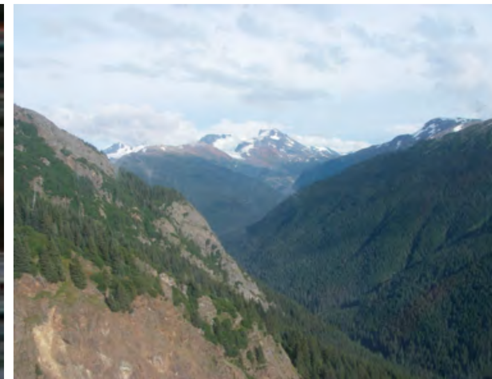
APPENDIX 10-B
ACCESS ROADS METAL LEACHING AND ACID ROCK DRAINAGE POTENTIAL ASSESSMENT

Seabridge Gold Inc.

KSM PROJECT
Access Roads Metal Leaching and Acid Rock Drainage Potential Assessment



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ACCESS ROADS METAL LEACHING AND ACID ROCK DRAINAGE POTENTIAL ASSESSMENT

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Prepared for:

SEABRIDGE GOLD

Seabridge Gold Inc.

Prepared by:

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Executive Summary

This report provides an assessment of the ML/ARD potential along the proposed KSM Project road alignments. The ML/ARD ranking is intended as a tool to develop adequate and proper waste and water management plans to be implemented during access road construction. Additionally, this report describes the geological and geochemical characterization program completed to assess the ML/ARD potential of cut and fill material of the proposed access roads and alternatives.

In this report the term acid rock drainage (ARD) describes the oxidation of sulphide minerals from their exposure to air and water at or near the earth's surface. Acidity, sulphate, and elemental constituents, primarily as metals/metalloids, are produced. Metal leaching (ML) refers to the release of metals/ metalloids and sulphate that may occur under a range of pH values from acidic to alkaline. Where sulphide-bearing minerals are exposed at the proposed Project and surrounding area, ML/ARD is already naturally occurring.

The proposed access roads for the proposed Project transect mountainous terrain in northwest British Columbia. The regional geology consists of strongly tectonically deformed metavolcanic and metasedimentary assemblages of Triassic to Jurassic age. The marine metasedimentary units of the Middle to Upper Jurassic Bowser Lake Group dominate the geology along the Treaty Creek Access Road (TCAR), and northern portion of the Coulter Creek Access Road (CCAR). The eastern portion of the CCAR, east of Station 20+600, transects metasedimentary and metavolcanic units of the Middle to Lower Jurassic Hazelton Group and the Upper Triassic Stuhini Group. ML/ARD is possible from rocks from the Bowser Lake Group while there is a low potential for ML/ARD from the other rock types found along the road alignments.

This ML/ARD assessment is based on 1) publicly accessible geology and geochemistry databases, 2) the regional geology, 3) static testing and Acid-Base Accounting on a number of field samples, and 4) construction planning estimates of material excavation volumes.

The ML/ARD potential rankings of the CCAR are relatively evenly distributed among possible, low, and none. Road segments of the CCAR with a high ML/ARD potential (3% of the alignment) are frequently associated with fault zones and geological contacts, as well as those sections where construction planning indicates that cut will dominate over fill. The ML/ARD potential of the northern 20 km of the CCAR alignment along Coulter Creek is possible to high and the majority of the south-eastern sections along Sulphurets Creek have an ML/ARD potential of none.

The ML/ARD potential rankings of the TCAR are predominantly low to none with a few 200 m segments of high or possible ML/ARD potential. These rankings reflect the location of the alignment predominantly on quaternary alluvial and colluvial sediments.

Acknowledgments

This report was prepared for Seabridge Gold Inc. by Rescan Environmental Services Ltd. The fieldwork was conducted by Gerhard Jacobs (M.Sc., P.Geo.), a subcontractor to Rescan, and Rescan Scientists, Mark Nelson (M.Sc., P.Geo.) and Kelsey Norlund (Ph.D.). Data analysis and report writing was conducted by Gerhard Jacobs (M.Sc., P.Geo.), Keith Mountjoy (M.Sc., P.Geo.), Kelsey Norlund (Ph.D.) and Brenda Bailey (M.Sc.). This report was reviewed by Greg McKillop (M.Sc., P.Geo.), Gerry Papini (M.Sc., P.Geo.) and Kelsey Norlund (Ph.D.).

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ACCESS ROADS METAL LEACHING AND ACID ROCK DRAINAGE POTENTIAL ASSESSMENT

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1. Introduction

The overall objective of the KSM Project Access Roads ML/ARD Potential Assessment is to provide sufficient data for construction planning and ML/ARD management plans. The access road assessment started in 2008 and has been updated to incorporate changes in road alignments. The ML/ARD prediction along the proposed Project access road alignments was undertaken to assess and characterize the ML/ARD potential along 200 m sections of the proposed road alignments as delineated by construction planning design (McElhanney 2011). The accompanying maps are intended to support the detailed design and construction of the access roads by limiting the ML/ARD effects on the environment.

