Earl Grey Lithium Project
Waste Rock Characterisation

Prepared for:

Kidman Resources Limited

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Prepared by:

Martinick Bosch Sell Pty Ltd
4 Cook Street
West Perth WA 6005
Ph: (08) 9226 3166
Fax: (08) 9226 3177
Email: info@mbsenvironmental.com.au
Web: www.mbsenvironmental.com.au

MBS ENVIRONMENTAL

EARL GREY LITHIUM PROJECT
WASTE ROCK CHARACTERISATION

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EXECUTIVE SUMMARY

Kidman Resourced Limited (Kidman) is the owner of the Earl Grey Lithium Project (the Project), located 105 km south-southeast of Southern Cross in the Yilgarn Mineral Field of Western Australia. A large economic pegmatite lithium deposit was discovered by Kidman in 2016. The deposit and proposed operation is situated within the abandoned Mt Holland Mine Site, which was operated between 1988 and 2001, and comprises a number of open pits, an underground mine, a processing plant, waste rock dumps, tailings storage facilities and other infrastructure that is largely unrehabilitated and currently a liability of the State of Western Australia.

Kidman is currently completing a feasibility study to develop Earl Grey, which is expected to comprise open pit mining of lithium-bearing ore and onsite processing. It is proposed that waste rock produced from open pit mining will be managed using a combination of surface waste rock dumps and progressive backfilling into the mine void as mining progresses from south to north across the deposit. MBS Environmental (MBS) was engaged by Kidman to undertake a geochemical characterisation of waste rock and expected process tailings to inform environmental approvals and closure planning practices. The primary objective of the study was to determine any environmental risk associated with waste rock and/or expected tailings properties and to inform waste landform designs.

The findings and implications for management were:

- All fresh rock waste (comprising mafic and contact zone rock types), was classified non acid forming (NAF) and geochemically benign with very low levels of soluble metals and metalloids and no considered risk of any seepage or run-off adversely impacting the surrounding environment. The mine waste rock material is considered suitable for general use within the mining area , as rock armouring or as a construction material.
- All clay rich oxide overburden material (mafic and pegmatite) sourced from within 30 m of the land surface is highly saline to extremely saline and naturally highly acidic with significant levels of exchangeable aluminium acidity. Although low in other soluble toxicants, these properties make the material unsuitable as growth medium. Natural exchangeable aluminium acidity presents a much lower risk for mine waste management than that of acidity and metalliferous drainage (AMD) produced by oxidation of sulfidic mine waste.
- Deeper transitional material sourced from approximately 30 to 45 m below ground level is circum-neutral and slightly to moderately saline. This material is better suited (compared to highly weathered oxide) as growth medium (e.g. subsoil).
- Due to the elevated fines content and sodic nature, oxide and transitional mine waste material is either spontaneously dispersive or likely to become so if placed in exposed (surface or near surface) locations due to the salt which currently stabilise clay aggregates gradually leaching from the material . Weathered mafics have an elevated fines content and are likely to be prone to erosion if placed on slopes (erosion being a somewhat different process to dispersion).
- Management of oxide waste should avoid placing the material on sloped surfaces in order to prevent erosion. Suitable options would include returning oxide materials to the mined out pit void and/or encapsulation with the competent mafic mine waste rock in an above ground landform.
- Tailings predicted to be NAF, although enriched in beryllium, tin, tantalum and rubidium, have very low solubility of metals, metalloids and fluoride (based on ore samples). Any net seepage from the tailings material is not considered to be a risk to the surrounding environment and saline groundwater.
- Due to expected levels of quartz (20 to 30%) in the tailings material and the process of grinding to allow beneficiation of the spodumene, management of the mine (and tailings processing facility) should be done to minimise the potential for respirable dust/quartz exposure.
- As a result of calculated radioactivity of 2.5 Bq/g to 3 Bq/g in the ore and tailings respectively (primarily due to beta emitting rubidium-87 isotope), the materials have low levels of naturally occurring radiation. Control

of airborne dust within statutory limits as for respirable quartz above is considered sufficient to control exposure within safe levels.

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1.1 PROJECT BACKGROUND

Kidman Resourced Limited (Kidman) is the owner of the Earl Grey Lithium Project (the Project), located 105 km south-southeast of Southern Cross in the Yilgarn Mineral Field of Western Australia. A large economic pegmatite lithium deposit was discovered by Kidman in 2016. The deposit and proposed operation is situated within the abandoned Mt Holland Mine Site, which was operated between 1988 and 2001, and comprises a number of open pits, an underground mine, a processing plant, waste rock dumps, tailings storage facilities and other infrastructure that is largely unrehabilitated and currently a liability of the State of Western Australia.

In 2016, Kidman announced the discovery of a significant lithium pegmatite deposit located west of the Bounty Mine, within the historic Earl Grey open pit area and extending approximately 1.5 km to the south on Mining Lease M77/1080. The Earl Grey Lithium Deposit (Earl Grey) has a maiden resource of 128 Mt at 1.44% Li_2O for 1.84 Mt lithium oxide was announced in December 2016. A conceptual pit design shows shallow expression of mineralised pegmatite at the southern end of the deposit, with an average thickness of 70 m.

To support development of the Project and inform the associated approvals, Kidman engaged MBS Environmental (MBS) to undertake a geochemical mine waste characterisation. Additionally, samples of ore were assessed to inform of potential for risk from stockpiled ore and tailings which would be produced from processing of primary ore and spodumene concentrate.

1.2 OBJECTIVES AND SCOPE OF WORK

The objectives of the study were to:

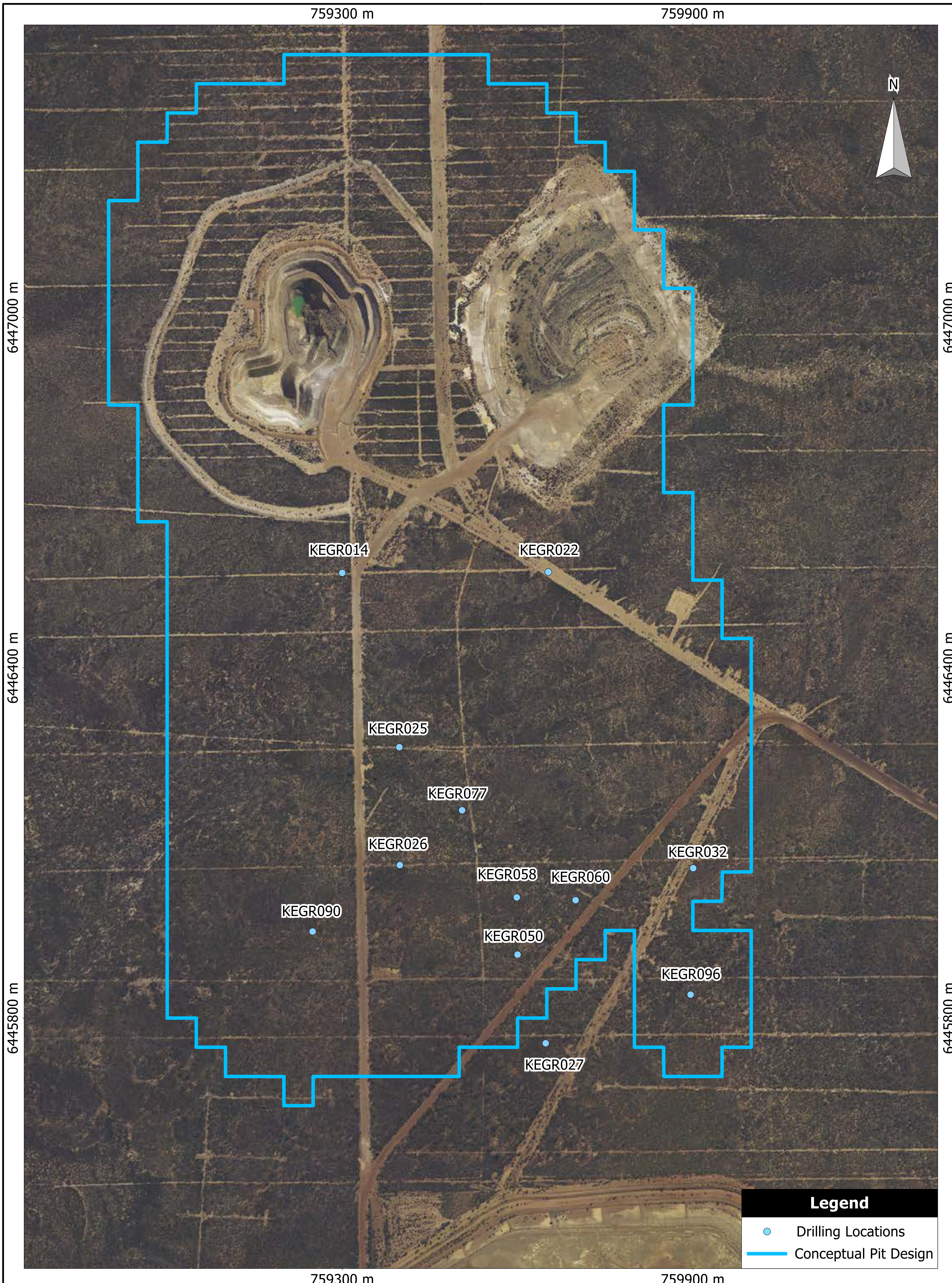
- Determine the potential for generation of acid within mine waste rock and expected tailings.
- Determine the potential for trace element pollution and salinisation of local groundwater and surface water due to run-off and seepage from mine waste rock stockpiles and/or tailings storage facilities.
- Evaluate the suitability of specific mine waste rock materials for mine use.
- Evaluate the suitability of specific mine waste rock materials for waste landform rehabilitation.
- Provide guidance on any further need for investigative work such as kinetic testing.

The scope or works involved the following:

- Review of existing assay data from exploration drilling to inform sample selection for preliminary examination and laboratory testing.
- Collaboration with Kidman geologists to determine suitable mine waste sampling intervals.
- A site visit to collect 64 waste rock samples from 12 drill locations selected by Kidman (Figure 2).
- Preparation of this report in accordance with DMP Draft Guidance on Material Characterisation (2016).

Scale: 1:3300000 Original Size: A4 Grid: MGA94(50) 0 100 km	Kidman Resources Limited Earl Grey Lithium Project Waste Rock Assessment	**Figure 1** **Location**	4 Cook St West Perth WA 6005 Ph: (08) 9226 3166 Fax: (08) 9226 3177 info@mbsenvironmental.com.au www.mbsenvironmental.com.au

W:\Kidman\Earl Grey\Waste Rock Report\Drawings\Figure 1 Earl Grey Location Plan.map 16/02/2017 Layout



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Kidman Resources Limited
Earl Grey Lithium Project
Waste Rock Assessment

Figure 2

Waste Rock Sampling Locations

Martinick Bosch Sell Pty Ltd
4 Cook St
West Perth WA 6005
Ph: (08) 9226 3166
Fax: (08) 9226 3177
info@mbsenvironmental.com.au
www.mbsenvironmental.com.au
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2. PROJECT DESCRIPTION

Kidman is currently completing a feasibility study for the Project. The current scope comprises open pit mining of lithium bearing ore and onsite mineral processing.

It is proposed that waste rock produced from open pit mining will be both stockpiled in surface waste rock dumps and backfilled progressively into the mine void as mining progresses from the south to the north of the deposit. Opportunity also exists for waste rock to be used to cover the historic TSF, immediately south of Earl Grey. This TSF is a liability of the State of Western Australia as the gold tailings are potentially acid forming (PAF), the TSF is uncovered and has zero freeboard. Kidman proposes to assess an option to cover the TSF with waste rock, which is expected to deliver a substantial environmental benefit by reducing oxidation of sulfide minerals, thereby reducing the volume and improving the quality of tailings seepage and contaminated runoff.

Processing will generate two tailings streams:

- Coarse rejects, which will be managed as waste rock.
- Fine tailings, which will be deposited in an existing gold tailings storage facility following refurbishment and expansion.

Other infrastructure for the Project is likely to include a Run-of-Mine (ROM) pad, water supply infrastructure, office and workshop facilities and an accommodation village (to be established at the historic camp site).

The expected composition of waste rock is summarised in Table 1. From this it can be seen that the majority of waste rock will be fresh compared to transitional zone and oxide/alluvial mine waste material.

Table 1: Estimated Composition of Earl Grey Waste Rock

Waste Rock Source	Weathering Zone	Estimated Waste Rock Tonnage (Mt)	Estimated % of Total Waste Rock
Earl Grey	Alluvial/Oxide	18	9
	Transition Zone	99	50
	Fresh (Mafic)	83	42
	Total	200	

3. EXISTING ENVIRONMENT

3.1 REGIONAL SETTING

The Project is located within the Yilgarn region, which forms part of the Eastern Wheatbelt of Western Australia. Historically, the wider region encompassing the Project has been subject to a variety of mining and minerals exploration activities, and remains subject to numerous Mining and Exploration Leases. As a consequence of previous mining activities, the Project area is highly disturbed.

Although regionally pastoralism and dryland agriculture have been recognised as primary industries, there are no pastoral leases or other significant land uses within the vicinity of the Project.

The Earl Grey lithium deposit is located in the Southern Cross subregion of the Coolgardie Interim Biogeographic Regionalisation for Australia (IBRA) Bioregion. This bioregion is characterised by subdued relief, comprising gently undulating uplands dissected by broad valleys with bands of low greenstone hills and numerous saline playa lakes. The vegetation is dominated by Eucalyptus woodlands, shrublands of *Allocasuarina* and *Acacia*, and mixed heath of *Melaleuca* and *Acacia*.

3.2 CLIMATE

A desktop assessment of available climate data was completed by Groundwater Resource Management (2014). The Project area experiences a semi-arid climate and is subject to extremes where droughts and major floods can occur within a few years of each other.

The Bureau of Meteorology (BoM) Lake Carmody rainfall station (No. 10670) is located approximately 51 km southwest of the Project and provides 77 complete years of data. Over this period annual rainfall has ranged from 156.2 to 558.3 mm with a long term average of 332 mm. On average, there were approximately 66 rain days each year, although the frequency of rainfall has historically varied from 15 to 130 days per annum. The rainfall that occurs during the early winter months (June and July) tends to be more reliable and a greater volume than summer months (January to March) (Figure 3). Occasionally, heavy rainfall in the region can be attributed to remnant tropical cyclones and associated depressions. However, these weather systems are unpredictable in nature and occur infrequently.

No temperature data are available from the Carmody weather station. Temperatures recorded at the BoM Hyden synoptic station (BoM #010568), approximately 88 km west-southwest of the Mt Holland Project have recorded (Figure 3):

- Mean daily maximum temperatures range from 33.7°C in January to 16.4°C in July.
- Mean daily minimum temperatures range from 15.9°C in February to 4.6°C in July.
- Highest and lowest daily temperatures of 48.6°C and -5.6°C have been recorded in February (2007) and July (1982) respectively.
- Typically there will be in the order of 10 days each year with daily maximum temperatures in excess of 40°C, approximately 8.5 of which will occur in December, January and February.
- On average 31 days each year can be expected when minimum temperatures will be 2°C or less and light ground frosts are possible. Two thirds of such days will occur in June, July and August.

In the absence of a local evaporation record, the average of pan evaporation data for the Merredin and Salmon Gums Research Stations has been applied to the Project. This provides a mean annual pan evaporation of some 1,867 mm.

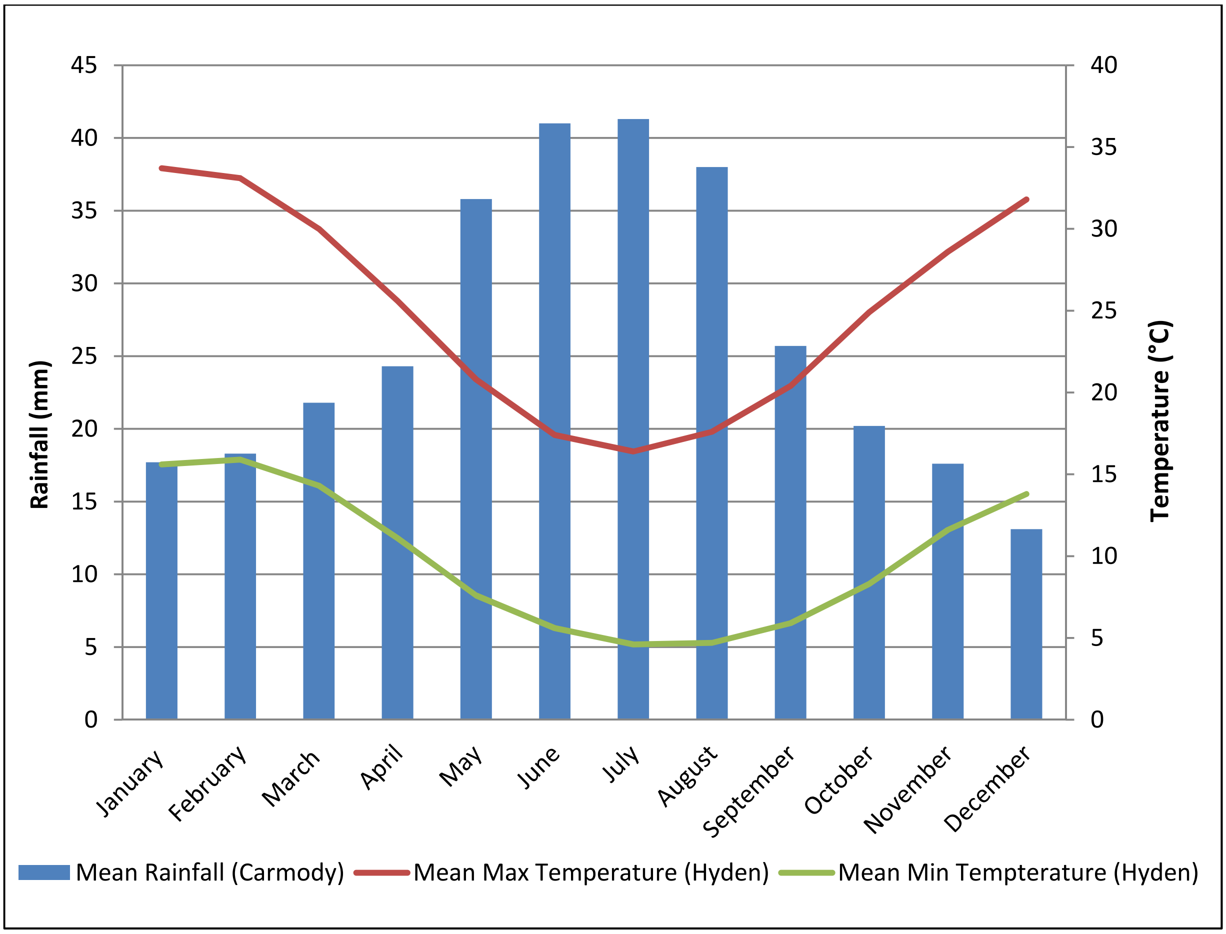

Figure 3: Historical Rainfall (Recorded at Carmody) and Temperature (Recorded at Hyden) Data (BoM)

3.3 GEOLOGY

3.3.1 Regional Geology

The Mt Holland Gold Field covers southern sections of the Archaean Southern Cross – Forrestania Greenstone Belt. The Belt extends over 300 km and generally strikes NNW (Kidman 2017). Regional mapping identified two distinct lithostratigraphic units within the Belt; an ultramafic metavolcanic suite, and a sequence of overlying immature clastic metasediments. These units are regionally folded with a north plunging synform, a steep east and shallow west limbs (East and West ultramafic-mafic domains) with a core of Package One ultramafic-mafic-sedimentary rocks) (Kidman 2017).

The greenstones are predominantly mafic and ultramafic flows generally intercalated with banded iron formations (BIF), cherts, and clastic sediments. Regional metamorphism is recorded at amphibolite grade, with local areas of retrograde chlorite metamorphic facies. The Belt is enclosed by syntectonic granitoids.

The Eastern Domain mafic-ultramafic basal rocks comprise a thick sequence of tholeiitic basalts with minor high-magnesium basalts and exhalative sediments. The basal rocks overlie a granitoid basement, and are overlain by the Bounty sequence. The Bounty sequence is approximately 600 m thick and consists of komatiitic peridotite flows and basalts which are intercalated with BIFs. This sequence is host to the Bounty Gold mine and the nickel mineralisation within the Forrestania Belt. A dolerite sill overlies the Bounty sequence and is the basal unit in of the uppermost ultramafic suite, which also contains tholeiitic basalts and miner exhalative sediment horizons.

The basal rocks of the Western Domain consist of clastic metasediments which lie upon a younger intrusive granitoid (west). Stratigraphically above the basal metasediments are a thick package of (from bottom to top) komatiitic high MgO olivine orthocumulate; then a low MgO pyroxenite with locally developed dolerite-gabbro differentiates and intercalated flow sediments; then finally a unit of high MgO basalts with intercalated flow sediments (Kidman 2017).

The Central Domain consists mainly of pelitic and psammitic schists (±-garnet), thin BIF lenses and bands of graphitic schists. Two major shear zones in the Forrestania Belt separate the three domains. The Mt Holland Shear defines the Central and Eastern Domains. Likewise, the Van Uden Shear separates the Central and Western Domains. Additional shear zones are recorded as parallel and crosscutting stratigraphy dominantly orientated north south; and north north-west to south southeast (Kidman 2017).

Lastly, NNE striking sets of Proterozoic dykes cut the three domains.

3.3.2 Project Geology

Historically three basic varieties of pegmatite have been recognised within the Mt Holland District:

- Complex zoned pegmatite containing spodumene and albite in addition to coarse perthite and quartz.
- Albitic aplite rich in black tourmaline and commonly containing cassiterite.
- Coarse cleavelanditic albite veins with minor apatite and spodumene.

These pegmatites appear to be abundant on the eastern margin of the Forrestania Greenstone belt, where several of Kidman's tenements occur. Amongst these are the known Bounty lithium-bearing pegmatites and the voluminous, but currently untested, Texas pegmatites.

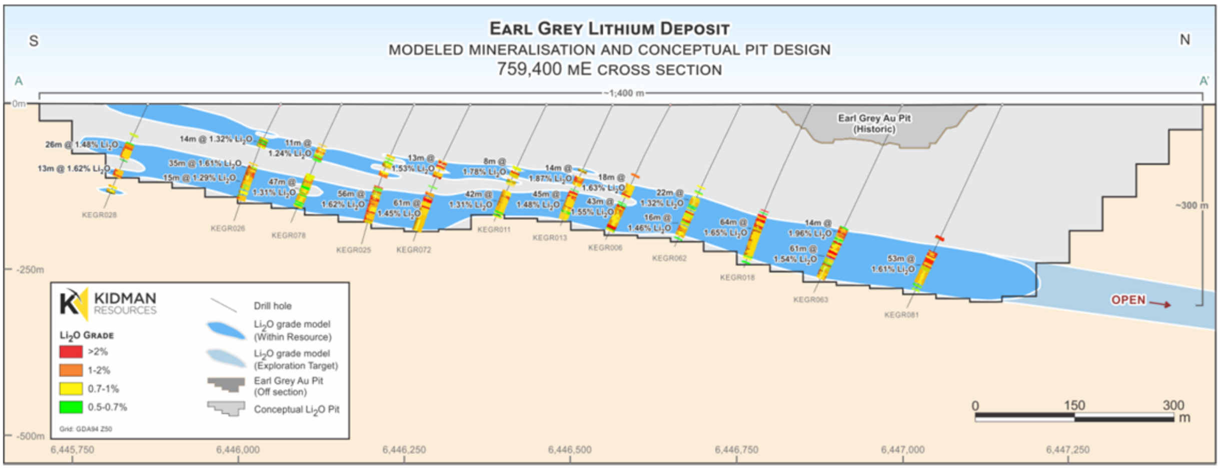

Figure 4 presents a cross section of the Earl Grey pegmatite deposit and test drilling locations in relation to the pit profile and the block model. The locations of drill holes on the horizontal plane versus the proposed pit shell are presented in Figure 2.

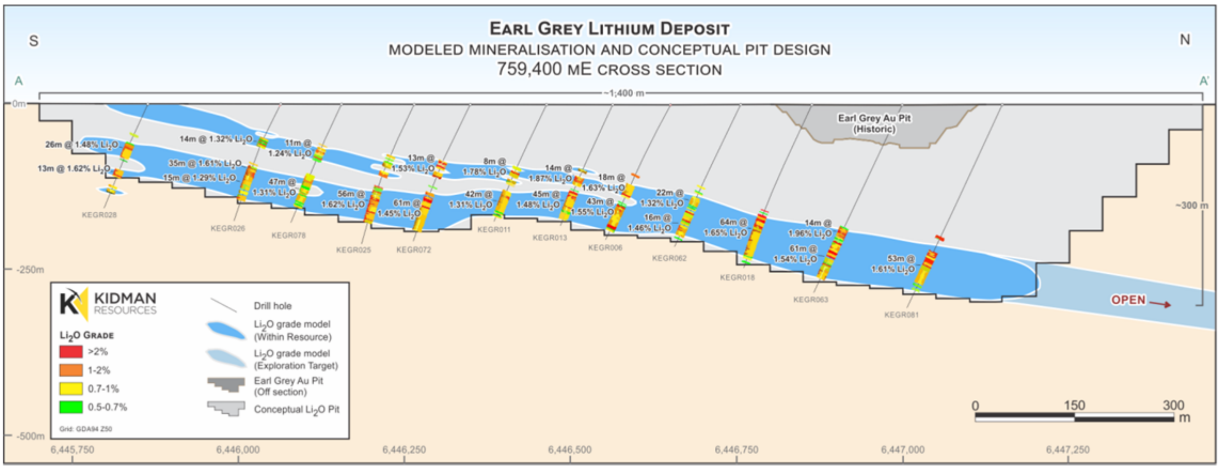

Figure 4: Earl Grey Lithium Deposit Cross Section (Kidman Resources)

3.4 LANDFORM AND SOILS

The Project is located in the Kalgoorlie Province, which has been described at the regional level (Tille 2006) as undulating plains, with some sandplains, hills and salt lakes, on granitic rocks and greenstone of the Yilgarn Craton. The Kalgoorlie Province is located in the southern Goldfields between Paynes Find, Menzies, Southern Cross and Balladonia.

A soil and landform assessment by MBS Environmental (MBS 2017) identified two soil and landform units within the Project area:

- Gently undulating sandplain. The dominant soil type within this unit was described as duplex sandy gravel (DAFWA Soil Group 302).
- Broad valleys and drainage lines. The dominant soil type within this unit was described as yellow/brown loamy duplex (DAFWA Soil Group 508).

Duplex sandy gravel soil profiles consist of a shallow gravelly sand A-horizon over compacted lateritic gravel in sandy clay matrix B-horizon. This soil type is present on topographically elevated areas and usually identified by association with sandplain heath vegetation, with sparse to scattered low eucalypts. Its typical profile is naturally strongly acidic[1] throughout (with lower pH in the B-horizon), non-saline and low sodicity. Deeper sand phases, indicated by the presence of *Banksia* species, may become water repellent when dry.

Yellow/brown loamy duplex soil profiles consist of a shallow sandy loam A-horizon over a compacted sandy clay to clay loam B-horizon. This soil type is present on lower lying landscapes and drainage lines within the Project area and usually identified by association with low eucalypt woodland and *Melaleuca* shrubs. The duplex character of profiles of this soil type is reflected by a circum-neutral, non-saline A-horizon over an alkaline, saline and highly sodic B-horizon.

3.5 SURFACE WATER DRAINAGE AND QUALITY

The Project is located within the Swan/Avon/Yilgarn Catchment of the Avon River Basin. No significant surface water features or watercourses occur within the vicinity of the Project. Minor ephemeral drainage lines are present, but only flow for short periods following intense rainfall events. Runoff from the Project area generally drains offsite as sheet flow and shallow concentrated flow in these minor watercourses, flowing in a northeasterly direction.

3.6 REGIONAL HYDROGEOLOGY AND GROUNDWATER QUALITY

The Project is within the Westonia Groundwater Area of the Southern Cross Province. The main groundwater sources in the Southern Cross Province are derived from:

- Regional catchment controlled flow systems in fresh and weathered fractured rock.
- Tertiary palaeochannel sands.
- Calcrete units that commonly overlie palaeochannel deposits.
- Shallow alluvium.

Significant aquifer types in the Southern Cross region are derived from palaeochannel, calcrete and shallow alluvial deposits. Groundwater quality varies with salinity generally increasing downstream along the drainage lines. The lowest salinity groundwater typically occurs beneath catchment divides. In the vicinity of Earl Grey, tertiary palaeochannel sediments comprise gypsiferous silt and sands to the east of the Project area (MBS 2017).

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1 Natural strongly acidic soils are widespread throughout the semi-arid areas of southwestern Australia. The natural acidity was caused by extended periods of intense leaching during geological periods associated with formation of lateritic landscapes. In agricultural regions, these soils are referred to as 'Wodjil' soils.

The deep weathering profile of the ultramafic and basaltic sequences, characteristic of the Southern Cross region, comprises a thick siliceous caprock. Modest supplies of groundwater can be derived from fractured rock aquifers within this weathered zone. Fractured basement aquifers are characterised by secondary porosity and permeability, resulting in complex fracturing enhanced by chemical dissolution. The storage capacity and hydraulic conductivity of these aquifers is largely related to the degree of fracture intensity. In the vicinity of the Project area fracturing below the caprock is prevalent, with the development of siliceous magnesite veins. The groundwater supplies are typically saline to hypersaline.

Small quantities of potable water are known to occur in fractures within granite outcrops. Typically the limited exposure of granite indicates there is limited recharge potential and consequently the supply is not considered sustainable as a Project supply. No fresh water supplies have been identified near the Project area.

Historic water quality data from various production and dewatering bores in the area indicates that natural groundwater quality can be characterised by:

- Circum-neutral to slightly acidic, with pH values varying between 6.1 and 7.1.
- Hypersaline, with total dissolved solids (TDS) varying between approximately 70,000 mg/L and 120,000 mg/L.
- Relatively consistent major ion composition, with sodium and chloride as the dominant ions. Sulfate, bicarbonate, calcium and magnesium are also present in elevated concentrations and the water is therefore classified as very hard.
- Elevated boron and manganese concentrations that exceed long term irrigation levels.
- Slightly elevated concentrations of other metals and metalloids including aluminium, beryllium, and copper, which are not of environmental significance in this environment.

4. GEOCHEMICAL CHARACTERISATION METHODS

4.1 ACID FORMING WASTE CLASSIFICATION METHODOLOGY

There is no simple method to define whether mine waste containing small quantities of sulfur will produce sulfuric acid. Sulfide minerals are variable in their behaviour under oxidising conditions and not all forms will produce sulfuric acid (H_2SO_4). Instead, a combination of approaches is often applied to more accurately classify mine waste. These approaches are listed below in order of increasing data requirements (and therefore increased reliability):

- The "Analysis Concept", which only requires data for total sulfur content. Its adoption is based on long term experience of wastes from Western Australian mine sites in arid and semi-arid conditions. Experience has shown that waste rock containing very low sulfur contents (less than 0.2 to 0.3%) rarely produces significant amounts of acidic seepage.
- The "Ratio Concept", which compares the relative proportions of acid neutralising minerals (measured by the Acid Neutralising Capacity (ANC)) to acid generating minerals (measured by the Acid Production Potential (AP)). Experience has shown that the risk of generating acidic seepage is generally low when this ratio (the Neutralisation Potential Ratio – NPR) is above a value of two.
- Acid-Base Accounting, in which the calculated value for Net Acid Producing Potential (NAPP) is used to classify the acid generating potential of mine waste. NAPP is equal to the AP minus the ANC.
- Procedures recommended by AMIRA (2002) and DIIS (2016), which take into consideration measured values provided by the Net Acid Generation (NAG) test and calculated NAPP values.
- Kinetic leaching column test data, which provides information for the relative rates of acid generation under controlled laboratory conditions, intended to simulate those within a waste rock stockpile or tailings storage facility.

A sound knowledge of geological and geochemical processes must also be employed in the application of the above methods. The methods are described in greater detail in Appendix 1. Non pyrite (FeS_2) sulfides and non-sulfide minerals that contribute to acid drainage are also discussed in Appendix 1.

Classification of wastes in this report uses procedures based on NAPP values (for samples containing less than 0.2% total sulfur) and those recommended by AMIRA (2002), based on NAPP and NAGpH results, for samples containing greater than 0.2% total sulfur. Results are also compared to the Analysis Concept (total sulfur) and Ratio Concept models and a modification of the AMIRA procedure by determination of the following:

- Analysis for total sulfur (Tot_S) and sulfate sulfur (SO_4_S), both reported as sulfur.
- Analysis for ANC (quoted in kg H_2SO_4/t).
- Calculation of Acid Production Potential (AP) = [(Tot_S – SO_4_S) * 30.6] kg H_2SO_4/t for samples containing greater than 0.2% sulfur.
- Calculation of NAPP = [AP – ANC] kg H_2SO_4/t.
- Analysis for NAG (quoted in kg H_2SO_4/t).
- Analysis for NAG pH.
- Calculation of NPR = ANC/AP.

This AMIRA approach is more conservative than either the Analysis Concept or the Ratio Concept alone, but assumes the absence of insoluble sulfates such as barium sulfate which if present leads to overestimation of oxidisable sulfur. The AMIRA approach of using NAG testing is particularly useful for PAF-LC materials or where there is very low ANC in the host rock. A combined acid generation classification scheme based on NAPP and NAG determinations is presented in Table 2 (see also Appendix 1).

