Appendix 11-C

Geochemical Baseline

Geochemical Baseline
Crown Mountain Project

Prepared for

NWP Coal Canada Ltd.

Prepared by

SRK Consulting (Canada) Inc.
1CN028-003
September 2021

Geochemical Baseline
Crown Mountain Project

September 2021

Prepared for

NWP Coal Canada Ltd.
Suite 810, 789 West Pender Street
Vancouver, BC V6C 1H2
Canada

Tel:	+1 604 629 8605
Web:	www.nwpcoal.com

Prepared by

SRK Consulting (Canada) Inc.
2200–1066 West Hastings Street
Vancouver, BC V6E 3X2
Canada

Tel:	+1 604 681 4196
Web:	www.srk.com

Project No:	1CN028-003

File Name:	CrownMtnGeochemicalBaseline_1CN028-003_20210927_SJD_CW.docx

Executive Summary

The Crown Mountain Coal Project is a proposed open pit metallurgical coal mine in the Elk Valley coal field in the East Kootenay Region of south eastern British Columbia. The operation will extract coal from the Mist Mountain Formation, a thick sequence of interbedded coal, mudstone, siltstone, and sandstone deposited mainly in a freshwater paleo-environment.

Geochemical characterization of the Mist Mountain Formation and Fernie Formation for the Crown Mountain Project indicates that, in general, the potential for acid rock drainage is low due to the low sulphide content (average is about 0.1%) and presence of excess neutralization potential, which offset acid potential. The Morrissey Formation in the footwall of the coal-bearing sequence is classified as PAG.

Two samples of coal processing products were found to have low potential for ARD based on humidity cell testing, and the inferred presence of carbonate minerals sufficient to offset acid generation by sulphide oxidation. The coal processing products will be co-disposed in the layered waste rock dump as part of the waste rock management on site. The design is intended to limit the availability of oxygen.

Results of geochemical characterization show comparable geochemical characteristics to other coal operations in the Elk Valley.

The main water quality concern is the potential leaching of selenium that originates from the oxidation of pyrite, which is characteristic of other coal mines in the Elk Valley. The layered waste rock design is intended to provide in situ mitigation of selenium leaching.

Table of Contents

List of Figures

List of Tables

Appendices

List of Abbreviations

ABA – Acid Base Accounting
AP – Acid Potential
ARD – Acid Rock Drainage
BC – British Columbia
EA – Environmental Assessment
EC – Electrical Conductivity
FF – Fernie Formation
HCT – Humidity Cell test
ICP-MS - Inductively Coupled Plasma Mass Spectrometry
LSA – Local Study Area
MF – Morrissey Formation
ML – Metal Leaching
MMF – Mist Mountain Formation
MMM – Moose Mountain Member
NP – Neutralization Potential
ORP – Oxidation Redox Potential
PAG – Potentially Acid Generating
QAQC – Quality Assurance and Quality Control
ROM – Run of Mine
TDS – Total Dissolved Solids
TIC – Total Inorganic Carbon
UBC – University of British Columbia
WRM – Weary Ridge Member
XRD – X-ray Diffraction

1 Introduction

1.1 Overview

The Crown Mountain Coking Coal Project is a proposed open pit metallurgical coal mine in the Elk Valley coal field in the East Kootenay Region of south eastern British Columbia (BC). The Project is proposed by NWP Coal Canada Ltd. (NWP Coal), is owned by Jameson Resources Limited (JRL) and Bathurst Resources Canda Limited.

The Project is located approximately 150 km line-of-sight and 300 km by road southwest of Calgary, Alberta (AB). By road, the Project is situated approximately 30 km from Sparwood. The Project is accessed by several Forest Service roads, including Grave Creek Road in the northwest and Alexander Creek Road from the south.

The Project consists of ten coal tenure licences covering a total area of 5,630 ha and one license application. Exploration activities were undertaken in 2012, 2013, and 2018 resulted in the definition of a total open-pit coal resource of 57 million tonnes for the Project. The major workable seams that have been identified during exploration are 8 Seam (Lower, Middle and Upper), 9 Seam and 10 Seam (Lower, Middle and Upper). The Project is in close proximity to other metallurgical coal mines in the Elk Valley and Crowsnest coal fields, including Teck Corporation’s (Teck) Elkview Operations (8 km southwest) and Line Creek Operations (12 km north). The Elk Valley and Crowsnest coal fields are an important coal mining region in Canada and are home to four of Canada’s eight producing coking coal mines.

Exploration activities to date indicate that the coal at the Crown Mountain site is typical of the coking coals produced from existing mines in the Elk Valley. The Project is expected to have an average strip ratio of 4.7 bank cubic metres (bcm)/ROMt (Run of Mine) over the life of the Project. Waste rock from the Project will be managed using a combination of both external waste rock management areas and internal waste rock management areas, which backfill mined-out pit areas. The proposed external waste rock management area is situated within the West Alexander Creek valley.

Similar to other Projects in the area, there are concerns related to the potential mobilization of trace elements, such as selenium from waste rock, and the potential for introduction into aquatic systems. Selenium is a naturally occurring element present in the waste rock of coal mines within the Elk Valley.

The Project is subject to an environmental assessment under the Canadian Environmental Assessment Act (CEAA) 2012 and the British Columbia Environmental Assessment Act 2002.

1.2 Purpose

The purpose of this baseline report is to describe the geochemical characteristics of the area impacted by the Project and to provide sufficient information to other disciplines to complete the environmental assessment (EA) including:

- Evaluate the geochemical characteristics of mine wastes for the Project;
- Provide input to mine waste management for the Project; and
- Predict water quality as an input into mine planning.

Based on SRK's experience of existing mine operations in the Elk Valley and publicly available information, water quality predictions will address leaching of regulated components of the rock into the water, leaching of explosives residues (nitrogen forms), and leaching of rock components leading to the formation of carbonate precipitates (calcium and alkalinity).

1.3 Scope

The scope of work for geochemistry included compilation of existing information from literature and other sources, chemical analysis of geological materials, and data interpretation on metal leaching and acid rock drainage (ML/ARD) potential.

2 Background

2.1 Regional Geological Setting

The Project is located in the Front Ranges of the Rocky Mountains of BC, in an area of the Elk Valley coal field with non-marine sediments of the Jurassic-Cretaceous Kootenay Group. This area is characterized by numerous thrust faults, open to tight folds, and some normal faults. The high mountains of the area are composed of parallel ridge systems of resistant Paleozoic carbonates, separated by thrust faults of large displacement. Regionally the Crown Mountain project lies within the Lewis Thrust sheet, between the Lewis Thrust and overlying Bourgeau Thrust.

The Jurassic-Cretaceous Kootenay Group includes the Elk Formation, the Mist Mountain Formation (MMF) and the Morrissey Formation (MF). The Kootenay Group is underlain by marine sediments, mostly shales of the Jurassic Fernie Formation (FF). These shales grade upward into the MF, a package of fine to coarse grained cliff forming sandstones. The MF is divided into the lower Weary Ridge member consisting of up to 55 m of fine-grained sandstone and the Moose Mountain Member, which consists of up to 36 m of medium to coarse grained sandstone. Overlying the MF, the MMF contains mudstone, shale, siltstone, sandstone, and coal. This formation is overlain by the Elk Formation. Of the formation within the Jurassic-Cretaceous Kootenay Group, the MMF is the main coal-bearing unit (the regional stratigraphy is shown in Table 2-1, while the local coal seam stratigraphy is shown in Figure 2-1). All the mines in the Elk Valley and Crowsnest coalfields extract coal from the MMF.

Table 2-1: Regional Stratigraphy

Period	Group	Formation Member	Principal Rock Types
Lower Cretaceous	Blairmore Group	Upper Blairmore (Undivided)	Massive bedded sandstones and conglomerates
		Cadomin Formation	
Lower Cretaceous to Upper Jurassic	Kootenay Group	Elk Formation	Sandstone, siltstone, shale, mudstones, chert pebble conglomerate, minor coal
		Mist Mountain Formation	Sandstone, siltstone, shale, mudstones, thick coal seams
		Morrisey Formation	Medium to coarse grained, slightly ferruginous quartz-chert sandstone
Jurassic	Fernie Group	Fernie Formation	Shale, siltstone, fine-grained sandstone

Source: NWP Coal Canada Ltd (2014)

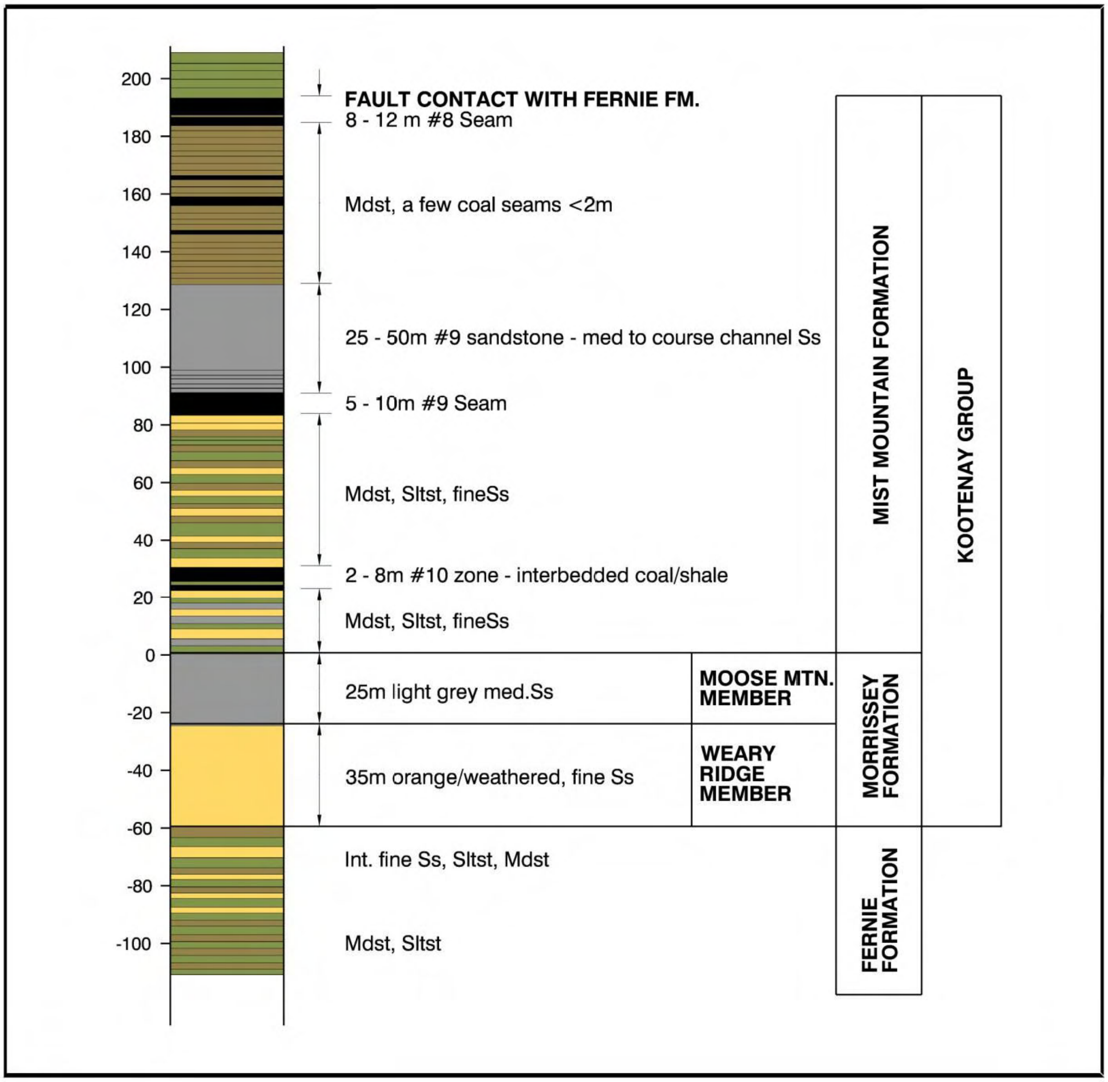


Figure 2-1: Local Coal Seam Stratigraphy
Source: NWP Coal Canada Ltd (2014)

Regionally, the paleo-environment of deposition in the Elk Valley was an easterly pro-grading coastline of the Fernie Sea with sediments eroded from uplands to the west being deposited in deltaic and beach environments along the coast. The older FF was deposited in a marine environment, whereas the MMF was dominantly non-marine. The depositional environment of the MF was debated (Gibson 1985) but is transitional from marine to non-marine. Gibson (1985) concluded that marine and non-marine environments in a beach-dune complex were probably present.

It is unclear if diagenetic conditions in the MF were dominated by freshwater or salt water, but the overall trend downward through the stratigraphy is towards increasing marine influence. This may result in increasing sulphide content though not necessarily increasing ARD potential.

2.2 Site Geology

The site geology is shown in Figure 2-2. The North Block is a syncline with the Morrissey Formation below the Mist Mountain Formation. The East and South Block is a west dipping outlier of Mist Mountain Formation forming a ridge top. The Fernie Formation is thrust over the MMF.

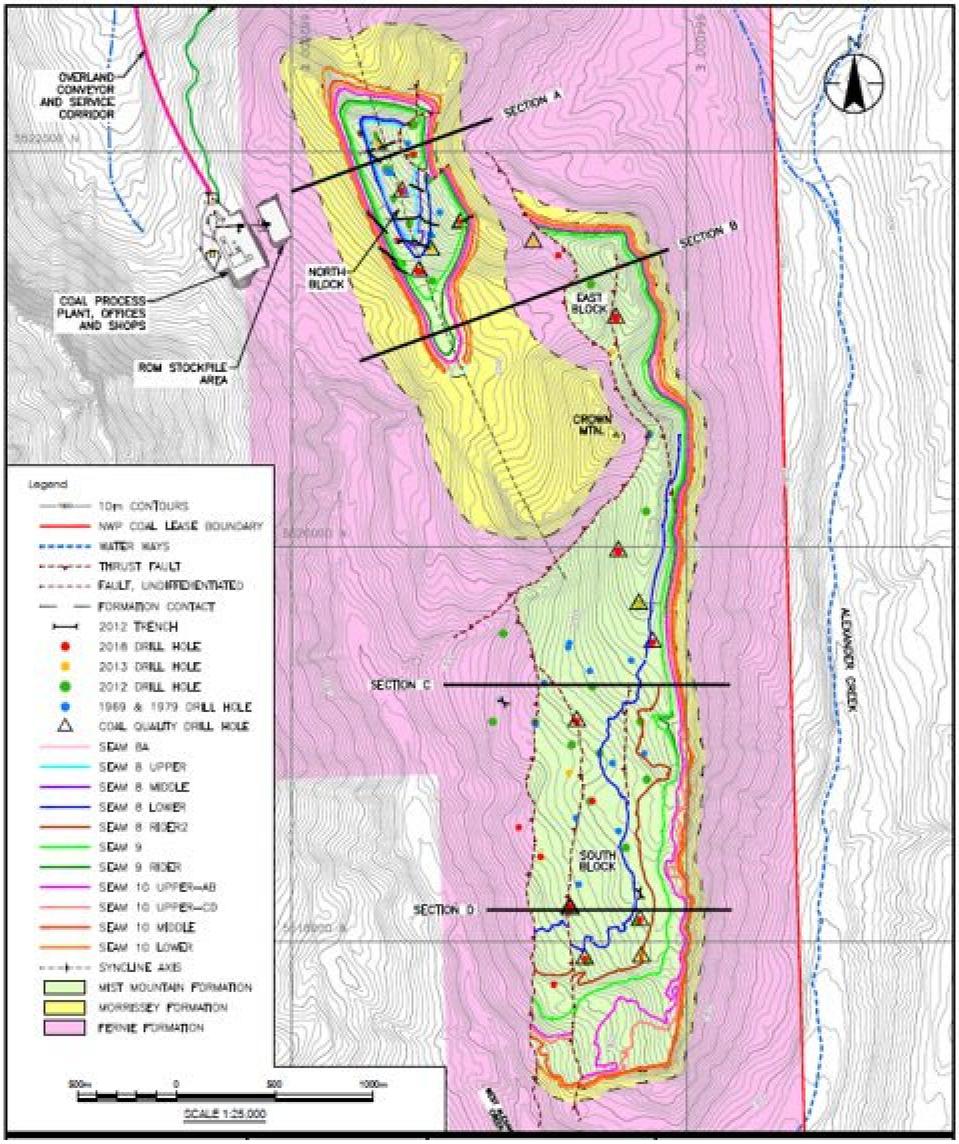


Figure 2-2: Geology of the Project (Source: Stantec 2020)

The Project consists of three principal coal seams, which comprise a total of seven major seams. The seams are interpreted to be the equivalents of Seam 8, Seam 9, and Seam 10, which are mined at the nearby Line Creek metallurgical coal mine, approximately 12 km to the north of the Project. Host lithology is composed of sandstone, siltstone, shale, and mudstone of the Mist Mountain Formation.

2.3 Mine Plan

The mine plan described below is a summary of the mine plan presented in the Bankable Feasibility Study (BFS, Stantec, 2020).

The anticipated production capacity of the Project is estimated upto 4.0 M ROMt per annum with a predicted mine life of approximately 15 years. Run of mine (ROM) coal reserves are estimated at 57 million tonnes, of which 44 million tonnes are proved and 13 million tonnes are probable

(Table 2-2). Exploration activities to date indicate that the coal at the Crown Mountain site is typical of the coking coals produced from existing mines in the Elk Valley. The daily production rate equates to approximately 10,150 tpd. The Project mine production schedule is shown in Table 2-3.

Table 2-2: Calculated ROM Coal Reserves (‘000 tonnes)at the Crown Mountain Project

Area	Coking			PCI		
	Proved	**Probable**	**Total**	**Proved**	**Probable**	**Total**
North Pit	9,603	3,924	13,527	429	1,068	1,496
East Pit	2,271	532	2,803	135	46	180
South Pit	27,975	4,828	32,803	3,218	3,514	6,731
Total	**39,848**	**9,284**	**49,132**	**3,781**	**4,627**	**8,408**

Source: Stantec, 2020

Each of the pits will be developed sequentially, starting with the North Pit. Waste from the North Pit will be placed in the external mine rock storage facility and also used to develop the East Pit access. The East Pit will be mined after North Pit is substantially completed, which allows time for the access to be developed to the top of the East Pit. The majority of the waste from the East Pit will be placed in the external mine rock storage facility. The East Pit will be mined from Year 4 to Year 6, while the development of access to South Pit is completed.

Operations will then be moved to the southern end of the South Pit. Once the East Pit is completed, it and North Pit will then be backfilled with waste rock from South Pit The South Pit will be mined in four phases, which will allow for earlier sequential backfilling of the South Pit with waste rock from earlier phases. The balance of the waste will be placed in the external mine rock storage facility.

Table 2-3: Crown Mountain Mine Production Schedule

Year	ROM Coal			Clean Coal			Total Waste (Kbcm)	PAG Waste (Kbcm)	ROM Strip Ratio (bcm/tonne)	CC Strip Ratio (bcm/tonne)
	Total (Ktonnes)	Coking (Ktonnes)	PCI (Ktonnes)	Total (Ktonnes)	Coking (Ktonnes)	PCI (Ktonnes)				
Pre-Production	538	176	362	337	94	242	2,054	25	3.8	6.1
1	3,669	2,989	681	2,328	1,864	464	11,935	698	3.3	5.1
2	3,907	3,648	259	2,241	2,089	152	16,329	817	4.2	7.3
3	3,833	3,662	170	2,111	2,022	89	14,627	712	3.8	6.9
4	3,964	3,795	170	2,049	1,972	78	17,569	450	4.4	8.6
5	3,859	2,925	934	1,680	1,284	396	18,022	81	4.7	10.7
6	3,864	2,656	1,208	1,586	1,134	452	18,056	0	4.7	11.4
7	4,066	2,688	1,378	1,744	1,193	551	17,784	0	4.4	10.2
8	3,983	3,009	974	1,597	1,234	363	17,907	0	4.5	11.2
9	3,958	2,737	1,221	1,577	1,038	539	17,786	0	4.5	11.3
10	3,973	3,293	680	1,656	1,370	286	23,603	0	5.9	14.2
11	3,920	3,806	114	1,621	1,578	43	24,051	0	6.1	14.8
12	3,889	3,813	76	1,599	1,565	33	23,874	0	6.1	14.9
13	3,887	3,843	45	1,583	1,566	17	18,280	0	4.7	11.5
14	3,954	3,841	113	1,841	1,768	73	18,306	0	4.6	9.9
15	2,227	2,252	25	723	713	10	9,838	0	4.3	13.6
Total	**57,540**	**49,123**	**8,408**	**26,272**	**22,484**	**3,788**	**270,021**	**2,785**	**4.7**	**10.3**

Source: Stantec (2020)

2.4 Geochemical Characteristics

2.4.1 Background

Several decades of work to determine the geochemical characteristics of mine wastes in the Elk Valley have been carried out. During the late 1990s and into the mid-2000s this work was undertaken collaboratively by the operators of the five mines (prior to consolidation under Teck Coal Limited), the University of British Columbia (UBC) and the Ministry of Energy, Mines and Petroleum Resources. The work focussed on selenium content and leaching characteristics due to the observed upward trend in concentrations of selenium in the Elk River at the Highway 93 bridge.

In late 2006, Teck Coal Limited initiated a process that was designed to lead to the development of a source leaching model that could be used to predict selenium leaching. The overall approach was developed in consultation with the Elk Valley Selenium Task Force and resulted in the initiation of detailed mineralogical, bulk chemical and kinetic leaching studies on the occurrence and release of selenium by weathering of rock in the Elk Valley (SRK 2008). Those studies continued under the Applied Research and Development (AR&D) Program that was implemented by Teck Coal Limited in 2011 in response to the findings of the Strategic Advisory Panel on Selenium Management (Swanson 2010).

The following sections summarize the main findings from research activities relating to the geochemical characteristics of mine wastes in the Elk Valley. Findings from the AR&D program were not published and are not described in this report.

2.4.2 Acid Rock Drainage Potential

Historically, a number of studies have looked at the ARD potential of rocks and mine wastes associated with the Elk Valley coal mines. This includes work by provincial geologists (Ryan and Dittrick 2001; Ryan et al. 2002), the University of British Columbia (Lussier 2001) and Kennedy et al. 2012.

The studies have shown that the total sulphur content of the rocks varies by rock type but is relatively low (approximately 0.2% on average). The mines in the region have no reported history of acid rock drainage (ARD) from the waste rock as a result of the low sulphide content coupled with excess carbonate minerals dominated by dolomite and ankerite. Sulphur occurs as the iron sulphides pyrite and marcasite and bound with carbonaceous materials. It should be noted that some waste rock units within the Elk Valley have been classified as PAG, such as the MF at Coal Mountain (Teck Resources Limited, 2017). However, sufficient non-PAG waste rock (with sufficient neutralization potential) exists that has been co-mingled (both intentionally and simply due to mine sequencing), and ARD does not usually develop. An acidic pit was discovered at Teck’s Coal Mountain Operations in 2014 (Teck 2017)

Based on these studies and wider knowledge of the geochemistry of the Elk Valley coal mines, it is evident that ARD is typically of low concern. However, these studies have all identified metal leaching, specifically relating to the release of selenium of principal concern.

2.4.3 Selenium

Studies by provincial geologists (Ryan and Dittrick 2001 and Ryan et al. 2002), the University of British Columbia (Lussier 2001) and Kennedy et al. (2012) show that selenium concentrations are correlated with rock type. The lowest concentrations of selenium and sulphur occur in sandstones (typically near 1 mg/kg) and higher concentrations in mudstones (2 to 4 mg/kg) (Ryan and Dittrick 2001, and Ryan et al. 2002). Concentrations in siltstones range between these values. Maximum selenium concentrations typically do not exceed 10 mg/kg.

The mineralogical occurrence of selenium was investigated by SRK (2008), Kennedy et al. (2012) and Hendry et al (2015). It has been shown that the main reactive host for selenium is iron sulphide, but it was also found to be associated with other sulphur-bearing minerals (barite and gypsum). Sulphur and selenium concentrations are commonly correlated, confirming the overall link to the occurrence of sulphur.

In addition to the work described above, monitoring data from other Elk Valley mine sites was interpreted to better understand selenium release from coal waste rock dumps (SRK Consulting 2014a). It was found that selenium and sulphate loading from waste rock dumps spans a relatively narrow range throughout the Elk Valley, despite differences in waste rock volume. This implies that sulphide oxidation rates are similar throughout the Elk Valley and that a consistent proportion of the rock mass is contributing to selenium loadings regardless of waste rock dump scale. Seasonal patterns of release of sulphate and selenium show no detectable lag between high flow events and high loading release implying that selenium is leached from components of the waste rock dumps via a piston flow mechanism. A further study into the effects of scaling was conducted (Kennedy 2012) and found that sulphate and selenium release under field conditions is at least an order of magnitude lower than under laboratory conditions.

2.4.4 Other Elements

Villeneuve et.al (2017) indicates that in addition to sulphate (associated with the oxidation of pyrite), cadmium, chloride and nitrate can also be present at elevated concentrations. However, they are typical of short-term concern and are associated with the initial flushing of solutes. Nitrate is typically associated with mine blasting activities and is, therefore, a common parameter of concern at mining operations, and management measures are commonplace to minimise this.

Recent geochemical studies have also identified arsenic and iron in Elk Valley dump solutes and showed that these solutes are associated with the oxidation of primary sulfides (Biswas et al., 2017; Essilfie-Dughan et al., 2017). However, these studies note that the sorption of arsenic onto secondary iron oxyhydroxides provided a control on the release of both of the elements.

3 Study Design

3.1 Conceptual Geochemical Model

The conceptual geochemical model formed the basis for the design of the data collection program and subsequent interpretation of geochemical data and was developed based on the SRK's knowledge of Elk Valley coal mining operations as well as researching the literature. The following sections describe the conceptual model for each component of the site.

3.1.1 Layered Waste Rock

Conceptual models for the weathering of conventional waste rock are well-established in the geochemical literature. These describe that the release of selenium may be affected by its specific chemical properties. It is these properties that have led to the development of the layered approach. Specifics of the models for coal wastes and leaching of selenium have been defined previously (e.g. SRK (2008)).

The approach to waste rock management for Crown Mountain is based on a layering of coal rejects and waste rock (Figure 3-1). The reject layers will act as suboxic environments where oxygen, nitrate and selenate will be reduced to water, nitrogen gas and selenite, or elemental selenium, respectively. The layers also act to disrupt large-scale gas convection thereby restricting oxidation of the waste rock. Oxidation will continue on the edges of the facility but is modelled to be restricted internally.

Oxidative weathering and leaching of waste rock occur predominantly through several groups of processes:

- Oxidation of pyrite under oxygenated conditions resulting in release of soluble components of pyrite (mainly sulphate and acidity but also traces of elements including selenium and other metals) followed by consumption of the resulting acidity by large excess quantities of acid neutralizing minerals and release of soluble components of those minerals (mainly base cations).
- Interaction of trace elements with reactive surfaces (e.g. iron oxides) under dominantly basic conditions results in attenuation of elements in solution as cations (e.g. cadmium, cobalt, copper and zinc) whereas elements released as oxyanions (e.g. selenium, sulphate) remain mobile and show limited attenuation unless precipitated as secondary minerals (e.g. sulphate as gypsum and/or barite).
- Leaching of explosives residuals contributes inorganic nitrogen (e.g. nitrate) to contact waters. Since explosives are introduced during mining and nitrogen forms are not expected to be generated significantly by rock weathering, loadings of explosives residuals are expected to diminish with time.

The aim of the "layer cake" approach to waste rock management at Crown Mountain is to mitigate against the oxidation of pyrite and prevent the release of selenium and nitrate in the long term. As layers are deposited, oxygen ingress to the waste rock and coal rejects will be limited (Figure 3-1, Point A), after which time oxygen is consumed. During this initial period, selenium and nitrate reflect cumulative and annual rock volume – traditionally the trend seen in the Elk Valley. Afterwards, selenium and nitrate are sequestered. The overall consumption of the initial oxygen, followed by the limited future ingress, also means that the oxidation of pyrite is limited minimising the release of sulphate, acidity and trace elements, including selenium and other metals. Nitrate will be denitrified in the low oxygen (reducing) conditions. Excess NP will also lead to attenuation of elements such as cadmium, zinc and copper by reaction with iron oxides under basic weathering conditions.

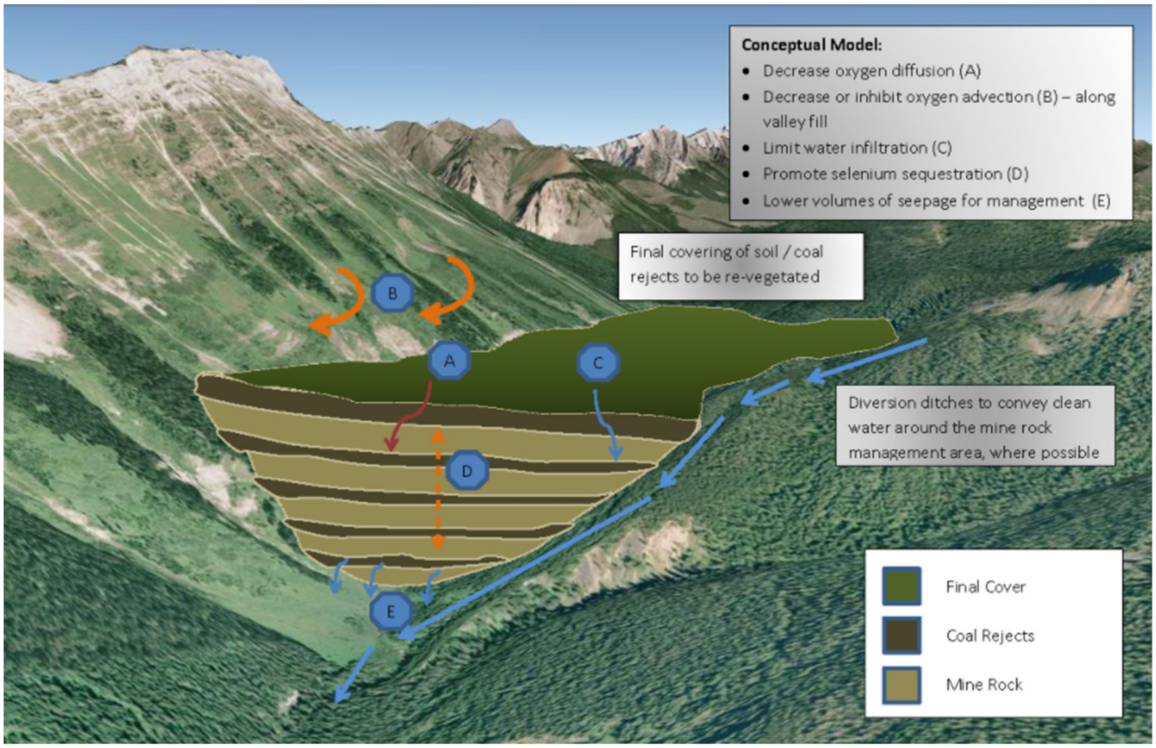


Figure 3-1: Layered Approach to Waste Rock Management

Source: NWP Coal Limited (https://www.nwpcoal.com/environmental)

3.1.2 Pit Walls

Weathering and leaching processes in pit walls are comparable to waste rock. The main difference is the much lower amount of exposed rock surface area and quantity of rock involved as well as the likelihood that carbon dioxide will not accumulate to the same degree in pores and water.

3.1.3 Plant Rejects

Plant rejects will be co-deposited with waste rock in discrete layers, as described above. Weathering processes in plant rejects are similar to waste rock. However, monitoring of gas concentrations in deposited plant rejects has shown that oxygen penetration into this material type may be limited by oxygen-consuming reactions (SRK 2013).

In addition, the presence of coal fines in plant rejects indicates that reactive surfaces may serve to control trace element concentrations to low levels and limit oxygen ingress. The presence of oxygen-limited conditions may limit selenium leaching by transformation to chemically reduced forms.

3.2 Study Design Components

The study was designed with the primary objective of confirming that the conceptual model developed above from experience observing the performance of waste and other coal management facilities in the Elk Valley can reasonably be applied to the Project.

The main requirement of the design was to demonstrate wastes will leach dominantly under non-acidic conditions and also that trace element distribution (particularly selenium) will lead to similar leaching characteristics as observed elsewhere.

The sampling design consisted of two separate components: waste rock and process products.

A summary of the design components and methods is presented in Table 3-1.

Table 3-1: Study Design Components

Mine Component	Geochemical Question	Characterization Requirement	Program Design	Methods
Waste Rock	ARD Potential	Evaluation of the balance between acid generating and neutralizing minerals and controlling variables	Continuous core sampling of the complete stratigraphy in the area of mining	ABA, trace element analysis
		Understanding of carbonate and sulphide mineralogy and calibration of ABA to site conditions	Mineralogical testing of representative waste rock samples covering the range of observed characteristics	XRD
		Rate of depletion of sulphides and acid neutralizing minerals and correlation with bulk characteristics	Samples representing the range of characteristics in each rock type were selected for kinetic testing	Humidity cells, observations of analogs
		Understanding of mineralogy including major and trace carbonates and sulphides	Mineralogical testing of all samples undergoing HCT	ABA and XRD
		Deportment of trace elements not occurring as specific minerals into the major and trace minerals.	Mineralogical testing of all samples undergoing HCT	Trace element analysis and XRD
		Evaluation of the relationship between bulk characteristics, and trace element release	Kinetic testing of samples containing a range of trace element contents	Humidity cells, observations of analogs
	Chemistry of Waste Dump Seepage	Water Chemistry Prediction	Confirm samples have similar characteristics to analog sites and apply existing prediction model	Analog sites, modelling
	Calcite Deposition	Water Chemistry Prediction	Apply existing prediction model used at analog sites	Analog sites, modelling
Process Products	ARD Potential	Evaluation of the balance between acid generating and neutralizing minerals and controlling variables	Sampling and testing of representative process products	ABA, trace element analysis
		Understanding of carbonate and sulphide mineralogy and calibration of ABA to site conditions	Mineralogical testing of all samples undergoing HCT	XRD
	Metal Leaching Potential	Understanding of mineralogy including major and trace carbonates and sulphides	Mineralogical testing of all samples undergoing HCT	XRD, optical mineralogy, and microprobe
		Deportment of trace elements not occurring as specific minerals into the major and trace minerals.	Mineralogical testing of representative process products	XRD, Humidity cells
	Chemistry of Seepage and Runoff	Water Chemistry Prediction	Prediction of water quality for use in water balance	Supernatant chemistry, existing seepage monitoring

4 Study Methods

4.1 Regional Study Area

The Geochemical Baseline does not include a regional study component or assess the effects of the Project.

Knowledge of regional geochemistry from other mines in the valley has been considered to understand the geochemical characteristics of the wastes that would be generated by the Project.

4.2 Local Study Area

The local study area (LSA) is the waste rock and process wastes (plant rejects) that would be produced by the Project. This is defined by the extent of the open pits and waste rock spoils.

4.3 Sample Selection

4.3.1 Waste Rock

Selection of waste rock samples followed methodologies developed elsewhere to provide a stratigraphic characterization of waste rock in coal deposits. The overall stratigraphic sequence was divided into the following six packages:

- Hangingwall of Seam 8
- Seam 8 to 9 interburden
- Seam 9 to 10 interburden
- Seam 10 footwall to contact with Morrissey Formation
- Morrissey Formation
- Fernie Formation

For each of the three mining blocks (North, East and South), drill holes were identified to provide at least two intersections for each of the stratigraphic packages (Table 4-1). Diamond drill holes (CHs in Table 4-1) yielding core were preferred with air rotary chips used only where DDH spatial coverage was not sufficient. Locations of drill holes sampled are provided in Table 4-2

Table 4-1: Drill Hole Sampling Design

Block	North	North	North	North	North	North	North	East	East	East	South	South	South	South	South	South
Hole	**18-03CH**	**18-04CH**	**18-05CH**	**11-11CH**	**12-01CH**	**11-12CH**	**18 RC Hole**	**13-15CH**	**18-10**	**18-14CH**	**18-16CH**	**11-22CH**	**18-16-GC**	**18-27-GC**	**18-25-GC**	**11-19CH**
Fernie Fm*																
Seam 8U HW		3			9											
8 to 9 IB	25		22		5				6		9			16		
9 to 10 IB	15		14		12	13					15			17		
10FW	6		5	1					7		5	2	6	8		1
Morrissey Fm	3		3											3		

Source: P:\01_SITES\Crown Mountain\1CN028.003_Geochemistry\100_Acquisition_of_Rock_Samples\1.Exploration_Planning\[DrillHoleSelection_1CN028001_SJD_R8.xlsx]

Note:

*Intersections of Fernie Formation were not available for any drill holes, and samples of Fernie Formation were obtained from a test pit and boreholes in the proposed plant area.

Table 4-2: Drill Hole Collars

DDH	NORTH	EAST	ELEV survey
18-03CH	5521991.038	662616.315	2200.754
18-04CH	5521802.016	662557.025	2141.706
18-05CH	5521549.717	662537.573	2073.469
11-11CH	5521514.999	662691.658	2086.896
12-01CH	5522037.31	662428.831	2143.309
11-12CH	5521640.622	662855.895	2171.148
18 RC Hole	5519512.237	663818.306	2083.402
13-15CH	5521542.621	663221.886	2131.921
18-10	5521475.932	663347.51	2124.198
18-14CH	5521162.802	663638.867	2141.674
18-16CH	5519981.91	663651.111	2108.226
11-22CH	5519706.651	663757.327	2121.157
18-16-GC	5519973.55	663649.399	2108.184
18-27-GC	5518429.945	663257.357	1876.669
18-25-GC	5518173.413	663407.221	1886.249
11-19CH	5518161.682	663408.624	1886.645

Sample intervals were continuous in the package sections and were selected from drill hole logs based on lithology or consistent interbedded rock type mixtures where strata were thin. Rock within 30 cm of seams was sampled separately to characterize seam cleanings and seam dilution. The resulting sample distribution by package is shown in Table 4-3.

Table 4-3: Rock Sample Distribution by Block and Package

Stratigraphic Package	Block			Total
	North	East	South	
Fernie Fm	3	2	0	5
Seam 8U HW	12	0	0	12
8 to 9 IB	52	6	25	83
9 to 10 IB	53	0	32	85
10FW	12	7	22	41
Morrissey Fm	6	0	3	9
Sub-total	137	13	82	235

Source: P:\01_SITES\Crown Mountain\1CN028.003_Geochemistry\100_Acquisition_of_Rock_Samples\1.Exploration_Planning\[DrillHoleSelection_1CN028001_SJD_R8.xlsx]

4.3.2 Plant Rejects

Two samples of plant rejects were provided by NWP Coal resulting from coal recovery testwork performed on coal seam bulk samples representing the North and South Blocks which are the main source of raw coal feed for the plant. The plant rejects consist of a combination of coarse coal rejects and tailings (fine fraction) from the processing of the ROM coal.

4.4 Sample Analysis

4.4.1 Static Testing

Core boxes were shipped to Bureau Veritas Laboratories in Burnaby, British Columbia, where samples were made from specified intervals under SRK’s guidance. Selected samples were analyzed for a modified acid base accounting (ABA) package (*including paste pH, total sulphur (Leco), sulphate (Hydrochloric Acid (HCl) leach), total carbon (Leco), total carbonate (Leco), modified Sobek neutralization potential (NP) (Lawerence and Wang 1996)).*

All samples were tested for trace elements using aqua regia digestion followed by inductively coupled plasma mass spectrometry (ICP-MS) finish (including F on approximately 10% of samples).

Mineralogical characterization (Rietveld X-ray diffraction (XRD)) was also carried out on selected samples (including all samples that were used in humidity cell tests) by the University of British Columbia. At the time of report preparation, XRD results were available for two samples (Plant Rejects), with other results pending for the remaining samples.

4.4.2 Supernatants

One supernatant sample, associated with plant rejects, was sent to Bureau Veritas Laboratories in Burnaby, BC. The sample was analyzed for general parameters, such as pH, EC, anions and dissolved elements

4.4.3 Laboratory Kinetic Testing

HCTs were initiated on twelve samples of waste rock and plant rejects, including one duplicate cell. The samples were selected using the static test results and were designed to represent typical and upper limit characteristics for formations and rock types.

All cells were operated using the ASTM (2001) method at Bureau Veritas Laboratories in Burnaby, BC. Leachate analysis is outlined in Table 4-4.

Table 4-4: Humidity Cell Leachate Analysis

Parameter Type	Frequency
General Parameters	
pH, EC	Weekly
Alkalinity	Biweekly
Ions and Nutrients	
Sulphate, Cl, F, nitrate	Monthly
Metals	
ICP-MS metals scan – 41 element suite including Hg	Monthly

4.4.4 QA/QC

In addition to Bureau Veritas Laboratories own quality assurance/quality control (QA/QC) programs, all work was performed with reference to Bureau Veritas Laboratories specific commitments to SRK's Expectations for Geochemical Data Quality (SRK 2011) and was used as a basis for review of all incoming data.

Static Testing

The following QA/QC criteria were applied to solids data:

- Total sulphur is greater than or equal to sulphur as sulphate (within 30%).
- Total carbon is greater than or equal to total inorganic carbon (TIC) (within 30%).
- NP does not exceed maximum NP indicated by acid strength and acid volume indicated by fizz rating.
- Negative NP has paste pH below 5.

- Ten percent of samples tested in duplicate using a relative percent difference of 20% as a target for reproducibility (with the exception of metals data, which has a 30% target for reproducibility) for levels >10 times the limit of reporting.
- Control reference materials are included with each batch, and results are within certified values.

Kinetic Testing

For humidity cells, the following QA/QC criteria were applied:

- Ten percent of all cells tested in duplicate using a relative percent difference of 30% as a target for reproducibility.
- Leachate analysis includes 10% duplicates per cycle with a target reproducibility of 20% for metals.
- Ten percent of samples (with a minimum of one sample) per program were tested as blanks; all results are less than the limit of reporting.
- Ion balance is within 10%, except for samples with TDS <70 mg/L or EC <100 µs/cm. Outside of this range, ion balance is not a useful indicator of data quality.
- Lixiviant blanks are included with each batch, and results are within certified values.

All data were screened for the quality criteria listed above upon receipt. All data used in this report passed SRK's quality criteria.

5 Results

5.1 Waste Rock

5.1.1 Acid Potential

Three types of sulphur analyses were performed:

- Total sulphur concentrations indicate sulphur in all forms, including organically-bound, sulphide and sulphate.
- Hydrochloric acid soluble sulphur indicates sulphur in the form of sulphates.
- Aqua regia digestible sulphur measured using inductively coupled plasma mass spectrometry (ICP-MS) indicates approximately sulphur as sulphide minerals (mainly pyrite) and sulphate because aqua regia does not readily oxidize organic matter. Therefore, ICP-MS was used to calculate sulphide concentrations:

$$S_{\mathrm{Sulphide}} = S_{\mathrm{ICP}} - S_{\mathrm{SO4}}$$

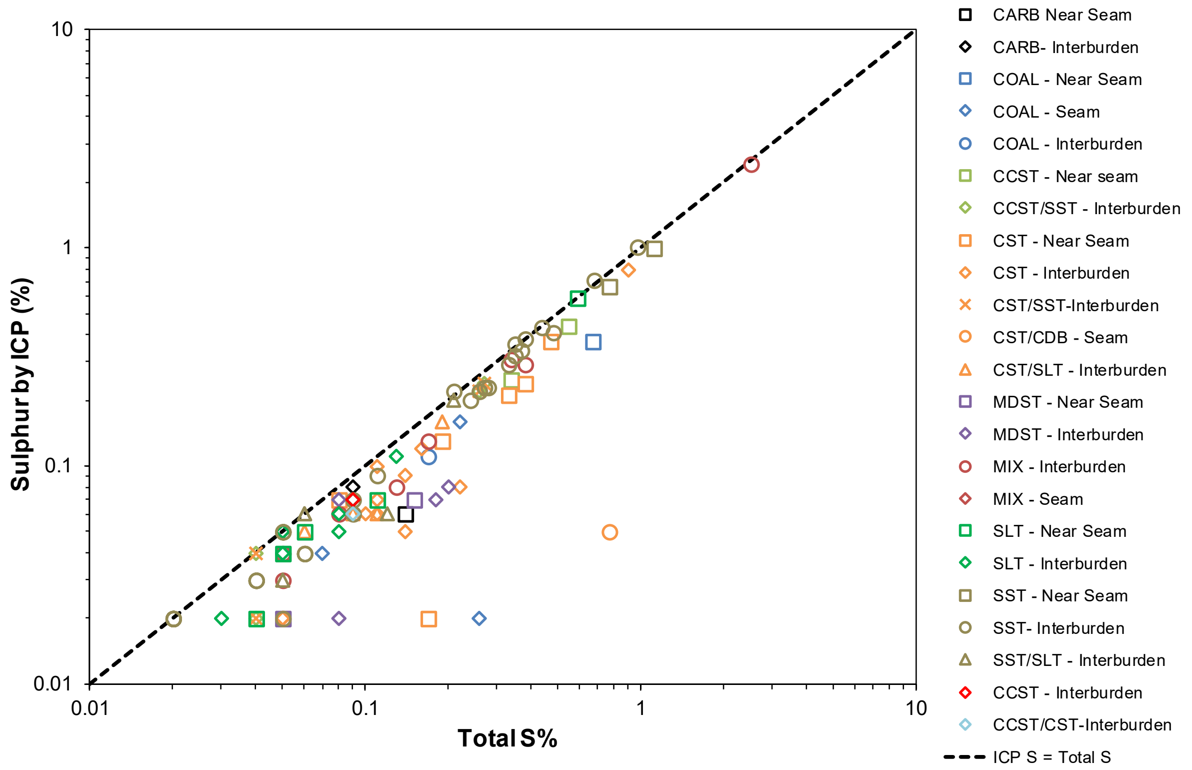
A statistical summary of samples by rock type is presented in Table 5-1, Table 5-2 and Table 5-3 for each of the lithologies in MMF, MF and FF. The complete data set is provided in Appendix B.

Graphs have been presented by respective formations (i.e. MMF, MF and FF), with each graph showing each of the different lithologies that have been sampled (i.e. coal, mudstone, siltstone and sandstone etc.).

Sulphate was measured above the detection level of 0.01% in 61 samples (26%), while all concentrations were below 0.08% sulphate sulphur. The highest sulphate concentrations were associated with sandstone and siltstone samples. Overall, sulphate minerals are therefore shown to be a minor component of the samples.

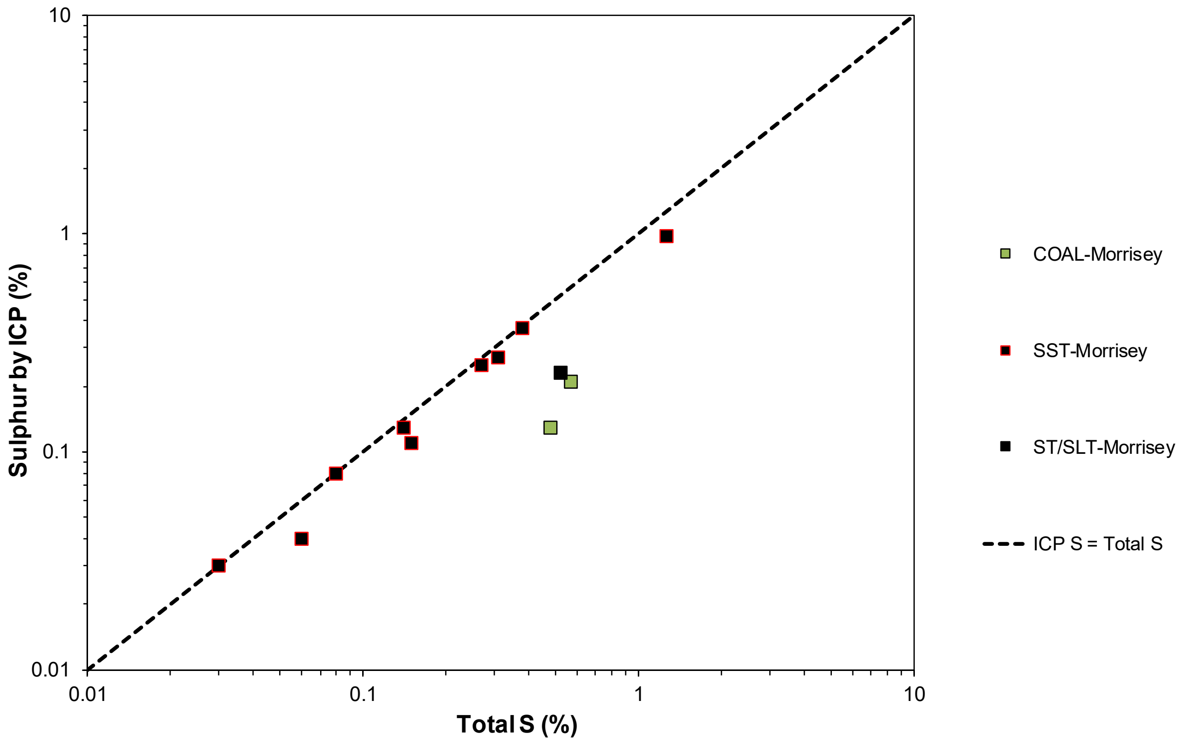
Figure 5-1, Figure 5-2 and Figure 5-3 compare total sulphur and sulphur by aqua regia for MMF, MF and FF, respectively. The presence of organic sulphur is indicated by the distribution of sulphur concentrations below the diagonal line. Hence, the data show that the majority of the sulphur present is in the organic form, with less sulphide sulphur that could generate acid.

Figure 5-4, Figure 5-5 and Figure 5-6 plots sulphur in organic form (calculated as Total Sulphur – ICP Sulphur) against organic carbon (calculated as the difference between total carbon and inorganic carbon) for MMF, MF and FF, respectively. These show that in general higher organic sulphur contents are associated with higher organic carbon contents, although this trend is less clear for the samples from FF.