1.1 PROJECT PROPONENT

Seabridge Gold Inc. (Seabridge) is the proponent for the proposed KSM Project (the Project), a gold, copper, silver, molybdenum mine.

1.2 PROJECT LOCATION

The Project is located in the coastal mountains of northwestern British Columbia. It is approximately 950 km northwest of Vancouver and 65 km northwest of Stewart, within 30 km of the British Columbia-Alaska border (Figure 1.2-1).

1.3 PROJECT OVERVIEW

The Project is located in two geographical areas: the Mine Site and Processing and Tailing Management Area (PTMA), connected by twin 23-km tunnels, the Mitchell-Treaty Twinned Tunnels (Figure 1.3-1). The Mine Site is located south of the closed Eskay Creek Mine, within the Mitchell, McTagg, and Sulphurets Creek valleys. Sulphurets Creek is a main tributary of the Unuk River, which flows to the Pacific Ocean. The PTMA is located in the upper tributaries of Teigen and Treaty creeks. Both creeks are tributaries of the Bell-Irving River, which flows to the Nass River and into the Pacific Ocean. The PTMA is located about 19 km southwest of Bell II on Highway 37.

The Mine Site will be accessed by a new road, the Coulter Creek Access Road, which will be built from km 70 on the Eskay Creek Mine Road. This road will follow Coulter and Sulphurets creeks to the Mine Site. The PTMA will also be accessed by a new road, the Treaty Creek Access Road, the first 3-km segment of which is a forest service road off of Highway 37. The Treaty Creek Access Road will parallel Treaty Creek.

Four deposits will be mined at the KSM Project—Kerr, Sulphurets, Mitchell, and Iron Cap—using a combination of open pit and underground mining methods. Waste rock will be stored in engineered rock storage facilities located in the Mitchell and McTagg valleys at the Mine Site. Ore will be crushed and transported through one of the Mitchell-Treaty Twinned Tunnels to the PTMA. This tunnel will also be used to route the electrical power transmission lines. The second tunnel will be used to transport personnel and bulk materials. The Process Plant will process an average of 130,000 tpd of ore to produce a daily average of 1,200 t of concentrate. Tailing will be pumped to the Tailing Management Facility from the Process Plant. Copper concentrate will be trucked from the PTMA along highways 37 and 37A to the Port of Stewart, which is approximately 170 km away via road.

The mine operating life is estimated at 51.5 years. Approximately 1,800 people will be employed annually during the Operation Phase. Project Construction will take about five years, and the capital cost of the Project is approximately US$5.3 billion.

Figure 1.2-1

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KSM Project Location

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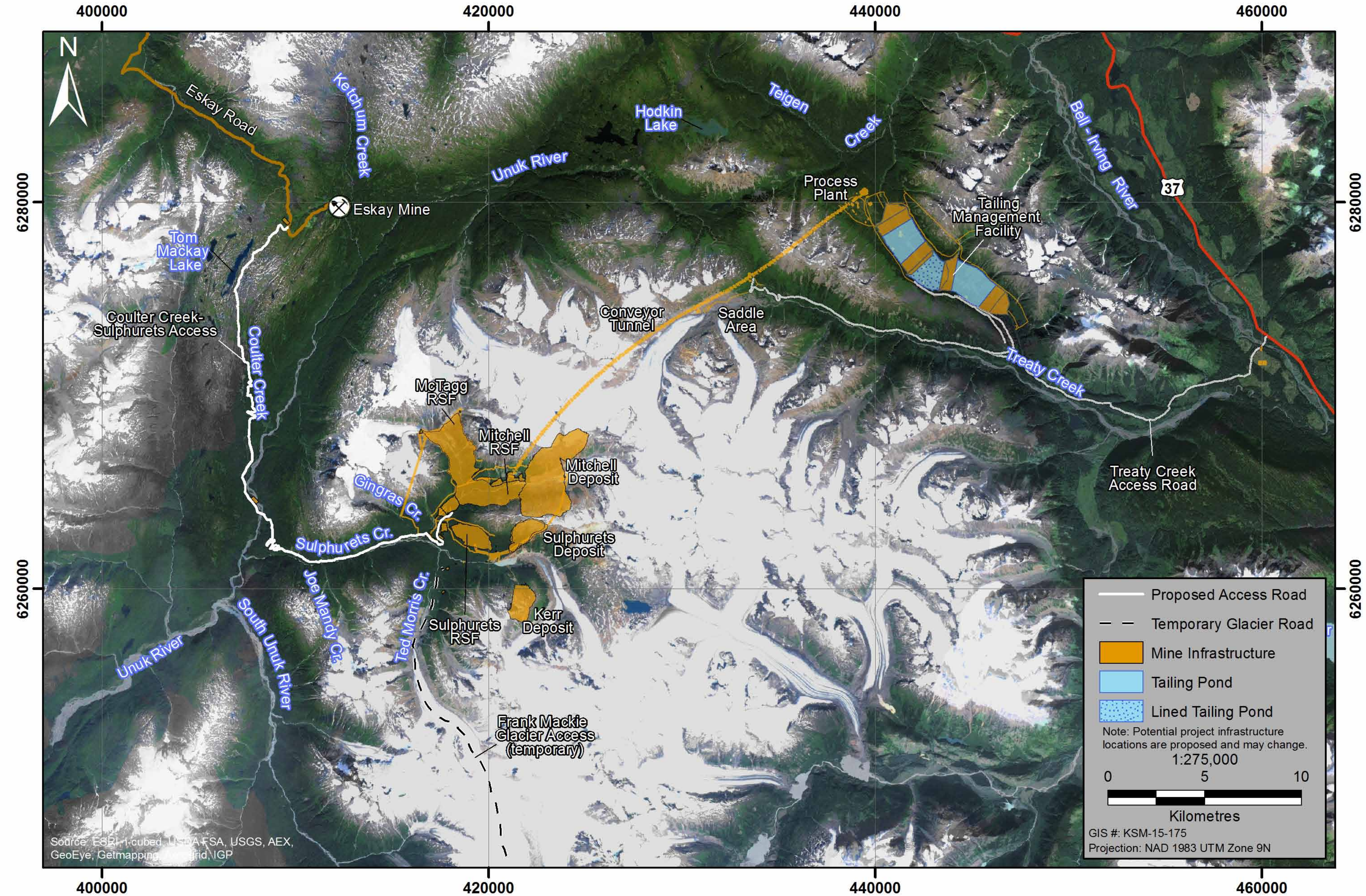

