Carmichael Coal Mine and Rail Project:

Mine Waste Characterisation

Prepared for

GHD Pty Ltd

Report Prepared by

SRK Consulting (Australasia) Pty Ltd

GHD003

August 2013

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Executive Summary

Adani Mining Pty Ltd is proposing to develop the Carmichael thermal coal project (the Project). The Project is located approximately 160 km north west of Clermont in the Galilee Basin in Queensland.

The project is expected to produce 60 million tonnes of (product) coal per annum and has a potential life of 60 years and the total quantity of waste that is expected to be moved is about 2.4 billion tonnes.

Four hundred and seventy samples of potential mine wastes and coal materials were taken from drill core and assessed for their potential to produce acid and metalliferous drainage (AMD). Four hundred and thirteen samples were of overburden and interburden, 57 samples were roof, floor or coal materials. No coal reject samples were available for characterisation. Standard static geochemical tests were conducted to characterise the samples. Neutralisation potential ratio (NPR) and AMIRA (2002) methods were used to classify the materials into acid generating or non-acid forming categories.

Ninety two samples were tested to determine their potential to be dispersive.

In addition to the geochemical characterisation, a statistical assessment was undertaken to assess the representation of the whole mass of waste by the 470 samples and determine the need for additional samples.

Typically only a small number of samples were from each lithological unit. To increase the robustness of statistical assessment of the various rock types, samples from lithological units expected to have similar geochemical behaviour were considered to be members of a lithological group.

Conclusions

Representativeness of samples

Statistical analysis showed that the selection of samples was large enough to draw conclusions about average values of the total sulfur content, acid neutralising capacity (ANC) and net acid producing potential (NAPP) across the site for several lithological units. The average NAPP and the upper 95% confidence interval for the average NAPP was less than 0 kg (H_2SO_4)/t for carbonaceous mudstone, clay, clayey sand, claystone, coal, mudstone, sandstone, siltstone and tuff. The upper 95% confidence limit was above 0 kg (H_2SO_4)/t for carbonaceous siltstone. The 95% confidence intervals for the average NAPP could not be determined for carbonaceous sandstone, conglomerate, soil and shale because there were too few samples of these types.

The fraction of samples representing each lithological group was approximately proportional to the fraction of the waste in the respective lithological group. The carbonaceous group was intentionally oversampled.

The number of samples was insufficient to make assessments about the spatial variability of the total S content, ANC and NAPP.

Potential for Acid and Metalliferous Drainage

Chromium reducible sulfur (CRS) tests indicated that not all acid generating capacity determined from total sulfur may be available to generate acid. Similarly, acid buffering characteristic curve (ABCC) testing indicated that not all acid neutralising capacity determined from ANC testing may be available to neutralise acid. Thus, there is expected to be some uncertainty on the accuracy of the NPR and AMIRA classifications of the samples.

Based on the available results the majority of the overburden and interburden materials (not immediately adjacent to the coal seams) and roof and floor wastes are not likely to be a source of acid immediately after mining. Nor would most of these materials be expected to be an immediate source of salinity; however, some portion could be a source of salinity. The clay materials of the overburden and interburden could have a markedly higher potential to release salts and metals to contact water even though the pH may remain alkaline. Typically however, the concentrations of metals in water contacting the waste would be expected to be low while waters remain circumneutral.

The majority of the overburden and interburden waste from all lithological groups is likely to be non-acid forming in the longer term. Some carbonaceous mudstone, carbonaceous sandstone, carbonaceous siltstone, clay, claystone, mudstone, sandstone, sandy clay, siltstone and tuff may be acid forming in the long term and there may be a requirement to manage these materials to prevent or limit the longer-term development of AMD.

Some portion of the roof, floor and coal could be expected to be acid forming in the long term. Washed coal wastes were not available for testing.

Kinetic testing of 10 samples to estimate rates of acid production and neutralisation and rates of metals release commenced in May 2013.

Dispersivity and Breakdown

Test results for 92 samples indicate that the clays, weathered rocks (including mudstone, claystone, carbonaceous mudstone and siltstone) may have dispersive behaviour. Slightly weathered siltstone may show very slight potential for dispersivity. The weathered sandstone did not show any indication of dispersive behaviour. Soil samples showed completely non-dispersive results due to the presence of calcite.

The fresh rocks were generally non-dispersive, although some claystones and siltstones may have a very low potential for dispersion. There was variability in dispersion results within each group.

Weathered rock, siltstone and sandstone showed potential for deterioration and breakdown after exposure to water. The siltstone showed moderate rate deterioration, and sandstone slow deterioration. This may indicate that although the fresh rock units are not dispersive, they are not durable, and with time may degrade to sand, silt or clay. The degraded material may be more prone to physical erosion than the original fresh rock.

Water Quality and Waste Management

Concentrations of sulfate, fluoride, boron and molybdenum in surface runoff from the overburden dump could exceed the cattle drinking water quality guidelines. Similarly, estimated concentrations of the above solutes and zinc in percolate from the overburden dumps are predicted to exceed the cattle drinking water quality guidelines. However, based on the proposed water management strategy for the project, under normal operating conditions the runoff will be captured in the dams and will be recycled or used in the process.

The estimated concentrations are intended to indicate concentrations that might be expected as a result of the first flushing of the overburden. They would not be expected to be sustained in the longer term as readily available solutes would be transported from the overburden.

Water quality in the longer term would be expected to be dependent on the presence and distribution of PAF materials within the dumps including the tailings. However, results from longer term kinetic testing would be required to complete these estimates.

Recommendations

Further sampling and testing is required to: i) improve the estimate average values of AMD parameters for the significant lithological units, and ii) characterise the spatial variability of AMD related parameters for all lithological units. Further sampling from drillholes spaced between 1000 m and 3000 m apart is recommended in the first instance.

Kinetic testing that commenced in May 2013 should continue.

Further sampling and testing should be undertaken to improve the understanding of the types and quantities of waste that would have the potential to be dispersive. Until such testing is complete precautions should be taken to prevent runoff water contacting the more dispersive lithological units. Storage of the soil and clays and weathered mudstone, weathered claystone and weathered siltstones which showed a high potential for dispersion within the interior of the waste dumps is recommended. After additional testing the management strategy should be revised.

Testing of additional samples should be undertaken to confirm trends in the dispersive and weathering behaviour of the various rock types.

Samples representative of coal washery wastes should be obtained and characterised.

Potentially acid forming materials including tailings should be placed in clay lined encapsulation cells within overburden dumps and located at least 5 m below the dump surface. During dump and cell construction, contact between UC, PAF and dispersive materials should be avoided. In the short term, surface and percolate water would need to be managed.

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Disclaimer

The opinions expressed in this Report have been based on the information supplied to SRK Consulting (Australasia) Pty Ltd (SRK) by GHD Pty Ltd (GHD). The opinions in this Report are provided in response to a specific request from GHD to do so. SRK has exercised all due care in reviewing the supplied information. Whilst SRK has compared key supplied data with expected values, the accuracy of the results and conclusions from the review are entirely reliant on the accuracy and completeness of the supplied data. SRK does not accept responsibility for any errors or omissions in the supplied information and does not accept any consequential liability arising from commercial decisions or actions resulting from them. Opinions presented in this Report apply to the site conditions and features as they existed at the time of SRK's investigations, and those reasonably foreseeable. These opinions do not necessarily apply to conditions and features that may arise after the date of this Report, about which SRK had no prior knowledge nor had the opportunity to evaluate.

List of Abbreviations

Term	Definition
ABA	Acid base account
ABCC	Acid buffering capacity curve
ALS	Australian Laboratory Services
AMD	Acid and metalliferous drainage
ANC	Acid neutralising capacity
AP	Acid potential calculated based on all non-sulfate sulfur present as pyrite (kg H_2SO_4/tonne)
ARD	Acid rock drainage
CarbNP	Carbonate neutralisation potential estimated from the measured inorganic carbon concentration and assuming all carbon is present as carbonate (CO_3) (kg H_2SO_4/tonne)
CEC	Cation exchange capacity
CHPP	Coal handling and preparation plant
CRS	Chromium reducible sulfur
DD	Diamond drilling
EC	Electrical conductivity
EIS	Environmental impact statement
EPC	Exploration permit coal
ESP	Exchangeable sodium percent
GAI	Global abundance index
ha	Hectares
ICP-MS	Inductively coupled plasma mass spectrometry
ICP-OES	Inductively coupled optical emission spectroscopy
kg	Kilogram
LOM	Life of mine
M	Million
m	Metre
mAHD	Metres Australian Height Datum
MDL	Mineral development lease
ML	Mining lease
MLA	Mining lease application
MPA	Maximum potential acidity calculated assuming that all sulfur is present as pyrite (kg H_2SO_4/tonne)
NAF	Non-acid forming - a classification in regard to potential for rock to be acid forming
NAG	Net acid generation (kg H_2SO_4/tonne)
NAPP	Net acid producing potential (kg H_2SO_4/tonne)
NMD	Neutral mine drainage
NP	Acid neutralising capacity (kg H_2SO_4/tonne)
NPR	Neutralisation potential Ratio
PAF	Potentially acid forming - a classification in regard to potential for rock to be acid forming

Term	Definition
PAF-LC	Potentially acid forming and of low capacity to produce acid
pH	Negative logarithm of the concentration of hydrogen ions
RC	Reverse circulation drilling
RL	Relative levels
ROM	Run of mine
SD	Saline drainage
SRK	SRK Consulting (Australasia) Pty Ltd
t	tonnes
TC	Total carbon
TDS	Total dissolved salts
TIC	Total inorganic carbon
TOC	Total organic carbon
tpa	Tonnes per annum
TOTS/Stot	Total sulfur
UC	Uncertain – a classification in regard to potential for rock to be acid forming
wt%	Weight percent

1 Introduction

Adani Mining Pty Ltd (Adani) is proposing to develop the Carmichael Coal Mine and Rail Project (the Project). The Project is located approximately 160 km north west of Clermont in the Galilee Basin in Queensland and would produce 60 million tonnes of coal product per annum. Both open cut and underground mining methods are planned for the site. Large quantities of mine waste (overburden and rock) and tailings would be produced as a result of mining.

SRK was contracted to undertake an assessment of the potential for contaminant release from, and dispersivity of, the waste materials that would be mined at the Project. This included selecting and characterising 470 samples from the drill core, developing a waste management strategy and assessing the potential water quality that may result from the final landforms.

The scope of work to support the assessment included:

- Review of the geology of the region to determine the lithology types at the Project and the potential abundance and distribution of each lithology across the Project area.
- Development of a sampling strategy.
- Site visits for selection of samples.
- Geochemical characterisation of samples.
- An assessment of adequacy of the samples collected to represent the AMD potential of the various lithologies.
- Assessment of the mining strategy and implications on overburden and tailings management
- Assessment of potential water quality impacts for surface runoff and percolate from the landforms.

The report also includes preliminary conclusions and recommendations with respect to waste management.

2 Geological Setting

2.1 Regional Geology

2.1.1 Structural Setting

The Galilee Basin, located in central Queensland, is a Late Carboniferous to Mid-Triassic extensional intracratonic terrestrial basin of predominantly fluvial sediment infill. The basin covers an area of some 247,000 km^2.

2.1.2 Stratigraphy and structure

The Carmichael Project is located to eastern edge of the Koburra trough (Figure 2-1). The entire stratigraphic sequence present in the Koburra Trough in the northern Galilee Basin is summarized in Table 2-1 along with paleogeography and structural/basin event history. Along the north-east margin of the basin all sequences are consistently present and laterally persistent.

Figure 2-2 shows a cross section of the Koburra Trough in the region of the Carmichael Project. The stratigraphic units of relevance to the Carmichael Project are the conformable interval between the coal-bearing Colinlea Sandstone-Bandanna Formation and the overlying Rewan Formation with an unconformable and variable veneer of Tertiary sediments which cover the deposit.

The Colinlea Sandstone

The Colinlea sandstone sequence overlies and onlaps the Joe Joe Group and the distribution of the sequence within the Galilee Basin is shown in Figure 2-1. The sequence comprises dominantly quartz sandstone and conglomerate with minor shale and a number of low rank sub-bituminous and sub-hydrous coal seams. This sequence represents fluvial deposition with sandy braided channel and flood plain deposits associated with mire and coal seam development. Three coal seams (D-F Seams) are laterally persistent and correlated regionally.

The Bandanna Formation

The conformably overlying Bandanna Formation comprises calcareous, lithic sandstone, siltstone and a number of low rank sub-bituminous and sub-hydrous coal seams. This sequence represents fluvial deposition with sandy braided channel and flood plain deposits associated with mire and coal seam development. Three coal seams (A-C Seams) are laterally persistent and correlated regionally.

The distribution of the sequence within the Galilee Basin is shown in Figure 2-1 and is similar in distribution to the Colinlea Sandstone unit. In the southern part of the Galilee Basin the marine Black Alley Shale (Figure 2-1) of the southern Bowen Basin interfingers with the lower Bandanna Formation and effectively separates this unit from the underlying Colinlea Sandstone.

The Betts Creek Beds equivalent

Along the far northern margin of the Galilee Basin the conformable contact between the Bandanna Formation and Colinlea Sandstone units is difficult to distinguish which has led to the naming of this combined sequence as the Betts Creek Beds (Figure 2-1 and Figure 2-2).

The Rewan Formation

The stratigraphy of the Triassic units in the Galilee is broadly continuous across the northern and southern regions of the Galilee Basin with little lithofacies or paleaogeographic variance. The Rewan Formation conformably overlies the Bandanna Formation and comprises a monotonous sequence of labile sandstones and multi-coloured argillaceous sediments.

Importantly, along the eastern margin of the northern Galilee Basin this conformable sequence of stratigraphic units has a consistent regional expression, i.e., they are consistent in their paleaogeographic characteristics over broad areas.

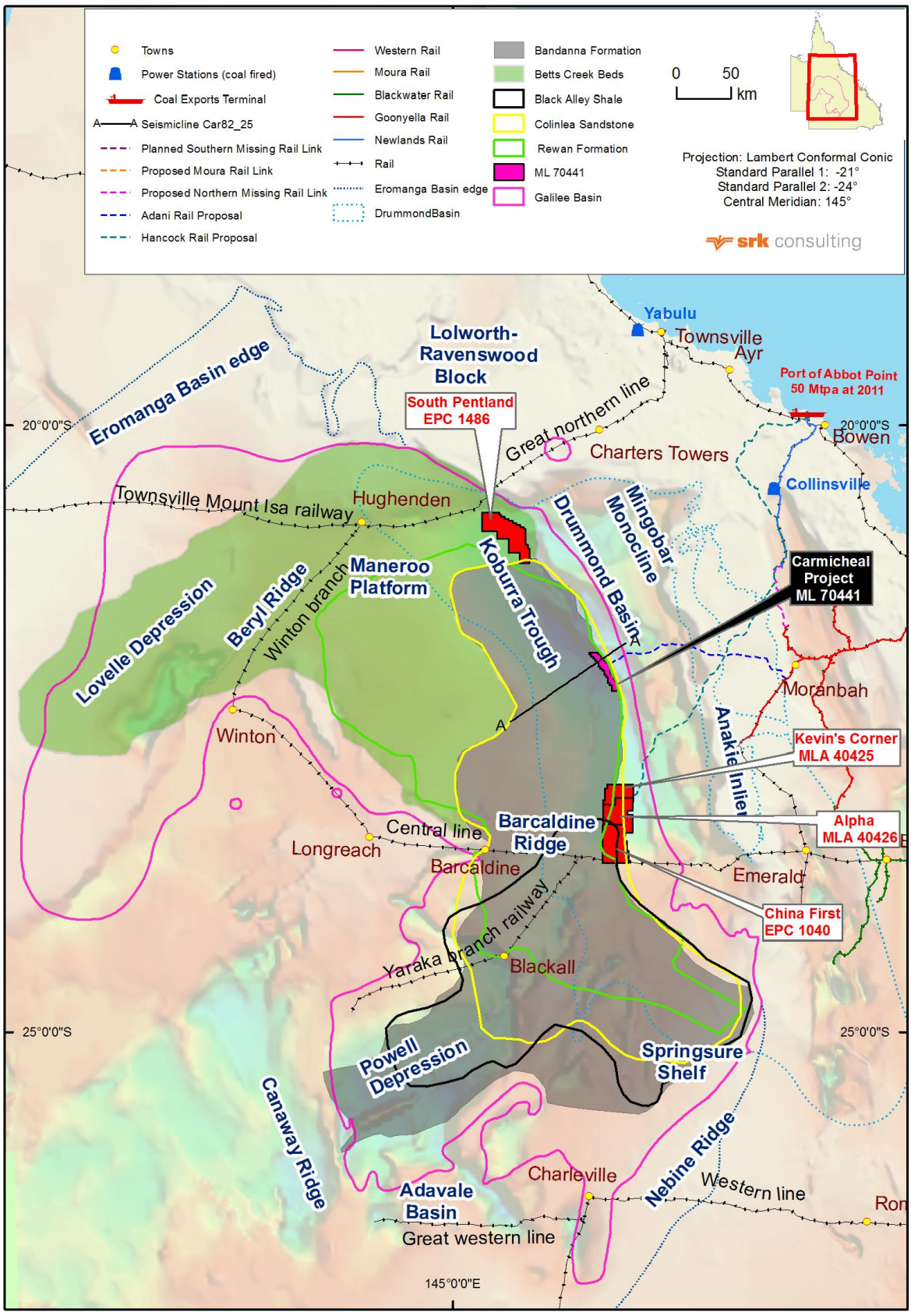


Figure 2-1: Palaeoenvironment - Areal extent of the stratigraphic formations of the Galilee basin

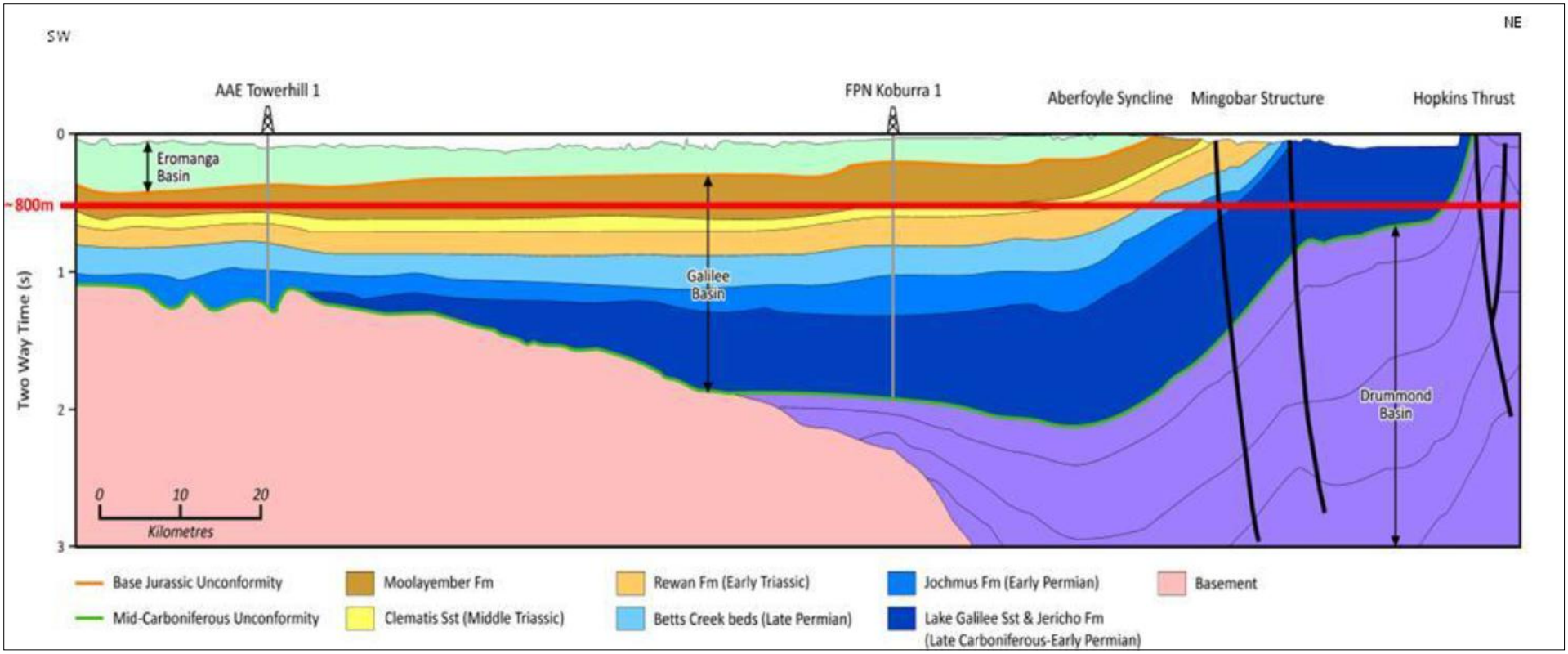


Figure 2-2: Schematic of the north eastern margin of the Galilee basin

Source: Queensland Carbon Dioxide Geological Storage Atlas, 2009.

Note:
Based on interpretations from seismic line CAR82-25 (note vertical exaggeration).

Table 2-1: Stratigraphy, palaeoenvironment and tectonic event history for the northern Galilee Basin

Age		Northern Region	Lithological unit	Palaeogeographic Environment	Tectonic Unit	Tectonic Event
Tertiary		Undifferentiated	Argillaceous sandstones and clays	Colluvium, alluvium and lacustrine.		
Unconformity						
Triassic	Middle	Clematis Sandstone	Quartz sandstone, minor siltstone and mudstone.	Fluvial braided river system.	Galilee Basin	Foreland Basin Development
		Dunda Beds	Labile sandstone, siltstone and mudstone.	Fluvial and channel and floodplain.		Foreland Basin Development
	Early	Rewan Fm	Green-grey mudstone, siltstone and labile sandstones.	Fluvial and channel and floodplain.		Foreland Basin Development
Permian	Late	Bandanna Fm	Labile sandstones, siltstones and mudstone and coal seams (3 correlate: A-C).	Braided channel and floodplain.		Thermal Subsidence
		Colinlea Sandstone	Labile quartz sandstone and coal seams (3 correlate: D-F), minor conglomerate and shale.	Sandy braided channel and floodplain with peat swamp development.		Thermal Subsidence
	Unconformity					
	Early	Upper Jochmus Fm	Volcanic-lithic labile sandstones.	Cold-climate fluvioglacial-lacustrine.	Galilee Basin	Thermal Subsidence
		Edie Tuff	Pelite and tuff.	Cold-climate fluvioglacial-lacustrine.		Thermal Subsidence
Carboniferous	Late	Lower Jochmus Fm	Volcanic-lithic labile sandstones.	Cold-climate fluvioglacial-lacustrine.		Thermal Subsidence
		Upper Jericho Fm	Mudstones, siltstones and sandstones, minor mudstone and siltstone	Braided Channel and floodplain.		Thermal Subsidence
		Oakleigh Siltstone Mbr	Varved argillaceous siltstone.	Lacustrine and minor fluvial sedimentation		Thermal Subsidence
		Lower Jericho Fm	Pebbly mudstones, volcaniclastic sandstones and conglomerate.	Low-energy fluviatile environment.		Thermal Subsidence
		Lake Galilee Sandstone	Quartzose sandstone, with minor conglomeritic bands, and minor argillaceous dark-grey to black mudstone bands in upper part.	High-energy fluviatile environment.		Thermal Subsidence
	Early	Unconformity				
		Drummond Basin Basement				

2.2 Local Geology

The Carmichael deposit is located on the eastern margin of the Koburra Trough. The targeted coal seams (A to F Seams) are hosted within the Late Permian Colinlea Sandstone and overlying Bandanna Formation which sub-crop beneath a thin cover of Triassic Rewan Formation. The Rewan Formation is in turn, obscured beneath a variable cover of unconsolidated to poorly consolidated Tertiary sediments.

2.2.1 Local Stratigraphy

At surface, the stratigraphy is dominated by a sequence of undifferentiated Tertiary Sediments up to 100 m thick, although typically about 50 m thick. The Tertiary unit is principally composed of clayey mudstones and soft sandstones and unconformably overly the Triassic sediments of the Rewan Formation and intermittently, where present, the Dunda Beds.

The Dunda Beds are described as an 'outcrop facies variant of the uppermost Rewan Group characterised by a greater quartzose content and subordinate lutites' (Heeswijk, 2006). The lower half is dominated by sandstone and the upper half mudstone.

The Rewan Formation is described at Carmichael as an interbedded grey-green fine- to medium-grained lithic sandstone and grey-green mudstone, suggesting an extensive floodplain or fluvial environment of deposition. Thicknesses are variable from 20 to greater than 200 m as a result of the unconformable contact with the overlying Tertiary sequences and the general westward dip of the strata (Xenith, 2013.

The Bandanna Coal Measures and Colinlea Sandstone conformably underlie the Triassic sequences and consist of interbedded coal, sandstones, siltstones and mudstones. The combined sequence is up to 150 m thick. Sandstones are dominant with generally thin mudstone bands, often carbonaceous, usually found both above, below and as partings within coal seams. The larger interburden units are predominantly interbedded sandstone and siltstone. Sediment sources were defined as being generally from the west, whilst limited palaeocurrent evidence indicates a south-southeast transport direction (Heeswijk, 2006).

2.2.2 Igneous and Metamorphic Alteration

The Carmichael project is located within a relatively benign area with respect to igneous or tectonic activity. To date, no igneous intrusive material has been encountered during drilling, and magnetic data do not indicate any dykes or igneous plugs within the project area.

2.2.3 Palaeoenvironment and Sulfur Implications

The percentage of pyrite in sedimentary rocks is limited principally by available sulfur during diagenesis, which is generally a function of the available sulfate in water under favourable (anoxic, reducing) conditions. Sedimentary pyrite mineralization occurs when Fe^{2+} and H_2S formed by sulfate reduction in the presence of decomposing organic material and water react to form FeS and S^0, which subsequently form FeS_2 (pyrite).

The availability of sulfur in a freshwater environment is much less than that in sea water due to the much lower concentrations of dissolved sulfate. As a result, during diagenesis net formation of pyrite within a freshwater or fluvial environment is often much less than that in marine environments.

Furthermore, a greater percentage of sulfur in freshwater environments has a tendency to be bound up organically within coal, reducing the potential for AMD in the waste.

The Galilee Basin has been shown to be predominantly fluvial, and as such, the in-situ sulfur content of the coal can be expected to be low to medium (i.e. less than 1% (air dried basis, adb) based

solely upon palaeoenvironment. The only unit determined to have a partial marine influence, the Black Alley Shale, does not extend north into the Carmichael project area, nor is it present in some of the key mining developments within equivalent stratigraphy to the south. This is supported by the similarity in sulfur contents determined as part of the coal quality assessment at nearby mines (Table 2-2).

A study by Hunt and Hobday (1984) on Permian age coals in Australia showed a clear correlation between palaeoenvironment and sulfur content and supports the influence of marine environments on elevated seam sulfur contents. Coal seams deposited in lower delta plain facies typically showed average raw sulfur contents >0.55%; coal seams associated with braided fluvial facies more distal from marine palaeoenvironments typically contained average raw sulfur contents <0.55%; and upper delta plain palaeoenvironments typically displayed intermediate sulfur contents.

The coal seams present at the Carmichael deposit typically display raw sulfur contents of ~0.4-0.5% consistent with a braided fluvial facies.

Total sulfur contents from coal quality assessments at five project sites in the northern Galilee Basin indicate that the sulfur contents of the coal are similar (Table 2-2).

Table 2-2: Total raw sulfur content of coal at five project sites in the northern Galilee Basin

		Total Sulfur % (adb)		
Project	**Samples**	**Min**	**Max**	**Mean**
Carmichael Coal Project	185	0.03	1.15	0.42
Alpha Coal Project	170	0.31	1.67	0.57
Kevin's Corner Project	296	0.12	1.82	0.51
China First Project	-	-	-	0.45
Pentland South Project	-	0.25	0.31	-

3 Sample Acquisition

3.1 Sample Selection

For the purposes of assessing the potential for acid and metalliferous drainage and dispersivity of the materials, the existing drill logs were reviewed and a sampling plan was developed. The plan was based on the lithological units present, available drill core, distribution of drillholes across the project and need to obtain a set of samples that would be used in a geostatistical assessment of the distribution of geochemical characteristics.

Sample selection was undertaken during a first site visit in December 2011 and a second in November 2012. At the time of the second visit Adani Mining had drilled 328 holes across the deposit. The locations of the drillholes are shown in Figure 3-1. Some holes had been partially cored while the other holes were fully cored. Core had been stored in a core library and had been sampled previously for coal quality and geotechnical testing. Consequently some core was not available for geochemical characterisation. A total of 470 samples were collected for testing during two rounds of sample collection. Sample descriptions are provided in Appendix A.

The sampled drillholes are distributed from north to south across the deposit and located within or near the proposed pits (Figure 3-1). The numbers of samples from each drillhole are listed in Table 3-1. The lithological unit representation of these samples is discussed in Section 3.2.1.

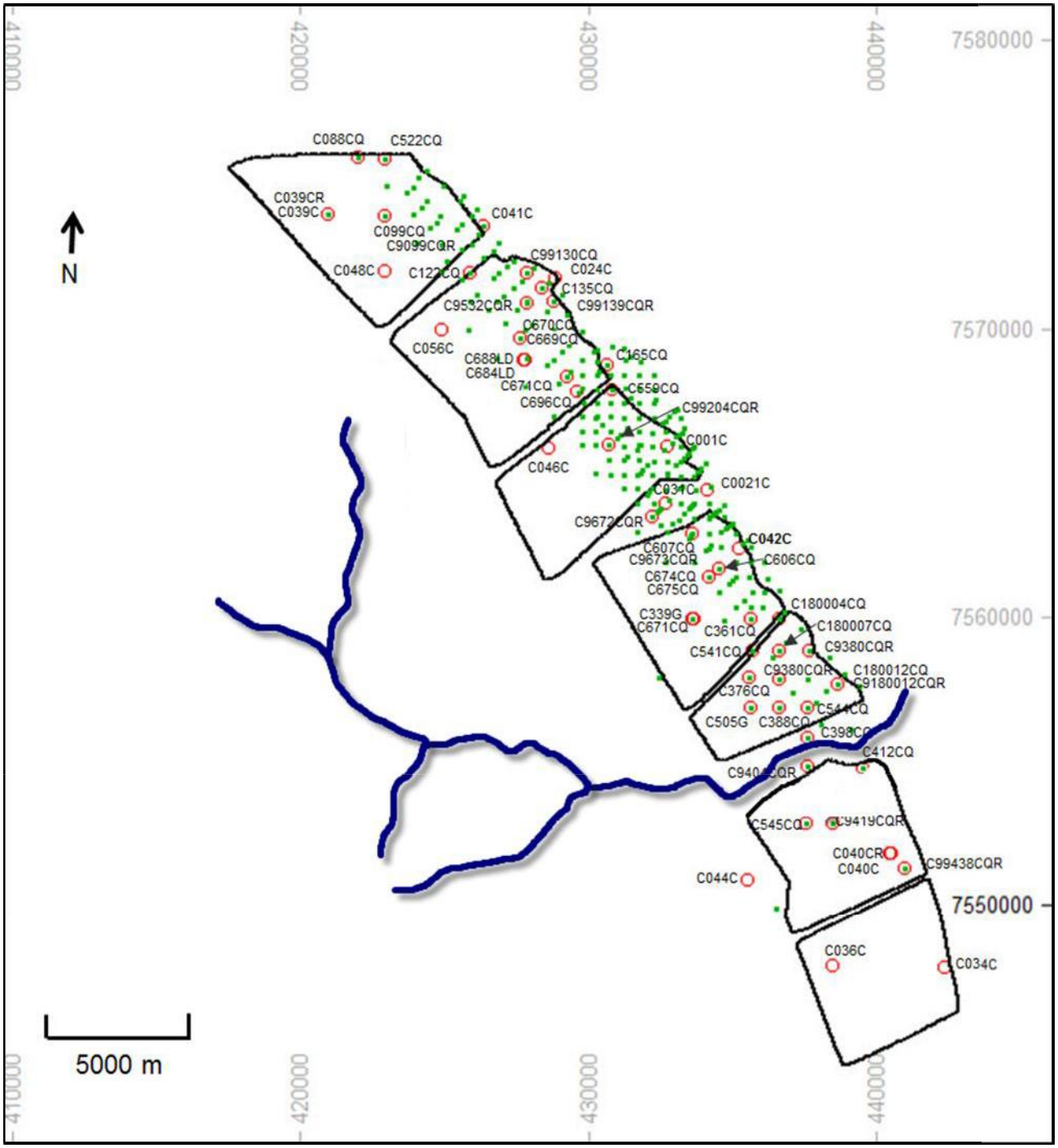


Figure 3-1: Approximate locations of pit boundary (dashed) and drillholes sampled (labelled) for geochemical characterisation

Table 3-1: Samples collected for geochemical characterisation from each drillhole

Drill hole ID	No. of Samples	Drill hole ID	No. of Samples	Drill hole ID	No. of Samples
C001C	5	C165CQ	2	C671CQ	20
C0021C	4	C180004CQ	9	C674CQ	5
C024C	5	C180007CQ	10	C675CQ	7
C031C	9	C180012CQ	6	C684LD	28
C034C	5	C339G	14	C688LD	11
C036C	7	C361CQ	12	C696CQ	9
C039C	3	C376CQ	8	C9099CQR	2
C039CR	4	C388CQ	10	C9180007CQR	1
C040C	3	C398CQ	16	C9180009CQR	6
C040CR	2	C412CQ	3	C9180012CQR	3
C041C	6	C505G	10	C9380CQR	15
C042C	3	C522CQ	2	C9404CQR	15
C044C	2	C541CQ	10	C9419CQR	16
C046C	6	C544CQ	8	C9532CQR	2
C048C	29	C545CQ	9	C9672CQR	9
C056C	7	C559CQ	2	C9673CQR	4
C088CQ	15	C606CQ	8	C99130CQR	1
C099CQ	12	C607CQ	8	C99139CQR	1
C122CQ	13	C669CQ	9	C99204CQR	3
C135CQ	1	C670CQ	10	C99438CQR	5

3.2 Rock Types

3.2.1 Lithological units and lithological groups

More than 60 different lithological units and sub categories were logged for the core from the Project. Since some of the lithological units were expected to have similar geochemical behaviour they were grouped together for the purposes of statistical and geochemical assessment. A comprehensive listing of the lithological groupings is given in Appendix B.

Table 3-2 presents the lithological units and sample numbers from each unit. Section 5.6 discusses these sample numbers in relation to the volumetric proportions of each lithology within the mined materials.

Table 3-2: Number of samples from lithological units

Lithological unit	Number of Samples
Carbonaceous Mudstone	31
Carbonaceous Sandstone	4
Carbonaceous Siltstone	21
Clay	15
Clayey Sand	11
Conglomerate	4
Sandy Clay	10
Claystone	22
Coal	36
Interbedded sand and siltstone	2
Interbedded carb mudstone and tuff	1
Mudstone	14
Sandstone	188
Shale	2
Siltstone	96
Soil	1
Tuff	12
Total	470

Sulfide minerals can form as a result of sulfate reduction during the formation of coal (Berner et al., 1985), therefore, the potential for sulfides to be present in material in and adjacent to coal seams is significantly greater than the potential in the overlying bedrock and regolith.

Mining methods used immediately adjacent to the coal seams may handle material at smaller unit rates (blocks) than methods used for the overburden and interburden (e.g. truck and shovel vs face shovel). Thus, there is potential to handle waste rock originating from near the coal seam with greater selectivity. The raw coal would potentially be stockpiled and while stockpiled could be a potential source of AMD. The coarse and fine wastes from coal wash plants could also be a potential source of AMD and are generally handled and disposed of separately.

Samples from immediately above or below the coal seams are identified as roof and floor materials. Twenty one such samples were collected. Thirty six samples were taken from within coal seams and the remaining 413 samples were collected from overburden and interburden not immediately adjacent to coal seams. At the time of sample collection, material representing the coal washery wastes (for example from pilot plants) was not available.

3.2.2 Degree of weathering

Oxidation (an aspect of weathering) consumes sulfides and produces sulfates, thus lithological units that originally contained sulfides may have significantly lower sulfide contents after oxidation. Oxygen supporting the oxidation originates in the atmosphere and therefore the oxidised zone generally forms above the regional water table (over geological time).

The distribution of fresh and weathered samples (as identified by visual logging) is presented in Figure 3-2, as a function of depth. Table 3-3 shows that collected samples were selected from materials with various degrees of weathering as documented in drill logs.

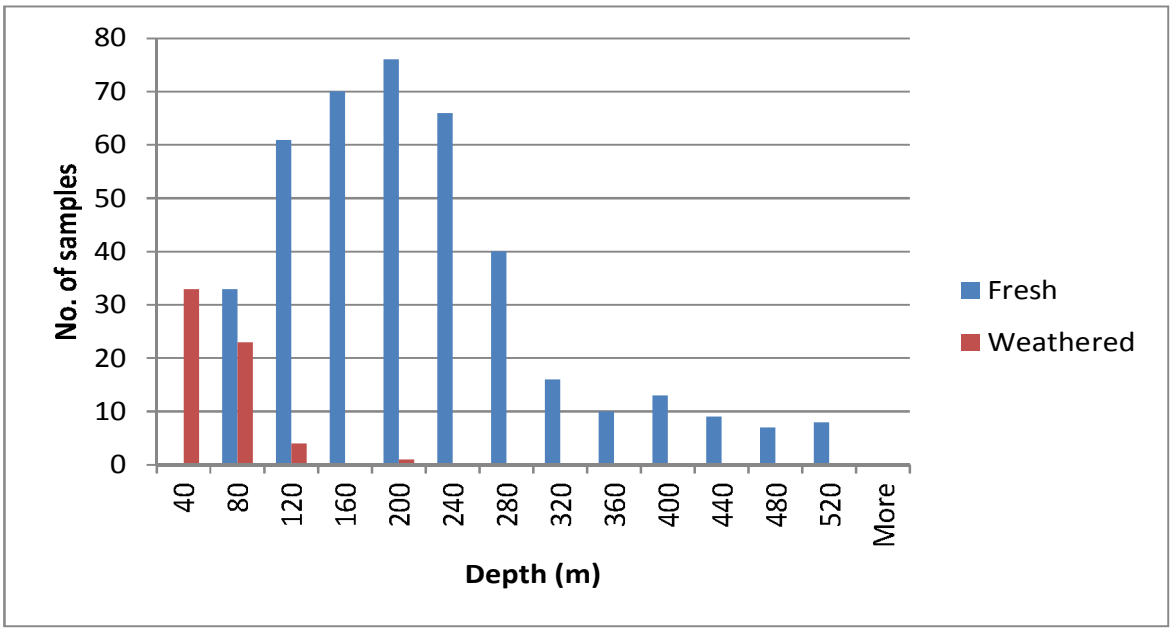


Figure 3-2: Frequency of weathered and fresh samples as a function of depth

Table 3-3: Distribution of samples amongst lithological units and weathering states

Lithological group and unit	Weathering Code							Total
	F	S	W	M	D	H	E	
Carbonaceous	57	1						58
CARBONACEOUS MUDSTONE	30	1						31
CARBONACEOUS SANDSTONE	4							4
CARBONACEOUS SILTSTONE	21							21
INTERBEDDED CARB MUDSTONE AND TUFF	2							2
Clay and soil		1	1	6	1	9	9	27
CLAY		1	1	1		6	6	15
CLAYEY SAND				5	1	3	2	11
SOIL							1	1
Coal	35		1					36
COAL	35		1					36
Rem	319	7	5	9		9	2	351
CLAYSTONE	13	2	1	1		4	1	22
CONGLOMERATE	4							4
INTERBEDDED SANDSTONE AND SILTSTONE	1							1
MUDSTONE	14							14
SANDSTONE	178	3	1	2		4		188
SANDY CLAY			3	5		1	1	10
SHALE	2							2
SILTSTONE	93	2		1				96
TUFF	12							12
Grand Total	409	9	7	15	1	18	11	470

Notes:
F – fresh (unweathered)
E **–** extremely weathered
H - highly weathered
D - distinctly weathered
M **–** moderately weathered
S **–** slightly weathered
W - weathered
‘ ‘ **–** indicates zero samples

4 Testing and Analytical Methods

4.1 Static testing

The following geochemical analyses and tests were undertaken on all 470 samples collected:

- Paste pH and electrical conductivity (AMIRA, 2002)
- Total sulfur content (Leco)
- Acid neutralising capacity (ANC) (AMIRA, 2002)
- Multi-element analysis (four acid digest and/or aqua regia digest followed by ICPAES/ICPMS).

Subsequently, subsets of samples were selected for further testing including:

- Sulfur speciation (sulfate sulfur and chromium reducible sulfur content)
- Carbon speciation: total inorganic carbon (TIC), total organic carbon (TOC), total carbon (TC)
- Acid buffering characteristics curve (AMIRA, 2002)
- Net acid generation (NAG) test – single (AMIRA, 2002)
- Modified NAG test with extended boil (EGi, 2008)
- Static leach tests on solid, single and multiple as appropriate – (solid to de-ionised water (s:w) at a ratio of 1:3) – and multi element scan of the extract (Price, 1997)
- Dispersivity testing:
  - Cation exchange capacity (CEC) and exchangeable sodium percentage (ESP)
  - Emerson aggregate test
  - Electrical conductivity (s:w ratio 1:5).

ALS Environmental, Brisbane, conducted and coordinated all testing.

4.2 Kinetic testing

Based on the results of the static testing ten samples were selected for kinetic testing. The kinetic testing method selected for use was based on the AMIRA (2002) test method and testing commenced in May 2013.

5 Results and Discussion

5.1 Paste pH and Electrical Conductivity

Paste parameters provide an indication of the acidity and salinity of a sample at the time of testing. The degree of weathering the material has experienced as well as the availability of readily soluble salts can be inferred from these parameters.

Generally, paste pH ($pH_{1:2}$) values less than pH 5 indicate the presence of stored acidity (i.e. stored oxidation products) and net acid generating conditions, whereas alkaline paste pH values suggest the presence of reactive neutralising minerals.

Paste electrical conductivity ($EC_{1:2}$) provides an indication of the soluble salt loading associated with the sample. Where the sample originates from a naturally saline environment, an elevated paste $EC_{1:2}$ may simply indicate salinity. However, where natural salinity is low, a high paste EC would indicate the presence of soluble sulfide oxidation products which can then be used to infer the degree of weathering of the material.

Low paste pH or elevated paste EC values may be indicative of the immediate potential of a sample to impact the quality of water contacting the waste Such potential may exist whether the sample is classified as non-acid forming (NAF), potentially acid forming (PAF) or uncertain (UC) with respect to acid potential.

5.1.1 Roof, Floor and Coal

The non-coal roof and floor samples are from materials immediately adjacent to the coal seams and they originate from members of the non-coal lithological units in Table 3-2. The 26 non-coal roof and floor samples selected are from the Carbonaceous and the Rem groups. The samples were carbonaceous mudstone, carbonaceous siltstone, claystone, sandstone or siltstone.

Paste $pH_{1:2}$ and $EC_{1:2}$ data are presented in Figure 5-1, Figure 5-2 and Figure 5-3 for the roof and floor and coal samples. Summary statistics are provided in Table 5-1.

Table 5-1: Roof and floor material $EC_{1:2}$ summary statistics

Statistic	$pH_{1:2}$	$EC_{1:2}$
		µS/cm
no. of samples	57	57
minimum	5.3	37
mean	7.5	417
median	7.4	420
maximum	9.8	1620

The lowest pH and highest EC tend to be associated with samples with higher total S contents (> 0.1%). The paste pH of the samples ranged from circum neutral to alkaline (5.3 to 9.8). The majority (75%) of samples had a paste pH greater than 7. The absence of samples with a paste pH less than 5 indicates none of the samples that may be potentially acid forming had progressed to acidic conditions at the time of testing. Since the majority of samples had a paste pH > 7, the results suggest the presence of reactive neutralising minerals and that the roof, floor and coal materials should not be a source of acid immediately after mining. The circum neutral pH values do not, however, exclude the potential for acid release if sulfides are present and oxidise after mining.

The paste EC values ranged between 37 and 1620 µS/cm with the results for all but two samples being less than 1000 µS/cm, and 10 samples below 200 µS/cm (i.e. most samples were within the EC range of 200 to 1000 µS/cm).

The results suggest that most of roof, floor and coal would not be expected to be an immediate source of salinity.

There was no apparent correlation between the paste EC and paste pH (Figure 5-3).

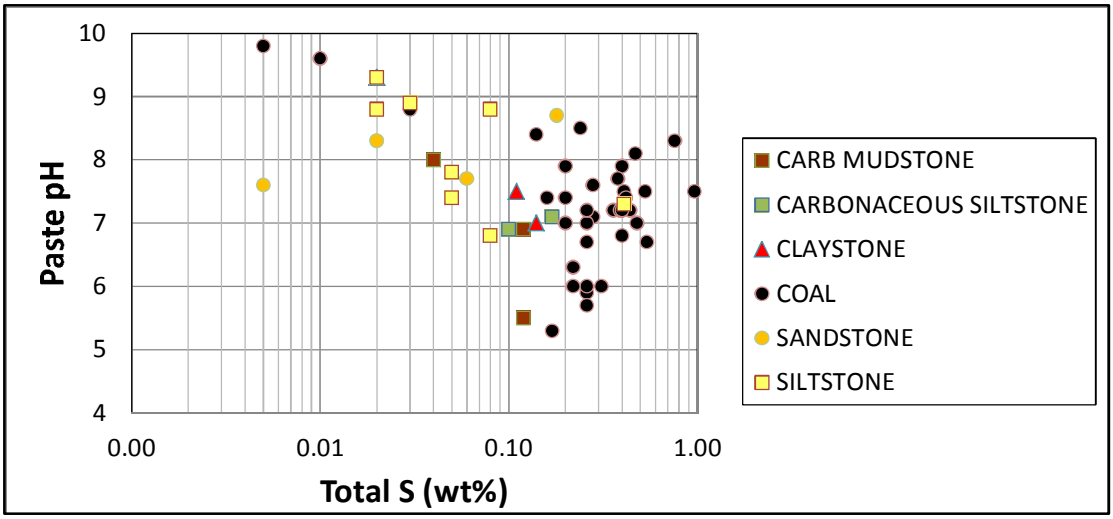


Figure 5-1: Paste pH as a function of total sulfur content (roof, floor and coal)

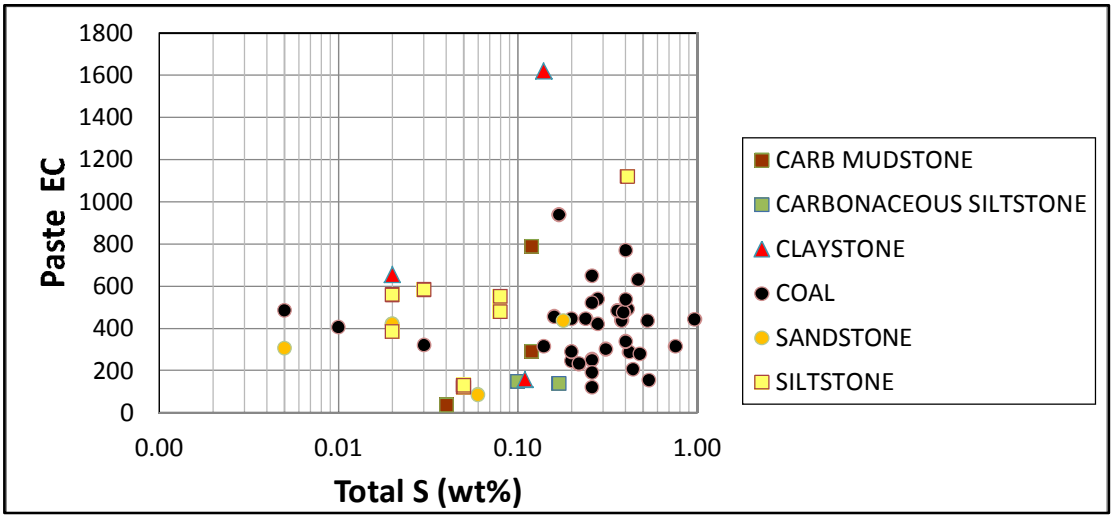


Figure 5-2: Paste EC as a function of total sulfur content (roof, floor and coal)

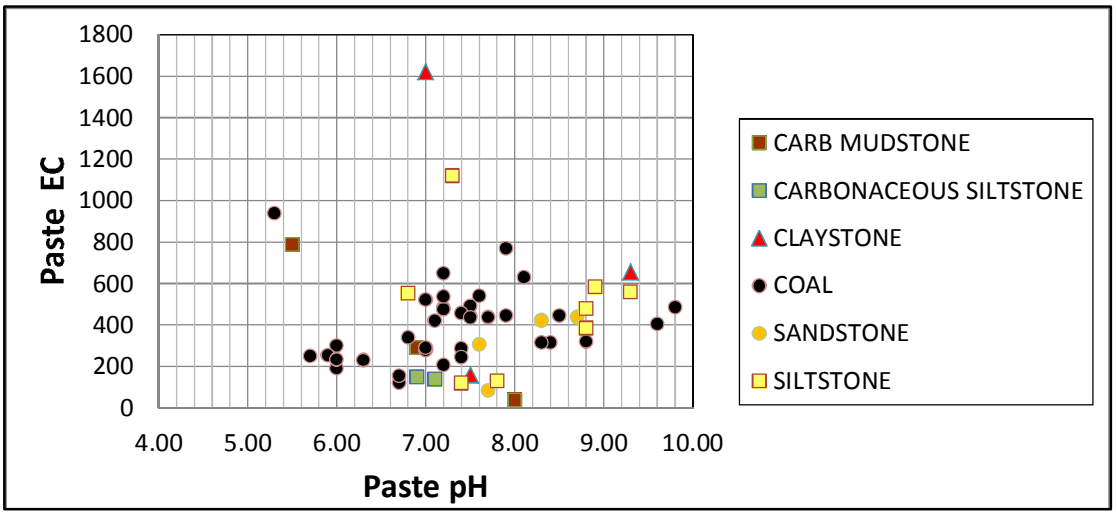


Figure 5-3: Paste EC as a function of paste pH (roof, floor and coal)

5.1.2 Overburden and Interburden

Paste pH and EC data are presented in Figure 5-4, Figure 5-5 and Figure 5-6 for the overburden and interburden samples. A total of 413 overburden and interburden samples were tested and the summary statistics of the samples are provided in Table 5-2.

Table 5-2: Overburden and interburden material pH1:2 and EC1:2 summary statistics

Statistic	$pH_{1:2}$	$EC_{1:2}$
		µS/cm
no. of samples	413	413
minimum	3.0	26
mean	8.1	413
median	8.1	264
maximum	9.7	6200

Paste pH ranged from acidic to alkaline (3.0 to 9.7) and there was a weak trend for the paste pH to decrease with total S content samples. The mean and median paste pH values of the overburden and interburden were about half a pH unit larger than those of the roof, floor and coal samples. Only two samples had paste pH values less than 5, suggesting that limited stored oxidation products were present in the samples characterised. The majority of samples (90%) had a paste pH greater than 7, suggesting the presence of reactive neutralising minerals and that the overburden and interburden would not be a source of acid immediately after mining.

Overall there was a trend for the paste EC to increase with total S; however, for each lithological unit the paste EC tended to be independent of the total S content (e.g. clay). The median paste EC of the overburden and interburden (264 µS/cm) was less than that of the roof, floor and coal samples, whilst the average was similar. The average value was strongly influenced by the clay materials, which had an average paste $EC_{1:2}$ for the fifteen clay samples of 2110 µS/cm, compared with the average of 349 µS/cm, for all other overburden and interburden samples.

The majority of overburden and interburden is not likely to be a significant source of salinity. The exception is clay materials; the potential for clays to release salts and metals to contacting water could be greater than for all other tested materials – including overburden, interburden, roof, floor and coal (Figure 5-6).

Like the roof, floor and coal materials there were generally no significant correlations between the paste EC and paste pH. Clay, however, produced paste EC values greater than 1000 µS/cm with corresponding paste pH values between 7.5 and 8.4. For paste pH values outside this range the paste EC was less than 1000 µS/cm. Only four clay samples lay outside of this paste pH range, so testing of additional samples would be required to confirm this observation.

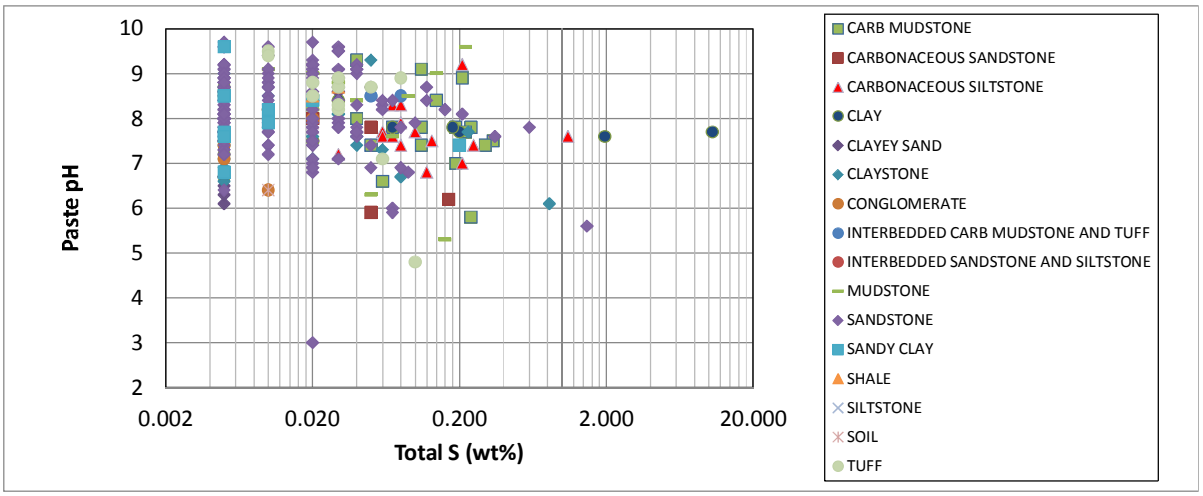


Figure 5-4: Paste pH as a function of total sulfur content (overburden and interburden)

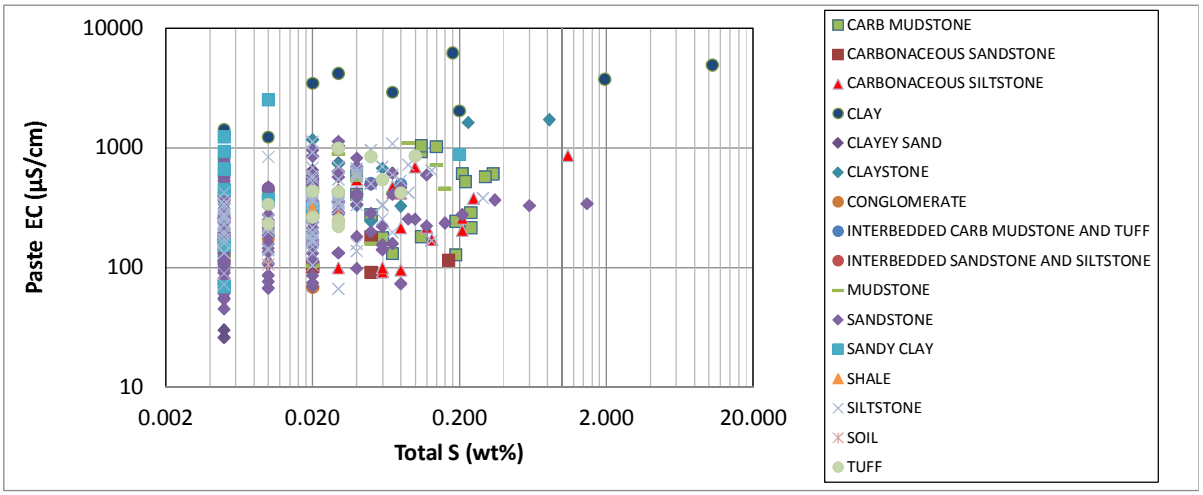


Figure 5-5: Paste EC as a function of total sulfur content (overburden and interburden)

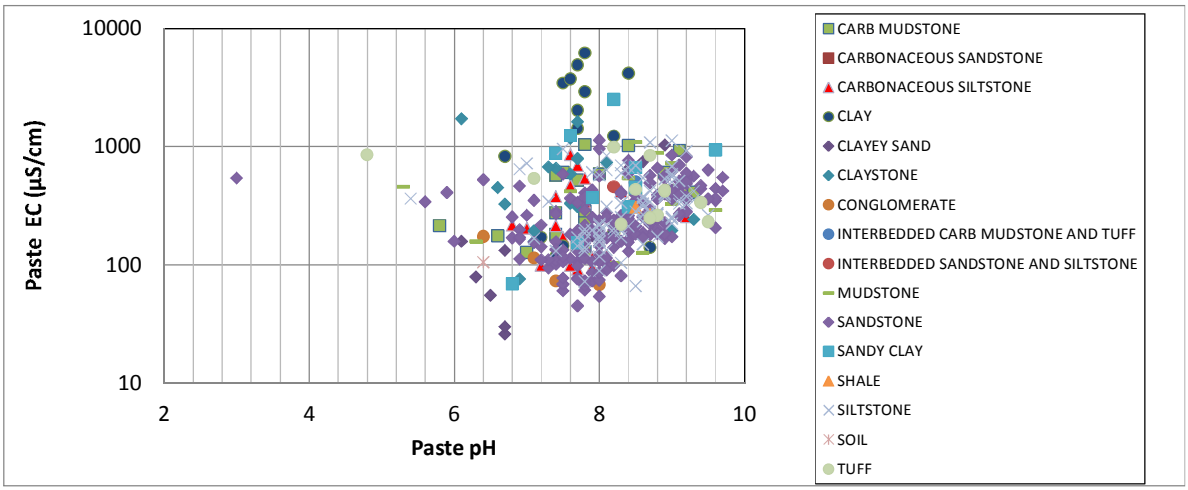


Figure 5-6: Paste EC as a function of paste pH (overburden and interburden)

5.2 Acid Base Account

The net acid producing potential (NAPP) is the theoretical balance between the capacity of the sample to generate acid due to the oxidation of sulfides and its capacity to neutralise any acid formed. The maximum potential acidity (MPA) of the sample is calculated from the total sulfur content, assuming that all sulfur is present as pyrite. This assumption generally overestimates the amount of acid potential since sulfur may exist in other forms that are not acid generating (e.g. as sulfate). It is therefore viewed as a conservative approach.

The acid neutralising capacity (ANC) of a sample may be sourced from both carbonate and silicate minerals. Readily reactive neutralising capacity is usually contributed by carbonate minerals present. Silicates are usually less reactive, unless conditions become very acidic.

The NAPP is calculated as follows:

NAPP = MPA – ANC (kg (H_2SO_4)/t

Where MPA = 30.6 x S% and the sulfur content is expressed as weight per cent (wt%).

The MPA, ANC and NAPP are reported in Appendix C.

5.2.1 Acid Potential

The MPA summary statistics for a) the roof, floor and coal, and, b) the overburden and interburden are presented in Table 5-3. The maximum values are significantly different. For the roof, floor and coal samples the maximum MPA was 29.7 kg (H_2SO_4)/t, compared with the larger value of 324.4 kg (H_2SO_4)/t for the overburden and interburden samples.

These results suggest that, overall, the roof, floor and coal waste may have more potential to produce acid per mass but that there may be a small fraction of overburden and interburden with a larger potential to produce acid.

Table 5-3: MPA summary statistics

Statistic	Roof, floor & coal	Overburden and interburden
	kg (H_2SO_4)/t	
no. of samples	57	413
minimum	0.2	0.2
mean	7.2	2.4
median	6.1	0.6
maximum	29.7	324.4
no. MPA>3 kg (H_2SO_4)/t	41	45
% MPA>3 kg (H_2SO_4)/t	72	11

Note: Minimum values correspond to half the limit of detection for total sulfur (0.01 wt%).

The MPA values reported in Table 5-3 may be an overestimate of the actual potential acidity. This is because, as described above, the MPA is determined from the total sulfur content. Where a significant portion of sulfur is present as sulfate, a more appropriate measure of the potential for acid generation is the acid potential (AP) calculated based on the sulfide content. The sulfide content may be estimated by subtracting the sulfate-sulfur content from the total sulfur content. Alternatively, the chromium reducible sulfur (CRS) test is a supplemental test which provides a measure of reduced inorganic sulfur and was developed to differentiate between oxidisable sulfides and other forms of sulfur, which may not be acid forming.

A subset of 80 samples was submitted for sulfate sulfur measurement. Forty eight samples were overburden and interburden samples and 32 were coal, roof and floor samples. Thirty one of these roof, floor and coal samples and 18 of the overburden and interburden samples were also subjected to the chromium reducible sulfur (CRS) analysis.

Roof, floor and coal

Sulfide S (the difference between total S and sulfate-sulfur) and total sulfur are presented in Figure 5-7. The dashed line represents a line of equivalence, where the sulfide sulfur and total sulfur are equal. The dotted line is where the sulfide sulfur content is half the total sulfur content. The figure shows that the there is little sulfate S present for the majority of samples, particularly the coal samples. CRS and sulfide S are presented in Figure 5-8 . For some samples the CRS is a relatively small fraction of the sulfide S. That is, a relatively large fraction of the sulfur is not in a reduced inorganic form and therefore would not oxidise and contribute to AMD. This is the case for the coal samples of which all but two samples have less than 50% of their sulfide S in reduced inorganic form.

Less than 50% of the sulfide S of the carbonaceous siltstone and sandstone samples is in reduced organic form; however, it must be noted that the number of samples is small (three and two respectively) and more samples from across the site would need to be characterised to confirm this finding.

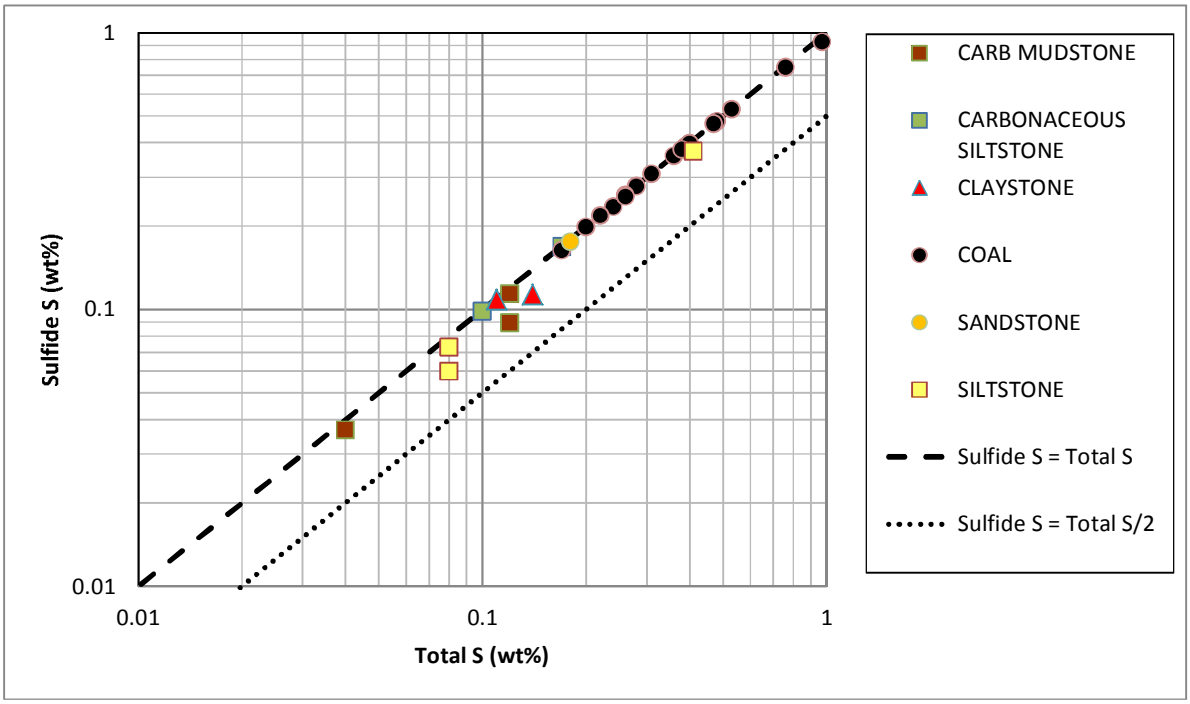


Figure 5-7: Sulfide sulfur (non sulfate sulfur) as a function of total sulfur content for roof, floor and coal samples

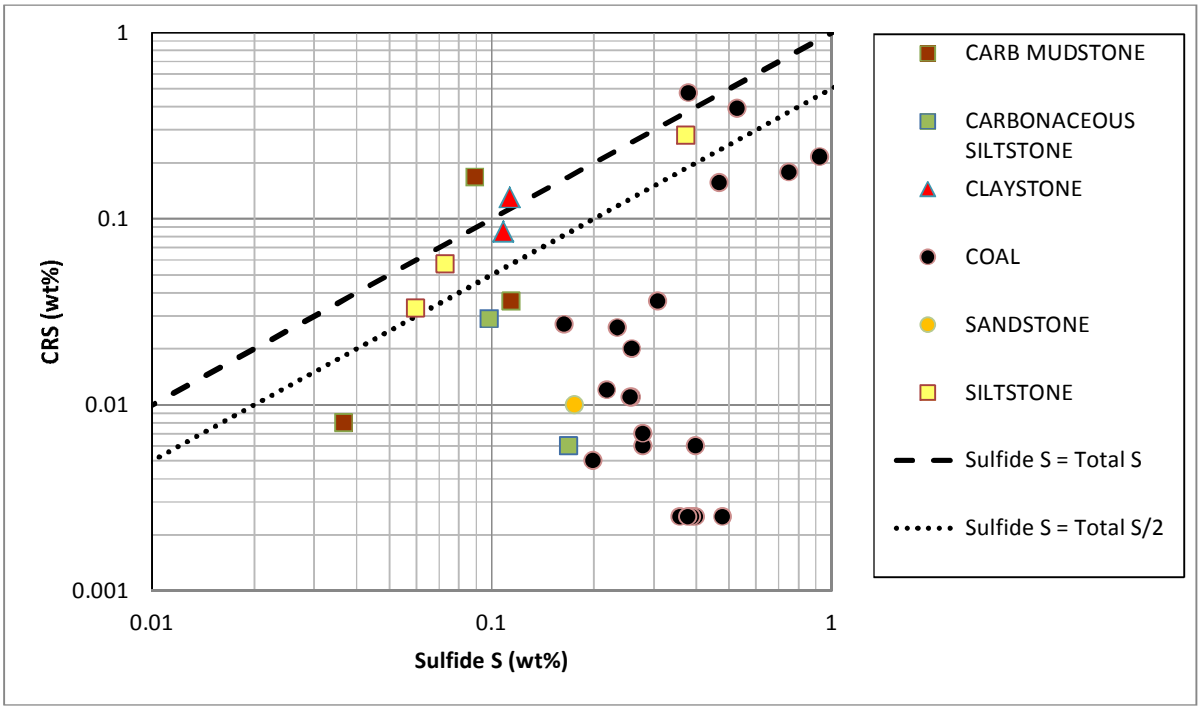


Figure 5-8: Chromium reducible sulfur as a function of sulfide sulfur content for roof, floor and coal samples

Overburden and interburden

A plot of sulfide sulfur as a function of total sulfur for the overburden and interburden is presented in Figure 5-9.

Generally, the sulfate sulfur content was a small fraction of the total S content. However, there were a few samples where the sulfate S content was about 50% of the total S.

Figure 5-10 shows that for the majority of samples, the chromium reducible S was less than 50% of the sulfide sulfur content indicating that the sulfate analysis may not identify all of the sulfate sulfur that is present in the sample. This suggests compounds not soluble in HCl (used for sulfate analysis), such as alunite, barite or other insoluble sulfate minerals,) may be present.

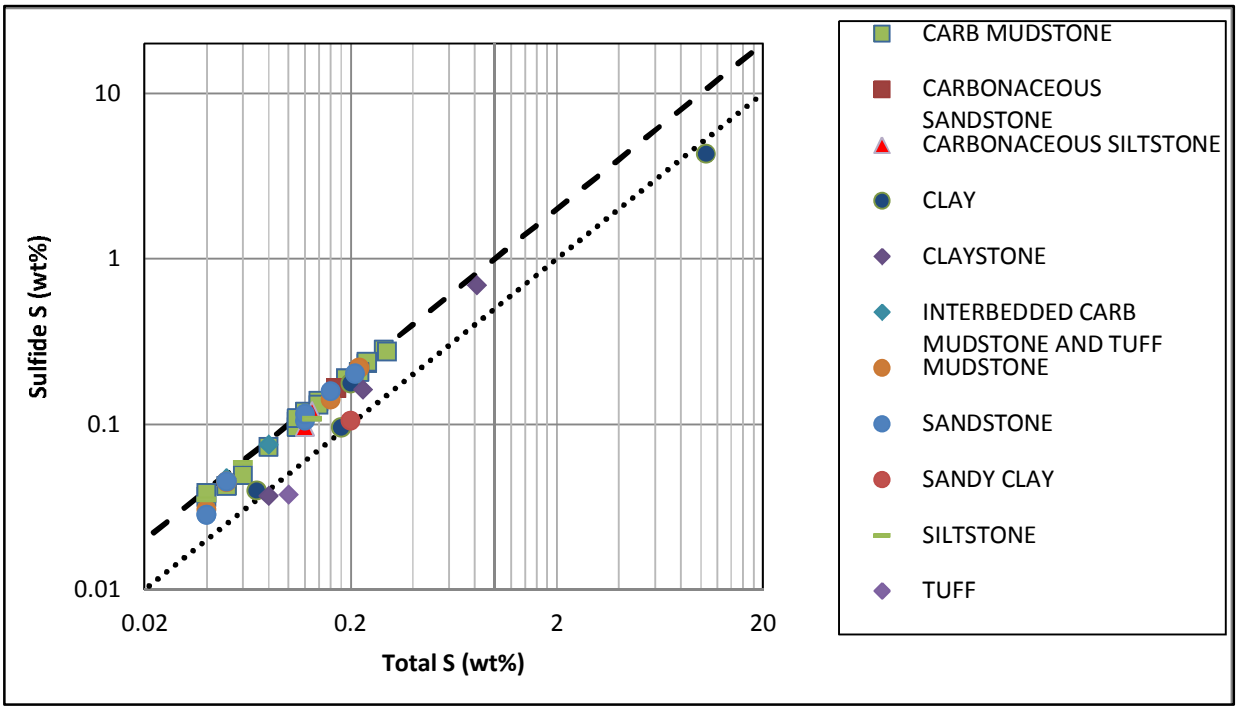


Figure 5-9: Sulfide sulfur (non sulfate sulfur) as a function of total sulfur content for overburden and interburden

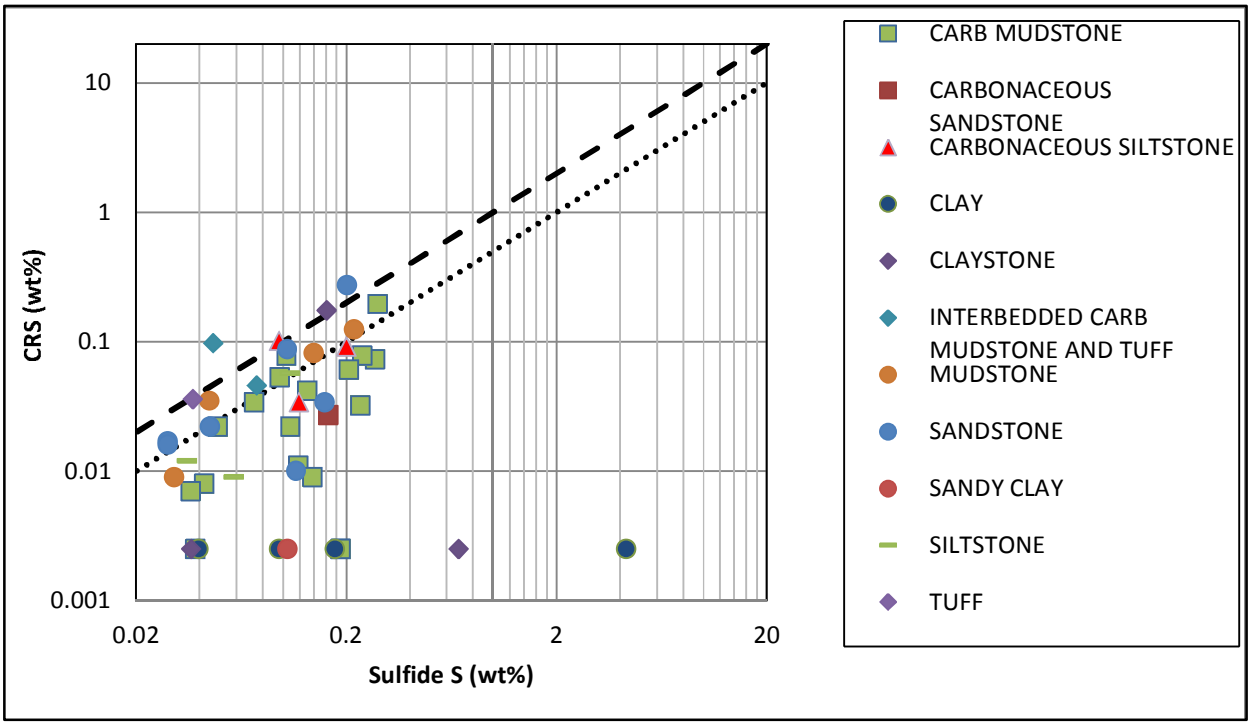


Figure 5-10: Chromium reducible sulfur as a function of sulfide sulfur content for overburden and interburden

5.2.2 Neutralisation Capacity

Sample ANC is determined by the ANC test (AMIRA, 2002). The endpoint pH after the addition of hydrochloric acid (HCl) is very low (typically between pH values of 1 and 2) and leads to reactions that will occur only at a low pH (i.e. neutralisation due to dissolution of the silicate minerals). The ANC measurement may therefore overestimate the neutralisation capacity that is readily available to maintain a near neutral pH. Other analytical methods, such as acid buffering characteristics curve (ABCC) and carbonate neutralising potential, are available to improve the accuracy of the estimate of acid neutralising capacity.

Acid Neutralising Capacity

The ANC summary statistics for a) the roof, floor and coal and b) the overburden and interburden are presented in Table 5-4. The median values of the ANC for a) the roof, floor and coal b) the overburden and interburden materials are 34.0 and 23.5 kg (H_2SO_4)/t respectively. However, in each case, there are samples with ANC greater than 350 kg (H_2SO_4)/t.

Table 5-4: ANC summary statistics

Statistic	Roof, floor & coal	Overburden and interburden
	ANC	
	kg (H_2SO_4)/t	
no. of samples	57	413
minimum	0.7	0.3
mean	34.0	23.5
median	7.5	6.8
maximum	381.0	555.0

Carbonate Neutralising Capacity

The Ca and Mg carbonate minerals are of greatest importance in terms of neutralising acidity generated, as they react rapidly and buffer in the near neutral pH range. The total inorganic carbon content can be used to infer the carbonate mineral content and estimate the carbonate neutralization potential (CarbNP). The CarbNP of a subset of samples was measured and the summary statistics are presented in Table 5-5.

Table 5-5: Carbonate neutralising potential summary statistics

Statistic	Roof, floor & coal	Overburden and interburden
	CarbNP	
	kg (H_2SO_4)/t	
no. of samples	20	83
minimum	0.8	0.8
mean	72.0	82.0
median	10.2	27.8
maximum	438.4	579.6

The ANC is plotted as a function of CarbNP in Figure 5-11 and Figure 5-12. A line of equivalence is also shown on each plot (dotted diagonal line), which indicates where the ANC equals the CarbNP. Where the CarbNP equals or exceeds the ANC (below the line of equivalence) it may be assumed that a portion of the carbonate minerals present, do not contribute to acid neutralisation (e.g. siderite ($FeCO_3$)). Where the ANC exceeds the CarbNP (above the line) it may be assumed that slow reacting silicate minerals contribute to the ANC.

Roof, Floor and Coal

Of the roof, floor and coal samples 8 of the 20 samples had an ANC/CarbNP ratio that is less than 1.0, and of those four had an ANC/CarbNP ratio of less than 0.5, suggesting some carbonate present does not contribute to ANC.

For the other samples with the ANC/CarbNP greater than 1.0 a portion of ANC is attributed to slow reacting silicate minerals. It is therefore expected that the ANC readily available to neutralise acidity for these samples is less than that indicated by the ANC test.

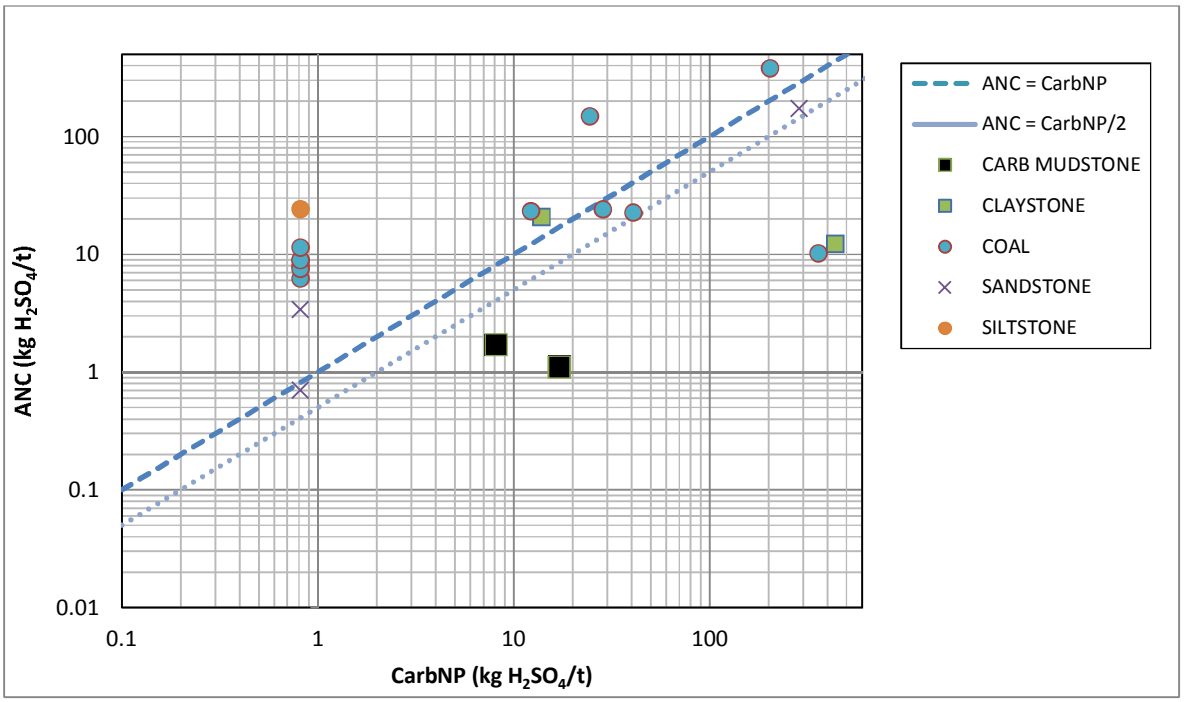


Figure 5-11: ANC plotted as a function of CarbNP (roof, floor and coal)

Overburden and interburden

For 20% of the overburden and interburden samples at least 50% of the ANC is not present as carbonate and therefore could be expected to be available as slow reacting aluminosilicates. About 48% of the samples had ANC/CarbNP values that indicated the presence of non-neutralising carbonates. The presence of non-neutralising carbonates in the waste is consistent with the records of siderite in the drill logs.

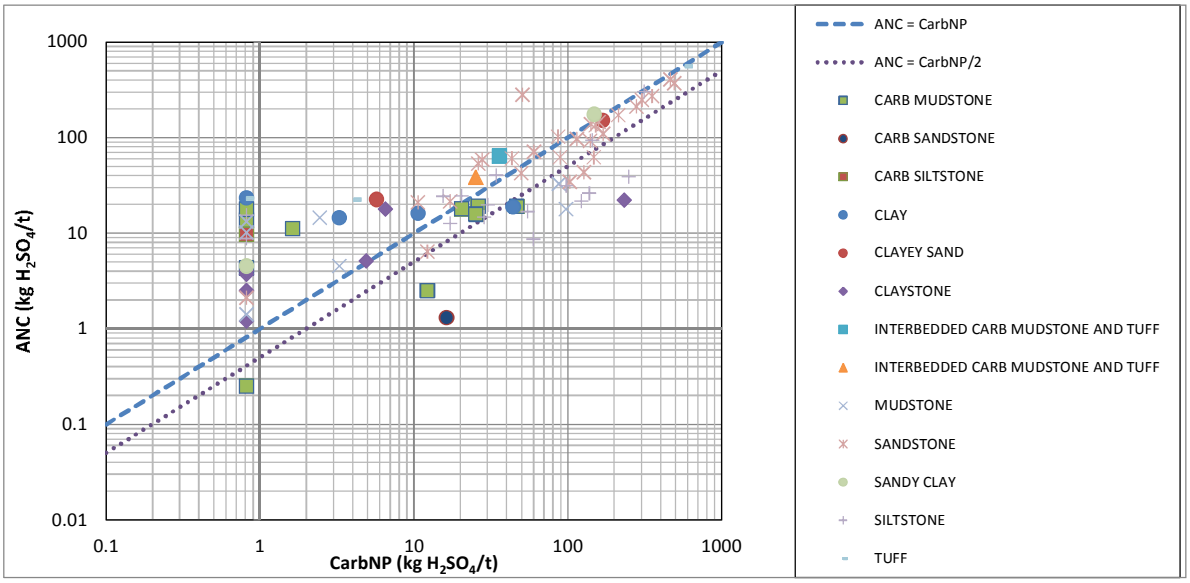


Figure 5-12: ANC plotted as a function of CarbNP (overburden and interburden)

Acid Buffering Characteristic Curves

The determination of the acid base characteristic curve (ABCC) is a method of inferring the availability of the neutralisation potential for carbonates (such as calcite and dolomite) and non-carbonates separately. The test involves the slow titration of the sample with hydrochloric acid, whilst continuously monitoring pH. The ABCC yields a plot of acid consumed (often recalculated to ANC equivalent) as a function of the pH. The ANC consumed while pH remains above 6 is considered indicative of the ANC contributed by calcium and magnesium carbonate minerals, such as calcite and dolomite.

Samples with a broad range of ANC values were selected for acid buffering characteristics curve (ABCC) testing.

The results of the ABCC tests are compared with the ANC and CarbNP in Appendix C. Figure 5-13 presents a plot of ANC versus available neutralising capacity determined from the ABCC test results. The results show that the ABCC neutralisation potentials to pH 6 were significantly lower than those indicated by the CarbNP and ANC methods. The sandstone samples tend to have the largest portion of available ANC, however, again the number of samples characterised is small and more samples should be tested to confirm this result. The figure also indicates that the proportion of ANC readily available is lower at smaller ANC valves.

The neutralising capacity available to buffer above pH 6.0 ranges between <1 to 320 kg (H_2SO_4)/t, representing between 2 and 94% of the ANC. The balance of neutralising capacity as measured by the ANC method may be due to reactions with aluminosilicates at low pH values.

The readily available ANC to pH6 for sandstone for individual samples ranged between <1 and 320 kg (H_2SO_4)/t and the median value was 63 kg (H_2SO_4)/t.

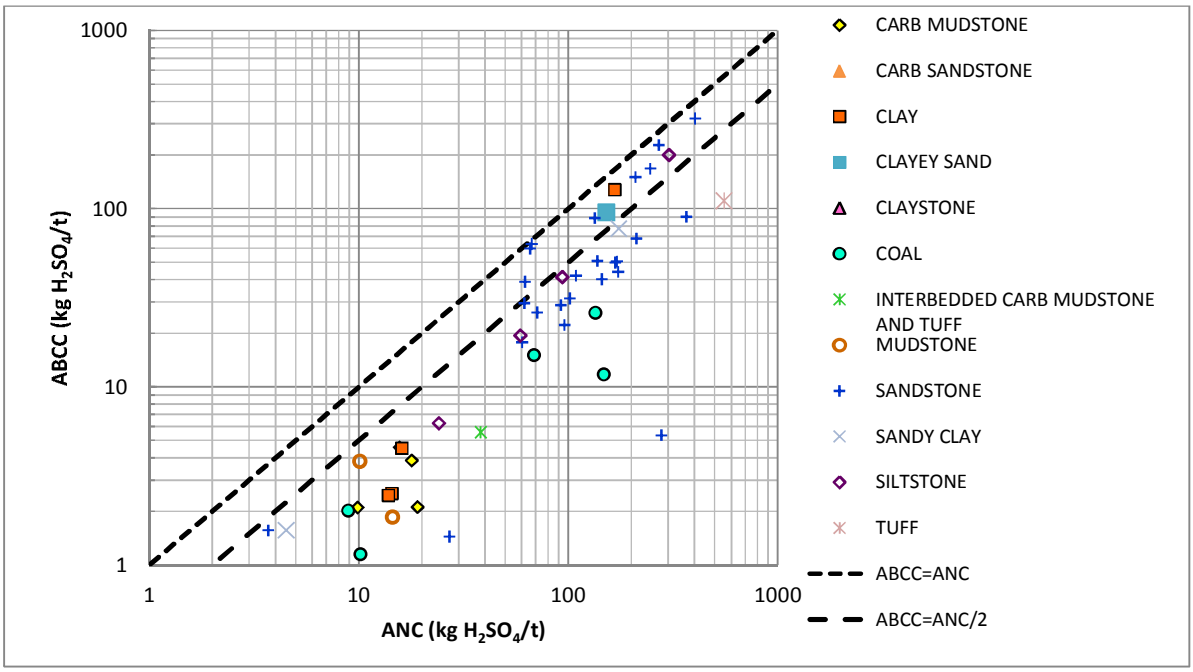


Figure 5-13: ANC and ABCC to pH6

5.3 Sample Classification Schemes

5.3.1 Neutralisation Potential Ratio

Sample classification is based on the acid generating and acid neutralisation potentials of a material. Whilst the neutralisation potential may be assessed using the NAPP, an alternative method is based on the neutralisation potential ratio (NPR). The NPR is defined as the ratio of ANC to MPA (Price, 1997). For waste rock, a sample may be classified using the NPR as follows:

- NPR < 1 – potentially acid forming (PAF)
- 1 < NPR < 3 – uncertain (UC) (materials may or may not be net acid forming)
- NPR > 3 – non-acid forming (NAF)
- Total S < 0.1 wt% – non-acid forming (net acid production is low (< 3 kg (H_2SO_4)/t).

Note the last criterion is not a part of the standard NPR method. It is adopted here because samples with acid potential values of less than 3 kg (H_2SO_4)/t have been assessed as low risk at other sites. However, this risk associated with such low acid potentials should be confirmed by kinetic testing.

The NPR classification scheme can be refined by replacing the MPA with the AP based on estimates of the sulfide sulfur content rather than the total sulfur and the estimates of the neutralising capacity based on ABCC results. However, as these were not available for all samples the above scheme was used.

5.3.2 Roof and floor and coal

Figure 5-14 provides a plot of the ANC versus total sulfur for the samples of coal and roof and floor material. The green dashed line in the plot differentiates samples with characteristics that are NAF (NPR>3) from those that are UC. The dotted pink line differentiates the samples with PAF (NPR<1) characteristics from those that are UC. The samples below the dotted pink line also have a positive NAPP. The calculated NAPP and NPR values and the sample classifications based on the NPR are shown in Appendix C.

The raw coal samples would potentially be representative of coal stockpile material or uneconomic coal that would be left in the pit. A portion of the roof and floor material, which may comprise non-coal material immediately above and below the coal seams, would also remain in the pit.

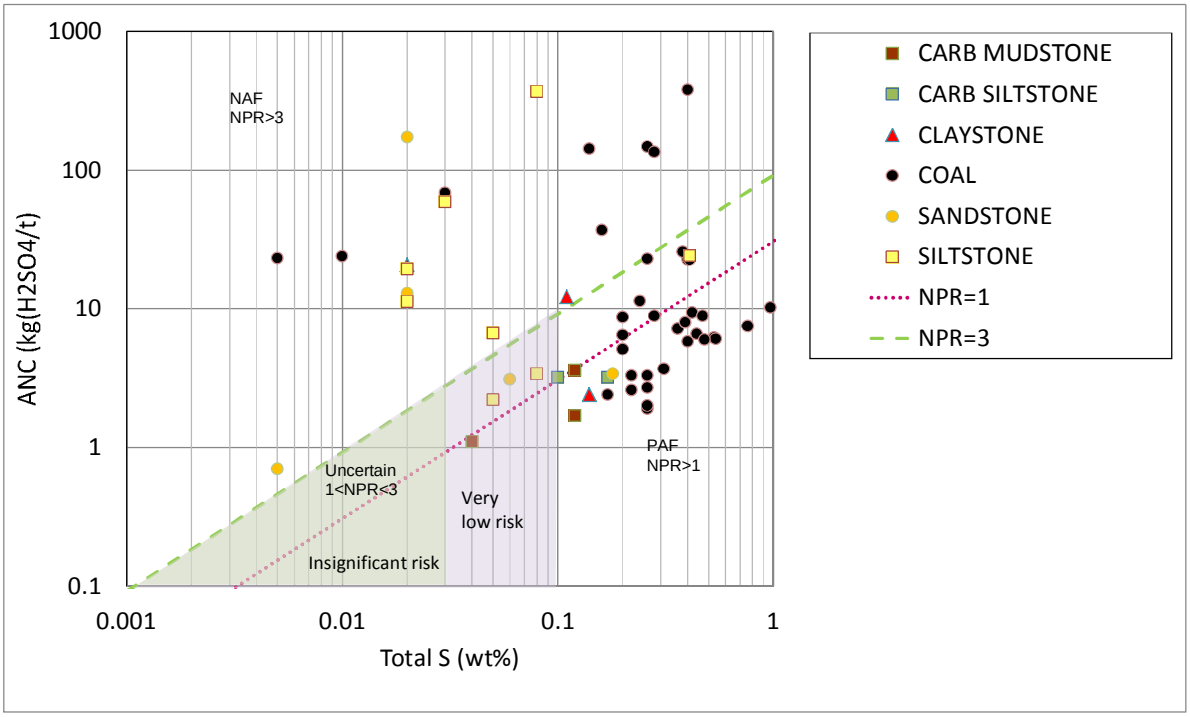


Figure 5-14: ABA plot of coal and roof and floor samples

Table 5-6: Roof, floor and coal sample classification (NPR method)

	Number of Samples				Percentage of Samples		
	NAF	UC	PAF	Totals	NAF	UC	PAF
Coal	8	8	20	36	22.2	22.2	55.6
Roof & Floor	14	2	5	21	66.7	9.5	23.8
Totals	22	10	25	57	38.6	17.5	43.9

The results in Figure 5-14 indicate that a proportion of the coal would be expected to be acid generating. As much of this coal is saleable product (not waste), it is expected that it would only be stored on site for a short period of time, thus reducing the risk for generation of AMD on site.

A proportion of the roof and floor material would be expected to also be potentially acid forming.

Waste reject from the coal handling and processing plant (CHPP) may pose a greater risk of AMD as this would be disposed of on site. Testing of coal washery wastes would be required to assess the potential AMD risks associated with these materials.

As the number of tested samples of each material type and classification is relatively small further sampling and characterisation should be undertaken as the project develops to confirm the findings.

5.3.3 Overburden and Interburden

Acid base accounting was conducted for all overburden and interburden samples.

Figure 5-15 shows the results for the 413 samples of overburden and interburden. The calculated NAPP and NPR values and the sample classifications based on the NPR are shown in the ABA table in Appendix C.

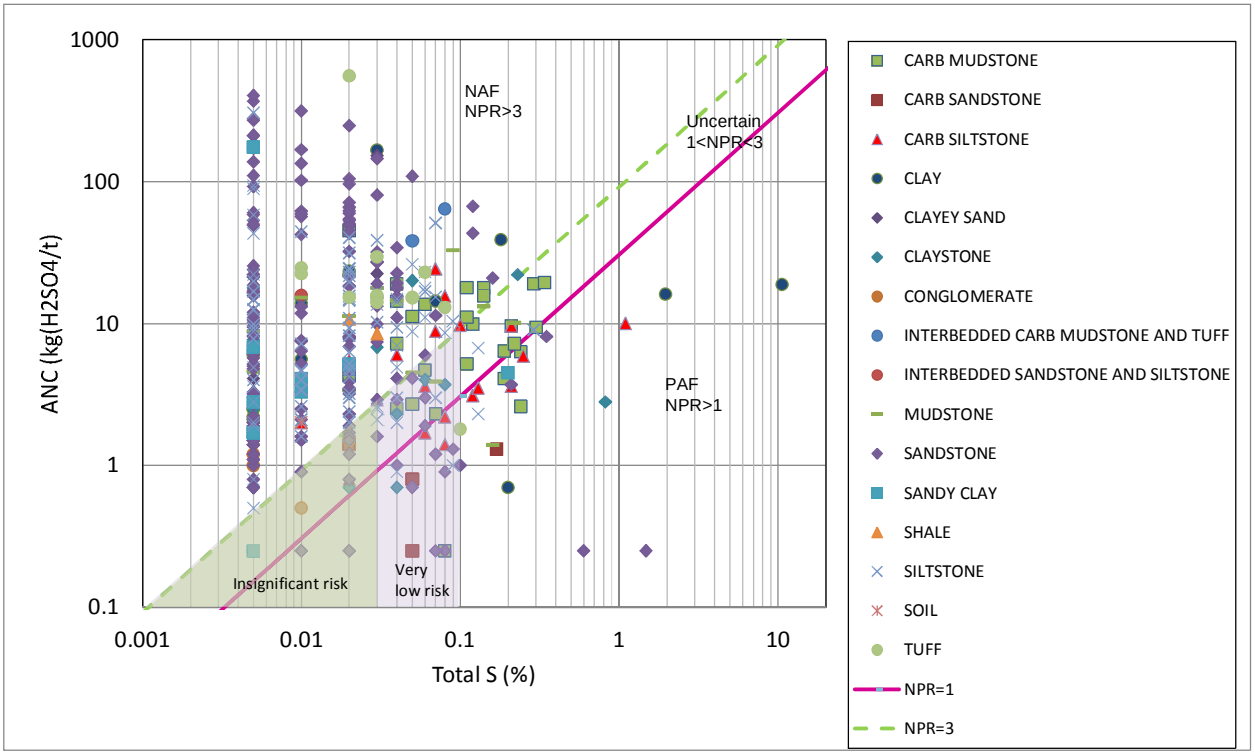


Figure 5-15: ABA plot for overburden and interburden samples

A summary of the overburden and interburden sample classification by lithological unit using the NPR classification system is shown in Table 5-7.

Table 5-7: Overburden and interburden sample classification (NPR method)

Lithological unit	No. of samples				Percentage of samples		
	NAF	UC	PAF	Total	NAF	UC	PAF
Carb mudstone	17	8	3	28	60.7	28.6	10.7
Carb sandstone	3	0	1	4	75.0	0.0	25.0
Carb siltstone	13	1	5	19	68.4	5.3	26.3
Clay	12	0	3	15	80.0	0.0	20.0
Clayey sand	11	0	0	11	100.0	0.0	0.0
Claystone	18	0	1	19	94.7	0.0	5.3
Conglomerate	4	0	0	4	100.0	0.0	0.0
Interbedded carb mudstone and tuff	2	0	0	2	100.0	0.0	0.0
Interbedded sandstone and siltstone	1	0	0	1	100.0	0.0	0.0
Mudstone	12	1	1	14	85.7	7.1	7.1
Sandstone	178	0	5	183	97.3	0.0	2.7
Sandy clay	9	0	1	10	90.0	0.0	10.0
Shale	2	0	0	2	100.0	0.0	0.0
Siltstone	85	2	1	88	96.6	2.3	1.1
Soil	1	0	0	1	100.0	0.0	0.0
Tuff	11	0	1	12	91.7	0.0	8.3
Totals	379	12	22	413	91.8	2.9	5.3

The results in Table 5-7 indicate that:

- The majority of the samples (60.7 to 100%) from all lithological units were classed as NAF.
- The lithological units with the largest percentage classed as PAF or UC were carbonaceous mudstone, carbonaceous siltstone, carbonaceous sandstone and clay. Materials from these lithological units may require active management to prevent or limit the development of AMD.
- Between 90 and 100% of each of the claystone, sandstone, siltstone and sandy clay units were classified NAF.

As the number of tested samples of each material type and classification is relatively small further sampling and characterisation should be undertaken as the project develops to confirm the findings.

5.3.4 Net Acid Generation Results

The net acid generation (NAG) test measures how a sample could behave under highly oxidising conditions. The sample is contacted with the strong oxidant hydrogen peroxide, which oxidises the sulfides contained in the sample to generate acid. Concurrently, neutralising minerals that may be present react to consume all or part of the acid generated. Following a predetermined contact time, the solution pH (NAGpH) is recorded and the NAG acidity of the sample is quantified by titration with a base (sodium hydroxide).

Titration to pH 4.5 generally accounts for acidity attributable to free acid (H_2SO_4) and ferric iron generated during the oxidation of sulfide minerals (that has not been neutralised by the contained ANC). Titration from pH 4.5 to pH 7 generally accounts for acidity associated with some metals, such as copper, that are mostly soluble at pH 4.5 but practically insoluble at pH 7. Acidity attributed to unoxidised ferrous iron will also be accounted for in the titration up to pH 7 (ferrous iron remains soluble at pH 4.5; however, oxidation to ferric by atmospheric oxygen accelerates as the pH increases).

In the NAG tests, there is a potential for generation of organic acids due to partial oxidation of carbonaceous materials (an effect that does not occur naturally in the environment). This may lead

to erroneously low NAGpH values and high acidities in the test, which are unrelated to acid generation from sulfide oxidation and can lead to misclassification of the samples. This effect is most likely to occur in samples where the organic carbon content is greater than 7% and the pyrite content is less than 0.7% (e.g. coal washery wastes (ACARP, 2008)).

