	200	15	4.62	8.15	5.4	41	Min	NAM
MD7578	W51000	36	38	NAM	NAM	One	Goethe/Henriette	MD2	0.07	3.28	0.25	3.41	288	51	3.7	0.1	0.21	0.25	26.5	25	120	0.4	192	104	705	215	5.4	8.8	1.2	22	0.01	0.02	6.6	2	1.22	0.12	1050	4	0.02	25	233	112	500	13	4.24	1	0.05	8.2	43	25	7.4	1	1.5	0.2	1.52	0.1	36	0.11	0.2	1.12	5.9	200	15	4.62	8.15	5.4	41	Min	NAM
MD7578	W51000	36	38	NAM	NAM	One	Goethe/Henriette	MD2	0.07	3.28	0.25	3.41	288	51	3.7	0.1	0.21	0.25	26.5	25	120	0.4	192	104	705	215	5.4	8.8	1.2	22	0.01	0.02	6.6	2	1.22	0.12	1050	4	0.02	25	233	112	500	13	4.24	1	0.05	8.2	43	25	7.4	1	1.5	0.2	1.52	0.1	36	0.11	0.2	1.12	5.9	200	15	4.62	8.15	5.4	41	Min	NAM
MD7578	W51000	36	38	NAM	NAM	One	Goethe/Henriette	MD2	0.07	3.28	0.25	3.41	288	51	3.7	0.1	0.21	0.25	26.5	25	120	0.4	192	104	705	215	5.4	8.8	1.2	22	0.01	0.02	6.6	2	1.22	0.12	1050	4	0.02	25	233	112	500	13	4.24	1	0.05	8.2	43	25	7.4	1	1.5	0.2	1.52	0.1	36	0.11	0.2	1.12	5.9	200	15	4.62	8.15	5.4	41	Min	NAM
MD7578	W51000	36	38	NAM	NAM	One	Goethe/Henriette	MD2	0.07	3.28	0.25	3.41	288	51	3.7	0.1	0.21	0.25	26.5	25	120	0.4	192	104	705	215	5.4	8.8	1.2	22	0.01	0.02	6.6	2	1.22	0.12	1050	4	0.02	25	233	112	500	13	4.24	1	0.05	8.2	43	25	7.4	1	1.5	0.2	1.52	0.1	36	0.11	0.2	1.12	5.9	200	15	4.62	8.15	5.4	41	Min	NAM
MD7578	W51000	36	38	NAM	NAM	One	Goethe/Henriette	MD2	0.07	3.28	0.25	3.41	288	51	3.7	0.1	0.21	0.25	26.5	25	120	0.4	192	104	705	215	5.4	8.8	1.2	22	0.01	0.02	6.6	2	1.22	0.12	1050	4	0.02	25	233	112	500	13	4.24	1	0.05	8.2	43	25	7.4	1	1.5	0.2	1.52	0.1	36	0.11	0.2	1.12	5.9	200	15	4.62	8.15	5.4	41	Min	NAM
MD7578	W51000	36	38	NAM	NAM	One	Goethe/Henriette	MD2	0.07	3.28	0.25	3.41	288	51	3.7	0.1	0.21	0.25	26.5	25	120	0.4	192	104	705	215	5.4	8.8	1.2	22	0.01	0.02	6.6	2	1.22	0.12	1050	4	0.02	25	233	112	500	13	4.24	1	0.05	8.2	43	25	7.4	1	1.5	0.2	1.52	0.1	36	0.11	0.2	1.12	5.9	200	15	4.62	8.15	5.4	41	Min	NAM
MD7578	W51000	36	38	NAM	NAM	One	Goethe/Henriette	MD2	0.07	3.28	0.25	3.41	288	51	3.7	0.1	0.21	0.25	26.5	25	120	0.4	192	104	705	215	5.4	8.8	1.2	22	0.01	0.02	6.6	2	1.22	0.12	1050	4	0.02	25	233	112	500	13	4.24	1	0.05	8.2	43	25	7.4	1	1.5	0.2	1.52	0.1	36	0.11	0.2	1.12	5.9	200	15	4.62	8.15	5.4	41	Min	NAM
MD7578	W51000	36	38	NAM	NAM	One	Goethe/Henriette	MD2	0.07	3.28	0.25	3.41	288	51	3.7	0.1	0.21	0.25	26.5	25	120	0.4	192	104	705	215	5.4	8.8	1.2	22	0.01	0.02	6.6	2	1.22	0.12	1050	4	0.02	25	233	112	500	13	4.24	1	0.05	8.2	43	25	7.4	1	1.5	0.2	1.52	0.1	36	0.11	0.2	1.12	5.9	200	15	4.62	8.15	5.4	41	Min	NAM
MD7578	W51000	36	38	NAM	NAM	One	Goethe/Henriette	MD2	0.07	3.28	0.25	3.41	288	51	3.7	0.1	0.21	0.25	26.5	25	120	0.4	192	104	705	215	5.4	8.8	1.2	22	0.01	0.02	6.6	2	1.22	0.12	1050	4	0.02	25	233	112	500	13	4.24	1	0.05	8.2	43	25	7.4	1	1.5	0.2	1.52	0.1	36	0.11	0.2	1.12	5.9	200	15	4.62	8.15	5.4	41	Min	NAM
MD7578	W51000	36	38	NAM	NAM	One	Goethe/Henriette	MD2	0.07	3.28	0.25	3.41	288	51	3.7	0.1	0.21	0.25	26.5	25	120	0.4	192	104	705	215	5.4	8.8	1.2	22	0.01	0.02	6.6	2	1.22	0.12	1050	4	0.02	25	233	112	500	13	4.24	1	0.05	8.2	43	25	7.4	1	1.5	0.2	1.52	0.1	36	0.11	0.2	1.12	5.9	200	15	4.62	8.15	5.4	41	Min	NAM
MD7578	W51000	36	38	NAM	NAM	One	Goethe/Henriette	MD2	0.07	3.28	0.25	3.41	288	51	3.7	0.1	0.21	0.25	26.5	25	120	0.4	192	104	705	215	5.4	8.8	1.2	22	0.01	0.02	6.6	2	1.22	0.12	1050	4	0.02	25	233	112	500	13	4.24	1	0.05	8.2	43	25	7.4	1	1.5	0.2	1.52	0.1	36	0.11	0.2	1.12	5.9	200	15	4.62	8.15	5.4	41	Min	NAM
MD7578	W51000	36	38	NAM	NAM	One	Goethe/Henriette	MD2	0.07	3.28	0.25	3.41	288	51	3.7	0.1	0.21	0.25	26.5	25	120	0.4	192	104	705	215	5.4	8.8	1.2	22	0.01	0.02	6.6	2	1.22	0.12	1050	4	0.02	25	233	112	500	13	4.24	1	0.05	8.2	43	25	7.4	1	1.5	0.2	1.52	0.1	36	0.11	0.2	1.12	5.9	200	15	4.62	8.15	5.4	41	Min	NAM
MD7578	W51000	36	38	NAM	NAM	One	Goethe/Henriette	MD2	0.07	3.28	0.25	3.41	288	51	3.7	0.1	0.21	0.25	26.5	25	120	0.4	192	104	705	215	5.4	8.8	1.2	22	0.01	0.02	6.6	2	1.22	0.12	1050	4	0.02	25	233	112	500	13	4.24	1	0.05	8.2	43	25	7.4	1	1.5	0.2	1.52	0.1	36	0.11	0.2	1.12	5.9	200	15	4.62	8.15	5.4	41	Min	NAM
MD7578	W51000	36	38	NAM	NAM	One	Goethe/Henriette	MD2	0.07	3.28	0.25	3.41	288	51	3.7	0.1	0.21	0.25	26.5	25	120	0.4	192	104	705	215	5.4	8.8	1.2	22	0.01	0.02	6.6	2	1.22	0.12	1050	4	0.02	25	233	112	500	13	4.24	1	0.05	8.2	43	25	7.4	1	1.5	0.2	1.52	0.1	36	0.11	0.2	1.12	5.9	200	15	4.62	8.15	5.4	41	Min	NAM
MD7578	W51000	36	38	NAM	NAM	One	Goethe/Henriette	MD2	0.07	3.28	0.25	3.41	288	51	3.7	0.1	0.21	0.25	26.5	25	120	0.4	192	104	705	215	5.4	8.8	1.2	22	0.01	0.02	6.6	2	1.22	0.12	1050	4	0.02	25	233	112	500	13	4.24	1	0.05	8.2	43	25	7.4	1	1.5	0.2	1.52	0.1	36	0.11	0.2	1.12	5.9	200	15	4.62	8.15	5.4	41	Min	NAM
MD7578	W51000	36	38	NAM	NAM	One	Goethe/Henriette	MD2	0.07	3.28	0.25	3.41	288	51	3.7	0.1	0.21	0.25	26.5	25	120	0.4	192	104	705	215	5.4	8.8	1.2	22	0.01	0.02	6.6	2	1.22	0.12	1050	4	0.02	25	233	112	500	13	4.24	1	0.05	8.2	43	25	7.4	1	1.5	0.2	1.52	0.1	36	0.11	0.2	1.12	5.9	200	15	4.62	8.15	5.4	41	Min	NAM
MD7578	W51000	36	38	NAM	NAM	One	Goethe/Henriette	MD2	0.07	3.28	0.25	3.41	288	51	3.7	0.1	0.21	0.25	26.5	25	120	0.4	192	104	705	215	5.4	8.8	1.2	22	0.01	0.02	6.6	2	1.22	0.12	1050	4	0.02	25	233	112	500	13	4.24	1	0.05	8.2	43	25	7.4	1	1.5	0.2	1.52	0.1	36	0.11	0.2	1.12	5.9	200	15	4.62	8.15	5.4	41	Min	NAM
MD7578	W51000	36	38	NAM	NAM	One	Goethe/Henriette	MD2	0.07	3.28	0.25	3.41	288	51	3.7	0.1	0.21	0.25	26.5	25	120	0.4	192	104	705	215	5.4	8.8	1.2	22	0.01	0.02	6.6	2	1.22	0.12	1050	4	0.02	25	233	112	500	13	4.24	1	0.05	8.2	43	25	7.4	1	1.5	0.2	1.52	0.1	36	0.11	0.2	1.12	5.9	200	15	4.62	8.15	5.4	41	Min	NAM
MD7578	W51000	36	38	NAM	NAM	One	Goethe/Henriette	MD2	0.07	3.28	0.25	3.41	288	51	3.7	0.1	0.21	0.25	26.5	25	120	0.4	192	104	705	215	5.4	8.8	1.2	22	0.01	0.02	6.6	2	1.22	0.12	1050	4	0.02	25	233	112	500	13	4.24	1	0.05	8.2	43	25	7.4	1	1.5	0.2	1.52	0.1	36	0.11	0.2	1.12	5.9	200	15	4.62	8.15	5.4	41	Min	NAM
MD7578	W51000	36	38	NAM	NAM	One	Goethe/Henriette	MD2	0.07	3.28	0.25	3.41	288	51	3.7	0.1	0.21	0.25	26.5	25	120	0.4	192	104	705	215	5.4	8.8	1.2	22	0.01	0.02	6.6	2	1.22	0.12	1050	4	0.02	25	233	112	500	13	4.24	1	0.05	8.2	43	25	7.4	1	1.5	0.2	1.52	0.1	36	0.11	0.2	1.12	5.9	200	15	4.62	8.15	5.4	41	Min	NAM
MD7578	W51000	36	38	NAM																																																																	

M02628	W077010	24	26	CD3	ALU	Waste	Calcrete	CC2B3	0.04	5.85	0.25	5.38	15	289	0.9	0.2	8.85	0.25	35.9	15	70	44	50	32	1.75	0.85	14.6	3.4	2.6	0.4	0.06	0.97	17.5	22	0.34	4.35	776	1	0.14	5.5	16.9	40	250	15	4.22	60.5	0.05	0.8	13	2.5	3.6	2	161	0.5	0.32	0.1	7.3	0.27	0.5	0.24	12	95	1	16.5	1.65	54	98	Odde Allevium
M02628	W077011	26	28	CD3	ALU	Waste	Calcrete	CC2B3	0.03	5.98	0.25	6.41	13	289	0.9	0.2	9.1	0.25	37.5	15	70	44	50	32	1.75	0.85	14.6	3.4	2.6	0.4	0.06	0.97	17.5	22	0.34	4.35	776	1	0.14	5.5	16.9	40	250	15	4.22	60.5	0.05	0.8	13	2.5	3.6	2	161	0.5	0.32	0.1	7.3	0.27	0.5	0.24	12	95	1	16.5	1.65	54	98	Odde Allevium
M02628	W077012	28	30	CD3	ALU	Waste	Calcrete	CC2B3	0.03	5.98	0.25	6.41	13	289	0.9	0.2	9.1	0.25	37.5	15	70	44	50	32	1.75	0.85	14.6	3.4	2.6	0.4	0.06	0.97	17.5	22	0.34	4.35	776	1	0.14	5.5	16.9	40	250	15	4.22	60.5	0.05	0.8	13	2.5	3.6	2	161	0.5	0.32	0.1	7.3	0.27	0.5	0.24	12	95	1	16.5	1.65	54	98	Odde Allevium
M02628	W077013	30	32	CD3	ALU	Waste	Calcrete	CC2B3	0.04	18	0.25	6.8	27	285	1.6	0.3	0.82	0.25	45.4	20	180	3.8	78	4.55	29	1.05	28.4	4.8	4.6	0.50	0.2	1.1	24.6	32.5	0.44	0.76	84	2.5	0.25	12.5	21.6	58	400	23	5.48	57.4	0.05	1.8	26	2.5	4.55	3	39	1.1	0.76	0.2	118	0.46	0.3	0.46	28	470	3	244	3	70	271	Odde Allevium
M02628	W077014	32	34	CD3	ALU	Waste	Calcrete	CC2B3	0.03	12.8	0.25	7.66	18	375	1.3	0.3	0.38	0.25	54	20	140	44	70	4.75	2.95	1.1	25.8	4.8	4.6	0.50	0.2	1.1	25.7	37	0.44	0.98	906	2	0.22	15.5	21.9	56	300	22	5.46	62.6	0.05	1.4	26	2.5	4.75	3	38.5	1.1	0.72	0.1	142	0.63	0.4	0.46	25	130	2	245	3.2	66	234	Odde Allevium
M02628	W077015	34	36	CD3	ALU	Waste	Calcrete	CC2B3	0.03	10.1	0.25	7.21	17	221	1.2	0.3	0.83	0.25	48.4	20	140	44	70	4.75	2.95	1.1	25.8	4.8	4.6	0.50	0.2	1.1	25.7	37	0.44	0.98	906	2	0.22	15.5	21.9	56	300	22	5.46	62.6	0.05	1.4	26	2.5	4.75	3	38.5	1.1	0.72	0.1	142	0.63	0.4	0.46	25	130	2	245	3.2	66	234	Odde Allevium
M02628	W077016	36	38	CD3	ALU	Waste	Calcrete	CC2B3	0.03	10.1	0.25	7.21	17	221	1.2	0.3	0.83	0.25	48.4	20	140	44	70	4.75	2.95	1.1	25.8	4.8	4.6	0.50	0.2	1.1	25.7	37	0.44	0.98	906	2	0.22	15.5	21.9	56	300	22	5.46	62.6	0.05	1.4	26	2.5	4.75	3	38.5	1.1	0.72	0.1	142	0.63	0.4	0.46	25	130	2	245	3.2	66	234	Odde Allevium
M02628	W077017	38	40	CD3	ALU	Waste	Calcrete	CC2B3	0.03	10.1	0.25	7.21	17	221	1.2	0.3	0.83	0.25	48.4	20	140	44	70	4.75	2.95	1.1	25.8	4.8	4.6	0.50	0.2	1.1	25.7	37	0.44	0.98	906	2	0.22	15.5	21.9	56	300	22	5.46	62.6	0.05	1.4	26	2.5	4.75	3	38.5	1.1	0.72	0.1	142	0.63	0.4	0.46	25	130	2	245	3.2	66	234	Odde Allevium
M02628	W077018	40	42	CD3	ALU	Waste	Calcrete	CC2B3	0.03	10.1	0.25	7.21	17	221	1.2	0.3	0.83	0.25	48.4	20	140	44	70	4.75	2.95	1.1	25.8	4.8	4.6	0.50	0.2	1.1	25.7	37	0.44	0.98	906	2	0.22	15.5	21.9	56	300	22	5.46	62.6	0.05	1.4	26	2.5	4.75	3	38.5	1.1	0.72	0.1	142	0.63	0.4	0.46	25	130	2	245	3.2	66	234	Odde Allevium
M02628	W077019	42	44	CD3	ALU	Waste	Calcrete	CC2B3	0.03	10.1	0.25	7.21	17	221	1.2	0.3	0.83	0.25	48.4	20	140	44	70	4.75	2.95	1.1	25.8	4.8	4.6	0.50	0.2	1.1	25.7	37	0.44	0.98	906	2	0.22	15.5	21.9	56	300	22	5.46	62.6	0.05	1.4	26	2.5	4.75	3	38.5	1.1	0.72	0.1	142	0.63	0.4	0.46	25	130	2	245	3.2	66	234	Odde Allevium
M02628	W077020	44	46	CD3	ALU	Waste	Calcrete	CC2B3	0.03	10.1	0.25	7.21	17	221	1.2	0.3	0.83	0.25	48.4	20	140	44	70	4.75	2.95	1.1	25.8	4.8	4.6	0.50	0.2	1.1	25.7	37	0.44	0.98	906	2	0.22	15.5	21.9	56	300	22	5.46	62.6	0.05	1.4	26	2.5	4.75	3	38.5	1.1	0.72	0.1	142	0.63	0.4	0.46	25	130	2	245	3.2	66	234	Odde Allevium
M02628	W077021	46	48	CD3	ALU	Waste	Calcrete	CC2B3	0.03	10.1	0.25	7.21	17	221	1.2	0.3	0.83	0.25	48.4	20	140	44	70	4.75	2.95	1.1	25.8	4.8	4.6	0.50	0.2	1.1	25.7	37	0.44	0.98	906	2	0.22	15.5	21.9	56	300	22	5.46	62.6	0.05	1.4	26	2.5	4.75	3	38.5	1.1	0.72	0.1	142	0.63	0.4	0.46	25	130	2	245	3.2	66	234	Odde Allevium
M02628	W077022	48	50	CD3	ALU	Waste	Calcrete	CC2B3	0.03	10.1	0.25	7.21	17	221	1.2	0.3	0.83	0.25	48.4	20	140	44	70	4.75	2.95	1.1	25.8	4.8	4.6	0.50	0.2	1.1	25.7	37	0.44	0.98	906	2	0.22	15.5	21.9	56	300	22	5.46	62.6	0.05	1.4	26	2.5	4.75	3	38.5	1.1	0.72	0.1	142	0.63	0.4	0.46	25	130	2	245	3.2	66	234	Odde Allevium
M02628	W077023	50	52	CD3	SCR	Waste	Calcrete	CC2B3	0.02	36.4	0.5	9.05	31	121	1.8	0.6	0.12	0.25	96.5	15	210	21	16	4	2.5	1.05	30	4.4	4.6	0.76	0.18	0.13	24.2	11	0.38	0.22	370	2	0.12	15.5	22.6	70	150	33	5.84	9	0.05	1.4	20	2.5	4.4	4	21	1.2	0.42	0.1	183	0.6	0.2	0.34	26	180	3	20	245	16	173	Odde Allevium
M02628	W077024	52	54	CD3	SCR	Waste	Calcrete	CC2B3	0.02	36.4	0.5	9.05	31	121	1.8	0.6	0.12	0.25	96.5	15	210	21	16	4	2.5	1.05	30	4.4	4.6	0.76	0.18	0.13	24.2	11	0.38	0.22	370	2	0.12	15.5	22.6	70	150	33	5.84	9	0.05	1.4	20	2.5	4.4	4	21	1.2	0.42	0.1	183	0.6	0.2	0.34	26	180	3	20	245	16	173	Odde Allevium
M02628	W077025	54	56	CD3	SCR	Waste	Calcrete	CC2B3	0.02	36.4	0.5	9.05	31	121	1.8	0.6	0.12	0.25	96.5	15	210	21	16	4	2.5	1.05	30	4.4	4.6	0.76	0.18	0.13	24.2	11	0.38	0.22	370	2	0.12	15.5	22.6	70	150	33	5.84	9	0.05	1.4	20	2.5	4.4	4	21	1.2	0.42	0.1	183	0.6	0.2	0.34	26	180	3	20	245	16	173	Odde Allevium
M02628	W077026	56	58	CD3	SCR	Waste	Calcrete	CC2B3	0.02	36.4	0.5	9.05	31	121	1.8	0.6	0.12	0.25	96.5	15	210	21	16	4	2.5	1.05	30	4.4	4.6	0.76	0.18	0.13	24.2	11	0.38	0.22	370	2	0.12	15.5	22.6	70	150	33	5.84	9	0.05	1.4	20	2.5	4.4	4	21	1.2	0.42	0.1	183	0.6	0.2	0.34	26	180	3	20	245	16	173	Odde Allevium
M02628	W077027	58	60	CD3	SCR	Waste	Calcrete	CC2B3	0.02	36.4	0.5	9.05	31	121	1.8	0.6	0.12	0.25	96.5	15	210	21	16	4	2.5	1.05	30	4.4	4.6	0.76	0.18	0.13	24.2	11	0.38	0.22	370	2	0.12	15.5	22.6	70	150	33	5.84	9	0.05	1.4	20	2.5	4.4	4	21	1.2	0.42	0.1	183	0.6	0.2	0.34	26	180	3	20	245	16	173	Odde Allevium
M02628	W077028	60	62	CD3	SCR	Waste	Calcrete	CC2B3	0.02	36.4	0.5	9.05	31	121	1.8	0.6	0.12	0.25	96.5	15	210	21	16	4	2.5	1.05	30	4.4	4.6	0.76	0.18	0.13	24.2	11	0.38	0.22	370	2	0.12	15.5	22.6	70	150	33	5.84	9	0.05	1.4	20	2.5	4.4	4	21	1.2	0.42	0.1	183	0.6	0.2	0.34	26	180	3	20	245	16	173	Odde Allevium
M02628	W077029	62	64	CD3	SCR	Waste	Calcrete	CC2B3	0.02	36.4	0.5	9.05	31	121	1.8	0.6	0.12	0.25	96.5	15	210	21	16	4	2.5	1.05	30	4.4	4.6	0.76	0.18	0.13	24.2	11	0.38	0.22	370	2	0.12	15.5	22.6	70	150	33	5.84	9	0.05	1.4	20	2.5	4.4	4	21	1.2	0.42	0.1	183	0.6	0.2	0.34	26	180	3	20	245	16	173	Odde Allevium
M02628	W077030	64	66	CD3	SCR	Waste	Calcrete	CC2B3	0.02	36.4	0.5	9.05	31	121	1.8	0.6	0.12	0.25	96.5	15	210	21	16	4	2.5	1.05	30	4.4	4.6	0.76	0.18	0.13	24.2	11	0.38	0.22	370	2	0.12	15.5	22.6	70	150	33	5.84	9	0.05	1.4	20	2.5	4.4	4	21	1.2	0.42	0.1	183	0.6	0.2	0.34	26	180	3	20	245	16	173	Odde Allevium
M02628	W077031	66	68	CD3	SCR	Waste	Calcrete	CC2B3	0.02	36.4	0.5	9.05	31	121	1.8	0.6	0.12	0.25	96.5	15	210	21	16	4	2.5	1.05	30	4.4	4.6	0.76	0.18	0.13	24.2	11	0.38	0.22	370	2	0.12	15.5	22.6	70	150	33	5.84	9	0.05	1.4	20	2.5	4.4	4	21	1.2	0.42	0.1	183	0.6	0.2	0.34	26	180	3	20	245	16	173	Odde Allevium

MD0763	MD0763 78J	78	80	WA	Waste	Dolomite	DM	0.02	0.83	0.25	1.02	4	13	0.2	0.05	19.3	0.25	12.2	2.5	20	1.2	6	0.85	0.5	0.25	2.8	0.8	0.4	0.18	0.01	0.77	6.5	3.5	0.08	11.2	4070	0.5	0.02	1.5	4.9	12	100	4	1.34	18.8	0.05	0.8	2	2.5	1	0.5	18	0.05	0.36	0.1	1.6	0.05	0.05	0.08	0.6	15	0.5	7.2	0.45	10	14	Shale WA		
MD0763	MD0763 80J	80	82	WA	Waste	Dolomite	DM	0.02	0.73	0.25	0.47	2	17	0.1	0.05	20.6	0.25	7.6	2.5	10	0.4	4	0.6	0.45	0.2	1.4	0.6	0.1	0.14	0.01	0.93	4.7	2.5	0.08	11.9	1120	0.25	0.02	0.5	3.95	6	90	2	0.88	8.2	0.05	0.4	0.5	2.5	0.6	0.5	16.5	0.05	0.08	0.1	0.8	0.03	0.05	0.06	0.4	10	0.25	6.6	0.35	6	5	Shale WA		
MD0763	MD0763 82J	82	84	WA	Waste	Dolomite	DM	0.02	0.7	0.25	0.5	2	18	0.1	0.05	20.4	0.25	6.2	2.5	10	0.4	4	0.5	0.35	0.15	1.4	0.4	0.1	0.12	0.01	0.25	3.5	2.5	0.04	11.9	1380	0.5	0.02	0.5	2.55	6	90	1	0.68	8.8	0.05	0.2	1	2.5	0.5	0.5	15	0.05	0.06	0.1	0.7	0.03	0.05	0.06	0.4	0.25	4.6	0.3	6	1	Shale WA			
MD0763	MD0763 84J	84	86	WA	Waste	Dolomite	DM	0.02	0.57	0.25	0.11	0.5	1	0.05	0.05	21.1	0.25	2.3	2.5	5	0.1	1	0.2	0.15	0.005	0.4	0.2	0.1	0.04	0.01	0.03	1.4	1	0.04	12.6	4880	0.25	0.005	0.25	0.85	8	25	0.5	0.24	1.4	0.05	0.1	0.5	2.5	0.2	0.5	10.5	0.05	0.04	0.1	0.3	0.005	0.05	0.02	0.2	2.5	0.25	9	0.15	10	2	Shale WA		
MD0763	MD0763 86J	86	88	WA	Waste	Dolomite	DM	0.03	0.99	0.25	0.22	5	8	0.2	0.05	19.3	0.25	4.6	2.5	10	0.3	2	0.4	0.25	0.1	0.8	0.4	0.1	0.1	0.01	0.14	3	3.5	0.04	11.1	4600	1	0.005	0.25	2.05	6	100	2	0.48	4.4	0.05	0.4	0.5	2.5	0.35	0.5	12.5	0.05	0.06	0.1	0.3	0.01	0.05	0.04	0.2	10	1	4.4	0.25	4	1	Shale WA		
MD0763	MD0763 88J	88	90	WA	Waste	Dolomite	DM SH3	0.03	0.83	0.25	0.81	3	39	0.2	0.05	19.7	0.25	4.6	2.5	10	0.7	10	0.75	0.5	0.25	0.8	0.4	0.16	0.08	0.27	6.3	3.5	0.08	10.9	4570	0.25	0.03	1	4.55	8	150	3	1.08	7.5	0.05	0.4	2	2.5	0.9	0.5	19	0.05	0.14	0.1	0.9	0.05	0.05	0.08	0.5	20	0.5	7.4	0.45	8	11	Shale WA			
MD0763	MD0763 90J	90	92	WA	Waste	Dolomite	DM	0.02	0.59	0.25	0.15	0.5	1	0.05	0.05	20.7	0.25	4.5	2.5	5	0.2	6	0.45	0.25	0.15	0.4	0.4	0.1	0.1	0.01	0.1	1.2	1	0.02	11.9	3810	0.25	0.02	0.25	2.15	6	90	0.5	0.48	2.6	0.05	0.1	0.5	2.5	0.25	0.5	14.5	0.05	0.06	0.1	0.3	0.01	0.05	0.04	0.2	10	0.25	4.4	0.15	6	2	Shale WA		
MD0763	MD0763 92J	92	94	WA	Waste	Dolomite	DM	0.02	0.5	0.25	0.16	0.5	1	0.05	0.05	20.7	0.25	3.2	2.5	5	0.2	6	0.2	0.15	0.05	0.4	0.2	0.1	0.04	0.01	0.09	3	1	0.01	12	3170	0.25	0.02	0.25	1.2	1	90	1	0.34	2.8	0.05	0.1	0.5	2.5	0.25	0.5	14	0.05	0.02	0.1	0.3	0.05	0.05	0.02	0.2	10	0.25	4.6	0.15	6	2	Shale WA		
MD0763	MD0763 94J	94	96	WA	Waste	Dolomite	DM	0.02	0.5	0.25	0.18	1	5	0.05	0.05	21.3	0.25	3.4	2.5	10	0.2	2	0.25	0.15	0.1	0.4	0.2	0.1	0.04	0.01	0.08	2.2	1	0.02	11.9	3260	0.25	0.02	0.25	1.25	1	90	1	0.32	2.6	0.05	0.1	0.5	2.5	0.2	0.5	14.5	0.05	0.04	0.1	0.3	0.005	0.05	0.02	0.2	10	0.25	2.8	0.15	6	2	Shale WA		
MD0763	MD0763 96J	96	98	WA	Waste	Dolomite	DM SH3	0.04	0.99	0.25	0.67	4	27	0.2	0.05	19.3	0.25	10.4	2.5	10	0.6	12	0.75	0.5	0.25	2	1	0.2	0.18	0.01	0.39	6.1	2.5	0.08	10.7	4990	1	0.02	1	4.5	8	100	6	1.2	17.4	0.05	0.4	1	2.5	0.75	0.5	21	0.05	0.12	0.1	0.8	0.04	0.1	0.06	0.5	25	0.25	7.2	0.35	26	8	Shale WA		
MD0763	MD0763 98J	98	100	WA	Waste	Dolomite	DM	0.03	0.83	0.25	0.27	2	11	0.05	0.05	20.1	0.25	5.5	2.5	10	0.3	8	0.5	0.35	0.15	0.8	0.6	0.1	0.12	0.01	0.2	3.7	2	0.04	11.3	4900	0.5	0.02	0.25	2.45	8	100	1	0.56	5.2	0.05	0.1	1	2.5	0.5	0.5	19	0.05	0.06	0.1	0.3	0.02	0.05	0.04	0.2	10	0.25	5.7	0.25	12	4	Shale WA		
MD0763	MD0763 100	100	102	WA	Waste	Dolomite	DM	0.03	0.88	0.25	0.19	0.5	4	0.05	0.05	20.5	0.25	1.4	2.5	10	0.2	1	0.25	0.2	0.05	0.6	0.2	0.1	0.04	0.01	0.08	2.2	1	0.01	11.8	5020	0.25	0.02	0.25	1.4	2	100	0.5	0.32	2.4	0.05	0.1	0.5	2.5	0.2	0.5	12.5	0.05	0.04	0.1	0.3	0.01	0.05	0.02	0.2	10	0.25	3.1	0.15	6	2	Shale WA		
MD0763	MD0763 102	102	104	WA	Waste	Dolomite	DM	0.02	0.78	0.5	0.19	1	8	0.05	0.05	20.1	0.25	1.8	2.5	5	0.2	1	0.35	0.2	0.1	0.6	0.4	0.1	0.06	0.01	0.12	1.4	2	0.01	11.6	4870	0.25	0.02	0.25	1.46	2	100	0.5	0.38	3.2	0.05	0.1	0.5	2.5	0.25	0.5	16	0.05	0.04	0.1	0.3	0.01	0.05	0.02	0.2	10	0.25	3.7	0.2	6	1	Shale WA		
MD0763	MD0763 104	104	106	WA	Waste	Dolomite	DM	0.02	0.86	0.25	0.28	0.5	6	0.05	0.05	20.2	0.25	5	2.5	5	0.3	1	0.45	0.25	0.1	0.8	0.4	0.1	0.1	0.01	0.21	1.8	1	0.04	11.7	4730	0.25	0.02	0.25	2.2	2	100	0.5	0.54	4.8	0.05	0.1	0.5	2.5	0.45	0.5	14	0.05	0.06	0.1	0.3	0.02	0.05	0.04	0.2	2.5	0.25	4.4	0.25	2	14	Shale WA		
MD0743	MD0743 1	0	6	C3D3	ALL	Waste	Shale	SH3	0.18	1.98	0.5	6.07	30	289	1.5	0.3	0.67	0.25	49.9	20	170	6.9	7.2	2.55	1.05	17.4	4.2	3.2	0.36	2.15	28.9	21	0.4	0.35	478	2	0.08	8	22.9	104	30	4.38	98.8	0.05	2	19	2.5	4.85	9	37	0.7	0.72	0.2	6.6	0.4	0.8	0.36	2	140	1.5	21.9	2.58	84	116	Chert-Aluminum				
MD0743	MD0743 2	6	14	C3D3	ALL	Waste	Shale	SH2/SH3	0.68	5.22	0.25	7.21	47	363	0.7	1.3	0.04	0.25	40.2	5	140	4.2	140	3.45	2.4	1.1	23.2	3.6	4.2	0.66	2.04	198	21.6	8.5	0.4	0.38	64	5	0.06	10.5	16.4	34	330	59	4.36	54.6	0.05	4	18	1	5	1.7	6	89	0.9	0.16	1.4	8.3	0.5	0.8	0.36	2	125	2	17.5	2.35	24	157	Chert-Aluminum
MD0743	MD0743 3	14	22	JER	JER	Waste	Shale	SHC	0.26	2.44	0.25	6.94	37	374	1	1.1	0.03	0.25	76.9	25	180	8.2	106	5.1	3.2	1.6	26.6	5.4	5.2	0.96	2.04	39.1	34	0.44	0.53	46	4.5	0.04	13.5	31.7	24	330	54	8.36	85	0.05	4	18	2.5	6.3	5	87	1	0.86	0.4	5.6	0.55	1.1	0.46	3.8	135	3	25.4	3.15	18	191	Shale JER		
MD0743	MD0743 4	22	28	JER	JER	Waste	Shale	SHC/DM	1.82	6.5	0.25	6.8	39	360	1.7	0.5	1.5	2	48.2	30	180	8	138	7	4.3	1.6	22.1	7.2	4.4	1.66	0.28	4.37	31.7	33	0.38	1.6	784	6	0.38	8.5	31.7	132	330	50	7.94	103	0.05	2.6	39	2.5	7.1	4	29	0.6	1.1	0.2	1.4	0.37	1.1	0.6	2.6	135	1.4	230	158	Shale JER			
MD0743	MD0743 5	28	38	JER	JER	Waste	Shale	OS/DM	1.24	5.18	0.25	6.21	18	261	1.5	0.3	1.9	2	45.3	80	330	3.8	118	4.2	2.75	12	17.2	4.8	4	0.88	0.12	38.1	22.1	17.5	0.38	2.8	4000	2	0.16	8.5	21.5	380	500	24	5.3	76.8	0.05	2	22	2.5	1.05	2	28	0.6	0.74	0.1	1.6	0.51	0.8	0.36	1.5	140	1	23.6	2.55	1370	144	Shale JER	
MD0743	MD0743 6	38	48	JER	JER	Waste	Shale	OS/DM	1.91	7.56	0.25	5.92	26	391	1.3	0.7	4.1	1	51.9	40	180	5.1	94	4.05	2.4	1.25	18	4.5	3.8	0.78	0.12	3.82	26	50	0.22	2.44	1600	3.5	0.18	9	21.8	568	500	28	6.06	94.8	0.05	2.1	15	2.5	1.05	4	39	0.5	0.88	0.6	5.7	0.55	1	0.34	1.7	130	1.2	221	125	Shale JER			
MD0743	MD0743 7	48	58	JER	JER	Waste	Shale	OS/DM	4.86	18.21	0.25	4.42	65	212	1.7	0.7	4.69	1	47.8	35	100	7.3	72	3.35	2.1	0.95	13.4	3.6	3	0.72	0.24	2.27	24.4	21	0.28	1.96	1930	3.5	0.07	7	20	128	300	35	5.28	69.8	0.05	3.4	12	2.5	1.1	4	49	0.5	0.56	0.2	1.3	0.24	1.8	0.28	1.7	252	101	Shale JER					
MD0743	MD0743 8	58	68	JER	JER	Waste	Shale	OS/DM	1.82	19.8	0.25	3.5	50	357	1.6	0.6	5.71	0.5	49.5	20	130	5.4	34	3.45	2.25	0.8	11.8	3.4	3.4	0.64	0.12	3.7	26.8	19.5	0.32	1.07	1380	3	0.06	19.9	104	330	36	5.28	63.4	0.05	3.4	9	2.5	4.15	2	37.5	0.5	0.4	0.7	1.5	0.18	1.2	0.32	2.5	85	5	18	2	120	106	Shale JER		
MD0743	MD0743 9	68	78	JER	JER	Waste	Shale	SH3	1.49	0.25	7.56	46	363	0.7	0.9	0.46	0.25	38.1	35	140	3.7																																																