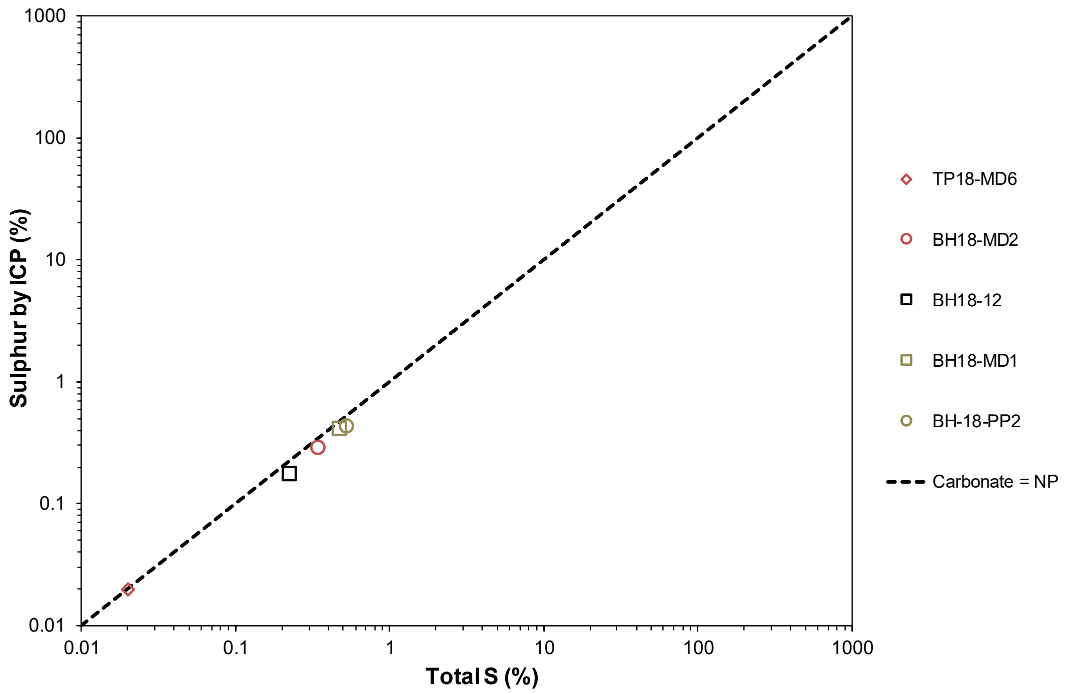
\\srk.ad\dfs\NA\VAN\Projects\01_SITES\Crown Mountain\1CN028.003_Geochemistry\100_Acquisition_of_Rock_Samples\5.Sample_Inventory\Compiled_LabData_1CN028001_WICK_Rev5.xls

Figure 5-1: Comparison of Total Sulphur and Sulphur Determined by ICP-MS Following Aqua Regia Digestion Waste Rock for Mist Mountain Formation



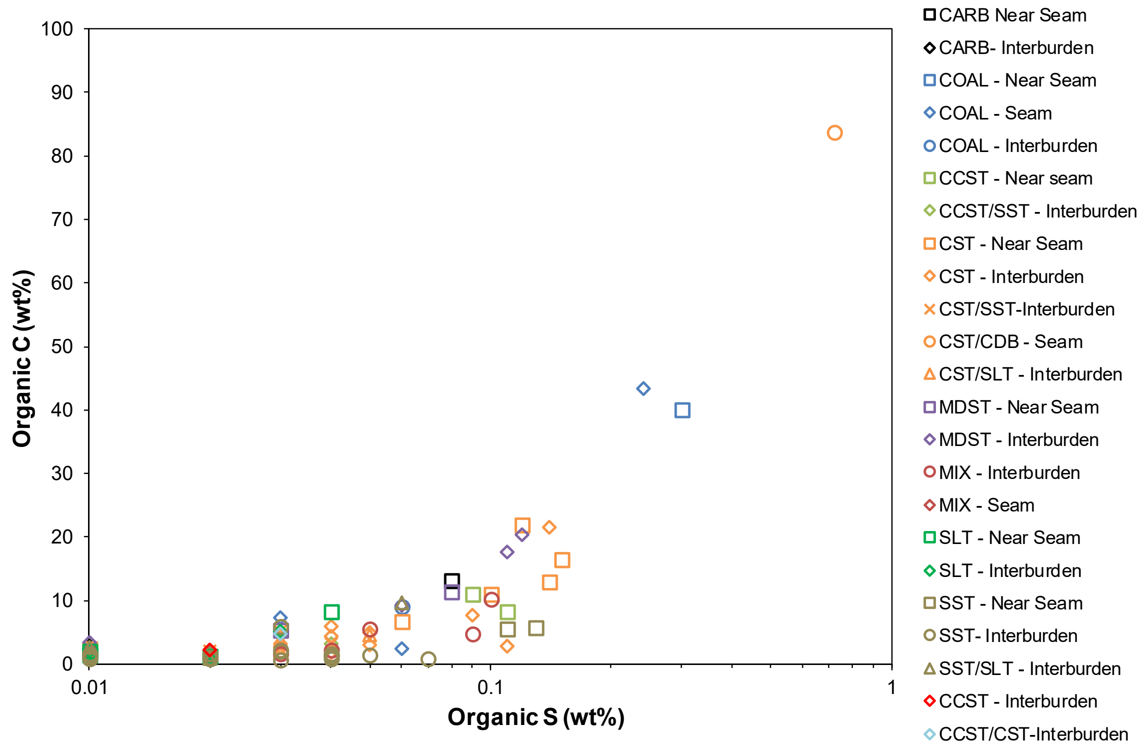
\\srk.ad\dfs\NA\VAN\Projects\01_SITES\Crown Mountain\1CN028.003_Geochemistry\100_Acquisition_of_Rock_Samples\5.Sample_Inventory\Compiled_LabData_1CN028001_WICK_Rev5.xls

Figure 5-2: Comparison of Total Sulphur and Sulphur Determined by ICP-MS Following Aqua Regia Digestion Waste Rock for Morrisey Formation



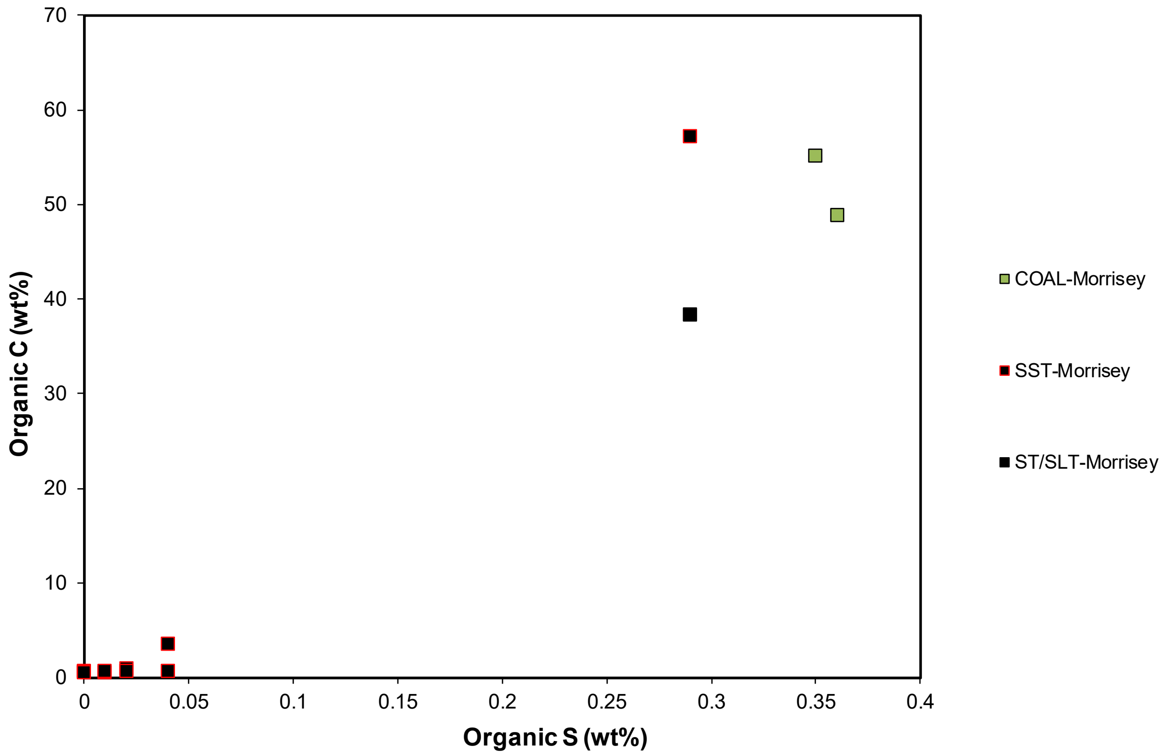
\\srk.ad\dfs\NA\VAN\Projects\01_SITES\Crown Mountain\1CN028.003_Geochemistry\100_Acquisition_of_Rock_Samples\5.Sample_Inventory\Compiled_LabData_1CN028001_WICK_Rev5.xls

Figure 5-3: Comparison of Total Sulphur and Sulphur Determined by ICP-MS Following Aqua Regia Digestion Waste Rock for Fernie Formation



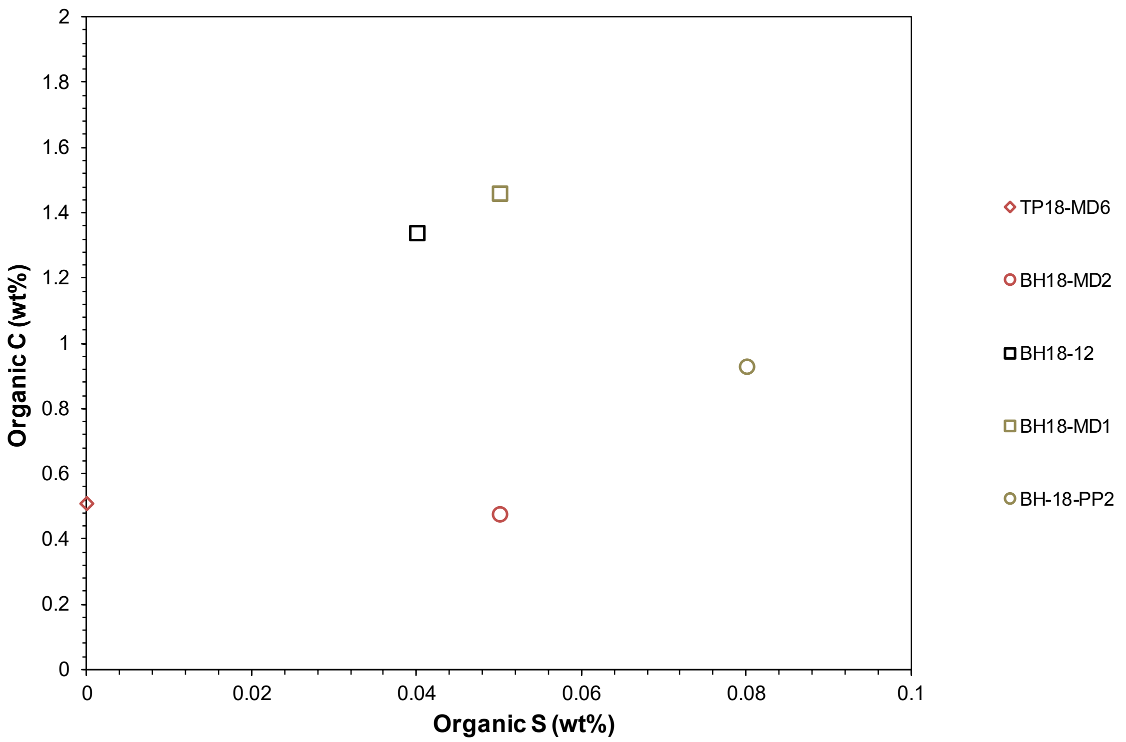
\\srk.ad\dfs\NA\VAN\Projects\01_SITES\Crown Mountain\1CN028.003_Geochemistry\100_Acquisition_of_Rock_Samples\5.Sample_Inventory\Compiled_LabData_1CN028001_WICK_Rev5.xls

Figure 5-4: Organic Carbon Content Compared to Organic Sulphur Waste Rock for Mist Mountain Formation



\\srk.ad\dfs\NA\VAN\Projects\01_SITES\Crown Mountain\1CN028.003_Geochemistry\100_Acquisition_of_Rock_Samples\5.Sample_Inventory\Compiled_LabData_1CN028001_WICK_Rev5.xls

Figure 5-5: Organic Carbon Content Compared to Organic Sulphur Waste Rock for Morrisey Formation



\\srk.ad\dfs\NA\VAN\Projects\01_SITES\Crown Mountain\1CN028.003_Geochemistry\100_Acquisition_of_Rock_Samples\5.Sample_Inventory\Compiled_LabData_1CN028001_WICK_Rev5.xls

Figure 5-6: Organic Carbon Content Compared to Organic Sulphur Waste Rock for Fernie Formation

Table 5-1: Summary Statistics by Rock Type for Mist Mountain Formation

Rock Type	Sample Count (or Sample ID)	Statistic	Paste pH	Total Carbon %	TIC kg $CaCO_3$/t	Total S %	Sulphate S (HCl method) %	ICP-MS S %	ICP Sulphide %	AP (ICP Sulphide) kg $CaCO_3$/t	Mod. NP kg $CaCO_3$/t	Mod NP /AP	Se mg/kg
SST	47	Average	7.5	2.1	39	0.27	0.014	0.18	0.17	5.2	21	16	0.8
		P5	6.1	0.56	1.8	0.02	0.01	0.02	0.01	0.31	1.6	0.65	0.2
		P50	7.5	1.6	22	0.21	0.01	0.07	0.06	1.9	8.3	6.3	0.6
		P95	9.2	5.8	120	0.87	0.03	0.7	0.67	21	74	77	1.9
SLT	28	Average	7.5	3.4	51	0.11	0.013	0.11	0.099	3.1	31	32	1.5
		P5	5.7	1.3	1.8	0.036	0.01	0.02	0.01	0.31	0.28	0.013	0.74
		P50	7.8	2.9	8.1	0.07	0.01	0.05	0.04	1.3	9.5	10	1.5
		P95	8.5	6.9	150	0.34	0.02	0.43	0.38	12	110	150	2.4
CST	30	Average	7.8	8.6	70	0.22	0.01	0.11	0.099	3.1	26	16	1.8
		P5	6.6	2.4	1.8	0.05	0.01	0.02	0.01	0.31	0.8	0.12	0.86
		P50	8	5.2	30	0.14	0.01	0.07	0.06	1.9	11	4.8	1.5
		P95	8.4	23	230	0.56	0.01	0.3	0.29	9	78	60	3.5
CCST	CM18-03-GC-47	-	7.0	#N/A	#N/A	#N/A	0.01	0.13	0.12	3.8	2.0	0.53	0.8
	CM18-03-GC-45	-	7.5	11	7.1	0.34	0.01	0.25	0.24	7.5	2.5	0.33	7.5
	CM18-05-GC2-42	-	8.1	14	510	0.55	0.01	0.44	0.43	13	39	2.9	0.4
	CM18-05-GC2-28	-	7.8	#N/A	#N/A	#N/A	0.01	0.04	0.03	0.94	2.5	2.7	1.3
MDST	22	Average	7.3	9.7	49	0.11	0.01	0.064	0.054	1.7	26	15	2.3
		P5	5.5	4.2	2.8	0.05	0.01	0.02	0.01	0.31	-2.3	-7.6	1.1
		P50	7.5	7.4	8.1	0.085	0.01	0.06	0.05	1.6	2.4	3	1.9
		P95	8.3	19	160	0.19	0.01	0.15	0.14	4.4	100	65	4.3
CARB	SAMPLE 8	-	5.4	13	1.8	0.14	0.02	0.06	0.04	1.25	0.0	0.0	3.4
	SAMPLE 6	-	6.3	#N/A	#N/A	#N/A	0.01	0.07	0.06	1.88	5.3	2.8	2.6
	11-12-37	-	7.3	3.9	84	0.09	0.01	0.08	0.07	2.19	18	8.1	1.8
COAL	17	Average	7.4	23	11	0.31	0.013	0.092	0.079	2.5	7	8.3	2
		P5	6.3	3.1	3.1	0.093	0.01	0.028	0.018	0.56	0.9	0.17	0.48
		P50	7.6	24	4.6	0.24	0.01	0.06	0.05	1.6	2.5	1.6	1.4
		P95	8.1	43	28	0.61	0.024	0.2	0.18	5.7	22	38	5
MIX	25	Average	8.0	4.3	73	0.42	0.011	0.18	0.17	5.4	33	25	1.4
		P5	6.8	1.8	8.9	0.032	0.01	0.03	0.02	0.63	2.5	0.69	0.32
		P50	8.0	3.1	71	0.13	0.01	0.07	0.06	1.9	20	13	0.9
		P95	9.0	9.2	150	1.7	0.01	0.31	0.3	9.3	98	77	4
CCST/CST	CM18-27-GC-32	-	7.8	4.9	15	0.09	0.01	0.06	0.05	1.6	4.30	2.75	2.0
	CM18-27-GC-29	-	8.3	#N/A	#N/A	#N/A	0.01	0.05	0.04	1.3	60	48	1.4
CCST/SST	CM18-27-GC-11	-	7.8	2.6	27	0.09	0.01	0.07	0.06	1.9	16.5	8.8	0.70
CST/CDB	CM18-16-GC-33	-	7.9	84	6.6	0.77	0.01	0.05	0.04	1.3	9.5	7.6	0.50
CST/SST	6	Average	8.2	3.1	18	0.15	0.01	0.11	0.1	3.2	29	17	1.3
		P5	7.7	1.3	12	0.04	0.01	0.025	0.015	0.47	5	0.84	0.85
		P50	8.3	2.9	17	0.15	0.01	0.08	0.07	2.2	8.8	13	1.3
		P95	8.5	5	27	0.27	0.01	0.24	0.23	7	74	42	1.8
CST/SLT	13	Average	8.4	4.6	130	0.11	0.01	0.065	0.055	1.7	88	58	1.8
		P5	7.6	3	97	0.065	0.01	0.032	0.022	0.69	35	17	0.66
		P50	8.5	4.2	120	0.1	0.01	0.06	0.05	1.6	79	44	1.4
		P95	9	6.6	180	0.18	0.01	0.11	0.1	3.2	150	120	3.7

Rock Type	Sample Count (or Sample ID)	Statistic	Paste pH	Total Carbon %	TIC kg $CaCO_3$/t	Total S %	Sulphate S (HCl method) %	ICP-MS S %	ICP Sulphide %	AP (ICP Sulphide) kg $CaCO_3$/t	Mod. NP kg $CaCO_3$/t	Mod NP /AP	Se mg/kg
MDST/SLT	SAMPLE 28	-	8.2	#NA	#NA	#NA	0.01	0.07	0.06	1.9	52	28	1.2
	SAMPLE 29	-	7.5	#N/A	#N/A	#N/A	0.01	0.02	0.01	0.31	0.0	0.0	0.9
SST/SLT	11	Average	8.1	4	75	0.1	0.01	0.058	0.048	1.5	64	69	1.3
		P5	7.1	1.7	18	0.052	0.01	0.025	0.015	0.47	4.8	6.2	0.5
		P50	8.3	2.8	73	0.06	0.01	0.04	0.03	0.94	71	60	1
		P95	8.6	8.4	120	0.19	0.01	0.14	0.13	3.9	110	170	3.4
ST/CST	CM18-27-GC-33	-	8.3	#NA	#NA	#NA	0.01	0.03	0.02	0.63	9.3	15	1.7
ST/SLT	CM18-05-GC2-25	-	8.5	#NA	#NA	#NA	0.01	0.04	0.03	0.94	90	96	0.60

Source: \\srk.ad\dfs\NA\VAN\Projects\01_SITES\CrownMountain\1CN028.003_Geochemistry\100_Acquisition_of_Rock_Samples\5.Sample_Inventory\Compiled_LabData_1CN028001_WICK_Rev5.xls

Table 5-2: Static Test Results for Morrissey Formation

Rock Type	Sample ID	Paste pH	Total Carbon %	TIC kg $CaCO_3$/t	Total S %	Sulphate S (HCl method) %	ICP-MS S %	ICP Sulphide %	AP (ICP Sulphide) kg $CaCO_3$/t	Mod. NP kg $CaCO_3$/t	Mod. NP /AP	Se mg/kg
ST	CM18-03-GC-61	7.5	55	4.3	0.48	0.01	0.13	0.12	3.8	2.0	0.53	1.1
ST/CDB	CM18-05-GC2-43	8.0	49	4.3	0.57	0.01	0.21	0.20	6.3	2.3	0.37	1.1
SST	CM18-03-GC-62	6.5	0.69	1.8	0.03	0.01	0.03	0.02	0.63	1.8	2.9	0.1
SST	CM18-03-GC-63	5.6	0.56	3.2	0.14	0.03	0.13	0.10	3.1	4.3	1.4	0.2
SST	CM18-27-GC-43	7.8	3.5	1.8	0.15	0.03	0.11	0.08	2.5	2.5	1.0	0.1
SST	CM18-27-GC-44	6.2	0.72	5.0	0.31	0.03	0.27	0.24	7.5	4.8	0.64	0.2
SST	CM18-05-GC2-45	6.7	1.0	3.4	0.06	0.01	0.04	0.03	0.94	3.5	3.7	0.1
ST/SLT	CM18-27-GC-42	9.0	38	5.9	0.52	0.01	0.23	0.22	6.9	2.5	0.36	0.7
SST	CM18-16-LDC3-40	7.1	0.84	7.1	0.27	0.01	0.25	0.24	7.5	3.3	0.44	0.2
SST	CM18-16-LDC3-41	7.0	1.2	39	0.38	0.02	0.37	0.35	11	9.5	0.87	0.2
SST	CM18-16-LDC3-42	8.1	58	57	1.26	0.01	0.97	0.96	30	6.5	0.22	0.5
SST	CM18-16-LDC3-43	7.0	0.67	8.0	0.08	0.02	0.08	0.06	1.9	6.8	3.6	0.2

Source: \\srk.ad\dfs\NA\VAN\Projects\01_SITES\CrownMountain\1CN028.003_Geochemistry\100_Acquisition_of_Rock_Samples\5.Sample_Inventory\Compiled_LabData_1CN028001_WICK_Rev5.xls

Table 5-3: Static Test Results for Fernie Formation

Rock Type	Sample ID	Paste pH	Total Carbon %	TIC kg $CaCO_3$/t	Total S %	Sulphate S (HCl method) %	ICP-MS S %	ICP Sulphide %	AP (ICP Sulphide) kg $CaCO_3$/t	Mod. NP kg $CaCO_3$/t	Mod. NP /AP	Se mg/kg
Not recorded	TP18-MD6	8.3	0.78	23	0.02	0.01	0.02	0.01	0.31	33	110	0.10
Not recorded	BH18-MD2	8.8	4.8	360	0.34	0.01	0.29	0.28	8.8	370	42	0.10
Not recorded	BH18-12	8.7	3.3	160	0.22	0.01	0.18	0.17	5.3	170	32	1.0
Not recorded	BH18-MD1	8.7	3.0	130	0.47	0.01	0.42	0.41	13	140	11	1.3
Not recorded	BH-18-PP2	8.5	5.1	340	0.52	0.03	0.44	0.41	13	360	28	0.60

Source: \\srk.ad\dfs\NA\VAN\Projects\01_SITES\CrownMountain\1CN028.003_Geochemistry\100_Acquisition_of_Rock_Samples\5.Sample_Inventory\Compiled_LabData_1CN028001_WICK_Rev5.xls

Notes:

(1) For values below detection limit, the detection limit was used for statistical calculations.

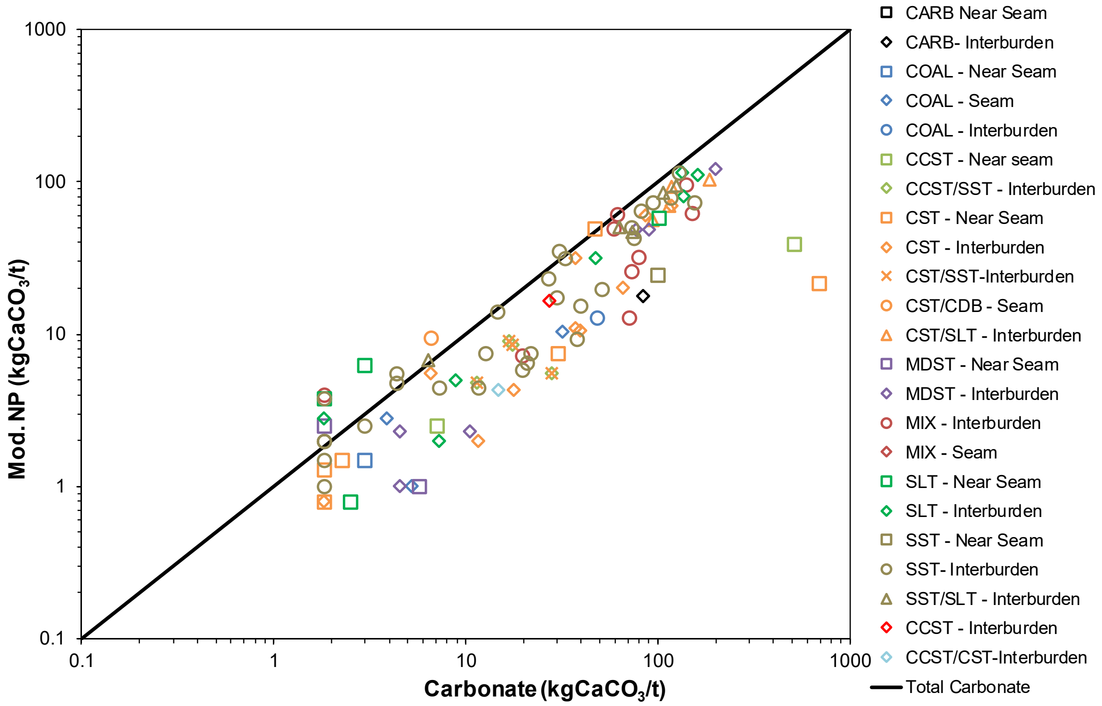
(2) SST – Sandstone; ST – Stoney Coal; SLT – Siltstone; CST – Claystone; CCST – Carbonaceous Claystone; MDST – Mudstone; CARB – Carbonaceous; CBD – Dull Banded; MIX Mixed rock type.

5.1.2 Neutralization Potential

Neutralizing rock components were determined by the modified Sobek method and carbonate analysis.

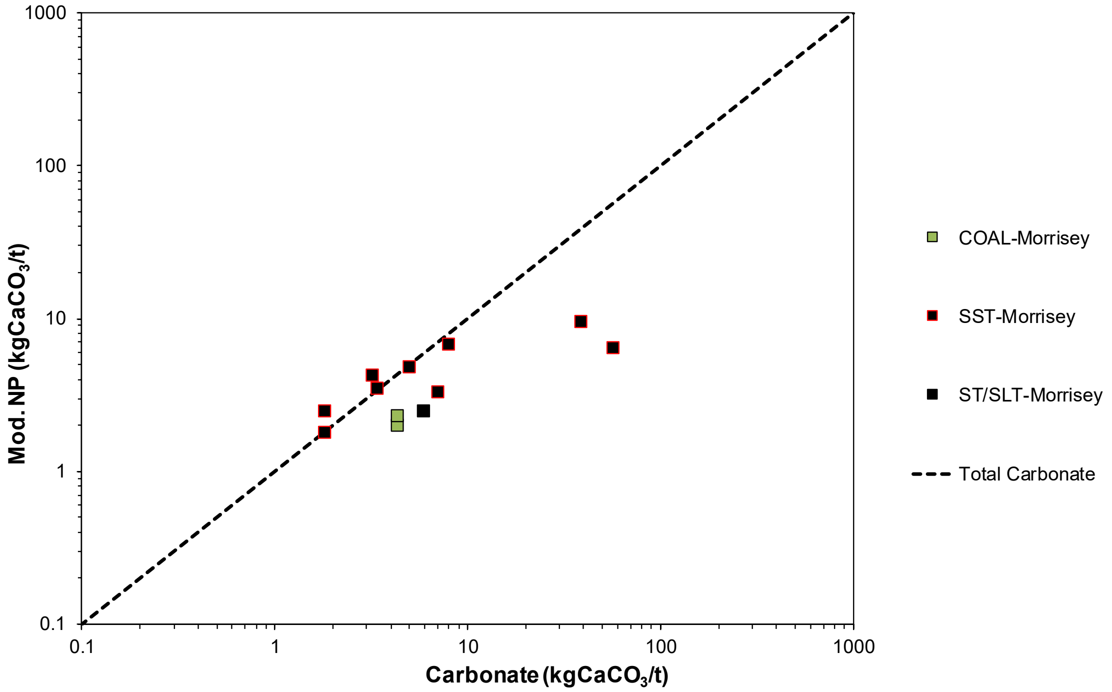
Modified NP and carbonate content are compared in Figure 5-7 and show that NP and carbonate content are correlated, but carbonate is typically higher. These results are consistent with the presence of iron-bearing carbonate minerals (e.g. ferroan dolomite, ankerite and siderite) because these contribute to carbonate but not modified NP.

In addition, Modified NP was compared to carbonate calculated using magnesium and calcium ICP-MS data. Data for MMF are shown in Figure 5-10 and indicate that there is also a good correlation, although Modified NP is lower in the majority of samples. Based on these findings, it is concluded that modified NP appropriately represents acid neutralizing minerals. The conclusion will be reviewed in the context of XRD mineralogy when results become available.



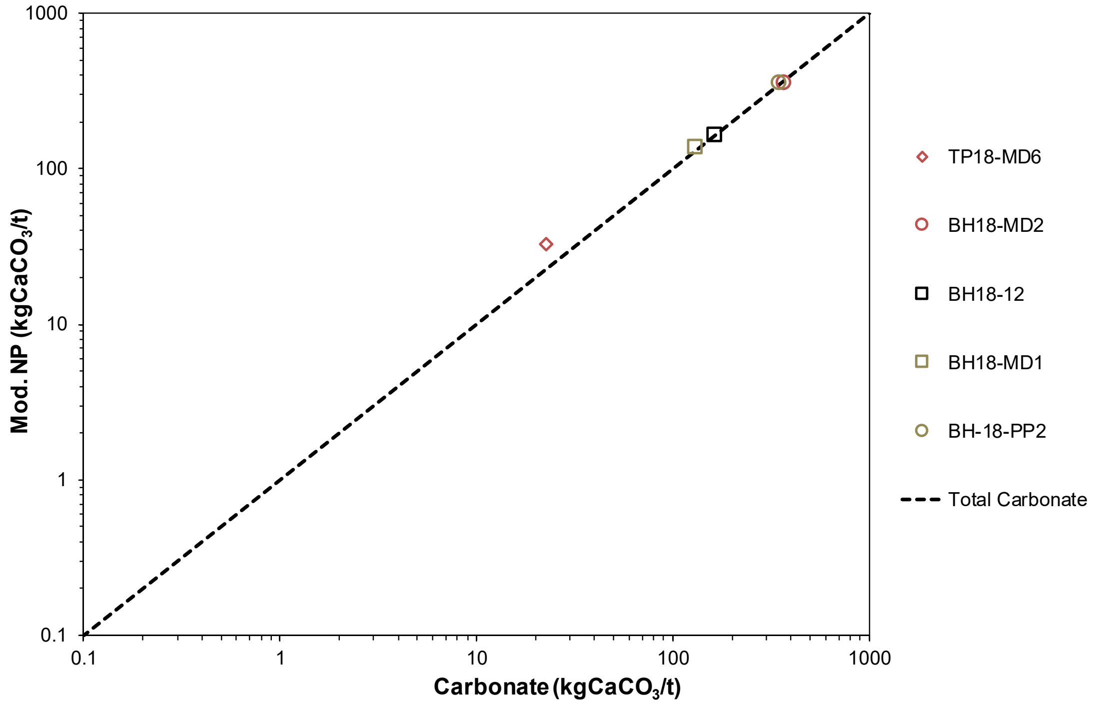
\\srk.ad\dfs\NA\VAN\Projects\01_SITES\Crown Mountain\1CN028.003_Geochemistry\100_Acquisition_of_Rock_Samples\5.Sample_Inventory\Compiled_LabData_1CN028001_WICK_Rev5.xls

Figure 5-7: Comparison of Carbonate and Modified NP for Mist Mountain Formation



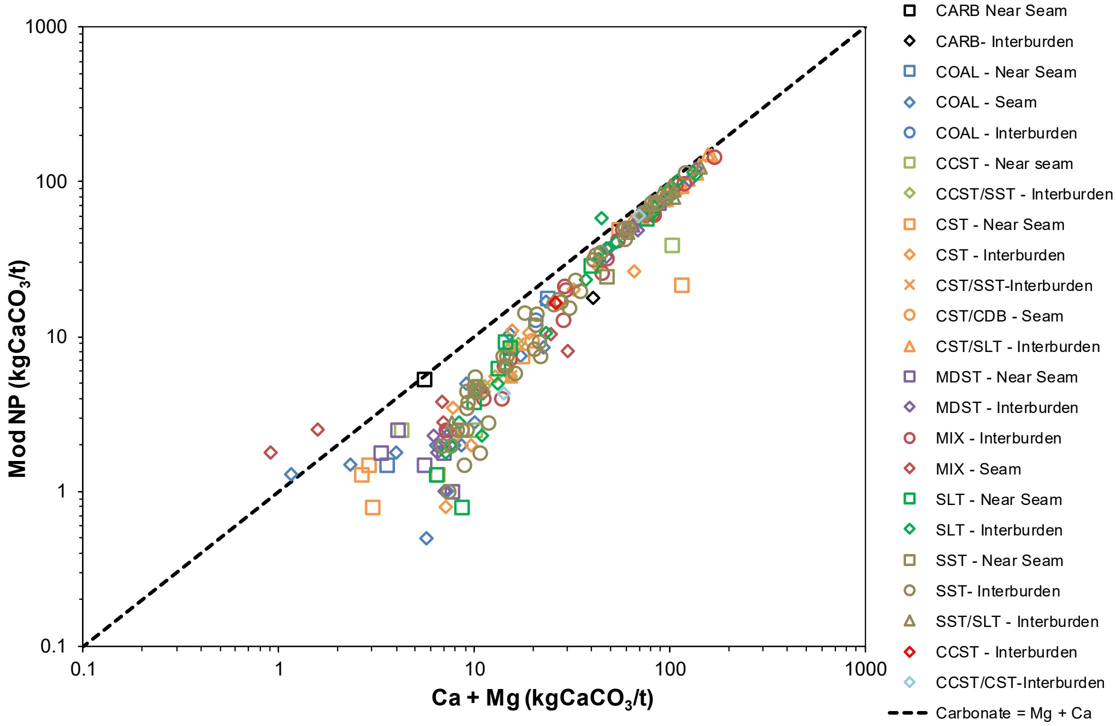
\\srk.ad\dfs\NA\VAN\Projects\01_SITES\Crown Mountain\1CN028.003_Geochemistry\100_Acquisition_of_Rock_Samples\5.Sample_Inventory\Compiled_LabData_1CN028001_WICK_Rev5.xls

Figure 5-8: Comparison of Carbonate and Modified NP for Morrisey Formation



\\srk.ad\dfs\NA\VAN\Projects\01_SITES\Crown Mountain\1CN028.003_Geochemistry\100_Acquisition_of_Rock_Samples\5.Sample_Inventory\Compiled_LabData_1CN028001_WICK_Rev5.xls

Figure 5-9: Comparison of Carbonate and Modified NP for Fernie Formation



\\srk.ad\dfs\NA\VAN\Projects\01_SITES\Crown Mountain\1CN028.003_Geochemistry\100_Acquisition_of_Rock_Samples\5.Sample_Inventory\Compiled_LabData_1CN028001_WICK_Rev5.xls

Figure 5-10: Comparison of Carbonate (Ca + Mg) and Modified NP for Mist Mountain Formation

5.1.3 Acid Rock Drainage Potential

The dataset provides two measures of ARD potential: paste pH and the NP/AP ratio. Paste pH below 5.5 indicates the instantaneous acidity of de-ionized water in contact with the samples and is a result of acid generated by sulphide oxidation prior to testing exceeding the available reactive NPs of the samples. The NP/AP ratio ≤2 indicates future potential for ARD.

Paste pH

Figure 5-11, Figure 5-12 and Figure 5-13 compares paste pH with Modified NP for MMF, MF and FF respectively. A total of five samples (2.1% of the total sample population), each from MMF resulted in an acidic pH, (i.e. less than about 5.5, which is the pH of de-ionized water). These samples had paste pHs of between 5.1 and 5.5; three of these were near-seam (8U) materials, while one was coal and one interburden material.

Negative modified NP values are expected in samples with a paste pH of less than 5.5. However, this was only the case for three samples. This indicates that those samples did not contain significant amounts of stored acidity and the paste pH is due to the de-ionized water. This is also supported by the lack of negative NP values in the dataset (of which there are only four), which indicate the presence of stored acidity. The overall trend toward decreasing pH as Modified NP decreases reflects the decrease in reactive carbonate content and weaker effect on the de-ionized water. The presence of less soluble carbonate minerals also results in weaker buffering of pH in the test.

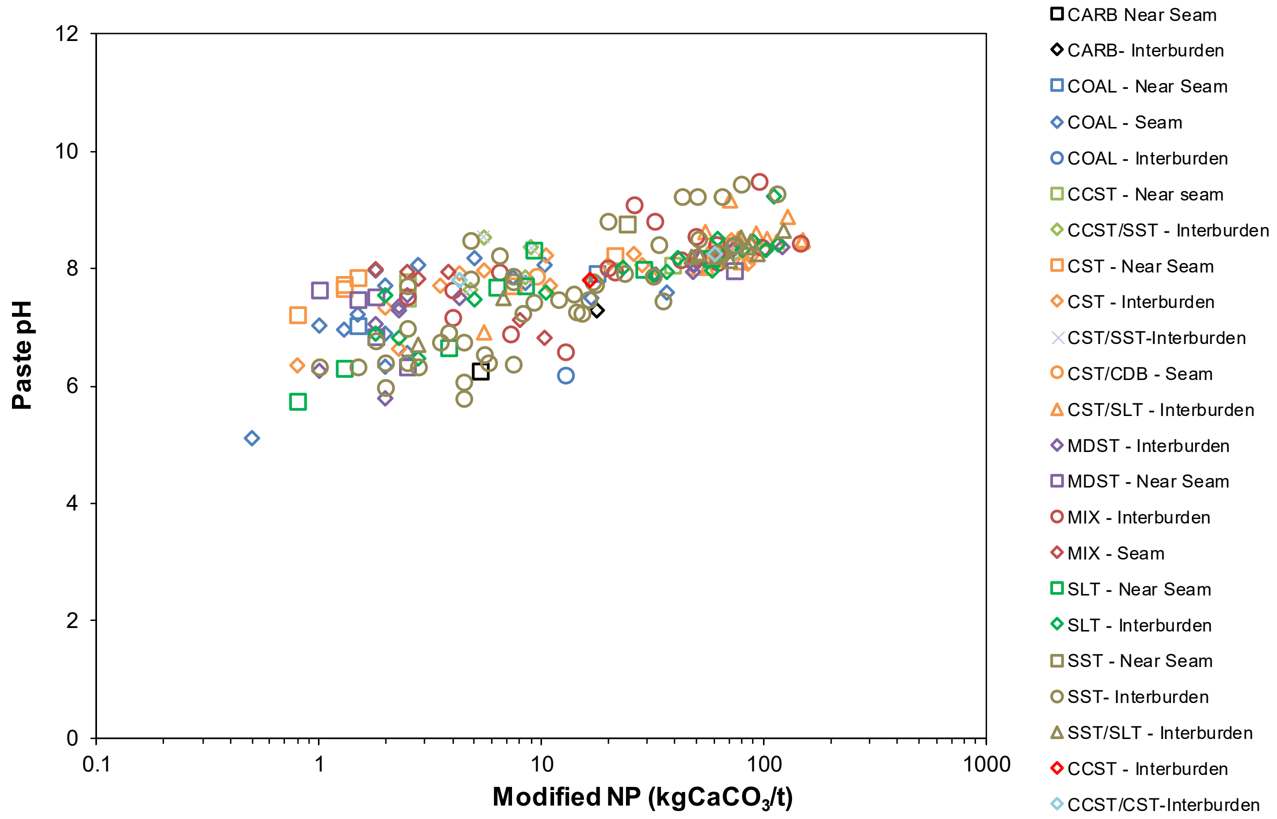
ARD Potential Classification

Charts presenting modified NP and AP for MMF, MF and FF are shown in Figure 5-14, Figure 5-15 and Figure 5-16, respectively. The charts compare the results with modified NP/AP criterion for ARD potential of 1 and 2. Modified NP/AP >2 indicates rock with negligible potential for ARD whereas modified NP/AP <1 indicates the material has the potential to generate ARD. In addition to the modified NP/AP ratio classification described, an additional parameter was used to classify ARD potential and is shown on the charts. At low sulphur concentrations, interpretation of ARD potential using modified NP/AP ratios may not be meaningful because oxidation of low concentrations of sulphide produces low amounts of acid that are readily neutralized by many rock components in addition to carbonate. A conservative ICP-MS sulphur concentration of 0.1% was selected to represent low sulphur concentrations - no samples generated acidic paste pH below this value. Below 0.1% ICP-MS sulphur, rock was classified as non-PAG regardless of the modified NP/AP ratio.

Figure 5-14 shows that a total of 27 samples (12%) are classified as PAG for MMF, while 8 samples (4%) are classified uncertain and the rest (84%) as non-PAG. For MF, shown on Figure 5-15, eight samples (67%) are classified PAG, with one uncertain classification (8%) and three samples non-PAG (25%). The five FF samples were all classified non-PAG and are shown in Figure 5-16.

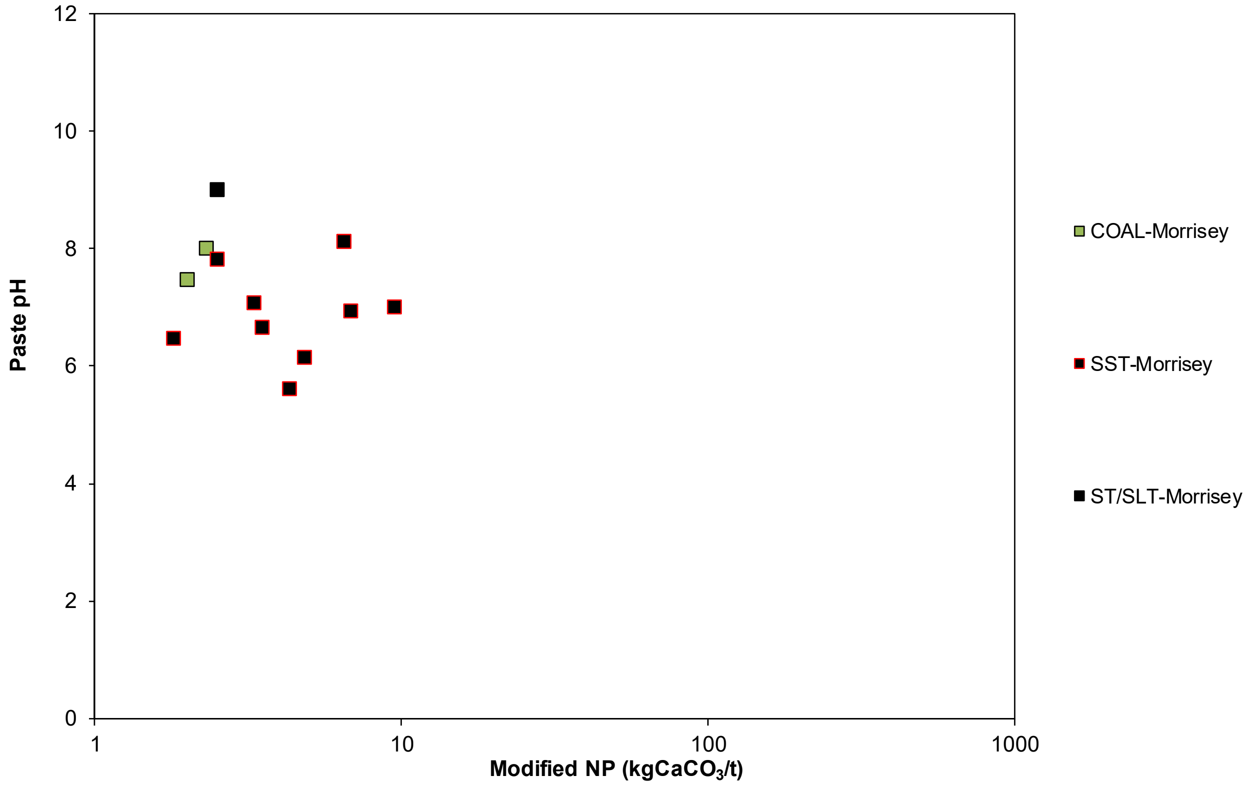
For MMF waste rock, the data show that a higher proportion of SST samples are classified as PAG (22%) as a proportion of total SST samples (shown in Figure 5-17). Claystone samples (shown in Figure 5-18) had the next highest proportion of PAG samples (17%) with mudstone recording a total of 10% PAG samples. Siltstone recorded a total of 8% PAG samples. The mixed lithology samples recorded 7% samples as PAG. For reference, a total of 10% of coal samples were recorded as PAG.

Overall the potential for ARD is considered to be low for MMF and FF. This is because 12% of MMF samples returned a PAG classification and all samples associated with FF were non-PAG. However, MF is classified as PAG overall because 67% of MF samples were classified as PAG. This finding is consistent with observations elsewhere in the Elk Valley (Teck 2017).