AMIRA (2002) described the NAG test method used to classify the rock samples according to their potential to be acid forming for samples with low organic carbon contents. The scheme takes account of both the NAGpH and the NAPP of the sample.

The samples were classified according to the scheme shown in Table 5-8. The scheme is that of AMIRA (2002) with the addition that samples with total S < 0.1 wt% are classed as NAF. This criteria is used because such samples at other sites have been classed NAF based on kinetic tests; however, the criterion needs to be confirmed for this site.

The extended boil NAG test may provide a more reliable measure of the acid forming potential of a carbonaceous sample. This test is carried out if the NAGpH is less than 4.5. Additional hydrogen peroxide is added to a split of the NAG solution, which is boiled vigorously for several hours followed by a further measurement of the pH. A sample is classified as acid producing if the solution pH is still less than 4.5.

The acid potential of the sample is uncertain if the pH is greater than 4.5. A solution assay step is then carried out on the other split of the NAG solution for the main cations generated from acid generating (S) and acid neutralising (Ca, Mg, Na, K) processes. The net acid potential is calculated from the solution composition.

The NAG results and the sample classifications are presented in Appendix C.

Table 5-8: Acid-base accounting classification

Class	Sub-class	Description
NAF	NAF	Samples with a negative NAPP value and a NAG pH of ≥4.5 or total S < 0.1 wt%
	NAF-Barren	As above, and also a low ANC (≤5 kg (H_2SO_4)/t). Such samples have little value with respect to mitigating the effects of acid production in other mine waste materials.
PAF	PAF	Samples with a positive NAPP value and a NAG pH of <4.5
	PAF-LC	PAF materials associated with low NAG acidities (NAG pH4.5 < 5 kg (H_2SO_4)/t).
Uncertain	UC(PAF)	Samples with negative NAPP but giving NAG pH values <4.5 or NAPP ≥0 but giving NAG pH values ≥4.5 and total S > 1%S.
	UC(NAF)	Samples with NAPP ≥0 but giving NAG pH values ≥4.5. Possibly in these samples some of the sulfur present is in non-pyritic forms.

Notes:
ANC=acid neutralisation capacity; NAPP=net acid producing potential; NAG pH=pH measured during net acid generation test.

Coal, roof and floor materials

The classifications of 14 coal, roof and floor samples by the standard AMIRA method are presented in Figure 5-16. The majority of the roof and floor samples were classed NAF (Table 5-9) which were also an outcome of the NPR classification. One sample of coal was classed NAF and the other PAF-LC which is consistent with the classification under the NPR method where, classification of coal samples, were distributed from NAF to PAF, with a large percentage being PAF. The samples classed as PAF and UC(NAF) had small net acid producing potentials of less than 3 kg (H_2SO_4)/t.

The number of samples from any lithological unit was small and the geochemical characteristics of the set therefore may not accurately represent the distribution of characteristics present in the waste at the site and further samples should be tested as the project develops.

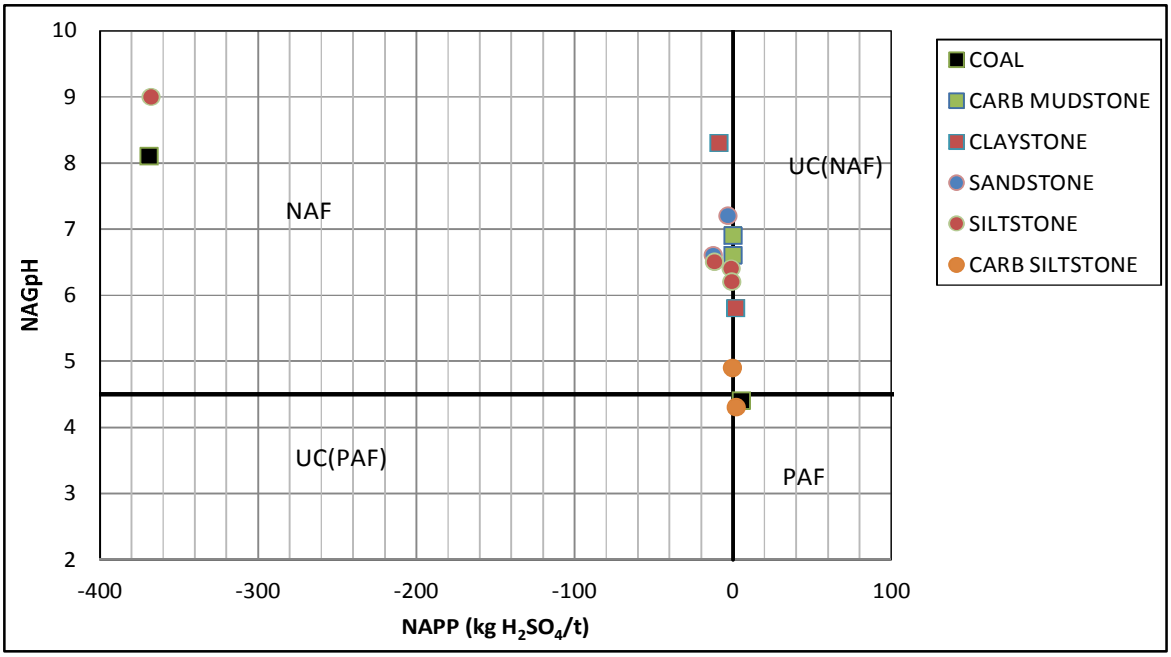


Figure 5-16: Geochemical classification (AMIRA) plot for the coal, roof and floor samples

Table 5-9: Number of roof, floor and coal samples in each classification

	No. of samples						
	NAF-Barren	NAF	UC(NAF)	UC(PAF)	PAF-LC	PAF	Total
Coal	0	1	0	0	1	0	2
Roof & Floor	5	3	3	0	1	0	12
Totals	5	4	3	0	2	0	14

Ten roof, floor and coal samples were subjected to the extended boil NAG test. The classifications of the various samples are shown in Table 5-10 where they are compared to AMIRA classifications. The extended boil NAG test indicates that some carbonaceous mudstone and coal material may be potentially acid forming, which is consistent with outcomes of NPR classification.

The two PAF coal samples 81382 and CQ146995 had NAG acidities of 16.4 and 10.1 kg (H_2SO_4)/t respectively. The carbonaceous siltstone sample CQ14768 was classified as PAF under the extended boil NAG test and had a NAG acidity of only 1.4 kg (H_2SO_4)/t. The carbonaceous mudstone sample (81400) classed as PAF had a NAG acidity of 4 kg (H_2SO_4)/t.

Together the AMIRA and extended boil NAG methods indicate that proportion of the roof floor and coal materials would be PAF.

Table 5-10: Extended boil NAG test classification of selected roof floor and coal samples compared with AMIRA classification

Client Sample ID	Lithological unit	AMIRA classification	Extended boil NAG classification
81400	CARB MUDSTONE	-	PAF
CQ172674	CARB MUDSTONE	UC(NAF)	NAF
CQ14768	CARB SILTSTONE	NAF-Barren	PAF
81358	CLAYSTONE	UC(NAF)	NAF
81370	COAL	NAF	NAF
81382	COAL	-	PAF
CQ146995	COAL	-	PAF
2209	COAL	-	NAF
81372	SILTSTONE	NAF	NAF
81373	SILTSTONE	NAF-Barren	NAF

Overburden and Interburden

Eighty six of the overburden and interburden samples characterised using the NPR method were also subjected to NAG tests. Twenty three samples were subjected to extended boil NAG tests. Results for samples subjected to the NAG test are shown in Figure 5-17. The full results are presented in Appendix C.

The NAG classification (NAF, UC, PAF) is indicated in each quadrant of the plot of Figure 5-17.

Table 5-11 provides the breakdown of samples by lithological unit and AMIRA classification. Eighty three percent of samples were classed as either NAF or NAF-Barren and 15% were classed as uncertain. Two samples (3%) were classed as PAF. The number of samples of each lithological unit is again small; however, the results indicate that some PAF material may be present in the overburden and interburden waste rock. Characterisation of additional samples should be undertaken as the project develops and kinetic testing of samples classed as UC and PAF used to assess the distribution of PAF material across the site. Note that 46.5% of the waste samples were NAF-Barren and therefore had little capacity to neutralise acidity.

Table 5-12 compares classifications of samples by the AMIRA and extended boil classification schemes. There was general agreement between the classifications using the two schemes. Under the extended boil classification scheme, one carbonaceous sandstone and one sandstone sample were classed as PAF. The respective acidities were 4 and 5.3 kg (H_2SO_4)/t.

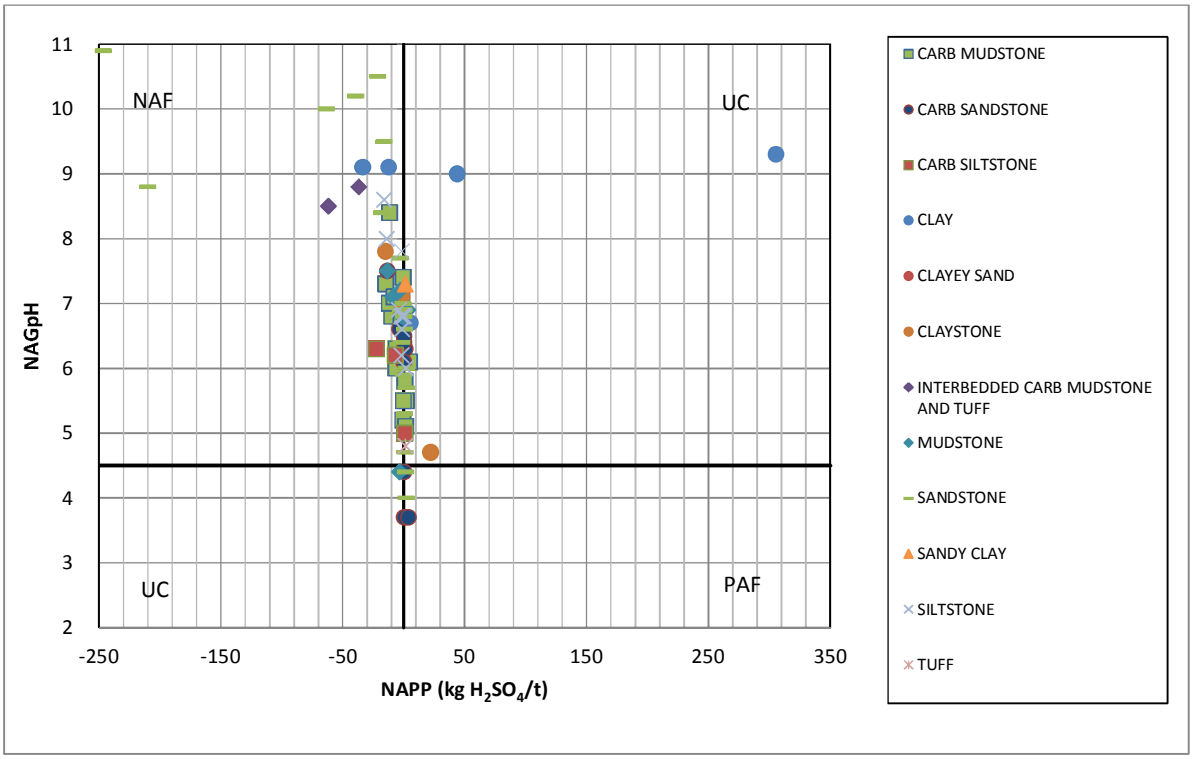


Figure 5-17: Geochemical classification plot for overburden and interburden samples

Table 5-11: Number of samples in each classification

Lithological unit	No. of samples						
	NAF-Barren	NAF	UC(NAF)	UC(PAF)	PAF-LC	PAF	Total
Carb mudstone	3	11	3	0	0	0	17
Carb sandstone	2	0	0	0	0	1	3
Carb siltstone	3	4	1	0	1	0	9
Clay	0	2	3	0	0	0	5
Claystone	3	1	1	0	0	0	5
Interbedded carb mudstone and tuff	0	2	0	0	0	0	2
Mudstone	2	2	1	0	0	0	5
Sandstone	18	7	1	0	0	0	26
Sandy clay	0	0	1	0	0	0	1
Siltstone	9	2	1	0	0	0	12
Tuff	0	0	1	0	0	0	1
Totals	40	31	13	0	1	1	86
Percent	46.5	36.0	15.1	0.0	1.2	1.2	100.0

Table 5-12: Comparison of extended boil NAG and AMIRA classifications

Client Sample ID	Short Lithology Name	AMIRA classification	Extended boil NAG classification
81381	CARB MUDSTONE	-	NAF
81392	CARB MUDSTONE	NAF	NAF
81393	CARB MUDSTONE	NAF	NAF
81406	CARB MUDSTONE	NAF-Barren	NAF
81415	CARB MUDSTONE	NAF	NAF
81445	CARB MUDSTONE	NAF-Barren	NAF
81455	CARB MUDSTONE	-	NAF
169967	CARB MUDSTONE	NAF	NAF
146719	CARB MUDSTONE	UC(NAF)	NAF
148058	CARB MUDSTONE	UC(NAF)	NAF
146718	CARB MUDSTONE	NAF	NAF
152619	CARB SANDSTONE	PAF	PAF
169610	CARB SILTSTONE	NAF	NAF
81365	CLAY	UC(NAF)	NAF
81395	CLAY	NAF	NAF
81398	CLAYSTONE	UC(NAF)	NAF
81364	SANDSTONE	NAF	NAF
81378	SANDSTONE	NAF-Barren	NAF
81384	SANDSTONE	-	PAF
81421	SANDSTONE	NAF	NAF
81454	SANDSTONE	NAF	NAF
81367	SILTSTONE	NAF	NAF
81379	SILTSTONE	NAF	NAF

5.4 Elemental Abundance and Solubility

5.4.1 Elemental Abundance

Quantitative elemental analysis of solid samples was undertaken to determine the abundance of elements in the samples. Dissolution of the samples was either by four acid digest or aqua regia digest. The four acid digest was preferred, however, samples containing greater than 3% organic carbon are incompatible with this digest and sample dissolution was by aqua regia digest instead. The aqua regia digest is less aggressive and so the two digests may dissolve different fractions of the sample with a larger portion of the some samples remaining unreacted for the aqua regia digest..

A direct comparison of the measured abundances of the elements was made with the average abundance of elements in the sediment documented by Bowen (1979). As the abundance of elements varies many-fold, a log base 2 index was developed to simplify comparison of measured abundances with average abundances. The index, called the global abundance index (GAI), was reported by Förstner (1993).

The GAI indicates which elements are 'enriched' in the sample with respect to a reference average abundance. The GAI is calculated using the following formula:

$$\text{GAI} = Int\left(\log_2\left(\frac{\text{Measured Concentration}}{1.5\times\text{Average Abundance}}\right)\right)$$

An example of GAI values is provided in Table 5-13. In the table *n* is the ratio of the measured abundance in the sample to the reference material abundance.

Table 5-13: Ranges of the Ratio of the Measured Concentration to Average Abundance (n) and the Corresponding Global Abundance Index

n range	GAI
1.5 < n < 3	0
3 ≤ n < 6	1
6 ≤ n < 12	2
12 ≤ n < 24	3
24 ≤ n < 48	4
48 ≤ n < 96	5
96 ≤ n < 192	6

Zero or positive GAI values indicate enrichment of the element in the sample when compared to average-crustal abundances. As a general rule, a GAI of 3 or higher signifies enrichment that warrants further evaluation. GAI values are presented in Appendix D.

All 470 samples were submitted for multi-element analysis. Elements that were identified as enriched in a number of samples were S (2 samples), Ag (18), Co(1), Re (9) and Te (223).

Whilst these elements are enriched, further evaluation of element leachability is required (see Section 5.4.2).

5.4.2 Solute Release

Static leach tests (Price, 1997) were carried out on 76 samples at a solid:water ratio 1:3 over a period of 24 hours. Electrical conductivities were measured for 29 of those samples. Selected parameter values are presented in Figure 5-18 and full results are presented in Appendix E. The tests provide an indication of the soluble elements and salts that are already present in the samples and form a basis for an initial assessment of the potential for changes to water quality as a result of contact with the waste.

Since the physical and chemical conditions of the leach test will not be the same as those expected in the 'as placed' environment (e.g. solubility constraints, liquid to solid ratio, particle size, etc.), the leach composition is not expected to be representative of that which may develop in the field. Thus, the results cannot be directly extrapolated to predict the leachate quality expected to seep from a dump of the material. They are however useful to provide an indication of the leachable elements that may be present.

The results can be compared to stock drinking water quality guidelines (ANZGFMWQ, 2000) only to identify solutes that potentially may be of significance. Note however, that water quality predictions need to consider actual site conditions and are not part of the current scope and report.

The pH values of all leachates were circum neutral. The electrical conductivities, alkalinity, acidity and sulfate concentration were generally low. The largest EC value (2120 µS/cm) was more than 4 times the next largest value and was observed for a clay sample (81394). This clay sample also exhibited the largest SO_4 concentration. Electrical conductivity testing conducted when assessing the potential for samples to be dispersive (Section 6) also identified clays with high electrical conductivities. These results indicate that the quality of water contacting some clay materials could be adversely impacted.

Concentrations of metals were generally low and did not exceed guideline values for livestock drinking water. However, this may not be the case for the conditions in the waste dumps. Relevant stock water guideline values are SO_4:1000 mg/L; Ca:1000 mg/L and As:0.5 mg/L.

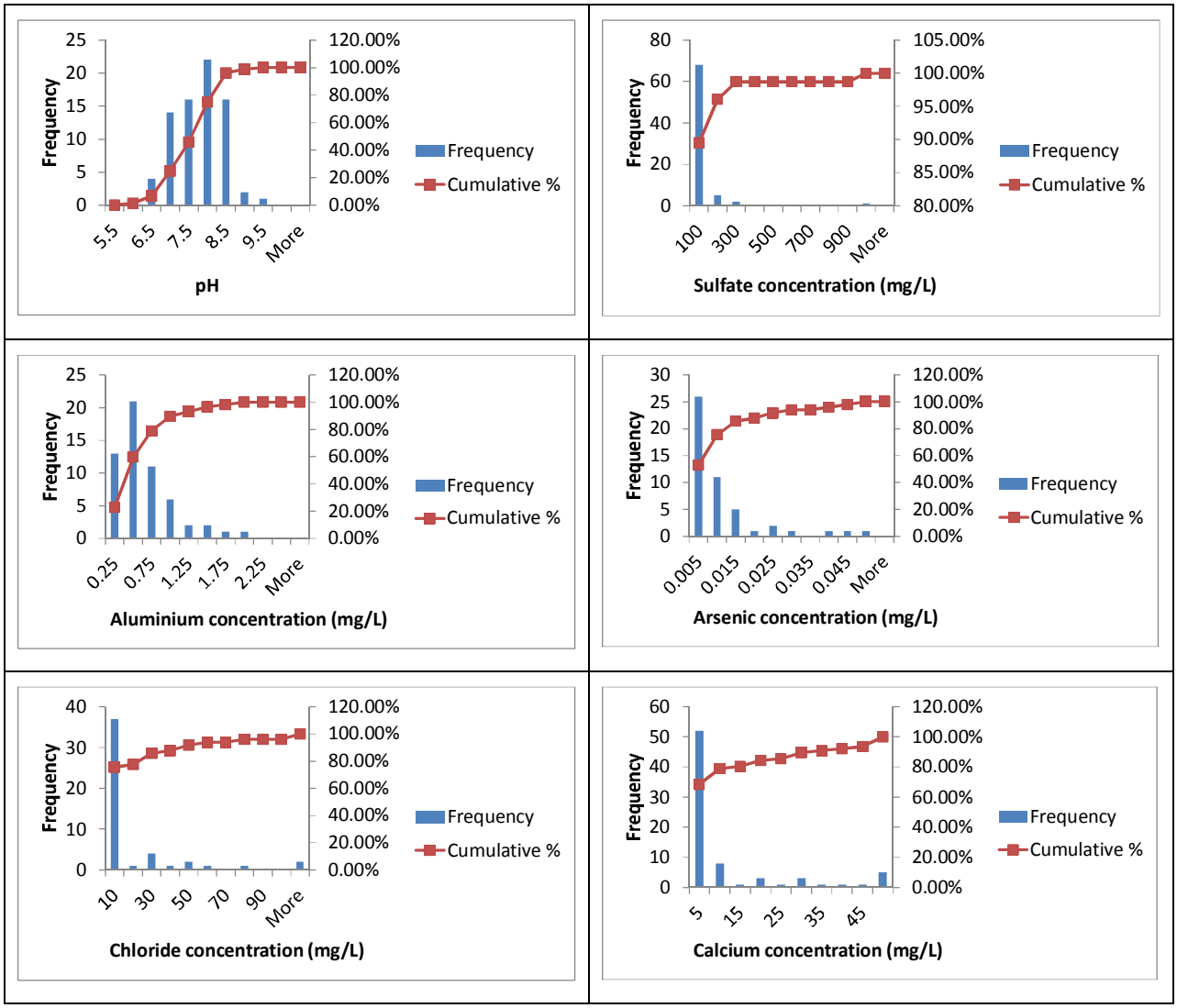


Figure 5-18: Selected parameters for static leach test water quality

5.5 Kinetic testing

Ten samples were selected for kinetic testing and are listed in Table 5-14 with their classification based on the neutralisation potential ratio. These samples will be subjected to additional tests for characterisation including X-ray diffraction analysis. The kinetic testing method was based on the AMIRA (2002).

Kinetic testing typically occurs over a period of six months or more. As the testing of the ten samples commenced in May 2013 the available data was inadequate to provide estimates of the rates of acid production, neutralisation and metal release rates at the time of preparation of this report. Kinetic test results will be reported separately at a later date.

Table 5-14: Column material characteristics

Lithological unit	Column ID	Total S	ANC	ANC/MPA	NPR classification
		%	kg (H_2SO_4)/t		
Carb Mudstone	C3	0.4	9.3	0.76	PAF
Carb Mudstone	C5	0.25	4.7	0.61	PAF
Carb Mudstone	KT3	0.16	3.6	0.74	PAF
Carb Siltstone	C2	0.53	8.7	0.54	PAF
Carb Siltstone	KT7	0.23	3.2	0.45	PAF
Coal	KT4	1	8.9	0.29	PAF
Coal	KT8	0.3	8	0.87	PAF
Sandstone	C1	0.5	4.7	0.31	PAF
Siltstone	C4	0.11	9.7	2.88	UC
Siltstone	KT6	0.31	24.2	2.55	UC

5.6 Representativeness of samples

The representation of overall waste material characteristics by the characteristics of a limited number of samples needs to be assessed at a number of levels. These include the capacity of the available samples to:

1 Provide an estimate of the average value of a parameter of interest that can be compared with a specified value at a desired level of (statistical) confidence. For example, can it be concluded that the average of all sulfur contents of a lithological unit is below a trigger value for classifying the material as non-acid forming at the 95% confidence level?

2 Characterise the spatial variability of the parameters of interest to ensure that the density of sampling is sufficient to cover the full range of local fluctuations that may occur.

3 Correctly represent the overall proportions of each lithological unit within the waste volume of interest.

5.6.1 Outlier values

Some measured values of total S and ANC in the geochemical characterisation were markedly different from other members of the sample set, i.e. they were outliers. As outliers can indicate measurement error or a population that has a long-tailed distribution the 95% confidence intervals on mean valves were calculated both including and excluding the outlier value for total S and ANC.

Total Sulfur

Two samples that were primarily clay and from near the surface in hole C040C, had total sulfur (TOTS) contents of 2% and 10%, in excess of any other of the total sulfur values. The next nearest sulfur contents were 0.2% and 0.18%, and the mean 0.03%. The source of the sulfur in these samples was not clear. One possibility is that the gypsum was mistakenly identified as calcite during field logging of drillholes. The other possibility is that hole C040C may have been contaminated in some way.

For the purpose of geostatistical analyses these two samples were removed from the clay lithological unit classification and the Clay and Soil group as they were not deemed to accurately represent the Clay and Soil population statistically (Table 5-15 and Table 5-16). (The relationship between lithological units and lithological groups was described in Section 3.2.1).

Acid Neutralising Capacity

Outliers were identified in the ANC values for the tuff (555 kg (H_2SO_4)/t), coal (381 kg (H_2SO_4)/t) and sandy clay (175 kg (H_2SO_4)/t) lithological units.

In the case of tuff and sandy clay the values are considered outliers for these individual lithologies but when considered at the group lithology level they were not. This suggests they do in fact belong to the larger population statistically (the Remaining Group), but appear as anomalies due to limited number of samples for at the lithological unit level. Thus, the high values (555 and 175 kg (H_2SO_4)/t) were removed for analysis at the lithological unit level, but not for the analysis at the lithological group level.

The coal value (381 kg (H_2SO_4)/t), however was extremely high, even at the group level, and was removed for all statistical analysis.

Table 5-15: Number of samples per lithological group

		Removed value (if applicable)		
Lithological Group Units	**Number of samples**	**ANC**	**TOTS**	**Number of samples after removal of outliers**
		kg (H_2SO_4)/t	**wt%**	
Carbonaceous	57	n/a	n/a	57
Clay and Soil	27	n/a	1.96 and 10.6	25
Coal	36	381	n/a	35
Remaining	350	n/a	n/a	350
Total	**470**			

Table 5-16: Number of samples per lithology

		Removed value (if applicable)		
Lithological Group	**Number of Samples**	**ANC**	**TOTS**	**Number of samples after outliers have been removed**
		kg (H_2SO_4)/t	**wt%**	
Carbonaceous Mudstone	31	n/a	n/a	
Carbonaceous Siltstone	21	n/a	n/a	
Clay	15	n/a	1.96 and 10.6	13
Clayey Sand	11	n/a	n/a	
Sandy Clay	10	175	n/a	9
Claystone	22	n/a	n/a	
Coal	36	381	n/a	35
Mudstone	14	n/a	n/a	
Sandstone	188	n/a	n/a	
Siltstone	96	n/a	n/a	
Tuff	12	555	n/a	11
Total	**456**			

Lithological units with small numbers of samples analysed (< 6) were not included in the statistical analysis. Determination of the 95% confidence intervals on means using the 'bootstrap' method requires more than five samples. Table 5-17 lists the lithological units excluded from the statistical analysis.

Table 5-17: Lithological units excluded from the geostatistical analysis

Lithological unit	No. of samples characterised
Carbonaceous Sandstone	4
Conglomerate	4
Soil	1
Interbedded sand and siltstone	2
Interbedded carb mudstone and tuff	1
Shale	2
Total	**14**

5.6.2 Proportions of lithological groups and approximate volumes

All 328 drillhole logs within the pit area were examined to determine the approximate proportions of waste in each lithological group. Of these holes 237 were within the proposed open pit. The locations of the holes are shown in Figure 3-1. There were more holes in the north than south of the proposed pit area, therefore the sample density was greater in the north than the south.

As drillholes were not evenly spaced declustering was implemented to assigned a weight to each sample based on its' area of influence (i.e proximity to other samples). A cell size of 6000 x 6000 x 1000 m was used in the declustering, as this approximated the maximum drill spacing over the pit area and ensured that all samples were analysed equally. For example, a sample with 12 nearby samples would receive a lower weight than a sample with 2 nearby samples.

Although the drill logs recorded six weathered states only two states were used in the statistical analysis. All five weathering states associated with any degree of weathering other than fresh were designated as 'Weathered' and fresh samples were designated 'Fresh'.

Figure 5-19 shows a typical stratigraphic column from the proposed Carmichael pit. While roof, floor and coal seams contribute significantly to the overall proportion of the open pit, the majority of the drill core of these materials had been sent for geotechnical or coal quality testing, limiting the material available for geochemical characterisation. Because of this, these samples could not be determined as a proportion of the entire database. However roof floor and coal samples, were used in the determination of proportions within the selected lithologies and lithological groups. Proportions were determined using the final weight (mentioned above) to determine proportion by length; and proportion by volume using the total pit volumes estimates from wireframes.

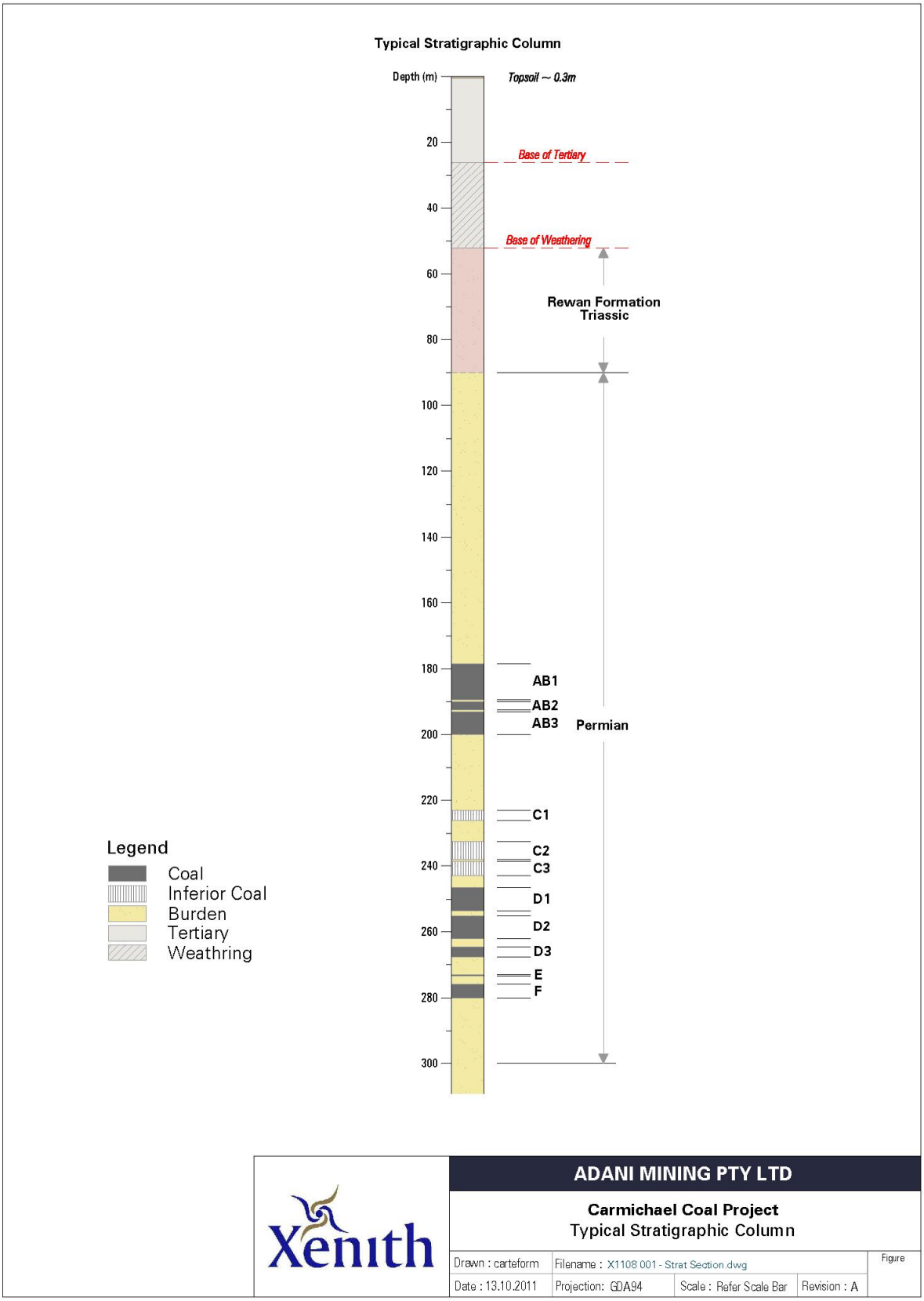


Figure 5-19: Typical stratigraphic column

Table 5-18 presents volumes and proportions of the material to be mined in each lithological group. The largest lithological group is the Remaining group and the smallest is the Carbonaceous group. Volumes of materials without logged weathering codes are listed under the 'No record' heading.

Table 5-19 presents the volumes of each lithological unit that would be mined. The largest lithological unit is sandstone followed by siltstone. The carbonaceous mudstone and carbonaceous siltstone which had relatively large proportions of samples identified as either PAF or UC in Section 0 would be mined in relatively small volumes (< 1,000 Mbcm each).

Table 5-18: Lithological group volumes within the proposed open cut

Lithological group	Volume (Mbcm)				Proportion of volume (%)		
	All	Fresh	Weathered	No record	All	Fresh	Weathered
Carbonaceous	2138	887	186	1065	5	7	2
Clay and Soil	6542	65	4933	1550	16	1	42
Remaining	27886	9593	6525	11768	68	78	56
Coal	4322	1768	56	2498	11	14	5
Total	40888	12307	11694	16887	**100**	**100**	**100**

Table 5-19: Lithological unit volumes within the proposed open cut

Lithological unit	Volume (Mbcm)				Proportion of volume (%)		
	All	Fresh	Weathered	No record	All	Fresh	Weathered
Carb Mudstone	818	420	36	361	7.0	3.0	3.0
Carb Siltstone	82	82	0	0	3.0	3.0	2.0
Clay	5,438	60	4,389	990	5.0	0.5	37.0
Clayey Sand	859	6	593	259	2.0	0.0	5.0
Sandy Clay	2,372	43	1,850	479	2.0	0.5	16.0
Claystone	4,825	560	2,736	1,529	7.0	4.5	23.0
Coal	4,457	1,836	58	2,563	8.0	14.0	0.5
Mudstone	736	392	127	217	3.0	3.0	1.0
Sandstone	13,902	6,145	1,362	6,395	42.0	47.0	11.0
Siltstone	6,297	2,374	699	3,224	19.0	19.0	6.0
Tuff	1,104	614	9	481	2.0	5.0	0.0
Total	40,888	12,307	11,694	16,887	**100.00**	**99.56**	**105**

Table 5-20 and Table 5-21 present the proportions of geochemically characterised samples within the lithological groups and lithological units, respectively. The Clay and Soil group comprises 6% of the overall samples, all of which were weathered and either overburden or interburden. Although all the clay and soil material was classed as weathered a minority of samples were classed as PAF or UC in Section 5.3.3 and Section 5.3.4.

Table 5-20: Proportion of geochemically characterised samples in lithological groups

Lithological group	No. of samples			Percentage of samples		
	All	Fresh	Weathered	All	Fresh	Weathered
Carbonaceous	58	57	1	12	14	2
Clay and soil	27	0	27	6	0	44
Rem	349	317	32	74	78	52
Coal	36	35	1	8	9	2
Grand Total	470	409	61	100	100	100

Table 5-21: Proportion of geochemically characterised samples in lithological units

Lithological unit	No. of samples			Percentage of samples		
	All	Fresh	Weathered	All	Fresh	Weathered
Carbonaceous mudstone	31	30	1	7	7	2
Carbonaceous sandstone	4	4	0	1	1	0
Carbonaceous siltstone	21	21	0	4	5	0
Interbedded carbonaceous mudstone and tuff	2	2	0	0	0	0
Clay	15	0	15	3	0	25
Clayey sand	11	0	11	2	0	18
Soil	1	0	1	0	0	2
Coal	36	35	1	8	9	2
Claystone	22	13	9	5	3	15
Conglomerate	4	4	0	1	1	0
Interbedded sandstone and siltsone	1	1	0	0	0	0
Mudstone	14	14	0	3	3	0
Sandstone	188	178	10	40	44	16
Sandy clay	10	0	10	2	0	16
Shale	2	2	0	0	0	0
Siltstone	96	93	3	20	23	5
Tuff	12	12	0	3	3	0
Grand Total	**470**	**409**	**61**	**100**	**100**	**100**

Comparison of the proportions of the number of samples with the proportions of volumes of in-pit material shows that the proportions are similar. Carbonaceous lithological units made up 12% of the geochemically characterised samples but only 5% of the mined material; this was intentional as carbonaceous materials can be a significant source of AMD whilst making up a small volume of the waste.

5.6.3 Global confidence on the means

In the absence of multiple sample sets, the 'bootstrap' statistical procedure allows distribution of properties of the material to be mined to be inferred. The accuracy of this inference depends on how representative the geochemically characterised samples are of all the waste. A limitation of the process is that the bootstrap distribution from a very small sample set may not closely mimic the shape and spread of the sampling distribution. This limitation potentially applies for the small sample sets obtained for geochemical characterisation.

Ninety five percent confidence intervals for the mean of total S, ANC and NAPP were calculated. The mean values of the total S and NAPP for the sample set and confidence intervals generated from the bootstrap procedure were compared to threshold values of interest in assessing the potential for AMD. For total S and NAPP the respective the thresholds were set at 0.1 wt% and 0 kg (H_2SO_4)/t. These values were chosen because samples with total S of 0.1 wt% would have a low potential to produce AMD (i.e. low MPA) and samples with a negative NAPP would be classed as NAF or UC(PAF) under the AMIRA classification scheme.

In general the relationship between the mean and threshold would be examined for each lithology individually; however, this is not always necessary. Lithologies may be grouped if they display similar properties and confidence intervals. They can then be re-assessed by group. Grouping will change the confidence interval because more samples are available and will usually, but not always, tighten the confidence interval range.

5.6.4 By lithological unit

Lithologies sampled with less than six samples or that failed to reach a 95% confidence were:

- Carbonaceous sandstone
- Conglomerate
- Soil
- Interbedded sand and siltstone
- Interbedded carb mudstone and tuff
- Shale

Confidence intervals for these lithologies are not reported.

Results for total S, ANC and NAPP are presented in Figure 5-20 to Figure 5-22.

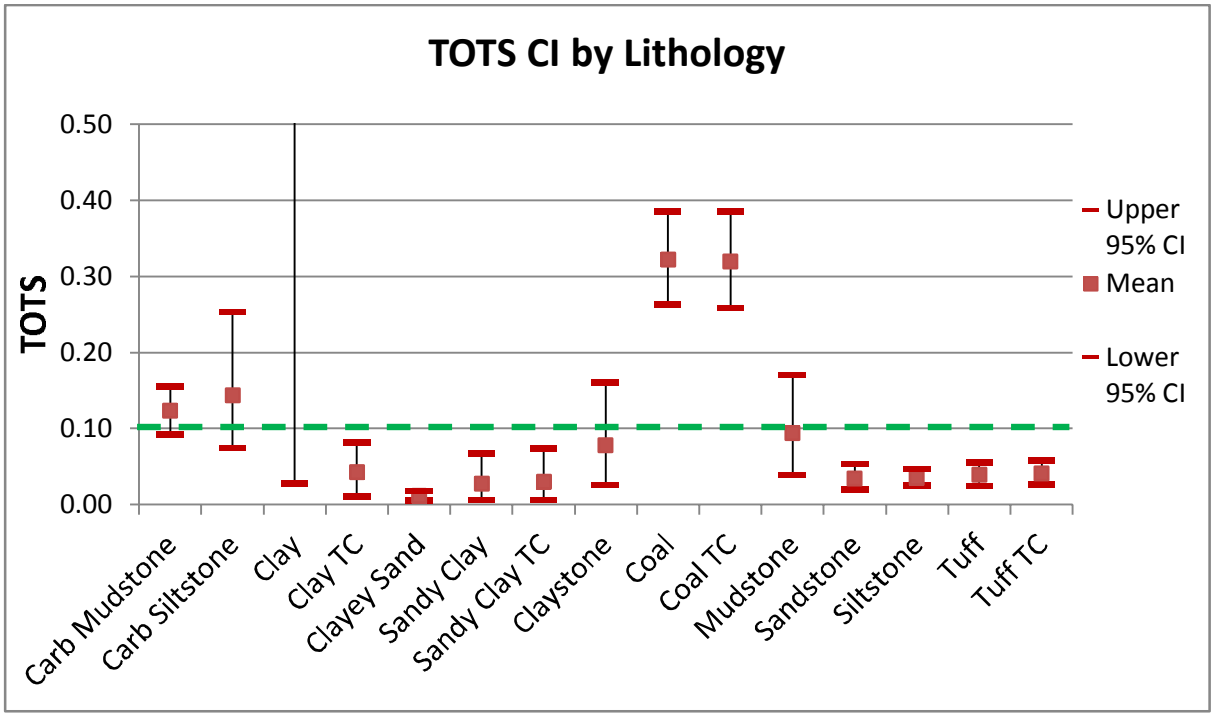


Figure 5-20: Mean and 95% confidence interval of the total sulfur by lithological unit

Note:
Units are wt%. 'TC' denotes a Lithology that has had the outliers excluded. Clay mean and 95% confidence interval values are 0.87 and 2.40%.

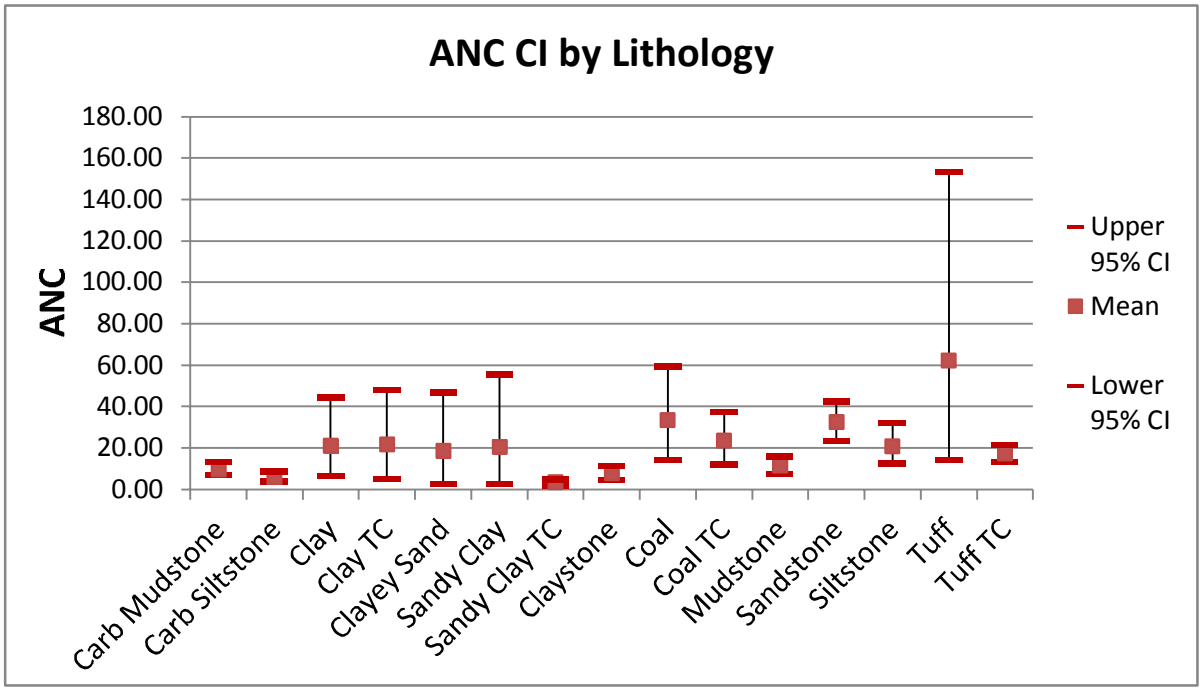


Figure 5-21: Mean and 95% confidence interval of the ANC by lithological unit

Note:
Units are kg(H_2SO_4/t)%. 'TC' denotes a Lithology that has had the outliers excluded.

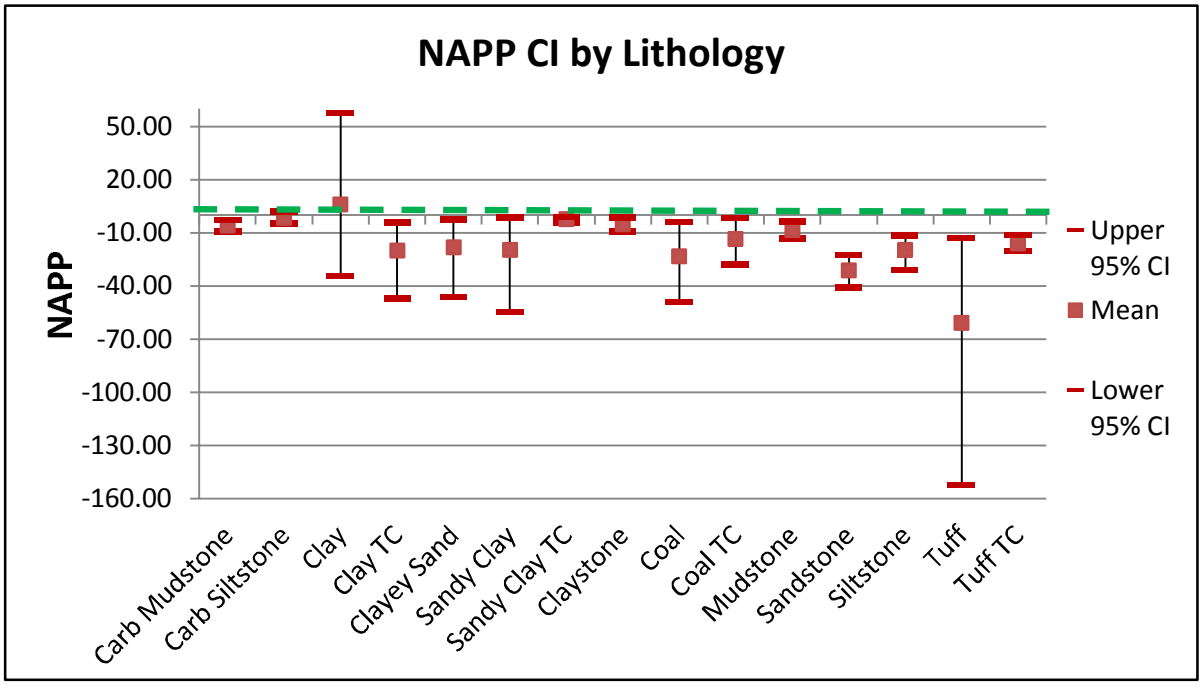


Figure 5-22: Mean and 95% confidence interval of the NAPP by lithological unit

Note:
Units are kg(H_2SO_4/t)%. 'TC' denotes a Lithology that has had the outliers excluded.

Total sulfur

The 95% confidence intervals of total sulfur lie below the 0.1% total S threshold for:

- Clayey sand
- Sandy clay
- Mudstone
- Sandstone
- Siltstone
- Tuff

This indicates that the mean MPA of these materials could be below 3 kg(H_2SO_4/t). The Clay unit has the 95% confidence intervals below the 0.1% total S threshold for the case where the outlier is excluded but not when the outlier is included in the statistical analysis. This suggests that further investigation of the geochemistry of the clay should be undertaken.

The following had total S content 95% confidence intervals on the mean above the 0.1%5threshold:

- Carbonaceous mudstone
- Carbonaceous siltstone
- Claystone
- Coal
- Mudstone

Clay (with the outlier) had the highest mean value of total S and coal had the second highest (0.32%).

ANC

With the outlier for tuff excluded from the analysis the mean ANC values for all lithological units was below 40 kg (H_2SO_4)/t with sandstone potentially having the largest mean ANC value of about 35 kg (H_2SO_4)/t.

NAPP

With the removal of the clay outlier carbonaceous mudstone, carbonaceous siltstone, clay, clayey sand, claystone, coal, mudstone, sandstone, siltstone and tuff have both 95% confidence intervals below the threshold of 0 kg (H_2SO_4)/t for NAPP. The upper 95% confidence intervals exceeded the threshold of 0 kg (H_2SO_4)/t for carbonaceous siltstone by about 3 kg (H_2SO_4)/t. Sandstone had a mean NAPP of -31.3 kg (H_2SO_4)/t and a narrow confidence interval. This combined with the large volumes of sandstone in the waste indicates that sandstone may be a significant source of neutralising capacity.

5.6.5 By lithological group

The lithological units were grouped as described in Appendix B. The grouping was designed to aggregate lithological units that are likely to have similar properties with respect to acid and metalliferous drainage characteristics. The groups were also split into weathered and fresh materials.

Groups that were present in the samples analysed but had only one or two samples are:

- Coal – Weathered
- Remaining – Extremely Weathered
- Clay and Soil – Weathered, Slightly and Distinctly Weathered
- Carbonaceous – Slightly Weathered

These groups were therefore insufficiently sampled to allow confidence intervals to could be calculated.

Lithological groups that were analysed and contained more than five samples are:

- Carbonaceous – Fresh
- Clay and Soil – Extremely, High and Moderately Weathered
- Remaining – Fresh, Weathered, High, Moderate and Slightly Weathered
- Coal – Fresh

The Remaining Lithological group was separated into Fresh and Weathered for the analysis. Other lithological groups were not divided into Fresh and Weathered groups for analysis as the number of samples was too small.

The results are shown in Figure 5-23 to Figure 5-25. Results for lithological groups with and without outliers are presented.

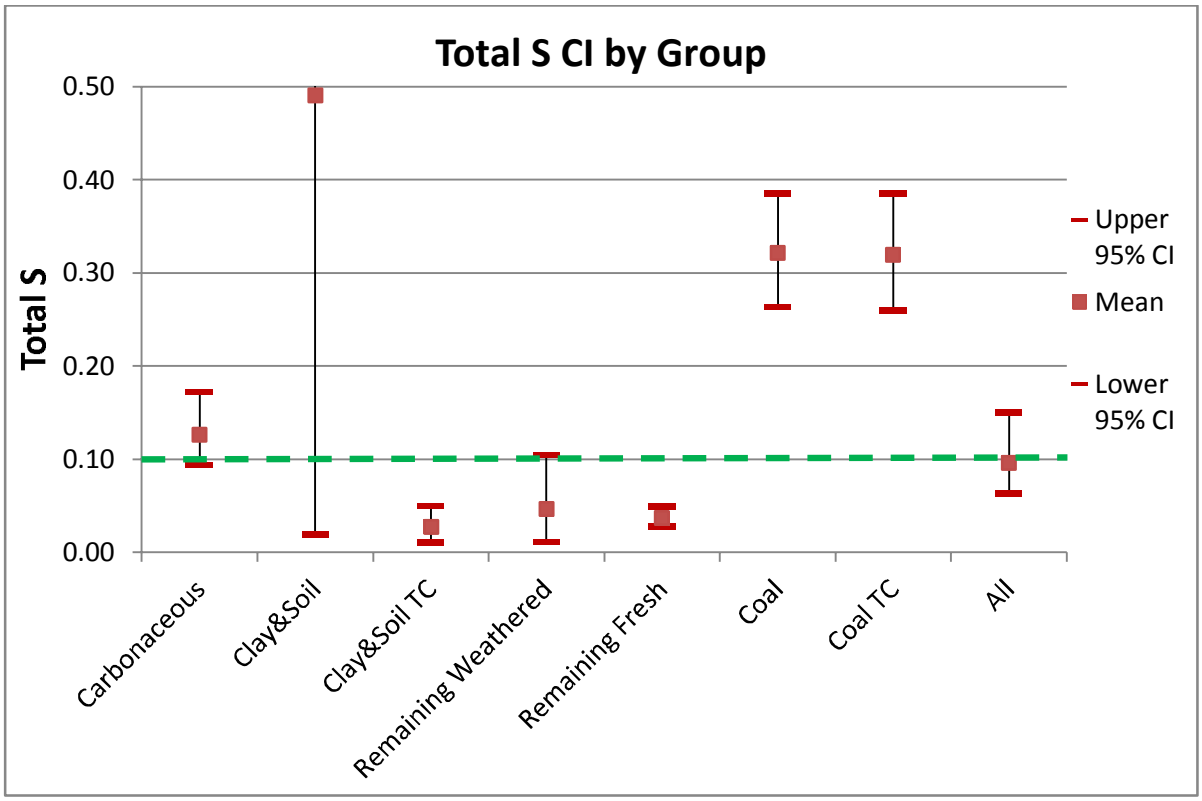


Figure 5-23: Mean and 95% confidence interval of the TOTS by Group.

Note:
Units are wt%. 'TC' denotes a lithology that has had the outliers excluded. Clay and soil mean and 95% confidence interval values are 0.49 and 1.35%.

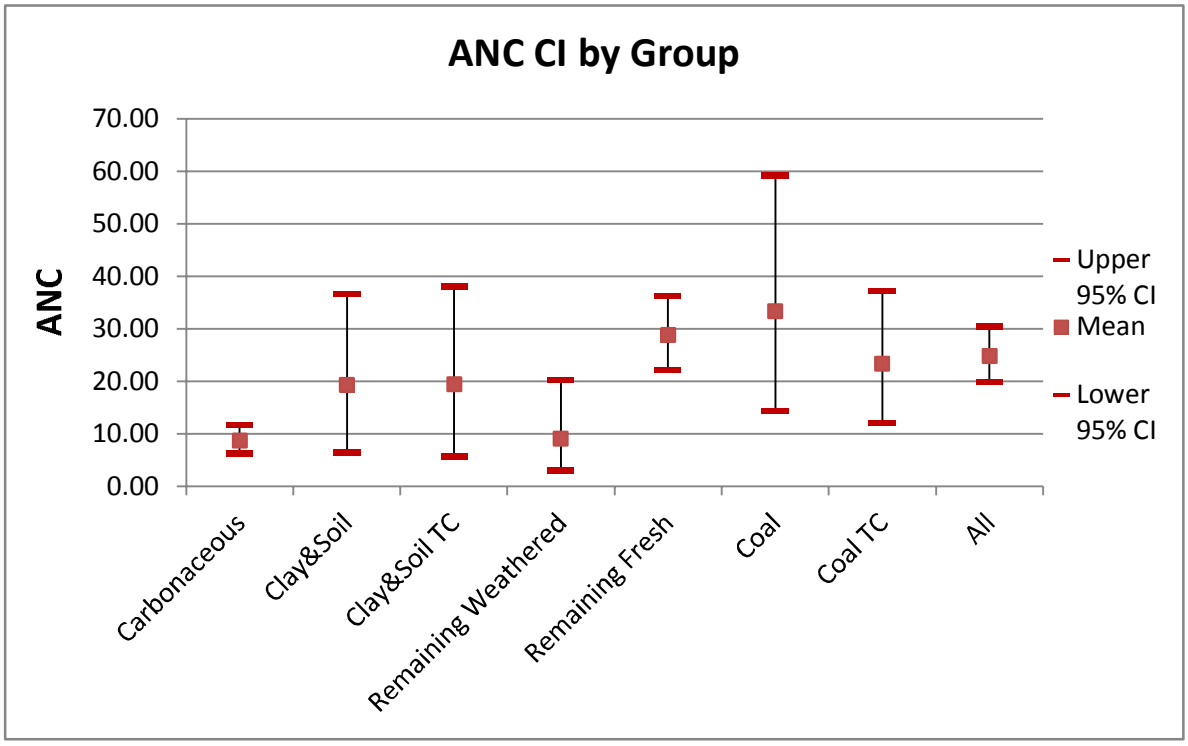


Figure 5-24: Mean and 95% confidence interval of the ANC by Group

Note:
Units are kg(H_2SO_4/t)%. 'TC' denotes a lithology that has had the outliers excluded.

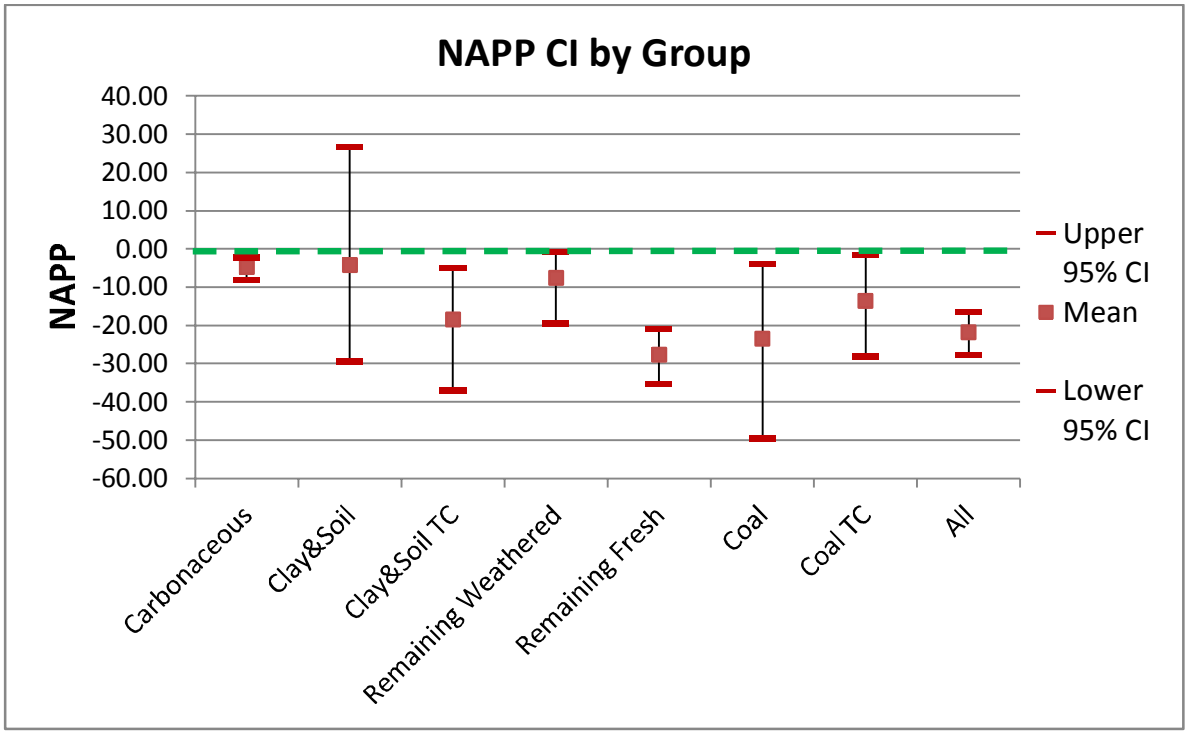


Figure 5-25: Mean and 95% confidence interval of the NAPP by Group

Note:
Units are kg(H_2SO_4/t)%. 'TC' denotes a lithology that has had the total S outliers excluded.

For the Remaining Fresh and Clay and Soil (without the total S outliers) both 95% confidence intervals were less 0.1% total S. This was not the case for the other groups and for all groups combined. For the Coal group both 95% confidence intervals were above 0.1%.

The Coal Group had the largest ANC, followed by the Remaining Fresh group.

The zero NAPP threshold lies above both 95% confidence intervals for the Remaining Weathered group, however, this is sensitive to the exclusion of the outlier. Further samples should be characterised to assess the significance of the outlier.

5.6.6 Spatial variabiltiy

Variography is a form of spatial statistics where the variogram model describes the degree of spatial dependence of a variable in relation to other variables. It is defined as the variance of the difference between field values at two locations across realizations of the field (or range). Variographic modelling was conducted on each of the Lithological Groups for total sulfur and ANC. While Carbonaceous (TOTS only) and Remaining Group (ANC only) gave an indication of the possible ranges, none of the variograms showed any structure. This indicates that insufficient samples were analysed to characterise the spatial distribution of material properties.

5.6.7 Conclusions and recommendations

The proportions of samples from each lithological group and lithological unit subjected to geochemical characterisation were similar to the proportions of each lithological group and unit that would be mined. However, the proportion of characterised samples from the carbonaceous group was deliberately larger than the proportion of the mined material that would be in the carbonaceous group. Coal was under-represented in terms of proportions due to limited availability of coal samples for geochemical characterisation.

There were too few samples of carbonaceous sandstone, conglomerate, soil and shale to conduct a statistical analysis to estimate the confidence interval on the mean value.

The clay, sandy, clay tuff and coal samples contained outliers indicating that the distribution of samples characterised may not adequately represent the distribution of waste geochemical characteristics.

With the removal of outliers statistical analysis indicates that Carbonaceous siltstone was the only lithological unit for which the upper 95% confidence interval on the mean NAPP value exceeded of 0 kg (H_2SO_4)/t, by about 3 kg (H_2SO_4)/t.

Sandstone had a mean NAPP of -31.3 and narrow confidence interval on the mean. This, combined with the large volumes of sandstone in the waste, indicates that sandstone may be a significant source of neutralising capacity.

The spatial density of sampling was inadequate to characterize the spatial distribution of total sulfur, ANC and NAPP. Further sampling from drillholes spaced between 1000 m and 3000 m apart would be required to further investigate the spatial variability. Samples of each significant lithological unit would be required from these holes. The samples should be distributed amongst the various lithological units in proportions similar to those of the drillhole records. The aim would be estimate the variability of the potential for AMD across the pit area.

6 Dispersivity Assessment

6.1 Introduction

Dispersion is assessed for mine waste materials as the rapid erosion of these materials can cause tunnel erosion and gullying in the waste dumps, which can affect their long term stability and sustainability.

In non-dispersive materials, the clay fraction remains flocculated in still water, and the water needs to be flowing above a threshold velocity to cause erosion. By contrast, there is no threshold velocity for dispersive materials, the clay particles go into suspension even in still water, and, therefore are highly susceptible to erosion and piping.

The potential for dispersivity is determined primarily by the mineralogy and chemistry of the clay fraction of the material, and by the dissolved salts in the pore and eroding fluids. The presence of exchangeable sodium is the principal chemical factor contributing to the soil dispersion. The exchangeable sodium percentage (ESP) is determined by measuring the concentration of all the exchangeable cations (Cation Exchange Capacity or CEC) in the materials and expressing the amount of exchangeable sodium as a percentage of the CEC.

Another property that governs the susceptibility of clayey soils to dispersion is the total content of dissolved salts (TDS, also assessed indirectly as electrical conductivity, EC) in the pore or eroding water. Generally, the lower the TDS or EC, the greater the susceptibility of sodium saturated materials to dispersion. Materials with high content of dissolved salts may remain flocculated even if the ESP is high. Thus, for a given eroding fluid, the boundary between the flocculated and deflocculated (when dispersion can occur) states depends on the mineralogy and sodium content of the clay, the salt concentration of pore water and the eroding water.

6.2 Testing for Dispersivity

Dispersivity can be assessed by means of chemical tests to ascertain potential causes of dispersion, or by physical tests to observe the effect of dispersion. Dispersivity can be affected by a range of factors as listed in the previous section. For this reason, it is recommended that a variety of tests be conducted to assess the potential of a material to disperse. Some variability between the results of the different test results is common.

For this project, four tests were conducted to determine the dispersion potential for the materials.

- Exchangeable sodium percentage (ESP) and cation exchange capacity (CEC)
- Electrical conductivity (EC)
- Emerson aggregate test
- Simple accelerated weathering testing on four rock samples
- For the ESP and CEC a sub-sample of material was dried and pulverised to better than 85% passing 75 microns as pulp. The EC (1:5) was also performed on the pulp. The Emerson aggregate test was tested “as received” with no further sample preparation.

For soil materials, an ESP greater than 6% may indicate dispersive properties, and greater than 15% indicates highly dispersive properties (Gerber and von Maltitz Harmse, 1987). However, in SRK’s experience of testing on crushed rock material the threshold values appear to be higher, with an ESP less than 15% indicating non-dispersive properties and an ESP of greater than 30% indicating highly dispersive properties. Factors such as clay type (determined indirectly from the CEC) and total dissolved salts (assessed using the EC) govern the overall behaviour of the material. Materials with a CEC less than 10 meq/100g are generally classified as non-dispersive (Gerber and von

Maltitz Harmse, 1987). A high dissolved salt content may mask the effect of the high sodium content, which can cause soils with a high ESP to behave as a non-dispersive material.

The Emerson aggregate test (also called the crumb test) is a simple test in which a block of material (about 2 cm in diameter) is placed in still water and the reaction between soil/rock and water (slaking or dispersion) noted. If no reaction occurs, the sample is remoulded, then shaken and the reaction observed, and also tested for gypsum. Appendix F shows a flow chart for the testing and classification of soils in the Emerson aggregate test and also shows examples of highly dispersive, slightly dispersive and non-dispersive samples in the Emerson aggregate test. The Emerson test gives a good indication of the expected behaviour of the materials.

6.3 Sample Selection

Dispersivity testing was conducted on samples from the Carmichael project. Ninety two samples were selected for the Emerson aggregate test and 48 samples for chemical testing. The samples were selected to cover all major material types and weathering grades, but with emphasis on materials more likely to show dispersive behaviour. In addition, four samples were selected for accelerated weathering testing (AWT) in which the deterioration of submerged samples was visually observed. The number of tests completed for each rock type is given in Table 6-1.

Table 6-1: Sample selection

Lithology Group	Rock type	Number of Samples		
		Emerson Testing	Chemical Testing	AWT
Coal	Coal	5	3	
Clay and Soil	Clay (weathered layers)	8	5	1
Sand and Gravel	Sandstone	1		
Carbonaceous	Carb. Mudstone	8	4	1
Potentially AN	Clay	2	1	
Remaining	Weathered	11	8	
	Claystone/ Mudstone	8	6	
	Siltstone	19	8	1
	Sandstone	27	11	1
	Tuff	3	2	
Total number of samples		92	48	4

6.4 Test Results

Test results are summarised in Appendix F, and an interpretation of the dispersivity of each sample given in Table 6-2. An overall classification of dispersive, marginally dispersive and non-dispersive (Gerber and von Maltitz Harmse, 1987) was assessed for each lithology group, according to results of the individual tests.

Paste testing, and results from leach testing, suggest that the rock samples contained little salinity; paste electroconductivity (EC) ranged from 37 to 6684 µS/cm for fresh rock and 525 to 1580 µS/cm for weathered rock. The clay samples showed high salinity, with EC ranging up to 3740 µS/cm. The exchangeable sodium percentage (ESP) values ranged from 0.4 to 57%. The ESP must be assessed in the context of cation exchange capacity and EC, and also the fact that the common ranges for milled rock may be different from published values for soil classification.

Table 6-2: Interpretation of results

SAMPLE NUMBER	From	To	LITHOLOGY	Lithology Group	Weathering	EMERSON CLASS	EC (µS/cm)	CEC	ESP	Sample Interpretation	Lithology Group Interpretation
81356	5.58	6.51	CLAY	CLAY AND SOIL GROUP	EW	1	2910	44.2	44.4	Dispersive	Dispersive
14971	29.37	29.68	CLAY	CLAY AND SOIL GROUP	EW	2	1370	10.7	39.6	Dispersive	
14965	1.33	1.66	CLAYEY SAND	CLAY AND SOIL GROUP	EW	2	661	39.4	3.10	Dispersive	
14975	0.00	0.30	SOIL	CLAY AND SOIL GROUP	EW	5				Nondispersive	
14976	0.76	1.08	CLAYEY SAND	CLAY AND SOIL GROUP	D	1				Dispersive	
81362	30.00	30.42	CLAYSTONE	CLAY AND SOIL GROUP	HW	1				Dispersive	
148388	51.97	52.30	CLAY	CLAY AND SOIL GROUP	W	2	72	2.20	15.9	Marginal	
14970	21.58	21.93	CLAYEY SAND	CLAY AND SOIL GROUP	MW	1	1580	14.4	39.2	Dispersive	
81351	50.48	50.71	SANDSTONE	SAND AND GRAVEL GROUP	MW	5				Nondispersive	Nondispersive
81363	43.31	44.26	SANDSTONE	REMAINING	MW	6	525	2.2	12.30	Nondispersive	
81396	5.43	5.81	CLAY	POTENTIAL AN GROUP	HW	5				Nondispersive	Nondispersive
81394	4.36	4.55	CLAY	POTENTIAL AN GROUP	EW	6	3740	206.00	3.8	Nondispersive	
81450	75.20	75.99	CLAYSTONE	REMAINING	EW	5				Nondispersive	Nondispersive
14973	34.40	34.74	SANDY CLAY	REMAINING	EW	2	454	17	34.8	Dispersive	Dispersive
81365	14.22	15.08	CLAY	REMAINING	HW	2	2030	9.8	56.7	Dispersive	
81357	34.27	34.90	CLAYSTONE	REMAINING	HW	2	790	5.2	53	Dispersive	
81397	46.63	47.00	CLAYSTONE	REMAINING	HW	5	1170	26.7	38.7	Marginal	
14966	6.10	6.47	SANDY CLAY	REMAINING	MW	2				Dispersive	
14967	9.00	9.34	SANDY CLAY	REMAINING	MW	3	370	18.20	6.00	Marginal	
14969	15.70	16.00	SANDY CLAY	REMAINING	MW	2	845	2.20	32.20	Marginal	
81400	64.38	65.23	CARB MUDSTONE	CARBONACEOUS GROUP	SW	2				Dispersive	Dispersive
81367	54.96	55.36	SILTSTONE	REMAINING	SW	5	668	26.80	12.70	Marginal	Marginal
81382	298.14	298.27	C5 COAL	COAL GROUP	FR	5	443	5.90	24.80	Nondispersive	Nondispersive
81370	92.42	92.89	COAL	COAL GROUP	FR	5				Nondispersive	
2209	195.21	195.52	COAL	COAL GROUP	FR	3	170	28.90	1.40	Nondispersive	
2220	198.75	199.14	COAL	COAL GROUP	FR	3				Marginal	
2221	199.14	199.50	COAL	COAL GROUP	FR	3	213	8.80	12.30	Nondispersive	
81355	105.80	106.34	CARB MUDSTONE	CARBONACEOUS GROUP	FR	5	37	3.90	17.20	Nondispersive	Generally nondispersive, occasional marginally dispersive
81406	96.55	97.14	CARB MUDSTONE	CARBONACEOUS GROUP	FR	5				Nondispersive	
81455	366.80	367.73	CARB MUDSTONE	CARBONACEOUS GROUP	FR	5				Nondispersive	
81438	463.00	465.26	CARB MUDSTONE &	CARBONACEOUS GROUP	FR	5				Nondispersive	
81401	67.70	68.21	MUDSTONE	CARBONACEOUS GROUP	FR	5	158	4.30	12.10	Nondispersive	
81403	98.70	99.45	MUDSTONE	CARBONACEOUS GROUP	FR	5				Nondispersive	
154041	138.15	138.42	CARB MUDSTONE	CARBONACEOUS GROUP	FR	3	380	13.40	16.60	Marginal	
170252	157.37	157.59	CARBONACEOUS	CARBONACEOUS GROUP	FR	3	228	6.30	15.10	Marginal	
81453	169.96	171.24	CLAYSTONE	REMAINING	FR	5	195	25.50	12.50	Marginal	Generally nondispersive, occasional marginally dispersive
170286	74.30	74.59	CLAYSTONE	REMAINING	FR	5				Nondispersive	
154261	154.77	155.07	CLAYSTONE	REMAINING	FR	6	508	7.60	4.00	Nondispersive	
154262	156.53	156.79	CLAYSTONE	REMAINING	FR	5				Nondispersive	
CQ17280	197.93	198.23	CLAYSTONE	REMAINING	FR	3	327	8.60	21.90	Marginal	
154270	193.96	194.21	MUDSTONE	REMAINING	FR	5	117	6.60	3.40	Nondispersive	
177659	125.13	125.40	MUDSTONE	REMAINING	FR	3	157	10.10	19.00	Marginal	
146717	190.72	190.94	MUDSTONE	REMAINING	FR	3	423	5.30	12.50	Nondispersive	
81404	107.00	107.57	SANDSTONE	REMAINING	FR	5				Nondispersive	Generally nondispersive, occasional marginally dispersive
81405	85.97	86.88	SANDSTONE	REMAINING	FR	5	437	3.20	35.00	Nondispersive	
81410	258.26	259.19	SANDSTONE	REMAINING	FR	5				Nondispersive	
81436	444.40	445.79	SANDSTONE	REMAINING	FR	4				Nondispersive	
154038	122.12	122.39	SANDSTONE	REMAINING	FR	3				Marginal	
GT148411	136.78	137.08	SANDSTONE	REMAINING	FR	4	156	14.90	2.70	Nondispersive	
204851	52.01	52.32	SANDSTONE	REMAINING	FR	5	42	0.90	13.10	Nondispersive	
81710	105.84	106.08	SANDSTONE	REMAINING	FR	4	137	22.70	0.90	Nondispersive	
154255	84.80	85.05	SANDSTONE	REMAINING	FR	4				Nondispersive	
148393	80.75	81.05	SANDSTONE	REMAINING	FR	5				Nondispersive	
153308	252.90	253.19	SANDSTONE	REMAINING	FR	5				Nondispersive	
170112	124.92	125.66	SANDSTONE	REMAINING	FR	5	152	11.00	3.50	Nondispersive	
169713	208.21	208.56	SANDSTONE	REMAINING	FR	5				Nondispersive	
154272	72.01	72.35	SANDSTONE	REMAINING	FR	3	268	5.80	21.80	Nondispersive	
154284	141.00	141.30	SANDSTONE	REMAINING	FR	5				Nondispersive	
177687	121.68	122.02	SANDSTONE	REMAINING	FR	3	272	29.00	5.80	Nondispersive	
147284	220.20	220.48	SANDSTONE	REMAINING	FR	3				Marginal	
146738	107.94	108.26	SANDSTONE	REMAINING	FR	5	145	18.70	0.40	Nondispersive	
177957	206.38	206.78	SANDSTONE	REMAINING	FR	5	140	2.00	1.70	Nondispersive	
153334	146.22	146.48	SANDSTONE	REMAINING	FR	3				Marginal	
152623	103.10	103.44	SANDSTONE	REMAINING	FR	6				Nondispersive	
169963	118.61	119.00	SANDSTONE	REMAINING	FR	3	232	37.10	8.30	Marginal	
170289	91.01	91.33	SANDSTONE	REMAINING	FR	4				Nondispersive	
GT169961	107.05	107.36	SANDSTONE	REMAINING	FR	2				Dispersive	
GT169962	113.21	113.52	SANDSTONE	REMAINING	FR	4				Nondispersive	
182759	100.91	101.19	SANDSTONE	REMAINING	FR	4				Nondispersive	
177688	128.16	128.48	SANDSTONE	REMAINING	FR	3	244	33.50	4.70	Nondispersive	
81371	96.83	97.88	SILTSTONE	REMAINING	FR	3	584	37.20	10.20	Marginal	Marginal
81379	253.43	253.77	SILTSTONE	REMAINING	FR	3				Marginal	
81418	356.16	356.93	SILTSTONE	REMAINING	FR	5	376	15.70	11.60	Marginal	
154043	146.44	146.75	SILTSTONE	REMAINING	FR	5				Nondispersive	
170288	85.89	86.19	SILTSTONE	REMAINING	FR	3				Marginal	
GT148412	140.77	141.03	SILTSTONE	REMAINING	FR	3				Marginal	
154021	147.92	148.28	SILTSTONE	REMAINING	FR	3				Marginal	
154273	76.33	76.63	SILTSTONE	REMAINING	FR	3				Marginal	
182651	55.29	55.57	SILTSTONE	REMAINING	FR	5				Nondispersive	
GT148360	150.84	151.11	SILTSTONE	REMAINING	FR	3	410	11.10	19.90	Dispersive	
153301	167.94	168.19	SILTSTONE	REMAINING	FR	5	109	28.20	0.50	Nondispersive	
169959	93.32	93.58	SILTSTONE	REMAINING	FR	3				Marginal	
169606	96.50	96.80	SILTSTONE	REMAINING	FR	3				Marginal	
182753	77.54	77.90	SILTSTONE	REMAINING	FR	3	216	8.30	15.50	Marginal	
177665	165.62	165.99	SILTSTONE	REMAINING	FR	3	383	28.80	7.60	Marginal	
GT152502	188.21	188.50	SILTSTONE	REMAINING	FR	3	170	26.80	1.60	Nondispersive	
GT147593	137.85	138.19	SILTSTONE	REMAINING	FR	5				Nondispersive	
154040	128.00	128.31	SILTSTONE	REMAINING	FR	3				Marginal	
CQ17265	212.26	212.53	SILTSTONE	REMAINING	FR	4	400	13.70	1.80	Nondispersive	
169716	216.88	217.17	TUFF	REMAINING	FR	4	94	14.40	1.30	Nondispersive	Generally nondispersive, occasional marginally dispersive
GT169953	63.40	63.70	TUFF	REMAINING	FR	6				Nondispersive	
177693	173.28	173.53	TUFF	REMAINING	FR	3	311	20.00	11.10	Marginal	

6.5 Visual assessment

Simple accelerated weathering testing (AWT) was conducted on samples of weathered claystone, and unweathered sandstone, siltstone and mudstone. These rock types showed non-dispersive behaviour in laboratory. AWT testing was conducted to determine the potential for time dependant deterioration or slaking, which may affect long term stability of waste dumps. The testing involved submerging rock fragments in water, and subjected a second set of samples to daily wetting and drying, and observing changes to the samples over a 20 day period. Results are shown in Appendix H.

As with laboratory testing results, none of the samples showed dispersive results: the water remained clear, with clay particles settling out with time, and no clay particles remaining in suspension in the water. The samples did, however, show different degrees of durability/ physical slaking. The extremely weathered claystone showed very rapid slaking, the siltstone moderate slaking and the sandstone minor slaking. The mudstone did not show signs of slaking.

This testing may indicate that although the fresh rock units are not dispersive, they are not durable, and with time may degrade. The degraded material may be more prone to physical erosion than the original fresh rock. It is recommended to conduct laboratory testing to qualify the slake potential of the fresh rock, to understand the effect of this on long term dump behaviour.

6.6 Discussion and Conclusion

Test results for 92 samples indicate that the clays, weathered rocks (including mudstone, claystone, carbonaceous mudstone and siltstone) may have dispersive behaviour. Slightly weathered siltstone may show very slight potential for dispersivity. The weathered sandstone did not show any indication of dispersive behaviour. Clay samples from the NA group showed completely non-dispersive results due to the presence of calcite (as noted in the sample description comments).

The fresh rocks were generally non-dispersive, although some claystones and siltstones may have a very low potential for dispersion. There was variability in dispersion results within each group.

Weathered rock, siltstone and sandstone showed potential for deterioration and breakdown after exposure to water. The siltstone showed moderate rate deterioration, and sandstone slow deterioration. This may indicate that although the fresh rock units are not dispersive, they are not durable, and with time may degrade to sand, silt or clay. The degraded material may be more prone to physical erosion than the original fresh rock.

As a general recommendation, suitable precautions should be taken to prevent water flow over or ponding on the waste dumps to minimise physical erosion materials, and also to minimise waste rock deterioration. Good compaction may also help prevent ingress of water into the slopes. Storage of the soil and clays and weathered mudstone, weathered claystone and weathered siltstones which showed a high potential for dispersion within the interior of the waste dumps is recommended. The use of shallow or concave slopes (with steepest gradient at the top of the slope and reduced gradient at the toe of the slope) has been recommended to minimise gully formation (Loch, 2005; Vacher et al., 2004).

7 Waste Rock and Tailings Management

7.1 Mine Development

Mining at Carmichael would be by underground and open cut methods. Prior to mining the topsoil would be stripped from the open cut mining areas of pits B to G and from overburden storage areas to the east and north east of these pits as indicated in Figure 7-1. The topsoil would be stored to the west and south west of the pits.

Initially the overburden would be deposited to the north east of the pits and as pits develop the overburden dumps would expand to the south west and become taller, reaching a maximum height of up to 140 m. This development is illustrated in plan views of Pits D and E for four different years in Figure 7-2. Cross-section views of Pits D and E at three different times are presented in Appendix H. This type of development would apply to all overburden dumps. To complete the construction the overburden dumps and some pits would be reshaped by reducing the angle of dump batters and pit slopes.

The coal product would be separated and managed as shown in **Error! Reference source not found.**. Twenty four percent of the annual production of Coal Product would become waste (14.06 Mtpa). Less than half of the fine waste circuit material would be dried by passing it through a belt filter press. The remainder of the waste from the fine waste circuit would be wet rejects and would be temporarily placed in the tailings containment areas to the north east of Pit D. Here the excess tailings water would be decanted and the beached tailings dried. Clayey material from the top 60 to 90 m of tertiary strata would be used in the construction of the tailings containment areas so as to limit seepage.

Table 7-1: Percentages of the Coal Product subjected to various treatments

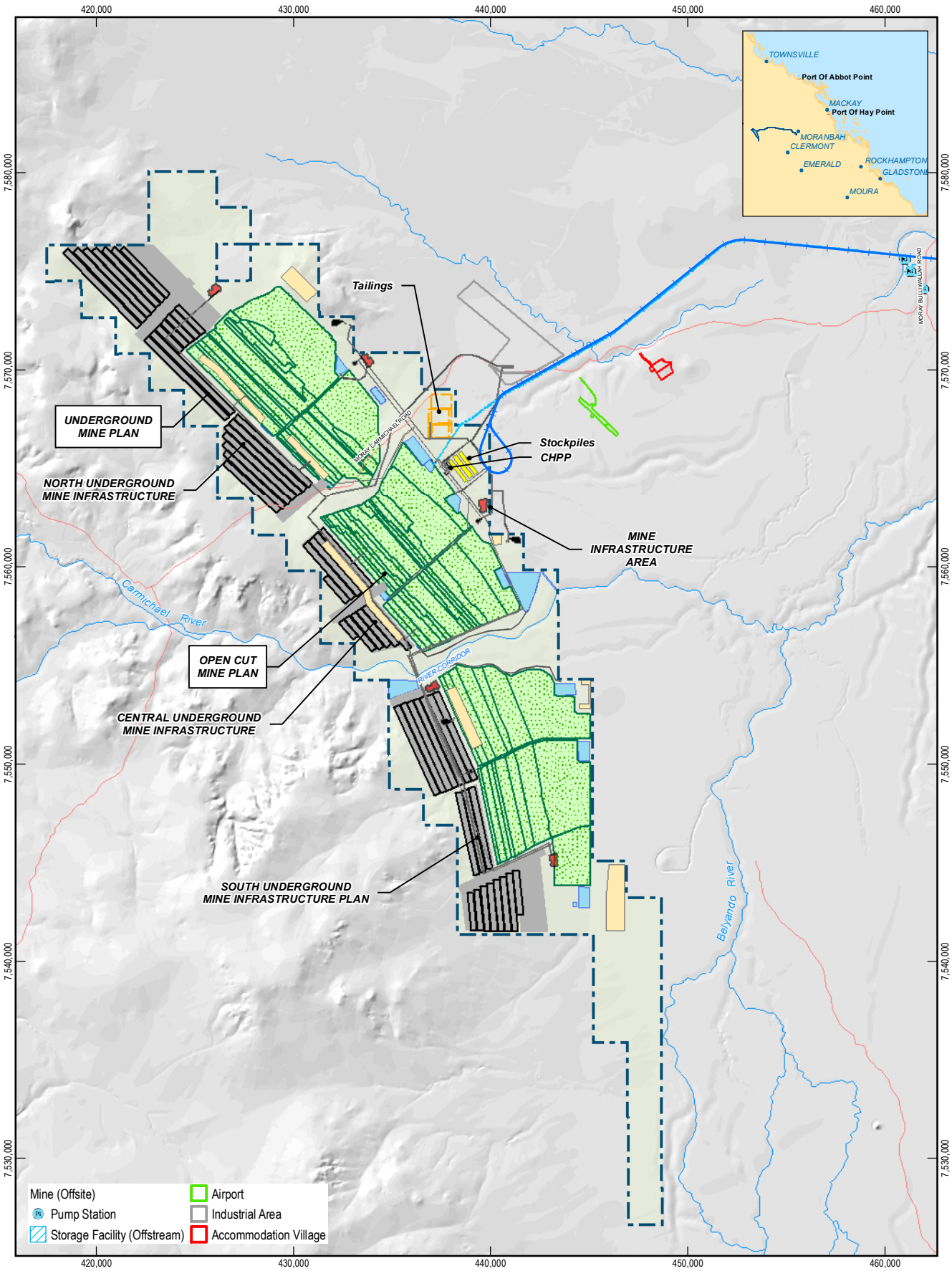
Coal Product Waste (24% of Coal Product)			**Total**
Coarse rejects (75.4%)	Fine waste circuit (24.6%)		
Mtpa	Belt press filter (35%) Mtpa	Tailings dam (65%) Mtpa	
10.6	1.21	2.25	14.06

After drying the tailings would be removed and placed in cells constructed within the overburden dumps of Pits D and E outside of the pits. The tailings would be mixed with coarse rejects and overburden as required to ensure geotechnical stability.

A natural consequence of this mining sequence in general would result in the weathered material being placed at the base and the fresh material to be placed closer to and on the top surfaces of the overburden dumps.

Geochemical characterisation indicated that chromium reducible sulfur (sulfide sulfur) is less prevalent within overburden sourced from within 40 m of ground surface (Figure 7-3) which corresponds to material from above the groundwater table (Section 7.2.3). The near surface overburden is therefore less likely to be a potential source of acidic drainage. Materials that may pose a risk of acid generation would be sourced from depth. Therefore, without appropriate waste management techniques, the proposed method of construction would increase the risk of exposing potentially acid generating material near the outer surfaces of overburden dumps. Preliminary recommendations for waste management are discussed in the Section 7.4 and include separation of the near surface materials for strategic use.

Pits B, D and G will be backfilled up to the level of seam D and Pits C, E and F will be filled to the level of AB seam. This will limit the exposed area of coal seams on the pit wall to the atmosphere.



LEGEND

- Local Road
- River / Watercourse
- Overland Conveyors
- Rail (West)
- Mine (Onsite)
- Open Cut Blocks
- Water Management Dams
- Mine Infrastructure Area
- Mine Infrastructure
- Stockpiles
- Tailings Cell
- Top Soil Storage

1:275,000 (at A4)

0 2 4 6 8 10

Kilometres

Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia (GDA)
Grid: Map Grid of Australia 1994, Zone 55

N

Adani Mining Pty Ltd
Carmichael Coal Mine and Rail Project SEIS

Job Number 41-26422
Revision B
Date 29-10-2013

Project onsite and offsite infrastructure

Figure 7-1

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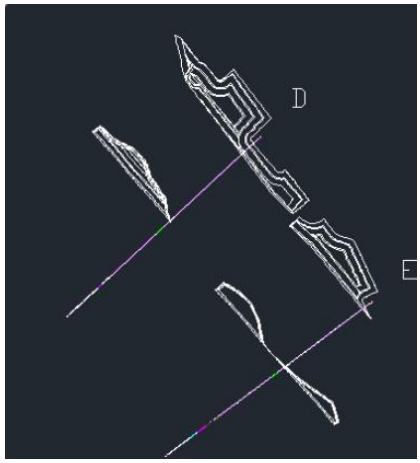
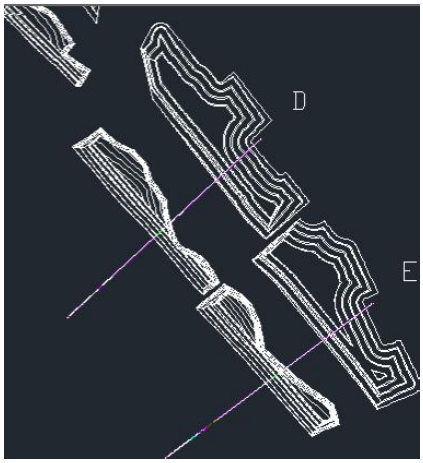
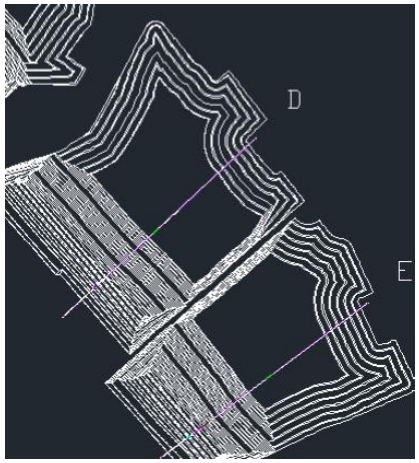
Data Source: GA: Road, River / Watercourse (2007); DME:EPC1690 (2010), EPC1080 (2011); Adani: Alignment, Offsite(2013), Mine Layout / Infrastructure (2013); Created by: MS



2015



2019



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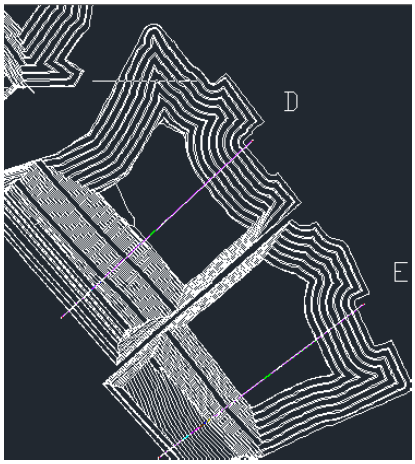

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Figure 7-2: Plan views of Pits D and E for four years

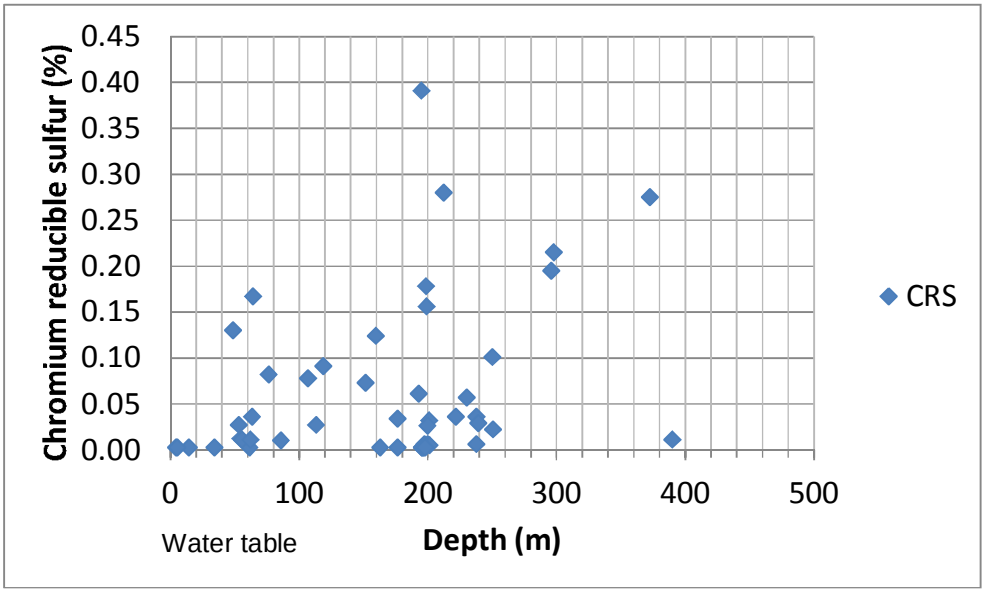


Figure 7-3: Chromium reducible sulfur content versus depth

7.2 Water Supply and Quality

7.2.1 Demand

Make-up water will be imported to the project area throughout the project life to meet the on-site water demand. This would include 2 GL/y of groundwater from a bore field during the first 5 years. Figure 7-4 presents estimates of the volumes of raw water that would be supplied from off-site.

The estimated water requirement of the CHPP is presented in Figure 7-5. Mine affected water would be supplied to the CHPP from the Process Water Dam which would be supplied with water from sediment dams. The sediment dams would collect water from disturbed areas and overburden. Water would circulate from the CHPP to the Tailings Dam and back (less evaporative losses) and would be treated as required (actual treatment method has not yet been determined).

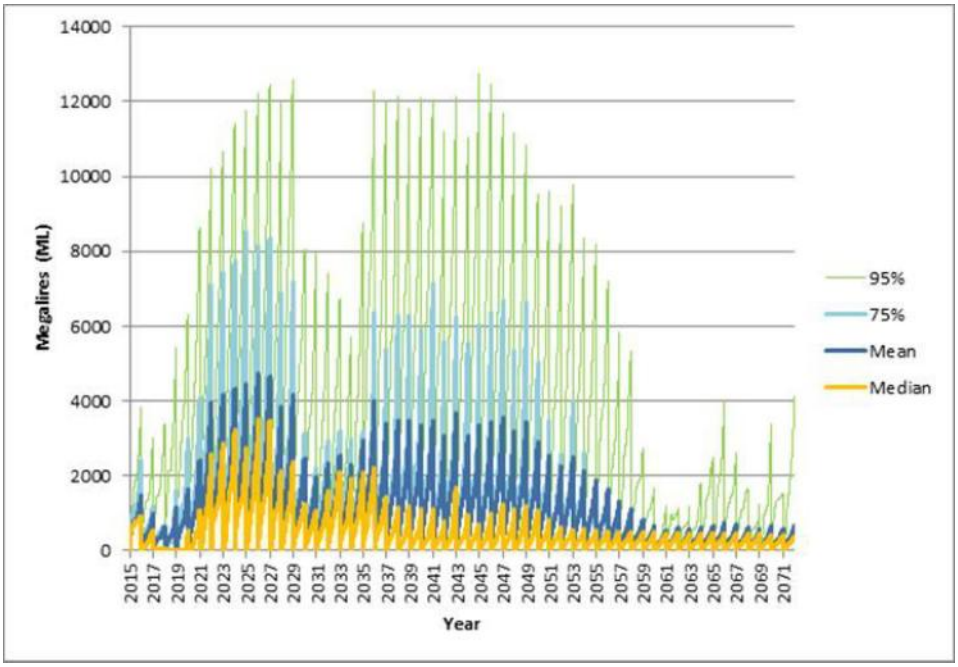


Figure 7-4: Estimated raw water requirements supplied from offsite

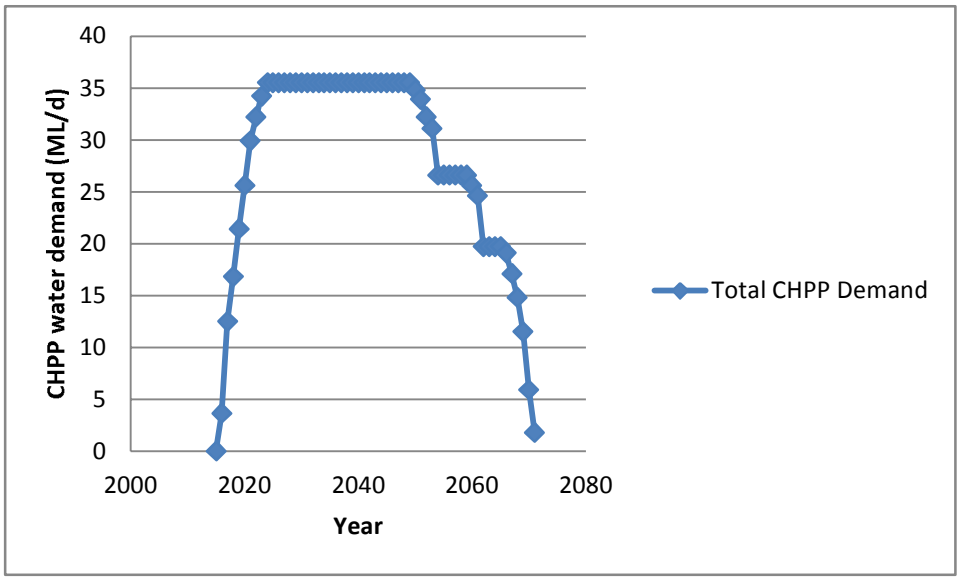


Figure 7-5: Water requirements of the CHPP

7.2.2 Surface water

Surface water quality has been monitored at locations upstream and downstream of the mine lease on four occasions between October 2012 and February 2013. Surface water was circum-neutral. Maximum concentrations of selected solutes are presented in Table 7-2 and indicate that the water would be suitable for watering stock.

Table 7-2: Selected solute concentration in surface water

Parameter	Maximum concentration (mg/L)	ANZGFMWQ* (Stock)
EC	2410	
SO4	760	1000
Ca	31	1000
Al	1.37	5
As	0.004	0.5
Cd	< 0.0001	0.01
Se	< 0.01	0.02
Zn	0.007	20

Note:

* From Australian and New Zealand Guidelines for Fresh and Marine Water Quality Table 4.3.2

7.2.3 Groundwater

Away from the Carmichael River the depth of the pre-mining groundwater level is approximately 40 m below ground at an elevation of 200 mAHD (GHD, 2003a). Due to low rainfall, high evaporation rates and slow lateral recharge the pit voids at the end of mining would be expected to generally be dry and the groundwater table is not expected to rebound after mine closure. It is therefore unlikely that a significant fraction of overburden inside or outside the pit would be saturated in the long term.

A total of four rounds of groundwater quality monitoring were undertaken in 2011, 2012 and 2013. Average values of electrical conductivities (EC) in various aquifers or geological units are presented in Table 7-3. Figure 7-6 indicates the locations of the geological units in which the groundwater was monitored and provides an overprint of the proposed open-cut footprint.

The base of the pits would be at about the -40m mAHDand the open cut would produce overburden from the Tertiary, other Quaternary, Rewan Formation, Permian overburden and the Permian between AB and D seams. Water quality monitoring results indicate pore water present in the Quaternary alluvium, Tertiary, Permian overburden and Interburden wastes to be of low quality. The contained pore water associated with these units would be released into the surface runoff and percolate from the mined overburden.