Table 2: Waste Classification Criteria

Primary Geochemical Waste Type Class	NAPP Value kg H_2SO_4/t	NAGpH	Sulfide S Content
Barren	≤3	-	≤0.1%
Potentially Acid Forming (PAF)	≥10	< 4.5	≥ 0.3%
Potentially Acid Forming – Low Capacity (PAF-LC)	0 to 10	< 4.5	0.16 to 0.3%
Uncertain (UC)	0 to 5	> 4.5	Not important
Uncertain (UC)	-10 to 0	< 4.5	Not important
Non Acid Forming (NAF)	-100 to 0	> 4.5	Not important
Acid Consuming (AC)	< -100	>4.5	Not important

Table 2 is based on the Australian Government's Guidelines on Managing Acidic and Metalliferous Drainage (DIIS 2016) and is in turn based on an earlier classification system included within the AMIRA ARD Test Handbook (AMIRA 2002), which is advocated by the Global Acid Rock Drainage Guidelines (GARD) published by the International Network for Acid Prevention (INAP 2009). This classification system, based on static acid base accounting procedures and used in conjunction with geological, geochemical and mineralogical analysis can still leave materials classified as 'uncertain' where there is conflicting NAGpH and NAPP results. Uncertain materials demonstrating a NAGpH above 4.5 may be tentatively assigned as potentially NAF and those below pH 4.5 as potentially PAF – however in such cases, further assessment, such as the use of kinetic leaching columns may be required to provide a definitive classification.

4.2 LABORATORY METHODS

4.2.1 Acid Base Accounting

Sample analysis was performed by a NATA accredited laboratory (Intertek Genalysis). Preliminary analysis included selected acid base accounting (ABA) parameters.

Total sulfur was measured by combustion analysis. ANC was measured by a modified Sobek procedure (AMIRA 2002), which involves addition of dilute hydrochloric acid to the sample, followed by gentle simmering (two hours) to complete the reaction. The concentration of acid used for this procedure is first determined by testing the vigour of the reaction of the sample with hydrochloric acid, as assessed by the rate evolution of carbon dioxide gas and any colour change (a 'fizz rating'). ANC was then measured by titrating the amount of excess acid after addition and reaction using standardised sodium hydroxide solution.

The ABA scheme relies on measurement of oxidisable sulfur. The value of this fraction of sulfur in mine waste samples is calculated as the difference between total sulfur and sulfate-sulfur, which is present in a fully oxidised form and therefore not capable of generating additional acidity. Sulfate-sulfur content was determined by a heated hydrochloric acid extraction and Inductively Coupled Plasma – Optical Emission Spectrometry (ICP-OES) finish.

When assessing data for the AP and NAPP, it must be noted that both parameters are based on the assumption that all sulfur other than soluble sulfate-sulfur in the sample is acid producing (and sourced from pyrite (FeS_2) and other iron sulfide minerals). However, this represents a worst case scenario as not all minerals containing sulfur will result in acid production. Conversely, the NAPP calculation also assumes that the acid neutralising material measured in ANC is rapid-acting. In practice, some neutralising capacity is supplied by silicate and aluminosilicate minerals, which can be much slower to react (termed 'silicate ANC'). Furthermore, iron carbonate minerals such as siderite ($FeCO_3$) have limited or no capacity to neutralise acidity due to acid producing reactions resulting from oxidation of the dissolved ferrous iron component. Despite these assumptions, NAPP remains a suitable conservative prediction of potential acid generation when used in conjunction with mineralogical data.

Sulfate-sulfur determinations were made on samples containing greater than 0.2% total sulfur using extraction of soluble sulfate with heated dilute hydrochloric acid and determination by ICP-OES finish. This value is used to calculate the AP by deduction from total sulfur. Sulfate-sulfur determination does not however extract sulfate that may be present in insoluble forms such as barite (barium sulfate) and hence AP is more conservative for situations where such minerals are present.

The NAG test involves the addition of hydrogen peroxide, a strong oxidising agent, to a finely ground sample of mine waste to oxidise reactive sulfides. An aliquot of hydrogen peroxide is added to a sample, allowed to react overnight, heated and then finally boiled the following day. After cooling the sample solution pH was measured (NAGpH) and any acidity generated was measured by back titrating with sodium hydroxide solution to a pH of 4.5 (NAG to pH 4.5) and pH 7 (NAG to pH 7). NAG is expressed in units of kg H_2SO_4/t. A significant NAG result (i.e. final NAGpH less than 4.5) generally indicates that the sample is PAF (Table 2) and the test provides a direct measure of the NAG potential. A NAGpH of 4.5 or more generally indicates that the sample is NAF, but may still be capable of generating metalliferous drainage following oxidation of the sulfide minerals. Results for titrations of aliquots of the NAG solution to endpoint pH values of 4.5 and 7.0 allow estimation by the difference between these results of the relative amounts of non-acid producing base metal (such as copper and nickel) and iron sulfides in the sample. This is explained in more detail in Appendix 1.

4.2.2 Elemental Composition

Major and trace metals/metalloids were measured following digestion of a finely ground sample with a four acid mixture of nitric, hydrochloric, perchloric and hydrofluoric acids, which is a total determination for the elements measured. The method is not suitable for accurate measurement of volatile elements such as mercury and boron.

Digest solutions were analysed using inductively coupled plasma mass spectrometry (ICP-MS) or ICP-OES. Samples were analysed for a 28 element suite of metals and metalloids (Table A2-2, Appendix 2

From this data, the global abundance index (GAI) for each element was calculated by comparison to the average earth crustal abundance (AIMM 2001). The main purpose of the GAI is to provide an indication of any elemental enrichment that could be of environmental significance. The GAI (based on a log-2 scale) is expressed in integer increments from 0 to 6 (GARD Guide). A GAI of 0 indicates that the content of the element is less than or up to three times the average crustal abundance; a GAI of 1 corresponds to a three to six fold enrichment; a GAI of 2 corresponds to a 6 to 12 fold enrichment and so forth, up to a GAI of 6, which corresponds to a 96-fold, or greater, enrichment above average crustal abundances. A GAI of 3 or more is generally considered significant and may warrant further investigation.

4.2.3 Water Leachable Characterisation

Pulverised waste rock samples examined during this investigation were subject to a water leach similar to the Australian Standards Leaching Procedure (ASLP) 4439.3 Class 1 specification, except that the dilution used was 1:5 weight/weight, sample to water, instead of a 1:20 weight/weight, sample to water. Analytical finish of the filtered (0.45 μm) extract was via ICP-OES or ICP-MS finish, as necessary, for a range of elements based on the total concentrations determined from four acid digestion. This included sodium, potassium, calcium, magnesium, water soluble sulfur (sulfate) and 25 other environmentally significant metals and metalloids (including mercury).

Water extracts of waste rock samples were simultaneously tested for Electrical Conductivity (EC), pH, alkalinity (bicarbonate, carbonate and hydroxide forms), sulfate, fluoride and chloride.

4.2.4 Dilute Acid Leachable Characterisation

Pulverised waste rock samples examined during this investigation were subject to analysis using dilute acetic acid as the leaching fluid (initial pH 2.9) according to Australian Standards Leaching Procedure (ASLP) 4439.3 specification (1:20 extraction ratio). Analytical finish of the filtered (0.45 µm) extract was via ICP-OES or ICP-MS finish, as necessary, for the same metals and metalloids as performed for the water leachable fraction excluding sulfur) and also included boron, iron and silicon. This test provides indication of metals and metalloids that are likely to be leached should acid condition prevail; either by oxidation of sulfide minerals in the waste rock materials being assessed or by co-storage with other sources of PAF mine waste.

4.2.5 Exchangeable Cations

Ten selected samples of oxide waste rock and alluvium were analysed by The Chemistry Centre for exchangeable cations (calcium, magnesium, sodium and potassium) following extraction of samples with ammonium chloride solution at pH 7. Effective Cation Exchange Capacity (ECEC) was calculated by the sum of the concentrations of individual cations expressed with units of centimoles of positive charge per kilogram (cmol(+)/kg). Exchangeable Sodium Percentage (ESP), a measure of waste rock sodicity, was calculated by the percentage of exchangeable sodium of ECEC. Waste rock with moderate to high ESP values (>15%) and containing substantial amounts of clay minerals are prone to water erosion, resulting in waste dump instability by processes including tunnelling, rilling and deep gully formation.

Although rarely encountered as an exchangeable soil cation, lithium was included in the analytical suite. Exchangeable lithium has similar properties to exchangeable sodium in that its presence increases potential for clay dispersion.

4.2.6 Mineralogical Assessment

Five samples (representing two fresh mafic, one fresh pegmatite ore, one transitional mafic and one transitional pegmatite) were chosen for mineralogical determination. These samples were submitted to Intertek Genalysis Laboratory Services for a quantitative powder X-Ray diffraction analysis (XRD) of the crystalline and amorphous contents. Samples were further ground to a very fine powder in an agate mortar and pestle and subsampled for analysis with and without addition of zinc oxide (solid dilution 10% by weight) to determine amorphous content. XRD patterns were then collected on PANalytical Cubix wavelength dispersive XRD with quantitative analysis performed using an automated Rietveld method of correction. Full experimental details are provided in the mineralogical laboratory report presented in Appendix 3

5. DESCRIPTIONS OF SAMPLES

Selection of drill core/chip material for geochemical characterisation was chosen on the basis of the following:

- Drill hole material was readily accessible and has been protected from contamination and excessive weathering or oxidation.
- A minimum of ten drill holes across the proposed mining area, providing at least three samples from each significant lithological rock type identified. The lithologies were mafic, pegmatite and the immediate contact zone between these lithologies. The actual number of samples from each lithological waste rock type was intended to be consistent with its relative contribution to the total waste rock volume calculated from the mining model.
- Consideration was also made for suitable sampling of each lithology type identified by the weathering zones (Fresh, Transition and Oxide) intercepted in proposed mining. Higher sampling numbers were chosen from the fresh and transitional rock waste with higher potential for presence of oxidisable sulfur forms.
- Sampling was to a depth at least 10 m below the proposed maximum depth of mining.

All samples represented at least one linear metre of core with depths as indicated in Table A2-1 of Appendix 2. A summary breakdown of sample numbers selected across lithology and weathering zone is shown in Appendix 2 – note that all fresh rock pegmatite is considered ore material.

The 64 samples from 12 drill holes taken across the defined orebodies at Kidman Resources were analysed and screened for total sulfur and Acid Neutralising Capacity (ANC). Full acid base accounting (ABA) was conducted if the initially determined total sulfur was more than 0.2% (Section 4.1). A selection of samples were also analysed for elemental composition (21), water and acid leachable parameters (13) and minerology composition (5) (Section 4.2) by Intertek Genalysis laboratories before the results were forwarded to MBS Environmental for assessment. A selection of 10 clay rich weathered oxide samples (representing subsoils/overburden), were analysed by for parameters including pH, Electrical Conductivity (EC) and Cation Exchange Capacity (CEC). Particle Size Distribution included six samples and Emerson Class nine samples respectively.

Table 3: Summary of Kidman Resources Limited Waste Rock Samples

Weathering Zone	Lithology Type	No. of Samples
Oxide (Clay)	Weathered Mafic	7
Oxide (Clay)	Weathered Pegmatite	4
Transitional	Transitional Mafic	5
Transitional	Transitional Pegmatite	4
Fresh	Fresh Mafic	24
Ore	Pegmatite Ore	15
Fresh	Contact Zone	5
Total number of samples		64

6. RESULTS AND DISCUSSION FOR WASTE ROCK CHARACTERISATION

6.1 ACID BASE ACCOUNTING

Laboratory results for total sulfur, sulfate-sulfur, ANC, acid base accounting parameters and NAG tests of waste rock samples are collated in Table A2-2 of Appendix 2.

6.1.1 Sulfur Forms and Distribution

Based on examination of the data in Table A2-2 (Appendix 2) and a summary of total sulfur data provided in Table 4 below, the following are noted as key points:

- Only one sample (KEGR60 55-70, a fresh rock mafic sample) had a measured concentration of more than 0.3% total sulfur. The majority (60 of 64 samples) contained less than 0.2% total sulfur and were not analysed further for ABA parameters.
- One sample of weathered mafic (KEGR22 3-11) analysed contained 0.28% total sulfur and 0.07% of acid soluble sulfate sulfur. The sulfate sulfur in this sample is considered an underestimate due to the likely presence of insoluble sulfates such as barium sulfate or strontium sulfate, which will contribute to the total sulfur measured by combustion. Actual acid generation potential (AP) is therefore overestimated as this sulfur is an already oxidised form.
- Fresh rock samples are expected to contain only low levels of sulfate sulfur with most sulfur present as sulfide sulfur. Fresh rock samples with sufficient total sulfur to warrant analysis of sulfate sulfur all had less than 10% of sulfur present as sulfate sulfur. The highest sample KEGR60 55-70 (fresh rock mafic sample) for example had 0.04% sulfate sulfur of a total sulfur content of 0.55%.

Table 4: Total Sulfur Content Summary by Lithology Unit (%)

Lithology Unit	No. of Samples	Total S Minimum	Total S Maximum	Total S Mean
Weathered Mafic	7	0.01	0.28	0.07
Weathered Pegmatite	4	<0.01	0.04	0.03
Contact Zone (Fresh)	5	<0.01	0.25	0.07
Fresh Mafic	24	<0.01	0.55	0.07
Pegmatite Ore	15	<0.01	0.12	0.02
Transitional	9	<0.01	0.02	0.01

Chart 1 shows a frequency distribution of sulfur content across the waste rock and ore samples with the cumulative percentage on the right hand axis. As discussed in section 4.1, total sulfur levels in hard rock mining of less than 0.3% are generally regarded as posing little risk of AMD formation in an arid climate according to the 'Analysis Concept'. Only one sample (KEGR60 55-70, 0.55% sulfur in fresh rock mafic) contained more than 0.3% total sulfur of the 64 samples analysed.

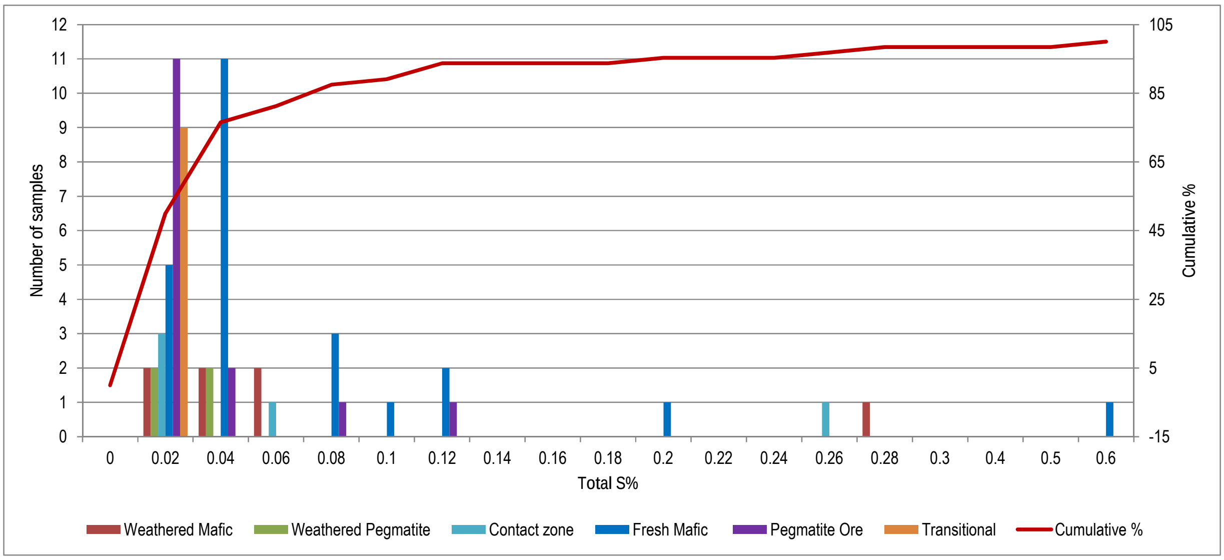

Chart 1: Frequency Plot of Total Sulfur Concentrations for Waste Rock and Ore

A study was done on completed minesite assay samples for sulfur which comprised 551 samples from drill cores including 401 samples of pegmatite and 111 mafic lithology samples to assess if samples for the current work were typical of the Project geology. The primary fresh rock waste lithology of mafic/ultramafics has a mean sulfur content of 0.123% and maximum sulfur content of 2.45% (one sample significantly higher than all others). A total of 99 of the 111 samples (89%) of mafic lithology samples had less than 0.3% sulfur which is comparable to results of the current work given above. Chart 2 shows a frequency distribution of sulfur content across the assayed samples with the cumulative percentages for mafic and pegmatite lithologies on the right hand axis.

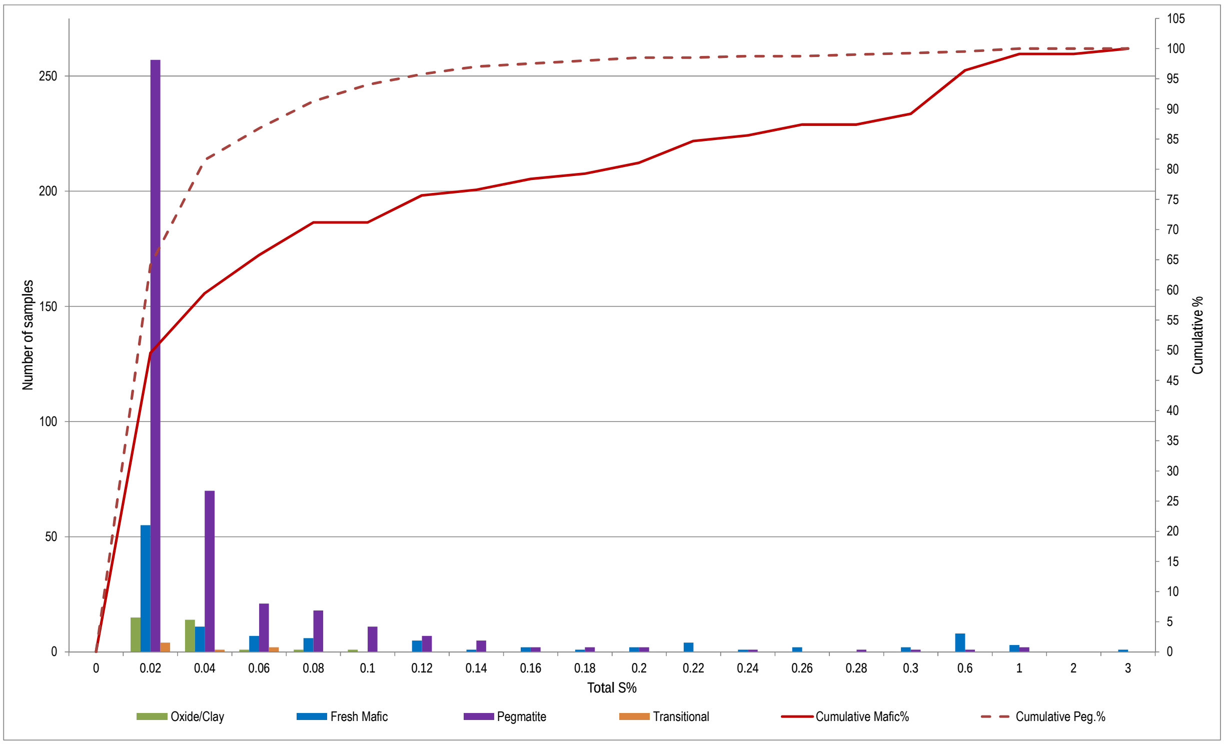

Chart 2: Frequency Plot of Total Sulfur Concentrations from Assay Database

6.1.2 Acid Neutralisation Capacity

The ANC of Earl Grey waste rock samples ranged from <1 to 84 kg/t H_2SO_4. Pegmatite ore samples ranged from 4 to 29 84 kg/t H_2SO_4. A summary of ANC analysis by lithology unit across all samples is presented in Table 5, along with the calculated carbonate neutralisation potential (Carb NP) which is calculated from measured total carbon and is a measure of readily available carbonate ANC if all carbon is present as carbonate in the form of calcite ($CaCO_3$). In general the following is noted:

- Weathered waste mafic and pegmatite samples (especially those within 40 m of surface) had very low ANC values, which is consistent with the inherent natural acidity of these materials (Section 6.3.1).
- Levels of Carb NP were generally low to moderate in most samples with slightly higher results in only a few samples — one of these (KEGR22 106-107), was a fresh rock contact zone sample where carbonate mineral may be expected to accumulate.
- Higher levels of ANC versus Carb NP indicate most acid neutralisation would be provided by reactive silicates such as chlorite rather than carbonates – particularly for mafic lithologies.

Table 5: ANC and Carbonate NP Summary by Lithology Unit (kg H_2SO_4/t)

Lithology Unit	No. of Samples	ANC Minimum	ANC Maximum	ANC Mean	Carb NP Minimum	Carb NP Maximum	Carb NP Mean
Weathered Mafic	7	<1	7	2.7	2	16	7.1
Weathered Pegmatite	4	1	7	3	2	9	4.5
Contact Zone (Fresh)	5	8	68	27	2	51	17
Fresh Mafic	24	9	84	31	2	38	13
Pegmatite Ore	15	4	29	10.5	2	36	8.4
Transitional	9	3	26	8.9	2	25	6.6

6.1.3 Acid Drainage Classification

Based upon classification methods outlined in Section 4.1 and results of analysis of Kidman Earl Grey samples (Appendix 2, Table A2-2), the following key points regarding acid classifications are made:

- All samples except one (KEGR32 3-7) were classified as NAF as a consequence of low total sulfur contents and low to moderate ANC. Three of the four samples with more than 0.2% sulfur (the exception being KEGR32 3-7), recorded NAGpH values in the range of 6.5 to 8.4.
- As a result of the above, all fresh rock (both waste and pegmatite ore) is considered to have no potential for acid generation.
- Sample KEGR32 3-7 is a clay rich weathered mafic oxide sample which, because of an acidic NAGpH of less than 4.5 (result 4.2) and positive NAPP (6 kg/t H_2SO_4), was classified as PAF (low capacity) under ABA criteria. In reality this material is already fully oxidised but has a small amount of insoluble sulfates and a naturally acidic pH (pH 3.9). Using acid sulfate soil terminology and classification, it would be termed an 'actual acid sulfate soil'. Existing acidity in the soil is caused by a high level of exchangeable aluminium (Table A2-9 of Appendix 2, the significance of which is discussed in Section 6.5).
- Sample KEGR32 3-7 and all weathered oxide and transitional material for the Project should therefore be considered NAF for the purposes of management.

A plot of ANC versus maximum potential acidity (AP – corrected for sulfate sulfur) for all samples is shown in Chart 3. The blue and red lines in this Chart represent ratios of ANC to AP ratio (neutralisation potential ratio, NPR) of 2:1 and 1:1 respectively. In accordance with the 'Ratio Concept' discussed in Section 4.1 , samples with an NPR of less than two and in particular less than one (red line) are considered PAF. Based on this approach, all samples assessed are characterised as NAF, except KEGR32 3-7 (weathered mafic) discussed above, which is more correctly termed as having existing/residual acidity.

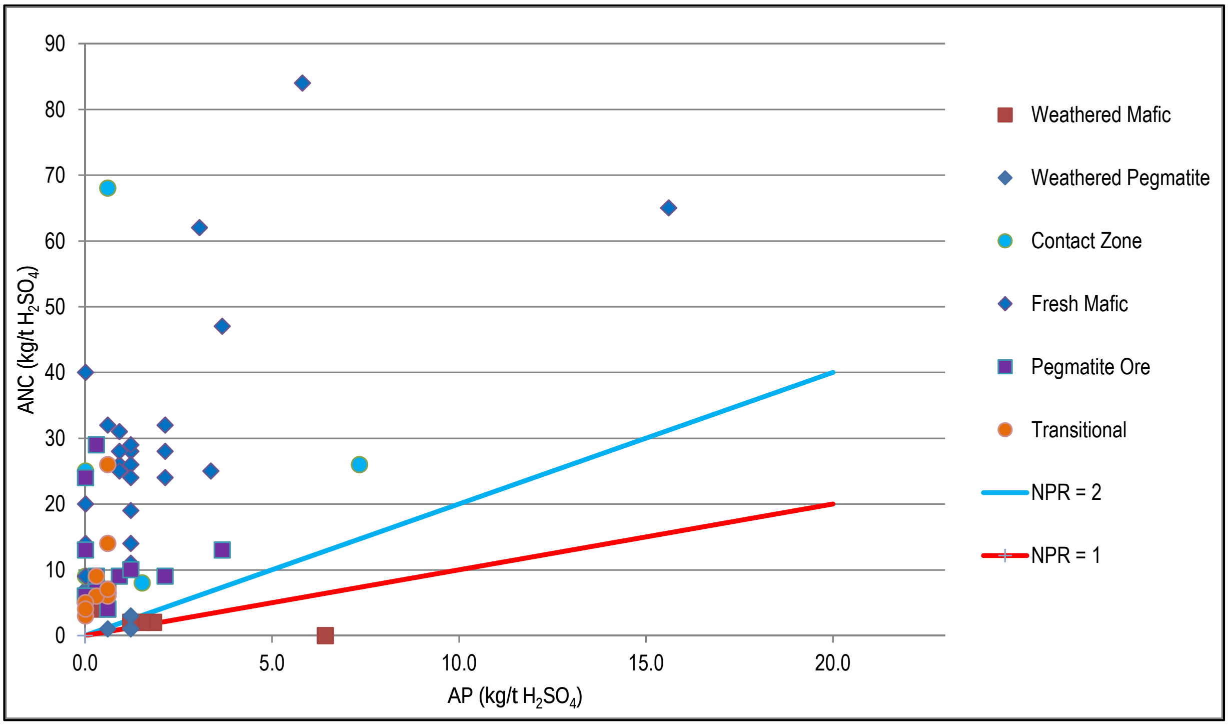

Chart 3: Ratio Classification Plot for ANC versus AP

6.2 ELEMENTAL COMPOSITION

Table A2-3 of Appendix 2 presents heavy metal and metalloid compositions for the 21 waste rock and ore samples selected for elemental analysis. Table A2-4 of Appendix 2 presents the calculated GAIs for these samples, as outlined in Section 4.2.2.

Mineral deposits by their nature are anticipated to have some elements present in concentrations above the average crustal abundance. The GAI does, however, provide a useful screening tool for identifying elements requiring further assessment by more specific test methods. Examination of the total element concentrations and the corresponding GAI values for Kidman Earl Grey samples indicates the following:

- As expected for a lithium deposit, lithium was enriched in all samples except highly weathered clays. This included the mafic waste rock due to fractionation during cooling of both lithologies (mafic and pegmatite) from a single lithium enriched igneous intrusion. Concentrations in fresh waste rock (mafic and contact zone samples) ranged from 354 mg/kg to 6,426 mg/kg (GAI 4 to 6) with the latter being at the contact zone. The crustal average for lithium is 20 mg/kg.
- Beryllium was found to be associated with lithium enrichment and was also enriched in all samples except highly weathered clays. Concentrations (as for lithium), were generally highest in pegmatite ore samples (range 98 to 151 mg/kg) with waste rock ranging from 2.0 mg/kg to 34 mg/kg versus a crustal average of 0.17 mg/kg. The contact zone sample KEGR26 152-153 had the highest concentration of 167 mg/kg. Beryllium is likely present as the highly insoluble beryl group of minerals ($Be_3Al_2Si_6O_{18}$).
- Enrichment in other elements was associated with lithology:
  - Pegmatite ore samples and the high lithium concentration contact zone sample KEGR26 152-153 were enriched in tin (GAI 3 to 4), tantalum (GAI 4 to 5) and rubidium (3 to 5) versus crustal averages

of 2 mg/kg, 2 mg/kg and 90 mg/kg respectively. Enrichment in tin and tantalum is typical of all pegmatites due to minerals such as cassiterite and tantalite.

- Maximum rubidium concentration in the pegmatite ore was 3,274 mg/kg versus a global crustal average of 90 mg/kg.
- Quartz rich pegmatite samples were otherwise low in significant enrichment with only arsenic in one ore sample (KEGR25 150-155, 310 mg/kg arsenic) and the contact zone sample (KEGR26 152-153, 224 mg/kg arsenic) recording values considered enriched (GAI 3) versus an average soil abundance of 25 mg/kg.
- Mafic waste rocks showed a broader range of enriched elements but only at levels of marginal enrichment (GAI of three for all except antimony at GAI four). Enriched elements included arsenic (two samples), cadmium (one sample), chromium (three samples), antimony (one sample), rubidium (one sample) and tin (one sample) (Table A2-4 of Appendix 2). Marginal enrichment in chromium is expected for mafic (dark coloured) lithologies.

- No enrichment in any samples was noted for environmentally significant metals copper, nickel, thorium, uranium, lead, zinc or cobalt. Overall levels of enrichment apart from geologically associated lithium, beryllium, rubidium, tin and tantalum were low and the form of many of these elements (e.g. tin as cassiterite) is expected to be in a highly insoluble form.
- Niobium concentrations in pegmatite samples, ranging from 48 to 75 mg/kg, were higher than the average crustal abundance of 20 mg/kg. GAI values of one do not however indicate significant geological enrichment.

6.3 WATER LEACHATE CHARACTERISATION

6.3.1 pH and Soluble Major Ions

Results for pH, EC and major ions in the 1:5 extracts are given in Table A2-5 of Appendix 2. Samples across the lithology types were found to have:

- Circum-neutral to alkaline pH (ranging from 7.8 to 9.8) for transitional to fresh rock mafic and pegmatite. Weathered material (mafic and pegmatite) was acidic (pH 5.5 to 6.1).
- Relatively low soluble alkalinity (range 5 to 41 mg/L), present as a mixture of bicarbonate and carbonate alkalinity.
- Although various fluoride minerals are known to occur in pegmatite, levels of soluble fluoride were low with a maximum concentration of 1 mg/L in 1:5 extract versus an ANZECC 2000 livestock drinking water guideline of 2 mg/L.
- Samples of fresh to transitional waste rock and pegmatite ore were found to have low salinity levels with limited dissolution of soluble salts, and were sodium dominant. EC values of most fresh rock and transitional sample leachates ranged from 60 µS/cm to 540 µS/cm with the upper level sample being in the contact zone (sample KEGR26 50-52). Sample KEGR25 195-200 had an EC of 3,264 µS/cm and is considered an outlier (particularly at this depth). The elevated EC is likely caused by contact of this sample with saline groundwater during collection or storage.
- Samples of weathered mafic and pegmatite oxide waste were of higher salinity than fresh/transitional (up to 2,907 µS/cm) — oxide waste rock salinity is discussed further in Section 6.5.

Overall, results suggest that any seepage from pegmatite ore stockpiles or fresh rock waste will be of low salinity and be slightly alkaline. This is not considered to pose any risk to the surrounding environment and salinity of any seepage will only decrease over time. No significant levels of soluble fluoride were observed.

6.3.2 Soluble Metals and Metalloids

Results for water soluble metals and metalloids in the 1:5 extracts are given in Table A2-5 of Appendix 2. ANZECC livestock drinking water guidelines (cattle) and Department of Health non-potable groundwater use guidelines (DoH 2014) are provided for comparison. There are no identified groundwater uses or receptors in the vicinity of the Project other than for use as process water. When comparing results, it needs to be kept in mind that as the analysis was performed on a 1:5 extract (appropriate for seepage estimation in arid environments), versus a commonly used comparison ratio of 1:20 extraction (deionised water ASLP). Key observations of soluble metals and metalloids data are summarised below.

- No metals or metalloids in the water leachates of any samples were found to exceed ANZECC livestock drinking water guidelines other than for three samples for aluminium, indicating a low risk of material adversely impacting groundwater and surface water quality by a process of leaching or run-off from rainfall.
- Despite significant enrichment in total beryllium, tin and tantalum associated with pegmatite ore, these elements were present only at trace concentrations in the water extract of (maximum) 3.9 µg/L, 6.8 µg/L and 3.1 µg/L respectively. These results indicate that these elements are present as highly insoluble mineral forms.
- Cadmium (maximum 0.15 µg/L) and chromium (0.11 mg/L) were also at very low levels in the corresponding total enriched samples and significantly below the livestock drinking water guideline values of 10 µg/L and 1 mg/L respectively.
- Aluminium concentrations were very variable with results between <0.01 to 12 mg/L in the 1:5 extract, with three samples (KEGR26 50-52, KEGR50 70-75 and KEGR50 60-64) slightly exceeding the livestock drinking water guideline of 5 mg/L. Although aluminium can dissolve under strongly acidic or alkaline conditions and various samples were alkaline in nature, the trend of solubility did not match pH or alkalinity. As these highest concentration samples and levels found did not correlate with acetic acid soluble aluminium (Table A2-6 of Appendix 2), it is considered these aluminium results are largely an artefact of incomplete filtration of very fine material, followed by acidification for analysis which will dissolve small amounts of particulate aluminium.
- Arsenic was the most soluble environmentally significant metalloid, but remained at concentrations below the livestock drinking water guideline of 5 mg/L, with water leachate concentrations ranging from 0.0018 to 1.0 mg/L (the latter from transitional pegmatite).
- Lithium solubility was only slightly correlated to measured total lithium concentrations, however the highest concentration in the 1:5 extract was in a pegmatite ore sample (KEGR77 110-115) at 1.62 mg/L. There are no aquatic ecological, livestock or human health drinking water guidelines for lithium, but the ANZECC 2000 irrigation guideline (long term) for lithium is 2.5 mg/L. Groundwater concentrations of lithium in the area are likely to be naturally elevated due to the presence of pegmatite although no data is currently available – the associated element beryllium was noted as being elevated in groundwater (Section 3.6). Given the hypersaline nature of the groundwater no potential receptor is considered at risk from any marginal elevations of these elements.

6.4 DILUTE ACID LEACHATE

Dilute acetic acid leachate results for the waste rock samples are presented in Table A2-6 of Appendix 2. As discussed in Section 4.2.4, analysis of this leachate can provide an indication of heavy metals and metalloids that may be leachable over extended periods of acidic conditions if weakly acidic conditions (approximately pH 3.5) were to prevail. In the case of the Earl Grey resource, this is considered only possible at the contact zone of fresh rock with acidic waste oxide (Section 6.5).

