Broken Hill Operations Pty Ltd

Long Term Geochemical Degradation Assessment for Waste Rock MOD6 Waste Rock Management, Rasp Mine

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Long Term Geochemical Degradation Assessment for Waste Rock

MOD6 Waste Rock Management, Rasp Mine

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ACRONYMS AND ABBREVIATIONS

AHD	Australian Height Datum
AMD	Acid and metalliferous drainage
AMIRA	Australian Mineral Industries Research Association
ANC	Acid neutralisation capacity
ANZECC	Australian and New Zealand Environment and Conservation Council
ARI	Average Recurrence Interval
ARMCANZ	Agriculture and Resource Management Council of Australia and New Zealand
BHO	Broken Hill Operations Pty Ltd
BHP	Broken Hill Propriety
BOM	Bureau of Meteorology
CML7	Consolidated Mine Lease 7
CSM	Conceptual site model
DI	Deionised
ERM	Environmental Resources Management Australia Pty Ltd
GAI	Geochemical abundance index
GDE	Groundwater Dependant Ecosystem
km	Kilometre
kt	Kilotonne
LOR	Limit of reporting
L/s	Litre a second
m bgl	Metres below ground surface
m/d	Metres a day
mg/L	Milligram per litre
mm	Millimetre
MRC	Maximum reasonable consequence
MW	Monitoring well
MWM	Mine Waste Management
NAG	Net acid generation
NAF	Non-acid forming
NPR	Net potential ratio
PAF	Potentially acid forming
TDS	Total dissolved solids
TSF	Tailings storage facility
SPR	Source – pathway – receptor

EXECUTIVE SUMMARY

Broken Hill Operations Pty Ltd (BHO) engaged ERM Australia Pty Ltd (ERM) to undertake waste rock characterisation and a geochemical risk assessment associated with waste rock management changes that are proposed under the MOD6 application for the Rasp Mine. The Rasp Mine is an underground zinc-lead-silver mine located in Broken Hill, New South Wales. The main objective of the MOD6 application proposes to place tailing in Kintore Pit (as TSF3) co-disposed with excess waste rock generated from underground mining. This will require the excavation of a boxcut and new decline as the current mine entrance portal is located in the base of Kintore Pit. MOD6 also proposes to install waste rock as rehabilitation capping material for designated 'free areas' (non-active mine areas) within Consolidated Mine Lease 7 (CML7).

This risk assessment has been undertaken to assess potential long term geochemical degradation risks associated with the management and emplacement of the waste rock that will be generated. All waste rock materials encountered during excavation of the new boxcut are proposed to be stored in-pit. Waste rock material for rehabilitation capping in designated areas included in the waste rock emplacement domains will be sourced from underground development which is proposed at 146,000 t per year until 2026 with 16,000 t of this material proposed for rehabilitation capping works.

The Rasp Mine officially opened on 25 July 2012, is located on CML7 and occupies the central region of the historic Broken Hill Line of Lode orebody. CML7 incorporates the original mine areas that commenced operations as Broken Hill Propriety (BHP) in the 1880s. Historical open cut pits remain on CML7 including the BHP Pit, the Kintore Pit, the Little Kintore Pit and the Blackwood Pit. Planned waste rock placement domains as indicated in MOD6 for the period 2022 to 2026 include waste rock emplacement in the Kintore Pit (Domain A), the BHP Pit (Domain B), the Little Kintore Pit (Domain C), and an above ground emplacement area atop Mount Hebbard (Domain D).

Due to the inherent variability in waste rock types encountered at the Rasp Mine, BHO has not developed a waste rock block model and it has not been considered feasible to determine volumes of specific waste rock types (BHO, 2019c). Geochemical testing has been undertaken on 50 waste rock samples collected by BHO site personal with the samples considered by BHO to represent the waste lithologies commonly found at the Rasp Mine. These samples were geochemically tested using conventional static testing methods including their potential to generate acid and metalliferous drainage (AMD) (MWM, 2020) with the results informing the source characterisation component of the risk assessment. A total elemental analysis was also undertaken.

Waste characterisation works showed that the total sulfur content of the majority of samples was found to be low (<0.3 weight % S) and the majority of samples (76% of the samples) have been classified as non-acid forming (NAF). While 4% of samples (two psammopelite samples) were identified as potentially acid forming (PAF) and 20% of samples were identified as uncertain (UC), all rock type groupings (including the psammopelite rock type) had average net potential ratio (NPR) values ⩾2. The NPR ratio is the ratio of acid neutralisation capacity (ANC) over maximum potential acidity (MPA) with a ratio above 2 indicating that the material is NAF. The central tendency in the data (and specifically the average NPR ratio ⩾ 2 for all rock types) indicate that the material is expected to be largely NAF. This aligns with site observations, which indicate that acidic drainage associated with waste rock has not been identified on the surface at the site (since mining commenced in the 1880s).

While the majority of samples have been classified as non-acid generating, the deionised (DI) leachate and the net acid generation (NAG) testing indicate that the majority of material sampled has potential to generate metalliferous drainage, including elevated concentrations in aluminium, chromium, copper and lead. Note that the NAG liquor data presents a conservative estimation for drainage quality in the long term, with NAG testing entailing aggressive oxidation of a pulverised rock sample.

The review of the waste rock characterisation results against the bedrock aquifer baseline water quality (collected prior to the Rasp Mine commencing operations in 2012) indicates that potential metalliferous drainage from the waste rock tested should have limited, if any, material impact on the existing water quality of the basement rock aquifer.

Pathway evaluation focussed on solute transport in water (surface water and groundwater) from each of the waste rock placement domains (Domains A – D). This included a review of groundwater dynamics at the mine site, including consideration of the potential of groundwater transport in the deep fractured bedrock aquifer as well as shallow seepage within disturbed material overlying the basement rock (with the latter understood to be limited in extent, primarily occurring in close proximity to the TSF storage facilities on site (both historical and current). Surface water management, including drainage patterns and drainage control at the mine were considered for the evaluation of surface water pathways. Receptor identification focussed on receptors that could potentially be exposed to AMD water quality impacts, both within CML7 and off site from the mine lease. This included a review of aerial imagery as well as a search of public databases.

The risk assessment for the mine placement domains indicates that potentially complete source-pathway-receptor (SPR) linkages are limited to on-site receptors. These are related to use of dewatering water and surface water onsite. A qualitative risk assessment was undertaken for the potentially complete SPR linkages identified, taking into consideration the potential consequence of the potential linkages as well as the likelihood of the risk being realised. The risk assessment included a workshop with BHO staff familiar with the Rasp Mine operations and associated environmental management activities. ERM facilitated the workshop, during which each potentially complete SPR linkage was discussed, the maximum reasonable consequence was described, and the risks were ranked based on the consequence categories and potential likelihood of realisation. Risk rankings for these potentially complete SPR linkages were considered to be low.

Of the waste rock emplacement domains, the in-pit domains carry the lowest risk for AMD generation and migration and it is recommended that waste rock material that has relatively higher potential geochemical risk (e.g. with total sulfur concentrations >0.2%) be preferentially placed within the in-pit storage areas (Domain A, B and C).

Specifics of waste segregation and placement should be captured in a waste rock management plan. It is further recommended that BHO implements an operational testing program for the further collection of samples of waste rock as mining progresses. This will facilitate validation of current waste rock characterisation and will enable the assessment of material property heterogeneity during the operational life of the Rasp Mine. Specifics of the testing program should be captured as part of the Waste Rock Management Plan.

1. INTRODUCTION

1.1 Background

Broken Hill Operations Pty Ltd (BHO) engaged ERM Australia Pty Ltd (ERM) to undertake waste rock characterisation and *a* geochemical risk assessment associated with waste rock management changes that are proposed under the MOD6 application for the Rasp Mine. The Rasp Mine is an underground zinc-lead-silver mine located in Broken Hill, New South Wales.

The main objective of the MOD6 application proposes to place tailing in Kintore Pit (as TSF3) co-disposed with excess waste rock generated from underground mining. This will require the excavation of a boxcut and new decline as the current mine entrance portal is located in the base of Kintore Pit. MOD6 also proposes to install waste rock as rehabilitation capping material for 'free areas' (non-active mine areas) within Consolidated Mine Lease 7 (CML7).

The waste rock characterisation and geochemical risk assessment has been undertaken to assess potential long term geochemical degradation risks associated with the management and emplacement of the waste rock that will be generated. All waste rock materials encountered during excavation of the new boxcut are proposed to be stored in-pit. Waste rock material for rehabilitation capping will be sourced from underground development which is proposed at 146,000 t per year until 2026 with 16,000 t of this material proposed for rehabilitation capping works. The rehabilitation capping works will take place in designated areas that have been included in the waste rock domains evaluated as part of the risk assessment.

This report should be read in conjunction with the statement of limitations outlined in Appendix A.

1.2 Objectives

The overarching objectives of the study are to characterise waste rock and assess potential water quality related risks associated with MOD6 related waste rock management, using the source – pathway – receptor (SPR) linkage approach. The findings of the risk assessment will inform the development of a site-specific waste rock management plan with the goal of providing practical waste management solutions for BHO.

In discussion with BHO, we understand that the Resources Regulator, NSW, has requested that the environmental assessment works include "an assessment of long term geochemical degradation .i.e. 100 to 500 years of waste rock". The net acid generation (NAG) tests present a conservative estimation for drainage quality in the long term, with NAG testing entailing aggressive oxidation of a pulverised rock sample. Evaluation of the NAG results is therefore considered to present a conservative assessment to potential long term geochemical degradation.

1.3 Scope of work

In order to achieve the objectives outlined above, the following scope of work was undertaken:

- Development and implementation of a static geochemistry laboratory testing program for waste rock characterisation purposes including laboratory coordination,
- Assessment of laboratory results within the context of acid and metalliferous drainage (AMD) potential and waste rock classification;
- A site visit to the Rasp Mine for site familiarisation purposes associated with the risk assessment. The site visit including viewing of historical waste rock stockpiles, current waste rock management practices and on-site drainage features;
- Data review and source description based on waste rock characterisation works;
- Pathways review focussed on the potential for solute transport in water (both groundwater and surface water);

- Environmental receptor identification;
- Conceptual site model (CSM) development for each of the waste rock domains;
- Qualitative risk assessment including risk assessment workshop; and
- Reporting.

ERM engaged Mine Waste Management Pty Ltd (MWM), a specialist environmental geochemistry and mine waste management consultancy, to undertake the works associated with the first two bullet points above. The remainder of the works was undertaken by ERM.

2. SITE SETTING

2.1 Mine description and waste rock placement domains

The Rasp Mine officially opened on 25 July 2012. The underground zinc-lead-silver mine is located on Consolidated Mine Lease 7 (CML7) and occupies the central region of the historic Broken Hill Line of Lode orebody (see Figure 1). CML7 incorporate the original mine areas that commenced operations as Broken Hill Propriety (BHP) in the 1880s.

Mining has occurred on the site since BHP mining commenced in1885. The original outcrop has been mostly replaced with extensive mounds formed from historical waste rock and tailings. Historical open cut pits remain on CML7 including the BHP Pit, the Kintore Pit, the Little Kintore Pit and the Blackwood Pit. Planned waste rock placement domains are shown on Figure 3, and include waste rock emplacement in the Kintore Pit (Domain A), the BHP Pit (Domain B), the Little Kintore Pit (Domain C), and an above ground emplacement areas shown as Domains D (atop Mount Hebbard). For Domain D "paddock dumping" will be used for waste rock placement (a preferable method over end tip dumping, with end tip dumping typically leading to the physical segregation of material and the creation of preferential flow paths for oxygen ingress).

Table 2-1 Estimated capacity of waste rock placement domains (BHO, 2020)

Waste Rock Emplacement Domain	Description	Approximate Capacity (kt)
A	Kintore Pit (co-disposed with tailings)	11,350
B	Infill of BHP Pit	197
C	Infill of Little Kintore Pit	310
D	Atop Mount Hebbard historical tailings storage facility as rehabilitation capping	90
Total		11,947

2.2 Climate

The Rasp Mine is located in an area with an arid climate with average annual rainfall of approximately 250 mm and average annual pan evaporation of approximately 2,600 mm. Monthly mean temperatures vary from 15ºC in July to 33ºC in January. When comparing average monthly rainfall versus average monthly evaporation, evaporation significantly exceeds rainfall for all months of the year (with mean monthly evaporation more than 15 times mean monthly rainfall in January and mean monthly evaporation exceeding mean monthly rainfall by approximately five times in July) (Broken Hill Operations, 2019a).

2.3 Geology

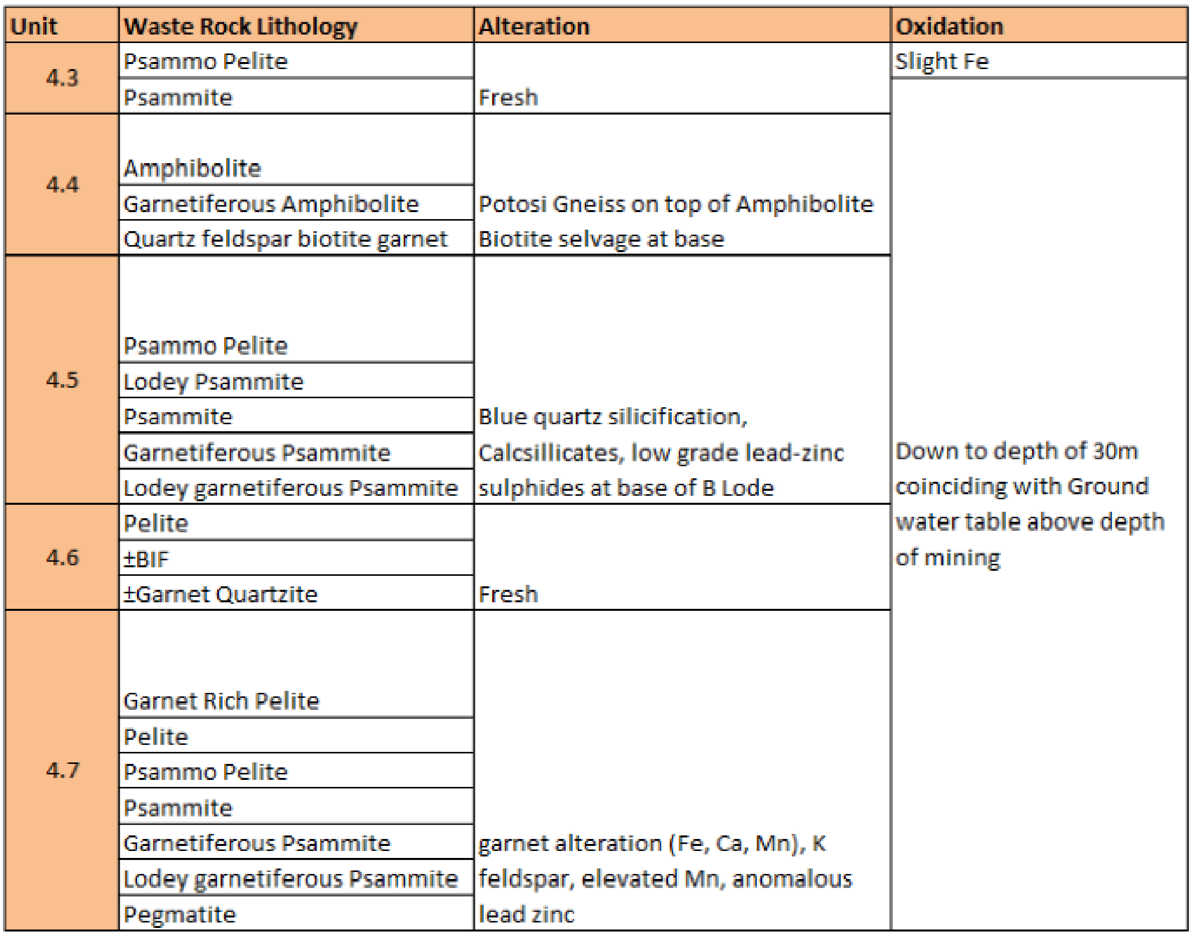
According to the regional 1:100 000 geological map for Broken Hill (Willis, 1989) the area is underlain by the Willyama Supergroup consisting of metasediments and composite gneisses with lesser quartzo-feldspatic and amphibhole/pyroxene rich gneisses. The Thackaringa Group, Broken Hill Group and Sundown Group of the Willyama Supergroup are present at and within the immediate vicinity of the Rasp Mine.

As described in Golder (2008) the Thackaringa Group consists of migmatitic gneiss and quartzo-feldspathic rock intercalated with psammopelites. The Broken Hill Group conformably overlies the

Thackaringa Group and consists of pelitic to psammopelitic metasediments with minor calc-silicate rocks, basis gneisses and amphibolites. The Broken Hill Group is overlain by the Sundown Group which consists of a succession of pelite, psammite, calc-silicate rocks and graphitic phyllite and schist.

In the vicinity of the Broken Hill mine the Broken Hill Group has been divided into eight units (units 4.1 through to unit 4.8). Waste rock is generated from five of these units (unit 4.3 thought to unit 4.7) during mining and the waste rock lithology for these units is presented in Table 2-2.

Table 2-2 Waste Lithology's associated with each rock unit of the Line of Lode units at the Rasp Mine (BHO, 2019c)



Unit	Waste Rock Lithology	Alteration	Oxidation
4.3	Psammo Pelite	Fresh	Slight Fe
	Psammite		Down to depth of 30m coinciding with Ground water table above depth of mining
4.4	Amphibolite	Potosi Gneiss on top of Amphibolite Biotite selvage at base	
	Garnetiferous Amphibolite		
	Quartz feldspar biotite garnet		
4.5	Psammo Pelite	Blue quartz silicification, Calcsillicates, low grade lead-zinc sulphides at base of B Lode	
	Lodey Psammite		
	Psammite		
	Garnetiferous Psammite		
	Lodey garnetiferous Psammite		
4.6	Pelite	Fresh	
	±BIF		
	±Garnet Quartzite		
4.7	Garnet Rich Pelite	garnet alteration (Fe, Ca, Mn), K feldspar, elevated Mn, anomalous lead zinc	
	Pelite		
	Psammo Pelite		
	Psammite		
	Garnetiferous Psammite		
	Lodey garnetiferous Psammite		
	Pegmatite		

2.4 Hydrogeology

2.4.1 Regional Hydrogeology

According to the Geoscience Australia *Assessment of Groundwater Resources in the Broken Hill Region* (Lewis et al. 2008), the main aquifers in the Broken Hill area consist of fractured rock aquifers of the Proterozoic Willyama Supergroup and Adelaidean sequences. These aquifers generally have low groundwater quality (due to elevated salinity) and low yields (Lewis et al. 2008). Due to the low groundwater resource development potential in the immediate vicinity of Broken Hill, coupled with the low rainfall in the region, water supply for the town of Broken Hill is sourced from the Murray River through the 270 kilometre Wentworth to Broken Hill pipeline.

2.4.2 Site Hydrogeology

Groundwater Occurrence

At the Rasp Mine, dewatering activities draw groundwater from a deep fractured rock basement aquifer with groundwater levels in excess of 100 m below ground surface (m bgs). Hydraulic gradients are towards the mine site due to mine dewatering activities (BHO, 2019a).

Given the metamorphosed nature of the Broken Hill Group rocks, primary porosity is expected to be very limited with groundwater storage and flow governed predominantly by structural features and fracture networks presenting secondary porosity in the aquifer.

Hydraulic conductivity testing data are not available for the basement aquifer underlying the Rasp Mine. The low yielding nature of the basement rock aquifer is however demonstrated by reported mine dewatering rates in the order of 6 L/s. This was the rate reported by Perilya for pumping from Shaft No. 7 (located in the south-west section of CML7) to reduce groundwater inflow in the Perilya mine and to maintain groundwater levels at approximately 500 m bgs prior to BHO starting operations at the Rasp Mine (Golder, 2008). This pumping rate is similar to the current dewatering rate (understood to be approximately 7 L/s) based on discussions with site personal during the site visit undertaken in February 2020.

Shallow groundwater seepage is encountered within shallow disturbed and unconsolidated material overlying the basement rock. The shallow subsurface seepage is considered to be limited in extent, with seepage mainly occurring in close proximity to the historical tailings storage facility (TSF). Given current tailings disposal in the Blackwood Pit, shallow subsurface seepage would also be expected to occur in this area of the mine site as well. Aquifer parameter testing (through a combination of pumping and slug tests) undertaken for the shallow unconsolidated material indicate moderate to high hydraulic conductivities ranging between 0.2 m/d to 92 m/d (Golder, 2012).

Groundwater Quality

Prior to the Rasp Mine commencing operations in July 2012, baseline groundwater quality monitoring of the deep basement aquifer was undertaken during May 2007 and August 2011 at Shaft 7. The baseline monitoring indicated that the groundwater within the basement rock aquifer is of poor quality BHO, 2019b) with elevated salinity (total dissolved solids [TDS]) concentrations in the order of 8,000 mg/L) and with a number of elevated metal(loid) concentrations present in solution (see Table 4.1 for a summary of baseline data from the bedrock aquifer). The baseline pH level for the bedrock aquifer was reported to be 5.8 (BHO, 2019b).

The Rasp Mine has an ongoing water quality monitoring program with groundwater samples collected quarterly. Monitoring between 2012 and 2019 (BHO, 2020) indicated that salinity levels in the bedrock aquifer have remained stable (generally within the 10,000 mg/L range) with pH levels remaining circum-neutral (typically ranging between 6 and 7) over the monitoring period. Groundwater quality of the shallow seepage zone indicated that the water quality in the shallow unconsolidated material is also of poor quality with TDS levels in the circa 10,000 mg/L range and a number of metals occurring at elevated concentrations pH level within the shallow unit have generally varied between 5 and 8 (BHO, 2020).

2.5 Topography and Surface Water Hydrology

The Rasp Mine is located at a high point in the regional topography, with most of the mine site raised from the adjoining area in the form of an extensive mounds formed from waste rock and tailings with little of the original outcrop visible. Surface elevations at the site range from 356 m above Australian Height Datum (m AHD) at the parking bay of the Miners' Memorial to approximately 216 m AHD at the base of the Kintore Pit (BHO, 2019a).

The Site Water Management Plan (BHO, 2019a) includes measures to retain surface water runoff from the active mine areas in a 1 in a 100 average recurrence internal (ARI) 24 hour rainfall event. Surface water management catchments and water management infrastructure are shown on Figure 2. The mine is subdivided into 64 small catchments and sub-catchments with engineered water diversions to retain a 1:100 year rainfall event (BHO, 2019a).

3. METHODOLOGY

3.1 Waste rock characterisation

Geochemical characterisation was undertaken on 50 waste rock samples taken by BHO site personnel and Table 3-1 provides a summary of the waste rock lithology's sampled. These samples represent the waste rock lithology's commonly encountered at the Rasp mine (BHO, 2019d).

Table 3-1 Waste rock sample lithology

Waste Rock Lithology	Number of samples
Psammopelite	33
Psammite	3
Pegmatite	2
Garnetiferous psammite	2
Lodey psammite	1
Lodey psammopelite	2
Psammopelite and pegmatite	3
Lodey garnetiferous psammite	2
Psammopelite and garnetiferous pegmatite	1
Unidentified meta-sediments	1

The sampling was undertaken on 21 August 2019 and samples were dispatched to the Australian Laboratory Services Pty Ltd (ALS) laboratory in Brisbane. MWM coordinated with ALS and developed the static geochemistry laboratory testing program for waste rock characterisation purposes. Testing included:

- Paste pH and paste electrical conductivity (EC);
- Total sulfur;
- Sulfate sulfur;
- Chromium reducible sulfur;
- Total carbon;
- Acid neatralisation capacity (ANC);
- Acid buffering characteristic curves (ABCC);
- Total elemental analysis
- Net acid generating (NAG) testing including NAG liquor analysis for EC, sulfate, chloride, alkalinity and dissolved metals (following back titrating);

- Mineralogical testing (quantitative XRD); and
- DI water extract analysis for pH, EC, sulfate, chloride, alkalinity and dissolved metals (utilising a 1:2 solid to liquid ratio and 12 hour bottle roll).

Further specifics including sample preperation and laboratory method codes are provided in Appendix B.

3.2 Risk assessment approach

3.2.1 Risk based framework

The risk based framework of the risk assessment is based on a SPR evaluation. For exposure to the identified receptors to be considered possible, a mechanism ('pathway') must exist by which impact from a given source can reach a given receptor (which would constitue a SPR linkage). Whenever one or more of these elements are missing, the SPR linkage is incomplete and the potential risk to the identified receptor is considered unlikely.

In assessing potential environmental geochemistry risks associated with waste rock, potential SPR linkages have been evaluated for based on the existence of:

- A source of potential AMD associated with wate rock;
- A mechanism for release of contaminants from identified sources with a focus on solute transport in waer (e.g. acidic and/or metalliferous leachate seepage to surface water or groundwater) and the presence of a transport medium (e.g. surface water or groundwater flow); and
- Potential receptors of impact (e.g. people using water from groundwater bores for potable water supply, vegetation and fauna associated with surface water bodies, groundwater dependant ecosystems [GDEs] etc.) along with a mechanism for chemical intake by the receptors at the point of exposure (ingestion, dermal contact, or a combination thereof).

The following sections provide a summary of potential sources based on the waste rock characterisation works, potential solute pathways from the waste rock domains, identified receptors and an evaluation of potentially complete SPR linkages. Where SPR linkages were identified as potentially complete, a qualitative risk assessment was undertaken taking into consideration the potential consequence of the potential linkage as well as the likelihood of the risk being realised.

3.2.2 Evaluation of sources

Source characterisation was based on the waste rock characterisation undertaken by MWM (2020). Due to the inherent variability in waste rock types encountered at the Raps Mine, BHO has not developed a waste rock block model and it has not been considered feasible to determine volumes of specific waste rock types (BHO, 2019c). For this reason, the potential for AMD generation (as informed by the MWM 2020 characterisation works) for all waste rock types has been considered for all waste rock placement domains. A copy of the MWM waste rock characterisation memo summarising the characterisation methodology and results is provided in Appendix B (with results in Section 4.1).

3.2.3 Pathway considerations

Pathway evaluation focussed on solute transport in water (surface water and groundwater) from each of the waste rock placement domains (Domains A – D). This included a review of groundwater dynamics at the mine site, including consideration of the potential of groundwater transport in the deep fractured bedrock aquifer as well as shallow seepage within disturbed material overlying the basement rock (with the latter understood to be limited in extent, primarily occurring in close proximity to the TSF storage facilities on site (both historical and current). Surface water management, including drainage patterns and drainage control at the mine were considered for the evaluation of surface water pathways.

3.2.4 Receptor identification

Receptor identification focussed on receptors that could potentially be exposed to AMD water quality impacts, both within CML7 and off site form the mine lease. This included a review of aerial imagery as well as a search of public databases. The latter included a search of the Bureau of Meteorology (BOM) Australian Groundwater Explorer to identify registered groundwater bores as well as a review of the BOM Groundwater Dependant Ecosystem (GDE) Atlas. Seaches were conducted within a 5 km radius of the central section of the Rasp Mine.

3.2.5 SPR linkage approach

The approach to identifying potentially complete SPR linkages included evaluation of AMD sources associated with the waste rock placement domains, pathways for AMD impacted water and consideration of identified sensitive receptors. Conceptual site models, in the form of source-pathway-receptor flow charts were developed for each waste rock placement domain and these are presented in Appendix C.

3.2.6 Risk assessment workshop

A qualitative risk assessment was undertaken for the potentially complete SPR linkages identified, taking into consideration the potential consequence of the potential linkage as well as the likelihood of the risk being realised. The risk matrix and risk ranking categories specified in the *Risk Ranking Matrix - Broken Hill Operations Pty Ltd – RASP Mine* (BHO-FRM-SAF-004) were utilised for the risk assessment.

The risk assessment included a workshop with BHO staff familiar with the Rasp Mine operations and associated environmental management activities. ERM facilitated the workshop, during which each potentially complete SPR linkage was discussed, the maximum reasonable consequence (MRC) was described, and the risks were ranked based on the consequence categories and potential likelihood of realisation.

4. ASSESSMENT FINDINGS

4.1 Geochemical testing results and source characterisation

Geochemical testing has been undertaken on 50 waste rock samples collected by BHO site personal with the samples considered by BHO to represent the waste lithologies commonly found at the Rasp Mine. The full set of laboratory results are presented and discussed in the MWM memo (MWM, 2020), which is presented in Appendix B.

A summary of the waste rock testing results, within the context of AMD potential/geochemical risk and waste rock classification, is provided below.

4.1.1 Potential for acidic drainage

- The total sulfur content of the majority of the samples was found to be low (<0.3 weight % S) with only three psammopelite samples containing moderate to high sulfur (ranging between 0.42 and 1.14 weight % S).
- Based on the Australian Mineral Industries Research Association (AMIRA) classification system, the majority of samples (76 % of the samples) have been classified as non-acid forming (NAF). These are samples with low total sulfur content (<0.3 weight % S).
- Two psammopelite samples (4% of samples) were identified as potentially acid forming (PAF) and 10 samples (20% of samples) as uncertain (UC) using the AMIRA system. All PAF and UC samples had a weight % S >0.2%.
- Mineralogy testing demonstrated that the samples mostly consist of quartz and very slow to slow reacting silicates (e.g. plagioclase, potassium feldspar, kaolinite and illite). Some chlorite was present in most samples, a mineral with intermediate reactivity. Garnets were identified in all samples, which can provide fast reacting silicate buffering. No carbonate minerals were identified. While sphalerite and galena do not generate acidity upon oxidation in the same manner as a sulfide mineral such as pyrite does, the substitution of iron in these minerals can result in acid generation. The sulfides galena and sphalerite were identified in one sample only (one of the two psammopelite samples classified as PAF).
- All rock type groupings, including the psammopelite rock type, had average net potential ratio (NPR) values ⩾2. The NPR ratio is the ratio of acid neutralisation capacity (ANC) over maximum potential acidity (MPA), with a ratio above 2 indicating that the material is NAF.
- While a small subset of samples have been identified as PAF, the central tendency in the data (and specifically the average NPR ratio ⩾2 for all rock types) indicate that the material is expected to be largely NAF.
- This aligns with site observations by the author, which indicate that acidic drainage has not been identified at the site (where mining commenced in the 1880s).

4.1.2 Potential for metalliferous drainage

- Elemental enrichment, based on the total elemental data for the samples and using the geochemical abundance index (GAI), identified a number of elements enriched more than 12 times the average crustal abundance (a level of enrichment that warrants further examination - such as through the leachate testing undertaken as part of this geochemical testing scope).
- The majority of these where identified for psammopelite samples and elements enriched at this level included Ag, As, Bi, Cd, Mo, Pb, Sb and Zn.
- Analysis of a deionised (DI) water leach at a solid to liquid ratio of 1:2 and of the NAG test liquor for the samples indicate the potential for metalliferous drainage when the metal content of the leachate is compared to conservative freshwater aquatic ecology guidelines (specifically the

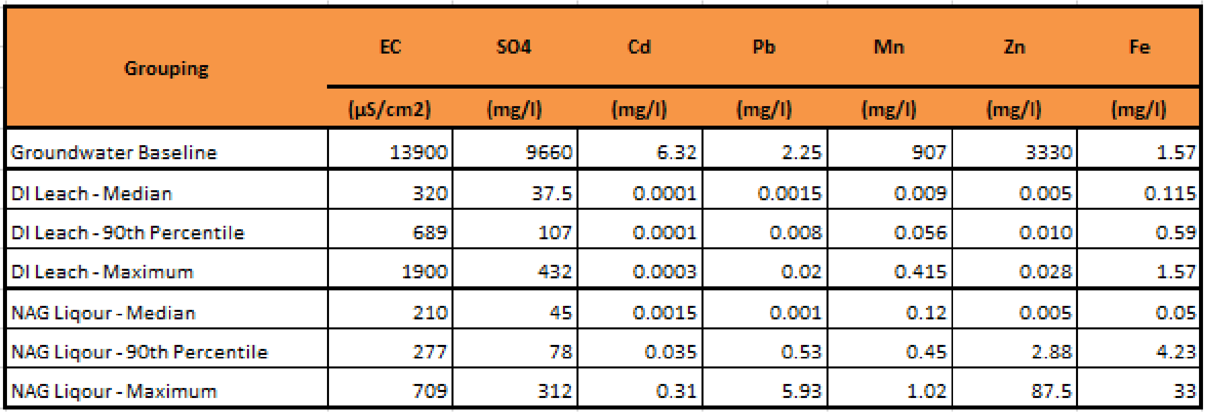
freshwater aquatic guidelines for slightly to moderately disturbed aquatic ecosystems - ANZECC & ARMCANC, 2000).

- Metals leaching at concentrations above the conservative aquatic guidelines for both the DI leachate and NAG liquor included (but were not limited to) Al, Cr, Cu and Pb. It should be noted that the NAG liquor data presents a conservative estimation for drainage quality in the long term, with NAG testing entailing aggressive oxidation of a pulverised rock sample.
- While the majority of samples have been classified as non-acid generating, the DI leachate and the NAG testing indicate that the majority of material sampled has potential to generate metalliferous drainage.

4.1.3 Consideration of background groundwater quality

- The Rasp Mine is located in a region with an arid climate and within a mineralised area. Consequently, groundwater would be expected to potentially be naturally elevated in metals and salinity.
- This is demonstrated by the results of regional groundwater studies summarised in the Golder (2008) hydrogeological assessment for the Rasp Mine, indicating that groundwater within the bedrock aquifer is generally unsuitable for potable use or irrigation, and marginal for stock watering.
- BHO undertook baseline groundwater sampling prior to the mine re-opening in 2012 (BHO, 2019a), and baseline values are presented in Table 4-1. Descriptive statistics are provided for the waste rock leach testing results (DI water leach and NAG liquor analysis) along with the baseline values.

Table 4-1 Summary of metalliferous drainage data in comparison to groundwater baseline data



Grouping	EC	SO4	Cd	Pb	Mn	Zn	Fe
	(µS/cm2)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)
Groundwater Baseline	13900	9660	6.32	2.25	907	3330	1.57
DI Leach - Median	320	37.5	0.0001	0.0015	0.009	0.005	0.115
DI Leach - 90th Percentile	689	107	0.0001	0.008	0.056	0.010	0.59
DI Leach - Maximum	1900	432	0.0003	0.02	0.415	0.028	1.57
NAG Liqour - Median	210	45	0.0015	0.001	0.12	0.005	0.05
NAG Liqour - 90th Percentile	277	78	0.035	0.53	0.45	2.88	4.23
NAG Liqour - Maximum	709	312	0.31	5.93	1.02	87.5	33

- As can be seen in Table 4-1, all median leaching values (for both the DI leach and NAG liquor) are well below baseline values. With the exception of Fe for the NAG liquor data, all 90th percentile values are also below the baseline values.

With consideration of the above values for which both background water quality and waste rock testing results are available, potential metalliferous drainage from the waste rock tested should have limited if any material impact on the existing water quality of the basement rock aquifer.

4.2 Pathway evaluation

Weathering and oxidation of waste rock followed by mobilisation of weathering products by water seepage can lead to the mobilisation of AMD to groundwater and surface water. In areas of water seepage in the shallow material on site, offsite migration could occur. During operations dewatering is expected to have a dominant influence on pathways within the basement rock aquifer. Following closure and cessation of dewatering, groundwater flow pathways in the deep aquifer may change and a closure plan will need to consider this possibility including the effect that may have on potential groundwater pathways away from the site.

Surface water management is designed to retain surface water runoff from the active mine areas in a 1 in a 100 ARI 24 hour rainfall event (BHP, 2019a). Potential pathways for each waste rock placement domain are described further in the SPR flowcharts presented in Appendix C.

4.3 Identified receptors

Potential receptors that have been identified include on-site personal and off-site groundwater users.

The BOM Australian Groundwater Explorer database search identified a total of 47 registered bores. 40 of these are registered as groundwater monitoring bores, six for water supply (without specifying the type of supply) and one as "other". All water supply bores and the bore registered for "other" use are located to the north of the Rasp Mine, with the closest located approximately 1.6 km to the north of the Rasp Mine (see Figure 4). These are all located to the north of the Globe Vauxhall Shear, which according to the Golder 2008 hydrogeological assessment, is understood to present a hydraulic barrier between the mine site and groundwater bores located to the north of this shear zone. Based on the aforementioned hydrogeological conceptualisation, there are no identified water supply bores or bores registered as “other” located where they could be impacted by mine influenced groundwater.

The closest potential aquatic GDE, identified through the BOM GDE Atlas, is a potential GDE located approximately 2.2 km to the north-east of the northern most mine site boundary (see Figure 4). This potential GDE is the feature known as Imperial Lakes at Broken Hill.

4.4 Evaluation of potentially complete SPR linkages and risk ranking

Source-pathway-receptor flow charts were developed for each waste rock placement domain and these are presented in Appendix C. A summary of potentially complete SPR linkages for each waste rock placement domain is provided in Table 4-2.

Table 4-2 Summary of potentially complete SPR linkages

Waste Rock Domain	Source	Pathway	Receptors
A - D	Potential for Metalliferous Drainage from Waste Rock	1) Seepage to bedrock aquifer 2) Pumping of groundwater for dewatering purposes at the mine	On-site workers
A - D	Potential for Metalliferous Drainage from Waste Rock	1) Seepage to bedrock aquifer 2) Pumping of groundwater for dewatering purposes at the mine	On-site vegetation
D	Potential for Metalliferous Drainage from Waste Rock	Surface water drainage from waste rock emplacement facility	On-site vegetation
D	Potential for Metalliferous Drainage from Waste Rock	Surface water drainage reports to on-site dams	On-site workers

A qualitative risk assessment was undertaken for the potentially complete SPR linkages identified, taking into consideration the potential consequence of the potential linkage as well as the likelihood of the risk being realised. The risk assessment included a workshop with BHO staff familiar with the Rasp Mine operations and environmental setting of the site. Note that the risk rankings were based on the following assumptions:

- The base case inherent risk ranking assumed the potential risk was unmitigated; and
- The revised risk assessment included consideration of operational controls at the Rasp Mine that mitigates AMD risk.

The completed risk register is provided in Appendix D. The risks listed in the spreadsheet, as well as the risk rankings, present the joint inputs of the ERM and BHO panel that contributed to the risk assessment, and reflect the rankings collectively agreed upon by the workshop panel. Risks associated with these potentially complete SPR linkages were considered to be low in magnitude.

5. CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

The following conclusions are drawn from the waste rock characterisation and geochemical risk assessment associated with the MOD6 application:

- The potential for acidic drainage is expected to be low. Waste characterisation works showed that the total sulfur content of the majority of samples was found to be low (<0.3 weight % S) and the majority of samples (76% of the samples) have been classified as NAF.
- While 4% of samples (two psammopelite samples) were identified as PAF and 20% of samples were identified as UC, all rock type groupings (including the psammopelite rock type) had average NPR values ⩾2. The NPR ratio is the ratio of ANC over MPA with a ratio above 2 indicating that the material is NAF.
- The central tendency in the data (and specifically the average NPR ratio ⩾ 2 for all rock types) indicate that the material is expected to be largely NAF. This aligns with site observations, which indicate that acidic drainage has not been identified at the surface of the site (since mining commenced in the 1880s).
- No carbonate minerals were identified. The samples mostly consist of quartz and very slow to slow reacting silicates (e.g. plagioclase, potassium feldspar, kaolinite and illite). Some chlorite was present in most samples, a mineral with intermediate reactivity. Garnets were identified in all samples which can provide fast reacting silicate buffering. The sulfides galena and sphalerite were identified in one sample only (one of the two psammopelite samples classified as PAF).
- While the majority of samples have been classified as non-acid generating, the leachate and NAG liquor testing indicate that the majority of material sampled has potential to generate metalliferous drainage. The NAG testing entails aggressive oxidation of a pulverised rock sample, and therefore presents a conservative assessment of long term geochemical degradation.
- The review of the waste rock characterisation results against the bedrock aquifer baseline water quality (collected prior to the Rasp Mine commencing operations in 2012) however indicates that potential metalliferous drainage from the waste rock tested should have limited, if any, material impact on the existing water quality of the basement rock aquifer.
- The risk assessment for the waste rock placement domains indicates that potentially complete SPR linkages are limited to on-site receptors. These are related to use of dewatering water and surface water onsite. Risk rankings for these potentially complete SPR linkages were considered to be low.

5.2 Recommendations

- Of the waste rock emplacement domains, the in-pit domains carry the lowest risk for AMD generation and migration and it is recommended that waste rock material that has relatively higher potential geochemical risk (e.g. with total S concentrations >0.2%) be preferentially placed within the in-pit storage areas (Domain A, B and C). Specifics of waste segregation and placement should be captured in a Waste Rock Management Plan.
- It is further recommended that BHO implements an operational testing program for the further collection of samples of waste rock as mining progresses. This will facilitate validation of current waste rock characterisation and will enable the assessment of material property heterogeneity during the operational life of the Rasp Mine.

6. REFERENCES

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FIGURES

Data Source:
NSW DFSI, DCDB/DTDB 2020
Esri World Imagery July 2019
Inset: Esri OpenStreetMap 2019

Site Location

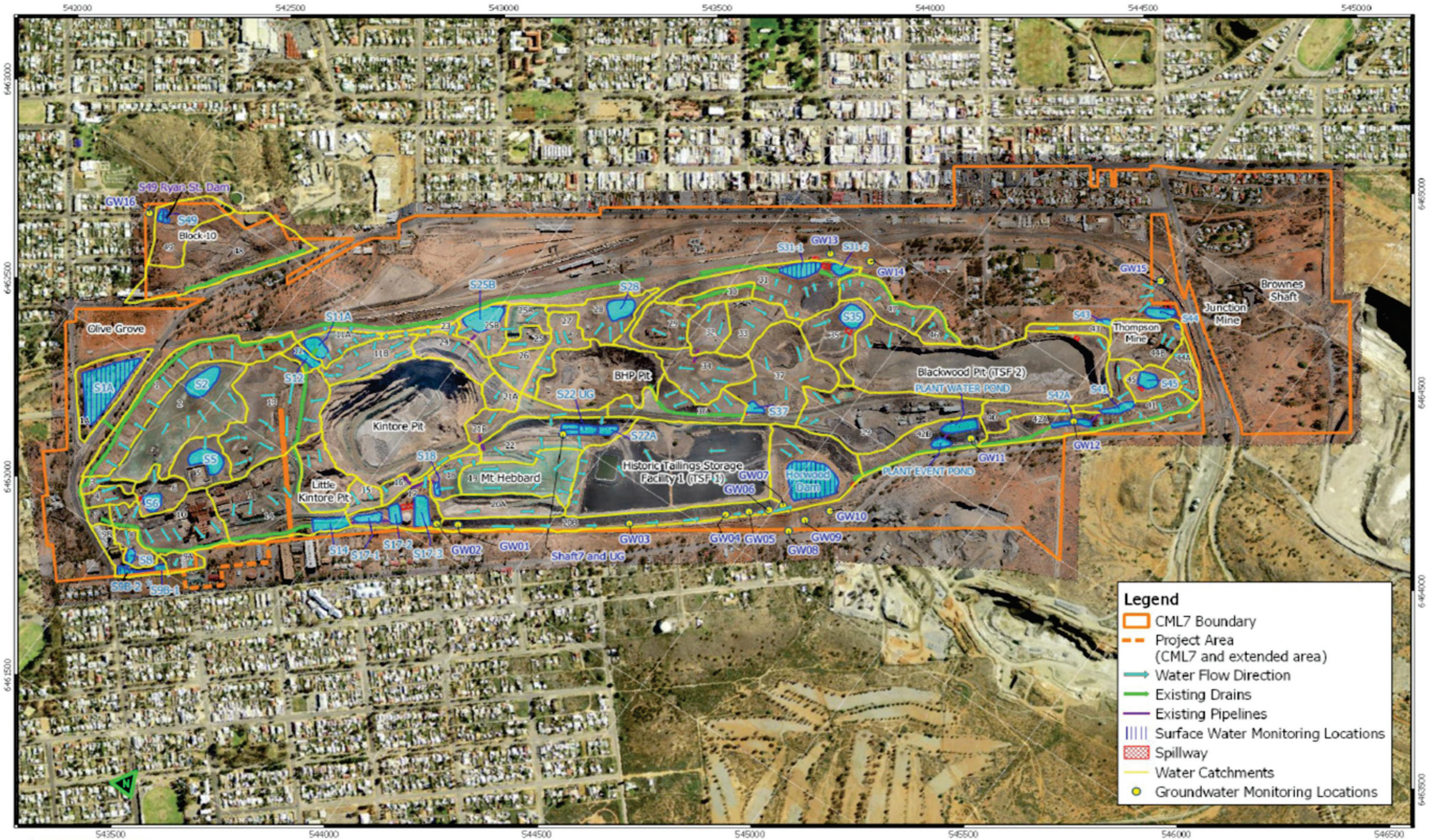
F1

Drawing No:	0484252s_AMDRA_G001_R0.mxd		AMD Risk Assessment Broken Hill NSW
Date:	22/07/2020	Drawing Size: A3	
Drawn By:	GC	Reviewed By: WG	Client: Broken Hill Operations Pty Ltd

Coordinate System: GDA 1994 MGA Zone 54

This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.

ERM



Site Water Management Plan and Surface Water Drainages

F2

Drawing No:	0484252s_AMDRA_C001_R0.cdr		**AMD Risk Assessment** **Broken Hill NSW**
Date:	08/09/2020	Drawing size: A4	
Drawn by:	GC	Reviewed by: WG	Client: Broken Hill Operations Pty Ltd

0 100 200 300m

N

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ERM

Source:

Broken Hill Operations (BHO), 2019a. Site Water Management Plan, BHO-PLN-ENV-006. Plan updated January 2019.

Legend

A - Kintore Pit TSF3 Co-disposal of waste rock & tailings
B - BHP Pit placement of waste rock in in-fill area
C - Little Kintore Pit placement of boxcut materials
D - Mt Hebbard rehabilitation capping

Source:

Broken Hill Operations (BHO), 2020. Project Brief, Kintore Pit TSF3, Rasp Mine, Draft dated August 2020.

Proposed Waste Rock Placement Domains

F3

Drawing No: 0484252s_AMDRA_C002_R1.cdr
Date: 08/09/2020 Drawing size: A4
Drawn by: GC Reviewed by: WG

Drawing Not to Scale

N

AMD Risk Assessment
Broken Hill NSW

Client: Broken Hill Operations Pty Ltd

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ERM

Legend

▭ CML7 Boundary (approximate)

● Registered Groundwater Bore

BOM Atlas Identified GDEs:

🟩 Aquatic GDE (Wetland)

Data Source:
GDEs: BOM GDE Atlas, (c) State of NSW (Department of Planning Industry and Environment – Water)
NSW DFSI, DCDB/DTDB 2020
Esri World Imagery July 2019

Groundwater Bore Summary

F4

Drawing No: 0484252s_AMDRA_G003_R0.mxd
Date: 23/07/2020 Drawing Size: A3
Drawn By: GC Reviewed By: WG
Coordinate System: GDA 1994 MGA Zone 54
0 250 500 750m
N

AMD Risk Assessment
Broken Hill NSW
Client: Broken Hill Operations Pty Ltd

This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.

ERM

APPENDIX A STATEMENT OF LIMITATIONS

1. This Report is based solely on the scope of work described in Section 1 of this Report and performed by Environmental Resources Management (ERM) for Broken Hill Operations Pty Ltd (the Client).
2. No limitation, qualification or caveat set out below is intended to derogate from the rights and obligations of ERM and the Client under the Contract.
3. The findings of this Report are solely based on, and the information provided in this report is strictly limited to that required by, the Scope of Work. Except to the extent stated otherwise, in preparing this Report ERM has not considered any question, nor provides any information, beyond that required by the Scope of Work.
4. This Report was prepared between 8 June 2020 and 24 July 2020 and is based on conditions encountered and information reviewed at the time of preparation. The Report does not, and cannot, take into account changes in law, factual circumstances, applicable regulatory instruments or any other future matter. ERM does not, and will not, provide any on-going advice on the impact of any future matters unless it has agreed with the Client to amend the Scope of Work or has entered into a new engagement to provide a further report.
5. This Report is based on data derived from Client supplied waste rock samples and geological characterisation provided by the Client. All conclusions and recommendations made in the report are the professional opinions of the ERM personnel involved. Whilst normal checking of data accuracy was undertaken, except to the extent expressly set out in this report ERM:
   a) did not, nor was able to, make further enquiries to assess the reliability of the information or independently verify information provided by;
   b) assumes no responsibility or liability for errors in data obtained from, the Client, any third parties or external sources (including regulatory agencies).
6. This Report should be read in full and no excerpts are to be taken as representative of the whole Report. To ensure its contextual integrity, the Report is not to be copied, distributed or referred to in part only. No responsibility or liability is accepted by ERM for use of any part of this Report in any other context.
7. Except to the extent that ERM has agreed otherwise with the Client in the Scope of Work or the Contract, this Report:
   a) has been prepared and is intended only for the exclusive use of the Client;
   b) must not to be relied upon or used by any other party; and
   c) does not purport to provide, nor should be construed as, legal advice.

APPENDIX B FACTUAL WASTE ROCK CHARACTERISATION ASSESSMENT MEMORANDUM

MINE WASTE MANAGEMENT

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MEMORANDUM

Recipient:	Wijnand Gemson – ERM
From:	Josh Pearce – MWM
Date:	2 January 2020
Cc:	Ed Dennis – ERM; Marlese Fairgray – MWM
Document Number:	J-AU0053-002-M-Rev2
Document Title:	Factual Waste Rock Characterisation Assessment Memorandum

Mine Waste Management Pty Ltd (MWM) has been engaged by Environmental Resources Management Australia Pty Ltd (ERM) to assist them with the waste rock characterisation assessment of samples collected from Broken Hill Operations Pty Ltd's (BHO) Rasp Mine. This scope of work has been completed in accordance with:

- MWM Proposal: *J-AU0053-001-P-Rev0 Broken Hill Waste Characterisation* (MWM, 2019a); and
- Email variation to complete additional laboratory tests (MWM to ERM; 13 November 2019).

This memorandum follows on from a sampling and analysis program delivered to ERM and BHO on 9 August 2019 (MWM, 2019b).

OBJECTIVES

The objectives of the scope work were to:

- Provide ERM with a laboratory geochemical testing program for 50 samples (selected and supplied by BHO) using conventional static testing methods; and
- Provide a factual characterisation memorandum that:
    - Includes classifications according to the AMIRA (2002) and Price (2009) acid generating classification systems; and
    - Provides commentary on potential neutral metalliferous and/or saline drainage risks.

SCOPE OF WORKS

The proposed scope of work was split into two key tasks:

1. LAB TESTING PROGRAM: MWM provided an analysis program to BHO (MWM, 2019b) for the geochemical characterisation of 24 waste rock samples, 10 samples were from an existing program and a further 24 were to be collected by BHO staff. This analysis program was adjusted upon receipt of 50 waste rock samples collected by BHO from the Kintore Pit Waste Rock Dump. The 10 samples from the earlier program were excluded by BHO.

2. FACTUAL CHARACTERISATION MEMORANDUM: MWM has prepared a brief factual characterisation memorandum on the results for the 50 samples submitted for testing by BHO. This memorandum includes:

    a. Sample details as supplied by BHO (Attachment A);

    b. Laboratory methods used (Attachment B);

    c. Laboratory results (Attachments C-G);

    d. Classification of each sample as per the AMIRA (2002) and Price (2009) guidelines for acid generating potential; and

    e. Commentary on neutral metalliferous and/or saline drainage potential of the samples.

Prior to BHO supplying the samples for this characterisation program, they completed an assessment of the Rasp Mine waste rock lithologies (*Rasp Waste Characterisation (Surface Transportation) to 2026*; BHO, 2019a). In the supporting *Rasp Waste Characterisation Sampling Details* memorandum (BHO, 2019b), BHO state that the samples selected by BHO represent the waste lithology's commonly found throughout the Rasp Mine as well as representing rock types likely to be stockpiles on the surface when future back fill locations are exhausted.

METHODS

The following section provides an outline of the supplied sample details, the sample preparation procedure, and the completed laboratory analysis program.

Sample Details

A total of 50 samples ranging between 3.9-7.2 kg of waste rock from the Kintore pit tipple area were collected by BHO site personnel on 21 August 2019 and dispatched to the Australian Laboratory Services Pty Ltd (ALS) laboratory in Brisbane. These samples represent the waste lithology's commonly found throughout the Rasp mine (BHO, 2019). These samples also represent rock types likely to be stockpiles on the surface when future back fill locations are exhausted (BHO, 2019). Provided details for the samples are presented in Table A1 in Attachment A. Table 1 provides a breakdown of the number of samples collected per lithology.

Table 1: Samples collected per lithology.

LITHOLOGY	NUMBER OF SAMPLES	LITHOLOGY	NUMBER OF SAMPLES
Psammopelite	33	Lodey Psammopelite	2
Psammite	3	Psammopelite and Pegmatite	3
Pegmatite	2	Lodey Garnetiferous Psammite	2
Garnetiferous Psammite	2	Psammopelite and Garnetiferous Pegmatite	1
Lodey Psammite	1	Unidentified Meta-sediments	1

Sample Preparation

All samples were prepared following the flow diagram outlined in Figure B1 (Attachment B). Samples were received by ALS on the 27th August 2019. Initial analysis by ALS was completed on the 28th October 2019. The remaining pulverised splits were then sent to Environmental Geochemistry Services (EGS), Bibra Lake, which were received on 3 December 2019.

Laboratory Analysis

The tests listed in Table 2 were undertaken as part of MWM's agreed scope of work. Specific method details can be found in Attachment B. Due to concerns with ANC QAQC results, all primary and reference samples were analysed in by EGS to verify ANC results.

Table 2: Laboratory testing program.

TEST PARAMETER	ALS LAB METHOD CODE	NUMBER OF BHO SAMPLES
Paste pH/EC	EA031/EA032	50
Total sulfur	ED042T	50
Sulfate sulfur (acid soluble)	EA029* ED040T**	50
Sulfide sulfur (chromium reducible sulfur; CRS)	EA026	50
Total carbon	EP003TC	50
Acid neutralisation capacity (ANC)	EA013 EGS M-001***	50 50
Acid buffering characteristic curves (ABCC)	EGS M-009	10
Total elemental	EG020T	50
Net acid generating (NAG) testing including: • NAG pH and NAG acidity (4.5 and 7.0); and • NAG liquor analysis (after back titration) for EC, SO_4, Cl, alkalinity, full metal suite (dissolved).	EA011	50
Mineralogical testing (XRD – quantitative)	QUT	50
DI water extract analysis for pH, EC, Cl, SO_4, alkalinity, and full metals suite (dissolved).	1:2 solid to liquid 12 Hour Bottle Roll	50

*EA029 method produced erroneous results with repeated sulfate results significantly exceeding total sulfur. EA209 results are within laboratory certificates but have not been tabulated with other acid base accounting results.

**ED040T method produced more reliable results and are reported within this memorandum.

***Additional ANC verification testing was completed by Environmental Geochemistry Services (EGS).

Acid Generating Classifications

Guidelines for evaluating acid forming potential of mine wastes presented by AMIRA are summarised in Table 3 (AMIRA, 2002). As the AMIRA classification system is the preferred system in Australia, where both NAG and NAPP data are available, the AMIRA system will be used as the point of reference, although both the AMIRA and Price classifications are provided. Guidelines for evaluating acid forming potential of mine wastes presented by the Mine Environment Neutral Drainage Program (MEND) are summarised in Table 4. The Price guidelines (Price, 2009) are commonly used in North America for the evaluation of ABA results.

Table 3: AMIRA acid generating classification system.

CLASSIFICATION	CRITERIA	COMMENTS
Potentially Acid Forming (PAF)	NAPP > 0 NAG pH < 4.5	Sample always has a significant sulfur content, the acid generating potential of which exceeds the inherent acid neutralising capacity of the material.
Non-Acid Forming (NAF)	NAPP < 0 NAG pH ≥4.5	Sample may, or may not, have a significant sulfur content but the ANC availability is more than adequate to neutralise the acid that theoretically could be produced.
Uncertain (UC)	NAPP > 0 NAG pH ≥4.5 NAPP < 0 NAG pH < 4.5	An uncertain classification is used when there is an apparent conflict between the NAPP and NAG results.

Table 4: Price acid generating classification system.

CLASSIFICATION	CRITERIA	COMMENTS
Potentially Acid Forming (PAF)	ANC/MPA < 1	Potentially acid generating material, unless sulfide minerals are non-reactive, or ANC is preferentially exposed on surfaces.
Non-Acid Forming (NAF)	ANC/MPA > 2	Non-potentially acid generation material, unless ANC is insufficiently reactive, extremely reactive sulfides are present, or preferential exposure of sulfides is found in the material.
Uncertain (UC)	1 < ANC/MPA < 2	Possibly PAF if ANC is insufficiently reactive or is depleted at a faster rate than sulfides

RESULTS

The following section provides a summary of the testing and analysis results. Tabulated results and laboratory certificates are provided in the following Attachments:

- Table C1: Kintore Pit Acid Base Accounting Results (Attachment C);
- Table D1: Multi-Elemental Analysis (Attachment D);
- Table D2: Geochemical Abundance Indices (Attachment D);
- Table E1: DI Water Leach Results (Attachment E);
- Table E2: NAG Liquor Leach Results (Attachment E);
- Table F1: Mineralogy (Attachment F);
- Figures G1-G14: ABCC Charts; and
- Attachment H – Laboratory Certificates.

AMD Potential – Acid Base Accounting

Table 5 provides a summary of key ABA data per lithology sampled. These data are used to provide a preliminary classification of acid generating potential using the AMIRA (2002) and Price (2009) classification systems.

Table 5: Key ABA summary data.

		SULFIDE SULFUR			MPA-SULFIDE			ANC			NAPP-SULFIDE			NPR-SULFIDE		
		%S			kg H_2SO_4/t			kg H_2SO_4/t			kg H_2SO_4/t			kg H_2SO_4/t		
LITHOLOGY	SAMPLES	MIN	AVE	MAX	MIN	AVE	MAX	MIN	AVE	MAX	MIN	AVE	MAX	MIN	AVE	MAX
Psammopelite	33	0.05	0.20	1.08	1.4	6.2	33	10.8	13.7	18.3	-14	-8	17	0.5	3.4	10.5
Psammite	3	0.08	0.10	0.11	2.5	3.0	3.4	15.1	17.4	20.5	-17	-14	-12	4.4	5.8	6.7
Psammopelite and Pegmatite	3	0.05	0.09	0.15	1.4	2.7	4.5	11.4	13.5	16.3	-12	-11	-9	3.6	5.9	9.2
Garnetiferous Psammite	2	0.08	0.16	0.23	2.6	4.8	6.9	14.5	16.3	18.0	-15	-11	-8	2.1	4.5	7.0
Lodey Garnetiferous Psammite	2	0.09	0.14	0.19	2.6	4.2	5.8	10.9	11.8	12.6	-10	-8	-5	1.9	3.3	4.8
Lodey Psammopelite	2	0.07	0.08	0.09	2.1	2.4	2.6	14.8	15.3	15.8	-13	-13	-13	6.0	6.5	6.9
Pegmatite	2	0.02	0.09	0.15	0.7	2.7	4.7	12.9	13.8	14.7	-14	-11	-8	2.8	12.3	21.8
Lodey Psammite	1	0.07	0.07	0.07	2.1	2.1	2.1	13.3	13.3	13.3	-11	-11	-11	6.5	6.5	6.5
Psammopelite and Garnetiferous Pegmatite	1	0.05	0.05	0.05	1.5	1.5	1.5	13.8	13.8	13.8	-12	-12	-12	9.4	9.4	9.4
Unidentified Meta-sediments	1	0.26	0.26	0.26	7.9	7.9	7.9	15.5	15.5	15.5	-8	-8	-8	2.0	2.0	2.0

Positive NAPP values and NPR values less than 1 highlighted red (e.g. PAF classification).

NPR values between 1 and 2 highlighted orange (e.g. UC classification).

**Sulfide data was used to calculate MPA and therefore was subsequently used in NAPP and NPR calculations.*

Sulfide sulfur was found to strongly correlate with total sulfur (Figure 1) suggesting sulfur present is sulfidic. Sulfate data produced ambiguous results which were inconsistent with total sulfur and chromium reducible sulfur data. Therefore, the more conservative approach of assuming that all sulfur is present as sulfides was taken. In the absence of sulfide sulfur data, total sulfur should provide a good proxy for sulfide content.

Generally, sulfur content is low (<0.3 wt%S) in all samples with only three psammopelite samples (BH66543, BH66517, and BH66519) containing moderate to high sulfur (0.42 wt%S, 0.46 wt%S, and 1.14 wt%S). Mineralogical analyses identified sphalerite and galena in the high sulfur sample. No other sulfur minerals were identified.

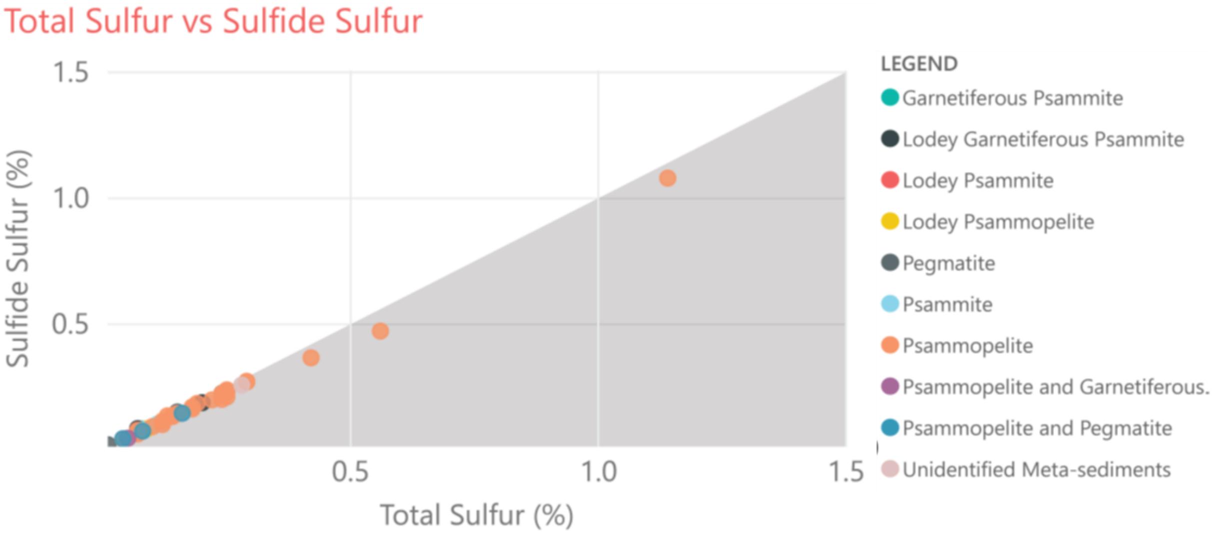

Figure 1: Strong correlation observed between total sulfur and sulfide sulfur.

Several samples (*n* = 11) generated acidic NAG pH values under the specific conditions of the NAG test. Ten of theses samples were psammopelite samples with total sulfur between 0.24 and 1.14 wt%S. One lodey garnetiferous psammite sample with total sulfur of 0.2 wt%S was the only other sample that generated an acidic NAG pH (Figure 2).

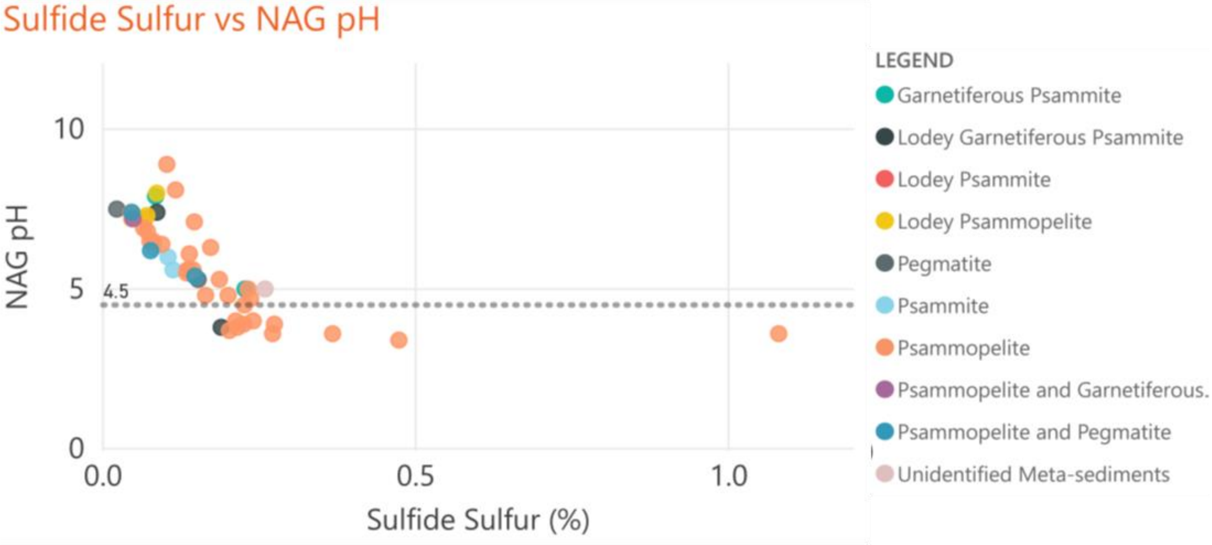

Figure 2: Sulfide sulfur versus NAG pH.

ANC is generally low to moderate with all samples between 10.8 and 20.5 kg H_2SO_4/t. As demonstrated in Figure 3, a poor correlation between measured ANC and calculated ANC using total carbon suggests a lack of carbonate neutralisation potential. Therefore, results suggest measured ANC is silicate based and depending on the specific mineralogy, will likely be slow reacting in comparison to carbonate reactivity. No carbonates were identified by mineralogical analysis. This inference is supported by ABCC results (Attachment G) which shows a lack of readily available reactive ANC.

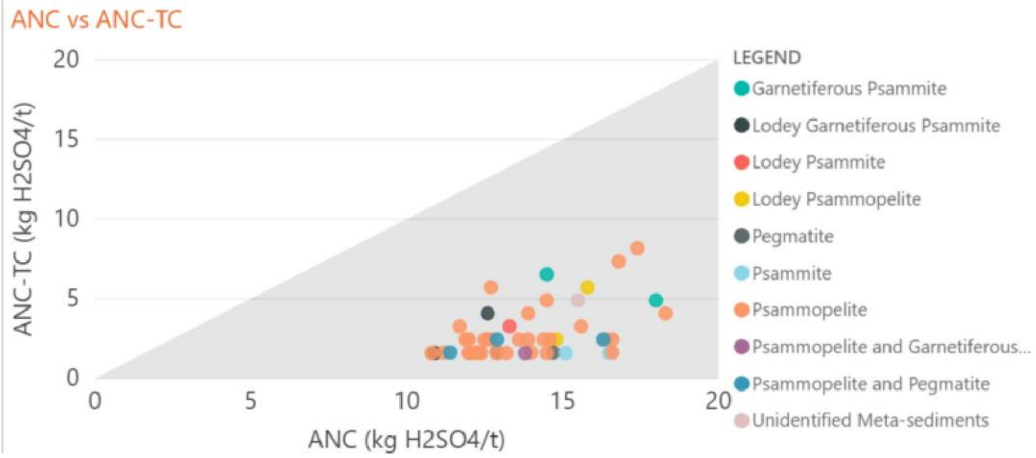

Figure 3: Poor correlation demonstrated between total carbon and measured ANC.

Of the 50 samples analysed, two psammopelite (BH66517 and BH66543) samples were classified as potentially acid forming (PAF) by both the AMIRA (2002) and Price (2009) classification systems (Figure 4). Nine psammopelite samples and one lodey garnetiferous psammite sample were classified uncertain (UC) using both classification systems. One psammopelite and the unidentified meta-sediment sample were classified as UC by the Price system only. The UC classification from the Price system is due to ANC exceeding MPA by less than a factor of 2 (e.g. NPR between 1-2). The UC classification from the AMIRA system is due to acidic NAG pH values (e.g. NAG pH < 4.5) conflicting with negative NAPP values. The remainder of the samples (*n* = 36; Price system and *n*=38; AMIRA system) were classed as being non-acid forming (NAF).

