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DATE:	7 December 2012
SUBJECT:	Preliminary Report on the First Stage Geochemical Assessment of the Galilee Coal Project

Introduction

Environmental Geochemistry International Pty Ltd (EGi) have been commissioned by Coffey Environments on behalf of Waratah Coal Pty Ltd (Waratah Coal) to carry out a geochemical assessment of the Galilee Coal Project, a multi-seamed thermal coal resource within the Galilee Basin located approximately 30 km north of the town of Alpha in Central Queensland. The objectives of the work are to:

- assess the acid rock drainage (ARD), salinity and elemental solubility (including neutral mine drainage, NMD) potential of the proposed mine materials;
- identify any geochemical issues; and
- provide recommendations for materials management and any follow up test work required.

This memorandum provides preliminary findings based on work completed to date. It incorporates: findings from a site visit in May 2012 to view the project area and examine drill core through the mine stratigraphic sequence; a review of project data; and assessment of initial ARD testing completed on overburden/interburden samples collected from 4 drillholes in the project area. Additional geochemical testing of overburden/interburden is in progress, and samples are being prepared to represent coal, coarse rejects and fine rejects materials.

Background and Geology

The main target coal seams are (from youngest to oldest) B, C and D Seams. The proposed project would involve development of 4 underground mines, 2 open cut mines (10km and 15km strike lengths) and 2 coal preparation plants. Surface mining would involve a combination of walking draglines for overburden removal in conjunction with truck and shovel fleets for handling of partings and coal. Underground development would be carried out using large scale long-wall mining. Rejects and tailings disposal areas would be integrated within mine spoil areas.

The coal is hosted by the late Permian Bandanna formation (A and B Seam) and Colinlea Sandstone (from C Seam down), which are understood to have been deposited under a dominantly fluvial/lacustrine environment. Lithologies comprise mainly lithic sandstone, siltstone, claystone, carbonaceous mudstone and coal. The seams dip gently (1-2°) to the west, and appear to be free of significant faulting and displacement. The B Seam is separated from the C Seam by a 90m thick sequence of mainly sandstone, resulting in two north-south oriented bands of seam sub-crop, with A and B Seams in the west and C and D Seams in the East. The proposed open pit development would follow these seam groupings, with the western pit targeting the B Seam and terminating in the B Seam floor, and the parallel eastern pit targeting C and D Seams and terminating in the DL Seam floor. Underground mining would target B and D Seams.

The Permian sedimentary rocks are unconformably overlain by a Triassic sedimentary sequence, which is part of the Great Artesian Basin, in the western part of the project area. The sequence includes (from oldest to youngest) the Rewan Formation, Dunda Beds and Clematis Sandstone. The Clematis Sandstone is an aquifer, and is separated from the Permian by the Rewan Formation and Dunda Beds, which act as a thick (100m to 175m) aquitard. Cainozoic sediments unconformably blanket the project area with thicknesses of up to 90m in eastern and central sections, and directly overly the Permian in the area of the proposed open cut pits. Weathering depth is variable, but extends from surface into the upper part of the Permian and is typically 30 to 50m deep. Figure 1 shows a typical stratigraphic section for the open cut area of the project, and Figure 2 is a schematic cross-section for the northern part of the project area.

Results of Core Examination

Two cored holes SK04 and WAR2809C were examined during the site visit to check for evidence of pyrite and neutralising carbonate occurrence, obtain a better understanding of the continuity and variation of the major rock types, and assess the suitability of the core for sampling. Both holes were representative of the full proposed mine stratigraphic sequence, with SK04 located on the northern margin and to the west of the western pit and hole WAR2809C located within the potential underground resource area in the southern part of the lease. Note that although hole WAR2809C is located around 8km west of the western pit margin and does not directly represent material to be open cut mined, it covers the same Permian stratigraphy.

Pyrite appeared to be generally very minor throughout the stratigraphy, and was mainly apparent by the presence of iron staining and jarosite and sulphate salts due to partial oxidation of pyrite. The pyrite mainly occurred as traces and as thin veneers on bedding surfaces associated with carbonaceous partings and lenses (Plate 1, 2 and 3), scattered blebs and spheroids in sandstone (Plate 4), and in one case associated with A Seam coal (Plate 5).

Plate 1: Jarosite and sulphate salts due to partial oxidation of pyrite associated with a thin carbonaceous layer. Hole SK04, depth 170.7m.

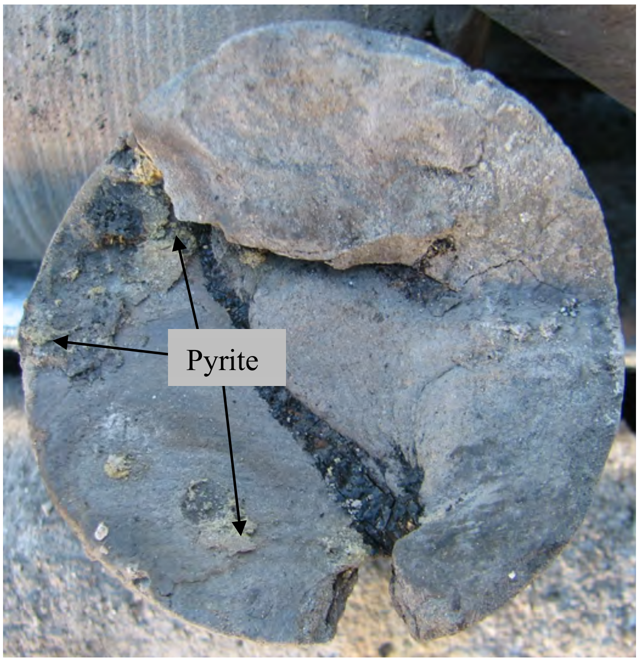

Plate 2: Minor pyrite on bedding plane associated with coaly parting. Hole SK04, depth 47m.

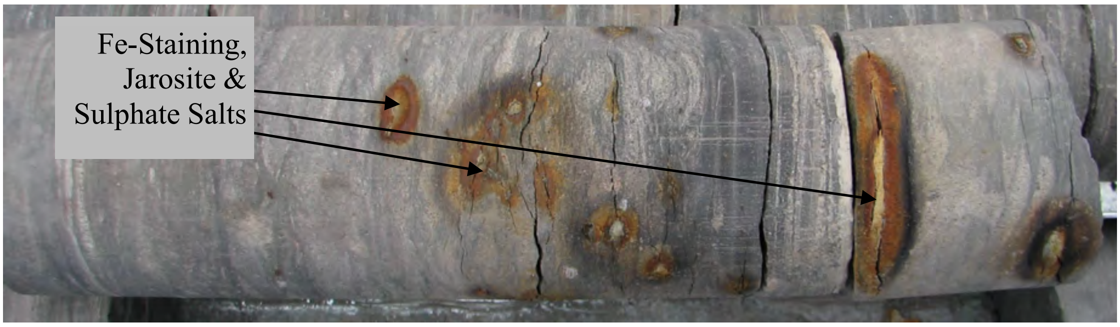

Plate 3: Iron staining, jarosite and sulphate salts due to partial oxidation of pyrite associated with carbonaceous layers and wisps. Hole WAR2809, depth 241.6m.

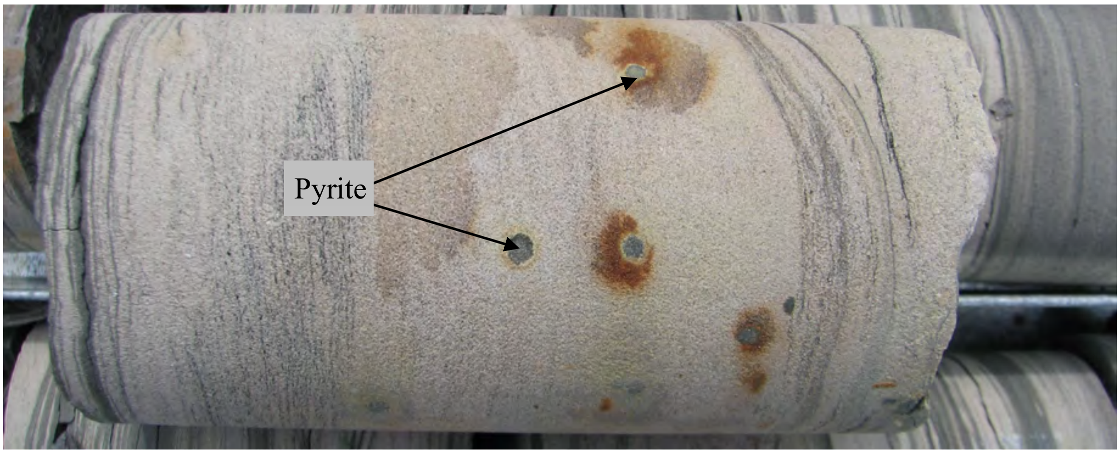

Plate 4: Scattered pyrite spheroids in sandstone with associated iron staining, jarosite and sulphate salts due to partial oxidation. Hole WAR2809, depth 294.6m.

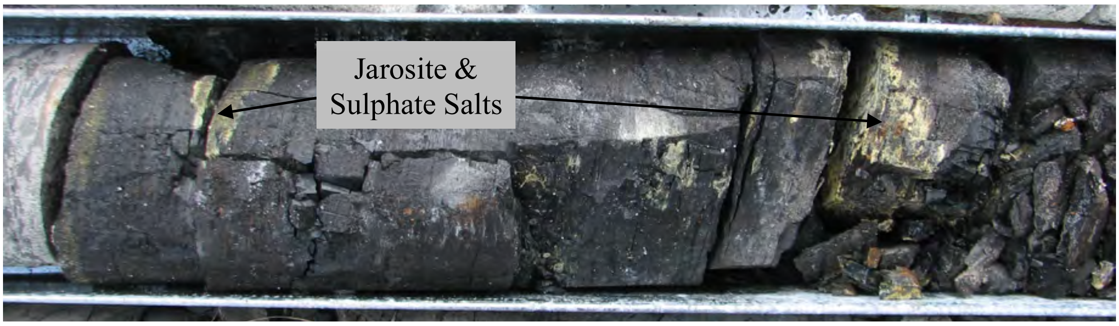

Plate 5: Jarosite and sulphate salts in coal from A Seam. Hole WAR2809, depth 153.7m.

Hole WAR2809C was drilled in November 2009, and with over 2 years of exposure any major pyritic zones should have been readily apparent as distinctive zones with jarosite and sulphate salts. Only two zones with significant pyrite were identified at depths of 246.0 to 247.5m, and 261.5 to 264.5m just above C Seam. The general lack of extensive pyrite oxidation products suggests the units intersected by WAR2809C are likely to have low pyrite contents overall.

Application of 10% HCl to rock containing significant amounts of reactive acid neutralising carbonates (such as calcite and dolomite) results in vigorous fizzing. Materials with high contents of reactive carbonate can be used to help mitigate ARD. During inspection of the core, 10% HCl was applied intermittently to provide an indication of the presence of reactive carbonate. Results showed common strong fizzing throughout the core, indicting the presence of reactive carbonate. Strong fizzing was observed mainly above C Seam. Below C Seam, fizzing was generally absent or weak, with intermittent stronger fizzing zones. The reactive carbonate was most often associated with carbonate grains or matrix in sandstone units (Plate 6), and sideritic lenses in siltstone and sandstone (Plate 7). The occasional intercepts of igneous rock also included veins of reactive carbonate within the igneous rock and in the surrounding country rock (Plate 8).

Plate 6: Sandstone with calcitic carbonate as grains or in the matrix, with bivalve fossil trace. Hole SK04, depth 70.7m.

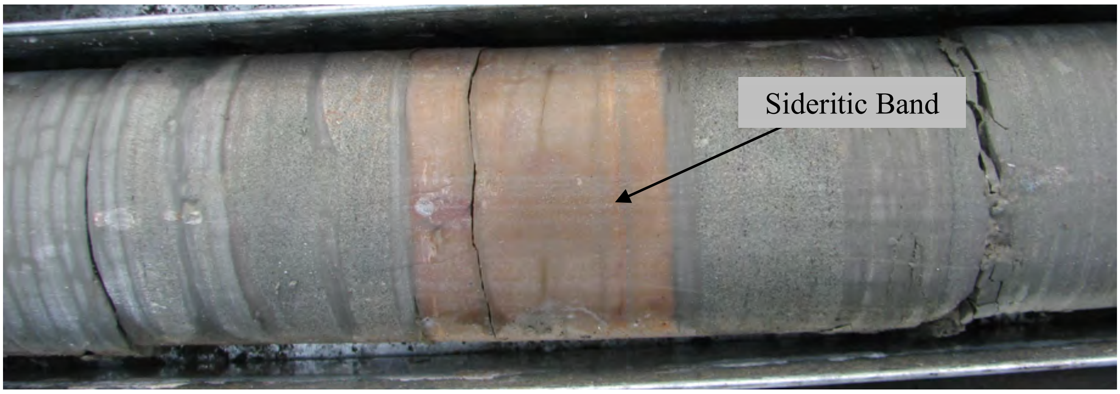

Plate 7: Siltstone/sandstone with calcitic carbonate associated with sideritic band. Hole WAR2809, depth 90.6m.

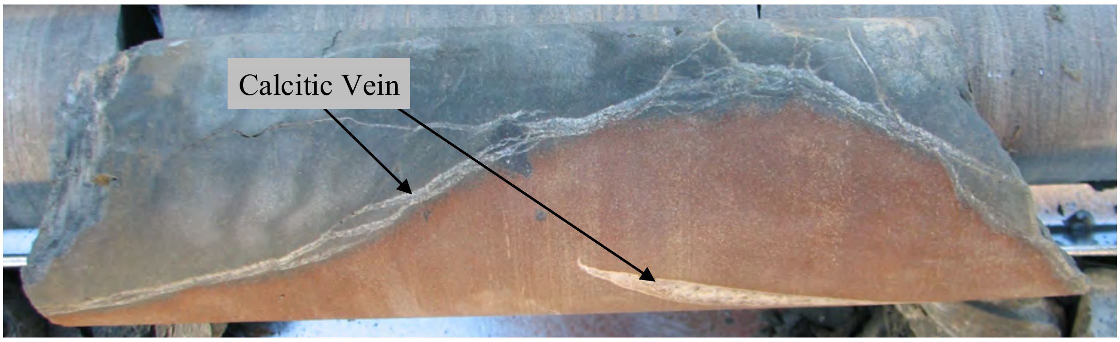

Plate 8: Calcitic veining associated with igneous rock. Hole SK04, 40.9m depth.

In summary, examination of the core shows that pyrite generally occurs in low abundances in overburden and interburden, apart from some isolated pyritic zones. The acid generation potential from pyrite in overburden and interburden is likely to be mostly offset by reactive acid neutralising calcitic carbonate.

Coal seam intervals had already been removed from most of the core examined, and no judgement can be made on the overall pyrite abundance in coal materials apart from some pyrite associated with A Seam in hole WAR2809C.

Sample Collection and Preparation

The distribution and abundance of pyrite in coal bearing sedimentary sequences are largely controlled by the original depositional environment, with influences such as seawater incursions and presence of organic matter key to pyrite formation. As a result of these controls, pyrite is usually preferentially distributed in particular lithologies (such as carbonaceous mudstones) and stratigraphic horizons. Coal sequences usually have high lithological variation in the vertical sense, but tend to show lateral continuity, and hence sampling for ARD assessment needs to take this into account by obtaining detailed continuous samples in individual holes spaced at wide intervals. The core sampling strategy carried out aimed to screen the entire mine stratigraphy for acid potential, identify horizons of concern and look for correlations between holes that indicate continuity, and rely on geological controls to help predict the distribution of potentially acid forming (PAF) and non-acid forming (NAF) rock types. This approach results in better representation of mine materials in coal deposits than purely lithological based sampling.

An initial sampling programme of 4 broadly spaced diamond holes was carried out to represent the proposed mine overburden and interburden stratigraphy across the project area. The holes sampled were SK04, WAR2809C, WAR3114C and WAR3312C, and hole collar locations are shown in Figure 3.

Sampling involved collection of detailed continuous samples in all four holes. Intervals were selected by Waratah Coal geologists in conjunction with EGi to match geological boundaries, with intervals ranging from less than 0.5m to over 5m. A total of 285 samples were collected. All samples were collected by site personnel.

