Whitehaven

2025

Maules Creek Continuation Project

Environmental Impact Statement

Appendix P
Geochemistry Assessment

MAULES CREEK CONTINUATION PROJECT

GEOCHEMISTRY ASSESSMENT

March 2025

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1.0 Introduction

The Maules Creek Coal Mine (MCCM) is an open cut coal mine located approximately 17 kilometres (km) north-east of Boggabri, New South Wales (NSW) (Figure 1). MCCM is a joint venture between Aston Coal 2 Pty Ltd (a wholly owned subsidiary of Whitehaven Coal Limited [Whitehaven]) (75 per cent [%]), ICRA MC Pty Ltd (a wholly owned subsidiary of Itochu Corporation) (15%) and J-Power Australia Pty Ltd (a wholly owned subsidiary of Electric Power Development Co. Ltd) (10%). MCCM is operated by Maules Creek Coal Pty Ltd (MCC).

Mining operations at MCCM are currently approved until 31 December 2034 with a coal extraction rate of up to 13 million tonnes per annum (Mtpa) in accordance with Project Approval (PA) 10_0138 (as modified). The existing MCCM comprises a single open cut pit, Northern Emplacement and Southern Emplacement areas, and Mine Infrastructure Area (MIA) (Figure 2). The MIA includes the Coal Handling and Preparation Plant (CHPP), run-of-mine (ROM) coal stockpiles, product coal stockpiles, train load-out infrastructure, workshops and administration buildings, hardstand and laydown areas, car parking, wash bays, and other associated infrastructure.

1.1 Project Description

MCC is seeking approval to continue open cut mining operations within the MCCM mining and exploration tenements for a further 10 years (from 2035 to 2044). Development Consent for the Maules Creek Continuation Project (the Project) is being sought under the State Significant provisions (i.e. Division 4.7) under Part 4 of the NSW *Environmental Planning and Assessment Act 1979*. The indicative Project general arrangement is provided on Figure 2.

Compared to the existing approved MCCM, the Project would include the following additional key activities:

- extension of open cut operations within CL 375, ML 1719 and AUTH 346 to allow mining and processing of additional coal reserves until approximately 31 December 2044;
- extraction of approximately 117 million tonnes (Mt) of ROM coal (in addition to the approved MCCM coal resource of 240 Mt of ROM coal);
- extraction of up to 14 Mtpa of ROM coal (i.e. a 1 Mtpa increase from the currently approved maximum ROM coal mining rate of 13 Mtpa);
- a revegetation program to establish approximately 2,300 ha of native woodland in the vicinity of the MCCM (i.e. in addition to any offset and rehabilitation obligations);
- an increase in the operational workforce to an average of approximately 940 people, with a peak operational workforce of approximately 1,030 people;
- continued operation of the existing CHPP and train load loud-out and rail spur infrastructure, with upgrades as required;
- continued transport of up to 12.4 Mtpa of product coal via rail (i.e. no change to the currently approved maximum product coal transport rate);

LEGEND

- MCCM Mining Tenement Boundary (CL and ML)
- Mine Site
- Local Government Boundary
- State Forest
- State Conservation Area, Aboriginal Area
- Rail Line

Source: NSW Spatial Services (2023); Geoscience Australia (2011)

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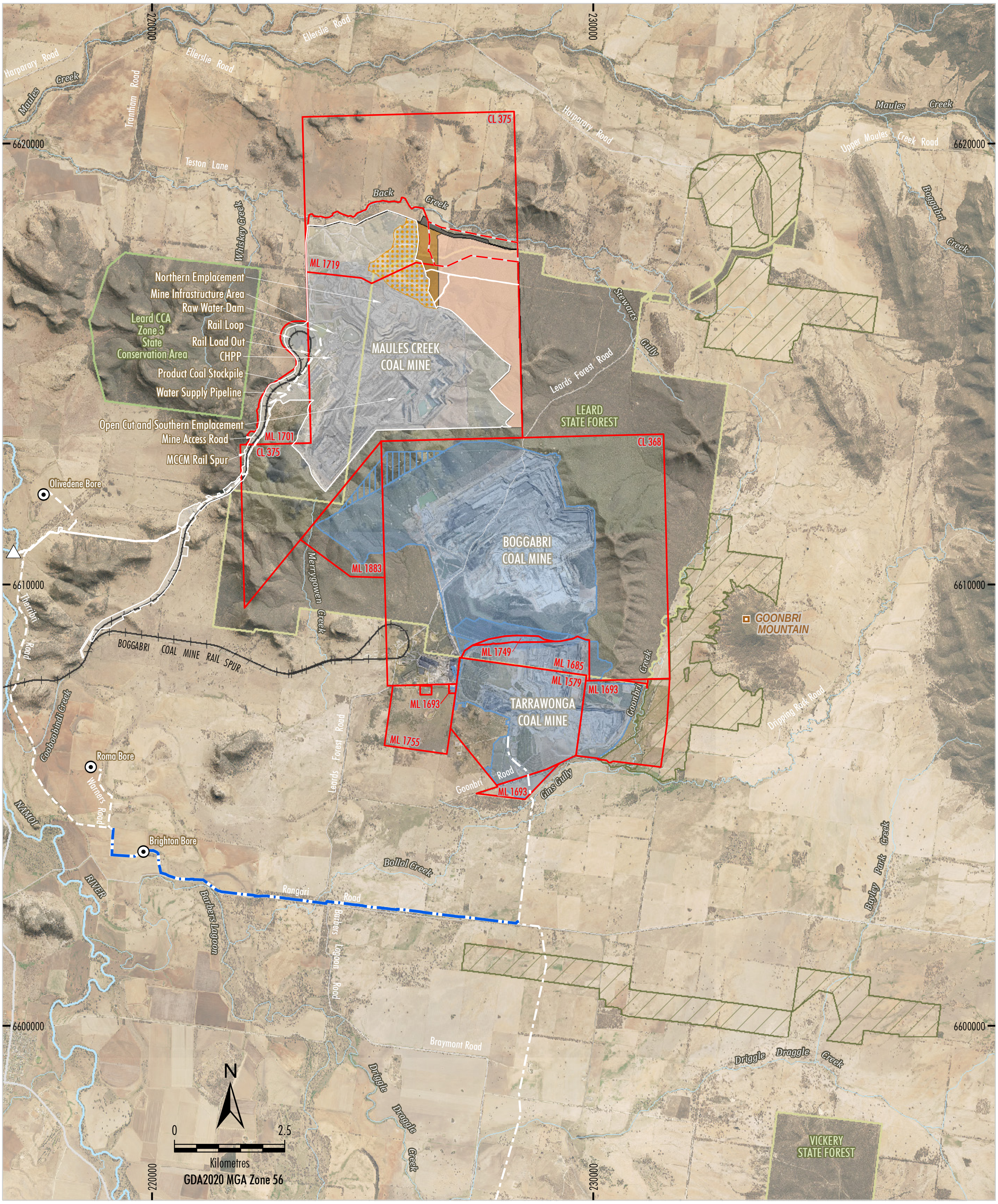
MAULES CREEK CONTINUATION PROJECT

Project Location

Figure 1



LEGEND

- Rail Line
- State Conservation Area
- State Forest
- Mining Tenement Boundary (ML and CL)
- Provisional Mining Lease Application Area
- Other Mining Operation *
- Other Mining Operation - Proposed *
- VCM to TCM Water Transfer Pipeline

Existing/Approved MCCM Development

- Approximate Extent of Existing/Approved Surface Development
- MCCM Water Supply Pipeline
- MCCM Groundwater Supply Bore
- MCCM Namoi River Pump Station

Maules Creek Continuation Project

- Indicative Go-line, Access and Infrastructure Area
- Indicative Open Cut Extension Area
- Indicative Overburden Emplacement Extension
- Existing Overburden Rehabilitation to be Disturbed
- Indicative Landscape Revegetation Zones#
- Indicative Water Transfer Pipeline (Proposed)

Source: NSW Spatial Services (2024)
Orthophoto Mosaic: Whitehaven (2019-2024)

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MAULES CREEK CONTINUATION PROJECT

General Arrangement of the Project

** BCM boundary digitised from Figure 1 of the BCM Modification 10 Scoping Letter.*

#Landscape Revegetation Zones shown on this figure are approximate extents only.

Figure 2

- development of an integrated waste rock emplacement landform that incorporates geomorphic design principles;
- construction and use of a remote go-line, access and infrastructure area;
- continued operation and extension of the MCCM water management system;
- upgrades to workshops, electricity distribution and other ancillary infrastructure;
- continued placement of coarse rejects within the mined out voids and the out-of-pit overburden emplacements areas;
- construction of a water transfer pipeline between the MCCM water pipeline network and the approved Vickery Coal Mine (VCM) to Tarrawonga Coal Mine (TCM) pipeline;
- ongoing exploration activities; and
- other associated infrastructure, equipment and activities.

1.2 Assessment Objectives

Geo-Environmental Management Pty Ltd (GEM) was commissioned by MCC to undertake this geochemistry assessment for the Project. This assessment was conducted in two stages. Stage 1 comprised a review of the previous geochemical investigations for MCCM and surrounding mining operations, and selection of representative overburden and interburden, target coal seam and coal reject samples for the assessment. Stage 2 of the assessment involved the geochemical characterisation of the selected samples, and evaluation and reporting of the test results. The objectives of the two stages of the assessment include the following:

Stage 1 – Review of Existing Data

1. Review of available geological information, drill hole logs and previous geochemical investigations completed for MCCM and surrounding the mining operation, including:
    - geochemical assessments previously conducted for the MCCM;
    - geochemical assessments conducted for the adjacent Boggabri Coal Mine (BCM) and the nearby TCM (Figure 2);
    - surface water quality results as detailed in recent Annual Reviews for the MCCM and any surrounding operations; and
    - drilling records as maintained by Whitehaven, including any further exploration drilling undertaken during the preparation of the Project Environmental Impact Statement (EIS).
2. Review of the preliminary Project information and existing data, and consideration of the required additional geochemical test work, including:
    - geochemical characterisation of samples representing the overburden and interburden, target coal seams and coal rejects, using materials collected from the existing and/or future drill-core;
    - selection of the required assessment parameters and analytical laboratories to be used;

- provision of a brief memorandum providing Whitehaven with the findings of the review and recommendations for additional test work requirements; and
- provision of clear instructions to Whitehaven and coordination of the sampling program/s to enable on-site personnel to collect, bag and dispatch the required samples.

Stage 2 – Geochemistry Assessment and Reporting

3. Geochemical characterisation of the samples collected during Stage 1, including salinity and sodicity, acid-forming potential, and metal enrichment and solubility:
    - coordination of sample preparation and analysis to be undertaken by the nominated external laboratories; and
    - tabulation and evaluation of the received test results.
4. Preparation of the Geochemistry Assessment Report for inclusion in the Project EIS, including:
    - a detailed description of previous and additional geochemical test work and management measures;
    - an assessment of the acid-forming potential of coal stockpiles, overburden emplacement areas and reject emplacement areas (particularly the potential environmental risks associated with the proximity of the proposed pit and overburden emplacement to the Back Creek and associated alluvial deposits);
    - an assessment of the potential for migration of metals, minerals or salts from coal stockpiles, overburden emplacement areas or reject emplacement areas;
    - provision of any materials (coal/overburden/rejects) handling or monitoring recommendations; and
    - incorporation of comments from Whitehaven and Resource Strategies received on draft reports.

2.0 Regional Geology and Local Stratigraphy

The Project is located within the Gunnedah Basin which hosts resources of coal formed during the Early to Late Permian. Coal deposits of the Gunnedah Basin comprise two distinct Groups; the Early Permian Bellata Group, and the Late Permian Black Jack Group. A north-northwest trending basement structure, known as the Boggabri Ridge, effectively divides the Gunnedah Basin into two sub-basins, the Mullaley Sub-basin to the west and the Maules Creek Sub-basin to the east. The Maules Creek Sub-basin contains a number of thermal, pulverized coal injection and soft coking coal deposits including the Maules Creek, Boggabri, Vickery and Tarrawonga deposits (Dawson *et al.*, 2004).

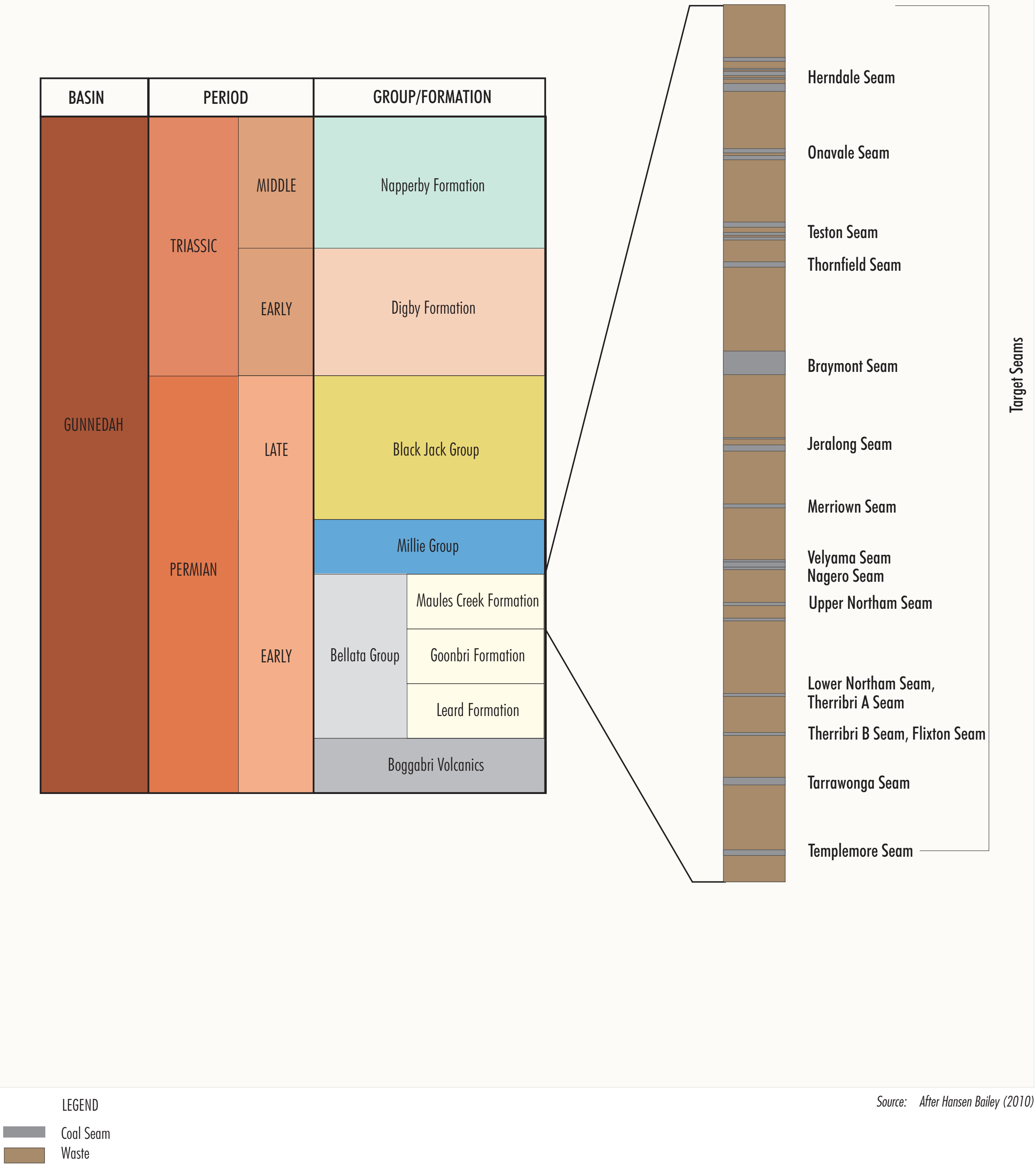
The Maules Creek Sub-basin contains sediments of the Maules Creek Formation that onlap the basal volcanics of the Boggabri Ridge to the west and thicken eastward to greater than 1000 metres (m). The Boggabri Volcanics, consisting primarily of the acid volcanic dacite, rhyolite, basalt, tuff and pyroclastics, form the basement of the Maules Creek Formation. The Maules Creek Formation is the primary coal bearing unit and consists of interbedded coal, conglomerate, sandstone, siltstone, mudstone, claystone, carbonaceous material and coal. The Maules Creek Formation contains up to 25 coal seams ranging in thickness from 0.3 to 3.5 m and generally thicken to the west. Quaternary alluvial deposits overlie the stratigraphy in places across the Project area and the typical weathering depth ranges from 30 to 40 m.

Figure 3 provides a conceptual stratigraphic section of the Gunnedah Basin and the indicative coal seam stratigraphy for the Maules Creek Formation. The 15 identified target coal seams for the Project are listed on Table 1.

Table 1: Target coal seams of the Maules Creek Formation.

Target Coal Seam	Seam Code
Herndale Seam	HRN
Onavale Seam	ONV
Teston Seam	TST
Thornfield Seam	TNN
Braymont Seam	BRY
Jeralong Seam	JER
Merriown Seam	MER
Velyama Seam	VEL
Nagero Seam	NAG
Upper Northam Seam	UPN
Lower Northam Seam	LRN
Therribri Seam[1]	TER
Flixton Seam	FLX
Tarrawonga Seam	TWA
Templemore Seam	TEM

1 The Therribri Seam includes two components, Therribri A and Therribri B (refer to Figure 3).



Source: *After Hansen Bailey (2010)*

WHC-23-95 EIS_App GeoChem_001A

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MAULES CREEK CONTINUATION

Indicative Stratigraphy of the Project Area

Figure 3

3.0 Related Investigations

A number of investigations relevant to this assessment, including geochemical assessments of overburden and interburden, and coal rejects from the MCCM and nearby mining operations, all targeting coal seams of the Maules Creek Formation, are reviewed for this assessment along with the results of the site water quality monitoring program for the MCCM. The previous geochemical investigations relevant to this assessment include:

- A geochemical assessment of overburden and coal rejects from the MCCM including:
  - *Maules Creek Project – Geochemical Assessment of Overburden and Potential Coal Reject Materials* (RGS Environmental Pty Ltd [RGS], 2011).
- A geochemical assessment of overburden and interburden, and coal and coal rejects from the TCM including:
  - *Environmental Geochemistry Assessment of the Tarrawonga Coal Mine Modification* (GEM, 2010).
  - *Tarrawonga Coal Project – Geochemistry Assessment of Overburden, Interburden and Coal Rejects* (GEM, 2011).
- A geochemical assessment of overburden and interburden, and coal and coal rejects from the VCM including:
  - *Vickery Coal Project – Geochemistry Assessment of Overburden, Interburden and Coal Rejects* (GEM, 2012).
  - *Vickery Extension Project – Geochemistry Assessment of Overburden, Interburden and Coal Rejects* (GEM, 2018).
- A geochemical assessment of interburden and coal rejects from the BCM including:
  - *Boggabri Coal Mine – Geochemical Assessment of Interburden and Potential Coal Reject* (RGS, 2021).
  - *Boggabri Coal Mine – Geochemical Assessment of Coal Reject Materials* (RGS, 2023).

3.1 Maules Creek Coal Mine Geochemical Assessments

The geochemical characteristics of 47 drill hole samples, representing the overburden and interburden from the Maules Creek Project, and surface water quality investigations were reported in the 1989 EIS and reviewed by RGS (2011). These results indicated that:

- Although most of the overburden and interburden was expected to be non-acid forming (NAF), overburden from above the Herndale seam and interburden from the Herndale to Onavale seam may contain potentially acid forming (PAF) material.
- Although the overburden and interburden were typically found to be non-sodic, some sodic materials were identified in the carbonaceous shales and sandstones and the placement of these material on the final rehabilitation landforms would need to be avoided.
- The surface run-off had a neutral pH (6.8-7.3) and a low conductivity (80 – 110 microSiemens per centimetre), with relatively low concentrations of sulfate (SO_4) and metals.

A total of 138 additional drill hole samples representing the overburden and interburden and coal rejects from the Maules Creek Coal Project (RGS, 2011) were included in the assessment program and the reported results indicated that:

- The overburden and interburden were likely to be non-sodic with a relatively low-salinity and to be NAF, with a low sulfur (S) content and moderate acid neutralising capacity (ANC).
- The concentration of metals in overburden and interburden solids and seepage were below the applied guideline criteria and unlikely to present any environmental issues associated with revegetation and rehabilitation.
- Although most of the coal rejects were expected to be NAF, those from the Braymont, Hemdale and Onavale seams were likely to contain PAF materials.
- The concentration of metals in coal reject solids was below the applied guideline criteria for soils and unlikely to present any environmental issues associated with revegetation and rehabilitation.
- Although the NAF coal reject would generate slightly alkaline and relatively low salinity run-off and seepage following surface exposure, the PAF rejects were expected to generate acidic and relatively saline run-off and seepage if exposed to atmospheric oxidising conditions.

3.2 Tarrawonga Coal Mine Geochemical Assessments

A geochemical assessment of overburden and interburden from the TCM was carried out by URS Australia Pty Ltd (URS) in 2005 for the East Boggabri Joint Venture EIS (URS, 2005), prepared by R.W Corkery & Co Pty Limited (R.W. Corkery) (2005). Five mixed lithology drill hole sample composites were prepared for this assessment. The results from the geochemical characterisation program indicated that the materials represented had relatively low S contents (0.04 to 0.31 %S) and a range in ANC from 8 to 64 kilograms of sulfuric acid per tonne of material (i.e. kg H_2SO_4/t). The net acid generation (NAG) test results confirmed that all of these samples were classified as NAF with only a low salinity risk.

A detailed geochemical assessment was performed on 29 discrete lithology drill hole samples representing the overburden and interburden from the TCM Modification (GEM, 2010). As with the results from the previous assessment, the results from this program indicated that, with low S contents (<0.01 to 0.11 %S) and a relatively large range in ANC values from 5 to 185 kg H_2SO_4/t, the overburden and interburden was likely to be NAF with a low ongoing salinity risk. However, some of this material was likely to be moderately sodic, and potentially highly dispersive if left exposed to surface weathering conditions.

Although no environmentally sensitive metals were found to be significantly enriched in the overburden and interburden solids, arsenic (As), molybdenum (Mo), antimony (Sb) and selenium (Se) were found to be readily soluble in some of the samples tested (GEM, 2010).

A further 119 discrete lithology drill hole samples representing the overburden and interburden from the proposed eastern and northern pit extensions were characterised for the Tarrawonga Coal Project (GEM, 2011). Consistent with the previous assessments, these results confirmed that the overburden and interburden was expected to be NAF with a low salinity risk, and a proportion of this material was likely to range from moderately to highly sodic.

Consistent with the previous assessments and typical of the coal deposits in this region, the overburden and interburden materials from the proposed pit extension areas were likely to contain significantly enriched concentrations of As and Se and slightly enriched concentrations of Sb compared to the average crustal abundance. Additional to this, As, Mo and Se were likely to be slightly soluble under the prevailing near-neutral pH conditions.

3.3 Vickery Coal Mine Geochemical Assessments

The geochemical assessment of 107 discrete lithology drill hole samples representing the overburden and interburden, and the previous coal reject samples from the Maules Creek Formation was undertaken for the Vickery Coal Project EIS (GEM, 2012). This assessment found that the overburden and interburden was typically expected to be alkaline and non-saline, and to be NAF. Due to the low total S content, this material does not present an ongoing salinity risk following exposure to weathering conditions. However, a small quantity of the overburden and interburden occurring as roof and/or floor rock to the coal seams, was identified as PAF with a low capacity to generate acid (i.e. PAF/LC).

Although no environmentally sensitive metals were found to be significantly enriched in the overburden and interburden materials, under the predicted slightly alkaline to neutral pH conditions, aluminium (Al), As, Mo and Se are likely to be readily soluble.

The coal rejects were typically expected to be non- to slightly saline and NAF, but some of these materials have a risk of being PAF. These materials were typically expected to be enriched with silver (Ag), As, mercury (Hg) and Se, and Mo and Se were expected to be readily soluble under the prevailing near-neutral pH conditions.

A combined 141 drill hole samples representing overburden and interburden and 21 drill hole samples representing the target coal seams were included in the Geochemistry Assessment for the Vickery Extension Project Environmental Impact Statement (GEM, 2018). This assessment confirmed that the overburden and interburden generally have a low S content and was expected to be NAF with a low salinity risk. Some of the strata located immediately above and/or below the coal seams (i.e. roof and floor rock) may be PAF due to the increased S content. However, most of these materials were expected to only have a low capacity to generate acid (<10 kg H_2SO_4/t) and to have a relatively long geochemical lag period, so that acid conditions are only likely to develop if these materials are left exposed to atmospheric oxidation for a period ranging from a year to a number of years.

Although this assessment identified that the majority of the overburden and interburden was expected to be non- or slightly sodic, a small proportion of moderately to highly sodic material was identified.

The overburden and interburden was typically expected to contain enriched concentrations of As, Ag, Sb and Se, and under the prevailing quasi-neutral to moderately alkaline pH conditions, As, Mo and Se were likely to be readily soluble.

The coal seam samples representing the ROM coal comprised NAF and PAF material depending on the ANC. The samples with a relatively high ANC (>10 kg H_2SO_4/t) were determined to be NAF, while those with low ANC (<10 kg H_2SO_4/t) were determined to be PAF.

Based on these results, the ROM coal was expected to be enriched in a number of environmentally significant metals including As, boron, Hg, Sb and Se, and As, Mo and Se are expected to be readily soluble under the predicted near-neutral pH conditions (i.e. pH >6) of the stockpiled ROM coal.

3.4 Boggabri Coal Mine Geochemical Assessments

The geochemical assessment of interburden and coal reject from the BCM was undertaken for the MOD8 Modification Report (RGS, 2021). A total of 92 drill hole samples representing interburden and coal reject from the Maules Creek Formation, were included in the assessment and it was reported that the majority of these materials had low S content with an excess in ANC, resulting in NAF classification. Although the run-off and seepage from the interburden and coal reject were expected to be slightly alkaline with low salinity, these materials were found to be potentially sodic and may be prone to dispersion and erosion.

The interburden and coal reject samples did not exceed the guidelines for any metals when compared to the median crustal abundance, and it was reported that these materials were not expected to present any environmental issues associated with their revegetation and rehabilitation.

A total of 20 samples were collected from a variety of coal seam blends used to generate coal reject materials from the CHPP over a 10 month period for the Geochemical Assessment of Coal Reject Materials, BCM (RGS, 2023). The acid-base account (ABA) results confirm that the coal rejects typically have a relatively high total S content with variable ANC, resulting in these materials posing a significant risk of generating acid and metalliferous drainage (AMD).

Based on this program, the coal rejects were not expected to contain any significantly enriched metal concentrations and the dissolved metals and salinity in run-off and/or seepage were expected to be low. However, due to the relatively high reactive S content, these materials may develop saline runoff, if left exposed to atmospheric oxidation.

4.0 Existing and Approved MCCM Management Measures

Existing/approved management strategies implemented at the MCCM for overburden, interburden, coal and coal reject materials are described in the *Maules Creek Rehabilitation Management Plan* (MCC, 2023) and the relevant site water management programs provided in the *Maules Creek Coal Mine Water Management Plan* (MCC, 2023).

A summary of the existing/approved management strategies implemented at the MCCM for key mine material types and the relevant site water management programs are provided below.

