Knight Piésold CONSULTING

MEMORANDUM

To:	**Savannah Resources**	**Date:**	4 February 2020
Attn:	Dale Ferguson	**Our Ref:**	PE20-00124
		KP File Ref.:	PE501-00080/04-A EJT M20002
cc:		**From:**	Ed Tuplin

RE: MINA DO BARROSO – TAILINGS GEOCHEMISTRY ASSESSMENT

1. INTRODUCTION

A tailings sample produced from metallurgical work for the Mina Do Barroso project was provided to Knight Piésold (KP) for geochemical analysis. The sample was received as a filter cake from Nagrom and Co. and was labelled "By-Product Tails Comp". The sample will be referred to as "Savannah Sample" for the purposes of this memorandum. A sub-sample of the filter cake was submitted for geochemical analysis at Intertek Genalysis (Perth).

This memorandum summarises the results of the testwork conducted by Intertek Genalysis. Details of the testwork methods and interpretation principles are provided in Appendix A, with laboratory test certificates for the analytical testing provided in Appendix B.

2. TAILINGS GEOCHEMICAL CHARACTERISTICS

2.1 INTRODUCTION

The testwork results are presented and discussed in the following sections. It should be noted that this assessment of the tailings geochemistry does not include specific assessment of residual proprietary process chemicals and reagents which may be present within the tailings. Given that the reagents used vary throughout metallurgical testwork programmes, it is recommended that consideration of the reagents is conducted during the pilot plant testwork phase conducted as part of the detailed engineering. This may involve obtaining and reviewing the material safety data sheets (MSDSs) which state each product's identify and ingredients, health and physical hazards, safe handling and storage procedures and disposal considerations.

2.2 ACID BASE ACCOUNTING

The results of the analysis are summarised in Tables 2.1 and 2.2 and indicate that sulfur was not identified above the analytical detection limit of 0.01%. As such, the sample was essentially devoid of sulfur and has a negligible maximum potential acidity (MPA).

The acid neutralising capacity (ANC) of the sample was determined along with estimates of the carbonate content. The two results can be used as a check against one another and to identify the contribution of ANC from carbonates and other non-carbonate minerals. The sample recorded a low ANC value of 6 kg H_2SO_4/t, compared to the ANC estimated as being available from carbonate minerals of 0.4 kg H_2SO_4/t. As

such, the vast majority of the ANC is derived from non-carbonate minerals, which may be less reactive and only available to buffer acid under low pH conditions.

Based on the MPA and ANC results the sample recorded a negative net acid producing potential (NAPP) of -6 kg H_2SO_4/t. The ANC/MPA ratio couldn't be determined due to an MPA value of zero.

2.3 NET ACID GENERATION

The net acid generation (NAG) test aids in interpretation of acid formation potential classifications. It also identifies whether the sulfides and neutralising minerals contained in the sample are readily available to produce or consume acid.

The results of the NAG test are given in Table 2.2 and indicate that under extreme oxidising conditions, the tailings did not produce any measurable acid, with the final pH of the NAG solution recorded at pH 7.4.

2.4 ACID FORMATION POTENTIAL

The acid formation potential of the sample is calculated based on the acid base accounting results and the NAG test. The acid base accounting results for the sample indicates a negative NAPP values and circum neutral NAG pH value. Therefore, the sample is classified as Non Acid Forming (NAF) as there is no perceived risk of this tailings sample generating acid.

The acid formation potential is shown in Figure 2.1.

Table 2.1: Acid Base Accounting Results

Sample	Sulfur Species			ANC	Carbon Species				Paste pH
	Sulfur %	Sulfate %	Sulfide %	kg H_2SO_4/t	Carbon %	Acid Insoluble Carbon %	Calcite Equivalent % $CaCO_3$	$CaCO_3$-ANC kg H_2SO_4/t	
Savannah Sample	0.01	0.01	0.00	3	0.03	0.02	0.04	0.4	8.1

Table 2.2: Acid Base Accounting Calculations and NAG Test Results

Sample	Calculations			NAG Results			Acid Forming Potential
	MPA kg H_2SO_4/t	ANC/MPA Ratio	NAPP kg H_2SO_4/t	NAG (7.0) kg H_2SO_4/t	NAG (4.5) kg H_2SO_4/t	NAG pH	
Savannah Sample	0	-	-6	0	0	7.4	Non Acid Forming (NAF)

Note: Values in the tables have been rounded.

2.5 MULTI-ELEMENT RESULTS

2.5.1 Element Enrichments

Whole rock multi-element analysis of the tailings solids was conducted to assess element enrichments within the solid fraction of the tailings. Multi-element analysis results were compared to the average crustal abundance (ACA) to calculate the geochemical abundance indices (GAIs). The GAI quantifies an assay result for a particular element in terms of ACA. The assay results, ACAs and GAIs are provided in Table 2.3 and indicate that the sample had a moderate number of enrichments, with the level of enrichment varying from slight to high. Highly enriched elements include silver, bismuth, molybdenum and selenium, with antimony and tin found to be significantly enriched and arsenic, beryllium and copper classed as slightly enriched. The metals and metalloids recorded are naturally occurring in the ore and remain in the tailings after processing. Such concentrations can be considered typical of mineralised deposits.

2.5.2 Preliminary Soil Quality Screening

The results of the multi-element analysis have also been compared to a set of soil quality screening guidelines for human health, ecology and soil contamination intervention values. The establishment of these soil quality screening values is to allow for evaluation only and it is not implied by production of these values that the project will be required to meet these reference levels or that these reference levels should be used as the regulatory framework.

The results indicate that the sample met the criteria for human health (recreational / open space), but exceeded the ecological values for antimony, chromium, copper, nickel, selenium, silver and zinc. In addition, the sample exceeded the soil intervention values for copper, nickel and silver. As such, the tailings management design includes suitable controls to mitigate potential risks, as discussed in Section 3. The summarised results compared to the assessment criteria are presented in Table 2.4.

Table 2.3: Assay Results, ACA and GAIs

Element	Unit	Assay Result	ACA	GAI
Ag	ppm	33	0.07	6
Al	ppm	72572	82000	0
As	ppm	15.5	1.5	2
B	ppm	50	10	1
Ba	ppm	7	500	0
Be	ppm	29	2.6	2
Bi	ppm	3	0.048	5
C	ppm	250	480	0
Ca	ppm	1248	41000	0
Cd	ppm	0.3	0.11	0
Cl	ppm	200	130	0
Co	ppm	7.8	20	0
Cr	ppm	249	100	0
Cu	ppm	339	50	2
F	ppm	455	950	0
Fe	ppm	5950	41000	0
Hg	ppm	0.01	0.05	0
K	ppm	24745	21000	0
Mg	ppm	174	23000	0
Mn	ppm	874	950	0
Mo	ppm	88.8	1.5	5
Na	ppm	32197	23000	0
Ni	ppm	407	80	1
P	ppm	1595	1000	0
Pb	ppm	18.5	14	0
S	ppm	100	260	0
Sb	ppm	5.6	0.2	4
Se	ppm	3.7	0.05	5
Sn	ppm	42	2.2	3
Sr	ppm	28	370	0
Th	ppm	0.1	12	0
U	ppm	3.1	2.4	0
V	ppm	4	160	0
Zn	ppm	91	75	0

Legend:

Not Enriched	0 – 1
Slightly Enriched	2
Significantly Enriched	3 – 4
Highly Enriched	5 – 6