Under the acidic conditions of this test, the primary elements released were iron, aluminium, silicon, calcium and magnesium, which are all considered a slight dissolution of acid reactive species. One pegmatite ore sample (KEGR96 60-65) released a moderate concentration of lithium (5.6 mg/L in 1:20 extract), but ore samples are considered unlikely to be in prolonged contact with acidic clays.

Arsenic was generally more soluble under acidic conditions, but results were variable. For example in the fresh mafic waste sample KEGR50 70-75 was found to be more soluble (10.6 mg/kg soluble) in acetic acid than a water extract (2.9 mg/kg soluble). The transitional pegmatite sample KEGR32 34-36, however, arsenic was less soluble under acidic conditions (0.09 mg/kg soluble versus 5.1 mg/kg soluble in water). Overall, concentrations of arsenic in any net seepage from initial contact of fresh rock with acidic waste oxide are expected to be marginal and for migration of arsenic through the clays to groundwater to be limited by surface adsorption of the arsenic oxy-anions onto hydrous iron oxide minerals in highly weathered material.

Concentrations of other environmentally significant metals and metalloids were not found to significantly increase versus a 1:5 water extract and therefore mobilisation of these species is not expected under any of the conditions expected for the Project.

6.5 OXIDE WASTE ROCK

Ten samples of highly weathered waste material were analysed for parameters to characterise the likely physical/clay characteristics of oxide waste from Earl Grey. This comprised five samples of transitional/weathered pegmatite and five of weathered mafic waste. Results for analysis of particle size distribution (six samples), pH, electrical conductivity (EC), Emerson Class and exchangeable cations (as well as derived parameters ECEC and ESP) are provided in Tables A2-7, A2-8 and A2-9 of Appendix 2. As indicated previously in Section 4.2.5, the ESP (especially above 15%), is an indication of the sodicity and hence potential dispersivity of clay rich waste. An Emerson Class of one or two indicates by physical testing if the clay fraction of natural aggregates is spontaneously dispersive.

Examination of the results in comparison to typical criteria for soils (MBS 2017) indicated the following properties of Earl Grey oxide waste:

- Samples had variable, but generally appreciable levels of clay fraction content of up to 34%. Sand contents varied in range from 42% to 78% which categorised most samples as sandy clay loams to silty clay loams.
- There was a strong correlation of pH with depth. The pH of all samples less than approximately 30 m deep (i.e. the most highly weathered samples) was found to be naturally strongly to extremely acid, with pH values in the range 3.9 to 5.4. The acidity is associated with the intensively leached characteristics of Earl Grey oxide waste which are resulting in leaching of basic cations (calcium, magnesium, sodium and potassium) with acidic cations (mainly aluminium with minor manganese and iron). This form of natural exchangeable acidity presents a much lower potential environmental risk compared to acidity generated by oxidation of sulfide minerals in fresh rock.
- Two weathered pegmatite samples at deeper depths (KEGR32 34-36 and KEGR26 44-45) were circum-neutral with pH values of 7.4 and 7.7 respectively. These latter samples also had high ECEC values of 22.5 and 25.3 cmol(+)/kg. Both these observations suggest a shift at approximately this depth (30 m) from highly weathered, naturally acidic kaolinite based clays to less weathered illite 'layered' clays.
- All oxide samples were sodium and magnesium dominant with high ESPs of between 16% and 62%, indicating all samples of oxide waste from the project are highly sodic and prone to be dispersive.
- Emerson Class testing (Table A2-8 of Appendix 2) indicated four (two pegmatite and two mafic derived) of the nine samples were Emerson Class one or two and spontaneously dispersive. These dispersive samples all had EC values in the 1:5 extract of less than 1,500 µS/cm. Higher salinity samples, despite high sodicity are not spontaneously dispersive due to the salt content holding the clay material together. Gradual leaching of salt from these samples in the field from rainfall is expected to result in the samples becoming increasingly dispersive, based on the ESP and clay contents.
- The levels of exchangeable aluminium as shown in Table A2-9 Appendix 2 (e.g KEGR32 3-7 0.73 cmoles(+)/kg) indicates that exchangeable aluminium is a major source of acidity in weathered oxide wastes from the Project. The levels of exchangeable aluminium (as well as the salinity and high silt

content) would make the materials hostile for use in rehabilitation as a growth medium. However, leachate from oxide waste contains relatively little titratable acidity and has limited capacity for mobilising heavy metals (AMD) when compared to acidity generated by oxidation of sulfide minerals in fresh rock lithologies.

6.6 MINERALOGY

Results for the mineralogical assessment of the crystalline and amorphous content of five selected samples from the fresh and transitional rock zones are summarised in Table 6. The quantitative X-ray diffraction analysis report is provided in Appendix 3 .

The results confirm the absence of both sulfidic minerals (namely pyrite), as well as calcite and/or dolomite as readily reactive carbonate minerals for acid neutralisation. Significant amounts of reactive silicate ANC was found to be present as chlorite and illite/muscovite, although these minerals react very slowly and are only capable of acid neutralisation to pH 4.5 to 5.0. Mafic samples were dominated by various dark coloured amphiboles collectively classed as hornblende, as well as sodium plagioclase (albite). The weathered pegmatite sample KEGR32 34-36 is notable for being dominated by mixed layer clays such as illite/smectite (along with quartz), which is consistent with the high ECEC values of these samples and tendency towards clay dispersion.

The presence of a lithium aluminium hydroxy sheet silicate cookeite (9%) tentatively identified in the transitional pegmatite sample KEGR32 34-36 is consistent with a process of weathering of spodumene in the fresh rock. The lithium bearing minerals petalite (a tectosilicate) or lepidolite (a mica) were not detected in this ore sample, although petalite was indicated by Kidman Resources as also being present in pegmatite ore from Earl Grey. Lepidolite is a possible mineral source of the rubidium enrichment by isomorphous substitution of rubidium for lithium. Consistent with variable enrichment in lithium (Section 6.2) in the mafic lithology, the fresh mafic sample KEGR22 90-99 was identified as having lithium amphiboles (3%) present.

Table 6: Mineralogical Summary

Sample	Weathering Zone	Lithology	Mineral Content (%)
KEGR22 55-60	Fresh	Mafic	Hornblende/calcium aluminium amphiboles (69), sodium plagioclase/albite (14), clinopyroxene (5), chlorite (5), quartz (2), amorphous (2), illite/muscovite (1), goethite (1), potassium feldspar (1).
KEGR22 90-99	Fresh	Mafic	Hornblende/calcium aluminium amphiboles (52), sodium plagioclase/albite (22), clinopyroxene (1), chlorite (10), quartz (2), amorphous (6), illite/muscovite (4), lithium amphibole (3), potassium feldspar (2).
KEGR27 60-67	Transitional	Mafic	Hornblende/calcium aluminium amphiboles (52), calcium plagioclase (18), clinopyroxene (9), chlorite (3), quartz (4), amorphous (5), illite/muscovite (2), tourmaline (2), potassium feldspar (4), clay (2).
KEGR50 64-66	Fresh	Pegmatite (Ore)	Sodium plagioclase/albite (27), hornblende/calcium aluminium amphiboles (17), quartz (22), spodumene (10), illite/muscovite (6), potassium feldspar (9), clays (2), chlorite (1), amorphous (2).
KEGR32 34-36	Transitional	Pegmatite	Quartz (37), mixed layer clays (24), sodium plagioclase/albite (6), cookeite (9), hornblende/calcium aluminium amphiboles (1), illite/muscovite (4), potassium feldspar (3), chlorite (5), amorphous (9), kaolinite/other clays (1).

7. RESULTS AND DISCUSSION FOR PREDICTED TAILINGS PROPERTIES BASED ON ORE ANALYSIS

In addition to analysis of six ore samples for metals and metalloids, the results of X-Ray fluorescence (XRF) analysis of 5,117 samples of pegmatite ore were collated in order to predict the likely composition of tailings from the Project. A conservative estimation of tailings composition was made on an assumption that all of lithium in the pegmatite would be floated from the pegmatite as a mixture with approximately 20% quartz (and/or feldspar) content (i.e. producing a concentrate comprising 80% spodumene and 20% quartz) — leaving behind all elements in the original ore other than Li, Al and Si removed with the spodumene.

Processing will generate two tailings streams:

- Coarse (oversize) rejects.
- Fine tailings, which will be deposited in an existing gold tailings storage facility following refurbishment and expansion.

The geochemical characteristics of the coarse rejects are expected to be similar to that of pegmatite waste rock.

Results for the calculated average of XRF assay, the average of the five ore samples analysed as part of this study, the calculated tailings composition and GAI values are given in Table A2-10 of Appendix 2. The calculated average lithium content of the ore samples from the present study was equivalent to 1.62% as Li_2O, which is considered sufficiently similar to the overall resource estimate of 1.44% (Kidman Resources February 2017 estimate) on which to draw conclusions.

The following aspects are noted from examination of Table A2-10 of Appendix 2:

- Although arsenic was enriched in one sample of ore (KEGR25 150-155, 310 mg/kg), the overall average concentration of arsenic in ore was 108 mg/kg and 144 mg/kg in the tailings and below the level considered enriched (calculated GAI of 2).
- Enriched elements in the calculated tailings consisted of beryllium (168 mg/kg, GAI 6), rubidium (3,198 mg/kg GAI 4), tin (62 mg/kg GAI 4) and tantalum (70 mg/kg, GAI 4). As the process of gravity separation and flotation of spodumene from the ore will not chemically alter mineral phases present, these elements are expected to remain low in solubility as assessed on the ore samples themselves (Section 6.3.2).

As described above, rubidium is geochemically enriched in the pegmatite ore and following flotation of the spodumene, it is assumed for the present purpose that rubidium will remain in the tailings materials at slightly higher than original concentrations (rubidium is associated with the feldspars by substitution for potassium). As rubidium is naturally radioactive due to the Rb-87 isotope, an estimation of the total expected activity of tailings materials for the project was made based on the calculated concentrations (Table A2-10 Appendix 2) and specific activities for each element of the four naturally occurring elements in the tailings (U, Th, K and Rb). Results are outlined in Table 7 below where the specific activities for naturally occurring proportions of the isotopes applied were: U (U-238) 12,445 Bq/g, Th (Th-232) 4,059 Bq/g, K (K-40) 30.9 Bq/g and Rb (Rb-87) 670 Bq/g.

Table 7: Estimated Activity of Tailings

Tailings Calc. as:	Uranium		Thorium		Potassium		Rubidium		Total Activity
Units	mg/kg	Bq/g	mg/kg	Bq/g	mg/kg	Bq/g	mg/kg	Bq/g	Bq/g
Average Ore	3.16	0.039	1.78	0.007	18,711	0.58	2,390	1.60	2.23
Calculated Tailings	4.22	0.053	2.38	0.010	25,048	0.77	3,199	2.14	3.00

A level of 1 Bq/g head of chain total activity is considered 'inherently safe' to humans (IAEA 2004) as the resulting effective dose to workers is very unlikely to be more than 1 mSv/year – but this assumes the activity is from natural uranium and thorium radionuclides. For rubidium the *Radiation Safety Act 1975 (WA)* has a defined criteria of 30 Bq/g for a radioactive material or a total activity (accounting for volume and activity) of less than 0.4 MBq for Rb-87 (Schedule V). On this basis for tailings at 3 Bq/g, quantities above approximately 130 kg classify as a radioactive substance. A level of 10,000 Bq/g is applicable in relation to placarding and management during transport of Rb-87 based naturally occurring radioactive material (ARPANSA 2014, Table 2). Hence, naturally occurring radiation levels in these materials although present are very low and do not classify for dangerous goods purposes. Monitoring under part 16.2 of the *Mines Safety Inspection Regulations 1995 (WA)* will only be required to maintain inhalable and respirable dust levels below statutory limits in order to control the risk of exposure to this NORM material (DMP 2010)

Due to the elevated quartz content and finely ground nature of tailings, management for airborne respirable silica as part of site dust management and monitoring will be required. This can be achieved by adequately maintaining the moisture content on the TSF surface during operations.

8. CONCLUSIONS AND IMPLICATIONS FOR MANAGEMENT

8.1 FRESH ROCK WASTE CHARACTERISATION

Geochemical assessment of 24 fresh mafic waste rock samples and 5 fresh rock contact zone samples indicated that:

- Only one of the 28 samples of mafic/contact zone fresh analysed contained more than the 0.3% total sulfur content considered capable of potentially generating AMD in a semi-arid environment. All fresh rock waste samples were classified by acid base accounting procedures as NAF. Fresh mafic waste rock had very low average total sulfur concentrations (0.07% equal to an AP of 2 kg H_2SO_4/t) versus a moderate average ANC (31 kg H_2SO_4/t).
- All mafic and contact zone waste rocks showed significant enrichment in lithium and beryllium consistent with the geology of the orebody formation. Arsenic (maximum 333 mg/kg) and chromium (maximum 1,101 mg/kg) were the most commonly enriched elements other than these in mafic/contact zone samples, with both being enriched in three samples (GAI 3). Although other selected samples were also enriched in antimony, rubidium, tin, tantalum and cadmium (one sample) from these lithologies, the levels of enrichment were marginal and average overall concentrations of environmentally significant metals and metalloids were low.
- Water leachates were alkaline and with low salinity and indicated very low to less than detectable concentrations of most metals and metalloids, which is consistent with the insoluble nature of the expected mineral forms. All results were well below ANZECC 2000 livestock drinking and DoH 2014 non-potable groundwater water use guidelines, with the exception of aluminium for which results were inconsistent and more likely to be a result very fine particulate material. Any seepage or runoff from these materials is predicted to be alkaline, low to brackish salinity with very low concentrations of metals and metalloids and low levels of soluble alkalinity.
- Any contact with acidic materials (e.g. contact with acidic pore water from acidic subsoils and oxide waste) was simulated by leaching with a weak acid (acetic acid). Under the acidic conditions of this test, the primary elements released were iron, aluminium, silicon, calcium and magnesium, which are all considered a slight dissolution of available acid neutralising species.
- Arsenic was more soluble for fresh mafic and contact zone samples under acid conditions than for water leachates, however all samples (maximum 0.53 mg/L arsenic in the 1:20 extract) remained approximately one tenth of the ANZECC 2000 livestock drinking water guideline of 5 mg/L. Concentrations of all other environmentally significant metals and metalloids remained low to very low, even under acidic conditions and also below ANZECC 2000 livestock drinking water guidelines.

8.2 TRANSITIONAL AND OXIDE WASTE CHARACTERISATION

Geochemical assessment of nine transitional mafic/pegmatite, seven weathered oxide mafic and four weathered oxide pegmatite samples indicated that:

- Only one highly weathered clay rich mafic oxide had sufficient sulfur to warrant full ABA analysis and was technically classed as PAF (low capacity) according to standard ABA classification. However, this classification is considered an artefact of the presence of acid insoluble sulfates, which leads to overestimation of oxidisable sulfur content. This sample along, with other oxide waste samples, should be considered as naturally acidic subsoil/oxide waste.
- All transitional mine waste rock samples were classified as NAF.
- As for fresh rock samples, transitional mine waste rocks showed significant enrichment in lithium and beryllium but these were absent in more highly weathered oxide clays. Antimony, tin and tantalum were also enriched in a sample of transitional pegmatite, which is again consistent with the largely unweathered

orebody. Overall the concentrations of environmentally significant metals and metalloids were lower than for fresh rock material.

- Arsenic was the most soluble environmentally significant metalloid in water leachates with a maximum of 1.0 mg/L soluble in transitional pegmatite in the 1:5 extract. This remains significantly below the ANZECC 2000 livestock drinking water guideline of 5 mg/L and is not considered a risk to the surrounding environment – particularly given the hypersaline nature of the groundwater.
- The pH and salinity of transitional and oxide mine waste material was strongly correlated with depth. All samples less than approximately 30 m deep (i.e. the most weathered samples) were strongly to extremely acid, with pH values in the range 3.9 to 5.4, and highly to extremely saline (EC > 780 µS/cm). Transitional samples at deeper depths were circum-neutral and only slightly saline (approximately 200 to 300 µS/cm in a 1:5 extract). Both observations suggest a shift at approximately this depth (30 m) from highly weathered acidic kaolinite based clays to less weathered illite 'layer' clays.
- All oxide samples were sodium and magnesium dominant with high ESP values between 16 and 62%, indicating all samples of clay-rich oxide waste from the project are highly sodic and prone to be dispersive. Emerson Class results indicated four of the nine oxide/transition samples were spontaneously dispersive, however the samples which were not spontaneously dispersive all had EC values in the 1:5 extract of greater than 1,500 µS/cm. Gradual leaching of excess salt from these higher salinity samples in the field if under exposed conditions is expected to result in these materials becoming increasingly dispersive, based on the ESP and clay contents.
- The levels of exchangeable aluminium indicate this is a major source of the acidity in weathered oxides from the Project. The levels of aluminium (as well as salinity) would make these materials hostile for any use in rehabilitation as a growth medium.

8.3 ORE CHARACTERISATION AND PREDICTED TAILINGS PROPERTIES

Acid base accounting assessment was conducted for 15 fresh rock samples of ore-grade pegmatite from the project, with additional geochemical testing conducted on five selected samples. A prediction of tailings composition was made based on the average ore composition from this study (which aligned with Project averages from 5,117 samples for XRF assay) and typical flotation recoveries for spodumene. These results indicated that:

- All samples of pegmatite ore contained extremely low levels of total sulfur (average 0.02% and maximum 0.12%) which resulted in all ore samples, and hence tailings, being classified as NAF.
- As expected for a pegmatite orebody, all ore samples showed significant geochemical enrichment in lithium, beryllium, rubidium, tantalum and tin. Ore samples were otherwise very low in significant enrichment with only arsenic in one ore sample recording a value considered enriched (GAI 3) versus an average soil abundance of 25 mg/kg.
- Water leachate results for ore samples (which should closely match those of process tailings), were alkaline, low salinity and indicated very low to less than detectable concentrations of most metals and metalloids. All results were well below ANZECC 2000 livestock drinking water and DoH 2014 non-potable groundwater water use guidelines, with the exception of aluminium for which overall results were inconsistent and more likely to be a result of very fine particulate material. Arsenic, despite enrichment in one sample, had very low solubility in water extracts (lower than for corresponding concentrations in mafic waste rock).
- Spodumene was the only lithium bearing mineral positively identified in mineralogy analysis of a single ore sample – potentially present petalite was not detected in this sample. Cookeite (a likely alteration product of spodumene) was identified as the principal lithium mineral in transitional pegmatite.
- Tailings concentrations for most elements were calculated to be approximately 1.3 times the concentration present in the ore after allowing for removal of the spodumene (80%) and quartz (20%) by gravity

separation/flotation. Enriched elements in the calculated tailings consisted of beryllium (168 mg/kg, GAI 6), rubidium (3,198 mg/kg, GAI 4), tin (62 mg/kg, GAI 4) and tantalum (70 mg/kg, GAI 4). As the process of gravity separation and flotation of spodumene from crushed ore will not chemically alter mineral phases present, these elements are expected to remain low in solubility as assessed on the ore samples themselves.

- Calculated total radioactivity of the ore and tailings material expected for the Project was calculated as 2.23 Bq/g and 3.0 Bq/g respectively – primarily due to the enriched presence of rubidium and hence the naturally occurring beta emitter rubidium isotope Rb-87. Normal dust control measures will be sufficient for control of beta radiation exposure from these materials.

8.4 IMPLICATIONS FOR MANAGEMENT

8.4.1 Fresh Rock Waste

As a result of this study the following are deemed suitable uses for the fresh rock mafic waste from the Project:

- All fresh rock waste is considered NAF and geochemically benign with very low levels of soluble metals and metalloids and no considered risk of any seepage or run-off impacting the surrounding environment.
- The material is suitable for use in mine use, rock armouring or other purposes as required.

8.4.2 Oxide Waste

As a result of this study the following considerations for management of oxide waste from the project should be considered:

- All clay rich oxide overburden material (mafic and pegmatite) within 30 m of the surface is highly saline to extremely saline and highly naturally acidic with significant levels of exchangeable aluminium acidity. Although low in general soluble toxicants, these properties make the material unsuitable as growth medium. As stated in discussion in Section 6.5, leachate from highly weathered oxide regolith contains relatively low concentrations of titratable acidity and therefore presents much lower environmental risk than AMD resulting from oxidation of sulfide minerals.
- Deeper transitional zone material from approximately 30 to 45 m is circum-neutral and slightly to moderately saline. This material is better suited (compared to highly weathered oxide) as growth medium if this is required.
- Due to the elevated fines content and sodic nature of these materials, all oxide and transitional waste is either spontaneously dispersive or likely to become so if placed in exposed (surface or near surface) locations where the salt, which currently stabilises clay aggregates, will gradually leach from the material. Weathered mafics have an elevated fines content and are likely to erode if placed on slopes (erosion being a somewhat different process to dispersion).
- Management of oxide mine waste should avoid placing the material on sloped surfaces in order to prevent erosion. Suitable options would include returning oxide mine waste materials into the pit void and/or encapsulation with the competent mafic rock waste and/or coarse rejects in an above ground landform. Rehabilitation outcomes for pit void filling would be improved if the most acidic and saline oxide material is not placed in the upper 2 to 3 m of the backfill – transitional zone material should be used in this upper most part of the backfill..

8.4.3 Tailings

Considerations for management of tailings produced by downstream processing of Project ore include:

- Tailings, comprising fines and coarse rejects streams, are predicted to be NAF and although enriched in beryllium, tin, tantalum and rubidium, have very low solubility of metals, metalloids and fluoride. Any seepage from tailings material is not considered to be a risk to the surrounding environment and saline groundwater.

- Due to levels of quartz (20 to 30%) in the tailings material and the process of grinding to allow beneficiation of the spodumene, management of the mine and downstream fine tailings should be done to minimise the potential for dust exposure (respirable quartz human health risk). Such management measures may include maintaining a moist bed of tailings across the surface of the tailings storage facility or to dispose of the tailing in cells in a pit void prior to covering with mine waste and soil materials.
- Although a calculated activity of 2.5 Bq/g to 3 Bq/g was estimated in the ore and tailings respectively, the levels of rubidium-87 based NORM radiation in these materials is very low and exposure will be adequately controlled by controlling airborne dust levels within normal exposure limits (DMP 2010). Use of other radioactive sources on site in addition to this NORM material may (depending on type) warrant an assessment of total effective dose for workers.

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10. GLOSSARY OF TECHNICAL TERMS

Term	Explanation
AC	Acid consuming material. Defined as NAF material which has a NAPP value in excess of –100 kg H_2SO_4/t.
ANC	Acid Neutralising Capacity. A process where a sample is reacted with excess 0.5 m HCl at a pH of about 1.5, for 2-3 hours at 80-90ºC followed by back-titration to pH=7 with sodium hydroxide. This determines the acid consumed by soluble materials in the sample.
ankerite	A calcium, iron, magnesium, manganese carbonate mineral of general formula $Ca(Fe,Mg,Mn)(CO_3)_2$. In composition it is closely related to dolomite, but differs from this in having magnesium replaced by varying amounts of iron(II) and manganese. The calcium and magnesium components are acid consuming, but the iron and manganese components are not.
AP	Acid Potential. Similar to MPA, but only is based on the amount of sulfide-sulfur (calculated at the difference between total sulfur and sulfate-sulfur (SO4-S)) rather than total sulfur. AP (kg H_2SO_4/t) = (Total S – SO_4-S) x 30.6.
basalt	A dark coloured fine grained mafic extrusive igneous rock composed chiefly of calcium plagioclase and pyroxene. Extrusive equivalent of gabbro underlies the ocean basins and comprises oceanic crust.
beryl	A group of minerals all of composition $Be_3Al_2(SiO_3)_6$ (hexagonal cyclosilicates) found almost exclusively in granitic pegmatites. Gemstone varieties (differences in colour only) include emerald and aquamarine.
BIF	Banded Iron Formation. Layered rock formed from banded deposits of iron rich sediment laid down at the bottom of primordial oceans.
dolerite	A mafic, holocrystalline, subvolcanic rock equivalent to volcanic basalt (but larger grained) or plutonic gabbro.
dolomite	Calcium magnesium carbonate $CaMg(CO_3)_2$.
calcite	Calcium carbonate $CaCO_3$.
Carb NP	Carbonate Neutralisation Potential. The amount of ANC provided by carbonate minerals. Carb NP (kg H_2SO_4/t) = TIC (%) x 81.7.
cassiterite	Tin oxide SnO_2 a highly insoluble tetragonal tin mineral associated with pegmatites and the primary tin ore.
circum-neutral pH	pH value near 7.
EC	Electrical conductivity. A measurement of solution salinity. Conversion: 1,000 µS/cm = 1 dS/m = 1 mS/cm.
ECEC	Effective Cation Exchange Capacity, defined as the total amount of exchangeable cations, which are mostly sodium, potassium, calcium and magnesium in non-acidic regolith, and include aluminium in acidic regolith. Units for ECEC and individual exchangeable cations are centimoles of positive charge equivalents per kilogram (cmol(+)/kg).
ESP	Exchangeable sodium percentage – the proportion of exchangeable sodium cations to the total exchangeable cation capacity (sodium, potassium, calcium, magnesium and possibly aluminium).
felsic	Silicate minerals, magma, and rocks which are enriched in the lighter elements such as silicon, oxygen, aluminium, sodium, and potassium.
granite	A coarse-grained, intrusive igneous rock composed primarily of light coloured minerals such

Term	Explanation
	as quartz, plagioclase, orthoclase and muscovite mica. Granite is one of the main components of continental crust.
lepidolite	A mica mineral with the general formula $K(Li,Al,Rb)_2(Al,Si)_4O_{10}(F,OH)_2$.
mafic	Descriptive of igneous rock containing a high content of ferromagnesian silicate minerals, but less than those present in ultramafic rocks. Common mafic rocks include basalt, dolerite and gabbro.
MPA	Maximum Potential Acidity. A calculation where the total sulfur in the sample is assumed to all be present as pyrite. This value is multiplied by 30.6 to produce a value known as the Maximum Potential Acidity reported in units of kg H_2SO_4/t.
NAF	Non Acid Forming.
NAG	Net Acid Generation. A process where a sample is reacted with 15% hydrogen peroxide solution at pH = 4.5 to oxidise all sulfides and then time allowed for the solution to react with acid soluble materials. This is a direct measure of the acid generating capacity of the sample but can be affected by the presence of organic materials.
NAG pH	The pH after the NAG test with hydrogen peroxide and heating is completed i.e. oxidation of all sulfides.
NAPP	Net Acid Producing Potential. NAPP (kg H_2SO_4/t) = AP – ANC.
PAF	Potentially Acid Forming.
PAF-LC	Potentially Acid Forming – Low Capacity. Waste rock classification for samples with NAPP values less than or equal to 10 kg H_2SO_4/t.
PAF-HC	Potentially Acid Forming – High Capacity. Waste rock classification for samples with NAPP values greater than 10 kg H_2SO_4/t.
petalite	Lithium aluminium tectosilicate [$LiAlSi_4O_{10}$] a feldspar mineral associated with pegmatites and and ore of lithium. It converts to spodumene and quartz upon heating to ca. 500 °C.
pyrite	Iron (II) sulfide, FeS_2. Pyrite is the most common sulfide minerals and the major acid forming mineral oxidising to produce sulfuric acid.
saprock	A rock chemically broken down in its original place by deep weathering of the bedrock surface. It consists of partially weathered and unweathered primary minerals and maintains all of the fabric and structural features of the parent fresh rock.
saprolite	Highly weathered saprock. Minerals such as feldspars and micas have been fully weathered to clay minerals, while only highly resistant minerals such as quartz and zircon remain unaltered. Saprolite still retains the fabric and some of the structural features of the parent fresh rock.
siderite	Iron(II) carbonate $FeCO_3$.
spodumene	Lithium aluminium inosilicate [$LiAl(SiO_3)_2$] the primary source of 'hard rock' lithium.
tantalite	Tantalum oxide [$(Fe, Mn)Ta_2O_6$] a highly insoluble mineral associated with pegmatites and the primary source of tantalum.
TIC	Total Inorganic Carbon.
TSF	Tails Storage Facility.
Ultramafic	An igneous rock with very low silica content and rich in minerals such as hypersthene, augite and olivine. These rocks are also known as ultrabasic rocks.

APPENDICES

APPENDIX 1: ACID FORMING WASTE CLASSIFICATION METHODOLOGY

ACID FORMING WASTE CLASSIFICATION METHODOLOGY

1. OXIDATION OF SULFIDES

There is no simple method of defining whether mine waste containing small quantities of sulfur will produce sulfuric acid. Sulfide minerals containing ferrous iron such as pyrite (FeS_2), marcasite (FeS_2) and pyrrhotite ($Fe_{(1-x)}S$) normally oxidise to produce sulfuric acid and ferric oxy-hydroxide. Whilst sulfur in pyrite will always form sulfuric acid, a portion of the sulfur in marcasite and pyrrhotite forms highly soluble sulfite, thiosulfate, more complex polythionate ions and elemental sulfur, some or all of which may never form acid. Similarly, sulfur in chalcopyrite and arsenopyrite rarely forms sulfuric acid due to simultaneous oxidation of copper and/or arsenic resulting in formation of non-acid forming copper sulfides and soluble sulfates (Section 4). Sulfur in galena (PbS), sphalerite (ZnS), stibnite (Sb_2S_3) and other iron-free sulfides is non-acid producing. Sulfur present as sulfate in minerals such as barite ($BaSO_4$), anhydrite ($CaSO_4$), gypsum ($CaSO_4.2H_2O$), epsomite ($MgSO_4.7H_2O$) and alkali sulfates is also non-acid producing.

There is a group of iron and aluminium sulfate minerals that fall into a special category. An example is the mineral jarosite ($KFe_3(OH)_6(SO_4)_2$), an oxidation product of pyrite formed under certain environmental conditions. Substitution of aluminium for iron results in the common aluminium sulfate mineral, alunite ($KAl_3(OH)_6(SO_4)_2$). Although sulfur in jarosite (and alunite) is fully oxidised and therefore cannot produce further acidity under oxidising conditions, it can release acidity by hydrolysis as indicated by the chemical Equation 1:

Equation 1

$$KFe_3(OH)_6(SO_4)_2 + 3H_2O \rightarrow 3Fe(OH)_3 + K^+ + 3H^+ + 2SO_4^{2-}$$

This form of acidity is commonly referred to as “stored acidity” or “residual acidity”. This aspect of acidity in discussed further in Section 5 of this Appendix.

Potential for acid production relies on determination of total sulfur content (Tot_S), and non-sulfide sulfur content (commonly described as sulfate sulfur (SO_4_S)). Where necessary, determination of sulfur in the acid insoluble minerals barite (barium sulfate) and celestite (strontium sulfate) commonly described as barite sulfur, may be undertaken.

2. ACID NEUTRALISATION

Acid Neutralising Capacity (ANC) is a measure of the natural ability of the sample to neutralise acid. It is normally determined in the laboratory by measuring the amount of residual acidity following reaction of a finely ground sample of mine waste with an excess of dilute hydrochloric acid. This method captures all minerals, including carbonates, oxides, hydroxides, phosphates and some silicate minerals that are capable of neutralising hydrochloric acid.

The ANC results are based on the assumption that all acid-neutralising materials are rapid-acting. In practice, some neutralising capacity is supplied by silicate and alumino-silicate minerals which can have slow to very slow reaction kinetics. The most common and reactive group of acid-consuming minerals are calcite ($CaCO_3$) and dolomite ($CaMg(CO_3)_2$). Measurement of total carbon content (or total inorganic carbon) provides a rapid and usually accurate method of estimating the contribution of these carbonate minerals to the ANC.

3. WASTE CLASSIFICATION

Calculations are undertaken of Maximum Potential Acidity (MPA) and Net Acid Producing Potential (NAPP). MPA is based on the incorrect assumption that all sulfur present in the sample is acid producing (sourced from pyrite FeS_2). Measurement of sulfate sulfur which does not contribute to acidity, will allow for correction of the MPA this to give Acid Production Potential (AP). As discussed in Section 2 of this appendix, NAPP calculations may also over value the ANC. Generally, NAPP tends to over-estimate potential acidity. However, with care and a good knowledge of the minerals present, it is suitable for conservative prediction of potential acid generation.

Due to the lack of reliability of uncorrected MPA calculations, geological and geochemical experience is required to classify the wastes. Two concepts have been developed to alleviate the degree of difficulty associated with evaluating MPA results:

1. *The analysis concept* refers to situations where Tot_S is less than 0.3% sulfur; Acid Rock Drainage (ARD) is unlikely to occur. This sulfur value corresponds to a maximum of 9.2 kg H_2SO_4/t. With weathered rocks in arid areas where there may be a substantial percentage of SO_4_S and the presence of some carbonate minerals, the analysis concept is often correct. It is, however, commonly inaccurate in humid climates where some sulfur may be present in organic forms and unsuitable for acid sulfate soils investigations.

2. *The ratio concept* compares the direct calculation of MPA from Tot_S and the ANC analytical measurement, then classifies samples as either Non Acid Forming (NAF), where the ratio of ANC/AP is greater than or equal to two, or Potentially Acid Forming (PAF) where the same ratio is less than or equal to two.

The methodology of the ratio concept is unsatisfactory as it does not allow for SO_4_S, or sulfur associated with barium sulfate or organic materials. It therefore tends to overestimate the MPA, resulting in a lower ratio value. For oxide to fresh rock, transitional, supergene enriched sulfide samples, many iron ores, most manganese ores and most zinc-copper stratiform sulfide horizons in felsic volcanics, this methodology fails. Ratio concept classification can be incorrect due to SO_4_S and barium sulfate content, particularly in manganese ores and most zinc-copper stratiform sulfide horizons where barite is often a substantial rock forming mineral. The ratio concept often gives incorrect results when used with acid sulfate soils and in conditions of very high salinity. It will also give incorrect results if applied to waste dumps that have not been rehabilitated and where the dominant residual sulfides in the wastes are base metal sulfides. This includes the iron-bearing sulfides chalcopyrite, bornite and arsenopyrite which all have high sulfur content but generate little or no acid.