Figure 1.3-1

KSM Project Layout

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1.4 REGULATORY FRAMEWORK

Whenever significant bedrock or unconsolidated material will be excavated or disturbed in British Columbia an ML/ARD program must be conducted so that, if necessary, prevention, mitigation and monitoring plans can be implemented.

The guiding BC provincial and federal principles for ML/ARD applicable to the long-term environmental management of the proposed KSM Project include:

- The prevention of ML/ARD. Prevention should be achieved through prediction, appropriate design, and effective implementation of appropriate mitigation strategies throughout the life of the proposed Project;
- The demonstration that the proposed mitigation strategies meet the environmental objectives for the proposed Project and are compatible with the proposed Project plan and site conditions; and
- The ML/ARD potential is evaluated on a site-specific basis.

The federal Ministry of Environment's *Environmental Code of Practice for Metal Mines* sections 3 and 4 provide recommendations on predicting acidic drainage and metal leaching and creating environmental management plans for water and wastewater management at metal mines. In British Columbia, mining activities are regulated under the *Mines Act* (1996) and the Health, Safety and Reclamation Code for Mines in British Columbia (BCMEMPR 2008). Part 10 of the Health, Safety and Reclamation Code contains requirements for acid rock drainage and metal leaching prediction and prevention and reporting. ML/ARD prediction, prevention and mitigation in British Columbia are further guided by the following documents:

- Draft Recommended Methods for the Prediction of Metal Leaching and Acid Rock Drainage at Minesites in British Columbia (Price 1997);
- Policy for Metal Leaching and Acid Rock Drainage in British Columbia (BCMEM and BCMELP 1998);
- Guidelines for Metal Leaching and Acid Rock Drainage at Minesites in British Columbia (Price and Errington 1998);
- MEND Manual. Volume 3 – Prediction (MEND 2000);
- List of Potential Information Requirements in Metal Leaching/Acid Rock Drainage Assessment and Mitigation Work. MEND Report 5.10E (Price 2005); and
- Prediction Manual for Drainage Chemistry from Sulphidic Geologic Materials (Price 2009).

The general principles, policies, guidelines and recommended methods were applied to this assessment of the ML/ARD potential for the proposed KSM Project.

1.5 ACCESS ROAD ALIGNMENTS

The proposed KSM Project will require the construction of permanent access roads to the mine area and to the Tailing Management Facility (TMF) and Process Plant. Temporary access will be required to the intermediate portals of the Mitchell-Treaty Tunnels (MTT). Access to the mine area is proposed via the Coulter Creek Access Road (CCAR; Figure 1.5-1). The Treaty Creek Access Road (TCAR) is proposed to access the tunnel portals, with a junction to the North Treaty Creek Access Road (NTCAR) near the North Treaty Tributary to access the TMF and Process Plant (Figure 1.5-2).