Table 2.4: Assay Results and Soil Quality Screening Guidelines

Element	Assay Results (ppm)	Human Health-Based Investigation Levels [1] (ppm)	Ecological Soil Screening Levels [2,3] (ppm)	Soil Remediation Intervention Values [4] (ppm)
Antimony	5.6	N/G	**0.27**	15
Arsenic	15.5	300	46	55
Barium	7	N/G	2000	625
Beryllium	29	90	21	30
Boron	50	20000	N/G	N/G
Cadmium	0.30	90	0.4	12
Chromium	249	N/G	**34**	380
Cobalt	7.8	300	230	240
Copper	339	17000	**49**	**190**
Lead	18.5	600	56	530
Manganese	874	19000	4000	N/G
Mercury	0.01	80	N/G	10
Molybdenum	89	N/G	N/G	200
Nickel	407	1200	**130**	**210**
Phosphorus	1595	N/G	2000	N/G
Selenium	3.7	700	**0.63**	100
Silver	33	N/G	**14**	**15**
Sulfur	100	N/G	600	N/G
Sulfate	100	N/G	2000	N/G
Tin	42	N/G	N/G	900
Vanadium	4.0	N/G	280	250
Zinc	91	30000	**79**	720

Notes:

Values in red bold indicate where a guideline value has been exceeded.

[1] National Environment Protection (Assessment of Site Contamination) Amendment Measure 2013 (No. 1). Health Investigation Levels for Soil Contaminants, Generic Land Use HIL C – Recreational.

[2] United States Environmental Protection Agency (U.S. EPA) Ecological Soil Screening Levels (Eco-SSLs), http://www.epa.gov/ecotox/ecossl/ (mammalian wildlife).

[3] Ecological guideline values for phosphorous, sulfur and sulfate are based on National Environment Protection (Assessment of Site Contamination) Measure (NEPC, 1999). These former Australian ecological investigation levels for urban areas have been included for reference purposes in the absence of other more applicable ecological assessment criteria.

[4] Netherlands Ministry of Housing, Spatial Planning and the Environment (VROM) 2000. Circular on Target Values and Intervention Values for Soil Remediation, Reference DBO/1999226863. Soil remediation intervention values. In the absence of intervention values for beryllium, selenium, silver, tin and vanadium, “indicative levels for serious soil contamination” have been applied.

2.6 DISTILLED WATER EXTRACT ANALYSIS

Extract testing was conducted to provide an indication of readily soluble metals and metalloids in the tailings solids. A filtrate sample was not provided to KP.

The results of the extract testing have been compared to a range of reference water quality values to allow for initial evaluation of the leachate water chemistry. These reference values are outlined below with additional details provided in Appendix A. It is not implied by production of the reference water quality values that the project will be required to meet these reference levels or that these reference levels should be used as the regulatory framework.

2.6.1 Release and Surface Water Guidelines

The results of the extract testing have been compared to IFC guidelines for mining effluents, Portuguese emission limit values for wastewater discharge and European surface water guidelines. A range of guidelines have been adopted to enable assessment of a wider range of parameters.

The results of the comparison are summarised in Table 2.5 and indicate the extract to be of a reasonable quality, meeting the IFC release guidelines and Portuguese emission standards. However, the laboratory was only able to achieve a detection limit for mercury of 0.0001 mg/L (0.1 µg/L), compared to the EU surface water guideline of 0.00007 mg/L (0.07 µg/L). Although mercury was not detected above 0.0001 mg/L it is not possible to determine whether it is present above the EU surface water threshold of 0.00007 mg/L. All other metals and metalloids were confirmed as being below the EU surface water thresholds.

2.6.2 EU Drinking Water Guidelines

The extract sample has also been compared to EU drinking water guidelines, supplemented with WHO guidelines for barium and uranium to allow a fuller assessment. The sample was found to exceed the health guidelines for antimony and arsenic (chemical parameters) by factors of 2 and 5 respectively, together with a slight exceedance of aluminium (indicator parameter). It is not currently known whether the project will be required to meet drinking water standards.

The results of the analyses compared to drinking water guidelines are shown in Table 2.6, with the implications for tailings management provided in Section 3.

Table 2.5: Extract Comparison to Surface Water and Release Guidelines

Parameter	IFC Mining Release (mg/L)	Portuguese Emissions (mg/L)	EU Surface Water (mg/L)	Assay Results (mg/L)
pH	6 to 9	6 to 9	N/G	8.2
TDS	N/G	N/G	N/G	30
EC	N/G	N/G	N/G	97
Aluminium	N/G	10	N/G	0.24
Antimony	N/G	N/G	N/G	0.012
Arsenic	0.1	1	N/G	0.05
Barium	N/G	N/G	N/G	0.002
Boron	N/G	N/G	N/G	0.04
Cadmium	0.05	0.2	0.00045 - 0.0015[2]	0.00002
Calcium	N/G	N/G	N/G	2.1
Chloride	N/G	N/G	N/G	12
Chromium	N/G	2	N/G	0.01
Cobalt	N/G	N/G	N/G	0.0001
Copper	0.3	1	N/G	0.03
Fluoride	N/G	N/G	N/G	0.60
Iron	2	2	N/G	0.07
Lead	0.2	1	0.0072	0.001
Magnesium	N/G	N/G	N/G	1.0
Manganese	N/G	2	N/G	0.03
Mercury	0.002	0.05	0.00007[3]	0.0001
Molybdenum	N/G	N/G	N/G	0.006
Nickel	0.5	2	0.02	0.01
Phosphorus	N/G	10	N/G	1.5
Selenium	N/G	N/G	N/G	0.001
Silver	N/G	N/G	N/G	0.0004
Sodium	N/G	N/G	N/G	13
Sulfate	N/G	2000	N/G	7
Tin	N/G	N/G	N/G	0.001
Uranium	N/G	N/G	N/G	0.0009
Vanadium	N/G	N/G	N/G	0.01
Zinc	N/G	N/G	N/G	0.01

Notes:

N/G = No guideline.

[2] Varies according to water hardness.

[3] Mercury was not detected, but as the limit of detection exceeds the surface water guideline it is not possible to determine the whether the metal is present at levels exceeding or below the surface water threshold.

Table 2.6: Extract Comparison to Drinking Water Guidelines

Parameter	Drinking Water Guideline (mg/L)	Assay Results (mg/L)
pH	6.5-9.5	8.2
TDS	N/G	30
EC	2500	97
Aluminium	0.2[1]	**0.24**
Antimony	0.005	**0.012**
Arsenic	0.01	**0.05**
Barium	0.7[2]	0.002
Boron	1	0.04
Cadmium	0.005	0.00002
Calcium	N/G	2.1
Chloride	250	12
Chromium	0.05	0.01
Cobalt	N/G	0.0001
Copper	2	0.03
Fluoride	1.5	0.60
Iron	0.2	0.07
Lead	0.01	0.001
Magnesium	N/G	1.0
Manganese	0.05	0.03
Mercury	0.001	0.0001
Molybdenum	N/G	0.006
Nickel	0.02	0.01
Phosphorus	N/G	1.5
Selenium	0.01	0.001
Silver	N/G	0.0004
Sodium	200	13
Sulfate	250	7
Tin	N/G	0.001
Uranium	0.03[2]	0.0009
Vanadium	N/G	0.01
Zinc	N/G	0.01

Notes:

N/G = No guideline.