Table 7-3: Electrical conductivity of geological formations

Monitored unit	Average EC (µS/cm)
AB Seam	5,442
Alluvium	14,321
Clematis Sandstone	1,089
D Seam	1,631
Dunda Beds	1,570
Interburden	10,659
Permian Overburden	13,172
Rewan Group	2,478
Tertiary	13,331
Tertiary / Permian Overburden	130
Tertiary/Permian	3,776

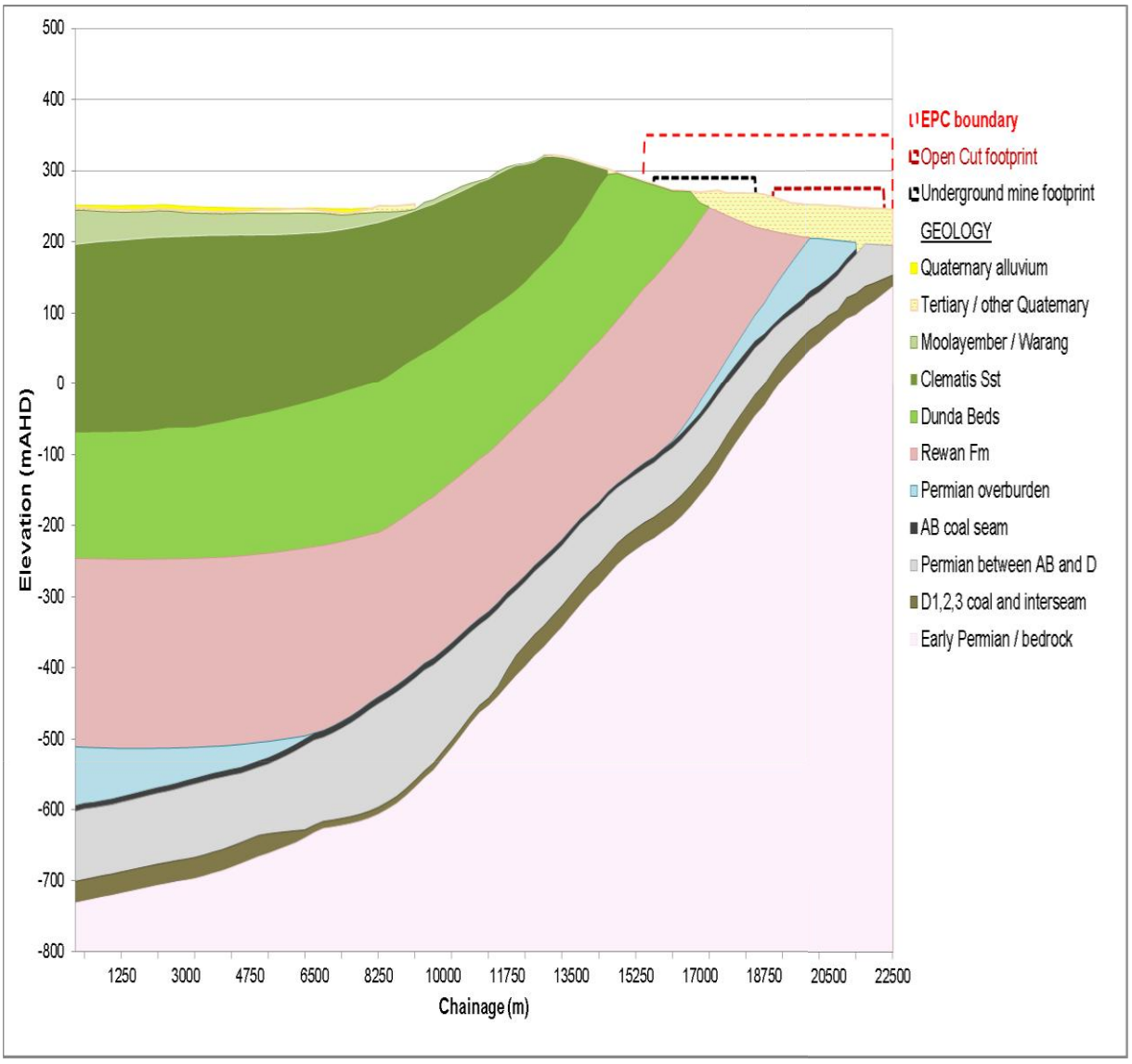


Figure 7-6: Geological cross-section

7.3 Geochemical Response of Overburden Materials

The large majority of overburden and interburden not immediately adjacent to the coal seams and generally above the regional water table would not be expected to be significant sources of salinity. However, the clay materials and materials sourced from the lithological units identified previously that contain saline water could have a markedly higher potential to release salts and metals to contact water. In particular, the geochemical static testing indicated that a portion of the carbonaceous mudstone, carbonaceous siltstone, claystone, sandstone and siltstone and roof and floor and coal materials could also be expected to be potentially acid forming in the longer term.

Clays, weathered rocks (including mudstone, claystone, carbonaceous mudstone and siltstone) may have dispersive behaviour. Slightly weathered siltstone may show very slight potential for dispersivity.

Potential issues related to the geochemical characteristics of wastes that could arise in the absence of adequate management strategies include:

1 AMD from PAF overburden materials.

2 AMD from Coal washery wastes. Although tailings samples have not been available for geochemically characterisation, testing on coal (which may serve as a surrogate) indicated that some coal samples were PAF.

3 Saline neutral drainage. Some clay materials of the overburden and interburden could have the potential to produce saline drainage.

4 Sedimentation and erosion from dispersive materials.

7.3.1 Preliminary Water Quality Estimates

Preliminary estimates of solute concentrations in run-off and percolate from the overburden were based on the combined results of initial solute releases from static leach testing (Section 5.4.2) and from the first five weeks of kinetic column operation. These estimated concentrations are intended to indicate concentrations that might be expected as a result of the first flushing of the overburden. They would not be expected to be sustained in the longer term as readily available solutes would be transported from the overburden.

To estimate percolate water quality, it was assumed that rainfall would infiltrate the overburden. Flow through the overburden is expected to form selective flow paths so that only a fraction of the waste material would be contacted by the flow. In contrast to the laboratory tests (which generally are saturated during the leach cycle) in the field the flow would be unsaturated and only a fraction of the total leachable solutes would be dissolved and transported out of the overburden landform. The relevant parameters are given in Table 7-4.

Table 7-4: Parameters used to estimate percolate water quality

Parameter	Units	Value
Overburden thickness	m	140
Mean average precipitation	mm	665
Fraction of the rain infiltrating the surface		0.3
Fraction of the overburden contacted by percolating water		0.3
Fraction of the solutes released		0.3

The water quality for surface run-off were based on total runoff estimates using the Green Ampt relation (Hillel, 1998) to assess the volume of runoff that could occur for various recurrence intervals and intensity of rainfall events. The lowest rainfall event that would be expected to generate runoff was then adopted to estimate the potential maximum concentrations that could result. (The lowest runoff yields the highest concentrations for a similar solute release as it would provide the least amount of dilution.) For the purposes of this assessment it was assumed that the surface of the overburden dump would be level and trafficked so that the surface materials would generally be ground to fine clayey silt material; this assumption is conservative as it would tend to result in runoff for relatively small rainfall events (i.e. small quantities of water). The preliminary calculations suggest that a 6 minute event with a 1 year return period could result in about 6 mm of runoff.

The solute release would be restricted to the near surface materials only. When a rainfall event occurs, initially a certain amount of water would infiltrate until the soils become saturated; water would continue to infiltrate as long as the rate of rainfall does not exceed the permeability of the soils. Once the initial saturation occurs and the rainfall exceeds the rate at which water may infiltrate water would start to pond, and only once the water level exceeds local undulations would runoff commence.

Salts accumulated on the surface of the overburden dump would be dissolved and could be transported with the surface runoff. The salt accumulation would depend on the amount of salt wicking that had occurred in advance of the rainfall event; this would depend on the time between events and the depth to which wicking would occur. Since the runoff estimate noted above would be for a 1 year return period, it is anticipated that wicking would not have progressed to any significant depths. It was therefore assumed that salt wicking could have progressed from a depth of about 0.1 m below surface and that all of the solutes had moved to the surface of the dump. It should be noted that during the initial infiltration process as rainfall commences, salts would be dissolved and transported back into the dump and would be 'lost' to runoff. Furthermore, since the first event would have removed most of the available solutes, the solute concentrations in subsequent events would be lower.

For the purposes of this assessment it was therefore assumed that thirty percent of the solutes in the top 0.1 m of the overburden would be released to the flush. Table 7-5 summarises the preliminary estimates of concentrations in the percolate and surface runoff water. Estimates were made with and without mineral solubility controls and are compared with maximum concentrations measured in surface water at and near the project site and with water quality guideline values for stock drinking water.

Table 7-5: Preliminary estimate of surface and percolate water qualities

Parameter	Initial Solute Release (combined kinetic and static results)	Short Term Percolate Concentration	Initial Runoff Concentrations	Percolate	Runoff	Mineral control	Max. conc. In surface water	Cattle livestock drinking water guideline values*
	mg/kg	mg/L						
Chloride	57.12	5772	411	5791	411			
Sulfate	147.04	14859	1058	5779	1044	Gypsum	760	1000
Fluoride	1.47	149	11	2	2	Fluorite, fluorapatite	0.8	2
Calcium	44.27	4474	318	705	308	Gypsum	31	
Magnesium	9.43	953	68	957	68		35	2000
Potassium	10.14	1025	73	954	72		45	
Sodium	145.38	14691	1046	14740	1046		420	
Total Phosphorus as P	0.06	6	0.4	0.1	0.001	Fluorapatite	0.75	
Aluminium	1.82	184	13	0.01	0.01	Gibbsite	1.37	5
Arsenic	0.02	2	0.1	2.1	0.15		0.004	0.5
Boron	1.76	177	13	178	13		0.26	5
Barium	1.33	135	10	0.007	0.01	Barite	0.42	5
Copper	0.01	0.5	0.04	0.5	0.04		0.003	1
Iron	0.78	79	5.6	0.7	0.04	K-jarosite	2.78	
Manganese	0.09	9	0.7	10	0.7		4.49	
Molybdenum	0.07	8	0.5	8	0.5		0.002	0.15
Strontium	0.71	72	5	72	5		0.41	
Zinc	0.60	61	4	61	4		0.007	20

Note: * From Australian and New Zealand Guidelines for Fresh and Marine Water Quality Table 4.3.2

Estimated concentrations of sulfate, fluoride, boron and molybdenum in surface runoff are predicted to exceed the cattle drinking water quality guidelines (ANZGFMWQ, 2000). Similarly, estimated concentrations of sulfate, fluoride, boron, molybdenum and zinc in percolate from the overburden dumps (for the maximum height of the dump) are predicted to exceed the cattle drinking water quality guidelines (ANZGFMWQ, 2000).

Based on the proposed operational water management plan, surface water runoff, and toe seepage that reports to surface runoff, will be captured and recycled or reused in the pant.

Water quality in the longer term would be expected to be different to those presented above; in part they would be dictated by the presence and distribution of PAF materials within the dumps. However, results from longer term kinetic testing would be required to complete these estimates.

7.4 Conceptual Waste Management Strategies

In the short term, surface and percolate water would need to be managed, as noted above. In the event that the longer term water quality assessment determines that it is necessary to manage PAF material several options could be available, including:

i) Covering or isolating the PAF waste with NAF materials to reduce the quantity of water contacting the PAF waste.

ii) Co-mingling or blending the PAF waste with acid consuming waste that has excess neutralisation capacity (however, there are currently no indications that such NAF materials would be available in large quantities).

iii) A variation of option ii) is the addition of limestone ($CaCO_3$) during deposition of PAF waste. This has been demonstrated at some sites to extend the lag time to acidification. The benefits include improvements in surface and pore water quality prior to implementing other longer term management strategies.

iv) Segregating and placing the PAF waste where acid generation can easily be controlled or prevented through reduction in the rate of oxygen supply.

For option i) NAF material would be placed at the base of the dump to reduce contact between PAF waste and the water that flows at the interface of the waste (base of the dump) and the original ground surface. PAF material would then be covered with NAF material, graded to enhance runoff and compacted to limit infiltration, thus reducing the contact between infiltrating rainwater and PAF waste. Depending on the properties of the NAF material (e.g. thickness of layer, sulfide mineral content, particle size distribution, weathering properties etc.), it may also serve to reduce the availability of oxygen to the PAF material thus reducing the rate of oxidation. This management strategy may be used during mining when the pit is being constructed and PAF material must be removed from the pit for efficient mining.

For option ii) PAF material would be blended with material containing excess neutralisation capacity and would require tight controls on blending ratios. This process is operationally complex to implement. Success has been limited in the past due to the fact that it is not always possible to achieve well mixed conditions during placement and maintain contact between the acid produced and neutralising materials in the longer term. It is further constrained by the simultaneous availability of the neutralising materials during mining, and may require rehandling of materials. Based on current information this option would not be recommended.

For option iv), reducing the rate oxygen transport to PAF waste would reduce the rate of sulfide oxidation and thus acid and sulfate production.

A reduction in oxygen transport rates can potentially be achieved by covering the PAF wastes within NAF material (low sulfate production rate) that has low intrinsic permeability and low oxygen diffusion coefficient. Some materials, such as clay, can be suitable for reducing oxygen transport if compacted and maintained at a high degree of saturation (say, greater than 0.85). The success of this approach would depend on the characteristics of the materials available and the amount and frequency of rainfall at the site. The suitability of dispersive materials for use as a cover would need to be investigated.

In-pit disposal could limit oxygen ingress and thus oxidation rates of sulfides to very low levels if the PAF waste is placed below the long term steady water level in the pit. At the Carmichael site the groundwater table is not expected to rebound and inundate the pit. Therefore, subaqueous disposal of PAF waste may not be an option.

The proposed management strategy for tailings is to place the tailings in clay lined cells in the overburden dumps as shown in Figure 7-7. Clay cells would be designed to reduce the water flux into and out of the tailings thereby reducing the quantity of water passing through the tailings, as per option (iii) described above. Reduced water flux increases the potential for solubility control of dissolution of the metals and salts thereby reducing the load released from the cells.

PAF overburden wastes could be managed in the same manner as the tailings. As a minor proportion of samples of the various lithological units were classed as PAF and UC, a sampling and testing program, possibly associated with coal quality testing and verification, would be required to identify PAF and UC materials in advance of mining.

To reduce the possibility of desiccation of waste in the cells and to reduce the potential for transport of metals and salts to the surface of the overburden dumps the top level of the cells should be at least 5 m below the dump surface. During dump and cell construction, contact between UC, PAF and dispersive materials should be avoided. Further, dispersive materials should be placed below the surface and not be used for construction of cell linings.

Lower concentrations of sulfide minerals (Figure 7-3) in the near surface unmined material indicate that this material is less likely to be acid forming in the long term. Near surface materials that are not dispersive and have low concentrations of readily soluble salts could be used to cover the top surface of the overburden dumps to prevent run-off contamination. Stockpiling of near surface materials with these properties should be undertaken.

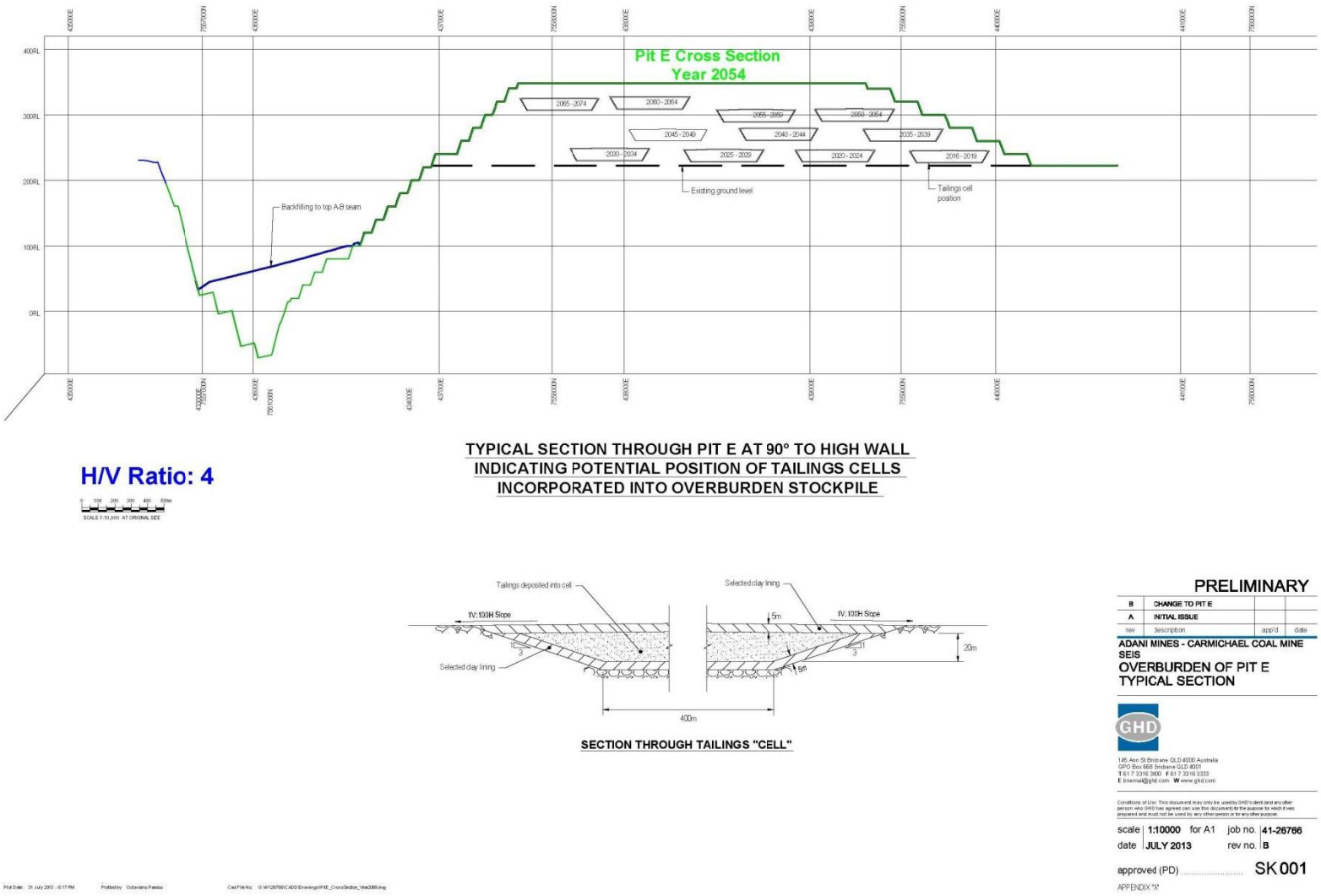


Figure 7-7: Proposed tailing cells within the overburden

8 Conclusions and Recommendations

8.1 Representativeness of samples

The number of samples tested (470 total) was large enough to draw conclusions about the mean values of AMD related parameters across the site for most of the lithological stet, but was insufficient to make assessments about the spatial variability of those parameter values.

There were too few samples of Carbonaceous Sandstone, Conglomerate, Soil and Shale to conduct a statistical analysis to estimate the confidence interval on the mean value NAPP value.

With the removal of outliers statistical analysis indicates that Carbonaceous siltstone was the only lithological unit for which the upper 95% confidence interval on the mean NAPP exceeded 0 kg (H_2SO_4)/t and this was by about 3 kg (H_2SO_4)/t.

Estimates of the mean and the 95% confidence intervals of the mean for total S, ANC and NAPP were obtained for the carbonaceous mudstone, clay, claystone, mudstone, sandstone and siltstone. The NAPP values of all except the mudstone were less than 0 kg (H_2SO_4)/t. Only three mudstone samples were characterised. The number of samples should be increased to improve the best estimate of the mean and narrow the 95% confidence interval of the mean for mudstone.

Further sampling is required to characterise the spatial variability of AMD related parameters. It is expected that sampling from holes spaced between 1000 m and 3000 m apart would be required to support an assessment of the spatial variability.

Coal washery wastes were not available for testing in the initial programme. Consequently samples representative of coal washery wastes should also be obtained and characterised.

8.2 Geochemical Properties

8.2.1 Acid generation and neutralisation

Acid generation capacities were estimated from the total sulfur, total sulfur minus sulfate sulfur (sulfide sulfur) and chromium reducible sulfur (CRS) contents of the individual samples. The acid generating capacity determined from the CRS measurements was typically less than that determined from the other two parameters.

Similarly acid neutralisation capacities were estimated using three approaches: acid neutralising capacity (ANC), carbonate neutralising capacity (CarbNP) and acid buffering characteristic curve (ABCC). The test results indicated that the readily available neutralising capacity may be significantly less than that determined by the more frequently used ANC test. The fraction of ANC available tends to be larger for samples with larger ANC values.

8.2.2 Roof, floor and coal

Acidity

The majority of roof and floor wastes and coal are not likely to be a source of acid immediately after mining.

Salinity

Most of roof, floor and coal would not be expected to be an immediate source of salinity; however, some portion could be a source of salinity.

Potential for AMD

Of the 57 samples classified using the neutralisation potential ratio method 39% were NAF, 17% were UC and 44% were PAF. The subset of 14 samples classified using the AMIRA (2002) method contained samples classed as NAF, UC and PAF.

A portion of the carbonaceous mudstone, carbonaceous siltstone, claystone, sandstone and siltstone roof and floor and coal materials could be expected to be potentially acid forming in the longer term.

Concentrations of metals in water contacting the waste would be expected to be low while waters remain circumneutral.

8.2.3 Overburden and interburden

Acidity

The large majority of overburden and interburden not immediately adjacent to coal seams is not likely to be a source of acid immediately after mining.

Salinity and metals

The large majority of overburden and interburden not immediately adjacent to the coal seams is not likely to be a significant source of salinity. However, the clay materials could have a markedly higher potential to release salts and metals to water contacting them whilst the pH may remain alkaline. Typically, however, the concentrations of metals in water contacting the waste would be expected to be low while waters remain circumneutral.

Potential for AMD

The majority of the overburden and interburden waste from all lithological groups is likely to be non-acid forming in the longer term. Of the 470 samples classified using the neutralisation potential ratio classification scheme 92% were classified as NAF, 3% were UC and 5% were PAF. Of a subset classified using the AMIRA (2002) classification scheme 83% were NAF, 15% were UC and 2% were PAF. Some carbonaceous mudstone, carbonaceous sandstone, carbonaceous siltstone, clay, claystone, mudstone, sandstone, sandy clay, siltstone and tuff may be acid forming in the long term and there may be a requirement to manage these materials to prevent or limit the longer-term development of AMD.

Concentrations of metals in water contacting the waste would be expected to be low while waters remain circumneutral.

8.3 Kinetic Testing

Kinetic testing commenced in May 2013 and should be continued to determine the rates of oxidation, acid generation, acid neutralisation and metal leaching rates. The measured rates can then be used to complete water quality predictions and infer potential impacts on receiving water quality. These estimates would also be used to identify suitable mitigation and environmental management measures that would address any issues that may be of significance.

8.4 Dispersivity

Test results for 92 samples indicate that the clays, weathered rocks (including mudstone, claystone, carbonaceous mudstone and siltstone) may have dispersive behaviour. Slightly weathered siltstone may show very slight potential for dispersivity. The weathered sandstone did not show any indication of dispersive behaviour. Soil samples showed completely non-dispersive results due to the presence of calcite.

The fresh rocks were generally non-dispersive, although some claystones and siltstones may have a very low potential for dispersion. There was variability in dispersion results within each group.

Weathered rock, siltstone and sandstone showed potential for deterioration and breakdown after exposure to water. The siltstone showed moderate rate deterioration, and sandstone slow deterioration. This may indicate that although the fresh rock units are not dispersive, they are not durable, and with time may degrade to sand, silt or clay. The degraded material may be more prone to physical erosion than the original fresh rock.

Testing of additional samples should be undertaken to confirm trends in the dispersive and weathering behaviour of the various rock types.

Precautions should be taken to prevent surface runoff water contacting materials with dispersive properties. Placement of these materials within the core of the storage areas is recommended.

8.5 Water Quality Estimates and Waste Management

Preliminary estimates of solute concentrations in run-off and percolate indicate that sulfate, fluoride, boron and molybdenum in surface runoff from the overburden dump could exceed the cattle drinking water quality guidelines. Similarly, estimated concentrations of sulfate, fluoride, boron, molybdenum and zinc in percolate from the overburden dumps (for the maximum height of the dump) are predicted to exceed the cattle drinking water quality guidelines

These estimated concentrations are intended to indicate concentrations that might be expected as a result of the first flushing of the overburden. They would not be expected to be sustained in the longer term as readily available solutes would be transported from the overburden.

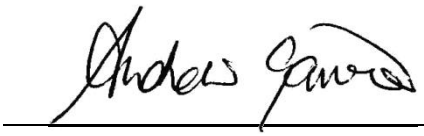
Water quality in the longer term would be expected; in part, to be dictated by the presence and distribution of PAF materials within the dumps including the tailings. However, results from longer term kinetic testing would be required to complete these estimates.

Potentially acid forming materials including tailings would be placed in clay lined encapsulation cells within Pit D and E overburden dumps and located at least 5 m below the dump surface. During dump and cell construction, contact between UC, PAF and dispersive materials should be avoided. In the short term, surface and percolate water would need to be managed.

Carmichael Coal Mine and Rail Project:

Mine Waste Characterisation

Prepared by



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All data used as source material plus the text, tables, figures, and attachments of this document have been reviewed and prepared in accordance with generally accepted professional engineering and environmental practices.

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Appendices

Appendix A: Sample Description

Batch #	Client Sample ID	Drill Hole	Lithology	Lithology Group	Weathering	Roof, floor, coal, interburden (r, f, c, i)	RFC/OI	From (m)	To (m)
1	81351	C001C	SANDSTONE	Rem	MW		OI	50.48	50.71
1	81352	C001C	CLAY	Clay and soil	HW		OI	51.55	51.83
1	81353	C001C	SILTSTONE	Rem	MW		OI	57.86	58.23
1	81354	C001C	SANDSTONE	Rem	FR		OI	86.47	86.8
1	81355	C001C	CARB MUDSTONE	Carbonaceous	FR	f	RFC	105.8	106.34
1	81356	C0021C	CLAY	Clay and soil	EW		OI	5.58	6.51
1	81357	C0021C	CLAYSTONE	Rem	HW		OI	34.27	34.9
1	81358	C0021C	CLAYSTONE	Rem	FR	r	RFC	48.55	48.88
1	81359	C0021C	SANDSTONE	Rem	FR	f	RFC	54.55	55.35
1	81360	C024C	CLAY	Clay and soil	EW		OI	5.08	5.8
1	81361	C024C	CLAY	Clay and soil	HW		OI	12.55	13.55
1	81362	C024C	CLAYSTONE	Rem	HW		OI	30	30.42
1	81363	C024C	SANDSTONE	Rem	MW		OI	43.31	44.26
1	81364	C024C	SANDSTONE	Rem	FR		OI	89.67	90.44
1	81365	C031C	CLAY	Clay and soil	HW		OI	14.22	15.08
1	81366	C031C	SANDSTONE	Rem	SW		OI	45.75	46.71
1	81367	C031C	SILTSTONE	Rem	SW		OI	54.96	55.36
1	81368	C031C	SANDSTONE	Rem	FR		OI	85.41	86.04
1	81369	C031C	SILTSTONE	Rem	FR	r	RFC	92.17	92.42
1	81370	C031C	COAL	Coal	FR	c	RFC	92.42	92.89
1	81371	C031C	SILTSTONE	Rem	FR	r	RFC	96.83	97.88
1	81372	C031C	SILTSTONE	Rem	FR	r	RFC	104.13	104.3
1	81373	C031C	SILTSTONE	Rem	FR	r	RFC	157.76	158.18
1	81374	C034C	CLAY	Clay and soil	HW		OI	20.71	20.99
1	81375	C034C	CLAY	Clay and soil	MW		OI	29.8	30.69
1	81376	C034C	CLAY	Clay and soil	SW		OI	44.24	45.22
1	81377	C034C	CLAYSTONE	Rem	HW		OI	83.03	83.6
1	81378	C034C	SANDSTONE	Rem	FR		OI	103.46	103.87
1	81379	C036C	SILTSTONE	Rem	FR		OI	253.43	253.77
1	81380	C036C	SANDSTONE	Rem	FR		OI	255.9	256.28
1	81381	C036C	CARB MUDSTONE	Carbonaceous	FR		OI	295.82	296.21
1	81382	C036C	COAL	Coal	FR	c	RFC	298.14	298.27
1	81383	C036C	SANDSTONE	Rem	FR		OI	334.8	335.17
1	81384	C036C	SANDSTONE	Rem	FR		OI	372.53	373.1
1	81386	C036C	SANDSTONE	Rem	FR		OI	384.72	385.97
1	81387	C039C	SANDSTONE	Rem	HW		OI	61	61.77
1	81388	C039C	SANDSTONE	Rem	HW		OI	83.82	84.63
1	81389	C039C	SANDSTONE	Rem	SW		OI	178.7	179.02
1	81390	C039CR	SANDSTONE	Rem	FR		OI	410.71	411.24
1	81391	C039CR	SANDSTONE	Rem	FR		OI	427.08	427.51
1	81392	C039CR	CARB MUDSTONE	Carbonaceous	FR		OI	461.55	462
1	81393	C039CR	CARB MUDSTONE	Carbonaceous	FR		OI	478.36	478.77
1	81394	C040C	CLAY	Clay and soil	EW		OI	4.36	4.55
1	81395	C040C	CLAY	Clay and soil	HW		OI	4.55	5.1
1	81396	C040C	CLAY	Clay and soil	HW		OI	5.43	5.81
1	81397	C040CR	CLAYSTONE	Rem	HW		OI	46.63	47
1	81398	C040CR	CLAYSTONE	Rem	SW		OI	61.51	62.46
1	81399	C041C	CLAYSTONE	Rem	SW		OI	60.95	61.23
1	81400	C041C	CARB MUDSTONE	Carbonaceous	SW	r	RFC	64.38	65.23
1	81401	C041C	MUDSTONE	Rem	FR		OI	67.7	68.21
1	81402	C041C	MUDSTONE	Rem	FR		OI	76.35	76.9
1	81403	C041C	MUDSTONE	Rem	FR		OI	98.7	99.45
1	81404	C041C	SANDSTONE	Rem	FR		OI	107	107.57
1	81405	C042C	SANDSTONE	Rem	FR	r	RFC	85.97	86.88
1	81406	C042C	CARB MUDSTONE	Carbonaceous	FR		OI	96.55	97.14
1	81407	C042C	SANDSTONE	Rem	FR		OI	103.39	103.66
1	81408	C044C	CARB MUDSTONE	Carbonaceous	FR		OI	342	342.86
1	81409	C044C	SANDSTONE	Rem	FR		OI	364.66	365.17
1	81410	C046C	SANDSTONE	Rem	FR		OI	258.26	259.19
1	81411	C046C	SILTSTONE	Rem	FR		OI	261.4	262.22
1	81413	C046C	SANDSTONE	Rem	FR		OI	318.5	319.24
1	81414	C046C	SILTSTONE	Rem	FR	r	RFC	321.42	322.27
1	81415	C046C	CARB MUDSTONE	Carbonaceous	FR		OI	390.06	390.34

Batch #	Client Sample ID	Drill Hole	Lithology	Lithology Group	Weathering	Roof, floor, coal, interburden (r, f, c, i)	RFC/OI	From (m)	To (m)
1	81416	C046C	SILTSTONE	Rem	FR		OI	424.87	425.8
1	81417	C048C	SILTSTONE	Rem	FR		OI	351.92	352.78
1	81418	C048C	SILTSTONE	Rem	FR		OI	356.16	356.93
1	81419	C048C	SANDSTONE	Rem	FR		OI	360.2	360.79
1	81420	C048C	CARB MUDSTONE	Carbonaceous	FR		OI	373.28	373.83
1	81421	C048C	SANDSTONE	Rem	FR		OI	375.08	375.98
1	81423	C048C	SANDSTONE	Rem	FR		OI	382.12	382.94
1	81424	C048C	SANDSTONE	Rem	FR		OI	386.73	387.69
1	81425	C048C	SANDSTONE	Rem	FR		OI	391.3	392.3
1	81426	C048C	SANDSTONE	Rem	FR		OI	395.1	396
1	81427	C048C	SANDSTONE	Rem	FR		OI	398.9	399.9
1	81428	C048C	SANDSTONE	Rem	FR		OI	402.86	403.84
1	81430	C048C	SANDSTONE	Rem	FR		OI	410.46	411.4
1	81431	C048C	SANDSTONE	Rem	FR		OI	414.56	415.46
1	81432	C048C	CARB MUDSTONE	Carbonaceous	FR		OI	419.25	419.86
1	81433	C048C	INTERBEDDED SANDSTONE AND SILTSTONE	Rem	FR		OI	428.06	429.13
1	81434	C048C	SILTSTONE	Rem	FR		OI	437.13	437.87
1	81435	C048C	SANDSTONE	Rem	FR		OI	440.38	441.29
1	81436	C048C	SANDSTONE	Rem	FR		OI	444.4	445.79
1	81437	C048C	SANDSTONE	Rem	FR		OI	447.77	448.65
1	81438	C048C	INTERBEDDED CARB MUDSTONE AND TUFF	Carbonaceous	FR		OI	463	465.26
1	81439	C048C	INTERBEDDED CARB MUDSTONE AND TUFF	Carbonaceous	FR		OI	465.26	466.45
1	81440	C048C	CARB MUDSTONE	Carbonaceous	FR		OI	484.43	485.29
1	81441	C048C	SANDSTONE	Rem	FR		OI	488.53	489.43
1	81443	C048C	SANDSTONE	Rem	FR		OI	497.48	498.36
1	81444	C048C	SANDSTONE	Rem	FR		OI	500.63	501.55
1	81445	C048C	CARB MUDSTONE	Carbonaceous	FR		OI	504.2	505.18
1	81446	C048C	SILTSTONE	Rem	FR		OI	510.76	511.7
1	81447	C048C	SILTSTONE	Rem	FR		OI	513.54	514.53
1	81448	C048C	SILTSTONE	Rem	FR		OI	518.37	519.34
1	81449	C056C	CLAY	Clay and soil	EW		OI	4.14	5.12
1	81450	C056C	CLAYSTONE	Rem	EW		OI	75.2	75.99
1	81451	C056C	SANDSTONE	Rem	HW		OI	85.2	85.8
1	81452	C056C	CLAYSTONE	Rem	FR		OI	148.07	149.04
1	81453	C056C	CLAYSTONE	Rem	FR		OI	169.96	171.24
1	81454	C056C	SANDSTONE	Rem	FR		OI	315.89	316.88
1	81455	C056C	CARB MUDSTONE	Carbonaceous	FR		OI	366.8	367.73
2	169619	C180004CQ	SANDSTONE	Rem	F		OI	74.49	74.83
2	169624	C180004CQ	SANDSTONE	Rem	F		OI	103.86	104.17
2	169633	C180004CQ	SANDSTONE	Rem	F		OI	159.79	160.07
2	169634	C180004CQ	SANDSTONE	Rem	F		OI	169.99	170.3
2	182769	C180007CQ	SANDSTONE	Rem	F		OI	155.09	155.35
2	154036	C675CQ	SANDSTONE	Rem	F		OI	94.64	94.93
2	154038	C675CQ	SANDSTONE	Rem	F		OI	122.12	122.39
2	154041	C675CQ	CARB MUDSTONE	Carbonaceous	F		OI	138.15	138.42
2	154043	C675CQ	SILTSTONE	Rem	F		OI	146.44	146.75
2	147657	C675CQ	SILTSTONE	Rem	F		OI	217.02	217.25
2	GT147150	C9532CQR	CLAYSTONE	Rem	F		OI	133.44	133.71
2	182752	C180007CQ	SILTSTONE	Rem	F		OI	75.79	76.11
2	182755	C180007CQ	SILTSTONE	Rem	F		OI	86.52	86.77
2	182767	C180007CQ	SANDSTONE	Rem	F		OI	145.84	146.12
2	169915	C339G	SANDY CLAY	Rem	M		OI	42.59	42.84
2	170286	C607CQ	CLAYSTONE	Rem	F		OI	74.3	74.59
2	170288	C607CQ	SILTSTONE	Rem	F		OI	85.89	86.19
2	170294	C607CQ	SANDSTONE	Rem	F		OI	150.56	150.85
2	177670	C669CQ	SILTSTONE	Rem	F		OI	206.78	207.09
2	GT148409	C9672CQR	TUFF	Rem	F		OI	130.78	131.08
2	GT148411	C9672CQR	SANDSTONE	Rem	F		OI	136.78	137.08
2	GT148425	C9672CQR	SILTSTONE	Rem	F		OI	216.88	217.13
2	GT147596	C541CQ	SILTSTONE	Rem	F		OI	164.56	164.86

Batch #	Client Sample ID	Drill Hole	Lithology	Lithology Group	Weathering	Roof, floor, coal, interburden (r, f, c, i)	RFC/OI	From (m)	To (m)
2	GT152519	C541CQ	CARB SANDSTONE	Carbonaceous	F		OI	283.2	283.42
2	170109	C544CQ	SILTSTONE	Rem	F		OI	109.21	109.48
2	170269	C544CQ	SANDSTONE	Rem	F		OI	220.28	220.53
2	204851	C696CQ	SANDSTONE	Rem	F		OI	52.01	52.32
2	204852	C696CQ	CLAYSTONE	Rem	W		OI	65.81	66.04
2	152622	C9180012CQR	SANDSTONE	Rem	F		OI	113.73	113.97
2	169716	C9419CQR	TUFF	Rem	F		OI	216.88	217.17
2	81710	C9673CQR	SANDSTONE	Rem	F		OI	105.84	106.08
2	176524	C99438CQR	SANDSTONE	Rem	F		OI	116.62	116.89
2	176526	C99438CQR	SANDSTONE	Rem	F		OI	152.65	152.9
2	177679	C670CQ	SANDSTONE	Rem	F		OI	78	78.31
2	177697	C670CQ	SILTSTONE	Rem	F		OI	194.68	195.03
2	148395	C9180009CQR	SANDSTONE	Rem	F		OI	89.8	90.07
2	GT148355	C9380CQR	SILTSTONE	Rem	F		OI	124.86	125.15
2	GT148361	C9380CQR	CARB MUDSTONE	Carbonaceous	F		OI	157.59	157.82
2	GT148362	C9380CQR	CARB MUDSTONE	Carbonaceous	F		OI	163.04	163.38
2	GT148371	C9380CQR	SANDSTONE	Rem	F		OI	220.22	220.46
2	GT175913	C9404CQR	CLAYSTONE	Rem	F		OI	120.45	120.79
2	GT175924	C9404CQR	SANDSTONE	Rem	F		OI	194.2	194.51
2	GT175931	C9404CQR	CARB SILTSTONE	Carbonaceous	F		OI	241.88	241.94
2	GT175932	C9404CQR	CARB SILTSTONE	Carbonaceous	F		OI	251.08	251.32
2	GT175941	C9404CQR	SANDSTONE	Rem	F		OI	314.38	314.65
2	147473	C088CQ	SANDSTONE	Rem	F		OI	217.18	217.43
2	147482	C088CQ	SILTSTONE	Rem	F		OI	250.39	250.68
2	147487	C088CQ	SANDSTONE	Rem	F		OI	262.33	262.59
2	147489	C088CQ	SANDSTONE	Rem	F		OI	273.19	273.53
2	154255	C122CQ	SANDSTONE	Rem	F		OI	84.8	85.05
2	176506	C545CQ	SILTSTONE	Rem	F		OI	258.19	258.52
2	176514	C545CQ	SANDSTONE	Rem	F		OI	291.23	291.54
2	154022	C674CQ	TUFF	Rem	F		OI	154.74	155.09
2	154024	C674CQ	CARB MUDSTONE	Carbonaceous	F		OI	176.63	176.92
2	148390	C9180009CQR	SANDSTONE	Rem	F		OI	63.35	63.68
2	148393	C9180009CQR	SANDSTONE	Rem	F		OI	80.75	81.05
2	153302	C099CQ	SANDSTONE	Rem	F		OI	177.46	177.77
2	153304	C099CQ	SANDSTONE	Rem	F		OI	200.27	200.52
2	153308	C099CQ	SANDSTONE	Rem	F		OI	252.9	253.19
2	153313	C099CQ	SANDSTONE	Rem	F		OI	285.89	286.12
2	153317	C099CQ	SANDSTONE	Rem	F		OI	326.91	327.18
2	154260	C122CQ	SANDSTONE	Rem	F		OI	133.76	134.05
2	154263	C122CQ	SANDSTONE	Rem	F		OI	166.76	167.06
2	154266	C122CQ	SANDSTONE	Rem	F		OI	172.12	172.42
2	154269	C122CQ	SANDSTONE	Rem	F		OI	185.12	185.4
2	154271	C122CQ	SANDSTONE	Rem	F		OI	208.72	209
2	153327	C165CQ	SANDSTONE	Rem	S		OI	54.64	54.89
2	153330	C165CQ	SANDSTONE	Rem	F		OI	82.91	83.17
2	152614	C180012CQ	SANDSTONE	Rem	F		OI	76.54	76.85
2	152617	C180012CQ	SANDSTONE	Rem	F		OI	90.89	91.15
2	175912	C522CQ	SANDSTONE	Rem	F		OI	158.56	158.8
2	GT169952	C671CQ	SANDSTONE	Rem	F		OI	48.89	49.16
2	GT169953	C671CQ	TUFF	Rem	F		OI	63.4	63.7
2	GT169957	C671CQ	MUDSTONE	Rem	F		OI	80.51	80.79
2	GT169958	C671CQ	SANDSTONE	Rem	F		OI	87.44	87.74
2	153337	C99204CQR	SILTSTONE	Rem	F		OI	173.29	173.54
2	170107	C544CQ	SANDSTONE	Rem	F		OI	86.9	87.19
2	GT148407	C9672CQR	SANDSTONE	Rem	F		OI	113.14	113.39
2	GT148412	C9672CQR	SILTSTONE	Rem	F		OI	140.77	141.03
2	GT148413	C9672CQR	SANDSTONE	Rem	F		OI	147.7	147.95
2	GT148416	C9672CQR	MUDSTONE	Rem	F		OI	159.67	159.92
2	GT148420	C9672CQR	SANDSTONE	Rem	F		OI	191.82	192.12
2	GT148421	C9672CQR	SANDSTONE	Rem	F		OI	198.08	198.36
2	176529	C99438CQR	SANDSTONE	Rem	F		OI	166.03	166.34
2	176531	C99438CQR	SANDSTONE	Rem	F		OI	179.73	180.02
2	176534	C99438CQR	SANDSTONE	Rem	F		OI	192.83	193.12

Batch #	Client Sample ID	Drill Hole	Lithology	Lithology Group	Weathering	Roof, floor, coal, interburden (r, f, c, i)	RFC/OI	From (m)	To (m)
2	172101	C412CQ	TUFF	Rem	F		OI	87.24	87.51
2	172108	C412CQ	SANDSTONE	Rem	F		OI	155.39	155.64
2	172109	C412CQ	SILTSTONE	Rem	F		OI	171.12	171.43
2	170112	C544CQ	SANDSTONE	Rem	F		OI	124.92	125.66
2	170251	C544CQ	SANDSTONE	Rem	F		OI	149.27	149.61
2	170254	C544CQ	SILTSTONE	Rem	F		OI	177.32	177.56
2	170263	C544CQ	SANDSTONE	Rem	F		OI	202.2	202.46
2	154017	C674CQ	SANDSTONE	Rem	F		OI	127.07	127.32
2	154021	C674CQ	SILTSTONE	Rem	F		OI	147.92	148.28
2	154032	C674CQ	SANDSTONE	Rem	F		OI	216.08	216.41
2	169701	C9419CQR	SILTSTONE	Rem	F		OI	134.15	134.41
2	169703	C9419CQR	SANDSTONE	Rem	F		OI	144.3	144.59
2	169704	C9419CQR	SANDSTONE	Rem	F		OI	155.07	155.36
2	169707	C9419CQR	SILTSTONE	Rem	F		OI	161.4	161.69
2	169713	C9419CQR	SANDSTONE	Rem	F		OI	208.21	208.56
2	169714	C9419CQR	SHALE	Rem	F		OI	210.82	211.14
2	169715	C9419CQR	SHALE	Rem	F		OI	212.08	212.4
2	169718	C9419CQR	SILTSTONE	Rem	F		OI	222.02	222.3
2	170274	C99130CQR	CLAYSTONE	Rem	F		OI	53.82	54.09
2	154272	C361CQ	SANDSTONE	Rem	F		OI	72.01	72.35
2	154273	C361CQ	SILTSTONE	Rem	F		OI	76.33	76.63
2	154275	C361CQ	SANDSTONE	Rem	F		OI	101.23	101.53
2	154280	C361CQ	CARB MUDSTONE	Carbonaceous	F		OI	118.99	119.28
2	154281	C361CQ	SILTSTONE	Rem	F		OI	122.19	122.48
2	169723	C9419CQR	SANDSTONE	Rem	F		OI	232.79	233.06
2	169727	C9419CQR	SILTSTONE	Rem	F		OI	243.88	244.13
2	169728	C9419CQR	SANDSTONE	Rem	F		OI	265.94	266.23
2	169729	C9419CQR	SANDSTONE	Rem	F		OI	272.28	272.54
2	169730	C9419CQR	SILTSTONE	Rem	F		OI	274.28	274.6
2	169736	C9419CQR	SANDSTONE	Rem	F		OI	303.03	303.34
2	154284	C361CQ	SANDSTONE	Rem	F		OI	141	141.3
2	154285	C361CQ	MUDSTONE	Rem	F		OI	143	143.29
2	154288	C361CQ	SILTSTONE	Rem	F		OI	184.03	184.3
2	154290	C361CQ	SANDSTONE	Rem	F		OI	208.46	208.79
2	154293	C361CQ	CARB SANDSTONE	Carbonaceous	F		OI	224.6	224.91
2	154295	C361CQ	SANDSTONE	Rem	F		OI	234.61	234.92
2	154296	C361CQ	SILTSTONE	Rem	F		OI	238.31	238.61
2	182651	C9180007CQR	SILTSTONE	Rem	F		OI	55.29	55.57
2	81702	C9673CQR	SANDSTONE	Rem	F		OI	64.49	64.81
2	81706	C9673CQR	SANDSTONE	Rem	F		OI	87.73	88.03
2	81712	C9673CQR	SANDSTONE	Rem	F		OI	147.99	148.31
2	177990	C99139CQR	SANDSTONE	Rem	F		OI	97.13	97.48
2	152620	C9180012CQR	SANDSTONE	Rem	F		OI	109.66	109.91
2	152624	C9180012CQR	SANDSTONE	Rem	F		OI	115.33	115.64
2	GT148353	C9380CQR	SILTSTONE	Rem	F		OI	99.47	99.76
2	GT148360	C9380CQR	SILTSTONE	Rem	F		OI	150.84	151.11
2	GT148363	C9380CQR	SANDSTONE	Rem	F		OI	169.65	170
2	GT148366	C9380CQR	SANDSTONE	Rem	F		OI	190.62	190.93
2	GT148368	C9380CQR	SANDSTONE	Rem	F		OI	204.26	204.5
2	GT148373	C9380CQR	SANDSTONE	Rem	F		OI	227.56	227.87
2	GT148375	C9380CQR	SILTSTONE	Rem	F		OI	235.19	235.54
2	GT148379	C9380CQR	CARB SILTSTONE	Carbonaceous	F		OI	254.57	254.9
2	175946	C376CQ	MUDSTONE	Rem	F		OI	173.2	173.44
2	147281	C376CQ	SILTSTONE	Rem	F		OI	210.04	210.35
2	177683	C670CQ	SILTSTONE	Rem	F		OI	101.06	101.37
2	177687	C670CQ	SANDSTONE	Rem	F		OI	121.68	122.02
2	177693	C670CQ	TUFF	Rem	F		OI	173.28	173.53
2	177694	C670CQ	SANDSTONE	Rem	F		OI	175.6	175.9
2	177698	C670CQ	SILTSTONE	Rem	F		OI	206.96	207.26
2	177700	C670CQ	SILTSTONE	Rem	F		OI	216.25	216.64
2	148380	C9380CQR	SANDSTONE	Rem	F		OI	256.27	256.56
2	147284	C376CQ	SANDSTONE	Rem	F		OI	220.2	220.48
2	147288	C376CQ	SANDSTONE	Rem	F		OI	257.91	258.22

Batch #	Client Sample ID	Drill Hole	Lithology	Lithology Group	Weathering	Roof, floor, coal, interburden (r, f, c, i)	RFC/OI	From (m)	To (m)
2	147289	C376CQ	SILTSTONE	Rem	F		OI	263.01	263.35
2	147292	C376CQ	SANDSTONE	Rem	F		OI	284.46	284.82
2	147293	C376CQ	SILTSTONE	Rem	F		OI	286.41	286.71
2	147295	C376CQ	SANDSTONE	Rem	F		OI	303.17	303.44
2	175918	C9404CQR	SILTSTONE	Rem	F		OI	148.45	148.7
2	175919	C9404CQR	SILTSTONE	Rem	F		OI	153.82	154.1
2	148388	C9180009CQR	CLAY	Clay and soil	W		OI	51.97	52.3
2	148389	C9180009CQR	SANDSTONE	Rem	W		OI	55.43	55.69
2	148392	C9180009CQR	CARB SANDSTONE	Carbonaceous	F		OI	76.99	77.27
2	175920	C9404CQR	SANDSTONE	Rem	F		OI	161.1	161.38
2	175921	C9404CQR	CARB SILTSTONE	Carbonaceous	F		OI	164.02	164.28
2	175925	C9404CQR	SILTSTONE	Rem	F		OI	199.49	199.81
2	175926	C9404CQR	SANDSTONE	Rem	F		OI	213.84	214.17
2	175928	C9404CQR	SANDSTONE	Rem	F		OI	223.08	223.33
2	175934	C9404CQR	CONGLOMERATE	Rem	F		OI	277.91	278.23
2	175936	C9404CQR	CONGLOMERATE	Rem	F		OI	288.87	289.23
2	175938	C9404CQR	CONGLOMERATE	Rem	F		OI	296.44	296.7
2	176508	C545CQ	CARB SILTSTONE	Carbonaceous	F		OI	266.97	267.31
2	176509	C545CQ	CLAYSTONE	Rem	F		OI	272.23	272.56
2	176511	C545CQ	CARB SILTSTONE	Carbonaceous	F		OI	277.84	278.08
2	175516	C545CQ	SANDSTONE	Rem	F		OI	322.41	322.72
2	176517	C545CQ	SANDSTONE	Rem	F		OI	325.36	325.68
2	176518	C545CQ	MUDSTONE	Rem	F		OI	327.92	328.21
2	176521	C545CQ	SILTSTONE	Rem	F		OI	354.28	354.58
2	177977	C559CQ	TUFF	Rem	F		OI	65.13	65.4
2	177983	C559CQ	SANDSTONE	Rem	F		OI	89.07	89.37
2	147456	C088CQ	SANDSTONE	Rem	F		OI	141.39	141.64
2	147458	C088CQ	SILTSTONE	Rem	F		OI	148.53	148.79
2	147466	C088CQ	SILTSTONE	Rem	F		OI	191.48	191.79
2	147469	C088CQ	CARB SILTSTONE	Carbonaceous	F		OI	202.47	202.75
2	147475	C088CQ	CARB SILTSTONE	Carbonaceous	F		OI	229.05	229.31
2	147280	C088CQ	TUFF	Rem	F		OI	230.71	230.96
2	147476	C088CQ	TUFF	Rem	F		OI	231.07	231.35
2	153323	C9099CQR	SANDSTONE	Rem	F		OI	208.09	208.36
2	153324	C9099CQR	SANDSTONE	Rem	F		OI	221.29	221.53
2	147479	C088CQ	SILTSTONE	Rem	F		OI	245.91	246.21
2	153301	C099CQ	SILTSTONE	Rem	F		OI	167.94	168.19
2	153303	C099CQ	SILTSTONE	Rem	F		OI	184.91	185.16
2	153305	C099CQ	SANDSTONE	Rem	F		OI	207.36	207.61
2	154259	C122CQ	SILTSTONE	Rem	F		OI	128	128.34
2	154261	C122CQ	CLAYSTONE	Rem	F		OI	154.77	155.07
2	154262	C122CQ	CLAYSTONE	Rem	F		OI	156.53	156.79
2	154265	C122CQ	SILTSTONE	Rem	F		OI	168.9	169.17
2	154270	C122CQ	MUDSTONE	Rem	F		OI	193.96	194.21
2	153311	C099CQ	SILTSTONE	Rem	F		OI	278.92	279.19
2	153312	C099CQ	CARB MUDSTONE	Carbonaceous	F		OI	283.1	283.38
2	153315	C099CQ	CARB MUDSTONE	Carbonaceous	F		OI	310.23	310.49
2	146736	C398CQ	SANDSTONE	Rem	F		OI	94.3	94.64
2	146738	C398CQ	SANDSTONE	Rem	F		OI	107.94	108.26
2	146740	C398CQ	SILTSTONE	Rem	F		OI	119.91	120.17
2	146743	C398CQ	CARB SILTSTONE	Carbonaceous	F		OI	129.62	129.91
2	146744	C398CQ	CARB MUDSTONE	Carbonaceous	F		OI	130.66	130.95
2	146747	C398CQ	SANDSTONE	Rem	F		OI	152.62	152.91
2	146749	C398CQ	SANDSTONE	Rem	F		OI	170.34	170.6
2	177953	C398CQ	SANDSTONE	Rem	F		OI	189.18	189.48
2	177957	C398CQ	SANDSTONE	Rem	F		OI	206.38	206.78
2	152610	C180012CQ	TUFF	Rem	F		OI	44.97	45.24
2	152611	C180012CQ	CARB MUDSTONE	Carbonaceous	F		OI	59.35	59.65
2	177959	C398CQ	SILTSTONE	Rem	F		OI	230.14	230.4
2	177961	C398CQ	SANDSTONE	Rem	F		OI	243.31	243.56
2	177964	C398CQ	CARB SILTSTONE	Carbonaceous	F		OI	250.18	250.45
2	177967	C398CQ	SANDSTONE	Rem	F		OI	258.96	259.24
2	177976	C398CQ	SANDSTONE	Rem	F		OI	277.71	278.01

Batch #	Client Sample ID	Drill Hole	Lithology	Lithology Group	Weathering	Roof, floor, coal, interburden (r, f, c, i)	RFC/OI	From (m)	To (m)
2	153334	C99204CQR	SANDSTONE	Rem	F		OI	146.22	146.48
2	154429	C99204CQR	SANDSTONE	Rem	F		OI	169.92	170.2
2	152623	C180012CQ	SANDSTONE	Rem	F		OI	103.1	103.44
2	152619	C180012CQ	CARB SANDSTONE	Carbonaceous	F		OI	113.17	113.42
2	169951	C671CQ	SANDSTONE	Rem	F		OI	49.96	50.25
2	169954	C671CQ	SILTSTONE	Rem	F		OI	64.49	64.82
2	169955	C671CQ	SANDSTONE	Rem	F		OI	69.45	69.72
2	169959	C671CQ	SILTSTONE	Rem	F		OI	93.32	93.58
2	169960	C671CQ	SANDSTONE	Rem	F		OI	99.09	99.35
2	169963	C671CQ	SANDSTONE	Rem	F		OI	118.61	119
2	169964	C671CQ	SILTSTONE	Rem	F		OI	123.24	123.5
2	169967	C671CQ	CARB MUDSTONE	Carbonaceous	F		OI	151.69	151.95
2	169602	C606CQ	SILTSTONE	Rem	F		OI	79.33	79.65
2	169606	C606CQ	SILTSTONE	Rem	F		OI	96.5	96.8
2	169609	C606CQ	CARB MUDSTONE	Carbonaceous	F		OI	115.01	115.32
2	169610	C606CQ	CARB SILTSTONE	Carbonaceous	F		OI	118.87	119.14
2	169613	C606CQ	SANDSTONE	Rem	F		OI	151.04	151.34
2	169614	C606CQ	CARB SILTSTONE	Carbonaceous	F		OI	165.35	165.63
2	169968	C671CQ	SILTSTONE	Rem	F		OI	167.3	167.55
2	169971	C671CQ	SANDSTONE	Rem	F		OI	174.85	175.13
2	169973	C671CQ	CARB MUDSTONE	Carbonaceous	F		OI	187.65	187.95
2	169974	C671CQ	CONGLOMERATE	Rem	F		OI	189.8	190.15
2	169976	C671CQ	SANDSTONE	Rem	F		OI	198.95	199.25
2	169621	C180004CQ	SANDSTONE	Rem	F		OI	87	87.3
2	146702	C388CQ	MUDSTONE	Rem	F		OI	111.79	112.05
2	146712	C388CQ	SILTSTONE	Rem	F		OI	163.14	163.45
2	146716	C388CQ	MUDSTONE	Rem	F		OI	189.23	189.53
2	146719	C388CQ	CARB MUDSTONE	Carbonaceous	F		OI	201.05	201.31
2	146720	C388CQ	MUDSTONE	Rem	F		OI	206.27	206.52
2	146725	C388CQ	SANDSTONE	Rem	F		OI	232.89	233.14
2	146732	C388CQ	SANDSTONE	Rem	F		OI	268.19	268.51
2	175910	C522CQ	CARB SILTSTONE	Carbonaceous	F		OI	151.91	152.15
2	169616	C606CQ	CARB SILTSTONE	Carbonaceous	F		OI	176.69	176.98
2	169617	C606CQ	CARB SILTSTONE	Carbonaceous	F		OI	183.22	183.55
2	169627	C180004CQ	CARB SILTSTONE	Carbonaceous	F		OI	130.3	130.56
2	169628	C180004CQ	SANDSTONE	Rem	F		OI	136.33	136.68
2	169629	C180004CQ	CARB SILTSTONE	Carbonaceous	F		OI	140.13	140.42
2	169630	C180004CQ	SANDSTONE	Rem	F		OI	145.87	146.18
2	182753	C180007CQ	SILTSTONE	Rem	F		OI	77.54	77.9
2	182756	C180007CQ	CARB MUDSTONE	Carbonaceous	F		OI	89.46	89.72
2	182763	C180007CQ	SANDSTONE	Rem	F		OI	134.69	134.98
2	182766	C180007CQ	SANDSTONE	Rem	F		OI	143.95	144.24
2	182771	C180007CQ	SANDSTONE	Rem	F		OI	160	160.25
2	177654	C669CQ	SILTSTONE	Rem	S		OI	86.65	87.01
2	177659	C669CQ	MUDSTONE	Rem	F		OI	125.13	125.4
2	177661	C669CQ	SANDSTONE	Rem	F		OI	137.8	138.1
2	177665	C669CQ	SILTSTONE	Rem	F		OI	165.62	165.99
2	177669	C669CQ	TUFF	Rem	F		OI	191.89	192.18
2	177673	C669CQ	SANDSTONE	Rem	F		OI	226.65	226.95
2	177676	C669CQ	SANDSTONE	Rem	F		OI	243.76	244.05
2	177677	C669CQ	SANDSTONE	Rem	F		OI	247.93	248.21
2	148058	C135CQ	CARB MUDSTONE	Carbonaceous	F		OI	107.09	107.32
2	GT152502	C541CQ	SILTSTONE	Rem	F		OI	188.21	188.5
2	GT152509	C541CQ	SILTSTONE	Rem	F		OI	241.39	241.67
2	170252	C544CQ	CARB SILTSTONE	Carbonaceous	F		OI	157.37	157.59
2	170282	C607CQ	CLAYSTONE	Rem	M		OI	53.81	54.07
2	170289	C607CQ	SANDSTONE	Rem	F		OI	91.01	91.33
2	170296	C607CQ	SILTSTONE	Rem	F		OI	157.14	157.5
2	170297	C607CQ	SILTSTONE	Rem	F		OI	163.14	163.52
2	154046	C675CQ	SILTSTONE	Rem	F		OI	185.46	185.75
2	GT148358	C9380CQR	SILTSTONE	Rem	F		OI	142.9	143.13
2	GT148378	C9380CQR	CARB MUDSTONE	Carbonaceous	F		OI	250.59	250.82
2	153309	C099CQ	SANDSTONE	Rem	F		OI	266.89	267.15

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2	154251	C122CQ	SANDSTONE	Rem	H		OI	54.08	54.38
2	154256	C122CQ	SANDSTONE	Rem	F		OI	100.9	101.2
2	146717	C388CQ	MUDSTONE	Rem	F		OI	190.72	190.94
2	146718	C388CQ	CARB MUDSTONE	Carbonaceous	F		OI	192.96	193.18
2	146730	C388CQ	SANDSTONE	Rem	F		OI	263.28	263.57
2	177952	C398CQ	SANDSTONE	Rem	F		OI	185.67	186.02
2	177968	C398CQ	SILTSTONE	Rem	F		OI	261.1	261.34
2	GT169961	C671CQ	SANDSTONE	Rem	F		OI	107.05	107.36
2	GT169962	C671CQ	SANDSTONE	Rem	F		OI	113.21	113.52
2	GT169966	C671CQ	CARB SILTSTONE	Carbonaceous	F		OI	150.38	150.61
2	147454	C088CQ	SANDSTONE	Rem	F		OI	126.71	126.98
2	147462	C088CQ	SANDSTONE	Rem	F		OI	172.21	172.54
2	147478	C088CQ	TUFF	Rem	F		OI	235.08	235.38
2	182759	C180007CQ	SANDSTONE	Rem	F		OI	100.91	101.19
2	169719	C9419CQR	SILTSTONE	Rem	F		OI	222.7	223.04
2	GT147148	C9532CQR	SILTSTONE	Rem	F		OI	124.76	124.98
2	GT147593	C541CQ	SILTSTONE	Rem	F		OI	137.85	138.19
2	GT152501	C541CQ	SILTSTONE	Rem	F		OI	182.57	182.83
2	GT152507	C541CQ	SANDSTONE	Rem	F		OI	227.28	227.57
2	GT152513	C541CQ	SILTSTONE	Rem	F		OI	261.02	261.31
2	GT152514	C541CQ	SANDSTONE	Rem	F		OI	264.73	264.97
2	GT152517	C541CQ	SILTSTONE	Rem	F		OI	274.56	274.88
2	170292	C607CQ	SILTSTONE	Rem	F		OI	132.97	133.38
2	177688	C670CQ	SANDSTONE	Rem	F		OI	128.16	128.48
2	177699	C670CQ	SILTSTONE	Rem	F		OI	212.63	213.01
2	154040	C675CQ	SILTSTONE	Rem	F		OI	128	128.31
2	CQ146995	C684LD	COAL	Rem	F	r	RFC	195.12	195.38
2	CQ146996	C684LD	COAL	Coal	F	c	RFC	195.38	195.7
2	CQ146997	C684LD	COAL	Coal	F	c	RFC	195.7	195.96
2	CQ146999	C684LD	COAL	Coal	F	c	RFC	196.17	196.4
2	CQ172801	C684LD	COAL	Coal	F	c	RFC	196.67	196.91
2	CQ172805	C684LD	COAL	Rem	F	c	RFC	197.63	197.93
2	CQ172806	C684LD	CLAYSTONE	Rem	F	f	RFC	197.93	198.23
2	CQ172809	C684LD	COAL	Coal	F	c	RFC	198.73	199.03
2	CQ172811	C684LD	COAL	Coal	F	c	RFC	199.33	199.63
2	CQ172813	C684LD	COAL	Coal	F	c	RFC	199.86	200.13
2	CQ172815	C684LD	COAL	Coal	F	c	RFC	200.32	200.46
2	CQ172816	C684LD	SANDSTONE	Rem	F	f	RFC	200.46	200.76
2	CQ172817	C684LD	SANDSTONE	Rem	F	r	RFC	201.27	201.57
2	CQ172818	C684LD	COAL	Coal	F	c	RFC	201.57	201.79
2	CQ172821	C684LD	COAL	Coal	F	c	RFC	202.28	202.61
2	CQ172836	C684LD	COAL	Coal	F	c	RFC	207.18	207.48
2	CQ172654	C684LD	COAL	Coal	F	c	RFC	211.99	212.26
2	CQ172655	C684LD	SILTSTONE	Rem	F	f	RFC	212.26	212.53
2	CQ172674	C684LD	CARB MUDSTONE	Carbonaceous	F	r	RFC	221.85	222.15
2	CQ172698	C684LD	SILTSTONE	Rem	F	f	RFC	229.35	229.64
2	CQ172699	C684LD	SILTSTONE	Rem	F	r	RFC	229.64	229.93
2	CQ14755	C684LD	CLAYSTONE	Rem	F	f	RFC	231.27	231.65
2	CQ14758	C684LD	SANDSTONE	Rem	F	r	RFC	236.71	237.01
2	CQ14759	C684LD	COAL	Coal	F	c	RFC	237.01	237.31
2	CQ14761	C684LD	CARB SILTSTONE	Carbonaceous	F	f	RFC	237.59	237.77
2	CQ14763	C684LD	COAL	Coal	F	c	RFC	238	238.24
2	CQ14767	C684LD	COAL	Coal	F	c	RFC	239.04	239.32
2	CQ14768	C684LD	CARB SILTSTONE	Carbonaceous	F	f	RFC	239.32	239.62
2	2209	C688LD	COAL	Coal	F	r	RFC	195.21	195.52
2	2210	C688LD	COAL	Coal	F	c	RFC	195.52	195.86
2	2212	C688LD	COAL	Coal	F	c	RFC	196.18	196.5
2	2215	C688LD	COAL	Coal	F	c	RFC	197.14	197.4
2	2218	C688LD	COAL	Coal	F	c	RFC	198.08	198.38
2	2219	C688LD	COAL	Coal	F	f	RFC	198.38	198.75
2	2220	C688LD	COAL	Coal	F	r	RFC	198.75	199.14
2	2221	C688LD	COAL	Coal	F	c	RFC	199.14	199.5
2	2223	C688LD	COAL	Coal	F	c	RFC	199.8	200.12

Batch #	Client Sample ID	Drill Hole	Lithology	Lithology Group	Weathering	Roof, floor, coal, interburden (r, f, c, i)	RFC/OI	From (m)	To (m)
2	2224	C688LD	COAL	Coal	F	c	RFC	200.12	200.4
2	2226	C688LD	COAL	Coal	F	f	RFC	200.65	200.95
2	14964	C505G	CLAYEY SAND	Clay and soil	E		OI	0	0.4
2	14965	C505G	CLAYEY SAND	Clay and soil	E		OI	1.33	1.66
2	14966	C505G	SANDY CLAY	Rem	M		OI	6.1	6.47
2	14967	C505G	SANDY CLAY	Rem	M		OI	9	9.34
2	14968	C505G	SANDY CLAY	Rem	M		OI	10	10.36
2	14969	C505G	SANDY CLAY	Rem	M		OI	15.7	16
2	14970	C505G	CLAYEY SAND	Clay and soil	M		OI	21.58	21.93
2	14971	C505G	CLAY	Clay and soil	E		OI	29.37	29.68
2	14972	C505G	CLAY	Clay and soil	E		OI	31.2	31.6
2	14973	C505G	SANDY CLAY	Rem	E		OI	34.4	34.74
2	14975	C339G	SOIL	Clay and soil	E		OI	0	0.3
2	14976	C339G	CLAYEY SAND	Clay and soil	D		OI	0.76	1.08
2	14977	C339G	SANDY CLAY	Rem	W		OI	1.56	1.87
2	14978	C339G	SANDY CLAY	Rem	W		OI	2.7	3.01
2	14979	C339G	SANDY CLAY	Rem	W		OI	7.47	7.8
2	14980	C339G	SANDY CLAY	Rem	H		OI	15.3	15.61
2	14981	C339G	CLAYEY SAND	Clay and soil	H		OI	16.7	17
2	14982	C339G	CLAYEY SAND	Clay and soil	H		OI	18.3	18.46
2	14983	C339G	CLAYEY SAND	Clay and soil	H		OI	20.95	21.27
2	14984	C339G	CLAYEY SAND	Clay and soil	M		OI	22.54	22.79
2	14985	C339G	CLAYEY SAND	Clay and soil	M		OI	27.3	27.6
2	14986	C339G	CLAYEY SAND	Clay and soil	M		OI	57.36	57.76
2	14987	C339G	CLAYEY SAND	Clay and soil	M		OI	59.9	60.2
2	204802	C696CQ	COAL	Coal	W	c	RFC	53.13	53.22
2	204803	C696CQ	COAL	Coal	F	c	RFC	54.42	54.52
2	204804	C696CQ	COAL	Coal	F	c	RFC	55.74	56.29
2	204807	C696CQ	COAL	Coal	F	c	RFC	58.59	59.44
2	204813	C696CQ	COAL	Coal	F	c	RFC	62.35	62.94
2	204814	C696CQ	COAL	Coal	F	c	RFC	62.94	64.12
2	204815	C696CQ	CLAYSTONE	Rem	F		OI	65.35	65.59

Appendix B: Lithological units and groups

Lithology Code	Lithological Unit Name	Short Lithology Name	Lithological Group
AL	ALLUVIUM		NON REACTIVE
AK	ARKOSE		NON REACTIVE
AA	AS ABOVE		NON-ROCK GROUP
BA	BASALT		NON REACTIVE
BT	BENTONITE		CLAY AND SOIL GROUP
BY	BILLY		NON REACTIVE
CA	CALCITE		POTENTIAL AN GROUP
CK	CALCRETE		POTENTIAL AN GROUP
XY	CARBONACEOUS CLAY		CARBONACEOUS GROUP
XC	CARBONACEOUS CLAYSTONE		CARBONACEOUS GROUP
XE	CARBONACEOUS LAMELLE		CARBONACEOUS GROUP
CM	CARBONACEOUS MUDSTONE	CARB MUDSTONE	CARBONACEOUS GROUP
XM	CARBONACEOUS MUDSTONE		CARBONACEOUS GROUP
XA	CARBONACEOUS SAND		CARBONACEOUS GROUP
XS	CARBONACEOUS SANDSTONE	CARB SANDSTONE	CARBONACEOUS GROUP
XH	CARBONACEOUS SHALE		CARBONACEOUS GROUP
XT	CARBONACEOUS SILTSTONE	CARB SILTSTONE	CARBONACEOUS GROUP
XX	CARBONACEOUS SILTSTONE		CARBONACEOUS GROUP
CB	CARBONATE		POTENTIAL AN GROUP
CH	CHERT		NON REACTIVE
CL	CLAY	CLAY	CLAY AND SOIL GROUP
CS	CLAYSTONE	CLAYSTONE	NON REACTIVE
C4	COAL 10-40% bright	COAL	COAL GROUP
CR	COAL FIBROUS		COAL GROUP
CP	COAL SAPROPELIC		COAL GROUP
CU	COAL UNDIFFERENTIATED	COAL	COAL GROUP
CW	COAL WEATHERED	COAL	COAL GROUP
C5	COAL, <10% bright	COAL	COAL GROUP
C1	COAL, >90% bright	COAL	COAL GROUP
C3	COAL, 40-60% bright	COAL	COAL GROUP
C2	COAL, 60-90% bright	COAL	COAL GROUP
C6	COAL, dull <1% bright	COAL	COAL GROUP
C7	COAL, dull, conchoidal	COAL	COAL GROUP
CO	COAL, undifferentiated	COAL	COAL GROUP
C9	COAL, weathered	COAL	COAL GROUP
ZC	COALY CLAYSTONE		COAL GROUP
ZM	COALY MUDSTONE		COAL GROUP
CZ	COALY SHALE		COAL GROUP
ZH	COALY SHALE		COAL GROUP
ZS	COALY SILTSTONE		COAL GROUP
CC	COBBLE CONGLOMERATE		NON REACTIVE
CG	CONGLOMERATE	CONGLOMERATE	NON REACTIVE
KL	CORE LOSS		NON-ROCK GROUP
LC	CORE LOST		NON-ROCK GROUP
DC	DIRTY COAL		COAL GROUP
FK	FERRICRETE		NON REACTIVE
CF	FUSAINOUS COAL	COAL	COAL GROUP
GC	GRANULE CONGLOMERATE	CONGLOMERATE	NON REACTIVE
GR	GRANULES		NON REACTIVE
GV	GRAVEL		SAND AND GRAVEL GROUP
GW	GREYWACKE		NON REACTIVE
GY	GYPSUM		NON REACTIVE
IG	IGNEOUS ROCK		NON REACTIVE
IC	INFERIOR COAL		COAL GROUP
IS	IRONSTONE		NON REACTIVE
JA	JASPERLITE		NON REACTIVE
LT	LATERITE		NON REACTIVE
LS	LIMESTONE		POTENTIAL AN GROUP
LM	LIMONITE		NON REACTIVE

Lithology Code	Lithological Unit Name	Short Lithology Name	Lithological Group
MU	MUD		CLAY AND SOIL GROUP
MS	MUDSTONE	MUDSTONE	NON REACTIVE
NS	NO SAMPLE		NON-ROCK GROUP
NL	NOT LOGGED		NON-ROCK GROUP
PC	PEBBLE CONGLOMERATE	CONGLOMERATE	NON REACTIVE
PB	PEBBLES		NON REACTIVE
PY	PYRITE		SULPHIDE GROUP
QZ	QUARTZ		NON REACTIVE
SA	SAND		SAND AND GRAVEL GROUP
SS	SANDSTONE	SANDSTONE	NON REACTIVE
S1	SANDSTONE VERY FINE GRAINED	SANDSTONE	NON REACTIVE
SC	SCHIST		NON REACTIVE
SH	SHALE	SHALE	NON REACTIVE
SD	SIDERITE		NON REACTIVE
SK	SILCRETE		NON REACTIVE
SI	SILT		NON REACTIVE
SL	SILTSTONE	SILTSTONE	NON REACTIVE
SO	SOIL	SOIL	CLAY AND SOIL GROUP
SU	SOOT		COAL GROUP
CX	SOOTY CLAY		NON REACTIVE
CY	SOOTY COAL		COAL GROUP
CN	STONY COAL		COAL GROUP
TO	TONSTEIN		NON REACTIVE
TF	TUFF	TUFF	NON REACTIVE
UD	UNDIFFERENTIATED ROCK TYPE		NON REACTIVE

Appendix C: Static test results

Sample ID	Lithology	pH1:2	EC1:2	Total S	CRS	Sulfate as SO4 2-	Total C	TIC	TOC	ANC	CarbNP	NAGpH	NAG [pH 4.5]	NAG [pH 7.0]	pH (OX) (extended boil)	pH -2 (extended boil)	MPA	NAPP (MPA)	ANC/MPA (NPR)	Class NPR	AMIRA classification	Extended boil NAG classific-ation
Units		pH Unit	µS/cm	%		*mg/kg*	%			kg H_2SO_4/t		pH Unit	kg H_2SO_4/t		pH Unit		kg H_2SO_4/t		-	Price, 2009		
LOD		0.1	1	0.01	0.005	100	0.02	0.02	0.02	0.5	1.63	0.1	0.1	0.1	0.1	0.1	0.306	-	-			
81351	SANDSTONE	8.8	390	0.01			0.23	0.15	0.08	6.4	12.24						0.31	-6.1	20.92	NAF		
81352	CLAY	8.7	140	<0.01						2.1							0.15	-1.9	13.73	NAF		
81353	SILTSTONE	8.3	171	<0.01						4							0.15	-3.8	26.14	NAF		
81354	SANDSTONE	8.3	81	<0.01						1.2							0.15	-1	7.84	NAF		
81355	CARB MUDSTONE	8	37	0.04	0.008	100	4.14	0.21	3.93	1.1	17.14	6.9	<0.1	0.1			1.22	0.1	0.9	NAF	NAF-Barren	
81356	CLAY	7.8	2910	0.07	<0.005	910	0.06	0.04	0.02	14.4	3.27	9.1	<0.1	<0.1			2.14	-12.3	6.72	NAF	NAF	
81357	CLAYSTONE	7.7	790	<0.01			0.15	<0.02	0.14	1.2	0.82						0.15	-1	7.84	NAF		
81358	CLAYSTONE	7	1620	0.14	0.13	810				2.4		5.8	<0.1	0.3	5.8		4.28	1.9	0.56	PAF	UC(NAF)	NAF
81359	SANDSTONE	7.6	306	<0.01			0.14	<0.02	0.13	0.7	0.82						0.15	-0.5	4.58	NAF		
81360	CLAY	7.5	145	<0.01						2.5							0.15	-2.3	16.34	NAF		
81361	CLAY	6.7	825	<0.01						2.2							0.15	-2	14.38	NAF		
81362	CLAYSTONE	6.7	326	0.08	<0.005	1300	0.09	<0.02	0.08	3.7	0.82	7.1	<0.1	<0.1			2.45	-1.3	1.51	NAF	NAF-Barren	
81363	SANDSTONE	6.4	525	<0.01						1.6							0.15	-1.4	10.46	NAF		
81364	SANDSTONE	8.4	591	0.12	0.087	460				43.1		10.2	<0.1	<0.1	10.2		3.67	-39.4	11.74	NAF	NAF	NAF
81365	CLAY	7.7	2030	0.2	<0.005	700				0.7		6.7	<0.1	<0.1	6.7		6.12	5.4	0.11	PAF	UC(NAF)	NAF
81366	SANDSTONE	8	563	<0.01						8.2							0.15	-8	53.59	NAF		
81367	SILTSTONE	8.4	668	0.04	0.012	150				14.9		8	<0.1	<0.1	8		1.22	-13.7	12.17	NAF	NAF	NAF
81368	SANDSTONE	8.9	438	0.03						27.2							0.92	-26.3	29.63	NAF		
81369	SILTSTONE	8.8	384	0.02						11.3							0.61	-10.7	18.46	NAF		
81370	COAL	7.9	770	0.4	0.476	620	18.1	2.5	15.6	381	204.08	8.1	<0.1	<0.1	8.1		12.24	-368.8	31.13	NAF	NAF	NAF
81371	SILTSTONE	8.9	584	0.03						59.3							0.92	-58.4	64.6	NAF		
81372	SILTSTONE	8.8	478	0.08	0.057	210				370		9	<0.1	<0.1	9		2.45	-367.6	151.14	NAF	NAF	NAF
81373	SILTSTONE	6.8	552	0.08	0.033	610				3.4		6.4	<0.1	0.2	6.4		2.45	-1	1.39	NAF	NAF-Barren	NAF
81374	CLAY	8.4	4180	0.03						167							0.92	-166.1	181.92	NAF		
81375	CLAY	7.5	3450	0.02			0.11	<0.02	0.11	23.3	0.82						0.61	-22.7	38.07	NAF		
81376	CLAY	8.2	1230	0.01						13.9							0.31	-13.6	45.42	NAF		
81377	CLAYSTONE	7.6	585	<0.01						0.7							0.15	-0.5	4.58	NAF		
81378	SANDSTONE	6.9	198	0.05	0.022	150				0.7		6.6	<0.1	0.2	6.6		1.53	0.8	0.46	NAF	NAF-Barren	NAF
81379	SILTSTONE	9	253	0.06	0.009	<100				17.8		8.6	<0.1	<0.1	8.6		1.84	-16	9.69	NAF	NAF	NAF
81380	SANDSTONE	8.6	254	0.02						65.9							0.61	-65.3	107.68	NAF		
81381	CARB MUDSTONE	9.1	640	0.29	0.195	250	9.92	0.32	9.6	19.1	26.12				4.4	7.4	8.87	-10.2	2.15	UC		NAF
81382	COAL	7.5	443	0.97	0.215	1370	57.9	4.4	53.5	10.2	359.17				2.3	4.4	29.68	19.5	0.34	PAF		PAF
81383	SANDSTONE	8.7	251	<0.01						6.9							0.15	-6.7	45.1	NAF		
81384	SANDSTONE	8.1	276	0.21	0.275	250				3.7					2.9	3.1	6.43	2.7	0.58	PAF		PAF
81386	SANDSTONE	8.2	98	<0.01						1							0.15	-0.8	6.54	NAF		
81387	SANDSTONE	7.3	94	<0.01						<0.5							0.15	-0.1	1.63	NAF		
81388	SANDSTONE	7.5	68	<0.01			<0.02	<0.02	<0.02	2.1	0.82						0.15	-1.9	13.73	NAF		
81389	SANDSTONE	8.4	130	<0.01						5.7							0.15	-5.5	37.25	NAF		
81390	SANDSTONE	8.1	253	<0.01						9.4							0.15	-9.2	61.44	NAF		
81391	SANDSTONE	9.1	260	<0.01						212							0.15	-211.8	1385.62	NAF		
81392	CARB MUDSTONE	8.2	306	0.05	0.008	230				11.2		6.8	<0.1	<0.1	6.8		1.53	-9.7	7.32	NAF	NAF	NAF
81393	CARB MUDSTONE	8.1	235	0.04	0.007	110				7.2		6.3	<0.1	2.5	6.3		1.22	-6	5.88	NAF	NAF	NAF
81394	CLAY	7.6	3740	1.96	<0.005	206000	0.19	0.13	0.06	16.1	10.61	9	<0.1	<0.1			59.98	43.9	0.27	PAF	UC(NAF)	
81395	CLAY	7.8	6200	0.18	<0.005	2530				38.9		9.1	<0.1	<0.1	9.1		5.51	-33.4	7.06	NAF	NAF	NAF
81396	CLAY	7.7	4910	10.6	<0.005	189000	0.54	0.54	<0.02	18.8	44.08	9.3	<0.1	<0.1			324.36	305.6	0.06	PAF	UC(NAF)	
81397	CLAYSTONE	7.6	1170	0.02			0.19	0.06	0.13	5.1	4.9						0.61	-4.5	8.33	NAF		
81398	CLAYSTONE	6.1	1720	0.82	<0.005	4010				2.8		4.7	<0.1	2.6	4.7		25.09	22.3	0.11	PAF	UC(NAF)	NAF
81399	CLAYSTONE	7.7	311	<0.01						7.7							0.15	-7.5	50.33	NAF		

Sample ID	Lithology	pH1:2	EC1:2	Total S	CRS	Sulfate as SO4 2-	Total C	TIC	TOC	ANC	CarbNP	NAGpH	NAG [pH 4.5]	NAG [pH 7.0]	pH (OX) (extended boil)	pH -2 (extended boil)	MPA	NAPP (MPA)	ANC/MPA (NPR)	Class NPR	AMIRA classification	Extended boil NAG classific-ation
Units		pH Unit	µS/cm	%		*mg/kg*	%			kg H_2SO_4/t		pH Unit	kg H_2SO_4/t		pH Unit		kg H_2SO_4/t		-	Price, 2009		
LOD		0.1	1	0.01	0.005	100	0.02	0.02	0.02	0.5	1.63	0.1	0.1	0.1	0.1	0.1	0.306	-	-			
81400	CARB MUDSTONE	5.5	789	0.12	0.167	920	10.8	0.1	10.7	1.7	8.16				4.2	4.7	3.67	2	0.46	PAF		PAF
81401	MUDSTONE	6.3	158	0.05	0.035	160	2.7	0.04	2.66	4.5	3.27	7.2	<0.1	<0.1			1.53	-3	2.94	NAF	NAF-Barren	
81402	MUDSTONE	5.3	457	0.16	0.082	580	5.03	<0.02	5.03	1.4	0.82	6.9	<0.1	0.2			4.9	3.5	0.29	PAF	UC(NAF)	
81403	MUDSTONE	8.4	539	0.04	0.009	290	0.65	0.03	0.62	14.5	2.45	7.5	<0.1	<0.1			1.22	-13.3	11.85	NAF	NAF	
81404	SANDSTONE	8	1130	0.03						31.8							0.92	-30.9	34.64	NAF		
81405	SANDSTONE	8.7	437	0.18	0.01	140	0.26	<0.02	0.25	3.4	0.82	7.2	<0.1	<0.1			5.51	2.1	0.62	PAF	UC(NAF)	
81406	CARB MUDSTONE	7.3	680	0.08	0.034	210	9.19	<0.02	9.18	<0.5	0.82	5.5	<0.1	2.9	5.5		2.45	2.2	0.1	NAF	NAF-Barren	NAF
81407	SANDSTONE	7.5	584	0.02						<0.5							0.61	0.4	0.41	NAF		
81408	CARB MUDSTONE	7.8	262	0.02			4.05	<0.02	4.05	4.3	0.82						0.61	-3.7	7.03	NAF		
81409	SANDSTONE	9.5	634	0.03						80.3							0.92	-79.4	87.47	NAF		
81410	SANDSTONE	8.6	340	<0.01						16.5							0.15	-16.3	107.84	NAF		
81411	SILTSTONE	9.1	328	<0.01			0.45	0.35	0.1	14.7	28.57						0.15	-14.5	96.08	NAF		
81413	SANDSTONE	9.7	547	0.02						105							0.61	-104.4	171.57	NAF		
81414	SILTSTONE	9.3	559	0.02						19.4							0.61	-18.8	31.7	NAF		
81415	CARB MUDSTONE	8.1	566	0.12	0.011	<100				9.9		6	<0.1	1.9	6		3.67	-6.2	2.7	UC	NAF	NAF
81416	SILTSTONE	8.6	368	<0.01						19.9							0.15	-19.7	130.07	NAF		
81417	SILTSTONE	8.7	340	<0.01			0.41	0.21	0.2	12.6	17.14						0.15	-12.4	82.35	NAF		
81418	SILTSTONE	8.6	376	0.02						14.9							0.61	-14.3	24.35	NAF		
81419	SANDSTONE	8.4	259	<0.01						22.2							0.15	-22	145.1	NAF		
81420	CARB MUDSTONE	8.2	694	0.06	0.022	330	4.07	<0.02	4.06	13.6	0.82	7	<0.1	<0.1			1.84	-11.8	7.41	NAF	NAF	
81421	SANDSTONE	9.1	697	0.04	0.017	350				22.6		10.5	<0.1	<0.1	10.5		1.22	-21.4	18.46	NAF	NAF	NAF
81423	SANDSTONE	9.3	561	0.02						32.2							0.61	-31.6	52.61	NAF		
81424	SANDSTONE	9.4	441	0.01						315							0.31	-314.7	1029.41	NAF		
81425	SANDSTONE	9.2	531	0.02						50.3							0.61	-49.7	82.19	NAF		
81426	SANDSTONE	9	615	0.02			0.6	0.32	0.28	53.3	26.12						0.61	-52.7	87.09	NAF		
81427	SANDSTONE	9.1	510	0.02						54.5							0.61	-53.9	89.05	NAF		
81428	SANDSTONE	9.2	487	0.02						48.5							0.61	-47.9	79.25	NAF		
81430	SANDSTONE	9.2	554	0.02						59.9							0.61	-59.3	97.88	NAF		
81431	SANDSTONE	9.2	594	<0.01						53.3							0.15	-53.1	348.37	NAF		
81432	CARB MUDSTONE	9	880	0.02						44.9							0.61	-44.3	73.37	NAF		
81433	INTERBEDDED SANDSTONE AND SILTSTONE	8.2	459	0.01			2.2	0.28	1.92	15.8	22.86						0.31	-15.5	51.63	NAF		
81434	SILTSTONE	7.8	186	<0.01						9.9							0.15	-9.7	64.71	NAF		
81435	SANDSTONE	7.9	195	<0.01						3.2							0.15	-3	20.92	NAF		
81436	SANDSTONE	8.8	183	<0.01						110							0.15	-109.8	718.95	NAF		
81437	SANDSTONE	8.1	168	<0.01						10.6							0.15	-10.4	69.28	NAF		
81438	INTERBEDDED CARB MUDSTONE AND TUFF	8.5	494	0.08	0.046	150	3.62	0.44	3.18	64.1	35.92	8.5	<0.1	<0.1			2.45	-61.7	26.18	NAF	NAF	
81439	INTERBEDDED CARB MUDSTONE AND TUFF	8.5	502	0.05	0.097	100	2.14	0.31	1.83	38.3	25.31	8.8	<0.1	<0.1			1.53	-36.8	25.03	NAF	NAF	
81440	CARB MUDSTONE	7.8	184	0.02						4.8							0.61	-4.2	7.84	NAF		
81441	SANDSTONE	7.7	194	<0.01						6.3							0.15	-6.1	41.18	NAF		
81443	SANDSTONE	7.5	134	<0.01						5							0.15	-4.8	32.68	NAF		
81444	SANDSTONE	8.5	212	<0.01						15.7							0.15	-15.5	102.61	NAF		
81445	CARB MUDSTONE	7.5	177	0.04	<0.005	<100	7.37	0.15	7.22	2.5	12.24	6.7	<0.1	0.3	6.7		1.22	-1.3	2.04	NAF	NAF-Barren	NAF
81446	SILTSTONE	8.7	280	<0.01						22.2							0.15	-22	145.1	NAF		
81447	SILTSTONE	8.8	264	<0.01						43.1							0.15	-42.9	281.7	NAF		

Sample ID	Lithology	pH1:2	EC1:2	Total S	CRS	Sulfate as SO4 2-	Total C	TIC	TOC	ANC	CarbNP	NAGpH	NAG [pH 4.5]	NAG [pH 7.0]	pH (OX) (extended boil)	pH -2 (extended boil)	MPA	NAPP (MPA)	ANC/MPA (NPR)	Class NPR	AMIRA classification	Extended boil NAG classific-ation
Units		pH Unit	µS/cm	%		*mg/kg*	%			kg H_2SO_4/t		pH Unit	kg H_2SO_4/t		pH Unit		kg H_2SO_4/t		-	Price, 2009		
LOD		0.1	1	0.01	0.005	100	0.02	0.02	0.02	0.5	1.63	0.1	0.1	0.1	0.1	0.1	0.306	-	-			
81448	SILTSTONE	9	245	0.01						44.3							0.31	-44	144.77	NAF		
81449	CLAY	7.4	118	<0.01						2.5							0.15	-2.3	16.34	NAF		
81450	CLAYSTONE	6.9	76	<0.01			<0.02	<0.02	<0.02	2.5	0.82						0.15	-2.3	16.34	NAF		
81451	SANDSTONE	7.4	101	<0.01						2							0.15	-1.8	13.07	NAF		
81452	CLAYSTONE	8.7	242	<0.01			0.08	0.08	<0.02	17.8	6.53						0.15	-17.6	116.34	NAF		
81453	CLAYSTONE	9	195	<0.01						21.6							0.15	-21.4	141.18	NAF		
81454	SANDSTONE	9.2	820	0.04	0.016	350				19.3		8.4	<0.1	<0.1	8.4		1.22	-18.1	15.77	NAF	NAF	NAF
81455	CARB MUDSTONE	8.3	412	0.14	0.009	<100	18.7	<0.02	18.7	17.8	0.82				4.4	6.1	4.28	-13.5	4.15	NAF		NAF
169619	SANDSTONE	8.4	263	0.02						4.6					#N/A	#N/A	0.61	-4	7.52	NAF		
169624	SANDSTONE	7.6	181	0.04						4.1		7.7	<0.1	<0.1			1.22	-2.9	3.35	NAF	NAF-Barren	
169633	SANDSTONE	7.8	73	0.08						<0.5		5.7	<0.1	4.8			2.45	2.2	0.1	NAF	NAF-Barren	
169634	SANDSTONE	7.8	158	0.01						1.6							0.31	-1.3	5.23	NAF		
182769	SANDSTONE	8.5	182	0.01						11.8							0.31	-11.5	38.56	NAF		
154036	SANDSTONE	3	541	0.02						6.9							0.61	-6.3	11.27	NAF		
154038	SANDSTONE	9.6	348	0.03			2.11	1.94	0.17	145	158.36						0.92	-144.1	157.95	NAF		
154041	CARB MUDSTONE	9.1	928	0.11	0.078	180	3.02	0.25	2.77	17.9	20.41	7.3	<0.1	<0.1			3.37	-14.5	5.32	NAF	NAF	
154043	SILTSTONE	9	502	0.05			2.74	1.69	1.05	26.1	137.95						1.53	-24.6	17.06	NAF		
147657	SILTSTONE	8	89	<0.01						0.5							0.15	-0.3	3.27	NAF		
GT147150	CLAYSTONE	7.1	193	0.02						0.7							0.61	-0.1	1.14	NAF		
182752	SILTSTONE	8	574	0.04						4.9		6.9	<0.1	0.4			1.22	-3.7	4	NAF	NAF-Barren	
182755	SILTSTONE	8.5	693	0.03						16.4							0.92	-15.5	17.86	NAF		
182767	SANDSTONE	8.9	227	0.01						13.2							0.31	-12.9	43.14	NAF		
169915	SANDY CLAY	7.7	153	<0.01						<0.5							0.15	-0.1	1.63	NAF		
170286	CLAYSTONE	8.1	735	0.03						6.8							0.92	-5.9	7.41	NAF		
170288	SILTSTONE	8.3	695	0.06			2.04	0.67	1.37	16.8	54.69						1.84	-15	9.15	NAF		
170294	SANDSTONE	7.7	131	0.02						7.8							0.61	-7.2	12.75	NAF		
177670	SILTSTONE	7.8	139	0.01						1.6							0.31	-1.3	5.23	NAF		
GT148409	TUFF	8.2	988	0.03						15.4							0.92	-14.5	16.78	NAF		
GT148411	SANDSTONE	8.7	492	0.05			2.5	2.08	0.42	109	169.79						1.53	-107.5	71.24	NAF		
GT148425	SILTSTONE	8.4	211	0.01						4.6							0.31	-4.3	15.03	NAF		
GT147596	SILTSTONE	8.1	632	0.04						3		6.8	<0.1	1.1			1.22	-1.8	2.45	NAF	NAF-Barren	
GT152519	CARB SANDSTONE	7.8	91	0.05						0.8		3.7	5.5	21.4			1.53	0.7	0.52	NAF	NAF-Barren	
170109	SILTSTONE	8	137	0.04						2		6.8	<0.1	0.3			1.22	-0.8	1.63	NAF	NAF-Barren	
170269	SANDSTONE	5.6	341	1.48						<0.5							45.29	45	0.01	PAF		
204851	SANDSTONE	7.5	106	<0.01						<0.5							0.15	-0.1	1.63	NAF		
204852	CLAYSTONE	7.4	658	0.04						0.7		6.9	<0.1	0.1			1.22	0.5	0.57	NAF	NAF-Barren	
152622	SANDSTONE	7.8	290	0.03						7.4							0.92	-6.5	8.06	NAF		
169716	TUFF	8.8	262	0.02			7.31	7.1	0.21	555	579.57						0.61	-554.4	906.86	NAF		
81710	SANDSTONE	9	359	0.02			2.58	1.4	1.18	96.3	114.28						0.61	-95.7	157.35	NAF		
176524	SANDSTONE	7.4	283	0.05						4.1		6.9	<0.1	0.2			1.53	-2.6	2.68	NAF	NAF-Barren	
176526	SANDSTONE	7.4	157	0.02						<0.5		6.8	<0.1	<0.1			0.61	0.4	0.41	NAF	NAF-Barren	
177679	SANDSTONE	8.8	201	0.01						168							0.31	-167.7	549.02	NAF		
177697	SILTSTONE	8.6	330	0.06						23.1							1.84	-21.3	12.58	NAF		
148395	SANDSTONE	6	158	0.07						<0.5		4	0.6	1.9			2.14	1.9	0.12	NAF	NAF-Barren	
GT148355	SILTSTONE	9	586	0.02						14.5							0.61	-13.9	23.69	NAF		
GT148361	CARB MUDSTONE	7.8	1040	0.11	0.053	410	2.9	0.02	2.88	11.1	1.63	7.1	<0.1	<0.1			3.37	-7.7	3.3	NAF	NAF	
GT148362	CARB MUDSTONE	7.8	243	0.19	<0.005	<100				6.4		5.2	<0.1	9.4			5.81	-0.6	1.1	UC	NAF	
GT148371	SANDSTONE	8.7	180	<0.01						2							0.15	-1.8	13.07	NAF		

Sample ID	Lithology	pH1:2	EC1:2	Total S	CRS	Sulfate as SO4 2-	Total C	TIC	TOC	ANC	CarbNP	NAGpH	NAG [pH 4.5]	NAG [pH 7.0]	pH (OX) (extended boil)	pH -2 (extended boil)	MPA	NAPP (MPA)	ANC/MPA (NPR)	Class NPR	AMIRA classification	Extended boil NAG classific-ation
Units		pH Unit	µS/cm	%		*mg/kg*	%			kg H_2SO_4/t		pH Unit	kg H_2SO_4/t		pH Unit		kg H_2SO_4/t		-	Price, 2009		
LOD		0.1	1	0.01	0.005	100	0.02	0.02	0.02	0.5	1.63	0.1	0.1	0.1	0.1	0.1	0.306	-	-			
GT175913	CLAYSTONE	8.5	324	0.01						14.9							0.31	-14.6	48.69	NAF		
GT175924	SANDSTONE	8.4	278	0.03						19							0.92	-18.1	20.7	NAF		
GT175931	CARB SILTSTONE	7.4	378	0.25						5.9							7.65	1.8	0.77	PAF		
GT175932	CARB SILTSTONE	7	204	0.21						3.6							6.43	2.8	0.56	PAF		
GT175941	SANDSTONE	8.6	170	<0.01						5.1							0.15	-4.9	33.33	NAF		
147473	SANDSTONE	7.6	113	<0.01						6.1							0.15	-5.9	39.87	NAF		
147482	SILTSTONE	7.7	144	0.01						3.4							0.31	-3.1	11.11	NAF		
147487	SANDSTONE	7.4	108	0.01						<0.5							0.31	0.1	0.82	NAF		
147489	SANDSTONE	8	172	<0.01						2.7							0.15	-2.5	17.65	NAF		
154255	SANDSTONE	8.3	260	<0.01			4.39	4.32	0.07	271	352.64						0.15	-270.8	1771.24	NAF		
176506	SILTSTONE	8.5	282	0.02						23.1							0.61	-22.5	37.75	NAF		
176514	SANDSTONE	7.9	192	<0.01						11							0.15	-10.8	71.9	NAF		
154022	TUFF	9.5	231	0.01						24.7							0.31	-24.4	80.72	NAF		
154024	CARB MUDSTONE	7	127	0.19	<0.005	<100				4.1		5.1	<0.1	7.4			5.81	1.7	0.71	PAF	UC(NAF)	
148390	SANDSTONE	6.9	165	0.02						3.9							0.61	-3.3	6.37	NAF		
148393	SANDSTONE	8.2	235	0.16	0.034	<100	0.22	0.13	0.09	20.9	10.61	9.5	<0.1	<0.1			4.9	-16	4.27	NAF	NAF	
153302	SANDSTONE	8.3	158	<0.01						5.2							0.15	-5	33.99	NAF		
153304	SANDSTONE	8.8	185	<0.01						16.7							0.15	-16.5	109.15	NAF		
153308	SANDSTONE	9.2	280	<0.01						49.2							0.15	-49	321.57	NAF		
153313	SANDSTONE	8.9	175	<0.01						4.8							0.15	-4.6	31.37	NAF		
153317	SANDSTONE	7.8	132	0.03						2.9		6.4	<0.1	0.4			0.92	-2	3.16	NAF	NAF-Barren	
154260	SANDSTONE	8	169	<0.01						1.6							0.15	-1.4	10.46	NAF		
154263	SANDSTONE	7.5	117	0.02						3.2							0.61	-2.6	5.23	NAF		
154266	SANDSTONE	7.7	76	0.01						<0.5							0.31	0.1	0.82	NAF		
154269	SANDSTONE	7.9	73	<0.01						1.6							0.15	-1.4	10.46	NAF		
154271	SANDSTONE	9.1	270	<0.01						21.2							0.15	-21	138.56	NAF		
153327	SANDSTONE	7.8	61	<0.01						1.5							0.15	-1.3	9.8	NAF		
153330	SANDSTONE	8.4	164	<0.01						7.1							0.15	-6.9	46.41	NAF		
152614	SANDSTONE	7.3	110	<0.01						1.1							0.15	-0.9	7.19	NAF		
152617	SANDSTONE	8.2	169	<0.01						2							0.15	-1.8	13.07	NAF		
175912	SANDSTONE	8.9	167	<0.01						1.1							0.15	-0.9	7.19	NAF		
GT169952	SANDSTONE	6.9	464	0.08						0.9		4.4	0.3	1.5			2.45	1.5	0.37	NAF	NAF-Barren	
GT169953	TUFF	4.8	852	0.1	0.036	1880				1.8		4.8	<0.1	2.5			3.06	1.3	0.59	PAF	UC(NAF)	
GT169957	MUDSTONE	9	458	0.02						11.3							0.61	-10.7	18.46	NAF		
GT169958	SANDSTONE	9.2	501	0.02			0.57	0.21	0.36	21.4	17.14						0.61	-20.8	34.97	NAF		
153337	SILTSTONE	9.2	379	0.29						9							8.87	-0.1	1.01	UC		
170107	SANDSTONE	7.6	365	0.35						8.1							10.71	2.6	0.76	PAF		
GT148407	SANDSTONE	7.9	390	0.01						3.7							0.31	-3.4	12.09	NAF		
GT148412	SILTSTONE	9.3	418	0.02			1.64	1.2	0.44	31.4	97.96						0.61	-30.8	51.31	NAF		
GT148413	SANDSTONE	9	376	0.01						7.6							0.31	-7.3	24.84	NAF		
GT148416	MUDSTONE	9.6	290	0.22	0.124	<100	4.58	<0.02	4.77	10.1	0.82	4.4	0.2	10.6			6.73	-3.4	1.5	UC		
GT148420	SANDSTONE	7.8	153	0.02						<0.5		6.9	<0.1	0.2			0.61	0.4	0.41	NAF	NAF-Barren	
GT148421	SANDSTONE	7.2	142	<0.01						0.8							0.15	-0.6	5.23	NAF		
176529	SANDSTONE	8.2	212	0.01						<0.5							0.31	0.1	0.82	NAF		
176531	SANDSTONE	6.8	169	0.02						<0.5		5.9	<0.1	1			0.61	0.4	0.41	NAF	NAF-Barren	
176534	SANDSTONE	7.7	98	0.04						1		6.9	<0.1	<0.1			1.22	0.2	0.82	NAF	NAF-Barren	
172101	TUFF	8.7	249	0.03						29.5							0.92	-28.6	32.14	NAF		
172108	SANDSTONE	7.8	329	0.6						<0.5							18.36	18.1	0.01	PAF		