Samples classified UC using the AMIRA classification system, that is plotting in the bottom left quadrant of the AMIRA diagram (lower scatter plot in Figure 4), could be due to the laboratory ANC method overestimating the available ANC. If measured ANC is found to overestimate the available neutralisation capacity, which is demonstrated by ABCC testing, these samples may have a low capacity to generate acidic conditions. Initial ANC results for reference ABA check samples (Table C2, Attachment C) were above the acceptable upper range for the QAQC samples. Upon re-testing of the reference samples by ALS Environmental, using a lower fizz rating and batch method, secondary results were lower and within the acceptable range. Verification ANC testing of all reference samples by EGS resulted in closer agreement with manufacturer values. Therefore, the ANC dataset generated by EGS, which were slightly higher ANC results, was considered more valid and were substituted into the NAPP and NPP calculations. EGS analysed all 50 primary samples for ANC as well as the reference check samples.

With respect to the two psammopelite samples classified as PAF, acidity generated under conditions of the NAG test is predominantly metal based acidity as NAG_7 values (9.8-15.3 kg H_2SO_4/t) exceed sulfide based acidity represented by $NAG_{4.5}$ values (3.3-4.6 kg H_2SO_4/t). When comparing NAPP and $NAG_{4.5}$, which can give an indication of the presence of non-acid generating sulfides, results suggest a portion of the sulfide content measured within sample BH66543 may be non-acid generating. Correlation between NAPP and $NAG_{4.5}$ values for the remaining PAF sample suggest measured sulfide may be pyritic.

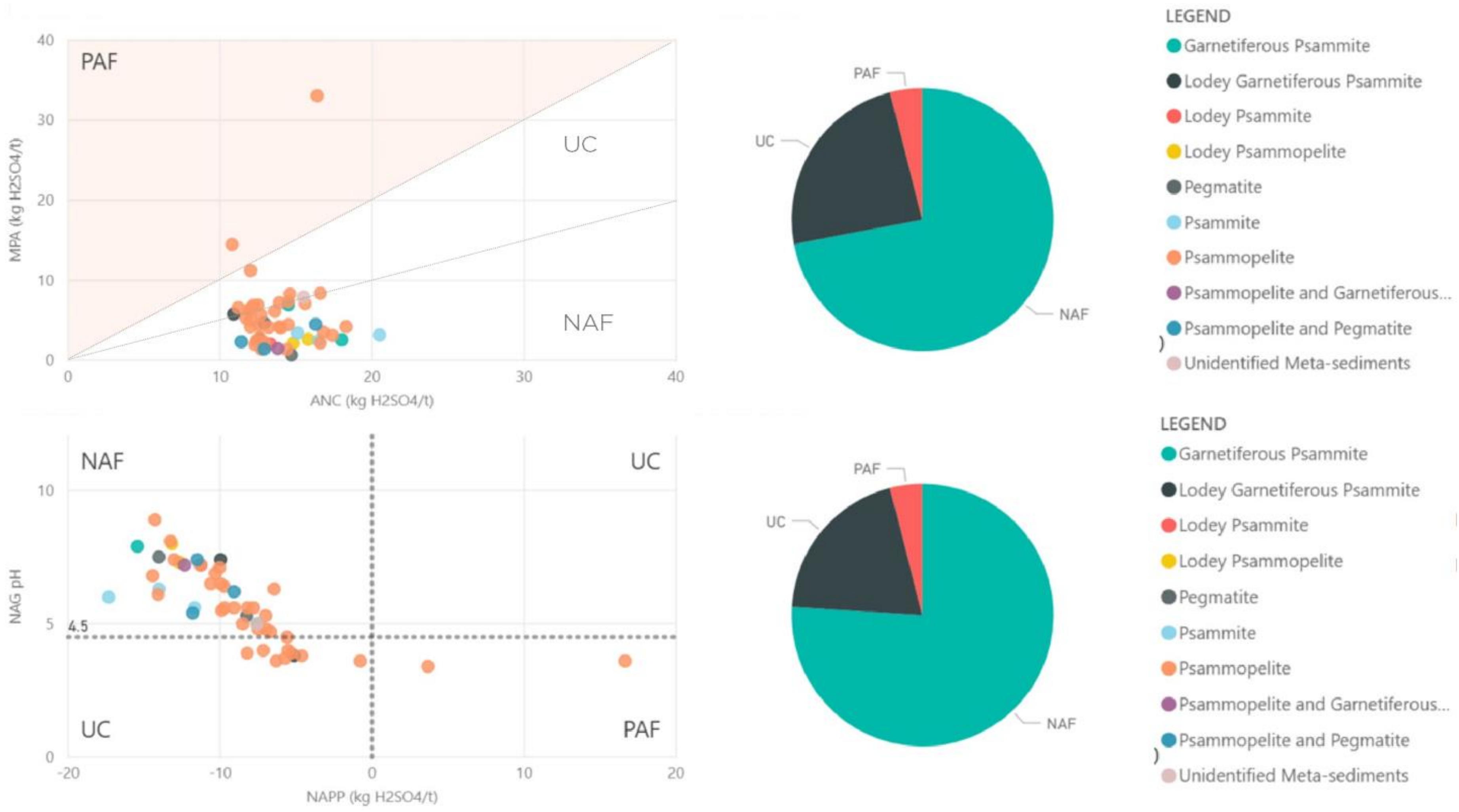

Figure 4: Acid generating classifications using the Price (upper charts) and AMIRA (lower charts) classifications systems. Price-2 and AMIRA-2 refers to the use of sulfide sulfur opposed to total sulfur for the calculation of MPA.

Total Elemental Analysis

Total elemental scans were carried out on all 50 samples. Results can be assessed using tools such as the geochemical abundance index (GAI) to identify elements that may be enriched in respect to average values. However, an enrichment in a specific element does not imply mobility or bioavailability which are dependent on a number of factors such as elemental form (mineralogy), solubility, environmental conditions (e.g. reducing, oxidising), and volume (flow rate) of drainage (Price, 2009).

Element enrichments may be identified using the GAI (Förstner et al. 1993). The GAI quantifies an assay result for a particular element in terms of the average crustal-abundance of that element. The GAI (based on a log-2 scale) is expressed in 7 integer increments (viz. 0 to 6). A GAI of 0 indicates that the content of the element is less than, or similar to, the average crustal-abundance; a GAI of 3 corresponds to a 12-fold enrichment above the average crustal-abundance; and so forth, up to a GAI of 6 which corresponds to a 96-fold, or greater, enrichment above average crustal abundances. Generally, a GAI of 3 or greater signifies enrichment that warrants further examination.

The average-crustal-abundances of the elements for the GAI calculations are based on the values listed in Field Geologists' Manual (AusIMM, 2011) supplemented with data from Bowen (1979) for mean crustal abundance for the elements Al, Ca, Fe, K, Mg, Na, P, S and Ti. For GAI calculation purposes, less than values were treated as equal to half the limit of reporting value. Therefore, where the limit of reporting exceeds the average crustal abundance value, false enrichments such as those for Bi, Sb, and Te have been ignored in the following summary.

Of the samples tested, approximately half (*n* = 23) of the samples had elements with a GAI ≥ 3. Of these samples, 18 were psammopelite samples (Table 6).

Table 6: Number of samples per lithology for which elements were enriched by more than 12 × average crustal abundance (GAI ≥ 3). Maximum GAI in brackets.

LITHOLOGIES	ELEMENT							
	Ag	As	Bi	Cd	Mo	Pb	Sb	Zn
Psammopelite	7 (7)	9 (5)	2 (6)	5 (6)	2 (3)	14 (8)	1 (3)	3 (6)
Lodey Psammopelite						1 (3)		
Psammopelite and Garnetiferous Pegmatite						1 (3)		
Garnetiferous Psammite		1 (3)						
Lodey Garnetiferous Psammite						1 (3)		
Unidentified Meta-sediments	1 (4)	1 (4)	1 (4)			1 (7)		

Water and NAG Leachate Results

All 50 samples were submitted for leachate analysis. A deionised (DI) water leach at a solid to liquid ratio of 1:2 was completed to assess the readily soluble fraction and analysis of the NAG leachate was undertaken to assess the oxidisable fraction of the samples. Results were compared against ANZECC/ARMCANZ (2018) default 95% protection values. It should be noted that these protection values have been used in the absence of site specific trigger values and should only be interpreted as a point of comparison.

The DI water leaching method generated circum-neutral to alkaline leachates with acidic to circum-neutral leachates being generated by the NAG method. The elements listed in Table 7 exceeded the protection values in either the 1:2 DI water leachate or the NAG leachate. Full details on all elemental concentrations as well as pH, EC, sulfate, and chloride results from the two leaching methods can be found in Table E1 (1:2 DI water leachate) and Table E2 (NAG leachate). For the following elements (Ag, Be, Bi, La, Tl, U and V) the limit of reporting (LOR) is greater than the trigger value and therefore these elements may be present at concentrations above the trigger values.

Table 7. Number of samples for which the concentration of an element in the 1:2 DI water leachate and the NAG leachate exceeded the ANZECC/ARMCANZ (2000) guideline.

ELEMENT	ANZECC/ ARMCANZ 95% SLP (mg/L)	DI LEACHATE	NAG LEACHATE
Ag	0.00005	0	6
Al	0.055	50	34
As	0.013	2	3
B	0.37	0	35
Be	0.00013	0	5
Cd	0.0002	1	26
Co	0.0028	0	19
Cr	0.001	25	42
Cu	0.0014	22	22
Fe	0.3	14	8
La	0.00004	1	17
Mo	0.034	0	3
Ni	0.011	0	19
Pb	0.0034	11	21
Sb	0.009	8	1
U	0.0005	5	21
V	0.006	7	32
Zn	0.008	7	20

Mineralogy Results

Samples mostly consisted of very slow to slow reacting silicates (e.g. plagioclase, K-feldspar, kaolinite, illite). Some chlorite was present in most samples, which has intermediate reactivity. Garnets were identified in all samples, up to 15%. Garnets can provide fast reacting silicate buffering. Sulfides, galena and sphalerite, were identified in only one sample (BH66543). Although pure sphalerite and galena do not generate acidity upon oxidation, the substitution of iron into these minerals results in acid generation. No samples contained sulfate or carbonate minerals. Full details of XRD analysis can be found in Table F1.

CONCLUSIONS

The following conclusions are made based on the data received to date:

- The majority of samples tested are classified NAF with low total sulfur (<0.3 wt%S) and low to moderate ANC (10.8-20.5 kg H_2SO_4/t).
- Twelve samples are classified as UC using the Price method due to the potential for acid neutralisation not exceeding the potential for acid generation by a great enough factor of safety (e.g. NPR between 1-2). Ten samples are classified as UC using the AMIRA method due to acidic NAG pH values conflicting with negative NAPP values. Depending on the availability of measured ANC as indicated by the lack of carbonate neutralisation potential (total carbon, mineralogical, and ABCC data), samples classified as UC may have a low capacity to generate acidity if the reactivity of measured sulfides exceeds the reactivity of silicate based ANC.
- Two psammopelite samples were classified as PAF with moderate sulfur content (0.56-1.14 wt%S). NAG testing suggests that a portion of the measured sulfur within the highest sulfur bearing sample (BH66543) may be from non-acid generating sulfides (e.g. PbS).
- Leachates under oxidising (NAG leachate) and DI water leaching conditions ranged from acidic to alkaline and contained several elements at concentrations above the selected trigger values, suggesting the potential for both acidic and neutral metalliferous drainage:
    - DI water leaching conditions: Leachates were circum-neutral to alkaline and aluminium was generally measured in the milligrams per litre (concentrations increased with pH as expected of an element with amphoteric properties). Several elements were above the selected trigger values in leachate generated from psammite, psammopelite, pegmatite, and garnetiferous samples.
    - Oxidising (NAF leachate) conditions: Psammopelite samples classified as PAF generated acidic leachates with selected elements in the tens of milligrams per litre (up to three orders of magnitude above trigger values). Several samples classified as NAF generated leachates with pH values between 4.5-5.5. Lead and zinc were measured in the milligrams per litre (up to two orders of magnitude above trigger values) in select psammopelite meta-sediment samples.

RECOMMENDATIONS

Based on the data received to date, the following preliminary recommendations are provided:

- Build on Environmental Geochemical Dataset: The environmental geochemical dataset is limited. BHO should consider developing an operational testing program to continuously collect samples of waste rock as mining progresses. This will facilitate validation of current waste rock characteristic assumptions and interpretations. It will also enable a better understanding of AMD risk, specifically related to material properties heterogeneity.
- Kinetic Testing: Commence kinetic testing of moderate to high sulfur psammopelite samples classified as PAF and UC. Lodey garnetiferous psammite material classified as UC could also be included in the kinetic program, should the expected volume of this material type be

significant. A number of NAF samples with elevated elemental concentrations should also be incorporated into the kinetic testing program to further assess the inferred potential to generate neutral metalliferous drainage.

CLOSING REMARKS

Please do not hesitate to contact Josh Pearce at +61 409 882 823 or josh.pearce@minewaste.com.au should you wish to discuss this memorandum in greater detail.

Attachments:	Attachment A	–	Sample Details
	Attachment B	–	Laboratory Methods
	Attachment C	–	Acid-Base Accounting
	Attachment D	–	Total Elemental Analysis
	Attachment E	–	Leach Testing
	Attachment F	–	Mineralogy
	Attachment G	–	ABCC Charts
	Attachment H	–	Laboratory Certificates

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ATTACHMENT A – SAMPLE DETAILS

Table A1: Sample Details

SAMPLE ID	NORTHING (MGA)	EASTING (MGA)	RL	LITHOLOGY	COLOUR 1	COLOUR 2	WEATHERING	OXIDISATION	ALTERATION
BH66502	6,462,640.79	543,457.54	288.63	Psammite	Grey	Brown	Fresh	Surface	
BH66503	6,462,641.92	543,458.92	288.65	Psammite	Grey	Brown	Fresh	Surface	Minor Quartz
BH66504	6,462,642.63	543,459.89	288.70	Garnetiferous Psammite	Grey	Pink	Fresh	Weak	
BH66505	6,462,644.18	543,461.38	288.84	Lodey Psammite	Grey	Blue	Moderate	Weak	Blue Quartz
BH66506	6,462,645.37	543,462.66	288.76	Lodey Psammopelite	Grey		Moderate	Weak	Blue Quartz
BH66507	6,462,646.97	543,463.85	288.82	Psammopelite	Grey	Brown	Moderate	Weak	
BH66508	6,462,648.28	543,464.84	288.78	Psammopelite	Grey		Weak	No	Garnet
BH66509	6,462,650.44	543,465.71	288.76	Psammopelite	Grey	Pink	Weak	No	Garnet/Biotite
BH66510	6,462,653.76	543,467.31	288.95	Psammopelite	Grey		Weak	Weak	Sillimanite
BH66511	6,462,656.09	543,468.36	288.98	Psammopelite	Grey	Brown	Weak	Weak	Sillimanite/Biotite
BH66512	6,462,658.42	543,469.31	289.13	Psammopelite	Grey	Brown	Weak	Weak	Sillimanite/Biotite
BH66513	6,462,660.36	543,469.90	288.97	Psammopelite	Grey	Brown	Weak	Weak	Sillimanite/Biotite/Garnet
BH66514	6,462,661.46	543,470.74	289.24	Psammopelite	Grey		Fresh	Surface	Biotite/Quartz
BH66515	6,462,663.39	543,471.31	289.05	Garnetiferous Psammite	Grey	Pink	Fresh	Surface	Garnet/Quartz
BH66516	6,462,664.45	543,472.13	289.24	Psammopelite	Grey		Fresh	No	Biotite
BH66517	6,462,668.27	543,472.19	288.81	Psammopelite	Grey		Fresh	No	Quartz/Biotite
BH66518	6,462,669.78	543,470.72	288.75	Psammopelite	Grey		Fresh	No	Quartz/Biotite
BH66519	6,462,671.24	543,468.79	288.74	Psammopelite	Grey		Moderate	No	Sillimanite
BH66520	6,462,671.75	543,464.53	288.68	Psammopelite	Grey	Pink	Fresh	No	Garnet/Biotite/Quartz
BH66521	6,462,670.11	543,462.53	288.69	Psammopelite	Grey	Orange	Weak	Weak + Surface	Garnet/Biotite/Quartz
BH66522	6,462,670.13	543,459.81	288.64	Psammopelite	Grey		Fresh	Surface	Biotite/Quartz
BH66523	6,462,670.36	543,456.78	288.64	Psammopelite	Grey		Fresh	Surface	Biotite/Garnet
BH66524	6,462,668.11	543,455.01	288.70	Psammopelite	Grey		Moderate	Weak	Minor Clay
BH66525	6,462,667.26	543,452.39	288.82	Psammite	Dark Grey		Fresh	No	Quartz/Biotite
BH66526	6,462,667.42	543,451.05	288.56	Psammopelite and Pegmatite	Grey		Moderate	No	Quartz/Biotite
BH66527	6,462,667.63	543,449.42	288.56	Psammopelite and Garnetiferous Pegmatite	Grey	Pink	Fresh	Surface	Garnet/Quartz/Biotite

Table A1: Sample Details

SAMPLE ID	NORTHING (MGA)	EASTING (MGA)	RL	LITHOLOGY	COLOUR 1	COLOUR 2	WEATHERING	OXIDISATION	ALTERATION
BH66528	6,462,667.13	543,447.35	288.48	Psammopelite and Pegmatite	Grey	White	Fresh	No	Quartz/Biotite
BH66529	6,462,667.59	543,445.69	288.51	Psammopelite	Grey		Fresh	No	Biotite/Garnet
BH66530	6,462,667.49	543,444.43	288.21	Lodey Garnetiferous Psammite	Pink		Fresh	No	Quartz
BH66531	6,462,666.70	543,441.72	288.30	Psammopelite	Grey		Fresh	No	Quartz/Biotite
BH66532	6,462,666.46	543,439.01	288.06	Psammopelite	Grey		Fresh	No	Quartz/Biotite
BH66533	6,462,665.07	543,436.37	288.17	Psammopelite	Grey	Pink	Fresh	No	Garnet/Muscovite
BH66534	6,462,664.42	543,434.62	288.08	Psammopelite	Grey		Fresh	No	Garnet/Muscovite
BH66535	6,462,663.68	543,431.98	288.33	Psammopelite and Pegmatite	Grey		Weak	No	Quartz/Garnet
BH66536	6,462,663.42	543,430.25	288.18	Psammopelite	Grey		Fresh	No	Biotite
BH66537	6,462,662.63	543,427.86	288.24	Unidentified Meta-sediments	Grey	Brown	Weak	Weak	
BH66538	6,462,662.41	543,425.50	288.32	Psammopelite	Grey	Brown	Weak	Weak	Biotite
BH66539	6,462,660.13	543,423.32	288.21	Lodey Psammopelite	Grey	Orange	Fresh	Surface	Blue Quartz
BH66540	6,462,659.04	543,422.69	288.13	Pegmatite	White		Fresh	Surface	Quartz/Sillimanite
BH66541	6,462,657.29	543,421.77	288.29	Psammopelite	Grey		Fresh	No	Quartz/Biotite
BH66542	6,462,656.20	543,420.76	288.30	Lodey Garnetiferous Psammite	White	Pink	Fresh	No	Quartz/Garnet
BH66543	6,462,650.25	543,421.75	288.18	Psammopelite	Grey		Fresh	No	Blue Quartz
BH66544	6,462,648.56	543,425.46	288.23	Psammopelite	Grey	Pink	Fresh	No	Garnet/Sillimanite
BH66545	6,462,648.36	543,426.54	288.37	Psammopelite	Grey		Weak	No	Sillimanite/Biotite
BH66546	6,462,647.38	543,429.08	288.47	Psammopelite	Grey		Fresh	No	Muscovite/Biotite
BH66547	6,462,644.85	543,430.60	288.33	Psammopelite	Grey	Cream	Moderate	Weak	Sillimanite
BH66548	6,462,643.96	543,432.47	288.43	Psammopelite	Orange	Cream	Moderate	Weak	Muscovite/Biotite
BH66549	6,462,640.30	543,433.98	288.62	Psammopelite	Grey	Pink	Fresh	No	Biotite/Garnet
BH66550	6,462,637.57	543,436.99	288.63	Psammopelite	Grey	Pink	Fresh	No	Biotite/Garnet
BH66551	6,462,635.87	543,437.99	288.49	Pegmatite	White	Cream	Weak	No	Minor Sericite/Clay

ATTACHMENT B – LABORATORY METHODS

ACID BASE ACCOUNTING

Acid base accounting (ABA) is conducted to predict the acid generation characteristics of a waste rock material through determination of the acid neutralising capacity (ANC) and the maximum potential acidity (MPA). Although analysis of pH using distilled water is not a standard ABA test, it is often completed to aid in the interpretation of the ABA data as ancillary information.

The net acid production potential (NAPP) is a measure of the samples overall acid generating capacity and is calculated by subtracting the ANC of the sample from the MPA. A negative NAPP indicates that the sample has a net neutralising capacity and a positive NAPP indicates that the sample has a net acid generating capacity. NAPP, MPA, and ANC are expressed in kg H_2SO_4/tonne equivalent.

ANC is determined by acid digestion (using HCl) of the sample followed by back-titration (using NaOH) to determine the quantity of acid consumed by neutralising minerals within the rock sample. MPA is based on total sulfur in wt%S (or sulfide sulfur if available) multiplied by the stoichiometric conversion factor 30.6. This conversion factor is determined from the stoichiometry of pyrite oxidation. NAPP is calculated via Equation 1 (all units are in kg H_2SO_4/t):

Equation 1: $NAPP = MPA – ANC$

Thus, potentially acid forming (PAF) material have a positive NAPP and non-acid forming (NAF) material have a negative NAPP.

ABA analysis for this project included the following:

- Paste pH/EC: Pulverised sample (25 g) is equilibrated with deionised water at a 1:2 ratio and left for 12 hours (or overnight) before pH and EC measurements of the slurry are recorded (AMIRA, 2002).
- Total sulfur (TS): Measured by heating a pulverised sample (< 2 g) in a LECO furnace to ~1,650°C and measuring the sulfur dioxide production. Assay sulfur values measured by XRF analysis on pelletised samples can be used as a substitute for total sulfur measured by LECO.
- Total carbon (TC): Measured by heating a pulverised sample (< 2 g) in a LECO furnace to ~1,650°C and measuring the carbon dioxide production.
- Acid soluble sulfur ($S\text{-}SO_4$ or S_{HCl}): Method uses 3M hydrochloric acid (HCl) to extract soluble and slightly soluble sulfate from a pulverised sample (< 2 g) over a 1 hour period. Sulfides should not react and would normally be expelled; extracted sulfur is determined by ICP analysis of the digestion liquor.
- Chromium Reducible Sulfur (S-CRS): Method is based on the conversion of reduced inorganic sulfur to H2S by a hot acidic CrCl2 solution. The evolved H2S is trapped in a zinc acetate solution as ZnS which is then quantified by iodometric titration (Ahern et al., 2004).
- Sulfide sulfur: Can be calculated indirectly if sulfide sulfur has not been measured directly via Equation 2.

Equation 2: $Sulfide\ Sulfur = TS – S\text{-}SO_4$

- Maximum potential acidity (MPA): A measure of the maximum potential of a sample to generate acidity. MPA can be calculated using TS or sulfide sulfur (all units are in kg H_2SO_4/t):

Equation 3: $MPA = TS \times 30.6$

- Acid neutralising capacity (ANC): Measures the amount of HCl a pulped sample (2 g) can neutralise with gentle heating and the addition of hydrogen peroxide (2 drops of 30%) to dissolve any ferrous iron present (AMIRA, 2002).
- Net acid production potential (NAPP): The NAPP value is calculated as the difference between MPA and ANC as per Equation 1. A negative NAPP value indicates that a sample may have sufficient ANC to prevent acid generation and conversely, if MPA exceeds ANC, the material may be acid generating.
- Single Addition Net Acid Generation (NAG) Test: A pulverised sample (2.5 g) is digested with 250 mL of 15% hydrogen peroxide and allowed to react to completion before measuring the pH of the NAG liquor. The NAG liquor is then titrated with NaOH to pH 4.5 and pH 7. Acidity measured by the titration to pH 4.5 is due to free hydrogen ion as well as acidity from aluminium and iron (AMIRA, 2002). Additional acidity measured by the titration to pH 7 can be attributed to metal hydrolysis reactions such as copper and zinc (AMIRA, 2002).

TOTAL ELEMENTAL ANALYSIS

The results from solid phase total or near-total analysis such as total elemental (TE) analysis can be used to make an inference regarding elements of potential environmental concern. Results can be assessed using tools such as the geochemical abundance index (GAI) to identify elements that may be enriched in respect to average values. However, an enrichment in a specific element does not imply mobility or bioavailability.

It is important to understand the strengths and weaknesses of each method, particularly the various digestions to ensure drainage predictions are not adversely affected (Price 2009).

Samples were digested using an in house ALS method (Referenced to USEPA 200.2). Hot Block Acid Digestion 1.0g of sample is heated with Nitric and Hydrochloric acids, then cooled. Peroxide is added and samples heated and cooled again before being filtered and bulked to volume for analysis.

MINERALOGICAL ANALYSIS

Mineralogical analysis is an essential part of geochemical assessments because the mineralogical properties determine the physical and geochemical stability and relative weathering rates of waste rock under different weathering conditions (Price, 2009). Step scanned X-ray diffraction patterns were collected for an hour per sample using a PANalytical X'Pert Pro powder diffractometer and cobalt Kα radiation operating in Bragg-Brentano geometry. The collected data was analysed using JADE (V2010, Materials Data Inc.), EVA (V5, Bruker) and X'Pert Highscore Plus (V4, PANalytical) with various reference databases (PDF4+, AMCSD, COD) for phase identification. Rietveld refinement was performed using TOPAS (V6, Bruker). The known addition of corundum facilitates reporting of absolute phase abundances for the modelled phases. The sum of the absolute abundances is subtracted from 100 wt% to obtain a residual (called non-diffracting/unidentified, also known as "amorphous").

Powder X-ray diffraction is bulk phase analysis, it is not bulk chemical analysis. Phase abundances may be mis-estimated if an incorrect chemical formula is assigned to a phase. Therefore, the closest matches in the reference phase identification databases were used in the Rietveld refinement model, but other members of the identified mineral groups may be present

STATIC LEACH TESTING

Methods for static (or short-term) leach tests can vary widely, however, all tests generally measure readily soluble constituents of mine wastes and geologic materials. The short-term nature of static leach tests provides a snapshot in time of a material's environmental stability. Test results depend entirely on the present disposition of the sample (e.g., unoxidised vs. oxidised; oxidation products absent vs. oxidation products present). For reactive rocks (e.g., material that contains oxidisable sulfur), the transient processes that lead to changes in solution chemistry during water-rock interactions often develop over periods of time that are much greater than is stipulated in the testing protocols. Therefore, the results from short-term leach tests generally cannot be applied to develop reaction rates and predict long-term mine water quality, but should instead be used to get an initial indication of parameters of constituents of interest.

The method is completed on the <2 mm size fraction collected during the sample preparation phase. The sample (100 g) is leached with distilled water at a ratio of 2:1 (liquid to solid) for a period of 12 hours (bottle rolled). The leachate is then filtered through a 0.45 µm filter prior to analysis for Ca, Mg, Na, K, pH, EC, Cl, SO_4, alkalinity, F, hardness, TDS, and trace metals including As, Cd, Cr, Cu, Pb, Mn, Ni, Se, Hg, and B. The liquid to solid ratio (L:S) of 2:1 is designed to better reflect field conditions (in the order of 0.2:1) in comparison to other static leach methods such as the SPLP and ASLP which use ratios up to 20:1.

NAG LIQUOR ANALYSIS

Methods for NAG liquor analysis can vary widely, however, all tests generally measure readily soluble constituents of mine wastes and geologic materials. The short-term nature of static leach tests provides a snapshot in time of a material's environmental stability. Test results depend entirely on the present disposition of the sample (e.g., unoxidised vs. oxidised; oxidation products absent vs. oxidation products present). For reactive rocks (e.g., material that contains oxidisable sulfur), the transient processes that lead to changes in solution chemistry during water-rock interactions often develop over periods of time that are much greater than is stipulated in the testing protocols. Therefore, the results from short-term leach tests generally cannot be applied to develop reaction rates and predict long-term mine water quality, but should instead be used to get an initial indication of parameters of constituents of interest. Upon completion of the single addition NAG test, the NAG liquor is retained and filtered prior to analysing for EC, SO_4, As, Cd, Cr, Cu, Pb, Mn, Ni, Se, Hg, and B.

ACID BUFFERING CHARACTERISTIC CURVES (ABCCS)

Acid buffering characteristic curve (ABCC) testing (AMIRA, 2002) were carried out to confirm the effective neutralising capacity (ENC) of specific samples. This should be used to provide some indication of reactive and available ANC and then be considered as part of the acid base accounting procedure. The ABCC test involves slow titration of a sample to pH 2.5 with acid while continuously monitoring pH. The ENC is equal to the amount of acid added to decrease the pH to 4.5. These data provide an indication of the portion of the ANC measured in a sample that is readily available for acid neutralisation.

SAMPLE PREPARATION PROCEDURE

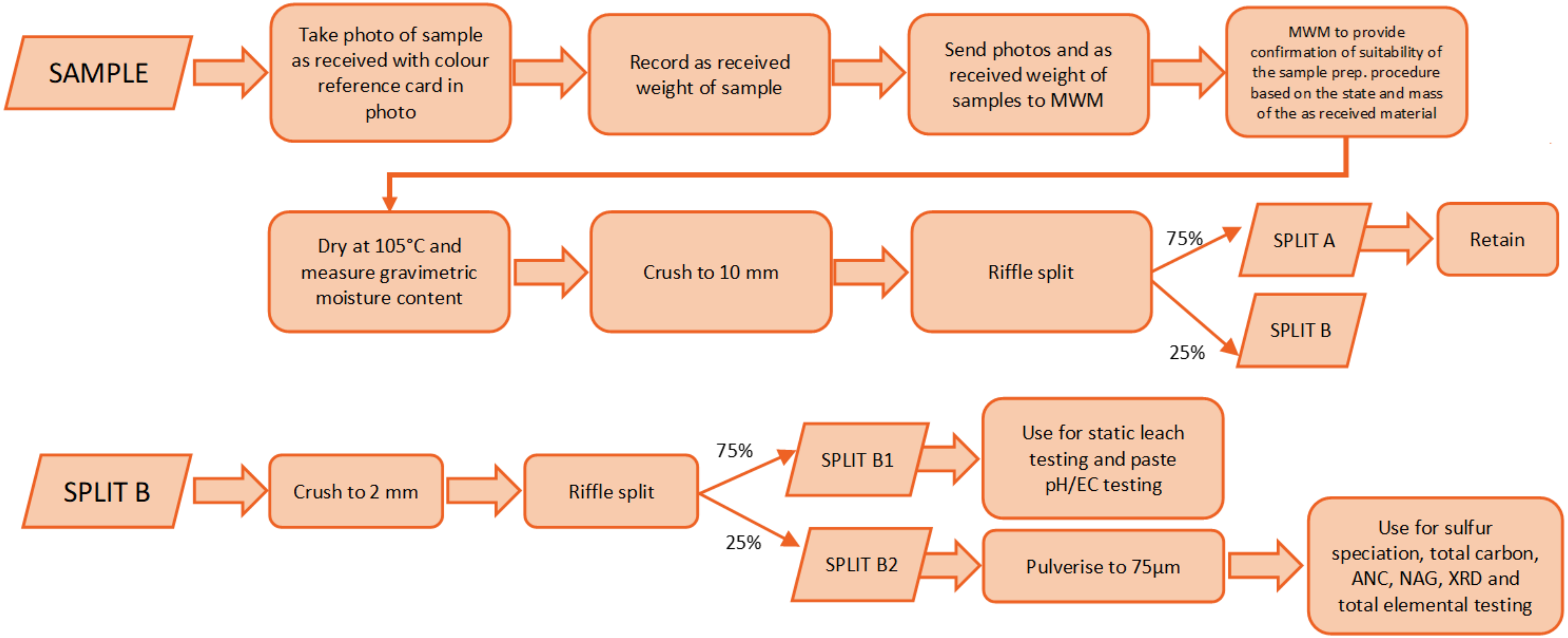


Figure B1: Sample preparation procedure.

ATTACHMENT C – ACID-BASE ACCOUNTING

Table C1: Kintore Pit Acid Base Accounting Results

				PASTE pH/EC		ACID-BASE ACCOUNTING								SINGLE ADDITION NAG			ACID GENERATING CLASSIFICATION	
				$pH_{1:2}$	$EC_{1:2}$	TS	S-CRS	$S\text{-}SO_4$	TC	[2]$MPA_{S\text{-}CRS}$	ANC[8]	[5]$NAPP_{S\text{-}CRS}$	[7]$NPR_{S\text{-}CRS}$	NAG pH	$NAG_{4.5}$	NAG_7		
				no units	µS/cm	%S	%S	%S	%C	kg H_2SO_4/t			no units	no units	kg H_2SO_4/t		$PRICE_{S\text{-}CRS}$	$AMIRA_{S\text{-}CRS}$
SAMPLE ID	LITHOLOGY	COLOUR	WEATH.	0.1	10	0.01	0.02		0.01	0.1		1.0		0.1	1	1		
BH66502	Psammite	Grey	Fresh	8.1	361	0.11	0.10	0.11	<0.02	3.2	20.5	-17.3	6.4	6.0		1.0	NAF	NAF
BH66503	Psammite	Grey	Fresh	7.9	275	0.08	0.08	0.04	<0.02	2.5	16.5	-14.0	6.7	6.3		0.8	NAF	NAF
BH66504	Garnetiferous Psammite	Grey	Fresh	8.3	329	0.08	0.08	0.05	0.06	2.6	18.0	-15.4	7.0	7.9			NAF	NAF
BH66505	Lodey Psammite	Grey	Moderate	7.8	2,000	0.07	0.07	0.03	0.04	2.1	13.3	-11.2	6.5	7.2			NAF	NAF
BH66506	Lodey Psammopelite	Grey	Moderate	8.4	1,360	0.07	0.07	0.02	0.03	2.1	14.8	-12.7	6.9	7.3			NAF	NAF
BH66507	Psammopelite	Grey	Moderate	8.3	456	0.04	0.05	0.01	0.03	1.4	14.4	-13.0	10.5	7.4			NAF	NAF
BH66508	Psammopelite	Grey	Weak	9.4	1,340	0.22	0.20	0.14	0.03	6.1	13.6	-7.5	2.2	4.8		1.6	NAF	NAF
BH66509	Psammopelite	Grey	Weak	8.4	2,580	0.12	0.10	0.03	0.10	3.1	17.4	-14.3	5.6	8.9			NAF	NAF
BH66510	Psammopelite	Grey	Weak	8.3	571	0.07	0.07	0.02	0.02	2.0	12.3	-10.3	6.2	6.9		0.4	NAF	NAF
BH66511	Psammopelite	Grey	Weak	8.3	454	0.14	0.14	0.12	<0.02	4.1	13.2	-9.1	3.2	5.6		0.8	NAF	NAF
BH66512	Psammopelite	Grey	Weak	8.2	801	0.14	0.14	0.17	<0.02	4.2	12.0	-7.8	2.9	5.6		0.8	NAF	NAF
BH66513	Psammopelite	Grey	Weak	8.4	305	0.04	0.05	0.01	0.07	1.4	12.7	-11.3	9.0	7.2			NAF	NAF
BH66514	Psammopelite	Grey	Fresh	8.4	278	0.07	0.08	0.02	<0.02	2.3	12.9	-10.6	5.6	6.5		0.7	NAF	NAF
BH66515	Garnetiferous Psammite	Grey	Fresh	8.4	362	0.24	0.23	0.13	0.08	6.9	14.5	-7.6	2.1	5.0		1.2	NAF	NAF
BH66516	Psammopelite	Grey	Fresh	8.3	828	0.29	0.27	0.12	0.03	8.4	16.6	-8.2	2.0	3.9	1.2	4.1	UC	UC
BH66517	Psammopelite	Grey	Fresh	8.1	958	0.56	0.47	0.23	0.01	14.5	10.8	3.7	0.7	3.4	4.6	9.8	PAF	PAF
BH66518	Psammopelite	Grey	Fresh	8.3	427	0.24	0.23	0.22	<0.02	6.9	12.2	-5.3	1.8	3.9	1.4	3.8	UC	UC
BH66519	Psammopelite	Grey	Moderate	8.1	622	0.42	0.37	0.17	<0.02	11.2	12.0	-0.8	1.1	3.6	2.7	7.7	UC	UC
BH66520	Psammopelite	Grey	Fresh	8.7	296	0.24	0.23	0.23	0.03	6.9	12.5	-5.6	1.8	4.5		1.3	UC	UC
BH66521	Psammopelite	Grey	Weak	8.4	666	0.07	0.08	0.05	<0.02	2.4	12.4	-10.0	5.1	6.5		0.8	NAF	NAF
BH66522	Psammopelite	Grey	Fresh	8.3	1,260	0.14	0.13	0.08	0.02	4.1	14.0	-9.9	3.4	5.5		0.6	NAF	NAF
BH66523	Psammopelite	Grey	Fresh	8.0	1,810	0.25	0.21	0.08	0.02	6.5	12.0	-5.5	1.8	4.0	0.6	2.4	UC	UC
BH66524	Psammopelite	Grey	Moderate	8.3	1,020	0.10	0.09	0.08	0.03	2.9	12.6	-9.7	4.4	6.4		0.6	NAF	NAF
BH66525	Psammite	Grey	Fresh	8.2	740	0.12	0.11	0.06	<0.02	3.4	15.1	-11.7	4.4	5.6		0.8	NAF	NAF
BH66526	Psammopelite and Pegmatite	Grey	Moderate	8.3	1,040	0.04	0.05	0.02	0.03	1.4	12.9	-11.5	9.2	7.4			NAF	NAF
BH66527	Psammopelite and Garnetiferous Pegm.	Grey	Fresh	8.3	1,320	0.05	0.05	0.01	<0.02	1.5	13.8	-12.3	9.4	7.2			NAF	NAF
BH66528	Psammopelite and Pegmatite	Grey	Fresh	8.6	589	0.16	0.15	0.13	0.03	4.5	16.3	-11.8	3.6	5.4		0.9	NAF	NAF
BH66529	Psammopelite	Grey	Fresh	8.8	308	0.14	0.14	0.06	0.05	4.2	18.3	-14.1	4.3	6.1		0.8	NAF	NAF
BH66530	Lodey Garnetiferous Psammite	Pink	Fresh	8.4	413	0.20	0.19	0.18	<0.02	5.8	10.9	-5.1	1.9	3.8	1.3	3.3	UC	UC
BH66531	Psammopelite	Grey	Fresh	9.6	1,030	0.15	0.15	0.10	0.06	4.5	14.5	-10.0	3.2	7.1			NAF	NAF
BH66532	Psammopelite	Grey	Fresh	9.0	388	0.18	0.16	0.08	0.03	5.0	12.0	-7.0	2.4	4.8		1.4	NAF	NAF
BH66533	Psammopelite	Grey	Fresh	8.5	428	0.24	0.20	0.14	0.03	6.2	11.9	-5.7	1.9	3.7	1.4	3.2	UC	UC
BH66534	Psammopelite	Grey	Fresh	8.5	583	0.25	0.24	0.19	0.05	7.2	13.9	-6.7	1.9	4.7		1.7	UC	NAF
BH66535	Psammopelite and Pegmatite	Grey	Weak	8.6	415	0.08	0.08	0.03	0.02	2.3	11.4	-9.1	4.9	6.2		0.6	NAF	NAF
BH66536	Psammopelite	Grey	Fresh	8.7	581	0.19	0.19	0.20	0.03	5.7	12.7	-7.0	2.2	5.3		1.1	NAF	NAF
BH66537	Unidentified Meta-sediments	Grey	Weak	8.6	553	0.28	0.26	0.17	0.06	7.9	15.5	-7.6	2.0	5.0		2.1	UC	NAF
BH66538	Psammopelite	Grey	Weak	9.1	1,310	0.25	0.23	0.14	0.04	7.1	15.6	-8.5	2.2	5.0		1.8	NAF	NAF
BH66539	Lodey Psammopelite	Grey	Fresh	8.9	476	0.09	0.09	0.05	0.07	2.6	15.8	-13.2	6.0	8.0			NAF	NAF
BH66540	Pegmatite	White	Fresh	8.8	785	0.15	0.15	0.11	0.02	4.7	12.9	-8.2	2.8	5.3		0.7	NAF	NAF
BH66541	Psammopelite	Grey	Fresh	10.2	615	0.18	0.17	0.12	0.04	5.3	11.7	-6.4	2.2	6.3		0.6	NAF	NAF
BH66542	Lodey Garnetiferous Psammite	Pink	Fresh	9.0	476	0.07	0.09	0.15	0.05	2.6	12.6	-10.0	4.8	7.4			NAF	NAF
BH66543	Psammopelite	Grey	Fresh	9.3	484	1.14	1.08	1.20	0.03	33.0	16.4	16.6	0.5	3.6	3.3	15.3	PAF	PAF
BH66544	Psammopelite	Grey	Fresh	8.8	289	0.24	0.22	0.22	0.02	6.6	11.2	-4.6	1.7	3.8	1.4	3.1	UC	UC
BH66545	Psammopelite	Grey	Weak	8.7	301	0.15	0.14	0.20	0.03	4.4	12.6	-8.2	2.9	5.6		1.1	NAF	NAF
BH66546	Psammopelite	Grey	Fresh	8.4	664	0.29	0.27	0.39	0.03	8.3	14.6	-6.3	1.8	3.6	1.9	4.2	UC	UC
BH66547	Psammopelite	Grey	Moderate	8.6	1,380	0.13	0.14	0.28	0.03	4.2	13.9	-9.7	3.3	5.6		0.9	NAF	NAF
BH66548	Psammopelite	Grey	Moderate	10.1	1,380	0.12	0.12	0.14	0.09	3.5	16.8	-13.3	4.7	8.1			NAF	NAF

Table C1: Kintore Pit Acid Base Accounting Results

				PASTE pH/EC		ACID-BASE ACCOUNTING								SINGLE ADDITION NAG			ACID GENERATING CLASSIFICATION	
				$pH_{1:2}$	$EC_{1:2}$	TS	S-CRS	$S-SO_4$	TC	[2]MPA_{S-CRS}	ANC[8]	[5]$NAPP_{S-CRS}$	[7]NPR_{S-CRS}	NAG pH	$NAG_{4.5}$	NAG_7		
				no units	µS/cm	%S	%S	%S	%C	kg H_2SO_4/t			no units	no units	kg H_2SO_4/t		$PRICE_{S-CRS}$	$AMIRA_{S-CRS}$
SAMPLE ID	LITHOLOGY	COLOUR	WEATH.	0.1	10	0.01	0.02		0.01	0.1		1.0		0.1	1	1		
BH66549	Psammopelite	Grey	Fresh	9.0	470	0.07	0.07	0.06	0.02	2.2	16.6	-14.4	7.6	6.8		0.5	NAF	NAF
BH66550	Psammopelite	Grey	Fresh	8.8	319	0.25	0.24	0.72	<0.02	7.3	14.5	-7.2	2.0	4.0	0.7	2.6	UC	UC
BH66551	Pegmatite	White	Weak	8.9	360	0.01	0.02	0.02	0.02	0.7	14.7	-14.0	21.8	7.5			NAF	NAF
KEY												>0	<1	<4.5				

$pH_{1:2}$ = pH of 1:2 extract

$EC_{1:2}$ = Electrical Conductivity of 1:2 extract (µS/m)

TS = Total Sulfur; $S-SO_4$ = Sulfate Sulfur; S-CRS = Sulfide Sulfur

MPA = Maximum Potential Acidity (kg H_2SO_4/t)

MPA_{S-CRS} = Uses Sulfide Sulfur opposed to Total Sulfur

ANC = Acid Neutralising Capacity (kg H_2SO_4/t)

NAPP = Net Acid Producing Potential (kg H_2SO_4/t)

$NAPP_{S-CRS}$ = Uses Sulfide Sulfur opposed to Total Sulfur

NPR = Ratio of ANC over MPA

NPR_{S-CRS} = Uses Sulfide Sulfur opposed to Total Sulfur

[1] MPA = TS × 30.6

[2] MPA = S-CRS × 30.6

[4] NAPP = MPA - ANC

[5] NAPP = MPA_{S-CRS} - ANC

[6] NPR = ANC / MPA

[5] NPR = ANC/MPA_{S-CRS}

[8] ANC: EGS data

NAF = Non-Acid Forming

PAF = Potentially Acid Forming

UC = Uncertain Classification

Table C2: QAQC ABA Reference Check Sample Results

		$pH_{1:2}$	TS	MPA	ANC	FIZZ TEST	ANC*	FIZZ TEST*	NAPP	NPR	NAG pH	$NAG_{4.5}$	NAG_7
		no units	%S	kg H_2SO_4/t	kg H_2SO_4/t		kg H_2SO_4/t		kg H_2SO_4/t	no units	no units	kg H_2SO_4/t	
SAMPLE ID	SAMPLE DESCRIPTION	0.1	0.01	0.1	1.0	1			1.0	0.1	0.1	1	1
MWM-001	Reference Check Sample	9.3	0.30	9.2	58.9	2	57.0	2	-49.7	6.4	9.5		
MWM-002	Reference Check Sample	9.3	0.32	9.8	60.7	2	57.4	2	-50.9	6.2	9.4		
NAF SAMPLE	Reference Check Sample	8.3	0.24	7.3	57.5	1			-50.2	7.8	8.0		

		$pH_{1:2}$	TS	MPA	ANC	FIZZ TEST	ANC*	FIZZ TEST*	NAPP	NPR	NAG pH	$NAG_{4.5}$	NAG_7
		no units	%S	kg H_2SO_4/t	kg H_2SO_4/t		kg H_2SO_4/t			no units	no units	kg H_2SO_4/t	
SAMPLE ID	SAMPLE DESCRIPTION	0.1	0.01	0.1	1.0	1			1.0	0.1	0.1	1	1
MWM-021	Reference Check Sample	8.0	1.42	43.5	4.6	0	2.6	0	38.9	0.1	2.6	34.3	42.7
MWM-022	Reference Check Sample	7.9	1.40	42.8	4.6	0	2.9	0	38.2	0.1	2.6	35.3	41.8
PAF SAMPLE	Reference Check Sample	7.6	1.41	43.1	3.6	0			39.6	0.1	2.6	29.2	31.9

**EGS Results*

Reference Check Sample Manufacturer Supplied Data

ATTACHMENT D – TOTAL ELEMENTAL ANALYSIS

Table D1: Multi-Elemental Analysis

ELEMENT	Ag	Al	As	Ba	Bi	Cd	Co	Cr	Cu	Fe	Li	Mn	Mo	Ni	Pb	Sb	Sn	Sr	Tl	V	Zn
UNITS	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
LOR	0.1	50	0.1	0.1	0.1	0.1	0.1	0.1	1	50	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	1	0.5
BH66502	0.2	17,600	6.4	67.4	0.2	0.1	10.6	28.5	27	24,800	9.8	153	1.2	22.0	32	<0.1	0.5	11.1	1.4	26	106
BH66503	0.1	19,200	2.6	64.0	0.2	<0.1	9.8	30.6	17	22,700	9.4	185	1.2	19.3	24	<0.1	1.1	13.9	1.4	29	87
BH66504	0.2	15,800	25.5	78.4	0.2	0.2	10.3	30.0	25	22,700	9.7	170	2.8	20.1	47	<0.1	0.5	10.0	1.0	27	111
BH66505	0.2	16,200	19.5	69.4	0.2	0.3	10.4	31.2	21	25,400	12.2	164	1.3	23.3	59	<0.1	1.0	9.0	1.2	29	168
BH66506	0.2	16,800	6.7	87.4	0.2	0.3	10.5	29.1	21	25,700	13.3	137	1.2	23.2	59	<0.1	0.6	8.9	1.1	30	169
BH66507	<0.1	14,900	3.7	67.2	0.2	<0.1	9.1	29.8	20	22,700	12.7	136	2.2	20.1	28	<0.1	0.8	8.1	0.8	26	87
BH66508	0.8	13,600	165.0	67.8	0.4	5.9	10.8	25.1	56	24,200	12.3	165	6.2	20.0	599	0.2	0.6	7.7	1.1	25	1,040
BH66509	4.8	13,400	14.3	61.7	0.4	1.8	9.7	22.7	178	25,200	9.2	368	4.3	21.5	482	0.8	1.0	11.0	0.9	20	538
BH66510	0.3	15,300	9.0	87.0	0.2	0.2	11.6	28.0	27	25,300	12.8	184	1.2	25.5	42	<0.1	0.5	7.6	1.0	27	101
BH66511	0.2	18,200	2.5	105.0	0.3	0.2	12.9	32.4	57	30,400	14.0	138	1.1	27.2	32	<0.1	1.0	5.9	1.3	32	120
BH66512	1.2	15,100	5.2	89.9	0.4	0.2	10.9	26.9	44	25,700	11.0	220	1.2	23.2	185	0.3	0.5	8.8	1.2	24	110
BH66513	0.1	12,400	1.0	123.0	0.5	<0.1	8.4	28.3	32	24,400	13.2	129	1.5	18.0	16	<0.1	0.7	4.4	0.8	20	66
BH66514	0.1	13,000	0.9	105.0	0.2	0.1	9.9	23.1	29	25,600	12.0	117	1.1	20.3	16	<0.1	0.5	4.2	0.9	20	69
BH66515	0.2	13,700	1.2	99.8	0.2	<0.1	11.8	24.5	59	29,000	14.3	171	1.6	19.7	24	<0.1	0.6	6.7	0.8	19	63
BH66516	0.2	18,800	7.2	141.0	0.2	0.2	15.2	28.3	72	32,900	18.4	147	1.3	28.5	30	<0.1	0.4	10.3	1.1	33	91
BH66517	2.4	13,500	96.5	88.0	0.9	3.5	15.4	20.8	148	31,200	9.4	245	1.0	23.8	1,620	0.4	1.3	3.9	1.7	19	617
BH66518	0.4	13,600	40.3	89.5	0.2	1.4	11.8	21.9	91	27,400	8.9	225	1.6	22.1	273	<0.1	0.5	5.4	1.6	22	430
BH66519	0.7	12,900	31.7	58.8	0.3	0.6	14.6	20.3	226	29,600	8.2	225	1.0	26.5	290	0.1	0.8	4.3	1.9	15	212
BH66520	0.1	15,600	2.4	131.0	17.2	0.2	11.7	29.6	47	31,800	12.7	156	1.3	24.6	33	<0.1	0.3	7.5	0.8	25	105
BH66521	0.1	14,400	8.3	97.5	0.2	0.1	9.8	28.0	27	25,000	9.5	160	1.1	23.2	27	<0.1	0.6	8.4	0.8	23	90
BH66522	<0.1	16,800	0.6	145.0	0.2	0.1	11.3	31.5	27	29,500	11.6	158	1.4	23.3	15	<0.1	0.4	8.0	0.9	28	102
BH66523	0.5	13,100	21.2	93.5	0.6	2.1	10.8	24.6	36	27,100	10.0	202	1.3	20.0	256	0.1	1.0	7.8	1.0	23	667
BH66524	<0.1	16,500	0.9	136.0	0.2	0.1	11.3	32.1	26	30,000	11.5	153	1.2	26.0	13	<0.1	0.3	8.7	0.8	26	95
BH66525	0.2	17,200	11.7	67.0	0.4	0.4	9.9	25.9	39	25,600	9.9	175	1.1	22.1	83	<0.1	0.7	11.0	0.9	22	165
BH66526	0.1	17,100	2.9	50.8	0.2	0.1	11.0	29.9	14	27,200	11.1	179	0.9	25.5	35	<0.1	0.4	8.8	1.2	27	105
BH66527	0.3	17,000	6.3	46.6	0.2	0.2	7.7	25.2	15	21,500	7.8	178	1.1	18.6	211	<0.1	0.9	10.2	1.2	23	103
BH66528	0.1	17,100	1.0	96.9	0.2	0.1	9.7	23.1	31	24,800	9.6	155	2.7	21.2	32	<0.1	0.4	10.1	0.8	21	82
BH66529	0.1	16,000	1.1	120.0	0.3	0.1	10.7	31.5	50	32,700	14.7	138	11.3	24.3	20	<0.1	0.7	5.7	0.8	22	87
BH66530	0.4	14,000	10.4	78.3	0.5	0.3	10.8	23.1	112	28,800	10.2	208	2.6	26.7	157	0.1	0.5	4.3	1.6	18	124

Table D1: Multi-Elemental Analysis

ELEMENT	Ag	Al	As	Ba	Bi	Cd	Co	Cr	Cu	Fe	Li	Mn	Mo	Ni	Pb	Sb	Sn	Sr	Tl	V	Zn
UNITS	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
LOR	0.1	50	0.1	0.1	0.1	0.1	0.1	0.1	1	50	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	1	0.5
BH66531	0.6	13,800	18.5	94.7	0.5	0.6	10.2	24.1	50	28,100	9.8	203	1.5	20.8	458	<0.1	0.7	6.6	1.2	20	192
BH66532	<0.1	14,100	0.6	109.0	0.2	<0.1	12.4	31.1	40	28,000	12.4	136	1.6	26.5	11	<0.1	0.4	6.7	0.7	30	84
BH66533	0.4	13,400	74.7	96.4	0.4	0.3	14.9	25.2	110	29,700	11.7	173	5.2	21.7	226	<0.1	0.8	4.5	1.3	20	118
BH66534	1.0	13,700	16.4	64.1	0.6	1.2	10.5	22.0	97	25,500	9.6	182	1.1	20.9	612	0.1	0.6	8.6	1.0	20	369
BH66535	0.2	15,300	4.2	36.3	0.2	0.4	6.1	21.0	28	16,200	6.9	161	1.1	12.5	128	<0.1	0.6	11.5	0.7	16	110
BH66536	1.1	14,600	55.6	92.7	0.8	4.1	11.8	29.7	48	25,500	7.7	195	1.3	19.2	794	0.2	0.5	14.0	1.5	25	812
BH66537	3.1	15,700	50.1	47.4	8.0	1.4	9.7	23.8	38	25,400	9.5	198	1.4	16.8	2,670	0.7	1.0	15.3	1.1	21	338
BH66538	0.3	16,600	23.5	75.4	0.3	6.6	11.5	27.4	33	25,100	10.0	158	1.5	23.6	162	<0.1	0.4	12.0	0.8	26	1,130
BH66539	0.4	14,400	5.4	63.0	0.5	0.4	9.5	26.1	22	23,200	9.3	168	1.4	19.5	279	<0.1	0.7	13.4	0.9	22	182
BH66540	0.1	13,900	7.3	70.1	0.2	0.2	8.8	21.8	29	22,400	8.3	132	1.8	19.1	70	<0.1	0.4	10.9	0.7	23	115
BH66541	1.5	14,300	11.0	85.1	1.2	1.9	10.6	26.5	124	27,700	10.8	156	1.4	21.8	637	0.2	1.1	9.8	1.0	29	621
BH66542	0.2	13,700	14.2	83.6	0.3	0.3	9.2	25.6	23	19,700	7.8	148	1.2	19.1	92	<0.1	0.7	10.4	0.8	23	141
BH66543	16.7	14,300	149.0	44.9	21.2	27.3	13.6	17.0	141	28,800	8.0	238	1.3	14.1	8,740	4.3	2.8	10.8	1.8	16	7,730
BH66544	0.3	15,300	1.7	110.0	0.7	0.1	11.0	28.0	79	32,900	16.0	119	34.6	27.2	51	<0.1	0.3	3.4	0.8	24	109
BH66545	0.2	17,200	1.6	93.4	0.3	0.2	10.6	25.7	70	36,200	21.3	139	14.6	23.0	38	<0.1	0.7	5.6	0.7	24	105
BH66546	0.2	15,500	1.3	116.0	0.4	0.2	13.4	28.8	99	33,900	17.1	110	25.0	30.2	29	<0.1	0.3	3.2	0.8	23	154
BH66547	0.1	16,300	3.6	112.0	0.4	0.1	11.4	26.6	32	32,400	14.9	142	1.8	23.6	26	<0.1	0.7	8.0	0.8	24	138
BH66548	0.1	16,300	2.7	118.0	0.4	0.3	11.4	25.1	30	31,900	14.9	124	1.8	23.2	31	0.1	0.4	11.3	0.9	23	159
BH66549	0.2	18,700	3.6	72.3	0.1	0.1	8.9	24.8	37	21,000	9.6	133	1.0	15.8	50	0.1	0.8	29.4	0.9	21	84
BH66550	0.2	16,900	31.3	97.6	0.3	0.6	13.2	30.0	44	28,000	9.6	148	1.5	25.3	108	<0.1	0.4	10.1	1.0	28	194
BH66551	0.2	9,990	1.1	21.8	0.2	0.1	3.0	12.2	9	9,140	2.3	124	1.0	5.4	60	<0.1	1.0	5.9	0.4	9	43

Table D2: Geochemical Abundance Indices

ELEMENT	Ag	Al	As	Ba	Bi	Cd	Co	Cr	Cu	Fe	Li	Mn	Mo	Ni	Pb	Sb	Sn	Sr	Tl	V	Zn
Ave. Crustal Abundance	0.07	81,300	1.8	425	0.17	0.2	25	100	55	50,000	20	950	1.5	75	12.5	0.2	2	375	0.45	135	70
BH66502	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
BH66503	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
BH66504	0	0	3	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
BH66505	0	0	2	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
BH66506	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
BH66507	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BH66508	2	0	5	0	0	4	0	0	0	0	0	0	1	0	4	0	0	0	0	0	3
BH66509	5	0	2	0	0	2	0	0	1	0	0	0	0	0	4	1	0	0	0	0	2
BH66510	1	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
BH66511	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BH66512	3	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0
BH66513	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BH66514	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BH66515	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BH66516	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BH66517	4	0	5	0	1	3	0	0	0	0	0	0	0	0	6	0	0	0	1	0	2
BH66518	1	0	3	0	0	2	0	0	0	0	0	0	0	0	3	0	0	0	1	0	2
BH66519	2	0	3	0	0	1	0	0	1	0	0	0	0	0	3	0	0	0	1	0	1
BH66520	0	0	0	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BH66521	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BH66522	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BH66523	2	0	2	0	1	2	0	0	0	0	0	0	0	0	3	0	0	0	0	0	2
BH66524	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BH66525	0	0	2	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0
BH66526	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BH66527	1	0	1	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0
BH66528	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BH66529	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0
BH66530	1	0	1	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	1	0	0

Table D2: Geochemical Abundance Indices

ELEMENT	Ag	Al	As	Ba	Bi	Cd	Co	Cr	Cu	Fe	Li	Mn	Mo	Ni	Pb	Sb	Sn	Sr	Tl	V	Zn
Ave. Crustal Abundance	0.07	81,300	1.8	425	0.17	0.2	25	100	55	50,000	20	950	1.5	75	12.5	0.2	2	375	0.45	135	70
BH66531	2	0	2	0	0	1	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0
BH66532	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BH66533	1	0	4	0	0	0	0	0	0	0	0	0	1	0	3	0	0	0	0	0	0
BH66534	3	0	2	0	1	2	0	0	0	0	0	0	0	0	5	0	0	0	0	0	1
BH66535	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0
BH66536	3	0	4	0	1	3	0	0	0	0	0	0	0	0	5	0	0	0	1	0	2
BH66537	4	0	4	0	4	2	0	0	0	0	0	0	0	0	7	1	0	0	0	0	1
BH66538	1	0	3	0	0	4	0	0	0	0	0	0	0	0	3	0	0	0	0	0	3
BH66539	1	0	1	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0
BH66540	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
BH66541	3	0	2	0	2	2	0	0	0	0	0	0	0	0	5	0	0	0	0	0	2
BH66542	0	0	2	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0
BH66543	7	0	5	0	6	6	0	0	0	0	0	0	0	0	8	3	0	0	1	0	6
BH66544	1	0	0	0	1	0	0	0	0	0	0	0	3	0	1	0	0	0	0	0	0
BH66545	0	0	0	0	0	0	0	0	0	0	0	0	2	0	1	0	0	0	0	0	0
BH66546	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0
BH66547	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BH66548	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BH66549	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
BH66550	0	0	3	0	0	1	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0
BH66551	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0

Average-crustal-abundances of the elements for the GAI calculations are based on the values listed in Field Geologists' Manual (AusIMM, 2011) supplemented with data from Bowen (1979) for mean crustal abundance for the elements Al, Ca, Fe, K, Mg, Na, P, S, and Ti.

For GAI calculation purposes, less than values were treated as equal to half the limit of reporting value.

*Where the limit of reporting exceeds the average crustal abundance value, false enrichments may be presented. Therefore, where GAI's of 3 or greater are due to this false enrichment, cells have been left blank (e.g. Bi, Sb, Te).