Appendix B

Tabulated results

TABLE B1 - ACID FORMATION POTENTIAL RESULTS

SampleID	BHID	Interval (m)	Strat	Strand	Lithology	pH (1:2) -	EC (1:2) mS/cm	Total-S (%)	CRS (%)	Total-C (%)	CO3-C (%)	Carb-ANC kg H2SO4/tonne	ANC+ ITK	NAG-pH 4.5 ITK	NAG-pH 7.0 kg H2SO4/tonne	NAG-pH ITK	MPA (CRS)	ANC/MPA (CRS)	AFP Category	MPA total-S	NAPP total-S	AFP Category	MPA (al)	ANC / MPA (al)	NAPP (al)	AFP Category
						ITK	ITK	ITK	EAL	ITK	ITK	calc	ITK	ITK	ITK	ITK	calc	calc		calc	calc	Prelim	calc	calc	calc	Prelim
146309	MD8304	2-6	CzD3	ALU	clay	6.4	0.14	0.37	0.01	0.11	0.05	4	6	-	-	7.3	0.3	19.6	NAF	11.3	5.3	UC	8.5	0.7	2.5	UC
136362	MD7291	0-4	CzD3	ALU	clay	6.4	0.12	0.05	-	0.38	0.1	8	5	-	-	-	-	-	NAF	1.5	-3.5	NAF	1.1	4.4	-3.9	NAF
158056	MD7814	2-6	CzD3	ALU	clay	7.6	3.3	0.24	0.008	0.2	0.17	14	22	-	-	8.7	0.2	89.9	NAF	7.3	-14.7	NAF	5.5	4.0	-16.5	NAF
159723	MD7877	0-4	CzD3	ALU	clay	6.6	0.18	0.29	0.01	0.07	0.01	1	3	-	-	7	0.3	9.8	NAF	8.9	5.9	UC	6.7	0.5	3.7	UC
159185	MD7855	4-8	CzD3	ALU	clay	7.8	0.17	0.39	0.005	0.08	0.03	2	6	-	-	7.7	0.2	39.2	NAF	11.9	5.9	UC	9.0	0.7	3.0	UC
148774	MD8434	4-8	CzD3	ALU	clay	7.9	0.14	0.34	0.008	0.04	0.01	1	2	-	-	7.2	0.2	8.2	NAF	10.4	8.4	UC	7.8	0.3	5.8	UC
159195	MD7855	24-28	CzD3	ALU	clay	7.3	0.15	0.04	-	0.1	0.04	3	6	-	-	-	-	-	NAF	1.2	-4.8	NAF	0.9	6.5	-5.1	NAF
153018	MD7687	0-4	CzD3	ALU	clay	7.1	0.12	0.26	0.009	0.07	0.02	2	4	-	-	6.9	0.3	14.5	NAF	8.0	4.0	UC	6.0	0.7	2.0	UC
161138	MD7918	2-6	CzD3	ALU	clay	7.4	0.12	0.15	0.002	0.05	0.02	2	6	-	-	7.2	0.1	98.0	NAF	4.6	-1.4	NAF	3.4	1.7	-2.6	NAF
161151	MD7918	28-32	CzD3	ALU	clay	7.3	0.13	<0.01	-	0.04	0.01	1	3	-	-	-	-	-	NAF	0.2	-2.8	NAF	0.1	26.1	-2.9	NAF
125317	MD7191	6-8	CzD3	ALU	clay	7.3	0.14	0.14	0.01	0.06	0.02	2	5	-	-	7	0.3	16.3	NAF	4.3	-0.7	NAF	3.2	1.6	-1.8	NAF
169688	MD8902	22-26	CzD3	ALU	clay	7.3	0.35	0.05	-	0.08	0.04	3	5	-	-	-	-	-	NAF	1.5	-3.5	NAF	1.1	4.4	-3.9	NAF
143324	MD8226	6-10	CzD3	ALU	clay	8.1	0.32	0.5	0.008	0.07	0.03	2	7	-	-	7.4	0.2	28.6	NAF	15.3	8.3	UC	11.5	0.6	4.5	UC
143161	MD8222	16-20	CzD3	ALU	clay	7.7	0.56	0.1	-	0.19	0.13	11	15	-	-	8.9	-	-	NAF	3.1	-11.9	NAF	2.3	6.5	-12.7	NAF
158063	MD7814	16-20	CzD3	ALU	chert	7.5	0.09	0.02	-	0.06	0.02	2	3	-	-	-	-	-	NAF	0.6	-2.4	NAF	0.5	6.5	-2.5	NAF
0.31	MD7601	2-6	CzD3	ALU	chert	7.2	0.1	0.31	0.008	0.05	0.02	2	5	-	-	6.9	0.2	20.4	NAF	9.5	4.5	UC	7.1	0.7	2.1	UC
141544	MD7433	0-4	CzD3	CC	calcrete	9.4	1.92	0.07	-	6.68	6.63	542	573	-	-	-	-	-	NAF	2.1	-570.9	NAF	-	-	-	NAF
147748	MD8374	0-4	CzD3	SCR	hematite/goethite	8	0.19	0.03	-	0.28	0.19	16	13	-	-	-	-	-	NAF	0.9	-12.1	NAF	-	-	-	NAF
122694	MD5984	58-62	CzD2	DCL	silcrete	8.3	0.21	<0.01	-	0.35	0.28	23	26	-	-	-	-	-	NAF	0.2	-25.8	NAF	-	-	-	-
114667	MD5879	54-58	CzD2	CC	calcrete	8.1	0.23	0.02	-	3.25	3.16	258	264	-	-	-	-	-	NAF	0.6	-263.4	NAF	-	-	-	-
158501	MD7826	52-56	CzD2	DCL	shale	7.3	0.22	<0.01	-	0.03	0.01	1	3	-	-	-	-	-	NAF	0.2	-2.8	NAF	-	-	-	-
141551	MD7433	14-18	CzD2	CIDW	goethite	8.1	0.35	0.04	-	0.12	0.05	4	8	-	-	-	-	-	NAF	1.2	-6.8	NAF	-	-	-	-
140111	MD7390	22-26	CzD2	CIDW	hematite	7.5	0.11	0.02	-	0.09	0.04	3	5	-	-	-	-	-	NAF	0.6	-4.4	NAF	-	-	-	-
154912	MD8454	44-48	CzD2	CIDW	manganese	7.2	0.22	0.02	-	0.14	0.08	7	8	-	-	-	-	-	NAF	0.6	-7.4	NAF	-	-	-	-
159596	MD7871	28-32	NEW	NEW	chert	7.6	0.1	0.02	-	0.04	0.02	2	1	-	-	-	-	-	NAF	0.6	-0.4	NAF	-	-	-	-
128354	MD7457	42-46	MAC	MAC	chert	7.8	0.2	0.02	-	0.07	0.03	2	4	-	-	-	-	-	NAF	0.6	-3.4	NAF	-	-	-	-
130281	MD7269	20-24	MAC	MAC	chert	7.7	0.14	<0.01	-	0.04	0.02	2	1	-	-	-	-	-	NAF	0.2	-0.8	NAF	-	-	-	-
114686	MD5879	92-96	MAC	MAC	chert	7.4	0.55	0.17	0.146	2.29	1.96	160	30	-	-	7.6	4.5	6.7	NAF	5.2	-24.8	NAF	-	-	-	-
147965	MD8389	8-12	MAC	MAC	chert	7.6	0.1	0.02	-	0.07	0.04	3	5	-	-	-	-	-	NAF	0.6	-4.4	NAF	-	-	-	-
147597	MD8365	16-20	MAC	MAC	chert	8	0.48	0.02	-	0.04	0.03	2	2	-	-	-	-	-	NAF	0.6	-1.4	NAF	-	-	-	-
149702	MD7530	12-16	MAC	MAC	chert	6.7	0.08	0.02	-	0.08	0.05	4	6	-	-	-	-	-	NAF	0.6	-5.4	NAF	-	-	-	-
117105	MD7090	22-26	MAC	MAC	chert	6.7	0.1	<0.01	-	0.14	0.04	3	3	-	-	-	-	-	NAF	0.2	-2.8	NAF	-	-	-	-
127348	MD7237	86-90	MAC	MAC	shale/dolomite	8.7	0.46	0.25	0.237	5.36	5.05	413	274	-	-	8.5	7.3	37.8	NAF	7.7	-266.4	NAF	-	-	-	-
125353	MD7191	78-82	MAC	MAC	shale/chert	7.1	0.69	0.34	0.287	3.75	3.33	272	7*	-	-	7.5	8.8	24.4	LC-PAF	10.4	3.4	LC-PAF	-	-	-	-
161162	MD7918	50-54	NAM	NAM	chert	7.2	0.11	<0.01	-	0.06	0.03	2	3	-	-	-	-	-	NAF	0.2	-2.8	NAF	-	-	-	-
117123	MD7090	58-62	NAM	NAM	chert	7.7	0.86	0.38	0.311	4.23	3.58	292	150	-	-	8.4	9.5	15.8	NAF	11.6	-138.4	NAF	-	-	-	-
169708	MD8902	62-66	NAM	NAM	chert	7.3	0.34	<0.01	-	0.08	0.06	5	8	-	-	-	-	-	NAF	0.2	-7.8	NAF	-	-	-	-
140137	MD7390	74-78	NAM	NAM	chert	7.7	1.69	0.43	0.331	2.46	1.6	131	114	-	-	8.2	10.1	11.3	NAF	13.2	-100.8	NAF	-	-	-	-
153091	MD7689	20-24	NAM	NAM	chert	6.9	0.4	0.02	-	0.03	0.01	1	1	-	-	-	-	-	NAF	0.6	-0.4	NAF	-	-	-	-
152409	MD7664	12-16	NAM	NAM	shale	6.6	0.37	<0.01	-	0.02	<0.01	<1	1	-	-	-	-	-	NAF	0.2	-0.8	NAF	-	-	-	-
150088	MD7554	0-4	NAM	NAM	shale	7.5	3.69	0.83	0.002	0.05	0.02	2	11	-	-	7.2	0.1	179.7	NAF	25.4	14.4	NAF	-	-	-	-
150090	MD7554	4-8	NAM	NAM	shale	7.5	6.06	0.39	0.002	0.08	0.06	5	9	-	-	7.3	0.1	147.1	NAF	11.9	2.9	NAF	-	-	-	-
147794	MD7545	26-30	NAM	NAM	shale	7.2	0.81	0.21	0.005	0.03	0.01	1	2	-	-	6.6	0.2	13.1	NAF	6.4	4.4	NAF	-	-	-	-
119988	MD7169	28-32	NAM	NAM	shale	7.1	0.32	0.54	0.002	1.21	<0.01	<1	6	-	-	7.1	0.1	98.0	NAF	16.5	10.5	NAF	-	-	-	-
154192	MD7773	8-12	NAM	NAM	shale	8.6	0.28	0.02	-	0.14	0.11	9	12	-	-	-	-	-	NAF	0.6	-11.4	NAF	-	-	-	-
153368	MD7711	22-26	NAM	NAM	shale	7.1	0.94	0.01	-	0.03	0.01	1	2	-	-	-	-	-	NAF	0.3	-1.7	NAF	-	-	-	-
151570	MD7616	46-50	NAM	NAM	shale	5.3	0.2	0.03	-	0.03	0.01	1	1	-	-	-	-	-	NAF	0.9	-0.1	NAF	-	-	-	-
145933	MD8454	86-90	NAM	NAM	shale	7.7	0.29	0.02	-	0.06	0.02	2	16	-	-	-	-	-	NAF	0.6	-15.4	NAF	-	-	-	-
143199	MD8222	92-96	NAM	DNAM	shale	6.8	2.38	1.68	1.5	7.58	7.17	586	78	-	14	4.7	45.9	1.7	PAF	51.4	-26.6	NAF	-	-	-	-
143363	MD8226	84-88	NAM	DNAM	shale	3.3	5.51	3.46	2.552	4.6	0.29	24	-1*	38	71	2.3	78.1	0.0	PAF	105.9	106.9	PAF	-	-	-	-
114213	MD5871	88-92	NAM	NAM	shale	7	0.58	0.49	0.388	1.54	0.79	65	15*	-	-	6.4	11.9	1.3	LC-PAF	15.0	-0.01	NAF	-	-	-	-
154937	MD8454	94-98	NAM	NAM	shale	6.8	2.15	0.75	0.592	0.92	0.07	6	6*	3	7	3.4	18.1	0.3	PAF	23.0	17.0	PAF	-	-	-	-
109481	MD5866	102-106	NAM	NAM	shale	6	0.96	2.07	1.867	3.77	1.87	153	39*	1	29	4	57.1	0.7	PAF	63.3	24.3	PAF	-	-	-	-
117023	MD7087	54-58	NAM	DNAM	shale	2.8	1.7	0.92	0.728	1.16	0.09	7	-4	19	23	2.5	22.3	-0.2	PAF	28.2	32.2	PAF	-	-	-	-
151575	MD7616	56-60	NAM	NAM	shale	3.5	1.72	1	0.282	2.48	0.05	4	-1	3	10	3.4	8.6	-0.1	PAF	30.6	31.6	PAF	-	-	-	-
143201	MD8222	96-100	NAM	DNAM	dolomite	7.9	4.01	1.19	1.002	6.43	5.72	467	302	-	-	8.2	30.7	9.8	NAF	36.4	-265.6	NAF	-	-	-	-
122710	MD5984	90-94	NAM	NAM	magnetite	7.5	1.67	0.09	-	0.23	0.12	10	33	-	-	-	-	-	NAF	2.8	-30.2	NAF	-	-	-	-
119975	MD7169	2-6	NAM	NAM	goethite	6.9	0.13	0.06	-	0.11	0.03	2	6	-	-	-	-	-	NAF	1.8	-4.2	NAF	-	-	-	-
161028	MD7914	4-8	NAM	HNAM	goethite	7.6	0.11	0.03	-	0.1																

TABLE B2a - MULTI-ELEMENT RESULTS

SampleID	BHID	Interval (m)	Strat	Strand	Lithology	S (%)	Ca (%)	Mg (%)	K (%)	Na (%)	Fe (%)	Al (%)	Si (%)	Ti (%)	Hg (ppm)	As (ppm)	Sb (ppm)	Se (ppm)	Mo (ppm)	B (ppm)	F (ppm)
Average Crustal Abundance															0.06	6	0.2	0.4	2	15	200
Analytical Laboratory						ITK	ITK	ITK	ITK	ITK	ITK	ITK	ITK	ITK	ITK	ITK	ITK	ITK	ITK	ITK	ITK
146309	MD8304	2-6	CzD3	ALU	clay	0.33	0.10	0.21	0.93	0.05	19.0	5.04	25.0	0.28	0.048	43.5	2.70	1.22	2.6	53	483
143161	MD8222	16-20	CzD3	ALU	clay	0.11	0.37	0.27	0.66	0.06	18.1	5.75	24.9	0.45	0.089	58.5	4.20	1.94	3.0	66	419
153018	MD7687	0-4	CzD3	ALU	clay	0.27	0.11	0.29	1.23	0.03	13.0	4.95	29.8	0.26	0.027	40.4	2.33	1.07	2.2	<50	507
161151	MD7918	28-32	CzD3	ALU	clay	0.02	0.07	0.16	0.52	0.04	16.6	9.76	22.3	0.71	0.009	53.8	4.45	0.71	3.1	60	325
158056	MD7814	2-6	CzD3	ALU	clay	0.24	0.85	0.56	1.28	0.12	11.7	6.44	26.1	0.34	0.016	24.1	1.83	0.50	1.6	70	498
125317	MD7191	6-8	CzD3	ALU	clay	0.15	0.11	0.35	1.68	0.03	11.4	5.53	31.1	0.33	0.034	35.6	2.24	0.90	2.1	60	643
169688	MD8902	22-26	CzD3	ALU	clay	0.05	0.07	0.20	0.41	0.05	23.8	7.30	20.0	0.64	0.071	72.2	6.02	1.13	3.9	59	390
159723	MD7877	0-4	CzD3	ALU	clay	0.29	0.10	0.28	1.31	0.04	13.3	5.77	29.0	0.31	0.038	40.8	2.66	1.04	2.5	55	563
148774	MD8434	4-8	CzD3	ALU	clay	0.35	0.15	0.36	1.38	0.08	11.8	5.69	29.9	0.32	0.032	43.5	2.58	1.12	2.4	58	597
159195	MD7855	24-28	CzD3	ALU	clay	0.04	0.11	0.34	0.53	0.04	13.3	11.14	22.1	0.81	0.075	48.3	4.25	0.56	2.8	86	569
141544	MD7433	0-4	CzD3	CC	calcrete	0.07	19.64	1.99	0.45	0.24	3.5	2.10	13.8	0.10	0.014	5.8	0.40	0.32	0.6	58	2,089
140111	MD7390	22-26	CzD2	CIDW	hematite	0.03	0.07	0.10	0.12	0.05	38.5	5.01	4.5	0.30	0.167	30.9	1.78	0.63	1.4	<50	192
127348	MD7237	86-90	MAC	MAC	shale/dolomite	0.24	5.88	4.00	0.06	0.03	17.2	0.95	19.2	0.06	0.020	7.4	0.82	0.22	1.3	<50	426
161162	MD7918	50-54	NAM	NAM	chert	0.01	0.02	0.05	0.03	0.01	31.4	0.53	23.4	0.03	0.048	5.3	0.49	0.10	2.0	<50	78
140137	MD7390	74-78	NAM	NAM	chert	0.38	1.17	2.23	0.06	0.03	15.3	2.49	26.8	0.15	0.044	15.7	1.34	0.40	20.7	<50	559
119988	MD7169	28-32	NAM	NAM	shale	0.52	0.10	0.34	1.50	0.02	4.0	7.46	33.9	0.38	1.154	37.7	3.57	2.33	1.4	56	735
114213	MD5871	88-92	NAM	NAM	shale	0.46	0.13	2.27	0.12	0.02	18.6	3.74	26.3	0.21	0.104	54.8	1.54	0.54	3.0	<50	749
109481	MD5866	102-106	NAM	NAM	shale	1.92	0.47	7.54	0.21	0.13	18.9	5.06	12.7	0.21	0.059	72.1	1.76	0.54	1.3	<50	2,808
143363	MD8226	84-88	NAM	DNAM	shale	3.19	0.06	5.12	0.02	0.03	20.1	7.94	11.5	0.41	0.135	45.2	3.93	1.20	3.2	<50	2,158
143201	MD8222	96-100	NAM	DNAM	dolomite	1.21	6.93	5.17	0.05	0.11	18.0	2.62	12.0	0.15	0.061	13.2	0.61	0.53	1.3	<50	736
161028	MD7914	4-8	NAM	HNAM	goethite	0.04	0.04	0.05	0.04	0.01	51.9	0.80	4.4	0.05	0.029	4.2	2.33	0.35	0.6	<50	121
119975	MD7169	2-6	NAM	NAM	goethite	0.07	0.11	0.38	1.43	0.04	15.8	4.86	28.5	0.29	0.022	33.8	2.35	0.75	2.4	50	652
119991	MD7169	34-38	JER	JER	shale	7.12	0.05	0.49	2.91	0.03	6.6	6.02	25.5	0.33	1.655	36.3	2.15	4.31	1.7	88	762
151578	MD7616	62-66	JER	JER	shale	3.98	0.06	0.73	3.53	0.03	7.2	7.06	25.5	0.41	1.193	47.9	3.92	2.37	2.2	152	1,233
138063	MD7338	60-64	MAC	SOMAC	hematite (ore)	0.04	0.07	0.11	0.13	0.01	50.0	2.48	5.8	0.12	0.132	18.4	1.70	0.97	1.5	<50	191
159202	MD7855	38-42	NAM	TNAM	goethite (ore)	0.04	0.03	0.08	0.10	0.01	56.1	1.45	4.0	0.06	0.143	10.5	0.69	0.37	0.9	<50	212

SampleID	BHID	Interval (m)	Strat	Strand	Lithology	Cu (ppm)	Zn (ppm)	Cd (ppm)	Pb (ppm)	Ni (ppm)	Cr (ppm)	Co (ppm)	Mn (ppm)	Ag (ppm)	Bi (ppm)	P (ppm)	Sr (ppm)	Ba (ppm)	Sn (ppm)	V (ppm)	Tl (ppm)	Th (ppm)	U (ppm)
Average Crustal Abundance						30	90	0.4	35	50	70	8	1000	0.07	0.06	800	250	500	4	90	0.75	9	2
Analytical Laboratory						ITK	ITK	ITK	ITK	ITK	ITK	ITK	ITK	ITK	ITK	ITK	ITK	ITK	ITK	ITK	ITK	ITK	ITK
146309	MD8304	2-6	CzD3	ALU	clay	65.9	71	0.08	25.2	61.7	210	13.9	1,200	0.14	0.48	344	53	239	2.3	144	0.76	7.62	1.75
143161	MD8222	16-20	CzD3	ALU	clay	86.3	59	0.07	35.9	39.9	232	12.4	653	0.4	0.79	296	50	414	4.1	182	0.55	13.41	2.64
158056	MD7814	2-6	CzD3	ALU	clay	68.9	94	0.14	21.3	76.2	142	21.1	924	0.1	0.39	250	57	391	2.5	126	0.86	8.74	1.98
125317	MD7191	6-8	CzD3	ALU	clay	74.7	93	0.19	22.4	68.1	185	15.2	383	0.17	0.6	301	38	290	2.7	150	0.75	8.38	1.98
169688	MD8902	22-26	CzD3	ALU	clay	86.4	43	0.09	35.4	39.3	294	7.9	4,051	0.29	0.99	231	30	1,313	5.7	278	0.45	19	3.17
153018	MD7687	0-4	CzD3	ALU	clay	73.8	85	0.11	23.8	75.9	166	19.5	680	0.15	0.45	273	42	257	2	126	0.86	6.7	1.68
161151	MD7918	28-32	CzD3	ALU	clay	115.3	57	0.09	34.2	51.1	279	11.5	1,023	0.19	0.93	234	21	154	5.9	268	0.78	18.17	4.12
159723	MD7877	0-4	CzD3	ALU	clay	84.9	92	0.09	26.3	71.8	167	15.9	461	0.14	0.56	280	44	213	2.7	135	0.9	7.92	1.86
148774	MD8434	4-8	CzD3	ALU	clay	88.4	98	0.1	27.8	68.1	158	15.4	321	0.17	0.52	280	56	415	2.8	131	0.92	8.33	1.88
159195	MD7855	24-28	CzD3	ALU	clay	88.4	85	0.19	37.1	62.7	271	15.6	1,303	0.15	0.94	198	19	136	6.2	222	0.6	18.98	4.29
141544	MD7433	0-4	CzD3	CC	calcrete	18.4	24	0.06	5.3	16.4	42	5.1	382	0.07	0.09	82	197	292	0.8	32	0.22	2.67	1.52
140111	MD7390	22-26	CzD2	CIDW	hematite	22.5	39	0.34	8.8	42.1	61	31.3	72,240	<0.05	0.55	308	84	109	2	87	0.30	11.24	3.64
127348	MD7237	86-90	MAC	MAC	shale/dolomite	11.2	14	<0.02	3.2	16.1	36	4.6	2,233	<0.05	0.1	141	11	8	0.4	20	0.05	1.43	0.47
161162	MD7918	50-54	NAM	NAM	chert	6.3	136	0.36	2.3	26.9	46	12.7	2,412	<0.05	0.05	305	4	54	0.2	14	0.18	0.81	1.28
140137	MD7390	74-78	NAM	NAM	chert	22.8	56	0.07	6	136.5	234	13.1	1,029	0.11	0.2	150	5	16	0.9	47	0.06	3.42	0.86
119988	MD7169	28-32	NAM	NAM	shale	392.0	333	0.41	50.6	100.7	150	96.5	873	0.46	1.54	157	26	161	4.8	98	3.00	8.52	4.35
114213	MD5871	88-92	NAM	NAM	shale	15.0	87	0.09	8.8	59.9	111	20.7	2,697	<0.05	0.32	246	11	62	1.2	73	1.48	5.66	2.01
109481	MD5866	102-106	NAM	NAM	shale	7.0	114	0.12	15.8	61.3	86	18.7	4,044	<0.05	0.42	560	14	76	1.2	88	0.09	5.83	1.67
143363	MD8226	84-88	NAM	DNAM	shale	8.7	524	0.05	22.9	211.8	179	24.2	2,497	<0.05	0.71	192	6	5	2.1	157	0.11	11.61	3.51
143201	MD8222	96-100	NAM	DNAM	dolomite	6.9	35	0.19	5.5	40.3	64	12.4	3,290	<0.05	0.18	215	11	16	0.9	45	0.07	3.49	0.91
161028	MD7914	4-8	NAM	HNAM	goethite	7.0	23	0.11	10	11.6	71	5.1	10,612	<0.05	0.1	547	13	79	0.3	102	0.07	1.76	9.41
119975	MD7169	2-6	NAM	NAM	goethite	64.7	110	0.11	22	72.8	158	16.6	594	0.12	0.46	286	34	299	2.1	141	0.78	6.86	1.98
119991	MD7169	34-38	JER	JER	shale	128.0	25	0.05	55.4	53.9	115	21.3	254	0.38	0.65	148	16	130	5.9	90	2.96	8.32	2.84
151578	MD7616	62-66	JER	JER	shale	165.2	82	0.1	36.9	84.8	151	30.3	331	0.35	0.79	338	12	109	4.3	121	2.30	9.11	3.12
138063	MD7338	60-64	MAC	SOMAC	hematite	25.3	358	0.79	9.1	81.0	60	33.6	6,349	<0.05	0.26	173	9	151	0.7	52	0.51	3.59	2.11
159202	MD7855	38-42	NAM	TNAM	goethite	11.8	288	0.81	8.4	65.6	31	5.2	960	<0.05	0.1	400	5	21	0.5	21	0.09	1.81	1.27

Notes: ACA = Average Crustal Abundance
Bowen 1979. Environmental Geochemisrty of the elements. New York: Academic Press
Reimann, C. and Caritat, P., 1998. Chemical elements in the environment. 1. Berlin: Springer-Verlag.

enriched over GAI 3

enriched over GAI 6

TABLE B2b - Low level Hg and Se Results

SampleID	BHID	Interval (m)	Strat	Strand	Lithology	Hg ppb 0.05	Se ppm 0.05
ACA						ITK	ITK
146309	MD8304	2-6	CzD3	ALU	clay	0.048	1.22
136362	MD7291	0-4	CzD3	ALU	clay	0.04	0.68
158056	MD7814	2-6	CzD3	ALU	clay	0.016	0.5
159723	MD7877	0-4	CzD3	ALU	clay	0.038	1.04
159185	MD7855	4-8	CzD3	ALU	clay	0.033	1.08
148774	MD8434	4-8	CzD3	ALU	clay	0.032	1.12
159195	MD7855	24-28	CzD3	ALU	clay	0.075	0.56
153018	MD7687	0-4	CzD3	ALU	clay	0.027	1.07
161138	MD7918	2-6	CzD3	ALU	clay	0.02	0.84
161151	MD7918	28-32	CzD3	ALU	clay	0.009	0.71
125317	MD7191	6-8	CzD3	ALU	clay	0.034	0.9
169688	MD8902	22-26	CzD3	ALU	clay	0.071	1.13
143324	MD8226	6-10	CzD3	ALU	clay	0.03	1.8
143161	MD8222	16-20	CzD3	ALU	clay	0.089	1.94
158063	MD7814	16-20	CzD3	ALU	chert	0.013	1.03
151274	MD7601	2-6	CzD3	ALU	chert	0.019	1.19
141544	MD7433	0-4	CzD3	CC	calcrete	0.014	0.32
147748	MD8374	0-4	CzD3	SCR	hematite/goethite	0.045	1.33
122694	MD5984	58-62	CzD2	DCL	silcrete	0.063	0.19
114667	MD5879	54-58	CzD2	CC	calcrete	0.027	0.14
158501	MD7826	52-56	CzD2	DCL	shale	0.056	0.07
141551	MD7433	14-18	CzD2	CIDW	goethite	0.069	1.49
140111	MD7390	22-26	CzD2	CIDW	hematite	0.167	0.63
154912	MD8454	44-48	CzD2	CIDW	manganese	0.563	0.75
159596	MD7871	28-32	NEW	NEW	chert	0.015	0.09
128354	MD7457	42-46	MAC	MAC	chert	0.019	0.16
130281	MD7269	20-24	MAC	MAC	chert	0.004	0.43
114686	MD5879	92-96	MAC	MAC	chert	0.021	0.33
147965	MD8389	8-12	MAC	MAC	chert	0.01	0.33
147597	MD8365	16-20	MAC	MAC	chert	0.034	0.33
149702	MD7530	12-16	MAC	MAC	chert	0.003	0.16
117105	MD7090	22-26	MAC	MAC	chert	0.019	0.15
127348	MD7237	86-90	MAC	MAC	shale/dolomite	0.02	0.22
125353	MD7191	78-82	MAC	MAC	shale/chert	0.059	0.27
161162	MD7918	50-54	NAM	NAM	chert	0.048	0.1
117123	MD7090	58-62	NAM	NAM	chert	0.043	0.31
169708	MD8902	62-66	NAM	NAM	chert	0.185	1.35
140137	MD7390	74-78	NAM	NAM	chert	0.044	0.4
153091	MD7689	20-24	NAM	NAM	chert	0.006	0.03
152409	MD7664	12-16	NAM	NAM	shale	0.006	0.7
145933	MD8454	86-90	NAM	NAM	shale	0.085	0.69
150088	MD7554	0-4	NAM	NAM	shale	0.232	1.26
150090	MD7554	4-8	NAM	NAM	shale	0.155	1.64
147794	MD7545	26-30	NAM	NAM	shale	0.019	1.4
119988	MD7169	28-32	NAM	NAM	shale	1.154	2.33
154192	MD7773	8-12	NAM	NAM	shale	0.01	0.35
153368	MD7711	22-26	NAM	NAM	shale	0.014	0.13
151570	MD7616	46-50	NAM	NAM	shale	0.057	2.83
143199	MD8222	92-96	NAM	DNAM	shale	0.07	0.73
143363	MD8226	84-88	NAM	DNAM	shale	0.135	1.2
114213	MD5871	88-92	NAM	NAM	shale	0.104	0.54
154937	MD8454	94-98	NAM	NAM	shale	0.157	0.68
109481	MD5866	102-106	NAM	NAM	shale	0.059	0.54
117023	MD7087	54-58	NAM	DNAM	shale	0.163	0.62
151575	MD7616	56-60	NAM	NAM	shale	1.231	4.25
143201	MD8222	96-100	NAM	DNAM	dolomite	0.061	0.53
122710	MD5984	90-94	NAM	NAM	magnetite	0.017	0.13
119975	MD7169	2-6	NAM	NAM	goethite	0.022	0.75
161028	MD7914	4-8	NAM	HNAM	goethite	0.029	0.35
150095	MD7554	14-18	JER	JER	shale	0.393	2.38
119991	MD7169	34-38	JER	JER	shale	1.655	4.31
151578	MD7616	62-66	JER	JER	shale	1.193	2.37
150700	MD7578	36-40	NAM	HNAM	hematite	0.008	0.68
138063	MD7338	60-64	MAC	SOMAC	hematite	0.132	0.97
161561	MD7935	20-24	MAC/NAM	HMAM/MNAM	goethite	0.043	0.84
158511	MD7826	72-76	NAM	ONAM	shale	0.072	0.15
151558	MD7616	22-26	NAM	TNAM	goethite	0.034	0.24
159202	MD7855	38-42	NAM	TNAM	goethite	0.143	0.37

Notes:

ACA = Average Crustal Abundance

Bowen 1979. Environmental Geochemistry of the elements. New York: Academic Press

Reimann, C. and Caritat, P., 1998. Chemical elements in the environment. 1. Berlin: Springer-Verlag.

 enriched over GAI 3

 enriched over GAI 6

Table B3 - Water extraction results aganst groundwater baseline

						pH*	EC*	TDS (calc)#	Total Alkalinity*	OH*	HCO3*	CO3	Ag	Al	As	B	Ba	Bi	Ca	Cd	Cl*	Co	Cr	Cu
						-	mS/cm	mg/L	mgCaCO3/L	mgCaCO3/L	mgCaCO3/L	mgCaCO3/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
LOR									2	1		1	0.00005	0.01	0.00005	0.01	0.00005	0.00001	0.1	0.00002	2	0.0001	0.01	0.01
Groundwater baseline 80th percentile						7.1-7.9	8	5,200	400	NA	470	NA	0.002 ^{1,2}	0.05	0.0025	1.4	0.033	NA ³	160	0.00002 ^{1,2}	2200	0.001	0.006	0.001 ^{1,2}
Sample ID	BHID	Interval (m)	Strat	Strand	Lithology																			
146309	MD8304	2-6	CzD3	ALU	clay	6.4	0.14	94	21	<1	21	<1	<0.00005	<0.01	0.00166	0.05	0.03997	<0.00001	5.12	<0.00002	5	0.0023	<0.010	<0.010
143161	MD8222	16-20	CzD3	ALU	clay	7.7	0.56	375	125	<1	125	<1	<0.00005	<0.01	0.00343	0.09	0.04545	<0.00001	16.41	0.00004	90	0.0097	<0.010	<0.010
153018	MD7687	0-4	CzD3	ALU	clay	7.1	0.12	80	26	<1	26	<1	<0.00005	0.15	0.00128	0.07	0.06176	<0.00001	6.44	<0.00002	<2	0.0008	<0.010	<0.010
161151	MD7918	28-32	CzD3	ALU	clay	7.3	0.13	87	29	<1	29	<1	<0.00005	1.05	0.00575	0.11	0.01207	<0.00001	3.53	<0.00002	13	0.0002	<0.010	<0.010
158056	MD7814	2-6	CzD3	ALU	clay	7.6	3.30	2,211	44	<1	44	<1	<0.00005	0.13	0.00504	0.64	0.05586	<0.00001	539.47	<0.00002	26	0.0007	<0.010	<0.010
125317	MD7191	6-8	CzD3	ALU	clay	7.3	0.14	94	21	<1	21	<1	<0.00005	0.02	0.00176	0.05	0.0497	<0.00001	6.74	<0.00002	<2	0.0004	<0.010	<0.010
169688	MD8902	22-26	CzD3	ALU	clay	7.3	0.35	235	35	<1	35	<1	<0.00005	<0.01	0.00304	0.10	0.05481	<0.00001	4.82	0.00003	80	0.0039	<0.010	<0.010
159723	MD7877	0-4	CzD3	ALU	clay	6.6	0.18	121	18	<1	18	<1	<0.00005	<0.01	0.00182	0.06	0.0479	<0.00001	11.98	<0.00002	8	0.0035	<0.010	<0.010
148774	MD8434	4-8	CzD3	ALU	clay	7.9	0.14	94	48	<1	48	<1	<0.00005	0.26	0.00455	0.09	0.07007	<0.00001	4.45	<0.00002	<2	0.0002	<0.010	<0.010
159195	MD7855	24-28	CzD3	ALU	clay	7.3	0.15	101	40	<1	40	<1	<0.00005	<0.01	0.00071	0.11	0.01315	<0.00001	6.08	<0.00002	8	<0.0001	<0.010	<0.010
141544	MD7433	0-4	CzD3	CC	calcrete	9.4	1.92	1,286	110	<1	110	106	<0.00005	<0.01	0.04508	2.92	0.01517	<0.00001	2.53	<0.00002	230	0.0003	<0.010	<0.010
140111	MD7390	22-26	CzD2	CIDW	hematite	7.5	0.11	74	31	<1	31	<1	<0.00005	0.07	0.00043	0.08	0.00058	<0.00001	1.61	<0.00002	5	<0.0001	<0.010	<0.010
161162	MD7918	50-54	NAM	NAM	chert	7.2	0.11	74	37	<1	37	<1	<0.00005	<0.01	0.00005	0.02	0.05068	<0.00001	10.8	0.00002	<2	0.001	<0.010	<0.010
140137	MD7390	74-78	NAM	NAM	chert	7.7	1.69	1,132	108	<1	108	<1	<0.00005	0.03	0.00044	0.05	0.00641	<0.00001	120.78	<0.00002	93	0.0006	<0.010	<0.010
119988	MD7169	28-32	NAM	NAM	shale	7.1	0.32	214	48	<1	48	<1	<0.00005	<0.01	0.00753	0.05	0.03173	<0.00001	15.21	0.00006	17	0.0026	<0.010	<0.010
114213	MD5871	88-92	NAM	NAM	shale	7.0	0.58	389	98	<1	98	<1	<0.00005	<0.01	0.00079	0.07	0.01035	<0.00001	37.14	<0.00002	22	0.0018	<0.010	<0.010
109481	MD5866	102-106	NAM	NAM	shale	6.0	0.96	643	34	<1	34	<1	<0.00005	0.01	0.0001	0.02	0.01765	<0.00001	99.73	0.00005	4	0.0063	<0.010	<0.010
143363	MD8226	84-88	NAM	DNAM	shale	3.3	5.51	3,692	<2	<1	<2	<1	0.00083	176.6	0.00432	0.11	0.00131	0.00012	174	0.00959	4	4.1938	0.182	0.054
143201	MD8222	96-100	NAM	DNAM	dolomite	7.9	4.01	2,687	52	<1	52	<1	<0.00005	0.08	0.00013	0.06	0.0010	<0.00001	356.72	<0.00002	430	0.0002	<0.010	<0.010
161028	MD7914	4-8	NAM	HNAM	goethite	7.6	0.11	74	35	<1	35	<1	<0.00005	<0.01	0.00006	0.04	0.00865	<0.00001	9.04	<0.00002	3	<0.0001	<0.010	<0.010
119975	MD7169	2-6	NAM	NAM	goethite	6.9	0.13	87	46	<1	46	<1	<0.00005	1.27	0.00253	0.06	0.09307	<0.00001	5.4	<0.00002	3	0.0069	<0.010	<0.010
119991	MD7169	34-38	JER	JER	shale	2.2	11.21	7,511	<2	<1	<2	<1	0.00041	914.39	2.02066	0.03	0.00336	0.00014	55	0.01015	<2	5.0868	2.350	31.195
151578	MD7616	62-66	JER	JER	shale	2.3	8.66	5,802	<2	<1	<2	<1	0.00038	629.41	1.32806	0.04	0.00740	0.00010	160	0.04002	<2	10.2792	1.318	58.299
138063	MD7338	60-64	MAC	SOMAC	hematite	7.0	0.11	74	36	<1	36	<1	<0.00005	<0.01	0.00019	0.05	0.01277	<0.00001	7.13	<0.00002	4	0.0006	<0.010	<0.010
159202	MD7855	38-42	NAM	TNAM	goethite	6.8	0.06	40	16	<1	16	<1	<0.00005	<0.01	0.00021	0.04	0.00722	<0.00001	2.63	<0.00002	<2	0.0003	<0.010	<0.010

Water extract testwork performed with 1:2 (w/v) ratio

*Results reported from the raw water extract. All other results reported from the acidified water extract

#TDS calculated as per ARMCANZ and ANZECC: TDS=EC(µg/L)*0.67.

