

Assessment of Acid Sulfate Soils in the Tiwest Dongara Project Area



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SUMMARY

Mining activities, such as those proposed for the Dongara Project may expose potentially acid forming soils to oxidizing conditions through:

- Excavation of materials from below the water table (perched or superficial formations) to the ground surface outside the saturated zone.
- Mine pit dewatering resulting in groundwater drawdown beyond the natural range.

Criteria for action to manage acid sulfate soils have been set by the WA Department of Environmental Conservation (DEC 2009) for soils in general and by the WA Department of Mines and Petroleum (DMP-Environment 2006) and Commonwealth Department of Industry, Tourism and Resources (DITR 2007) specifically for soils in mining areas.

This report discusses results of investigating any presence and potential impacts of acid sulfate soils in the Dongara Project area and provides management recommendations based on these results. In addition ranges of a number of metals (Al, Fe, Mn, Ni, Cr, Pb, Cu, Zn, As and Se) in soils from the Dongara Project area were determined as well as levels of exchangeable base and acid cations in surface soils.

Findings are:

- Elevated ‘peroxide oxidizable sulfur’ (POS) in soils at the Dongara Project is associated with high levels of clay. Elevated POS in soils from resource areas at the Dongara Project is linked to elevated levels of Fe, Al and Mn. No link between POS and As is evident.
- Within the resource areas of the Dongara Project, peroxide oxidizable sulfur (POS) exceeds the DEC action criterium of 0.03 %S in only one sample (from core 26922) with a POS of 0.06 %S. This sample is from about 17 m below the water table at a depth of 30 m bgl (5.3 m AHD) in the Zeus resource area. Analyses by XRF in a previous investigation of the ‘non-magnetic’ fraction of materials sampled from a depth of about 30 m bgl in cores from the Zeus deposit area indicated that levels of ‘pyrite’ S in about 10% of samples ranged from 0.04 to 0.07% and were <0.03% in the remaining samples.
- Elevated levels of POS (up to 0.6 %S) with little ANC (acid neutralizing capacity) of soils to compensate occur at 9 m and 30 m bgl (3 and 27 m below the water table) about 2 km to the west of the Zeus deposit (core 27131) and near the water table about 400 m to the east of the Zeus deposit (12 m bgl in core 27137). Groundwater drawdown during mining at 2 km to the west of the Zeus deposit is estimated to be 0.5 m and not to expose soils with elevated POS to air. Drawdown of groundwater 400 m to the east of the Zeus deposit is estimated to be 5 m, increasingly exposing soils with elevated POS to air.
- Exposure to air and subsequent oxidation of potentially acidic soil materials in the drawdown zone outside of the Zeus pit can acidify groundwater entering the pit and downgradient. Once the groundwater level has recovered post pit dewatering, reducing conditions should return and any generation of acid from these upgradient soil materials will cease.
- Elevated levels of POS (up to 0.16 %S) with little ANC to compensate occur at 15 m and 25 m bgl (9 and 19 m below the water table) about 1.5 km to the west of the Heracles deposit (core 27161). Groundwater drawdown during mining in this area is estimated to be 0.5 m and not to expose soils with elevated POS to air.
- Significant decreases in pH after peroxidation in the resource areas are commonly associated with alkaline soil materials ($\text{pH} > 7$) and not related to POS. The ANC of these soils is sufficient to buffer any acid that can be generated. It is possible that presence in these non-sulfidic soils of (marine derived) limestone is associated with reduced Fe in low levels of glauconite.

- The exchange complex (CEC) of surface soils is dominated by base cations (Ca, Mg, Na, K). Ca and Mg dominate the exchangeable base cations and exchangeable acidity from H⁺ is commonly between 5 and 20% of CEC.
- Titratable actual acidity and exchangeable acidity in surface soils of the Dongara Project area are commonly below 2 meq/kg. The equivalent of this in terms of pyrite S is < 0.02 %S, which is below the action criterium of 0.03 %S for managing acid sulfate soils.
- Concentrations of Mn, Ni, Cr, Pb, Cu, Zn, As do not exceed ‘Health Investigation Levels’ for soils (HIL) in any resource area at the Dongara Project. Concentrations of As exceed ‘Ecological Investigation Level’ for soils (EIL) in the Hades, Demeter and Heracles resource areas (As>20 mg/kg). Concentrations of Ni exceed the EIL in the Heracles and Dionysus resource areas (Ni>60 mg/kg).

To manage the scale of potential effects on groundwater from mining, the following options are recommended:

- Evaluate the potential acidity from tailings of ore mined below the water table at the Zeus deposit in greater detail by:
 - Analysing drill logs for similar lithological material as indicated for elevated POS in cores 26922, 27131 and 27137 in order to better establish the spatial spread of elevated POS at the Zeus ore body as well as to the west and east of it. In this way it may be possible to avoid mining certain sections of Zeus. If uncertainties remain or a high risk is identified after this investigation THEN
 - Target areas with suggested possible elevated POS, but with no further quantitative analytical information, for drilling and SPOCAS analyses AND
 - Check POS, ANC and NA by regular SPOCAS analyses of ore mined from below the water table AND based on outcomes of this
 - Consider liming tailings from ore mined from below the water table at the Zeus deposit, where the acid neutralizing capacity (ANC) is insufficient to maintain a net acidity (NA) at or below the equivalent of 0.02 %S. Rationale for this: Within the resource areas of the Dongara Project, peroxide oxidizable sulfur (POS) exceeds the DEC action criterium of 0.03 %S in only one sample from about 17 m below the water table at a depth of 30 m bgl in the Zeus resource area (core 26922: POS 0.06 %S). The ANC of this sample is such that NA equates to only 0.02 %S. A previous investigation of other cores at the Zeus deposit confirms possible levels of ‘pyrite’ S from 0.04 to 0.07% in soils below the water table, but no SPOCAS analyses are available for these soils.
- Monitor drawdown of groundwater outside the Zeus pit in areas with potentially acidic soil materials and consider liming groundwater at a rate of 0.075.10^(6-pH) kg CaCO₃ per megalitre (ML) of groundwater entering the mine, when pH drops below 5.5. Rationale for this: Drawdown of groundwater during mining operations at the Dongara Project may result in acidification of groundwater to the east of the Zeus deposit. The background range of groundwater pH in the Dongara area is 6-8. When mining ceases and the water table at the Zeus deposit returns to its original level, reducing conditions should return, reversing any acidification.
- Liming of tailings from the Heracles, Demeter, Hades, Hebe and Dionysus resource areas is not required as no significant risk of acid generation from POS in soil materials during mining operations is evident.

TABLE of CONTENTS

1	BACKGROUND	1
1.1	SCOPE	1
1.2	METHODOLOGY	2
1.3	GROUNDWATER QUALITY	3
1.4	GEOMORPHOLOGY AND SOILS	4
1.5	GEOLOGY, HYDROGEOLOGY AND HYDROLOGY	5
2	SAMPLING AND ANALYSES.....	6
2.1	PROCEDURES	6
2.2	PROCESSING OF RESULTS.....	8
3	RESULTS OF SPOCAS ANALYSES	8
3.1	ZEUS	8
3.2	HERACLES	11
3.3	DEMETER.....	14
3.4	HADES	15
3.5	HEBE.....	16
3.6	DIONYSUS.....	18
3.7	SPOCAS SUMMARY AND DISCUSSION.....	20
4	ACIDITY OF SURFACE SOILS.....	21
5	METAL ANALYSES.....	22
6	FINDINGS	25
7	CONCLUSIONS AND RECOMMENDATIONS	26
8	REFERENCES.....	27
9	APPENDIX A – SPOCAS ANALYSES.....	31
10	APPENDIX B – BASE AND ACID CATIONS	67
11	APPENDIX C – TRACE METALS.....	68

1 Background

1.1 Scope

Tiwest Pty Ltd (Tiwest) is planning a mineral-sands mining and concentrating operation some 25km southeast of Dongara, Western Australia (Tiwest Dongara Project). A general description of the proposal and associated potential impacts was referred to the Environmental Protection Authority (EPA) by Tiwest during 2007 in accordance with Section 38 of the *Environmental Protection Act 1986*. In September 2007 the EPA set a level of assessment of Public Environmental Review (PER) with a four week public review period.

For further development of the Public Environmental Review (PER) and a soil management plan, Tiwest commissioned Geoproc to collate all their results on acid sulfate soils in the Dongara Project area into a report.

Acid sulfate soils have the potential to cause soil and water contamination through the acidification of soil water and resulting mobilisation of contained metals. Acidification primarily results from oxidation of sulfur bearing minerals (e.g. pyrite), resulting in generation of sulfuric acid.

Mining activities proposed for the Dongara Project may expose potentially acid forming soils to oxidizing conditions through:

- Excavation of materials from below the water table (perched or superficial formations) to the ground surface outside the saturated zone and
- Mine pit dewatering resulting in groundwater drawdown beyond the natural range.

Investigation methodologies for assessing the risk from potentially acid forming soils during mining activities are set out in the following WA Government (DEC and DMP) and Commonwealth (DITR) reports:

- *Identification and Investigation of Acid Sulfate Soils and Acidic Landscapes* (DEC 2009).
- *Mining Proposals in Western Australia* (DMP-Environment 2006).
- *Managing Acid and Metalliferous Drainage* (DITR 2007).

Guidelines in neither of these reports deal in detail with requirements for mining of mineral-sands. As such, aspects of approaches recommended in the reports with adaptations were applied. The DITR report (DITR 2007) is listed as guideline material by the DMP on their website (<http://www.dmp.wa.gov.au/836.aspx>) and (page 29) details requirements for sampling cores in proposed mined areas, based on Scott *et al.* (2000):

- Drill core samples should represent no more than 10 m intervals and cover individual geological types and ore types.
- Each composite sample should not be obtained from more than one drill hole.
- Each sample should be approximately 1-2 kg and be crushed to nominal 4 mm size and then riffle split to produce 200-300 g for pulverizing to <75 µm. The <4 mm and pulverized splits should be retained for testing.

Criteria for action to manage an acid sulfate soil have been set by the WA Department of Environmental Conservation (DEC 2009) at 0.03 % S for sandy soils (<5% clay), 0.06% S for soils with clay contents between 5 and 40% and 0.1% S for a clay content >40%. Ward *et al.* (2004), however, argue that environmental action criteria should be set at 0.03 %S for all soils, irrespective of clay content. Guideline material (DITR 2007: page 34) listed by the WA Department of Mines and Petroleum (DMP) considers soils in mining areas with <0.25 % S as non-acid forming and sets its action criterium for managing acid forming soil materials in mining areas at >0.25 %S.

This report discusses results of investigating any presence and potential impact of acid sulfate soils in the Dongara Project area from SPOCAS (Suspension Peroxide Oxidation Combined Acidity & Sulfur) analyses in terms of DEC guidelines (DEC 2009) and provides management recommendations based on these results. In addition results of analyses of a number of metals (Al, Fe, Mn, Ni, Cr, Pb, Cu, Zn, As and Se) as well as of exchangeable base and acid cations in surface soils are presented and discussed.

1.2 Methodology

The Dongara Project area with the outlines of proposed areas to be mined and drilling locations of cores is shown in Figure 1-1.

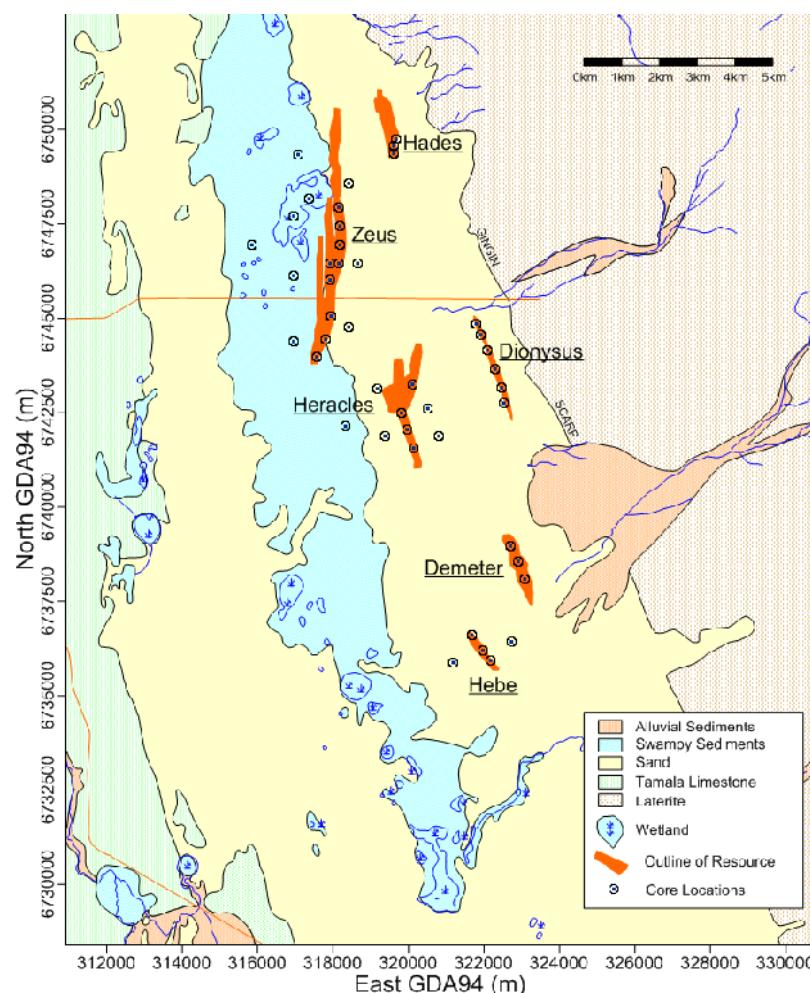


Figure 1-1
Locations of cores,
drilled at the deposits in
the Dongara Project area
for investigating
presence of potentially
acid forming
materials.

Cores were drilled at the locations, shown in Figure 1-1, inside and outside the proposed areas of mining, sampling across the soil profiles at 1m intervals and testing samples “in the field” for pH and and pH after oxidation with hydrogen peroxide (pH-Ox). Results, in combination with lithological information, were then used to focus the testing by SPOCAS (Ahern *et al.* 2004, Appendix A). Aim was for representative samples from each lithological unit to be screened. In addition the potential for acid formation in the resource areas was tested by sampling to depths exceeding those proposed for mining by at least two metres. Outside the resource areas exposure was investigated of any acid forming soils in the saturated zone to (modelled) groundwater drawdown from mining operations (Brown 2010). Some (approximate) geometric details for the Dongara deposits are given in Table 1-1. Deposits of Zeus, Hades and Hebe will be mined to below the water table. Deposits of Heracles and Dionysis will only be mined below the water table at the deepest points.

Table 1-1 Approximate geometric details of the deposits in the Dongara Project Area

Deposit (Fig. 1-1)	Planar area ~ ha	Depth of Mining m bgl	% Below Water Table %
Zeus	169	25-30	70
Heracles	67	20-25	<1
Demeter	47	30-35	0
Hades	38	30-31	10
Hebe	20	40-45	30
Dionysis	17	30-35	1

Interpretation of “field data” resulted in selecting samples from cores at between 2 to 7 m intervals for detailed analysis by the SPOCAS method (Ahern *et al.* 2004, Appendix A). The SPOCAS method provides an all in one acid base account and is the standard method required by DEC (DEC 2009) for assessing acid sulfate soils to determine their acid forming potential. Results of SPOCAS analyses (Appendix A) together with modelled drawdown areas for groundwater under different mining scenarios (Brown 2010) are used to map the extent of potentially acid forming units and thereby to assess requirements for managing associated risks.

A first round of acidic soil investigations in 2007 indicated oxidizable sulfur to be commonly below 0.02 % S. The present, more extensive, round of acidic soil investigations was completed in December 2009 in conjunction with metal analyses (Al, Fe, Mn, Ni, Cr, Pb, Cu, Zn, As and Se) in cores from within the resource areas only (Figure 1-1) and is discussed in this report.

In addition, based on recommendations from the DEC (pers. comm. Steve Appleyard), the overall soil acidity in the Dongara Project area was also determined from levels of exchangeable base and acid cations in soils, sampled at 9 locations to a depth of 4 m at 1 m intervals (Figure 2-1) and is discussed in this report.

1.3 Groundwater Quality

Groundwater was sampled from piezometers and existing monitor bores in February 2007 and in November 2007 and analysed for major and minor ions and trace

elements (Gerritse 2007, 2008). The following pattern for hydrochemistry and underlying processes in groundwater at the Dongara project area emerges:

- Groundwater pH is mildly acidic (~6-6.5) and is mainly governed by NaHCO₃ and high partial pressures of CO₂.
- Some groundwater samples from piezometers at the Zeus, Heracles and Dionysus deposits and increasingly towards the western part of the Dongara project area data reflect spatially variable presence of calcite and magnesite through a pH>7 and elevated concentrations of Ca and Mg .
- Elevated groundwater concentrations of SiO₂ reflect weathering of albite and feldspar minerals into kaolinite. Resulting reaction products (NaHCO₃ and KHCO₃) contribute measurably to groundwater alkalinity, particularly near the Zeus and Heracles deposits.
- Salinity (EC) and pH decrease with depth in the surficial aquifer and increase towards the west.
- Redox potentials (Eh) are significantly more reducing in shallow groundwater than in deeper groundwater at ore bodies. Groundwater Eh is governed by oxidation-reduction of Fe-oxides.
- Groundwater concentrations of SO₄ are relatively low at ore bodies, reflecting reduction of SO₄ at or up-gradient of ore bodies. Reduction of SO₄ contributes to small increases in groundwater pH and alkalinity.
- Activities of radionuclides of Ra in groundwater reflect elevated concentrations of U and Th in aquifer materials.
- Concentrations of trace metals in shallow groundwater at the Dongara project area are commonly below analytical limits of reporting. Cu, Zn, Pb and Ni are, however, detected in groundwater from some bores. No relationship with pH or other parameters emerges and it is likely that detected levels are the result of contamination from dissolution/corrosion of materials used in the construction of bores and/or sampling equipment.

1.4 Geomorphology and Soils

The project area is within the major regional physiographic unit, termed the Swan Coastal Plain. Within this unit, three principal sub-units can be recognized in the general vicinity of the project. These, running west to east, comprise:

- The Quindalup Dune System, a coastal dune system of Holocene age (<10,000 ybp) (McArthur and Bettenay, 1960; Semeniuk *et al.*, 1989) that has a width of 4.5km.
- The Spearwood Dune System, an inland dune system of Middle to Late Pleistocene age (800,000 ybp to 100,000 ybp), (McArthur and Bettenay, 1960), now referred to as the Tamala Limestone.
- The Eneabba Plain (Playford *et al.* 1976), an area of undulating but gently rising plain between the Tamala Limestone and the Gingin Scarp.

The Dongara Project area lies wholly within the Eneabba Plain. Two detailed field investigations have been completed to date by D.C. Blandford & Associates on behalf of Tiwest. The first (Blandford 2007) was undertaken in order to broadly characterize the landform and soil landscapes within the general project area and the second study

(Blandford 2008) focused on the soil profile characteristics of a paleo-lake system adjacent to the western ore bodies.

1.5 Geology, Hydrogeology and Hydrology

In the area of the proposed mines the surface geology consists of superficial formations of Quaternary-Tertiary age that extend to depths of 20-60 m below ground. The superficial formations overlie the Yarragadee Formation which extends to approximately 1 km depth. The Mesozoic and Permian strata of the Perth Basin in total extend to depths of more than 3 km in this area.

The Geological Survey of Western Australia investigated the hydrogeology of the superficial formations and the uppermost Yarragadee Formation between Leeman and Dongara to depths up to 100 m. Sediments of the superficial formations in downward order in the area of the proposed mines comprise Bassendean Sand (Quaternary age), Guildford Formation (Quaternary age) and Yoganup Formation (Tertiary age). The Bassendean Sand is a medium-grained sand of aeolian origin and is present only at and near the ground surface to depths of less than 10 m. The Guildford and Yoganup Formations are comprised mainly of sand and clayey sand. The Yoganup Formation is a shoreline deposit representing a buried prograding coastline of dunes, beach ridges and deltaic deposits.

The Yarragadee Formation is of late Jurassic age. In 2008 Tiwest explored the Yarragadee strata to 229 m depth near Department of Water bore site LS32 between the Heracles and Dionysus deposits. Geophysical logs show that about one-third of the thickness of the Yarragadee Formation to that depth is sand. Drill cuttings show that the sand is of medium to coarse grain size. The sand occurs as both thin beds (typically 1 metre thick) and thick beds (typically 6 m thick). The other two-thirds of the total Yarragadee thickness drilled is clay and shale. The Yarragadee strata dip gently to the east in the area of the mines. This has been shown by correlations of geophysical logs between bores and also by seismic sections produced as part of oil and gas exploration in the area.

Several faults in the Mesozoic strata have been delineated on the basis of seismic data (Mory 1995). Most are aligned approximately NNW-SSE.

Hydrogeological characteristics of the Dongara Project have been summarized in reports by Haselgrove (2006, 2009). It was noted that:

- Two major gas fields have been developed in the vicinity of the mineral sands deposits at the Dongara project area.
- The saturated thickness of the superficial aquifer in the eastern part of the Dongara project area is likely to be insufficient to support reasonable bore yields.
- Intense pumping of the superficial aquifer in the central part of the project area may impact on vegetation.
- Quality of water from the shallow Yarragadee aquifer is suitable for drinking water.

Local hydrology and potential impacts of mining on groundwater levels have been described by Brown (2010).

2 Sampling and Analyses

2.1 Procedures

Sampling density was aimed to meet the intent of the DEC's sampling requirements, but more closely meets the expectations implied by the DITR and DMP waste characterization requirements, which are better suited to bulk volumetric movements associated with mining.

At each location a light truck mounted aircore rig was used to drill to a depth exceeding the proposed depth of mining by at least two meters. This is in accordance with requirements of DEC *Guidelines* (DEC 2009), which recommend soil bores to be drilled to 1 m below the proposed depth of disturbance. Samples were taken via air cyclone sample splitter at 1m intervals providing a representative sample across the full metre interval. All locations were logged for lithology.

The drilling technique selected for assessment of the deposits is industry standard. Dual tube reverse circulation or air core system was developed specifically to enable drilling and recovery of sand samples for the heavy mineral sands industry, by Wallis Drilling Pty Ltd.

Cores were drilled at the locations in the deposit areas shown in Figure 1-1. Cores were sampled between 2 and 7 m to 1-2 beyond the maximum depth of mining. Samples were analysed at the ALS laboratories, following the SPOCAS method (Aherne *et al.* 2004) for peroxide oxidizable sulfur and an acid-base account. Cores from within the resource areas only (Figure 1-1) were also analysed for total concentrations of Al, Fe, Mn, Ni, Cr, Pb, Cu, Zn, As and Se.

The ALS laboratories are NATA (National Association of Testing Authorities) certified. Major points of their QA procedures are:

- All chemicals received are logged and tested for possible contamination.
- All reagents used for analysis are standardised daily.
- A reagent blank analysis is performed every 20 samples.
- Duplicate analysis is performed every 10 samples, or part thereof.
- A laboratory control standard is performed every 20 samples for each part of the suite. For ASS work this standard is not reported due to the case that results are reported as suites of work, not as individual tests.
- All samples are dried in a temperature controlled drying oven (80-85°C), and monitored as per NATA requirements.
- pH meters used are calibrated at the start of analysis and pH readings are checked every 10 samples. The meters are also re-calibrated every 20 samples.
- Samples are analysed for metals using an ICPAES which undergoes daily performance checks before analysis proceeds.

- All metal analytical runs are checked using independent calibration verification standards and instrument run standards to check for any drift in instrument readings. These independent standards are obtained from a completely differing source from the standards used for instrument calibration.

The overall acidity of surface soils in the Dongara Project area was tested together with the level of base cation saturation and exchangeable acid cations (H^+ , Al, Fe and Mn) in samples from nine locations at depths to 4 m at 1 m intervals. Sampling locations are shown in Figure 2-1. Sampling and analysis methods follow the ICP-Forests manuals (ICP 2006). The effective cation exchange capacity (ECEC) and exchangeable acidity (EA) are assessed with a one step $BaCl_2$ extraction method (ICP 2006, Schwertfeger & Hendershot 2009). The soil is first saturated with respect to Ba by treating the soil one single time with a 0.1 mol/L $BaCl_2$ solution. Concentrations of the exchangeable basic cations Na, K, Ca and Mg and the exchangeable acid cations Al, Fe, Mn, are determined in the 0.1 mol/L $BaCl_2$ extract of the soil using spectrometry. To determine exchangeable acidity (H^+ , Fe^{3+} , Al^{3+} , Mn^{2+}), the 0.1 mol/L extract is titrated with a 0.05 mol/L NaOH solution to a pH of 7.8. Determination of free H^+ is realized using a method in which NaF is added to the soil extract before the titration (Al and Fe ions are complexed and only free H^+ is detected in the titration process). Alternatively free H^+ can be calculated empirically with a so called Ulrich/Prenzel factor, measuring only exchangeable Al in the 0.1 mol/L $BaCl_2$ extract (ICP 2006). Analyses of exchangeable base and acid cations were conducted at the ALS laboratories, using methods approximating those in the ICP protocol (ICP 2006).

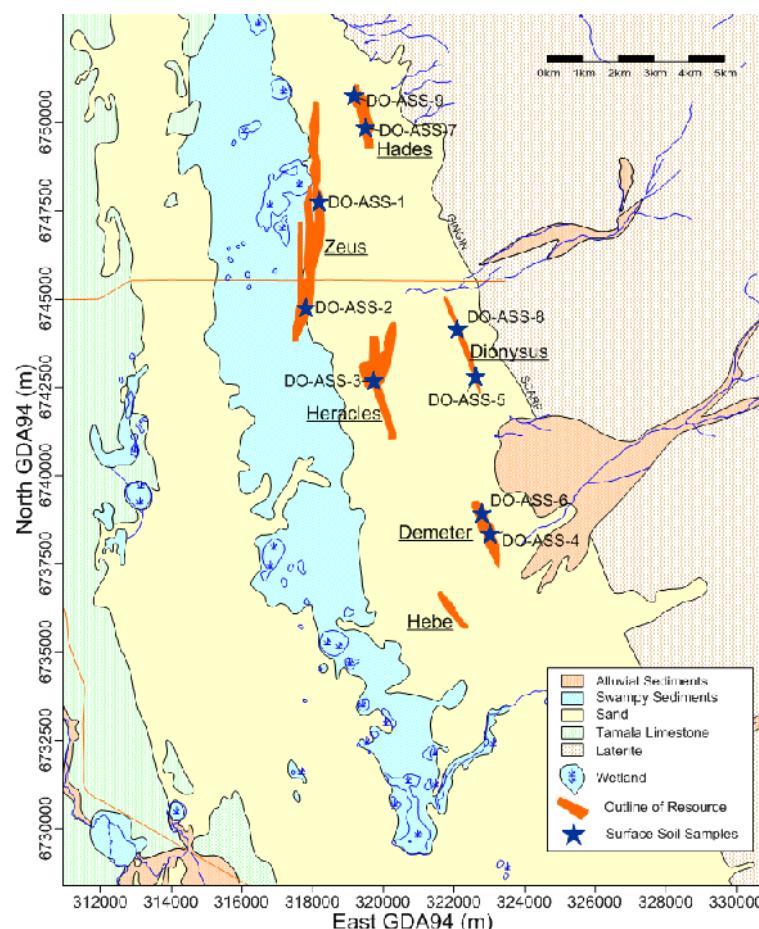


Figure 2-1
Sampling sites for surface soils in the Dongara Project area for investigating overall acidity from levels of exchangeable base and acid cations.(Appendix C).

2.2 Processing of Results

Laboratory data for the SPOCAS analyses of samples from cores at the deposits are given in Appendix A and are discussed in section 3 and plotted in Figures 3-1 to 3-14 for various transects through the deposit areas.

Results of analysing exchangeable base and acid cations are given in Appendix B and are discussed in section 4 and are plotted in Figure 4-1.

Results of metal analyses in cores are given in Appendix C and are discussed in section 5 and plotted as depth profiles in Figures 5-1 to 5-3.

3 Results of SPOCAS analyses

3.1 Zeus

Locations of cores at the Zeus deposit are shown in Figure 3-1. Solid and dashed lines, connecting cores indicate north-to-south and east-west transects used to plot the SPOCAS analysis data (Appendix A) against depth. Transects through the Zeus deposit for the SPOCAS analysis data are shown in Figures 3-2 (NS-1 and NS-2 transects) and Figure 3-3 (EW-1 and EW-2 transects).

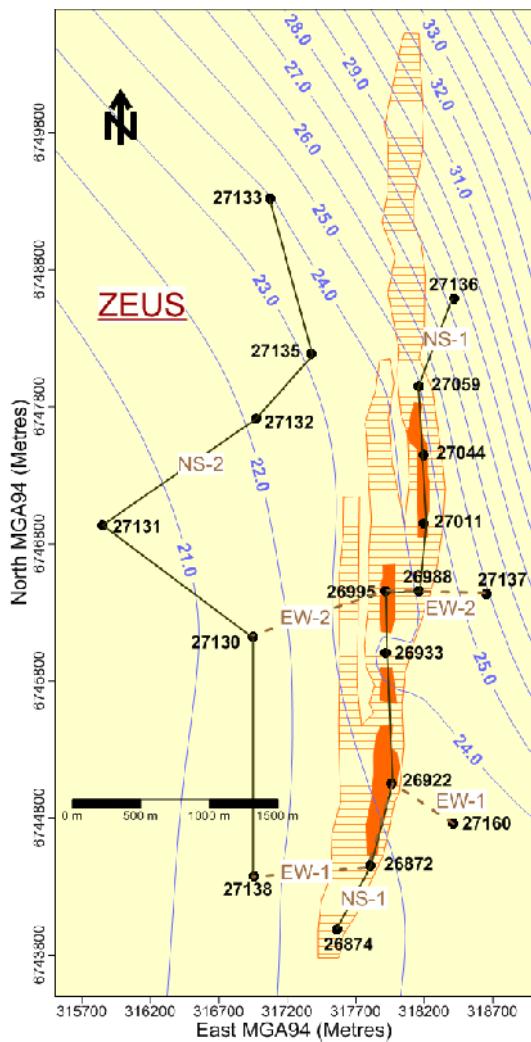


Figure 3-1

Drill locations at the Zeus deposit in the Dongara Project area (Figure 1-1) for investigating presence of potentially acid forming materials. Cores are indicated by black dots and are numbered as in Appendix A. Solid lines, connecting cores, are for transects in a north-south direction (NS-1 and NS-2). Dashed lines are for transects in an east-west direction (EW-1 and EW-2). SPOCAS results for the transects are plotted in Figures 3-2 and 3-3. Blue contour lines indicate water table in m AHD (Haselgrove 2009).