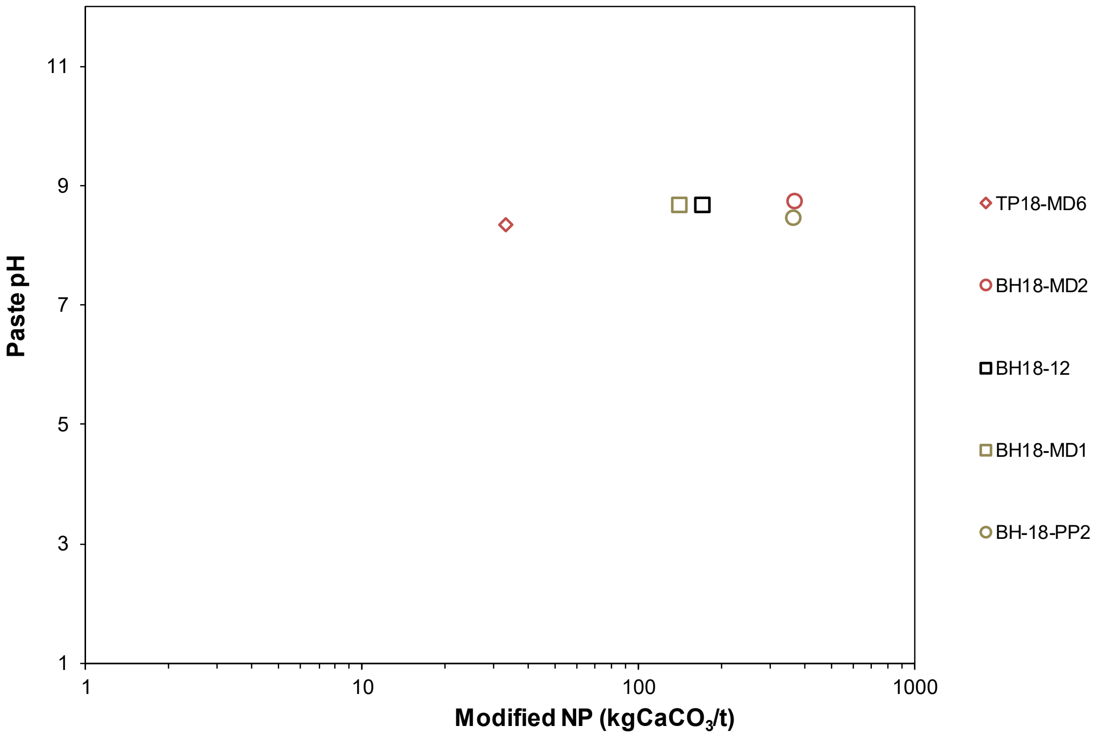
\\srk.ad\dfs\NA\VAN\Projects\01_SITES\Crown Mountain\1CN028.003_Geochemistry\100_Acquisition_of_Rock_Samples\5.Sample_Inventory\Compiled_LabData_1CN028001_WICK_Rev5.xls

Figure 5-11: Comparison of NPWR with Paste pH for Mist Mountain Formation



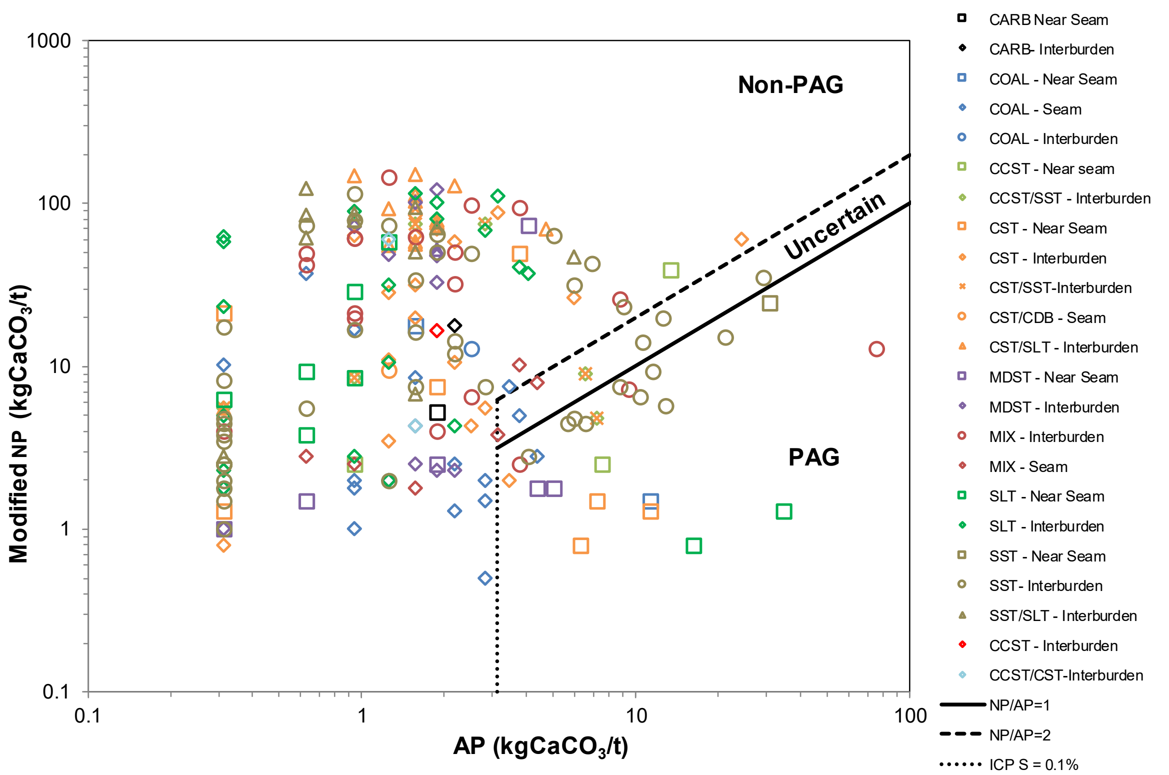
\\srk.ad\dfs\NA\VAN\Projects\01_SITES\Crown Mountain\1CN028.003_Geochemistry\100_Acquisition_of_Rock_Samples\5.Sample_Inventory\Compiled_LabData_1CN028001_WICK_Rev5.xls

Figure 5-12: Comparison of NPWR with Paste Ph for Morrisey Formation



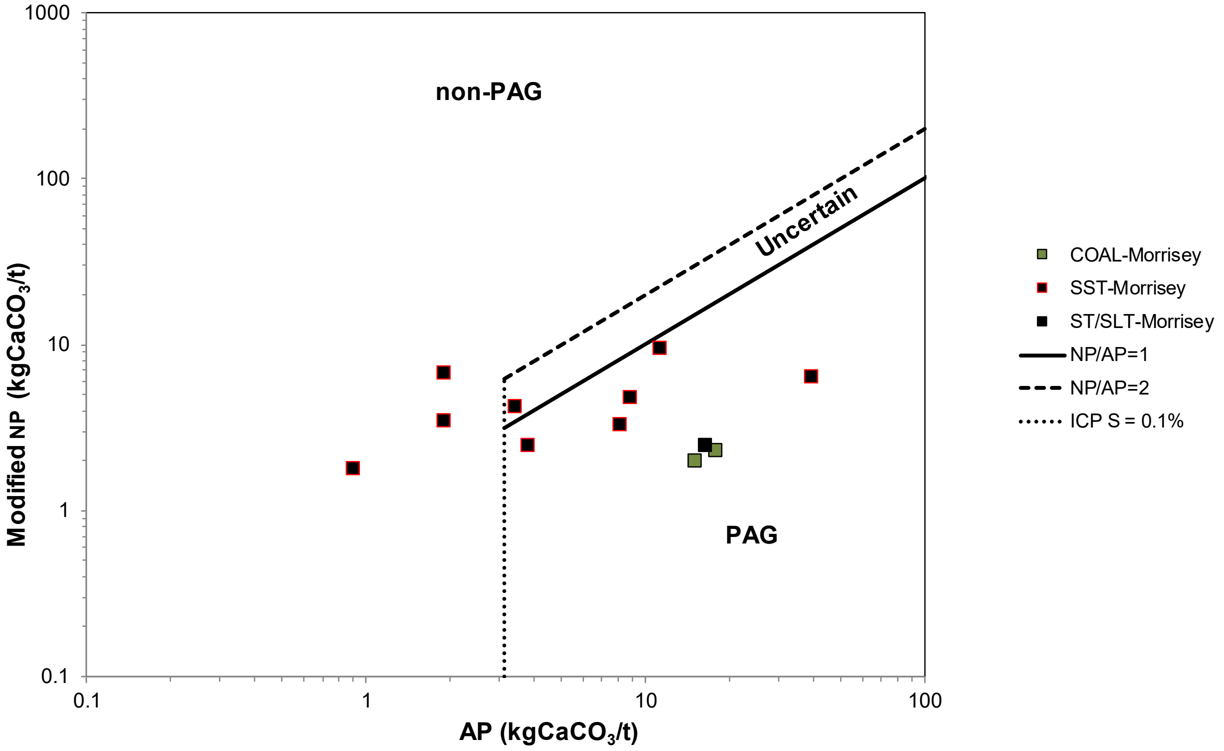
\\srk.ad\dfs\NA\VAN\Projects\01_SITES\Crown Mountain\1CN028.003_Geochemistry\100_Acquisition_of_Rock_Samples\5.Sample_Inventory\Compiled_LabData_1CN028001_WICK_Rev5.xls

Figure 5-13: Comparison of NPWR with Paste pH for Fernie Formation



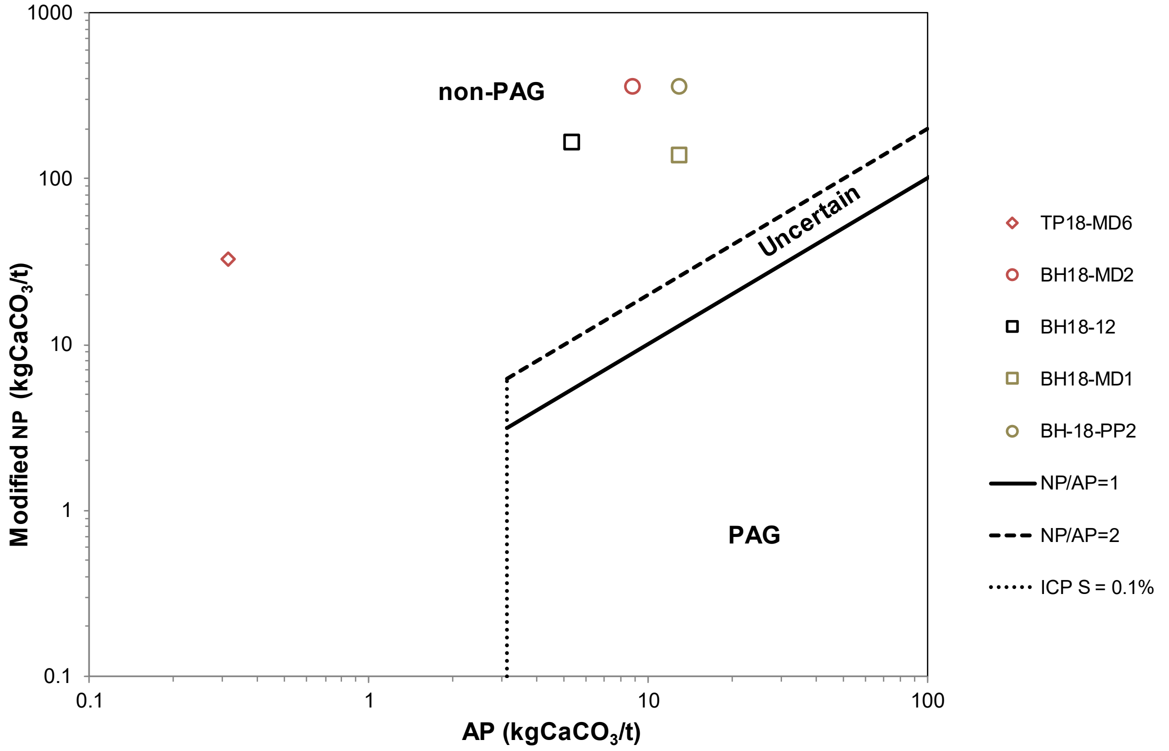
\\srk.ad\dfs\NA\VAN\Projects\01_SITES\Crown Mountain\1CN028.003_Geochemistry\100_Acquisition_of_Rock_Samples\5.Sample_Inventory\Compiled_LabData_1CN028001_WICK_Rev5.xls

Figure 5-14: Acid Rock Drainage Potential Indicated by Acid-Base Accounting for Mist Mountain Formation



\\srk.ad\dfs\NA\VAN\Projects\01_SITES\Crown Mountain\1CN028.003_Geochemistry\100_Acquisition_of_Rock_Samples\5.Sample_Inventory\Compiled_LabData_1CN028001_WICK_Rev5.xls

Figure 5-15: Acid Rock Drainage Potential Indicated by Acid-Base Accounting for Morrisey Formation



\\srk.ad\dfs\NA\VAN\Projects\01_SITES\Crown Mountain\1CN028.003_Geochemistry\100_Acquisition_of_Rock_Samples\5.Sample_Inventory\Compiled_LabData_1CN028001_WICK_Rev5.xls

Figure 5-16: Acid Rock Drainage Potential Indicated by Acid-Base Accounting for Fernie Formation

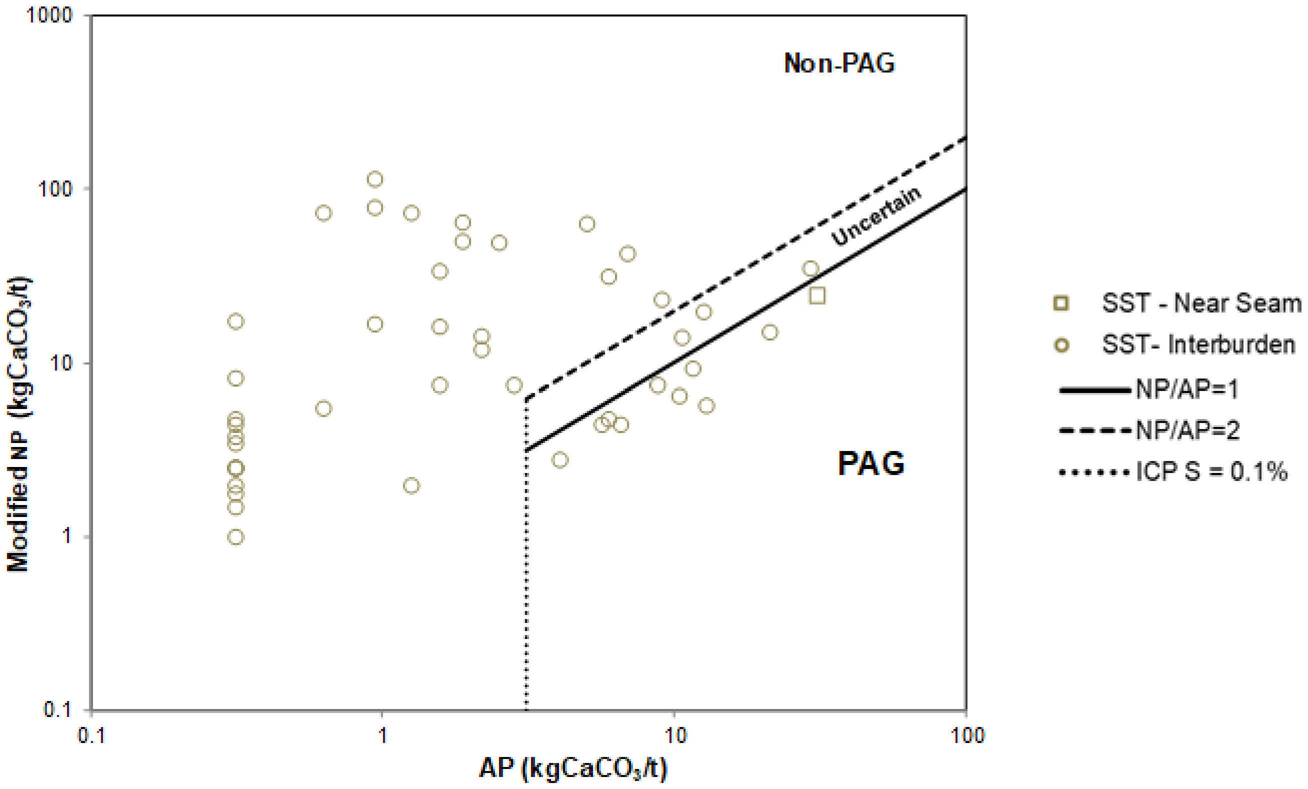


Figure 5-17: Acid Rock Drainage Potential of SST Indicated by Acid-Base Accounting for Mist Mountain Formation

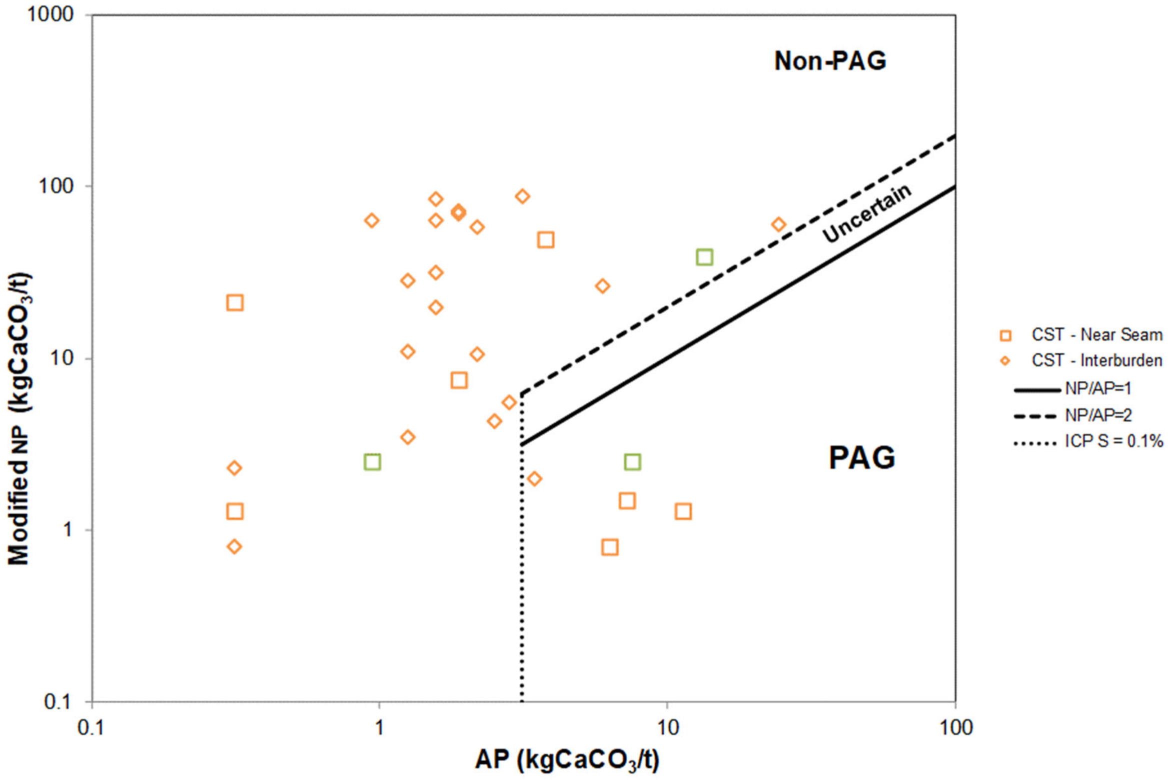


Figure 5-18: Acid Rock Drainage Potential of CST Indicated by Acid-Base Accounting for Mist Mountain Formation

5.1.4 Relationships with Stratigraphy

Table 5-4 summarizes ABA data by stratigraphic position for interburden rocks; downhole graphics are presented in Appendix C, and an example of which is shown in Figure 5-19.

Due to the presence of low AP and elevated modified NP, there are generally no differences in the composition of interburden rocks related to stratigraphy with some exceptions.

Results are discussed below for between the seams, near seam, and within seam (coal).

Between Seam

All between samples and hence zones, associated with MMF are classified as non-PAG using the NP/AP and sulphur criteria. Some interburden samples had lower NP/AP ratios in comparison to the majority of MMF material, including 8U, which had a negative NP/AP ratio of -2.0 due to negative NPs. However, sulphide sulphur for this stratigraphic interval is low at between 0.03 and 0.09% and as such the risk of ARD is low.

Average concentrations of selenium within the interburden samples of MMF were highest in samples from 8U Hangingwall (3.5 mg/kg), with the remaining samples from MMF (i.e. lower in the stratigraphic sequence) recording lower concentrations of selenium in the range of 1.0 to 2.1 mg/kg.

None of the averages indicated an acidic paste pH, ranging between 5.5 and 8.6.

The interburden data for Moose and Below Moose indicate lower average NP/AP (1.8 and 1.2, respectively). These interburden samples also recorded relatively high sulphide concentrations of 0.37 and 0.1%, respectively and as such are classified as having an uncertain ARD potential.

Near Seam

Table 5-5 provides the same summary for near seam materials. Compared to the interburden rocks of MMF, these materials have a slightly lower paste pH range, between 5.4 and 7.9. Average selenium contents were higher, being between 2.2 and 3.2 mg/kg. As for the interburden samples, the highest average selenium content was for near seam 8U (3.1 mg/kg).

Average NP/AP are lower in near seam materials of MMF, ranging between 0 and 21. Those with NP/AP ratios of less than 1 include 8U, 8R and 10U, although sulphide concentrations are less than 0.1% in all but 10U, which has a sulphide concentration of 0.12%, hence this has been classified to have an uncertain ARD potential.

There are 11 samples of near seam 10U material, with a range of sulphide sulphur concentrations of between 0.01 and 0.65%. A total of 7 out of the 11 samples have a sulphide sulphur concentration of <0.1%, with a range of 0.01 and 0.05%. The 90th percentile for sulphide sulphur is 0.24%. Paste ranges for 10U near seam material were between 6.6 and 8.0 s.u. and therefore not acidic.

Some coal was logged in the MF though these seams will not be recovered. Near seam rock in the Moose Mountain Member (MMM) had an NP/AP ratio of 0.7 and a sulphide concentration of 0.61%; hence this material is PAG. Selenium in the MMM was 1.2 mg/kg. In contrast, near seam material for Below the MMM had a higher NP/AP of 69 and a sulphide concentration of 0.01% and is therefore non-PAG.

Seam Material (Coal)

Table 5-6 shows the same summary for seam materials. Selenium concentrations are lower than for interburden and near seam material, at between <0.1 and 0.7 mg/kg. None of the seam material recorded NP/AP values of <1 with vales between 1.2 and 7.6. Sulphide sulphur concentrations between 0.02 and 0.14% are recorded. Overall, seam 10U, 10M and 10L are classified as non-PAG with sulphide sulphur concentrations of less than 0.1%. Seam 9 in classified as uncertain due to sulphide sulphur concentrations of between 0.12 and 0.14%.

Summary

Conclusions to be drawn from the review of the data associated with stratigraphic sections are:

- Average data for stratigraphic sections of MMF indicates that this material is generally non-PAG. The only exception is near seam material at 10U, which is classified as uncertain, with a sulphide sulphur concentration marginally above 0.1% at 0.12%.
- The average data for MF indicate that the interburden and near seam material is classified as uncertain or PAG. This is consistent with expectations for this material and for results at other sites in the Elk Valley (Teck 2017).

Table 5-4: Averages by Stratigraphic Position for Interburden Rocks

Formation	Interburden	n	Paste pH	Sulphide Sulphur	AP	Modified NP	NP/AP	Se	ARD Classification
			(%)	(%)	(kg $CaCO_3$/t)	(kg $CaCO_3$/t)	-	mg/kg	
MMF	8U Hangingwall	2	5.6	0.03	0.9	-1.9	-2.0	3.5	non-PAG
MMF	8U to 9	67	7.6	0.08	2.5	32	13	1.2	non-PAG
MMF	9 to 9L	3	8.1	0.06	1.8	79	44	2.1	non-PAG
MMF	9L to 10U	24	8.2	0.05	1.5	61	40	1.4	non-PAG
MMF	10U to 10M	7	7.9	0.08	2.6	21	7.9	1.3	non-PAG
MMF	10M to 10L	13	8.6	0.09	2.9	58	20	1.0	non-PAG
MF	Moose Mountain Member	21	8.0	0.37	11	20	1.8	0.61	Uncertain
MF	Below Moose Mountain Member	4	6.2	0.10	3.1	3.6	1.2	0.15	Uncertain

Source: \\srk.ad\dfs\NA\VAN\Projects\01_SITES\CrownMountain\1CN028.003_Geochemistry\100_Acquisition_of_Rock_Samples\5.Sample_Inventory\Compiled_LabData_1CN028001_WICK_Rev5.xls

Notes

(1) Samples of coal seams were not included in the calculation
(2) * Single result, not average.

Table 5-5: Averages by Stratigraphy for Near Seam Rocks

Formation	Near Seam	n	Paste pH	Sulphide Sulphur	AP	Modified NP	NP/AP	Se	ARD Classification
			(%)	(%)	(kg $CaCO_3$/t)	(kg $CaCO_3$/t)	-	mg/kg	
MMF	8U	3	5.6	0.04	1.3	0.0	0.0	3.1	non-PAG
MMF	8R	1*	5.4	0.04	1.3	0.0	0.0	3.4	non-PAG
MMF	9	2	7.9	0.03	1.0	21	21	2.2	non-PAG
MMF	9R	1*	8.0	0.13	4.1	74	18	3.2	non-PAG
MMF	10U	11	7.4	0.12	3.8	5.0	1.3	2.3	Uncertain
MF	Moose	2	8.3	0.61	19	13	0.7	1.2	PAG
MF	Below Moose	1	8.2	0.01	0.3	21.5	69	0.1	non-PAG

Source: \\srk.ad\dfs\NA\VAN\Projects\01_SITES\CrownMountain\1CN028.003_Geochemistry\100_Acquisition_of_Rock_Samples\5.Sample_Inventory\Compiled_LabData_1CN028001_WICK_Rev5.xls

Notes

(1) Samples of coal seams were not included in the calculation
(2) * Single result, not average.

Table 5-6: Results by Stratigraphy for Coal Seam Samples

Formation	Above Seam	n	Paste pH	Sulphide Sulphur	AP	Modified NP	NP/AP	Se	ARD Classification
			(%)	(%)	(kg $CaCO_3$/t)	(kg $CaCO_3$/t)	-	mg/kg	
MMF	9	1	6.8	0.12	3.8	10	2.8	0.4	Uncertain
MMF	9	1	7.1	0.14	4.4	8.0	1.8	<0.1	Uncertain
MMF	10U	4	7.8	0.02	0.6	2.8	4.5	0.7	non-PAG
MMF	10M	2	7.9	0.04	1.3	9.5	7.6	0.5	non-PAG
MMF	10L	1*	8.0	0.05	1.6	1.8	1.2	0.3	non-PAG

Source: \\srk.ad\dfs\NA\VAN\Projects\01_SITES\CrownMountain\1CN028.003_Geochemistry\100_Acquisition_of_Rock_Samples\5.Sample_Inventory\Compiled_LabData_1CN028001_WICK_Rev5.xls

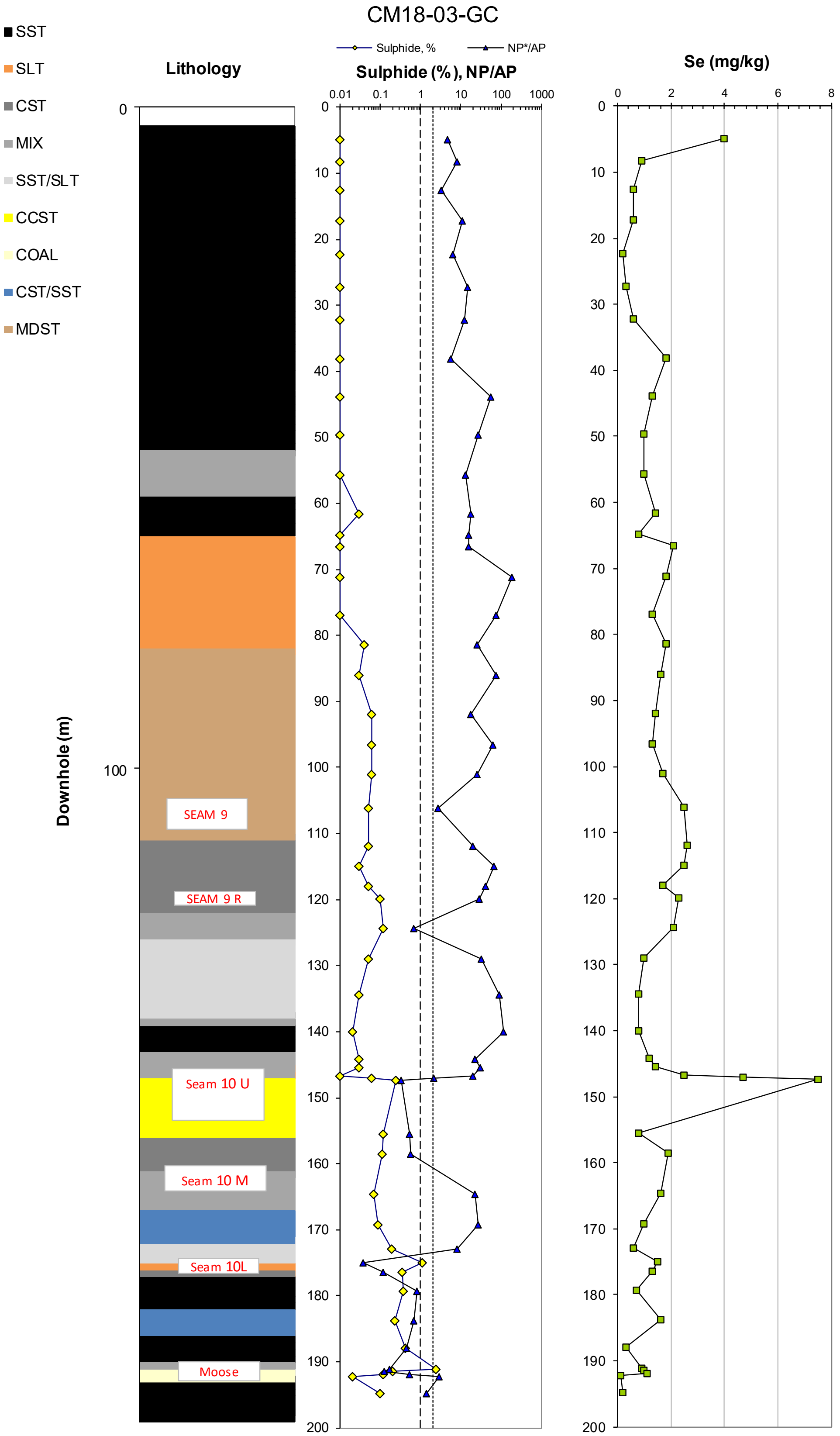


Figure 5-19: Downhole Plot of CM18-03-GC

5.1.5 Metal Leaching Potential

The complete data set is provided in Appendix B.

Trace element concentrations provide an indication of the degree to which rock may contain elevated concentrations compared to global average values. This may or may not be correlated with leaching potential but is the basis for initial screening of metal leaching potential. Enrichment of trace elements was evaluated by comparison with global average values in similar rock types (Price 1997). Values exceeding 10 times the global value were considered “enriched.”

Coal, mudstone, and mixed rock samples were compared to 10 times the crustal abundance for shale. Sandstone and siltstones in the Elk Valley have fine interbeds of carbonaceous matter, which can skew comparisons to crustal abundances of pure quartz sandstones not representative of the actual geology. Therefore, sandstone and siltstone samples from the MMF were compared to 10 times the crustal abundance for sandstone and shale.

The majority of elements in coal and mudstone samples were recorded at less than 10 times average crustal concentrations for shale. The only exceptions to this were cadmium in 12 samples (3.08-5.92 mg/kg) and selenium in two samples (6.80-7.50 mg/kg). For all samples, the average concentration of cadmium and selenium was 1.56 mg/kg and 1.76 mg/kg, with the 90th percentiles being 3.53 mg/kg and 2.98 mg/kg, also all below 10 times the average crustal abundance.

Sandstone, siltstone, and mixed samples were also mostly less than 10 times the average crustal values of shale; the only exception was cadmium in three samples (3.01 – 4.80 mg/kg). The 95th percentile for cadmium was less than 10 times the average crustal abundance for shale. When compared to ten times the average crustal abundance for sandstone, values for antimony, barium, molybdenum, copper, nickel, zinc, nickel, cobalt, arsenic, mercury, cadmium and selenium were higher. This is consistent with the fact that sandstones in the Elk Valley contain fine interbeds of carbonaceous matter, and therefore, the comparison with shale is more appropriate.

Table 5-1, Table 5-2 and Table 5-3 summarizes selenium concentration statistics by rock type in MMF, MF and FF respectively (FF – the rock type as this was not provided). Lowest average concentrations occur in sandstones (0.80 mg/kg), followed by siltstones (1.80 mg/kg), coals (2.13 mg/kg) and mudstones (2.15 mg/kg). Average values for sandstone, siltstone and coal are very similar to averages for the Elk Valley determined by Ryan and Dittrick (2001).

5.1.6 Laboratory Kinetic Tests

Thirteen humidity cell tests (Table 5-7) were operated for 40 leaching cycles with the exception of cell HC-08, which was operated for 66 cycles to evaluate declining pH.

pH

The tests generated variable pH results resulting in several groups (Figure 5-20):

- Fernie Formation (HC-12 and HC-13) generated highest pHs between pH 8.2 and 9.0, and the trend was stable.
- Mist Mountain Formation siltstones/mudstones and claystone's (HCTs -01, -02, -06, 07 and -10) generated stable pHs near 8. HC-11 (Coal) also generated a pH of near 8 for the majority of testing, although there was a decline at the end of testing – the final pH was approaching 7.
- pHs recorded for leachates of two sandstone cells (HC-03 and HC-04) from MF and MMF respectively were stable between 6 and 7.
- A coal sample (HC-09) associated with the Mist Mountain Formation generated a leachate that had a stable pH around 4.5. PAG sample HC-08 (coal) also showed low pH, declining to near 5.
- PAG sample HC-05 (sandstone from MMF) containing 0.65% sulphide S showed lowest pHs stabilizing between 2 and 3.

Sulphate

For sulphate, the overall trends are stable or decreasing slowly in most cases. Sulphate leaching rates (shown in Figure 5-21) were mostly <100 mg/kg/week, but increasing trends are notable from some samples. This includes sample HC-13 (Fernie Formation) which increased from 3.64 mg/kg/week at week 18 to 12.6 mg/kg/week at week 38. Sample HC-08 (Morrisey) also shows an increase from 1.39 mg/kg/week at week 6 to 6.2 mg/kg/week at week 26, although subsequent to this, it remains stable to week 64 at 6.4 mg/kg/week.

Increases in sulphate in HC-08 correspond with the decline in pH. Sample HC-05, which generated the lowest pH, generated the highest concentrations of sulphate for the majority of the testing period. Sulphate release rates were generally 100 mg/kg/week, although after week 20, there was a gradual decline in the release rate to 60 mg/kg/week. This decline also corresponded with stabilisation of pH at 2.7; prior to this time, the pH has been declining. This is less clear for sample HC-13, as sulphate increases from week 18 does not correspond with a decline in pH.

Alkalinity

Like pH, results for alkalinity can be grouped together. The alkalinity results claystone, mudstone and the FF all had relatively stable results (similar to pH). For these lithologies, alkalinity generally varied between 10 and 44 mg/kg/week.

Sandstone samples (HC-03, HC-04 and HC-05) demonstrated low or declining trends for alkalinity during the testing period. For example, at week 0 the alkalinity in HC-04 (SST) was 5.1 mg/kg/week; this declined throughout testing and was recorded at 0.24 mg/kg/week at the end of the test. It is clear that the lowest release rates for alkalinity are associated with those samples that have the lowest pH, including HC-03, HC-04, HC-05, HC-08 and HC-09. After week 20, release rates for alkalinity were all below 1 mg/kg/week in HC-03 and HC-4, whilst values were much lower (<0.25 mg/kg/week) in HC-05, HC-08 and HC-09 after this time.

Elements

Concentrations of aluminium (Figure 5-24), chromium (Figure 5-28), manganese (Figure 5-29), cadmium (Figure 5-25), iron (Figure 5-26) and zinc (Figure 5-30) were very low in all samples, with the notable exception of sample HC-05 (sandstone). This sample yielded results for these elements that showed the same trend for release rates between week 8 and 36. Individual peaks were noted at week 16 for aluminium (2.56 mg/kg/week), chromium (0.002 mg/kg/week) and manganese (2.20 mg/kg/week), cadmium (peak 0.013 mg/kg/week), iron (peak of 20.1 mg/kg/week) and zinc (2.16 mg/kg/week), Each of the peaks were followed by sharp decline in release rates. Sample HC-05 showed a decline in pH from week 0 to 19 and the peak release rate for those elements described correspond well to the decline in pH. Following the stabilisation of pH in this sample, the release rate for those elements also begins to stabilize.

An upward trend is also evident for cadmium in HC-08 (Coal – Morrisey) which is recorded at 0.00001 mg/kg/week at week 0, rising to 0.0003 mg/kg/week at week 65, although this is still a low release rate. The steady increase in the release rate for cadmium corresponds with a gradual decline in pH that is noted for this sample.

Release rates for selenium are all stable and/or generally decreasing and are shown in Figure 5-27. The highest selenium leaching rates were observed in sample HC-09 (coal) and were generally highest in the coal and siltstone/mudstone/claystone samples. The lowest release rate for selenium was recorded in HC-13 (Fernie Formation). There is a very marginal increase in the selenium release rate subsequent to week 28 in HC-13. This marginal increase in the selenium release rate does correspond with a decline in pH in this sample at the end of testing, although in general, there isn’t a clear relationship between pH trends and selenium release for the samples.

Plots of pH and selected elements show that at lower pH values, metal release rates are generally several orders of magnitude higher. For example, for zinc, lower pH between 2.7 and 4.6 correspond with release rates for zinc of between 0.52 and 8.3 mg/kg/week (HC-5, SST and HC-09, COAL) while samples with pH of between 6.4 and 8.4 s.u. (HC-04, SST and HC-11, COAL) results in zinc release rates of between 0.001 and 0.01 mg/kg/week. This is shown in Figure 5-31 to Figure 5-34 for zinc, cadmium, cobalt and nickel. A plot for pH and selenium is also shown in Figure 5-35 and confirms an overall lack of relationship between selenium release and pH.

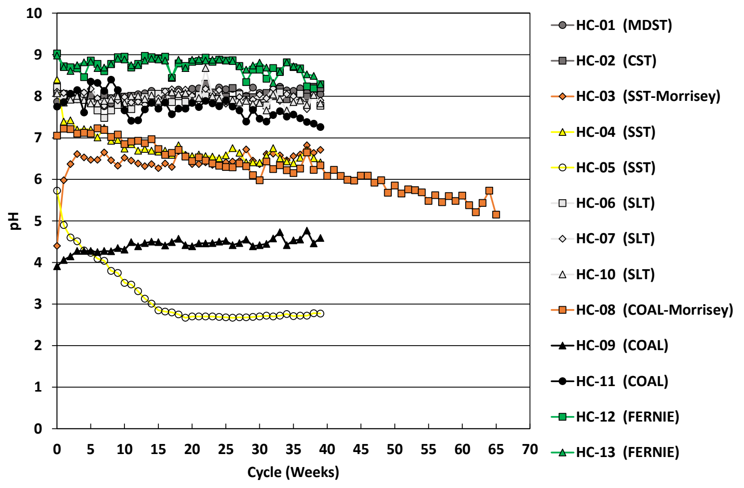
Table 5-7: Selected Characteristics of Humidity Cell Test Samples (Waste Rock and Coal)

HCT-ID	Sample ID	Formation	Lithology	Paste pH s.u.	Total S %	Sulphate S (HCl method) %	ICP Sulphide %	AP (ICP Sulphide) kg $CaCO_3$/t	Modified NP* kg $CaCO_3$/t	Modified NP*/AP	Se mg/kg
HC-01	Sample 23	MMF	MDST	8.0	Pending	0.01	0.13	4.1	74	18	3.2
HC-02	CM18 03-GC-32	MMF	CST	8.2	Pending	0.01	0.10	3.1	88	28	2.3
HC-03	CM18 03-GC-63	MF	SST	5.6	0.14	0.03	0.10	3.1	4.3	1.4	0.2
HC-04	CM18-27-GC-37	MMF	SST	8.5	0.24	<0.01	0.19	5.9	4.8	0.8	0.5
HC-05	CM18-10-GC-29	MMF	SST	6.6	0.77	0.01	0.65	20	-0.8	0.0	1.5
HC-06	CM18-05-GC2-23	MMF	SLT	8.0	Pending	<0.01	0.13	4.1	37	9.1	1.4
HC-07	CM18-05-GC2-23 Dup	MMF	SLT	8.0	Pending	<0.01	0.13	4.1	37	9.1	1.4
HC-08	CM18-05-GC2-43	MMF	COAL-Morrisey	8.0	0.57	<0.01	0.20	6.3	2.3	0.4	1.1
HC-09	11-12-35	MMF	COAL	5.1	Pending	0.04	0.09	2.8	0.5	0.2	2.3
HC-10	11-12-44	MMF	SLT	8.2	Pending	0.01	0.12	3.8	41	11	0.7
HC-11	11-19-101	MMF	COAL	8.1	0.22	0.02	0.14	4.4	2.8	0.6	0.5
HC-12	BH-18-12	FF	SST	8.7	0.22	0.01	0.17	5.3	170	32	1.0
HC-13	BH-18-PP12	FF	Not specified	8.5	0.52	0.03	0.41	13	360	28	0.6

Source: \\srk.ad\dfs\NA\VAN\Projects\01_SITES\CrownMountain\1CN028.003_Geochemistry\100_Acquisition_of_Rock_Samples\5.Sample_Inventory\Compiled_LabData_1CN028001_WICK_Rev5.xls

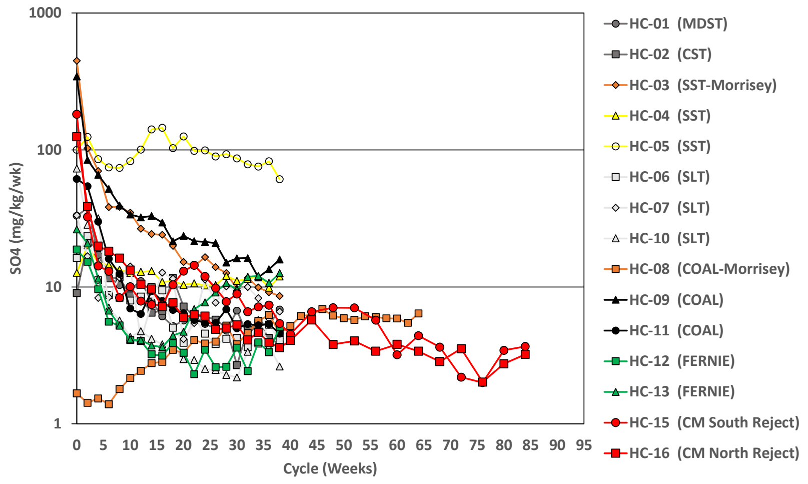
Notes:

Pending – testing for total S is in progress.



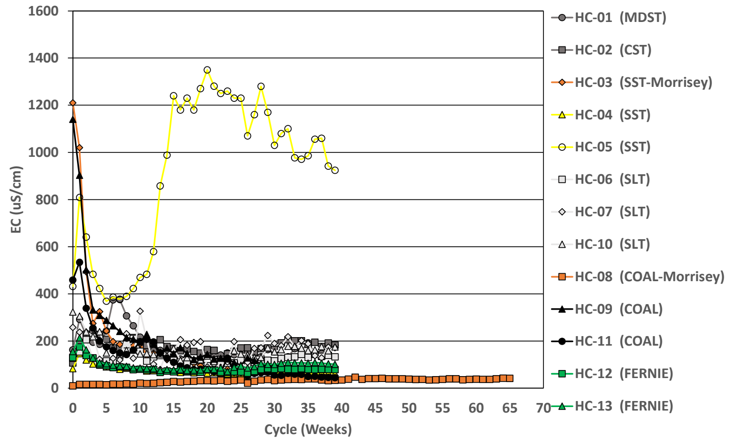
P:\U7160 Vancouver Geochem Assistance\Project\23_1CN028.003_Crown Mountain Geochemistry\300_Laboratory Kinetic Testing\Calculations+Charts\[Crown_Mt_ HCT_WR_loading

Figure 5-20: Results of Humidity Cell Testing (pH)



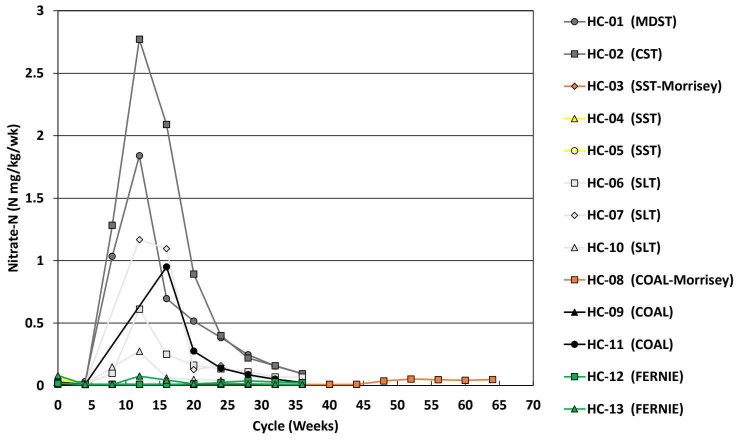
P:\U7160 Vancouver Geochem Assistance\Project\23_1CN028.003_Crown Mountain Geochemistry\300_Laboratory Kinetic Testing\Calculations+Charts\[Crown_Mt_ HCT_WR_loading

Figure 5-21: Results of Humidity Cell Testing (Sulphate Release Rate)



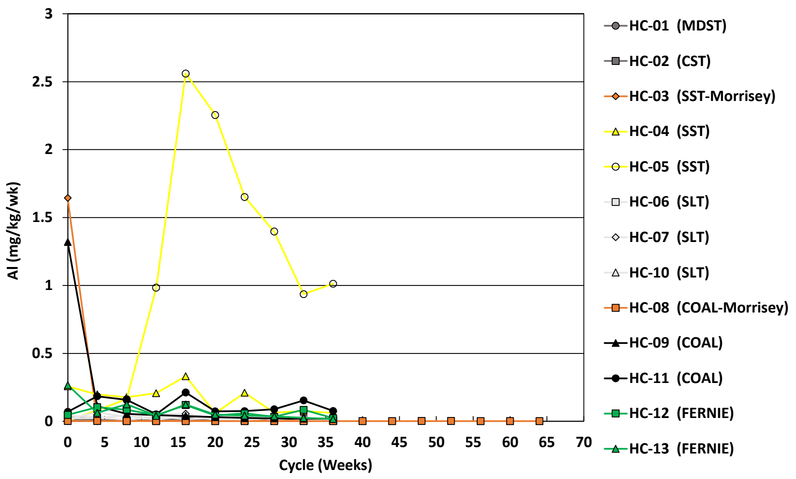
P:\U7160 Vancouver Geochem Assistance\Project\23_1CN028.003_Crown Mountain Geochemistry\300_Laboratory Kinetic Testing\Calculations+Charts\[Crown_Mt_ HCT_WR_loading

Figure 5-22: Results of Humidity Cell Testing (Electrical Conductivity)



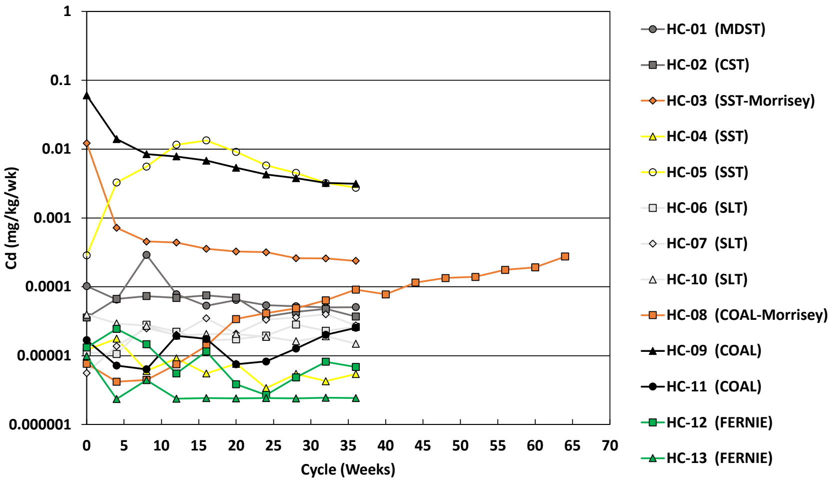
P:\U7160 Vancouver Geochem Assistance\Project\23_1CN028.003_Crown Mountain Geochemistry\300_Laboratory Kinetic Testing\Calculations+Charts\[Crown_Mt_ HCT_WR_loading

Figure 5-23: Results of Humidity Cell Testing (Nitrate - N Release Rate)



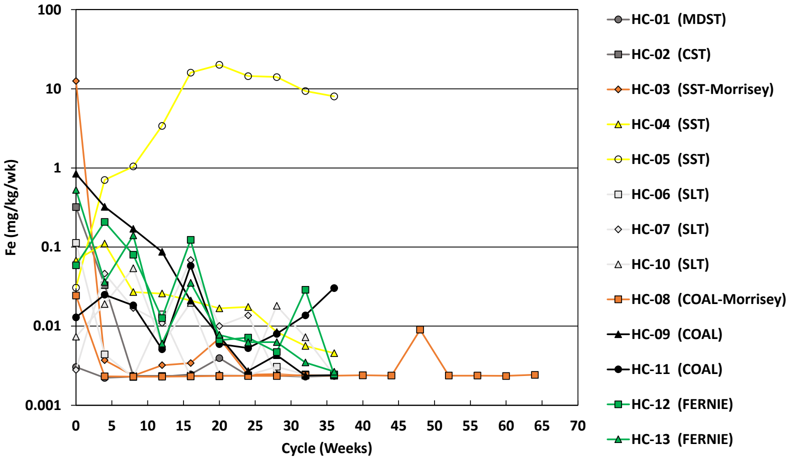
P:\U7160 Vancouver Geochem Assistance\Project\23_1CN028.003_Crown Mountain Geochemistry\300_Laboratory Kinetic Testing\Calculations+Charts\[Crown_Mt_ HCT_WR_loading

Figure 5-24: Results of Humidity Cell Testing (Al Release Rate)



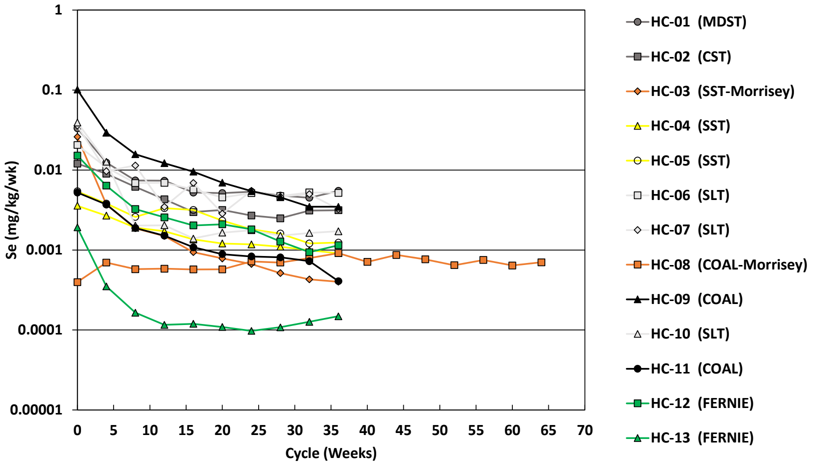
P:\U7160 Vancouver Geochem Assistance\Project\23_1CN028.003_Crown Mountain Geochemistry\300_Laboratory Kinetic Testing\Calculations+Charts\[Crown_Mt_ HCT_WR_loading

Figure 5-25: Results of Humidity Cell Testing (Cd Release Rate)



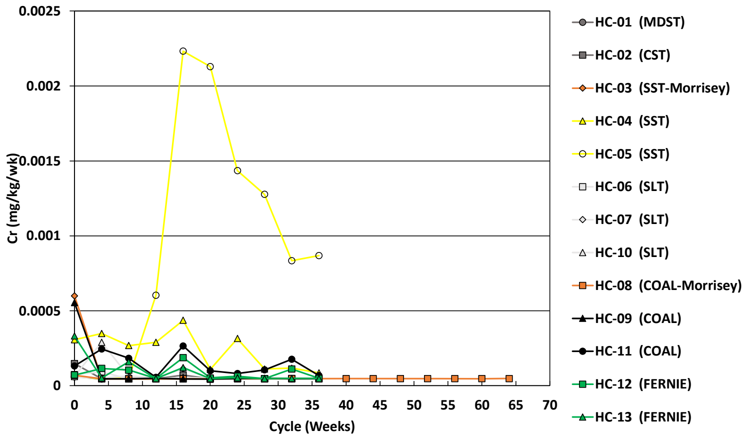
P:\U7160 Vancouver Geochem Assistance\Project\23_1CN028.003_Crown Mountain Geochemistry\300_Laboratory Kinetic Testing\Calculations+Charts\[Crown_Mt_ HCT_WR_loading

Figure 5-26: Results of Humidity Cell Testing (Fe Release Rate)



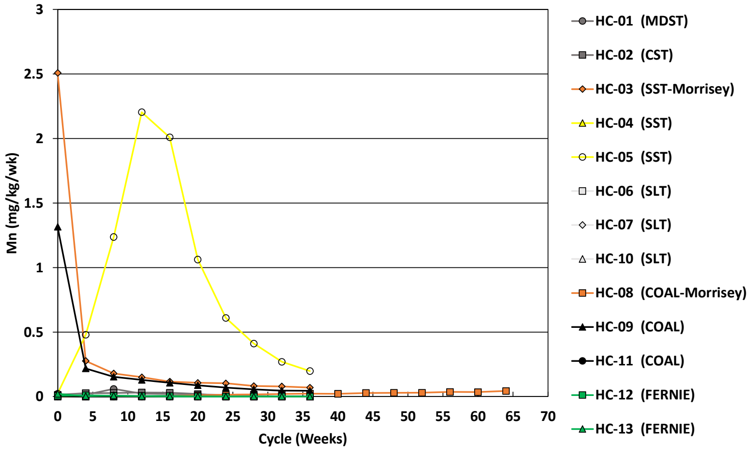
P:\U7160 Vancouver Geochem Assistance\Project\23_1CN028.003_Crown Mountain Geochemistry\300_Laboratory Kinetic Testing\Calculations+Charts\[Crown_Mt_ HCT_WR_loading

Figure 5-27: Results of Humidity Cell Testing (Se Release Rate)



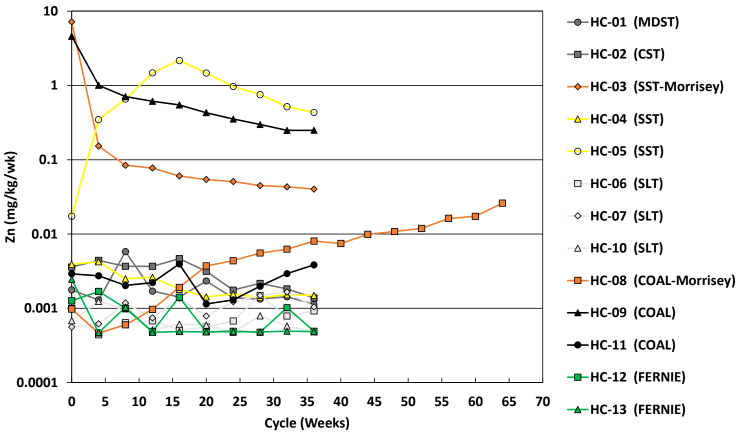
P:\U7160 Vancouver Geochem Assistance\Project\23_1CN028.003_Crown Mountain Geochemistry\300_Laboratory Kinetic Testing\Calculations+Charts\[Crown_Mt_ HCT_WR_loading

Figure 5-28: Results of Humidity Cell Testing (Cr Release Rate)



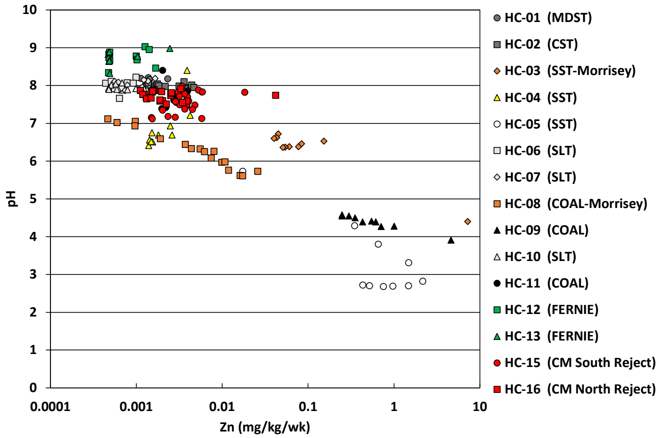
P:\U7160 Vancouver Geochem Assistance\Project\23_1CN028.003_Crown Mountain Geochemistry\300_Laboratory Kinetic Testing\Calculations+Charts\[Crown_Mt_ HCT_WR_loading

Figure 5-29: Results of Humidity Cell Testing (Mn Release Rate)



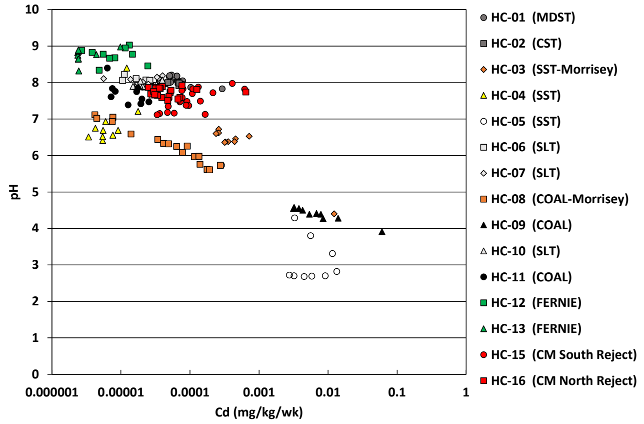
P:\U7160 Vancouver Geochem Assistance\Project\23_1CN028.003_Crown Mountain Geochemistry\300_Laboratory Kinetic Testing\Calculations+Charts\[Crown_Mt_ HCT_WR_loading

Figure 5-30: Results of Humidity Cell Testing (Zn Release Rate)



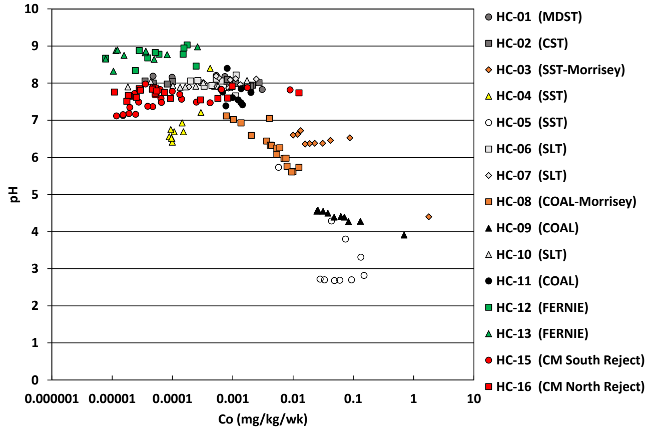
P:\U7160 Vancouver Geochem Assistance\Project\23_1CN028.003_Crown Mountain Geochemistry\300_Laboratory Kinetic Testing\Calculations+Charts\[Crown_Mt_ HCT_WR_loading

Figure 5-31: Results for Humidity Cell Testing (Zn vs pH)



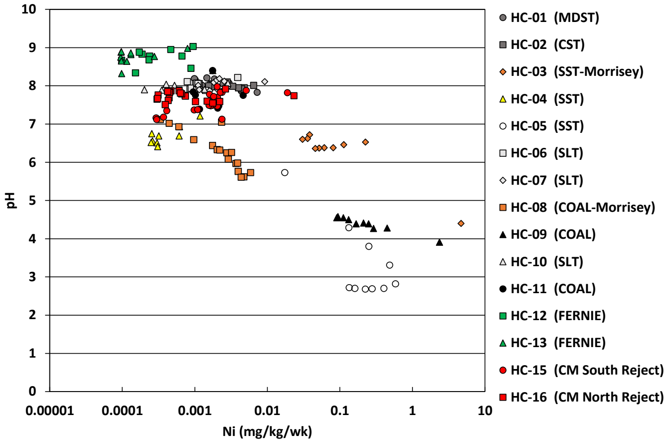
P:\U7160 Vancouver Geochem Assistance\Project\23_1CN028.003_Crown Mountain Geochemistry\300_Laboratory Kinetic Testing\Calculations+Charts\[Crown_Mt_ HCT_WR_loading

Figure 5-32: Results for Humidity Cell Testing (Cd vs pH)



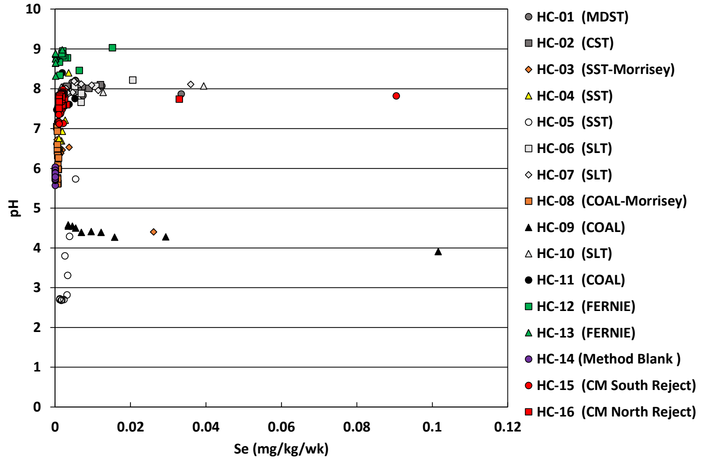
P:\U7160 Vancouver Geochem Assistance\Project\23_1CN028.003_Crown Mountain Geochemistry\300_Laboratory Kinetic Testing\Calculations+Charts\[Crown_Mt_ HCT_WR_loading

Figure 5-33: Results for Humidity Cell Testing (Co vs pH)



P:\U7160 Vancouver Geochem Assistance\Project\23_1CN028.003_Crown Mountain Geochemistry\300_Laboratory Kinetic Testing\Calculations+Charts\[Crown_Mt_ HCT_WR_loading

Figure 5-34: Results for Humidity Cell Testing (Ni vs pH)



P:\U7160 Vancouver Geochem Assistance\Project\23_1CN028.003_Crown Mountain Geochemistry\300_Laboratory Kinetic Testing\Calculations+Charts\[Crown_Mt_ HCT_WR_loading

Figure 5-35: Results for Humidity Cell Testing (Se vs pH)

5.2 Plant Rejects

5.2.1 Mineralogy

Results of XRD for the plant reject samples are provided in Appendix A and Table 5-8. Overall mineralogy was dominated by quartz, kaolinite and illite type clays, with smaller amounts of siderite, anatase, apatite, pyrite, ankerite and rutile.