This initial programme was focussed on sampling fresh Permian overburden/interburden materials using available core, since the weathered profile (Cainozoic cover sediments and weathered Permian) was not readily available to sample and was unlikely to have significant ARD potential. A follow up programme is planed which will involve sampling additional drillholes and including the weathered profile. Sampling of coal and equivalent washery waste materials is also planned.

Sample preparation of core was arranged by Waratah Coal geologists with advice from EGi, and was carried out by ALS Laboratory Group (Emerald), which involved drying (as required), crushing to a nominal -5mm, splitting, pulverising a 300g to 500g split to -212µm, and dispatch of 300g to 500g of -212µm pulverised samples and 500g -4mm crushed samples to EGi.

Methodology

All 285 overburden samples have been analysed for the following standard ARD tests:

- pH and electrical conductivity (EC) of deionised water extracts at a ratio of 1 part solid to 2 parts water ($pH_{1:2}$ and $EC_{1:2}$);
- Leco equivalent total S
- acid neutralising capacity (ANC);
- net acid producing potential (NAPP), calculated from total S and ANC; and
- standard single addition net acid generation (NAG) test.

Further testing will be carried out on selected samples to better define total acid generating capacities, relative reactivities of sulphides and neutralising components, and to help resolve uncertainties in the above test results, as follows:

- extended boil and calculated NAG testing to account for high organic carbon contents;
- sulphur speciation testing;
- kinetic NAG test;
- sequential NAG test; and
- acid buffering characteristic curve (ABCC) test.

A general description of ARD test methods and calculations used is provided in Attachment A.

In addition, selected samples will be assayed for the following to identify any potential elemental concerns and to provide initial elemental solubility data:

- multi-element scans of solids; and
- multi-element scans of single stage deionised water batch extracts (ratio of 1 part solid to 2 parts water).

Selected samples will also tested for soluble and exchangeable cations to provide an initial indication of sodicity and dispersion potential.

Total sulphur assays were arranged by Waratah Coal and were carried out by ALS Laboratory Group (Emerald). Analysis of pH/EC, ANC, NAPP and NAG were carried out by EGi.

Fresh Overburden/Interburden Results

Acid forming characteristics of overburden/interburden samples are presented in Table 1, comprising pH and EC of water extracts, total S, maximum potential acidity (MPA), ANC, NAPP, ANC/MPA ratio and single addition NAG.

pH and EC

The $pH_{1:2}$ and $EC_{1:2}$ results were determined by equilibrating the sample in deionised water for approximately 16 hours at a solid to water ratio of 1:2 (w/w). This gives an indication of the inherent acidity and salinity of the waste material when initially exposed in a waste emplacement area.

The $pH_{1:2}$ values ranged from 2.5 to 9.2, with the vast majority (97%) of samples showing no inherent acidity with a pH greater than 6. Only 4 of the samples tested (4259, 4260, 4316 and 4392) had an acidic pH of less than 4.0, associated with elevated S of 0.77% to 4.56%S.

$EC_{1:2}$ values ranged from 0.12 to 6.76 dS/m with most samples (96%) falling within the non-saline to slightly saline range with an EC of 0.8 dS/m or less. The 4 samples with acidic pH values and elevated S were also moderately saline to saline, with EC values greater than 0.8 dS/m. This indicates that lower $pH_{1:2}$ and higher $EC_{1:2}$ values in the fresh overburden/interburden are primarily the result of partial pyrite oxidation occurring between sample collection and sample testing.

One additional sample (4182) had a saline EC of 2.2 dS/m, also associated with elevated S of 0.48%S, but with a pH of 8.3 and moderate ANC of 16 kg H_2SO_4/t. In this case partial pyrite oxidation is likely to have occurred, but the ANC was sufficient to buffer any acid released, hence the slightly alkaline pH.

Results indicate low immediately available acidity and salinity in the samples except where pyrite is present and it has partially oxidised.

Acid Base (NAPP) Results

Total S ranges from below detection to 4.6%S, with 93% of samples having very low total S of 0.05%S or less. ANC ranges up to 279 kg H_2SO_4/t, with a moderate ANC median of 20 kg H_2SO_4/t. Results are consistent with the apparent general lack of pyrite and excess reactive carbonate observed during inspection of core.

The NAPP value is an acid-base account calculation using measured total S and ANC values. It represents the balance between the MPA and ANC. A negative NAPP value indicates that the sample may have sufficient ANC to prevent acid generation. Conversely, a positive NAPP value indicates that the material may be acid generating.

Figure 4 is an acid-base account plot of ANC versus total S. The NAPP zero line is shown which defines the NAPP positive and NAPP negative domains, and the line representing an ANC/MPA value of 2 is also plotted. Note that the NAPP = 0 line is equivalent to an

ANC/MPA of l. The ANC/MPA value is used as an indication of the relative factor of safety within the NAPP negative domain. Usually a ratio of 2 or more signifies a high probability that the material will remain circum-neutral in pH and thereby should not be problematic with respect to ARD.

The results show that the majority of samples tested plot in the NAPP negative domain with low S and ANC/MPA ratios of 2 or more, indicating a high factor of safety. Only ten samples plot in the NAPP positive domain.

Single Addition NAG Results

Generally a NAGpH value less than 4.5 indicates a sample may be acid forming. However, samples with high organic carbon contents (such as coal and carbonaceous sedimentary materials) can cause interference with standard NAG tests due to partial oxidation of carbonaceous materials. This can lead to low NAGpH values and high acidities in standard single addition NAG tests unrelated to acid generation from sulphides.

Most samples (85%) had NAGpH values of 4.5 and greater, indicating they are likely to be non acid forming (NAF). Thirty four samples had a NAGpH less than 4.5, but many of these were associated with carbonaceous horizons and coal seams, and results are inconclusive in isolation due to potential organic acid effects. Standard NAG test results affected by organic acids are highlighted in yellow in Table 1.

NAG test results are used in conjunction with NAPP values to classify samples according to acid forming potential. Figure 5 is an ARD classification plot showing NAGpH versus NAPP value. Potentially acid forming (PAF), NAF and uncertain (UC) classification domains are indicated. A sample is classified PAF when it has a positive NAPP and NAGpH < 4.5, and NAF when it has a negative NAPP and NAGpH ≥ 4.5. Samples are classified uncertain 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.

The plot shows that most samples (85%) plot in the NAF domain, with 9 samples plotting in the PAF domain, 25 samples plotting in the lower left uncertain domain and 1 sample plotting in the upper right uncertain domain.

A total of 250 samples plot in the NAF domain, and all have relatively low total S of less than 0.5%S.

PAF domain sample 4328 is a coal sample and organic acid effects on the NAG test are apparent, indicated by a large difference between the $NAG_{(pH4.5)}$ and $NAG_{(pH7.0)}$ values, and $NAG_{(pH4.5)}$ values that exceed the MPA. The NAG results overestimate the acid potential in this sample. Specialised testing will be carried out to confirm the classification of this sample, but it is conservatively assumed to be PAF at this stage. Three of the PAF domain samples have NAG to pH 4.5 values of less than 5 kg H_2SO_4/t and are classified PAF with a low capacity (PAF-LC). The remaining PAF domain samples have NAG to pH 4.5 values of greater than 5 kg H_2SO_4/t and are classified PAF.

Of the 25 samples plotting in the lower left uncertain domain, 21 have a total S of 0.05%S or less and have negligible risk of generating ARD and the samples are classified NAF. The acidic NAGpH for these samples is due to either organic acid effects (highlighted in yellow) or a lack of buffering and the effects of residual hydrogen peroxide in the test solution. The remaining 4 samples are conservatively assumed to be PAF-LC. Further testing is in progress to confirm the classification of these samples.

The sample plotting in the upper right uncertain domain has low total S of 0.27%S and low ANC of 6 kg H_2SO_4/t, and the NAG test would normally account for all pyritic S in the sample. This sample is expected to be NAF in accordance with the NAG results.

Sample Classification and Distribution of ARD Rock Types

Results and discussions above were used to classify samples as NAF, PAF, PAF low capacity (PAF-LC) or UC in Table 1. PAF-LC samples are defined as having an acid capacity of 5 kg H_2SO_4/t or less. All samples with S values of less than or equal to 0.05%S were classified NAF due to the negligible risk of acid formation. Results show that the vast majority of fresh overburden/interburden is likely to be NAF, accounting for 95% of samples tested.

Figure 6 is a plot of total S profiles for the drillholes tested. In addition to total S, the hole profiles also show coal seams and sample ARD classification, with NAF (including UC(NAF)) samples represented as blue symbols, PAF-LC (including UC(PAF-LC)) samples as orange symbols, and PAF (including UC(PAF)) samples as red symbols. The holes are approximately aligned according to coal seam stratigraphy. The plot emphasises the lack of elevated S and PAF materials in most of the overburden/interburden sequence. The main PAF horizon appears to be associated with the C Seam roof, with PAF-LC materials associated with C Seam partings, DU Seam roof and floor and DU Seam roof. There is also an isolated potentially PAF coal seam below DU Seam in hole WAR3312C.

Figure 7 shows ANC profiles with the same information as Figure 6. The profiles show broad zones of moderate to high ANC in fresh overburden/interburden down to about 20 to 30m above C Seam. ANC is low below this zone. Results are consistent with core observations, and confirm the presence of significant excess buffering available in overburden/interburden, which will assist management of the isolated PAF horizons identified to date.

Preliminary Conclusions and Implications for Mine Materials Management

Results to date indicate that the vast majority of fresh overburden and interburden is likely to be NAF with significant excess buffering. Zones of moderate to high ANC were apparent in fresh overburden and interburden down to within 20 to 30m of the C Seam roof, with low ANC thereafter. The main PAF horizon appears to be within 5m of the C Seam roof, with low capacity PAF materials associated with C Seam partings, DU Seam roof and floor and DU Seam roof.

Further test work is being carried out to geochemically classify samples (including coal, coarse rejects and fine rejects), but in the interim it should be conservatively assumed that PAF materials would comprise the following:

- coarse and fine coal washery rejects;
- ROM coal and product coal;
- coal seam partings reporting to waste rock dumps;
- immediate roof and floor of coal seams including coal seam cleanings;
- overburden/interburden within 5m of C Seam roof; and
- overburden/interburden within 2m of DU Seam roof and floor.

It is understood the pit floor would mainly comprise the base of the B Seam and DL Seam. Test results to date indicate that the floor of both these seams would be mainly NAF.

Results have the following implications for mine materials management:

- Most of the overburden and interburden is expected to be NAF and will not require special handling for ARD control. NAF materials with elevated neutralising carbonate contents could be used to assist management of PAF materials.
- The small proportion of PAF indicated for overburden/interburden materials should allow considerable flexibility in mine materials management. The following management strategies for PAF overburden/interburden and washery waste materials should considered:
  - all out of pit dumps should be constructed with NAF material;
  - PAF materials should be preferentially placed in pit below the long term recovery water table level to allow inundation at closure and prevent long term exposure to atmospheric oxidation;
  - PAF materials should be placed in thin layers to a maximum height of no more than 5m, traffic compacted and immediately over-dumped with NAF spoil (single lift);
  - long term ARD control of any PAF materials placed above the long term recovery water table level should include a thick (not less than 20m) outer zone of NAF materials (preferably high ANC), and may require a designed cover or internal seal system to limit oxygen transfer and fluctuating moisture conditions in PAF materials;
  - blending of PAF and acid neutralising materials (limestone and/or high ANC NAF overburden/interburden) could be used to increase lag times before onset of acid conditions, and may be sufficient to control ARD, but would require trials and further investigation to confirm ratios and blending methods;

  - if placement of PAF in out-of-pit dumps is required, in addition to the thick outer zone and cover/seal system described for in-pit dumps, designs should ensure PAF materials are set back at least 100m from the outer face of the dump, and the immediate base of the dump should comprise a 2 to 5m thick layer of NAF material to help isolate overlying PAF materials from any water flow along the interface between the dump and natural ground. Blending of PAF materials with limestone and/or higher ANC NAF should also be carried out to increase lag times and factor of safety;
  - interim lifts/faces of placed PAF waste rock and washery wastes may need to be treated with crushed limestone for operational control of ARD before inundation can take place.

- Design of an appropriate cover or internal seal system for in-pit and out-of-pit dumps would require assessment of the hydraulic and physical properties of the various mine materials in conjunction with local climate controls to determine the type of cover system that is appropriate.
- Any materials with sodic/dispersion potential should be treated (with gypsum or lime) if exposed on dump surfaces or used in engineered structures.
- Any naturally saline materials may need to be isolated from growth horizons and drainage from these materials may need to be managed.
- The final open cut pit floor and underground workings are expected to be mainly NAF, but provision should be made for monitoring runoff/leachate, limestone spreading on exposed surfaces and water capture and treatment if required.
- If ROM and product coal stockpiles are likely to generate ARD, provision for capture of runoff/leachate, monitoring and lime/limestone treatment may be required.

In addition to the above, routine monitoring across the site should be carried out to provide checks on materials management and effects of ARD as follows:

- A programme of routine sampling and geochemical testing of overburden/interburden, washery waste and coal materials is recommended during operations to monitor variation in acid potential and to reconcile the predicted distribution of ARD rock types.
- Water quality monitoring of seepage and runoff from pit walls and floors, waste rock dumps, ROM stockpiles and washery waste disposal areas should be carried out to check for ARD generation, assess the performance of management strategies, and determine and/or refine NAF/PAF blending ratios and lime and limestone treatment requirements.
- Routine site water quality monitoring programmes should include pH, EC, acidity/alkalinity, Ca, Mg, SO_4, Al, As, Cd, Co, Cu, Fe, Mn, Ni, Se and Zn to monitor for effects of pyrite oxidation and acid and neutral mine drainage.

- The distribution and extent of sodic/dispersive and saline materials may also need to be investigated further.

Planned Follow Up Work

Geochemical investigations for the Galilee Coal Project are ongoing and will be carried out in a staged approach.

Stage 1 is the current initial testing programme in progress, which will involve:

- continued geochemical characterisation of the 285 fresh overburden and interburden samples from holes SK04, WAR2809C, WAR3114C and WAR3312C;
- retrieval and geochemical characterisation of coal quality samples from the same holes to ensure representation of the entire stratigraphy; and
- geochemical testing of equivalent ROM coal, product coal and coarse and fine rejects samples from laboratory washability investigations to provide an indication of the relative ARD potential of these materials.

Stage 2 involves expanding the coverage of testing with additional drilling, sampling and geochemical characterisation of samples from 4 to 6 holes. Samples would be collected continuously as for Stage 1 and include the weathered zone, which is not currently represented in sampling to date. Testing is likely to be simplified in Stage 2 and utilise selected ARD indicator parameters, rather than a full characterisation suite, calibrated based on Stage 1 findings.

Stage 3 comprises leach column kinetic testing, which would commence after Stage 1 and is likely be run in parallel with Stage 2. Leach columns provide information on leaching rates and geochemical evolution under atmospheric oxidation rates that can be related to field conditions. Results can be used in prediction of leachate water quality and contaminant loadings from mine materials for assessment of impacts on the receiving environment and to refine operational and long term management strategies. The tests involve subjecting crushed waste rock (typically 2-3 kg of -4mm material) or as received process wastes (such as rejects) to wetting and drying cycles to encourage oxidation, with monthly sampling and analysis of leachates. These tests typically run for 12 months or more, and are normally be carried out as a follow up stage after the EIS process. Leach columns testing of the following materials is recommended:

- PAF overburden/interburden to determine lag times before onset of acid conditions and short and long term ARD potential to refine operational and long term management strategies.
- PAF, PAF-LC and NAF materials in various ratios to help assess the effectiveness of operational blending of ROM overburden/interburden.
- NAF materials to better evaluate neutral mine drainage chemistry.

In addition, further investigations may be require during operations to refine and optimise management strategies for PAF materials, including:

- Continued testing of overburden/interburden during infill drilling to further define the continuity and variation of PAF materials and higher ANC NAF materials.
- Geochemical characterisation of CHPP washery waste materials to define variability and overall acid potential, which will highlight opportunities for alternative management options such as blending with NAF overburden/interburden.
- Leach column testing of representative CHPP washery waste materials, including blends in various ratios with limestone and high ANC NAF material to help optimise blending ratios.
- Field trials of operationally placed and other blended ROM overburden/ interburden and CHPP washery waste materials to assess the effectiveness of operational blending and opportunities for reducing the need for selective handling of PAF materials.
- Assessment of the hydrological and oxidation processes occurring in spoil dumps during construction to identify options to optimise long term ARD controls.