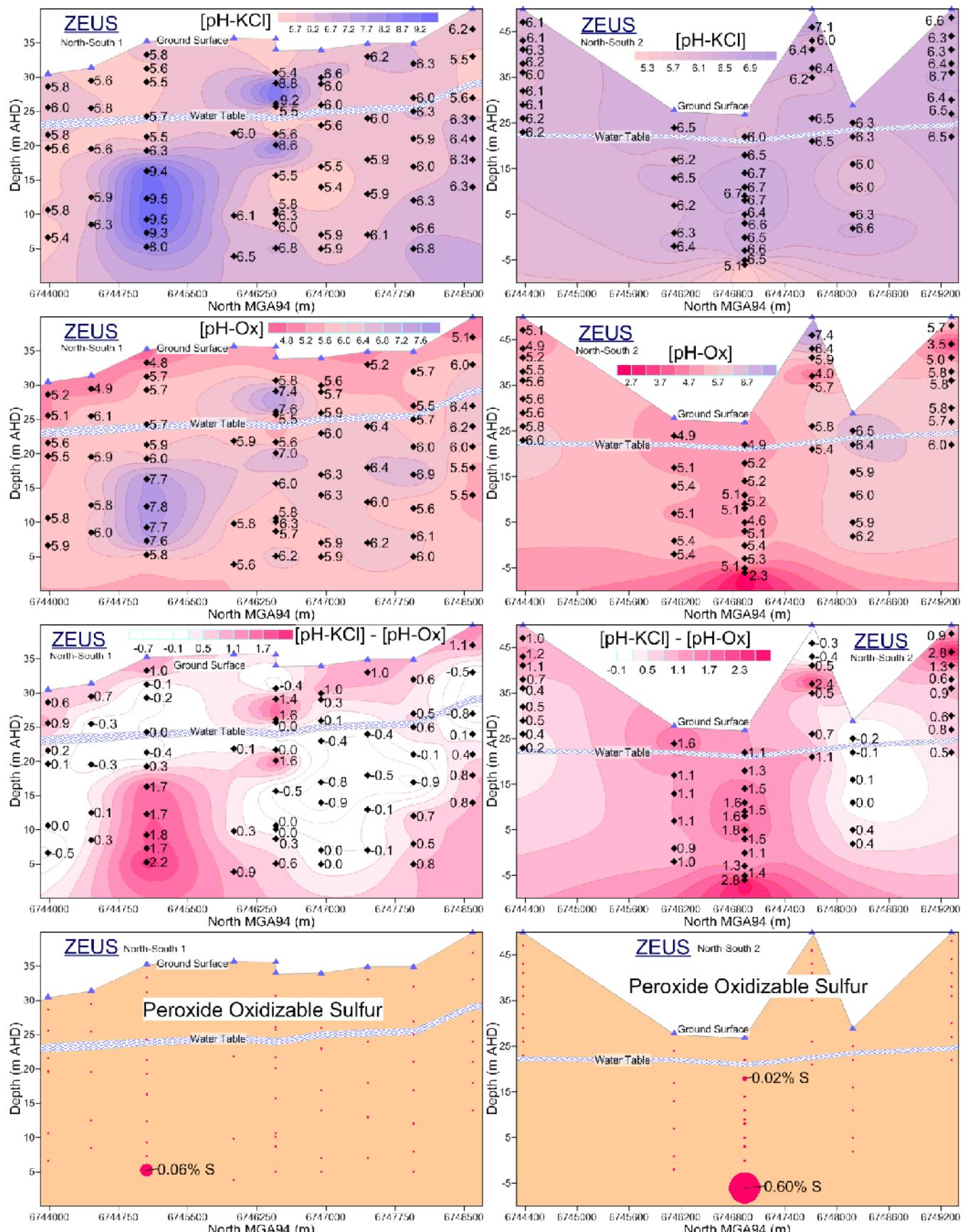


Figure 3-2 North-south transects (NS-1 and NS-2 in Figure 3-1) of SPOCAS parameters (Appendix A) against depth for the Zeus deposit in the Dongara Project area (Figure 1-1). POS is shown only for S > 0.02%.

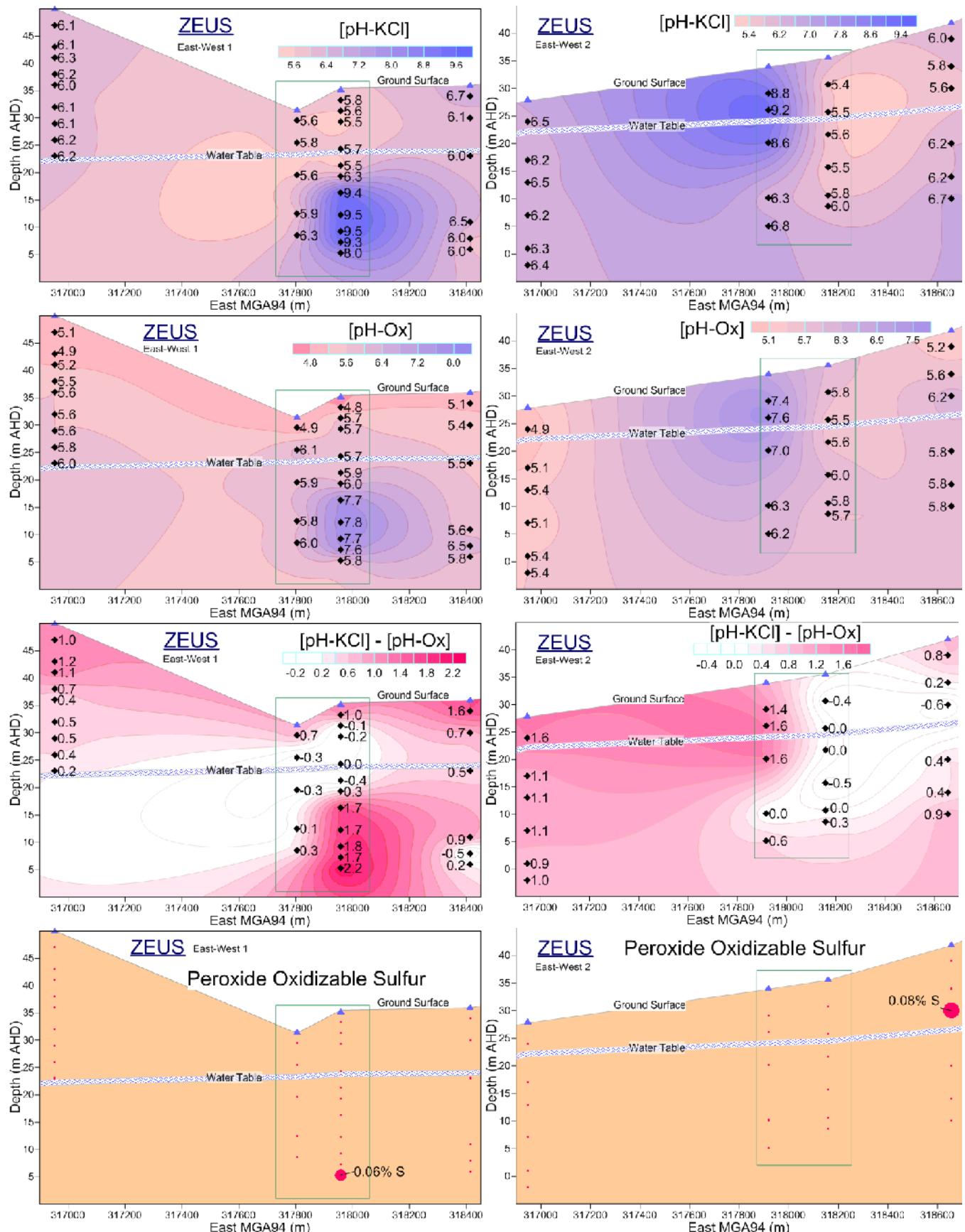


Figure 3-3 East-west transects (EW-1 and EW-2 in Figure 3-1) of SPOCAS parameters (Appendix A) against depth for the Zeus deposit in the Dongara Project area (Figure 1-1). POS is shown only for S = 0.02%. Rectangles indicates resource area.

Peroxide oxidizable sulfur (POS) within the Zeus deposit is below 0.02% S, except at one location (Figures 3-2 & 3-3: 0.06 % at 30 m bgl). To the west of the deposit area, elevated POS is detected in two samples (Figure 3-2: 0.02 %S and 0.6 %S at 9 and 33 m bgl respectively) and to the east in one sample (Figure 3-3: 0.08 %S at 12 m bgl). Results are summarized in Table 3-1.

Samples with elevated POS located at and to the west of the Zeus deposit are from below the water table. The sample with a POS of 0.08 %S to the east of the Zeus deposit (Table 3-1) appears to be from near the water table.

Table 3-1 Core samples at the Zeus deposit with ‘Peroxidizable Sulfur’ (POS) 0.02 %S. Details on POS, net acidity (NA) and potential acidity (=NA – ANC) are given in Appendix A.

Core No.	Depth	Lithology	POS	Net Acidity	Potential Acidity
	m bgl		% S	meq H ⁺ /kg	meq H ⁺ /kg
26922	30	Stiff Black Clay	0.06	13	39
(27131)	(9)	Grey Clayey Sand	(0.02)	(15)	(15)
(27131)	(33)	Stiff Black Clay	(0.60)	(420)	(420)
(27137)	(12)	Orange Clayey Sand, poorly sorted with partial sandstone pieces	(0.08)	(55)	(55)

‘Net Acidity = for Acidity, generated on oxidation of POS, including the ANC’ & ‘Potential Acidity = for Acidity excluding the ANC’. Data in brackets are for samples from outside the mined area.

Acid generating capacity of the sample from within the Zeus deposit with a POS of 0.06 %S is buffered by the acid neutralizing capacity (ANC) of soil materials. The ANC lowers the liming rate required to neutralize acidity from oxidation of POS from 3 to <1 kg CaCO₃/t (Appendix A, Table 3-1).

3.2 Heracles

Locations of cores at the Heracles deposit are shown in Figure 3-4. Solid and dashed lines, connecting cores indicate north-south and east-west transects used to plot the SPOCAS analyses (Appendix A) against depth in Figure 3-5 (transect NS) and Figure 3-6 (transects EW-1 and EW-2).

Table 3-2 Core samples to the west of the Heracles deposit with ‘Peroxidizable Sulfur’ (POS) 0.02 %S. Details on POS, net acidity (NA) and acidity (NA – ANC) are given in Appendix A.

Core No.	Depth	Lithology	POS	Net Acidity	Acidity
	m bgl		% S	meq H ⁺ /kg	meq H ⁺ /kg
(27161)	(15)	Brown Clayey Sand	(0.04)	(<10)	(26)
(27161)	(25)	Firm Black Clay	(0.16)	(110)	(110)

‘Net Acidity = for Acidity including the ANC’ & ‘Acidity = for Acidity excluding the ANC’, generated on oxidation of POS. Data in brackets are for samples from outside the mined area.

Peroxide oxidizable sulfur (POS) levels in all soils sampled from within the Heracles resource area are < 0.02 %S and thus below the DEC action criterium of 0.03 %S.

POS is elevated in two soil samples from below the water table at locations to the west of the Heracles resource area (Figure 3-6: 0.04 %S and 0.16 %S at 15 and 25 m bgl respectively). Results are summarized in Table 3-2. Effects of groundwater drawdown on these locations and subsequent generation of acid from exposure of POS to oxidation is discussed in section 3.7.

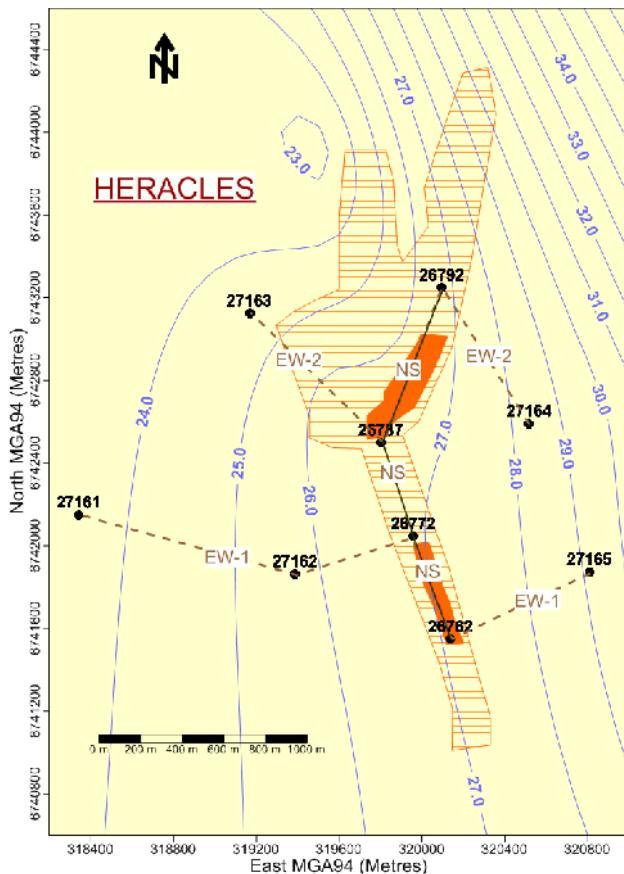


Figure 3-4

Drill locations at the Heracles deposit in the Dongara Project area (Figure 1-1) for investigating presence of potentially acid forming materials. Solid line connecting cores is for a transect in a north-south direction (NS). Dashed lines are for transects in east-west directions (EW-1 and EW-2). SPOCAS results for the transects are plotted in Figures 3-2 and 3-3. Blue contour lines indicate water table in m AHD (Haselgrove 2009).

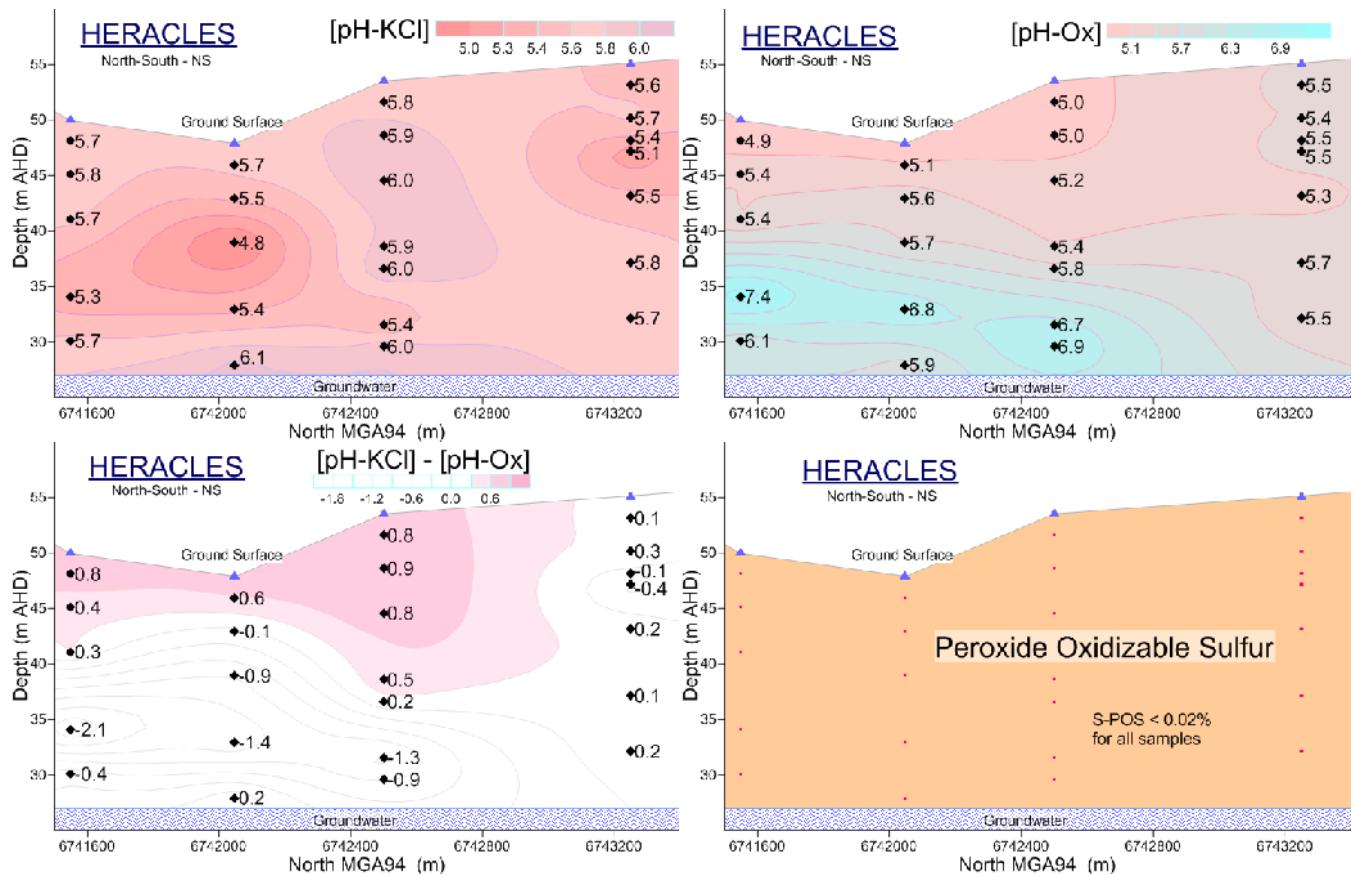


Figure 3-5 North-south transects (NS in Figure 3-4) of SPOCAS parameters (Appendix A) against depth for the Heracles deposit in the Dongara Project area (Figure 1-1). POS is shown only for S > 0.02%.

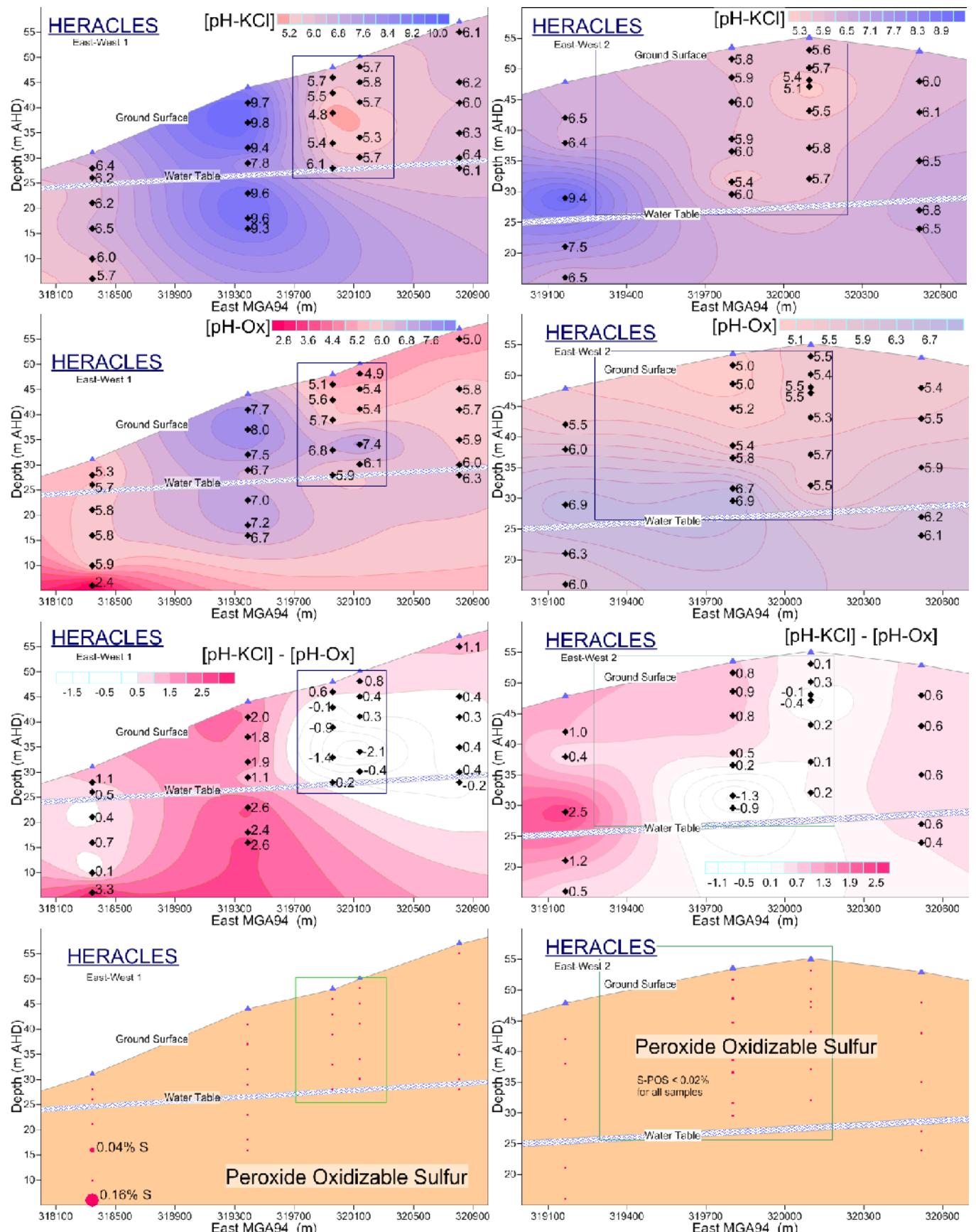


Figure 3-6 East-west transects (EW-1 and EW-2 in Figure 3-4) of SPOCAS parameters (Appendix A) against depth for the Heracles deposit in the Dongara Project area (Figure 1-1). POS is shown only for S > 0.02%. Rectangles indicate extent of resource.

3.3 Demeter

Locations of cores at the Demeter deposit are shown in Figure 3-7.

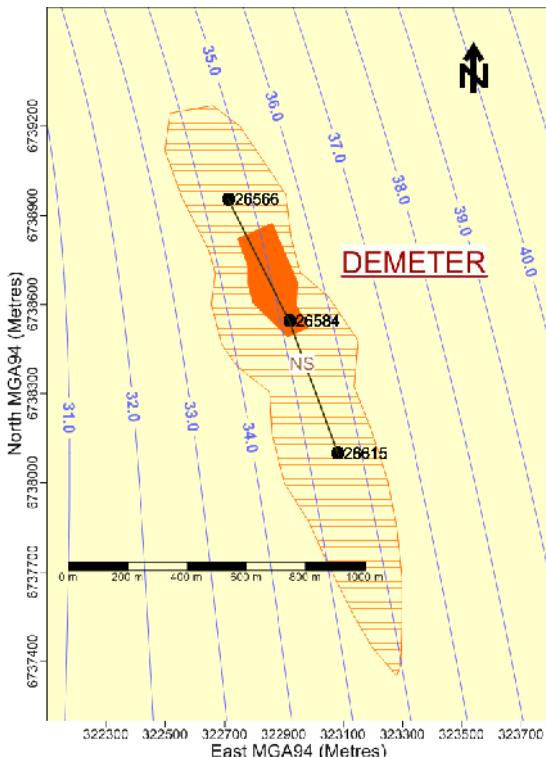


Figure 3-7

Drill locations at the Demeter deposit in the Dongara Project area (Figure 1-1) for investigating presence of potentially acid forming materials. Cores are indicated by black dots and are numbered as in Appendix A. Solid line connecting cores is for a transect in a north-south direction. SPOCAS results for the transect are plotted in Figure 3-8. Blue contour lines indicate water table in m AHD (Haselgrave 2009).

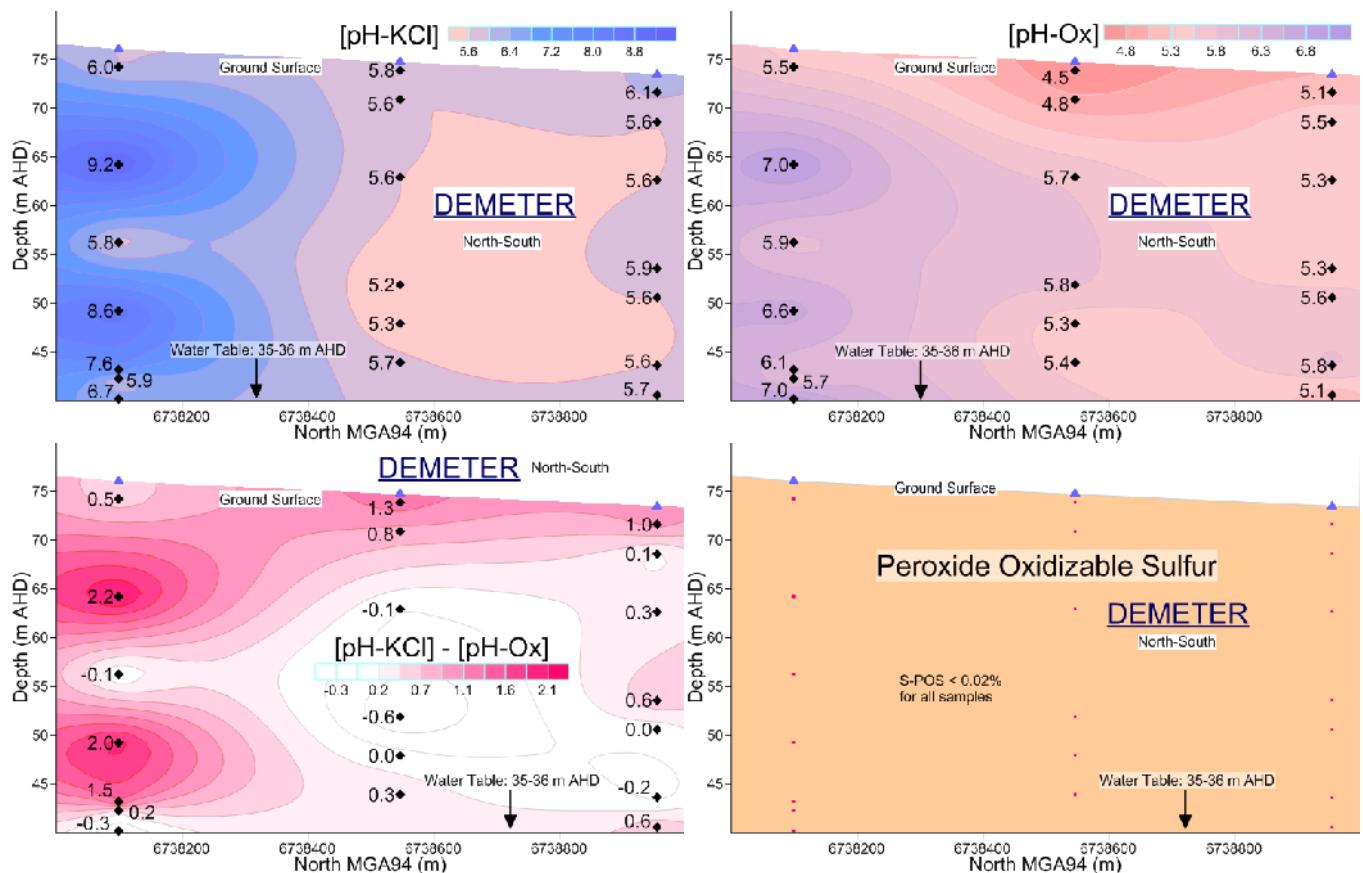


Figure 3-8 North-south transects (NS in Figure 3-7) of SPOCAS parameters (Appendix A) against depth for the Demeter deposit in the Dongara Project area (Figure 1-1). POS is shown only for S > 0.02%.

A north-to-south transect through the Demeter deposit for SPOCAS analysis data is shown in Figure 3-8. Peroxide oxidizable sulfur (POS) is below 0.02% S in all soils sampled from the deposit.

Figure 3-8 also shows that soils in the southern section of the Demeter deposit are alkaline, with elevated Ca and Mg concentration in SPOCAS extracts (Appendix A), reflecting presence of Ca/Mg carbonates.

Generation of acidity on peroxidation (Figure 3-8: [pH-KCl]-[pH-Ox]) is also significant in the southern section of the Hades deposit and is not related to elevated levels of sulfide (POS<0.02 %S). This non-sulfide related acidity is more than compensated by an excess acid neutralizing capacity (ANC-exc in Appendix A). A possible source of non-sulfide related acidity is discussed in section 5.

3.4 Hades

Locations of cores at the Hades deposit are shown in Figure 3-9. North-to-south transects through the Demeter deposit for SPOCAS analysis data are shown in Figure 3-10. Peroxide oxidizable sulfur (POS) in all soils, sampled from the Hades deposit, is below 0.02% S (Figure 3-10, Appendix A). A previous investigation of Fe and S in the ‘non-magnetic’ fraction of materials from a depth of about 30 m bgl at the Hades deposit indicated that levels of ‘pyrite’ S were all <0.03% (Gerritse 2007).

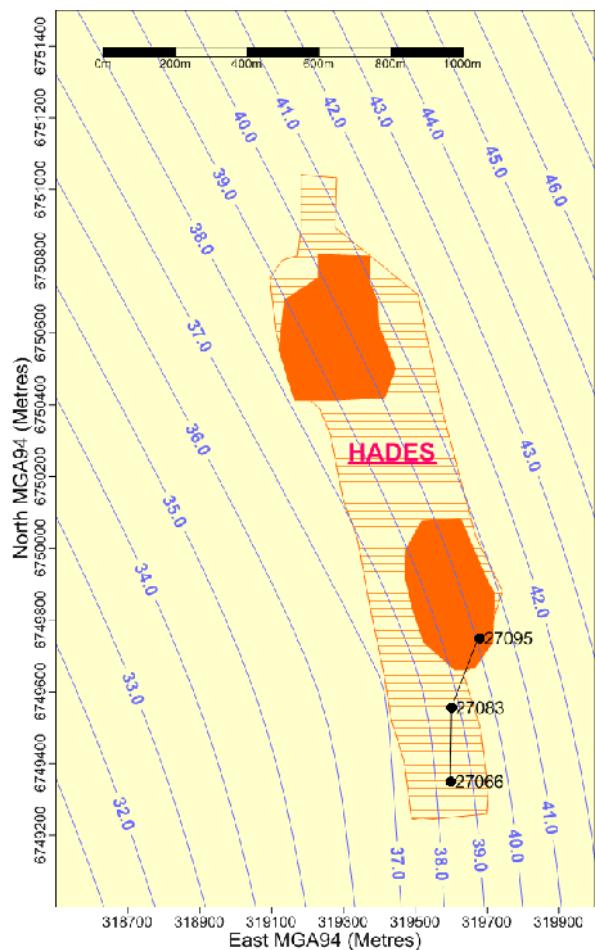


Figure 3-9
Drill locations at the Hades deposit in the Dongara Project area (Figure 1-1) for investigating presence of potentially acid forming materials. Cores are indicated by black dots and are numbered as in Appendix A. Solid line connecting cores is for a transect in a north-south direction. SPOCAS results for the transect are plotted in Figure 3-10. Blue contours indicate water table in m AHD (Haselgrove 2009).