The results indicate an absence of carbonate that would contribute significantly to NP. The main form of carbonate is siderite, with between 2.1 and 3.3% determined, while ankerite was only found at 0.1% in CM North Reject and was not detected in CM South Reject. Pyrite was not identified in CM North Reject, while a pyrite content of 0.5% was recorded in CM South Reject Sample.

Table 5-8: X-Ray Diffraction Results (in %) for Plant Rejects

Mineral	Ideal Formula	CM South Reject	CM North Reject
Quartz	SiO_2	40.7	36.0
Kaolinite	$Al_2Si_2O_5(OH)_4$	34.5	40.0
Illite/Muscovite	$K_{0.65}Al_{2.0}Al_{0.65}Si_{3.35}O_{10}(OH)_2$/ $KAl_2AlSi_3O_{10}(OH)_2$	19.8	18.3
Anatase	TiO_2	0.9	0.9
Siderite	$Fe^{2+}CO_3$	2.1	3.3
Apatite	$Ca_5(PO_4)_3(OH, F,Cl)$	1.0	1.4
Pyrite	FeS_2	0.5	-
Ankerite (Dolomite?)	$Ca(Fe^{2+},Mg,Mn)(CO_3)_2 – CaMg(CO_3)_2$	-	0.1
Rutile	TiO_2	0.6	
Total		100	100

Source: Mineralogy Report – Appendix A

5.2.2 Acid Potential

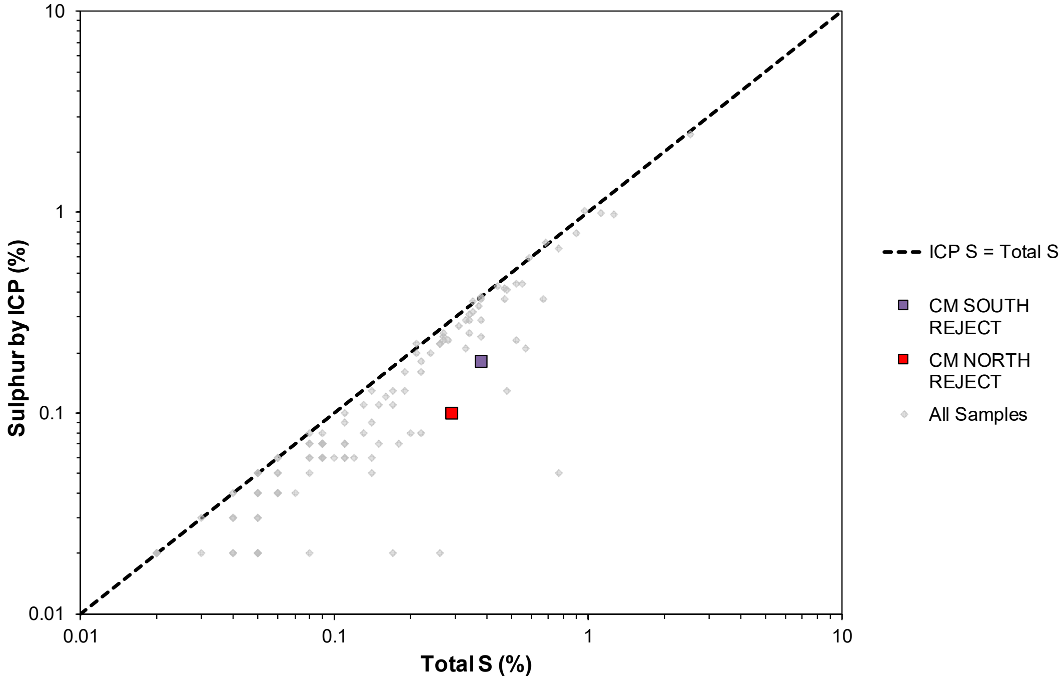
Three types of sulphur analyses were performed, as described in Section 5.1.1.

The results for the plant rejects samples are presented in Table 5-9, and the complete data set is provided in Appendix D. Graphs have been presented that show the plant reject data relative to all other static data (as described above) for comparison purposes.

Sulphate was measured at 0.01% in both plant reject samples. Sulphate minerals are therefore considered to be a minor component of the samples, consistent with the waste rock samples discussed above.

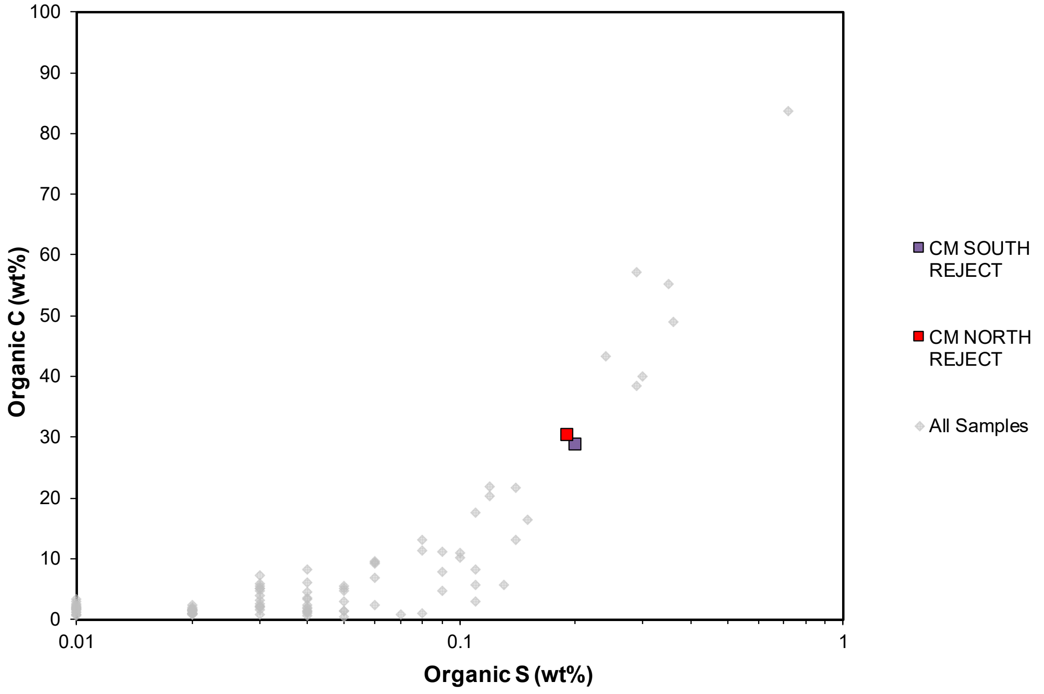
Figure 5-36 compares total sulphur and sulphur by aqua regia for the plant rejects samples. The presence of organic sulphur is indicated by the distribution of sulphur concentrations below the diagonal line. Hence, the data show that the majority of the sulphur present is in the organic form, with less sulphide sulphur that could generate acid. This is also consistent with the waste rock results described above.

Figure 5-37 plots sulphur in organic form against organic carbon. The results are also consistent with the waste rock, which indicated that higher organic sulphur contents are associated with higher organic carbon contents.



P:\U7160 Vancouver Geochem Assistance\Project\23_1CN028.003_Crown Mountain Geochemistry\100_Acquisition of Rock Samples\5.Sample_Inventory

Figure 5-36: Comparison of Total Sulphur and Sulphur Determined by ICP-MS Following Aqua Regia Digestion Waste Rock for Plant Rejects



P:\U7160 Vancouver Geochem Assistance\Project\23_1CN028.003_Crown Mountain Geochemistry\100_Acquisition of Rock Samples\5.Sample_Inventory

Figure 5-37: Organic Carbon Content Compared to Organic Sulphur Waste Rock for Plant Rejects

Table 5-9: Summary Data for Plant Reject Samples

Sample ID	Rock Type	Paste pH	Total Carbon %	TIC kg $CaCO_3$/t	Total S %	Sulphate S (HCl method) %	ICP-MS S %	ICP Sulphide %	AP (ICP Sulphide) kg $CaCO_3$/t	Mod. NP kg $CaCO_3$/t	Mod. NP /AP	Ca+Mg kg CaCO3/t	(Ca+Mg) NP/AP	Se mg/kg
CM SOUTH REJECT	Plant Reject	7.9	29	12	0.38	0.01	0.18	0.17	5.3	9.5	1.8	21	3.9	2.0
CM NORTH REJECT	Plant Reject	7.8	31	28	0.29	0.01	0.10	0.09	2.8	7.3	2.6	14	5.0	1.4

Source: P:\U7160 Vancouver Geochem Assistance\Project\23_1CN028.003_Crown Mountain Geochemistry\100_Acquisition of Rock Samples\5.Sample_Inventory\Compiled_LabData_1CN028001_WICK_Rev5.xls

Notes:

(1) For values below detection limit, the detection limit was used for statistical calculations.

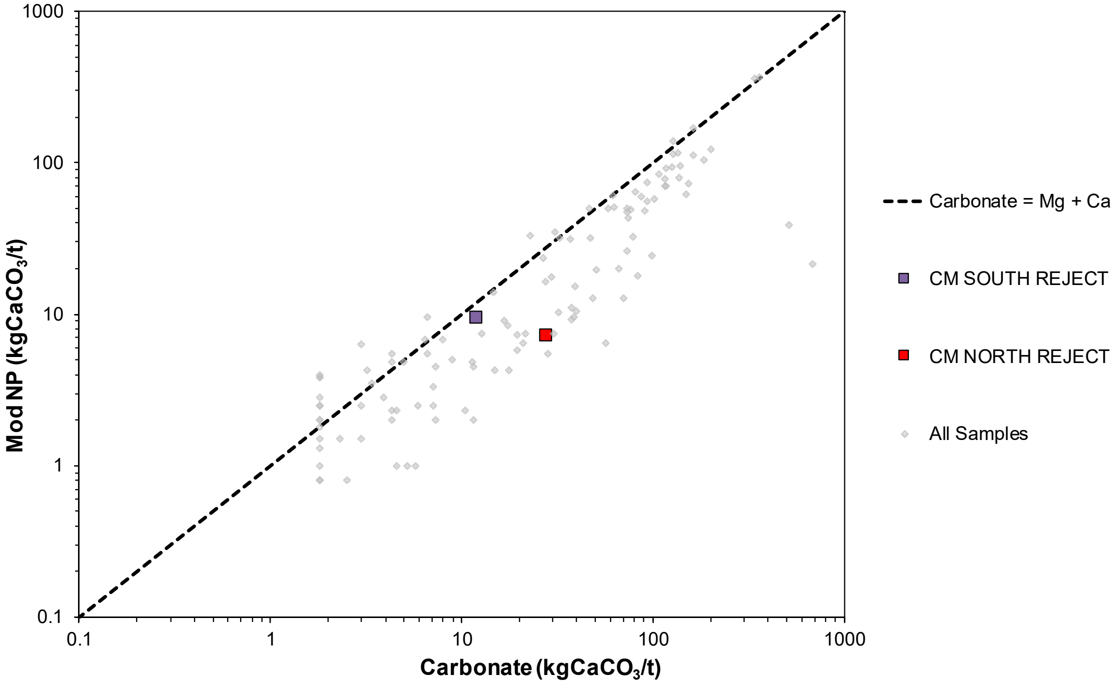
5.2.3 Neutralization Potential

Neutralizing rock components were determined by the modified Sobek method and carbonate analysis.

Modified NP and carbonate content are compared for plant rejects in Figure 5-38 and show that carbonate is typically higher. These results are consistent with the presence of iron-bearing carbonate minerals (e.g. ferroan dolomite, ankerite and siderite) because these contribute to carbonate but not NP.

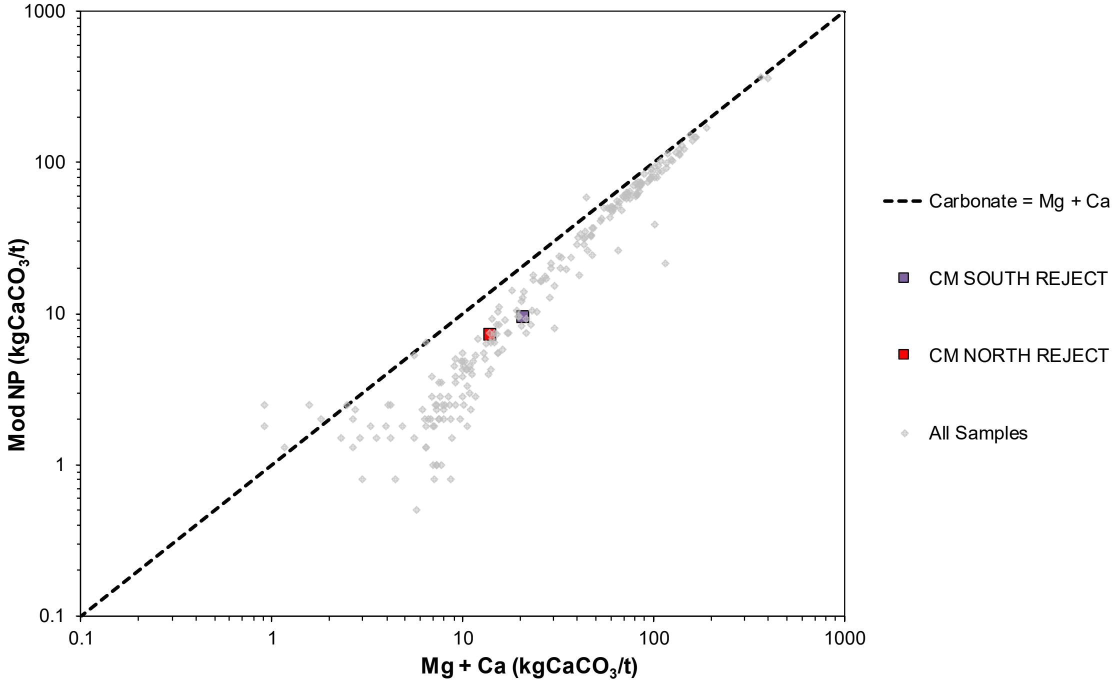
As for the waste rock data, Modified NP is plotted against carbonate calculated using magnesium and calcium ICP-MS data in Figure 5-39. The data show that the results for the Plant Rejects are comparable to the waste rock.

Overall, as for the waste rock data, the use of modified NP is appropriate.



P:\U7160 Vancouver Geochem Assistance\Project\23_1CN028.003_Crown Mountain Geochemistry\100_Acquisition of Rock Samples\5.Sample_Inventory

Figure 5-38: Comparison of Carbonate and Modified NP for Plant Rejects



P:\U7160 Vancouver Geochem Assistance\Project\23_1CN028.003_Crown Mountain Geochemistry\100_Acquisition of Rock Samples\5.Sample_Inventory

Figure 5-39: Comparison of Carbonate (Ca + Mg) and Modified NP for Plant Rejects

Site Specific Neutralization Potential (NP*)

The mineralogy data indicates that there is a very small amount of calcium and magnesium carbonate minerals.

Therefore the data suggests that a site-specific NP is not appropriate for the plant reject samples, and the standard Modified NP is most appropriate.

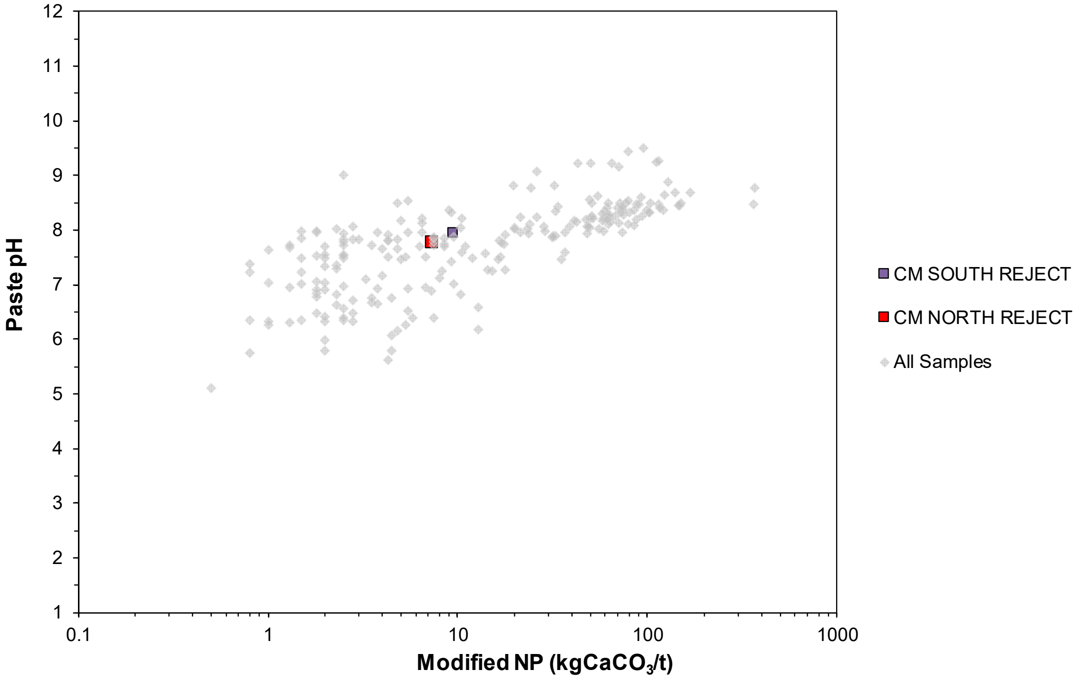
5.2.4 Acid Rock Drainage Potential

The dataset provides two measures of acid rock drainage potential (ARD): paste pH and the NP/AP ratio have been used to assess ARD potential, as described in Section 5.1.3.

Figure 5-40 compares paste pH with Modified NP for the plant rejects. Neither samples generated an acidic pH.

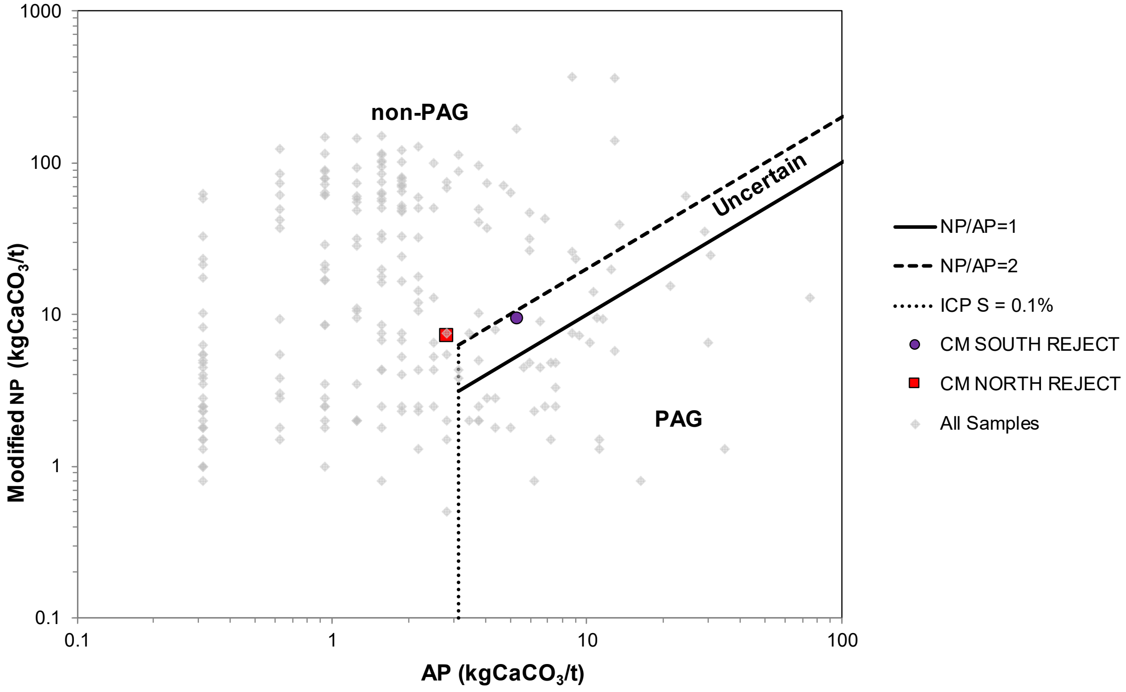
A chart presenting modified NP and AP for the plant rejects is shown in Figure 5-41. It shows that the CM South plant reject and CM North plant reject samples are classified as Uncertain and non-PAG respectively.

The data for the plant rejects are comparable to the waste rock, and overall, the potential for ARD is considered to be similar. The CM South plant reject sample did have a Mod. NP/AP <2 while the ratio for the CM North plant reject sample was >2.



P:\U7160 Vancouver Geochem Assistance\Project\23_1CN028.003_Crown Mountain Geochemistry\100_Acquisition of Rock Samples\5.Sample_Inventory

Figure 5-40: Comparison of Modified NP with Paste pH for Plant Rejects



P:\U7160 Vancouver Geochem Assistance\Project\23_1CN028.003_Crown Mountain Geochemistry\100_Acquisition of Rock Samples\5.Sample_Inventory

Figure 5-41: Acid Rock Drainage Potential Indicated by Acid-Base Accounting for Plant Rejects

5.2.5 Metal Leaching Potential

Solids Data

The complete data set for plant rejects is also provided in Appendix D.

The Plant Rejects have been compared to the average crustal abundance for shale in the same way as described above in Section 5.1.5.

There were no exceedances of the average crustal abundances for shale within the plant rejects samples.

Supernatant

Results are presented in Appendix D. The single sample reported a neutral pH of 7.29, a low EC, sulphate and total alkalinity concentrations of 130 µS/cm, 16.6 mg/L and 24 $mgCaCO_3/L$, respectively. Nitrate-N and nitrite-N concentrations were below the limit of detection (<0.2 mg/L and <0.05 mg/L, respectively).

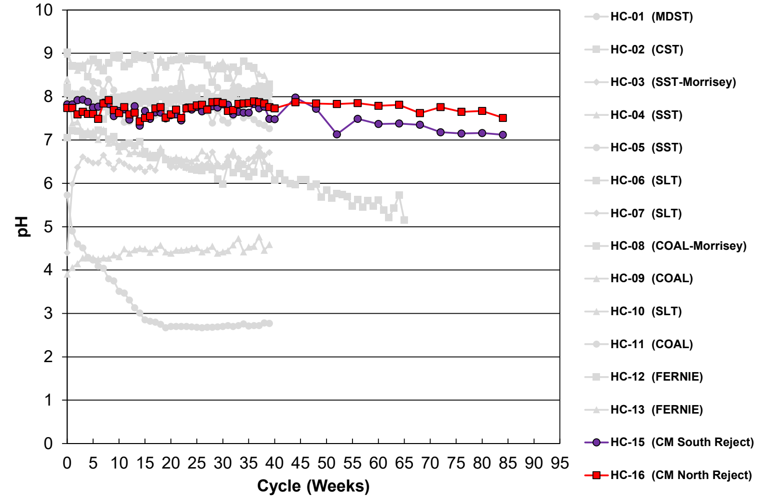
Almost 40% of metal analyses were recorded at less than the limit of detection, including metals such as cadmium, beryllium, bismuth and mercury. Overall, concentrations of dissolved metals were low, including 0.08 mg/L aluminium, 0.0002 m/L arsenic, 0.01 mg/L iron, 0.004 mg/L manganese, 0.00007 mg/L selenium and 0.009 mg/L zinc.

5.2.6 Laboratory Kinetic Tests

Two humidity cell tests corresponding to the plant rejects are shown in Figure 5-42 and Figure 5-52. The results are discussed below and shown in Figure 5-42 to Figure 5-52 with specific reference to the results for waste rock and coal discussed above in Section 5.1.6 in order to make a direct comparison. For ease of comparison, the results for plant rejects are plotted alongside the results for waste rock and coal, the latter of which is greyed out. Where required, notable trends that were specific to the plant rejects have been noted.

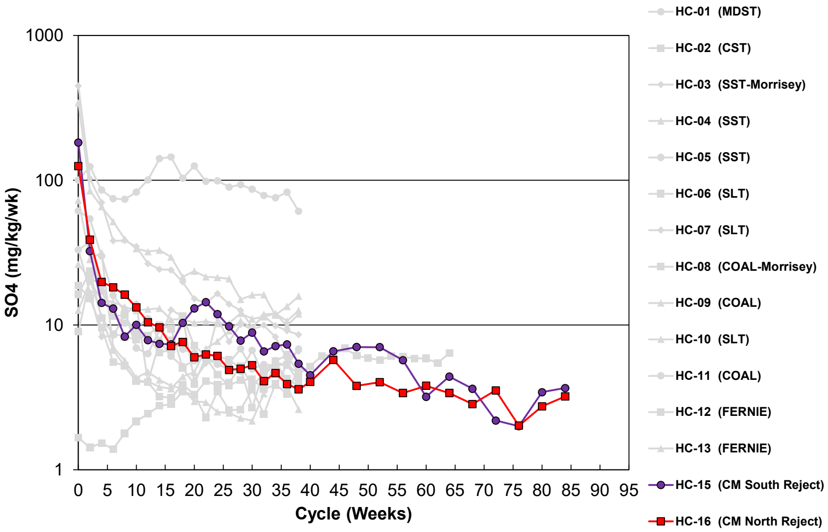
Broadly, the results for the plant rejects are comparable to waste rock and coal. In summary, the results show;

- pH results were between 7.4 and 8.0 to week 44 with both reject samples presenting similar pH values, with no particular upwards or downwards trend (shown in Figure 5-42). After this time, the pH of HC-15 (CM South Reject) was generally lower than that of HC-16 (CM North Reject). The pH values of HC-16 over this time period are similar to previous results (i.e. up to week 44) whereas the pH for HC-15 does show a slight overall decline after week 44 from 7.9 to 7.1. The results are closest in comparison to the claystone, mudstone and siltstone samples which all had relatively stable pH results in the same range.
- Results for sulfate (Figure 5-43) indicate an overall decreasing trend in release rate, from highs of 125 to 182 mg/kg/week to lows of around 3.2 and 3.7 mg/kg/week, respectively. Overall, like the waste rock and coal samples, release rates for sulfate are low and after week 26 are always <10 mg/kg/week).
- Up to week 56 results for alkalinity (Figure 5-46) are similar to that of the waste rock samples that generated higher pHs. Alkalinity for the plant rejects was generally between 10 and 25 mg/kg/week up to week 56. After this time, HC-16 remains similar to week 85, however, HC-15 is observed to decline from 20 mg/kg/week, at week 60 to between 2 and 5 mg/kg/week at week 76. The decline in alkalinity observed for HC-16 is consistent with the drop in pH also observed for this sample over the same period.
- Concentrations of aluminium, manganese, chromium and iron were all very low and showed no upwards or downward trends, shown in Figure 5-47, Figure 5-52, Figure 5-51 and Figure 5-49, respectively.
- Release rates for zinc (Figure 5-53) and cadmium (Figure 5-48) are also comparable to the waste rock and coal samples and are generally stable.
- There is no indication that the lower pH of leachate from for CM South Reject resulted in accelerated metal leaching.
- Selenium release rates (Figure 5-50) for the plant rejects are also comparable to the waste rock and coal samples. Release rates for selenium have been low after week 4, with release rates between 0.00008 mg/kg/week and 0.001 mg/kg/week.



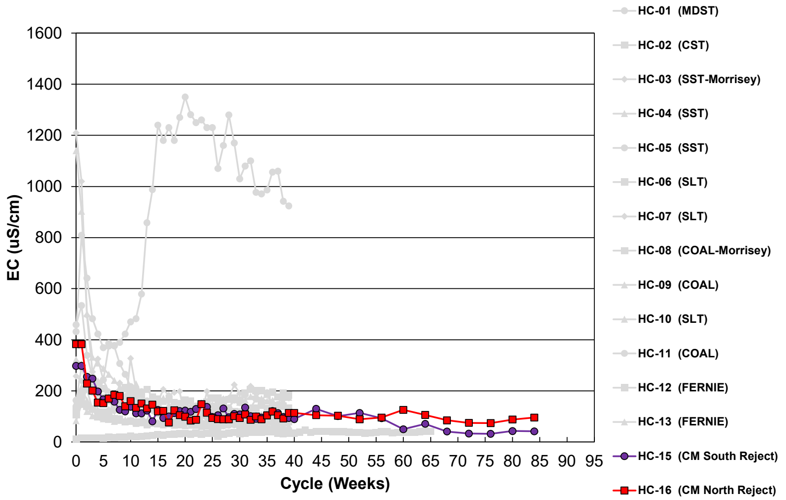
P:\U7160 Vancouver Geochem Assistance\Project\23_1CN028.003_Crown Mountain Geochemistry\300_Laboratory Kinetic Testing\Calculations+Charts\[Crown_Mt_ HCT_WR_loading

Figure 5-42: Results of Humidity Cell Testing (pH)



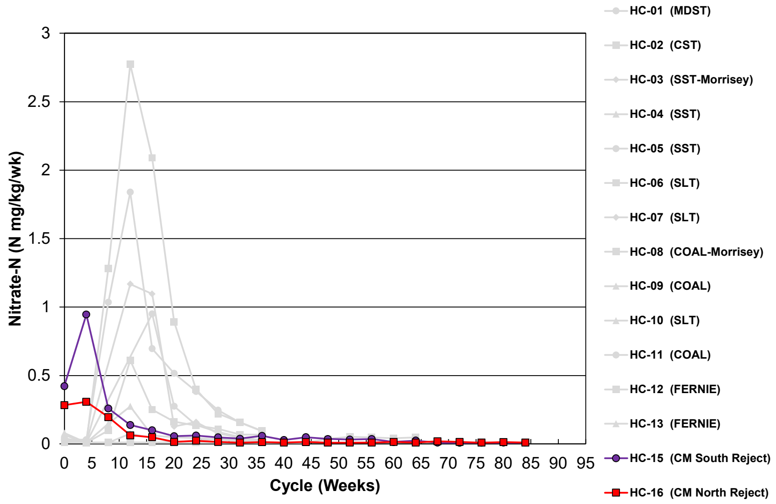
P:\U7160 Vancouver Geochem Assistance\Project\23_1CN028.003_Crown Mountain Geochemistry\300_Laboratory Kinetic Testing\Calculations+Charts\[Crown_Mt_ HCT_WR_loading

Figure 5-43: Results of Humidity Cell Testing (Sulphate Release Rate)



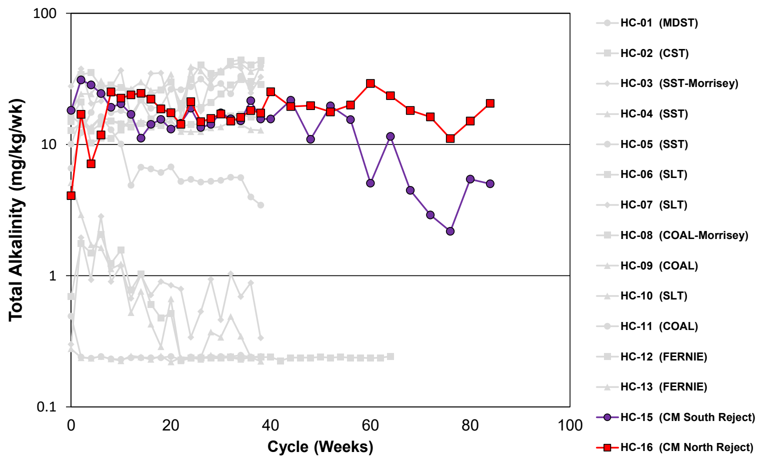
P:\U7160 Vancouver Geochem Assistance\Project\23_1CN028.003_Crown Mountain Geochemistry\300_Laboratory Kinetic Testing\Calculations+Charts\[Crown_Mt_ HCT_WR_loading

Figure 5-44: Results of Humidity Cell Testing (EC Release Rate)



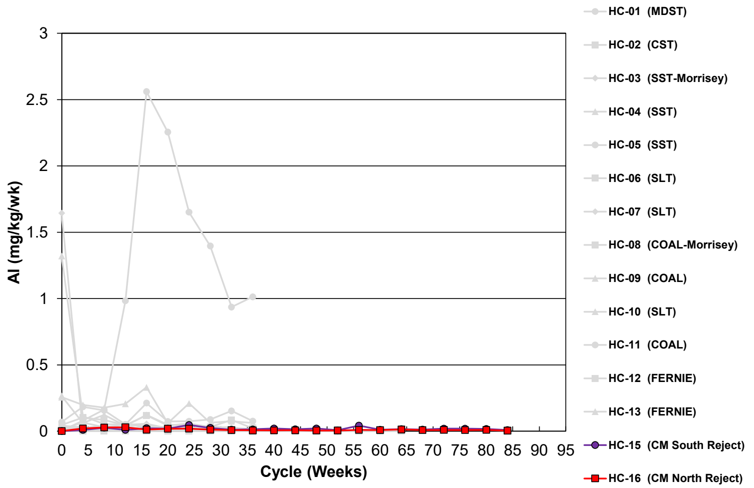
P:\U7160 Vancouver Geochem Assistance\Project\23_1CN028.003_Crown Mountain Geochemistry\300_Laboratory Kinetic Testing\Calculations+Charts\[Crown_Mt_ HCT_WR_loading

Figure 5-45: Results of Humidity Cell Testing (Nitrate - N Release Rate)



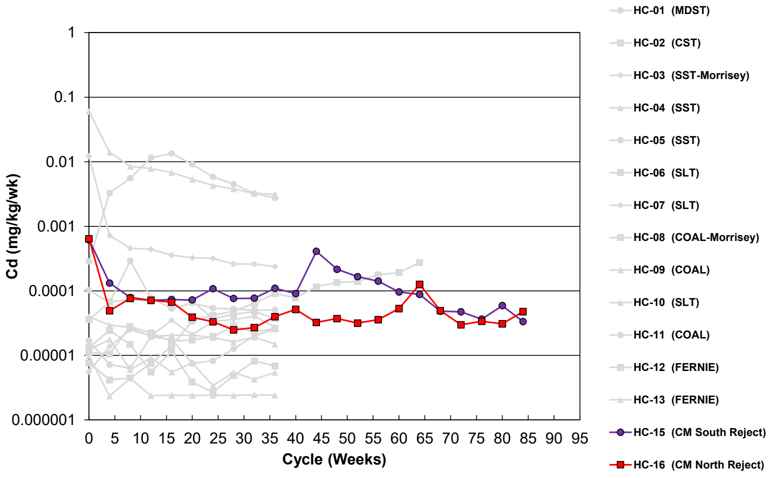
P:\U7160 Vancouver Geochem Assistance\Project\23_1CN028.003_Crown Mountain Geochemistry\300_Laboratory Kinetic Testing\Calculations+Charts\[Crown_Mt_ HCT_WR_loading

Figure 5-46: Results of Humidity Cell Testing (Alkalinity Release Rate)



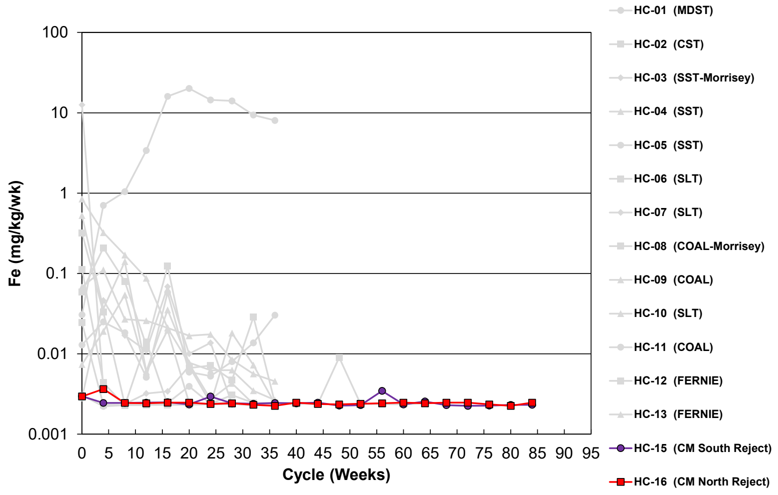
P:\U7160 Vancouver Geochem Assistance\Project\23_1CN028.003_Crown Mountain Geochemistry\300_Laboratory Kinetic Testing\Calculations+Charts\[Crown_Mt_ HCT_WR_loading

Figure 5-47: Results of Humidity Cell Testing (Al Release Rate)



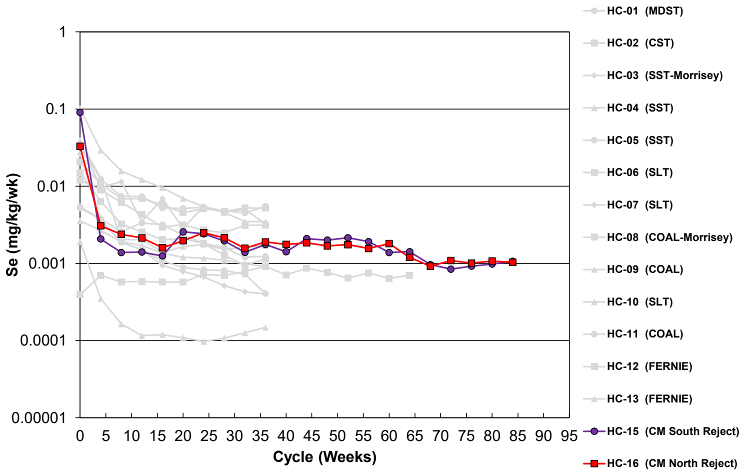
P:\U7160 Vancouver Geochem Assistance\Project\23_1CN028.003_Crown Mountain Geochemistry\300_Laboratory Kinetic Testing\Calculations+Charts\[Crown_Mt_ HCT_WR_loading

Figure 5-48: Results of Humidity Cell Testing (Cd Release Rate)



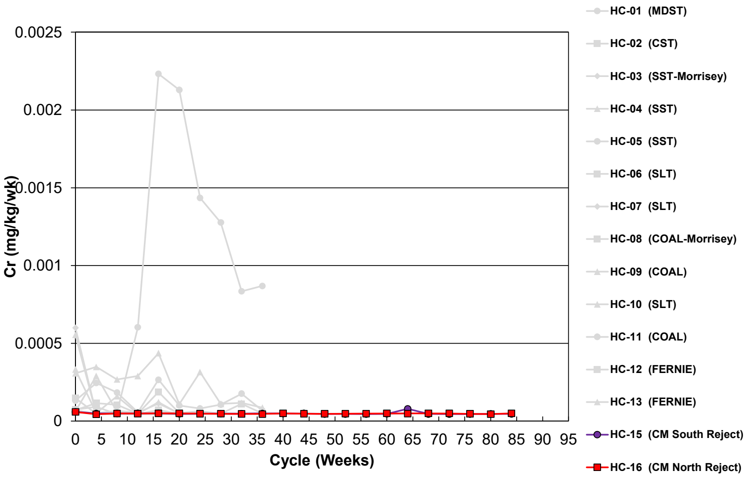
P:\U7160 Vancouver Geochem Assistance\Project\23_1CN028.003_Crown Mountain Geochemistry\300_Laboratory Kinetic Testing\Calculations+Charts\[Crown_Mt_ HCT_WR_loading

Figure 5-49: Results of Humidity Cell Testing (Fe Release Rate)



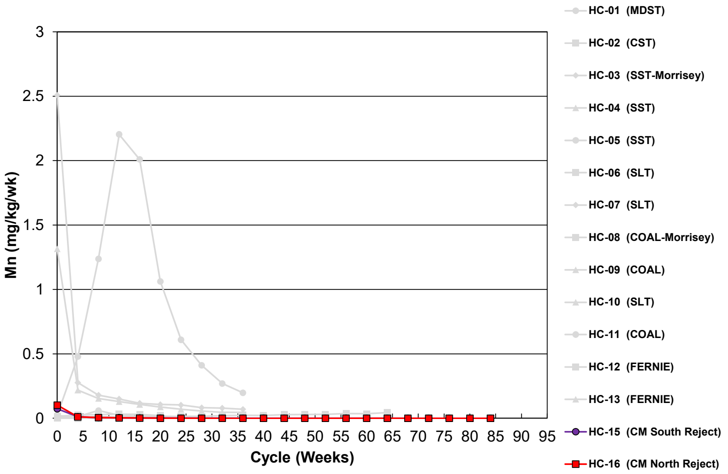
P:\U7160 Vancouver Geochem Assistance\Project\23_1CN028.003_Crown Mountain Geochemistry\300_Laboratory Kinetic Testing\Calculations+Charts\[Crown_Mt_ HCT_WR_loading

Figure 5-50: Results of Humidity Cell Testing (Se Release Rate)



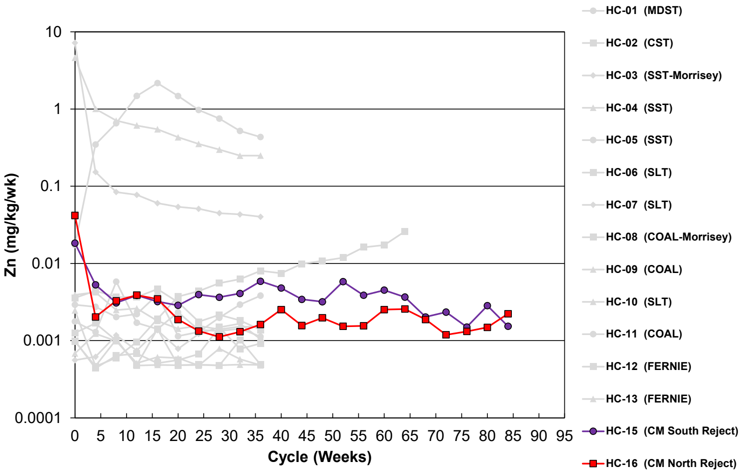
P:\U7160 Vancouver Geochem Assistance\Project\23_1CN028.003_Crown Mountain Geochemistry\300_Laboratory Kinetic Testing\Calculations+Charts\[Crown_Mt_ HCT_WR_loading

Figure 5-51: Results of Humidity Cell Testing (Cr Release Rate)



P:\U7160 Vancouver Geochem Assistance\Project\23_1CN028.003_Crown Mountain Geochemistry\300_Laboratory Kinetic Testing\Calculations+Charts\[Crown_Mt_ HCT_WR_loading

Figure 5-52: Results of Humidity Cell Testing (Mn Release Rate)



P:\U7160 Vancouver Geochem Assistance\Project\23_1CN028.003_Crown Mountain Geochemistry\300_Laboratory Kinetic Testing\Calculations+Charts\[Crown_Mt_ HCT_WR_loading

Figure 5-53: Results of Humidity Cell Testing (Zn Release Rate)

6 Interpretation

6.1 Comparison with Regional Characteristics

Geochemical data obtained from the Project was compared to other sites in the Elk Valley for the purpose of confirming the geochemical characteristics observed at the Project are consistent with those observed elsewhere for the same geological setting. By establishing similarity, expectations for the geochemical performance of the Project can be assumed to the comparable to existing mining operations.

Key predictors that have been used to assess the ML/ARD potential in the Elk Valley (MMF in particular) are sulphide sulphur, modified NP, NP/AP, selenium and cadmium. Based on a visual review of results presented on box and whisker plots in SRK (2014b) for each of these key predictors, the following statements can be made generally for Elk Valley coal mines in comparison to the Crown Mountain results (for MMF):

- Average sulphide sulphur contents for both MMF coal and waste rock for other mines in the Elk Valley are approximately between 0.04 and 0.20%. This is very similar to the results for Crown Mountain, with average concentrations of sulphide sulphur being 0.12% across all samples in this study.
- Average values of modified NP for coal in the Elk Valley are between 10 and 100 kg $CaCO_3$/t, while waste rock is generally higher than this being between approximately 30 and 200 kg $CaCO_3$/t. In comparison, modified NP for coal at Crown Mountain was 6.56 kg $CaCO_3$/t, while average values for waste rock were between 21.2 and 90.3 kg $CaCO_3$/t. Therefore, the modified NP values for the Crown Mountain coal samples are lower than the regional average, whilst the waste rock data are broadly within range.
- Average NP/AP ratios for coal in the Elk Valley are between approximately 8 and 50, while waste rock is generally higher than this being between approximately 10 and 200. For Crown Mountain, the data shows average NP/AP for coal was 6.36, slightly lower than the average values for coal in the wider Elk Valley. Average NP/AP values for waste rock at Crown Mountain ranged between 14.2 and 69.1 and are comparable to the results for Elk Valley. The MMF is dominantly non-PAG.
- Average selenium in coal and waste rock is similar and typically between 0.4 mg/kg to 3 mg/kg. The selenium data for Crown Mountain is comparable to this, showing that the average selenium content in coal is 2.13 mg/kg and for waste rock it is between 0.80 and 2.15 mg/kg.
- Average cadmium is between 0.2 mg/kg and 3 mg/kg for coal, with waste rock typically a little higher, between approximately 1 mg/kg and 4 mg/kg. The data for Crown Mountain shows that the average cadmium concentration in coal is 1.56 mg/kg and for waste rock it is between 0.99 and 2.15 mg/kg.

Regionally the MF has been classified as mostly PAG. The data presented herein is broadly consistent with that, with many samples associated with MF classified as PAG.

6.2 Acid Drainage Potential

6.2.1 Waste Rock

Acid-base accounting for the Project indicated a generally low potential for ARD in MMF and FF waste rock due to an overall low sulphur content combined with excess NP. Isolated potentially ARD generating strata and/or samples have been identified (i.e. near seam 10U) but the sulphur content is only marginally above 0.1% at 0.12%.

The overall conclusion is that ARD potential for waste rock is low is supported by the lack of acid drainage throughout the Elk Valley, despite the long history of coal mining in the area and a significant amount of monitoring that has taken place over the past 40 years or so.

6.2.2 Plant Rejects

Two samples of plant rejects were tested. One sample was classified as non-PAG, while the other was classified as having an uncertain acid generating potential. The HCT results were very similar to the waste rock samples, and the pH results were circum-neutral between 7.1 and 8.0. HC-15 (CM South plant reject) showed a gradual decline in pH between from 8.0 to 7.1. There was no indication that a decline in pH was associated with accelerated sulphide oxidation or metal leaching. The decline in pH may reflect slowing and low oxidation rates with corresponding less dissolution of carbonate minerals resulting in the greater effect from the de-ionized water (pH near 6).

The results suggest the samples are able to sustain non-acidic conditions while sulphide oxidizes, which is consistent with the presence of acid neutralizing minerals despite the lack of detection by XRD. The South Reject sample has NP/AP of 1.8 and sulphide sulphur of 0.17%, which indicates that residual sulphide content when NP is depleted will be below 0.1%. Generation of acid by rejects appears unlikely, particularly under the disposal conditions which are designed to restrict oxygen availability.

6.3 Trace Element Leaching

Trace element characterization for the Project indicated a similar potential for leaching from waste rock compared to other sites in the Elk Valley, with the primary constituent of concern being selenium. Other elements were elevated in the waste rock, such as antimony, barium, molybdenum, copper, nickel, zinc, nickel, cobalt, arsenic, mercury and cadmium. However, HCT results did not indicate any significant upward trends in release rates for these.

7 Conclusions

The main conclusions from this study include:

- The MMF in the Project footprint has a comparable low ARD potential to MMF elsewhere in the Elk Valley. It is classified as non-PAG. Isolated zones of PAG material are generally associated with near seam material, which represents a small volume of waste.