Table 1: Acid forming characteristics of overburden/interburden and coal samples tested by EGi.

Hole Name	Depth (m)			Lithology	Seam	Weathering	Comments	Coal Quality Sample No	Galilee Sample No	EGi Sample Number	$pH_{1:2}$	$EC_{1:2}$	ACID-BASE ANALYSIS					SINGLE ADDITION NAG			ARD Classification
	From	To	Interval										Total %S	MPA	ANC	NAPP	ANC/MPA	NAGpH	$NAG_{(pH4.5)}$	$NAG_{(pH7.0)}$	
SK04	33.00	34.80	1.80	Sandstone		SW	Chip														
SK04	34.80	39.35	4.55	Sandstone		FR			80268	4126	8.4	0.24	<0.01	0	41	-41	266.09	8.4	0	0	NAF
SK04	39.35	41.44	2.09	Siltstone		FR			80269	4127	8.3	0.31	<0.01	0	108	-108	707.73	8.2	0	0	NAF
SK04	41.44	41.60	0.16	Core Loss																	
SK04	41.60	44.60	3.00	Siltstone		FR			80270	4128	8.5	0.28	<0.01	0	15	-14	95.71	6.5	0	0	NAF
SK04	44.60	46.04	1.44	Siltstone		FR			80271	4129	8.2	0.20	<0.01	0	16	-16	105.61	7.2	0	0	NAF
SK04	46.04	46.97	0.93	Sandstone/Siltstone		HW			80272	4130	8.1	0.42	<0.01	0	10	-10	68.46	6.9	0	0	NAF
SK04	46.97	47.43	0.46	Siltstone		FR			80273	4131	7.9	0.24	<0.01	0	13	-13	87.73	6.9	0	0	NAF
SK04	47.43	47.60	0.17	Core Loss																	
SK04	47.60	50.71	3.11	Siltstone		FR			80274	4132	7.8	0.23	<0.01	0	18	-18	119.59	7.1	0	0	NAF
SK04	50.71	51.72	1.01	Siltstone/Sandstone		FR			80275	4133	7.5	0.28	<0.01	0	30	-29	193.78	7.7	0	0	NAF
SK04	51.72	54.02	2.30	Sandstone		FR			80276	4134	7.6	0.28	<0.01	0	84	-84	551.28	8.2	0	0	NAF
SK04	54.02	55.97	1.95	Sandstone		FR			80277	4135	8.2	0.28	<0.01	0	36	-35	232.77	7.5	0	0	NAF
SK04	55.97	59.60	3.63	Siltstone		FR			80278	4136	8.1	0.35	<0.01	0	22	-22	143.55	7.7	0	0	NAF
SK04	59.60	62.60	3.00	Siltstone		FR			80279	4137	8.0	0.36	<0.01	0	31	-31	202.58	7.9	0	0	NAF
SK04	62.60	65.60	3.00	Siltstone		FR			80280	4138	8.2	0.38	<0.01	0	48	-47	310.94	7.6	0	0	NAF
SK04	65.60	66.66	1.06	Sandstone		FR			80281	4139	7.9	0.32	<0.01	0	106	-106	694.07	7.8	0	0	NAF
SK04	66.66	67.04	0.38	Coal	A	FR		65091													
SK04	67.04	68.00	0.96	Sandstone		FR			80282	4140	8.2	0.31	<0.01	0	47	-47	306.31	7.4	0	0	NAF
SK04	68.00	71.60	3.60	Sandstone		FR			80283	4141	8.3	0.32	<0.01	0	149	-149	972.30	7.7	0	0	NAF
SK04	71.60	74.66	3.06	Sandstone		FR			80284	4142	7.9	0.23	<0.01	0	203	-203	1328.97	7.8	0	0	NAF
SK04	74.66	77.36	2.70	Sandstone		FR			80285	4143	8.4	0.34	<0.01	0	126	-126	821.96	7.9	0	0	NAF
SK04	77.36	78.21	0.85	Siltstone		FR			80286	4144	8.2	0.25	<0.01	0	19	-18	121.24	7.5	0	0	NAF
SK04	78.21	80.60	2.39	Sandstone		FR			80287	4145	9.2	0.34	<0.01	0	57	-56	369.86	8.1	0	0	NAF
SK04	80.60	83.60	3.00	Siltstone		FR			80288	4146	7.7	0.25	<0.01	0	22	-22	142.04	7.4	0	0	NAF
SK04	83.60	84.00	0.40	Sandstone		FR			80289	4147	8.4	0.22	<0.01	0	80	-80	523.37	7.6	0	0	NAF
SK04	84.00	84.11	0.11	Sandstone	B	FR		65082													
SK04	84.11	85.19	1.08	Coal	B	FR		65083													
SK04	85.19	85.49	0.30	Sandstone	B	FR		65084													
SK04	85.49	86.18	0.69	Coal	B	FR		65085													
SK04	86.18	86.33	0.15	Tuff	B	FR		65086													
SK04	86.33	86.60	0.27	Core Loss																	
SK04	86.60	86.94	0.34	Siltstone/Carb Mudstone		FR			80290	4148	8.5	0.28	<0.01	0	48	-47	310.66	7.5	0	0	NAF
SK04	86.94	87.04	0.10	Siltstone	B	FR		65087													
SK04	87.04	87.48	0.44	Coal	B	FR		65088													
SK04	87.48	87.80	0.32	Siltstone/Carb Mudstone	B	FR		65089													
SK04	87.80	89.67	1.87	Coal	B	FR		65090													
SK04	89.67	90.56	0.89	Coal	B-Seam	FR		65092													
SK04	90.56	90.66	0.10	Siltstone	B-Seam	FR		65093													
SK04	90.66	91.60	0.94	Siltstone		FR			80291	4149	8.2	0.28	<0.01	0	15	-14	95.07	7.2	0	0	NAF
SK04	91.60	93.58	1.98	Siltstone		FR			80292	4150	8.3	0.30	<0.01	0	14	-14	90.53	7.1	0	0	NAF
SK04	93.58	96.28	2.70	Sandstone		FR			80293	4151	8.4	0.21	<0.01	0	41	-41	269.33	7.6	0	0	NAF
SK04	96.28	96.47	0.19	Siltstone		FR			80294	4152	7.8	0.22	<0.01	0	21	-21	136.70	7.2	0	0	NAF
SK04	96.47	100.45	3.98	Sandstone		FR			80295	4153	7.5	0.18	<0.01	0	51	-51	333.07	7.8	0	0	NAF
SK04	100.45	100.63	0.18	Carb Mudstone		FR			80296	4154	7.4	0.18	<0.01	0	4	-4	28.37	2.5	19	37	NAF
SK04	100.63	104.20	3.57	Sandstone		FR	Coal at base		80297	4155	8.3	0.24	<0.01	0	178	-178	1166.12	7.9	0	0	NAF
SK04	104.20	107.60	3.40	Sandstone		FR			80298	4156	7.7	0.25	<0.01	0	34	-34	223.89	7.8	0	0	NAF
SK04	107.60	110.60	3.00	Sandstone		FR			80299	4157	7.8	0.19	<0.01	0	123	-123	805.80	8.4	0	0	NAF
SK04	110.60	113.60	3.00	Siltstone		FR			80300	4158	8.2	0.18	<0.01	0	28	-28	182.07	8.1	0	0	NAF
SK04	113.60	116.60	3.00	Sandstone		FR			80301	4159	7.4	0.16	<0.01	0	53	-52	343.80	7.9	0	0	NAF
SK04	116.60	119.60	3.00	Sandstone		FR			80302	4160	7.5	0.15	<0.01	0	135	-135	882.04	8.3	0	0	NAF
SK04	119.60	122.60	3.00	Sandstone		FR			80303	4161	6.8	0.14	<0.01	0	152	-152	995.80	8.2	0	0	NAF
SK04	122.60	125.60	3.00	Sandstone		FR			80304	4162	7.7	0.23	<0.01	0	45	-45	292.35	7.9	0	0	NAF
SK04	125.60	128.60	3.00	Sandstone		FR			80305	4163	8.3	0.24	<0.01	0	70	-70	456.73	8.0	0	0	NAF
SK04	128.60	131.03	2.43	Siltstone		FR			80306	4164	7.5	0.31	<0.01	0	35	-35	230.28	7.9	0	0	NAF
SK04	131.03	134.60	3.57	Sandstone		FR			80307	4165	6.8	0.33	<0.01	0	112	-112	730.75	8.1	0	0	NAF
SK04	134.60	137.60	3.00	Siltstone		FR			80308	4166	7.6	0.31	<0.01	0	43	-43	280.47	8.4	0	0	NAF
SK04	137.60	139.00	1.40	Siltstone		FR			80309	4167	8.3	0.33	<0.01	0	43	-43	279.00	8.3	0	0	NAF
SK04	139.00	142.60	3.60	Siltstone		FR			80310	4168	7.7	0.27	<0.01	0	38	-37	245.27	8.5	0	0	NAF
SK04	142.60	143.45	0.85	Sandstone		FR			80311	4169	6.7	0.28	<0.01	0	22	-21	141.29	7.5	0	0	NAF
SK04	143.45	143.60	0.15	Core Loss																	
SK04	143.60	146.60	3.00	Siltstone		FR			80312	4170	7.4	0.27	<0.01	0	68	-67	441.46	8.2	0	0	NAF
SK04	146.60	149.71	3.11	Siltstone		FR	Minor SS		80313	4171	8.0	0.38	<0.01	0	23	-22	147.88	7.4	0	0	NAF
SK04	149.71	150.70	0.99	Siltstone		FR			80314	4172	8.1	0.39	<0.01	0	20	-19	128.19	7.5	0	0	NAF

Table 1: Acid forming characteristics of overburden/interburden and coal samples tested by EGi.

Hole Name	Depth (m)			Lithology	Seam	Weathering	Comments	Coal Quality Sample No	Galilee Sample No	EGi Sample Number	$pH_{1:2}$	$EC_{1:2}$	ACID-BASE ANALYSIS					SINGLE ADDITION NAG			ARD Classification
	From	To	Interval										Total %S	MPA	ANC	NAPP	ANC/MPA	NAGpH	$NAG_{(pH4.5)}$	$NAG_{(pH7.0)}$	
SK04	150.70	152.60	1.90	Siltstone		FR			80315	4173	8.2	0.41	<0.01	0	28	-28	181.72	7.9	0	0	NAF
SK04	152.60	155.60	3.00	Siltstone		FR			80316	4174	8.5	0.41	<0.01	0	10	-10	66.48	7.1	0	0	NAF
SK04	155.60	157.00	1.40	Siltstone		FR			80317	4175	8.4	0.39	<0.01	0	8	-8	53.01	7.1	0	0	NAF
SK04	157.00	158.60	1.60	Siltstone/Clay		FR			80318	4176	7.8	0.43	<0.01	0	47	-47	308.87	7.6	0	0	NAF
SK04	158.60	161.15	2.55	Siltstone		FR			80319	4177	6.8	0.38	0.08	2	10	-8	4.28	5.1	0	0	NAF
SK04	161.15	162.11	0.96	Sandstone		FR			80320	4178	7.5	0.37	<0.01	0	52	-52	341.56	7.6	0	0	NAF
SK04	162.11	164.60	2.49	Siltstone		FR			80321	4179	7.6	0.35	<0.01	0	17	-17	109.33	7.5	0	0	NAF
SK04	164.60	168.00	3.40	Siltstone		FR			80322	4180	7.5	0.48	<0.01	0	12	-12	79.61	7.3	0	0	NAF
SK04	168.00	170.71	2.71	Siltstone		FR			80323	4181	8.2	0.35	0.40	12	14	-2	1.16	3.7	1	5	UC(PAF-LC)
SK04	170.71	171.26	0.55	Carb Mudstone		FR			80324	4182	8.3	2.21	0.48	15	16	-1	1.09	4.5	0	7	NAF
SK04	171.26	171.48	0.22	Conglomerate		FR			80325	4183	7.6	0.28	<0.01	0	27	-27	178.10	7.2	0	0	NAF
SK04	171.48	173.18	1.70	Carb Mudstone		FR			80326	4184	8.1	0.35	0.02	1	16	-15	25.63	6.9	0	0	NAF
SK04	173.18	173.92	0.74	Carb Mudstone		FR			80327	4185	7.8	0.23	0.01	0	16	-16	52.85	5.3	0	3	NAF
SK04	173.92	174.02	0.10	Carb Mudstone	C	FR		65094													
SK04	174.02	175.34	1.32	Coal	C	FR		65095													
SK04	175.34	175.43	0.09	Carb Mudstone	C	FR		65096													
SK04	175.43	175.88	0.45	Sandstone		FR			80328	4186	7.7	0.23	0.01	0	5	-5	16.25	6.9	0	0	NAF
SK04	175.88	176.60	0.72	Siltstone		FR			80329	4187	7.9	0.23	0.02	1	3	-2	5.07	4.8	0	2	NAF
SK04	176.60	177.69	1.09	Sandstone		FR			80330	4188	7.7	0.24	<0.01	0	3	-3	20.83	6.0	0	0	NAF
SK04	177.69	177.87	0.18	Carb Mudstone		FR			80331	4189	6.5	0.35	<0.01	0	4	-4	26.74	2.6	48	98	NAF
SK04	177.87	180.00	2.13	Sandstone		FR			80332	4190	7.5	0.31	0.27	8	9	-1	1.08	5.2	0	1	NAF
SK04	180.00	180.99	0.99	Sandstone		FR			80333	4191	7.6	0.32	0.25	8	9	-2	1.22	6.9	0	0	NAF
SK04	180.99	182.08	1.09	Coal	DU	FR		65097													
SK04	182.08	182.19	0.11	Tuff	DU	FR		65098													
SK04	182.19	182.60	0.41	Coal	DU	FR		65099													
SK04	182.60	183.71	1.11	Coal	DU	FR		65100													
SK04	183.71	183.81	0.10	Siltstone	DU	FR		65101													
SK04	183.81	185.26	1.45	Siltstone		FR			80334	4192	7.4	0.24	<0.01	0	4	-3	22.94	6.9	0	0	NAF
SK04	185.26	188.60	3.34	Sandstone		FR			80335	4193	8.0	0.25	<0.01	0	4	-4	25.86	6.0	0	2	NAF
SK04	188.60	189.60	1.00	Sandstone		FR			80336	4194	7.4	0.33	<0.01	0	8	-8	55.31	4.7	0	5	NAF
SK04	189.60	190.50	0.90	Sandstone		FR			80337	4195	8.2	0.23	<0.01	0	3	-3	19.78	4.8	0	6	NAF
SK04	190.50	190.54	0.04	Sandstone	DL	FR		65102													
SK04	190.54	191.25	0.71	Coal	DL	FR		65103													
SK04	191.25	191.53	0.28	Sandstone	DL	FR		65104													
SK04	191.53	191.66	0.13	Coal	DL	FR		65105													
SK04	191.66	192.40	0.74	Coal	DL	FR		65106													
SK04	192.40	193.69	1.29	Coal	DL	FR		65107													
SK04	193.69	193.79	0.10	Siltstone	DL	FR		65108													
SK04	193.79	194.41	0.62	Sandstone		FR			80338	4196	7.8	0.28	<0.01	0	6	-5	36.23	5.9	0	0	NAF
SK04	194.41	194.60	0.19	Core Loss																	
SK04	194.60	195.55	0.95	Mudstone					80339	4197	8.1	0.23	<0.01	0	3	-3	20.11	4.5	0	8	NAF
SK04	195.55	197.60	2.05	Sandstone					80340	4198	8.6	0.12	<0.01	0	3	-3	19.20	4.5	0	6	NAF
WAR3114C	89.00	89.60	0.60	Sandstone/Siltstone					17801	4199	8.0	0.24	<0.01	0	117	-117	762.54	8.7	0	0	NAF
WAR3114C	89.60	92.80	3.20	Sandstone					17802	4200	8.2	0.15	<0.01	0	82	-82	536.97	9.4	0	0	NAF
WAR3114C	92.80	98.00	5.20	Sandstone/Siltstone					17803	4201	8.3	0.18	<0.01	0	42	-42	272.31	8.9	0	0	NAF
WAR3114C	98.00	103.00	5.00	Sandstone/Siltstone					17804	4202	8.2	0.16	<0.01	0	23	-23	150.19	9.2	0	0	NAF
WAR3114C	103.00	108.00	5.00	Sandstone/Siltstone					17805	4203	8.4	0.20	<0.01	0	47	-47	308.72	9.1	0	0	NAF
WAR3114C	108.00	113.04	5.04	Sandstone/Siltstone					17806	4204	8.5	0.20	<0.01	0	31	-31	203.60	9.0	0	0	NAF
WAR3114C	113.04	116.74	3.70	Sandstone					17807	4205	8.2	0.19	<0.01	0	92	-92	602.63	8.6	0	0	NAF
WAR3114C	116.74	117.49	0.75	Sandstone/Siltstone					17808	4206	8.1	0.18	<0.01	0	27	-27	178.38	8.5	0	0	NAF
WAR3114C	117.49	119.11	1.62	Sandstone					17809	4207	8.1	0.35	<0.01	0	50	-50	328.37	8.7	0	0	NAF
WAR3114C	119.11	120.14	1.03	Claystone					17810	4208	7.7	0.37	<0.01	0	13	-13	84.98	7.4	0	0	NAF
WAR3114C	120.14	122.69	2.55	Sandstone					17811	4209	7.8	0.33	<0.01	0	69	-69	452.46	8.6	0	0	NAF
WAR3114C	122.69	124.00	1.31	Siltstone/Sandstone					17812	4210	8.3	0.23	<0.01	0	30	-30	193.87	8.1	0	0	NAF
WAR3114C	124.00	127.00	3.00	Siltstone/Sandstone			Rare Calcite		17813	4211	7.6	0.28	<0.01	0	20	-20	128.56	7.7	0	0	NAF
WAR3114C	127.00	130.00	3.00	Siltstone/Sandstone			Rare Calcite		17814	4212	7.7	0.28	<0.01	0	21	-21	138.59	7.6	0	0	NAF
WAR3114C	130.00	133.43	3.43	Siltstone/Sandstone			Rare Calcite		17815	4213	8.2	0.38	<0.01	0	54	-54	355.49	8.4	0	0	NAF
WAR3114C	133.43	137.58	4.15	Sandstone					17816	4214	7.9	0.35	0.01	0	7	-7	22.79	6.5	0	1	NAF
WAR3114C	137.58	140.72	3.14	Sandstone			Minor CM		17817	4215	6.1	0.54	0.27	8	3	5	0.38	3.0	6	7	PAF
WAR3114C	140.72	142.31	1.59	Siltstone					17818	4216	7.4	0.50	<0.01	0	11	-11	69.89	6.9	0	0	NAF
WAR3114C	142.31	143.36	1.05	Siltstone/Sandstone					17819	4217	8.2	0.42	<0.01	0	15	-15	96.84	7.1	0	0	NAF
WAR3114C	143.36	149.22	5.86	Sandstone					17820	4218	7.7	0.38	<0.01	0	30	-30	194.34	7.5	0	0	NAF
WAR3114C	149.22	153.15	3.93	Siltstone/Sandstone					17821	4219	7.6	0.43	<0.01	0	38	-38	247.20	7.7	0	0	NAF
WAR3114C	153.15	154.65	1.50	Sandstone/Carb Mudstone					17822	4220	8.3	0.36	<0.01	0	46	-45	297.53	7.8	0	0	NAF