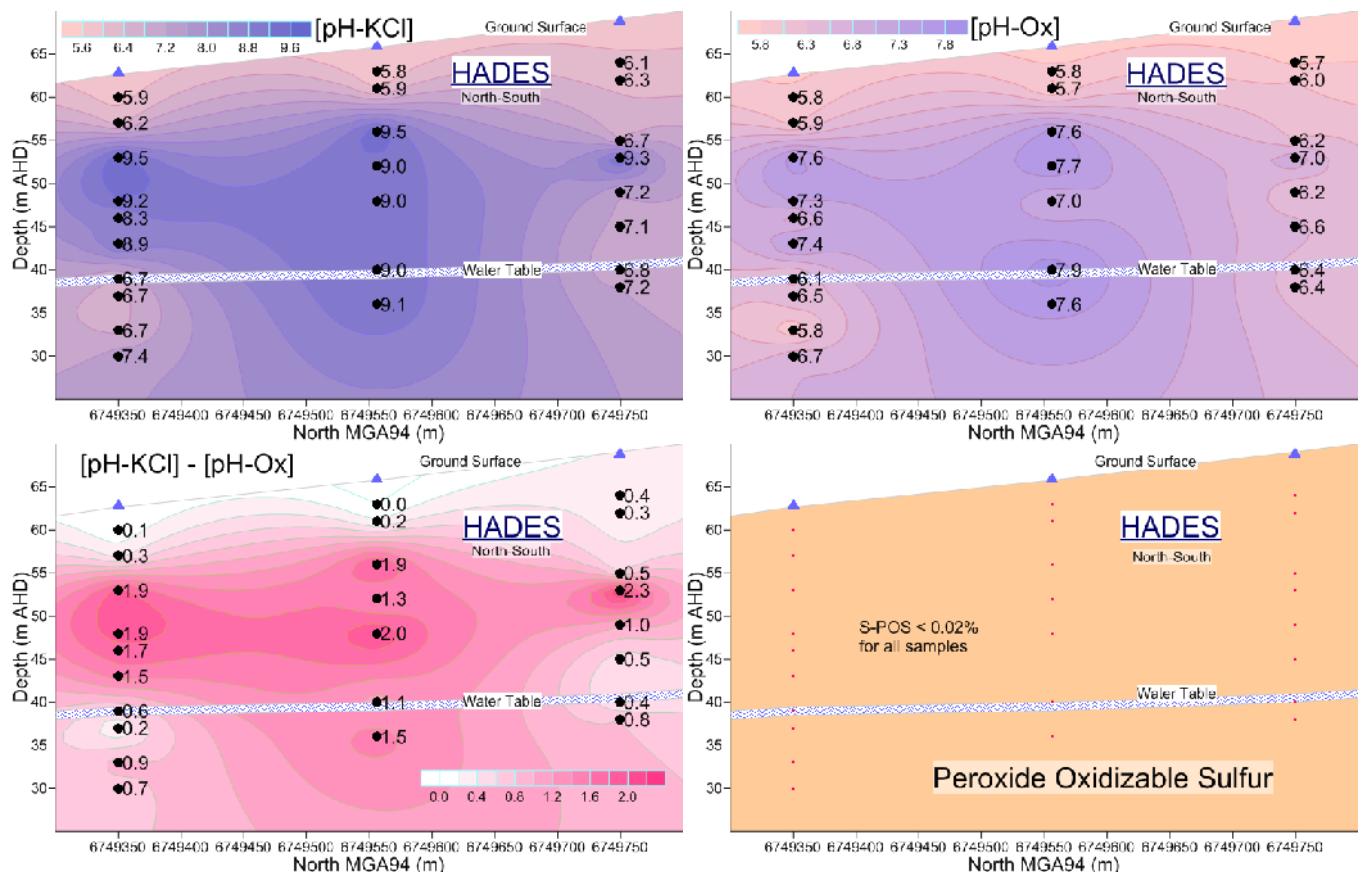


Figure 3-10 North-south transects (Figure 3-9) of SPOCAS parameters (Appendix A) against depth for the Hades deposit in the Dongara Project area (Figure 1-1). POS is shown only for S < 0.02%.

Figure 3-10 indicates that soils at depth in the southern section of the Hades deposit are alkaline, with elevated Ca and Mg concentration in SPOCAS extracts (Appendix A), reflecting presence of Ca/Mg carbonates.

Acidity on peroxidation (Figure 3-10: [pH-KCl]-[pH-Ox]) is also elevated at the Hades deposit and is not related to sulfide (POS<0.02 %S). This non-sulfide related acidity is more than compensated by an excess acid neutralizing capacity (ANC-exc in Appendix A). A possible source of non-sulfide related acidity is discussed in section 5.

3.5 Hebe

Locations of cores at the Hebe deposit are shown in Figure 3-11. North-to-south transects through the Hebe deposit for SPOCAS analysis data are shown in Figure 3-12. Peroxide oxidizable sulfur (POS) in all soils, sampled from the Hebe deposit, is below 0.02% S (Figures 3-12 & 3-13, Appendix A).

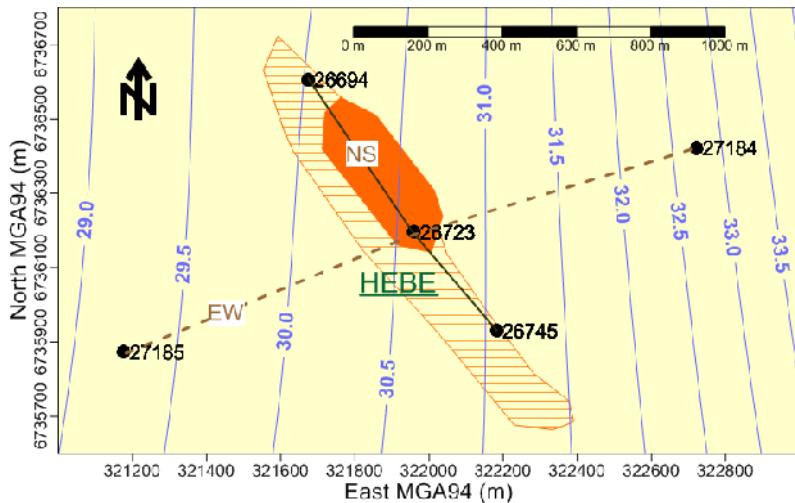


Figure 3-11
Drill locations at the Hebe deposit in the Dongara Project area (Figure 1-1). Cores are indicated by black dots and are numbered as in Appendix A. Lines connecting cores are for north-south (NS) and east-west (EW) transects. SPOCAS results for transects are plotted in Figure 3-12. Blue contours indicate water table in m AHD (Haselgrove 2009).

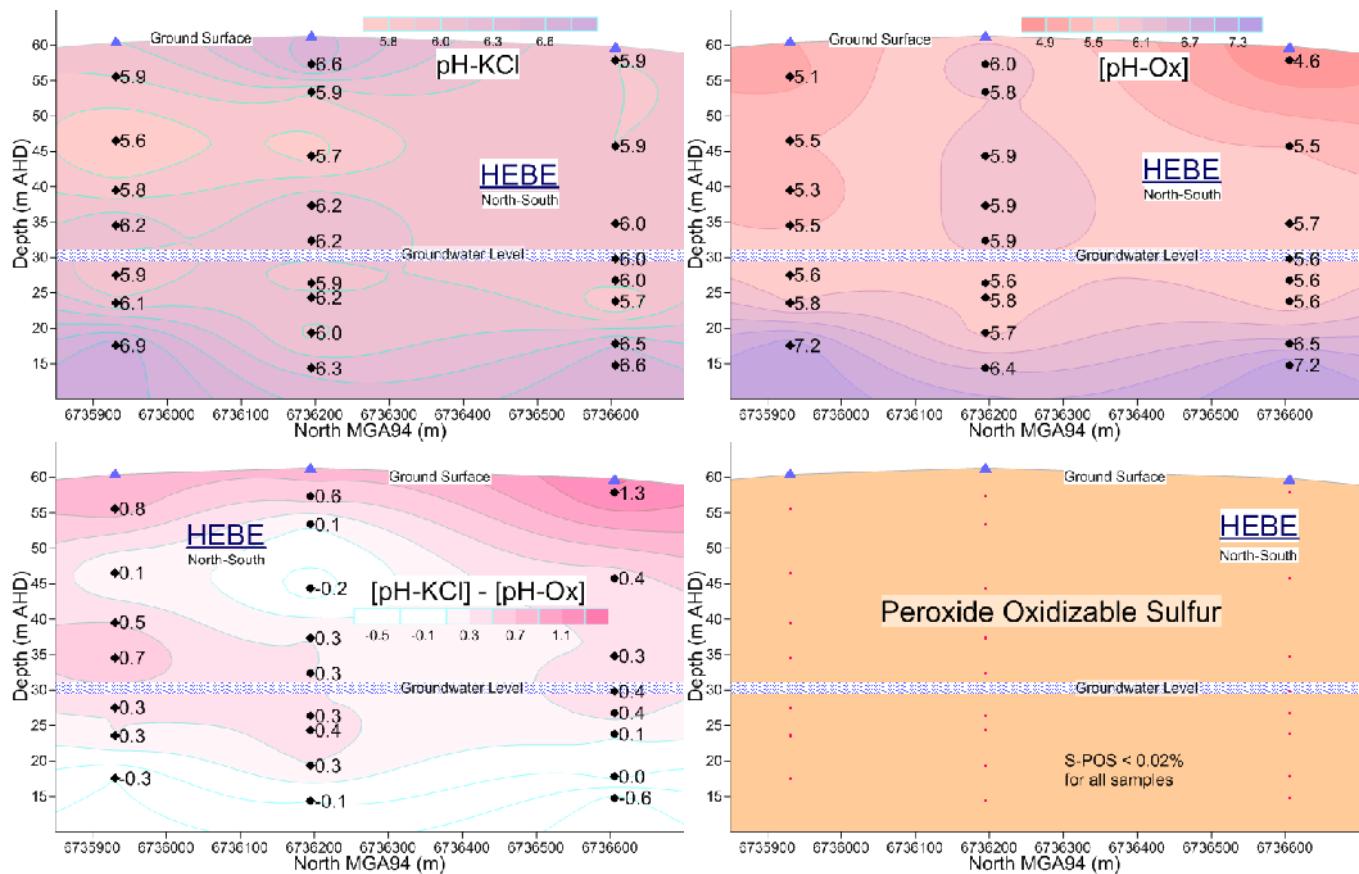


Figure 3-12 An north-south transect (NS in Figure 3-11) of SPOCAS parameters (Appendix A) against depth for the Heracles deposit in the Dongara Project area (Figure 1-1). POS is shown only for S > 0.02%.

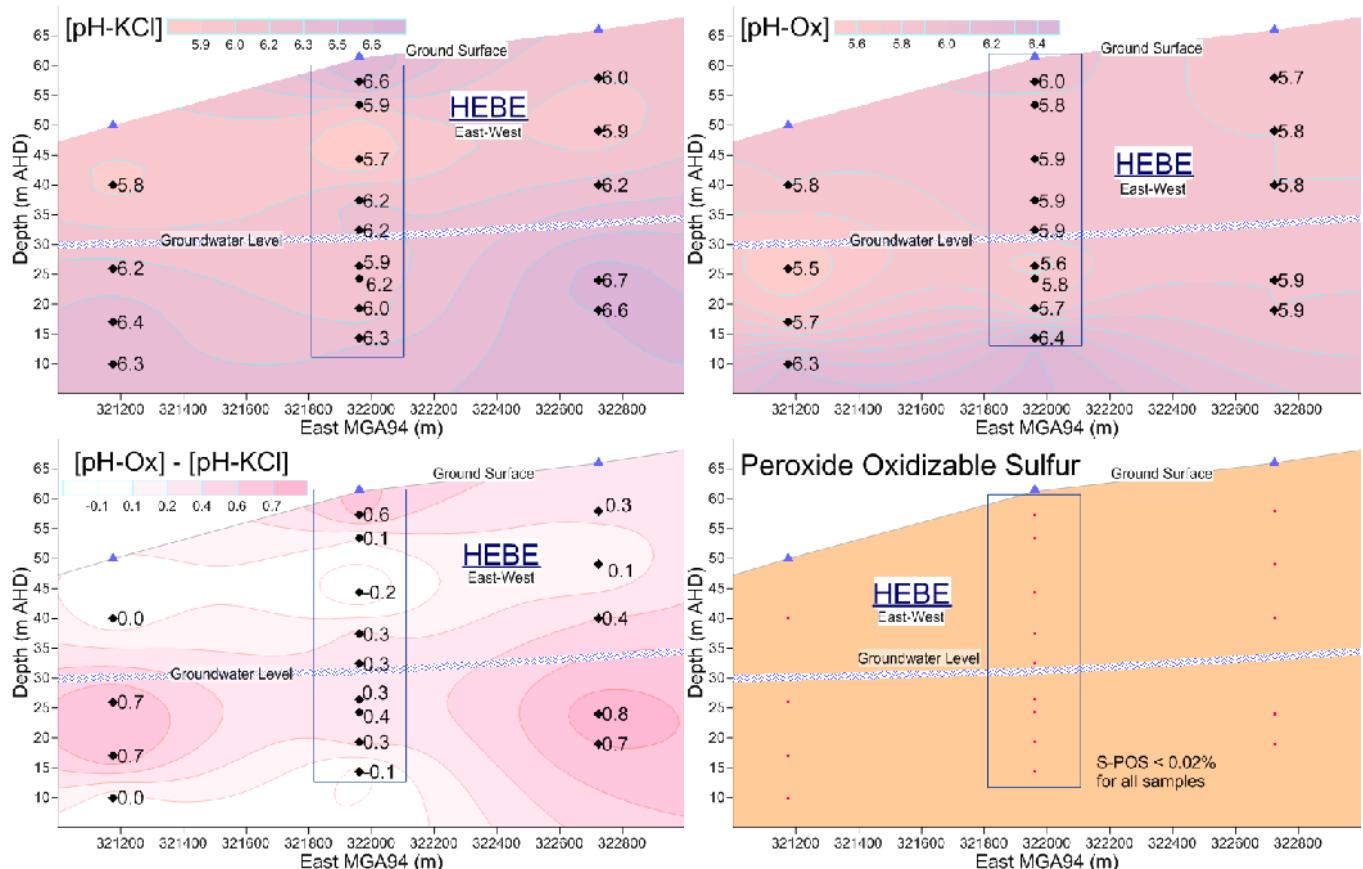


Figure 3-13 An east-west transect (EW in Figure 3-11) of SPOCAS parameters (Appendix A) against depth for the Heracles deposit in the Dongara Project area (Figure 1-1). POS is shown only for S < 0.02%. Rectangles indicate resource area.

3.6 Dionysus

Locations of cores at the Dionysus deposit are shown in Figure 3-14. A north-to-south transect through the Dionysus deposit for SPOCAS analysis data is shown in Figure 3-15. Peroxide oxidizable sulfur (POS) in all soils, sampled from the Dionysus deposit, is below 0.02% S (Figure 3-15, Appendix A).

Figure 3-15 indicates that soils in the northern section of the Dionysus deposit are alkaline, particularly towards the surface, with elevated Ca and Mg concentration in SPOCAS extracts (Appendix A), reflecting presence of Ca/Mg carbonates.

Acidity on peroxidation (Figure 3-10: [pH-KCl]-[pH-Ox]) is also elevated in the northern section of the Dionysus deposit and is not related to sulfide (POS<0.02 %S). This non-sulfide related acidity is more than compensated by an excess acid neutralizing capacity (ANC-exc in Appendix A). A possible source of non-sulfide related acidity is discussed in section 5.

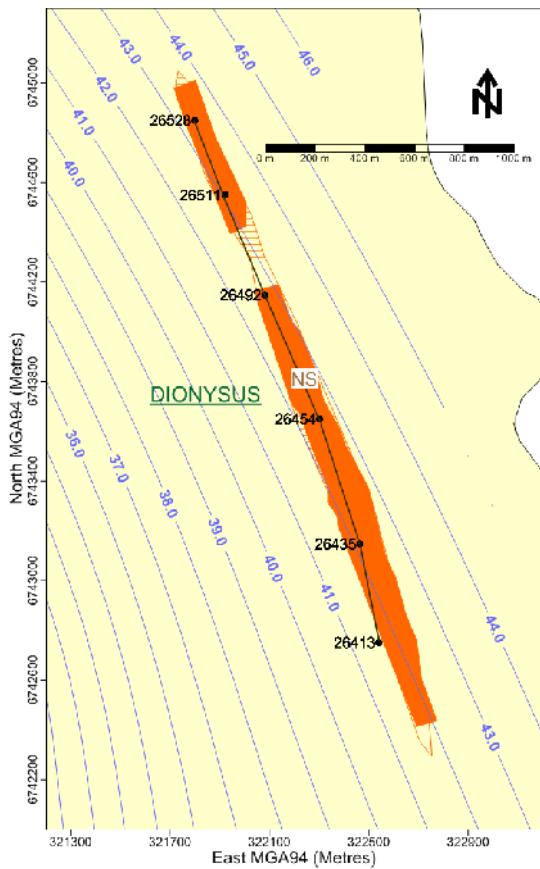


Figure 3-14

Drill locations at the Dionysus deposit in the Dongara Project area (Figure 1-1) for investigating presence of potentially acid forming materials. Cores are indicated by black dots and are numbered as in Appendix A. Solid line connecting cores is for a transect in a north-south direction (NS). SPOCAS results for the transect are plotted in Figure 3-14. Blue contours indicate water table in m AHD (Haselgrave 2009).

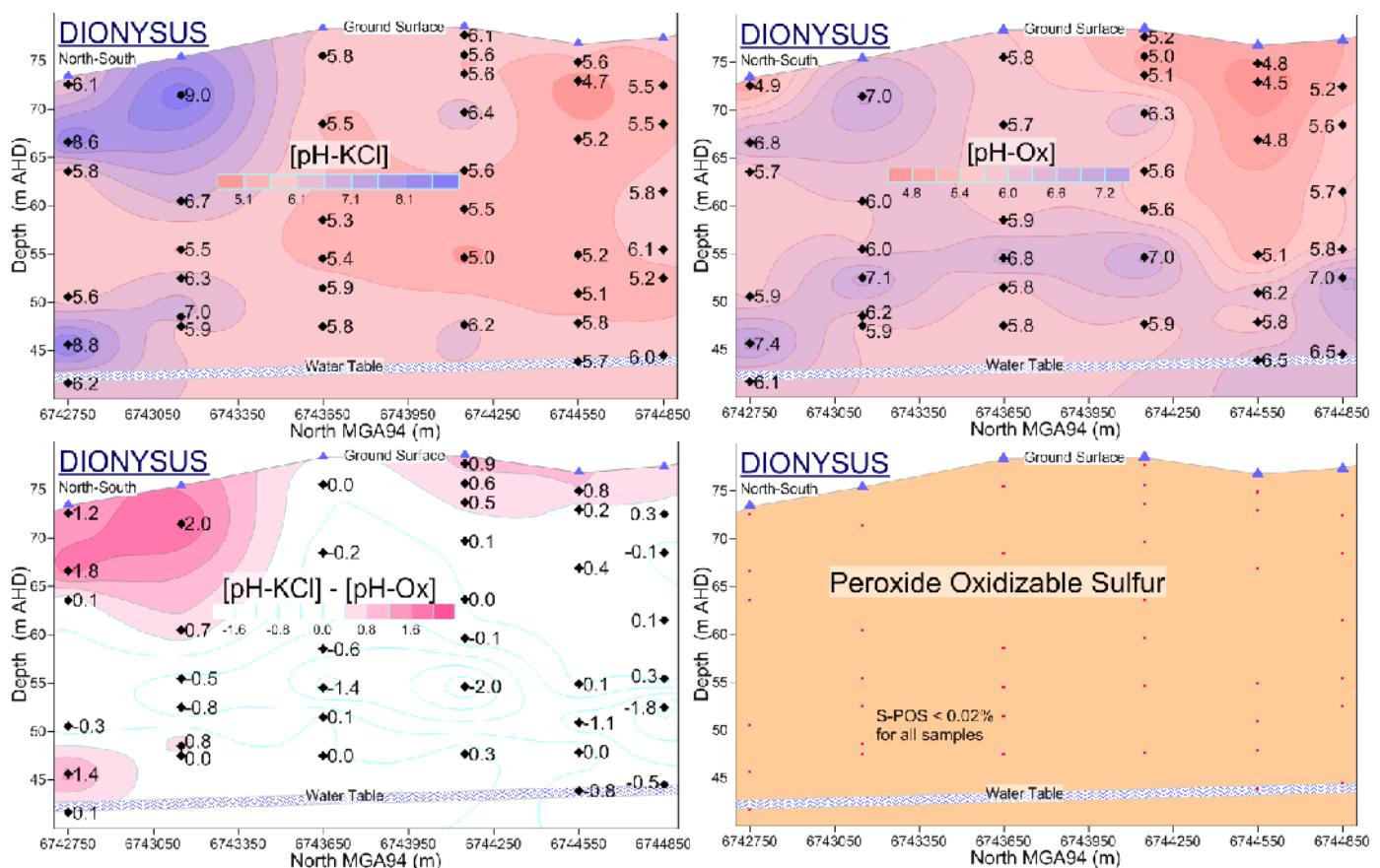


Figure 3-15 North-south transects (Figure 3-13) of SPOCAS parameters (Appendix A) against depth for the Dionysus deposit in the Dongara Project area (Figure 1-1). POS is shown only for S > 0.02%.

3.7 SPOCAS Summary and Discussion

From sections 3.1 to 3.6 and Tables 3-1 and 3-2 it follows that, within the resource areas of the Dongara Project, peroxide oxidizable sulfur (POS) exceeds the DEC action criterium of 0.03 %S in only one sample with a POS of 0.06 %S. This sample is from well below the water table at a depth of 30 m bgl (5.3 m AHD) in the Zeus resource area (Figure 3-3, Table 3-1, Appendix A). The acid neutralizing capacity (ANC) of soil materials in this sample from Ca and Mg carbonates is such that net acidity (NA) equates to only 0.02 %S. Analyses by XRF in a previous investigation of the ‘non-magnetic’ fraction of materials sampled from a depth of about 30 m bgl in cores from the Zeus deposit area indicated that levels of ‘pyrite’ S in about 10% of samples ranged from 0.04 to 0.07% and were <0.03% in the remaining samples (Gerritse 2007). It can be concluded from the above that liming of tailings from ore mined from below the water table at the Zeus deposit is not required as long as the ANC is sufficient to maintain net acidities (NA) at or below the equivalent of 0.02 %S. This could be verified by regular SPOCAS analyses of ore mined from below the water table (see also other recommendation in section 7).

Lithological descriptions of soils at the Dongara Project with elevated POS (Tables 3-1 & 3-2) indicate that elevated POS is associated with a high level of clay.

Significant decreases in pH after peroxidation (pH-Ox, Appendix A) are also observed in soils at the Dongara Project with no significant levels of sulfide (POS<0.02 %S) and are commonly associated with alkaline soil materials. The acid neutralizing potential of these soils exceeds any acid that can be generated (ANC-exc, Appendix A). A possible source of acidity in these soils, not related to sulfide, is discussed in section 5.

Elevated levels of POS (up to 0.6 %S: Table 3-1) with little ANC to compensate occur at depth below the water table at about 2 km to the west of the Zeus deposit and near the water table about 400 m to the east of the Zeus deposit. When subject to groundwater drawdown from mining operations and subsequent exposure to air, these soils can become a source of acidity to groundwater. Groundwater drawdown during operation of the mines at the Zeus and Heracles deposits will be >15 m (Brown 2010). Groundwater drawdown during mining at 2 km to the west of the Zeus deposit is estimated to be <0.5 m (Brown 2010), thus not exposing the soils with elevated POS (Figure 3-2, Table 3-1) to air. Drawdown of groundwater to the east of the Zeus deposit is estimated to be <5 m (Brown 2010), increasingly exposing soils with elevated POS (Figure 3-3, Table 3-1) to air.

Elevated levels of POS (up to 0.16 %S: Table 3-2) with little ANC to compensate occur at depth below the water table at about 1.5 km to the west of the Heracles deposit. Groundwater drawdown during mining at 1.5 km to the west of the Heracles deposit is estimated to be <0.5 m (Brown 2010), thus not exposing the soils with elevated POS (Figure 3-6, Table 3-2) to air.

It can be tentatively concluded that drawdown during mining operations can result in acidification of groundwater only to the east of the Zeus deposit. All other deposits should be able to be mined with no significant risk of acid generation. A decrease in pH of groundwater flowing into the Zeus mining pit, particularly below a pH of 4,

would accelerate the oxidation of sulfide in mined material with elevated POS on exposure to air (Ward *et al.* 2004). The background range of groundwater pH in the Dongara area is 6-8 (Gerritse 2007, 2008). Action could be taken when the pH of inflowing groundwater dips below 5.5 by neutralizing the acidity from inflowing groundwater with lime at a rate of $0.075 \cdot 10^{(6-\text{pH})}$ kg CaCO₃ per megalitre (ML).

Oxidation of pyrite and other sulfides produces sulfuric acid. Underlying reactions have been extensively reviewed in the literature (Williamson & Rimstidt 1994, Salmon & Malström 2000, Hartog *et al.* 2001, Cook *et al.* 2004, Appelo & Postma 2005). One mole of sulfuric acid results from complete oxidation of one mole of sulfur in pyrite (FeS₂). Under natural conditions the oxidation of pyrite in aquifer materials proceeds in two steps. The first step is oxidation by oxygen to sulfate and ferrous iron, producing one mole of sulfuric acid for every two moles of oxidized sulphur. The supply of electron acceptors (e.g. oxygen or other reducible compounds) then determines the second step, when further oxidation of ferrous (Fe²⁺) to ferric (Fe³⁺) iron can occur to complete the oxidation of pyrite. Oxidation of Fe²⁺ to Fe³⁺ is usually mediated and accelerated through microorganisms (*thiobacillus ferro-oxydans*). Formation of Fe³⁺ in its turn catalyzes the oxidation of pyrite by orders of magnitude. Formation of siderite (FeCO₃) at the often high partial pressures of CO₂ associated with pyrite oxidation (Hartog *et al.* 2001) and its subsequent oxidation are also important in determining the rate of pyrite oxidation. All these steps and their effect on the rate of oxidation of pyrite form the basis of management strategies to minimize the oxidation of pyrite (Spotts & Dollhopf 1992, Mulvey 1993, Ward *et al.* 2004). Maximum groundwater concentrations of sulfuric acid are limited to about 0.37 meq/L if oxygen in groundwater is the only oxidant available (saturation levels of oxygen in groundwater are about 0.33 mmol/L). With no buffering this would result in a minimum pH in groundwater of about 3.4. A pH below 3.4 would indicate further accession of oxygen e.g through diffusion from exposure to air during mining operations.

Buffering through alkalinity, naturally present in soil and aquifer materials from minerals, such as calcite and various aluminosilicates, and/or in solution (e.g. NaHCO₃ from weathering of minerals: Appelo & Postma, 2005) can effectively limit the potential decrease in pH from oxidation of pyrite and thus its rate of oxidation and associated production of sulfuric acid.

When tailings from pyrite containing deposits are redeposited below the water table after rehabilitation, reducing conditions should return (Ward *et al.* 2004), reversing any acidification. Sulfate reduction and pyritization, the reverse of pyrite oxidation, are important processes in the rehabilitation of mined areas and result in increases in groundwater of pH and decreases of Eh, concentrations of sulfate, iron and associated trace elements (Gerritse 2007, 2008).

4 Acidity of Surface Soils

Surface soils were sampled down to 4 m in the resource areas of the Dongara Project and analysed for exchangeable base cations (Ca, Mg, K, Na) and acid cations (H⁺, Al) by the ALS laboratories (section 2.1). Results are given in Appendix C. Ca and Mg dominate the exchangeable base cations in all soils (Appendix C). Exchangeable acidity (EA) from H⁺ is commonly between 5 and 20% of CEC as shown in Figure 4-

1. Base cations (Ca, Mg, Na and K) thus dominate the exchange complex of surface soils in the Dongara Project area. It should be noted that EA and CEC, as determined by the ALS laboratories (Appendix C), do not follow the ICP protocol as outlined in section 2.1 and EA does not include exchangeable acidity from Al, Fe and Mn as intended by the ICP protocol (ICP 2006).

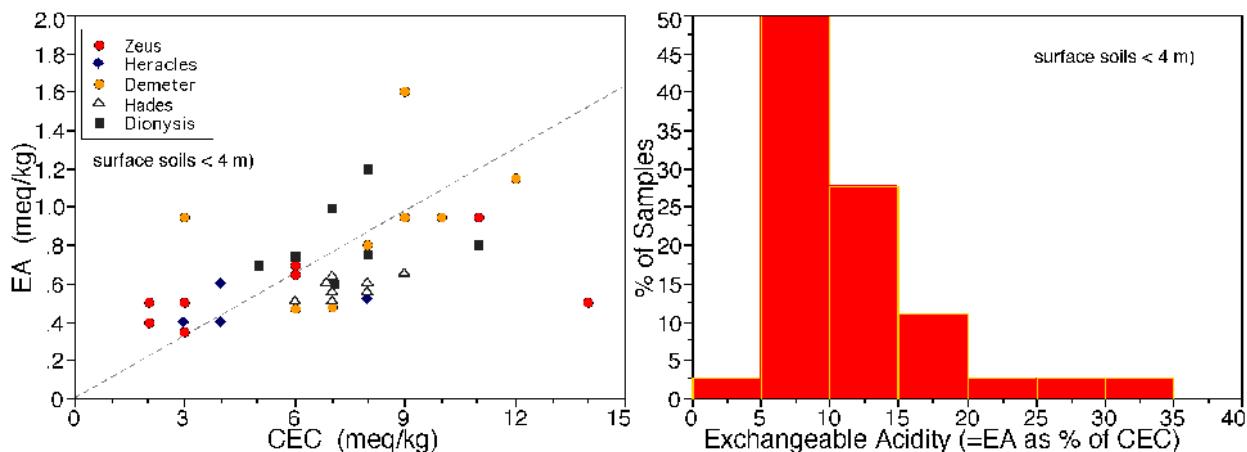


Figure 4-1 Plot (left figure) of ‘exchangeable acidity’ (EA) against the exchange capacity occupied by base cations (CEC) in surface soils sampled from resource areas in the Dongara Project area. A frequency distribution of % of total exchange capacity for cations (CEC) occupied by H^+ (=EA) is shown in the figure on the right.