- MF is classified as PAG, also comparable with other results in the Elk Valley, where MF material is typically managed by blending with non-PAG MMF.
- Coal rejects are not expected to be acid generating based on the presence of low levels of sulphide minerals and carbonate minerals which appear to provide sufficient buffering of low levels of acidity, and the disposal configuration, which is designed to limit oxidation.
- Selenium concentrations in the Project footprint rocks are consistent with valley-wide experience, which shows concentrations varying from 0.80 to 2.2 mg/kg on average with lower concentrations in sandstones and higher concentrations in mudstones. These results are very similar to academic studies in the Elk Valley.
- Trace element concentrations in the MMF are comparable to those observed in the MMF elsewhere in the Elk Valley.

This report, Metal Leaching and Acid Rock Drainage Characterization NWP Coal Crown Mountain Project Report, was prepared by

<Original signed by>

Craig Wickham, BSc, FGS
Consultant (Geochemistry)

and reviewed by

<Original signed by>

Stephen Day, PGeo
Corporate Consultant (Geochemistry)

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.

Disclaimer—SRK Consulting (Canada) Inc. has prepared this document for NWP Coal Canada Ltd.. Any use or decisions by which a third party makes of this document are the responsibility of such third parties. In no circumstance does SRK accept any consequential liability arising from commercial decisions or actions resulting from the use of this report by a third party.

The opinions expressed in this report have been based on the information available to SRK at the time of preparation. SRK has exercised all due care in reviewing information supplied by others for use on this Project. 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, except to the extent that SRK was hired to verify the data.

8 References

ASTM Standard D5744-96. 2001. Standard Test Method for Accelerated Weathering of Solid Materials Using a Modified Humidity Cell. ASTM International, West Conshohocken, PA, 2001.DOI: 10.1520/D5744-96, www.astm.org

Biswas, A., Hendry, M.J., Essilfie-Dughan, J., 2017. Geochemistry of arsenic in low sulfidehigh carbonate coal waste rock, Elk Valley, British Columbia, Canada. Sci. Total Environ. 579, 396–408

Essilfie-Dughan, J., Hendry, M.J., Dynes, J.J., Hu, Y., Biswas, A., Barbour, S.L., 2017. Geochemical and mineralogical characterization of sulfur and iron in coal waste rock, Elk Valley, British Columbia, Canada. Sci. Total Environ. 586, 753–769

Gibson, D.W. 1985. Stratigraphy, Sedimentology and Depositional Environments of the Coal-Bearing Jurassic-Cretaceous Kootenay Group, Alberta and British Columbia, Geological Survey of Canada, Bulletin 357, 108 pages.

Hendry, M.J., Biswas, A., Essilfie-Dughan, J., Chen, N., Day, S.J. and Barbour, S.L., 2015. Reservoirs of selenium in coal waste rock: Elk Valley, British Columbia, Canada. Environmental science & technology, 49(13), pp.8228-8236.

Kennedy, C, Day, S., MacGregor, D. and Pumphrey, J. 2012. Selenium leaching from coal waste rock in the Elk Valley, B.C. Proceedings of the 9th International Conference on Acid Rock Drainage, May 20-26, 2012. Ottawa, Canada.

Lawrence, R.W. and Y. Wang. 1996. Determination of Neutralization Potential for Acid Rock Drainage Prediction. MEND Project 1.16.3.

Lussier, C. 2001. Geochemistry of Se Release from the Elk Valley Coal Mines. University of British Columbia, M.Sc. Thesis.

NWP Coal Limited (https://www.nwpcoal.com/environmental). Accessed 11th November 2020.

NWP Coal Canada Limited (2014). Crown Mountain Coking Coal Project. Project Description. October 2014.

Price, W. 1997. Draft Guidelines and Recommended Methods for the Prediction of Metal Leaching and Acid Rock Drainage at Minesites in British Columbia. Reclamation Section, British Columbia Ministry of Energy and Mines. April 1997.

Ryan, B., Fournier, M. and Dittrick, M. 2002. *Selenium Concentrations in Mine Refuse and Mist Mountain Rocks; Evaluation of Variations Laterally and Over Time*. Geological Fieldwork 2001, BC Ministry of Energy and Mines, Paper 2002-1.

Ryan, B.D. and m. Dittrick. 2001. Selenium in the Mist Mountain Formation of southeastern British Columbia. In Geological Fieldwork 2000, BC. Ministry of Energy and Mines, Paper 2001-1, pages 337-362.

Sobek A A, Schuller W A, Freeman J R, and Smith R M., 1978, Field and laboratory methods applicable to overburden and minesoils. USEPA Report No. 600/2-78-054, 203 pp.

SRK Consulting (Canada) Inc. 2008. Selenium Geochemistry and Water Quality Predictions Phase 2 – Study Design. SRK Project Number 1CE003.001. Report prepared for Elk Valley Selenium Task Force. Dated November 2008.

SRK Consulting 2011. Response to Expectations for Laboratory Geochemical Data Quality-DRAFT. Comments provided December 2011

SRK Consulting (Canada) Inc. 2013. Geochemical Source Term Inputs and Methods for Elk Valley Water Quality Planning Model. SRK Project Number 1CT017.054. Report prepared for Teck Coal. November 2013.

SRK Consulting (Canada) Inc. 2014a. Geochemical Source Term Inputs and Methods for the Elk Valley Water Quality Planning Model. Prepared for Teck Coal Limited. June 2014. https://www2.gov.bc.ca/assets/gov/environment/waste-management/industrial-waste/industrial-waste/mining-smelt-energy/area-based-man-plan/annexes/d4_geochemical_source_term_inputs_methods.pdf

SRK Consulting (Canada) Inc. 2014b.Fording River Operations Swift Project Geochemistry Baseline Report - FINAL. Prepared for Teck Coal Limited. November 2014.

Stantec Consulting LTD. 2020. Crown Mountain Bankable Feasibility Study. Report prepared for NWP Coal Canada LTD. July 2020.

Swanson, S. 2010 The Way Forward: A Strategic Plan for the Management of Selenium at Teck Coal Operations. The Strategic Advisory Panel on Selenium Management. Report prepared for Teck Coal Limited. June 30, 2010.

Teck Coal Limited. 2017. Updated Metal Leaching and Acid Rock Drainage Management Plan Coal Mountain Operations. October 2017. https://mines.empr.gov.bc.ca/api/document/5a3a9bb983f80d0019c02c85/fetch

Villeneuve S.A., Barboura S.L, Hendry M.J., Carey S.K. Estimates of water and solute release from a coal waste rock dump in the Elk Valley, British Columbia, Canada. Science of The Total Environment Volumes 601–602, 1 December 2017, Pages 543-555

Appendix A: Mineralogy

QUANTITATIVE PHASE ANALYSIS OF 2 POWDER SAMPLES USING THE RIETVELD METHOD AND X-RAY POWDER DIFFRACTION DATA.

Project: NWP Coal-Crown Mountain - B973268

Tim O'Hearn
Bureau Veritas Laboratories
4606 Canada Way
Burnaby, BC V5G 1K5

Jacob Kabel, B.Sc.
Elisabetta Pani, Ph.D.
Edith Czech, M.Sc.
Jenny Lai, B.Sc.
Lan Kato, B.A.

Dept. of Earth, Ocean & Atmospheric Sciences
The University of British Columbia
6339 Stores Road
Vancouver, BC V6T 1Z4

September 26, 2019

EXPERIMENTAL METHOD

The two samples of **NWP Coal-Crown Mountain** were reduced to the optimum grain-size range for quantitative X-ray analysis (<10 μm) by grinding under ethanol in a vibratory McCrone Micronising Mill for 10 minutes. Continuous-scan X-ray powder-diffraction data were collected over a range 3-80°2θ with CoKα radiation on a Bruker D8 Advance Bragg-Brentano diffractometer equipped with an Fe filter foil, 0.6 mm (0.3°) divergence slit, incident- and diffracted-beam Soller slits and a LynxEye-XE detector. The long fine-focus Co X-ray tube was operated at 35 kV and 40 mA, using a take-off angle of 6°.

RESULTS

The X-ray diffractograms were analyzed using the International Centre for Diffraction Database PDF-4 and Search-Match software by Bruker. X-ray powder-diffraction data of the samples were refined with Rietveld program Topas 4.2 (Bruker AXS). The results of quantitative phase analysis by Rietveld refinements are given in Table 1. The Rietveld refinement plots are shown in Figures 1-2.

The samples contain abundant amorphous/nanoscale material (about 30%, estimated from a degree of crystallinity calculation) that was accounted fitting the patterns with broad calculated peaks. Also, the kaolinite is highly disordered and its amount was estimated using an empirical crystal structure based on a 50:50 weighed standard mixture of kaolinite and quartz using the "PONCKS" method (Scarlett and Madsen, Powder Diffr., Vol.21, No 4, December 2006). The small hump at about 10°2θ, fitted with a calculated peak (see first vertical line), is due probably to the presence of unanalyzable illite. Therefore the results should be considered approximate.

Table 1. Results of quantitative phase analysis (wt.%) XRD-Rietveld – Project NWP Coal-Crown Mountain

Mineral	**Ideal Formula**	**S.No. 1** **WK4312** **CM South Reject**	**S.No. 2** **WK4313** **CM North Reject**
Quartz	SiO_2	40.7	36.0
Kaolinite	$Al_2Si_2O_5(OH)_4$	34.5	40.0
Illite/Muscovite 2M1	$K_{0.65}Al_{2.0}Al_{0.65}Si_{3.35}O_{10}(OH)_2$/ $KAl_2AlSi_3O_{10}(OH)_2$	19.8	18.3
Anatase	TiO_2	0.9	0.9
Siderite	$Fe^{2+}CO_3$	2.1	3.3
Apatite	$Ca_5(PO_4)_3(OH, F,Cl)$	1.0	1.4
Pyrite ?	FeS_2	0.5	
Ankerite – Dolomite ?	$Ca(Fe^{2+},Mg,Mn)(CO_3)_2$ – $CaMg(CO_3)_2$		0.1
Rutile	TiO_2	0.6	
Total		100.0	100.0

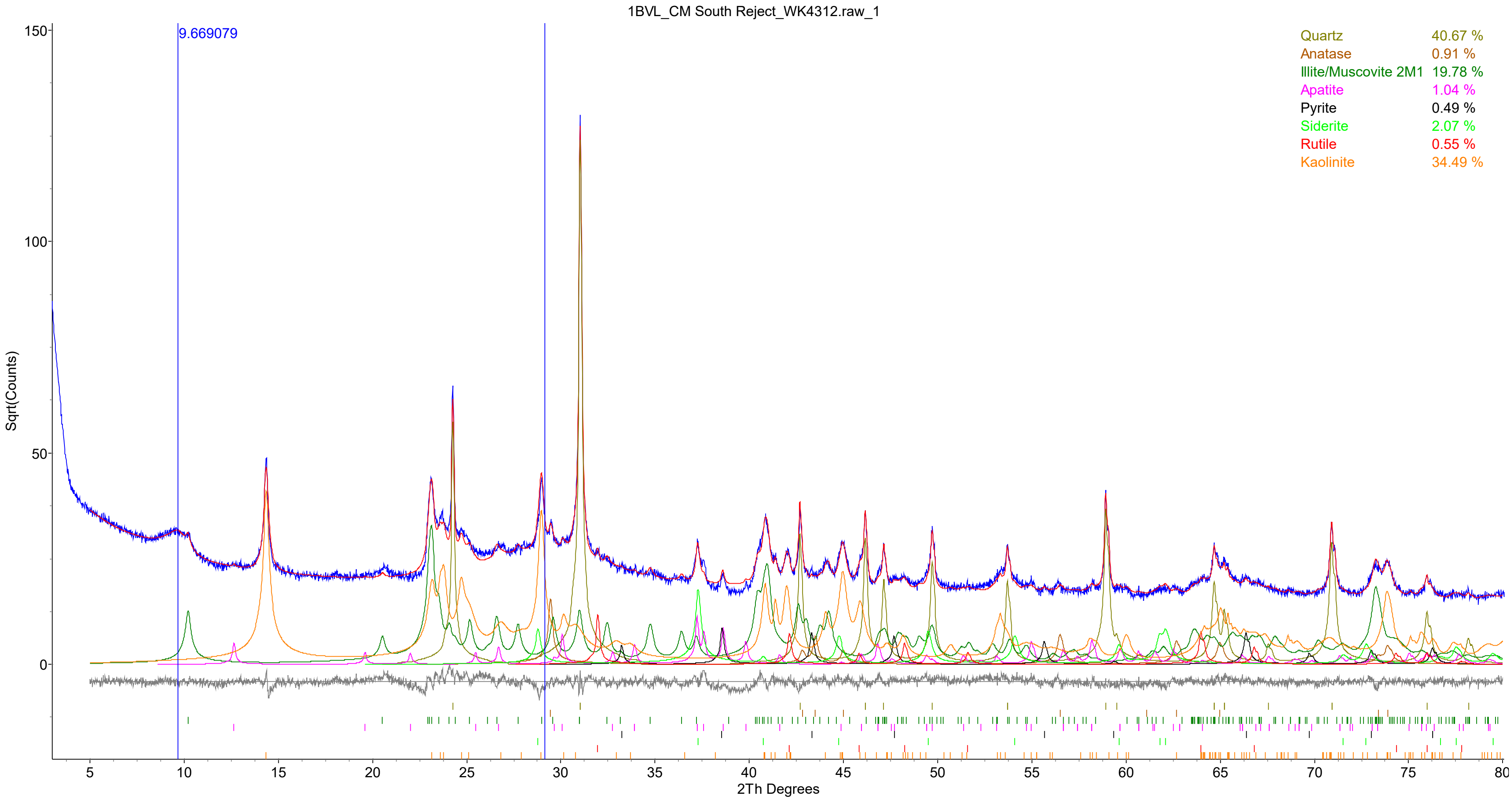


Figure 1. Rietveld refinement plot of sample **BV Labs 1 - WK4312 - CM South Reject** (blue line - observed intensity at each step; red line - calculated pattern; solid grey line below – difference between observed and calculated intensities; vertical bars, positions of all Bragg reflections). Coloured lines are individual diffraction patterns of all phases.

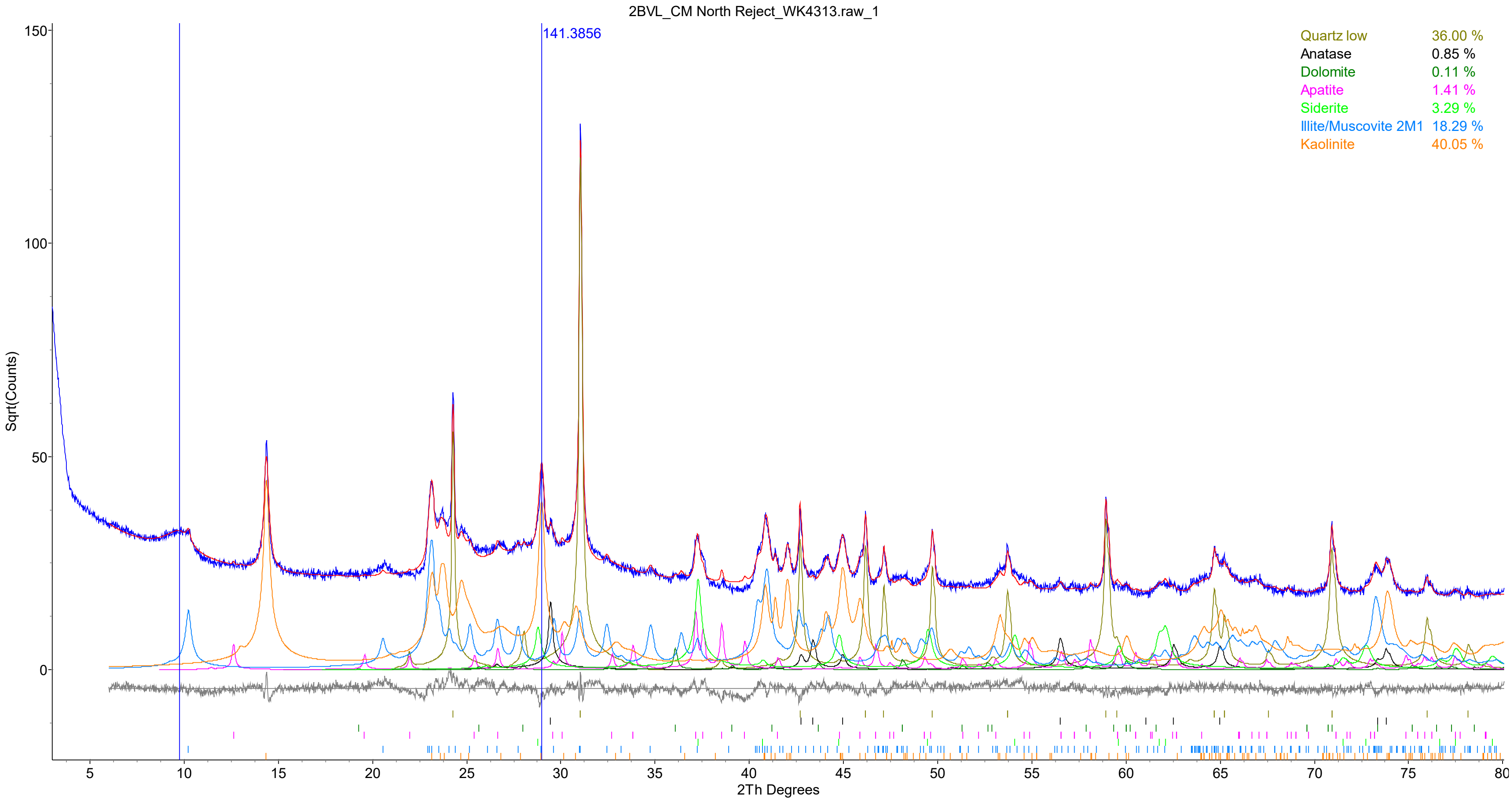


Figure 2. Rietveld refinement plot of sample **BV Labs 2 - WK4313 - CM North Reject** (blue line - observed intensity at each step; red line - calculated pattern; solid grey line below – difference between observed and calculated intensities; vertical bars, positions of all Bragg reflections). Coloured lines are individual diffraction patterns of all phases.

Appendix B: Waste Rock Raw Data

Maxxam Analytics 4606 Canada Way, Burnaby, BC Canada V5G 1K5 Tel: 604 734 7276 Fax: 604 731 2386 www.maxxam.ca

Client: NWP Coal Canada Ltd.

Table 1: ABA Test Results for project CROWN MOUNTAIN PROJECT

Maxxam Sample No	Sample ID	Paste pH	Total Carbon	CO2	CaCO3 Equiv.	Total S	HCl Extractable Sulphur	Sulphide Sulphur (by diff.)	Acid Generation Potential	Mod. ABA Neutralization Potential	Fizz Rating	Net Neutralization Potential	Neutralization Potential Ratio
	Units	pH Units	wt%	wt%	Kg CaCO3/T	wt%	wt%	wt%	Kg CaCO3/T	Kg CaCO3/T	N/A	Kg CaCO3/T	N/A
UZ7160	CM18-16-LDC3-38	8.22	2.41	0.92	20.9	0.37	0.01	0.36	11.3	6.50	NONE	-4.80	0.6
UZ7161	CM18-16-LDC3-39	9.23	2.58	3.21	73.0	0.11	<0.01	0.11	3.4	50.0	SLIGHT	46.6	14.7
UZ7162	CM18-16-LDC3-40	7.09	0.84	0.31	7.1	0.27	0.01	0.26	8.1	3.30	NONE	-4.80	0.4
UZ7163	CM18-16-LDC3-41	7.01	1.21	1.71	38.9	0.38	0.02	0.36	11.3	9.50	NONE	-1.80	0.8
UZ7164	CM18-16-LDC3-42	8.12	57.91	2.51	57.1	1.26	<0.01	1.26	39.4	6.50	NONE (H)	-32.9	0.2
UZ7165	CM18-16-LDC3-43	6.95	0.67	0.35	8.0	0.08	0.02	0.06	1.9	6.80	NONE	4.90	3.6
UZ7166	SAMPLE 1	5.38					<0.01			-3.80	NONE		
UZ7167	SAMPLE 2	5.45					<0.01			-2.50	NONE		
UZ7168	SAMPLE 4	5.13	8.30	<0.08	<1.8	0.11	0.02	0.09	2.8	-2.80	NONE	-5.60	#N/A
UZ7169	SAMPLE 5	5.75					0.02			0.0	NONE		
UZ7170	SAMPLE 6	6.26					0.01			5.30	NONE (H)		
UZ7171	SAMPLE 8	5.40	13.08	<0.08	1.8	0.14	0.02	0.12	3.8	0.0	NONE	-3.80	#N/A
UZ7172	SAMPLE 9	5.80					0.01			2.00	NONE		
UZ7173	SAMPLE 10+11	6.18	9.68	2.13	48.4	0.17	0.03	0.14	4.4	12.8	NONE	8.40	2.9
UZ7175	SAMPLE 15	6.33					0.02			2.80	NONE		
UZ7176	SAMPLE 16	6.32					0.01			2.00	NONE		
VA9769	SAMPLE 16 SPLIT DUP	6.36					0.01			1.50	NONE		
UZ7177	SAMPLE 17	8.06	4.41	3.97	90.2	0.08	0.01	0.07	2.2	48.5	SLIGHT	46.3	22.0
UZ7178	SAMPLE 20	7.48					0.01			1.50	NONE		
UZ7179	SAMPLE 21	8.07	5.16	3.37	76.6	0.05	0.01	0.04	1.3	49.0	SLIGHT	47.7	37.7
UZ7180	SAMPLE 22	8.32					0.01			102	MODERATE		
UZ7181	SAMPLE 23	7.96					0.01			73.5	SLIGHT		
UZ7182	SAMPLE 25	7.63	5.46	0.25	5.7	0.05	<0.01	0.05	1.6	1.00	NONE	-0.600	0.6
UZ7183	SAMPLE 26	7.55					<0.01			2.50	NONE		
UZ7184	SAMPLE 27	8.38	3.14	6.78	154.1	0.05	<0.01	0.05	1.6	73.3	SLIGHT	71.7	45.8
UZ7185	SAMPLE 28	8.21					<0.01			52.0	SLIGHT		
UZ7186	SAMPLE 29	7.50					<0.01			0.0	NONE		
UZ7187	SAMPLE 31	6.65	2.15	<0.08	<1.8	0.05	0.02	0.03	0.9	3.80	NONE	2.90	4.2
UZ7188	SAMPLE 32	8.27					<0.01			61.0	SLIGHT		
UZ7189	SAMPLE 33	7.70					<0.01			8.50	NONE		
UZ7190	SAMPLE 35	7.51	9.62	0.28	6.4	0.12	0.01	0.11	3.4	6.80	NONE	3.40	2.0
VD9727	SAMPLE 35 SPLIT DUP	7.24	9.69	0.28	6.4	0.16	0.01	0.15	4.7	7.50	NONE	2.80	1.6
UZ7191	SAMPLE 36	7.52					0.01			1.80	NONE		
UZ7192	SAMPLE 38	6.85					0.01			1.80	NONE (H)		
UZ7193	SAMPLE 39	7.35	17.78	0.46	10.5	0.18	0.01	0.17	5.3	2.30	NONE	-3.00	0.4
UZ7194	11-11-59	5.80	1.04	0.32	7.3	0.27	0.05	0.22	6.9	4.50	NONE	-2.40	0.7
UZ7195	CM18-03-GC-01	6.34	0.81	<0.08	<1.8	<0.02	<0.01	<0.02	<0.6	1.50	NONE	1.50	#N/A
UZ7196	CM18-03-GC-02	6.40					<0.01			2.50	NONE		
UZ7197	CM18-03-GC-03	6.33	0.67	<0.08	<1.8	<0.02	<0.01	<0.02	<0.6	1.00	NONE	1.00	#N/A
UZ7198	CM18-03-GC-04	6.76					<0.01			3.50	NONE		
UZ7199	CM18-03-GC-05	6.41	0.59	<0.08	<1.8	<0.02	<0.01	<0.02	<0.6	2.00	NONE	2.00	#N/A
UZ7200	CM18-03-GC-06	6.75					<0.01			4.50	NONE		
UZ7201	CM18-03-GC-07	6.92	0.53	<0.08	<1.8	<0.02	<0.01	<0.02	<0.6	3.80	NONE	3.80	#N/A
UZ7202	CM18-03-GC-08	6.77					<0.01			1.80	NONE		
UZ7203	CM18-03-GC-09	7.74	1.60	1.30	29.6	<0.02	<0.01	<0.02	<0.6	17.5	NONE	17.5	#N/A
UZ7204	CM18-03-GC-10	7.24					<0.01			8.30	NONE		
VA9768	CM18-03-GC-10 SPLIT DUP	7.18	1.47	1.00	22.7	0.02	<0.01	0.02	0.6	10.00	NONE	9.38	16.0
UZ7205	CM18-03-GC-11	7.17	2.07	<0.08	<1.8	0.02	<0.01	0.02	0.6	4.00	NONE	3.40	6.7
UZ7206	CM18-03-GC-12	7.77					<0.01			17.0	NONE		
UZ7207	CM18-03-GC-13	7.82					<0.01			4.80	NONE		
UZ7208	CM18-03-GC-14	7.47	2.06	0.39	8.9	0.03	<0.01	0.03	0.9	5.00	NONE	4.10	5.6
UZ7209	CM18-03-GC-15	7.97					<0.01			58.5	SLIGHT		
UZ7210	CM18-03-GC-16	8.02					<0.01			23.3	SLIGHT		
UZ7211	CM18-03-GC-17	7.90	1.85	2.08	47.3	0.05	<0.01	0.05	1.6	31.8	SLIGHT	30.2	19.9
UZ7212	CM18-03-GC-18	8.31					<0.01			72.3	SLIGHT		
UZ7213	CM18-03-GC-19	7.90					<0.01			32.8	SLIGHT		
UZ7214	CM18-03-GC-20	8.36	4.05	8.84	200.9	0.09	<0.01	0.09	2.8	122	SLIGHT	120	43.7
UZ7215	CM18-03-GC-21	7.94					<0.01			48.0	SLIGHT		
UZ7216	CM18-03-GC-25	7.51					<0.01			4.30	NONE		
UZ7217	CM18-03-GC-29	7.86	4.87	1.63	37.1	0.10	<0.01	0.10	3.1	31.5	SLIGHT	28.4	10.2
UZ7218	CM18-03-GC-30	8.21					<0.01			63.5	SLIGHT		
UZ7219	CM18-03-GC-31	8.15					<0.01			63.8	SLIGHT		
UZ7220	CM18-03-GC-32	8.19					0.01			87.8	SLIGHT		
UZ7221	CM18-03-GC-36	7.53					<0.01			2.50	NONE		
UZ7222	CM18-03-GC-37	8.25	1.62	2.76	62.7	0.06	<0.01	0.06	1.9	50.8	SLIGHT	48.9	26.7
UZ7223	CM18-03-GC-38	8.47					<0.01			87.3	SLIGHT		
UZ7224	CM18-03-GC-39	8.42	2.85	4.13	93.9	0.04	<0.01	0.04	1.3	73.8	SLIGHT	72.5	56.8
UZ7225	CM18-03-GC-40	7.95					<0.01			21.3	SLIGHT		
UZ7226	CM18-03-GC-41	7.98					<0.01			28.8	SLIGHT		
UZ7227	CM18-03-GC-43	7.69	1.34	0.13	3.0	0.04	<0.01	0.04	1.3	6.30	NONE	5.00	4.8
UZ7228	CM18-03-GC-44	7.65					<0.01			4.00	NONE		
VA9771	CM18-03-GC-44 SPLIT DUP	7.60	4.29	0.18	4.1	0.12	<0.01	0.12	3.8	5.00	NONE	1.25	1.3
UZ7229	CM18-03-GC-45	7.49	11.14	0.31	7.1	0.34	<0.01	0.34	10.6	2.50	NONE	-8.10	0.2
UZ7230	CM18-03-GC-47	7.03					<0.01			2.00	NONE (H)		
UZ7231	CM18-03-GC-48	7.34	6.16	0.51	11.6	0.16	<0.01	0.16	5.0	2.00	NONE	-3.00	0.4
UZ7232	CM18-03-GC-50	8.21					<0.01			50.3	SLIGHT		
UZ7233	CM18-03-GC-51	8.34					<0.01			74.3	SLIGHT		
UZ7234	CM18-03-GC-52	8.19	3.51	3.23	73.4	0.21	<0.01	0.21	6.6	47.3	SLIGHT	40.7	7.2
UZ7235	CM18-03-GC-53	6.31					0.01			1.30	NONE		
UZ7236	CM18-03-GC-55	7.67	10.98	<0.08	<1.8	0.47	<0.01	0.47	14.7	1.30	NONE	-13.4	<0.1
UZ7237	CM18-03-GC-56	7.42	2.83	1.66	37.7	0.38	0.01	0.37	11.6	9.30	SLIGHT	-2.30	0.8
UZ7238	CM18-03-GC-57	7.65	5.29	0.50	11.4	0.27	<0.01	0.27	8.4	4.80	NONE	-3.60	0.6
UZ7239	CM18-03-GC-58	6.40	1.44	0.86	19.6	0.44	0.02	0.42	13.1	5.80	NONE	-7.30	0.4
UZ7240	CM18-03-GC-59	6.59	10.99	3.10	70.5	2.53	0.03	2.50	78.1	12.8	NONE	-65.3	0.2
VD9732	CM18-03-GC-59 SPLIT DUP	6.49	11.59	3.17	72.1	2.49	0.03	2.46	76.9	10.3	NONE	-66.6	0.1
UZ7241	CM18-03-GC-60	7.22	21.86	<0.08	<1.8	0.33	<0.01	0.33	10.3	0.800	NONE	-9.50	<0.1
UZ7242	CM18-03-GC-61	7.48	55.23	0.19	4.3	0.48	<0.01	0.48	15.0	2.00	NONE (H)	-13.0	0.1
UZ7243	CM18-03-GC-62	6.48	0.69	<0.08	<1.8	0.03	<0.01	0.03	0.9	1.80	NONE	0.900	2.0
UZ7244	CM18-03-GC-63	5.61	0.56	0.14	3.2	0.14	0.03	0.11	3.4	4.30	NONE	0.900	1.3
UZ7245	CM18-16-GC-15	7.70	8.21	1.65	37.5	0.14	<0.01	0.14	4.4	11.0	NONE	6.60	2.5
UZ7246	CM18-16-GC-16	7.72					<0.01			3.50	NONE		
UZ7247	CM18-16-GC-17	8.62					<0.01			55.0	SLIGHT		
UZ7248	CM18-16-GC-18	8.56	1.73	2.58	58.6	0.05	<0.01	0.05	1.6	49.8	SLIGHT	48.2	31.1
UZ7249	CM18-16-GC-19	8.50					<0.01			50.8	SLIGHT		
UZ7250	CM18-16-GC-20	8.42					<0.01			33.8	SLIGHT		
UZ7251	CM18-16-GC-21	7.79	2.18	0.56	12.7	0.09	<0.01	0.09	2.8	7.50	NONE	4.70	2.7
UZ7252	CM18-16-GC-22	6.82					<0.01			10.3	NONE (H)		
UZ7253	CM18-16-GC-23	7.97					<0.01			1.50	NONE		
UZ7254	CM18-16-GC-24	8.05	3.79	2.90	65.9	0.11	<0.01	0.11	3.4	20.0	SLIGHT	16.6	5.9
UZ7255	CM18-16-GC-25	8.49					<0.01			72.0	SLIGHT		
UZ7256	CM18-16-GC-26	8.88					<0.01			129	MODERATE		
UZ7257	CM18-16-GC-27	8.50	6.87	8.15	185.2	0.11	<0.01	0.11	3.4	104	MODERATE	101	30.6
UZ7258	CM18-16-GC-28	7.82					<0.01			2.80	NONE (H)		
UZ7259	CM18-16-GC-29	8.15					<0.01			42.5	SLIGHT		
UZ7260	CM18-16-GC-30	8.11	3.11	6.60	150.0	0.08	0.01	0.07	2.2	62.3	SLIGHT	60.1	28.3
VD9734	CM18-16-GC-30 SPLIT DUP	8.23	3.14	6.38	145.0	0.08	<0.01	0.08	2.5	65.3	SLIGHT	62.8	26.1
UZ7261	CM18-16-GC-31	8.17					<0.01			5.00	NONE (H)		
UZ7262	CM18-16-GC-32	8.45					<0.01			148	MODERATE		
UZ7263	CM18-16-GC-33	7.88	83.76	0.29	6.6	0.77	<0.01	0.77	24.1	9.50	NONE (H)	-14.6	0.4
VA9770	CM18-16-GC-33 SPLIT DUP	7.74	83.09	0.33	7.5	0.69	<0.01	0.69	21.6	10.30	NONE	-11.26	0.5
UZ7264	CM18-16-GC-34	8.50					<0.01			76.8	SLIGHT		
UZ7265	CM18-16-GC-35	7.96					<0.01			1.80	NONE (H)		
UZ7266	CM18-16-GC-36	7.92	5.24	0.78	17.7	0.14	<0.01	0.14	4.4	4.30	NONE	-0.100	1.0
UZ7267	CM18-16-GC-37	7.51					<0.01			16.8	NONE (H)		
UZ7268	CM18-16-GC-38	7.95					<0.01			3.80	NONE		
UZ7269	CM18-16-GC-39	8.81	6.45	3.48	79.1	0.13	<0.01	0.13	4.1	32.3	SLIGHT	28.2	7.9
UZ7270	CM18-16-GC-40	9.27	2.31	5.64	128.2	0.06	<0.01	0.06	1.9	115	MODERATE	113	60.5
VD9735	CM18-16-GC-40 SPLIT DUP	9.22	2.28	5.67	128.9	0.05	<0.01	0.05	1.6	114	MODERATE	112	71.3
UZ7271	CM18-16-GC-41	9.23	1.91	3.58	81.4	0.09	<0.01	0.09	2.8	64.8	SLIGHT	62.0	23.1
UZ7272	CM18-16-GC-42	9.24	3.33	7.15	162.5	0.13	<0.01	0.13	4.1	112	MODERATE	108	27.3
UZ7273	CM18-16-GC-43	9.16	3.45	5.06	115.0	0.19	<0.01	0.19	5.9	70.3	SLIGHT	64.4	11.9
UZ7274	CM18-27-GC-01	6.35	2.57	<0.08	<1.8	0.05	<0.01	0.05	1.6	0.800	NONE	-0.800	0.5
UZ7275	CM18-27-GC-02	6.63					<0.01			2.30	NONE		
UZ7276	CM18-27-GC-03	6.63	3.13	<0.08	<1.8	0.05	<0.01	0.05	1.6	0.0	NONE	-1.60	#N/A
UZ7277	CM18-27-GC-04	6.71					<0.01			2.80	NONE		
UZ7278	CM18-27-GC-05	6.98					<0.01			2.50	NONE		
UZ7279	CM18-27-GC-06	6.92					<0.01			5.50	NONE		
UZ7280	CM18-27-GC-07	6.48	1.29	<0.08	<1.8	0.05	<0.01	0.05	1.6	2.80	NONE	1.20	1.8
UZ7281	CM18-27-GC-08	6.83					<0.01			2.30	NONE		
UZ7282	CM18-27-GC-09	6.90					<0.01			1.80	NONE		
UZ7283	CM18-27-GC-10	7.59					<0.01			10.5	NONE		
UZ7284	CM18-27-GC-11	7.81	2.62	1.20	27.3	0.09	<0.01	0.09	2.8	16.5	SLIGHT	13.7	5.9
UZ7285	CM18-27-GC-12	8.07					0.01			28.5	SLIGHT		
UZ7286	CM18-27-GC-13	8.54					<0.01			79.5	SLIGHT		
UZ7287	CM18-27-GC-14	8.50					<0.01			62.3	SLIGHT		
UZ7288	CM18-27-GC-15	8.17	2.73	4.47	101.6	0.06	<0.01	0.06	1.9	58.0	SLIGHT	56.1	30.5
UZ7289	CM18-27-GC-16	7.13					<0.01			8.00	NONE		
UZ7290	CM18-27-GC-17	7.37					<0.01			0.800	NONE		
UZ7291	CM18-27-GC-18	7.84	1.16	0.77	17.5	0.04	<0.01	0.04	1.3	8.50	NONE	7.20	6.5
UZ7292	CM18-27-GC-19	8.64					<0.01			123	MODERATE		
UZ7293	CM18-27-GC-20	8.30					<0.01			57.8	SLIGHT		
UZ7294	CM18-27-GC-21	8.41	2.75	2.70	61.4	0.05	<0.01	0.05	1.6	61.3	SLIGHT	59.7	38.3
UZ7295	CM18-27-GC-22	8.49					<0.01			151	MODERATE		
UZ7296	CM18-27-GC-23	8.47					<0.01			114	MODERATE		
UZ7297	CM18-27-GC-24	8.22	22.08	1.74	39.6	0.22	<0.01	0.22	6.9	10.5	SLIGHT	3.60	1.5
UZ7298	CM18-27-GC-25	7.70					<0.01			2.00	NONE		
UZ7299	CM18-27-GC-26	7.95					<0.01			6.50	NONE		
VA9772	CM18-27-GC-26 SPLIT DUP	7.84	7.51	0.24	5.5	0.14	<0.01	0.14	4.4	6.80	NONE	2.43	1.6
UZ7300	CM18-27-GC-27	7.23					<0.01			1.50	NONE		
UZ7301	CM18-27-GC-28	8.60	2.97	5.16	117.3	0.06	<0.01	0.06	1.9	92.8	SLIGHT	90.9	48.8
UZ7302	CM18-27-GC-29	8.26					<0.01			60.3	SLIGHT		
UZ7303	CM18-27-GC-30	8.24					<0.01			26.3	SLIGHT		
UZ7304	CM18-27-GC-31	7.96	1.78	0.29	6.6	0.11	<0.01	0.11	3.4	5.50	NONE	2.10	1.6
UZ7305	CM18-27-GC-32	7.81	4.86	0.65	14.8	0.09	<0.01	0.09	2.8	4.30	NONE	1.50	1.5
UZ7306	CM18-27-GC-33	8.32					<0.01			9.30	NONE		
UZ7307	CM18-27-GC-34	8.53	2.39	1.24	28.2	0.04	<0.01	0.04	1.3	5.50	NONE	4.20	4.2
UZ7308	CM18-27-GC-35	9.44	2.46	5.10	115.9	0.06	<0.01	0.06	1.9	79.0	SLIGHT	77.1	41.6
UZ7309	CM18-27-GC-36	9.49	3.99	6.13	139.3	0.17	<0.01	0.17	5.3	95.5	SLIGHT	90.2	18.0
UZ7310	CM18-27-GC-37	8.49	1.73	0.19	4.3	0.24	<0.01	0.24	7.5	4.80	NONE	-2.70	0.6
VD9739	CM18-27-GC-37 SPLIT DUP	8.40	1.60	0.17	3.9	0.21	<0.01	0.21	6.6	4.30	NONE	-2.30	0.7
UZ7311	CM18-27-GC-38	9.08	5.66	3.22	73.2	0.38	<0.01	0.38	11.9	26.0	SLIGHT	14.1	2.2
UZ7312	CM18-27-GC-39	9.23	2.26	3.29	74.8	0.28	<0.01	0.28	8.8	43.0	SLIGHT	34.2	4.9
UZ7313	CM18-27-GC-40	8.81	1.50	2.24	50.9	0.48	<0.01	0.48	15.0	19.8	SLIGHT	4.80	1.3
UZ7314	CM18-27-GC-41	8.77	6.92	4.36	99.1	1.12	<0.01	1.12	35.0	24.5	SLIGHT	-10.5	0.7
UZ7315	CM18-27-GC-42	9.01	38.49	0.26	5.9	0.52	<0.01	0.52	16.3	2.50	NONE	-13.8	0.2
UZ7316	CM18-27-GC-43	7.82	3.52	<0.08	<1.8	0.15	0.03	0.12	3.8	2.50	SLIGHT	-1.30	0.7
UZ7317	CM18-27-GC-44	6.15	0.72	0.22	5.0	0.31	0.03	0.28	8.8	4.80	SLIGHT	-4.00	0.5
UZ7318	CM18-10-GC-01	8.34	3.94	3.81	86.6	0.90	<0.01	0.90	28.1	60.0	SLIGHT	31.9	2.1
UZ7319	CM18-10-GC-02	8.36					<0.01			98.8	MODERATE		
UZ7320	CM18-10-GC-03	8.41	3.13	5.92	134.6	0.08	0.01	0.07	2.2	116	MODERATE	114	52.6
VD9740	CM18-10-GC-03 SPLIT DUP	8.48	2.99	6.17	140.2	0.07	0.01	0.06	1.9	114	MODERATE	112	60.2
UZ7321	CM18-10-GC-04	8.44					<0.01			146	MODERATE		
UZ7322	CM18-10-GC-05	8.40	3.32	5.17	117.5	0.11	0.01	0.10	3.1	69.8	SLIGHT	66.7	22.5
UZ7323	CM18-10-GC-06	8.10					<0.01			24.0	SLIGHT		
UZ7324	CM18-10-GC-29	6.63	5.61	0.14	3.2	0.77	0.01	0.76	23.8	-0.800	NONE	-24.6	#N/A
UZ7325	CM18-10-GC-30	7.87	1.70	0.95	21.6	0.33	<0.01	0.33	10.3	7.50	NONE	-2.80	0.7
VA9767	CM18-10-GC-30 SPLIT DUP	7.85	1.69	0.95	21.6	0.33	<0.01	0.33	10.3	6.50	NONE	-3.81	0.6
UZ7326	CM18-10-GC-31	8.36	3.45	0.74	16.8	0.26	<0.01	0.26	8.1	9.00	NONE	0.900	1.1
UZ7327	CM18-10-GC-32	7.56	1.43	0.64	14.6	0.35	0.02	0.33	10.3	14.0	SLIGHT	3.70	1.4
UZ7328	CM18-10-GC-33	7.25	1.35	1.73	39.3	0.68	0.03	0.65	20.3	15.3	SLIGHT	-5.00	0.8
UZ7329	CM18-10-GC-34	7.88	1.14	1.44	32.7	0.21	0.03	0.18	5.6	31.8	SLIGHT	26.2	5.7
UZ7330	CM18-10-GC-35	7.46	1.06	1.35	30.7	0.97	0.08	0.89	27.8	35.0	SLIGHT	7.20	1.3
VD9741	CM18-10-GC-35 SPLIT DUP	7.38	0.94	1.52	34.6	0.95	0.07	0.88	27.5	33.5	SLIGHT	6.00	1.2
UZ7331	CM18-05-GC2-01	5.98	0.52	<0.08	<1.8	0.05	<0.01	0.05	1.6	2.00	NONE	0.400	1.3
UZ7332	CM18-05-GC2-02	7.26					<0.01			14.3	SLIGHT		
UZ7333	CM18-05-GC2-03	7.48					<0.01			12.0	NONE		
UZ7334	CM18-05-GC2-04	6.53	0.87	0.19	4.3	0.04	<0.01	0.04	1.3	5.50	NONE	4.20	4.2
UZ7335	CM18-05-GC2-05	7.47					<0.01			16.3	SLIGHT		
UZ7336	CM18-05-GC2-06	8.13					<0.01			70.5	SLIGHT		
UZ7337	CM18-05-GC2-07	8.19					<0.01			61.3	SLIGHT		
UZ7338	CM18-05-GC2-08	8.26	2.80	5.53	125.7	0.06	<0.01	0.06	1.9	94.0	SLIGHT	92.1	49.5
UZ7339	CM18-05-GC2-09	8.22					<0.01			58.8	SLIGHT		
UZ7340	CM18-05-GC2-10	8.09					<0.01			85.0	SLIGHT		
UZ7341	CM18-05-GC2-11	8.27					<0.01			74.5	SLIGHT		
UZ7342	CM18-05-GC2-12	7.71	2.78	1.33	30.2	0.08	<0.01	0.08	2.5	7.50	NONE	5.00	3.0
UZ7343	CM18-05-GC2-13	7.75					<0.01			8.50	NONE (H)		
UZ7344	CM18-05-GC2-14	7.73					<0.01			1.30	NONE		
UZ7345	CM18-05-GC2-15	8.01	4.98	4.13	93.9	0.09	<0.01	0.09	2.8	55.8	SLIGHT	53.0	19.9
UZ7346	CM18-05-GC2-16	8.32					<0.01			102	MODERATE		
UZ7347	CM18-05-GC2-17	8.10					<0.01			79.3	MODERATE		
UZ7348	CM18-05-GC2-18	8.04	7.31	2.05	46.6	0.19	<0.01	0.19	5.9	49.8	MODERATE	43.9	8.4
UZ7349	CM18-05-GC2-19	7.84					<0.01			7.50	NONE (H)		
UZ7350	CM18-05-GC2-20	7.82					<0.01			3.00	NONE		
UZ7351	CM18-05-GC2-21	7.55	5.25	0.32	7.3	0.08	<0.01	0.08	2.5	2.00	NONE	-0.500	0.8
UZ7352	CM18-05-GC2-22	6.95					<0.01			1.30	NONE (H)		
UZ7353	CM18-05-GC2-23	7.95					<0.01			37.0	SLIGHT		
UZ7354	CM18-05-GC2-24	8.37	2.20	4.71	107.1	0.05	<0.01	0.05	1.6	84.8	MODERATE	83.2	53.0
UZ7355	CM18-05-GC2-25	8.47					<0.01			90.0	MODERATE		
UZ7356	CM18-05-GC2-26	8.01					<0.01			20.0	SLIGHT		
UZ7357	CM18-05-GC2-27	8.05	43.78	1.41	32.1	0.26	<0.01	0.26	8.1	10.3	SLIGHT	2.20	1.3
UZ7358	CM18-05-GC2-28	7.79					<0.01			2.50	NONE		
UZ7359	CM18-05-GC2-29	7.80					<0.01			4.30	NONE		
VA9766	CM18-05-GC2-29 SPLIT DUP	7.00	7.06	0.53	12.0	0.14	<0.01	0.14	4.4	4.30	NONE	-0.08	1.0
UZ7360	CM18-05-GC2-30	7.51					<0.01			5.30	NONE		
UZ7361	CM18-05-GC2-31	7.02	40.08	0.13	3.0	0.67	0.01	0.66	20.6	1.50	NONE	-19.1	<0.1
UZ7362	CM18-05-GC2-32	7.94					<0.01			2.50	NONE		
UZ7363	CM18-05-GC2-33	7.92					<0.01			17.8	SLIGHT		
UZ7364	CM18-05-GC2-34	8.33	3.22	6.00	136.4	0.09	<0.01	0.09	2.8	80.3	SLIGHT	77.5	28.7
UZ7365	CM18-05-GC2-35	8.27					<0.01			63.5	SLIGHT		
UZ7367	CM18-05-GC2-37	7.98					<0.01			1.80	NONE		
UZ7368	CM18-05-GC2-38	7.85	13.02	0.10	2.3	0.38	<0.01	0.38	11.9	1.50	NONE	-10.4	0.1
UZ7369	CM18-05-GC2-39	6.07	1.35	0.51	11.6	0.26	0.01	0.25	7.8	4.50	NONE	-3.30	0.6
UZ7370	CM18-05-GC2-40	6.88	1.90	0.86	19.6	0.34	0.01	0.33	10.3	7.30	NONE	-3.00	0.7
UZ7371	CM18-05-GC2-41	7.93	1.04	1.18	26.8	0.35	0.03	0.32	10.0	23.5	SLIGHT	13.5	2.4
VD9745	CM18-05-GC2-41 SPLIT DUP	7.72	0.99	1.30	29.6	0.32	0.01	0.31	9.7	21.3	SLIGHT	11.6	2.2
UZ7372	CM18-05-GC2-42	8.07	14.40	22.63	514.3	0.55	<0.01	0.55	17.2	39.0	SLIGHT	21.8	2.3
UZ7373	CM18-05-GC2-43	8.02	48.96	0.19	4.3	0.57	<0.01	0.57	17.8	2.30	NONE	-15.5	0.1
UZ7374	CM18-05-GC2-44	8.23	24.61	30.21	686.6	0.17	<0.01	0.17	5.3	21.5	NONE	16.2	4.1
UZ7375	CM18-05-GC2-45	6.67	1.04	0.15	3.4	0.06	<0.01	0.06	1.9	3.50	NONE	1.60	1.8
VA9939	11-12-11	6.34	11.43	<0.08	<1.8	0.15	0.01	0.14	4.4	2.50	NONE	-1.90	0.6
VA9940	11-12-12	7.59					0.01			37.0	SLIGHT		
VA9941	11-12-15	7.05					0.01			1.80	NONE		
VA9942	11-12-22	7.04	7.31	0.23	5.2	0.07	0.01	0.06	1.9	1.00	NONE	-0.900	0.5
VA9943	11-12-27	6.90					0.01			2.00	NONE		
VA9944	11-12-28	6.57					0.02			2.50	NONE		
VA9945	11-12-29	6.26	9.34	0.20	4.6	0.08	0.01	0.07	2.2	1.00	NONE	-1.20	0.5
VA9946	11-12-33	6.38					0.01			7.50	NONE		
VA9947	11-12-35	5.11					0.04			0.500	NONE		
VA9948	11-12-37	7.28	3.89	3.68	83.6	0.09	0.01	0.08	2.5	17.8	NONE	15.3	7.1
VA9949	11-12-40	8.26					0.01			68.0	SLIGHT		
VA9950	11-12-44	8.17					0.01			41.0	SLIGHT		
VA9951	11-12-45	5.74	5.83	0.11	2.5	0.59	0.07	0.52	16.3	0.800	NONE	-15.5	<0.1
VA9952	11-22-41	7.30	20.33	0.20	4.6	0.20	<0.01	0.20	6.3	2.30	NONE	-4.00	0.4
VA9953	11-22-43	7.71	5.98	0.13	3.0	0.05	<0.01	0.05	1.6	2.50	NONE	0.900	1.6
VD9747	11-22-43 SPLIT DUP	7.78	5.71	0.14	3.2	0.07	<0.01	0.07	2.2	2.80	NONE	0.600	1.3
VB9483	11-19-101	8.07	2.38	0.17	3.9	0.22	0.02	0.20	6.3	2.80	NONE	-3.50	0.4
Detection Limits		*N/A*	*0.02*	*0.08*	*1.8*	*0.02*	*0.01*	*0.02*	*0.6*	*0.1*	*N/A*	*0.1*	*0.1*
Maxxam SOP #		*BBY0SO*	*LECO*	*LECO*	*BBY WI-00033*	*LECO*	*BBY0SOP-00010*	*BBY WI-00033*	*BBY WI-00033*	*BBY0SOP-00020*	*BBY0SOP-0*	*BBY WI-00033*	*BBY WI-00033*

Notes:

Lawrence, R.W. 1991. Acid Rock Drainage Prediction Manual

Sobek, A.A., Schuller, W.A., Freeman, J.R. and Smith, R.M. (March 1978), Field and Laboratory Methods Applicable to Overburden and Minesoils, Report EPA-600/2-78-054, U.S. National Technical Information Service Report PB-280 495 pages 46-47.