Table 1: Acid forming characteristics of overburden/interburden and coal samples tested by EGi.

Hole Name	Depth (m)			Lithology	Seam	Weathering	Comments	Coal Quality Sample No	Galilee Sample No	EGi Sample Number	$pH_{1:2}$	$EC_{1:2}$	ACID-BASE ANALYSIS					SINGLE ADDITION NAG			ARD Classification
	From	To	Interval										Total %S	MPA	ANC	NAPP	ANC/MPA	NAGpH	$NAG_{(pH4.5)}$	$NAG_{(pH7.0)}$	
WAR3114C	154.65	158.13	3.48	Sandstone					17823	4221	7.5	0.44	<0.01	0	34	-34	222.91	7.9	0	0	NAF
WAR3114C	158.13	160.18	2.05	Siltstone/Sandstone					17824	4222	7.6	0.33	<0.01	0	79	-79	515.18	8.5	0	0	NAF
WAR3114C	160.18	162.90	2.72	Sandstone					17825	4223	7.7	0.33	0.01	0	64	-64	209.71	8.2	0	0	NAF
WAR3114C	162.90	165.31	2.41	Sandstone			Siderite		17826	4224	7.8	0.48	<0.01	0	74	-74	483.94	7.9	0	0	NAF
WAR3114C	165.31	169.08	3.77	Sandstone					17827	4225	8.1	0.41	<0.01	0	42	-42	275.70	8.9	0	0	NAF
WAR3114C	169.08	170.90	1.82	Siltstone/Sandstone					17828	4226	7.8	0.48	<0.01	0	30	-30	194.44	7.6	0	0	NAF
WAR3114C	170.90	172.80	1.90	Carb Mudstone/Tuff					17829	4227	7.7	0.37	0.05	2	17	-15	10.94	3.0	21	49	NAF
WAR3114C	172.80	173.80	1.00	Tuff/Carb Mudstone					17830	4228	8.2	0.35	0.01	0	15	-15	50.22	6.4	0	3	NAF
WAR3114C	173.80	174.50	0.70	Tuff/Carb Mudstone					17831	4229	7.9	0.38	<0.01	0	5	-5	35.40	6.9	0	0	NAF
WAR3114C	174.50	175.05	0.55	Tuff					17832	4230	7.8	0.33	<0.01	0	12	-12	79.55	6.9	0	0	NAF
WAR3114C	175.05	175.79	0.74	Coal	B2			287719													
WAR3114C	175.79	177.92	2.13	Coal/Tuff	B3/B4/B5/B7			287720													
WAR3114C	177.92	180.19	2.28	Coal	B7B81/B82/B83			287721													
WAR3114C	180.19	180.44	0.25	Siltstone					17833	4231	8.3	0.32	<0.01	0	20	-20	129.95	7.2	0	0	NAF
WAR3114C	180.44	181.76	1.32	Tuff					17834	4232	7.9	0.28	<0.01	0	8	-8	54.13	7.5	0	0	NAF
WAR3114C	181.76	183.94	2.18	Siltstone/Sandstone					17835	4233	8.2	0.24	<0.01	0	23	-23	153.17	7.6	0	0	NAF
WAR3114C	183.94	188.00	4.06	Sandstone			Minor ST		17836	4234	8.2	0.35	<0.01	0	80	-80	524.00	7.8	0	0	NAF
WAR3114C	188.00	191.43	3.43	Sandstone			Minor ST		17837	4235	8.5	0.55	<0.01	0	120	-120	782.71	7.9	0	0	NAF
WAR3114C	191.43	195.00	3.57	Clay					17838	4236	8.3	0.29	<0.01	0	73	-73	480.11	7.8	0	0	NAF
WAR3114C	195.00	198.00	3.00	Clay					17839	4237	8.4	0.28	<0.01	0	35	-35	228.37	7.7	0	0	NAF
WAR3114C	198.00	200.66	2.66	Clay			Not Available														
WAR3114C	200.66	201.82	1.16	Sandstone/Carb Mudstone					17841	4238	7.7	0.38	<0.01	0	38	-38	247.15	7.8	0	0	NAF
WAR3114C	201.82	203.00	1.18	Carb Mudstone					17842	4239	7.6	0.38	<0.01	0	20	-20	131.58	7.5	0	0	NAF
WAR3114C	203.00	204.08	1.08	Carb Mudstone					17843	4240	8.3	0.39	<0.01	0	190	-189	1239.02	8.6	0	0	NAF
WAR3114C	204.08	206.95	2.87	Sandstone					17844	4241	8.2	0.45	<0.01	0	60	-60	390.68	8.5	0	0	NAF
WAR3114C	206.95	210.45	3.50	Siltstone					17845	4242	8.1	0.42	<0.01	0	39	-39	255.14	8.4	0	0	NAF
WAR3114C	210.45	211.86	1.41	Carb Mudstone					17846	4243	7.8	0.52	<0.01	0	54	-54	352.10	8.1	0	0	NAF
WAR3114C	211.86	216.50	4.64	Sandstone					17847	4244	8.4	0.62	<0.01	0	92	-92	602.84	8.7	0	0	NAF
WAR3114C	216.50	220.94	4.44	Sandstone					17848	4245	8.9	0.96	<0.01	0	57	-56	369.31	8.5	0	0	NAF
WAR3114C	220.94	225.45	4.51	Sandstone					17849	4246	8.2	0.72	<0.01	0	45	-45	292.29	8.6	0	0	NAF
WAR3114C	225.45	229.52	4.07	Sandstone					17850	4247	8.5	0.55	<0.01	0	50	-50	329.78	9.2	0	0	NAF
WAR3114C	229.52	231.82	2.29	Sandstone/Siltstone			Minor TF		17851	4248	7.9	0.41	<0.01	0	70	-69	454.48	9.5	0	0	NAF
WAR3114C	231.82	234.52	2.71	Siltstone/Sandstone			Minor TF		17852	4249	8.4	0.39	<0.01	0	19	-19	125.97	9.4	0	0	NAF
WAR3114C	234.52	236.17	1.65	Siltstone/Sandstone					17853	4250	7.8	0.33	<0.01	0	58	-58	377.40	9.3	0	0	NAF
WAR3114C	236.17	239.52	3.35	Siltstone/Sandstone					17854	4251	7.7	0.43	<0.01	0	23	-23	153.08	8.2	0	0	NAF
WAR3114C	239.52	241.27	1.74	Carb Mudstone					17855	4252	8.2	0.15	<0.01	0	13	-13	84.42	6.9	0	0	NAF
WAR3114C	241.27	242.41	1.15	Sandstone/Tuff					17856	4253	7.9	0.19	0.01	0	26	-26	84.79	8.5	0	0	NAF
WAR3114C	242.41	243.40	0.99	Sandstone/Carb Mudstone					17857	4254	6.8	0.21	0.01	0	6	-6	19.95	3.2	12	33	NAF
WAR3114C	243.40	245.40	2.00	Sandstone/Siltstone					17858	4255	7.4	0.28	<0.01	0	4	-4	24.96	5.0	0	5	NAF
WAR3114C	245.40	246.27	0.87	Siltstone/Sandstone					17859	4256	6.7	0.33	<0.01	0	6	-6	37.39	6.4	0	1	NAF
WAR3114C	246.27	254.41	8.14	Sandstone					17860	4257	7.5	0.35	<0.01	0	4	-4	24.83	5.0	0	5	NAF
WAR3114C	254.41	254.78	0.37	Siltstone/Sandstone					17861	4258	7.2	0.36	0.27	8	6	2	0.71	4.6	0	7	UC(NAF)
WAR3114C	254.78	255.28	0.50	Siltstone/Sandstone			C Roof, Not Available														
WAR3114C	255.28	255.89	0.61	Sandstone					17863	4259	3.0	3.61	1.56	48	0	48	0.00	2.4	15	24	PAF
WAR3114C	255.89	256.22	0.33	Carb Mudstone			Minor Pyrite		17864	4260	2.5	6.76	4.56	140	0	140	0.00	2.0	61	98	PAF
WAR3114C	256.22	257.03	0.81	Coal	C			288710													
WAR3114C	257.03	258.22	1.19	Sandstone					17865	4261	7.2	0.22	0.02	1	3	-3	5.35	3.5	2	11	NAF
WAR3114C	258.22	258.72	0.50	Sandstone			C Floor	287712													
WAR3114C	258.72	258.93	0.20	Sandstone					17867	4262	6.7	0.23	0.05	2	5	-3	3.27	3.3	5	19	NAF
WAR3114C	258.93	260.71	1.78	Siltstone/Sandstone					17868	4263	7.5	0.25	<0.01	0	6	-6	39.38	5.9	0	1	NAF
WAR3114C	260.71	262.16	1.45	Sandstone					17869	4264	7.4	0.31	<0.01	0	7	-7	44.74	4.5	0	5	NAF
WAR3114C	262.16	262.72	0.56	Siltstone					17870	4265	6.4	0.20	<0.01	0	7	-7	46.73	5.7	0	1	NAF
WAR3114C	262.72	263.68	0.96	Siltstone/Sandstone					17871	4266	6.5	0.24	<0.01	0	6	-6	39.52	5.7	0	1	NAF
WAR3114C	263.68	265.85	2.17	Sandstone					17872	4267	7.2	0.22	<0.01	0	5	-5	31.72	3.6	2	12	NAF
WAR3114C	265.85	268.00	2.15	Sandstone					17873	4268	7.3	0.23	<0.01	0	7	-6	43.24	6.2	0	3	NAF
WAR3114C	268.00	269.60	1.60	Sandstone					17874	4269	7.5	0.22	<0.01	0	4	-4	27.40	4.5	0	7	NAF
WAR3114C	269.60	270.10	0.50	Sandstone			Geotech sample	287713													
WAR3114C	270.10	270.85	0.75	Sandstone					17875	4270	7.6	0.23	<0.01	0	4	-4	28.88	4.7	0	6	NAF
WAR3114C	270.85	271.53	0.68	Coal	DU			WR0002													
WAR3114C	271.53	272.54	1.01	Sandstone					17876	4271	6.7	0.20	0.02	1	3	-2	5.07	3.4	2	9	NAF
WAR3114C	272.54	273.95	1.41	Sandstone/Coal					17877	4272	6.6	0.19	0.08	2	4	-2	1.77	2.4	34	59	UC(PAF-LC)
WAR3114C	273.95	274.96	1.01	Sandstone					17878	4273	7.5	0.23	<0.01	0	4	-3	23.63	4.5	0	7	NAF
WAR3114C	274.96	275.44	0.48	Sandstone			DU Floor	287714													
WAR3114C	275.44	277.78	2.34	Sandstone					17879	4274	7.4	0.15	<0.01	0	3	-3	21.51	4.7	0	8	NAF

Table 1: Acid forming characteristics of overburden/interburden and coal samples tested by EGi.