Titratable actual acidity (TAA: Ahern *et al.* 2004, Appendix A) in surface soils of the Dongara Project area is, as EA (Figure 4-1), commonly below 2 meq/kg (Figure 4-2). The equivalent of this in terms of pyrite S is < 0.02 %S (Appendix A), which is below the action criterium for managing acid sulfate soils (DEC 2009).

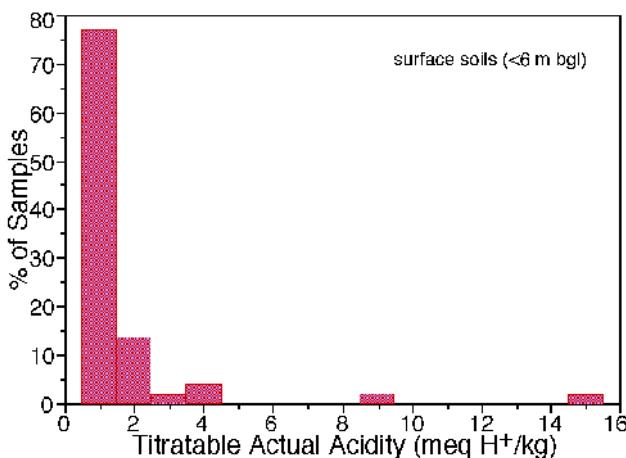


Figure 4-2
Frequency distribution of ‘Titratable Actual Acidity’ (TAA: Appendix A) for surface soils in the Dongara Project area.

5 Metal Analyses

Results for analyses of Al, Fe, Mn, Ni, Cr, Pb, Cu, Zn, As and Se in soil samples from cores in resource areas (Figure 1-1) are given in Appendix B.

Concentrations of metals in soil samples from all cores were cross correlated. Results are shown as correlation coefficients (R) in Table 5-1. Correlation coefficients below 0.7 can be considered as statistically not significant. Results in Table 5-1 should be interpreted with caution as many analyses other than for Al and Fe are below

reporting limits of <1, <2 or <5 mg/kg. Analysis results for Cd (<1 mg/kg) and Se (<5 mg/kg) are all below the reporting limits and were not processed in the cross correlation. Results in Table 1 suggest a cluster for Al, Fe, Mn, Ni and Zn and one for Fe, Ni, Cr and Zn. As, Cu and Pb are typically not correlated with each other or the other metals. Moisture content and thus water table does not appear to have affected the distribution of metals (see also Figures 5-1, 5-2 and 5-3).

Table 5-1 Correlation (R) matrix for metal concentrations in samples from soil cores in the resource areas of the Dongara Project (Figure 1-1).

	H ₂ O	Al	Fe	Mn	Zn	Pb	Cu	Ni	Cr	As	pH	pH
H ₂ O	1	0.1	0.1	0	0.3	0	0.3	0.2	0.1	0	0.1	-0.1
Al	0.1	1	0.9	0.8	0.7	0.6	0.2	0.7	0.6	0.1	-0.1	-0.4
Fe	0.1	0.9	1	0.7	0.7	0.5	0.1	0.7	0.7	0.3	-0.1	-0.5
Mn	0	0.8	0.7	1	0.7	0.5	0	0.8	0.5	0.1	0	-0.4
Zn	0.3	0.7	0.7	0.7	1	0.5	0.4	0.9	0.8	0.4	0	-0.2
Pb	0	0.6	0.5	0.5	0.5	1	0.3	0.4	0.5	0	0	-0.2
Cu	0.3	0.2	0.1	0	0.4	0.3	1	0.3	0.3	0.2	0.3	0.3
Ni	0.2	0.7	0.7	0.8	0.9	0.4	0.3	1	0.7	0.3	0	-0.3
Cr	0.1	0.6	0.7	0.5	0.8	0.5	0.3	0.7	1	0.6	0	-0.3
As	0	0.1	0.3	0.1	0.4	0	0.2	0.3	0.6	1	0	-0.1
pH	0.1	-0.1	-0.1	-0.1	0	0	0.3	0	0	0	1	0.8
pH	-0.1	-0.4	-0.5	-0.4	-0.2	-0.2	0.3	-0.3	-0.3	-0.1	0.8	1

H ₂ O = moisture content of sample
pH= as determined for pH-KCl in the SPOCAS analysis (Appendix A)
pH = change in pH on peroxidation in the SPOCAS analysis (Appendix A)

Results for pH-KCl and pH from the SPOCAS analyses (Appendix A) were also included in the correlation matrix. Data in Table 5-1 suggests that decreases in pH after peroxidation (pH = [pH-KCl] – [pH-Ox]), which are related to potential acidification from POS (Appendix A), increase with pH and thus acid buffering capacity of soils. This buffering capacity is related to increased concentrations of Ca and Mg (Ca-KCl and Mg-KCl in Appendix A) and thus limestone. It is possible that the (marine derived) limestone is associated with reduced Fe in low levels of glauconite (Kern 1997, Thompson & Hower 1975), explaining an increase of the pH with pH.

No significant relationship is found between pH and Fe, Al or Mn and other metals.

SPOCAS data for the same cores as analysed for metals indicate that oxidizable sulfur (POS in Appendix A) can only be compared for a few cases with elevated POS (Tables 3-1 and 3-2) and suggest elevated POS is linked to elevated levels of Fe, Al and Mn. No link between POS and As is evident. In peaty soils from the Coastal Plain in Perth, however, pyrite (and thus POS) and As are found to be strongly correlated (Appleyard *et al.* 2004).

Depth profiles of metals analysed in samples from soil cores from the Dongara Project area are shown in Figures 5-1, 5-2 and 5-3. Concentrations of metals commonly peak between 15 and 35 m bgl. As and Pb are typically absent (below reporting limits) from cores of Hebe. Cu is absent from cores of Heracles and Demeter. Elevated levels of Mn are seen in cores from Heracles and Dionysus.

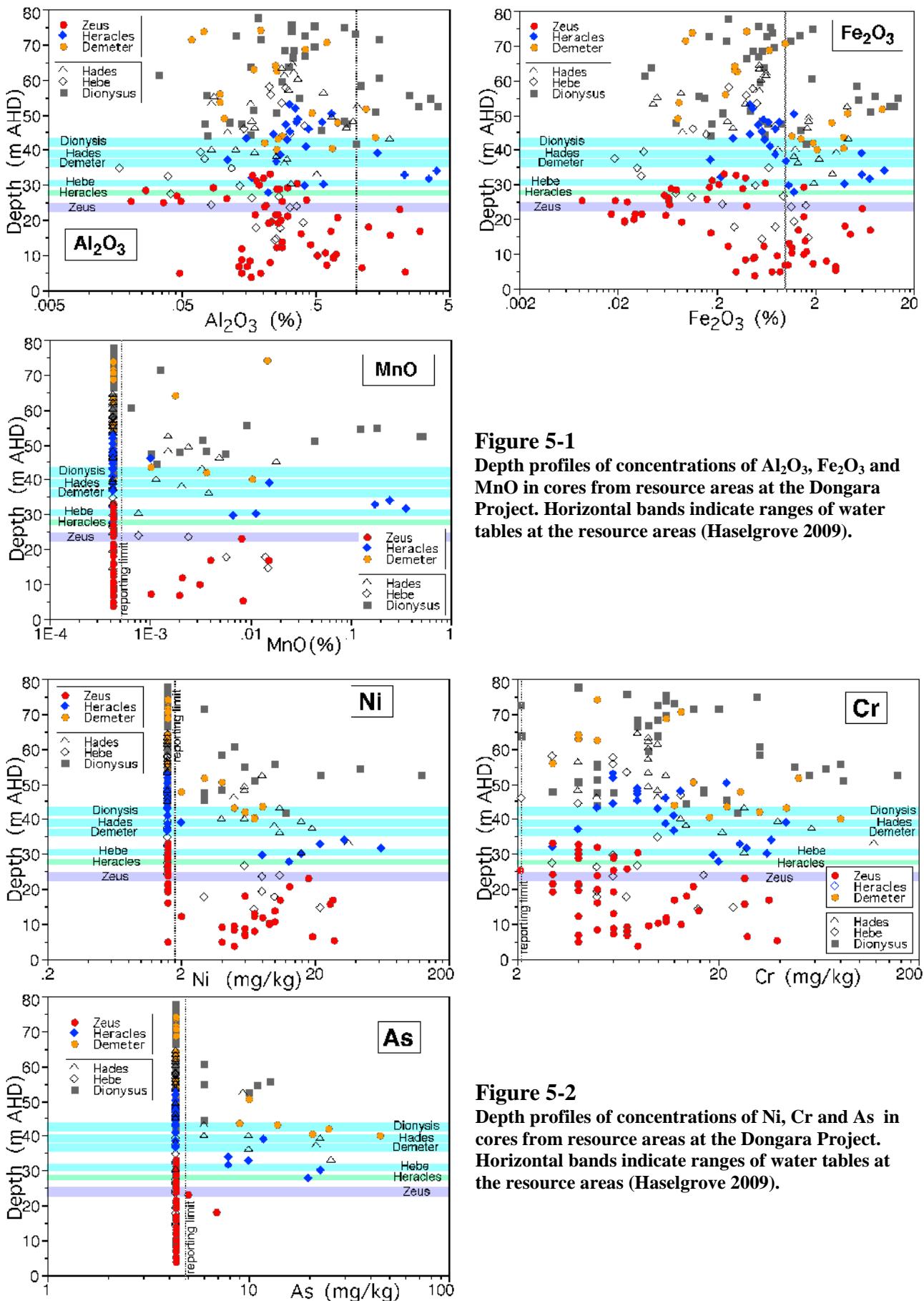


Figure 5-2
Depth profiles of concentrations of Ni, Cr and As in cores from resource areas at the Dongara Project. Horizontal bands indicate ranges of water tables at the resource areas (Haselgrove 2009).

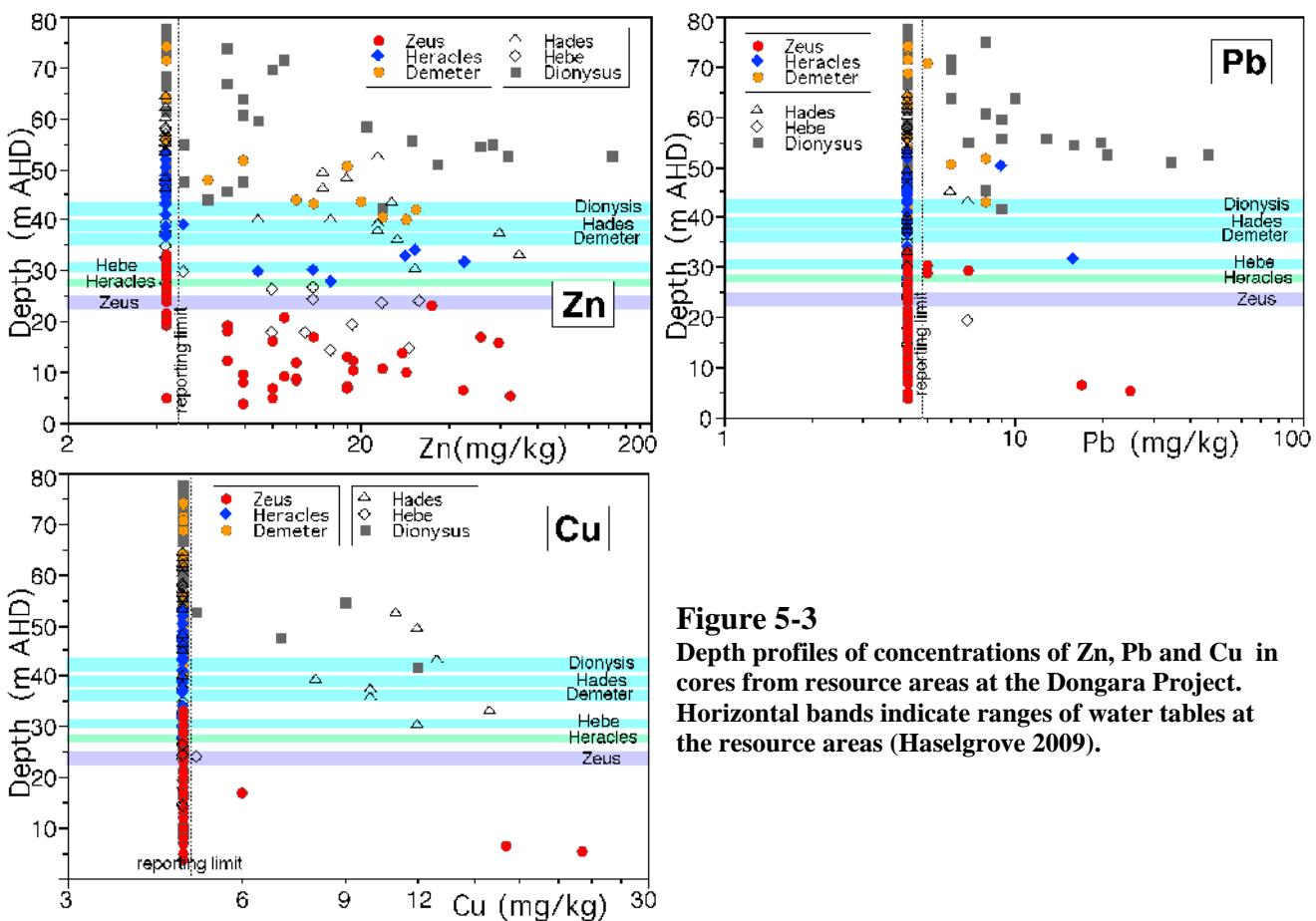


Figure 5-3

Depth profiles of concentrations of Zn, Pb and Cu in cores from resource areas at the Dongara Project. Horizontal bands indicate ranges of water tables at the resource areas (Haselgrave 2009).

Concentrations of Mn, Ni, Cr, Pb, Cu, Zn, As do not exceed ‘Health Investigation Levels’ for soils (HILs: DEC 2010) in any soil core. Concentrations of As exceed ‘Ecological Investigation Levels’ for soils (EILs: DEC 2010) in a few samples from cores in the Hades, Demeter and Heracles resource areas (As>20 mg/kg). Concentrations of Ni exceed the EIL in samples from cores in the Heracles and Dionysus resource areas (Ni>60 mg/kg).

6 Findings

- Elevated POS in soils at the Dongara Project is associated with a high level of clay. Elevated POS in soils from resource areas at the Dongara Project is linked to elevated levels of Fe, Al and Mn. No link between POS and As is evident.
- Within the resource areas of the Dongara Project, peroxide oxidizable sulfur (POS) exceeds the DEC action criterium of 0.03 %S in only one sample with a POS of 0.06 %S. This sample is from about 17 m below the water table at a depth of 30 m bgl (5.3 m AHD) in the Zeus resource area (core 26922). Analyses by XRF in a previous investigation of the ‘non-magnetic’ fraction of materials sampled from a depth of about 30 m bgl in cores from the Zeus deposit area indicated that levels of ‘pyrite’ S in about 10% of samples ranged from 0.04 to 0.07% and were <0.03% in the remaining samples.
- Elevated levels of POS (up to 0.6 %S) in soils with little ANC (acid neutralizing capacity) to compensate occur at depths of 9 and 33 m bgl (3 and 27 m below the

water table) about 2 km to the west of the Zeus deposit (core 27131) and near the water table about 400 m to the east of the Zeus deposit (12 m bgl in core 27137). Groundwater drawdown during mining at 2 km to the west of the Zeus deposit is estimated to be 0.5 m and not to expose soils with elevated POS to air. Drawdown of groundwater 400 m to the east of the Zeus deposit is estimated to be 5 m, increasingly exposing soils with elevated POS to air.

- Elevated levels of POS (up to 0.16 %S) in soils with little ANC to compensate occur at depths of 15 and 25 m bgl (9 and 19 m below the water table) about 1.5 km to the west of the Heracles deposit (core 27161). Groundwater drawdown during mining in this area is estimated to be 0.5 m and not to expose soils with elevated POS to air.
- Significant decreases in pH after peroxidation in the resource areas are commonly associated with alkaline soil materials ($\text{pH} > 7$) and not related to POS. The ANC of these soils is sufficient to buffer any acid that can be generated. It is possible that presence in these non-sulfidic soils of (marine derived) limestone is associated with reduced Fe in low levels of glauconite.
- The exchange complex (CEC) of surface soils is dominated by base cations (Ca, Mg, Na, K). Ca and Mg dominate the exchangeable base cations and exchangeable acidity from H^+ is commonly between 5 and 20% of CEC.
- Titratable actual acidity and exchangeable acidity in surface soils of the Dongara Project area are commonly below 2 meq/kg. The equivalent of this in terms of pyrite S is < 0.02 %S, which is below the action criterium of 0.03 %S for managing acid sulfate soils.
- Concentrations of Mn, Ni, Cr, Pb, Cu, Zn, As do not exceed ‘Health Investigation Levels’ for soils (HIL) in any resource area at the Dongara Project. Concentrations of As exceed ‘Ecological Investigation Level’ for soils (EIL) in the Hades, Demeter and Heracles resource areas (As>20 mg/kg). Concentrations of Ni exceed the EIL in the Heracles and Dionysus resource areas (Ni>60 mg/kg).

7 Conclusions and Recommendations

- Within the resource areas of the Dongara Project, peroxide oxidizable sulfur (POS) exceeds the DEC action criterium of 0.03 %S in only one sample from about 17 m below the water table at a depth of 30 m bgl in the Zeus resource area (core 26922: POS 0.06 %S). The acid neutralizing capacity (ANC) of this sample is such that net acidity (NA) equates to only 0.02 %S. A previous investigation of other cores at the Zeus deposit confirms possible levels of ‘pyrite’ S from 0.04 to 0.07% in soils below the water table, but no SPOCAS analyses are available for these soils. It can be concluded from the above that liming of tailings from ore mined from below the water table at the Zeus deposit would not be necessary as long as the ANC is sufficient to maintain a NA at or below the equivalent of 0.02 %S.
- In order to manage potential acidity from tailings of ore mined below the water table at the Zeus deposit it is suggested to:

- Analyse existing drill logs for similar lithological material as indicated for elevated POS in cores 26922, 27131 and 27137 in order to better establish the spatial spread of elevated POS at the Zeus ore body as well as to the west and east of it. In this way it may be possible to avoid mining certain sections of Zeus. If uncertainties remain or a high risk is identified after this investigation THEN
- Target areas with suggested possible elevated POS, but with no further quantitative analytical information, for drilling and SPOCAS analyses AND
- Check POS, ANC and NA by regular SPOCAS analyses of ore mined from below the water table and lime resulting tailings where it is essential
- Drawdown of groundwater during mining operations at the Dongara Project can result in acidification of groundwater to the east of the Zeus deposit. The background range of groundwater pH in the Dongara area is 6-8. Action at the Zeus deposit could be taken during mining when pH of inflowing groundwater dips below 5.5 by neutralizing acidity with lime at a rate of 0.075.10^(6-pH) kg CaCO₃ per megalitre (ML) of inflowing groundwater. When mining ceases and the water table at the Zeus deposit returns to its original level, reducing conditions should return, reversing any acidification.
- All other deposits at the Dongara Project should be able to be mined with no significant risk of acid generation.

8 References

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Appendix A

9 Appendix A – SPOCAS Analyses

Analysis data for samples from cores drilled at and near the mineral sands deposits in Dongara project area (locations of cores are shown in Figure 1-1).

Abbreviations:

RL	= ground level in m AHD
Depth	= depth of sampling in ‘m bgl’ or ‘m AHD’
pH-KCl	= pH in 1:40 suspension in 1 M KCl
pH-Ox	= pH in suspension after oxidation with H ₂ O ₂
pH	= [pH-KCl] – [pH-Ox]
TAA	= Titratable Actual Acidity
TPA	= Titratable Peroxide Acidity
TSA	= Titratable Sulfidic Acidity = [TPA] – [TAA]
S-KCl	= S in KCl solution
S-Ox	= S in KCl solution after oxidation with H ₂ O ₂
POS	= Peroxide Oxidizable Sulfur = [S-Ox] – [S- KCl]
Ca/Mg-KCl	= Ca/Mg in KCl solution
Ca/Mg-Ox	= Ca/Mg in KCl solution after oxidation with H ₂ O ₂
Ca/Mg-acid	= Ca/Mg from acidity generated after oxidation with H ₂ O ₂ = [Ca/Mg-Ox] – [Ca/Mg-KCl]
ANC-exc	= Acid Neutralizing Capacity for acid generated after oxidation with H ₂ O ₂ as measured by titration if pH-Ox>6.5
Fineness	= safety factor used to multiply a calculated liming rate
NA	= Net Acidity = [TSA] + [retained acidity from acid generating compounds*] – {ANC-exc/[Fineness]}
lime	= liming rate calculated from ‘NA’
NA(-ANC)	= Net Acidity (NA) excluding ‘ANC-exc/[Fineness]’
lime(-ANC)	= liming rate calculated from ‘NA(-ANC)’

* acid generating compounds are Al/Fe hydroxy-sulfate compounds (e.g. jarosite, basaluminate, jurbanite)

Appendix A

	Core	26872	26872	26872	26872	26872	26874	26874	26874	26874
Ore Body		Zeus	Zeus	Zeus	Zeus	Zeus	Zeus	Zeus	Zeus	Zeus
Depth	m bgl	2	6	12	19	23	2	5	9	11
RL	m AHD	31.5	31.5	31.5	31.5	31.5	30.6	30.6	30.6	30.6
Depth	m AHD	29.5	25.5	19.5	12.5	8.5	28.6	25.6	21.6	19.6
North	m GDA	6744450	6744450	6744450	6744450	6744450	6743984	6743984	6743984	6743984
East	m GDA	317803	317803	317803	317803	317803	317561	317561	317561	317561
pH	pH KCl	5.6	5.8	5.6	5.9	6.3	5.8	6.0	5.8	5.6
	pH Ox	4.9	6.1	5.9	5.8	6.0	5.2	5.1	5.6	5.5
	pH	0.7	-0.3	-0.3	0.1	0.3	0.6	0.9	0.2	0.1
Acidity Trail	TAA	moles H+/t	<2	2	<2	<2	<2	<2	<2	<2
	TPA	moles H+/t	<2	5	2	<2	2	<2	2	<2
	TSA	moles H+/t	<2	2	<2	<2	2	<2	<2	<2
	TAA	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	TPA	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	TSA	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
S Trail	S-KCl	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	S-Ox	% S	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	POS	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	POS	moles H+/t	12	<10	<10	<10	<10	<10	<10	<10
Ca Values	Ca-KCl	%Ca	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Ca-Ox	%Ca	0.03	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Ca-Acid	%Ca	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Ca-Acid	moles H+/t	12	<10	<10	<10	<10	<10	<10	<10
	Ca-Acid	%S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Mg Values	Mg-KCl	%Mg	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Mg-Ox	%Mg	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Mg-acid	%Mg	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Mg-acid	moles H+/t	12	<10	<10	<10	<10	<10	<10	<10
	Mg-acid	%S	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Alkalinity	ANC-exc	% CaCO ₃								
	ANC-exc	moles H+/t								
	ANC-exc	%S								
Acid Base Accounting	Fineness		1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
	NA	%S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	NA	moles H+/t	<10	<10	<10	<10	<10	<10	<10	<10
	Lime	(kg CaCO ₃ /t)	<1	<1	<1	<1	<1	<1	<1	<1
	NA (-ANC)	%S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	NA (-ANC)	moles H+/t	<10	<10	<10	<10	<10	<10	<10	<10
	Lime (- ANC)	(kg CaCO ₃ /t)	<1	<1	<1	<1	<1	<1	<1	<1

Appendix A

	Core	26874	26874	26922	26922	26922	26922	26922	26922	26922
Ore Body		Zeus	Zeus	Zeus	Zeus	Zeus	Zeus	Zeus	Zeus	Zeus
Depth	m bgl	20	24	2	4	6	11	14	16	19
RL	m AHD	30.6	30.6	35.3	35.3	35.3	35.3	35.3	35.3	35.3
Depth	m AHD	10.6	6.6	33.3	31.3	29.3	24.3	21.3	19.3	16.3
North	m GDA	6743984	6743984	6745051	6745051	6745051	6745051	6745051	6745051	6745051
East	m GDA	317561	317561	317959	317959	317959	317959	317959	317959	317959
pH	pH KCl	5.8	5.4	5.8	5.6	5.5	5.7	5.5	6.3	9.4
	pH Ox	5.8	5.9	4.8	5.7	5.7	5.7	5.9	6.0	7.7
	pH	0.0	-0.5	1.0	-0.1	-0.2	0.0	-0.4	0.3	1.7
Acidity Trail	TAA	moles H+/t	2	4	<2	<2	4	2	4	<2
	TPA	moles H+/t	<2	8	<2	<2	2	<2	2	<2
	TSA	moles H+/t	<2	5	<2	<2	<2	<2	<2	<2
	TAA	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	TPA	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	TSA	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
S Trail	S-KCl	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	S-Ox	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	POS	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	POS	moles H+/t	<10	<10	<10	<10	<10	<10	<10	<10
Ca Values	Ca-KCl	%Ca	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.02	0.21
	Ca-Ox	%Ca	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.02	1.1
	Ca-Acid	%Ca	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.89
	Ca-Acid	moles H+/t	<10	<10	<10	<10	<10	<10	<10	445
	Ca-Acid	%S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.71
Mg Values	Mg-KCl	%Mg	<0.02	0.05	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Mg-Ox	%Mg	<0.02	0.04	<0.02	<0.02	<0.02	<0.02	<0.02	0.02
	Mg-acid	%Mg	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Mg-acid	moles H+/t	<10	<10	<10	<10	<10	<10	<10	<10
	Mg-acid	%S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Alkalinity	ANC-exc	% CaCO ₃								2.88
	ANC-exc	moles H+/t								576
	ANC-exc	%S								0.92
Acid Base Accounting	Fineness		1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
	NA	%S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	NA	moles H+/t	<10	<10	<10	<10	<10	<10	<10	<10
	Lime	(kg CaCO ₃ /t)	<1	<1	<1	<1	<1	<1	<1	<1
	NA (-ANC)	%S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	NA (-ANC)	moles H+/t	<10	<10	<10	<10	<10	<10	<10	<10
	Lime (- ANC)	(kg CaCO ₃ /t)	<1	<1	<1	<1	<1	<1	<1	<1

Appendix A

	Core	26922	26922	26922	26922	26933	26933	26933	26988	26988
Ore Body		Zeus	Zeus	Zeus	Zeus	Zeus	Zeus	Zeus	Zeus	Zeus
Depth	m bgl	23	26	28	30	14	26	32	5	10
RL	m AHD	35.3	35.3	35.3	35.3	35.8	35.8	35.8	35.7	35.7
Depth	m AHD	12.3	9.3	7.3	5.3	21.8	9.8	3.8	30.7	25.7
North	m GDA	6745051	6745051	6745051	6745051	6746000	6746000	6746000	6746455	6746455
East	m GDA	317959	317959	317959	317959	317918	317918	317918	318158	318158
pH	pH KCl	9.5	9.5	9.3	8.0	6.0	6.1	6.5	5.4	5.5
	pH Ox	7.8	7.7	7.6	5.8	5.9	5.8	5.6	5.8	5.5
	pH	1.7	1.8	1.7	2.2	0.1	0.3	0.9	-0.4	0.0
Acidity Trail	TAA	moles H+/t	<2	<2	<2	<2	<2	<2	8	5
	TPA	moles H+/t	<2	<2	<2	<2	2	<2	8	8
	TSA	moles H+/t	<2	<2	<2	<2	<2	<2	<2	3
	TAA	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	TPA	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	TSA	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
S Trail	S-KCl	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	S-Ox	% S	<0.02	<0.02	<0.02	0.08	<0.02	<0.02	<0.02	<0.02
	POS	% S	<0.02	<0.02	<0.02	0.06	<0.02	<0.02	<0.02	<0.02
	POS	moles H+/t	<10	<10	<10	39	<10	<10	<10	<10
Ca Values	Ca-KCl	%Ca	0.2	0.2	0.18	0.14	<0.02	<0.02	<0.02	<0.02
	Ca-Ox	%Ca	0.62	0.91	0.33	0.13	<0.02	<0.02	<0.02	<0.02
	Ca-Acid	%Ca	0.42	0.72	0.14	<0.02	<0.02	<0.02	<0.02	<0.02
	Ca-Acid	moles H+/t	210	357	73	<10	<10	<10	<10	<10
	Ca-Acid	%S	0.34	0.57	0.12	<0.02	<0.02	<0.02	<0.02	<0.02
Mg Values	Mg-KCl	%Mg	<0.02	<0.02	<0.02	0.03	<0.02	<0.02	<0.02	<0.02
	Mg-Ox	%Mg	<0.02	<0.02	<0.02	0.02	<0.02	<0.02	<0.02	<0.02
	Mg-acid	%Mg	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Mg-acid	moles H+/t	<10	<10	<10	<10	11	<10	<10	<10
	Mg-acid	%S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Alkalinity	ANC-exc	% CaCO3	1.38	2.71	0.91					
	ANC-exc	moles H+/t	277	541	181					
	ANC-exc	%S	0.44	0.87	0.29					
Acid Base Accounting	Fineness		1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
	NA	%S	<0.02	<0.02	<0.02	0.02	<0.02	<0.02	<0.02	<0.02
	NA	moles H+/t	<10	<10	<10	13	<10	<10	<10	<10
	Lime	(kg CaCO3/t)	<1	<1	<1	<1	<1	<1	<1	<1
	NA (-ANC)	%S	<0.02	<0.02	<0.02	0.06	<0.02	<0.02	<0.02	<0.02
	NA (-ANC)	moles H+/t	<10	<10	<10	39	<10	<10	<10	<10
	Lime (- ANC)	(kg CaCO3/t)	<1	<1	<1	3	<1	<1	<1	<1