In arid areas where rainfall comes in short heavy showers, followed by long periods of low humidity, climatic conditions minimise sulfide alteration. Oxidation products are flushed with each rainfall period resulting in dispersal over large areas with little or no acidic build-up. This is the basis behind the Analysis Concept, which gives sound results in areas with seasonal rainfall and an arid climate.

The “analysis concept” methodology is suitable to characterise mine waste during the early stages of feasibility drilling to ensure potentially acid forming materials are not missed utilising inexpensive mixed acid analytical methods with ICP-OES finish for base metals and sulfur determination. It is preferable to reduce the total sulfur cut off to 0.2%. This mixed acid methodology does not include barium sulfate sulfur in the final result. The sulfur values obtained approximate sulfide sulfur plus sulfate sulfur required for calculation of NAPP.

Basic classification of wastes undertaken in this report utilises the following methodology:

- Analysis for total sulfur (Tot_S).
- Analysis for non-sulfide sulfur (SO_4_S), quoted as sulfur, not sulfate.
- Analysis for ANC (quoted in kg H_2SO_4/t).

- Calculation of AP (SO_4_S corrected MPA) = [(Tot_S - SO_4_S) multiplied by 30.6 kg] H_2SO_4/t.
- Calculation of NAPP = [AP- ANC] kg H_2SO_4/t.

The waste classifications are based directly on the difference between total and non-sulfide sulfur (Tot_S - SO_4_S) and the NAPP value. The classifications are substantially more conservative than the Analysis Concept and the Ratio Concept but assume the absence of barium sulfate sulfur. The PAF-LC and "Uncertain" Classes will record as NAF using either of the Analysis or the Ratio concepts. These classes are defined in Table A1-1.

Table A1-1: NAPP Classification of Acid Rock Drainage

Primary Geochemical Waste Type Class	Sulfide - Sulfur Content *	NAPP Value kg H_2SO_4/t *
Potentially Acid Forming (PAF)	≥ 0.3%	≥ 10
Potentially Acid Forming - Low Capacity (PAF-LC)	≥ 0.16 ≤ 0.3%	5 to 10
Uncertain, probably NAF	≥ 0.00 ≤ 0.16%	0 to 5
Non Acid Forming (NAF)	Not important	- 100 to 0
Acid Consuming Materials	Not important	< -100

* *The NAPP value, not the sulfur value, is used to define the Class.*

"Uncertain samples" can be reclassified by undertaking a NAG determination (oxidation of a subsample in the laboratory with hydrogen peroxide to oxidise all the sulfide minerals to sulfuric acid where possible followed by an acidity and pH determination). NAG testing is particularly useful for PAF-LC materials or where there is a very low ANC in the host rock. A combined acid generation classification scheme based on NAPP and NAG determinations is presented in Table A1-2.

Table A1-2: Combined NAPP and NAG Classification of Acid Rock Drainage

Primary Geochemical Waste Type Class	NAPP Value kg H_2SO_4/t	NAG pH	Sulfide S Content
Potentially Acid Forming (PAF)	≥ 10	< 4.5	≥ 0.3%
Potentially Acid Forming – Low Capacity (PAF-LC)	0 to 10	< 4.5	0.16 to 0.3%
Uncertain possibly NAF	0 to 5	> 4.5	Not important
Uncertain possibly PAF	-10 to 0	< 4.5	Not important
Non Acid Forming (NAF)	-100 to 0	> 4.5	Not important
Acid Consuming Materials (AC)	< -100	> 4.5	Not important

4. ACID GENERATION FROM OTHER SULFIDE MINERALS

The principle of Acid Base Accounting procedures described above is based on the acid generating properties of the iron sulfide mineral pyrite (FeS_2). Pyrite reacts with oxygen and water to produce acidity (H^+) according to Equation 2:

Equation 2

$$4FeS_2 + 15O_2 + 14H_2O \rightarrow 4Fe(OH)_3 + 16H^+ + 8SO_4^{2-}$$

The stoichiometry of this reaction indicates that oxidation of one mole of pyrite will produce two moles of sulfuric acid or alternatively, 30.6 kg of sulfuric acid will be produced by oxidation of one tonne of mine waste containing 1% by weight of sulfur.

Other iron sulfides, such as pyrrhotite ($Fe_{(1-x)}S$), marcasite (FeS_2) and mackinawite ($Fe_{(1+x)}S$) react by different mechanisms, but all result in production of a maximum of one mole of sulfuric acid per mole of sulfur (30.6 kg of sulfuric acidic will be produced by oxidation of one tonne of mine waste containing 1% by weight of sulfur).

Copper sulfide minerals also react with oxygen, but the amount of acid produced depends on the composition of the mineral, and in particular the iron content. Chemical equations for the oxidation of copper sulfide minerals such as chalcocite (Cu_2S), covellite (CuS), chalcopyrite ($CuFeS_2$) and bornite (Cu_5FeS_4) are presented in Equation 3 to Equation 6 (inclusive):

Equation 3

$$2Cu_2S + 2H_2O + 5O_2 \rightarrow 2Cu(OH)_2 + 2Cu^{2+} + 2SO_4^{2-}$$

Equation 4

$$CuS + 2O_2 \rightarrow Cu^{2+} + SO_4^{2-}$$

Equation 5

$$4CuFeS_2 + 17O_2 + 10H_2O \rightarrow 4Cu^{2+} + 4Fe(OH)_3 + 8SO_4^{2-} + 8H^+$$

Equation 6

$$4Cu_5FeS_4 + 18H_2O + 37O_2 \rightarrow 12Cu^{2+} + 8(Cu(OH)_2 + 4Fe(OH)_3 + 16SO_4^{2-} + 8H^+$$

Other base metal sulfides containing metals including cobalt, nickel, lead and zinc indicate similar behaviour to those of copper sulfides. Chemical equations for the oxidation of common nickel sulfide minerals such as millerite (NiS), pentlandite ($Fe_xNi_{(9-x)}S_8$), and violarite ($FeNi_2S_4$) are presented in Equation 7 to Equation 9 (inclusive):

Equation 7

$$NiS + 2O_2 \rightarrow Ni^{2+} + SO_4^{2-}$$

Equation 8

$$Fe_xNi_{(9-x)}S_8 + {}^{(5x-2)}/_2H_2O + {}^{(36-7x)}/_2O_2 \rightarrow (9-x)Ni^{2+} + xFe(OH)_3 + 8SO_4^{2-} + (2x-2)H^+$$

Equation 9

$$4FeNi_2S_4 + 14H_2O + 31O_2 \rightarrow 8Ni^{2+} + 4Fe(OH)_3 + 16SO_4^{2-} + 16H^+$$

The predicted maximum amounts of sulfuric acid that can be produced by complete oxidation of various iron, copper and nickel sulfide minerals are listed in Table A1-3. These values indicate that acid generation is only possible if the sulfide mineral contains iron. Chalcopyrite, a common iron-copper sulfide mineral, has potential to generate acidity upon complete oxidation, but the maximum amount of potential acidity per percentage unit of sulfur in the mine waste is only half that of pyrite (or marcasite or pyrrhotite).

Table A1-3: Predicted Sulfur Acid Generation Potential from Oxidation of Iron, Copper and Nickel Sulfide Minerals

Mineral Name	Formula	Acid Generation Potential ($kg\ H_2SO_4/t$)	
		Per tonne of Mineral	Per 1% Sulfur
Pyrite	FeS_2	1,633	30.6
Marcasite	FeS_2	1,633	30.6
Pyrrhotite	$Fe_{(1-x)}S$	1,115	30.6
Chalcocite	Cu_2S	Nil	Nil
Covellite	CuS	Nil	Nil
Chalcopyrite	$CuFeS_2$	267	15.3
Bornite	Cu_5FeS_4	49	7.6
Millerite	NiS	Nil	Nil
Pentlandite	$Fe_xNi_{(9-x)}S_8$	Variable, depending on the value of x.	
Violarite	$FeNi_2S_4$	650	15.3

It should also be noted that oxidation of copper and nickel sulfide minerals can form soluble copper (Cu^{2+}) and nickel (Ni^{2+}) ions. Both metals form slightly soluble hydroxides (($Cu(OH)_2$) and $Ni(OH)_2$)), which significantly reduces the concentration of free metal ions in solution if the pH remains above 6.5. However, oxidation of copper and nickel sulfide minerals containing iron (e.g. chalcopyrite and violarite) can result in very low pH values, typically below 4.5 if there are insufficient carbonate minerals present to consume the generated acidity. For this reason, it is recommended that NAG measurements for mine waste containing copper and/or nickel sulfides be conducted to endpoint pH values of 4.5 and 7.0:

- NAG acidity to pH 4.5 includes hydrogen (H^+), ferric (Fe^{3+}), manganese (Mn^{2+}) and aluminium (Al^{3+}) ion acidity, but not copper ions (Cu^{2+}) or nickel (Ni^{2+}) ions.
- NAG acidity to pH 7.0 also includes the amount of alkalinity required to precipitate all of the soluble copper ions as $Cu(OH)_2$ and nickel ions as $Ni(OH)_2$. The difference between NAG acidity to pH 4.5 and NAG acidity to pH 7.0 is a measure of the amount of oxidisable copper and nickel sulfides in the sample.

The potential for mixed element iron sulfides to generate variable amounts of acidity is further complicated by the presence of arsenic. Arsenopyrite (FeAsS) is a common sulfide mineral often associated with gold mineralisation in the Western Australian goldfields.

Oxidation of arsenopyrite may be described by Equation 10 and Equation 11:

Equation 10

$$4FeAsS + 21O_2 + 16H_2O \rightarrow 4Fe(OH)_3 + 4SO_4^{2-} + 4AsO_4^{3-} + 20H^+$$

Equation 11

$$2FeAsS + 7O_2 + 2H_2O \rightarrow 2\text{"}FeAsO_4\text{"} + 2SO_4^{2-} + 4H^+$$

"$FeAsO_4$" may vary from crystalline ferric arsenate minerals such as scorodite ($FeAsO_4.2H_2O$) to arsenate anions adsorbed onto hydrous iron oxide surfaces. Regardless of the actual form of "FeAsO4", oxidation of arsenopyrite results in formation of 30.6 kg of sulfuric acid from one tonne of mine waste containing 1% by weight of sulfur, as for pyrite, marcasite and pyrrhotite (Table A1-3). If, however, the iron end product is $Fe(OH)_3$, then the resulting amount of acid (in the form of both sulfuric acid, H_2SO_4, and arsenic acid, H_3AsO_4) will be 2.5 times higher. Alternatively, oxidation of arsenopyrite by this reaction results in formation of 76.5 kg of sulfuric acid equivalents from one tonne of mine waste containing 1% by weight of sulfur.

In conclusion, using a factor of 30.6 to calculate the amount of acidity as kg H_2SO_4/t is only valid if all of the sulfur is present as iron sulfide minerals. If mixed copper, nickel and other base metals are present, use of the 30.6 conversion factor will over-estimate the amount of acidity produced. If arsenopyrite is present, use of the 30.6 conversion factor may under-estimate the amount of acidity produced.

5. RESIDUAL ACIDITY

It is important to note that material classified as NAF by acid-base accounting methodology described above may not have circum-neutral or alkaline pH values. For reasons outlined in this Section, it is possible for NAF waste to be moderately to highly acidic as a result of existing "residual" or "natural" acidity. Conversely, it is common for PAF waste to be slightly to moderately alkaline.

Laterite waste rock is an example of material that usually classifies as NAF by acid-base accounting procedures described above, but often records moderate to highly acidic pH values. A NAF classification results from very low total sulfur contents, most of which is present in oxidised form, combined with moderate ANC values. However, most of this ANC is associated with silicate minerals that require highly acidic conditions (pH 1.5 to 4.5) to consume acidity in the ANC test procedure.

As discussed in Section 1 of this Appendix, most of the "residual" or "natural" acidity of these materials may be explained by the presence of iron and aluminium sulfate minerals including jarosite and alunite. Additional acidity may be associated with cation exchange properties of highly weathered clay minerals. In circum-neutral or alkaline wastes, basic cations (calcium, magnesium, sodium and potassium) account for most or all of the Cation Exchange Capacity (CEC). In acidic materials, the sum of concentrations of basic cations (expressed in units of centimoles of positive charge per kilogram) is less than CEC expressed with the same units. In these situations, charge neutrality is maintained by the presence of "acidic" cations including H^+, Al^{3+} and Mn^{2+}. The sum of the concentrations of these cations (expressed in units of centimoles of positive charge per kilogram) is referred to as "exchangeable acidity". The contribution of "exchangeable acidity" in acidic, clay-rich lateritic waste rock may be as high as 5 kg H_2SO_4/t (depending on clay mineralogy). It is important to note that leachate from materials containing only "exchangeable acidity" usually contain low levels of soluble acidity, which presents a low risk to the receiving environment. However, elevated levels of "exchangeable acidity" are toxic to plants, meaning that such materials are unsuitable as a growth medium or as a subsoil water storage layer for plants.

pH values of freshly mined waste rock, regardless of a NAF or PAF classification, is determined by the presence of various acid-consuming minerals. A summary of typical pH conditions associated with different waste types is presented in Table A1-4.

Table A1-4: pH Values of Various Waste Rock Types as Controlled by Significant Minerals

Typical pH Values	Significant Minerals	Typical Waste Rock Types
Greater than 9.0	Sodium and potassium carbonate, reactive silicates such as forsterite (Mg_2SiO_4), wollastonite ($CaSiO_3$) and cordierite ($(Mg,Fe)_2Al3(Si_5AlO_{18})$.	Mafic and ultramafic volcanics.
8.0 to 9.0	Calcium and magnesium carbonates such as calcite ($CaCO_3$), magnesite ($MgCO_3$), dolomite ($CaMg(CO_3)_2$) and ankerite ($Ca(Fe,Mg,Mn)(CO_3)_2$).	Mafic and ultramafic volcanics, calcareous sedimentary rocks.
5.0 to 9.0	Many common silicate and aluminosilicate minerals such as feldspars, micas and pyroxenes.	Many igneous, non-calcareous sedimentary and metamorphic rock types.
4.0 to 5.0	Highly weathered clay minerals including kaolinite ($Al_2Si_2O_5(OH)_4$), goethite (FeOOH) and gibbsite ($Al(OH)_3$).	Laterite and saprock developed over acidic igneous rock types.
Less than 4.0	Alunite, jarosite and related minerals.	Gossans, acid sulfate soils, oxidised sulfidic wastes.

APPENDIX 2: COLLATED GEOCHEMICAL RESULTS

LIST OF APPENDIX TABLES

Table A2-1: Sample Descriptions

Sample	Drill Hole	Depth (m)	Description
KEGR22 3-11	KEGR22	3 – 11	Clay, highly weathered saprock from weathered mafics
KEGR22 55-60	KEGR22	55 – 60	Fresh mafic waste
KEGR22 85-89	KEGR22	85 – 89	Pegmatite ore
KEGR22 90-99	KEGR22	90 – 99	Fresh mafic waste
KEGR22 106-107	KEGR22	106 – 107	Pegmatite/mafic contact
KEGR22 140-145	KEGR22	140 – 145	Pegmatite ore
KEGR32 3-7	KEGR32	3 – 7	Clay, highly weathered saprock from weathered mafics
KEGR32 11-15	KEGR32	11 – 15	Oxide/transition zone mafics
KEGR32 34-36	KEGR32	34 – 36	Oxide/transition zone pegmatite
KEGR32 86-102	KEGR32	86 – 102	Fresh mafic waste
KEGR32 102-112	KEGR32	102 – 112	Pegmatite ore
KEGR32 140-147	KEGR32	140 – 147	Fresh mafic waste
KEGR25 6-11	KEGR25	6 – 11	Clay, highly weathered saprock from weathered mafics
KEGR25 15-18	KEGR25	15 – 18	Clay, highly weathered saprock from weathered pegmatite
KEGR25 45-50	KEGR25	45 – 50	Oxide/transition zone mafics
KEGR25 90-95	KEGR25	90 – 95	Fresh mafic waste
KEGR25 145-147	KEGR25	145 – 147	Pegmatite/mafic contact
KEGR25 150-155	KEGR25	150 – 155	Pegmatite ore
KEGR25 195-200	KEGR25	195 – 200	Fresh mafic waste
KEGR26 44-45	KEGR26	44 – 45	Clay, highly weathered saprock from weathered pegmatite
KEGR26 50-52	KEGR26	50 – 52	Pegmatite/mafic contact
KEGR26 90-95	KEGR26	90 – 95	Fresh mafic waste
KEGR26 110-115	KEGR26	110 – 115	Pegmatite ore
KEGR26 152-153	KEGR26	152 – 153	Pegmatite/mafic contact
KEGR26 160-165	KEGR26	160 – 165	Fresh mafic waste
KEGR27 17-25	KEGR27	17 – 25	Clay, highly weathered saprock from weathered pegmatite
KEGR27 37-44	KEGR27	37 – 44	Clay, highly weathered saprock from weathered mafics
KEGR27 60-67	KEGR27	60 – 67	Oxide/transition zone mafics
KEGR27 81-84	KEGR27	81 – 84	Fresh mafic waste
KEGR50 13-19	KEGR50	13 – 19	Clay, highly weathered saprock from weathered pegmatite
KEGR50 19-21	KEGR50	19 – 21	Clay, highly weathered saprock from weathered mafics
KEGR50 21-25	KEGR50	21 – 25	Oxide/transition zone mafics
KEGR50 35-40	KEGR50	35 – 40	Pegmatite ore
KEGR50 64-66	KEGR50	64 – 66	Pegmatite ore
KEGR50 69-70	KEGR50	69 – 70	Pegmatite/mafic contact
KEGR50 70-75	KEGR50	70 – 75	Fresh mafic waste
KEGR50 80-85	KEGR50	80 – 85	Fresh mafic waste
KEGR58 43-47	KEGR58	43 – 47	Oxide/transition zone pegmatite
KEGR58 55-60	KEGR58	55 – 60	Pegmatite ore
KEGR58 85-90	KEGR58	85 – 90	Fresh mafic waste

Sample	Drill Hole	Depth (m)	Description
KEGR60 40-42	KEGR60	40 – 42	Oxide/transition zone pegmatite
KEGR60 42-45	KEGR60	42 – 45	Fresh mafic waste
KEGR60 50-53	KEGR60	50 – 53	Pegmatite ore
KEGR60 61-63	KEGR60	61 – 63	Pegmatite ore
KEGR60 65-70	KEGR60	65 – 70	Fresh mafic waste
KEGR90 52-56	KEGR90	52 – 56	Fresh mafic waste
KEGR90 70-75	KEGR90	70 – 75	Fresh mafic waste
KEGR90 154-156	KEGR90	154 – 156	Pegmatite ore
KEGR90 175-180	KEGR90	175 - 180	Pegmatite ore
KEGR90 200-205	KEGR90	200 – 205	Fresh mafic waste
KEGR96 6-10	KEGR96	6 – 10	Clay, highly weathered saprock from weathered mafics
KEGR96 31-34	KEGR96	31 -34	Oxide/transition zone mafics
KEGR96 35-40	KEGR96	35 – 40	Fresh mafic waste
KEGR96 44-50	KEGR96	44 – 45	Fresh mafic waste
KEGR96 60-65	KEGR96	60 – 65	Pegmatite ore
KEGR96 95-100	KEGR96	95 – 100	Fresh mafic waste
KEGR77 39-43	KEGR77	39 - 43	Oxide/transition zone pegmatite
KEGR77 54-59	KEGR77	54 – 59	Fresh mafic waste
KEGR77 75-80	KEGR77	75 – 80	Fresh mafic waste
KEGR77 110-115	KEGR77	110 – 115	Pegmatite ore
KEGR77 145-150	KEGR77	145 – 150	Pegmatite ore
KEGR14 15-20	KEGR14	15 – 20	Clay, highly weathered saprock from weathered mafics
KEGR14 52-55	KEGR14	52 – 55	Fresh mafic waste
KEGR14 83-88	KEGR14	83 – 88	Fresh mafic waste

Table A2-2: Acid Base Accounting

Sample	Waste Type	Total-S	SO4-S	Total C	AP	ANC	NAPP	NAG	NAGpH	NPR Ratio	Classification
		%	%	%	kg H_2SO_4/t				pH units		
KEGR22 3-11	Weathered Mafic	0.04		0.04	1.2	2				1.6	NAF
KEGR32 3-7	Weathered Mafic	0.28	0.07	0.15	6.4	0	6	2	4.2	0.0	PAF-LC*
KEGR25 6-11	Weathered Mafic	0.06		0.04	1.8	2				1.1	NAF
KEGR27 37-44	Weathered Mafic	0.01		0.02	0.3	4				13	NAF
KEGR50 19-21	Weathered Mafic	0.05		0.08	1.5	2				1.3	NAF
KEGR96 6-10	Weathered Mafic	0.04		0.08	1.2	2				1.6	NAF
KEGR14 15-20	Weathered Mafic	0.02		0.20	0.6	7				11	NAF
KEGR25 15-18	Weathered Pegmatite	0.04		0.05	1.2	3				2.5	NAF
KEGR26 44-45	Weathered Pegmatite	<0.01		0.03	<0.3	7				23	NAF
KEGR27 17-25	Weathered Pegmatite	0.02		0.03	0.6	1				1.6	NAF
KEGR50 13-19	Weathered Pegmatite	0.04		0.11	1.2	1				0.8	NAF
KEGR22 106-107	Contact Zone	0.02		0.63	0.6	68				111	NAF
KEGR25 145-147	Contact Zone	0.25	0.01	0.23	7.3	26	-19	0	6.5	3.5	NAF
KEGR26 50-52	Contact Zone	<0.01		0.02	<0.3	9				30.0	NAF
KEGR26 152-153	Contact Zone	0.05		0.12	1.5	8				5.2	NAF
KEGR50 69-70	Contact Zone	<0.01		0.04	<0.3	25				83.3	NAF
KEGR22 55-60	Fresh Mafic	0.04		0.04	1.2	28				22.9	NAF
KEGR22 90-99	Fresh Mafic	0.03		0.06	0.9	26				28.3	NAF
KEGR32 86-102	Fresh Mafic	0.07		0.16	2.1	28				13.1	NAF
KEGR32 140-147	Fresh Mafic	0.04		0.16	1.2	26				21.2	NAF
KEGR25 90-95	Fresh Mafic	0.03		0.08	0.9	25				27.2	NAF
KEGR25 195-200	Fresh Mafic	0.12		0.45	3.7	47				12.8	NAF

Sample	Waste Type	Total-S	SO4-S	Total C	AP	ANC	NAPP	NAG	NAGpH	NPR Ratio	Classification
		%	%	%	kg H_2SO_4/t				pH units		
KEGR26 90-95	Fresh Mafic	0.04		0.07	1.2	19				15.5	NAF
KEGR26 160-165	Fresh Mafic	0.04		0.13	1.2	24				19.6	NAF
KEGR27 81-84	Fresh Mafic	0.07		0.02	2.1	24				11.2	NAF
KEGR50 70-75	Fresh Mafic	0.03		0.31	0.9	28				30.5	NAF
KEGR50 80-85	Fresh Mafic	0.02		0.39	0.6	32				52.3	NAF
KEGR58 85-90	Fresh Mafic	0.03		0.21	0.9	31				33.8	NAF
KEGR60 42-45	Fresh Mafic	<0.01		0.03	<0.3	20				66.7	NAF
KEGR60 65-70	Fresh Mafic	0.55	0.04	0.47	15.6	65	-49	0	8.4	4.2	NAF
KEGR90 52-56	Fresh Mafic	<0.01		0.02	<0.3	9				30.0	NAF
KEGR90 70-75	Fresh Mafic	0.04		0.08	1.2	14				11.4	NAF
KEGR90 200-205	Fresh Mafic	0.20	0.01	0.13	5.8	84	-78	0	8.1	14.4	NAF
KEGR96 35-40	Fresh Mafic	<0.01		0.22	<0.3	14				46.7	NAF
KEGR96 44-50	Fresh Mafic	0.11		0.44	3.4	25				7.4	NAF
KEGR96 95-100	Fresh Mafic	0.07		0.12	2.1	32				14.9	NAF
KEGR77 54-59	Fresh Mafic	0.04		0.04	1.2	11				9.0	NAF
KEGR77 75-80	Fresh Mafic	0.04		0.04	1.2	29				23.7	NAF
KEGR14 52-55	Fresh Mafic	<0.01		0.04	<0.3	40				133	NAF
KEGR14 83-88	Fresh Mafic	0.1		0.20	3.1	62				20.3	NAF
KEGR22 85-89	Pegmatite Ore	0.01		0.05	0.3	8				26.1	NAF
KEGR22 140-145	Pegmatite Ore	0.03		0.09	0.9	9				9.8	NAF
KEGR32 102-112	Pegmatite Ore	0.04		0.07	1.2	10				8.2	NAF
KEGR25 150-155	Pegmatite Ore	0.02		0.10	0.6	4				6.5	NAF
KEGR26 110-115	Pegmatite Ore	0.02		0.05	0.6	4				6.5	NAF
KEGR50 35-40	Pegmatite Ore	0.01		0.44	0.3	8				26.1	NAF

Sample	Waste Type	Total-S	SO4-S	Total C	AP	ANC	NAPP	NAG	NAGpH	NPR Ratio	Classification
		%	%	%	kg H_2SO_4/t				pH units		
KEGR50 64-66	Pegmatite Ore	<0.01		0.20	<0.3	13				43.3	NAF
KEGR58 55-60	Pegmatite Ore	<0.01		0.04	<0.3	6				20.0	NAF
KEGR60 50-53	Pegmatite Ore	<0.01		0.03	<0.3	6				20.0	NAF
KEGR60 61-63	Pegmatite Ore	<0.01		0.02	<0.3	24				80.0	NAF
KEGR90 154-156	Pegmatite Ore	0.12		0.12	3.7	13				3.5	NAF
KEGR90 175-180	Pegmatite Ore	0.07		0.07	2.1	9				4.2	NAF
KEGR96 60-65	Pegmatite Ore	0.01		0.11	0.3	29				94.8	NAF
KEGR77 110-115	Pegmatite Ore	<0.01		0.05	<0.3	6				20.0	NAF
KEGR77 145-150	Pegmatite Ore	0.01		0.11	0.3	9				29.4	NAF
KEGR32 11-15	Transitional Mafic	0.02		0.02	0.6	6				9.8	NAF
KEGR25 45-50	Transitional Mafic	0.02		0.07	0.6	14				22.9	NAF
KEGR27 60-67	Transitional Mafic	0.02		0.01	0.6	26				42.5	NAF
KEGR50 21-25	Transitional Mafic	0.01		0.16	0.3	6				19.6	NAF
KEGR96 31-34	Transitional Mafic	0.01		0.30	0.3	9				29.4	NAF
KEGR32 34-36	Transitional Pegmatite	0.02		0.04	0.6	7				11.4	NAF
KEGR58 43-47	Transitional Pegmatite	<0.01		0.04	<0.3	5				16.7	NAF
KEGR60 40-42	Transitional Pegmatite	<0.01		0.06	<0.3	3				10.0	NAF
KEGR77 39-43	Transitional Pegmatite	<0.01		0.03	<0.3	4				13.3	NAF

**As NAGpH is equal to the original pH this samples is already fully oxidised.*

Denotes PAF classification

Denotes Uncertain classification

Denotes NAF/AC classification

Table A2-3: Metals and Metalloids

Sample	Waste Type	Ag	Al	As	Ba	Be	Ca	Cd	Co	Cr	Cu	Fe	K	Li	Mg
		mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	%	mg/kg	mg/kg	mg/kg
KEGR22 3-11	Weathered Mafic	<0.05	113834	116	60	1.0	197	<0.02	24	520	32	5	1472	64	1020
KEGR25 15-18	Weathered Pegmatite	0.11	183100	8.5	5.7	0.6	260	<0.02	4.3	188	12	0.5	426	103	826
KEGR26 50-52	Contact Zone	<0.05	79290	147	175	11.9	39681	0.40	116	23	189	11	4916	1074	23068
KEGR26 152-153	Contact Zone	0.08	43578	224	6.3	167	2303	0.64	1.6	17	6	0.5	20051	6426	504
KEGR22 55-60	Fresh Mafic	0.11	68810	108	393	2.1	83281	0.14	40	762	49	8.7	5590	354	65968
KEGR22 90-99	Fresh Mafic	0.11	67242	58.9	450	5.4	55824	0.08	59	973	76	8.4	8986	1736	76347
KEGR32 86-102	Fresh Mafic	0.12	76943	18	160	9.3	65102	0.09	40	159	91	6.9	4832	1027	41247
KEGR25 90-95	Fresh Mafic	0.10	76907	129	247	34	55886	0.13	36	10	90	7.2	15408	2150	23298
KEGR25 195-200	Fresh Mafic	0.10	57766	333	28	2.0	105914	0.07	45	1101	48	7.8	4410	410	55555
KEGR27 81-84	Fresh Mafic	0.21	78650	73.7	400	4.5	59266	0.14	47	75	79	8.9	16257	526	41646
KEGR50 70-75	Fresh Mafic	0.10	67056	158	55	5.2	61927	1.24	52	947	46	7.5	2574	459	62037
KEGR90 52-56	Fresh Mafic	0.07	77753	65.5	37	8.4	50984	0.16	70	509	145	8.8	1296	1592	43096
KEGR96 44-50	Fresh Mafic	0.07	77942	277	134	3.9	54651	0.16	39	182	93	7.2	7035	871	41797
KEGR22 140-145	Pegmatite Ore	0.07	67077	106	11	124	4117	0.30	2.9	56	5	0.7	15226	8018	2514
KEGR25 150-155	Pegmatite Ore	0.07	38046	310	3	136	1404	0.18	2.4	23	5	0.6	17441	9391	252
KEGR50 64-66	Pegmatite Ore	0.11	78424	16.3	33	98	20020	0.25	14	196	21	2.3	18060	4226	16109
KEGR60 50-53	Pegmatite Ore	0.05	64860	22.2	1.2	129	1241	0.28	0.4	16	3	0.5	23346	7078	284
KEGR96 60-65	Pegmatite Ore	0.09	53173	5.6	8	115	4058	0.41	1.7	21	7	0.5	17746	8606	613
KEGR77 110-115	Pegmatite Ore	0.10	41917	186	1.9	151	1051	0.15	0.7	14	3	0.5	20447	7948	348
KEGR27 60-67	Transitional Mafic	0.13	70895	87	148	11.1	86169	0.33	39	67	39	7.3	7579	739	45491
KEGR32 34-36	Transitional Pegmatite	0.08	78276	73	28	130	1087	<0.02	20	129	55	4.1	9126	2569	7080
DER 2010 EIL				**20**	**300**			**3**	**50**	**400**	**100**				
Crustal Average		**0.07**	**82,000**	**25**	**425**	**0.17**	**41,000**	**0.11**	**20**	**100**	**50**	**4.1**	**21,000**	**20**	**23,000**

Table A2-3: Metals and Metalloids, continued

Sample	Waste Type	Mn	Mo	Na	Nb	Ni	Pb	Rb	Sb	Se	Sn	Ta	Th	U	V	Zn
		mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
KEGR22 3-11	Weathered Mafic	25	3.1	2065	10	105	10	14	1.5	0.9	4.0	2.2	16	2.9	310	6.0
KEGR25 15-18	Weathered Pegmatite	112	0.3	3006	3.2	37	9.0	4.1	6.1	<0.5	2.1	1.2	2.6	1.1	389	10
KEGR26 50-52	Contact Zone	2107	0.4	19995	2.1	448	0.9	267	1.5	<0.5	13	0.5	0.5	4.2	295	179
KEGR26 152-153	Contact Zone	1169	2.9	27760	79	6.0	6.9	2985	0.7	<0.5	42	51	2.3	5.5	3.0	148
KEGR22 55-60	Fresh Mafic	1428	1.5	8150	2.6	201	6.7	137	0.8	<0.5	8.7	0.2	8	1.4	251	95
KEGR22 90-99	Fresh Mafic	1447	0.9	12475	2.1	304	2.6	326	0.6	<0.5	4.9	1.7	0.3	0.2	215	76
KEGR32 86-102	Fresh Mafic	1796	1.2	15096	5.2	101	1.6	343	0.9	<0.5	6.9	6.4	0.5	2.4	241	89
KEGR25 90-95	Fresh Mafic	1531	1.3	13574	14	50	2.6	1142	0.8	<0.5	16	9.5	1	1.8	204	92
KEGR25 195-200	Fresh Mafic	1445	2.3	10115	0.9	172	2.2	78	0.9	<0.5	12	0.5	0.2	0.2	215	89
KEGR27 81-84	Fresh Mafic	1333	0.3	11445	1.4	79	2.5	450	1.2	<0.5	45	0.2	0.3	0.3	289	84
KEGR50 70-75	Fresh Mafic	1146	1.9	13798	3.0	310	1.9	137	1.7	<0.5	3.6	1.5	0.6	0.9	201	74
KEGR90 52-56	Fresh Mafic	1271	0.5	18928	1.4	330	1.4	152	1.2	<0.5	1.6	0.8	0.4	2.9	215	198
KEGR96 44-50	Fresh Mafic	1415	3.0	17399	3.4	111	1	313	0.5	0.5	4.7	6.9	0.3	0.3	251	73
KEGR22 140-145	Pegmatite Ore	773	2.6	25263	60	15	7.1	1154	0.5	<0.5	29	37	1.8	4.0	7.0	78
KEGR25 150-155	Pegmatite Ore	750	4.6	21629	75	4.0	6	1884	0.7	<0.5	46	50	1.3	2.4	6.0	99
KEGR50 64-66	Pegmatite Ore	952	2.4	25786	48	56	5.9	2758	0.5	<0.5	38	47	2.5	3.3	54	95
KEGR60 50-53	Pegmatite Ore	1274	2.7	24888	67	17	7.7	3274	0.3	<0.5	46	72	1.9	3.3	3.0	96
KEGR96 60-65	Pegmatite Ore	1354	3.6	22766	53	9.0	5.9	2689	0.2	<0.5	64	56	1.2	3.1	8.0	75
KEGR77 110-115	Pegmatite Ore	886	3.4	23036	70	1.0	6.3	2581	0.9	<0.5	56	52	2.0	2.8	1.0	85
KEGR27 60-67	Transitional Mafic	1481	0.6	7539	3.2	92	6.0	378	0.6	<0.5	69	6.2	0.5	0.3	239	89
KEGR32 34-36	Transitional Pegmatite	647	0.7	12218	43	79	4.2	1341	1.9	<0.5	41	32	2	2.2	153	116
DER 2010 EIL		**500**	**40**			**60**	**600**				**50**				**50**	**200**
Crustal Average		**950**	**1.5**	**23,000**	**20**	**75**	**14**	**90**	**0.2**	**0.2**	**2**	**2**	**10**	**2.7**	**135**	**75**