Hole Name	Depth (m)			Lithology	Seam	Weathering	Comments	Coal Quality Sample No	Galilee Sample No	EGi Sample Number	$pH_{1:2}$	$EC_{1:2}$	ACID-BASE ANALYSIS					SINGLE ADDITION NAG			ARD Classification
	From	To	Interval										Total %S	MPA	ANC	NAPP	ANC/MPA	NAGpH	$NAG_{(pH4.5)}$	$NAG_{(pH7.0)}$	
WAR3114C	277.78	278.60	0.82	Sandstone					17880	4275	7.8	0.17	0.01	0	4	-3	12.16	3.3	3	14	NAF
WAR3114C	278.60	278.93	0.33	Siltstone					17881	4276	8.1	0.17	0.01	0	5	-5	17.36	3.1	7	23	NAF
WAR3114C	278.93	282.42	3.49	Sandstone			DL Roof	287715	287715	4277	8.3	0.19	<0.01	0	3	-3	20.40	4.5	0	8	NAF
WAR3114C	282.42	282.48	0.06	Siltstone					17882	4278	8.5	0.30	0.01	0	5	-5	17.64	4.2	0.1	6	NAF
WAR3114C	282.48	284.60	2.12	Coal	DL			287716													
WAR3114C	284.60	284.89	0.29	Coal	DL			287717													
WAR3114C	284.89	285.19	0.30	Siltstone/Sandstone			DL Floor	287718													
WAR3114C	285.19	285.42	0.23	Coal			Not Available														
WAR3114C	285.42	285.87	0.44	Sandstone			Not Available														
WAR3312C	102.00	107.44	5.44	Sandstone					17901	4279	8.4	0.43	0.01	0	105	-105	344.75	8.2	0	0	NAF
WAR3312C	107.44	110.74	3.30	Sandstone					17902	4280	8.5	0.34	<0.01	0	66	-65	428.60	7.6	0	0	NAF
WAR3312C	110.74	115.17	4.43	Siltstone/Siderite			Siderite		17903	4281	8.2	0.35	<0.01	0	23	-22	147.82	7.8	0	0	NAF
WAR3312C	115.17	117.50	2.33	Claystone					17904	4282	7.7	0.43	<0.01	0	23	-23	152.80	8.1	0	0	NAF
WAR3312C	117.50	120.40	2.90	Claystone					17905	4283	8.2	0.30	0.01	0	24	-24	83.23	7.8	0	0	NAF
WAR3312C	120.40	120.65	0.25	Sandstone					17906	4284	8.3	0.44	0.02	1	16	-15	26.49	7.4	0	0	NAF
WAR3312C	120.65	122.00	1.35	Claystone					17907	4285	8.4	0.43	0.02	1	16	-15	24.96	7.5	0	0	NAF
WAR3312C	122.00	123.08	1.08	Claystone					17908	4286	7.9	0.38	0.02	1	21	-20	33.97	7.6	0	0	NAF
WAR3312C	123.08	123.53	0.45	Siltstone					17909	4287	8.2	0.39	0.02	1	28	-27	45.48	7.7	0	0	NAF
WAR3312C	123.53	125.47	1.94	Coal/Clay	B2/B3		Minor Calcite	287701													
WAR3312C	125.47	126.81	1.34	Coal/Clay	B4/B5			287702													
WAR3312C	126.81	127.59	0.78	Clay/Coal	B6/B7			287703													
WAR3312C	127.59	128.71	1.12	Coal	Coal			287704													
WAR3312C	128.71	130.00	1.29	Coal	B82/B83		Minor Py	287705													
WAR3312C	130.00	130.50	0.50	Sandstone/Mudstone					17910	4288	8.2	0.32	0.05	2	16	-14	10.14	7.1	0	0	NAF
WAR3312C	130.50	131.48	0.98	Sandstone					17911	4289	7.4	0.34	0.02	1	24	-23	36.53	7.6	0	0	NAF
WAR3312C	131.48	133.07	1.59	Claystone					17912	4290	8.4	0.35	0.02	1	14	-14	22.44	7.4	0	0	NAF
WAR3312C	133.07	133.58	0.51	Siltstone/Claystone					17913	4291	8.3	0.40	0.03	1	13	-12	15.02	6.9	0	0	NAF
WAR3312C	133.58	137.75	4.17	Sandstone					17914	4292	7.9	0.31	0.02	1	44	-43	69.94	7.8	0	0	NAF
WAR3312C	137.75	140.96	3.21	Sandstone					17915	4293	8.8	0.28	0.02	1	90	-89	144.11	7.9	0	0	NAF
WAR3312C	140.96	141.24	0.28	Siltstone					17916	4294	8.7	0.25	0.02	0	20	-20	41.38	7.2	0	0	NAF
WAR3312C	141.24	144.03	2.79	Sandstone					17917	4295	8.6	0.33	0.02	1	45	-45	71.09	7.9	0	0	NAF
WAR3312C	144.03	149.32	5.29	Sandstone					17918	4296	8.5	0.35	0.02	1	62	-61	111.28	7.8	0	0	NAF
WAR3312C	149.32	154.64	5.32	Sandstone					17919	4297	7.9	0.23	0.01	0	43	-43	113.01	8.1	0	0	NAF
WAR3312C	154.64	155.60	0.96	Mudstone					17920	4298	8.4	0.22	0.02	1	30	-29	52.06	8.0	0	0	NAF
WAR3312C	155.60	156.74	1.14	Mudstone					17921	4299	7.8	0.23	<0.01	0	30	-29	193.80	7.9	0	0	NAF
WAR3312C	156.74	161.00	4.26	Sandstone					17922	4300	8.5	0.25	<0.01	0	49	-49	319.30	8.2	0	0	NAF
WAR3312C	161.00	165.00	4.00	Sandstone					17923	4301	8.5	0.25	<0.01	0	64	-64	419.30	8.3	0	0	NAF
WAR3312C	165.00	169.00	4.00	Sandstone					17924	4302	8.4	0.27	<0.01	0	48	-48	312.04	8.2	0	0	NAF
WAR3312C	169.00	174.00	5.00	Sandstone					17925	4303	7.9	0.28	<0.01	0	41	-41	269.22	8.3	0	0	NAF
WAR3312C	174.00	178.90	4.90	Sandstone					17926	4304	8.6	0.28	<0.01	0	39	-39	257.98	8.1	0	0	NAF
WAR3312C	178.90	181.48	2.58	Siltstone			Minor CL at base		17927	4305	8.7	0.38	<0.01	0	17	-17	111.84	7.5	0	0	NAF
WAR3312C	181.48	183.21	1.73	Siltstone			Minor TF at base		17928	4306	8.6	0.34	<0.01	0	35	-35	229.17	7.9	0	0	NAF
WAR3312C	183.21	185.22	2.01	Siltstone					17929	4307	7.5	0.35	0.02	1	7	-7	12.60	7.1	0	0	NAF
WAR3312C	185.22	188.07	2.85	Siltstone					17930	4308	8.2	0.33	<0.01	0	14	-14	94.10	7.4	0	0	NAF
WAR3312C	188.07	188.30	0.23	Tuff					17931	4309	8.3	0.29	0.01	0	8	-7	18.84	7.2	0	0	NAF
WAR3312C	188.30	189.25	0.95	Sandstone					17932	4310	8.2	0.28	0.01	0	56	-56	143.92	7.6	0	0	NAF
WAR3312C	189.25	189.31	0.06	Coal	UNK																
WAR3312C	189.31	190.63	1.32	Sandstone					17933	4311	7.8	0.25	<0.01	0	6	-6	39.61	4.7	0	5	NAF
WAR3312C	190.63	193.41	2.78	Sandstone					17934	4312	7.7	0.29	<0.01	0	5	-4	29.76	5.3	0	5	NAF
WAR3312C	193.41	197.95	4.54	Siltstone					17935	4313	8.4	0.30	<0.01	0	9	-9	60.31	6.9	0	0	NAF
WAR3312C	197.95	198.64	0.69	Tuff/Siltstone/Clay					17936	4314	7.8	0.28	<0.01	0	19	-19	122.59	7.2	0	0	NAF
WAR3312C	198.64	200.65	2.01	Siltstone					17937	4315	5.7	0.98	0.10	3	9	-6	3.02	4.6	0	6	NAF
WAR3312C	200.65	201.28	0.63	Siltstone					17938	4316	3.2	1.45	0.77	23	1	22	0.05	2.8	9	15	PAF
WAR3312C	201.28	202.52	1.24	Coal	C5			287706													
WAR3312C	202.52	204.04	1.52	Sandstone					17939	4317	5.6	0.89	<0.01	0	4	-4	24.85	3.7	1	9	NAF
WAR3312C	204.04	205.00	0.96	Siltstone					17940	4318	7.4	0.25	<0.01	0	4	-4	26.47	4.5	0	4	NAF
WAR3312C	205.00	208.00	3.00	Sandstone					17941	4319	8.2	0.33	<0.01	0	6	-6	42.42	5.1	0	3	NAF
WAR3312C	208.00	210.69	2.69	Sandstone					17942	4320	7.9	0.35	<0.01	0	7	-7	43.64	5.8	0	3	NAF
WAR3312C	210.69	213.92	3.23	Sandstone					17943	4321	7.8	0.36	<0.01	0	8	-8	50.96	5.4	0	4	NAF
WAR3312C	213.92	216.00	2.08	Sandstone					17944	4322	6.7	0.27	<0.01	0	3	-3	19.66	5.4	0	6	NAF
WAR3312C	216.00	218.00	2.00	Sandstone					17945	4323	6.8	0.26	<0.01	0	3	-3	20.74	5.3	0	6	NAF
WAR3312C	218.00	218.96	0.96	Sandstone					17946	4324	5.5	0.31	0.28	9	4	5	0.44	3.1	4	7	PAF-LC
WAR3312C	218.96	220.37	1.41	Coal	DU			287707													
WAR3312C	220.37	220.69	0.32	Siltstone					17947	4325	5.7	0.43	0.07	2	5	-3	2.33	2.7	19	43	UC(PAF-LC)

Table 1: Acid forming characteristics of overburden/interburden and coal samples tested by EGi.

Hole Name	Depth (m) From	Depth (m) To	Depth (m) Interval	Lithology	Seam	Weathering	Comments	Coal Quality Sample No	Galilee Sample No	EGi Sample Number	$pH_{1:2}$	$EC_{1:2}$	ACID-BASE ANALYSIS Total %S	MPA	ANC	NAPP	ANC/MPA	SINGLE ADDITION NAG NAGpH	$NAG_{(pH4.5)}$	$NAG_{(pH7.0)}$	ARD Classification
WAR3312C	220.69	223.00	2.31	Sandstone					17948	4326	7.5	0.18	<0.01	0	4	-3	23.37	4.9	0	6	NAF
WAR3312C	223.00	223.73	0.73	Sandstone					17949	4327	7.6	0.19	<0.01	0	3	-3	19.82	5.2	0	5	NAF
WAR3312C	223.73	224.01	0.28	Coal	UNK				287709	4328	5.0	0.22	0.55	17	5	12	0.29	2.0	154	235	UC(PAF)
WAR3312C	224.01	224.92	0.91	Sandstone/Siltstone					17950	4329	6.7	0.24	<0.01	0	1	-1	6.15	4.5	0	6	NAF
WAR3312C	224.92	227.00	2.09	Sandstone					17951	4330	7.5	0.23	<0.01	0	3	-3	19.66	3.9	0.2	7	NAF
WAR3312C	227.00	230.50	3.50	Sandstone					17952	4331	8.2	0.21	<0.01	0	3	-3	19.71	4.9	0	6	NAF
WAR3312C	230.50	232.50	2.00	Sandstone					17953	4332	7.7	0.22	<0.01	0	3	-3	20.50	5.3	0	4	NAF
WAR3312C	232.50	233.36	0.86	Sandstone					17954	4333	7.8	0.21	0.01	0	4	-4	12.67	4.5	0	6	NAF
WAR3312C	233.36	235.35	1.99	Coal	DL1/DL3			287708													
WAR3312C	235.35	235.80	0.45	Sandstone					17955	4334	7.9	0.25	<0.01	0	4	-4	24.19	5.2	0	3	NAF
WAR3312C	235.80	236.50	0.70	Sandstone					17956	4335	8.3	0.28	<0.01	0	3	-3	19.99	5.2	0	3	NAF
WAR3312C	236.50	237.18	0.68	Sandstone					17957	4336	7.7	0.30	<0.01	0	3	-3	19.78	4.7	0	3	NAF
WAR3312C	237.18	237.74	0.56	Siltstone					17958	4337	7.8	0.29	<0.01	0	3	-3	19.67	4.0	0.2	6	NAF
WAR3312C	237.74	239.56	1.82	Sandstone					17959	4338	8.1	0.28	<0.01	0	3	-3	20.05	3.9	0.4	6	NAF
WAR2809C	89.00	90.00	1.00	Claystone		SW	Chips														
WAR2809C	90.00	95.00	5.00	Siltstone		FR	Rewan Formation		80341	4339	7.4	0.27	<0.01	0	59	-58	382.58	7.9	0	0	NAF
WAR2809C	95.00	100.00	5.00	Siltstone		FR	Rewan Formation		80342	4340	8.2	0.24	<0.01	0	61	-61	401.36	8.3	0	0	NAF
WAR2809C	100.00	103.40	3.40	Siltstone		FR	Rewan Formation		80343	4341	8.3	0.24	<0.01	0	41	-41	270.73	8.5	0	0	NAF
WAR2809C	103.40	108.03	4.63	Sandstone		FR			80344	4342	8.4	0.28	<0.01	0	54	-54	353.37	8.4	0	0	NAF
WAR2809C	108.03	113.00	4.97	Siltstone		FR			80345	4343	8.5	0.29	<0.01	0	38	-38	251.17	8.4	0	0	NAF
WAR2809C	113.00	117.43	4.43	Siltstone		FR			80346	4344	8.7	0.29	<0.01	0	44	-44	290.43	8.6	0	0	NAF
WAR2809C	117.43	122.00	4.57	Sandstone/Siltstone		FR			80347	4345	8.6	0.33	<0.01	0	87	-87	568.03	8.5	0	0	NAF
WAR2809C	122.00	126.00	4.00	Sandstone/Siltstone		FR			80348	4346	7.5	0.33	<0.01	0	44	-44	286.16	8.7	0	0	NAF
WAR2809C	126.00	130.00	4.00	Sandstone/Siltstone		FR			80349	4347	8.2	0.35	<0.01	0	74	-73	481.35	8.6	0	0	NAF
WAR2809C	130.00	133.50	3.50	Sandstone/Siltstone		FR			80350	4348	7.9	0.35	<0.01	0	52	-52	338.11	8.7	0	0	NAF
WAR2809C	133.50	138.50	5.00	Sandstone/Siltstone		FR			80351	4349	8.3	0.35	<0.01	0	58	-58	377.71	8.8	0	0	NAF
WAR2809C	138.50	143.90	5.40	Sandstone/Siltstone		FR			80352	4350	8.2	0.31	<0.01	0	14	-14	92.27	7.5	0	0	NAF
WAR2809C	143.90	148.00	4.10	Sandstone		FR			80353	4351	7.6	0.39	0.06	2	5	-3	2.66	4.5	0	3	NAF
WAR2809C	148.00	151.00	3.00	Sandstone		FR			80354	4352	7.7	0.38	<0.01	0	3	-3	20.96	6.0	0	2	NAF
WAR2809C	151.00	152.90	1.90	Sandstone		FR			80355	4353	8.4	0.40	0.04	1	3	-2	2.46	4.5	0	3	NAF
WAR2809C	152.90	153.39	0.49	Sandstone		FR			80356	4354	7.9	0.42	0.02	1	7	-7	11.96	5.9	0	1	NAF
WAR2809C	153.39	153.80	0.41	Coal	A	FR	Trace Py														
WAR2809C	153.80	154.50	0.70	Siltstone		FR			80357	4355	6.2	1.13	<0.01	0	9	-9	57.97	2.2	77	119	NAF
WAR2809C	154.50	156.60	2.10	Siltstone		FR			80358	4356	7.2	0.44	<0.01	0	20	-20	129.12	7.5	0	0	NAF
WAR2809C	156.60	160.02	3.42	Siltstone		FR			80359	4357	8.4	0.48	<0.01	0	14	-14	94.31	7.9	0	0	NAF
WAR2809C	160.02	163.00	2.98	Sandstone		FR			80360	4358	7.8	0.23	<0.01	0	279	-278	1820.43	7.8	0	0	NAF
WAR2809C	163.00	167.48	4.48	Sandstone		FR			80361	4359	7.7	0.20	<0.01	0	155	-155	1015.80	7.9	0	0	NAF
WAR2809C	167.48	170.00	2.52	Carb Siltstone		FR			80362	4360	7.6	0.24	<0.01	0	33	-32	213.10	7.8	0	0	NAF
WAR2809C	170.00	172.47	2.47	Carb Siltstone		FR			80363	4361	8.3	0.19	<0.01	0	52	-52	342.80	8.2	0	0	NAF
WAR2809C	172.47	175.79	3.32	Sandstone		FR			80364	4362	7.5	0.20	<0.01	0	68	-68	445.30	8.3	0	0	NAF
WAR2809C	175.79	178.00	2.21	Sandstone		FR			80365	4363	7.6	0.22	<0.01	0	19	-19	124.87	8.1	0	0	NAF
WAR2809C	178.00	180.00	2.00	Sandstone		FR			80366	4364	7.7	0.18	<0.01	0	32	-32	208.50	8.0	0	0	NAF
WAR2809C	180.00	180.92	0.92	Sandstone		FR			80367	4365	8.2	0.28	0.02	1	34	-33	54.92	7.9	0	0	NAF
WAR2809C	180.92	182.39	1.47	Coal	B2	FR		287956													
WAR2809C	182.39	182.77	0.38	Carb Mudstone/Sandstone	B3	FR		287957													
WAR2809C	182.77	184.51	1.74	Coal	B4	FR		287958													
WAR2809C	184.51	184.69	0.18	Tuff/Coal	B5	FR		287959													
WAR2809C	184.69	185.00	0.31	Coal	B6	FR		287960													
WAR2809C	185.00	185.21	0.21	Tuff/Coal	B7	FR		287961													
WAR2809C	185.21	185.74	0.53	Coal	B81	FR		287962													
WAR2809C	185.74	185.85	0.11	Coal	B81	FR															
WAR2809C	185.85	186.59	0.74	Coal	B82	FR		287963													
WAR2809C	186.59	187.17	0.58	Coal	B83	FR		287964													
WAR2809C	187.17	188.00	0.83	Sandstone		FR			80368	4366	7.8	0.27	0.02	1	28	-28	46.07	7.2	0	0	NAF
WAR2809C	188.00	189.00	1.00	Sandstone		FR			80369	4367	8.1	0.32	<0.01	0	89	-88	578.91	7.7	0	0	NAF
WAR2809C	189.00	191.04	2.04	Sandstone		FR			80370	4368	7.9	0.24	<0.01	0	74	-73	480.45	7.6	0	0	NAF
WAR2809C	191.04	193.00	1.96	Sandstone		FR			80371	4369	8.4	0.31	<0.01	0	107	-106	696.83	7.8	0	0	NAF
WAR2809C	193.00	198.00	5.00	Sandstone		FR			80372	4370	7.8	0.38	<0.01	0	49	-49	318.19	8.2	0	0	NAF
WAR2809C	198.00	203.00	5.00	Sandstone		FR			80373	4371	8.3	0.38	<0.01	0	68	-68	444.51	8.1	0	0	NAF
WAR2809C	203.00	207.52	4.52	Sandstone		FR			80374	4372	7.5	0.39	<0.01	0	132	-132	861.36	8.5	0	0	NAF
WAR2809C	207.52	212.40	4.88	Sandstone		FR			80375	4373	8.1	0.25	<0.01	0	34	-34	220.98	8.2	0	0	NAF
WAR2809C	212.40	217.00	4.60	Sandstone		FR			80376	4374	8.2	0.27	<0.01	0	42	-42	276.25	8.1	0	0	NAF
WAR2809C	217.00	222.00	5.00	Sandstone		FR			80377	4375	8.8	1.11	<0.01	0	42	-42	275.83	7.8	0	0	NAF
WAR2809C	222.00	227.00	5.00	Sandstone		FR			80378	4376	7.4	0.28	<0.01	0	66	-66	431.73	7.9	0	0	NAF

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Table 1: Acid forming characteristics of overburden/interburden and coal samples tested by EGi.