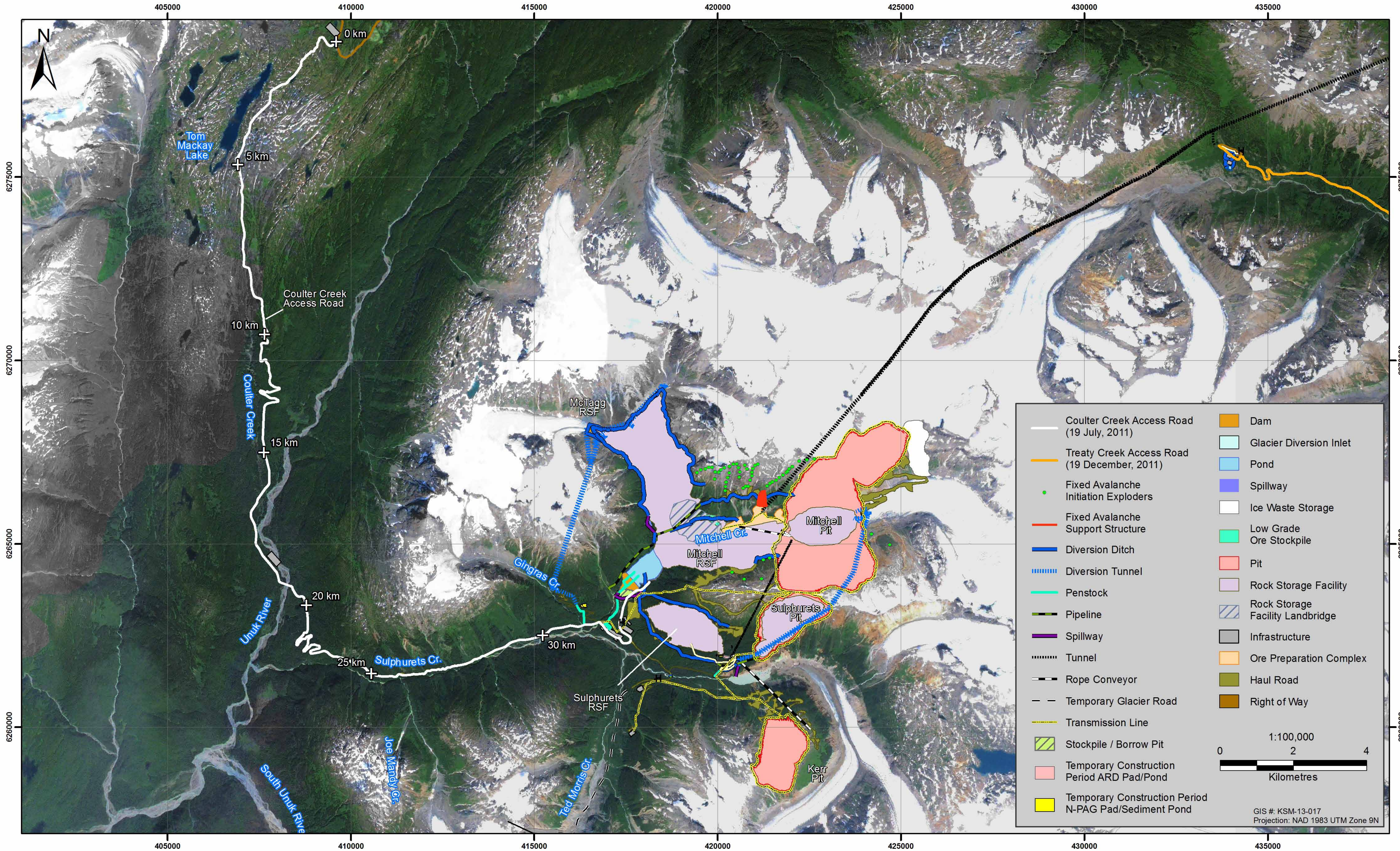

Figure 1.5-1

General Layout of Proposed Coulter Creek Access Road Alignment

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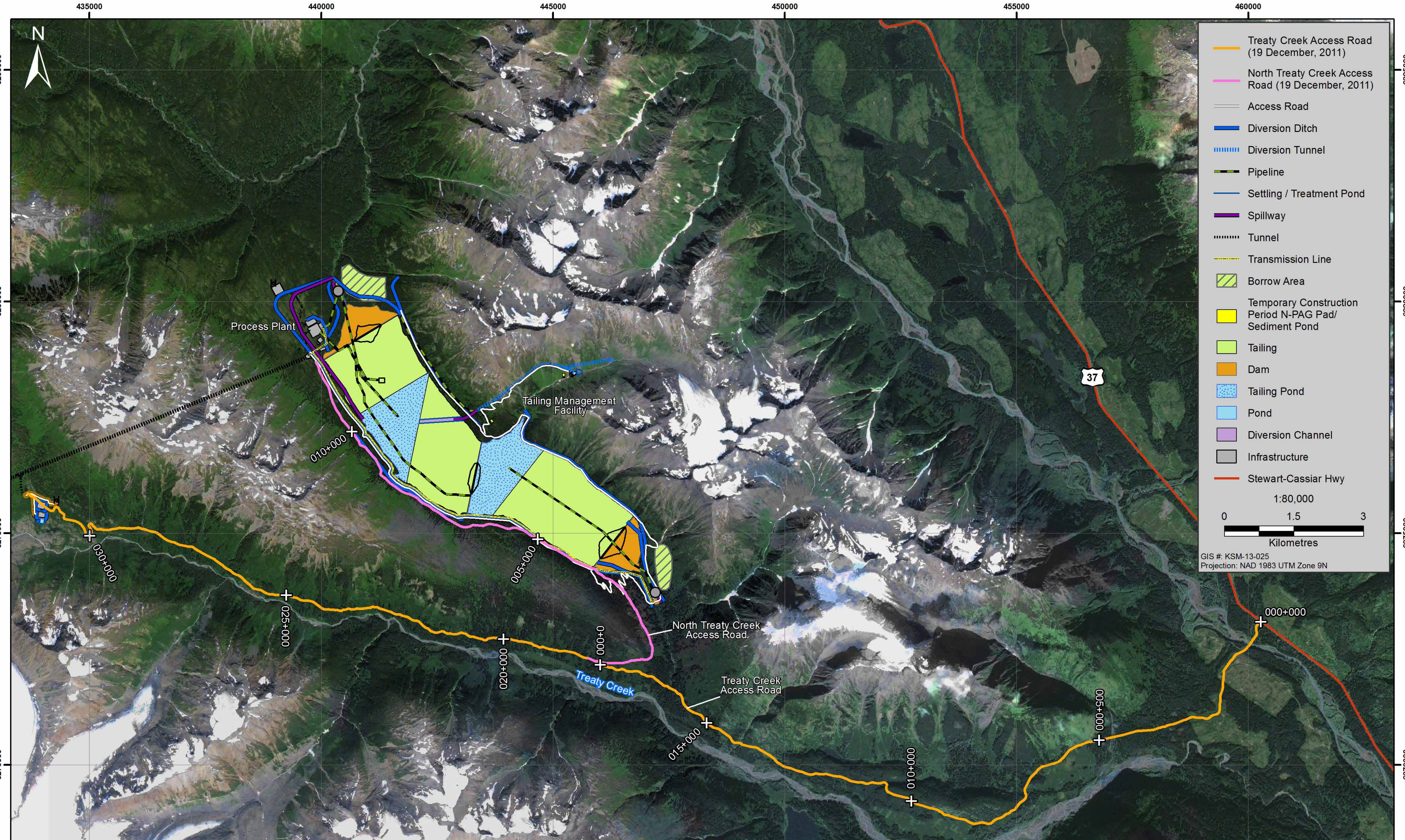

Figure 1.5-2

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General Layout of Proposed Treaty Creek Access Road Alignment

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The access roads will transect mountainous terrain and will cross slopes through dense forests and undergrowth consisting of typical northern Pacific Coast vegetation. The CCAR, TCAR, and NTCAR alignments have been designed by McElhanney Consulting Services for the Seabridge KSM Prefeasibility Study. The following descriptions are taken from the 2012 PFS Update (McElhanney 2011; Tetra Tech Wardrop 2012).

1.5.1 Coulter Creek Access Road

The Coulter Creek Access Road (CCAR) will be primarily a single-lane, radio-controlled road constructed for moving large equipment and supplies to the mine site. An existing road leaves Highway 37, south of Bob Quinn, and extends approximately 59 km southwest to the former Eskay Creek Mine. The first 37 km of this road is classified as a public road but is subject to controlled and shared access. The remaining 22 km of existing road length is private and subject to a shared access agreement. Upgrades to sections of the existing road will be required.

The new 35 km-long CCAR will commence near the former Eskay Creek Mine and follow the west side of the valley south for approximately 21 km before crossing the Unuk River. It then turns east through a series of switchbacks and follows the north side of the Sulphurets Creek valley to the Mitchell Creek valley and mine site.

1.5.2 Treaty Creek Access Road

The Treaty Creek Access Road (TCAR) will consist of a two-lane road, constructed to provide permanent access from Highway 37 to the plant site and east portal of the MTT. This road will leave Highway 37 approximately 19 km south of Bell II, cross the Bell-Irving River, and follow the north side of the Treaty Creek valley for approximately 18 km. It will then turn north and follow the west side of the North Treaty Creek/Teigen Creek valley for approximately 12 km to the plant site, TMF, and east portal of the MTT. Initially the North Treaty Lower Road will be built low in the valley to facilitate access for construction of the north tailing dam, and provide reduced road grades and access road length during the first half of mine life.