Appendix A

	Core	26988	26988	26988	26988	26995	26995	26995	26995	26995
Ore Body		Zeus	Zeus	Zeus	Zeus	Zeus	Zeus	Zeus	Zeus	Zeus
Depth	m bgl	14	20	25	27	5	8	14	24	29
RL	m AHD	35.7	35.7	35.7	35.7	34.1	34.1	34.1	34.1	34.1
Depth	m AHD	21.7	15.7	10.7	8.7	29.1	26.1	20.1	10.1	5.1
North	m GDA	6746455	6746455	6746455	6746455	6746455	6746455	6746455	6746455	6746455
East	m GDA	318158	318158	318158	318158	317917	317917	317917	317917	317917
pH	pH KCl	5.6	5.5	5.8	6.0	8.8	9.2	8.6	6.3	6.8
	pH Ox	5.6	6.0	5.8	5.7	7.4	7.6	7.0	6.3	6.2
	pH	0.0	-0.5	0.0	0.3	1.4	1.6	1.6	0.0	0.6
Acidity Trail	TAA	moles H+/t	4	6	5	<2	<2	<2	<2	<2
	TPA	moles H+/t	6	5	5	4	<2	<2	<2	<2
	TSA	moles H+/t	2	<2	<2	2	<2	<2	<2	<2
	TAA	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	TPA	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	TSA	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
S Trail	S-KCl	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	S-Ox	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	POS	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	POS	moles H+/t	<10	<10	<10	<10	<10	<10	<10	<10
Ca Values	Ca-KCl	%Ca	<0.02	<0.02	<0.02	<0.02	0.15	0.15	0.14	0.04
	Ca-Ox	%Ca	<0.02	<0.02	<0.02	<0.02	0.15	0.17	0.11	0.03
	Ca-Acid	%Ca	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Ca-Acid	moles H+/t	<10	<10	<10	<10	<10	<10	<10	<10
	Ca-Acid	%S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Mg Values	Mg-KCl	%Mg	<0.02	0.04	<0.02	<0.02	<0.02	0.03	0.02	<0.02
	Mg-Ox	%Mg	<0.02	0.03	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Mg-acid	%Mg	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Mg-acid	moles H+/t	<10	<10	<10	<10	<10	<10	<10	<10
	Mg-acid	%S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Alkalinity	ANC-exc	% CaCO ₃					0.34	0.52	0.24	
	ANC-exc	moles H+/t					68	104	47	
	ANC-exc	%S					0.11	0.17	0.08	
Acid Base Accounting	Fineness		1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
	NA	%S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	NA	moles H+/t	<10	<10	<10	<10	<10	<10	<10	<10
	Lime	(kg CaCO ₃ /t)	<1	<1	<1	<1	<1	<1	<1	<1
	NA (-ANC)	%S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	NA (-ANC)	moles H+/t	<10	<10	<10	<10	<10	<10	<10	<10
	Lime (- ANC)	(kg CaCO ₃ /t)	<1	<1	<1	<1	<1	<1	<1	<1

Appendix A

	Core	27011	27011	27011	27011	27011	27011	27011	27011	27044
Ore Body		Zeus	Zeus	Zeus	Zeus	Zeus	Zeus	Zeus	Zeus	Zeus
Depth	m bgl	4	5	8	11	17	20	27	29	2
RL	m AHD	34.0	34.0	34.0	34.0	34.0	34.0	34.0	34.0	35.0
Depth	m AHD	30.0	29.0	26.0	23.0	17.0	14.0	7.0	5.0	33.0
North	m GDA	6746948	6746948	6746948	6746948	6746948	6746948	6746948	6746948	6747450
East	m GDA	318197	318197	318197	318197	318197	318197	318197	318197	318194
pH	pH KCl	6.6	6.0	6.0	5.6	5.5	5.4	5.9	5.9	6.2
	pH Ox	5.6	5.7	5.9	6.0	6.3	6.3	5.9	5.9	5.2
	pH	1.0	0.3	0.1	-0.4	-0.8	-0.9	0.0	0.0	1.0
Acidity Trail	TAA	moles H+/t	<2	<2	<2	4	13	12	2	<2
	TPA	moles H+/t	4	<2	<2	<2	13	14	4	<2
	TSA	moles H+/t	4	<2	<2	<2	<2	2	<2	<2
	TAA	% S	<0.02	<0.02	<0.02	<0.02	0.02	<0.02	<0.02	<0.02
	TPA	% S	<0.02	<0.02	<0.02	<0.02	0.02	0.02	<0.02	<0.02
	TSA	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
S Trail	S-KCl	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	S-Ox	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	POS	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	POS	moles H+/t	<10	<10	<10	<10	<10	<10	<10	<10
Ca Values	Ca-KCl	%Ca	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Ca-Ox	%Ca	0.05	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Ca-Acid	%Ca	0.04	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Ca-Acid	moles H+/t	20	<10	<10	<10	<10	<10	<10	<10
	Ca-Acid	%S	0.03	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Mg Values	Mg-KCl	%Mg	<0.02	<0.02	<0.02	0.02	0.05	0.03	<0.02	<0.02
	Mg-Ox	%Mg	<0.02	<0.02	<0.02	<0.02	0.05	0.02	<0.02	<0.02
	Mg-acid	%Mg	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Mg-acid	moles H+/t	<10	<10	<10	<10	<10	<10	<10	<10
	Mg-acid	%S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Alkalinity	ANC-exc	% CaCO3								
	ANC-exc	moles H+/t								
	ANC-exc	%S								
	Fineness		1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
	NA	%S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	NA	moles H+/t	<10	<10	<10	<10	12	11	<10	<10
	Lime	(kg CaCO3/t)	<1	<1	<1	<1	<1	<1	<1	<1
Acid Base Accounting	NA (-ANC)	%S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	NA (-ANC)	moles H+/t	<10	<10	<10	<10	12	11	<10	<10
	Lime (- ANC)	(kg CaCO3/t)	<1	<1	<1	<1	<1	<1	<1	<1

Appendix A

	Core	27044	27044	27044	27044	27059	27059	27059	27059
Ore Body		Zeus	Zeus	Zeus	Zeus	Zeus	Zeus	Zeus	Zeus
Depth	m bgl	11	17	22	28	3	8	10	14
RL	m AHD	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0
Depth	m AHD	24.0	18.0	13.0	7.0	32.0	27.0	25.0	21.0
North	m GDA	6747450	6747450	6747450	6747450	6747950	6747950	6747950	6747950
East	m GDA	318194	318194	318194	318194	318159	318159	318159	318159
pH	pH KCl	6.0	5.9	5.9	6.1	6.3	6.0	6.3	5.9
	pH Ox	6.4	6.4	6.0	6.2	5.7	5.5	5.7	6.0
	pH	-0.4	-0.5	-0.1	-0.1	0.6	0.5	0.6	-0.1
Acidity Trail	TAA	moles H+/t	2	4	2	<2	<2	<2	3
	TPA	moles H+/t	<2	<2	2	<2	<2	<2	<2
	TSA	moles H+/t	<2	<2	<2	<2	<2	<2	<2
	TAA	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	TPA	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	TSA	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
S Trail	S-KCl	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	S-Ox	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	POS	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	POS	moles H+/t	<10	<10	<10	<10	11	<10	<10
Ca Values	Ca-KCl	%Ca	0.03	0.03	<0.02	<0.02	<0.02	<0.02	<0.02
	Ca-Ox	%Ca	0.03	0.03	<0.02	<0.02	0.02	<0.02	0.03
	Ca-Acid	%Ca	<0.02	<0.02	<0.02	<0.02	0.02	<0.02	0.03
	Ca-Acid	moles H+/t	<10	<10	<10	<10	12	<10	13
	Ca-Acid	%S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.02
Mg Values	Mg-KCl	%Mg	0.06	0.05	0.02	<0.02	<0.02	<0.02	0.04
	Mg-Ox	%Mg	0.05	0.04	<0.02	<0.02	<0.02	<0.02	0.06
	Mg-acid	%Mg	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Mg-acid	moles H+/t	<10	<10	<10	<10	<10	<10	12
	Mg-acid	%S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Alkalinity	ANC-exc	% CaCO ₃							0.1
	ANC-exc	moles H+/t							19
	ANC-exc	%S							0.03
Acid Base Accounting	Fineness		1.5	1.5	1.5	1.5	1.5	1.5	1.5
	NA	%S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	NA	moles H+/t	<10	<10	<10	<10	<10	<10	<10
	Lime	(kg CaCO ₃ /t)	<1	<1	<1	<1	<1	<1	<1
	NA (-ANC)	%S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	NA (-ANC)	moles H+/t	<10	<10	<10	<10	<10	<10	<10
	Lime (- ANC)	(kg CaCO ₃ /t)	<1	<1	<1	<1	<1	<1	<1

Appendix A

	Core	27059	27059	27059	27130	27130	27130	27130	27130	27130
Ore Body	Zeus	Zeus	Zeus	Zeus	Zeus	Zeus	Zeus	Zeus	Zeus	Zeus
Depth	m bgl	23	27	30	4	11	15	21	27	30
RL	m AHD	35.0	35.0	35.0	28.0	28.0	28.0	28.0	28.0	28.0
Depth	m AHD	12.0	8.0	5.0	24.0	17.0	13.0	7.0	1.0	-2.0
North	m GDA	6747950	6747950	6747950	6746119	6746119	6746119	6746119	6746119	6746119
East	m GDA	318159	318159	318159	316947	316947	316947	316947	316947	316947
pH	pH KCl	6.3	6.6	6.8	6.5	6.2	6.5	6.2	6.3	6.4
	pH Ox	5.6	6.1	6.0	4.9	5.1	5.4	5.1	5.4	5.4
	pH	0.7	0.5	0.8	1.6	1.1	1.1	1.1	0.9	1
Acidity Trail	TAA	moles H+/t	<2	<2	<2	<2	<2	<2	<2	<2
	TPA	moles H+/t	<2	<2	<2	<2	<2	<2	<2	<2
	TSA	moles H+/t	<2	<2	<2	<2	<2	<2	<2	<2
	TAA	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	TPA	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	TSA	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
S Trail	S-KCl	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	S-Ox	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	POS	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	POS	moles H+/t	10	<10	<10	<10	<10	<10	<10	<10
Ca Values	Ca-KCl	%Ca	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Ca-Ox	%Ca	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Ca-Acid	%Ca	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Ca-Acid	moles H+/t	10	<10	<10	<10	<10	<10	<10	<10
	Ca-Acid	%S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Mg Values	Mg-KCl	%Mg	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Mg-Ox	%Mg	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Mg-acid	%Mg	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Mg-acid	moles H+/t	15	14	<10	<10	<10	<10	<10	<10
	Mg-acid	%S	0.02	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Alkalinity	ANC-exc	% CaCO ₃								
	ANC-exc	moles H+/t								
	ANC-exc	%S								
Acid Base Accounting	Fineness		1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
	NA	%S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	NA	moles H+/t	<10	<10	<10	<10	<10	<10	<10	<10
	Lime	(kg CaCO ₃ /t)	<1	<1	<1	<1	<1	<1	<1	<1
	NA (-ANC)	%S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	NA (-ANC)	moles H+/t	<10	<10	<10	<10	<10	<10	<10	<10
	Lime (- ANC)	(kg CaCO ₃ /t)	<1	<1	<1	<1	<1	<1	<1	<1

Appendix A

	Core	27131	27131	27131	27131	27131	27131	27131	27131	27131
Ore Body		Zeus	Zeus	Zeus	Zeus	Zeus	Zeus	Zeus	Zeus	Zeus
Depth	m bgl	5	9	13	16	18	19	22	24	27
RL	m AHD	27.0	27.0	27.0	27.0	27.0	27.0	27.0	27.0	27.0
Depth	m AHD	22.0	18.0	14.0	11.0	9.0	8.0	5.0	3.0	0.0
North	m GDA	6746932	6746932	6746932	6746932	6746932	6746932	6746932	6746932	6746932
East	m GDA	315848	315848	315848	315848	315848	315848	315848	315848	315848
pH	pH KCl	6	6.5	6.7	6.7	6.7	6.7	6.4	6.6	6.5
	pH Ox	4.9	5.2	5.2	5.1	5.2	5.1	4.6	5.1	5.4
	pH	1.1	1.3	1.5	1.6	1.5	1.6	1.8	1.5	1.1
Acidity Trail	TAA	moles H+/t	<2	<2	<2	<2	<2	<2	<2	<2
	TPA	moles H+/t	<2	<2	<2	<2	<2	<2	<2	<2
	TSA	moles H+/t	<2	<2	<2	<2	<2	<2	<2	<2
	TAA	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	TPA	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	TSA	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
S Trail	S-KCl	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	S-Ox	% S	<0.02	0.03	0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	POS	% S	<0.02	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	POS	moles H+/t	<10	15	10	<10	<10	<10	<10	<10
Ca Values	Ca-KCl	%Ca	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Ca-Ox	%Ca	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Ca-Acid	%Ca	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Ca-Acid	moles H+/t	<10	<10	<10	<10	<10	<10	<10	<10
	Ca-Acid	%S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Mg Values	Mg-KCl	%Mg	<0.02	<0.02	0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Mg-Ox	%Mg	<0.02	<0.02	0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Mg-acid	%Mg	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Mg-acid	moles H+/t	<10	<10	<10	<10	<10	<10	<10	<10
	Mg-acid	%S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Alkalinity	ANC-exc	% CaCO ₃								
	ANC-exc	moles H+/t								
	ANC-exc	%S								
Acid Base Accounting	Fineness		1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
	NA	%S	<0.02	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	NA	moles H+/t	<10	15	<10	<10	<10	<10	<10	<10
	Lime	(kg CaCO ₃ /t)	<1	1	<1	<1	<1	<1	<1	<1
	NA (-ANC)	%S	<0.02	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	NA (-ANC)	moles H+/t	<10	15	10	<10	<10	<10	<10	<10
	Lime (- ANC)	(kg CaCO ₃ /t)	<1	1	<1	<1	<1	<1	<1	<1

Appendix A

	Core	27131	27131	27131	27132	27132	27132	27132	27132	27132
Ore Body		Zeus	Zeus	Zeus	Zeus	Zeus	Zeus	Zeus	Zeus	Zeus
Depth	m bgl	30	32	33	4	7	9	13	15	24
RL	m AHD	27.0	27.0	27.0	50.0	50.0	50.0	50.0	50.0	50.0
Depth	m AHD	-3.0	-5.0	-6.0	46.0	43.0	41.0	37.0	35.0	26.0
North	m GDA	6746932	6746932	6746932	6747713	6747713	6747713	6747713	6747713	6747713
East	m GDA	315848	315848	315848	316969	316969	316969	316969	316969	316969
pH	pH KCl	6.6	6.5	5.1	7.1	6	6.4	6.4	6.2	6.5
	pH Ox	5.3	5.1	2.3	7.4	6.4	5.9	4	5.7	5.8
	pH	1.3	1.4	2.8	-0.30	-0.40	0.50	2.4	0.5	0.7
Acidity Trail	TAA	moles H+/t	<2	<2	44	<2	4	<2	<2	<2
	TPA	moles H+/t	<2	<2	336	<2	<2	<2	8	<2
	TSA	moles H+/t	<2	<2	292	<2	<2	<2	8	<2
	TAA	% S	<0.02	<0.02	0.07	<0.02	<0.02	<0.02	<0.02	<0.02
	TPA	% S	<0.02	<0.02	0.54	<0.02	<0.02	<0.02	<0.02	<0.02
	TSA	% S	<0.02	<0.02	0.47	<0.02	<0.02	<0.02	<0.02	<0.02
S Trail	S-KCl	% S	<0.02	<0.02	0.16	<0.02	<0.02	<0.02	<0.02	<0.02
	S-Ox	% S	<0.02	<0.02	0.76	<0.02	<0.02	0.03	<0.02	<0.02
	POS	% S	<0.02	<0.02	0.6	<0.02	<0.02	<0.02	<0.02	<0.02
	POS	moles H+/t	<10	<10	377	<10	<10	<10	12	<10
Ca Values	Ca-KCl	%Ca	<0.02	<0.02	0.04	0.03	<0.02	<0.02	<0.02	<0.02
	Ca-Ox	%Ca	<0.02	<0.02	0.14	0.03	<0.02	<0.02	<0.02	<0.02
	Ca-Acid	%Ca	<0.02	<0.02	0.09	<0.02	<0.02	<0.02	<0.02	<0.02
	Ca-Acid	moles H+/t	<10	<10	46	<10	<10	<10	<10	<10
	Ca-Acid	%S	<0.02	<0.02	0.07	<0.02	<0.02	<0.02	<0.02	<0.02
Mg Values	Mg-KCl	%Mg	<0.02	<0.02	0.1	0.11	0.05	0.02	<0.02	0.03
	Mg-Ox	%Mg	<0.02	<0.02	0.14	0.11	0.05	<0.02	<0.02	<0.02
	Mg-acid	%Mg	<0.02	<0.02	0.04	<0.02	<0.02	<0.02	<0.02	<0.02
	Mg-acid	moles H+/t	<10	<10	37	<10	<10	<10	<10	<10
	Mg-acid	%S	<0.02	<0.02	0.06	<0.02	<0.02	<0.02	<0.02	<0.02
Alkalinity	ANC-exc	% CaCO3				0.37				
	ANC-exc	moles H+/t				73				
	ANC-exc	%S				0.12				
Acid Base Accounting	Fineness		1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
	NA	%S	<0.02	<0.02	0.68	<0.02	<0.02	<0.02	<0.02	<0.02
	NA	moles H+/t	<10	<10	421	<10	<10	<10	12	<10
	Lime	(kg CaCO3/t)	<1	<1	32	<1	<1	<1	<1	<1
	NA (-ANC)	%S	<0.02	<0.02	0.68	<0.02	<0.02	<0.02	<0.02	<0.02
	NA (-ANC)	moles H+/t	<10	<10	421	<10	<10	<10	12	<10
	Lime (- ANC)	(kg CaCO3/t)	<1	<1	32	<1	<1	<1	<1	<1

Appendix A

	Core	27132	27133	27133	27133	27133	27133	27133	27133	27133
Ore Body		Zeus	Zeus	Zeus	Zeus	Zeus	Zeus	Zeus	Zeus	Zeus
Depth	m bgl	29	2	6	9	12	14	20	23	28
RL	m AHD	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0
Depth	m AHD	21.0	48.0	44.0	41.0	38.0	36.0	30.0	27.0	22.0
North	m GDA	6747713	6749321	6749321	6749321	6749321	6749321	6749321	6749321	6749321
East	m GDA	316969	317077	317077	317077	317077	317077	317077	317077	317077
pH	pH KCl	6.5	6.6	6.3	6.3	6.4	6.7	6.4	6.5	6.5
	pH Ox	5.4	5.7	3.5	5	5.8	5.8	5.8	5.7	6
	pH	1.1	0.90	2.80	1.30	0.60	0.90	0.60	0.80	0.50
Acidity Trail	TAA	moles H+/t	<2	<2	<2	<2	<2	<2	<2	<2
	TPA	moles H+/t	<2	<2	4	<2	<2	<2	<2	<2
	TSA	moles H+/t	<2	<2	4	<2	<2	<2	<2	<2
	TAA	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	TPA	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	TSA	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
S Trail	S-KCl	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	S-Ox	% S	<0.02	<0.02	<0.02	0.02	<0.02	<0.02	<0.02	<0.02
	POS	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	POS	moles H+/t	<10	<10	<10	<10	<10	<10	<10	<10
Ca Values	Ca-KCl	%Ca	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Ca-Ox	%Ca	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Ca-Acid	%Ca	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Ca-Acid	moles H+/t	<10	<10	<10	<10	<10	<10	<10	<10
	Ca-Acid	%S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Mg Values	Mg-KCl	%Mg	<0.02	<0.02	<0.02	0.03	0.03	0.02	<0.02	<0.02
	Mg-Ox	%Mg	<0.02	<0.02	<0.02	0.02	0.02	<0.02	<0.02	<0.02
	Mg-acid	%Mg	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Mg-acid	moles H+/t	<10	<10	<10	<10	<10	<10	<10	<10
	Mg-acid	%S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Alkalinity	ANC-exc	% CaCO ₃								
	ANC-exc	moles H+/t								
	ANC-exc	%S								
Acid Base Accounting	Fineness		1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
	NA	%S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	NA	moles H+/t	<10	<10	<10	<10	<10	<10	<10	<10
	Lime	(kg CaCO ₃ /t)	<1	<1	<1	<1	<1	<1	<1	<1
	NA (-ANC)	%S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	NA (-ANC)	moles H+/t	<10	<10	<10	<10	<10	<10	<10	<10
	Lime (- ANC)	(kg CaCO ₃ /t)	<1	<1	<1	<1	<1	<1	<1	<1

Appendix A

	Core	27135	27135	27135	27135	27135	27135	27136	27136	27136
Ore Body		Zeus	Zeus	Zeus	Zeus	Zeus	Zeus	Zeus	Zeus	Zeus
Depth	m bgl	4	7	13	18	24	27	3	7	13
RL	m AHD	29.0	29.0	29.0	29.0	29.0	29.0	40.0	40.0	40.0
Depth	m AHD	25.0	22.0	16.0	11.0	5.0	2.0	37.0	33.0	27.0
North	m GDA	6748183	6748183	6748183	6748183	6748183	6748183	6748588	6748588	6748588
East	m GDA	317375	317375	317375	317375	317375	317375	318417	318417	318417
pH	pH KCl	6.3	6.3	6	6	6.3	6.6	6.2	5.5	5.6
	pH Ox	6.5	6.4	5.9	6	5.9	6.2	5.1	6	6.4
	pH	-0.20	-0.10	0.10	0.00	0.40	0.40	1.10	-0.50	-0.80
Acidity Trail	TAA	moles H+/t	<2	<2	<2	2	<2	<2	9	6
	TPA	moles H+/t	<2	<2	<2	<2	<2	2	<2	<2
	TSA	moles H+/t	<2	<2	<2	<2	<2	2	<2	<2
	TAA	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	TPA	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	TSA	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
S Trail	S-KCl	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	S-Ox	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	POS	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	POS	moles H+/t	<10	<10	<10	<10	<10	<10	<10	<10
Ca Values	Ca-KCl	%Ca	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Ca-Ox	%Ca	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Ca-Acid	%Ca	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Ca-Acid	moles H+/t	<10	<10	<10	<10	<10	<10	<10	<10
	Ca-Acid	%S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Mg Values	Mg-KCl	%Mg	<0.02	0.03	<0.02	0.03	<0.02	<0.02	0.03	0.05
	Mg-Ox	%Mg	<0.02	0.03	<0.02	<0.02	<0.02	<0.02	0.03	0.03
	Mg-acid	%Mg	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Mg-acid	moles H+/t	<10	<10	<10	<10	<10	<10	<10	<10
	Mg-acid	%S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Alkalinity	ANC-exc	% CaCO ₃								
	ANC-exc	moles H+/t								
	ANC-exc	%S								
Acid Base Accounting	Fineness		1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
	NA	%S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	NA	moles H+/t	<10	<10	<10	<10	<10	<10	<10	<10
	Lime	(kg CaCO ₃ /t)	<1	<1	<1	<1	<1	<1	<1	<1
	NA (-ANC)	%S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	NA (-ANC)	moles H+/t	<10	<10	<10	<10	<10	<10	<10	<10
	Lime (- ANC)	(kg CaCO ₃ /t)	<1	<1	<1	<1	<1	<1	<1	<1

Appendix A

		27136	27136	27136	27136	27137	27137	27137	27137	27137
Ore Body	Core	Zeus	Zeus	Zeus	Zeus	Zeus	Zeus	Zeus	Zeus	Zeus
Depth	m bgl	16	19	22	26	3	8	12	22	28
RL	m AHD	40.0	40.0	40.0	40.0	42.0	42.0	42.0	42.0	42.0
Depth	m AHD	24.0	21.0	18.0	14.0	39.0	34.0	30.0	20.0	14.0
North	m GDA	6748588	6748588	6748588	6748588	6746437	6746437	6746437	6746437	6746437
East	m GDA	318417	318417	318417	318417	318655	318655	318655	318655	318655
pH	pH KCl	6.3	6.4	6.3	6.3	6	5.8	5.6	6.2	6.2
	pH Ox	6.2	6	5.5	5.5	5.2	5.6	6.2	5.8	5.8
	pH	0.10	0.40	0.80	0.80	0.80	0.20	-0.60	0.40	0.40
Acidity Trail	TAA	moles H+/t	2	<2	<2	<2	2	6	<2	<2
	TPA	moles H+/t	<2	<2	<2	<2	<2	<2	<2	<2
	TSA	moles H+/t	<2	<2	<2	<2	<2	<2	<2	<2
	TAA	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	TPA	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	TSA	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
S Trail	S-KCl	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	S-Ox	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.08	<0.02
	POS	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.08	<0.02
	POS	moles H+/t	<10	<10	<10	<10	<10	<10	49	<10
Ca Values	Ca-KCl	%Ca	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Ca-Ox	%Ca	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Ca-Acid	%Ca	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Ca-Acid	moles H+/t	<10	<10	<10	<10	<10	<10	<10	<10
	Ca-Acid	%S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Mg Values	Mg-KCl	%Mg	0.02	0.02	<0.02	<0.02	<0.02	0.03	<0.02	<0.02
	Mg-Ox	%Mg	<0.02	0.02	<0.02	<0.02	<0.02	0.06	0.02	<0.02
	Mg-acid	%Mg	<0.02	<0.02	<0.02	<0.02	<0.02	0.03	<0.02	<0.02
	Mg-acid	moles H+/t	<10	<10	<10	<10	<10	25	<10	<10
	Mg-acid	%S	<0.02	<0.02	<0.02	<0.02	<0.02	0.04	<0.02	<0.02
Alkalinity	ANC-exc	% CaCO ₃								
	ANC-exc	moles H+/t								
	ANC-exc	%S								
Acid Base Accounting	Fineness		1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
	NA	%S	<0.02	<0.02	<0.02	<0.02	<0.02	0.09	<0.02	<0.02
	NA	moles H+/t (kg CaCO ₃ /t)	<10	<10	<10	<10	<10	55	11	<10
	Lime		<1	<1	<1	<1	<1	4	<1	<1
	NA (-ANC)	%S	<0.02	<0.02	<0.02	<0.02	<0.02	0.09	<0.02	<0.02
	NA (-ANC)	moles H+/t (kg CaCO ₃ /t)	<10	<10	<10	<10	<10	55	11	<10
	Lime (- ANC)		<1	<1	<1	<1	<1	4	<1	<1

Appendix A

	Core	27137	27138	27138	27138	27138	27138	27138	27138	27138
Ore Body		Zeus	Zeus	Zeus	Zeus	Zeus	Zeus	Zeus	Zeus	Zeus
Depth	m bgl	32	3	7	9	12	14	18	21	24
RL	m AHD	42.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0
Depth	m AHD	10.0	47.0	43.0	41.0	38.0	36.0	32.0	29.0	26.0
North	m GDA	6744373	6744373	6744373	6744373	6744373	6744373	6744373	6744373	6744373
East	m GDA	318655	316953	316953	316953	316953	316953	316953	316953	316953
pH	pH KCl	6.7	6.1	6.1	6.3	6.2	6	6.1	6.1	6.2
	pH Ox	5.8	5.1	4.9	5.2	5.5	5.6	5.6	5.6	5.8
	pH	0.90	1.00	1.20	1.10	0.70	0.40	0.50	0.50	0.40
Acidity Trail	TAA	moles H+/t	<2	<2	<2	<2	<2	<2	<2	<2
	TPA	moles H+/t	<2	<2	<2	<2	<2	<2	<2	<2
	TSA	moles H+/t	<2	<2	<2	<2	<2	<2	<2	<2
	TAA	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	TPA	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	TSA	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
S Trail	S-KCl	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	S-Ox	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	POS	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	POS	moles H+/t	<10	<10	<10	<10	<10	<10	<10	<10
Ca Values	Ca-KCl	%Ca	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Ca-Ox	%Ca	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Ca-Acid	%Ca	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Ca-Acid	moles H+/t	<10	<10	<10	<10	<10	<10	<10	<10
	Ca-Acid	%S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Mg Values	Mg-KCl	%Mg	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Mg-Ox	%Mg	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Mg-acid	%Mg	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Mg-acid	moles H+/t	<10	<10	<10	<10	<10	<10	<10	<10
	Mg-acid	%S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Alkalinity	ANC-exc	% CaCO ₃								
	ANC-exc	moles H+/t								
	ANC-exc	%S								
Acid Base Accounting	Fineness		1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
	NA	%S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	NA	moles H+/t	<10	<10	<10	<10	<10	10	<10	<10
	Lime	(kg CaCO ₃ /t)	<1	<1	<1	<1	<1	<1	<1	<1
	NA (-ANC)	%S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	NA (-ANC)	moles H+/t	<10	<10	<10	<10	<10	10	<10	<10
	Lime (- ANC)	(kg CaCO ₃ /t)	<1	<1	<1	<1	<1	<1	<1	<1