GAI Score	**Explanation**	
0	<3 times average crustal abundance	
1	3 to 6 times average crustal abundance	
2	6 to 12 times average crustal abundance	
3	12 to 24 times average crustal abundance	
4	24 to 48 times average crustal abundance	
5	48 to 96 times average crustal abundance	🟪
6	>96 times average crustal abundance	🟥

ATTACHMENT E – LEACH TESTING

Table E1: 1:2 DI Water Leachate

ELEMENT	pH	EC	ALK-OH	ALK-CO3	ALK-HCO	ALK-TOT	SO4	Cl	Ag	Al	As	B	Ba	Be	Bi	Cd	Ce	Co	Cr	Cs	Cu	Dy	Er	Eu	Fe	Gd	Ga	Hf	Hg
UNITS	no units	µS/cm	mg/L as CaCO3				mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
LOR	0.1	1	1	1	1	1	1	1	0.001	0.01	0.001	0.05	0.001	0.001	0.001	0.0001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.05	0.001	0.001	0.01	0.0001
BH66502	7.9	266	<1	<1	38	38	37	23	<0.001	**1.92**	0.005	<0.05	0.010	<0.001	<0.001	<0.0001	<0.001	<0.001	**0.003**	<0.001	**0.014**	<0.001	<0.001	<0.001	0.30	<0.001	0.004	<0.01	<0.0001
BH66503	8.0	230	<1	<1	55	55	30	18	<0.001	**3.59**	0.002	<0.05	0.020	<0.001	<0.001	<0.0001	0.002	<0.001	**0.005**	<0.001	**0.003**	<0.001	<0.001	<0.001	**1.57**	<0.001	0.005	<0.01	<0.0001
BH66504	**8.3**	269	<1	<1	48	48	35	22	<0.001	**2.17**	0.009	<0.05	0.009	<0.001	<0.001	<0.0001	<0.001	<0.001	**0.002**	<0.001	**0.013**	<0.001	<0.001	<0.001	**0.35**	<0.001	0.004	<0.01	<0.0001
BH66505	7.7	**1,180**	<1	<1	31	31	201	108	<0.001	**0.34**	<0.001	<0.05	0.015	<0.001	<0.001	0.0002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.05	<0.001	0.001	<0.01	<0.0001
BH66506	**8.4**	**915**	<1	2	27	29	120	90	<0.001	**0.70**	0.002	<0.05	0.012	<0.001	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.05	<0.001	0.004	<0.01	<0.0001
BH66507	**8.2**	261	<1	<1	35	35	21	21	<0.001	**1.99**	<0.001	<0.05	0.010	<0.001	<0.001	<0.0001	<0.001	<0.001	0.001	<0.001	**0.006**	<0.001	<0.001	<0.001	**0.35**	<0.001	0.004	<0.01	<0.0001
BH66508	**9.5**	571	<1	21	14	36	102	51	<0.001	**1.53**	**0.024**	<0.05	0.005	<0.001	<0.001	<0.0001	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.05	<0.001	0.005	<0.01	<0.0001
BH66509	8.0	**1,900**	<1	<1	33	33	432	222	<0.001	**0.26**	0.002	0.06	0.023	<0.001	<0.001	0.0002	<0.001	<0.001	**0.003**	<0.001	**0.008**	<0.001	<0.001	<0.001	<0.05	<0.001	0.002	<0.01	<0.0001
BH66510	**8.0**	418	<1	<1	41	41	75	32	<0.001	**1.01**	0.006	<0.05	0.005	<0.001	<0.001	<0.0001	<0.001	<0.001	**0.002**	<0.001	**0.012**	<0.001	<0.001	<0.001	0.05	<0.001	0.004	<0.01	<0.0001
BH66511	7.9	351	<1	<1	33	33	50	32	<0.001	**1.42**	0.001	<0.05	0.008	<0.001	<0.001	<0.0001	<0.001	<0.001	**0.005**	<0.001	**0.004**	<0.001	<0.001	<0.001	0.20	<0.001	0.004	<0.01	<0.0001
BH66512	8.0	392	<1	<1	42	42	54	37	<0.001	**1.14**	0.004	<0.05	0.005	<0.001	<0.001	<0.0001	<0.001	<0.001	**0.002**	<0.001	**0.032**	<0.001	<0.001	<0.001	0.11	<0.001	0.004	<0.01	<0.0001
BH66513	8.0	257	<1	<1	41	41	29	17	<0.001	**2.19**	0.001	<0.05	0.017	<0.001	<0.001	<0.0001	<0.001	<0.001	**0.004**	<0.001	**0.006**	<0.001	<0.001	<0.001	**0.51**	<0.001	0.004	<0.01	<0.0001
BH66514	**8.2**	234	<1	<1	42	42	26	14	<0.001	**2.89**	0.001	<0.05	0.017	<0.001	<0.001	<0.0001	0.001	<0.001	**0.003**	<0.001	**0.002**	<0.001	<0.001	<0.001	**0.82**	<0.001	0.004	<0.01	<0.0001
BH66515	**8.3**	261	<1	<1	50	50	22	14	<0.001	**1.45**	0.001	<0.05	0.007	<0.001	<0.001	<0.0001	<0.001	<0.001	**0.002**	<0.001	**0.004**	<0.001	<0.001	<0.001	0.18	<0.001	0.004	<0.01	<0.0001
BH66516	**8.4**	426	<1	3	40	44	35	24	<0.001	**0.96**	0.002	<0.05	0.006	<0.001	<0.001	<0.0001	<0.001	<0.001	**0.002**	<0.001	**0.009**	<0.001	<0.001	<0.001	0.09	<0.001	0.003	<0.01	<0.0001
BH66517	7.8	494	<1	<1	37	37	42	33	<0.001	**0.57**	0.002	<0.05	0.004	<0.001	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.05	<0.001	0.002	<0.01	<0.0001
BH66518	**8.1**	261	<1	<1	37	37	19	15	<0.001	**1.74**	0.004	<0.05	0.007	<0.001	<0.001	<0.0001	0.001	<0.001	**0.002**	<0.001	**0.003**	<0.001	<0.001	<0.001	0.23	<0.001	0.005	<0.01	<0.0001
BH66519	7.5	328	<1	<1	22	22	32	28	<0.001	**0.76**	0.002	<0.05	0.004	<0.001	<0.001	<0.0001	0.001	<0.001	0.001	<0.001	0.001	<0.001	<0.001	<0.001	0.17	<0.001	0.002	<0.01	<0.0001
BH66520	**8.3**	245	<1	<1	48	48	25	15	<0.001	**1.98**	0.002	<0.05	0.007	<0.001	<0.001	<0.0001	<0.001	<0.001	**0.002**	<0.001	**0.009**	<0.001	<0.001	<0.001	0.24	<0.001	0.005	<0.01	<0.0001
BH66521	7.9	355	<1	<1	37	37	37	38	<0.001	**1.18**	0.002	<0.05	0.005	<0.001	<0.001	<0.0001	<0.001	<0.001	**0.003**	<0.001	**0.002**	<0.001	<0.001	<0.001	0.07	<0.001	0.004	<0.01	<0.0001
BH66522	7.6	557	<1	<1	28	28	88	65	<0.001	**0.77**	<0.001	<0.05	0.007	<0.001	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.05	<0.001	0.003	<0.01	<0.0001
BH66523	7.7	**1,030**	<1	<1	44	44	209	123	<0.001	**0.24**	0.002	<0.05	0.018	<0.001	<0.001	**0.0003**	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.05	<0.001	0.002	<0.01	<0.0001
BH66524	7.6	625	<1	<1	30	30	81	56	<0.001	**0.57**	<0.001	<0.05	0.010	<0.001	<0.001	<0.0001	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.05	<0.001	0.003	<0.01	<0.0001
BH66525	7.7	664	<1	<1	38	38	106	75	<0.001	**0.36**	0.001	<0.05	0.006	<0.001	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.05	<0.001	0.002	<0.01	<0.0001
BH66526	7.6	576	<1	<1	32	32	92	65	<0.001	**0.54**	<0.001	<0.05	0.004	<0.001	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.05	<0.001	0.003	<0.01	<0.0001
BH66527	6.8	557	<1	<1	50	50	72	68	<0.001	**0.76**	0.001	<0.05	0.019	<0.001	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.05	<0.001	0.003	<0.01	<0.0001
BH66528	7.8	388	<1	<1	35	35	61	35	<0.001	**0.98**	<0.001	<0.05	0.004	<0.001	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.05	<0.001	0.004	<0.01	<0.0001
BH66529	**8.6**	217	<1	11	68	79	12	8	<0.001	**3.61**	0.002	<0.05	0.016	<0.001	<0.001	<0.0001	0.002	<0.001	**0.004**	<0.001	**0.007**	<0.001	<0.001	<0.001	**1.20**	<0.001	0.005	<0.01	<0.0001
BH66530	7.9	263	<1	<1	58	58	29	13	<0.001	**1.29**	0.006	<0.05	0.004	<0.001	<0.001	<0.0001	0.001	<0.001	**0.002**	<0.001	**0.004**	<0.001	<0.001	<0.001	0.23	<0.001	0.004	<0.01	<0.0001
BH66531	**9.9**	625	16	68	<1	84	104	37	<0.001	**2.51**	**0.017**	0.06	0.007	<0.001	<0.001	<0.0001	<0.001	<0.001	**0.002**	<0.001	<0.001	<0.001	<0.001	<0.001	<0.05	<0.001	0.008	<0.01	<0.0001
BH66532	**8.2**	240	<1	<1	45	45	28	16	<0.001	**2.30**	0.003	<0.05	0.016	<0.001	<0.001	<0.0001	<0.001	<0.001	0.001	<0.001	**0.002**	<0.001	<0.001	<0.001	**0.36**	<0.001	0.004	<0.01	<0.0001
BH66533	**8.5**	266	<1	7	47	54	26	20	<0.001	**2.17**	0.007	<0.05	0.012	<0.001	<0.001	<0.0001	0.002	<0.001	**0.002**	<0.001	<0.001	<0.001	<0.001	<0.001	**0.50**	<0.001	0.003	<0.01	<0.0001
BH66534	**8.5**	275	<1	7	48	55	27	24	<0.001	**1.92**	0.003	<0.05	0.009	<0.001	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.29	<0.001	0.003	<0.01	<0.0001
BH66535	**8.5**	260	<1	6	50	56	21	25	<0.001	**2.40**	0.005	<0.05	0.008	<0.001	<0.001	<0.0001	0.001	<0.001	**0.002**	<0.001	<0.001	<0.001	<0.001	<0.001	**0.46**	<0.001	0.003	<0.01	<0.0001
BH66536	**8.5**	266	<1	9	48	57	30	26	<0.001	**2.74**	0.009	<0.05	0.013	<0.001	<0.001	<0.0001	0.001	<0.001	**0.002**	<0.001	<0.001	<0.001	<0.001	<0.001	**0.54**	<0.001	0.004	<0.01	<0.0001
BH66537	7.9	491	<1	<1	38	38	93	41	<0.001	**0.59**	0.003	0.05	0.003	<0.001	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.05	<0.001	0.003	<0.01	<0.0001
BH66538	**8.8**	263	<1	14	27	41	37	23	<0.001	**1.56**	0.006	<0.05	0.005	<0.001	<0.001	<0.0001	<0.001	<0.001	0.001	<0.001	**0.002**	<0.001	<0.001	<0.001	0.14	<0.001	0.003	<0.01	<0.0001
BH66539	**8.7**	323	<1	12	31	43	44	28	<0.001	**1.31**	0.004	<0.05	0.005	<0.001	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.09	<0.001	0.003	<0.01	<0.0001
BH66540	**8.5**	316	<1	8	35	43	40	25	<0.001	**1.26**	0.005	<0.05	0.004	<0.001	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	0.06	<0.001	0.003	<0.01	<0.0001
BH66541	**10.4**	354	15	62	<1	77	49	26	<0.001	**3.63**	0.009	<0.05	0.003	<0.001	<0.001	<0.0001	<0.001	<0.001	**0.004**	<0.001	<0.001	<0.001	<0.001	<0.001	<0.05	<0.001	0.006	<0.01	<0.0001
BH66542	**8.6**	292	<1	<1	32	32	50	26	<0.001	**0.92**	0.008	0.05	0.004	<0.001	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.001	**0.015**	<0.001	<0.001	<0.001	0.09	<0.001	0.003	<0.01	<0.0001
BH66543	**8.7**	313	<1	10	23	34	46	33	<0.001	**0.60**	0.009	0.05	0.002	<0.001	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.05	<0.001	0.002	<0.01	<0.0001
BH66544	**8.6**	233	<1	10	48	58	14	13	<0.001	**2.44**	0.002	<0.05	0.016	<0.001	<0.001	<0.0001	<0.001	<0.001	**0.002**	<0.001	**0.002**	<0.001	<0.001	<0.001	**0.77**	<0.001	0.003	<0.01	<0.0001
BH66545	**8.7**	295	<1	15	58	73	16	13	<0.001	**2.69**	0.003	<0.05	0.013	<0.001	<0.001	<0.0001	<0.001	<0.001	**0.002**	<0.001	<0.001	<0.001	<0.001	<0.001	**0.77**	<0.001	0.004	<0.01	<0.0001
BH66546	**8.5**	394	<1	9	51	60	15	14	<0.001	**1.11**	<0.001	<0.05	0.008	<0.001	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.001	**0.004**	<0.001	<0.001	<0.001	0.12	<0.001	0.003	<0.01	<0.0001
BH66547	**8.3**	548	<1	<1	51	51	56	63	<0.001	**1.07**	0.003	<0.05	0.005	<0.001	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.10	<0.001	0.004	<0.01	<0.0001
BH66548	**10.6**	**915**	39	62	<1	100	117	76	<0.001	**4.79**	0.002	<0.05	0.010	<0.001	<0.001	<0.0001	<0.001	<0.001	**0.005**	<0.001	0.001	<0.001	<0.001	<0.001	<0.05	<0.001	0.009	<0.01	<0.0001
BH66549	**8.5**	260	<1	9	63	72	26	26	<0.001	**2.00**	0.003	<0.05	0.009	<0.001	<0.001	<0.0001	0.003	<0.001	**0.002**	<0.001	<0.001	<0.001	<0.001	<0.001	**0.57**	<0.001	0.003	<0.01	<0.0001
BH66550	**8.3**	307	<1	2	41	44	38	31	<0.001	**1.46**	0.010	<0.05	0.006	<0.001	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.18	<0.001	0.004	<0.01	<0.0001
BH66551	**8.3**	260	<1	2	40	43	15	34	<0.001	**1.86**	0.002	<0.05	0.005	<0.001	<0.001	<0.0001	<0.001	<0.001	0.001	<0.001	0.001	<0.001	<0.001	<0.001	**0.36**	<0.001	0.002	<0.01	<0.0001
A/A 95%	6.0-8.0	90-900	NA	NA	NA	NA	NA	NA	0.00005	0.055	0.013	0.37	NA	0.00013	0.0007	0.0002	NA	0.0028	0.0010	NA	0.0014	NA	NA	NA	0.3	NA	NA	NA	0.0006

🟨 indicates where LOR is greater than the ANZECC/ARMCANZ (2000) trigger value

Bold, red values indicate an exceedance of the ANZECC/ARMCANZ (2000) trigger value

Table E1: 1:2 DI Water Leachate

ELEMENT	Ho	In	La	Li	Lu	Mn	Mo	Nb	Ni	Pb	Pr	Rb	Sb	Se	Sm	Sn	Sr	Tb	Te	Ti	Tl	Th	Tm	U	V	Y	Yb	Zn	Zr
UNITS	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
LOR	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.01	0.001	0.001	0.001	0.001	0.005	0.01	0.001	0.001	0.001	0.001	0.01	0.001	0.001	0.005	0.005
BH66502	<0.001	<0.001	<0.001	0.010	<0.001	0.014	0.005	<0.001	<0.001	0.002	<0.001	0.034	0.001	<0.01	<0.001	<0.001	0.015	<0.001	<0.005	0.03	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	**0.011**	<0.005
BH66503	<0.001	<0.001	<0.001	0.016	<0.001	0.029	0.003	<0.001	0.002	**0.005**	<0.001	0.034	<0.001	<0.01	<0.001	<0.001	0.009	<0.001	<0.005	0.14	<0.001	<0.001	<0.001	<0.001	**0.010**	<0.001	<0.001	**0.028**	<0.005
BH66504	<0.001	<0.001	<0.001	0.012	<0.001	0.010	0.008	<0.001	<0.001	0.002	<0.001	0.025	0.001	<0.01	<0.001	<0.001	0.011	<0.001	<0.005	0.03	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	0.008	<0.005
BH66505	<0.001	<0.001	<0.001	0.033	<0.001	0.321	0.014	<0.001	<0.001	<0.001	<0.001	0.114	<0.001	<0.01	<0.001	<0.001	0.218	<0.001	<0.005	<0.01	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.005	<0.005
BH66506	<0.001	<0.001	<0.001	0.028	<0.001	0.010	0.008	<0.001	<0.001	<0.001	<0.001	0.065	<0.001	<0.01	<0.001	<0.001	0.192	<0.001	<0.005	<0.01	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.005	<0.005
BH66507	<0.001	<0.001	<0.001	0.020	<0.001	0.009	0.005	<0.001	<0.001	0.002	<0.001	0.029	<0.001	<0.01	<0.001	<0.001	0.025	<0.001	<0.005	0.03	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	**0.009**	<0.005
BH66508	<0.001	<0.001	<0.001	0.012	<0.001	<0.001	0.004	<0.001	<0.001	<0.001	<0.001	0.028	0.004	<0.01	<0.001	<0.001	0.108	<0.001	<0.005	<0.01	<0.001	<0.001	<0.001	<0.001	**0.010**	<0.001	<0.001	<0.005	<0.005
BH66509	<0.001	<0.001	<0.001	0.016	<0.001	0.077	0.010	<0.001	<0.001	0.001	<0.001	0.100	**0.022**	<0.01	<0.001	<0.001	0.593	<0.001	<0.005	<0.01	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.005	<0.005
BH66510	<0.001	<0.001	<0.001	0.016	<0.001	0.014	0.006	<0.001	<0.001	0.001	<0.001	0.039	0.002	<0.01	<0.001	<0.001	0.052	<0.001	<0.005	<0.01	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.005	<0.005
BH66511	<0.001	<0.001	<0.001	0.026	<0.001	0.015	0.011	<0.001	<0.001	0.001	<0.001	0.038	<0.001	<0.01	<0.001	<0.001	0.025	<0.001	<0.005	0.01	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	0.007	<0.005
BH66512	<0.001	<0.001	<0.001	0.012	<0.001	0.019	0.006	<0.001	<0.001	**0.005**	<0.001	0.038	**0.018**	<0.01	<0.001	<0.001	0.029	<0.001	<0.005	0.01	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	**0.020**	<0.005
BH66513	<0.001	<0.001	<0.001	0.017	<0.001	0.017	0.005	<0.001	<0.001	0.002	<0.001	0.031	0.002	<0.01	<0.001	<0.001	0.019	<0.001	<0.005	0.04	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	**0.010**	<0.005
BH66514	<0.001	<0.001	<0.001	0.012	<0.001	0.013	0.005	<0.001	<0.001	0.003	<0.001	0.036	<0.001	<0.01	<0.001	<0.001	0.013	<0.001	<0.005	0.07	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	0.008	<0.005
BH66515	<0.001	<0.001	<0.001	0.014	<0.001	0.007	0.008	<0.001	<0.001	<0.001	<0.001	0.032	0.001	<0.01	<0.001	<0.001	0.020	<0.001	<0.005	0.02	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.005	<0.005
BH66516	<0.001	<0.001	<0.001	0.016	<0.001	0.007	0.002	<0.001	<0.001	0.001	<0.001	0.069	0.009	<0.01	<0.001	<0.001	0.046	<0.001	<0.005	<0.01	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	0.008	<0.005
BH66517	<0.001	<0.001	<0.001	0.012	<0.001	0.042	0.005	<0.001	<0.001	0.001	<0.001	0.098	**0.017**	<0.01	<0.001	<0.001	0.067	<0.001	<0.005	<0.01	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.005	<0.005
BH66518	<0.001	<0.001	<0.001	0.010	<0.001	0.009	0.004	<0.001	<0.001	**0.005**	<0.001	0.046	0.006	<0.01	<0.001	<0.001	0.020	<0.001	<0.005	0.02	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	0.01	<0.005
BH66519	<0.001	<0.001	<0.001	0.006	<0.001	0.077	0.005	<0.001	<0.001	**0.004**	<0.001	0.056	0.007	<0.01	<0.001	<0.001	0.020	<0.001	<0.005	0.01	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.005	<0.005
BH66520	<0.001	<0.001	<0.001	0.008	<0.001	0.004	0.007	<0.001	<0.001	0.001	<0.001	0.016	0.001	<0.01	<0.001	<0.001	0.022	<0.001	<0.005	0.02	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	0.006	<0.005
BH66521	<0.001	<0.001	<0.001	0.013	<0.001	0.010	0.006	<0.001	<0.001	<0.001	<0.001	0.019	<0.001	<0.01	<0.001	<0.001	0.036	<0.001	<0.005	<0.01	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.005	<0.005
BH66522	<0.001	<0.001	<0.001	0.030	<0.001	0.028	0.010	<0.001	<0.001	<0.001	<0.001	0.024	<0.001	<0.01	<0.001	<0.001	0.065	<0.001	<0.005	<0.01	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.005	<0.005
BH66523	<0.001	<0.001	<0.001	0.027	<0.001	0.415	0.016	<0.001	<0.001	<0.001	<0.001	0.053	0.003	<0.01	<0.001	<0.001	0.182	<0.001	<0.005	<0.01	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.005	<0.005
BH66524	<0.001	<0.001	<0.001	0.025	<0.001	0.054	0.011	<0.001	<0.001	<0.001	<0.001	0.055	<0.001	<0.01	<0.001	<0.001	0.099	<0.001	<0.005	<0.01	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.005	<0.005
BH66525	<0.001	<0.001	<0.001	0.023	<0.001	0.113	0.017	<0.001	<0.001	<0.001	<0.001	0.040	0.002	<0.01	<0.001	<0.001	0.096	<0.001	<0.005	<0.01	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.005	<0.005
BH66526	<0.001	<0.001	<0.001	0.020	<0.001	0.049	0.013	<0.001	<0.001	<0.001	<0.001	0.036	<0.001	<0.01	<0.001	<0.001	0.082	<0.001	<0.005	<0.01	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.005	<0.005
BH66527	<0.001	<0.001	<0.001	0.018	<0.001	0.052	0.010	<0.001	<0.001	<0.001	<0.001	0.033	<0.001	<0.01	<0.001	<0.001	0.055	<0.001	<0.005	<0.01	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.005	<0.005
BH66528	<0.001	<0.001	<0.001	0.019	<0.001	0.008	0.012	<0.001	<0.001	<0.001	<0.001	0.024	<0.001	<0.01	<0.001	<0.001	0.051	<0.001	<0.005	<0.01	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.005	<0.005
BH66529	<0.001	<0.001	<0.001	0.005	<0.001	0.007	0.008	<0.001	0.002	0.002	<0.001	0.016	0.005	<0.01	<0.001	<0.001	0.009	<0.001	<0.005	0.07	<0.001	<0.001	<0.001	**0.001**	**0.010**	<0.001	<0.001	0.006	<0.005
BH66530	<0.001	<0.001	<0.001	0.054	<0.001	0.008	0.010	<0.001	<0.001	0.003	<0.001	0.035	**0.013**	<0.01	<0.001	<0.001	0.018	<0.001	<0.005	0.02	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.005	<0.005
BH66531	<0.001	<0.001	<0.001	0.019	<0.001	<0.001	0.007	<0.001	<0.001	0.002	<0.001	0.042	0.006	<0.01	<0.001	<0.001	0.163	<0.001	<0.005	<0.01	<0.001	<0.001	<0.001	<0.001	**0.020**	<0.001	<0.001	<0.005	<0.005
BH66532	<0.001	<0.001	<0.001	0.006	<0.001	0.005	0.007	<0.001	<0.001	<0.001	<0.001	0.021	<0.001	<0.01	<0.001	<0.001	0.027	<0.001	<0.005	0.03	<0.001	<0.001	<0.001	<0.001	**0.010**	<0.001	<0.001	0.006	<0.005
BH66533	<0.001	<0.001	<0.001	0.009	<0.001	0.014	0.008	<0.001	<0.001	**0.008**	<0.001	0.036	0.004	<0.01	<0.001	<0.001	0.019	<0.001	<0.005	0.04	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	0.006	<0.005
BH66534	<0.001	<0.001	<0.001	0.006	<0.001	0.008	0.009	<0.001	<0.001	**0.009**	<0.001	0.021	0.006	<0.01	<0.001	<0.001	0.027	<0.001	<0.005	0.02	<0.001	<0.001	<0.001	**0.001**	<0.01	<0.001	<0.001	0.01	<0.005
BH66535	<0.001	<0.001	<0.001	0.006	<0.001	0.016	0.009	<0.001	<0.001	**0.009**	<0.001	0.028	0.002	<0.01	<0.001	<0.001	0.014	<0.001	<0.005	0.05	<0.001	<0.001	<0.001	**0.003**	<0.01	<0.001	<0.001	0.008	<0.005
BH66536	<0.001	<0.001	<0.001	0.004	<0.001	0.008	0.009	<0.001	<0.001	**0.020**	<0.001	0.016	**0.012**	<0.01	<0.001	<0.001	0.018	<0.001	<0.005	0.05	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	**0.01**	<0.005
BH66537	<0.001	<0.001	<0.001	0.008	<0.001	0.009	0.015	<0.001	<0.001	<0.001	<0.001	0.034	**0.012**	<0.01	<0.001	<0.001	0.098	<0.001	<0.005	<0.01	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.005	<0.005
BH66538	<0.001	<0.001	<0.001	0.007	<0.001	0.004	0.006	<0.001	<0.001	0.002	<0.001	0.014	<0.001	<0.01	<0.001	<0.001	0.031	<0.001	<0.005	0.02	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.005	<0.005
BH66539	<0.001	<0.001	<0.001	0.006	<0.001	0.003	0.009	<0.001	<0.001	0.002	<0.001	0.022	0.001	<0.01	<0.001	<0.001	0.038	<0.001	<0.005	<0.01	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.005	<0.005
BH66540	<0.001	<0.001	<0.001	0.008	<0.001	0.005	0.009	<0.001	<0.001	<0.001	<0.001	0.022	<0.001	<0.01	<0.001	<0.001	0.048	<0.001	<0.005	<0.01	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.005	<0.005
BH66541	<0.001	<0.001	<0.001	0.002	<0.001	<0.001	0.002	<0.001	<0.001	0.003	<0.001	0.015	0.004	<0.01	<0.001	<0.001	0.128	<0.001	<0.005	<0.01	<0.001	<0.001	<0.001	<0.001	**0.020**	<0.001	<0.001	<0.005	<0.005
BH66542	<0.001	<0.001	<0.001	0.006	<0.001	0.004	0.006	<0.001	<0.001	0.001	<0.001	0.017	<0.001	<0.01	<0.001	0.001	0.044	<0.001	<0.005	<0.01	<0.001	<0.001	<0.001	**0.001**	<0.01	<0.001	<0.001	0.008	<0.005
BH66543	<0.001	<0.001	<0.001	0.005	<0.001	<0.001	0.003	<0.001	<0.001	**0.008**	<0.001	0.017	**0.045**	<0.01	<0.001	<0.001	0.058	<0.001	<0.005	<0.01	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.005	<0.005
BH66544	<0.001	<0.001	<0.001	0.006	<0.001	0.008	0.012	<0.001	0.001	0.002	<0.001	0.043	0.003	<0.01	<0.001	<0.001	0.016	<0.001	<0.005	0.04	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	0.005	<0.005
BH66545	<0.001	<0.001	<0.001	0.005	<0.001	0.006	0.009	<0.001	0.001	0.001	<0.001	0.041	0.004	<0.01	<0.001	<0.001	0.014	<0.001	<0.005	0.04	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.005	<0.005
BH66546	<0.001	<0.001	<0.001	0.008	<0.001	0.003	0.011	<0.001	<0.001	<0.001	<0.001	0.084	0.004	<0.01	<0.001	<0.001	0.037	<0.001	<0.005	<0.01	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.005	<0.005
BH66547	<0.001	<0.001	<0.001	0.008	<0.001	0.007	0.010	<0.001	<0.001	<0.001	<0.001	0.025	**0.013**	<0.01	<0.001	<0.001	0.062	<0.001	<0.005	<0.01	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.005	<0.005
BH66548	<0.001	<0.001	<0.001	0.002	<0.001	<0.001	0.006	<0.001	<0.001	0.002	<0.001	0.026	0.002	<0.01	<0.001	<0.001	0.422	<0.001	<0.005	<0.01	<0.001	<0.001	<0.001	<0.001	**0.020**	<0.001	<0.001	<0.005	<0.005
BH66549	<0.001	<0.001	**0.001**	0.008	<0.001	0.012	0.008	0.001	<0.001	**0.004**	<0.001	0.018	0.007	<0.01	<0.001	<0.001	0.012	<0.001	<0.005	0.04	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	0.008	<0.005
BH66550	<0.001	<0.001	<0.001	0.009	<0.001	0.007	0.011	<0.001	<0.001	0.002	<0.001	0.022	0.001	<0.01	<0.001	<0.001	0.030	<0.001	<0.005	0.02	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	0.005	<0.005
BH66551	<0.001	<0.001	<0.001	0.005	<0.001	0.025	0.007	<0.001	<0.001	**0.015**	<0.001	0.025	<0.001	<0.01	<0.001	<0.001	0.016	<0.001	<0.005	0.02	<0.001	<0.001	<0.001	**0.005**	<0.01	<0.001	<0.001	**0.013**	<0.005
A/A 95%	NA	NA	0.00004	NA	NA	1.900	0.034	NA	0.011	0.0034	NA	NA	0.009	0.011	NA	0.003	NA	NA	NA	NA	0.00003	NA	NA	0.0005	0.006	NA	NA	0.008	NA

Table E2: NAG Leachate

ELEMENT	pH	EC	ALK-OH	ALK-CO3	ALK-HCO	ALK-TOT	SO4	Cl	Ag	Al	As	B	Ba	Be	Bi	Cd	Ce	Co	Cr	Cs	Cu	Dy	Er	Eu	Fe	Gd	Ga	Hf	Hg	Ho
UNITS	no units	µS/cm	mg/L as CaCO3				mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
LOR	0.1	1	1	1	1	1	1	1	0.001	0.01	0.001	0.05	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.05	0.001	0.001	0.01	0.0001	0.001
BH66502	**5.1**	185	<1	<1	3	3	34	<1	<0.001	**0.06**	0.001	**0.64**	0.004	<0.001	<0.001	<0.0001	<0.001	<0.001	**0.014**	<0.001	<0.001	<0.001	<0.001	<0.001	<0.05	<0.001	<0.001	<0.01	<0.0001	<0.001
BH66503	**5.1**	163	<1	<1	3	3	27	<1	<0.001	0.04	<0.001	**0.78**	0.003	<0.001	<0.001	<0.0001	<0.001	<0.001	**0.012**	<0.001	<0.001	<0.001	<0.001	<0.001	<0.05	<0.001	<0.001	<0.01	<0.0001	<0.001
BH66504	7.1	199	<1	<1	21	21	28	<1	<0.001	**0.21**	**0.039**	**0.48**	0.001	<0.001	<0.001	<0.0001	<0.001	<0.001	**0.012**	<0.001	<0.001	<0.001	<0.001	<0.001	<0.05	<0.001	<0.001	<0.01	<0.0005	<0.001
BH66505	6.4	186	<1	<1	7	7	27	2	<0.001	**0.07**	**0.020**	**0.71**	0.002	<0.001	<0.001	<0.0001	<0.001	<0.001	**0.018**	<0.001	<0.001	<0.001	<0.001	<0.001	<0.05	<0.001	<0.001	<0.01	<0.0001	<0.001
BH66506	6.2	183	<1	<1	8	8	25	1	<0.001	**0.17**	0.007	**0.59**	0.002	<0.001	<0.001	<0.0001	<0.001	<0.001	**0.015**	<0.001	<0.001	<0.001	<0.001	<0.001	0.07	<0.001	<0.001	<0.01	<0.0001	<0.001
BH66507	6.5	155	<1	<1	10	10	14	6	<0.001	**0.08**	0.003	**0.42**	0.002	<0.001	<0.001	<0.0001	<0.001	<0.001	**0.011**	<0.001	<0.001	<0.001	<0.001	<0.001	<0.05	<0.001	<0.001	<0.01	<0.0001	<0.001
BH66508	**4.5**	268	<1	<1	<1	<1	71	2	**0.002**	**0.23**	0.011	**0.50**	0.076	<0.001	<0.001	**0.0468**	0.009	**0.028**	**0.004**	<0.001	**0.065**	<0.001	<0.001	<0.001	<0.05	<0.001	<0.001	<0.01	<0.0001	<0.001
BH66509	7.5	246	<1	<1	27	27	36	5	<0.001	**1.54**	0.006	**0.47**	<0.001	<0.001	<0.001	<0.0001	<0.001	<0.001	**0.013**	<0.001	<0.001	<0.001	<0.001	<0.001	<0.05	<0.001	0.002	<0.01	<0.0001	<0.001
BH66510	**5.8**	160	<1	<1	3	3	23	2	<0.001	0.04	0.006	**0.52**	0.002	<0.001	<0.001	<0.0001	<0.001	<0.001	**0.013**	<0.001	<0.001	<0.001	<0.001	<0.001	<0.05	<0.001	<0.001	<0.01	<0.0001	<0.001
BH66511	**4.8**	218	<1	<1	<1	<1	45	<1	<0.001	**0.10**	<0.001	**0.52**	0.016	<0.001	<0.001	**0.0004**	<0.001	<0.001	**0.007**	<0.001	<0.001	<0.001	<0.001	<0.001	<0.05	<0.001	<0.001	<0.01	<0.0001	<0.001
BH66512	**4.7**	210	<1	<1	<1	<1	43	<1	**0.002**	**0.23**	<0.001	**0.51**	0.020	<0.001	<0.001	**0.0006**	<0.001	<0.001	**0.010**	<0.001	<0.001	<0.001	<0.001	<0.001	0.09	<0.001	<0.001	<0.01	<0.0001	<0.001
BH66513	6.5	148	<1	<1	9	9	14	4	<0.001	0.05	<0.001	**0.42**	0.003	<0.001	<0.001	<0.0001	<0.001	<0.001	**0.015**	<0.001	<0.001	<0.001	<0.001	<0.001	<0.05	<0.001	<0.001	<0.01	<0.0001	<0.001
BH66514	**5.5**	146	<1	<1	4	4	23	1	<0.001	0.04	<0.001	**0.48**	0.003	<0.001	<0.001	<0.0001	<0.001	<0.001	**0.010**	<0.001	<0.001	<0.001	<0.001	<0.001	<0.05	<0.001	<0.001	<0.01	<0.0001	<0.001
BH66515	**4.8**	266	<1	<1	<1	<1	76	<1	<0.001	**0.24**	<0.001	0.35	0.042	<0.001	<0.001	**0.0007**	<0.001	**0.003**	**0.003**	<0.001	**0.002**	<0.001	<0.001	<0.001	<0.05	<0.001	<0.001	<0.01	<0.0001	<0.001
BH66516	**3.9**	293	<1	<1	<1	<1	78	<1	<0.001	**2.62**	<0.001	0.35	0.132	**0.001**	<0.001	**0.0013**	0.043	**0.029**	**0.003**	<0.001	**0.034**	<0.001	<0.001	<0.001	0.06	0.002	0.001	<0.01	<0.0001	<0.001
BH66517	**3.7**	404	<1	<1	<1	<1	126	1	<0.001	**1.98**	0.009	0.35	0.071	**0.001**	<0.001	**0.0335**	0.194	**0.081**	0.001	<0.001	**0.142**	0.002	<0.001	<0.001	**23.20**	0.007	0.004	<0.01	<0.0001	<0.001
BH66518	**4.2**	272	<1	<1	<1	<1	71	<1	<0.001	**1.10**	0.003	0.34	0.114	<0.001	<0.001	**0.0124**	0.135	**0.049**	0.001	<0.001	**0.209**	0.001	<0.001	<0.001	**3.26**	0.005	0.003	<0.01	<0.0001	<0.001
BH66519	**4.0**	301	<1	<1	<1	<1	85	1	<0.001	**1.30**	0.006	0.29	0.068	<0.001	<0.001	**0.0051**	0.184	**0.064**	<0.001	<0.001	**0.140**	0.001	<0.001	<0.001	**16.70**	0.006	0.004	<0.01	<0.0001	<0.001
BH66520	**4.3**	259	<1	<1	<1	<1	68	<1	<0.001	**0.55**	<0.001	**0.39**	0.093	<0.001	<0.001	**0.0014**	0.004	**0.010**	**0.002**	<0.001	**0.007**	<0.001	<0.001	<0.001	<0.05	<0.001	<0.001	<0.01	<0.0001	<0.001
BH66521	**5.6**	163	<1	<1	4	4	28	<1	<0.001	0.03	0.001	**0.56**	0.004	<0.001	<0.001	<0.0001	<0.001	<0.001	**0.012**	<0.001	<0.001	<0.001	<0.001	<0.001	<0.05	<0.001	<0.001	<0.01	<0.0001	<0.001
BH66522	**5.1**	202	<1	<1	3	3	43	<1	<0.001	**0.08**	<0.001	**0.45**	0.020	<0.001	<0.001	0.0002	<0.001	<0.001	**0.011**	<0.001	<0.001	<0.001	<0.001	<0.001	<0.05	<0.001	<0.001	<0.01	<0.0001	<0.001
BH66523	**4.0**	275	<1	<1	<1	<1	104	3	**0.001**	**1.30**	<0.001	0.28	0.110	<0.001	<0.001	**0.0199**	0.082	**0.054**	**0.002**	<0.001	**0.117**	0.002	<0.001	<0.001	<0.05	0.004	0.002	<0.01	<0.0001	<0.001
BH66524	**5.5**	171	<1	<1	4	4	31	<1	<0.001	0.03	<0.001	**0.47**	0.007	<0.001	<0.001	<0.0001	<0.001	<0.001	**0.013**	<0.001	<0.001	<0.001	<0.001	<0.001	<0.05	<0.001	<0.001	<0.01	<0.0005	<0.001
BH66525	**5.3**	191	<1	<1	3	3	39	<1	<0.001	0.04	<0.001	**0.41**	0.008	<0.001	<0.001	**0.0006**	<0.001	<0.001	**0.008**	<0.001	<0.001	<0.001	<0.001	<0.001	<0.05	<0.001	<0.001	<0.01	<0.0001	<0.001
BH66526	6.7	154	<1	<1	15	15	13	4	<0.001	0.05	0.007	0.32	0.001	<0.001	<0.001	<0.0001	<0.001	<0.001	**0.013**	<0.001	<0.001	<0.001	<0.001	<0.001	<0.05	<0.001	<0.001	<0.01	<0.0001	<0.001
BH66527	6.5	150	<1	<1	11	11	16	7	<0.001	0.03	0.006	0.30	0.002	<0.001	<0.001	<0.0001	<0.001	<0.001	**0.011**	<0.001	<0.001	<0.001	<0.001	<0.001	<0.05	<0.001	<0.001	<0.01	<0.0001	<0.001
BH66528	**5.3**	210	<1	<1	3	3	47	<1	<0.001	**0.09**	<0.001	0.34	0.026	<0.001	<0.001	**0.0004**	<0.001	<0.001	**0.008**	<0.001	<0.001	<0.001	<0.001	<0.001	<0.05	<0.001	<0.001	<0.01	<0.0001	<0.001
BH66529	**5.4**	194	<1	<1	4	4	42	<1	<0.001	0.03	<0.001	**0.40**	0.008	<0.001	<0.001	0.0001	<0.001	<0.001	**0.010**	<0.001	<0.001	<0.001	<0.001	<0.001	<0.05	<0.001	<0.001	<0.01	<0.0001	<0.001
BH66530	**4.2**	231	<1	<1	<1	<1	55	<1	<0.001	**0.49**	<0.001	**0.38**	0.049	**0.001**	<0.001	**0.0021**	0.061	**0.035**	<0.001	<0.001	**0.137**	<0.001	<0.001	<0.001	**5.73**	0.002	0.001	<0.01	<0.0001	<0.001
BH66531	6.3	216	<1	<1	4	4	46	<1	<0.001	0.05	0.006	0.29	0.003	<0.001	<0.001	<0.0001	<0.001	<0.001	**0.010**	<0.001	<0.001	<0.001	<0.001	<0.001	<0.05	<0.001	<0.001	<0.01	<0.0001	<0.001
BH66532	**4.8**	208	<1	<1	1	1	48	<1	<0.001	**0.16**	<0.001	**0.41**	0.037	<0.001	<0.001	**0.0003**	<0.001	**0.003**	**0.005**	<0.001	0.001	<0.001	<0.001	<0.001	<0.05	<0.001	<0.001	<0.01	<0.0001	<0.001
BH66533	**4.1**	263	<1	<1	<1	<1	71	<1	<0.001	**0.53**	0.001	**0.43**	0.084	<0.001	<0.001	**0.0027**	0.060	**0.036**	<0.001	<0.001	**0.134**	<0.001	<0.001	<0.001	**6.86**	0.002	0.001	<0.01	<0.0001	<0.001
BH66534	**4.7**	202	<1	<1	<1	<1	54	<1	**0.003**	**0.19**	<0.001	0.31	0.058	<0.001	<0.001	**0.0073**	0.009	**0.031**	**0.002**	<0.001	**0.086**	<0.001	<0.001	<0.001	<0.05	<0.001	<0.001	<0.01	<0.0001	<0.001
BH66535	**5.5**	159	<1	<1	4	4	26	2	<0.001	0.03	<0.001	0.36	0.002	<0.001	<0.001	**0.0003**	<0.001	<0.001	**0.011**	<0.001	<0.001	<0.001	<0.001	<0.001	<0.05	<0.001	<0.001	<0.01	<0.0001	<0.001
BH66536	**5.2**	227	<1	<1	3	3	57	2	**0.003**	**0.09**	<0.001	0.36	0.057	<0.001	<0.001	**0.0235**	<0.001	**0.018**	**0.005**	<0.001	**0.018**	<0.001	<0.001	<0.001	<0.05	<0.001	<0.001	<0.01	<0.0001	<0.001
BH66537	**4.9**	268	<1	<1	2	2	81	2	<0.001	**0.14**	0.001	**0.41**	0.083	<0.001	<0.001	**0.0094**	0.006	**0.013**	**0.002**	<0.001	**0.009**	<0.001	<0.001	<0.001	<0.05	<0.001	<0.001	<0.01	<0.0001	<0.001
BH66538	**5.0**	260	<1	<1	2	2	77	1	<0.001	**0.11**	<0.001	**0.49**	0.042	<0.001	<0.001	**0.0478**	<0.001	**0.043**	**0.006**	<0.001	**0.020**	<0.001	<0.001	<0.001	<0.05	<0.001	<0.001	<0.01	<0.0001	<0.001
BH66539	7.3	200	<1	<1	25	25	28	<1	<0.001	**0.34**	0.007	**0.45**	<0.001	<0.001	<0.001	<0.0001	<0.001	<0.001	**0.011**	<0.001	0.001	<0.001	<0.001	<0.001	<0.05	<0.001	0.001	<0.01	<0.0001	<0.001
BH66540	**5.5**	214	<1	<1	4	4	48	<1	<0.001	**0.12**	<0.001	**0.46**	0.025	<0.001	<0.001	**0.0010**	<0.001	0.001	**0.006**	<0.001	**0.004**	<0.001	<0.001	<0.001	<0.05	<0.001	<0.001	<0.01	<0.0001	<0.001
BH66541	**5.8**	234	<1	<1	4	4	58	1	**0.001**	<0.01	<0.001	**0.52**	0.015	<0.001	<0.001	**0.0016**	<0.001	0.001	**0.009**	<0.001	**0.002**	<0.001	<0.001	<0.001	<0.05	<0.001	<0.001	<0.01	<0.0001	<0.001
BH66542	7.0	173	<1	<1	11	11	26	1	<0.001	**0.08**	**0.020**	**0.58**	0.001	<0.001	<0.001	<0.0001	<0.001	<0.001	**0.012**	<0.001	<0.001	<0.001	<0.001	<0.001	<0.05	<0.001	<0.001	<0.01	<0.0001	<0.001
BH66543	**3.8**	709	<1	<1	<1	<1	312	2	<0.001	**2.68**	0.009	**0.60**	<0.001	**0.002**	<0.001	**0.3100**	0.064	**0.092**	0.001	<0.001	**0.115**	0.002	<0.001	<0.001	**33.00**	0.003	0.002	<0.01	<0.0001	<0.001
BH66544	**4.2**	264	<1	<1	<1	<1	72	<1	<0.001	**0.61**	<0.001	**0.51**	0.090	<0.001	<0.001	**0.0008**	0.015	**0.036**	<0.001	<0.001	**0.079**	<0.001	<0.001	<0.001	**4.06**	<0.001	<0.001	<0.01	<0.0001	<0.001
BH66545	**5.2**	210	<1	<1	3	3	46	<1	<0.001	<0.01	<0.001	**0.50**	0.010	<0.001	<0.001	0.0002	<0.001	<0.001	**0.010**	<0.001	<0.001	<0.001	<0.001	<0.001	<0.05	<0.001	<0.001	<0.01	<0.0001	<0.001
BH66546	**3.9**	293	<1	<1	<1	<1	77	<1	<0.001	**0.96**	<0.001	0.35	0.094	**0.002**	<0.001	**0.0022**	0.028	**0.068**	<0.001	<0.001	**0.261**	<0.001	<0.001	<0.001	**3.72**	0.001	<0.001	<0.01	<0.0001	<0.001
BH66547	**5.2**	206	<1	<1	3	3	44	1	<0.001	<0.01	<0.001	**0.45**	0.009	<0.001	<0.001	0.0002	<0.001	<0.001	**0.009**	<0.001	**0.003**	<0.001	<0.001	<0.001	<0.05	<0.001	<0.001	<0.01	<0.0001	<0.001
BH66548	7.3	236	<1	<1	26	26	39	<1	<0.001	**0.32**	0.004	0.36	0.001	<0.001	<0.001	<0.0001	<0.001	<0.001	**0.014**	<0.001	<0.001	<0.001	<0.001	<0.001	<0.05	<0.001	0.002	<0.01	<0.0001	<0.001
BH66549	6.5	157	<1	<1	6	6	22	<1	<0.001	0.01	0.002	**0.53**	0.001	<0.001	<0.001	<0.0001	<0.001	<0.001	**0.012**	<0.001	0.001	<0.001	<0.001	<0.001	<0.05	<0.001	<0.001	<0.01	<0.0001	<0.001
BH66550	**4.2**	269	<1	<1	<1	<1	70	1	<0.001	**1.93**	<0.001	**0.55**	0.090	<0.001	<0.001	**0.0049**	0.024	**0.035**	**0.004**	<0.001	**0.027**	<0.001	<0.001	<0.001	<0.05	0.001	<0.001	<0.01	<0.0001	<0.001
BH66551	6.8	143	<1	<1	23	23	5	6	<0.001	**0.06**	0.001	**0.52**	<0.001	<0.001	<0.001	<0.0001	<0.001	<0.001	**0.008**	<0.001	**0.002**	<0.001	<0.001	<0.001	<0.05	<0.001	<0.001	<0.01	<0.0001	<0.001
A/A 95%	6.0-8.0	90-900	NA	NA	NA	NA	NA	NA	0.00005	0.055	0.013	0.37	NA	0.00013	0.0007	0.0002	NA	0.0028	0.0010	NA	0.0014	NA	NA	NA	0.3	NA	NA	NA	0.0006	NA

🟨 indicates where LOR is greater than the ANZECC/ARMCANZ (2000) trigger value

Bold, red values indicate an exceedance of the ANZECC/ARMCANZ (2000) trigger value

Table E2: NAG Leachate

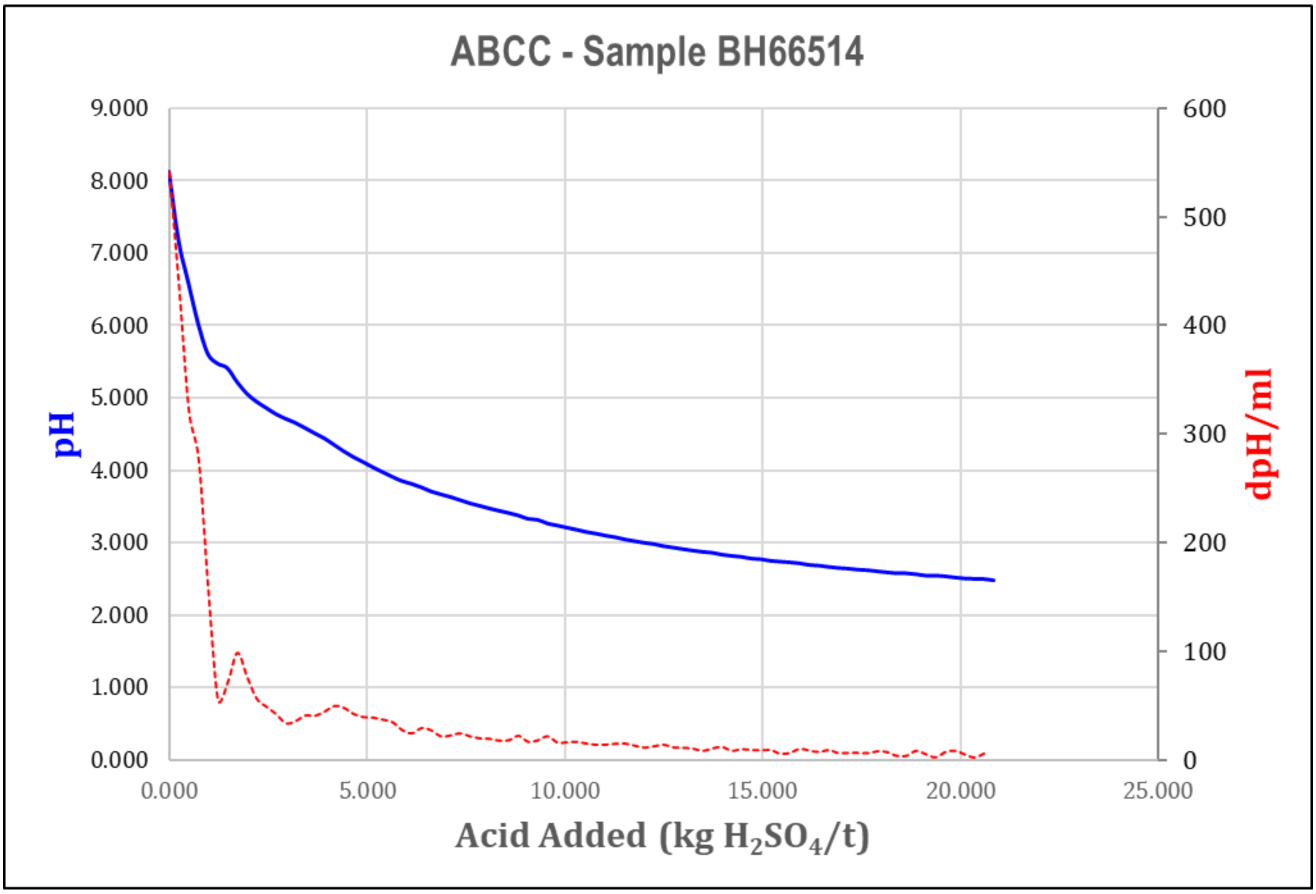
ELEMENT	In	La	Li	Lu	Mn	Mo	Nb	Ni	Pb	Pr	Rb	Sb	Se	Sm	Sn	Sr	Tb	Te	Ti	Tl	Th	Tm	U	V	Y	Yb	Zn	Zr
UNITS	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
LOR	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.010	0.001	0.001	0.001	0.001	0.005	0.01	0.001	0.001	0.001	0.001	0.010	0.001	0.001	0.005	0.005
BH66502	<0.001	<0.001	<0.001	<0.001	0.054	0.005	<0.001	<0.001	<0.001	<0.001	0.064	<0.001	<0.01	<0.001	<0.001	0.011	<0.001	<0.005	<0.01	<0.001	<0.001	<0.001	<0.001	**0.020**	<0.001	<0.001	<0.005	<0.005
BH66503	<0.001	<0.001	<0.001	<0.001	0.033	0.002	<0.001	<0.001	<0.001	<0.001	0.058	<0.001	<0.01	<0.001	<0.001	0.008	<0.001	<0.005	<0.01	<0.001	<0.001	<0.001	<0.001	**0.020**	<0.001	<0.001	<0.005	<0.005
BH66504	<0.001	<0.001	<0.001	<0.001	<0.001	0.028	<0.001	<0.001	<0.001	<0.001	0.043	<0.001	<0.01	<0.001	<0.001	0.010	<0.001	<0.005	<0.01	<0.001	<0.001	<0.001	<0.001	**0.020**	<0.001	<0.001	<0.005	<0.005
BH66505	<0.001	<0.001	<0.001	<0.001	0.014	0.004	<0.001	<0.001	<0.001	<0.001	0.055	<0.001	<0.01	<0.001	<0.001	0.011	<0.001	<0.005	<0.01	<0.001	<0.001	<0.001	<0.001	**0.020**	<0.001	<0.001	<0.005	<0.005
BH66506	<0.001	<0.001	<0.001	<0.001	0.004	0.003	<0.001	<0.001	<0.001	<0.001	0.050	<0.001	<0.01	<0.001	<0.001	0.014	<0.001	<0.005	<0.01	<0.001	<0.001	<0.001	<0.001	**0.020**	<0.001	<0.001	<0.005	<0.005
BH66507	<0.001	<0.001	<0.001	<0.001	0.009	0.014	<0.001	<0.001	<0.001	<0.001	0.047	<0.001	<0.01	<0.001	<0.001	0.009	<0.001	<0.005	<0.01	<0.001	<0.001	<0.001	<0.001	**0.010**	<0.001	<0.001	<0.005	<0.005
BH66508	<0.001	**0.006**	0.012	<0.001	0.399	0.026	0.004	**0.040**	**0.579**	0.001	0.067	<0.001	<0.01	<0.001	<0.001	0.036	<0.001	<0.005	<0.01	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	**5.86**	<0.005
BH66509	<0.001	<0.001	0.002	<0.001	<0.001	**0.058**	<0.001	<0.001	0.002	<0.001	0.042	**0.016**	<0.01	<0.001	<0.001	0.020	<0.001	<0.005	<0.01	<0.001	<0.001	<0.001	<0.001	**0.010**	<0.001	<0.001	<0.005	<0.005
BH66510	<0.001	<0.001	<0.001	<0.001	0.022	0.005	<0.001	<0.001	<0.001	<0.001	0.048	<0.001	<0.01	<0.001	<0.001	0.010	<0.001	<0.005	<0.01	<0.001	<0.001	<0.001	**0.001**	**0.020**	<0.001	<0.001	<0.005	<0.005
BH66511	<0.001	<0.001	0.002	<0.001	0.106	0.004	<0.001	0.001	<0.001	<0.001	0.086	<0.001	<0.01	<0.001	<0.001	0.016	<0.001	<0.005	<0.01	<0.001	<0.001	<0.001	<0.001	**0.020**	<0.001	<0.001	0.005	<0.005
BH66512	<0.001	<0.001	<0.001	<0.001	0.250	0.004	<0.001	<0.001	**0.008**	<0.001	0.070	<0.001	<0.01	<0.001	<0.001	0.022	<0.001	<0.005	<0.01	<0.001	<0.001	<0.001	<0.001	**0.020**	<0.001	<0.001	0.005	<0.005
BH66513	<0.001	<0.001	<0.001	<0.001	0.010	0.008	<0.001	<0.001	<0.001	<0.001	0.042	<0.001	<0.01	<0.001	<0.001	0.007	<0.001	<0.005	<0.01	<0.001	<0.001	<0.001	<0.001	**0.010**	<0.001	<0.001	<0.005	<0.005
BH66514	<0.001	<0.001	<0.001	<0.001	0.018	0.003	<0.001	<0.001	<0.001	<0.001	0.044	<0.001	<0.01	<0.001	<0.001	0.008	<0.001	<0.005	<0.01	<0.001	<0.001	<0.001	<0.001	**0.010**	<0.001	<0.001	<0.005	<0.005
BH66515	<0.001	<0.001	0.003	<0.001	0.433	0.010	<0.001	**0.032**	**0.004**	<0.001	0.062	<0.001	<0.01	<0.001	<0.001	0.032	<0.001	<0.005	<0.01	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	0.007	<0.005
BH66516	<0.001	**0.021**	0.014	<0.001	0.245	0.003	0.016	**0.157**	**0.035**	0.004	0.086	<0.001	<0.01	0.003	<0.001	0.029	<0.001	<0.005	<0.01	<0.001	<0.001	<0.001	**0.003**	**0.010**	0.005	<0.001	**0.112**	<0.005
BH66517	<0.001	**0.090**	0.010	<0.001	0.596	<0.001	0.066	**0.163**	**5.930**	0.018	0.074	<0.001	<0.01	0.010	<0.001	0.026	<0.001	<0.005	<0.01	<0.001	<0.001	<0.001	**0.014**	<0.01	0.006	<0.001	**4.35**	<0.005
BH66518	<0.001	**0.063**	0.008	<0.001	0.422	<0.001	0.049	**0.108**	**0.489**	0.013	0.081	<0.001	<0.01	0.008	<0.001	0.030	<0.001	<0.005	<0.01	<0.001	<0.001	<0.001	**0.005**	<0.01	0.004	<0.001	**2.37**	<0.005
BH66519	<0.001	**0.086**	0.007	<0.001	0.542	<0.001	0.063	**0.123**	**0.614**	0.017	0.061	<0.001	<0.01	0.010	<0.001	0.017	<0.001	<0.005	<0.01	<0.001	<0.001	<0.001	**0.005**	<0.01	0.004	<0.001	**0.960**	<0.005
BH66520	<0.001	**0.005**	0.006	<0.001	0.201	0.007	0.003	**0.077**	**0.017**	<0.001	0.059	<0.001	<0.01	<0.001	<0.001	0.037	<0.001	<0.005	<0.01	<0.001	<0.001	<0.001	<0.001	**0.010**	0.003	<0.001	**0.063**	<0.005
BH66521	<0.001	<0.001	<0.001	<0.001	0.032	0.003	<0.001	<0.001	<0.001	<0.001	0.039	<0.001	<0.01	<0.001	<0.001	0.015	<0.001	<0.005	<0.01	<0.001	<0.001	<0.001	<0.001	**0.010**	<0.001	<0.001	<0.005	<0.005
BH66522	<0.001	<0.001	<0.001	<0.001	0.154	0.007	<0.001	<0.001	<0.001	<0.001	0.055	<0.001	<0.01	<0.001	<0.001	0.022	<0.001	<0.005	<0.01	<0.001	<0.001	<0.001	<0.001	**0.020**	<0.001	<0.001	<0.005	<0.005
BH66523	<0.001	**0.042**	0.011	<0.001	0.537	0.005	0.033	**0.107**	**0.520**	0.009	0.066	<0.001	<0.01	0.006	<0.001	0.031	<0.001	<0.005	<0.01	<0.001	<0.001	<0.001	**0.002**	**0.010**	0.006	<0.001	**4.28**	<0.005
BH66524	<0.001	<0.001	<0.001	<0.001	0.049	0.003	<0.001	<0.001	<0.001	<0.001	0.041	<0.001	<0.01	<0.001	<0.001	0.015	<0.001	<0.005	<0.01	<0.001	<0.001	<0.001	<0.001	**0.020**	<0.001	<0.001	<0.005	<0.005
BH66525	<0.001	<0.001	0.001	<0.001	0.216	0.003	<0.001	<0.001	<0.001	<0.001	0.045	<0.001	<0.01	<0.001	<0.001	0.021	<0.001	<0.005	<0.01	<0.001	<0.001	<0.001	<0.001	**0.010**	<0.001	<0.001	<0.005	<0.005
BH66526	<0.001	<0.001	<0.001	<0.001	0.010	0.002	<0.001	<0.001	<0.001	<0.001	0.047	<0.001	<0.01	<0.001	<0.001	0.009	<0.001	<0.005	<0.01	<0.001	<0.001	<0.001	**0.001**	**0.020**	<0.001	<0.001	<0.005	<0.005
BH66527	<0.001	<0.001	<0.001	<0.001	0.039	0.002	<0.001	<0.001	<0.001	<0.001	0.051	<0.001	<0.01	<0.001	<0.001	0.008	<0.001	<0.005	<0.01	<0.001	<0.001	<0.001	**0.004**	**0.010**	<0.001	<0.001	<0.005	<0.005
BH66528	<0.001	<0.001	0.001	<0.001	0.178	0.028	<0.001	0.007	<0.001	<0.001	0.059	<0.001	<0.01	<0.001	<0.001	0.028	<0.001	<0.005	<0.01	<0.001	<0.001	<0.001	<0.001	**0.010**	<0.001	<0.001	<0.005	<0.005
BH66529	<0.001	<0.001	<0.001	<0.001	0.078	**0.140**	<0.001	<0.001	<0.001	<0.001	0.048	<0.001	<0.01	<0.001	<0.001	0.022	<0.001	<0.005	<0.01	<0.001	<0.001	<0.001	<0.001	**0.010**	<0.001	<0.001	<0.005	<0.005
BH66530	<0.001	**0.029**	0.009	<0.001	0.426	<0.001	0.019	**0.120**	**0.075**	0.005	0.059	<0.001	<0.01	0.003	<0.001	0.021	<0.001	<0.005	<0.01	<0.001	<0.001	<0.001	**0.002**	<0.01	0.001	<0.001	**0.308**	<0.005
BH66531	<0.001	<0.001	0.001	<0.001	0.004	0.012	<0.001	<0.001	<0.001	<0.001	0.038	<0.001	<0.01	<0.001	<0.001	0.024	<0.001	<0.005	<0.01	<0.001	<0.001	<0.001	<0.001	**0.010**	<0.001	<0.001	<0.005	<0.005
BH66532	<0.001	<0.001	0.002	<0.001	0.127	0.007	<0.001	**0.042**	0.002	<0.001	0.054	<0.001	<0.01	<0.001	<0.001	0.032	<0.001	<0.005	<0.01	<0.001	<0.001	<0.001	<0.001	**0.010**	<0.001	<0.001	**0.024**	<0.005
BH66533	<0.001	**0.026**	0.007	<0.001	0.445	<0.001	0.019	**0.059**	**0.212**	0.005	0.063	<0.001	<0.01	0.003	<0.001	0.028	<0.001	<0.005	<0.01	<0.001	<0.001	<0.001	**0.002**	<0.01	0.002	<0.001	**0.283**	<0.005
BH66534	<0.001	**0.006**	0.004	<0.001	0.226	0.002	0.004	**0.064**	**0.494**	0.001	0.042	<0.001	<0.01	<0.001	<0.001	0.025	<0.001	<0.005	<0.01	<0.001	<0.001	<0.001	**0.001**	<0.01	0.002	<0.001	**1.22**	<0.005
BH66535	<0.001	<0.001	<0.001	<0.001	0.077	0.002	<0.001	<0.001	<0.001	<0.001	0.037	<0.001	<0.01	<0.001	<0.001	0.013	<0.001	<0.005	<0.01	<0.001	<0.001	<0.001	**0.002**	<0.01	<0.001	<0.001	<0.005	<0.005
BH66536	<0.001	**0.001**	0.003	<0.001	0.216	0.003	<0.001	**0.014**	**0.243**	<0.001	0.055	<0.001	<0.01	<0.001	<0.001	0.032	<0.001	<0.005	<0.01	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	**2.72**	<0.005
BH66537	<0.001	**0.006**	0.004	<0.001	0.548	<0.001	0.003	**0.013**	**5.030**	<0.001	0.056	<0.001	<0.01	<0.001	<0.001	0.046	<0.001	<0.005	<0.01	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	**0.493**	<0.005
BH66538	<0.001	**0.002**	0.007	<0.001	0.286	0.006	<0.001	**0.075**	**0.059**	<0.001	0.063	<0.001	<0.01	<0.001	<0.001	0.037	<0.001	<0.005	<0.01	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	**5.67**	<0.005
BH66539	<0.001	<0.001	<0.001	<0.001	0.002	0.005	<0.001	<0.001	<0.001	<0.001	0.043	<0.001	<0.01	<0.001	<0.001	0.018	<0.001	<0.005	<0.01	<0.001	<0.001	<0.001	**0.001**	**0.010**	<0.001	<0.001	<0.005	<0.005
BH66540	<0.001	<0.001	0.001	<0.001	0.178	0.012	<0.001	0.010	**0.007**	<0.001	0.051	<0.001	<0.01	<0.001	<0.001	0.035	<0.001	<0.005	<0.01	<0.001	<0.001	<0.001	<0.001	**0.010**	<0.001	<0.001	**0.010**	<0.005
BH66541	<0.001	<0.001	0.003	<0.001	0.109	0.002	<0.001	<0.001	**0.008**	<0.001	0.053	<0.001	<0.01	<0.001	<0.001	0.041	<0.001	<0.005	<0.01	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	**0.073**	<0.005
BH66542	<0.001	<0.001	<0.001	<0.001	0.003	0.005	<0.001	<0.001	<0.001	<0.001	0.039	<0.001	<0.01	<0.001	<0.001	0.016	<0.001	<0.005	<0.01	<0.001	<0.001	<0.001	**0.004**	**0.020**	<0.001	<0.001	<0.005	<0.005
BH66543	<0.001	**0.019**	0.014	<0.001	1.020	<0.001	0.030	**0.094**	**5.050**	0.007	0.078	<0.001	0.010	0.005	<0.001	0.031	<0.001	<0.005	<0.01	<0.001	<0.001	<0.001	**0.025**	<0.01	0.007	<0.001	**87.5**	<0.005
BH66544	<0.001	**0.007**	0.008	<0.001	0.401	<0.001	0.005	**0.150**	**0.013**	0.001	0.056	<0.001	<0.01	<0.001	<0.001	0.022	<0.001	<0.005	<0.01	<0.001	<0.001	<0.001	**0.001**	<0.01	0.002	<0.001	**0.197**	<0.005
BH66545	<0.001	<0.001	<0.001	<0.001	0.119	**0.178**	<0.001	<0.001	<0.001	<0.001	0.050	<0.001	<0.01	<0.001	<0.001	0.024	<0.001	<0.005	<0.01	<0.001	<0.001	<0.001	<0.001	**0.010**	<0.001	<0.001	<0.005	<0.005
BH66546	<0.001	**0.014**	0.009	<0.001	0.372	<0.001	0.010	**0.204**	**0.017**	0.003	0.057	<0.001	<0.01	0.002	<0.001	0.026	<0.001	<0.005	<0.01	<0.001	<0.001	<0.001	**0.002**	<0.01	0.004	<0.001	**0.738**	<0.005
BH66547	<0.001	<0.001	<0.001	<0.001	0.121	0.012	<0.001	<0.001	<0.001	<0.001	0.042	<0.001	<0.01	<0.001	<0.001	0.029	<0.001	<0.005	<0.01	<0.001	<0.001	<0.001	<0.001	**0.020**	<0.001	<0.001	<0.005	<0.005
BH66548	<0.001	<0.001	<0.001	<0.001	<0.001	0.016	<0.001	<0.001	<0.001	<0.001	0.041	0.002	<0.01	<0.001	<0.001	0.029	<0.001	<0.005	<0.01	<0.001	<0.001	<0.001	**0.002**	**0.020**	<0.001	<0.001	<0.005	<0.005
BH66549	<0.001	<0.001	<0.001	<0.001	0.016	0.002	<0.001	<0.001	<0.001	<0.001	0.038	0.001	<0.01	<0.001	<0.001	0.010	<0.001	<0.005	<0.01	<0.001	<0.001	<0.001	**0.002**	**0.010**	<0.001	<0.001	<0.005	<0.005
BH66550	<0.001	**0.013**	0.006	<0.001	0.286	<0.001	0.010	**0.126**	**0.114**	0.003	0.073	<0.001	<0.01	0.002	<0.001	0.033	<0.001	<0.005	<0.01	<0.001	<0.001	<0.001	**0.002**	<0.01	0.004	<0.001	**0.469**	<0.005
BH66551	<0.001	<0.001	<0.001	<0.001	0.011	0.001	<0.001	<0.001	<0.001	<0.001	0.044	<0.001	<0.01	<0.001	<0.001	0.008	<0.001	<0.005	<0.01	<0.001	<0.001	<0.001	**0.021**	<0.01	<0.001	<0.001	<0.005	<0.005
A/A 95%	NA	0.00004	NA	NA	1.900	0.034	NA	0.011	0.0034	NA	NA	0.009	0.011	NA	0.003	NA	NA	NA	NA	0.00003	NA	NA	0.0005	0.006	NA	NA	0.008	NA

ATTACHMENT F – XRD

Table F1: Mineralogical Data

Sample ID	Sphalerite	Galena	Quartz	Plagioclase	K-Feldspar	Kaolinite	Illite/ Mica	Chlorite	Pyralspite Garnet	Sillimanite	Amorph.
BH66502			28.1	6.2	14.9		25.2	2.0	9.6	5.5	8.6
BH66503			32.0	6.2	20.0		16.0	2.0	10.4	6.9	6.6
BH66504			37.2	5.1	14.4	0.9	20.0	2.3	10.4	3.1	6.6
BH66505			33.8	7.6	15.7		19.8	2.3	8.8	3.7	8.3
BH66506			30.9	7.8	17.7		20.9	2.7	9.4	6.4	4.3
BH66507			35.5	8.8	13.0		16.1	1.0	9.8	4.7	11.0
BH66508			36.9	6.7	14.4		17.5	2.3	9.6	5.6	7.0
BH66509			33.7	5.9	13.0	1.2	25.0	2.2	9.7	2.9	6.4
BH66510			29.5	7.7	15.5	1.1	22.4	2.1	10.7	4.9	6.2
BH66511			27.4	4.9	17.3		22.7	0.0	9.4	6.6	11.6
BH66512			33.3	6.0	12.9	2.0	24.8	2.4	11.7	4.5	2.5
BH66513			34.9	11.3	13.6		23.9	2.0	7.9	1.8	4.6
BH66514			34.8	12.1	10.0	1.1	24.1	3.5	9.7	4.5	0.1
BH66515			39.2	8.5		0.3	37.0	1.9	7.4	2.2	3.5
BH66516			28.9	10.1		0.2	33.9	3.7	11.1	1.7	10.5
BH66517			28.0	2.2	9.0	1.6	25.7	4.3	14.4	5.1	9.7
BH66518			29.6	6.5	12.5		26.2	2.6	14.4	5.0	3.4
BH66519			37.3		9.2		28.1	2.8	14.8	2.9	5.0
BH66520			32.4	13.0	0.0		30.6	1.1	8.2	2.5	12.2
BH66521			32.2	9.6	11.8		22.9	2.0	11.3	4.3	6.1
BH66522			33.1	12.2	7.6		27.5	2.5	8.5	3.3	5.3
BH66523			34.3	12.2	9.9	2.8	15.2	2.6	10.2	4.2	8.6
BH66524			30.0	13.5	6.6		28.0	3.4	9.5	3.7	5.4
BH66525			33.4	7.7	13.0		22.6	4.1	11.3	2.5	5.6
BH66526			31.2	5.9	15.4		24.1	0.8	10.0	6.0	6.6
BH66527			31.1	8.0	23.4		16.4	2.6	8.5	6.3	3.8
BH66528			32.7	11.2	12.3		22.1	1.3	9.7	3.8	6.9
BH66529			32.7	14.3	3.7	1.1	25.1	3.6	9.1	1.7	8.9
BH66530			35.2	3.7	6.6	1.2	27.1	0.8	13.9	4.2	7.3
BH66531			30.3	6.7	9.0	3.0	27.7	3.0	11.4	4.3	4.7
BH66532			31.2	14.6	12.0		21.8	2.5	9.9	4.8	3.2
BH66533			31.5	10.5	9.3		27.4	3.9	11.3	2.4	3.6
BH66534			33.3	4.8	10.2		27.4	2.4	8.8	4.2	8.0
BH66535			39.8	6.3	19.1		18.9	1.4	9.5	3.2	1.8
BH66536			38.7	1.8	7.8		28.1	2.9	9.7	2.9	8.2
BH66537			36.6	6.4	15.3	0.7	19.8	1.1	8.7	3.8	7.7
BH66538			34.1	10.2	13.5		20.0	2.6	10.4	4.8	4.4
BH66539			32.5	5.6	18.1	0.7	18.7	2.1	8.8	4.9	8.6
BH66540			32.2	10.1	15.9		15.6	0.4	11.0	5.6	9.3
BH66541			27.8	6.4	16.0		19.8	3.1	10.7	8.0	8.2
BH66542			30.4	8.4	22.0		16.6	0.4	10.4	5.5	6.4
BH66543	1.0	1.2	39.0	4.9	14.1		14.4	3.4	12.5	2.5	7.0
BH66544			29.7	9.5			35.4	1.1	10.4	0.9	13.0
BH66545			23.0	12.1			40.4	1.8	7.2	0.9	14.7
BH66546			24.2	9.6			44.7	3.4	7.6	0.9	9.7
BH66547			26.4	9.8	6.2	0.9	31.5	3.2	8.2	1.7	12.0
BH66548			29.7	9.9	5.9	1.9	36.3	3.7	4.2	1.2	7.3
BH66549			40.7	9.1	14.6		15.8	2.8	8.8	2.3	5.8
BH66550			27.4	7.2	11.7	0.8	19.2	3.6	10.6	5.3	14.2
BH66551			40.0	3.7	39.1		6.7	0.0	2.8	4.0	3.8