Table A2-4: Global Abundance Index (GAI)

Sample	Waste Type	Ag	Al	As	Ba	Be	Ca	Cd	Co	Cr	Cu	Fe	K	Li	Mg
KEGR22 3-11	Weathered Mafic	0	0	2	0	2	0	0	0	2	0	0	0	1	0
KEGR25 15-18	Weathered Pegmatite	0	1	0	0	1	0	0	0	0	0	0	0	2	0
KEGR26 50-52	Contact Zone	0	0	2	0	6	0	1	2	0	1	1	0	5	0
KEGR26 152-153	Contact Zone	0	0	3	0	6	0	2	0	0	0	0	0	6	0
KEGR22 55-60	Fresh Mafic	0	0	2	0	3	0	0	0	2	0	1	0	4	1
KEGR22 90-99	Fresh Mafic	0	0	1	0	4	0	0	1	3	0	0	0	6	1
KEGR32 86-102	Fresh Mafic	0	0	2	0	5	0	0	0	0	0	0	0	5	0
KEGR25 90-95	Fresh Mafic	0	0	2	0	6	0	0	0	0	0	0	0	6	0
KEGR25 195-200	Fresh Mafic	0	0	3	0	3	1	0	1	3	0	0	0	4	1
KEGR27 81-84	Fresh Mafic	0	0	1	0	4	0	0	1	0	0	1	0	4	0
KEGR50 70-75	Fresh Mafic	0	0	2	0	4	0	3	1	3	0	0	0	4	1
KEGR90 52-56	Fresh Mafic	0	0	1	0	5	0	0	1	2	1	1	0	6	0
KEGR96 44-50	Fresh Mafic	0	0	3	0	4	0	0	0	0	0	0	0	5	0
KEGR22 140-145	Pegmatite Ore	0	0	1	0	6	0	1	0	0	0	0	0	6	0
KEGR25 150-155	Pegmatite Ore	0	0	3	0	6	0	0	0	0	0	0	0	6	0
KEGR50 64-66	Pegmatite Ore	0	0	0	0	6	0	1	0	0	0	0	0	6	0
KEGR60 50-53	Pegmatite Ore	0	0	0	0	6	0	1	0	0	0	0	0	6	0
KEGR96 60-65	Pegmatite Ore	0	0	0	0	6	0	1	0	0	0	0	0	6	0
KEGR77 110-115	Pegmatite Ore	0	0	2	0	6	0	0	0	0	0	0	0	6	0
KEGR27 60-67	Transitional Mafic	0	0	1	0	5	0	1	0	0	0	0	0	5	0
KEGR32 34-36	Transitional Pegmatite	0	0	1	0	6	0	0	0	0	0	0	0	6	0
Crustal Average (mg/kg)		**0.07**	**82000**	**25**	**425**	**0.17**	**41000**	**0.11**	**20**	**100**	**50**	**4.1**	**21000**	**20**	**23000**

Table A2-4: Global Abundance Index (GAI) continued

Sample	Waste Type	Mn	Mo	Na	Nb	Ni	Pb	Rb	Sb	Se	Sn	Ta	Th	U	V	Zn
KEGR22 3-11	Weathered Mafic	0	0	0	0	0	0	0	2	2	0	0	0	0	1	0
KEGR25 15-18	Weathered Pegmatite	0	0	0	0	0	0	0	4	0	0	0	0	0	1	0
KEGR26 50-52	Contact Zone	1	0	0	0	2	0	1	2	0	2	0	0	0	1	1
KEGR26 152-153	Contact Zone	0	0	0	1	0	0	4	1	0	4	4	0	0	0	0
KEGR22 55-60	Fresh Mafic	0	0	0	0	1	0	0	1	0	2	0	0	0	0	0
KEGR22 90-99	Fresh Mafic	0	0	0	0	1	0	1	1	0	1	0	0	0	0	0
KEGR32 86-102	Fresh Mafic	0	0	0	0	0	0	1	2	0	1	1	0	0	0	0
KEGR25 90-95	Fresh Mafic	0	0	0	0	0	0	3	1	0	2	2	0	0	0	0
KEGR25 195-200	Fresh Mafic	0	0	0	0	1	0	0	2	0	2	0	0	0	0	0
KEGR27 81-84	Fresh Mafic	0	0	0	0	0	0	2	2	0	4	0	0	0	1	0
KEGR50 70-75	Fresh Mafic	0	0	0	0	1	0	0	3	0	0	0	0	0	0	0
KEGR90 52-56	Fresh Mafic	0	0	0	0	2	0	0	2	0	0	0	0	0	0	1
KEGR96 44-50	Fresh Mafic	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0
KEGR22 140-145	Pegmatite Ore	0	0	0	1	0	0	3	1	0	3	4	0	0	0	0
KEGR25 150-155	Pegmatite Ore	0	1	0	1	0	0	4	1	0	4	4	0	0	0	0
KEGR50 64-66	Pegmatite Ore	0	0	0	1	0	0	4	1	0	4	4	0	0	0	0
KEGR60 50-53	Pegmatite Ore	0	0	0	1	0	0	5	0	0	4	5	0	0	0	0
KEGR96 60-65	Pegmatite Ore	0	1	0	1	0	0	4	0	0	4	4	0	0	0	0
KEGR77 110-115	Pegmatite Ore	0	1	0	1	0	0	4	2	0	4	4	0	0	0	0
KEGR27 60-67	Transitional Mafic	0	0	0	0	0	0	1	1	0	5	1	0	0	0	0
KEGR32 34-36	Transitional Pegmatite	0	0	0	1	0	0	3	3	0	4	3	0	0	0	0
Crustal Average (mg/kg)		**950**	**1.5**	**23000**	**20**	**75**	**14**	**90**	**0.2**	**0.2**	**2**	**2**	**10**	**2.7**	**135**	**70**

Table A2-5: Water Leachate (1:5), Major Ions, Metals and Metalloids, Waste Rock and Ore Samples

Sample	Waste Type	pH	EC	Ca	Mg	Na	K	Cl	F	SO_4	HCO_3	CO_3
			µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg $CaCO_3$/L	
KEGR22 3-11	Weathered Mafic	5.5	1130	0.4	11	211	10	313	<0.1	87	3.0	<1
KEGR25 15-18	Weathered Pegmatite	6.1	2907	2.8	63	511	27	825	0.3	192	8.0	<1
KEGR26 50-52	Contact Zone	7.8	540	0.3	1.9	102	1.8	131	0.9	18	7.0	<1
KEGR22 55-60	Fresh Mafic	8.0	290	9.1	3.2	40	2.9	9.0	0.4	97	17	<1
KEGR22 90-99	Fresh Mafic	9.7	110	3.5	1.6	12	5.4	3.0	0.2	3.7	11	29
KEGR25 195-200	Fresh Mafic	8.8	3264	104	66	507	9.5	730	<0.1	212	8	8
KEGR50 70-75	Fresh Mafic	9.6	150	0.7	3.9	31	1.2	9.0	0.6	14	19	22
KEGR96 44-50	Fresh Mafic	9.5	190	1.0	0.8	31	2.8	7.0	0.2	31	19	22
KEGR50 64-66	Pegmatite Ore	9.4	60	0.5	4.1	14	0.9	7.0	1	4.1	8	8
KEGR96 60-65	Pegmatite Ore	9.8	130	1.2	0.4	18	2.7	9.0	0.3	2.9	10	29
KEGR77 110-115	Pegmatite Ore	9.2	210	0.3	1.3	31	3	46	0.2	3.3	12	<1
KEGR27 60-67	Transitional Mafic	9.3	60	0.2	0.5	11	0.4	5.0	0.4	5.5	5	4
KEGR32 34-36	Transitional Pegmatite	7.9	250	0.1	0.3	31	0.9	44	0.8	15	14	<1

Table A2-5: Water Leachate, Metals and Metalloids, Waste Rock and Ore Samples, continued

Sample	Waste Type	Ag	Al	As	Ba	Be	Cd	Co	Cr	Cu	Hg	Li	Mn
		µg/L	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	mg/L	µg/L	mg/L	mg/L
KEGR22 3-11	Weathered Mafic	0.02	0.01	1.8	20	<0.1	<0.02	0.9	<0.01	<0.01	<0.1	0.015	0.01
KEGR25 15-18	Weathered Pegmatite	<0.01	0.05	0.5	1.9	<0.1	<0.02	1.1	<0.01	<0.01	<0.1	0.045	0.01
KEGR26 50-52	Contact Zone	<0.01	5.2	36	1.4	1.7	0.02	14	0.01	0.05	<0.1	0.053	0.11
KEGR22 55-60	Fresh Mafic	0.02	0.6	99	2.5	<0.1	<0.02	0.5	<0.01	<0.01	<0.1	0.21	0.01
KEGR22 90-99	Fresh Mafic	0.02	1.3	156	11	<0.1	<0.02	1.1	0.02	<0.01	<0.1	1.20	0.02
KEGR25 195-200	Fresh Mafic	0.02	<0.01	46	2.1	<0.1	<0.02	3.9	<0.01	<0.01	<0.1	0.33	0.02
KEGR50 70-75	Fresh Mafic	0.02	7.5	585	0.6	1.9	0.15	13	0.11	<0.01	<0.1	0.14	0.04
KEGR96 44-50	Fresh Mafic	0.02	1.5	256	1.1	0.2	<0.02	1.2	<0.01	<0.01	<0.1	0.57	0.02
KEGR50 64-66	Pegmatite Ore	0.02	12	35	1.2	3.9	0.05	3.6	0.01	0.02	<0.1	0.26	0.18
KEGR96 60-65	Pegmatite Ore	<0.01	2.9	10	0.3	2.9	<0.02	0.1	<0.01	<0.01	<0.1	1.35	0.28
KEGR77 110-115	Pegmatite Ore	<0.01	3.5	41	0.2	1.4	<0.02	0.3	<0.01	<0.01	<0.1	1.62	0.24
KEGR27 60-67	Transitional Mafic	0.44	4.7	86	1.3	2.0	<0.02	2.3	0.01	<0.01	0.4	0.054	0.03
KEGR32 34-36	Transitional Pegmatite	0.01	0.6	1017	0.2	0.3	<0.02	1.8	<0.01	<0.01	<0.1	0.12	0.002
Livestock (ANZECC 2000)			**5**	**5000**	**N/G**		**10**	**1000**	**1**	**1**	**2**	**N/G**	**N/G**
Non-Potable Groundwater Use (DOH 2014)			**0.2**	**100**	**20000**	**600**	**20**	**N/G**	**0.5(CrVI)**	**20**	**10**	**2.5***	**5**

** ANZECC 2000 Irrigation guideline*
N/G No guideline

Table A2-5: Water Leachate, Metals and Metalloids, Waste Rock and Ore Samples, continued

Sample	Waste Type	Mo	Nb	Ni	Pb	Sb	Se	Sn	Ta	Th	U	V	Zn
		µg/L	µg/L	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	mg/L
KEGR22 3-11	Weathered Mafic	<0.05	<0.005	<0.01	0.8	<0.01	<0.5	<0.1	0.002	<0.005	0.07	<0.01	<0.01
KEGR25 15-18	Weathered Pegmatite	0.3	<0.005	<0.01	<0.5	0.8	<0.5	<0.1	0.001	<0.005	<0.005	<0.01	0.05
KEGR26 50-52	Contact Zone	1.8	0.1	0.2	0.6	0.7	<0.5	3.3	0.04	0.05	0.30	0.03	0.04
KEGR22 55-60	Fresh Mafic	8.5	0.01	<0.01	<0.5	0.6	0.7	<0.1	0.002	0.04	0.02	<0.01	<0.01
KEGR22 90-99	Fresh Mafic	1.6	0.1	<0.01	<0.5	0.8	0.6	<0.1	0.06	0.03	0.04	<0.01	<0.01
KEGR25 195-200	Fresh Mafic	25	<0.005	0.01	0.7	3.9	<0.5	<0.1	0.002	<0.005	<0.005	<0.01	<0.01
KEGR50 70-75	Fresh Mafic	81	0.2	0.1	<0.5	7.1	6.7	0.7	0.11	0.02	0.21	0.08	0.02
KEGR96 44-50	Fresh Mafic	94	0.03	<0.01	<0.5	0.3	0.6	<0.1	0.04	<0.005	0.01	0.01	<0.01
KEGR50 64-66	Pegmatite Ore	43	3.3	0.02	1.6	0.4	<0.5	4.6	3.1	0.10	1.2	0.01	0.20
KEGR96 60-65	Pegmatite Ore	16	0.9	<0.01	<0.5	0.2	1.1	2.4	0.80	0.10	3.3	<0.01	<0.01
KEGR77 110-115	Pegmatite Ore	28	2.8	<0.01	0.9	1.7	<0.5	1.6	1.7	0.16	2.3	<0.01	0.01
KEGR27 60-67	Transitional Mafic	6.2	0.1	0.02	1.0	0.4	<0.5	6.8	0.2	0.04	0.12	0.04	<0.01
KEGR32 34-36	Transitional Pegmatite	89	0.1	<0.01	<0.5	12	10	1.2	0.02	<0.005	0.20	0.04	<0.01
Livestock (ANZECC 2000)		**150**	**N/G**	**1**	**100**	**N/G**	**20**	**N/G**	**N/G**	**N/G**	**200**	**N/G**	**20**
Non-Potable Groundwater Use (DOH 2014)		**500**	**N/G**	**0.2**	**100**	**30**	**100**	**N/G**	**N/G**	**N/G**	**170**	**N/G**	**3**

Table A2-6: 1:20 Acetic Acid Leachate, Major Ions, Metals and Metalloids, Waste Rock and Ore Samples

Sample	Waste Type	pH	Ag	Al	As	B	Ba	Be	Ca	Cd	Co	Cr	Cu	Fe	Hg	K
		pH units	µg/L	mg/L	µg/L	mg/L	µg/L	µg/L	mg/L	µg/L	µg/L	mg/L	mg/L	mg/L	µg/L	mg/L
KEGR22 3-11	Weathered Mafic	3.2	0.03	0.6	23	0.30	162	0.9	0.7	<0.02	7.2	<0.01	<0.01	0.3	<0.1	6.9
KEGR25 15-18	Weathered Pegmatite	3.1	0.02	0.7	1.2	0.20	2.8	4.5	1.1	0.03	1.7	<0.01	0.02	0.07	<0.1	9.1
KEGR26 50-52	Contact Zone	3.4	0.04	0.06	6.5	0.01	1.0	13.1	1.2	0.50	21	<0.01	<0.01	0.05	<0.1	5.6
KEGR22 55-60	Fresh Mafic	3.6	<0.01	11	100	0.05	137	1.7	37	0.44	126	0.09	0.1	20	<0.1	5.7
KEGR22 90-99	Fresh Mafic	3.7	<0.01	9.3	127	<0.01	382	5.0	61	0.04	79	0.20	0.02	26	<0.1	9.8
KEGR25 195-200	Fresh Mafic	4.3	0.01	3.5	169	<0.01	13	0.7	486	0.28	45	0.05	0.05	7.0	<0.1	3.8
KEGR50 70-75	Fresh Mafic	3.7	<0.01	3.0	531	0.02	8.0	29	22	7.9	180	0.04	0.12	21	<0.1	5.4
KEGR96 44-50	Fresh Mafic	3.7	0.02	12	310	0.03	99	18	49	0.42	167	0.07	0.10	29	<0.1	8.5
KEGR50 64-66	Pegmatite Ore	3.5	0.02	3.0	86.5	0.01	9.6	69	30	1.5	27	0.02	0.05	18	<0.1	4.9
KEGR96 60-65	Pegmatite Ore	3.7	<0.01	22	11	0.03	16	123	42	0.59	6.5	0.03	0.02	7.1	<0.1	5.6
KEGR77 110-115	Pegmatite Ore	3.3	<0.01	3.2	296	0.04	11	25	25	0.51	5.7	0.03	<0.01	11	<0.1	4.3
KEGR27 60-67	Transitional Mafic	3.4	0.12	2.5	52	<0.01	16	19	11	0.35	47	<0.01	0.03	0.2	<0.1	2.3
KEGR32 34-36	Transitional Pegmatite	3.4	<0.01	0.6	4.5	<0.01	0.30	4.9	0.1	<0.02	2	<0.01	<0.01	0.7	<0.1	3.8

Table A2-6: Dilute Acid (1:20 Acetic) Leachate, Major Ions, Metals and Metalloids, Waste Rock and Ore Samples, continued

Sample	Waste Type	Li	Mg	Mn	Mo	Na	Nb	Ni	Pb	Sb	Se	Si	Sn	Ta	Th	U	V	Zn
		mg/L	mg/L	mg/L	µg/L	mg/L	µg/L	mg/L	µg/L	µg/L	µg/L	mg/L	µg/L	µg/L	µg/L	µg/L	mg/L	mg/L
KEGR22 3-11	Weathered Mafic	0.018	11	0.07	<0.05	60	<0.005	0.03	4.5	<0.01	<0.5	8.3	<0.1	0.003	0.5	30	<0.01	0.02
KEGR25 15-18	Weathered Pegmatite	0.026	22	0.02	<0.05	135	<0.005	<0.01	11	0.2	<0.5	6.3	<0.1	0.001	0.01	8.6	<0.01	0.20
KEGR26 50-52	Contact zone	0.042	6.0	0.3	<0.05	80	<0.005	0.1	<0.5	0.03	<0.5	15	<0.1	0.002	<0.005	7.1	<0.01	<0.01
KEGR22 55-60	Fresh Mafic	0.22	11	0.7	3.5	13	<0.005	0.2	1.7	0.3	0.9	19	<0.1	0.002	0.02	3.0	0.02	0.50
KEGR22 90-99	Fresh Mafic	1.01	15	2.0	2.9	4.9	<0.005	0.2	2.6	0.5	<0.5	12	<0.1	0.02	0.03	2.6	<0.01	0.50
KEGR25 195-200	Fresh Mafic	0.12	21	2.8	0.2	84	<0.005	0.2	1.8	2.1	<0.5	5	<0.1	0.001	0.02	1.3	<0.01	0.70
KEGR50 70-75	Fresh Mafic	0.22	28	1.2	5.9	37	<0.005	0.6	0.7	1.5	2.1	17	<0.1	0.008	<0.005	5.3	0.02	0.20
KEGR96 44-50	Fresh Mafic	0.53	17	2.1	6.8	15	<0.005	0.4	1.3	0.3	0.7	21	<0.1	0.03	0.03	1.2	0.02	0.20
KEGR50 64-66	Pegmatite Ore	0.29	14	2.0	15	25	0.04	0.07	<0.5	0.2	<0.5	9.4	0.2	0.09	<0.005	32	0.02	0.30
KEGR96 60-65	Pegmatite Ore	5.60	2.9	19	3.9	12	0.01	0.03	7	0.2	0.6	29	<0.1	0.3	<0.005	47	<0.01	0.20
KEGR77 110-115	Pegmatite Ore	1.45	5.1	15	7.2	13	0.03	0.01	4	0.8	<0.5	5	<0.1	0.2	<0.005	52	<0.01	0.30
KEGR27 60-67	Transitional Mafic	0.067	7.3	0.6	0.1	19	<0.005	0.03	1.2	0.04	<0.5	13	<0.1	0.01	<0.005	1.1	<0.01	<0.01
KEGR32 34-36	Transitional Pegmatite	0.16	1.7	0.05	<0.05	70	0.05	<0.01	<0.5	0.02	<0.5	13	<0.1	0.2	<0.005	1	<0.01	<0.01

Table A2-7: Particle Size Distribution, Oxide Waste Rock Samples

Sample	Waste Type	Less than 2 mm Fraction (% of <2 mm fraction)		
		Sand (>20 µm)	Silt (2 to 20 µm)	Clay (<2 µm)
KEGR22 3-11	Weathered Mafic	71	11.5	17.5
KEGR32 3-7	Weathered Mafic	61	8	31
KEGR25 6-11	Weathered Mafic	68.5	12.5	19
KEGR96 6-10	Weathered Mafic	42.5	23	34.5
KEGR14 15-20	Weathered Mafic	52.5	24	23.5
KEGR26 44-45	Weathered Pegmatite	78	13.5	8.5

Table A2-8: pH, EC (1:5 Extract) and Emerson Class for Oxide Waste Rock Samples

Sample	Waste Type	pH (H_2O)	EC	Emerson Class
		pH units	µS/cm	No Units
KEGR22 3-11	Weathered Mafic	5.4	1200	2
KEGR32 3-7	Weathered Mafic	3.9	1600	6
KEGR25 6-11	Weathered Mafic	4.5	1800	6
KEGR96 6-10	Weathered Mafic	4.4	2100	5
KEGR14 15-20	Weathered Mafic	4.9	1400	1
KEGR25 15-18	Weathered Pegmatite	5.2	2800	6
KEGR26 44-45	Weathered Pegmatite	7.7	230	1
KEGR27 17-25	Weathered Pegmatite	4.2	780	Not Analysed
KEGR50 13-19	Weathered Pegmatite	4.0	1700	6
KEGR32 34-36	Transitional Pegmatite	7.4	270	1

Table A2-9: Exchangeable Cations, Oxide Waste Rock Samples

Sample	Waste Type	Ca	Mg	Na	K	Al	Mn	Li	ECEC	ESP
		centimoles (+)/kg								%
KEGR22 3-11	Weathered Mafic	<0.02	0.15	0.09	<0.02	<0.02	<0.02	0.0016	0.3	32
KEGR32 3-7	Weathered Mafic	0.03	2.5	1.4	0.28	0.73	<0.02	0.0034	5.0	28
KEGR25 6-11	Weathered Mafic	0.05	4.3	1.9	0.39	0.2	<0.02	0.0068	6.9	28
KEGR96 6-10	Weathered Mafic	0.11	3	7.5	0.26	0.61	<0.02	0.0109	11.5	65
KEGR14 15-20	Weathered Mafic	0.59	3.6	10	0.28	0.49	<0.02	0.045	15.0	67
KEGR25 15-18	Weathered Pegmatite	0.09	3.4	0.71	0.29	0.08	<0.02	0.0045	4.6	16
KEGR26 44-45	Weathered Pegmatite	1.5	14	9.2	0.59	N/A	N/A	0.0146	25.3	36
KEGR27 17-25	Weathered Pegmatite	1.2	5.2	3.1	0.34	0.05	0.09	0.0051	10.0	31
KEGR50 13-19	Weathered Pegmatite	0.05	1.8	3.9	0.2	0.35	<0.02	0.0118	6.3	62
KEGR32 34-36	Transitional Pegmatite	0.77	12	9.2	0.55	N/A	N/A	0.0456	22.5	41

Table A2-10: Calculated Tailings Composition and GAIs Based on Average of Ore Samples*

Sample	Ag	Al	As	Ba	Be	Ca	Cd	Co	Cr	Cu	Fe	K	Li	Mg
	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	%	mg/kg	mg/kg	mg/kg
Average of XRF 5117 Samples Ore	NA	NA	143	NA	136	NA	NA	<LOR	NA	<LOR	NA	NA		NA
Average Ore (Present Work)	0.08	57,250	108	9.67	126	5,315	0.26	3.7	54	7.33	0.84	18,711	7,545	3,353
Calculated Tailings	0.11	NA	144	13	168	7,114	0.35	4.9	73	10	1.1	25,043	0	4,488
Calculated GAI Values														
Calculated Tailings	1	NA	2	0	6	0	1	0	0	0	0	0	0	0
DER 2010 EIL			**20**	**300**			**3**	**50**	**400**	**100**				
Crustal Average	**0.07**	**82,000**	**25**	**425**	**0.17**	**41,000**	**0.11**	**20**	**100**	**50**	**4.1**	**21,000**	**20**	**23,000**

Table A2-10: Calculated Tailings Composition and GAIs Based on Average of Ore Samples, continued

Sample	Mn	Mo	Na	Nb	Ni	Pb	Rb	Sb	Se	Sn	Ta	Th	U	V	Zn
	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Average of XRF 5117 Samples Ore	NA	NA	27,547	73	<LOR	<LOR	2,284	NA	NA	62	55	3.09	NA	NA	NA
Average Ore (Present Work)	998	3	23,895	62	17	6	2,390	0.51	<0.5	46	52	1.78	3.16	13	88
Calculated Tailings	1,336	4	31,981	83	23	9	3,198	0.68	<0.5	62	70	2.4	4.2	18	118
Calculated GAI Values															
Calculated Tailings	0	1	0	1	0	0	4	1	1	4	4	0	0	0	0
DER 2010 EIL	**500**	**40**			**60**	**600**				**50**				**50**	**200**
Crustal Average	**950**	**1.5**	**23,000**	**20**	**75**	**14**	**90**	**0.2**	**0.2**	**2**	**2**	**10**	**2.7**	**135**	**75**

** <LOR indicates below limit of reporting, NA indicates not analysed*

APPENDIX 3: MINERALOGY ANALYSIS REPORT

15 Davison Street, Maddington
Western Australia 6109
Telephone: +61 8 9251 8100
Facsimile: +61 8 9251 8110
www.intertek.com
ABN: 32 008 787 237

Quantitative X-Ray Diffraction Analysis

REPORT PREPARED FOR	MARTINICK BOSCH SELL PTY LTD D. ALLEN
CLIENT CODE	282.0
JOB CODE	1617102
No. of SAMPLES	5
CLIENT O/N	D. ALLEN
SAMPLE SUBMISSION No.	N/A
PROJECT	N/A
STATE	PULP samples
DATE RECEIVED	22/11/2016
DATE COMPLETED	14/02/2017
DATE WRITTEN	14/02/2017
WRITTEN BY	Dr Sharon Ness
ANALYSING LABORATORY	Perth

15 Davison Street, Maddington
Western Australia 6109
Telephone: +61 8 9251 8100
Facsimile: +61 8 9251 8110
www.intertek.com
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Sample Details

DISCLAIMER

This report relates specifically to the sample(s) that were drawn and/or provided by the client or their nominated third party. The reported results(s) provide no warranty or verification on the sample(s) representing any specific goods and/or shipment and only relate to the sample(s) as received and tested. This report is prepared solely for the use of the client named in this report. Intertek accepts no responsibility for any loss, damage or laibility suffered by a third party as a result of any reliance upon or use of this report.

The results provided are not intended for commercial settlement purposes.

SIGNIFICANT FIGURES

The method detection limit is approximately 1 wt% for most phases.

Uncertainty in the analysis should reflect errors (absolute) of no greater than: +/- 10% for phases 50-95%, +/- 5% for phases 10-50% and +/- 2% for phases 3-10%. Phases of < 3% are approaching detection limit and normally no refinements are made on these.

Please note that results are rounded off to integer values

LEGEND

ND	Not Detected

15 Davison Street, Maddington
Western Australia 6109
Telephone: +61 8 9251 8100
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Job Information

Preparation

XRD15 (dry 50C, mill < 60um, micronised)

Analytical Method

XRDQUANT02 - Quantitative analysis, crystalline and amorphous content, double scan

Sampling

Sample(s) coned and quartered, then grab(s) taken

Amorphous content determination

Internal standard double scan

Additions

Internal standard ZnO (zincite)

Method

Sample(s) packed and presented as unoriented powder mount(s) of the total sample

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Job Information

Instrumentation and Parameters

Instrument:

PANalytical Cubix^3 XRD
Copper radiation (operating at 45 kV and 40 mA)
Graphite monochromator (diffracted beam)

Parameters:

Parameter	Setting
Start angle (deg 2θ)	4
End angle (deg 2θ)	65
Step size (deg 2θ)	0.02
Time/active length (secs)	150
Active length (deg 2θ)	4.01

Software

Qualitative analysis:

Bruker Diffrac.EVA 4.2 Search/Match
ICDD PDF-2 (2015) database

Quantitative analysis:

SIROQUANT Version 4

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Western Australia 6109
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Facsimile: +61 8 9251 8110
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Results

The quantitative analysis of the crystalline and amorphous content of each sample is given in the file, **282.0_1617102 XRD RESULTS.xlsx**, attached to the report email.

Calculation of the phase abundances has been based on the Brindley contrast corrections using a particle diameter of 4 µm.

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Notes

1

The amorphous content may contain some of the more poorly crystalline clay phases and conversely the clay phase content may contain some poorly crystalline or amorphous material. Where there is a significant presence of clay material, the distinction between poorly crystalline material and amorphous content can be imprecise.

2

For confirmation of the clay mineralogy, a clay separation followed by analysis of oriented clay mounts (glycol and heat treated) would be required.

3

The mixed layer clay is usually a mixture of poorly ordered transitional minerals and may be characterised, for example, as an illite/smectite and/or chlorite/smectite.

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Quality Control

NIST Standard Reference Material (SRM) 656

This standard is used for quality control on the instrument and software.

The standard reference material is a powder which consists of sub-micrometer, equi-axial, non-aggregated grains that do not display the effects of absorption contrast, extinction or preferred orientation.

An aliquot of this SRM, spiked with 10% Al2O3 (SRM 676a) for the amorphous content determination, was prepared as un-oriented powder mount of the total sample and the pattern analysed with SIROQUANT™

Sample ID **α 656 (High α Phase Powder)**

		1617102	method std dev	SRM certified	SRM uncert
Phase	**Formula**	**wt%**	**wt%**	**wt%**	**wt%**
Amorphous content		9.2	0.6	9.6	0.61
Si3N4, alpha	Si3N4	87.9	0.6	87.3	0.59
Si3N4, beta	Si3N4	2.9	0.1	3.1	0.05

Each interval defined by the certified value and its uncertainty is a 95% confidence interval for the true value of the mean in the absence of systematic error.

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Method Description

Quantification is determined from the chosen software package: this uses the full-profile Rietveld method of refining the profile of the calculated XRD pattern against the profile of the measured XRD pattern. The total calculated pattern is the sum of the calculated patterns of the individual phases.

Results are given as weight % of the total crystalline phases and amorphous content.

The amorphous content quantifies the amorphous material and unknown minerals or known minerals for which there is not a suitable crystal structure.

Corrections are incorporated into the process that allows for a more accurate description of the mineral's contribution to the measured pattern and to allow for variation due to atomic substitution, layer disordering, preferred orientation, and other factors that affect the acquisition of the XRD scan.

The limitations of qualitative XRD analysis are as follows:

There is a limit of detection of approximately 1 wt% on the crystalline phases.

The detection of a phase may be dependent on its crystallinity.

Where there exist multiple phases, overlap of diffracted reflections can occur, thus rendering some ambiguity into the interpretation.

Overlapping reflections of a major phase can mask the presence of minor or trace phases.

Some phases cannot be unambiguously identified as they are present in minor or trace amounts.

The limitations of quantitative XRD analysis by a full-profile Rietveld method are as follows:

The limitations for qualitative XRD analysis apply.

The method as described is standardless: it relies solely on the published crystallographic data available for each phase. Some data may not exactly describe the phases present.

Particle size is important with respect to the absorption of the X-rays by the sample. Micronising reduces the particle size to that more suitable for quantitative analysis.

The accuracy of the analysis is dependent on sampling and sample preparation in addition to the calculated profiles being exactly representative of the chemistry of the component phases and their crystallinity. Some preferred orientation effects and reflection overlaps may occur which cannot be adequately resolved.

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Amorphous Content

Internal standard method

Single scan (SIROQUANT™ and TOPAS)

The amorphous content is determined from the addition of a known spike of a well-crystalline internal standard to each sample.

When amorphous material is present, the weight percentage of the spike found is larger than actually weighed out. The amount of amorphous material that causes the difference in the spike weight percentages is then calculated and all weight percentages are normalised to include the amorphous content.

Double scan (SIROQUANT only)

SIROQUANT™ also allows the choice of using the spiked pattern completely, or combining the run with a previous unspiked pattern result. This choice is given because the weight percentages from an unspiked pattern are more accurate since the intensities are not diluted by the spike addition. The percentages from the unspiked sample are normalised to the amorphous content calculated from the spiked sample pattern.

External standard method

The amorphous content is determined from the external standard method[1]

The normalisation constant is determined from the external standard which allows the calculated weight fractions to be placed on an absolute scale.

Reference:

1. O'Connor, B.H., and Raven, M.D., "Application of the Rietveld Refinement Procedure in Assaying Powdered Mixtures", Powder Diffraction 3(1), (1988), 2-6.

Modelling

A pattern representing a poorly crystalline form of silica is used in the SIROQUANT program.[2]

Reference:

2. Ward, C.R. and French, D., "Determination of glass content and estimation of glass composition in fly ash using quantitative X-ray diffractometry." Fuel 85 (2006), 2268-2277.