Values in red bold highlighted exceed EU drinking water guideline

[1] Threshold for aluminium is an indicator parameter rather than health based.

[2] Value taken from WHO guidelines in the absence of an EU threshold.

3. SUMMARY OF RESULTS AND IMPLICATIONS FOR TAILINGS MANAGEMENT

3.1 ACID FORMING POTENTIAL

The tailings sample is considered to be Non Acid Forming (NAF) based on the negligible sulfur content, negative NAPP value and circum neutral NAG pH result. Based on these results, there is no perceived risk of the tailings sample generating acid.

3.2 MULTI-ELEMENT ENRICHMENT

The sample had a moderate number of enrichments with silver, bismuth, molybdenum and selenium found to be highly enriched, with antimony and tin found to be significantly enriched and arsenic, beryllium and copper classed as slightly enriched.

Comparison of the multi-element analysis results with soil quality screening guidelines indicate that the sample met the criteria for human health (recreational / open space) but exceeded the ecological values for antimony, chromium, copper, nickel, selenium, silver and zinc. In addition, the sample exceeded the soil intervention values for copper, nickel and silver.

The multi-element concentrations recorded in the tailings are naturally occurring within the ore and remain in the tailings after processing. The concentrations can be considered typical of mineralised deposits, with appropriate engineering controls outlined in Section 3.4.

3.3 EXTRACT WATER QUALITY

The distilled water extract sample was found to be of a reasonable quality when compared to IFC guidelines for mining effluents, Portuguese emission standards and EU surface water guidelines. However, the sample was found to exceed the EU drinking water guidelines for antimony and arsenic by factors of 2 and 5 respectively, together with a slight exceedance of aluminium. The engineering controls implemented on the basis of these results are outlined in Section 3.4.

3.4 TAILINGS MANAGEMENT DESIGN

The geochemical properties of the tailings are generally considered to be low risk and should be able to be adequately managed through the implementation of appropriate engineering design, as outlined below.

The tailings produced will be placed concurrently with Run of Mine waste as part of an Integrated Waste Landform (IWL). Continuous cover and encapsulation of the tailings will be achieved as part of standard waste dump operating procedures. This cover system should be resistant to erosion and incorporate a growth medium to encourage revegetation. The requirement for the cover system to reduce infiltration will depend on the environmental discharge limits specified for the project, which may take into consideration baseline surface water and groundwater quality. It is noted that the current IWL design incorporates surface water drainage and capping measures to reduce infiltration into the waste and seepage collection systems at the downstream toe from which leachate will be pumped to a water polishing / treatment system prior to reuse or discharge during operations. Therefore, the intent is for the water discharged from the IWL to meet the project discharge limits.

On the basis of these results the IWL facility should be designed to prevent the loss of tailings solids through adequate sediment control structures. These structures will

intercept the main drainage lines and direct water around mining areas using low embankments, low bunds and diversion channels. It is intended that all disturbed areas are diverted into these systems to enable sediment control and water quality polishing prior to release downstream or recycle back to the process plant for treatment (to provide water of quality suitable for processing or for direct release back to the Rio Covas). Post closure, after removal of contained sediments (placed in mine waste storages) and once rehabilitation areas have stabilised, these structures will be removed to restore drainage lines to the original configuration as far as practical. The requirement to completely remove structures post closure will be reviewed towards the end of the mine life as part of the overall closure strategy.

Further geochemical analysis should be conducted to confirm the current results during the pilot plant testwork phase conducted as part of the detailed engineering. This testing may include humidity cell testing to examine the metal leaching rates and seepage quality in response to weathering, which are likely to be lower than those recorded in the distilled water extract test. This is because the distilled water extract test comprises agitating a pulverized sub-sample of tailings in water for 24 hours to encourage release of readily soluble metals/metalloids. By contrast, the humidity cell testing involves placement of 2 kg of (non-pulverised) tailings in a cell, where the sample is then exposed to heat and wetting/drying cycles to simulate and accelerate weathering, with a weekly flush of distilled water. This water is then analysed to determine the leachate quality in response to weathering, which is usually considered to provide a more accurate reflection of the seepage quality which is likely to occur when the tailings are placed within the IWL. However, as humidity cell testing usually runs for a period of 6 to 12 months, this will need to be considered in the detailed engineering design schedule.

We trust this memorandum report meets your current requirements, however, please do not hesitate to contact us should have any queries.

Yours faithfully
KNIGHT PIÉSOLD PTY LTD

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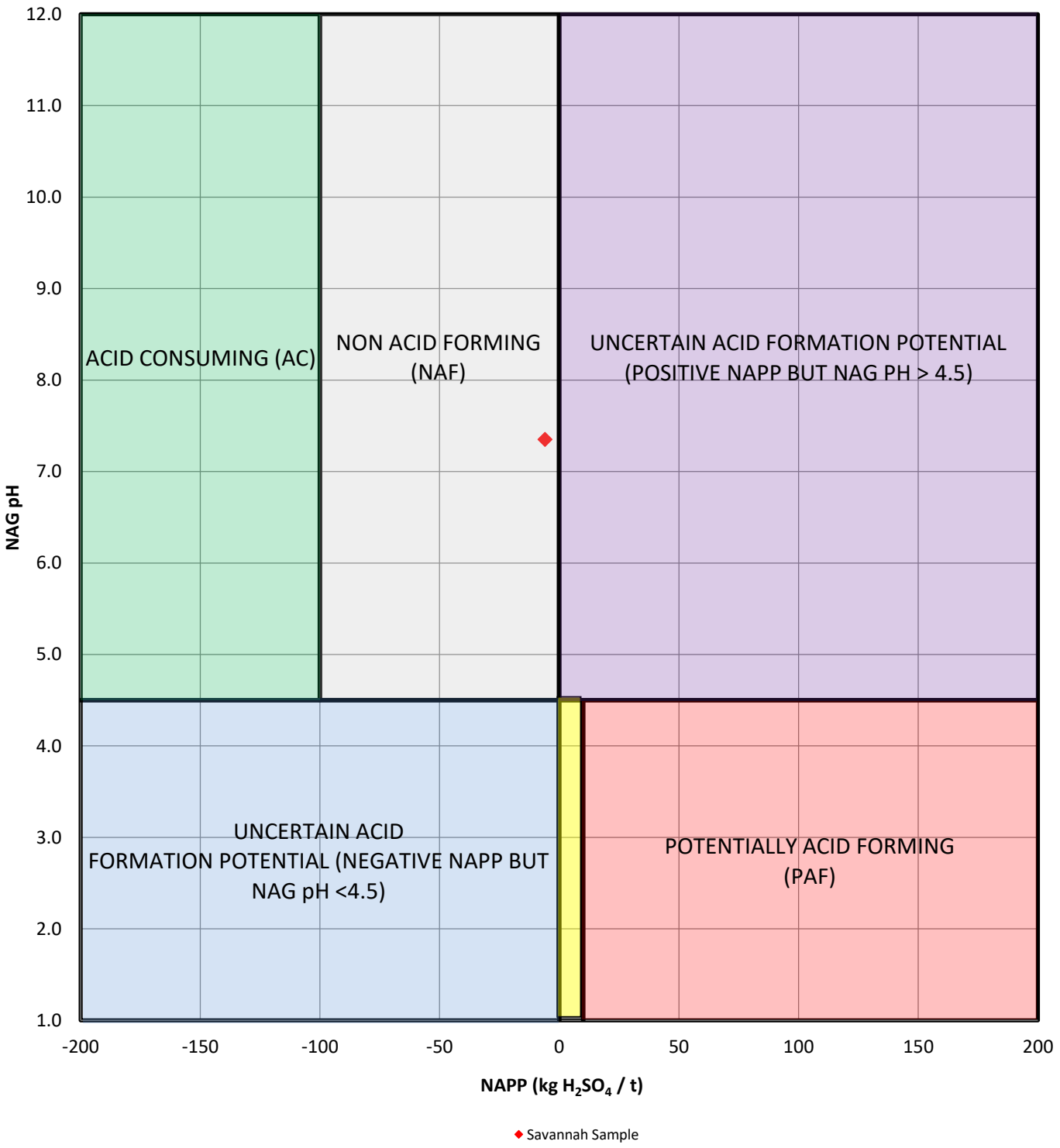
FIGURES