Leaving the TCAR at approximately kilometre 18 and heading west, there will be a 15 km-long single-lane, radio-controlled road providing access to the MTT saddle construction access portals. It will be used for construction and will be maintained for service access. Near the end of this road, there is a temporary spur road extending approximately 4 km further to the west. This road will provide access to an additional adit entry point required for construction of the MTT.

1.6 DELIVERABLES

The following deliverables are provided:

- A description of the geology along the proposed road alignments;
- Criteria used to define the ML/ARD potential of geological units that will be exposed, excavated, or disturbed along the proposed KSM Project road alignments; and
- An assessment of ML/ARD potential along the proposed road alignments with the following specific objectives:
  - To determine if any geological units along the proposed Project road alignments are currently leaching metal or generating acid; and
  - To establish if any geological units along the proposed Project road alignments have the potential for ML/ARD if exposed during road construction.

2. Methodology

The criteria for the assessment of the ML/ARD potential of the proposed Project road alignments are described below (Figure 2-1). Stage I uses a ML/ARD potential ranking system that was modified from a ranking system that has been approved for use in previous projects in British Columbia (Rescan 2006). Stage II uses the non-site specific criteria for ML/ARD assessment for projects in British Columbia (Price 1997). Stage III applies the construction planning material excavation volume data for the proposed access road alignments as a qualitative consideration for the ML/ARD assessment. An individual ranking is applied for every road segment of 200 m length.

2.1 STAGE I: DESKTOP STUDY RANKING

Stage I of the ML/ARD potential ranking was based on the findings of a desktop study of relevant publically-available geoscience information. Five rankings from ***None*** to ***Extreme*** were developed and defined as follows:

- None: only regionally-transported unconsolidated surficial overburden materials (e.g., alluvium) that will be excavated from the road alignment sections are assigned this ranking.
- Low: the road alignment sections intersect rock units with either a strong neutralization potential (NP) including limestone or abundant carbonates, or regionally low mineralization (< 0.1% sulphides). Most metal concentrations are within 3× typical crustal abundances.
- Moderate: the road alignment sections intersect a rock unit that may have regionally elevated sulphide mineralization often related to structural features such as fault zones. Most metal concentrations exceed 3× typical crustal abundances.
- High: the road alignment intersects a rock unit hosting a known sulphide-bearing mineral occurrence.
- Extreme: the road alignment is located within 2 km of a known sulphide-bearing deposit with a defined resource.

To assist in screening of the ML/ARD potential reconnaissance level geoscience information was obtained from Provincial, Federal and client sources, and reviewed.

The following is a list of geoscience resources reviewed for the study:

- Geological Survey of Canada (GSC) and British Columbia Geological Survey (BCGS) geological reports accompanied by geological maps summarizing the overall geology, mineralization, and rock types along the proposed road alignments;
- MINFILE mineral occurrences: Provincial database of mineral occurrences in British Columbia used to identify mineral occurrences within 2 km of the proposed road alignments;
- Assessment Report Index System (ARIS): Assessment reports documenting mineral claim exploration and/or mining activities used to identify sulphide mineral occurrences, associated rock types, and mineralization controls;
- Government regional bedrock geochemistry data were applied as a regional screening tool for identification of elevated trace elements in bedrock and associations with rock types; and
- Regional geochemical survey (RGS) for stream water and sediment quality data were applied as a regional screening tool for areas with elevated trace elements and other constituents.