References:

Acid Generation Potential = Sulphide Sulphur (by diff.)*31.25
CaCO3 Equivalency = Carbonate Carbon (CO2)*(100/44)*10
Carbonate carbon (CO2; HCl direct method) by Leco
Fizz Rating - Reference method used is based on NP method.
HCl Extractable Sulphur is based on a modified version of ASTM Method D 2492-02
Mod. ABA Neutralization Potential - MEND Acid Rock Drainage Prediction Manual, MEND Project 1.16.1b (pages 6.2-11 to 17), March 1991.
Net Neutralization Potential = (Modified ABA Neutralization Potential)-(Acid Generation Potential (S-S by diff))
Neutralization Potential Ratio = (Neutralization Potential)/(Acid Generation Potential)
Paste pH - Field and Laboratory Methods Applicable to Overburdens and Minesoils, (EPA 600 / 2-78-054, March 1978).
Sulphide Sulphur = (Total Sulphur)-(HCl Extractable Sulphur)
Total sulphur, total carbon & carbonate carbon (CO2; HCl direct method) by Leco

Table 3: Ultratrace Metals Test Results for project CROWN MOUNTAIN PROJECT

Maxxam Sample No	Sample ID	Mo	Cu	Pb	Zn	Ag	Ni	Co	Mn	Fe	As	U	Au	Th	Sr	Cd	Sb	Bi	V	Ca	P	La	Cr	Mg	Ba	Ti	B	Al	Na	K	W	Sc	Tl	Hg	Se	Te	Ga	S
	Units	ppm	ppm	ppm	ppm	ppb	ppm	ppm	ppm	%	ppm	ppm	ppb	ppm	ppm	ppm	ppm	ppm	ppm	%	%	ppm	ppm	%	ppm	%	ppm	%	%	%	ppm	ppm	ppm	ppb	ppm	ppm	ppm	%
UZ7160	CM18-16-LDC3-38	0.88	13.5	8.60	99.8	289	21.3	7.1	65	1.44	6.7	1.1	0.4	3.6	32.9	0.51	0.17	0.09	19	0.34	0.126	5.6	7.8	0.15	321	-0.001	36	0.47	0.067	0.20	-0.1	4.0	0.04	145	0.6	-0.02	1.1	0.34
UZ7161	CM18-16-LDC3-39	1.03	16.9	9.79	98.5	276	21.9	7.6	193	1.86	3.2	1.0	1.0	3.3	43.1	1.10	0.25	0.13	19	1.46	0.099	5.8	6.4	0.55	458	-0.001	-20	0.45	0.072	0.21	-0.1	3.2	0.03	40	0.9	0.03	1.1	0.09
UZ7162	CM18-16-LDC3-40	0.58	4.64	5.11	40.7	303	11.7	4.2	50	0.76	2.9	0.9	1.0	2.3	34.0	0.21	0.11	0.03	12	0.31	0.148	4.5	7.0	0.07	413	<0.001	<20	0.32	0.036	0.13	<0.1	2.7	0.06	89	0.2	<0.02	1.0	0.25
UZ7163	CM18-16-LDC3-41	0.53	4.77	5.52	44.7	264	10.9	4.6	138	2.22	3.3	0.9	0.5	2.3	35.4	0.15	0.12	0.03	15	0.40	0.136	5.4	8.0	0.24	284	<0.001	<20	0.34	0.037	0.13	<0.1	5.5	0.06	79	0.2	<0.02	0.9	0.37
UZ7164	CM18-16-LDC3-42	0.38	10.8	4.66	15.2	63	5.7	2.3	618	3.45	1.3	0.4	0.2	1.1	10.2	0.12	0.13	0.08	8	0.16	0.014	4.3	3.1	0.06	110	<0.001	<20	0.10	0.023	0.04	<0.1	2.7	<0.02	183	0.5	0.02	1.5	0.97
UZ7165	CM18-16-LDC3-43	0.43	4.35	4.24	36.5	192	16.9	6.0	93	0.75	3.0	0.7	0.3	1.5	28.8	0.25	0.18	0.02	13	0.38	0.119	3.7	15.3	0.06	285	<0.001	<20	0.20	0.023	0.09	<0.1	4.2	<0.02	38	0.2	<0.02	0.6	0.08
UZ7166	SAMPLE 1	3.51	25.7	21.7	39.0	433	5.9	0.9	11	0.69	7.4	2.6	2.4	7.2	32.1	0.81	0.87	0.38	73	0.07	0.073	9.6	17.6	0.03	222	0.001	<20	1.05	0.006	0.37	<0.1	7.2	0.10	260	3.9	0.10	2.8	<0.02
UZ7167	SAMPLE 2	3.00	34.5	24.1	39.7	527	7.2	0.9	10	0.44	4.8	2.3	2.4	7.8	51.6	1.15	0.77	0.42	60	0.05	0.059	12.3	17.9	0.04	274	0.001	<20	1.17	0.006	0.39	<0.1	5.5	0.09	267	4.7	0.09	3.2	<0.02
UZ7168	SAMPLE 4	1.82	42.0	19.2	189	408	34.5	10.6	44	0.41	6.0	1.1	1.7	1.6	8.0	2.14	0.37	0.31	29	0.02	0.004	1.9	7.9	0.04	222	<0.001	<20	0.73	0.006	0.31	<0.1	6.5	0.03	165	2.0	0.07	1.9	0.07
UZ7169	SAMPLE 5	2.09	37.1	17.1	202	456	34.4	9.0	93	0.66	3.5	1.6	0.7	2.6	13.1	2.32	0.44	0.27	40	0.08	0.027	3.6	9.6	0.06	264	<0.001	<20	0.77	0.007	0.31	<0.1	5.5	0.02	147	3.0	0.05	2.1	0.07
VD9725	SAMPLE 5 SPLIT DUP	2.07	33.7	17.2	182	433	33.2	8.2	80	0.61	3.2	1.6	0.8	2.5	13.7	2.15	0.30	0.26	42	0.07	0.025	3.7	9.0	0.06	267	0.001	-20	0.73	0.008	0.30	-0.05	5.3	0.02	124	2.8	0.07	2.1	0.06
UZ7170	SAMPLE 6	1.61	33.7	15.8	128	483	16.0	5.1	275	2.04	1.9	1.1	1.9	1.4	7.4	2.41	0.66	0.22	33	0.09	0.008	2.2	8.1	0.08	250	0.001	<20	0.39	0.004	0.19	<0.1	6.5	<0.02	90	2.6	0.06	1.3	0.07
UZ7171	SAMPLE 8	1.79	30.8	17.9	143	517	13.4	3.0	29	0.34	1.2	1.5	<0.2	3.7	15.0	1.68	0.45	0.31	35	0.08	0.027	3.8	8.9	0.05	331	<0.001	<20	0.81	0.005	0.28	<0.1	4.8	0.03	96	3.4	0.06	2.2	0.06
UZ7172	SAMPLE 9	1.90	32.4	15.5	218	381	41.9	11.1	58	0.47	3.3	1.5	1.4	5.2	30.6	2.19	0.25	0.21	28	0.20	0.098	8.5	8.1	0.04	304	0.001	<20	0.74	0.005	0.28	<0.1	4.4	0.05	147	1.6	0.06	1.8	0.05
UZ7174	SAMPLE 10+11	3.21	44.5	17.4	190	488	59.3	13.6	190	2.77	9.9	2.1	1.2	5.1	44.7	3.23	0.57	0.29	49	0.38	0.084	9.1	12.9	0.27	520	0.001	<20	0.96	0.007	0.34	<0.1	6.0	0.03	218	4.3	0.08	2.2	0.11
UZ7175	SAMPLE 15	1.79	42.8	19.1	200	431	45.3	11.2	78	0.79	25.7	2.0	1.0	6.6	38.7	2.51	0.50	0.32	38	0.29	0.111	8.7	11.7	0.11	326	0.001	<20	0.96	0.007	0.37	<0.1	5.5	0.16	210	2.1	0.06	2.5	0.15
UZ7176	SAMPLE 16	2.28	42.9	19.0	207	443	35.2	11.1	20	0.33	4.4	1.5	0.5	4.1	17.5	2.22	0.53	0.31	34	0.14	0.049	5.1	8.1	0.07	245	0.001	<20	0.83	0.007	0.30	<0.1	5.2	<0.02	228	2.9	0.07	2.5	0.10
VA9769	SAMPLE 16 SPLIT DUP	2.08	41.4	18.3	214	411	33.5	10.0	19	0.33	4.3	1.4	<0.2	3.9	16.6	2.23	0.49	0.31	33	0.14	0.048	5.0	7.9	0.07	229	<0.001	<20	0.82	0.007	0.30	<0.1	5.1	<0.02	217	2.9	0.07	2.4	0.09
UZ7177	SAMPLE 17	1.75	37.9	19.3	182	334	38.7	11.6	385	2.66	5.0	1.7	0.5	6.4	51.2	2.01	0.32	0.30	53	1.45	0.116	8.8	13.8	0.79	374	0.001	<20	1.06	0.009	0.40	<0.1	7.6	0.05	163	1.9	0.06	2.6	0.07
UZ7178	SAMPLE 20	0.97	54.1	17.5	136	433	7.4	1.5	15	0.27	1.8	0.9	0.8	1.7	10.1	3.08	0.32	0.40	33	0.09	0.002	2.7	8.7	0.08	350	<0.001	<20	0.73	0.007	0.31	<0.1	4.4	<0.02	182	2.8	0.07	1.7	0.03
UZ7179	SAMPLE 21	1.57	37.7	16.2	196	424	36.1	9.9	325	2.51	2.4	2.0	<0.2	6.1	48.5	2.74	0.50	0.27	50	1.36	0.117	8.0	13.9	0.67	437	0.001	<20	0.87	0.008	0.33	<0.1	7.1	0.04	147	2.2	0.05	2.0	0.05
UZ7180	SAMPLE 22	1.53	34.5	15.2	168	361	36.7	9.7	345	2.64	3.5	1.8	0.5	5.7	72.7	2.38	0.45	0.26	54	3.63	0.130	9.1	14.6	0.86	433	0.001	<20	1.00	0.011	0.37	<0.1	7.2	0.03	170	2.0	0.05	2.4	0.06
VD9726	SAMPLE 22 SPLIT DUP	1.52	36.0	16.4	188	378	40.0	10.3	369	2.80	3.9	2.1	0.9	5.9	83.7	2.49	0.26	0.26	56	3.58	0.147	10.7	16.6	0.87	490	0.001	-20	1.12	0.013	0.40	-0.05	7.8	0.02	162	2.6	0.08	3.1	0.06
UZ7181	SAMPLE 23	3.31	42.4	20.1	203	387	51.5	12.7	284	0.94	10.4	2.9	0.4	7.6	79.2	2.97	0.78	0.35	47	2.11	0.193	11.5	15.1	0.84	572	0.002	<20	0.91	0.010	0.36	<0.1	9.6	0.03	343	3.2	0.07	2.3	0.14
UZ7182	SAMPLE 25	0.54	30.5	15.5	44.3	327	5.4	1.1	14	0.33	4.3	0.7	<0.2	1.2	11.0	0.94	0.23	0.33	19	0.11	0.002	1.9	5.9	0.12	419	<0.001	<20	0.72	0.007	0.32	<0.1	3.4	0.04	87	1.1	0.06	1.6	<0.02
UZ7183	SAMPLE 26	0.85	37.5	17.4	158	283	28.2	7.7	19	0.33	12.8	0.9	<0.2	3.5	17.9	1.62	0.40	0.29	19	0.16	0.033	4.6	5.3	0.08	365	<0.001	<20	0.62	0.006	0.28	<0.1	4.2	0.04	127	1.1	0.05	1.6	0.06
UZ7184	SAMPLE 27	1.15	23.1	13.8	113	226	29.8	11.7	402	5.65	8.3	1.4	0.5	4.9	28.9	1.25	0.30	0.16	36	1.46	0.097	7.3	10.1	1.08	320	0.001	<20	0.66	0.006	0.25	<0.1	5.9	0.07	86	0.9	0.02	1.5	0.05
UZ7185	SAMPLE 28	0.92	28.2	16.3	148	243	32.4	11.0	850	4.38	14.9	1.3	0.4	5.4	26.4	1.39	0.31	0.25	36	1.48	0.095	6.3	9.4	0.69	298	0.001	<20	0.83	0.010	0.35	<0.1	6.9	0.08	116	1.2	0.05	2.0	0.07
UZ7186	SAMPLE 29	0.17	42.5	15.7	41.7	179	0.9	0.2	7	0.07	<0.1	0.5	<0.2	1.1	9.4	0.50	0.10	0.36	14	0.11	0.002	1.7	3.4	0.04	308	<0.001	<20	0.60	0.007	0.26	<0.1	3.1	<0.02	63	0.9	0.08	1.1	0.02
UZ7187	SAMPLE 31	0.29	31.6	14.8	137	238	3.1	1.2	31	0.27	0.3	2.0	<0.2	6.5	23.2	1.81	0.12	0.25	21	0.30	0.110	7.5	7.6	0.06	343	0.001	<20	0.90	0.008	0.34	<0.1	2.9	0.06	142	1.3	0.04	2.0	0.04
UZ7188	SAMPLE 32	1.41	33.8	16.0	152	274	35.5	13.7	430	2.82	4.1	1.6	<0.2	6.5	35.4	1.65	0.26	0.24	35	1.80	0.111	7.8	9.5	0.91	354	0.001	<20	0.81	0.007	0.32	<0.1	7.9	0.05	126	0.9	0.06	1.9	0.04
UZ7189	SAMPLE 33	1.39	38.7	19.3	104	254	25.7	12.3	40	0.34	2.5	1.6	<0.2	6.1	23.2	1.15	0.33	0.33	23	0.41	0.097	6.8	7.5	0.12	436	0.001	<20	0.95	0.009	0.38	<0.1	3.9	0.04	115	1.5	0.06	2.5	0.04
UZ7190	SAMPLE 35	3.51	37.4	14.3	220	626	53.1	9.8	31	0.40	2.9	3.0	0.4	5.2	35.7	4.80	0.66	0.22	38	0.41	0.140	8.2	12.3	0.10	546	0.001	<20	0.82	0.008	0.32	<0.1	4.5	0.03	250	5.1	0.06	2.0	0.06
VD9727	SAMPLE 35 SPLIT DUP	3.35	37.7	14.7	223	626	52.9	9.9	30	0.40	3.1	2.9	<0.2	5.0	37.0	4.60	0.32	0.21	44	0.40	0.149	8.9	14.8	0.11	541	0.001	<20	0.90	0.009	0.34	<0.05	5.0	<0.02	259	5.0	0.06	2.4	0.06
UZ7191	SAMPLE 36	1.13	37.4	15.6	152	574	11.2	3.7	14	0.41	21.8	1.0	<0.2	2.5	12.8	3.61	0.28	0.28	30	0.13	0.018	2.4	7.5	0.09	410	<0.001	<20	0.73	0.007	0.31	<0.1	4.8	0.04	300	4.1	0.08	1.5	0.17
UZ7192	SAMPLE 38	1.36	42.4	16.3	149	276	14.1	10.5	16	0.34	13.9	0.4	<0.2	1.0	5.8	0.99	0.22	0.24	20	0.05	0.002	1.2	3.5	0.05	196	<0.001	<20	0.68	0.005	0.14	<0.1	6.0	<0.02	317	2.1	0.06	1.4	0.15
UZ7193	SAMPLE 39	2.05	35.3	16.9	122	225	21.8	8.5	29	0.51	1.4	0.9	<0.2	1.9	9.9	1.11	0.41	0.30	20	0.11	0.011	2.2	4.8	0.11	267	<0.001	<20	0.57	0.008	0.25	<0.1	5.6	<0.02	131	1.2	0.04	1.6	0.07
UZ7194	11-11-59	0.64	4.81	5.76	61.7	262	15.6	5.7	51	0.92	6.7	0.9	<0.2	2.0	19.1	0.33	0.08	0.03	15	0.29	0.084	3.8	7.6	0.07	145	<0.001	<20	0.31	0.002	0.13	<0.1	2.4	0.05	117	0.2	<0.02	0.9	0.23
UZ7195	CM18-03-GC-01	1.23	23.8	12.2	136	186	21.0	4.7	59	1.03	2.2	2.2	<0.2	5.4	20.9	1.30	0.22	0.15	33	0.32	0.136	9.3	11.4	0.02	118	0.001	<20	0.59	0.005	0.22	<0.1	5.6	0.16	86	4.0	0.05	1.6	<0.02
UZ7196	CM18-03-GC-02	0.64	21.2	15.8	224	148	10.0	3.4	55	0.64	2.0	2.3	<0.2	5.5	23.4	1.14	0.13	0.16	31	0.31	0.128	9.0	12.8	0.02	160	0.001	<20	0.62	0.007	0.23	<0.1	5.1	0.18	61	0.9	0.04	1.8	<0.02
UZ7197	CM18-03-GC-03	1.53	26.7	13.5	197	87	45.2	10.9	138	1.21	5.3	1.7	<0.2	5.5	18.2	1.35	0.33	0.13	28	0.26	0.112	7.8	10.6	0.02	340	0.001	<20	0.50	0.004	0.18	<0.1	4.6	0.10	113	0.6	0.03	1.5	<0.02
UZ7198	CM18-03-GC-04	1.36	28.7	15.7	343	118	58.1	12.9	272	2.22	3.8	1.8	<0.2	5.8	19.6	2.55	0.29	0.14	34	0.30	0.128	9.3	12.5	0.04	265	0.001	<20	0.50	0.004	0.19	<0.1	5.5	0.10	102	0.6	0.02	1.5	<0.02
UZ7199	CM18-03-GC-05	0.55	15.1	11.3	208	93	21.4	3.9	98	0.85	4.3	1.4	<0.2	4.4	21.9	1.01	0.22	0.07	24	0.27	0.119	8.3	13.0	0.02	211	0.001	<20	0.45	0.004	0.16	<0.1	3.3	0.09	92	0.2	<0.02	1.4	<0.02
UZ7200	CM18-03-GC-06	0.81	13.3	10.6	177	94	18.1	6.4	145	1.26	4.7	1.6	<0.2	3.2	25.1	0.93	0.27	0.05	30	0.33	0.160	8.0	12.6	0.02	221	0.001	<20	0.40	0.004	0.14	<0.1	4.0	0.10	66	0.3	<0.02	1.4	<0.02
VD9728	CM18-03-GC-06 SPLIT DUP	0.72	12.1	9.61	178	102	16.5	5.7	138	1.19	4.3	1.5	1.4	3.1	27.9	0.88	0.25	0.05	31	0.33	0.157	7.9	11.2	0.02	240	0.001	<20	0.41	0.003	0.13	<0.05	4.3	0.10	53	0.4	<0.02	1.4	<0.02
UZ7201	CM18-03-GC-07	1.08	15.9	13.5	232	124	25.7	7.0	233	1.83	4.7	1.4	<0.2	3.4	25.0	1.32	0.34	0.07	34	0.32	0.146	8.0	14.6	0.03	217	0.002	<20	0.43	0.005	0.14	<0.1	4.5	0.09	87	0.6	<0.02	1.3	<0.02
UZ7202	CM18-03-GC-08	2.38	36.1	18.6	366	234	57.4	17.4	401	3.53	3.4	1.8	<0.2	6.3	23.4	2.70	0.25	0.22	57	0.31	0.122	8.5	17.7	0.07	210	0.001	<20	1.05	0.008	0.36	<0.1	8.9	0.09	114	1.8	0.04	2.6	<0.02
UZ7203	CM18-03-GC-09	1.11	40.6	21.7	256	269	39.0	13.6	747	4.06	6.9	1.6	<0.2	7.3	29.4	1.73	0.25	0.24	41	0.65	0.122	8.6	13.3	0.26	300	0.001	<20	0.64	0.007	0.24	<0.1	9.0	0.08	123	1.3	0.06	1.8	<0.02
UZ7204	CM18-03-GC-10	1.10	39.8	24.9	289	304	37.3	12.1	523	2.67	4.1	1.7	<0.2	7.2	41.7	1.52	0.19	0.26	47	0.50	0.126	9.2	16.0	0.19	299	0.001	<20	0.97	0.010	0.37	<0.1	8.6	0.08	131	1.0	0.06	2.5	<0.02
VA9768	CM18-03-GC-10 SPLIT DUP	1.03	40.7	24.4	285	285	37.9	11.8	535	2.64	4.1	1.7	<0.2	7.1	39.1	1.52	0.22	0.25	47	0.49	0.122	9.3	14.9	0.18	290	0.001	<20	0.97	0.009	0.36	<0.1	8.4	0.08	137	0.9	0.06	2.5	<0.02
UZ7205	CM18-03-GC-11	0.75	37.1	28.0	317	216	25.3	7.1	445	2.54	4.8	1.4	<0.2	6.5	23.9	1.11	0.20	0.24	37	0.33	0.100	7.6	11.1	0.07	239	0.001	<20	0.71	0.006	0.27	<0.1	7.3	0.06	124	1.0	0.05	1.9	<0.02
UZ7206	CM18-03-GC-12	1.36	34.0	28.3	300	246	35.4	12.7	680	4.43	6.6	1.2	<0.2	5.9	23.9	1.30	0.42	0.24	33	0.48	0.077	7.6	9.3	0.38	318	<0.001	<20	0.60	0.006	0.23	<0.1	7.3	0.10	133	1.4	0.05	1.5	0.04
UZ7207	CM18-03-GC-13	8.27	32.4	22.9	212	326	76.6	24.8	478	2.03	0.8	1.9	1.6	6.6	45.9	1.06	0.32	0.26	47	0.28	0.092	9.0	14.7	0.07	335	0.001	<20	0.77	0.005	0.30	<0.1	6.1	0.13	135	0.8	0.06	2.2	<0.02
UZ7208	CM18-03-GC-14	9.38	29.6	23.0	248	410	95.9	30.9	873	3.90	2.3	1.8	0.6	5.9	50.7	1.66	0.62	0.25	59	0.33	0.094	9.2	15.8	0.12	466	0.001	<20	0.71	0.004	0.27	<0.1	8.5	0.09	208	2.1	0.06	2.1	<0.02
UZ7209	CM18-03-GC-15	1.32	36.8	22.9	225	334	26.8	7.2	556	3.47	1.9	2.0	1.4	6.2	65.4	2.56	0.24	0.22	51	0.97	0.148	12.0	15.6	0.50	601	0.001	<20	0.71	0.003	0.25	<0.1	7.3	0.07	93	1.8	0.04	2.0	<0.02
UZ7210	CM18-03-GC-16	1.36	37.2	19.6	236	331	43.9	11.2	1200	7.23	5.9	1.5	1.4	6.1	70.0	2.48	0.28	0.22	47	0.84	0.164	11.7	13.5	0.39	469	0.002	<20	0.66	0.005	0.23	<0.1	7.2	0.09	88	1.3	0.05	1.8	<0.02
VD9729	CM18-03-GC-16 SPLIT DUP	1.34	36.5	21.5	259	350	43.0	10.5	1230	7.28	6.6	1.5	0.9	5.8	88.1	2.85	0.21	0.21	51	0.84	0.163	12.4	14.0	0.38	491	0.001	<20	0.68	0.006	0.24	<0.05	8.4	0.08	108	1.4	0.06	2.1	<0.02
UZ7211	CM18-03-GC-17	2.09	41.3	19.2	209	377	76.5	17.5	289	1.67	5.1	1.9	0.2	6.3	78.8	2.56	0.41	0.22	34	0.99	0.140	10.5	10.8	0.46	470	0.001	<20	0.75	0.003	0.28	<0.1	4.9	0.09	123	1.8	0.03	2.1	0.05
UZ7212	CM18-03-GC-18	1.50	38.5	16.3	176	354	41.5	11.4	490	2.51	2.2	1.9	<0.2	6.2	62.5	2.23	0.34	0.22	46	1.93	0.142	10.8	14.6	0.92	323	0.001	<20	0.70	0.005	0.28	<0.1	6.7	0.07	107	1.6	0.05	2.0	0.04
UZ7213	CM18-03-GC-19	0.54	32.4	23.5	173	329	19.3	7.3	440	2.64	3.2	1.5	0.4	6.7	157	1.64	0.28	0.25	49	1.10	0.143	12.6	15.9	0.48	453	0.002	<20	1.13	0.008	0.40	<0.1	6.4	0.08	87	1.4	0.05	2.8	0.07
UZ7214	CM18-03-GC-20	1.74	33.1	17.6	163	264	40.1	12.4	935	4.84	2.9	1.8	<0.2	6.3	116	1.36	0.33	0.24	56	3.38	0.158	12.1	18.5	1.27	408	0.002	<20	0.79	0.007	0.30	<0.1	7.9	0.07	111	1.3	0.05	2.0	0.07
UZ7215	CM18-03-GC-21	1.92	40.6	19.7	207	307	38.2	11.6	462	2.60	3.0	1.6	<0.2	6.0	38.5	1.80	0.37	0.26	46	1.29	0.104	7.5	12.9	0.67	309	0.001	<20	0.82	0.005	0.33	<0.1	6.7	0.05	160	1.7	0.06	2.1	0.07
UZ7216	CM18-03-GC-25	1.86	53.8	23.7	245	427	52.7	16.0	24	0.43	3.1	1.5	<0.2	5.9	23.1	2.84	0.23	0.33	31	0.23	0.066	6.6	9.1	0.13	356	0.001	<20	0.90	0.007	0.34	<0.1	4.2	0.05	192	2.5	0.08	2.4	0.06
UZ7217	CM18-03-GC-29	2.00	44.7	31.2	255	415	40.8	10.9	103	0.86	2.5	2.0	<0.2	6.1	41.4	2.85	0.36	0.27	45	0.98	0.105	7.8	15.1	0.45	428	0.001	<20	1.19	0.009	0.42	<0.1	5.7	0.04	156	2.6	0.05	3.1	0.06
UZ7218	CM18-03-GC-30	1.36	41.5	22.9	201	410	44.1	11.7	176	1.14	1.3	1.9	1.3	6.4	90.9	2.44	0.35	0.25	35	1.73	0.119	11.1	11.4	0.72	428	0.001	<20	0.75	0.006	0.27	<0.1	5.8	0.04	121	2.5	0.06	1.9	0.04
UZ7219	CM18-03-GC-31	1.56	36.7	15.1	158	301	32.7	8.6	1120	7.34	2.6	1.9	0.3	5.6	91.0	1.93	0.39	0.25	54	1.93	0.145	10.3	16.1	0.88	462	0.002	<20	0.89	0.010	0.30	<0.1	9.6	0.03	116	1.7	0.05	2.3	0.06
UZ7220	CM18-03-GC-32	2.40	37.4	16.9	178	299	39.8	10.8	632	3.41	8.9	2.5	<0.2	6.4	57.2	2.21	0.45	0.27	48	2.38	0.170	10.0	17.3	1.25	410	0.001	<20	1.01	0.010	0.35	<0.1	9.3	0.03	225	2.3	0.05	2.3	0.11
VD9730	CM18-03-GC-32 SPLIT DUP	2.33	38.6	16.9	210	316	40.5	10.2	650	3.54	9.9	2.4	<0.2	6.6	63.9	2.43	0.32	0.29	53	2.52	0.165	10.4	16.7	1.26	416	0.001	<20	1.06	0.012	0.38	<0.05	9.7	0.05	244	2.6	0.05	3.0	0.10
UZ7221	CM18-03-GC-36	1.47	43.1	20.2	200	282	36.5	11.7	24	0.44	9.0	1.1	0.4	3.1	20.0	1.74	0.33	0.31	26	0.14	0.029	3.7	7.2	0.09	286	<0.001	<20	0.77	0.006	0.32	<0.1	4.1	0.05	170	2.1	0.04	1.9	0.13
UZ7222	CM18-03-GC-37	1.06	27.0	14.1	140	217	24.5	9.2	148	1.45	5.0	1.3	<0.2	4.9	27.8	1.29	0.18	0.17	24	1.44	0.080	6.9	8.6	0.58	259	<0.001	<20	0.61	0.004	0.22	<0.1	4.3	0.10	101	1.0	0.04	1.6	0.06
UZ7223	CM18-03-GC-38	1.05	25.5	14.2	117	205	33.3	11.7	915	4.58	3.7	1.4	0.2	5.6	33.9	1.13	0.30	0.17	32	2.52	0.117	7.8	10.2	1.04	252	0.001	<20	0.58	0.007	0.22	<0.1	6.3	0.06	77	0.8	0.03	1.6	0.04
UZ7224	CM18-03-GC-39	0.93	26.6	14.2	135	218	25.4	8.8	568	2.44	2.4	1.4	<0.2	5.5	29.9	1.23	0.22	0.17	26	2.12	0.110	6.6	8.5	0.81	215	0.001	<20	0.55	0.005	0.22	<0.1	5.1	0.05	87	0.8	0.03	1.4	0.03
UZ7225	CM18-03-GC-40	1.34	34.2	18.3	151	232	33.7	13.3	62	0.55	3.2	1.2	0.2	4.8	19.4	1.25	0.18	0.27	24	0.68	0.067	5.4	7.1	0.29	250	<0.001	<20	0.80	0.006	0.31	<0.1	4.3	0.04	115	1.2	0.05	2.0	0.04
UZ7226	CM18-03-GC-41	1.13	39.2	16.5	136	221	22.4	9.9	66	0.38	2.4	1.8	0.4	6.1	26.5	1.23	0.25	0.26	25	0.94	0.104	7.0	7.0	0.39	274	0.001	<20	0.84	0.007	0.29	<0.1	6.1	0.02	85	1.4	0.06	1.8	0.04
UZ7227	CM18-03-GC-43	1.84	24.6	9.24	176	514	7.5	1.4	33	0.31	4.1	2.5	<0.2	4.7	35.2	3.55	0.12	0.12	22	0.43	0.187	9.6	9.8	0.06	517	0.001	<20	0.74	0.007	0.25	<0.1	3.3	0.06	154	2.5	0.03	1.4	0.02
UZ7228	CM18-03-GC-44	1.64	35.5	14.4	172	486	24.9	5.5	19	0.28	2.2	2.8	<0.2	4.6	33.2	3.45	0.20	0.25	37	0.40	0.142	7.9	15.0	0.09	349	0.001	<20	1.12	0.009	0.42	<0.1	3.9	0.05	149	4.7	0.06	2.3	0.07
VA9771	CM18-03-GC-44 SPLIT DUP	1.68	35.2	14.5	174	478	27.6	6.8	25	0.35	2.7	2.7	<0.2	4.4	31.7	3.24	0.24	0.29	44	0.38	0.129	6.9	17.5	0.11	338	0.001	<20	1.31	0.012	0.50	<0.1	4.0	0.06	161	5.2	0.07	2.7	0.08
UZ7229	CM18-03-GC-45	2.55	49.3	18.2	270	661	32.7	7.7	39	0.53	5.3	2.9	<0.2	4.5	24.0	5.53	0.69	0.31	32	0.24	0.072	4.9	12.5	0.10	350	<0.001	<20	0.84	0.008	0.34	<0.1	4.3	0.04	268	7.5	0.06	1.9	0.25
UZ7230	CM18-03-GC-47	1.55	36.5	12.9	369	122	6.3	2.0	15	0.22	0.5	0.8	0.4	0.7	3.8	0.87	0.47	0.16	14	0.04	0.002	0.7	4.3	0.04	148	<0.001	<20	0.41	0.004	0.14	<0.1	4.9	<0.02	104	0.8	0.03	1.8	0.13
VD9731	CM18-03-GC-47 SPLIT DUP	1.49	33.5	13.8	388	136	6.9	2.1	16	0.22	0.6	0.9	<0.2	1.0	5.0	0.90	0.42	0.17	16	0.04	0.003	1.1	4.2	0.05	158	0.001	<20	0.45	0.007	0.14	<0.05	6.1	<0.02	119	0.6	0.04	2.0	0.13
UZ7231	CM18-03-GC-48	1.37	47.7	21.5	214	279	30.2	9.4	54	0.69	4.0	1.1	<0.2	2.5	13.3	1.62	0.31	0.35	27	0.14	0.022	2.8	7.2	0.15	277	<0.001	<20	0.77	0.009	0.29	<0.1	5.5	0.03	153	1.9	0.05	1.9	0.12
UZ7232	CM18-03-GC-50	1.80	37.1	16.9	149	232	28.9	10.0	282	2.22	2.0	1.5	<0.2	5.2	30.2	1.43	0.24	0.26	35	1.45	0.087	5.6	10.6	0.62	292	<0.001	<20	0.77	0.008	0.30	<0.1	5.9	0.03	108	1.6	0.04	1.9	0.08
UZ7233	CM18-03-GC-51	1.14	29.2	14.6	123	198	28.5	10.2	560	3.21	6.6	1.5	0.7	5.5	34.8	1.18	0.22	0.20	36	2.05	0.101	6.1	11.0	1.04	305	<0.001	<20	0.74	0.008	0.27	<0.1	6.5	0.06	79	1.0	0.04	1.8	0.10
UZ7234	CM18-03-GC-52	1.37	18.5	11.7	119	224	24.5	12.2	628	3.25	3.6	1.1	<0.2	5.1	28.3	1.00	0.14	0.14	27	1.39	0.095	6.4	9.3	0.64	364	0.001	<20	0.76	0.009	0.28	<0.1	5.3	0.04	58	0.6	0.02	1.9	0.20
UZ7235	CM18-03-GC-53	1.18	24.5	17.0	157	229	40.7	23.2	16	1.02	18.0	0.9	<0.2	4.1	11.5	1.34	0.39	0.12	13	0.19	0.062	5.1	4.6	0.04	288	<0.001	<20	0.68	0.006	0.21	<0.1	3.0	0.08	454	1.5	0.04	1.6	1.12
UZ7236	CM18-03-GC-55	0.73	23.0	13.2	73.3	451	21.1	7.2	15	0.41	5.3	0.5	<0.2	0.9	5.7	0.82	0.12	0.15	13	0.04	0.001	2.0	4.3	0.04	394	<0.001	<20	0.41	0.003	0.24	<0.1	2.2	<0.02	154	1.3	0.03	1.0	0.37
UZ7237	CM18-03-GC-56	1.03	12.9	9.59	111	306	22.8	7.6	111	2.30	8.5	1.1	<0.2	2.9	18.9	0.53	0.18	0.09	20	0.40	0.083	5.2	9.4	0.28	260	<0.001	<20	0.48	0.003	0.21	<0.1	3.3	0.05	125	0.7	0.03	1.1	0.38
UZ7238	CM18-03-GC-57	1.14	27.3	14.7	181	296	26.8	12.6	47	0.84	3.9	0.9	<0.2	4.4	15.5	1.55	0.25	0.21	19	0.24	0.062	5.1	6.2	0.13	384	<0.001	<20	0.72	0.005	0.29	<0.1	4.8	0.03	90	1.6	0.05	1.8	0.24
UZ7239	CM18-03-GC-58	0.78	6.71	6.57	59.0	271	14.0	5.9	129	1.66	4.0	1.1	<0.2	2.5	19.9	0.28	0.14	0.04	16	0.40	0.121	5.1	9.2	0.15	316	0.001	<20	0.41	0.002	0.16	<0.1	3.0	0.06	86	0.3	<0.02	1.2	0.43
UZ7240	CM18-03-GC-59	0.89	16.4	12.0	115	251	23.7	9.7	419	5.50	6.1	1.1	<0.2	3.3	16.8	0.53	0.17	0.13	22	0.50	0.077	5.3	7.5	0.39	51.8	0.001	<20	0.59	0.004	0.23	<0.1	5.2	0.06	309	0.9	0.02	1.7	2.43
VD9732	CM18-03-GC-59 SPLIT DUP	0.88	15.8	12.2	117	289	23.1	8.7	415	5.53	6.5	1.1	<0.2	3.5	19.7	0.47	0.10	0.14	24	0.52	0.078	5.6	7.5	0.38	39.7	<0.001	<20	0.68	0.005	0.26	<0.05	5.7	0.05	338	0.9	0.04	2.2	2.43
UZ7241	CM18-03-GC-60	0.58	22.0	15.7	241	146	9.3	10.2	9	0.19	0.2	0.8	<0.2	3.8	5.3	0.76	0.10	0.20	5	0.07	0.008	6.0	2.7	0.03	382	<0.001	<20	0.46	0.002	0.17	<0.1	2.7	<0.02	64	1.0	0.03	1.0	0.21
UZ7242	CM18-03-GC-61	0.26	17.7	11.1	91.9	89	5.3	4.1	51	0.28	<0.1	0.6	<0.2	3.0	5.8	0.29	0.09	0.16	7	0.04	0.009	10.9	4.6	0.02	200	0.002	<20	0.19	0.005	0.09	<0.1	4.6	<0.02	15	1.1	0.03	1.3	0.13
UZ7243	CM18-03-GC-62	0.46	5.24	1.50	45.3	55	5.2	2.3	62	0.56	0.3	0.5	<0.2	1.7	13.7	0.29	0.05	0.03	7	0.16	0.073	3.0	11.0	0.02	100	<0.001	<20	0.19	<0.001	0.09	<0.1	2.3	0.04	10	<0.1	<0.02	0.8	0.03
UZ7244	CM18-03-GC-63	0.77	6.03	6.93	59.9	319	19.5	6.9	59	0.68	5.7	0.9	<0.2	1.9	21.9	0.30	0.19	0.03	16	0.36	0.147	4.2	14.1	0.04	310	<0.001	<20	0.25	0.002	0.11	<0.1	2.9	0.03	32	0.2	<0.02	0.8	0.13
UZ7245	CM18-16-GC-15	1.41	36.6	15.5	171	389	20.4	4.9	103	1.85	6.5	0.9	<0.2	2.2	32.3	2.35	0.37	0.25	23	0.21	0.020	5.0	6.7	0.25	388	<0.001	<20	0.56	0.006	0.25	<0.1	4.2	<0.02	131	2.5	0.04	1.5	0.05
UZ7246	CM18-16-GC-16	1.10	29.1	14.1	138	269	28.5	7.6	22	0.31	3.6	1.0	<0.2	2.9	16.9	1.36	0.21	0.18	18	0.18	0.042	5.0	5.4	0.08	308	<0.001	<20	0.57	0.005	0.25	<0.1	2.5	0.04	114	1.1	0.03	1.4	0.05
UZ7247	CM18-16-GC-17	0.88	26.2	13.4	114	208	20.2	7.7	236	2.34	2.4	1.3	<0.2	4.9	25.7	1.25	0.18	0.16	26	1.65	0.092	6.6	8.9	0.60	367	0.001	<20	0.55	0.008	0.24	<0.1	4.6	0.05	84	0.6	0.04	1.4	0.05
UZ7248	CM18-16-GC-18	0.64	20.5	10.8	110	201	20.8	7.6	138	1.30	2.9	1.3	<0.2	4.5	22.8	1.00	0.16	0.10	27	1.33	0.103	6.3	9.2	0.59	400	0.001	<20	0.58	0.007	0.24	<0.1	4.4	0.04	59	0.4	<0.02	1.7	0.03
UZ7249	CM18-16-GC-19	0.94	18.1	10.3	91.4	230	24.4	7.8	123	1.08	6.2	1.3	0.5	4.2	21.7	0.92	0.20	0.10	22	1.46	0.099	5.6	8.4	0.60	298	0.001	<20	0.44	0.005	0.18	<0.1	3.7	0.07	98	0.6	0.02	1.3	0.07
UZ7250	CM18-16-GC-20	0.77	11.0	7.85	62.5	329	15.0	6.3	138	1.10	8.9	1.1	1.5	2.4	21.6	0.72	0.22	0.05	20	1.04	0.099	4.5	7.8	0.38	185	0.001	<20	0.35	0.004	0.14	<0.1	2.6	0.04	110	0.6	<0.02	1.0	0.06
VD9733	CM18-16-GC-20 SPLIT DUP	0.82	11.1	8.70	66.8	372	15.4	6.3	148	1.15	10.0	1.3	<0.2	2.8	25.1	0.82	0.19	0.05	22	1.00	0.107	5.2	7.8	0.37	208	0.001	<20	0.37	0.006	0.14	<0.05	3.0	0.04	126	0.6	<0.02	1.1	0.06
UZ7251	CM18-16-GC-21	0.78	9.29	7.65	53.2	349	14.2	6.3	111	0.80	9.6	1.1	<0.2	1.8	20.1	0.67	0.31	0.02	16	0.36	0.100	4.1	6.4	0.12	124	0.001	<20	0.23	0.004	0.09	<0.1	2.6	0.03	131	0.4	<0.02	0.8	0.06