4.1 Overburden and Interburden Management

Waste rock at the MCCM comprises overburden and interburden from the open cut pit. The majority of the waste rock has historically been placed within the out-of-pit Northern Emplacement area. However, mining operations have now progressed to a point where sufficient capacity is available to allow an increase in the quantity of in-pit waste rock emplacement. Over the next three years, MCCM plans to transition away from majority out-of-pit to full in-pit waste rock emplacement. The overburden is blasted prior to being excavated using truck and excavator and to-date, no specific management measures are required for the waste rock emplacement.

4.2 Coal and Coal Reject Management

The raw coal and washed coal at the MCCM are stockpiled on the ROM coal pad and product coal stockpile, respectively. These stockpiles are located within the existing water management system (refer Section 4.3).

No specific management measures are required for the ROM coal pad or product coal stockpile.

The coal reject management measures implemented at the MCCM include the following (MCC, 2023):

- use of drainage and containment structures to re-direct or capture runoff, as required;
- placement of NAF coal reject materials in the open cut pit and/or co-disposed with overburden;
- in-pit encapsulation of the PAF and PAF/LC coal reject material identified within a number of the target coal seams. The encapsulation cells are designed to ensure that the PAF and PAF/LC material is encapsulated with at least 15 m final coverage of inert waste rock. Out-of-pit co-disposal of PAF and PAF/LC rejects within encapsulated cells may be adopted if there is insufficient capacity available within the in-pit disposal facility, providing at least 15 m of inert waste rock forms the final cover;
- placement of PAF and PAF/LC material from immediately above or below the coal seams (i.e. roof and floor rock) should be treated as PAF and PAF/LC coal reject for disposal unless ROM blending with the CHPP rejects, is sufficient to produce an overall NAF material; and

- covering the NAF carbonaceous waste materials as soon as practical with at least 5 m of inert waste rock to minimise the length of exposure to oxidising conditions in order to minimize the risk of spontaneous generation.

4.3 Site Water Management

Site water management at the MCCM is conducted in accordance with the *Maules Creek Coal Mine Water Management Plan* (MCC, 2023).

The objectives of the MCCM water management system are as follows:

- clean water runoff from undisturbed catchment areas is diverted away from the mining area, where possible and practical to do so;
- sediment laden runoff from disturbed areas is reused in the water management system or released into the receiving environment if water quality meets the Environmental Protection Licence (EPL) requirements;
- mine water and groundwater collected within open cut pits is contained and reused on-site;
- no discharge of mine water off-site; and
- on-site water demands are satisfied whilst minimising offsite water requirements.

To meet these objectives, the MCCM water management system comprises the following:

- sediment dams to collect and treat runoff from overburden emplacement areas;
- clean water diversion drains and dams to divert runoff from undisturbed catchments around areas disturbed by mining where reasonable and feasible;
- surface water drains to divert sediment-laden runoff from overburden emplacement areas to sediment dams;
- a mine-affected water system to store water from active mining areas and infrastructure areas; and
- other ancillary water management infrastructure (including pumps, piping and drains), as required.

5.0 Geochemical Assessment Program

5.1 Testing Methodology

The laboratory program for this assessment included the following tests and procedures:

- pH and electrical conductivity (EC) determination;
- total S assay;
- maximum potential acidity (MPA) calculation;
- ANC determination;
- net acid producing potential (NAPP) calculation;
- exchangeable cation analysis;
- chromium reducible sulfur (CRS) analysis;
- single addition NAG test;
- extended boil NAG ($NAG_{ext.}$) test;
- kinetic NAG (KNAG) test;
- acid buffering characteristic curve (ABCC) determination; and
- multi-element scans on solids and water extracts.

The sample preparation, exchangeable cation analysis, acid-base analysis (total S assays and ANC determinations), NAG testing and ABCC determinations were performed by Australian Laboratory Services Pty Ltd (ALS) Geochemistry (Brisbane). The pH and EC determinations, and water extract preparation were conducted by GEM, and the multi-element scans were performed by Genalysis Laboratories Ltd Pty in Perth.

An overview of the testing program used for this assessment is presented below.

5.1.1 pH, Salinity and Sodicity Determination

pH and Electrical Conductivity Determination

The pH and EC of a material is determined by equilibrating the sample in deionised water for a minimum of 2 hours at a solid to water ratio of 1:2 (w/w). This test provides an indication of the inherent acidity and salinity of the material when it is initially exposed. Table 2 provides the salinity rankings based on $EC_{1:2}$ values.

Table 2: Salinity ranking based on the EC value.

$EC_{1:2}$ (dS/m)	Salinity
< 0.5	Non-Saline
0.5 to 1.5	Slightly Saline
1.5 to 2.5	Moderately Saline
> 2.5	Highly Saline

(Rhoades *et al*., 1999) dS/m = deci-siemens per metre

Sodicity Determination – Exchangeable Cation Analysis

Exchangeable cation analyses are carried out to determine the sodicity of a sample. Sodicity occurs in materials that have high concentrations of exchangeable sodium (Na) relative to the other major cations, calcium (Ca) and magnesium (Mg), causing the material to be highly dispersive. The exchangeable sodium percent (ESP) is used to determine the sodicity of a sample by comparing the amount of exchangeable Na to that of Ca and Mg concentrations. Table 3 provides the sodicity ranking and dispersion characteristics based on the ESP.

Table 3: Sodicity ranking and dispersion characteristics based on the ESP.

ESP	Sodicity	Dispersion
< 6	Non-Sodic	Not Dispersive
6 to 15	Slightly Sodic	Slightly Dispersive
15 to 30	Moderately Sodic	Moderately Dispersive
> 30	Highly Sodic	Highly Dispersive

(Northcote & Skene, 1972)

5.1.2 **Acid Forming Characteristic Evaluation**

A number of test procedures are used to assess the acid forming characteristics of mine waste materials. The most widely used assessment methods are the ABA and the NAG test. These methods are referred to as static procedures because they involve a single measurement in time.

Acid-Base Account

The ABA involves laboratory procedures that evaluate the balance between acid generation processes (oxidation of sulfide minerals) and acid neutralising processes (dissolution of alkaline carbonates, displacement of exchangeable bases, and weathering of silicates). The values arising from the ABA are referred to as the MPA and the ANC, respectively. The difference between the MPA and ANC value is referred to as the NAPP.

The MPA is calculated using the total S content of the sample. This calculation assumes that all of the S measured in the sample occurs as pyrite (FeS_2) and that the pyrite reacts under oxidising conditions to generate acid according to the following reaction:

$$FeS_2 + 15/4\ O_2 + 7/2\ H_2O \Rightarrow Fe(OH)^3 + 2\ H_2SO_4$$

According to this reaction, the MPA of a sample containing 1 %S as pyrite would be 30.6 kg H_2SO_4/t. Hence the MPA of a sample is calculated from the total S content using the following formula:

$$MPA\ (kg\ H_2SO_4/t) = (Total\ \%S) \times 30.6$$

The use of the total S assay to estimate the MPA is a conservative approach because some S may occur in forms other than pyrite. Sulfate-sulfur and native sulfur, for example, are non-acid generating S forms. Also, some S may occur as other metal sulfides (e.g. covellite, chalcocite, sphalerite, galena) that yield less acidity than pyrite when oxidised. The CRS analysis method is used to determine the sulfide-S content and this information is used to assess the proportion of the total S within a sample that occurs as reactive sulfide.

The acid formed from pyrite oxidation will to some extent react with acid neutralising minerals contained within the sample. This inherent acid neutralisation is quantified in terms of the ANC and is determined using the Modified Sobek method. This method involves the addition of a known amount of standardised hydrochloric acid (HCl) to an accurately weighed sample, allowing the sample time to react (with heating), then back titrating the mixture with standardised sodium hydroxide (NaOH) to determine the amount of unreacted HCl. The amount of acid consumed by reaction with the sample is then calculated giving the ANC expressed in the units of kg H_2SO_4/t.

Determination of the ANC using the Modified Sobek method (Sobek *et al*., 1978) provides an indication of the total neutralisation capacity of a material. However, in some materials not all mineral phases will be readily available to neutralise sulfide generated acidity. For these material types ABCC can be used to determine the amount of ANC that is available to neutralise any sulfide generated acidity under more natural weathering conditions. The ABCCs are obtained by slow titration of a sample with acid while continuously monitoring pH and plotting the amount of acid added against pH. The plot provides an indication of the portion of ANC within a sample that is readily available for acid neutralisation.

The NAPP is a theoretical calculation commonly used to indicate if a material has the potential to produce acid. It represents the balance between the MPA and its ANC. The NAPP is also expressed in units of kg H_2SO_4/t and is calculated as follows:

$$\text{NAPP} = \text{MPA} - \text{ANC}$$

If the MPA is less than the ANC then the NAPP is negative, which indicates that the sample may have sufficient ANC to prevent acid generation. Conversely, if the MPA exceeds the ANC then the NAPP is positive, which indicates that the material may be acid generating.

The ANC/MPA ratio is used as a means of assessing the risk of acid generation from mine waste materials. A positive NAPP is equivalent to an ANC/MPA ratio less than 1, and a negative NAPP is equivalent to an ANC/MPA ratio greater than 1. Generally, an ANC/MPA ratio of 3 or more signifies that there is a high probability that the material is not acid generating.

Figure 4 is an ABA plot which is commonly used to provide a graphical representation of the distribution of S and ANC in a sample set. This figure shows a plotted line where the NAPP = 0 (i.e. ANC = MPA or ANC/MPA=1). Samples that plot to the lower-right of this line have a positive NAPP and samples that plot to the upper-left of it have a negative NAPP. Figure 4 also shows the plotted lines corresponding to ANC/MPA ratios of 2 and 3.

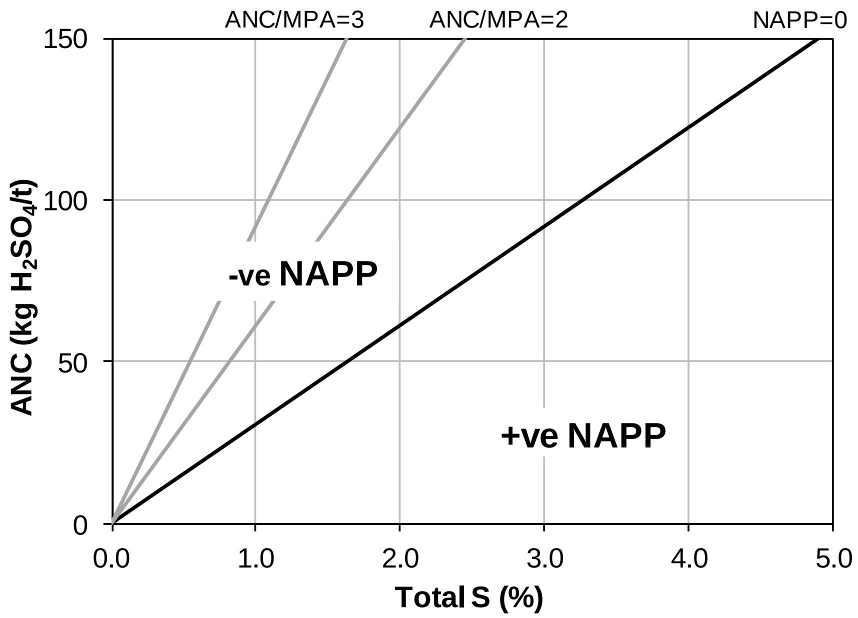

Figure 4: Typical acid-base account plot.

Net Acid Generation Test

The single addition NAG test is used in association with the NAPP to classify the acid generating potential of a sample. The standard (single addition) NAG test involves reaction of a sample with hydrogen peroxide to oxidise any sulfide minerals contained within a sample. During the NAG test, acid generation and neutralisation reactions occur simultaneously and the end result represents a direct measurement of the net amount of acid generated by the oxidised sample. The pH of the NAG solution on completion of the oxidation reaction is referred to as the NAGpH. A NAGpH < 4.5 indicates that acid conditions remain after all acid generating and acid neutralising reactions have taken place and a NAGpH > 4.5 indicates that any generated acidity has been neutralised. An indication of the capacity of the sample to generate acid is provided by titrating the NAG solution to the pH end-points of 4.5 and 7.0. This value is commonly referred to as the NAG capacity and is expressed in the same units as the NAPP (i.e. kg H_2SO_4/t). The titration value at pH 4.5 includes the acidity produced due to free acid (i.e. H_2SO_4) as well as soluble iron and aluminium. The titration value at pH 7 also includes metallic ions that precipitate as hydroxides.

In samples containing carbonaceous material, organic acids may be generated during the NAG reaction, leading to anomalously low NAGpH values and high NAG capacities. The NAG_{ext} test is used to overcome this effect, where any organic acids present are fully decomposed by boiling the NAG solution, thus ensuring that the recorded NAGpH and NAG capacity values are due to the sulfide oxidation reaction only. Although the NAGpH from the NAG_{ext} test can be used to confirm if a sample is PAF, due to the loss of free acid during the extended boiling procedure, a NAGpH $\geq$ 4.5 does not necessarily confirm that a sample is NAF. To address this, the NAG capacity is calculated from the assays of the anions and cations released to the NAG_{ext} solution, where a calculated NAG capacity of $\leq$ 0 kg H_2SO_4/t indicates that the sample is NAF, and a calculated NAG capacity of > 0 kg H_2SO_4/t indicates that the sample is PAF.

5.1.3 **Multi-Element Analysis**

Multi-element scans are carried out on the solid samples to identify any elements that are present at concentrations that may be of environmental concern with respect to water quality, revegetation and public health. The assay results from the solid samples are compared to the average crustal abundance for each element to provide a measure of the extent of element enrichment. The extent of enrichment is reported as the Geochemical Abundance Index. However, identified element enrichment does not necessarily mean that an element will be a concern for water quality, revegetation or public health and this technique is used to identify any significant element enrichments that warrant further examination.

Multi-element scans also are performed on liquor samples to determine the chemical composition of the solution and identify any elemental concerns for water quality. Multi-element scans are performed on water extracts, typically extracted from a 1 part sample to 2 parts deionised water suspension, in order to identify any elements that are likely to be readily soluble under the existing pH conditions. These analyses are designed to identify any elements that may be a concern for water quality and warrant further investigation.

5.2 Geochemical Classification

The acid forming potential of a sample is classified on the basis of the ABA and NAG test results into one of the following categories:

- Barren.
- NAF.
- PAF.
- PAF/LC.
- Acid Consuming (AC).
- Uncertain (UC).

Barren
A sample classified as barren essentially has no acid generating capacity and no acid buffering capacity. This category is most likely to apply to highly weathered materials. In essence, it represents an 'inert' material with respect to acid generation. The criteria used to classify a sample as barren may vary between sites, but it generally applies to materials with a total sulfur content ≤ 0.1 %S and an ANC ≤ 10 kg H_2SO_4/t.

Non-Acid Forming
A sample classified as NAF may or may not have a significant sulfur content, but the availability of the ANC within the sample is adequate to neutralise all of the acid that could theoretically be produced by the contained sulfide minerals. As such, material classified as NAF is considered unlikely to be a source of acidic drainage. A sample is usually defined as NAF when it has a negative NAPP and a final NAGpH ≥ 4.5.

Potentially Acid Forming
A sample classified as PAF always has a significant sulfur content, the acid generating potential of which exceeds the inherent ANC of the material. This means there is a high risk that such a material, even if pH circum-neutral when freshly mined or processed, could oxidise and generate acidic drainage if exposed to atmospheric conditions. A sample is classified as PAF if it has a positive NAPP and a final NAGpH < 4.5. Typically, if a PAF sample has a NAPP ≤ 5 kg H_2SO_4/t it is considered to only have a low capacity to generate acid and is classified as PAF/LC.

Acid Consuming
A sample is classified as AC if it has the same characteristics as NAF material, but has sufficient ANC to result in a NAPP of ≤ -100 kg H_2SO_4/t.

Uncertain
An uncertain classification is used when there is an apparent conflict between the NAPP and NAG results (i.e. when the NAPP is positive and NAGpH > 4.5, or when the NAPP is negative and NAGpH ≤ 4.5).

Figure 5 shows a typical geochemical classification plot for mine waste materials where the NAPP values are plotted against the NAGpH values. Samples that plot in the upper left quadrate, with negative NAPP values and NAGpH values > 4.5, are classified as NAF. Those that plot on the lower right quadrate, with positive NAPP values and NAGpH values ≤ 4.5, are classified as PAF. Those that plot in this quadrate with a NAPP ≤ 5 kg H_2SO_4/t are classified as PAF/LC. Samples that plot in the upper right or lower left quadrates of this plot are classified as UC due to a contradiction in the acid-base and NAG test results, and further testing is required to determine the geochemical classification of these material types.

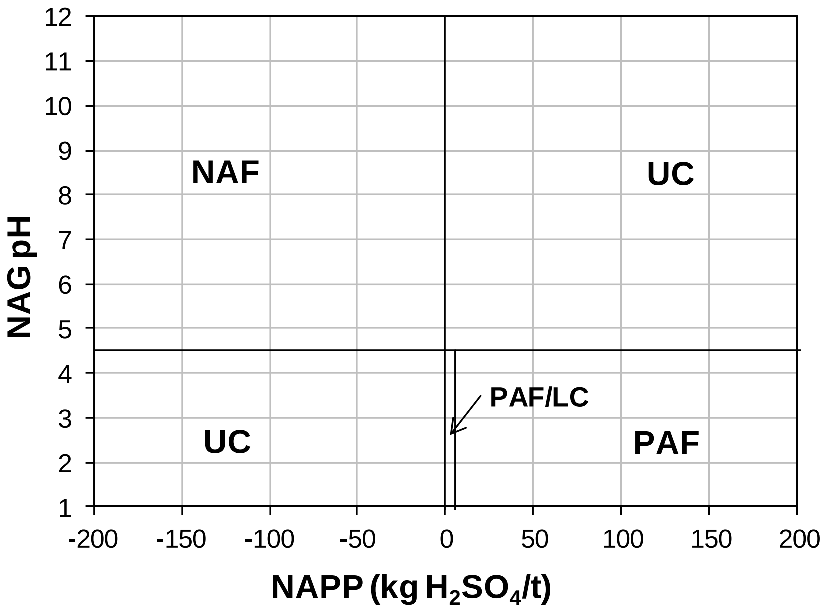

Figure 5: Typical geochemical classification plot.

5.3 Sample Selection and Preparation

The materials sampled for this assessment include the overburden and interburden, and the coal and coal rejects, from the proposed open cut extension area. The overburden and interburden samples were collected from selected drill-core by MCC personnel, under instruction from GEM, and the coal and coal reject samples were prepared by ALS Coal (Newcastle) from selected coal seam samples used for coal quality and washability testing, also under instruction from GEM. The sample details are provided in Attachment A and include the drill hole, depth interval, and material type (lithology and weathering) for the overburden and interburden samples (Table A-1), and the coal and coal reject composite and seam samples (Tables A-2 and A-3). The location of the drill holes used for sampling the overburden and interburden, and coal and coal reject assessment are provided in Attachment A (Figure A-1).

5.3.1 Overburden and Interburden Samples

A total of 134 overburden and interburden samples were collected from five drill holes distributed over the open cut extension area. This sampling program was designed to provide representative samples of the major overburden and interburden material types, based on weathering and lithology. In order to achieve this, continuous drill-core was collected from selected intervals comprising discrete lithology or mixed lithology, as logged. The number of samples collected to represent each material type was estimated from the relative proportion of the different material types that would be excavated as part of the Project. Table 4 provides a list of the different material types sampled for this assessment. The mixed lithology samples are grouped according to the dominant lithology present within each sample.

All of the drill-core samples collected were sent to ALS Geochemistry (Brisbane) for preparation prior to analysis. This involved crushing all of the sample to minus 10 millimetres, and a minimum 200 gram split was pulverised to minus 75 micrometres for analysis.

Table 4: Overburden and interburden samples prepared for the assessment.

Material Type	Sample Count
Weathered Material	**12**
Sandstone	**47**
Siltstone	**22**
Conglomerate	**31**
Shale	**7**
Coaly Shale	**2**
Carbonaceous Material	**7**
Claystone	**3**
Mudstone	**2**
Volcanics	**1**
Total	**134**

5.3.2 Coal and Coal Reject Samples

Selected coal seam samples prepared by ALS Coal (Newcastle) for coal quality and washability testing were utilised for this assessment. Composite samples representing the raw coal, washed coal and coal rejects from two drill holes (i.e. MAC3256C & MAC3259C) were prepared for this assessment, along with the coal reject from each individual target coal seam. Due to the relatively small seam thickness and the insufficient quantity of material available for sampling, the raw and washed coal composites, and coal rejects for the Templemore Seam were not included in the analytical program. All of the composite samples were produced using an equal volume of material. The coal reject material was prepared by combining all of the fractions >1.70 (sinks) from the flotation testing. Due to the small sample volumes, the individual samples were combined from a number of drill holes. Attachment A provides the composite sample detail (Table A-2) and coal reject seam detail (Table A-3), and Table 5 lists the samples produced for this assessment.

As listed on Table 5, a total of six composite samples, including two raw coal, two washed coal and two coal reject samples, and 26 individual coal reject samples, including two samples from each seam, were prepared for the analysis.

Table 5: Coal and coal reject samples prepared for this assessment.

Material Type	MAC3256C	MAC3259C
Raw Coal Composite	MC/RAW-1	MC/RAW-2
Clean Coal Composite	MC/CCC-1	MC/CCC-2
Coal Reject Composite	MC/REJ-1	MC/REJ-2
Coal Reject (Seam)	MC/HRN-1	MC/HRN-2
	MC/ONV-1	MC/ONV-2
	MC/TST-1	MC/TST-2
	MC/TNN-1	MC/TNN-2
	MC/BRY-1	MC/BRY-2
	MC/JER-1	MC/JER-2
	MC/MER-1	MC/MER-2
	MC/VEL-1	MC/VEL-2
	MC/NAG-1	MC/NAG-2
	MC/NTH-1	MC/NTH-2
	MC/TER-1	MC/TER-2
	MC/FLX-1	MC/FLX-2
	MC/TWA-1	MC/TWA-2

6.0 Overburden and Interburden Geochemistry

The geochemical test results for the overburden and interburden, including the $pH_{1:2}$ and $EC_{1:2}$, acid forming characteristics, sodicity assessment and element enrichment and solubility, are provided in Attachment B. A summary of the acid forming characteristics for the different overburden and interburden material types are provided in Table 6.

Table 6: Summary of the pH, EC, acid-base account and NAGpH test results for the different overburden and interburden material types.

Overburden Type		$pH_{1:2}$	$EC_{1:2}$ (dS/m)	Total S (%S)	MPA (kg H_2SO_4/t)	ANC	NAPP	ANC/ MPA	NAGpH
All Overburden	*Min*	4.6	0.115	0.01	0	1	-180	0.1	3.3
	Max	9.7	2.312	0.41	13	180	5	588.2	11.1
(134 samples)	*Aver*	8.4	0.404	0.04	1	31	-30	52.2	8.2
Weathered Material	*Min*	5.2	0.121	0.01	0	2	-27	0.9	5.8
	Max	8.5	2.005	0.23	7	27	1	78.4	8.1
(12 samples)	*Aver*	8.2	0.480	0.03	1	11	-10	26.8	7.2
Fresh Material	*Min*	4.6	0.115	0.01	0	1	-180	0.1	3.3
	Max	9.7	2.312	0.41	13	180	5	588.2	11.1
(122 samples)	*Aver*	8.4	0.397	0.04	1	33	-32	54.5	8.4
Sandstone	*Min*	6.9	0.144	0.01	0	7	-180	4.1	4.6
	Max	9.7	2.312	0.41	13	180	-6	588.2	11.1
(47 samples)	*Aver*	8.5	0.381	0.03	1	42	-41	83.4	8.6
Siltstone	*Min*	6.6	0.252	0.02	1	3	-29	2.1	6.6
	Max	9.2	1.168	0.14	4	30	-1	49.2	9.0
(22 samples)	*Aver*	7.8	0.385	0.04	1	17	-15	17.6	7.8
Conglomerate	*Min*	7.1	0.184	0.01	0	15	-156	17.8	7.8
	Max	9.2	0.575	0.06	2	157	-15	256.5	11.1
(31 samples)	*Aver*	8.5	0.338	0.02	1	39	-38	60.2	9.1
Shale	*Min*	6.3	0.225	0.02	1	5	-34	0.9	4.8
	Max	8.6	2.244	0.17	5	35	1	56.9	9.2
(7 samples)	*Aver*	7.8	0.644	0.05	2	14	-12	16.1	7.3
Coaly Shale	*Min*	4.6	0.337	0.09	3	1	-23	0.1	3.3
	Max	7.1	1.986	0.17	5	26	5	9.3	8.7
(2 samples)	*Aver*	5.9	1.162	0.13	4	13	-9	4.7	6.0
Carbonaceous Material	*Min*	7.0	0.115	0.03	1	4	-122	3.0	5.6
	Max	9.2	0.392	0.12	4	124	-2	81.0	10.5
(7 samples)	*Aver*	8.5	0.255	0.06	2	31	-29	23.3	7.7
Claystone	*Min*	6.8	0.415	0.03	1	10	-15	4.5	7.3
	Max	8.4	1.450	0.07	2	16	-8	17.0	8.0
(3 samples)	*Aver*	8.3	0.769	0.05	2	13	-12	9.8	8.0
Mudstone	*Min*	7.9	0.238	0.01	0	16	-19	26.1	7.8
	Max	8.3	0.241	0.02	1	19	-15	63.4	8.0
(2 samples)	*Aver*	8.1	0.240	0.02	0	18	-17	44.8	7.9
Volcanics *(1 Sample)*		8.6	0.135	0.01	0	24	-24	79.1	8.9

NOTE: Average values for $pH_{1:2}$ and NAGpH are median values

6.1 pH, Salinity and Sodicity

The $pH_{1:2}$ and $EC_{1:2}$ results for the overburden and interburden samples from each drill hole are provided in Attachment B (Tables B-1 to B-5). The $pH_{1:2}$ values range from 4.6 to 9.7 with an alkaline median $pH_{1:2}$ of 8.4. Apart from a coaly shale sample with a $pH_{1:2}$ of 4.6 and a weathered mixed lithology sample with a $pH_{1:2}$ of 5.2, all samples have a $pH_{1:2}$ values > 6.0.

With $EC_{1:2}$ values ranging from 0.115 to 2.312 dS/m and an average value of 0.404 dS/m, the overburden and interburden materials typically have low salinity. The samples range from non-saline to moderately saline, however, the majority of the samples (i.e. 87%) are non-saline, 10% are slightly saline and only 3% are moderately saline. The slightly to moderately saline materials were not restricted to any particular material type through the tested strata.

Twenty-eight samples representing the range of overburden and interburden types present, were selected for exchangeable cation analysis and determination of the ESP in order to assess the sodicity risk presented by these materials. The results from these analyses are provided in Attachment B (Table B-6) and indicate that 50% of the selected samples were non-sodic, 25% were ranked slightly sodic and 25% ranked moderately sodic (including one highly sodic sample), with salinity rankings from non-saline to moderately saline. These results indicate no specific trends between the salinity and sodicity ranking according to the different lithological and weathering types.