¹ provisional - baseline values requiring more analyses for confirmation

² lower detection limits required

³ Should be added to analytical suite

NA Not analysed

Table B3 - Water extraction results aganst groundwater baseline

						F*	Fe	Hg	K	Mg	Mn	Mo	Na	Ni	P	Pb	SO4	Sb	Se	Si	Sn	Sr	Th	Tl	U	V	Zn
						mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
LOR						0.1	0.01	0.0001	0.1	0.01	0.01	0.00005	0.1	0.01	0.01	0.0002	0.1	0.00005	0.0005	0.05	0.0001	0.00002	0.00001				
Groundwater baseline 80th percentile						1.4	0.013	NA ³	140	190	0.079	0.002	1300	0.0025	0.09	0.001	1100	-	0.008	66	0.001	1.5	-	0.001 ^{1,2}	-	0.007	0.013
Sample ID	BHID	Interval (m)	Strat	Strand	Lithology																						

146309	MD8304	2-6	CzD3	ALU	clay	0.2	<0.01	<0.0001	8.3	2.5	0.13	0.00009	11.2	<0.010	<0.010	<0.0002	31	0.0002	0.0005	17.01	0.0003	0.03509	<0.00001	0.00004	0.000012	<0.010	<0.010
143161	MD8222	16-20	CzD3	ALU	clay	1.9	<0.01	<0.0001	14.8	6.5	<0.01	0.01649	87.7	0.024	0.06	<0.0002	62	0.0016	0.0013	12.93	0.0001	0.06464	<0.00001	0.00002	0.000508	<0.010	<0.010
153018	MD7687	0-4	CzD3	ALU	clay	0.2	0.1	<0.0001	10.1	2.2	0.05	0.00078	5.0	<0.010	<0.010	<0.0002	22	0.00038	<0.0005	22.3	<0.0001	0.04019	<0.00001	0.00003	0.00003	<0.010	<0.010
161151	MD7918	28-32	CzD3	ALU	clay	0.3	0.3	<0.0001	5.3	2.4	<0.01	0.00074	16.2	<0.010	<0.010	0.0007	13	0.00027	<0.0005	20.98	<0.0001	0.02270	0.00023	0.00002	0.000656	<0.010	<0.010
158056	MD7814	2-6	CzD3	ALU	clay	0.9	<0.01	<0.0001	25.8	113.5	0.02	0.01028	189.5	<0.010	0.03	0.0004	2,044	0.00136	0.0036	21.17	<0.0001	2.38736	0.00002	0.00006	0.000959	<0.010	<0.010
125317	MD7191	6-8	CzD3	ALU	clay	0.4	0.1	<0.0001	6.2	2.2	0.03	0.00211	10.7	<0.010	<0.010	<0.0002	36	0.00189	<0.0005	18.4	0.0001	0.04469	<0.00001	0.00002	0.000022	<0.010	<0.010
169688	MD8902	22-26	CzD3	ALU	clay	0.8	<0.01	<0.0001	8.2	4.0	<0.01	0.00068	59.2	<0.010	<0.010	<0.0002	58	0.00028	0.0006	14.1	<0.0001	0.03152	<0.00001	<0.00001	0.000018	<0.010	<0.010
159723	MD7877	0-4	CzD3	ALU	clay	0.2	<0.01	<0.0001	7.6	4.84	0.20	0.00010	8.5	<0.010	<0.010	<0.0002	45.5	0.00043	0.0008	17.89	<0.0001	0.06352	<0.00001	0.00003	0.000033	<0.010	<0.010
148774	MD8434	4-8	CzD3	ALU	clay	0.9	0.28	<0.0001	9.4	2.15	<0.01	0.00431	15.7	<0.010	<0.010	0.0006	14.7	0.00122	<0.0005	21.97	<0.0001	0.02637	0.00002	0.00002	0.000087	<0.010	<0.010
159195	MD7855	24-28	CzD3	ALU	clay	0.8	<0.01	<0.0001	7.1	3.76	<0.01	0.00050	14.4	<0.010	<0.010	<0.0002	16.2	<0.00005	<0.0005	16.18	0.0001	0.03431	<0.00001	0.00003	0.000025	<0.010	<0.010
141544	MD7433	0-4	CzD3	CC	calcrete	6.6	<0.01	<0.0001	25.6	0.4	<0.01	0.03354	379.6	<0.010	0.042	<0.0002	362	0.00061	0.0346	19.79	<0.0001	0.04071	<0.00001	0.00003	0.002987	0.144	<0.010
140111	MD7390	22-26	CzD2	CIDW	hematite	1.0	0.3	<0.0001	4.5	1.2	0.03	0.00010	15.6	<0.010	<0.010	<0.0002	13	0.00013	0.0005	9.49	<0.0001	0.00402	0.00009	<0.00001	0.000064	<0.010	<0.010
161162	MD7918	50-54	NAM	NAM	chert	0.2	<0.01	<0.0001	3.0	3.57	0.10	0.00022	4.8	<0.010	<0.010	<0.0002	4.2	0.00009	<0.0005	6.17	<0.0001	0.04746	<0.00001	0.00009	0.000012	<0.010	<0.010
140137	MD7390	74-78	NAM	NAM	chert	0.9	0.03	<0.0001	13.6	91.4	0.07	0.00471	119.7	<0.010	<0.010	0.0003	780	0.00013	0.0215	2.35	<0.0001	0.17308	<0.00001	0.00005	0.000196	<0.010	<0.010
119988	MD7169	28-32	NAM	NAM	shale	0.4	<0.01	<0.0001	15.4	12.70	0.07	0.00093	13.9	<0.010	<0.010	<0.0002	23.7	0.00013	0.001	12.48	<0.0001	0.10585	<0.00001	0.00021	0.000023	<0.010	<0.010
114213	MD5871	88-92	NAM	NAM	shale	0.5	<0.01	<0.0001	11.4	31.1	1.20	0.00043	35.2	<0.010	0.022	0.0024	159	0.00011	0.0043	4.14	<0.0001	0.11075	<0.00001	0.00009	0.000027	<0.010	<0.010
109481	MD5866	102-106	NAM	NAM	shale	<0.1	<0.01	<0.0001	10.3	67.7	5.42	<0.00005	4.0	0.026	0.017	0.0008	514	<0.00005	0.0017	3.93	<0.0001	0.17173	<0.00001	0.00013	0.000007	<0.010	0.02
143363	MD8226	84-88	NAM	DNAM	shale	<0.1	142	<0.0001	<0.1	609.8	471.7	0.00049	7.9	31.624	0.05	0.0569	5,015	0.00043	0.0344	8.5	<0.0001	0.05617	0.00265	0.00022	0.008137	<0.010	85.826
143201	MD8222	96-100	NAM	DNAM	dolomite	0.6	<0.01	<0.0001	45.0	120.7	0.14	0.00481	459.3	<0.010	<0.010	<0.0002	1,742	0.00006	0.0316	1.18	<0.0001	0.49215	<0.00001	0.00012	0.000199	<0.010	<0.010
161028	MD7914	4-8	NAM	HNAM	goethite	0.3	<0.01	<0.0001	4.2	2.0	<0.01	0.00026	6.9	<0.010	<0.010	<0.0002	10.2	0.00009	0.0006	8.5	<0.0001	0.05937	<0.00001	<0.00001	0.000035	<0.010	<0.010
119975	MD7169	2-6	NAM	NAM	goethite	0.7	1.7	<0.0001	7.1	4.5	0.07	0.00031	9.5	<0.010	<0.010	0.0008	12	0.00011	<0.0005	25.89	<0.0001	0.05472	0.00012	0.00002	0.000141	<0.010	<0.010
119991	MD7169	34-38	JER	JER	shale	<0.1	3,990	<0.0001	0.2	100.15	107.6	0.00507	1.7	7.785	1.245	0.0174	15,043	0.00083	0.1337	7.85	<0.0001	0.10766	0.08564	0.00088	0.092727	1.998	2.385
151578	MD7616	62-66	JER	JER	shale	<0.1	2,785	<0.0001	0.2	174.29	95.8	0.00203	0.5	17.228	3.371	0.0261	11,170	0.00064	0.0127	9.88	<0.0001	0.04052	0.17086	0.00032	0.125232	0.284	24.265
138063	MD7338	60-64	MAC	SOMAC	hematite	0.2	<0.01	<0.0001	5.9	3.07	0.05	0.00016	6.4	<0.010	0.011	<0.0002	7.8	<0.00005	0.0006	7.6	<0.0001	0.03272	<0.00001	0.00002	0.000009	<0.010	<0.010
159202	MD7855	38-42	NAM	TNAM	goethite	0.2	<0.01	<0.0001	4.3	1.36	0.04	<0.00005	3.3	<0.010	<0.010	<0.0002	5.1	<0.00005	0.0005	7.36	<0.0001	0.01299	<0.00001	0.00004	0.00001	<0.010	<0.010

Water extract testwork performed with 1:2 (w/v) ratio

*Results reported from the raw water extract. All other results reported from the acidified water extract

#TDS calculated as per ARMCANZ and ANZECC: TDS=EC(µg/L)*0.67.

¹ provisional - baseline values requiring more analyses for confirmation

² lower detection limits required

³ Should be added to analytical suite

NA Not analysed

TABLE B4a - MINERALOGY RESULTS ALS

SampleID BHID Interval (m) Stratigraphy Lithology	146309 MD8304 2-6 CzD3 Clay	143161 MD8222 16-20 CzD3 clay	148774 MD8434 4-8 CzD3 clay	158056 MD7814 2-6 CzD3 clay	153018 MD7687 0-4 CzD3 clay	161151 MD7918 28-32 CzD3 clay	141544 MD7433 0-4 CzD3 calcrete
Dominant (>50%)	quartz	quartz	quartz	quartz	quartz	quartz	calcite
Major (50-20%)						kaolinite	
Minor (20-10%)	hematite	kaolinite		kaolinite		hematite goethite	
Accessory (10-1%)	goethite kaolinite muscovite K-feldspar ± rutile anatase alunite	hematite goethite muscovite serpentine K-feldspar ± rutile anatase calcite	hematite goethite kaolinite serpentine annite-biotite- phlogopite muscovite K-feldspar± rutile anatase alunite	hematite goethite annite-biotite- phlogopite muscovite anatase plagioclase K-feldspar ± rutile	hematite goethite annite-biotite- phlogopite kaolinite muscovite anatase plagioclase alunite K-feldspar ± rutile	muscovite K-feldspar ± rutile anatase annite-biotite- phlogopite K-feldspar ± rutile muscovite dolomite-ankerite quartz	
Trace (1%)	serpentine annite-biotite- phlogopite	annite-biotite- phlogopite		gypsum		annite-biotite- phlogopite plagioclase	

SampleID BHID Interval (m) Statigraphy Lithology	149702 MD7530 72-76 MAC chert	117105 MD7090 22-26 MAC chert	147597 MD8365 46-50 MAC chert	161162 MD7918 50-54 NAM chert
Dominant (>50%)	quartz	quartz	quartz	quartz
Major (50-20%)				hematite
Minor (20-10%)	hematite goethite	hematite goethite		goethite
Accessory (10-1%)	kaolinite	kaolinite	hematite goethite kaolinite	magnetite kaolinite
Trace (<1%)			muscovite	

SampleID BHID Interval (m) Statigraphy Lithology	119988 MD7169 28-32 NAM shale	152409 MD7664 12-16 NAM shale	151578 MD7616 62-66 JER shale	119991 MD7169 34-38 JER shale
Dominant (>50%)	quartz	quartz	quartz	quartz
Major (50-20%)		hematite		
Minor (20-10%)				
Accessory (10-1%)	hematite serpentine annite-biotite- phlogopite anatase alunite muscovite kaolinite	kaolinite serpentine	hematite goethite illite-smectite kaolinite annite-biotite- phlogopite muscovite anatase jarosite pyrite*	illite-smectite kaolinite annite-biotite- phlogopite muscovite anatase alunite jarosite pyrite*
Trace (<1%)	K-feldspar± rutile		serpentine gypsum	clay mineral serpentine

SampleID BHID Interval (m) Statigraphy Lithology	147748 MD8374 0-4 CzD3 hematite/goethite	140111 MD7390 22-26 CzD2 hematite	141551 MD7433 14-18 CzD2 goethite	150700 MD7578 36-40 NAM hematite
Dominant (>50%)	goethite			hematite
Major (50-20%)		hematite goethite	hematite goethite	goethite
Minor (20-10%)	hematite kaolinite	kaolinite	kaolinite	kaolinite
Accessory (10-1%)	serpentine quartz anatase gibbsite calcite	serpentine K-feldspar ± rutile quartz anatase pyrolusite	serpentine K-feldspar ± rutile quartz anatase	serpentine quartz anatase
Trace (<1%)	K-feldspar± rutile			

Notes:
* Occurrence of pyrite as an accessory component inferred from chromium-reducible sulphur values.
Pyrite was not detected via the powder X-ray diffraction technique whose diagnostic diffraction peaks may have been
ounts of jarosite which were identified in these samples.

TABLE B4b - MINERALOGY RESULTS Microanalysis

SampleID BHID Interval (m) Stratigraphy Lithology	MLE001 (146309) MD8304 2-6 CzD3 Clay	MLE003 (158056) MD7814 2-6 CzD3 clay	MLE004 (159723) MD7877 0-4 CzD3 clay	MLE005 (159185) MD7855 4-8 CzD3 clay	MLE006 (148774) MD8434 4-8 CzD3 clay	MLE008 (153018) MD7687 0-4 CzD3 clay	MLE009 (161138) MD7918 2-6 CzD3 clay
Dominant (>50%)		quartz	quartz	quartz	quartz	quartz	quartz
Major (50-20%)	quartz	kaolinite					
Minor (20-10%)	hematite goethite kaolinite		kaolinite	kaolinite hematite	kaolinite	kaolinite	kaolinite
Accessory (10-1%)	muscovite alunite magnetite microcline	hematite goethite muscovite gypsum magnetite microcline calcite	hematite goethite muscovite microcline alunite magnetite	goethite muscovite alunite microcline magnetite	hematite goethite muscovite alunite microcline magnetite	hematite goethite muscovite microcline alunite magnetite	hematite goethite muscovite microcline alunite magnetite
Trace (<1%)							

SampleID BHID Interval (m) Statigraphy Lithology	MLE011 (125317) MD7191 6-8 CzD3 clay	MLE013 (143324) MD8226 6-10 CzD3 clay	MLE014 (143161) MD8222 16-20 CzD3 clay	MLE019 (151274) MD7601 2-6 CzD3 chert	MLE038 (150088) MD7554 0-4 NAM shale	MLE041 (119988) MD7169 28-32 NAM shale
Dominant (>50%)	quartz			quartz		quartz
Major (50-20%)		quartz kaolinite	quartz kaolinite	kaolinite	kaolinite hematite	kaolinite
Minor (20-10%)	kaolinite		goethite hematite		quartz goethite	
Accessory (10-1%)	goethite muscovite hematite microcline alunite magnetite	hematite microcline goethite alunite magnetite muscovite	muscovite microcline magnetite alunite	hematite goethite microcline muscovite alunite magnetite	gypsum muscovite magnetite	muscovite montmorillionite alunite goethite hematite
Trace (<1%)						

Appendix C

Laboratory reports

MINERALS TEST REPORT

CLIENT

NICOLE DE KEVER
MINE EARTH PTY LTD
 PO Box 404
 FREMANTLE, W.A. 6959
 AUSTRALIA

JOB INFORMATION

JOB CODE : 1960.0/2128597
 NO. SAMPLES : 69
 NO. ELEMENTS : 6
 CLIENT ORDER NO. : MLE-2104 (Job 1 of 1)
 SAMPLE SUBMISSION NO. : MLE-2104
 PROJECT : MULGA EAST WASTE CHARACTERISATIO
 SAMPLE TYPE : Various
 DATE RECEIVED : 24/12/2021
 DATE TESTED : 10/02/2022 - 28/02/2022
 DATE REPORTED : 01/03/2022
 DATE PRINTED : 01/03/2022

REPORT NOTES

1. Please note:
 1. The following EXTRA sample was received with this consignment:
143167

TESTED BY

Intertek
 544 Bickley Road, Maddington 6109, Western Australia
 PO Box 144, Gosnells 6990, Western Australia
 Tel: +61 8 9263 0100
 Email: min.aus.per@intertek.com

APPROVED SIGNATURE FOR



Craig RITCHIE
 Operations Manager - Perth

Accredited for compliance with ISO/IEC 17025 - Testing.
 Company Accreditation Number 3244



This report relates specifically to the sample(s) tested that were drawn and/or provided by the client or their nominated third party to Intertek. The reported result(s) provide no warranty or verification on the sample(s) representing any specific goods and/or shipment. This report was prepared solely for the use of the client named in this report. Intertek accepts no responsibility for any loss, damage or liability suffered by a third party as a result of any reliance upon or use of this report. The results provided are not intended for commercial settlement purposes.

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SIGNIFICANT FIGURES

It is common practice to report data derived from analytical instrumentation to a maximum of two or three significant figures. Some data reported herein may show more figures than this. The reporting of more than two or three figures in no way implies that figures beyond the least significant digit have significance.

For more information on the uncertainty on individual reported values, please contact the laboratory.

MEASUREMENT OF UNCERTAINTY

Measurement of uncertainty estimates are available for most tests upon request.

SAMPLE STORAGE

All solid samples (assay pulps, bulk pulps and residues) will be stored for 60 days without charge. Following this samples will be stored at a daily rate until clients written advice regarding return, collection or disposal is received. If storage information is not supplied on the submission, or arranged with the laboratory in writing the default will be to store the samples with the applicable charges. Storage is charged at \$4.00 per m3 per day, expenses related to the return or disposal of samples will be charged at cost. Current disposal cost is charged at \$150.00 per m3.

Samples received as liquids, waters or solutions will be held for 60 days free of charge then disposed of, unless written advice for return or collection is received.

LEGEND	X	= Less than Detection Limit	NA	= Not Analysed
	SNR	= Sample Not Received	UA	= Unable to Assay
	LNR	= Lab Not Received	>	= Value beyond Limit of Method
	DTF	= Result still to come	+	= Extra Sample Received Not Listed
	I/S	= Insufficient Sample for Analysis		



ELEMENTS	C	C-Acinsol	C-CO3	Hg	S	Se
UNITS	%	%	%	ppb	%	ppm
DETECTION LIMIT	0.01	0.01	0.01	1	0.01	0.01
DIGEST		C71/		AR005/		SE1/
ANALYTICAL FINISH	/CSA	CSA	/CALC	MSHg	/CSA	MS
SAMPLE NUMBERS						
0001 109481	3.77	1.90	1.87	59	2.07	0.54
0002 114213	1.54	0.75	0.79	104	0.49	0.54
0003 114667	3.25	0.09	3.16	27	0.02	0.14
0004 114686	2.29	0.33	1.96	21	0.17	0.33
0005 122694	0.35	0.07	0.28	63	X	0.19
0006 122710	0.23	0.11	0.12	17	0.09	0.13
0007 117023	1.16	1.07	0.09	163	0.92	0.62
0008 117105	0.14	0.10	0.04	19	X	0.15
0009 117123	4.23	0.65	3.58	43	0.38	0.31
0010 119975	0.11	0.08	0.03	22	0.06	0.75
0011 119988	1.21	1.21	X	1154	0.54	2.33
0012 119991	4.62	4.44	0.18	1655	7.65	4.31
0013 125317	0.06	0.04	0.02	34	0.14	0.90
0014 125353	3.75	0.42	3.33	59	0.34	0.27
0015 127348	5.36	0.31	5.05	20	0.25	0.22
0016 130281	0.04	0.02	0.02	4	X	0.43
0017 136362	0.38	0.28	0.10	40	0.05	0.68
0018 138063	0.18	0.11	0.07	132	0.04	0.97
0019 140111	0.09	0.05	0.04	167	0.02	0.63
0020 140137	2.46	0.86	1.60	44	0.43	0.40
0021 141544	6.68	0.05	6.63	14	0.07	0.32
0022 141551	0.12	0.07	0.05	69	0.04	1.49
0023 128354	0.07	0.04	0.03	19	0.02	0.16
0024 149702	0.08	0.03	0.05	3	0.02	0.16
0025 147794	0.03	0.02	X	19	0.21	1.40
0026 150088	0.05	0.03	0.02	232	0.83	1.26
0027 150090	0.08	0.02	0.06	155	0.39	1.64
0028 150095	0.72	0.02	0.70	393	0.97	2.38
0029 150700	0.06	0.04	0.02	8	0.15	0.68
0030 151274	0.05	0.03	0.02	19	0.31	1.19
0031 151558	0.13	0.10	0.03	34	0.01	0.24
0032 151570	0.03	0.02	X	57	0.03	2.83
0033 151575	2.48	2.43	0.05	1231	1.00	4.25
0034 151578	4.78	4.75	0.03	1193	4.21	2.37
0035 152409	0.02	0.02	X	6	X	0.70
0036 153018	0.07	0.05	0.02	27	0.26	1.07
0037 153091	0.03	0.02	X	6	0.02	0.03
0038 153368	0.03	0.02	X	14	0.01	0.13
0039 154192	0.14	0.03	0.11	10	0.02	0.35
0040 158056	0.20	0.03	0.17	16	0.24	0.50



ELEMENTS	C	C-Acinsol	C-CO3	Hg	S	Se
UNITS	%	%	%	ppb	%	ppm
DETECTION LIMIT	0.01	0.01	0.01	1	0.01	0.01
DIGEST		C71/		AR005/		SE1/
ANALYTICAL FINISH	/CSA	CSA	/CALC	MSHg	/CSA	MS
SAMPLE NUMBERS						
0041 158063	0.06	0.04	0.02	13	0.02	1.03
0042 158501	0.03	0.02	X	56	X	0.07
0043 158511	0.06	0.04	0.02	72	X	0.15
0044 159185	0.08	0.05	0.03	33	0.39	1.08
0045 159195	0.10	0.06	0.04	75	0.04	0.56
0046 159202	0.15	0.11	0.04	143	0.03	0.37
0047 159596	0.04	0.02	0.02	15	0.02	0.09
0048 159723	0.07	0.06	X	38	0.29	1.04
0049 161028	0.12	0.09	0.03	29	0.03	0.35
0050 161138	0.05	0.03	0.02	20	0.15	0.84
0051 161151	0.04	0.03	X	9	X	0.71
0052 161162	0.06	0.03	0.03	48	X	0.10
0053 161561	0.13	0.09	0.04	43	0.02	0.84
0054 143161	0.19	0.06	0.13	89	0.10	1.94
0055 143167	0.49	0.03	0.46	26	0.04	0.24
0056 143199	7.58	0.41	7.17	70	1.68	0.73
0057 143201	6.43	0.71	5.72	61	1.19	0.53
0058 143324	0.07	0.04	0.03	30	0.50	1.80
0059 143363	4.60	4.31	0.29	135	3.46	1.20
0060 146309	0.11	0.06	0.05	48	0.37	1.22
0061 147597	0.04	X	0.03	34	0.02	0.33
0062 147748	0.28	0.09	0.19	45	0.03	1.33
0063 147965	0.07	0.03	0.04	10	0.02	0.33
0064 148774	0.04	0.03	X	32	0.34	1.12
0065 154912	0.14	0.06	0.08	563	0.02	0.75
0066 145933	0.06	0.04	0.02	85	0.02	0.69
0067 154937	0.92	0.85	0.07	157	0.75	0.68
0068 169688	0.08	0.04	0.04	71	0.05	1.13
0069 169708	0.08	0.02	0.06	185	X	1.35
CHECKS						
0001 136362	0.38	0.27	0.11	37	0.05	0.71
0002 161138	0.05	0.04	X	23	0.15	0.85
STANDARDS						
0001 OREAS 138	4.02				12.91	
0002 OREAS 130	3.55				6.10	
0003 AMISO268	1.14				1.31	
0004 OREAS 97.01						0.64
0005 OREAS 97.01						0.64



ELEMENTS	C	C-Acinsol	C-CO3	Hg	S	Se
UNITS	%	%	%	ppb	%	ppm
DETECTION LIMIT	0.01	0.01	0.01	1	0.01	0.01
DIGEST		C71/		AR005/		SE1/
ANALYTICAL FINISH	/CSA	CSA	/CALC	MSHg	/CSA	MS
STANDARDS						
0006 NBS1577b						0.62
0007 Se 0.1ppm						0.10
0008 Se 1.0 ppm						1.01
0009 OREAS 277		0.12				
0010 OREAS 278		0.17				
0011 OREAS 279		0.22				
0012 HgSTD-7				1523		
0013 OREAS 608				157		
0014 OREAS 609				481		
0015 OREAS 45f	0.31				0.03	
0016 OREAS 45h				22		
0017 OREAS 277				>2000		
0018 OREAS 278				>2000		
0019 OREAS 279				>2000		
0020 HgSTD-8				>2000		
BLANKS						
0001 Control Blank	X	X		X	X	X
0002 Control Blank	X	X		X	X	X
0003 Control Blank	X	X		X	X	X

**METHOD CODE DESCRIPTION**

Method Code Date Tested	Analysing Laboratory NATA Laboratory Accreditation	NATA Scope of Accreditation
/CALC 28/02/22 18:09	Intertek Genalysis Perth 3244 3237	*
No digestion or other pre-treatment undertaken. Results Determined by calculation from other reported data.		
/CSA 28/02/22 18:09	Intertek Genalysis Perth 3244 3237	ENV_W061
Induction Furnace Analysed by Infrared Spectrometry		
AR005/MSHg 10/02/22 11:56	Intertek Genalysis Perth 3244 3237	*
0.5 gram mini Aqua-Regia digest. Analysed by Inductively Coupled Plasma Mass Spectrometry.		
C71/CSA 15/02/22 12:04	Intertek Genalysis Perth 3244 3237	ENV_W063
Digestion by hot acid(s) and Induction Furnace Analysed by Infrared Spectrometry		
SE1/MS 10/02/22 22:34	Intertek Genalysis Perth 3244 3237	MPL_W005, MS_IM_001
Aqua-Regia digest followed by Precipitation and Concentration. Specific for Selenium. Analysed by Inductively Coupled Plasma Mass Spectrometry.		

* Denotes not on Scope of Accreditation



The contents of this report have been prepared in accordance with the terms of NATA accreditation and as such should only be reproduced in full.

The analysis results reported herein have been obtained using the following methods and conditions:

Job: 1960/2128597

Project: MULGA EAST WASTE CHARACTERISATION

SAMPLES:

69 composite samples were received on 24/12/21.

SAMPLE PREPARATION:

67 samples (all samples except 150700 and 158511 pulp samples) were dried at 45°C overnight in a forced-fan oven and crushed to -2mm nominal. Approximately 300g of each of these crushings was then pulverised to -75µm using a steel bowl.

ANALYSES

The pulverised samples were analysed for the following:

- AR005/MSHg samples were analysed for Hg
- SE1/MS samples were analysed for Se
- Total-C, total-S by Carbon and Sulphur analyser (/CSA)
- C-Acinsol (acid insoluble carbon – C71/) by Carbon and Sulphur analyser after removal of carbonates and soluble organic carbon using hot hydrochloric acid.
- C-CO3 Calculation $C-CO3 = Total\ C - C-Acinsol$

DIGESTIONS:

GL_W009 (AR005/), MPL_W005 (SE1/), ENV_W063 (C71).

ANALYTICAL FINISHES:

MS_IM_001 (/MS), ENV_W061 (/CSA).

OBSRVATIONS:

No remarks.

RESULTS:

Results are expressed in units: ppm (SE1/MS), ppb (AR005/MSHg), % (CSA, C71, C-CO3).

The results included the assay of blanks and international reference standards: OREAS 608 (AR005), OREAS 609 (AR005), OREAS 45h (AR005), OREAS 277 (AR005), OREAS 278 (AR005), OREAS 279 (AR005), OREAS 97.01 (SE1), NBS1577b (SE1), OREAS138 (CSA), OREAS45f (CSA), OREAS277 (C71), OREAS278 (C71), OREAS279 (C71).

In-House reference standards: HgSTD-7 (AR005), HgSTD-8 (AR005), Se 0.1ppm (SE1), Se 1.0 ppm (SE1)

Intertek Genalysis signatory

Martin CROSSLEY

A handwritten signature in blue ink, appearing to read 'Martin Crossley', is written over a light blue horizontal line.

Date: 18-Jan-2022

MINERALS TEST REPORT

CLIENT

NICOLE DE KEVER
ROY HILL IRON ORE PTY LTD
PO Box 404
FREMANTLE, W.A. 6959
AUSTRALIA

JOB INFORMATION

JOB CODE : 1995.1/2205152
NO. SAMPLES : 120
NO. ELEMENTS : 52
CLIENT ORDER NO. : MLE-2104 (Job 1 of 1)
SAMPLE SUBMISSION NO. :
PROJECT : MULGA EAST WASTE CHARACTERISI
SAMPLE TYPE : Ex-Pulp
DATE RECEIVED : 08/03/2022
DATE TESTED : 28/04/2022 - 24/05/2022
DATE REPORTED : 27/05/2022
DATE PRINTED : 12/07/2022

REPORT NOTES

1. Amended Report: ANC results have been modified as requested.

TESTED BY

Intertek
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Tel: +61 8 9263 0100
Email: min.aus.per@intertek.com

APPROVED SIGNATURE FOR



Craig RITCHIE
Operations Manager - Perth

Accredited for compliance with ISO/IEC 17025 - Testing.
Company Accreditation Number 3244



This report relates specifically to the sample(s) tested that were drawn and/or provided by the client or their nominated third party to Intertek. The reported result(s) provide no warranty or verification on the sample(s) representing any specific goods and/or shipment. This report was prepared solely for the use of the client named in this report. Intertek accepts no responsibility for any loss, damage or liability suffered by a third party as a result of any reliance upon or use of this report. The results provided are not intended for commercial settlement purposes.

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SIGNIFICANT FIGURES

It is common practice to report data derived from analytical instrumentation to a maximum of two or three significant figures. Some data reported herein may show more figures than this. The reporting of more than two or three figures in no way implies that figures beyond the least significant digit have significance.

For more information on the uncertainty on individual reported values, please contact the laboratory.

MEASUREMENT OF UNCERTAINTY

Measurement of uncertainty estimates are available for most tests upon request.

SAMPLE STORAGE

All solid samples (assay pulps, bulk pulps and residues) will be stored for 60 days without charge. Following this samples will be stored at a daily rate until clients written advice regarding return, collection or disposal is received. If storage information is not supplied on the submission, or arranged with the laboratory in writing the default will be to store the samples with the applicable charges. Storage is charged at \$4.00 per m3 per day, expenses related to the return or disposal of samples will be charged at cost. Current disposal cost is charged at \$150.00 per m3.

Samples received as liquids, waters or solutions will be held for 60 days free of charge then disposed of, unless written advice for return or collection is received.

LEGEND	X	= Less than Detection Limit	NA	= Not Analysed
	SNR	= Sample Not Received	UA	= Unable to Assay
	LNR	= Lab Not Received	>	= Value beyond Limit of Method
	DTF	= Result still to come	+	= Extra Sample Received Not Listed
	I/S	= Insufficient Sample for Analysis		

UNITS	ppm for Solid Samples	= mg/Kg
	ppb for Solid Samples	= µg/Kg
	ppm for Liquid Samples	= mg/L
	ppb for Liquid Samples	= µg/L



ELEMENTS	Acidy	Ag	Ag	Al	Al	ANC
UNITS	mgCaCO3/L	ppm	ug/l	ppm	mg/l	kgH2SO4/t
DETECTION LIMIT	0.2	0.05	0.05	50	0.01	1
DIGEST	18Ws2/	4A/	18Ws2/	4A/	18Ws2/	ANCx/
ANALYTICAL FINISH	VOL	MS	MS	OE	OE	VOL
SAMPLE NUMBERS						
0001 109481		X		5.06%		39
0002 114213		X		3.74%		15
0003 114667						264
0004 114686						30
0005 122694						26
0006 122710						33
0007 117023						-4
0008 117105						3
0009 117123						150
0010 119975		0.12		4.86%		6
0011 119988		0.46		7.46%		6
0012 119991		0.38		6.02%		-35
0013 125317		0.17		5.53%		5
0014 125353						7
0015 127348		X		9469		274
0016 130281						1
0017 136362						5
0018 138063		X		2.48%		7
0019 140111		X		5.01%		5
0020 140137		0.11		2.48%		114
0021 141544		0.07		2.10%		573
0022 141551						8
0023 128354						4
0024 149702						6
0025 147794						2
0026 150088						11
0027 150090						9
0028 150095						59
0029 150700						2
0030 151274						5
0031 151558						4
0032 151570						1
0033 151575						-1
0034 151578		0.35		7.06%		-26
0035 152409						1
0036 153018		0.15		4.95%		4
0037 153091						1
0038 153368						2
0039 154192						12
0040 158056		0.10		6.44%		22



ELEMENTS	As	As	B	B	Ba	Ba
UNITS	ppm	ug/l	ppm	mg/l	ppm	ug/l
DETECTION LIMIT	0.5	0.05	50	0.01	0.1	0.05
DIGEST	4A/	18Ws2/	FP1/	18Ws2/	4A/	18Ws2/
ANALYTICAL FINISH	MS	MS	OE	OE	MS	MS
SAMPLE NUMBERS						
0001 109481	72.1		X		75.6	
0002 114213	54.8		X		61.6	
0003 114667						
0004 114686						
0005 122694						
0006 122710						
0007 117023						
0008 117105						
0009 117123						
0010 119975	33.8		50		298.5	
0011 119988	37.7		56		160.8	
0012 119991	36.3		88		129.5	
0013 125317	35.6		60		289.7	
0014 125353						
0015 127348	7.4		X		7.7	
0016 130281						
0017 136362						
0018 138063	18.4		X		151.0	
0019 140111	30.9		X		108.9	
0020 140137	15.7		X		15.8	
0021 141544	5.8		58		291.7	
0022 141551						
0023 128354						
0024 149702						
0025 147794						
0026 150088						
0027 150090						
0028 150095						
0029 150700						
0030 151274						
0031 151558						
0032 151570						
0033 151575						
0034 151578	47.9		152		109.3	
0035 152409						
0036 153018	40.4		X		257.1	
0037 153091						
0038 153368						
0039 154192						
0040 158056	24.1		70		390.5	



ELEMENTS	Bi	Bi	CO3	Ca	Ca	Cd
UNITS	ppm	ug/l	mgCaCO3/L	ppm	mg/l	ppm
DETECTION LIMIT	0.01	0.01	1	50	0.01	0.02
DIGEST	4A/	18Ws2/	18Ws2/	4A/	18Ws2/	4A/
ANALYTICAL FINISH	MS	MS	VOL	OE	OE	MS
SAMPLE NUMBERS						
0001 109481	0.42			4714		0.12
0002 114213	0.32			1341		0.09
0003 114667						
0004 114686						
0005 122694						
0006 122710						
0007 117023						
0008 117105						
0009 117123						
0010 119975	0.46			1116		0.11
0011 119988	1.54			1016		0.41
0012 119991	0.65			471		0.05
0013 125317	0.60			1099		0.19
0014 125353						
0015 127348	0.10			5.88%		X
0016 130281						
0017 136362						
0018 138063	0.26			724		0.79
0019 140111	0.55			685		0.34
0020 140137	0.20			1.17%		0.07
0021 141544	0.09			19.64%		0.06
0022 141551						
0023 128354						
0024 149702						
0025 147794						
0026 150088						
0027 150090						
0028 150095						
0029 150700						
0030 151274						
0031 151558						
0032 151570						
0033 151575						
0034 151578	0.79			612		0.10
0035 152409						
0036 153018	0.45			1104		0.11
0037 153091						
0038 153368						
0039 154192						
0040 158056	0.39			8475		0.14



ELEMENTS	Cd	Cl	Co	Co	ColourChange	Cr
UNITS	ug/l	mg/l	ppm	ug/l	NONE	ppm
DETECTION LIMIT	0.02	2	0.1	0.1	0	1
DIGEST	18Ws2/	18Ws2/	4A/	18Ws2/	ANCx/	4A/
ANALYTICAL FINISH	MS	COL	MS	MS	QUAL	MS
SAMPLE NUMBERS						
0001 109481			18.7		No	86
0002 114213			20.7		No	111
0003 114667					No	
0004 114686					No	
0005 122694					No	
0006 122710					No	
0007 117023					No	
0008 117105					No	
0009 117123					No	
0010 119975			16.6		No	158
0011 119988			96.5		No	150
0012 119991			21.3		No	115
0013 125317			15.2		No	185
0014 125353					No	
0015 127348			4.6		No	36
0016 130281					No	
0017 136362					No	
0018 138063			33.6		No	60
0019 140111			31.3		No	61
0020 140137			13.1		No	234
0021 141544			5.1		No	42
0022 141551					No	
0023 128354					No	
0024 149702					No	
0025 147794					No	
0026 150088					No	
0027 150090					No	
0028 150095					No	
0029 150700					No	
0030 151274					No	
0031 151558					No	
0032 151570					No	
0033 151575					No	
0034 151578			30.3		No	151
0035 152409					No	
0036 153018			19.5		No	166
0037 153091					No	
0038 153368					No	
0039 154192					No	
0040 158056			21.1		No	142



ELEMENTS	Cr	Cu	Cu	EC	F	F
UNITS	ug/l	ppm	ug/l	mS/cm	ppm	mg/l
DETECTION LIMIT	10	0.5	10	0.01	50	0.1
DIGEST	18Ws2/	4A/	18Ws2/	18Ws2/	FC7/	18Ws2/
ANALYTICAL FINISH	MS	MS	MS	MTR	SIE	SIE
SAMPLE NUMBERS						
0001 109481		7.0		0.96	2808	
0002 114213		15.0		0.58	749	
0003 114667				0.23		
0004 114686				0.55		
0005 122694				0.21		
0006 122710				1.67		
0007 117023				1.70		
0008 117105				0.10		
0009 117123				0.86		
0010 119975		64.7		0.13	652	
0011 119988		392.0		0.32	735	
0012 119991		128.0		11.21	762	
0013 125317		74.7		0.14	643	
0014 125353				0.69		
0015 127348		11.2		0.46	426	
0016 130281				0.14		
0017 136362				0.12		
0018 138063		25.3		0.11	191	
0019 140111		22.5		0.11	192	
0020 140137		22.8		1.69	559	
0021 141544		18.4		1.92	2089	
0022 141551				0.35		
0023 128354				0.20		
0024 149702				0.08		
0025 147794				0.81		
0026 150088				3.69		
0027 150090				6.06		
0028 150095				1.89		
0029 150700				I/S		
0030 151274				0.10		
0031 151558				0.08		
0032 151570				0.20		
0033 151575				1.72		
0034 151578		165.2		8.66	1233	
0035 152409				0.37		
0036 153018		73.8		0.12	507	
0037 153091				0.40		
0038 153368				0.94		
0039 154192				0.28		
0040 158056		68.9		3.30	498	



ELEMENTS	Fe	Fe	Fe-Rp1	Final-pH	Fizz-Rate	HCO3
UNITS	%	mg/l	%	NONE	NONE	mgCaCO3/L
DETECTION LIMIT	0.01	0.01	0.01	0.1	1	2
DIGEST	4A/	18Ws2/	4AH/	ANCx/	ANCx/	18Ws2/
ANALYTICAL FINISH	OE	OE	OE	MTR	QUAL	VOL
SAMPLE NUMBERS						
0001 109481	18.93			2.1	X	
0002 114213	18.56			4.0	X	
0003 114667				1.0	3	
0004 114686				1.5	1	
0005 122694				0.9	1	
0006 122710				1.6	X	
0007 117023				1.8	X	
0008 117105				1.3	1	
0009 117123				1.3	1	
0010 119975	15.82			1.3	2	
0011 119988	3.98			0.9	1	
0012 119991	6.55			0.9	1	
0013 125317	11.40			1.8	1	
0014 125353				3.0	1	
0015 127348	17.16			2.0	3	
0016 130281				1.6	1	
0017 136362				0.9	1	
0018 138063	49.98			1.4	1	
0019 140111	38.54			1.7	X	
0020 140137	15.28			1.1	2	
0021 141544	3.52			1.0	3	
0022 141551				1.3	1	
0023 128354				1.7	1	
0024 149702				1.6	1	
0025 147794				1.7	1	
0026 150088				1.9	1	
0027 150090				1.8	1	
0028 150095				1.0	2	
0029 150700				1.7	1	
0030 151274				1.8	1	
0031 151558				1.3	1	
0032 151570				1.7	1	
0033 151575				0.9	1	
0034 151578	7.16			0.9	1	
0035 152409				1.6	1	
0036 153018	12.97			1.8	1	
0037 153091				1.5	1	
0038 153368				1.6	1	
0039 154192				1.4	1	
0040 158056	11.69			1.5	2	