Acid Formation Potential



Acid Formation Potential	NAPP (kg H_2SO_4 / t)	NAG pH
Potential Acid Forming (PAF)	>10	<4.5
Potential Acid Forming - Low Capacity (PAF - LC)	0 to 10	<4.5
Non Acid Forming (NAF)	Negative	≥4.5
Acid Consuming (AC)	Less than - 100	≥4.5
Uncertain	Positive	≥4.5
	Negative	<4.5

APPENDIX A

Testwork Methods and Interpretation Principles

A. TESTWORK METHODS

A.1 ACID BASE ACCOUNTING

Acid base accounting (ABA) assesses a sample's potential to form acid from the oxidation of sulfides and the ability to neutralise acid by the dissolution of minerals, especially carbonates, contained in the sample. The test work methods used were based on the ABA methodology defined in the Mine Environment Neutral Drainage (MEND) Acid Rock Drainage Prediction Manual (Ref. 1) and Guidelines for Metal Leaching and Acid Rock Drainage at Mine Sites in British Columbia (Ref. 2), as detailed below.

Total carbon and total inorganic carbon were determined by LECO induction furnace, with infrared detection. Sulfate sulfur was determined by HCl digest with ICP detection. Acid Neutralising Capacity (ANC) was determined by digestion in a standard solution of HCl, followed by back titration with NaOH to determine the amount of acid consumed. The technique used was based on Sobek et al (Ref. 3), however, a siderite correction step has been added to the method, after Stewart et al (Ref. 4).

The results of the ABA test work are used to calculate the Maximum Potential Acidity (MPA) which is a measure of the maximum amount of sulfuric acid which can be produced from the total oxidation of all sulfides within the sample, assuming all sulfide is present as pyrite.

The Net Acid Producing Potential (NAPP) is the balance between the Maximum Potential Acidity and the Acid Neutralising Capacity. A negative NAPP indicates that there is an excess neutralising capacity and a positive NAPP indicates there is excess potential acidity.

A.2 NET ACID GENERATION

Net Acid Generation (NAG) test work is a direct measure of the sample's ability to produce acid through sulfide oxidation. The addition of hydrogen peroxide to samples causes rapid oxidation of the contained sulfides to produce sulfuric acid.

The procedure employed is based upon the Static NAG Test (Ref. 5 and 6). The static NAG test involves the addition of 250 mL of 15% hydrogen peroxide to 2.5 g of pulverised sample. The sample is allowed to react overnight prior to heating for a period of three hours. Once the sample has cooled the pH of the sample is measured prior to titration back to pH 4.5 and 7 to determine the acidity produced by the oxidation reactions.

A.3 ACID FORMING POTENTIAL

The acid formation potential of a sample is calculated based on the acid base accounting, i.e. the balance between a sample's ability to produce acid from the oxidation of sulfide minerals (MPA) and the sample's ability to neutralise acid by the dissolution of alkaline minerals contained within the sample (ANC).

Historically a safety margin was applied to ratio between the ANC and MPA to allow for variability in the rates of acid production and neutralisation processes and the potential for geographic separation of the acid producing and acid neutralising phases. This safety margin was generally set by industry at 2 in North America and 3 in Australia.

With recent advances in the understanding and acceptance of the NAG test there has been a move away from this method of classifying materials based solely on the ANC and MPA as these calculated parameters do not take into consideration the true availability of acid producing and acid neutralising phases.

Knight Piésold prefers to utilise the results of the acid base accounting in combination with the NAG testing results to classify the acid formation potential of materials. Knight

Piésold's classification system is summarised in Table A.1. It is based on the Australian Government publication; Managing Acidic and Metalliferous Drainage (Ref. 7) and is broadly similar to the classification system contained within the AMIRA ARD Test Handbook (Ref. 8), which is advocated by the Global Acid Rock Drainage Guidelines (Ref. 9).

Table A.1: Acid Formation Potential Classification System

Acid Formation Potential Class	NAPP (kg H_2SO_4 /t)	NAG pH
Potentially Acid Forming (PAF)	>10	<4.5
Potentially Acid Forming – Low Capacity (PAF-LC)	0 to 10	<4.5
Non Acid Forming (NAF)	Negative	≥4.5
Acid Consuming (AC)	Less than -100	≥4.5
Uncertain (UC)	Positive	≥4.5
	Negative	<4.5

A.4 MULTI-ELEMENT ANALYSIS OF SOLIDS

A.4.1 Geochemical Enrichments

Multi-element analysis of the tailings solids was conducted to assess element enrichments within the sample. The four acid digestion method used results in near total digestion of the sample to assess the whole rock geochemistry.

Multi-element analysis results were compared to average crustal abundances to calculate the geochemical abundance indices. The Geochemical Abundance Index (GAI) quantifies an assay result for a particular element in terms of average crustal abundance.

The GAI is calculated from the following formula:

$$\mathbf{GAI = Log_2 (C_n / (1.5 \times B_n))}$$

Where:
Cn = measured concentration of element in sample
Bn = average crustal abundance (Bowen, Ref. 10)

The GAI is expressed on a scale of 0 to 6, with 0 indicating that the element concentration is less than or similar to average crustal abundance, and a GAI of 6 indicating an element concentration of more than 96 times the average crustal abundance. The enrichment ranges for GAIs are as follows:

- GAI = 0 represents <3 times crustal abundance.
- GAI = 1 represents 3 to 6 times crustal abundance.
- GAI = 2 represents 6 to 12 times crustal abundance.
- GAI = 3 represents 12 to 24 times crustal abundance.
- GAI = 4 represents 24 to 48 times crustal abundance.
- GAI = 5 represents 48 to 96 times crustal abundance.
- GAI = 6 represents more than 96 times crustal abundance.

Knight Piésold has assigned an arbitrary scale to the GAI, with indices of 0 and 1 being classified as "not enriched", an index of 2 being classed as "slightly enriched", indices of 3 and 4 being classed as "significantly enriched" and indices of 5 and 6 being classified as "highly enriched".

A.4.1 Soil Quality Screening for Closure Planning

The multi-element analysis results were also compared to guideline concentrations for soil quality based on risk to human health and ecology for preliminary assessment of possible closure requirements, such as construction of engineered cover systems or limiting land use / access.