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Western Australia 6109
Telephone: +61 8 9251 8100
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www.intertek.com
ABN: 32 008 787 237

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Intertek GENALYSIS LABORATORY SERVICES

ANALYTICAL REPORT

MARTINICK BOSCH SELL PTY LTD
4 Cook Street
WEST PERTH, W.A. 6005
AUSTRALIA

COMMENTS

1. Amended Report - This report replaces the previously issued results - FP1/MS Rb and WS/SIE added

JOB INFORMATION

JOB CODE	:	282.0/1617099
No. of SAMPLES	:	64
No. of ELEMENTS	:	51
CLIENT O/N	:	D. ALLEN (Job 1 of 0)
SAMPLE SUBMISSION No.	:	
PROJECT	:	
STATE	:	Rock
DATE RECEIVED	:	22/11/2016
DATE COMPLETED	:	01/02/2017
DATE PRINTED	:	01/02/2017
ANALYSING LABORATORY	:	Intertek Genalysis Perth

LEGEND

X	= Less than Detection Limit
N/R	= Sample Not Received
*	= Result Checked
( )	= Result still to come
I/S	= Insufficient Sample for Analysis
E6	= Result X 1,000,000
UA	= Unable to Assay
>	= Value beyond Limit of Method
OV	= Value over-range for Package

MAIN OFFICE AND LABORATORY NATA: 3244 3273
15 Davison Street, Maddington 6109, Western Australia
PO Box 144, Gosnells 6990, Western Australia
Tel: +61 8 9251 8100 Fax: +61 8 9251 8110
Email: genalysis@intertek.com
Web Page: www.genalysis.com.au

KALGOORLIE SAMPLE PREPARATION DIVISION
12 Keogh Way, Kalgoorlie 6430, Western Australia
Tel: +61 8 9021 6057 Fax: +61 8 9021 3476

ADELAIDE LABORATORY NATA: 3244 18645
11 Senna Road, Wingfield, 5013, South Australia
Tel: +61 8 8162 9714 Fax: +61 8 8349 7444

JOHANNESBURG LABORATORY
43 Malcolm Moodie Crescent,
Jet Park, Gauteng, South Africa 1459
Tel: +27 11 552 8149 Fax: +27 11 552 8248

TOWNSVILLE LABORATORY NATA: 3244 20462
9-23 Kelli Street, Mt St John, Bohle, Queensland, Australia 4818
Tel: +61 7 4774 3655 Fax: +61 7 4774 4692

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It is common practice to report data derived from analytical instrumentation to a maximum of two or three significant figures. Some data reported herein may show more figures than this. The reporting of more than two or three figures in no way implies that the third, fourth and subsequent figures may be real or significant.

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SAMPLE STORAGE DETAILS

GENERAL CONDITIONS

SAMPLE STORAGE OF SOLIDS

Bulk Residues and Pulps will be stored for 60 DAYS without charge. After this time all Bulk Residues and Pulps will be stored at a rate of $4.00 per cubic metre per day until your written advice regarding collection or disposal is received. Expenses related to the return or disposal of samples will be charged to you at cost. Current disposal cost is charged at $150.00 per cubic metre.

SAMPLE STORAGE OF SOLUTIONS

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

ANALYSIS

ELEMENTS	Ag	Ag	Ag	Al	Al	Al
UNITS	ppm	ug/l	ug/l	ppm	mg/l	mg/l
DETECTION LIMIT	0.05	0.01	0.01	50	0.01	0.01
DIGEST	4A/	ASLP/	Ws/	4A/	ASLP/	Ws/
ANALYTICAL FINISH	MS	MS	MS	OE	OE	OE
SAMPLE NUMBERS						
0001 KEGR22 3-11	X	0.03	0.02	11.38%	0.56	0.01
0002 KEGR22 55-60	0.11	X	0.02	6.88%	10.57	0.61
0003 KEGR22 85-89						
0004 KEGR22 90-99	0.11	X	0.02	6.72%	9.25	1.28
0005 KEGR22 106-107						
0006 KEGR22 140-145	0.07			6.71%		
0007 KEGR32 3-7						
0008 KEGR32 11-15						
0009 KEGR32 34-36	0.08	X	0.01	7.83%	0.64	0.63
0010 KEGR32 86-102	0.12			7.69%		
0011 KEGR32 102-112						
0012 KEGR32 140-147						
0013 KEGR25 6-11						
0014 KEGR25 15-18	0.11	0.02	X	>15.00%	0.69	0.05
0015 KEGR25 45-50						
0016 KEGR25 90-95	0.10			7.69%		
0017 KEGR25 145-147						
0018 KEGR25 150-155	0.07			3.80%		
0019 KEGR25 195-200	0.10	0.01	0.02	5.78%	3.54	X
0020 KEGR26 44-45						
0021 KEGR26 50-52	X	0.04	X	7.93%	0.06	5.19
0022 KEGR26 90-95						
0023 KEGR26 110-115						
0024 KEGR26 152-153	0.08			4.36%		
0025 KEGR26 160-165						
0026 KEGR27 17-25						
0027 KEGR27 37-44						
0028 KEGR27 60-67	0.13	0.12	0.44	7.09%	2.53	4.71
0029 KEGR27 81-84	0.21			7.86%		
0030 KEGR50 13-19						
0031 KEGR50 19-21						
0032 KEGR50 21-25						
0033 KEGR50 35-40						
0034 KEGR50 64-66	0.11	0.02	0.02	7.84%	3.01	11.59
0035 KEGR50 69-70						
0036 KEGR50 70-75	0.10	X	0.02	6.71%	2.99	7.51
0037 KEGR50 80-85						
0038 KEGR58 43-47						
0039 KEGR58 55-60						
0040 KEGR58 85-90						

ANALYSIS

ELEMENTS	Al-Rp1	ANC	As	As	As	B
UNITS	%	kgH2SO4/t	ppm	ug/l	ug/l	mg/l
DETECTION LIMIT	0.01	1	0.5	0.1	0.1	0.01
DIGEST	FP1/	ANCx/	4A/	ASLP/	Ws/	ASLP/
ANALYTICAL FINISH	OE	VOL	MS	MS	MS	OE
SAMPLE NUMBERS						
0001 KEGR22 3-11		2	116.2	23.2	1.8	0.27
0002 KEGR22 55-60		28	108.0	99.8	99.4	0.05
0003 KEGR22 85-89		8				
0004 KEGR22 90-99		26	58.9	127.0	155.6	X
0005 KEGR22 106-107		68				
0006 KEGR22 140-145		9	105.8			
0007 KEGR32 3-7		0				
0008 KEGR32 11-15		6				
0009 KEGR32 34-36		7	72.9	4.5	1017.4	X
0010 KEGR32 86-102		28	182.7			
0011 KEGR32 102-112		10				
0012 KEGR32 140-147		26				
0013 KEGR25 6-11		2				
0014 KEGR25 15-18	18.31	3	8.5	1.2	0.5	0.16
0015 KEGR25 45-50		14				
0016 KEGR25 90-95		25	129.2			
0017 KEGR25 145-147		26				
0018 KEGR25 150-155		4	310.4			
0019 KEGR25 195-200		47	333.1	169.5	45.8	X
0020 KEGR26 44-45		7				
0021 KEGR26 50-52		9	146.9	6.5	35.6	0.01
0022 KEGR26 90-95		19				
0023 KEGR26 110-115		4				
0024 KEGR26 152-153		8	224.4			
0025 KEGR26 160-165		24				
0026 KEGR27 17-25		1				
0027 KEGR27 37-44		4				
0028 KEGR27 60-67		26	86.7	52.2	85.8	X
0029 KEGR27 81-84		24	73.7			
0030 KEGR50 13-19		1				
0031 KEGR50 19-21		2				
0032 KEGR50 21-25		6				
0033 KEGR50 35-40		8				
0034 KEGR50 64-66		13	16.3	86.5	34.8	0.01
0035 KEGR50 69-70		25				
0036 KEGR50 70-75		28	158.2	531.2	585.1	0.02
0037 KEGR50 80-85		32				
0038 KEGR58 43-47		5				
0039 KEGR58 55-60		6				
0040 KEGR58 85-90		31				

ANALYSIS

ELEMENTS	Ba	Ba	Ba	Be	Be	Be
UNITS	ppm	ug/l	ug/l	ppm	ug/l	ug/l
DETECTION LIMIT	0.1	0.05	0.05	0.05	0.1	0.1
DIGEST	4A/	ASLP/	Ws/	4A/	ASLP/	Ws/
ANALYTICAL FINISH	MS	MS	MS	MS	MS	MS
SAMPLE NUMBERS						
0001 KEGR22 3-11	59.7	161.88	19.75	0.96	0.9	X
0002 KEGR22 55-60	393.3	137.31	2.53	2.07	1.7	X
0003 KEGR22 85-89						
0004 KEGR22 90-99	450.0	382.43	11.21	5.36	5.0	X
0005 KEGR22 106-107						
0006 KEGR22 140-145	11.0			124.01		
0007 KEGR32 3-7						
0008 KEGR32 11-15						
0009 KEGR32 34-36	28.0	0.27	0.22	129.98	4.9	0.3
0010 KEGR32 86-102	159.9			9.29		
0011 KEGR32 102-112						
0012 KEGR32 140-147						
0013 KEGR25 6-11						
0014 KEGR25 15-18	5.7	2.77	1.90	0.63	4.5	X
0015 KEGR25 45-50						
0016 KEGR25 90-95	247.1			33.57		
0017 KEGR25 145-147						
0018 KEGR25 150-155	3.0			136.47		
0019 KEGR25 195-200	27.5	13.45	2.11	1.98	0.7	X
0020 KEGR26 44-45						
0021 KEGR26 50-52	174.5	1.04	1.39	11.90	13.1	1.7
0022 KEGR26 90-95						
0023 KEGR26 110-115						
0024 KEGR26 152-153	6.3			167.19		
0025 KEGR26 160-165						
0026 KEGR27 17-25						
0027 KEGR27 37-44						
0028 KEGR27 60-67	148.3	15.50	1.29	11.06	18.9	2.0
0029 KEGR27 81-84	400.0			4.51		
0030 KEGR50 13-19						
0031 KEGR50 19-21						
0032 KEGR50 21-25						
0033 KEGR50 35-40						
0034 KEGR50 64-66	32.9	9.55	1.22	98.40	68.5	3.9
0035 KEGR50 69-70						
0036 KEGR50 70-75	55.3	8.03	0.62	5.23	29.3	1.9
0037 KEGR50 80-85						
0038 KEGR58 43-47						
0039 KEGR58 55-60						
0040 KEGR58 85-90						

ANALYSIS

ELEMENTS	C	CO3	Ca	Ca	Ca	Cd
UNITS	%	mgCaCO3/L	ppm	mg/l	mg/l	ppm
DETECTION LIMIT	0.01	1	50	0.01	0.01	0.02
DIGEST		Ws/	4A/	ASLP/	Ws/	4A/
ANALYTICAL FINISH	/CSA	VOL	OE	OE	OE	MS
SAMPLE NUMBERS						
0001 KEGR22 3-11	0.04	X	197	0.72	0.41	X
0002 KEGR22 55-60	0.04	X	8.33%	37.38	9.08	0.14
0003 KEGR22 85-89	0.05					
0004 KEGR22 90-99	0.06	29	5.58%	61.14	3.49	0.08
0005 KEGR22 106-107	0.63					
0006 KEGR22 140-145	0.09		4117			0.30
0007 KEGR32 3-7	0.15					
0008 KEGR32 11-15	0.02					
0009 KEGR32 34-36	0.04	X	1087	0.13	0.09	X
0010 KEGR32 86-102	0.16		6.51%			0.09
0011 KEGR32 102-112	0.07					
0012 KEGR32 140-147	0.16					
0013 KEGR25 6-11	0.04					
0014 KEGR25 15-18	0.05	X	260	1.08	2.78	X
0015 KEGR25 45-50	0.07					
0016 KEGR25 90-95	0.08		5.59%			0.13
0017 KEGR25 145-147	0.23					
0018 KEGR25 150-155	0.10		1404			0.18
0019 KEGR25 195-200	0.45	8	10.59%	486.02	103.99	0.07
0020 KEGR26 44-45	0.03					
0021 KEGR26 50-52	0.02	X	3.97%	1.21	0.29	0.40
0022 KEGR26 90-95	0.07					
0023 KEGR26 110-115	0.05					
0024 KEGR26 152-153	0.12		2303			0.64
0025 KEGR26 160-165	0.13					
0026 KEGR27 17-25	0.03					
0027 KEGR27 37-44	0.02					
0028 KEGR27 60-67	0.01	4	8.62%	10.81	0.21	0.33
0029 KEGR27 81-84	0.02		5.93%			0.14
0030 KEGR50 13-19	0.11					
0031 KEGR50 19-21	0.08					
0032 KEGR50 21-25	0.16					
0033 KEGR50 35-40	0.44					
0034 KEGR50 64-66	0.20	8	2.00%	30.19	0.53	0.25
0035 KEGR50 69-70	0.04					
0036 KEGR50 70-75	0.31	22	6.19%	22.42	0.74	1.24
0037 KEGR50 80-85	0.39					
0038 KEGR58 43-47	0.04					
0039 KEGR58 55-60	0.04					
0040 KEGR58 85-90	0.21					

ANALYSIS

ELEMENTS	Cd	Cd	Cl	Co	Co	Co
UNITS	ug/l	ug/l	mg/L	ppm	ug/l	ug/l
DETECTION LIMIT	0.02	0.02	2	0.1	0.1	0.1
DIGEST	ASLP/	Ws/	Ws/	4A/	ASLP/	Ws/
ANALYTICAL FINISH	MS	MS	VOL	MS	MS	MS
SAMPLE NUMBERS						
0001 KEGR22 3-11	X	X	313	24.3	7.2	0.9
0002 KEGR22 55-60	0.44	X	9	39.5	126.3	0.5
0003 KEGR22 85-89						
0004 KEGR22 90-99	0.04	X	3	58.9	79.1	1.1
0005 KEGR22 106-107						
0006 KEGR22 140-145				2.9		
0007 KEGR32 3-7						
0008 KEGR32 11-15						
0009 KEGR32 34-36	X	X	44	20.2	2.0	1.8
0010 KEGR32 86-102				39.5		
0011 KEGR32 102-112						
0012 KEGR32 140-147						
0013 KEGR25 6-11						
0014 KEGR25 15-18	0.03	X	825	4.3	1.7	1.1
0015 KEGR25 45-50						
0016 KEGR25 90-95				35.7		
0017 KEGR25 145-147						
0018 KEGR25 150-155				2.4		
0019 KEGR25 195-200	0.28	X	730	45.3	44.9	3.9
0020 KEGR26 44-45						
0021 KEGR26 50-52	0.50	0.02	131	116.7	21.2	14.1
0022 KEGR26 90-95						
0023 KEGR26 110-115						
0024 KEGR26 152-153				1.6		
0025 KEGR26 160-165						
0026 KEGR27 17-25						
0027 KEGR27 37-44						
0028 KEGR27 60-67	0.35	X	5	38.5	46.8	2.3
0029 KEGR27 81-84				47.2		
0030 KEGR50 13-19						
0031 KEGR50 19-21						
0032 KEGR50 21-25						
0033 KEGR50 35-40						
0034 KEGR50 64-66	1.50	0.05	7	13.9	27.1	3.6
0035 KEGR50 69-70						
0036 KEGR50 70-75	7.94	0.15	9	51.5	179.9	13.3
0037 KEGR50 80-85						
0038 KEGR58 43-47						
0039 KEGR58 55-60						
0040 KEGR58 85-90						

ANALYSIS

ELEMENTS	ColourChange	Cr	Cr	Cr	Cu	Cu
UNITS	NONE	ppm	mg/l	mg/l	ppm	mg/l
DETECTION LIMIT	0	5	0.01	0.01	1	0.01
DIGEST	ANCx/	4A/	ASLP/	Ws/	4A/	ASLP/
ANALYTICAL FINISH	QUAL	OE	OE	OE	OE	OE
SAMPLE NUMBERS						
0001 KEGR22 3-11	No	520	X	X	32	X
0002 KEGR22 55-60	No	762	0.09	X	49	0.10
0003 KEGR22 85-89	No					
0004 KEGR22 90-99	Yes	973	0.19	0.02	76	0.02
0005 KEGR22 106-107	Yes					
0006 KEGR22 140-145	No	56			5	
0007 KEGR32 3-7	No					
0008 KEGR32 11-15	No					
0009 KEGR32 34-36	No	129	X	X	55	X
0010 KEGR32 86-102	Yes	159			91	
0011 KEGR32 102-112	No					
0012 KEGR32 140-147	Yes					
0013 KEGR25 6-11	No					
0014 KEGR25 15-18	No	188	X	X	12	0.02
0015 KEGR25 45-50	No					
0016 KEGR25 90-95	No	10			90	
0017 KEGR25 145-147	No					
0018 KEGR25 150-155	Yes	23			5	
0019 KEGR25 195-200	No	1101	0.05	X	48	0.05
0020 KEGR26 44-45	No					
0021 KEGR26 50-52	No	23	X	0.01	189	X
0022 KEGR26 90-95	No					
0023 KEGR26 110-115	No					
0024 KEGR26 152-153	No	17			6	
0025 KEGR26 160-165	No					
0026 KEGR27 17-25	No					
0027 KEGR27 37-44	No					
0028 KEGR27 60-67	No	67	X	0.01	39	0.03
0029 KEGR27 81-84	Yes	75			79	
0030 KEGR50 13-19	No					
0031 KEGR50 19-21	No					
0032 KEGR50 21-25	No					
0033 KEGR50 35-40	Yes					
0034 KEGR50 64-66	No	196	0.02	0.01	21	0.05
0035 KEGR50 69-70	No					
0036 KEGR50 70-75	Yes	947	0.04	0.11	46	0.12
0037 KEGR50 80-85	No					
0038 KEGR58 43-47	No					
0039 KEGR58 55-60	No					
0040 KEGR58 85-90	No					

ANALYSIS

ELEMENTS	Cu	EC	F	Fe	Fe	Fe
UNITS	mg/l	uS/cm	mg/l	%	mg/l	mg/l
DETECTION LIMIT	0.01	10	0.1	0.01	0.01	0.01
DIGEST	Ws/	Ws/	Ws/	4A/	ASLP/	Ws/
ANALYTICAL FINISH	OE	MTR	SIE	OE	OE	OE
SAMPLE NUMBERS						
0001 KEGR22 3-11	X	1130	X	4.90	0.28	X
0002 KEGR22 55-60	X	290	0.4	8.70	20.42	0.61
0003 KEGR22 85-89						
0004 KEGR22 90-99	X	110	0.2	8.41	25.65	1.07
0005 KEGR22 106-107						
0006 KEGR22 140-145				0.69		
0007 KEGR32 3-7						
0008 KEGR32 11-15						
0009 KEGR32 34-36	X	250	0.8	4.09	0.67	1.41
0010 KEGR32 86-102				6.88		
0011 KEGR32 102-112						
0012 KEGR32 140-147						
0013 KEGR25 6-11						
0014 KEGR25 15-18	X	2907	0.3	0.46	0.07	X
0015 KEGR25 45-50						
0016 KEGR25 90-95				7.18		
0017 KEGR25 145-147						
0018 KEGR25 150-155				0.60		
0019 KEGR25 195-200	X	3264	X	7.77	7.04	X
0020 KEGR26 44-45						
0021 KEGR26 50-52	0.05	540	0.9	10.91	0.05	13.69
0022 KEGR26 90-95						
0023 KEGR26 110-115						
0024 KEGR26 152-153				0.52		
0025 KEGR26 160-165						
0026 KEGR27 17-25						
0027 KEGR27 37-44						
0028 KEGR27 60-67	X	60	0.4	7.27	0.15	5.12
0029 KEGR27 81-84				8.94		
0030 KEGR50 13-19						
0031 KEGR50 19-21						
0032 KEGR50 21-25						
0033 KEGR50 35-40						
0034 KEGR50 64-66	0.02	60	1.0	2.28	18.23	9.83
0035 KEGR50 69-70						
0036 KEGR50 70-75	X	150	0.6	7.47	21.13	17.45
0037 KEGR50 80-85						
0038 KEGR58 43-47						
0039 KEGR58 55-60						
0040 KEGR58 85-90						

ANALYSIS

ELEMENTS	Final-pH	Fizz-Rate	HCO3	Hg	Hg	K
UNITS	NONE	NONE	mgCaCO3/L	ug/l	ug/l	ppm
DETECTION LIMIT	0.1	1	2	0.1	0.1	20
DIGEST	ANCx/	ANCx/	Ws/	ASLP/	Ws/	4A/
ANALYTICAL FINISH	MTR	QUAL	VOL	MS	MS	OE
SAMPLE NUMBERS						
0001 KEGR22 3-11	1.6	X	3	X	X	1472
0002 KEGR22 55-60	1.8	X	17	X	X	5590
0003 KEGR22 85-89	1.5	X				
0004 KEGR22 90-99	1.8	X	11	X	X	8986
0005 KEGR22 106-107	1.3	2				
0006 KEGR22 140-145	1.6	X				1.52%
0007 KEGR32 3-7	1.6	X				
0008 KEGR32 11-15	1.5	X				
0009 KEGR32 34-36	1.5	X	14	X	X	9126
0010 KEGR32 86-102	1.8	1				4832
0011 KEGR32 102-112	1.6	X				
0012 KEGR32 140-147	1.8	X				
0013 KEGR25 6-11	1.5	X				
0014 KEGR25 15-18	1.5	X	8	X	X	426
0015 KEGR25 45-50	1.6	X				
0016 KEGR25 90-95	1.8	X				1.54%
0017 KEGR25 145-147	1.8	X				
0018 KEGR25 150-155	1.5	X				1.74%
0019 KEGR25 195-200	1.8	1	8	X	X	4410
0020 KEGR26 44-45	1.6	X				
0021 KEGR26 50-52	1.6	X	7	X	X	4916
0022 KEGR26 90-95	1.7	X				
0023 KEGR26 110-115	1.5	X				
0024 KEGR26 152-153	1.5	X				2.01%
0025 KEGR26 160-165	1.8	X				
0026 KEGR27 17-25	1.5	X				
0027 KEGR27 37-44	1.5	X				
0028 KEGR27 60-67	1.8	X	5	X	0.4	7579
0029 KEGR27 81-84	1.8	X				1.63%
0030 KEGR50 13-19	1.5	X				
0031 KEGR50 19-21	1.6	X				
0032 KEGR50 21-25	1.5	X				
0033 KEGR50 35-40	1.6	X				
0034 KEGR50 64-66	1.6	X	8	X	X	1.81%
0035 KEGR50 69-70	1.8	X				
0036 KEGR50 70-75	1.8	X	19	X	X	2574
0037 KEGR50 80-85	1.8	X				
0038 KEGR58 43-47	1.5	X				
0039 KEGR58 55-60	1.5	X				
0040 KEGR58 85-90	1.8	X				

ANALYSIS

ELEMENTS	K	K	Li	Li	Li	Li-Rp1
UNITS	mg/l	mg/l	ppm	ug/l	ug/l	ppm
DETECTION LIMIT	0.1	0.1	0.1	0.05	0.05	50
DIGEST	ASLP/	Ws/	4A/	ASLP/	Ws/	FP1/
ANALYTICAL FINISH	OE	OE	MS	MS	MS	OE
SAMPLE NUMBERS						
0001 KEGR22 3-11	6.9	10.4	63.5	18.48	15.17	
0002 KEGR22 55-60	5.7	2.9	354.3	220.74	210.50	
0003 KEGR22 85-89						
0004 KEGR22 90-99	9.8	5.4	1736.5	1007.35	1208.59	
0005 KEGR22 106-107						
0006 KEGR22 140-145			>5000.0			8018
0007 KEGR32 3-7						
0008 KEGR32 11-15						
0009 KEGR32 34-36	3.8	0.9	2568.6	158.13	118.22	
0010 KEGR32 86-102			1027.0			
0011 KEGR32 102-112						
0012 KEGR32 140-147						
0013 KEGR25 6-11						
0014 KEGR25 15-18	9.1	26.5	103.2	25.97	45.02	
0015 KEGR25 45-50						
0016 KEGR25 90-95			2150.0			
0017 KEGR25 145-147						
0018 KEGR25 150-155			>5000.0			9391
0019 KEGR25 195-200	3.8	9.5	410.3	121.74	333.41	
0020 KEGR26 44-45						
0021 KEGR26 50-52	5.6	1.8	1074.7	42.33	53.10	
0022 KEGR26 90-95						
0023 KEGR26 110-115						
0024 KEGR26 152-153			>5000.0			6426
0025 KEGR26 160-165						
0026 KEGR27 17-25						
0027 KEGR27 37-44						
0028 KEGR27 60-67	2.3	0.4	739.0	66.68	53.71	
0029 KEGR27 81-84			526.3			
0030 KEGR50 13-19						
0031 KEGR50 19-21						
0032 KEGR50 21-25						
0033 KEGR50 35-40						
0034 KEGR50 64-66	4.9	0.9	4226.3	285.72	261.15	
0035 KEGR50 69-70						
0036 KEGR50 70-75	5.4	1.2	459.3	215.94	135.82	
0037 KEGR50 80-85						
0038 KEGR58 43-47						
0039 KEGR58 55-60						
0040 KEGR58 85-90						

ANALYSIS

ELEMENTS	Mg	Mg	Mg	Mn	Mn	Mn
UNITS	ppm	mg/l	mg/l	ppm	mg/l	mg/l
DETECTION LIMIT	20	0.01	0.01	1	0.001	0.001
DIGEST	4A/	ASLP/	Ws/	4A/	ASLP/	Ws/
ANALYTICAL FINISH	OE	OE	OE	OE	OE	OE
SAMPLE NUMBERS						
0001 KEGR22 3-11	1020	11.46	10.51	25	0.065	0.014
0002 KEGR22 55-60	6.60%	10.73	3.17	1428	0.705	0.011
0003 KEGR22 85-89						
0004 KEGR22 90-99	7.63%	15.07	1.61	1447	1.957	0.023
0005 KEGR22 106-107						
0006 KEGR22 140-145	2514			773		
0007 KEGR32 3-7						
0008 KEGR32 11-15						
0009 KEGR32 34-36	7080	1.67	0.33	647	0.045	0.002
0010 KEGR32 86-102	4.12%			1796		
0011 KEGR32 102-112						
0012 KEGR32 140-147						
0013 KEGR25 6-11						
0014 KEGR25 15-18	826	21.88	62.75	112	0.016	0.010
0015 KEGR25 45-50						
0016 KEGR25 90-95	2.33%			1531		
0017 KEGR25 145-147						
0018 KEGR25 150-155	252			750		
0019 KEGR25 195-200	5.56%	20.81	66.17	1445	2.846	0.019
0020 KEGR26 44-45						
0021 KEGR26 50-52	2.31%	6.03	1.85	2107	0.260	0.112
0022 KEGR26 90-95						
0023 KEGR26 110-115						
0024 KEGR26 152-153	504			1169		
0025 KEGR26 160-165						
0026 KEGR27 17-25						
0027 KEGR27 37-44						
0028 KEGR27 60-67	4.55%	7.33	0.49	1481	0.639	0.034
0029 KEGR27 81-84	4.16%			1333		
0030 KEGR50 13-19						
0031 KEGR50 19-21						
0032 KEGR50 21-25						
0033 KEGR50 35-40						
0034 KEGR50 64-66	1.61%	13.71	4.12	952	2.014	0.183
0035 KEGR50 69-70						
0036 KEGR50 70-75	6.20%	28.17	3.94	1146	1.149	0.041
0037 KEGR50 80-85						
0038 KEGR58 43-47						
0039 KEGR58 55-60						
0040 KEGR58 85-90						

ANALYSIS

ELEMENTS	Mo	Mo	Mo	Na	Na	Na
UNITS	ppm	ug/l	ug/l	ppm	mg/l	mg/l
DETECTION LIMIT	0.1	0.05	0.05	20	0.1	0.1
DIGEST	4A/	ASLP/	Ws/	4A/	ASLP/	Ws/
ANALYTICAL FINISH	MS	MS	MS	OE	OE	OE
SAMPLE NUMBERS						
0001 KEGR22 3-11	3.1	X	X	2065	60.3	210.6
0002 KEGR22 55-60	1.5	3.48	8.46	8150	12.9	40.3
0003 KEGR22 85-89						
0004 KEGR22 90-99	0.9	2.90	1.60	1.25%	4.9	11.7
0005 KEGR22 106-107						
0006 KEGR22 140-145	2.6			2.53%		
0007 KEGR32 3-7						
0008 KEGR32 11-15						
0009 KEGR32 34-36	0.7	X	89.21	1.22%	69.7	31.1
0010 KEGR32 86-102	1.2			1.51%		
0011 KEGR32 102-112						
0012 KEGR32 140-147						
0013 KEGR25 6-11						
0014 KEGR25 15-18	0.3	X	0.28	3006	135.2	510.5
0015 KEGR25 45-50						
0016 KEGR25 90-95	1.3			1.36%		
0017 KEGR25 145-147						
0018 KEGR25 150-155	4.6			2.16%		
0019 KEGR25 195-200	2.3	0.24	25.16	1.01%	84.1	506.8
0020 KEGR26 44-45						
0021 KEGR26 50-52	0.4	X	1.76	2.00%	79.8	101.9
0022 KEGR26 90-95						
0023 KEGR26 110-115						
0024 KEGR26 152-153	2.9			2.78%		
0025 KEGR26 160-165						
0026 KEGR27 17-25						
0027 KEGR27 37-44						
0028 KEGR27 60-67	0.6	0.12	6.22	7539	19.2	10.7
0029 KEGR27 81-84	0.3			1.14%		
0030 KEGR50 13-19						
0031 KEGR50 19-21						
0032 KEGR50 21-25						
0033 KEGR50 35-40						
0034 KEGR50 64-66	2.4	15.08	42.52	2.58%	25.0	13.9
0035 KEGR50 69-70						
0036 KEGR50 70-75	1.9	5.89	80.74	1.38%	36.9	30.8
0037 KEGR50 80-85						
0038 KEGR58 43-47						
0039 KEGR58 55-60						
0040 KEGR58 85-90						

ANALYSIS

ELEMENTS	NAG	NAGpH	NAG(4.5)	Nb	Nb	Nb
UNITS	kgH2SO4/t	NONE	kgH2SO4/t	ppm	ug/l	ug/l
DETECTION LIMIT	1	0.1	1	0.05	0.005	0.005
DIGEST	NAGx/	NAGx/	NAGx/	4A/	ASLP/	Ws/
ANALYTICAL FINISH	VOL	MTR	VOL	MS	MS	MS
SAMPLE NUMBERS						
0001 KEGR22 3-11				10.43	X	X
0002 KEGR22 55-60				2.61	X	0.006
0003 KEGR22 85-89						
0004 KEGR22 90-99				2.10	X	0.092
0005 KEGR22 106-107						
0006 KEGR22 140-145				60.24		
0007 KEGR32 3-7	2	4.2	0			
0008 KEGR32 11-15						
0009 KEGR32 34-36				43.23	0.047	0.064
0010 KEGR32 86-102				5.16		
0011 KEGR32 102-112						
0012 KEGR32 140-147						
0013 KEGR25 6-11						
0014 KEGR25 15-18				3.24	X	X
0015 KEGR25 45-50						
0016 KEGR25 90-95				13.98		
0017 KEGR25 145-147	0	6.5	0			
0018 KEGR25 150-155				74.87		
0019 KEGR25 195-200				0.86	X	X
0020 KEGR26 44-45						
0021 KEGR26 50-52				2.10	X	0.134
0022 KEGR26 90-95						
0023 KEGR26 110-115						
0024 KEGR26 152-153				78.60		
0025 KEGR26 160-165						
0026 KEGR27 17-25						
0027 KEGR27 37-44						
0028 KEGR27 60-67				3.15	X	0.124
0029 KEGR27 81-84				1.39		
0030 KEGR50 13-19						
0031 KEGR50 19-21						
0032 KEGR50 21-25						
0033 KEGR50 35-40						
0034 KEGR50 64-66				48.31	0.041	3.281
0035 KEGR50 69-70						
0036 KEGR50 70-75				2.99	X	0.224
0037 KEGR50 80-85						
0038 KEGR58 43-47						
0039 KEGR58 55-60						
0040 KEGR58 85-90						

ANALYSIS

ELEMENTS	Ni	Ni	Ni	OH	Pb	Pb
UNITS	ppm	mg/l	mg/l	mgCaCO3/L	ppm	ug/l
DETECTION LIMIT	1	0.01	0.01	1	0.5	0.5
DIGEST	4A/	ASLP/	Ws/	Ws/	4A/	ASLP/
ANALYTICAL FINISH	OE	OE	OE	VOL	MS	MS
SAMPLE NUMBERS						
0001 KEGR22 3-11	105	0.03	X	X	10.6	4.5
0002 KEGR22 55-60	201	0.20	X	X	6.7	1.7
0003 KEGR22 85-89						
0004 KEGR22 90-99	304	0.23	X	X	2.6	2.6
0005 KEGR22 106-107						
0006 KEGR22 140-145	15				7.1	
0007 KEGR32 3-7						
0008 KEGR32 11-15						
0009 KEGR32 34-36	79	X	X	X	4.2	X
0010 KEGR32 86-102	101				1.6	
0011 KEGR32 102-112						
0012 KEGR32 140-147						
0013 KEGR25 6-11						
0014 KEGR25 15-18	37	X	X	X	9.0	10.9
0015 KEGR25 45-50						
0016 KEGR25 90-95	50				2.6	
0017 KEGR25 145-147						
0018 KEGR25 150-155	4				6.0	
0019 KEGR25 195-200	172	0.19	0.01	X	2.2	1.8
0020 KEGR26 44-45						
0021 KEGR26 50-52	448	0.06	0.16	X	0.9	X
0022 KEGR26 90-95						
0023 KEGR26 110-115						
0024 KEGR26 152-153	6				6.9	
0025 KEGR26 160-165						
0026 KEGR27 17-25						
0027 KEGR27 37-44						
0028 KEGR27 60-67	92	0.03	0.02	X	6.0	1.2
0029 KEGR27 81-84	79				2.5	
0030 KEGR50 13-19						
0031 KEGR50 19-21						
0032 KEGR50 21-25						
0033 KEGR50 35-40						
0034 KEGR50 64-66	56	0.07	0.02	X	5.9	X
0035 KEGR50 69-70						
0036 KEGR50 70-75	310	0.56	0.09	X	1.9	0.7
0037 KEGR50 80-85						
0038 KEGR58 43-47						
0039 KEGR58 55-60						
0040 KEGR58 85-90						