ELEMENTS	Hg	K	K	Mg	Mg	Mn
UNITS	ug/l	ppm	mg/l	ppm	mg/l	ppm
DETECTION LIMIT	0.1	20	0.1	20	0.01	1
DIGEST	18Ws2/	4A/	18Ws2/	4A/	18Ws2/	4A/
ANALYTICAL FINISH	MS	OE	OE	OE	OE	MS
SAMPLE NUMBERS						
0001 109481		2082		7.54%		4044
0002 114213		1235		2.27%		2697
0003 114667						
0004 114686						
0005 122694						
0006 122710						
0007 117023						
0008 117105						
0009 117123						
0010 119975		1.43%		3777		594
0011 119988		1.50%		3384		873
0012 119991		2.91%		4916		254
0013 125317		1.68%		3467		383
0014 125353						
0015 127348		584		4.00%		2233
0016 130281						
0017 136362						
0018 138063		1346		1069		6349
0019 140111		1186		1045		>5.00%
0020 140137		593		2.23%		1029
0021 141544		4518		1.99%		382
0022 141551						
0023 128354						
0024 149702						
0025 147794						
0026 150088						
0027 150090						
0028 150095						
0029 150700						
0030 151274						
0031 151558						
0032 151570						
0033 151575						
0034 151578		3.53%		7299		331
0035 152409						
0036 153018		1.23%		2903		680
0037 153091						
0038 153368						
0039 154192						
0040 158056		1.28%		5593		924



ELEMENTS	Mn	Mn-Rp1	Mo	Mo	Na	Na
UNITS	ug/l	ppm	ppm	ug/l	ppm	mg/l
DETECTION LIMIT	10	10	0.1	0.05	20	0.1
DIGEST	18Ws2/	4AH/	4A/	18Ws2/	4A/	18Ws2/
ANALYTICAL FINISH	MS	OE	MS	MS	OE	OE
SAMPLE NUMBERS						
0001 109481			1.3		1343	
0002 114213			3.0		171	
0003 114667						
0004 114686						
0005 122694						
0006 122710						
0007 117023						
0008 117105						
0009 117123						
0010 119975			2.4		376	
0011 119988			1.4		224	
0012 119991			1.7		277	
0013 125317			2.1		341	
0014 125353						
0015 127348			1.3		302	
0016 130281						
0017 136362						
0018 138063			1.5		126	
0019 140111		7.22%	1.4		514	
0020 140137			20.7		345	
0021 141544			0.6		2423	
0022 141551						
0023 128354						
0024 149702						
0025 147794						
0026 150088						
0027 150090						
0028 150095						
0029 150700						
0030 151274						
0031 151558						
0032 151570						
0033 151575						
0034 151578			2.2		277	
0035 152409						
0036 153018			2.2		334	
0037 153091						
0038 153368						
0039 154192						
0040 158056			1.6		1197	



ELEMENTS	NAG	NAGpH	NAG(4.5)	Ni	Ni	OH
UNITS	kgH2SO4/t	NONE	kgH2SO4/t	ppm	ug/l	mgCaCO3/L
DETECTION LIMIT	1	0.1	1	0.5	10	1
DIGEST	NAGx/	NAGx/	NAGx/	4A/	18Ws2/	18Ws2/
ANALYTICAL FINISH	VOL	MTR	VOL	MS	MS	VOL
SAMPLE NUMBERS						
0001 109481	29	4.0	1	61.3		
0002 114213	0	6.4	0	59.9		
0003 114667						
0004 114686	0	7.6	0			
0005 122694						
0006 122710						
0007 117023	23	2.5	19			
0008 117105						
0009 117123	0	8.4	0			
0010 119975				72.8		
0011 119988	0	7.1	0	100.7		
0012 119991	156	1.8	129	53.9		
0013 125317	0	7.0	0	68.1		
0014 125353	0	7.5	0			
0015 127348	0	8.5	0	16.1		
0016 130281						
0017 136362						
0018 138063				81.0		
0019 140111				42.1		
0020 140137	0	8.2	0	136.5		
0021 141544				16.4		
0022 141551						
0023 128354						
0024 149702						
0025 147794	0	6.6	0			
0026 150088	0	7.2	0			
0027 150090	0	7.3	0			
0028 150095	0	8.8	0			
0029 150700	0	5.9	0			
0030 151274	0	6.9	0			
0031 151558						
0032 151570						
0033 151575	10	3.4	3			
0034 151578	93	2.0	74	84.8		
0035 152409						
0036 153018	0	6.9	0	75.9		
0037 153091						
0038 153368						
0039 154192						
0040 158056	0	8.7	0	76.2		



ELEMENTS	P	P	Pb	Pb	ABCC	ANCslurry
UNITS	ppm	ug/l	ppm	ug/l	kgH2SO4/t	NONE
DETECTION LIMIT	20	10	0.5	0.2	1	0.1
DIGEST	4A/	18Ws2/	4A/	18Ws2/		ANCx/
ANALYTICAL FINISH	MS	MS	MS	MS	/VOL	MTR
SAMPLE NUMBERS						
0001 109481	560		15.8			1.27
0002 114213	246		8.8		7	1.09
0003 114667						1.00
0004 114686						1.54
0005 122694						0.89
0006 122710						1.65
0007 117023						1.75
0008 117105						1.28
0009 117123						1.25
0010 119975	286		22.0			1.32
0011 119988	157		50.6			0.92
0012 119991	148		55.4			0.86
0013 125317	301		22.4			1.79
0014 125353						0.91
0015 127348	141		3.2			1.99
0016 130281						1.61
0017 136362						0.90
0018 138063	173		9.1			1.38
0019 140111	308		8.8			1.74
0020 140137	150		6.0			1.07
0021 141544	82		5.3		514	0.98
0022 141551						1.31
0023 128354						1.67
0024 149702						1.62
0025 147794						1.66
0026 150088						1.89
0027 150090						1.80
0028 150095					108	1.04
0029 150700						1.72
0030 151274						1.83
0031 151558						1.32
0032 151570						1.74
0033 151575						0.88
0034 151578	338		36.9			0.90
0035 152409						1.61
0036 153018	273		23.8			1.79
0037 153091						1.55
0038 153368						1.56
0039 154192						1.39
0040 158056	250		21.3			1.52



ELEMENTS	pH	pH Drop	S	S	Sb	Sb
UNITS	NONE	NONE	ppm	mg/l	ppm	ug/l
DETECTION LIMIT	0.1	0.1	50	0.1	0.05	0.05
DIGEST	18Ws2/	ANCx/	4A/	18Ws2/	4A/	18Ws2/
ANALYTICAL FINISH	MTR	MTR	OE	OE	MS	MS
SAMPLE NUMBERS						
0001 109481	6.0	2.5	1.92%		1.76	
0002 114213	7.0	2.8	4624		1.54	
0003 114667	8.1	5.0				
0004 114686	7.4	2.5				
0005 122694	8.3	4.8				
0006 122710	7.5	3.9				
0007 117023	2.8	3.0				
0008 117105	6.7	4.0				
0009 117123	7.7	2.5				
0010 119975	6.9	4.1	710		2.35	
0011 119988	7.1	4.9	5168		3.57	
0012 119991	2.2	3.0	7.12%		2.15	
0013 125317	7.3	4.4	1524		2.24	
0014 125353	7.1	2.4				
0015 127348	8.7	2.5	2381		0.82	
0016 130281	7.7	3.9				
0017 136362	6.4	4.7				
0018 138063	7.0	4.8	415		1.70	
0019 140111	7.5	4.8	325		1.78	
0020 140137	7.7	2.7	3813		1.34	
0021 141544	9.4	4.9	718		0.40	
0022 141551	8.1	4.9				
0023 128354	7.8	4.8				
0024 149702	6.7	4.9				
0025 147794	7.2	4.5				
0026 150088	7.5	4.9				
0027 150090	7.5	4.9				
0028 150095	8.1	4.9				
0029 150700	I/S	4.9				
0030 151274	7.2	4.6				
0031 151558	7.3	4.9				
0032 151570	5.3	4.9				
0033 151575	3.5	3.3				
0034 151578	2.3	3.0	3.98%		3.92	
0035 152409	6.6	4.8				
0036 153018	7.1	4.8	2665		2.33	
0037 153091	6.9	3.7				
0038 153368	7.1	4.6				
0039 154192	8.6	4.3				
0040 158056	7.6	4.8	2426		1.83	



ELEMENTS	Se	Si	Si	Sn	Sn	Sr
UNITS	ug/l	%	mg/l	ppm	ug/l	ppm
DETECTION LIMIT	0.5	0.1	0.05	0.1	0.1	0.05
DIGEST	18Ws2/	FP1/	18Ws2/	4A/	18Ws2/	4A/
ANALYTICAL FINISH	MS	OE	OE	MS	MS	MS
SAMPLE NUMBERS						
0001 109481		12.7		1.2		14.03
0002 114213		26.3		1.2		10.57
0003 114667						
0004 114686						
0005 122694						
0006 122710						
0007 117023						
0008 117105						
0009 117123						
0010 119975		28.5		2.1		34.23
0011 119988		33.9		4.8		26.35
0012 119991		25.5		5.9		15.99
0013 125317		31.1		2.7		38.44
0014 125353						
0015 127348		19.2		0.4		10.89
0016 130281						
0017 136362						
0018 138063		5.8		0.7		8.68
0019 140111		4.5		2.0		83.81
0020 140137		26.8		0.9		5.14
0021 141544		13.8		0.8		196.70
0022 141551						
0023 128354						
0024 149702						
0025 147794						
0026 150088						
0027 150090						
0028 150095						
0029 150700						
0030 151274						
0031 151558						
0032 151570						
0033 151575						
0034 151578		25.5		4.3		11.71
0035 152409						
0036 153018		29.8		2.0		42.33
0037 153091						
0038 153368						
0039 154192						
0040 158056		26.1		2.5		56.63



ELEMENTS	Sr	Th	Th	Ti	Tl	Tl
UNITS	ug/l	ppm	ug/l	ppm	ppm	ug/l
DETECTION LIMIT	0.02	0.01	0.01	5	0.02	0.01
DIGEST	18Ws2/	4A/	18Ws2/	4A/	4A/	18Ws2/
ANALYTICAL FINISH	MS	MS	MS	OE	MS	MS
SAMPLE NUMBERS						
0001 109481		5.83		2073	0.09	
0002 114213		5.66		2128	1.48	
0003 114667						
0004 114686						
0005 122694						
0006 122710						
0007 117023						
0008 117105						
0009 117123						
0010 119975		6.86		2909	0.78	
0011 119988		8.52		3796	3.00	
0012 119991		8.32		3306	2.96	
0013 125317		8.38		3313	0.75	
0014 125353						
0015 127348		1.43		557	0.05	
0016 130281						
0017 136362						
0018 138063		3.59		1242	0.51	
0019 140111		11.24		3017	0.30	
0020 140137		3.42		1501	0.06	
0021 141544		2.67		955	0.22	
0022 141551						
0023 128354						
0024 149702						
0025 147794						
0026 150088						
0027 150090						
0028 150095						
0029 150700						
0030 151274						
0031 151558						
0032 151570						
0033 151575						
0034 151578		9.11		4090	2.30	
0035 152409						
0036 153018		6.70		2551	0.86	
0037 153091						
0038 153368						
0039 154192						
0040 158056		8.74		3409	0.86	



ELEMENTS	TotAlk	U	U	V	V	Zn
UNITS	mgCaCO3/L	ppm	ug/l	ppm	ug/l	ppm
DETECTION LIMIT	5	0.01	0.005	1	10	1
DIGEST		4A/	18Ws2/	4A/	18Ws2/	4A/
ANALYTICAL FINISH	/CALC	MS	MS	MS	MS	MS
SAMPLE NUMBERS						
0001 109481		1.67		88		114
0002 114213		2.01		73		87
0003 114667						
0004 114686						
0005 122694						
0006 122710						
0007 117023						
0008 117105						
0009 117123						
0010 119975		1.98		141		110
0011 119988		4.35		98		333
0012 119991		2.84		90		25
0013 125317		1.98		150		93
0014 125353						
0015 127348		0.47		20		14
0016 130281						
0017 136362						
0018 138063		2.11		52		358
0019 140111		3.64		87		39
0020 140137		0.86		47		56
0021 141544		1.52		32		24
0022 141551						
0023 128354						
0024 149702						
0025 147794						
0026 150088						
0027 150090						
0028 150095						
0029 150700						
0030 151274						
0031 151558						
0032 151570						
0033 151575						
0034 151578		3.12		121		82
0035 152409						
0036 153018		1.68		126		85
0037 153091						
0038 153368						
0039 154192						
0040 158056		1.98		126		94



ELEMENTS	Zn
UNITS	ug/l
DETECTION LIMIT	10
DIGEST	18Ws2/
ANALYTICAL FINISH	MS
SAMPLE NUMBERS	

0001 109481

0002 114213

0003 114667

0004 114686

0005 122694

0006 122710

0007 117023

0008 117105

0009 117123

0010 119975

0011 119988

0012 119991

0013 125317

0014 125353

0015 127348

0016 130281

0017 136362

0018 138063

0019 140111

0020 140137

0021 141544

0022 141551

0023 128354

0024 149702

0025 147794

0026 150088

0027 150090

0028 150095

0029 150700

0030 151274

0031 151558

0032 151570

0033 151575

0034 151578

0035 152409

0036 153018

0037 153091

0038 153368

0039 154192

0040 158056



ELEMENTS	Acidy	Ag	Ag	Al	Al	ANC
UNITS	mgCaCO3/L	ppm	ug/l	ppm	mg/l	kgH2SO4/t
DETECTION LIMIT	0.2	0.05	0.05	50	0.01	1
DIGEST	18Ws2/	4A/	18Ws2/	4A/	18Ws2/	ANCx/
ANALYTICAL FINISH	VOL	MS	MS	OE	OE	VOL
SAMPLE NUMBERS						
0041 158063						3
0042 158501						3
0043 158511						2
0044 159185						6
0045 159195		0.15		11.14%		6
0046 159202		X		1.45%		3
0047 159596						1
0048 159723		0.14		5.77%		3
0049 161028		X		8035		3
0050 161138						6
0051 161151		0.19		9.76%		3
0052 161162		X		5307		3
0053 161561						3
0054 143161		0.40		5.75%		15
0055 143199						78
0056 143201		X		2.62%		302
0057 143324						7
0058 143363		X		7.94%		-1
0059 146309		0.14		5.04%		6
0060 147597						2
0061 147748						13
0062 147965						5
0063 148774		0.17		5.69%		2
0064 154912						8
0065 145933						16
0066 154937						6
0067 169688		0.29		7.30%		5
0068 169708						8
0069 109481 Raw						
0070 114213 Raw						
0071 119975 Raw						
0072 119988 Raw						
0073 119991 Raw	15504.2					
0074 125317 Raw						
0075 127348 Raw						
0076 138063 Raw						
0077 140111 Raw						
0078 140137 Raw						
0079 141544 Raw						
0080 151578 Raw	11291.2					



ELEMENTS	As	As	B	B	Ba	Ba
UNITS	ppm	ug/l	ppm	mg/l	ppm	ug/l
DETECTION LIMIT	0.5	0.05	50	0.01	0.1	0.05
DIGEST	4A/	18Ws2/	FP1/	18Ws2/	4A/	18Ws2/
ANALYTICAL FINISH	MS	MS	OE	OE	MS	MS
SAMPLE NUMBERS						
0041 158063						
0042 158501						
0043 158511						
0044 159185						
0045 159195	48.3		86		135.9	
0046 159202	10.5		X		21.1	
0047 159596						
0048 159723	40.8		55		213.4	
0049 161028	4.2		X		78.7	
0050 161138						
0051 161151	53.8		60		154.3	
0052 161162	5.3		X		54.2	
0053 161561						
0054 143161	58.5		66		414.1	
0055 143199						
0056 143201	13.2		X		15.5	
0057 143324						
0058 143363	45.2		X		4.7	
0059 146309	43.5		53		238.8	
0060 147597						
0061 147748						
0062 147965						
0063 148774	43.5		58		415.2	
0064 154912						
0065 145933						
0066 154937						
0067 169688	72.2		59		1312.6	
0068 169708						
0069 109481 Raw						
0070 114213 Raw						
0071 119975 Raw						
0072 119988 Raw						
0073 119991 Raw						
0074 125317 Raw						
0075 127348 Raw						
0076 138063 Raw						
0077 140111 Raw						
0078 140137 Raw						
0079 141544 Raw						
0080 151578 Raw						



ELEMENTS	Bi	Bi	CO3	Ca	Ca	Cd
UNITS	ppm	ug/l	mgCaCO3/L	ppm	mg/l	ppm
DETECTION LIMIT	0.01	0.01	1	50	0.01	0.02
DIGEST	4A/	18Ws2/	18Ws2/	4A/	18Ws2/	4A/
ANALYTICAL FINISH	MS	MS	VOL	OE	OE	MS
SAMPLE NUMBERS						
0041 158063						
0042 158501						
0043 158511						
0044 159185						
0045 159195	0.94			1143		0.19
0046 159202	0.10			289		0.81
0047 159596						
0048 159723	0.56			988		0.09
0049 161028	0.10			433		0.11
0050 161138						
0051 161151	0.93			683		0.09
0052 161162	0.05			233		0.36
0053 161561						
0054 143161	0.79			3696		0.07
0055 143199						
0056 143201	0.18			6.93%		0.19
0057 143324						
0058 143363	0.71			571		0.05
0059 146309	0.48			993		0.08
0060 147597						
0061 147748						
0062 147965						
0063 148774	0.52			1463		0.10
0064 154912						
0065 145933						
0066 154937						
0067 169688	0.99			682		0.09
0068 169708						
0069 109481 Raw			X			
0070 114213 Raw			X			
0071 119975 Raw			X			
0072 119988 Raw			X			
0073 119991 Raw			X			
0074 125317 Raw			X			
0075 127348 Raw			X			
0076 138063 Raw			X			
0077 140111 Raw			X			
0078 140137 Raw			X			
0079 141544 Raw			106			
0080 151578 Raw			X			



ELEMENTS	Cd	Cl	Co	Co	ColourChange	Cr
UNITS	ug/l	mg/l	ppm	ug/l	NONE	ppm
DETECTION LIMIT	0.02	2	0.1	0.1	0	1
DIGEST	18Ws2/	18Ws2/	4A/	18Ws2/	ANCx/	4A/
ANALYTICAL FINISH	MS	COL	MS	MS	QUAL	MS
SAMPLE NUMBERS						
0041 158063					No	
0042 158501					No	
0043 158511					No	
0044 159185					No	
0045 159195			15.6		No	271
0046 159202			5.2		No	31
0047 159596					No	
0048 159723			15.9		No	167
0049 161028			5.1		No	71
0050 161138					No	
0051 161151			11.5		No	279
0052 161162			12.7		No	46
0053 161561					No	
0054 143161			12.4		No	232
0055 143199					No	
0056 143201			12.4		No	64
0057 143324					No	
0058 143363			24.2		No	179
0059 146309			13.9		No	210
0060 147597					No	
0061 147748					No	
0062 147965					No	
0063 148774			15.4		No	158
0064 154912					No	
0065 145933					No	
0066 154937					No	
0067 169688			7.9		No	294
0068 169708					No	
0069 109481 Raw		4				
0070 114213 Raw		22				
0071 119975 Raw		3				
0072 119988 Raw		17				
0073 119991 Raw		X				
0074 125317 Raw		X				
0075 127348 Raw		18				
0076 138063 Raw		4				
0077 140111 Raw		5				
0078 140137 Raw		93				
0079 141544 Raw		230				
0080 151578 Raw		X				



ELEMENTS	Cr	Cu	Cu	EC	F	F
UNITS	ug/l	ppm	ug/l	mS/cm	ppm	mg/l
DETECTION LIMIT	10	0.5	10	0.01	50	0.1
DIGEST	18Ws2/	4A/	18Ws2/	18Ws2/	FC7/	18Ws2/
ANALYTICAL FINISH	MS	MS	MS	MTR	SIE	SIE
SAMPLE NUMBERS						
0041 158063				0.09		
0042 158501				0.22		
0043 158511				I/S		
0044 159185				0.17		
0045 159195		88.4		0.15	569	
0046 159202		11.8		0.06	212	
0047 159596				0.10		
0048 159723		84.9		0.18	563	
0049 161028		7.0		0.11	121	
0050 161138				0.12		
0051 161151		115.3		0.13	325	
0052 161162		6.3		0.11	78	
0053 161561				0.07		
0054 143161		86.3		0.56	419	
0055 143199				2.38		
0056 143201		6.9		4.01	736	
0057 143324				0.32		
0058 143363		8.7		5.51	2158	
0059 146309		65.9		0.14	483	
0060 147597				0.48		
0061 147748				0.19		
0062 147965				0.10		
0063 148774		88.4		0.14	597	
0064 154912				0.22		
0065 145933				0.29		
0066 154937				2.15		
0067 169688		86.4		0.35	390	
0068 169708				0.34		
0069 109481 Raw				0.96		X
0070 114213 Raw				0.58		0.5
0071 119975 Raw				0.13		0.7
0072 119988 Raw				0.32		0.4
0073 119991 Raw				11.21		X
0074 125317 Raw				0.14		0.4
0075 127348 Raw				0.46		0.9
0076 138063 Raw				0.11		0.2
0077 140111 Raw				0.11		1.0
0078 140137 Raw				1.69		0.9
0079 141544 Raw				1.92		6.6
0080 151578 Raw				8.66		X



ELEMENTS	Fe	Fe	Fe-Rp1	Final-pH	Fizz-Rate	HCO3
UNITS	%	mg/l	%	NONE	NONE	mgCaCO3/L
DETECTION LIMIT	0.01	0.01	0.01	0.1	1	2
DIGEST	4A/	18Ws2/	4AH/	ANCx/	ANCx/	18Ws2/
ANALYTICAL FINISH	OE	OE	OE	MTR	QUAL	VOL
SAMPLE NUMBERS						
0041 158063				1.7	1	
0042 158501				1.6	1	
0043 158511				1.6	1	
0044 159185				1.7	1	
0045 159195	13.32			1.3	1	
0046 159202	>50.00		56.05	1.3	1	
0047 159596				1.5	1	
0048 159723	13.32			1.8	1	
0049 161028	>50.00		51.85	1.2	1	
0050 161138				1.8	1	
0051 161151	16.55			1.7	1	
0052 161162	31.36			1.6	1	
0053 161561				1.3	1	
0054 143161	18.09			1.4	1	
0055 143199				3.9	1	
0056 143201	17.98			3.5	2	
0057 143324				1.9	1	
0058 143363	20.09			2.6	1	
0059 146309	18.99			1.4	1	
0060 147597				1.6	1	
0061 147748				0.9	1	
0062 147965				1.8	1	
0063 148774	11.84			1.7	1	
0064 154912				1.3	1	
0065 145933				1.9	1	
0066 154937				2.1	1	
0067 169688	23.83			1.8	1	
0068 169708				1.6	1	
0069 109481 Raw						34
0070 114213 Raw						98
0071 119975 Raw						46
0072 119988 Raw						48
0073 119991 Raw						X
0074 125317 Raw						21
0075 127348 Raw						159
0076 138063 Raw						36
0077 140111 Raw						31
0078 140137 Raw						108
0079 141544 Raw						110
0080 151578 Raw						X



ELEMENTS	Hg	K	K	Mg	Mg	Mn
UNITS	ug/l	ppm	mg/l	ppm	mg/l	ppm
DETECTION LIMIT	0.1	20	0.1	20	0.01	1
DIGEST	18Ws2/	4A/	18Ws2/	4A/	18Ws2/	4A/
ANALYTICAL FINISH	MS	OE	OE	OE	OE	MS
SAMPLE NUMBERS						
0041 158063						
0042 158501						
0043 158511						
0044 159185						
0045 159195		5262		3435		1303
0046 159202		1007		760		960
0047 159596						
0048 159723		1.31%		2815		461
0049 161028		363		513		1.06%
0050 161138						
0051 161151		5158		1554		1023
0052 161162		323		473		2412
0053 161561						
0054 143161		6641		2733		653
0055 143199						
0056 143201		533		5.17%		3290
0057 143324						
0058 143363		158		5.12%		2497
0059 146309		9346		2075		1200
0060 147597						
0061 147748						
0062 147965						
0063 148774		1.38%		3643		321
0064 154912						
0065 145933						
0066 154937						
0067 169688		4061		1979		4051
0068 169708						
0069 109481 Raw						
0070 114213 Raw						
0071 119975 Raw						
0072 119988 Raw						
0073 119991 Raw						
0074 125317 Raw						
0075 127348 Raw						
0076 138063 Raw						
0077 140111 Raw						
0078 140137 Raw						
0079 141544 Raw						
0080 151578 Raw						



ELEMENTS	Mn	Mn-Rp1	Mo	Mo	Na	Na
UNITS	ug/l	ppm	ppm	ug/l	ppm	mg/l
DETECTION LIMIT	10	10	0.1	0.05	20	0.1
DIGEST	18Ws2/	4AH/	4A/	18Ws2/	4A/	18Ws2/
ANALYTICAL FINISH	MS	OE	MS	MS	OE	OE
SAMPLE NUMBERS						
0041 158063						
0042 158501						
0043 158511						
0044 159185						
0045 159195			2.8		425	
0046 159202			0.9		113	
0047 159596						
0048 159723			2.5		413	
0049 161028			0.6		149	
0050 161138						
0051 161151			3.1		388	
0052 161162			2.0		59	
0053 161561						
0054 143161			3.0		641	
0055 143199						
0056 143201			1.3		1057	
0057 143324						
0058 143363			3.2		320	
0059 146309			2.6		460	
0060 147597						
0061 147748						
0062 147965						
0063 148774			2.4		804	
0064 154912						
0065 145933						
0066 154937						
0067 169688			3.9		500	
0068 169708						
0069 109481 Raw						
0070 114213 Raw						
0071 119975 Raw						
0072 119988 Raw						
0073 119991 Raw						
0074 125317 Raw						
0075 127348 Raw						
0076 138063 Raw						
0077 140111 Raw						
0078 140137 Raw						
0079 141544 Raw						
0080 151578 Raw						



ELEMENTS	NAG	NAGpH	NAG(4.5)	Ni	Ni	OH
UNITS	kgH2SO4/t	NONE	kgH2SO4/t	ppm	ug/l	mgCaCO3/L
DETECTION LIMIT	1	0.1	1	0.5	10	1
DIGEST	NAGx/	NAGx/	NAGx/	4A/	18Ws2/	18Ws2/
ANALYTICAL FINISH	VOL	MTR	VOL	MS	MS	VOL
SAMPLE NUMBERS						
0041 158063						
0042 158501						
0043 158511						
0044 159185	0	7.7	0			
0045 159195				62.7		
0046 159202				65.6		
0047 159596						
0048 159723	0	7.0	0	71.8		
0049 161028				11.6		
0050 161138	0	7.2	0			
0051 161151				51.1		
0052 161162				26.9		
0053 161561						
0054 143161	0	8.9	0	39.9		
0055 143199	14	4.7	0			
0056 143201	0	8.2	0	40.3		
0057 143324	0	7.4	0			
0058 143363	71	2.3	38	211.8		
0059 146309	0	7.3	0	61.7		
0060 147597						
0061 147748						
0062 147965						
0063 148774	0	7.2	0	68.1		
0064 154912						
0065 145933						
0066 154937	7	3.4	3			
0067 169688				39.3		
0068 169708						
0069 109481 Raw						X
0070 114213 Raw						X
0071 119975 Raw						X
0072 119988 Raw						X
0073 119991 Raw						X
0074 125317 Raw						X
0075 127348 Raw						X
0076 138063 Raw						X
0077 140111 Raw						X
0078 140137 Raw						X
0079 141544 Raw						X
0080 151578 Raw						X



ELEMENTS	P	P	Pb	Pb	ABCC	ANCslurry
UNITS	ppm	ug/l	ppm	ug/l	kgH2SO4/t	NONE
DETECTION LIMIT	20	10	0.5	0.2	1	0.1
DIGEST	4A/	18Ws2/	4A/	18Ws2/		ANCx/
ANALYTICAL FINISH	MS	MS	MS	MS	/VOL	MTR
SAMPLE NUMBERS						
0041 158063						1.71
0042 158501						1.64
0043 158511						1.64
0044 159185						1.74
0045 159195	198		37.1			1.29
0046 159202	400		8.4			1.25
0047 159596						1.51
0048 159723	280		26.3			1.82
0049 161028	547		10.0			1.23
0050 161138						1.80
0051 161151	234		34.2			1.68
0052 161162	305		2.3			1.58
0053 161561						1.28
0054 143161	296		35.9			1.41
0055 143199					16	3.93
0056 143201	215		5.5		251	3.52
0057 143324						1.88
0058 143363	192		22.9			1.46
0059 146309	344		25.2			1.36
0060 147597						1.62
0061 147748						0.92
0062 147965						1.79
0063 148774	280		27.8			1.66
0064 154912						1.31
0065 145933						1.86
0066 154937						0.97
0067 169688	231		35.4			1.81
0068 169708						1.65
0069 109481 Raw						
0070 114213 Raw						
0071 119975 Raw						
0072 119988 Raw						
0073 119991 Raw						
0074 125317 Raw						
0075 127348 Raw						
0076 138063 Raw						
0077 140111 Raw						
0078 140137 Raw						
0079 141544 Raw						
0080 151578 Raw						



ELEMENTS	pH	pH Drop	S	S	Sb	Sb
UNITS	NONE	NONE	ppm	mg/l	ppm	ug/l
DETECTION LIMIT	0.1	0.1	50	0.1	0.05	0.05
DIGEST	18Ws2/	ANCx/	4A/	18Ws2/	4A/	18Ws2/
ANALYTICAL FINISH	MTR	MTR	OE	OE	MS	MS
SAMPLE NUMBERS						
0041 158063	7.5	4.6				
0042 158501	7.3	4.7				
0043 158511	I/S	4.8				
0044 159185	7.8	4.8				
0045 159195	7.3	4.7	400		4.25	
0046 159202	6.8	4.7	368		0.69	
0047 159596	7.6	4.1				
0048 159723	6.6	4.7	2891		2.66	
0049 161028	7.6	4.8	367		2.33	
0050 161138	7.4	4.5				
0051 161151	7.3	4.8	152		4.45	
0052 161162	7.2	4.9	116		0.49	
0053 161561	6.8	4.7				
0054 143161	7.7	4.8	1089		4.20	
0055 143199	6.8	2.3				
0056 143201	7.9	2.5	1.21%		0.61	
0057 143324	8.1	4.9				
0058 143363	3.3	2.1	3.19%		3.93	
0059 146309	6.4	4.8	3343		2.70	
0060 147597	8.0	3.9				
0061 147748	8.0	4.8				
0062 147965	7.6	4.6				
0063 148774	7.9	4.3	3452		2.58	
0064 154912	7.2	4.8				
0065 145933	7.7	5.0				
0066 154937	6.8	2.9				
0067 169688	7.3	5.0	491		6.02	
0068 169708	7.3	4.9				
0069 109481 Raw	6.0			171.7		
0070 114213 Raw	7.0			53.2		
0071 119975 Raw	6.9			4.1		
0072 119988 Raw	7.1			7.9		
0073 119991 Raw	2.2			5022.8		
0074 125317 Raw	7.3			12.1		
0075 127348 Raw	8.7			15.8		
0076 138063 Raw	7.0			2.6		
0077 140111 Raw	7.5			4.5		
0078 140137 Raw	7.7			260.5		
0079 141544 Raw	9.4			120.8		
0080 151578 Raw	2.3			3729.6		



ELEMENTS	Se	Si	Si	Sn	Sn	Sr
UNITS	ug/l	%	mg/l	ppm	ug/l	ppm
DETECTION LIMIT	0.5	0.1	0.05	0.1	0.1	0.05
DIGEST	18Ws2/	FP1/	18Ws2/	4A/	18Ws2/	4A/
ANALYTICAL FINISH	MS	OE	OE	MS	MS	MS
SAMPLE NUMBERS						
0041 158063						
0042 158501						
0043 158511						
0044 159185						
0045 159195		22.1		6.2		18.63
0046 159202		4.0		0.5		4.59
0047 159596						
0048 159723		29.0		2.7		44.26
0049 161028		4.4		0.3		13.00
0050 161138						
0051 161151		22.3		5.9		21.19
0052 161162		23.4		0.2		3.66
0053 161561						
0054 143161		24.9		4.1		50.43
0055 143199						
0056 143201		12.0		0.9		10.80
0057 143324						
0058 143363		11.5		2.1		6.02
0059 146309		25.0		2.3		53.09
0060 147597						
0061 147748						
0062 147965						
0063 148774		29.9		2.8		55.70
0064 154912						
0065 145933						
0066 154937						
0067 169688		20.0		5.7		30.40
0068 169708						
0069 109481 Raw						
0070 114213 Raw						
0071 119975 Raw						
0072 119988 Raw						
0073 119991 Raw						
0074 125317 Raw						
0075 127348 Raw						
0076 138063 Raw						
0077 140111 Raw						
0078 140137 Raw						
0079 141544 Raw						
0080 151578 Raw						



ELEMENTS	Sr	Th	Th	Ti	Tl	Tl
UNITS	ug/l	ppm	ug/l	ppm	ppm	ug/l
DETECTION LIMIT	0.02	0.01	0.01	5	0.02	0.01
DIGEST	18Ws2/	4A/	18Ws2/	4A/	4A/	18Ws2/
ANALYTICAL FINISH	MS	MS	MS	OE	MS	MS
SAMPLE NUMBERS						
0041 158063						
0042 158501						
0043 158511						
0044 159185						
0045 159195		18.98		8079	0.60	
0046 159202		1.81		591	0.09	
0047 159596						
0048 159723		7.92		3147	0.90	
0049 161028		1.76		454	0.07	
0050 161138						
0051 161151		18.17		7074	0.78	
0052 161162		0.81		274	0.18	
0053 161561						
0054 143161		13.41		4466	0.55	
0055 143199						
0056 143201		3.49		1512	0.07	
0057 143324						
0058 143363		11.61		4104	0.11	
0059 146309		7.62		2780	0.76	
0060 147597						
0061 147748						
0062 147965						
0063 148774		8.33		3152	0.92	
0064 154912						
0065 145933						
0066 154937						
0067 169688		19.00		6388	0.45	
0068 169708						
0069 109481 Raw						
0070 114213 Raw						
0071 119975 Raw						
0072 119988 Raw						
0073 119991 Raw						
0074 125317 Raw						
0075 127348 Raw						
0076 138063 Raw						
0077 140111 Raw						
0078 140137 Raw						
0079 141544 Raw						
0080 151578 Raw						



ELEMENTS	TotAlk	U	U	V	V	Zn
UNITS	mgCaCO3/L	ppm	ug/l	ppm	ug/l	ppm
DETECTION LIMIT	5	0.01	0.005	1	10	1
DIGEST		4A/	18Ws2/	4A/	18Ws2/	4A/
ANALYTICAL FINISH	/CALC	MS	MS	MS	MS	MS
SAMPLE NUMBERS						
0041 158063						
0042 158501						
0043 158511						
0044 159185						
0045 159195		4.29		222		85
0046 159202		1.27		21		288
0047 159596						
0048 159723		1.86		135		92
0049 161028		9.41		102		23
0050 161138						
0051 161151		4.12		268		57
0052 161162		1.28		14		136
0053 161561						
0054 143161		2.64		182		59
0055 143199						
0056 143201		0.91		45		35
0057 143324						
0058 143363		3.51		157		524
0059 146309		1.75		144		71
0060 147597						
0061 147748						
0062 147965						
0063 148774		1.88		131		98
0064 154912						
0065 145933						
0066 154937						
0067 169688		3.17		278		43
0068 169708						
0069 109481 Raw	34					
0070 114213 Raw	98					
0071 119975 Raw	46					
0072 119988 Raw	48					
0073 119991 Raw	X					
0074 125317 Raw	21					
0075 127348 Raw	159					
0076 138063 Raw	36					
0077 140111 Raw	31					
0078 140137 Raw	108					
0079 141544 Raw	216					
0080 151578 Raw	X					



ELEMENTS	Zn
UNITS	ug/l
DETECTION LIMIT	10
DIGEST	18Ws2/
ANALYTICAL FINISH	MS
SAMPLE NUMBERS	

0041 158063

0042 158501

0043 158511

0044 159185

0045 159195

0046 159202

0047 159596

0048 159723

0049 161028

0050 161138

0051 161151

0052 161162

0053 161561

0054 143161

0055 143199

0056 143201

0057 143324

0058 143363

0059 146309

0060 147597

0061 147748

0062 147965

0063 148774

0064 154912

0065 145933

0066 154937

0067 169688

0068 169708

0069 109481 Raw

0070 114213 Raw

0071 119975 Raw

0072 119988 Raw

0073 119991 Raw

0074 125317 Raw

0075 127348 Raw

0076 138063 Raw

0077 140111 Raw

0078 140137 Raw

0079 141544 Raw

0080 151578 Raw



ELEMENTS	Acidy	Ag	Ag	Al	Al	ANC
UNITS	mgCaCO3/L	ppm	ug/l	ppm	mg/l	kgH2SO4/t
DETECTION LIMIT	0.2	0.05	0.05	50	0.01	1
DIGEST	18Ws2/	4A/	18Ws2/	4A/	18Ws2/	ANCx/
ANALYTICAL FINISH	VOL	MS	MS	OE	OE	VOL
SAMPLE NUMBERS						
0081 153018 Raw						
0082 158056 Raw						
0083 159195 Raw						
0084 159202 Raw						
0085 159723 Raw						
0086 161028 Raw						
0087 161151 Raw						
0088 161162 Raw						
0089 143161 Raw						
0090 143201 Raw						
0091 143363 Raw	2125.9					
0092 146309 Raw						
0093 148774 Raw						
0094 169688 Raw						
0095 109481 HNO3			X		0.01	
0096 114213 HNO3						
0097 119975 HNO3			X		1.27	
0098 119988 HNO3						
0099 119991 HNO3			0.41		914.39	
0100 125317 HNO3						
0101 127348 HNO3			X		X	
0102 138063 HNO3						
0103 140111 HNO3			X		0.07	
0104 140137 HNO3						
0105 141544 HNO3			X		X	
0106 151578 HNO3						
0107 153018 HNO3			X		0.15	
0108 158056 HNO3						
0109 159195 HNO3			X		X	
0110 159202 HNO3						
0111 159723 HNO3			X		X	
0112 161028 HNO3						
0113 161151 HNO3			X		1.05	
0114 161162 HNO3						
0115 143161 HNO3			X		X	
0116 143201 HNO3						
0117 143363 HNO3			0.83		176.60	
0118 146309 HNO3						
0119 148774 HNO3			X		0.26	
0120 169688 HNO3						