Appendix A

	Core	27138	27160	27160	27160	27160	27160	27160
Ore Body		Zeus	Zeus	Zeus	Zeus	Zeus	Zeus	Zeus
Depth	m bgl	27	2	6	13	25	28	30
RL	m AHD	50.0	36.0	36.0	36.0	36.0	36.0	36.0
Depth	m AHD	23.0	34.0	30.0	23.0	11.0	8.0	6.0
North	m GDA	6744373	6744756	6744756	6744756	6744756	6744756	6744756
East	m GDA	316953	318413	318413	318413	318413	318413	318413
pH	pH KCl	6.2	6.7	6.1	6	6.5	6	6
	pH Ox	6	5.1	5.4	5.5	5.6	6.5	5.8
	pH	0.20	1.60	0.70	0.50	0.90	-0.50	0.20
Acidity Trail	TAA	moles H+/t	<2	<2	<2	<2	4	2
	TPA	moles H+/t	<2	<2	<2	<2	<2	<2
	TSA	moles H+/t	<2	<2	<2	<2	<2	<2
	TAA	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	TPA	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	TSA	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
S Trail	S-KCl	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	S-Ox	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	POS	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	POS	moles H+/t	<10	<10	<10	<10	<10	<10
Ca Values	Ca-KCl	%Ca	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Ca-Ox	%Ca	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Ca-Acid	%Ca	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Ca-Acid	moles H+/t	<10	<10	<10	<10	<10	<10
	Ca-Acid	%S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Mg Values	Mg-KCl	%Mg	<0.02	<0.02	<0.02	0.02	0.03	0.04
	Mg-Ox	%Mg	<0.02	<0.02	<0.02	<0.02	0.02	0.04
	Mg-acid	%Mg	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Mg-acid	moles H+/t	<10	<10	<10	<10	<10	<10
	Mg-acid	%S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Alkalinity	ANC-exc	% CaCO ₃					0.12	
	ANC-exc	moles H+/t					24	
	ANC-exc	%S					0.04	
Acid Base Accounting	Fineness		1.5	1.5	1.5	1.5	1.5	1.5
	NA	%S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	NA	moles H+/t	<10	<10	<10	<10	<10	<10
	Lime	(kg CaCO ₃ /t)	<1	<1	<1	<1	<1	<1
	NA (-ANC)	%S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	NA (-ANC)	moles H+/t	<10	<10	<10	<10	<10	<10
	Lime (- ANC)	(kg CaCO ₃ /t)	<1	<1	<1	<1	<1	<1

Appendix A

	Core	26762	26762	26762	26762	26762	26772	26772	26772
Ore Body		Heracles	Heracles	Heracles	Heracles	Heracles	Heracles	Heracles	Heracles
Depth	m bgl	2	5	9	16	20	2	5	9
RL	m AHD	50.1	50.1	50.1	50.1	50.1	47.9	47.9	47.9
Depth	m AHD	48.1	45.1	41.1	34.1	30.1	45.9	42.9	38.9
North	m GDA	6741549	6741549	6741549	6741549	6741549	6742047	6742047	6742047
East	m GDA	320139	320139	320139	320139	320139	319960	319960	319960
pH	pH KCl		5.7	5.8	5.7	5.3	5.7	5.7	5.5
	pH Ox		4.9	5.4	5.4	7.4	6.1	5.1	5.6
	pH		0.8	0.4	0.3	-2.1	-0.4	0.6	-0.1
Acidity Trail	TAA	moles H+/t	2	<2	2	7	2	<2	<2
	TPA	moles H+/t	<2	<2	2	<2	<2	<2	<2
	TSA	moles H+/t	<2	<2	<2	<2	<2	<2	<2
	TAA	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.02
	TPA	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.02
	TSA	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
S Trail	S-KCl	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	S-Ox	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	POS	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	POS	moles H+/t	<10	<10	<10	<10	<10	<10	<10
Ca Values	Ca-KCl	%Ca	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Ca-Ox	%Ca	<0.02	<0.02	<0.02	0.05	<0.02	<0.02	<0.02
	Ca-Acid	%Ca	<0.02	<0.02	<0.02	0.04	<0.02	<0.02	<0.02
	Ca-Acid	moles H+/t	<10	<10	<10	19	<10	<10	<10
	Ca-Acid	%S	<0.02	<0.02	<0.02	0.03	<0.02	<0.02	<0.02
Mg Values	Mg-KCl	%Mg	<0.02	<0.02	<0.02	0.04	0.02	<0.02	0.04
	Mg-Ox	%Mg	<0.02	<0.02	<0.02	0.06	0.02	<0.02	0.04
	Mg-acid	%Mg	<0.02	<0.02	<0.02	0.02	<0.02	<0.02	<0.02
	Mg-acid	moles H+/t	<10	<10	<10	18	<10	<10	<10
	Mg-acid	%S	<0.02	<0.02	<0.02	0.03	<0.02	<0.02	<0.02
Alkalinity	ANC-exc	% CaCO ₃				0.18			
	ANC-exc	moles H+/t				35			
	ANC-exc	%S				0.06			
Acid Base Accounting	Fineness		1.5	1.5	1.5	1.5	1.5	1.5	1.5
	NA	%S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	NA	moles H+/t	<10	<10	<10	<10	<10	<10	<10
	Lime	(kg CaCO ₃ /t)	<1	<1	<1	<1	<1	<1	<1
	NA (-ANC)	%S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	NA (-ANC)	moles H+/t	<10	<10	<10	<10	<10	<10	<10
	Lime (- ANC)	(kg CaCO ₃ /t)	<1	<1	<1	<1	<1	<1	<1

Appendix A

	Core	26772	26772	26787	26787	26787	26787	26787	26787	26787
Ore Body		Heracles	Heracles	Heracles	Heracles	Heracles	Heracles	Heracles	Heracles	Heracles
Depth	m bgl	15	20	2	5	9	15	17	22	24
RL	m AHD	47.9	47.9	53.6	53.6	53.6	53.6	53.6	53.6	53.6
Depth	m AHD	32.9	27.9	51.6	48.6	44.6	38.6	36.6	31.6	29.6
North	m GDA	6742047	6742047	6742499	6742499	6742499	6742499	6742499	6742499	6742499
East	m GDA	319960	319960	319802	319802	319802	319802	319802	319802	319802
pH	pH KCl	5.4	6.1	5.8	5.9	6.0	5.9	6.0	5.4	6.0
	pH Ox	6.8	5.9	5.0	5.0	5.2	5.4	5.8	6.7	6.9
	pH	-1.4	0.2	0.8	0.9	0.8	0.5	0.2	-1.3	-0.9
Acidity Trail	TAA	moles H+/t	5	<2	<2	<2	<2	<2	4	<2
	TPA	moles H+/t	<2	<2	<2	<2	<2	<2	<2	<2
	TSA	moles H+/t	<2	<2	<2	<2	<2	<2	<2	<2
	TAA	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	TPA	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	TSA	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
S Trail	S-KCl	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	S-Ox	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	POS	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	POS	moles H+/t	<10	<10	<10	<10	<10	<10	<10	<10
Ca Values	Ca-KCl	%Ca	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Ca-Ox	%Ca	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Ca-Acid	%Ca	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Ca-Acid	moles H+/t	<10	<10	<10	<10	<10	<10	<10	<10
	Ca-Acid	%S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Mg Values	Mg-KCl	%Mg	0.03	<0.02	<0.02	<0.02	<0.02	<0.02	0.04	0.04
	Mg-Ox	%Mg	0.04	<0.02	<0.02	<0.02	<0.02	<0.02	0.03	0.03
	Mg-acid	%Mg	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Mg-acid	moles H+/t	<10	<10	<10	<10	<10	<10	<10	<10
	Mg-acid	%S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Alkalinity	ANC-exc	% CaCO ₃	0.19						0.12	0.12
	ANC-exc	moles H+/t	38						23	24
	ANC-exc	%S	0.06						0.04	0.04
Acid Base Accounting	Fineness		1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
	NA	%S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	NA	moles H+/t	<10	<10	<10	<10	<10	<10	<10	<10
	Lime	(kg CaCO ₃ /t)	<1	<1	<1	<1	<1	<1	<1	<1
	NA (-ANC)	%S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	NA (-ANC)	moles H+/t	<10	<10	<10	<10	<10	<10	<10	<10
	Lime (- ANC)	(kg CaCO ₃ /t)	<1	<1	<1	<1	<1	<1	<1	<1

Appendix A

		Core	26792	26792	26792	26792	26792	26792	26792	27161
Ore Body			Heracles	Heracles	Heracles	Heracles	Heracles	Heracles	Heracles	Heracles
Depth	m bgl		2	5	7	8	12	18	23	3
RL	m AHD		55.1	55.1	55.1	55.1	55.1	55.1	55.1	31.0
Depth	m AHD		53.1	50.1	48.1	47.1	43.1	37.1	32.1	28.0
North	m GDA	6743249	6743249	6743249	6743249	6743249	6743249	6743249	6743249	6742148
East	m GDA	320097	320097	320097	320097	320097	320097	320097	320097	318343
pH	pH KCl		5.6	5.7	5.4	5.1	5.5	5.8	5.7	6.4
	pH Ox		5.5	5.4	5.5	5.5	5.3	5.7	5.5	5.3
	pH		0.1	0.3	-0.1	-0.4	0.2	0.1	0.2	1.10
Acidity Trail	TAA	moles H+/t	2	4	11	15	2	<2	2	<2
	TPA	moles H+/t	<2	5	11	15	<2	<2	<2	<2
	TSA	moles H+/t	<2	<2	<2	<2	<2	<2	<2	<2
	TAA	% S	<0.02	<0.02	<0.02	0.02	<0.02	<0.02	<0.02	<0.02
	TPA	% S	<0.02	<0.02	<0.02	0.02	<0.02	<0.02	<0.02	<0.02
	TSA	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
S Trail	S-KCl	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	S-Ox	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	POS	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	POS	moles H+/t	<10	<10	<10	<10	<10	<10	<10	<10
Ca Values	Ca-KCl	%Ca	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Ca-Ox	%Ca	<0.02	<0.02	<0.02	0.03	<0.02	<0.02	<0.02	<0.02
	Ca-Acid	%Ca	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Ca-Acid	moles H+/t	<10	<10	<10	<10	<10	<10	<10	<10
	Ca-Acid	%S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Mg Values	Mg-KCl	%Mg	<0.02	<0.02	0.02	0.03	<0.02	<0.02	<0.02	<0.02
	Mg-Ox	%Mg	<0.02	<0.02	<0.02	0.03	<0.02	<0.02	<0.02	<0.02
	Mg-acid	%Mg	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Mg-acid	moles H+/t	<10	<10	<10	<10	<10	<10	<10	<10
	Mg-acid	%S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Alkalinity	ANC-exc	% CaCO ₃								
	ANC-exc	moles H+/t								
	ANC-exc	%S								
Acid Base Accounting	Fineness		1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
	NA	%S	<0.02	<0.02	<0.02	0.03	<0.02	<0.02	<0.02	<0.02
	NA	moles H+/t (kg CaCO ₃ /t)	<10	<10	<10	16	<10	<10	<10	<10
	Lime		<1	<1	<1	1	<1	<1	<1	<1
	NA (-ANC)	%S	<0.02	<0.02	<0.02	0.03	<0.02	<0.02	<0.02	<0.02
	NA (-ANC)	moles H+/t (kg CaCO ₃ /t)	<10	<10	<10	16	<10	<10	<10	<10
	Lime (- ANC)		<1	<1	<1	1	<1	<1	<1	<1

Appendix A

	Core	27161	27161	27161	27161	27161	27162	27162	27162	27162
Ore Body		Heracles	Heracles	Heracles	Heracles	Heracles	Heracles	Heracles	Heracles	Heracles
Depth	m bgl	5	10	15	21	25	3	7	12	15
RL	m AHD	31.0	31.0	31.0	31.0	31.0	44.0	44.0	44.0	44.0
Depth	m AHD	26.0	21.0	16.0	10.0	6.0	41.0	37.0	32.0	29.0
North	m GDA	6742148	6742148	6742148	6742148	6742148	6741863	6741863	6741863	6741863
East	m GDA	318343	318343	318343	318343	318343	319388	319388	319388	319388
pH	pH KCl	6.2	6.2	6.5	6	5.7	9.7	9.8	9.4	7.8
	pH Ox	5.7	5.8	5.8	5.9	2.4	7.7	8	7.5	6.7
	pH	0.50	0.40	0.70	0.10	3.30	2.00	1.80	1.90	1.10
Acidity Trail	TAA	moles H+/t	<2	<2	<2	<2	10	<2	<2	<2
	TPA	moles H+/t	<2	<2	<2	<2	201	<2	<2	<2
	TSA	moles H+/t	<2	<2	<2	<2	191	<2	<2	<2
	TAA	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	TPA	% S	<0.02	<0.02	<0.02	<0.02	0.32	<0.02	<0.02	<0.02
	TSA	% S	<0.02	<0.02	<0.02	<0.02	0.31	<0.02	<0.02	<0.02
S Trail	S-KCl	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	S-Ox	% S	<0.02	<0.02	0.04	<0.02	0.16	<0.02	<0.02	<0.02
	POS	% S	<0.02	<0.02	0.04	<0.02	0.16	<0.02	<0.02	<0.02
	POS	moles H+/t	<10	<10	26	<10	99	<10	<10	<10
Ca Values	Ca-KCl	%Ca	<0.02	<0.02	<0.02	0.03	0.04	0.21	0.19	0.11
	Ca-Ox	%Ca	<0.02	<0.02	0.03	0.04	0.04	5.01	3.94	0.12
	Ca-Acid	%Ca	<0.02	<0.02	<0.02	<0.02	<0.02	4.8	3.75	<0.02
	Ca-Acid	moles H+/t	<10	<10	<10	<10	<10	2390	1870	<10
	Ca-Acid	%S	<0.02	<0.02	<0.02	<0.02	<0.02	3.84	3	<0.02
Mg Values	Mg-KCl	%Mg	<0.02	0.02	<0.02	0.08	0.06	<0.02	<0.02	<0.02
	Mg-Ox	%Mg	<0.02	<0.02	0.1	0.08	0.07	0.06	0.03	<0.02
	Mg-acid	%Mg	<0.02	<0.02	0.08	<0.02	<0.02	0.06	0.03	<0.02
	Mg-acid	moles H+/t	<10	<10	69	<10	<10	46	22	<10
	Mg-acid	%S	<0.02	<0.02	0.11	<0.02	<0.02	0.07	0.03	<0.02
Alkalinity	ANC-exc	% CaCO ₃					11	8.36	0.3	0.16
	ANC-exc	moles H+/t					2200	1670	60	31
	ANC-exc	%S					3.53	2.68	0.1	0.05
Acid Base Accounting	Fineness		1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
	NA	%S	<0.02	<0.02	<0.02	<0.02	0.17	<0.02	<0.02	<0.02
	NA	moles H+/t	<10	<10	<10	<10	109	<10	<10	<10
	Lime	(kg CaCO ₃ /t)	<1	<1	<1	<1	8	<1	<1	<1
	NA (-ANC)	%S	<0.02	<0.02	0.04	<0.02	0.17	<0.02	<0.02	<0.02
	NA (-ANC)	moles H+/t	<10	<10	26	<10	109	<10	<10	<10
	Lime (- ANC)	(kg CaCO ₃ /t)	<1	<1	2	<1	8	<1	<1	<1

Appendix A

		Core	27162	27162	27162	27163	27163	27163	27163
	Ore Body		Heracles						
Depth	m bgl		21	26	28	6	10	19	27
RL	m AHD		44.0	44.0	44.0	48.0	48.0	48.0	48.0
Depth	m AHD		23.0	18.0	16.0	42.0	38.0	29.0	21.0
North	m GDA	6741863	6741863	6741863	6743123	6743123	6743123	6743123	6743123
East	m GDA	319388	319388	319388	319167	319167	319167	319167	319167
pH	pH KCl		9.6	9.6	9.3	6.5	6.4	9.4	7.5
	pH Ox		7	7.2	6.7	5.5	6	6.9	6.3
	pH		2.60	2.40	2.60	1.00	0.40	2.50	1.20
Acidity Trail	TAA	moles H+/t	<2	<2	<2	<2	<2	<2	<2
	TPA	moles H+/t	<2	<2	<2	<2	2	<2	<2
	TSA	moles H+/t	<2	<2	<2	<2	2	<2	<2
	TAA	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	TPA	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	TSA	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
S Trail	S-KCl	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	S-Ox	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	POS	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	POS	moles H+/t	<10	<10	<10	<10	<10	<10	<10
Ca Values	Ca-KCl	%Ca	0.08	0.1	0.05	<0.02	0.03	0.08	0.03
	Ca-Ox	%Ca	0.09	0.17	0.04	<0.02	0.06	0.08	0.02
	Ca-Acid	%Ca	<0.02	0.07	<0.02	<0.02	0.03	<0.02	<0.02
	Ca-Acid	moles H+/t	<10	37	<10	<10	16	<10	<10
	Ca-Acid	%S	<0.02	0.06	<0.02	<0.02	0.02	<0.02	<0.02
Mg Values	Mg-KCl	%Mg	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.03
	Mg-Ox	%Mg	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Mg-acid	%Mg	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Mg-acid	moles H+/t	<10	<10	<10	<10	<10	<10	<10
	Mg-acid	%S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Alkalinity	ANC-exc	% CaCO ₃	0.23	0.42	0.17			0.23	
	ANC-exc	moles H+/t	46	85	34			46	
	ANC-exc	%S	0.07	0.14	0.05			0.07	
Acid Base Accounting	Fineness		1.5	1.5	1.5	1.5	1.5	1.5	1.5
	NA	%S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	NA	moles H+/t	<10	<10	<10	<10	<10	<10	<10
	Lime	(kg CaCO ₃ /t)	<1	<1	<1	<1	<1	<1	<1
	NA (-ANC)	%S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	NA (-ANC)	moles H+/t	<10	<10	<10	<10	<10	<10	<10
	Lime (- ANC)	(kg CaCO ₃ /t)	<1	<1	<1	<1	<1	<1	<1

Appendix A

		Core	27164	27164	27164	27164	27164	27165	27165	27165	27165
Ore Body		Heracles	Heracles	Heracles	Heracles	Heracles	Heracles	Heracles	Heracles	Heracles	Heracles
Depth	m bgl	5	10	18	26	29	2	12	16	22	
RL	m AHD	53.0	53.0	53.0	53.0	53.0	57.0	57.0	57.0	57.0	57.0
Depth	m AHD	48.0	43.0	35.0	27.0	24.0	55.0	45.0	41.0	35.0	
North	m GDA	6742590	6742590	6742590	6742590	6742590	6741874	6741874	6741874	6741874	6741874
East	m GDA	320519	320519	320519	320519	320519	320810	320810	320810	320810	320810
pH	pH KCl	6	6.1	6.5	6.8	6.5	6.1	6.2	6	6.3	
	pH Ox	5.4	5.5	5.9	6.2	6.1	5	5.8	5.7	5.9	
	pH	0.60	0.60	0.60	0.60	0.40	1.10	0.40	0.30	0.40	
Acidity Trail	TAA	moles H+/t	2	<2	<2	<2	<2	<2	<2	<2	<2
	TPA	moles H+/t	2	4	<2	<2	<2	<2	<2	<2	<2
	TSA	moles H+/t	<2	2	<2	<2	<2	<2	<2	<2	<2
	TAA	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	TPA	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	TSA	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
S Trail	S-KCl	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	S-Ox	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	POS	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	POS	moles H+/t	<10	<10	<10	<10	<10	<10	<10	<10	<10
Ca Values	Ca-KCl	%Ca	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Ca-Ox	%Ca	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.03
	Ca-Acid	%Ca	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.03
	Ca-Acid	moles H+/t	<10	<10	<10	<10	<10	<10	<10	<10	14
	Ca-Acid	%S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.02
Mg Values	Mg-KCl	%Mg	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Mg-Ox	%Mg	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Mg-acid	%Mg	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Mg-acid	moles H+/t	<10	<10	<10	<10	<10	<10	<10	<10	<10
	Mg-acid	%S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Alkalinity	ANC-exc	% CaCO ₃									
	ANC-exc	moles H+/t									
	ANC-exc	%S									
Acid Base Accounting	Fineness		2.5	1.5	1.5	1.5	1.5	5.5	3.5	4.5	6.5
	NA	%S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	NA	moles H+/t (kg CaCO ₃ /t)	<10	<10	<10	<10	<10	<10	<10	<10	<10
	Lime		<1	<1	<1	<1	<1	<1	<1	<1	<1
	NA (-ANC)	%S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	NA (-ANC)	moles H+/t (kg CaCO ₃ /t)	<10	<10	<10	<10	<10	<10	<10	<10	<10
	Lime (- ANC)		<1	<1	<1	<1	<1	<1	<1	<1	<1

Appendix A

	Core		27165	27165
Ore Body		Heracles	Heracles	
Depth	m bgl	27	29	
RL	m AHD	57.0	57.0	
Depth	m AHD	30.0	28.0	
North	m GDA	6741874	6741874	
East	m GDA	320810	320810	
pH	pH KCl	6.4	6.1	
	pH Ox	6	6.3	
	pH	0.40	-0.20	
Acidity Trail	TAA	moles H+/t	<2	<2
	TPA	moles H+/t	<2	<2
	TSA	moles H+/t	<2	<2
	TAA	% S	<0.02	<0.02
	TPA	% S	<0.02	<0.02
	TSA	% S	<0.02	<0.02
S Trail	S-KCl	% S	<0.02	<0.02
	S-Ox	% S	<0.02	<0.02
	POS	% S	<0.02	<0.02
	POS	moles H+/t	<10	<10
Ca Values	Ca-KCl	%Ca	<0.02	<0.02
	Ca-Ox	%Ca	<0.02	<0.02
	Ca-Acid	%Ca	<0.02	<0.02
	Ca-Acid	moles H+/t	<10	<10
	Ca-Acid	%S	<0.02	<0.02
Mg Values	Mg-KCl	%Mg	<0.02	0.04
	Mg-Ox	%Mg	<0.02	0.03
	Mg-acid	%Mg	<0.02	<0.02
	Mg-acid	moles H+/t	<10	<10
	Mg-acid	%S	<0.02	<0.02
Alkalinity	ANC-exc	% CaCO ₃		
	ANC-exc	moles H+/t		
	ANC-exc	%S		
Acid Base Accounting	Fineness		7.5	8.5
	NA	%S	<0.02	<0.02
	NA	moles H+/t (kg CaCO ₃ /t)	<10	<10
	Lime		<1	<1
	NA (-ANC)	%S	<0.02	<0.02
	NA (-ANC)	moles H+/t	<10	<10
	Lime (- ANC)	(kg CaCO ₃ /t)	<1	<1

Appendix A

Core		26566-----							26584-----		
Ore Body	m bgl	Demeter-----							Demeter-----		
Depth	m bgl	2	5	11	20	23	30	33	1	4	12
RL	m AHD	73.6	73.6	73.6	73.6	73.6	73.6	73.6	74.9	74.9	74.9
Depth	m AHD	71.6	68.6	62.6	53.6	50.6	43.6	40.6	73.9	70.9	62.9
North	m GDA	6738955-----							6738546-----		
East	m GDA	322714-----							322920-----		
pH	pH KCl	6.1	5.6	5.6	5.9	5.6	5.6	5.7	5.8	5.6	5.6
	pH Ox	5.1	5.5	5.3	5.3	5.6	5.8	5.1	4.5	4.8	5.7
	pH	1.0	0.1	0.3	0.6	0.0	-0.2	0.6	1.3	0.8	-0.1
Acidity Trail	TAA moles H+/t	<2	2	2	<2	6	4	4	<2	2	4
	TPA moles H+/t	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
	TSA moles H+/t	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
	TAA % S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	TPA % S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	TSA % S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
S Trail	S-KCl % S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	S-Ox % S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	POS % S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	POS moles H+/t	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Ca Values	Ca-KCl %Ca	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Ca-Ox %Ca	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Ca-Acid %Ca	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Ca-Acid moles H+/t	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
	Ca-Acid %S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Mg Values	Mg-KCl %Mg	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Mg-Ox %Mg	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Mg-acid %Mg	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Mg-acid moles H+/t	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
	Mg-acid %S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Alkalinity	ANC-exc % CaCO3										
	ANC-exc moles H+/t										
	ANC-exc %S										
Acid Base Accounting	Fineness		1.5	1.5	1.5						
	NA %S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	NA moles H+/t	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
	Lime (kg CaCO3/t)	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
	NA (- ANC) %S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	NA (- ANC) moles H+/t	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
	Lime (- ANC) (kg CaCO3/t)	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1

Appendix A

	Core		-----26584-----		-----26615-----							
Ore Body			-----Demeter-----		-----Demeter-----							
Depth	m bgl	23	27	31	2	12	20	27	33	34	36	
RL	m AHD	74.9	74.9	74.9	76.2	76.2	76.2	76.2	76.2	76.2	76.2	
Depth	m AHD	51.9	47.9	43.9	74.2	64.2	56.2	49.2	43.2	42.2	40.2	
North	m GDA	-----6738546-----			-----6738099-----							
East	m GDA	-----322920-----			-----323082-----							
pH	pH KCl		5.2	5.3	5.7	6.0	9.2	5.8	8.6	7.6	5.9	6.7
	pH Ox		5.8	5.3	5.4	5.5	7.0	5.9	6.6	6.1	5.7	7.0
	pH	-0.6	0.0	0.3	0.5	2.2	-0.1	2.0	1.5	0.2	-0.3	
Acidity Trail	TAA	moles H+/t	8	7	2	<2	<2	<2	<2	<2	<2	<2
	TPA	moles H+/t	6	<2	<2	<2	<2	<2	<2	<2	<2	<2
	TSA	moles H+/t	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
	TAA	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	TPA	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	TSA	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
S Trail	S-KCl	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	S-Ox	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	POS	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	POS	moles H+/t	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Ca Values	Ca-KCl	%Ca	<0.02	<0.02	<0.02	<0.02	0.14	<0.02	0.04	0.03	<0.02	<0.02
	Ca-Ox	%Ca	<0.02	<0.02	<0.02	0.04	0.12	0.02	0.05	0.03	0.03	<0.02
	Ca-Acid	%Ca	<0.02	<0.02	<0.02	0.04	<0.02	0.02	<0.02	<0.02	0.02	<0.02
	Ca-Acid	moles H+/t	<10	<10	<10	18	<10	11	<10	<10	12	<10
	Ca-Acid	%S	<0.02	<0.02	<0.02	0.03	<0.02	<0.02	<0.02	<0.02	0.02	<0.02
Mg Values	Mg-KCl	%Mg	0.03	0.04	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Mg-Ox	%Mg	0.04	<0.02	<0.02	0.02	<0.02	<0.02	<0.02	<0.02	0.03	<0.02
	Mg-acid	%Mg	<0.02	<0.02	<0.02	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Mg-acid	moles H+/t	<10	<10	<10	18	<10	<10	<10	<10	16	<10
	Mg-acid	%S	<0.02	<0.02	<0.02	0.03	<0.02	<0.02	<0.02	<0.02	0.02	<0.02
Alkalinity	ANC-exc	% CaCO ₃				0.46			0.16		0.12	
	ANC-exc	moles H+/t				93			32		25	
	ANC-exc	%S				0.15			0.05		0.04	
Acid Base Accounting	Fineness		1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	
	NA	%S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	NA	moles H+/t (kg CaCO ₃ /t)	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
	Lime		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
	NA (-ANC)	%S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	NA (-ANC)	moles H+/t (kg CaCO ₃ /t)	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
	Lime (-ANC)		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1

Appendix A

	Core	27066	27066	27066	27066	27066	27066	27066	27066	27066
Ore Body		Hades	Hades	Hades	Hades	Hades	Hades	Hades	Hades	Hades
Depth	m bgl	3	6	10	15	17	20	24	26	30
RL	m AHD	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0
Depth	m AHD	60.0	57.0	53.0	48.0	46.0	43.0	39.0	37.0	33.0
North	m GDA	6749350	6749350	6749350	6749350	6749350	6749350	6749350	6749350	6749350
East	m GDA	319600	319600	319600	319600	319600	319600	319600	319600	319600
pH	pH KCl	5.9	6.2	9.5	9.2	8.3	8.9	6.7	6.7	6.7
	pH Ox	5.8	5.9	7.6	7.3	6.6	7.4	6.1	6.5	5.8
	pH	0.1	0.3	1.9	1.9	1.7	1.5	0.6	0.2	0.9
Acidity Trail	TAA	moles H+/t	<2	<2	<2	<2	<2	<2	<2	<2
	TPA	moles H+/t	4	<2	<2	<2	<2	<2	<2	<2
	TSA	moles H+/t	2	<2	<2	<2	<2	<2	<2	<2
	TAA	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	TPA	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	TSA	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
S Trail	S-KCl	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	S-Ox	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	POS	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	POS	moles H+/t	<10	<10	<10	<10	<10	<10	<10	<10
Ca Values	Ca-KCl	%Ca	<0.02	<0.02	0.2	0.12	0.04	0.15	<0.02	<0.02
	Ca-Ox	%Ca	<0.02	<0.02	4.1	0.46	0.04	<0.02	<0.02	<0.02
	Ca-Acid	%Ca	<0.02	<0.02	3.91	0.35	<0.02	<0.02	<0.02	<0.02
	Ca-Acid	moles H+/t	<10	<10	1950	174	<10	<10	<10	<10
	Ca-Acid	%S	<0.02	<0.02	3.13	0.28	<0.02	<0.02	<0.02	<0.02
Mg Values	Mg-KCl	%Mg	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Mg-Ox	%Mg	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Mg-acid	%Mg	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Mg-acid	moles H+/t	<10	<10	<10	13	<10	<10	<10	12
	Mg-acid	%S	<0.02	<0.02	<0.02	0.02	<0.02	<0.02	<0.02	<0.02
Alkalinity	ANC-exc	% CaCO ₃			10.2	1.2	0.16	0.66		0.08
	ANC-exc	moles H+/t			2030	240	32	131		17
	ANC-exc	%S			3.25	0.38	0.05	0.21		0.03
Acid Base Accounting	Fineness		1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
	NA	%S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	NA	moles H+/t	<10	<10	<10	<10	<10	<10	<10	<10
	Lime	(kg CaCO ₃ /t)	<1	<1	<1	<1	<1	<1	<1	<1
	NA (-ANC)	%S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	NA (-ANC)	moles H+/t	<10	<10	<10	<10	<10	<10	<10	<10
	Lime (- ANC)	(kg CaCO ₃ /t)	<1	<1	<1	<1	<1	<1	<1	<1