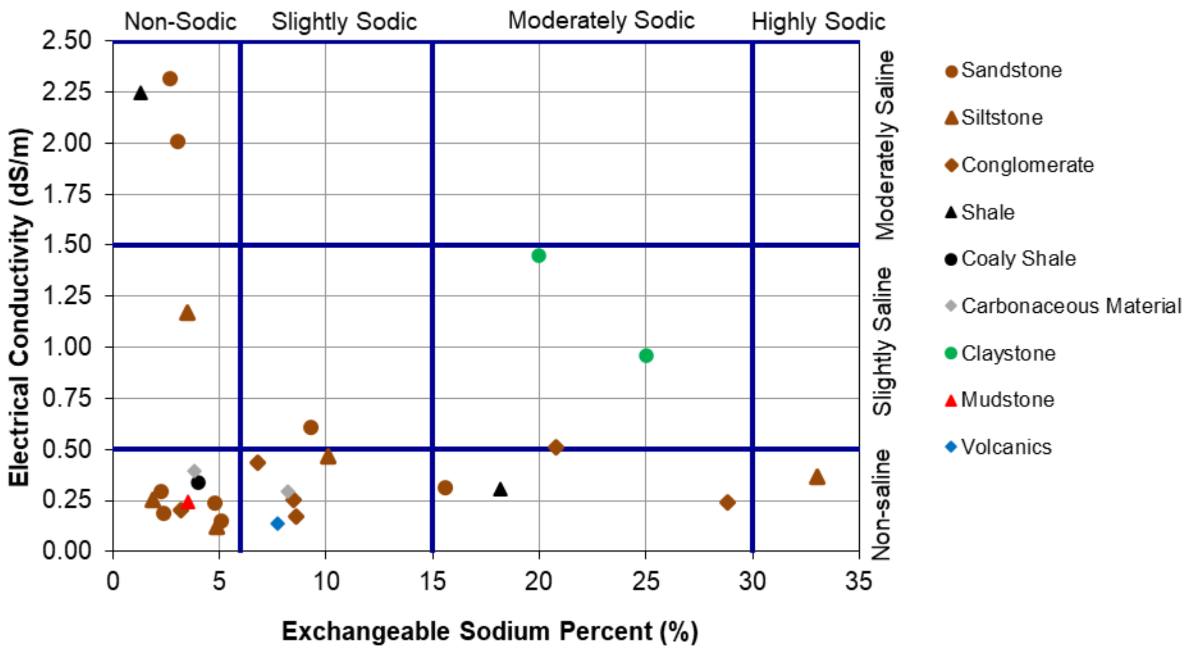

Figure 6: Sodicity ranking (ESP) compared to salinity ranking (EC) for the overburden and interburden material types.

6.2 Acid Forming Characteristics

The acid forming characteristic test results for the overburden and interburden from each drill hole are provided in Attachment B (Table B-1 to B-5) and are summarised in Table 6. The total S contents are typically low, ranging from < 0.01 to 0.41 %S with an average of 0.04 %S. The majority of the samples (95%) have a total S content ≤ 0.1 %S. Additional to this, when compared to the sulfide S content, 20% to 80% of the contained total S occurs as reactive sulfide.

The ANC of these samples is variable, ranging from 1 to 180 kg H_2SO_4/t. Seven of these samples (i.e. 5%), including sandstone, conglomerate and carbonaceous shales, have a high ANC > 100 kg H_2SO_4/t and these samples are classified AC. The calculated NAPP values range from +5 to -180 kg H_2SO_4/t. Three samples, including sandstone/siltstone (DH76/3), shale (DH100/3) and coaly shale (DH100/4), have a positive NAPP. However, when the NAPP is calculated using the sulfide S contents, a negative NAPP is reported for the sandstone/siltstone and shale and a zero NAPP is reported for the coaly shale sample. With a NAGpH of 6.7 and 6.8 for the sandstone/siltstone and shale, respectively, these samples are confirmed to be NAF. However, with a NAGpH 3.1 and an extended boil NAGpH (i.e. $NAGpH_{ext.}$) 3.3, the coaly shale sample is confirmed to be PAF.

These results indicate that all of the overburden and interburden from the open cut extension area are NAF or AC. However, one sample representing the coaly shale, and located at the base of the Herndale seam (refer to Figure 3), is classified PAF.

6.3 Metal Enrichment and Solubility

A total of 25 overburden and interburden samples, representing the range of weathering and lithology types present, were selected for multi-element analysis. The results from these analyses and the geochemical abundances indices are provided in Attachment B (Tables B-7 and B-8). These results indicate that As, Sb and Se are typically slightly enriched (i.e. GAI 1 to 2) in the majority of the samples. Previous geochemistry assessments in the region indicate that the enrichment of As, Sb and Se is a relatively common characteristic of the coal deposits of this region (GEM, 2011 & GEM, 2012).

Multi-element scans were also performed on the water extracts from these samples in order to provide an indication of relative element solubility under the prevailing pH conditions of these materials and the results are presented in Attachment B (Table B-9). Although the pH values range from 4.6 to 9.2, with a median pH of 8.2, these samples typically have a neutral to alkaline pH. However, one sample, representing the coaly shale with a PAF classification (DH100/4), has a pH 4.6. These results indicate that under the typical neutral to alkaline pH conditions most of the contained metals are relatively insoluble. However, as characterised by the overburden materials from throughout the mining region, As, Mo and Se are found to be readily soluble in these materials. Table 7 compares the concentration of these metals in the weathered and fresh materials to the concentrations described in the draft *Livestock Drinking Water Guidelines* (Australian and New Zealand Guidelines for Fresh and Marine Water Quality [ANZG], 2023). These results indicate that As, Mo and Se are readily soluble and exceed the ANZG criteria in the majority of the fresh materials and less so for the weathered materials.

Table 7: Dissolved As, Mo and Se concentration ranges in the weathered and fresh overburden and interburden samples compared to the ANZG livestock drinking water guideline values (ANZG, 2023).

Element	Concentration Range (µg/L)		ANZG Livestock Drinking Water Guideline
	Weathered Material	Fresh Material	
As	0.9 to 14.6	0.6 to 320.9	25 (µg/L)
Mo	4.48 to 51.82	0.19 to 123.83	10 (µg/L)
Se	0.6 to 216.7	1.9 to 182.6	20 (µg/L)

NOTE: µg/L = micrograms per litre

7.0 Coal and Coal Reject Geochemistry

The geochemical test results for the coal (raw coal and washed coal) and coal reject composite samples, and the coal reject seam samples, including the $pH_{1:2}$ and $EC_{1:2}$, acid forming characteristics, and element enrichment and solubility, are provided in Attachment C (Tables C-1 to C-4). A summary of the $pH_{1:2}$ and $EC_{1:2}$, and acid forming characteristics of the coal and coal reject composites (i.e. an equal volume blend of all coal seams) and of the individual seam coal rejects is provided on Table 8.

Table 8: Summary of the pH, EC, acid-base account and NAGpH test results for the coal and coal reject composite and individual seam coal reject samples.

Overburden Type		$pH_{1:2}$	$EC_{1:2}$ (dS/m)	Total S (%S)	Sulfide S (%S)	MPA	ANC	NAPP	$NAGpH_{ext}$	Acidity (kgH_2SO_4/t)
						(kg H_2SO_4/t)				
Raw Coal Composite	*Aver*	6.6	0.714	0.56	0.18	17	23	-6	6.8	2
Clean Coal Composite	*Aver*	7.1	0.254	0.39	0.04	12	7	5	3.0	6
Coal Reject Composite	*Aver*	5.8	2.385	2.62	1.04	80	173	-93	9.1	0
Coal Reject (Seam)	*Min*	4.4	0.188	0.12	0.03	4	0	-606	1.7	1
	Max	10.1	2.372	23.20	13.40	710	613	710	3.0	229
(26 samples)	*Aver*	7.5	0.753	2.66	1.86	81	172	-91	2.0	84

NOTE: Average values for $pH_{1:2}$ and NAGpH are median values

7.1 pH and Salinity

The $pH_{1:2}$ and $EC_{1:2}$ results for the raw coal, washed coal and coal reject composite samples are provided in Attachment C (Table C-1) and for the individual seam coal reject samples are provided in Attachment C (Table C-2). The raw coal and washed coal composites samples are relatively pH neutral ($pH_{1:2}$ 6.4 to 7.1) with low salinity ($EC_{1:2}$ 0.222 to 1.035 dS/m), and differing from these characteristics, the coal reject composites have a lower pH ($pH_{1:2}$ 5.7 to 5.8) and moderate to high salinity ($EC_{1:2}$ 1.460 to 3.310 dS/m).

The $pH_{1:2}$ and $EC_{1:2}$ results for the individual seam coal reject samples are highly variable with the pH ranging from acid to alkaline ($pH_{1:2}$ 4.4 to 10.1) and the EC ranging from non- to moderately saline ($EC_{1:2}$ 0.188 to 2.372 dS/m). The two samples representing the Onavale Seam (MC/ONV-1 & MC/ONV-2) have a significantly higher pH ($pH_{1:2}$ 10.1 & 9.9) in comparison to all other coal reject seam samples and a significantly higher EC ($EC_{1:2}$ 2.255 & 2.372 dS/m) in comparison to all other samples). Additional to this, one of the Teston Seam coal reject samples (MC/TST-2) and one of the Merriown Seam coal reject samples (MC/MER-2) have acid $pH_{1:2}$ values of 4.5 and 4.4, respectively.

7.2 Acid Forming Characteristics

The acid forming characteristics of the raw coal, washed coal and coal reject composite samples are provided in Attachment C (Table C-1) and of the coal reject samples from each target seam, in Attachment C (Table C-2).

The total S content of the raw and washed coal composite samples is moderate, ranging from 0.37 to 0.74 %S and 0.32 to 0.45 %S, respectively. Differing from this, the coal reject composites have a relatively high total S content, ranging from 1.56 to 3.68 %S. A relatively small proportion of the total S content in the raw coal and washed coal composite samples occurred as sulfide S, whereas a significantly higher proportion of sulfide S occurred in the coal reject. Based on these test results, it is expected that only 10 to 30% of the total S is expected to occur as reactive sulfide in the raw coal and washed coal, and up to 80% of the total S is expected to occur as reactive sulfide in the coal reject.

The raw coal composites have a moderate ANC, ranging from 22 to 24 kg H_2SO_4/t and the washed coal composites have a low ANC ranging from 5 to 8 kg H_2SO_4/t, whereas the coal reject composites have a high ANC ranging from 147 to 199 kg H_2SO_4/t. The ABCCs for the raw coal and coal reject composites are provided in Attachment D (Figures D-1 to D-4). These results indicate that all of the total ANC is expected to be readily available to neutralise any sulfide generated acidity in the raw coal, and the >90% of the total ANC is expected to be readily available in the coal reject.

Figure 7 is the ABA plot for the raw coal, washed coal and coal reject composite samples and for this plot, the sulfide S content is plotted against the ANC. Although the washed coal composites are NAPP positive when the total S is used to calculate the NAPP, when the sulfide S is used, all of the composite samples are NAPP negative.

Figure 8 is the geochemical classification plot for the composite samples using the extended boil NAGpH ($NAGpH_{ext}$) for the raw coal and washed coal samples. These results show that the coal reject composites are NAF and due to the high available ANC, these materials are classified as AC. The raw coal composites are confirmed to be NAF and due to the negative NAPP, the washed coal composites have a UC classification. From the extended boil NAG tests, the washed coal composites have calculated acidities of 4 and 8 kg H_2SO_4/t, and these samples are classified as PAF with a low capacity to generate acid (i.e. PAF/LC).

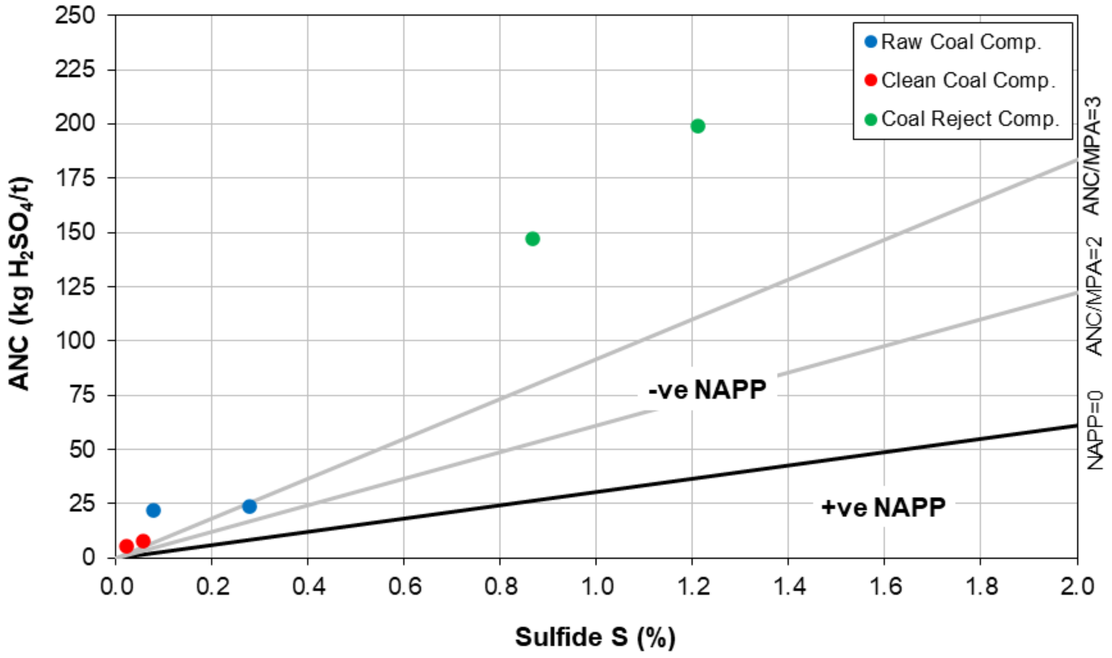

Figure 7: Acid-base account plot for the raw coal, washed coal and coal reject composite samples.

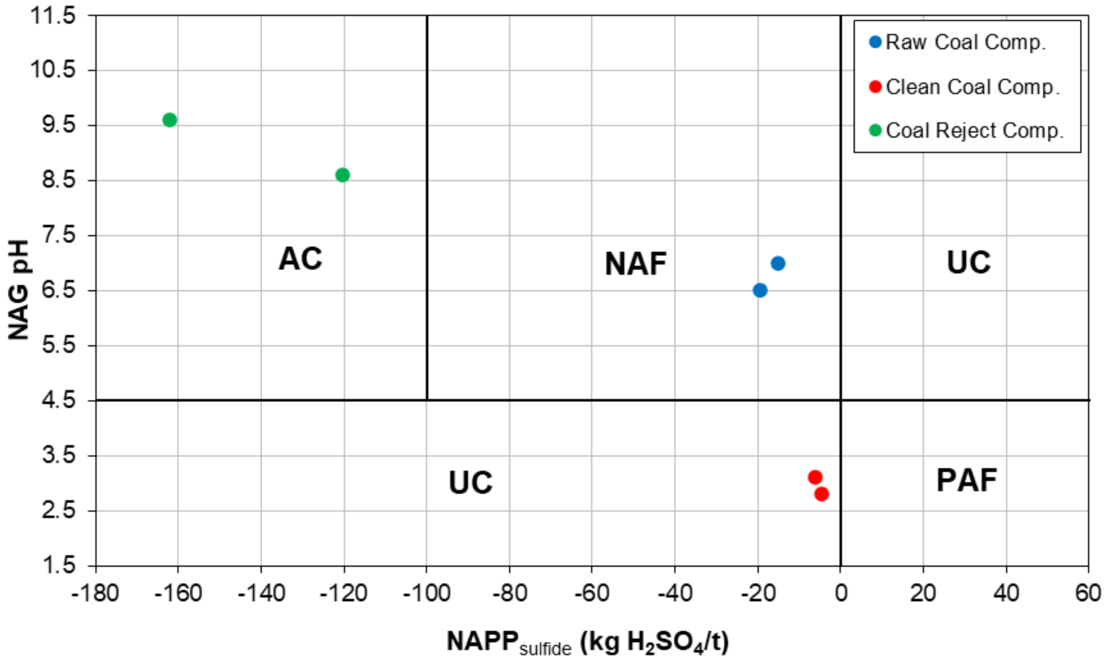

Figure 8: Geochemical classification plot for the raw coal, washed coal and coal reject composite samples.

Figure 9 is the ABA plot for the coal reject seam samples where the sulfide S content is plotted against the ANC. Due to the range in ANC values, these samples are divided into three groups based on ANC, including:

Low ANC	<5 kg H_2SO_4/t
Mod. ANC	5 to 100 kg H_2SO_4/t
High ANC	>100 kg H_2SO_4/t

The samples from the high and moderate ANC groupings are all NAPP negative and those from the low ANC grouping are all NAPP positive.

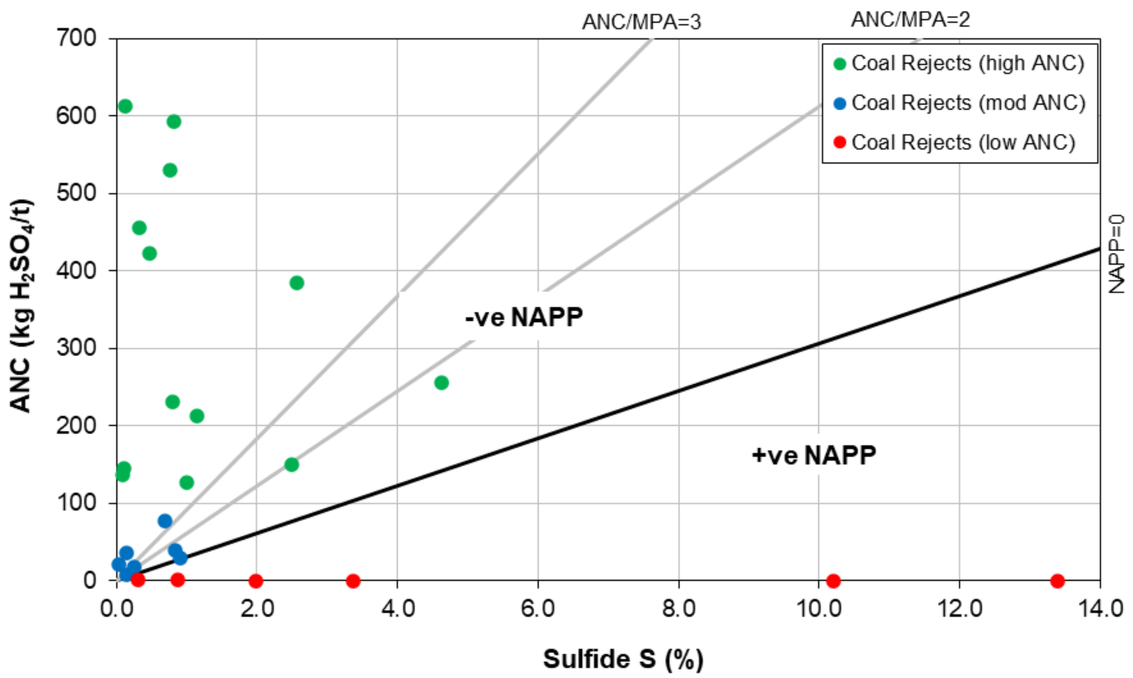

Figure 9: Acid-base account plot for the low ANC (<5 kg H_2SO_4/t), moderate ANC (5 to 100 kg H_2SO_4/t) and high ANC (>100 kg H_2SO_4/t) coal reject seam samples.

Figure 10 is the geochemical classification plot for the coal reject seam samples using the extended boil NAGpH ($NAGpH_{ext}$) for the PAF samples. This plot shows that all of the low ANC samples are classified as PAF and of these, one sample from the Braymont Seam (MC/BRY-1), with a NAG_{calc} of 5 kg H_2SO_4/t, is classified as PAF/LC. All of the samples with a moderate ANC are classified as NAF. Although one of these samples has a $NAGpH_{ext}$ of 3.0 (MC/TER-2), due to the NAG_{calc} of zero, this sample is classified as NAF. All of the high ANC samples are NAF and classified as AC.

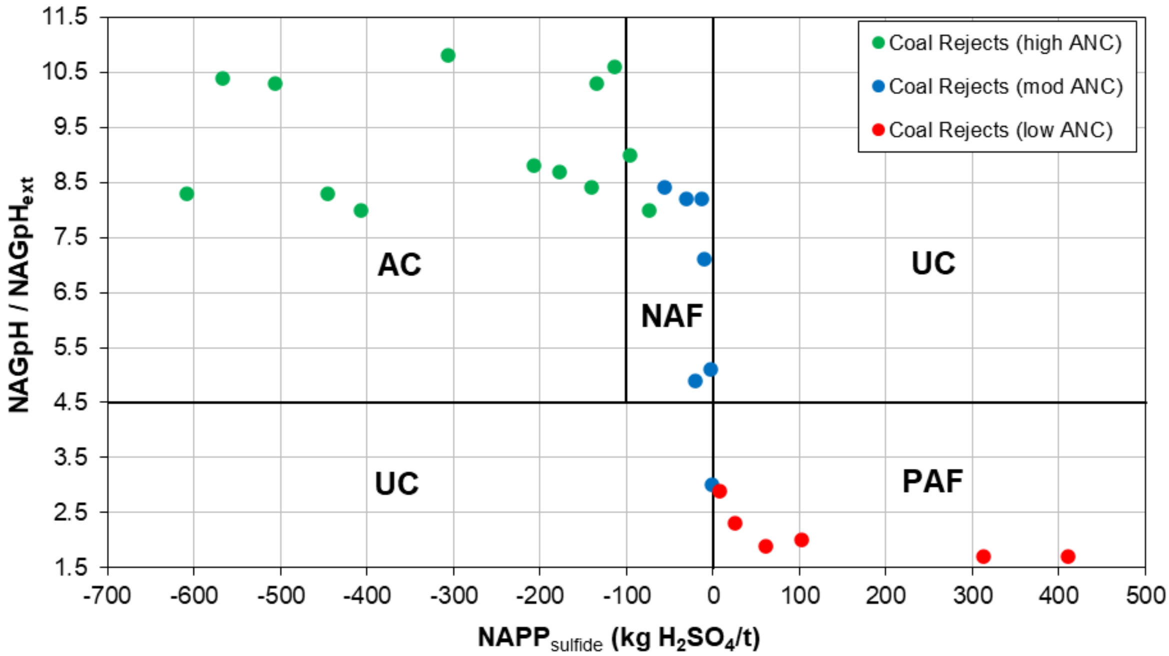

Figure 10: Geochemical classification plot for the low ANC (<5 kg H_2SO_4/t), moderate ANC (5 to 100 kg H_2SO_4/t) and high ANC (>100 kg H_2SO_4/t) coal reject seam samples.

The kinetic NAG test profiles for selected samples are provided in Attachment E. The temperature and pH profiles indicate that the PAF coal reject seam samples (MC/ONV-1, MC/TST-2, MC/BRY-1, MC/MER-2 & MC/TER-2) are relatively reactive and likely to develop acid conditions within one to four months following exposure to atmospheric oxidation.

Table 9 provides the geochemical classification of the coal rejects from the different target seams. The Onavale Seam has significantly higher risk and capacity for acid generation in the coal reject compared to the other seams. These results also indicate that the seams from Velyama and below are likely to only NAF or AC coal rejects.

Table 9: Predicted geochemical classification of the coal rejects from each of the target seams.

Maules Creek Formation Target Seams	Coal Reject Geochemical Classification	
Herndale (HRN) seam	AC	NAF
Onavale (ONV) seam	PAF	
Teston (TST) seam	AC	PAF
Thornfield (TNN) seam	AC	
Braymont (BRY) seam	PAF/LC	PAF
Jeralong (JER) seam	AC	NAF
Merriown (MER) seam	AC	PAF
Velyama (VEL) seam	NAF	
Nagero (NAG) seam	NAF	AC
Northam (NTH) seam	AC	
Therribri (TER) seam	AC	NAF
Flixton (FLX) seam	AC	
Tarrawonga (TWA) seam	NAF	AC

7.3 Metal Enrichment and Solubility

The six composite samples, including two raw coal, two washed coal and two coal reject samples were submitted for multi-element analysis and the results from these analyses, and the geochemical abundance indices are provided in Attachment C (Table C-3). These results indicate that As, Hg and Se were significantly enriched in one or both of the coal reject composites, and that Se was enriched in both of the raw coal composites. No metals were found to be significantly enriched in the washed coal composites. Previous geochemistry assessments in the region indicate that the enrichment of As, Sb and Se is a relatively common characteristic of the coal deposits of this region (GEM, 2011 & GEM, 2012).

The results of multi-element scans performed on the water extracts from these samples are presented in Attachment C (Table C-4). Typical of coal deposits in the region, Mo and Se are found to be readily soluble in the coal and coal reject samples. The dissolved Mo and Se concentrations are compared to the draft *Livestock Drinking Water Guidelines* (ANZG, 2023) in Table 10 in order to provide an indication of the relative solubility of these elements. These results indicate that the dissolved Mo concentrations exceed the ANZG livestock drinking water quality guideline values for the washed coal, and dissolved Se concentrations exceed the guideline values for coal reject.

Table 10: Dissolved Mo and Se concentration ranges in the raw coal, washed coal and coal reject composites compared to the ANZG livestock drinking water guideline values.

Element	Concentration Range (µg/L)			ANZG Livestock Drinking Water Guideline
	Raw Coal	Clean Coal	Coal Reject	
Mo	4.30 to 5.99	12.38 to 26.38	< 0.05	10 (µg/L)
Se	14.4 to 22.2	9.9 to 10.1	22.5 to 41.0	20 (µg/L)

8.0 Conclusions and Recommendations

This assessment includes the geochemical characteristics of the overburden and interburden, the coal (raw and washed coal) and the coal rejects from the Project. A total of 134 overburden and interburden samples were collected from 5 drill holes, from drill-core stored on-site. Two composite samples each of the raw coal, washed coal and coal reject, and 26 coal reject samples from each seam, were prepared by ALS Coal (Newcastle) from the coal quality and washability testing program.

8.1 Overburden and Interburden

Consistent with the findings from the previous investigations for the MCCM and the surrounding mines, the overburden and interburden is typically expected to be non-saline and to be NAF. Although the bulk of this material is expected to be relatively barren in terms of acid generation and neutralisation, due to a relatively high ANC, some of these materials are expected to be AC.

As reported for the previous geochemical investigations, the overburden and interburden is expected to contain some sodic materials. For this assessment it is expected that the majority of the material would be non-sodic, but that a proportion of slightly and moderately sodic material would be present (refer to Section 6.1). If the sodic materials are left exposed on the surface of any emplacements or engineered structures, they may become dispersive potentially resulting in increased erosion and instability, and potentially impacting water quality due to increased total suspended solids (TSS).

Recommendations
Based on these findings the following recommendations are provided for the overburden and interburden:

- No selective handling would be required for placement of the overburden and interburden material, which is expected to be either NAF or AC. The bulk of NAF material is expected to be relatively inert in terms of acid generation and neutralisation (i.e. barren).
- In order to reduce the risk of increased instability and erosion potential for any emplacements and any engineered structures, the identified potentially sodic material should be excluded from the surface of any engineered structures (i.e. covered with at least 0.2 m of non-sodic material as part of the overburden emplacement and/or rehabilitation activities), where practicable. If sodic materials are unable to be excluded from the surface, they should be treated with materials containing soluble calcium such as gypsum, calcium chloride or limestone, prior to rehabilitation.
- All overburden and interburden should continue to be managed within the site water management system in accordance with the existing *Maules Creek Coal Mine Water Management Plan* (MCC, 2023) (refer to Section 4.3).

8.2 Coal and Coal Rejects

All of the target coal seams were composited and representative samples of raw coal, washed coal and coal rejects were prepared for this assessment. The test results indicate that the raw coal is expected to be non-saline and NAF and the washed coal is expected to be non-saline and PAF/LC. Differing from the coal materials, the rejects are expected to be moderately to highly saline, and due to the high ANC, this material is classified as AC.