ATTACHMENT G – ABCC CHARTS


ABCC - Sample BH66514
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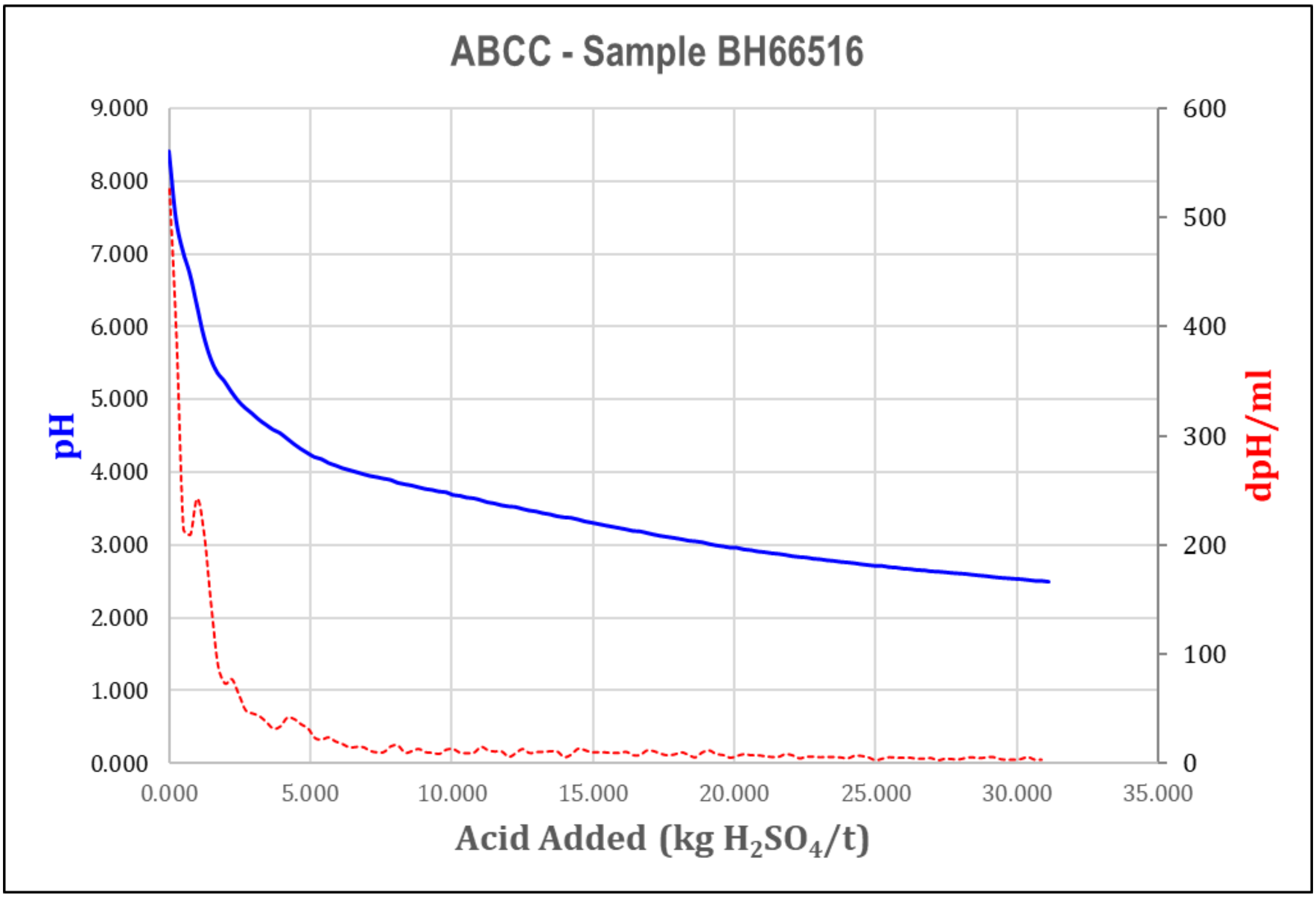
9.000
8.000
7.000
6.000
5.000
4.000
3.000
2.000
1.000
0.000
dpH/ml
600
500
400
300
200
100
0
0.000
5.000
10.000
15.000
20.000
25.000
Acid Added (kg H_2SO_4/t)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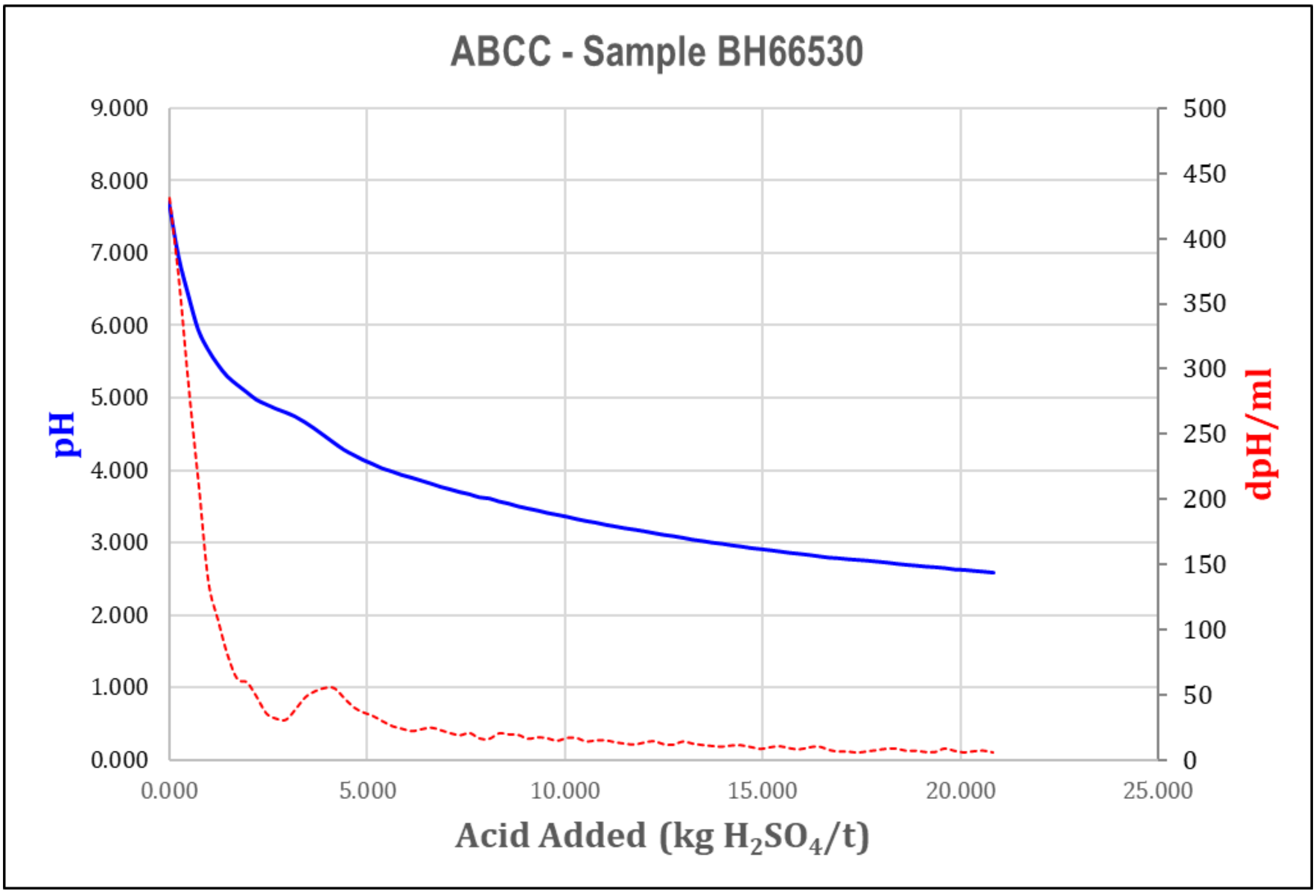
8.000
7.000
6.000
5.000
4.000
3.000
2.000
1.000
0.000
dpH/ml
600
500
400
300
200
100
0
0.000
5.000
10.000
15.000
20.000
25.000
30.000
35.000
Acid Added (kg H_2SO_4/t)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dpH/ml
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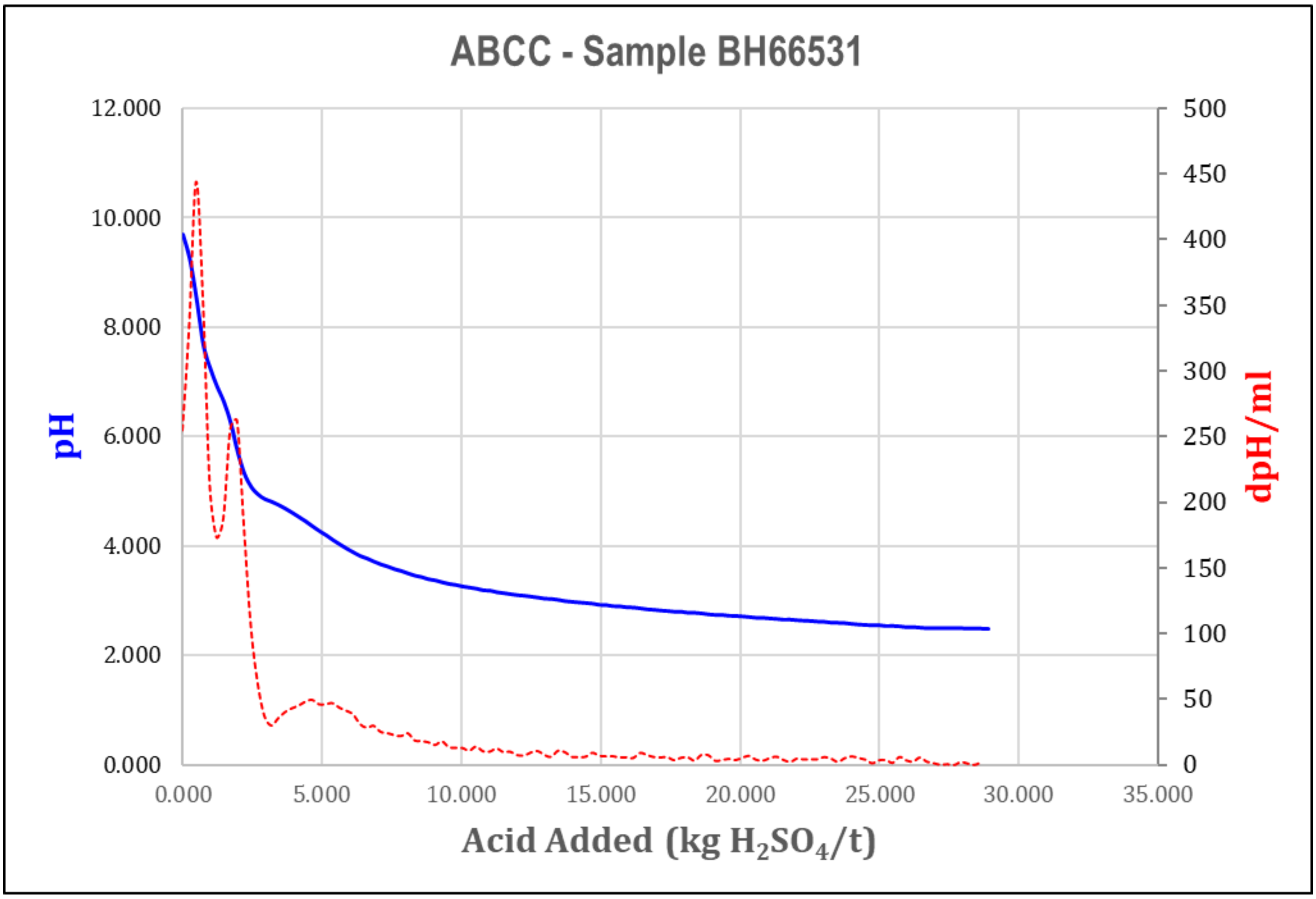
8.000
7.000
6.000
5.000
4.000
3.000
2.000
1.000
0.000
500
450
400
350
300
250
200
150
100
50
0
0.000
5.000
10.000
15.000
20.000
25.000
Acid Added (kg H_2SO_4/t)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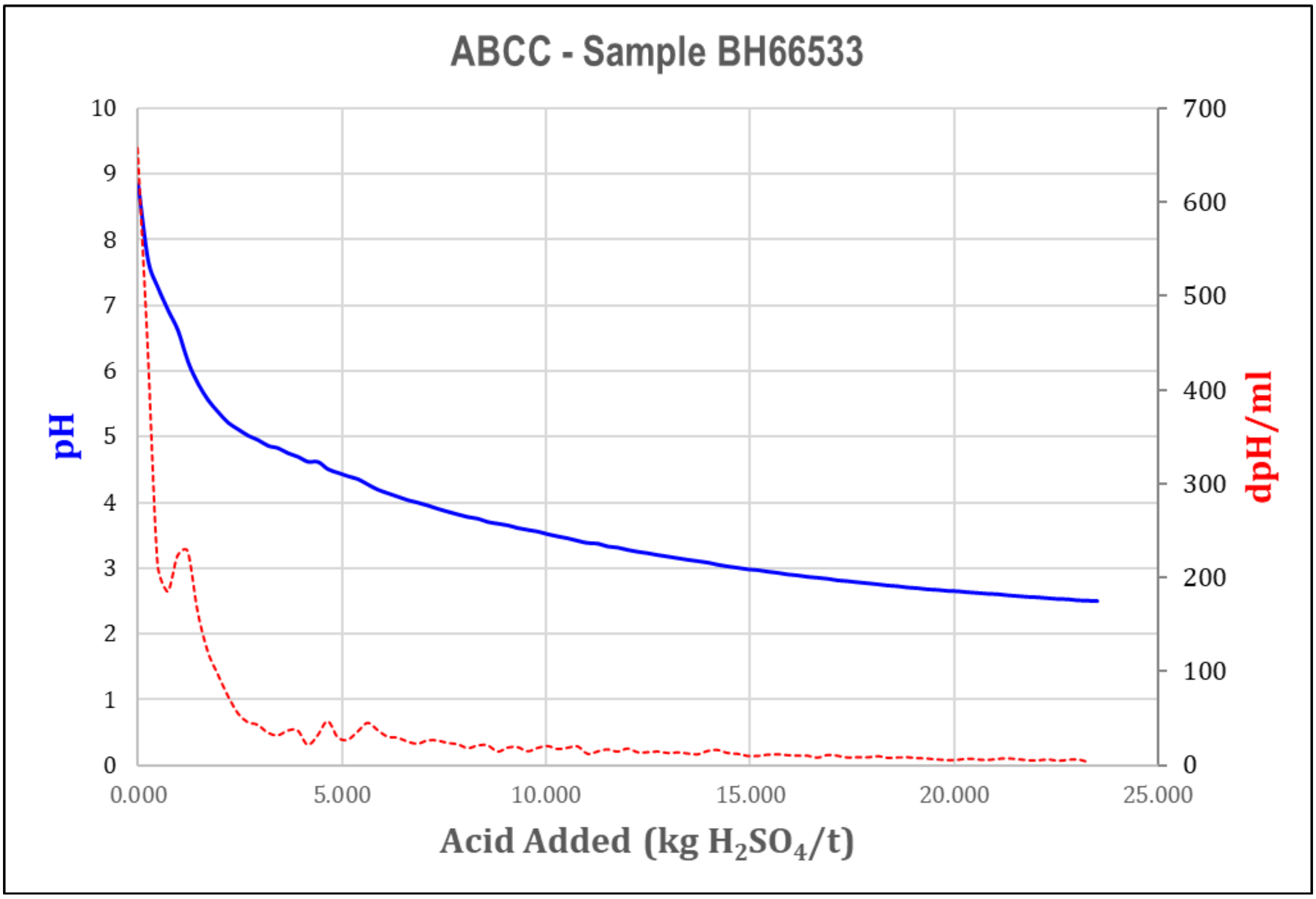
dpH/ml
12.000
10.000
8.000
6.000
4.000
2.000
0.000
500
450
400
350
300
250
200
150
100
50
0
0.000
5.000
10.000
15.000
20.000
25.000
30.000
35.000
Acid Added (kg H_2SO_4/t)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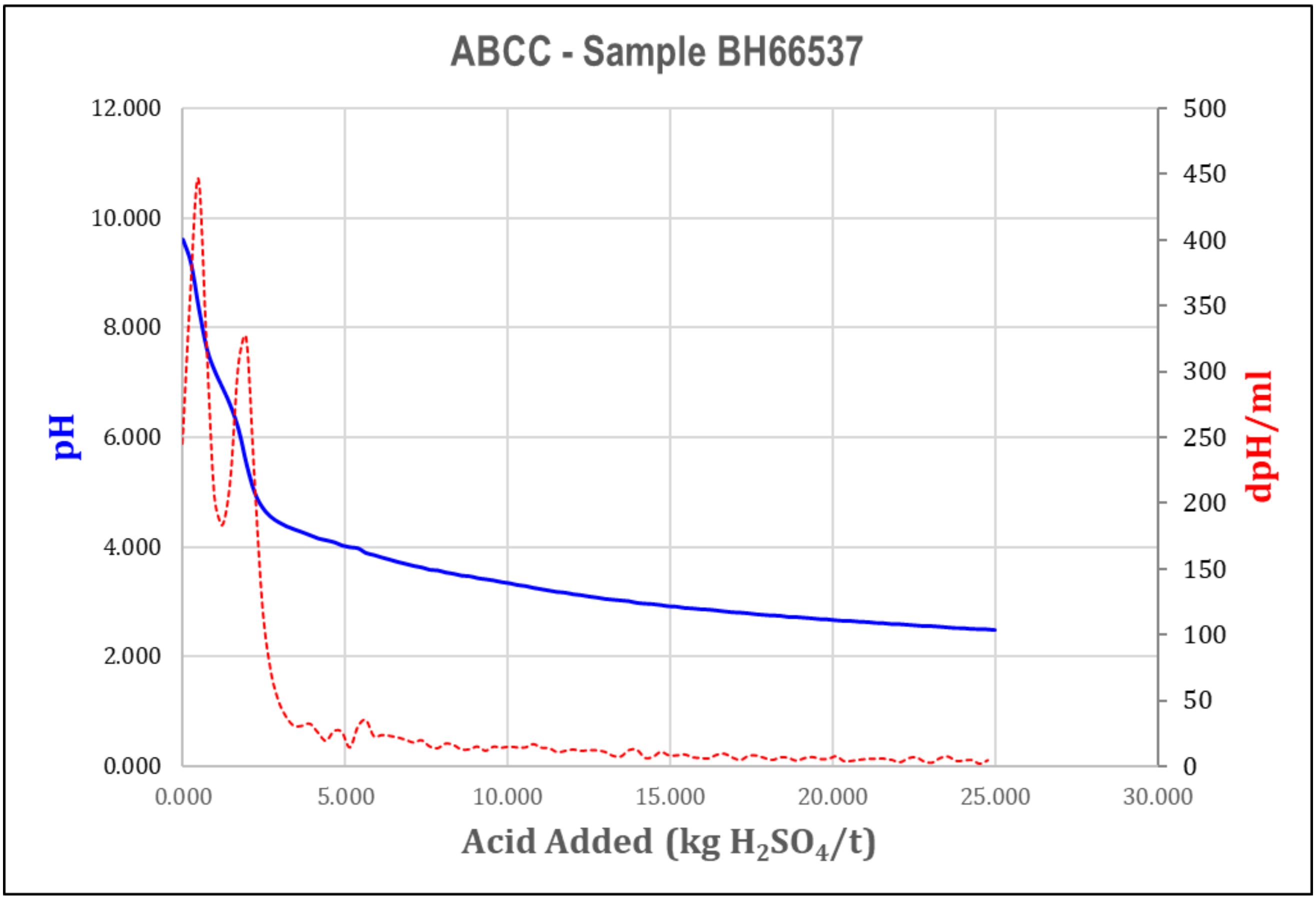
pH
dpH/ml
10
9
8
7
6
5
4
3
2
1
0
700
600
500
400
300
200
100
0
0.000
5.000
10.000
15.000
20.000
25.000
Acid Added (kg H2SO4/t)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pH
dpH/ml
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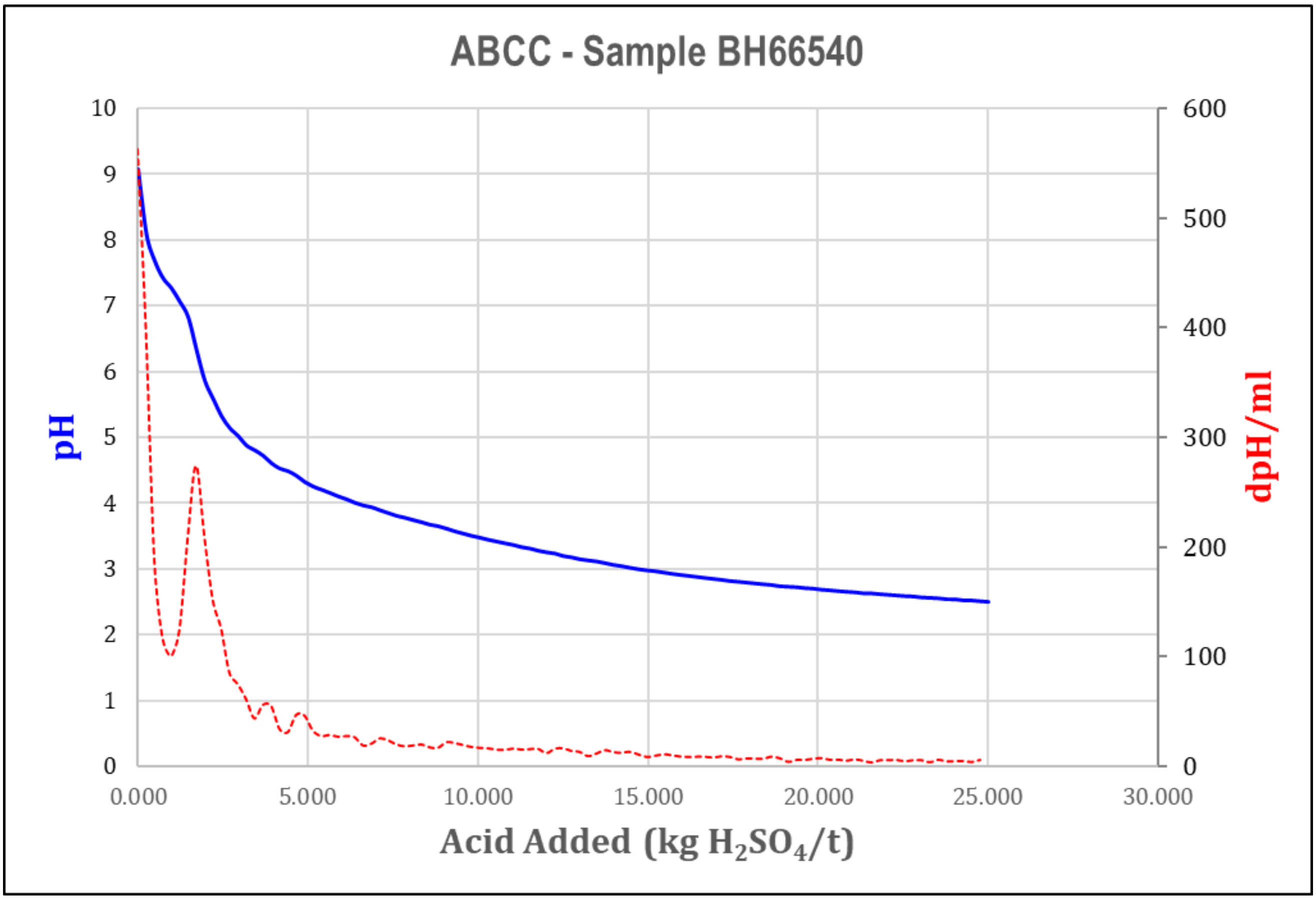
10.000
8.000
6.000
4.000
2.000
0.000
500
450
400
350
300
250
200
150
100
50
0
0.000
5.000
10.000
15.000
20.000
25.000
30.000
Acid Added (kg H2SO4/t)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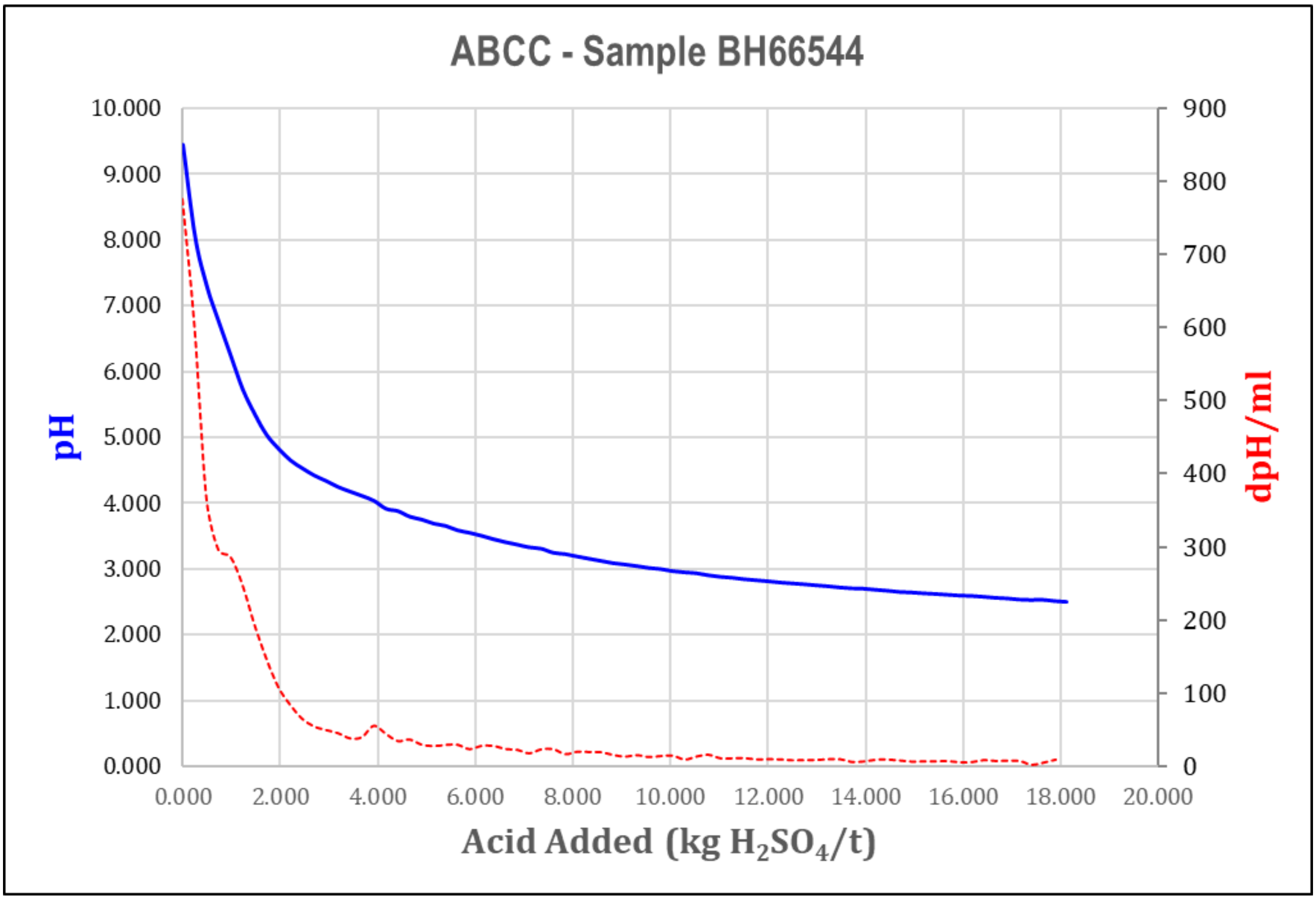
pH
10
9
8
7
6
5
4
3
2
1
0
dpH/ml
600
500
400
300
200
100
0
0.000
5.000
10.000
15.000
20.000
25.000
30.000
Acid Added (kg H2SO4/t)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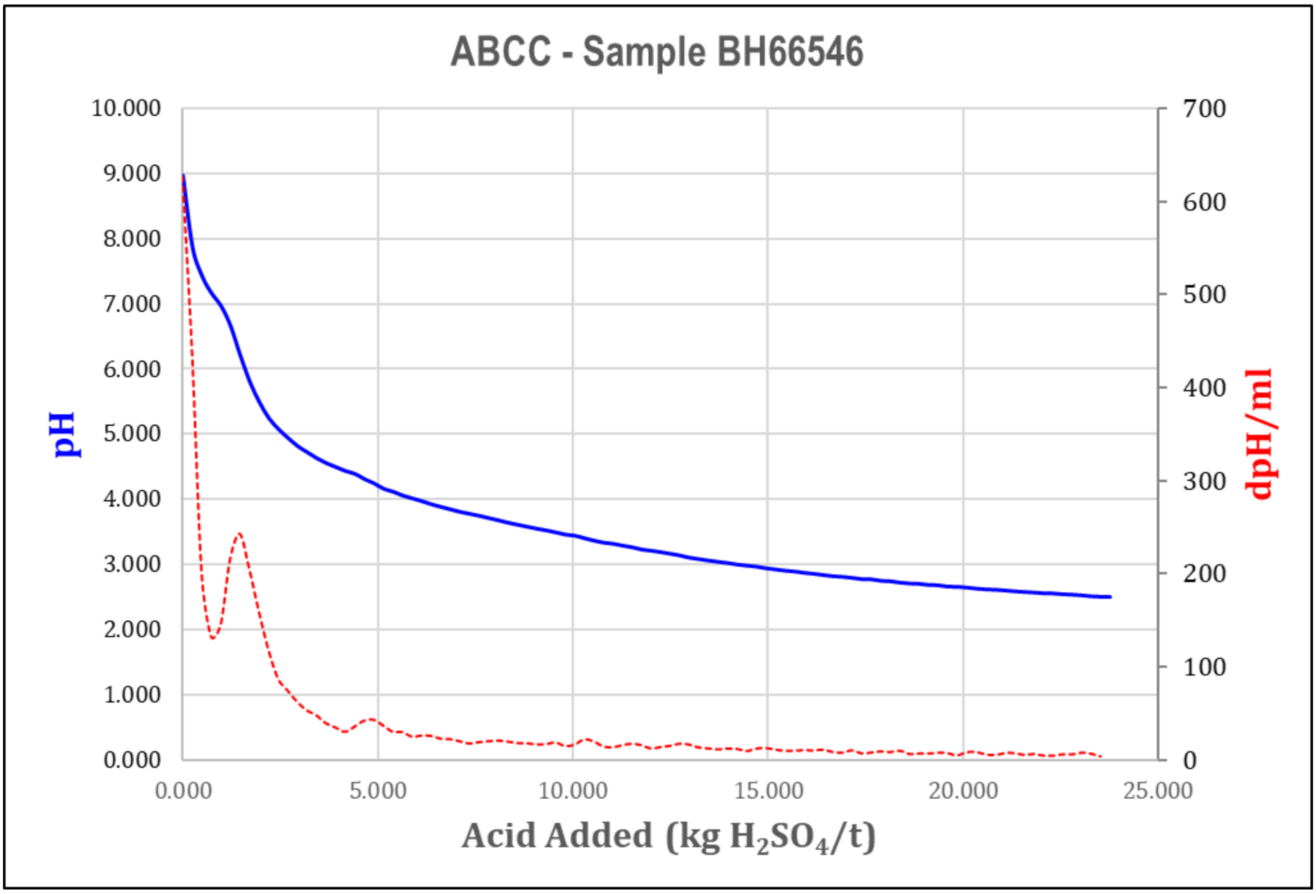
8.000
7.000
6.000
5.000
4.000
3.000
2.000
1.000
0.000
dpH/ml
900
800
700
600
500
400
300
200
100
0
0.000
2.000
4.000
6.000
8.000
10.000
12.000
14.000
16.000
18.000
20.000
Acid Added (kg H2SO4/t)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pH
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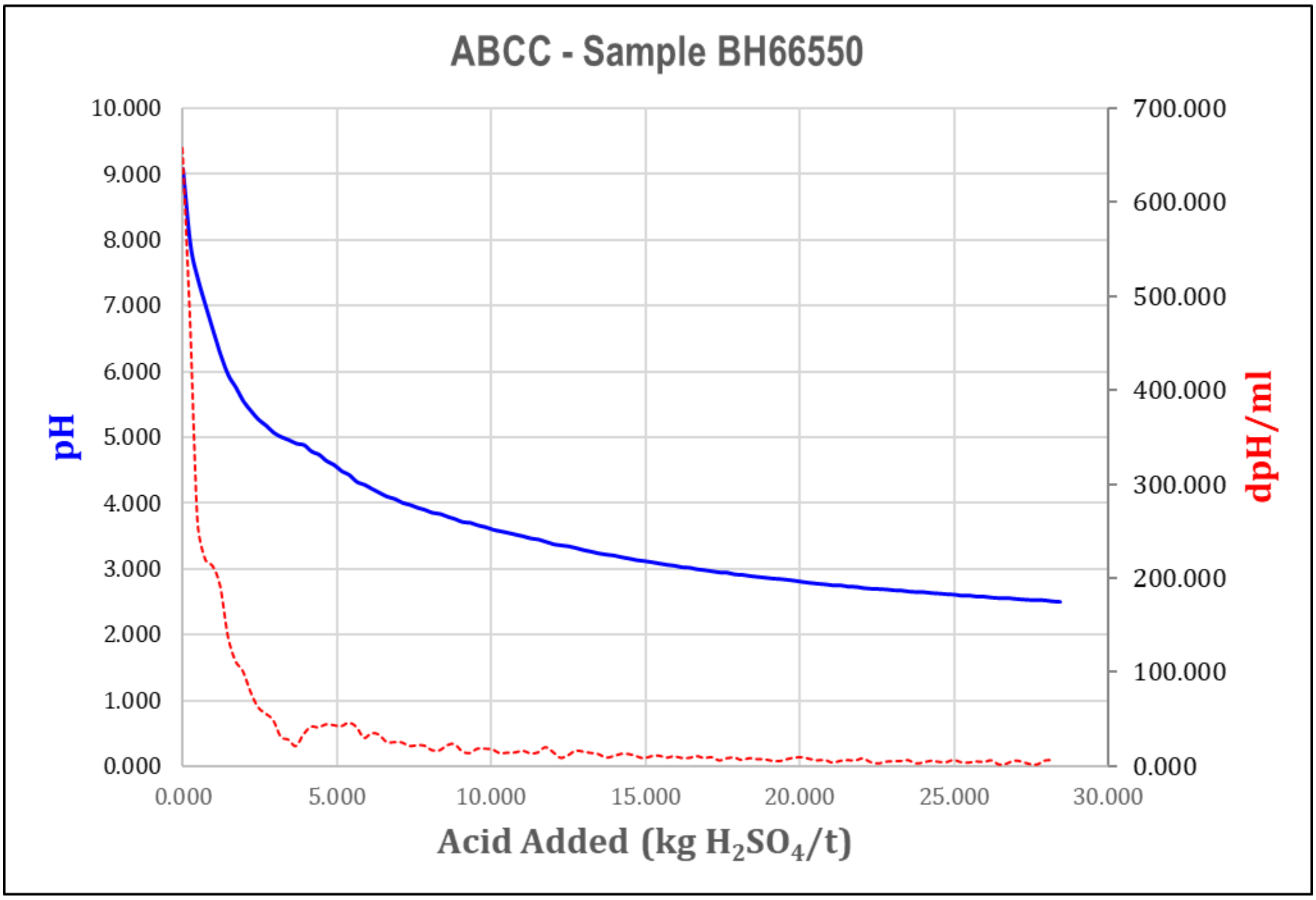
9.000
8.000
7.000
6.000
5.000
4.000
3.000
2.000
1.000
0.000
dpH/ml
700
600
500
400
300
200
100
0
0.000
5.000
10.000
15.000
20.000
25.000
Acid Added (kg H_2SO_4/t)


ABCC - Sample BH66550
pH
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9.000
8.000
7.000
6.000
5.000
4.000
3.000
2.000
1.000
0.000
dpH/ml
700.000
600.000
500.000
400.000
300.000
200.000
100.000
0.000
0.000
5.000
10.000
15.000
20.000
25.000
30.000
Acid Added (kg H_2SO_4/t)

ATTACHMENT H – LABORATORY CERTIFICATES RECEIVED

CERTIFICATE OF ANALYSIS

Work Order	: **EB1922319**	Page	: 1 of 30
Amendment	: **1**		
Client	: **BROKEN HILL OPERATIONS PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: Georgina Seward	Contact	: Customer Services EB
Address	: PO BOX 5073 BROKEN HILL NSW 2880	Address	: 2 Byth Street Stafford QLD Australia 4053
Telephone	: ----	Telephone	: +61-7-3243 7222
Project	: Waste Rock samples 2019	Date Samples Received	: 26-Aug-2019 15:40
Order number	: ----	Date Analysis Commenced	: 16-Sep-2019
C-O-C number	: ----	Issue Date	: 22-Oct-2019 17:50
Sampler	: BRETT NEILSEN		
Site	: ----		
Quote number	: EN/333		
No. of samples received	: 50		
No. of samples analysed	: 50		

NATA

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Ben Felgendrejeris	Senior Acid Sulfate Soil Chemist	Brisbane Acid Sulphate Soils, Stafford, QLD
Dave Gitsham	Metals Instrument Chemist	Brisbane Inorganics, Stafford, QLD
Kim McCabe	Senior Inorganic Chemist	Brisbane Acid Sulphate Soils, Stafford, QLD
Kim McCabe	Senior Inorganic Chemist	Brisbane Inorganics, Stafford, QLD
Mark Hallas	Senior Inorganic Chemist	Brisbane Inorganics, Stafford, QLD

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key :
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- **SPLIT WORK ORDER: It should be noted that ALS has split this work order over the following work orders (EB1922319, EB1924186, EB1924193) due to the size of the sample numbers and range of analysis requested. Analysis on Non-leachate analysis will be reported under EB1922319, NAG Leachate analysis under EB1924186, & non-standard DI leachate analysis under EB1924193. For any further information regarding this processing of samples please contact ALS client services division on ALSEnviro.Brisbane@alsglobal.com**
- EA031 (Saturated Paste pH): NATA accreditation does not cover the performance of this service.
- EA032 (Saturated Paste EC): NATA accreditation does not cover the performance of this service.
- EA029: HCl Extractable Sulphur results returning higher than ED042T (Total Sulphur). Repeat analysis of both methods confirms results. Unable to determine cause of discrepency.
- It is recognised that ED042T (Sulfur - Total as S (LECO)): is less than ED040T (Sulfate as SO4 2 - Total by ICP-AES): for some samples. This was confirmed by re-digestion and re-analysis.
- ASS: EA013 (ANC) Fizz Rating: 0- None; 1- Slight; 2- Moderate; 3- Strong; 4- Very Strong; 5- Lime.
- ASS: EA029 (SPOCAS): Liming rate is calculated and reported on a dry weight basis assuming use of fine agricultural lime (CaCO3) and using a safety factor of 1.5 to allow for non-homogeneous mixing and poor reactivity of lime. For conversion of Liming Rate from kg/t dry weight to kg/m3 in-situ soil, multiply reported results x wet bulk density of soil in t/m3.

Analytical Results

Sub-Matrix: **PULP** (Matrix: **SOIL)**			Client sample ID	**BH66508**	**BH66509**	**BH66515**	**BH66517**	**BH66518**
			Client sampling date / time	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00
Compound	CAS Number	LOR	Unit	**EB1922319-007**	**EB1922319-008**	**EB1922319-014**	**EB1922319-016**	**EB1922319-017**
				Result	Result	Result	Result	Result
EA011: Net Acid Generation								
pH (OX)	----	0.1	pH Unit	**4.8**	**8.9**	----	----	**3.9**
NAG (pH 4.5)	----	0.1	kg H2SO4/t	<0.1	<0.1	----	----	**1.4**
NAG (pH 7.0)	----	0.1	kg H2SO4/t	**1.6**	<0.1	----	----	**3.8**
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	**12.2**	**17.5**	----	----	**10.3**
ANC as CaCO3	----	0.1	% CaCO3	**1.2**	**1.8**	----	----	**1.0**
Fizz Rating	----	0	Fizz Unit	**1**	**1**	----	----	**1**
EA026 : Chromium Reducible Sulfur								
Chromium Reducible Sulphur	----	0.005	%	**0.200**	**0.102**	**0.227**	**0.473**	**0.225**
EA029-G: Retained Acidity								
HCl Extractable Sulfur (20Be)	----	0.020	% S	**1.35**	**0.360**	**1.38**	**2.78**	**1.35**

Analytical Results

Sub-Matrix: **PULP** (Matrix: **SOIL)**			*Client sample ID*	**BH66519**	**BH66520**	**BH66521**	**BH66522**	**BH66523**
			Client sampling date / time	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00
Compound	*CAS Number*	*LOR*	*Unit*	**EB1922319-018**	**EB1922319-019**	**EB1922319-020**	**EB1922319-021**	**EB1922319-022**
				Result	Result	Result	Result	Result
EA011: Net Acid Generation								
pH (OX)	----	0.1	pH Unit	**3.6**	**4.5**	**6.5**	**5.5**	**4.0**
NAG (pH 4.5)	----	0.1	kg H2SO4/t	**2.7**	<0.1	<0.1	<0.1	**0.6**
NAG (pH 7.0)	----	0.1	kg H2SO4/t	**7.7**	**1.3**	**0.8**	**0.6**	**2.4**
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	**10.2**	**10.9**	**10.8**	**12.9**	**14.2**
ANC as CaCO3	----	0.1	% CaCO3	**1.0**	**1.1**	**1.1**	**1.3**	**1.4**
Fizz Rating	----	0	Fizz Unit	**1**	**1**	**1**	**1**	**1**
EA026 : Chromium Reducible Sulfur								
Chromium Reducible Sulphur	----	0.005	%	**0.367**	**0.226**	**0.080**	**0.134**	**0.212**
EA029-G: Retained Acidity								
HCl Extractable Sulfur (20Be)	----	0.020	% S	**2.74**	**1.48**	**0.736**	**0.727**	**1.56**

Analytical Results

Sub-Matrix: **PULP** (Matrix: **SOIL**)			*Client sample ID*	**BH66524**	**BH66525**	**BH66527**	**BH66528**	**BH66529**
			Client sampling date / time	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00
Compound	*CAS Number*	*LOR*	*Unit*	**EB1922319-023**	**EB1922319-024**	**EB1922319-026**	**EB1922319-027**	**EB1922319-028**
				Result	Result	Result	Result	Result
EA011: Net Acid Generation								
pH (OX)	----	0.1	pH Unit	**6.4**	**5.6**	**7.2**	**5.4**	**6.1**
NAG (pH 4.5)	----	0.1	kg H2SO4/t	<0.1	<0.1	<0.1	<0.1	<0.1
NAG (pH 7.0)	----	0.1	kg H2SO4/t	**0.6**	**0.8**	<0.1	**0.9**	**0.8**
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	**13.0**	**13.9**	**12.3**	**13.8**	**12.7**
ANC as CaCO3	----	0.1	% CaCO3	**1.3**	**1.4**	**1.2**	**1.4**	**1.3**
Fizz Rating	----	0	Fizz Unit	**1**	**1**	**1**	**1**	**1**
EA026 : Chromium Reducible Sulfur								
Chromium Reducible Sulphur	----	0.005	%	**0.094**	**0.112**	**0.048**	**0.147**	**0.138**
EA029-G: Retained Acidity								
HCl Extractable Sulfur (20Be)	----	0.020	% S	**0.486**	**0.853**	**0.232**	**0.893**	**0.913**

Analytical Results

Sub-Matrix: **PULP** (Matrix: **SOIL)**			Client sample ID	**BH66530**	**BH66531**	**BH66532**	**BH66533**	**BH66534**
			Client sampling date / time	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00
Compound	CAS Number	LOR	Unit	**EB1922319-029**	**EB1922319-030**	**EB1922319-031**	**EB1922319-032**	**EB1922319-033**
				Result	Result	Result	Result	Result
EA026 : Chromium Reducible Sulfur								
Chromium Reducible Sulphur	----	0.005	%	**0.189**	**0.146**	**0.164**	**0.202**	**0.236**
EA029-G: Retained Acidity								
HCl Extractable Sulfur (20Be)	----	0.020	% S	**1.13**	**1.15**	**1.31**	**1.83**	**1.70**

Analytical Results

Sub-Matrix: **PULP** (Matrix: **SOIL)**			Client sample ID	**BH66535**	**BH66536**	**BH66537**	**BH66538**	**BH66539**
			Client sampling date / time	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00
Compound	CAS Number	LOR	Unit	**EB1922319-034**	**EB1922319-035**	**EB1922319-036**	**EB1922319-037**	**EB1922319-038**
				Result	Result	Result	Result	Result
EA011: Net Acid Generation								
pH (OX)	----	0.1	pH Unit	**----**	**5.3**	**5.0**	**5.0**	**8.0**
NAG (pH 4.5)	----	0.1	kg H2SO4/t	**----**	<0.1	<0.1	<0.1	<0.1
NAG (pH 7.0)	----	0.1	kg H2SO4/t	**----**	**1.1**	**2.1**	**1.8**	<0.1
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	**----**	**15.9**	**16.7**	**14.2**	**15.9**
ANC as CaCO3	----	0.1	% CaCO3	**----**	**1.6**	**1.7**	**1.4**	**1.6**
Fizz Rating	----	0	Fizz Unit	**----**	**1**	**1**	**1**	**1**
EA026 : Chromium Reducible Sulfur								
Chromium Reducible Sulphur	----	0.005	%	**0.076**	**0.186**	**0.259**	**0.232**	**0.086**
EA029-G: Retained Acidity								
HCl Extractable Sulfur (20Be)	----	0.020	% S	**0.932**	**1.36**	**2.73**	**1.40**	**0.661**

Analytical Results

Sub-Matrix: **PULP** (Matrix: **SOIL)**			*Client sample ID*	**BH66540**	**BH66541**	**BH66542**	**BH66543**	**BH66544**
			Client sampling date / time	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00
Compound	*CAS Number*	*LOR*	*Unit*	**EB1922319-039**	**EB1922319-040**	**EB1922319-041**	**EB1922319-042**	**EB1922319-043**
				Result	Result	Result	Result	Result
EA011: Net Acid Generation								
pH (OX)	----	0.1	pH Unit	**5.3**	**6.3**	**7.4**	**3.6**	**3.8**
NAG (pH 4.5)	----	0.1	kg H2SO4/t	<0.1	<0.1	<0.1	**3.3**	**1.4**
NAG (pH 7.0)	----	0.1	kg H2SO4/t	**0.7**	**0.6**	<0.1	**15.3**	**3.1**
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	**13.2**	**12.3**	**14.7**	**15.7**	**10.8**
ANC as CaCO3	----	0.1	% CaCO3	**1.3**	**1.2**	**1.5**	**1.6**	**1.1**
Fizz Rating	----	0	Fizz Unit	**1**	**1**	**1**	**1**	**1**
EA026 : Chromium Reducible Sulfur								
Chromium Reducible Sulphur	----	0.005	%	**0.152**	**0.172**	**0.086**	**1.08**	**0.215**
EA029-G: Retained Acidity								
HCl Extractable Sulfur (20Be)	----	0.020	% S	**1.04**	**1.18**	**0.184**	**3.77**	**0.620**

Analytical Results

Sub-Matrix: **PULP** (Matrix: **SOIL)**			*Client sample ID*	**BH66545**	**BH66546**	**BH66547**	**BH66548**	**BH66549**
			Client sampling date / time	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00
Compound	*CAS Number*	*LOR*	*Unit*	**EB1922319-044**	**EB1922319-045**	**EB1922319-046**	**EB1922319-047**	**EB1922319-048**
				Result	Result	Result	Result	Result
EA011: Net Acid Generation								
pH (OX)	----	0.1	pH Unit	**5.6**	**3.6**	**5.6**	----	----
NAG (pH 4.5)	----	0.1	kg H2SO4/t	<0.1	**1.9**	<0.1	----	----
NAG (pH 7.0)	----	0.1	kg H2SO4/t	**1.1**	**4.2**	**0.9**	----	----
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	**14.6**	**13.0**	**14.6**	----	----
ANC as CaCO3	----	0.1	% CaCO3	**1.5**	**1.3**	**1.5**	----	----
Fizz Rating	----	0	Fizz Unit	**1**	**1**	**1**	----	----
EA026 : Chromium Reducible Sulfur								
Chromium Reducible Sulphur	----	0.005	%	**0.144**	**0.271**	**0.137**	**0.116**	**0.071**
EA029-G: Retained Acidity								
HCl Extractable Sulfur (20Be)	----	0.020	% S	**0.372**	**0.810**	**0.596**	**0.402**	**0.221**

Analytical Results

Sub-Matrix: **PULP** (Matrix: **SOIL)**			Client sample ID	**BH66550**	**BH66551**	**----**	**----**	**----**
			Client sampling date / time	21-Aug-2019 09:00	21-Aug-2019 09:00	----	----	----
Compound	CAS Number	LOR	Unit	**EB1922319-049**	**EB1922319-050**	**--------**	**--------**	**--------**
				Result	Result	----	----	----
EA026 : Chromium Reducible Sulfur								
Chromium Reducible Sulphur	----	0.005	%	**0.240**	**0.022**	----	----	----
EA029-G: Retained Acidity								
HCl Extractable Sulfur (20Be)	----	0.020	% S	**0.736**	**0.043**	----	----	----

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Client sample ID*	**BH66502**	**BH66503**	**BH66504**	**BH66505**	**BH66506**
			Client sampling date / time	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00
Compound	*CAS Number*	*LOR*	*Unit*	**EB1922319-001**	**EB1922319-002**	**EB1922319-003**	**EB1922319-004**	**EB1922319-005**
				Result	Result	Result	Result	Result
EA011: Net Acid Generation								
pH (OX)	----	0.1	pH Unit	**6.0**	**6.3**	**7.9**	**7.2**	**7.3**
NAG (pH 4.5)	----	0.1	kg H2SO4/t	<0.1	<0.1	<0.1	<0.1	<0.1
NAG (pH 7.0)	----	0.1	kg H2SO4/t	**1.0**	**0.8**	<0.1	<0.1	<0.1
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	**12.3**	**12.8**	**18.1**	**12.0**	**11.6**
ANC as CaCO3	----	0.1	% CaCO3	**1.2**	**1.3**	**1.8**	**1.2**	**1.2**
Fizz Rating	----	0	Fizz Unit	**1**	**1**	**1**	**1**	**1**
EA026 : Chromium Reducible Sulfur								
Chromium Reducible Sulphur	----	0.005	%	**0.104**	**0.081**	**0.084**	**0.067**	**0.070**
EA029-G: Retained Acidity								
HCl Extractable Sulfur (20Be)	----	0.020	% S	**1.08**	**0.960**	**0.858**	**0.578**	**0.492**
EA031: pH (saturated paste)								
ø **pH (Saturated Paste)**	----	0.1	pH Unit	**8.1**	**7.9**	**8.3**	**7.8**	**8.4**
EA032: Electrical Conductivity (saturated paste)								
ø **Electrical Conductivity (Saturated Paste)**	----	1	µS/cm	**361**	**275**	**329**	**2000**	**1360**
ED040: Sulfur as SO4 2-								
Sulfate as SO4 2-	14808-79-8	100	mg/kg	**3250**	**1270**	**1420**	**770**	**580**
ED042T: Total Sulfur by LECO								
Sulfur - Total as S (LECO)	----	0.01	%	**0.11**	**0.08**	**0.08**	**0.07**	**0.07**
EG005(ED093)T: Total Metals by ICP-AES								
Aluminium	7429-90-5	50	mg/kg	**17600**	**19200**	**15800**	**16200**	**16800**
Boron	7440-42-8	50	mg/kg	<50	<50	<50	<50	<50
Iron	7439-89-6	50	mg/kg	**24800**	**22700**	**22700**	**25400**	**25700**
EG020T: Total Metals by ICP-MS								
Arsenic	7440-38-2	0.1	mg/kg	**6.4**	**2.6**	**25.5**	**19.5**	**6.7**
Selenium	7782-49-2	1	mg/kg	<1	<1	<1	<1	<1
Silver	7440-22-4	0.1	mg/kg	**0.2**	**0.1**	**0.2**	**0.2**	**0.2**
Barium	7440-39-3	0.1	mg/kg	**67.4**	**64.0**	**78.4**	**69.4**	**87.4**
Thallium	7440-28-0	0.1	mg/kg	**1.4**	**1.4**	**1.0**	**1.2**	**1.1**
Beryllium	7440-41-7	0.1	mg/kg	**0.7**	**0.7**	**0.5**	**1.2**	**1.3**
Cadmium	7440-43-9	0.1	mg/kg	**0.1**	<0.1	**0.2**	**0.3**	**0.3**
Bismuth	7440-69-9	0.1	mg/kg	**0.2**	**0.2**	**0.2**	**0.2**	**0.2**
Cobalt	7440-48-4	0.1	mg/kg	**10.6**	**9.8**	**10.3**	**10.4**	**10.5**

Analytical Results

Sub-Matrix: **SOIL**
(Matrix: **SOIL**)

			Client sample ID	**BH66502**	**BH66503**	**BH66504**	**BH66505**	**BH66506**
			Client sampling date / time	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00
Compound	*CAS Number*	*LOR*	*Unit*	**EB1922319-001**	**EB1922319-002**	**EB1922319-003**	**EB1922319-004**	**EB1922319-005**
				Result	Result	Result	Result	Result
EG020T: Total Metals by ICP-MS - Continued								
Chromium	7440-47-3	0.1	mg/kg	**28.5**	**30.6**	**30.0**	**31.2**	**29.1**
Copper	7440-50-8	0.1	mg/kg	**26.8**	**17.2**	**25.4**	**20.7**	**21.3**
Thorium	7440-29-1	0.1	mg/kg	**11.5**	**6.0**	**7.8**	**8.1**	**6.8**
Manganese	7439-96-5	0.1	mg/kg	**153**	**185**	**170**	**164**	**137**
Strontium	7440-24-6	0.1	mg/kg	**11.1**	**13.9**	**10.0**	**9.0**	**8.9**
Molybdenum	7439-98-7	0.1	mg/kg	**1.2**	**1.2**	**2.8**	**1.3**	**1.2**
Nickel	7440-02-0	0.1	mg/kg	**22.0**	**19.3**	**20.1**	**23.3**	**23.2**
Lead	7439-92-1	0.1	mg/kg	**32.3**	**23.6**	**47.3**	**58.7**	**58.7**
Antimony	7440-36-0	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Uranium	7440-61-1	0.1	mg/kg	**1.6**	**0.8**	**2.7**	**1.2**	**0.8**
Zinc	7440-66-6	0.5	mg/kg	**106**	**87.0**	**111**	**168**	**169**
Lithium	7439-93-2	0.1	mg/kg	**9.8**	**9.4**	**9.7**	**12.2**	**13.3**
Vanadium	7440-62-2	1	mg/kg	**26**	**29**	**27**	**29**	**30**
Tin	7440-31-5	0.1	mg/kg	**0.5**	**1.1**	**0.5**	**1.0**	**0.6**
EP003TC: Total Carbon (TC) in Soil								
Total Carbon	TC	0.02	%	<0.02	<0.02	**0.06**	**0.04**	**0.03**

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Client sample ID*	**BH66507**	**BH66508**	**BH66509**	**BH66510**	**BH66511**
			Client sampling date / time	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00
Compound	*CAS Number*	*LOR*	*Unit*	**EB1922319-006**	**EB1922319-007**	**EB1922319-008**	**EB1922319-009**	**EB1922319-010**
				Result	Result	Result	Result	Result
EA011: Net Acid Generation								
pH (OX)	----	0.1	pH Unit	**7.4**	----	----	**6.9**	**5.6**
NAG (pH 4.5)	----	0.1	kg H2SO4/t	<0.1	----	----	<0.1	<0.1
NAG (pH 7.0)	----	0.1	kg H2SO4/t	<0.1	----	----	**0.4**	**0.8**
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	**11.9**	----	----	**10.3**	**11.0**
ANC as CaCO3	----	0.1	% CaCO3	**1.2**	----	----	**1.0**	**1.1**
Fizz Rating	----	0	Fizz Unit	**1**	----	----	**1**	**1**
EA026 : Chromium Reducible Sulfur								
Chromium Reducible Sulphur	----	0.005	%	**0.045**	----	----	**0.065**	**0.135**
EA029-G: Retained Acidity								
HCl Extractable Sulfur (20Be)	----	0.020	% S	**0.300**	----	----	**0.332**	**0.946**
EA031: pH (saturated paste)								
ø **pH (Saturated Paste)**	----	0.1	pH Unit	**8.3**	**9.4**	**8.4**	**8.3**	**8.3**
EA032: Electrical Conductivity (saturated paste)								
ø **Electrical Conductivity (Saturated Paste)**	----	1	µS/cm	**456**	**1340**	**2580**	**571**	**454**
ED040: Sulfur as SO4 2-								
Sulfate as SO4 2-	14808-79-8	100	mg/kg	**360**	**4100**	**940**	**550**	**3640**
ED042T: Total Sulfur by LECO								
Sulfur - Total as S (LECO)	----	0.01	%	**0.04**	**0.22**	**0.12**	**0.07**	**0.14**
EG005(ED093)T: Total Metals by ICP-AES								
Aluminium	7429-90-5	50	mg/kg	**14900**	**13600**	**13400**	**15300**	**18200**
Boron	7440-42-8	50	mg/kg	<50	<50	<50	<50	<50
Iron	7439-89-6	50	mg/kg	**22700**	**24200**	**25200**	**25300**	**30400**
EG020T: Total Metals by ICP-MS								
Arsenic	7440-38-2	0.1	mg/kg	**3.7**	**165**	**14.3**	**9.0**	**2.5**
Selenium	7782-49-2	1	mg/kg	<1	<1	<1	<1	<1
Silver	7440-22-4	0.1	mg/kg	<0.1	**0.8**	**4.8**	**0.3**	**0.2**
Barium	7440-39-3	0.1	mg/kg	**67.2**	**67.8**	**61.7**	**87.0**	**105**
Thallium	7440-28-0	0.1	mg/kg	**0.8**	**1.1**	**0.9**	**1.0**	**1.3**
Beryllium	7440-41-7	0.1	mg/kg	**1.1**	**1.0**	**0.8**	**1.0**	**1.1**
Cadmium	7440-43-9	0.1	mg/kg	<0.1	**5.9**	**1.8**	**0.2**	**0.2**
Bismuth	7440-69-9	0.1	mg/kg	**0.2**	**0.4**	**0.4**	**0.2**	**0.3**
Cobalt	7440-48-4	0.1	mg/kg	**9.1**	**10.8**	**9.7**	**11.6**	**12.9**

Analytical Results

Sub-Matrix: **SOIL**
(Matrix: **SOIL**)

			Client sample ID	**BH66507**	**BH66508**	**BH66509**	**BH66510**	**BH66511**
			Client sampling date / time	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00
Compound	CAS Number	LOR	Unit	**EB1922319-006**	**EB1922319-007**	**EB1922319-008**	**EB1922319-009**	**EB1922319-010**
				Result	Result	Result	Result	Result
EG020T: Total Metals by ICP-MS - Continued								
Chromium	7440-47-3	0.1	mg/kg	**29.8**	**25.1**	**22.7**	**28.0**	**32.4**
Copper	7440-50-8	0.1	mg/kg	**20.3**	**55.5**	**178**	**27.2**	**57.0**
Thorium	7440-29-1	0.1	mg/kg	**6.9**	**7.5**	**10.3**	**8.0**	**6.7**
Manganese	7439-96-5	0.1	mg/kg	**136**	**165**	**368**	**184**	**138**
Strontium	7440-24-6	0.1	mg/kg	**8.1**	**7.7**	**11.0**	**7.6**	**5.9**
Molybdenum	7439-98-7	0.1	mg/kg	**2.2**	**6.2**	**4.3**	**1.2**	**1.1**
Nickel	7440-02-0	0.1	mg/kg	**20.1**	**20.0**	**21.5**	**25.5**	**27.2**
Lead	7439-92-1	0.1	mg/kg	**27.9**	**599**	**482**	**41.9**	**31.7**
Antimony	7440-36-0	0.1	mg/kg	<0.1	**0.2**	**0.8**	<0.1	<0.1
Uranium	7440-61-1	0.1	mg/kg	**0.8**	**1.1**	**2.2**	**2.4**	**0.8**
Zinc	7440-66-6	0.5	mg/kg	**86.5**	**1040**	**538**	**101**	**120**
Lithium	7439-93-2	0.1	mg/kg	**12.7**	**12.3**	**9.2**	**12.8**	**14.0**
Vanadium	7440-62-2	1	mg/kg	**26**	**25**	**20**	**27**	**32**
Tin	7440-31-5	0.1	mg/kg	**0.8**	**0.6**	**1.0**	**0.5**	**1.0**
EP003TC: Total Carbon (TC) in Soil								
Total Carbon	TC	0.02	%	**0.03**	**0.03**	**0.10**	**0.02**	<0.02

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Client sample ID*	**BH66512**	**BH66513**	**BH66514**	**BH66515**	**BH66516**
			Client sampling date / time	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00
Compound	*CAS Number*	*LOR*	*Unit*	**EB1922319-011**	**EB1922319-012**	**EB1922319-013**	**EB1922319-014**	**EB1922319-015**
				Result	Result	Result	Result	Result
EA011: Net Acid Generation								
pH (OX)	----	0.1	pH Unit	**5.6**	**7.2**	**6.5**	**5.0**	**3.9**
NAG (pH 4.5)	----	0.1	kg H2SO4/t	<0.1	<0.1	<0.1	<0.1	**1.2**
NAG (pH 7.0)	----	0.1	kg H2SO4/t	**0.8**	<0.1	**0.7**	**1.2**	**4.1**
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	**11.2**	**8.4**	**9.4**	**14.3**	**12.1**
ANC as CaCO3	----	0.1	% CaCO3	**1.1**	**0.9**	**1.0**	**1.5**	**1.2**
Fizz Rating	----	0	Fizz Unit	**1**	**1**	**1**	**1**	**1**
EA026 : Chromium Reducible Sulfur								
Chromium Reducible Sulphur	----	0.005	%	**0.137**	**0.046**	**0.075**	----	**0.274**
EA029-G: Retained Acidity								
HCl Extractable Sulfur (20Be)	----	0.020	% S	**1.06**	**0.216**	**0.367**	----	**0.565**
EA031: pH (saturated paste)								
ø **pH (Saturated Paste)**	----	0.1	pH Unit	**8.2**	**8.4**	**8.4**	**8.4**	**8.3**
EA032: Electrical Conductivity (saturated paste)								
ø **Electrical Conductivity (Saturated Paste)**	----	1	µS/cm	**801**	**305**	**278**	**362**	**828**
ED040: Sulfur as SO4 2-								
Sulfate as SO4 2-	14808-79-8	100	mg/kg	**5240**	**410**	**480**	**3770**	**3600**
ED042T: Total Sulfur by LECO								
Sulfur - Total as S (LECO)	----	0.01	%	**0.14**	**0.04**	**0.07**	**0.24**	**0.29**
EG005(ED093)T: Total Metals by ICP-AES								
Aluminium	7429-90-5	50	mg/kg	**15100**	**12400**	**13000**	**13700**	**18800**
Boron	7440-42-8	50	mg/kg	<50	<50	<50	<50	<50
Iron	7439-89-6	50	mg/kg	**25700**	**24400**	**25600**	**29000**	**32900**
EG020T: Total Metals by ICP-MS								
Arsenic	7440-38-2	0.1	mg/kg	**5.2**	**1.0**	**0.9**	**1.2**	**7.2**
Selenium	7782-49-2	1	mg/kg	<1	<1	<1	<1	<1
Silver	7440-22-4	0.1	mg/kg	**1.2**	**0.1**	**0.1**	**0.2**	**0.2**
Barium	7440-39-3	0.1	mg/kg	**89.9**	**123**	**105**	**99.8**	**141**
Thallium	7440-28-0	0.1	mg/kg	**1.2**	**0.8**	**0.9**	**0.8**	**1.1**
Beryllium	7440-41-7	0.1	mg/kg	**0.8**	**0.8**	**0.6**	**0.5**	**0.7**
Cadmium	7440-43-9	0.1	mg/kg	**0.2**	<0.1	**0.1**	<0.1	**0.2**
Bismuth	7440-69-9	0.1	mg/kg	**0.4**	**0.5**	**0.2**	**0.2**	**0.2**
Cobalt	7440-48-4	0.1	mg/kg	**10.9**	**8.4**	**9.9**	**11.8**	**15.2**

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Client sample ID*	**BH66512**	**BH66513**	**BH66514**	**BH66515**	**BH66516**
			Client sampling date / time	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00
Compound	*CAS Number*	*LOR*	*Unit*	**EB1922319-011**	**EB1922319-012**	**EB1922319-013**	**EB1922319-014**	**EB1922319-015**
				Result	Result	Result	Result	Result
EG020T: Total Metals by ICP-MS - Continued								
Chromium	7440-47-3	0.1	mg/kg	**26.9**	**28.3**	**23.1**	**24.5**	**28.3**
Copper	7440-50-8	0.1	mg/kg	**44.1**	**31.6**	**28.7**	**59.0**	**71.5**
Thorium	7440-29-1	0.1	mg/kg	**12.1**	**6.0**	**11.2**	**6.8**	**7.0**
Manganese	7439-96-5	0.1	mg/kg	**220**	**129**	**117**	**171**	**147**
Strontium	7440-24-6	0.1	mg/kg	**8.8**	**4.4**	**4.2**	**6.7**	**10.3**
Molybdenum	7439-98-7	0.1	mg/kg	**1.2**	**1.5**	**1.1**	**1.6**	**1.3**
Nickel	7440-02-0	0.1	mg/kg	**23.2**	**18.0**	**20.3**	**19.7**	**28.5**
Lead	7439-92-1	0.1	mg/kg	**185**	**15.6**	**16.1**	**24.1**	**30.4**
Antimony	7440-36-0	0.1	mg/kg	**0.3**	<0.1	<0.1	<0.1	<0.1
Uranium	7440-61-1	0.1	mg/kg	**8.1**	**0.8**	**1.1**	**1.1**	**1.2**
Zinc	7440-66-6	0.5	mg/kg	**110**	**65.5**	**69.0**	**62.5**	**91.3**
Lithium	7439-93-2	0.1	mg/kg	**11.0**	**13.2**	**12.0**	**14.3**	**18.4**
Vanadium	7440-62-2	1	mg/kg	**24**	**20**	**20**	**19**	**33**
Tin	7440-31-5	0.1	mg/kg	**0.5**	**0.7**	**0.5**	**0.6**	**0.4**
EP003TC: Total Carbon (TC) in Soil								
Total Carbon	TC	0.02	%	<0.02	**0.07**	<0.02	**0.08**	**0.03**

Analytical Results

Sub-Matrix: **SOIL**
(Matrix: **SOIL**)

			Client sample ID	**BH66517**	**BH66518**	**BH66519**	**BH66520**	**BH66521**
			Client sampling date / time	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00
Compound	*CAS Number*	*LOR*	*Unit*	**EB1922319-016**	**EB1922319-017**	**EB1922319-018**	**EB1922319-019**	**EB1922319-020**
				Result	Result	Result	Result	Result
EA011: Net Acid Generation								
pH (OX)	----	0.1	pH Unit	**3.4**	----	----	----	----
NAG (pH 4.5)	----	0.1	kg H2SO4/t	**4.6**	----	----	----	----
NAG (pH 7.0)	----	0.1	kg H2SO4/t	**9.8**	----	----	----	----
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	**10.7**	----	----	----	----
ANC as CaCO3	----	0.1	% CaCO3	**1.1**	----	----	----	----
Fizz Rating	----	0	Fizz Unit	**1**	----	----	----	----
EA031: pH (saturated paste)								
ø **pH (Saturated Paste)**	----	0.1	pH Unit	**8.1**	**8.3**	**8.1**	**8.7**	**8.4**
EA032: Electrical Conductivity (saturated paste)								
ø **Electrical Conductivity (Saturated Paste)**	----	1	µS/cm	**958**	**427**	**622**	**296**	**666**
ED040: Sulfur as SO4 2-								
Sulfate as SO4 2-	14808-79-8	100	mg/kg	**6920**	**6620**	**5060**	**6780**	**1390**
ED042T: Total Sulfur by LECO								
Sulfur - Total as S (LECO)	----	0.01	%	**0.56**	**0.24**	**0.42**	**0.24**	**0.07**
EG005(ED093)T: Total Metals by ICP-AES								
Aluminium	7429-90-5	50	mg/kg	**13500**	**13600**	**12900**	**15600**	**14400**
Boron	7440-42-8	50	mg/kg	<50	<50	<50	<50	<50
Iron	7439-89-6	50	mg/kg	**31200**	**27400**	**29600**	**31800**	**25000**
EG020T: Total Metals by ICP-MS								
Arsenic	7440-38-2	0.1	mg/kg	**96.5**	**40.3**	**31.7**	**2.4**	**8.3**
Selenium	7782-49-2	1	mg/kg	<1	<1	<1	<1	<1
Silver	7440-22-4	0.1	mg/kg	**2.4**	**0.4**	**0.7**	**0.1**	**0.1**
Barium	7440-39-3	0.1	mg/kg	**88.0**	**89.5**	**58.8**	**131**	**97.5**
Thallium	7440-28-0	0.1	mg/kg	**1.7**	**1.6**	**1.9**	**0.8**	**0.8**
Beryllium	7440-41-7	0.1	mg/kg	**0.6**	**0.6**	**0.3**	**0.7**	**0.6**
Cadmium	7440-43-9	0.1	mg/kg	**3.5**	**1.4**	**0.6**	**0.2**	**0.1**
Bismuth	7440-69-9	0.1	mg/kg	**0.9**	**0.2**	**0.3**	**17.2**	**0.2**
Cobalt	7440-48-4	0.1	mg/kg	**15.4**	**11.8**	**14.6**	**11.7**	**9.8**
Chromium	7440-47-3	0.1	mg/kg	**20.8**	**21.9**	**20.3**	**29.6**	**28.0**
Copper	7440-50-8	0.1	mg/kg	**148**	**90.5**	**226**	**46.6**	**26.6**
Thorium	7440-29-1	0.1	mg/kg	**13.5**	**11.9**	**15.0**	**10.6**	**8.0**
Manganese	7439-96-5	0.1	mg/kg	**245**	**225**	**225**	**156**	**160**