ANALYSIS

ELEMENTS	Pb	pH	pH	pH Drop	Rb	Rb
UNITS	ug/l	NONE	NONE	NONE	ppm	ppm
DETECTION LIMIT	0.5	0.1	0.1	0.1	0.05	0.02
DIGEST	Ws/	Ws/	ASLP/	ANCx/	4A/	FP1/
ANALYTICAL FINISH	MS	MTR	METER	MTR	MS	MS
SAMPLE NUMBERS						
0001 KEGR22 3-11	0.8	5.5	3.2		14.43	
0002 KEGR22 55-60	X	8.0	3.6		137.16	
0003 KEGR22 85-89				3.9		
0004 KEGR22 90-99	X	9.7	3.7	3.6	326.02	
0005 KEGR22 106-107				3.5		
0006 KEGR22 140-145					1153.87	
0007 KEGR32 3-7						
0008 KEGR32 11-15						
0009 KEGR32 34-36	X	7.9	3.4		1341.27	
0010 KEGR32 86-102				3.9	343.03	
0011 KEGR32 102-112						
0012 KEGR32 140-147				3.8		
0013 KEGR25 6-11						
0014 KEGR25 15-18	X	6.1	3.1		4.09	
0015 KEGR25 45-50						
0016 KEGR25 90-95				3.9	1141.87	
0017 KEGR25 145-147				3.9		
0018 KEGR25 150-155				3.7	1883.77	
0019 KEGR25 195-200	0.7	8.8	4.3		77.80	
0020 KEGR26 44-45						
0021 KEGR26 50-52	0.6	7.8	3.4		267.05	
0022 KEGR26 90-95				3.8		
0023 KEGR26 110-115				3.9		
0024 KEGR26 152-153				3.9	>2000.00	2984.88
0025 KEGR26 160-165				3.7		
0026 KEGR27 17-25						
0027 KEGR27 37-44						
0028 KEGR27 60-67	1.0	9.3	3.4		377.81	
0029 KEGR27 81-84				3.7	450.12	
0030 KEGR50 13-19						
0031 KEGR50 19-21						
0032 KEGR50 21-25						
0033 KEGR50 35-40				3.9		
0034 KEGR50 64-66	1.6	9.4	3.5		>2000.00	2757.53
0035 KEGR50 69-70						
0036 KEGR50 70-75	X	9.6	3.7	3.6	137.13	
0037 KEGR50 80-85				3.8		
0038 KEGR58 43-47						
0039 KEGR58 55-60				3.9		
0040 KEGR58 85-90				3.5		

ANALYSIS

ELEMENTS	S	S	S-Rp1	SO4	Sb	Sb
UNITS	%	mg/l	%	mg/l	ppm	ug/l
DETECTION LIMIT	0.01	0.05	0.01	0.2	0.05	0.01
DIGEST		Ws/	SHCl/		4A/	ASLP/
ANALYTICAL FINISH	/CSA	OE	OE	/CALC	MS	MS
SAMPLE NUMBERS						
0001 KEGR22 3-11	0.04	28.91		86.6	1.51	X
0002 KEGR22 55-60	0.04	32.45		97.2	0.83	0.25
0003 KEGR22 85-89	0.01					
0004 KEGR22 90-99	0.03	1.23		3.7	0.57	0.54
0005 KEGR22 106-107	0.02					
0006 KEGR22 140-145	0.03				0.53	
0007 KEGR32 3-7	0.28		0.07			
0008 KEGR32 11-15	0.02					
0009 KEGR32 34-36	0.02	5.04		15.1	1.87	0.02
0010 KEGR32 86-102	0.07				0.90	
0011 KEGR32 102-112	0.04					
0012 KEGR32 140-147	0.04					
0013 KEGR25 6-11	0.06					
0014 KEGR25 15-18	0.04	64.19		192.3	6.13	0.20
0015 KEGR25 45-50	0.02					
0016 KEGR25 90-95	0.03				0.83	
0017 KEGR25 145-147	0.25		0.01			
0018 KEGR25 150-155	0.02				0.72	
0019 KEGR25 195-200	0.12	70.78		212.1	0.92	2.08
0020 KEGR26 44-45	X					
0021 KEGR26 50-52	X	5.97		17.9	1.51	0.03
0022 KEGR26 90-95	0.04					
0023 KEGR26 110-115	0.02					
0024 KEGR26 152-153	0.05				0.74	
0025 KEGR26 160-165	0.04					
0026 KEGR27 17-25	0.02					
0027 KEGR27 37-44	0.01					
0028 KEGR27 60-67	0.02	1.83		5.5	0.59	0.04
0029 KEGR27 81-84	0.07				1.22	
0030 KEGR50 13-19	0.04					
0031 KEGR50 19-21	0.05					
0032 KEGR50 21-25	0.01					
0033 KEGR50 35-40	0.01					
0034 KEGR50 64-66	X	1.35		4.1	0.45	0.21
0035 KEGR50 69-70	X					
0036 KEGR50 70-75	0.03	4.53		13.6	1.70	1.46
0037 KEGR50 80-85	0.02					
0038 KEGR58 43-47	X					
0039 KEGR58 55-60	X					
0040 KEGR58 85-90	0.03					

ANALYSIS

ELEMENTS	Sb	Se	Se	Se	Si	Sn
UNITS	ug/l	ppm	ug/l	ug/l	mg/l	ppm
DETECTION LIMIT	0.01	0.5	0.5	0.5	0.05	0.1
DIGEST	Ws/	4A/	ASLP/	Ws/	ASLP/	4A/
ANALYTICAL FINISH	MS	MS	MS	MS	OE	MS
SAMPLE NUMBERS						
0001 KEGR22 3-11	X	0.9	X	X	8.26	4.0
0002 KEGR22 55-60	0.56	X	0.9	0.7	19.36	8.7
0003 KEGR22 85-89						
0004 KEGR22 90-99	0.77	X	X	0.6	12.01	4.9
0005 KEGR22 106-107						
0006 KEGR22 140-145		X				29.0
0007 KEGR32 3-7						
0008 KEGR32 11-15						
0009 KEGR32 34-36	11.52	X	X	10.3	12.75	41.2
0010 KEGR32 86-102		X				6.9
0011 KEGR32 102-112						
0012 KEGR32 140-147						
0013 KEGR25 6-11						
0014 KEGR25 15-18	0.78	X	X	X	6.26	2.1
0015 KEGR25 45-50						
0016 KEGR25 90-95		X				16.0
0017 KEGR25 145-147						
0018 KEGR25 150-155		X				45.5
0019 KEGR25 195-200	3.90	X	X	X	4.92	12.0
0020 KEGR26 44-45						
0021 KEGR26 50-52	0.66	X	X	X	15.33	12.7
0022 KEGR26 90-95						
0023 KEGR26 110-115						
0024 KEGR26 152-153		X				41.6
0025 KEGR26 160-165						
0026 KEGR27 17-25						
0027 KEGR27 37-44						
0028 KEGR27 60-67	0.38	X	X	X	12.58	69.5
0029 KEGR27 81-84		X				44.8
0030 KEGR50 13-19						
0031 KEGR50 19-21						
0032 KEGR50 21-25						
0033 KEGR50 35-40						
0034 KEGR50 64-66	0.44	X	X	X	9.38	37.9
0035 KEGR50 69-70						
0036 KEGR50 70-75	7.06	X	2.1	6.7	16.82	3.6
0037 KEGR50 80-85						
0038 KEGR58 43-47						
0039 KEGR58 55-60						
0040 KEGR58 85-90						

ANALYSIS

ELEMENTS	Sn	Sn	Ta	Ta	Ta	Th
UNITS	ug/l	ug/l	ppm	ug/l	ug/l	ppm
DETECTION LIMIT	0.1	0.1	0.01	0.001	0.001	0.01
DIGEST	ASLP/	Ws/	4A/	ASLP/	Ws/	4A/
ANALYTICAL FINISH	MS	MS	MS	MS	MS	MS
SAMPLE NUMBERS						
0001 KEGR22 3-11	X	X	2.20	0.003	0.002	16.39
0002 KEGR22 55-60	X	X	0.24	0.002	0.002	7.97
0003 KEGR22 85-89						
0004 KEGR22 90-99	X	X	1.71	0.020	0.063	0.33
0005 KEGR22 106-107						
0006 KEGR22 140-145			37.21			1.81
0007 KEGR32 3-7						
0008 KEGR32 11-15						
0009 KEGR32 34-36	X	1.2	31.90	0.201	0.023	2.02
0010 KEGR32 86-102			6.42			0.51
0011 KEGR32 102-112						
0012 KEGR32 140-147						
0013 KEGR25 6-11						
0014 KEGR25 15-18	X	X	1.20	0.001	0.001	2.57
0015 KEGR25 45-50						
0016 KEGR25 90-95			9.53			1.04
0017 KEGR25 145-147						
0018 KEGR25 150-155			50.13			1.25
0019 KEGR25 195-200	X	X	0.53	0.001	0.002	0.16
0020 KEGR26 44-45						
0021 KEGR26 50-52	X	3.3	0.46	0.002	0.038	0.52
0022 KEGR26 90-95						
0023 KEGR26 110-115						
0024 KEGR26 152-153			50.97			2.35
0025 KEGR26 160-165						
0026 KEGR27 17-25						
0027 KEGR27 37-44						
0028 KEGR27 60-67	X	6.8	6.17	0.014	0.240	0.47
0029 KEGR27 81-84			0.20			0.31
0030 KEGR50 13-19						
0031 KEGR50 19-21						
0032 KEGR50 21-25						
0033 KEGR50 35-40						
0034 KEGR50 64-66	0.2	4.6	46.78	0.085	3.122	2.51
0035 KEGR50 69-70						
0036 KEGR50 70-75	X	0.7	1.46	0.008	0.114	0.60
0037 KEGR50 80-85						
0038 KEGR58 43-47						
0039 KEGR58 55-60						
0040 KEGR58 85-90						

ANALYSIS

ELEMENTS	Th	Th	TotAlk	U	U	U
UNITS	ug/l	ug/l	mgCaCO3/L	ppm	ug/l	ug/l
DETECTION LIMIT	0.005	0.005	5	0.01	0.005	0.005
DIGEST	ASLP/	Ws/		4A/	ASLP/	Ws/
ANALYTICAL FINISH	MS	MS	/CALC	MS	MS	MS
SAMPLE NUMBERS						
0001 KEGR22 3-11	0.468	X	X	2.87	30.476	0.069
0002 KEGR22 55-60	0.017	0.040	17	1.39	3.028	0.020
0003 KEGR22 85-89						
0004 KEGR22 90-99	0.025	0.030	40	0.24	2.617	0.036
0005 KEGR22 106-107						
0006 KEGR22 140-145				4.05		
0007 KEGR32 3-7						
0008 KEGR32 11-15						
0009 KEGR32 34-36	X	X	14	2.22	1.038	0.195
0010 KEGR32 86-102				2.40		
0011 KEGR32 102-112						
0012 KEGR32 140-147						
0013 KEGR25 6-11						
0014 KEGR25 15-18	0.006	X	8	1.11	8.629	X
0015 KEGR25 45-50						
0016 KEGR25 90-95				1.77		
0017 KEGR25 145-147						
0018 KEGR25 150-155				2.42		
0019 KEGR25 195-200	0.023	X	16	0.16	1.266	X
0020 KEGR26 44-45						
0021 KEGR26 50-52	X	0.048	7	4.17	7.084	0.297
0022 KEGR26 90-95						
0023 KEGR26 110-115						
0024 KEGR26 152-153				5.48		
0025 KEGR26 160-165						
0026 KEGR27 17-25						
0027 KEGR27 37-44						
0028 KEGR27 60-67	X	0.036	9	0.31	1.101	0.119
0029 KEGR27 81-84				0.33		
0030 KEGR50 13-19						
0031 KEGR50 19-21						
0032 KEGR50 21-25						
0033 KEGR50 35-40						
0034 KEGR50 64-66	X	0.103	16	3.25	31.918	1.164
0035 KEGR50 69-70						
0036 KEGR50 70-75	X	0.024	41	0.86	5.289	0.217
0037 KEGR50 80-85						
0038 KEGR58 43-47						
0039 KEGR58 55-60						
0040 KEGR58 85-90						

ANALYSIS

ELEMENTS	V	V	V	Zn	Zn	Zn
UNITS	ppm	mg/l	mg/l	ppm	mg/l	mg/l
DETECTION LIMIT	1	0.01	0.01	1	0.01	0.01
DIGEST	4A/	ASLP/	Ws/	4A/	ASLP/	Ws/
ANALYTICAL FINISH	OE	OE	OE	OE	OE	OE
SAMPLE NUMBERS						
0001 KEGR22 3-11	310	X	X	6	0.02	X
0002 KEGR22 55-60	251	0.02	X	95	0.45	X
0003 KEGR22 85-89						
0004 KEGR22 90-99	215	X	X	76	0.46	X
0005 KEGR22 106-107						
0006 KEGR22 140-145	7			78		
0007 KEGR32 3-7						
0008 KEGR32 11-15						
0009 KEGR32 34-36	153	X	0.04	116	X	X
0010 KEGR32 86-102	241			89		
0011 KEGR32 102-112						
0012 KEGR32 140-147						
0013 KEGR25 6-11						
0014 KEGR25 15-18	389	X	X	10	0.23	0.05
0015 KEGR25 45-50						
0016 KEGR25 90-95	204			92		
0017 KEGR25 145-147						
0018 KEGR25 150-155	6			99		
0019 KEGR25 195-200	215	X	X	89	0.74	X
0020 KEGR26 44-45						
0021 KEGR26 50-52	295	X	0.03	179	X	0.04
0022 KEGR26 90-95						
0023 KEGR26 110-115						
0024 KEGR26 152-153	3			148		
0025 KEGR26 160-165						
0026 KEGR27 17-25						
0027 KEGR27 37-44						
0028 KEGR27 60-67	239	X	0.04	89	X	X
0029 KEGR27 81-84	289			84		
0030 KEGR50 13-19						
0031 KEGR50 19-21						
0032 KEGR50 21-25						
0033 KEGR50 35-40						
0034 KEGR50 64-66	54	0.02	0.01	95	0.26	0.20
0035 KEGR50 69-70						
0036 KEGR50 70-75	201	0.02	0.08	74	0.17	0.02
0037 KEGR50 80-85						
0038 KEGR58 43-47						
0039 KEGR58 55-60						
0040 KEGR58 85-90						

ANALYSIS

ELEMENTS	Ag	Ag	Ag	Al	Al	Al
UNITS	ppm	ug/l	ug/l	ppm	mg/l	mg/l
DETECTION LIMIT	0.05	0.01	0.01	50	0.01	0.01
DIGEST	4A/	ASLP/	Ws/	4A/	ASLP/	Ws/
ANALYTICAL FINISH	MS	MS	MS	OE	OE	OE
SAMPLE NUMBERS						
0041 KEGR60 40-42						
0042 KEGR60 42-45						
0043 KEGR60 50-53	0.05			6.49%		
0044 KEGR60 61-63						
0045 KEGR60 65-70						
0046 KEGR90 52-56	0.07			7.78%		
0047 KEGR90 70-75						
0048 KEGR90 154-156						
0049 KEGR90 175-180						
0050 KEGR90 200-205						
0051 KEGR96 6-10						
0052 KEGR96 31-34						
0053 KEGR96 35-40						
0054 KEGR96 44-50	0.07	0.02	0.02	7.79%	11.58	1.45
0055 KEGR96 60-65	0.09	X	X	5.32%	21.54	2.89
0056 KEGR96 95-100						
0057 KEGR77 39-43						
0058 KEGR77 54-59						
0059 KEGR77 75-80						
0060 KEGR77 110-115	0.10	X	X	4.19%	3.19	3.54
0061 KEGR77 145-150						
0062 KEGR14 15-20						
0063 KEGR14 52-55						
0064 KEGR14 83-88						

CHECKS						
0001 KEGR25 90-95						
0002 KEGR58 55-60						
0003 KEGR25 90-95	0.10			7.89%		

STANDARDS						
0001 PD-1						
0002 AMIS0355						
0003 ANC-2						
0004 OREAS 24b						
0005 OREAS 922	0.90			7.54%		
0006 ANC-2						
0007 OREAS 184						
0008 GWS-1						

ANALYSIS

ELEMENTS	Al-Rp1	ANC	As	As	As	B
UNITS	%	kgH2SO4/t	ppm	ug/l	ug/l	mg/l
DETECTION LIMIT	0.01	1	0.5	0.1	0.1	0.01
DIGEST	FP1/	ANCx/	4A/	ASLP/	Ws/	ASLP/
ANALYTICAL FINISH	OE	VOL	MS	MS	MS	OE
SAMPLE NUMBERS						
0041 KEGR60 40-42		3				
0042 KEGR60 42-45		20				
0043 KEGR60 50-53		6	22.2			
0044 KEGR60 61-63		24				
0045 KEGR60 65-70		65				
0046 KEGR90 52-56		9	65.5			
0047 KEGR90 70-75		14				
0048 KEGR90 154-156		13				
0049 KEGR90 175-180		9				
0050 KEGR90 200-205		84				
0051 KEGR96 6-10		2				
0052 KEGR96 31-34		9				
0053 KEGR96 35-40		14				
0054 KEGR96 44-50		25	276.5	310.9	255.7	0.03
0055 KEGR96 60-65		29	5.6	11.0	10.1	0.03
0056 KEGR96 95-100		32				
0057 KEGR77 39-43		4				
0058 KEGR77 54-59		11				
0059 KEGR77 75-80		29				
0060 KEGR77 110-115		6	186.0	296.1	41.2	0.04
0061 KEGR77 145-150		9				
0062 KEGR14 15-20		7				
0063 KEGR14 52-55		40				
0064 KEGR14 83-88		62				

CHECKS						
0001 KEGR25 90-95		23				
0002 KEGR58 55-60		6				
0003 KEGR25 90-95			134.7			

STANDARDS						
0001 PD-1						
0002 AMIS0355						
0003 ANC-2		112				
0004 OREAS 24b						
0005 OREAS 922			8.8			
0006 ANC-2		109				
0007 OREAS 184						
0008 GWS-1						

ANALYSIS

ELEMENTS	Ba	Ba	Ba	Be	Be	Be
UNITS	ppm	ug/l	ug/l	ppm	ug/l	ug/l
DETECTION LIMIT	0.1	0.05	0.05	0.05	0.1	0.1
DIGEST	4A/	ASLP/	Ws/	4A/	ASLP/	Ws/
ANALYTICAL FINISH	MS	MS	MS	MS	MS	MS
SAMPLE NUMBERS						
0041 KEGR60 40-42						
0042 KEGR60 42-45						
0043 KEGR60 50-53	1.2			129.07		
0044 KEGR60 61-63						
0045 KEGR60 65-70						
0046 KEGR90 52-56	37.4			8.40		
0047 KEGR90 70-75						
0048 KEGR90 154-156						
0049 KEGR90 175-180						
0050 KEGR90 200-205						
0051 KEGR96 6-10						
0052 KEGR96 31-34						
0053 KEGR96 35-40						
0054 KEGR96 44-50	133.6	99.28	1.14	3.90	18.0	0.2
0055 KEGR96 60-65	8.0	15.81	0.29	115.13	122.9	2.9
0056 KEGR96 95-100						
0057 KEGR77 39-43						
0058 KEGR77 54-59						
0059 KEGR77 75-80						
0060 KEGR77 110-115	1.9	11.23	0.19	151.02	24.8	1.4
0061 KEGR77 145-150						
0062 KEGR14 15-20						
0063 KEGR14 52-55						
0064 KEGR14 83-88						

CHECKS						
0001 KEGR25 90-95						
0002 KEGR58 55-60						
0003 KEGR25 90-95	253.6			35.85		

STANDARDS						
0001 PD-1						
0002 AMIS0355						
0003 ANC-2						
0004 OREAS 24b						
0005 OREAS 922	501.5			2.53		
0006 ANC-2						
0007 OREAS 184						
0008 GWS-1						

ANALYSIS

ELEMENTS	C	CO3	Ca	Ca	Ca	Cd
UNITS	%	mgCaCO3/L	ppm	mg/l	mg/l	ppm
DETECTION LIMIT	0.01	1	50	0.01	0.01	0.02
DIGEST		Ws/	4A/	ASLP/	Ws/	4A/
ANALYTICAL FINISH	/CSA	VOL	OE	OE	OE	MS
SAMPLE NUMBERS						
0041 KEGR60 40-42	0.06					
0042 KEGR60 42-45	0.03					
0043 KEGR60 50-53	0.03		1241			0.28
0044 KEGR60 61-63	0.02					
0045 KEGR60 65-70	0.47					
0046 KEGR90 52-56	0.02		5.10%			0.16
0047 KEGR90 70-75	0.08					
0048 KEGR90 154-156	0.12					
0049 KEGR90 175-180	0.07					
0050 KEGR90 200-205	0.13					
0051 KEGR96 6-10	0.08					
0052 KEGR96 31-34	0.30					
0053 KEGR96 35-40	0.22					
0054 KEGR96 44-50	0.44	22	5.47%	48.78	1.04	0.16
0055 KEGR96 60-65	0.11	29	4058	41.70	1.17	0.41
0056 KEGR96 95-100	0.12					
0057 KEGR77 39-43	0.03					
0058 KEGR77 54-59	0.04					
0059 KEGR77 75-80	0.04					
0060 KEGR77 110-115	0.05	X	1051	24.75	0.29	0.15
0061 KEGR77 145-150	0.11					
0062 KEGR14 15-20	0.20					
0063 KEGR14 52-55	0.04					
0064 KEGR14 83-88	0.20					

CHECKS						
0001 KEGR25 90-95	0.08					
0002 KEGR58 55-60	0.03					
0003 KEGR25 90-95			5.64%			0.16

STANDARDS						
0001 PD-1						
0002 AMIS0355						
0003 ANC-2						
0004 OREAS 24b	0.20					
0005 OREAS 922			4881			0.31
0006 ANC-2						
0007 OREAS 184	0.09					
0008 GWS-1						

ANALYSIS

ELEMENTS	Cd	Cd	Cl	Co	Co	Co
UNITS	ug/l	ug/l	mg/L	ppm	ug/l	ug/l
DETECTION LIMIT	0.02	0.02	2	0.1	0.1	0.1
DIGEST	ASLP/	Ws/	Ws/	4A/	ASLP/	Ws/
ANALYTICAL FINISH	MS	MS	VOL	MS	MS	MS
SAMPLE NUMBERS						
0041 KEGR60 40-42						
0042 KEGR60 42-45						
0043 KEGR60 50-53				0.4		
0044 KEGR60 61-63						
0045 KEGR60 65-70						
0046 KEGR90 52-56				69.8		
0047 KEGR90 70-75						
0048 KEGR90 154-156						
0049 KEGR90 175-180						
0050 KEGR90 200-205						
0051 KEGR96 6-10						
0052 KEGR96 31-34						
0053 KEGR96 35-40						
0054 KEGR96 44-50	0.42	X	7	38.7	167.6	1.2
0055 KEGR96 60-65	0.59	X	9	1.7	6.5	0.1
0056 KEGR96 95-100						
0057 KEGR77 39-43						
0058 KEGR77 54-59						
0059 KEGR77 75-80						
0060 KEGR77 110-115	0.51	X	46	0.7	5.7	0.3
0061 KEGR77 145-150						
0062 KEGR14 15-20						
0063 KEGR14 52-55						
0064 KEGR14 83-88						
CHECKS						
0001 KEGR25 90-95						
0002 KEGR58 55-60						
0003 KEGR25 90-95				37.5		
STANDARDS						
0001 PD-1						
0002 AMIS0355						
0003 ANC-2						
0004 OREAS 24b						
0005 OREAS 922				20.8		
0006 ANC-2						
0007 OREAS 184						
0008 GWS-1						

ANALYSIS

ELEMENTS	ColourChange	Cr	Cr	Cr	Cu	Cu
UNITS	NONE	ppm	mg/l	mg/l	ppm	mg/l
DETECTION LIMIT	0	5	0.01	0.01	1	0.01
DIGEST	ANCx/	4A/	ASLP/	Ws/	4A/	ASLP/
ANALYTICAL FINISH	QUAL	OE	OE	OE	OE	OE
SAMPLE NUMBERS						
0041 KEGR60 40-42	No					
0042 KEGR60 42-45	No					
0043 KEGR60 50-53	No	16			3	
0044 KEGR60 61-63	No					
0045 KEGR60 65-70	Yes					
0046 KEGR90 52-56	No	509			145	
0047 KEGR90 70-75	No					
0048 KEGR90 154-156	No					
0049 KEGR90 175-180	Yes					
0050 KEGR90 200-205	Yes					
0051 KEGR96 6-10	No					
0052 KEGR96 31-34	No					
0053 KEGR96 35-40	No					
0054 KEGR96 44-50	No	182	0.07	X	93	0.09
0055 KEGR96 60-65	No	21	0.03	X	7	0.02
0056 KEGR96 95-100	No					
0057 KEGR77 39-43	No					
0058 KEGR77 54-59	Yes					
0059 KEGR77 75-80	Yes					
0060 KEGR77 110-115	Yes	14	0.03	X	3	X
0061 KEGR77 145-150	Yes					
0062 KEGR14 15-20	No					
0063 KEGR14 52-55	No					
0064 KEGR14 83-88	Yes					

CHECKS						
0001 KEGR25 90-95	No					
0002 KEGR58 55-60	No					
0003 KEGR25 90-95		15			87	

STANDARDS						
0001 PD-1						
0002 AMIS0355						
0003 ANC-2						
0004 OREAS 24b						
0005 OREAS 922		84			2164	
0006 ANC-2						
0007 OREAS 184						
0008 GWS-1						

ANALYSIS

ELEMENTS	Cu	EC	F	Fe	Fe	Fe
UNITS	mg/l	uS/cm	mg/l	%	mg/l	mg/l
DETECTION LIMIT	0.01	10	0.1	0.01	0.01	0.01
DIGEST	Ws/	Ws/	Ws/	4A/	ASLP/	Ws/
ANALYTICAL FINISH	OE	MTR	SIE	OE	OE	OE
SAMPLE NUMBERS						
0041 KEGR60 40-42						
0042 KEGR60 42-45						
0043 KEGR60 50-53				0.46		
0044 KEGR60 61-63						
0045 KEGR60 65-70						
0046 KEGR90 52-56				8.78		
0047 KEGR90 70-75						
0048 KEGR90 154-156						
0049 KEGR90 175-180						
0050 KEGR90 200-205						
0051 KEGR96 6-10						
0052 KEGR96 31-34						
0053 KEGR96 35-40						
0054 KEGR96 44-50	X	190	0.2	7.24	29.11	1.01
0055 KEGR96 60-65	X	130	0.3	0.53	7.07	0.35
0056 KEGR96 95-100						
0057 KEGR77 39-43						
0058 KEGR77 54-59						
0059 KEGR77 75-80						
0060 KEGR77 110-115	X	210	0.2	0.47	11.18	0.42
0061 KEGR77 145-150						
0062 KEGR14 15-20						
0063 KEGR14 52-55						
0064 KEGR14 83-88						

CHECKS	Cu	EC	F	Fe	Fe	Fe
0001 KEGR25 90-95						
0002 KEGR58 55-60						
0003 KEGR25 90-95				7.44		

STANDARDS	Cu	EC	F	Fe	Fe	Fe
0001 PD-1						
0002 AMIS0355						
0003 ANC-2						
0004 OREAS 24b						
0005 OREAS 922				5.83		
0006 ANC-2						
0007 OREAS 184						
0008 GWS-1			0.6			

ANALYSIS

ELEMENTS	Final-pH	Fizz-Rate	HCO3	Hg	Hg	K
UNITS	NONE	NONE	mgCaCO3/L	ug/l	ug/l	ppm
DETECTION LIMIT	0.1	1	2	0.1	0.1	20
DIGEST	ANCx/	ANCx/	Ws/	ASLP/	Ws/	4A/
ANALYTICAL FINISH	MTR	QUAL	VOL	MS	MS	OE
SAMPLE NUMBERS						
0041 KEGR60 40-42	1.5	X				
0042 KEGR60 42-45	1.6	X				
0043 KEGR60 50-53	1.5	X				2.33%
0044 KEGR60 61-63	1.8	X				
0045 KEGR60 65-70	1.5	1				
0046 KEGR90 52-56	1.5	X				1296
0047 KEGR90 70-75	1.6	X				
0048 KEGR90 154-156	1.5	X				
0049 KEGR90 175-180	1.5	X				
0050 KEGR90 200-205	1.4	X				
0051 KEGR96 6-10	1.5	X				
0052 KEGR96 31-34	1.5	X				
0053 KEGR96 35-40	1.7	X				
0054 KEGR96 44-50	1.8	X	19	X	X	7035
0055 KEGR96 60-65	1.8	X	10	X	X	1.77%
0056 KEGR96 95-100	1.8	1				
0057 KEGR77 39-43	1.5	X				
0058 KEGR77 54-59	1.6	X				
0059 KEGR77 75-80	1.8	X				
0060 KEGR77 110-115	1.5	X	12	X	X	2.04%
0061 KEGR77 145-150	1.5	X				
0062 KEGR14 15-20	1.6	X				
0063 KEGR14 52-55	1.8	X				
0064 KEGR14 83-88	1.3	X				

CHECKS						
0001 KEGR25 90-95	1.8	X				
0002 KEGR58 55-60	1.5	X				
0003 KEGR25 90-95						1.59%

STANDARDS						
0001 PD-1						
0002 AMIS0355						
0003 ANC-2	1.8					
0004 OREAS 24b						
0005 OREAS 922						2.65%
0006 ANC-2	1.7					
0007 OREAS 184						
0008 GWS-1						

ANALYSIS

ELEMENTS	K	K	Li	Li	Li	Li-Rp1
UNITS	mg/l	mg/l	ppm	ug/l	ug/l	ppm
DETECTION LIMIT	0.1	0.1	0.1	0.05	0.05	50
DIGEST	ASLP/	Ws/	4A/	ASLP/	Ws/	FP1/
ANALYTICAL FINISH	OE	OE	MS	MS	MS	OE
SAMPLE NUMBERS						
0041 KEGR60 40-42						
0042 KEGR60 42-45						
0043 KEGR60 50-53			>5000.0			7078
0044 KEGR60 61-63						
0045 KEGR60 65-70						
0046 KEGR90 52-56			1592.8			
0047 KEGR90 70-75						
0048 KEGR90 154-156						
0049 KEGR90 175-180						
0050 KEGR90 200-205						
0051 KEGR96 6-10						
0052 KEGR96 31-34						
0053 KEGR96 35-40						
0054 KEGR96 44-50	8.5	2.8	871.5	526.30	569.06	
0055 KEGR96 60-65	5.6	2.7	>5000.0	5597.11	1354.40	8606
0056 KEGR96 95-100						
0057 KEGR77 39-43						
0058 KEGR77 54-59						
0059 KEGR77 75-80						
0060 KEGR77 110-115	4.3	3.0	>5000.0	1446.88	1617.57	7948
0061 KEGR77 145-150						
0062 KEGR14 15-20						
0063 KEGR14 52-55						
0064 KEGR14 83-88						

CHECKS						
0001 KEGR25 90-95						
0002 KEGR58 55-60						
0003 KEGR25 90-95			2184.6			

STANDARDS						
0001 PD-1						
0002 AMIS0355						
0003 ANC-2						
0004 OREAS 24b						
0005 OREAS 922			50.9			
0006 ANC-2						
0007 OREAS 184						
0008 GWS-1						

ANALYSIS

ELEMENTS	Mg	Mg	Mg	Mn	Mn	Mn
UNITS	ppm	mg/l	mg/l	ppm	mg/l	mg/l
DETECTION LIMIT	20	0.01	0.01	1	0.001	0.001
DIGEST	4A/	ASLP/	Ws/	4A/	ASLP/	Ws/
ANALYTICAL FINISH	OE	OE	OE	OE	OE	OE
SAMPLE NUMBERS						
0041 KEGR60 40-42						
0042 KEGR60 42-45						
0043 KEGR60 50-53	284			1274		
0044 KEGR60 61-63						
0045 KEGR60 65-70						
0046 KEGR90 52-56	4.31%			1271		
0047 KEGR90 70-75						
0048 KEGR90 154-156						
0049 KEGR90 175-180						
0050 KEGR90 200-205						
0051 KEGR96 6-10						
0052 KEGR96 31-34						
0053 KEGR96 35-40						
0054 KEGR96 44-50	4.18%	16.55	0.82	1415	2.146	0.015
0055 KEGR96 60-65	613	2.92	0.37	1354	19.425	0.281
0056 KEGR96 95-100						
0057 KEGR77 39-43						
0058 KEGR77 54-59						
0059 KEGR77 75-80						
0060 KEGR77 110-115	348	5.13	1.25	886	14.928	0.238
0061 KEGR77 145-150						
0062 KEGR14 15-20						
0063 KEGR14 52-55						
0064 KEGR14 83-88						

CHECKS						
0001 KEGR25 90-95						
0002 KEGR58 55-60						
0003 KEGR25 90-95	2.38%			1582		

STANDARDS						
0001 PD-1						
0002 AMIS0355						
0003 ANC-2						
0004 OREAS 24b						
0005 OREAS 922	1.62%			868		
0006 ANC-2						
0007 OREAS 184						
0008 GWS-1						