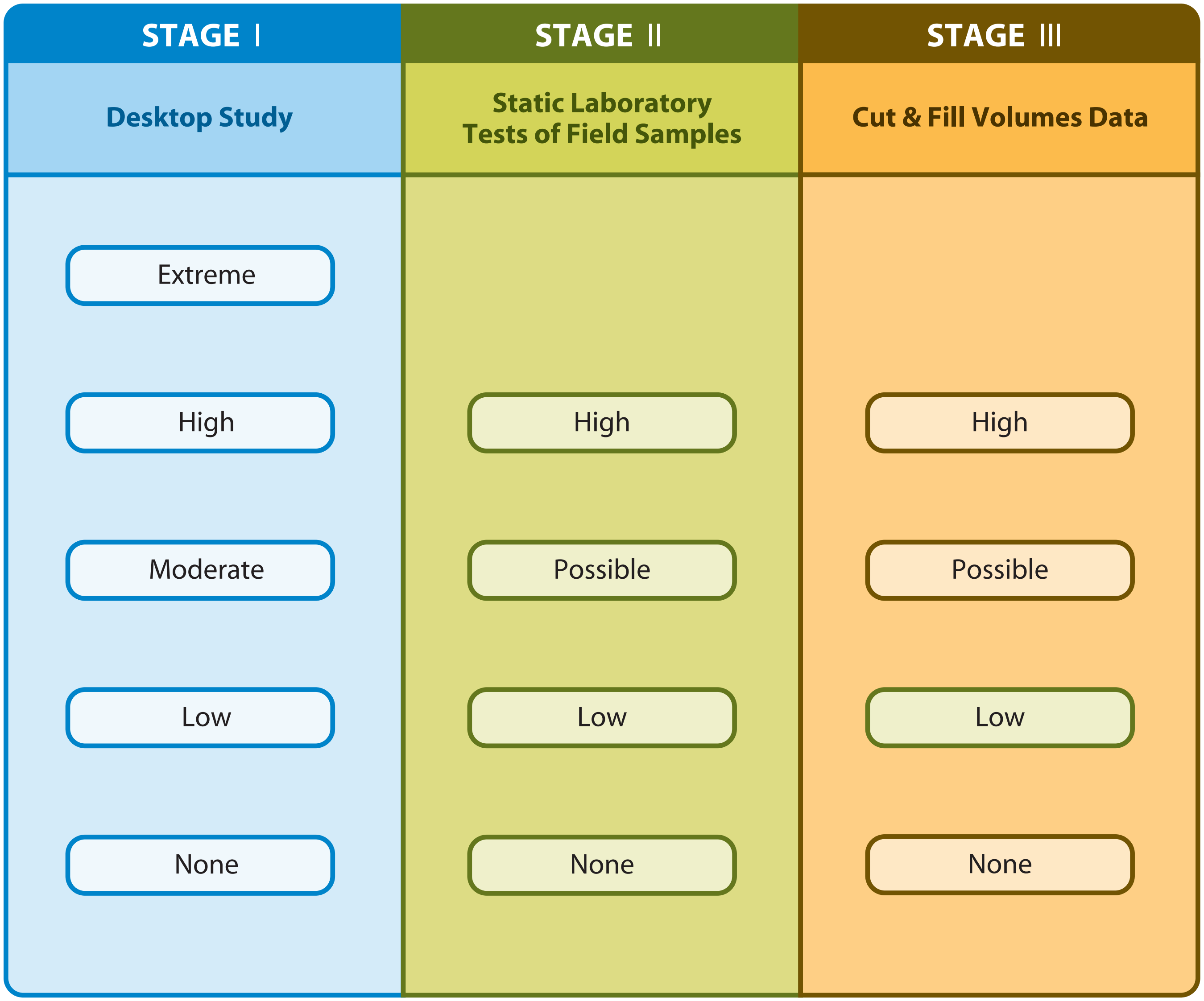

Figure 2-1

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Flowchart for the Stages of Development
of ML/ARD Ranking for the KSM Project

Figure 2-1

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2.1.1 Regional and Local Geology

The description of regional and local geology draws upon the most recent compilation map of the regional geology for the proposed KSM Project, including the road alignments (Alldrick et al. 2006). The compilation map, Open File 2006-2, published at a 1:100,000 scale, covers the south-eastern portion of NTS map sheet 104. Earlier regional mapping reports covering this area were also considered (Alldrick and Britton 1988, 1992; Alldrick, Nelson, and Barresi 2005).

Seabridge obtained a digital geology map (GeoFile 2005-1) containing the regional geological information for the proposed KSM Project Area (Massey et al. 2005).

The geological information was then transferred and compiled with relevant 1:20,000 Terrain Resource Inventory Maps (TRIM) information.

Based on a review of the available regional and local geology, the following rock types were considered for this ML/ARD potential assessment (Table 2.1-1).

Table 2.1-1. Rock Types along the Access Road Alignments

Rock Code (on maps)	Description
Qal	Quaternary: colluvial and alluvial sediments
muJB(RA)	Middle to Upper Jurassic Bowser Lake Group, Ritchie Alger Assemblage: layered marine meta-clastics, with turbiditic features
lmJEr/d	Lower to Middle Jurassic, Upper Hazelton Group, Eskay Rift sequence: meta-volcanics
lmJi	Lower to Middle Jurassic: undifferentiated rocks – predominantly andesite to dacite flows
uTs/v	Upper Triassic Stuhini Group: undifferentiated meta-sediments and meta-volcanics

2.1.2 MINFILE Mineral Occurrences

The BC Ministry of Energy and Mines maintains a provincial database of more than 12,500 metallic, industrial mineral, and coal occurrences in British Columbia (BCMEM 2011b). This database was searched and mineral occurrences in NTS Mapsheets 104B and 104A, which includes the proposed KSM Project area, were extracted. The number of mineral occurrences from each NTS Mapsheet was further reduced by selection of mineral occurrences near the access road alignments.

2.1.3 Assessment Reports

Assessment reports are filed with the provincial government by mineral claim holders as a requirement to keep mineral claims in good standing and provide information on mineral exploration activities that are undertaken to fulfil the requirements. The reports provide information on geology, geophysical and geochemical surveys, drilling, and other exploration activities. These reports remain confidential for a period of one year, after which they are available to the public through the Assessment Report Information System (ARIS; (BCMEM 2011a). This database was searched for the occurrence of mineralization as evidenced by mineral exploration activities in the vicinity of the proposed Project access road alignments.