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			Client sample ID	**BH66517**	**BH66518**	**BH66519**	**BH66520**	**BH66521**
			Client sampling date / time	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00
Compound	*CAS Number*	*LOR*	*Unit*	**EB1922319-016**	**EB1922319-017**	**EB1922319-018**	**EB1922319-019**	**EB1922319-020**
				Result	Result	Result	Result	Result
EG020T: Total Metals by ICP-MS - Continued								
Strontium	7440-24-6	0.1	mg/kg	**3.9**	**5.4**	**4.3**	**7.5**	**8.4**
Molybdenum	7439-98-7	0.1	mg/kg	**1.0**	**1.6**	**1.0**	**1.3**	**1.1**
Nickel	7440-02-0	0.1	mg/kg	**23.8**	**22.1**	**26.5**	**24.6**	**23.2**
Lead	7439-92-1	0.1	mg/kg	**1620**	**273**	**290**	**32.9**	**26.8**
Antimony	7440-36-0	0.1	mg/kg	**0.4**	<0.1	**0.1**	<0.1	<0.1
Uranium	7440-61-1	0.1	mg/kg	**3.0**	**1.7**	**2.0**	**1.0**	**2.6**
Zinc	7440-66-6	0.5	mg/kg	**617**	**430**	**212**	**105**	**89.6**
Lithium	7439-93-2	0.1	mg/kg	**9.4**	**8.9**	**8.2**	**12.7**	**9.5**
Vanadium	7440-62-2	1	mg/kg	**19**	**22**	**15**	**25**	**23**
Tin	7440-31-5	0.1	mg/kg	**1.3**	**0.5**	**0.8**	**0.3**	**0.6**
EP003TC: Total Carbon (TC) in Soil								
Total Carbon	TC	0.02	%	<0.02	<0.02	<0.02	**0.03**	<0.02

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH66522	BH66523	BH66524	BH66525	BH66526
			Client sampling date / time	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00
Compound	CAS Number	LOR	Unit	EB1922319-021	EB1922319-022	EB1922319-023	EB1922319-024	EB1922319-025
				Result	Result	Result	Result	Result
EA011: Net Acid Generation								
pH (OX)	----	0.1	pH Unit	----	----	----	----	7.4
NAG (pH 4.5)	----	0.1	kg H2SO4/t	----	----	----	----	<0.1
NAG (pH 7.0)	----	0.1	kg H2SO4/t	----	----	----	----	<0.1
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	----	----	----	----	11.6
ANC as CaCO3	----	0.1	% CaCO3	----	----	----	----	1.2
Fizz Rating	----	0	Fizz Unit	----	----	----	----	1
EA026 : Chromium Reducible Sulfur								
Chromium Reducible Sulphur	----	0.005	%	----	----	----	----	0.046
EA029-G: Retained Acidity								
HCl Extractable Sulfur (20Be)	----	0.020	% S	----	----	----	----	0.186
EA031: pH (saturated paste)								
ø pH (Saturated Paste)	----	0.1	pH Unit	8.3	8.0	8.3	8.2	8.3
EA032: Electrical Conductivity (saturated paste)								
ø Electrical Conductivity (Saturated Paste)	----	1	µS/cm	1260	1810	1020	740	1040
ED040: Sulfur as SO4 2-								
Sulfate as SO4 2-	14808-79-8	100	mg/kg	2260	2480	2260	1880	450
ED042T: Total Sulfur by LECO								
Sulfur - Total as S (LECO)	----	0.01	%	0.14	0.25	0.10	0.12	0.04
EG005(ED093)T: Total Metals by ICP-AES								
Aluminium	7429-90-5	50	mg/kg	16800	13100	16500	17200	17100
Boron	7440-42-8	50	mg/kg	<50	<50	<50	<50	<50
Iron	7439-89-6	50	mg/kg	29500	27100	30000	25600	27200
EG020T: Total Metals by ICP-MS								
Arsenic	7440-38-2	0.1	mg/kg	0.6	21.2	0.9	11.7	2.9
Selenium	7782-49-2	1	mg/kg	<1	<1	<1	<1	<1
Silver	7440-22-4	0.1	mg/kg	<0.1	0.5	<0.1	0.2	0.1
Barium	7440-39-3	0.1	mg/kg	145	93.5	136	67.0	50.8
Thallium	7440-28-0	0.1	mg/kg	0.9	1.0	0.8	0.9	1.2
Beryllium	7440-41-7	0.1	mg/kg	0.6	0.6	0.8	0.9	0.9
Cadmium	7440-43-9	0.1	mg/kg	0.1	2.1	0.1	0.4	0.1
Bismuth	7440-69-9	0.1	mg/kg	0.2	0.6	0.2	0.4	0.2
Cobalt	7440-48-4	0.1	mg/kg	11.3	10.8	11.3	9.9	11.0

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Client sample ID*	**BH66522**	**BH66523**	**BH66524**	**BH66525**	**BH66526**
			Client sampling date / time	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00
Compound	*CAS Number*	*LOR*	*Unit*	**EB1922319-021**	**EB1922319-022**	**EB1922319-023**	**EB1922319-024**	**EB1922319-025**
				Result	Result	Result	Result	Result
EG020T: Total Metals by ICP-MS - Continued								
Chromium	7440-47-3	0.1	mg/kg	**31.5**	**24.6**	**32.1**	**25.9**	**29.9**
Copper	7440-50-8	0.1	mg/kg	**27.1**	**35.8**	**25.7**	**39.0**	**14.1**
Thorium	7440-29-1	0.1	mg/kg	**14.1**	**13.5**	**11.9**	**10.3**	**12.4**
Manganese	7439-96-5	0.1	mg/kg	**158**	**202**	**153**	**175**	**179**
Strontium	7440-24-6	0.1	mg/kg	**8.0**	**7.8**	**8.7**	**11.0**	**8.8**
Molybdenum	7439-98-7	0.1	mg/kg	**1.4**	**1.3**	**1.2**	**1.1**	**0.9**
Nickel	7440-02-0	0.1	mg/kg	**23.3**	**20.0**	**26.0**	**22.1**	**25.5**
Lead	7439-92-1	0.1	mg/kg	**15.0**	**256**	**12.9**	**82.6**	**34.6**
Antimony	7440-36-0	0.1	mg/kg	<0.1	**0.1**	<0.1	<0.1	<0.1
Uranium	7440-61-1	0.1	mg/kg	**1.0**	**1.1**	**1.1**	**1.7**	**1.3**
Zinc	7440-66-6	0.5	mg/kg	**102**	**667**	**95.3**	**165**	**105**
Lithium	7439-93-2	0.1	mg/kg	**11.6**	**10.0**	**11.5**	**9.9**	**11.1**
Vanadium	7440-62-2	1	mg/kg	**28**	**23**	**26**	**22**	**27**
Tin	7440-31-5	0.1	mg/kg	**0.4**	**1.0**	**0.3**	**0.7**	**0.4**
EP003TC: Total Carbon (TC) in Soil								
Total Carbon	TC	0.02	%	**0.02**	**0.02**	**0.03**	<0.02	**0.03**

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Client sample ID*	**BH66527**	**BH66528**	**BH66529**	**BH66530**	**BH66531**
			Client sampling date / time	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00
Compound	*CAS Number*	*LOR*	*Unit*	**EB1922319-026**	**EB1922319-027**	**EB1922319-028**	**EB1922319-029**	**EB1922319-030**
				Result	Result	Result	Result	Result
EA011: Net Acid Generation								
pH (OX)	----	0.1	pH Unit	----	----	----	**3.8**	**7.1**
NAG (pH 4.5)	----	0.1	kg H2SO4/t	----	----	----	**1.3**	<0.1
NAG (pH 7.0)	----	0.1	kg H2SO4/t	----	----	----	**3.3**	<0.1
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	----	----	----	**9.4**	**16.1**
ANC as CaCO3	----	0.1	% CaCO3	----	----	----	**1.0**	**1.6**
Fizz Rating	----	0	Fizz Unit	----	----	----	**1**	**1**
EA031: pH (saturated paste)								
ø **pH (Saturated Paste)**	----	0.1	pH Unit	**8.3**	**8.6**	**8.8**	**8.4**	**9.6**
EA032: Electrical Conductivity (saturated paste)								
ø **Electrical Conductivity (Saturated Paste)**	----	1	µS/cm	**1320**	**589**	**308**	**413**	**1030**
ED040: Sulfur as SO4 2-								
Sulfate as SO4 2-	14808-79-8	100	mg/kg	**400**	**3760**	**1680**	**5530**	**2850**
ED042T: Total Sulfur by LECO								
Sulfur - Total as S (LECO)	----	0.01	%	**0.05**	**0.16**	**0.14**	**0.20**	**0.15**
EG005(ED093)T: Total Metals by ICP-AES								
Aluminium	7429-90-5	50	mg/kg	**17000**	**17100**	**16000**	**14000**	**13800**
Boron	7440-42-8	50	mg/kg	<50	<50	<50	<50	<50
Iron	7439-89-6	50	mg/kg	**21500**	**24800**	**32700**	**28800**	**28100**
EG020T: Total Metals by ICP-MS								
Arsenic	7440-38-2	0.1	mg/kg	**6.3**	**1.0**	**1.1**	**10.4**	**18.5**
Selenium	7782-49-2	1	mg/kg	<1	<1	<1	<1	<1
Silver	7440-22-4	0.1	mg/kg	**0.3**	**0.1**	**0.1**	**0.4**	**0.6**
Barium	7440-39-3	0.1	mg/kg	**46.6**	**96.9**	**120**	**78.3**	**94.7**
Thallium	7440-28-0	0.1	mg/kg	**1.2**	**0.8**	**0.8**	**1.6**	**1.2**
Beryllium	7440-41-7	0.1	mg/kg	**0.7**	**0.8**	**0.9**	**1.0**	**0.6**
Cadmium	7440-43-9	0.1	mg/kg	**0.2**	**0.1**	**0.1**	**0.3**	**0.6**
Bismuth	7440-69-9	0.1	mg/kg	**0.2**	**0.2**	**0.3**	**0.5**	**0.5**
Cobalt	7440-48-4	0.1	mg/kg	**7.7**	**9.7**	**10.7**	**10.8**	**10.2**
Chromium	7440-47-3	0.1	mg/kg	**25.2**	**23.1**	**31.5**	**23.1**	**24.1**
Copper	7440-50-8	0.1	mg/kg	**15.4**	**30.8**	**50.0**	**112**	**50.4**
Thorium	7440-29-1	0.1	mg/kg	**8.1**	**13.5**	**26.2**	**19.9**	**15.5**
Manganese	7439-96-5	0.1	mg/kg	**178**	**155**	**138**	**208**	**203**

Analytical Results

Sub-Matrix: **SOIL**
(Matrix: **SOIL)**

			Client sample ID	**BH66527**	**BH66528**	**BH66529**	**BH66530**	**BH66531**
			Client sampling date / time	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00
Compound	CAS Number	LOR	Unit	**EB1922319-026**	**EB1922319-027**	**EB1922319-028**	**EB1922319-029**	**EB1922319-030**
				Result	Result	Result	Result	Result
EG020T: Total Metals by ICP-MS - Continued								
Strontium	7440-24-6	0.1	mg/kg	**10.2**	**10.1**	**5.7**	**4.3**	**6.6**
Molybdenum	7439-98-7	0.1	mg/kg	**1.1**	**2.7**	**11.3**	**2.6**	**1.5**
Nickel	7440-02-0	0.1	mg/kg	**18.6**	**21.2**	**24.3**	**26.7**	**20.8**
Lead	7439-92-1	0.1	mg/kg	**211**	**31.7**	**20.0**	**157**	**458**
Antimony	7440-36-0	0.1	mg/kg	<0.1	<0.1	<0.1	**0.1**	<0.1
Uranium	7440-61-1	0.1	mg/kg	**5.7**	**5.7**	**2.3**	**1.9**	**1.2**
Zinc	7440-66-6	0.5	mg/kg	**103**	**82.4**	**86.6**	**124**	**192**
Lithium	7439-93-2	0.1	mg/kg	**7.8**	**9.6**	**14.7**	**10.2**	**9.8**
Vanadium	7440-62-2	1	mg/kg	**23**	**21**	**22**	**18**	**20**
Tin	7440-31-5	0.1	mg/kg	**0.9**	**0.4**	**0.7**	**0.5**	**0.7**
EP003TC: Total Carbon (TC) in Soil								
Total Carbon	TC	0.02	%	<0.02	**0.03**	**0.05**	<0.02	**0.06**

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Client sample ID*	**BH66532**	**BH66533**	**BH66534**	**BH66535**	**BH66536**
			Client sampling date / time	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00
Compound	*CAS Number*	*LOR*	*Unit*	**EB1922319-031**	**EB1922319-032**	**EB1922319-033**	**EB1922319-034**	**EB1922319-035**
				Result	Result	Result	Result	Result
EA011: Net Acid Generation								
pH (OX)	----	0.1	pH Unit	**4.8**	**3.7**	**4.7**	**6.2**	----
NAG (pH 4.5)	----	0.1	kg H2SO4/t	<0.1	**1.4**	<0.1	<0.1	----
NAG (pH 7.0)	----	0.1	kg H2SO4/t	**1.4**	**3.2**	**1.7**	**0.6**	----
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	**12.8**	**11.4**	**15.6**	**13.7**	----
ANC as CaCO3	----	0.1	% CaCO3	**1.3**	**1.2**	**1.6**	**1.4**	----
Fizz Rating	----	0	Fizz Unit	**1**	**1**	**1**	**1**	----
EA031: pH (saturated paste)								
ø **pH (Saturated Paste)**	----	0.1	pH Unit	**9.0**	**8.5**	**8.5**	**8.6**	**8.7**
EA032: Electrical Conductivity (saturated paste)								
ø **Electrical Conductivity (Saturated Paste)**	----	1	µS/cm	**388**	**428**	**583**	**415**	**581**
ED040: Sulfur as SO4 2-								
Sulfate as SO4 2-	14808-79-8	100	mg/kg	**2500**	**4270**	**5730**	**880**	**6060**
ED042T: Total Sulfur by LECO								
Sulfur - Total as S (LECO)	----	0.01	%	**0.18**	**0.24**	**0.25**	**0.08**	**0.19**
EG005(ED093)T: Total Metals by ICP-AES								
Aluminium	7429-90-5	50	mg/kg	**14100**	**13400**	**13700**	**15300**	**14600**
Boron	7440-42-8	50	mg/kg	<50	<50	<50	<50	<50
Iron	7439-89-6	50	mg/kg	**28000**	**29700**	**25500**	**16200**	**25500**
EG020T: Total Metals by ICP-MS								
Arsenic	7440-38-2	0.1	mg/kg	**0.6**	**74.7**	**16.4**	**4.2**	**55.6**
Selenium	7782-49-2	1	mg/kg	<1	<1	<1	<1	<1
Silver	7440-22-4	0.1	mg/kg	<0.1	**0.4**	**1.0**	**0.2**	**1.1**
Barium	7440-39-3	0.1	mg/kg	**109**	**96.4**	**64.1**	**36.3**	**92.7**
Thallium	7440-28-0	0.1	mg/kg	**0.7**	**1.3**	**1.0**	**0.7**	**1.5**
Beryllium	7440-41-7	0.1	mg/kg	**1.1**	**0.7**	**0.7**	**0.6**	**0.8**
Cadmium	7440-43-9	0.1	mg/kg	<0.1	**0.3**	**1.2**	**0.4**	**4.1**
Bismuth	7440-69-9	0.1	mg/kg	**0.2**	**0.4**	**0.6**	**0.2**	**0.8**
Cobalt	7440-48-4	0.1	mg/kg	**12.4**	**14.9**	**10.5**	**6.1**	**11.8**
Chromium	7440-47-3	0.1	mg/kg	**31.1**	**25.2**	**22.0**	**21.0**	**29.7**
Copper	7440-50-8	0.1	mg/kg	**39.6**	**110**	**97.0**	**28.3**	**48.0**
Thorium	7440-29-1	0.1	mg/kg	**7.9**	**16.1**	**15.0**	**11.8**	**11.3**
Manganese	7439-96-5	0.1	mg/kg	**136**	**173**	**182**	**161**	**195**

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			Client sample ID	**BH66532**	**BH66533**	**BH66534**	**BH66535**	**BH66536**
			Client sampling date / time	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00
Compound	CAS Number	LOR	Unit	**EB1922319-031**	**EB1922319-032**	**EB1922319-033**	**EB1922319-034**	**EB1922319-035**
				Result	Result	Result	Result	Result
EG020T: Total Metals by ICP-MS - Continued								
Strontium	7440-24-6	0.1	mg/kg	**6.7**	**4.5**	**8.6**	**11.5**	**14.0**
Molybdenum	7439-98-7	0.1	mg/kg	**1.6**	**5.2**	**1.1**	**1.1**	**1.3**
Nickel	7440-02-0	0.1	mg/kg	**26.5**	**21.7**	**20.9**	**12.5**	**19.2**
Lead	7439-92-1	0.1	mg/kg	**11.0**	**226**	**612**	**128**	**794**
Antimony	7440-36-0	0.1	mg/kg	<0.1	<0.1	**0.1**	<0.1	**0.2**
Uranium	7440-61-1	0.1	mg/kg	**0.8**	**1.7**	**8.7**	**10.0**	**1.6**
Zinc	7440-66-6	0.5	mg/kg	**84.1**	**118**	**369**	**110**	**812**
Lithium	7439-93-2	0.1	mg/kg	**12.4**	**11.7**	**9.6**	**6.9**	**7.7**
Vanadium	7440-62-2	1	mg/kg	**30**	**20**	**20**	**16**	**25**
Tin	7440-31-5	0.1	mg/kg	**0.4**	**0.8**	**0.6**	**0.6**	**0.5**
EP003TC: Total Carbon (TC) in Soil								
Total Carbon	TC	0.02	%	**0.03**	**0.03**	**0.05**	**0.02**	**0.03**

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Client sample ID*	**BH66537**	**BH66538**	**BH66539**	**BH66540**	**BH66541**
			Client sampling date / time	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00
Compound	*CAS Number*	*LOR*	*Unit*	**EB1922319-036**	**EB1922319-037**	**EB1922319-038**	**EB1922319-039**	**EB1922319-040**
				Result	Result	Result	Result	Result
EA031: pH (saturated paste)								
ø pH (Saturated Paste)	----	0.1	pH Unit	**8.6**	**9.1**	**8.9**	**8.8**	**10.2**
EA032: Electrical Conductivity (saturated paste)								
ø Electrical Conductivity (Saturated Paste)	----	1	µS/cm	**553**	**1310**	**476**	**785**	**615**
ED040: Sulfur as SO4 2-								
Sulfate as SO4 2-	14808-79-8	100	mg/kg	**5040**	**4240**	**1550**	**3260**	**3740**
ED042T: Total Sulfur by LECO								
Sulfur - Total as S (LECO)	----	0.01	%	**0.28**	**0.25**	**0.09**	**0.15**	**0.18**
EG005(ED093)T: Total Metals by ICP-AES								
Aluminium	7429-90-5	50	mg/kg	**15700**	**16600**	**14400**	**13900**	**14300**
Boron	7440-42-8	50	mg/kg	<50	<50	<50	<50	<50
Iron	7439-89-6	50	mg/kg	**25400**	**25100**	**23200**	**22400**	**27700**
EG020T: Total Metals by ICP-MS								
Arsenic	7440-38-2	0.1	mg/kg	**50.1**	**23.5**	**5.4**	**7.3**	**11.0**
Selenium	7782-49-2	1	mg/kg	<1	<1	<1	<1	<1
Silver	7440-22-4	0.1	mg/kg	**3.1**	**0.3**	**0.4**	**0.1**	**1.5**
Barium	7440-39-3	0.1	mg/kg	**47.4**	**75.4**	**63.0**	**70.1**	**85.1**
Thallium	7440-28-0	0.1	mg/kg	**1.1**	**0.8**	**0.9**	**0.7**	**1.0**
Beryllium	7440-41-7	0.1	mg/kg	**0.8**	**1.0**	**0.9**	**0.8**	**0.9**
Cadmium	7440-43-9	0.1	mg/kg	**1.4**	**6.6**	**0.4**	**0.2**	**1.9**
Bismuth	7440-69-9	0.1	mg/kg	**8.0**	**0.3**	**0.5**	**0.2**	**1.2**
Cobalt	7440-48-4	0.1	mg/kg	**9.7**	**11.5**	**9.5**	**8.8**	**10.6**
Chromium	7440-47-3	0.1	mg/kg	**23.8**	**27.4**	**26.1**	**21.8**	**26.5**
Copper	7440-50-8	0.1	mg/kg	**37.9**	**33.3**	**22.1**	**28.5**	**124**
Thorium	7440-29-1	0.1	mg/kg	**8.2**	**6.8**	**6.6**	**7.7**	**7.2**
Manganese	7439-96-5	0.1	mg/kg	**198**	**158**	**168**	**132**	**156**
Strontium	7440-24-6	0.1	mg/kg	**15.3**	**12.0**	**13.4**	**10.9**	**9.8**
Molybdenum	7439-98-7	0.1	mg/kg	**1.4**	**1.5**	**1.4**	**1.8**	**1.4**
Nickel	7440-02-0	0.1	mg/kg	**16.8**	**23.6**	**19.5**	**19.1**	**21.8**
Lead	7439-92-1	0.1	mg/kg	**2670**	**162**	**279**	**70.1**	**637**
Antimony	7440-36-0	0.1	mg/kg	**0.7**	<0.1	<0.1	<0.1	**0.2**
Uranium	7440-61-1	0.1	mg/kg	**3.8**	**1.8**	**3.0**	**2.4**	**1.2**
Zinc	7440-66-6	0.5	mg/kg	**338**	**1130**	**182**	**115**	**621**
Lithium	7439-93-2	0.1	mg/kg	**9.5**	**10.0**	**9.3**	**8.3**	**10.8**
Vanadium	7440-62-2	1	mg/kg	**21**	**26**	**22**	**23**	**29**

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL)**			*Client sample ID*	**BH66537**	**BH66538**	**BH66539**	**BH66540**	**BH66541**
			Client sampling date / time	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00
Compound	*CAS Number*	*LOR*	*Unit*	**EB1922319-036**	**EB1922319-037**	**EB1922319-038**	**EB1922319-039**	**EB1922319-040**
				Result	Result	Result	Result	Result
EG020T: Total Metals by ICP-MS - Continued								
Tin	7440-31-5	0.1	mg/kg	**1.0**	**0.4**	**0.7**	**0.4**	**1.1**
EP003TC: Total Carbon (TC) in Soil								
Total Carbon	TC	0.02	%	**0.06**	**0.04**	**0.07**	**0.02**	**0.04**

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Client sample ID*	**BH66542**	**BH66543**	**BH66544**	**BH66545**	**BH66546**
			Client sampling date / time	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00
Compound	*CAS Number*	*LOR*	*Unit*	**EB1922319-041**	**EB1922319-042**	**EB1922319-043**	**EB1922319-044**	**EB1922319-045**
				Result	Result	Result	Result	Result
EA031: pH (saturated paste)								
ø pH (Saturated Paste)	----	0.1	pH Unit	**9.0**	**9.3**	**8.8**	**8.7**	**8.4**
EA032: Electrical Conductivity (saturated paste)								
ø Electrical Conductivity (Saturated Paste)	----	1	µS/cm	**476**	**484**	**289**	**301**	**664**
ED040: Sulfur as SO4 2-								
Sulfate as SO4 2-	14808-79-8	100	mg/kg	**4600**	**36000**	**6590**	**6110**	**11800**
ED042T: Total Sulfur by LECO								
Sulfur - Total as S (LECO)	----	0.01	%	**0.07**	**1.14**	**0.24**	**0.15**	**0.29**
EG005(ED093)T: Total Metals by ICP-AES								
Aluminium	7429-90-5	50	mg/kg	**13700**	**14300**	**15300**	**17200**	**15500**
Boron	7440-42-8	50	mg/kg	<50	<50	<50	<50	<50
Iron	7439-89-6	50	mg/kg	**19700**	**28800**	**32900**	**36200**	**33900**
EG020T: Total Metals by ICP-MS								
Arsenic	7440-38-2	0.1	mg/kg	**14.2**	**149**	**1.7**	**1.6**	**1.3**
Selenium	7782-49-2	1	mg/kg	<1	**2**	<1	<1	<1
Silver	7440-22-4	0.1	mg/kg	**0.2**	**16.7**	**0.3**	**0.2**	**0.2**
Barium	7440-39-3	0.1	mg/kg	**83.6**	**44.9**	**110**	**93.4**	**116**
Thallium	7440-28-0	0.1	mg/kg	**0.8**	**1.8**	**0.8**	**0.7**	**0.8**
Beryllium	7440-41-7	0.1	mg/kg	**0.8**	**0.9**	**0.9**	**1.6**	**1.2**
Cadmium	7440-43-9	0.1	mg/kg	**0.3**	**27.3**	**0.1**	**0.2**	**0.2**
Bismuth	7440-69-9	0.1	mg/kg	**0.3**	**21.2**	**0.7**	**0.3**	**0.4**
Cobalt	7440-48-4	0.1	mg/kg	**9.2**	**13.6**	**11.0**	**10.6**	**13.4**
Chromium	7440-47-3	0.1	mg/kg	**25.6**	**17.0**	**28.0**	**25.7**	**28.8**
Copper	7440-50-8	0.1	mg/kg	**23.4**	**141**	**78.9**	**70.2**	**99.4**
Thorium	7440-29-1	0.1	mg/kg	**8.0**	**6.8**	**29.5**	**36.0**	**20.1**
Manganese	7439-96-5	0.1	mg/kg	**148**	**238**	**119**	**139**	**110**
Strontium	7440-24-6	0.1	mg/kg	**10.4**	**10.8**	**3.4**	**5.6**	**3.2**
Molybdenum	7439-98-7	0.1	mg/kg	**1.2**	**1.3**	**34.6**	**14.6**	**25.0**
Nickel	7440-02-0	0.1	mg/kg	**19.1**	**14.1**	**27.2**	**23.0**	**30.2**
Lead	7439-92-1	0.1	mg/kg	**92.0**	**8740**	**51.0**	**37.6**	**29.4**
Antimony	7440-36-0	0.1	mg/kg	<0.1	**4.3**	<0.1	<0.1	<0.1
Uranium	7440-61-1	0.1	mg/kg	**4.7**	**3.5**	**1.9**	**2.2**	**1.1**
Zinc	7440-66-6	0.5	mg/kg	**141**	**7730**	**109**	**105**	**154**
Lithium	7439-93-2	0.1	mg/kg	**7.8**	**8.0**	**16.0**	**21.3**	**17.1**
Vanadium	7440-62-2	1	mg/kg	**23**	**16**	**24**	**24**	**23**

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL)**			*Client sample ID*	**BH66542**	**BH66543**	**BH66544**	**BH66545**	**BH66546**
			Client sampling date / time	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00
Compound	*CAS Number*	*LOR*	*Unit*	**EB1922319-041**	**EB1922319-042**	**EB1922319-043**	**EB1922319-044**	**EB1922319-045**
				Result	Result	Result	Result	Result
EG020T: Total Metals by ICP-MS - Continued								
Tin	7440-31-5	0.1	mg/kg	**0.7**	**2.8**	**0.3**	**0.7**	**0.3**
EP003TC: Total Carbon (TC) in Soil								
Total Carbon	TC	0.02	%	**0.05**	**0.03**	**0.02**	**0.03**	**0.03**

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Client sample ID*	**BH66547**	**BH66548**	**BH66549**	**BH66550**	**BH66551**
			Client sampling date / time	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00
Compound	*CAS Number*	*LOR*	*Unit*	**EB1922319-046**	**EB1922319-047**	**EB1922319-048**	**EB1922319-049**	**EB1922319-050**
				Result	Result	Result	Result	Result
EA011: Net Acid Generation								
pH (OX)	----	0.1	pH Unit	**----**	**8.1**	**6.8**	**4.0**	**7.5**
NAG (pH 4.5)	----	0.1	kg H2SO4/t	**----**	<0.1	<0.1	**0.7**	<0.1
NAG (pH 7.0)	----	0.1	kg H2SO4/t	**----**	<0.1	**0.5**	**2.6**	<0.1
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	**----**	**19.3**	**15.2**	**14.2**	**15.9**
ANC as CaCO3	----	0.1	% CaCO3	**----**	**2.0**	**1.5**	**1.4**	**1.6**
Fizz Rating	----	0	Fizz Unit	**----**	**1**	**1**	**1**	**1**
EA031: pH (saturated paste)								
ø **pH (Saturated Paste)**	----	0.1	pH Unit	**8.6**	**10.1**	**9.0**	**8.8**	**8.9**
EA032: Electrical Conductivity (saturated paste)								
ø **Electrical Conductivity (Saturated Paste)**	----	1	µS/cm	**1380**	**1380**	**470**	**319**	**360**
ED040: Sulfur as SO4 2-								
Sulfate as SO4 2-	14808-79-8	100	mg/kg	**8420**	**4290**	**1890**	**21500**	**680**
ED042T: Total Sulfur by LECO								
Sulfur - Total as S (LECO)	----	0.01	%	**0.13**	**0.12**	**0.07**	**0.25**	**0.01**
EG005(ED093)T: Total Metals by ICP-AES								
Aluminium	7429-90-5	50	mg/kg	**16300**	**16300**	**18700**	**16900**	**9990**
Boron	7440-42-8	50	mg/kg	<50	<50	<50	<50	<50
Iron	7439-89-6	50	mg/kg	**32400**	**31900**	**21000**	**28000**	**9140**
EG020T: Total Metals by ICP-MS								
Arsenic	7440-38-2	0.1	mg/kg	**3.6**	**2.7**	**3.6**	**31.3**	**1.1**
Selenium	7782-49-2	1	mg/kg	<1	<1	<1	<1	<1
Silver	7440-22-4	0.1	mg/kg	**0.1**	**0.1**	**0.2**	**0.2**	**0.2**
Barium	7440-39-3	0.1	mg/kg	**112**	**118**	**72.3**	**97.6**	**21.8**
Thallium	7440-28-0	0.1	mg/kg	**0.8**	**0.9**	**0.9**	**1.0**	**0.4**
Beryllium	7440-41-7	0.1	mg/kg	**0.9**	**0.8**	**0.8**	**0.7**	**0.2**
Cadmium	7440-43-9	0.1	mg/kg	**0.1**	**0.3**	**0.1**	**0.6**	**0.1**
Bismuth	7440-69-9	0.1	mg/kg	**0.4**	**0.4**	**0.1**	**0.3**	**0.2**
Cobalt	7440-48-4	0.1	mg/kg	**11.4**	**11.4**	**8.9**	**13.2**	**3.0**
Chromium	7440-47-3	0.1	mg/kg	**26.6**	**25.1**	**24.8**	**30.0**	**12.2**
Copper	7440-50-8	0.1	mg/kg	**32.1**	**29.8**	**36.6**	**43.9**	**8.5**
Thorium	7440-29-1	0.1	mg/kg	**7.3**	**8.8**	**15.7**	**9.1**	**3.2**
Manganese	7439-96-5	0.1	mg/kg	**142**	**124**	**133**	**148**	**124**

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Client sample ID*	**BH66547**	**BH66548**	**BH66549**	**BH66550**	**BH66551**
			Client sampling date / time	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00
Compound	*CAS Number*	*LOR*	*Unit*	**EB1922319-046**	**EB1922319-047**	**EB1922319-048**	**EB1922319-049**	**EB1922319-050**
				Result	Result	Result	Result	Result
EG020T: Total Metals by ICP-MS - Continued								
Strontium	7440-24-6	0.1	mg/kg	**8.0**	**11.3**	**29.4**	**10.1**	**5.9**
Molybdenum	7439-98-7	0.1	mg/kg	**1.8**	**1.8**	**1.0**	**1.5**	**1.0**
Nickel	7440-02-0	0.1	mg/kg	**23.6**	**23.2**	**15.8**	**25.3**	**5.4**
Lead	7439-92-1	0.1	mg/kg	**25.6**	**30.5**	**49.9**	**108**	**59.5**
Antimony	7440-36-0	0.1	mg/kg	<0.1	**0.1**	**0.1**	<0.1	<0.1
Uranium	7440-61-1	0.1	mg/kg	**2.0**	**4.0**	**4.0**	**1.1**	**8.6**
Zinc	7440-66-6	0.5	mg/kg	**138**	**159**	**83.6**	**194**	**42.5**
Lithium	7439-93-2	0.1	mg/kg	**14.9**	**14.9**	**9.6**	**9.6**	**2.3**
Vanadium	7440-62-2	1	mg/kg	**24**	**23**	**21**	**28**	**9**
Tin	7440-31-5	0.1	mg/kg	**0.7**	**0.4**	**0.8**	**0.4**	**1.0**
EP003TC: Total Carbon (TC) in Soil								
Total Carbon	TC	0.02	%	**0.03**	**0.09**	**0.02**	<0.02	**0.02**

CERTIFICATE OF ANALYSIS

Work Order	: **EB1924479**	Page	: 1 of 2
Amendment	: **1**		
Client	: **BROKEN HILL OPERATIONS PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: MR JOSHUA PEARCE	Contact	: Customer Services EB
Address	: PO BOX 5073 BROKEN HILL NSW 2880	Address	: 2 Byth Street Stafford QLD Australia 4053
Telephone	: ----	Telephone	: +61-7-3243 7222
Project	: CBH/ERM J-AU0053	Date Samples Received	: 17-Sep-2019 10:24
Order number	: ----	Date Analysis Commenced	: 19-Sep-2019
C-O-C number	: ----	Issue Date	: 21-Oct-2019 15:03
Sampler	: ----		
Site	: ----		
Quote number	: EN/333		
No. of samples received	: 4		
No. of samples analysed	: 4		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Ben Felgendrejeris	Senior Acid Sulfate Soil Chemist	Brisbane Acid Sulphate Soils, Stafford, QLD
Satishkumar Trivedi	Senior Acid Sulfate Soil Chemist	Brisbane Acid Sulphate Soils, Stafford, QLD

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- ASS: EA013 (ANC) Fizz Rating: 0- None; 1- Slight; 2- Moderate; 3- Strong; 4- Very Strong; 5- Lime.

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Client sample ID*	**MWM-001**	**MWM-002**	**MWM-021**	**MWM-022**	**----**
			Client sampling date / time	11-Sep-2019 00:00	11-Sep-2019 00:00	11-Sep-2019 00:00	11-Sep-2019 00:00	----
Compound	*CAS Number*	*LOR*	*Unit*	**EB1924479-001**	**EB1924479-002**	**EB1924479-003**	**EB1924479-004**	**--------**
				Result	Result	Result	Result	----
EA002: pH 1:5 (Soils)								
pH Value	----	0.1	pH Unit	**9.3**	**9.3**	**8.0**	**7.9**	----
EA010: Conductivity (1:5)								
Electrical Conductivity @ 25°C	----	1	µS/cm	**146**	**146**	**412**	**411**	----
EA011: Net Acid Generation								
pH (OX)	----	0.1	pH Unit	**9.5**	**9.4**	**2.6**	**2.6**	----
NAG (pH 4.5)	----	0.1	kg H2SO4/t	<0.1	<0.1	**34.3**	**35.3**	----
NAG (pH 7.0)	----	0.1	kg H2SO4/t	<0.1	<0.1	**42.7**	**41.8**	----
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	**58.9**	**60.7**	**4.6**	**4.6**	----
ANC as CaCO3	----	0.1	% CaCO3	**6.0**	**6.2**	**0.5**	**0.5**	----
Fizz Rating	----	0	Fizz Unit	**2**	**2**	**0**	**0**	----
ED042T: Total Sulfur by LECO								
Sulfur - Total as S (LECO)	----	0.01	%	**0.30**	**0.32**	**1.42**	**1.40**	----
EP003TC: Total Carbon (TC) in Soil								
Total Carbon	TC	0.02	%	**0.73**	**0.72**	**0.17**	**0.03**	----

ALS Environmental

CERTIFICATE OF ADDRESS

Work Order	: **EB1924193**	Page	: 1 of 22
Client	: **BROKEN HILL OPERATIONS PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: GWEN WILSON	Contact	: Customer Services EB
Address	: PO BOX 5073 BROKEN HILL NSW 2880	Address	: 2 Byth Street Stafford QLD Australia 4053
Telephone	: ----	Telephone	: +61-7-3243 7222
Project	: Waste Rock samples 2019	Date Samples Received	: 26-Aug-2019 15:40
Order number	: ----	Date Analysis Commenced	: 25-Sep-2019
C-O-C number	: ----	Issue Date	: 04-Oct-2019 14:51
Sampler	: BRETT NIELSEN		
Site	: ----		
Quote number	: EN/333		
No. of samples received	: 50		
No. of samples analysed	: 50		

ilac-MRA NATA

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Kim McCabe	Senior Inorganic Chemist	Brisbane Inorganics, Stafford, QLD

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- **SPLIT WORK ORDER: It should be noted that ALS has split this work order over the following work orders (EB1922319, EB1924186, EB1924193) due to the size of the sample numbers and range of analysis requested. Analysis on Non-leachate analysis will be reported under EB1922319, NAG Leachate analysis under EB1924186, & non-standard DI leachate analysis under EB1924193. For any further information regarding this processing of samples please contact ALS client services division on ALSEnviro.Brisbane@alsglobal.com**

Analytical Results

Sub-Matrix: **LEACHATE** (Matrix: **WATER**)			*Client sample ID*	**BH66502** **1:2 DI Leachate**	**BH66503** **1:2 DI Leachate**	**BH66504** **1:2 DI Leachate**	**BH66505** **1:2 DI Leachate**	**BH66506** **1:2 DI Leachate**
			Client sampling date / time	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00
Compound	*CAS Number*	*LOR*	*Unit*	**EB1924193-001**	**EB1924193-002**	**EB1924193-003**	**EB1924193-004**	**EB1924193-005**
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**7.93**	**7.98**	**8.28**	**7.67**	**8.39**
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**266**	**230**	**269**	**1180**	**915**
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	**2**
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**38**	**55**	**48**	**31**	**27**
Total Alkalinity as CaCO3	----	1	mg/L	**38**	**55**	**48**	**31**	**29**
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**37**	**30**	**35**	**201**	**120**
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**23**	**18**	**22**	**108**	**90**
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	**1.92**	**3.59**	**2.17**	**0.34**	**0.70**
Dysprosium	7429-91-6	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Silver	7440-22-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Arsenic	7440-38-2	0.001	mg/L	**0.005**	**0.002**	**0.009**	<0.001	**0.002**
Bismuth	7440-69-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Erbium	7440-52-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05
Europium	7440-53-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Strontium	7440-24-6	0.001	mg/L	**0.015**	**0.009**	**0.011**	**0.218**	**0.192**
Barium	7440-39-3	0.001	mg/L	**0.010**	**0.020**	**0.009**	**0.015**	**0.012**
Gadolinium	7440-54-2	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Titanium	7440-32-6	0.01	mg/L	**0.03**	**0.14**	**0.03**	<0.01	<0.01
Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Gallium	7440-55-3	0.001	mg/L	**0.004**	**0.005**	**0.004**	**0.001**	**0.004**
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	**0.0002**	<0.0001
Hafnium	7440-58-6	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Tellurium	22541-49-7	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Cobalt	7440-48-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Holmium	7440-60-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Uranium	7440-61-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Caesium	7440-46-2	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001

Analytical Results

Sub-Matrix: **LEACHATE** (Matrix: **WATER**)			*Client sample ID*	**BH66502 1:2 DI Leachate**	**BH66503 1:2 DI Leachate**	**BH66504 1:2 DI Leachate**	**BH66505 1:2 DI Leachate**	**BH66506 1:2 DI Leachate**
			Client sampling date / time	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00
Compound	*CAS Number*	*LOR*	*Unit*	**EB1924193-001**	**EB1924193-002**	**EB1924193-003**	**EB1924193-004**	**EB1924193-005**
				Result	Result	Result	Result	Result
EG020F: Dissolved Metals by ICP-MS - Continued								
Chromium	7440-47-3	0.001	mg/L	**0.003**	**0.005**	**0.002**	<0.001	<0.001
Indium	7440-74-6	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L	**0.014**	**0.003**	**0.013**	<0.001	<0.001
Lanthanum	7439-91-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Rubidium	7440-17-7	0.001	mg/L	**0.034**	**0.034**	**0.025**	**0.114**	**0.065**
Lithium	7439-93-2	0.001	mg/L	**0.010**	**0.016**	**0.012**	**0.033**	**0.028**
Lutetium	7439-94-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Thorium	7440-29-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Cerium	7440-45-1	0.001	mg/L	<0.001	**0.002**	<0.001	<0.001	<0.001
Manganese	7439-96-5	0.001	mg/L	**0.014**	**0.029**	**0.010**	**0.321**	**0.010**
Neodymium	7440-00-8	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Molybdenum	7439-98-7	0.001	mg/L	**0.005**	**0.003**	**0.008**	**0.014**	**0.008**
Praseodymium	7440-10-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Nickel	7440-02-0	0.001	mg/L	<0.001	**0.002**	<0.001	<0.001	<0.001
Samarium	7440-19-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Lead	7439-92-1	0.001	mg/L	**0.002**	**0.005**	**0.002**	<0.001	<0.001
Terbium	7440-27-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Antimony	7440-36-0	0.001	mg/L	**0.001**	<0.001	**0.001**	<0.001	<0.001
Thulium	7440-30-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Ytterbium	7440-64-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Tin	7440-31-5	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Yttrium	7440-65-5	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Thallium	7440-28-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Zirconium	7440-67-7	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Vanadium	7440-62-2	0.01	mg/L	<0.01	**0.01**	<0.01	<0.01	<0.01
Zinc	7440-66-6	0.005	mg/L	**0.011**	**0.028**	**0.008**	<0.005	<0.005
Iron	7439-89-6	0.05	mg/L	**0.30**	**1.57**	**0.35**	<0.05	<0.05
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001

Analytical Results

Sub-Matrix: **LEACHATE** (Matrix: **WATER**)			*Client sample ID*	**BH66507** **1:2 DI Leachate**	**BH66508** **1:2 DI Leachate**	**BH66509** **1:2 DI Leachate**	**BH66510** **1:2 DI Leachate**	**BH66511** **1:2 DI Leachate**
			Client sampling date / time	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00
Compound	*CAS Number*	*LOR*	*Unit*	**EB1924193-006**	**EB1924193-007**	**EB1924193-008**	**EB1924193-009**	**EB1924193-010**
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**8.15**	**9.45**	**7.98**	**8.02**	**7.91**
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**261**	**571**	**1900**	**418**	**351**
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	**21**	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**35**	**14**	**33**	**41**	**33**
Total Alkalinity as CaCO3	----	1	mg/L	**35**	**36**	**33**	**41**	**33**
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**21**	**102**	**432**	**75**	**50**
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**21**	**51**	**222**	**32**	**32**
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	**1.99**	**1.53**	**0.26**	**1.01**	**1.42**
Dysprosium	7429-91-6	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Silver	7440-22-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Arsenic	7440-38-2	0.001	mg/L	<0.001	**0.024**	**0.002**	**0.006**	**0.001**
Bismuth	7440-69-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Erbium	7440-52-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	**0.06**	<0.05	<0.05
Europium	7440-53-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Strontium	7440-24-6	0.001	mg/L	**0.025**	**0.108**	**0.593**	**0.052**	**0.025**
Barium	7440-39-3	0.001	mg/L	**0.010**	**0.005**	**0.023**	**0.005**	**0.008**
Gadolinium	7440-54-2	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Titanium	7440-32-6	0.01	mg/L	**0.03**	<0.01	<0.01	<0.01	**0.01**
Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Gallium	7440-55-3	0.001	mg/L	**0.004**	**0.005**	**0.002**	**0.004**	**0.004**
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	**0.0002**	<0.0001	<0.0001
Hafnium	7440-58-6	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Tellurium	22541-49-7	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Cobalt	7440-48-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Holmium	7440-60-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Uranium	7440-61-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Caesium	7440-46-2	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001

Analytical Results

Sub-Matrix: **LEACHATE** (Matrix: **WATER**)			*Client sample ID*	**BH66507** **1:2 DI Leachate**	**BH66508** **1:2 DI Leachate**	**BH66509** **1:2 DI Leachate**	**BH66510** **1:2 DI Leachate**	**BH66511** **1:2 DI Leachate**
			Client sampling date / time	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00
Compound	*CAS Number*	*LOR*	*Unit*	**EB1924193-006**	**EB1924193-007**	**EB1924193-008**	**EB1924193-009**	**EB1924193-010**
				Result	Result	Result	Result	Result
EG020F: Dissolved Metals by ICP-MS - Continued								
Chromium	7440-47-3	0.001	mg/L	**0.001**	**0.001**	**0.003**	**0.002**	**0.005**
Indium	7440-74-6	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L	**0.006**	<0.001	**0.008**	**0.012**	**0.004**
Lanthanum	7439-91-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Rubidium	7440-17-7	0.001	mg/L	**0.029**	**0.028**	**0.100**	**0.039**	**0.038**
Lithium	7439-93-2	0.001	mg/L	**0.020**	**0.012**	**0.016**	**0.016**	**0.026**
Lutetium	7439-94-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Thorium	7440-29-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Cerium	7440-45-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Manganese	7439-96-5	0.001	mg/L	**0.009**	<0.001	**0.077**	**0.014**	**0.015**
Neodymium	7440-00-8	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Molybdenum	7439-98-7	0.001	mg/L	**0.005**	**0.004**	**0.010**	**0.006**	**0.011**
Praseodymium	7440-10-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Samarium	7440-19-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Lead	7439-92-1	0.001	mg/L	**0.002**	<0.001	**0.001**	**0.001**	**0.001**
Terbium	7440-27-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Antimony	7440-36-0	0.001	mg/L	<0.001	**0.004**	**0.022**	**0.002**	<0.001
Thulium	7440-30-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Ytterbium	7440-64-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Tin	7440-31-5	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Yttrium	7440-65-5	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Thallium	7440-28-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Zirconium	7440-67-7	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Vanadium	7440-62-2	0.01	mg/L	<0.01	**0.01**	<0.01	<0.01	<0.01
Zinc	7440-66-6	0.005	mg/L	**0.009**	<0.005	<0.005	<0.005	**0.007**
Iron	7439-89-6	0.05	mg/L	**0.35**	<0.05	<0.05	**0.05**	**0.20**
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001

Analytical Results

Sub-Matrix: **LEACHATE**
(Matrix: **WATER**)

			Client sample ID	**BH66512** **1:2 DI Leachate**	**BH66513** **1:2 DI Leachate**	**BH66514** **1:2 DI Leachate**	**BH66515** **1:2 DI Leachate**	**BH66516** **1:2 DI Leachate**
			Client sampling date / time	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00
Compound	*CAS Number*	*LOR*	*Unit*	**EB1924193-011**	**EB1924193-012**	**EB1924193-013**	**EB1924193-014**	**EB1924193-015**
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**7.99**	**7.99**	**8.20**	**8.27**	**8.44**
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**392**	**257**	**234**	**261**	**426**
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	**3**
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**42**	**41**	**42**	**50**	**40**
Total Alkalinity as CaCO3	----	1	mg/L	**42**	**41**	**42**	**50**	**44**
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**54**	**29**	**26**	**22**	**35**
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**37**	**17**	**14**	**14**	**24**
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	**1.14**	**2.19**	**2.89**	**1.45**	**0.96**
Dysprosium	7429-91-6	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Silver	7440-22-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Arsenic	7440-38-2	0.001	mg/L	**0.004**	**0.001**	**0.001**	**0.001**	**0.002**
Bismuth	7440-69-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Erbium	7440-52-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05
Europium	7440-53-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Strontium	7440-24-6	0.001	mg/L	**0.029**	**0.019**	**0.013**	**0.020**	**0.046**
Barium	7440-39-3	0.001	mg/L	**0.005**	**0.017**	**0.017**	**0.007**	**0.006**
Gadolinium	7440-54-2	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Titanium	7440-32-6	0.01	mg/L	**0.01**	**0.04**	**0.07**	**0.02**	<0.01
Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Gallium	7440-55-3	0.001	mg/L	**0.004**	**0.004**	**0.004**	**0.004**	**0.003**
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Hafnium	7440-58-6	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Tellurium	22541-49-7	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Cobalt	7440-48-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Holmium	7440-60-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Uranium	7440-61-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Caesium	7440-46-2	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001

Analytical Results

Sub-Matrix: **LEACHATE** (Matrix: **WATER**)			*Client sample ID*	**BH66512** **1:2 DI Leachate**	**BH66513** **1:2 DI Leachate**	**BH66514** **1:2 DI Leachate**	**BH66515** **1:2 DI Leachate**	**BH66516** **1:2 DI Leachate**
			Client sampling date / time	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00
Compound	*CAS Number*	*LOR*	*Unit*	**EB1924193-011**	**EB1924193-012**	**EB1924193-013**	**EB1924193-014**	**EB1924193-015**
				Result	Result	Result	Result	Result
EG020F: Dissolved Metals by ICP-MS - Continued								
Chromium	7440-47-3	0.001	mg/L	**0.002**	**0.004**	**0.003**	**0.002**	**0.002**
Indium	7440-74-6	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L	**0.032**	**0.006**	**0.002**	**0.004**	**0.009**
Lanthanum	7439-91-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Rubidium	7440-17-7	0.001	mg/L	**0.038**	**0.031**	**0.036**	**0.032**	**0.069**
Lithium	7439-93-2	0.001	mg/L	**0.012**	**0.017**	**0.012**	**0.014**	**0.016**
Lutetium	7439-94-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Thorium	7440-29-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Cerium	7440-45-1	0.001	mg/L	<0.001	<0.001	**0.001**	<0.001	<0.001
Manganese	7439-96-5	0.001	mg/L	**0.019**	**0.017**	**0.013**	**0.007**	**0.007**
Neodymium	7440-00-8	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Molybdenum	7439-98-7	0.001	mg/L	**0.006**	**0.005**	**0.005**	**0.008**	**0.002**
Praseodymium	7440-10-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Samarium	7440-19-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Lead	7439-92-1	0.001	mg/L	**0.005**	**0.002**	**0.003**	<0.001	**0.001**
Terbium	7440-27-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Antimony	7440-36-0	0.001	mg/L	**0.018**	**0.002**	<0.001	**0.001**	**0.009**
Thulium	7440-30-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Ytterbium	7440-64-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Tin	7440-31-5	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Yttrium	7440-65-5	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Thallium	7440-28-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Zirconium	7440-67-7	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Zinc	7440-66-6	0.005	mg/L	**0.020**	**0.010**	**0.008**	<0.005	**0.008**
Iron	7439-89-6	0.05	mg/L	**0.11**	**0.51**	**0.82**	**0.18**	**0.09**
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001

Analytical Results

Sub-Matrix: **LEACHATE** (Matrix: **WATER**)			*Client sample ID*	**BH66517 1:2 DI Leachate**	**BH66518 1:2 DI Leachate**	**BH66519 1:2 DI Leachate**	**BH66520 1:2 DI Leachate**	**BH66521 1:2 DI Leachate**
			Client sampling date / time	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00
Compound	*CAS Number*	*LOR*	*Unit*	**EB1924193-016**	**EB1924193-017**	**EB1924193-018**	**EB1924193-019**	**EB1924193-020**
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**7.80**	**8.10**	**7.45**	**8.28**	**7.91**
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**494**	**261**	**328**	**245**	**355**
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**37**	**37**	**22**	**48**	**37**
Total Alkalinity as CaCO3	----	1	mg/L	**37**	**37**	**22**	**48**	**37**
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**42**	**19**	**32**	**25**	**37**
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**33**	**15**	**28**	**15**	**38**
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	**0.57**	**1.74**	**0.76**	**1.98**	**1.18**
Dysprosium	7429-91-6	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Silver	7440-22-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Arsenic	7440-38-2	0.001	mg/L	**0.002**	**0.004**	**0.002**	**0.002**	**0.002**
Bismuth	7440-69-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Erbium	7440-52-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05
Europium	7440-53-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Strontium	7440-24-6	0.001	mg/L	**0.067**	**0.020**	**0.020**	**0.022**	**0.036**
Barium	7440-39-3	0.001	mg/L	**0.004**	**0.007**	**0.004**	**0.007**	**0.005**
Gadolinium	7440-54-2	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Titanium	7440-32-6	0.01	mg/L	<0.01	**0.02**	**0.01**	**0.02**	<0.01
Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Gallium	7440-55-3	0.001	mg/L	**0.002**	**0.005**	**0.002**	**0.005**	**0.004**
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Hafnium	7440-58-6	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Tellurium	22541-49-7	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Cobalt	7440-48-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Holmium	7440-60-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Uranium	7440-61-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Caesium	7440-46-2	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001

Analytical Results

Sub-Matrix: **LEACHATE** (Matrix: **WATER**)			*Client sample ID*	**BH66517** **1:2 DI Leachate**	**BH66518** **1:2 DI Leachate**	**BH66519** **1:2 DI Leachate**	**BH66520** **1:2 DI Leachate**	**BH66521** **1:2 DI Leachate**
			Client sampling date / time	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00
Compound	*CAS Number*	*LOR*	*Unit*	**EB1924193-016**	**EB1924193-017**	**EB1924193-018**	**EB1924193-019**	**EB1924193-020**
				Result	Result	Result	Result	Result
EG020F: Dissolved Metals by ICP-MS - Continued								
Chromium	7440-47-3	0.001	mg/L	<0.001	**0.002**	**0.001**	**0.002**	**0.003**
Indium	7440-74-6	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L	<0.001	**0.003**	**0.001**	**0.009**	**0.002**
Lanthanum	7439-91-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Rubidium	7440-17-7	0.001	mg/L	**0.098**	**0.046**	**0.056**	**0.016**	**0.019**
Lithium	7439-93-2	0.001	mg/L	**0.012**	**0.010**	**0.006**	**0.008**	**0.013**
Lutetium	7439-94-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Thorium	7440-29-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Cerium	7440-45-1	0.001	mg/L	<0.001	**0.001**	**0.001**	<0.001	<0.001
Manganese	7439-96-5	0.001	mg/L	**0.042**	**0.009**	**0.077**	**0.004**	**0.010**
Neodymium	7440-00-8	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Molybdenum	7439-98-7	0.001	mg/L	**0.005**	**0.004**	**0.005**	**0.007**	**0.006**
Praseodymium	7440-10-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Samarium	7440-19-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Lead	7439-92-1	0.001	mg/L	**0.001**	**0.005**	**0.004**	**0.001**	<0.001
Terbium	7440-27-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Antimony	7440-36-0	0.001	mg/L	**0.017**	**0.006**	**0.007**	**0.001**	<0.001
Thulium	7440-30-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Ytterbium	7440-64-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Tin	7440-31-5	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Yttrium	7440-65-5	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Thallium	7440-28-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Zirconium	7440-67-7	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Zinc	7440-66-6	0.005	mg/L	<0.005	**0.005**	<0.005	**0.006**	<0.005
Iron	7439-89-6	0.05	mg/L	<0.05	**0.23**	**0.17**	**0.24**	**0.07**
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001

Analytical Results

Sub-Matrix: **LEACHATE**
(Matrix: **WATER**)

			Client sample ID	**BH66522** **1:2 DI Leachate**	**BH66523** **1:2 DI Leachate**	**BH66524** **1:2 DI Leachate**	**BH66525** **1:2 DI Leachate**	**BH66526** **1:2 DI Leachate**
			Client sampling date / time	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00
Compound	*CAS Number*	*LOR*	*Unit*	**EB1924193-021**	**EB1924193-022**	**EB1924193-023**	**EB1924193-024**	**EB1924193-025**
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**7.57**	**7.74**	**7.60**	**7.70**	**7.59**
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**557**	**1030**	**625**	**664**	**576**
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**28**	**44**	**30**	**38**	**32**
Total Alkalinity as CaCO3	----	1	mg/L	**28**	**44**	**30**	**38**	**32**
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**88**	**209**	**81**	**106**	**92**
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**65**	**123**	**56**	**75**	**65**
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	**0.77**	**0.24**	**0.57**	**0.36**	**0.54**
Dysprosium	7429-91-6	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Silver	7440-22-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Arsenic	7440-38-2	0.001	mg/L	<0.001	**0.002**	<0.001	**0.001**	<0.001
Bismuth	7440-69-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Erbium	7440-52-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05
Europium	7440-53-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Strontium	7440-24-6	0.001	mg/L	**0.065**	**0.182**	**0.099**	**0.096**	**0.082**
Barium	7440-39-3	0.001	mg/L	**0.007**	**0.018**	**0.010**	**0.006**	**0.004**
Gadolinium	7440-54-2	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Titanium	7440-32-6	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Gallium	7440-55-3	0.001	mg/L	**0.003**	**0.002**	**0.003**	**0.002**	**0.003**
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	**0.0003**	<0.0001	<0.0001	<0.0001
Hafnium	7440-58-6	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Tellurium	22541-49-7	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Cobalt	7440-48-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Holmium	7440-60-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Uranium	7440-61-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Caesium	7440-46-2	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001

Analytical Results

Sub-Matrix: **LEACHATE**
(Matrix: **WATER**)

			Client sample ID	**BH66522 1:2 DI Leachate**	**BH66523 1:2 DI Leachate**	**BH66524 1:2 DI Leachate**	**BH66525 1:2 DI Leachate**	**BH66526 1:2 DI Leachate**
			Client sampling date / time	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00
Compound	*CAS Number*	*LOR*	*Unit*	**EB1924193-021**	**EB1924193-022**	**EB1924193-023**	**EB1924193-024**	**EB1924193-025**
				Result	Result	Result	Result	Result
EG020F: Dissolved Metals by ICP-MS - Continued								
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	**0.001**	<0.001	<0.001
Indium	7440-74-6	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Lanthanum	7439-91-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Rubidium	7440-17-7	0.001	mg/L	**0.024**	**0.053**	**0.055**	**0.040**	**0.036**
Lithium	7439-93-2	0.001	mg/L	**0.030**	**0.027**	**0.025**	**0.023**	**0.020**
Lutetium	7439-94-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Thorium	7440-29-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Cerium	7440-45-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Manganese	7439-96-5	0.001	mg/L	**0.028**	**0.415**	**0.054**	**0.113**	**0.049**
Neodymium	7440-00-8	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Molybdenum	7439-98-7	0.001	mg/L	**0.010**	**0.016**	**0.011**	**0.017**	**0.013**
Praseodymium	7440-10-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Samarium	7440-19-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Terbium	7440-27-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Antimony	7440-36-0	0.001	mg/L	<0.001	**0.003**	<0.001	**0.002**	<0.001
Thulium	7440-30-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Ytterbium	7440-64-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Tin	7440-31-5	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Yttrium	7440-65-5	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Thallium	7440-28-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Zirconium	7440-67-7	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001

Analytical Results

Sub-Matrix: **LEACHATE**
(Matrix: **WATER**)

			Client sample ID	**BH66527 1:2 DI Leachate**	**BH66528 1:2 DI Leachate**	**BH66529 1:2 DI Leachate**	**BH66530 1:2 DI Leachate**	**BH66531 1:2 DI Leachate**
			Client sampling date / time	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00
Compound	*CAS Number*	*LOR*	*Unit*	**EB1924193-026**	**EB1924193-027**	**EB1924193-028**	**EB1924193-029**	**EB1924193-030**
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**6.78**	**7.77**	**8.60**	**7.94**	**9.91**
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**557**	**388**	**217**	**263**	**625**
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	**16**
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	**11**	<1	**68**
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**50**	**35**	**68**	**58**	<1
Total Alkalinity as CaCO3	----	1	mg/L	**50**	**35**	**79**	**58**	**84**
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**72**	**61**	**12**	**29**	**104**
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**68**	**35**	**8**	**13**	**37**
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	**0.76**	**0.98**	**3.61**	**1.29**	**2.51**
Dysprosium	7429-91-6	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Silver	7440-22-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Arsenic	7440-38-2	0.001	mg/L	**0.001**	<0.001	**0.002**	**0.006**	**0.017**
Bismuth	7440-69-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Erbium	7440-52-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	<0.05	<0.05	**0.06**
Europium	7440-53-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Strontium	7440-24-6	0.001	mg/L	**0.055**	**0.051**	**0.009**	**0.018**	**0.163**
Barium	7440-39-3	0.001	mg/L	**0.019**	**0.004**	**0.016**	**0.004**	**0.007**
Gadolinium	7440-54-2	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Titanium	7440-32-6	0.01	mg/L	<0.01	<0.01	**0.07**	**0.02**	<0.01
Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Gallium	7440-55-3	0.001	mg/L	**0.003**	**0.004**	**0.005**	**0.004**	**0.008**
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Hafnium	7440-58-6	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Tellurium	22541-49-7	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Cobalt	7440-48-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Holmium	7440-60-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Uranium	7440-61-1	0.001	mg/L	<0.001	<0.001	**0.001**	<0.001	<0.001
Caesium	7440-46-2	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001

Analytical Results

Sub-Matrix: **LEACHATE** (Matrix: **WATER**)			*Client sample ID*	**BH66527** **1:2 DI Leachate**	**BH66528** **1:2 DI Leachate**	**BH66529** **1:2 DI Leachate**	**BH66530** **1:2 DI Leachate**	**BH66531** **1:2 DI Leachate**
			Client sampling date / time	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00
Compound	*CAS Number*	*LOR*	*Unit*	**EB1924193-026**	**EB1924193-027**	**EB1924193-028**	**EB1924193-029**	**EB1924193-030**
				Result	Result	Result	Result	Result
EG020F: Dissolved Metals by ICP-MS - Continued								
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	**0.004**	**0.002**	**0.002**
Indium	7440-74-6	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	**0.007**	**0.004**	<0.001
Lanthanum	7439-91-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Rubidium	7440-17-7	0.001	mg/L	**0.033**	**0.024**	**0.016**	**0.035**	**0.042**
Lithium	7439-93-2	0.001	mg/L	**0.018**	**0.019**	**0.005**	**0.054**	**0.019**
Lutetium	7439-94-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Thorium	7440-29-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Cerium	7440-45-1	0.001	mg/L	<0.001	<0.001	**0.002**	**0.001**	<0.001
Manganese	7439-96-5	0.001	mg/L	**0.052**	**0.008**	**0.007**	**0.008**	<0.001
Neodymium	7440-00-8	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Molybdenum	7439-98-7	0.001	mg/L	**0.010**	**0.012**	**0.008**	**0.010**	**0.007**
Praseodymium	7440-10-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	**0.002**	<0.001	<0.001
Samarium	7440-19-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	**0.002**	**0.003**	**0.002**
Terbium	7440-27-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Antimony	7440-36-0	0.001	mg/L	<0.001	<0.001	**0.005**	**0.013**	**0.006**
Thulium	7440-30-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Ytterbium	7440-64-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Tin	7440-31-5	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Yttrium	7440-65-5	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Thallium	7440-28-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Zirconium	7440-67-7	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	**0.01**	<0.01	**0.02**
Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	**0.006**	<0.005	<0.005
Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	**1.20**	**0.23**	<0.05
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001

Analytical Results

Sub-Matrix: **LEACHATE** (Matrix: **WATER**)			*Client sample ID*	**BH66532** **1:2 DI Leachate**	**BH66533** **1:2 DI Leachate**	**BH66534** **1:2 DI Leachate**	**BH66535** **1:2 DI Leachate**	**BH66536** **1:2 DI Leachate**
			Client sampling date / time	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00
Compound	*CAS Number*	*LOR*	*Unit*	**EB1924193-031**	**EB1924193-032**	**EB1924193-033**	**EB1924193-034**	**EB1924193-035**
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**8.19**	**8.47**	**8.46**	**8.47**	**8.52**
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**240**	**266**	**275**	**260**	**266**
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	**7**	**7**	**6**	**9**
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**45**	**47**	**48**	**50**	**48**
Total Alkalinity as CaCO3	----	1	mg/L	**45**	**54**	**55**	**56**	**57**
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**28**	**26**	**27**	**21**	**30**
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**16**	**20**	**24**	**25**	**26**
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	**2.30**	**2.17**	**1.92**	**2.40**	**2.74**
Dysprosium	7429-91-6	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Silver	7440-22-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Arsenic	7440-38-2	0.001	mg/L	**0.003**	**0.007**	**0.003**	**0.005**	**0.009**
Bismuth	7440-69-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Erbium	7440-52-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05
Europium	7440-53-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Strontium	7440-24-6	0.001	mg/L	**0.027**	**0.019**	**0.027**	**0.014**	**0.018**
Barium	7440-39-3	0.001	mg/L	**0.016**	**0.012**	**0.009**	**0.008**	**0.013**
Gadolinium	7440-54-2	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Titanium	7440-32-6	0.01	mg/L	**0.03**	**0.04**	**0.02**	**0.05**	**0.05**
Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Gallium	7440-55-3	0.001	mg/L	**0.004**	**0.003**	**0.003**	**0.003**	**0.004**
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Hafnium	7440-58-6	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Tellurium	22541-49-7	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Cobalt	7440-48-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Holmium	7440-60-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Uranium	7440-61-1	0.001	mg/L	<0.001	<0.001	**0.001**	**0.003**	<0.001
Caesium	7440-46-2	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001

Analytical Results

Sub-Matrix: **LEACHATE**
(Matrix: **WATER**)

Client sample ID				**BH66532** **1:2 DI Leachate**	**BH66533** **1:2 DI Leachate**	**BH66534** **1:2 DI Leachate**	**BH66535** **1:2 DI Leachate**	**BH66536** **1:2 DI Leachate**
Client sampling date / time				21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00
Compound	*CAS Number*	*LOR*	*Unit*	**EB1924193-031**	**EB1924193-032**	**EB1924193-033**	**EB1924193-034**	**EB1924193-035**
				Result	Result	Result	Result	Result
EG020F: Dissolved Metals by ICP-MS - Continued								
Chromium	7440-47-3	0.001	mg/L	**0.001**	**0.002**	<0.001	**0.002**	**0.002**
Indium	7440-74-6	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L	**0.002**	<0.001	<0.001	<0.001	<0.001
Lanthanum	7439-91-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Rubidium	7440-17-7	0.001	mg/L	**0.021**	**0.036**	**0.021**	**0.028**	**0.016**
Lithium	7439-93-2	0.001	mg/L	**0.006**	**0.009**	**0.006**	**0.006**	**0.004**
Lutetium	7439-94-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Thorium	7440-29-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Cerium	7440-45-1	0.001	mg/L	<0.001	**0.002**	<0.001	**0.001**	**0.001**
Manganese	7439-96-5	0.001	mg/L	**0.005**	**0.014**	**0.008**	**0.016**	**0.008**
Neodymium	7440-00-8	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Molybdenum	7439-98-7	0.001	mg/L	**0.007**	**0.008**	**0.009**	**0.009**	**0.009**
Praseodymium	7440-10-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Samarium	7440-19-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Lead	7439-92-1	0.001	mg/L	<0.001	**0.008**	**0.009**	**0.009**	**0.020**
Terbium	7440-27-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Antimony	7440-36-0	0.001	mg/L	<0.001	**0.004**	**0.006**	**0.002**	**0.012**
Thulium	7440-30-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Ytterbium	7440-64-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Tin	7440-31-5	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Yttrium	7440-65-5	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Thallium	7440-28-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Zirconium	7440-67-7	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Vanadium	7440-62-2	0.01	mg/L	**0.01**	<0.01	<0.01	<0.01	<0.01
Zinc	7440-66-6	0.005	mg/L	**0.006**	**0.006**	**0.006**	**0.008**	**0.012**
Iron	7439-89-6	0.05	mg/L	**0.36**	**0.50**	**0.29**	**0.46**	**0.54**
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001