Sample ID	Lithology	pH1:2	EC1:2	Total S	CRS	Sulfate as SO4 2-	Total C	TIC	TOC	ANC	CarbNP	NAGpH	NAG [pH 4.5]	NAG [pH 7.0]	pH (OX) (extended boil)	pH -2 (extended boil)	MPA	NAPP (MPA)	ANC/MPA (NPR)	Class NPR	AMIRA classification	Extended boil NAG classific-ation
Units		pH Unit	µS/cm	%		*mg/kg*	%			kg H_2SO_4/t		pH Unit	kg H_2SO_4/t		pH Unit		kg H_2SO_4/t		-	Price, 2009		
LOD		0.1	1	0.01	0.005	100	0.02	0.02	0.02	0.5	1.63	0.1	0.1	0.1	0.1	0.1	0.306	-	-			
172109	SILTSTONE	8.3	193	<0.01						3.6							0.15	-3.4	23.53	NAF		
170112	SANDSTONE	7.7	337	0.04			2.31	1.26	1.05	34.2	102.85						1.22	-33	27.94	NAF		
170251	SANDSTONE	7.7	183	0.01						<0.5							0.31	0.1	0.82	NAF		
170254	SILTSTONE	7.3	342	0.03						2.1		6.6	<0.1	0.3			0.92	-1.2	2.29	NAF	NAF-Barren	
170263	SANDSTONE	7.8	67	0.01						0.9							0.31	-0.6	2.94	NAF		
154017	SANDSTONE	9.5	361	0.03						9.9							0.92	-9	10.78	NAF		
154021	SILTSTONE	8.9	532	0.08			1.46	0.73	0.73	8.6	59.59						2.45	-6.2	3.51	NAF		
154032	SANDSTONE	7.9	85	0.02						1.2							0.61	-0.6	1.96	NAF		
169701	SILTSTONE	8.3	251	<0.01						9.3							0.15	-9.1	60.78	NAF		
169703	SANDSTONE	8.4	239	<0.01						10.2							0.15	-10	66.67	NAF		
169704	SANDSTONE	8.1	114	<0.01						16.3							0.15	-16.1	106.54	NAF		
169707	SILTSTONE	5.4	363	0.03						2.6		6.2	<0.1	0.4			0.92	-1.7	2.83	NAF	NAF-Barren	
169713	SANDSTONE	8.5	328	0.02			1.79	1.56	0.23	43.3	127.34						0.61	-42.7	70.75	NAF		
169714	SHALE	8.7	265	0.03						8.5							0.92	-7.6	9.26	NAF		
169715	SHALE	8.5	307	0.02						10.7							0.61	-10.1	17.48	NAF		
169718	SILTSTONE	8.3	595	0.07						51							2.14	-48.9	23.81	NAF		
170274	CLAYSTONE	7.1	157	<0.01						<0.5							0.15	-0.1	1.63	NAF		
154272	SANDSTONE	8.4	768	<0.01						8.1							0.15	-7.9	52.94	NAF		
154273	SILTSTONE	8.1	838	0.01						4.7							0.31	-4.4	15.36	NAF		
154275	SANDSTONE	8	957	0.02						<0.5		6.9	<0.1	0.9			0.61	0.4	0.41	NAF	NAF-Barren	
154280	CARB MUDSTONE	9.3	410	0.04			2.9	0.57	2.33	19	46.53						1.22	-17.8	15.52	NAF		
154281	SILTSTONE	9	679	0.02						10.9							0.61	-10.3	17.81	NAF		
169723	SANDSTONE	7.7	162	<0.01						1.7							0.15	-1.5	11.11	NAF		
169727	SILTSTONE	8.4	593	0.04						14.1							1.22	-12.9	11.52	NAF		
169728	SANDSTONE	8	86	0.01						0.9							0.31	-0.6	2.94	NAF		
169729	SANDSTONE	8.1	100	<0.01						<0.5							0.15	-0.1	1.63	NAF		
169730	SILTSTONE	8	157	0.04						0.9		6.8	<0.1	0.2			1.22	0.3	0.74	NAF	NAF-Barren	
169736	SANDSTONE	8.8	361	<0.01			0.59	0.53	0.06	60.3	43.26						0.15	-60.1	394.12	NAF		
154284	SANDSTONE	9.1	447	0.01			2.26	1.09	1.17	61.9	88.98						0.31	-61.6	202.29	NAF		
154285	MUDSTONE	9	717	0.14			0.47	<0.02	0.47	13.2	0.82	7.1	<0.1	<0.1			4.28	-8.9	3.08	NAF	NAF	
154288	SILTSTONE	8	159	<0.01						2.8							0.15	-2.6	18.3	NAF		
154290	SANDSTONE	8.9	182	<0.01						1.4							0.15	-1.2	9.15	NAF		
154293	CARB SANDSTONE	8	101	0.02						1.4							0.61	-0.8	2.29	NAF		
154295	SANDSTONE	9	415	0.04						2.9		6.4	<0.1	0.2			1.22	-1.7	2.37	NAF	NAF-Barren	
154296	SILTSTONE	8.1	217	0.01						3.4							0.31	-3.1	11.11	NAF		
182651	SILTSTONE	7	721	0.09						1		6	<0.1	0.3			2.75	1.8	0.36	NAF	NAF-Barren	
81702	SANDSTONE	9.1	411	0.03						27							0.92	-26.1	29.41	NAF		
81706	SANDSTONE	9.1	393	0.04						17.8							1.22	-16.6	14.54	NAF		
81712	SANDSTONE	8.4	155	0.06						1.9		6.8	<0.1	<0.1			1.84	-0.1	1.03	NAF	NAF-Barren	
177990	SANDSTONE	7.4	135	0.01						2.1							0.31	-1.8	6.86	NAF		
152620	SANDSTONE	7.7	45	<0.01						2							0.15	-1.8	13.07	NAF		
152624	SANDSTONE	6.9	112	0.02						1.7							0.61	-1.1	2.78	NAF		
GT148353	SILTSTONE	8.2	187	0.02						4.2							0.61	-3.6	6.86	NAF		
GT148360	SILTSTONE	8.7	1080	0.07			2.21	<0.02	2.37	15.4	0.82						2.14	-13.3	7.19	NAF		
GT148363	SANDSTONE	7.2	217	0.01						1.5							0.31	-1.2	4.9	NAF		
GT148366	SANDSTONE	8.8	256	<0.01						17.2							0.15	-17	112.42	NAF		
GT148368	SANDSTONE	8.2	238	0.02						5							0.61	-4.4	8.17	NAF		
GT148373	SANDSTONE	8.1	90	<0.01						0.7							0.15	-0.5	4.58	NAF		

Sample ID	Lithology	pH1:2	EC1:2	Total S	CRS	Sulfate as SO4 2-	Total C	TIC	TOC	ANC	CarbNP	NAGpH	NAG [pH 4.5]	NAG [pH 7.0]	pH (OX) (extended boil)	pH -2 (extended boil)	MPA	NAPP (MPA)	ANC/MPA (NPR)	Class NPR	AMIRA classification	Extended boil NAG classific-ation
Units		pH Unit	µS/cm	%		*mg/kg*	%			kg H_2SO_4/t		pH Unit	kg H_2SO_4/t		pH Unit		kg H_2SO_4/t		-	Price, 2009		
LOD		0.1	1	0.01	0.005	100	0.02	0.02	0.02	0.5	1.63	0.1	0.1	0.1	0.1	0.1	0.306	-	-			
GT148375	SILTSTONE	8	118	0.01						2.1							0.31	-1.8	6.86	NAF		
GT148379	CARB SILTSTONE	7.7	92	0.06						1.7		6.1	<0.1	2.3			1.84	0.1	0.93	NAF	NAF-Barren	
175946	MUDSTONE	7.6	418	0.07						3.9		6.8	<0.1	0.2			2.14	-1.8	1.82	NAF	NAF-Barren	
147281	SILTSTONE	8.9	401	0.03						10.2							0.92	-9.3	11.11	NAF		
177683	SILTSTONE	8.6	368	0.02						4.8							0.61	-4.2	7.84	NAF		
177687	SANDSTONE	9.4	470	0.01			1.14	1.06	0.08	102	86.53						0.31	-101.7	333.33	NAF		
177693	TUFF	9.4	337	0.01			0.23	0.05	0.18	22.4	4.08						0.31	-22.1	73.2	NAF		
177694	SANDSTONE	8.7	275	0.01			2.19	1.86	0.33	134	151.83						0.31	-133.7	437.91	NAF		
177698	SILTSTONE	7.8	131	0.02						3.2							0.61	-2.6	5.23	NAF		
177700	SILTSTONE	8	222	0.01						2.6							0.31	-2.3	8.5	NAF		
148380	SANDSTONE	8	74	0.02						1.6							0.61	-1	2.61	NAF		
147284	SANDSTONE	9	428	0.02			2.96	0.74	2.22	71.2	60.41						0.61	-70.6	116.34	NAF		
147288	SANDSTONE	8.4	247	0.01						5.2							0.31	-4.9	16.99	NAF		
147289	SILTSTONE	8.6	149	0.02						6.3							0.61	-5.7	10.29	NAF		
147292	SANDSTONE	8.6	170	<0.01						3							0.15	-2.8	19.61	NAF		
147293	SILTSTONE	8.3	104	0.02						2.4							0.61	-1.8	3.92	NAF		
147295	SANDSTONE	8.3	219	0.06						6							1.84	-4.2	3.27	NAF		
175918	SILTSTONE	8.6	264	<0.01						14.8							0.15	-14.6	96.73	NAF		
175919	SILTSTONE	8.6	233	<0.01						16.8							0.15	-16.6	109.8	NAF		
148388	CLAY	7.2	171	<0.01						<0.5							0.15	-0.1	1.63	NAF		
148389	SANDSTONE	7.2	110	<0.01						2.2							0.15	-2	14.38	NAF		
148392	CARB SANDSTONE	5.9	179	0.05						<0.5		6.3	<0.1	0.4			1.53	1.3	0.16	NAF	NAF-Barren	
175920	SANDSTONE	8	236	<0.01						11.6							0.15	-11.4	75.82	NAF		
175921	CARB SILTSTONE	7.2	99	0.03						2.9							0.92	-2	3.16	NAF		
175925	SILTSTONE	8.3	334	0.06						11							1.84	-9.2	5.99	NAF		
175926	SANDSTONE	8.4	613	0.07						11.4							2.14	-9.3	5.32	NAF		
175928	SANDSTONE	8.6	187	<0.01						1.4							0.15	-1.2	9.15	NAF		
175934	CONGLOMERATE	6.4	174	0.01						0.5							0.31	-0.2	1.63	NAF		
175936	CONGLOMERATE	7.4	73	<0.01						1.2							0.15	-1	7.84	NAF		
175938	CONGLOMERATE	7.1	114	<0.01						1							0.15	-0.8	6.54	NAF		
176508	CARB SILTSTONE	7.6	857	1.1						10							33.66	23.7	0.3	PAF		
176509	CLAYSTONE	9.3	242	0.05						20.1							1.53	-18.6	13.14	NAF		
176511	CARB SILTSTONE	7.8	536	0.04						6							1.22	-4.8	4.9	NAF		
175516	SANDSTONE	8	107	<0.01						1.5							0.15	-1.3	9.8	NAF		
176517	SANDSTONE	7.7	77	<0.01						0.7							0.15	-0.5	4.58	NAF		
176518	MUDSTONE	8.2	104	0.02						3.4							0.61	-2.8	5.56	NAF		
176521	SILTSTONE	8.8	421	<0.01						7.8							0.15	-7.6	50.98	NAF		
177977	TUFF	8.9	420	0.08						13							2.45	-10.6	5.31	NAF		
177983	SANDSTONE	7.7	106	<0.01						1.9							0.15	-1.7	12.42	NAF		
147456	SANDSTONE	9.2	358	0.02						18.4							0.61	-17.8	30.07	NAF		
147458	SILTSTONE	8.3	332	0.04						7							1.22	-5.8	5.72	NAF		
147466	SILTSTONE	8.6	312	0.03						13.6							0.92	-12.7	14.81	NAF		
147469	CARB SILTSTONE	8.3	420	0.07						8.8							2.14	-6.7	4.11	NAF		
147475	CARB SILTSTONE	8.3	416	0.08						15.6		7.5	<0.1	<0.1			2.45	-13.2	6.37	NAF	NAF	
147280	TUFF	8.5	434	0.02						15.3							0.61	-14.7	25	NAF		
147476	TUFF	8.3	220	0.03						15.8							0.92	-14.9	17.21	NAF		
153323	SANDSTONE	7.8	162	<0.01						6.1							0.15	-5.9	39.87	NAF		
153324	SANDSTONE	8.9	396	<0.01						6.5							0.15	-6.3	42.48	NAF		

Sample ID	Lithology	pH1:2	EC1:2	Total S	CRS	Sulfate as SO4 2-	Total C	TIC	TOC	ANC	CarbNP	NAGpH	NAG [pH 4.5]	NAG [pH 7.0]	pH (OX) (extended boil)	pH -2 (extended boil)	MPA	NAPP (MPA)	ANC/MPA (NPR)	Class NPR	AMIRA classification	Extended boil NAG classific-ation
Units		pH Unit	µS/cm	%		*mg/kg*	%			kg H_2SO_4/t		pH Unit	kg H_2SO_4/t		pH Unit		kg H_2SO_4/t		-	Price, 2009		
LOD		0.1	1	0.01	0.005	100	0.02	0.02	0.02	0.5	1.63	0.1	0.1	0.1	0.1	0.1	0.306	-	-			
147479	SILTSTONE	7.8	199	0.01						4							0.31	-3.7	13.07	NAF		
153301	SILTSTONE	8.8	273	<0.01			3.94	3.85	0.09	304	314.28						0.15	-303.8	1986.93	NAF		
153303	SILTSTONE	8.8	172	<0.01						12.4							0.15	-12.2	81.05	NAF		
153305	SANDSTONE	8.5	212	<0.01						22.1							0.15	-21.9	144.44	NAF		
154259	SILTSTONE	8	168	0.02						5.2							0.61	-4.6	8.5	NAF		
154261	CLAYSTONE	7.7	1620	0.23	0.174	2060	3.1	2.85	0.25	22.1	232.65	7.8	<0.1	<0.1			7.04	-15.1	3.14	NAF	NAF	
154262	CLAYSTONE	7.3	674	0.06			1.84	<0.02	2.01	4	0.82	6.9	<0.1	0.1			1.84	-2.2	2.18	NAF	NAF-Barren	
154265	SILTSTONE	7.4	131	<0.01						4.9							0.15	-4.7	32.03	NAF		
154270	MUDSTONE	8.5	400	<0.01						8.8							0.15	-8.6	57.52	NAF		
153311	SILTSTONE	8.1	310	<0.01						8.8							0.15	-8.6	57.52	NAF		
153312	CARB MUDSTONE	8	585	0.04						14.3							1.22	-13.1	11.68	NAF		
153315	CARB MUDSTONE	7.5	604	0.34						19.5							10.4	-9.1	1.87	UC		
146736	SANDSTONE	8.8	364	<0.01						18.6							0.15	-18.4	121.57	NAF		
146738	SANDSTONE	8.7	292	<0.01			1.82	1.73	0.09	138	141.22						0.15	-137.8	901.96	NAF		
146740	SILTSTONE	9	224	<0.01						58.2							0.15	-58	380.39	NAF		
146743	CARB SILTSTONE	7.8	338	0.02						5.5							0.61	-4.9	8.99	NAF		
146744	CARB MUDSTONE	6.6	176	0.06						4.7							1.84	-2.9	2.56	NAF		
146747	SANDSTONE	7.9	429	0.03						15.3							0.92	-14.4	16.67	NAF		
146749	SANDSTONE	8.3	410	0.04						15.5							1.22	-14.3	12.66	NAF		
177953	SANDSTONE	8	187	<0.01						9.6							0.15	-9.4	62.75	NAF		
177957	SANDSTONE	7.8	406	0.04						11							1.22	-9.8	8.99	NAF		
152610	TUFF	8.7	844	0.05						15.2							1.53	-13.7	9.93	NAF		
152611	CARB MUDSTONE	7.4	275	0.05						2.7		7.1	<0.1	<0.1			1.53	-1.2	1.76	NAF	NAF-Barren	
177959	SILTSTONE	7.1	167	0.13	0.057	660				2.3		4.8	<0.1	3.9			3.98	1.7	0.58	PAF	UC(NAF)	
177961	SANDSTONE	8	123	<0.01						2.8							0.15	-2.6	18.3	NAF		
177964	CARB SILTSTONE	6.8	217	0.12	0.101	720				3.1		4.4	<0.1	7.5			3.67	0.6	0.84	PAF	PAF-LC	
177967	SANDSTONE	6.9	170	0.02						2.3							0.61	-1.7	3.76	NAF		
177976	SANDSTONE	7.5	69	0.02						1.9							0.61	-1.3	3.1	NAF		
153334	SANDSTONE	9	846	0.02						44.4							0.61	-43.8	72.55	NAF		
154429	SANDSTONE	8.9	425	0.02			2.79	1.81	0.98	62.2	147.75						0.61	-61.6	101.63	NAF		
152623	SANDSTONE	7.8	375	0.01						7.5							0.31	-7.2	24.51	NAF		
152619	CARB SANDSTONE	6.2	115	0.17	0.027	160	18.6	0.2	18.4	1.3	16.33	3.7	9.7	31.5	3	3.9	5.2	3.9	0.25	PAF	PAF	PAF
169951	SANDSTONE	5.9	408	0.07						1.2		5.3	<0.1	0.7			2.14	0.9	0.56	NAF	NAF-Barren	
169954	SILTSTONE	7.9	196	0.07						3		6.8	<0.1	0.1			2.14	-0.9	1.4	NAF	NAF-Barren	
169955	SANDSTONE	8.7	569	0.03						13.3							0.92	-12.4	14.49	NAF		
169959	SILTSTONE	9	556	0.02			0.87	0.25	0.62	24.4	20.41						0.61	-23.8	39.87	NAF		
169960	SANDSTONE	8.8	660	<0.01						50.1							0.15	-49.9	327.45	NAF		
169963	SANDSTONE	8.9	532	<0.01			3.54	3.43	0.11	210	279.99	8.8	<0.1	<0.1			0.15	-209.8	1372.55	NAF	NAF	
169964	SILTSTONE	8.9	375	0.02						15.6							0.61	-15	25.49	NAF		
169967	CARB MUDSTONE	7.4	572	0.3	0.073	780				9.4		5.5	<0.1	8.3	3.8	6.2	9.18	-0.2	1.02	UC	NAF	NAF
169602	SILTSTONE	7.5	953	0.05			0.73	<0.02	0.85	8.8	0.82						1.53	-7.3	5.75	NAF		
169606	SILTSTONE	9.1	511	0.02			2.18	1.5	0.68	21.7	122.45						0.61	-21.1	35.46	NAF		
169609	CARB MUDSTONE	8.9	607	0.21						9.6							6.43	-3.2	1.49	UC		
169610	CARB SILTSTONE	9.2	256	0.21	0.091	280				9.6		6.6	<0.1	0.3	6.4		6.43	-3.2	1.49	UC	NAF	NAF
169613	SANDSTONE	7.9	106	0.01						2.5							0.31	-2.2	8.17	NAF		
169614	CARB SILTSTONE	8.1	119	0.01						2							0.31	-1.7	6.54	NAF		
169968	SILTSTONE	8	196	0.02						3							0.61	-2.4	4.9	NAF		
169971	SANDSTONE	8	54	<0.01						1.2							0.15	-1	7.84	NAF		

Sample ID	Lithology	pH1:2	EC1:2	Total S	CRS	Sulfate as SO4 2-	Total C	TIC	TOC	ANC	CarbNP	NAGpH	NAG [pH 4.5]	NAG [pH 7.0]	pH (OX) (extended boil)	pH -2 (extended boil)	MPA	NAPP (MPA)	ANC/MPA (NPR)	Class NPR	AMIRA classification	Extended boil NAG classific-ation
Units		pH Unit	µS/cm	%		*mg/kg*	%			kg H_2SO_4/t		pH Unit	kg H_2SO_4/t		pH Unit		kg H_2SO_4/t		-	Price, 2009		
LOD		0.1	1	0.01	0.005	100	0.02	0.02	0.02	0.5	1.63	0.1	0.1	0.1	0.1	0.1	0.306	-	-			
169973	CARB MUDSTONE	7.8	130	0.07						2.3							2.14	-0.2	1.07	NAF		
169974	CONGLOMERATE	8	68	0.02						1.5							0.61	-0.9	2.45	NAF		
169976	SANDSTONE	7.8	113	<0.01						3.3							0.15	-3.1	21.57	NAF		
169621	SANDSTONE	7.4	268	0.02						3.4							0.61	-2.8	5.56	NAF		
146702	MUDSTONE	9.1	419	0.01						15.2							0.31	-14.9	49.67	NAF		
146712	SILTSTONE	9.1	351	0.03						16.4							0.92	-15.5	17.86	NAF		
146716	MUDSTONE	9	327	0.02						22							0.61	-21.4	35.95	NAF		
146719	CARB MUDSTONE	7.8	286	0.24	0.032	210				6.3		5.8	<0.1	4.3	5.6		7.34	1	0.86	PAF	UC(NAF)	NAF
146720	MUDSTONE	8.6	126	<0.01						4.6							0.15	-4.4	30.07	NAF		
146725	SANDSTONE	8.7	222	0.12	0.01	140				67		10	<0.1	<0.1			3.67	-63.3	18.25	NAF	NAF	
146732	SANDSTONE	8.2	140	0.06						3		6.4	<0.1	0.5			1.84	-1.2	1.63	NAF	NAF-Barren	
175910	CARB SILTSTONE	7.6	99	0.06						3.6							1.84	-1.8	1.96	NAF		
169616	CARB SILTSTONE	7.5	170	0.13	0.034	330				3.5		6.4	<0.1	0.6			3.98	0.5	0.88	PAF	UC(NAF)	
169617	CARB SILTSTONE	7.9	95	0.08						2.2		6.5	<0.1	0.4			2.45	0.2	0.9	NAF	NAF-Barren	
169627	CARB SILTSTONE	7.4	213	0.08						1.4		5	<0.1	3			2.45	1	0.57	NAF	NAF-Barren	
169628	SANDSTONE	7.8	215	0.02						1.5							0.61	-0.9	2.45	NAF		
169629	CARB SILTSTONE	7.9	115	0.02						0.8							0.61	-0.2	1.31	NAF		
169630	SANDSTONE	7	262	0.02						0.8							0.61	-0.2	1.31	NAF		
182753	SILTSTONE	7.9	608	0.04						9.4							1.22	-8.2	7.68	NAF		
182756	CARB MUDSTONE	8.4	1020	0.14	0.042	270	2.37	0.31	2.06	15.7	25.31	8.4	<0.1	<0.1			4.28	-11.4	3.66	NAF	NAF	
182763	SANDSTONE	7.1	350	0.03						1.6		7	<0.1	<0.1			0.92	-0.7	1.74	NAF	NAF-Barren	
182766	SANDSTONE	8.7	236	0.01						56.8							0.31	-56.5	185.62	NAF		
182771	SANDSTONE	8.4	197	0.02						8.1							0.61	-7.5	13.24	NAF		
177654	SILTSTONE	6.9	644	0.13						6.7							3.98	-2.7	1.68	UC		
177659	MUDSTONE	8.8	885	0.03			1.92	1.19	0.73	17.8	97.14						0.92	-16.9	19.39	NAF		
177661	SANDSTONE	9.6	442	0.01			0.77	0.61	0.16	42.3	49.79						0.31	-42	138.24	NAF		
177665	SILTSTONE	9.2	916	0.02			0.78	0.42	0.36	40.3	34.28						0.61	-39.7	65.85	NAF		
177669	TUFF	8.9	426	0.03						14.1							0.92	-13.2	15.36	NAF		
177673	SANDSTONE	8.2	197	<0.01						12							0.15	-11.8	78.43	NAF		
177676	SANDSTONE	7.1	155	0.02						3.5							0.61	-2.9	5.72	NAF		
177677	SANDSTONE	7.5	77	<0.01						3							0.15	-2.8	19.61	NAF		
148058	CARB MUDSTONE	5.8	214	0.24	0.078	<100				2.6		6.1	<0.1	0.7	6.3		7.34	4.7	0.35	PAF	UC(NAF)	NAF
GT152502	SILTSTONE	8.6	544	0.03			3.73	3.05	0.68	38.6	248.97						0.92	-37.7	42.05	NAF		
GT152509	SILTSTONE	8	175	0.02						4.6							0.61	-4	7.52	NAF		
170252	CARB SILTSTONE	7.7	690	0.1			9.96	<0.02	10	9.7	0.82	6.2	<0.1	1.4			3.06	-6.6	3.17	NAF	NAF	
170282	CLAYSTONE	6.6	450	<0.01						1.8							0.15	-1.6	11.76	NAF		
170289	SANDSTONE	8.5	352	0.02			3.9	3.71	0.19	247	302.85	10.9	<0.1	<0.1			0.61	-246.4	403.59	NAF	NAF	
170296	SILTSTONE	7.8	72	<0.01						0.8							0.15	-0.6	5.23	NAF		
170297	SILTSTONE	8.3	254	0.01						7.2							0.31	-6.9	23.53	NAF		
154046	SILTSTONE	7.7	170	0.02						5.2							0.61	-4.6	8.5	NAF		
GT148358	SILTSTONE	8.7	422	0.09						10.4							2.75	-7.6	3.78	NAF		
GT148378	CARB MUDSTONE	7.4	181	0.11	0.022	<100				5.2		6.7	<0.1	0.2			3.37	-1.8	1.54	UC	NAF	
153309	SANDSTONE	8.3	401	0.01						59.1							0.31	-58.8	193.14	NAF		
154251	SANDSTONE	7.5	60	<0.01						1.5							0.15	-1.3	9.8	NAF		
154256	SANDSTONE	8.5	388	<0.01						25.4							0.15	-25.2	166.01	NAF		
146717	MUDSTONE	8.5	1090	0.09			2.11	1.07	1.04	32.8	87.34						2.75	-30	11.91	NAF		
146718	CARB MUDSTONE	7.7	520	0.22	0.061	400				7.2		7.4	<0.1	<0.1	6.9		6.73	-0.5	1.07	UC	NAF	NAF
146730	SANDSTONE	7.9	252	0.1						1		6	<0.1	0.3			3.06	2.1	0.33	PAF	UC(NAF)	

Sample ID	Lithology	pH1:2	EC1:2	Total S	CRS	Sulfate as SO4 2-	Total C	TIC	TOC	ANC	CarbNP	NAGpH	NAG [pH 4.5]	NAG [pH 7.0]	pH (OX) (extended boil)	pH -2 (extended boil)	MPA	NAPP (MPA)	ANC/MPA (NPR)	Class NPR	AMIRA classification	Extended boil NAG classific-ation
Units		pH Unit	µS/cm	%		*mg/kg*	%			kg H_2SO_4/t		pH Unit	kg H_2SO_4/t		pH Unit		kg H_2SO_4/t		-	Price, 2009		
LOD		0.1	1	0.01	0.005	100	0.02	0.02	0.02	0.5	1.63	0.1	0.1	0.1	0.1	0.1	0.306	-	-			
177952	SANDSTONE	8	144	0.01						3.3							0.31	-3	10.78	NAF		
177968	SILTSTONE	7.8	162	0.02						2							0.61	-1.4	3.27	NAF		
GT169961	SANDSTONE	8.9	567	<0.01			1.84	1.71	0.13	92.4	139.59						0.15	-92.2	603.92	NAF		
GT169962	SANDSTONE	9.2	376	<0.01			6.1	6.01	0.09	368	490.6						0.15	-367.8	2405.23	NAF		
GT169966	CARB SILTSTONE	7.6	471	0.07						24.2		6.3	<0.1	0.3			2.14	-22.1	11.3	NAF	NAF	
147454	SANDSTONE	8.8	243	<0.01						23.9							0.15	-23.7	156.21	NAF		
147462	SANDSTONE	9.6	205	<0.01			0.67	0.34	0.33	58.5	27.75						0.15	-58.3	382.35	NAF		
147478	TUFF	7.1	538	0.06			9.1	<0.02	9.23	23	0.82						1.84	-21.2	12.53	NAF		
182759	SANDSTONE	9.6	365	<0.01			2.75	2.61	0.14	171	213.05						0.15	-170.8	1117.65	NAF		
169719	SILTSTONE	9.3	352	0.02			6.56	0.37	6.19	19.6	30.2						0.61	-19	32.03	NAF		
GT147148	SILTSTONE	8	215	0.02						8.2							0.61	-7.6	13.4	NAF		
GT147593	SILTSTONE	9.2	331	<0.01			1.96	1.76	0.2	93.8	143.67						0.15	-93.6	613.07	NAF		
GT152501	SILTSTONE	8.9	395	0.02						9.3							0.61	-8.7	15.2	NAF		
GT152507	SANDSTONE	9	173	<0.01			1.47	0.62	0.85	279	50.61						0.15	-278.8	1823.53	NAF		
GT152513	SILTSTONE	8.2	201	<0.01						1.9							0.15	-1.7	12.42	NAF		
GT152514	SANDSTONE	6.8	253	0.09						1.3		4.7	<0.1	1.2			2.75	1.5	0.47	NAF	NAF-Barren	
GT152517	SILTSTONE	8.1	133	<0.01						2							0.15	-1.8	13.07	NAF		
170292	SILTSTONE	9.5	263	<0.01						89							0.15	-88.8	581.7	NAF		
177688	SANDSTONE	9.7	422	<0.01			6.1	5.7	0.4	404	465.29						0.15	-403.8	2640.52	NAF		
177699	SILTSTONE	8.5	66	0.03						2.5		7.8	<0.1	<0.1			0.92	-1.6	2.72	NAF	NAF-Barren	
154040	SILTSTONE	9	1120	0.02			0.53	0.19	0.34	24.2	15.51						0.61	-23.6	39.54	NAF		
CQ146995	COAL	7.5	436	0.53	0.391	<100	21.6	<0.02	22.3	6.2	0.82				2.8	3.2	16.22	10	0.38	PAF		PAF
CQ146996	COAL	6.8	338	0.4	<0.005	<100				5.8							12.24	6.4	0.47	PAF		
CQ146997	COAL	7.2	483	0.36	<0.005	<100				7.2							11.02	3.8	0.65	PAF		
CQ146999	COAL	7.2	475	0.39	<0.005	<100	43.5	<0.02	44.9	8	0.82						11.93	3.9	0.67	PAF		
CQ172801	COAL	7.2	207	0.44						6.6							13.46	6.9	0.49	PAF		
CQ172805	COAL	7.2	537	0.4	0.006	<100	38.6	0.5	38.1	22.6	40.82						12.24	-10.4	1.85	UC		
CQ172806	CLAYSTONE	9.3	655	0.02			0.37	0.17	0.2	20.7	13.88						0.61	-20.1	33.82	NAF		
CQ172809	COAL	8.3	315	0.76	0.178	320	29.2	<0.02	29.9	7.5	0.82						23.26	15.8	0.32	PAF		
CQ172811	COAL	7.9	446	0.2						8.7							6.12	-2.6	1.42	UC		
CQ172813	COAL	7.1	420	0.28	0.006	<100	33.6	<0.02	34.7	8.9	0.82						8.57	-0.3	1.04	UC		
CQ172815	COAL	7.4	456	0.16						36.9							4.9	-32	7.54	NAF		
CQ172816	SANDSTONE	8.3	422	0.02			4.46	3.5	0.96	173	285.71						0.61	-172.4	282.68	NAF		
CQ172817	SANDSTONE	8.3	420	0.02						13							0.61	-12.4	21.24	NAF		
CQ172818	COAL	7.4	245	0.2	0.005	<100				6.5							6.12	-0.4	1.06	UC		
CQ172821	COAL	7	289	0.2						5.1							6.12	1	0.83	PAF		
CQ172836	COAL	7	521	0.26						23							7.96	-15	2.89	UC		
CQ172654	COAL	7.2	650	0.26	0.02	<100	34.1	0.3	33.8	148	24.49						7.96	-140	18.6	NAF		
CQ172655	SILTSTONE	7.3	1120	0.41	0.28	1120	12.8	<0.02	13.2	24.2	0.82	6.5	<0.1	1.7			12.55	-11.7	1.93	UC	NAF	
CQ172674	CARB MUDSTONE	6.9	292	0.12	0.036	180				3.6		6.6	<0.1	0.4	6.6		3.67	0.1	0.98	PAF	UC(NAF)	NAF
CQ172698	SILTSTONE	7.4	119	0.05						2.2		6.2	<0.1	0.9			1.53	-0.7	1.44	NAF	NAF-Barren	
CQ172699	SILTSTONE	7.8	130	0.05						6.7							1.53	-5.2	4.38	NAF		
CQ14755	CLAYSTONE	7.5	158	0.11	0.085	<100	6.24	5.37	0.87	12.2	438.35	8.3	<0.1	<0.1			3.37	-8.8	3.62	NAF	NAF	
CQ14758	SANDSTONE	7.7	85	0.06						3.1		6.6	<0.1	0.8			1.84	-1.3	1.69	NAF	NAF-Barren	
CQ14759	COAL	6.7	121	0.26						3.3							7.96	4.7	0.41	PAF		
CQ14761	CARB SILTSTONE	7.1	138	0.17	0.006	<100				3.2		4.3	2.6	24.4			5.2	2	0.62	PAF	PAF-LC	
CQ14763	COAL	6	301	0.31	0.036	<100				3.7							9.49	5.8	0.39	PAF		
CQ14767	COAL	6.7	155	0.54						6.1							16.52	10.4	0.37	PAF		

Sample ID	Lithology	pH1:2	EC1:2	Total S	CRS	Sulfate as SO4 2-	Total C	TIC	TOC	ANC	CarbNP	NAGpH	NAG [pH 4.5]	NAG [pH 7.0]	pH (OX) (extended boil)	pH -2 (extended boil)	MPA	NAPP (MPA)	ANC/MPA (NPR)	Class NPR	AMIRA classification	Extended boil NAG classific-ation
Units		pH Unit	µS/cm	%		*mg/kg*	%			kg H_2SO_4/t		pH Unit	kg H_2SO_4/t		pH Unit		kg H_2SO_4/t		-	Price, 2009		
LOD		0.1	1	0.01	0.005	100	0.02	0.02	0.02	0.5	1.63	0.1	0.1	0.1	0.1	0.1	0.306	-	-			
CQ14768	CARB SILTSTONE	6.9	148	0.1	0.029	<100				3.2		4.9	<0.1	8.7	3.7	5.8	3.06	-0.1	1.05	UC	NAF-Barren	PAF
2209	COAL	7.6	540	0.28	0.007	<100				135					6.7		8.57	-126.4	15.76	NAF		NAF
2210	COAL	7.5	492	0.41						22.6							12.55	-10.1	1.8	UC		
2212	COAL	7.4	287	0.42						9.4							12.85	3.5	0.73	PAF		
2215	COAL	7	279	0.48	<0.005	<100				6							14.69	8.7	0.41	PAF		
2218	COAL	7.7	437	0.38	<0.005	<100				25.9							11.63	-14.3	2.23	UC		
2219	COAL	9.6	405	0.01			0.71	0.35	0.36	24	28.57						0.31	-23.7	78.43	NAF		
2220	COAL	9.8	485	<0.01			0.31	0.15	0.16	23.2	12.24						0.15	-23	151.63	NAF		
2221	COAL	8.1	630	0.47	0.156	<100	21.6	<0.02	21.6	8.9	0.82	4.4	0.2	15.4			14.38	5.5	0.62	PAF	PAF-LC	
2223	COAL	8.5	446	0.24	0.026	160	26.1	<0.02	26.4	11.4	0.82						7.34	-4.1	1.55	UC		
2224	COAL	8.4	315	0.14						143							4.28	-138.7	33.38	NAF		
2226	COAL	8.8	320	0.03						68.8							0.92	-67.9	74.95	NAF		
14964	CLAYEY SAND	6.7	132	<0.01						3.2							0.15	-3	20.92	NAF		
14965	CLAYEY SAND	8.9	1030	0.03			2.18	2.07	0.11	152	168.97						0.92	-151.1	165.58	NAF		
14966	SANDY CLAY	7.6	1240	<0.01						2.8							0.15	-2.6	18.3	NAF		
14967	SANDY CLAY	9.6	933	<0.01			1.92	1.82	0.1	175	148.57						0.15	-174.8	1143.79	NAF		
14968	SANDY CLAY	8.5	665	<0.01						1.7							0.15	-1.5	11.11	NAF		
14969	SANDY CLAY	8.2	2500	0.01						4.1							0.31	-3.8	13.4	NAF		
14970	CLAYEY SAND	8.4	650	0.02						8							0.61	-7.4	13.07	NAF		
14971	CLAY	7.7	1420	<0.01						6							0.15	-5.8	39.22	NAF		
14972	CLAY	8.2	186	0.01						5.6							0.31	-5.3	18.3	NAF		
14973	SANDY CLAY	7.4	878	0.2	<0.005	2850	0.09	<0.02	0.09	4.5	0.82	7.3	<0.1	<0.1			6.12	1.6	0.74	PAF	UC(NAF)	
14975	SOIL	6.4	105	0.01						2							0.31	-1.7	6.54	NAF		
14976	CLAYEY SAND	8.6	746	0.03			0.14	0.07	0.07	22.5	5.71						0.92	-21.6	24.51	NAF		
14977	SANDY CLAY	8.4	308	0.02						5.2							0.61	-4.6	8.5	NAF		
14978	SANDY CLAY	8.5	447	<0.01						6.8							0.15	-6.6	44.44	NAF		
14979	SANDY CLAY	7.9	368	0.01						3.3							0.31	-3	10.78	NAF		
14980	SANDY CLAY	6.8	69	<0.01						1.7							0.15	-1.5	11.11	NAF		
14981	CLAYEY SAND	6.1	158	<0.01						0.7							0.15	-0.5	4.58	NAF		
14982	CLAYEY SAND	6.3	79	<0.01						1.5							0.15	-1.3	9.8	NAF		
14983	CLAYEY SAND	6.7	26	<0.01						1.5							0.15	-1.3	9.8	NAF		
14984	CLAYEY SAND	6.7	30	<0.01						1.9							0.15	-1.7	12.42	NAF		
14985	CLAYEY SAND	6.5	55	<0.01						1.4							0.15	-1.2	9.15	NAF		
14986	CLAYEY SAND	7.8	180	<0.01						4.1							0.15	-3.9	26.8	NAF		
14987	CLAYEY SAND	7.9	176	<0.01						6.5							0.15	-6.3	42.48	NAF		
204802	COAL	5.3	938	0.17	0.027	200				2.4							5.2	2.8	0.46	PAF		
204803	COAL	6	233	0.22	0.012	<100				3.3							6.73	3.4	0.49	PAF		
204804	COAL	5.9	253	0.26	0.011	<100				1.9							7.96	6.1	0.24	PAF		
204807	COAL	5.7	250	0.26						2							7.96	6	0.25	PAF		
204813	COAL	6	191	0.26	0.011	120				2.7							7.96	5.3	0.34	PAF		
204814	COAL	6.3	230	0.22						2.6							6.73	4.1	0.39	PAF		
204815	CLAYSTONE	7.6	330	0.04						2.3							1.22	-1.1	1.88	NAF		

Batch #	Client Sample ID	Lithological Unit	Lithological Group	ANC	CarbNP	ABCC (to pH 6)	ABCC (to pH 4.5)	Available ANC (to pH 6)
				kgH_2SO_4/t				%
1	81381	CARB MUDSTONE	Carbonaceous	19.1	26.12	2.1	3.7	11
1	81392	CARB MUDSTONE	Carbonaceous	11.2	-	0.5	1.1	4
1	81415	CARB MUDSTONE	Carbonaceous	9.9	-	2.1	2.8	21
1	81445	CARB MUDSTONE	Carbonaceous	2.5	12.24	0.3	0.9	13
2	154041	CARB MUDSTONE	Carbonaceous	17.9	20.41	3.85	8.23	21.51
2	182756	CARB MUDSTONE	Carbonaceous	15.7	25.31	4.57	8.71	29.11
2	152619	CARB SANDSTONE	Carbonaceous	1.3	16.33	0.16	1.64	12.31
1	81356	CLAY	Clay and soil	14.4	3.27	2.5	4.8	18
1	81374	CLAY	Clay and soil	167	-	127.2	136.9	76
1	81376	CLAY	Clay and soil	13.9	-	2.5	4.5	18
1	81394	CLAY	Clay and soil	16.1	10.61	4.5	6.8	28
2	14965	CLAYEY SAND	CLAY	152	168.97	95.17	121.18	62.61
1	81362	CLAYSTONE	Rem	3.7	0.82	0.4	1.0	10
2	CQ 14755	CLAYSTONE	Rem	12.2	438.35	0.74	1.53	6.07
1	81382	COAL	Coal	10.2	359.17	1.2	2.2	11
2	CQ 172654	COAL	Coal	148	24.49	11.72	21.73	7.92
2	2209	COAL	Coal	135	-	26.06	35.46	19.30
2	2221	COAL	Coal	8.9	0.82	2.02	3.2	22.70
2	2226	COAL	Coal	68.8	-	15.06	21.08	21.89
1	81439	INTERBEDDED CARB MUDSTONE AND TUFF	Carbonaceous	38.3	25.31	5.6	13.3	15
1	81403	MUDSTONE	Rem	14.5	2.45	1.9	3.1	13
2	GT 148416	MUDSTONE	Rem	10.1	0.82	3.82	8.21	37.82
1	81368	SANDSTONE	Rem	27.2	-	1.4	2.8	5
1	81380	SANDSTONE	Rem	65.9	-	59.6	78.0	90
1	81384	SANDSTONE	Rem	3.7	-	1.6	5.3	42
1	81391	SANDSTONE	Rem	212	-	67.8	134.4	32
1	81405	SANDSTONE	Rem	3.4	0.82	0.5	1.0	14
2	154038	SANDSTONE	Rem	145	158.36	40.07	56.73	27.63
2	GT 148411	SANDSTONE	Rem	109	169.79	41.96	53.02	38.50
2	81710	SANDSTONE	Rem	96.3	114.28	22.22	28.46	23.07
2	177679	SANDSTONE	Rem	168		49.83	67.35	29.66
2	154255	SANDSTONE	Rem	271	352.64	227.14	272.96	83.82
2	169736	SANDSTONE	Rem	60.3	43.26	17.75	21.97	29.44
2	154284	SANDSTONE	Rem	61.9	88.98	29.35	41.76	47.42
2	177687	SANDSTONE	Rem	102	86.53	31.34	38.92	30.73
2	177694	SANDSTONE	Rem	134	151.83	88.44	135.3	66.00
2	147284	SANDSTONE	Rem	71.2	60.41	26.04	32.76	36.57
2	146738	SANDSTONE	Rem	138	141.22	50.79	83.42	36.80
2	154429	SANDSTONE	Rem	62.2	147.75	38.73	47.53	62.27
2	169963	SANDSTONE	Rem	210	279.99	150.07	211.38	71.46
2	146725	SANDSTONE	Rem	67	-	63.19	80.52	94.31
2	170289	SANDSTONE	Rem	247	302.85	167.75	248.11	67.91
2	146730	SANDSTONE	Rem	1	-	0.17	1.71	17.00
2	GT 169961	SANDSTONE	Rem	92.4	139.59	28.78	36.56	31.15
2	GT 169962	SANDSTONE	Rem	368	490.6	89.58	300.57	24.34
2	182759	SANDSTONE	Rem	171	213.05	50.44	59.62	29.50
2	GT 152507	SANDSTONE	Rem	279	50.61	5.33	8.86	1.91
2	177688	SANDSTONE	Rem	404	465.29	319.51	395.57	79.09
2	CQ 172816	SANDSTONE	Rem	173	285.71	44.13	47.53	25.51
2	14967	SANDY CLAY	CLAY	175	148.57	76.99	136.16	43.99
2	14973	SANDY CLAY	CLAY	4.5	0.82	1.57	3.8	34.89
1	81371	SILTSTONE	Rem	59.3	-	19.4	23.4	33
2	153301	SILTSTONE	Rem	304	314.28	199.92	288.66	65.76
2	GT 147593	SILTSTONE	Rem	93.8	143.67	41.2	82.29	43.92
2	CQ 172655	SILTSTONE	Rem	24.2	0.82	6.24	13.34	25.79
2	169716	TUFF	Rem	555	579.57	110.6	203.94	19.93

Appendix D: Metal concentrations and Abundance Indices

Batch #	Sample ID	Site No.	Analyte	Al	Ca	Fe	K	Mg	Mn	Na	P	S	Ag	As	B	Ba	Be	Bi	Cd	Ce	Co
			Units	%	%	%	%	%	ppm	%	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
			Comparative Abundance	7.2	6.6	4.1	2	1.4	770	0.57	670	0.22	0.057	7.7	100	460	2	0.4	0.17	83	14
1	81351	C001C	SANDSTONE	2.41	0.22	0.92	0.42	0.09	239	0.04	80	0.03	0.1	2.4	10	180	0.63	0.11	<0.02	33.2	3.6
1	81352	C0021C	CLAY	7.51	0.07	1.74	1.12	0.15	50	0.08	140	<0.01	0.08	3.1	20	260	2.75	0.32	<0.02	69.7	6.6
1	81353	C0021C	SILTSTONE	9.02	0.15	2.03	1.81	0.19	39	0.1	290	0.01	0.06	2.3	20	360	2.09	0.41	0.06	55.5	9.8
1	81354	C0021C	SANDSTONE	6.27	0.05	0.93	2.05	0.15	140	0.07	120	0.01	0.02	3.8	10	480	1.04	0.43	0.05	49.9	3.2
1	81355	C0021C	CARB MUDSTONE	8.13	0.07	0.45	0.47	0.04	17	0.04	100	0.02	3.06	3.2	10	110	1.77	0.29	0.17	51.1	1.9
1	81356	C024C	CLAY	8.56	0.28	4.36	1.17	0.5	629	0.49	490	0.09	0.11	6.6	60	250	1.44	0.42	0.02	53.6	15.1
1	81357	C024C	CLAYSTONE	7.35	0.02	0.82	0.06	0.02	34	0.08	220	<0.01	0.01	6.6	20	120	0.66	0.76	<0.02	36	1.3
1	81358	C024C	CLAYSTONE	13.9	0.08	0.25	0.06	0.05	12	0.11	190	0.11	0.06	3.8	20	60	3.26	0.8	<0.02	97.6	1.1
1	81359	C024C	SANDSTONE	7.32	0.03	0.27	0.2	0.03	19	0.04	120	0.02	0.03	1.3	20	80	0.98	0.14	<0.02	29.7	1.7
1	81360	C024C	CLAY	6.1	0.06	2.83	0.33	0.14	45	0.04	70	0.01	0.06	5.4	30	220	1.27	0.31	<0.02	33.9	7.3
1	81361	C031C	CLAY	5.99	0.02	0.76	0.1	0.1	15	0.08	90	0.01	0.03	2.6	20	160	0.46	0.36	<0.02	21.2	1.1
1	81362	C031C	CLAYSTONE	7.66	0.17	0.74	0.1	0.14	<5	0.06	5480	0.06	0.09	14.2	30	1410	5.43	0.39	0.02	780	1
1	81363	C031C	SANDSTONE	4.55	0.03	0.4	0.22	0.02	13	0.02	110	0.02	0.05	4.5	10	110	0.66	0.12	<0.02	41.4	0.7
1	81364	C031C	SANDSTONE	8.09	2.14	3.52	1.73	0.28	410	0.14	520	0.13	0.07	16.6	20	330	1.38	0.21	0.09	50.9	12.8
1	81365	C031C	CLAY	7.06	0.03	3.89	0.63	0.08	206	0.14	360	0.2	0.03	4.7	30	200	0.96	0.4	<0.02	29.8	5.4
1	81366	C031C	SANDSTONE	7.77	0.5	1.8	1.57	0.82	81	0.44	690	0.02	0.06	3.6	20	290	2.07	0.12	0.04	35.9	20.3
1	81367	C031C	SILTSTONE	7.72	0.47	1.64	2.15	0.55	121	0.19	400	0.04	0.07	5	20	360	1.92	0.35	0.11	43.5	13
1	81368	C031C	SANDSTONE	7.25	0.8	7.61	2.17	0.71	1410	0.3	810	0.05	0.08	8.3	10	320	1.66	0.21	0.09	50	17
1	81369	C031C	SILTSTONE	7.78	0.35	1.78	2.33	0.47	184	0.14	610	0.03	0.1	4.2	20	410	1.4	0.48	0.13	52.8	7.9
1	81370	C034C	COAL	3.44	13.45	1.48	0.16	0.3	2110	0.08	120	0.23	14.8	6.6	10	90	1.17	0.31	0.17	25.2	6.2
1	81371	C034C	SILTSTONE	6.06	2.53	1.6	1.17	0.51	323	0.29	320	0.04	0.07	3.6	10	320	1.27	0.36	0.1	54	9.7
1	81372	C034C	SILTSTONE	6.28	8.84	14.55	0.56	0.53	5810	0.11	3760	0.09	0.12	4.8	<10	200	0.71	0.11	0.08	33.8	5.3
1	81373	C034C	SILTSTONE	10.65	0.1	0.31	0.12	0.03	34	0.03	150	0.04	0.22	12.3	10	90	2.74	0.6	0.23	35	6.4
1	81374	C034C	CLAY	8.43	6.5	5.6	1.39	1.01	1430	0.54	590	0.06	0.08	6.2	60	270	1.16	0.17	0.1	41.5	42.8
1	81375	C036C	CLAY	9.13	0.35	4.99	0.55	0.8	254	0.67	260	0.05	0.1	4.2	60	210	1.66	0.36	<0.02	41.6	19.9
1	81376	C036C	CLAY	7.85	0.3	3.71	0.54	0.56	86	0.41	140	0.03	0.12	3.8	60	180	1.33	0.36	0.02	23.7	18.3
1	81377	C036C	CLAYSTONE	7.68	0.02	0.29	0.04	0.02	5	0.06	80	0.01	0.01	0.8	10	90	0.8	0.66	<0.02	4.39	0.7
1	81378	C036C	SANDSTONE	8.68	0.05	0.43	0.96	0.1	39	0.05	110	0.05	0.11	5.7	20	230	3.28	0.73	0.23	98.2	3.2
1	81379	C036C	SILTSTONE	6.76	0.36	3.61	1.45	0.46	519	0.18	440	0.01	0.12	3.1	30	250	2.24	0.47	0.05	29.4	13
1	81380	C036C	SANDSTONE	6.18	4.89	4.78	0.9	0.4	1130	0.14	700	0.04	0.07	61.8	10	240	1.01	0.18	0.16	57.9	20.2
1	81381	C036C	CARB MUDSTONE	5.22	0.56	3.14	0.94	0.54	901	0.35	260	0.19	14.2	9.7	10	220	2.38	0.68	0.5	20.9	46.1
1	81382	C039C	COAL	1.43	0.16	1.54	0.13	0.07	394	0.08	70	0.16	1.83	3.7	30	40	7.04	0.48	0.27	8.32	5.9
1	81383	C039C	SANDSTONE	7.8	0.16	1.48	2.4	0.26	191	0.37	330	0.01	0.07	9.3	10	450	2.07	0.32	0.1	64.1	6.4
1	81384	C039C	SANDSTONE	6.15	0.17	0.45	1.29	0.06	75	0.05	100	0.21	0.03	5.9	10	350	1.18	0.12	0.08	35.9	2.2
1	81386	C039CR	SANDSTONE	4.97	0.03	0.64	1.46	0.07	89	0.06	80	0.01	0.02	3.5	<10	370	1.05	0.07	0.03	33.8	3
1	81387	C039CR	SANDSTONE	4.39	0.02	0.36	0.5	0.06	26	0.03	110	0.02	0.03	2.6	10	470	0.77	0.46	<0.02	70.2	0.8
1	81388	C039CR	SANDSTONE	6.63	0.16	2.5	1.85	0.82	202	0.09	280	<0.01	0.06	3.1	10	480	2.21	0.25	0.06	96.2	7.5
1	81389	C039CR	SANDSTONE	7.6	0.25	4.12	1.79	0.4	420	0.1	210	0.01	0.11	2.4	10	370	2.95	0.6	0.02	74.6	10.8
1	81390	C040C	SANDSTONE	4.44	0.11	3.12	1.54	0.32	407	0.42	180	0.02	0.06	5.5	<10	360	1.15	0.19	0.06	44.4	13.9
1	81391	C040C	SANDSTONE	5.84	6.76	2.43	1.79	0.34	2330	0.49	360	0.01	0.07	9.6	10	320	1.17	0.87	0.05	48.5	10.1
1	81392	C040C	CARB MUDSTONE	5.8	0.21	0.67	0.42	0.05	14	0.07	250	0.02	17.55	4.2	10	190	2.45	0.73	0.23	17	2.7
1	81393	C040CR	CARB MUDSTONE	6.78	0.12	1.17	1.79	0.17	75	0.07	160	0.02	46.3	3.7	20	360	3.26	0.61	0.33	42.9	9.3
1	81394	C040CR	CLAY	3.48	11.9	1.98	0.46	0.3	506	0.26	140	10.35	0.03	<5	20	160	0.66	0.14	<0.02	27.8	10.8
1	81395	C041C	CLAY	7	1.79	4.43	1.08	0.72	644	0.51	290	0.24	0.15	5.8	50	450	1.4	0.29	0.07	57.3	17.8
1	81396	C041C	CLAY	3.38	13	2.12	0.53	0.31	383	0.23	110	11	0.02	<5	20	90	0.65	0.12	0.02	23.3	8.6
1	81397	C041C	CLAYSTONE	7.62	0.2	1.78	0.14	0.17	58	0.27	70	0.03	0.06	2.5	40	390	1.27	0.46	<0.02	8.83	5.6
1	81398	C041C	CLAYSTONE	9.7	0.1	0.77	0.63	0.06	21	0.21	300	0.88	0.09	3.3	20	600	1.33	0.77	<0.02	68.3	1.7
1	81399	C041C	CLAYSTONE	9.22	0.25	0.37	0.57	0.09	61	0.06	220	0.01	0.03	2.4	20	250	1.51	0.59	<0.02	72.8	1.1
1	81400	C041C	CARB MUDSTONE	6.35	0.09	0.34	0.72	0.1	17	0.06	140	0.09	17.5	7.2	<10	220	6.13	0.59	0.56	69.9	15
1	81401	C042C	MUDSTONE	8.62	0.03	0.38	0.99	0.11	24	0.05	90	0.01	10.2	2	20	240	2.42	0.66	0.58	47.5	6.3
1	81402	C042C	MUDSTONE	8.66	0.05	0.58	0.98	0.11	32	0.05	140	0.03	14.9	4.4	20	210	4.8	0.86	0.36	80.7	5.4
1	81403	C042C	MUDSTONE	6.12	0.45	3.35	1.37	0.22	76	0.12	160	0.07	125	4.7	20	260	2.21	0.72	0.17	45.9	5
1	81404	C044C	SANDSTONE	5.88	3.59	3.07	2.06	0.2	927	0.21	340	0.05	0.07	8.3	10	370	1.32	0.22	0.12	27.7	5
1	81405	C044C	SANDSTONE	5.76	0.1	0.66	0.72	0.12	31	0.16	60	0.2	0.16	5.2	10	180	1.03	0.22	0.03	34.3	11
1	81406	C046C	CARB MUDSTONE	8.92	0.06	0.22	0.15	0.04	13	0.09	90	0.03	29.1	1.4	10	60	2.51	0.86	0.13	47.5	1.1
1	81407	C046C	SANDSTONE	4.76	0.05	0.69	0.81	0.1	47	0.06	90	0.03	0.01	2.2	20	190	1.31	0.16	<0.02	72.2	4.5
1	81408	C046C	CARB MUDSTONE	7.45	0.07	0.36	0.17	0.03	11	0.11	240	0.02	26.7	4.3	20	120	2.78	1.02	0.09	21.1	4.5
1	81409	C046C	SANDSTONE	7.72	9.37	2.82	1.38	0.46	1160	0.54	990	0.05	0.05	22.3	10	710	1.39	0.11	0.06	37.8	11.4

Batch #	Sample ID	Site no.	Analyte	Al	Ca	Fe	K	Mg	Mn	Na	P	S	Ag	As	B	Ba	Be	Bi	Cd	Ce	Co
			Units	%	%	%	%	%	ppm	%	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
			Comparative Abundance	7.2	6.6	4.1	2	1.4	770	0.57	670	0.2	0.057	7.7	100	460	2	0.4	0.17	83	14
1	81351	C001C	SANDSTONE																		
1	81352	C0021C	CLAY																		
1	81353	C0021C	SILTSTONE																		
1	81354	C0021C	SANDSTONE																		
1	81355	C0021C	CARB MUDSTONE										5								
1	81356	C024C	CLAY																		
1	81357	C024C	CLAYSTONE																		
1	81358	C024C	CLAYSTONE																		
1	81359	C024C	SANDSTONE																		
1	81360	C024C	CLAY																		
1	81361	C031C	CLAY																		
1	81362	C031C	CLAYSTONE								2					1				2	
1	81363	C031C	SANDSTONE																		
1	81364	C031C	SANDSTONE																		
1	81365	C031C	CLAY																		
1	81366	C031C	SANDSTONE																		
1	81367	C031C	SILTSTONE																		
1	81368	C031C	SANDSTONE																		
1	81369	C031C	SILTSTONE																		
1	81370	C034C	COAL										7								
1	81371	C034C	SILTSTONE																		
1	81372	C034C	SILTSTONE			1			2		1										
1	81373	C034C	SILTSTONE										1								
1	81374	C034C	CLAY																		1
1	81375	C036C	CLAY																		
1	81376	C036C	CLAY																		
1	81377	C036C	CLAYSTONE																		
1	81378	C036C	SANDSTONE																		
1	81379	C036C	SILTSTONE																		
1	81380	C036C	SANDSTONE											2							
1	81381	C036C	CARB MUDSTONE										7								1
1	81382	C039C	COAL										4				1				
1	81383	C039C	SANDSTONE																		
1	81384	C039C	SANDSTONE																		
1	81386	C039CR	SANDSTONE																		
1	81387	C039CR	SANDSTONE																		
1	81388	C039CR	SANDSTONE																		
1	81389	C039CR	SANDSTONE																		
1	81390	C040C	SANDSTONE																		
1	81391	C040C	SANDSTONE						1												
1	81392	C040C	CARB MUDSTONE										7								
1	81393	C040CR	CARB MUDSTONE										9								
1	81394	C040CR	CLAY									4									
1	81395	C041C	CLAY																		
1	81396	C041C	CLAY									5									
1	81397	C041C	CLAYSTONE																		
1	81398	C041C	CLAYSTONE									1									
1	81399	C041C	CLAYSTONE																		
1	81400	C041C	CARB MUDSTONE										7				1		1		
1	81401	C042C	MUDSTONE										6						1		
1	81402	C042C	MUDSTONE										7								
1	81403	C042C	MUDSTONE										10								
1	81404	C044C	SANDSTONE																		
1	81405	C044C	SANDSTONE																		
1	81406	C046C	CARB MUDSTONE										8								
1	81407	C046C	SANDSTONE																		
1	81408	C046C	CARB MUDSTONE										8								
1	81409	C046C	SANDSTONE																		

Batch #	Sample ID	Site no.	Analyte	Cr	Cs	Cu	Ga	Ge	Hf	In	La	Li	Mo	Nb	Ni	Pb	Rb	Re	Sb	Sc	Se
			Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
			Comparative Abundance	72	72	33	18	1.7	2.5	0.044	41	56	2	13	52	19	135	0.0004	1.2	10	0.42
1	81351	C001C	SANDSTONE																		
1	81352	C0021C	CLAY																		1
1	81353	C0021C	SILTSTONE																		1
1	81354	C0021C	SANDSTONE																		
1	81355	C0021C	CARB MUDSTONE															1			
1	81356	C024C	CLAY																		1
1	81357	C024C	CLAYSTONE																		1
1	81358	C024C	CLAYSTONE						1									1			2
1	81359	C024C	SANDSTONE																		
1	81360	C024C	CLAY																		
1	81361	C031C	CLAY																		
1	81362	C031C	CLAYSTONE								2					1		2			2
1	81363	C031C	SANDSTONE																		
1	81364	C031C	SANDSTONE															2			1
1	81365	C031C	CLAY																		1
1	81366	C031C	SANDSTONE																		
1	81367	C031C	SILTSTONE															1			1
1	81368	C031C	SANDSTONE															1			
1	81369	C031C	SILTSTONE																		1
1	81370	C034C	COAL															2			
1	81371	C034C	SILTSTONE																		
1	81372	C034C	SILTSTONE			1															
1	81373	C034C	SILTSTONE			1			1	1											2
1	81374	C034C	CLAY																		
1	81375	C036C	CLAY																		1
1	81376	C036C	CLAY																		
1	81377	C036C	CLAYSTONE																		
1	81378	C036C	SANDSTONE																		1
1	81379	C036C	SILTSTONE																		
1	81380	C036C	SANDSTONE																		1
1	81381	C036C	CARB MUDSTONE															2			1
1	81382	C039C	COAL					1										2	1		
1	81383	C039C	SANDSTONE																		1
1	81384	C039C	SANDSTONE																		
1	81386	C039CR	SANDSTONE																		
1	81387	C039CR	SANDSTONE																		
1	81388	C039CR	SANDSTONE																		1
1	81389	C039CR	SANDSTONE																		1
1	81390	C040C	SANDSTONE																		
1	81391	C040C	SANDSTONE																		
1	81392	C040C	CARB MUDSTONE							1								1			1
1	81393	C040CR	CARB MUDSTONE															1			1
1	81394	C040CR	CLAY																		
1	81395	C041C	CLAY																		1
1	81396	C041C	CLAY																		
1	81397	C041C	CLAYSTONE																		
1	81398	C041C	CLAYSTONE																		1
1	81399	C041C	CLAYSTONE																		1
1	81400	C041C	CARB MUDSTONE															3			1
1	81401	C042C	MUDSTONE															1			
1	81402	C042C	MUDSTONE															1			1
1	81403	C042C	MUDSTONE																		
1	81404	C044C	SANDSTONE																		
1	81405	C044C	SANDSTONE																		
1	81406	C046C	CARB MUDSTONE																		1
1	81407	C046C	SANDSTONE																		
1	81408	C046C	CARB MUDSTONE							1											
1	81409	C046C	SANDSTONE																		

Batch #	Sample ID	Site no.	Analyte	Sn	Sr	Ta	Te	Th	Ti	Tl	U	V	W	Y	Zn	Zr	Hg	F	C
			Units	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	%
			Comparative Abundance	4.6	320	1.5	0.005	9.6	0.38	0.95	3.1	105	1.7	40	95	150	0.19	640	2.94
1	81351	C001C	SANDSTONE										1						
1	81352	C0021C	CLAY																
1	81353	C0021C	SILTSTONE																
1	81354	C0021C	SANDSTONE																
1	81355	C0021C	CARB MUDSTONE				2												
1	81356	C024C	CLAY				2												
1	81357	C024C	CLAYSTONE				4												
1	81358	C024C	CLAYSTONE				4												
1	81359	C024C	SANDSTONE																
1	81360	C024C	CLAY																
1	81361	C031C	CLAY				3												
1	81362	C031C	CLAYSTONE		2		3												
1	81363	C031C	SANDSTONE																
1	81364	C031C	SANDSTONE																
1	81365	C031C	CLAY				3												
1	81366	C031C	SANDSTONE																
1	81367	C031C	SILTSTONE				3												
1	81368	C031C	SANDSTONE																
1	81369	C031C	SILTSTONE				3												
1	81370	C034C	COAL				4												
1	81371	C034C	SILTSTONE																
1	81372	C034C	SILTSTONE				2												
1	81373	C034C	SILTSTONE				4												
1	81374	C034C	CLAY																
1	81375	C036C	CLAY																
1	81376	C036C	CLAY																
1	81377	C036C	CLAYSTONE				6												
1	81378	C036C	SANDSTONE				3												
1	81379	C036C	SILTSTONE				3												
1	81380	C036C	SANDSTONE																
1	81381	C036C	CARB MUDSTONE				4												
1	81382	C039C	COAL				4												
1	81383	C039C	SANDSTONE																
1	81384	C039C	SANDSTONE																
1	81386	C039CR	SANDSTONE																
1	81387	C039CR	SANDSTONE																
1	81388	C039CR	SANDSTONE				3												
1	81389	C039CR	SANDSTONE																
1	81390	C040C	SANDSTONE																
1	81391	C040C	SANDSTONE																
1	81392	C040C	CARB MUDSTONE				5												
1	81393	C040CR	CARB MUDSTONE				4												
1	81394	C040CR	CLAY																
1	81395	C041C	CLAY		1														
1	81396	C041C	CLAY																
1	81397	C041C	CLAYSTONE																
1	81398	C041C	CLAYSTONE										1						
1	81399	C041C	CLAYSTONE																
1	81400	C041C	CARB MUDSTONE				4												
1	81401	C042C	MUDSTONE				4												
1	81402	C042C	MUDSTONE				5												
1	81403	C042C	MUDSTONE				4												
1	81404	C044C	SANDSTONE				2												
1	81405	C044C	SANDSTONE																
1	81406	C046C	CARB MUDSTONE				4												
1	81407	C046C	SANDSTONE																
1	81408	C046C	CARB MUDSTONE				4						1						
1	81409	C046C	SANDSTONE																

Batch #	Sample ID	Site no.	Analyte	Al	Ca	Fe	K	Mg	Mn	Na	P	S	Ag	As	B	Ba	Be	Bi	Cd	Ce	Co
			Units	%	%	%	%	%	ppm	%	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
			Comparative Abundance	7.2	6.6	4.1	2	1.4	770	0.57	670	0.2	0.057	7.7	100	460	2	0.4	0.17	83	14
1	81410	C046C	SANDSTONE																		
1	81411	C046C	SILTSTONE																		
1	81413	C048C	SANDSTONE																		
1	81414	C048C	SILTSTONE																		
1	81415	C048C	CARB MUDSTONE										5								
1	81416	C048C	SILTSTONE																		
1	81417	C048C	SILTSTONE																		
1	81418	C048C	SILTSTONE																		
1	81419	C048C	SANDSTONE																		
1	81420	C048C	CARB MUDSTONE										7								
1	81421	C048C	SANDSTONE																		
1	81423	C048C	SANDSTONE																		
1	81424	C048C	SANDSTONE																		
1	81425	C048C	SANDSTONE																		
1	81426	C048C	SANDSTONE																		
1	81427	C048C	SANDSTONE																		
1	81428	C048C	SANDSTONE																		
1	81430	C048C	SANDSTONE																		
1	81431	C048C	SANDSTONE																		
1	81432	C048C	CARB MUDSTONE										6								
1	81433	C048C	INTERBEDDED SANDSTONE AND SILTSTONE																		
1	81434	C048C	SILTSTONE																		
1	81435	C048C	SANDSTONE																		
1	81436	C048C	SANDSTONE																		
1	81437	C048C	SANDSTONE																		
1	81438	C048C	INTERBEDDED CARB MUDSTONE AND TUFF																		
1	81439	C048C	INTERBEDDED CARB MUDSTONE AND TUFF																		
1	81440	C048C	CARB MUDSTONE										5								
1	81441	C048C	SANDSTONE																		
1	81443	C048C	SANDSTONE																		
1	81444	C048C	SANDSTONE																		
1	81445	C056C	CARB MUDSTONE										8								
1	81446	C056C	SILTSTONE																		
1	81447	C056C	SILTSTONE																		
1	81448	C056C	SILTSTONE																		
1	81449	C056C	CLAY																		
1	81450	C056C	CLAYSTONE																		
1	81451	C056C	SANDSTONE										1								
1	81452	C180004CQ	CLAYSTONE											1							
1	81453	C180004CQ	CLAYSTONE																		
1	81454	C180004CQ	SANDSTONE													1					
1	81455	C180004CQ	CARB MUDSTONE										7								
2	169619	C180004CQ	SANDSTONE																		
2	169624	C180004CQ	SANDSTONE																		
2	169633	C180004CQ	SANDSTONE																		
2	169634	C180004CQ	SANDSTONE																		
2	182769	C180007CQ	SANDSTONE																		
2	154036	C675CQ	SANDSTONE																		
2	154038	C675CQ	SANDSTONE																		
2	154041	C675CQ	CARB MUDSTONE																		
2	154043	C675CQ	SILTSTONE																		
2	147657	C675CQ	SILTSTONE															1			
2	GT147150	C9532CQR	CLAYSTONE																		
2	182752	C180007CQ	SILTSTONE																		
2	182755	C180007CQ	SILTSTONE																		
2	182767	C180007CQ	SANDSTONE																		
2	169915	C339G	SANDY CLAY																		
2	170286	C607CQ	CLAYSTONE																		

Batch #	Sample ID	Site no.	Analyte	Cr	Cs	Cu	Ga	Ge	Hf	In	La	Li	Mo	Nb	Ni	Pb	Rb	Re	Sb	Sc	Se
			Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
			Comparative Abundance	72	72	33	18	1.7	2.5	0.044	41	56	2	13	52	19	135	0.0004	1.2	10	0.42
1	81410	C046C	SANDSTONE																		
1	81411	C046C	SILTSTONE																		
1	81413	C048C	SANDSTONE																		
1	81414	C048C	SILTSTONE																		
1	81415	C048C	CARB MUDSTONE																		
1	81416	C048C	SILTSTONE																		
1	81417	C048C	SILTSTONE																		
1	81418	C048C	SILTSTONE																		
1	81419	C048C	SANDSTONE																		
1	81420	C048C	CARB MUDSTONE															2			
1	81421	C048C	SANDSTONE																		
1	81423	C048C	SANDSTONE																		
1	81424	C048C	SANDSTONE																		
1	81425	C048C	SANDSTONE																		
1	81426	C048C	SANDSTONE																		
1	81427	C048C	SANDSTONE																		
1	81428	C048C	SANDSTONE																		
1	81430	C048C	SANDSTONE																		
1	81431	C048C	SANDSTONE																		
1	81432	C048C	CARB MUDSTONE															2			1
1	81433	C048C	INTERBEDDED SANDSTONE AND SILTSTONE																		
1	81434	C048C	SILTSTONE																		1
1	81435	C048C	SANDSTONE																		
1	81436	C048C	SANDSTONE																		
1	81437	C048C	SANDSTONE																		
1	81438	C048C	INTERBEDDED CARB MUDSTONE AND TUFF															1			1
1	81439	C048C	INTERBEDDED CARB MUDSTONE AND TUFF															1			1
1	81440	C048C	CARB MUDSTONE																		
1	81441	C048C	SANDSTONE																		
1	81443	C048C	SANDSTONE																		
1	81444	C048C	SANDSTONE																		
1	81445	C056C	CARB MUDSTONE							1											1
1	81446	C056C	SILTSTONE															1			1
1	81447	C056C	SILTSTONE															1			1
1	81448	C056C	SILTSTONE																		
1	81449	C056C	CLAY																		
1	81450	C056C	CLAYSTONE																		
1	81451	C056C	SANDSTONE																		
1	81452	C180004CQ	CLAYSTONE																		
1	81453	C180004CQ	CLAYSTONE																		
1	81454	C180004CQ	SANDSTONE															1			
1	81455	C180004CQ	CARB MUDSTONE																		
2	169619	C180004CQ	SANDSTONE															1			1
2	169624	C180004CQ	SANDSTONE															1			
2	169633	C180004CQ	SANDSTONE																		
2	169634	C180004CQ	SANDSTONE																		
2	182769	C180007CQ	SANDSTONE																		
2	154036	C675CQ	SANDSTONE																		
2	154038	C675CQ	SANDSTONE																		
2	154041	C675CQ	CARB MUDSTONE															1			
2	154043	C675CQ	SILTSTONE															1			1
2	147657	C675CQ	SILTSTONE						1	1						1		1			2
2	GT147150	C9532CQR	CLAYSTONE																		1
2	182752	C180007CQ	SILTSTONE															1			1
2	182755	C180007CQ	SILTSTONE															1			
2	182767	C180007CQ	SANDSTONE																		
2	169915	C339G	SANDY CLAY															1			
2	170286	C607CQ	CLAYSTONE																		

Batch #	Sample ID	Site no.	Analyte	Sn	Sr	Ta	Te	Th	Ti	Tl	U	V	W	Y	Zn	Zr	Hg	F	C
			Units	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	%
			Comparative Abundance	4.6	320	1.5	0.005	9.6	0.38	0.95	3.1	105	1.7	40	95	150	0.19	640	2.94
1	81410	C046C	SANDSTONE																
1	81411	C046C	SILTSTONE				3												
1	81413	C048C	SANDSTONE																
1	81414	C048C	SILTSTONE				3												
1	81415	C048C	CARB MUDSTONE				2												
1	81416	C048C	SILTSTONE				2												
1	81417	C048C	SILTSTONE				3												
1	81418	C048C	SILTSTONE				3												
1	81419	C048C	SANDSTONE																
1	81420	C048C	CARB MUDSTONE				4												
1	81421	C048C	SANDSTONE																
1	81423	C048C	SANDSTONE																
1	81424	C048C	SANDSTONE																
1	81425	C048C	SANDSTONE																
1	81426	C048C	SANDSTONE																
1	81427	C048C	SANDSTONE																
1	81428	C048C	SANDSTONE																
1	81430	C048C	SANDSTONE																
1	81431	C048C	SANDSTONE																
1	81432	C048C	CARB MUDSTONE				2												
1	81433	C048C	INTERBEDDED SANDSTONE AND SILTSTONE																
1	81434	C048C	SILTSTONE				3												
1	81435	C048C	SANDSTONE																
1	81436	C048C	SANDSTONE																
1	81437	C048C	SANDSTONE																
1	81438	C048C	INTERBEDDED CARB MUDSTONE AND TUFF				3												
1	81439	C048C	INTERBEDDED CARB MUDSTONE AND TUFF				2												
1	81440	C048C	CARB MUDSTONE				3												
1	81441	C048C	SANDSTONE																
1	81443	C048C	SANDSTONE																
1	81444	C048C	SANDSTONE																
1	81445	C056C	CARB MUDSTONE				4												
1	81446	C056C	SILTSTONE				2												
1	81447	C056C	SILTSTONE				2												
1	81448	C056C	SILTSTONE																
1	81449	C056C	CLAY																
1	81450	C056C	CLAYSTONE																
1	81451	C056C	SANDSTONE																
1	81452	C180004CQ	CLAYSTONE				3												
1	81453	C180004CQ	CLAYSTONE				3												
1	81454	C180004CQ	SANDSTONE																
1	81455	C180004CQ	CARB MUDSTONE				4												
2	169619	C180004CQ	SANDSTONE				2												
2	169624	C180004CQ	SANDSTONE																
2	169633	C180004CQ	SANDSTONE																
2	169634	C180004CQ	SANDSTONE				2												
2	182769	C180007CQ	SANDSTONE																
2	154036	C675CQ	SANDSTONE				3												
2	154038	C675CQ	SANDSTONE																
2	154041	C675CQ	CARB MUDSTONE				3												
2	154043	C675CQ	SILTSTONE				3												
2	147657	C675CQ	SILTSTONE				4				1								
2	GT147150	C9532CQR	CLAYSTONE				3												
2	182752	C180007CQ	SILTSTONE				3												
2	182755	C180007CQ	SILTSTONE				3												
2	182767	C180007CQ	SANDSTONE																
2	169915	C339G	SANDY CLAY				3												
2	170286	C607CQ	CLAYSTONE				3												

Batch #	Sample ID	Site no.	Analyte	Al	Ca	Fe	K	Mg	Mn	Na	P	S	Ag	As	B	Ba	Be	Bi	Cd	Ce	Co
			Units	%	%	%	%	%	ppm	%	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
			Comparative Abundance	7.2	6.6	4.1	2	1.4	770	0.57	670	0.2	0.057	7.7	100	460	2	0.4	0.17	83	14
2	170288	C607CQ	SILTSTONE																		
2	170294	C607CQ	SANDSTONE										1					1			
2	177670	C669CQ	SILTSTONE											1							
2	GT148409	C9672CQR	TUFF																		
2	GT148411	C9672CQR	SANDSTONE																		
2	GT148425	C9672CQR	SILTSTONE																		
2	GT147596	C541CQ	SILTSTONE																		
2	GT152519	C541CQ	CARB SANDSTONE																		
2	170109	C544CQ	SILTSTONE																		
2	170269	C544CQ	SANDSTONE									2		2							
2	204851	C696CQ	SANDSTONE																		
2	204852	C696CQ	CLAYSTONE																		
2	152622	C9180012CQR	SANDSTONE																		
2	169716	C9419CQR	TUFF		1				2												
2	81710	C9673CQR	SANDSTONE																		
2	176524	C99438CQR	SANDSTONE																		
2	176526	C99438CQR	SANDSTONE																		
2	177679	C670CQ	SANDSTONE																		
2	177697	C670CQ	SILTSTONE																		
2	148395	C9180009CQR	SANDSTONE																		
2	GT148355	C9380CQR	SILTSTONE																		
2	GT148361	C9380CQR	CARB MUDSTONE																		1
2	GT148362	C9380CQR	CARB MUDSTONE																		
2	GT148371	C9380CQR	SANDSTONE																		
2	GT175913	C9404CQR	CLAYSTONE																		
2	GT175924	C9404CQR	SANDSTONE																		
2	GT175931	C9404CQR	CARB SILTSTONE																		
2	GT175932	C9404CQR	CARB SILTSTONE																		
2	GT175941	C9404CQR	SANDSTONE																		
2	147473	C088CQ	SANDSTONE																		
2	147482	C088CQ	SILTSTONE																		
2	147487	C088CQ	SANDSTONE																		
2	147489	C088CQ	SANDSTONE																		
2	154255	C122CQ	SANDSTONE																		
2	176506	C545CQ	SILTSTONE																		
2	176514	C545CQ	SANDSTONE						1												
2	154022	C674CQ	TUFF																		
2	154024	C674CQ	CARB MUDSTONE																		
2	148390	C9180009CQR	SANDSTONE																		
2	148393	C9180009CQR	SANDSTONE																		
2	153302	C099CQ	SANDSTONE																		
2	153304	C099CQ	SANDSTONE																		
2	153308	C099CQ	SANDSTONE																		
2	153313	C099CQ	SANDSTONE																		
2	153317	C099CQ	SANDSTONE											1							
2	154260	C122CQ	SANDSTONE																		
2	154263	C122CQ	SANDSTONE																		
2	154266	C122CQ	SANDSTONE																		
2	154269	C122CQ	SANDSTONE																		
2	154271	C122CQ	SANDSTONE																		
2	153327	C165CQ	SANDSTONE																		
2	153330	C165CQ	SANDSTONE																		
2	152614	C180012CQ	SANDSTONE																		
2	152617	C180012CQ	SANDSTONE																		
2	175912	C522CQ	SANDSTONE																		
2	GT169952	C671CQ	SANDSTONE										2	1							
2	GT169953	C671CQ	TUFF																		
2	GT169957	C671CQ	MUDSTONE																		

Batch #	Sample ID	Site no.	Analyte	Cr	Cs	Cu	Ga	Ge	Hf	In	La	Li	Mo	Nb	Ni	Pb	Rb	Re	Sb	Sc	Se
			Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
			Comparative Abundance	72	72	33	18	1.7	2.5	0.044	41	56	2	13	52	19	135	0.0004	1.2	10	0.42
2	170288	C607CQ	SILTSTONE															1			1
2	170294	C607CQ	SANDSTONE						1	1						1					1
2	177670	C669CQ	SILTSTONE															1			1
2	GT148409	C9672CQR	TUFF															1			
2	GT148411	C9672CQR	SANDSTONE																		
2	GT148425	C9672CQR	SILTSTONE															1			1
2	GT147596	C541CQ	SILTSTONE															1			
2	GT152519	C541CQ	CARB SANDSTONE							1											2
2	170109	C544CQ	SILTSTONE															1			
2	170269	C544CQ	SANDSTONE																		
2	204851	C696CQ	SANDSTONE															1			
2	204852	C696CQ	CLAYSTONE															1			
2	152622	C9180012CQR	SANDSTONE																		
2	169716	C9419CQR	TUFF															1			
2	81710	C9673CQR	SANDSTONE																		
2	176524	C99438CQR	SANDSTONE																		
2	176526	C99438CQR	SANDSTONE																		
2	177679	C670CQ	SANDSTONE																		
2	177697	C670CQ	SILTSTONE										1					1			1
2	148395	C9180009CQR	SANDSTONE																		
2	GT148355	C9380CQR	SILTSTONE															1			
2	GT148361	C9380CQR	CARB MUDSTONE			1				1								1			2
2	GT148362	C9380CQR	CARB MUDSTONE															2			
2	GT148371	C9380CQR	SANDSTONE																		
2	GT175913	C9404CQR	CLAYSTONE																		
2	GT175924	C9404CQR	SANDSTONE															2			
2	GT175931	C9404CQR	CARB SILTSTONE															2			
2	GT175932	C9404CQR	CARB SILTSTONE															1			
2	GT175941	C9404CQR	SANDSTONE																		
2	147473	C088CQ	SANDSTONE																		
2	147482	C088CQ	SILTSTONE																		
2	147487	C088CQ	SANDSTONE																		
2	147489	C088CQ	SANDSTONE																		
2	154255	C122CQ	SANDSTONE																		
2	176506	C545CQ	SILTSTONE																		
2	176514	C545CQ	SANDSTONE																		
2	154022	C674CQ	TUFF																		
2	154024	C674CQ	CARB MUDSTONE															2			
2	148390	C9180009CQR	SANDSTONE															3			
2	148393	C9180009CQR	SANDSTONE															1			
2	153302	C099CQ	SANDSTONE																		
2	153304	C099CQ	SANDSTONE																		
2	153308	C099CQ	SANDSTONE																		
2	153313	C099CQ	SANDSTONE																		
2	153317	C099CQ	SANDSTONE																		
2	154260	C122CQ	SANDSTONE																		
2	154263	C122CQ	SANDSTONE																		
2	154266	C122CQ	SANDSTONE																		
2	154269	C122CQ	SANDSTONE																		
2	154271	C122CQ	SANDSTONE																		
2	153327	C165CQ	SANDSTONE																		
2	153330	C165CQ	SANDSTONE																		
2	152614	C180012CQ	SANDSTONE																		
2	152617	C180012CQ	SANDSTONE																		
2	175912	C522CQ	SANDSTONE																		
2	GT169952	C671CQ	SANDSTONE															3			
2	GT169953	C671CQ	TUFF															1			
2	GT169957	C671CQ	MUDSTONE																		

Batch #	Sample ID	Site no.	Analyte	Sn	Sr	Ta	Te	Th	Ti	Tl	U	V	W	Y	Zn	Zr	Hg	F	C
			Units	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	%
			Comparative Abundance	4.6	320	1.5	0.005	9.6	0.38	0.95	3.1	105	1.7	40	95	150	0.19	640	2.94
2	170288	C607CQ	SILTSTONE				4												
2	170294	C607CQ	SANDSTONE				3				1								
2	177670	C669CQ	SILTSTONE				2												
2	GT148409	C9672CQR	TUFF																
2	GT148411	C9672CQR	SANDSTONE				2												
2	GT148425	C9672CQR	SILTSTONE				3												
2	GT147596	C541CQ	SILTSTONE				2												
2	GT152519	C541CQ	CARB SANDSTONE				4												
2	170109	C544CQ	SILTSTONE				3												
2	170269	C544CQ	SANDSTONE							1									
2	204851	C696CQ	SANDSTONE																
2	204852	C696CQ	CLAYSTONE				3												
2	152622	C9180012CQR	SANDSTONE				2												
2	169716	C9419CQR	TUFF															1	
2	81710	C9673CQR	SANDSTONE																
2	176524	C99438CQR	SANDSTONE																
2	176526	C99438CQR	SANDSTONE																
2	177679	C670CQ	SANDSTONE																
2	177697	C670CQ	SILTSTONE				3												
2	148395	C9180009CQR	SANDSTONE																
2	GT148355	C9380CQR	SILTSTONE				3												
2	GT148361	C9380CQR	CARB MUDSTONE				5												
2	GT148362	C9380CQR	CARB MUDSTONE				3												2
2	GT148371	C9380CQR	SANDSTONE																
2	GT175913	C9404CQR	CLAYSTONE				2												
2	GT175924	C9404CQR	SANDSTONE				3												
2	GT175931	C9404CQR	CARB SILTSTONE				4												2
2	GT175932	C9404CQR	CARB SILTSTONE				3												3
2	GT175941	C9404CQR	SANDSTONE																
2	147473	C088CQ	SANDSTONE																
2	147482	C088CQ	SILTSTONE																
2	147487	C088CQ	SANDSTONE																
2	147489	C088CQ	SANDSTONE																
2	154255	C122CQ	SANDSTONE																
2	176506	C545CQ	SILTSTONE				3												
2	176514	C545CQ	SANDSTONE																
2	154022	C674CQ	TUFF																
2	154024	C674CQ	CARB MUDSTONE				3												2
2	148390	C9180009CQR	SANDSTONE																
2	148393	C9180009CQR	SANDSTONE																
2	153302	C099CQ	SANDSTONE				2												
2	153304	C099CQ	SANDSTONE																
2	153308	C099CQ	SANDSTONE																
2	153313	C099CQ	SANDSTONE				3												
2	153317	C099CQ	SANDSTONE																
2	154260	C122CQ	SANDSTONE																
2	154263	C122CQ	SANDSTONE																
2	154266	C122CQ	SANDSTONE																
2	154269	C122CQ	SANDSTONE																
2	154271	C122CQ	SANDSTONE																
2	153327	C165CQ	SANDSTONE																
2	153330	C165CQ	SANDSTONE																
2	152614	C180012CQ	SANDSTONE																
2	152617	C180012CQ	SANDSTONE																
2	175912	C522CQ	SANDSTONE																
2	GT169952	C671CQ	SANDSTONE																
2	GT169953	C671CQ	TUFF																
2	GT169957	C671CQ	MUDSTONE				2												

Batch #	Sample ID	Site no.	Analyte	Al	Ca	Fe	K	Mg	Mn	Na	P	S	Ag	As	B	Ba	Be	Bi	Cd	Ce	Co
			Units	%	%	%	%	%	ppm	%	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
			Comparative Abundance	7.2	6.6	4.1	2	1.4	770	0.57	670	0.2	0.057	7.7	100	460	2	0.4	0.17	83	14
2	GT169958	C671CQ	SANDSTONE										1								
2	153337	C99204CQR	SILTSTONE																		
2	170107	C544CQ	SANDSTONE																		
2	GT148407	C9672CQR	SANDSTONE																		
2	GT148412	C9672CQR	SILTSTONE																		
2	GT148413	C9672CQR	SANDSTONE																		
2	GT148416	C9672CQR	MUDSTONE																		
2	GT148420	C9672CQR	SANDSTONE																		
2	GT148421	C9672CQR	SANDSTONE																		
2	176529	C99438CQR	SANDSTONE																		
2	176531	C99438CQR	SANDSTONE																		
2	176534	C99438CQR	SANDSTONE																		
2	172101	C412CQ	TUFF																		
2	172108	C412CQ	SANDSTONE																		
2	172109	C412CQ	SILTSTONE																		
2	170112	C544CQ	SANDSTONE																		
2	170251	C544CQ	SANDSTONE																		
2	170254	C544CQ	SILTSTONE																		
2	170263	C544CQ	SANDSTONE																		
2	154017	C674CQ	CLAYSTONE																		
2	154021	C674CQ	SANDSTONE																		
2	154032	C674CQ	SILTSTONE																		
2	169701	C9419CQR	SANDSTONE																		
2	169703	C9419CQR	SILTSTONE																		
2	169704	C9419CQR	SANDSTONE																		
2	169707	C9419CQR	SANDSTONE																		1
2	169713	C9419CQR	SILTSTONE																		
2	169714	C9419CQR	SANDSTONE																		
2	169715	C9419CQR	SHALE																		
2	169718	C9419CQR	SHALE																		
2	170274	C99130CQR	SILTSTONE																		
2	154272	C361CQ	CLAYSTONE																		
2	154273	C361CQ	SANDSTONE																		
2	154275	C361CQ	SILTSTONE																		
2	154280	C361CQ	SANDSTONE																		
2	154281	C361CQ	CARB MUDSTONE																		
2	169723	C9419CQR	SILTSTONE																		
2	169727	C9419CQR	SANDSTONE																		
2	169728	C9419CQR	SILTSTONE																		
2	169729	C9419CQR	SANDSTONE																		
2	169730	C9419CQR	SANDSTONE																		
2	169736	C9419CQR	SILTSTONE																		
2	154284	C361CQ	SANDSTONE																		
2	154285	C361CQ	SANDSTONE											1							
2	154288	C361CQ	MUDSTONE																		
2	154290	C361CQ	SILTSTONE																		
2	154293	C361CQ	SANDSTONE																		
2	154295	C361CQ	CARB SANDSTONE																		
2	154296	C361CQ	SANDSTONE																		
2	182651	C9180007CQR	SILTSTONE																1		
2	81702	C9673CQR	SILTSTONE																		
2	81706	C9673CQR	SANDSTONE																		
2	81712	C9673CQR	SANDSTONE																		
2	177990	C99139CQR	SANDSTONE																		
2	152620	C9180012CQR	SANDSTONE																		
2	152624	C9180012CQR	SANDSTONE																		
2	GT148353	C9380CQR	SANDSTONE																		
2	GT148360	C9380CQR	SILTSTONE																		

Batch #	Sample ID	Site no.	Analyte	Cr	Cs	Cu	Ga	Ge	Hf	In	La	Li	Mo	Nb	Ni	Pb	Rb	Re	Sb	Sc	Se
			Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
			Comparative Abundance	72	72	33	18	1.7	2.5	0.044	41	56	2	13	52	19	135	0.0004	1.2	10	0.42
2	GT169958	C671CQ	SANDSTONE																		
2	153337	C99204CQR	SILTSTONE															1			
2	170107	C544CQ	SANDSTONE																		
2	GT148407	C9672CQR	SANDSTONE																		
2	GT148412	C9672CQR	SILTSTONE															1			
2	GT148413	C9672CQR	SANDSTONE																		
2	GT148416	C9672CQR	MUDSTONE															1			
2	GT148420	C9672CQR	SANDSTONE																		
2	GT148421	C9672CQR	SANDSTONE															1			
2	176529	C99438CQR	SANDSTONE															1			
2	176531	C99438CQR	SANDSTONE																		
2	176534	C99438CQR	SANDSTONE																		1
2	172101	C412CQ	TUFF																		
2	172108	C412CQ	SANDSTONE															1			
2	172109	C412CQ	SILTSTONE															1			
2	170112	C544CQ	SANDSTONE															1			
2	170251	C544CQ	SANDSTONE																		
2	170254	C544CQ	SILTSTONE															1			
2	170263	C544CQ	SANDSTONE															1			
2	154017	C674CQ	CLAYSTONE															1			
2	154021	C674CQ	SANDSTONE															1			
2	154032	C674CQ	SILTSTONE															1			
2	169701	C9419CQR	SANDSTONE															1			
2	169703	C9419CQR	SILTSTONE																		
2	169704	C9419CQR	SANDSTONE															2			
2	169707	C9419CQR	SANDSTONE						1							1					1
2	169713	C9419CQR	SILTSTONE															1			
2	169714	C9419CQR	SANDSTONE															2			
2	169715	C9419CQR	SHALE															2			
2	169718	C9419CQR	SHALE															1			
2	170274	C99130CQR	SILTSTONE						1												
2	154272	C361CQ	CLAYSTONE															1			
2	154273	C361CQ	SANDSTONE															1			
2	154275	C361CQ	SILTSTONE															1			
2	154280	C361CQ	SANDSTONE															1			
2	154281	C361CQ	CARB MUDSTONE															1			
2	169723	C9419CQR	SILTSTONE																		
2	169727	C9419CQR	SANDSTONE															1			
2	169728	C9419CQR	SILTSTONE															1			
2	169729	C9419CQR	SANDSTONE																		
2	169730	C9419CQR	SANDSTONE																		1
2	169736	C9419CQR	SILTSTONE															1			
2	154284	C361CQ	SANDSTONE															1			
2	154285	C361CQ	SANDSTONE															1			
2	154288	C361CQ	MUDSTONE															1			1
2	154290	C361CQ	SILTSTONE															1			
2	154293	C361CQ	SANDSTONE																		
2	154295	C361CQ	CARB SANDSTONE								1							1			1
2	154296	C361CQ	SANDSTONE																		
2	182651	C9180007CQR	SILTSTONE															2			
2	81702	C9673CQR	SILTSTONE															1			
2	81706	C9673CQR	SANDSTONE															1			
2	81712	C9673CQR	SANDSTONE																		
2	177990	C99139CQR	SANDSTONE																		
2	152620	C9180012CQR	SANDSTONE																		
2	152624	C9180012CQR	SANDSTONE															1			
2	GT148353	C9380CQR	SANDSTONE															1			
2	GT148360	C9380CQR	SILTSTONE															1			

Batch #	Sample ID	Site no.	Analyte	Sn	Sr	Ta	Te	Th	Ti	Tl	U	V	W	Y	Zn	Zr	Hg	F	C
			Units	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	%
			Comparative Abundance	4.6	320	1.5	0.005	9.6	0.38	0.95	3.1	105	1.7	40	95	150	0.19	640	2.94
2	GT169958	C671CQ	SANDSTONE																
2	153337	C99204CQR	SILTSTONE				4												
2	170107	C544CQ	SANDSTONE				3												
2	GT148407	C9672CQR	SANDSTONE				2												
2	GT148412	C9672CQR	SILTSTONE																
2	GT148413	C9672CQR	SANDSTONE				3												
2	GT148416	C9672CQR	MUDSTONE				3												
2	GT148420	C9672CQR	SANDSTONE																
2	GT148421	C9672CQR	SANDSTONE																
2	176529	C99438CQR	SANDSTONE																
2	176531	C99438CQR	SANDSTONE																
2	176534	C99438CQR	SANDSTONE				3												
2	172101	C412CQ	TUFF				3												
2	172108	C412CQ	SANDSTONE																
2	172109	C412CQ	SILTSTONE				2												
2	170112	C544CQ	SANDSTONE				3												
2	170251	C544CQ	SANDSTONE																
2	170254	C544CQ	SILTSTONE				3												
2	170263	C544CQ	SANDSTONE																
2	154017	C674CQ	CLAYSTONE				3												
2	154021	C674CQ	SANDSTONE				3												
2	154032	C674CQ	SILTSTONE				4												
2	169701	C9419CQR	SANDSTONE				3												
2	169703	C9419CQR	SILTSTONE				3												
2	169704	C9419CQR	SANDSTONE				3												
2	169707	C9419CQR	SANDSTONE				5				2								
2	169713	C9419CQR	SILTSTONE																
2	169714	C9419CQR	SANDSTONE				3												
2	169715	C9419CQR	SHALE				4												
2	169718	C9419CQR	SHALE				2												
2	170274	C99130CQR	SILTSTONE				4												
2	154272	C361CQ	CLAYSTONE				3												
2	154273	C361CQ	SANDSTONE				3												
2	154275	C361CQ	SILTSTONE				3												
2	154280	C361CQ	SANDSTONE				4												
2	154281	C361CQ	CARB MUDSTONE				3												
2	169723	C9419CQR	SILTSTONE																
2	169727	C9419CQR	SANDSTONE				4												
2	169728	C9419CQR	SILTSTONE				2												
2	169729	C9419CQR	SANDSTONE																
2	169730	C9419CQR	SANDSTONE				3												
2	169736	C9419CQR	SILTSTONE																
2	154284	C361CQ	SANDSTONE																
2	154285	C361CQ	SANDSTONE				3												
2	154288	C361CQ	MUDSTONE				3												
2	154290	C361CQ	SILTSTONE																
2	154293	C361CQ	SANDSTONE																
2	154295	C361CQ	CARB SANDSTONE																
2	154296	C361CQ	SANDSTONE																
2	182651	C9180007CQR	SILTSTONE				4								1				
2	81702	C9673CQR	SILTSTONE																
2	81706	C9673CQR	SANDSTONE				3												
2	81712	C9673CQR	SANDSTONE																
2	177990	C99139CQR	SANDSTONE																
2	152620	C9180012CQR	SANDSTONE																
2	152624	C9180012CQR	SANDSTONE				3												
2	GT148353	C9380CQR	SANDSTONE				4												
2	GT148360	C9380CQR	SILTSTONE				4												