ELEMENTS	As	As	B	B	Ba	Ba
UNITS	ppm	ug/l	ppm	mg/l	ppm	ug/l
DETECTION LIMIT	0.5	0.05	50	0.01	0.1	0.05
DIGEST	4A/	18Ws2/	FP1/	18Ws2/	4A/	18Ws2/
ANALYTICAL FINISH	MS	MS	OE	OE	MS	MS
SAMPLE NUMBERS						
0081 153018 Raw						
0082 158056 Raw						
0083 159195 Raw						
0084 159202 Raw						
0085 159723 Raw						
0086 161028 Raw						
0087 161151 Raw						
0088 161162 Raw						
0089 143161 Raw						
0090 143201 Raw						
0091 143363 Raw						
0092 146309 Raw						
0093 148774 Raw						
0094 169688 Raw						
0095 109481 HNO3		0.10		0.02		17.65
0096 114213 HNO3		0.79		0.07		10.35
0097 119975 HNO3		2.53		0.06		93.07
0098 119988 HNO3		7.53		0.05		31.73
0099 119991 HNO3		2020.66		0.03		3.36
0100 125317 HNO3		1.76		0.05		49.70
0101 127348 HNO3		0.49		0.03		0.37
0102 138063 HNO3		0.19		0.05		12.77
0103 140111 HNO3		0.43		0.08		0.58
0104 140137 HNO3		0.44		0.05		6.41
0105 141544 HNO3		45.08		2.92		15.17
0106 151578 HNO3		1328.06		0.04		7.40
0107 153018 HNO3		1.28		0.07		61.76
0108 158056 HNO3		5.04		0.64		55.86
0109 159195 HNO3		0.71		0.11		13.15
0110 159202 HNO3		0.21		0.04		7.22
0111 159723 HNO3		1.82		0.06		47.90
0112 161028 HNO3		0.06		0.04		8.65
0113 161151 HNO3		5.75		0.11		12.07
0114 161162 HNO3		0.05		0.02		50.68
0115 143161 HNO3		3.43		0.09		45.45
0116 143201 HNO3		0.13		0.06		1.00
0117 143363 HNO3		4.32		0.11		1.31
0118 146309 HNO3		1.66		0.05		39.97
0119 148774 HNO3		4.55		0.09		70.07
0120 169688 HNO3		3.04		0.10		54.81



ELEMENTS	Bi	Bi	CO3	Ca	Ca	Cd
UNITS	ppm	ug/l	mgCaCO3/L	ppm	mg/l	ppm
DETECTION LIMIT	0.01	0.01	1	50	0.01	0.02
DIGEST	4A/	18Ws2/	18Ws2/	4A/	18Ws2/	4A/
ANALYTICAL FINISH	MS	MS	VOL	OE	OE	MS
SAMPLE NUMBERS						
0081 153018 Raw			X			
0082 158056 Raw			X			
0083 159195 Raw			X			
0084 159202 Raw			X			
0085 159723 Raw			X			
0086 161028 Raw			X			
0087 161151 Raw			X			
0088 161162 Raw			X			
0089 143161 Raw			X			
0090 143201 Raw			X			
0091 143363 Raw			X			
0092 146309 Raw			X			
0093 148774 Raw			X			
0094 169688 Raw			X			
0095 109481 HNO3		X			99.73	
0096 114213 HNO3		X			37.14	
0097 119975 HNO3		X			5.40	
0098 119988 HNO3		X			15.21	
0099 119991 HNO3		0.14			54.80	
0100 125317 HNO3		X			6.74	
0101 127348 HNO3		X			14.32	
0102 138063 HNO3		X			7.13	
0103 140111 HNO3		X			1.61	
0104 140137 HNO3		X			120.78	
0105 141544 HNO3		X			2.53	
0106 151578 HNO3		0.10			159.75	
0107 153018 HNO3		X			6.44	
0108 158056 HNO3		X			539.47	
0109 159195 HNO3		X			6.08	
0110 159202 HNO3		X			2.63	
0111 159723 HNO3		X			11.98	
0112 161028 HNO3		X			9.04	
0113 161151 HNO3		X			3.53	
0114 161162 HNO3		X			10.76	
0115 143161 HNO3		X			16.41	
0116 143201 HNO3		X			356.72	
0117 143363 HNO3		0.12			174.27	
0118 146309 HNO3		X			5.12	
0119 148774 HNO3		X			4.45	
0120 169688 HNO3		X			4.82	



ELEMENTS	Cd	Cl	Co	Co	ColourChange	Cr
UNITS	ug/l	mg/l	ppm	ug/l	NONE	ppm
DETECTION LIMIT	0.02	2	0.1	0.1	0	1
DIGEST	18Ws2/	18Ws2/	4A/	18Ws2/	ANCx/	4A/
ANALYTICAL FINISH	MS	COL	MS	MS	QUAL	MS
SAMPLE NUMBERS						
0081 153018 Raw		X				
0082 158056 Raw		26				
0083 159195 Raw		8				
0084 159202 Raw		X				
0085 159723 Raw		8				
0086 161028 Raw		3				
0087 161151 Raw		13				
0088 161162 Raw		X				
0089 143161 Raw		90				
0090 143201 Raw		430				
0091 143363 Raw		4				
0092 146309 Raw		5				
0093 148774 Raw		X				
0094 169688 Raw		80				
0095 109481 HNO3	0.05			6.3		
0096 114213 HNO3	X			1.8		
0097 119975 HNO3	X			6.9		
0098 119988 HNO3	0.06			2.6		
0099 119991 HNO3	10.15			5086.8		
0100 125317 HNO3	X			0.4		
0101 127348 HNO3	X			X		
0102 138063 HNO3	X			0.6		
0103 140111 HNO3	X			X		
0104 140137 HNO3	X			0.6		
0105 141544 HNO3	X			0.3		
0106 151578 HNO3	40.02			10279.2		
0107 153018 HNO3	X			0.8		
0108 158056 HNO3	X			0.7		
0109 159195 HNO3	X			X		
0110 159202 HNO3	X			0.3		
0111 159723 HNO3	X			3.5		
0112 161028 HNO3	X			X		
0113 161151 HNO3	X			0.2		
0114 161162 HNO3	0.02			1.0		
0115 143161 HNO3	0.04			9.7		
0116 143201 HNO3	X			0.2		
0117 143363 HNO3	9.59			4193.8		
0118 146309 HNO3	X			2.3		
0119 148774 HNO3	X			0.2		
0120 169688 HNO3	0.03			3.9		



ELEMENTS	Cr	Cu	Cu	EC	F	F
UNITS	ug/l	ppm	ug/l	mS/cm	ppm	mg/l
DETECTION LIMIT	10	0.5	10	0.01	50	0.1
DIGEST	18Ws2/	4A/	18Ws2/	18Ws2/	FC7/	18Ws2/
ANALYTICAL FINISH	MS	MS	MS	MTR	SIE	SIE
SAMPLE NUMBERS						
0081 153018 Raw				0.12		0.2
0082 158056 Raw				3.30		0.9
0083 159195 Raw				0.15		0.8
0084 159202 Raw				0.06		0.2
0085 159723 Raw				0.18		0.2
0086 161028 Raw				0.11		0.3
0087 161151 Raw				0.13		0.3
0088 161162 Raw				0.11		0.2
0089 143161 Raw				0.56		1.9
0090 143201 Raw				4.01		0.6
0091 143363 Raw				5.51		X
0092 146309 Raw				0.14		0.2
0093 148774 Raw				0.14		0.9
0094 169688 Raw				0.35		0.8
0095 109481 HNO3	X		X			
0096 114213 HNO3	X		X			
0097 119975 HNO3	X		X			
0098 119988 HNO3	X		X			
0099 119991 HNO3	2350		31195			
0100 125317 HNO3	X		X			
0101 127348 HNO3	X		X			
0102 138063 HNO3	X		X			
0103 140111 HNO3	X		X			
0104 140137 HNO3	X		X			
0105 141544 HNO3	X		X			
0106 151578 HNO3	1318		58299			
0107 153018 HNO3	X		X			
0108 158056 HNO3	X		X			
0109 159195 HNO3	X		X			
0110 159202 HNO3	X		X			
0111 159723 HNO3	X		X			
0112 161028 HNO3	X		X			
0113 161151 HNO3	X		X			
0114 161162 HNO3	X		X			
0115 143161 HNO3	X		X			
0116 143201 HNO3	X		X			
0117 143363 HNO3	182		54			
0118 146309 HNO3	X		X			
0119 148774 HNO3	X		X			
0120 169688 HNO3	X		X			



ELEMENTS	Fe	Fe	Fe-Rp1	Final-pH	Fizz-Rate	HCO3
UNITS	%	mg/l	%	NONE	NONE	mgCaCO3/L
DETECTION LIMIT	0.01	0.01	0.01	0.1	1	2
DIGEST	4A/	18Ws2/	4AH/	ANCx/	ANCx/	18Ws2/
ANALYTICAL FINISH	OE	OE	OE	MTR	QUAL	VOL
SAMPLE NUMBERS						
0081 153018 Raw						26
0082 158056 Raw						44
0083 159195 Raw						40
0084 159202 Raw						16
0085 159723 Raw						18
0086 161028 Raw						35
0087 161151 Raw						29
0088 161162 Raw						37
0089 143161 Raw						125
0090 143201 Raw						52
0091 143363 Raw						X
0092 146309 Raw						21
0093 148774 Raw						48
0094 169688 Raw						35
0095 109481 HNO3		X				
0096 114213 HNO3		X				
0097 119975 HNO3		1.72				
0098 119988 HNO3		X				
0099 119991 HNO3		3990.29				
0100 125317 HNO3		0.12				
0101 127348 HNO3		X				
0102 138063 HNO3		X				
0103 140111 HNO3		0.32				
0104 140137 HNO3		0.03				
0105 141544 HNO3		X				
0106 151578 HNO3		2785.23				
0107 153018 HNO3		0.12				
0108 158056 HNO3		X				
0109 159195 HNO3		X				
0110 159202 HNO3		X				
0111 159723 HNO3		X				
0112 161028 HNO3		X				
0113 161151 HNO3		0.28				
0114 161162 HNO3		X				
0115 143161 HNO3		X				
0116 143201 HNO3		X				
0117 143363 HNO3		142.00				
0118 146309 HNO3		X				
0119 148774 HNO3		0.28				
0120 169688 HNO3		X				



ELEMENTS	Hg	K	K	Mg	Mg	Mn
UNITS	ug/l	ppm	mg/l	ppm	mg/l	ppm
DETECTION LIMIT	0.1	20	0.1	20	0.01	1
DIGEST	18Ws2/	4A/	18Ws2/	4A/	18Ws2/	4A/
ANALYTICAL FINISH	MS	OE	OE	OE	OE	MS
SAMPLE NUMBERS						
0081 153018 Raw						
0082 158056 Raw						
0083 159195 Raw						
0084 159202 Raw						
0085 159723 Raw						
0086 161028 Raw						
0087 161151 Raw						
0088 161162 Raw						
0089 143161 Raw						
0090 143201 Raw						
0091 143363 Raw						
0092 146309 Raw						
0093 148774 Raw						
0094 169688 Raw						
0095 109481 HNO3	X		10.3		67.68	
0096 114213 HNO3	X		11.4		31.11	
0097 119975 HNO3	X		7.1		4.47	
0098 119988 HNO3	X		15.4		12.70	
0099 119991 HNO3	X		0.2		100.15	
0100 125317 HNO3	X		6.2		2.20	
0101 127348 HNO3	X		12.6		5.70	
0102 138063 HNO3	X		5.9		3.07	
0103 140111 HNO3	X		4.5		1.15	
0104 140137 HNO3	X		13.6		91.40	
0105 141544 HNO3	X		25.6		0.37	
0106 151578 HNO3	X		0.2		174.29	
0107 153018 HNO3	X		10.1		2.23	
0108 158056 HNO3	X		25.8		113.48	
0109 159195 HNO3	X		7.1		3.76	
0110 159202 HNO3	X		4.3		1.36	
0111 159723 HNO3	X		7.6		4.84	
0112 161028 HNO3	X		4.2		2.03	
0113 161151 HNO3	X		5.3		2.37	
0114 161162 HNO3	X		3.0		3.57	
0115 143161 HNO3	X		14.8		6.45	
0116 143201 HNO3	X		45.0		120.65	
0117 143363 HNO3	X		X		609.76	
0118 146309 HNO3	X		8.3		2.50	
0119 148774 HNO3	X		9.4		2.15	
0120 169688 HNO3	X		8.2		4.02	



ELEMENTS	Mn	Mn-Rp1	Mo	Mo	Na	Na
UNITS	ug/l	ppm	ppm	ug/l	ppm	mg/l
DETECTION LIMIT	10	10	0.1	0.05	20	0.1
DIGEST	18Ws2/	4AH/	4A/	18Ws2/	4A/	18Ws2/
ANALYTICAL FINISH	MS	OE	MS	MS	OE	OE
SAMPLE NUMBERS						
0081 153018 Raw						
0082 158056 Raw						
0083 159195 Raw						
0084 159202 Raw						
0085 159723 Raw						
0086 161028 Raw						
0087 161151 Raw						
0088 161162 Raw						
0089 143161 Raw						
0090 143201 Raw						
0091 143363 Raw						
0092 146309 Raw						
0093 148774 Raw						
0094 169688 Raw						
0095 109481 HNO3	5415			X		4.0
0096 114213 HNO3	1200			0.43		35.2
0097 119975 HNO3	68			0.31		9.5
0098 119988 HNO3	66			0.93		13.9
0099 119991 HNO3	107587			5.07		1.7
0100 125317 HNO3	31			2.11		10.7
0101 127348 HNO3	X			38.31		74.5
0102 138063 HNO3	52			0.16		6.4
0103 140111 HNO3	32			0.10		15.6
0104 140137 HNO3	69			4.71		119.7
0105 141544 HNO3	X			33.54		379.6
0106 151578 HNO3	95834			2.03		0.5
0107 153018 HNO3	47			0.78		5.0
0108 158056 HNO3	18			10.28		189.5
0109 159195 HNO3	X			0.50		14.4
0110 159202 HNO3	42			X		3.3
0111 159723 HNO3	196			0.10		8.5
0112 161028 HNO3	X			0.26		6.9
0113 161151 HNO3	X			0.74		16.2
0114 161162 HNO3	103			0.22		4.8
0115 143161 HNO3	X			16.49		87.7
0116 143201 HNO3	136			4.81		459.3
0117 143363 HNO3	471740			0.49		7.9
0118 146309 HNO3	134			0.09		11.2
0119 148774 HNO3	X			4.31		15.7
0120 169688 HNO3	X			0.68		59.2



ELEMENTS	NAG	NAGpH	NAG(4.5)	Ni	Ni	OH
UNITS	kgH2SO4/t	NONE	kgH2SO4/t	ppm	ug/l	mgCaCO3/L
DETECTION LIMIT	1	0.1	1	0.5	10	1
DIGEST	NAGx/	NAGx/	NAGx/	4A/	18Ws2/	18Ws2/
ANALYTICAL FINISH	VOL	MTR	VOL	MS	MS	VOL
SAMPLE NUMBERS						
0081 153018 Raw						X
0082 158056 Raw						X
0083 159195 Raw						X
0084 159202 Raw						X
0085 159723 Raw						X
0086 161028 Raw						X
0087 161151 Raw						X
0088 161162 Raw						X
0089 143161 Raw						X
0090 143201 Raw						X
0091 143363 Raw						X
0092 146309 Raw						X
0093 148774 Raw						X
0094 169688 Raw						X
0095 109481 HNO3					26	
0096 114213 HNO3					X	
0097 119975 HNO3					X	
0098 119988 HNO3					X	
0099 119991 HNO3					7785	
0100 125317 HNO3					X	
0101 127348 HNO3					X	
0102 138063 HNO3					X	
0103 140111 HNO3					X	
0104 140137 HNO3					X	
0105 141544 HNO3					X	
0106 151578 HNO3					17228	
0107 153018 HNO3					X	
0108 158056 HNO3					X	
0109 159195 HNO3					X	
0110 159202 HNO3					X	
0111 159723 HNO3					X	
0112 161028 HNO3					X	
0113 161151 HNO3					X	
0114 161162 HNO3					X	
0115 143161 HNO3					24	
0116 143201 HNO3					X	
0117 143363 HNO3					31624	
0118 146309 HNO3					X	
0119 148774 HNO3					X	
0120 169688 HNO3					X	



ELEMENTS	P	P	Pb	Pb	ABCC	ANCslurry
UNITS	ppm	ug/l	ppm	ug/l	kgH2SO4/t	NONE
DETECTION LIMIT	20	10	0.5	0.2	1	0.1
DIGEST	4A/	18Ws2/	4A/	18Ws2/		ANCx/
ANALYTICAL FINISH	MS	MS	MS	MS	/VOL	MTR
SAMPLE NUMBERS						
0081 153018 Raw						
0082 158056 Raw						
0083 159195 Raw						
0084 159202 Raw						
0085 159723 Raw						
0086 161028 Raw						
0087 161151 Raw						
0088 161162 Raw						
0089 143161 Raw						
0090 143201 Raw						
0091 143363 Raw						
0092 146309 Raw						
0093 148774 Raw						
0094 169688 Raw						
0095 109481 HNO3		17		0.8		
0096 114213 HNO3		22		2.4		
0097 119975 HNO3		X		0.8		
0098 119988 HNO3		X		X		
0099 119991 HNO3		1245		17.4		
0100 125317 HNO3		X		X		
0101 127348 HNO3		14		X		
0102 138063 HNO3		11		X		
0103 140111 HNO3		X		1.0		
0104 140137 HNO3		X		0.3		
0105 141544 HNO3		42		X		
0106 151578 HNO3		3371		26.1		
0107 153018 HNO3		X		X		
0108 158056 HNO3		30		0.4		
0109 159195 HNO3		X		X		
0110 159202 HNO3		X		X		
0111 159723 HNO3		X		X		
0112 161028 HNO3		X		X		
0113 161151 HNO3		X		0.7		
0114 161162 HNO3		X		X		
0115 143161 HNO3		60		X		
0116 143201 HNO3		X		X		
0117 143363 HNO3		50		56.9		
0118 146309 HNO3		X		X		
0119 148774 HNO3		X		0.6		
0120 169688 HNO3		X		X		



ELEMENTS	pH	pH Drop	S	S	Sb	Sb
UNITS	NONE	NONE	ppm	mg/l	ppm	ug/l
DETECTION LIMIT	0.1	0.1	50	0.1	0.05	0.05
DIGEST	18Ws2/	ANCx/	4A/	18Ws2/	4A/	18Ws2/
ANALYTICAL FINISH	MTR	MTR	OE	OE	MS	MS
SAMPLE NUMBERS						
0081 153018 Raw	7.1			7.2		
0082 158056 Raw	7.6			682.5		
0083 159195 Raw	7.3			5.4		
0084 159202 Raw	6.8			1.7		
0085 159723 Raw	6.6			15.2		
0086 161028 Raw	7.6			3.4		
0087 161151 Raw	7.3			4.5		
0088 161162 Raw	7.2			1.4		
0089 143161 Raw	7.7			20.6		
0090 143201 Raw	7.9			581.8		
0091 143363 Raw	3.3			1674.5		
0092 146309 Raw	6.4			10.2		
0093 148774 Raw	7.9			4.9		
0094 169688 Raw	7.3			19.2		
0095 109481 HNO3				163.8		X
0096 114213 HNO3				52.4		0.11
0097 119975 HNO3				3.9		0.11
0098 119988 HNO3				7.7		0.13
0099 119991 HNO3				4958.3		0.83
0100 125317 HNO3				11.8		1.89
0101 127348 HNO3				15.3		0.63
0102 138063 HNO3				2.6		X
0103 140111 HNO3				4.7		0.13
0104 140137 HNO3				250.3		0.13
0105 141544 HNO3				114.5		0.61
0106 151578 HNO3				3617.9		0.64
0107 153018 HNO3				7.1		0.38
0108 158056 HNO3				668.9		1.36
0109 159195 HNO3				5.3		X
0110 159202 HNO3				1.7		X
0111 159723 HNO3				15.1		0.43
0112 161028 HNO3				3.5		0.09
0113 161151 HNO3				4.6		0.27
0114 161162 HNO3				1.4		0.09
0115 143161 HNO3				19.9		1.60
0116 143201 HNO3				556.2		0.06
0117 143363 HNO3				1622.3		0.43
0118 146309 HNO3				9.7		0.20
0119 148774 HNO3				5.0		1.22
0120 169688 HNO3				18.9		0.28



ELEMENTS	Se	Si	Si	Sn	Sn	Sr
UNITS	ug/l	%	mg/l	ppm	ug/l	ppm
DETECTION LIMIT	0.5	0.1	0.05	0.1	0.1	0.05
DIGEST	18Ws2/	FP1/	18Ws2/	4A/	18Ws2/	4A/
ANALYTICAL FINISH	MS	OE	OE	MS	MS	MS
SAMPLE NUMBERS						
0081 153018 Raw						
0082 158056 Raw						
0083 159195 Raw						
0084 159202 Raw						
0085 159723 Raw						
0086 161028 Raw						
0087 161151 Raw						
0088 161162 Raw						
0089 143161 Raw						
0090 143201 Raw						
0091 143363 Raw						
0092 146309 Raw						
0093 148774 Raw						
0094 169688 Raw						
0095 109481 HNO3	1.7		3.93		X	
0096 114213 HNO3	4.3		4.14		X	
0097 119975 HNO3	X		25.89		X	
0098 119988 HNO3	1.0		12.48		X	
0099 119991 HNO3	133.7		7.85		X	
0100 125317 HNO3	X		18.40		0.1	
0101 127348 HNO3	1.6		3.08		X	
0102 138063 HNO3	0.6		7.60		X	
0103 140111 HNO3	0.5		9.49		X	
0104 140137 HNO3	21.5		2.35		X	
0105 141544 HNO3	34.6		19.79		X	
0106 151578 HNO3	12.7		9.88		X	
0107 153018 HNO3	X		22.30		X	
0108 158056 HNO3	3.6		21.17		X	
0109 159195 HNO3	X		16.18		0.1	
0110 159202 HNO3	0.5		7.36		X	
0111 159723 HNO3	0.8		17.89		X	
0112 161028 HNO3	0.6		8.50		X	
0113 161151 HNO3	X		20.98		X	
0114 161162 HNO3	X		6.17		X	
0115 143161 HNO3	1.3		12.93		0.1	
0116 143201 HNO3	31.6		1.18		X	
0117 143363 HNO3	34.4		8.50		X	
0118 146309 HNO3	0.5		17.01		0.3	
0119 148774 HNO3	X		21.97		X	
0120 169688 HNO3	0.6		14.10		X	



ELEMENTS	Sr	Th	Th	Ti	TI	TI
UNITS	ug/l	ppm	ug/l	ppm	ppm	ug/l
DETECTION LIMIT	0.02	0.01	0.01	5	0.02	0.01
DIGEST	18Ws2/	4A/	18Ws2/	4A/	4A/	18Ws2/
ANALYTICAL FINISH	MS	MS	MS	OE	MS	MS
SAMPLE NUMBERS						
0081 153018 Raw						
0082 158056 Raw						
0083 159195 Raw						
0084 159202 Raw						
0085 159723 Raw						
0086 161028 Raw						
0087 161151 Raw						
0088 161162 Raw						
0089 143161 Raw						
0090 143201 Raw						
0091 143363 Raw						
0092 146309 Raw						
0093 148774 Raw						
0094 169688 Raw						
0095 109481 HNO3	171.73		X			0.13
0096 114213 HNO3	110.75		X			0.09
0097 119975 HNO3	54.72		0.12			0.02
0098 119988 HNO3	105.85		X			0.21
0099 119991 HNO3	107.66		85.64			0.88
0100 125317 HNO3	44.69		X			0.02
0101 127348 HNO3	25.50		X			0.02
0102 138063 HNO3	32.72		X			0.02
0103 140111 HNO3	4.02		0.09			X
0104 140137 HNO3	173.08		X			0.05
0105 141544 HNO3	40.71		X			0.03
0106 151578 HNO3	40.52		170.86			0.32
0107 153018 HNO3	40.19		X			0.03
0108 158056 HNO3	2387.36		0.02			0.06
0109 159195 HNO3	34.31		X			0.03
0110 159202 HNO3	12.99		X			0.04
0111 159723 HNO3	63.52		X			0.03
0112 161028 HNO3	59.37		X			X
0113 161151 HNO3	22.70		0.23			0.02
0114 161162 HNO3	47.46		X			0.09
0115 143161 HNO3	64.64		X			0.02
0116 143201 HNO3	492.15		X			0.12
0117 143363 HNO3	56.17		2.65			0.22
0118 146309 HNO3	35.09		X			0.04
0119 148774 HNO3	26.37		0.02			0.02
0120 169688 HNO3	31.52		X			X



ELEMENTS	TotAlk	U	U	V	V	Zn
UNITS	mgCaCO3/L	ppm	ug/l	ppm	ug/l	ppm
DETECTION LIMIT	5	0.01	0.005	1	10	1
DIGEST		4A/	18Ws2/	4A/	18Ws2/	4A/
ANALYTICAL FINISH	/CALC	MS	MS	MS	MS	MS
SAMPLE NUMBERS						
0081 153018 Raw	26					
0082 158056 Raw	44					
0083 159195 Raw	40					
0084 159202 Raw	16					
0085 159723 Raw	18					
0086 161028 Raw	35					
0087 161151 Raw	29					
0088 161162 Raw	37					
0089 143161 Raw	125					
0090 143201 Raw	52					
0091 143363 Raw	X					
0092 146309 Raw	21					
0093 148774 Raw	48					
0094 169688 Raw	35					
0095 109481 HNO3			0.007		X	
0096 114213 HNO3			0.027		X	
0097 119975 HNO3			0.141		X	
0098 119988 HNO3			0.023		X	
0099 119991 HNO3			92.727		1998	
0100 125317 HNO3			0.022		X	
0101 127348 HNO3			0.174		X	
0102 138063 HNO3			0.009		X	
0103 140111 HNO3			0.064		X	
0104 140137 HNO3			0.196		X	
0105 141544 HNO3			2.987		144	
0106 151578 HNO3			125.232		284	
0107 153018 HNO3			0.030		X	
0108 158056 HNO3			0.959		X	
0109 159195 HNO3			0.025		X	
0110 159202 HNO3			0.010		X	
0111 159723 HNO3			0.033		X	
0112 161028 HNO3			0.035		X	
0113 161151 HNO3			0.656		X	
0114 161162 HNO3			0.012		X	
0115 143161 HNO3			0.508		X	
0116 143201 HNO3			0.199		X	
0117 143363 HNO3			8.137		X	
0118 146309 HNO3			0.012		X	
0119 148774 HNO3			0.087		X	
0120 169688 HNO3			0.018		X	



ELEMENTS	Zn
UNITS	ug/l
DETECTION LIMIT	10
DIGEST	18Ws2/
ANALYTICAL FINISH	MS
SAMPLE NUMBERS	

0081 153018 Raw

0082 158056 Raw

0083 159195 Raw

0084 159202 Raw

0085 159723 Raw

0086 161028 Raw

0087 161151 Raw

0088 161162 Raw

0089 143161 Raw

0090 143201 Raw

0091 143363 Raw

0092 146309 Raw

0093 148774 Raw

0094 169688 Raw

0095 109481 HNO3 20

0096 114213 HNO3 X

0097 119975 HNO3 X

0098 119988 HNO3 X

0099 119991 HNO3 2385

0100 125317 HNO3 X

0101 127348 HNO3 X

0102 138063 HNO3 X

0103 140111 HNO3 X

0104 140137 HNO3 X

0105 141544 HNO3 X

0106 151578 HNO3 24265

0107 153018 HNO3 X

0108 158056 HNO3 X

0109 159195 HNO3 X

0110 159202 HNO3 X

0111 159723 HNO3 X

0112 161028 HNO3 X

0113 161151 HNO3 X

0114 161162 HNO3 X

0115 143161 HNO3 X

0116 143201 HNO3 X

0117 143363 HNO3 85826

0118 146309 HNO3 X

0119 148774 HNO3 X

0120 169688 HNO3 X



ELEMENTS	Acidy	Ag	Ag	Al	Al	ANC
UNITS	mgCaCO3/L	ppm	ug/l	ppm	mg/l	kgH2SO4/t
DETECTION LIMIT	0.2	0.05	0.05	50	0.01	1
DIGEST	18Ws2/	4A/	18Ws2/	4A/	18Ws2/	ANCx/
ANALYTICAL FINISH	VOL	MS	MS	OE	OE	VOL
CHECKS						

0001 140111						5
0002 153091						1
0003 151274						
0004 114213						
0005 125317		0.21		5.58%		
0006 140111 HNO3			X		0.08	
0007 140111 Raw						

STANDARDS						
0001 GWS-4						
0002 GWS-4						
0003 GWS-4						
0004 NAG Std 3						
0005 NAG Std 3						
0006 GWS-4						
0007 GWS-4						
0008 GWS-4						
0009 GWS-4						
0010 GWS-4						
0011 ANC-5						
0012 GWS-4						
0013 OREAS 231		0.17		7.27%		
0014 AMIS0371						
0015 AMIS0342						
0016 ANC-5						100
0017 ANC-5						100
0018 ANC-5						98
0019 CRM-TMDW-500			1.84		0.12	

BLANKS						
0001 Control Blank						0
0002 Control Blank						0
0003 Control Blank						0
0004 Control Blank						
0005 Control Blank						
0006 Control Blank						
0007 Control Blank						
0008 Control Blank	1.8					
0009 Control Blank		X		X		
0010 Control Blank			X			



ELEMENTS	As	As	B	B	Ba	Ba
UNITS	ppm	ug/l	ppm	mg/l	ppm	ug/l
DETECTION LIMIT	0.5	0.05	50	0.01	0.1	0.05
DIGEST	4A/	18Ws2/	FP1/	18Ws2/	4A/	18Ws2/
ANALYTICAL FINISH	MS	MS	OE	OE	MS	MS
CHECKS						

0001 140111						
0002 153091						
0003 151274						
0004 114213						
0005 125317	37.2		60		299.5	
0006 140111 HNO3		0.42		0.07		0.57
0007 140111 Raw						

STANDARDS						
0001 GWS-4						
0002 GWS-4						
0003 GWS-4						
0004 NAG Std 3						
0005 NAG Std 3						
0006 GWS-4						
0007 GWS-4						
0008 GWS-4						
0009 GWS-4						
0010 GWS-4						
0011 ANC-5						
0012 GWS-4						
0013 OREAS 231	27.1				108.3	
0014 AMIS0371			X			
0015 AMIS0342						
0016 ANC-5						
0017 ANC-5						
0018 ANC-5						
0019 CRM-TMDW-500		81.35		X		48.99

BLANKS						
0001 Control Blank						
0002 Control Blank						
0003 Control Blank						
0004 Control Blank						
0005 Control Blank						
0006 Control Blank						
0007 Control Blank						
0008 Control Blank						
0009 Control Blank	X		X		X	
0010 Control Blank		X				0.06



ELEMENTS	Bi	Bi	CO3	Ca	Ca	Cd
UNITS	ppm	ug/l	mgCaCO3/L	ppm	mg/l	ppm
DETECTION LIMIT	0.01	0.01	1	50	0.01	0.02
DIGEST	4A/	18Ws2/	18Ws2/	4A/	18Ws2/	4A/
ANALYTICAL FINISH	MS	MS	VOL	OE	OE	MS
CHECKS						

0001 140111						
0002 153091						
0003 151274						
0004 114213						
0005 125317	0.61			1091		0.18
0006 140111 HNO3		X			1.61	
0007 140111 Raw			X			

STANDARDS						
0001 GWS-4						
0002 GWS-4						
0003 GWS-4						
0004 NAG Std 3						
0005 NAG Std 3						
0006 GWS-4						
0007 GWS-4						
0008 GWS-4						
0009 GWS-4						
0010 GWS-4						
0011 ANC-5						
0012 GWS-4			X			
0013 OREAS 231	0.03			7.37%		0.38
0014 AMIS0371						
0015 AMIS0342						
0016 ANC-5						
0017 ANC-5						
0018 ANC-5						
0019 CRM-TMDW-500		9.05			35.73	

BLANKS						
0001 Control Blank						
0002 Control Blank						
0003 Control Blank						
0004 Control Blank						
0005 Control Blank						
0006 Control Blank						
0007 Control Blank						
0008 Control Blank			X			
0009 Control Blank	X			X		X
0010 Control Blank		X				



ELEMENTS	Cd	Cl	Co	Co	ColourChange	Cr
UNITS	ug/l	mg/l	ppm	ug/l	NONE	ppm
DETECTION LIMIT	0.02	2	0.1	0.1	0	1
DIGEST	18Ws2/	18Ws2/	4A/	18Ws2/	ANCx/	4A/
ANALYTICAL FINISH	MS	COL	MS	MS	QUAL	MS
CHECKS						
0001 140111					No	
0002 153091					No	
0003 151274						
0004 114213						
0005 125317			15.4			192
0006 140111 HNO3	X			X		
0007 140111 Raw						
STANDARDS						
0001 GWS-4						
0002 GWS-4						
0003 GWS-4		32				
0004 NAG Std 3						
0005 NAG Std 3						
0006 GWS-4						
0007 GWS-4						
0008 GWS-4						
0009 GWS-4						
0010 GWS-4						
0011 ANC-5						
0012 GWS-4						
0013 OREAS 231			42.4			137
0014 AMIS0371						
0015 AMIS0342						
0016 ANC-5						
0017 ANC-5						
0018 ANC-5						
0019 CRM-TMDW-500	10.14			26.1		
BLANKS						
0001 Control Blank						
0002 Control Blank						
0003 Control Blank		X				
0004 Control Blank						
0005 Control Blank						
0006 Control Blank						
0007 Control Blank						
0008 Control Blank						
0009 Control Blank			X			X
0010 Control Blank	X			X		



ELEMENTS	Cr	Cu	Cu	EC	F	F
UNITS	ug/l	ppm	ug/l	mS/cm	ppm	mg/l
DETECTION LIMIT	10	0.5	10	0.01	50	0.1
DIGEST	18Ws2/	4A/	18Ws2/	18Ws2/	FC7/	18Ws2/
ANALYTICAL FINISH	MS	MS	MS	MTR	SIE	SIE
CHECKS						
0001 140111				0.11		
0002 153091				0.40		
0003 151274						
0004 114213						
0005 125317		76.0			657	
0006 140111 HNO3	X		X			
0007 140111 Raw				0.11		1.0
STANDARDS						
0001 GWS-4				0.34		
0002 GWS-4				0.34		
0003 GWS-4				0.34		
0004 NAG Std 3						
0005 NAG Std 3						
0006 GWS-4						
0007 GWS-4						
0008 GWS-4						
0009 GWS-4						
0010 GWS-4						
0011 ANC-5						
0012 GWS-4				0.34		0.6
0013 OREAS 231		158.0				
0014 AMIS0371						
0015 AMIS0342					1161	
0016 ANC-5						
0017 ANC-5						
0018 ANC-5						
0019 CRM-TMDW-500	20		21			
BLANKS						
0001 Control Blank				X		
0002 Control Blank				X		
0003 Control Blank				X		
0004 Control Blank						
0005 Control Blank						
0006 Control Blank						
0007 Control Blank						
0008 Control Blank				X		X
0009 Control Blank		X			X	
0010 Control Blank	X		X			



ELEMENTS	Fe	Fe	Fe-Rp1	Final-pH	Fizz-Rate	HCO3
UNITS	%	mg/l	%	NONE	NONE	mgCaCO3/L
DETECTION LIMIT	0.01	0.01	0.01	0.1	1	2
DIGEST	4A/	18Ws2/	4AH/	ANCx/	ANCx/	18Ws2/
ANALYTICAL FINISH	OE	OE	OE	MTR	QUAL	VOL
CHECKS						
0001 140111				1.7	X	
0002 153091				1.6	1	
0003 151274						
0004 114213						
0005 125317	11.57					
0006 140111 HNO3		0.49				
0007 140111 Raw						31
STANDARDS						
0001 GWS-4						
0002 GWS-4						
0003 GWS-4						
0004 NAG Std 3						
0005 NAG Std 3						
0006 GWS-4						
0007 GWS-4						
0008 GWS-4						
0009 GWS-4						
0010 GWS-4						
0011 ANC-5						
0012 GWS-4						96
0013 OREAS 231	8.25					
0014 AMIS0371						
0015 AMIS0342						
0016 ANC-5				1.8	1	
0017 ANC-5				1.8		
0018 ANC-5				1.7		
0019 CRM-TMDW-500		0.11				
BLANKS						
0001 Control Blank				1.5		
0002 Control Blank				1.5		
0003 Control Blank				1.5		
0004 Control Blank						
0005 Control Blank						
0006 Control Blank						
0007 Control Blank						
0008 Control Blank						3
0009 Control Blank	X					
0010 Control Blank						



ELEMENTS	Hg	K	K	Mg	Mg	Mn
UNITS	ug/l	ppm	mg/l	ppm	mg/l	ppm
DETECTION LIMIT	0.1	20	0.1	20	0.01	1
DIGEST	18Ws2/	4A/	18Ws2/	4A/	18Ws2/	4A/
ANALYTICAL FINISH	MS	OE	OE	OE	OE	MS
CHECKS						

0001 140111						
0002 153091						
0003 151274						
0004 114213						
0005 125317		1.71%		3496		391
0006 140111 HNO3	X		4.5		1.17	
0007 140111 Raw						

STANDARDS						
0001 GWS-4						
0002 GWS-4						
0003 GWS-4						
0004 NAG Std 3						
0005 NAG Std 3						
0006 GWS-4						
0007 GWS-4						
0008 GWS-4						
0009 GWS-4						
0010 GWS-4						
0011 ANC-5						
0012 GWS-4						
0013 OREAS 231		2912		3.86%		1356
0014 AMIS0371						
0015 AMIS0342						
0016 ANC-5						
0017 ANC-5						
0018 ANC-5						
0019 CRM-TMDW-500	X		2.5		9.15	

BLANKS						
0001 Control Blank						
0002 Control Blank						
0003 Control Blank						
0004 Control Blank						
0005 Control Blank						
0006 Control Blank						
0007 Control Blank						
0008 Control Blank						
0009 Control Blank		X		X		X
0010 Control Blank	X					