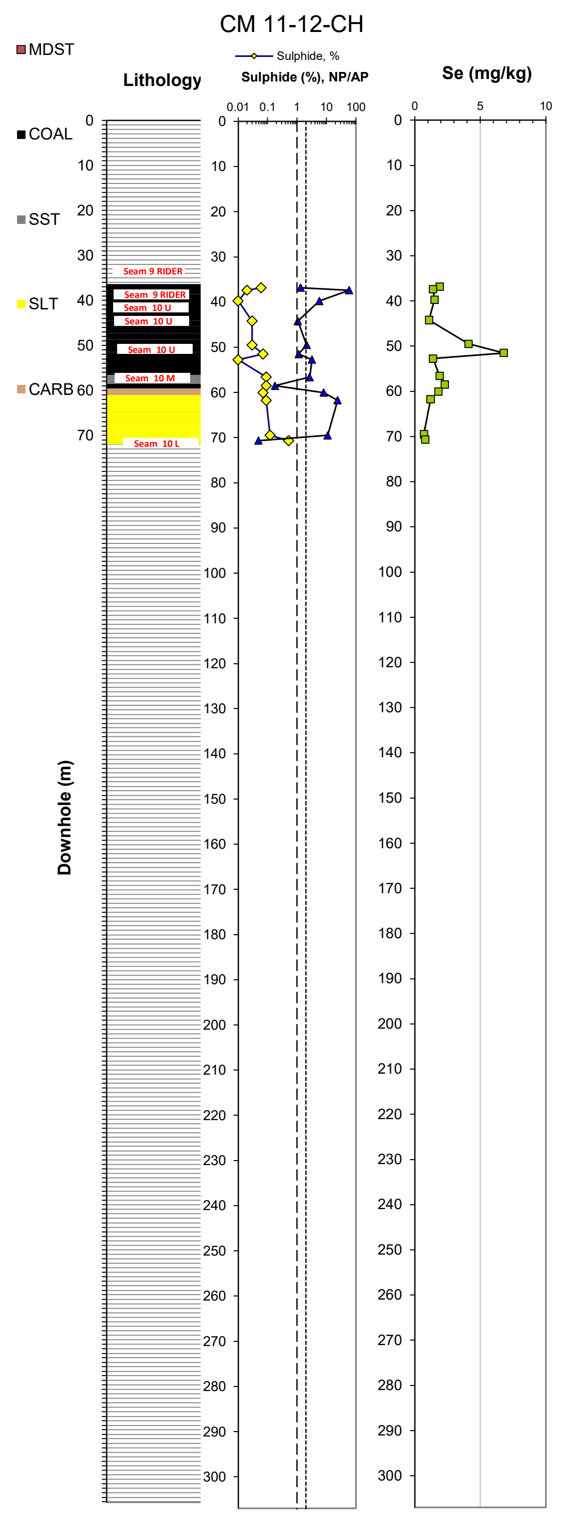
UZ7252	CM18-16-GC-22	1.09	8.38	5.42	17.4	62	4.0	2.2	90	0.86	1.5	0.9	0.2	1.0	1260	0.15	0.22	0.04	10	0.79	0.467	6.6	2.3	0.12	1650	0.007	<20	0.52	0.003	0.03	<0.1	3.9	<0.02	49	0.4	0.06	1.8	0.13
UZ7253	CM18-16-GC-23	0.72	34.4	12.2	136	271	3.6	1.2	16	0.19	0.4	1.1	<0.2	1.3	153	2.09	0.26	0.24	15	0.07	0.034	5.1	4.5	0.06	1260	<0.001	<20	0.44	0.009	0.19	<0.1	3.4	<0.02	102	1.5	0.06	1.1	0.02
UZ7254	CM18-16-GC-24	1.63	36.3	14.6	185	352	31.3	9.1	221	2.49	6.0	1.7	0.7	5.3	30.3	2.48	0.36	0.24	32	0.64	0.090	6.2	9.1	0.40	733	0.001	<20	0.62	0.018	0.26	<0.1	5.6	0.04	125	1.8	0.07	1.7	0.06
UZ7255	CM18-16-GC-25	1.30	34.6	13.9	148	270	27.6	9.1	532	3.22	13.5	1.5	<0.2	5.9	36.1	1.64	0.33	0.22	35	1.96	0.117	6.4	9.9	0.89	349	0.001	<20	0.67	0.029	0.26	<0.1	6.7	0.05	100	1.1	0.03	1.8	0.07
UZ7256	CM18-16-GC-26	1.64	30.3	12.7	136	229	30.3	10.0	523	2.64	3.1	1.6	0.4	4.9	49.2	1.59	0.43	0.18	43	3.58	0.112	6.8	12.3	1.27	299	0.001	<20	0.55	0.033	0.22	<0.1	6.9	0.04	94	0.8	0.03	1.5	0.08
UZ7257	CM18-16-GC-27	1.89	30.7	13.9	139	263	28.6	9.3	934	4.86	2.7	1.8	<0.2	5.4	57.3	1.67	0.31	0.20	46	3.02	0.141	8.1	14.3	1.20	386	0.002	<20	0.76	0.022	0.27	<0.1	6.6	<0.02	113	1.5	0.05	1.9	0.06
UZ7258	CM18-16-GC-28	2.21	21.9	8.48	6.4	56	2.4	1.5	6	0.02	0.6	0.9	<0.2	2.2	468	0.08	0.47	0.16	8	0.26	0.197	9.6	1.6	<0.01	897	0.003	<20	0.39	0.005	0.03	<0.1	2.9	<0.02	44	0.7	0.08	1.1	0.03
UZ7259	CM18-16-GC-29	1.21	28.0	12.9	104	212	27.9	9.6	100	1.34	3.7	1.5	<0.2	4.4	28.3	1.34	0.20	0.17	22	1.35	0.086	5.9	7.8	0.49	270	0.001	<20	0.66	0.012	0.24	<0.1	4.4	<0.02	100	0.9	0.03	1.7	0.03
UZ7260	CM18-16-GC-30	0.92	26.4	13.4	115	200	25.6	9.5	888	4.73	7.3	1.5	<0.2	5.7	37.6	1.33	0.19	0.19	35	1.85	0.131	6.7	11.4	0.85	305	0.002	<20	0.77	0.015	0.28	<0.1	6.2	0.04	91	0.9	0.04	1.9	0.06
VD9734	CM18-16-GC-30 SPLIT DUP	0.93	26.3	13.8	117	235	26.0	8.8	889	4.66	7.2	1.5	<0.2	5.5	46.7	1.50	0.11	0.18	41	1.92	0.138	7.9	12.7	0.85	341	0.001	<20	0.95	0.015	0.34	<0.05	6.6	0.05	92	0.9	0.02	2.6	0.06
UZ7261	CM18-16-GC-31	1.82	41.8	12.9	187	449	25.8	4.6	16	0.24	5.6	2.0	<0.2	3.8	48.9	3.45	0.77	0.23	22	0.25	0.073	5.8	5.9	0.07	347	0.001	<20	0.43	0.011	0.21	<0.1	4.1	0.06	281	4.5	0.07	1.0	0.13
UZ7262	CM18-16-GC-32	2.59	26.6	10.8	176	449	35.9	7.4	528	2.51	1.7	2.2	<0.2	5.2	74.0	3.37	0.36	0.14	50	4.29	0.207	9.0	17.9	1.38	358	0.002	<20	0.80	0.019	0.31	<0.1	6.2	0.04	112	2.9	0.05	1.8	0.04
UZ7263	CM18-16-GC-33	1.87	5.56	1.96	11.8	34	3.5	1.7	38	0.08	0.6	0.3	<0.2	0.8	200	0.22	0.21	0.03	6	0.67	0.244	2.4	1.7	0.07	331	0.002	<20	0.18	0.004	0.03	<0.1	1.7	<0.02	15	0.5	0.03	0.4	0.05
VA9770	CM18-16-GC-33 SPLIT DUP	1.93	6.09	1.71	14.2	40	3.8	1.8	36	0.09	0.5	0.3	<0.2	0.8	199	0.22	0.32	0.03	6	0.65	0.257	2.5	1.8	0.07	341	0.002	<20	0.20	0.006	0.03	<0.1	1.6	<0.02	15	0.3	<0.02	0.4	0.05
UZ7264	CM18-16-GC-34	2.95	30.3	12.0	212	516	36.4	7.7	648	3.58	1.7	2.6	<0.2	5.7	71.3	4.05	0.35	0.17	58	2.30	0.211	9.6	21.0	0.94	414	0.002	<20	0.94	0.027	0.32	<0.1	7.3	0.03	129	4.0	0.05	2.2	0.07
UZ7265	CM18-16-GC-35	1.07	33.0	12.9	44.1	102	2.4	1.2	9	0.07	0.1	1.4	<0.2	3.3	687	0.40	0.19	0.28	17	0.11	0.146	11.5	3.5	0.03	1140	0.003	<20	0.62	0.009	0.07	<0.1	3.9	<0.02	79	2.3	0.11	1.5	0.04
UZ7266	CM18-16-GC-36	0.76	36.5	17.6	129	230	29.5	7.9	55	1.02	14.3	0.6	<0.2	1.3	16.4	1.37	0.17	0.27	19	0.14	0.009	1.8	6.0	0.17	256	<0.001	<20	0.68	0.016	0.26	<0.1	4.4	0.03	116	1.1	0.05	1.7	0.09
UZ7267	CM18-16-GC-37	2.75	17.6	5.92	58.8	49	5.9	1.9	177	3.18	0.1	0.5	<0.2	0.6	12.6	0.19	2.29	0.08	14	0.21	0.003	1.8	2.2	0.44	62.7	0.001	<20	0.10	0.005	0.02	<0.1	10.9	<0.02	41	0.7	0.03	2.5	0.04
UZ7268	CM18-16-GC-38	3.12	38.7	16.1	138	291	31.9	7.0	15	0.34	2.5	1.1	<0.2	2.5	14.8	1.95	0.40	0.25	19	0.11	0.017	2.5	5.3	0.10	207	<0.001	<20	0.52	0.017	0.19	<0.1	4.1	<0.02	141	3.0	0.06	1.4	0.11
UZ7269	CM18-16-GC-39	1.35	33.0	16.1	136	247	30.1	10.0	452	3.02	4.2	1.5	<0.2	5.5	34.6	1.41	0.27	0.21	24	1.02	0.093	6.1	8.5	0.53	356	0.001	<20	0.63	0.059	0.26	<0.1	4.6	<0.02	96	1.2	0.04	1.6	0.08
UZ7270	CM18-16-GC-40	0.75	16.5	9.03	79.3	165	18.7	7.3	235	1.46	2.8	1.3	<0.2	4.2	42.6	0.81	0.16	0.08	22	2.91	0.093	6.7	9.6	1.14	241	0.001	<20	0.44	0.035	0.16	<0.1	4.4	0.03	39	0.4	<0.02	1.1	0.04
VD9735	CM18-16-GC-40 SPLIT DUP	0.73	14.5	9.19	76.8	185	16.9	6.5	233	1.46	2.8	1.3	<0.2	4.3	46.9	0.84	0.12	0.08	25	3.04	0.096	7.2	8.8	1.16	258	<0.001	<20	0.50	0.034	0.18	<0.05	4.3	0.04	59	0.4	<0.02	1.3	0.04
UZ7271	CM18-16-GC-41	1.12	19.9	10.9	83.8	259	22.3	9.7	260	1.51	6.7	1.3	<0.2	3.9	42.1	0.94	0.24	0.11	24	1.85	0.105	5.8	9.6	0.71	221	0.001	<20	0.45	0.046	0.18	<0.1	4.7	0.07	55	0.5	0.03	1.2	0.07
UZ7272	CM18-16-GC-42	0.95	34.1	16.8	129	230	29.5	10.9	664	3.10	5.5	1.5	<0.2	6.2	91.2	1.33	0.19	0.23	37	3.79	0.102	6.8	11.4	1.01	438	0.001	<20	0.75	0.101	0.31	<0.1	8.2	0.06	72	1.0	0.05	1.8	0.11
UZ7273	CM18-16-GC-43	1.61	21.1	12.2	117	230	25.2	12.0	651	3.21	4.0	1.1	<0.2	5.1	63.0	1.04	0.17	0.15	27	2.32	0.098	6.4	8.7	0.62	398	0.001	<20	0.66	0.081	0.26	<0.1	5.2	0.05	59	0.7	0.04	1.6	0.16
UZ7274	CM18-27-GC-01	1.60	33.1	15.8	173	182	24.8	5.1	37	0.90	2.6	1.6	1.4	6.2	52.0	1.39	0.28	0.31	32	0.22	0.086	10.3	10.4	0.04	430	0.001	<20	0.80	0.006	0.30	<0.1	5.1	0.12	120	2.7	0.04	2.0	<0.02
UZ7275	CM18-27-GC-02	1.27	24.6	12.3	163	202	23.9	4.2	77	1.31	2.3	1.8	0.9	5.2	41.4	2.03	0.31	0.21	42	0.22	0.087	8.3	14.7	0.06	524	0.001	<20	0.88	0.006	0.33	<0.1	5.2	0.12	88	1.6	0.04	2.3	<0.02
UZ7276	CM18-27-GC-03	1.00	28.7	10.5	86.3	212	8.6	1.3	32	0.52	2.4	1.4	<0.2	2.7	26.0	0.61	0.34	0.22	26	0.16	0.050	6.1	9.4	0.04	410	<0.001	<20	0.73	0.005	0.29	<0.1	3.2	0.07	111	1.4	0.06	1.8	<0.02
UZ7277	CM18-27-GC-04	0.72	23.9	11.0	83.0	122	15.9	2.4	38	0.42	4.9	1.3	0.6	5.2	29.3	0.57	0.29	0.17	29	0.24	0.084	8.0	10.2	0.04	415	0.001	<20	0.75	0.004	0.28	<0.1	2.9	0.10	79	0.4	0.03	1.9	<0.02
UZ7278	CM18-27-GC-05	1.03	24.1	9.30	109	113	20.5	3.7	79	0.94	3.0	1.7	0.4	5.4	43.0	0.94	0.24	0.16	35	0.30	0.130	10.1	13.4	0.04	201	0.001	<20	0.72	0.003	0.26	<0.1	3.9	0.08	92	0.4	0.05	2.1	<0.02
UZ7279	CM18-27-GC-06	1.07	31.2	12.9	117	222	17.6	3.9	649	5.50	2.6	1.7	<0.2	5.3	108	1.06	0.33	0.25	36	0.37	0.144	11.3	12.5	0.15	441	0.002	<20	0.81	0.005	0.30	<0.1	4.9	0.07	115	1.3	0.04	2.0	<0.02
UZ7280	CM18-27-GC-07	1.33	34.4	14.2	106	301	21.0	4.9	30	0.50	3.9	1.9	0.5	6.4	86.5	1.34	0.38	0.25	36	0.27	0.110	11.9	10.6	0.04	377	0.001	<20	0.84	0.004	0.31	<0.1	5.3	0.15	175	1.4	0.05	2.3	0.04
VD9736	CM18-27-GC-07 SPLIT DUP	1.37	30.3	14.6	110	338	20.6	4.8	30	0.48	4.3	2.0	<0.2	6.9	115	1.42	0.25	0.24	39	0.27	0.141	14.6	11.1	0.05	443	0.001	<20	0.95	0.006	0.34	<0.05	6.0	0.17	211	1.5	0.07	3.0	0.03
UZ7281	CM18-27-GC-08	1.54	45.3	16.2	150	341	32.5	8.0	217	1.79	6.9	2.1	<0.2	7.4	97.8	2.64	0.40	0.33	52	0.31	0.143	13.5	15.9	0.08	471	0.002	<20	0.99	0.004	0.34	<0.1	6.8	0.10	161	1.7	0.06	2.6	0.02
UZ7282	CM18-27-GC-09	1.53	33.6	12.0	117	288	17.2	4.3	55	0.59	5.9	1.5	<0.2	4.3	25.0	1.82	0.20	0.19	29	0.17	0.056	7.2	10.0	0.07	215	<0.001	<20	0.75	0.004	0.26	<0.1	4.0	0.07	138	1.5	0.04	2.0	<0.02
UZ7283	CM18-27-GC-10	1.26	39.6	14.7	218	417	27.1	7.5	263	0.99	4.7	1.9	<0.2	5.7	30.7	3.01	0.21	0.27	38	0.55	0.114	8.2	13.5	0.23	287	0.001	<20	0.97	0.007	0.35	<0.1	5.4	0.07	139	1.9	0.06	2.4	0.05
UZ7284	CM18-27-GC-11	1.32	26.8	13.8	127	247	27.3	8.9	177	1.24	11.4	1.0	<0.2	3.9	16.5	1.11	0.26	0.17	22	0.58	0.060	5.1	8.8	0.28	232	<0.001	<20	0.66	0.003	0.26	<0.1	4.3	0.05	117	0.7	0.02	1.6	0.07
UZ7285	CM18-27-GC-12	1.21	35.0	16.5	163	259	30.9	10.1	257	1.45	1.8	1.6	<0.2	5.8	21.5	1.47	0.15	0.24	30	1.03	0.090	6.6	11.0	0.42	240	0.001	<20	0.80	0.006	0.31	<0.1	5.3	0.05	110	1.0	0.04	2.1	0.05
UZ7286	CM18-27-GC-13	1.10	26.1	13.0	119	217	22.3	7.3	605	3.91	1.9	1.6	<0.2	5.3	32.4	1.35	0.19	0.17	43	2.32	0.112	7.9	13.4	1.14	229	0.001	<20	0.72	0.005	0.28	<0.1	6.7	0.05	95	0.8	0.03	1.9	0.04
UZ7287	CM18-27-GC-14	0.74	30.1	14.7	126	216	15.8	5.8	679	3.61	2.0	1.6	<0.2	5.9	35.5	1.34	0.11	0.19	43	1.74	0.129	8.3	13.7	0.93	220	0.002	<20	0.86	0.006	0.32	<0.1	6.6	0.07	65	0.7	0.03	2.1	0.02
UZ7288	CM18-27-GC-15	0.70	36.2	13.4	115	251	32.3	8.3	755	3.16	7.9	1.7	<0.2	6.1	37.4	1.38	0.28	0.25	49	1.60	0.128	8.0	15.9	0.87	324	0.002	<20	0.89	0.008	0.34	<0.1	9.2	0.05	122	1.1	0.05	2.4	0.05
UZ7289	CM18-27-GC-16	0.76	11.9	4.34	21.7	42	2.9	1.1	741	6.86	1.2	0.4	<0.2	0.9	1030	0.12	0.12	0.09	10	0.73	0.299	6.6	3.4	0.29	1960	0.005	<20	0.56	0.008	0.09	0.1	3.4	<0.02	71	<0.1	0.04	1.4	0.15
UZ7290	CM18-27-GC-17	0.33	29.9	11.3	77.6	231	6.0	1.2	28	0.28	3.8	0.6	<0.2	1.0	7.1	1.03	0.18	0.21	14	0.08	0.002	1.7	5.1	0.06	190	<0.001	<20	0.45	0.004	0.22	<0.1	2.7	<0.02	97	0.8	0.04	1.0	0.06
VD9737	CM18-27-GC-17 SPLIT DUP	0.38	31.0	13.0	90.7	279	6.7	1.4	35	0.35	4.7	0.7	<0.2	1.3	9.1	1.18	0.14	0.22	17	0.08	0.002	2.3	5.9	0.06	226	<0.001	<20	0.50	0.005	0.22	<0.05	3.4	0.03	116	1.1	0.03	1.4	0.05
UZ7291	CM18-27-GC-18	1.03	30.0	12.4	169	303	23.4	6.2	103	1.26	4.0	1.3	1.1	4.1	21.6	2.14	0.17	0.16	28	0.34	0.073	7.0	11.0	0.17	184	0.001	<20	0.75	0.005	0.27	<0.1	3.3	0.07	100	1.2	0.03	2.1	0.04
UZ7292	CM18-27-GC-19	1.11	21.3	9.78	115	240	22.8	7.2	409	3.27	2.0	1.5	0.4	4.5	44.9	1.53	0.19	0.11	39	3.44	0.109	8.0	14.2	1.43	218	0.001	<20	0.72	0.007	0.27	<0.1	5.1	0.05	80	1.0	0.03	1.6	0.03
UZ7293	CM18-27-GC-20	1.61	34.8	14.1	159	331	41.3	10.8	421	2.54	6.9	1.6	0.4	5.3	35.3	2.14	0.24	0.20	46	1.63	0.103	8.0	14.7	0.77	215	0.001	<20	0.84	0.008	0.31	<0.1	7.4	0.08	108	1.4	0.05	2.2	0.06
UZ7294	CM18-27-GC-21	1.35	31.2	12.2	139	240	28.5	8.5	244	1.17	1.3	1.6	<0.2	5.2	39.9	1.81	0.18	0.19	35	1.78	0.101	7.0	10.6	0.73	210	0.001	<20	0.81	0.008	0.31	<0.1	5.0	0.04	99	1.3	0.04	1.9	0.04
UZ7295	CM18-27-GC-22	1.39	33.9	13.0	133	232	29.8	9.9	437	2.01	5.4	1.5	<0.2	5.4	58.5	1.60	0.28	0.21	41	3.96	0.112	6.7	13.9	1.41	226	0.001	<20	0.82	0.009	0.31	<0.1	6.4	0.05	93	1.0	0.03	2.1	0.06
UZ7296	CM18-27-GC-23	1.90	37.4	14.7	140	254	29.6	9.5	591	2.73	2.2	1.7	<0.2	5.7	55.8	1.68	0.29	0.24	46	3.48	0.109	8.1	14.4	1.22	236	0.002	<20	0.80	0.012	0.30	<0.1	7.0	0.04	100	1.3	0.05	2.1	0.06
UZ7297	CM18-27-GC-24	2.74	46.1	15.3	175	382	29.9	8.6	724	2.11	3.1	2.6	<0.2	5.3	62.9	2.38	0.54	0.31	28	0.47	0.135	10.1	7.7	0.18	344	0.002	<20	0.76	0.007	0.22	<0.1	5.5	<0.02	164	4.2	0.09	1.9	0.08
UZ7298	CM18-27-GC-25	2.88	24.6	13.0	5.1	47	4.3	1.8	6	0.03	<0.1	3.5	<0.2	2.6	1950	0.05	2.44	0.20	19	0.33	0.446	23.0	3.8	<0.01	3130	0.012	<20	0.78	0.003	0.03	<0.1	6.2	<0.02	75	1.3	0.14	4.0	0.05
UZ7299	CM18-27-GC-26	2.27	41.5	13.7	238	504	36.6	7.8	37	0.50	8.2	2.7	<0.2	5.2	51.3	4.27	0.32	0.23	36	0.40	0.124	8.7	13.0	0.10	358	0.001	<20	0.95	0.010	0.35	<0.1	4.7	0.02	169	4.2	0.05	2.1	0.09
VA9772	CM18-27-GC-26 SPLIT DUP	2.51	41.3	14.6	245	521	39.5	8.2	38	0.49	9.3	2.7	<0.2	5.1	53.7	4.53	0.41	0.24	37	0.39	0.128	8.9	13.7	0.10	365	0.001	<20	0.95	0.010	0.35	<0.1	4.8	0.03	170	4.4	0.05	2.3	0.09
UZ7300	CM18-27-GC-27	2.65	5.87	2.63	10.6	41	3.1	1.0	37	0.12	<0.1	0.6	<0.2	0.4	150	0.17	1.26	0.04	4	0.06	0.033	7.7	1.3	0.02	236	0.001	<20	0.11	0.004	0.03	<0.1	1.8	<0.02	33	0.9	0.06	0.7	0.10
VD9738	CM18-27-GC-27 SPLIT DUP	2.24	4.69	2.33	7.9	29	1.6	0.7	27	0.09	0.2	0.5	<0.2	0.4	137	0.15	1.05	0.03	4	0.05	0.030	7.2	0.6	0.01	216	<0.001	<20	0.10	0.002	0.02	<0.05	1.7	<0.02	25	0.5	0.03	0.6	0.09
UZ7301	CM18-27-GC-28	3.45	26.4	10.6	168	494	40.5	6.7	384	2.00	1.4	2.5	<0.2	5.0	68.3	3.88	0.27	0.14	49	2.87	0.191	9.5	20.0	1.09	288	0.002	<20	0.87	0.015	0.33	<0.1	5.9	0.04	119	3.5	0.03	2.0	0.05
UZ7302	CM18-27-GC-29	1.06	33.4	16.5	163	239	28.4	10.6	503	3.62	1.7	1.4	<0.2	4.9	36.4	1.51	0.15	0.27	38	1.46	0.106	6.8	11.8	0.80	297	0.001	<20	0.95	0.014	0.32	<0.1	6.5	0.03	97	1.4	0.03	2.3	0.05
UZ7303	CM18-27-GC-30	0.71	42.1	18.6	181	269	32.2	8.0	832	7.24	17.6	1.7	<0.2	6.0	37.2	1.81	0.38	0.28	48	1.24	0.232	8.0	15.6	0.84	372	0.003	<20	1.24	0.018	0.41	<0.1	6.8	0.10	112	1.4	0.06	3.3	0.20
UZ7304	CM18-27-GC-31	0.55	34.6	16.6	196	257	22.7	7.9	36	0.53	9.0	1.1	<0.2	4.4	23.6	1.47	0.28	0.26	26	0.30	0.071	4.7	8.6	0.13	274	<0.001	<20	0.93	0.013	0.33	<0.1	3.9	0.05	86	0.9	0.05	2.3	0.10
UZ7305	CM18-27-GC-32	1.45	38.8	17.9	184	251	34.9	11.2	83	0.96	2.1	1.1	<0.2	3.3	28.8	1.52	0.20	0.29	27	0.30	0.065	3.8	8.2	0.16	305	<0.001	<20	0.83	0.014	0.32	<0.1	4.8	0.02	73	2.0	0.04	2.2	0.06
UZ7306	CM18-27-GC-33	1.04	41.0	17.3	106	184	6.8	3.2	30	0.35	<0.1	0.8	<0.2	0.9	32.8	1.23	0.12	0.32	16	0.31	0.012	1.2	4.6	0.16	296	<0.001	<20	0.59	0.020	0.24	<0.1	4.1	<0.02	56	1.7	0.05	1.2	0.03
UZ7307	CM18-27-GC-34	0.95	35.5	16.7	124	240	10.8	5.0	80	1.66	1.4	1.2	1.5	3.9	52.3	1.24	0.15	0.26	25	0.27	0.068	4.9	8.9	0.21	275	0.001	<20	0.81	0.058	0.30	<0.1	4.5	0.03	31	0.8	0.04	2.1	<0.02
UZ7308	CM18-27-GC-35	1.57	26.6	12.3	109	184	28.5	9.7	357	2.50	1.6	1.3	0.9	4.9	75.4	1.07	0.23	0.18	33	2.28	0.094	6.7	12.2	0.95	224	0.001	<20	0.75	0.077	0.26	<0.1	5.7	0.04	52	0.6	0.03	1.9	0.04
UZ7309	CM18-27-GC-36	1.25	23.1	12.4	112	212	25.3	10.6	554	3.11	5.7	1.1	<0.2	4.3	90.1	1.09	0.24	0.17	28	2.79	0.086	5.1	10.2	0.90	327	0.001	<20	0.69	0.106	0.28	<0.1	5.5	0.04	63	0.7	0.03	1.6	0.13
UZ7310	CM18-27-GC-37	0.84	11.6	9.24	109	293	23.9	7.7	85	0.94	9.0	1.3	0.4	3.7	49.8	0.44	0.15	0.07	21	0.33	0.124	7.0	12.2	0.05	342	0.002	<20	0.61	0.062	0.24	<0.1	2.9	0.04	103	0.5	<0.02	1.7	0.20
VD9739	CM18-27-GC-37 SPLIT DUP	0.86	10.4	8.75	101	312	21.4	6.7	77	0.87	8.9	1.3	<0.2	3.8	49.0	0.47	0.10	0.07	21	0.32	0.123	6.6	10.4	0.05	339	<0.001	<20	0.58	0.056	0.22	<0.05	3.0	0.04	104	0.7	<0.02	1.5	0.19
UZ7311	CM18-27-GC-38	1.05	17.0	10.4	108	253	24.0	7.5	232	3.44	7.6	1.2	1.0	3.3	58.9	0.79	0.22	0.13	25	0.94	0.114	6.7	13.9	0.52	300	0.001	<20	0.64	0.075	0.25	<0.1	4.7	0.02	112	0.8	0.02	1.5	0.29
UZ7312	CM18-27-GC-39	0.99	15.5	10.2	106	252	21.6	8.0	456	2.73	3.8	1.3	0.2	3.8	72.3	0.99	0.23	0.12	28	1.36	0.121	6.4	11.7	0.61	467	0.001	<20	0.69	0.086	0.27	<0.1	5.1	0.06	66	0.9	0.02	1.7	0.23
UZ7313	CM18-27-GC-40	0.68	5.45	5.85	55.5	221	13.6	6.0	233	2.92	3.1	1.1	0.3	2.6	56.1	0.18	0.12	0.03	19	0.74	0.136	6.9	12.9	0.40	327	0.001	<20	0.51	0.056	0.19	<0.1	4.2	0.08	72	0.2	<0.02	1.5	0.41
UZ7314	CM18-27-GC-41	0.95	14.7	14.4	116	330	24.1	10.1	648	5.52	8.3	1.3	1.2	3.4	55.5	0.53	0.25	0.12	25	0.89	0.104	6.9	12.6	0.62	325	0.001	<20	0.64	0.083	0.22	<0.1	5.5	0.06	152	1.0	<0.02	2.0	0.99
UZ7315	CM18-27-GC-42	0.48	21.6	11.8	73.8	126	7.8	5.4	72	0.49	0.6	0.7	0.3	2.6	25.9	0.41	0.17	0.21	4	0.05	0.008	5.5	2.5	0.03	374	<0.001	<20	0.31	0.056	0.11	<0.1	2.9	<0.02	52	0.7	0.05	0.9	0.23
UZ7316	CM18-27-GC-43	0.61	4.57	1.41	14.7	41	5.3	1.5	107	0.98	0.7	0.2	0.3	0.4	33.2	0.04	0.04	0.02	5	0.02	0.003	0.9	10.1	0.01	1730	<0.001	<20	0.18	0.030	0.10	<0.1	0.8	<0.02	14	<0.1	<0.02	0.5	0.11
UZ7317	CM18-27-GC-44	1.13	6.70	7.12	48.3	283	21.2	6.0	128	1.24	5.6	0.9	<0.2	1.6	41.8	0.29	0.24	0.02	15	0.32	0.108	3.7	13.5	0.05	377	0.001	<20	0.31	0.031	0.14	<0.1	2.9	0.04	74	0.2	<0.02	1.0	0.27
UZ7318	CM18-10-GC-01	0.84	20.5	14.9	109	282	28.7	11.0	201	2.46	6.9	0.6	0.8	4.4	61.1	0.24	0.06	0.19	24	2.06	0.104	5.4	8.9	0.73	189	<0.001	<20	0.85	0.013	0.38	<0.1	6.0	<0.02	165	1.3	0.06	2.2	0.79
UZ7319	CM18-10-GC-02	1.44	26.2	13.4	122	240	18.9	8.0	440	2.14	2.9	1.3	<0.2	4.4	57.1	1.40	0.17	0.16	32	3.08	0.125	5.0	10.2	0.99	211	<0.001	<20	0.78	0.009	0.30	<0.1	5.5	<0.02	61	1.1	0.03	1.9	0.09
UZ7320	CM18-10-GC-03	1.67	25.6	13.5	130	254	26.3	9.7	505	2.16	2.5	1.4	0.7	4.9	66.6	1.57	0.19	0.15	36	3.55	0.131	5.7	10.7	1.05	406	<0.001	<20	0.71	0.010	0.27	<0.1	6.1	0.04	59	1.0	0.04	1.8	0.06
VD9740	CM18-10-GC-03 SPLIT DUP	1.80	27.7	14.2	132	265	25.2	8.4	488	2.13	2.3	1.6	<0.2	5.6	78.8	1.58	0.22	0.16	34	3.55	0.123	6.1	10.2	1.03	446	<0.001	<20	0.65	0.015	0.26	<0.05	6.1	0.05	64	1.1	0.03	1.8	0.06
UZ7321	CM18-10-GC-04	1.63	25.4	13.6	123	249	29.1	10.4	619	3.12	4.0	1.5	0.3	4.6	75.6	1.46	0.14	0.17	43	4.49	0.140	5.8	12.4	1.35	304	<0.001	<20	0.77	0.010	0.29	<0.1	7.2	0.04	78	1.3	0.05	1.7	0.05
UZ7322	CM18-10-GC-05	0.99	32.3	15.2	156	252	33.2	11.1	578	3.28	8.0	1.4	<0.2	5.5	61.1	1.48	0.19	0.22	45	2.09	0.125	5.9	12.6	0.80	285	<0.001	<20	0.90	0.010	0.35	<0.1	7.2	0.05	126	1.3	0.05	2.3	0.07
UZ7323	CM18-10-GC-06	1.94	42.6	21.3	178	433	38.2	11.1	55	0.45	1.9	1.9	<0.2	5.5	52.9	2.33	0.37	0.36	29	0.85	0.127	5.7	9.8	0.26	349	<0.001	34	0.83	0.008	0.33	<0.1	7.1	<0.02	220	3.2	0.09	2.1	0.07
UZ7324	CM18-10-GC-29	1.78	8.45	8.65	71.1	401	25.3	5.8	62	1.02	46.9	0.3	0.2	0.5	21.4	0.51	0.14	0.04	12	0.03	0.003	1.0	5.3	0.03	203	<0.001	<20	0.28	0.041	0.14	<0.1	1.3	0.08	285	1.5	<0.02	0.9	0.66
UZ7325	CM18-10-GC-30	0.74	9.51	7.82	98.4	284	21.5	7.5	95	1.57	8.5	1.0	<0.2	3.1	36.0	0.39	0.08	0.05	20	0.32	0.093	5.3	9.1	0.16	281	<0.001	40	0.48	0.053	0.21	<0.1	3.6	0.06	124	0.3	<0.02	1.1	0.29
VA9767	CM18-10-GC-30 SPLIT DUP	0.75	9.32	7.65	93.2	276	21.3	7.4	89	1.65	8.5	0.9	<0.2	2.9	36.5	0.41	0.09	0.05	20	0.32	0.084	5.2	8.6	0.15	290	<0.001	43	0.46	0.053	0.20	<0.1	3.6	0.06	120	0.2	<0.02	1.0	0.29
UZ7326	CM18-10-GC-31	1.40	28.8	15.0	145	366	29.1	11.1	87	1.17	5.1	1.2	<0.2	4.4	58.7	1.86	0.18	0.18	27	0.44	0.114	6.2	10.3	0.14	482	<0.001	<20	0.82	0.088	0.36	<0.1	4.4	0.05	70	1.9	0.05	2.1	0.22
UZ7327	CM18-10-GC-32	0.80	5.90	6.62	47.2	342	15.8	4.8	78	1.25	6.4	1.0	<0.2	2.1	48.8	0.31	0.19	0.02	17	0.57	0.129	4.9	10.3	0.16	225	<0.001	<20	0.37	0.034	0.14	<0.1	3.8	0.13	159	0.3	<0.02	1.2	0.36
UZ7328	CM18-10-GC-33	0.78	4.92	6.00	41.3	293	15.2	6.1	186	2.54	5.7	0.9	<0.2	1.9	50.4	0.18	0.14	<0.02	19	0.76	0.116	5.0	12.9	0.28	206	<0.001	<20	0.32	0.031	0.12	<0.1	7.5	0.12	245	0.2	<0.02	0.9	0.71
UZ7329	CM18-10-GC-34	0.83	6.29	7.26	48.7	333	15.9	5.8	105	1.34	6.1	0.8	<0.2	1.3	61.4	0.29	0.19	0.02	20	1.09	0.099	4.2	11.2	0.32	165	<0.001	<20	0.26	0.026	0.11	<0.1	3.8	0.05	75	0.2	<0.02	0.8	0.22
UZ7330	CM18-10-GC-35	1.07	7.52	8.95	51.3	418	19.2	6.1	122	1.71	7.9	0.9	<0.2	1.7	58.3	0.35	0.26	0.03	21	1.20	0.092	3.8	8.8	0.34	289	<0.001	<20	0.26	0.030	0.11	<0.1	3.0	0.10	245	0.3	<0.02	0.8	1.01
VD9741	CM18-10-GC-35 SPLIT DUP	1.10	7.71	9.02	52.1	425	18.6	5.3	149	1.63	7.7	0.9	0.2	1.9	68.8	0.31	0.23	0.03	21	1.09	0.088	4.0	8.9	0.32	278	<0.001	<20	0.26	0.031	0.11	<0.05	2.9	0.09	222	0.4	0.02	0.9	0.93
UZ7331	CM18-05-GC2-01	0.67	9.57	7.38	67.6	328	16.6	5.8	62	0.62	8.2	1.1	0.3	2.4	20.0	1.14	0.32	0.03	20	0.24	0.130	5.6	10.5	0.02	157	<0.001	<20	0.32	0.002	0.11	<0.1	2.3	0.14	82	0.6	<0.02	1.2	0.05
UZ7332	CM18-05-GC2-02	0.83	8.79	5.92	66.2	347	15.2	5.9	75	0.81	10.5	1.0	<0.2	2.0	17.8	1.31	0.30	0.03	21	0.51	0.118	4.8	8.9	0.13	121	<0.001	<20	0.28	0.001	0.11	<0.1	2.7	0.12	93	0.8	<0.02	0.9	0.08
UZ7333	CM18-05-GC2-03	1.31	21.7	10.8	135	402	35.3	10.5	109	0.96	5.3	1.4	<0.2	4.1	18.8	2.29	0.25	0.12	27	0.54	0.120	7.1	10.3	0.17	136	<0.001	<20	0.52	0.004	0.20	<0.1	3.5	0.11	81	1.4	0.03	1.5	0.08
UZ7334	CM18-05-GC2-04	0.67	9.61	7.13	78.9	312	17.8	5.5	81	0.73	6.7	1.1	<0.2	2.5	19.6	1.44	0.24	0.03	25	0.32	0.139	5.7	10.3	0.05	164	<0.001	<20	0.34	0.003	0.13	<0.1	3.6	0.08	68	0.6	<0.02	1.1	0.03
UZ7335	CM18-05-GC2-05	1.08	12.6	8.04	91.7	362	22.0	7.9	223	1.43	8.2	1.2	<0.2	2.7	20.5	1.61	0.39	0.06	25	0.64	0.143	6.1	9.6	0.23	147	<0.001	<20	0.37	0.004	0.14	<0.1	4.3	0.08	104	1.1	0.02	1.2	0.06
UZ7336	CM18-05-GC2-06	1.14	27.5	12.5	129	273	27.0	9.8	678	3.81	5.1	1.2	<0.2	5.2	24.7	1.55	0.19	0.18	37	1.74	0.104	6.3	10.3	0.86	200	<0.001	<20	0.57	0.004	0.25	<0.1	7.2	0.05	78	1.0	0.04	1.6	0.07
UZ7337	CM18-05-GC2-07	1.35	27.0	12.4	142	308	28.6	8.0	441	2.57	2.9	1.4	<0.2	4.9	27.7	1.90	0.21	0.15	37	1.63	0.112	7.8	10.8	0.75	211	<0.001	<20	0.57	0.004	0.24	<0.1	5.9	0.06	76	1.7	0.04	1.6	0.03
UZ7338	CM18-05-GC2-08	1.60	22.9	10.4	124	263	29.7	9.1	573	3.07	2.3	1.3	<0.2	4.6	30.0	1.53	0.26	0.12	40	2.38	0.114	7.7	11.2	1.02	187	<0.001	<20	0.52	0.005	0.22	<0.1	6.0	0.06	107	1.1	0.04	1.4	0.06
UZ7339	CM18-05-GC2-09	1.27	29.7	12.4	145	334	34.6	9.3	594	3.63	4.9	1.4	<0.2	5.1	28.3	1.84	0.32	0.16	45	1.51	0.120	7.3	11.9	0.80	240	<0.001	<20	0.62	0.005	0.27	<0.1	6.6	0.06	109	1.3	0.04	1.6	0.08
UZ7340	CM18-05-GC2-10	1.20	25.7	12.7	125	314	28.6	8.0	406	2.76	5.1	1.6	<0.2	5.4	56.9	1.85	0.21	0.16	41	2.27	0.178	10.6	12.9	0.98	328	<0.001	<20	0.68	0.004	0.29	<0.1	6.2	0.07	90	1.3	0.06	1.8	0.06
VD9742	CM18-05-GC2-10 SPLIT DUP	1.29	30.0	13.9	141	360	30.4	7.7	445	2.90	5.6	1.9	<0.2	6.2	81.3	1.83	0.17	0.19	45	2.56	0.162	12.4	13.8	1.02	364	0.001	<20	0.76	0.006	0.31	<0.05	6.1	0.06	96	1.7	0.05	2.1	0.05
UZ7341	CM18-05-GC2-11	1.43	28.0	14.0	161	300	29.6	9.0	392	1.82	3.2	1.5	<0.2	4.9	35.0	1.76	0.26	0.18	37	1.97	0.120	7.9	10.8	0.83	235	<0.001	<20	0.72	0.006	0.31	<0.1	6.4	0.04	126	1.3	0.03	1.9	0.06
UZ7342	CM18-05-GC2-12	2.19	40.5	20.3	195	392	43.0	11.8	362	1.62	1.9	2.0	<0.2	6.9	22.2	2.45	0.28	0.32	41	0.42	0.131	7.6	11.0	0.17	290	<0.001	<20	0.83	0.007	0.38	<0.1	6.5	0.05	185	2.2	0.07	2.5	0.07
UZ7343	CM18-05-GC2-13	2.06	55.4	3.79	12.0	62	2.0	1.4	19	0.12	0.5	0.3	<0.2	0.8	97.5	0.17	0.20	0.08	21	0.86	0.382	3.1	3.0	0.03	169	0.002	39	0.48	0.006	0.10	<0.1	3.7	<0.02	40	0.4	0.04	1.1	0.06
UZ7344	CM18-05-GC2-14	1.06	46.9	12.5	62.8	422	5.7	1.3	15	0.22	0.2	1.0	1.1	2.4	12.5	1.86	0.19	0.30	23	0.11	0.010	4.2	6.3	0.09	237	<0.001	<20	0.56	0.008	0.26	<0.1	4.4	0.03	152	2.2	0.07	1.5	0.02
UZ7345	CM18-05-GC2-15	1.76	32.0	13.8	161	384	34.6	8.7	353	2.90	2.4	1.8	0.6	5.6	35.2	2.49	0.32	0.23	42	1.46	0.110	7.9	13.1	0.67	317	<0.001	<20	0.88	0.007	0.34	<0.1	6.4	0.03	136	2.5	0.06	2.2	0.06
UZ7346	CM18-05-GC2-16	1.28	29.9	12.5	151	348	34.0	9.1	452	2.73	3.3	1.8	<0.2	5.4	130	2.47	0.27	0.19	49	2.86	0.146	12.2	14.9	0.92	414	<0.001	<20	0.82	0.008	0.31	<0.1	8.0	0.04	116	1.8	0.04	2.1	0.07
UZ7347	CM18-05-GC2-17	1.69	31.8	14.9	162	329	35.7	10.1	652	4.20	3.8	1.8	<0.2	5.7	68.0	2.13	0.22	0.25	52	2.15	0.163	9.1	16.1	1.05	324	0.001	<20	0.99	0.008	0.37	<0.1	8.7	0.03	153	2.0	0.06	2.4	0.07
UZ7348	CM18-05-GC2-18	3.11	36.0	22.6	182	362	58.5	12.9	106	0.48	6.3	1.9	<0.2	6.4	27.1	2.50	0.42	0.33	24	1.37	0.128	6.6	8.0	0.50	285	<0.001	<20	0.70	0.006	0.29	<0.1	6.4	0.02	247	3.8	0.06	1.7	0.13
UZ7349	CM18-05-GC2-19	2.78	22.3	11.0	58.5	111	10.8	4.3	4	0.08	2.1	1.4	<0.2	3.1	703	0.68	0.42	0.16	18	0.64	0.363	13.3	5.5	0.03	1140	0.003	<20	0.82	0.004	0.15	<0.1	5.1	<0.02	90	1.6	0.08	1.9	0.12
UZ7350	CM18-05-GC2-20	1.01	33.8	17.1	191	337	6.9	2.9	35	0.66	3.2	1.0	<0.2	1.4	22.9	2.19	0.14	0.30	24	0.19	0.038	3.6	7.8	0.15	237	<0.001	<20	0.76	0.006	0.31	<0.1	5.8	0.02	201	2.0	0.06	2.2	0.03

VD9743	CM18-05-GC2-20 SPLIT DUP	0.97	38.2	18.8	195	348	6.4	2.9	35	0.65	2.8	1.2	<0.2	1.8	29.1	2.27	0.12	0.33	25	0.18	0.038	4.2	7.1	0.17	247	<0.001	<20	0.77	0.008	0.30	<0.05	5.6	0.03	227	1.7	0.05	2.0	0.03
UZ7351	CM18-05-GC2-21	0.65	35.6	15.6	136	287	22.4	6.6	18	0.41	2.9	0.8	<0.2	1.9	13.8	1.68	0.15	0.29	23	0.12	0.010	3.2	6.7	0.11	241	<0.001	37	0.74	0.008	0.31	<0.1	4.3	0.03	123	1.5	0.05	1.9	0.05
UZ7352	CM18-05-GC2-22	1.50	7.19	4.88	10.3	42	8.1	3.3	1	0.02	0.4	0.8	<0.2	0.9	304	0.10	1.04	0.05	15	0.03	0.065	16.0	2.2	<0.01	431	0.003	<20	0.14	0.002	0.02	<0.1	3.6	<0.02	41	0.7	0.04	1.5	0.08
UZ7353	CM18-05-GC2-23	1.03	26.7	15.0	129	232	29.1	9.9	146	1.64	21.1	1.3	<0.2	5.2	25.9	1.42	0.18	0.21	29	1.10	0.092	6.7	9.2	0.49	236	<0.001	<20	0.78	0.007	0.31	<0.1	5.7	0.08	135	1.4	0.05	2.2	0.14
UZ7354	CM18-05-GC2-24	0.69	20.8	10.4	95.0	182	18.8	7.3	322	1.96	2.1	1.1	<0.2	4.5	28.8	1.08	0.12	0.13	28	2.16	0.098	6.2	8.2	0.87	181	<0.001	34	0.55	0.007	0.22	<0.1	4.7	0.04	70	0.6	<0.02	1.4	0.03
UZ7355	CM18-05-GC2-25	1.01	23.0	12.1	108	209	27.2	9.4	365	1.71	2.6	1.2	0.2	4.8	30.5	1.27	0.20	0.16	29	2.41	0.103	6.9	9.4	0.92	244	<0.001	<20	0.63	0.005	0.26	<0.1	5.4	0.06	78	0.6	0.03	1.7	0.04
UZ7356	CM18-05-GC2-26	1.76	37.5	14.6	169	411	33.1	8.9	47	0.42	2.8	1.8	<0.2	5.3	29.2	2.59	0.26	0.25	26	0.74	0.136	7.1	8.6	0.26	360	<0.001	53	0.76	0.009	0.31	<0.1	5.5	0.03	133	2.7	0.08	1.8	0.04
UZ7357	CM18-05-GC2-27	1.16	19.8	9.40	12.8	130	2.8	1.2	110	1.28	0.6	0.7	<0.2	1.0	55.5	0.20	0.15	0.24	14	0.38	0.100	4.4	3.8	0.14	253	<0.001	<20	0.58	0.006	0.14	<0.1	3.1	<0.02	44	1.2	0.06	1.4	0.02
UZ7358	CM18-05-GC2-28	0.75	40.3	8.01	71.3	201	12.4	5.5	9	0.24	1.8	0.3	<0.2	1.0	5.5	1.42	0.09	0.25	18	0.07	0.001	1.3	3.7	0.06	237	<0.001	47	0.59	0.004	0.15	<0.1	4.8	<0.02	105	1.3	0.07	1.2	0.04
UZ7359	CM18-05-GC2-29	1.78	42.1	17.4	134	264	30.0	10.2	27	0.70	3.0	0.9	<0.2	3.1	14.5	1.21	0.19	0.29	26	0.17	0.030	4.1	7.9	0.14	307	<0.001	36	0.88	0.008	0.32	<0.1	5.1	0.04	152	1.2	0.05	2.1	0.08
VA9766	CM18-05-GC2-29 SPLIT DUP	1.85	39.8	16.5	133	256	27.6	9.9	26	0.71	2.5	0.9	<0.2	3.0	13.7	1.28	0.16	0.29	25	0.17	0.030	3.7	7.3	0.14	299	<0.001	38	0.84	0.008	0.31	<0.1	5.1	0.03	141	1.3	0.03	2.0	0.07
UZ7360	CM18-05-GC2-30	1.21	46.3	19.7	141	266	29.1	8.5	287	1.43	3.1	1.0	<0.2	1.8	11.6	1.48	0.13	0.35	28	0.19	0.009	2.5	7.4	0.17	267	<0.001	33	0.88	0.007	0.32	<0.1	6.1	0.03	111	1.8	0.05	2.0	0.09
VD9744	CM18-05-GC2-30 SPLIT DUP	1.17	46.3	21.9	156	274	27.9	8.3	309	1.34	3.6	1.2	<0.2	2.0	14.7	1.58	0.12	0.41	29	0.17	0.010	2.9	6.7	0.18	292	<0.001	<20	0.85	0.010	0.31	<0.05	6.3	0.03	114	2.0	0.07	2.2	0.09
UZ7361	CM18-05-GC2-31	2.86	51.6	23.8	137	229	13.7	5.5	6	0.37	2.2	1.4	<0.2	1.5	4.6	1.95	0.58	0.36	25	0.06	0.001	1.1	4.2	0.05	199	0.001	39	0.42	0.002	0.13	<0.1	7.2	<0.02	281	2.7	0.10	0.9	0.37
UZ7362	CM18-05-GC2-32	0.85	16.7	9.21	26.0	98	1.9	1.1	4	0.05	<0.1	0.5	<0.2	0.6	4.2	0.24	0.17	0.16	14	0.03	0.001	0.8	3.3	0.02	169	0.001	<20	0.27	0.002	0.10	<0.1	2.6	<0.02	39	0.9	0.03	0.8	0.04
UZ7363	CM18-05-GC2-33	1.58	41.4	18.9	134	253	29.2	10.9	52	0.56	0.9	1.3	<0.2	5.6	26.5	1.71	0.26	0.25	24	0.63	0.096	5.9	8.3	0.19	324	<0.001	44	0.78	0.007	0.31	<0.1	4.4	0.03	139	2.0	0.05	2.0	0.06
UZ7364	CM18-05-GC2-34	1.18	28.7	14.4	121	227	30.1	10.4	636	3.45	6.9	1.2	0.3	5.3	35.3	1.37	0.18	0.21	42	2.27	0.100	6.8	11.5	1.09	326	<0.001	<20	0.82	0.007	0.30	<0.1	7.4	0.04	89	0.9	0.05	1.8	0.07
UZ7365	CM18-05-GC2-35	1.18	19.1	11.7	107	227	22.9	11.1	585	3.15	4.5	0.9	<0.2	4.4	30.4	1.06	0.12	0.16	29	1.81	0.087	5.8	8.7	0.67	282	<0.001	<20	0.73	0.006	0.27	<0.1	5.3	0.03	69	0.9	0.04	1.6	0.17
UZ7367	CM18-05-GC2-37	0.21	13.7	3.70	8.3	44	1.3	1.1	5	0.03	0.3	0.3	<0.2	0.5	8.0	0.11	0.07	0.06	8	0.02	0.003	1.6	1.4	<0.01	73.5	0.001	<20	0.12	0.004	0.04	<0.1	2.0	<0.02	11	0.3	0.03	0.8	0.06
UZ7368	CM18-05-GC2-38	0.56	23.8	14.2	97.4	571	20.7	7.6	13	0.38	4.3	0.5	<0.2	1.3	7.8	1.08	0.09	0.18	16	0.05	0.003	3.7	5.2	0.04	398	<0.001	33	0.50	0.002	0.27	<0.1	2.5	<0.02	156	1.4	0.03	1.3	0.24
UZ7369	CM18-05-GC2-39	0.73	6.33	7.28	84.0	294	19.1	7.1	63	1.20	8.4	0.9	0.3	2.3	18.0	0.41	0.09	0.04	17	0.27	0.083	4.9	8.4	0.10	202	<0.001	<20	0.44	<0.001	0.17	<0.1	2.9	0.08	141	0.5	<0.02	1.0	0.22
UZ7370	CM18-05-GC2-40	1.00	12.2	10.6	98.7	333	22.3	8.9	79	1.54	7.3	1.0	<0.2	3.0	22.0	0.65	0.17	0.10	23	0.36	0.109	5.3	10.8	0.15	246	<0.001	<20	0.55	0.001	0.23	<0.1	4.9	0.05	96	0.9	0.02	1.6	0.31
UZ7371	CM18-05-GC2-41	0.73	5.16	6.12	55.5	294	14.6	7.0	114	1.41	4.0	1.1	0.3	2.4	27.4	0.24	0.09	0.02	17	0.87	0.141	6.3	9.5	0.27	170	<0.001	<20	0.44	0.002	0.16	<0.1	4.1	0.10	80	0.2	<0.02	1.3	0.32
VD9745	CM18-05-GC2-41 SPLIT DUP	0.70	4.42	5.74	51.6	262	11.6	5.8	113	1.28	3.1	1.1	<0.2	2.6	28.3	0.18	0.08	0.02	17	0.83	0.134	5.5	7.7	0.24	147	<0.001	<20	0.41	0.005	0.16	<0.05	3.5	0.10	78	0.1	<0.02	1.2	0.31
UZ7372	CM18-05-GC2-42	0.41	9.58	5.47	49.2	123	9.7	6.0	2990	24.2	3.2	0.6	<0.2	1.8	24.9	0.30	0.10	0.08	34	1.52	0.058	11.0	10.1	1.56	384	0.001	<20	0.48	0.013	0.15	<0.1	9.9	0.03	91	0.4	<0.02	1.3	0.44
UZ7373	CM18-05-GC2-43	0.32	25.0	10.4	72.2	101	9.2	11.5	51	0.31	0.8	0.6	<0.2	3.0	6.2	0.42	0.13	0.15	8	0.06	0.009	9.9	3.0	0.03	293	0.001	<20	0.31	0.003	0.12	<0.1	4.5	<0.02	53	1.1	0.05	1.3	0.21
UZ7374	CM18-05-GC2-44	0.08	1.72	0.78	8.6	4	3.8	1.1	6060	32.6	1.4	0.1	<0.2	0.3	27.9	<0.01	0.14	<0.02	88	2.47	0.061	17.1	57.3	1.29	293	<0.001	<20	0.03	0.021	<0.001	<0.1	65.5	<0.02	<5	<0.1	<0.02	0.6	<0.02
UZ7375	CM18-05-GC2-45	0.35	5.25	3.14	53.1	141	9.5	4.8	70	0.74	1.0	0.7	<0.2	1.8	15.5	0.28	0.08	0.02	9	0.25	0.096	3.6	12.6	0.03	78.8	<0.001	45	0.21	0.008	0.10	<0.1	2.8	0.03	19	<0.1	<0.02	0.6	0.04
VA9939	11-12-11	1.14	39.8	16.8	142	255	23.9	10.9	5	0.11	5.5	0.8	0.7	1.5	11.7	1.65	0.36	0.32	18	0.08	0.008	2.4	4.5	0.05	312	<0.001	<20	0.63	0.005	0.30	<0.1	3.5	0.04	150	1.9	0.08	1.2	0.07
VA9940	11-12-12	1.22	34.9	15.7	163	270	30.9	8.7	154	1.07	2.7	1.6	0.3	5.8	31.3	1.90	0.35	0.25	39	1.16	0.095	6.8	11.2	0.48	320	0.001	<20	1.08	0.009	0.39	<0.1	5.8	0.04	124	1.4	0.05	2.8	0.03
VA9941	11-12-15	0.61	36.8	18.4	89.4	227	21.9	7.5	26	0.32	0.4	0.7	<0.2	1.5	12.3	0.91	0.11	0.32	36	0.11	0.006	2.7	11.7	0.09	207	<0.001	<20	1.53	0.011	0.55	<0.1	4.0	0.03	87	1.5	0.04	3.6	<0.02
VA9942	11-12-22	0.45	29.8	16.6	82.4	211	6.9	2.6	33	0.42	1.8	0.7	<0.2	1.9	11.5	0.75	0.11	0.36	25	0.11	0.008	2.7	7.8	0.11	309	<0.001	<20	0.99	0.008	0.38	<0.1	4.5	0.03	58	1.1	0.06	2.4	0.04
VA9943	11-12-27	1.29	29.5	13.5	168	596	10.8	2.3	33	0.40	6.1	1.6	<0.2	3.3	21.4	3.64	0.33	0.24	22	0.17	0.048	5.0	7.9	0.09	332	<0.001	<20	0.64	0.005	0.26	<0.1	4.7	0.04	136	4.1	0.05	1.4	0.04
VD9746	11-12-27 SPLIT DUP	1.28	26.9	13.4	156	607	10.4	2.2	28	0.39	5.6	1.7	<0.2	3.4	27.6	3.49	0.16	0.21	26	0.17	0.049	6.3	9.1	0.10	376	<0.001	<20	0.73	0.007	0.28	<0.05	4.2	0.04	145	4.3	0.05	1.7	0.05
VA9944	11-12-28	3.84	43.6	17.1	353	722	32.5	10.3	68	0.53	2.7	2.3	<0.2	3.4	21.2	5.92	0.63	0.28	32	0.15	0.033	3.5	8.0	0.10	367	<0.001	<20	0.61	0.006	0.28	<0.1	5.6	0.03	275	6.8	0.08	1.3	0.09
VA9945	11-12-29	0.82	38.5	19.0	44.1	178	4.7	1.3	21	0.32	<0.1	0.7	0.7	1.8	7.2	0.33	0.12	0.37	24	0.10	0.004	1.6	7.4	0.11	294	<0.001	<20	0.79	0.008	0.25	<0.1	4.7	0.04	32	1.4	0.05	1.9	0.02
VA9946	11-12-33	0.95	46.6	21.2	169	250	22.2	6.3	2260	7.79	3.3	1.1	0.5	2.2	11.5	1.68	0.30	0.34	34	0.32	0.022	2.8	8.2	0.33	232	<0.001	<20	0.81	0.012	0.28	<0.1	6.5	0.05	67	1.9	0.07	2.1	0.10
VA9947	11-12-35	2.15	57.9	23.8	198	279	55.4	14.7	23	0.55	14.0	1.2	<0.2	2.3	12.6	1.97	0.49	0.38	32	0.08	0.020	3.0	8.6	0.09	334	<0.001	<20	0.86	0.009	0.31	<0.1	6.1	0.05	170	2.3	0.10	2.6	0.13
VA9948	11-12-37	1.72	41.1	19.0	151	261	39.2	12.4	682	5.04	5.0	1.2	0.4	4.9	23.4	1.46	0.24	0.27	48	0.78	0.093	5.5	14.8	0.52	310	<0.001	<20	0.97	0.013	0.35	<0.1	7.3	0.04	84	1.8	0.05	2.6	0.08
VA9949	11-12-40	1.61	34.4	16.0	127	223	32.3	11.8	875	4.44	7.5	1.4	<0.2	6.0	34.4	1.25	0.28	0.22	45	1.94	0.138	7.8	14.5	0.85	249	<0.001	<20	0.80	0.010	0.29	<0.1	7.4	0.08	57	1.2	0.05	2.1	0.10
VA9950	11-12-44	1.34	19.9	11.8	114	206	24.2	11.7	931	5.00	3.4	1.0	<0.2	4.8	24.7	0.88	0.16	0.15	26	1.22	0.096	6.1	9.2	0.55	247	<0.001	<20	0.63	0.008	0.23	<0.1	5.3	0.06	37	0.7	0.04	1.5	0.13
VA9951	11-12-45	1.35	17.7	12.2	144	248	29.5	15.8	49	1.02	11.3	1.0	<0.2	4.5	16.0	1.20	0.20	0.12	26	0.23	0.098	6.5	13.6	0.07	312	<0.001	<20	1.35	0.016	0.40	<0.1	3.6	0.08	191	0.8	0.03	2.8	0.59
VA9952	11-22-41	1.32	48.2	25.1	88.9	304	5.1	1.0	10	0.27	<0.1	2.0	0.4	4.3	14.6	1.09	0.23	0.37	22	0.10	0.003	2.6	6.7	0.09	221	<0.001	<20	0.69	0.009	0.21	<0.1	5.2	0.02	204	4.3	0.04	1.4	0.08
VA9953	11-22-43	0.50	39.0	16.0	152	254	8.3	4.4	18	0.26	0.8	0.9	<0.2	4.1	24.9	1.57	0.15	0.22	23	0.21	0.059	4.9	9.4	0.07	313	<0.001	<20	0.82	0.017	0.36	<0.1	4.3	0.03	81	0.6	0.04	2.0	<0.02
VD9747	11-22-43 SPLIT DUP	0.49	37.3	16.7	143	281	7.9	3.8	19	0.26	0.8	1.1	<0.2	4.7	29.6	1.63	0.11	0.26	25	0.20	0.055	5.1	7.9	0.08	330	<0.001	<20	0.80	0.016	0.35	<0.05	4.4	<0.02	114	0.6	0.05	2.2	<0.02
VB9483	11-19-101	1.24	14.2	10.4	142	344	28.2	15.9	33	0.42	7.2	1.2	<0.2	4.9	41.0	0.97	0.11	0.09	15	0.32	0.103	6.1	7.1	0.05	479	<0.001	<20	0.57	0.054	0.23	<0.1	3.1	0.04	78	0.5	0.02	1.7	0.16
QAQC																																						
Duplicates																																						
UZ7164 Dup	CM18-16-LDC3-42	0.40	9.86	4.82	16.2	62	6.1	2.3	577	3.43	1.4	0.4	<0.2	1.1	10.0	0.12	0.14	0.07	8	0.16	0.015	4.2	3.1	0.06	111	<0.001	<20	0.10	0.023	0.04	<0.1	2.7	<0.02	183	0.4	0.03	1.5	0.95
UZ7171 Dup	SAMPLE 8	1.68	31.1	17.0	148	488	13.6	3.1	28	0.34	1.2	1.5	1.8	3.4	14.5	1.65	0.41	0.29	35	0.07	0.027	3.7	8.5	0.05	312	<0.001	<20	0.78	0.005	0.27	<0.1	4.4	<0.02	93	3.1	0.06	2.0	0.06
UZ7272 Dup	CM18-16-GC-42	1.06	35.6	16.5	131	229	29.8	11.0	650	3.09	4.9	1.4	<0.2	5.9	92.6	1.28	0.23	0.23	38	3.82	0.104	6.7	11.2	1.01	426	0.001	<20	0.76	0.099	0.31	<0.1	8.0	0.06	67	1.1	0.04	1.8	0.11
UZ7293 Dup	CM18-27-GC-20	1.61	34.6	13.8	160	328	39.4	10.4	408	2.51	6.4	1.6	<0.2	4.9	34.6	2.03	0.27	0.20	46	1.61	0.100	7.5	14.3	0.75	205	0.001	<20	0.80	0.007	0.30	<0.1	7.1	0.09	94	1.1	0.05	2.1	0.06
UZ7361 Dup	CM18-05-GC2-31	2.98	51.6	23.5	126	213	12.7	5.5	6	0.36	1.9	1.4	<0.2	1.3	4.6	1.77	0.61	0.35	25	0.06	0.002	1.1	4.0	0.05	192	0.001	32	0.42	<0.001	0.13	<0.1	6.8	<0.02	302	2.1	0.07	0.9	0.36
VA9946 Dup	11-12-33	0.93	42.8	19.4	155	239	21.3	5.9	2200	7.59	2.8	1.0	0.7	2.0	10.9	1.52	0.28	0.30	34	0.31	0.020	2.6	7.6	0.33	219	<0.001	<20	0.79	0.009	0.28	<0.1	5.7	0.06	72	1.7	0.07	2.0	0.10
VD9730 Dup	CM18-03-GC-32 SPLIT DUP	2.39	37.6	16.8	191	329	40.1	10.5	659	3.59	9.7	2.5	<0.2	6.7	61.9	2.37	0.35	0.28	51	2.45	0.176	10.9	17.0	1.26	436	0.001	<20	1.01	0.011	0.37	<0.05	10.3	0.05	273	2.3	0.06	2.9	0.10
Blanks																																						
Method Blank										<0.01										<0.01	<0.001			<0.01		<0.001		<0.01	<0.001	<0.01								<0.02
Method Blank						<2							<0.2																					<5				
Method Blank		<0.01	<0.01	<0.01	<0.1		<0.1	<0.1	<1		<0.1	<0.1		<0.1	<0.5	<0.01	<0.02	<0.02	<2			<0.5	<0.5		<0.5		<20				<0.1	<0.1	<0.02		<0.1	<0.02	<0.1	
Reference Material																																						
DS11 % (9300983)										3.13										1.07	0.08			0.85		0.085		1.2	0.068	0.41								0.28
True Values DS11 %										**3.1**										**1.1**	**0.1**			**0.9**		**0.1**		**1.1**	**0.1**	**0.4**								**0.3**
Percent Difference (9300983)										1.0										0.7	14.1			0.0		-12.9		6.3	-2.0	2.5								-1.2
Reference Material																																						
DS11 ppb (9300987)						1580							57.3																					316				
True Values DS11 ppb						**1710.0**							**79.0**																					**300.0**				
Percent Difference (9300987)						-7.6							-27.5																					5.3				
Reference Material																																						
DS11 ppm (9301400)		14.51	146.85	139.23	334.1		84.5	15.9	1066		44.5	2.4		7	62.2	2.48	5.85	10.59	50			19.2	62.5		456.2						3.1	3.4	5.24		2.4	4.75	5.1	
True Values DS11 ppm		**13.9**	**149.0**	**138.0**	**345.0**		**77.7**	**14.2**	**1055.0**		**42.8**	**2.6**		**7.7**	**67.3**	**2.4**	**7.2**	**12.2**	**50.0**			**18.6**	**61.5**		**417.0**						**2.9**	**3.1**	**4.9**		**2.2**	**4.6**	**4.7**	
Percent Difference (9301400)		4.4	-1.4	0.9	-3.2		8.8	12.0	1.0		4.0	-7.3		-8.5	-7.6	4.6	-18.8	-13.2	0.0			3.2	1.6		9.4						6.9	9.7	6.9		9.1	4.2	8.5	
Reference Material																																						
REF OREAS262 (%) (9300983)										3.28										3.17	0.039			1.2		0.003		1.32	0.065	0.32								0.26
True Values REF OREAS262										**3.1**										**2.98**	**0.04**			**1.17**		**0.0027**		**1.3**	**0.071**	**0.295**								**0.253**
Percent Difference (9300983)										5.8										6.4	-2.5			2.6		11.1		1.5	-8.5	8.5								2.8
Reference Material																																						
REF OREAS262 PPB (9300987)						469							55.4																					158				
True Values REF OREAS262 PPB						**450**							**72**																					**170**				
Percent Difference (9300987)						4.2							-23.1																					-7.1				
Reference Material																																						
REF OREAS262 PPM (9301400)		0.65	109.62	57.22	145.9		67.2	30.2	581		37.4	1.1		8.4	33.1	0.67	5.72	0.93	24			17.6	45		261.7						0.1	3.3	0.47		0.4	0.24	3.9	
True Values REF OREAS262 PPM		**0.68**	**118**	**56**	**154**		**62**	**26.9**	**530**		**35.8**	**1.22**		**9.33**	**36**	**0.61**	**5.06**	**0.98**	**22.5**			**15.9**	**41.7**		**246**						**0.2**	**3.24**	**0.47**		**0.4**	**0.23**	**3.73**	
Percent Difference (9301400)		-4.4	-7.1	2.2	-5.3		8.4	12.3	9.6		4.5	-9.8		-10.0	-8.1	9.8	13.0	-5.1	6.7			10.7	7.9		6.4						-50.0	1.9	0.0		0.0	4.3	4.6	
Detection Limits		0.01	0.01	0.01	0.1	2	0.1	0.1	1	0.01	0.1	0.05	0.2	0.1	0.5	0.01	0.02	0.002	2	0.01	0.001	0.5	0.5	0.01	0.5	0.001	20	0.01	0.001	0.01	0.05	0.1	0.02	5	0.1	0.02	0.1	0.02
Maxxam SOP #		AQ-250	AQ-250	AQ-250	AQ-250	AQ-250	AQ-250	AQ-250	AQ-250	AQ-250	AQ-250	AQ-250	AQ-250	AQ-250	AQ-250	AQ-250	AQ-250	AQ-250	AQ-250	AQ-250	AQ-250	AQ-250	AQ-250	AQ-250	AQ-250	AQ-250	AQ-250	AQ-250	AQ-250	AQ-250	AQ-250	AQ-250	AQ-250	AQ-250	AQ-250	AQ-250	AQ-250	AQ-250