Analytical Results

Sub-Matrix: **LEACHATE**
(Matrix: **WATER**)

			Client sample ID	**BH66537 1:2 DI Leachate**	**BH66538 1:2 DI Leachate**	**BH66539 1:2 DI Leachate**	**BH66540 1:2 DI Leachate**	**BH66541 1:2 DI Leachate**
			Client sampling date / time	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00
Compound	*CAS Number*	*LOR*	*Unit*	**EB1924193-036**	**EB1924193-037**	**EB1924193-038**	**EB1924193-039**	**EB1924193-040**
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**7.90**	**8.76**	**8.65**	**8.52**	**10.4**
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**491**	**263**	**323**	**316**	**354**
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	**15**
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	**14**	**12**	**8**	**62**
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**38**	**27**	**31**	**35**	<1
Total Alkalinity as CaCO3	----	1	mg/L	**38**	**41**	**43**	**43**	**77**
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**93**	**37**	**44**	**40**	**49**
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**41**	**23**	**28**	**25**	**26**
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	**0.59**	**1.56**	**1.31**	**1.26**	**3.63**
Dysprosium	7429-91-6	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Silver	7440-22-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Arsenic	7440-38-2	0.001	mg/L	**0.003**	**0.006**	**0.004**	**0.005**	**0.009**
Bismuth	7440-69-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Erbium	7440-52-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Boron	7440-42-8	0.05	mg/L	**0.05**	<0.05	<0.05	<0.05	<0.05
Europium	7440-53-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Strontium	7440-24-6	0.001	mg/L	**0.098**	**0.031**	**0.038**	**0.048**	**0.128**
Barium	7440-39-3	0.001	mg/L	**0.003**	**0.005**	**0.005**	**0.004**	**0.003**
Gadolinium	7440-54-2	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Titanium	7440-32-6	0.01	mg/L	<0.01	**0.02**	<0.01	<0.01	<0.01
Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Gallium	7440-55-3	0.001	mg/L	**0.003**	**0.003**	**0.003**	**0.003**	**0.006**
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Hafnium	7440-58-6	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Tellurium	22541-49-7	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Cobalt	7440-48-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Holmium	7440-60-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Uranium	7440-61-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Caesium	7440-46-2	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001

Analytical Results

Sub-Matrix: **LEACHATE** (Matrix: **WATER**)			*Client sample ID*	**BH66537** **1:2 DI Leachate**	**BH66538** **1:2 DI Leachate**	**BH66539** **1:2 DI Leachate**	**BH66540** **1:2 DI Leachate**	**BH66541** **1:2 DI Leachate**
			Client sampling date / time	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00
Compound	*CAS Number*	*LOR*	*Unit*	**EB1924193-036**	**EB1924193-037**	**EB1924193-038**	**EB1924193-039**	**EB1924193-040**
				Result	Result	Result	Result	Result
EG020F: Dissolved Metals by ICP-MS - Continued								
Chromium	7440-47-3	0.001	mg/L	<0.001	**0.001**	<0.001	<0.001	**0.004**
Indium	7440-74-6	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L	<0.001	**0.002**	<0.001	**0.001**	<0.001
Lanthanum	7439-91-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Rubidium	7440-17-7	0.001	mg/L	**0.034**	**0.014**	**0.022**	**0.022**	**0.015**
Lithium	7439-93-2	0.001	mg/L	**0.008**	**0.007**	**0.006**	**0.008**	**0.002**
Lutetium	7439-94-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Thorium	7440-29-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Cerium	7440-45-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Manganese	7439-96-5	0.001	mg/L	**0.009**	**0.004**	**0.003**	**0.005**	<0.001
Neodymium	7440-00-8	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Molybdenum	7439-98-7	0.001	mg/L	**0.015**	**0.006**	**0.009**	**0.009**	**0.002**
Praseodymium	7440-10-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Samarium	7440-19-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Lead	7439-92-1	0.001	mg/L	<0.001	**0.002**	**0.002**	<0.001	**0.003**
Terbium	7440-27-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Antimony	7440-36-0	0.001	mg/L	**0.012**	<0.001	**0.001**	<0.001	**0.004**
Thulium	7440-30-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Ytterbium	7440-64-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Tin	7440-31-5	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Yttrium	7440-65-5	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Thallium	7440-28-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Zirconium	7440-67-7	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	**0.02**
Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Iron	7439-89-6	0.05	mg/L	<0.05	**0.14**	**0.09**	**0.06**	<0.05
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001

Analytical Results

Sub-Matrix: **LEACHATE** (Matrix: **WATER**)			Client sample ID	BH66542 1:2 DI Leachate	BH66543 1:2 DI Leachate	BH66544 1:2 DI Leachate	BH66545 1:2 DI Leachate	BH66546 1:2 DI Leachate
			Client sampling date / time	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00
Compound	CAS Number	LOR	Unit	EB1924193-041	EB1924193-042	EB1924193-043	EB1924193-044	EB1924193-045
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**8.56**	**8.74**	**8.55**	**8.70**	**8.45**
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**292**	**313**	**233**	**295**	**394**
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	**10**	**10**	**15**	**9**
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**32**	**23**	**48**	**58**	**51**
Total Alkalinity as CaCO3	----	1	mg/L	**32**	**34**	**58**	**73**	**60**
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**50**	**46**	**14**	**16**	**15**
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**26**	**33**	**13**	**13**	**14**
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	**0.92**	**0.60**	**2.44**	**2.69**	**1.11**
Dysprosium	7429-91-6	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Silver	7440-22-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Arsenic	7440-38-2	0.001	mg/L	**0.008**	**0.009**	**0.002**	**0.003**	<0.001
Bismuth	7440-69-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Erbium	7440-52-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Boron	7440-42-8	0.05	mg/L	**0.05**	**0.05**	<0.05	<0.05	<0.05
Europium	7440-53-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Strontium	7440-24-6	0.001	mg/L	**0.044**	**0.058**	**0.016**	**0.014**	**0.037**
Barium	7440-39-3	0.001	mg/L	**0.004**	**0.002**	**0.016**	**0.013**	**0.008**
Gadolinium	7440-54-2	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Titanium	7440-32-6	0.01	mg/L	<0.01	<0.01	**0.04**	**0.04**	<0.01
Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Gallium	7440-55-3	0.001	mg/L	**0.003**	**0.002**	**0.003**	**0.004**	**0.003**
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Hafnium	7440-58-6	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Tellurium	22541-49-7	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Cobalt	7440-48-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Holmium	7440-60-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Uranium	7440-61-1	0.001	mg/L	**0.001**	<0.001	<0.001	<0.001	<0.001
Caesium	7440-46-2	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001

Analytical Results

Sub-Matrix: **LEACHATE** (Matrix: **WATER**)			*Client sample ID*	**BH66542** **1:2 DI Leachate**	**BH66543** **1:2 DI Leachate**	**BH66544** **1:2 DI Leachate**	**BH66545** **1:2 DI Leachate**	**BH66546** **1:2 DI Leachate**
			Client sampling date / time	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00
Compound	*CAS Number*	*LOR*	*Unit*	**EB1924193-041**	**EB1924193-042**	**EB1924193-043**	**EB1924193-044**	**EB1924193-045**
				Result	Result	Result	Result	Result
EG020F: Dissolved Metals by ICP-MS - Continued								
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	**0.002**	**0.002**	<0.001
Indium	7440-74-6	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L	**0.015**	<0.001	**0.002**	<0.001	**0.004**
Lanthanum	7439-91-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Rubidium	7440-17-7	0.001	mg/L	**0.017**	**0.017**	**0.043**	**0.041**	**0.084**
Lithium	7439-93-2	0.001	mg/L	**0.006**	**0.005**	**0.006**	**0.005**	**0.008**
Lutetium	7439-94-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Thorium	7440-29-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Cerium	7440-45-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Manganese	7439-96-5	0.001	mg/L	**0.004**	<0.001	**0.008**	**0.006**	**0.003**
Neodymium	7440-00-8	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Molybdenum	7439-98-7	0.001	mg/L	**0.006**	**0.003**	**0.012**	**0.009**	**0.011**
Praseodymium	7440-10-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	**0.001**	**0.001**	<0.001
Samarium	7440-19-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Lead	7439-92-1	0.001	mg/L	**0.001**	**0.008**	**0.002**	**0.001**	<0.001
Terbium	7440-27-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Antimony	7440-36-0	0.001	mg/L	<0.001	**0.045**	**0.003**	**0.004**	**0.004**
Thulium	7440-30-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Ytterbium	7440-64-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Tin	7440-31-5	0.001	mg/L	**0.001**	<0.001	<0.001	<0.001	<0.001
Yttrium	7440-65-5	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Thallium	7440-28-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Zirconium	7440-67-7	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Zinc	7440-66-6	0.005	mg/L	**0.008**	<0.005	**0.005**	<0.005	<0.005
Iron	7439-89-6	0.05	mg/L	**0.09**	<0.05	**0.77**	**0.77**	**0.12**
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001

Analytical Results

Sub-Matrix: **LEACHATE**
(Matrix: **WATER**)

			Client sample ID	**BH66547 1:2 DI Leachate**	**BH66548 1:2 DI Leachate**	**BH66549 1:2 DI Leachate**	**BH66550 1:2 DI Leachate**	**BH66551 1:2 DI Leachate**
			Client sampling date / time	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00
Compound	*CAS Number*	*LOR*	*Unit*	**EB1924193-046**	**EB1924193-047**	**EB1924193-048**	**EB1924193-049**	**EB1924193-050**
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**8.27**	**10.6**	**8.54**	**8.31**	**8.31**
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**548**	**915**	**260**	**307**	**260**
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	**39**	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	**62**	**9**	**2**	**2**
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**51**	<1	**63**	**41**	**40**
Total Alkalinity as CaCO3	----	1	mg/L	**51**	**100**	**72**	**44**	**43**
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**56**	**117**	**26**	**38**	**15**
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**63**	**76**	**26**	**31**	**34**
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	**1.07**	**4.79**	**2.00**	**1.46**	**1.86**
Dysprosium	7429-91-6	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Silver	7440-22-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Arsenic	7440-38-2	0.001	mg/L	**0.003**	**0.002**	**0.003**	**0.010**	**0.002**
Bismuth	7440-69-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Erbium	7440-52-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05
Europium	7440-53-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Strontium	7440-24-6	0.001	mg/L	**0.062**	**0.422**	**0.012**	**0.030**	**0.016**
Barium	7440-39-3	0.001	mg/L	**0.005**	**0.010**	**0.009**	**0.006**	**0.005**
Gadolinium	7440-54-2	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Titanium	7440-32-6	0.01	mg/L	<0.01	<0.01	**0.04**	**0.02**	**0.02**
Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Gallium	7440-55-3	0.001	mg/L	**0.004**	**0.009**	**0.003**	**0.004**	**0.002**
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Hafnium	7440-58-6	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Tellurium	22541-49-7	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Cobalt	7440-48-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Holmium	7440-60-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Uranium	7440-61-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	**0.005**
Caesium	7440-46-2	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001

Analytical Results

Sub-Matrix: **LEACHATE**
(Matrix: **WATER**)

			Client sample ID	**BH66547 1:2 DI Leachate**	**BH66548 1:2 DI Leachate**	**BH66549 1:2 DI Leachate**	**BH66550 1:2 DI Leachate**	**BH66551 1:2 DI Leachate**
			Client sampling date / time	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00
Compound	*CAS Number*	*LOR*	*Unit*	**EB1924193-046**	**EB1924193-047**	**EB1924193-048**	**EB1924193-049**	**EB1924193-050**
				Result	Result	Result	Result	Result
EG020F: Dissolved Metals by ICP-MS - Continued								
Chromium	7440-47-3	0.001	mg/L	<0.001	**0.005**	**0.002**	<0.001	**0.001**
Indium	7440-74-6	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L	<0.001	**0.001**	<0.001	<0.001	**0.001**
Lanthanum	7439-91-0	0.001	mg/L	<0.001	<0.001	**0.001**	<0.001	<0.001
Rubidium	7440-17-7	0.001	mg/L	**0.025**	**0.026**	**0.018**	**0.022**	**0.025**
Lithium	7439-93-2	0.001	mg/L	**0.008**	**0.002**	**0.008**	**0.009**	**0.005**
Lutetium	7439-94-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Thorium	7440-29-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Cerium	7440-45-1	0.001	mg/L	<0.001	<0.001	**0.003**	<0.001	<0.001
Manganese	7439-96-5	0.001	mg/L	**0.007**	<0.001	**0.012**	**0.007**	**0.025**
Neodymium	7440-00-8	0.001	mg/L	<0.001	<0.001	**0.001**	<0.001	<0.001
Molybdenum	7439-98-7	0.001	mg/L	**0.010**	**0.006**	**0.008**	**0.011**	**0.007**
Praseodymium	7440-10-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Samarium	7440-19-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Lead	7439-92-1	0.001	mg/L	<0.001	**0.002**	**0.004**	**0.002**	**0.015**
Terbium	7440-27-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Antimony	7440-36-0	0.001	mg/L	**0.013**	**0.002**	**0.007**	**0.001**	<0.001
Thulium	7440-30-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Ytterbium	7440-64-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Tin	7440-31-5	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Yttrium	7440-65-5	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Thallium	7440-28-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Zirconium	7440-67-7	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Vanadium	7440-62-2	0.01	mg/L	<0.01	**0.02**	<0.01	<0.01	<0.01
Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	**0.008**	**0.005**	**0.013**
Iron	7439-89-6	0.05	mg/L	**0.10**	<0.05	**0.57**	**0.18**	**0.36**
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order : **EB1924186**
Client : **BROKEN HILL OPERATIONS PTY LTD**
Contact : GWEN WILSON
Address : PO BOX 5073
BROKEN HILL NSW 2880
Telephone : ----
Project : Waste Rock samples 2019
Order number : ----
C-O-C number : ----
Sampler : BRETT NIELSEN
Site : ----
Quote number : EN/333
No. of samples received : 50
No. of samples analysed : 50

Page : 1 of 22
Laboratory : Environmental Division Brisbane
Contact : Customer Services EB
Address : 2 Byth Street Stafford QLD Australia 4053
Telephone : +61-7-3243 7222
Date Samples Received : 26-Aug-2019 15:40
Date Analysis Commenced : 24-Sep-2019
Issue Date : 30-Sep-2019 09:48

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Kim McCabe	Senior Inorganic Chemist	Brisbane Inorganics, Stafford, QLD

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- **SPLIT WORK ORDER: It should be noted that ALS has split this work order over the following work orders (EB1922319, EB1924186, EB1924193) due to the size of the sample numbers and range of analysis requested. Analysis on Non-leachate analysis will be reported under EB1922319, NAG Leachate analysis under EB1924186, & non-standard DI leachate analysis under EB1924193. For any further information regarding this processing of samples please contact ALS client services division on ALSEnviro.Brisbane@alsglobal.com**
- EG035F (Dissolved Mercury): Some samples diluted due to matrix interference. LOR adjusted accordingly.

Analytical Results

Sub-Matrix: **LEACHATE** (Matrix: **WATER**)			*Client sample ID*	**BH66502** **NAG Leachate**	**BH66503** **NAG Leachate**	**BH66504** **NAG Leachate**	**BH66505** **NAG Leachate**	**BH66506** **NAG Leachate**
			Client sampling date / time	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00
Compound	*CAS Number*	*LOR*	*Unit*	**EB1924186-001**	**EB1924186-002**	**EB1924186-003**	**EB1924186-004**	**EB1924186-005**
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**5.07**	**5.06**	**7.09**	**6.42**	**6.22**
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**185**	**163**	**199**	**186**	**183**
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**3**	**3**	**21**	**7**	**8**
Total Alkalinity as CaCO3	----	1	mg/L	**3**	**3**	**21**	**7**	**8**
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**34**	**27**	**28**	**27**	**25**
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	<1	<1	<1	**2**	**1**
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	**0.06**	**0.04**	**0.21**	**0.07**	**0.17**
Dysprosium	7429-91-6	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Silver	7440-22-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Arsenic	7440-38-2	0.001	mg/L	**0.001**	<0.001	**0.039**	**0.020**	**0.007**
Bismuth	7440-69-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Erbium	7440-52-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Boron	7440-42-8	0.05	mg/L	**0.64**	**0.78**	**0.48**	**0.71**	**0.59**
Europium	7440-53-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Strontium	7440-24-6	0.001	mg/L	**0.011**	**0.008**	**0.010**	**0.011**	**0.014**
Barium	7440-39-3	0.001	mg/L	**0.004**	**0.003**	**0.001**	**0.002**	**0.002**
Gadolinium	7440-54-2	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Titanium	7440-32-6	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Gallium	7440-55-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Hafnium	7440-58-6	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Tellurium	22541-49-7	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Cobalt	7440-48-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Holmium	7440-60-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Uranium	7440-61-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Caesium	7440-46-2	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001

Analytical Results

Sub-Matrix: **LEACHATE** (Matrix: **WATER**)			*Client sample ID*	**BH66502** **NAG Leachate**	**BH66503** **NAG Leachate**	**BH66504** **NAG Leachate**	**BH66505** **NAG Leachate**	**BH66506** **NAG Leachate**
			Client sampling date / time	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00
Compound	*CAS Number*	*LOR*	*Unit*	**EB1924186-001**	**EB1924186-002**	**EB1924186-003**	**EB1924186-004**	**EB1924186-005**
				Result	Result	Result	Result	Result
EG020F: Dissolved Metals by ICP-MS - Continued								
Chromium	7440-47-3	0.001	mg/L	**0.014**	**0.012**	**0.012**	**0.018**	**0.015**
Indium	7440-74-6	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Lanthanum	7439-91-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Rubidium	7440-17-7	0.001	mg/L	**0.064**	**0.058**	**0.043**	**0.055**	**0.050**
Lithium	7439-93-2	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Lutetium	7439-94-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Thorium	7440-29-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Cerium	7440-45-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Manganese	7439-96-5	0.001	mg/L	**0.054**	**0.033**	<0.001	**0.014**	**0.004**
Neodymium	7440-00-8	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Molybdenum	7439-98-7	0.001	mg/L	**0.005**	**0.002**	**0.028**	**0.004**	**0.003**
Praseodymium	7440-10-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Samarium	7440-19-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Terbium	7440-27-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Antimony	7440-36-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Thulium	7440-30-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Ytterbium	7440-64-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Tin	7440-31-5	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Yttrium	7440-65-5	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Thallium	7440-28-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Zirconium	7440-67-7	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Vanadium	7440-62-2	0.01	mg/L	**0.02**	**0.02**	**0.02**	**0.02**	**0.02**
Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	<0.05	<0.05	**0.07**
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0005	<0.0001	<0.0001

Analytical Results

Sub-Matrix: **LEACHATE** (Matrix: **WATER**)			*Client sample ID*	**BH66507** **NAG Leachate**	**BH66508** **NAG Leachate**	**BH66509** **NAG Leachate**	**BH66510** **NAG Leachate**	**BH66511** **NAG Leachate**
			Client sampling date / time	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00
Compound	*CAS Number*	*LOR*	*Unit*	**EB1924186-006**	**EB1924186-007**	**EB1924186-008**	**EB1924186-009**	**EB1924186-010**
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**6.46**	**4.53**	**7.53**	**5.78**	**4.79**
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**155**	**268**	**246**	**160**	**218**
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**10**	<1	**27**	**3**	<1
Total Alkalinity as CaCO3	----	1	mg/L	**10**	<1	**27**	**3**	<1
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**14**	**71**	**36**	**23**	**45**
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**6**	**2**	**5**	**2**	<1
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	**0.08**	**0.23**	**1.54**	**0.04**	**0.10**
Dysprosium	7429-91-6	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Silver	7440-22-4	0.001	mg/L	<0.001	**0.002**	<0.001	<0.001	<0.001
Arsenic	7440-38-2	0.001	mg/L	**0.003**	**0.011**	**0.006**	**0.006**	<0.001
Bismuth	7440-69-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Erbium	7440-52-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Boron	7440-42-8	0.05	mg/L	**0.42**	**0.50**	**0.47**	**0.52**	**0.52**
Europium	7440-53-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Strontium	7440-24-6	0.001	mg/L	**0.009**	**0.036**	**0.020**	**0.010**	**0.016**
Barium	7440-39-3	0.001	mg/L	**0.002**	**0.076**	<0.001	**0.002**	**0.016**
Gadolinium	7440-54-2	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Titanium	7440-32-6	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Gallium	7440-55-3	0.001	mg/L	<0.001	<0.001	**0.002**	<0.001	<0.001
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	**0.0468**	<0.0001	<0.0001	**0.0004**
Hafnium	7440-58-6	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Tellurium	22541-49-7	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Cobalt	7440-48-4	0.001	mg/L	<0.001	**0.028**	<0.001	<0.001	<0.001
Holmium	7440-60-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Uranium	7440-61-1	0.001	mg/L	<0.001	<0.001	<0.001	**0.001**	<0.001
Caesium	7440-46-2	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001

Analytical Results

Sub-Matrix: **LEACHATE** (Matrix: **WATER**)			*Client sample ID*	**BH66507 NAG Leachate**	**BH66508 NAG Leachate**	**BH66509 NAG Leachate**	**BH66510 NAG Leachate**	**BH66511 NAG Leachate**
			Client sampling date / time	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00
Compound	*CAS Number*	*LOR*	*Unit*	**EB1924186-006**	**EB1924186-007**	**EB1924186-008**	**EB1924186-009**	**EB1924186-010**
				Result	Result	Result	Result	Result
EG020F: Dissolved Metals by ICP-MS - Continued								
Chromium	7440-47-3	0.001	mg/L	**0.011**	**0.004**	**0.013**	**0.013**	**0.007**
Indium	7440-74-6	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L	<0.001	**0.065**	<0.001	<0.001	<0.001
Lanthanum	7439-91-0	0.001	mg/L	<0.001	**0.006**	<0.001	<0.001	<0.001
Rubidium	7440-17-7	0.001	mg/L	**0.047**	**0.067**	**0.042**	**0.048**	**0.086**
Lithium	7439-93-2	0.001	mg/L	<0.001	**0.012**	**0.002**	<0.001	**0.002**
Lutetium	7439-94-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Thorium	7440-29-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Cerium	7440-45-1	0.001	mg/L	<0.001	**0.009**	<0.001	<0.001	<0.001
Manganese	7439-96-5	0.001	mg/L	**0.009**	**0.399**	<0.001	**0.022**	**0.106**
Neodymium	7440-00-8	0.001	mg/L	<0.001	**0.004**	<0.001	<0.001	<0.001
Molybdenum	7439-98-7	0.001	mg/L	**0.014**	**0.026**	**0.058**	**0.005**	**0.004**
Praseodymium	7440-10-0	0.001	mg/L	<0.001	**0.001**	<0.001	<0.001	<0.001
Nickel	7440-02-0	0.001	mg/L	<0.001	**0.040**	<0.001	<0.001	**0.001**
Samarium	7440-19-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Lead	7439-92-1	0.001	mg/L	<0.001	**0.579**	**0.002**	<0.001	<0.001
Terbium	7440-27-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Antimony	7440-36-0	0.001	mg/L	<0.001	<0.001	**0.016**	<0.001	<0.001
Thulium	7440-30-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Ytterbium	7440-64-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Tin	7440-31-5	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Yttrium	7440-65-5	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Thallium	7440-28-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Zirconium	7440-67-7	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Vanadium	7440-62-2	0.01	mg/L	**0.01**	<0.01	**0.01**	**0.02**	**0.02**
Zinc	7440-66-6	0.005	mg/L	<0.005	**5.86**	<0.005	<0.005	**0.005**
Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001

Analytical Results

Sub-Matrix: **LEACHATE** (Matrix: **WATER**)			*Client sample ID*	**BH66512 NAG Leachate**	**BH66513 NAG Leachate**	**BH66514 NAG Leachate**	**BH66515 NAG Leachate**	**BH66516 NAG Leachate**
			Client sampling date / time	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00
Compound	*CAS Number*	*LOR*	*Unit*	**EB1924186-011**	**EB1924186-012**	**EB1924186-013**	**EB1924186-014**	**EB1924186-015**
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**4.65**	**6.45**	**5.54**	**4.77**	**3.85**
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**210**	**148**	**146**	**266**	**293**
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	<1	**9**	**4**	<1	<1
Total Alkalinity as CaCO3	----	1	mg/L	<1	**9**	**4**	<1	<1
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**43**	**14**	**23**	**76**	**78**
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	<1	**4**	**1**	<1	<1
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	**0.23**	**0.05**	**0.04**	**0.24**	**2.62**
Dysprosium	7429-91-6	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Silver	7440-22-4	0.001	mg/L	**0.002**	<0.001	<0.001	<0.001	<0.001
Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Bismuth	7440-69-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Erbium	7440-52-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Boron	7440-42-8	0.05	mg/L	**0.51**	**0.42**	**0.48**	**0.35**	**0.35**
Europium	7440-53-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Strontium	7440-24-6	0.001	mg/L	**0.022**	**0.007**	**0.008**	**0.032**	**0.029**
Barium	7440-39-3	0.001	mg/L	**0.020**	**0.003**	**0.003**	**0.042**	**0.132**
Gadolinium	7440-54-2	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	**0.002**
Titanium	7440-32-6	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	**0.001**
Gallium	7440-55-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	**0.001**
Cadmium	7440-43-9	0.0001	mg/L	**0.0006**	<0.0001	<0.0001	**0.0007**	**0.0013**
Hafnium	7440-58-6	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Tellurium	22541-49-7	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Cobalt	7440-48-4	0.001	mg/L	<0.001	<0.001	<0.001	**0.003**	**0.029**
Holmium	7440-60-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Uranium	7440-61-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	**0.003**
Caesium	7440-46-2	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001

Analytical Results

Sub-Matrix: **LEACHATE** (Matrix: **WATER**)			*Client sample ID*	**BH66512** **NAG Leachate**	**BH66513** **NAG Leachate**	**BH66514** **NAG Leachate**	**BH66515** **NAG Leachate**	**BH66516** **NAG Leachate**
			Client sampling date / time	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00
Compound	*CAS Number*	*LOR*	*Unit*	**EB1924186-011**	**EB1924186-012**	**EB1924186-013**	**EB1924186-014**	**EB1924186-015**
				Result	Result	Result	Result	Result
EG020F: Dissolved Metals by ICP-MS - Continued								
Chromium	7440-47-3	0.001	mg/L	**0.010**	**0.015**	**0.010**	**0.003**	**0.003**
Indium	7440-74-6	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	<0.001	**0.002**	**0.034**
Lanthanum	7439-91-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	**0.021**
Rubidium	7440-17-7	0.001	mg/L	**0.070**	**0.042**	**0.044**	**0.062**	**0.086**
Lithium	7439-93-2	0.001	mg/L	<0.001	<0.001	<0.001	**0.003**	**0.014**
Lutetium	7439-94-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Thorium	7440-29-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Cerium	7440-45-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	**0.043**
Manganese	7439-96-5	0.001	mg/L	**0.250**	**0.010**	**0.018**	**0.433**	**0.245**
Neodymium	7440-00-8	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	**0.016**
Molybdenum	7439-98-7	0.001	mg/L	**0.004**	**0.008**	**0.003**	**0.010**	**0.003**
Praseodymium	7440-10-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	**0.004**
Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	<0.001	**0.032**	**0.157**
Samarium	7440-19-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	**0.003**
Lead	7439-92-1	0.001	mg/L	**0.008**	<0.001	<0.001	**0.004**	**0.035**
Terbium	7440-27-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Antimony	7440-36-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Thulium	7440-30-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Ytterbium	7440-64-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Tin	7440-31-5	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Yttrium	7440-65-5	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	**0.005**
Thallium	7440-28-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Zirconium	7440-67-7	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Vanadium	7440-62-2	0.01	mg/L	**0.02**	**0.01**	**0.01**	<0.01	**0.01**
Zinc	7440-66-6	0.005	mg/L	**0.005**	<0.005	<0.005	**0.007**	**0.112**
Iron	7439-89-6	0.05	mg/L	**0.09**	<0.05	<0.05	<0.05	**0.06**
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001

Analytical Results

Sub-Matrix: **LEACHATE** (Matrix: **WATER**)			*Client sample ID*	**BH66517** **NAG Leachate**	**BH66518** **NAG Leachate**	**BH66519** **NAG Leachate**	**BH66520** **NAG Leachate**	**BH66521** **NAG Leachate**
			Client sampling date / time	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00
Compound	*CAS Number*	*LOR*	*Unit*	**EB1924186-016**	**EB1924186-017**	**EB1924186-018**	**EB1924186-019**	**EB1924186-020**
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**3.72**	**4.16**	**3.96**	**4.28**	**5.62**
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**404**	**272**	**301**	**259**	**163**
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	<1	<1	<1	<1	**4**
Total Alkalinity as CaCO3	----	1	mg/L	<1	<1	<1	<1	**4**
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**126**	**71**	**85**	**68**	**28**
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**1**	<1	**1**	<1	<1
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	**1.98**	**1.10**	**1.30**	**0.55**	**0.03**
Dysprosium	7429-91-6	0.001	mg/L	**0.002**	**0.001**	**0.001**	<0.001	<0.001
Silver	7440-22-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Arsenic	7440-38-2	0.001	mg/L	**0.009**	**0.003**	**0.006**	<0.001	**0.001**
Bismuth	7440-69-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Erbium	7440-52-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Boron	7440-42-8	0.05	mg/L	**0.35**	**0.34**	**0.29**	**0.39**	**0.56**
Europium	7440-53-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Strontium	7440-24-6	0.001	mg/L	**0.026**	**0.030**	**0.017**	**0.037**	**0.015**
Barium	7440-39-3	0.001	mg/L	**0.071**	**0.114**	**0.068**	**0.093**	**0.004**
Gadolinium	7440-54-2	0.001	mg/L	**0.007**	**0.005**	**0.006**	<0.001	<0.001
Titanium	7440-32-6	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Beryllium	7440-41-7	0.001	mg/L	**0.001**	<0.001	<0.001	<0.001	<0.001
Gallium	7440-55-3	0.001	mg/L	**0.004**	**0.003**	**0.004**	<0.001	<0.001
Cadmium	7440-43-9	0.0001	mg/L	**0.0335**	**0.0124**	**0.0051**	**0.0014**	<0.0001
Hafnium	7440-58-6	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Tellurium	22541-49-7	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Cobalt	7440-48-4	0.001	mg/L	**0.081**	**0.049**	**0.064**	**0.010**	<0.001
Holmium	7440-60-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Uranium	7440-61-1	0.001	mg/L	**0.014**	**0.005**	**0.005**	<0.001	<0.001
Caesium	7440-46-2	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001

Analytical Results

Sub-Matrix: **LEACHATE** (Matrix: **WATER**)			*Client sample ID*	**BH66517** **NAG Leachate**	**BH66518** **NAG Leachate**	**BH66519** **NAG Leachate**	**BH66520** **NAG Leachate**	**BH66521** **NAG Leachate**
			Client sampling date / time	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00
Compound	*CAS Number*	*LOR*	*Unit*	**EB1924186-016**	**EB1924186-017**	**EB1924186-018**	**EB1924186-019**	**EB1924186-020**
				Result	Result	Result	Result	Result
EG020F: Dissolved Metals by ICP-MS - Continued								
Chromium	7440-47-3	0.001	mg/L	**0.001**	**0.001**	<0.001	**0.002**	**0.012**
Indium	7440-74-6	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L	**0.142**	**0.209**	**0.140**	**0.007**	<0.001
Lanthanum	7439-91-0	0.001	mg/L	**0.090**	**0.063**	**0.086**	**0.005**	<0.001
Rubidium	7440-17-7	0.001	mg/L	**0.074**	**0.081**	**0.061**	**0.059**	**0.039**
Lithium	7439-93-2	0.001	mg/L	**0.010**	**0.008**	**0.007**	**0.006**	<0.001
Lutetium	7439-94-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Thorium	7440-29-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Cerium	7440-45-1	0.001	mg/L	**0.194**	**0.135**	**0.184**	**0.004**	<0.001
Manganese	7439-96-5	0.001	mg/L	**0.596**	**0.422**	**0.542**	**0.201**	**0.032**
Neodymium	7440-00-8	0.001	mg/L	**0.066**	**0.049**	**0.063**	**0.003**	<0.001
Molybdenum	7439-98-7	0.001	mg/L	<0.001	<0.001	<0.001	**0.007**	**0.003**
Praseodymium	7440-10-0	0.001	mg/L	**0.018**	**0.013**	**0.017**	<0.001	<0.001
Nickel	7440-02-0	0.001	mg/L	**0.163**	**0.108**	**0.123**	**0.077**	<0.001
Samarium	7440-19-9	0.001	mg/L	**0.010**	**0.008**	**0.010**	<0.001	<0.001
Lead	7439-92-1	0.001	mg/L	**5.93**	**0.489**	**0.614**	**0.017**	<0.001
Terbium	7440-27-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Antimony	7440-36-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Thulium	7440-30-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Ytterbium	7440-64-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Tin	7440-31-5	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Yttrium	7440-65-5	0.001	mg/L	**0.006**	**0.004**	**0.004**	**0.003**	<0.001
Thallium	7440-28-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Zirconium	7440-67-7	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	<0.01	**0.01**	**0.01**
Zinc	7440-66-6	0.005	mg/L	**4.35**	**2.37**	**0.960**	**0.063**	<0.005
Iron	7439-89-6	0.05	mg/L	**23.2**	**3.26**	**16.7**	<0.05	<0.05
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001

Analytical Results

Sub-Matrix: **LEACHATE**
(Matrix: **WATER**)

			Client sample ID	**BH66522 NAG Leachate**	**BH66523 NAG Leachate**	**BH66524 NAG Leachate**	**BH66525 NAG Leachate**	**BH66526 NAG Leachate**
			Client sampling date / time	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00
Compound	*CAS Number*	*LOR*	*Unit*	**EB1924186-021**	**EB1924186-022**	**EB1924186-023**	**EB1924186-024**	**EB1924186-025**
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**5.11**	**3.98**	**5.45**	**5.33**	**6.74**
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**202**	**275**	**171**	**191**	**154**
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**3**	<1	**4**	**3**	**15**
Total Alkalinity as CaCO3	----	1	mg/L	**3**	<1	**4**	**3**	**15**
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**43**	**104**	**31**	**39**	**13**
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	<1	**3**	<1	<1	**4**
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	**0.08**	**1.30**	**0.03**	**0.04**	**0.05**
Dysprosium	7429-91-6	0.001	mg/L	<0.001	**0.002**	<0.001	<0.001	<0.001
Silver	7440-22-4	0.001	mg/L	<0.001	**0.001**	<0.001	<0.001	<0.001
Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	**0.007**
Bismuth	7440-69-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Erbium	7440-52-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Boron	7440-42-8	0.05	mg/L	**0.45**	**0.28**	**0.47**	**0.41**	**0.32**
Europium	7440-53-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Strontium	7440-24-6	0.001	mg/L	**0.022**	**0.031**	**0.015**	**0.021**	**0.009**
Barium	7440-39-3	0.001	mg/L	**0.020**	**0.110**	**0.007**	**0.008**	**0.001**
Gadolinium	7440-54-2	0.001	mg/L	<0.001	**0.004**	<0.001	<0.001	<0.001
Titanium	7440-32-6	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Gallium	7440-55-3	0.001	mg/L	<0.001	**0.002**	<0.001	<0.001	<0.001
Cadmium	7440-43-9	0.0001	mg/L	**0.0002**	**0.0199**	<0.0001	**0.0006**	<0.0001
Hafnium	7440-58-6	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Tellurium	22541-49-7	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Cobalt	7440-48-4	0.001	mg/L	<0.001	**0.054**	<0.001	<0.001	<0.001
Holmium	7440-60-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Uranium	7440-61-1	0.001	mg/L	<0.001	**0.002**	<0.001	<0.001	**0.001**
Caesium	7440-46-2	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001

Analytical Results

Sub-Matrix: **LEACHATE** (Matrix: **WATER**)			*Client sample ID*	**BH66522** **NAG Leachate**	**BH66523** **NAG Leachate**	**BH66524** **NAG Leachate**	**BH66525** **NAG Leachate**	**BH66526** **NAG Leachate**
			Client sampling date / time	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00
Compound	*CAS Number*	*LOR*	*Unit*	**EB1924186-021**	**EB1924186-022**	**EB1924186-023**	**EB1924186-024**	**EB1924186-025**
				Result	Result	Result	Result	Result
EG020F: Dissolved Metals by ICP-MS - Continued								
Chromium	7440-47-3	0.001	mg/L	**0.011**	**0.002**	**0.013**	**0.008**	**0.013**
Indium	7440-74-6	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L	<0.001	**0.117**	<0.001	<0.001	<0.001
Lanthanum	7439-91-0	0.001	mg/L	<0.001	**0.042**	<0.001	<0.001	<0.001
Rubidium	7440-17-7	0.001	mg/L	**0.055**	**0.066**	**0.041**	**0.045**	**0.047**
Lithium	7439-93-2	0.001	mg/L	<0.001	**0.011**	<0.001	**0.001**	<0.001
Lutetium	7439-94-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Thorium	7440-29-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Cerium	7440-45-1	0.001	mg/L	<0.001	**0.082**	<0.001	<0.001	<0.001
Manganese	7439-96-5	0.001	mg/L	**0.154**	**0.537**	**0.049**	**0.216**	**0.010**
Neodymium	7440-00-8	0.001	mg/L	<0.001	**0.033**	<0.001	<0.001	<0.001
Molybdenum	7439-98-7	0.001	mg/L	**0.007**	**0.005**	**0.003**	**0.003**	**0.002**
Praseodymium	7440-10-0	0.001	mg/L	<0.001	**0.009**	<0.001	<0.001	<0.001
Nickel	7440-02-0	0.001	mg/L	<0.001	**0.107**	<0.001	<0.001	<0.001
Samarium	7440-19-9	0.001	mg/L	<0.001	**0.006**	<0.001	<0.001	<0.001
Lead	7439-92-1	0.001	mg/L	<0.001	**0.520**	<0.001	<0.001	<0.001
Terbium	7440-27-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Antimony	7440-36-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Thulium	7440-30-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Ytterbium	7440-64-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Tin	7440-31-5	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Yttrium	7440-65-5	0.001	mg/L	<0.001	**0.006**	<0.001	<0.001	<0.001
Thallium	7440-28-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Zirconium	7440-67-7	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Vanadium	7440-62-2	0.01	mg/L	**0.02**	**0.01**	**0.02**	**0.01**	**0.02**
Zinc	7440-66-6	0.005	mg/L	<0.005	**4.28**	<0.005	<0.005	<0.005
Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0005	<0.0001	<0.0001

Analytical Results

Sub-Matrix: **LEACHATE**
(Matrix: **WATER**)

			Client sample ID	**BH66527** **NAG Leachate**	**BH66528** **NAG Leachate**	**BH66529** **NAG Leachate**	**BH66530** **NAG Leachate**	**BH66531** **NAG Leachate**
			Client sampling date / time	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00
Compound	*CAS Number*	*LOR*	*Unit*	**EB1924186-026**	**EB1924186-027**	**EB1924186-028**	**EB1924186-029**	**EB1924186-030**
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**6.46**	**5.30**	**5.43**	**4.16**	**6.28**
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**150**	**210**	**194**	**231**	**216**
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**11**	**3**	**4**	<1	**4**
Total Alkalinity as CaCO3	----	1	mg/L	**11**	**3**	**4**	<1	**4**
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**16**	**47**	**42**	**55**	**46**
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**7**	<1	<1	<1	<1
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	**0.03**	**0.09**	**0.03**	**0.49**	**0.05**
Dysprosium	7429-91-6	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Silver	7440-22-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Arsenic	7440-38-2	0.001	mg/L	**0.006**	<0.001	<0.001	<0.001	**0.006**
Bismuth	7440-69-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Erbium	7440-52-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Boron	7440-42-8	0.05	mg/L	**0.30**	**0.34**	**0.40**	**0.38**	**0.29**
Europium	7440-53-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Strontium	7440-24-6	0.001	mg/L	**0.008**	**0.028**	**0.022**	**0.021**	**0.024**
Barium	7440-39-3	0.001	mg/L	**0.002**	**0.026**	**0.008**	**0.049**	**0.003**
Gadolinium	7440-54-2	0.001	mg/L	<0.001	<0.001	<0.001	**0.002**	<0.001
Titanium	7440-32-6	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	<0.001	**0.001**	<0.001
Gallium	7440-55-3	0.001	mg/L	<0.001	<0.001	<0.001	**0.001**	<0.001
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	**0.0004**	**0.0001**	**0.0021**	<0.0001
Hafnium	7440-58-6	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Tellurium	22541-49-7	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Cobalt	7440-48-4	0.001	mg/L	<0.001	<0.001	<0.001	**0.035**	<0.001
Holmium	7440-60-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Uranium	7440-61-1	0.001	mg/L	**0.004**	<0.001	<0.001	**0.002**	<0.001
Caesium	7440-46-2	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001

Analytical Results

Sub-Matrix: **LEACHATE**
(Matrix: **WATER**)

			Client sample ID	**BH66527 NAG Leachate**	**BH66528 NAG Leachate**	**BH66529 NAG Leachate**	**BH66530 NAG Leachate**	**BH66531 NAG Leachate**
			Client sampling date / time	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00
Compound	CAS Number	LOR	Unit	**EB1924186-026**	**EB1924186-027**	**EB1924186-028**	**EB1924186-029**	**EB1924186-030**
				Result	Result	Result	Result	Result
EG020F: Dissolved Metals by ICP-MS - Continued								
Chromium	7440-47-3	0.001	mg/L	**0.011**	**0.008**	**0.010**	<0.001	**0.010**
Indium	7440-74-6	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	<0.001	**0.137**	<0.001
Lanthanum	7439-91-0	0.001	mg/L	<0.001	<0.001	<0.001	**0.029**	<0.001
Rubidium	7440-17-7	0.001	mg/L	**0.051**	**0.059**	**0.048**	**0.059**	**0.038**
Lithium	7439-93-2	0.001	mg/L	<0.001	**0.001**	<0.001	**0.009**	**0.001**
Lutetium	7439-94-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Thorium	7440-29-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Cerium	7440-45-1	0.001	mg/L	<0.001	<0.001	<0.001	**0.061**	<0.001
Manganese	7439-96-5	0.001	mg/L	**0.039**	**0.178**	**0.078**	**0.426**	**0.004**
Neodymium	7440-00-8	0.001	mg/L	<0.001	<0.001	<0.001	**0.019**	<0.001
Molybdenum	7439-98-7	0.001	mg/L	**0.002**	**0.028**	**0.140**	<0.001	**0.012**
Praseodymium	7440-10-0	0.001	mg/L	<0.001	<0.001	<0.001	**0.005**	<0.001
Nickel	7440-02-0	0.001	mg/L	<0.001	**0.007**	<0.001	**0.120**	<0.001
Samarium	7440-19-9	0.001	mg/L	<0.001	<0.001	<0.001	**0.003**	<0.001
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	**0.075**	<0.001
Terbium	7440-27-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Antimony	7440-36-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Thulium	7440-30-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Ytterbium	7440-64-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Tin	7440-31-5	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Yttrium	7440-65-5	0.001	mg/L	<0.001	<0.001	<0.001	**0.001**	<0.001
Thallium	7440-28-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Zirconium	7440-67-7	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Vanadium	7440-62-2	0.01	mg/L	**0.01**	**0.01**	**0.01**	<0.01	**0.01**
Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	<0.005	**0.308**	<0.005
Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	<0.05	**5.73**	<0.05
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001

Analytical Results

Sub-Matrix: **LEACHATE**
(Matrix: **WATER**)

			Client sample ID	**BH66532** **NAG Leachate**	**BH66533** **NAG Leachate**	**BH66534** **NAG Leachate**	**BH66535** **NAG Leachate**	**BH66536** **NAG Leachate**
			Client sampling date / time	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00
Compound	*CAS Number*	*LOR*	*Unit*	**EB1924186-031**	**EB1924186-032**	**EB1924186-033**	**EB1924186-034**	**EB1924186-035**
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**4.76**	**4.06**	**4.72**	**5.52**	**5.19**
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**208**	**263**	**202**	**159**	**227**
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**1**	<1	<1	**4**	**3**
Total Alkalinity as CaCO3	----	1	mg/L	**1**	<1	<1	**4**	**3**
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**48**	**71**	**54**	**26**	**57**
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	<1	<1	<1	**2**	**2**
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	**0.16**	**0.53**	**0.19**	**0.03**	**0.09**
Dysprosium	7429-91-6	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Silver	7440-22-4	0.001	mg/L	<0.001	<0.001	**0.003**	<0.001	**0.003**
Arsenic	7440-38-2	0.001	mg/L	<0.001	**0.001**	<0.001	<0.001	<0.001
Bismuth	7440-69-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Erbium	7440-52-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Boron	7440-42-8	0.05	mg/L	**0.41**	**0.43**	**0.31**	**0.36**	**0.36**
Europium	7440-53-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Strontium	7440-24-6	0.001	mg/L	**0.032**	**0.028**	**0.025**	**0.013**	**0.032**
Barium	7440-39-3	0.001	mg/L	**0.037**	**0.084**	**0.058**	**0.002**	**0.057**
Gadolinium	7440-54-2	0.001	mg/L	<0.001	**0.002**	<0.001	<0.001	<0.001
Titanium	7440-32-6	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Gallium	7440-55-3	0.001	mg/L	<0.001	**0.001**	<0.001	<0.001	<0.001
Cadmium	7440-43-9	0.0001	mg/L	**0.0003**	**0.0027**	**0.0073**	**0.0003**	**0.0235**
Hafnium	7440-58-6	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Tellurium	22541-49-7	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Cobalt	7440-48-4	0.001	mg/L	**0.003**	**0.036**	**0.031**	<0.001	**0.018**
Holmium	7440-60-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Uranium	7440-61-1	0.001	mg/L	<0.001	**0.002**	**0.001**	**0.002**	<0.001
Caesium	7440-46-2	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001

Analytical Results

Sub-Matrix: **LEACHATE** (Matrix: **WATER**)			*Client sample ID*	**BH66532** **NAG Leachate**	**BH66533** **NAG Leachate**	**BH66534** **NAG Leachate**	**BH66535** **NAG Leachate**	**BH66536** **NAG Leachate**
			Client sampling date / time	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00
Compound	*CAS Number*	*LOR*	*Unit*	**EB1924186-031**	**EB1924186-032**	**EB1924186-033**	**EB1924186-034**	**EB1924186-035**
				Result	Result	Result	Result	Result
EG020F: Dissolved Metals by ICP-MS - Continued								
Chromium	7440-47-3	0.001	mg/L	**0.005**	<0.001	**0.002**	**0.011**	**0.005**
Indium	7440-74-6	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L	**0.001**	**0.134**	**0.086**	<0.001	**0.018**
Lanthanum	7439-91-0	0.001	mg/L	<0.001	**0.026**	**0.006**	<0.001	**0.001**
Rubidium	7440-17-7	0.001	mg/L	**0.054**	**0.063**	**0.042**	**0.037**	**0.055**
Lithium	7439-93-2	0.001	mg/L	**0.002**	**0.007**	**0.004**	<0.001	**0.003**
Lutetium	7439-94-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Thorium	7440-29-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Cerium	7440-45-1	0.001	mg/L	<0.001	**0.060**	**0.009**	<0.001	<0.001
Manganese	7439-96-5	0.001	mg/L	**0.127**	**0.445**	**0.226**	**0.077**	**0.216**
Neodymium	7440-00-8	0.001	mg/L	<0.001	**0.019**	**0.004**	<0.001	<0.001
Molybdenum	7439-98-7	0.001	mg/L	**0.007**	<0.001	**0.002**	**0.002**	**0.003**
Praseodymium	7440-10-0	0.001	mg/L	<0.001	**0.005**	**0.001**	<0.001	<0.001
Nickel	7440-02-0	0.001	mg/L	**0.042**	**0.059**	**0.064**	<0.001	**0.014**
Samarium	7440-19-9	0.001	mg/L	<0.001	**0.003**	<0.001	<0.001	<0.001
Lead	7439-92-1	0.001	mg/L	**0.002**	**0.212**	**0.494**	<0.001	**0.243**
Terbium	7440-27-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Antimony	7440-36-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Thulium	7440-30-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Ytterbium	7440-64-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Tin	7440-31-5	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Yttrium	7440-65-5	0.001	mg/L	<0.001	**0.002**	**0.002**	<0.001	<0.001
Thallium	7440-28-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Zirconium	7440-67-7	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Vanadium	7440-62-2	0.01	mg/L	**0.01**	<0.01	<0.01	<0.01	<0.01
Zinc	7440-66-6	0.005	mg/L	**0.024**	**0.283**	**1.22**	<0.005	**2.72**
Iron	7439-89-6	0.05	mg/L	<0.05	**6.86**	<0.05	<0.05	<0.05
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001

Analytical Results

Sub-Matrix: **LEACHATE** (Matrix: **WATER**)			*Client sample ID*	**BH66537 NAG Leachate**	**BH66538 NAG Leachate**	**BH66539 NAG Leachate**	**BH66540 NAG Leachate**	**BH66541 NAG Leachate**
			Client sampling date / time	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00
Compound	*CAS Number*	*LOR*	*Unit*	**EB1924186-036**	**EB1924186-037**	**EB1924186-038**	**EB1924186-039**	**EB1924186-040**
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**4.91**	**5.02**	**7.29**	**5.46**	**5.77**
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**268**	**260**	**200**	**214**	**234**
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**2**	**2**	**25**	**4**	**4**
Total Alkalinity as CaCO3	----	1	mg/L	**2**	**2**	**25**	**4**	**4**
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**81**	**77**	**28**	**48**	**58**
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**2**	**1**	<1	<1	**1**
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	**0.14**	**0.11**	**0.34**	**0.12**	<0.01
Dysprosium	7429-91-6	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Silver	7440-22-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	**0.001**
Arsenic	7440-38-2	0.001	mg/L	**0.001**	<0.001	**0.007**	<0.001	<0.001
Bismuth	7440-69-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Erbium	7440-52-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Boron	7440-42-8	0.05	mg/L	**0.41**	**0.49**	**0.45**	**0.46**	**0.52**
Europium	7440-53-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Strontium	7440-24-6	0.001	mg/L	**0.046**	**0.037**	**0.018**	**0.035**	**0.041**
Barium	7440-39-3	0.001	mg/L	**0.083**	**0.042**	<0.001	**0.025**	**0.015**
Gadolinium	7440-54-2	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Titanium	7440-32-6	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Gallium	7440-55-3	0.001	mg/L	<0.001	<0.001	**0.001**	<0.001	<0.001
Cadmium	7440-43-9	0.0001	mg/L	**0.0094**	**0.0478**	<0.0001	**0.0010**	**0.0016**
Hafnium	7440-58-6	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Tellurium	22541-49-7	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Cobalt	7440-48-4	0.001	mg/L	**0.013**	**0.043**	<0.001	**0.001**	**0.001**
Holmium	7440-60-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Uranium	7440-61-1	0.001	mg/L	<0.001	<0.001	**0.001**	<0.001	<0.001
Caesium	7440-46-2	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001

Analytical Results

Sub-Matrix: **LEACHATE** (Matrix: **WATER**)			*Client sample ID*	**BH66537 NAG Leachate**	**BH66538 NAG Leachate**	**BH66539 NAG Leachate**	**BH66540 NAG Leachate**	**BH66541 NAG Leachate**
			Client sampling date / time	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00
Compound	*CAS Number*	*LOR*	*Unit*	**EB1924186-036**	**EB1924186-037**	**EB1924186-038**	**EB1924186-039**	**EB1924186-040**
				Result	Result	Result	Result	Result
EG020F: Dissolved Metals by ICP-MS - Continued								
Chromium	7440-47-3	0.001	mg/L	**0.002**	**0.006**	**0.011**	**0.006**	**0.009**
Indium	7440-74-6	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L	**0.009**	**0.020**	**0.001**	**0.004**	**0.002**
Lanthanum	7439-91-0	0.001	mg/L	**0.006**	**0.002**	<0.001	<0.001	<0.001
Rubidium	7440-17-7	0.001	mg/L	**0.056**	**0.063**	**0.043**	**0.051**	**0.053**
Lithium	7439-93-2	0.001	mg/L	**0.004**	**0.007**	<0.001	**0.001**	**0.003**
Lutetium	7439-94-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Thorium	7440-29-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Cerium	7440-45-1	0.001	mg/L	**0.006**	<0.001	<0.001	<0.001	<0.001
Manganese	7439-96-5	0.001	mg/L	**0.548**	**0.286**	**0.002**	**0.178**	**0.109**
Neodymium	7440-00-8	0.001	mg/L	**0.003**	<0.001	<0.001	<0.001	<0.001
Molybdenum	7439-98-7	0.001	mg/L	<0.001	**0.006**	**0.005**	**0.012**	**0.002**
Praseodymium	7440-10-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Nickel	7440-02-0	0.001	mg/L	**0.013**	**0.075**	<0.001	**0.010**	<0.001
Samarium	7440-19-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Lead	7439-92-1	0.001	mg/L	**5.03**	**0.059**	<0.001	**0.007**	**0.008**
Terbium	7440-27-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Antimony	7440-36-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Thulium	7440-30-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Ytterbium	7440-64-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Tin	7440-31-5	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Yttrium	7440-65-5	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Thallium	7440-28-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Zirconium	7440-67-7	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	**0.01**	**0.01**	<0.01
Zinc	7440-66-6	0.005	mg/L	**0.493**	**5.67**	<0.005	**0.010**	**0.073**
Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001

Analytical Results

Sub-Matrix: **LEACHATE**
(Matrix: **WATER**)

			Client sample ID	**BH66542 NAG Leachate**	**BH66543 NAG Leachate**	**BH66544 NAG Leachate**	**BH66545 NAG Leachate**	**BH66546 NAG Leachate**
			Client sampling date / time	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00
Compound	*CAS Number*	*LOR*	*Unit*	**EB1924186-041**	**EB1924186-042**	**EB1924186-043**	**EB1924186-044**	**EB1924186-045**
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**6.97**	**3.76**	**4.16**	**5.20**	**3.86**
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**173**	**709**	**264**	**210**	**293**
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**11**	<1	<1	**3**	<1
Total Alkalinity as CaCO3	----	1	mg/L	**11**	<1	<1	**3**	<1
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**26**	**312**	**72**	**46**	**77**
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**1**	**2**	<1	<1	<1
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	**0.08**	**2.68**	**0.61**	<0.01	**0.96**
Dysprosium	7429-91-6	0.001	mg/L	<0.001	**0.002**	<0.001	<0.001	<0.001
Silver	7440-22-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Arsenic	7440-38-2	0.001	mg/L	**0.020**	**0.009**	<0.001	<0.001	<0.001
Bismuth	7440-69-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Erbium	7440-52-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Boron	7440-42-8	0.05	mg/L	**0.58**	**0.60**	**0.51**	**0.50**	**0.35**
Europium	7440-53-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Strontium	7440-24-6	0.001	mg/L	**0.016**	**0.031**	**0.022**	**0.024**	**0.026**
Barium	7440-39-3	0.001	mg/L	**0.001**	<0.001	**0.090**	**0.010**	**0.094**
Gadolinium	7440-54-2	0.001	mg/L	<0.001	**0.003**	<0.001	<0.001	**0.001**
Titanium	7440-32-6	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Beryllium	7440-41-7	0.001	mg/L	<0.001	**0.002**	<0.001	<0.001	**0.002**
Gallium	7440-55-3	0.001	mg/L	<0.001	**0.002**	<0.001	<0.001	<0.001
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	**0.310**	**0.0008**	**0.0002**	**0.0022**
Hafnium	7440-58-6	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Tellurium	22541-49-7	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Cobalt	7440-48-4	0.001	mg/L	<0.001	**0.092**	**0.036**	<0.001	**0.068**
Holmium	7440-60-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Uranium	7440-61-1	0.001	mg/L	**0.004**	**0.025**	**0.001**	<0.001	**0.002**
Caesium	7440-46-2	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001

Analytical Results

Sub-Matrix: **LEACHATE** (Matrix: **WATER**)			*Client sample ID*	**BH66542** **NAG Leachate**	**BH66543** **NAG Leachate**	**BH66544** **NAG Leachate**	**BH66545** **NAG Leachate**	**BH66546** **NAG Leachate**
			Client sampling date / time	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00
Compound	*CAS Number*	*LOR*	*Unit*	**EB1924186-041**	**EB1924186-042**	**EB1924186-043**	**EB1924186-044**	**EB1924186-045**
				Result	Result	Result	Result	Result
EG020F: Dissolved Metals by ICP-MS - Continued								
Chromium	7440-47-3	0.001	mg/L	**0.012**	**0.001**	<0.001	**0.010**	<0.001
Indium	7440-74-6	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L	<0.001	**0.115**	**0.079**	<0.001	**0.261**
Lanthanum	7439-91-0	0.001	mg/L	<0.001	**0.019**	**0.007**	<0.001	**0.014**
Rubidium	7440-17-7	0.001	mg/L	**0.039**	**0.078**	**0.056**	**0.050**	**0.057**
Lithium	7439-93-2	0.001	mg/L	<0.001	**0.014**	**0.008**	<0.001	**0.009**
Lutetium	7439-94-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Thorium	7440-29-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Cerium	7440-45-1	0.001	mg/L	<0.001	**0.064**	**0.015**	<0.001	**0.028**
Manganese	7439-96-5	0.001	mg/L	**0.003**	**1.02**	**0.401**	**0.119**	**0.372**
Neodymium	7440-00-8	0.001	mg/L	<0.001	**0.030**	**0.005**	<0.001	**0.010**
Molybdenum	7439-98-7	0.001	mg/L	**0.005**	<0.001	<0.001	**0.178**	<0.001
Praseodymium	7440-10-0	0.001	mg/L	<0.001	**0.007**	**0.001**	<0.001	**0.003**
Nickel	7440-02-0	0.001	mg/L	<0.001	**0.094**	**0.150**	<0.001	**0.204**
Samarium	7440-19-9	0.001	mg/L	<0.001	**0.005**	<0.001	<0.001	**0.002**
Lead	7439-92-1	0.001	mg/L	<0.001	**5.05**	**0.013**	<0.001	**0.017**
Terbium	7440-27-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Antimony	7440-36-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Thulium	7440-30-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Selenium	7782-49-2	0.01	mg/L	<0.01	**0.01**	<0.01	<0.01	<0.01
Ytterbium	7440-64-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Tin	7440-31-5	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Yttrium	7440-65-5	0.001	mg/L	<0.001	**0.007**	**0.002**	<0.001	**0.004**
Thallium	7440-28-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Zirconium	7440-67-7	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Vanadium	7440-62-2	0.01	mg/L	**0.02**	<0.01	<0.01	**0.01**	<0.01
Zinc	7440-66-6	0.005	mg/L	<0.005	**87.5**	**0.197**	<0.005	**0.738**
Iron	7439-89-6	0.05	mg/L	<0.05	**33.0**	**4.06**	<0.05	**3.72**
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001

Analytical Results

Sub-Matrix: **LEACHATE** (Matrix: **WATER**)			*Client sample ID*	**BH66547** **NAG Leachate**	**BH66548** **NAG Leachate**	**BH66549** **NAG Leachate**	**BH66550** **NAG Leachate**	**BH66551** **NAG Leachate**
			Client sampling date / time	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00
Compound	*CAS Number*	*LOR*	*Unit*	**EB1924186-046**	**EB1924186-047**	**EB1924186-048**	**EB1924186-049**	**EB1924186-050**
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	5.18	7.28	6.53	4.16	6.76
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	206	236	157	269	143
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	3	26	6	<1	23
Total Alkalinity as CaCO3	----	1	mg/L	3	26	6	<1	23
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	44	39	22	70	5
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	1	<1	<1	1	6
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	<0.01	0.32	0.01	1.93	0.06
Dysprosium	7429-91-6	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Silver	7440-22-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Arsenic	7440-38-2	0.001	mg/L	<0.001	0.004	0.002	<0.001	0.001
Bismuth	7440-69-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Erbium	7440-52-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Boron	7440-42-8	0.05	mg/L	0.45	0.36	0.53	0.55	0.52
Europium	7440-53-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Strontium	7440-24-6	0.001	mg/L	0.029	0.029	0.010	0.033	0.008
Barium	7440-39-3	0.001	mg/L	0.009	0.001	0.001	0.090	<0.001
Gadolinium	7440-54-2	0.001	mg/L	<0.001	<0.001	<0.001	0.001	<0.001
Titanium	7440-32-6	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Gallium	7440-55-3	0.001	mg/L	<0.001	0.002	<0.001	<0.001	<0.001
Cadmium	7440-43-9	0.0001	mg/L	0.0002	<0.0001	<0.0001	0.0049	<0.0001
Hafnium	7440-58-6	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Tellurium	22541-49-7	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Cobalt	7440-48-4	0.001	mg/L	<0.001	<0.001	<0.001	0.035	<0.001
Holmium	7440-60-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Uranium	7440-61-1	0.001	mg/L	<0.001	0.002	0.002	0.002	0.021
Caesium	7440-46-2	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001

Analytical Results

Sub-Matrix: **LEACHATE** (Matrix: **WATER**)			*Client sample ID*	**BH66547 NAG Leachate**	**BH66548 NAG Leachate**	**BH66549 NAG Leachate**	**BH66550 NAG Leachate**	**BH66551 NAG Leachate**
			Client sampling date / time	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00	21-Aug-2019 09:00
Compound	*CAS Number*	*LOR*	*Unit*	**EB1924186-046**	**EB1924186-047**	**EB1924186-048**	**EB1924186-049**	**EB1924186-050**
				Result	Result	Result	Result	Result
EG020F: Dissolved Metals by ICP-MS - Continued								
Chromium	7440-47-3	0.001	mg/L	**0.009**	**0.014**	**0.012**	**0.004**	**0.008**
Indium	7440-74-6	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L	**0.003**	<0.001	**0.001**	**0.027**	**0.002**
Lanthanum	7439-91-0	0.001	mg/L	<0.001	<0.001	<0.001	**0.013**	<0.001
Rubidium	7440-17-7	0.001	mg/L	**0.042**	**0.041**	**0.038**	**0.073**	**0.044**
Lithium	7439-93-2	0.001	mg/L	<0.001	<0.001	<0.001	**0.006**	<0.001
Lutetium	7439-94-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Thorium	7440-29-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Cerium	7440-45-1	0.001	mg/L	<0.001	<0.001	<0.001	**0.024**	<0.001
Manganese	7439-96-5	0.001	mg/L	**0.121**	<0.001	**0.016**	**0.286**	**0.011**
Neodymium	7440-00-8	0.001	mg/L	<0.001	<0.001	<0.001	**0.010**	<0.001
Molybdenum	7439-98-7	0.001	mg/L	**0.012**	**0.016**	**0.002**	<0.001	**0.001**
Praseodymium	7440-10-0	0.001	mg/L	<0.001	<0.001	<0.001	**0.003**	<0.001
Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	<0.001	**0.126**	<0.001
Samarium	7440-19-9	0.001	mg/L	<0.001	<0.001	<0.001	**0.002**	<0.001
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	**0.114**	<0.001
Terbium	7440-27-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Antimony	7440-36-0	0.001	mg/L	<0.001	**0.002**	**0.001**	<0.001	<0.001
Thulium	7440-30-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Ytterbium	7440-64-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Tin	7440-31-5	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Yttrium	7440-65-5	0.001	mg/L	<0.001	<0.001	<0.001	**0.004**	<0.001
Thallium	7440-28-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Zirconium	7440-67-7	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Vanadium	7440-62-2	0.01	mg/L	**0.02**	**0.02**	**0.01**	<0.01	<0.01
Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	<0.005	**0.469**	<0.005
Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001

QUT Central Analytical Research Facility

Materials Characterisation Report

CLIENT	ALS Environmental
REPORT DATE	9th October 2019
PREPARED BY	Henry Spratt
ANALYSIS REQUESTED	Quantitative XRD
OUR REFERENCE	X19335
YOUR REFERENCE	EB1922319
QUT CONTACTS	Mr Ashley Locke, X-ray Analysis Coordinator Ph: 0400128230 | email: a.locke@qut.edu.au Dr Henry Spratt, Senior X-ray Technologist (Geoscience) Ph: 07 3138 9526 | email: henry.spratt@qut.edu.au **X-ray and Particles Laboratory enquiries: xandp@qut.edu.au**

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RESULTS

Phase Identification / Quantification

The powder X-ray diffraction patterns show the presence of crystalline phases. The estimated normalised abundance of the corundum internal standard in the samples is higher than 20 wt%. This means there is an unaccounted for component in the samples (i.e., the samples contain non-diffracting and/or unidentified material). This component is frequently referred to as amorphous.

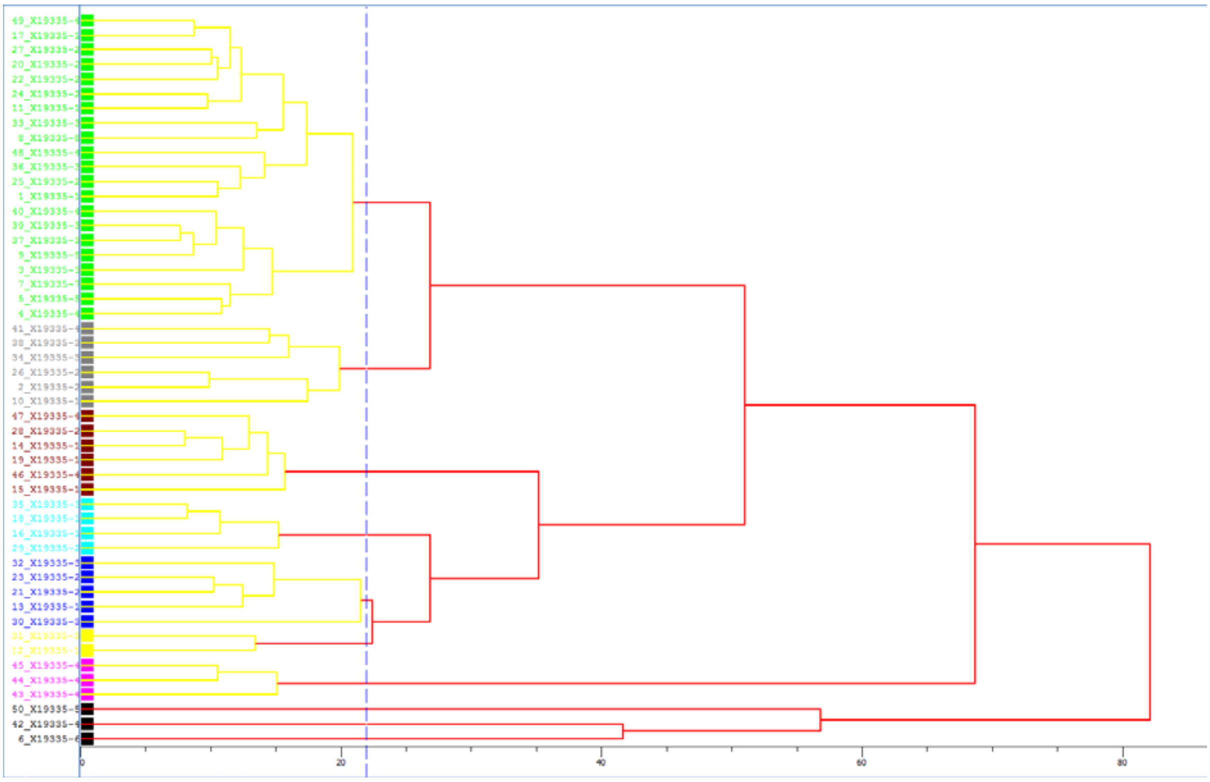
In many samples garnet phases were identified. In the absence of other information they are reported as pyralspite (pyrope, almandine, spessartine) based on which end-member/s were the best fit to the acquired data, or had the highest agreement indices from phase identification. Ugrandite (andradite, grossular, uvarovite) garnets were poor matches to the acquired data. The samples are all very crystalline with minimal amorphous content, and preferred orientation is present in many of the phases (particularly mica, K-Feldspar and sillimanite).