Hole Name	Depth (m)			Lithology	Seam	Weathering	Comments	Coal Quality Sample No	Galilee Sample No	EGi Sample Number	$pH_{1:2}$	$EC_{1:2}$	ACID-BASE ANALYSIS					SINGLE ADDITION NAG			ARD Classification
	From	To	Interval										Total %S	MPA	ANC	NAPP	ANC/MPA	NAGpH	$NAG_{(pH4.5)}$	$NAG_{(pH7.0)}$	
WAR2809C	227.00	231.63	4.63	Sandstone		FR			80379	4377	8.6	0.23	<0.01	0	60	-60	392.04	8.3	0	0	NAF
WAR2809C	231.63	233.50	1.87	Siltstone/Sandstone		FR			80380	4378	7.5	0.24	<0.01	0	41	-41	267.26	9.5	0	0	NAF
WAR2809C	233.50	237.00	3.50	Siltstone/Sandstone		FR			80381	4379	8.3	0.25	<0.01	0	27	-27	178.22	7.7	0	0	NAF
WAR2809C	237.00	239.92	2.92	Siltstone/Sandstone		FR			80382	4380	8.4	0.30	<0.01	0	29	-29	192.72	7.9	0	0	NAF
WAR2809C	239.92	240.22	0.30	Basalt		FR			80383	4381	7.8	0.32	<0.01	0	137	-137	897.95	8.6	0	0	NAF
WAR2809C	240.22	244.00	3.78	Siltstone		FR			80384	4382	8.1	0.23	<0.01	0	12	-11	75.68	7.3	0	0	NAF
WAR2809C	244.00	246.00	2.00	Siltstone		FR			80385	4383	7.9	0.24	<0.01	0	8	-8	54.44	7.2	0	0	NAF
WAR2809C	246.00	246.85	0.85	Siltstone		FR			80386	4384	8.2	0.25	<0.01	0	8	-8	54.07	6.9	0	0	NAF
WAR2809C	246.85	247.68	0.83	Sandstone		FR			80387	4385	8.4	0.25	0.04	1	8	-7	6.70	5.2	0	2	NAF
WAR2809C	247.68	250.49	2.81	Sandstone		FR			80388	4386	8.1	0.28	<0.01	0	5	-5	32.73	3.5	2	13	NAF
WAR2809C	250.49	253.00	2.51	Sandstone		FR			80389	4387	8.4	0.32	<0.01	0	4	-4	24.80	4.6	0	4	NAF
WAR2809C	253.00	256.00	3.00	Sandstone		FR			80390	4388	7.8	0.31	<0.01	0	3	-3	21.23	5.3	0	6	NAF
WAR2809C	256.00	259.70	3.70	Sandstone		FR			80391	4389	8.2	0.25	<0.01	0	3	-3	20.23	4.5	0	5	NAF
WAR2809C	259.70	261.70	2.00	Sandstone		FR			80392	4390	8.3	0.24	<0.01	0	9	-9	60.15	4.6	0	5	NAF
WAR2809C	261.70	263.50	1.80	Sandstone		FR			80393	4391	6.5	0.99	0.62	19	0	19	0.00	3.3	3	10	PAF-LC
WAR2809C	263.50	264.45	0.95	Sandstone		FR			80394	4392	2.7	2.86	1.02	31	0	31	0.00	2.3	19	23	PAF
WAR2809C	264.45	265.77	1.32	Coal	C	FR	Pyrite	287965													
WAR2809C	265.77	266.92	1.15	Sandstone		FR			80395	4393	6.6	0.92	0.11	3	2	1	0.62	3.6	2	11	PAF-LC
WAR2809C	266.92	267.44	0.52	Coal	UN	FR															
WAR2809C	267.44	268.50	1.06	Sandstone		FR			80396	4394	7.5	0.45	<0.01	0	3	-3	22.19	4.1	0.1	5	NAF
WAR2809C	268.50	270.50	2.00	Sandstone		FR			80397	4395	7.6	0.38	<0.01	0	3	-3	20.75	5.2	0	5	NAF
WAR2809C	270.50	274.50	4.00	Sandstone		FR			80398	4396	7.5	0.17	<0.01	0	3	-3	20.30	5.2	0	5	NAF
WAR2809C	274.50	276.50	2.00	Sandstone		FR			80399	4397	8.3	0.16	<0.01	0	3	-3	20.09	4.6	0	6	NAF
WAR2809C	276.50	277.64	1.14	Sandstone		FR			80400	4398	7.4	0.23	0.01	0	5	-5	17.53	4.1	0.3	7	NAF
WAR2809C	277.64	278.61	0.97	Coal	DU	FR		287966													
WAR2809C	278.61	280.00	1.39	Sandstone		FR			80401	4399	8.2	0.17	<0.01	0	4	-4	28.33	4.5	0	6	NAF
WAR2809C	280.00	281.16	1.16	Sandstone		FR			80402	4400	7.8	0.19	<0.01	0	5	-5	33.96	3.2	5	19	NAF
WAR2809C	281.16	281.32	0.16	Coal	UN	FR															
WAR2809C	281.32	282.30	0.98	Sandstone		FR			80403	4401	7.9	0.18	<0.01	0	4	-3	23.62	5.0	0	3	NAF
WAR2809C	282.30	284.30	2.00	Sandstone		FR			80404	4402	8.5	0.28	<0.01	0	3	-3	21.86	4.5	0	6	NAF
WAR2809C	284.30	286.70	2.40	Sandstone		FR			80405	4403	7.4	0.18	<0.01	0	3	-3	21.95	4.5	0	7	NAF
WAR2809C	286.70	288.70	2.00	Sandstone		FR			80406	4404	8.2	0.15	<0.01	0	4	-4	26.78	7.1	0	0	NAF
WAR2809C	288.70	289.69	0.99	Sandstone		FR			80407	4405	7.6	0.24	<0.01	0	3	-3	19.74	4.2	0.1	5	NAF
WAR2809C	289.69	289.94	0.25	Coal	DL1	FR		287967													
WAR2809C	289.94	291.04	1.10	Coal	DL2	FR		287968													
WAR2809C	291.04	292.00	0.96	Coal	DL3	FR		287969													
WAR2809C	292.00	292.54	0.54	Sandstone		FR			80408	4406	8.1	0.17	0.04	1	6	-5	4.73	4.5	0	7	NAF
WAR2809C	292.54	293.17	0.63	Carb Siltstone		FR			80409	4407	7.8	0.17	0.10	3	6	-3	1.92	3.6	2	7	UC(PAF-LC)
WAR2809C	293.17	295.20	2.03	Sandstone		FR			80410	4408	8.4	0.18	<0.01	0	4	-4	24.00	5.8	0	1	NAF
WAR2809C	295.20	297.19	1.99	Sandstone		FR			80411	4409	7.2	0.19	<0.01	0	5	-5	32.19	6.9	0	0	NAF
WAR2809C	297.19	302.60	5.41	Sandstone		FR			80412	4410	6.7	0.20	<0.01	0	3	-3	20.38	6.9	0	0	NAF

KEY

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

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

Coal seam interval

Missing interval or sample not available

Standard NAG results overestimate acid potential due to organic acid effects

NAGpH = pH of NAG liquor

$NAG_{(pH4.5)}$ = Net Acid Generation capacity to pH 4.5 (kgH_2SO_4/t)

$NAG_{(pH7.0)}$ = Net Acid Generation capacity to pH 7.0 (kgH_2SO_4/t)

NAF = Non-Acid Forming

PAF = Potentially Acid Forming

PAF-LC = PAF Low Capacity

UC = Uncertain Classification

(expected classification in brackets)

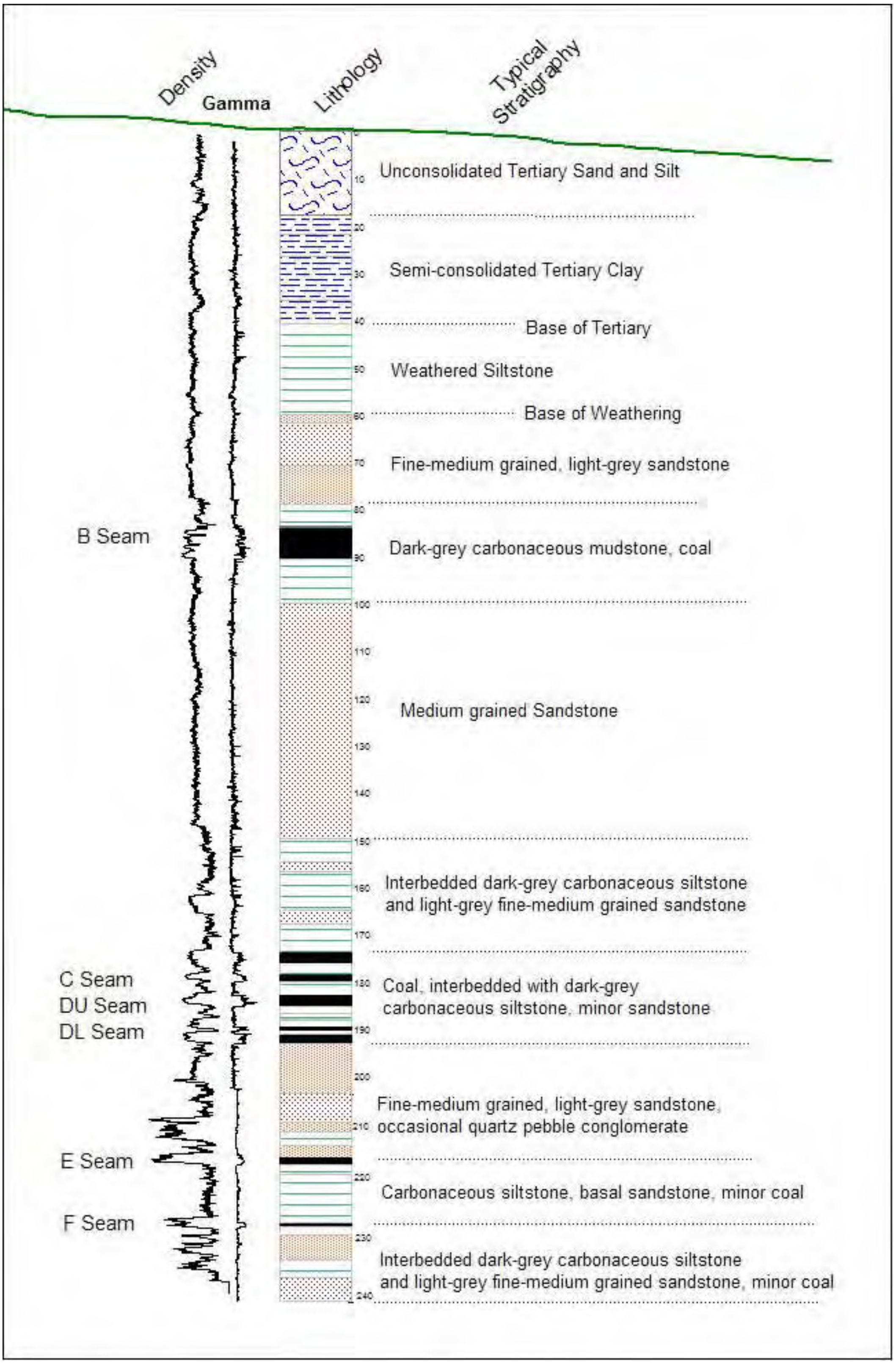


Figure 1: Typical stratigraphic section for the proposed open cut pits.