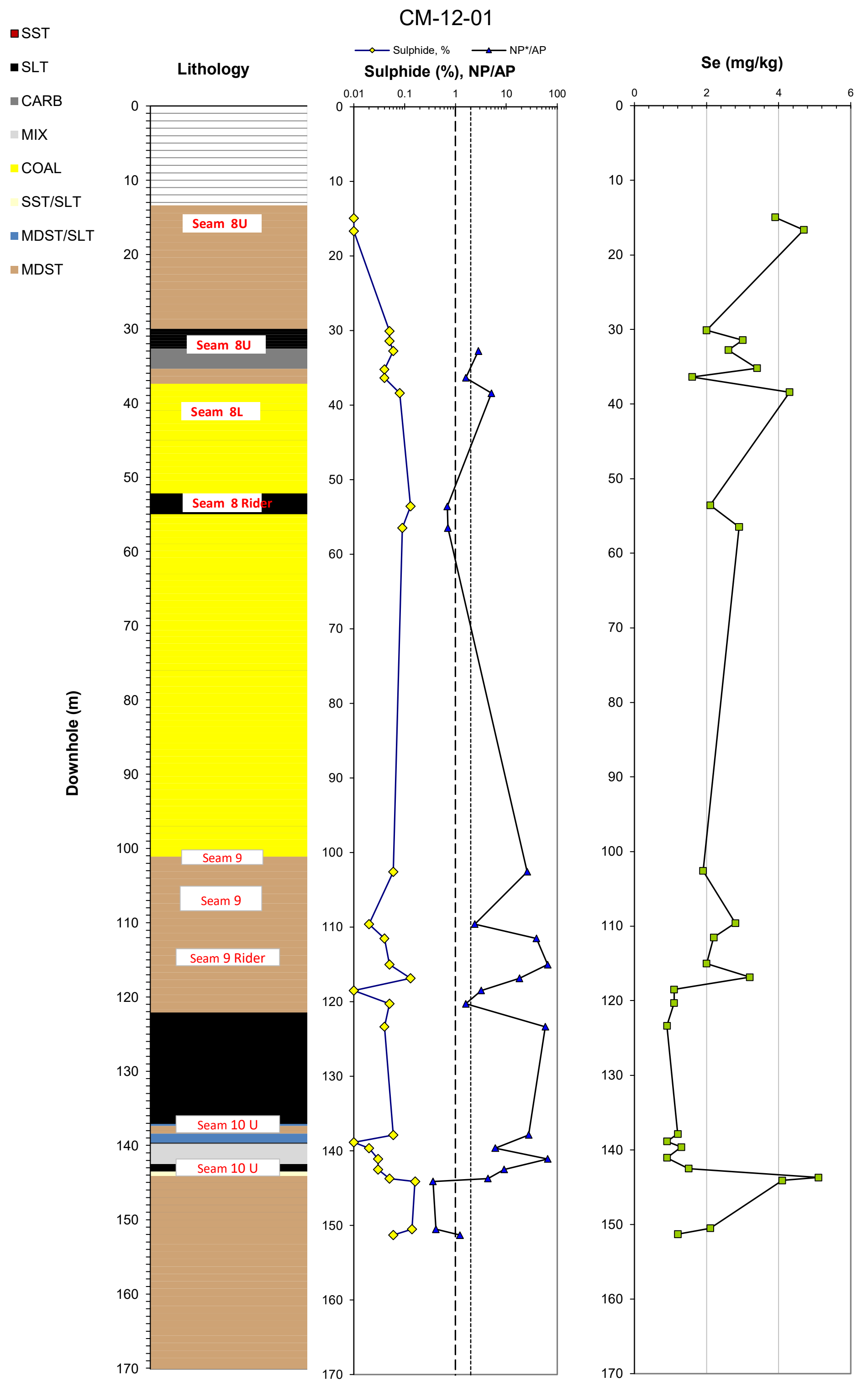
Table 4: Flouride by Fusion Test Results for project CROWN MOUNTAIN PROJECT

Maxxam Sample No	Sample ID	Flourine (F)
	Units	ppm
UZ7165	CM18-16-LDC3-43	352
UZ7168	SAMPLE 4	591
UZ7193	SAMPLE 39	574
UZ7194	11-11-59	413
UZ7199	CM18-03-GC-05	522
UZ7204	CM18-03-GC-10	827
UZ7208	CM18-03-GC-14	794
UZ7213	CM18-03-GC-19	838
UZ7219	CM18-03-GC-31	918
UZ7246	CM18-16-GC-16	422
UZ7258	CM18-16-GC-28	269
UZ7267	CM18-16-GC-37	60
UZ7274	CM18-27-GC-01	770
UZ7285	CM18-27-GC-12	740
UZ7296	CM18-27-GC-23	752
UZ7307	CM18-27-GC-34	693
UZ7318	CM18-10-GC-01	639
UZ7331	CM18-05-GC2-01	371
UZ7337	CM18-05-GC2-07	641
UZ7343	CM18-05-GC2-13	781
UZ7349	CM18-05-GC2-19	840
VA9945	11-12-29	748
VA9952	11-22-41	525
VB9483	11-19-101	666
QAQC		
Duplicates		
UZ7258 Dup	CM18-16-GC-28	312
UZ7343 Dup	CM18-05-GC2-13	805
Blanks		
Method Blank		<10
Reference Material		
STD STSD-1		1000.00
True Values STD STSD-1		950.00
Percent Difference		5.26
Reference Material		
STD STSD-1		976.00
True Values STD STSD-1		950.00
Percent Difference		2.74
Detection Limits		10.00
Maxxam SOP #		GC-840

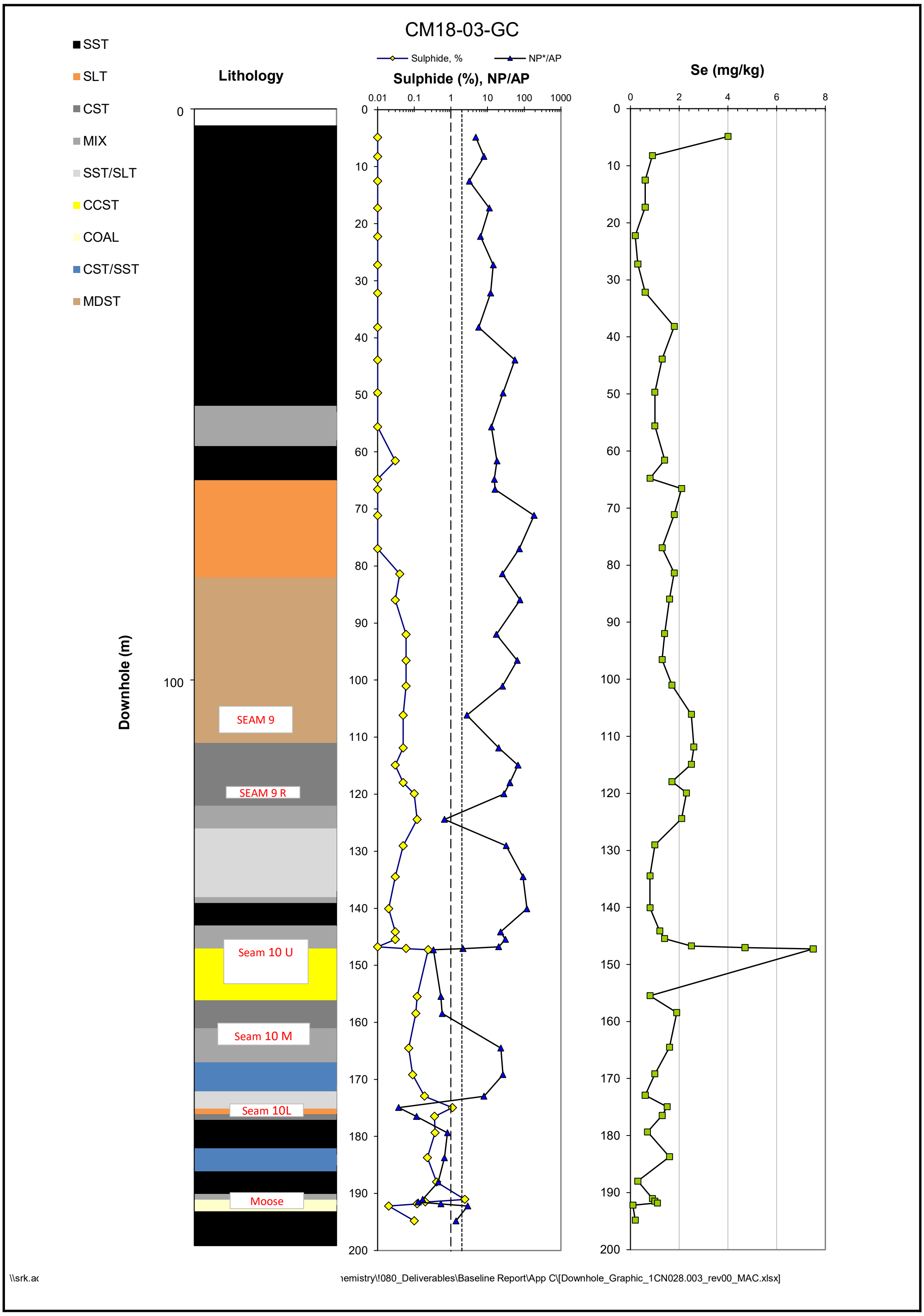
Appendix C: Downhole Plots

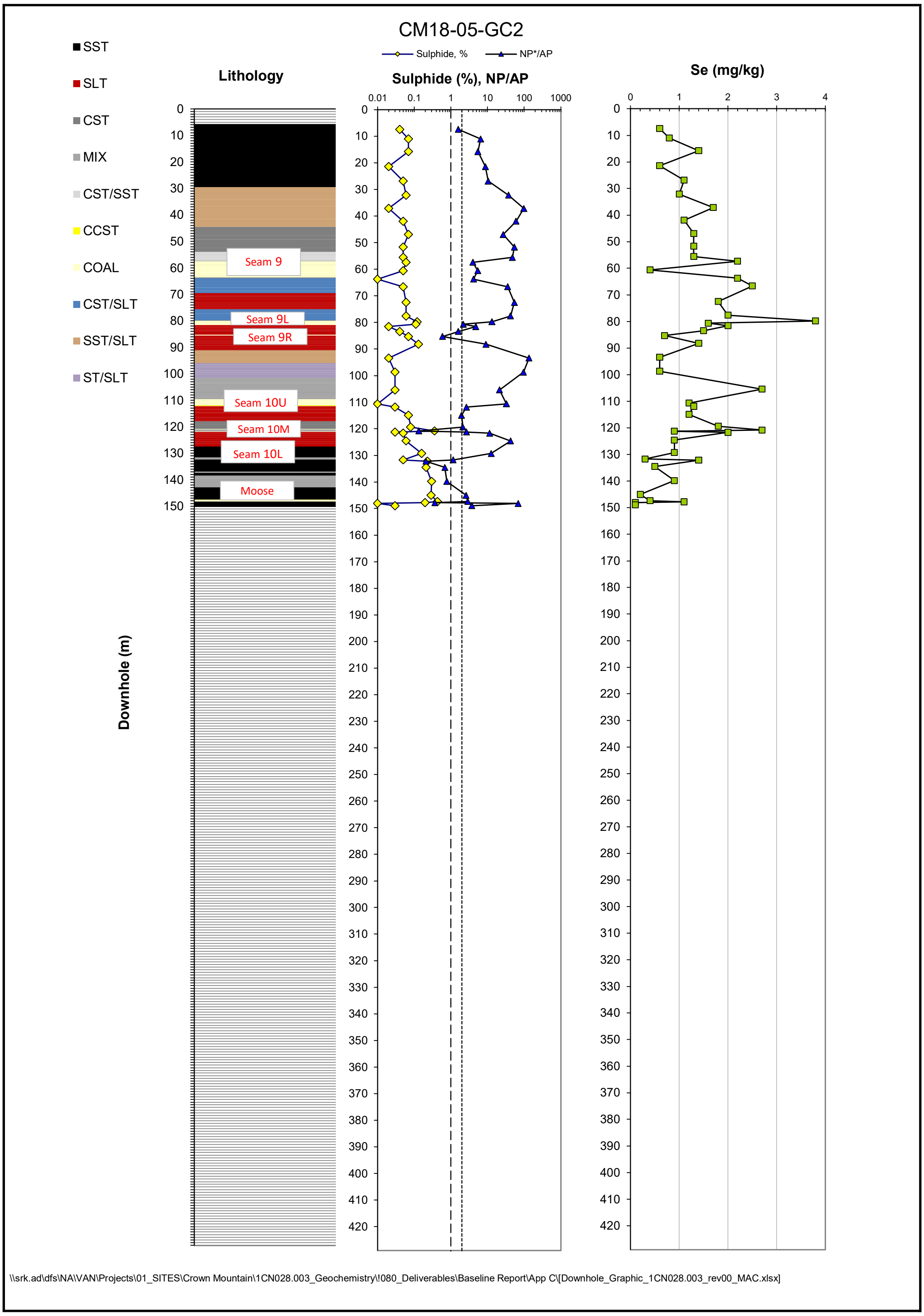


\\srk.ad\dfs\NA\VAN\Projects\01_SITES\Crown Mountain\1CN028.003_Geochemistry\!080_Deliverables\Baseline Report\App C\[Downhole_Graphic_1CN028.003_rev00_MAC.xlsx]

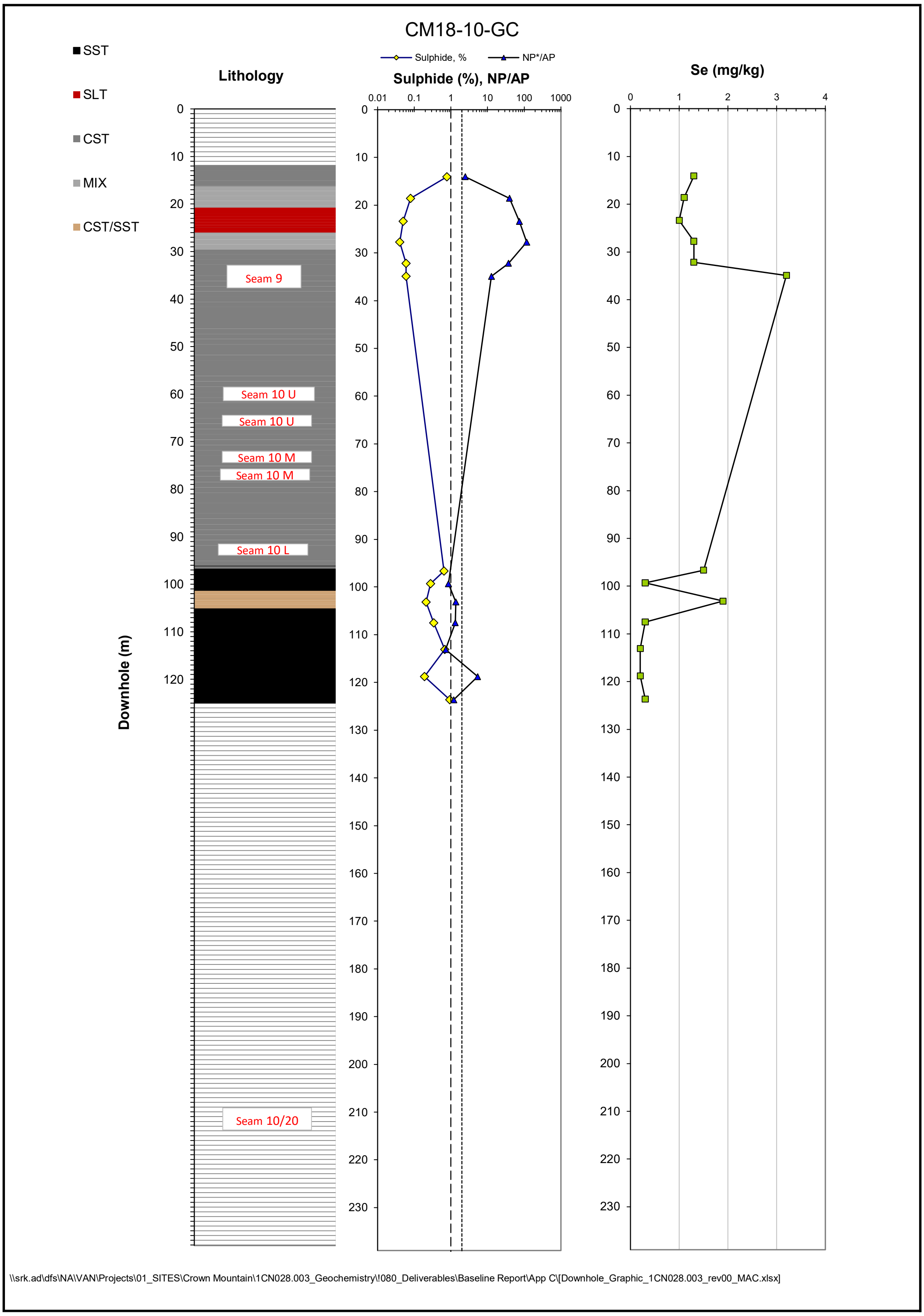


\\srk.ad\dfs\NA\VAN\Projects\01_SITES\Crown Mountain\1CN028.003_Geochemistry\!080_Deliverables\Baseline Report\App C\[Downhole_Graphic_1CN028.003_rev00_MAC.xlsx]

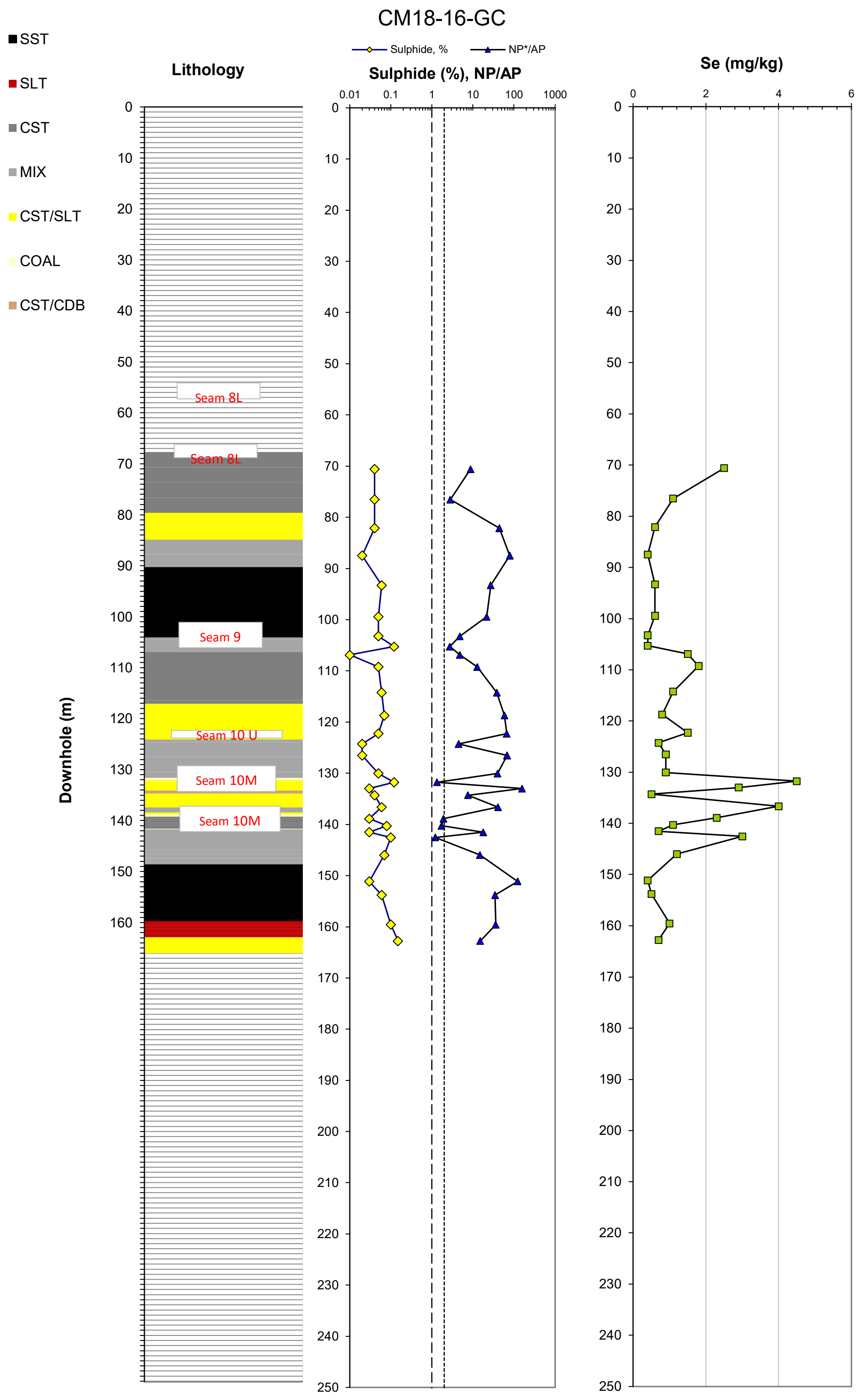

CM18-03-GC
SST
SLT
CST
MIX
SST/SLT
CCST
COAL
CST/SST
MDST
Lithology
Downhole (m)
0
100
SEAM 9
SEAM 9 R
Seam 10 U
Seam 10 M
Seam 10L
Moose
Sulphide, %
NP*/AP
Sulphide (%), NP/AP
0.01
0.1
1
10
100
1000
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
190
200
Se (mg/kg)
0
2
4
6
8
\\srk.ac
hemistry\!080_Deliverables\Baseline Report\App C\[Downhole_Graphic_1CN028.003_rev00_MAC.xlsx]



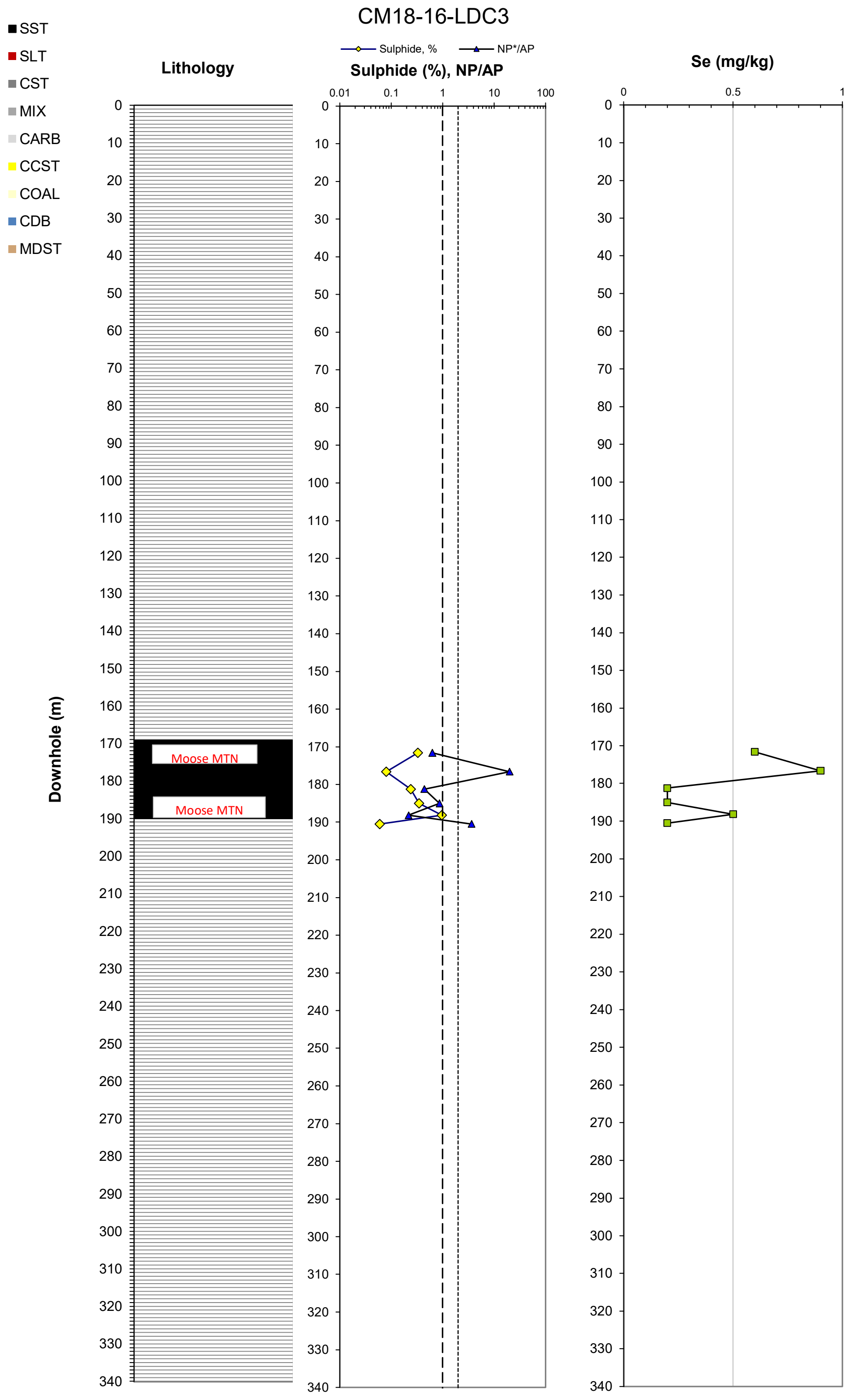
\\srk.ad\dfs\NA\VAN\Projects\01_SITES\Crown Mountain\1CN028.003_Geochemistry\!080_Deliverables\Baseline Report\App C\[Downhole_Graphic_1CN028.003_rev00_MAC.xlsx]



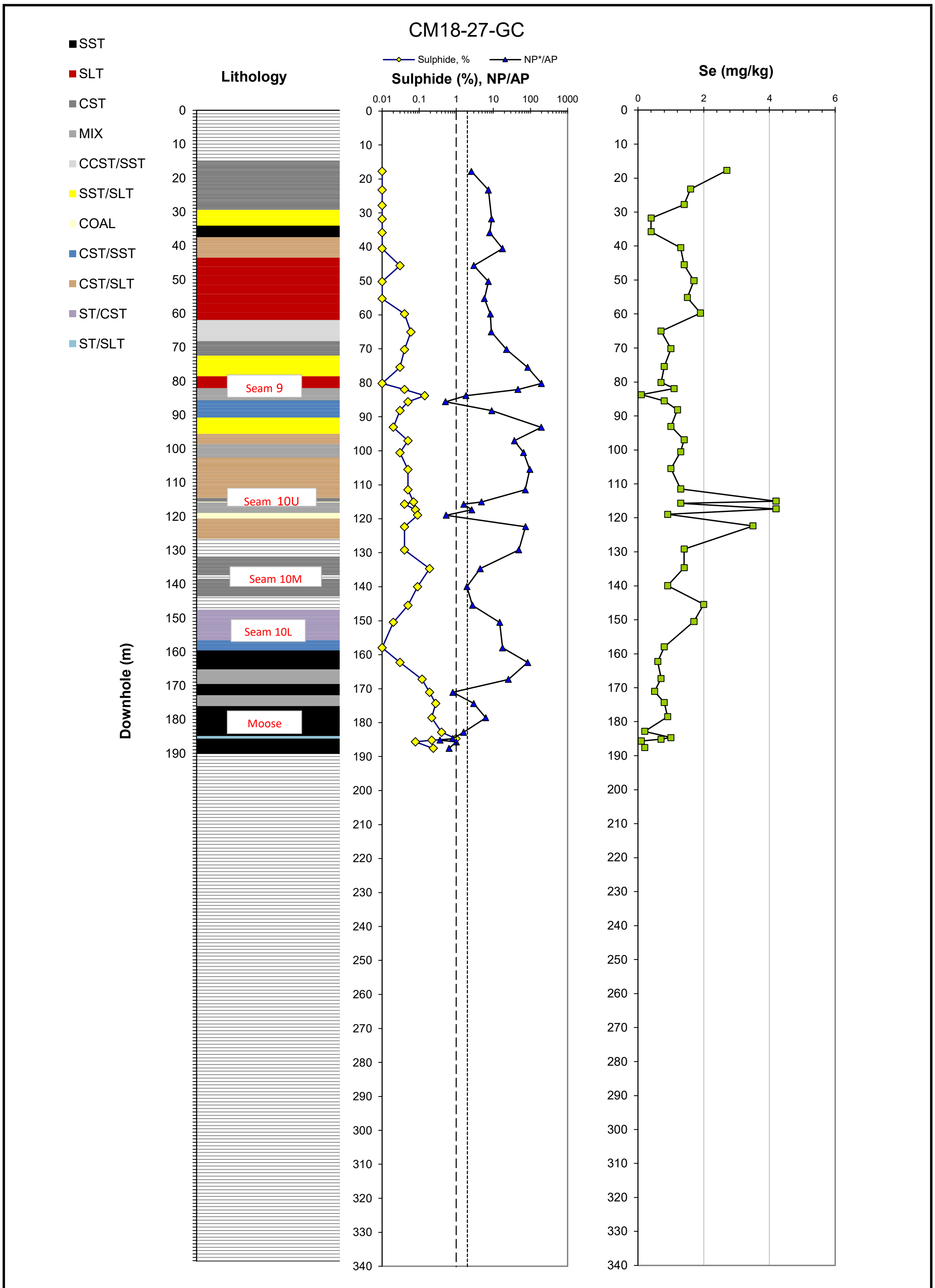
\\srk.ad\dfs\NA\VAN\Projects\01_SITES\Crown Mountain\1CN028.003_Geochemistry\!080_Deliverables\Baseline Report\App C\[Downhole_Graphic_1CN028.003_rev00_MAC.xlsx]



\\srk.ad\dfs\NA\VAN\Projects\01_SITES\Crown Mountain\1CN028.003_Geochemistry\!080_Deliverables\Baseline Report\App C\[Downhole_Graphic_1CN028.003_rev00_MAC.xlsx]



\\srk.ad\dfs\NA\VAN\Projects\01_SITES\Crown Mountain\1CN028.003_Geochemistry\!080_Deliverables\Baseline Report\App C\[Downhole_Graphic_1CN028.003_rev00_MAC.xlsx]



\\srk.ad\dfs\NA\VAN\Projects\01_SITES\Crown Mountain\1CN028.003_Geochemistry\!080_Deliverables\Baseline Report\App C\[Downhole_Graphic_1CN028.003_rev00_MAC.xlsx]

Appendix D: Plant Reject Raw Data, including Supernatant Analysis

Table 1: ABA Test Results for project GEOCHEMICAL CHARACTERIZATION FOR ENVIRONMENTAL ASSESSMENT, CROWN MOUNTAIN PROJECT

Maxxam Sample No	Sample ID	Paste pH	Total Carbon	CO2	CaCO3 Equiv.	Total S	HCl Extractable Sulphur	Sulphide Sulphur (by diff.)	Acid Generation Potential	Mod. ABA Neutralization Potential	Fizz Rating	Net Neutralization Potential	Neutralization Potential Ratio
	Units	pH Units	wt%	wt%	Kg CaCO3/T	wt%	wt%	wt%	Kg CaCO3/T	Kg CaCO3/T	N/A	Kg CaCO3/T	N/A
WK4312	CM SOUTH REJECT	7.93	28.96	0.52	11.82	0.38	0.01	0.37	11.6	9.50	NONE (H)	-2.10	0.8
WK4313	CM NORTH REJECT	7.78	30.71	1.21	27.50	0.29	0.01	0.28	8.8	7.30	NONE (H)	-1.50	0.8
Detection Limits		*N/A*	*0.02*	*0.02*	*0.50*	*0.02*	*0.01*	*0.02*	*0.6*	*N/A*	*N/A*	*N/A*	*N/A*
BV Labs SOP #		*BBY0SOF*	*LECO*	*LECO*	*BBY WI-00033*	*LECO*	*BBY ARD-00009*	*BBY WI-00033*	*BBY WI-00033*	*BBY0SOP-00020*	*BBY0SOP-00*	*BBY WI-00033*	*BBY WI-00033*

Notes:

Lawrence, R.W. 1991. Acid Rock Drainage Prediction Manual

Sobek, A.A., Schuller, W.A., Freeman, J.R. and Smith, R.M. (March 1978), Field and Laboratory Methods Applicable to Overburden and Minesoils, Report EPA-600/2-78-054, U.S. National Technical Information Service Report PB-280 495 pages 46-47.

References:

Acid Generation Potential = Sulphide Sulphur (by diff.)*31.25

CaCO3 Equivalency = Carbonate Carbon (CO2)*(100/44)*10

Carbonate carbon (CO2; HCl direct method) by Leco done at Bureau Veritas Minerals

Fizz Rating - Reference method used is based on NP method.

HCl Extractable Sulphur is based on a modified version of ASTM Method D 2492-02

Mod. ABA Neutralization Potential - MEND Acid Rock Drainage Prediction Manual, MEND Project 1.16.1b (pages 6.2-11 to 17), March 1991.

Net Neutralization Potential = (Modified ABA Neutralization Potential)-(Acid Generation Potential (S-S by diff))
Neutralization Potential Ratio = (Neutralization Potential)/(Acid Generation Potential)
Paste pH - Field and Laboratory Methods Applicable to Overburdens and Minesoils, (EPA 600 / 2-78-054, March 1978).
Sulphide Sulphur = (Total Sulphur)-(Sulphate Sulphur)
Total sulphur, total carbon & carbonate carbon (CO2; HCl direct method) by Leco done at Bureau Veritas Minerals

Table 3: Ultratrace Metals Test Results for project GEOCHEMICAL CHARACTERIZATION FOR ENVIRONMENTAL ASSESSMENT, CROWN MOUNTAIN PROJECT

Maxxam Sample No	Sample ID	Mo	Cu	Pb	Zn	Ag	Ni	Co	Mn	Fe	As	U	Au	Th	Sr	Cd	Sb	Bi	V	Ca	P	La	Cr	Mg	Ba	Ti	B	Al	Na	K	W	Sc	Tl	Hg	Se	Te	Ga	S
	Units	ppm	ppm	ppm	ppm	ppb	ppm	ppm	ppm	%	ppm	ppm	ppb	ppm	ppm	ppm	ppm	ppm	ppm	%	%	ppm	ppm	%	ppm	%	ppm	%	%	%	ppm	ppm	ppm	ppb	ppm	ppm	ppm	%
WK4312	CM SOUTH REJECT	2.20	38.2	114	186	720	13.6	4.6	375	0.87	11.0	1.2	<0.2	2.5	119	1.62	1.48	0.28	16	0.65	0.233	4.9	7.8	0.11	368	0.002	<20	0.60	0.011	0.14	<0.1	4.8	<0.02	136	2.0	0.06	1.3	0.18
WK4313	CM NORTH REJECT	2.32	34.5	72.4	126	506	10.8	4.0	226	1.37	6.0	1.0	<0.2	2.3	57.0	1.17	0.75	0.29	14	0.31	0.063	3.7	12.5	0.15	269	<0.001	<20	0.50	0.012	0.13	<0.1	5.1	<0.02	101	1.4	0.07	1.2	0.10
QAQC																																						
Duplicates																																						
WK4312 Dup	CM SOUTH REJECT	2.09	38.0	109	191	709	13.2	4.0	360	0.87	9.6	1.1	<0.2	2.5	117	1.61	1.60	0.27	15	0.61	0.219	4.7	7.4	0.11	348	0.002	<20	0.58	0.010	0.13	<0.1	5.0	<0.02	128	2.3	0.07	1.3	0.17
Blanks																																						
Method Blank										<0.01										<0.01	<0.001			<0.01		<0.001		<0.01	<0.001	<0.01								<0.02
Method Blank						<2							<0.2																					<5				
Method Blank		0.02	<0.01	0.02	<0.1		<0.1	<0.1	<1		<0.1	<0.1		<0.1	<0.5	<0.01	<0.02	<0.02	<2			<0.5	<0.5		<0.5		<20				<0.1	0.1	<0.02		<0.1	<0.02	<0.1	
Reference Material																																						
DS11 % (9613107)										3.13										1.05	0.068			0.85		0.094		1.16	0.07	0.39								0.28
True Values DS11 %										**3.1**										**1.063**	**0.0701**			**0.85**		**0.0976**		**1.129**	**0.0694**	**0.4**								**0.2835**
Percent Difference (9613107)										1.0										-1.2	-3.0			0.0		-3.7		2.7	0.9	-2.5								-1.2
Reference Material																																						
DS11 PPB (9613156)						1656							55																					261				
True Values DS11 PPB						**1710**							**79**																					**260**				
Percent Difference (9613156)						-3.2							-30.4																					0.4				
Reference Material																																						
DS11 PPM (9613252)		15.21	148.39	136.6	339.5		79.6	13.7	1023		41.5	2.5		7.7	69.1	2.41	6.46	11.42	48			18.3	56.1		420.5						2.4	3.6	4.81		2.2	4.58	4.7	
True Values DS11 PPM		**13.9**	**149**	**138**	**345**		**77.7**	**14.2**	**1055**		**42.8**	**2.59**		**7.65**	**67.3**	**2.37**	**7.2**	**12.2**	**50**			**18.6**	**61.5**		**417**						**2.9**	**3.1**	**4.9**		**2.2**	**4.56**	**4.7**	
Percent Difference (9613252)		9.4	-0.4	-1.0	-1.6		2.4	-3.5	-3.0		-3.0	-3.5		0.7	2.7	1.7	-10.3	-6.4	-4.0			-1.6	-8.8		0.8						-17.2	16.1	-1.8		0.0	0.4	0.0	
Reference Material																																						
OREAS262 % (9613107)										3.28										3	0.037			1.18		0.003		1.26	0.067	0.31								0.26
True Values OREAS262 %										**3.284**										**2.98**	**0.04**			**1.17**		**0.003**		**1.204**	**0.071**	**0.295**								**0.253**
Percent Difference (9613107)										-0.1										0.7	-7.5			0.9		0.0		4.7	-5.6	5.1								2.8
Reference Material																																						
OR262 PPB (9613156)						459							50.9																					169				
True Values OR262 PPB						**450**							**72**																					**170**				
Percent Difference (9613156)						2.0							-29.3																					-0.6				
Reference Material																																						
OREAS262 PPM (9613252)		0.58	117.93	57.15	154.1		64.7	28.2	533		36.1	1.3		9.4	35.6	0.72	2.15	1.02	21			15.6	42.2		245.3						<0.1	3.5	0.44		0.3	0.23	3.7	
True Values OREAS262 PPM		**0.68**	**118**	**56**	**154**		**62**	**26.9**	**530**		**35.8**	**1.22**		**9.33**	**36**		**3.39**	**0.98**	**22.5**			**15.9**	**41.7**		**248**						**0.13**	**3.24**	**0.47**		**0.4**	**0.23**	**3.73**	
Percent Difference (9613252)		-14.7	-0.1	2.1	0.1		4.4	4.8	0.6		0.8	6.6		0.8	-1.1		-36.6	4.1	-6.7			-1.9	1.2		-1.1						-100.0	8.0	-6.4		-25.0	0.0	-0.8	
Detection Limits		0.01	0.01	0.01	0.1	2	0.1	0.1	1	0.01	0.1	0.05	0.2	0.1	0.5	0.01	0.02	0.002	2	0.01	0.001	0.5	0.5	0.01	0.5	0.001	20	0.01	0.001	0.01	0.05	0.1	0.02	5	0.1	0.02	0.1	0.02
BV Labs SOP #		AQ-250	AQ-250	AQ-250	AQ-250	AQ-250	AQ-250	AQ-250	AQ-250	AQ-250	AQ-250	AQ-250	AQ-250	AQ-250	AQ-250	AQ-250	AQ-250	AQ-250	AQ-250	AQ-250	AQ-250	AQ-250	AQ-250	AQ-250	AQ-250	AQ-250	AQ-250	AQ-250	AQ-250	AQ-250	AQ-250	AQ-250	AQ-250	AQ-250	AQ-250	AQ-250	AQ-250	AQ-250

Table 4: Supernatant Test Results for project GEOCHEMICAL CHARACTERIZATION FOR ENVIRONMENTAL ASSESSMENT, CROWN MOUNTAIN PROJECT

Maxxam Sample No	Sample ID	pH	EC	SO4	Total Alkalinity	Bicarbonate	Carbonate	Hydroxide	Fluoride	Dissolved Chloride	Nitrate-N	Nitrite-N	Hardness CaCO3
	Units	pH Units	uS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
WK4314	COAL WASHING H20 TAP WATER	7.29	130	16.6	24	30	<0.5	<0.5	0.12	11.1	<0.2	<0.05	38.3
QAQC													
Duplicates													
WK4314 Dup	COAL WASHING H20 TAP WATER	7.34	126									<0.05	
Blanks													
Detection Limits		N/A	1	0.5	0.5	0.5	0.5	0.5	0.01	0.5	0.02	0.005	0.50
BV Labs SOP #		BBY0SOP-00(	3BY0SOP-0000	3Y6SOP-00(	BBY6SOP-00026	3BY6SOP-000	IBY6SOP-000	IBY6SOP-000	3BY6SOP-000	BY6SOP-00(	BBY WI-0003	BBY6SOP-0001	BBY WI-0003

Maxxam Sample No	Dissolved Aluminum (Al)	Dissolved Antimony (Sb)	Dissolved Arsenic (As)	Dissolved Barium (Ba)	Dissolved Beryllium (Be)	Dissolved Bismuth (Bi)	Dissolved Boron (B)	Dissolved Cesium (Cs)	Dissolved Cadmium (Cd)	Dissolved Calcium (Ca)	Dissolved Chromium (Cr)	Dissolved Cobalt (Co)	Dissolved Copper (Cu)	Dissolved Lanthanum (La)	Dissolved Iron (Fe)	Dissolved Lead (Pb)
	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
WK4314	0.082	0.000046	0.00021	0.0183	<0.00001	<0.000005	<0.05	<0.00005	<0.000005	11.7	0.00015	0.0000156	0.00147	<0.00005	0.0143	0.0000224
QAQC																
Duplicates																
WK4314 Dup																
Blanks																
Detection Limits	0.0005	0.00002	0.00002	0.00002	0.00001	0.000005	0.05	0.00005	0.0000	0.05	0.0001	0.000005	0.00005	0.00005	0.001	0.000005
BV Labs SOP #	BY7SOP-000	BY7SOP-000	3Y7SOP-00(	BY7SOP-000	IBY7SOP-000	IY7SOP-00	BY7SOP-000	BY7SOP-000	3BY7SOP-000(	3BY7SOP-000(	3BY7SOP-0000	3BY7SOP-000(	BY7SOP-000	BY7SOP-000	BY7SOP-000	BY7SOP-000

Maxxam Sample No	Dissolved Lithium (Li)	Dissolved Magnesium (Mg)	Dissolved Manganese (Mn)	Dissolved Phosphorus (P)	Dissolved Molybdenum (Mo)	Dissolved Nickel (Ni)	Dissolved Potassium (K)	Dissolved Rubidium (Rb)	Dissolved Selenium (Se)	Dissolved Silicon (Si)	Dissolved Silver (Ag)	Dissolved Sodium (Na)
	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
WK4314	0.00166	2.21	0.00388	0.0027	0.000953	0.000378	0.724	0.000608	0.000066	3.16	<0.000005	10
QAQC												
Duplicates												
WK4314 Dup												
Blanks												
Detection Limits	0.0005	0.05	0.00005	0.002	0.00005	0.00002	0.05	0.00005	0.00004	0.1	0.000005	0.05
BV Labs SOP #	BY7SOP-000	BY7SOP-000	BY7SOP-000	BY7SOP-000	BY7SOP-000	BY7SOP-000	BY7SOP-000	BY7SOP-000	BY7SOP-000	BY7SOP-000	BY7SOP-000	BY7SOP-000

Maxxam Sample No	Dissolved Strontium (Sr)	Dissolved Sulphur (S)	Dissolved Tellurium (Te)	Dissolved Thallium (Tl)	Dissolved Thorium (Th)	Dissolved Tin (Sn)	Dissolved Titanium (Ti)	Dissolved Tungsten (W)	Dissolved Uranium (U)	Dissolved Vanadium (V)	Dissolved Zinc (Zn)	Dissolved Zirconium (Zr)	Dissolved Mercury (Hg)	Anion Sum	Cation Sum	Balance %
	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	N/A	N/A	N/A
WK4314	0.0586	<10	<0.00002	<0.000002	<0.000005	<0.0002	<0.0005	0.00002	0.00021	0.00113	0.00935	<0.0001	<0.00005	1.16	1.23	-3.30
QAQC																
Duplicates																
WK4314 Dup																
Blanks																
Detection Limits	0.00005	10	0.00002	0.000002	0.000005	0.0002	0.0005	0.00001	0.000002	0.0002	0.0001	0.0001	0.00005			
BV Labs SOP #	3Y7SOP-00(	3Y7SOP-00(	3Y7SOP-000	BY7SOP-000	BY7SOP-000	BY7SOP-000	BY7SOP-000	BY7SOP-000	BY7SOP-000	BY7SOP-000	BY7SOP-000	BY7SOP-000	BBY7SOP-00002	BBY WI-0003	BBY WI-0003	BBY WI-00033

Notes:

Calculated parameter based on the concentration of Nitrate plus Nitrite(NO2+NO3) minus Nitrite(NO2)

References:

Anions = Dissolved Sulphate*2/96+Total Alkalinity*60/100*2/60 Cations = Dissolved Aluminum*3/27+Dissolved Calcium*2/40.08+Dissolved Copper*2/63.5+Dissolved Iron*2/55.8+Dissolved Magnesium*2/24.3+Dissolved Manganese*2/54.9+Dissolved Potassium*1/39.1+Dissolved Sodium*1/23+Dissolved Zinc*2/65.4

Hardness = (Calcium*2.497) + (Magnesium*4.118)

Table 4: Flouride by Fusion Test Results for project FRO CASTLE MOUNTAIN

Sample No	**Sample ID**	**Flourine (F)**
Units		**%**
WK4312	CM SOUTH REJECT	0.09
QA/QC		
Duplicates		
WK4312	CM SOUTH REJECT	0.09
Blanks		
Method Blank		<0.01
Reference Material		
STD STSD-1		0.11
True Value STD STSD-1		**0.095**
Percent Difference		15.8
Reference Material		
STD AMIS0250		8.9
True Value STD STSD-1		**9**
Percent Difference		-1.0
Detection Limits		0.01
BV Labs SOP#		GC841