Batch #	Sample ID	Site no.	Analyte	Al	Ca	Fe	K	Mg	Mn	Na	P	S	Ag	As	B	Ba	Be	Bi	Cd	Ce	Co
			Units	%	%	%	%	%	ppm	%	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
			Comparative Abundance	7.2	6.6	4.1	2	1.4	770	0.57	670	0.2	0.057	7.7	100	460	2	0.4	0.17	83	14
2	GT148363	C9380CQR	SILTSTONE																		
2	GT148366	C9380CQR	SANDSTONE																		
2	GT148368	C9380CQR	SANDSTONE																		
2	GT148373	C9380CQR	SANDSTONE																		
2	GT148375	C9380CQR	SANDSTONE																		
2	GT148379	C9380CQR	SILTSTONE																		
2	175946	C376CQ	CARB SILTSTONE										3	1							
2	147281	C376CQ	MUDSTONE																		
2	177683	C670CQ	SILTSTONE																		
2	177687	C670CQ	SILTSTONE																		
2	177693	C670CQ	SANDSTONE																		
2	177694	C670CQ	TUFF																		
2	177698	C670CQ	SANDSTONE																		
2	177700	C670CQ	SILTSTONE																		
2	148380	C9380CQR	SILTSTONE																		
2	147284	C376CQ	SANDSTONE																		
2	147288	C376CQ	SANDSTONE																		
2	147289	C376CQ	SANDSTONE																		
2	147292	C376CQ	SILTSTONE																		
2	147293	C376CQ	SANDSTONE																		
2	147295	C376CQ	SILTSTONE																		
2	175918	C9404CQR	SANDSTONE																		
2	175919	C9404CQR	SILTSTONE																		
2	148388	C9180009CQR	SILTSTONE																		
2	148389	C9180009CQR	CLAY																		
2	148392	C9180009CQR	SANDSTONE																		
2	175920	C9404CQR	CARB SANDSTONE																		
2	175921	C9404CQR	SANDSTONE														1				
2	175925	C9404CQR	CARB SILTSTONE																		
2	175926	C9404CQR	SILTSTONE																		
2	175928	C9404CQR	SANDSTONE																		
2	175934	C9404CQR	SANDSTONE																		
2	175936	C9404CQR	CONGLOMERATE																		
2	175938	C9404CQR	CONGLOMERATE																		
2	176508	C545CQ	CONGLOMERATE											2							
2	176509	C545CQ	CARB SILTSTONE																		
2	176511	C545CQ	CLAYSTONE																		
2	175516	C545CQ	CARB SILTSTONE																		
2	176517	C545CQ	SANDSTONE																		
2	176518	C545CQ	SANDSTONE																		
2	176521	C545CQ	MUDSTONE																		
2	177977	C559CQ	SILTSTONE																		
2	177983	C559CQ	TUFF																		
2	147456	C088CQ	SANDSTONE																		
2	147458	C088CQ	SANDSTONE																		
2	147466	C088CQ	SILTSTONE																		
2	147469	C088CQ	SILTSTONE																		
2	147475	C088CQ	CARB SILTSTONE																		
2	147280	C088CQ	CARB SILTSTONE																		
2	147476	C088CQ	TUFF																		
2	153323	C9099CQR	TUFF											1							
2	153324	C9099CQR	SANDSTONE																		
2	147479	C088CQ	SANDSTONE																		
2	153301	C099CQ	SILTSTONE																		
2	153303	C099CQ	SILTSTONE																		
2	153305	C099CQ	SILTSTONE																		
2	154259	C122CQ	SANDSTONE																		
2	154261	C122CQ	SILTSTONE						2					2							

Batch #	Sample ID	Site no.	Analyte	Cr	Cs	Cu	Ga	Ge	Hf	In	La	Li	Mo	Nb	Ni	Pb	Rb	Re	Sb	Sc	Se
			Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
			Comparative Abundance	72	72	33	18	1.7	2.5	0.044	41	56	2	13	52	19	135	0.0004	1.2	10	0.42
2	GT148363	C9380CQR	SILTSTONE															1			
2	GT148366	C9380CQR	SANDSTONE															1			
2	GT148368	C9380CQR	SANDSTONE																		
2	GT148373	C9380CQR	SANDSTONE																		
2	GT148375	C9380CQR	SANDSTONE															1			
2	GT148379	C9380CQR	SILTSTONE															1			1
2	175946	C376CQ	CARB SILTSTONE															1			1
2	147281	C376CQ	MUDSTONE																		
2	177683	C670CQ	SILTSTONE																		
2	177687	C670CQ	SILTSTONE															1			
2	177693	C670CQ	SANDSTONE																		
2	177694	C670CQ	TUFF															1			
2	177698	C670CQ	SANDSTONE															1			
2	177700	C670CQ	SILTSTONE																		
2	148380	C9380CQR	SILTSTONE																		
2	147284	C376CQ	SANDSTONE																		
2	147288	C376CQ	SANDSTONE																		
2	147289	C376CQ	SANDSTONE																		
2	147292	C376CQ	SILTSTONE																		
2	147293	C376CQ	SANDSTONE																		
2	147295	C376CQ	SILTSTONE																		
2	175918	C9404CQR	SANDSTONE																		
2	175919	C9404CQR	SILTSTONE																		
2	148388	C9180009CQR	SILTSTONE																		
2	148389	C9180009CQR	CLAY																		1
2	148392	C9180009CQR	SANDSTONE																		
2	175920	C9404CQR	CARB SANDSTONE																		
2	175921	C9404CQR	SANDSTONE																		1
2	175925	C9404CQR	CARB SILTSTONE																		
2	175926	C9404CQR	SILTSTONE																		
2	175928	C9404CQR	SANDSTONE																		
2	175934	C9404CQR	SANDSTONE																		
2	175936	C9404CQR	CONGLOMERATE																		
2	175938	C9404CQR	CONGLOMERATE																		
2	176508	C545CQ	CONGLOMERATE															2			
2	176509	C545CQ	CARB SILTSTONE																		
2	176511	C545CQ	CLAYSTONE																		
2	175516	C545CQ	CARB SILTSTONE																		
2	176517	C545CQ	SANDSTONE																		
2	176518	C545CQ	SANDSTONE																		
2	176521	C545CQ	MUDSTONE																		
2	177977	C559CQ	SILTSTONE															3			
2	177983	C559CQ	TUFF																		
2	147456	C088CQ	SANDSTONE																		
2	147458	C088CQ	SANDSTONE																		
2	147466	C088CQ	SILTSTONE																		
2	147469	C088CQ	SILTSTONE															1			1
2	147475	C088CQ	CARB SILTSTONE																		1
2	147280	C088CQ	CARB SILTSTONE																		
2	147476	C088CQ	TUFF																		
2	153323	C9099CQR	TUFF															1			
2	153324	C9099CQR	SANDSTONE																		
2	147479	C088CQ	SANDSTONE															1			
2	153301	C099CQ	SILTSTONE																		
2	153303	C099CQ	SILTSTONE																		
2	153305	C099CQ	SILTSTONE																		
2	154259	C122CQ	SANDSTONE																		
2	154261	C122CQ	SILTSTONE																		

Batch #	Sample ID	Site no.	Analyte	Sn	Sr	Ta	Te	Th	Ti	Tl	U	V	W	Y	Zn	Zr	Hg	F	C
			Units	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	%
			Comparative Abundance	4.6	320	1.5	0.005	9.6	0.38	0.95	3.1	105	1.7	40	95	150	0.19	640	2.94
2	GT148363	C9380CQR	SILTSTONE																
2	GT148366	C9380CQR	SANDSTONE																
2	GT148368	C9380CQR	SANDSTONE																
2	GT148373	C9380CQR	SANDSTONE																
2	GT148375	C9380CQR	SANDSTONE				2												
2	GT148379	C9380CQR	SILTSTONE				3												
2	175946	C376CQ	CARB SILTSTONE				4												
2	147281	C376CQ	MUDSTONE				3												
2	177683	C670CQ	SILTSTONE				3												
2	177687	C670CQ	SILTSTONE																
2	177693	C670CQ	SANDSTONE																
2	177694	C670CQ	TUFF																
2	177698	C670CQ	SANDSTONE				3												
2	177700	C670CQ	SILTSTONE				3												
2	148380	C9380CQR	SILTSTONE				3												
2	147284	C376CQ	SANDSTONE																
2	147288	C376CQ	SANDSTONE																
2	147289	C376CQ	SANDSTONE				3												
2	147292	C376CQ	SILTSTONE																
2	147293	C376CQ	SANDSTONE				3												
2	147295	C376CQ	SILTSTONE																
2	175918	C9404CQR	SANDSTONE				3												
2	175919	C9404CQR	SILTSTONE				3												
2	148388	C9180009CQR	SILTSTONE				3												
2	148389	C9180009CQR	CLAY				3												
2	148392	C9180009CQR	SANDSTONE																
2	175920	C9404CQR	CARB SANDSTONE				3												
2	175921	C9404CQR	SANDSTONE				4												
2	175925	C9404CQR	CARB SILTSTONE				3												
2	175926	C9404CQR	SILTSTONE																
2	175928	C9404CQR	SANDSTONE																
2	175934	C9404CQR	SANDSTONE																
2	175936	C9404CQR	CONGLOMERATE																
2	175938	C9404CQR	CONGLOMERATE																
2	176508	C545CQ	CONGLOMERATE				4												2
2	176509	C545CQ	CARB SILTSTONE				3												
2	176511	C545CQ	CLAYSTONE				3												
2	175516	C545CQ	CARB SILTSTONE																
2	176517	C545CQ	SANDSTONE																
2	176518	C545CQ	SANDSTONE				3												
2	176521	C545CQ	MUDSTONE				3												
2	177977	C559CQ	SILTSTONE				3												
2	177983	C559CQ	TUFF																
2	147456	C088CQ	SANDSTONE																
2	147458	C088CQ	SANDSTONE				3												
2	147466	C088CQ	SILTSTONE				3												
2	147469	C088CQ	SILTSTONE				3												1
2	147475	C088CQ	CARB SILTSTONE				4												
2	147280	C088CQ	CARB SILTSTONE				3												
2	147476	C088CQ	TUFF				3												
2	153323	C9099CQR	TUFF																
2	153324	C9099CQR	SANDSTONE																
2	147479	C088CQ	SANDSTONE				2												
2	153301	C099CQ	SILTSTONE				3												
2	153303	C099CQ	SILTSTONE				2												
2	153305	C099CQ	SILTSTONE																
2	154259	C122CQ	SANDSTONE				3												
2	154261	C122CQ	SILTSTONE				4												

Batch #	Sample ID	Site no.	Analyte	Al	Ca	Fe	K	Mg	Mn	Na	P	S	Ag	As	B	Ba	Be	Bi	Cd	Ce	Co
			Units	%	%	%	%	%	ppm	%	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
			Comparative Abundance	7.2	6.6	4.1	2	1.4	770	0.57	670	0.2	0.057	7.7	100	460	2	0.4	0.17	83	14
2	154262	C122CQ	CLAYSTONE																		
2	154265	C122CQ	CLAYSTONE																		
2	154270	C122CQ	SILTSTONE																		
2	153311	C099CQ	MUDSTONE																		
2	153312	C099CQ	SILTSTONE																		
2	153315	C099CQ	CARB MUDSTONE																		
2	146736	C398CQ	CARB MUDSTONE																		
2	146738	C398CQ	SANDSTONE																		
2	146740	C398CQ	SANDSTONE																		
2	146743	C398CQ	SILTSTONE																		
2	146744	C398CQ	CARB SILTSTONE														2				
2	146747	C398CQ	CARB MUDSTONE																		
2	146749	C398CQ	SANDSTONE																		
2	177953	C398CQ	SANDSTONE																		
2	177957	C398CQ	SANDSTONE																		
2	152610	C180012CQ	SANDSTONE																		
2	152611	C180012CQ	TUFF																		
2	177959	C398CQ	CARB MUDSTONE																		
2	177961	C398CQ	SILTSTONE																		
2	177964	C398CQ	SANDSTONE																		
2	177967	C398CQ	CARB SILTSTONE																		
2	177976	C398CQ	SANDSTONE																		
2	153334	C99204CQR	SANDSTONE																		
2	154429	C99204CQR	SANDSTONE																		
2	152623	C180012CQ	SANDSTONE																		
2	152619	C180012CQ	SANDSTONE																		
2	169951	C671CQ	CARB SANDSTONE																		1
2	169954	C671CQ	SANDSTONE																		
2	169955	C671CQ	SILTSTONE																		
2	169959	C671CQ	SANDSTONE																		
2	169960	C671CQ	SILTSTONE																		
2	169963	C671CQ	SANDSTONE																		
2	169964	C671CQ	SANDSTONE																		
2	169967	C671CQ	SILTSTONE																		
2	169602	C606CQ	CARB MUDSTONE																		
2	169606	C606CQ	SILTSTONE																		
2	169609	C606CQ	SILTSTONE																		
2	169610	C606CQ	CARB MUDSTONE																		
2	169613	C606CQ	CARB SILTSTONE																		
2	169614	C606CQ	SANDSTONE																		
2	169968	C671CQ	CARB SILTSTONE																		
2	169971	C671CQ	SILTSTONE										4								
2	169973	C671CQ	SANDSTONE																		
2	169974	C671CQ	CARB MUDSTONE																		
2	169976	C671CQ	CONGLOMERATE																		
2	169621	C180004CQ	SANDSTONE																		
2	146702	C388CQ	SANDSTONE										2								
2	146712	C388CQ	MUDSTONE																		
2	146716	C388CQ	SILTSTONE																		
2	146719	C388CQ	MUDSTONE																		
2	146720	C388CQ	CARB MUDSTONE																		
2	146725	C388CQ	MUDSTONE																		
2	146732	C388CQ	SANDSTONE																		
2	175910	C522CQ	SANDSTONE																		
2	169616	C606CQ	CARB SILTSTONE																		
2	169617	C606CQ	CARB SILTSTONE																		
2	169627	C180004CQ	CARB SILTSTONE																		
2	169628	C180004CQ	CARB SILTSTONE																		

Batch #	Sample ID	Site no.	Analyte	Cr	Cs	Cu	Ga	Ge	Hf	In	La	Li	Mo	Nb	Ni	Pb	Rb	Re	Sb	Sc	Se
			Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
			Comparative Abundance	72	72	33	18	1.7	2.5	0.044	41	56	2	13	52	19	135	0.0004	1.2	10	0.42
2	154262	C122CQ	CLAYSTONE																		1
2	154265	C122CQ	CLAYSTONE																		1
2	154270	C122CQ	SILTSTONE																		
2	153311	C099CQ	MUDSTONE															1			
2	153312	C099CQ	SILTSTONE																		
2	153315	C099CQ	CARB MUDSTONE															2			
2	146736	C398CQ	CARB MUDSTONE																		
2	146738	C398CQ	SANDSTONE															1			
2	146740	C398CQ	SANDSTONE															1			
2	146743	C398CQ	SILTSTONE																		
2	146744	C398CQ	CARB SILTSTONE													1					2
2	146747	C398CQ	CARB MUDSTONE																		
2	146749	C398CQ	SANDSTONE															1			
2	177953	C398CQ	SANDSTONE																		
2	177957	C398CQ	SANDSTONE																		
2	152610	C180012CQ	SANDSTONE															1			
2	152611	C180012CQ	TUFF																		1
2	177959	C398CQ	CARB MUDSTONE																		
2	177961	C398CQ	SILTSTONE																		
2	177964	C398CQ	SANDSTONE															1			
2	177967	C398CQ	CARB SILTSTONE															2			
2	177976	C398CQ	SANDSTONE																		
2	153334	C99204CQR	SANDSTONE															1			
2	154429	C99204CQR	SANDSTONE															1			
2	152623	C180012CQ	SANDSTONE															1			
2	152619	C180012CQ	SANDSTONE																		
2	169951	C671CQ	CARB SANDSTONE															2			
2	169954	C671CQ	SANDSTONE																		
2	169955	C671CQ	SILTSTONE															1			
2	169959	C671CQ	SANDSTONE																		
2	169960	C671CQ	SILTSTONE															1			
2	169963	C671CQ	SANDSTONE															1			
2	169964	C671CQ	SANDSTONE															1			
2	169967	C671CQ	SILTSTONE															3			
2	169602	C606CQ	CARB MUDSTONE															1			
2	169606	C606CQ	SILTSTONE																		
2	169609	C606CQ	SILTSTONE															1			
2	169610	C606CQ	CARB MUDSTONE															1			
2	169613	C606CQ	CARB SILTSTONE																		
2	169614	C606CQ	SANDSTONE																		
2	169968	C671CQ	CARB SILTSTONE															1			1
2	169971	C671CQ	SILTSTONE																		
2	169973	C671CQ	SANDSTONE															1			2
2	169974	C671CQ	CARB MUDSTONE																		
2	169976	C671CQ	CONGLOMERATE																		
2	169621	C180004CQ	SANDSTONE																		
2	146702	C388CQ	SANDSTONE																		
2	146712	C388CQ	MUDSTONE															1			
2	146716	C388CQ	SILTSTONE																		
2	146719	C388CQ	MUDSTONE															2			
2	146720	C388CQ	CARB MUDSTONE																		
2	146725	C388CQ	MUDSTONE															1			
2	146732	C388CQ	SANDSTONE																		
2	175910	C522CQ	SANDSTONE															1			1
2	169616	C606CQ	CARB SILTSTONE			1				1								1			
2	169617	C606CQ	CARB SILTSTONE															1			1
2	169627	C180004CQ	CARB SILTSTONE																		
2	169628	C180004CQ	CARB SILTSTONE																		

Batch #	Sample ID	Site no.	Analyte	Sn	Sr	Ta	Te	Th	Ti	Tl	U	V	W	Y	Zn	Zr	Hg	F	C
			Units	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
			Comparative Abundance	4.6	320	1.5	0.005	9.6	0.38	0.95	3.1	105	1.7	40	95	150	0.19	640	2.94
2	154262	C122CQ	CLAYSTONE				5												
2	154265	C122CQ	CLAYSTONE				3												
2	154270	C122CQ	SILTSTONE				3												
2	153311	C099CQ	MUDSTONE																
2	153312	C099CQ	SILTSTONE				3												1
2	153315	C099CQ	CARB MUDSTONE				4												2
2	146736	C398CQ	CARB MUDSTONE				3												
2	146738	C398CQ	SANDSTONE																
2	146740	C398CQ	SANDSTONE				2												
2	146743	C398CQ	SILTSTONE				3												
2	146744	C398CQ	CARB SILTSTONE				4	1			1								1
2	146747	C398CQ	CARB MUDSTONE																
2	146749	C398CQ	SANDSTONE				3												
2	177953	C398CQ	SANDSTONE																
2	177957	C398CQ	SANDSTONE																
2	152610	C180012CQ	SANDSTONE																
2	152611	C180012CQ	TUFF				3												
2	177959	C398CQ	CARB MUDSTONE				3												
2	177961	C398CQ	SILTSTONE																
2	177964	C398CQ	SANDSTONE				3												1
2	177967	C398CQ	CARB SILTSTONE																
2	177976	C398CQ	SANDSTONE																
2	153334	C99204CQR	SANDSTONE				2												
2	154429	C99204CQR	SANDSTONE				3												
2	152623	C180012CQ	SANDSTONE																
2	152619	C180012CQ	SANDSTONE				3												2
2	169951	C671CQ	CARB SANDSTONE				2								2				
2	169954	C671CQ	SANDSTONE				3												
2	169955	C671CQ	SILTSTONE																
2	169959	C671CQ	SANDSTONE				3												
2	169960	C671CQ	SILTSTONE																
2	169963	C671CQ	SANDSTONE																
2	169964	C671CQ	SANDSTONE				3												
2	169967	C671CQ	SILTSTONE				4												2
2	169602	C606CQ	CARB MUDSTONE				3												
2	169606	C606CQ	SILTSTONE				2												
2	169609	C606CQ	SILTSTONE				4												1
2	169610	C606CQ	CARB MUDSTONE				3												
2	169613	C606CQ	CARB SILTSTONE																
2	169614	C606CQ	SANDSTONE																
2	169968	C671CQ	CARB SILTSTONE				3												
2	169971	C671CQ	SILTSTONE																
2	169973	C671CQ	SANDSTONE				4												
2	169974	C671CQ	CARB MUDSTONE				3												
2	169976	C671CQ	CONGLOMERATE																
2	169621	C180004CQ	SANDSTONE																
2	146702	C388CQ	SANDSTONE				3												
2	146712	C388CQ	MUDSTONE				3												
2	146716	C388CQ	SILTSTONE				2												
2	146719	C388CQ	MUDSTONE				4												2
2	146720	C388CQ	CARB MUDSTONE				2												
2	146725	C388CQ	MUDSTONE																
2	146732	C388CQ	SANDSTONE				3												
2	175910	C522CQ	SANDSTONE				3												
2	169616	C606CQ	CARB SILTSTONE				5												1
2	169617	C606CQ	CARB SILTSTONE				3												1
2	169627	C180004CQ	CARB SILTSTONE				3												
2	169628	C180004CQ	CARB SILTSTONE																

Batch #	Sample ID	Site no.	Analyte	Al	Ca	Fe	K	Mg	Mn	Na	P	S	Ag	As	B	Ba	Be	Bi	Cd	Ce	Co
			Units	%	%	%	%	%	ppm	%	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
			Comparative Abundance	7.2	6.6	4.1	2	1.4	770	0.57	670	0.2	0.057	7.7	100	460	2	0.4	0.17	83	14
2	169629	C180004CQ	SANDSTONE																1		
2	169630	C180004CQ	CARB SILTSTONE																		
2	182753	C180007CQ	SANDSTONE																		
2	182756	C180007CQ	SILTSTONE																		1
2	182763	C180007CQ	CARB MUDSTONE																		
2	182766	C180007CQ	SANDSTONE																		
2	182771	C180007CQ	SANDSTONE																		
2	177654	C669CQ	SANDSTONE																		
2	177659	C669CQ	SILTSTONE																		
2	177661	C669CQ	MUDSTONE																		
2	177665	C669CQ	SANDSTONE																		
2	177669	C669CQ	SILTSTONE																		
2	177673	C669CQ	TUFF																		
2	177676	C669CQ	SANDSTONE																		
2	177677	C669CQ	SANDSTONE																		
2	148058	C135CQ	SANDSTONE																		
2	GT152502	C541CQ	CARB MUDSTONE																		
2	GT152509	C541CQ	SILTSTONE																		
2	170252	C544CQ	SILTSTONE																		
2	170282	C607CQ	CARB SILTSTONE																		
2	170289	C607CQ	CLAYSTONE											1							
2	170296	C607CQ	SANDSTONE																		
2	170297	C607CQ	SILTSTONE																		
2	154046	C675CQ	SILTSTONE																		
2	GT148358	C9380CQR	SILTSTONE											1							
2	GT148378	C9380CQR	SILTSTONE																		
2	153309	C099CQ	CARB MUDSTONE																		
2	154251	C122CQ	SANDSTONE																		
2	154256	C122CQ	SANDSTONE																		
2	146717	C388CQ	SANDSTONE								2										
2	146718	C388CQ	MUDSTONE																		
2	146730	C388CQ	CARB MUDSTONE																		
2	177952	C398CQ	SANDSTONE																		
2	177968	C398CQ	SANDSTONE																		
2	GT169961	C671CQ	SILTSTONE																		
2	GT169962	C671CQ	SANDSTONE						1												
2	GT169966	C671CQ	SANDSTONE																		
2	147454	C088CQ	CARB SILTSTONE																		
2	147462	C088CQ	SANDSTONE																		
2	147478	C088CQ	SANDSTONE								2										
2	182759	C180007CQ	TUFF																		
2	169719	C9419CQR	SANDSTONE																		
2	GT147148	C9532CQR	SILTSTONE																		
2	GT147593	C541CQ	SILTSTONE																		
2	GT152501	C541CQ	SILTSTONE																		
2	GT152507	C541CQ	SILTSTONE																		
2	GT152513	C541CQ	SANDSTONE																		
2	GT152514	C541CQ	SILTSTONE																		
2	GT152517	C541CQ	SANDSTONE																		
2	170292	C607CQ	SILTSTONE																		
2	177688	C670CQ	SILTSTONE																		
2	177699	C670CQ	SANDSTONE																		
2	154040	C675CQ	SILTSTONE																		
2	CQ146995	C684LD	SILTSTONE											1							
2	CQ146996	C684LD	COAL																		
2	CQ146997	C684LD	COAL																		
2	CQ146999	C684LD	COAL																		
2	CQ172801	C684LD	COAL																		

Batch #	Sample ID	Site no.	Analyte	Cr	Cs	Cu	Ga	Ge	Hf	In	La	Li	Mo	Nb	Ni	Pb	Rb	Re	Sb	Sc	Se
			Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
			Comparative Abundance	72	72	33	18	1.7	2.5	0.044	41	56	2	13	52	19	135	0.0004	1.2	10	0.42
2	169629	C180004CQ	SANDSTONE																		
2	169630	C180004CQ	CARB SILTSTONE																		
2	182753	C180007CQ	SANDSTONE															1			
2	182756	C180007CQ	SILTSTONE															1			
2	182763	C180007CQ	CARB MUDSTONE																		
2	182766	C180007CQ	SANDSTONE																		
2	182771	C180007CQ	SANDSTONE															1			
2	177654	C669CQ	SANDSTONE															1			
2	177659	C669CQ	SILTSTONE															1			
2	177661	C669CQ	MUDSTONE																		
2	177665	C669CQ	SANDSTONE																		
2	177669	C669CQ	SILTSTONE															1			
2	177673	C669CQ	TUFF																		
2	177676	C669CQ	SANDSTONE																		
2	177677	C669CQ	SANDSTONE																		
2	148058	C135CQ	SANDSTONE																		
2	GT152502	C541CQ	CARB MUDSTONE															1			
2	GT152509	C541CQ	SILTSTONE															1			1
2	170252	C544CQ	SILTSTONE			1												1			1
2	170282	C607CQ	CARB SILTSTONE															1			1
2	170289	C607CQ	CLAYSTONE															1			
2	170296	C607CQ	SANDSTONE																		
2	170297	C607CQ	SILTSTONE																		
2	154046	C675CQ	SILTSTONE															1			
2	GT148358	C9380CQR	SILTSTONE															1			
2	GT148378	C9380CQR	SILTSTONE																		
2	153309	C099CQ	CARB MUDSTONE																		
2	154251	C122CQ	SANDSTONE																		
2	154256	C122CQ	SANDSTONE															1			
2	146717	C388CQ	SANDSTONE			2												2			1
2	146718	C388CQ	MUDSTONE			1												1			
2	146730	C388CQ	CARB MUDSTONE															1			
2	177952	C398CQ	SANDSTONE																		
2	177968	C398CQ	SANDSTONE															1			
2	GT169961	C671CQ	SILTSTONE															1			
2	GT169962	C671CQ	SANDSTONE																		
2	GT169966	C671CQ	SANDSTONE															1			1
2	147454	C088CQ	CARB SILTSTONE																		
2	147462	C088CQ	SANDSTONE																		
2	147478	C088CQ	SANDSTONE															2			1
2	182759	C180007CQ	TUFF															1			
2	169719	C9419CQR	SANDSTONE															1			
2	GT147148	C9532CQR	SILTSTONE															1			1
2	GT147593	C541CQ	SILTSTONE															1			
2	GT152501	C541CQ	SILTSTONE															2			
2	GT152507	C541CQ	SILTSTONE															1			
2	GT152513	C541CQ	SANDSTONE															1			1
2	GT152514	C541CQ	SILTSTONE																		
2	GT152517	C541CQ	SANDSTONE															1			
2	170292	C607CQ	SILTSTONE															1			
2	177688	C670CQ	SILTSTONE															1			
2	177699	C670CQ	SANDSTONE																		
2	154040	C675CQ	SILTSTONE															1			
2	CQ146995	C684LD	SILTSTONE																		
2	CQ146996	C684LD	COAL															1			
2	CQ146997	C684LD	COAL															1			
2	CQ146999	C684LD	COAL															3			
2	CQ172801	C684LD	COAL																		

Batch #	Sample ID	Site no.	Analyte	Sn	Sr	Ta	Te	Th	Ti	Tl	U	V	W	Y	Zn	Zr	Hg	F	C
			Units	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	%
			Comparative Abundance	4.6	320	1.5	0.005	9.6	0.38	0.95	3.1	105	1.7	40	95	150	0.19	640	2.94
2	169629	C180004CQ	SANDSTONE																
2	169630	C180004CQ	CARB SILTSTONE																
2	182753	C180007CQ	SANDSTONE				3												
2	182756	C180007CQ	SILTSTONE				4												
2	182763	C180007CQ	CARB MUDSTONE																
2	182766	C180007CQ	SANDSTONE																
2	182771	C180007CQ	SANDSTONE				2												
2	177654	C669CQ	SANDSTONE				2												
2	177659	C669CQ	SILTSTONE				3												
2	177661	C669CQ	MUDSTONE																
2	177665	C669CQ	SANDSTONE				3												
2	177669	C669CQ	SILTSTONE				3												
2	177673	C669CQ	TUFF																
2	177676	C669CQ	SANDSTONE																
2	177677	C669CQ	SANDSTONE																
2	148058	C135CQ	SANDSTONE				5												3
2	GT152502	C541CQ	CARB MUDSTONE				3												
2	GT152509	C541CQ	SILTSTONE				3												
2	170252	C544CQ	SILTSTONE				4												1
2	170282	C607CQ	CARB SILTSTONE				3												
2	170289	C607CQ	CLAYSTONE																
2	170296	C607CQ	SANDSTONE																
2	170297	C607CQ	SILTSTONE				3												
2	154046	C675CQ	SILTSTONE				3												
2	GT148358	C9380CQR	SILTSTONE				3												
2	GT148378	C9380CQR	SILTSTONE				4												1
2	153309	C099CQ	CARB MUDSTONE																
2	154251	C122CQ	SANDSTONE				2												
2	154256	C122CQ	SANDSTONE																
2	146717	C388CQ	SANDSTONE				3												
2	146718	C388CQ	MUDSTONE				4												2
2	146730	C388CQ	CARB MUDSTONE																
2	177952	C398CQ	SANDSTONE				3												
2	177968	C398CQ	SANDSTONE				3												
2	GT169961	C671CQ	SILTSTONE																
2	GT169962	C671CQ	SANDSTONE																
2	GT169966	C671CQ	SANDSTONE				4												2
2	147454	C088CQ	CARB SILTSTONE																
2	147462	C088CQ	SANDSTONE																
2	147478	C088CQ	SANDSTONE				4												1
2	182759	C180007CQ	TUFF																
2	169719	C9419CQR	SANDSTONE				3												
2	GT147148	C9532CQR	SILTSTONE				3												
2	GT147593	C541CQ	SILTSTONE				2												
2	GT152501	C541CQ	SILTSTONE				3												
2	GT152507	C541CQ	SILTSTONE																
2	GT152513	C541CQ	SANDSTONE				3												
2	GT152514	C541CQ	SILTSTONE																
2	GT152517	C541CQ	SANDSTONE				2												
2	170292	C607CQ	SILTSTONE																
2	177688	C670CQ	SILTSTONE																
2	177699	C670CQ	SANDSTONE				3												1
2	154040	C675CQ	SILTSTONE																
2	CQ146995	C684LD	SILTSTONE				3												2
2	CQ146996	C684LD	COAL				3												3
2	CQ146997	C684LD	COAL				3												3
2	CQ146999	C684LD	COAL				4												3
2	CQ172801	C684LD	COAL				3												3

Batch #	Sample ID	Site no.	Analyte	Al	Ca	Fe	K	Mg	Mn	Na	P	S	Ag	As	B	Ba	Be	Bi	Cd	Ce	Co
			Units	%	%	%	%	%	ppm	%	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
			Comparative Abundance	7.2	6.6	4.1	2	1.4	770	0.57	670	0.2	0.057	7.7	100	460	2	0.4	0.17	83	14
2	CQ172805	C684LD	COAL																		
2	CQ172806	C684LD	COAL																		
2	CQ172809	C684LD	CLAYSTONE																		
2	CQ172811	C684LD	COAL																		
2	CQ172813	C684LD	COAL																		
2	CQ172815	C684LD	COAL																		
2	CQ172816	C684LD	COAL																		
2	CQ172817	C684LD	SANDSTONE																		
2	CQ172818	C684LD	SANDSTONE																		
2	CQ172821	C684LD	COAL																		
2	CQ172836	C684LD	COAL																		
2	CQ172654	C684LD	COAL																		
2	CQ172655	C684LD	COAL										1								
2	CQ172674	C684LD	SILTSTONE																		
2	CQ172698	C684LD	CARB MUDSTONE																		
2	CQ172699	C684LD	SILTSTONE																		
2	CQ14755	C684LD	SILTSTONE			1			1												
2	CQ14758	C684LD	CLAYSTONE																		
2	CQ14759	C684LD	SANDSTONE																		
2	CQ14761	C684LD	COAL																		
2	CQ14763	C684LD	CARB SILTSTONE																		1
2	CQ14767	C684LD	COAL														1				
2	CQ14768	C684LD	COAL																		
2	2209	C688LD	CARB SILTSTONE																		
2	2210	C688LD	COAL																		
2	2212	C688LD	COAL																		
2	2215	C688LD	COAL																		
2	2218	C688LD	COAL																		
2	2219	C688LD	COAL																		
2	2220	C688LD	COAL																		
2	2221	C688LD	COAL																		
2	2223	C688LD	COAL																		
2	2224	C688LD	COAL																		
2	2226	C688LD	COAL																		
2	14964	C505G	COAL																		
2	14965	C505G	CLAYEY SAND										1								
2	14966	C505G	CLAYEY SAND																		
2	14967	C505G	SANDY CLAY																		
2	14968	C505G	SANDY CLAY																		
2	14969	C505G	SANDY CLAY										2								
2	14970	C505G	SANDY CLAY																		
2	14971	C505G	CLAYEY SAND																		
2	14972	C505G	CLAY																		
2	14973	C505G	CLAY																		
2	14975	C339G	SANDY CLAY																		
2	14976	C339G	SOIL																		
2	14977	C339G	CLAYEY SAND																		
2	14978	C339G	SANDY CLAY																	1	
2	14979	C339G	SANDY CLAY																		
2	14980	C339G	SANDY CLAY										2								
2	14981	C339G	SANDY CLAY										2								
2	14982	C339G	CLAYEY SAND										1								
2	14983	C339G	CLAYEY SAND																		
2	14984	C339G	CLAYEY SAND											1							
2	14985	C339G	CLAYEY SAND																		
2	14986	C339G	CLAYEY SAND																		
2	14987	C339G	CLAYEY SAND																		
2	204802	C696CQ	CLAYEY SAND														1				3

Batch #	Sample ID	Site no.	Analyte	Cr	Cs	Cu	Ga	Ge	Hf	In	La	Li	Mo	Nb	Ni	Pb	Rb	Re	Sb	Sc	Se
			Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
			Comparative Abundance	72	72	33	18	1.7	2.5	0.044	41	56	2	13	52	19	135	0.0004	1.2	10	0.42
2	CQ172805	C684LD	COAL															2			
2	CQ172806	C684LD	COAL															1			
2	CQ172809	C684LD	CLAYSTONE															1			
2	CQ172811	C684LD	COAL															1			
2	CQ172813	C684LD	COAL																		
2	CQ172815	C684LD	COAL															1			
2	CQ172816	C684LD	COAL															1			
2	CQ172817	C684LD	SANDSTONE															1			
2	CQ172818	C684LD	SANDSTONE															2			
2	CQ172821	C684LD	COAL															2			
2	CQ172836	C684LD	COAL															1			
2	CQ172654	C684LD	COAL															2			
2	CQ172655	C684LD	COAL			2												3			
2	CQ172674	C684LD	SILTSTONE															1			1
2	CQ172698	C684LD	CARB MUDSTONE															1			
2	CQ172699	C684LD	SILTSTONE															1			1
2	CQ14755	C684LD	SILTSTONE															1			1
2	CQ14758	C684LD	CLAYSTONE															1			
2	CQ14759	C684LD	SANDSTONE															1			1
2	CQ14761	C684LD	COAL															1			1
2	CQ14763	C684LD	CARB SILTSTONE										1					2			1
2	CQ14767	C684LD	COAL															1			
2	CQ14768	C684LD	COAL													1		1			
2	2209	C688LD	CARB SILTSTONE															2			
2	2210	C688LD	COAL																		
2	2212	C688LD	COAL															1			
2	2215	C688LD	COAL															1			
2	2218	C688LD	COAL															2			
2	2219	C688LD	COAL															1			
2	2220	C688LD	COAL															1			
2	2221	C688LD	COAL															1			
2	2223	C688LD	COAL															2			
2	2224	C688LD	COAL															1			
2	2226	C688LD	COAL															1			
2	14964	C505G	COAL																		
2	14965	C505G	CLAYEY SAND																		
2	14966	C505G	CLAYEY SAND																		
2	14967	C505G	SANDY CLAY																		
2	14968	C505G	SANDY CLAY																		
2	14969	C505G	SANDY CLAY																		
2	14970	C505G	SANDY CLAY																		
2	14971	C505G	CLAYEY SAND																		
2	14972	C505G	CLAY																		1
2	14973	C505G	CLAY															1			1
2	14975	C339G	SANDY CLAY															1			
2	14976	C339G	SOIL															1			
2	14977	C339G	CLAYEY SAND															1			
2	14978	C339G	SANDY CLAY															1			2
2	14979	C339G	SANDY CLAY															1			1
2	14980	C339G	SANDY CLAY																		
2	14981	C339G	SANDY CLAY																		
2	14982	C339G	CLAYEY SAND																		1
2	14983	C339G	CLAYEY SAND																		1
2	14984	C339G	CLAYEY SAND																		
2	14985	C339G	CLAYEY SAND															1			
2	14986	C339G	CLAYEY SAND																		
2	14987	C339G	CLAYEY SAND																		
2	204802	C696CQ	CLAYEY SAND												1			4			1

Batch #	Sample ID	Site no.	Analyte	Sn	Sr	Ta	Te	Th	Ti	Tl	U	V	W	Y	Zn	Zr	Hg	F	C
			Units	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	%
			Comparative Abundance	4.6	320	1.5	0.005	9.6	0.38	0.95	3.1	105	1.7	40	95	150	0.19	640	2.94
2	CQ172805	C684LD	COAL				3												3
2	CQ172806	C684LD	COAL				3												
2	CQ172809	C684LD	CLAYSTONE				3												3
2	CQ172811	C684LD	COAL				3												2
2	CQ172813	C684LD	COAL				2												3
2	CQ172815	C684LD	COAL																2
2	CQ172816	C684LD	COAL																
2	CQ172817	C684LD	SANDSTONE				3												
2	CQ172818	C684LD	SANDSTONE				3												2
2	CQ172821	C684LD	COAL				4												3
2	CQ172836	C684LD	COAL				3												3
2	CQ172654	C684LD	COAL				3												2
2	CQ172655	C684LD	COAL				4												1
2	CQ172674	C684LD	SILTSTONE				5												1
2	CQ172698	C684LD	CARB MUDSTONE				3												
2	CQ172699	C684LD	SILTSTONE				3												
2	CQ14755	C684LD	SILTSTONE																
2	CQ14758	C684LD	CLAYSTONE				3												1
2	CQ14759	C684LD	SANDSTONE				3												
2	CQ14761	C684LD	COAL				4												2
2	CQ14763	C684LD	CARB SILTSTONE				4												2
2	CQ14767	C684LD	COAL				3												
2	CQ14768	C684LD	COAL				4												1
2	2209	C688LD	CARB SILTSTONE				3												2
2	2210	C688LD	COAL																3
2	2212	C688LD	COAL				3												
2	2215	C688LD	COAL				3												
2	2218	C688LD	COAL				3												2
2	2219	C688LD	COAL				3												
2	2220	C688LD	COAL				2												
2	2221	C688LD	COAL				2												2
2	2223	C688LD	COAL				3												2
2	2224	C688LD	COAL				2												2
2	2226	C688LD	COAL																
2	14964	C505G	COAL																
2	14965	C505G	CLAYEY SAND																
2	14966	C505G	CLAYEY SAND																
2	14967	C505G	SANDY CLAY																
2	14968	C505G	SANDY CLAY																
2	14969	C505G	SANDY CLAY																
2	14970	C505G	SANDY CLAY																
2	14971	C505G	CLAYEY SAND																
2	14972	C505G	CLAY																
2	14973	C505G	CLAY										1						
2	14975	C339G	SANDY CLAY				2												
2	14976	C339G	SOIL																
2	14977	C339G	CLAYEY SAND																
2	14978	C339G	SANDY CLAY				3												
2	14979	C339G	SANDY CLAY				3												
2	14980	C339G	SANDY CLAY				3												
2	14981	C339G	SANDY CLAY				3												
2	14982	C339G	CLAYEY SAND				3												
2	14983	C339G	CLAYEY SAND				3												
2	14984	C339G	CLAYEY SAND				3												
2	14985	C339G	CLAYEY SAND				3												
2	14986	C339G	CLAYEY SAND																
2	14987	C339G	CLAYEY SAND				2												
2	204802	C696CQ	CLAYEY SAND				4												3

Batch #	Sample ID	Site no.	Analyte	Al	Ca	Fe	K	Mg	Mn	Na	P	S	Ag	As	B	Ba	Be	Bi	Cd	Ce	Co
			Units	%	%	%	%	%	ppm	%	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
			Comparative Abundance	7.2	6.6	4.1	2	1.4	770	0.57	670	0.2	0.057	7.7	100	460	2	0.4	0.17	83	14
2	204803	C696CQ	COAL																		
2	204804	C696CQ	COAL																		
2	204807	C696CQ	COAL																		
2	204813	C696CQ	COAL																		
2	204814	C696CQ	COAL																		
2	204815	C696CQ	COAL																		

Batch #	Sample ID	Site no.	Analyte	Cr	Cs	Cu	Ga	Ge	Hf	In	La	Li	Mo	Nb	Ni	Pb	Rb	Re	Sb	Sc	Se
			Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
			Comparative Abundance	72	72	33	18	1.7	2.5	0.044	41	56	2	13	52	19	135	0.0004	1.2	10	0.42
2	204803	C696CQ	COAL															3			
2	204804	C696CQ	COAL															2			
2	204807	C696CQ	COAL															2			
2	204813	C696CQ	COAL															1			
2	204814	C696CQ	COAL															1			
2	204815	C696CQ	COAL																		

Batch #	Sample ID	Site no.	Analyte	Sn	Sr	Ta	Te	Th	Ti	Tl	U	V	W	Y	Zn	Zr	Hg	F	C
			Units	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	%
			Comparative Abundance	4.6	320	1.5	0.005	9.6	0.38	0.95	3.1	105	1.7	40	95	150	0.19	640	2.94
2	204803	C696CQ	COAL				3												3
2	204804	C696CQ	COAL				3												3
2	204807	C696CQ	COAL				3												3
2	204813	C696CQ	COAL																3
2	204814	C696CQ	COAL				3												3
2	204815	C696CQ	COAL				2												

Batch #	Sample ID	Site No.	Analyte	Cr	Cs	Cu	Ga	Ge	Hf	In	La	Li	Mo	Nb	Ni	Pb	Rb	Re	Sb	Sc	Se
			Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
			Comparative Abundance	72	72	33	18	1.7	2.5	0.044	41	56	2	13	52	19	135	0.0004	1.2	10	0.42
1	81351	C001C	SANDSTONE	55	1.45	33.4	6.23	<0.05	1.6	0.021	14.4	11.2	0.88	3.7	8.1	9.4	24.9	<0.002	0.47	4.7	1
1	81352	C0021C	CLAY	44	5.52	27.5	24.1	0.1	5.1	0.078	29.4	25.5	0.87	11.6	17	20.9	76.9	<0.002	0.56	15.9	2
1	81353	C0021C	SILTSTONE	64	7.74	32.2	25.6	0.09	4.9	0.082	24.7	26.5	0.29	11.8	17.5	25.5	116.5	<0.002	0.72	20.4	2
1	81354	C0021C	SANDSTONE	22	4.71	6.8	17.75	0.06	2.7	0.048	23.7	18.4	0.41	12.2	7.1	23	121	<0.002	0.34	7.5	1
1	81355	C0021C	CARB MUDSTONE	13	4.06	7.6	23.1	0.07	4.7	0.08	23.6	27.1	0.8	12.7	4.4	36.9	28.5	0.002	0.55	9.2	1
1	81356	C024C	CLAY	70	5.61	38.4	25.8	0.15	4.2	0.085	23.8	25.3	0.74	15.4	48.5	25.1	74	<0.002	0.78	18.1	2
1	81357	C024C	CLAYSTONE	15	0.59	46.1	25.9	0.05	6.9	0.085	8.4	31.5	2.48	12	3.2	25.5	4	<0.002	0.68	24.7	2
1	81358	C024C	CLAYSTONE	17	0.75	36.8	36.1	0.15	9.4	0.128	41.2	22.7	2.72	13.6	4	32.9	4.2	0.002	1.42	23.4	3
1	81359	C024C	SANDSTONE	14	1.74	6.2	17.75	<0.05	3.7	0.056	19.8	14.4	0.41	6.9	4	14.5	13.6	<0.002	0.58	11.1	1
1	81360	C024C	CLAY	49	4.95	17	15.9	0.05	2.7	0.057	18.3	24.7	0.56	9.5	17.7	19.4	46.5	<0.002	0.78	11.4	1
1	81361	C031C	CLAY	27	1.55	11.8	16.05	<0.05	3.7	0.027	12.4	13.7	1.3	6.6	4.9	8.8	11	<0.002	0.69	7.5	1
1	81362	C031C	CLAYSTONE	9	0.81	31.7	35.4	1.94	6	0.064	280	13.2	0.95	8	4.9	62.8	5.3	0.003	0.45	12.9	5
1	81363	C031C	SANDSTONE	21	1.11	5.6	10.4	<0.05	2.3	0.026	18	10.5	0.7	4.9	2.9	12.9	17.5	<0.002	0.63	5.6	1
1	81364	C031C	SANDSTONE	15	4.11	14.7	19.6	0.12	3.6	0.064	21.2	25.4	2.49	6.9	8.5	16.3	59.6	0.003	0.82	16.7	2
1	81365	C031C	CLAY	51	2.34	29.9	22.1	0.07	3.8	0.065	14.9	9.4	0.39	9.5	16	19.9	32.4	<0.002	0.96	12.4	2
1	81366	C031C	SANDSTONE	30	6.58	38.2	21.4	0.07	2.5	0.055	15.7	8.4	0.49	5.4	39	12	67.4	<0.002	0.4	12.2	1
1	81367	C031C	SILTSTONE	42	6.85	44.3	23.3	0.11	4	0.07	17.5	29	0.59	8.7	29.1	19.7	96.1	0.002	0.47	13.6	2
1	81368	C031C	SANDSTONE	45	4.91	31	18.2	0.19	3.1	0.054	22.2	13.7	0.66	6.7	23	14.8	103.5	0.002	0.5	16.4	1
1	81369	C031C	SILTSTONE	31	8.49	48.1	20.9	0.1	3.8	0.073	22.1	28.4	0.99	8.3	16.4	23.2	113.5	<0.002	0.51	15.9	2
1	81370	C034C	COAL	3	1.6	20	8.24	0.07	2.1	0.046	13.2	8.7	1.03	3.2	8.4	9.4	12.5	0.003	0.36	7.9	1
1	81371	C034C	SILTSTONE	31	5.74	20.7	15.65	0.11	3.4	0.053	24.5	17	1.64	7.1	11.3	17.5	71	<0.002	0.58	11.8	1
1	81372	C034C	SILTSTONE	3	2.18	137.5	12.65	0.2	1.7	0.038	17.9	15.7	1.06	3.1	0.9	9.8	25.9	<0.002	0.11	5.2	1
1	81373	C034C	SILTSTONE	14	1.52	138.5	31.9	0.06	9	0.17	13.8	50.6	0.78	15.3	42.1	30.7	8.3	<0.002	0.57	19.1	3
1	81374	C034C	CLAY	117	4.81	35.2	22.8	0.13	3.2	0.069	19.5	25.1	1.01	13	89.6	10.1	59.2	<0.002	0.4	19.2	1
1	81375	C036C	CLAY	97	6.54	42	27.7	0.16	3.9	0.091	17.9	24.8	0.96	16.7	64.9	18.2	41.9	<0.002	0.63	20.4	2
1	81376	C036C	CLAY	77	9.76	37.1	23	0.07	3.5	0.078	14.7	21.9	0.9	14.6	61.1	18.2	61.5	<0.002	0.73	17.3	1
1	81377	C036C	CLAYSTONE	9	0.4	5.6	24.6	<0.05	6.9	0.09	1.9	33	0.61	13	3.2	5.6	2.2	<0.002	0.52	13.7	1
1	81378	C036C	SANDSTONE	48	9.01	40.1	28.5	0.1	4.3	0.1	43.5	31.5	0.68	15.8	10.2	42.7	80	<0.002	0.64	14.5	2
1	81379	C036C	SILTSTONE	45	7.64	48.1	24.9	0.16	3.7	0.076	12.8	49.3	0.29	9.8	36.4	22.8	68.4	<0.002	0.8	14	1
1	81380	C036C	SANDSTONE	94	3.05	19.8	15.7	0.14	3.1	0.061	26.7	14.5	0.56	9.2	50.7	15.2	53.5	<0.002	0.78	16.2	2
1	81381	C036C	CARB MUDSTONE	16	7.26	41.4	17.2	0.09	4.2	0.082	9.6	13	3.97	6.7	68.9	25.7	30.5	0.004	1.19	9.1	2
1	81382	C039C	COAL	11	0.61	21.8	11.4	8.89	2.5	0.043	3.3	8.8	3.41	7.5	11.6	10.8	2.8	0.003	5.05	4.7	<1
1	81383	C039C	SANDSTONE	44	6.71	29.2	22.5	0.11	4.3	0.077	27.1	24.6	0.54	10.1	15.8	22.2	134.5	<0.002	0.58	15.6	2
1	81384	C039C	SANDSTONE	35	3.52	6.6	17.7	<0.05	2.8	0.045	17.6	19.9	0.67	10.7	7.6	24.9	74.3	<0.002	0.39	6.2	1
1	81386	C039CR	SANDSTONE	32	2.75	4.2	13.7	<0.05	2.1	0.034	15.7	14.6	0.5	8.5	6.7	19.6	81.2	<0.002	0.35	4.7	<1
1	81387	C039CR	SANDSTONE	51	3.35	7.3	16.75	<0.05	3.4	0.037	32.5	13.6	0.25	9.6	3.8	23.1	36.5	<0.002	1.14	9.4	1
1	81388	C039CR	SANDSTONE	53	8.9	37	16.6	0.22	2.9	0.053	32.7	14.3	0.17	7.7	23.4	17	149.5	<0.002	0.64	13.7	2
1	81389	C039CR	SANDSTONE	41	11.75	28.1	20.7	0.15	4	0.074	33.7	49.3	0.2	11	22.9	29.4	143.5	<0.002	1	15.3	2
1	81390	C040C	SANDSTONE	41	4.08	9.3	10.6	0.09	2.4	0.038	21.8	14.4	0.51	4.8	13	13.7	88.2	<0.002	0.57	7.3	1
1	81391	C040C	SANDSTONE	40	4.56	16	13.15	0.11	2.7	0.044	25.3	16.3	0.58	6.4	15.4	14.8	102.5	<0.002	0.5	11.6	1
1	81392	C040C	CARB MUDSTONE	14	1.92	54.2	26.5	0.08	6.1	0.137	7.8	35.5	1.62	11.4	6	33.3	16.9	0.002	0.76	8.7	2
1	81393	C040CR	CARB MUDSTONE	39	9.35	38.6	25.3	0.1	3.6	0.097	18.8	50.6	0.41	15.5	23.8	39.1	91.8	0.002	0.67	10.7	2
1	81394	C040CR	CLAY	36	2.32	16	9.35	0.07	2	0.031	17	9.9	0.64	10.2	26.6	7.5	37.4	<0.002	0.31	8.8	1
1	81395	C041C	CLAY	110	4.88	30.7	19.65	0.14	4	0.067	33.5	20.9	0.55	20.8	52.9	17.1	77.3	<0.002	0.63	18.1	2
1	81396	C041C	CLAY	38	2.03	15.3	9.65	<0.05	1.6	0.031	11.6	10.8	0.38	8.2	30	6	35.2	<0.002	0.3	8.7	1
1	81397	C041C	CLAYSTONE	69	2.1	82.2	38.5	0.14	3.6	0.074	5.4	18.1	1.28	17	28.1	11	12.5	<0.002	0.88	13.6	1
1	81398	C041C	CLAYSTONE	43	6.3	38.9	35	0.06	4.4	0.091	39.3	28	0.68	19.6	8.4	41	33.5	<0.002	1.74	20.1	2
1	81399	C041C	CLAYSTONE	55	4.84	21.2	25.9	0.11	5.6	0.124	31.6	13.2	0.46	13.2	3.2	21	44.2	<0.002	0.8	22.9	2
1	81400	C041C	CARB MUDSTONE	39	6.32	85.9	22.1	0.11	3.3	0.094	29.5	23.3	0.68	13.9	35.9	41	53.3	0.006	0.63	12.1	2
1	81401	C042C	MUDSTONE	44	9.24	33.7	26.9	0.08	3.5	0.103	23.4	28.2	0.48	18.4	22.1	44.2	74.4	0.002	0.67	11.5	1
1	81402	C042C	MUDSTONE	38	10.85	48.6	29.1	0.13	3.7	0.116	34.2	39.1	0.39	16.7	23	45.7	77.8	0.002	1.23	15.6	2
1	81403	C042C	MUDSTONE	21	16.05	29.8	21.8	0.12	3.6	0.092	22.5	17	0.39	9.5	5.9	24.1	84.4	<0.002	0.73	10.3	1
1	81404	C044C	SANDSTONE	20	4.03	13.2	16.8	0.11	3	0.062	13	17.2	0.63	6.7	6.9	14.2	62.1	<0.002	0.58	11.1	1
1	81405	C044C	SANDSTONE	32	3.82	22.9	14.55	<0.05	3.1	0.043	16.9	15.4	1.86	6.6	11.3	18.6	47.8	<0.002	0.62	8.1	1
1	81406	C046C	CARB MUDSTONE	13	2.65	12.3	24.4	0.07	6	0.128	20.4	25.1	0.98	16.5	3.1	47.2	12.7	<0.002	0.75	10.6	2
1	81407	C046C	SANDSTONE	23	4.01	5.5	11.75	0.07	3.2	0.029	38.3	11.8	0.23	7.6	3.3	11.8	60.4	<0.002	0.49	7.4	1
1	81408	C046C	CARB MUDSTONE	30	2.57	51.3	32.4	0.07	6.1	0.135	9.2	127	1.7	17.2	16.1	49.8	10.5	<0.002	1.05	8.4	1
1	81409	C046C	SANDSTONE	26	3.45	21.3	18.45	0.11	2.2	0.047	18.2	12	0.82	4.8	19.4	13.3	62.6	<0.002	0.38	14.3	1

Batch #	Sample ID	Site No.	Analyte	Sn	Sr	Ta	Te	Th	Ti	Tl	U	V	W	Y	Zn	Zr	Hg	F	C
			Units	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	%
			Comparative Abundance	4.6	320	1.5	0.005	9.6	0.38	0.95	3.1	105	1.7	40	95	150	0.19	640	2.94
1	81351	C001C	SANDSTONE	1.8	34.2	0.34	<0.05	5.1	0.111	0.18	1.1	23	7.5	16.6	17	57.3	0.016		
1	81352	C0021C	CLAY	3.2	37.5	0.99	<0.05	12	0.477	0.4	3.2	90	2.7	29.3	59	176	0.008		
1	81353	C0021C	SILTSTONE	3.7	50.7	1.01	<0.05	13	0.537	0.58	3.2	115	3.1	24.1	86	172.5	0.02		
1	81354	C0021C	SANDSTONE	2.8	42.7	1.02	<0.05	10.7	0.247	0.69	2.5	32	1.8	12.3	71	93.2	0.048		
1	81355	C0021C	CARB MUDSTONE	4.6	18.9	1.12	0.05	16.1	0.316	0.24	3.8	38	2.7	14.8	47	137.5	0.196		
1	81356	C024C	CLAY	3.3	119.5	1.23	0.05	11.2	0.604	0.55	2.5	107	2.3	19.4	67	154.5	0.007		
1	81357	C024C	CLAYSTONE	4.6	43.1	1.01	0.2	10.4	0.533	0.04	2.8	85	3	18.1	13	236	0.01		
1	81358	C024C	CLAYSTONE	4.3	38	1.26	0.15	17.4	0.603	0.04	5.9	124	2.4	60.6	9	315	0.045		
1	81359	C024C	SANDSTONE	2	46.4	0.57	<0.05	9.4	0.381	0.17	2.2	73	1.6	8.8	26	133.5	0.019		
1	81360	C024C	CLAY	2.5	26.7	0.82	<0.05	12.4	0.356	0.31	1.8	69	3.1	11.2	17	93.8	0.007		
1	81361	C031C	CLAY	1.9	47.4	0.49	0.06	5.5	0.293	0.08	1	50	1.8	9.7	8	126.5	<0.005		
1	81362	C031C	CLAYSTONE	2.2	2590	0.67	0.07	13.2	0.368	0.06	6.5	84	2.1	46.1	10	222	0.012		
1	81363	C031C	SANDSTONE	1.7	19	0.47	<0.05	7.4	0.186	0.11	2.1	37	1.3	11.9	4	80.2	<0.005		
1	81364	C031C	SANDSTONE	1.9	118	0.54	<0.05	7.9	0.456	1.09	2.3	83	2.4	25.6	82	130.5	0.044		
1	81365	C031C	CLAY	2.7	359	0.79	0.06	8.3	0.477	0.23	2.4	119	2	9.7	28	137.5	<0.005		
1	81366	C031C	SANDSTONE	1.4	172.5	0.43	<0.05	4.6	0.431	0.74	1.4	103	0.9	11.2	215	89.3	0.023		
1	81367	C031C	SILTSTONE	2.7	106	0.74	0.06	7.5	0.487	0.59	2.7	105	1.8	17	139	139.5	0.054		
1	81368	C031C	SANDSTONE	1.9	136	0.53	<0.05	7.9	0.371	0.52	2.1	107	1.3	21.2	75	114	0.036		
1	81369	C031C	SILTSTONE	2.9	112	0.72	0.09	9.9	0.391	0.57	2.7	99	1.9	19.6	72	132.5	0.07		
1	81370	C034C	COAL	1.1	226	0.26	0.12	4.1	0.139	0.51	1	28	0.6	16.5	41	80.2	0.083		
1	81371	C034C	SILTSTONE	2.3	183	0.59	<0.05	9.3	0.29	0.41	2.4	54	1.8	26	57	126	0.039		
1	81372	C034C	SILTSTONE	0.9	214	0.25	0.05	2.8	0.32	0.47	1.1	42	0.7	27.2	26	55.4	0.046		
1	81373	C034C	SILTSTONE	4.4	20.6	1.04	0.22	9.1	0.946	0.58	4.5	192	2.6	24.6	146	314	0.159		
1	81374	C034C	CLAY	2.1	160.5	0.9	<0.05	7.5	0.521	0.31	2.8	92	1.1	18.7	75	126.5	0.005		
1	81375	C036C	CLAY	3.3	118	1.27	<0.05	12.1	0.6	0.38	3.4	106	2	20.1	79	149	<0.005		
1	81376	C036C	CLAY	3.1	113.5	1.18	<0.05	10.1	0.503	0.64	2.9	81	2.1	17.7	102	130	<0.005		
1	81377	C036C	CLAYSTONE	4	16.4	1.07	0.7	8.2	0.415	0.02	3.1	81	2.6	12.2	3	239	0.032		
1	81378	C036C	SANDSTONE	4.4	25.6	1.4	0.06	19.8	0.39	0.46	6.3	81	3.6	27.3	105	143.5	0.058		
1	81379	C036C	SILTSTONE	3	92.7	0.83	0.07	7	0.432	0.62	2.5	105	2	14.2	67	133	0.029		
1	81380	C036C	SANDSTONE	2.1	92	0.68	<0.05	9.9	0.664	0.29	2.3	166	1.4	21.5	127	113.5	0.058		
1	81381	C036C	CARB MUDSTONE	2.5	443	0.59	0.21	6.4	0.288	0.92	2.7	82	1.4	13.1	59	167	0.083		
1	81382	C039C	COAL	1.1	78	0.24	0.18	1.9	0.1	1.2	1.3	35	0.7	12.1	26	183.5	0.088		
1	81383	C039C	SANDSTONE	3.2	75.2	0.88	<0.05	11.7	0.428	0.72	3.3	91	2.1	23.9	86	151	0.019		
1	81384	C039C	SANDSTONE	2.7	45.9	0.95	<0.05	10	0.227	0.52	2.9	30	1.9	8	89	89.8	0.035		
1	81386	C039CR	SANDSTONE	2.2	41.7	0.77	<0.05	7.7	0.174	0.52	1.9	24	1.5	6.7	42	69.2	0.011		
1	81387	C039CR	SANDSTONE	3.1	45.2	0.87	<0.05	13.8	0.352	0.23	2.1	32	2.4	12.7	9	111.5	0.007		
1	81388	C039CR	SANDSTONE	2.1	131	0.68	0.06	11.6	0.368	0.73	2.8	72	1.5	43.6	84	97.8	0.01		
1	81389	C039CR	SANDSTONE	3.6	90.4	0.97	<0.05	14.5	0.395	0.82	2.6	62	2	29.1	57	144.5	0.029		
1	81390	C040C	SANDSTONE	1.9	49.8	0.48	<0.05	8.6	0.152	0.56	1.9	46	1.3	17.5	33	75.9	0.017		
1	81391	C040C	SANDSTONE	2	157.5	0.55	<0.05	8.4	0.273	0.54	2	60	1.4	24.6	54	93.7	0.016		
1	81392	C040C	CARB MUDSTONE	4.3	39.4	0.87	0.3	5.6	0.695	0.43	3.7	151	3.1	10.3	71	205	0.139		
1	81393	C040CR	CARB MUDSTONE	5	31.4	1.39	0.12	11.6	0.374	0.88	6	68	2.9	14.9	103	109.5	0.093		
1	81394	C040CR	CLAY	1.2	170	0.72	<0.05	5.8	0.388	0.2	1.5	40	1.1	16.8	26	76.9	0.008		
1	81395	C041C	CLAY	2.5	1330	1.55	<0.05	12	0.833	0.41	2.9	91	2.1	32	59	155	<0.005		
1	81396	C041C	CLAY	1.1	222	0.57	<0.05	4.6	0.297	0.17	1.4	41	1.2	9.6	24	64.6	<0.005		
1	81397	C041C	CLAYSTONE	4.6	51.4	1.42	<0.05	7.6	0.575	0.14	2.2	64	2.6	7.4	40	132	0.012		
1	81398	C041C	CLAYSTONE	5.6	225	1.86	<0.05	12.8	0.653	0.31	6.1	88	5.3	14.5	11	151.5	0.203		
1	81399	C041C	CLAYSTONE	4.4	57.1	1.2	<0.05	14.6	0.566	0.28	5	103	3.5	35.4	7	187.5	0.01		
1	81400	C041C	CARB MUDSTONE	4.6	34.8	1.26	0.13	13.6	0.371	0.58	8.1	81	2.9	39.9	269	99.6	0.251		
1	81401	C042C	MUDSTONE	5.5	22	1.77	0.13	19.8	0.422	0.57	5.7	59	3.3	15	222	104.5	0.095		
1	81402	C042C	MUDSTONE	5.7	22.6	1.56	0.33	17.8	0.421	0.85	6.2	79	3.6	29.9	93	110	0.131		
1	81403	C042C	MUDSTONE	2.8	96.6	0.79	0.16	8.4	0.355	0.77	4.2	84	2.3	15.5	73	120	0.158		
1	81404	C044C	SANDSTONE	1.8	81.2	0.52	0.05	5.4	0.436	0.55	2.4	77	2	20.3	87	109.5	0.023		
1	81405	C044C	SANDSTONE	1.9	87.5	0.62	<0.05	9	0.206	0.79	2	43	2.2	15.3	27	94.5	0.069		
1	81406	C046C	CARB MUDSTONE	5.7	16.1	1.52	0.13	18.6	0.45	0.17	5.4	40	3.5	16.5	18	180	0.121		
1	81407	C046C	SANDSTONE	2.1	23.6	0.72	<0.05	10	0.236	0.34	1.7	47	1.5	36.9	5	104	0.029		
1	81408	C046C	CARB MUDSTONE	7.7	51.8	1.73	0.19	10.2	0.623	0.21	5.9	98	5.2	8.9	27	184	0.122		
1	81409	C046C	SANDSTONE	1.3	402	0.37	<0.05	5.1	0.362	0.41	1.3	104	0.8	22.4	82	78.1	0.045		

Batch #	Sample ID	Site No.	Analyte	Al	Ca	Fe	K	Mg	Mn	Na	P	S	Ag	As	B	Ba	Be	Bi	Cd	Ce	Co
			Units	%	%	%	%	%	ppm	%	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
			Comparative Abundance	7.2	6.6	4.1	2	1.4	770	0.57	670	0.22	0.057	7.7	100	460	2	0.4	0.17	83	14
1	81410	C046C	SANDSTONE	7.48	0.41	3.21	1.47	0.39	465	0.55	480	0.02	0.12	20.8	20	300	1.75	0.29	0.17	56.5	19.9
1	81411	C046C	SILTSTONE	7.79	0.4	3.97	1.58	0.49	366	0.35	640	0.01	0.12	1.8	30	290	2.13	0.45	0.05	43.9	14.5
1	81413	C048C	SANDSTONE	6.74	10.4	2.76	1.39	0.8	1480	0.93	760	0.04	0.05	7	<10	310	1.29	0.1	0.05	37.5	14.5
1	81414	C048C	SILTSTONE	8	0.51	3.38	2.32	0.75	582	0.61	610	0.03	0.1	6.1	20	390	1.88	0.47	0.16	45.1	12.5
1	81415	C048C	CARB MUDSTONE	4.5	0.27	1.01	1.11	0.16	100	0.07	50	0.04	4.3	1.4	20	210	2.11	0.49	0.12	21.5	4.5
1	81416	C048C	SILTSTONE	7.3	0.59	4.03	0.82	0.25	107	0.07	110	0.02	0.09	5	10	160	2.38	0.47	0.08	69.7	12.3
1	81417	C048C	SILTSTONE	7.71	0.59	5.23	1.45	0.74	1310	0.24	1280	0.01	0.12	2.9	20	310	2.23	0.45	0.07	36.6	20.4
1	81418	C048C	SILTSTONE	7.96	0.49	3.19	1.35	0.53	424	0.33	650	0.03	0.12	4.9	10	310	1.94	0.46	0.17	38.9	15.4
1	81419	C048C	SANDSTONE	6.45	0.79	2.41	0.98	0.33	510	0.49	550	0.01	0.05	9.5	<10	210	0.92	0.21	0.06	38.2	12.6
1	81420	C048C	CARB MUDSTONE	6.02	0.3	1.14	1.58	0.28	57	0.44	90	0.07	21.4	4.3	10	370	1.84	0.44	0.17	17.4	12.4
1	81421	C048C	SANDSTONE	7.22	0.93	1.3	1.72	0.61	160	0.84	120	0.06	0.05	12.1	<10	630	1.19	0.15	0.1	29.5	25.7
1	81423	C048C	SANDSTONE	7.63	1.54	2.28	1.63	0.97	276	1.07	670	0.03	0.04	5.8	<10	540	1.5	0.14	0.07	42.1	16.1
1	81424	C048C	SANDSTONE	6.26	11.85	1.43	1.33	0.5	1400	1.43	590	0.02	0.04	5	<10	380	1.29	0.08	0.05	36	14.3
1	81425	C048C	SANDSTONE	7.01	1	3.32	1.63	1.12	194	1.12	720	0.03	0.05	7	<10	590	1.35	0.13	0.07	33	21.4
1	81426	C048C	SANDSTONE	6.45	1.45	2.94	1.87	0.82	325	1.09	710	0.03	0.05	6.8	<10	630	1.31	0.11	0.08	30.4	18.6
1	81427	C048C	SANDSTONE	7.36	1.75	2.7	1.91	0.75	221	1.09	680	0.04	0.05	6.2	<10	690	1.34	0.11	0.07	42.9	14.6
1	81428	C048C	SANDSTONE	7.15	0.99	4.14	2.05	0.87	307	1.04	710	0.03	0.05	5.3	<10	590	1.44	0.11	0.04	42.9	16.3
1	81430	C048C	SANDSTONE	7.26	1.84	2.76	2.1	0.83	726	1.01	730	0.03	0.05	5.1	10	470	1.16	0.11	0.06	41	14.6
1	81431	C048C	SANDSTONE	7.5	1.56	2.51	1.86	0.92	679	0.92	750	0.02	0.05	5.2	10	410	1.1	0.1	0.06	41.2	13.6
1	81432	C048C	CARB MUDSTONE	5.75	0.91	1.7	0.58	0.74	64	0.53	440	0.04	10.35	5.9	10	280	1.49	0.25	0.14	27.6	23.2
1	81433	C048C	INTERBEDDED SANDSTONE AND SILTSTONE	6.71	0.29	2.94	2.08	0.43	428	0.45	410	0.02	0.06	8.7	20	420	1.77	0.31	0.12	40.4	8.3
1	81434	C048C	SILTSTONE	9.36	0.15	2.02	2.3	0.39	114	0.28	180	0.02	0.1	4.2	20	520	3.48	0.64	0.2	76.6	6.8
1	81435	C048C	SANDSTONE	5.13	0.08	0.96	1.85	0.14	110	0.08	190	0.01	0.03	6.4	10	490	0.94	0.16	0.04	34.5	7.5
1	81436	C048C	SANDSTONE	4.31	4.31	0.53	1.77	0.09	218	0.08	90	0.01	0.03	4	10	480	0.69	0.08	0.02	25.7	4.1
1	81437	C048C	SANDSTONE	5.37	0.08	1.25	1.75	0.15	380	0.07	190	0.01	0.04	5.2	10	460	1.09	0.16	0.04	43.3	13.3
1	81438	C048C	INTERBEDDED CARB MUDSTONE AND TUFF	8.14	1.72	2.67	0.47	0.5	198	0.13	640	0.1	0.08	7.4	10	310	1.73	0.35	0.11	50.9	6.6
1	81439	C048C	INTERBEDDED CARB MUDSTONE AND TUFF	7.05	1.37	2.05	0.47	0.35	110	0.13	450	0.06	0.12	8.3	10	280	1.59	0.46	0.11	51	5.2
1	81440	C048C	CARB MUDSTONE	7.03	0.1	1.2	1.79	0.24	55	0.08	100	0.02	5.45	3	30	400	3.46	0.69	0.18	58.6	4.4
1	81441	C048C	SANDSTONE	4.06	0.05	0.62	1.36	0.09	46	0.05	120	0.01	0.02	8.2	10	330	0.97	0.09	0.03	30.8	5.6
1	81443	C048C	SANDSTONE	4.35	0.04	0.67	1.29	0.09	120	0.05	90	0.01	0.05	5.2	10	310	1.1	0.11	0.02	64.8	14.2
1	81444	C048C	SANDSTONE	3.99	0.31	0.45	1.25	0.06	71	0.05	70	0.01	0.02	3.7	10	280	0.76	0.07	<0.02	28.1	5.7
1	81445	C056C	CARB MUDSTONE	6.91	0.11	0.2	0.17	0.02	13	0.03	100	0.02	23.8	1.9	10	60	2.53	0.92	0.28	37.8	2
1	81446	C056C	SILTSTONE	7.49	0.8	4.93	1.88	0.24	115	0.06	110	0.01	0.07	1.7	20	220	2.18	0.29	0.04	48.9	3.7
1	81447	C056C	SILTSTONE	7.86	0.97	2.74	2.02	0.24	109	0.08	280	0.01	0.08	4.2	20	250	2.66	0.48	0.13	119	5.9
1	81448	C056C	SILTSTONE	5.57	0.94	4.24	1.21	0.31	153	0.43	60	0.02	0.08	5.6	20	280	1.9	0.28	0.05	74.6	11.9
1	81449	C056C	CLAY	4.24	0.02	2.01	0.2	0.09	57	0.06	100	0.01	0.06	3.4	10	210	1.12	0.23	<0.02	36.8	2.9
1	81450	C056C	CLAYSTONE	8.37	0.01	4.22	0.8	0.09	32	0.05	350	0.01	0.05	5.8	20	240	1.76	0.57	<0.02	38.4	4.2
1	81451	C056C	SANDSTONE	3.29	0.02	0.29	0.27	0.04	26	0.02	140	0.01	0.27	0.9	10	270	0.71	0.2	<0.02	110.5	1
1	81452	C180004CQ	CLAYSTONE	8.47	0.4	4.96	1.74	0.7	708	0.12	500	<0.01	0.15	23.4	20	390	2.35	0.59	<0.02	48.7	16.2
1	81453	C180004CQ	CLAYSTONE	7.67	0.51	4.72	1.74	0.81	514	0.23	510	<0.01	0.12	7.2	30	360	1.9	0.37	<0.02	50.6	19.5
1	81454	C180004CQ	SANDSTONE	8.31	0.59	1.28	1.61	0.64	85	0.69	450	0.06	0.04	6.9	10	1390	1.32	0.14	0.08	41	20.5
1	81455	C180004CQ	CARB MUDSTONE	4.72	0.27	1.39	0.92	0.18	41	0.16	120	0.07	21.7	2.2	20	270	2.43	0.57	0.16	26.9	6.8
2	169619	C180004CQ	SANDSTONE	7.98	0.18	0.86	2.46	0.1	53	0.1	280	0.03	0.06	2.1	10	550	2.85	0.23	0.03	116	4.9
2	169624	C180004CQ	SANDSTONE	6.7	0.18	1.74	2.46	0.19	364	0.1	500	0.08	0.06	4.8	10	540	1.38	0.2	0.05	57.1	12.3
2	169633	C180004CQ	SANDSTONE	3.33	0.02	0.34	0.22	0.04	17	0.02	30	0.01	0.03	3.2	10	60	0.48	0.08	0.03	23	1.6
2	169634	C180004CQ	SANDSTONE	6.76	0.09	1.01	0.54	0.09	37	0.05	70	0.02	0.06	1	10	120	1.81	0.38	0.07	57.1	2
2	182769	C180007CQ	SANDSTONE	6.31	0.22	1.96	2.36	0.22	418	0.09	450	0.01	0.06	4	10	500	1.48	0.16	0.07	52.8	11.8
2	154036	C675CQ	SANDSTONE	9.05	0.27	2.83	1.36	0.37	444	0.11	770	0.03	0.11	4.3	20	280	1.95	0.38	0.15	62.2	14.4
2	154038	C675CQ	SANDSTONE	7.03	5.2	2.81	1.74	0.74	640	0.53	810	0.03	0.06	12.6	10	470	1.23	0.11	0.08	44	13.3
2	154041	C675CQ	CARB MUDSTONE	7.42	0.71	2.55	1.2	0.89	533	0.38	520	0.12	0.11	4.9	20	270	1.84	0.49	0.15	48.4	15
2	154043	C675CQ	SILTSTONE	8	0.72	4.03	2.71	0.41	800	0.16	730	0.07	0.1	11.6	20	970	2.07	0.43	0.16	61.1	11.2
2	147657	C675CQ	SILTSTONE	13.25	0.07	0.24	0.14	0.03	21	0.04	180	0.01	0.05	1.7	10	80	2.32	1.21	0.04	124	0.7
2	GT147150	C9532CQR	CLAYSTONE	9.39	0.06	0.69	1.11	0.13	71	0.05	220	0.02	0.09	3.1	30	350	3.7	0.66	0.37	110	22.5
2	182752	C180007CQ	SILTSTONE	9.16	0.26	0.74	1.58	0.28	73	0.15	830	0.05	0.09	9.7	20	490	1.95	0.32	0.14	70	7.3
2	182755	C180007CQ	SILTSTONE	7.34	0.56	3.44	1.57	0.76	506	0.36	670	0.05	0.09	4.9	20	350	1.96	0.32	0.14	45.8	12.9
2	182767	C180007CQ	SANDSTONE	6.62	0.46	1.09	2.37	0.21	190	0.1	380	0.01	0.05	3.6	10	480	1.31	0.16	0.05	51.5	8.7
2	169915	C339G	SANDY CLAY	9.24	0.2	3.75	1.77	0.66	149	0.12	550	0.01	0.1	9.1	40	340	2.37	0.52	0.03	151	11
2	170286	C607CQ	CLAYSTONE	8.2	0.4	1.48	2.34	0.66	137	0.2	700	0.05	0.08	4.6	20	550	1.53	0.34	0.14	55	11.8

Batch #	Sample ID	Site No.	Analyte	Cr	Cs	Cu	Ga	Ge	Hf	In	La	Li	Mo	Nb	Ni	Pb	Rb	Re	Sb	Sc	Se
			Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
			Comparative Abundance	72	72	33	18	1.7	2.5	0.044	41	56	2	13	52	19	135	0.0004	1.2	10	0.42
1	81410	C046C	SANDSTONE	49	5.03	27.2	19.3	0.12	3.3	0.058	25.9	24	0.37	9	32.7	20.5	82.6	<0.002	1.29	14.7	1
1	81411	C046C	SILTSTONE	52	8.14	46	23	0.1	3.9	0.074	20.3	32.2	0.26	10.3	37.9	21.5	79.4	<0.002	0.75	15.7	1
1	81413	C048C	SANDSTONE	26	3.49	16.5	16.2	0.08	2.1	0.036	18.4	9	0.49	4.4	18.3	10.1	70.1	<0.002	0.32	12.7	1
1	81414	C048C	SILTSTONE	38	10.2	52.6	22.5	0.11	3.7	0.075	20.3	22.4	1.15	8.5	27.9	22	110.5	<0.002	0.59	15.5	1
1	81415	C048C	CARB MUDSTONE	20	13.05	28.5	16	0.05	2.6	0.064	11.1	21.3	1.05	6.5	11.3	18.2	66	<0.002	0.97	9.3	1
1	81416	C048C	SILTSTONE	22	10.6	14.2	17.85	0.12	4.4	0.054	34.9	26.9	0.25	12	14.2	22	81.7	<0.002	0.59	10.3	1
1	81417	C048C	SILTSTONE	55	6.68	52	23.7	0.14	3.7	0.077	16.7	39	0.25	9.4	47.4	23.2	51.1	<0.002	0.84	15.9	1
1	81418	C048C	SILTSTONE	45	7.49	51.7	23.7	0.09	3.8	0.078	16.8	39.1	0.3	9.2	31.6	24	61.8	<0.002	0.94	16.5	1
1	81419	C048C	SANDSTONE	48	2.82	18.1	17.35	0.07	2.8	0.058	17.6	18.5	1.86	7.5	21.1	16.1	46.9	<0.002	0.74	10.2	1
1	81420	C048C	CARB MUDSTONE	28	10.4	77.3	22.9	0.06	2.9	0.065	10.7	25.5	1.54	7.2	34.7	22.3	66.9	0.004	0.84	7	1
1	81421	C048C	SANDSTONE	36	3.69	28.8	20.5	0.05	3	0.065	14.3	11.8	1.77	6.8	31.7	14.4	61.3	<0.002	0.53	11.1	1
1	81423	C048C	SANDSTONE	49	4.49	25	19.25	0.08	2.7	0.055	19.8	14.6	0.75	5.7	25.2	12.5	76.7	<0.002	0.36	17	1
1	81424	C048C	SANDSTONE	29	2.78	16.6	15.6	0.08	2	0.04	17.2	10.2	0.58	4.6	18.9	9	65.9	<0.002	0.27	13	1
1	81425	C048C	SANDSTONE	42	3.25	22.6	19.8	0.1	2.6	0.051	15	16.4	1.03	5.5	29.1	13.1	56.5	<0.002	0.44	15.3	1
1	81426	C048C	SANDSTONE	44	2.86	21.7	17.6	0.1	2.5	0.045	13.7	15.1	0.91	5.7	23.1	12.9	58.5	<0.002	0.49	12.8	1
1	81427	C048C	SANDSTONE	39	3.29	20	17.45	0.1	2.6	0.043	20.1	15.7	0.56	5.1	19.3	13	85.7	<0.002	0.47	12.8	1
1	81428	C048C	SANDSTONE	31	3.38	27.3	16.85	0.13	2.6	0.041	20.4	18.7	0.59	5.1	20.2	12.1	93.2	<0.002	0.45	11.7	1
1	81430	C048C	SANDSTONE	33	3.36	18.5	16.8	0.1	2.5	0.043	19.4	9.4	0.5	5.1	18.6	14.1	96.1	<0.002	0.49	12.8	1
1	81431	C048C	SANDSTONE	37	3.19	19.9	17.9	0.1	2.5	0.048	19.2	9.2	0.57	5	18.6	11.7	87.7	<0.002	0.42	16.9	1
1	81432	C048C	CARB MUDSTONE	13	2.73	19	21.4	0.09	4.2	0.078	13.1	10.1	2.54	7	30.4	20.9	7.9	0.003	0.47	7.6	2
1	81433	C048C	INTERBEDDED SANDSTONE AND SILTSTONE	56	6.29	29.8	18.9	0.1	4.1	0.073	18.2	23	0.61	9.2	18.4	20.3	96.9	<0.002	0.59	13.6	1
1	81434	C048C	SILTSTONE	38	9.52	39.7	27.1	0.12	5.1	0.103	34.7	44.3	0.45	13.8	16	35	130.5	<0.002	0.58	16.8	2
1	81435	C048C	SANDSTONE	31	3.06	6.4	11.25	0.05	2.1	0.033	18.6	12.6	0.56	5.5	9.6	18.3	94.4	<0.002	0.43	6.2	1
1	81436	C048C	SANDSTONE	15	2.02	3.3	8.29	0.11	1.5	0.02	13.8	8.6	0.3	3.3	4.9	16.1	83.1	<0.002	0.31	3.6	1
1	81437	C048C	SANDSTONE	23	3.45	7.6	13.15	0.07	2.6	0.04	21.6	13.5	1.37	7.4	12.5	20	96.7	<0.002	0.46	6.7	1
1	81438	C048C	INTERBEDDED CARB MUDSTONE AND TUFF	4	2.49	37.8	22.4	0.11	6.1	0.086	22.3	12.3	3.93	8.3	4	24.1	12.4	0.002	0.71	13.3	2
1	81439	C048C	INTERBEDDED CARB MUDSTONE AND TUFF	4	1.86	20.7	23.6	0.13	7.1	0.084	21.7	13.4	2.49	9.5	2.8	30.6	12.2	0.002	0.59	10.1	2
1	81440	C048C	CARB MUDSTONE	45	14.85	29.9	28.5	0.09	3.5	0.094	28	49.8	0.49	19.3	15.1	40.4	105.5	<0.002	0.46	10.9	1
1	81441	C048C	SANDSTONE	23	2.49	4.7	11.9	0.07	2	0.029	16.5	13.2	1.3	6.9	9.5	19.7	82.1	<0.002	0.29	3.7	<1
1	81443	C048C	SANDSTONE	25	2.35	5.2	12.95	0.11	2.3	0.034	32.6	14.6	0.99	9.2	8.6	19.5	76.9	<0.002	0.35	4.9	1
1	81444	C048C	SANDSTONE	25	1.77	3.1	10.5	0.08	1.7	0.022	14.9	11.4	1.19	5.2	5	17.5	72.8	<0.002	0.32	3.4	<1
1	81445	C056C	CARB MUDSTONE	23	2.7	21.3	27.9	0.06	6.8	0.14	15.8	41.6	0.8	20.9	5.8	49.2	13	<0.002	0.66	10.3	2
1	81446	C056C	SILTSTONE	17	16.7	16.8	19.55	0.19	4.1	0.062	37.4	24.7	0.28	8.3	6.9	10.9	140	0.002	0.63	12.4	2
1	81447	C056C	SILTSTONE	19	10.95	22.3	22.2	0.28	5.4	0.07	70.8	25.5	0.34	10.9	8.9	22.7	122	0.002	0.68	13.3	2
1	81448	C056C	SILTSTONE	22	10.75	9.9	15.2	0.17	4.2	0.041	37.7	19.8	0.18	10.3	11.9	18.9	122	<0.002	0.94	6.9	1
1	81449	C056C	CLAY	46	3.38	13.2	12.15	0.11	2.6	0.039	18.6	17.5	0.85	8.6	13	14.5	31	<0.002	0.55	9.3	1
1	81450	C056C	CLAYSTONE	68	4.1	25.1	26.8	0.15	4.5	0.11	21.2	10.8	0.55	16.3	18.5	27.1	59	<0.002	1.44	17.8	1
1	81451	C056C	SANDSTONE	32	1.89	6.2	9.07	0.19	2.8	0.045	43.9	16.3	0.26	6.4	3.6	16.5	23.9	<0.002	0.62	13.5	1
1	81452	C180004CQ	CLAYSTONE	58	11.1	66.9	24.5	0.19	4.1	0.077	22.5	54.1	0.23	10.5	44.5	22.9	106.5	<0.002	1.08	17.9	1
1	81453	C180004CQ	CLAYSTONE	59	10.15	35.5	23.2	0.18	3.9	0.075	23.5	34.9	0.2	10.1	44.2	21.3	92.4	<0.002	1.06	16.1	1
1	81454	C180004CQ	SANDSTONE	31	3.06	42	24.6	0.12	3.7	0.06	18.4	14.7	1.49	7.1	19.3	13.5	59.5	0.002	0.4	12.4	1
1	81455	C180004CQ	CARB MUDSTONE	11	4.97	37.7	19.05	0.07	4	0.088	12.2	25.1	0.79	7.6	10.2	28.3	40.9	<0.002	0.77	8.4	1
2	169619	C180004CQ	SANDSTONE	127	3.69	52	19.45	0.23	3.8	0.06	50.6	11.4	0.5	8.1	11.6	26.4	120	0.002	0.88	18	2
2	169624	C180004CQ	SANDSTONE	61	4.04	13.5	15.65	0.14	3.6	0.047	26	14.3	0.82	7.4	20	19.2	126.5	0.002	0.8	11.8	1
2	169633	C180004CQ	SANDSTONE	52	1.68	3.7	8.45	0.06	1.6	0.018	12.2	10	0.84	4.1	4.1	9.1	18.1	<0.002	0.31	3.3	<1
2	169634	C180004CQ	SANDSTONE	46	8.02	12	18.65	0.11	4.6	0.054	26.4	18	0.43	11	7	20.9	58	<0.002	0.42	9.5	1
2	182769	C180007CQ	SANDSTONE	64	4.36	14	15.95	0.13	3.3	0.047	23.8	14.8	0.68	7.1	13	16.6	126.5	<0.002	0.69	11.7	1
2	154036	C675CQ	SANDSTONE	66	7.23	48.3	24.9	0.15	4.3	0.079	28.1	35.6	0.36	10.5	29	23.6	92.3	<0.002	0.88	21.3	1
2	154038	C675CQ	SANDSTONE	67	2.87	22.1	19.8	0.17	2.5	0.055	20.1	10.3	0.97	5.9	26.2	13.4	62.3	<0.002	0.32	16.6	1
2	154041	C675CQ	CARB MUDSTONE	33	5.92	44.7	20.8	0.15	4.9	0.068	21.8	12.6	2.38	7.7	25.9	25.8	50.6	0.002	0.81	13.1	1
2	154043	C675CQ	SILTSTONE	50	7.21	52.6	23	0.18	4.1	0.078	27.1	19.7	0.89	9.4	20.8	20.8	130	0.002	0.66	17.6	2
2	147657	C675CQ	SILTSTONE	11	1.39	10.1	39.2	0.19	11.1	0.158	47.9	53.3	1.37	24.5	4.9	70.1	9.5	0.002	0.59	18.6	3
2	GT147150	C9532CQR	CLAYSTONE	47	9.05	39	32.8	0.18	6.2	0.102	49	41.7	0.95	18.5	35.9	42	87	<0.002	0.87	18	2
2	182752	C180007CQ	SILTSTONE	57	5.77	51.6	26.5	0.14	4.4	0.08	30.5	22.5	0.92	9.7	23.4	20.2	89.8	0.002	0.59	20.3	2
2	182755	C180007CQ	SILTSTONE	52	6.54	51.6	22.2	0.16	3.6	0.063	21.1	12.3	1.19	7.5	22.3	16.3	82.5	0.002	0.61	15.7	1
2	182767	C180007CQ	SANDSTONE	53	4.69	14.4	16.85	0.13	3.2	0.038	23.3	14.7	0.49	6.8	14	16.6	133.5	<0.002	0.68	12.2	1
2	169915	C339G	SANDY CLAY	57	12.35	45	28.4	0.25	4.1	0.081	51.9	39	0.21	11	35.3	22.5	123.5	0.002	0.83	21.4	1
2	170286	C607CQ	CLAYSTONE	38	7	52.8	24.5	0.15	3.9	0.074	24.5	20.7	0.61	9.3	28	18.4	120.5	<0.002	0.48	18.7	1

Batch #	Sample ID	Site No.	Analyte	Sn	Sr	Ta	Te	Th	Ti	Tl	U	V	W	Y	Zn	Zr	Hg	F	C
			Units	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	%
			Comparative Abundance	4.6	320	1.5	0.005	9.6	0.38	0.95	3.1	105	1.7	40	95	150	0.19	640	2.94
1	81410	C046C	SANDSTONE	2.4	78.3	0.77	<0.05	11	0.414	0.49	2.7	100	1.7	19.7	82	117.5	0.016		
1	81411	C046C	SILTSTONE	2.9	126.5	0.89	0.06	8.7	0.492	0.59	2.5	117	2.2	18.7	81	136.5	0.014		
1	81413	C048C	SANDSTONE	1.1	486	0.35	<0.05	5.6	0.278	0.35	1.3	85	0.7	19.5	64	74.6	0.021		
1	81414	C048C	SILTSTONE	2.8	297	0.73	0.08	9.1	0.406	0.69	2.7	107	1.9	19.2	87	126	0.056		
1	81415	C048C	CARB MUDSTONE	2.9	41.6	0.59	0.05	6.1	0.28	0.68	2.2	82	1.7	13.3	29	90.8	0.063		
1	81416	C048C	SILTSTONE	3	52.4	1.09	0.05	16.6	0.284	0.51	4.5	47	2.2	26.1	56	151	0.054		
1	81417	C048C	SILTSTONE	2.7	129.5	0.8	0.09	7.1	0.44	0.55	2.5	120	1.9	19.8	95	129	0.042		
1	81418	C048C	SILTSTONE	2.7	115.5	0.78	0.09	8	0.458	0.6	3.1	119	2	17.5	89	132.5	0.082		
1	81419	C048C	SANDSTONE	2	51.7	0.61	<0.05	11.8	0.429	0.38	2.5	101	1.8	15.7	57	94.8	0.035		
1	81420	C048C	CARB MUDSTONE	2.7	248	0.67	0.14	5	0.386	1.04	2.4	66	1.7	5.9	100	91.4	0.114		
1	81421	C048C	SANDSTONE	1.9	410	0.52	<0.05	5.9	0.49	0.71	1.8	95	1.1	8.9	96	102.5	0.052		
1	81423	C048C	SANDSTONE	1.6	514	0.45	<0.05	6.4	0.434	0.47	1.6	167	1	16.1	89	90.1	0.022		
1	81424	C048C	SANDSTONE	1.1	550	0.33	<0.05	5.1	0.31	0.35	1.2	96	0.7	18.7	54	70.6	0.017		
1	81425	C048C	SANDSTONE	1.5	453	0.42	<0.05	5.2	0.399	0.47	1.5	128	1	13.4	80	90.7	0.017		
1	81426	C048C	SANDSTONE	1.4	400	0.46	<0.05	4.8	0.391	0.47	1.4	119	0.9	13.3	71	87.7	0.017		
1	81427	C048C	SANDSTONE	1.4	334	0.42	<0.05	6.5	0.343	0.48	1.6	112	0.8	15.5	68	87.9	0.013		
1	81428	C048C	SANDSTONE	1.4	331	0.41	<0.05	6.4	0.328	0.46	1.6	105	0.9	17	63	88.6	0.013		
1	81430	C048C	SANDSTONE	1.4	500	0.41	<0.05	6.3	0.364	0.45	1.5	109	0.8	16	69	86.8	0.017		
1	81431	C048C	SANDSTONE	1.4	559	0.41	<0.05	6	0.374	0.43	1.4	118	0.8	15.2	69	84.5	0.021		
1	81432	C048C	CARB MUDSTONE	2.5	642	0.55	0.05	3.7	0.514	0.56	2.5	98	1.4	13.5	86	146	0.105		
1	81433	C048C	INTERBEDDED SANDSTONE AND SILTSTONE	3.2	116.5	0.83	<0.05	8.8	0.424	0.65	2.9	102	2.2	19.5	78	137.5	0.02		
1	81434	C048C	SILTSTONE	4.6	91.3	1.22	0.07	16.4	0.456	0.84	5	94	2.8	28.7	116	170	0.047		
1	81435	C048C	SANDSTONE	1.8	48.3	0.52	<0.05	7.7	0.16	0.59	1.7	35	1.1	13.4	35	65	0.011		
1	81436	C048C	SANDSTONE	1.1	187.5	0.33	<0.05	5.1	0.077	0.5	1.1	19	0.7	14.3	19	46	0.008		
1	81437	C048C	SANDSTONE	2.2	45.2	0.65	<0.05	9	0.222	0.64	2.1	39	1.5	15.4	37	81.8	0.01		
1	81438	C048C	INTERBEDDED CARB MUDSTONE AND TUFF	2.6	214	0.71	0.07	8.6	0.456	0.58	3	70	2.7	26.3	77	207	0.147		
1	81439	C048C	INTERBEDDED CARB MUDSTONE AND TUFF	3	179	0.9	0.05	10	0.335	0.39	3.9	43	1.9	22.2	71	225	0.146		
1	81440	C048C	CARB MUDSTONE	6.1	30.7	1.81	0.07	16.9	0.423	0.95	6.6	90	3.6	14.1	92	115	0.052		
1	81441	C048C	SANDSTONE	1.6	31.7	0.57	<0.05	7.1	0.117	0.53	1.7	15	0.7	8.4	34	63.9	0.021		
1	81443	C048C	SANDSTONE	2.3	31.6	0.85	<0.05	15.4	0.201	0.63	2.2	26	1.2	12.7	33	67.9	0.02		
1	81444	C048C	SANDSTONE	1.4	30.5	0.46	<0.05	6	0.085	0.44	1.3	18	0.6	7.3	24	50.3	0.013		
1	81445	C056C	CARB MUDSTONE	6.5	15.2	1.95	0.2	14.4	0.542	0.17	6	62	3.6	15	20	233	0.069		
1	81446	C056C	SILTSTONE	2.3	83.4	0.68	0.05	11.1	0.346	0.69	3.2	68	1.5	38.8	40	140	0.056		
1	81447	C056C	SILTSTONE	3	89	0.92	0.05	16.5	0.336	0.71	4	59	1.6	56.2	87	174.5	0.031		
1	81448	C056C	SILTSTONE	2.4	85.1	0.85	<0.05	14.1	0.229	0.61	3.1	35	1.5	27.2	42	140.5	0.025		
1	81449	C056C	CLAY	1.9	21.5	0.7	<0.05	9.3	0.305	0.25	1.4	50	3.9	12.7	11	86.4	<0.005		
1	81450	C056C	CLAYSTONE	4.7	63.3	1.47	<0.05	16.2	0.465	0.36	3.7	125	3.6	10.6	33	144	<0.005		
1	81451	C056C	SANDSTONE	1.4	56.7	0.56	<0.05	10.7	0.221	0.16	1.7	23	3.4	10.6	10	88.1	0.013		
1	81452	C180004CQ	CLAYSTONE	3	137.5	0.87	0.07	10.3	0.437	0.74	3.3	95	1.9	21.8	82	137.5	<0.005		
1	81453	C180004CQ	CLAYSTONE	2.9	163.5	0.82	0.06	9.3	0.436	0.67	2.5	95	1.9	22	98	133	0.006		
1	81454	C180004CQ	SANDSTONE	1.8	507	0.51	<0.05	6	0.586	0.7	1.9	139	0.8	9.8	87	128	0.048		
1	81455	C180004CQ	CARB MUDSTONE	3.1	156.5	0.65	0.13	5.9	0.327	0.48	2.8	71	1.8	14.2	59	134	0.1		
2	169619	C180004CQ	SANDSTONE	2.2	120	0.61	0.05	11.2	0.38	0.5	3.7	143	2	45.8	42	136.5	0.019	240	0.17
2	169624	C180004CQ	SANDSTONE	2.1	45	0.54	<0.05	10.8	0.3	0.92	2.8	63	1.4	23	49	119.5	0.03	260	0.38
2	169633	C180004CQ	SANDSTONE	1	13.6	0.3	<0.05	4	0.121	0.15	1.1	16	0.9	6.8	13	54.3	0.013	60	0.45
2	169634	C180004CQ	SANDSTONE	2.6	29.6	0.82	0.05	11.7	0.328	0.32	3.3	50	1.9	22.5	21	159	0.045	110	1.5
2	182769	C180007CQ	SANDSTONE	2	42.1	0.52	<0.05	9.4	0.293	0.65	2.3	68	1.5	20.7	45	112.5	0.02	220	0.66
2	154036	C675CQ	SANDSTONE	2.7	64.8	0.74	0.07	11.7	0.5	0.53	3.3	123	2	25	138	147	0.349	410	0.51
2	154038	C675CQ	SANDSTONE	1.5	272	0.38	<0.05	4.9	0.457	0.45	1.3	118	0.8	24.5	102	84.5	0.034	390	2.1
2	154041	C675CQ	CARB MUDSTONE	2.4	432	0.6	0.11	9.9	0.362	0.53	3.6	82	1.7	19.6	81	166.5	0.046	440	2.85
2	154043	C675CQ	SILTSTONE	2.9	125.5	0.69	0.09	10.1	0.44	0.56	3.1	115	1.9	25.9	85	145	0.048	370	2.43
2	147657	C675CQ	SILTSTONE	6.8	24.5	1.7	0.16	28.5	0.598	0.14	12.2	51	3.8	38.4	26	351	0.158	160	1.58
2	GT147150	C9532CQR	CLAYSTONE	5.5	41.2	1.46	0.07	19.6	0.49	0.58	5.9	96	3.4	34.1	151	196	0.094	290	0.7
2	182752	C180007CQ	SILTSTONE	2.8	125.5	0.7	0.06	10	0.522	0.58	2.9	143	1.9	22.1	111	151	0.063	430	1.45
2	182755	C180007CQ	SILTSTONE	2.2	320	0.54	0.07	7.9	0.411	0.46	2.4	130	1.4	18.1	84	125	0.033	430	1.94
2	182767	C180007CQ	SANDSTONE	2	44	0.49	<0.05	9	0.305	0.68	2.2	78	1.4	20	48	107.5	0.022	200	0.32
2	169915	C339G	SANDY CLAY	3.3	535	0.83	0.08	10.5	0.436	0.77	2.9	99	2	19.9	87	138	<0.005	500	0.03
2	170286	C607CQ	CLAYSTONE	2.6	188.5	0.64	0.07	8.9	0.457	0.57	2.6	117	1.6	19.3	80	143	0.038	370	0.59