Appendix A

Core		27066	27083	27083	27083	27083	27083	27083	27083	27095
Ore Body		Hades	Hades	Hades	Hades	Hades	Hades	Hades	Hades	Hades
Depth	m bgl	33	3	5	10	14	18	26	30	5
RL	m AHD	63.0	66.0	66.0	66.0	66.0	66.0	66.0	66.0	69.0
Depth	m AHD	30.0	63.0	61.0	56.0	52.0	48.0	40.0	36.0	64.0
North	m GDA	6749350	6749556	6749556	6749556	6749556	6749556	6749556	6749556	6749749
East	m GDA	319600	319602	319602	319602	319602	319602	319602	319602	319681
pH	pH KCl	7.4	5.8	5.9	9.5	9.0	9.0	9.0	9.1	6.1
	pH Ox	6.7	5.8	5.7	7.6	7.7	7.0	7.9	7.6	5.7
	pH	0.7	0.0	0.2	1.9	1.3	2.0	1.1	1.5	0.4
Acidity Trail	TAA	moles H+/t	<2	2	<2	<2	<2	<2	<2	<2
	TPA	moles H+/t	<2	2	<2	<2	<2	<2	<2	<2
	TSA	moles H+/t	<2	<2	<2	<2	<2	<2	<2	<2
	TAA	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	TPA	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	TSA	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
S Trail	S-KCl	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	S-Ox	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	POS	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	POS	moles H+/t	<10	<10	<10	<10	<10	<10	<10	<10
Ca Values	Ca-KCl	%Ca	<0.02	<0.02	<0.02	0.21	0.28	0.15	0.22	0.17
	Ca-Ox	%Ca	<0.02	<0.02	<0.02	3.19	0.89	0.15	0.32	0.19
	Ca-Acid	%Ca	<0.02	<0.02	<0.02	2.98	0.61	<0.02	0.1	<0.02
	Ca-Acid	moles H+/t	<10	<10	<10	1480	303	<10	48	<10
	Ca-Acid	%S	<0.02	<0.02	<0.02	2.38	0.49	<0.02	0.08	<0.02
Mg Values	Mg-KCl	%Mg	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Mg-Ox	%Mg	<0.02	<0.02	<0.02	0.03	0.02	<0.02	0.04	<0.02
	Mg-acid	%Mg	<0.02	<0.02	<0.02	0.02	<0.02	<0.02	0.02	<0.02
	Mg-acid	moles H+/t	<10	<10	<10	19	<10	<10	19	<10
	Mg-acid	%S	<0.02	<0.02	<0.02	0.03	<0.02	<0.02	0.03	<0.02
Alkalinity	ANC-exc	% CaCO ₃	0.07			8.46	2.17	0.32	0.72	0.52
	ANC-exc	moles H+/t	13			1690	433	65	144	104
	ANC-exc	%S	0.02			2.71	0.69	0.1	0.23	0.17
Acid Base Accounting	Fineness		1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
	NA	%S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	NA	moles H+/t	<10	<10	<10	<10	<10	<10	<10	<10
	Lime	(kg CaCO ₃ /t)	<1	<1	<1	<1	<1	<1	<1	<1
	NA (-ANC)	%S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	NA (-ANC)	moles H+/t	<10	<10	<10	<10	<10	<10	<10	<10
	Lime (-ANC)	(kg CaCO ₃ /t)	<1	<1	<1	<1	<1	<1	<1	<1

Appendix A

	Core	27095	27095	27095	27095	27095	27095	27095
	Ore Body	Hades	Hades	Hades	Hades	Hades	Hades	Hades
Depth	m bgl	7	14	16	20	24	29	31
RL	m AHD	69.0	69.0	69.0	69.0	69.0	69.0	69.0
Depth	m AHD	62.0	55.0	53.0	49.0	45.0	40.0	38.0
North	m GDA	6749749	6749749	6749749	6749749	6749749	6749749	6749749
East	m GDA	319681	319681	319681	319681	319681	319681	319681
pH	pH KCl	6.3	6.7	9.3	7.2	7.1	6.8	7.2
	pH Ox	6.0	6.2	7.0	6.2	6.6	6.4	6.4
	pH	0.3	0.5	2.3	1.0	0.5	0.4	0.8
Acidity Trail	TAA	moles H+/t	<2	<2	<2	<2	<2	<2
	TPA	moles H+/t	<2	<2	<2	<2	<2	<2
	TSA	moles H+/t	<2	<2	<2	<2	<2	<2
	TAA	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	TPA	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	TSA	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
S Trail	S-KCl	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	S-Ox	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	POS	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	POS	moles H+/t	<10	<10	<10	<10	<10	<10
Ca Values	Ca-KCl	%Ca	0.02	0.03	0.1	0.04	0.03	<0.02
	Ca-Ox	%Ca	0.02	0.03	0.12	0.03	0.03	<0.02
	Ca-Acid	%Ca	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Ca-Acid	moles H+/t	<10	<10	<10	<10	<10	<10
	Ca-Acid	%S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Mg Values	Mg-KCl	%Mg	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Mg-Ox	%Mg	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Mg-acid	%Mg	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Mg-acid	moles H+/t	<10	<10	<10	<10	<10	<10
	Mg-acid	%S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Alkalinity	ANC-exc	% CaCO ₃		0.36		0.1		
	ANC-exc	moles H+/t		71		21		
	ANC-exc	%S		0.11		0.03		
Acid Base Accounting	Fineness		1.5	1.5	1.5	1.5	1.5	1.5
	NA	%S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	NA	moles H+/t	<10	<10	<10	<10	<10	<10
	Lime	(kg CaCO ₃ /t)	<1	<1	<1	<1	<1	<1
	NA (-ANC)	%S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	NA (-ANC)	moles H+/t	<10	<10	<10	<10	<10	<10
	Lime (- ANC)	(kg CaCO ₃ /t)	<1	<1	<1	<1	<1	<1

Appendix A

	Core	26694	26694	26694	26694	26694	26694	26694	26694	26723
Ore Body		2	14	25	30	33	36	42	45	4
Depth	m bgl	Hebe	Hebe	Hebe	Hebe	Hebe	Hebe	Hebe	Hebe	Hebe
RL	m AHD	59.8	59.8	59.8	59.8	59.8	59.8	59.8	59.8	61.4
Depth	m AHD	57.8	45.8	34.8	29.8	26.8	23.8	17.8	14.8	57.4
North	m GDA	6736606	6736606	6736606	6736606	6736606	6736606	6736606	6736606	6736195
East	m GDA	321674	321674	321674	321674	321674	321674	321674	321674	321960
pH	pH KCl	5.9	5.9	6.0	6.0	6.0	5.7	6.5	6.6	6.6
	pH Ox	4.6	5.5	5.7	5.6	5.6	5.6	6.5	7.2	6.0
	pH	1.3	0.4	0.3	0.4	0.4	0.1	0.0	-0.6	0.6
Acidity Trail	TAA	moles H+/t	<2	<2	<2	<2	<2	<2	<2	<2
	TPA	moles H+/t	<2	<2	<2	<2	<2	<2	<2	<2
	TSA	moles H+/t	<2	<2	<2	<2	<2	<2	<2	<2
	TAA	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	TPA	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	TSA	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
S Trail	S-KCl	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	S-Ox	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	POS	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	POS	moles H+/t	<10	<10	<10	<10	<10	<10	<10	<10
Ca Values	Ca-KCl	%Ca	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.03
	Ca-Ox	%Ca	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Ca-Acid	%Ca	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Ca-Acid	moles H+/t	<10	<10	<10	<10	<10	<10	<10	<10
	Ca-Acid	%S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Mg Values	Mg-KCl	%Mg	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.02	<0.02
	Mg-Ox	%Mg	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.03	<0.02
	Mg-acid	%Mg	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Mg-acid	moles H+/t	<10	<10	<10	<10	<10	<10	<10	<10
	Mg-acid	%S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Alkalinity	ANC-exc	% CaCO3						0.06	0.12	
	ANC-exc	moles H+/t						13	25	
	ANC-exc	%S						0.02	0.04	
Acid Base Accounting	Fineness		1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
	NA	%S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	NA	moles H+/t	<10	<10	<10	<10	<10	<10	<10	<10
	Lime	(kg CaCO3/t)	<1	<1	<1	<1	<1	<1	<1	<1
	NA (-ANC)	%S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	NA (-ANC)	moles H+/t	<10	<10	<10	<10	<10	<10	<10	<10
	Lime (- ANC)	(kg CaCO3/t)	<1	<1	<1	<1	<1	<1	<1	<1

Appendix A

	Core	26723	26723	26723	26723	26723	26723	26723	26723	26745
Ore Body		8	17	24	29	35	37	42	47	5
Depth	m bgl	Hebe	Hebe	Hebe	Hebe	Hebe	Hebe	Hebe	Hebe	Hebe
RL	m AHD	61.4	61.4	61.4	61.4	61.4	61.4	61.4	61.4	60.6
Depth	m AHD	53.4	44.4	37.4	32.4	26.4	24.4	19.4	14.4	55.6
North	m GDA	6736195	6736195	6736195	6736195	6736195	6736195	6736195	6736195	6735930
East	m GDA	321960	321960	321960	321960	321960	321960	321960	321960	322183
pH	pH KCl	5.9	5.7	6.2	6.2	5.9	6.2	6.0	6.3	5.9
	pH Ox	5.8	5.9	5.9	5.9	5.6	5.8	5.7	6.4	5.1
	pH	0.1	-0.2	0.3	0.3	0.3	0.4	0.3	-0.1	0.8
Acidity Trail	TAA	moles H+/t	<2	4	<2	<2	<2	<2	<2	<2
	TPA	moles H+/t	6	11	2	2	7	2	4	<2
	TSA	moles H+/t	5	7	<2	2	6	2	2	<2
	TAA	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	TPA	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	TSA	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
S Trail	S-KCl	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	S-Ox	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	POS	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	POS	moles H+/t	<10	<10	<10	<10	<10	<10	<10	<10
Ca Values	Ca-KCl	%Ca	<0.02	<0.02	<0.02	<0.02	0.02	<0.02	<0.02	<0.02
	Ca-Ox	%Ca	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Ca-Acid	%Ca	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Ca-Acid	moles H+/t	<10	<10	<10	<10	<10	<10	<10	<10
	Ca-Acid	%S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Mg Values	Mg-KCl	%Mg	<0.02	<0.02	<0.02	<0.02	0.02	<0.02	<0.02	<0.02
	Mg-Ox	%Mg	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Mg-acid	%Mg	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Mg-acid	moles H+/t	<10	<10	<10	<10	<10	<10	<10	<10
	Mg-acid	%S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Alkalinity	ANC-exc	% CaCO3								
	ANC-exc	moles H+/t								
	ANC-exc	%S								
Acid Base Accounting	Fineness		1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
	NA	%S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	NA	moles H+/t	<10	<10	<10	<10	<10	<10	<10	<10
	Lime	(kg CaCO3/t)	<1	<1	<1	<1	<1	<1	<1	<1
	NA (-ANC)	%S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	NA (-ANC)	moles H+/t	<10	<10	<10	<10	<10	<10	<10	<10
	Lime (- ANC)	(kg CaCO3/t)	<1	<1	<1	<1	<1	<1	<1	<1

Appendix A

	Core	26745	26745	26745	26745	26745	26745	27184	27184	27184
Ore Body		14	21	26	33	37	43	8	17	26
Depth	m bgl	Hebe	Hebe	Hebe	Hebe	Hebe	Hebe	Hebe	Hebe	Hebe
RL	m AHD	60.6	60.6	60.6	60.6	60.6	60.6	66.0	66.0	66.0
Depth	m AHD	46.6	39.6	34.6	27.6	23.6	17.6	58.0	49.0	40.0
North	m GDA	6735930	6735930	6735930	6735930	6735930	6735930	6736422	6736422	6736422
East	m GDA	322183	322183	322183	322183	322183	322183	322722	322722	322722
pH	pH KCl	5.6	5.8	6.2	5.9	6.1	6.9	6	5.9	6.2
	pH Ox	5.5	5.3	5.5	5.6	5.8	7.2	5.7	5.8	5.8
	pH	0.1	0.5	0.7	0.3	0.3	-0.3	0.3	0.1	0.4
Acidity Trail	TAA	moles H+/t	2	<2	<2	<2	<2	<2	<2	<2
	TPA	moles H+/t	4	<2	<2	<2	<2	<2	<2	<2
	TSA	moles H+/t	<2	<2	<2	<2	<2	<2	<2	<2
	TAA	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	TPA	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	TSA	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
S Trail	S-KCl	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	S-Ox	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	POS	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	POS	moles H+/t	<10	<10	<10	<10	<10	<10	<10	<10
Ca Values	Ca-KCl	%Ca	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Ca-Ox	%Ca	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Ca-Acid	%Ca	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Ca-Acid	moles H+/t	<10	<10	<10	<10	<10	<10	<10	<10
	Ca-Acid	%S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Mg Values	Mg-KCl	%Mg	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Mg-Ox	%Mg	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Mg-acid	%Mg	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Mg-acid	moles H+/t	<10	<10	<10	<10	<10	<10	<10	<10
	Mg-acid	%S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Alkalinity	ANC-exc	% CaCO ₃						0.06		
	ANC-exc	moles H+/t						12		
	ANC-exc	%S						0.02		
Acid Base Accounting	Fineness		1.5	1.5	1.5	1.5	1.5	13.5	9.5	10.5
	NA	%S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	NA	moles H+/t (kg CaCO ₃ /t)	<10	<10	<10	<10	<10	<10	<10	<10
	Lime		<1	<1	<1	<1	<1	<1	<1	<1
	NA (-ANC)	%S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	NA (-ANC)	moles H+/t (kg CaCO ₃ /t)	<10	<10	<10	<10	<10	<10	<10	<10
	Lime (- ANC)		<1	<1	<1	<1	<1	<1	<1	<1

Appendix A

	Core	27184	27184	27185	27185	27185	27185
Ore Body		42	47	10	24	33	40
Depth	m bgl	Hebe	Hebe	Hebe	Hebe	Hebe	Hebe
RL	m AHD	66.0	66.0	50.0	50.0	50.0	50.0
Depth	m AHD	24.0	19.0	40.0	26.0	17.0	10.0
North	m GDA	6736422	6736422	6735872	6735872	6735872	6735872
East	m GDA	322722	322722	321176	321176	321176	321176
pH	pH KCl	6.7	6.6	5.8	6.2	6.4	6.3
	pH Ox	5.9	5.9	5.8	5.5	5.7	6.3
	pH	0.8	0.7	0.0	0.7	0.7	0.0
Acidity Trail	TAA	moles H+/t	<2	<2	4	<2	<2
	TPA	moles H+/t	<2	<2	<2	<2	<2
	TSA	moles H+/t	<2	<2	<2	<2	<2
	TAA	% S	<0.02	<0.02	<0.02	<0.02	<0.02
	TPA	% S	<0.02	<0.02	<0.02	<0.02	<0.02
	TSA	% S	<0.02	<0.02	<0.02	<0.02	<0.02
S Trail	S-KCl	% S	<0.02	<0.02	<0.02	<0.02	<0.02
	S-Ox	% S	<0.02	<0.02	<0.02	<0.02	<0.02
	POS	% S	<0.02	<0.02	<0.02	<0.02	<0.02
	POS	moles H+/t	<10	<10	<10	<10	<10
Ca Values	Ca-KCl	%Ca	<0.02	<0.02	<0.02	<0.02	<0.02
	Ca-Ox	%Ca	<0.02	<0.02	<0.02	<0.02	<0.02
	Ca-Acid	%Ca	<0.02	<0.02	<0.02	<0.02	<0.02
	Ca-Acid	moles H+/t	<10	<10	<10	<10	<10
	Ca-Acid	%S	<0.02	<0.02	<0.02	<0.02	<0.02
Mg Values	Mg-KCl	%Mg	<0.02	<0.02	<0.02	<0.02	0.03
	Mg-Ox	%Mg	<0.02	<0.02	<0.02	<0.02	0.03
	Mg-acid	%Mg	<0.02	<0.02	<0.02	<0.02	<0.02
	Mg-acid	moles H+/t	<10	<10	<10	<10	<10
	Mg-acid	%S	<0.02	<0.02	<0.02	<0.02	<0.02
Alkalinity	ANC-exc	% CaCO ₃					
	ANC-exc	moles H+/t					
	ANC-exc	%S					
Acid Base Accounting	Fineness		11.5	12.5	1.5	1.5	1.5
	NA	%S	<0.02	<0.02	<0.02	<0.02	<0.02
	NA	moles H+/t	<10	<10	<10	<10	<10
	Lime	(kg CaCO ₃ /t)	<1	<1	<1	<1	<1
	NA (-ANC)	%S	<0.02	<0.02	<0.02	<0.02	<0.02
	NA (-ANC)	moles H+/t	<10	<10	<10	<10	<10
	Lime (- ANC)	(kg CaCO ₃ /t)	<1	<1	<1	<1	<1

Appendix A

	Core	26413	26413	26413	26413	26413	26413	26435	26435
Ore Body		Dionysus	Dionysus	Dionysus	Dionysus	Dionysus	Dionysus	Dionysus	Dionysus
Depth	m bgl	1	7	10	23	28	32	4	15
RL	m AHD	73.6	73.6	73.6	73.6	73.6	73.6	75.5	75.5
Depth	m AHD	72.6	66.6	63.6	50.6	45.6	41.6	71.5	60.5
North	m GDA	6742751	6742751	6742751	6742751	6742751	6742751	6743147	6743147
East	m GDA	322539	322539	322539	322539	322539	322539	322462	322462
pH	pH KCl	6.1	8.6	5.8	5.6	8.8	6.2	9.0	6.7
	pH Ox	4.9	6.8	5.7	5.9	7.4	6.1	7.0	6.0
	pH	1.2	1.8	0.1	-0.3	1.4	0.1	2.0	0.7
Acidity Trail	TAA	moles H+/t	<2	<2	<2	2	<2	<2	<2
	TPA	moles H+/t	<2	<2	<2	<2	<2	<2	<2
	TSA	moles H+/t	<2	<2	<2	<2	<2	<2	<2
	TAA	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	TPA	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	TSA	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
S Trail	S-KCl	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	S-Ox	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	POS	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	POS	moles H+/t	<10	<10	<10	<10	<10	<10	<10
Ca Values	Ca-KCl	%Ca	<0.02	0.12	<0.02	<0.02	0.19	<0.02	0.17
	Ca-Ox	%Ca	0.02	0.11	<0.02	<0.02	0.16	<0.02	0.21
	Ca-Acid	%Ca	<0.02	<0.02	<0.02	<0.02	<0.02	0.04	<0.02
	Ca-Acid	moles H+/t	<10	<10	<10	<10	<10	19	<10
	Ca-Acid	%S	<0.02	<0.02	<0.02	<0.02	<0.02	0.03	<0.02
Mg Values	Mg-KCl	%Mg	<0.02	<0.02	<0.02	0.03	0.02	<0.02	<0.02
	Mg-Ox	%Mg	<0.02	<0.02	<0.02	0.03	0.02	<0.02	<0.02
	Mg-acid	%Mg	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Mg-acid	moles H+/t	<10	<10	<10	<10	<10	<10	<10
	Mg-acid	%S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Alkalinity	ANC-exc	% CaCO ₃		0.28			0.46		0.52
	ANC-exc	moles H+/t		56			91		103
	ANC-exc	%S		0.09			0.14		0.16
Acid Base Accounting	Fineness		1.5	1.5	1.5	1.5	1.5	1.5	1.5
	NA	%S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	NA	moles H+/t	<10	<10	<10	<10	<10	<10	<10
	Lime	(kg CaCO ₃ /t)	<1	<1	<1	<1	<1	<1	<1
	NA (-ANC)	%S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	NA (-ANC)	moles H+/t	<10	<10	<10	<10	<10	<10	<10
	Lime (- ANC)	(kg CaCO ₃ /t)	<1	<1	<1	<1	<1	<1	<1

Appendix A

		26435	26435	26435	26435	26454	26454	26454	26454
Ore Body		Dionysus	Dionysus	Dionysus	Dionysus	Dionysus	Dionysus	Dionysus	Dionysus
Depth	m bgl	20	23	27	28	3	10	20	24
RL	m AHD	75.5	75.5	75.5	75.5	78.5	78.5	78.5	78.5
Depth	m AHD	55.5	52.5	48.5	47.5	75.5	68.5	58.5	54.5
North	m GDA	6743147	6743147	6743147	6743147	6743649	6743649	6743649	6743649
East	m GDA	322462	322462	322462	322462	322302	322302	322302	322302
pH	pH KCl	5.5	6.3	7.0	5.9	5.8	5.5	5.3	5.4
	pH Ox	6.0	7.1	6.2	5.9	5.8	5.7	5.9	6.8
	pH	-0.5	-0.8	0.8	0.0	0.0	-0.2	-0.6	-1.4
Acidity Trail	TAA	moles H+/t	4	<2	<2	<2	3	6	5
	TPA	moles H+/t	2	<2	<2	<2	4	5	<2
	TSA	moles H+/t	<2	<2	<2	<2	<2	<2	<2
	TAA	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	TPA	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	TSA	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
S Trail	S-KCl	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	S-Ox	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	POS	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	POS	moles H+/t	<10	<10	<10	<10	<10	<10	<10
Ca Values	Ca-KCl	%Ca	<0.02	0.04	0.03	<0.02	<0.02	<0.02	<0.02
	Ca-Ox	%Ca	0.02	0.05	0.04	<0.02	<0.02	<0.02	<0.02
	Ca-Acid	%Ca	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Ca-Acid	moles H+/t	<10	<10	<10	<10	<10	<10	<10
	Ca-Acid	%S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Mg Values	Mg-KCl	%Mg	<0.02	<0.02	<0.02	<0.02	<0.02	0.04	0.03
	Mg-Ox	%Mg	<0.02	<0.02	<0.02	<0.02	<0.02	0.04	<0.02
	Mg-acid	%Mg	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Mg-acid	moles H+/t	<10	<10	<10	<10	<10	<10	<10
	Mg-acid	%S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Alkalinity	ANC-exc	% CaCO ₃	0.22						0.16
	ANC-exc	moles H+/t	43						31
	ANC-exc	%S	0.07						0.05
Acid Base Accounting	Fineness		1.5	1.5	1.5	1.5	1.5	1.5	1.5
	NA	%S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	NA	moles H+/t	12	<10	<10	<10	<10	10	<10
	Lime	(kg CaCO ₃ /t)	<1	<1	<1	<1	<1	<1	<1
	NA (-ANC)	%S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	NA (-ANC)	moles H+/t	12	<10	<10	<10	<10	10	<10
	Lime (-ANC)	(kg CaCO ₃ /t)	<1	<1	<1	<1	<1	<1	<1

Appendix A

	Core	26454	26454	26492	26492	26492	26492	26492	26492
Ore Body		Dionysus	Dionysus	Dionysus	Dionysus	Dionysus	Dionysus	Dionysus	Dionysus
Depth	m bgl	27	31	1	3	5	9	15	19
RL	m AHD	78.5	78.5	78.7	78.7	78.7	78.7	78.7	78.7
Depth	m AHD	51.5	47.5	77.7	75.7	73.7	69.7	63.7	59.7
North	m GDA	6743649	6743649	6744148	6744148	6744148	6744148	6744148	6744148
East	m GDA	322302	322302	322080	322080	322080	322080	322080	322080
pH	pH KCl	5.9	5.8	6.1	5.6	5.6	6.4	5.6	5.5
	pH Ox	5.8	5.8	5.2	5.0	5.1	6.3	5.6	5.6
	pH	0.1	0.0	0.9	0.6	0.5	0.1	0.0	-0.1
Acidity Trail	TAA	moles H+/t	<2	<2	<2	2	<2	2	2
	TPA	moles H+/t	<2	<2	<2	<2	<2	<2	<2
	TSA	moles H+/t	<2	<2	<2	<2	<2	<2	<2
	TAA	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	TPA	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	TSA	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
S Trail	S-KCl	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	S-Ox	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	POS	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	POS	moles H+/t	<10	<10	<10	<10	<10	<10	<10
Ca Values	Ca-KCl	%Ca	<0.02	<0.02	<0.02	<0.02	0.04	<0.02	<0.02
	Ca-Ox	%Ca	<0.02	<0.02	<0.02	<0.02	0.04	<0.02	<0.02
	Ca-Acid	%Ca	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Ca-Acid	moles H+/t	<10	<10	<10	<10	<10	<10	<10
	Ca-Acid	%S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Mg Values	Mg-KCl	%Mg	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Mg-Ox	%Mg	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Mg-acid	%Mg	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Mg-acid	moles H+/t	<10	<10	<10	<10	<10	<10	<10
	Mg-acid	%S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Alkalinity	ANC-exc	% CaCO ₃							
	ANC-exc	moles H+/t							
	ANC-exc	%S							
Acid Base Accounting	Fineness		1.5	1.5	1.5	1.5	1.5	1.5	1.5
	NA	%S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	NA	moles H+/t	<10	<10	<10	<10	<10	<10	<10
	Lime	(kg CaCO ₃ /t)	<1	<1	<1	<1	<1	<1	<1
	NA (-ANC)	%S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	NA (-ANC)	moles H+/t	<10	<10	<10	<10	<10	<10	<10
	Lime (- ANC)	(kg CaCO ₃ /t)	<1	<1	<1	<1	<1	<1	<1

Appendix A

		Core	26492	26492	26511	26511	26511	26511	26511
Ore Body			Dionysus	Dionysus	Dionysus	Dionysus	Dionysus	Dionysus	Dionysus
Depth	m bgl		24	31	2	4	10	22	26
RL	m AHD		78.7	78.7	76.9	76.9	76.9	76.9	76.9
Depth	m AHD		54.7	47.7	74.9	72.9	66.9	54.9	50.9
North	m GDA	6744148	6744148	6744550	6744550	6744550	6744550	6744550	6744550
East	m GDA	322080	322080	321919	321919	321919	321919	321919	321919
pH	pH KCl		5.0	6.2	5.6	4.7	5.2	5.2	5.1
	pH Ox		7.0	5.9	4.8	4.5	4.8	5.1	6.2
	pH		-2.0	0.3	0.8	0.2	0.4	0.1	-1.1
Acidity Trail	TAA	moles H+/t	12	<2	4	15	7	6	8
	TPA	moles H+/t	<2	<2	5	15	5	5	<2
	TSA	moles H+/t	<2	<2	<2	<2	<2	<2	<2
	TAA	% S	<0.02	<0.02	<0.02	0.02	<0.02	<0.02	<0.02
	TPA	% S	<0.02	<0.02	<0.02	0.02	<0.02	<0.02	<0.02
	TSA	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
S Trail	S-KCl	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	S-Ox	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	POS	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	POS	moles H+/t	<10	<10	<10	<10	<10	<10	<10
Ca Values	Ca-KCl	%Ca	0.04	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Ca-Ox	%Ca	0.04	<0.02	0.02	<0.02	<0.02	<0.02	<0.02
	Ca-Acid	%Ca	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Ca-Acid	moles H+/t	<10	<10	<10	<10	<10	<10	<10
	Ca-Acid	%S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Mg Values	Mg-KCl	%Mg	0.1	<0.02	<0.02	0.03	<0.02	<0.02	<0.02
	Mg-Ox	%Mg	0.08	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Mg-acid	%Mg	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Mg-acid	moles H+/t	<10	<10	<10	<10	<10	<10	<10
	Mg-acid	%S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Alkalinity	ANC-exc	% CaCO ₃	0.1						
	ANC-exc	moles H+/t	21						
	ANC-exc	%S	0.03						
Acid Base Accounting	Fineness		1.5	1.5	1.5	1.5	1.5	1.5	1.5
	NA	%S	<0.02	<0.02	<0.02	0.03	<0.02	<0.02	<0.02
	NA	moles H+/t	<10	<10	<10	17	10	<10	<10
	Lime	(kg CaCO ₃ /t)	<1	<1	<1	1	<1	<1	<1
	NA (-ANC)	%S	<0.02	<0.02	<0.02	0.03	<0.02	<0.02	<0.02
	NA (-ANC)	moles H+/t	<10	<10	<10	17	10	<10	<10
	Lime (-ANC)	(kg CaCO ₃ /t)	<1	<1	<1	1	<1	<1	<1

Appendix A

Core		26511	26528	26528	26528	26528	26528	26528
Ore Body		Dionysus	Dionysus	Dionysus	Dionysus	Dionysus	Dionysus	Dionysus
Depth	m bgl	33	5	9	16	22	25	33
RL	m AHD	76.9	77.5	77.5	77.5	77.5	77.5	77.5
Depth	m AHD	43.9	72.5	68.5	61.5	55.5	52.5	44.5
North	m GDA	6744550	6744849	6744849	6744849	6744849	6744849	6744849
East	m GDA	321919	321798	321798	321798	321798	321798	321798
pH	pH KCl	5.7	5.5	5.5	5.8	6.1	5.2	6.0
	pH Ox	6.5	5.2	5.6	5.7	5.8	7.0	6.5
	pH	-0.8	0.3	-0.1	0.1	0.3	-1.8	-0.5
Acidity Trail	TAA	moles H+/t	<2	3	5	<2	<2	<2
	TPA	moles H+/t	<2	<2	<2	<2	<2	<2
	TSA	moles H+/t	<2	<2	<2	<2	<2	<2
	TAA	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	TPA	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	TSA	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
S Trail	S-KCl	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	S-Ox	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	POS	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	POS	moles H+/t	<10	<10	<10	<10	<10	<10
Ca Values	Ca-KCl	%Ca	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Ca-Ox	%Ca	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Ca-Acid	%Ca	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Ca-Acid	moles H+/t	<10	<10	<10	<10	<10	<10
	Ca-Acid	%S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Mg Values	Mg-KCl	%Mg	<0.02	<0.02	<0.02	<0.02	0.03	<0.02
	Mg-Ox	%Mg	<0.02	<0.02	<0.02	<0.02	0.02	<0.02
	Mg-acid	%Mg	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Mg-acid	moles H+/t	<10	<10	<10	<10	<10	<10
	Mg-acid	%S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Alkalinity	ANC-exc	% CaCO ₃	0.06				0.07	<0.02
	ANC-exc	moles H+/t	12				14	<10
	ANC-exc	%S	<0.02				0.02	<0.02
Acid Base Accounting	Fineness		1.5	1.5	1.5	1.5	1.5	1.5
	NA	%S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	NA	moles H+/t	<10	<10	<10	<10	<10	<10
	Lime	(kg CaCO ₃ /t)	<1	<1	<1	<1	<1	<1
	NA (-ANC)	%S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	NA (-ANC)	moles H+/t	<10	<10	<10	<10	<10	<10
	Lime (- ANC)	(kg CaCO ₃ /t)	<1	<1	<1	<1	<1	<1

Appendix B

10 Appendix B - Exchangeable Base and Acid Cations

- H₂O = Moisture content determined at 103°C
CEC = Cation exchange capacity
EA = Exchangeable acidity from H⁺

CEC, Exchangeable Acidity (EA) and Exchangeable Al were determined with standard methods at the ALS laboratories. The acid forming exchangeable cations Fe and Mn were not measured.