ELEMENTS	Mn	Mn-Rp1	Mo	Mo	Na	Na
UNITS	ug/l	ppm	ppm	ug/l	ppm	mg/l
DETECTION LIMIT	10	10	0.1	0.05	20	0.1
DIGEST	18Ws2/	4AH/	4A/	18Ws2/	4A/	18Ws2/
ANALYTICAL FINISH	MS	OE	MS	MS	OE	OE
CHECKS						

0001 140111						
0002 153091						
0003 151274						
0004 114213						
0005 125317			2.1		342	
0006 140111 HNO3	32			0.11		15.7
0007 140111 Raw						

STANDARDS						
0001 GWS-4						
0002 GWS-4						
0003 GWS-4						
0004 NAG Std 3						
0005 NAG Std 3						
0006 GWS-4						
0007 GWS-4						
0008 GWS-4						
0009 GWS-4						
0010 GWS-4						
0011 ANC-5						
0012 GWS-4						
0013 OREAS 231			0.8		1.77%	
0014 AMIS0371						
0015 AMIS0342						
0016 ANC-5						
0017 ANC-5						
0018 ANC-5						
0019 CRM-TMDW-500	41			101.56		6.2

BLANKS						
0001 Control Blank						
0002 Control Blank						
0003 Control Blank						
0004 Control Blank						
0005 Control Blank						
0006 Control Blank						
0007 Control Blank						
0008 Control Blank						
0009 Control Blank			X		X	
0010 Control Blank	X			X		



ELEMENTS	NAG	NAGpH	NAG(4.5)	Ni	Ni	OH
UNITS	kgH2SO4/t	NONE	kgH2SO4/t	ppm	ug/l	mgCaCO3/L
DETECTION LIMIT	1	0.1	1	0.5	10	1
DIGEST	NAGx/	NAGx/	NAGx/	4A/	18Ws2/	18Ws2/
ANALYTICAL FINISH	VOL	MTR	VOL	MS	MS	VOL
CHECKS						

0001 140111						
0002 153091						
0003 151274	0	6.9	0			
0004 114213						
0005 125317				70.4		
0006 140111 HNO3					X	
0007 140111 Raw						X

STANDARDS						
0001 GWS-4						
0002 GWS-4						
0003 GWS-4						
0004 NAG Std 3	24	2.6	18			
0005 NAG Std 3	24	2.5	18			
0006 GWS-4						
0007 GWS-4						
0008 GWS-4						
0009 GWS-4						
0010 GWS-4						
0011 ANC-5						
0012 GWS-4						X
0013 OREAS 231				86.9		
0014 AMIS0371						
0015 AMIS0342						
0016 ANC-5						
0017 ANC-5						
0018 ANC-5						
0019 CRM-TMDW-500					61	

BLANKS						
0001 Control Blank						
0002 Control Blank						
0003 Control Blank						
0004 Control Blank						
0005 Control Blank						
0006 Control Blank	6	4.9	0			
0007 Control Blank	6	5.1	0			
0008 Control Blank						X
0009 Control Blank				X		
0010 Control Blank					X	



ELEMENTS	P	P	Pb	Pb	ABCC	ANCslurry
UNITS	ppm	ug/l	ppm	ug/l	kgH2SO4/t	NONE
DETECTION LIMIT	20	10	0.5	0.2	1	0.1
DIGEST	4A/	18Ws2/	4A/	18Ws2/		ANCx/
ANALYTICAL FINISH	MS	MS	MS	MS	/VOL	MTR
CHECKS						
0001 140111						1.71
0002 153091						1.57
0003 151274						
0004 114213					7	
0005 125317	310		25.4			
0006 140111 HNO3		X		0.6		
0007 140111 Raw						
STANDARDS						
0001 GWS-4						
0002 GWS-4						
0003 GWS-4						
0004 NAG Std 3						
0005 NAG Std 3						
0006 GWS-4						
0007 GWS-4						
0008 GWS-4						
0009 GWS-4						
0010 GWS-4						
0011 ANC-5					96	
0012 GWS-4						
0013 OREAS 231	390		12.5			
0014 AMIS0371						
0015 AMIS0342						
0016 ANC-5						1.83
0017 ANC-5						1.82
0018 ANC-5						1.72
0019 CRM-TMDW-500		X		39.3		
BLANKS						
0001 Control Blank						1.50
0002 Control Blank						1.45
0003 Control Blank						1.46
0004 Control Blank						
0005 Control Blank						
0006 Control Blank						
0007 Control Blank						
0008 Control Blank						
0009 Control Blank	X		X			
0010 Control Blank		X		X		



ELEMENTS	pH	pH Drop	S	S	Sb	Sb
UNITS	NONE	NONE	ppm	mg/l	ppm	ug/l
DETECTION LIMIT	0.1	0.1	50	0.1	0.05	0.05
DIGEST	18Ws2/	ANCx/	4A/	18Ws2/	4A/	18Ws2/
ANALYTICAL FINISH	MTR	MTR	OE	OE	MS	MS
CHECKS						
0001 140111	7.6	4.7				
0002 153091	6.9	3.7				
0003 151274						
0004 114213						
0005 125317			1519		2.24	
0006 140111 HNO3				4.7		0.14
0007 140111 Raw	7.6			4.7		
STANDARDS						
0001 GWS-4	8.4					
0002 GWS-4	8.5					
0003 GWS-4	8.5					
0004 NAG Std 3						
0005 NAG Std 3						
0006 GWS-4						
0007 GWS-4						
0008 GWS-4						
0009 GWS-4						
0010 GWS-4						
0011 ANC-5						
0012 GWS-4	8.4					
0013 OREAS 231			2198		0.69	
0014 AMIS0371						
0015 AMIS0342						
0016 ANC-5						
0017 ANC-5						
0018 ANC-5						
0019 CRM-TMDW-500				X		9.95
BLANKS						
0001 Control Blank	5.6					
0002 Control Blank	5.6					
0003 Control Blank	5.6					
0004 Control Blank						
0005 Control Blank						
0006 Control Blank						
0007 Control Blank						
0008 Control Blank	5.6			X		
0009 Control Blank			X		X	
0010 Control Blank				X		X



ELEMENTS	Se	Si	Si	Sn	Sn	Sr
UNITS	ug/l	%	mg/l	ppm	ug/l	ppm
DETECTION LIMIT	0.5	0.1	0.05	0.1	0.1	0.05
DIGEST	18Ws2/	FP1/	18Ws2/	4A/	18Ws2/	4A/
ANALYTICAL FINISH	MS	OE	OE	MS	MS	MS
CHECKS						

0001 140111						
0002 153091						
0003 151274						
0004 114213						
0005 125317		29.5		2.7		39.93
0006 140111 HNO3	X		9.45		X	
0007 140111 Raw						

STANDARDS						
0001 GWS-4						
0002 GWS-4						
0003 GWS-4						
0004 NAG Std 3						
0005 NAG Std 3						
0006 GWS-4						
0007 GWS-4						
0008 GWS-4						
0009 GWS-4						
0010 GWS-4						
0011 ANC-5						
0012 GWS-4						
0013 OREAS 231				0.8		170.40
0014 AMIS0371		6.6				
0015 AMIS0342						
0016 ANC-5						
0017 ANC-5						
0018 ANC-5						
0019 CRM-TMDW-500	10.6		X		X	

BLANKS						
0001 Control Blank						
0002 Control Blank						
0003 Control Blank						
0004 Control Blank						
0005 Control Blank						
0006 Control Blank						
0007 Control Blank						
0008 Control Blank						
0009 Control Blank		X		X		X
0010 Control Blank	X				X	



ELEMENTS	Sr	Th	Th	Ti	Tl	Tl
UNITS	ug/l	ppm	ug/l	ppm	ppm	ug/l
DETECTION LIMIT	0.02	0.01	0.01	5	0.02	0.01
DIGEST	18Ws2/	4A/	18Ws2/	4A/	4A/	18Ws2/
ANALYTICAL FINISH	MS	MS	MS	OE	MS	MS
CHECKS						

0001 140111						
0002 153091						
0003 151274						
0004 114213						
0005 125317		8.55		3383	0.77	
0006 140111 HNO3	4.04		0.10			X
0007 140111 Raw						

STANDARDS						
0001 GWS-4						
0002 GWS-4						
0003 GWS-4						
0004 NAG Std 3						
0005 NAG Std 3						
0006 GWS-4						
0007 GWS-4						
0008 GWS-4						
0009 GWS-4						
0010 GWS-4						
0011 ANC-5						
0012 GWS-4						
0013 OREAS 231		0.66		6297	0.12	
0014 AMIS0371						
0015 AMIS0342						
0016 ANC-5						
0017 ANC-5						
0018 ANC-5						
0019 CRM-TMDW-500	247.92		0.05			9.88

BLANKS						
0001 Control Blank						
0002 Control Blank						
0003 Control Blank						
0004 Control Blank						
0005 Control Blank						
0006 Control Blank						
0007 Control Blank						
0008 Control Blank						
0009 Control Blank		X		X	X	
0010 Control Blank	X		X			X



ELEMENTS	TotAlk	U	U	V	V	Zn
UNITS	mgCaCO3/L	ppm	ug/l	ppm	ug/l	ppm
DETECTION LIMIT	5	0.01	0.005	1	10	1
DIGEST		4A/	18Ws2/	4A/	18Ws2/	4A/
ANALYTICAL FINISH	/CALC	MS	MS	MS	MS	MS
CHECKS						
0001 140111						
0002 153091						
0003 151274						
0004 114213						
0005 125317		2.04		147		94
0006 140111 HNO3			0.064		X	
0007 140111 Raw						
STANDARDS						
0001 GWS-4						
0002 GWS-4						
0003 GWS-4						
0004 NAG Std 3						
0005 NAG Std 3						
0006 GWS-4	96					
0007 GWS-4	96					
0008 GWS-4	96					
0009 GWS-4	96					
0010 GWS-4	96					
0011 ANC-5						
0012 GWS-4						
0013 OREAS 231		0.19		281		110
0014 AMIS0371						
0015 AMIS0342						
0016 ANC-5						
0017 ANC-5						
0018 ANC-5						
0019 CRM-TMDW-500			9.743		32	
BLANKS						
0001 Control Blank	X					
0002 Control Blank	X					
0003 Control Blank	X					
0004 Control Blank	X					
0005 Control Blank	X					
0006 Control Blank						
0007 Control Blank						
0008 Control Blank						
0009 Control Blank		X		X		X
0010 Control Blank			X		X	



ELEMENTS	Zn
UNITS	ug/l
DETECTION LIMIT	10
DIGEST	18Ws2/
ANALYTICAL FINISH	MS

CHECKS

0001 140111

0002 153091

0003 151274

0004 114213

0005 125317

0006 140111 HNO3 X

0007 140111 Raw

STANDARDS

0001 GWS-4

0002 GWS-4

0003 GWS-4

0004 NAG Std 3

0005 NAG Std 3

0006 GWS-4

0007 GWS-4

0008 GWS-4

0009 GWS-4

0010 GWS-4

0011 ANC-5

0012 GWS-4

0013 OREAS 231

0014 AMIS0371

0015 AMIS0342

0016 ANC-5

0017 ANC-5

0018 ANC-5

0019 CRM-TMDW-500 72

BLANKS

0001 Control Blank

0002 Control Blank

0003 Control Blank

0004 Control Blank

0005 Control Blank

0006 Control Blank

0007 Control Blank

0008 Control Blank

0009 Control Blank

0010 Control Blank X



ELEMENTS	Acidy	Ag	Ag	Al	Al	ANC
UNITS	mgCaCO3/L	ppm	ug/l	ppm	mg/l	kgH2SO4/t
DETECTION LIMIT	0.2	0.05	0.05	50	0.01	1
DIGEST	18Ws2/	4A/	18Ws2/	4A/	18Ws2/	ANCx/
ANALYTICAL FINISH	VOL	MS	MS	OE	OE	VOL



ELEMENTS	As	As	B	B	Ba	Ba
UNITS	ppm	ug/l	ppm	mg/l	ppm	ug/l
DETECTION LIMIT	0.5	0.05	50	0.01	0.1	0.05
DIGEST	4A/	18Ws2/	FP1/	18Ws2/	4A/	18Ws2/
ANALYTICAL FINISH	MS	MS	OE	OE	MS	MS



ELEMENTS	Bi	Bi	CO3	Ca	Ca	Cd
UNITS	ppm	ug/l	mgCaCO3/L	ppm	mg/l	ppm
DETECTION LIMIT	0.01	0.01	1	50	0.01	0.02
DIGEST	4A/	18Ws2/	18Ws2/	4A/	18Ws2/	4A/
ANALYTICAL FINISH	MS	MS	VOL	OE	OE	MS



ELEMENTS	Cd	Cl	Co	Co	ColourChange	Cr
UNITS	ug/l	mg/l	ppm	ug/l	NONE	ppm
DETECTION LIMIT	0.02	2	0.1	0.1	0	1
DIGEST	18Ws2/	18Ws2/	4A/	18Ws2/	ANCx/	4A/
ANALYTICAL FINISH	MS	COL	MS	MS	QUAL	MS



ELEMENTS	Cr	Cu	Cu	EC	F	F
UNITS	ug/l	ppm	ug/l	mS/cm	ppm	mg/l
DETECTION LIMIT	10	0.5	10	0.01	50	0.1
DIGEST	18Ws2/	4A/	18Ws2/	18Ws2/	FC7/	18Ws2/
ANALYTICAL FINISH	MS	MS	MS	MTR	SIE	SIE



ELEMENTS	Fe	Fe	Fe-Rp1	Final-pH	Fizz-Rate	HCO3
UNITS	%	mg/l	%	NONE	NONE	mgCaCO3/L
DETECTION LIMIT	0.01	0.01	0.01	0.1	1	2
DIGEST	4A/	18Ws2/	4AH/	ANCx/	ANCx/	18Ws2/
ANALYTICAL FINISH	OE	OE	OE	MTR	QUAL	VOL



ELEMENTS	Hg	K	K	Mg	Mg	Mn
UNITS	ug/l	ppm	mg/l	ppm	mg/l	ppm
DETECTION LIMIT	0.1	20	0.1	20	0.01	1
DIGEST	18Ws2/	4A/	18Ws2/	4A/	18Ws2/	4A/
ANALYTICAL FINISH	MS	OE	OE	OE	OE	MS



ELEMENTS	Mn	Mn-Rp1	Mo	Mo	Na	Na
UNITS	ug/l	ppm	ppm	ug/l	ppm	mg/l
DETECTION LIMIT	10	10	0.1	0.05	20	0.1
DIGEST	18Ws2/	4AH/	4A/	18Ws2/	4A/	18Ws2/
ANALYTICAL FINISH	MS	OE	MS	MS	OE	OE



ELEMENTS	NAG	NAGpH	NAG(4.5)	Ni	Ni	OH
UNITS	kgH2SO4/t	NONE	kgH2SO4/t	ppm	ug/l	mgCaCO3/L
DETECTION LIMIT	1	0.1	1	0.5	10	1
DIGEST	NAGx/	NAGx/	NAGx/	4A/	18Ws2/	18Ws2/
ANALYTICAL FINISH	VOL	MTR	VOL	MS	MS	VOL



ELEMENTS	P	P	Pb	Pb	ABCC	ANCslurry
UNITS	ppm	ug/l	ppm	ug/l	kgH2SO4/t	NONE
DETECTION LIMIT	20	10	0.5	0.2	1	0.1
DIGEST	4A/	18Ws2/	4A/	18Ws2/		ANCx/
ANALYTICAL FINISH	MS	MS	MS	MS	/VOL	MTR



ELEMENTS	pH	pH Drop	S	S	Sb	Sb
UNITS	NONE	NONE	ppm	mg/l	ppm	ug/l
DETECTION LIMIT	0.1	0.1	50	0.1	0.05	0.05
DIGEST	18Ws2/	ANCx/	4A/	18Ws2/	4A/	18Ws2/
ANALYTICAL FINISH	MTR	MTR	OE	OE	MS	MS



ELEMENTS	Se	Si	Si	Sn	Sn	Sr
UNITS	ug/l	%	mg/l	ppm	ug/l	ppm
DETECTION LIMIT	0.5	0.1	0.05	0.1	0.1	0.05
DIGEST	18Ws2/	FP1/	18Ws2/	4A/	18Ws2/	4A/
ANALYTICAL FINISH	MS	OE	OE	MS	MS	MS



ELEMENTS	Sr	Th	Th	Ti	Tl	Tl
UNITS	ug/l	ppm	ug/l	ppm	ppm	ug/l
DETECTION LIMIT	0.02	0.01	0.01	5	0.02	0.01
DIGEST	18Ws2/	4A/	18Ws2/	4A/	4A/	18Ws2/
ANALYTICAL FINISH	MS	MS	MS	OE	MS	MS



ELEMENTS	TotAlk	U	U	V	V	Zn
UNITS	mgCaCO3/L	ppm	ug/l	ppm	ug/l	ppm
DETECTION LIMIT	5	0.01	0.005	1	10	1
DIGEST		4A/	18Ws2/	4A/	18Ws2/	4A/
ANALYTICAL FINISH	/CALC	MS	MS	MS	MS	MS



ELEMENTS	Zn
UNITS	ug/l
DETECTION LIMIT	10
DIGEST	18Ws2/
ANALYTICAL FINISH	MS



METHOD CODE DESCRIPTION

Method Code Date Tested	Analysing Laboratory NATA Laboratory Accreditation	NATA Scope of Accreditation
/CALC 24/05/22 15:30	Intertek Genalysis Perth 3244 3237	* No digestion or other pre-treatment undertaken. Results Determined by calculation from other reported data.
/VOL 24/05/22 08:55	Intertek Genalysis Perth 3244 3237	* No digestion or other pre-treatment undertaken. Analysed by Volumetric Technique.
18Ws2/COL 28/04/22 23:30	Intertek Genalysis Perth 3244 3237	18hr Water Extraction using a sample:water ratio of 1:2. Analysed by Inductively Coupled Plasma UV-Visible Spectrometry
18Ws2/MS 28/04/22 23:30	Intertek Genalysis Perth 3244 3237	18hr Water Extraction using a sample:water ratio of 1:2. Analysed by Inductively Coupled Plasma Mass Spectrometry.
18Ws2/MTR 28/04/22 23:30	Intertek Genalysis Perth 3244 3237	18hr Water Extraction using a sample:water ratio of 1:2. Analysed with Electronic Meter Measurement
18Ws2/OE 28/04/22 23:30	Intertek Genalysis Perth 3244 3237	18hr Water Extraction using a sample:water ratio of 1:2. Analysed by Inductively Coupled Plasma Optical (Atomic) Emission Spectrometry.
18Ws2/SIE 28/04/22 23:30	Intertek Genalysis Perth 3244 3237	18hr Water Extraction using a sample:water ratio of 1:2. Analysed by Specific Ion Electrode.
18Ws2/VOL 28/04/22 23:30	Intertek Genalysis Perth 3244 3237	18hr Water Extraction using a sample:water ratio of 1:2. Analysed by Inductively Coupled Plasma Volumetric Technique

METHOD CODE DESCRIPTION

Method Code Date Tested	Analysing Laboratory NATA Laboratory Accreditation	NATA Scope of Accreditation
4A/MS 28/04/22 23:29	Intertek Genalysis Perth 3244 3237	MPL_W002, MS_IM_001(Per), *(AdI) Multi-acid digest including Hydrofluoric, Nitric, Perchloric and Hydrochloric acids in Teflon Tubes. Analysed by Inductively Coupled Plasma Mass Spectrometry.
4A/OE 28/04/22 23:29	Intertek Genalysis Perth 3244 3237	MPL_W002, ICP_IM_001(Per), *(AdI) Multi-acid digest including Hydrofluoric, Nitric, Perchloric and Hydrochloric acids in Teflon Tubes. Analysed by Inductively Coupled Plasma Optical (Atomic) Emission Spectrometry.
ANCx/MTR 16/05/22 07:59	Intertek Genalysis Perth 3244 3237	ENV_W035 Acid Neutralizing Capacity Digestion Procedure. Analysed with Electronic Meter Measurement
ANCx/QUAL 16/05/22 07:59	Intertek Genalysis Perth 3244 3237	ENV_W035 Acid Neutralizing Capacity Digestion Procedure. Analysed by Qualitative Inspection
ANCx/VOL 16/05/22 07:59	Intertek Genalysis Perth 3244 3237	ENV_W035 Acid Neutralizing Capacity Digestion Procedure. Analysed by Volumetric Technique.
FC7/SIE 29/04/22 08:02	Intertek Genalysis Perth 3244 3237	ENV_W012 Alkaline fusion (Nickel crucible) specific for Fluorine. Analysed by Specific Ion Electrode.
FP1/OE 28/04/22 23:25	Intertek Genalysis Perth 3244 3237	MPL_W011, MS_IM_001 Sodium peroxide fusion (Zirconia crucibles) and Hydrochloric acid to dissolve the melt. Analysed by Inductively Coupled Plasma Optical (Atomic) Emission Spectrometry.
NAGx/MTR 02/05/22 10:38	Intertek Genalysis Perth 3244 3237	ENV_W036 Net Acid Generation Extraction of samples with H2O2 Analysed with Electronic Meter Measurement

METHOD CODE DESCRIPTION

Method Code	Analysing Laboratory	NATA Scope of Accreditation
Date Tested	NATA Laboratory Accreditation	
NAGx/VOL	Intertek Genalysis Perth	ENV_W036
02/05/22 10:38	3244 3237	
	Net Acid Generation Extraction of samples with H2O2 Analysed by Volumetric Technique.	

* Denotes not on Scope of Accreditation

The contents of this report have been prepared in accordance with the terms of NATA accreditation and as such should only be reproduced in full.

The analysis results reported herein have been obtained using the following methods and conditions:

Job: 1960/2205152

Project: MULGA EAST WASTE CHARACTERISATION

Rev1: Amendments for ANC+ method

SAMPLES:

68 composite sample were received on 8/3/22 from existing job 1960/2128597.

SAMPLE PREPARATION:

Water extract was performed on -2mm sieved samples and prepared using a sample:water ratio of 1:2 w/v and an 18hr bottle rolling time (18Ws2/). Bottles were left to settle for 1 day and the supernatant then decanted off the top and filtered (0.2 µm membrane).

ANALYSES

The composite samples underwent solid analyses and water extraction subsequently analysed for the following:

Solids

- 4A/MS samples were analysed for Ag, As, Ba, Bi, Cd, Co, Cr, Cu, Mn, Mo, Ni, P, Pb, Sb, Sn, Sr, Th, Tl, U, V and Zn
- 4A/OE samples were analysed for Al, Ca, Fe, K, Mg, Na, S and Ti
- 4AH/OE samples were analysed for Fe, Mn
- FP1/OE samples were analysed for B and Si
- Fluoride analysis was performed by carbonate fusion and dissolution (FC7/) and read by selective ion electrode (/SIE)
- Acid Neutralising Capacity (ANC+) in accordance with a modified AMIRA protocol. The test work was performed on -2mm sieved samples, whereas the fizz rating on pulped samples. The HCl digestion was conducted for 2hrs at 80-90°C, followed by measurement of the Slurry-pH (ANC slurry). The allowance range of Final pH after digestion was pH 0.8 – 4.
- Net Acid Generation (NAGx/) by hydrogen peroxide oxidation, followed by titration with NaOH. NAG digests are undertaken at 150 °C (1hr) and 250 °C (1hr).
- Acid Buffering Characteristic Curve (ABCC) by titration with HCl to pH 2.5, following AMIRA protocol.

Water Extracts

- 18Ws2/MS samples were analysed for Ag, As, Ba, Bi, Cd, Co, Cr, Cu, Hg, Mn, Mo, Ni, P, Pb, Sb, Se, Sn, Sr, Th, Tl, U, V and Zn
- 18Ws2/OE samples were analysed for Al, B, Ca, Fe, K, Mg, Na, S and Si

- 18Ws2/ samples were analysed for: forms of Alkalinity, Acidity, Chloride, EC, Fluoride, pH.

DIGESTIONS:

- MPL_W002 (4A/), MPL_W003 (4AH/), MPL_W011 (FP1/), ENV_W036 (NAGx/), W012 (FC7/SIE), ANC+/ (Modified AMIRA ANC, following client's requests) and ABCC/ (Reference: ARD Test Handbook, AMIRA International, May 2002)

ANALYTICAL FINISHES:

- Metals by MS_IM_001 (/MS), ICP_IM_001 (/OE)
- Alkalinity forms were determined by titration, expressed in units of mg(CaCO₃)/L by method ENV_W007
- Acidity was determined on samples with pH ≤5.0 to pH 8.3, expressed in units of mg(CaCO₃)/L by method ENV_W008
- pH and Electrical Conductivity (EC) were read by metered instrumentation using the respective method codes ENV_W001 and ENV_W002
- Chloride was read by UV-Vis spectrophotometric (/COL) method code ENV_W013
- Fluoride in solution was read by ion selective electrode using method number ENV_W011

OBSERVATIONS:

Fe, Mn results that were over range for 4A were reanalysed by 4AH/OE.

Acidity was performed only on 18Ws2 extract of samples with pH<5 (119991, 151578, and 143363).

18Ws2 extract of sample 119975, 119991, 140111, 151578, 161151, and 148774 displayed a yellow/orange colouration after filtration (0.45µm).

Chloride concentration in 18Ws2 extracts was too low to be analysed by titration (/VOL). Colourimetric method was used instead (/COL).

Applied HCl loading equivalents

mL 0.5M HCl ANC Kg(H₂SO₄)/tonne

<i>4</i>	<i>50</i>
<i>8</i>	<i>100</i>
<i>20</i>	<i>250</i>
<i>40</i>	<i>500</i>
<i>60</i>	<i>750</i>

RESULTS:

Results are expressed in units: $\mu\text{g/L}$ (18Ws2/MS), mg/L (18Ws2/: OE, Cl, F), ppm (4A/MS, 4A/OE, FP1/OE, FC7/SIE), % (FP1/OE, 4A/OE), $\text{mg}(\text{CaCO}_3)/\text{L}$ (18Ws2/: alkalinity, acidity), mS/cm (EC), pH unit (pH), $\text{KgH}_2\text{SO}_4/\text{t}$ (ANC/, NAGx/, ABCC/).

The results included the assay of blanks and international reference standards: CRM-TMDW-500 (18Ws2/MS, 18Ws2/OE), ICP-MS-68B-A (18Ws2/MS), ICP-AM-MISA6 (18Ws2/OE), CCV-1-B-500 (18Ws2/OE), OREAS 231 (4A), AMIS0371 (FP1), AMIS0342 (FC7/SIE) and in-house standards: ANC-5 (ANC/, ABCC/), NAG std-3 (NAGx/), GWS-4 (18Ws2/: EC, pH, Cl, F, alkalinity), Acidity std-4 (18Ws2/acidity)

Intertek Genalysis signatory

Chiara CAPORALE



Date: 26-May-2022



Southern Cross University
 PO Box 157 Lismore NSW 2480
 P: +61 2 6620 3678
 E: eal@scu.edu.au
 www.scu.edu.au/eal
 ABN: 41 995 651 524

Sample Receipt Notification (SRN)

Project: **EAL/M7551**
 Customer: Mine Earth Unit Trust
 Contact: Glendon Wesley
 Client Job ID: Project Mulga East MLE-2104
 No. of Samples: 31 x Soil
 Date Received: 08 APR 2022
 Comments: Standard Request

Billor: **Mine Earth Unit Trust - Glendon Wesley**

Page 1 of 5

Sample Text ID	Client Sample ID	Test Request			
		Admin Batch Charge	Hotblock Digest	CRS	General Metals - ICPMS - S
M7551/001	125317	1	1	1	1
M7551/002	161138	0	1	1	1
M7551/003	150700	0	1	1	1



Sample Receipt Notification (SRN) for EAL/M7551

Page 2 of 5

		ADMIN	SS-PREP-002	SS-SING-088	SS-SING-132
		Admin Batch Charge	Hotblock Digest	CRS	General Metals - ICPMS - S
M7551/004	114686	0	1	1	1
M7551/005	147794	0	1	1	1
M7551/006	158056	0	1	1	1
M7551/007	127348	0	1	1	1
M7551/008	153018	0	1	1	1
M7551/009	159723	0	1	1	1
M7551/010	151274	0	1	1	1
M7551/011	125353	0	1	1	1
M7551/012	148774	0	1	1	1
M7551/013	146309	0	1	1	1

Sample Receipt Notification (SRN)

for EAL/M7551

Page 3 of 5

		ADMIN	SS-PREP-002	SS-SING-088	SS-SING-132
		Admin Batch Charge	Hotblock Digest	CRS	General Metals - ICPMS - S
M7551/014	117123	0	1	1	1
M7551/015	150090	0	1	1	1
M7551/016	159185	0	1	1	1
M7551/017	140137	0	1	1	1
M7551/018	114213	0	1	1	1
M7551/019	143324	0	1	1	1
M7551/020	119988	0	1	1	1
M7551/021	154937	0	1	1	1
M7551/022	150088	0	1	1	1
M7551/023	117023	0	1	1	1

Sample Receipt Notification (SRN) for EAL/M7551

Page 4 of 5

		ADMIN	SS-PREP-002	SS-SING-088	SS-SING-132
		Admin Batch Charge	Hotblock Digest	CRS	General Metals - ICPMS - S
M7551/024	150095	0	1	1	1
M7551/025	151575	0	1	1	1
M7551/026	143201	0	1	1	1
M7551/027	143199	0	1	1	1
M7551/028	109481	0	1	1	1
M7551/029	143363	0	1	1	1
M7551/030	151578	0	1	1	1
M7551/031	119991	0	1	1	1
Total		1	31	31	31

Sample Receipt Notification (SRN) for EAL/M7551

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Test Descriptions

Test List Item	Item Description
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ADMIN	Admin Batch Charge
-------	--------------------

SS-PREP-002	Hotblock Digest
-------------	-----------------

Includes total Aqua-Regia or Nitric Acid digestion of solid samples.

SS-SING-088	CRS
-------------	-----

SS-SING-132	General Metals - ICPMS
-------------	------------------------

S

CHAIN OF CUSTODY AND ANALYTICAL REQUEST RECORD

	Unit 1, 94 Forsyth St O'Connor, WA, 6163 Ph: +61 8 9431 7318	Project: Mulga East Reference: MLE-2104 Date: 24 March 2022
	Mine Earth Contact: Glendon Wesley / Julia Heide Email: glendon@mineearth.com.au julia@mineearth.com	

Laboratory: Environmental Analytical Laboratory Address: Southern Cross University, Lismore Campus Military Rd, East Lismore NSW 2480	Contact: Nadia Toppler Email: nadia.toppler@scu.edu.au
---	---

Sample Preparation:	Sampled By: Mine Earth
Samples delivered as pulps (-75µm nominal)	

Analysis Requested										
DD = Diamond RC = Reverse Circ AC = Air Core GB = Grab/Field CP = Coarse/Pulp	Sample Type	Sample Total	Cr-Reducible Sulphur	35-51% 0.88	CRS					
SampleID								Total S %	35-51% 0.88	Notes
✓ 1 125317	CP	1	X					0.14		
✓ 2 161138	CP	1	X					0.15		
✓ 3 150700	CP	1	X					0.15		
✓ 4 114686	CP	1	X					0.17		
✓ 5 147794	CP	1	X					0.21		
✓ 6 158056	CP	1	X					0.24		
✓ 7 127348	CP	1	X					0.25		
✓ 8 153018	CP	1	X					0.26		
✓ 9 159723	CP	1	X					0.29		
✓ 10 151274	CP	1	X					0.31		
✓ 11 125353	CP	1	X					0.34		
✓ 12 148774	CP	1	X					0.34		
✓ 13 146309	CP	1	X					0.37		
✓ 14 117123	CP	1	X					0.38		
✓ 15 150090	CP	1	X					0.39		
✓ 16 159185	CP	1	X					0.39		
✓ 17 140137	CP	1	X					0.43		
✓ 18 114213	CP	1	X					0.49		
✓ 19 143324	CP	1	X					0.5		
✓ 20 119988	CP	1	X					0.54		
✓ 21 154937	CP	1	X					0.75		
✓ 22 150088	CP	1	X					0.83		
✓ 23 117023	CP	1	X					0.92		
✓ 24 150095	CP	1	X					0.97		
✓ 25 151575	CP	1	X					1		
✓ 26 143201	CP	1	X					1.19		
✓ 27 143199	CP	1	X					1.68		
✓ 28 109481	CP	1	X					2.07		
✓ 29 143363	CP	1	X					3.46		
✓ 30 151578	CP	1	X					4.21		
✓ 31 119991	CP	1	X					7.65		
Total		31								

Relinquished by: Mine Earth / Express Post	Date Despatched: 25-Mar-22	Retention:
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Comments:

M7551
XBI soil
MB 8.4.22.

RESULTS OF PULPS ANALYSIS

31 samples supplied by Mine Earth Unit Trust on 8/04/2022. Lab Job No. M7551
 Samples submitted by Glendon Wesley. Your Job: Project Mulga East MLE-2104
 PO Box 404 FREMANTLE WA 6959

Sample Identification	EAL Lab Code	Chromium Reducible Sulfur
		(% S _{cr})
Method Info.		(In-house method S20)
125317	M7551/1	0.010
161138	M7551/2	0.002
150700	M7551/3	0.001
114686	M7551/4	0.146
147794	M7551/5	0.005
158056	M7551/6	0.008
127348	M7551/7	0.237
153018	M7551/8	0.009
159723	M7551/9	0.010
151274	M7551/10	0.008
125353	M7551/11	0.287
148774	M7551/12	0.008
146309	M7551/13	0.010
117123	M7551/14	0.311
150090	M7551/15	0.002
159185	M7551/16	0.005
140137	M7551/17	0.331
114213	M7551/18	0.388
143324	M7551/19	0.008
119988	M7551/20	0.002
154937	M7551/21	0.592
150088	M7551/22	0.002
117023	M7551/23	0.728
150095	M7551/24	0.002
151575	M7551/25	0.282
143201	M7551/26	1.002
143199	M7551/27	1.500
109481	M7551/28	1.867
143363	M7551/29	2.552
151578	M7551/30	2.788
119991	M7551/31	4.686



Notes:

1. ppm = mg/Kg dried sample
2. All results as dry weight DW - samples were dried at 40oC for 24-48hrs prior to crushing and analysis.
3. Methods from Rayment and Lyons, Soil Chemical Methods - Australasia
4. Analysis conducted between sample arrival date and reporting date.
5. ** NATA accreditation does not cover the performance of this service.
6. .. Denotes not requested.
7. This report is not to be reproduced except in full.
8. All services undertaken by EAL are covered by the EAL Laboratory Services Terms and Conditions (refer scu.edu.au/eal/t&cs or on request)
9. Results relate only to the samples tested.
10. This report was issued on 14/04/2022.



A23342 (MIN5636) **Mine Earth - MLE-2104**

Samples received

Nineteen samples were submitted to ALS Metallurgy for semi-quantitative XRD analysis.

Sample 1	117105
Sample 2	119988
Sample 3	119991
Sample 4	140111
Sample 5	141544
Sample 6	141551
Sample 7	143161
Sample 8	146309
Sample 9	147597
Sample 10	147748

Sample 11	148774
Sample 12	149702
Sample 13	150700
Sample 14	151578
Sample 15	152409
Sample 16	153018
Sample 17	158056
Sample 18	161151
Sample 19	161162

Sample preparation

The samples were pressed into a back-packed sample holder to minimise preferred orientation of the particles. Powder X-ray diffraction (XRD) was used to analyse each sample and a combination of matrix flushing and reference intensity ratio (RIR) derived constants was used in the quantification of the minerals identified in each sample.

Analytical procedure

The XRD traces were collected under the following instrument conditions:

XRD	Panalytical Empyrean
Radiation	Co Kα 1.789
Generator	40 kV 40 mA
Angular Range	5° to 77° 2θ
Time/Step	120 s
Step Size	0.0131° 2θ
Divergence Slit	1 °
Anti-Scatter Slit	7.5 mm
Slit Type	Fixed
Detector	PIXcel in linear mode
Rotation Speed	60 rpm

Samples submitted by

Mine Earth

Interpretation and reporting

Swati Deol (ALS Metallurgy Mineralogy)

Final check

Karsten Winter (ALS Metallurgy Mineralogy)

Report date

24 May 2022



Results

The quantitative results shown in the table below have been normalised to 100 %, and the values shown represent the relative proportion of the crystalline material in the sample. Totals greater or less than 100 % are due to rounding errors. Results in the table preceded by an asterisk indicate a larger than usual uncertainty in regard to the quantity of the phase reported; for some of the minor and trace phases it may also indicate an uncertainty in regard to the presence of the phase itself, or both.

Mineral or mineral group	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5
	117105	119988	119991	140111	141544
	Mass %				
Hematite	12	2	0	23	2
Magnetite	0	0	0	0	0
Goethite	10	0	0	51	2
Pyrite	0	0	18	0	0
Clay mineral	0	0	< 1	0	0
Illite - smectite	0	0	6	0	0
Kaolinite	2	9	2	16	3
Serpentine	0	1	< 1	1	0
Annite - biotite - phlogopite	0	1	1	0	< 1
Muscovite	0	2	3	0	< 1
Plagioclase	0	0	0	0	0
K-feldspar and/or rutile	0	< 1	0	1	< 1
Quartz	76	77	54	2	9
Anatase	0	2	2	2	0
Gibbsite	0	0	0	0	0
Pyrolusite	0	0	0	4	0
Alunite	0	6	10	0	0
Jarosite	0	0	3	0	0
Gypsum	0	0	0	0	0
Dolomite - ankerite	0	0	0	0	3
Calcite	0	0	0	0	82

Mineral or mineral group	Sample 6	Sample 7	Sample 8	Sample 9	Sample 10
	141551	143161	146309	147597	147748
	Mass %				
Hematite	28	8	10	1	14
Magnetite	0	0	0	0	0
Goethite	48	7	5	6	55
Pyrite	0	0	0	0	0
Clay mineral	0	0	0	0	0
Illite - smectite	0	0	0	0	0
Kaolinite	15	14	6	2	13
Serpentine	1	1	< 1	0	1
Annite - biotite - phlogopite	0	< 1	< 1	0	0
Muscovite	0	1	1	< 1	0
Plagioclase	0	0	0	0	0
K-feldspar and/or rutile	1	1	1	0	< 1
Quartz	4	64	72	91	7
Anatase	3	3	1	0	2
Gibbsite	0	0	0	0	6
Pyrolusite	0	0	0	0	0
Alunite	0	0	3	0	0
Jarosite	0	0	0	0	0
Gypsum	0	0	0	0	0
Dolomite - ankerite	0	0	0	0	0
Calcite	0	1	0	0	1



Mineral or mineral group	Sample 11	Sample 12	Sample 13	Sample 14	Sample 15
	148774	149702	150700	151578	152409
	Mass %				
Hematite	5	16	57	2	22
Magnetite	0	0	0	0	0
Goethite	2	16	26	2	0
Pyrite	0	0	0	13	0
Clay mineral	0	0	0	0	0
Illite - smectite	0	0	0	8	0
Kaolinite	6	2	11	5	6
Serpentine	1	0	1	< 1	1
Annite - biotite - phlogopite	1	0	0	1	0
Muscovite	2	0	0	5	0
Plagioclase	0	0	0	0	0
K-feldspar and/or rutile	1	0	0	0	0
Quartz	77	66	4	57	71
Anatase	1	0	1	3	0
Gibbsite	0	0	0	0	0
Pyrolusite	0	0	0	0	0
Alunite	4	0	0	0	0
Jarosite	0	0	0	2	0
Gypsum	0	0	0	< 1	0
Dolomite - ankerite	0	0	0	0	0
Calcite	0	0	0	0	0

Mineral or mineral group	Sample 16	Sample 17	Sample 18	Sample 19
	153018	158056	161151	161162
	Mass %			
Hematite	6	5	11	23
Magnetite	0	0	0	3
Goethite	3	5	5	13
Pyrite	0	0	0	0
Clay mineral	0	0	0	0
Illite - smectite	0	0	0	0
Kaolinite	5	11	37	1
Serpentine	0	0	0	0
Annite - biotite - phlogopite	1	1	< 1	0
Muscovite	1	2	1	0
Plagioclase	1	1	< 1	0
K-feldspar and/or rutile	1	2	1	0
Quartz	79	73	42	60
Anatase	1	1	4	0
Gibbsite	0	0	0	0
Pyrolusite	0	0	0	0
Alunite	3	0	0	0
Jarosite	0	0	0	0
Gypsum	0	< 1	0	0
Dolomite - ankerite	0	0	0	0
Calcite	0	0	0	0



Comments

Sample **117105** might contain a trace amount of anatase.