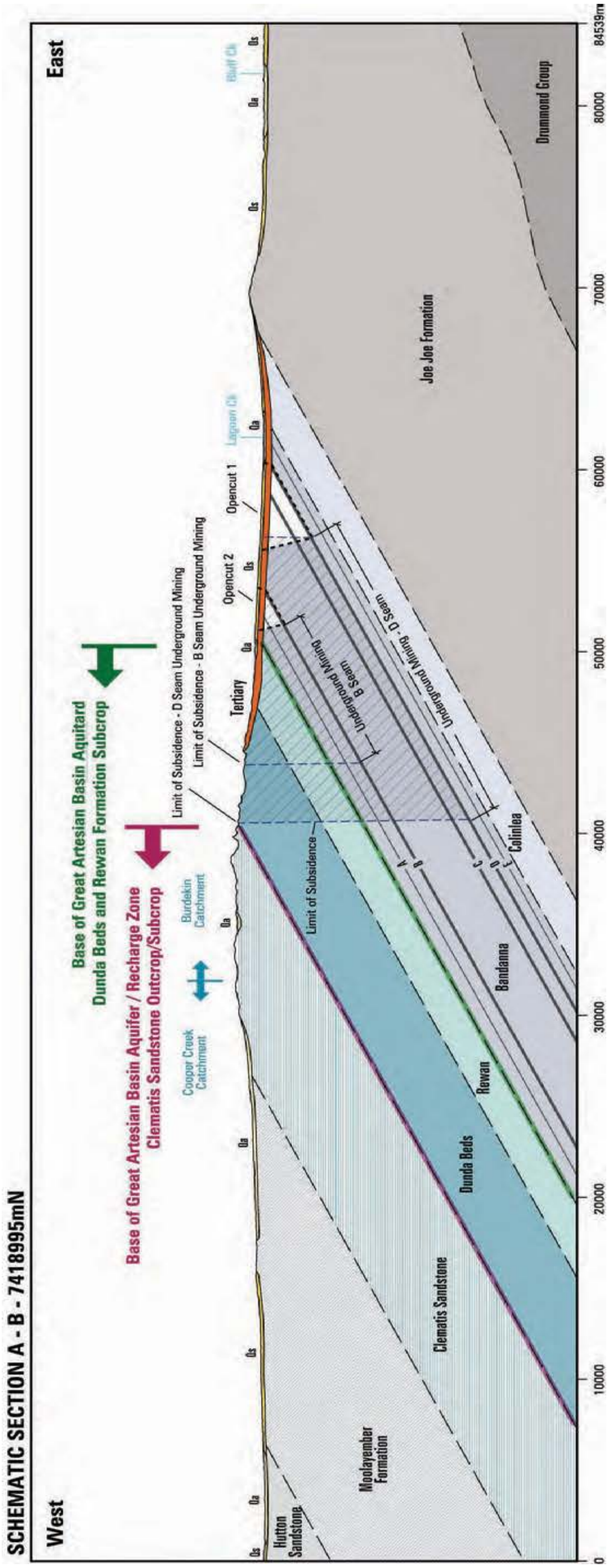
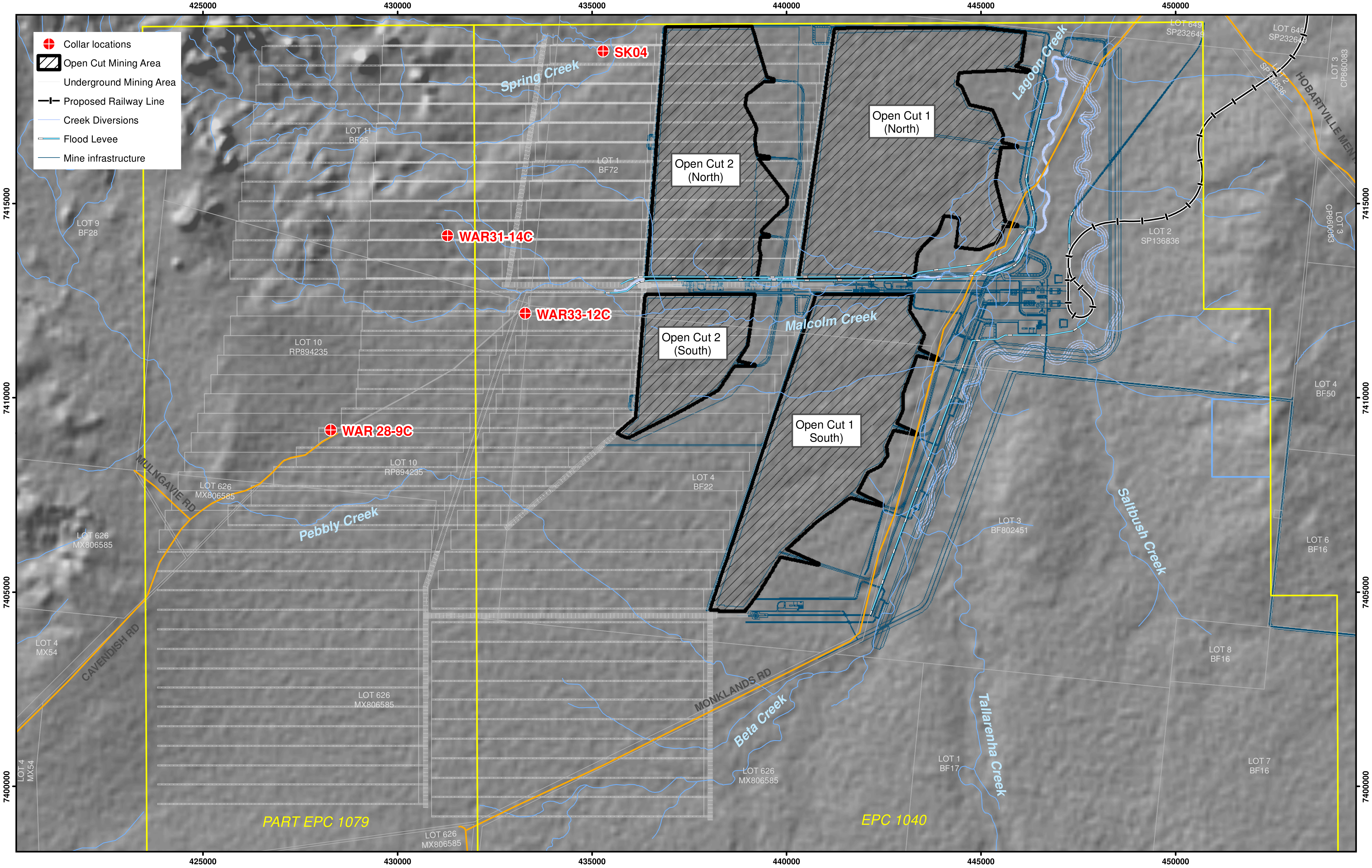


Figure 2: Schematic east-west cross-section across the northern part of the project area.



GALILEE COAL PROJECT (Northern Export Facility)		
Waratah Coal THE NEW ENERGY IN COAL	Source:	Cadastral Boundaries: DERM 2012; EPC Boundary: Department of Natural Resources and Mines (DNRM) 2012; Mine Detail & Bores: Waratah Coal Pty. Ltd. 2012; Background Image: Shaded relief: ESRI Data & amp; Maps 2006; Watercourses: Department of Environment and Heritage Protection 2012
	Disclaimer:	This plan is based on or contains data provided by others. Waratah Coal Pty. Ltd. gives no warranty in relation to the data (including accuracy, reliability, completeness, currency or suitability) and accepts no liability (including without limitation, liability in negligence) for any loss, damage or costs (including consequential damage) relating to any use of the data. Data must not be used for direct marketing or be used in breach of privacy laws.
	File:	File: WAR20-26-SEIS0061a-FIGXX-MINE-INFRASTRUCTURE AND COLLARS-121029 Date: 29/10/2012

A4 Scale 1:120,000

EPC1040 & Part of EPC1079
Cadastral Boundary
Road/Track
Watercourse

Figure 3: Location of drillholes sampled for geochemical assessment.

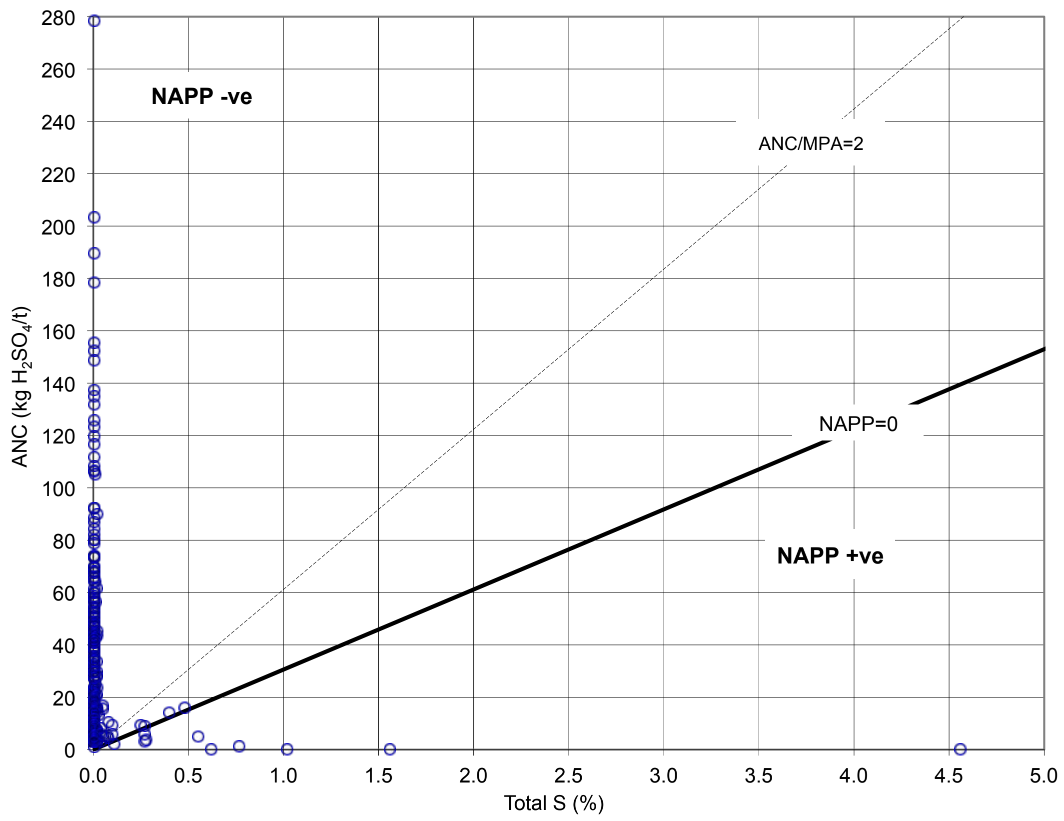


Figure 4: Acid-base account (ABA) plot showing ANC versus total S for overburden/interburden and coal samples.

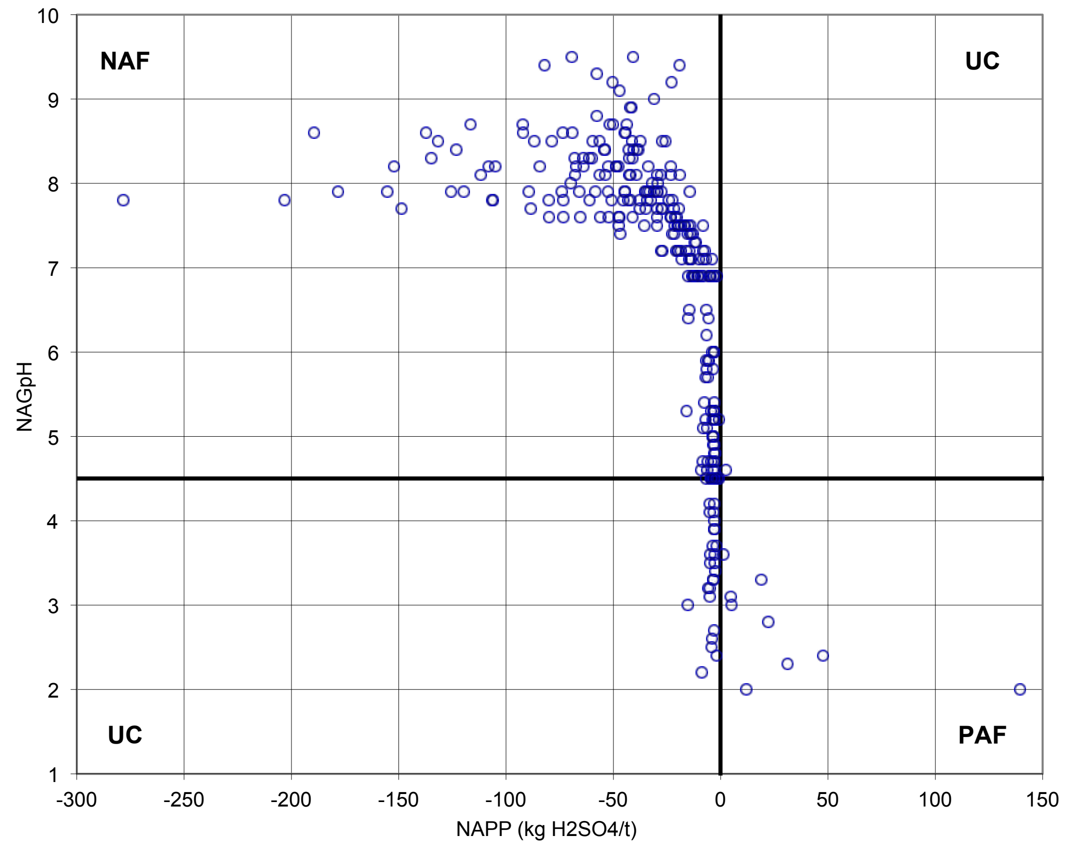


Figure 5: ARD classification plot showing NAGpH versus NAPP for overburden/interburden and coal samples, with ARD classification domains indicated.

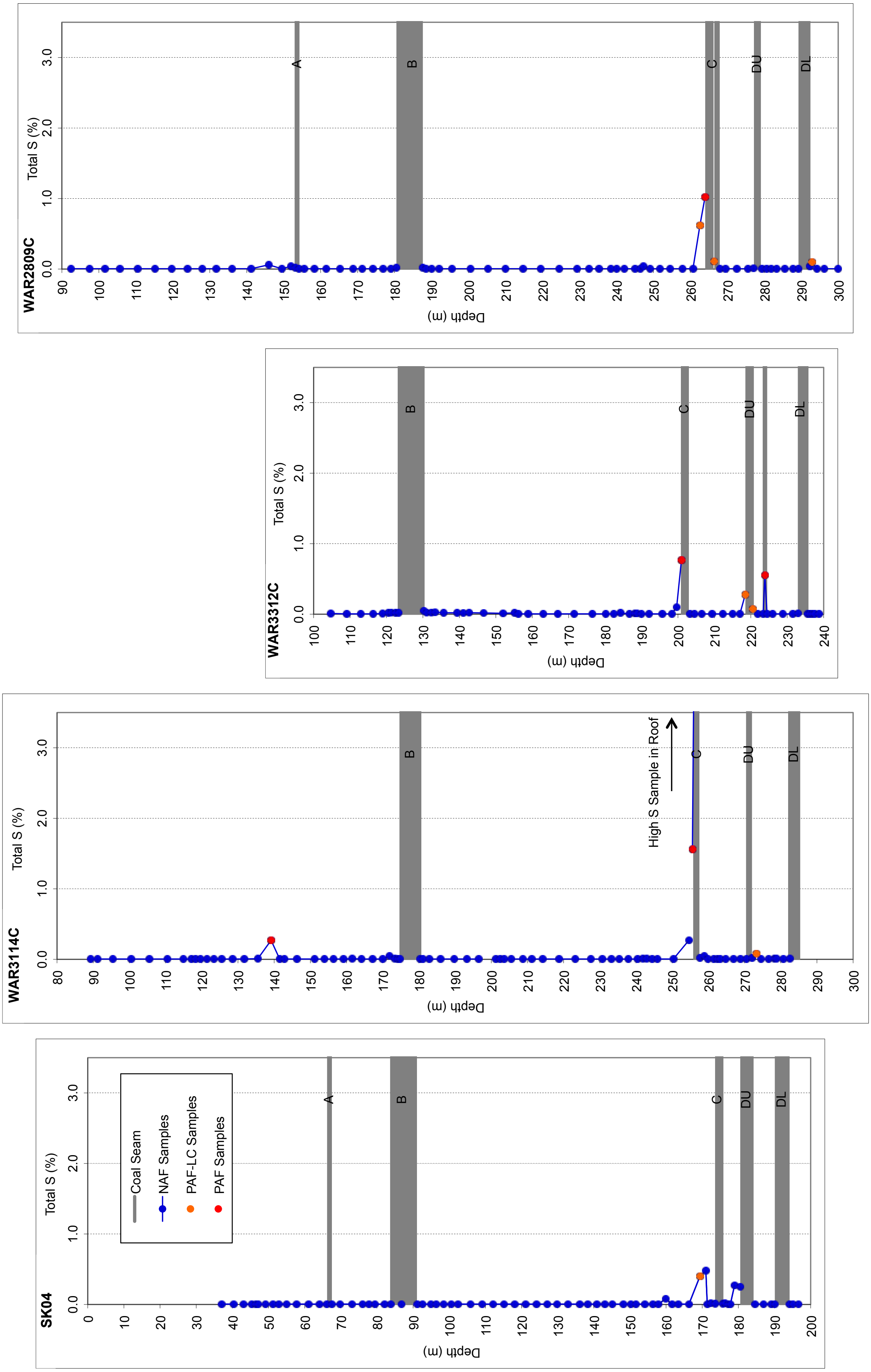


Figure 6: Plot of total S profiles for Galilee drill holes. NAF samples are shown as blue symbols, uncertain samples are shown as black symbols. Profiles are aligned by seam stratigraphy.