The geochemical characteristics of the coal rejects derived from the target coal seams are expected to range from AC, with high ANC values up to 500 kg H_2SO_4/t, to PAF, with high acid capacities up to 200 kg H_2SO_4/t. Although the coal rejects are expected to have a large range in geochemical material types, due to the presence of significant AC material, blending of the rejects during ROM transport and disposal is expected to maintain an overall NAF rejects material. However, if prolonged periods processing seams with no AC material are encountered, there is a risk of producing PAF or PAF/LC rejects. The seams that have an identified risk of producing PAF or PAF/LC rejects include:

- Onavale Seam.
- Teston Seam.
- Braymont Seam.
- Merriown Seam.

All of the seams from the Velyama Seam and below are expected to produce NAF or AC coal rejects. It is noted that one sample representing the coaly shale located at the base of the Herndale seam is classified PAF, however, two coal reject samples from this seam were analysed and classified as AC or NAF.

Recommendations

Based on these findings the following recommendations are made for the raw coal, washed coal and coal reject:

- Stockpiling the ROM coal would not require any specific management for geochemical security.
- Due to the risk of the washed coal being PAF/LC, the product coal stockpile should be replenished within the geochemical lag period of the stockpiled material (i.e. the exposure time when acid conditions are expected to develop) to minimise the potential for low pH or acid conditions developing within the surface of the product coal stockpile.
- Management of suspected PAF coal rejects should be undertaken in accordance with existing procedures in place at the MCCM, which includes:
  - Placement of PAF coal reject materials with at least 15 m final coverage of inert waste rock material.
  - Placement of PAF (roof and floor) materials that do not report as dilution to the CHPP in at least 15 m of inert waste rock material.

- All coal and coal rejects should continue to be managed within the site water management system in accordance the existing *Maules Creek Coal Mine Water Management Plan* (MCC, 2023) (refer to Section 4.3).

8.3 Water Quality Monitoring Program

Consistent with the coal mines of this region, the overburden and interburden are expected to be slightly enriched with As, Sb and Se, the coal reject is enriched with As and Se, and the raw coal is enriched with Se. Under the prevailing pH conditions, As, Mo and Se are readily soluble in the overburden and interburden material, Mo is readily soluble in the washed coal and Se is readily soluble in the coal reject.

Recommendations

Due to these identified element enrichments and solubilities in the overburden and interburden, and the coal and coal rejects, and due to the potential presence of PAF, PAF/LC and/or sodic materials, it is recommended that the site surface water quality monitoring program includes analysis of the following:

- pH;
- EC;
- TSS; and
- target analytes, including SO_4, As, Mo and Se.

All the above parameters are monitored at the MCCM in accordance with the *Maules Creek Coal Mine Water Management Plan* (MCC, 2023), with the exception of Mo. The *Maules Creek Coal Mine Water Management Plan* should be revised to allow for monitoring of Mo.

9.0 References

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Attachment A

Geochemical Sample Details

Table A-1: Overburden and interburden drill hole sample details.

Table A-2: Raw coal, washed coal and coal rejects samples produced from drill holes MAC3256C and MAC 3259C.

Table A-3: Drill hole samples used to produce the coal reject samples from each target coal seam.

Figure A-1: Geochemical Drill Hole Locations.

Table A-1: Overburden and interburden drill hole sample details.

Drill-Hole	Sample ID	Lithology	Weathering	Depth (m)		
				from	to	interval
M00042	DH42/1	Sandstone (EW)	Extremely Weathered	19.22	22.06	2.84
M00042	DH42/2	Conglomerate (DW)	Distinctly Weathered	22.06	26.38	4.32
M00042	DH42/3	Siltstone	Fresh	28.95	33.60	4.65
M00042	DH42/4	Sandstone	Fresh	36.05	37.68	1.63
M00042	DH42/5	Siltstone	Fresh	39.35	40.34	0.99
M00042	DH42/6	Conglomerate	Fresh	46.77	56.77	10.00
M00042	DH42/7	Conglomerate	Fresh	56.77	67.72	10.95
M00042	DH42/8	Sandstone,Siltstone	Fresh	71.68	74.36	2.68
M00042	DH42/12	Sandstone	Fresh	102.08	102.83	0.75
M00042	DH42/13	Sandstone	Fresh	116.28	119.00	2.72
M00042	DH42/14	Sandstone,Siltstone	Fresh	122.09	123.96	1.87
M00042	DH42/15	Carbonaceous Siltstone	Fresh	128.26	129.27	1.01
M00042	DH42/16	Conglomerate	Fresh	138.55	141.43	2.88
M00042	DH42/17	Shale	Fresh	142.24	142.50	0.26
M00042	DH42/18	Conglomerate	Fresh	145.02	155.02	10.00
M00042	DH42/19	Conglomerate	Fresh	155.02	165.87	10.85
M00042	DH42/20	Sandstone,Siltstone	Fresh	167.53	174.49	6.96
M00042	DH42/21	Sandstone	Fresh	179.96	180.38	0.42
M00042	DH42/22	Conglomerate	Fresh	187.40	188.79	1.39
M00042	DH42/23	Siltstone	Fresh	191.03	191.90	0.87
M00042	DH42/24	Sandstone,Siltstone	Fresh	192.73	193.58	0.85
M00042	DH42/25	Conglomerate	Fresh	201.74	208.13	6.39
M00042	DH42/26	Carbonaceous Siltstone	Fresh	224.01	225.25	1.24
M00042	DH42/27	Sandstone	Fresh	225.78	227.57	1.79
M00042	DH42/28	Sandstone,Conglomerate	Fresh	227.57	231.29	3.72
M00042	DH42/29	Shale	Fresh	239.39	239.60	0.21
M00042	DH42/30	Claystone	Fresh	242.26	243.51	1.25
M00076	DH76/1	Conglomerate (DW)	Distinctly Weathered	9.04	10.39	1.35
M00076	DH76/2	Sandstone (DW)	Distinctly Weathered	18.12	18.59	0.47
M00076	DH76/3	Sandstone,Siltstone (SW)	Slightly Weathered	33.37	35.94	2.57
M00076	DH76/4	Conglomerate	Fresh	44.45	56.29	11.84
M00076	DH76/5	Siltstone	Fresh	66.99	67.77	0.78
M00076	DH76/6	Shale	Fresh	71.93	72.96	1.03
M00076	DH76/7	Sandstone,Siltstone	Fresh	75.26	76.35	1.09
M00076	DH76/8	Mudstone	Fresh	82.81	83.40	0.59
M00076	DH76/9	Sandstone	Fresh	84.20	86.68	2.48
M00076	DH76/10	Sandstone,Siltstone	Fresh	90.59	94.03	3.44
M00076	DH76/11	Conglomerate	Fresh	97.10	107.89	10.79
M00076	DH76/12	Sandstone,Siltstone	Fresh	108.06	109.54	1.48
M00076	DH76/13	Coaly Shale	Fresh	110.41	110.95	0.54
M00076	DH76/14	Conglomerate	Fresh	114.67	117.64	2.97
M00076	DH76/15	Siltstone,Shale	Fresh	117.64	118.42	0.78
M00076	DH76/16	Siltstone	Fresh	120.59	121.17	0.58
M00076	DH76/17	Sandstone	Fresh	122.12	123.80	1.68
M00076	DH76/18	Conglomerate	Fresh	123.80	130.67	6.87
M00076	DH76/19	Siltstone,Shale	Fresh	132.66	146.02	13.36

Table A-1: Overburden and interburden drill hole sample details. CONTINUED

Drill-Hole	Sample ID	Lithology	Weathering	Depth (m)		
				from	to	interval
M00076	DH76/20	Carbonaceous Shale	Fresh	147.16	147.90	0.74
M00076	DH76/21	Shale	Fresh	156.14	157.14	1.00
M00076	DH76/22	Sandstone	Fresh	176.02	177.57	1.55
M00076	DH76/23	Conglomerate	Fresh	186.95	198.13	11.18
M00076	DH76/24	Sandstone,Siltstone	Fresh	198.35	199.12	0.77
M00076	DH76/25	Sandstone,Conglomerate	Fresh	203.14	205.11	1.97
M00076	DH76/26	Conglomerate	Fresh	216.28	221.59	5.31
M00076	DH76/27	Sandstone,Siltstone	Fresh	264.51	268.83	4.32
M00076	DH76/28	Sandstone,Conglomerate	Fresh	277.66	279.76	2.10
M00076	DH76/29	Sandstone	Fresh	286.17	289.71	3.54
M00076	DH76/30	Siltstone,Shale	Fresh	296.70	297.62	0.92
M00076	DH76/31	Sandstone	Fresh	316.70	321.68	4.98
M00076	DH76/33	Carbonaceous Shale	Fresh	331.39	331.64	0.25
M00076	DH76/34	Claystone	Fresh	331.77	334.70	2.93
M00100	DH100/1	Conglomerate (DW)	Distinctly Weathered	3.86	33.64	29.78
M00100	DH100/2	Sandstone	Fresh	37.52	39.46	1.94
M00100	DH100/3	Shale	Fresh	40.00	40.46	0.46
M00100	DH100/4	Coaly Shale	Fresh	53.65	53.90	0.25
M00100	DH100/5	Conglomerate	Fresh	54.57	65.72	11.15
M00100	DH100/7	Siltstone	Fresh	98.03	100.95	2.92
M00100	DH100/8	Siltstone,Shale	Fresh	101.31	103.52	2.21
M00100	DH100/10	Sandstone	Fresh	114.96	119.14	4.18
M00100	DH100/11	Conglomerate	Fresh	130.78	140.78	10.00
M00100	DH100/12	Conglomerate	Fresh	140.78	150.78	10.00
M00100	DH100/13	Conglomerate	Fresh	150.78	160.78	10.00
M00100	DH100/14	Conglomerate	Fresh	160.78	170.84	10.06
M00100	DH100/15	Sandstone	Fresh	182.10	183.21	1.11
M00100	DH100/16	Siltstone	Fresh	185.92	186.70	0.78
M00100	DH100/17	Sandstone,Siltstone	Fresh	188.70	193.83	5.13
M00100	DH100/18	Sandstone,Shale	Fresh	196.75	197.33	0.58
M00100	DH100/19	Shale	Fresh	198.07	199.18	1.11
M00100	DH100/20	Siltstone	Fresh	201.86	202.71	0.85
M00100	DH100/21	Conglomerate	Fresh	212.19	220.19	8.00
M00100	DH100/22	Conglomerate	Fresh	220.19	228.90	8.71
M00100	DH100/23	Sandstone,Siltstone	Fresh	230.93	234.49	3.56
M00100	DH100/24	Sandstone	Fresh	246.06	251.30	5.24
M00100	DH100/25	Conglomerate	Fresh	251.30	254.06	2.76
M00100	DH100/26	Siltstone	Fresh	255.88	256.47	0.59
M00100	DH100/27	Sandstone	Fresh	259.15	260.36	1.21
M00100	DH100/28	Sandstone	Fresh	263.58	266.16	2.58
M00100	DH100/29	Conglomerate	Fresh	272.11	276.84	4.73
M00100	DH100/30	Shale	Fresh	291.65	294.53	2.88
M00100	DH100/31	Siltstone	Fresh	300.41	301.54	1.13
M00138	DH138/2	Siltstone (SW)	Slightly Weathered	42.15	43.17	1.02
M00138	DH138/3	Sandstone	Fresh	44.47	45.37	0.90

Table A-1: Overburden and interburden drill hole sample details. CONTINUED

Drill-Hole	Sample ID	Lithology	Weathering	Depth (m)		
				from	to	interval
M00138	DH138/4	Siltstone	Fresh	45.75	47.29	1.54
M00138	DH138/5	Sandstone	Fresh	50.83	56.62	5.79
M00138	DH138/6	Sandstone,Siltstone	Fresh	62.52	65.98	3.46
M00138	DH138/7	Mudstone	Fresh	76.47	76.68	0.21
M00138	DH138/11	Conglomerate	Fresh	126.01	134.50	8.49
M00138	DH138/12	Conglomerate	Fresh	134.50	141.70	7.20
M00138	DH138/13	Siltstone,Shale	Fresh	143.82	146.54	2.72
M00138	DH138/14	Sandstone,Siltstone	Fresh	146.86	147.44	0.58
M00138	DH138/15	Siltstone	Fresh	152.69	153.38	0.69
M00138	DH138/16	Sandstone,Conglomerate	Fresh	156.60	159.15	2.55
M00138	DH138/17	Sandstone	Fresh	171.45	176.12	4.67
M00138	DH138/18	Carbonaceous Siltstone	Fresh	180.10	180.35	0.25
MAC3276C	DH3276/2	Conglomerate (EW)	Extremely Weathered	2.90	11.13	8.23
MAC3276C	DH3276/3	Claystone (DW)	Distinctly Weathered	12.10	14.47	2.37
MAC3276C	DH3276/4	Conglomerate (SW)	Slightly Weathered	18.17	19.38	1.21
MAC3276C	DH3276/5	Sandstone (SW)	Slightly Weathered	32.36	33.51	1.15
MAC3276C	DH3276/6	Siltstone (SW)	Slightly Weathered	34.27	34.74	0.47
MAC3276C	DH3276/7	Claystone	Fresh	36.36	36.80	0.44
MAC3276C	DH3276/8	Sandstone	Fresh	40.90	43.23	2.33
MAC3276C	DH3276/9	Siltstone	Fresh	59.57	60.59	1.02
MAC3276C	DH3276/10	Sandstone,Siltstone	Fresh	67.03	68.90	1.87
MAC3276C	DH3276/11	Conglomerate	Fresh	76.32	84.74	8.42
MAC3276C	DH3276/13	Sandstone,Siltstone	Fresh	102.30	104.94	2.64
MAC3276C	DH3276/14	Conglomerate	Fresh	115.47	123.35	7.88
MAC3276C	DH3276/15	Carbonaceous Siltstone	Fresh	131.12	133.37	2.25
MAC3276C	DH3276/16	Carbonaceous Siltstone	Fresh	139.90	140.22	0.32
MAC3276C	DH3276/17	Conglomerate	Fresh	143.99	151.47	7.48
MAC3276C	DH3276/18	Sandstone	Fresh	157.50	164.28	6.78
MAC3276C	DH3276/19	Siltstone	Fresh	167.06	169.08	2.02
MAC3276C	DH3276/20	Sandstone	Fresh	177.89	178.93	1.04
MAC3276C	DH3276/21	Sandstone	Fresh	199.51	203.15	3.64
MAC3276C	DH3276/22	Siltstone	Fresh	207.41	208.60	1.19
MAC3276C	DH3276/23	Conglomerate	Fresh	221.53	223.33	1.80
MAC3276C	DH3276/24	Conglomerate	Fresh	231.75	238.85	7.10
MAC3276C	DH3276/25	Sandstone	Fresh	249.55	252.67	3.12
MAC3276C	DH3276/26	Siltstone	Fresh	252.99	256.20	3.21
MAC3276C	DH3276/27	Sandstone	Fresh	260.69	261.61	0.92
MAC3276C	DH3276/28	Conglomerate	Fresh	267.12	272.00	4.88
MAC3276C	DH3276/29	Sandstone	Fresh	303.92	306.83	2.91
MAC3276C	DH3276/31	Conglomerate	Fresh	317.37	324.30	6.93
MAC3276C	DH3276/32	Siltstone	Fresh	330.80	343.88	13.08
MAC3276C	DH3276/33	Sandstone,Siltstone	Fresh	351.90	354.30	2.40
MAC3276C	DH3276/34	Volcanics	Fresh	365.44	372.63	7.19

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Table A-2: Raw coal, washed coal and coal rejects samples produced from drill holes MAC3256C and MAC 3259C.

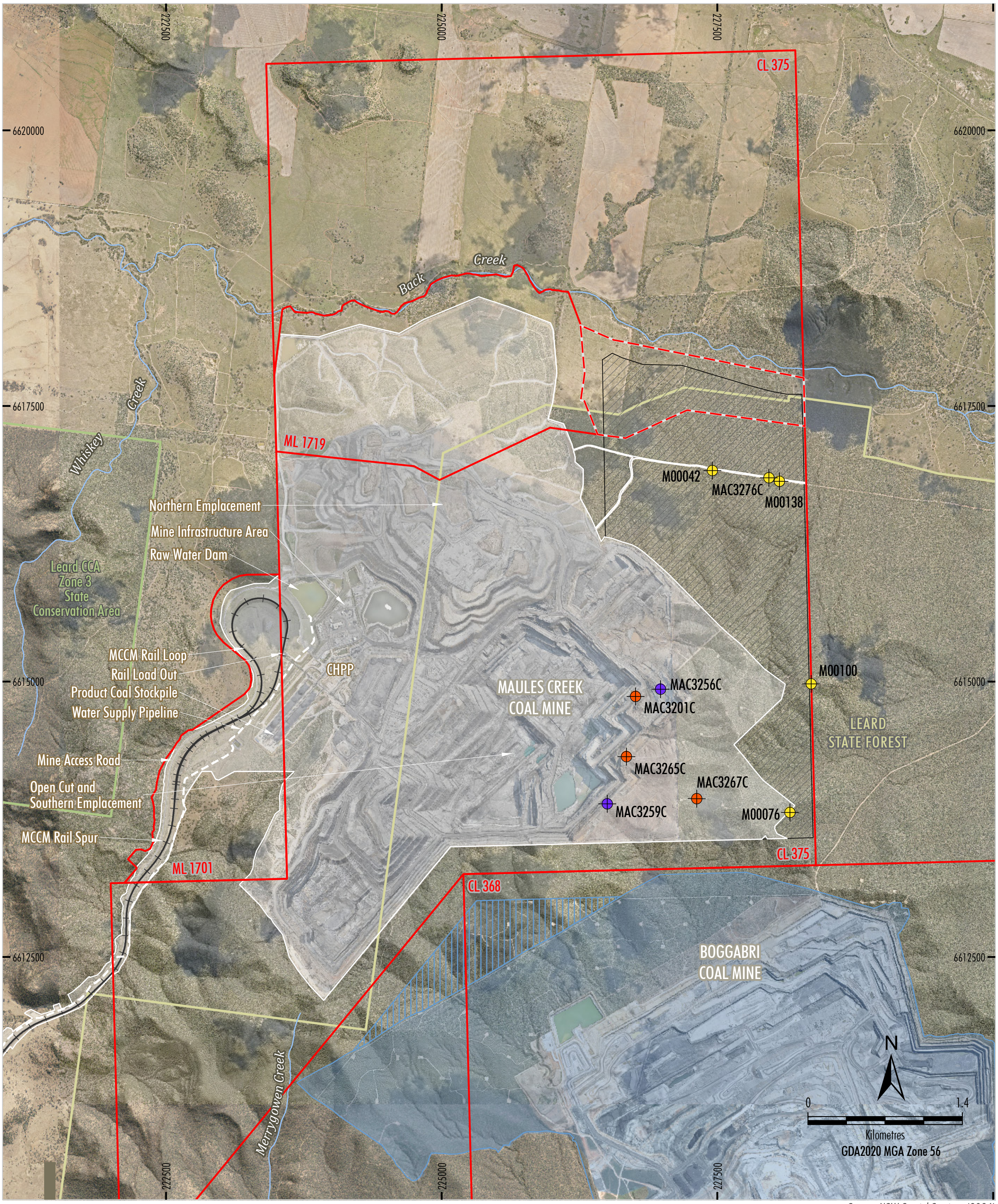
Drill-Hole	Material Type	Composite Sample ID
MAC3256C	Raw Coal	MC/RAW-1
MAC3256C	Clean Coal	MC/CCC-1
MAC3256C	Coal Reject	MC/REJ-1

Drill-Hole	Material Type	Composite Sample ID
MAC3259C	Raw Coal	MC/RAW-2
MAC3259C	Clean Coal	MC/CCC-2
MAC3259C	Reject	MC/REJ-2

Table A-3: Drill hole samples used to produce the coal reject samples from each target coal seam.

Sample ID	MAC3256C	MAC3201C
MC/HRN-1	51241R 51243R 51245R	
MC/ONV-1	51248-50R	
MC/TST-1	51251R 51252R 51255R	
MC/TNN-1	51256R	49957R
MC/BRY-1	51258-67R	
MC/JER-1	51268R 51269R 51270R	
MC/MER-1	51271R 51272R	49971R 49972R
MC/VEL-1	51273R 51275R 51277R	49974R 49976R 49978R
MC/NAG-1	51279R	49980R
MC/NTH-1	51281R 51283R	
MC/TER-1	51284-85R	
MC/FLX-1	51287R	49991R
MC/TWA-1	51288R	

Sample ID	MAC3259C	MAC3267C	MAC3265C
MC/HRN-2	31353-55R 31356-58R 31360R 31361R		
MC/ONV-2	31362-63R		
MC/TST-2	31364R 31365-66R		
MC/TNN-2		51768R	51598R
MC/BRY-2	31369R 31371-73R 31375-81R		
MC/JER-2	31383-84R	51784R 51786-788R 51789R	
MC/MER-2	31385-86R	51790-793R	51623R
MC/VEL-2	31387-93R		
MC/NAG-2	31394R	51798-799R	51637R
MC/NTH-2	31396R 31397R 31398R	51801-802R 51803R 51804R	
MC/TER-2	31400R		
MC/FLX-2	31401-03R		
MC/TWA-2	31405R 31407R 31410R 31412R		



Source: NSW Spatial Services (2024)
Orthophoto Mosaic: Whitehaven Coal (2024-2022)

LEGEND

- Rail Line
- State Conservation Area, Aboriginal Area
- State Forest
- Provisional Mining Lease Application Area
- Mining Tenement Boundary (ML and CL)
- Other Mining Operation *
- Other Mining Operation - Proposed *

Existing/Approved MCCM Development

- Approximate Extent of Existing/Approved Surface Development
- MCCM Water Transfer Pipeline

Maules Creek Continuation Project

- Indicative Open Cut Extension Area

Drill Hole and Coal/Reject Samplig Sites

- Overburden/Interburden
- Coal/Coal Rejects (Primary Drill Holes)
- Coal/Coal Rejects (Secondary Drill Holes)

* BCM boundary digitised from Figure 1 of the BCM Modification 10 Scoping Letter

Whitehaven

MAULES CREEK CONTINUATION PROJECT

Geochemical Drill Hole Locations

Figure A-1

Attachment B

Overburden and Interburden Test Results

Table B-1: Acid forming characteristics of overburden and interburden samples from drill hole M00042.

Sample ID	Lithology	Depth (m)			$pH_{1:2}$	$EC_{1:2}$	ACID-BASE ANALYSIS						NAG TEST			Geochem. Class.
		from	to	inter.			Total %S	Sulfide %S	MPA	ANC	NAPP	NAPP (sulfide)	NAGpH	$NAGpH_{ext}$	NAG_{calc}	
DH42/1	Sandstone (EW)	19.22	22.06	2.84	8.2	0.605	0.01		0	14	-13		7.6			NAF
DH42/2	Conglomerate (DW)	22.06	26.38	4.32	8.4	0.434	0.02		1	27	-27		8.1			NAF
DH42/3	Siltstone	28.95	33.60	4.65	7.5	0.468	0.04	0.03	1	18	-17	-17	8.2			NAF
DH42/4	Sandstone	36.05	37.68	1.63	7.6	0.326	0.02		1	13	-12		7.6			NAF
DH42/5	Siltstone	39.35	40.34	0.99	7.6	0.359	0.02		1	11	-10		7.4			NAF
DH42/6	Conglomerate	46.77	56.77	10.00	7.6	0.255	0.02		1	15	-15		8.5			NAF
DH42/7	Conglomerate	56.77	67.72	10.95	8.2	0.214	0.02		1	47	-46		10.3			NAF
DH42/8	Sandstone,Siltstone	71.68	74.36	2.68	7.7	0.295	0.02		1	18	-17		7.8			NAF
DH42/12	Sandstone	102.08	102.83	0.75	8.4	0.298	0.01		0	14	-13		8.4			NAF
DH42/13	Sandstone	116.28	119.00	2.72	8.5	0.270	0.02		1	48	-47		9.8			NAF
DH42/14	Sandstone,Siltstone	122.09	123.96	1.87	8.3	0.258	0.02		1	13	-12		7.9			NAF
DH42/15	Carbonaceous Siltstone	128.26	129.27	1.01	8.2	0.238	0.03		1	19	-18		8.0			NAF
DH42/16	Conglomerate	138.55	141.43	2.88	8.1	0.312	0.03		1	21	-20		9.0			NAF
DH42/17	Shale	142.24	142.50	0.26	8.1	0.225	0.03		1	8	-7		7.3			NAF
DH42/18	Conglomerate	145.02	155.02	10.00	8.8	0.247	0.01		0	30	-30		9.2			NAF
DH42/19	Conglomerate	155.02	165.87	10.85	8.8	0.351	0.02		1	31	-30		8.0			NAF
DH42/20	Sandstone,Siltstone	167.53	174.49	6.96	9.1	0.307	0.02		1	50	-50		9.8			NAF
DH42/21	Sandstone	179.96	180.38	0.42	9.1	0.408	0.02		1	104	-103		10.8			AC
DH42/22	Conglomerate	187.40	188.79	1.39	8.9	0.306	0.02		1	157	-156		9.8			AC
DH42/23	Siltstone	191.03	191.90	0.87	8.9	0.316	0.03		1	20	-19		8.4			NAF
DH42/24	Sandstone,Siltstone	192.73	193.58	0.85	8.8	0.265	0.02		1	9	-8		7.5			NAF
DH42/25	Conglomerate	201.74	208.13	6.39	9.0	0.232	0.02		1	49	-49		10.4			NAF
DH42/26	Carbonaceous Siltstone	224.01	225.25	1.24	8.6	0.294	0.03		1	32	-31		8.9			NAF
DH42/27	Sandstone	225.78	227.57	1.79	8.7	0.270	0.02		1	105	-104		10.7			AC
DH42/28	Sandstone,Conglomerate	227.57	231.29	3.72	8.5	0.340	0.02		1	110	-109		10.5			AC
DH42/29	Shale	239.39	239.60	0.21	8.6	0.293	0.03		1	8	-7		7.6			NAF
DH42/30	Claystone	242.26	243.51	1.25	8.3	0.415	0.03		1	16	-15		8.0			NAF

KEY

$pH_{1:2}$ = pH of 1:2 extract
$EC_{1:2}$ = Electrical Conductivity(dS/m)
MPA = Maximum Potential Acidity (kgH_2SO_4/t)
ANC = Acid Neutralising Capacity (kgH_2SO_4/t)
NAPP = Net Acid Producing Potential (kgH_2SO_4/t)
NAPP(sulfide) = NAPP using sulfide S (kgH_2SO_4/t)
NAGpH = pH of NAG liquor
$NAGpH_{ext}$ = pH of extended boil NAG liquor
NAG_{calc} = Calculated extended boil NAG value (kgH_2SO_4/t)

Weathering Classification Key

(EW) = Extremely Weathered
(DW) = Distinctly Weathered
(SW) = Slightly Weathered

ARD Classification Key

NAF = Non-Acid Forming
PAF = Potentially Acid Forming
PAF/LC = PAF Low Capacity
AC = Acid Consuming
UC = Uncertain (expected classification)

Table B-2: Acid forming characteristics of overburden and interburden samples from drill hole M00076.