Samples **141544, 143161, 148774, 150700 and 153018** might contain a trace amount of illite-smectite.

Samples **119988, 119991, 143161, 146309, 147748, 148774 and 151578** might contain a trace amount of plagioclase.

Sample **143161** might contain a trace amount of dolomite - ankerite.

Sample **151578** might contain a trace amount of alunite.

Sample **161151** might contain a trace amount of serpentine.

Some amorphous material might be present in the samples.

Determination of Oxygen-Consumption Rate (OCR)

	143199	109481	154937	143201	151575	143363	151578	119991	117023
<u>Test Specifications and Conditions</u>									
Moist-Solids (kg)	0.52	0.75	1.45	1.50	1.47	1.55	1.48	1.51	1.51
GWC (%)	7.7	15.2	12.4	7.3	16.4	18.1	10.7	13.0	9.4
Dry-Solids [DS] (kg)	0.48	0.64	1.27	1.39	1.23	1.27	1.38	1.31	1.37
Solids-SG	3.50	3.30	3.10	3.10	3.10	3.30	3.30	3.30	3.30
Dry-Solids Volume (L)	0.14	0.19	0.41	0.45	0.40	0.38	0.42	0.40	0.42
Pore-Fluid Volume (L)	0.04	0.11	0.18	0.11	0.24	0.28	0.10	0.20	0.14
Cell Volume (L)	0.31	0.85	1.15	1.15	1.15	1.15	1.15	1.15	1.15
Gas Volume [GV] (L)	0.13	0.55	0.56	0.59	0.51	0.49	0.63	0.55	0.59
GV/DS Ratio (L/kg)	0.28	0.85	0.44	0.43	0.42	0.38	0.46	0.42	0.43
Temperature (oC) [+/- 0.1]	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0
<u>Measurement with Quantek O2</u>									
Reaction-Time (days)	0.92	0.92	0.92	0.92	0.92	0.92	0.17	0.17	0.17
Reaction-Time (hrs)	22	22	22	22	22	22	4.0	4.0	4.0
Measured O2-Conc. (%) [+/- 0.1]	14.8	14.2	18.7	20.0	19.8	16.0	20.0	19.8	20.1
O2-Consumption (%) [+/- 0.2]	6.1	6.7	2.2	0.9	1.1	4.9	0.9	1.1	0.8
O2-Consumption (mg O2)	10.6	47.8	16.1	7.0	7.4	31.1	7.4	7.9	6.2
OCR (kg O2/kg/s)	2.8E-10	9.4E-10	1.6E-10	6.3E-11	7.6E-11	3.1E-10	3.7E-10	4.2E-10	3.2E-10
"Mud-pH"	6.4	6.0	6.8	2.9	3.4	3.1	1.7	1.6	2.4

Notes:

Testing performed on -4.75 mm fraction (dry-sieved).

The -4.75 mm fractions were moisture-conditioned via spraying with high-purity-deionised-water (HPDW), and homogenising by 'working-over-by-hand'. Water addition and 'hand-mixing' continued until moist solids developed a 'just-clumpy' state.

Following moistening, the samples were stored in plastic-bags (not airtight), and 'aged' for 12 days in a CT-room at 20-22 oC to equilibrate.

GWC = Gravimetric-Water Content; SG = Specific-Gravity.

GWC corresponds to overnight oven-drying of sub-samples collected following OCR determination at 105 oC.

SG estimated.

The relative-error for the OCR values is estimated to be ca. 10-20 %.

"Mud-pH" was measured for sub-samples collected following OCR determinations, and correspond to ca. 10-15 gms moist-solids to which ca. 10 mL of HPDW was added.





97748
Roy Hill

Lab No		WTS22170	WTS22171	WTS22172	WTS22173	WTS22174	WTS22175	WTS22176	WTS22177
Name		146309	158056	148774	125317	159185	141544	143161	141551
Code		1	2	3	4	5	6	7	8
Customer		Mine Earth Pty Ltd	Mine Earth Pty Ltd	Mine Earth Pty Ltd	Mine Earth Pty Ltd	Mine Earth Pty Ltd	Mine Earth Pty Ltd	Mine Earth Pty Ltd	Mine Earth Pty Ltd
Depth		0-10	0-10	0-10	0-10	0-10	0-10	0-10	0-10
Prewash exch. Ca	meq/100g	1.91	13.04	2.98	1.87	3.56	10.06	6.59	2.51
Prewash exch. K	meq/100g	0.62	1.15	0.88	0.62	0.53	0.98	0.79	0.18
Prewash exch. Mg	meq/100g	1.42	3.46	2.38	1.03	1.87	1.82	1.89	0.88
Prewash exch. Na	meq/100g	0.11	0.47	0.15	< 0.10	0.10	1.19	0.35	0.14



Lab No		WTS22178	WTS22179	WTS22180	WTS22181	WTS22182	WTS22183	WTS22184
Name		140111	161151	147748	114667	122694	154912	158501
Code		9	10	11	12	13	14	15
Customer		Mine Earth Pty Ltd	Mine Earth Pty Ltd	Mine Earth Pty Ltd	Mine Earth Pty Ltd	Mine Earth Pty Ltd	Mine Earth Pty Ltd	Mine Earth Pty Ltd
Depth		0-10	0-10	0-10	0-10	0-10	0-10	0-10
Prewash exch. Ca	meq/100g	1.02	1.58	7.58	9.69	4.96	1.55	2.29
Prewash exch. K	meq/100g	0.15	0.29	0.17	0.27	0.21	0.15	0.17
Prewash exch. Mg	meq/100g	0.93	1.38	0.54	3.22	3.04	0.56	2.46
Prewash exch. Na	meq/100g	0.13	0.16	< 0.10	< 0.10	0.13	0.17	< 0.10

Client: Mine Earth
Client address: Unit 1 94 Forsyth Street OConnor 'WA 6163
Job number: 23_0312
Lab ID: 23_0312_01
Client ID: MLE001
Analysis : Semi-quantitative XRD analysis

Date received: 27/02/2023
Date analysed: 28/02/2023
Date reported: 28/02/2023

Revision number: 1

Comments: This report supersedes 23_0312_01 'MLE001' XRD report - semi quantitative issued on 28/02/2023 due to clients request to look for trace sulphur phases.

Sample preparation

The sample was supplied by the client to Microanalysis Australia on 27/02/2023 for the above mentioned analyses. A representative sub-sample was removed and lightly ground such that 90% was passing 20 µm. Grinding to this size helps eliminate preferred orientation.

Analysis

Only crystalline material present in the sample will give peaks in the XRD scan. Amorphous (non-crystalline) material will add to the background. The search match software used was Eva 4.3. An up-to-date ICDD card set was used. The X-ray source was cobalt radiation.

No standards were used in the quantification process. The concentrations were calculated using the normalized reference intensity ratio method where the intensity of the 100% peak divided by the published I/Ic value for each mineral phase is summed and the relative percentages of each phase calculated based on the relative contribution to the sum. This method allows for slight attention to be paid to preferred orientation but is limited in considering other factors including but not limited to; variable crystallinity, alteration, fluorescence, substitution and lattice strain.

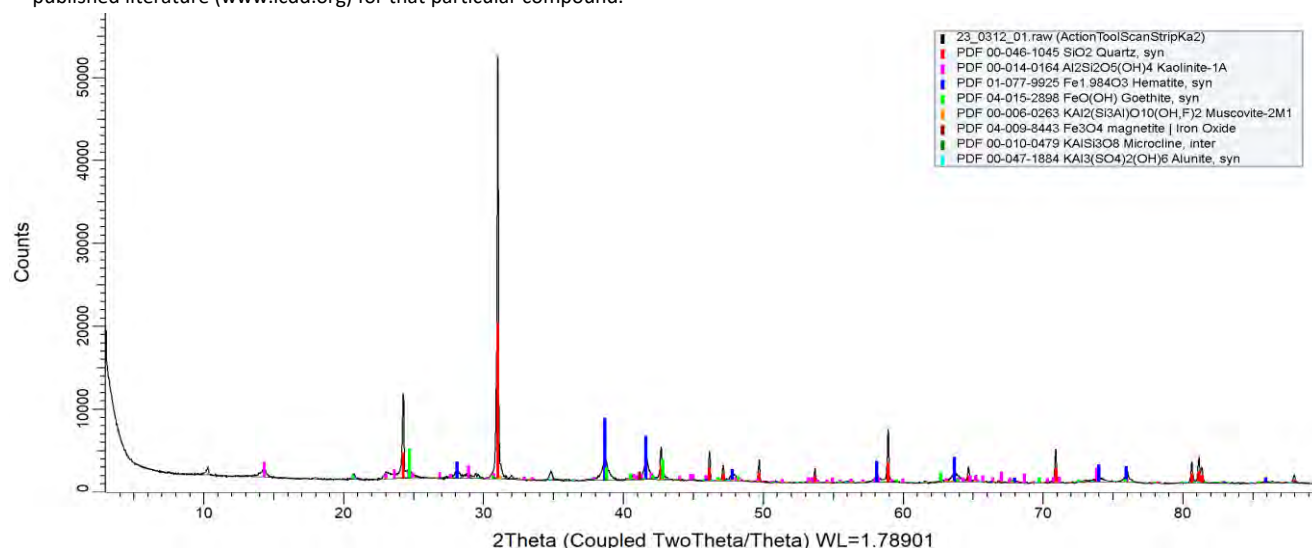
Chemical assay data (XRF/ICP) was supplied by the client as an elemental relative abundance/concentration indicator. The XRD concentration of the interpreted phases (below) may have been adjusted in consideration of the chemical assay.

Summary

The phases are listed in order of interpreted concentration:

Crystalline mineral phase	Concentration (%)	ICDD match probability
Quartz, syn (SiO ₂)	47	High
Hematite, syn (Fe _{1.984} O ₃)	19	High
Kaolinite-1A (Al ₂ Si ₂ O ₅ (OH) ₄)	16	High
Goethite, syn (FeO(OH))	11	Medium
Muscovite-2M1 (KAl ₂ (Si ₃ Al)O ₁₀ (OH,F) ₂)	3	Low
Alunite, syn (KAl ₃ (SO ₄) ₂ (OH) ₆)	2	Low
Magnetite Iron Oxide (Fe ₃ O ₄)	2	Low
Microcline, inter (KAlSi ₃ O ₈)	1	Low

The ICDD match probability is reported as an indication as to how well the peak positions and relative intensities for the sample matched those in the published literature (www.icdd.org) for that particular compound.



Analyst: Dr. Rhys Tilbury, B.Sc.(Nanotechnology)(Hons), PhD.(Chemistry)
Reported: Dr. Rhys Tilbury, B.Sc.(Nanotechnology)(Hons), PhD.(Chemistry)
Approved: Ian Davies, B.Sc.(Chemistry)

Client: Mine Earth
Client address: Unit 1 94 Forsyth Street OConnor 'WA 6163
Job number: 23_0312
Lab ID: 23_0312_02
Client ID: MLE003
Analysis : Semi-quantitative XRD analysis
Revision number: 0
Comments: None

Date received: 27/02/2023
Date analysed: 28/02/2023
Date reported: 28/02/2023

Sample preparation

The sample was supplied by the client to Microanalysis Australia on 27/02/2023 for the above mentioned analyses. A representative sub-sample was removed and lightly ground such that 90% was passing 20 µm. Grinding to this size helps eliminate preferred orientation.

Analysis

Only crystalline material present in the sample will give peaks in the XRD scan. Amorphous (non-crystalline) material will add to the background. The search match software used was Eva 4.3. An up-to-date ICDD card set was used. The X-ray source was cobalt radiation.

No standards were used in the quantification process. The concentrations were calculated using the normalized reference intensity ratio method where the intensity of the 100% peak divided by the published I/Ic value for each mineral phase is summed and the relative percentages of each phase calculated based on the relative contribution to the sum. This method allows for slight attention to be paid to preferred orientation but is limited in considering other factors including but not limited to; variable crystallinity, alteration, fluorescence, substitution and lattice strain.

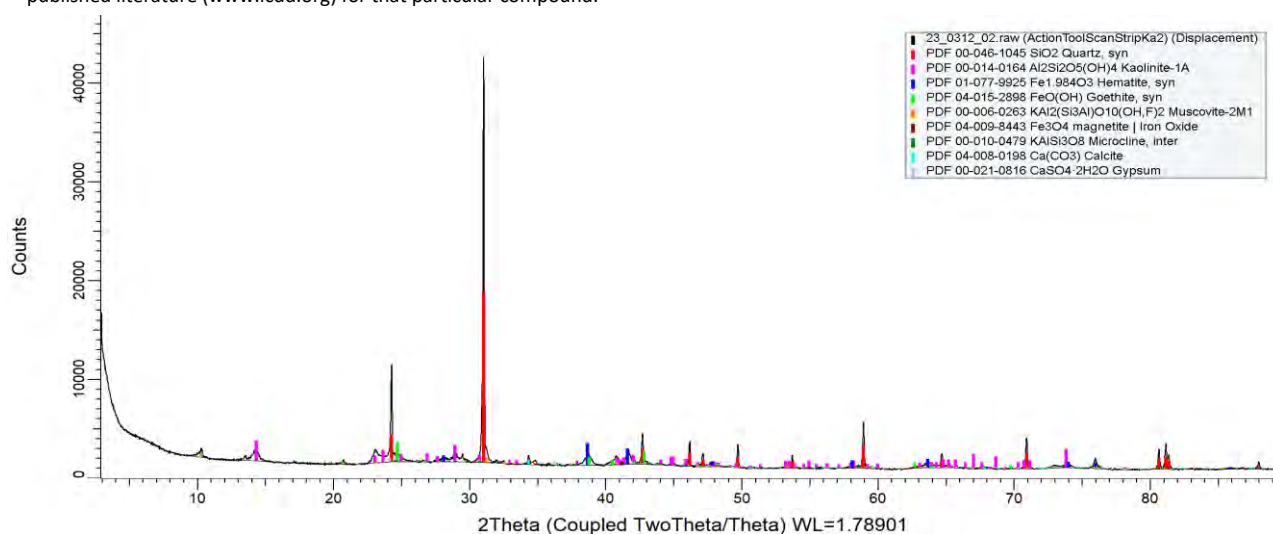
Chemical assay data (XRF/ICP) was supplied by the client as an elemental relative abundance/concentration indicator. The XRD concentration of the interpreted phases (below) may have been adjusted in consideration of the chemical assay.

Summary

The phases are listed in order of interpreted concentration:

Crystalline mineral phase	Concentration (%)	ICDD match probability
Quartz, syn (SiO ₂)	52	High
Kaolinite-1A (Al ₂ Si ₂ O ₅ (OH) ₄)	22	High
Goethite, syn (FeO(OH))	8	Medium
Hematite, syn (Fe _{1.984} O ₃)	7	Medium
Muscovite-2M1 (KAl ₂ (Si ₃ Al)O ₁₀ (OH,F) ₂)	5	Medium
Microcline, inter (KAlSi ₃ O ₈)	3	Low
Gypsum (CaSO ₄ ·2H ₂ O)	2	Low
Calcite (CaCO ₃)	1	Low
Magnetite Iron Oxide (Fe ₃ O ₄)	1	Low

The ICDD match probability is reported as an indication as to how well the peak positions and relative intensities for the sample matched those in the published literature (www.icdd.org) for that particular compound.



Analyst: Dr. Rhys Tilbury, B.Sc.(Nanotechnology)(Hons), PhD.(Chemistry)
Reported: Dr. Rhys Tilbury, B.Sc.(Nanotechnology)(Hons), PhD.(Chemistry)
Approved: Ian Davies, B.Sc.(Chemistry)

Client: Mine Earth
Client address: Unit 1 94 Forsyth Street OConnor 'WA 6163
Job number: 23_0312
Lab ID: 23_0312_03
Client ID: MLE004
Analysis : Semi-quantitative XRD analysis

Date received: 27/02/2023
Date analysed: 28/02/2023
Date reported: 28/02/2023
Date revised: 01/03/2023

Revision number: 1

Comments: This report supersedes 23_0312_03 'MLE004' XRD report - semi quantitative issued on 28/02/2023 due to clients request to look for trace sulphur phases.

Sample preparation

The sample was supplied by the client to Microanalysis Australia on 27/02/2023 for the above mentioned analyses. A representative sub-sample was removed and lightly ground such that 90% was passing 20 µm. Grinding to this size helps eliminate preferred orientation.

Analysis

Only crystalline material present in the sample will give peaks in the XRD scan. Amorphous (non-crystalline) material will add to the background. The search match software used was Eva 4.3. An up-to-date ICDD card set was used. The X-ray source was cobalt radiation.

No standards were used in the quantification process. The concentrations were calculated using the normalized reference intensity ratio method where the intensity of the 100% peak divided by the published I/Ic value for each mineral phase is summed and the relative percentages of each phase calculated based on the relative contribution to the sum. This method allows for slight attention to be paid to preferred orientation but is limited in considering other factors including but not limited to; variable crystallinity, alteration, fluorescence, substitution and lattice strain.

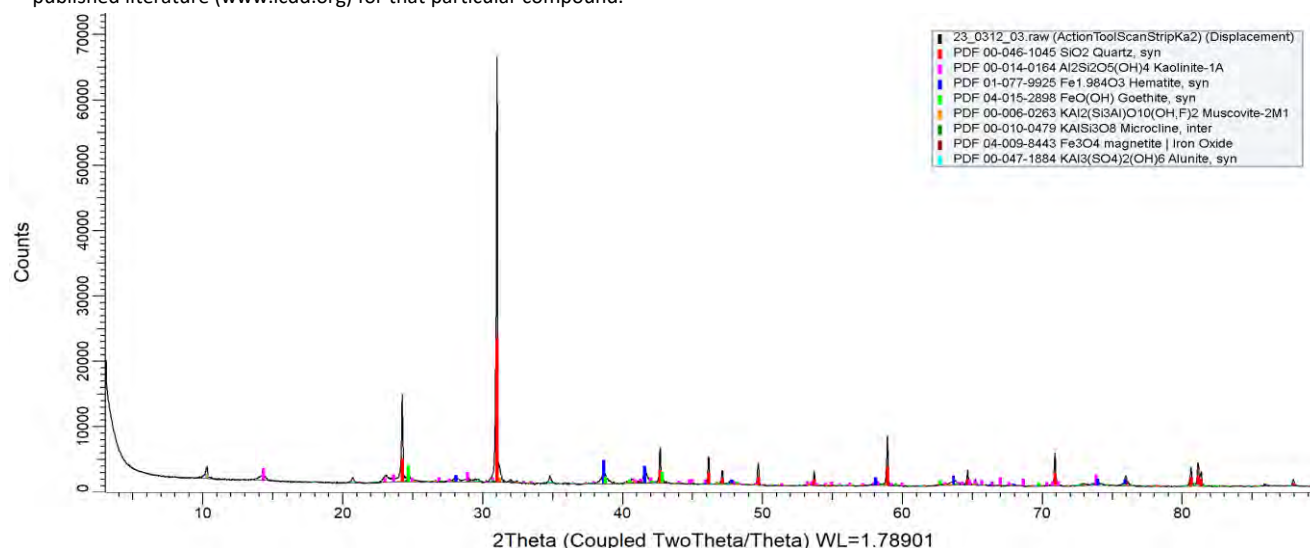
Chemical assay data (XRF/ICP) was supplied by the client as an elemental relative abundance/concentration indicator. The XRD concentration of the interpreted phases (below) may have been adjusted in consideration of the chemical assay.

Summary

The phases are listed in order of interpreted concentration:

Crystalline mineral phase	Concentration (%)	ICDD match probability
Quartz, syn (SiO ₂)	55	High
Kaolinite-1A (Al ₂ Si ₂ O ₅ (OH) ₄)	16	High
Hematite, syn (Fe _{1.984} O ₃)	9	Medium
Goethite, syn (FeO(OH))	8	Medium
Muscovite-2M1 (KAl ₂ (Si ₃ Al)O ₁₀ (OH,F) ₂)	6	Medium
Microcline, inter (KAlSi ₃ O ₈)	3	Low
Alunite, syn (KAl ₃ (SO ₄) ₂ (OH) ₆)	3	Low
Magnetite Iron Oxide (Fe ₃ O ₄)	1	Low

The ICDD match probability is reported as an indication as to how well the peak positions and relative intensities for the sample matched those in the published literature (www.icdd.org) for that particular compound.



Analyst: Dr. Rhys Tilbury, B.Sc.(Nanotechnology)(Hons), PhD.(Chemistry)
Reported: Dr. Rhys Tilbury, B.Sc.(Nanotechnology)(Hons), PhD.(Chemistry)
Approved: Ian Davies, B.Sc.(Chemistry)

Client: Mine Earth
Client address: Unit 1 94 Forsyth Street OConnor 'WA 6163
Job number: 23_0312
Lab ID: 23_0312_04
Client ID: MLE005
Analysis : Semi-quantitative XRD analysis

Date received: 27/02/2023
Date analysed: 28/02/2023
Date reported: 28/02/2023
Date revised: 01/03/2023

Revision number: 1

Comments: This report supersedes 23_0312_04 'MLE005' XRD report - semi quantitative issued on 28/02/2023 due to clients request to look for trace sulphur phases.

Sample preparation

The sample was supplied by the client to Microanalysis Australia on 27/02/2023 for the above mentioned analyses. A representative sub-sample was removed and lightly ground such that 90% was passing 20 µm. Grinding to this size helps eliminate preferred orientation.

Analysis

Only crystalline material present in the sample will give peaks in the XRD scan. Amorphous (non-crystalline) material will add to the background. The search match software used was Eva 4.3. An up-to-date ICDD card set was used. The X-ray source was cobalt radiation.

No standards were used in the quantification process. The concentrations were calculated using the normalized reference intensity ratio method where the intensity of the 100% peak divided by the published I/Ic value for each mineral phase is summed and the relative percentages of each phase calculated based on the relative contribution to the sum. This method allows for slight attention to be paid to preferred orientation but is limited in considering other factors including but not limited to; variable crystallinity, alteration, fluorescence, substitution and lattice strain.

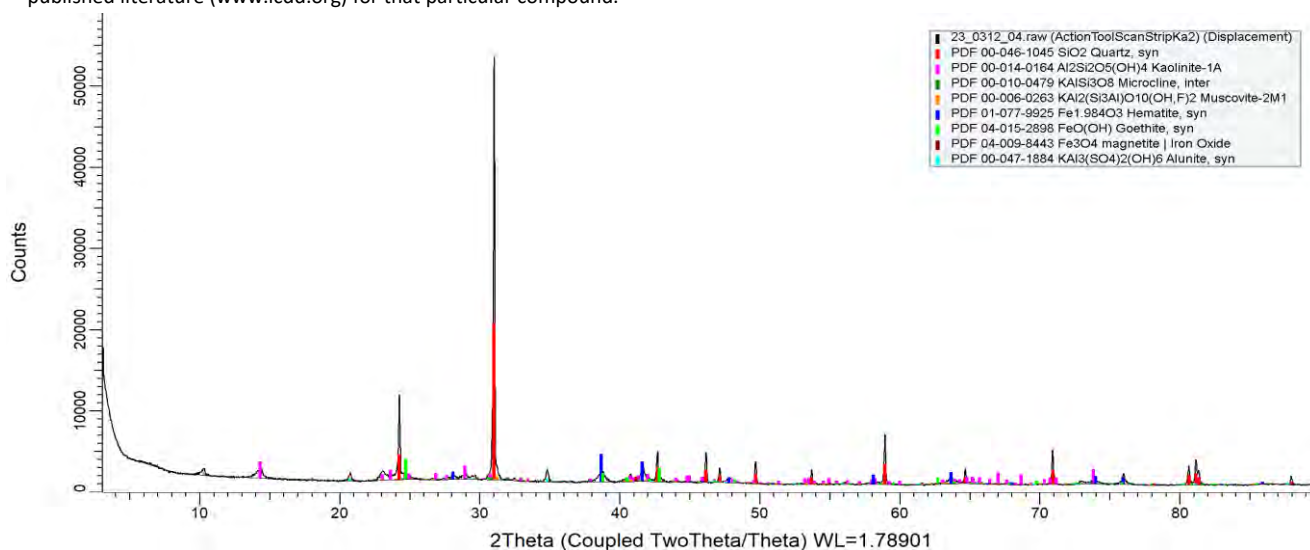
Chemical assay data (XRF/ICP) was supplied by the client as an elemental relative abundance/concentration indicator. The XRD concentration of the interpreted phases (below) may have been adjusted in consideration of the chemical assay.

Summary

The phases are listed in order of interpreted concentration:

Crystalline mineral phase	Concentration (%)	ICDD match probability
Quartz, syn (SiO ₂)	52	High
Kaolinite-1A (Al ₂ Si ₂ O ₅ (OH) ₄)	19	High
Hematite, syn (Fe _{1.984} O ₃)	10	Medium
Goethite, syn (FeO(OH))	8	Medium
Muscovite-2M1 (KAl ₂ (Si ₃ Al)O ₁₀ (OH,F) ₂)	4	Low
Alunite, syn (KAl ₃ (SO ₄) ₂ (OH) ₆)	3	Low
Microcline, inter (KAlSi ₃ O ₈)	3	Low
Magnetite Iron Oxide (Fe ₃ O ₄)	1	Low

The ICDD match probability is reported as an indication as to how well the peak positions and relative intensities for the sample matched those in the published literature (www.icdd.org) for that particular compound.



Analyst: Dr. Rhys Tilbury, B.Sc.(Nanotechnology)(Hons), PhD.(Chemistry)
Reported: Dr. Rhys Tilbury, B.Sc.(Nanotechnology)(Hons), PhD.(Chemistry)
Approved: Ian Davies, B.Sc.(Chemistry)

Client: Mine Earth
Client address: Unit 1 94 Forsyth Street OConnor 'WA 6163
Job number: 23_0312
Lab ID: 23_0312_05
Client ID: MLE006
Analysis : Semi-quantitative XRD analysis

Date received: 27/02/2023
Date analysed: 28/02/2023
Date reported: 28/02/2023
Date revised: 01/03/2023

Revision number: 1

Comments: This report supersedes 23_0312_05 'MLE006' XRD report - semi quantitative issued on 28/02/2023 due to clients request to look for trace sulphur phases.

Sample preparation

The sample was supplied by the client to Microanalysis Australia on 27/02/2023 for the above mentioned analyses. A representative sub-sample was removed and lightly ground such that 90% was passing 20 µm. Grinding to this size helps eliminate preferred orientation.

Analysis

Only crystalline material present in the sample will give peaks in the XRD scan. Amorphous (non-crystalline) material will add to the background. The search match software used was Eva 4.3. An up-to-date ICDD card set was used. The X-ray source was cobalt radiation.

No standards were used in the quantification process. The concentrations were calculated using the normalized reference intensity ratio method where the intensity of the 100% peak divided by the published I/Ic value for each mineral phase is summed and the relative percentages of each phase calculated based on the relative contribution to the sum. This method allows for slight attention to be paid to preferred orientation but is limited in considering other factors including but not limited to; variable crystallinity, alteration, fluorescence, substitution and lattice strain.

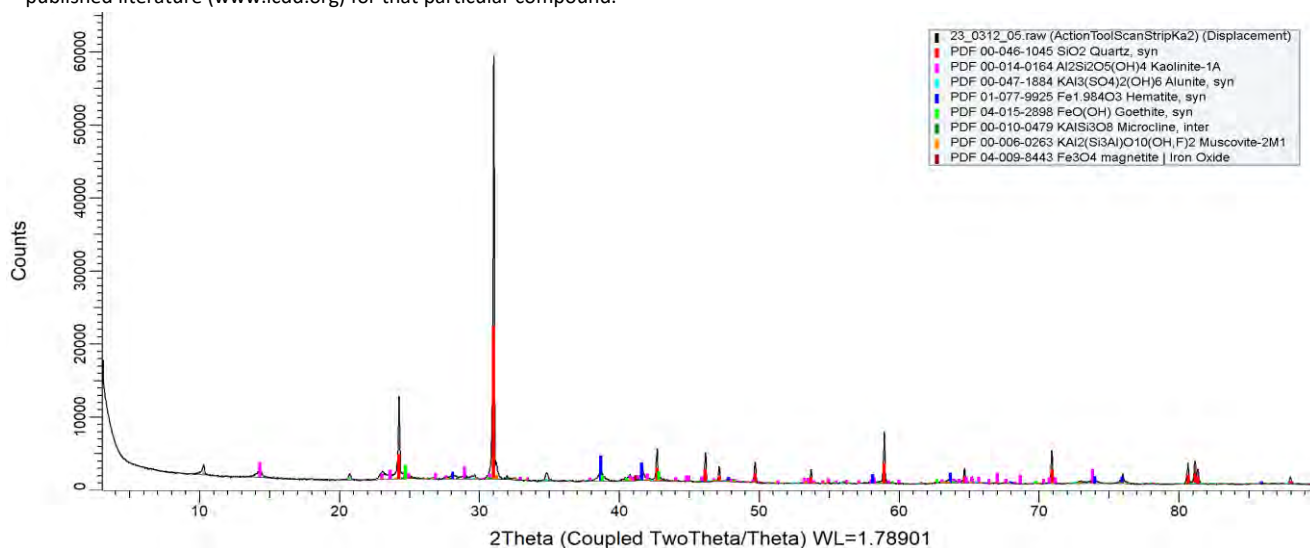
Chemical assay data (XRF/ICP) was supplied by the client as an elemental relative abundance/concentration indicator. The XRD concentration of the interpreted phases (below) may have been adjusted in consideration of the chemical assay.

Summary

The phases are listed in order of interpreted concentration:

Crystalline mineral phase	Concentration (%)	ICDD match probability
Quartz, syn (SiO ₂)	54	High
Kaolinite-1A (Al ₂ Si ₂ O ₅ (OH) ₄)	18	High
Hematite, syn (Fe _{1.984} O ₃)	9	Medium
Goethite, syn (FeO(OH))	6	Medium
Muscovite-2M1 (KAl ₂ (Si ₃ Al)O ₁₀ (OH,F) ₂)	5	Medium
Alunite, syn (KAl ₃ (SO ₄) ₂ (OH) ₆)	3	Low
Microcline, inter (KAlSi ₃ O ₈)	2	Low
Magnetite Iron Oxide (Fe ₃ O ₄)	1	Low

The ICDD match probability is reported as an indication as to how well the peak positions and relative intensities for the sample matched those in the published literature (www.icdd.org) for that particular compound.



Analyst: Dr. Rhys Tilbury, B.Sc.(Nanotechnology)(Hons), PhD.(Chemistry)
Reported: Dr. Rhys Tilbury, B.Sc.(Nanotechnology)(Hons), PhD.(Chemistry)
Approved: Ian Davies, B.Sc.(Chemistry)

Client: Mine Earth
Client address: Unit 1 94 Forsyth Street OConnor 'WA 6163
Job number: 23_0312
Lab ID: 23_0312_06
Client ID: MLE008
Analysis : Semi-quantitative XRD analysis
Revision number: 0
Comments: None

Date received: 27/02/2023
Date analysed: 28/02/2023
Date reported: 28/02/2023

Sample preparation

The sample was supplied by the client to Microanalysis Australia on 27/02/2023 for the above mentioned analyses. A representative sub-sample was removed and lightly ground such that 90% was passing 20 µm. Grinding to this size helps eliminate preferred orientation.

Analysis

Only crystalline material present in the sample will give peaks in the XRD scan. Amorphous (non-crystalline) material will add to the background. The search match software used was Eva 4.3. An up-to-date ICDD card set was used. The X-ray source was cobalt radiation.

No standards were used in the quantification process. The concentrations were calculated using the normalized reference intensity ratio method where the intensity of the 100% peak divided by the published I/Ic value for each mineral phase is summed and the relative percentages of each phase calculated based on the relative contribution to the sum. This method allows for slight attention to be paid to preferred orientation but is limited in considering other factors including but not limited to; variable crystallinity, alteration, fluorescence, substitution and lattice strain.

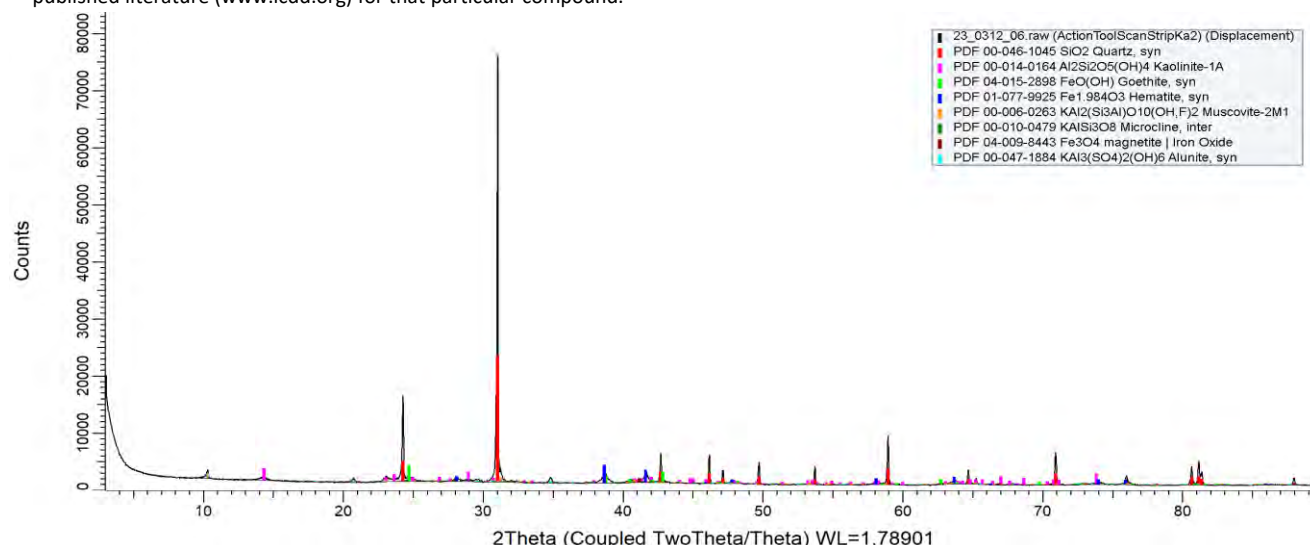
Chemical assay data (XRF/ICP) was supplied by the client as an elemental relative abundance/concentration indicator. The XRD concentration of the interpreted phases (below) may have been adjusted in consideration of the chemical assay.

Summary

The phases are listed in order of interpreted concentration:

Crystalline mineral phase	Concentration (%)	ICDD match probability
Quartz, syn (SiO ₂)	53	High
Kaolinite-1A (Al ₂ Si ₂ O ₅ (OH) ₄)	17	High
Goethite, syn (FeO(OH))	8	Medium
Hematite, syn (Fe _{1.984} O ₃)	8	Medium
Muscovite-2M1 (KAl ₂ (Si ₃ Al)O ₁₀ (OH,F) ₂)	7	Medium
Microcline, inter (KAlSi ₃ O ₈)	3	Low
Alunite, syn (KAl ₃ (SO ₄) ₂ (OH) ₆)	2	Low
Magnetite Iron Oxide (Fe ₃ O ₄)	1	Low

The ICDD match probability is reported as an indication as to how well the peak positions and relative intensities for the sample matched those in the published literature (www.icdd.org) for that particular compound.



Analyst: Dr. Rhys Tilbury, B.Sc.(Nanotechnology)(Hons), PhD.(Chemistry)
Reported: Dr. Rhys Tilbury, B.Sc.(Nanotechnology)(Hons), PhD.(Chemistry)
Approved: Ian Davies, B.Sc.(Chemistry)

Client: Mine Earth
Client address: Unit 1 94 Forsyth Street OConnor 'WA 6163
Job number: 23_0312
Lab ID: 23_0312_07
Client ID: MLE009
Analysis : Semi-quantitative XRD analysis

Date received: 27/02/2023
Date analysed: 28/02/2023
Date reported: 28/02/2023
Date revised: 02/03/2023

Revision number: 1

Comments: This report supersedes 23_0312_07 'MLE009' XRD report - semi quantitative issued on 28/02/2023 due to clients request to look for trace sulphur phases.

Sample preparation

The sample was supplied by the client to Microanalysis Australia on 27/02/2023 for the above mentioned analyses. A representative sub-sample was removed and lightly ground such that 90% was passing 20 µm. Grinding to this size helps eliminate preferred orientation.

Analysis

Only crystalline material present in the sample will give peaks in the XRD scan. Amorphous (non-crystalline) material will add to the background. The search match software used was Eva 4.3. An up-to-date ICDD card set was used. The X-ray source was cobalt radiation.

No standards were used in the quantification process. The concentrations were calculated using the normalized reference intensity ratio method where the intensity of the 100% peak divided by the published I/Ic value for each mineral phase is summed and the relative percentages of each phase calculated based on the relative contribution to the sum. This method allows for slight attention to be paid to preferred orientation but is limited in considering other factors including but not limited to; variable crystallinity, alteration, fluorescence, substitution and lattice strain.