The Australian National Environment Protection (Assessment of Site Contamination) Amendment Measure 2013 (Ref. 11) has been used to assess risk to human health, based on an assumed 'recreational' closure land use. This assumes the final landform will comprise public open space such as parks and playing fields rather than undeveloped public open space where the potential for exposure will be lower. However, these values assume that no planting of crops for human consumption will occur.
To assess ecological risk, the U.S. Environmental Protection Agency Ecological Soil Screening Levels (Eco-SSLs) (Ref. 12) have been applied. These values apply to sites where terrestrial organisms may be exposed directly or indirectly to contaminated soil. The Eco-SSL values for mammalian wildlife have been adopted for this study. The Eco-SSLs do not provide guideline values for sulfur, sulfate or phosphorous. Therefore, the former National Environment Protection (Assessment of Site Contamination) Measure (NEPC, 1999) (Ref. 13) ecological investigation levels for these substances have been included for reference purposes in the absence of other more applicable ecological assessment criteria.

The Netherlands Ministry of Housing, Spatial Planning and the Environment (VROM) has developed a series of soil-screening values for contaminated sites as part of the Dutch Soil Protection Act (VROM 2000) (Ref. 14). Soil quality is assessed and managed using target and intervention values which are independent of land use. Soils with contaminant concentrations below target values are considered to be at no risk and no restrictions on their use have been set. Soils with contaminant concentrations exceeding the intervention values require remediation as a matter of urgency, as the functional properties of the soil for humans, plant and animal life is seriously impaired or threatened. Therefore, for preliminary screening purposes, the intervention values have been applied in this study. For certain substances where intervention values have not been set, so-called "indicative levels for serious contamination" have been provided. These have also been included in this study, where appropriate.

The establishment of these soil quality screening values is to allow for evaluation only and it is not implied by production of these values that the project will be required to meet these reference levels or that these reference levels should be used as the regulatory framework.

A.5 LEACHATE WATER QUALITY

Distilled water extract testing of the tailings solids has been conducted to identify any readily soluble metals and metalloids.

The procedure specified is based on the Shake Flask Method as described in the Guidelines for Metal Leaching and Acid Rock Drainage at Minesites in British Columbia (Ref. 2), as described below.

Initially 50 grams of each sample was mixed with 150 mL of deionized water. The mixtures were then bottle rolled for 24 hours. The pH and the conductivity of the solutions were measured and the bottles left to stand for a minimum of three hours. The solution was then siphoned off and filtered through a 0.45 µm membrane before preservation of the solution by acid addition prior to analysis. The analysis was by Inductively Coupled Plasma Mass Spectrometry (ICP-MS) or Inductively Coupled Plasma Optical Emission Spectrometry (ICP-OES) depending on the element being analysed and the detection limits required.

The results have been compared to a set of reference water quality standards, which are discussed in Section A.6.

A.6 REFERENCE WATER QUALITY STANDARDS

To allow assessment of the results of the extract analysis, two sets of reference values have been established as follows:

- Reference Set 1 – IFC guidelines for release of water from mining operations (Ref. 15), Portuguese emission standards for wastewater (Ref. 16) and EU surface water guidelines (Ref. 17). These reference values are summarised in Table A.2.

- Reference Set 2 – EU drinking water standards (Ref. 18), supplemented with WHO guidelines (Ref. 19) to allow a fuller assessment. These reference values are presented in Table A.3.

The establishment of these reference water quality values is to allow for evaluation only and it is not implied by production of the reference water quality values that the project will be required to meet these reference levels or that these reference levels should be used as the regulatory framework.

Table A.2: Reference Guidelines for Release and Surface Water

Parameter	Unit	IFC Release	Portuguese Emissions	EU Surface Water
pH	S.U.	6 to 9	6 to 9	N/G
TDS	mg/kg	N/G	N/G	N/G
EC	µS/cm	N/G	N/G	N/G
Aluminum	mg/L	N/G	10	N/G
Antimony	mg/L	N/G	N/G	N/G
Arsenic	mg/L	0.1	1	N/G
Barium	mg/L	N/G	N/G	N/G
Boron	mg/L	N/G	N/G	N/G
Cadmium	mg/L	0.05	0.2	0.00045 - 0.0015[1]
Calcium	mg/L	N/G	N/G	N/G
Chloride	mg/L	N/G	N/G	N/G
Chromium	mg/L	N/G	2	N/G
Cobalt	mg/L	N/G	N/G	N/G
Copper	mg/L	0.3	1	N/G
Fluoride	mg/L	N/G	N/G	N/G
Iron	mg/L	2	2	N/G
Lead	mg/L	0.2	1	0.0072
Magnesium	mg/L	N/G	N/G	N/G
Manganese	mg/L	N/G	2	N/G
Mercury	mg/L	0.002	0.05	0.00007
Molybdenum	mg/L	N/G	N/G	N/G
Nickel	mg/L	0.5	2	0.02
Phosphorus	mg/L	N/G	10	N/G
Selenium	mg/L	N/G	N/G	N/G
Silver	mg/L	N/G	N/G	N/G
Sodium	mg/L	N/G	N/G	N/G
Sulfate	mg/L	N/G	2000	N/G
Tin	mg/L	N/G	N/G	N/G
Uranium	mg/L	N/G	N/G	N/G
Vanadium	mg/L	N/G	N/G	N/G
Zinc	mg/L	N/G	N/G	N/G

Notes:

N/G – No guideline

[1] Varies according to water hardness.

Table A.3: Drinking Water Guidelines

Parameter	Unit	Guideline
pH	S.U.	6.5-9.5
TDS	mg/kg	N/G
EC	µS/cm	2500
Aluminium	mg/L	0.2
Antimony	mg/L	0.005
Arsenic	mg/L	0.01
Barium	mg/L	0.7[1]
Boron	mg/L	1
Cadmium	mg/L	0.005
Calcium	mg/L	N/G
Chloride	mg/L	250
Chromium	mg/L	0.05
Cobalt	mg/L	N/G
Copper	mg/L	2
Fluoride	mg/L	1.5
Iron	mg/L	0.2
Lead	mg/L	0.01
Magnesium	mg/L	N/G
Manganese	mg/L	0.05
Mercury	mg/L	0.001
Molybdenum	mg/L	N/G
Nickel	mg/L	0.02
Phosphorus	mg/L	N/G
Selenium	mg/L	0.01
Silver	mg/L	N/G
Sodium	mg/L	200
Sulfate	mg/L	250
Tin	mg/L	N/G
Uranium	mg/L	0.03[1]
Vanadium	mg/L	N/G
Zinc	mg/L	N/G

Notes:

N/G = No guideline.

[1] Value taken from WHO guidelines in the absence of an EU threshold.

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APPENDIX B

Laboratory Reports

MINERALS
TEST REPORT

CLIENT

KNIGHT PIESOLD PTY LIMITED
PO Box 6837
EAST PERTH, W.A. 6892
AUSTRALIA

JOB INFORMATION

JOB CODE	: 752.0/1919866
NO. SAMPLES	: 1
NO. ELEMENTS	: 48
CLIENT ORDER NO.	: P18958 (Job 1 of 1)
SAMPLE SUBMISSION NO.	: PE501-00080/04
PROJECT	: MINA DO BARROSO
SAMPLE TYPE	: Solid
DATE RECEIVED	: 12/11/2019
DATE TESTED	: 15/11/2019 - 08/01/2020
DATE REPORTED	: 08/01/2020
DATE PRINTED	: 08/01/2020

REPORT NOTES

TESTED BY

Intertek
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PO Box 144, Gosnells 6990, Western Australia
Tel: +61 8 9251 8100
Email: min.aus.per@intertek.com