Sample ID	Lithology	Depth (m)			$pH_{1:2}$	$EC_{1:2}$	ACID-BASE ANALYSIS						NAG TEST			Geochem. Class.
		from	to	inter.			Total %S	Sulfide %S	MPA	ANC	NAPP	NAPP (sulfide)	NAGpH	$NAGpH_{ext}$	NAG_{calc}	
DH76/1	Conglomerate (DW)	9.04	10.39	1.35	6.8	0.171	0.02		1	2	-1		5.9			NAF
DH76/2	Sandstone (DW)	18.12	18.59	0.47	7.0	0.236	0.02		1	3	-3		5.8			NAF
DH76/3	Sandstone,Siltstone (SW)	33.37	35.94	2.57	5.2	2.005	0.23	0.07	7	7	1	-5	6.7			NAF
DH76/4	Conglomerate	44.45	56.29	11.84	7.7	0.418	0.03		1	34	-33		10.2			NAF
DH76/5	Siltstone	66.99	67.77	0.78	7.8	0.503	0.04	0.02	1	3	-1	-2	6.9			NAF
DH76/6	Shale	71.93	72.96	1.03	7.8	0.294	0.03		1	24	-23		8.2			NAF
DH76/7	Sandstone,Siltstone	75.26	76.35	1.09	8.1	0.315	0.02		1	31	-30		8.7			NAF
DH76/8	Mudstone	82.81	83.40	0.59	7.9	0.241	0.02		1	16	-15		7.8			NAF
DH76/9	Sandstone	84.20	86.68	2.48	6.9	1.419	0.41	0.37	13	51	-39	-40	9.1			NAF
DH76/10	Sandstone,Siltstone	90.59	94.03	3.44	7.7	0.263	0.02		1	15	-14		8.1			NAF
DH76/11	Conglomerate	97.10	107.89	10.79	8.5	0.271	0.02		1	37	-36		9.8			NAF
DH76/12	Sandstone,Siltstone	108.06	109.54	1.48	8.4	0.226	0.02		1	14	-13		8.2			NAF
DH76/13	Coaly Shale	110.41	110.95	0.54	7.1	0.337	0.09	0.02	3	26	-23	-25	8.7			NAF
DH76/14	Conglomerate	114.67	117.64	2.97	8.3	0.314	0.04	0.01	1	60	-58	-59	10.8			NAF
DH76/15	Siltstone,Shale	117.64	118.42	0.78	7.7	0.377	0.06	0.02	2	15	-13	-14	7.5			NAF
DH76/16	Siltstone	120.59	121.17	0.58	7.7	0.368	0.03		1	12	-11		7.7			NAF
DH76/17	Sandstone	122.12	123.80	1.68	7.4	0.808	0.10	0.06	3	14	-11	-12	8.0			NAF
DH76/18	Conglomerate	123.80	130.67	6.87	8.4	0.367	0.03		1	67	-66		10.9			NAF
DH76/19	Siltstone,Shale	132.66	146.02	13.36	6.6	1.168	0.14	0.03	4	21	-16	-20	8.6			NAF
DH76/20	Carbonaceous Shale	147.16	147.90	0.74	7.0	0.392	0.04	0.02	1	4	-2	-3	7.2			NAF
DH76/21	Shale	156.14	157.14	1.00	6.7	0.863	0.06	0.02	2	6	-5	-6	7.2			NAF
DH76/22	Sandstone	176.02	177.57	1.55	8.5	0.275	0.02		1	88	-88		10.2			NAF
DH76/23	Conglomerate	186.95	198.13	11.18	8.2	0.427	0.04	0.02	1	22	-21	-21	9.4			NAF
DH76/24	Sandstone,Siltstone	198.35	199.12	0.77	8.1	0.182	0.02		1	10	-10		8.1			NAF
DH76/25	Sandstone,Conglomerate	203.14	205.11	1.97	8.6	0.144	0.01		0	14	-14		8.0			NAF
DH76/26	Conglomerate	216.28	221.59	5.31	8.6	0.218	0.02		1	40	-39		10.1			NAF
DH76/27	Sandstone,Siltstone	264.51	268.83	4.32	9.0	0.307	0.04	0.02	1	15	-14	-14	7.9			NAF
DH76/28	Sandstone,Conglomerate	277.66	279.76	2.10	9.3	0.206	0.02		1	42	-42		9.1			NAF
DH76/29	Sandstone	286.17	289.71	3.54	9.5	0.296	0.01		0	180	-180		11.1			AC
DH76/30	Siltstone,Shale	296.70	297.62	0.92	8.7	0.513	0.05	0.02	2	13	-12	-13	7.3			NAF
DH76/31	Sandstone	316.70	321.68	4.98	9.2	0.270	0.02		1	79	-79		10.6			NAF
DH76/33	Carbonaceous Shale	331.39	331.64	0.25	9.2	0.350	0.05	0.04	2	124	-122	-123	10.5			AC
DH76/34	Claystone	331.77	334.70	2.93	6.8	1.450	0.07	0.03	2	10	-8	-9	8.0			NAF

KEY

$pH_{1:2}$ = pH of 1:2 extract
$EC_{1:2}$ = Electrical Conductivity(dS/m)
MPA = Maximum Potential Acidity (kgH_2SO_4/t)
ANC = Acid Neutralising Capacity (kgH_2SO_4/t)
NAPP = Net Acid Producing Potential (kgH_2SO_4/t)
NAPP(sulfide) = NAPP using sulfide S (kgH_2SO_4/t)
NAGpH = pH of NAG liquor
$NAGpH_{ext}$ = pH of extended boil NAG liquor
NAG_{calc} = Calculated extended boil NAG value (kgH_2SO_4/t)

Weathering Classification Key

(EW) = Extremely Weathered
(DW) = Distinctly Weathered
(SW) = Slightly Weathered

ARD Classification Key

NAF = Non-Acid Forming
PAF = Potentially Acid Forming
PAF/LC = PAF Low Capacity
AC = Acid Consuming
UC = Uncertain (expected classification)

Table B-3: Acid forming characteristics of overburden and interburden samples from drill hole M00100.

Sample ID	Lithology	Depth (m)			$pH_{1:2}$	$EC_{1:2}$	ACID-BASE ANALYSIS						NAG TEST			Geochem. Class.
		from	to	inter.			Total %S	Sulfide %S	MPA	ANC	NAPP	NAPP (sulfide)	NAGpH	$NAGpH_{ext}$	NAG_{calc}	
DH100/1	Conglomerate (DW)	3.86	33.64	29.78	8.4	0.203	<0.01		0	24	-24		7.6			NAF
DH100/2	Sandstone	37.52	39.46	1.94	7.7	0.848	0.05	0.02	2	92	-91	-92	9.1			NAF
DH100/3	Shale	40.00	40.46	0.46	6.3	2.244	0.17	0.03	5	5	1	-4	6.8			NAF
DH100/4	Coaly Shale	53.65	53.90	0.25	4.6	1.986	0.17	0.04	5	1	5	0	3.1	3.3	2.3	PAF
DH100/5	Conglomerate	54.57	65.72	11.15	7.1	0.528	0.04	0.01	1	30	-28	-29	8.8			NAF
DH100/7	Siltstone	98.03	100.95	2.92	7.5	0.285	0.02		1	17	-16		8.3			NAF
DH100/8	Siltstone,Shale	101.31	103.52	2.21	7.2	0.460	0.03		1	25	-24		8.4			NAF
DH100/10	Sandstone	114.96	119.14	4.18	7.3	1.051	0.06	0.05	2	59	-57	-57	9.8			NAF
DH100/11	Conglomerate	130.78	140.78	10.00	8.6	0.443	0.02		1	20	-19		8.4			NAF
DH100/12	Conglomerate	140.78	150.78	10.00	9.1	0.473	0.02		1	39	-38		9.9			NAF
DH100/13	Conglomerate	150.78	160.78	10.00	9.2	0.427	0.03		1	31	-30		9.3			NAF
DH100/14	Conglomerate	160.78	170.84	10.06	8.7	0.512	0.06	0.05	2	38	-36	-36	8.4			NAF
DH100/15	Sandstone	182.10	183.21	1.11	7.9	0.459	0.04	0.03	1	9	-8	-8	7.4			NAF
DH100/16	Siltstone	185.92	186.70	0.78	7.5	0.331	0.04	0.02	1	8	-7	-8	7.3			NAF
DH100/17	Sandstone,Siltstone	188.70	193.83	5.13	7.4	0.265	0.02		1	10	-9		8.0			NAF
DH100/18	Sandstone,Shale	196.75	197.33	0.58	7.0	0.235	0.04	0.02	1	7	-6	-7	4.6			NAF
DH100/19	Shale	198.07	199.18	1.11	6.6	0.288	0.04	0.02	1	11	-10	-11	4.8			NAF
DH100/20	Siltstone	201.86	202.71	0.85	6.9	0.286	0.04	0.02	1	17	-15	-16	8.0			NAF
DH100/21	Conglomerate	212.19	220.19	8.00	8.3	0.263	0.02		1	35	-34		9.5			NAF
DH100/22	Conglomerate	220.19	228.90	8.71	7.9	0.575	0.04	0.03	1	22	-21	-21	9.1			NAF
DH100/23	Sandstone,Siltstone	230.93	234.49	3.56	8.3	0.248	0.02		1	53	-52		9.8			NAF
DH100/24	Sandstone	246.06	251.30	5.24	8.6	2.312	0.02		1	53	-53		8.7			NAF
DH100/25	Conglomerate	251.30	254.06	2.76	8.6	0.191	0.02		1	20	-19		7.8			NAF
DH100/26	Siltstone	255.88	256.47	0.59	7.9	0.252	0.05	0.02	2	8	-7	-8	7.3			NAF
DH100/27	Sandstone	259.15	260.36	1.21	8.4	0.263	0.02		1	70	-70		10.1			NAF
DH100/28	Sandstone	263.58	266.16	2.58	8.7	0.207	0.01		0	23	-23		8.2			NAF
DH100/29	Conglomerate	272.11	276.84	4.73	8.5	0.350	0.02		1	28	-28		8.7			NAF
DH100/30	Shale	291.65	294.53	2.88	8.6	0.304	0.02		1	35	-34		9.2			NAF
DH100/31	Siltstone	300.41	301.54	1.13	8.2	0.270	0.02		1	9	-8		7.3			NAF

KEY

$pH_{1:2}$ = pH of 1:2 extract
$EC_{1:2}$ = Electrical Conductivity(dS/m)
MPA = Maximum Potential Acidity (kgH_2SO_4/t)
ANC = Acid Neutralising Capacity (kgH_2SO_4/t)
NAPP = Net Acid Producing Potential (kgH_2SO_4/t)
NAPP(sulfide) = NAPP using sulfide S (kgH_2SO_4/t)
NAGpH = pH of NAG liquor
$NAGpH_{ext}$ = pH of extended boil NAG liquor
NAG_{calc} = Calculated extended boil NAG value (kgH_2SO_4/t)

Weathering Classification Key

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ARD Classification Key

NAF = Non-Acid Forming
PAF = Potentially Acid Forming
PAF/LC = PAF Low Capacity
AC = Acid Consuming
UC = Uncertain (expected classification)

Table B-4: Acid forming characteristics of overburden and interburden samples from drill hole M00138.

Sample ID	Lithology	Depth (m)			$pH_{1:2}$	$EC_{1:2}$	ACID-BASE ANALYSIS						NAG TEST			Geochem. Class.
		from	to	inter.			Total %S	Sulfide %S	MPA	ANC	NAPP	NAPP (sulfide)	NAGpH	$NAGpH_{ext}$	NAG_{calc}	
DH138/2	Siltstone (SW)	42.15	43.17	1.02	7.4	0.256	0.02		1	6	-6		7.2			NAF
DH138/3	Sandstone	44.47	45.37	0.90	7.7	0.250	0.02		1	19	-19		7.6			NAF
DH138/4	Siltstone	45.75	47.29	1.54	7.7	0.339	0.03		1	24	-23		8.0			NAF
DH138/5	Sandstone	50.83	56.62	5.79	8.2	0.293	0.02		1	55	-55		9.6			NAF
DH138/6	Sandstone,Siltstone	62.52	65.98	3.46	8.2	0.303	0.04	0.02	1	26	-25	-26	7.8			NAF
DH138/7	Mudstone	76.47	76.68	0.21	8.3	0.238	<0.01		0	19	-19		8.0			NAF
DH138/11	Conglomerate	126.01	134.50	8.49	8.4	0.247	0.01		0	41	-41		8.9			NAF
DH138/12	Conglomerate	134.50	141.70	7.20	8.2	0.240	0.04	0.04	1	95	-93	-93	11.1			NAF
DH138/13	Siltstone,Shale	143.82	146.54	2.72	8.0	0.273	0.03		1	15	-14		7.5			NAF
DH138/14	Sandstone,Siltstone	146.86	147.44	0.58	7.5	0.240	0.04	0.02	1	19	-18	-19	7.7			NAF
DH138/15	Siltstone	152.69	153.38	0.69	7.4	0.300	0.06	0.03	2	16	-14	-15	6.6			NAF
DH138/16	Sandstone,Conglomerate	156.60	159.15	2.55	8.6	0.212	<0.01		0	26	-26		9.2			NAF
DH138/17	Sandstone	171.45	176.12	4.67	8.6	0.226	<0.01		0	28	-27		9.8			NAF
DH138/18	Carbonaceous Siltstone	180.10	180.35	0.25	8.2	0.200	0.12	0.01	4	11	-8	-11	5.6			NAF

KEY

$pH_{1:2}$ = pH of 1:2 extract
$EC_{1:2}$ = Electrical Conductivity(dS/m)
MPA = Maximum Potential Acidity (kgH_2SO_4/t)
ANC = Acid Neutralising Capacity (kgH_2SO_4/t)
NAPP = Net Acid Producing Potential (kgH_2SO_4/t)
NAPP(sulfide) = NAPP using sulfide S (kgH_2SO_4/t)
NAGpH = pH of NAG liquor
$NAGpH_{ext}$ = pH of extended boil NAG liquor
NAG_{calc} = Calculated extended boil NAG value (kgH_2SO_4/t)

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PAF = Potentially Acid Forming
PAF/LC = PAF Low Capacity
AC = Acid Consuming
UC = Uncertain (expected classification)

Table B-5: Acid forming characteristics of overburden and interburden samples from drill hole MAC3276C.

Sample ID	Lithology	Depth (m)			$pH_{1:2}$	$EC_{1:2}$	ACID-BASE ANALYSIS						NAG TEST			Geochem. Class.
		from	to	inter.			Total %S	Sulfide %S	MPA	ANC	NAPP	NAPP (sulfide)	NAGpH	$NAGpH_{ext}$	NAG_{calc}	
DH3276/2	Conglomerate (EW)	2.90	11.13	8.23	8.1	0.348	<0.01		0	9	-9		6.5			NAF
DH3276/3	Claystone (DW)	12.10	14.47	2.37	8.5	0.958	0.01		0	7	-7		7.1			NAF
DH3276/4	Conglomerate (SW)	18.17	19.38	1.21	8.3	0.242	<0.01		0	8	-8		6.4			NAF
DH3276/5	Sandstone (SW)	32.36	33.51	1.15	8.5	0.183	<0.01		0	13	-13		7.8			NAF
DH3276/6	Siltstone (SW)	34.27	34.74	0.47	8.2	0.121	<0.01		0	8	-8		7.3			NAF
DH3276/7	Claystone	36.36	36.80	0.44	8.4	0.443	0.06	0.04	2	14	-12	-13	7.3			NAF
DH3276/8	Sandstone	40.90	43.23	2.33	8.6	0.153	0.02		1	20	-19		7.9			NAF
DH3276/9	Siltstone	59.57	60.59	1.02	8.7	0.377	0.08	0.04	2	17	-15	-16	7.8			NAF
DH3276/10	Sandstone,Siltstone	67.03	68.90	1.87	8.7	0.165	0.01		0	26	-25		8.2			NAF
DH3276/11	Conglomerate	76.32	84.74	8.42	8.6	0.280	0.02		1	27	-26		8.9			NAF
DH3276/13	Sandstone,Siltstone	102.30	104.94	2.64	8.7	0.164	0.02		1	19	-18		8.3			NAF
DH3276/14	Conglomerate	115.47	123.35	7.88	8.5	0.184	0.01		0	22	-22		8.7			NAF
DH3276/15	Carbonaceous Siltstone	131.12	133.37	2.25	8.5	0.115	0.03		1	15	-14		7.7			NAF
DH3276/16	Carbonaceous Siltstone	139.90	140.22	0.32	8.5	0.198	0.11	0.05	3	12	-9	-10	4.9	6.2	<0.10	NAF
DH3276/17	Conglomerate	143.99	151.47	7.48	8.7	0.499	<0.01		0	19	-18		7.9			NAF
DH3276/18	Sandstone	157.50	164.28	6.78	8.5	0.457	0.02		1	25	-24		8.8			NAF
DH3276/19	Siltstone	167.06	169.08	2.02	9.0	0.264	0.02		1	16	-15		7.6			NAF
DH3276/20	Sandstone	177.89	178.93	1.04	9.0	0.196	0.01		0	15	-15		8.0			NAF
DH3276/21	Sandstone	199.51	203.15	3.64	9.4	0.348	0.01		0	93	-92		10.3			NAF
DH3276/22	Siltstone	207.41	208.60	1.19	9.0	0.277	0.02		1	30	-29		8.8			NAF
DH3276/23	Conglomerate	221.53	223.33	1.80	8.5	0.445	0.02		1	16	-15		8.6			NAF
DH3276/24	Conglomerate	231.75	238.85	7.10	8.6	0.268	0.01		0	20	-20		8.3			NAF
DH3276/25	Sandstone	249.55	252.67	3.12	9.7	0.330	<0.01		0	117	-117		10.8			AC
DH3276/26	Siltstone	252.99	256.20	3.21	8.9	0.308	0.02		1	28	-27		9.0			NAF
DH3276/27	Sandstone	260.69	261.61	0.92	9.3	0.282	0.02		1	15	-14		8.2			NAF
DH3276/28	Conglomerate	267.12	272.00	4.88	9.0	0.256	0.02		1	20	-20		8.7			NAF
DH3276/29	Sandstone	303.92	306.83	2.91	9.2	0.245	<0.01		0	19	-18		8.6			NAF
DH3276/31	Conglomerate	317.37	324.30	6.93	9.1	0.366	0.02		1	70	-69		10.9			NAF
DH3276/32	Siltstone	330.80	343.88	13.08	9.2	0.367	0.03		1	24	-23		8.8			NAF
DH3276/33	Sandstone,Siltstone	351.90	354.30	2.40	9.3	0.409	<0.01		0	52	-52		10.9			NAF
DH3276/34	Volcanics	365.44	372.63	7.19	8.6	0.135	<0.01		0	24	-24		8.9			NAF

KEY

$pH_{1:2}$ = pH of 1:2 extract
$EC_{1:2}$ = Electrical Conductivity(dS/m)
MPA = Maximum Potential Acidity (kgH_2SO_4/t)
ANC = Acid Neutralising Capacity (kgH_2SO_4/t)
NAPP = Net Acid Producing Potential (kgH_2SO_4/t)
NAPP(sulfide) = NAPP using sulfide S (kgH_2SO_4/t)
NAGpH = pH of NAG liquor
$NAGpH_{ext}$ = pH of extended boil NAG liquor
NAG_{calc} = Calculated extended boil NAG value (kgH_2SO_4/t)

Weathering Classification Key

(EW) = Extremely Weathered
(DW) = Distinctly Weathered
(SW) = Slightly Weathered

ARD Classification Key

NAF = Non-Acid Forming
PAF = Potentially Acid Forming
PAF/LC = PAF Low Capacity
AC = Acid Consuming
UC = Uncertain (expected classification)

Table B-6: pH and EC, exchangeable cations and exchangeable sodium percent for the selected overburden and interburden samples.

Sample ID	Material Type	$pH_{1:2}$	$EC_{1:2}$	Exchangeable Cations (meq/100g)				CEC	ESP
				Ca	Mg	K	Na		
DH42/1	Sandstone (EW)	8.2	0.605	11.4	2.6	0.3	1.5	16.0	9.3
DH42/2	Conglomerate (DW)	8.4	0.434	13.2	2.5	0.3	1.2	17.3	6.8
DH42/3	Siltstone	7.5	0.468	6.0	9.5	0.7	1.8	18.3	10.1
DH42/6	Conglomerate	7.6	0.255	2.8	2.6	0.4	0.5	6.5	8.5
DH42/26	Carbonaceous Siltstone	8.6	0.294	11.7	1.3	0.4	1.2	14.7	8.2
DH76/1	Conglomerate (DW)	6.8	0.171	1.4	1.7	0.8	0.4	4.4	8.6
DH76/2	Sandstone (DW)	7.0	0.236	3.5	3.2	0.7	0.4	7.9	4.8
DH76/3	Sandstone,Siltstone (SW)	5.2	2.005	4.6	7.8	0.5	0.4	13.3	3.1
DH76/8	Mudstone	7.9	0.241	6.7	4.4	0.6	0.4	12.3	3.5
DH76/13	Coaly Shale	7.1	0.337	13.4	5.0	0.4	0.8	19.8	4.0
DH76/19	Siltstone,Shale	6.6	1.168	10.6	5.7	0.7	0.6	17.7	3.5
DH76/20	Carbonaceous Shale	7.0	0.392	6.4	4.3	0.6	0.4	12.1	3.8
DH76/25	Sandstone,Conglomerate	8.6	0.144	4.9	2.4	0.4	0.4	8.4	5.1
DH76/27	Sandstone,Siltstone	9.0	0.307	6.8	3.9	0.7	2.1	13.8	15.6
DH76/34	Claystone	6.8	1.450	7.1	1.4	0.1	2.2	10.9	20.0
DH100/1	Conglomerate (DW)	8.4	0.203	5.7	3.8	0.4	0.3	10.3	3.2
DH100/3	Shale	6.3	2.244	5.6	10.1	0.3	0.2	16.4	1.3
DH100/14	Conglomerate	8.7	0.512	4.1	2.6	0.4	1.8	9.1	20.8
DH100/24	Sandstone	8.6	2.312	16.7	2.3	0.4	0.5	20.1	2.7
DH100/30	Shale	8.6	0.304	6.5	3.5	0.7	2.4	13.2	18.2
DH138/2	Siltstone (SW)	7.4	0.256	8.5	4.8	0.6	0.3	14.2	1.9
DH138/5	Sandstone	8.2	0.293	15.5	5.9	0.4	0.5	22.5	2.3
DH3276/3	Claystone (DW)	8.5	0.958	2.3	6.6	0.6	3.2	12.8	25.0
DH3276/4	Conglomerate (SW)	8.3	0.242	0.8	2.0	0.4	1.3	4.7	28.8
DH3276/5	Sandstone (SW)	8.5	0.183	16.1	3.4	0.3	0.5	20.4	2.4
DH3276/6	Siltstone (SW)	8.2	0.121	8.8	9.2	0.5	1.0	19.6	4.9
DH3276/32	Siltstone	9.2	0.367	9.7	1.3	0.7	5.8	17.6	33.0
DH3276/34	Volcanics	8.6	0.135	21.0	0.2	0.1	1.8	23.2	7.7

$pH_{1:2}$ = pH of 1:2 extract
$EC_{1:2}$ = Electrical Conductivity of 1:2 extract (dS/m)
CEC = Cation Exchange Capacity (meq/100g)
ESP = Exchangeable Sodium Percent (%)
EW = Extremely Weathered
DW = Distinctly Weathered
SW = Slightly Weathered

Table B-7: Multi-element composition of selected overburden and interburden drill hole samples.

Parameter		Detect. Limit	Extremely Weathered	Distinctly Weathered			Slightly Weathered		Fresh Material						
			Sandstone	Claystone	Conglom.	Sandstone	Siltstone	Conglom.	Sandstone		Siltstone		Conglomerate		Shale
			DH42/1	DH3276/3	DH42/2	DH76/2	DH138/2	DH3276/4	DH76/9	DH138/17	DH42/3	DH3276/32	DH100/14	DH138/11	DH76/21
Ag	ppm	0.01	0.06	0.08	0.06	0.07	0.07	0.06	0.06	0.06	0.07	0.07	0.05	<	0.08
Al	%	0.0001%	6.438%	8.446%	6.280%	7.148%	8.111%	6.514%	6.782%	6.608%	8.419%	8.184%	6.596%	6.469%	9.729%
As	ppm	0.03	5.2	9.4	4.3	4.7	4.1	6	16.3	6.8	5.3	10.4	7.8	5.3	11.1
B	ppm	50	<	<	<	<	<	<	<	<	<	<	<	<	<
Ba	ppm	0.05	845.7	682.2	1030.8	1159.2	611.2	1216.3	665.6	934.1	464	539.8	940.7	990.7	663.3
Be	ppm	0.005	1.51	2	1.61	2.27	2.41	2.09	1.14	1.5	1.87	2.08	1.77	2	2.61
Ca	%	0.0001%	0.540%	0.108%	0.993%	0.125%	0.299%	0.295%	1.177%	0.796%	0.270%	0.554%	0.643%	1.318%	0.170%
Cd	ppm	0.002	0.03	0.05	0.02	0.05	0.19	0.05	0.04	0.03	0.15	0.11	0.03	0.04	0.09
Co	ppm	0.01	3.6	6	3.1	1.6	4.8	10	10.8	4.3	6	11.5	3.7	3.7	5.4
Cr	ppm	0.1	20	51	12	20	41	13	30	17	38	49	17	15	51
Cu	ppm	0.05	6	13	4	5	18	5	8	4	22	24	5	4	26
Fe	%	0.0002%	1.000%	2.480%	0.840%	1.750%	1.080%	1.660%	2.180%	0.920%	3.420%	3.600%	1.320%	2.210%	0.830%
Hg	ppm	0.002	0.01	0.026	0.02	0.005	0.021	0.005	0.14	0.021	0.051	0.055	0.039	0.027	0.064
K	%	0.001%	2.599%	2.595%	2.869%	2.835%	2.581%	3.154%	1.631%	2.522%	2.178%	2.262%	3.082%	2.894%	2.572%
Mg	%	0.001%	0.120%	0.287%	0.249%	0.128%	0.375%	0.118%	0.580%	0.255%	0.646%	0.690%	0.272%	0.315%	0.286%
Mn	ppm	0.2	92	118	93	53	64	856	147	94	234	615	175	349	33
Mo	ppm	0.01	1	1.1	0.5	0.8	0.8	1.5	1.6	1.2	0.7	0.9	1.2	0.8	0.6
Na	%	0.001%	1.236%	0.629%	1.571%	0.712%	0.699%	1.820%	0.690%	1.715%	0.188%	0.781%	1.553%	1.796%	0.107%
Ni	ppm	0.04	8	22	8	11	12	12	31	10	20	32	10	11	25
P	ppm	2	178	212	192	195	343	207	213	167	339	534	201	200	152
Pb	ppm	0.005	17.4	16.2	16.2	14.4	20.8	15.8	15	15.7	24.9	19.4	16.9	15	24.3
Sb	ppm	0.005	0.67	0.74	0.63	0.65	0.56	0.74	0.63	0.64	0.54	0.69	0.84	0.64	0.99
Se	ppm	0.01	<	0.05	<	0.04	0.54	0.01	0.04	0.01	0.14	0.16	0.02	0.01	0.2
Si	%	0.1%	36.0%	31.4%	34.8%	33.6%	31.7%	35.0%	32.6%	35.1%	28.0%	29.0%	34.4%	32.6%	29.0%
Sn	ppm	0.02	1.5	2.1	1.8	1.7	2.6	2	1.4	1.5	3	2.6	2	2.1	3.2
Th	ppm	0.001	10.57	10.57	11.83	9.78	11.45	12.02	10.17	10.26	13.2	11.78	12.31	11.1	15.24
U	ppm	0.001	1.81	2.66	2.44	3.16	3.61	2.53	2.29	2.39	3.63	3.11	2.74	2.61	3.58
V	ppm	0.02	25	74	19	29	84	22	46	23	86	99	24	26	103
Zn	ppm	0.2	41	92	30	55	102	57	46	34	108	100	35	69	100

< element at or below analytical detection limit.