Batch #	Sample ID	Site No.	Analyte	Al	Ca	Fe	K	Mg	Mn	Na	P	S	Ag	As	B	Ba	Be	Bi	Cd	Ce	Co
			Units	%	%	%	%	%	ppm	%	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
			Comparative Abundance	7.2	6.6	4.1	2	1.4	770	0.57	670	0.22	0.057	7.7	100	460	2	0.4	0.17	83	14
2	170288	C607CQ	SILTSTONE	7.74	0.71	2.44	1.48	1.02	312	0.23	640	0.09	0.1	4.8	20	350	1.92	0.47	0.15	55.6	12.3
2	170294	C607CQ	SANDSTONE	9.39	0.1	2.62	0.74	0.11	565	0.05	170	0.03	0.22	6.8	20	190	3.69	1.58	0.39	96	3.7
2	177670	C669CQ	SILTSTONE	8.18	0.12	0.64	1.22	0.15	46	0.05	220	0.02	0.1	27.2	20	300	1.87	0.45	0.13	71.3	5.9
2	GT148409	C9672CQR	TUFF	7.87	0.51	0.66	1.01	0.29	64	0.17	220	0.04	0.08	7	10	450	1.26	0.21	0.17	26	10.9
2	GT148411	C9672CQR	SANDSTONE	6.51	4.23	0.85	1.49	0.28	146	0.26	690	0.04	0.07	7.4	20	410	1.21	0.22	0.11	30.8	20.8
2	GT148425	C9672CQR	SILTSTONE	8.56	0.28	1.7	2.05	0.3	113	0.12	460	0.02	0.12	3.2	20	410	2.26	0.55	0.2	75.6	5.8
2	GT147596	C541CQ	SILTSTONE	9	0.11	0.73	1.85	0.25	58	0.15	180	0.05	0.08	4	20	360	1.34	0.39	0.17	45.6	8.6
2	GT152519	C541CQ	CARB SANDSTONE	10.95	0.13	0.38	0.27	0.04	20	0.04	110	0.06	0.1	2.2	10	100	3.1	1.16	0.18	109.5	1.9
2	170109	C544CQ	SILTSTONE	9.12	0.14	0.72	2.02	0.23	86	0.09	350	0.04	0.09	8.3	20	430	1.55	0.49	0.19	48.1	3.6
2	170269	C544CQ	SANDSTONE	3.41	0.02	1.39	0.26	0.02	24	0.02	40	1.51	0.03	61.7	10	60	0.59	0.07	0.04	17.15	15.6
2	204851	C696CQ	SANDSTONE	7.19	0.03	0.25	0.8	0.06	22	0.05	110	0.01	0.06	2.3	10	200	1.23	0.22	0.03	53.3	1.2
2	204852	C696CQ	CLAYSTONE	10.95	0.16	0.5	1.08	0.22	28	0.15	120	0.04	0.09	10.9	20	310	2.22	0.38	0.24	38.3	27.3
2	152622	C9180012CQR	SANDSTONE	5.04	0.38	0.19	0.23	0.05	29	0.04	70	0.04	0.04	2.6	10	80	0.58	0.38	0.08	27.8	9.5
2	169716	C9419CQR	TUFF	2.62	22.7	7.75	0.09	0.6	7450	0.05	>10000	<0.01	0.05	<5	<10	140	1.02	0.08	0.05	43.2	0.8
2	81710	C9673CQR	SANDSTONE	6	3.65	1.03	1.65	0.4	239	0.33	460	0.02	0.06	5.7	20	380	1.01	0.23	0.08	56.8	9.1
2	176524	C99438CQR	SANDSTONE	7.91	0.14	2.51	1.51	0.23	611	0.08	260	0.06	0.08	12.6	20	370	2.47	0.39	0.09	59	7.2
2	176526	C99438CQR	SANDSTONE	8.84	0.04	0.32	0.82	0.08	35	0.05	120	0.02	0.06	3.5	10	250	2.03	0.32	0.05	57.1	2.2
2	177679	C670CQ	SANDSTONE	5.48	6.52	1.67	1.27	0.27	2250	0.44	460	<0.01	0.05	4.4	10	260	1.02	0.18	0.08	42.9	11
2	177697	C670CQ	SILTSTONE	8.4	0.87	3.91	0.46	0.43	426	0.14	1180	0.07	0.13	5.9	<10	290	1.39	0.34	0.14	49.4	8.6
2	148395	C9180009CQR	SANDSTONE	3.71	0.01	0.2	0.48	0.02	21	0.02	70	0.07	0.03	4.1	<10	170	0.73	0.07	0.02	23.6	6.6
2	GT148355	C9380CQR	SILTSTONE	7.04	0.47	2.3	1.7	0.63	280	0.43	620	0.04	0.09	3.6	10	430	1.93	0.37	0.13	40.6	17.1
2	GT148361	C9380CQR	CARB MUDSTONE	9.15	0.46	1.11	0.51	0.44	20	0.21	160	0.12	0.07	9.3	10	310	2.27	0.72	0.09	62.5	61.3
2	GT148362	C9380CQR	CARB MUDSTONE	2.78	0.28	1.28	0.11	0.19	332	0.09	90	0.18	0.03	0.8	<10	180	3.51	0.37	0.02	35.7	0.9
2	GT148371	C9380CQR	SANDSTONE	4.52	0.11	0.81	1.4	0.05	186	0.06	110	0.01	0.15	4	<10	390	0.79	0.09	0.02	78.6	2.8
2	GT175913	C9404CQR	CLAYSTONE	8.46	0.37	3.97	1.76	0.65	274	0.19	560	0.01	0.13	1.8	20	310	2.12	0.41	0.02	44.3	16.3
2	GT175924	C9404CQR	SANDSTONE	8.18	0.71	3.14	2.26	0.57	732	0.21	790	0.05	0.09	3.7	10	530	1.95	0.42	0.12	54.5	16.8
2	GT175931	C9404CQR	CARB SILTSTONE	4.55	0.24	0.93	0.64	0.21	133	0.08	170	0.11	0.05	1.8	10	280	1.76	0.27	0.09	19.5	5.9
2	GT175932	C9404CQR	CARB SILTSTONE	1.85	0.16	0.97	0.11	0.07	301	0.04	70	0.14	0.02	0.7	10	160	2.42	0.3	<0.02	22.2	1.8
2	GT175941	C9404CQR	SANDSTONE	5.24	0.21	3.12	1.79	0.41	154	0.07	370	0.01	0.06	2	20	350	1.76	0.19	0.07	59.9	4
2	147473	C088CQ	SANDSTONE	4.32	0.06	1.12	1.62	0.07	627	0.07	130	0.01	0.04	2.9	10	440	0.69	0.1	0.02	38.5	4.6
2	147482	C088CQ	SILTSTONE	9.06	0.27	6.58	1.19	0.24	1990	0.04	440	0.02	0.13	20	20	250	2.29	0.46	0.16	83.6	8.3
2	147487	C088CQ	SANDSTONE	8.09	0.06	0.68	1.34	0.14	93	0.06	100	0.02	0.05	5.8	20	300	2.22	0.23	0.07	69	4.3
2	147489	C088CQ	SANDSTONE	6.15	0.18	4.29	1.4	0.21	425	0.05	270	0.02	0.07	1.6	10	220	2.09	0.21	0.2	63.4	9.6
2	154255	C122CQ	SANDSTONE	5.88	10.85	4.75	1.29	0.71	1970	0.69	930	<0.01	0.04	<5	10	320	1.32	0.08	0.04	41.8	13.4
2	176506	C545CQ	SILTSTONE	8.55	0.52	1.92	3.08	0.46	353	0.25	740	0.04	0.09	3.6	20	560	1.9	0.44	0.15	57	8.3
2	176514	C545CQ	SANDSTONE	4.55	0.19	4.84	1.87	0.2	2470	0.07	360	0.01	0.04	3.3	10	470	1.09	0.13	0.02	36.3	5.3
2	154022	C674CQ	TUFF	7.3	1.17	2.51	0.22	1.22	386	0.39	1150	0.02	0.09	4.5	10	220	0.62	0.26	0.07	42.4	1.9
2	154024	C674CQ	CARB MUDSTONE	1.43	0.18	1.28	0.09	0.08	364	0.06	60	0.15	0.03	0.9	10	170	3.24	0.23	<0.02	29.7	1.6
2	148390	C9180009CQR	SANDSTONE	8.48	0.16	3.78	1.33	0.19	1000	0.05	420	0.04	0.08	16.8	20	330	1.72	0.28	0.16	65.4	25.6
2	148393	C9180009CQR	SANDSTONE	5.74	1.04	0.51	0.49	0.08	151	0.09	120	0.22	0.03	3.5	10	130	0.95	0.07	0.02	26.9	8.3
2	153302	C099CQ	SANDSTONE	7.16	0.2	3.26	1.65	0.48	200	0.77	510	0.01	0.05	9	20	340	1.41	0.22	0.11	52.8	16.3
2	153304	C099CQ	SANDSTONE	6.74	0.49	2.79	1.45	0.39	415	0.55	530	0.01	0.05	2.9	10	310	1.11	0.17	0.08	48.2	10.9
2	153308	C099CQ	SANDSTONE	7.38	2.27	2.31	2.12	0.75	461	1.17	730	0.02	0.05	6.5	20	640	1.38	0.1	0.06	48.3	13.3
2	153313	C099CQ	SANDSTONE	7.91	0.18	1.68	2.28	0.27	83	0.11	150	0.01	0.09	2.2	20	470	2.61	0.65	0.09	49.3	9.9
2	153317	C099CQ	SANDSTONE	8.58	0.15	0.99	1.74	0.19	84	0.07	320	0.02	0.08	25.6	70	360	1.38	0.31	0.14	79.2	8.5
2	154260	C122CQ	SANDSTONE	4.66	0.06	0.92	1.52	0.09	200	0.06	130	0.01	0.04	3.1	40	400	0.81	0.1	0.03	34.3	4.7
2	154263	C122CQ	SANDSTONE	8.34	0.12	1.14	0.89	0.16	225	0.04	270	0.02	0.09	16.6	40	220	1.44	0.43	0.19	58.7	6.8
2	154266	C122CQ	SANDSTONE	9.35	0.08	0.62	1.46	0.16	48	0.06	110	0.01	0.08	4.4	30	360	2.85	0.49	0.19	89.7	3.8
2	154269	C122CQ	SANDSTONE	7.63	0.08	0.44	0.62	0.07	24	0.03	270	0.01	0.04	1.1	20	150	1.42	0.17	0.14	72.5	1.2
2	154271	C122CQ	SANDSTONE	6.88	1.36	2.06	1.39	0.42	182	0.45	350	0.01	0.05	1.9	20	330	1.65	0.18	0.08	64.6	5.8
2	153327	C165CQ	SANDSTONE	6.22	0.06	0.52	1.34	0.06	57	0.05	130	<0.01	0.06	1.5	20	320	1.16	0.41	<0.02	42.1	3.2
2	153330	C165CQ	SANDSTONE	5.31	0.34	0.97	0.94	0.07	110	0.04	270	0.01	0.06	1.4	10	170	0.96	0.1	0.05	44.5	3.6
2	152614	C180012CQ	SANDSTONE	6.1	0.02	0.18	0.41	0.03	34	0.02	80	0.02	0.02	5.5	10	140	0.93	0.08	0.02	41.6	4.8
2	152617	C180012CQ	SANDSTONE	4.95	0.05	0.22	0.34	0.05	30	0.03	60	0.02	0.03	3.8	10	80	0.81	0.08	0.03	41.7	2.9
2	175912	C522CQ	SANDSTONE	4.5	0.06	0.32	1.05	0.08	64	0.06	60	0.01	0.02	2.4	10	270	0.73	0.08	0.02	21.4	3.4
2	GT169952	C671CQ	SANDSTONE	7.25	0.07	0.39	0.49	0.09	41	0.06	400	0.08	0.56	29.8	10	430	1.81	0.19	0.1	64	30.9
2	GT169953	C671CQ	TUFF	9.68	0.05	0.25	0.3	0.06	12	0.07	130	0.05	0.09	14.9	10	100	1.98	0.26	0.23	37.4	27.5
2	GT169957	C671CQ	MUDSTONE	6.66	0.55	4.53	2.12	0.81	933	0.34	700	0.03	0.08	3.2	20	340	2.25	0.32	0.1	38.4	30.3

Batch #	Sample ID	Site No.	Analyte	Cr	Cs	Cu	Ga	Ge	Hf	In	La	Li	Mo	Nb	Ni	Pb	Rb	Re	Sb	Sc	Se
			Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
			Comparative Abundance	72	72	33	18	1.7	2.5	0.044	41	56	2	13	52	19	135	0.0004	1.2	10	0.42
2	170288	C607CQ	SILTSTONE	30	7.38	53.3	22.1	0.16	4.4	0.069	27.1	14.5	2.08	8.4	19.5	22.6	75.6	0.002	0.72	15	2
2	170294	C607CQ	SANDSTONE	44	5.45	57.1	37.8	0.23	7.5	0.149	40.3	30.3	1.23	22.9	11.4	66.7	55.7	<0.002	1.24	13.3	2
2	177670	C669CQ	SILTSTONE	44	8.05	35.6	23.7	0.18	4.7	0.086	31.3	26.5	0.58	11.6	24.8	24.2	90.5	0.002	0.66	18.9	2
2	GT148409	C9672CQR	TUFF	15	1.98	34	28.6	0.13	5.4	0.083	10.5	17.7	2.28	9	15.5	24.6	33.8	0.002	0.39	9.1	1
2	GT148411	C9672CQR	SANDSTONE	29	3.2	46.8	25.3	0.25	3.4	0.06	12.9	16.6	1.54	6.8	23.3	15.6	41.3	<0.002	0.48	10.4	1
2	GT148425	C9672CQR	SILTSTONE	49	12.85	47.5	27.1	0.23	5.4	0.096	32.9	32.5	0.63	12.2	16.6	27	132.5	0.002	0.65	20.3	2
2	GT147596	C541CQ	SILTSTONE	45	6.78	56.7	26.2	0.13	4.5	0.083	19.8	20.4	1.47	10.9	18.4	22.6	103.5	0.002	0.55	19	1
2	GT152519	C541CQ	CARB SANDSTONE	48	4.01	25	33.8	0.16	7.4	0.17	48.1	41.9	1.05	22.7	7.8	48.8	24.7	<0.002	0.58	20.3	4
2	170109	C544CQ	SILTSTONE	36	6.83	66.3	26.7	0.12	4.3	0.084	22.8	21.7	0.85	10.1	14.1	20.5	111.5	0.002	0.58	18.1	1
2	170269	C544CQ	SANDSTONE	41	0.91	3.8	8.04	0.08	1.3	0.021	8.7	11.4	0.81	2.7	34.9	16	19.3	<0.002	1.46	2.9	<1
2	204851	C696CQ	SANDSTONE	62	2.69	13.2	18.8	0.12	3.1	0.055	24.5	19.1	0.54	8.2	8.4	16.2	50.1	0.002	0.83	15.2	1
2	204852	C696CQ	CLAYSTONE	34	3.85	40.1	33.5	0.11	7.2	0.119	18.1	29.9	3.98	14	36.2	36.4	54	0.002	0.53	10.1	1
2	152622	C9180012CQR	SANDSTONE	22	1.46	8	12.95	0.08	2.1	0.039	14.2	12.1	0.74	7.4	8	12.9	16.1	<0.002	0.38	5	1
2	169716	C9419CQR	TUFF	3	1.21	2.9	5.59	0.16	2	0.025	21.8	4.5	0.45	2.2	1.2	5.2	7	0.002	0.07	4.8	1
2	81710	C9673CQR	SANDSTONE	41	6.19	20.7	15.45	0.27	3.2	0.049	25.9	16	0.8	7.7	13.1	14.1	99	<0.002	0.36	12.5	1
2	176524	C99438CQR	SANDSTONE	50	8.64	27	22.3	0.21	3.9	0.071	27.1	26.1	0.37	10.5	17.5	21.8	105.5	<0.002	0.53	14.7	1
2	176526	C99438CQR	SANDSTONE	44	5.18	21.3	27.2	0.17	4	0.079	28.6	24.3	0.39	18.1	9.9	43.3	62.1	<0.002	0.56	11.1	1
2	177679	C670CQ	SANDSTONE	58	2.94	17.5	14.85	0.24	2.5	0.042	19.8	14.7	0.33	6.8	23.1	13.4	56.9	<0.002	0.63	10.3	1
2	177697	C670CQ	SILTSTONE	6	2.18	32.1	28.4	0.24	7.3	0.08	22.5	22.1	6.32	12.5	4	31.8	11.7	0.002	0.87	10.4	2
2	148395	C9180009CQR	SANDSTONE	41	1.02	4.6	8.01	<0.05	1.3	0.008	12.3	9	0.7	3.3	7.4	15.3	25.8	<0.002	0.29	2	<1
2	GT148355	C9380CQR	SILTSTONE	44	7.2	60.6	21.1	0.07	3.3	0.064	18.2	16.4	0.89	7.9	23.8	18	73	0.002	0.53	13.8	1
2	GT148361	C9380CQR	CARB MUDSTONE	16	3.51	111.5	22	0.08	5.3	0.132	27.7	22.4	4.36	8.2	23.3	24.8	24.3	0.002	0.81	20.9	4
2	GT148362	C9380CQR	CARB MUDSTONE	10	1.54	10.9	7.31	0.09	1.9	0.045	15.6	11.9	1.15	2.9	1.7	8.6	7.7	0.003	0.63	8.3	1
2	GT148371	C9380CQR	SANDSTONE	46	1.86	3.8	10.5	0.07	2.5	0.018	37.6	10	0.64	7.3	4.6	19	66.7	<0.002	0.3	3.9	1
2	GT175913	C9404CQR	CLAYSTONE	56	9.49	51	23.5	0.08	4.3	0.073	20.6	39	0.39	11	39	20.9	84.9	<0.002	0.87	16.2	1
2	GT175924	C9404CQR	SANDSTONE	40	8.11	55.7	21.3	0.08	3.7	0.068	24.9	16.6	0.72	8.5	25.9	21	110	0.004	0.63	16.2	1
2	GT175931	C9404CQR	CARB SILTSTONE	4	1.99	42.6	11.9	0.05	2.2	0.054	8.3	14.4	0.99	3.5	2.9	10.6	26.4	0.003	0.31	8.6	1
2	GT175932	C9404CQR	CARB SILTSTONE	6	0.92	10.1	5.63	0.05	1.2	0.026	9.8	9.5	1.14	2.8	2.4	7.2	8.2	0.002	0.6	5.1	<1
2	GT175941	C9404CQR	SANDSTONE	22	5.35	12.6	13.7	0.09	3.4	0.031	29.8	23.3	0.17	8.6	7	14.1	96.8	<0.002	0.44	7.9	1
2	147473	C088CQ	SANDSTONE	55	1.93	4	9.06	0.05	1.7	0.02	19.2	9.3	1.16	4	3.9	16.2	78.2	<0.002	0.3	4.5	<1
2	147482	C088CQ	SILTSTONE	59	8.33	35.3	21.5	0.13	4.5	0.083	39.8	24.8	0.86	11.6	20.9	24.9	83.6	<0.002	0.62	17.3	1
2	147487	C088CQ	SANDSTONE	50	5.14	14.8	21.7	0.08	3.2	0.059	33.6	22.5	0.67	13.3	7.9	24.1	82.3	<0.002	0.47	9.9	1
2	147489	C088CQ	SANDSTONE	48	7.76	12.3	14.95	0.1	3.4	0.038	31.7	19.1	0.13	8	8.1	17.5	100.5	<0.002	0.48	8.7	1
2	154255	C122CQ	SANDSTONE	41	2.91	25.2	12.85	0.08	1.8	0.031	20.3	6.5	0.49	4	15.1	8.8	57.1	<0.002	0.22	11	1
2	176506	C545CQ	SILTSTONE	44	8.81	57	23.1	0.1	4.2	0.079	25.2	16.9	0.7	9.8	18.6	21.3	142	<0.002	0.61	16.7	1
2	176514	C545CQ	SANDSTONE	77	2.56	5.3	10.6	0.08	1.8	0.024	18	8.3	0.5	4.7	4.2	14.4	91.4	<0.002	0.31	7.8	1
2	154022	C674CQ	TUFF	7	1.96	9.3	15.9	0.07	5.5	0.053	18.1	9.2	0.96	6.5	0.9	21.2	10.8	<0.002	0.31	10.9	1
2	154024	C674CQ	CARB MUDSTONE	14	0.82	12.4	4.24	0.07	1.1	0.024	12.3	10.1	1.18	2.7	1.7	5.9	6	0.003	0.6	6.7	1
2	148390	C9180009CQR	SANDSTONE	58	6.17	29.7	20.1	0.11	4	0.069	31.3	16.1	1.17	9.9	30.8	19.3	81.5	0.006	0.63	14.8	1
2	148393	C9180009CQR	SANDSTONE	54	1.52	5.9	13.35	<0.05	1.7	0.022	14.1	13.1	0.78	6.6	8.7	22.6	31.7	0.002	0.34	4.3	<1
2	153302	C099CQ	SANDSTONE	94	4.62	26.7	16.5	0.08	2.9	0.054	25.2	18	0.23	8.2	29	17.2	82.8	<0.002	0.88	13.4	1
2	153304	C099CQ	SANDSTONE	75	3.74	17.4	15.45	0.08	2.8	0.042	22.8	16.6	0.22	6.9	20.3	14.7	73.5	<0.002	0.58	12	1
2	153308	C099CQ	SANDSTONE	55	3.62	19.3	17.3	0.07	2.5	0.04	22.7	14	0.51	5.3	17.8	12.1	94.4	<0.002	0.48	13.6	1
2	153313	C099CQ	SANDSTONE	39	9.75	33.8	25.4	0.1	4.4	0.089	22.3	36.3	0.56	13.7	14.7	34.4	116	<0.002	0.5	11.4	1
2	153317	C099CQ	SANDSTONE	51	6.88	29.5	19.65	0.09	4.2	0.074	36.6	22.2	1.8	10.6	20.6	21	104	<0.002	0.65	15.9	1
2	154260	C122CQ	SANDSTONE	102	2.44	4.5	10.15	0.05	1.9	0.02	17.2	11.1	0.61	4.9	5.2	15.9	76.2	<0.002	0.36	4.1	<1
2	154263	C122CQ	SANDSTONE	62	6.72	38.7	21.5	0.09	4.9	0.082	25.9	25.1	1.61	12	17.9	25.4	61.7	<0.002	0.63	15.5	1
2	154266	C122CQ	SANDSTONE	61	9.17	25.9	26.2	0.1	5.2	0.086	43.6	35.4	0.29	19.9	10.3	36.9	100.5	<0.002	0.51	13.9	1
2	154269	C122CQ	SANDSTONE	25	3.14	9.5	14.6	0.1	3.9	0.042	79.7	11.8	0.39	8.2	2	18.7	45.7	<0.002	0.4	9.3	1
2	154271	C122CQ	SANDSTONE	26	6.5	8.9	14.75	0.11	3.5	0.036	34.5	11.1	0.23	7.9	6.3	15.5	79.3	<0.002	0.44	9.5	1
2	153327	C165CQ	SANDSTONE	53	7.1	9.5	15.55	0.06	2.3	0.031	22	14.2	0.23	9.4	6.9	18.5	85	<0.002	0.35	5.6	<1
2	153330	C165CQ	SANDSTONE	38	2.16	5.6	10.1	0.06	2.4	0.022	22.7	10.1	0.1	5.2	3.5	11.7	50.9	<0.002	0.36	6.1	<1
2	152614	C180012CQ	SANDSTONE	46	1.25	5.9	15.05	<0.05	2	0.032	20.8	9.8	0.53	8	6.3	23.7	28.2	<0.002	0.39	5.2	<1
2	152617	C180012CQ	SANDSTONE	46	1.05	4.9	11.45	<0.05	1.9	0.022	21.1	10.3	0.5	6.7	4.6	19.9	22.9	<0.002	0.32	3.9	<1
2	175912	C522CQ	SANDSTONE	44	1.77	5.2	10.15	<0.05	1.6	0.01	11	10.1	0.36	4.8	4.3	17	51.4	<0.002	0.3	3	<1
2	GT169952	C671CQ	SANDSTONE	85	1.97	19.9	16.25	0.08	2.9	0.051	29.1	16.7	1.41	8.1	62.6	16	31.4	0.005	0.76	13.8	1
2	GT169953	C671CQ	TUFF	16	1.59	41.5	29.5	0.05	6.6	0.086	15.9	20.4	4.95	11	24.7	33.7	16.4	0.002	0.5	7.4	1
2	GT169957	C671CQ	MUDSTONE	35	6.07	52.5	20	0.11	3.3	0.057	17.2	17.1	1.55	7.5	33.6	17.9	68.6	<0.002	0.54	11.9	1

Batch #	Sample ID	Site No.	Analyte	Sn	Sr	Ta	Te	Th	Ti	Tl	U	V	W	Y	Zn	Zr	Hg	F	C
			Units	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	%
			Comparative Abundance	4.6	320	1.5	0.005	9.6	0.38	0.95	3.1	105	1.7	40	95	150	0.19	640	2.94
2	170288	C607CQ	SILTSTONE	2.5	339	0.63	0.12	10.5	0.368	0.55	3.5	87	1.8	22.9	82	154.5	0.045	440	2.07
2	170294	C607CQ	SANDSTONE	8.4	31.7	1.8	0.1	24.8	0.379	0.39	9.4	76	3.7	40.8	154	214	0.097	310	4.12
2	177670	C669CQ	SILTSTONE	3.6	43.7	0.86	0.05	11.7	0.475	0.54	3.4	96	2.5	26.9	76	160.5	0.065	250	0.7
2	GT148409	C9672CQR	TUFF	2.5	132.5	0.6	<0.05	5.1	0.624	0.58	2.7	83	1.5	7.3	133	186.5	0.105	400	0.52
2	GT148411	C9672CQR	SANDSTONE	1.8	250	0.47	0.05	4	0.421	0.47	1.3	94	1.2	10.7	108	118	0.057	400	2.03
2	GT148425	C9672CQR	SILTSTONE	4.1	63.2	0.93	0.08	13.1	0.525	0.73	3.8	115	2.8	31.8	100	184	0.05	400	1.59
2	GT147596	C541CQ	SILTSTONE	3	129.5	0.76	0.05	9.6	0.512	0.63	3.4	100	2.1	16.7	91	153	0.064	310	1.39
2	GT152519	C541CQ	CARB SANDSTONE	5.8	30.6	1.57	0.2	26.5	0.539	0.17	6.9	64	3.8	38.2	18	252	0.047	140	8.46
2	170109	C544CQ	SILTSTONE	3	89.5	0.72	0.11	10.7	0.494	0.58	3	106	1.9	14	78	150	0.053	300	0.68
2	170269	C544CQ	SANDSTONE	0.8	10.6	0.25	<0.05	3.2	0.054	4.34	0.9	14	0.5	6.2	20	41.4	0.077	40	0.12
2	204851	C696CQ	SANDSTONE	2.1	28.4	0.6	<0.05	9.9	0.371	0.27	2.8	105	3.2	19.9	16	104	0.016	90	0.07
2	204852	C696CQ	CLAYSTONE	3.8	122	0.98	0.07	8.8	0.724	1	4.1	77	2.3	12.4	153	222	0.12	240	0.75
2	152622	C9180012CQR	SANDSTONE	1.8	26.6	0.54	0.05	5.1	0.195	0.18	1.6	23	1.4	11.3	29	69.5	0.096	90	2.14
2	169716	C9419CQR	TUFF	0.7	423	0.16	<0.05	2.4	0.103	0.08	0.7	8	0.7	47.7	26	74.6	0.011	2420	7.66
2	81710	C9673CQR	SANDSTONE	2.3	151.5	0.57	<0.05	9.2	0.313	0.55	2.4	66	1.7	23.1	62	109	0.027	320	2.39
2	176524	C99438CQR	SANDSTONE	3	48.3	0.78	<0.05	12.2	0.384	0.57	3.1	79	1.9	24.3	74	135.5	0.035	220	4.48
2	176526	C99438CQR	SANDSTONE	4	38.4	1.4	<0.05	19	0.384	0.37	4.5	51	3	15.4	25	120	0.057	280	2.09
2	177679	C670CQ	SANDSTONE	1.6	86	0.46	<0.05	6.4	0.356	0.38	1.6	88	1	18.3	53	89.4	0.011	170	2.22
2	177697	C670CQ	SILTSTONE	3	198	0.94	0.08	10.1	0.5	0.6	5.2	57	3	24.4	102	246	0.176	840	2.18
2	148395	C9180009CQR	SANDSTONE	0.9	22.8	0.33	<0.05	4.8	0.072	0.28	1	11	2.5	7.3	53	42.5	0.014	70	0.03
2	GT148355	C9380CQR	SILTSTONE	2.5	349	0.63	0.06	7.5	0.387	0.53	2.5	133	1.6	18.1	79	123	0.04	390	1.51
2	GT148361	C9380CQR	CARB MUDSTONE	2.4	201	0.54	0.37	8.2	0.644	1.4	2.8	193	2	27.7	67	191	0.36	350	2.81
2	GT148362	C9380CQR	CARB MUDSTONE	1.1	89.2	0.23	0.1	5.8	0.166	0.1	1.5	35	1.2	17.5	6	104	0.022	200	33
2	GT148371	C9380CQR	SANDSTONE	1.6	47.7	0.64	<0.05	15.4	0.177	0.45	2.2	21	2.4	13.4	29	79.4	0.01	90	0.28
2	GT175913	C9404CQR	CLAYSTONE	3	75.9	0.84	0.05	9.5	0.507	0.64	2.9	125	2.2	19.5	91	154.5	0.007	350	0.26
2	GT175924	C9404CQR	SANDSTONE	2.7	179	0.66	0.09	9.9	0.423	0.64	2.8	121	1.8	23.2	94	138.5	0.054	400	1.94
2	GT175931	C9404CQR	CARB SILTSTONE	1.2	72.3	0.27	0.14	3.5	0.289	0.51	1.2	92	0.5	8.3	47	84.2	0.074	210	33.7
2	GT175932	C9404CQR	CARB SILTSTONE	0.6	28.7	0.17	0.11	3.3	0.093	0.18	0.9	26	0.6	11	8	62.5	0.018	130	44.8
2	GT175941	C9404CQR	SANDSTONE	2	42	0.67	<0.05	10.7	0.267	0.44	2.5	43	1.2	19.2	45	126	<0.005	290	0.2
2	147473	C088CQ	SANDSTONE	1.2	45	0.35	<0.05	7.9	0.098	0.45	1.4	21	1.1	11.7	23	57.4	0.007	70	0.52
2	147482	C088CQ	SILTSTONE	3.7	30.6	0.9	<0.05	15	0.478	0.49	3.5	104	2.6	32.5	99	166	0.039	230	3.37
2	147487	C088CQ	SANDSTONE	3.5	30.4	1.02	<0.05	12.1	0.334	0.44	2.9	54	2.1	18.4	101	108	0.024	180	0.8
2	147489	C088CQ	SANDSTONE	2	39	0.63	<0.05	11.9	0.264	0.48	2.6	54	1.3	23.6	54	123.5	0.011	230	0.32
2	154255	C122CQ	SANDSTONE	1	345	0.26	<0.05	4.3	0.31	0.3	1	100	0.6	19.1	54	70	0.013	280	4.54
2	176506	C545CQ	SILTSTONE	3	172	0.72	0.07	9.7	0.488	0.66	2.9	131	2	22.8	99	155	0.051	360	1.65
2	176514	C545CQ	SANDSTONE	1.4	47.1	0.39	<0.05	7.1	0.131	0.53	1.4	34	1	16.7	25	64.7	0.009	130	1.35
2	154022	C674CQ	TUFF	2	484	0.52	<0.05	9.8	0.218	0.11	2.4	23	1.4	23.7	55	191	0.02	580	0.53
2	154024	C674CQ	CARB MUDSTONE	0.6	49.2	0.13	0.07	2.6	0.089	0.13	0.8	45	0.4	9.9	6	86.8	0.015	130	29.3
2	148390	C9180009CQR	SANDSTONE	3.1	39.6	0.78	<0.05	11.5	0.445	0.54	3	100	2.2	28.9	117	140.5	0.044	240	2.07
2	148393	C9180009CQR	SANDSTONE	1.7	42.1	0.54	<0.05	5.9	0.143	0.68	1.9	27	2.1	10	39	60.7	0.016	120	0.45
2	153302	C099CQ	SANDSTONE	2	71.3	0.58	0.05	9.2	0.471	0.47	2.1	139	1.4	17.9	72	107.5	0.008	210	0.03
2	153304	C099CQ	SANDSTONE	1.7	61	0.52	<0.05	8.9	0.406	0.4	2	109	1.2	16.2	80	96.9	0.046	190	0.41
2	153308	C099CQ	SANDSTONE	1.4	387	0.38	<0.05	7.3	0.339	0.48	1.7	107	0.8	17.8	77	93.8	0.013	300	0.56
2	153313	C099CQ	SANDSTONE	4.6	64.6	1.09	0.06	12.7	0.423	0.81	3.9	95	2.6	20.4	100	155	0.043	280	1.44
2	153317	C099CQ	SANDSTONE	3.2	36.2	0.8	<0.05	12.4	0.461	0.63	3.1	97	2.3	28.1	135	150.5	0.03	210	1.96
2	154260	C122CQ	SANDSTONE	1.5	39	0.4	<0.05	6.7	0.126	0.52	1.4	28	2.8	11.6	26	63.2	0.009	90	0.25
2	154263	C122CQ	SANDSTONE	3.6	29.2	0.91	<0.05	12.1	0.539	0.42	3.5	113	2.7	24.4	94	174.5	0.058	210	2.05
2	154266	C122CQ	SANDSTONE	5	31.7	1.5	<0.05	23.5	0.43	0.59	5.9	91	2.9	27.9	81	171.5	0.033	250	1.87
2	154269	C122CQ	SANDSTONE	2	49.2	0.63	<0.05	16	0.318	0.22	3	61	1.3	45.4	67	136	0.013	240	0.03
2	154271	C122CQ	SANDSTONE	1.9	147.5	0.56	<0.05	11	0.302	0.39	2.8	40	2	21.8	54	132.5	0.007	440	0.28
2	153327	C165CQ	SANDSTONE	2.3	32.9	0.73	<0.05	8.9	0.176	0.47	1.7	41	1.3	11.4	35	74.9	<0.005	210	0.1
2	153330	C165CQ	SANDSTONE	1.3	22.2	0.4	<0.05	7.6	0.202	0.25	1.6	35	0.8	13.9	40	90	0.015	220	0.13
2	152614	C180012CQ	SANDSTONE	1.9	17.5	0.63	<0.05	7.3	0.157	0.23	1.5	30	2.1	11.9	56	61.9	0.013	220	0.24
2	152617	C180012CQ	SANDSTONE	1.7	17.2	0.53	<0.05	7.9	0.136	0.19	1.6	23	1.7	9.1	29	60.6	0.009	180	0.21
2	175912	C522CQ	SANDSTONE	1.2	54.7	0.41	<0.05	4.7	0.098	0.3	1.2	16	0.7	6.9	19	54.7	0.008	180	0.26
2	GT169952	C671CQ	SANDSTONE	2	106	0.6	<0.05	9.2	0.472	0.33	2.6	128	1.5	20	74	108	0.048	230	0.1
2	GT169953	C671CQ	TUFF	3.3	40.3	0.76	<0.05	6.3	0.806	0.92	3.2	86	1.7	12.6	155	236	0.168	290	0.56
2	GT169957	C671CQ	MUDSTONE	2.3	246	0.56	0.05	6.4	0.389	0.61	2.3	111	1.4	18.4	76	126	0.029	450	1.75

Batch #	Sample ID	Site No.	Analyte	Al	Ca	Fe	K	Mg	Mn	Na	P	S	Ag	As	B	Ba	Be	Bi	Cd	Ce	Co
			Units	%	%	%	%	%	ppm	%	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
			Comparative Abundance	7.2	6.6	4.1	2	1.4	770	0.57	670	0.22	0.057	7.7	100	460	2	0.4	0.17	83	14
2	GT169958	C671CQ	SANDSTONE	7.44	1.06	2.58	2.33	0.98	387	0.54	970	0.04	0.18	11.4	20	380	1.56	0.17	0.11	33.5	23.6
2	153337	C99204CQR	SILTSTONE	8.45	0.45	2.78	1.96	0.41	705	0.41	720	0.04	0.1	8.2	20	380	1.96	0.5	0.17	54.9	9.9
2	170107	C544CQ	SANDSTONE	8.19	0.32	4.09	1.25	0.28	879	0.07	870	0.05	0.09	10	20	250	1.39	0.29	0.17	53.6	30.5
2	GT148407	C9672CQR	SANDSTONE	7.25	0.17	0.7	1.18	0.22	99	0.09	520	0.02	0.05	21.1	10	240	0.95	0.2	0.05	45.2	12.4
2	GT148412	C9672CQR	SILTSTONE	7.83	1.16	4.47	1.31	1.04	957	0.41	950	0.04	<0.01	0.2	10	320	<0.05	0.01	0.02	0.12	<0.1
2	GT148413	C9672CQR	SANDSTONE	8.39	0.39	1.23	2.51	0.43	297	0.41	490	0.03	0.06	3.3	10	430	1.35	0.29	0.11	49	5.9
2	GT148416	C9672CQR	MUDSTONE	6.55	0.86	1.21	0.21	0.94	20	0.25	210	0.22	0.07	4.5	<10	280	0.74	0.34	0.11	53.6	4.6
2	GT148420	C9672CQR	SANDSTONE	4.25	0.04	0.42	1.75	0.05	62	0.07	80	0.02	0.03	4.9	<10	420	0.65	1.14	0.02	33.2	6.6
2	GT148421	C9672CQR	SANDSTONE	4.1	0.04	0.38	1.68	0.05	63	0.06	120	0.01	0.03	5.1	<10	410	0.61	0.08	0.03	26.8	6.7
2	176529	C99438CQR	SANDSTONE	4.31	0.05	0.2	0.36	0.06	33	0.03	60	0.02	0.03	3.5	<10	120	0.76	0.08	0.03	22.1	4.5
2	176531	C99438CQR	SANDSTONE	4.58	0.02	0.2	0.38	0.03	31	0.02	50	0.02	0.02	3.5	<10	100	0.78	0.07	0.02	25.7	5.1
2	176534	C99438CQR	SANDSTONE	8.94	0.06	0.2	0.2	0.04	17	0.03	80	0.04	0.05	1.3	10	110	2.25	0.51	0.08	54.3	1.2
2	172101	C412CQ	TUFF	6.35	0.82	5.78	0.38	1.31	1820	0.12	560	0.04	0.09	8.8	<10	250	0.99	0.26	0.09	27.8	3.7
2	172108	C412CQ	SANDSTONE	3.78	0.04	0.67	0.24	0.03	38	0.03	40	0.58	0.03	10.3	<10	60	0.58	0.06	0.02	25.8	9.4
2	172109	C412CQ	SILTSTONE	6.76	0.16	5.7	1.21	0.39	171	0.07	300	0.01	0.08	2.1	20	230	2.79	0.33	0.11	75.8	7.2
2	170112	C544CQ	SANDSTONE	7.36	1.31	3.4	2.42	0.45	579	0.28	660	0.05	0.07	14.2	10	750	1.63	0.26	0.15	38.3	12.3
2	170251	C544CQ	SANDSTONE	5.78	0.03	0.22	0.96	0.06	30	0.05	120	0.01	0.08	6.5	10	280	1.13	0.22	0.05	41.5	5.6
2	170254	C544CQ	SILTSTONE	9.04	0.08	1.03	1.9	0.24	78	0.1	120	0.03	0.1	3.6	20	400	1.88	0.55	0.06	70.9	10.2
2	170263	C544CQ	SANDSTONE	6.3	0.02	0.2	0.6	0.05	34	0.03	70	0.01	0.03	5	10	140	1.21	0.11	0.03	45.6	3.1
2	154017	C674CQ	CLAYSTONE	8.58	0.61	1.22	2.19	0.57	144	0.39	810	0.04	0.08	4.8	20	390	1.62	0.25	0.13	39.8	13.8
2	154021	C674CQ	SANDSTONE	8.78	0.47	2.58	3.35	0.39	723	0.2	780	0.09	0.09	16.1	20	460	1.82	0.46	0.13	60.7	15.4
2	154032	C674CQ	SILTSTONE	5.27	0.04	0.18	0.15	0.03	13	0.02	90	0.03	0.05	1.3	10	50	0.56	0.61	0.06	31.7	0.7
2	169701	C9419CQR	SANDSTONE	9.21	0.37	4.06	2.05	0.83	501	0.09	770	0.01	0.11	2.6	30	350	2.88	0.48	<0.02	50.9	17.8
2	169703	C9419CQR	SILTSTONE	7.77	0.51	2.49	1.66	0.41	400	0.24	1720	0.01	0.1	3.3	20	340	2.16	0.35	0.06	48.9	11.6
2	169704	C9419CQR	SANDSTONE	7.41	0.83	8.28	1.43	0.79	1540	0.06	660	0.01	0.07	2	20	290	2.04	0.28	0.13	62.7	22
2	169707	C9419CQR	SANDSTONE	9.53	0.06	0.53	0.25	0.06	53	0.03	290	0.02	0.06	16.2	20	130	2.05	1.19	0.08	37.4	50.2
2	169713	C9419CQR	SILTSTONE	6.85	1.46	5.78	2.34	0.75	1350	0.34	970	0.03	0.05	5.8	10	640	1.29	0.12	0.06	42.4	15.9
2	169714	C9419CQR	SANDSTONE	9.12	0.58	1.84	2.97	0.54	334	0.25	750	0.04	0.09	5.4	20	530	1.91	0.41	0.15	64.8	14.3
2	169715	C9419CQR	SHALE	7.3	0.51	3.24	2.55	0.51	867	0.16	660	0.04	0.09	3	20	460	1.87	0.51	0.11	46.2	18.1
2	169718	C9419CQR	SHALE	6.77	2.26	1.89	1.5	0.57	556	0.17	280	0.09	0.05	3.7	20	780	1.35	0.24	0.11	68.1	6.5
2	170274	C99130CQR	SILTSTONE	9.59	0.1	0.55	0.14	0.12	18	0.06	250	<0.01	0.01	1	10	150	1.58	0.68	<0.02	24.2	0.7
2	154272	C361CQ	CLAYSTONE	8.57	0.44	5.54	1.64	0.54	1240	0.14	980	0.01	0.1	1.8	30	290	2.19	0.4	0.05	73.5	17.9
2	154273	C361CQ	SANDSTONE	8.36	0.34	4.96	1.54	0.49	1240	0.12	610	0.02	0.09	3.6	30	280	2.11	0.39	0.1	62.9	12.5
2	154275	C361CQ	SILTSTONE	9.43	0.09	0.51	1.62	0.22	37	0.14	140	0.03	0.07	5.9	20	360	1.18	0.27	0.15	39.7	3.3
2	154280	C361CQ	SANDSTONE	6.55	0.52	3.69	1.97	0.73	863	0.38	680	0.06	0.09	4.6	20	380	1.99	0.48	0.15	37.5	39.5
2	154281	C361CQ	CARB MUDSTONE	8.89	0.5	1.57	2.6	0.52	290	0.45	740	0.04	0.09	5.3	20	440	1.73	0.4	0.14	56.5	13.6
2	169723	C9419CQR	SILTSTONE	5.53	0.08	0.74	2.07	0.12	75	0.07	230	0.01	0.04	7.8	10	510	1.04	0.11	0.03	36	6.5
2	169727	C9419CQR	SANDSTONE	8.19	0.8	5.04	0.75	0.37	1340	0.14	980	0.05	0.1	2.6	30	310	2.19	0.38	0.06	25.6	2.5
2	169728	C9419CQR	SILTSTONE	9.31	0.06	0.47	1.3	0.11	42	0.06	180	0.02	0.06	3.3	20	340	2.53	0.39	0.19	68.3	2.7
2	169729	C9419CQR	SANDSTONE	4.12	0.03	0.36	0.83	0.04	86	0.04	70	0.01	0.01	4	10	220	0.72	0.08	0.02	31.5	2.5
2	169730	C9419CQR	SANDSTONE	10.3	0.09	0.52	1.28	0.15	35	0.08	110	0.04	0.09	2.7	30	320	4.5	0.62	0.16	63.9	5.5
2	169736	C9419CQR	SILTSTONE	7.27	2.77	3.02	1.29	0.41	508	0.28	510	0.01	0.04	1.8	10	290	1.89	0.14	0.07	40.2	4.8
2	154284	C361CQ	SANDSTONE	6.17	2.45	0.97	1.79	0.33	190	0.26	420	0.02	0.04	13.2	20	390	0.91	0.21	0.08	45.3	14.5
2	154285	C361CQ	SANDSTONE	8.58	0.53	1.53	1.04	0.49	22	0.36	150	0.18	0.08	24.8	30	250	1.98	0.37	0.07	34.6	3.1
2	154288	C361CQ	MUDSTONE	9.68	0.15	0.72	1.35	0.22	65	0.06	450	0.04	0.12	22.1	20	300	1.91	0.59	0.27	80.4	8.5
2	154290	C361CQ	SILTSTONE	5.4	0.09	0.42	0.73	0.07	50	0.05	80	0.01	0.03	3.8	10	180	0.9	0.11	0.03	29.1	2.6
2	154293	C361CQ	SANDSTONE	5.53	0.07	1.27	0.22	0.04	266	0.02	150	0.02	0.03	5.6	10	70	0.93	0.18	0.09	44.3	2.1
2	154295	C361CQ	CARB SANDSTONE	6.95	0.14	1.14	0.62	0.15	54	0.04	460	0.05	0.04	6.1	20	130	1.61	0.26	0.13	170	24.6
2	154296	C361CQ	SANDSTONE	6.19	0.14	2.63	0.96	0.28	91	0.05	350	0.02	0.06	4.2	20	190	1.83	0.23	0.1	78.9	5.8
2	182651	C9180007CQR	SILTSTONE	8.29	0.05	0.52	0.71	0.1	20	0.09	460	0.05	0.1	5.7	20	410	2.34	0.69	0.8	97.3	36.4
2	81702	C9673CQR	SILTSTONE	7.02	1.06	1.73	1.89	0.82	313	0.6	740	0.04	0.05	4.8	10	390	1.17	0.09	0.05	37.5	14.6
2	81706	C9673CQR	SANDSTONE	6.4	0.67	2.91	1.66	0.75	811	0.21	860	0.05	0.07	1.9	10	390	2	0.4	0.12	53.4	7.2
2	81712	C9673CQR	SANDSTONE	5.73	0.05	0.38	0.74	0.07	42	0.04	80	0.06	0.03	7.3	10	180	1.09	0.16	0.06	48.3	5
2	177990	C99139CQR	SANDSTONE	6.22	0.05	0.38	0.45	0.06	25	0.02	200	0.02	0.04	1.3	10	120	1.26	0.13	<0.02	99.9	1.9
2	152620	C9180012CQR	SANDSTONE	3.96	0.01	0.15	0.24	0.02	15	0.02	40	<0.01	0.02	1.3	<10	80	0.91	0.08	0.03	29	0.7
2	152624	C9180012CQR	SANDSTONE	8.74	0.04	0.24	0.26	0.05	11	0.03	80	0.03	0.03	2.9	10	100	1.76	0.34	<0.02	56	1.8
2	GT148353	C9380CQR	SANDSTONE	9.28	0.13	0.97	1.14	0.2	52	0.1	440	0.02	0.09	5.2	20	280	2.47	0.63	0.22	64.7	6.2
2	GT148360	C9380CQR	SILTSTONE	8.61	0.6	1.91	0.66	0.66	19	0.31	120	0.09	0.1	7.9	20	240	1.56	0.43	0.12	38	9.8

Batch #	Sample ID	Site No.	Analyte	Cr	Cs	Cu	Ga	Ge	Hf	In	La	Li	Mo	Nb	Ni	Pb	Rb	Re	Sb	Sc	Se
			Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
			Comparative Abundance	72	72	33	18	1.7	2.5	0.044	41	56	2	13	52	19	135	0.0004	1.2	10	0.42
2	GT169958	C671CQ	SANDSTONE	56	4.22	39.2	19.35	0.08	3.2	0.06	14.9	12.4	2.36	6.8	28.7	14.5	75.6	<0.002	0.51	13.6	1
2	153337	C99204CQR	SILTSTONE	41	7.48	56.1	22.3	0.09	4.1	0.075	24.6	24.9	0.91	9.6	20.7	24	92.1	0.002	0.6	16	1
2	170107	C544CQ	SANDSTONE	63	6.33	35.3	20.4	0.12	4	0.075	25	26.8	0.27	9.8	29.1	20.1	73.5	<0.002	0.75	18.8	1
2	GT148407	C9672CQR	SANDSTONE	54	3.19	20.1	16.9	0.07	2.9	0.05	21.4	19.9	1.55	6.9	21.9	16.9	59.5	<0.002	0.73	13.3	1
2	GT148412	C9672CQR	SILTSTONE	32	<0.05	0.6	0.05	<0.05	<0.1	0.019	<0.5	<0.2	<0.05	<0.1	0.7	1.1	0.1	0.002	<0.05	<0.1	<1
2	GT148413	C9672CQR	SANDSTONE	42	6.03	40.8	20.6	0.08	4	0.064	21.3	16.2	0.5	9.2	8.9	19.2	108	<0.002	0.47	14.3	1
2	GT148416	C9672CQR	MUDSTONE	5	2.36	17.6	13	0.09	5.1	0.064	24.2	10.1	1.18	6.6	2.2	19.1	12.4	0.002	0.62	11.6	1
2	GT148420	C9672CQR	SANDSTONE	54	2.4	4.4	9.01	0.05	1.7	0.029	16.4	8.9	0.46	4.3	6.7	16.3	83.4	<0.002	0.48	3.8	<1
2	GT148421	C9672CQR	SANDSTONE	46	2.04	4.1	8.83	<0.05	1.6	0.017	13	8.4	0.55	4.1	5.7	15.6	78.9	0.002	0.48	3.3	<1
2	176529	C99438CQR	SANDSTONE	46	1.12	2.7	9.34	<0.05	1.6	0.019	11.5	14	1.31	4.4	4.9	15.6	22.5	0.002	0.35	2.7	<1
2	176531	C99438CQR	SANDSTONE	59	1.22	3.2	9.71	<0.05	1.6	0.022	12.9	12.6	0.81	5.2	5.5	17.7	25.8	<0.002	0.4	3.1	<1
2	176534	C99438CQR	SANDSTONE	30	2.9	12.7	23.3	0.05	5.8	0.091	25.1	34	0.67	16.5	3.7	37.4	14.5	<0.002	0.38	10.7	2
2	172101	C412CQ	TUFF	5	2.81	11.2	14.3	0.08	5	0.051	12.5	9.6	0.54	6.4	3.1	17.5	22.9	<0.002	0.39	12	1
2	172108	C412CQ	SANDSTONE	86	0.78	2.8	7.42	0.05	1.3	0.016	12.4	9.5	0.64	3.4	7.1	12.6	15.9	0.002	0.48	2.8	<1
2	172109	C412CQ	SILTSTONE	42	10.4	16.5	16.6	0.13	4.4	0.053	35.5	23.4	0.12	12.6	12.4	19.4	105.5	0.002	0.54	9.9	1
2	170112	C544CQ	SANDSTONE	60	4.78	43.7	20.2	0.13	3.6	0.062	17.3	12.9	1.02	8	19.1	17	94.7	0.002	0.66	14.1	1
2	170251	C544CQ	SANDSTONE	54	2.54	7.8	12.65	0.07	2.7	0.031	20.4	14.5	0.61	6.7	6.2	18.3	54.9	<0.002	0.43	7.7	1
2	170254	C544CQ	SILTSTONE	50	15.35	37.6	23.7	0.1	4.8	0.081	32.2	28.3	0.2	11.5	40	26.2	115	0.002	0.68	15.7	1
2	170263	C544CQ	SANDSTONE	32	2.32	5.8	15.35	0.05	2.1	0.041	22.9	16	0.86	8.6	4.9	22.5	40.9	0.002	0.45	5.2	1
2	154017	C674CQ	CLAYSTONE	51	4.93	50.7	22.1	0.13	3.5	0.06	17.8	17	1.08	7.6	23.2	17.4	83.5	0.002	0.45	14.2	1
2	154021	C674CQ	SANDSTONE	40	8.6	54.2	21.7	0.12	3.9	0.074	28.3	19.1	0.76	8.8	42.1	21.3	149	0.002	0.68	16.6	1
2	154032	C674CQ	SILTSTONE	31	1.5	11.1	11.75	<0.05	3.7	0.056	16.3	12.3	0.34	10	2.3	16.3	11.3	0.002	0.41	6.7	1
2	169701	C9419CQR	SANDSTONE	53	12.5	47.8	25.4	0.13	4.2	0.079	23.6	41.3	0.21	10.9	43.3	22.8	114	0.002	0.9	18.7	1
2	169703	C9419CQR	SILTSTONE	59	6.44	47.3	22	0.12	4.1	0.072	19.6	34.1	0.29	10	30.7	20.4	74.2	<0.002	0.8	16.3	1
2	169704	C9419CQR	SANDSTONE	60	7.45	27.5	18	0.16	3.4	0.058	30.8	25.2	0.25	8.6	34.7	19.5	90.7	0.003	0.65	16.7	1
2	169707	C9419CQR	SANDSTONE	21	3.13	68.2	32	0.08	8.7	0.128	11	87	1.3	16.4	29.2	72.7	14.9	<0.002	1.6	9.6	2
2	169713	C9419CQR	SILTSTONE	59	3.15	22.2	17.05	0.14	2.5	0.046	19.9	9.7	0.68	5.8	20.1	12.6	103	0.002	0.4	16.2	1
2	169714	C9419CQR	SANDSTONE	52	9.03	53.1	22.9	0.11	4.2	0.074	31.1	16.6	1.23	9.4	17.3	21.4	144	0.003	0.6	17.1	1
2	169715	C9419CQR	SHALE	30	10.25	46.7	19.6	0.1	3.4	0.067	21.7	19	0.77	7.8	28.6	20.9	118.5	0.003	0.55	14	1
2	169718	C9419CQR	SHALE	49	8.36	27.6	15.55	0.15	3.8	0.056	31.3	13.1	1.25	7.7	9.1	19	89.3	0.002	0.46	13.2	1
2	170274	C99130CQR	SILTSTONE	8	1.54	43.7	28.4	<0.05	9.2	0.058	8.6	21.1	1.27	14.6	2.4	24.3	8.9	<0.002	0.6	16.8	1
2	154272	C361CQ	CLAYSTONE	60	8.31	41.3	21.6	0.16	3.9	0.071	34.1	28.1	0.2	9.8	37.2	19.9	98	0.002	0.71	20.2	1
2	154273	C361CQ	SANDSTONE	52	8.36	39.3	22	0.13	3.9	0.069	29.7	30.1	0.21	10.5	34.7	19.3	97.6	0.002	0.79	18	1
2	154275	C361CQ	SILTSTONE	41	5.49	42.9	22.7	0.07	4.1	0.072	19.8	18.1	0.52	9.8	8.6	19.3	82.7	0.002	0.46	12.8	1
2	154280	C361CQ	SANDSTONE	29	9.37	51.4	18.35	0.11	3.5	0.065	17	14.9	1.4	7	43.8	20.4	78.1	0.002	0.69	12.6	1
2	154281	C361CQ	CARB MUDSTONE	41	8.23	51.8	22.4	0.12	4.3	0.076	25.8	19.9	1.41	10.1	20.3	22	121	0.002	0.6	16.6	1
2	169723	C9419CQR	SILTSTONE	50	3.28	6.7	13.1	0.06	2.2	0.035	18.6	10.6	0.37	6	8.1	18.9	103	<0.002	0.4	6.2	1
2	169727	C9419CQR	SANDSTONE	8	3.62	25.3	27.6	0.12	6.7	0.109	9.2	15.6	0.25	10.3	2	20.7	19.4	0.002	0.34	12.5	1
2	169728	C9419CQR	SILTSTONE	39	8.42	21	26.5	0.09	5.1	0.093	35.6	29	0.37	19.8	7.1	42.1	93.1	0.002	0.54	10.9	1
2	169729	C9419CQR	SANDSTONE	44	1.62	4.3	9.48	0.05	1.5	0.011	15.9	8.7	0.86	5.1	4.5	13.3	43.4	<0.002	0.28	3.4	<1
2	169730	C9419CQR	SANDSTONE	40	13.5	33	31.9	0.08	4.8	0.106	30.4	39.1	0.26	17.7	20.2	43.2	97	<0.002	0.54	13.7	2
2	169736	C9419CQR	SILTSTONE	14	5.02	8.8	17.45	0.1	2.7	0.043	20.2	13.9	0.28	6.8	4.3	16.4	43.5	0.002	0.39	10.4	1
2	154284	C361CQ	SANDSTONE	73	6.59	21.1	14.05	0.08	3.2	0.051	22.3	15.9	1.59	7.5	16	15.6	93.4	0.002	0.42	11.4	1
2	154285	C361CQ	SANDSTONE	6	5.54	59.5	27.6	0.09	6.4	0.101	15.4	28.4	0.48	9	6.2	26.4	28.6	0.002	0.65	13.6	1
2	154288	C361CQ	MUDSTONE	57	9.72	47.6	24.6	0.1	5.1	0.098	36.5	26.2	0.94	13	23.8	29.1	93.3	0.002	0.84	18.5	2
2	154290	C361CQ	SILTSTONE	55	2.03	7.1	12.8	<0.05	2.1	0.024	15.2	11.9	0.76	7.1	4.2	19.2	41.3	0.002	0.36	4.6	<1
2	154293	C361CQ	SANDSTONE	38	3.38	6.3	13.8	0.06	3	0.041	22.7	11.1	1.86	8.3	4.1	16.7	19.2	<0.002	0.39	5.7	1
2	154295	C361CQ	CARB SANDSTONE	29	4.01	14.6	15.9	0.27	5.5	0.045	141.5	17.1	0.68	11	16	22.9	46.2	0.002	0.63	9.3	2
2	154296	C361CQ	SANDSTONE	42	4.62	13.7	15.45	0.13	4.6	0.04	39.7	21.3	0.34	10.6	10.9	18.3	70.3	<0.002	0.52	8.7	1
2	182651	C9180007CQR	SILTSTONE	42	4.77	60.2	27.9	0.15	6.8	0.1	46.3	61.6	1.07	14	78.3	51.8	45.6	0.003	1.43	12.5	1
2	81702	C9673CQR	SILTSTONE	54	2.82	18.1	17.8	0.09	2.6	0.038	17.2	8.5	0.49	5.1	19.6	12.3	67.4	0.002	0.37	12.6	1
2	81706	C9673CQR	SANDSTONE	27	8.11	44.5	16.75	0.11	3.1	0.053	27.4	13.4	1.14	6.6	11.2	17.5	86.6	0.002	0.51	12	1
2	81712	C9673CQR	SANDSTONE	76	2.25	8.4	15.85	0.07	2.3	0.042	25.3	16.4	1.34	9.8	7.3	23.1	44.6	<0.002	0.45	6.2	1
2	177990	C99139CQR	SANDSTONE	30	2.31	7.7	13.65	0.14	3.3	0.03	57.7	10.6	0.12	6.9	3	15.8	34.9	<0.002	0.44	6.9	1
2	152620	C9180012CQR	SANDSTONE	52	1.11	4.1	8.33	<0.05	1.5	0.016	15.7	13.4	0.14	4.2	1.7	9.9	16.4	<0.002	0.24	2.6	<1
2	152624	C9180012CQR	SANDSTONE	25	5.38	7.8	20	0.05	5.2	0.056	27.5	14.5	0.9	12.6	5.7	28.7	24.5	0.002	0.42	9.2	1
2	GT148353	C9380CQR	SANDSTONE	51	6.83	62.4	31.4	0.12	6.9	0.106	29.1	63.5	1	14.9	17	34.6	64.6	0.002	0.98	16.8	1
2	GT148360	C9380CQR	SILTSTONE	7	6.7	33.1	26.3	0.09	6	0.108	15.9	26.4	1.22	9.3	4.5	23.9	22.9	0.002	0.46	14.3	1

Batch #	Sample ID	Site No.	Analyte	Sn	Sr	Ta	Te	Th	Ti	Tl	U	V	W	Y	Zn	Zr	Hg	F	C
			Units	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	%
			Comparative Abundance	**4.6**	**320**	**1.5**	**0.005**	**9.6**	**0.38**	**0.95**	**3.1**	**105**	**1.7**	**40**	**95**	**150**	**0.19**	**640**	**2.94**
2	GT169958	C671CQ	SANDSTONE	1.8	354	0.45	<0.05	5.8	0.453	0.71	1.9	129	1.2	15.9	88	120	0.034	460	0.63
2	153337	C99204CQR	SILTSTONE	3	159.5	0.74	0.12	10.6	0.434	0.59	3.3	116	2	22.8	91	147.5	0.063	400	2.24
2	170107	C544CQ	SANDSTONE	2.4	45.9	0.69	0.06	11.3	0.526	0.49	2.8	149	1.8	25	186	140.5	0.287	310	0.72
2	GT148407	C9672CQR	SANDSTONE	1.8	61.9	0.51	0.05	8	0.35	0.39	2	100	1.3	18.9	72	101.5	0.039	250	0.16
2	GT148412	C9672CQR	SILTSTONE	<0.2	0.2	<0.05	<0.05	<0.2	0.36	0.02	<0.1	124	<0.1	<0.1	70	<0.5	0.033	450	1.85
2	GT148413	C9672CQR	SANDSTONE	2.4	208	0.64	0.06	8.6	0.485	0.65	2.8	98	2	16.7	98	143.5	0.042	350	0.77
2	GT148416	C9672CQR	MUDSTONE	1.7	480	0.48	0.1	9.6	0.231	0.34	2.5	36	0.9	22.5	57	194	0.046	370	4.37
2	GT148420	C9672CQR	SANDSTONE	1.3	40	0.37	<0.05	5.9	0.091	0.64	1.3	20	0.8	9.6	17	57.1	0.015	90	0.2
2	GT148421	C9672CQR	SANDSTONE	1.2	39.8	0.36	<0.05	5.4	0.093	0.55	1.3	19	0.7	9.5	18	56.1	0.021	90	0.08
2	176529	C99438CQR	SANDSTONE	1.2	32.5	0.37	<0.05	6.1	0.084	0.3	1.3	10	0.9	7.1	34	52	0.016	80	0.24
2	176531	C99438CQR	SANDSTONE	1.3	12.4	0.45	<0.05	6.1	0.097	0.22	1.3	18	1.6	6.8	39	51.9	0.023	70	0.15
2	176534	C99438CQR	SANDSTONE	4.3	21.9	1.19	0.09	19.6	0.449	0.15	4.8	55	3.1	19.5	23	192.5	0.085	110	3.81
2	172101	C412CQ	TUFF	1.9	110.5	0.47	0.07	9.4	0.211	0.16	1.9	30	1.5	22.6	46	174.5	0.043	450	1.58
2	172108	C412CQ	SANDSTONE	0.9	6.8	0.32	<0.05	4.1	0.074	0.62	1	19	0.8	7.9	17	43.4	0.034	60	0.11
2	172109	C412CQ	SILTSTONE	3.1	36.7	1.01	0.05	17.3	0.296	0.53	3.4	52	1.7	24.7	77	150	0.015	270	0.39
2	170112	C544CQ	SANDSTONE	2.2	155.5	0.56	0.08	7.4	0.44	0.63	2.4	128	1.5	17.2	90	130.5	0.034	310	2.51
2	170251	C544CQ	SANDSTONE	2	46.6	0.5	<0.05	8.4	0.196	0.35	1.9	46	1.4	19	41	89.7	0.018	80	0.17
2	170254	C544CQ	SILTSTONE	3.9	40.7	0.91	0.08	14.3	0.469	0.77	3.5	110	2.6	25	59	158.5	0.067	260	0.56
2	170263	C544CQ	SANDSTONE	2.2	16.5	0.69	<0.05	7.8	0.177	0.26	1.9	27	1.5	10	40	65.3	0.023	150	0.26
2	154017	C674CQ	CLAYSTONE	2.1	268	0.57	0.07	7.4	0.466	0.5	2.5	118	1.5	14.9	95	123	0.055	440	0.67
2	154021	C674CQ	SANDSTONE	2.7	150	0.65	0.1	10.9	0.424	0.7	2.8	114	1.8	23.6	81	139.5	0.059	320	1.49
2	154032	C674CQ	SILTSTONE	2.3	13.3	0.7	0.12	8.6	0.282	0.2	2.4	26	1.7	17.1	10	132	0.042	90	0.46
2	169701	C9419CQR	SANDSTONE	3	78.3	0.82	0.1	11.6	0.468	0.73	3.2	122	2	22.3	103	146.5	0.059	400	0.35
2	169703	C9419CQR	SILTSTONE	2.6	70.9	0.71	0.08	8.8	0.518	0.57	3.1	130	1.8	22.4	74	146	0.03	480	0.4
2	169704	C9419CQR	SANDSTONE	2.1	58.3	0.62	0.07	10.8	0.423	0.52	2.2	114	1.6	25.3	96	124.5	0.083	270	1.87
2	169707	C9419CQR	SANDSTONE	6.9	70.7	1.33	0.25	15.1	0.641	0.81	19.9	151	4.8	18.9	28	238	0.347	150	0.5
2	169713	C9419CQR	SILTSTONE	1.5	171	0.38	<0.05	6.8	0.382	0.5	1.8	148	1	18.4	69	94	0.024	310	1.81
2	169714	C9419CQR	SANDSTONE	2.9	200	0.68	0.09	11.7	0.459	0.66	3	122	1.8	22.4	89	149.5	0.04	340	1.33
2	169715	C9419CQR	SHALE	2.6	168	0.58	0.12	9.2	0.345	0.69	2.6	101	1.7	20.9	76	126	0.055	380	1.31
2	169718	C9419CQR	SHALE	2.4	205	0.59	0.05	10.8	0.323	0.57	2.8	62	1.7	26.3	69	127.5	0.059	310	6.56
2	170274	C99130CQR	SILTSTONE	3.6	42.6	0.99	0.18	18.6	0.592	0.06	4.7	100	3.4	24	10	333	0.022	320	0.26
2	154272	C361CQ	CLAYSTONE	2.7	64.6	0.73	0.09	12.4	0.454	0.56	3.4	125	1.9	31.8	81	141	0.019	380	1.27
2	154273	C361CQ	SANDSTONE	2.7	54.9	0.76	0.09	12.3	0.444	0.59	3.1	110	2	27.3	73	141	0.028	340	0.66
2	154275	C361CQ	SILTSTONE	2.6	87.3	0.71	0.06	10	0.529	0.49	3	92	1.8	11.7	66	137	0.042	260	0.54
2	154280	C361CQ	SANDSTONE	2.3	264	0.53	0.12	7.2	0.321	0.75	2.5	98	1.5	21.1	71	126.5	0.066	390	2.52
2	154281	C361CQ	CARB MUDSTONE	3	179	0.72	0.08	10.9	0.484	0.74	3.3	112	2.1	22	106	145.5	0.044	370	1.43
2	169723	C9419CQR	SILTSTONE	1.9	46.4	0.52	<0.05	7.5	0.167	0.61	1.6	37	1.1	13.3	45	72.7	0.011	140	0.25
2	169727	C9419CQR	SANDSTONE	3.2	222	0.76	0.14	6.9	0.567	0.36	2.8	78	2.2	21.1	23	239	0.064	500	1.22
2	169728	C9419CQR	SILTSTONE	4.9	47.2	1.62	0.05	21.6	0.408	0.59	6.3	58	3.5	17.4	80	167.5	0.095	280	3.77
2	169729	C9419CQR	SANDSTONE	1.3	32.8	0.45	<0.05	5.2	0.11	0.26	1.2	21	1.2	9.4	13	48.5	0.012	90	0.13
2	169730	C9419CQR	SANDSTONE	5.4	43.5	1.53	0.09	21.1	0.445	0.75	5.6	67	3.9	20.7	64	152.5	0.063	300	3.06
2	169736	C9419CQR	SILTSTONE	1.6	131.5	0.48	<0.05	7.1	0.381	0.39	2.1	80	1.6	19.1	70	97.6	0.016	400	0.54
2	154284	C361CQ	SANDSTONE	2.3	101	0.61	<0.05	9.6	0.322	0.58	2.2	75	1.8	18.5	67	110.5	0.022	260	2.19
2	154285	C361CQ	SANDSTONE	3.2	244	0.71	0.08	7.8	0.481	0.68	2.7	88	1.6	21.5	38	209	0.105	380	0.52
2	154288	C361CQ	MUDSTONE	4.5	50.6	1.06	0.08	15.6	0.533	0.57	4.5	123	3.4	30.5	116	166	0.085	290	1.29
2	154290	C361CQ	SILTSTONE	2	41.9	0.59	<0.05	7.5	0.18	0.3	1.7	28	1.7	9.8	25	68.6	0.02	150	0.04
2	154293	C361CQ	SANDSTONE	1.9	16.3	0.65	<0.05	8.2	0.228	0.17	2	29	1.6	14	36	104.5	0.021	90	1.96
2	154295	C361CQ	CARB SANDSTONE	2.7	42	0.92	<0.05	15.3	0.328	0.44	4.4	51	2	59.6	77	189.5	0.036	170	0.44
2	154296	C361CQ	SANDSTONE	2.5	36.8	0.88	<0.05	14.3	0.299	0.39	3.3	48	1.8	23.4	53	160	0.014	230	0.33
2	182651	C9180007CQR	SILTSTONE	4.8	179.5	1.16	0.14	15.8	0.568	0.54	5.9	125	3.7	24.8	476	231	0.27	280	0.58
2	81702	C9673CQR	SILTSTONE	1.3	266	0.38	<0.05	5.2	0.336	0.52	1.4	87	0.9	13.3	60	88.8	0.015	380	0.39
2	81706	C9673CQR	SANDSTONE	2.1	266	0.49	0.11	8.7	0.279	0.46	2.6	83	1.8	29.1	56	118.5	0.042	430	3.59
2	81712	C9673CQR	SANDSTONE	2.4	26.4	0.79	<0.05	10.4	0.18	0.35	2.4	40	2	11.8	81	81.7	0.022	120	0.66
2	177990	C99139CQR	SANDSTONE	1.8	29.5	0.57	<0.05	9.9	0.247	0.18	2.6	42	1.2	31.8	9	112	0.029	110	0.03
2	152620	C9180012CQR	SANDSTONE	1.4	10.2	0.4	<0.05	5.9	0.086	0.1	1.2	14	2.2	5.6	17	46.4	0.01	50	0.2
2	152624	C9180012CQR	SANDSTONE	3.6	22.4	1.01	0.06	15.5	0.281	0.22	3.6	33	2.8	31	7	182	0.024	140	1.38
2	GT148353	C9380CQR	SANDSTONE	4.4	55.1	1.17	0.12	14	0.633	0.62	7.2	135	3.5	24.8	140	243	0.348	340	0.75
2	GT148360	C9380CQR	SILTSTONE	3.1	317	0.66	0.15	7.4	0.496	0.69	3.2	79	2	19.7	66	233	0.135	370	2.03

Batch #	Sample ID	Site No.	Analyte	Al	Ca	Fe	K	Mg	Mn	Na	P	S	Ag	As	B	Ba	Be	Bi	Cd	Ce	Co
			Units	%	%	%	%	%	ppm	%	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
			Comparative Abundance	**7.2**	**6.6**	**4.1**	**2**	**1.4**	**770**	**0.57**	**670**	**0.22**	**0.057**	**7.7**	**100**	**460**	**2**	**0.4**	**0.17**	**83**	**14**
2	GT148363	C9380CQR	SILTSTONE	5.71	0.04	0.36	2.06	0.08	22	0.07	60	0.02	0.15	5	10	390	0.9	0.12	0.05	26.9	11.1
2	GT148366	C9380CQR	SANDSTONE	6.47	0.58	1.69	2.73	0.25	359	0.12	480	0.02	0.06	4	10	580	1.32	0.13	0.05	56.8	11.9
2	GT148368	C9380CQR	SANDSTONE	7.06	0.18	1.13	2.88	0.21	192	0.12	610	0.02	0.05	7.8	10	570	1.15	0.13	0.06	51.1	14
2	GT148373	C9380CQR	SANDSTONE	6.52	0.03	0.6	1.7	0.09	81	0.07	110	0.01	0.03	5.3	10	480	1.39	0.11	0.04	36.8	2.6
2	GT148375	C9380CQR	SANDSTONE	9.98	0.07	0.57	1.48	0.12	77	0.08	110	0.02	0.08	16.1	20	390	3.08	0.35	0.23	76	3.6
2	GT148379	C9380CQR	SILTSTONE	9.54	0.11	0.94	0.55	0.07	47	0.05	90	0.07	0.05	4.3	10	130	3.44	0.3	0.12	81.5	2.6
2	175946	C376CQ	CARB SILTSTONE	9.58	0.16	0.79	0.88	0.17	41	0.1	400	0.06	1.14	23.5	20	240	2.45	0.58	0.18	63.8	26.6
2	147281	C376CQ	MUDSTONE	7.97	0.42	1.74	2.64	0.35	407	0.36	690	0.04	0.1	4.4	20	470	2.17	0.4	0.14	44.2	9.7
2	177683	C670CQ	SILTSTONE	8.14	0.21	0.78	1.65	0.25	29	0.3	90	0.02	0.11	3.9	20	330	1.53	0.32	0.12	23.7	1.9
2	177687	C670CQ	SILTSTONE	7.32	4.41	2.21	1.87	0.79	727	1.25	950	0.01	0.04	3.8	10	500	1.51	0.1	0.06	39.4	14.2
2	177693	C670CQ	SANDSTONE	7.47	1.24	1.82	0.22	0.92	49	0.32	260	0.01	0.08	1.1	10	430	0.42	0.3	0.09	40.3	1.9
2	177694	C670CQ	TUFF	5.63	5.29	1.08	1.23	0.38	139	0.09	520	0.01	0.04	15.9	10	300	0.65	0.14	0.06	51.9	14.3
2	177698	C670CQ	SANDSTONE	7.77	0.75	0.67	1.2	0.18	57	0.06	280	0.03	0.07	6.9	10	300	1.87	0.46	0.15	61	5.2
2	177700	C670CQ	SILTSTONE	8.48	0.1	0.72	1.63	0.2	64	0.07	130	0.02	0.09	2.8	30	420	2.78	0.59	0.25	60.5	4.4
2	148380	C9380CQR	SILTSTONE	6.59	0.06	0.3	0.45	0.05	20	0.03	40	0.03	0.04	1.8	10	110	1.87	0.4	0.08	34.4	1.4
2	147284	C376CQ	SANDSTONE	5.9	2.6	1.03	1.54	0.43	153	0.39	680	0.03	0.04	5.6	10	790	1.08	0.2	0.08	58.2	11.9
2	147288	C376CQ	SANDSTONE	7.45	0.17	0.69	2.36	0.16	72	0.07	490	0.02	0.05	13.6	10	410	1.38	0.18	0.06	59.9	11.9
2	147289	C376CQ	SANDSTONE	7.3	0.18	2.02	2.07	0.26	534	0.11	390	0.03	0.11	4.5	20	370	2.78	0.5	0.19	45.5	10
2	147292	C376CQ	SILTSTONE	3.36	0.1	0.29	0.99	0.04	44	0.05	160	0.01	0.02	7.9	10	240	0.46	0.05	<0.02	21.3	4.9
2	147293	C376CQ	SANDSTONE	7.61	0.07	0.65	1.49	0.13	47	0.07	150	0.02	0.09	1.7	30	290	4.14	0.67	0.23	80.7	5.6
2	147295	C376CQ	SILTSTONE	2.82	0.21	0.26	0.6	0.02	57	0.03	100	0.11	0.03	8.1	<10	120	0.35	0.05	<0.02	28.8	13.1
2	175918	C9404CQR	SANDSTONE	8.13	0.42	3.67	1.66	0.62	309	0.14	600	0.02	0.09	2.7	20	290	2.25	0.38	<0.02	48.9	15.9
2	175919	C9404CQR	SILTSTONE	8.35	0.57	2.57	1.76	0.48	302	0.07	1060	0.01	0.09	1.9	30	330	2.02	0.39	0.03	59.2	9.3
2	148388	C9180009CQR	SILTSTONE	7.85	0.03	2.26	0.48	0.07	29	0.05	450	0.01	0.06	11.1	20	240	1.79	0.3	<0.02	43.5	4.9
2	148389	C9180009CQR	CLAY	7.53	0.06	3.9	0.93	0.1	67	0.06	630	<0.01	0.04	10.4	20	250	4.4	0.37	<0.02	62.2	11.8
2	148392	C9180009CQR	SANDSTONE	7.64	0.02	0.32	0.77	0.07	24	0.04	90	0.07	0.04	1.8	20	210	2.29	0.24	<0.02	42.2	5.5
2	175920	C9404CQR	CARB SANDSTONE	6.43	0.71	8.95	1.08	0.63	1940	0.06	830	0.02	0.1	2.3	20	220	2.4	0.41	0.14	41.2	30
2	175921	C9404CQR	SANDSTONE	10.65	0.12	0.55	0.45	0.11	32	0.04	150	0.03	0.06	2.6	20	170	6.98	0.85	0.08	92.4	3
2	175925	C9404CQR	CARB SILTSTONE	6.43	0.43	3.88	2.82	0.39	923	0.14	680	0.04	0.09	3.4	20	470	2.19	0.44	0.12	36.3	37
2	175926	C9404CQR	SILTSTONE	5.47	0.37	4.06	1.61	0.42	1100	0.13	400	0.05	0.07	5.1	10	430	1.38	0.24	0.11	39.6	16.3
2	175928	C9404CQR	SANDSTONE	3.73	0.03	0.39	1.82	0.04	125	0.08	80	0.01	0.02	4.3	10	540	0.64	0.07	0.02	23.7	5.4
2	175934	C9404CQR	SANDSTONE	3.17	0.01	0.27	0.41	0.02	69	0.02	130	0.02	0.09	16.1	10	230	0.73	0.08	<0.02	30.7	30.2
2	175936	C9404CQR	CONGLOMERATE	3.6	0.02	0.26	0.58	0.04	126	0.03	60	0.01	0.03	4	10	150	0.89	0.09	<0.02	41.6	6.5
2	175938	C9404CQR	CONGLOMERATE	2.59	0.01	0.14	0.17	0.01	24	0.01	30	0.01	0.02	2.6	10	50	0.49	0.05	<0.02	15.65	5.2
2	176508	C545CQ	CONGLOMERATE	4.56	0.47	2.79	0.34	0.42	784	0.08	130	0.38	0.09	90.5	20	230	2.52	0.63	0.13	31.1	6.7
2	176509	C545CQ	CARB SILTSTONE	6.68	0.99	2.39	0.32	1.04	317	0.15	340	0.03	0.09	4.1	10	310	0.64	0.27	0.08	59.8	2.5
2	176511	C545CQ	CLAYSTONE	8.08	0.22	1.5	2.25	0.24	153	0.1	330	0.07	0.09	3.3	20	440	3.09	0.49	0.2	101.5	20.3
2	175516	C545CQ	CARB SILTSTONE	5.64	0.04	1.21	1.17	0.06	496	0.05	70	0.01	0.03	3.7	10	280	0.94	0.08	0.04	34.1	2.3
2	176517	C545CQ	SANDSTONE	3.2	0.02	0.18	0.6	0.02	38	0.03	60	0.01	0.03	4	10	140	0.55	0.11	<0.02	47.6	6.1
2	176518	C545CQ	SANDSTONE	7.63	0.06	0.61	1.37	0.12	51	0.07	110	0.01	0.1	1.8	20	270	3.57	0.74	0.12	46.6	4.2
2	176521	C545CQ	MUDSTONE	7.76	0.35	2.36	2.5	0.28	146	0.19	150	0.01	0.08	1.9	20	320	2.84	0.35	0.14	68.3	8.3
2	177977	C559CQ	SILTSTONE	7.97	0.4	0.94	0.76	0.33	16	0.18	1020	0.06	0.09	4.4	10	220	1.29	0.3	0.13	34.7	24
2	177983	C559CQ	TUFF	3.54	0.04	0.34	0.79	0.04	92	0.04	110	0.01	0.02	6.8	10	180	0.52	0.13	<0.02	26.2	6.7
2	147456	C088CQ	SANDSTONE	6.96	1.25	2.28	0.96	0.89	458	0.74	650	0.02	0.04	5.1	10	270	1.31	0.11	0.13	24	5.6
2	147458	C088CQ	SANDSTONE	7.71	0.36	1.5	1.9	0.43	90	0.16	90	0.05	0.06	5	20	400	1.77	0.35	0.05	23.6	3.6
2	147466	C088CQ	SILTSTONE	8.14	0.55	2.39	1.97	0.54	125	0.2	630	0.04	0.07	4.8	20	380	1.22	0.39	0.1	52.4	7.5
2	147469	C088CQ	SILTSTONE	8.07	0.43	1.19	0.93	0.32	45	0.11	310	0.05	0.11	5.4	10	220	2.5	0.39	0.19	49.3	11.8
2	147475	C088CQ	CARB SILTSTONE	7.78	0.78	1.76	0.58	0.36	45	0.12	320	0.07	0.08	3	10	310	2.45	0.58	0.15	43.9	6.1
2	147280	C088CQ	CARB SILTSTONE	6.13	0.7	3.17	0.27	0.29	413	0.09	340	0.02	0.09	2.1	10	220	1.15	0.36	0.12	32.7	2.4
2	147476	C088CQ	TUFF	8.76	0.98	3.83	0.49	0.39	437	0.12	940	0.05	0.07	6.6	10	290	1.96	0.3	0.12	67.7	10.1
2	153323	C9099CQR	TUFF	6.57	0.15	2.06	1.28	0.33	190	0.36	450	0.02	0.06	23.8	10	290	1.21	0.21	0.07	66.7	20
2	153324	C9099CQR	SANDSTONE	7.93	0.32	0.99	1.61	0.39	78	0.51	110	0.05	0.05	9.4	20	490	1.41	0.15	0.08	17.95	16.1
2	147479	C088CQ	SANDSTONE	8.32	0.14	1.16	1.29	0.17	57	0.05	200	0.02	0.08	9	10	290	1.96	0.52	0.16	63.5	14.3
2	153301	C099CQ	SILTSTONE	6.87	10.55	3.34	1.21	0.55	1940	0.07	880	<0.01	0.08	<5	10	220	1.7	0.31	0.26	63.4	15.3
2	153303	C099CQ	SILTSTONE	7.53	0.34	4.47	1.49	0.75	433	0.27	510	0.01	0.09	1.7	20	280	2.01	0.37	<0.02	40.8	18
2	153305	C099CQ	SILTSTONE	6.18	0.81	1.53	1.21	0.28	269	0.4	470	0.01	0.04	14	<10	260	0.85	0.16	0.05	45.4	12.7
2	154259	C122CQ	SANDSTONE	8.99	0.16	2.15	2.14	0.32	306	0.11	250	0.03	0.13	5.8	10	460	3.3	0.64	0.24	89.5	6
2	154261	C122CQ	SILTSTONE	8.48	1.05	9.78	0.46	0.32	8590	0.11	300	0.21	0.08	47	10	210	2.19	0.33	0.03	23.9	24.4

Batch #	Sample ID	Site No.	Analyte	Cr	Cs	Cu	Ga	Ge	Hf	In	La	Li	Mo	Nb	Ni	Pb	Rb	Re	Sb	Sc	Se
			Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
			Comparative Abundance	72	72	33	18	1.7	2.5	0.044	41	56	2	13	52	19	135	0.0004	1.2	10	0.42
2	GT148363	C9380CQR	SILTSTONE	30	4.18	8.3	11.95	<0.05	2.7	0.026	14.1	13.4	0.26	5.6	7.1	19.2	106.5	0.002	0.69	4.1	1
2	GT148366	C9380CQR	SANDSTONE	49	4.28	14.7	14.4	0.1	3	0.039	27.4	12.4	0.51	6.5	12.9	15.3	130.5	0.002	0.7	11.3	1
2	GT148368	C9380CQR	SANDSTONE	50	4.31	15.8	16.8	0.1	3.5	0.042	24.2	13.6	1.18	7.2	14.3	17.3	133.5	<0.002	0.71	13.7	1
2	GT148373	C9380CQR	SANDSTONE	45	3.47	6.7	16.2	0.05	2.2	0.041	19.5	14.5	0.51	8.6	6.4	24.1	85.3	<0.002	0.4	6.9	<1
2	GT148375	C9380CQR	SANDSTONE	46	8.2	27.8	26.6	0.09	4.6	0.088	38.4	32	0.58	16.1	15.4	34	94.3	0.002	0.58	14	1
2	GT148379	C9380CQR	SILTSTONE	34	6.33	17.9	22.5	0.11	4.2	0.069	40.7	23	0.55	11.1	4.4	28	38.3	0.002	0.4	11.8	2
2	175946	C376CQ	CARB SILTSTONE	50	4.62	52.7	27.5	0.1	6.4	0.094	29.1	56.7	1.74	13.4	24.9	45.4	50.2	0.002	1.25	16.2	2
2	147281	C376CQ	MUDSTONE	44	8.34	53.7	23.3	0.1	4.1	0.074	19.5	18.7	0.62	9.9	19.3	22.3	119	<0.002	0.64	15.3	1
2	177683	C670CQ	SILTSTONE	24	5.44	55.3	24.9	0.07	4	0.061	10.2	16.6	0.3	7.8	7.8	24.2	64.4	<0.002	0.66	10.6	1
2	177687	C670CQ	SILTSTONE	48	3.82	31.7	18.3	0.12	2.5	0.046	18.6	12	0.89	5.6	19.1	11.3	66.2	0.002	0.36	15.1	1
2	177693	C670CQ	SANDSTONE	3	2	9.8	17.6	0.11	6.4	0.06	18.8	7	0.15	7.7	1.7	21.9	6.9	<0.002	0.28	11.3	1
2	177694	C670CQ	TUFF	59	3.82	13.3	12.35	0.13	2.8	0.039	25.5	11.5	2.28	6.4	13.9	12.1	73	0.002	0.38	11.5	1
2	177698	C670CQ	SANDSTONE	49	7.52	38.6	20.9	0.09	4.3	0.07	29.2	22.6	0.73	10.8	12.1	20.1	78.9	0.002	0.57	15.8	1
2	177700	C670CQ	SILTSTONE	52	9.35	31.6	26.6	0.12	4.8	0.109	31.3	36.7	0.49	20	12.8	41.5	105	<0.002	0.47	11.9	1
2	148380	C9380CQR	SILTSTONE	34	3.32	10.2	13.85	0.12	4.1	0.056	16.7	15.6	0.44	12.2	2.5	23	29.2	<0.002	0.43	7.9	1
2	147284	C376CQ	SANDSTONE	69	5.46	19.3	14.7	0.13	3.4	0.048	27.6	14	1.21	7.6	12.7	15.7	84.5	<0.002	0.42	12.1	1
2	147288	C376CQ	SANDSTONE	42	5.03	22.1	18.25	0.1	3.7	0.051	29.4	16.4	0.73	7.9	18.1	15.7	116.5	<0.002	0.85	10.3	1
2	147289	C376CQ	SANDSTONE	47	9.59	45.9	22.8	0.31	4.7	0.088	19.8	27.9	0.47	11	21	26.1	99.9	<0.002	0.91	15.1	1
2	147292	C376CQ	SILTSTONE	95	1.22	2.4	7.34	0.08	1.3	0.013	11.2	7	1.05	3.5	7.1	14.7	46.8	<0.002	0.29	2.3	<1
2	147293	C376CQ	SANDSTONE	42	9.63	44.6	27.7	0.25	4.5	0.095	37.8	40.6	0.23	17.1	13.5	40.5	95.2	<0.002	0.7	12.6	1
2	147295	C376CQ	SILTSTONE	84	1.06	2.4	5.78	0.05	1.5	0.009	13.7	6.5	0.78	2.8	8.4	11.5	31.5	<0.002	0.52	2.4	<1
2	175918	C9404CQR	SANDSTONE	55	10.9	45.3	21.9	0.25	3.5	0.066	23.1	37.1	0.37	9	40.1	21.8	94.9	<0.002	0.79	17.5	1
2	175919	C9404CQR	SILTSTONE	52	9.83	44	23	0.18	4.1	0.074	27.4	31.8	0.4	10.5	37.3	21.2	104	<0.002	0.99	17.6	1
2	148388	C9180009CQR	SILTSTONE	53	4.3	36.4	19.95	0.1	4	0.088	23.2	13.3	0.67	10.3	21.6	35.4	36	<0.002	1.11	12.9	1
2	148389	C9180009CQR	CLAY	51	8.76	47.6	20.3	0.17	4.4	0.067	28.3	14.4	1	9.9	37.5	21.8	68.4	<0.002	0.83	13.5	2
2	148392	C9180009CQR	SANDSTONE	40	4.99	15.3	23	0.12	4	0.075	22.5	30	0.44	17.1	15.3	38.7	55.1	<0.002	0.43	7.8	1
2	175920	C9404CQR	CARB SANDSTONE	45	6.29	48.7	21.1	0.4	3.3	0.072	18.7	33.1	0.31	8.2	45.4	21.6	41.9	<0.002	0.68	16.6	1
2	175921	C9404CQR	SANDSTONE	39	4.41	52.5	29.1	0.35	7.3	0.103	41.2	67.4	1.2	14.3	12	52.7	33.2	<0.002	1.19	15.3	2
2	175925	C9404CQR	CARB SILTSTONE	39	8.14	49.5	21.5	0.3	3.6	0.069	16	18.3	1.93	8.1	48.4	21	116	<0.002	0.63	12.8	1
2	175926	C9404CQR	SILTSTONE	44	6.76	29.3	16.1	0.21	3.7	0.059	18	12.4	1.65	7.7	22.4	19.1	72.2	<0.002	0.46	10.8	1
2	175928	C9404CQR	SANDSTONE	45	1.75	4	7.72	0.09	1.4	0.012	12.3	8.2	0.41	2.6	7.9	16.4	83.5	<0.002	0.32	2.3	<1
2	175934	C9404CQR	SANDSTONE	43	1.01	2.8	7.16	0.07	2.2	0.017	15.4	11.6	1.46	5.2	19.3	16.2	24	<0.002	0.44	2.9	1
2	175936	C9404CQR	CONGLOMERATE	48	1.49	4.8	8.51	0.08	2.4	0.016	21.3	9.9	0.67	7.6	5.9	14.9	32.7	<0.002	0.34	3.5	<1
2	175938	C9404CQR	CONGLOMERATE	63	0.68	2.5	5.58	0.05	1.4	<0.005	8	10.1	0.55	2.7	4.9	11.3	13.2	<0.002	0.42	2	<1
2	176508	C545CQ	CONGLOMERATE	11	3.11	21.4	12.45	0.1	3.2	0.081	13.6	12.6	2.73	5.5	12.3	24.5	16.6	0.003	1.35	8.7	1
2	176509	C545CQ	CARB SILTSTONE	3	2.85	10.4	15.65	0.15	5.6	0.057	28	9	1.03	6.9	1.2	19.9	20.2	<0.002	0.32	12.2	1
2	176511	C545CQ	CLAYSTONE	39	8.51	39.2	25.2	0.28	5	0.083	44.4	26.4	2.69	11.4	34	26.3	120	<0.002	0.7	17	1
2	175516	C545CQ	CARB SILTSTONE	38	2.13	5.2	14.6	0.1	1.8	0.031	17.7	11.3	0.58	7.7	4.3	25.7	61.3	<0.002	0.37	4.5	<1
2	176517	C545CQ	SANDSTONE	55	1.18	3.1	7.3	0.06	2.2	0.02	25	8.3	1.37	5.8	6.5	12.8	30.7	<0.002	0.48	2.5	1
2	176518	C545CQ	SANDSTONE	40	10.65	42.3	29.1	0.19	4.4	0.095	21.6	40.1	0.27	17.5	12.6	42.3	92.3	<0.002	0.54	10.1	1
2	176521	C545CQ	MUDSTONE	21	14.65	22.8	23.4	0.19	5.2	0.071	29.4	24.2	0.47	14.2	7.8	26.6	120.5	<0.002	0.69	12.1	1
2	177977	C559CQ	SILTSTONE	9	0.96	50.3	26.2	0.12	7	0.081	14.8	24.2	3.87	13.8	8	29.2	16.3	0.006	0.6	8.7	1
2	177983	C559CQ	TUFF	40	1.21	2.5	7.88	0.07	1.4	0.012	13.6	9.9	1.48	3.8	6.8	16.3	38.9	<0.002	0.27	2.7	<1
2	147456	C088CQ	SANDSTONE	21	2.3	5.1	19.2	0.11	2.1	0.04	10.8	11.7	1.22	6.9	6.6	16.7	20.5	<0.002	0.3	7.1	1
2	147458	C088CQ	SANDSTONE	33	7.63	43.5	23.5	0.15	2.9	0.049	11.2	34.8	0.34	7.7	20.5	20.9	78.3	<0.002	0.51	8.2	1
2	147466	C088CQ	SILTSTONE	40	7.77	48.1	23	0.16	4.2	0.068	23.6	27.2	1.08	9.6	16	20	85.5	<0.002	0.44	15.8	1
2	147469	C088CQ	SILTSTONE	17	3.9	25.9	21.1	0.11	6.2	0.101	19.5	22.3	1.09	9.9	13.3	31.4	33	0.002	0.92	12.1	2
2	147475	C088CQ	CARB SILTSTONE	12	3.26	88.5	24.8	0.15	5	0.115	18.2	14.8	1.24	8.3	4.5	22.3	22	<0.002	0.29	16.1	2
2	147280	C088CQ	CARB SILTSTONE	4	1.29	5.3	22.7	0.22	6.6	0.097	13.8	16.8	2.22	7.3	2.2	30.1	5.8	<0.002	0.61	9.9	1
2	147476	C088CQ	TUFF	5	2.57	25.7	24.6	0.21	5.6	0.082	30.1	14.6	5.26	9.2	6.7	26.1	16.8	<0.002	0.67	14.1	1
2	153323	C9099CQR	TUFF	47	3.35	16.3	16.35	0.15	2.7	0.043	33.9	19.7	1.83	6.1	27	19.2	63.9	0.002	0.9	9.5	1
2	153324	C9099CQR	SANDSTONE	35	3.77	31.3	21	0.12	2.6	0.059	8.6	23.2	1.37	7.3	31.5	13.9	64.1	<0.002	0.42	6.3	1
2	147479	C088CQ	SANDSTONE	51	8.12	38.7	21.2	0.13	5.2	0.089	28.6	31	1.07	11.9	18.4	27.8	81.6	0.002	0.62	16.6	1
2	153301	C099CQ	SILTSTONE	33	7.83	33.7	16.1	0.21	2.9	0.052	30.7	28.7	0.12	7.6	31.7	17.1	85.8	<0.002	0.64	14.5	1
2	153303	C099CQ	SILTSTONE	51	7.14	42.3	19.6	0.29	3.7	0.064	17.6	35.5	0.19	9.4	35.4	18.9	62.4	<0.002	0.82	15.6	1
2	153305	C099CQ	SILTSTONE	61	2.66	10.8	13.1	0.12	2.4	0.041	22.1	15.7	2.2	6	19.8	12.9	61.9	<0.002	0.8	9	1
2	154259	C122CQ	SANDSTONE	42	9.44	39.9	24.8	0.23	4.7	0.09	41.4	39.4	0.57	13.1	12.5	34.8	123	<0.002	0.65	15.9	1
2	154261	C122CQ	SILTSTONE	5	2.66	21.3	21.9	0.26	5.9	0.066	5.8	17.7	2.62	10	8.2	35.6	16.8	<0.002	1.15	10.7	1