APPROVED SIGNATURE FOR

Craig RITCHIE
Operations Manager - Perth

This report relates specifically to the sample(s) tested that were drawn and/or provided by the client or their nominated third party to Intertek. The reported result(s) provide no warranty or verification on the sample(s) representing any specific goods and/or shipment. This report was prepared solely for the use of the client named in this report. Intertek accepts no responsibility for any loss, damage or liability suffered by a third party as a result of any reliance upon or use of this report. The results provided are not intended for commercial settlement purposes.
Except where explicitly agreed in writing, all work and services performed by Intertek is subject to our standard Terms and Conditions which can be obtained at our website: intertek.com/terms/

SIGNIFICANT FIGURES

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

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

SAMPLE STORAGE

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

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

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

ELEMENTS	Ag	Ag	Al	Al	ANC	As
UNITS	ug/l	ppm	ppm	mg/l	kgH2SO4/t	ug/l
DETECTION LIMIT	0.01	0.1	50	0.01	1	0.1
DIGEST	Ws3/	4AB/	4AB/	Ws3/	ANCx/	Ws3/
ANALYTICAL FINISH	MS	MS	OE	OE	VOL	MS
SAMPLE NUMBERS						
0001 Savannah Sample	0.42	28.1	7.37%	0.23	6	54.9
CHECKS						
0001 Savannah Sample	0.42	37.8	7.15%	0.24	6	55.0
STANDARDS						
0001 TMDW	1.95					79.4
0002 OREAS 929		7.3	6.37%			
0003 OREAS 97.01						
0004 GTS-2a						
0005 OREAS 928						
0006 AMIS0343						
0007 OREAS 24b						
0008 ANC-3					99	
0009 NAG Std 3						
0010 PD-1						
0011 0.5%NaCl-1						
0012 PD-1						
0013 TOC-1b						
BLANKS						
0001 Control Blank	<0.01	<0.1	<50	<0.01	<1	<0.1

ELEMENTS	As	B	B	Ba	Ba	Be
UNITS	ppm	ppm	mg/l	ug/l	ppm	ug/l
DETECTION LIMIT	1	50	0.01	0.05	0.1	0.1
DIGEST	4AB/	FP1/	Ws3/	Ws3/	4AB/	Ws3/
ANALYTICAL FINISH	MS	OE	OE	MS	MS	MS
SAMPLE NUMBERS						
0001 Savannah Sample	15	<50	0.04	1.84	6.9	<0.1
CHECKS						
0001 Savannah Sample	16	<50	0.03	1.84	7.3	<0.1
STANDARDS						
0001 TMDW				49.94		19.8
0002 OREAS 929	10				328.1	
0003 OREAS 97.01						
0004 GTS-2a						
0005 OREAS 928		<50				
0006 AMIS0343						
0007 OREAS 24b						
0008 ANC-3						
0009 NAG Std 3						
0010 PD-1						
0011 0.5%NaCl-1						
0012 PD-1						
0013 TOC-1b						
BLANKS						
0001 Control Blank	<1	<50	<0.01	<0.05	<0.1	<0.1

ELEMENTS	Be	Bi	Bi	C	C-Acinsol	C-CO3
UNITS	ppm	ug/l	ppm	%	%	%
DETECTION LIMIT	0.1	0.005	0.01	0.01	0.01	0.01
DIGEST	4AB/	Ws3/	4AB/		C71/	
ANALYTICAL FINISH	MS	MS	MS	/CSA	CSA	/CALC
SAMPLE NUMBERS						
0001 Savannah Sample	28.8	0.154	3.15	0.02	0.02	<0.01
CHECKS						
0001 Savannah Sample	28.9	0.115	3.50	0.03	0.02	<0.01
STANDARDS						
0001 TMDW		9.526				
0002 OREAS 929	2.1		108.97			
0003 OREAS 97.01						
0004 GTS-2a						
0005 OREAS 928						
0006 AMIS0343						
0007 OREAS 24b				0.18		
0008 ANC-3						
0009 NAG Std 3						
0010 PD-1						
0011 0.5%NaCl-1						
0012 PD-1						
0013 TOC-1b					1.22	
BLANKS						
0001 Control Blank	<0.1	<0.005	0.01	<0.01	<0.01	

ELEMENTS	Ca	Ca	Cd	Cd	Cl	Cl
UNITS	ppm	mg/l	ug/l	ppm	%	mg/l
DETECTION LIMIT	50	0.01	0.02	0.1	0.02	1
DIGEST	4AB/	Ws3/	Ws3/	4AB/	CL1/	Ws3/
ANALYTICAL FINISH	OE	OE	MS	MS	COL	COL
SAMPLE NUMBERS						
0001 Savannah Sample	1246	2.11	<0.02	0.3	<0.02	12
CHECKS						
0001 Savannah Sample	1249	1.99	<0.02	0.3	<0.02	12
STANDARDS						
0001 TMDW			9.69			30
0002 OREAS 929	4384			0.8		
0003 OREAS 97.01						
0004 GTS-2a						
0005 OREAS 928						
0006 AMIS0343						
0007 OREAS 24b						
0008 ANC-3						
0009 NAG Std 3						
0010 PD-1						
0011 0.5%NaCl-1					0.29	
0012 PD-1						
0013 TOC-1b						
BLANKS						
0001 Control Blank	<50	0.01	<0.02	<0.1	<0.02	<1

ELEMENTS	Co	Co	ColourChange	Cr	Cr	Cu
UNITS	ug/l	ppm	NONE	ppm	mg/l	ppm
DETECTION LIMIT	0.1	0.1	0	5	0.01	1
DIGEST	Ws3/	4AB/	ANCx/	4AB/	Ws3/	4AB/
ANALYTICAL FINISH	MS	MS	QUAL	OE	OE	OE
SAMPLE NUMBERS						
0001 Savannah Sample	<0.1	7.7	No	238	<0.01	311
CHECKS						
0001 Savannah Sample	<0.1	7.9	No	260	<0.01	366
STANDARDS						
0001 TMDW	24.5					
0002 OREAS 929		35.4		70		1.97%
0003 OREAS 97.01						
0004 GTS-2a						
0005 OREAS 928						
0006 AMIS0343						
0007 OREAS 24b						
0008 ANC-3						
0009 NAG Std 3						
0010 PD-1						
0011 0.5%NaCl-1						
0012 PD-1						
0013 TOC-1b						
BLANKS						
0001 Control Blank	<0.1	0.2		<5	<0.01	<1

ELEMENTS	Cu	EC	EC	F	F	Fe
UNITS	mg/l	uS/cm	uS/cm	ppm	mg/l	%
DETECTION LIMIT	0.01	10	10	50	0.1	0.01
DIGEST	Ws3/	Paste/	Ws3/	FC7/	Ws3/	4AB/
ANALYTICAL FINISH	OE	MTR	MTR	SIE	SIE	OE
SAMPLE NUMBERS						
0001 Savannah Sample	0.03	139	97	455	0.6	0.60
CHECKS						
0001 Savannah Sample	0.03	133	97	455	0.6	0.59
STANDARDS						
0001 TMDW			323		0.6	
0002 OREAS 929						9.11
0003 OREAS 97.01						
0004 GTS-2a						
0005 OREAS 928						
0006 AMIS0343				2271		
0007 OREAS 24b						
0008 ANC-3						
0009 NAG Std 3						
0010 PD-1		323				
0011 0.5%NaCl-1						
0012 PD-1						
0013 TOC-1b						
BLANKS						
0001 Control Blank	<0.01	<10	<10	<50	<0.1	<0.01