ANALYSIS

ELEMENTS	Mo	Mo	Mo	Na	Na	Na
UNITS	ppm	ug/l	ug/l	ppm	mg/l	mg/l
DETECTION LIMIT	0.1	0.05	0.05	20	0.1	0.1
DIGEST	4A/	ASLP/	Ws/	4A/	ASLP/	Ws/
ANALYTICAL FINISH	MS	MS	MS	OE	OE	OE
SAMPLE NUMBERS						
0041 KEGR60 40-42						
0042 KEGR60 42-45						
0043 KEGR60 50-53	2.7			2.49%		
0044 KEGR60 61-63						
0045 KEGR60 65-70						
0046 KEGR90 52-56	0.5			1.89%		
0047 KEGR90 70-75						
0048 KEGR90 154-156						
0049 KEGR90 175-180						
0050 KEGR90 200-205						
0051 KEGR96 6-10						
0052 KEGR96 31-34						
0053 KEGR96 35-40						
0054 KEGR96 44-50	3.0	6.81	93.71	1.74%	15.1	30.5
0055 KEGR96 60-65	3.6	3.90	15.70	2.28%	11.7	17.5
0056 KEGR96 95-100						
0057 KEGR77 39-43						
0058 KEGR77 54-59						
0059 KEGR77 75-80						
0060 KEGR77 110-115	3.4	7.20	28.07	2.30%	12.8	31.0
0061 KEGR77 145-150						
0062 KEGR14 15-20						
0063 KEGR14 52-55						
0064 KEGR14 83-88						
CHECKS						
0001 KEGR25 90-95						
0002 KEGR58 55-60						
0003 KEGR25 90-95	1.5			1.40%		
STANDARDS						
0001 PD-1						
0002 AMIS0355						
0003 ANC-2						
0004 OREAS 24b						
0005 OREAS 922	1.0			4633		
0006 ANC-2						
0007 OREAS 184						
0008 GWS-1						

ANALYSIS

ELEMENTS	NAG	NAGpH	NAG(4.5)	Nb	Nb	Nb
UNITS	kgH2SO4/t	NONE	kgH2SO4/t	ppm	ug/l	ug/l
DETECTION LIMIT	1	0.1	1	0.05	0.005	0.005
DIGEST	NAGx/	NAGx/	NAGx/	4A/	ASLP/	Ws/
ANALYTICAL FINISH	VOL	MTR	VOL	MS	MS	MS
SAMPLE NUMBERS						
0041 KEGR60 40-42						
0042 KEGR60 42-45						
0043 KEGR60 50-53				67.57		
0044 KEGR60 61-63						
0045 KEGR60 65-70	0	8.4	0			
0046 KEGR90 52-56				1.43		
0047 KEGR90 70-75						
0048 KEGR90 154-156						
0049 KEGR90 175-180						
0050 KEGR90 200-205	0	8.1	0			
0051 KEGR96 6-10						
0052 KEGR96 31-34						
0053 KEGR96 35-40						
0054 KEGR96 44-50				3.35	X	0.031
0055 KEGR96 60-65				53.42	0.009	0.932
0056 KEGR96 95-100						
0057 KEGR77 39-43						
0058 KEGR77 54-59						
0059 KEGR77 75-80						
0060 KEGR77 110-115				69.66	0.031	2.776
0061 KEGR77 145-150						
0062 KEGR14 15-20						
0063 KEGR14 52-55						
0064 KEGR14 83-88						
CHECKS						
0001 KEGR25 90-95						
0002 KEGR58 55-60						
0003 KEGR25 90-95				18.84		
STANDARDS						
0001 PD-1						
0002 AMIS0355						
0003 ANC-2						
0004 OREAS 24b						
0005 OREAS 922				15.71		
0006 ANC-2						
0007 OREAS 184						
0008 GWS-1						

ANALYSIS

ELEMENTS	Ni	Ni	Ni	OH	Pb	Pb
UNITS	ppm	mg/l	mg/l	mgCaCO3/L	ppm	ug/l
DETECTION LIMIT	1	0.01	0.01	1	0.5	0.5
DIGEST	4A/	ASLP/	Ws/	Ws/	4A/	ASLP/
ANALYTICAL FINISH	OE	OE	OE	VOL	MS	MS
SAMPLE NUMBERS						
0041 KEGR60 40-42						
0042 KEGR60 42-45						
0043 KEGR60 50-53	17				7.7	
0044 KEGR60 61-63						
0045 KEGR60 65-70						
0046 KEGR90 52-56	330				1.4	
0047 KEGR90 70-75						
0048 KEGR90 154-156						
0049 KEGR90 175-180						
0050 KEGR90 200-205						
0051 KEGR96 6-10						
0052 KEGR96 31-34						
0053 KEGR96 35-40						
0054 KEGR96 44-50	111	0.37	X	X	1.0	1.3
0055 KEGR96 60-65	9	0.03	X	X	5.9	7.0
0056 KEGR96 95-100						
0057 KEGR77 39-43						
0058 KEGR77 54-59						
0059 KEGR77 75-80						
0060 KEGR77 110-115	1	0.01	X	X	6.3	4.0
0061 KEGR77 145-150						
0062 KEGR14 15-20						
0063 KEGR14 52-55						
0064 KEGR14 83-88						

CHECKS						
0001 KEGR25 90-95						
0002 KEGR58 55-60						
0003 KEGR25 90-95	50				2.5	

STANDARDS						
0001 PD-1						
0002 AMIS0355						
0003 ANC-2						
0004 OREAS 24b						
0005 OREAS 922	36				61.7	
0006 ANC-2						
0007 OREAS 184						
0008 GWS-1						

ANALYSIS

ELEMENTS	Pb	pH	pH	pH Drop	Rb	Rb
UNITS	ug/l	NONE	NONE	NONE	ppm	ppm
DETECTION LIMIT	0.5	0.1	0.1	0.1	0.05	0.02
DIGEST	Ws/	Ws/	ASLP/	ANCx/	4A/	FP1/
ANALYTICAL FINISH	MS	MTR	METER	MTR	MS	MS
SAMPLE NUMBERS						
0041 KEGR60 40-42						
0042 KEGR60 42-45						
0043 KEGR60 50-53					>2000.00	3273.69
0044 KEGR60 61-63						
0045 KEGR60 65-70				3.5		
0046 KEGR90 52-56					151.61	
0047 KEGR90 70-75				3.7		
0048 KEGR90 154-156				3.9		
0049 KEGR90 175-180				3.8		
0050 KEGR90 200-205				3.2		
0051 KEGR96 6-10						
0052 KEGR96 31-34						
0053 KEGR96 35-40						
0054 KEGR96 44-50	X	9.5	3.7		312.98	
0055 KEGR96 60-65	X	9.8	3.7		>2000.00	2688.86
0056 KEGR96 95-100						
0057 KEGR77 39-43						
0058 KEGR77 54-59						
0059 KEGR77 75-80						
0060 KEGR77 110-115	0.9	9.2	3.3	3.9	>2000.00	2580.57
0061 KEGR77 145-150				3.8		
0062 KEGR14 15-20						
0063 KEGR14 52-55						
0064 KEGR14 83-88				3.3		

CHECKS						
0001 KEGR25 90-95						
0002 KEGR58 55-60				3.9		
0003 KEGR25 90-95					1170.33	

STANDARDS						
0001 PD-1						
0002 AMIS0355						3930.29
0003 ANC-2						
0004 OREAS 24b						
0005 OREAS 922					202.93	
0006 ANC-2						
0007 OREAS 184						
0008 GWS-1						

ANALYSIS

ELEMENTS	S	S	S-Rp1	SO4	Sb	Sb
UNITS	%	mg/l	%	mg/l	ppm	ug/l
DETECTION LIMIT	0.01	0.05	0.01	0.2	0.05	0.01
DIGEST		Ws/	SHCl/		4A/	ASLP/
ANALYTICAL FINISH	/CSA	OE	OE	/CALC	MS	MS
SAMPLE NUMBERS						
0041 KEGR60 40-42	X					
0042 KEGR60 42-45	X					
0043 KEGR60 50-53	X				0.28	
0044 KEGR60 61-63	X					
0045 KEGR60 65-70	0.55		0.04			
0046 KEGR90 52-56	X				1.18	
0047 KEGR90 70-75	0.04					
0048 KEGR90 154-156	0.12					
0049 KEGR90 175-180	0.07					
0050 KEGR90 200-205	0.20		0.01			
0051 KEGR96 6-10	0.04					
0052 KEGR96 31-34	0.01					
0053 KEGR96 35-40	X					
0054 KEGR96 44-50	0.11	10.40		31.2	0.51	0.26
0055 KEGR96 60-65	0.01	0.96		2.9	0.22	0.19
0056 KEGR96 95-100	0.07					
0057 KEGR77 39-43	X					
0058 KEGR77 54-59	0.04					
0059 KEGR77 75-80	0.04					
0060 KEGR77 110-115	X	1.11		3.3	0.85	0.82
0061 KEGR77 145-150	0.01					
0062 KEGR14 15-20	0.02					
0063 KEGR14 52-55	X					
0064 KEGR14 83-88	0.10					

CHECKS						
0001 KEGR25 90-95	0.03					
0002 KEGR58 55-60	X					
0003 KEGR25 90-95					0.93	

STANDARDS						
0001 PD-1			4.13			
0002 AMIS0355						
0003 ANC-2						
0004 OREAS 24b	0.20					
0005 OREAS 922					1.40	
0006 ANC-2						
0007 OREAS 184	X					
0008 GWS-1						

ANALYSIS

ELEMENTS	Sb	Se	Se	Se	Si	Sn
UNITS	ug/l	ppm	ug/l	ug/l	mg/l	ppm
DETECTION LIMIT	0.01	0.5	0.5	0.5	0.05	0.1
DIGEST	Ws/	4A/	ASLP/	Ws/	ASLP/	4A/
ANALYTICAL FINISH	MS	MS	MS	MS	OE	MS
SAMPLE NUMBERS						
0041 KEGR60 40-42						
0042 KEGR60 42-45						
0043 KEGR60 50-53		X				45.9
0044 KEGR60 61-63						
0045 KEGR60 65-70						
0046 KEGR90 52-56		X				1.6
0047 KEGR90 70-75						
0048 KEGR90 154-156						
0049 KEGR90 175-180						
0050 KEGR90 200-205						
0051 KEGR96 6-10						
0052 KEGR96 31-34						
0053 KEGR96 35-40						
0054 KEGR96 44-50	0.30	0.5	0.7	0.6	21.11	4.7
0055 KEGR96 60-65	0.24	X	0.6	1.1	28.86	64.0
0056 KEGR96 95-100						
0057 KEGR77 39-43						
0058 KEGR77 54-59						
0059 KEGR77 75-80						
0060 KEGR77 110-115	1.70	X	X	X	4.98	56.0
0061 KEGR77 145-150						
0062 KEGR14 15-20						
0063 KEGR14 52-55						
0064 KEGR14 83-88						

CHECKS	Sb	Se	Se	Se	Si	Sn
0001 KEGR25 90-95						
0002 KEGR58 55-60						
0003 KEGR25 90-95		X				16.2

STANDARDS	Sb	Se	Se	Se	Si	Sn
0001 PD-1						
0002 AMIS0355						
0003 ANC-2						
0004 OREAS 24b						
0005 OREAS 922		3.9				10.2
0006 ANC-2						
0007 OREAS 184						
0008 GWS-1						

ANALYSIS

ELEMENTS	Sn	Sn	Ta	Ta	Ta	Th
UNITS	ug/l	ug/l	ppm	ug/l	ug/l	ppm
DETECTION LIMIT	0.1	0.1	0.01	0.001	0.001	0.01
DIGEST	ASLP/	Ws/	4A/	ASLP/	Ws/	4A/
ANALYTICAL FINISH	MS	MS	MS	MS	MS	MS
SAMPLE NUMBERS						
0041 KEGR60 40-42						
0042 KEGR60 42-45						
0043 KEGR60 50-53			72.14			1.93
0044 KEGR60 61-63						
0045 KEGR60 65-70						
0046 KEGR90 52-56			0.79			0.39
0047 KEGR90 70-75						
0048 KEGR90 154-156						
0049 KEGR90 175-180						
0050 KEGR90 200-205						
0051 KEGR96 6-10						
0052 KEGR96 31-34						
0053 KEGR96 35-40						
0054 KEGR96 44-50	X	X	6.95	0.032	0.038	0.31
0055 KEGR96 60-65	X	2.4	56.18	0.271	0.793	1.21
0056 KEGR96 95-100						
0057 KEGR77 39-43						
0058 KEGR77 54-59						
0059 KEGR77 75-80						
0060 KEGR77 110-115	X	1.6	52.45	0.207	1.696	1.97
0061 KEGR77 145-150						
0062 KEGR14 15-20						
0063 KEGR14 52-55						
0064 KEGR14 83-88						
CHECKS						
0001 KEGR25 90-95						
0002 KEGR58 55-60						
0003 KEGR25 90-95			17.24			0.99
STANDARDS						
0001 PD-1						
0002 AMIS0355						
0003 ANC-2						
0004 OREAS 24b						
0005 OREAS 922			1.26			17.21
0006 ANC-2						
0007 OREAS 184						
0008 GWS-1						

ANALYSIS

ELEMENTS	Th	Th	TotAlk	U	U	U
UNITS	ug/l	ug/l	mgCaCO3/L	ppm	ug/l	ug/l
DETECTION LIMIT	0.005	0.005	5	0.01	0.005	0.005
DIGEST	ASLP/	Ws/		4A/	ASLP/	Ws/
ANALYTICAL FINISH	MS	MS	/CALC	MS	MS	MS
SAMPLE NUMBERS						
0041 KEGR60 40-42						
0042 KEGR60 42-45						
0043 KEGR60 50-53				3.32		
0044 KEGR60 61-63						
0045 KEGR60 65-70						
0046 KEGR90 52-56				2.93		
0047 KEGR90 70-75						
0048 KEGR90 154-156						
0049 KEGR90 175-180						
0050 KEGR90 200-205						
0051 KEGR96 6-10						
0052 KEGR96 31-34						
0053 KEGR96 35-40						
0054 KEGR96 44-50	0.030	X	41	0.28	1.171	0.007
0055 KEGR96 60-65	X	0.093	39	3.05	46.660	3.297
0056 KEGR96 95-100						
0057 KEGR77 39-43						
0058 KEGR77 54-59						
0059 KEGR77 75-80						
0060 KEGR77 110-115	X	0.155	12	2.84	51.566	2.293
0061 KEGR77 145-150						
0062 KEGR14 15-20						
0063 KEGR14 52-55						
0064 KEGR14 83-88						

CHECKS						
0001 KEGR25 90-95						
0002 KEGR58 55-60						
0003 KEGR25 90-95				1.51		

STANDARDS						
0001 PD-1						
0002 AMIS0355						
0003 ANC-2						
0004 OREAS 24b						
0005 OREAS 922				3.36		
0006 ANC-2						
0007 OREAS 184						
0008 GWS-1						

ANALYSIS

ELEMENTS	V	V	V	Zn	Zn	Zn
UNITS	ppm	mg/l	mg/l	ppm	mg/l	mg/l
DETECTION LIMIT	1	0.01	0.01	1	0.01	0.01
DIGEST	4A/	ASLP/	Ws/	4A/	ASLP/	Ws/
ANALYTICAL FINISH	OE	OE	OE	OE	OE	OE
SAMPLE NUMBERS						
0041 KEGR60 40-42						
0042 KEGR60 42-45						
0043 KEGR60 50-53	3			96		
0044 KEGR60 61-63						
0045 KEGR60 65-70						
0046 KEGR90 52-56	215			198		
0047 KEGR90 70-75						
0048 KEGR90 154-156						
0049 KEGR90 175-180						
0050 KEGR90 200-205						
0051 KEGR96 6-10						
0052 KEGR96 31-34						
0053 KEGR96 35-40						
0054 KEGR96 44-50	251	0.02	0.01	73	0.18	X
0055 KEGR96 60-65	8	X	X	75	0.21	X
0056 KEGR96 95-100						
0057 KEGR77 39-43						
0058 KEGR77 54-59						
0059 KEGR77 75-80						
0060 KEGR77 110-115	1	X	X	85	0.27	0.01
0061 KEGR77 145-150						
0062 KEGR14 15-20						
0063 KEGR14 52-55						
0064 KEGR14 83-88						

CHECKS						
0001 KEGR25 90-95						
0002 KEGR58 55-60						
0003 KEGR25 90-95	210			93		

STANDARDS						
0001 PD-1						
0002 AMIS0355						
0003 ANC-2						
0004 OREAS 24b						
0005 OREAS 922	92			269		
0006 ANC-2						
0007 OREAS 184						
0008 GWS-1						

ANALYSIS

ELEMENTS	Ag	Ag	Ag	Al	Al	Al
UNITS	ppm	ug/l	ug/l	ppm	mg/l	mg/l
DETECTION LIMIT	0.05	0.01	0.01	50	0.01	0.01
DIGEST	4A/	ASLP/	Ws/	4A/	ASLP/	Ws/
ANALYTICAL FINISH	MS	MS	MS	OE	OE	OE
BLANKS						
0001 Control Blank						
0002 Control Blank						
0003 Control Blank	0.11			84		
0004 Control Blank			X			X
0005 Control Blank		0.03			0.01	
0006 Control Blank						
0007 Control Blank						
0008 Control Blank						

ANALYSIS

ELEMENTS	Al-Rp1	ANC	As	As	As	B
UNITS	%	kgH2SO4/t	ppm	ug/l	ug/l	mg/l
DETECTION LIMIT	0.01	1	0.5	0.1	0.1	0.01
DIGEST	FP1/	ANCx/	4A/	ASLP/	Ws/	ASLP/
ANALYTICAL FINISH	OE	VOL	MS	MS	MS	OE
BLANKS						
0001 Control Blank						
0002 Control Blank						
0003 Control Blank			X			
0004 Control Blank					X	
0005 Control Blank				0.1		X
0006 Control Blank		0				
0007 Control Blank		0				
0008 Control Blank		-1				

ANALYSIS

ELEMENTS	Ba	Ba	Ba	Be	Be	Be
UNITS	ppm	ug/l	ug/l	ppm	ug/l	ug/l
DETECTION LIMIT	0.1	0.05	0.05	0.05	0.1	0.1
DIGEST	4A/	ASLP/	Ws/	4A/	ASLP/	Ws/
ANALYTICAL FINISH	MS	MS	MS	MS	MS	MS
BLANKS						
0001 Control Blank						
0002 Control Blank						
0003 Control Blank	X			X		
0004 Control Blank			X			X
0005 Control Blank		0.05			X	
0006 Control Blank						
0007 Control Blank						
0008 Control Blank						

ANALYSIS

ELEMENTS	C	CO3	Ca	Ca	Ca	Cd
UNITS	%	mgCaCO3/L	ppm	mg/l	mg/l	ppm
DETECTION LIMIT	0.01	1	50	0.01	0.01	0.02
DIGEST		Ws/	4A/	ASLP/	Ws/	4A/
ANALYTICAL FINISH	/CSA	VOL	OE	OE	OE	MS
BLANKS						
0001 Control Blank						
0002 Control Blank						
0003 Control Blank			X			X
0004 Control Blank					X	
0005 Control Blank				X		
0006 Control Blank	X					
0007 Control Blank	X					
0008 Control Blank	X					

ANALYSIS

ELEMENTS	Cd	Cd	Cl	Co	Co	Co
UNITS	ug/l	ug/l	mg/L	ppm	ug/l	ug/l
DETECTION LIMIT	0.02	0.02	2	0.1	0.1	0.1
DIGEST	ASLP/	Ws/	Ws/	4A/	ASLP/	Ws/
ANALYTICAL FINISH	MS	MS	VOL	MS	MS	MS
BLANKS						
0001 Control Blank						
0002 Control Blank						
0003 Control Blank				X		
0004 Control Blank		X	X			X
0005 Control Blank	X				X	
0006 Control Blank						
0007 Control Blank						
0008 Control Blank						

ANALYSIS

ELEMENTS	ColourChange	Cr	Cr	Cr	Cu	Cu
UNITS	NONE	ppm	mg/l	mg/l	ppm	mg/l
DETECTION LIMIT	0	5	0.01	0.01	1	0.01
DIGEST	ANCx/	4A/	ASLP/	Ws/	4A/	ASLP/
ANALYTICAL FINISH	QUAL	OE	OE	OE	OE	OE
BLANKS						
0001 Control Blank						
0002 Control Blank						
0003 Control Blank		X			X	
0004 Control Blank				X		
0005 Control Blank			X			X
0006 Control Blank						
0007 Control Blank						
0008 Control Blank						

ANALYSIS

ELEMENTS	Cu	EC	F	Fe	Fe	Fe
UNITS	mg/l	uS/cm	mg/l	%	mg/l	mg/l
DETECTION LIMIT	0.01	10	0.1	0.01	0.01	0.01
DIGEST	Ws/	Ws/	Ws/	4A/	ASLP/	Ws/
ANALYTICAL FINISH	OE	MTR	SIE	OE	OE	OE
BLANKS						
0001 Control Blank						
0002 Control Blank						
0003 Control Blank				X		
0004 Control Blank	X	X	X			X
0005 Control Blank					X	
0006 Control Blank						
0007 Control Blank						
0008 Control Blank						

ANALYSIS

ELEMENTS	Final-pH	Fizz-Rate	HCO3	Hg	Hg	K
UNITS	NONE	NONE	mgCaCO3/L	ug/l	ug/l	ppm
DETECTION LIMIT	0.1	1	2	0.1	0.1	20
DIGEST	ANCx/	ANCx/	Ws/	ASLP/	Ws/	4A/
ANALYTICAL FINISH	MTR	QUAL	VOL	MS	MS	OE
BLANKS						
0001 Control Blank						
0002 Control Blank						
0003 Control Blank						X
0004 Control Blank					X	
0005 Control Blank				X		
0006 Control Blank	1.4					
0007 Control Blank	1.5					
0008 Control Blank	1.4					

ANALYSIS

ELEMENTS	K	K	Li	Li	Li	Li-Rp1
UNITS	mg/l	mg/l	ppm	ug/l	ug/l	ppm
DETECTION LIMIT	0.1	0.1	0.1	0.05	0.05	50
DIGEST	ASLP/	Ws/	4A/	ASLP/	Ws/	FP1/
ANALYTICAL FINISH	OE	OE	MS	MS	MS	OE
BLANKS						
0001 Control Blank						
0002 Control Blank						
0003 Control Blank			X			
0004 Control Blank		X			X	
0005 Control Blank	X			0.20		
0006 Control Blank						
0007 Control Blank						
0008 Control Blank						

ANALYSIS

ELEMENTS	Mg	Mg	Mg	Mn	Mn	Mn
UNITS	ppm	mg/l	mg/l	ppm	mg/l	mg/l
DETECTION LIMIT	20	0.01	0.01	1	0.001	0.001
DIGEST	4A/	ASLP/	Ws/	4A/	ASLP/	Ws/
ANALYTICAL FINISH	OE	OE	OE	OE	OE	OE
BLANKS						
0001 Control Blank						
0002 Control Blank						
0003 Control Blank	X			1		
0004 Control Blank			X			X
0005 Control Blank		X			X	
0006 Control Blank						
0007 Control Blank						
0008 Control Blank						

ANALYSIS

ELEMENTS	Mo	Mo	Mo	Na	Na	Na
UNITS	ppm	ug/l	ug/l	ppm	mg/l	mg/l
DETECTION LIMIT	0.1	0.05	0.05	20	0.1	0.1
DIGEST	4A/	ASLP/	Ws/	4A/	ASLP/	Ws/
ANALYTICAL FINISH	MS	MS	MS	OE	OE	OE
BLANKS						
0001 Control Blank						
0002 Control Blank						
0003 Control Blank	X			20		
0004 Control Blank			X			X
0005 Control Blank		X			X	
0006 Control Blank						
0007 Control Blank						
0008 Control Blank						

ANALYSIS

ELEMENTS	NAG	NAGpH	NAG(4.5)	Nb	Nb	Nb
UNITS	kgH2SO4/t	NONE	kgH2SO4/t	ppm	ug/l	ug/l
DETECTION LIMIT	1	0.1	1	0.05	0.005	0.005
DIGEST	NAGx/	NAGx/	NAGx/	4A/	ASLP/	Ws/
ANALYTICAL FINISH	VOL	MTR	VOL	MS	MS	MS
BLANKS						
0001 Control Blank						
0002 Control Blank						
0003 Control Blank				X		
0004 Control Blank						X
0005 Control Blank					X	
0006 Control Blank						
0007 Control Blank						
0008 Control Blank						

ANALYSIS

ELEMENTS	Ni	Ni	Ni	OH	Pb	Pb
UNITS	ppm	mg/l	mg/l	mgCaCO3/L	ppm	ug/l
DETECTION LIMIT	1	0.01	0.01	1	0.5	0.5
DIGEST	4A/	ASLP/	Ws/	Ws/	4A/	ASLP/
ANALYTICAL FINISH	OE	OE	OE	VOL	MS	MS
BLANKS						
0001 Control Blank						
0002 Control Blank						
0003 Control Blank	X				X	
0004 Control Blank			X			
0005 Control Blank		X				0.8
0006 Control Blank						
0007 Control Blank						
0008 Control Blank						

ANALYSIS

ELEMENTS	Pb	pH	pH	pH Drop	Rb	Rb
UNITS	ug/l	NONE	NONE	NONE	ppm	ppm
DETECTION LIMIT	0.5	0.1	0.1	0.1	0.05	0.02
DIGEST	Ws/	Ws/	ASLP/	ANCx/	4A/	FP1/
ANALYTICAL FINISH	MS	MTR	METER	MTR	MS	MS
BLANKS						
0001 Control Blank						0.32
0002 Control Blank						0.05
0003 Control Blank			2.9		0.08	
0004 Control Blank	X	5.9				
0005 Control Blank						
0006 Control Blank						
0007 Control Blank						
0008 Control Blank						

ANALYSIS

ELEMENTS	S	S	S-Rp1	SO4	Sb	Sb
UNITS	%	mg/l	%	mg/l	ppm	ug/l
DETECTION LIMIT	0.01	0.05	0.01	0.2	0.05	0.01
DIGEST		Ws/	SHCl/		4A/	ASLP/
ANALYTICAL FINISH	/CSA	OE	OE	/CALC	MS	MS
BLANKS						
0001 Control Blank						
0002 Control Blank						
0003 Control Blank					X	
0004 Control Blank		X		X		
0005 Control Blank						X
0006 Control Blank	0.01					
0007 Control Blank	X					
0008 Control Blank	X					

ANALYSIS

ELEMENTS	Sb	Se	Se	Se	Si	Sn
UNITS	ug/l	ppm	ug/l	ug/l	mg/l	ppm
DETECTION LIMIT	0.01	0.5	0.5	0.5	0.05	0.1
DIGEST	Ws/	4A/	ASLP/	Ws/	ASLP/	4A/
ANALYTICAL FINISH	MS	MS	MS	MS	OE	MS
BLANKS						
0001 Control Blank						
0002 Control Blank						
0003 Control Blank		X				X
0004 Control Blank	0.03			X		
0005 Control Blank			X		X	
0006 Control Blank						
0007 Control Blank						
0008 Control Blank						

ANALYSIS

ELEMENTS	Sn	Sn	Ta	Ta	Ta	Th
UNITS	ug/l	ug/l	ppm	ug/l	ug/l	ppm
DETECTION LIMIT	0.1	0.1	0.01	0.001	0.001	0.01
DIGEST	ASLP/	Ws/	4A/	ASLP/	Ws/	4A/
ANALYTICAL FINISH	MS	MS	MS	MS	MS	MS
BLANKS						
0001 Control Blank						
0002 Control Blank						
0003 Control Blank			X			X
0004 Control Blank		X			X	
0005 Control Blank	X			X		
0006 Control Blank						
0007 Control Blank						
0008 Control Blank						

ANALYSIS

ELEMENTS	Th	Th	TotAlk	U	U	U
UNITS	ug/l	ug/l	mgCaCO3/L	ppm	ug/l	ug/l
DETECTION LIMIT	0.005	0.005	5	0.01	0.005	0.005
DIGEST	ASLP/	Ws/		4A/	ASLP/	Ws/
ANALYTICAL FINISH	MS	MS	/CALC	MS	MS	MS
BLANKS						
0001 Control Blank						
0002 Control Blank						
0003 Control Blank				X		
0004 Control Blank		X				X
0005 Control Blank	X				X	
0006 Control Blank						
0007 Control Blank						
0008 Control Blank						

ANALYSIS

ELEMENTS	V	V	V	Zn	Zn	Zn
UNITS	ppm	mg/l	mg/l	ppm	mg/l	mg/l
DETECTION LIMIT	1	0.01	0.01	1	0.01	0.01
DIGEST	4A/	ASLP/	Ws/	4A/	ASLP/	Ws/
ANALYTICAL FINISH	OE	OE	OE	OE	OE	OE
BLANKS						
0001 Control Blank						
0002 Control Blank						
0003 Control Blank	X			X		
0004 Control Blank			X			X
0005 Control Blank		X			X	
0006 Control Blank						
0007 Control Blank						
0008 Control Blank						

METHOD CODE DESCRIPTION

Method Code	Analysing Laboratory **NATA Laboratory Accreditation**	NATA Scope of Accreditation
/CALC	Intertek Genalysis Perth **3244 3237**	
No digestion or other pre-treatment undertaken. Results Determined by calculation from other reported data.		
/CSA	Intertek Genalysis Perth **3244 3237**	**MPL_W043, CSA : MPL_W043**
Induction Furnace Analysed by Infrared Spectrometry		
4A/MS	Intertek Genalysis Perth **3244 3237**	**4A/ : MPL_W002, MS : ICP_W003**
Multi-acid digest including Hydrofluoric, Nitric, Perchloric and Hydrochloric acids in Teflon Tubes. Analysed by Inductively Coupled Plasma Mass Spectrometry.		
4A/OE	Intertek Genalysis Perth **3244 3237**	**4A/ : MPL_W002, OE : ICP_W004**
Multi-acid digest including Hydrofluoric, Nitric, Perchloric and Hydrochloric acids in Teflon Tubes. Analysed by Inductively Coupled Plasma Optical (Atomic) Emission Spectrometry.		
ANCx/MTR	Intertek Genalysis Perth **3244 3237**	
Acid Neutralizing Capacity Digestion Procedure. Analysed with Electronic Meter Measurement		
ANCx/QUAL	Intertek Genalysis Perth **3244 3237**	
Acid Neutralizing Capacity Digestion Procedure. Analysed by Qualitative Inspection		
ANCx/VOL	Intertek Genalysis Perth **3244 3237**	
Acid Neutralizing Capacity Digestion Procedure. Analysed by Volumetric Technique.		
ASLP/METER	Intertek Genalysis Perth **3244 3237**	
AS4439.3-1997: Australian Standard Leachates Protocol for Wastes, Sediments & Contaminated Soils. Analysed with Electronic Meter Measurement		
ASLP/MS	Intertek Genalysis Perth **3244 3237**	**ASLP/ : ENV_W037, MS : ICP_W003**
AS4439.3-1997: Australian Standard Leachates Protocol for Wastes, Sediments & Contaminated Soils. Analysed by Inductively Coupled Plasma Mass Spectrometry.		
ASLP/OE	Intertek Genalysis Perth **3244 3237**	**ASLP/ : ENV_W037, OE : ICP_W004**
AS4439.3-1997: Australian Standard Leachates Protocol for Wastes, Sediments & Contaminated Soils. Analysed by Inductively Coupled Plasma Optical (Atomic) Emission Spectrometry.		
FP1/MS	Intertek Genalysis Perth **3244 3237**	**FP1/ : MPL_W011, MS : ICP_W003**
Sodium peroxide fusion (Zirconia crucibles) and Hydrochloric acid to dissolve the melt. Analysed by Inductively Coupled Plasma Mass Spectrometry.		
FP1/OE	Intertek Genalysis Perth **3244 3237**	**FP1/ : MPL_W011, OE : ICP_W004**
Sodium peroxide fusion (Zirconia crucibles) and Hydrochloric acid to dissolve the melt. Analysed by Inductively Coupled Plasma Optical (Atomic) Emission Spectrometry.		

METHOD CODE DESCRIPTION

Method Code	Analysing Laboratory **NATA Laboratory Accreditation**	**NATA Scope of Accreditation**

NAGx/MTR Intertek Genalysis Perth
3244 3237

Net Acid Generation Extraction of samples with H2O2 Analysed with Electronic Meter Measurement

NAGx/VOL Intertek Genalysis Perth
3244 3237

Net Acid Generation Extraction of samples with H2O2 Analysed by Volumetric Technique.

SHCl/OE Intertek Genalysis Perth
3244 3237

Acid Soluble soil. Analysed by Inductively Coupled Plasma Optical (Atomic) Emission Spectrometry.

Ws/MS Intertek Genalysis Perth
3244 3237

Water Extraction using a sample:water ratio of 1:5 or to client request. Analysed by Inductively Coupled Plasma Mass Spectrometry.

Ws/MTR Intertek Genalysis Perth
3244 3237

Water Extraction using a sample:water ratio of 1:5 or to client request. Analysed with Electronic Meter Measurement

Ws/OE Intertek Genalysis Perth
3244 3237

Water Extraction using a sample:water ratio of 1:5 or to client request. Analysed by Inductively Coupled Plasma Optical (Atomic) Emission Spectrometry.

Ws/SIE Intertek Genalysis Perth
3244 3237

Water Extraction using a sample:water ratio of 1:5 or to client request. Analysed by Specific Ion Electrode.

Ws/VOL Intertek Genalysis Perth
3244 3237

Water Extraction using a sample:water ratio of 1:5 or to client request. Analysed by Volumetric Technique.