No one particular mica end-member (e.g. muscovite, biotite, phlogopite or phengite) was clearly a better fit and all were deficient in some way. Thus, the mica phase/s with the highest figure of merit from phase ID or the one/s that fit the best were used in the Rietveld refinement. A summed abundance is reported of all mica phases modelled (Illite/mica TOTAL) as this is believed to be more accurate. There are some samples where two distinct micas are present. This is seen as splitting of the major mica peaks (seen Appendix 1 graphics). An asterisk next to the abundance in the tables on the following pages indicates which samples have such mica peak splitting. It is hypothesised that chemical composition differences or elemental substitution account for the two distinct micas in some samples. However, in general, illite and biotite were the best fitting micas and muscovite was only added when peak splitting was observed.

Chlorite was identified and modelled on the basis of a peak at 7.0 – 7.1 Å and a weak but sharp peak at 14.0 – 14.1 Å. Some samples also have kaolinite due to the presence of a weak but separate peak at > 7.1 Å. Clay analysis is recommended to confirm these identifications.

Given the large number of samples analysed, a cluster analysis using Highscore (V4.5, PANalytical) was performed in order to simplify both phase identification and reporting of graphics. In brief, the cluster analysis partitions the collected XRD patterns into sets (clusters) based on their similarity – patterns that are similar will belong in the same cluster whilst dissimilar patterns will be in different ones. The cluster analysis suggests that the samples can be grouped into 7 major clusters on the basis of their XRD patterns, with 3 non-clustered. Reasons for this clustering or why certain samples are clustered or not is beyond the scope of this report.

Dendrogram of the cluster analysis. Clusters are colour coded, with black being non-clustered



PCA plot of the cluster analysis

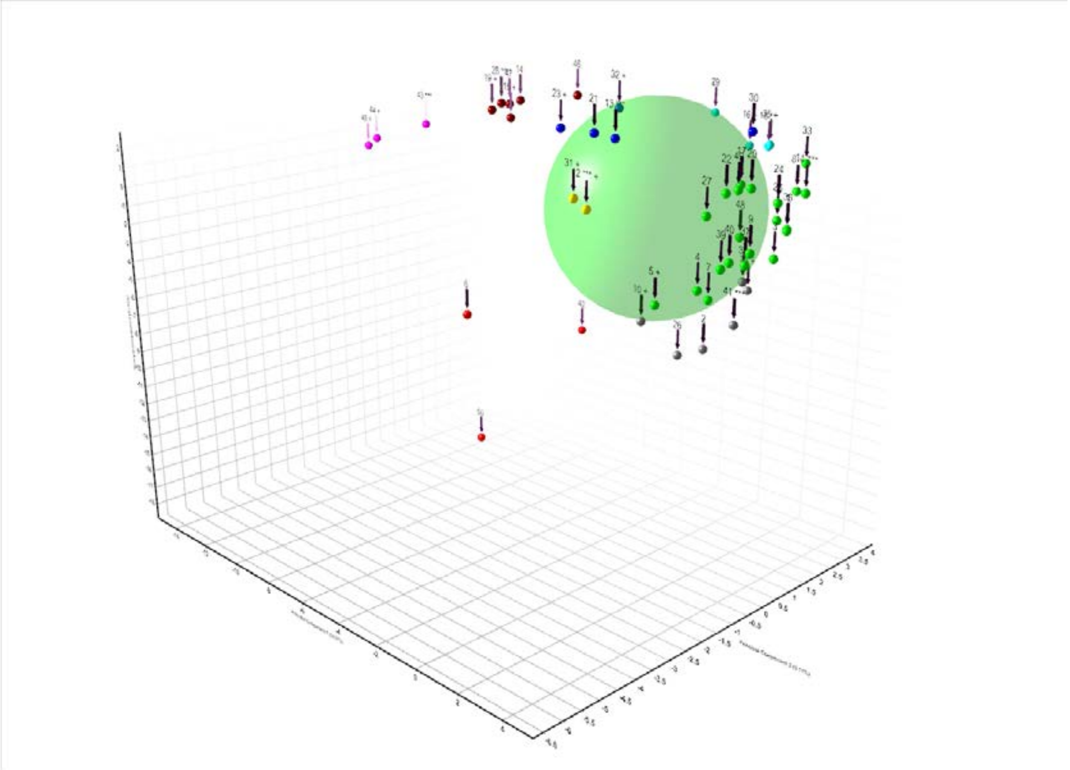


Table of phase abundances (nominal wt%, absolute) – Not Clustered

X19335 EB1922319	6 BH66507	42 BH66543	50 BH66551
Quartz	35.5	39	40
Sphalerite		1	
Galena		1.2	
Pyralspite garnet	9.8	12.5	2.8
Sillimanite	4.7	2.5	4
Plagioclase (An25-50)	8.8	4.9	3.7
K-Feldspar	13	14.1	39.1
Chlorite	1	3.4	
Illite/mica	16.1	14.4	6.7
Amorphous	11	7	3.8

Table of phase abundances (nominal wt%, absolute) – Cluster 1

X19335 EB1922319	13 BH66514	21 BH66522	23 BH66524	30 BH66531	32 BH66533
Quartz	34.8	33.1	30	30.3	31.5
Pyralspite garnet	9.7	8.5	9.5	11.4	11.3
Sillimanite	4.5	3.3	3.7	4.3	2.4
Plagioclase (An25-50)	12.1	12.2	13.5	6.7	10.5
K-Feldspar	10	7.6	6.6	9	9.3
Chlorite	3.5	2.5	3.4	3	3.9
Kaolinite	1.1			3	
Illite/mica	24.1	27.5	28	27.7	27.4
Amorphous	0.1	5.3	5.4	4.7	3.6

Table of phase abundances (nominal wt%, absolute) – Cluster 2

X19335 EB1922319	1 BH66502	3 BH66504	4 BH66505	5 BH66506	7 BH66508
Quartz	28.1	37.2	33.8	30.9	36.9
Pyralspite garnet	9.6	10.4	8.8	9.4	9.6
Sillimanite	5.5	3.1	3.7	6.4	5.6
Plagioclase (An25-50)	6.2	5.1	7.6	7.8	6.7
K-Feldspar	14.9	14.4	15.7	17.7	14.4
Chlorite	2	2.3	2.3	2.7	2.3
Kaolinite		0.9			
Illite/mica	25.2	20	19.8	20.9	17.5
Amorphous	8.6	6.6	8.3	4.3	7

X19335 EB1922319	8 BH66509	9 BH66510	11 BH66512	17 BH66518	20 BH66521	22 BH66523
Quartz	33.7	29.5	33.3	29.6	32.2	34.3
Pyralspite garnet	9.7	10.7	11.7	14.4	11.3	10.2
Sillimanite	2.9	4.9	4.5	5.0	4.3	4.2
Plagioclase (An25-50)	5.9	7.7	6	6.5	9.6	12.2
K-Feldspar	13	15.5	12.9	12.5	11.8	9.9
Chlorite	2.2	2.1	2.4	2.6	2	2.6
Kaolinite	1.2	1.1	2			2.8
Illite/mica	25	22.4	24.8	26.2	22.9	15.2
Amorphous	6.4	6.2	2.5	3.4	6.1	8.6

X19335 EB1922319	24 BH66523	25 BH66526	27 BH66528	33 BH66534	36 BH66537
Quartz	33.4	31.2	32.7	33.3	36.6
Pyralspite garnet	11.3	10	9.7	8.8	8.7
Sillimanite	2.5	6	3.8	4.2	3.8
Plagioclase (An25-50)	7.7	5.9	11.2	4.8	6.4
K-Feldspar	13	15.4	12.3	10.2	15.3
Chlorite	4.1	0.8	1.3	2.4	1.1
Kaolinite				0.9	0.7
Illite/mica	22.6	24.1	22.1	27.4	19.8
Amorphous	5.6	6.6	6.9	8	7.7

X19335 EB1922319	37 BH66538	39 BH66540	40 BH66541	48 BH66549	49 BH6650
Quartz	34.1	32.2	27.8	40.7	27.4
Pyralspite garnet	10.4	11	10.7	8.8	10.6
Sillimanite	4.8	5.6	8	2.3	5.3
Plagioclase (An25-50)	10.2	10.1	6.4	9.1	7.2
K-Feldspar	13.5	15.9	16	14.6	11.7
Chlorite	2.6	0.4	3.1	2.8	3.6
Kaolinite					0.8
Illite/mica	20	15.6	19.8	15.8	19.2
Amorphous	4.4	9.3	8.2	5.8	14.2

Table of phase abundances (nominal wt%, absolute) – Cluster 3

X19335	2	10	26	34	38	41
EB1922319	BH66503	BH66511	BH66527	BH66535	BH66539	BH66542
Quartz	32	27.4	31.1	39.8	32.5	30.4
Pyralspite garnet	10.4	9.4	8.5	9.5	8.8	10.4
Sillimanite	6.9	6.6	6.3	3.2	4.9	5.5
Plagioclase (An25-50)	6.2	4.9	8	6.3	5.6	8.4
K-Feldspar	20	17.3	23.4	19.1	18.1	22
Chlorite	2		2.6	1.4	2.1	0.4
Kaolinite					0.7	
Illite/mica	16	22.7	16.4	18.9	18.7	16.6
Amorphous	6.6	11.6	3.8	1.8	8.6	6.4

Table of phase abundances (nominal wt%, absolute) – Cluster 4

X19335	14	15	19	28	46	47
EB1922319	BH66515	BH66516	BH66520	BH66529	BH66547	BH66548
Quartz	39.2	28.9	32.4	32.7	26.4	29.7
Pyralspite garnet	7.4	11.1	8.2	9.1	8.2	4.2
Sillimanite	2.2	1.7	2.5	1.7	1.7	1.2
Plagioclase (An25-50)	8.5	10.1	13	14.3	9.8	9.9
K-Feldspar				3.7	6.2	5.9
Chlorite	1.9	3.7	1.1	3.6	3.2	3.7
Kaolinite	0.3	0.2		1.1	0.9	1.9
Illite/mica*	37	33.9	30.6	25.1	31.5	36.3
Amorphous	3.5	10.5	12.2	8.9	12	7.3

Table of phase abundances (nominal wt%, absolute) – Cluster 5

X19335	16	18	29	35
EB1922319	BH66517	BH66519	BH66530	BH66536
Quartz	28	37.3	35.2	38.7
Pyralspite garnet	14.4	14.8	13.9	9.7
Sillimanite	5.1	2.9	4.2	2.9
Plagioclase (An25-50)	2.2		3.7	1.8
K-Feldspar	9	9.2	6.6	7.8
Chlorite	4.3	2.8	0.8	2.9
Kaolinite	1.6		1.2	
Illite/mica	25.7	28.1	27.1	28.1
Amorphous	9.7	5	7.3	8.2

Table of phase abundances (nominal wt%, absolute) – Cluster 6

X19335 EB1922319	43 BH66544	44 BH66545	45 BH66546
Quartz	29.7	23	24.2
Pyralspite garnet	10.4	7.2	7.6
Sillimanite	0.9	0.9	0.9
Plagioclase (An0-16)	9.5	12.1	9.6
Chlorite	1.1	1.8	3.4
Illite/mica*	35.4	40.4	44.7
Amorphous	13	14.7	9.7

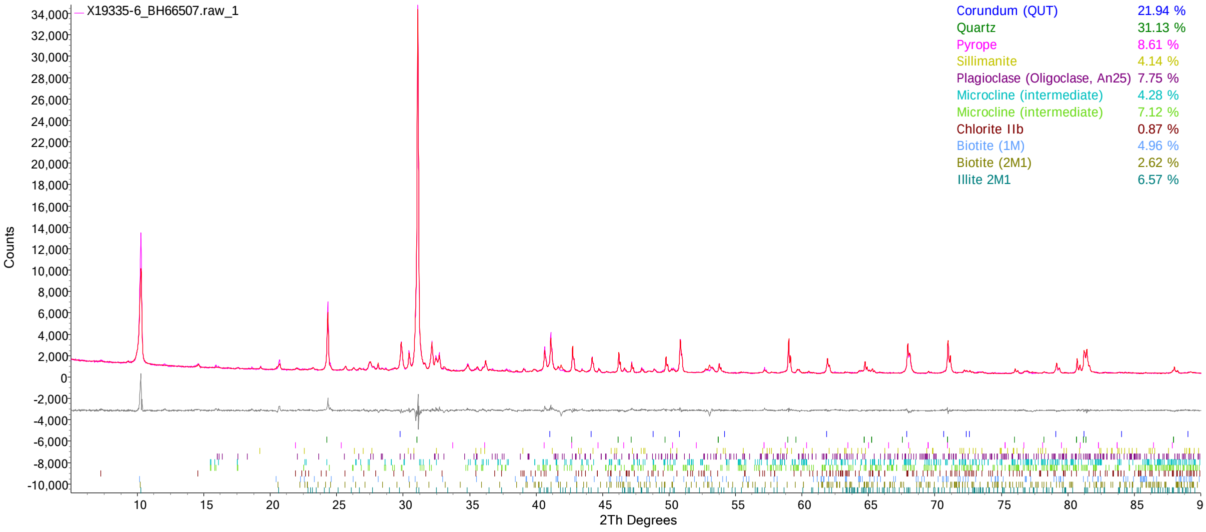
Table of phase abundances (nominal wt%, absolute) – Cluster 7

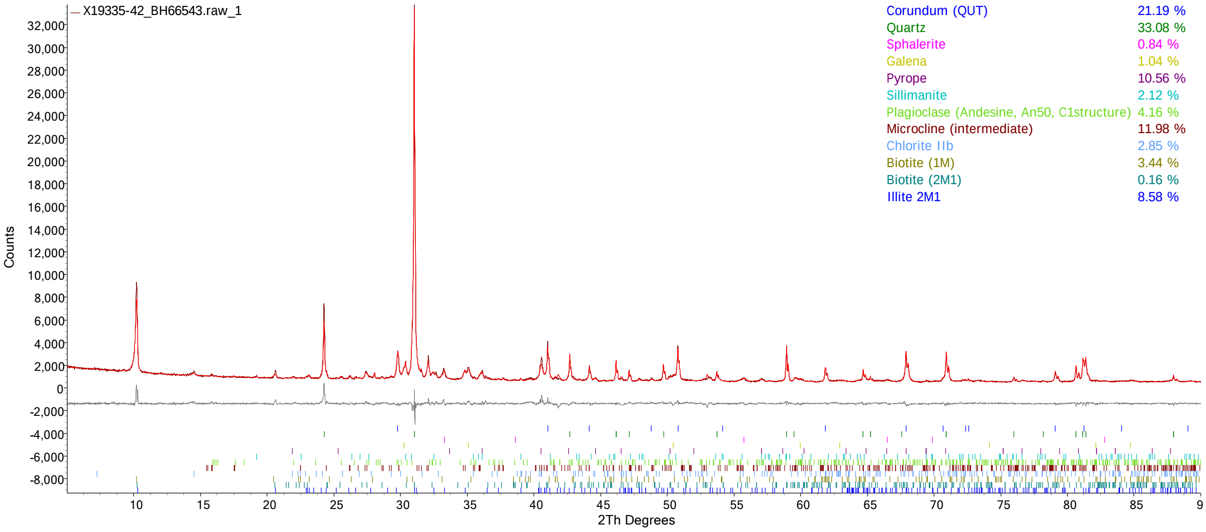
X19335 EB1922319	12 BH66513	31 BH66532
Quartz	34.9	31.2
Pyralspite garnet	7.9	9.9
Sillimanite	1.8	4.8
Plagioclase (An25-50)	11.3	14.6
K-Feldspar	13.6	12
Chlorite	2	2.5
Illite/mica	23.9	21.8
Amorphous	4.6	3.2

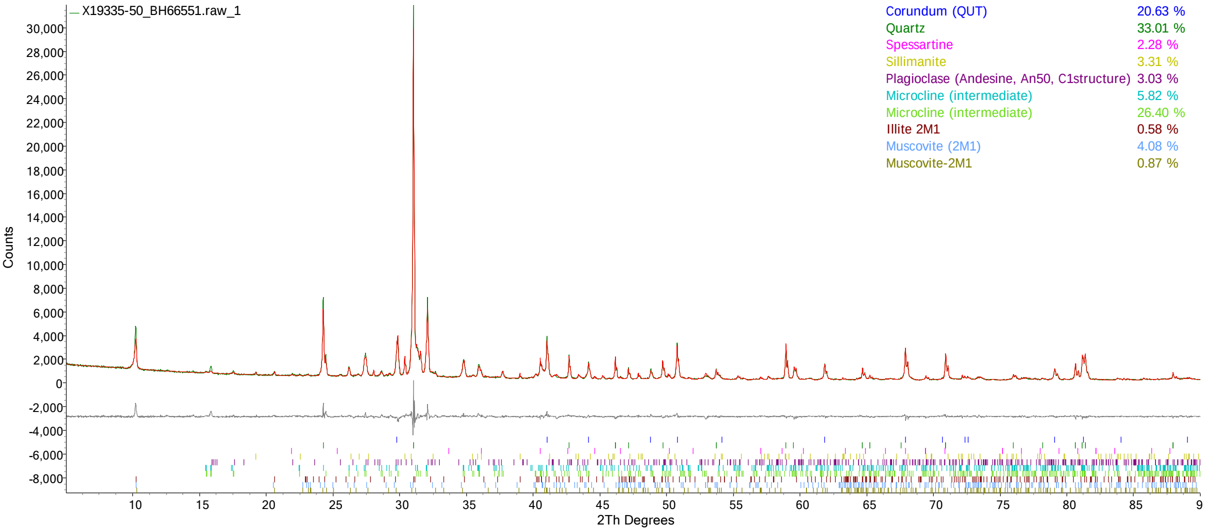
APPENDIX 1 – X-RAY DIFFRACTION DATA AND GRAPHICS

Powder X-ray Diffraction Patterns

In the graphics below the red line is the Rietveld refinement model, the coloured line is the collected data, and the grey line is the difference. The abundances on the graphics are before taking into account the known addition of corundum standard. Please use the tabulated abundances (wt% in original sample) which require no further manipulation. Graphics are arranged according to the cluster analysis. Additional graphics are available upon request.



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Corundum (QUT) 20.63 %
Quartz 33.01 %
Spessartine 2.28 %
Sillimanite 3.31 %
Plagioclase (Andesine, An50, C1structure) 3.03 %
Microcline (intermediate) 5.82 %
Microcline (intermediate) 26.40 %
Illite 2M1 0.58 %
Muscovite (2M1) 4.08 %
Muscovite-2M1 0.87 %
Counts
30,000
28,000
26,000
24,000
22,000
20,000
18,000
16,000
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
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-4,000
-6,000
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35
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45
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55
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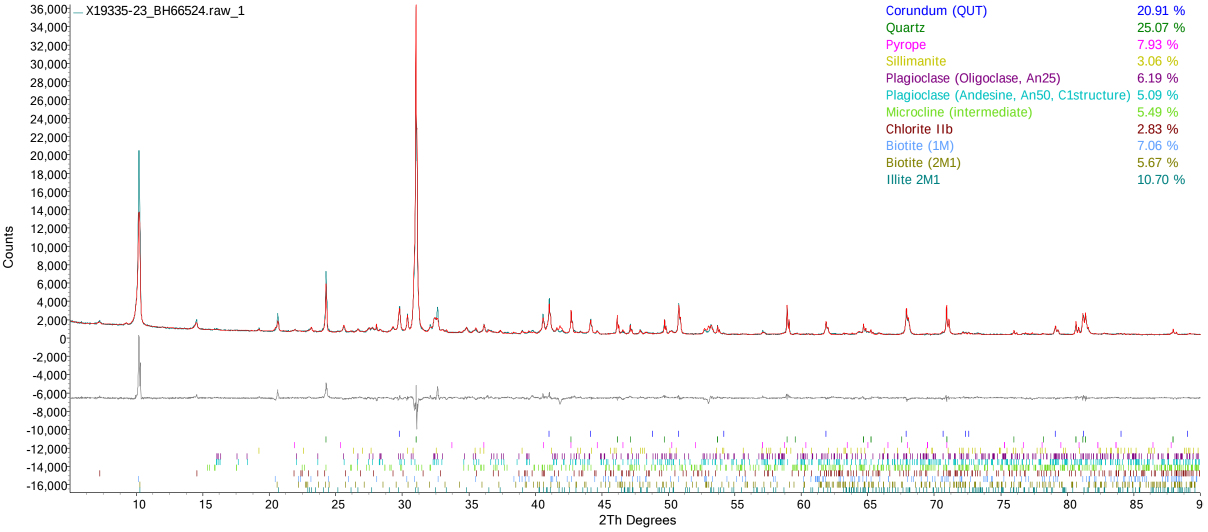
65
70
75
80
85
9
2Th Degrees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Corundum (QUT) 20.91 %
Quartz 25.07 %
Pyrope 7.93 %
Sillimanite 3.06 %
Plagioclase (Oligoclase, An25) 6.19 %
Plagioclase (Andesine, An50, C1structure) 5.09 %
Microcline (intermediate) 5.49 %
Chlorite IIb 2.83 %
Biotite (1M) 7.06 %
Biotite (2M1) 5.67 %
Illite 2M1 10.70 %
Counts
36,000
34,000
32,000
30,000
28,000
26,000
24,000
22,000
20,000
18,000
16,000
14,000
12,000
10,000
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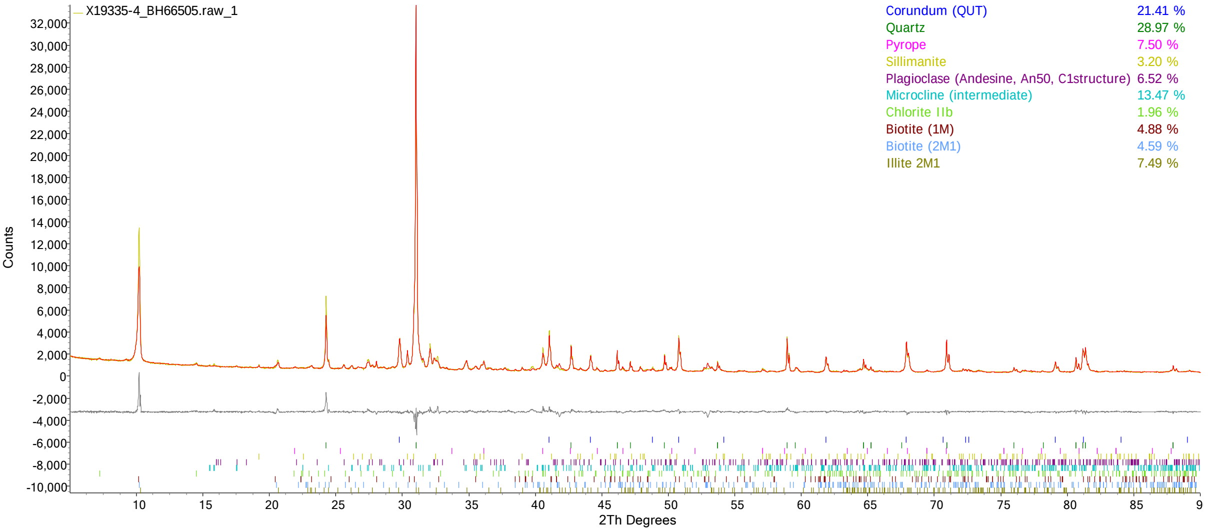
85
9
2Th Degrees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Corundum (QUT) 21.41 %
Quartz 28.97 %
Pyrope 7.50 %
Sillimanite 3.20 %
Plagioclase (Andesine, An50, C1structure) 6.52 %
Microcline (intermediate) 13.47 %
Chlorite IIb 1.96 %
Biotite (1M) 4.88 %
Biotite (2M1) 4.59 %
Illite 2M1 7.49 %
Counts
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26,000
24,000
22,000
20,000
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12,000
10,000
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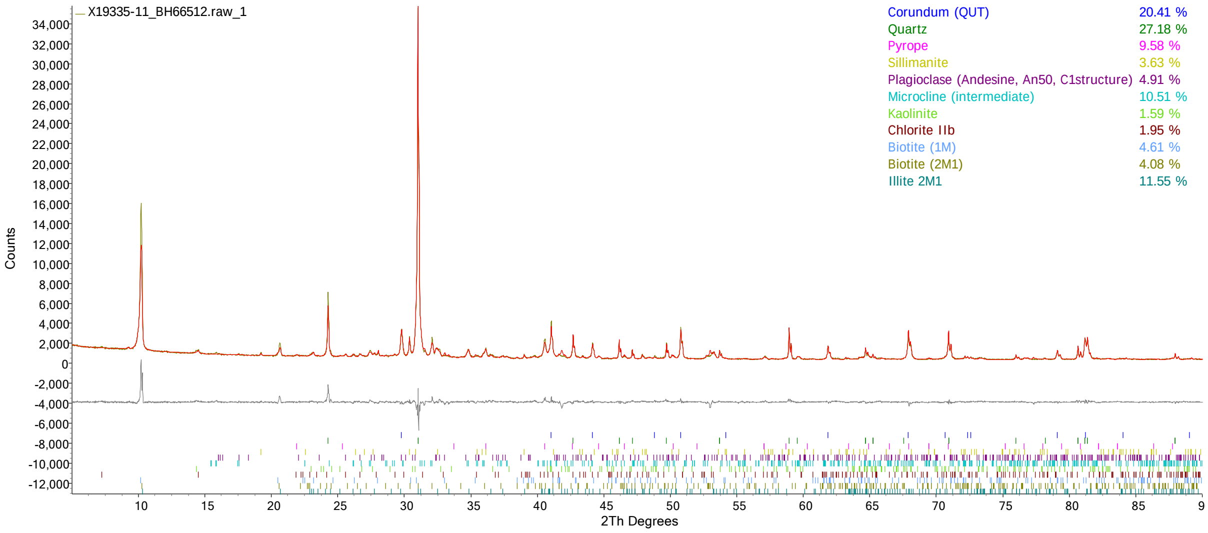
2Th Degrees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Corundum (QUT) 20.41 %
Quartz 27.18 %
Pyrope 9.58 %
Sillimanite 3.63 %
Plagioclase (Andesine, An50, C1structure) 4.91 %
Microcline (intermediate) 10.51 %
Kaolinite 1.59 %
Chlorite IIb 1.95 %
Biotite (1M) 4.61 %
Biotite (2M1) 4.08 %
Illite 2M1 11.55 %
Counts
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26,000
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20,000
18,000
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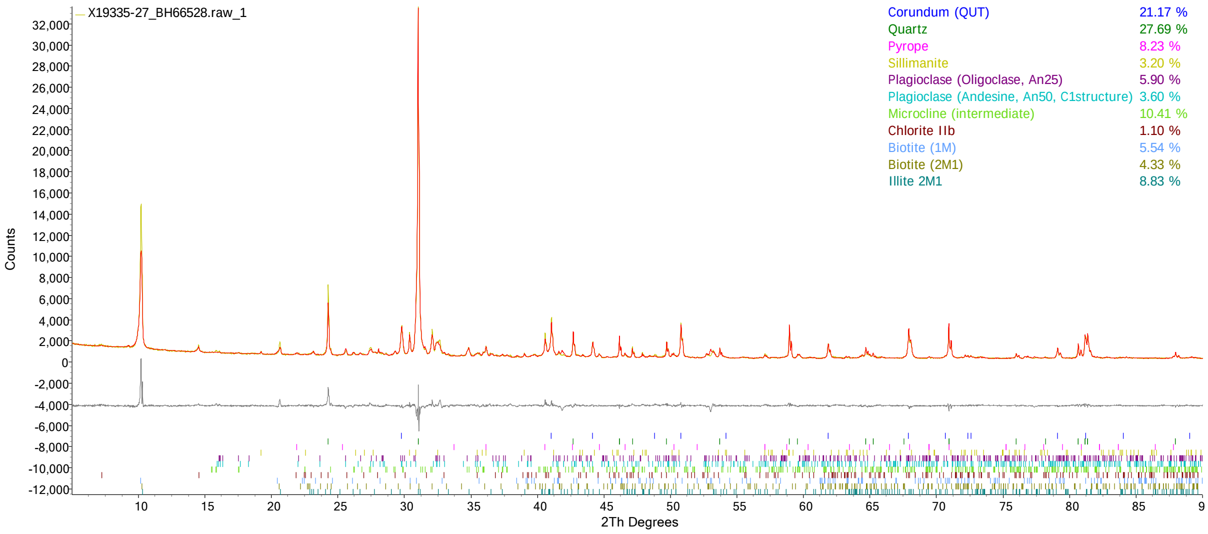
2Th Degrees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Corundum (QUT) 21.17 %
Quartz 27.69 %
Pyrope 8.23 %
Sillimanite 3.20 %
Plagioclase (Oligoclase, An25) 5.90 %
Plagioclase (Andesine, An50, C1structure) 3.60 %
Microcline (intermediate) 10.41 %
Chlorite IIb 1.10 %
Biotite (1M) 5.54 %
Biotite (2M1) 4.33 %
Illite 2M1 8.83 %
Counts
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30,000
28,000
26,000
24,000
22,000
20,000
18,000
16,000
14,000
12,000
10,000
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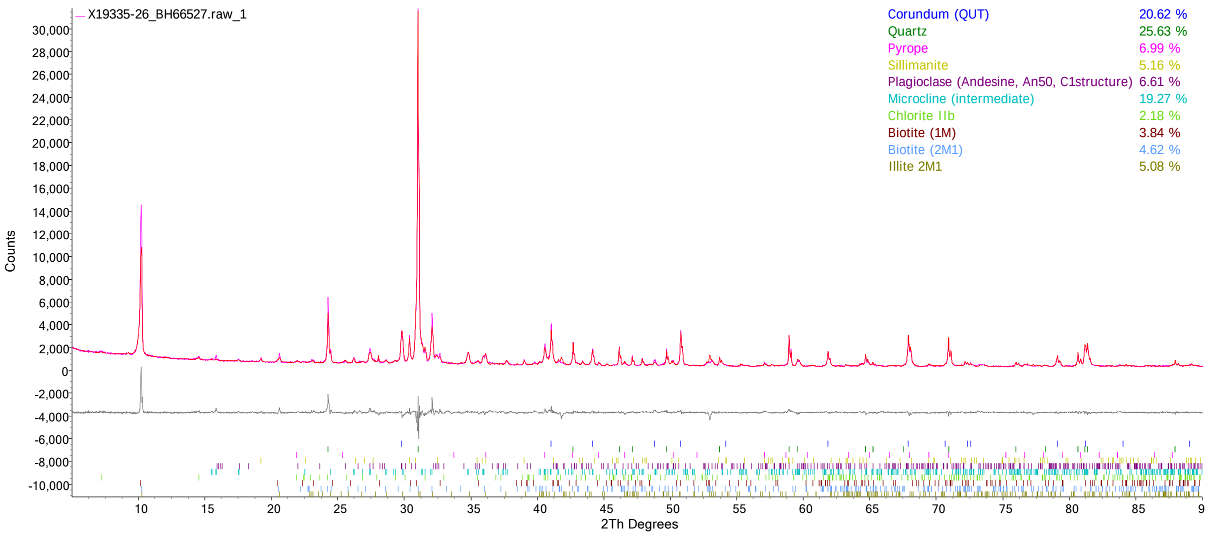
2Th Degrees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Corundum (QUT) 20.62 %
Quartz 25.63 %
Pyrope 6.99 %
Sillimanite 5.16 %
Plagioclase (Andesine, An50, C1structure) 6.61 %
Microcline (intermediate) 19.27 %
Chlorite IIb 2.18 %
Biotite (1M) 3.84 %
Biotite (2M1) 4.62 %
Illite 2M1 5.08 %
Counts
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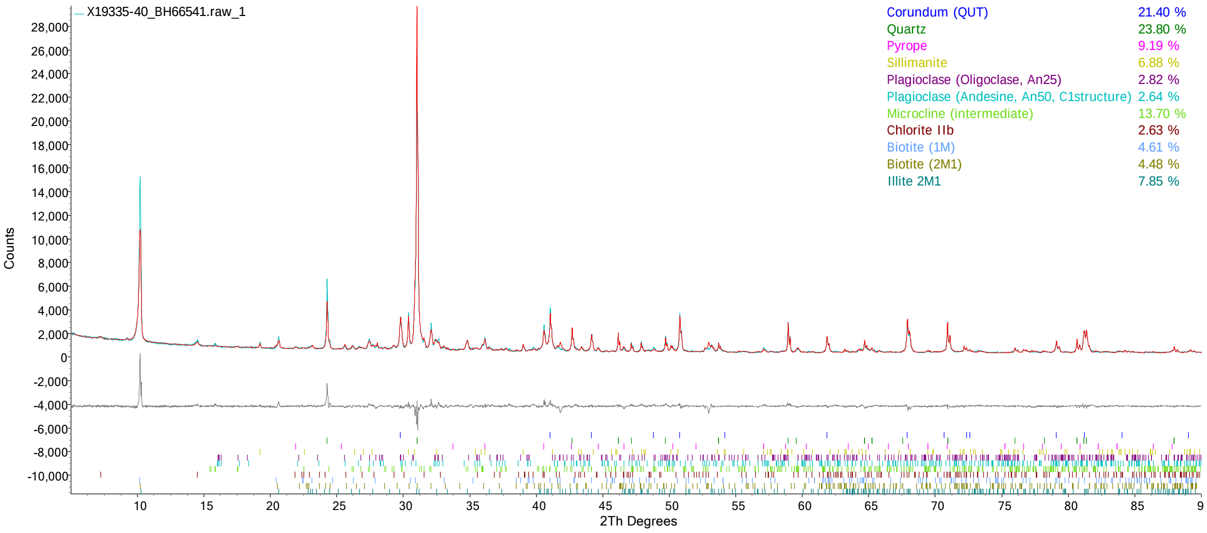
2Th Degrees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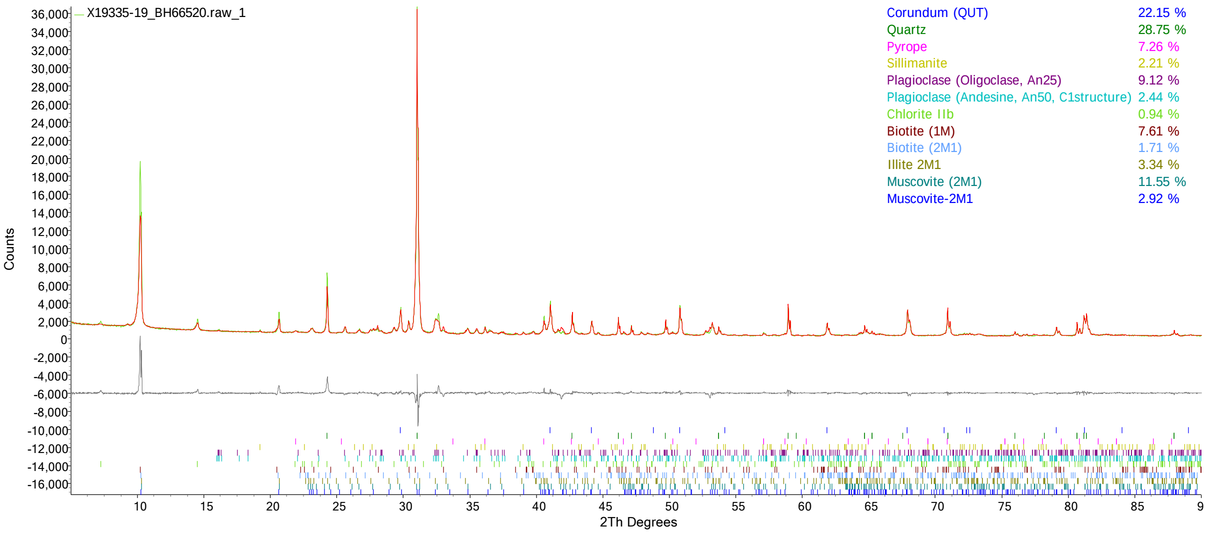
-10,000
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
9
Corundum (QUT) 21.40 %
Quartz 23.80 %
Pyrope 9.19 %
Sillimanite 6.88 %
Plagioclase (Oligoclase, An25) 2.82 %
Plagioclase (Andesine, An50, C1structure) 2.64 %
Microcline (intermediate) 13.70 %
Chlorite IIb 2.63 %
Biotite (1M) 4.61 %
Biotite (2M1) 4.48 %
Illite 2M1 7.85 %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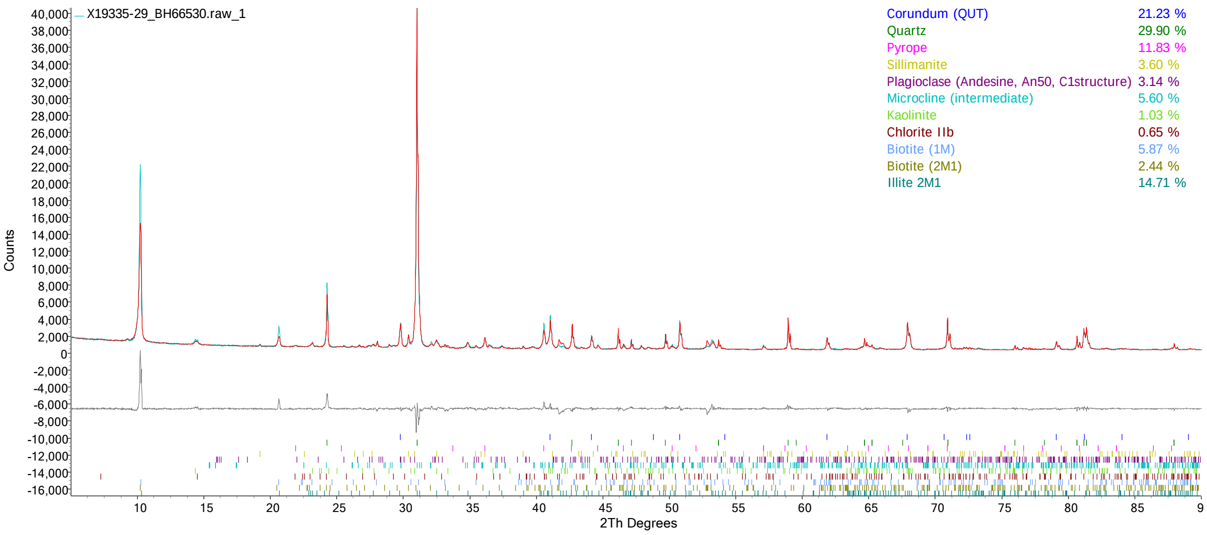
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
9
Corundum (QUT) 22.15 %
Quartz 28.75 %
Pyrope 7.26 %
Sillimanite 2.21 %
Plagioclase (Oligoclase, An25) 9.12 %
Plagioclase (Andesine, An50, C1structure) 2.44 %
Chlorite IIb 0.94 %
Biotite (1M) 7.61 %
Biotite (2M1) 1.71 %
Illite 2M1 3.34 %
Muscovite (2M1) 11.55 %
Muscovite-2M1 2.92 %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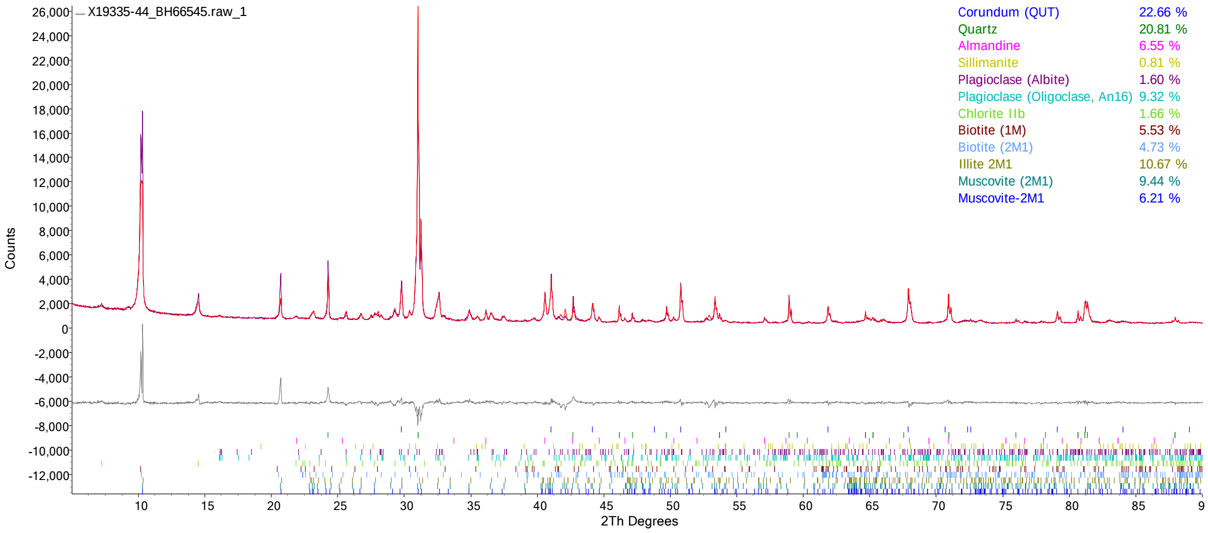
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
9
Corundum (QUT) 21.23 %
Quartz 29.90 %
Pyrope 11.83 %
Sillimanite 3.60 %
Plagioclase (Andesine, An50, C1structure) 3.14 %
Microcline (intermediate) 5.60 %
Kaolinite 1.03 %
Chlorite IIb 0.65 %
Biotite (1M) 5.87 %
Biotite (2M1) 2.44 %
Illite 2M1 14.71 %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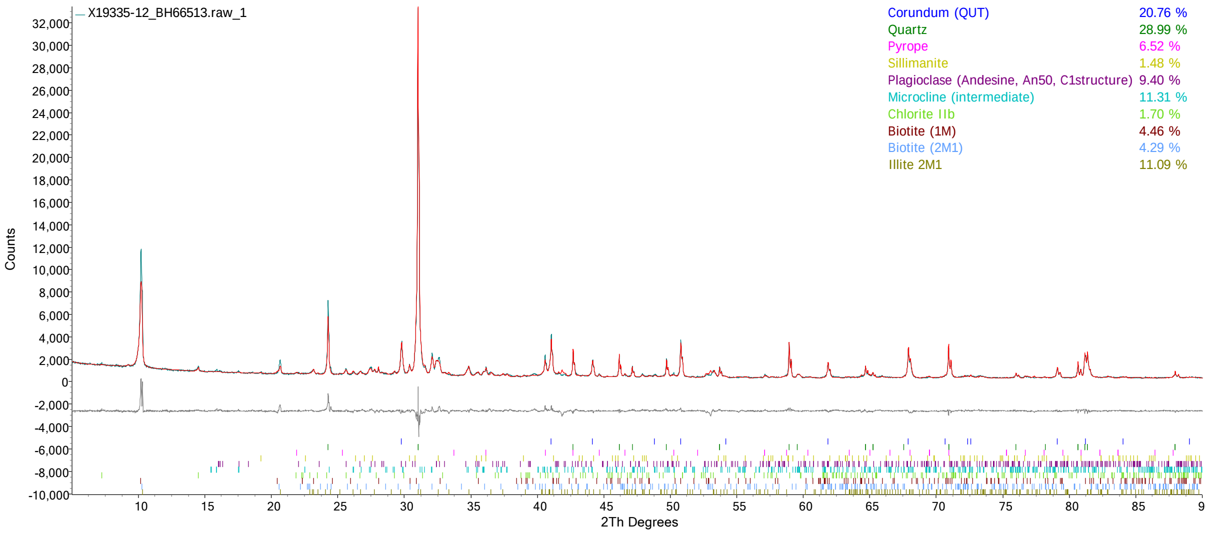
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
9
2Th Degrees
Corundum (QUT) 22.66 %
Quartz 20.81 %
Almandine 6.55 %
Sillimanite 0.81 %
Plagioclase (Albite) 1.60 %
Plagioclase (Oligoclase, An16) 9.32 %
Chlorite IIb 1.66 %
Biotite (1M) 5.53 %
Biotite (2M1) 4.73 %
Illite 2M1 10.67 %
Muscovite (2M1) 9.44 %
Muscovite-2M1 6.21 %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-10,000
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
9
2Th Degrees
Corundum (QUT) 20.76 %
Quartz 28.99 %
Pyrope 6.52 %
Sillimanite 1.48 %
Plagioclase (Andesine, An50, C1structure) 9.40 %
Microcline (intermediate) 11.31 %
Chlorite IIb 1.70 %
Biotite (1M) 4.46 %
Biotite (2M1) 4.29 %
Illite 2M1 11.09 %

APPENDIX 2 – ANALYTICAL TECHNIQUES

Sample preparation

Sub-samples were accurately weighed and specimens prepared for X-ray diffraction analysis by the addition of a corundum (Al_2O_3) internal standard at 20 wt%. The specimens were micronised in a McCrone mill using zirconia beads and ethanol, then dried in an oven overnight at 40 °C. The resultant homogenous powders were back-pressed into sample holders.

Sample analysis

Step scanned X-ray diffraction patterns were collected for an hour per sample using a PANalytical X'Pert Pro powder diffractometer and cobalt Kα radiation operating in Bragg-Brentano geometry. The collected data was analysed using JADE (V2010, Materials Data Inc.), EVA (V5, Bruker) and X'Pert Highscore Plus (V4, PANalytical) with various reference databases (PDF4+, AMCSD, COD) for phase identification. Rietveld refinement was performed using TOPAS (V6, Bruker). The known addition of corundum facilitates reporting of absolute phase abundances for the modelled phases. The sum of the absolute abundances is subtracted from 100 wt% to obtain a residual (called non-diffracting/unidentified, also known as "amorphous"). The residual represents the unexplained portion of the pattern: it may be non-diffracting content but will also contain unidentified phases and the error from poorly modelled phases. It is the least accurate measure as its error is the sum of the errors of the modelled phases. An absorption contrast correction (Brindley) was made on the basis that the average size of the particles in the specimens is approximately 5 µm. The more absorbing phases will be under estimated if their actual average particle size is greater than 5 µm. The estimated uncertainties in the reported phase abundances are 20 wt% relative or better for every modelled phase. Due to propagation of errors the uncertainty in the amorphous (non-diffracting/unidentified) content is higher at approximately 30 wt% relative. The detection limit and limit of quantification using our method is approximately 1 wt% or less depending on the phase in question and sample matrix.

Powder X-ray diffraction is bulk phase analysis, it is not bulk chemical analysis. Phase abundances may be mis-estimated if an incorrect chemical formula is assigned to a phase. Therefore, the closest matches in the reference phase identification databases were used in the Rietveld refinement model, but other members of the identified mineral groups may be present.

Environmental Geochemistry Services

Unit 4/5 Renewable Chase
Bibra Lake 6163
Western Australia

Telephone: 61 8 9434 9862
Email: ron@egservices.net.au

ANALYTICAL REPORT

Date	20 December 2019
EGS Reference	**EGS/2019/158**

CLIENT DETAILS

Contact	Josh Pearce
Client	Mine Waste Management
Address	50 Edward Street Osborne Park Western Australia 6017
Telephone	+61 409 882 823
Email.	josh.pearce@minewaste.com.au
Order Ref.	Project J-AU0053-COC-2
Samples	52 pulp powdered rock samples in paper sacs; 4 “check samples” in plastic zip-lock bags
Date received	3 December 2019 (am)
Date reported	17 December 2019 (partial)

COMMENTS

Two samples B1000 #5 and B1000 #6 were included in the batch received, but were not included on the Chain of Custody. As ANC testing was requested as "urgent", these two samples were tested for ANC prior to receipt of the CoC.

All samples, with the exception of "check samples" MWM-001 and MWM-002, were observed to have a fizz-rating of 0, on treatment with 25% HCl. Sulphurous fumes were emitted by numerous samples during the fizz test indicating the presence of sulphide. Ferrolysis was evident during the titration of a majority of the samples. The presence of siderite is also possible in some samples.

*Initial testing of selected samples showed acid addition prescribed for zero fizz-rating to be inappropriate, resulting in too great an initial pH (as high as 3.5) and a majority of samples yielding ANC values >10 kgH_2SO_4/t (range 8 - 14 kgH_2SO_4/t). Furthermore, duplicate testing of some samples yielded significantly different ANC values. Subsequently, all BH***** samples were tested using a fizz-rating of 1. This resulted, without exception, in ANC values that were higher (range 11 - 23 kgH_2SO_4/t) and entirely appropriate for the fizz-rating of 1 (Amira 2002). Duplicate determinations were entirely satisfactory using fizz-rating 1 and the strict procedural parameters used routinely by EGS. It was noted, however, through experiment. that minor deviation from these parameters (e.g. additional heating and minor acid addition) consistently resulted in increased ANC values. It is concluded that the BH***** samples contain slow-reacting acid-neutralising phases and/or components whose buffering capacity is particularly sensitive to acidity, temperature, or other factors.*

Two tests on certified international reference material KZK-1 (CANMET) (NP = 64.8 ± 5.8 kg$CaCO_3$/t) yielded 59.2 and 58.7 kg$CaCO_3$/t. A single test on EGS internal standard EIS-1 gave 84.5 kgH_2SO_4/t consistent with the running mean. Molarity of HCl reagents and NaOH titrants was verified by titration using 1.0M HCl and NaOH standard solutions prepared from certified (NIST-traceable) 1.0M/1L ampoules.

Methods Employed

EGS M-001	ANC -	modified Sobek method: procedure modified from AMIRA (2002) to include overnight (minimum 10 -16 hr) reaction at ambient T, and heating for precisely 2 hrs at 80°C.
EGS M-009	ABCC -	acid buffering characteristic curve (AMIRA, 2002)

General Comments

Analytical techniques employed by EGS are based upon published internationally recognized methods and procedures. In each case where in-house modifications and variations are employed by EGS, the results have been shown to be equivalent, or superior, to those produced by the original method.

Solid (powdered) samples are reported on an “as received” basis, unless drying/moisture determination is requested by the client.

Analytical parameters, such as blank values, are recorded together with QC data for each batch of analyses. Information on individual analytical methods and relevant parameters (e.g. instrumental and whole method precision, Limit of Reporting (LOR), Reference standards) is available to clients from EGS on request.

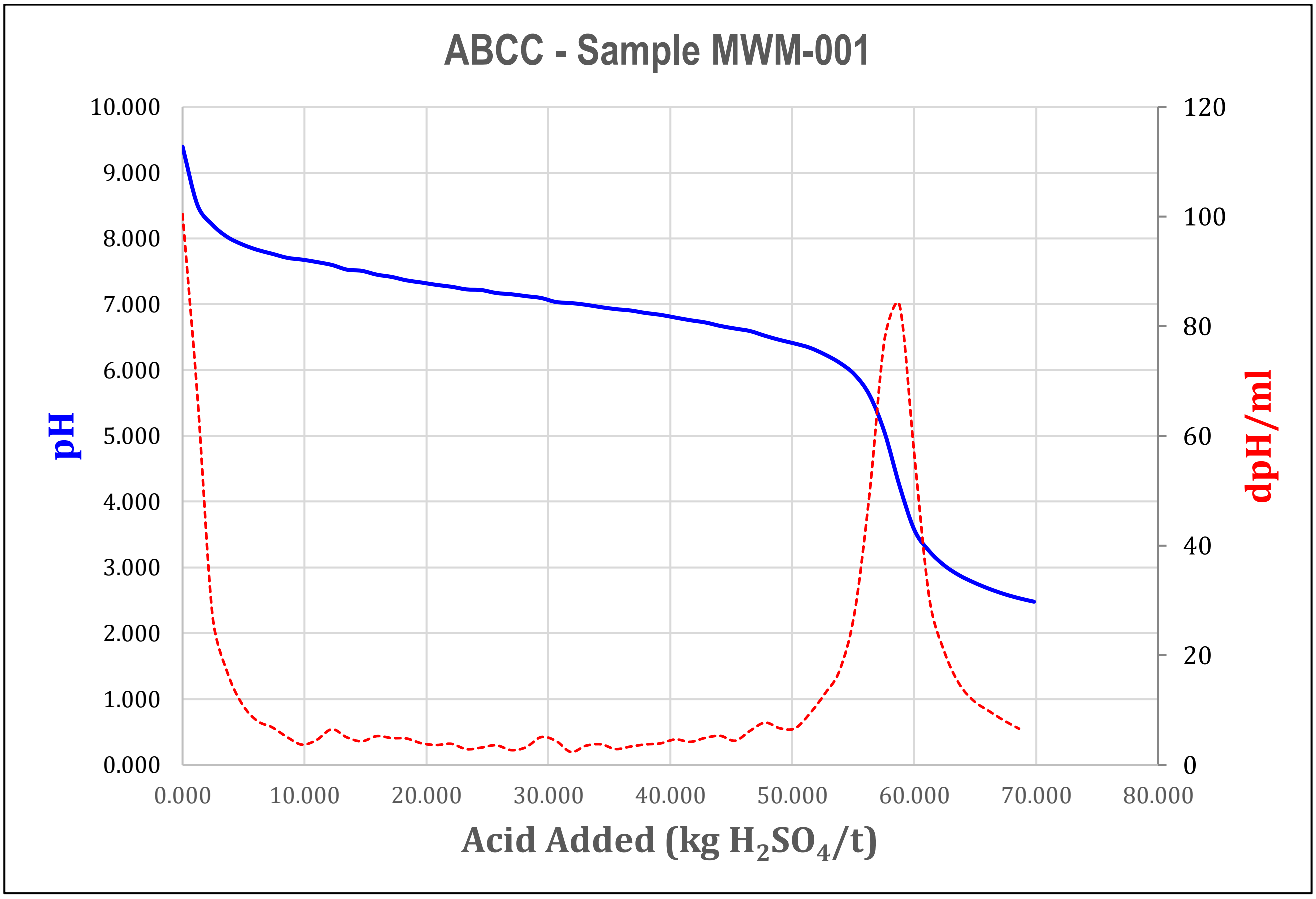
Results

Sample No.	Fizz rating	ANC	
		kgH_2SO_4/t	wt % $CaCO_3$ Eq
MWM-001	2	57.0	5.82
MWM-002	2	57.4	5.86
MWM-021	0	2.57	0.26
MWM-022	0	2.90	0.30
BH66502	1 (0)	20.5	2.09
BH66503	1 (0)	16.5	1.68
BH66504	1 (0)	18.0	1.82
BH66505	1 (0)	13.3	1.36
BH66506	1 (0)	14.8	1.51
BH66507	1 (0)	14.4	1.47
BH66508	1 (0)	13.6	1.39
BH66509	1 (0)	17.4	1.78
BH66510	1 (0)	12.3	1.26
BH66511	1 (0)	13.2	1.35
BH66512	1 (0)	12.0	1.22
BH66513	1 (0)	12.7	1.29
BH66514	1 (0)	12.9	1.32
BH66515	1 (0)	14.5	1.49
BH66516	1 (0)	16.6	1.70
BH66517	1 (0)	10.8	1.10
BH66518	1 (0)	12.2	1.24
BH66519	1 (0)	12.0	1.23
BH66520	1 (0)	12.5	1.27
BH66521	1 (0)	12.4	1.26
BH66522	1 (0)	14.0	1.43
BH66523	1 (0)	12.0	1.23
BH66524	1 (0)	12.6	1.29
BH66525	1 (0)	15.1	1.54
BH66526	1 (0)	12.9	1.33
BH66527	1 (0)	13.8	1.40
BH66528	1 (0)	16.3	1.67
BH66529	1 (0)	18.3	1.86
BH66530	1 (0)	10.9	1.12
BH66531	1 (0)	14.5	1.48
BH66532	1 (0)	12.0	1.22

Results [cont.]

Sample No.	Fizz rating	ANC	
		kgH_2SO_4/t	wt % $CaCO_3$ Eq
BH66533	1 (0)	11.9	1.22
BH66534	1 (0)	13.9	1.42
BH66535	1 (0)	11.4	1.16
BH66536	1 (0)	12.7	1.29
BH66537	1 (0)	15.5	1.58
BH66538	1 (0)	15.6	1.59
BH66539	1 (0)	15.8	1.62
BH66540	1 (0)	12.9	1.32
BH66541	1 (0)	11.7	1.20
BH66542	1 (0)	12.6	1.29
BH66543	1 (0)	16.4	1.67
BH66544	1 (0)	11.2	1.15
BH66545	1 (0)	12.6	1.29
BH66546	1 (0)	14.6	1.50
BH66547	1 (0)	13.9	1.42
BH66548	1 (0)	16.8	1.72
BH66549	1 (0)	16.6	1.69
BH66550	1 (0)	14.5	1.48
BH66551	1 (0)	14.7	1.5