ELEMENTS	Fe	Final-pH	Fizz-Rate	Hg	Hg	K
UNITS	mg/l	NONE	NONE	ppm	ug/l	ppm
DETECTION LIMIT	0.01	0.1	0	0.01	0.1	20
DIGEST	Ws3/	ANCx/	ANCx/	HG1/	Ws3/	4AB/
ANALYTICAL FINISH	OE	MTR	QUAL	CV	MS	OE
SAMPLE NUMBERS						
0001 Savannah Sample	0.08	1.5	0.0000000	<0.01	<0.1	2.49%
CHECKS						
0001 Savannah Sample	0.06	1.6	0.0000000	<0.01	<0.1	2.46%
STANDARDS						
0001 TMDW					<0.1	
0002 OREAS 929						2.10%
0003 OREAS 97.01						
0004 GTS-2a				0.25		
0005 OREAS 928						
0006 AMIS0343						
0007 OREAS 24b						
0008 ANC-3		1.7				
0009 NAG Std 3						
0010 PD-1						
0011 0.5%NaCl-1						
0012 PD-1						
0013 TOC-1b						
BLANKS						
0001 Control Blank	<0.01	1.5		<0.01	<0.1	<20

ELEMENTS	K	Mg	Mg	Mn	Mn	Mo
UNITS	mg/l	ppm	mg/l	ppm	mg/l	ug/l
DETECTION LIMIT	0.1	20	0.01	1	0.001	0.05
DIGEST	Ws3/	4AB/	Ws3/	4AB/	Ws3/	Ws3/
ANALYTICAL FINISH	OE	OE	OE	OE	OE	MS
SAMPLE NUMBERS						
0001 Savannah Sample	0.6	181	1.02	876	0.026	6.07
CHECKS						
0001 Savannah Sample	0.5	166	1.00	872	0.024	5.62
STANDARDS						
0001 TMDW						95.89
0002 OREAS 929		1.64%		1030		
0003 OREAS 97.01						
0004 GTS-2a						
0005 OREAS 928						
0006 AMIS0343						
0007 OREAS 24b						
0008 ANC-3						
0009 NAG Std 3						
0010 PD-1						
0011 0.5%NaCl-1						
0012 PD-1						
0013 TOC-1b						
BLANKS						
0001 Control Blank	<0.1	<20	0.03	<1	<0.001	<0.05

ELEMENTS	Mo	Na	Na	NAG	NAGpH	NAG(4.5)
UNITS	ppm	ppm	mg/l	kgH2SO4/t	NONE	kgH2SO4/t
DETECTION LIMIT	0.1	20	0.1	1	0.1	1
DIGEST	4AB/	4AB/	Ws3/	NAGx/	NAGx/	NAGx/
ANALYTICAL FINISH	MS	OE	OE	VOL	MTR	VOL
SAMPLE NUMBERS						
0001 Savannah Sample	88.5	3.27%	12.8	<1	7.3	<1
CHECKS						
0001 Savannah Sample	89.0	3.17%	12.5	<1	7.4	<1
STANDARDS						
0001 TMDW						
0002 OREAS 929	1.2	2163				
0003 OREAS 97.01						
0004 GTS-2a						
0005 OREAS 928						
0006 AMIS0343						
0007 OREAS 24b						
0008 ANC-3						
0009 NAG Std 3				21	2.7	16
0010 PD-1						
0011 0.5%NaCl-1						
0012 PD-1						
0013 TOC-1b						
BLANKS						
0001 Control Blank	<0.1	<20	<0.1	4	5.0	<1

ELEMENTS	Ni	Ni	P	P	Pb	Pb
UNITS	ppm	mg/l	ppm	mg/l	ug/l	ppm
DETECTION LIMIT	1	0.01	50	0.05	0.5	2
DIGEST	4AB/	Ws3/	4AB/	Ws3/	Ws3/	4AB/
ANALYTICAL FINISH	OE	OE	OE	OE	MS	MS
SAMPLE NUMBERS						
0001 Savannah Sample	406	<0.01	1591	1.47	1.5	18
CHECKS						
0001 Savannah Sample	407	<0.01	1599	1.50	0.9	19
STANDARDS						
0001 TMDW					38.4	
0002 OREAS 929	33		563			139
0003 OREAS 97.01						
0004 GTS-2a						
0005 OREAS 928						
0006 AMIS0343						
0007 OREAS 24b						
0008 ANC-3						
0009 NAG Std 3						
0010 PD-1						
0011 0.5%NaCl-1						
0012 PD-1						
0013 TOC-1b						
BLANKS						
0001 Control Blank	<1	<0.01	<50	<0.05	<0.5	<2

ELEMENTS	pH	pH	pH Drop	S	S	S-SO4
UNITS	NONE	NONE	NONE	%	mg/l	%
DETECTION LIMIT	0.1	0.1	0.1	0.01	0.05	0.01
DIGEST	Paste/	Ws3/	ANCx/		Ws3/	S71/
ANALYTICAL FINISH	MTR	MTR	MTR	/CSA	OE	OE
SAMPLE NUMBERS						
0001 Savannah Sample	8.1	8.2	UA	<0.01	2.21	<0.01
CHECKS						
0001 Savannah Sample	8.1	8.2		<0.01	2.19	<0.01
STANDARDS						
0001 TMDW		8.8				
0002 OREAS 929						
0003 OREAS 97.01						
0004 GTS-2a						
0005 OREAS 928						
0006 AMIS0343						
0007 OREAS 24b				0.20		
0008 ANC-3						
0009 NAG Std 3						
0010 PD-1	8.8					
0011 0.5%NaCl-1						
0012 PD-1						4.31
0013 TOC-1b						
BLANKS						
0001 Control Blank	5.5	5.5		<0.01	<0.05	<0.01

ELEMENTS	Sb	Sb	Se	Se	Sn	Sn
UNITS	ug/l	ppm	ppm	ug/l	ug/l	ppm
DETECTION LIMIT	0.01	0.05	0.01	0.5	0.1	0.1
DIGEST	Ws3/	4AB/	SE1/	Ws3/	Ws3/	4AB/
ANALYTICAL FINISH	MS	MS	MS	MS	MS	MS
SAMPLE NUMBERS						
0001 Savannah Sample	11.99	5.32	3.77	1.5	1.6	42.9
CHECKS						
0001 Savannah Sample	12.32	5.91	3.69	1.4	0.6	42.0
STANDARDS						
0001 TMDW	9.83			9.7	<0.1	
0002 OREAS 929		1.49				30.2
0003 OREAS 97.01			0.63			
0004 GTS-2a						
0005 OREAS 928						
0006 AMIS0343						
0007 OREAS 24b						
0008 ANC-3						
0009 NAG Std 3						
0010 PD-1						
0011 0.5%NaCl-1						
0012 PD-1						
0013 TOC-1b						
BLANKS						
0001 Control Blank	<0.01	0.09	<0.01	<0.5	<0.1	<0.1