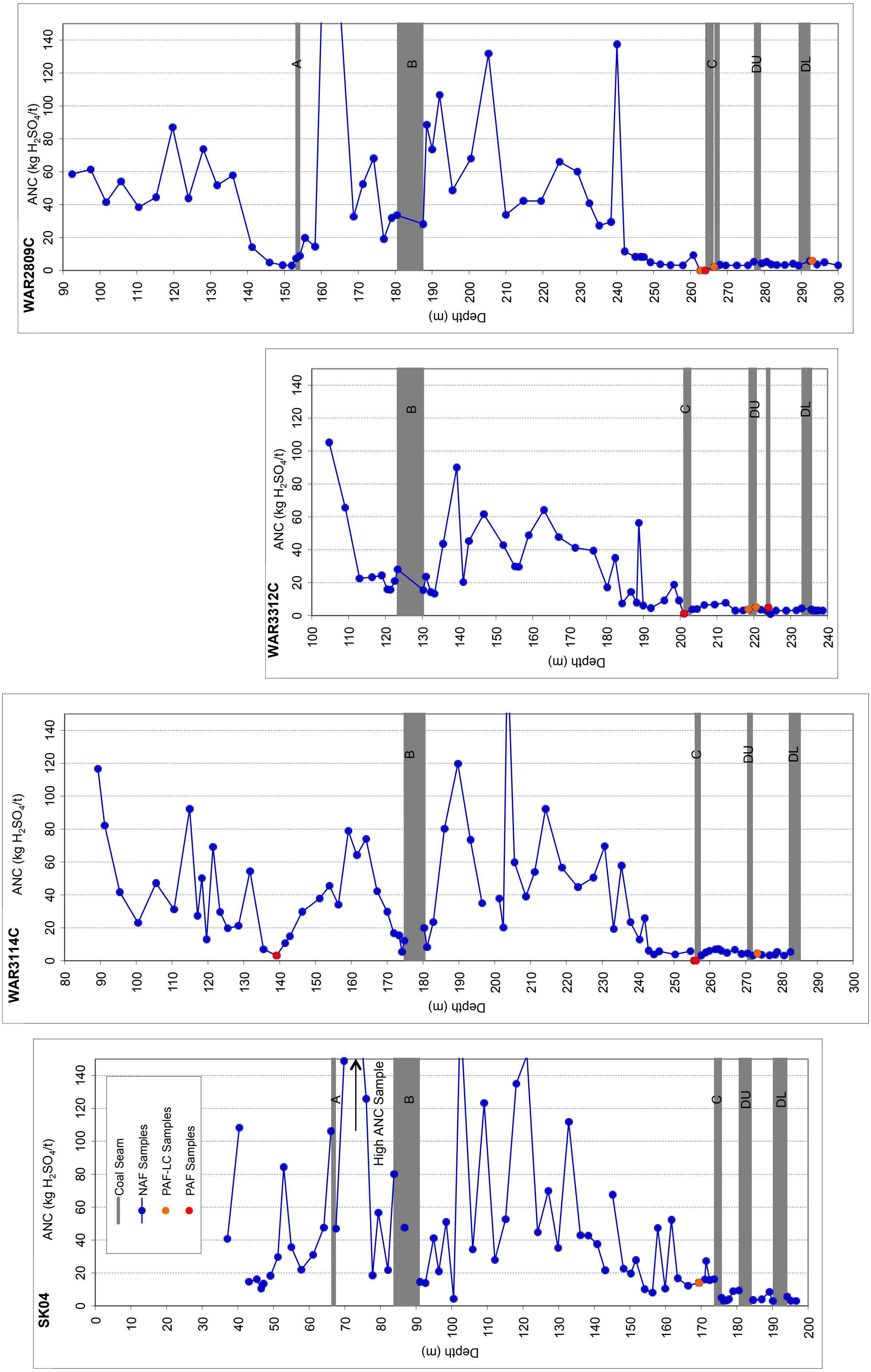


Figure 7: Plot of total ANC profiles for Galilee drill holes. NAF samples are shown as blue symbols, uncertain samples are shown as black symbols. Profiles are aligned by seam stratigraphy.

ATTACHMENT A

Assessment of Acid Forming Characteristics

Introduction

Acid rock drainage (ARD) is produced by the exposure of sulphide minerals such as pyrite to atmospheric oxygen and water. The ability to identify in advance any mine materials that could potentially produce ARD is essential for timely implementation of mine waste management strategies.

A number of procedures have been developed to assess the acid forming characteristics of mine waste materials. The most widely used methods are the Acid-Base Account (ABA) and the Net Acid Generation (NAG) test. These methods are referred to as static procedures because each involves a single measurement in time.

Acid-Base Account

The acid-base account involves static laboratory procedures that evaluate the balance between acid generation processes (oxidation of sulphide minerals) and acid neutralising processes (dissolution of alkaline carbonates, displacement of exchangeable bases, and weathering of silicates).

The values arising from the acid-base account are referred to as the potential acidity and the acid neutralising capacity, respectively. The difference between the potential acidity and the acid neutralising capacity value is referred to as the net acid producing potential (NAPP).

The chemical and theoretical basis of the ABA are discussed below.

Potential Acidity

The potential acidity that can be generated by a sample is calculated from an estimate of the pyrite (FeS_2) content and assumes that the pyrite reacts under oxidising conditions to generate acid according to the following reaction:

$$FeS_2 + 15/4\ O_2 + 7/2\ H_2O \Rightarrow Fe(OH)_3 + 2\ H_2SO_4$$

Based on the above reaction, the potential acidity of a sample containing 1 %S as pyrite would be 30.6 kilograms of H_2SO_4 per tonne of material (i.e. kg H_2SO_4/t). The pyrite content estimate can be based on total S and the potential acidity determined from total S is referred to as the maximum potential acidity (MPA), and is calculated as follows:

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

The use of an MPA calculated from total sulphur is a conservative approach because some sulphur may occur in forms other than pyrite. Sulphate-sulphur, organic sulphur and native sulphur, for example, are non-acid generating sulphur forms. Also, some sulphur may occur as other metal sulphides (e.g. covellite, chalcocite, sphalerite, galena) which yield less acidity than pyrite when oxidised or, in some cases, may be non-acid generating.

The total sulphur content is commonly used to assess potential acidity because of the difficulty, costs and uncertainty involved in routinely determining the speciation of sulphur forms within samples, and determining reactive sulphide-sulphur contents. However, if the sulphide mineral forms are known then allowance can be made for non- and lesser acid generating forms to provide a better estimate of the potential acidity.

Acid Neutralising Capacity (ANC)

The acid formed from pyrite oxidation will to some extent react with acid neutralising minerals contained within the sample. This inherent acid buffering is quantified in terms of the ANC.

The ANC is commonly determined by 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 and expressed in the same units as the MPA (kg H_2SO_4/t).

Net Acid Producing Potential (NAPP)

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

$$NAPP = MPA - ANC$$

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.

ANC/MPA Ratio

The ANC/MPA ratio is frequently used as a means of assessing the risk of acid generation from mine waste materials. The ANC/MPA ratio is another way of looking at the acid base account. 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. A NAPP of zero is equivalent to an ANC/MPA ratio of 1.

The purpose of the ANC/MPA ratio is to provide an indication of the relative margin of safety (or lack thereof) within a material. Various ANC/MPA values are reported in the literature for indicating safe values for prevention of acid generation. These values typically range from 1 to 3. As a general rule, an ANC/MPA ratio of 2 or more signifies that there is a high probability that the material will remain circum-neutral in pH and thereby should not be problematic with respect to acid rock drainage.

Acid-Base Account Plot

Sulphur and ANC data are often presented graphically in a format similar to that shown in Figure A-1. This figure includes a line indicating the division between NAPP positive samples from NAPP negative samples. Also shown are lines corresponding to ANC/MPA ratios of 2 and 3.

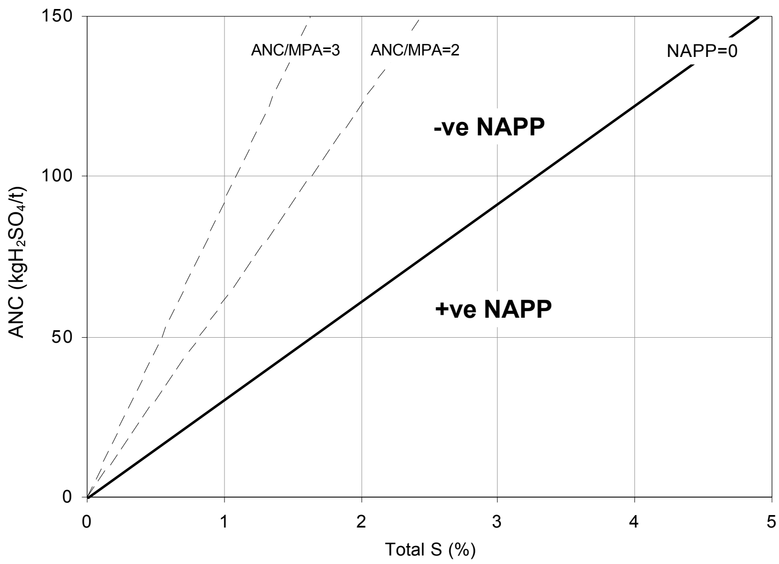


Figure A-1: Acid-base account (ABA) plot

Net Acid Generation (NAG) Test

The NAG test is used in association with the NAPP to classify the acid generating potential of a sample. The NAG test involves reaction of a sample with hydrogen peroxide to rapidly oxidise any sulphide minerals contained within a sample. During the NAG test both acid generation and acid neutralisation reactions can occur simultaneously. The end result represents a direct measurement of the net amount of acid generated by the sample. The final pH is referred to as the NAGpH and the amount of acid produced is commonly referred to as the NAG capacity, and is expressed in the same units as the NAPP (kg H_2SO_4/t).

Several variations of the NAG test have been developed to accommodate the wide geochemical variability of mine waste materials. The four main NAG test procedures currently used by EGi are the single addition NAG test, the sequential NAG test, the kinetic NAG test, and the extended boil and calculated NAG test.

Single Addition NAG Test

The single addition NAG test involves the addition of 250 ml of 15% hydrogen peroxide to 2.5 g of sample. The peroxide is allowed to react with the sample overnight and the following day the sample is gently heated to accelerate the oxidation of any remaining sulphides, then vigorously boiled for several minutes to decompose residual peroxide. When cool, the NAGpH and NAG capacity are measured.

An indication of the form of the acidity is provided by initially titrating the NAG liquor to pH 4.5, then continuing the titration up to pH 7. The titration value at pH 4.5 includes acidity 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 at between pH 4.5 and 7.

Sequential NAG Test

When testing samples with high sulphide contents it is not uncommon for oxidation to be incomplete in the single addition NAG test. This can sometimes occur when there is catalytic breakdown of the hydrogen peroxide before it has had a chance to oxidise all of the sulphides in a sample. To overcome this limitation, a sequential NAG test is often carried out. This test may also be used to assess the relative geochemical lag of PAF samples with high ANC.

The sequential NAG test is a multi-stage procedure involving a series of single addition NAG tests on the one sample (i.e. 2.5 g of sample is reacted two or more times with 250 ml aliquots of 15% hydrogen peroxide). At the end of each stage, the sample is filtered and the solution is used for measurement of NAGpH and NAG capacity. The NAG test is then repeated on the solid residue. The cycle is repeated until such time that there is no further catalytic decomposition of the peroxide, or when the NAGpH is greater than pH 4.5. The overall NAG capacity of the sample is then determined by summing the individual acid capacities from each stage.

Kinetic NAG Test

The kinetic NAG test is the same as the single addition NAG test except that the temperature and pH of the liquor are recorded. Variations in these parameters during the test provide an indication of the kinetics of sulphide oxidation and acid generation. This, in turn, can provide an insight into the behaviour of the material under field conditions. For example, the pH trend gives an estimate of relative reactivity and may be related to prediction of lag times and oxidation rates similar to those measured in leach columns. Also, sulphidic samples commonly produce a temperature excursion during the NAG test due to the decomposition of the peroxide solution, catalysed by sulphide surfaces and/or oxidation products.

Extended Boil and Calculated NAG Test

Organic acids may be generated in NAG tests due to partial oxidation of carbonaceous materials[1] such as coal washery wastes. This can lead to low NAGpH values and high acidities in standard single addition NAG tests unrelated to acid generation from sulphides. Organic acid effects can therefore result in misleading NAG values and misclassification of the acid forming potential of a sample.

The extended boil and calculated NAG tests can be used to account for the relative proportions of pyrite derived acidity and organic acidity in a given NAG solution, thus providing a more reliable measure of the acid forming potential of a sample. The procedure involves two steps to differentiating pyritic acid from organic derived acid:

Extended Boil NAG	decompose the organic acids and hence remove the influence of non-pyritic acidity on the NAG solution.
Calculated NAG	calculate the net acid potential based on the balance of cations and anions in the NAG solution, which will not be affected by organic acid.

The extended boiling test is carried out on the filtered liquor of a standard NAG test, and involves vigorous boiling of the solution on a hot plate for 3-4 hours. After the boiling step the solution is cooled and the pH measured. An extended boil NAGpH less than 4.5 confirms the sample is potentially acid forming (PAF), but a pH value greater than 4.5 does not necessarily mean that the sample is non acid forming (NAF), due to some loss of free acid during the extended boiling procedure. To address this issue, a split of the same filtered NAG solution is assayed for concentrations of S, Ca, Mg, Na, K and Cl, from which a calculated NAG value is determined[2].

The concentration of dissolved S is used to calculate the amount of acid (as H_2SO_4) generated by the sample and the concentrations of Ca, Mg, Na and K are used to estimate the amount of acid neutralised (as H_2SO_4). The concentration of Cl is used to correct for soluble cations associated with Cl salts, which may be present in the sample and unrelated to acid generating and acid neutralising reactions.

The calculated NAG value is the amount of acid neutralised subtracted from the amount of acid generated. A positive value indicates that the sample has excess acid generation and is likely to be PAF, and a zero or negative value indicates that the sample has excess neutralising capacity and is likely to be NAF.

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[1] Stewart, W., Miller, S., Thomas, J.E., and Smart R. (2003), 'Evaluation of the Effects of Organic Matter on the Net Acid Generation (NAG) Test', in *Proceedings of the Sixth International Conference on Acid Rock drainage (ICARD), Cairns, 12-18th July 2003*, 211-222.

[2] Environmental Geochemistry International, Levay and Co. and ACeSSS, 2008. *ACARP Project C15034: Development of ARD Assessment for Coal Process Wastes*, EGi Document No. 3207/817, July 2008.

Sample Classification

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

- Barren;
- Non-acid forming (NAF);
- Potentially acid forming (PAF); and
- 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 for hard rock mines it generally applies to materials with a total sulphur content ≤ 0.1 %S and an ANC ≤ 5 kg H_2SO_4/t.

Non-acid forming (NAF)

A sample classified as NAF may, or may not, have a significant sulphur content but the availability of ANC within the sample is more than adequate to neutralise all the acid that theoretically could be produced by any contained sulphide 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 the final NAG pH ≥ 4.5.

Potentially acid forming (PAF)

A sample classified as PAF always has a significant sulphur content, the acid generating potential of which exceeds the inherent acid neutralising capacity 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 usually defined as PAF when it has a positive NAPP and a final NAGpH < 4.5.

Uncertain (UC)

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). Uncertain samples are generally given a tentative classification that is shown in brackets e.g. UC(NAF).

Figure A-2 shows the format of the classification plot that is typically used for presentation of NAPP and NAG data. Marked on this plot are the quadrats representing the NAF, PAF and UC classifications.

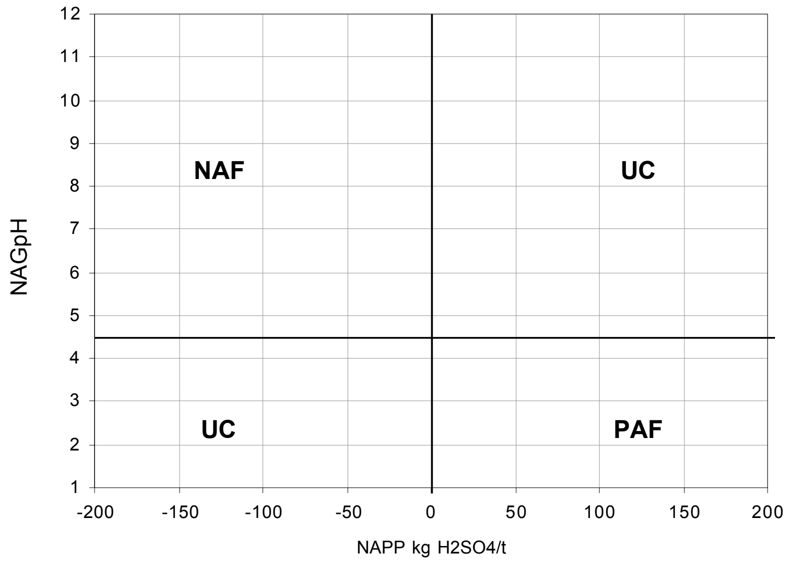

Figure A-2 ARD classification plot

Other Methods

Other test procedures may be used to define the acid forming characteristics of a sample.

pH and Electrical Conductivity

The pH and electrical conductivity (EC) of a sample is determined by equilibrating the sample in deionised water for a minimum of 12 hours (or overnight), typically at a solid to water ratio of 1:2 (w/w). This gives an indication of the inherent acidity and salinity of the waste material when initially exposed in a waste emplacement area.

Acid Buffering Characteristic Curve (ABCC) Test

The ABCC test involves slow titration of a sample with acid while continuously monitoring pH. These data provides an indication of the portion of ANC within a sample that is readily available for acid neutralisation.

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