observed inappropriate fizz ratings show in brackets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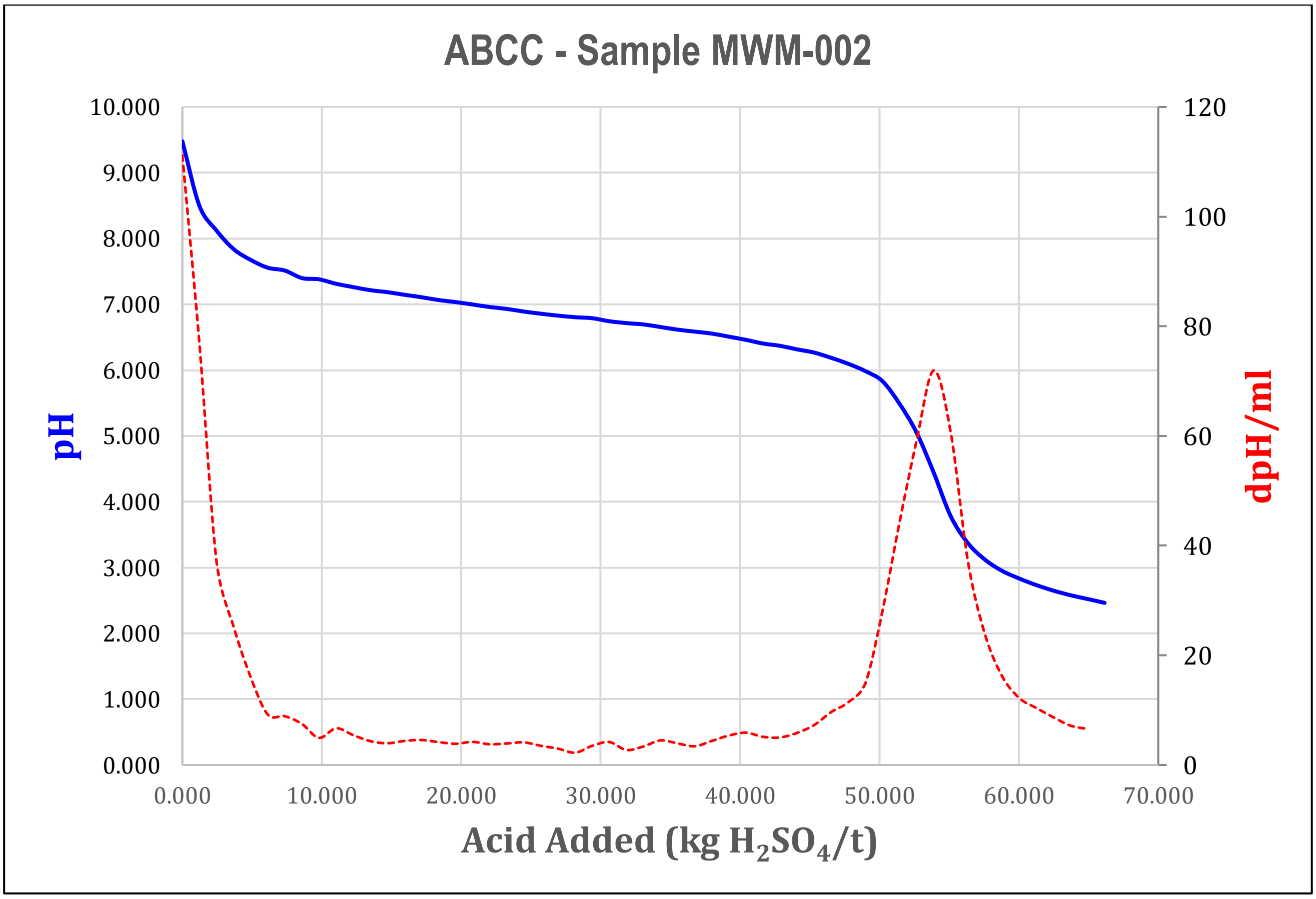
pH
dpH/ml
Acid Added (kg H_2SO_4/t)
10.000
9.000
8.000
7.000
6.000
5.000
4.000
3.000
2.000
1.000
0.000
120
100
80
60
40
20
0
0.000
10.000
20.000
30.000
40.000
50.000
60.000
70.000
80.000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pH
dpH/ml
Acid Added (kg H_2SO_4/t)
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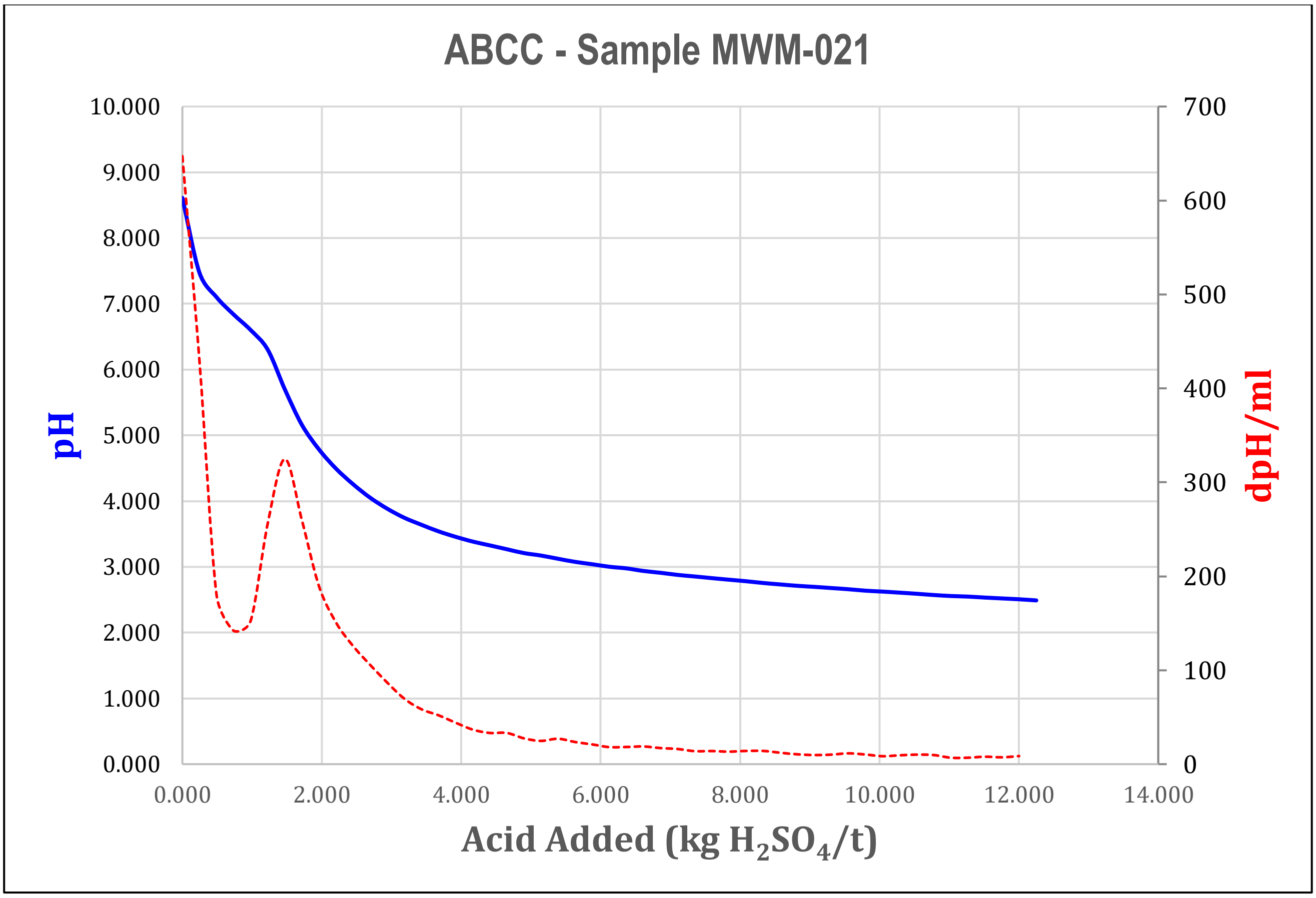
8.000
7.000
6.000
5.000
4.000
3.000
2.000
1.000
0.000
120
100
80
60
40
20
0
0.000
10.000
20.000
30.000
40.000
50.000
60.000
70.000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dpH/ml
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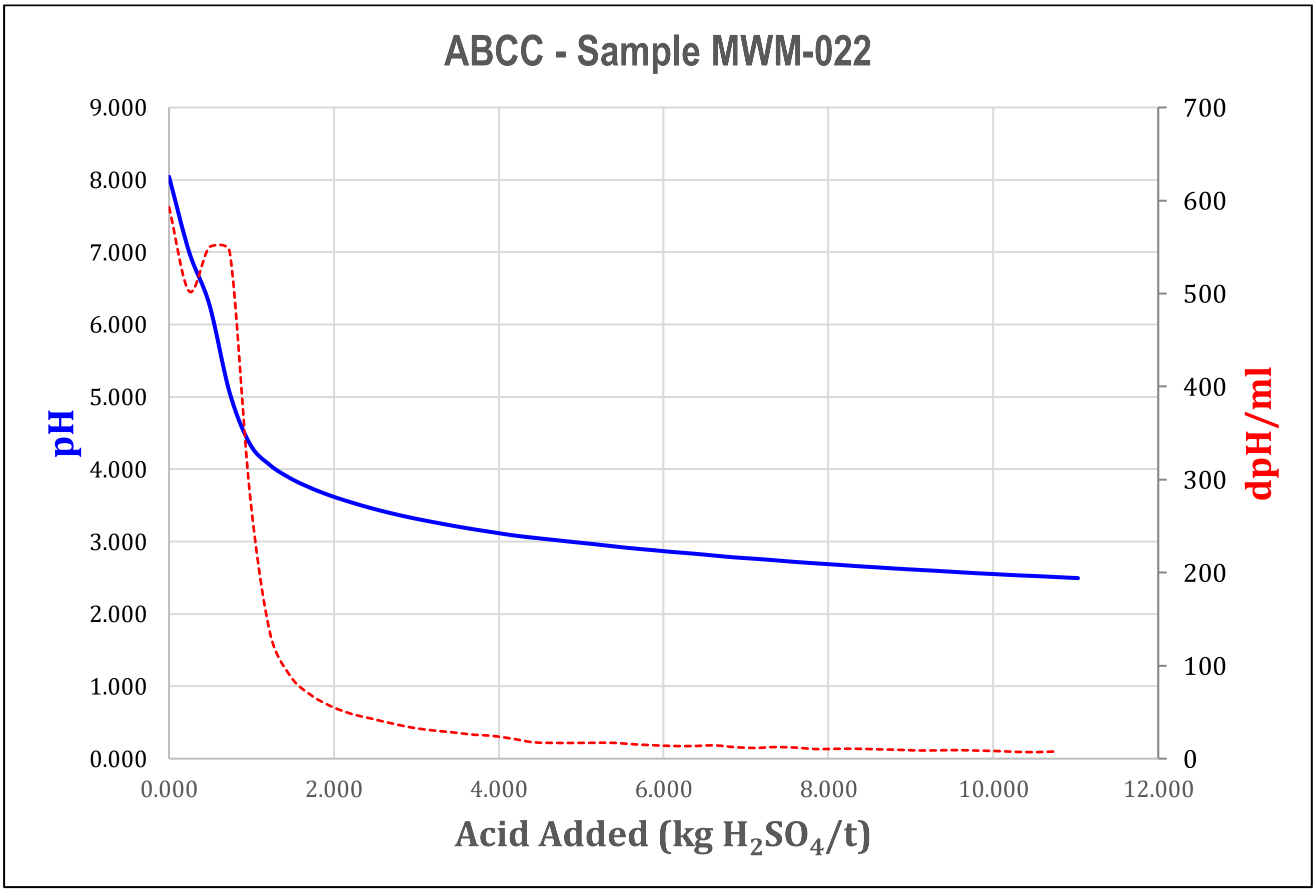
7.000
6.000
5.000
4.000
3.000
2.000
1.000
0.000
700
600
500
400
300
200
100
0
0.000
2.000
4.000
6.000
8.000
10.000
12.000
14.000
Acid Added (kg H_2SO_4/t)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pH
dpH/ml
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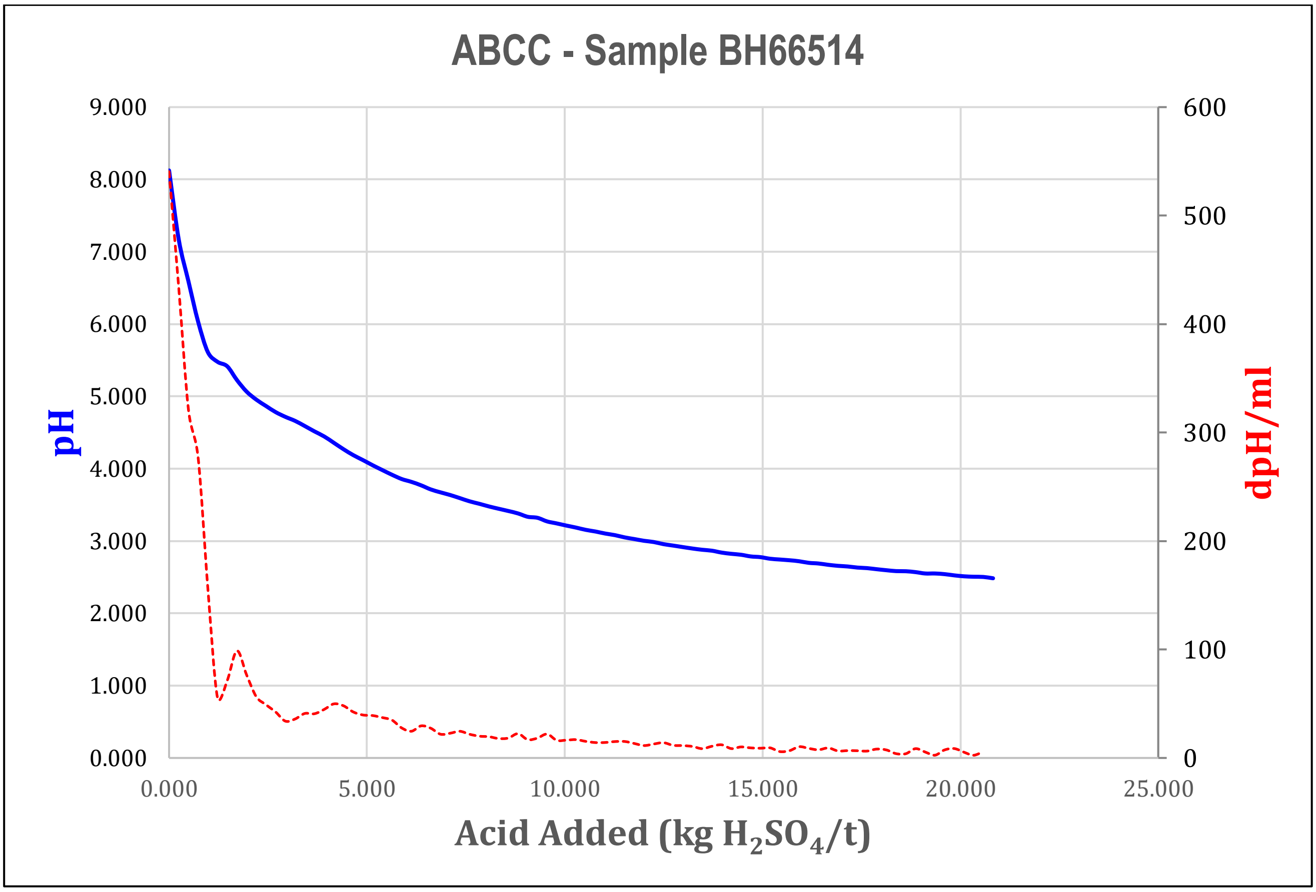
7.000
6.000
5.000
4.000
3.000
2.000
1.000
0.000
700
600
500
400
300
200
100
0
0.000
2.000
4.000
6.000
8.000
10.000
12.000
Acid Added (kg H_2SO_4/t)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pH
dpH/ml
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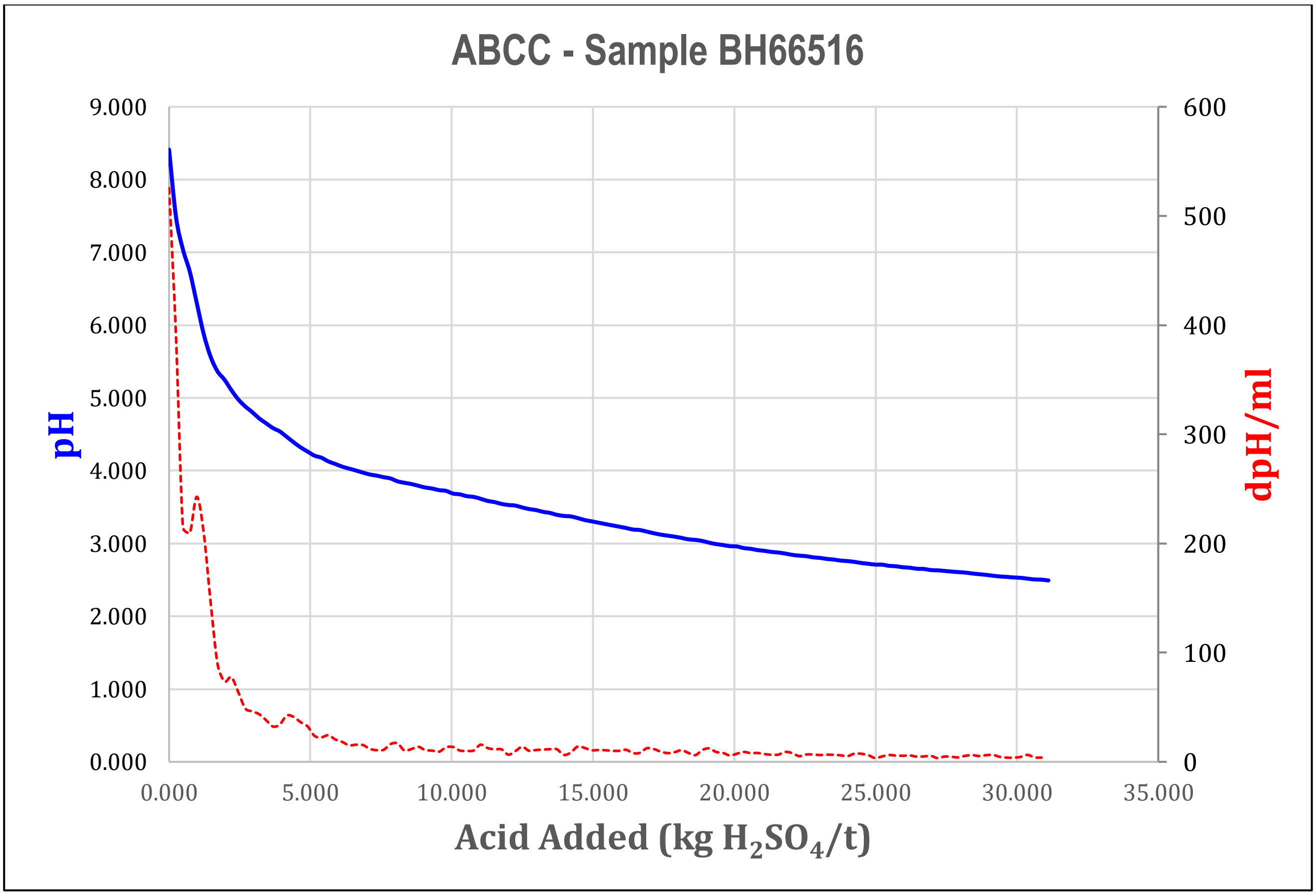
8.000
7.000
6.000
5.000
4.000
3.000
2.000
1.000
0.000
600
500
400
300
200
100
0
0.000
5.000
10.000
15.000
20.000
25.000
Acid Added (kg H2SO4/t)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dpH/ml
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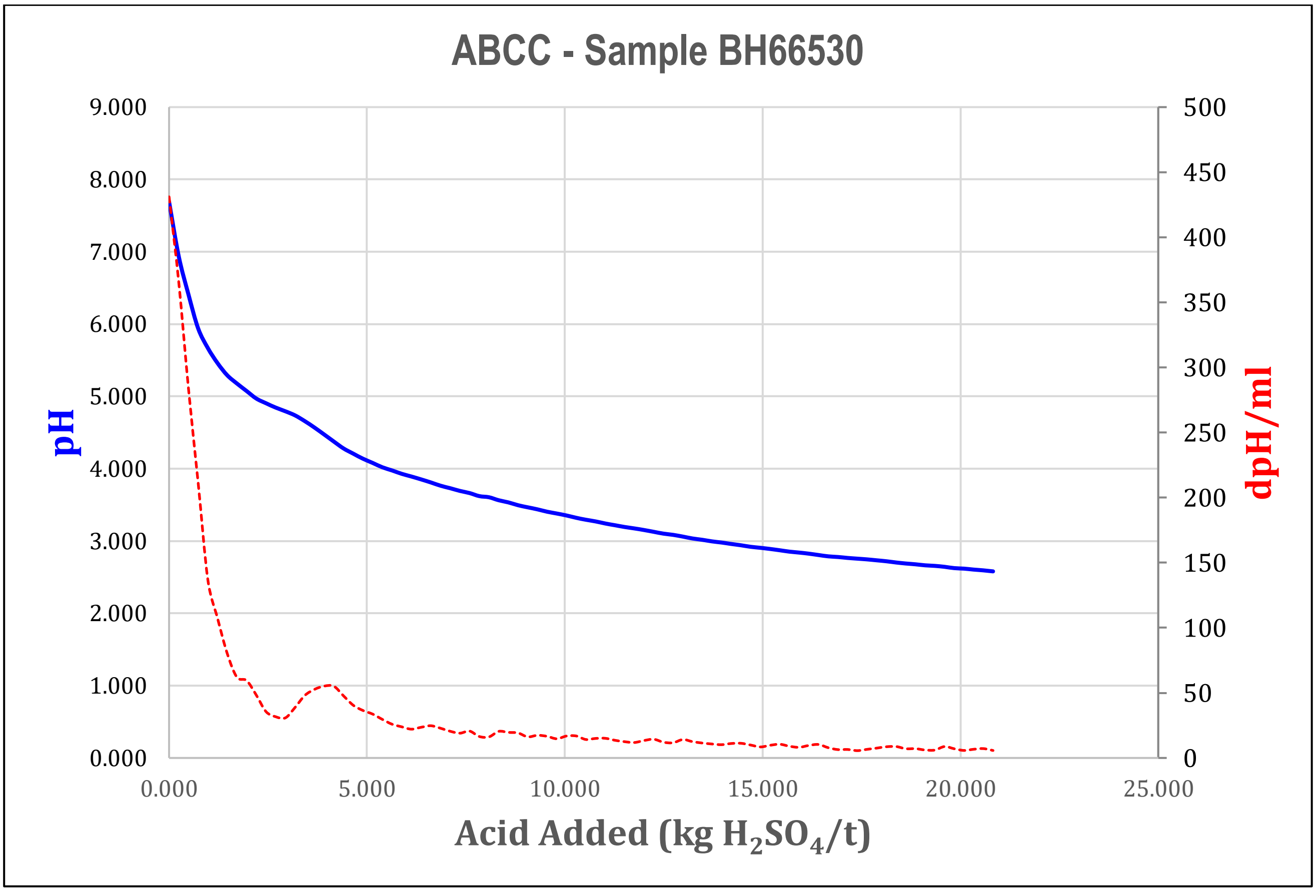
7.000
6.000
5.000
4.000
3.000
2.000
1.000
0.000
600
500
400
300
200
100
0
0.000
5.000
10.000
15.000
20.000
25.000
30.000
35.000
Acid Added (kg H2SO4/t)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pH
dpH/ml
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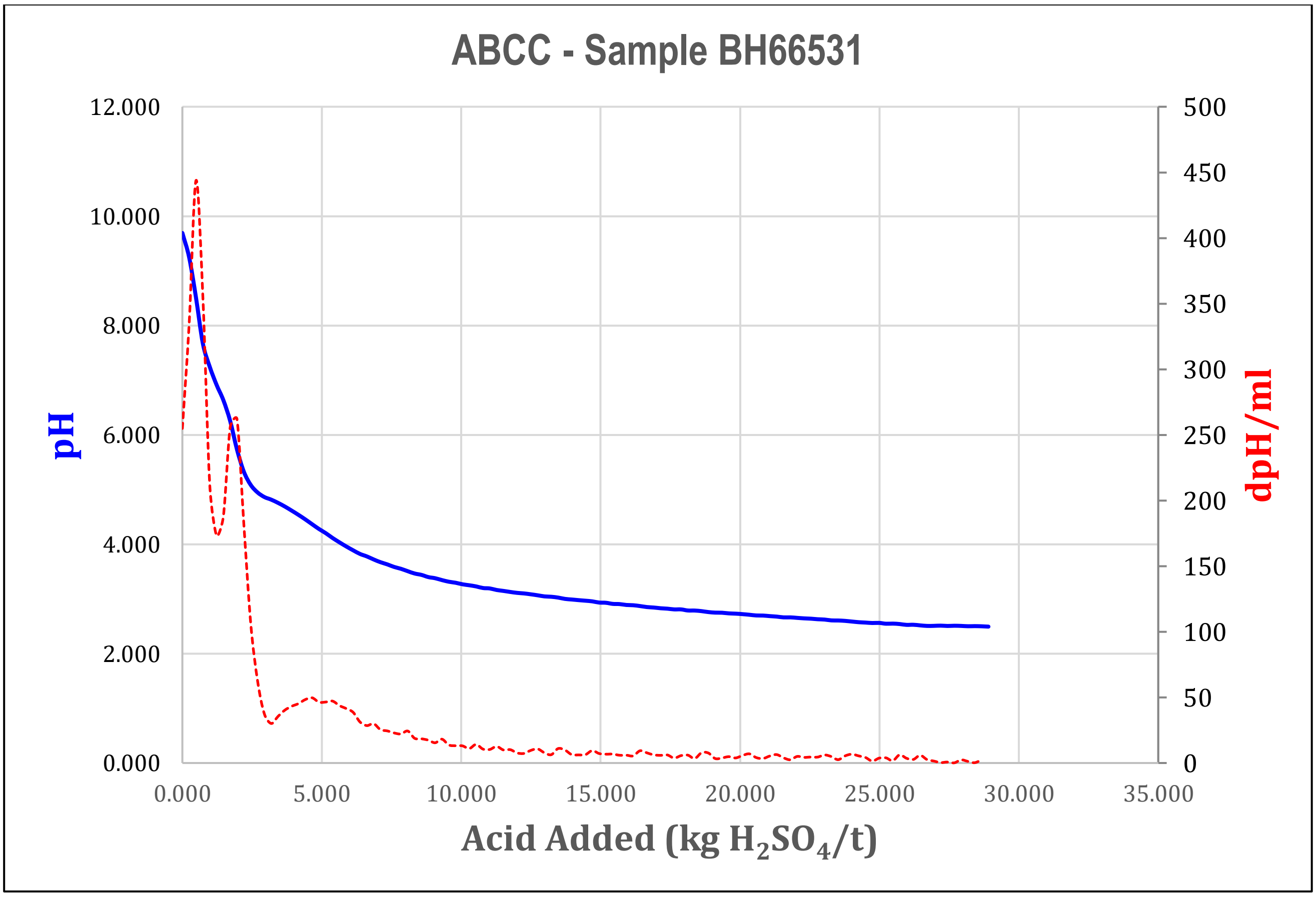
8.000
7.000
6.000
5.000
4.000
3.000
2.000
1.000
0.000
500
450
400
350
300
250
200
150
100
50
0
0.000
5.000
10.000
15.000
20.000
25.000
Acid Added (kg H_2SO_4/t)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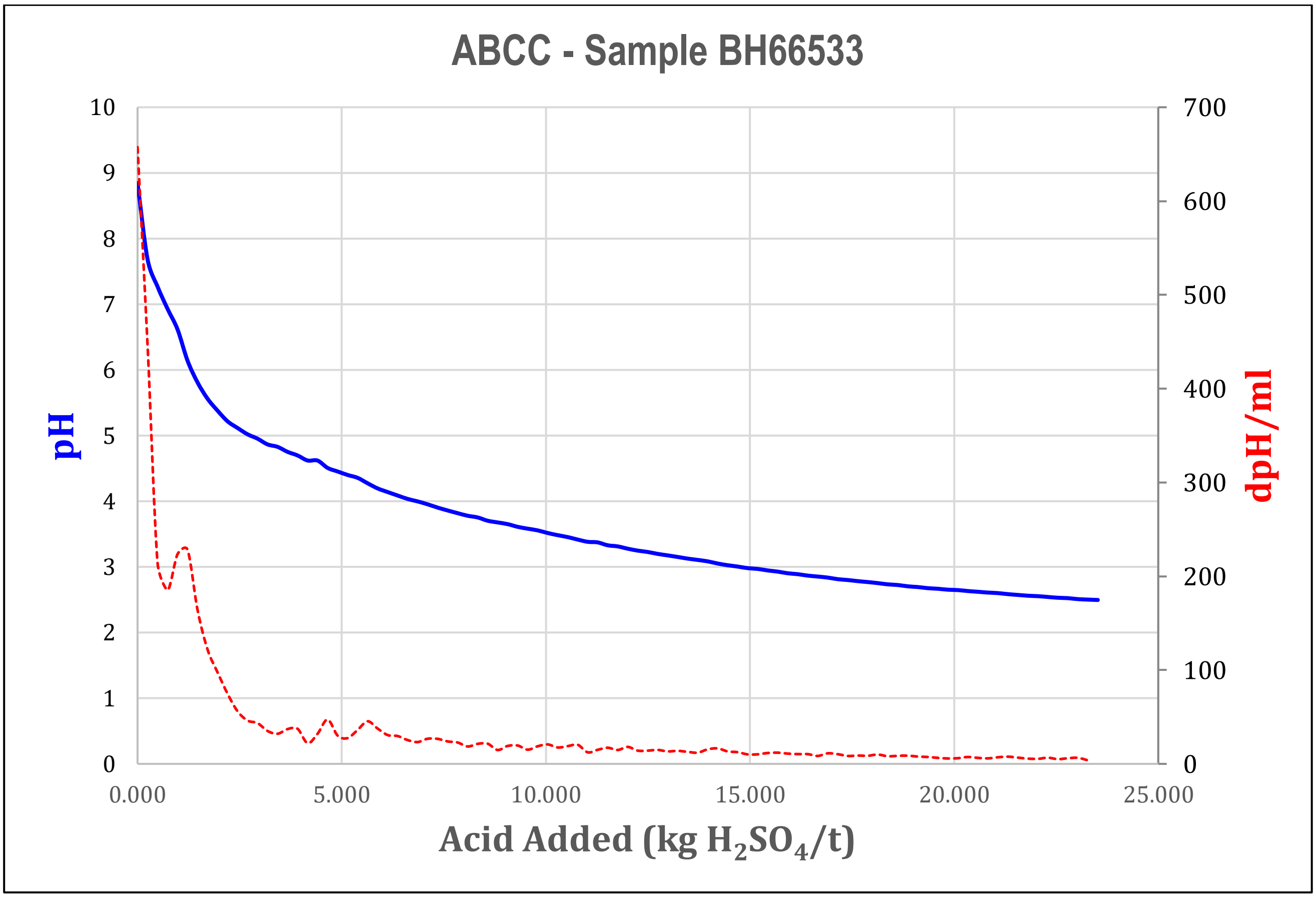
pH
dpH/ml
12.000
10.000
8.000
6.000
4.000
2.000
0.000
500
450
400
350
300
250
200
150
100
50
0
0.000
5.000
10.000
15.000
20.000
25.000
30.000
35.000
Acid Added (kg H_2SO_4/t)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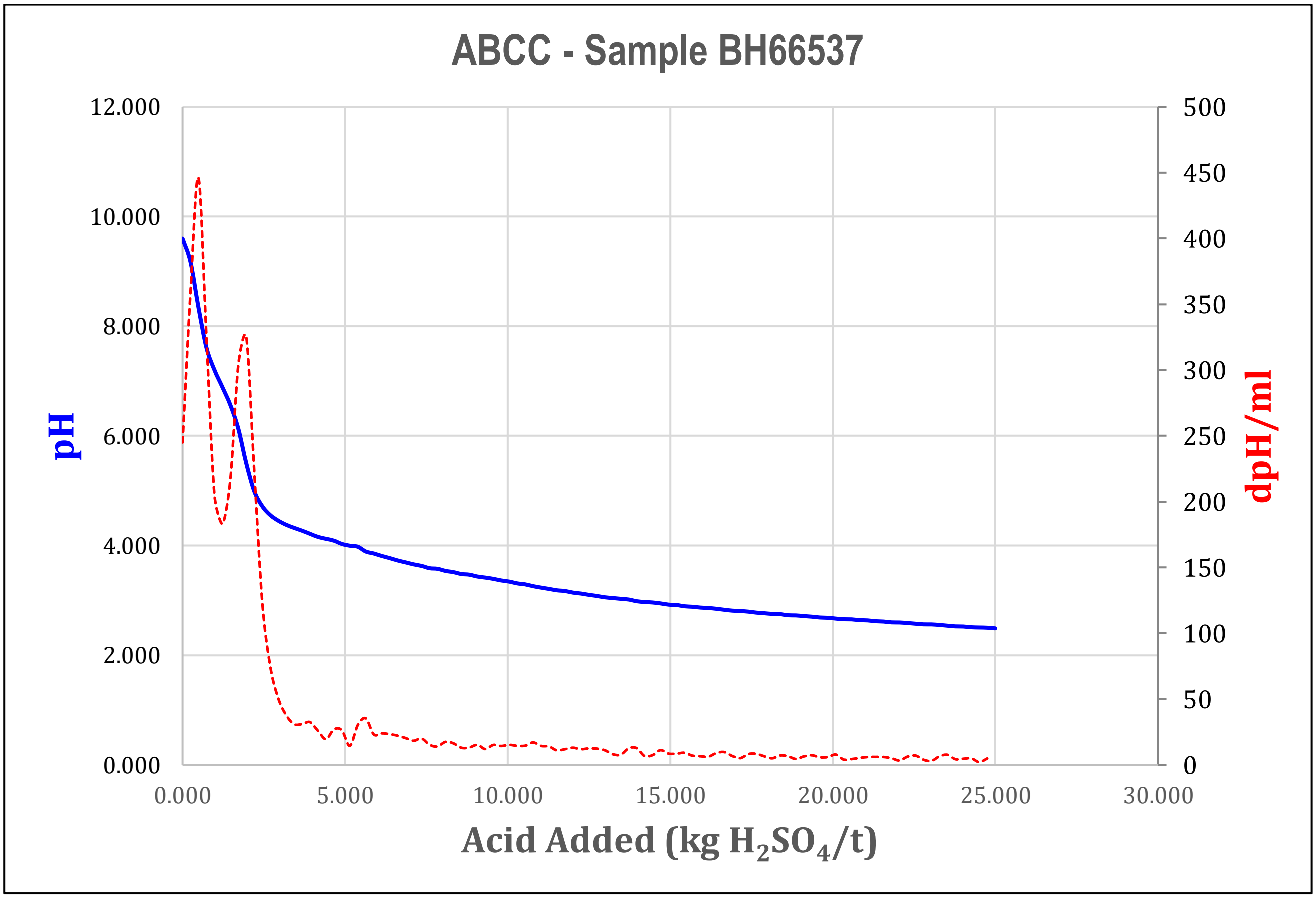
10
9
8
7
6
5
4
3
2
1
0
pH
700
600
500
400
300
200
100
0
dpH/ml
0.000
5.000
10.000
15.000
20.000
25.000
Acid Added (kg H_2SO_4/t)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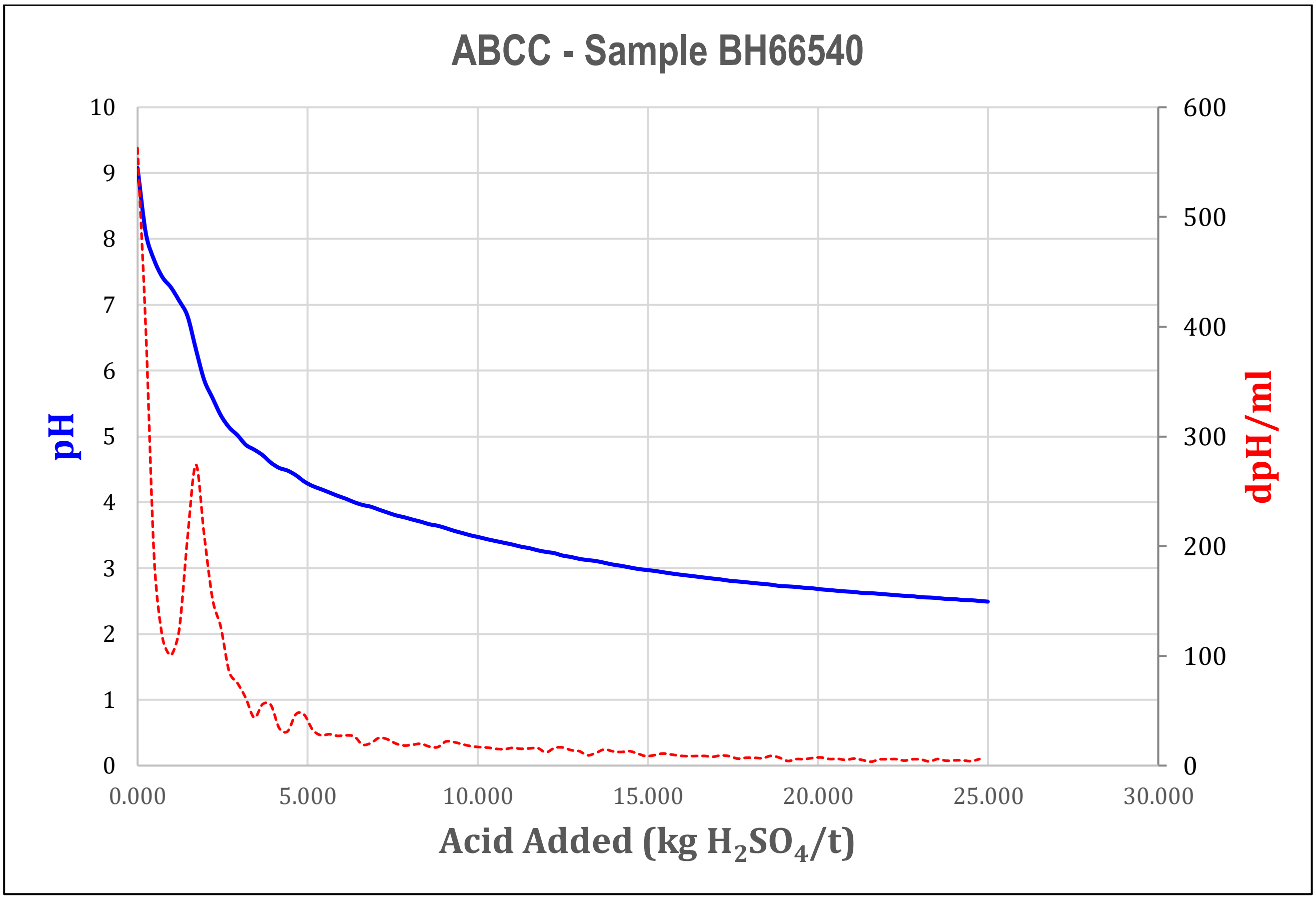
10.000
8.000
6.000
4.000
2.000
0.000
pH
500
450
400
350
300
250
200
150
100
50
0
dpH/ml
0.000
5.000
10.000
15.000
20.000
25.000
30.000
Acid Added (kg H_2SO_4/t)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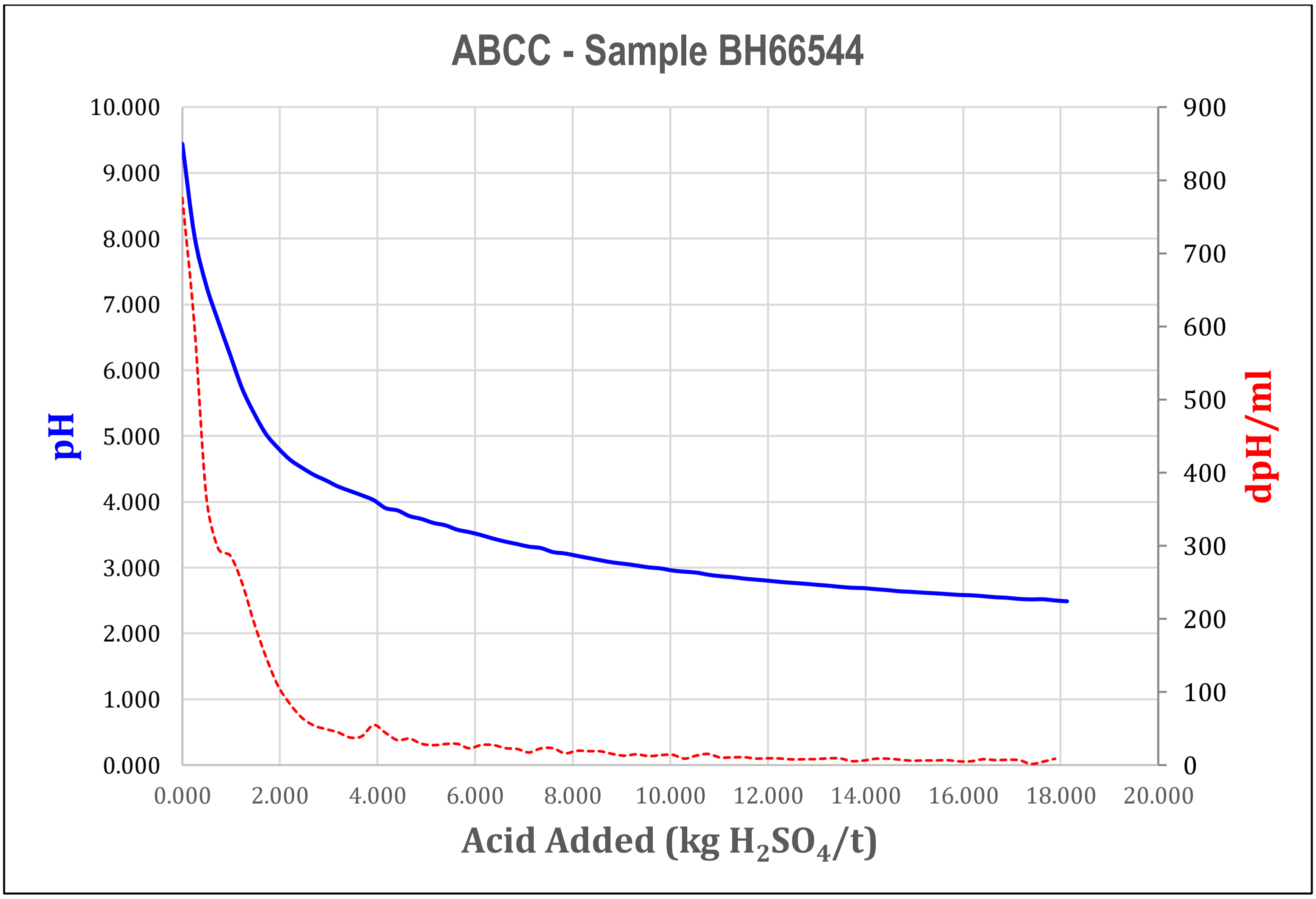
10
9
8
7
6
5
4
3
2
1
0
dpH/ml
600
500
400
300
200
100
0
0.000
5.000
10.000
15.000
20.000
25.000
30.000
Acid Added (kg H2SO4/t)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5.000
4.000
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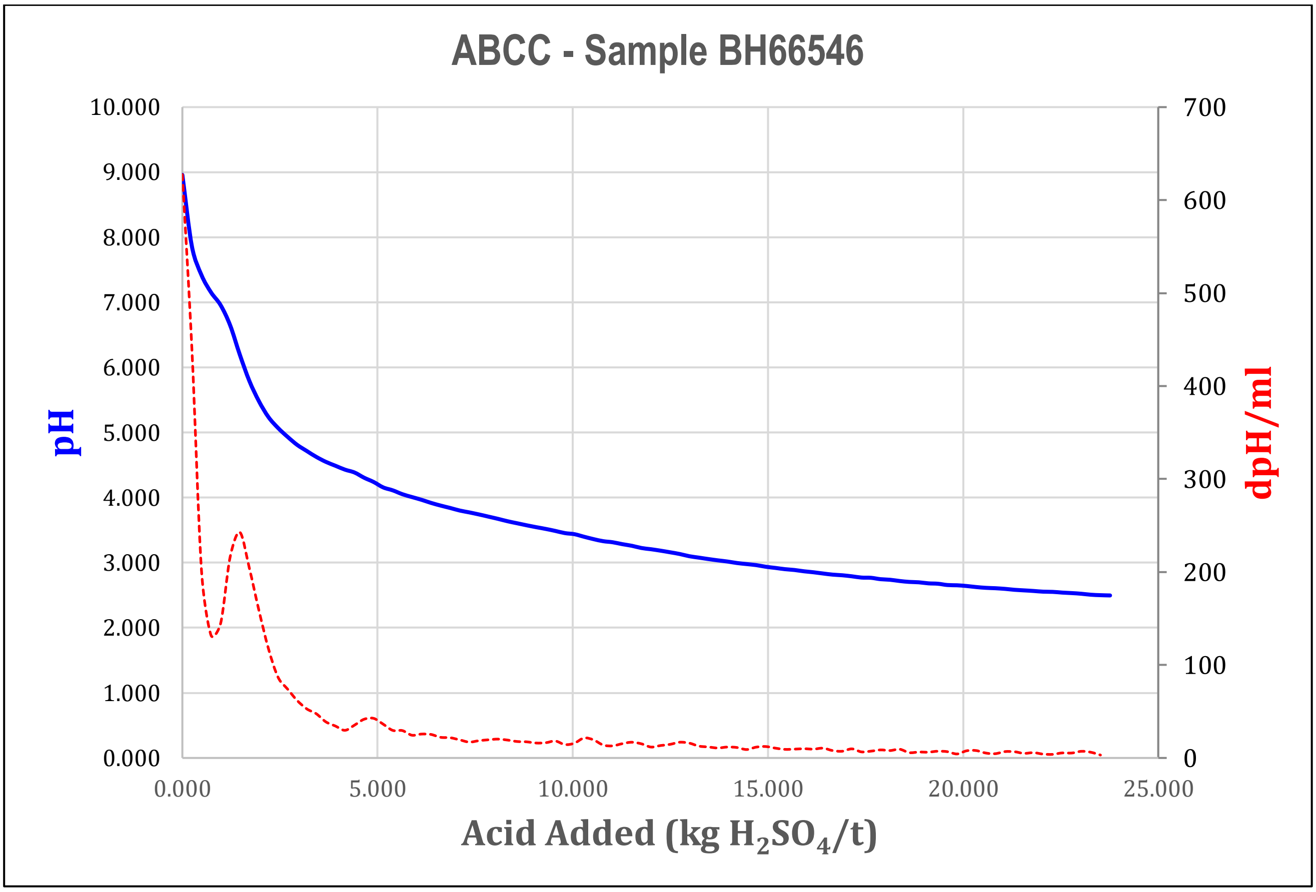
0.000
dpH/ml
900
800
700
600
500
400
300
200
100
0
0.000
2.000
4.000
6.000
8.000
10.000
12.000
14.000
16.000
18.000
20.000
Acid Added (kg H2SO4/t)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dpH/ml
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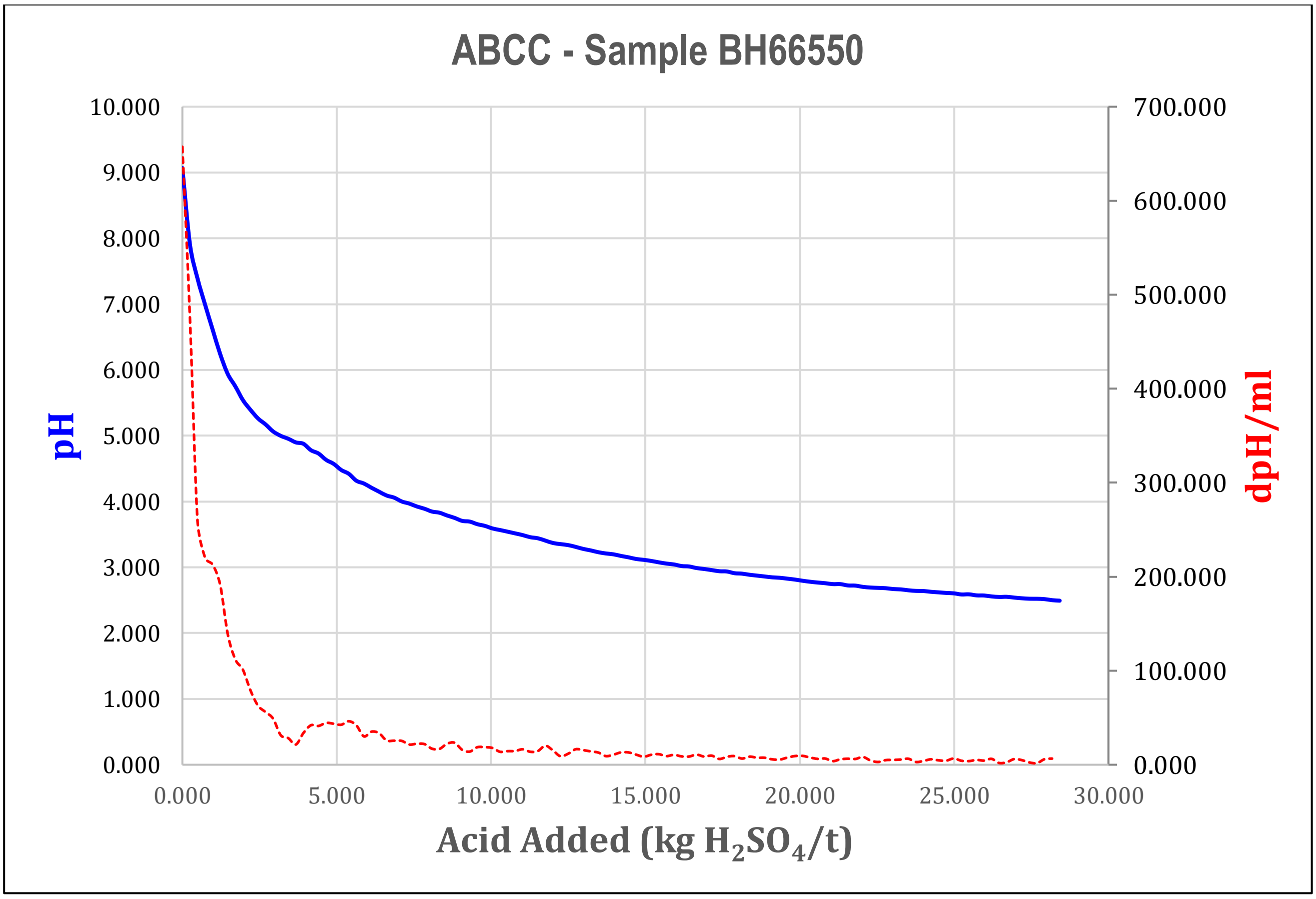
8.000
7.000
6.000
5.000
4.000
3.000
2.000
1.000
0.000
700
600
500
400
300
200
100
0
0.000
5.000
10.000
15.000
20.000
25.000
Acid Added (kg H_2SO_4/t)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pH
dpH/ml
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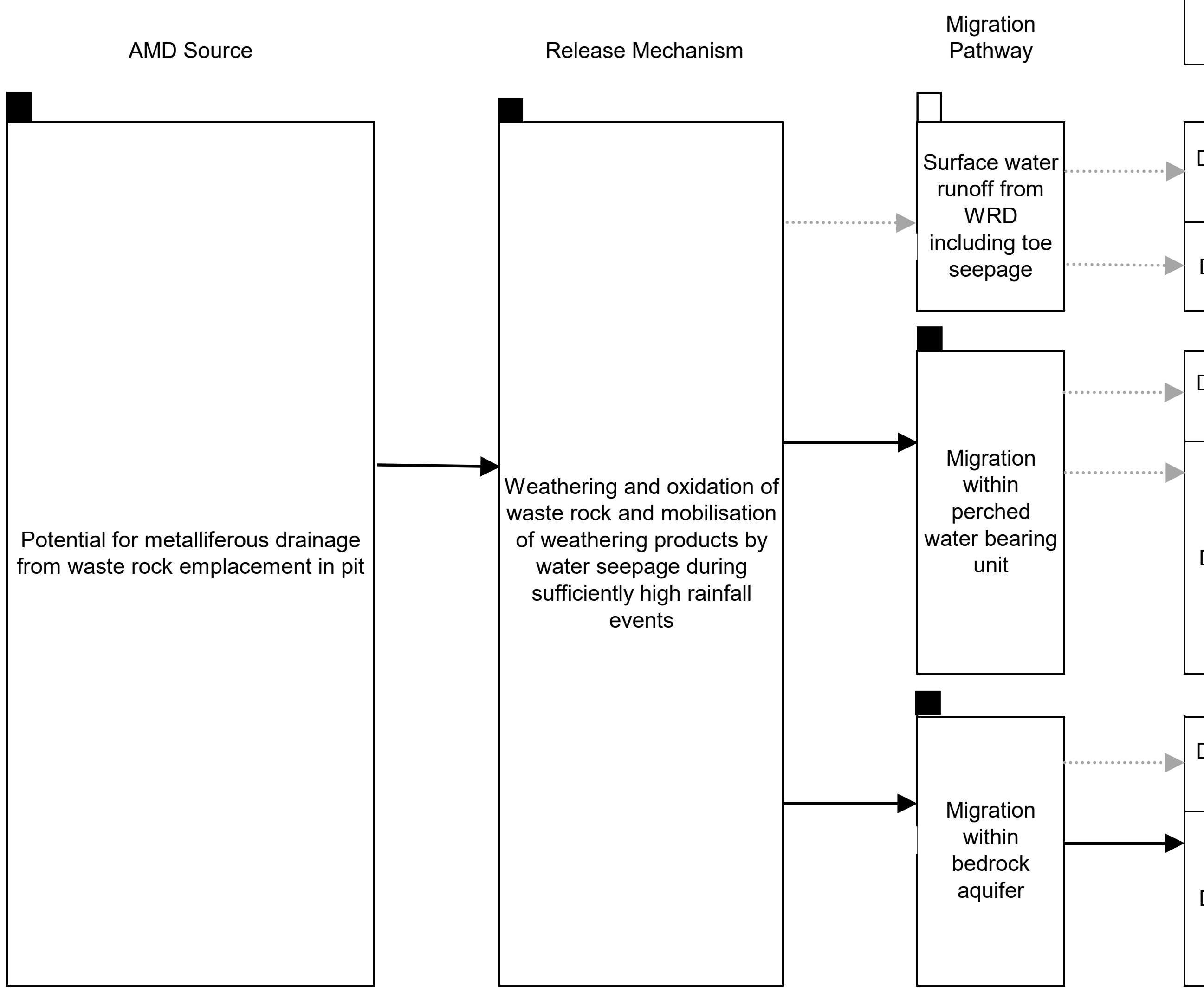
8.000
7.000
6.000
5.000
4.000
3.000
2.000
1.000
0.000
700.000
600.000
500.000
400.000
300.000
200.000
100.000
0.000
0.000
5.000
10.000
15.000
20.000
25.000
30.000
Acid Added (kg H_2SO_4/t)

Signatory

Dr Ron Watkins BSc., MSc., PhD, CGeol, FGS
Managing Director, Chief Scientist

APPENDIX C WASTE ROCK DOMAIN SOURCE-PATHWAY-RECEPTOR FLOWCHARTS

Waste Rock Domain A -
AMD Source-Pathway-Receptor Evaluation Flowchart



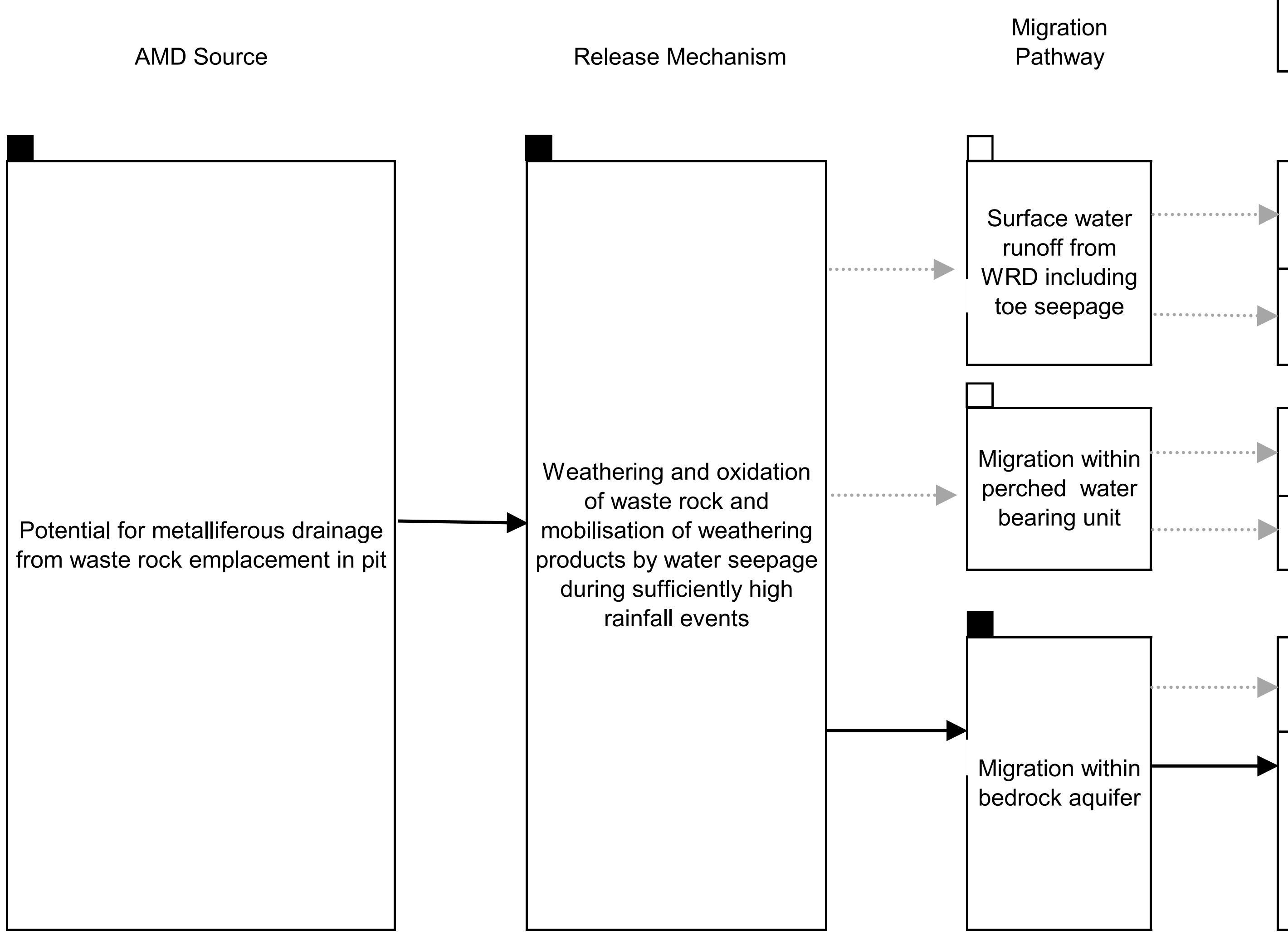
Exposure Route	Human Receptors		Ecological Receptors		Comments
	On-site Workers	Off-Site Groundwater Users	Groundwater Dependent Ecosystems	Terrestrial Receptors: On-Site Vegetation	
Drinking water (ingestion)					No surface water used for drinking water purposes.
Direct contact					Surface water runoff captured by topography of pit shell and expected to seep into mine workings. With no run-off leaving the pit no exposure of receptors to surface water is expected
Drinking water (ingestion)					No groundwater used for drinking water purposes.
Direct contact					With waste rock emplaced in a pit that will also receive processing tailings, a perched water bearing unit may form in this area of the mine site. While off-site migration in the perched water bearing unit could potentially occur the closest groundwater receptor is located 4.3km from this domain (the potential aquatic GDE identified through the BOM GDE Atlas). Note that the Perilya mine is located between the Rasp mine and this potential GDE and it is not considered likely that this potential GDE will be impacted through the perched water bearing unitas the unit is unlikely to extend to the potential GDE.
Drinking water (ingestion)					No groundwater used for drinking water purposes. Background water quality in basement aquifer not suitable for drinking water purposes.
Direct contact	X			X	Dewatering water used for onsite mineral processing and dust suppression. While dermal contact is not expected to be likely it is possible on-site. If water is used for dust suppression it may have a deleterious impact on soil quality and on-site vegetation. Dewatering activities draws groundwater towards the site and off-site migration is not expected within the bedrock aquifer during operations.

KEY

■	Potential	⟶	Potential
☐	Not applicable	⇢	Not applicable

X	Exposure pathway is potentially complete and will be assessed further (refer to risk register)
	Exposure pathway is not considered to be complete and will not be assessed further

Flowchart based on ASTM E1689 - 95 (Standard Guide for Developing Conceptual Site Models for Contaminated Sites)



Migration Pathway	Exposure Route	Human Receptors		Ecological Receptors		Comments
		On-site Workers	Off-Site Groundwater Users	Groundwater Dependent Ecosystems	Terrestrial Receptors: On-Site Vegetation	
☐ Surface water runoff from WRD including toe seepage	Drinking water (ingestion)					No surface water used for drinking water purposes.
	Direct contact					Surface water runoff captured by topography of pit shell and expected to seep into mine workings. With no run-off leaving the pit no exposure of receptors to surface water is expected.
☐ Migration within perched water bearing unit	Drinking water (ingestion)					No groundwater used for drinking water purposes.
	Direct contact					Perched water considered to be insignificant in this area of the mine site.
■ Migration within bedrock aquifer	Drinking water (ingestion)					No groundwater used for drinking water purposes. Background water quality in basement aquifer not suitable for drinking water purposes.
	Direct contact	X			X	Dewatering water used for onsite mineral processing and dust suppression. While dermal contact is not expected to be likely it is possible on-site. If water is used for dust suppression it may have a deleterious impact on soil quality and on-site vegetation. Dewatering activities draws groundwater towards the site and off-site migration is not expected within the bedrock aquifer during operations.

KEY

■ Potential

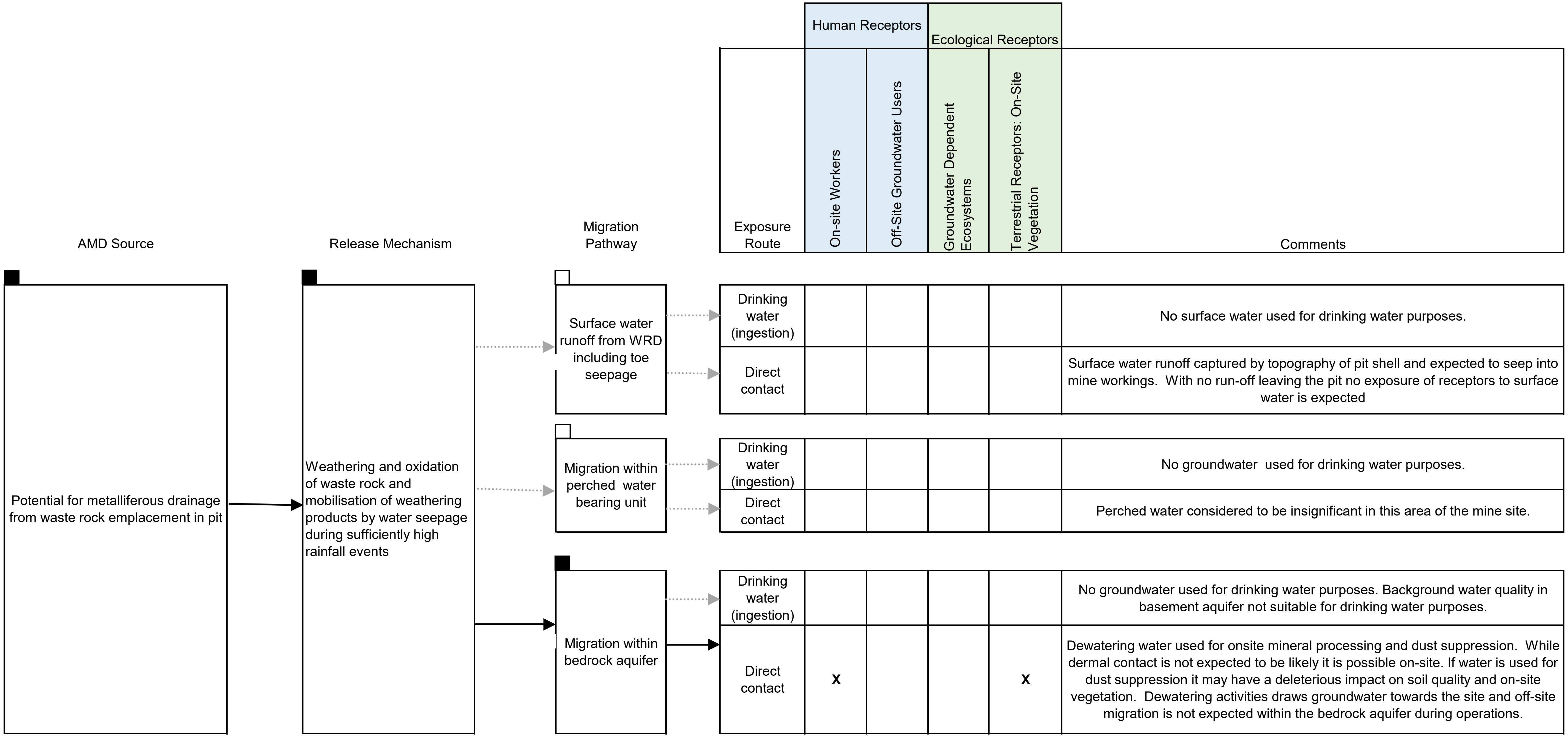
☐ Not applicable

→ Potential

⇢ Not applicable

X	Exposure pathway is potentially complete and will be assessed further (refer to risk register)
	Exposure pathway is not considered to be complete and will not be assessed further

Flowchart based on ASTM E1689 - 95 (Standard Guide for Developing Conceptual Site Models for Contaminated Sites)



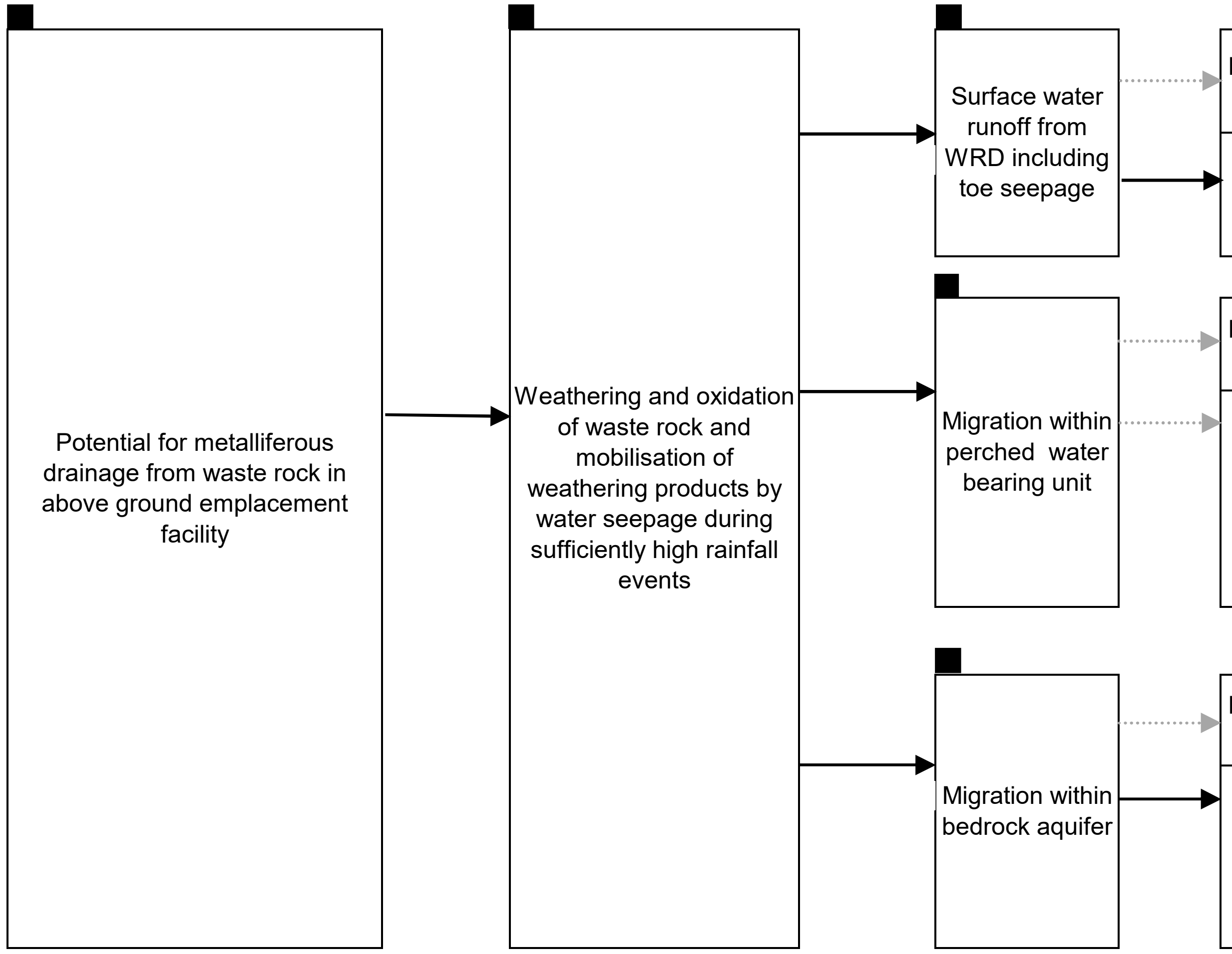
Migration Pathway	Exposure Route	Human Receptors		Ecological Receptors		Comments
		On-site Workers	Off-Site Groundwater Users	Groundwater Dependent Ecosystems	Terrestrial Receptors: On-Site Vegetation	
☐ Surface water runoff from WRD including toe seepage	Drinking water (ingestion)					No surface water used for drinking water purposes.
	Direct contact					Surface water runoff captured by topography of pit shell and expected to seep into mine workings. With no run-off leaving the pit no exposure of receptors to surface water is expected
☐ Migration within perched water bearing unit	Drinking water (ingestion)					No groundwater used for drinking water purposes.
	Direct contact					Perched water considered to be insignificant in this area of the mine site.
■ Migration within bedrock aquifer	Drinking water (ingestion)					No groundwater used for drinking water purposes. Background water quality in basement aquifer not suitable for drinking water purposes.
	Direct contact	X			X	Dewatering water used for onsite mineral processing and dust suppression. While dermal contact is not expected to be likely it is possible on-site. If water is used for dust suppression it may have a deleterious impact on soil quality and on-site vegetation. Dewatering activities draws groundwater towards the site and off-site migration is not expected within the bedrock aquifer during operations.

KEY

■	Potential	→	Potential
☐	Not applicable	⇢	Not applicable

X	Exposure pathway is potentially complete and will be assessed further (refer to risk register)
	Exposure pathway is not considered to be complete and will not be assessed further

Flowchart based on ASTM E1689 - 95 (Standard Guide for Developing Conceptual Site Models for Contaminated Sites)



AMD Source	Release Mechanism	Migration Pathway	Exposure Route	Human Receptors: On-site Workers	Human Receptors: Off-Site Groundwater Users	Ecological Receptors: Groundwater Dependent Ecosystems	Ecological Receptors: Terrestrial Receptors: On-Site Vegetation	Comments
■ Potential for metalliferous drainage from waste rock in above ground emplacement facility	■ Weathering and oxidation of waste rock and mobilisation of weathering products by water seepage during sufficiently high rainfall events	■ Surface water runoff from WRD including toe seepage	Drinking water (ingestion)					No surface water used for drinking water purposes.
			Direct contact	X			X	Surface water runoff captured by on-site drainage management, with water used for mine processing .While dermal contact is not expected to be likely it is possible on-site. Surface water drainage management on site prevents surface water draining off-site. On-site impacts to vegetation possible.
		■ Migration within perched water bearing unit	Drinking water (ingestion)					No groundwater used for drinking water purposes.
			Direct contact					With waste rock emplacement facility located adjacent to historical tailings storage facility, a perched water bearing unit is present in this area of the mine site. While off-site migration in the perched water bearing unit may occur the closest down-hydraulic gradient receptor is located 4km from this domain (the potential aquatic GDE identified through the BOM GDE Atlas). Note that the Perilya mine is located between the Rasp mine and this potential GDE and it is not considered likely that this potential GDE will be impacted through the perched water bearing unit as the unit is unlikely to extend to the potential GDE.
		■ Migration within bedrock aquifer	Drinking water (ingestion)					No groundwater used for drinking water purposes. Background water quality in basement aquifer not suitable for drinking water purposes.
			Direct contact	X			X	Dewatering water used for onsite mineral processing and dust suppression. While dermal contact is not expected to be likely it is possible on-site. If water is used for dust suppression it may have a deleterious impact on soil quality and on-site vegetation. Dewatering activities draws groundwater towards the site and off-site migration is not expected within the bedrock aquifer during operations.

KEY

■	Potential	→	Potential
☐	Not applicable	⇢	Not applicable

X	Exposure pathway is potentially complete and will be assessed further (refer to risk register)
	Exposure pathway is not considered to be complete and will not be assessed further

Flowchart based on ASTM E1689 - 95 (Standard Guide for Developing Conceptual Site Models for Contaminated Sites)

APPENDIX D AMD RISK REGISTER

Broken Hill Operations Pty Ltd – RASP Mine

Risk Ranking Matrix

BHO-FRM-SAF-004

Likelihood	Consequence				
	1- Minor	2 - Moderate	3 - Significant	4 - Major	5 - Catastrophic
A - Almost Certain	Medium 11	High 16	Extreme 20	Extreme 23	Extreme 25
B - Likely	Medium 7	Medium 12	High 17	Extreme 21	Extreme 24
C - Possible	Low 4	Medium 8	Medium 13	High 18	Extreme 22
D - Unlikely	Low 2	Low 5	Medium 9	High 14	Extreme 19
E - Rare	Low 1	Low 3	Low 6	Medium 10	High 15

Likelihood	Likelihood description	Frequency guide
Almost Certain	Event will occur if controls are not implemented or there is a critical control failure.	Weekly
Likely	The event will probably occur if controls are not implemented or there is a critical control failure.	Monthly
Possible	The event may occur, would require multiple control failures.	Yearly
Unlikely	The event could occur, would require multiple control failures, and could only result in the specific consequence.	Once every 5+ years
Rare	The event is practically impossible or may only occur in exceptional circumstances. Requires a combination of circumstances and multiple system and control failures.	Once every 10+ years

CONSEQUENCE CATEGORIES					
Impact	**Minor**	**Moderate**	**Significant**	**Major**	**Catastrophic**
People	No Injury/report only	First Aid Injury	Medically Treated Injury or Illness (MTI) or Restricted Work Injury or Illness (RWI).	Lost Time Injury or Illness (LTI)	Fatality/Fatalities
Environment	Spill of substance on site 5 - 20 litres	Spill of substance on site 21 - 200 litres	Offsite release of substance that exceeds license criteria. Spill of substance on site greater than 200 litres.	Offsite release impacting residents, flora or fauna. Major damage to heritage item	Death of or severe impact to protected flora or fauna. Severe impact on community members. Destruction of Heritage item
Property	Damage or loss $0 - $5,000	Damage or loss $5,000 - $20,000	Damage or loss $20,000 - $200,000	Damage or loss $200,000 - $1,000,000	Damage or loss greater than $1,000,000
Business	Production loss 30 minutes - 2 hours.	Production loss of 2 - 12 hours.	Production loss of 12 hours - 1 week.	Production loss of 1 week - 1 month.	Production loss greater than 1 month.
Community Reputation	Single complaint. No impact to operations.	Single complaint with regulator involvement or some impact to operations.	Community complaints, Local council level/media exposure.	Community complaints with Regulator involvement. Prosecution State government level/media exposure.	Community complaints with Regulator involvement. Prosecution/litigation National level exposure

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Waste Rock Domain	Potentially complete Source-Pathway-Receptor Linkages					Base Case Risk Assessment and Inherent Risk Ranking			Revised Risk Assessment and Residual Risk Ranking			
	AMD Source	**Migration Pathways**	**Exposure Route**	**Receptors**	**Maximum Reasonable Consequence**	**Highest Consequence Rating (Slight, Minor, Moderate, Major, Severe)**	**Highest Likelihood Rating (Rare, Unlikely, Possible, Likely, Almost Certain)**	**Inherent Risk Ranking**	**Controls**	**Consequence Rating**	**Revised Likelihood**	**Residual Risk Ranking**
A - D	Potential for Metalliferous Drainage from Waste Rock	1) Seepage to bedrock aquifer 2) Pumping of groundwater for dewatering purposes at the mine	Direct Contact	On-site workers	Potential for minor dermal irritation if direct contact to skin occurred. Note that given the poor background groundwater quality, the drainage from waste rock is not considered to materially change this risk relative to existing groundwater quality.	Minor	Possible	Low	Site operating procedures minimising contact with processing and dust suppression water, and use of appropriate PPE where required.	Minor	Unlikley	Low
A -D	Potential for Metalliferous Drainage from Waste Rock	1) Seepage to bedrock aquifer 2) Pumping of groundwater for dewatering purposes at the mine	Direct Contact	On-site vegetation	Deleterious affects on plant growth where water is being used for dust suppression. As above, further note that given the poor background groundwater quality, the drainage from waste rock is not considered to materially change this risk relative to existing groundwater quality.	Minor	Possible	Low	Groundwater used for dust suppression only used in designated areas (focussed on haul roads). Haul roads bunded with surface water drainage controlls.	Minor	Possible	Low
D	Potential for Metalliferous Drainage from Waste Rock	Surface water drainage from waste rock emplacement facility	Direct Contact	On-site vegetation	Potential deleterious affects on plant growth where impacted water comes into contact with vegetation.	Minor	Possible	Low	Surface water catchments and management preventing off-side drainage.	Minor	Unlikley	Low
D	Potential for Metalliferous Drainage from Waste Rock	Surface water drainage reports to on-site dams.	Direct Contact	On-site workers	Potential for minor dermal irritation if direct contact to skin occurred	Minor	Possible	Low	Dilution of water from surface water storages with raw water during process water make-up, site operating procedures minimising contact with processing water and use of appropriate PPE where required.	Minor	Unlikley	Low

Waste Rock Domain	Potentially complete Source-Pathway-Receptor Linkages					Base Case Risk Assessment and Inherent Risk Ranking			Revised Risk Assessment and Residual Risk Ranking			
	AMD Source	Migration Pathways	Exposure Route	Receptors	Maximum Reasonable Consequence	Highest Consequence Rating (Slight, Minor, Moderate, Major, Severe)	Highest Likelihood Rating (Rare, Unlikely, Possible, Likely, Almost Certain)	Inherent Risk Ranking	Controls	Consequence Rating	Revised Likelihood	Residual Risk Ranking

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