ELEMENTS	Sr	Sr	TDSEva	Th	Th	U
UNITS	ug/l	ppm	mg/Kg	ug/l	ppm	ug/l
DETECTION LIMIT	0.02	0.05	20	0.005	0.01	0.005
DIGEST	Ws3/	4AB/	Ws3/	Ws3/	4AB/	Ws3/
ANALYTICAL FINISH	MS	MS	GR	MS	MS	MS
SAMPLE NUMBERS						
0001 Savannah Sample	12.48	27.79	30	<0.005	0.12	0.875
CHECKS						
0001 Savannah Sample	11.54	28.35	30	<0.005	0.10	0.886
STANDARDS						
0001 TMDW	245.43		3706	<0.005		9.639
0002 OREAS 929		33.42			14.04	
0003 OREAS 97.01						
0004 GTS-2a						
0005 OREAS 928						
0006 AMIS0343						
0007 OREAS 24b						
0008 ANC-3						
0009 NAG Std 3						
0010 PD-1						
0011 0.5%NaCl-1						
0012 PD-1						
0013 TOC-1b						
BLANKS						
0001 Control Blank	0.03	<0.05	<20	<0.005	0.03	<0.005

ELEMENTS	U	V	V	Zn	Zn
UNITS	ppm	ppm	mg/l	ppm	mg/l
DETECTION LIMIT	0.01	2	0.01	1	0.01
DIGEST	4AB/	4AB/	Ws3/	4AB/	Ws3/
ANALYTICAL FINISH	MS	OE	OE	OE	OE
SAMPLE NUMBERS					
0001 Savannah Sample	2.90	4	<0.01	89	<0.01
CHECKS					
0001 Savannah Sample	3.36	4	<0.01	92	<0.01
STANDARDS					
0001 TMDW					
0002 OREAS 929	2.81	82		473	
0003 OREAS 97.01					
0004 GTS-2a					
0005 OREAS 928					
0006 AMIS0343					
0007 OREAS 24b					
0008 ANC-3					
0009 NAG Std 3					
0010 PD-1					
0011 0.5%NaCl-1					
0012 PD-1					
0013 TOC-1b					
BLANKS					
0001 Control Blank	0.01	<2	<0.01	<1	<0.01

METHOD CODE DESCRIPTION

Method Code Date Tested	Analysing Laboratory NATA Laboratory Accreditation	NATA Scope of Accreditation
/CALC **29/11/19 14:29**	Intertek Genalysis Perth **3244 3237** No digestion or other pre-treatment undertaken. Results Determined by calculation from other reported data.	
/CSA **08/01/20 11:06**	Intertek Genalysis Perth **3244 3237** Induction Furnace Analysed by Infrared Spectrometry	**ENV_W061, CSA : ENV_W061**
4AB/MS **18/11/19 06:46**	Intertek Genalysis Perth **3244 3237** Multi-acid digest including Hydrofluoric, Nitric, Perchloric and Hydrochloric acids in Teflon Beakers. Analysed by Inductively Coupled Plasma Mass Spectrometry.	**4AB/ : MPL_W001, MS : ICP_W003**
4AB/OE **18/11/19 06:46**	Intertek Genalysis Perth **3244 3237** Multi-acid digest including Hydrofluoric, Nitric, Perchloric and Hydrochloric acids in Teflon Beakers. Analysed by Inductively Coupled Plasma Optical (Atomic) Emission Spectrometry.	**4AB/ : MPL_W001, OE : ICP_W004**
ANCx/MTR **19/11/19 10:25**	Intertek Genalysis Perth **3244 3237** Acid Neutralizing Capacity Digestion Procedure. Analysed with Electronic Meter Measurement	
ANCx/QUAL **19/11/19 10:25**	Intertek Genalysis Perth **3244 3237** Acid Neutralizing Capacity Digestion Procedure. Analysed by Qualitative Inspection	
ANCx/VOL **19/11/19 10:25**	Intertek Genalysis Perth **3244 3237** Acid Neutralizing Capacity Digestion Procedure. Analysed by Volumetric Technique.	
C71/CSA **29/11/19 15:50**	Intertek Genalysis Perth **3244 3237** Digestion by hot acid(s) and Induction Furnace Analysed by Infrared Spectrometry	

METHOD CODE DESCRIPTION

Method Code Date Tested	Analysing Laboratory NATA Laboratory Accreditation	NATA Scope of Accreditation
CL1/COL **18/11/19 13:47**	Intertek Genalysis Perth **3244 3237** Carbonate leach specific for Chlorine. Analysed by UV-Visible Spectrometry.	**ENV_W014, COL : ENV_W014**
FC7/SIE **15/11/19 11:57**	Intertek Genalysis Perth **3244 3237** Alkaline fusion (Nickel crucible) specific for Fluorine. Analysed by Specific Ion Electrode.	**ENV_W012, SIE : ENV_W012**
FP1/OE **16/11/19 12:55**	Intertek Genalysis Adelaide **3244 18645** Sodium peroxide fusion (Zirconia crucibles) and Hydrochloric acid to dissolve the melt. Analysed by Inductively Coupled Plasma Optical (Atomic) Emission Spectrometry.	**FP1/ : MPL_W011, OE : ICP_W004**
HG1/CV **18/11/19 03:10**	Intertek Genalysis Perth **3244 3237** Low temperature Perchloric acid digest specific for Mercury. Analysed by Cold Vapour Generation Atomic Absorption Spectrometry.	
NAGx/MTR **19/11/19 10:47**	Intertek Genalysis Perth **3244 3237** Net Acid Generation Extraction of samples with H2O2 Analysed with Electronic Meter Measurement	
NAGx/VOL **19/11/19 10:47**	Intertek Genalysis Perth **3244 3237** Net Acid Generation Extraction of samples with H2O2 Analysed by Volumetric Technique.	
Paste/MTR **14/11/19 09:17**	Intertek Genalysis Perth **3244 3237** Water Extraction using a specific sample:water ratio. Analysed with Electronic Meter Measurement	
S71/OE **18/11/19 06:41**	Intertek Genalysis Perth **3244 3237** Digestion to eliminate sulphides. Analysed by Inductively Coupled Plasma Optical (Atomic) Emission Spectrometry.	

METHOD CODE DESCRIPTION

Method Code Date Tested	Analysing Laboratory NATA Laboratory Accreditation	NATA Scope of Accreditation
SE1/MS **18/11/19 06:45**	Intertek Genalysis Perth **3244 3237**	Aqua-Regia digest followed by Precipitation and Concentration. Specific for Selenium. Analysed by Inductively Coupled Plasma Mass Spectrometry.
Ws3/COL **14/11/19 09:11**	Intertek Genalysis Perth **3244 3237**	Water Extraction using a sample:water ratio of 1:3. Analysed by UV-Visible Spectrometry.
Ws3/GR **14/11/19 09:11**	Intertek Genalysis Perth **3244 3237**	Water Extraction using a sample:water ratio of 1:3. Analysed by Gravimetric Technique
Ws3/MS **14/11/19 09:11**	Intertek Genalysis Perth **3244 3237**	Water Extraction using a sample:water ratio of 1:3. Analysed by Inductively Coupled Plasma Mass Spectrometry.
Ws3/MTR **14/11/19 09:11**	Intertek Genalysis Perth **3244 3237**	Water Extraction using a sample:water ratio of 1:3. Analysed with Electronic Meter Measurement
Ws3/OE **14/11/19 09:11**	Intertek Genalysis Perth **3244 3237**	Water Extraction using a sample:water ratio of 1:3. Analysed by Inductively Coupled Plasma Optical (Atomic) Emission Spectrometry.
Ws3/SIE **14/11/19 09:11**	Intertek Genalysis Perth **3244 3237**	Water Extraction using a sample:water ratio of 1:3. Analysed by Specific Ion Electrode.
WT01 **08/01/20 11:06**	Intertek Genalysis Perth **3244 3237**	Reporting weights of samples