Table B-7: Multi-element composition of selected overburden and interburden drill hole samples. CONTINUED

Parameter		**Detect. Limit**	Fresh Material											
			Shale	Claystone		Mudstone		Volcanics	Carbonaceous Siltstone		Carbonaceous Shale		Coaly Shale	
			DH100/30	DH76/34	DH3276/7	DH76/8	DH138/7	DH3276/34	DH42/15	DH138/18	DH76/20	DH76/33	DH76/13	DH100/4
Ag	ppm	0.01	0.06	0.05	0.07	0.06	0.07	0.11	0.07	0.07	0.07	0.07	0.06	0.06
Al	%	0.0001%	7.420%	17.040%	7.857%	7.990%	7.875%	12.716%	8.152%	7.155%	9.065%	7.023%	7.010%	6.417%
As	ppm	0.03	8	13.6	7.5	5.1	6	0.9	6.4	6	9.7	11.6	6.3	6.8
B	ppm	50	<	<	<	<	<	<	<	<	<	<	<	<
Ba	ppm	0.05	579.3	55.8	1178.8	495.5	782.1	92.9	630.3	549.7	513.7	513.2	393.7	219.1
Be	ppm	0.005	1.93	0.82	2.07	1.9	1.44	2.03	2.36	2.03	1.71	1.81	2.7	3.01
Ca	%	0.0001%	0.793%	0.242%	0.286%	0.254%	0.615%	1.067%	0.332%	0.196%	0.152%	3.267%	0.728%	0.136%
Cd	ppm	0.002	0.11	0.16	0.11	0.08	0.09	0.29	0.11	0.15	0.17	0.08	0.09	0.08
Co	ppm	0.01	8.1	58.5	4.8	5.2	5.1	48.5	6.6	9.2	6.2	16.1	3.8	3.2
Cr	ppm	0.1	39	127	38	48	25	58	40	39	38	51	35	32
Cu	ppm	0.05	18	93	23	22	7	98	19	28	20	24	20	18
Fe	%	0.0002%	5.380%	4.620%	1.670%	5.930%	1.560%	10.850%	5.040%	0.780%	0.500%	7.030%	1.310%	0.450%
Hg	ppm	0.002	0.047	0.09	0.052	0.03	0.026	0.01	0.053	0.047	0.098	0.049	0.029	0.065
K	%	0.001%	2.375%	0.045%	2.366%	2.325%	2.402%	0.052%	2.571%	2.085%	1.939%	1.477%	2.275%	1.183%
Mg	%	0.001%	0.747%	0.069%	0.557%	0.399%	0.451%	0.210%	0.522%	0.303%	0.268%	1.381%	0.409%	0.201%
Mn	ppm	0.2	1043	423	116	1791	166	2282	640	52	16	1083	72	18
Mo	ppm	0.01	0.6	5.5	0.6	0.5	1.2	0.3	0.6	1.3	0.8	1.1	0.4	0.7
Na	%	0.001%	0.502%	0.107%	0.443%	0.408%	1.505%	0.079%	0.665%	0.476%	0.086%	0.493%	0.284%	0.053%
Ni	ppm	0.04	27	276	25	19	15	40	23	25	20	46	21	17
P	ppm	2	464	359	246	293	269	1501	364	207	318	459	165	72
Pb	ppm	0.005	19.4	12.2	20.5	19.9	16.3	10.2	20	18	22.7	16.4	20.5	16.3
Sb	ppm	0.005	0.65	0.22	0.98	0.43	0.45	0.08	0.57	0.68	0.74	0.56	1.94	1.65
Se	ppm	0.01	0.11	0.12	0.1	0.11	0.05	<	0.11	0.17	0.37	0.12	0.05	0.14
Si	%	0.1%	27.4%	18.7%	29.1%	28.6%	31.7%	16.5%	27.4%	17.2%	31.0%	23.0%	25.1%	21.4%
Sn	ppm	0.02	2.4	1.2	3	2.2	1.8	1.5	2.8	2.4	3.4	2	2.5	2.5
Th	ppm	0.001	10.66	2.24	13.29	10.13	9.01	1.92	12.03	10.52	14.28	9.19	11.08	10.54
U	ppm	0.001	2.97	0.81	2.94	2.6	2.32	0.36	3.26	2.74	3.78	2.55	3.11	2.41
V	ppm	0.02	83	176	95	90	45	135	93	85	92	92	79	77
Zn	ppm	0.2	84	94	81	85	63	173	110	60	131	97	61	45

< element at or below analytical detection limit.

Table B-8: Geochemical abundance indices of the selected overburden and interburden drill hole samples.

Parameter		***Mean Crustal Abund.**	Extremely Weathered	Distinctly Weathered			Slightly Weathered		Fresh Material						
			Sandstone	Claystone	Conglom.	Sandstone	Siltstone	Conglom.	Sandstone		Siltstone		Conglomerate		Shale
			DH42/1	DH3276/3	DH42/2	DH76/2	DH138/2	DH3276/4	DH76/9	DH138/17	DH42/3	DH3276/32	DH100/14	DH138/11	DH76/21
Ag	ppm	0.07	-	-	-	-	-	-	-	-	-	-	-	-	-
Al	%	8.2%	-	-	-	-	-	-	-	-	-	-	-	-	-
As	ppm	1.5	1	2	1	1	1	1	**3**	2	1	2	2	1	2
B	ppm	10	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Ba	ppm	500	-	-	-	-	-	-	-	-	-	-	-	-	-
Be	ppm	2.6	-	-	-	-	-	-	-	-	-	-	-	-	-
Ca	%	4.0%	-	-	-	-	-	-	-	-	-	-	-	-	-
Cd	ppm	0.11	-	-	-	-	-	-	-	-	-	-	-	-	-
Co	ppm	20	-	-	-	-	-	-	-	-	-	-	-	-	-
Cr	ppm	100	-	-	-	-	-	-	-	-	-	-	-	-	-
Cu	ppm	50	-	-	-	-	-	-	-	-	-	-	-	-	-
Fe	%	4.1%	-	-	-	-	-	-	-	-	-	-	-	-	-
Hg	ppm	0.05	-	-	-	-	-	-	1	-	-	-	-	-	-
K	%	2.1%	-	-	-	-	-	-	-	-	-	-	-	-	-
Mg	%	2.3%	-	-	-	-	-	-	-	-	-	-	-	-	-
Mn	ppm	950	-	-	-	-	-	-	-	-	-	-	-	-	-
Mo	ppm	1.5	-	-	-	-	-	-	-	-	-	-	-	-	-
Na	%	2.3%	-	-	-	-	-	-	-	-	-	-	-	-	-
Ni	ppm	80	-	-	-	-	-	-	-	-	-	-	-	-	-
P	ppm	1000	-	-	-	-	-	-	-	-	-	-	-	-	-
Pb	ppm	14	-	-	-	-	-	-	-	-	-	-	-	-	-
Sb	ppm	0.2	1	1	1	1	1	1	1	1	1	1	1	1	2
Se	ppm	0.05	-	-	-	-	**3**	-	-	-	1	1	-	-	1
Si	%	27.7%	-	-	-	-	-	-	-	-	-	-	-	-	-
Sn	ppm	2.2	-	-	-	-	-	-	-	-	-	-	-	-	-
Th	ppm	12	-	-	-	-	-	-	-	-	-	-	-	-	-
U	ppm	2.4	-	-	-	-	-	-	-	-	-	-	-	-	-
V	ppm	160	-	-	-	-	-	-	-	-	-	-	-	-	-
Zn	ppm	75	-	-	-	-	-	-	-	-	-	-	-	-	-

*Bowen H.J.M.(1979) Environmental Chemistry of the Elements.

Table B-8: Geochemical abundance indices of the selected overburden and interburden drill hole samples. CONTINUED

Parameter		*Mean Crustal Abund.	Fresh Material											
			Shale	Claystone		Mudstone		Volcanics	Carbonaceous Siltstone		Carbonaceous Shale		Coaly Shale	
			DH100/30	DH76/34	DH3276/7	DH76/8	DH138/7	DH3276/34	DH42/15	DH138/18	DH76/20	DH76/33	DH76/13	DH100/4
Ag	ppm	0.07	-	-	-	-	-	-	-	-	-	-	-	-
Al	%	8.2%	-	-	-	-	-	-	-	-	-	-	-	-
As	ppm	1.5	2	**3**	2	1	1	-	2	1	2	2	1	2
B	ppm	10	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Ba	ppm	500	-	-	-	-	-	-	-	-	-	-	-	-
Be	ppm	2.6	-	-	-	-	-	-	-	-	-	-	-	-
Ca	%	4.0%	-	-	-	-	-	-	-	-	-	-	-	-
Cd	ppm	0.11	-	-	-	-	-	1	-	-	-	-	-	-
Co	ppm	20	-	1	-	-	-	1	-	-	-	-	-	-
Cr	ppm	100	-	-	-	-	-	-	-	-	-	-	-	-
Cu	ppm	50	-	-	-	-	-	-	-	-	-	-	-	-
Fe	%	4.1%	-	-	-	-	-	1	-	-	-	-	-	-
Hg	ppm	0.05	-	-	-	-	-	-	-	-	-	-	-	-
K	%	2.1%	-	-	-	-	-	-	-	-	-	-	-	-
Mg	%	2.3%	-	-	-	-	-	-	-	-	-	-	-	-
Mn	ppm	950	-	-	-	-	-	1	-	-	-	-	-	-
Mo	ppm	1.5	-	1	-	-	-	-	-	-	-	-	-	-
Na	%	2.3%	-	-	-	-	-	-	-	-	-	-	-	-
Ni	ppm	80	-	1	-	-	-	-	-	-	-	-	-	-
P	ppm	1000	-	-	-	-	-	-	-	-	-	-	-	-
Pb	ppm	14	-	-	-	-	-	-	-	-	-	-	-	-
Sb	ppm	0.2	1	-	2	1	1	-	1	1	1	1	**3**	2
Se	ppm	0.05	1	1	-	1	-	-	1	1	2	1	-	1
Si	%	27.7%	-	-	-	-	-	-	-	-	-	-	-	-
Sn	ppm	2.2	-	-	-	-	-	-	-	-	-	-	-	-
Th	ppm	12	-	-	-	-	-	-	-	-	-	-	-	-
U	ppm	2.4	-	-	-	-	-	-	-	-	-	-	-	-
V	ppm	160	-	-	-	-	-	-	-	-	-	-	-	-
Zn	ppm	75	-	-	-	-	-	1	-	-	-	-	-	-

*Bowen H.J.M.(1979) Environmental Chemistry of the Elements.

Table B-9: Geochemical abundance indices of the selected overburden and interburden drill hole samples.

Parameter		Detect. Limit	Extremely Weathered	Distinctly Weathered			Slightly Weathered		Fresh Material						
			Sandstone	Claystone	Conglom.	Sandstone	Siltstone	Conglom.	Sandstone		Siltstone		Conglomerate		Shale
			DH42/1	DH3276/3	DH42/2	DH76/2	DH138/2	DH3276/4	DH76/9	DH138/17	DH42/3	DH3276/32	DH100/14	DH138/11	DH76/21
pH		0.1	8.2	8.5	8.4	7.0	7.4	8.3	6.9	8.6	7.5	9.2	8.7	8.4	6.7
EC	dS/m	0.001	0.605	0.958	0.434	0.236	0.256	0.242	1.419	0.226	0.468	0.367	0.512	0.247	0.863
Cl	mg/l	2	133	152	78	19	12	52	13	22	46	23	20	17	16
SO_4	mg/l	0.3	56.71	129.05	36.87	31.62	65.2	21.91	1142.21	40.01	93.75	34.78	141.79	67.36	401.25
Al	mg/l	0.01	0.07	0.2	0.06	0.04	0.04	0.25	<	0.15	0.03	1.16	0.45	0.06	<
B	mg/l	0.01	<	0.02	0.01	0.02	<	<	<	<	0.01	0.02	0.01	<	0.02
Ca	mg/l	0.01	7.23	1.41	6.27	6.18	18.81	0.24	237.36	2.89	6.61	0.86	3.71	11.55	78.37
Cr	mg/l	0.001	<	<	<	<	0.002	<	<	<	<	<	<	<	0.001
Cu	mg/l	0.005	0.046	<	0.01	0.031	<	<	<	<	0.05	<	0.006	<	0.007
Fe	mg/l	0.01	0.01	0.04	0.01	0.02	<	0.1	0.11	0.03	0.01	0.55	0.15	0.01	0.01
K	mg/l	0.1	5.4	6.7	5.2	15.4	9	2.2	14.7	2.5	8.4	2.8	4.3	6.5	15.3
Mg	mg/l	0.01	4.7	3.16	3.98	3.87	7.15	0.28	140.45	0.83	7.03	0.29	2.88	4.58	30.91
Mn	mg/l	0.001	0.006	0.002	0.004	0.023	0.003	0.039	1.713	0.002	0.006	0.006	0.007	0.015	0.122
Na	mg/l	0.1	105.8	157.9	80.2	23.3	14.8	45.5	21.3	49.1	76.2	115.5	110.7	36.3	44.3
Ni	mg/l	0.005	<	<	<	0.01	<	<	0.827	<	0.01	<	0.013	<	0.319
P	mg/l	0.02	<	0.07	0.02	0.25	<	0.11	<	<	<	0.06	<	<	<
Si	mg/l	0.02	2.42	2.93	2.4	8.44	6.78	3.71	3.84	2.67	5.72	4.5	1	3.59	4.92
V	mg/l	0.005	<	<	<	<	<	<	<	<	<	0.022	<	<	<
Zn	mg/l	0.005	0.031	0.008	0.009	0.022	0.01	0.01	0.459	0.012	0.021	0.01	0.018	0.011	0.25
Ag	ug/l	0.01	<	<	<	<	<	<	<	<	<	0.01	<	<	<
As	ug/l	0.1	0.9	7.4	1.1	2.8	14.6	2.3	0.6	131.4	16.1	304.9	20.8	20.6	1
Ba	ug/l	0.05	16.61	15.15	36.86	45.11	74.04	18.35	75.22	38.23	15.89	31.68	53.22	29.28	55.62
Be	ug/l	0.1	<	<	<	<	<	<	<	<	<	0.3	0.5	<	<
Cd	ug/l	0.02	<	<	<	<	<	<	0.73	<	0.04	<	0.03	<	0.39
Co	ug/l	0.1	2.6	0.2	0.2	2.6	0.7	0.5	406.5	0.6	2.1	0.8	2.3	0.5	60.6
Hg	ug/l	0.1	<	<	<	<	<	<	<	<	<	<	<	<	<
Mo	ug/l	0.05	5.11	12.31	4.48	7.02	51.82	22.15	1.23	64.76	50.38	104.08	65.09	46.52	0.52
Pb	ug/l	0.5	<	<	<	<	<	0.7	<	<	<	1.8	<	<	<
Sb	ug/l	0.01	0.15	0.13	0.12	0.71	1.55	0.08	0.15	4.79	1.59	12.61	1.74	3.1	0.52
Se	ug/l	0.5	1.1	9	0.6	1.3	216.7	3.3	4.8	7.3	66.9	44.2	1.9	2.9	74.4
Sn	ug/l	0.1	<	<	<	<	<	<	<	<	<	0.5	<	<	<
Th	ug/l	0.005	0.005	0.014	<	0.008	0.027	0.039	<	0.009	<	0.951	0.006	<	<
U	ug/l	0.005	0.282	0.088	0.417	0.637	1.808	0.053	0.616	2.529	0.143	1.901	1.932	2.862	0.062

< element at or below analytical detection limit.

Table B-9: Geochemical abundance indices of the selected overburden and interburden drill hole samples. CONTINUED

Parameter		Detect. Limit	Fresh Material											
			Shale	Claystone		Mudstone		Volcanics	Carbonaceous Siltstone		Carbonaceous Shale		Coaly Shale	Coaly Shale
			DH100/30	DH76/34	DH3276/7	DH76/8	DH138/7	DH3276/34	DH42/15	DH138/18	DH76/20	DH76/33	DH76/13	DH100/4
pH		0.1	8.6	6.8	8.4	7.9	8.3	8.6	8.2	8.2	7.0	9.2	7.1	4.6
EC	dS/m	0.001	0.304	1.450	0.443	0.241	0.238	0.135	0.238	0.200	0.392	0.350	0.337	1.986
Cl	mg/l	2	24	17	21	20	17	26	12	23	15	17	60	23
SO_4	mg/l	0.3	41.11	653.56	67.32	75	51.3	4.62	28.04	17.25	140.61	46.32	39.49	1400.21
Al	mg/l	0.01	0.25	0.04	0.12	0.05	0.09	0.76	0.08	0.16	<	0.4	<	42.49
B	mg/l	0.01	<	0.02	<	<	<	<	0.01	<	0.01	<	0.17	0.05
Ca	mg/l	0.01	1.62	94.25	10.09	13.55	4.92	2.32	2.53	1.54	22.55	2.58	29.41	253.04
Cr	mg/l	0.001	<	<	<	0.002	<	<	0.001	<	<	<	<	0.026
Cu	mg/l	0.005	0.005	0.016	<	<	<	<	0.02	0.006	0.006	<	0.005	0.346
Fe	mg/l	0.01	0.07	<	0.02	0.01	0.01	0.28	0.09	0.03	<	0.19	0.01	40.9
K	mg/l	0.1	3.3	3.2	8.5	8.4	3.9	0.5	3.7	1.4	12.7	3.4	4.2	22.1
Mg	mg/l	0.01	0.6	14.14	6.34	5.94	2.86	0.04	1.34	0.4	10.46	1.01	17.17	98.75
Mn	mg/l	0.001	0.002	0.503	0.001	0.002	0.001	0.009	0.002	0.001	0.014	0.004	0.029	0.467
Na	mg/l	0.1	81.1	181.8	43	23.3	48.6	34	58.4	58.2	27.8	93.8	27.1	29.4
Ni	mg/l	0.005	0.005	6.82	<	<	<	<	<	0.006	0.055	<	0.015	2.022
P	mg/l	0.02	0.25	<	<	<	<	<	<	0.02	<	0.02	<	<
Si	mg/l	0.02	4.15	4.98	4.26	3.86	4.21	3.29	3.41	4.45	4.86	2.73	7.8	9.54
V	mg/l	0.005	0.01	<	<	<	<	0.014	<	<	<	<	<	0.007
Zn	mg/l	0.005	0.015	1.47	0.008	0.012	0.009	0.007	0.015	0.015	0.234	0.013	0.038	2.376
Ag	ug/l	0.01	0.01	<	<	<	<	<	<	0.04	<	<	<	<
As	ug/l	0.1	320.9	4.9	90.5	5	90	2.1	6.7	75.6	3	22.2	8.6	3.2
Ba	ug/l	0.05	29.82	50.11	27.29	29.53	16.02	5.38	22.41	37.57	88.53	26.92	86.23	52.01
Be	ug/l	0.1	<	<	<	<	<	<	<	<	<	<	<	122.8
Cd	ug/l	0.02	<	2.31	<	0.02	<	<	<	0.02	0.28	0.02	0.03	4.9
Co	ug/l	0.1	0.7	1062.2	0.3	0.3	0.4	0.3	0.4	0.7	16.8	1	2.4	385.9
Hg	ug/l	0.1	<	<	<	<	<	<	<	<	<	<	<	<
Mo	ug/l	0.05	74.58	5.17	21.07	10.93	123.83	0.54	17.56	57.74	24.95	91.83	3.64	0.19
Pb	ug/l	0.5	0.7	<	<	<	<	<	<	0.9	<	<	<	51.7
Sb	ug/l	0.01	6.88	0.25	2.45	0.79	4.02	0.06	1.56	1.03	1.35	2.82	1.05	0.38
Se	ug/l	0.5	41.4	41.5	28.6	40	27	<	32.6	59.1	182.6	23.6	52.8	72
Sn	ug/l	0.1	<	<	<	<	<	<	<	<	<	<	<	<
Th	ug/l	0.005	0.02	<	0.018	<	<	0.032	<	0.179	<	<	0.019	0.69
U	ug/l	0.005	5.036	0.045	0.871	0.165	1.724	0.038	0.861	0.903	0.056	1.243	0.314	5.093

< element at or below analytical detection limit.

Attachment C

Coal and Coal Reject Test Results

Table C-1:	Acid forming characteristics of laboratory prepared raw coal, washed coal and coal reject composite samples.
Table C-2:	Acid forming characteristics of laboratory prepared coal seam reject samples.
Table C-3:	Multi-element composition and geochemical abundance indices of the raw coal, washed coal and coal reject composite samples.
Table C-4:	Chemical composition of water extracts from the raw coal, washed coal and coal reject composite samples.

Table C-1: Acid forming characteristics of laboratory prepared raw coal, washed coal and coal reject composite samples.

Material Type	Sample ID	$pH_{1:2}$	$EC_{1:2}$	ACID-BASE ANALYSIS							NAG TEST				Geochem. Class.
				Total %S	Sulfide %S	MPA	ANC	NAPP	NAPP (sulfide)	ANC/ MPA	NAGpH	$NAG_{pH\ 4.5}$	$NAGpH_{ext}$	NAG_{calc}	
Raw Coal Composite	MC/RAW-1	6.8	0.393	0.37	0.078	11	22	-11	-20	1.9	2.7	120	6.5	2	NAF
	MC/RAW-2	6.4	1.035	0.74	0.278	23	24	-1	-15	1.0	2.8	90	7.0	2	NAF
Clean Coal Composite	MC/CCC-1	7.1	0.222	0.32	0.023	10	5	5	-4	0.5	2.4	161	2.8	8	PAF/LC
	MC/CCC-2	7.0	0.286	0.45	0.057	14	8	6	-6	0.6	2.3	149	3.1	4	PAF/LC
Coal Reject Composite	MC/REJ-1	5.7	3.310	1.56	1.210	48	199	-151	-162	4.2	9.6				AC
	MC/REJ-2	5.8	1.460	3.68	0.868	113	147	-34	-120	1.3	8.6				AC

KEY

$pH_{1:2}$ = pH of 1:2 extract
$EC_{1:2}$ = Electrical Conductivity (dS/m)
MPA = Maximum Potential Acidity (kgH_2SO_4/t)
ANC = Acid Neutralising Capacity (kgH_2SO_4/t)
NAPP = Net Acid Producing Potential (kgH_2SO_4/t)
NAPP(sulfide) = NAPP using sulfide S (kgH_2SO_4/t)
NAGpH = pH of NAG liquor
$NAGpH_{ext}$ = pH of extended boil NAG liquor
$NAG_{pH4.5}$ = NAG capacity titrated to pH 4.5 (kgH_2SO_4/t)
NAG_{calc} = Calculated NAG value (kgH_2SO_4/t)

Geochemical Classification Key

AC = Acid Consuming
NAF = Non-Acid Forming
PAF = Potentially Acid Forming
PAF/LC = PAF Low Capacity

Table C-2: Acid forming characteristics of laboratory prepared coal seam reject samples.

Material Type	Sample ID	$pH_{1:2}$	$EC_{1:2}$	ACID-BASE ANALYSIS							NAG TEST				Geochem. Class.
				Total %S	Sulfide %S	MPA	ANC	NAPP	NAPP (sulfide)	ANC/ MPA	NAGpH	$NAG_{pH\ 4.5}$	$NAGpH_{ext}$	NAG_{calc}	
Coal Seam Rejects	MC/HRN-1	7.0	0.767	0.93	0.799	28	231	-203	-207	8.1	8.8				AC
	MC/HRN-2	7.5	0.387	0.30	0.249	9	17	-8	-10	1.9	7.1				NAF
	MC/ONV-1	10.1	2.255	15.30	10.200	468	0	468	312	0.0	1.9	287	1.7	194	PAF
	MC/ONV-2	9.9	2.372	23.20	13.400	710	0	710	410	0.0	1.9	398	1.7	229	PAF
	MC/TST-1	7.0	0.790	2.52	2.500	77	150	-73	-74	1.9	8.0				AC
	MC/TST-2	4.5	0.868	2.34	1.980	72	0	72	61	0.0	2.4	62	1.9	64	PAF
	MC/TNN-1	8.1	0.431	0.65	0.109	20	144	-124	-141	7.2	8.4				AC
	MC/TNN-2	-	-	0.57	0.470	17	422	-405	-408	24.2	8.0				AC
	MC/BRY-1	6.9	0.353	0.35	0.307	11	2	9	8	0.1	3.7	8	2.9	5	PAF/LC
	MC/BRY-2	6.1	0.592	1.04	0.878	32	1	31	26	0.0	2.8	30	2.3	22	PAF
	MC/JER-1	7.7	0.316	0.29	0.093	9	137	-128	-134	15.4	10.3				AC
	MC/JER-2	-	-	0.99	0.830	30	38	-8	-13	1.3	8.2				NAF
	MC/MER-1	7.3	0.960	1.56	1.150	48	212	-164	-177	4.4	8.7				AC
	MC/MER-2	4.4	1.033	5.20	3.360	159	0	159	103	0.0	2.2	96	2.0	75	PAF
	MC/VEL-1	7.9	0.667	0.90	0.689	28	77	-49	-56	2.8	8.4				NAF
	MC/VEL-2	7.3	0.432	0.21	0.145	6	7	0	-2	1.0	5.1				NAF
	MC/NAG-1	7.6	0.435	0.19	0.142	6	35	-29	-31	6.1	8.2				NAF
	MC/NAG-2	7.6	0.661	1.05	1.000	32	127	-95	-96	4.0	9.0				AC
	MC/NTH-1	7.5	0.545	0.85	0.808	26	592	-566	-567	22.8	10.4				AC
	MC/NTH-2	-	-	0.86	0.753	26	530	-504	-507	20.1	10.3				AC
	MC/TER-1	7.7	0.188	0.23	0.127	7	613	-606	-609	87.1	8.3				AC
	MC/TER-2	7.1	0.605	1.26	0.906	39	29	10	-1	0.8	3.3	14	3.0	0.0	UC(NAF)
	MC/FLX-1	7.6	0.503	0.38	0.323	12	456	-444	-446	39.2	8.3				AC
	MC/FLX-2	7.2	0.640	5.19	4.630	159	255	-96	-113	1.6	10.6				AC
	MC/TWA-1	7.7	0.375	0.12	0.030	4	21	-17	-20	5.7	4.9				NAF
	MC/TWA-2	6.8	1.153	2.70	2.570	83	385	-302	-306	4.7	10.8				AC

KEY

$pH_{1:2}$ = pH of 1:2 extract
$EC_{1:2}$ = Electrical Conductivity (dS/m)
MPA = Maximum Potential Acidity (kgH_2SO_4/t)
ANC = Acid Neutralising Capacity (kgH_2SO_4/t)
NAPP = Net Acid Producing Potential (kgH_2SO_4/t)
NAPP(sulfide) = NAPP using sulfide S (kgH_2SO_4/t)
NAGpH = pH of NAG liquor
$NAGpH_{ext}$ = pH of extended boil NAG liquor
$NAG_{pH4.5}$ = NAG capacity titrated to pH 4.5 (kgH_2SO_4/t)
NAG_{calc} = Calculated NAG value (kgH_2SO_4/t)

Geochemical Classification Key

AC = Acid Consuming
NAF = Non-Acid Forming
PAF = Potentially Acid Forming
PAF/LC = PAF Low Capacity

Table C-3: Multi-element composition and geochemical abundance indices of the raw coal, washed coal and coal reject composite samples.