Batch #	Sample ID	Site No.	Analyte	Sn	Sr	Ta	Te	Th	Ti	Tl	U	V	W	Y	Zn	Zr	Hg	F	C
			Units	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	%
			Comparative Abundance	**4.6**	**320**	**1.5**	**0.005**	**9.6**	**0.38**	**0.95**	**3.1**	**105**	**1.7**	**40**	**95**	**150**	**0.19**	**640**	**2.94**
2	GT148363	C9380CQR	SILTSTONE	1.9	32.6	0.51	<0.05	8.3	0.201	0.67	2.1	21	2	14.4	11	91.2	0.027	110	0.46
2	GT148366	C9380CQR	SANDSTONE	1.9	64	0.52	<0.05	10	0.322	0.71	2.3	80	1.7	17	57	107	0.014	270	0.52
2	GT148368	C9380CQR	SANDSTONE	2.1	62.5	0.61	<0.05	9.7	0.361	0.76	2.5	95	1.6	20.2	70	117.5	0.038	320	0.17
2	GT148373	C9380CQR	SANDSTONE	2.3	49.9	0.73	<0.05	8	0.199	0.52	1.9	39	1.9	11.3	55	69.3	0.009	160	0.28
2	GT148375	C9380CQR	SANDSTONE	4.1	43.8	1.26	0.05	19.3	0.447	0.6	4.9	68	3.5	20.5	125	158	0.027	260	1.79
2	GT148379	C9380CQR	SILTSTONE	3.1	25.6	0.84	0.08	16.1	0.336	0.3	3.3	55	2	28.9	36	145	0.099	100	8.67
2	175946	C376CQ	CARB SILTSTONE	3.9	93.1	1.02	0.15	13.6	0.627	1.14	6.2	137	3.2	25.3	156	223	0.3	260	0.78
2	147281	C376CQ	MUDSTONE	3.1	204	0.75	0.1	8.9	0.472	0.69	2.9	122	2	18.7	90	148	0.053	380	1.39
2	177683	C670CQ	SILTSTONE	2.2	207	0.62	0.08	5.7	0.454	0.56	2.7	78	1.5	6.8	104	131.5	0.08	240	0.51
2	177687	C670CQ	SILTSTONE	1.5	563	0.38	<0.05	5.4	0.453	0.44	1.3	129	0.9	16.7	68	91.2	0.01	350	1.23
2	177693	C670CQ	SANDSTONE	2.4	445	0.61	<0.05	9	0.238	0.11	2.5	26	1.6	25.4	70	233	0.117	550	0.3
2	177694	C670CQ	TUFF	1.9	149	0.51	<0.05	8.5	0.269	0.47	1.9	54	1.5	23.2	61	96	0.025	240	2.26
2	177698	C670CQ	SANDSTONE	3.6	52.7	0.85	0.06	13.1	0.449	0.51	3.1	101	2.5	26.3	82	155	0.06	220	2.04
2	177700	C670CQ	SILTSTONE	5.1	44	1.57	0.07	23.1	0.416	0.67	6.7	60	3.2	17.5	86	162	0.072	320	2.01
2	148380	C9380CQR	SILTSTONE	2.4	19.8	0.99	0.06	13.3	0.313	0.23	3.2	33	1.9	15.7	23	141	0.039	90	4.06
2	147284	C376CQ	SANDSTONE	2.3	171	0.59	<0.05	10.1	0.305	0.54	2.3	64	1.7	28.5	62	122.5	0.019	360	3.02
2	147288	C376CQ	SANDSTONE	2.3	48.6	0.59	<0.05	9.6	0.374	0.68	2.4	71	1.6	20.9	65	130.5	0.017	260	0.47
2	147289	C376CQ	SANDSTONE	3.9	50.1	0.89	0.09	10.6	0.489	0.71	3.7	119	2.5	22.5	88	159	0.076	430	2.39
2	147292	C376CQ	SILTSTONE	0.9	31.4	0.32	<0.05	4.6	0.055	0.32	1	12	0.8	6.6	18	42.6	0.011	140	0.25
2	147293	C376CQ	SANDSTONE	5.2	29.3	1.36	0.07	17	0.439	0.66	5.7	84	3.3	20.1	106	146	0.089	280	2.63
2	147295	C376CQ	SILTSTONE	1	16.3	0.27	<0.05	4.8	0.038	0.72	1.1	12	0.5	8.8	11	46.7	0.025	110	0.07
2	175918	C9404CQR	SANDSTONE	2.5	80.7	0.69	0.07	10.8	0.402	0.66	2.1	108	1.7	20.1	92	126	0.042	440	0.45
2	175919	C9404CQR	SILTSTONE	2.9	75.7	0.82	0.07	11.7	0.445	0.62	2.6	107	2.1	23.2	67	142.5	0.018	470	0.39
2	148388	C9180009CQR	SILTSTONE	3.5	43.6	0.88	0.06	10.2	0.429	0.2	4	181	2.7	23.5	35	128	<0.005	170	0.02
2	148389	C9180009CQR	CLAY	3.5	37.3	0.84	0.07	12.2	0.417	0.4	4.3	94	2.4	51.4	127	146	0.012	200	0.09
2	148392	C9180009CQR	SANDSTONE	4.3	20.1	1.43	<0.05	16.9	0.36	0.45	5.4	38	3.5	10.6	15	129	0.111	210	1.62
2	175920	C9404CQR	CARB SANDSTONE	2.3	69.9	0.61	0.1	6.7	0.386	0.48	2	115	1.6	21.5	100	120.5	0.163	270	2.82
2	175921	C9404CQR	SANDSTONE	5.5	42.2	1.16	0.16	27.6	0.497	0.32	6.7	93	4.6	25.6	44	219	0.15	160	7.59
2	175925	C9404CQR	CARB SILTSTONE	2.9	106.5	0.66	0.09	7.3	0.352	0.79	2.5	106	1.7	17.8	81	124.5	0.053	330	2.22
2	175926	C9404CQR	SILTSTONE	2.5	108	0.61	<0.05	7.5	0.327	0.68	2.6	72	1.6	20.8	64	135	0.07	330	5.54
2	175928	C9404CQR	SANDSTONE	0.9	61.4	0.25	<0.05	4.9	0.059	0.5	1	14	1.2	6.7	19	45.3	0.009	90	0.33
2	175934	C9404CQR	SANDSTONE	1.3	32.7	0.48	<0.05	8.2	0.059	0.59	1.7	11	0.8	16.9	15	69.9	0.037	70	0.08
2	175936	C9404CQR	CONGLOMERATE	1.8	18.1	0.73	<0.05	10.2	0.183	0.25	2	20	2	10	15	75.8	0.023	80	0.49
2	175938	C9404CQR	CONGLOMERATE	0.7	7.1	0.27	<0.05	3.9	0.034	0.13	0.9	8	1	8	11	45.9	0.011	70	0.02
2	176508	C545CQ	CONGLOMERATE	2.1	198.5	0.44	0.2	6.7	0.206	1.81	1.9	35	1.1	17.2	35	127.5	0.182	210	18.25
2	176509	C545CQ	CARB SILTSTONE	2.1	432	0.54	0.09	10.5	0.216	0.16	2.4	24	1.8	28.3	53	195	0.039	380	0.52
2	176511	C545CQ	CLAYSTONE	4	67.5	0.91	0.07	14.7	0.404	0.79	3.9	118	2.3	35	97	185	0.05	290	4.11
2	175516	C545CQ	CARB SILTSTONE	2	33.6	0.62	<0.05	7.5	0.147	0.37	1.6	23	1.5	7.7	61	61.3	0.017	140	0.61
2	176517	C545CQ	SANDSTONE	1.7	24.2	0.59	<0.05	13.1	0.108	0.24	1.8	12	1.9	19.1	16	65.7	0.01	90	0.03
2	176518	C545CQ	SANDSTONE	5.4	33.9	1.44	0.08	15.9	0.433	0.64	5.3	95	3.6	14	100	137	0.088	290	1.69
2	176521	C545CQ	MUDSTONE	3.2	82.9	1.03	0.06	14.8	0.469	0.81	4.4	112	2.2	22.8	95	192.5	0.036	260	0.61
2	177977	C559CQ	SILTSTONE	3.2	67.8	1.14	0.07	10.5	0.567	0.68	5.9	77	3.3	15.7	127	212	0.197	730	0.52
2	177983	C559CQ	TUFF	1	20.7	0.35	<0.05	5.2	0.062	0.27	1.2	14	0.7	8.7	19	43.8	0.015	100	0.17
2	147456	C088CQ	SANDSTONE	1.6	408	0.47	<0.05	4.3	0.286	0.28	1.6	42	1.5	12	46	70.5	0.033	400	0.39
2	147458	C088CQ	SANDSTONE	2.5	208	0.62	0.09	5.9	0.423	0.53	1.9	66	1.5	13.3	35	109	0.132	280	2.01
2	147466	C088CQ	SILTSTONE	2.9	194.5	0.72	0.08	9	0.446	0.58	2.8	116	2.2	18.5	91	147	0.061	380	0.76
2	147469	C088CQ	SILTSTONE	3.6	205	0.83	0.06	8	0.44	0.38	3.7	58	1.8	25	106	210	0.078	370	10.45
2	147475	C088CQ	CARB SILTSTONE	2.6	153	0.59	0.18	7.8	0.576	0.45	3	134	2	24	99	181	0.142	500	7.24
2	147280	C088CQ	CARB SILTSTONE	3	106	0.53	0.06	5.4	0.439	0.16	2.8	45	1.8	22.5	86	228	0.053	520	0.7
2	147476	C088CQ	TUFF	2.4	165	0.63	0.1	9.4	0.522	0.38	3.6	73	1.9	28.7	109	201	0.166	680	3.38
2	153323	C9099CQR	TUFF	1.7	46.9	0.47	<0.05	8.6	0.293	0.44	4.4	76	1.4	21.5	57	93.4	0.04	310	0.38
2	153324	C9099CQR	SANDSTONE	2	235	0.51	<0.05	5.6	0.543	0.59	2	60	1.3	7.8	112	87.5	0.08	280	0.22
2	147479	C088CQ	SANDSTONE	4.1	32	0.97	0.05	13.2	0.517	0.61	3.5	114	2.8	25.9	106	167	0.035	300	1.78
2	153301	C099CQ	SILTSTONE	2	148	0.57	0.06	9.2	0.326	0.44	2.3	76	1.6	36.5	70	99.6	0.011	460	3.98
2	153303	C099CQ	SILTSTONE	2.5	119.5	0.72	0.05	7.9	0.455	0.5	2.7	139	1.8	17.4	88	126.5	0.018	390	0.08
2	153305	C099CQ	SILTSTONE	1.5	49	0.45	<0.05	8	0.319	0.38	2.1	78	1.3	17.8	44	80.5	0.025	190	0.31
2	154259	C122CQ	SANDSTONE	4.1	77.7	1.04	0.08	18.1	0.403	0.76	4.7	89	2.4	32.3	107	152	0.039	440	3.67
2	154261	C122CQ	SILTSTONE	2.3	134	0.72	0.13	9.8	0.396	1.7	2.4	92	2.4	16.2	18	216	0.274	490	2.53

Batch #	Sample ID	Site No.	Analyte	Al	Ca	Fe	K	Mg	Mn	Na	P	S	Ag	As	B	Ba	Be	Bi	Cd	Ce	Co
			Units	%	%	%	%	%	ppm	%	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
			Comparative Abundance	7.2	6.6	4.1	2	1.4	770	0.57	670	0.22	0.057	7.7	100	460	2	0.4	0.17	83	14
2	154262	C122CQ	CLAYSTONE	9.44	0.17	0.32	0.34	0.04	17	0.05	290	0.03	0.11	3.2	<10	170	2.12	0.78	0.09	38	13.2
2	154265	C122CQ	CLAYSTONE	7.7	0.14	0.99	0.97	0.19	71	0.04	440	0.02	0.12	1.8	10	210	2.31	0.68	0.23	68.4	7.2
2	154270	C122CQ	SILTSTONE	7.53	0.59	2.92	1.54	0.33	78	0.12	110	0.01	0.06	0.8	10	280	3.52	0.46	0.08	105.5	3.8
2	153311	C099CQ	MUDSTONE	6.22	0.29	2.57	1.95	0.35	337	0.28	380	0.04	0.08	14.1	<10	380	2.17	0.34	0.31	46.2	8.8
2	153312	C099CQ	SILTSTONE	6.75	0.77	3.07	0.48	0.53	504	0.16	150	0.11	0.09	3.2	<10	260	2.53	0.31	0.12	52.6	9.7
2	153315	C099CQ	CARB MUDSTONE	5.56	0.85	1.31	0.31	0.12	200	0.05	240	0.2	0.07	6.6	<10	210	2.21	0.33	0.18	27.5	12.5
2	146736	C398CQ	CARB MUDSTONE	8.61	0.51	4.86	1.58	0.75	697	0.12	790	0.01	0.11	2.8	30	280	2.13	0.39	0.04	56.7	20.5
2	146738	C398CQ	SANDSTONE	6.1	5.03	2.23	1.42	0.33	1140	0.37	540	<0.01	0.04	3.8	20	280	1.08	0.19	0.06	46	10.1
2	146740	C398CQ	SANDSTONE	6.46	1.94	5.75	1.37	0.62	1540	0.08	790	<0.01	0.08	2.5	30	250	1.92	0.33	0.11	46.1	20.3
2	146743	C398CQ	SILTSTONE	9.37	0.17	0.93	0.93	0.21	49	0.07	440	0.03	0.12	3.8	20	230	2.2	0.5	0.15	60.4	7.8
2	146744	C398CQ	CARB SILTSTONE	8.73	0.17	0.48	0.28	0.09	25	0.06	190	0.06	0.08	5.9	10	130	12.95	1.06	0.11	102.5	4.4
2	146747	C398CQ	CARB MUDSTONE	6.92	0.45	1.22	1.81	0.28	286	0.19	1160	0.03	0.05	8.9	10	400	1.38	0.12	0.08	25.3	12.7
2	146749	C398CQ	SANDSTONE	7.7	0.51	2.69	2.98	0.45	524	0.17	700	0.05	0.08	16.7	20	480	1.96	0.36	0.12	48.5	9.2
2	177953	C398CQ	SANDSTONE	5.21	0.42	7.86	1.78	0.28	2080	0.07	1140	0.01	0.04	9.2	10	460	1.98	0.1	0.03	30.1	7
2	177957	C398CQ	SANDSTONE	5.07	0.35	1.42	1.69	0.2	320	0.13	280	0.04	0.03	8.1	10	460	1.14	0.09	0.03	31.5	11.3
2	152610	C180012CQ	SANDSTONE	9.34	0.64	3.61	0.59	0.83	805	0.48	400	0.06	0.11	3	10	280	1.26	0.38	0.02	72.9	20.9
2	152611	C180012CQ	TUFF	7.77	0.07	0.25	0.44	0.05	29	0.04	350	0.03	0.09	21.5	10	390	1.26	0.49	0.12	43.7	6.4
2	177959	C398CQ	CARB MUDSTONE	7.87	0.04	0.33	0.63	0.06	18	0.04	210	0.08	0.09	7.2	10	300	1.46	0.43	0.1	40.5	3.4
2	177961	C398CQ	SILTSTONE	6.93	0.05	0.37	1.2	0.1	38	0.08	110	0.01	0.02	5.7	10	340	2.03	0.16	0.03	33.6	3
2	177964	C398CQ	SANDSTONE	9.74	0.07	0.48	0.94	0.11	28	0.06	130	0.02	0.1	2.9	20	290	4.02	0.78	0.06	38.7	3
2	177967	C398CQ	CARB SILTSTONE	5.36	0.04	0.24	0.44	0.05	27	0.04	50	0.04	0.04	5	<10	110	1.6	0.23	0.02	25.8	5.7
2	177976	C398CQ	SANDSTONE	7.21	0.04	0.19	0.22	0.03	12	0.02	70	0.02	0.03	4.4	10	90	1.62	0.27	0.06	48.9	1.4
2	153334	C99204CQR	SANDSTONE	7.26	1.74	1.85	1.83	0.82	406	0.72	640	0.02	0.06	2.5	10	430	1.24	0.17	0.11	34.4	5.1
2	154429	C99204CQR	SANDSTONE	6.36	2.13	3.39	1.94	0.33	995	0.47	680	0.04	0.07	9	10	340	1.59	0.24	0.1	36.1	13.4
2	152623	C180012CQ	SANDSTONE	4.51	0.3	0.21	0.27	0.04	79	0.03	60	0.02	0.03	4.1	10	70	0.7	0.07	0.03	26	8.6
2	152619	C180012CQ	SANDSTONE	5.45	0.05	0.14	0.08	0.03	12	0.02	80	0.03	0.05	1.4	10	60	2.21	0.64	0.07	72.3	1.8
2	169951	C671CQ	CARB SANDSTONE	7.54	0.02	0.2	0.36	0.04	19	0.03	160	0.07	0.02	13.1	10	140	1.41	0.18	0.14	79.3	55.1
2	169954	C671CQ	SANDSTONE	7.12	0.12	0.57	1.03	0.19	18	0.12	100	0.05	0.08	2.7	20	240	3.23	0.39	0.13	27.6	4
2	169955	C671CQ	SILTSTONE	7.19	0.51	2.44	1.64	0.68	380	0.55	570	0.03	0.05	5.2	10	790	1.91	0.14	0.08	35.5	8.8
2	169959	C671CQ	SANDSTONE	5.91	1.03	3.22	2.14	0.96	428	0.41	710	0.03	0.07	4.2	20	300	1.96	0.26	0.11	31.9	5.7
2	169960	C671CQ	SILTSTONE	7.24	2.06	2.79	1.52	1.1	517	0.73	920	0.02	0.03	6.3	10	360	1.44	0.11	0.07	39.5	12
2	169963	C671CQ	SANDSTONE	6.2	7.76	3.21	1.39	0.71	1750	0.54	850	<0.01	0.05	3.2	10	290	1.47	0.11	0.05	40	12.1
2	169964	C671CQ	SANDSTONE	7.85	0.73	5.08	1.5	0.63	938	0.33	790	0.04	0.08	6.6	20	270	2.29	0.3	0.15	46.1	17.6
2	169967	C671CQ	SILTSTONE	3.52	0.43	1.69	0.19	0.12	392	0.06	130	0.21	0.05	2.5	10	230	2.74	0.36	0.16	29.8	4.7
2	169602	C606CQ	CARB MUDSTONE	9.07	0.08	0.42	0.84	0.17	18	0.12	130	0.06	0.07	2	20	290	1.69	0.44	0.12	55.2	7.1
2	169606	C606CQ	SILTSTONE	7.04	1.04	6.13	2.07	0.82	1030	0.34	890	0.05	0.08	5.8	20	350	1.54	0.25	0.1	36	16.4
2	169609	C606CQ	SILTSTONE	5.99	0.54	1	0.22	0.73	16	0.29	180	0.1	0.08	2.9	30	140	1.14	0.43	0.16	39	5.4
2	169610	C606CQ	CARB MUDSTONE	6.33	0.61	1.05	0.18	0.74	28	0.29	260	0.23	0.07	3.3	20	190	1.51	0.41	0.12	51.7	6.6
2	169613	C606CQ	CARB SILTSTONE	9.17	0.09	1.21	0.58	0.13	218	0.04	490	0.02	0.08	13.2	20	340	1.29	0.33	0.13	65.9	6.1
2	169614	C606CQ	SANDSTONE	9.13	0.07	0.68	1.11	0.15	75	0.06	150	0.02	0.05	3.4	20	280	2.05	0.61	0.03	70.6	2.9
2	169968	C671CQ	CARB SILTSTONE	9.21	0.12	0.72	1.03	0.18	55	0.05	180	0.03	0.1	9.4	10	280	1.35	0.53	0.19	81.5	4
2	169971	C671CQ	SILTSTONE	5.37	0.04	0.49	1.45	0.07	85	0.06	120	0.01	2.3	3.5	10	360	0.81	0.1	0.04	34.1	2.7
2	169973	C671CQ	SANDSTONE	11.55	0.12	0.31	0.33	0.05	32	0.04	110	0.07	0.04	1.6	10	100	3.71	0.8	0.11	93.4	2.2
2	169974	C671CQ	CARB MUDSTONE	6.97	0.08	0.33	0.56	0.05	30	0.04	90	0.03	0.02	2.3	10	140	2.7	0.3	0.11	101.5	0.9
2	169976	C671CQ	CONGLOMERATE	5.39	0.12	1.36	0.99	0.13	131	0.04	370	0.01	0.04	3.1	10	200	1.06	0.13	0.05	40.5	4.1
2	169621	C180004CQ	SANDSTONE	6	0.12	0.67	2.55	0.19	66	0.1	400	0.03	0.05	8.4	10	500	1.25	0.14	0.05	52.3	13.1
2	146702	C388CQ	SANDSTONE	8.48	0.49	4.02	1.42	0.68	321	0.24	840	0.02	0.35	2.2	20	270	2.06	0.38	0.06	44	17.6
2	146712	C388CQ	MUDSTONE	7.69	0.59	4.12	1.55	0.64	577	0.4	670	0.04	0.07	6.9	10	380	1.74	0.27	0.12	40	9.3
2	146716	C388CQ	SILTSTONE	7.01	1.02	1.48	1.73	0.41	135	0.25	320	0.03	0.06	2.2	10	430	1.36	0.35	0.1	71.5	7.3
2	146719	C388CQ	MUDSTONE	5.45	0.17	0.5	0.41	0.13	28	0.08	130	0.08	0.06	2	10	150	1.75	0.5	0.11	32.5	4
2	146720	C388CQ	CARB MUDSTONE	8.88	0.12	0.61	2.02	0.18	38	0.1	120	0.01	0.07	3.1	20	400	1.62	0.42	0.13	46.4	1.8
2	146725	C388CQ	MUDSTONE	5.54	2.86	1.38	2.37	0.28	710	0.1	420	0.02	0.05	4.4	10	520	0.96	0.15	0.05	43.3	12.3
2	146732	C388CQ	SANDSTONE	9.43	0.07	0.51	1.25	0.12	45	0.07	90	0.07	0.08	3.1	20	300	3.23	0.47	0.31	43.3	2.5
2	175910	C522CQ	SANDSTONE	10.45	0.13	0.99	1.32	0.22	75	0.06	180	0.07	0.12	3.9	30	360	3.4	0.78	0.32	137.5	8.6
2	169616	C606CQ	CARB SILTSTONE	9.86	0.08	0.15	0.08	0.03	19	0.04	150	0.04	0.17	2.5	10	80	2.37	0.64	0.28	47.2	3.9
2	169617	C606CQ	CARB SILTSTONE	7.77	0.09	0.22	0.21	0.03	17	0.04	170	0.02	0.08	2.2	20	90	3.8	0.58	0.11	67.9	1.2
2	169627	C180004CQ	CARB SILTSTONE	11.1	0.09	0.56	1.01	0.13	39	0.06	120	0.08	0.05	2.4	30	220	3.07	0.73	0.03	69.1	3.6
2	169628	C180004CQ	CARB SILTSTONE	6.54	0.07	0.37	0.71	0.09	41	0.04	150	0.03	0.04	5.7	20	180	1.08	0.29	0.11	51.5	5.4

Batch #	Sample ID	Site No.	Analyte	Cr	Cs	Cu	Ga	Ge	Hf	In	La	Li	Mo	Nb	Ni	Pb	Rb	Re	Sb	Sc	Se
			Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
			Comparative Abundance	**72**	**72**	**33**	**18**	**1.7**	**2.5**	**0.044**	**41**	**56**	**2**	**13**	**52**	**19**	**135**	**0.0004**	**1.2**	**10**	**0.42**
2	154262	C122CQ	CLAYSTONE	18	2.29	78.7	27.6	0.16	7.4	0.129	13.8	36.2	1.7	11.8	11.6	35.7	14.9	<0.002	0.76	16.4	2
2	154265	C122CQ	CLAYSTONE	52	8.49	56.8	25.1	0.25	5.4	0.103	29.2	38.2	0.37	14	14.2	29.3	64.4	<0.002	0.61	14.7	2
2	154270	C122CQ	SILTSTONE	21	16.25	15.7	17.2	0.2	4.9	0.064	50.8	17.6	0.21	10.9	8.1	25.2	128	<0.002	0.53	11.5	1
2	153311	C099CQ	MUDSTONE	93	6.05	40.1	17.15	0.24	3.9	0.071	20.7	25.8	0.87	8.8	24.7	21.5	90.9	0.002	0.81	14.4	1
2	153312	C099CQ	SILTSTONE	9	3.42	17.1	16.1	0.14	4.5	0.075	22.1	12	0.93	6.4	12.4	23.1	19.1	<0.002	0.63	10.7	1
2	153315	C099CQ	CARB MUDSTONE	8	1.63	58.7	15.1	0.11	3.2	0.074	10.9	18.8	1.89	4.1	4.3	13.1	12.9	0.004	1.1	14.3	1
2	146736	C398CQ	CARB MUDSTONE	55	8.26	40.1	21.6	0.41	4	0.069	24.9	36.5	0.32	10.1	42.1	20.8	84.5	<0.002	0.98	17.2	1
2	146738	C398CQ	SANDSTONE	67	3.46	21.9	13.35	0.16	2.4	0.043	21.9	14.7	0.25	6.6	22.7	13.8	64.3	0.002	0.6	13.6	1
2	146740	C398CQ	SANDSTONE	65	5.43	35.1	16.85	0.31	3.5	0.055	20.5	26.1	0.25	8.6	37.3	19.1	47.9	0.002	0.72	14.9	1
2	146743	C398CQ	SILTSTONE	50	6.41	54.7	26.2	0.18	5.5	0.081	27.6	51.1	0.59	12.5	20.2	31.3	61.7	<0.002	0.82	16.5	1
2	146744	C398CQ	CARB SILTSTONE	20	1.59	63.7	22	0.19	7.3	0.129	39.5	70.4	1.19	11.1	15.3	64.6	13.2	<0.002	0.98	15	3
2	146747	C398CQ	CARB MUDSTONE	38	2.27	35.4	22.2	0.19	3	0.055	10.4	21.6	1.11	5.8	19.6	12.7	58.1	<0.002	0.34	11.9	1
2	146749	C398CQ	SANDSTONE	47	6.65	50.5	19.5	0.21	3.7	0.062	22	16.5	1.11	8.1	23.6	20	128	0.002	0.56	13.8	1
2	177953	C398CQ	SANDSTONE	36	2.83	7.3	11.75	0.22	2	0.03	15.4	12.6	0.51	5.4	8.6	16.1	90.9	<0.002	0.35	10.3	1
2	177957	C398CQ	SANDSTONE	64	2.32	9.3	11.25	0.11	2	0.032	15.9	10.8	0.56	4.8	11.9	16.1	80.6	<0.002	0.47	6.4	<1
2	152610	C180012CQ	SANDSTONE	7	3.43	6.3	21.7	0.19	7.3	0.081	32.7	15.7	1.41	10	9.3	26.3	21.3	0.002	0.38	14.1	1
2	152611	C180012CQ	TUFF	50	3.54	54	21.4	0.11	4.7	0.082	19.5	18.3	1.03	11.8	21	25.5	28.9	<0.002	0.59	13.6	2
2	177959	C398CQ	CARB MUDSTONE	45	6.05	48	21.3	0.1	4.3	0.077	19.1	21.1	0.82	12.4	8.8	26.6	46.7	<0.002	0.56	12.4	1
2	177961	C398CQ	SILTSTONE	33	4.31	10.3	20.5	0.09	2.8	0.05	17.3	21.4	0.57	14.1	8.7	27.4	70.5	<0.002	0.37	6.9	<1
2	177964	C398CQ	SANDSTONE	29	11.6	39.4	26.7	0.07	3.7	0.104	20.1	29	0.28	15.4	17.2	37.1	77.2	0.002	1	12.2	1
2	177967	C398CQ	CARB SILTSTONE	34	3.09	11	12.9	0.08	2.1	0.038	14.2	16.6	0.74	6.3	8.3	20.9	34.6	0.003	0.44	5.1	<1
2	177976	C398CQ	SANDSTONE	31	2.96	4.7	17.3	0.09	3.9	0.045	24	17.6	0.89	8.4	3.1	22.7	18.1	<0.002	0.4	7	1
2	153334	C99204CQR	SANDSTONE	28	4.52	39.1	19.3	0.15	2.9	0.047	15.8	13.7	0.58	5.7	12	13.1	56.6	0.002	0.31	10.4	1
2	154429	C99204CQR	SANDSTONE	46	3.57	38.2	18.7	0.33	3.5	0.054	15.8	16.2	0.93	7.6	22.1	16	59.4	0.002	0.53	12.2	1
2	152623	C180012CQ	SANDSTONE	26	0.69	3.7	10	0.08	1.6	0.017	13	9.5	0.88	4.4	6.5	25.9	16.4	0.002	0.4	3.5	<1
2	152619	C180012CQ	SANDSTONE	22	1.91	11.5	18.2	0.11	3.2	0.069	31.8	11.5	1.85	20.4	4.9	22.9	11.3	<0.002	0.71	7.3	1
2	169951	C671CQ	CARB SANDSTONE	49	1.63	19.1	16.05	0.11	2.9	0.045	37.2	19	1.84	6.8	76.1	17.1	24	0.003	0.65	11.2	1
2	169954	C671CQ	SANDSTONE	25	6.6	55.3	20.3	0.13	3.4	0.067	13	31.8	0.4	7.7	21.7	21.5	59.4	<0.002	0.55	10.4	1
2	169955	C671CQ	SILTSTONE	48	3.87	30	18.75	0.18	3	0.052	16.6	14	0.86	6.5	16.2	13.4	63	0.002	0.43	14.8	1
2	169959	C671CQ	SANDSTONE	44	4.37	55	18.1	0.35	3.2	0.051	14.1	12.5	0.72	6.6	17.6	15.1	61.9	<0.002	0.48	11.5	1
2	169960	C671CQ	SILTSTONE	61	3.77	29.2	17.95	0.2	2.5	0.051	18.3	9.4	0.58	6	20.8	11	60.8	0.002	0.34	15.4	1
2	169963	C671CQ	SANDSTONE	31	2.54	28.1	15	0.21	2.1	0.041	19.4	6.6	0.58	4.7	16.8	10.2	47.5	0.002	0.27	11.9	1
2	169964	C671CQ	SANDSTONE	36	4.05	57.9	20.3	0.17	3.6	0.065	20.7	13.4	1.17	7.3	24.1	16.5	52.4	0.002	0.5	14.4	1
2	169967	C671CQ	SILTSTONE	10	1.44	36.7	8.06	0.09	1.8	0.055	12.5	14.7	1.25	2.7	2.7	6.6	10.7	0.005	0.47	9.3	1
2	169602	C606CQ	CARB MUDSTONE	41	6.61	52.7	22.8	0.09	4.1	0.074	27.1	23.1	0.59	9.8	15.9	20.3	61.2	0.002	0.56	14.5	1
2	169606	C606CQ	SILTSTONE	45	5.13	41.8	19.1	0.18	2.9	0.055	16.6	11.9	0.85	5.9	26.2	13.1	79	<0.002	0.48	13.1	1
2	169609	C606CQ	SILTSTONE	9	2.26	14.7	13.45	0.09	4.3	0.073	15.4	10.3	1.42	5.1	3.8	14.6	9.9	0.002	0.4	11.1	1
2	169610	C606CQ	CARB MUDSTONE	16	2.25	16.6	14.25	0.12	4.5	0.065	23.6	12	3.17	10.9	5.7	20.5	12.1	0.002	0.82	10.3	1
2	169613	C606CQ	CARB SILTSTONE	66	5.59	33.1	21.9	0.12	4.5	0.071	31.8	21.2	0.8	10.9	10.5	21.7	48.1	<0.002	0.63	15.3	1
2	169614	C606CQ	SANDSTONE	59	6.88	26.2	24.8	0.11	4.9	0.089	39.2	31.4	0.26	19.7	8.4	36.8	76.7	<0.002	0.44	11.2	1
2	169968	C671CQ	CARB SILTSTONE	46	7.78	39.6	21.5	0.15	4.8	0.086	39.3	24.5	0.6	11.8	10.9	24.5	74.3	0.002	0.56	18.1	2
2	169971	C671CQ	SILTSTONE	72	2.49	4.2	12.65	0.08	2.2	0.029	17.7	12.1	1.15	7.6	4.6	19.4	70.5	<0.002	0.33	4.6	<1
2	169973	C671CQ	SANDSTONE	62	3.5	16.4	28	0.11	7.3	0.126	39.7	41.5	0.92	19	5.2	42.2	21.7	0.002	0.85	17	3
2	169974	C671CQ	CARB MUDSTONE	38	5.8	10.6	16.2	0.12	4.2	0.058	47.1	17.2	0.49	10.7	3.1	21.8	38.3	<0.002	0.44	9.1	1
2	169976	C671CQ	CONGLOMERATE	32	2.5	7.4	11.5	0.08	2.8	0.029	20.6	14.8	0.18	5.7	3.7	12.4	51.4	<0.002	0.37	6.8	1
2	169621	C180004CQ	SANDSTONE	78	4.31	11.7	13.1	0.12	2.9	0.037	24.6	13.8	0.64	6.2	14.9	16.8	118	<0.002	0.7	9.8	1
2	146702	C388CQ	SANDSTONE	62	6.32	46	22.7	0.17	3.8	0.072	20.1	36.7	0.37	9.6	36.4	20.4	60.6	<0.002	0.92	17.3	1
2	146712	C388CQ	MUDSTONE	66	5.64	42.8	19.45	0.15	3.2	0.058	18.8	14.4	0.81	7	14.5	13.4	70.9	0.002	0.51	17.9	1
2	146716	C388CQ	SILTSTONE	41	8.78	28.4	18.8	0.15	3.6	0.064	34.5	23.4	1.03	8.6	9.3	18.8	102	<0.002	0.43	12.8	1
2	146719	C388CQ	MUDSTONE	10	2.35	50.5	17.65	0.09	3.3	0.091	12.6	28.1	1.49	5.5	3.1	23.6	16.3	0.004	0.58	10.4	1
2	146720	C388CQ	CARB MUDSTONE	49	8.32	32.1	21.5	0.1	4.4	0.081	23.7	23	0.29	11.1	5	22.7	118	<0.002	0.67	13.8	1
2	146725	C388CQ	MUDSTONE	81	3.65	12.1	11.75	0.12	2.7	0.033	20.4	10.7	0.75	5.4	12.7	13.2	107	0.002	0.73	9	1
2	146732	C388CQ	SANDSTONE	40	9.38	36.4	28	0.08	5	0.096	21.7	35.7	0.24	16.9	7.7	33.7	83.5	<0.002	0.49	11.5	1
2	175910	C522CQ	SANDSTONE	53	12.25	40.8	28.5	0.18	4.5	0.105	65.8	45.2	0.31	17.2	17.4	41.6	102.5	0.002	0.68	15.4	2
2	169616	C606CQ	CARB SILTSTONE	10	1.16	160	24.9	0.08	6.5	0.15	18.5	34.3	0.99	10.5	5.4	21.3	6	0.002	0.27	17.3	1
2	169617	C606CQ	CARB SILTSTONE	30	3.97	14.9	21.8	0.09	6.4	0.106	28.5	25	0.72	22	3.1	38.6	17	0.002	0.53	10.1	2
2	169627	C180004CQ	CARB SILTSTONE	44	9.06	39	30.1	0.11	5.1	0.101	34.9	33.1	0.21	17.8	12.6	23.9	80.5	<0.002	0.6	17.9	1
2	169628	C180004CQ	CARB SILTSTONE	31	3.44	18.1	15.75	0.07	3.1	0.045	25.9	19.3	0.61	9	12	21.1	45.6	<0.002	0.64	8.3	1

Batch #	Sample ID	Site No.	Analyte	Sn	Sr	Ta	Te	Th	Ti	Tl	U	V	W	Y	Zn	Zr	Hg	F	C
			Units	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	%
			Comparative Abundance	**4.6**	**320**	**1.5**	**0.005**	**9.6**	**0.38**	**0.95**	**3.1**	**105**	**1.7**	**40**	**95**	**150**	**0.19**	**640**	**2.94**
2	154262	C122CQ	CLAYSTONE	4.5	33.2	0.92	0.38	11.2	0.808	0.47	4.3	168	3.5	19.5	88	254	0.302	220	1.72
2	154265	C122CQ	CLAYSTONE	4.9	29.4	1.09	0.09	12.1	0.573	0.44	4.6	124	3.3	27	117	181.5	0.15	350	4.97
2	154270	C122CQ	SILTSTONE	3.3	93.1	0.92	0.06	17	0.303	0.58	4	52	2	34.3	67	155.5	0.037	470	0.54
2	153311	C099CQ	MUDSTONE	2.9	83.6	0.68	<0.05	8	0.371	0.63	2.8	140	1.9	25	84	137	0.02	380	5.78
2	153312	C099CQ	SILTSTONE	2.2	287	0.51	0.06	8.6	0.287	0.25	2.7	36	1.2	26.1	64	167	0.08	460	14.75
2	153315	C099CQ	CARB MUDSTONE	1.6	57.3	0.3	0.16	4.2	0.374	0.81	1.2	141	0.8	15.4	72	119.5	0.17	310	20.3
2	146736	C398CQ	CARB MUDSTONE	2.7	62.9	0.77	0.07	10.9	0.471	0.52	3.1	115	2	25.6	104	137.5	0.013	380	0.44
2	146738	C398CQ	SANDSTONE	1.7	79.5	0.47	<0.05	7.3	0.387	0.38	1.7	101	1.1	20.7	46	81.2	0.008	230	2.22
2	146740	C398CQ	SANDSTONE	2.2	75.3	0.65	0.05	8	0.412	0.46	1.9	108	1.6	24.6	94	117.5	0.011	410	2.01
2	146743	C398CQ	SILTSTONE	3.4	64.8	0.95	0.1	12.4	0.577	0.51	3.9	118	2.7	24.4	113	185.5	0.262	380	0.46
2	146744	C398CQ	CARB SILTSTONE	5.1	47.3	1.02	0.17	29.1	0.409	0.2	9.7	105	4	30.7	36	258	0.125	210	14.7
2	146747	C398CQ	CARB MUDSTONE	1.7	109	0.4	<0.05	3.7	0.523	0.52	1.5	159	0.9	9.9	106	95.9	0.064	540	0.49
2	146749	C398CQ	SANDSTONE	2.5	138	0.61	0.09	8.5	0.43	0.61	2.4	112	1.8	20.8	86	127	0.041	410	1.77
2	177953	C398CQ	SANDSTONE	1.7	85.6	0.44	<0.05	6.4	0.151	0.48	1.4	51	1.1	18.2	49	66.8	0.009	390	2.59
2	177957	C398CQ	SANDSTONE	1.5	71.7	0.38	<0.05	6.6	0.19	0.54	1.4	54	0.9	12.1	57	65	0.025	190	0.68
2	152610	C180012CQ	SANDSTONE	2.9	115	0.81	<0.05	10.5	0.336	0.61	2.9	30	1.6	29.1	24	188.5	0.14	640	0.63
2	152611	C180012CQ	TUFF	3.9	81.3	0.95	0.07	10.1	0.588	0.33	3.3	95	2.9	21.9	72	134.5	0.125	210	2.8
2	177959	C398CQ	CARB MUDSTONE	3.9	55	0.99	0.08	10	0.566	0.61	3.1	92	2.9	16.5	36	132	0.158	240	3.05
2	177961	C398CQ	SILTSTONE	3.5	46.2	1.16	<0.05	9.1	0.307	0.44	2.6	45	2.3	9	84	82.1	0.05	250	0.38
2	177964	C398CQ	SANDSTONE	4.8	39.9	1.29	0.08	17.3	0.409	0.68	4.9	72	3.2	13.4	29	120.5	0.07	350	9.43
2	177967	C398CQ	CARB SILTSTONE	1.8	22	0.66	<0.05	8.8	0.151	0.33	1.9	25	1.4	9.3	19	63.9	0.031	120	2
2	177976	C398CQ	SANDSTONE	2.5	20.3	0.63	<0.05	8.3	0.227	0.18	2.4	30	2	18.3	34	116	0.031	120	1.4
2	153334	C99204CQR	SANDSTONE	1.6	437	0.42	0.05	5.2	0.375	0.39	1.5	89	0.9	13	110	95	0.016	390	0.72
2	154429	C99204CQR	SANDSTONE	2.1	170	0.56	0.06	6	0.427	0.46	1.9	112	1.4	16.1	82	121	0.042	340	2.59
2	152623	C180012CQ	SANDSTONE	1.2	18	0.39	<0.05	4.8	0.102	0.16	2	25	1.5	7.2	23	48.9	0.018	250	0.14
2	152619	C180012CQ	SANDSTONE	5.6	16.9	1.66	0.1	15.6	0.583	0.13	3.1	48	4.6	18.3	15	121	0.028	150	21.3
2	169951	C671CQ	CARB SANDSTONE	1.8	33.6	0.52	0.05	8.9	0.366	0.37	2.1	105	1.5	17.9	571	94.6	0.051	130	0.1
2	169954	C671CQ	SANDSTONE	2.5	99.8	0.62	0.07	7.1	0.405	0.49	2.2	77	1.6	12.1	144	103.5	0.15	230	1.75
2	169955	C671CQ	SILTSTONE	1.8	246	0.46	<0.05	5.8	0.469	0.46	1.7	163	1.1	15.3	92	98.5	0.017	410	0.64
2	169959	C671CQ	SANDSTONE	1.9	332	0.48	0.06	5	0.412	0.44	1.8	126	1.2	13.2	79	113	0.027	410	1.28
2	169960	C671CQ	SILTSTONE	1.7	443	0.38	<0.05	5.4	0.516	0.35	1.3	148	1.1	16.6	90	87.2	0.007	410	0.59
2	169963	C671CQ	SANDSTONE	1.2	338	0.31	<0.05	4.5	0.383	0.32	1.1	110	0.7	20.1	58	73.4	0.011	340	3.35
2	169964	C671CQ	SANDSTONE	2.1	268	0.55	0.08	7.1	0.44	0.4	2.3	136	1.4	21.7	90	137	0.04	380	2.17
2	169967	C671CQ	SILTSTONE	0.9	43.8	0.17	0.2	3.1	0.223	0.45	0.8	104	0.5	16.7	47	88.5	0.104	210	22.3
2	169602	C606CQ	CARB MUDSTONE	2.9	98.8	0.79	0.07	11.6	0.482	0.41	2.9	88	2.4	15.5	60	140	0.063	220	0.69
2	169606	C606CQ	SILTSTONE	1.7	266	0.45	0.05	6.1	0.357	0.64	1.9	111	1.1	17.2	73	106.5	0.029	360	2.35
2	169609	C606CQ	SILTSTONE	1.9	288	0.45	0.13	6	0.261	0.32	1.7	36	0.8	23	58	164.5	0.045	310	13
2	169610	C606CQ	CARB MUDSTONE	1.9	279	0.63	0.08	11.9	0.211	0.53	3	36	0.8	25.4	58	236	0.047	260	8.58
2	169613	C606CQ	CARB SILTSTONE	3.4	129	0.9	<0.05	13.1	0.499	0.29	3.3	109	2.7	28	89	156	0.05	220	1.29
2	169614	C606CQ	SANDSTONE	4.7	42.9	1.57	<0.05	24.3	0.425	0.47	5.4	59	3.3	19.9	18	164	0.098	320	1.82
2	169968	C671CQ	CARB SILTSTONE	3.8	38.5	0.98	0.06	15.5	0.502	0.42	3.6	103	3.1	30.3	102	166	0.091	250	1.93
2	169971	C671CQ	SILTSTONE	1.9	36.2	0.64	<0.05	8.1	0.161	0.44	1.7	21	1.6	10.4	30	71.1	0.02	170	0.09
2	169973	C671CQ	SANDSTONE	4.9	24.9	1.5	0.12	21.6	0.517	0.19	5.4	88	3.2	30.6	27	290	0.081	130	8.55
2	169974	C671CQ	CARB MUDSTONE	2.7	24.3	0.9	0.06	15.2	0.342	0.25	3	51	2	24	19	151.5	0.024	140	4.21
2	169976	C671CQ	CONGLOMERATE	1.5	22.7	0.45	<0.05	7.8	0.223	0.3	1.7	39	1	13.8	35	99.3	0.026	210	0.1
2	169621	C180004CQ	SANDSTONE	2	42.2	0.53	<0.05	9.4	0.281	0.67	2.1	70	1.6	20.6	58	101	0.032	250	0.33
2	146702	C388CQ	SANDSTONE	2.5	81.1	0.74	0.09	8.6	0.495	0.52	2.4	127	1.7	20.1	90	138.5	0.065	430	0.52
2	146712	C388CQ	MUDSTONE	2	314	0.55	0.06	7.7	0.419	0.43	2.2	145	1.4	17.6	76	118	0.041	380	2.02
2	146716	C388CQ	SILTSTONE	2.9	133	0.7	0.05	11	0.347	0.52	2.8	76	1.8	28.9	70	134	0.033	340	1.88
2	146719	C388CQ	MUDSTONE	2.3	61.3	0.44	0.22	7.1	0.549	0.43	2.5	123	1.9	11.9	98	126	0.076	270	30.2
2	146720	C388CQ	CARB MUDSTONE	3.8	58.7	0.9	0.05	13	0.464	0.61	3.3	80	2.7	19.3	66	154	0.123	300	0.59
2	146725	C388CQ	MUDSTONE	1.7	83.6	0.47	<0.05	8.3	0.248	0.62	1.8	60	1.2	20	45	97.1	0.023	280	1.85
2	146732	C388CQ	SANDSTONE	4.4	36.9	1.34	0.06	18.2	0.483	0.51	5	60	3.7	15.4	92	163.5	0.05	310	2.03
2	175910	C522CQ	SANDSTONE	4.9	40.2	1.44	0.08	26.5	0.399	0.68	6.8	71	3.1	36.5	131	155.5	0.113	330	8.18
2	169616	C606CQ	CARB SILTSTONE	3.4	17.2	0.65	0.27	6.2	0.786	0.29	3.3	159	2.5	26.8	117	245	0.318	220	14.75
2	169617	C606CQ	CARB SILTSTONE	5	18.8	1.68	0.11	15.4	0.437	0.21	5	41	3.4	25.1	20	220	0.111	150	10.4
2	169627	C180004CQ	CARB SILTSTONE	5.3	37.3	1.43	0.06	20.3	0.468	0.61	4.6	91	3.4	32	19	171	0.092	440	1.6
2	169628	C180004CQ	CARB SILTSTONE	2.4	32.1	0.75	<0.05	10.7	0.276	0.38	2.4	49	1.8	16.7	88	110	0.12	280	0.75

Batch #	Sample ID	Site No.	Analyte	Al	Ca	Fe	K	Mg	Mn	Na	P	S	Ag	As	B	Ba	Be	Bi	Cd	Ce	Co
			Units	%	%	%	%	%	ppm	%	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
			Comparative Abundance	7.2	6.6	4.1	2	1.4	770	0.57	670	0.22	0.057	7.7	100	460	2	0.4	0.17	83	14
2	169629	C180004CQ	SANDSTONE	9.38	0.07	0.37	0.91	0.1	44	0.05	110	0.03	0.05	9	20	240	1.81	0.27	0.89	61	2.3
2	169630	C180004CQ	CARB SILTSTONE	3.72	0.02	0.14	0.22	0.02	36	0.02	30	0.03	0.02	4	10	60	0.35	0.06	0.04	19.25	5.9
2	182753	C180007CQ	SANDSTONE	8.4	0.3	1.64	1.91	0.37	310	0.19	820	0.05	0.08	11.7	20	380	2.03	0.42	0.17	61.5	7.7
2	182756	C180007CQ	SILTSTONE	8.39	0.67	2.57	1.46	0.86	394	0.31	610	0.15	0.09	8.3	20	330	2.04	0.53	0.14	57.8	45.5
2	182763	C180007CQ	CARB MUDSTONE	7.59	0.07	1.2	2.74	0.21	169	0.1	120	0.04	0.04	7.5	20	520	1.2	0.14	0.09	34.4	20.9
2	182766	C180007CQ	SANDSTONE	5.88	2.11	1.11	2.28	0.2	314	0.09	400	0.02	0.03	4.8	20	460	0.93	0.14	0.05	43.6	10.9
2	182771	C180007CQ	SANDSTONE	8.29	0.25	2.69	2.04	0.37	538	0.13	370	0.02	0.07	3.6	20	420	2.28	0.42	0.14	56.9	8.3
2	177654	C669CQ	SANDSTONE	9.72	0.21	2.02	1.54	0.36	237	0.16	560	0.13	0.06	22	20	350	1.6	0.26	0.11	64.7	21.8
2	177659	C669CQ	SILTSTONE	6.76	0.72	5.87	1.4	1.06	655	0.58	540	0.03	0.07	3.4	10	340	1.91	0.28	0.12	45.7	14.1
2	177661	C669CQ	MUDSTONE	7.06	1.84	3.39	1.68	0.96	610	1.08	1080	0.01	0.04	3.3	10	430	1.4	0.12	0.07	32.9	13.2
2	177665	C669CQ	SANDSTONE	7.27	1.75	0.97	0.96	0.49	105	0.4	670	0.02	0.06	6.8	10	240	1.66	0.26	0.11	38.3	19.8
2	177669	C669CQ	SILTSTONE	7.17	0.65	2	0.38	0.41	256	0.11	240	0.04	0.08	1.6	10	290	1.39	0.39	0.12	49.1	2
2	177673	C669CQ	TUFF	6.18	0.58	0.63	1.55	0.12	121	0.1	200	0.01	0.04	5.3	10	370	0.98	0.13	0.05	44	4.1
2	177676	C669CQ	SANDSTONE	6.05	0.06	0.47	0.28	0.04	23	0.02	70	0.03	0.03	3.3	10	80	0.94	0.29	0.05	26.8	1.9
2	177677	C669CQ	SANDSTONE	4.84	0.05	1.15	0.37	0.05	89	0.02	70	0.02	0.03	3	10	90	0.88	0.15	0.04	32.7	1.9
2	148058	C135CQ	SANDSTONE	4.57	0.08	0.18	0.07	0.02	16	0.02	90	0.06	0.07	2.1	10	70	3.12	0.96	0.1	73.5	1
2	GT152502	C541CQ	CARB MUDSTONE	6.98	1.95	6.54	2.2	0.62	2100	0.26	840	0.05	0.08	9.6	20	370	2.2	0.39	0.12	47.2	13.7
2	GT152509	C541CQ	SILTSTONE	9.43	0.17	0.82	1.7	0.25	67	0.08	490	0.03	0.1	21.1	20	360	1.93	0.56	0.19	71.1	8.5
2	170252	C544CQ	SILTSTONE	7.52	0.45	1.76	1.45	0.38	282	0.21	170	0.11	0.11	3.2	10	430	1.87	0.54	0.17	25.4	4.7
2	170282	C607CQ	CARB SILTSTONE	8.94	0.04	0.8	0.41	0.08	14	0.06	190	0.01	0.07	9.4	20	160	2.18	0.36	<0.02	87.2	1.5
2	170289	C607CQ	CLAYSTONE	6.43	9.79	1.41	2.25	0.29	488	0.39	790	0.01	0.05	33.7	10	330	1.11	0.17	0.07	44.3	13.1
2	170296	C607CQ	SANDSTONE	8.67	0.06	0.25	0.21	0.04	22	0.02	120	0.01	<0.01	0.9	10	80	0.83	0.13	<0.02	16.25	1.7
2	170297	C607CQ	SILTSTONE	7.51	0.17	3.51	0.99	0.18	1300	0.06	150	0.02	0.06	2.7	20	180	1.85	0.3	0.04	71	6
2	154046	C675CQ	SILTSTONE	7.35	0.09	0.52	1.03	0.12	53	0.07	150	0.02	0.1	7.4	10	260	1.42	0.49	0.19	41.2	4.9
2	GT148358	C9380CQR	SILTSTONE	7.29	0.4	2.75	2.77	0.42	881	0.26	690	0.1	0.09	36.4	20	450	1.89	0.51	0.12	37	15.9
2	GT148378	C9380CQR	SILTSTONE	8.3	0.1	0.19	0.19	0.04	19	0.05	110	0.04	0.1	1.6	<10	70	3.31	0.71	0.12	54.7	1.1
2	153309	C099CQ	CARB MUDSTONE	7.03	3.02	1.67	1.63	0.79	611	0.89	970	0.02	0.03	8.3	10	420	1.29	0.1	0.06	46.3	11
2	154251	C122CQ	SANDSTONE	7.27	0.02	0.38	0.44	0.05	13	0.03	100	0.01	0.02	1	20	270	0.86	0.52	<0.02	29.9	1.1
2	154256	C122CQ	SANDSTONE	7.18	1.23	2.28	2.19	0.9	489	0.61	710	0.02	0.03	7.6	10	410	1.2	0.11	0.06	41.6	11.8
2	146717	C388CQ	SANDSTONE	8.58	3.01	1.71	2.11	0.54	196	0.32	4090	0.1	0.13	8.3	10	470	1.02	0.21	0.14	43.9	20
2	146718	C388CQ	MUDSTONE	5.76	0.28	0.72	0.43	0.19	14	0.1	130	0.12	0.08	1.8	10	260	4.33	0.61	0.12	69.6	3.6
2	146730	C388CQ	CARB MUDSTONE	3.45	0.05	1.73	0.87	0.04	248	0.04	120	0.14	0.04	10.4	<10	240	0.61	0.06	0.03	18.2	12.2
2	177952	C398CQ	SANDSTONE	8.68	0.13	2.19	2.64	0.29	316	0.1	320	0.02	0.08	17.6	10	490	1.95	0.44	0.13	72.2	6.7
2	177968	C398CQ	SANDSTONE	9.87	0.06	0.37	0.93	0.1	39	0.06	100	0.02	0.06	6.5	20	250	2.91	0.39	0.2	78.1	3.8
2	GT169961	C671CQ	SILTSTONE	6.99	3.94	4.23	1.42	1.13	1300	0.69	1180	0.02	0.04	3.5	10	330	1.59	0.1	0.06	44	15.2
2	GT169962	C671CQ	SANDSTONE	4.57	11.9	8.67	0.92	0.69	2720	0.51	810	<0.01	0.03	<5	10	270	1.54	0.06	0.03	26.4	17.4
2	GT169966	C671CQ	SANDSTONE	4.48	0.81	2.01	0.42	0.1	545	0.05	160	0.24	0.05	8.5	20	190	1.56	0.29	0.1	17.85	29.2
2	147454	C088CQ	CARB SILTSTONE	6.55	0.82	4.18	1.45	0.43	1020	0.47	560	0.02	0.05	9.4	10	290	1.2	0.15	0.03	47.8	13.3
2	147462	C088CQ	SANDSTONE	7.34	2.15	3.54	1.91	1.05	602	0.75	840	0.03	0.04	3.8	10	530	1.39	0.21	0.07	44.7	13
2	147478	C088CQ	SANDSTONE	7.72	1.48	0.28	0.16	0.05	71	0.04	5700	0.06	0.11	10.6	10	180	2.65	0.5	0.15	57	32.4
2	182759	C180007CQ	TUFF	6.42	7.53	1.54	2.45	0.31	591	0.44	1260	0.01	0.05	15.9	10	390	1.07	0.13	0.06	39.4	10.3
2	169719	C9419CQR	SANDSTONE	6.98	0.78	3.24	1.48	0.68	963	0.2	400	0.06	0.06	4.6	10	440	1.41	0.25	0.14	64.4	10.9
2	GT147148	C9532CQR	SILTSTONE	8.46	0.26	0.75	0.9	0.2	104	0.1	340	0.04	0.11	2.7	20	370	2.39	0.64	0.26	68.4	10.6
2	GT147593	C541CQ	SILTSTONE	6.65	3.84	3.38	1.17	0.41	879	0.08	840	0.01	0.07	1.9	20	330	1.4	0.28	0.2	46.7	10.7
2	GT152501	C541CQ	SILTSTONE	7.89	0.3	1.88	2.78	0.31	521	0.31	660	0.06	0.09	9.7	20	460	1.85	0.46	0.15	45.9	24.2
2	GT152507	C541CQ	SILTSTONE	5.01	10.5	3.27	1.83	0.53	440	0.09	800	<0.01	0.05	7	<10	370	1.24	0.1	0.03	40.7	12.3
2	GT152513	C541CQ	SANDSTONE	10.2	0.09	0.84	1.6	0.17	66	0.07	140	0.02	0.11	3.2	30	350	4.27	0.81	0.23	73	14.3
2	GT152514	C541CQ	SILTSTONE	7.7	0.06	0.86	1.83	0.14	91	0.07	150	0.16	0.05	6.5	10	460	1.94	0.22	0.06	62.4	4.4
2	GT152517	C541CQ	SANDSTONE	9.2	0.07	0.62	1.59	0.13	61	0.08	130	0.01	0.07	9.7	20	400	2.29	0.42	0.19	90.5	3.4
2	170292	C607CQ	SILTSTONE	6.06	3.71	1.43	1.63	0.44	240	0.36	380	0.01	0.04	4.1	10	370	0.99	0.21	0.06	50.5	5
2	177688	C670CQ	SILTSTONE	4.98	16.2	4.35	0.99	1.16	1900	0.58	850	<0.01	0.04	<5	<10	350	1.48	0.08	0.04	31.7	12.3
2	177699	C670CQ	SANDSTONE	7.77	0.14	0.66	1.2	0.14	69	0.07	180	0.04	0.1	3.4	30	320	2.88	0.55	0.25	94.5	5.3
2	154040	C675CQ	SILTSTONE	7.35	0.98	1.42	1.8	0.76	166	0.49	990	0.04	0.06	5.7	20	360	1.24	0.15	0.1	23.9	17.3
2	CQ146995	C684LD	SILTSTONE	4.9	0.2	0.96	0.12	0.18	95	0.14	70	0.1	0.12	42	10	140	1.35	0.58	0.13	33.6	1.1
2	CQ146996	C684LD	COAL	1.13	0.17	0.25	0.02	0.03	47	0.06	30	0.13	0.02	0.6	20	70	0.99	0.2	0.04	10.55	0.9
2	CQ146997	C684LD	COAL	1.24	0.35	0.26	0.04	0.03	55	0.06	20	0.17	0.02	0.7	20	80	0.53	0.25	0.03	11.05	0.9
2	CQ146999	C684LD	COAL	2.48	0.24	0.21	0.06	0.05	24	0.08	50	0.15	0.05	0.9	10	110	1.12	0.47	0.08	19.35	1.7
2	CQ172801	C684LD	COAL	0.83	0.19	0.22	0.02	0.03	43	0.06	30	0.12	0.02	0.7	20	60	0.95	0.16	0.02	13	3

Batch #	Sample ID	Site No.	Analyte	Cr	Cs	Cu	Ga	Ge	Hf	In	La	Li	Mo	Nb	Ni	Pb	Rb	Re	Sb	Sc	Se
			Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
			Comparative Abundance	**72**	**72**	**33**	**18**	**1.7**	**2.5**	**0.044**	**41**	**56**	**2**	**13**	**52**	**19**	**135**	**0.0004**	**1.2**	**10**	**0.42**
2	169629	C180004CQ	SANDSTONE	36	5.74	22.1	24.9	0.09	4	0.078	30.4	24.2	0.52	15.6	9.1	31.9	64.1	<0.002	0.54	12.8	1
2	169630	C180004CQ	CARB SILTSTONE	35	0.87	3.5	7.51	<0.05	1.4	0.015	9.6	11.5	2.3	3.5	4.3	15.1	16.4	<0.002	0.35	2.1	<1
2	182753	C180007CQ	SANDSTONE	61	6.85	59.5	23.3	0.16	4.3	0.081	28.6	21.8	0.81	10.4	22.2	21.4	92.7	0.002	0.57	17.9	1
2	182756	C180007CQ	SILTSTONE	30	8.13	54.9	20.3	0.15	4.2	0.065	29.1	14.8	2.3	7.7	62.8	22.7	76.1	0.002	0.79	14.5	1
2	182763	C180007CQ	CARB MUDSTONE	38	3.96	16.8	17.5	0.1	3.2	0.044	18	16.4	1.7	7.5	26.5	15.4	122	<0.002	0.66	9.7	1
2	182766	C180007CQ	SANDSTONE	36	3.88	12.7	12.6	0.12	2.7	0.035	20.3	12.7	0.57	6.3	12	15.4	98.9	<0.002	0.66	10.4	1
2	182771	C180007CQ	SANDSTONE	62	9.27	40.3	22.7	0.16	4.1	0.074	26.2	24.2	0.59	10.3	16.4	22.9	116.5	0.002	0.69	16.8	1
2	177654	C669CQ	SANDSTONE	64	4.74	28.7	22.4	0.15	4	0.07	30.4	31.1	2.62	10.4	32.4	19.4	76.2	0.002	0.83	18.2	1
2	177659	C669CQ	SILTSTONE	43	5.9	49.3	16.9	0.21	3.1	0.057	21.3	13.7	0.85	6.5	21.8	14.9	66.8	0.002	0.56	13.2	1
2	177661	C669CQ	MUDSTONE	61	3.92	29.5	17.85	0.18	2.4	0.051	14.7	10.7	0.75	5.5	18.4	12.4	55.8	<0.002	0.37	13.3	1
2	177665	C669CQ	SANDSTONE	12	2.28	57.2	22.5	0.14	4.3	0.074	16	14.3	2.46	7.5	22.2	19.3	20.8	<0.002	0.49	9.8	1
2	177669	C669CQ	SILTSTONE	12	2.73	16.7	19	0.16	5.7	0.076	21.1	16	0.86	8.6	0.8	20	14.8	0.002	0.35	14	1
2	177673	C669CQ	TUFF	58	2.85	10.4	14.6	0.1	2.5	0.036	21.6	11.9	0.69	8.5	6.2	18.3	76.5	<0.002	0.4	7.2	1
2	177676	C669CQ	SANDSTONE	46	2.84	6.4	12.9	0.06	3.1	0.035	14.3	13.8	0.78	8.8	2.7	15.5	20.8	<0.002	0.54	5.4	1
2	177677	C669CQ	SANDSTONE	41	3.09	5.5	11.3	0.07	2.6	0.03	18.3	12.1	0.63	7.3	2.9	14.8	27	<0.002	0.44	5.1	1
2	148058	C135CQ	SANDSTONE	18	1.27	33.4	13.6	0.09	3.7	0.12	33.4	12.9	1.35	14.1	4.7	26.5	5.1	<0.002	0.45	9.7	1
2	GT152502	C541CQ	CARB MUDSTONE	34	7.28	42.4	18.8	0.23	3.1	0.058	21.4	16.5	0.66	7.4	27.6	17.3	90.2	0.002	0.47	15	1
2	GT152509	C541CQ	SILTSTONE	48	9.5	46.9	25.1	0.15	5.2	0.094	32.1	29.9	1.15	12.4	22	27.3	102	0.002	1.03	18.7	2
2	170252	C544CQ	SILTSTONE	6	5.6	136.5	21.6	0.08	3.7	0.113	9.7	20	0.81	5.8	2	15.1	42.9	0.002	0.17	12.8	2
2	170282	C607CQ	CARB SILTSTONE	23	2.48	36.4	24.9	0.17	4.7	0.095	24.8	17.2	2.41	9.3	5	36	24.1	0.002	0.71	8.9	2
2	170289	C607CQ	CLAYSTONE	44	3.6	26.7	16.2	0.14	2.7	0.05	21.2	11.8	1.17	6.6	31.5	12.3	77.2	0.002	0.42	12.5	1
2	170296	C607CQ	SANDSTONE	29	3.75	4.4	16.65	0.06	3.4	0.053	11.5	16.4	0.22	8.4	1.7	7.8	18.6	<0.002	0.56	15.4	1
2	170297	C607CQ	SILTSTONE	20	10.2	21.2	19.35	0.2	4.3	0.068	31.1	19.8	0.19	8.6	3.8	16.6	72.4	<0.002	0.68	13.6	1
2	154046	C675CQ	SILTSTONE	52	6.61	61.8	22.1	0.17	4.9	0.092	17.5	25.4	0.55	12.4	7.8	22.5	61.1	0.002	0.67	12.9	1
2	GT148358	C9380CQR	SILTSTONE	32	9.18	48.9	20.9	0.15	3.8	0.067	16.7	19	0.57	8	32.7	20.7	111.5	0.002	0.66	14.5	1
2	GT148378	C9380CQR	SILTSTONE	17	2.88	20.8	24.6	0.08	5.2	0.127	21.8	41.7	0.74	16.2	3.8	42.4	12.9	<0.002	0.44	11.3	1
2	153309	C099CQ	CARB MUDSTONE	70	3.56	20.8	18.75	0.14	2.8	0.053	21.6	9.8	1.33	6.7	15.5	11.8	61.3	<0.002	0.4	16	1
2	154251	C122CQ	SANDSTONE	70	2.05	5.9	23.2	0.05	4.9	0.07	17.4	17.2	0.33	12.5	7.7	28.2	22.4	<0.002	1.14	8.8	1
2	154256	C122CQ	SANDSTONE	63	3.1	17.8	16.85	0.14	2.7	0.045	19.5	9.8	0.36	6	18.8	12	92.5	0.002	0.4	14.6	1
2	146717	C388CQ	SANDSTONE	6	3.69	260	24.1	0.16	3.8	0.084	18.4	13.8	5.78	5.6	6.7	20.6	50.1	0.003	0.23	13.2	2
2	146718	C388CQ	MUDSTONE	8	1.8	121.5	15.1	0.11	3	0.104	28.7	24.5	1.05	5.7	1.7	18.8	17.5	0.002	0.3	12.8	1
2	146730	C388CQ	CARB MUDSTONE	52	1.25	7.4	7.5	0.08	1.2	0.014	9.5	7.6	1.01	3	8.6	13.8	40.8	0.002	0.37	3	<1
2	177952	C398CQ	SANDSTONE	65	8.78	31.1	21.9	0.17	4.5	0.079	34.2	24.4	1.29	11	14.8	24.3	138.5	<0.002	0.56	15.9	1
2	177968	C398CQ	SANDSTONE	58	7.1	30.2	26.5	0.12	4.3	0.086	37.8	27.7	0.69	16	8.2	31.9	69.7	0.002	0.54	14.6	1
2	GT169961	C671CQ	SILTSTONE	52	3.47	33	17.4	0.18	2.5	0.046	21.6	7.1	0.81	5.3	19.8	10.6	53.8	0.002	0.29	14.1	1
2	GT169962	C671CQ	SANDSTONE	28	2.59	15.4	10.3	0.19	1.4	0.024	13.1	5	0.31	2.9	16	5.7	40.6	<0.002	0.16	8.1	1
2	GT169966	C671CQ	SANDSTONE	24	0.79	36.1	13.1	0.25	2	0.064	6.6	18.5	2.1	3.5	8.3	16.5	12.5	0.002	0.49	7.2	2
2	147454	C088CQ	CARB SILTSTONE	40	3.37	13.3	15.05	0.18	2.5	0.034	24	15.3	0.57	5.4	19.3	13.8	67.3	<0.002	0.62	10.9	1
2	147462	C088CQ	SANDSTONE	53	3.42	26.4	18.35	0.19	2.6	0.046	22.1	14.9	0.47	6	18.5	12	82.2	<0.002	0.37	14.8	1
2	147478	C088CQ	SANDSTONE	9	0.79	84.2	24.7	0.2	4	0.105	28	31.2	3.57	3.8	10.5	29.1	6.4	0.003	0.32	12.5	2
2	182759	C180007CQ	TUFF	51	3.26	26.4	17.35	0.15	2.9	0.053	18.4	10.4	1.33	7.1	16.6	11.3	80	0.002	0.42	12.9	1
2	169719	C9419CQR	SANDSTONE	35	5.74	31	17.25	0.18	4.1	0.061	30.6	11	1.64	7.6	16.2	18.7	76.5	0.002	0.48	14.2	1
2	GT147148	C9532CQR	SILTSTONE	56	7.22	50.3	24.5	0.18	5.3	0.097	30.1	27.4	0.46	13.3	17.3	30.4	54.3	0.002	0.64	15.3	2
2	GT147593	C541CQ	SILTSTONE	80	4.8	27.5	17.65	0.16	3.9	0.058	21.7	18.2	0.22	9.2	25.8	17.3	51	0.002	0.69	15.4	1
2	GT152501	C541CQ	SILTSTONE	38	9.36	51	22.3	0.15	3.9	0.069	20.6	18.8	1.48	9	35	21.6	126.5	0.003	0.7	14.7	1
2	GT152507	C541CQ	SILTSTONE	50	3.13	10.8	10.65	0.15	2.3	0.027	20.2	10.2	0.46	4.6	11.7	11	90.5	0.002	0.54	10.6	1
2	GT152513	C541CQ	SANDSTONE	50	10.3	48.7	31.5	0.16	4.7	0.101	33.6	37.6	0.52	18.1	32.5	37.5	98.9	0.002	0.68	17.1	2
2	GT152514	C541CQ	SILTSTONE	45	4.89	13.3	20.3	0.11	3.1	0.05	31.5	18.8	0.44	13	9.4	26.2	98	<0.002	0.54	10.7	1
2	GT152517	C541CQ	SANDSTONE	68	7.64	30.4	26.1	0.16	4.3	0.085	40.9	32.4	0.59	16.3	10.6	35.2	92.9	0.002	0.51	14.1	1
2	170292	C607CQ	SILTSTONE	57	6.08	18.9	14.7	0.13	3.3	0.046	24.9	13.4	0.5	7.8	8	13.6	88.6	0.002	0.34	11.3	1
2	177688	C670CQ	SILTSTONE	29	3.12	26	11.1	0.15	1.7	0.025	15.4	7.3	0.69	3.2	13.1	8.9	44.1	0.002	0.35	7.5	1
2	177699	C670CQ	SANDSTONE	37	7.1	31.2	22.3	0.14	3.4	0.092	40.8	39.1	0.52	13.3	15.6	37.9	75.8	<0.002	0.59	12.6	1
2	154040	C675CQ	SILTSTONE	34	3.42	45.3	24	0.15	3.2	0.053	10.1	9.8	0.95	5.9	27.9	14.8	45.9	0.002	0.35	13.1	1
2	CQ146995	C684LD	SILTSTONE	5	0.6	6	11.95	0.08	4.3	0.08	13.7	17	1.09	9.8	1.2	25	3.1	<0.002	0.49	4.9	1
2	CQ146996	C684LD	COAL	3	0.24	7.2	3.7	<0.05	0.9	0.03	4.6	5.6	1.26	1.3	1.8	5	1.5	0.002	0.16	2.4	<1
2	CQ146997	C684LD	COAL	7	0.31	7.3	2.91	<0.05	0.7	0.023	5	6.5	1.13	1.6	1.7	6	2.5	0.002	0.16	2.6	1
2	CQ146999	C684LD	COAL	11	0.47	17.8	6.86	0.07	2.6	0.066	7.7	11.3	1.03	3.9	2.2	11.8	2.4	0.005	0.32	5	1
2	CQ172801	C684LD	COAL	2	0.17	6.6	6.17	<0.05	0.7	0.02	5.5	4.3	1.86	1	2.7	3.4	1.2	<0.002	0.33	3.1	<1

Batch #	Sample ID	Site No.	Analyte	Sn	Sr	Ta	Te	Th	Ti	Tl	U	V	W	Y	Zn	Zr	Hg	F	C
			Units	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	%
			Comparative Abundance	**4.6**	**320**	**1.5**	**0.005**	**9.6**	**0.38**	**0.95**	**3.1**	**105**	**1.7**	**40**	**95**	**150**	**0.19**	**640**	**2.94**
2	169629	C180004CQ	SANDSTONE	3.6	29.9	1.19	<0.05	15.1	0.403	0.38	3.7	63	3	19.7	129	139	0.083	330	1.53
2	169630	C180004CQ	CARB SILTSTONE	1	8.9	0.35	<0.05	4.2	0.054	0.23	1	11	2.9	7.1	18	46.8	0.035	190	0.07
2	182753	C180007CQ	SANDSTONE	3.1	135	0.79	0.06	10.5	0.51	0.54	3.2	147	2.1	29.9	103	154.5	0.061	500	1.74
2	182756	C180007CQ	SILTSTONE	2.4	361	0.62	0.14	11.4	0.371	0.65	3.3	98	1.7	27.2	89	157	0.061	490	2.74
2	182763	C180007CQ	CARB MUDSTONE	1.9	51.7	0.59	<0.05	10.2	0.384	0.72	2.3	71	1.5	11.4	78	114	0.038	320	0.37
2	182766	C180007CQ	SANDSTONE	1.8	58.5	0.52	<0.05	8	0.311	0.62	1.8	64	1.4	21.8	62	98.5	0.019	310	0.66
2	182771	C180007CQ	SANDSTONE	3.5	64.5	0.84	0.05	12.4	0.455	0.55	3	118	2.4	27.5	81	151	0.033	530	2
2	177654	C669CQ	SANDSTONE	2.5	59.9	0.75	0.05	10.9	0.614	0.65	2.7	140	1.8	24	116	147	0.091	360	0.5
2	177659	C669CQ	SILTSTONE	1.9	549	0.49	0.06	7.5	0.375	0.36	2.1	123	1.4	20.5	72	120	0.03	460	1.81
2	177661	C669CQ	MUDSTONE	1.5	583	0.39	<0.05	4.9	0.417	0.37	1.3	131	0.9	14.8	66	90.3	0.006	530	0.59
2	177665	C669CQ	SANDSTONE	2.3	451	0.52	0.06	4.9	0.503	0.42	2	123	1.3	19.2	95	162	0.086	540	0.61
2	177669	C669CQ	SILTSTONE	2.4	122.5	0.63	0.08	8.1	0.344	0.2	2.5	51	1.8	22.6	65	210	0.111	700	3.83
2	177673	C669CQ	TUFF	2.1	59	0.66	<0.05	8	0.239	0.41	1.9	47	1.5	12.5	41	82.6	0.022	310	0.44
2	177676	C669CQ	SANDSTONE	2	14.6	0.67	<0.05	6.6	0.291	0.22	1.6	29	1.5	11.9	25	111.5	0.028	200	1.61
2	177677	C669CQ	SANDSTONE	1.5	15.8	0.53	<0.05	7.2	0.279	0.22	1.6	29	1.2	10.2	23	92.6	0.016	190	0.64
2	148058	C135CQ	SANDSTONE	3.5	11.9	1.04	0.25	14.3	0.459	0.44	5.2	43	2.9	23.6	21	141.5	0.047	240	40
2	GT152502	C541CQ	CARB MUDSTONE	2.4	209	0.56	0.08	8.4	0.343	0.57	2.4	94	1.6	24.8	70	115.5	0.055	500	3.09
2	GT152509	C541CQ	SILTSTONE	4.2	49.5	1	0.08	14.6	0.527	0.67	4.2	123	3	30.1	105	172.5	0.075	500	2.66
2	170252	C544CQ	SILTSTONE	2.2	134.5	0.44	0.21	4.1	0.568	0.7	2	210	1.3	12.1	81	142.5	0.126	630	9.84
2	170282	C607CQ	CARB SILTSTONE	2.9	52.7	0.66	0.11	7.3	0.611	0.16	3.3	167	1.8	29	16	165.5	0.051	400	0.23
2	170289	C607CQ	CLAYSTONE	1.7	191.5	0.45	<0.05	6.1	0.412	0.47	1.7	93	1.2	20	80	100.5	0.034	440	3.78
2	170296	C607CQ	SANDSTONE	1.7	28.5	0.58	<0.05	9.2	0.62	0.11	2.7	100	2	7.6	17	121	0.087	270	0.29
2	170297	C607CQ	SILTSTONE	2.4	55.6	0.62	0.08	9.7	0.458	0.6	3.1	96	1.6	31.5	19	151	0.031	350	0.6
2	154046	C675CQ	SILTSTONE	3.9	48.5	0.95	0.07	9.8	0.614	0.47	3.8	125	3	14.8	65	149.5	0.116	430	3.13
2	GT148358	C9380CQR	SILTSTONE	2.7	232	0.61	0.1	8.2	0.385	0.77	2.6	107	1.8	17.7	75	129	0.068	570	0.82
2	GT148378	C9380CQR	SILTSTONE	5.3	23.3	1.29	0.14	16	0.44	0.18	4.9	60	3.1	22	22	187	0.098	150	15.65
2	153309	C099CQ	CARB MUDSTONE	1.7	579	0.43	<0.05	6.2	0.562	0.47	1.6	134	1.1	18.1	91	97.8	0.027	690	0.61
2	154251	C122CQ	SANDSTONE	3.4	38.2	0.94	0.05	12	0.583	0.18	2.4	68	2.4	8.5	11	165.5	<0.005	320	0.05
2	154256	C122CQ	SANDSTONE	1.5	268	0.4	<0.05	6.8	0.421	0.45	1.6	116	0.9	15.4	62	92.9	0.014	540	0.55
2	146717	C388CQ	SANDSTONE	1.4	369	0.35	0.09	4.8	0.576	1.31	2	243	1.1	24.8	121	132.5	0.168	1170	2.11
2	146718	C388CQ	MUDSTONE	2.3	96.5	0.46	0.23	7.4	0.368	0.48	2.3	152	1	20.8	87	121.5	0.13	240	19.4
2	146730	C388CQ	CARB MUDSTONE	0.9	35.1	0.28	<0.05	4.1	0.057	0.49	0.9	17	0.6	7	55	39.1	0.015	90	0.56
2	177952	C398CQ	SANDSTONE	3.7	55.2	0.84	0.06	14.9	0.411	0.72	3.6	93	2.4	28.8	91	149	0.026	270	1.77
2	177968	C398CQ	SANDSTONE	4	27	1.22	0.06	17.3	0.446	0.42	4.6	83	3.4	23.7	116	138.5	0.032	200	1.91
2	GT169961	C671CQ	SILTSTONE	1.4	457	0.35	<0.05	5.2	0.456	0.32	1.4	131	1	20.3	84	90.6	0.012	460	1.74
2	GT169962	C671CQ	SANDSTONE	0.7	293	0.19	<0.05	3.6	0.196	0.2	0.8	94	0.5	13.1	38	50	0.007	280	6.06
2	GT169966	C671CQ	SANDSTONE	1.2	38.8	0.24	0.14	2.4	0.287	1.62	0.8	111	0.7	8.5	73	85.6	0.457	250	22.5
2	147454	C088CQ	CARB SILTSTONE	1.4	60.9	0.42	<0.05	9	0.268	0.38	1.8	80	0.9	17.8	57	86.7	0.022	190	0.59
2	147462	C088CQ	SANDSTONE	1.5	433	0.39	<0.05	6.7	0.484	0.42	1.6	151	0.9	17.6	88	94.5	0.014	400	0.6
2	147478	C088CQ	SANDSTONE	1.4	86.9	0.28	0.17	8.1	0.294	0.81	3.5	188	1.2	32.7	91	150.5	0.357	1430	9.71
2	182759	C180007CQ	TUFF	1.8	210	0.45	<0.05	5.7	0.516	0.52	1.7	116	1.1	18.3	91	103.5	0.046	400	2.74
2	169719	C9419CQR	SANDSTONE	2.3	213	0.56	0.06	10	0.343	0.51	2.8	70	1.6	28.7	72	144.5	0.05	370	6.39
2	GT147148	C9532CQR	SILTSTONE	4.5	91.5	0.99	0.1	13.8	0.555	0.49	4.6	123	3.2	24.3	133	180	0.152	270	5.4
2	GT147593	C541CQ	SILTSTONE	2.2	75.4	0.65	0.05	9.5	0.477	0.44	2.2	117	1.8	22.9	150	139	0.066	300	1.87
2	GT152501	C541CQ	SILTSTONE	2.8	179	0.67	0.07	9.3	0.429	0.87	2.9	115	1.8	19.3	90	139.5	0.065	340	1.41
2	GT152507	C541CQ	SILTSTONE	1.3	193	0.36	<0.05	7.3	0.219	0.55	1.7	41	0.9	20.2	37	78.7	0.013	300	4.59
2	GT152513	C541CQ	SANDSTONE	5.3	38	1.34	0.08	18.2	0.471	0.7	5.6	96	3.5	28.4	111	160.5	0.065	300	1.5
2	GT152514	C541CQ	SILTSTONE	3.3	42.7	1	<0.05	14.8	0.328	0.68	3	68	2.7	16.1	59	97.9	0.023	300	0.48
2	GT152517	C541CQ	SANDSTONE	4.1	39.7	1.24	0.05	16.3	0.447	0.59	5	93	3.2	22.8	121	135.5	0.05	250	1.56
2	170292	C607CQ	SILTSTONE	2.3	156	0.62	<0.05	9.9	0.316	0.48	2.4	65	1.8	23.8	57	113.5	0.017	300	2.4
2	177688	C670CQ	SILTSTONE	0.9	542	0.22	<0.05	3.8	0.236	0.29	1	100	0.5	16.4	56	64.2	0.008	280	6.19
2	177699	C670CQ	SANDSTONE	4.1	39.8	1.13	0.07	15.3	0.356	0.53	5.2	64	2.4	22	81	112	0.084	240	14.8
2	154040	C675CQ	SILTSTONE	1.6	385	0.4	<0.05	4.1	0.461	0.46	1.7	133	1	9.2	95	107	0.04	430	0.59
2	CQ146995	C684LD	SILTSTONE	4.1	116	0.8	0.07	10.1	0.17	0.22	4.1	10	1	17.3	49	120	0.16	140	30.7
2	CQ146996	C684LD	COAL	0.6	49.5	0.13	0.06	1.8	0.079	0.17	0.5	8	0.8	5.9	3	30.7	<0.005	50	> 50
2	CQ146997	C684LD	COAL	0.6	49.4	0.12	0.07	2.1	0.067	0.16	0.5	10	0.6	4.9	3	27.2	<0.005	40	> 50
2	CQ146999	C684LD	COAL	1.5	62.6	0.27	0.21	3.4	0.14	0.16	1.2	28	0.6	11.8	13	101	0.027	110	48.7
2	CQ172801	C684LD	COAL	0.3	45.2	0.07	0.06	1.3	0.042	0.13	0.4	8	0.6	11.2	3	26.8	0.011	90	> 50

Batch #	Sample ID	Site No.	Analyte	Al	Ca	Fe	K	Mg	Mn	Na	P	S	Ag	As	B	Ba	Be	Bi	Cd	Ce	Co
			Units	%	%	%	%	%	ppm	%	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
			Comparative Abundance	**7.2**	**6.6**	**4.1**	**2**	**1.4**	**770**	**0.57**	**670**	**0.22**	**0.057**	**7.7**	**100**	**460**	**2**	**0.4**	**0.17**	**83**	**14**
2	CQ172805	C684LD	COAL	1.97	0.83	1.78	0.06	0.1	512	0.08	70	0.28	0.03	0.9	10	150	1.89	0.17	<0.02	21.6	3.2
2	CQ172806	C684LD	COAL	8.38	1.1	2.3	0.19	0.95	66	0.45	150	0.01	0.09	2	<10	380	0.49	0.34	0.13	44.6	3.7
2	CQ172809	C684LD	CLAYSTONE	5.62	0.27	1.06	0.16	0.2	81	0.13	80	0.11	0.07	8.5	20	180	1.96	0.34	0.07	40.5	2.6
2	CQ172811	C684LD	COAL	5.67	0.14	0.93	0.13	0.1	94	0.08	150	0.06	0.11	1.1	10	110	0.79	0.47	0.23	30	2.9
2	CQ172813	C684LD	COAL	4.13	0.19	0.59	0.1	0.07	68	0.07	100	0.09	0.07	0.7	20	90	1.81	0.31	0.06	29.9	7.3
2	CQ172815	C684LD	COAL	2.15	1.42	7.09	0.49	0.24	2030	0.07	170	0.21	0.04	0.7	20	180	2.12	0.13	0.02	17.1	6.3
2	CQ172816	C684LD	COAL	5.79	7.34	2.64	1.18	0.31	530	0.23	320	0.02	0.05	5.1	10	340	0.94	0.22	0.05	42	4.3
2	CQ172817	C684LD	SANDSTONE	7.55	0.37	1.03	1.41	0.23	136	0.11	410	0.04	0.08	6.3	20	360	1.31	0.38	0.14	59.2	5.8
2	CQ172818	C684LD	SANDSTONE	4.33	0.18	0.57	0.26	0.09	73	0.09	90	0.1	0.07	2.5	20	160	3.15	0.3	0.08	27.4	8
2	CQ172821	C684LD	COAL	4.06	0.16	0.69	0.29	0.08	153	0.07	90	0.14	0.05	2.1	10	150	1.62	0.23	0.06	31.7	6.3
2	CQ172836	C684LD	COAL	2.17	0.83	0.5	0.09	0.06	101	0.05	40	0.21	0.02	0.5	30	120	1.91	0.18	0.02	19.5	1.8
2	CQ172654	C684LD	COAL	4.71	6.26	2.91	0.23	0.12	1865	0.04	520	0.23	0.04	4.3	20	170	0.96	0.15	0.12	37.2	9.6
2	CQ172655	C684LD	COAL	7.96	0.96	0.9	1.69	0.16	48	0.13	540	0.16	0.19	6.5	20	400	0.98	0.39	0.21	26	17
2	CQ172674	C684LD	SILTSTONE	8.2	0.1	0.2	0.38	0.04	12	0.05	200	0.04	0.14	4.1	10	190	2.36	0.96	0.11	20.9	12.7
2	CQ172698	C684LD	CARB MUDSTONE	9.3	0.12	3.09	0.88	0.12	989	0.05	170	0.05	0.08	2.3	20	230	1.21	0.46	0.05	35	1.9
2	CQ172699	C684LD	SILTSTONE	8.08	0.22	1.54	0.79	0.1	367	0.04	670	0.03	0.1	2.7	20	180	1.13	0.56	0.05	34.6	11.5
2	CQ14755	C684LD	SILTSTONE	8.34	0.61	17.2	0.05	0.41	3170	0.02	290	0.12	0.13	17.3	<10	50	1.21	0.5	0.06	24.9	5.3
2	CQ14758	C684LD	CLAYSTONE	8.28	0.09	0.49	1.2	0.11	46	0.06	140	0.03	0.06	19.5	20	330	2.24	0.39	0.18	86	7.4
2	CQ14759	C684LD	SANDSTONE	2.02	0.13	0.22	0.1	0.02	34	0.02	30	0.13	0.01	2.6	20	40	5.2	0.23	0.04	17.6	7.6
2	CQ14761	C684LD	COAL	5.11	0.07	0.11	0.14	0.02	9	0.03	110	0.03	0.09	1.8	20	60	2.66	0.69	0.22	27.1	3.4
2	CQ14763	C684LD	CARB SILTSTONE	7.67	0.06	0.18	0.07	0.02	18	0.03	120	0.03	0.12	15.5	20	50	2.35	0.71	0.17	42.1	58.8
2	CQ14767	C684LD	COAL	1.51	0.13	1.6	0.02	0.03	347	0.02	50	0.17	0.05	5.2	20	20	9.58	0.28	0.03	25	11.4
2	CQ14768	C684LD	COAL	8.25	0.12	0.36	0.86	0.08	28	0.05	110	0.03	0.12	2.2	20	240	5.89	0.88	0.1	71.6	3.1
2	2209	C688LD	CARB SILTSTONE	3.15	5.83	3.42	0.13	0.16	1025	0.09	320	0.26	0.05	3.8	20	140	1.55	0.24	0.07	29.3	3.6
2	2210	C688LD	COAL	1.85	0.61	1.63	0.04	0.09	448	0.07	70	0.24	0.04	10.1	40	80	1.93	0.19	0.02	21.4	2.4
2	2212	C688LD	COAL	1.19	0.29	0.36	0.03	0.04	78	0.06	30	0.17	0.02	0.6	30	80	0.64	0.21	0.02	12.15	1.2
2	2215	C688LD	COAL	0.8	0.15	0.2	0.02	0.02	34	0.05	30	0.12	0.02	0.7	30	70	0.91	0.2	0.02	13.75	2.3
2	2218	C688LD	COAL	2.92	0.9	2.08	0.08	0.11	554	0.07	80	0.3	0.04	4.2	20	130	1.87	0.18	0.03	27.8	3
2	2219	C688LD	COAL	7.64	1.09	3.18	0.18	0.91	208	0.45	130	0.02	0.12	2.7	<10	330	0.49	0.32	0.14	36.7	3.1
2	2220	C688LD	COAL	8.1	1.15	1.79	0.25	0.86	47	0.42	400	0.01	0.09	1.9	10	350	0.45	0.31	0.1	50.4	6.9
2	2221	C688LD	COAL	5.43	0.35	1.26	0.18	0.23	81	0.14	90	0.14	0.07	11.6	20	200	1.85	0.31	0.11	27.2	2
2	2223	C688LD	COAL	4.59	0.27	0.68	0.1	0.14	45	0.09	80	0.11	0.14	1.5	20	120	1.49	0.39	0.1	33.2	4.4
2	2224	C688LD	COAL	3.59	5.73	1.58	0.08	0.07	507	0.06	140	0.14	0.11	2.5	10	100	1.05	0.37	0.1	30.6	6
2	2226	C688LD	COAL	6.03	3.13	1.73	1.43	0.28	373	0.15	340	0.05	0.06	12.2	10	380	1.11	0.21	0.07	43.3	15.3
2	14964	C505G	COAL	3.62	0.11	1.58	0.65	0.13	436	0.07	130	0.01	0.11	3.1	10	160	1	0.19	<0.02	44.9	6.7
2	14965	C505G	CLAYEY SAND	5.28	6.02	2.04	0.85	0.65	517	0.21	80	0.02	0.28	3.9	30	620	1.42	0.23	<0.02	67.4	10.2
2	14966	C505G	CLAYEY SAND	4.52	0.02	1.69	0.65	0.27	59	0.3	60	0.01	0.04	2	30	180	0.73	0.23	<0.02	31.4	3.9
2	14967	C505G	SANDY CLAY	1.87	3.83	1.16	0.4	2.27	643	0.18	50	<0.01	0.03	2.3	10	290	0.74	0.12	0.03	43.2	7.3
2	14968	C505G	SANDY CLAY	1.59	0.03	0.84	0.36	0.12	70	0.16	40	0.01	0.03	1.4	10	120	0.48	0.09	<0.02	23.2	2.4
2	14969	C505G	SANDY CLAY	2.22	0.03	1.36	0.34	0.12	137	0.17	60	0.01	0.5	4	20	150	0.78	0.18	<0.02	28.6	4.2
2	14970	C505G	SANDY CLAY	8.62	0.07	5.88	1.23	0.86	212	0.67	220	0.03	0.13	3.4	40	70	1.28	0.2	0.02	30.4	20.5
2	14971	C505G	CLAYEY SAND	8.53	0.13	3.65	0.24	0.75	99	0.64	140	0.02	0.07	3.1	90	70	2.16	0.35	<0.02	31.6	19.1
2	14972	C505G	CLAY	8.1	0.13	5.05	0.34	0.68	164	0.56	210	0.02	0.1	5.8	70	180	1.69	0.36	<0.02	45.2	17.2
2	14973	C505G	CLAY	5.63	0.12	9.67	0.27	0.33	91	0.34	320	0.19	0.11	11.2	40	160	0.83	0.39	<0.02	40.2	8.6
2	14975	C339G	SANDY CLAY	3.57	0.07	2.8	0.32	0.09	1060	0.03	150	0.01	0.09	6.2	30	250	1.07	0.24	<0.02	54.6	14.1
2	14976	C339G	SOIL	5.54	0.77	2.94	0.52	0.44	247	0.14	100	0.03	0.07	5	50	1320	1.25	0.27	<0.02	42.3	10.9
2	14977	C339G	CLAYEY SAND	4.74	0.1	2.16	1.18	0.73	600	0.22	120	0.01	0.06	3.8	60	570	1.97	0.22	<0.02	108	10.7
2	14978	C339G	SANDY CLAY	4.88	0.11	2.29	1.18	0.78	2150	0.27	200	0.01	0.1	3.7	60	890	2.29	0.3	0.02	260	39.1
2	14979	C339G	SANDY CLAY	5.86	0.04	4.67	0.79	0.39	1580	0.14	470	0.02	0.11	19.6	40	390	2.35	0.37	0.07	55.8	26.6
2	14980	C339G	SANDY CLAY	8.84	0.03	2.14	0.18	0.07	64	0.07	290	0.01	0.4	5.4	40	170	0.85	0.51	<0.02	59.7	2.2
2	14981	C339G	SANDY CLAY	8.77	0.02	3.4	0.23	0.06	98	0.05	280	0.01	0.35	8.4	30	100	0.86	0.53	<0.02	33.1	1.9
2	14982	C339G	CLAYEY SAND	8.67	0.02	5.55	0.32	0.07	74	0.04	290	0.01	0.19	10.3	30	100	1.01	0.55	<0.02	30.3	2
2	14983	C339G	CLAYEY SAND	8.39	0.04	8.77	0.59	0.11	60	0.05	370	0.01	0.06	20.8	30	190	1.32	0.66	<0.02	23.6	1.7
2	14984	C339G	CLAYEY SAND	8.66	0.04	8.83	0.68	0.14	61	0.06	610	0.01	0.07	23.6	30	160	1.54	0.57	<0.02	26.2	2.4
2	14985	C339G	CLAYEY SAND	9.35	0.06	3.95	1.03	0.22	79	0.06	270	0.01	0.04	8	50	190	1.46	0.51	<0.02	18.35	2.8
2	14986	C339G	CLAYEY SAND	6.88	0.23	2.91	2.06	0.47	544	0.37	590	<0.01	0.05	2.6	10	510	1.55	0.22	0.07	56.1	20.8
2	14987	C339G	CLAYEY SAND	6.79	0.34	3.39	2.05	0.57	897	0.64	730	0.01	0.05	3.5	20	600	1.44	0.24	0.08	56.6	19.1
2	204802	C696CQ	CLAYEY SAND	4.36	0.11	0.17	0.04	0.06	42	0.05	100	0.14	0.09	11.3	20	60	11.15	0.68	0.3	32.4	170