Sample	Location	Depth	H ₂ O	<u>CEC</u>	Exchangeable						Exchangeable	
					Ca	Mg	K	Na	<u>EA</u>	Al	Na	Ca/Mg
(Figure 2-1)		m	%	meq/kg	meq/kg						% of Base Cations	ratio
DO ASS 1	Zeus	1	3.1	14	9	2	1	<1	0.20	<1	5.6	3.8
DO ASS 1	Zeus	2	3	11	8	2	<1	<1	0.38	<1	6.1	4.3
DO ASS 1	Zeus	3	3.3	6	3	1	1	<1	0.26	<1	7.6	2.5
DO ASS 1	Zeus	4	3.2	6	3	1	<1	<1	0.28	<1	7.7	2.4
DO ASS 2	Zeus	1	1.6	3	2	<1	<1	<1	0.14	<1	9.9	2.1
DO ASS 2	Zeus	2	<1.0	3	2	<1	<1	<1	0.20	<1	6.2	1.9
DO ASS 2	Zeus	3	1.6	2	1	<1	<1	<1	0.16	<1	10.6	1
DO ASS 2	Zeus	4	1.3	2	1	<1	<1	<1	0.2	<1	11.4	1
DO ASS 3	Heracles	1	1	4	3	<1	<1	<1	0.16	<1	4.6	3.4
DO ASS 3	Heracles	2	1	3	2	<1	<1	<1	0.16	<1	5.3	2.2
DO ASS 3	Heracles	3	<1.0	4	2	1	<1	<1	0.24	<1	6.1	2
DO ASS 3	Heracles	4	2.1	8	4	3	<1	<1	0.22	<1	6.1	1.4
DO ASS 4	Demeter	1	1.2	3	2	<1	<1	<1	0.38	<1	6.9	2.2
DO ASS 4	Demeter	2	2.6	8	5	2	<1	<1	0.32	<1	6.5	2
DO ASS 4	Demeter	3	3.8	9	5	3	<1	<1	0.38	<1	6.9	1.5
DO ASS 4	Demeter	4	2.4	9	4	4	<1	<1	0.64	<1	8.6	1.2
DO ASS 6	Demeter	1	1.7	7	5	<1	1	<1	0.20	<1	8.4	4.7
DO ASS 6	Demeter	2	2	6	3	1	1	<1	0.20	<1	9.8	1.9
DO ASS 6	Demeter	3	2.6	10	4	4	1	<1	0.38	<1	8.2	1.2
DO ASS 6	Demeter	4	2.3	12	5	5	<1	1	0.46	<1	10.6	0.9
DO ASS 7	Hades	1	2.8	8	4	2	1	<1	0.24	<1	8.6	2.7
DO ASS 7	Hades	2	2.9	7	3	2	1	<1	0.20	<1	10.1	1.4
DO ASS 7	Hades	3	2.5	6	2	1	1	<1	0.20	<1	9.4	1.9
DO ASS 7	Hades	4	2.4	7	3	2	2	<1	0.24	<1	10.1	1.6
DO ASS 9	Hades	1	3.6	9	5	2	1	<1	0.26	<1	6.7	3
DO ASS 9	Hades	2	2.6	7	3	2	1	<1	0.24	<1	10	1.9
DO ASS 9	Hades	3	2.7	7	3	2	1	<1	0.22	<1	9.3	1.8
DO ASS 9	Hades	4	2.8	8	3	2	1	<1	0.22	<1	10.7	1.7
DO ASS 5	Dionysis	1	<1.0	7	4	1	<1	<1	0.24	<1	5.3	3.3
DO ASS 5	Dionysis	2	2	7	4	2	<1	<1	0.40	<1	8.5	2
DO ASS 5	Dionysis	3	2.6	5	3	2	<1	<1	0.28	<1	8.3	1.6
DO ASS 5	Dionysis	4	2.2	6	3	2	<1	<1	0.28	<1	7.1	1.9
DO ASS 8	Dionysis	1	3.3	8	5	1	<1	<1	0.30	<1	7.1	3.5
DO ASS 8	Dionysis	2	4.2	8	4	2	1	<1	0.48	<1	8.8	1.9
DO ASS 8	Dionysis	3	5.2	8	4	2	<1	<1	0.30	<1	10.9	2
DO ASS 8	Dionysis	4	5.3	11	5	4	1	1	0.32	<1	10.7	1.4

Appendix C

11 Appendix C – Trace Metals

Core	Location	RL	Depth		H ₂ O	Al	Fe	Mn	Ni	Cr	Zn	Cd	Pb	Cu	As	Se
			m AHD	m bgl	m AHD	%	-----g/kg-----	-----mg/kg-----								
26413	Dionysus	73.6	1	72.6	1.5	0.7	1.2	<5	<2	2	<5	<1	<5	<5	<5	<5
26413	Dionysus	73.6	7	66.6	1.1	1.8	2.8	<5	<2	8	<5	<1	<5	<5	<5	<5
26413	Dionysus	73.6	10	63.6	10.6	1.7	4.2	<5	<2	10	<5	<1	6	<5	<5	<5
26413	Dionysus	73.6	17	50.6	<1.0	1.3	1.6	<5	<2	4	<5	<1	<5	<5	<5	<5
26413	Dionysus	73.6	23	45.6	9.2	2.9	10.0	<5	3	22	7	<1	<5	<5	<5	<5
26413	Dionysus	73.6	28	41.6	21.8	5.3	11.4	<5	12	25	24	<1	9	12	<5	<5
26413	Dionysus	75.5	32	71.5	15.9	1.0	1.8	<5	3	15	11	<1	<5	<5	<5	<5
26435	Dionysus	75.5	4	71.5	<1.0	7.9	7.8	10	3	20	<5	<1	6	<5	<5	<5
26435	Dionysus	75.5	15	60.5	<1.0	7.8	12.7	5	5	32	8	<1	8	<5	6	<5
26435	Dionysus	75.5	20	55.5	<1.0	13.1	56.7	71	10	81	30	<1	9	<5	13	<5
26435	Dionysus	75.5	23	52.5	1.2	21.6	88.6	3780	126	156	147	<1	21	<5	10	<5
26435	Dionysus	75.5	27	48.5	<1.0	4.3	4.0	28	4	17	<5	<1	<5	<5	<5	<5
26435	Dionysus	75.5	28	47.5	<1.0	4.5	6.4	44	3	17	5	<1	<5	<5	<5	<5
26454	Dionysus	78.5	3	75.5	1.4	2.6	4.9	<5	<2	11	<5	<1	<5	<5	<5	<5
26454	Dionysus	78.5	10	68.5	2.0	1.6	3.2	<5	<2	8	<5	<1	<5	<5	<5	<5
26454	Dionysus	78.5	20	58.5	7.8	5.6	37.3	<5	4	32	21	<1	<5	<5	<5	<5
26454	Dionysus	78.5	24	54.5	14.6	19.3	37.7	965	43	69	52	<1	16	9	11	<5
26454	Dionysus	78.5	27	51.5	1.1	0.9	3.1	26	<2	5	<5	<1	<5	<5	<5	<5
26454	Dionysus	78.5	31	47.5	1.7	0.7	4.7	8	3	6	8	<1	<5	7	<5	<5
26492	Dionysus	78.7	1	77.7	2.6	1.0	1.8	<5	<2	4	<5	<1	<5	<5	<5	<5
26492	Dionysus	78.7	3	75.7	1.7	1.8	3.8	<5	<2	7	<5	<1	<5	<5	<5	<5
26492	Dionysus	78.7	5	73.7	<1.0	1.7	5.0	<5	<2	11	7	<1	<5	<5	<5	<5
26492	Dionysus	78.7	9	69.7	3.8	2.6	5.3	<5	<2	11	10	<1	6	<5	<5	<5
26492	Dionysus	78.7	15	63.7	3.3	0.9	0.3	<5	<2	2	8	<1	10	<5	<5	<5
26492	Dionysus	78.7	19	59.7	4.4	1.5	3.8	<5	<2	9	9	<1	9	<5	<5	<5
26492	Dionysus	78.7	24	54.7	9.9	19.2	96.0	1400	6	48	57	<1	20	<5	6	<5
26492	Dionysus	78.7	31	47.7	<1.0	0.4	1.3	<5	<2	5	<5	<1	<5	<5	<5	<5
26511	Dionysus	76.9	2	74.9	3.8	4.3	13.1	<5	<2	31	<5	<1	8	<5	<5	<5
26511	Dionysus	76.9	4	72.9	9.8	5.2	9.8	<5	<2	12	<5	<1	<5	<5	<5	<5
26511	Dionysus	76.9	10	66.9	4.1	2.2	3.7	<5	<2	9	7	<1	<5	<5	<5	<5
26511	Dionysus	76.9	22	54.9	6.2	2.0	1.0	<5	<2	5	5	<1	7	<5	<5	<5
26511	Dionysus	76.9	26	50.9	8.7	7.4	49.6	340	7	84	37	<1	35	<5	<5	<5
26511	Dionysus	76.9	29	47.9	1.3	0.6	0.6	15	<2	3	<5	<1	<5	<5	<5	<5
26511	Dionysus	76.9	33	43.9	7.0	0.4	1.2	<5	<2	5	6	<1	<5	<5	<5	<5
26528	Dionysus	77.5	5	72.5	2.1	2.2	4.5	<5	<2	10	<5	<1	<5	<5	<5	<5
26528	Dionysus	77.5	9	68.5	1.9	1.8	4.0	<5	<2	10	<5	<1	<5	<5	<5	<5
26528	Dionysus	77.5	16	61.5	<1.0	0.2	0.3	<5	<2	<2	<5	<1	<5	<5	<5	<5
26528	Dionysus	77.5	22	55.5	<1.0	0.4	0.9	<5	<2	5	<5	<1	13	<5	<5	<5
26528	Dionysus	77.5	25	52.5	8.2	15.4	81.1	4040	22	57	64	<1	47	5	<5	<5
26528	Dionysus	77.5	33	44.5	6.1	0.9	4.3	9	<2	14	<5	<1	8	<5	6	<5

Appendix C

Core	Location	RL	Depth		H ₂ O	Al	Fe	Mn	Ni	Cr	Zn	Cd	Pb	Cu	As	Se
			m	m												
			AHD	bgI	AHD											
26566	Demeter	73.6	2	71.6	<1.0	0.3	0.7	<5	<2	<2	<5	<1	<5	<5	<5	<5
26566	Demeter	73.6	5	68.6	2.1	2.2	4.7	<5	<2	11	<5	<1	<5	<5	<5	<5
26566	Demeter	73.6	11	62.6	1.3	1.4	2.3	<5	<2	5	<5	<1	<5	<5	<5	<5
26566	Demeter	73.6	20	53.6	<1.0	0.5	0.6	<5	<2	<2	<5	<1	<5	<5	<5	<5
26566	Demeter	73.6	23	50.6	3.1	2.5	29.8	<5	4	15	18	<1	6	<5	10	<5
26566	Demeter	73.6	30	43.6	5.3	7.4	26.9	8	8	22	20	<1	8	<5	9	<5
26566	Demeter	73.6	33	40.6	3.9	3.5	27.0	<5	7	18	24	<1	<5	<5	21	<5
26584	Demeter	74.9	1	73.9	1.1	0.4	0.8	<5	<2	<2	<5	<1	<5	<5	<5	<5
26584	Demeter	74.9	4	70.9	1.3	3.2	6.9	<5	<2	13	<5	<1	5	<5	<5	<5
26584	Demeter	74.9	12	62.9	1.8	0.9	2.1	<5	<2	4	<5	<1	<5	<5	<5	<5
26584	Demeter	74.9	23	51.9	9.4	6.3	66.4	<5	3	50	8	<1	8	<5	<5	<5
26584	Demeter	74.9	27	47.9	6.2	3.8	20.4	<5	2	26	6	<1	<5	<5	<5	<5
26584	Demeter	74.9	31	43.9	3.7	1.5	8.0	<5	<2	12	12	<1	<5	<5	<5	<5
26615	Demeter	76.2	2	74.2	1.7	1.0	2.8	114	<2	5	<5	<1	<5	<5	<5	<5
26615	Demeter	76.2	12	64.2	1.5	1.3	2.1	14	<2	4	<5	<1	<5	<5	<5	<5
26615	Demeter	76.2	20	56.2	<1.0	0.5	1.7	<5	<2	3	<5	<1	<5	<5	<5	<5
26615	Demeter	76.2	27	49.2	<1.0	0.5	0.6	<5	<2	<2	<5	<1	<5	<5	<5	<5
26615	Demeter	76.2	33	43.2	3.4	1.4	10.1	<5	5	44	14	<1	<5	<5	14	<5
26615	Demeter	76.2	34	42.2	1.4	1.1	13.3	28	6	32	31	<1	<5	<5	25	<5
26615	Demeter	76.2	36	40.2	2.0	1.4	14.6	81	7	81	29	<1	<5	<5	45	<5
26694	Hebe	59.8	2	57.8	4.0	1.2	1.9	<5	<2	3	<5	<1	<5	<5	<5	<5
26694	Hebe	59.8	14	45.8	<1.0	0.8	0.8	<5	<2	2	<5	<1	<5	<5	<5	<5
26694	Hebe	59.8	25	34.8	<1.0	0.6	4.7	<5	<2	10	<5	<1	<5	<5	<5	<5
26694	Hebe	59.8	30	29.8	2.8	0.7	3.5	<5	<2	6	5	<1	<5	<5	<5	<5
26694	Hebe	59.8	33	26.8	8.9	1.4	6.7	<5	6	8	14	<1	<5	<5	<5	<5
26694	Hebe	59.8	36	23.8	14.5	1.9	11.5	6	11	17	32	<1	<5	5	<5	<5
26694	Hebe	59.8	42	17.8	13.4	1.5	5.6	45	10	5	13	<1	<5	<5	<5	<5
26694	Hebe	59.8	45	14.8	18.5	1.3	11.9	119	22	24	29	<1	<5	<5	<5	<5
26723	Hebe	61.4	4	57.4	<1.0	1.6	3.3	<5	<2	6	<5	<1	<5	<5	<5	<5
26723	Hebe	61.4	8	53.4	2.1	1.5	3.6	<5	<2	7	<5	<1	<5	<5	<5	<5
26723	Hebe	61.4	17	44.4	5.0	1.7	1.1	<5	<2	4	<5	<1	<5	<5	<5	<5
26723	Hebe	61.4	24	37.4	<1.0	0.4	0.1	<5	<2	<2	<5	<1	<5	<5	<5	<5
26723	Hebe	61.4	29	32.4	<1.0	0.2	0.2	<5	<2	<2	<5	<1	<5	<5	<5	<5
26723	Hebe	61.4	35	26.4	14.5	0.9	0.8	<5	<2	5	10	<1	<5	<5	<5	<5
26723	Hebe	61.4	37	24.4	14.1	0.4	1.6	<5	<2	<2	14	<1	<5	<5	<5	<5
26723	Hebe	61.4	42	19.4	14.6	2.1	8.5	<5	8	5	19	<1	7	<5	<5	<5
26723	Hebe	61.4	47	14.4	19.5	1.3	4.1	<5	7	16	16	<1	<5	<5	<5	<5
26745	Hebe	60.6	5	55.6	<1.0	1.2	2.8	<5	<2	6	<5	<1	<5	<5	<5	<5
26745	Hebe	60.6	14	46.6	4.1	2.2	5.6	<5	<2	13	<5	<1	<5	<5	<5	<5
26745	Hebe	60.6	21	39.6	<1.0	0.4	0.3	<5	<2	<2	<5	<1	<5	<5	<5	<5
26745	Hebe	60.6	26	34.6	<1.0	0.1	0.2	<5	<2	<2	<5	<1	<5	<5	<5	<5
26745	Hebe	60.6	33	27.6	8.6	0.2	0.6	<5	<2	3	<5	<1	<5	<5	<5	<5
26745	Hebe	60.6	37	23.6	16.7	1.7	8.2	19	8	6	24	<1	<5	<5	<5	<5
26745	Hebe	60.6	43	17.6	13.0	1.0	2.2	111	3	7	10	<1	<5	<5	<5	<5

Appendix C

Core	Location	RL	Depth		H ₂ O	Al	Fe	Mn	Ni	Cr	Zn	Cd	Pb	Cu	As	Se
			m AHD	m bgl												
26762	Heracles	50.1	2	48.1	3.6	3.0	6.2	<5	<2	13	<5	<1	<5	<5	<5	<5
26762	Heracles	50.1	5	45.1	1.1	1.7	4.0	<5	<2	8	<5	<1	<5	<5	<5	<5
26762	Heracles	50.1	9	41.1	2.5	2.3	5.0	<5	<2	12	<5	<1	<5	<5	<5	<5
26762	Heracles	50.1	16	34.1	7.3	21.7	71.0	1940	33	37	31	<1	<5	<5	8	<5
26762	Heracles	50.1	20	30.1	9.8	3.1	27.9	90	16	35	14	<1	<5	<5	23	<5
26772	Heracles	47.9	2	45.9	3.5	2.4	5.5	8	<2	11	<5	<1	<5	<5	<5	<5
26772	Heracles	47.9	5	42.9	<1.0	1.6	4.4	<5	<2	10	<5	<1	<5	<5	<5	<5
26772	Heracles	47.9	9	38.9	6.7	7.7	41.1	122	2	44	5	<1	<5	<5	12	<5
26772	Heracles	47.9	15	32.9	5.2	12.2	41.4	1360	22	26	29	<1	<5	<5	10	<5
26772	Heracles	47.9	20	27.9	5.0	1.2	8.7	<5	13	20	16	<1	<5	<5	20	<5
26787	Heracles	53.6	2	51.6	1.8	1.9	3.3	<5	<2	6	<5	<1	<5	<5	<5	<5
26787	Heracles	53.6	5	48.6	<1.0	2.0	4.2	<5	<2	8	<5	<1	<5	<5	<5	<5
26787	Heracles	53.6	9	44.6	<1.0	1.3	3.1	<5	<2	6	<5	<1	<5	<5	<5	<5
26787	Heracles	53.6	15	38.6	1.1	1.5	5.6	<5	<2	11	<5	<1	<5	<5	<5	<5
26787	Heracles	53.6	17	36.6	<1.0	1.3	7.0	<5	<2	12	<5	<1	<5	<5	<5	<5
26787	Heracles	53.6	22	31.6	5.6	18.6	50.1	2780	62	28	46	<1	16	<5	8	<5
26787	Heracles	53.6	24	29.6	4.3	2.2	7.7	52	8	19	9	<1	<5	<5	<5	<5
26792	Heracles	55.1	2	53.1	1.7	1.7	3.1	<5	<2	6	<5	<1	<5	<5	<5	<5
26792	Heracles	55.1	5	50.1	2.4	3.5	8.7	<5	<2	22	<5	<1	9	<5	<5	<5
26792	Heracles	55.1	7	48.1	5.6	1.9	4.8	<5	<2	8	<5	<1	<5	<5	<5	<5
26792	Heracles	55.1	8	47.1	8.0	1.6	3.7	<5	<2	8	<5	<1	<5	<5	<5	<5
26792	Heracles	55.1	12	43.1	1.1	0.8	2.1	<5	<2	5	<5	<1	<5	<5	<5	<5
26792	Heracles	55.1	18	37.1	<1.0	0.6	1.2	<5	<2	4	<5	<1	<5	<5	<5	<5
26792	Heracles	55.1	23	32.1	<1.0	0.9	1.6	<5	<2	3	<5	<1	<5	<5	<5	<5
26872	Zeus	31.5	2	29.5	1.2	0.5	1.2	<5	<2	<2	<5	<1	<5	<5	<5	<5
26872	Zeus	31.5	6	25.5	<1.0	0.3	0.1	<5	<2	2	<5	<1	<5	<5	<5	<5
26872	Zeus	31.5	12	19.5	12.5	1.4	0.2	<5	<2	6	<5	<1	<5	<5	<5	<5
26872	Zeus	31.5	19	12.5	13.8	1.5	4.2	<5	7	4	19	<1	<5	<5	<5	<5
26872	Zeus	31.5	23	8.5	13.3	0.9	2.7	<5	5	5	12	<1	<5	<5	<5	<5
26874	Zeus	30.6	2	28.6	1.6	0.1	0.6	<5	<2	<2	<5	<1	<5	<5	<5	<5
26874	Zeus	30.6	5	25.6	<1.0	0.1	0.1	<5	<2	<2	<5	<1	<5	<5	<5	<5
26874	Zeus	30.6	9	21.6	10.7	1.3	0.2	<5	<2	4	<5	<1	<5	<5	<5	<5
26874	Zeus	30.6	11	19.6	12.3	1.2	0.2	<5	<2	4	<5	<1	<5	<5	<5	<5
26874	Zeus	30.6	20	10.6	15.4	3.8	8.0	<5	9	10	19	<1	<5	<5	<5	<5
26874	Zeus	30.6	24	6.6	21.8	5.9	22.5	<5	19	28	45	<1	17	17	<5	<5
26922	Zeus	35.3	2	33.3	1.5	1.2	1.6	<5	<2	3	<5	<1	<5	<5	<5	<5
26922	Zeus	35.3	4	31.3	<1.0	1.0	1.2	<5	<2	4	<5	<1	<5	<5	<5	<5
26922	Zeus	35.3	6	29.3	4.2	1.6	10.6	<5	<2	6	<5	<1	7	<5	<5	<5
26922	Zeus	35.3	11	24.3	11.2	1.1	0.5	<5	<2	3	<5	<1	<5	<5	<5	<5
26922	Zeus	35.3	14	21.3	13.1	1.6	0.4	<5	<2	4	<5	<1	<5	<5	<5	<5
26922	Zeus	35.3	16	19.3	13.5	1.2	0.6	<5	<2	3	7	<1	<5	<5	<5	<5
26922	Zeus	35.3	19	16.3	12.2	2.1	1.2	<5	<2	5	10	<1	<5	<5	<5	<5
26922	Zeus	35.3	23	12.3	15.6	1.4	1.8	<5	2	4	7	<1	<5	<5	<5	<5
26922	Zeus	35.3	26	9.3	14.0	3.6	3.4	<5	4	7	11	<1	<5	<5	<5	<5
26922	Zeus	35.3	28	7.3	15.5	3.2	13.4	8	6	6	18	<1	<5	<5	<5	<5
26922	Zeus	35.3	30	5.3	19.0	12.2	22.6	65	28	39	65	<1	25	23	<5	<5
26933	Zeus	35.8	14	21.8	<1.0	0.9	0.1	<5	<2	3	<5	<1	<5	<5	<5	<5
26933	Zeus	35.8	26	9.8	15.5	3.6	5.8	<5	5	9	8	<1	<5	<5	<5	<5
26933	Zeus	35.8	32	3.8	<1.0	0.9	3.4	<5	5	8	8	<1	<5	<5	<5	<5
26988	Zeus	35.7	5	30.7	3.6	1.9	4.3	<5	<2	8	<5	<1	5	<5	<5	<5
26988	Zeus	35.7	10	25.7	9.8	1.5	0.5	<5	<2	6	<5	<1	<5	<5	<5	<5
26988	Zeus	35.7	14	21.7	11.3	1.4	0.2	<5	<2	4	<5	<1	<5	<5	<5	<5
26988	Zeus	35.7	20	15.7	12.8	9.6	31.9	<5	26	27	60	<1	<5	<5	<5	<5
26988	Zeus	35.7	25	10.7	13.0	3.1	11.2	<5	10	11	24	<1	<5	<5	<5	<5
26988	Zeus	35.7	27	8.7	11.8	0.7	3.3	<5	6	6	12	<1	<5	<5	<5	<5

Appendix C

Core	Location	RL	Depth		H ₂ O %	Al -----g/kg-----	Fe	Mn	Ni	Cr	Zn	Cd	Pb	Cu	As	Se
			m AHD	m bg1												
26995	Zeus	34.1	5	29.1	7.2	1.4	2.5	<5	<2	6	<5	<1	<5	<5	<5	<5
26995	Zeus	34.1	8	26.1	2.5	0.6	0.5	<5	<2	<2	<5	<1	<5	<5	<5	<5
26995	Zeus	34.1	14	20.1	10.4	1.5	0.2	<5	<2	5	<5	<1	<5	<5	<5	<5
26995	Zeus	34.1	24	10.1	16.9	2.7	10.8	24	9	13	29	<1	<5	<5	<5	<5
26995	Zeus	34.1	29	5.1	14.5	0.7	6.1	<5	4	4	10	<1	<5	<5	<5	<5
27011	Zeus	34.0	5	30.0	<1.0	1.0	1.5	<5	<2	4	<5	<1	<5	<5	<5	<5
27011	Zeus	34.0	8	29.0	3.0	1.4	0.5	<5	<2	4	<5	<1	5	<5	<5	<5
27011	Zeus	34.0	11	26.0	11.4	2.3	1.1	<5	<2	7	<5	<1	<5	<5	<5	<5
27011	Zeus	34.0	17	23.0	13.7	11.1	41.7	63	18	27	35	<1	<5	<5	5	<5
27011	Zeus	34.0	20	17.0	17.8	16.0	50.8	117	27	36	52	<1	<5	6	<5	<5
27011	Zeus	34.0	27	14.0	13.1	1.5	10.9	<5	10	16	28	<1	<5	<5	<5	<5
27011	Zeus	34.0	29	7.0	15.8	0.8	6.8	<5	6	7	18	<1	<5	<5	<5	<5
27044	Zeus	34.0	2	5.0	1.1	1.0	2.2	<5	<2	4	<5	<1	<5	<5	<5	<5
27044	Zeus	35.0	4	33.0	<1.0	0.9	2.2	<5	<2	4	<5	<1	<5	<5	<5	<5
27044	Zeus	35.0	11	24.0	11.6	1.1	2.9	<5	<2	5	<5	<1	<5	<5	<5	<5
27044	Zeus	35.0	17	18.0	10.1	6.6	27.8	<5	6	14	7	<1	<5	<5	7	<5
27044	Zeus	35.0	22	13.0	16.2	2.4	7.5	<5	7	6	18	<1	<5	<5	<5	<5
27044	Zeus	35.0	28	7.0	16.0	0.7	7.3	15	6	4	10	<1	<5	<5	<5	<5
27059	Zeus	35.0	3	32.0	<1.0	1.1	2.7	<5	<2	5	<5	<1	<5	<5	<5	<5
27059	Zeus	35.0	8	27.0	<1.0	0.2	0.4	<5	<2	<2	<5	<1	<5	<5	<5	<5
27059	Zeus	35.0	10	25.0	9.3	0.2	0.2	<5	<2	<2	<5	<1	<5	<5	<5	<5
27059	Zeus	35.0	14	21.0	13.3	3.9	10.7	<5	13	15	11	<1	<5	<5	<5	<5
27059	Zeus	35.0	18	17.0	12.1	3.4	9.5	31	11	12	14	<1	<5	<5	<5	<5
27059	Zeus	35.0	23	12.0	14.9	0.7	8.0	16	8	11	12	<1	<5	<5	<5	<5
27059	Zeus	35.0	27	8.0	16.3	1.2	18.3	<5	7	7	8	<1	<5	<5	<5	<5
27059	Zeus	35.0	30	5.0	10.4	0.3	5.0	<5	<2	<2	<5	<1	<5	<5	<5	<5
27066	Hades	63.0	3	60.0	2.0	2.0	4.0	<5	<2	9	<5	<1	<5	<5	<5	<5
27066	Hades	63.0	6	57.0	1.3	1.7	3.9	<5	<2	9	<5	<1	<5	<5	<5	<5
27066	Hades	63.0	10	53.0	2.5	0.9	3.0	<5	<2	9	<5	<1	<5	<5	<5	<5
27066	Hades	63.0	15	48.0	<1.0	0.9	1.8	<5	<2	4	<5	<1	<5	<5	<5	<5
27066	Hades	63.0	17	46.0	<1.0	0.9	2.1	<5	<2	5	<5	<1	<5	<5	<5	<5
27066	Hades	63.0	20	43.0	5.8	9.5	30.3	26	11	27	26	<1	7	13	6	<5
27066	Hades	63.0	24	39.0	6.7	0.9	23.4	<5	16	40	23	<1	<5	8	23	<5
27066	Hades	63.0	26	37.0	14.9	1.6	15.7	<5	19	59	61	<1	<5	10	22	<5
27066	Hades	63.0	30	33.0	15.4	2.7	20.8	<5	36	120	71	<1	<5	16	26	<5
27066	Hades	63.0	33	30.0	19.7	1.7	13.6	6	16	27	31	<1	<5	12	<5	<5
27083	Hades	66.0	3	63.0	2.0	1.5	4.2	<5	<2	9	<5	<1	<5	<5	<5	<5
27083	Hades	66.0	5	61.0	<1.0	1.6	4.5	<5	<2	10	<5	<1	<5	<5	<5	<5
27083	Hades	66.0	10	56.0	3.3	3.1	0.6	<5	<2	4	<5	<1	<5	<5	<5	<5
27083	Hades	66.0	14	52.0	4.2	5.4	29.3	12	8	11	23	<1	<5	11	10	<5
27083	Hades	66.0	18	48.0	12.0	5.1	12.1	12	6	10	18	<1	<5	<5	<5	<5
27083	Hades	66.	20	46	5.0	4.5	11.6	38	5	10	15	<1	<5	<5	<5	<5
27083	Hades	66.0	26	40.0	1.8	0.4	6.0	9	4	13	9	<1	<5	6	<5	<5
27083	Hades	66.0	30	36.0	3.5	1.6	9.6	30	11	21	27	<1	<5	10	10	<5
27095	Hades	69.0	5	64.0	<1.0	1.8	3.8	<5	<2	8	<5	<1	<5	<5	<5	<5
27095	Hades	69.0	7	62.0	<1.0	1.8	4.4	<5	<2	9	<5	<1	<5	<5	<5	<5
27095	Hades	69.0	14	55.0	<1.0	0.5	0.4	<5	<2	<2	<5	<1	<5	<5	<5	<5
27095	Hades	69.0	16	53.0	<1.0	0.4	0.3	<5	<2	<2	<5	<1	<5	<5	<5	<5
27095	Hades	69.0	20	49.0	1.8	3.5	12.1	19	6	9	15	<1	<5	12	<5	<5
27095	Hades	69.0	24	45.0	<1.0	0.6	0.6	143	<2	<2	<5	<1	<5	<5	<5	<5
27095	Hades	69.0	29	40.0	<1.0	0.7	8.9	<5	6	13	16	<1	<5	10	<5	<5
27095	Hades	69.0	31	38.0	10.2	1.4	8.6	16	10	14	23	<1	<5	<5	<5	<5