Parameter		**Detect. Limit**	**Element Concentration**						**Parameter**		***Mean Crustal Abund.**	**Element Concentration**					
			Raw Coal		Clean Coal		Coal Reject					Raw Coal		Clean Coal		Coal Reject	
			MC/RAW-1	MC/RAW-2	MC/CCC-1	MC/CCC-2	MC/REJ-1	MC/REJ-2				MC/RAW-1	MC/RAW-2	MC/CCC-1	MC/CCC-2	MC/REJ-1	MC/REJ-2
Ag	ppm	0.01	0.05	0.06	0.02	0.02	0.08	0.07	Ag	ppm	0.07	-	-	-	-	-	-
Al	%	0.0001%	0.054%	0.068%	0.019%	0.037%	0.296%	0.305%	Al	%	8.2%	-	-	-	-	-	-
As	ppm	0.03	2.05	3.3	1.87	1.16	11.63	19.93	As	ppm	1.5	-	1	-	-	2	**3**
B	ppm	0.5	13	14.9	17.2	17.4	3.4	3.4	B	ppm	10	-	-	-	-	-	-
Ba	ppm	0.05	153.2	87.6	38.54	129.9	27.27	8.16	Ba	ppm	500	-	-	-	-	-	-
Be	ppm	0.005	0.475	0.357	0.391	0.337	0.614	0.631	Be	ppm	2.6	-	-	-	-	-	-
Bi	ppm	0.005	0.087	0.071	0.069	0.063	0.226	0.229	Bi	ppm	0.048	-	-	-	-	2	2
Ca	%	0.0001%	0.869%	1.250%	0.112%	0.259%	6.716%	5.924%	Ca	%	4.0%	-	-	-	-	-	-
Cd	ppm	0.002	0.053	0.032	0.021	0.022	0.161	0.145	Cd	ppm	0.11	-	-	-	-	-	-
Co	ppm	0.01	3.82	3.94	2.9	3.72	4.99	4.94	Co	ppm	20	-	-	-	-	-	-
Cr	ppm	0.1	6.6	9.8	4.3	5.4	39.9	46.6	Cr	ppm	100	-	-	-	-	-	-
Cu	ppm	0.05	8.85	9.97	6.51	9.21	24.63	22.47	Cu	ppm	50	-	-	-	-	-	-
Fe	%	0.0002%	0.242%	0.423%	0.107%	0.109%	4.894%	5.797%	Fe	%	4.1%	-	-	-	-	-	-
Hg	ppm	0.002	0.042	0.091	0.032	0.031	0.365	0.729	Hg	ppm	0.05	-	-	-	-	2	**3**
K	%	0.001%	0.012%	0.013%	0.004%	0.006%	0.060%	0.070%	K	%	2.1%	-	-	-	-	-	-
Mg	%	0.001%	0.080%	0.039%	0.031%	0.009%	0.573%	0.437%	Mg	%	2.3%	-	-	-	-	-	-
Mn	ppm	0.2	36.6	85.7	5.7	24.1	666.3	616	Mn	ppm	950	-	-	-	-	-	-
Mo	ppm	0.01	0.69	2.16	0.46	1.32	2.2	4.55	Mo	ppm	1.5	-	-	-	-	-	1
Na	%	0.001%	0.009%	0.006%	0.007%	0.006%	0.014%	0.014%	Na	%	2.3%	-	-	-	-	-	-
Ni	ppm	0.04	8.62	10.39	7.6	6.98	28.32	34.07	Ni	ppm	80	-	-	-	-	-	-
P	ppm	2	17	118	8	96	78	245	P	ppm	1000	-	-	-	-	-	-
Pb	ppm	0.005	4.785	3.585	3.258	3.131	9.612	7.44	Pb	ppm	14	-	-	-	-	-	-
Sb	ppm	0.005	0.059	0.081	0.036	0.048	0.176	0.268	Sb	ppm	0.2	-	-	-	-	-	-
Se	ppm	0.01	0.47	0.48	0.39	0.38	0.77	0.82	Se	ppm	0.05	**3**	**3**	2	2	**3**	**3**
Si	%	0.1%	1.9%	1.9%	1.4%	1.1%	13.6%	11.9%	Si	%	27.7%	-	-	-	-	-	-
Sn	ppm	0.02	0.13	0.12	0.05	0.08	0.71	0.64	Sn	ppm	2.2	-	-	-	-	-	-
Th	ppm	0.001	0.922	0.525	0.262	0.337	3.433	2.022	Th	ppm	12	-	-	-	-	-	-
U	ppm	0.001	0.188	0.138	0.083	0.117	0.57	0.438	U	ppm	2.4	-	-	-	-	-	-
V	ppm	0.02	14.92	22.99	6.48	22.54	17.4	12.61	V	ppm	160	-	-	-	-	-	-
Zn	ppm	0.2	27.3	13.8	9	10	124.7	68.2	Zn	ppm	75	-	-	-	-	-	-

< element at or below analytical detection limit.

*Bowen H.J.M.(1979) Environmental Chemistry of the Elements.

Table C-4: Chemical composition of water extracts from the raw coal, washed coal and coal reject composite samples.

Parameter		**Detect. Limit**	**Chemical Composition**					
			Raw Coal		Clean Coal		Coal Reject	
			MC/RAW-1	MC/RAW-2	MC/CCC-1	MC/CCC-2	MC/REJ-1	MC/REJ-2
pH		0.1	6.8	6.4	7.1	7.0	5.7	5.8
EC	dS/m	0.001	0.393	1.035	0.222	0.286	3.310	1.460
Cl	mg/l	2	2	<	<	<	28	23
SO_4	mg/l	0.3	568.6	1418.2	177.6	290.2	3237.7	4199.6
Al	mg/l	0.01	<	<	<	<	<	<
B	mg/l	0.01	0.07	0.09	0.07	0.09	0.07	0.04
Ca	mg/l	0.01	268.74	665.8	102.95	159.75	706.36	565.42
Cr	mg/l	0.01	<	<	<	<	<	<
Cu	mg/l	0.001	<	0.002	<	<	<	<
Fe	mg/l	0.01	<	0.5	<	<	638.59	1513.3
K	mg/l	0.1	2.5	2.1	1.1	1.1	21.6	22.6
Mg	mg/l	0.01	18.54	12.99	7.29	4.73	112.66	109.35
Mn	mg/l	0.001	0.41	2.878	0.119	0.647	10.963	12.785
Na	mg/l	0.1	7.9	5.3	5.2	3.8	31.7	26.4
Ni	mg/l	0.001	0.074	0.212	0.045	0.055	0.612	1.273
P	mg/l	0.05	<	<	<	<	<	<
Si	mg/l	0.05	1	0.98	0.66	0.66	4.94	3.74
V	mg/l	0.01	<	<	<	<	<	<
Zn	mg/l	0.01	0.01	0.04	0.01	0.04	2.76	1.06
Ag	ug/l	0.05	<	<	<	<	0.09	0.08
As	ug/l	0.05	0.45	0.35	0.29	0.27	0.36	0.65
Ba	ug/l	0.02	37.47	20.27	86.04	27.01	23.27	18.31
Be	ug/l	0.05	<	<	<	<	<	0.08
Cd	ug/l	0.02	0.12	0.25	0.08	0.14	0.05	0.06
Co	ug/l	0.05	12.88	114.07	8.71	52.11	31.62	78.09
Hg	ug/l	0.1	0.3	<	0.2	<	<	0.1
Mo	ug/l	0.05	5.99	4.3	12.38	26.38	<	<
Pb	ug/l	0.1	<	<	<	<	<	0.1
Sb	ug/l	0.05	0.08	<	0.13	0.1	0.22	0.3
Se	ug/l	0.2	22.2	14.4	10.1	9.9	41	22.5
Sn	ug/l	0.1	<	<	<	<	<	<
Th	ug/l	0.01	<	<	<	<	<	<
U	ug/l	0.005	0.768	0.509	0.252	0.193	1.139	0.689

< element at or below analytical detection limit.

Attachment D

Acid Buffering Characteristic Curves

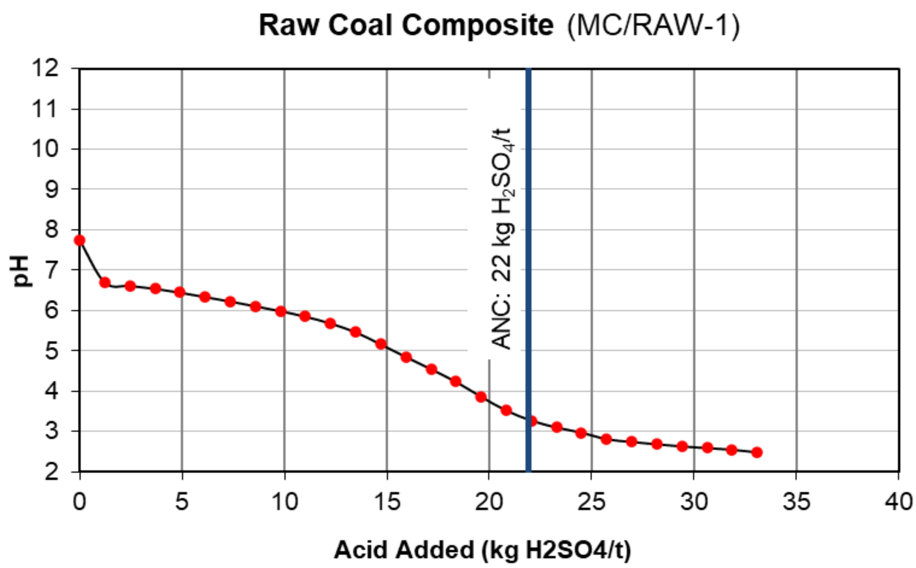

Figure D-1: Acid buffering characteristic curve for the Raw Coal Composite (Sample MC/RAW-1).

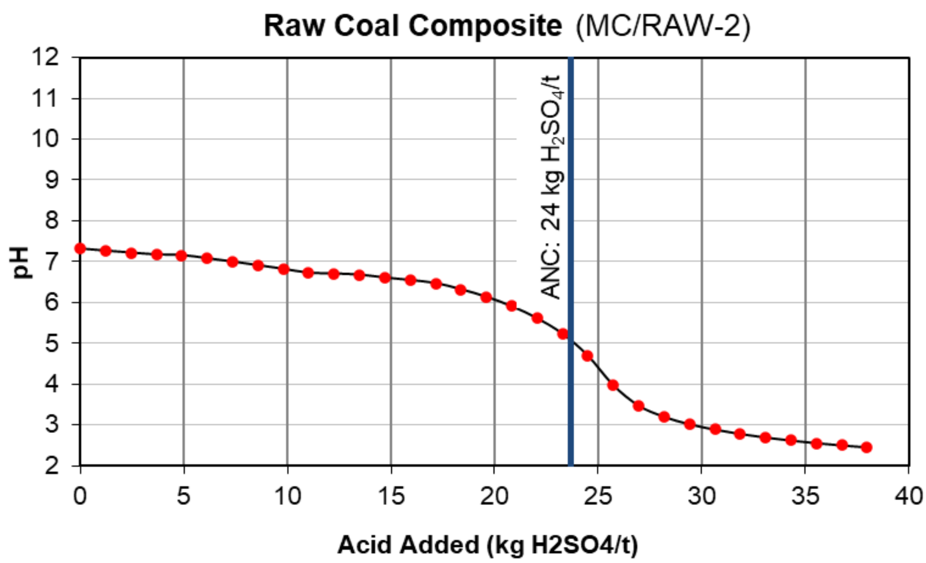

Figure D-2: Acid buffering characteristic curve for the Raw Coal Composite (Sample MC/RAW-2).

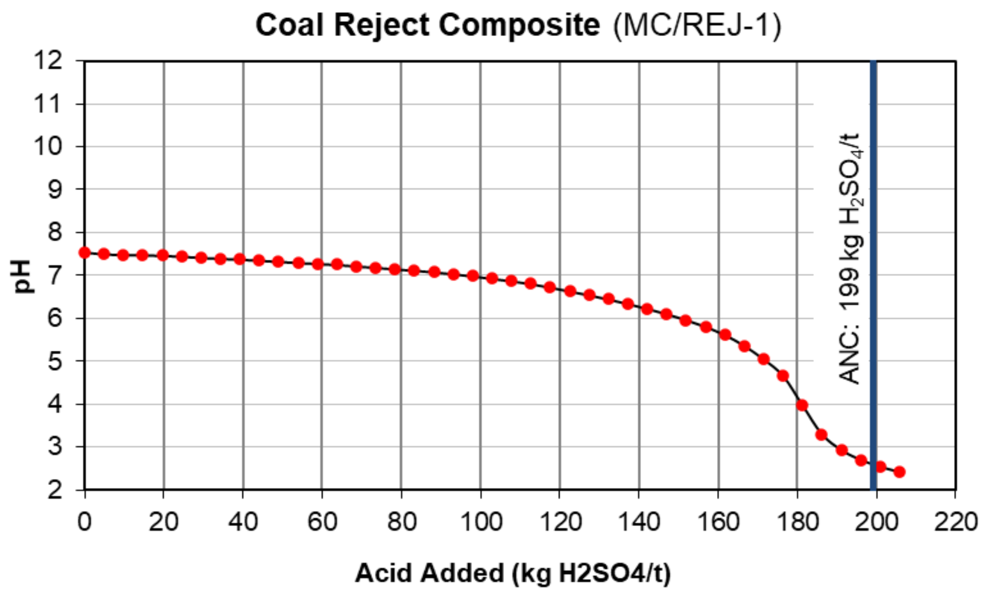

Figure D-3: Acid buffering characteristic curve for the Coal Reject Composite (Sample MC/REJ-1).

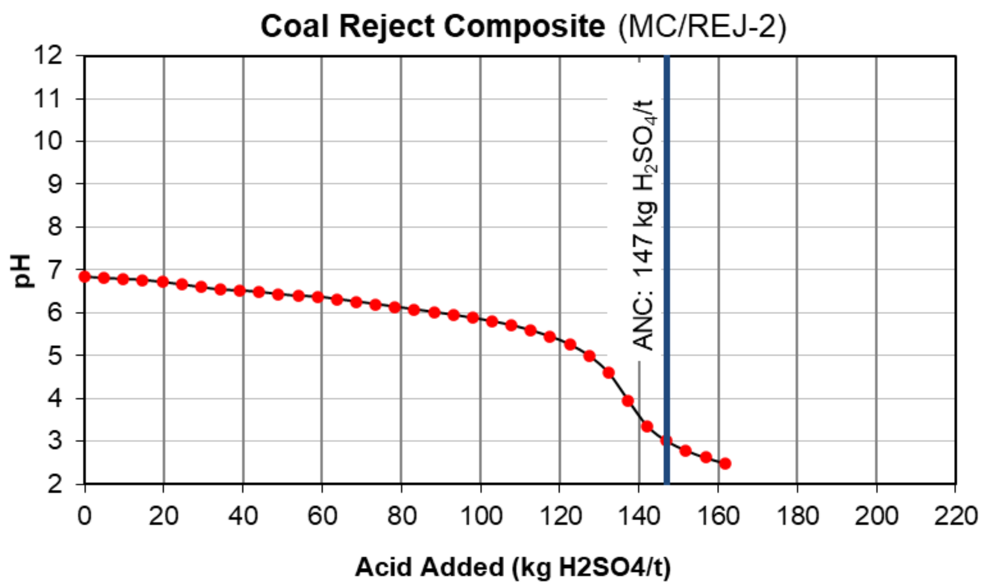

Figure D-4: Acid buffering characteristic curve for the Coal Reject Composite (Sample MC/REJ-2).

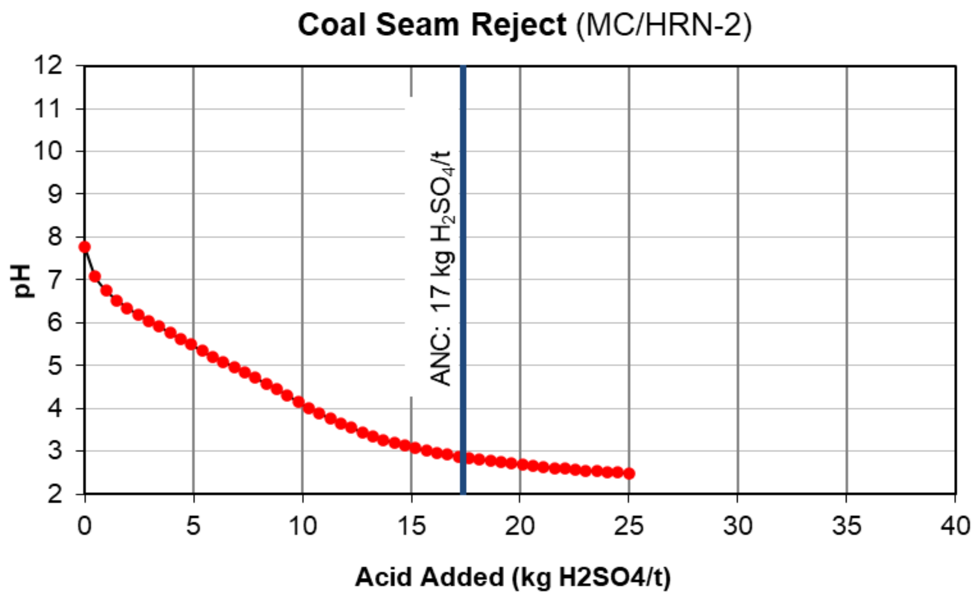

Figure D-5: Acid buffering characteristic curve for the Coal Seam Reject (Sample MC/HRN-2).

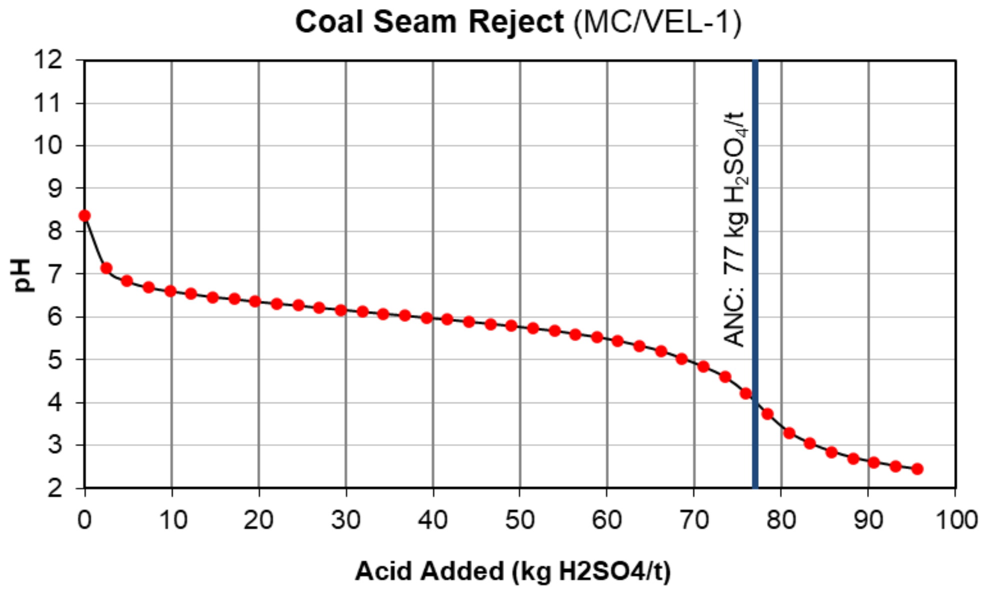

Figure D-6: Acid buffering characteristic curve for the Coal Seam Reject (Sample MC/VEL-1).

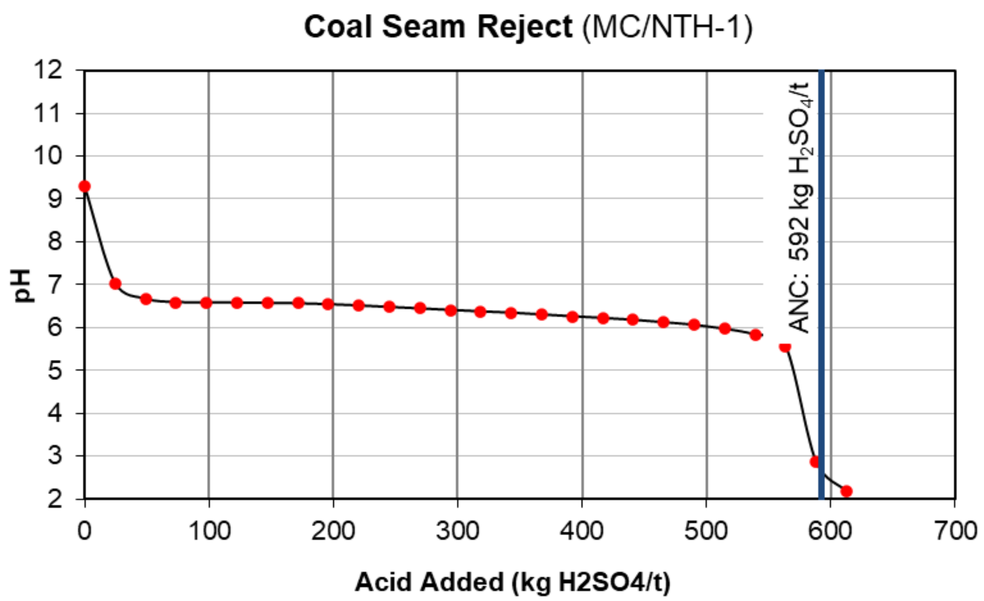

Figure D-7: Acid buffering characteristic curve for the Coal Seam Reject (Sample MC/NTH-1).

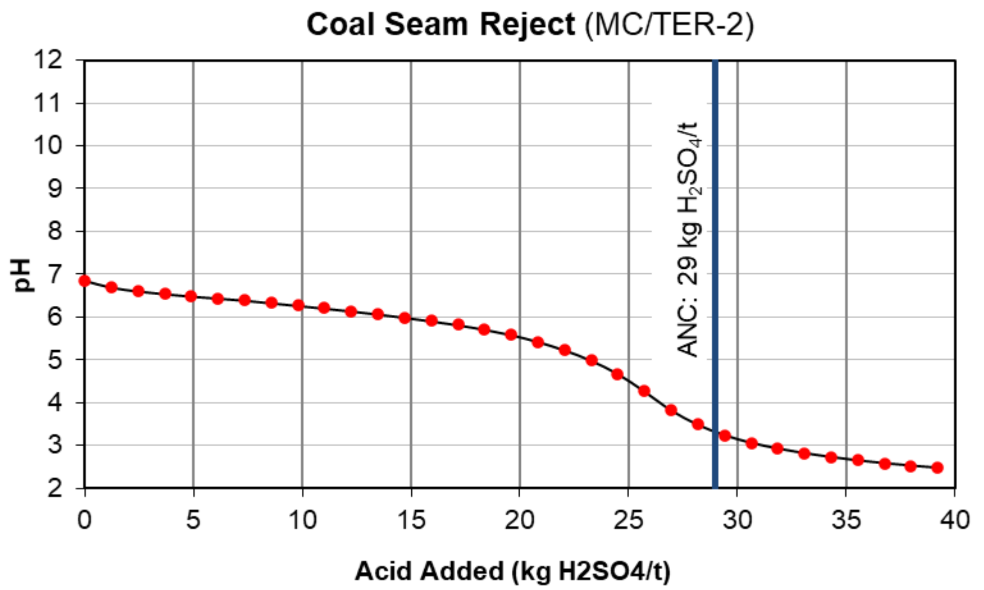

Figure D-8: Acid buffering characteristic curve for the Coal Seam Reject (Sample MC/TER-2).

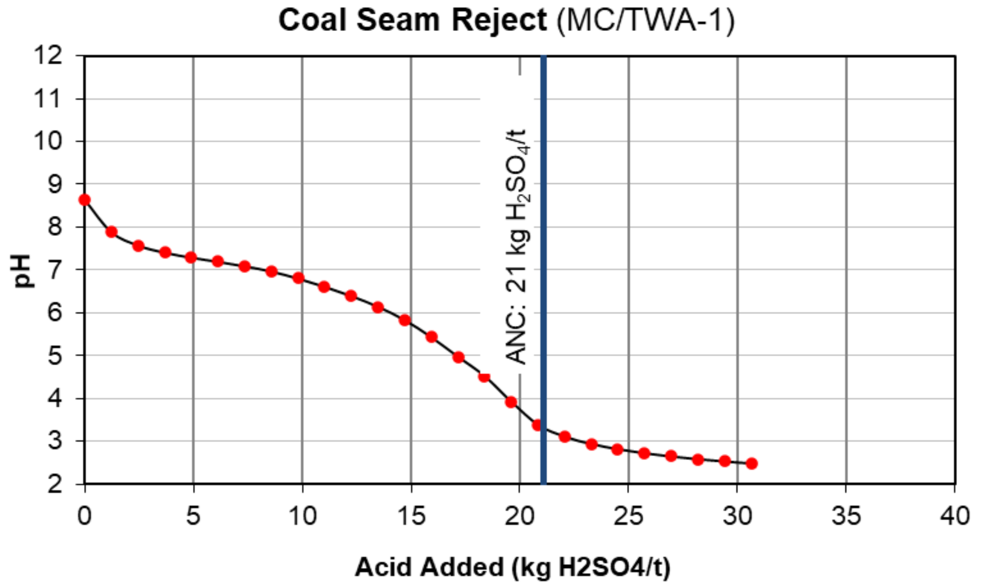

Figure D-9: Acid buffering characteristic curve for the Coal Seam Reject (Sample MC/TWA-1).

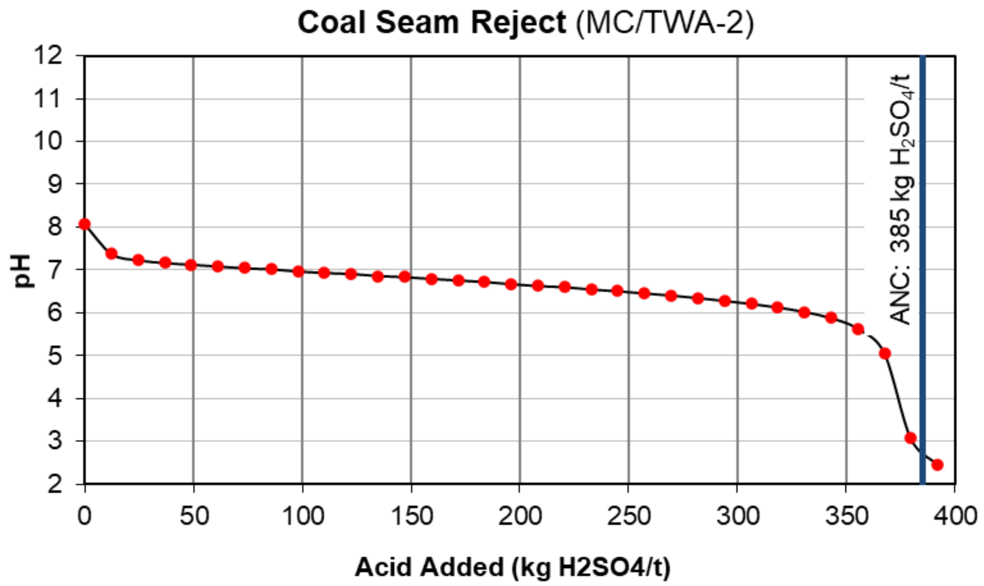

Figure D-10: Acid buffering characteristic curve for the Coal Seam Reject (Sample MC/TWA-2).