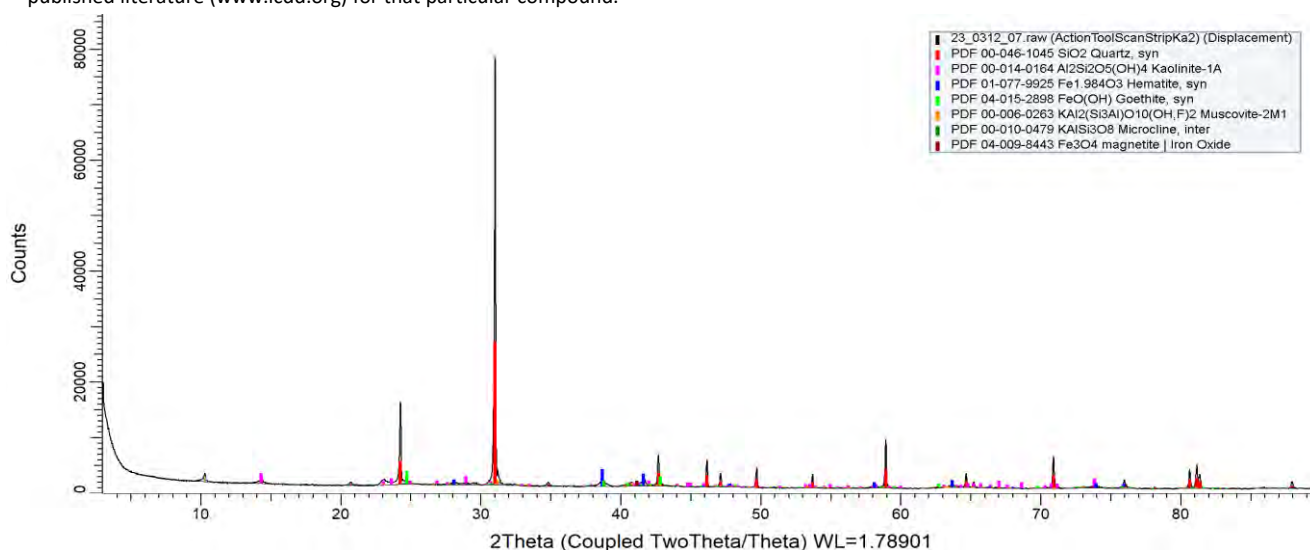
Chemical assay data (XRF/ICP) was supplied by the client as an elemental relative abundance/concentration indicator. The XRD concentration of the interpreted phases (below) may have been adjusted in consideration of the chemical assay.

Summary

The phases are listed in order of interpreted concentration:

Crystalline mineral phase	Concentration (%)	ICDD match probability
Quartz, syn (SiO ₂)	59	High
Kaolinite-1A (Al ₂ Si ₂ O ₅ (OH) ₄)	15	High
Hematite, syn (Fe _{1.984} O ₃)	7	Medium
Goethite, syn (FeO(OH))	7	Medium
Muscovite-2M1 (KAl ₂ (Si ₃ Al)O ₁₀ (OH,F) ₂)	7	Medium
Microcline, inter (KAlSi ₃ O ₈)	3	Low
Alunite, syn (KAl ₃ (SO ₄) ₂ (OH) ₆)	2	Low
Magnetite Iron Oxide (Fe ₃ O ₄)	2	Low

The ICDD match probability is reported as an indication as to how well the peak positions and relative intensities for the sample matched those in the published literature (www.icdd.org) for that particular compound.



Analyst: Dr. Rhys Tilbury, B.Sc.(Nanotechnology)(Hons), PhD.(Chemistry)
Reported: Dr. Rhys Tilbury, B.Sc.(Nanotechnology)(Hons), PhD.(Chemistry)
Approved: Ian Davies, B.Sc.(Chemistry)

Client: Mine Earth
Client address: Unit 1 94 Forsyth Street OConnor 'WA 6163
Job number: 23_0312
Lab ID: 23_0312_08
Client ID: MLE011
Analysis : Semi-quantitative XRD analysis

Date received: 27/02/2023
Date analysed: 28/02/2023
Date reported: 28/02/2023
Date revised: 02/03/2023

Revision number: 1

Comments: This report supersedes 23_0312_08 'MLE011' XRD report - semi quantitative issued on 28/02/2023 due to clients request to look for trace sulphur phases

Sample preparation

The sample was supplied by the client to Microanalysis Australia on 27/02/2023 for the above mentioned analyses. A representative sub-sample was removed and lightly ground such that 90% was passing 20 µm. Grinding to this size helps eliminate preferred orientation.

Analysis

Only crystalline material present in the sample will give peaks in the XRD scan. Amorphous (non-crystalline) material will add to the background. The search match software used was Eva 4.3. An up-to-date ICDD card set was used. The X-ray source was cobalt radiation.

No standards were used in the quantification process. The concentrations were calculated using the normalized reference intensity ratio method where the intensity of the 100% peak divided by the published I/Ic value for each mineral phase is summed and the relative percentages of each phase calculated based on the relative contribution to the sum. This method allows for slight attention to be paid to preferred orientation but is limited in considering other factors including but not limited to; variable crystallinity, alteration, fluorescence, substitution and lattice strain.

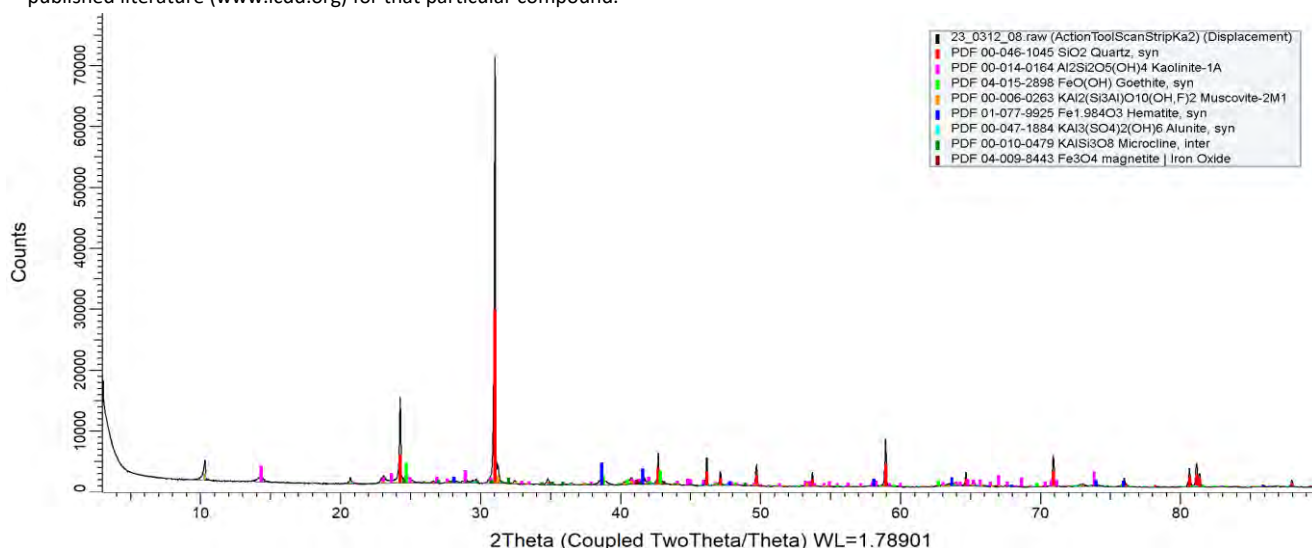
Chemical assay data (XRF/ICP) was supplied by the client as an elemental relative abundance/concentration indicator. The XRD concentration of the interpreted phases (below) may have been adjusted in consideration of the chemical assay.

Summary

The phases are listed in order of interpreted concentration:

Crystalline mineral phase	Concentration (%)	ICDD match probability
Quartz, syn (SiO ₂)	53	High
Kaolinite-1A (Al ₂ Si ₂ O ₅ (OH) ₄)	17	High
Goethite, syn (FeO(OH))	8	Medium
Muscovite-2M1 (KAl ₂ (Si ₃ Al)O ₁₀ (OH,F) ₂)	7	Medium
Hematite, syn (Fe _{1.984} O ₃)	7	Medium
Microcline, inter (KAlSi ₃ O ₈)	6	Medium
Alunite, syn (KAl ₃ (SO ₄) ₂ (OH) ₆)	1	Low
Magnetite Iron Oxide (Fe ₃ O ₄)	1	Low

The ICDD match probability is reported as an indication as to how well the peak positions and relative intensities for the sample matched those in the published literature (www.icdd.org) for that particular compound.



Analyst: Dr. Rhys Tilbury, B.Sc.(Nanotechnology)(Hons), PhD.(Chemistry)
Reported: Dr. Rhys Tilbury, B.Sc.(Nanotechnology)(Hons), PhD.(Chemistry)
Approved: Ian Davies, B.Sc.(Chemistry)

Client: Mine Earth
Client address: Unit 1 94 Forsyth Street OConnor 'WA 6163
Job number: 23_0312
Lab ID: 23_0312_09
Client ID: MLE013
Analysis : Semi-quantitative XRD analysis

Date received: 27/02/2023
Date analysed: 28/02/2023
Date reported: 28/02/2023
Date revised: 02/03/2023

Revision number: 1

Comments: This report supersedes 23_0312_09 'MLE013' XRD report - semi quantitative issued on 28/02/2023 due to clients request to look for trace sulphur phases

Sample preparation

The sample was supplied by the client to Microanalysis Australia on 27/02/2023 for the above mentioned analyses. A representative sub-sample was removed and lightly ground such that 90% was passing 20 µm. Grinding to this size helps eliminate preferred orientation.

Analysis

Only crystalline material present in the sample will give peaks in the XRD scan. Amorphous (non-crystalline) material will add to the background. The search match software used was Eva 4.3. An up-to-date ICDD card set was used. The X-ray source was cobalt radiation.

No standards were used in the quantification process. The concentrations were calculated using the normalized reference intensity ratio method where the intensity of the 100% peak divided by the published I/Ic value for each mineral phase is summed and the relative percentages of each phase calculated based on the relative contribution to the sum. This method allows for slight attention to be paid to preferred orientation but is limited in considering other factors including but not limited to; variable crystallinity, alteration, fluorescence, substitution and lattice strain.

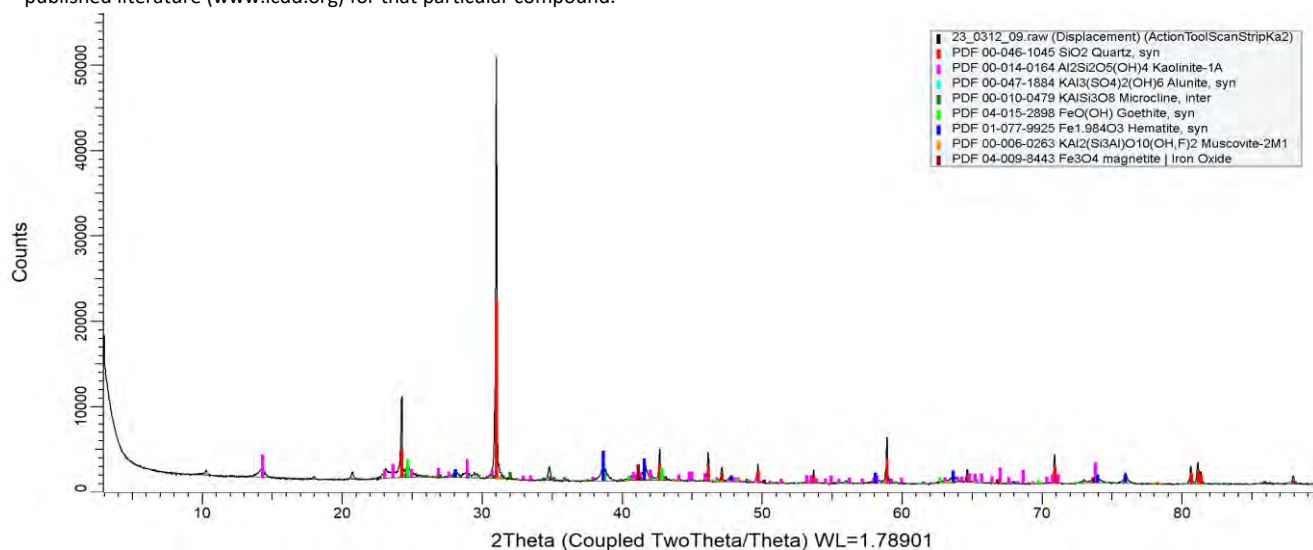
Chemical assay data (XRF/ICP) was supplied by the client as an elemental relative abundance/concentration indicator. The XRD concentration of the interpreted phases (below) may have been adjusted in consideration of the chemical assay.

Summary

The phases are listed in order of interpreted concentration:

Crystalline mineral phase	Concentration (%)	ICDD match probability
Quartz, syn (SiO ₂)	49	High
Kaolinite-1A (Al ₂ Si ₂ O ₅ (OH) ₄)	21	High
Hematite, syn (Fe _{1.984} O ₃)	8	Medium
Microcline, inter (KAlSi ₃ O ₈)	6	Medium
Goethite, syn (FeO(OH))	6	Medium
Alunite, syn (KAl ₃ (SO ₄) ₂ (OH) ₆)	4	Low
Magnetite Iron Oxide (Fe ₃ O ₄)	3	Low
Muscovite-2M1 (KAl ₂ (Si ₃ Al)O ₁₀ (OH,F) ₂)	3	Low

The ICDD match probability is reported as an indication as to how well the peak positions and relative intensities for the sample matched those in the published literature (www.icdd.org) for that particular compound.



Analyst: Dr. Rhys Tilbury, B.Sc.(Nanotechnology)(Hons), PhD.(Chemistry)
Reported: Dr. Rhys Tilbury, B.Sc.(Nanotechnology)(Hons), PhD.(Chemistry)
Approved: Ian Davies, B.Sc.(Chemistry)

Client: Mine Earth
Client address: Unit 1 94 Forsyth Street OConnor 'WA 6163
Job number: 23_0312
Lab ID: 23_0312_10
Client ID: MLE014
Analysis : Semi-quantitative XRD analysis

Date received: 27/02/2023
Date analysed: 28/02/2023
Date reported: 28/02/2023
Date revised: 02/03/2023

Revision number: 1

Comments: This report supersedes 23_0312_10 'MLE014' XRD report - semi quantitative issued on 28/02/2023 due to clients request to look for trace sulphur phases

Sample preparation

The sample was supplied by the client to Microanalysis Australia on 27/02/2023 for the above mentioned analyses. A representative sub-sample was removed and lightly ground such that 90% was passing 20 µm. Grinding to this size helps eliminate preferred orientation.

Analysis

Only crystalline material present in the sample will give peaks in the XRD scan. Amorphous (non-crystalline) material will add to the background. The search match software used was Eva 4.3. An up-to-date ICDD card set was used. The X-ray source was cobalt radiation.

No standards were used in the quantification process. The concentrations were calculated using the normalized reference intensity ratio method where the intensity of the 100% peak divided by the published I/Ic value for each mineral phase is summed and the relative percentages of each phase calculated based on the relative contribution to the sum. This method allows for slight attention to be paid to preferred orientation but is limited in considering other factors including but not limited to; variable crystallinity, alteration, fluorescence, substitution and lattice strain.

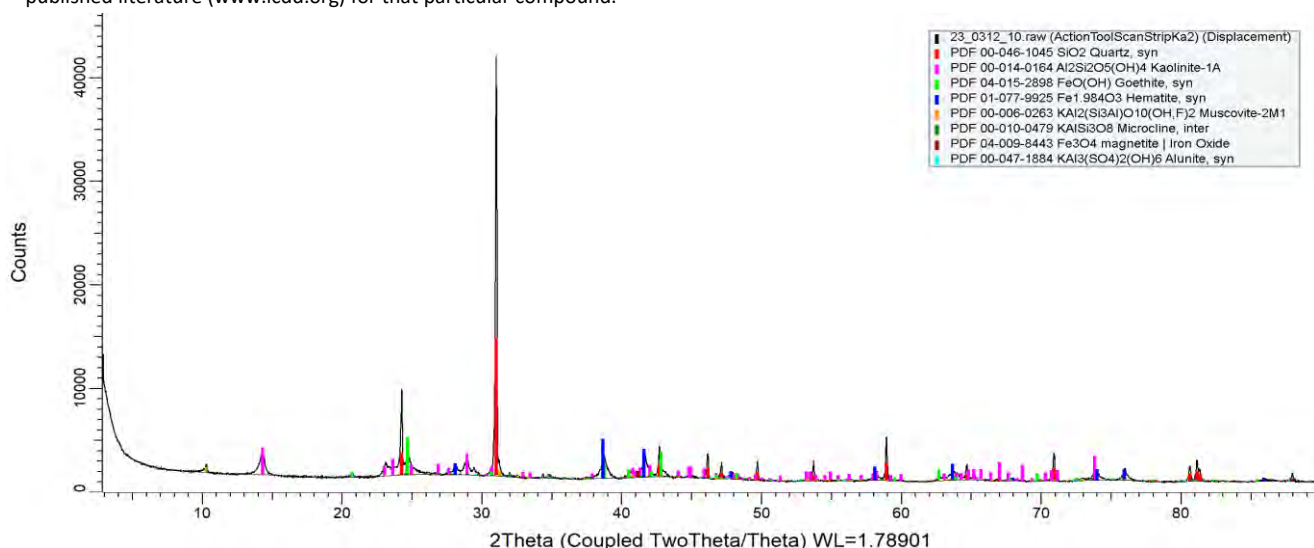
Chemical assay data (XRF/ICP) was supplied by the client as an elemental relative abundance/concentration indicator. The XRD concentration of the interpreted phases (below) may have been adjusted in consideration of the chemical assay.

Summary

The phases are listed in order of interpreted concentration:

Crystalline mineral phase	Concentration (%)	ICDD match probability
Quartz, syn (SiO ₂)	39	High
Kaolinite-1A (Al ₂ Si ₂ O ₅ (OH) ₄)	26	High
Goethite, syn (FeO(OH))	13	Medium
Hematite, syn (Fe _{1.984} O ₃)	12	Medium
Muscovite-2M1 (KAl ₂ (Si ₃ Al)O ₁₀ (OH,F) ₂)	5	Medium
Microcline, inter (KAlSi ₃ O ₈)	3	Low
Magnetite Iron Oxide (Fe ₃ O ₄)	1	Low
Alunite, syn (KAl ₃ (SO ₄) ₂ (OH) ₆)	1	Low

The ICDD match probability is reported as an indication as to how well the peak positions and relative intensities for the sample matched those in the published literature (www.icdd.org) for that particular compound.



Analyst: Dr. Rhys Tilbury, B.Sc.(Nanotechnology)(Hons), PhD.(Chemistry)
Reported: Dr. Rhys Tilbury, B.Sc.(Nanotechnology)(Hons), PhD.(Chemistry)
Approved: Ian Davies, B.Sc.(Chemistry)

Client: Mine Earth
Client address: Unit 1 94 Forsyth Street OConnor 'WA 6163
Job number: 23_0312
Lab ID: 23_0312_11
Client ID: MLE019
Analysis : Semi-quantitative XRD analysis

Date received: 27/02/2023
Date analysed: 28/02/2023
Date reported: 28/02/2023
Date revised: 02/03/2023

Revision number: 1

Comments: This report supersedes 23_0312_11 'MLE019' XRD report - semi quantitative issued on 28/02/2023 due to clients request to look for trace sulphur phases

Sample preparation

The sample was supplied by the client to Microanalysis Australia on 27/02/2023 for the above mentioned analyses. A representative sub-sample was removed and lightly ground such that 90% was passing 20 µm. Grinding to this size helps eliminate preferred orientation.

Analysis

Only crystalline material present in the sample will give peaks in the XRD scan. Amorphous (non-crystalline) material will add to the background. The search match software used was Eva 4.3. An up-to-date ICDD card set was used. The X-ray source was cobalt radiation.

No standards were used in the quantification process. The concentrations were calculated using the normalized reference intensity ratio method where the intensity of the 100% peak divided by the published I/Ic value for each mineral phase is summed and the relative percentages of each phase calculated based on the relative contribution to the sum. This method allows for slight attention to be paid to preferred orientation but is limited in considering other factors including but not limited to; variable crystallinity, alteration, fluorescence, substitution and lattice strain.

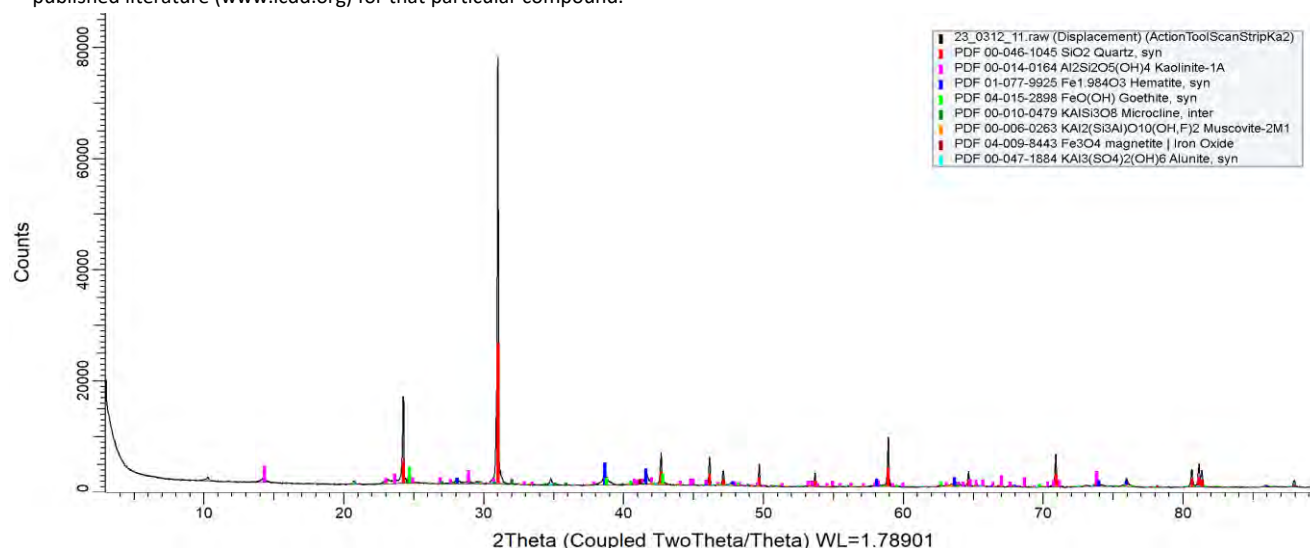
Chemical assay data (XRF/ICP) was supplied by the client as an elemental relative abundance/concentration indicator. The XRD concentration of the interpreted phases (below) may have been adjusted in consideration of the chemical assay.

Summary

The phases are listed in order of interpreted concentration:

Crystalline mineral phase	Concentration (%)	ICDD match probability
Quartz, syn (SiO ₂)	52	High
Kaolinite-1A (Al ₂ Si ₂ O ₅ (OH) ₄)	21	High
Hematite, syn (Fe _{1.984} O ₃)	8	Medium
Goethite, syn (FeO(OH))	8	Medium
Microcline, inter (KAlSi ₃ O ₈)	6	Medium
Muscovite-2M1 (KAl ₂ (Si ₃ Al)O ₁₀ (OH,F) ₂)	2	Low
Alunite, syn (KAl ₃ (SO ₄) ₂ (OH) ₆)	2	Low
Magnetite Iron Oxide (Fe ₃ O ₄)	1	Low

The ICDD match probability is reported as an indication as to how well the peak positions and relative intensities for the sample matched those in the published literature (www.icdd.org) for that particular compound.



Analyst: Dr. Rhys Tilbury, B.Sc.(Nanotechnology)(Hons), PhD.(Chemistry)
Reported: Dr. Rhys Tilbury, B.Sc.(Nanotechnology)(Hons), PhD.(Chemistry)
Approved: Ian Davies, B.Sc.(Chemistry)

Client: Mine Earth
Client address: Unit 1 94 Forsyth Street OConnor 'WA 6163
Job number: 23_0312
Lab ID: 23_0312_12
Client ID: MLE038
Analysis : Semi-quantitative XRD analysis
Revision number: 1

Date received: 27/02/2023
Date analysed: 28/02/2023
Date reported: 28/02/2023
Date revised: 02/03/2023

Comments: This report supersedes 23_0312_12 'MLE038' XRD report - semi quantitative issued on 28/02/2023 due to clients request to look for trace sulphur phases

Sample preparation

The sample was supplied by the client to Microanalysis Australia on 27/02/2023 for the above mentioned analyses. A representative sub-sample was removed and lightly ground such that 90% was passing 20 µm. Grinding to this size helps eliminate preferred orientation.

Analysis

Only crystalline material present in the sample will give peaks in the XRD scan. Amorphous (non-crystalline) material will add to the background. The search match software used was Eva 4.3. An up-to-date ICDD card set was used. The X-ray source was cobalt radiation.

No standards were used in the quantification process. The concentrations were calculated using the normalized reference intensity ratio method where the intensity of the 100% peak divided by the published I/Ic value for each mineral phase is summed and the relative percentages of each phase calculated based on the relative contribution to the sum. This method allows for slight attention to be paid to preferred orientation but is limited in considering other factors including but not limited to; variable crystallinity, alteration, fluorescence, substitution and lattice strain.

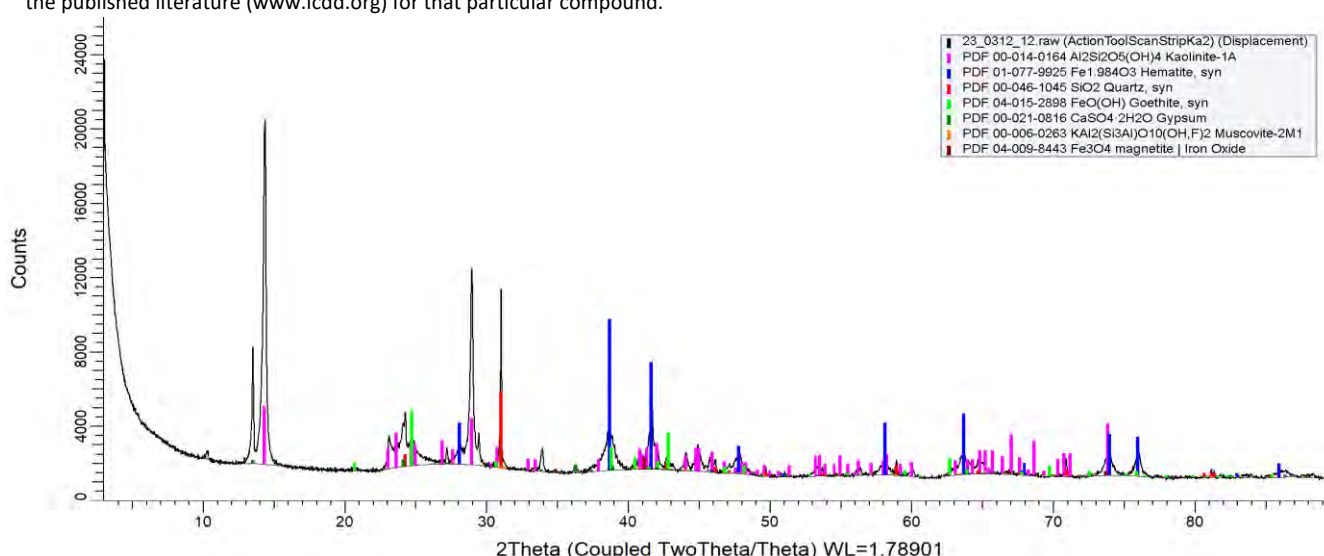
Chemical assay data (XRF/ICP) was supplied by the client as an elemental relative abundance/concentration indicator. The XRD concentration of the interpreted phases (below) may have been adjusted in consideration of the chemical assay.

Summary

The phases are listed in order of interpreted concentration:

Crystalline mineral phase	Concentration (%)	ICDD match probability
Kaolinite-1A (Al ₂ Si ₂ O ₅ (OH) ₄)	37	High
Hematite, syn (Fe _{1.984} O ₃)	29	High
Quartz, syn (SiO ₂)	14	High
Goethite, syn (FeO(OH))	13	Medium
Gypsum (CaSO ₄ ·2H ₂ O)	3	Low
Muscovite-2M1 (KAl ₂ (Si ₃ Al)O ₁₀ (OH,F) ₂)	2	Low
Magnetite Iron Oxide (Fe ₃ O ₄)	2	Low

The ICDD match probability is reported as an indication as to how well the peak positions and relative intensities for the sample matched those in the published literature (www.icdd.org) for that particular compound.



Analyst: Dr. Rhys Tilbury, B.Sc.(Nanotechnology)(Hons), PhD.(Chemistry)
Reported: Dr. Rhys Tilbury, B.Sc.(Nanotechnology)(Hons), PhD.(Chemistry)
Approved: Ian Davies, B.Sc.(Chemistry)

Client: Mine Earth
Client address: Unit 1 94 Forsyth Street OConnor 'WA 6163
Job number: 23_0312
Lab ID: 23_0312_13
Client ID: MLE041
Analysis : Semi-quantitative XRD analysis
Revision number: 1

Date received: 27/02/2023
Date analysed: 28/02/2023
Date reported: 28/02/2023
Date revised: 02/03/2023

Comments: This report supersedes 23_0312_13 'MLE041' XRD report - semi quantitative issued on 28/02/2023 due to clients request to look for trace sulphur phases.

Sample preparation

The sample was supplied by the client to Microanalysis Australia on 27/02/2023 for the above mentioned analyses. A representative sub-sample was removed and lightly ground such that 90% was passing 20 µm. Grinding to this size helps eliminate preferred orientation.

Analysis

Only crystalline material present in the sample will give peaks in the XRD scan. Amorphous (non-crystalline) material will add to the background. The search match software used was Eva 4.3. An up-to-date ICDD card set was used. The X-ray source was cobalt radiation.

No standards were used in the quantification process. The concentrations were calculated using the normalized reference intensity ratio method where the intensity of the 100% peak divided by the published I/Ic value for each mineral phase is summed and the relative percentages of each phase calculated based on the relative contribution to the sum. This method allows for slight attention to be paid to preferred orientation but is limited in considering other factors including but not limited to; variable crystallinity, alteration, fluorescence, substitution and lattice strain.

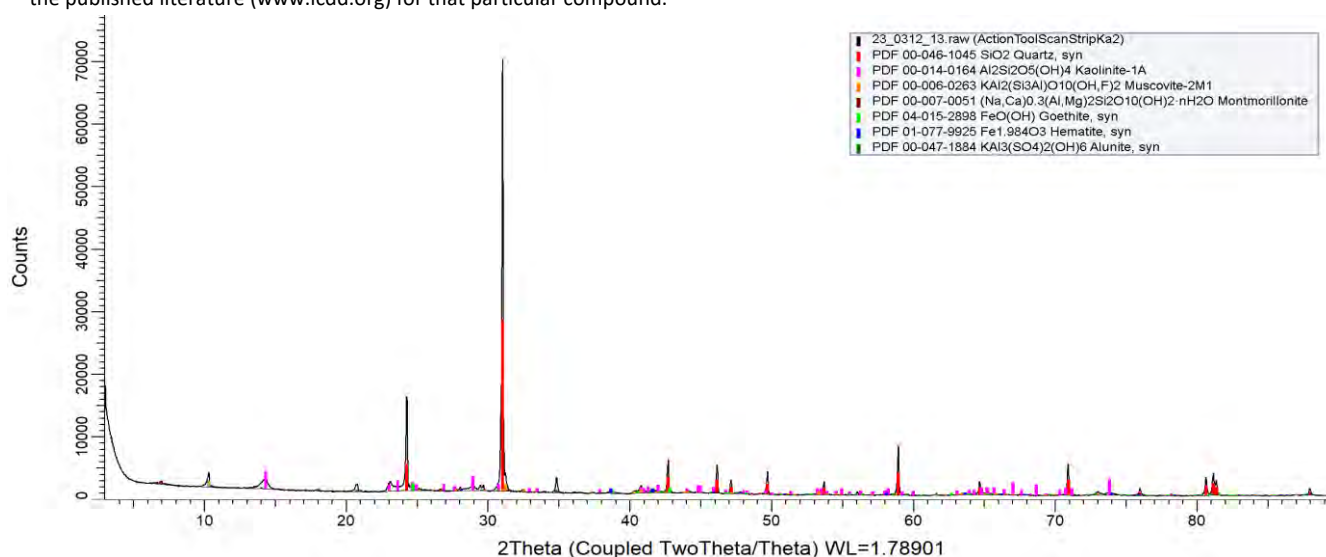
Chemical assay data (XRF/ICP) was supplied by the client as an elemental relative abundance/concentration indicator. The XRD concentration of the interpreted phases (below) may have been adjusted in consideration of the chemical assay.

Summary

The phases are listed in order of interpreted concentration:

Crystalline mineral phase	Concentration (%)	ICDD match probability
Quartz, syn (SiO ₂)	59	High
Kaolinite-1A (Al ₂ Si ₂ O ₅ (OH) ₄)	21	High
Muscovite-2M1 (KAl ₂ (Si ₃ Al)O ₁₀ (OH,F) ₂)	8	Medium
Montmorillonite ((Na,Ca)0.3(Al,Mg)2Si ₂ O ₁₀ (OH) ₂ ·nH ₂ O)	4	Low
Alunite, syn (KAl ₃ (SO ₄) ₂ (OH) ₆)	3	Low
Goethite, syn (FeO(OH))	3	Low
Hematite, syn (Fe _{1.984} O ₃)	2	Low

The ICDD match probability is reported as an indication as to how well the peak positions and relative intensities for the sample matched those in the published literature (www.icdd.org) for that particular compound.



Analyst: Dr. Rhys Tilbury, B.Sc.(Nanotechnology)(Hons), PhD.(Chemistry)
Reported: Dr. Rhys Tilbury, B.Sc.(Nanotechnology)(Hons), PhD.(Chemistry)
Approved: Ian Davies, B.Sc.(Chemistry)

Appendix D

Table of acronyms

Abbreviation	Full	Explanation
ABA	Acid-Base-Accounting	Evaluation of the balance between acid generation and acid neutralisation processes.
ACA	Average Crustal Abundance	The average abundance of elements found in Earth's crust (INAP 2009 and Reimann and Caritat 1998).
AFP	Acid formation potential	The potential of a sample to form acid.
AMD ARD	Acidic Metalliferous Drainage Acidic Rock Drainage	Acidic and /or metalliferous drainage.
ANC	Acid Neutralisation Capacity	Laboratory test method, modified AMIRA 2002 method. A measure for the overall buffering capacity against acidification of a solution.
BIF	Banded Iron Formation	A sedimentary rock consisting of alternating layers of iron oxides (hematite, goethite) and iron-poor chert.
BGL	Below ground level	A depth below surface level, usually referring to a mine pit depth.
BoM	Bureau of meteorology	Australian Bureau of meteorology.
CRS	Chromium- reducible sulphur	A specified laboratory measurement of reduced forms of sulphur (sulphide-sulphur).
CzD2	Cenozoic Detritals	Stratigraphic unit
CzD3	Recent Cover	Stratigraphic unit
EC	Electrical conductivity	A measurement of the soluble salts in rock/soils in a water extract. EC _{1:2} means 1:2 ratio of sample/water (w/w) in a laboratory test.
eCEC	Effective cation exchange capacity	A measure of the exchangeable cations held on clay surface and within organic matter in a soil.
EDT	Emerson Dispersion Test / Emerson Aggregate test	Test to classify behaviour of soil aggregates based on their coherence in water.
ESP	Exchangeable sodium percentage	The relative amount of sodium ions present on the soil surface, expressed as a percentage of the total cation exchange capacity.
GAI	Geochemical Abundance Index	Compares the actual concentration of an element in a sample with the average abundance for that element in the Earth's crust (see ACA)

JER	Jeerinah Formation	Stratigraphic unit
NAF	Non-acid forming	AFP classification for material deemed to have no potential to form harmful acidity
NAPP	Net acid production potential	The difference between the maximum potential acidity (MPA) and the acid neutralizing capacity (ANC).
NEW	Mount Newman Member	Stratigraphic unit
MAC	MacLeod Member	Stratigraphic unit
MMIF	Marra Mamba Iron Formation	Stratigraphic unit
NAM DNAM	Nammuldi Member Dolomitic Nammuldi member	Stratigraphic unit
OCR	Oxygen Consumption Rate	A laboratory test to measure the oxygen consumption rate indicative of the sulphide oxidation rate of rock. OCR _{30C} indicates the test has been performed at 30°C.
PAF	Potentially acid forming	AFP classification for material with the potential to produce acidity which can lead to acidic drainage when not managed accordingly.
PAF-LC	Potentially acid forming – low capacity	Sub-category of PAF for samples with NAPP values less than 10 kg H ₂ SO ₄ /t
pH	Potential hydrogen	A scale expressing the acidity or alkalinity of a solution. pH _{1:2} means 1:2 ration of sample/water (w/w) in a laboratory test.
RQD	Rock quality designation	The degree of fracturing in core.
SAP	Sampling analysis plan	A document detailing the procedural and analytical requirements for sampling of soils and/or waste rock.

WA	West Angelas Member	Stratigraphic unit
WRL/D	Waste rock dump / landform	Rock with uneconomical content of target minerals that will / has been mined and removed from the pit.

Ag	Silver	P	Phosphorous
Al	Aluminium	Pb	Lead
As	Arsenic	Pr	Praseodymium
Au	Gold	Rb	Rubidium
Ba	Barium	Re	Rhenium
Be	Beryllium	Sb	Antimony
Bi	Bismuth	Sc	Scandium
Ca	Calcium	Se	Selenium
Cd	Cadmium	Sm	Samarium
Ce	Cerium	Sn	Tin
Co	Cobalt	Sr	Strontium
Cr	Chromium	Ta	Tantalum
Cs	Caesium	Tb	Terbium
Cu	Copper	Te	Tellurium
Dy	Dysprosium	Th	Thorium
Er	Erbium	Ti	Titanium
Eu	Europium	Tl	Thallium
Fe	Iron	Tm	Thulium
Ga	Gallium	U	Uranium
Gd	Gadolinium	V	Vanadium
Hf	Hafnium	W	Tungsten
Hg	Mercury	Y	Yttrium
Ho	Holmium	Yb	Ytterbium
In	Indium	Zn	Zinc
K	Potassium	Zr	Zircon
Mo	Molybdenum	CO ₃ -C	Carbonate-carbon
Na	Sodium	H ₂ SO ₄	Sulphuric acid
Nb	Niobium	Total-C	Total-carbon
Nd	Neodymium	Total-S	Total-sulphur
Ni	Nickel		