Batch #	Sample ID	Site No.	Analyte	Cr	Cs	Cu	Ga	Ge	Hf	In	La	Li	Mo	Nb	Ni	Pb	Rb	Re	Sb	Sc	Se
			Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
			Comparative Abundance	72	72	33	18	1.7	2.5	0.044	41	56	2	13	52	19	135	0.0004	1.2	10	0.42
2	CQ172805	C684LD	COAL	8	0.7	11	5.41	0.07	1.4	0.028	9.4	9.9	1.94	2.4	2.7	5.2	4.2	0.003	1.27	6.1	1
2	CQ172806	C684LD	COAL	8	1.78	8.2	19.7	0.14	7	0.071	19.8	7.2	0.29	7.9	5.3	25.9	5	0.002	0.34	13.2	1
2	CQ172809	C684LD	CLAYSTONE	5	1.18	19.1	12.65	0.1	3.9	0.053	17.2	17	1.83	4.7	2.8	7.5	6.8	0.002	0.94	8.9	1
2	CQ172811	C684LD	COAL	3	0.69	19.7	12.45	0.12	6.4	0.094	11.6	30.7	1.64	6.3	2.6	28.8	4.7	0.002	0.34	6.6	1
2	CQ172813	C684LD	COAL	2	0.36	8.9	9.54	0.06	3.7	0.051	12	17	1.47	6.6	5	17.7	3.7	<0.002	0.62	5	<1
2	CQ172815	C684LD	COAL	23	3.61	10.7	6.84	0.14	1.2	0.022	7.6	8.6	1.52	2.2	9.2	6.3	30.5	0.002	1.02	7	1
2	CQ172816	C684LD	COAL	56	5.27	19.5	12.45	0.12	2.9	0.043	22.1	15.1	0.78	6.5	6.3	11.7	68.3	0.002	0.35	10.9	1
2	CQ172817	C684LD	SANDSTONE	52	5.27	32.4	19.2	0.14	4.6	0.074	27.2	19.2	1.17	9.4	8.9	24.5	73.5	0.002	0.5	13.9	1
2	CQ172818	C684LD	SANDSTONE	12	0.92	18.3	13.35	0.1	3.4	0.056	10.7	17.4	1.43	5.3	11.8	12	10.1	0.003	0.86	6	1
2	CQ172821	C684LD	COAL	4	0.7	25.3	9.03	0.07	1.8	0.04	14	13.3	1.23	2	4.8	11.7	13	0.004	0.16	7.5	<1
2	CQ172836	C684LD	COAL	4	0.45	21.9	6.88	0.05	1.2	0.03	9	9.4	1.09	1.8	1.9	7	4.8	0.002	0.22	4.6	1
2	CQ172654	C684LD	COAL	3	1.08	19.7	11.25	0.11	1.4	0.046	17.2	17.8	2.8	2	3.1	9.8	8.3	0.003	0.28	8.9	1
2	CQ172655	C684LD	COAL	5	1.8	253	21.4	0.09	4.1	0.095	9.7	20	2.39	7.1	5.3	22.7	44.7	0.007	0.24	10.7	1
2	CQ172674	C684LD	SILTSTONE	14	2.11	36.6	29.6	0.06	5	0.095	8.2	34.5	2.72	15.5	10.9	45.2	16.3	0.002	0.56	8.6	2
2	CQ172698	C684LD	CARB MUDSTONE	34	7.85	34.8	20.9	0.12	4.4	0.081	16.2	29.2	0.4	12.2	7.7	23.1	59.9	0.002	0.36	13.7	1
2	CQ172699	C684LD	SILTSTONE	23	5.89	30.5	23.2	0.13	7.1	0.097	15.1	34	0.96	12.5	13.2	30.1	48.1	0.002	0.41	12	2
2	CQ14755	C684LD	SILTSTONE	4	0.11	6.9	17.1	0.32	4.6	0.044	10.7	37.8	1.16	8.5	8.9	31.2	0.5	0.002	0.36	4.4	2
2	CQ14758	C684LD	CLAYSTONE	30	5.67	19	21.5	0.12	3.4	0.074	38.8	43.1	0.45	14.3	24.9	36.6	77.8	0.002	0.54	12.1	1
2	CQ14759	C684LD	SANDSTONE	7	0.39	8.9	5.49	0.05	1.2	0.034	7	14.6	0.42	3.5	14.4	10.9	5	0.002	0.86	4.5	2
2	CQ14761	C684LD	COAL	15	0.97	69.3	12.95	0.06	3.2	0.096	11.1	74	0.7	11.5	7.2	29.6	8.4	0.002	0.23	5	2
2	CQ14763	C684LD	CARB SILTSTONE	4	0.68	83.1	19.85	0.07	4.5	0.091	17.1	62.1	6.65	21.3	59.1	27	4.5	0.003	0.23	5.1	2
2	CQ14767	C684LD	COAL	14	0.24	13.5	10.5	0.54	1.5	0.036	11.1	5.3	0.83	3.6	22	11.6	1.1	0.002	2.59	5.1	1
2	CQ14768	C684LD	COAL	46	11.15	60.2	27	0.13	3.9	0.103	32	45.5	0.62	19	10.5	65.2	59.5	0.002	1.1	11	1
2	2209	C688LD	CARB SILTSTONE	6	0.78	41.8	8.75	0.11	2	0.031	13.2	11.3	2.26	3.1	1.5	9.3	6.9	0.003	0.43	7.1	1
2	2210	C688LD	COAL	3	0.41	5.2	8.18	0.06	1.3	0.026	9.8	7.2	1.58	4.2	1.8	7.8	2.6	<0.002	0.44	3.3	1
2	2212	C688LD	COAL	4	0.27	8.6	3.5	<0.05	0.8	0.02	5.4	5.9	1.4	1.4	1.8	4	2.2	0.002	0.12	2.3	1
2	2215	C688LD	COAL	2	0.22	7	5.39	<0.05	1	0.026	5.8	4.4	1.59	1.7	2.6	6.9	1.6	0.002	0.26	3.5	<1
2	2218	C688LD	COAL	6	0.75	10.1	7.07	0.08	1.8	0.031	12	13.2	1.85	2.7	2.2	7.5	5.2	0.003	1.1	7.4	1
2	2219	C688LD	COAL	3	1.85	9.9	20.7	0.16	6.6	0.079	16	6.7	0.22	7.3	2.6	23.9	4.4	0.002	0.33	13.4	1
2	2220	C688LD	COAL	4	1.77	11.8	19.15	0.14	6.6	0.069	22.7	9.5	0.78	8.1	4.7	22	7	0.002	0.39	11.7	1
2	2221	C688LD	COAL	7	1.21	13.7	13.1	0.07	3.9	0.059	11.4	16.3	1.49	5.9	2.6	15.5	5.8	0.002	0.85	8.1	1
2	2223	C688LD	COAL	6	0.74	16.8	12.8	0.08	4.2	0.068	13.7	15.7	1.31	6.1	4.2	18.8	4.2	0.003	0.37	8.5	1
2	2224	C688LD	COAL	5	0.29	9.4	10.55	0.14	4	0.068	13	18.5	0.97	5.8	2.9	22.5	1.2	0.002	0.42	4.3	1
2	2226	C688LD	COAL	63	5.82	21.2	13.5	0.13	3	0.046	22.1	16.2	1.83	6.6	15	12.4	81.8	0.002	0.53	10.5	1
2	14964	C505G	COAL	54	3.05	17.5	8.28	0.11	1.7	0.025	19.7	15.9	0.45	6.6	14.2	12	56.3	<0.002	0.55	6	1
2	14965	C505G	CLAYEY SAND	53	4.59	17.4	12.35	0.16	2.3	0.037	33.2	18.6	0.46	8.1	22.8	13.4	75	<0.002	0.63	9	1
2	14966	C505G	CLAYEY SAND	50	3.83	8.2	10.65	0.1	2	0.032	18.6	14.6	0.21	7.7	8.5	10.5	59.3	<0.002	0.59	7.4	<1
2	14967	C505G	SANDY CLAY	64	1.7	7.2	4.33	0.12	1.4	0.014	20.4	7.9	0.43	4.8	10.3	8.3	29.4	<0.002	0.43	3.4	1
2	14968	C505G	SANDY CLAY	70	1.51	6.9	3.81	0.07	1.1	0.013	10.6	8.1	0.16	3.5	8.3	7	26	<0.002	0.36	2.8	<1
2	14969	C505G	SANDY CLAY	69	2.4	10.3	5.59	0.07	1.6	0.02	14.8	10	0.38	5.3	10.4	9.7	30.3	<0.002	0.63	4	<1
2	14970	C505G	SANDY CLAY	156	3.98	37.6	23.9	0.18	3.5	0.076	13.8	23.4	0.49	16.9	82	10.6	44.3	<0.002	0.41	19.3	1
2	14971	C505G	CLAYEY SAND	63	6.27	42.6	22.4	0.15	3.1	0.074	15.9	19.5	0.71	11.4	50.1	15.9	28.2	<0.002	0.71	17.3	1
2	14972	C505G	CLAY	74	5.68	41	21.1	0.18	3.2	0.069	21.8	18.1	0.99	12.3	48.5	19.3	39.2	<0.002	0.72	18.1	2
2	14973	C505G	CLAY	74	4.4	29.8	16.2	0.2	2.7	0.076	26.2	15.5	1.27	9	20.7	26.9	23.1	0.002	0.87	23	2
2	14975	C339G	SANDY CLAY	84	3.06	21.4	8.91	0.16	2.2	0.036	22.9	15.5	0.82	9.6	21.5	16.1	46.9	0.002	0.73	8.1	1
2	14976	C339G	SOIL	67	5.26	21.6	13.45	0.15	2.7	0.045	25.7	21.9	0.52	10.5	28	14.4	67	0.002	0.68	10.5	1
2	14977	C339G	CLAYEY SAND	50	5.15	23.7	12.05	0.16	2.2	0.039	42.9	14.5	0.29	7.9	39.6	16	79.8	0.002	0.63	9	1
2	14978	C339G	SANDY CLAY	45	5.37	26.8	13.15	0.43	2.9	0.04	116	17.5	0.46	13.7	43.4	20	81.8	0.002	0.73	9.8	3
2	14979	C339G	SANDY CLAY	79	5.44	27.5	14.9	0.19	2.7	0.058	25.8	27.9	0.45	8	36	42	69.3	0.002	0.93	12.6	2
2	14980	C339G	SANDY CLAY	83	5.7	25.6	23.1	0.14	4.1	0.094	26.4	56.8	0.6	13.6	15.3	29.3	21.8	<0.002	0.94	21	1
2	14981	C339G	SANDY CLAY	83	6.59	24.9	22.1	0.13	4	0.09	17.4	41.2	0.67	11.8	13.8	22.2	27	<0.002	1.01	18.9	1
2	14982	C339G	CLAYEY SAND	105	6.28	27.3	23.5	0.17	3.8	0.086	16.9	33.9	0.72	10.5	10.8	19.2	35.1	<0.002	1.06	15.8	2
2	14983	C339G	CLAYEY SAND	79	7.09	20.9	24.2	0.21	4.3	0.077	17.4	24.3	0.44	11.6	7.2	17.4	55.5	<0.002	1.08	11.1	2
2	14984	C339G	CLAYEY SAND	82	8.57	17.4	25.9	0.26	4	0.068	17.3	28.1	0.55	11.5	10.6	17	69.6	<0.002	1.18	12	1
2	14985	C339G	CLAYEY SAND	60	9.19	14	24.6	0.16	4.4	0.055	13.4	28.8	0.27	12	10	12.9	75.4	0.002	0.8	12.9	1
2	14986	C339G	CLAYEY SAND	56	5.91	22.5	14.9	0.19	2.6	0.046	25.7	21.4	0.16	6.9	75.5	15.3	116	<0.002	0.76	12.6	1
2	14987	C339G	CLAYEY SAND	75	5	22.3	15.65	0.2	2.7	0.048	27.5	17.6	0.28	7.1	49	14.7	115.5	<0.002	0.72	13	1
2	204802	C696CQ	CLAYEY SAND	13	0.5	34.5	12.1	0.1	5.5	0.08	11.5	15.7	1.82	10.3	273	35.6	1.7	0.015	1.35	6.1	2

Batch #	Sample ID	Site No.	Analyte	Sn	Sr	Ta	Te	Th	Ti	Tl	U	V	W	Y	Zn	Zr	Hg	F	C
			Units	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	%
			Comparative Abundance	4.6	320	1.5	0.005	9.6	0.38	0.95	3.1	105	1.7	40	95	150	0.19	640	2.94
2	CQ172805	C684LD	COAL	0.6	82.1	0.13	0.06	2.2	0.102	0.21	1	32	0.5	16.4	6	64.7	0.042	100	38.9
2	CQ172806	C684LD	COAL	2.6	569	0.65	0.08	10.1	0.301	0.14	3	33	1.1	25	85	232	0.131	680	0.49
2	CQ172809	C684LD	CLAYSTONE	1.6	128	0.51	0.07	6.8	0.213	0.22	2	27	1.7	20.1	25	122	0.118	230	> 50
2	CQ172811	C684LD	COAL	3.8	47.2	0.83	0.1	5.7	0.292	0.22	3	35	1.4	14	75	181.5	0.187	380	21.8
2	CQ172813	C684LD	COAL	2	47.3	0.44	0.05	5.6	0.15	0.21	2.3	17	0.9	14.9	35	131	0.066	180	43.9
2	CQ172815	C684LD	COAL	0.8	68.4	0.14	<0.05	2.9	0.099	0.34	0.6	45	0.7	12.5	16	57.7	0.008	150	32.1
2	CQ172816	C684LD	COAL	2	168.5	0.53	<0.05	8.7	0.289	0.44	2.1	47	1.5	20.9	31	104	0.03	330	5.94
2	CQ172817	C684LD	SANDSTONE	3	74.6	0.73	0.06	12.4	0.403	0.51	3.4	83	2	23.7	90	153	0.043	480	5.83
2	CQ172818	C684LD	SANDSTONE	1.3	72.7	0.35	0.1	5.7	0.249	0.3	2.4	40	0.7	10.8	49	134	0.071	310	35
2	CQ172821	C684LD	COAL	0.9	60.9	0.22	0.13	5	0.208	0.33	0.9	60	0.7	11.6	31	64.7	0.039	170	40.7
2	CQ172836	C684LD	COAL	0.7	55.3	0.13	0.07	2.3	0.136	0.18	0.6	32	0.5	12.6	4	42.3	0.008	130	48.1
2	CQ172654	C684LD	COAL	0.9	117.5	0.16	0.09	2.7	0.262	0.41	0.9	54	0.5	19	65	40.1	0.056	310	28
2	CQ172655	C684LD	COAL	2.3	92.6	0.48	0.12	4.4	0.63	0.96	2.2	239	1.3	12.6	108	150.5	0.183	670	13
2	CQ172674	C684LD	SILTSTONE	5.9	23.5	1.2	0.38	8.7	0.952	0.32	3.2	113	3.4	9.9	94	196.5	0.187	340	12.1
2	CQ172698	C684LD	CARB MUDSTONE	3.5	32.6	0.95	0.07	13	0.457	0.39	3.6	80	2.6	14.3	25	148	0.054	360	4.59
2	CQ172699	C684LD	SILTSTONE	4.1	33.2	1.05	0.08	12.3	0.453	0.42	4.5	73	2.6	20.4	31	244	0.089	490	3.85
2	CQ14755	C684LD	SILTSTONE	2.6	20.4	0.91	<0.05	12.1	0.2	0.22	4.6	15	1.2	16.8	24	120	0.1	310	5.35
2	CQ14758	C684LD	CLAYSTONE	3.6	42.2	1.12	0.06	14.7	0.371	0.52	5	46	2.2	23.6	75	128.5	0.073	290	11.1
2	CQ14759	C684LD	SANDSTONE	1.1	18.9	0.24	0.08	3	0.107	0.23	1.1	20	0.5	9.7	13	51.5	0.031	100	>50
2	CQ14761	C684LD	COAL	3	15	0.95	0.17	8	0.36	0.2	3.6	38	1.7	8.1	8	106	0.032	160	31.1
2	CQ14763	C684LD	CARB SILTSTONE	4.2	13.5	1.72	0.23	15.8	0.448	0.98	6.6	36	3	12	14	150	0.263	190	29
2	CQ14767	C684LD	COAL	1	14.1	0.26	0.07	4.3	0.096	0.76	1.6	24	1	13.6	15	58.3	0.098	60	>50
2	CQ14768	C684LD	COAL	5.7	34.8	1.57	0.15	19.4	0.53	0.64	5.4	102	3.3	24.6	63	152.5	0.166	290	14.8
2	2209	C688LD	CARB SILTSTONE	0.9	173	0.21	0.07	3.9	0.196	0.33	1.1	55	0.9	18.5	38	91.6	0.034	180	34.2
2	2210	C688LD	COAL	0.9	60.9	0.21	<0.05	4.3	0.068	0.14	1.4	7	1.1	14.1	13	45.8	0.035	80	46.5
2	2212	C688LD	COAL	0.5	48.7	0.11	0.06	2.1	0.067	0.17	0.5	11	0.8	6	2	29	<0.005	70	>50
2	2215	C688LD	COAL	0.5	43.5	0.1	0.07	1.6	0.059	0.14	0.6	13	0.5	11.6	3	43.5	<0.005	40	>50
2	2218	C688LD	COAL	0.7	73.8	0.18	0.07	3.4	0.121	0.6	0.9	32	0.8	16.8	13	72.9	0.124	150	29.1
2	2219	C688LD	COAL	2.5	548	0.67	0.06	8.1	0.312	0.12	2.7	33	1	22.4	98	222	0.133	780	0.67
2	2220	C688LD	COAL	2.5	512	0.63	0.05	9.5	0.264	0.16	2.8	22	1.2	29.9	70	238	0.091	790	0.32
2	2221	C688LD	COAL	1.8	145.5	0.43	0.05	4.9	0.227	0.24	1.9	31	1.3	15.8	27	137	0.109	370	20.6
2	2223	C688LD	COAL	2.2	85.8	0.46	0.09	6.6	0.194	0.22	2.2	34	1	20.4	42	156	0.041	300	33.2
2	2224	C688LD	COAL	2.7	132.5	0.62	0.05	4.7	0.147	0.19	1.1	13	0.8	17	35	121	0.118	190	26.9
2	2226	C688LD	COAL	2.1	101	0.55	<0.05	9.8	0.284	0.56	2.2	61	2.4	21	55	100.5	0.043	300	6.92
2	14964	C505G	COAL	1.4	39.5	0.52	<0.05	8	0.261	0.29	1	42	2.7	15.5	20	61.3	0.018	140	0.41
2	14965	C505G	CLAYEY SAND	1.9	287	0.61	<0.05	9.8	0.29	0.38	1.4	61	2.5	28.7	33	78.7	0.007	280	2.04
2	14966	C505G	CLAYEY SAND	1.8	31.5	0.6	<0.05	9.7	0.268	0.27	1.5	41	2.3	10.3	22	68.2	<0.005	250	0.02
2	14967	C505G	SANDY CLAY	0.9	185	0.38	<0.05	6.5	0.169	0.19	1.3	27	2.4	17.1	12	50.2	<0.005	160	2.22
2	14968	C505G	SANDY CLAY	0.7	16.7	0.29	<0.05	4.7	0.131	0.13	0.7	20	3.5	7.6	11	37.7	<0.005	80	0.01
2	14969	C505G	SANDY CLAY	1.1	18.5	0.44	<0.05	7.6	0.18	0.17	1.2	33	1.5	9.4	15	54.6	<0.005	110	0.01
2	14970	C505G	SANDY CLAY	2.3	65.1	1.1	<0.05	7.3	0.685	0.3	1.9	91	1.3	14.4	89	137	<0.005	290	<0.01
2	14971	C505G	CLAYEY SAND	3.2	88.2	0.88	<0.05	12.1	0.434	0.22	3.4	85	2.1	27.1	119	111.5	<0.005	390	0.01
2	14972	C505G	CLAY	2.9	90.8	0.9	<0.05	16.6	0.479	0.34	3.6	106	2	27.5	90	116	0.011	330	0.05
2	14973	C505G	CLAY	2.3	360	0.67	<0.05	18.6	0.368	0.19	3.3	310	5.5	10.5	64	102	0.011	180	0.04
2	14975	C339G	SANDY CLAY	1.5	27.2	0.68	0.05	10.2	0.371	0.39	1.8	74	2.3	21.1	15	82.2	0.011	80	0.48
2	14976	C339G	SOIL	2	360	0.77	<0.05	10.8	0.398	0.41	1.6	72	1.7	20.9	24	98.3	0.006	350	0.29
2	14977	C339G	CLAYEY SAND	1.8	65.4	0.58	<0.05	8.5	0.279	0.49	1.4	57	1.3	52.7	36	79.3	<0.005	580	0.03
2	14978	C339G	SANDY CLAY	2	85.9	1.03	0.06	11.9	0.478	0.51	2.1	79	2.1	87.6	38	109	<0.005	610	<0.01
2	14979	C339G	SANDY CLAY	2.1	73	0.61	0.09	12.5	0.322	0.89	2.5	115	1.5	42.8	56	92.3	0.006	340	<0.01
2	14980	C339G	SANDY CLAY	3.6	85.3	1.04	0.07	19	0.533	0.29	3.4	73	2.4	12	44	145	<0.005	100	0.01
2	14981	C339G	SANDY CLAY	3.5	43.2	0.92	0.11	14.8	0.472	0.26	3.5	94	2.3	10.3	32	138.5	<0.005	100	0.01
2	14982	C339G	CLAYEY SAND	3.5	41.5	0.82	0.08	16.4	0.419	0.28	3.6	135	1.9	11	28	131	0.009	130	0.02
2	14983	C339G	CLAYEY SAND	3.6	35.5	0.9	0.1	13.3	0.455	0.32	3.8	178	2.1	13.7	20	151	<0.005	150	0.01
2	14984	C339G	CLAYEY SAND	3.4	44.8	0.9	0.1	13.2	0.46	0.36	4.5	169	2.1	13.3	23	143.5	<0.005	180	0.02
2	14985	C339G	CLAYEY SAND	3.3	48.3	0.94	0.08	9.4	0.555	0.41	3.7	119	2.3	12.2	25	149	<0.005	270	<0.01
2	14986	C339G	CLAYEY SAND	1.8	86.5	0.52	<0.05	9.5	0.349	0.59	4.2	89	1.4	21.3	85	92.6	<0.005	300	<0.01
2	14987	C339G	CLAYEY SAND	1.9	115.5	0.55	0.05	10	0.406	0.57	3.6	119	1.4	25.3	76	93.5	<0.005	330	<0.01
2	204802	C696CQ	CLAYEY SAND	3.3	24.7	0.81	0.17	11.1	0.383	1.07	4.6	48	2.7	21.4	11	191.5	0.152	120	41.8

Batch #	Sample ID	Site No.	Analyte	Al	Ca	Fe	K	Mg	Mn	Na	P	S	Ag	As	B	Ba	Be	Bi	Cd	Ce	Co
			Units	%	%	%	%	%	ppm	%	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
			Comparative Abundance	**7.2**	**6.6**	**4.1**	**2**	**1.4**	**770**	**0.57**	**670**	**0.22**	**0.057**	**7.7**	**100**	**460**	**2**	**0.4**	**0.17**	**83**	**14**
2	204803	C696CQ	COAL	2.98	0.07	0.08	0.03	0.03	29	0.03	140	0.08	0.05	2.1	20	50	3.96	0.24	0.14	16	22.9
2	204804	C696CQ	COAL	2.98	0.07	0.07	0.03	0.03	25	0.03	40	0.07	0.05	2.2	20	40	3.58	0.31	0.07	12.2	29.2
2	204807	C696CQ	COAL	4.69	0.06	0.07	0.02	0.02	16	0.03	60	0.04	0.06	2.6	40	40	2.57	0.22	0.08	18.5	14.1
2	204813	C696CQ	COAL	1.67	0.11	0.08	0.02	0.03	19	0.03	70	0.11	0.02	1	30	50	5.38	0.16	<0.02	93.6	5.5
2	204814	C696CQ	COAL	2.57	0.12	0.07	0.04	0.03	16	0.05	30	0.11	0.04	1.2	20	70	4.2	0.33	0.04	32.2	5.1
2	204815	C696CQ	COAL	6.77	0.12	0.28	0.52	0.13	13	0.11	70	0.02	0.06	2.5	20	180	1.59	0.19	0.14	4	6.2

Batch #	Sample ID	Site No.	Analyte	Cr	Cs	Cu	Ga	Ge	Hf	In	La	Li	Mo	Nb	Ni	Pb	Rb	Re	Sb	Sc	Se
			Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
			Comparative Abundance	**72**	**72**	**33**	**18**	**1.7**	**2.5**	**0.044**	**41**	**56**	**2**	**13**	**52**	**19**	**135**	**0.0004**	**1.2**	**10**	**0.42**
2	204803	C696CQ	COAL	7	0.31	14	8.25	0.05	2.3	0.036	5.6	21.5	1.86	3.6	25.8	11.7	1.1	0.006	0.26	4.6	1
2	204804	C696CQ	COAL	13	0.57	21.6	8.26	<0.05	1.8	0.025	4	24.4	1.47	3.5	37.9	14.8	1.7	0.004	0.46	3	1
2	204807	C696CQ	COAL	10	0.62	16.3	12.85	<0.05	3.5	0.042	7.2	12.2	3.16	5.7	20.6	15.1	1.5	0.003	0.64	4.6	1
2	204813	C696CQ	COAL	3	0.24	9.3	5.95	0.12	1.6	0.025	45	6.7	1.83	1.8	7.3	6.3	1.6	0.002	0.27	11.1	1
2	204814	C696CQ	COAL	3	0.43	16.6	7.66	0.06	1.7	0.036	12.8	16.5	1.28	3.3	6.4	12.9	2.2	0.002	0.36	3.8	1
2	204815	C696CQ	COAL	14	1.91	29.7	23.8	0.17	2.1	0.066	2.1	33.6	1	7.8	8.2	23.9	18.3	<0.002	0.33	2.7	1

Batch #	Sample ID	Site No.	Analyte	Sn	Sr	Ta	Te	Th	Ti	Tl	U	V	W	Y	Zn	Zr	Hg	F	C
			Units	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	%
			Comparative Abundance	**4.6**	**320**	**1.5**	**0.005**	**9.6**	**0.38**	**0.95**	**3.1**	**105**	**1.7**	**40**	**95**	**150**	**0.19**	**640**	**2.94**
2	204803	C696CQ	COAL	1.2	43.3	0.27	0.06	2.7	0.229	0.14	1.3	39	0.8	9	133	80.7	0.061	100	> 50
2	204804	C696CQ	COAL	2.3	16.1	0.45	0.08	3.7	0.153	0.16	1.7	29	0.8	8.3	138	65.7	0.092	100	> 50
2	204807	C696CQ	COAL	2	16.8	0.43	0.08	5.8	0.293	0.27	2.4	45	1.5	9.9	70	139	0.08	140	46.2
2	204813	C696CQ	COAL	0.7	38.5	0.12	<0.05	8	0.079	0.1	1.4	65	0.4	28	12	101	0.021	30	> 50
2	204814	C696CQ	COAL	1.5	50.4	0.34	0.09	4.4	0.119	0.09	1.6	27	0.5	16	27	57.9	0.023	60	> 50
2	204815	C696CQ	COAL	2.3	91.4	0.53	0.05	1.6	0.598	0.41	1.6	39	1.5	2.3	44	71.7	0.074	270	3.64

Appendix E: Static leach results

Client sample ID	Lithology	Batch #	pH Value	SO4 -	Cl	Ca	Fe	Mg	Na	K	Al	Ag	As	Bi	B	Sr	Ba	Ti	Cd	Co	U
		Units	pH Unit	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
		LOD	0.01	1	1	1	0.05	1	1	1	0.01	0.001	0.001	0.001	0.05	0.001	0.001	0.01	0.0001	0.001	0.001
81351	SANDSTONE	1	7.44	4	5	2	0.75	<1	20	<1	1.72	<0.001	0.006	<0.001	0.92	0.024	0.949	0.04	<0.0001	<0.001	<0.001
81355	CARB MUDSTONE	1	6.51	2	<1	1	0.5	<1	7	<1	2.06	<0.001	0.004	<0.001	0.79	0.013	0.718	0.07	0.0001	<0.001	<0.001
81356	CLAY	1	6.64	8	48	2	1.13	1	45	<1	2.27	<0.001	0.002	<0.001	1.54	0.036	1.78	0.06	0.0002	<0.001	<0.001
81370	COAL	1	7.48	22	4	5	0.09	2	28	2	0.23	<0.001	0.002	<0.001	0.68	0.119	1.11	<0.01	<0.0001	<0.001	<0.001
81382	COAL	1	7.46	169	10	112	0.28	18	83	4	0.28	<0.001	0.003	<0.001	3.96	2.38	0.822	0.01	0.0006	0.003	<0.001
81388	SANDSTONE	1	6.41	26	<1	1	0.08	<1	5	<1	0.2	<0.001	0.002	<0.001	0.8	0.028	0.615	<0.01	<0.0001	<0.001	<0.001
81394	CLAY	1	6.59	995	101	269	0.06	41	186	2	0.02	<0.001	0.001	<0.001	1	0.831	0.078	<0.01	0.0004	<0.001	<0.001
81397	CLAYSTONE	1	6.54	15	43	2	0.32	<1	38	<1	1.4	<0.001	0.002	<0.001	0.96	0.02	0.591	0.05	<0.0001	<0.001	<0.001
81400	CARB MUDSTONE	1	6.21	20	2	2	<0.05	1	13	<1	0.55	<0.001	0.023	<0.001	0.8	0.018	0.714	0.08	<0.0001	<0.001	<0.001
81403	MUDSTONE	1	7.05	10	2	2	0.68	<1	17	<1	1.31	<0.001	0.003	<0.001	0.85	0.025	0.956	0.06	<0.0001	<0.001	<0.001
81406	CARB MUDSTONE	1	6.89	6	34	3	0.13	<1	34	<1	0.65	<0.001	0.001	<0.001	0.86	0.034	1.15	0.07	<0.0001	<0.001	<0.001
81417	SILTSTONE	1	7.41	5	1	1	1.18	<1	21	<1	1.8	<0.001	0.003	<0.001	0.87	0.022	0.787	0.08	<0.0001	<0.001	<0.001
81420	CARB MUDSTONE	1	6.82	7	<1	1	0.16	<1	12	<1	0.59	<0.001	0.007	<0.001	0.63	0.016	0.549	0.03	<0.0001	<0.001	<0.001
81426	SANDSTONE	1	6.68	2	<1	<1	0.46	<1	7	<1	0.74	<0.001	0.009	<0.001	0.48	0.024	0.513	0.02	<0.0001	<0.001	<0.001
81433	INTERBEDDED SANDSTONE AND SILTSTONE	1	7.36	4	<1	2	0.66	<1	20	<1	1.16	<0.001	0.014	<0.001	0.78	0.036	0.999	0.08	<0.0001	<0.001	<0.001
81438	INTERBEDDED CARB MUDSTONE AND TUFF	1	6.62	6	2	1	0.36	<1	10	<1	0.99	<0.001	0.011	<0.001	0.7	0.027	0.789	0.03	<0.0001	<0.001	<0.001
81439	INTERBEDDED SANDSTONE AND SILTSTONE	1	6.4	2	<1	<1	0.32	<1	4	<1	1.14	<0.001	0.003	<0.001	0.44	0.016	0.488	0.03	<0.0001	<0.001	<0.001
81445	CARB MUDSTONE	1	6.81	8	1	2	0.11	<1	12	<1	1.46	<0.001	0.001	<0.001	0.85	0.025	1.06	0.2	0.0001	<0.001	<0.001
81450	CLAYSTONE	1	6.35	<1	3	1	<0.05	<1	7	<1	0.06	<0.001	<0.001	<0.001	0.81	0.012	0.787	<0.01	<0.0001	<0.001	<0.001
81455	CARB MUDSTONE	1	6.71	<1	<1	1	0.74	<1	9	<1	1.51	<0.001	0.002	<0.001	0.75	0.024	0.919	0.06	0.0001	<0.001	<0.001
Australian Water Quality Guidelines		**Health**	-	500	-	-	-	-	-	-	-	0.1	0.007	-	4	-	0.7	-	0.002	-	0.02
		Aesthetic	6.5 - 8.5	250	250	-	0.3	-	180	-	0.2	-	-	-	-	-	-	-	-	-	-
		Stock	-	1000	-	1000	-	-	-	-	5	-	0.5	-	5	-	-	-	0.01	-	0.2

Client sample ID	Lithology	Cr	Cu	Th	Mn	Mo	Ni	Pb	Sb	Se	Sn	V	Zn	Hg	F	Total P	EC	Total Alkalinity	Acidity	Sulfur as S
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µS/cm	mgCaCO3/L	mgCaCO3/L	mg/L
		0.001	**0.001**	**0.001**	**0.001**	**0.001**	**0.001**	**0.001**	**0.001**	**0.01**	**0.001**	**0.01**	**0.005**	**0.0001**	**0.1**	**0.01**	**1**	**1**	**1**	**1**
81351	SANDSTONE	0.002	0.006	<0.001	0.01	0.003	0.002	0.001	<0.001	<0.01	<0.001	0.02	0.102	<0.0001	0.6	0.05	113	37	<1	2
81355	CARB MUDSTONE	0.003	0.004	0.003	0.004	<0.001	<0.001	0.005	0.001	<0.01	<0.001	0.01	0.184	<0.0001	0.6	0.02	103	11	4	<1
81356	CLAY	0.004	0.004	<0.001	0.016	<0.001	0.002	<0.001	<0.001	<0.01	<0.001	<0.01	0.226	<0.0001	0.6	0.05	274	13	5	2
81370	COAL	<0.001	0.002	<0.001	0.004	0.014	0.001	<0.001	<0.001	0.02	<0.001	<0.01	0.076	<0.0001	0.3	0.01	176	53	5	8
81382	COAL	<0.001	0.007	<0.001	0.114	0.008	0.006	<0.001	<0.001	0.02	<0.001	<0.01	0.518	<0.0001	0.7	-	363	59	-	105
81388	SANDSTONE	0.004	0.002	<0.001	0.004	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.01	0.041	<0.0001	0.3	0.02	26	7	5	<1
81394	CLAY	<0.001	0.002	<0.001	0.008	<0.001	0.002	<0.001	<0.001	<0.01	<0.001	<0.01	0.348	<0.0001	0.4	<0.01	2120	10	5	343
81397	CLAYSTONE	0.001	0.004	<0.001	0.003	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.01	0.128	<0.0001	0.3	<0.01	240	11	5	5
81400	CARB MUDSTONE	<0.001	0.001	0.002	0.002	0.002	0.002	<0.001	0.001	0.02	<0.001	0.02	0.178	<0.0001	0.2	0.05	82	6	5	7
81403	MUDSTONE	<0.001	0.003	<0.001	0.003	0.004	<0.001	<0.001	<0.001	<0.01	<0.001	<0.01	0.097	<0.0001	0.4	<0.01	95	31	5	4
81406	CARB MUDSTONE	<0.001	0.003	<0.001	0.003	0.003	0.001	<0.001	<0.001	0.02	<0.001	<0.01	0.097	<0.0001	0.6	0.02	207	22	5	2
81417	SILTSTONE	0.002	0.004	<0.001	0.018	0.001	0.002	0.001	0.001	<0.01	<0.001	<0.01	0.075	<0.0001	0.5	0.04	104	46	5	2
81420	CARB MUDSTONE	<0.001	0.001	<0.001	0.003	0.014	<0.001	<0.001	<0.001	<0.01	<0.001	<0.01	0.032	<0.0001	0.2	<0.01	57	11	5	3
81426	SANDSTONE	<0.001	0.002	<0.001	0.003	0.004	<0.001	<0.001	<0.001	<0.01	<0.001	<0.01	0.036	<0.0001	0.2	<0.01	30	13	5	<1
81433	INTERBEDDED SANDSTONE AND SILTSTONE	0.003	0.003	<0.001	0.011	0.006	0.001	0.002	0.001	<0.01	<0.001	<0.01	0.058	<0.0001	0.3	<0.01	97	43	5	1
81438	INTERBEDDED CARB MUDSTONE AND TUFF	<0.001	0.002	<0.001	0.003	0.121	<0.001	<0.001	0.001	<0.01	<0.001	0.02	0.092	<0.0001	0.7	0.02	48	9	5	7
81439	INTERBEDDED SANDSTONE AND SILTSTONE	<0.001	0.005	<0.001	0.001	0.024	<0.001	<0.001	<0.001	<0.01	<0.001	<0.01	0.068	<0.0001	0.3	0.08	20	7	5	2
81445	CARB MUDSTONE	<0.001	0.005	<0.001	0.003	0.004	<0.001	0.003	<0.001	0.01	<0.001	<0.01	0.097	<0.0001	0.4	0.05	70	16	5	3
81450	CLAYSTONE	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.01	0.063	<0.0001	0.4	<0.01	36	7	5	<1
81455	CARB MUDSTONE	<0.001	0.003	<0.001	0.003	0.004	<0.001	0.001	<0.001	<0.01	<0.001	<0.01	0.109	<0.0001	0.2	<0.01	40	14	5	<1
Australian Water Quality Guidelines		**0.05***	**2**	**-**	**0.5**	**0.05**	**0.02**	**0.01**	**0.003**	**0.01**	**-**	**-**	**-**	**0.001**	**1.5**	**-**				
		-	**1**	**-**	**0.1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**	**-**				
		1**	**0.5^**	**-**	**-**	**0.15**	**1**	**0.1**	**-**	**0.02**	**-**	**-**	**20**	**0.002**	**2**	**-**				

Client sample ID	Lithology	Batch #	pH Value	SO4 -	Cl	Ca	Fe	Mg	Na	K	Al	Ag	As	Bi	B	Sr	Ba	Ti	Cd	Co	U
		Units	pH Unit	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
		LOD	0.01	1	1	1	0.05	1	1	1	0.01	0.001	0.001	0.001	0.05	0.001	0.001	0.01	0.0001	0.001	0.001
154038	SANDSTONE	2	7.96	19	8	2	0.06	<1	38	1	0.29	<0.001	0.036	<0.001	0.37	0.029	0.197	0.03	<0.0001	<0.001	<0.001
154041	CARB MUDSTONE	2	7.35	3	<1	2	0.19	<1	14	<1	0.64	<0.001	0.006	<0.001	0.4	0.031	0.179	0.01	<0.0001	<0.001	<0.001
154043	SILTSTONE	2	8.18	25	26	10	0.24	3	67	11	0.48	<0.001	0.008	<0.001	0.47	0.295	0.703	0.05	0.0001	<0.001	<0.001
170288	SILTSTONE	2	7.85	17	5	4	0.13	2	27	3	0.38	<0.001	0.002	<0.001	0.44	0.14	0.403	0.02	<0.0001	<0.001	0.001
GT148411	SANDSTONE	2	8.19	26	8	7	0.14	1	53	5	0.48	<0.001	0.009	<0.001	0.45	0.283	0.51	0.03	0.0001	<0.001	<0.001
169716	TUFF	2	8.2	5	1	17	0.06	3	37	6	0.14	<0.001	0.001	<0.001	0.44	0.434	0.546	<0.01	0.0001	<0.001	<0.001
81710	SANDSTONE	2	8.22	16	3	9	0.36	2	44	8	0.37	<0.001	0.025	<0.001	0.43	0.213	0.45	0.03	0.0001	<0.001	<0.001
GT148361	CARB MUDSTONE	2	8.41	189	5	24	0.17	4	157	8	0.42	<0.001	0.006	<0.001	0.6	0.626	0.622	0.04	0.0002	0.003	0.002
GT169953	TUFF	2	6.77	294	21	36	<0.05	18	81	10	0.04	<0.001	0.002	<0.001	0.67	1.39	0.659	<0.01	0.0031	1.08	<0.001
170112	SANDSTONE	2	8.24	23	2	10	0.08	3	58	10	0.36	<0.001	0.046	<0.001	0.53	0.231	0.617	0.04	0.0002	0.031	<0.001
154021	SILTSTONE	2	8.22	50	29	9	0.12	2	88	14	0.5	<0.001	0.013	<0.001	0.47	0.305	0.624	0.07	0.0002	0.008	<0.001
154272	SANDSTONE	2	7.8	14	48	2	0.2	<1	56	3	0.54	<0.001	0.004	<0.001	0.49	0.039	0.419	0.03	0.0001	0.003	<0.001
154273	SILTSTONE	2	7.41	26	53	1	0.28	<1	58	4	0.69	<0.001	0.003	<0.001	0.26	0.024	0.235	0.05	<0.0001	0.002	<0.001
169736	SANDSTONE	2	7.84	4	<1	1	0.4	<1	22	1	0.7	<0.001	0.004	<0.001	0.15	0.019	0.184	0.02	<0.0001	<0.001	<0.001
154285	MUDSTONE	2	7.7	33	6	1	0.12	<1	39	2	0.47	<0.001	0.007	<0.001	0.19	0.026	0.128	0.01	<0.0001	0.002	<0.001
182651	SILTSTONE	2	7	57	29	4	0.06	2	54	5	0.62	<0.001	0.002	<0.001	0.28	0.132	0.2	0.05	<0.0001	0.005	<0.001
GT148360	SILTSTONE	2	7.56	25	1	1	0.08	<1	22	<1	0.44	<0.001	0.002	<0.001	0.13	0.028	0.071	0.02	<0.0001	0.001	<0.001
177693	TUFF	2	7.45	3	<1	<1	0.11	<1	9	<1	0.41	<0.001	0.003	<0.001	0.11	0.014	0.06	<0.01	<0.0001	<0.001	<0.001
147284	SANDSTONE	2	8.26	17	2	3	0.07	<1	44	4	0.3	<0.001	0.044	<0.001	0.16	0.09	0.193	0.02	<0.0001	<0.001	<0.001
153301	SILTSTONE	2	8.35	5	<1	8	0.22	1	34	8	0.54	<0.001	0.004	<0.001	0.16	0.173	0.583	0.02	<0.0001	<0.001	<0.001
154262	CLAYSTONE	2	7.59	33	<1	10	<0.05	<1	16	2	0.19	<0.001	0.002	<0.001	0.16	0.104	0.163	0.03	<0.0001	<0.001	<0.001
177957	SANDSTONE	2	8.05	67	3	29	<0.05	4	17	16	0.18	<0.001	0.003	<0.001	0.05	0.511	0.075	0.03	<0.0001	0.001	<0.001
169959	SILTSTONE	2	7.62	5	<1	<1	0.36	<1	14	<1	0.73	<0.001	0.006	<0.001	0.13	0.02	0.078	0.02	<0.0001	<0.001	<0.001
169963	SANDSTONE	2	7.98	10	<1	2	0.32	<1	39	2	0.63	<0.001	0.008	<0.001	0.19	0.055	0.148	0.03	<0.0001	<0.001	<0.001
169967	CARB MUDSTONE	2	8.08	198	3	96	<0.05	21	59	10	0.13	<0.001	0.002	<0.001	0.5	1.14	0.281	<0.01	0.0004	0.004	<0.001
169602	SILTSTONE	2	7.73	43	103	7	<0.05	3	84	8	0.15	<0.001	0.002	<0.001	0.28	0.244	0.212	0.02	<0.0001	<0.001	<0.001
169606	SILTSTONE	2	7.74	8	4	<1	0.17	<1	25	1	0.42	<0.001	0.006	<0.001	0.21	0.026	0.092	<0.01	<0.0001	<0.001	<0.001
182753	SILTSTONE	2	7.21	13	11	<1	0.43	<1	22	1	0.94	<0.001	0.016	<0.001	0.22	0.029	0.149	0.03	<0.0001	<0.001	<0.001
177659	MUDSTONE	2	7.47	3	<1	<1	0.47	<1	9	<1	0.82	<0.001	0.002	<0.001	0.17	0.021	0.115	0.02	<0.0001	<0.001	<0.001
177661	SANDSTONE	2	7.19	2	<1	<1	0.33	<1	6	<1	0.63	<0.001	0.005	<0.001	0.15	0.017	0.06	0.02	<0.0001	<0.001	<0.001
177665	SILTSTONE	2	7.56	10	<1	<1	0.14	<1	15	<1	0.49	<0.001	0.03	<0.001	0.13	0.028	0.067	0.01	<0.0001	<0.001	<0.001
GT152502	SILTSTONE	2	8.32	20	7	4	0.14	<1	56	8	0.36	<0.001	0.008	<0.001	0.22	0.208	0.308	0.02	<0.0001	<0.001	<0.001
170252	CARB SILTSTONE	2	7.66	27	<1	2	0.23	<1	31	2	1.01	<0.001	0.001	<0.001	0.25	0.066	0.198	0.02	<0.0001	<0.001	<0.001
146718	CARB MUDSTONE	2	7.81	97	2	15	0.15	4	73	7	0.62	<0.001	<0.001	<0.001	0.38	0.431	0.299	0.02	<0.0001	<0.001	<0.001
GT169961	SANDSTONE	2	8.05	15	<1	1	0.23	<1	32	3	0.47	<0.001	0.007	<0.001	0.26	0.056	0.143	<0.01	<0.0001	<0.001	<0.001
GT169962	SANDSTONE	2	8.33	12	<1	2	0.42	<1	48	4	0.48	<0.001	0.002	<0.001	0.25	0.062	0.193	<0.01	<0.0001	<0.001	<0.001
147478	TUFF	2	7.1	165	2	44	0.11	6	32	6	0.17	<0.001	0.005	<0.001	0.36	0.49	0.23	<0.01	0.0001	0.117	<0.001
177688	SANDSTONE	2	8.57	10	1	3	1.18	<1	49	2	1.36	<0.001	0.005	<0.001	0.25	0.067	0.209	0.02	<0.0001	0.003	<0.001
CQ146995	COAL	2	7.31	6	<1	<1	0.23	<1	17	<1	0.88	<0.001	<0.001	<0.001	0.34	0.031	0.144	<0.01	<0.0001	0.002	<0.001
CQ146996	COAL	2	7.57	13	4	26	0.12	3	87	3	0.46	<0.001	<0.001	<0.001	1.91	0.608	0.743	<0.01	<0.0001	0.004	<0.001
CQ146999	COAL	2	7.95	13	3	26	<0.05	3	116	5	0.32	<0.001	<0.001	<0.001	0.87	0.82	0.93	0.03	<0.0001	0.002	<0.001

Client sample ID	Lithology	Cr	Cu	Th	Mn	Mo	Ni	Pb	Sb	Se	Sn	V	Zn	Hg	F	Total P
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
		0.001	**0.001**	**0.001**	**0.001**	**0.001**	**0.001**	**0.001**	**0.001**	**0.01**	**0.001**	**0.01**	**0.005**	**0.0001**	**0.1**	**0.01**
154038	SANDSTONE	<0.001	0.002	<0.001	0.011	0.034	0.002	<0.001	<0.001	<0.01	<0.001	0.01	0.072	<0.0001	0.5	0.03
154041	CARB MUDSTONE	0.002	0.001	<0.001	0.006	0.019	0.001	<0.001	<0.001	<0.01	<0.001	0.02	0.067	<0.0001	0.2	0.04
154043	SILTSTONE	<0.001	0.003	<0.001	0.018	0.036	0.002	<0.001	0.003	<0.01	<0.001	<0.01	0.393	<0.0001	0.7	0.03
170288	SILTSTONE	<0.001	0.002	<0.001	0.008	0.062	0.002	<0.001	0.001	<0.01	<0.001	<0.01	0.25	<0.0001	0.3	0.05
GT148411	SANDSTONE	<0.001	0.003	<0.001	0.006	0.087	0.001	<0.001	0.002	<0.01	<0.001	0.02	0.266	<0.0001	0.7	<0.01
169716	TUFF	<0.001	0.002	<0.001	0.017	0.037	<0.001	<0.001	<0.001	<0.01	<0.001	<0.01	0.316	<0.0001	1.2	0.04
81710	SANDSTONE	<0.001	0.002	<0.001	0.026	0.066	0.002	<0.001	0.001	<0.01	<0.001	0.02	0.29	<0.0001	0.6	0.1
GT148361	CARB MUDSTONE	<0.001	0.003	<0.001	0.03	0.351	0.004	<0.001	0.002	0.23	<0.001	0.02	0.756	<0.0001	0.6	0.03
GT169953	TUFF	<0.001	0.008	<0.001	0.172	0.004	0.807	<0.001	<0.001	0.01	<0.001	<0.01	3.54	<0.0001	0.4	0.01
170112	SANDSTONE	0.001	0.004	<0.001	0.011	0.069	0.025	<0.001	0.003	<0.01	<0.001	0.02	0.452	<0.0001	0.8	0.01
154021	SILTSTONE	<0.001	0.004	<0.001	0.014	0.049	0.007	<0.001	0.005	0.01	<0.001	0.01	0.515	<0.0001	0.7	0.03
154272	SANDSTONE	0.001	0.002	<0.001	0.007	0.002	0.003	0.001	0.001	<0.01	<0.001	0.02	0.258	<0.0001	1	0.02
154273	SILTSTONE	0.001	0.002	<0.001	0.007	0.002	0.002	0.001	0.002	<0.01	<0.001	<0.01	0.119	<0.0001	0.8	0.03
169736	SANDSTONE	<0.001	<0.001	<0.001	0.004	0.005	<0.001	<0.001	<0.001	<0.01	<0.001	0.01	0.07	<0.0001	0.4	<0.01
154285	MUDSTONE	<0.001	0.001	<0.001	0.002	0.005	0.002	<0.001	0.001	<0.01	<0.001	0.01	0.097	<0.0001	0.5	0.02
182651	SILTSTONE	<0.001	<0.001	<0.001	0.009	0.003	0.009	<0.001	0.004	<0.01	<0.001	0.01	0.131	<0.0001	0.2	0.01
GT148360	SILTSTONE	<0.001	<0.001	<0.001	0.001	0.021	0.001	<0.001	<0.001	<0.01	<0.001	<0.01	0.051	<0.0001	0.2	0.02
177693	TUFF	<0.001	<0.001	<0.001	<0.001	0.003	<0.001	<0.001	<0.001	<0.01	<0.001	<0.01	0.047	<0.0001	0.3	0.02
147284	SANDSTONE	<0.001	<0.001	<0.001	0.001	0.066	0.001	<0.001	0.002	<0.01	<0.001	0.02	0.052	<0.0001	0.6	0.04
153301	SILTSTONE	<0.001	<0.001	<0.001	0.005	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	0.01	0.054	<0.0001	0.5	0.05
154262	CLAYSTONE	<0.001	<0.001	<0.001	0.008	0.016	<0.001	<0.001	0.001	0.02	<0.001	<0.01	0.086	<0.0001	0.3	0.05
177957	SANDSTONE	<0.001	<0.001	<0.001	0.093	0.014	<0.001	<0.001	0.001	<0.01	<0.001	<0.01	0.018	<0.0001	0.3	0.03
169959	SILTSTONE	<0.001	<0.001	<0.001	0.005	0.01	<0.001	<0.001	<0.001	<0.01	<0.001	<0.01	0.043	<0.0001	0.2	<0.01
169963	SANDSTONE	<0.001	0.001	<0.001	0.007	0.015	<0.001	<0.001	<0.001	<0.01	<0.001	0.02	0.042	<0.0001	0.3	0.04
169967	CARB MUDSTONE	<0.001	0.002	<0.001	0.051	0.048	0.003	<0.001	0.002	0.07	<0.001	0.1	0.34	<0.0001	0.6	<0.01
169602	SILTSTONE	<0.001	<0.001	<0.001	0.007	0.021	0.001	<0.001	0.002	<0.01	<0.001	0.02	0.072	<0.0001	0.6	<0.01
169606	SILTSTONE	<0.001	<0.001	<0.001	0.004	0.017	0.001	<0.001	<0.001	<0.01	<0.001	<0.01	0.034	<0.0001	0.3	<0.01
182753	SILTSTONE	0.001	<0.001	<0.001	0.008	0.012	0.001	<0.001	<0.001	<0.01	<0.001	0.02	0.053	<0.0001	0.4	<0.01
177659	MUDSTONE	<0.001	<0.001	<0.001	0.006	0.005	<0.001	<0.001	<0.001	<0.01	<0.001	<0.01	0.046	<0.0001	0.2	<0.01
177661	SANDSTONE	<0.001	<0.001	<0.001	0.004	0.004	<0.001	<0.001	<0.001	<0.01	<0.001	<0.01	0.024	<0.0001	0.1	<0.01
177665	SILTSTONE	<0.001	<0.001	<0.001	0.002	0.062	<0.001	<0.001	0.001	<0.01	<0.001	0.02	0.028	<0.0001	0.2	<0.01
GT152502	SILTSTONE	<0.001	<0.001	<0.001	0.005	0.029	<0.001	<0.001	0.002	<0.01	<0.001	<0.01	0.051	<0.0001	0.7	<0.01
170252	CARB SILTSTONE	<0.001	0.003	<0.001	0.004	0.015	<0.001	<0.001	<0.001	0.03	<0.001	0.02	0.08	<0.0001	0.3	<0.01
146718	CARB MUDSTONE	<0.001	0.002	<0.001	0.016	0.02	<0.001	<0.001	<0.001	0.04	<0.001	0.05	0.309	<0.0001	0.3	<0.01
GT169961	SANDSTONE	<0.001	<0.001	<0.001	0.006	0.014	<0.001	<0.001	<0.001	<0.01	<0.001	<0.01	0.044	<0.0001	0.3	0.01
GT169962	SANDSTONE	<0.001	<0.001	<0.001	0.011	0.01	<0.001	<0.001	<0.001	<0.01	<0.001	0.01	0.04	<0.0001	0.3	<0.01
147478	TUFF	<0.001	<0.001	<0.001	0.077	0.048	0.024	<0.001	<0.001	0.18	<0.001	0.02	0.26	<0.0001	0.3	<0.01
177688	SANDSTONE	<0.001	<0.001	<0.001	0.029	0.03	0.002	<0.001	<0.001	<0.01	<0.001	0.02	0.072	<0.0001	0.3	0.02
CQ146995	COAL	<0.001	<0.001	0.002	0.003	0.01	<0.001	<0.001	<0.001	<0.01	<0.001	<0.01	0.06	<0.0001	0.2	0.02
CQ146996	COAL	<0.001	0.001	<0.001	0.039	0.027	0.001	<0.001	<0.001	<0.01	<0.001	<0.01	0.477	<0.0001	0.2	<0.01
CQ146999	COAL	0.002	<0.001	<0.001	0.013	0.034	<0.001	<0.001	<0.001	0.03	<0.001	0.01	0.473	<0.0001	0.4	<0.01

Client sample ID	Lithology	Batch #	pH Value	SO4 -	Cl	Ca	Fe	Mg	Na	K	Al	Ag	As	Bi	B	Sr	Ba	Ti	Cd	Co	U
		Units	pH Unit	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
		LOD	0.01	1	1	1	0.05	1	1	1	0.01	0.001	0.001	0.001	0.05	0.001	0.001	0.01	0.0001	0.001	0.001
CQ172805	COAL	2	7.96	11	2	62	<0.05	6	101	6	0.09	<0.001	<0.001	<0.001	1.11	1.71	0.981	<0.01	<0.0001	0.001	<0.001
CQ172806	CLAYSTONE	2	8.24	4	<1	<1	0.09	<1	20	<1	0.4	<0.001	0.004	<0.001	0.23	0.019	0.151	<0.01	<0.0001	<0.001	<0.001
CQ172809	COAL	2	7.93	6	<1	2	0.2	<1	31	1	0.71	<0.001	<0.001	<0.001	0.42	0.064	0.277	<0.01	<0.0001	<0.001	<0.001
CQ172813	COAL	2	7.72	5	2	2	0.19	<1	39	2	0.54	<0.001	<0.001	<0.001	0.78	0.075	0.508	0.01	0.0002	<0.001	<0.001
CQ172654	COAL	2	7.86	78	5	133	<0.05	14	35	6	0.04	<0.001	<0.001	<0.001	1.08	1.14	0.307	<0.01	<0.0001	0.004	<0.001
CQ14763	COAL	2	5.75	152	2	34	<0.05	4	47	5	0.03	<0.001	0.009	<0.001	0.62	0.488	0.156	<0.01	0.0004	0.911	<0.001
2220	COAL	2	7.78	4	<1	<1	0.08	<1	14	<1	0.35	<0.001	0.004	<0.001	0.16	0.014	0.114	<0.01	<0.0001	0.006	<0.001
2223	COAL	2	8.15	33	4	20	<0.05	2	107	5	0.06	<0.001	0.001	<0.001	2.14	0.642	0.47	<0.01	<0.0001	<0.001	<0.001
14966	SANDY CLAY	2	7.03	10	37	<1	0.91	<1	35	<1	0.85	<0.001	<0.001	<0.001	0.33	0.02	0.112	0.01	<0.0001	<0.001	<0.001
14967	SANDY CLAY	2	9.17	28	78	2	1.36	1	129	5	0.98	<0.001	0.014	<0.001	0.2	0.023	0.375	0.02	<0.0001	<0.001	<0.001
14969	SANDY CLAY	2	7.53	65	561	3	<0.05	7	373	10	0.14	<0.001	0.001	<0.001	0.26	0.083	0.442	<0.01	<0.0001	<0.001	<0.001
14976	CLAYEY SAND	2	8.53	38	40	4	0.32	4	134	4	0.63	<0.001	0.004	<0.001	0.87	0.104	0.404	0.02	<0.0001	<0.001	0.001
204802	COAL	2	6.69	285	5	20	<0.05	27	90	4	0.18	<0.001	0.025	<0.001	1.28	0.339	0.293	0.02	<0.0001	0.142	<0.001
204804	COAL	2	6.97	48	5	4	<0.05	4	52	2	0.41	<0.001	0.004	<0.001	0.87	0.073	0.292	0.04	<0.0001	0.027	<0.001
154275	SANDSTONE	2	7.35	25	48	1	<0.05	<1	49	2	0.24	<0.001	0.015	<0.001	0.18	0.033	0.137	0.07	<0.0001	<0.001	<0.001
Australian Water Quality Guidelines		**Health**	-	**500**	-	-	-	-	-	-	-	**0.1**	**0.007**	-	**4**	-	**0.7**	-	**0.002**	-	**0.02**
		Aesthetic	**6.5 - 8.5**	**250**	**250**	-	**0.3**	-	**180**	-	**0.2**	-	-	-	-	-	-	-	-	-	-
		Stock	-	**1000**	-	**1000**	-	-	-	-	**5**	-	**0.5**	-	**5**	-	-	-	**0.01**	-	**0.2**

* As Cr (VI)

** Total Cr

^ Sheep (strictest guideline)

Client sample ID	Lithology	Cr	Cu	Th	Mn	Mo	Ni	Pb	Sb	Se	Sn	V	Zn	Hg	F	Total P
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
		0.001	**0.001**	**0.001**	**0.001**	**0.001**	**0.001**	**0.001**	**0.001**	**0.01**	**0.001**	**0.01**	**0.005**	**0.0001**	**0.1**	**0.01**
CQ172805	COAL	<0.001	<0.001	<0.001	0.049	0.064	<0.001	<0.001	0.001	<0.01	<0.001	0.02	0.381	<0.0001	0.4	<0.01
CQ172806	CLAYSTONE	<0.001	<0.001	<0.001	<0.001	0.003	<0.001	<0.001	0.001	<0.01	0.001	0.02	0.042	<0.0001	0.6	<0.01
CQ172809	COAL	<0.001	<0.001	<0.001	0.002	0.01	<0.001	<0.001	<0.001	<0.01	<0.001	<0.01	0.081	<0.0001	0.3	<0.01
CQ172813	COAL	<0.001	0.002	<0.001	0.003	0.015	<0.001	<0.001	<0.001	<0.01	<0.001	<0.01	0.268	<0.0001	0.3	<0.01
CQ172654	COAL	<0.001	<0.001	<0.001	0.443	0.106	0.001	<0.001	<0.001	0.01	<0.001	0.02	0.031	<0.0001	0.7	<0.01
CQ14763	COAL	<0.001	0.002	<0.001	0.275	0.008	0.548	<0.001	<0.001	0.12	<0.001	<0.01	0.059	<0.0001	<0.1	<0.01
2220	COAL	<0.001	<0.001	<0.001	0.002	0.009	0.004	<0.001	0.001	<0.01	<0.001	<0.01	0.037	<0.0001	0.4	<0.01
2223	COAL	<0.001	<0.001	<0.001	0.009	0.042	<0.001	<0.001	<0.001	0.02	<0.001	<0.01	0.243	<0.0001	0.5	0.02
14966	SANDY CLAY	0.002	<0.001	<0.001	0.003	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.01	0.055	<0.0001	0.4	0.01
14967	SANDY CLAY	0.002	0.002	<0.001	0.053	0.004	<0.001	<0.001	<0.001	<0.01	<0.001	0.07	0.034	<0.0001	1	0.07
14969	SANDY CLAY	<0.001	<0.001	<0.001	0.216	0.004	<0.001	<0.001	<0.001	<0.01	<0.001	<0.01	0.067	<0.0001	1	<0.01
14976	CLAYEY SAND	<0.001	0.001	<0.001	0.044	0.005	<0.001	<0.001	<0.001	<0.01	<0.001	0.03	0.058	<0.0001	4.4	0.03
204802	COAL	<0.001	<0.001	<0.001	0.249	0.002	0.119	<0.001	0.003	0.04	<0.001	<0.01	0.422	<0.0001	0.2	0.02
204804	COAL	<0.001	<0.001	<0.001	0.056	0.004	0.028	<0.001	<0.001	<0.01	<0.001	<0.01	0.355	<0.0001	0.3	<0.01
154275	SANDSTONE	<0.001	<0.001	<0.001	0.004	0.011	<0.001	<0.001	<0.001	<0.01	<0.001	<0.01	0.027	<0.0001	0.5	<0.01
Australian Water Quality Guidelines		**0.05***	**2**	**-**	**0.5**	**0.05**	**0.02**	**0.01**	**0.003**	**0.01**	**-**	**-**	**-**	**0.001**	**1.5**	**-**
		-	**1**	**-**	**0.1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**	**-**
		1**	**0.5^**	**-**	**-**	**0.15**	**1**	**0.1**	**-**	**0.02**	**-**	**-**	**20**	**0.002**	**2**	**-**

* As Cr (VI)

** Total Cr

^ Sheep (strictest guideline)

Appendix F: Dispersivity data

Batch #	Sample ID	From	To	Length	Lithology	Weathering	Lithology Group	Emerson Class	Electrical Conductivity (µS/cm)	Cation Exchange Capacity	Exchangeable Ca	Exchangeable Mg	Exchangeable K	Exchangeable Na	Exchangeable Na Percent
		m	m	m					µS/cm	meq/100g	meq/100g	meq/100g	meq/100g	meq/100g	%
1	81351	50.48	50.71	0.23	SANDSTONE	MW	REMAINING	5							
1	81355	105.80	106.34	0.54	CARB MUDSTONE	FR	CARBONACEOUS	5	37	3.9	2.3	0.8	<0.1	0.7	17.2
1	81356	5.58	6.51	0.93	CLAY	EW	CLAY AND SOIL	1	2910	44.2	13.1	10.9	0.6	19.6	44.4
1	81357	34.27	34.90	0.63	CLAYSTONE	HW	REMAINING	2	790	5.2	0.8	1.6	0.1	2.8	53
1	81362	30.00	30.42	0.42	CLAYSTONE	HW	REMAINING	1							
1	81363	43.31	44.26	0.95	SANDSTONE	MW	REMAINING	6	525	2.2	1.5	0.3	<0.1	0.3	12.3
1	81365	14.22	15.08	0.86	CLAY	HW	CLAY AND SOIL	2	2030	9.8	1.4	2.8	<0.1	5.6	56.7
1	81367	54.96	55.36	0.4	SILTSTONE	SW	REMAINING	5	668	26.8	14.8	8	0.6	3.4	12.7
1	81370	92.42	92.89	0.47	COAL	FR	COAL GROUP	5							
1	81371	96.83	97.88	1.05	SILTSTONE	FR	REMAINING	3	584	37.2	26.5	6	0.8	3.8	10.2
1	81379	253.43	253.77	0.34	SILTSTONE	FR	REMAINING	3							
1	81382	298.14	298.27	0.13	COAL	FR	COAL GROUP	5	443	5.9	3	1.3	<0.1	1.4	24.8
1	81394	4.36	4.55	0.19	CLAY	EW	CLAY AND SOIL	6	3740	206	192	6	0.3	7.8	3.8
1	81396	5.43	5.81	0.38	CLAY	HW	CLAY AND SOIL	5							
1	81397	46.63	47.00	0.37	CLAYSTONE	HW	REMAINING	5	1170	26.7	8.8	7.1	0.5	10.3	38.7
1	81400	64.38	65.23	0.85	CARB MUDSTONE	SW	CARBONACEOUS	2							
1	81401	67.70	68.21	0.51	MUDSTONE	FR	REMAINING	5	158	4.3	1.2	2.4	0.2	0.5	12.1
1	81403	98.70	99.45	0.75	MUDSTONE	FR	REMAINING	5							
1	81404	107.00	107.57	0.57	SANDSTONE	FR	REMAINING	5	437	3.2	1.5	0.4	<0.1	1.1	35
1	81405	85.97	86.88	0.91	SANDSTONE	FR	REMAINING	5							
1	81406	96.55	97.14	0.59	CARB MUDSTONE	FR	CARBONACEOUS	5							
1	81410	258.26	259.19	0.93	SANDSTONE	FR	REMAINING	5							
1	81418	356.16	356.93	0.77	SILTSTONE	FR	REMAINING	5	376	15.7	12.6	0.9	0.3	1.8	11.6
1	81436	444.40	445.79	1.39	SANDSTONE	FR	REMAINING	4							
1	81438	463.00	465.26	2.26	CARB MUDSTN AND TUFF	FR	CARBONACEOUS	5							
1	81450	75.20	75.99	0.79	CLAYSTONE	EW	REMAINING	5							
1	81453	169.96	171.24	1.28	CLAYSTONE	FR	REMAINING	5	195	25.5	17.5	4.2	0.6	3.2	12.5
1	81455	366.80	367.73	0.93	CARB MUDSTONE	FR	CARBONACEOUS	5							
2	154038	122.12	122.39	0.27	SANDSTONE	F	REMAINING	3							
2	154041	138.15	138.42	0.27	CARB MUDSTONE	F	CARBONACEOUS	3	380	13.4	7.6	2.9	0.7	2.2	16.6
2	154043	146.44	146.75	0.31	SILTSTONE	F	REMAINING	5							
2	170286	74.3	74.59	0.29	CLAYSTONE	F	REMAINING	5							
2	170288	85.89	86.19	0.3	SILTSTONE	F	REMAINING	3							
2	GT148411	136.78	137.08	0.3	SANDSTONE	F	REMAINING	4	156	14.9	13.3	0.8	0.3	0.4	2.7
2	204851	52.01	52.32	0.31	SANDSTONE	F	REMAINING	5	42	0.9	0.3	0.4	<0.1	0.1	13.1
2	169716	216.88	217.17	0.29	TUFF	F	REMAINING	4	94	14.4	13.1	0.9	0.2	0.2	1.3
2	81710	105.84	106.08	0.24	SANDSTONE	F	REMAINING	4	137	22.7	21.2	1	0.3	0.2	0.9
2	154255	84.8	85.05	0.25	SANDSTONE	F	REMAINING	4							
2	148393	80.75	81.05	0.3	SANDSTONE	F	REMAINING	5							
2	153308	252.9	253.19	0.29	SANDSTONE	F	REMAINING	5							
2	GT169953	63.4	63.7	0.3	TUFF	F	REMAINING	6							
2	GT148412	140.77	141.03	0.26	SILTSTONE	F	REMAINING	3							
2	170112	124.92	125.66	0.74	SANDSTONE	F	REMAINING	5	152	11	8.3	1.9	0.4	0.4	3.5
2	154021	147.92	148.28	0.36	SILTSTONE	F	REMAINING	3							
2	169713	208.21	208.56	0.35	SANDSTONE	F	REMAINING	5							
2	154272	72.01	72.35	0.34	SANDSTONE	F	REMAINING	3	268	5.8	2.2	2.1	0.2	1.3	21.8
2	154273	76.33	76.63	0.3	SILTSTONE	F	REMAINING	3							

Batch #	Sample ID	From	To	Length	Lithology	Weathering	Lithology Group	Emerson Class	Electrical Conductivity (µS/cm)	Cation Exchange Capacity	Exchangeable Ca	Exchangeable Mg	Exchangeable K	Exchangeable Na	Exchangeable Na Percent
		m	m	m					µS/cm	meq/100g	meq/100g	meq/100g	meq/100g	meq/100g	%
2	154284	141	141.3	0.3	SANDSTONE	F	REMAINING	5							
2	182651	55.29	55.57	0.28	SILTSTONE	F	REMAINING	5							
2	GT148360	150.84	151.11	0.27	SILTSTONE	F	REMAINING	3	410	11.1	6.7	1.7	0.5	2.2	19.9
2	177687	121.68	122.02	0.34	SANDSTONE	F	REMAINING	3	272	29	26.4	0.6	0.4	1.7	5.8
2	177693	173.28	173.53	0.25	TUFF	F	REMAINING	3	311	20	16.2	1.2	0.4	2.2	11.1
2	147284	220.2	220.48	0.28	SANDSTONE	F	REMAINING	3							
2	148388	51.97	52.3	0.33	CLAY	W	CLAY AND SOIL	2	72	2.2	0.7	1.1	0.2	0.4	15.9
2	153301	167.94	168.19	0.25	SILTSTONE	F	REMAINING	5	109	28.2	26.8	1.1	0.3	0.1	0.5
2	154261	154.77	155.07	0.3	CLAYSTONE	F	REMAINING	6	508	7.6	6.5	0.5	0.3	0.3	4
2	154262	156.53	156.79	0.26	CLAYSTONE	F	REMAINING	5							
2	154270	193.96	194.21	0.25	MUDSTONE	F	REMAINING	5	117	6.6	6.2	<0.1	0.1	0.2	3.4
2	146738	107.94	108.26	0.32	SANDSTONE	F	REMAINING	5	145	18.7	18.1	0.4	0.1	<0.1	0.4
2	177957	206.38	206.78	0.4	SANDSTONE	F	REMAINING	5	140	2	1.6	0.3	<0.1	<0.1	1.7
2	153334	146.22	146.48	0.26	SANDSTONE	F	REMAINING	3							
2	152623	103.1	103.44	0.34	SANDSTONE	F	REMAINING	6							
2	169959	93.32	93.58	0.26	SILTSTONE	F	REMAINING	3							
2	169963	118.61	119	0.39	SANDSTONE	F	REMAINING	3	232	37.1	27.1	6.2	0.8	3.1	8.3
2	169606	96.5	96.8	0.3	SILTSTONE	F	REMAINING	3							
2	182753	77.54	77.9	0.36	SILTSTONE	F	REMAINING	3	216	8.3	4.2	2.5	0.4	1.3	15.5
2	177659	125.13	125.4	0.27	MUDSTONE	F	REMAINING	3	157	10.1	6.9	0.9	0.4	1.9	19
2	177665	165.62	165.99	0.37	SILTSTONE	F	REMAINING	3	383	28.8	25.4	0.9	0.4	2.2	7.6
2	GT152502	188.21	188.5	0.29	SILTSTONE	F	REMAINING	3	170	26.8	24.6	1.3	0.4	0.4	1.6
2	170252	157.37	157.59	0.22	CARB SILTSTONE	F	CARBONACEOUS	3	228	6.3	3.7	1.2	0.4	1	15.1
2	170289	91.01	91.33	0.32	SANDSTONE	F	REMAINING	4							
2	146717	190.72	190.94	0.22	MUDSTONE	F	REMAINING	3	423	5.3	3.9	0.4	0.3	0.7	12.5
2	GT169961	107.05	107.36	0.31	SANDSTONE	F	REMAINING	2							
2	GT169962	113.21	113.52	0.31	SANDSTONE	F	REMAINING	4							
2	182759	100.91	101.19	0.28	SANDSTONE	F	REMAINING	4							
2	GT147593	137.85	138.19	0.34	SILTSTONE	F	REMAINING	5							
2	177688	128.16	128.48	0.32	SANDSTONE	F	REMAINING	3	244	33.5	30.1	1.5	0.4	1.6	4.7
2	154040	128	128.31	0.31	SILTSTONE	F	REMAINING	3							
2	CQ172806	197.93	198.23	0.3	CLAYSTONE	F	REMAINING	3	327	8.6	6	0.4	0.2	1.9	21.9
2	CQ172655	212.26	212.53	0.27	SILTSTONE	F	REMAINING	4	400	13.7	11.9	1.3	0.2	0.2	1.8
2	2209	195.21	195.52	0.31	COAL	F	COAL	3	170	28.9	27.8	0.6	<0.1	0.4	1.4
2	2220	198.75	199.14	0.39	COAL	F	COAL	3							
2	2221	199.14	199.5	0.36	COAL	F	COAL	3	213	8.8	6.9	0.5	0.2	1.1	12.3
2	14965	1.33	1.66	0.33	CLAYEY SAND	E	CLAY AND SOIL	2	661	39.4	31.2	5.7	1.3	1.2	3.1
2	14966	6.1	6.47	0.37	SANDY CLAY	M	REMAINING	2							
2	14967	9	9.34	0.34	SANDY CLAY	M	REMAINING	3	370	18.2	7.9	8.8	0.5	1.1	6
2	14969	15.7	16	0.3	SANDY CLAY	M	REMAINING	2	845	2.2	0.2	1.1	0.1	0.7	32.2
2	14970	21.58	21.93	0.35	CLAYEY SAND	M	CLAY AND SOIL	1	1580	14.4	1.3	6.4	1.1	5.6	39.2
2	14971	29.37	29.68	0.31	CLAY	E	CLAY AND SOIL	2	1370	10.7	1.3	4.8	0.4	4.2	39.6
2	14973	34.4	34.74	0.34	SANDY CLAY	E	REMAINING	2	454	17	3	7.3	0.8	5.9	34.8
2	14975	0	0.3	0.3	SOIL	E	CLAY AND SOIL	5							
2	14976	0.76	1.08	0.32	CLAYEY SAND	D	CLAY AND SOIL	1							

Appendix G: Accelerated weathering test

Accelerated Weathering Test

Sample Number	Lab #	Borehole	Depth From	Depth To	Lithology	Weathering	Emerson	CEC, ESP & EC
81364	#14	C024C	89.67	90.44	Sandstone	FR	Nondispersive	Nondispersive
81402	#51	C041C	76.35	76.9	Mudstone	FR	Nondispersive	Marginal/ nondispersive
81414	#62	C046C	321.42	322.27	Siltstone	FR	Marginal	Marginal?
81450	#90	C056C	75.2	75.99	Claystone	EW	Dispersive	Dispersive

Three tests performed:

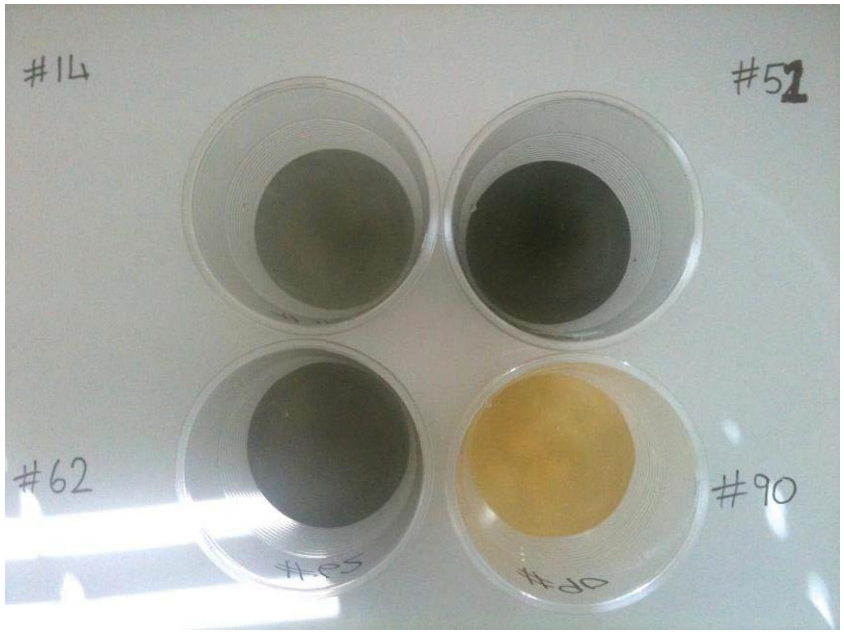
- Static durability test
- Wet/dry test
- Dynamic durability test

Static durability samples

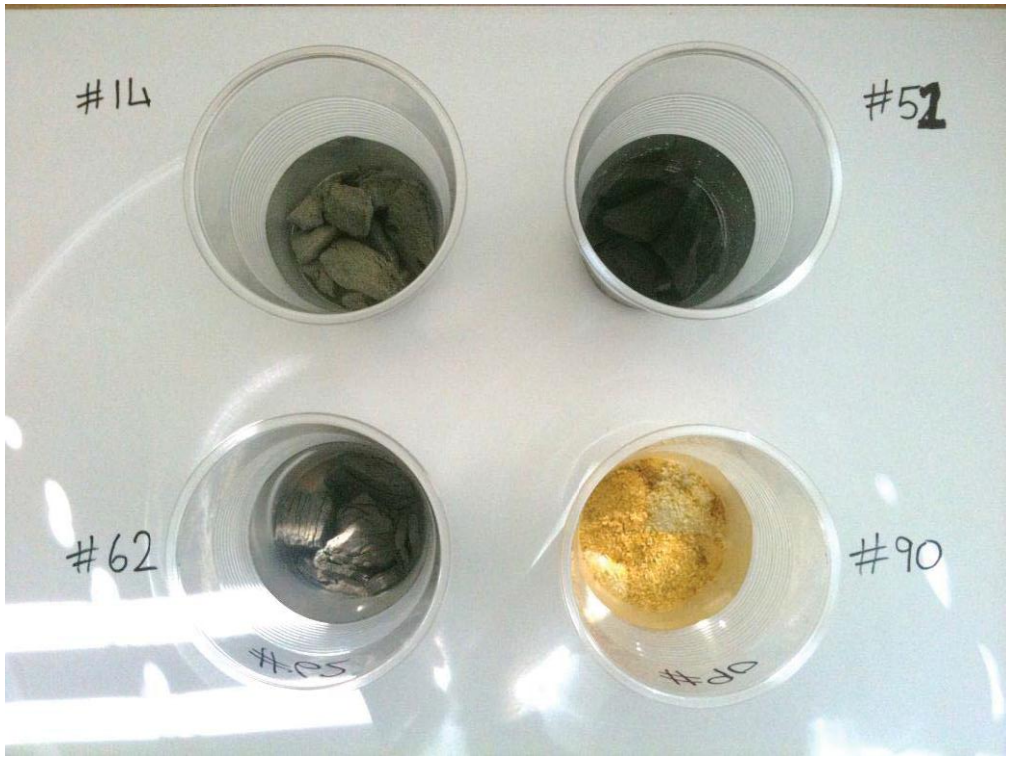
Time	Date	#14- Sandstone	#51 - Mudstone	#62 - Siltstone	#90- HW Claystone
5 minutes	1 March	Solution very cloudy	Solution very cloudy	Solution very cloudy	Solution very cloudy
1 hour	1 March	Cloudiness settling.	Cloudiness settling.	Cloudiness settling.	Cloudiness settling. Sample slaking.
1 day	2 March	Solution clear. Cracks appearing in fragments.	Solution clear No change in fragments.	Hint of cloudiness in solution. Fragments starting to cleave along bedding planes	Solution clear. All fragments have slaked completely.
5 days	5 March	Solution clear. Fragments show minor cracking, especially on edges.	Solution clear No change in fragments. Very minor slaking (thin layer of clay on bottom of container)	Bare hint of cloudiness in solution. Fragments starting to cleave and separate along bedding planes	Solution clear. All fragments have slaked completely.
10 days	12 March	No change	No change	No change	No change – colours of different fragments blending together
19 days	19 March	No change	No change	No change	Colours of different fragments blending together

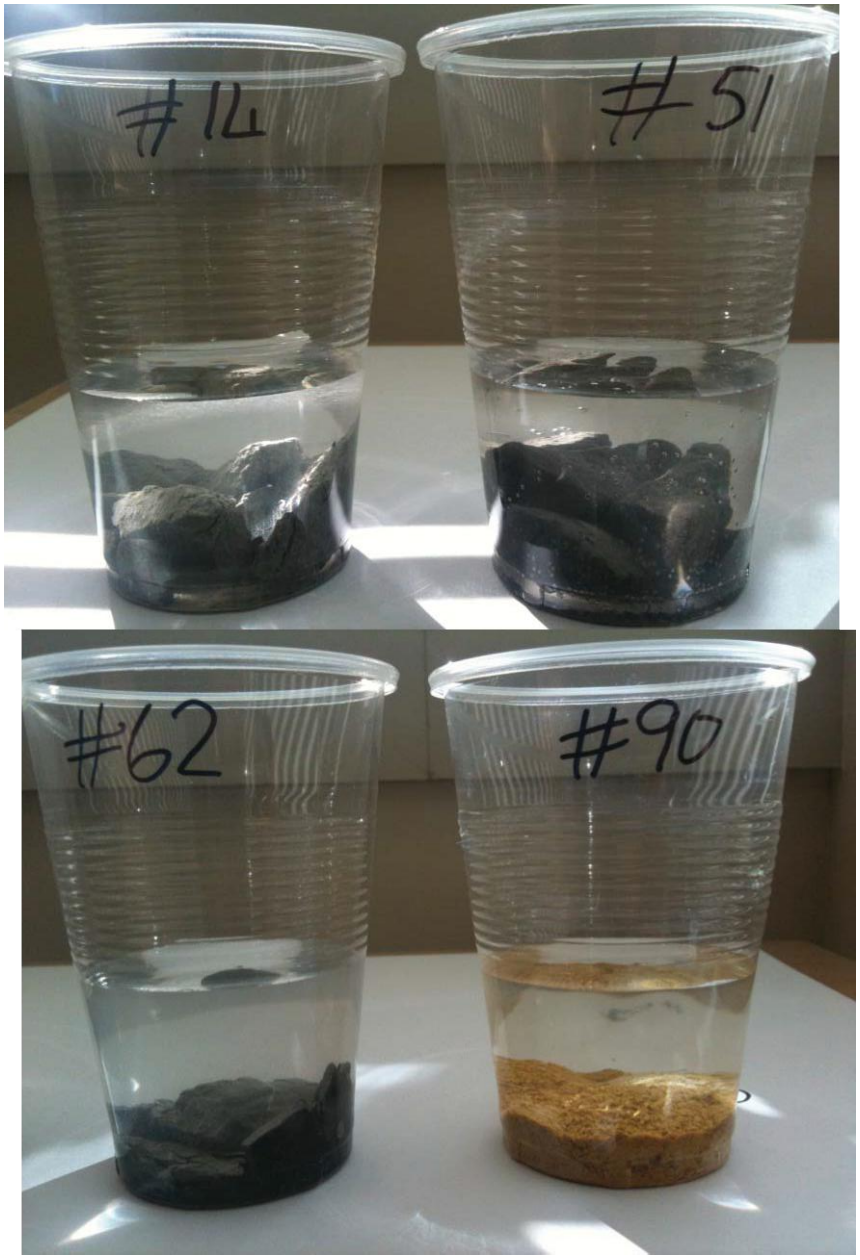
Samples submerged in water, thereafter not disturbed. Water was gently topped up when required.

Static durability: 1 hour



Static durability : Day 1



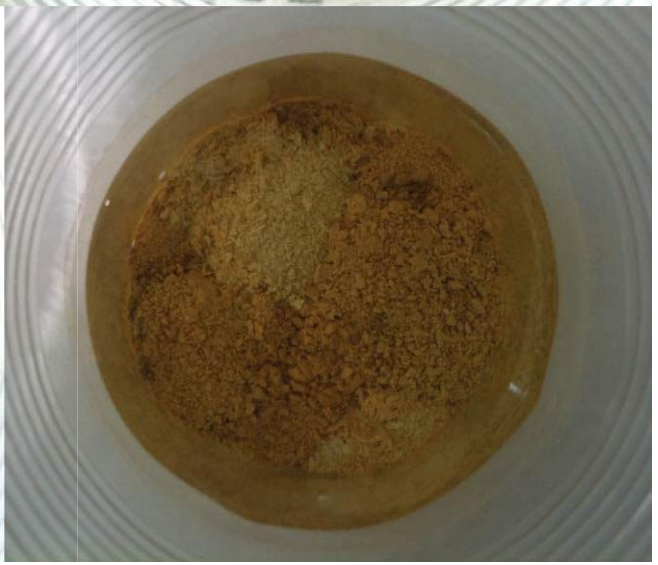


Static durability samples – Day 7

#14

#51

#62



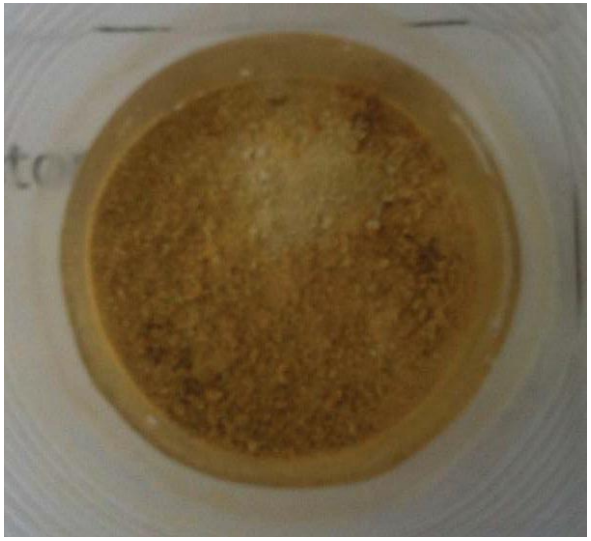
#90

Static durability samples – Day 12

#14

#51

#62



#90

Static durability samples: Day 19

#14

#51

#62

#90

Daily wet/ dry samples

Time	Date	#14- Sandstone	#51 - Mudstone	#62 - Siltstone	#90- HW Claystone
1 hour	1 March	No change	No change	No change	Fragments starting to slake
1 day	2 March	Minor slaking of fragments	No change	Cracks forming in fragments	Fragments starting to slake, but fragment shape still visible.
5 days	7 March	Fragments looking pitted as particles flake off. Minor cracks appearing in some fragments	Minor clay fraction present at base of cup, no noticeable change to fragments	Fragments are breaking into smaller fragments, small clay/silt fraction at base of cup	Fragments completely slaked, but fragment shape still visible.
10 days	12 March	Fragments looking more pitted, some cracks appear larger.	No noticeable change	As above, but showing more deterioration of fragments	Fragments completely slaked, fragment shape becoming indistinct
19 days	19 March	Fragments looking more pitted, some cracks appear larger.	No noticeable change	As above, but showing more deterioration of fragments	Fragments completely slaked, fragment shape lost

Samples just covered in water, allowed to dry out before covered in water again. Process repeated as required.

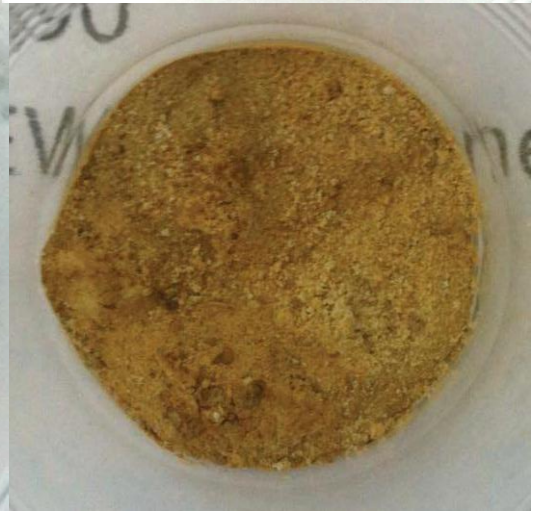
Wet/ dry samples: Day 1

Wet/ dry samples: Day 7

#14

#51

#62



#90

Wet/ dry samples: Day 12

#14

#51

#62

#90

Wet/ dry samples: Day 19

#14

#51

#62

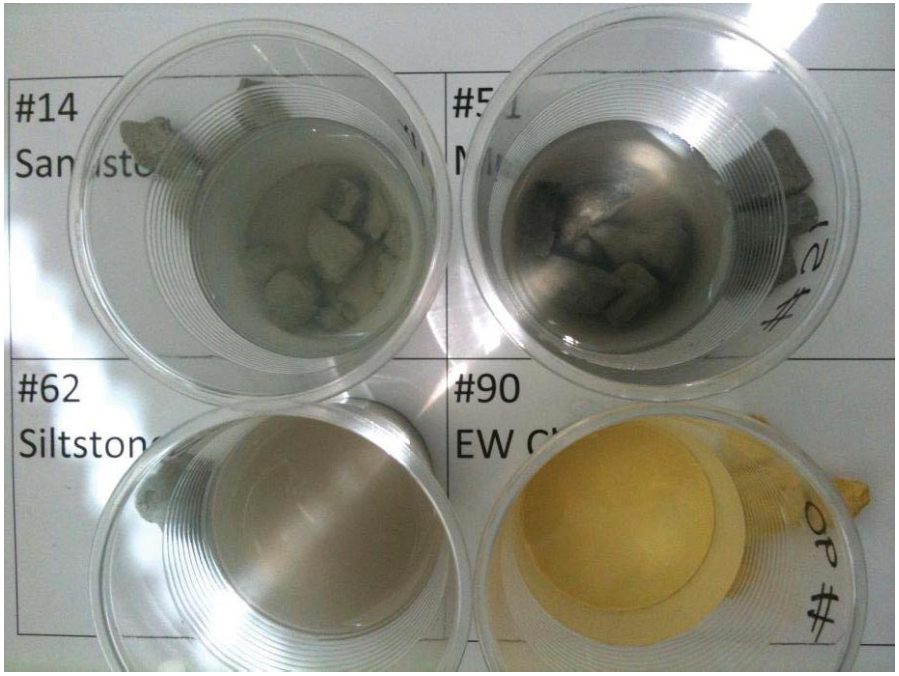
#90

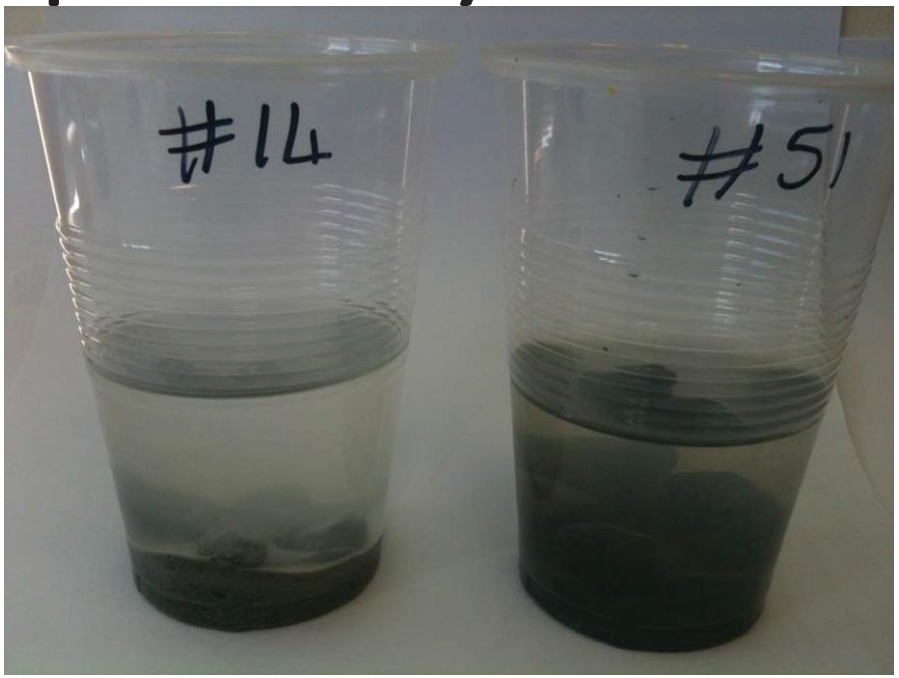
Agitated samples

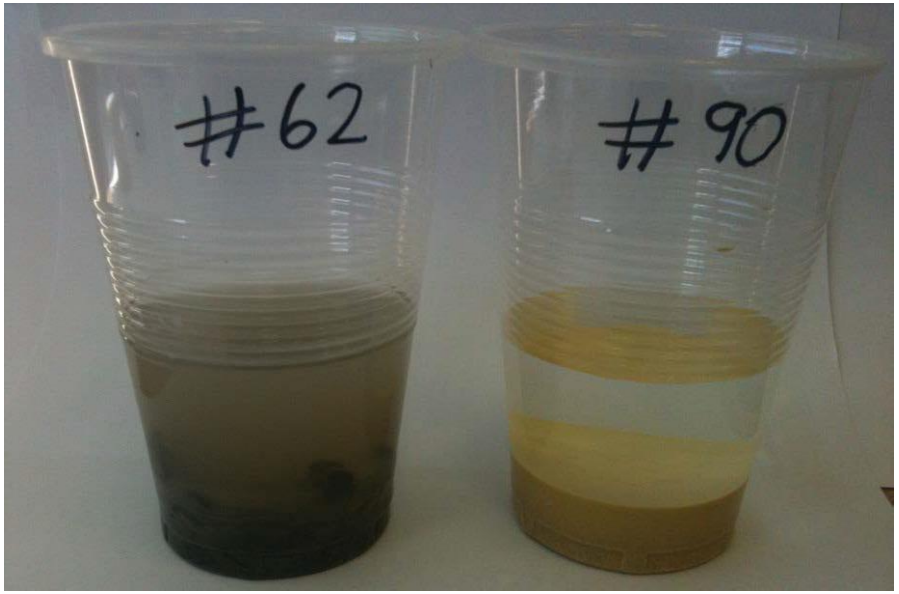
Time	Date	#14- Sandstone	#51 - Mudstone	#62 - Siltstone	#90- HW Claystone
5 Minutes	5 March	Fragments start to break down (30% breaks to sand) on first stirring	Some fragments break off	Fragments start to break down (50% breaks to silt, sand, clay) on first stirring	Fragments break down almost entirely on first agitation
1 day	6 March	Fragments start to break down (40% breaks to sand) on first stirring	Small fragments break off		
3 days	7 March	Fragments start to break down (50% breaks to sand)	Small fragments break off (5-10%) and slake to form clay. Water shows slight cloudiness overnight	Fragments start to break down (60% breaks to silt, sand, clay). Water still distinctly cloudy after samples has stood overnight.	Material completely broken to silt/ clay. Water almost clear overnight.
7 days	12 March	Fragments start to break down (60% breaks to sand/ silt)	Small fragments break off (10%) and break down to clay. Water shows slight cloudiness three days after last stir	Fragments start to break down (60% breaks to silt, sand, clay). Clay fraction slowly starting to settle (top half of water has hint of cloudiness, bottom half of water contains heavy colloidal contact.	As previous
15 days	19 March	~70% broken to sand/silt. Water completely clear	Surface of rock fragments appears overed in clay. Water with bear hint of cloudiness	~90% broken down to silt, clay, sand.	Silt /clay. Water completely clear.

Agitation by gentle stirring of the fragments submerged in water. Care was taken not to crush the fragments in the stirring process.

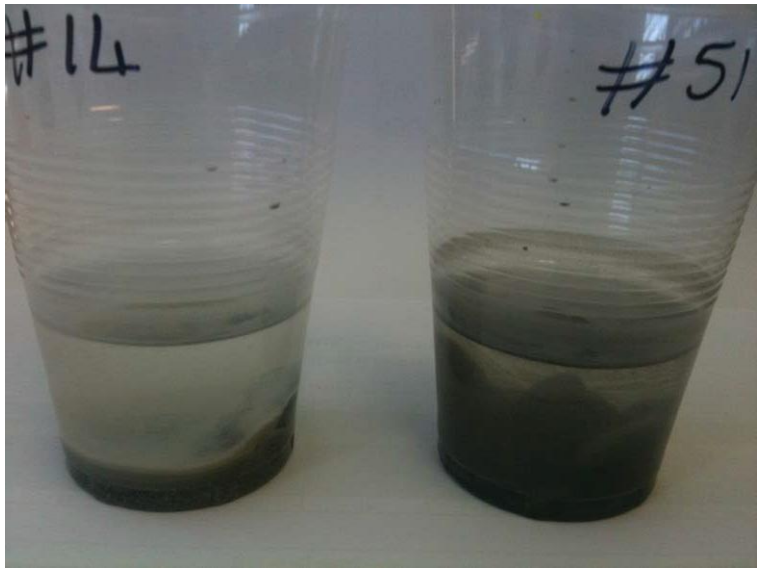
Agitated samples: day 3

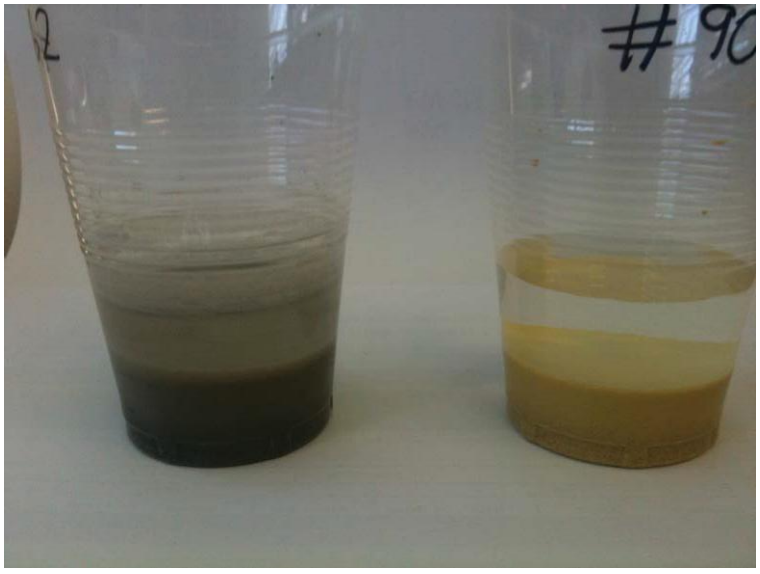






Agitated samples: day 7 (12Mar)

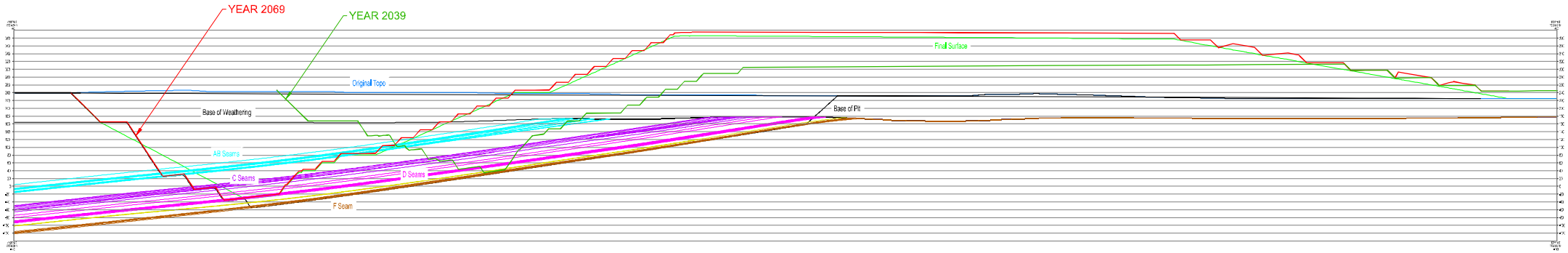




Agitated samples: day 15 (19Mar)

#14 Sandstone	#51 Mudstone
#62 Siltstone	#90 EW Claystone

Appendix H: Example Pit Development Cross Sections



INFORMATION ONLY
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REVISION HISTORY TABLE

SHEET SIZE A1

IF THE ABOVE BAR DOES NOT SCALE 25mm, THE DRAWING SCALE IS ALTERED

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LEAD PROJECT DRAFTER	PROJECT MANAGER
G.POWER	A.GARVIE

FILE: C:\PROJECTS\GHD003\00 - DRAWINGS\01 - SHEETS\GHD003-0001

GHD

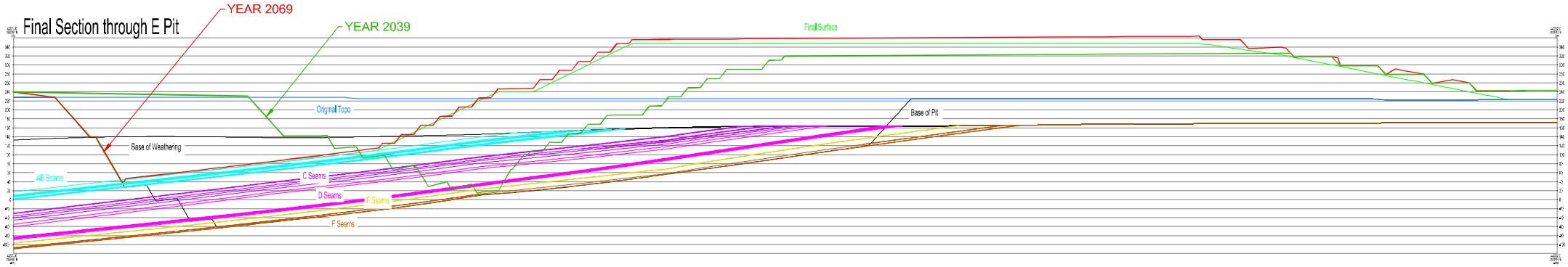
CARMICHAEL WASTE MANAGEMENT STRATEGIES

DRAWING TITLE

PIT D SECTION

DRAWING NUMBER: GHD003-0001

REVISION: A



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REVISION HISTORY TABLE

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LEAD PROJECT DRAFTER	PROJECT MANAGER
G.POWER	A.GARVIE

FILE: C:\PROJECTS\GHD003\00 - DRAWINGS\01 - SHEETS\GHD003-0002

GHD

CARMICHAEL WASTE MANAGEMENT STRATEGIES

DRAWING TITLE

PIT E SECTION

DRAWING NUMBER: GHD003-0002

REVISION: A

SRK Report Client Distribution Record

Project Number: GHD003

Report Title: Carmichael Coal Mine and Rail Project: Mine Waste Characterisation Report

Date Issued: 1 August 2013

Name/Title	Company
Stuart Winchester	GHD Pty Ltd

Rev No.	Date	Revised By	Revision Details
0	25 July 2013	A Garvie	Draft Report
1	30 July 2013	A Garvie	Draft Report
2	1 August 2013	A Garvie	Final Report