Attachment E

Kinetic NAG Test Plots

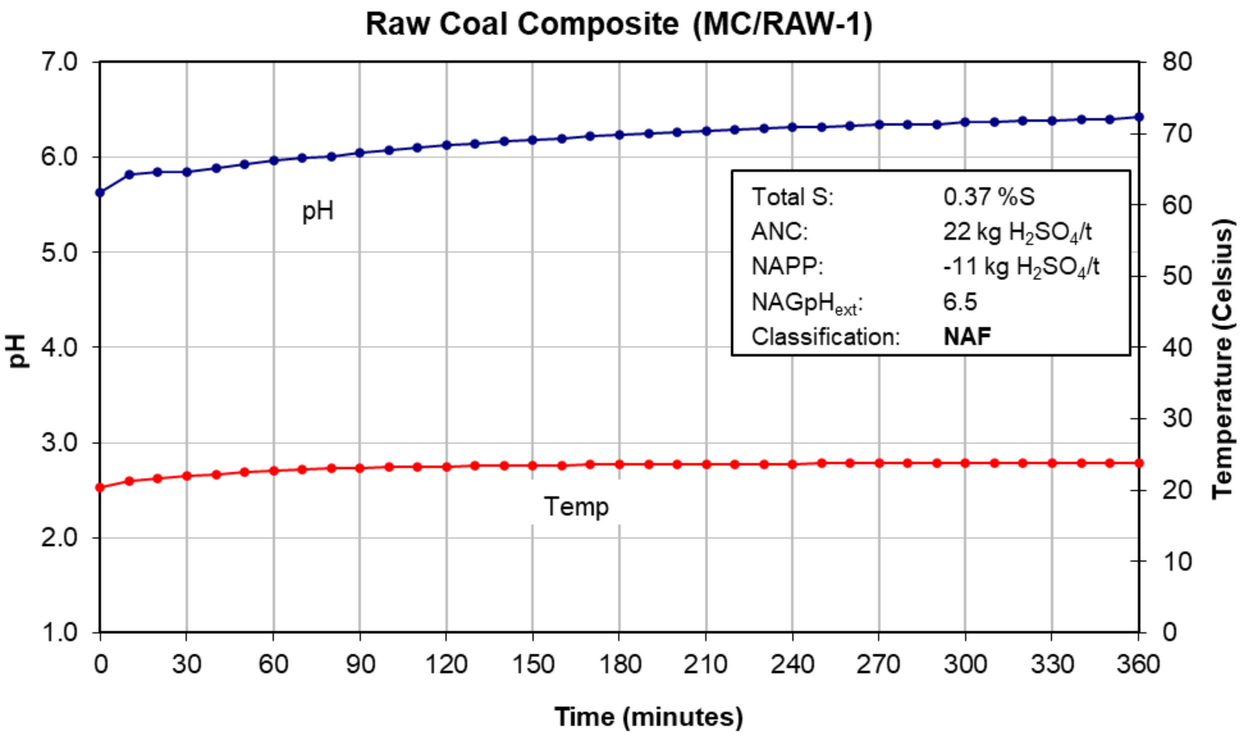

Figure E-1: Kinetic NAG test profiles for the Raw Coal Composite (Sample MC/RAW-1).

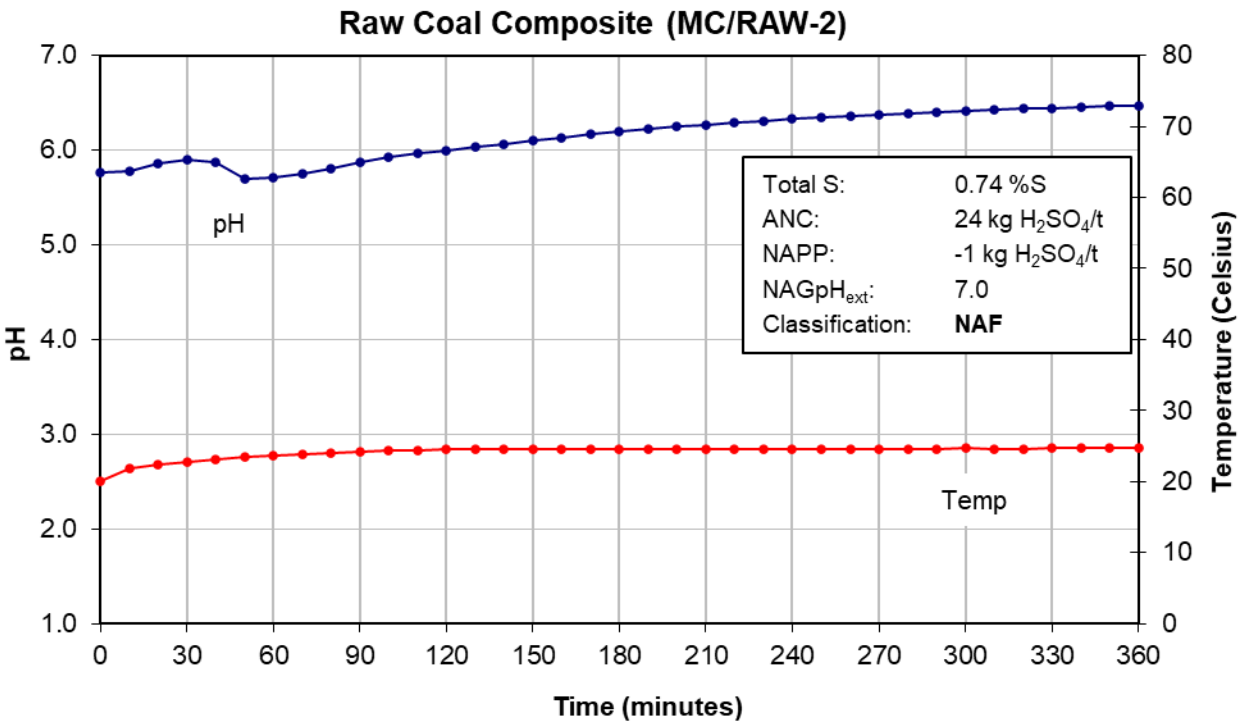

Figure E-2: Kinetic NAG test profiles for the Raw Coal Composite (Sample MC/RAW-2).

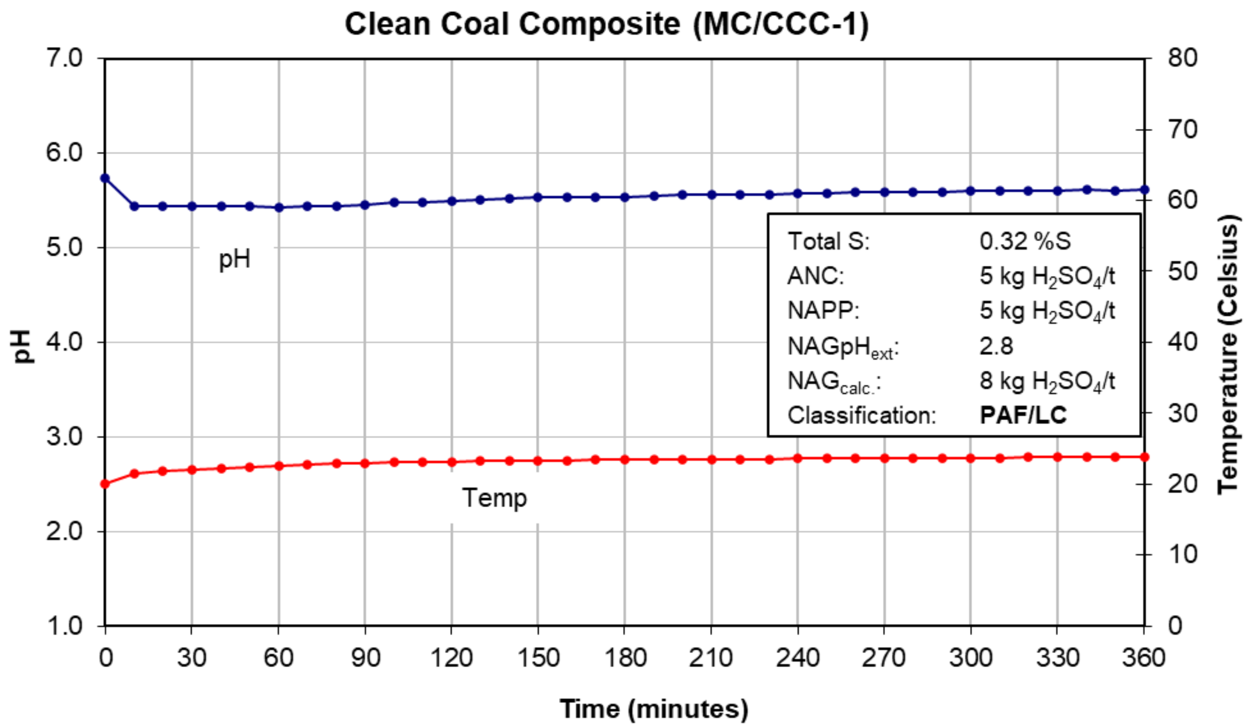

Figure E-3: Kinetic NAG test profiles for the Washed Coal Composite (Sample MC/CCC-1).

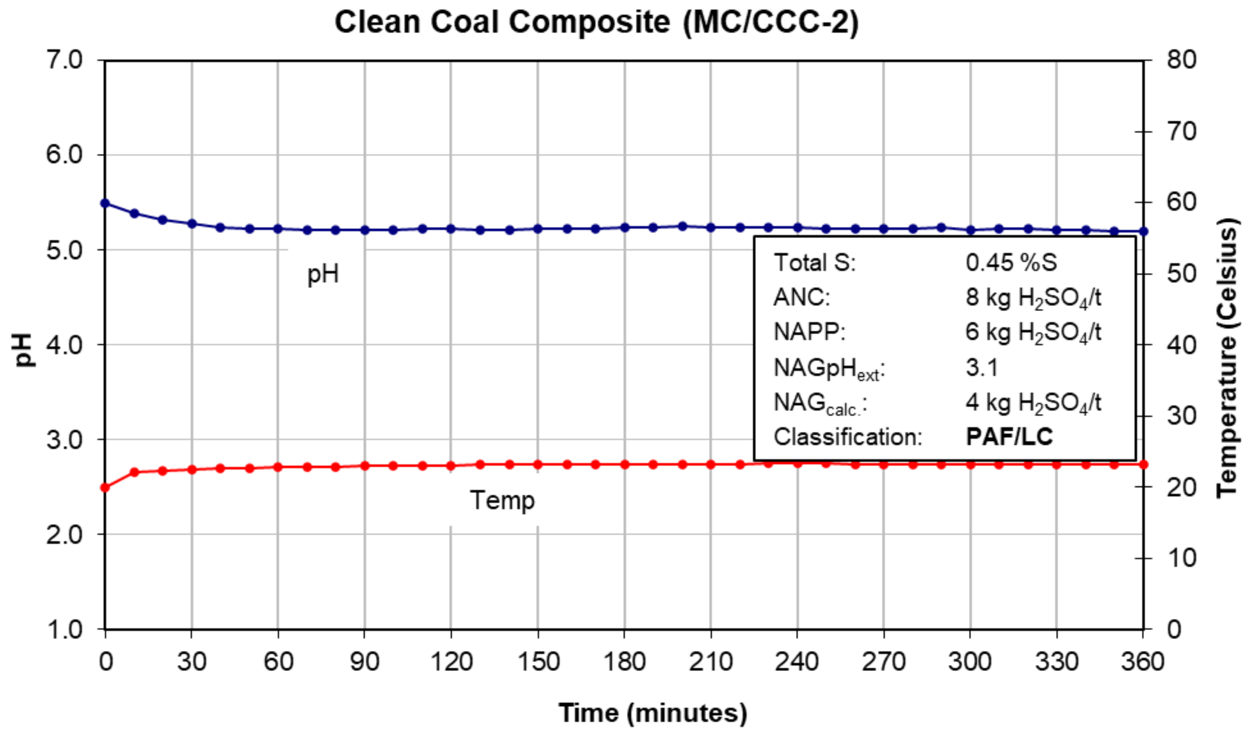

Figure E-4: Kinetic NAG test profiles for the Washed Coal Composite (Sample MC/CCC-2).

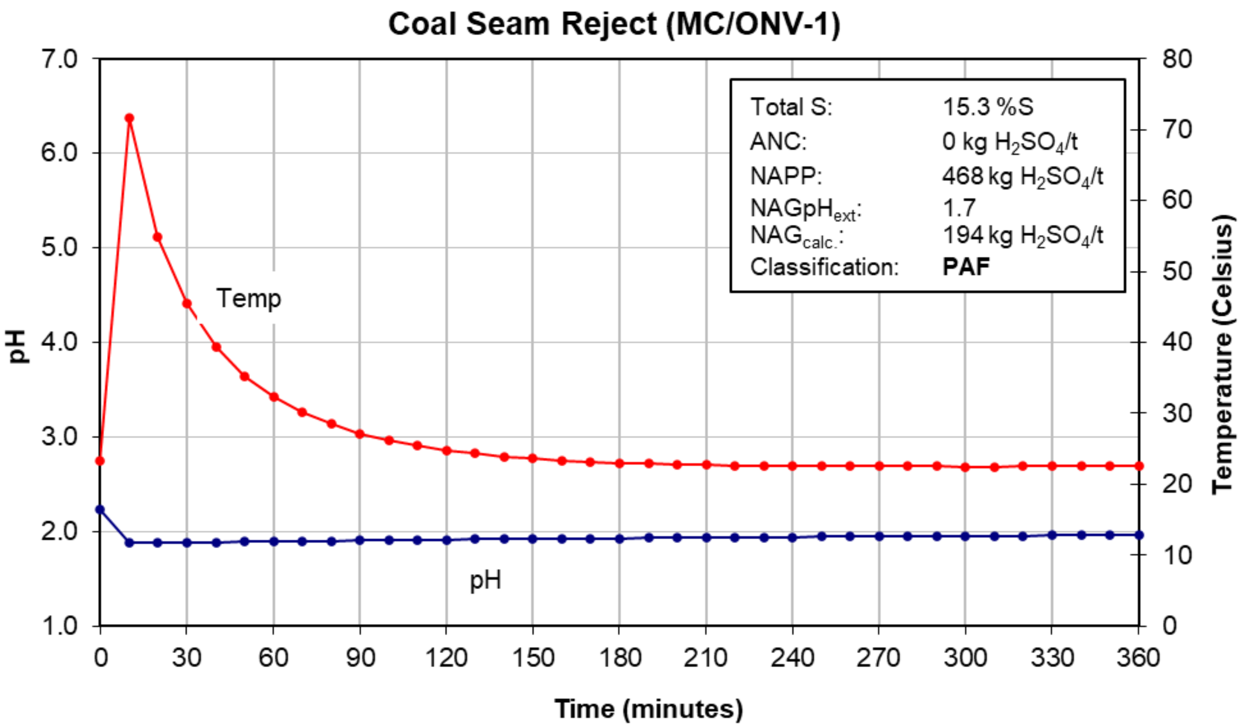

Figure E-5: Kinetic NAG test profiles for the Coal Seam Reject (Sample MC/ONV-1).

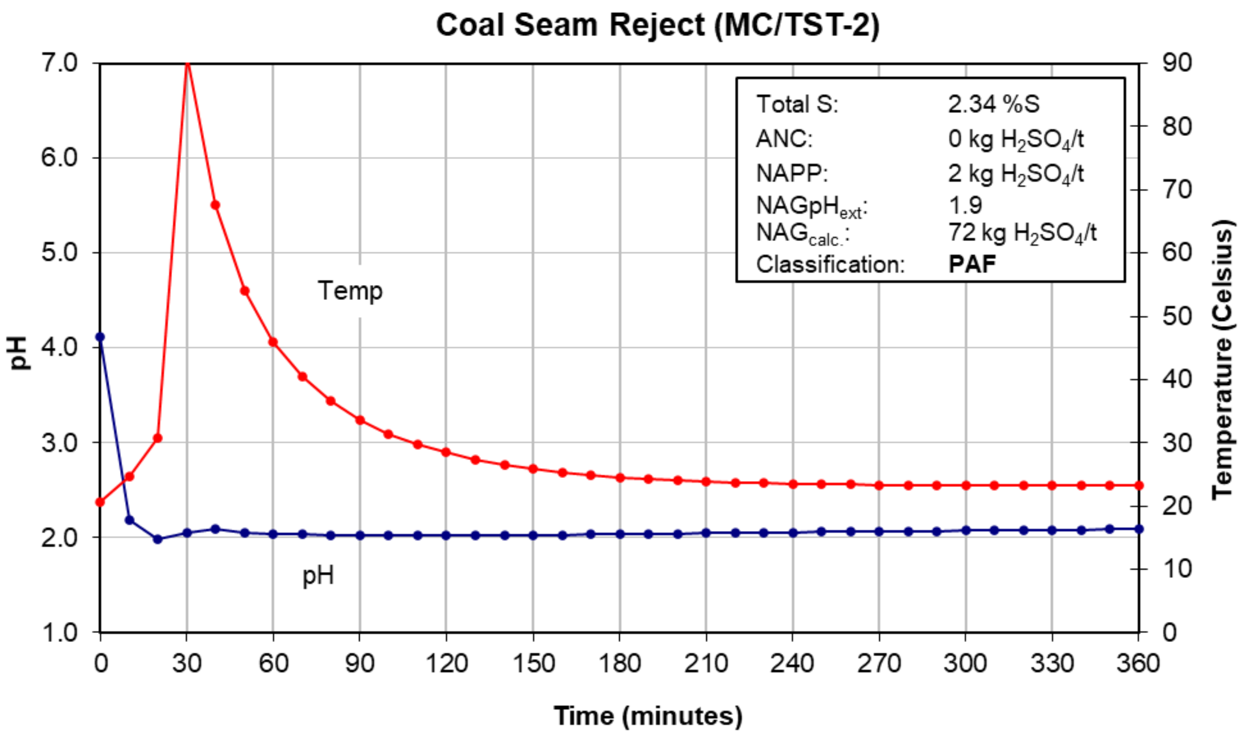

Figure E-6: Kinetic NAG test profiles for the Coal Seam Reject (Sample MC/TST-2).

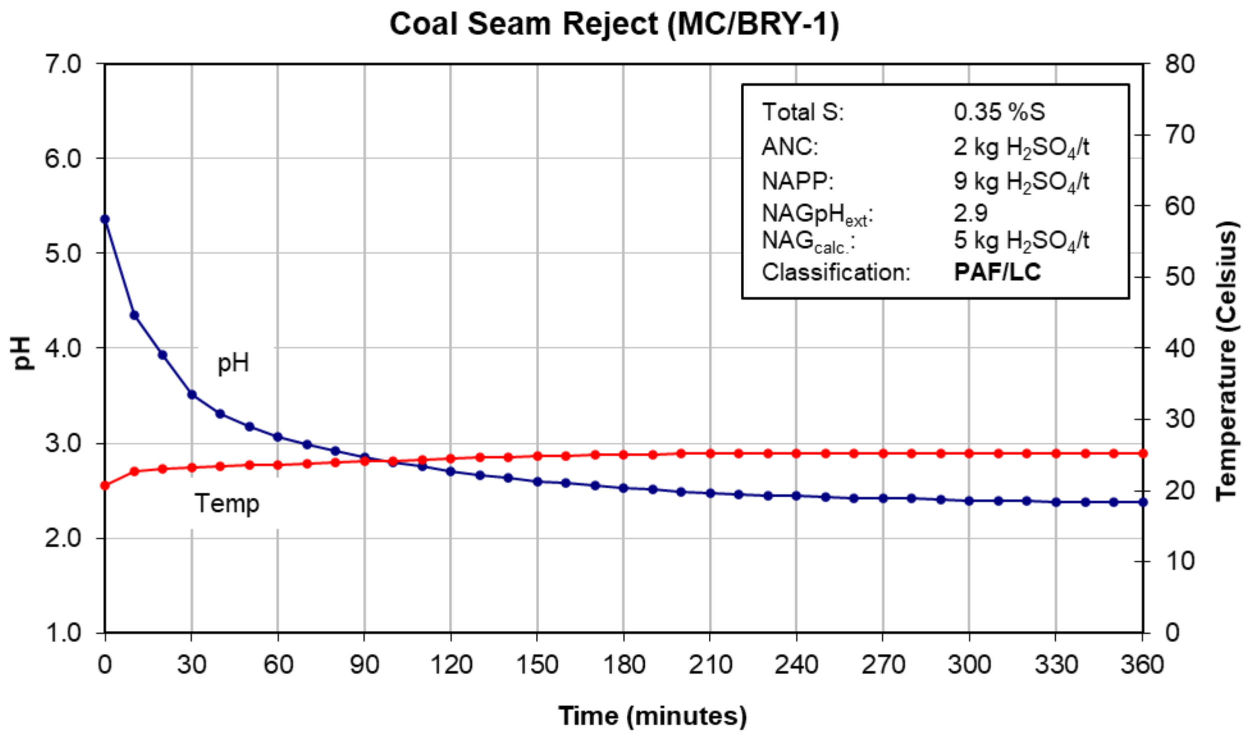

Figure E-7: Kinetic NAG test profiles for the Coal Seam Reject (Sample MC/BRY-1).

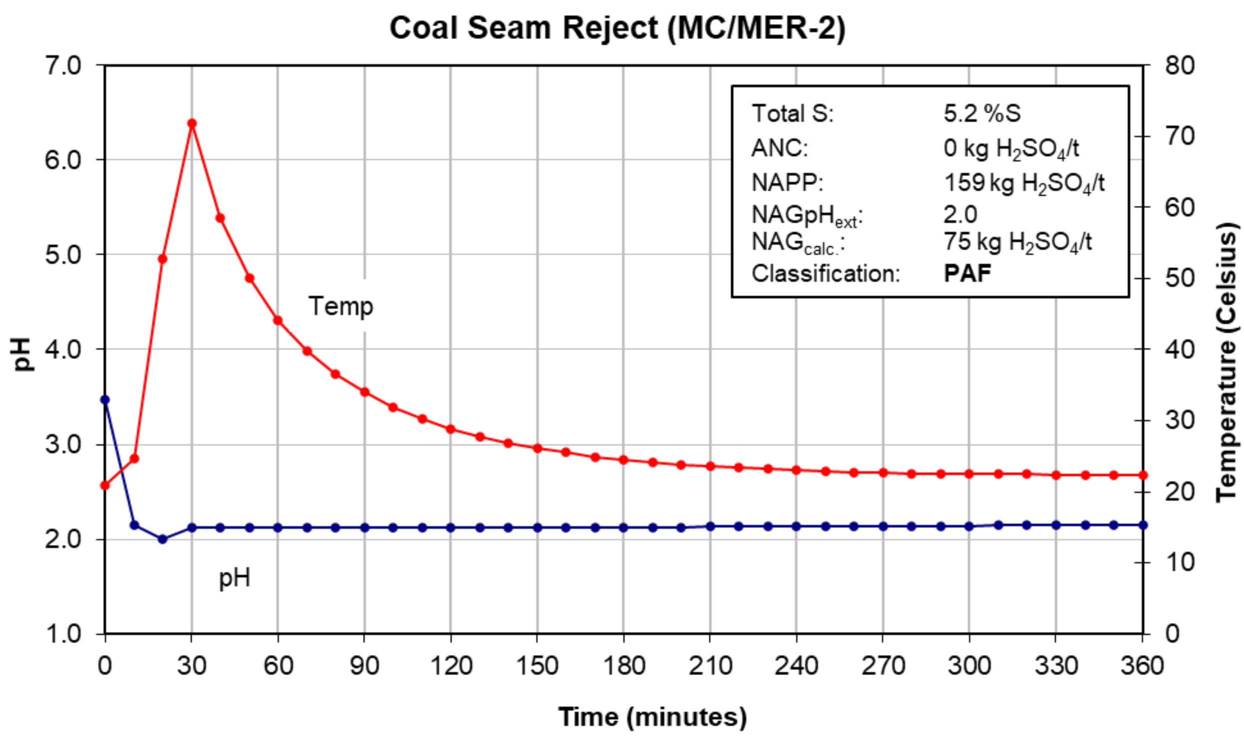

Figure E-8: Kinetic NAG test profiles for the Coal Seam Reject (Sample MC/MER-2).

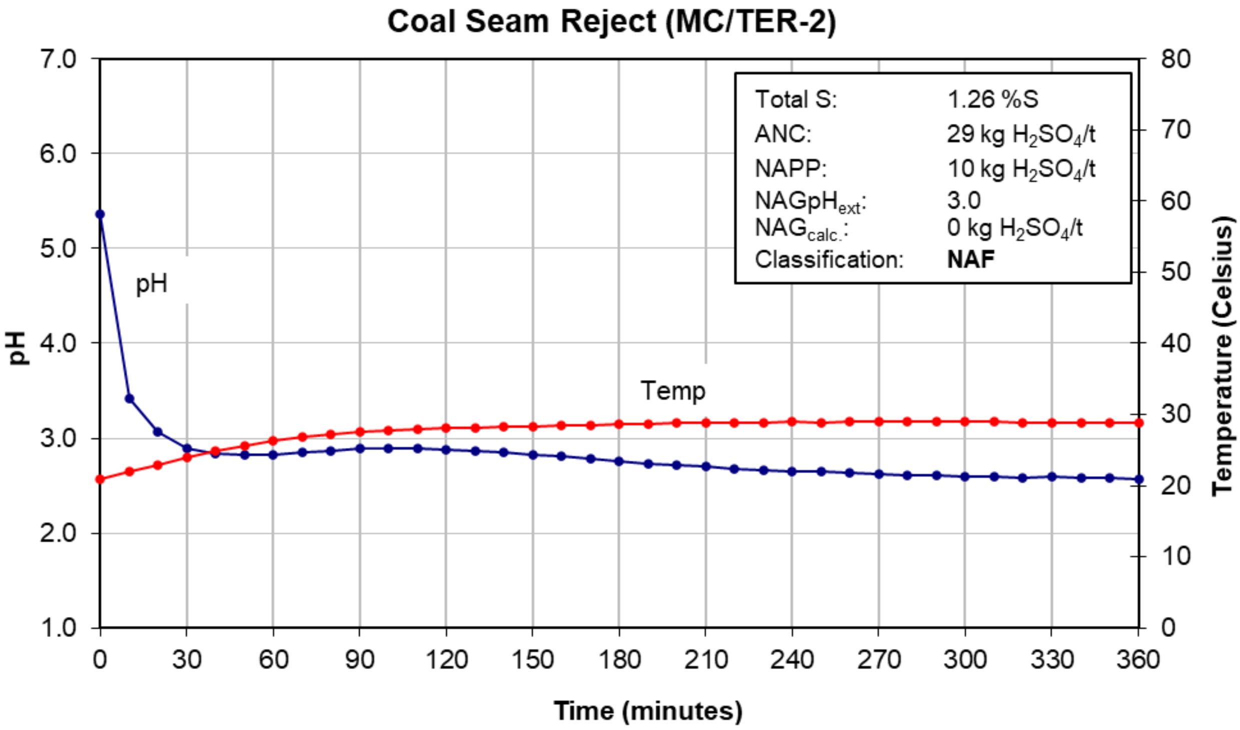

Figure E-9: Kinetic NAG test profiles for the Coal Seam Reject (Sample MC/TER-2).