Filed and publicly available assessment reports for minerals exploration and mining activities that have occurred along and adjacent to the proposed access road alignments were reviewed as appropriate to supplement information from the regional geology maps and MINFILE occurrences, particularly if assessment reports post-dated the most recent regional geological maps or if other field data were lacking.

2.1.4 Provincial Rock Geochemistry Database

In 2005, GEOFILE 2005-14 (Lett and Ronning 2005) was released by BC MEMPR compiling information previously released in various publications from 1985 to 2005. This compilation provides an extensive database of bedrock geochemistry containing approximately 20,000 analyses from locations throughout British Columbia. The database was searched for bedrock chemistry relevant to the proposed KSM Project proposed road alignments. Entries with locations within NTS Mapsheets 104A, 104B09 and 104B10 were extracted and locations within 5 kilometres of a Project road alignment were selected.

Provincial bedrock geochemistry data were compared to typical crustal abundances (Price 1997) for the rock types present along the road alignments (basalt and shale). Elements with concentrations greater than three times the typical crustal abundance are potential elements of interest with respect to metal leaching (ML) potential (Price 2009); however, elevated elements do not necessarily indicate that an adverse environmental effect will occur as element solubility varies with mineral form, weathering conditions, surface area, site precipitation, hydrology and other site-specific factors.

2.1.5 Regional Geochemical Surveys (RGS)

The British Columbia Geological Survey (BCGS) has conducted reconnaissance-scale steam sediment and water surveys across approximately 75% of British Columbia and the data are publicly available. Stream sediment elemental data within the NTS Mapsheets 104A, 104B/9 and 104B/10 were selected to provide a regional screening tool for elevated trace element concentrations near the road alignments. Stream water pH data were examined for evidence of naturally occurring ARD. Antimony, arsenic, barium, cadmium, cobalt, copper, gold, iron, lead, manganese, mercury, molybdenum, nickel, silver, tin, uranium, vanadium, tungsten, zinc were selected from the total dataset as these elements were measured at most of the RGS sampling sites identified within the vicinity of the access road alignments. Sediment element concentrations were compared to the 90th percentile of the RGS dataset for the NTS Mapsheets 104A and 104B to provide an assessment of concentrations elevated above natural background levels along the road alignments. This approach has been used in previous projects in British Columbia (Rescan 2006). Elements with elevated concentrations in stream sediments are potential elements of interest with respect to metal leaching (ML) potential or may indicate naturally occurring ML.

The Iskut River (NTS 104B) regional geochemical survey was completed in 1987 and the resulting field and analytical data were released in 1988. A total of 698 sediment samples were collected from 660 sample sites. Sediment samples were analyzed for loss on ignition (LOI) and up to 52 elements (BCMEM 1988).

The North-western BC (NTS 104A/H) reconnaissance-scale stream sediment and water survey was completed in 2004 and the resulting field and analytical data were released in 2005 (GSC OF 5000 2005). Stream sediment samples were collected in the Bowser Lake (104A) and Spatsizi River (104H) areas of north-western British Columbia. These samples were analyzed for trace metal and other element content. The surveys cover over 18,500 square kilometres of the contiguous Bowser Lake (104A) and Spatsizi River (104H) map sheets. A total of 1,463 stream sediment samples were collected from 1,385 sites at a density of one sample per 13.5 square kilometres. Sediment samples were analyzed for LOI and up to 48 elements (BCMEM 2005).

2.2 STAGE II: FIELD SAMPLE STATIC TEST RESULTS

Reconnaissance level fieldwork was completed in 2009 to 2012 and samples were collected along the proposed access road alignments to inform construction planning and for development of a ML/ARD management plan. Sampling locations were selected based on areas with exposed outcrops and that were in close proximity to the road alignment.

Table 2.2-1 presents the field samples collected categorized by road alignment and rock type.

Table 2.2-1. Outcrop Samples Collected along Access Road Alignments

Rock Type	CCAR	TCAR
Quaternary sediments	3	3
Bowser Lake Group	21	10
Upper Hazelton	7	
Undifferentiated upper to middle Jurassic	13	
Stuhini	4	
Total	**48**	**13**

Bedrock outcrop samples collected during the ML/ARD assessment field work for the CCAR were submitted to ALS Minerals Division of North Vancouver, BC, for static testing.

Static tests included Standard Sobek expanded Acid-base Accounting (ABA) including:

- Measured parameters:
  - fizz test,
  - paste pH,
  - total-sulphur by Leco furnace,
  - sulphide-sulphur by Leco furnace,
  - leachable sulphate-sulphur (both hydrochloric acid and carbonate leach) by Leco furnace,
  - standard-Sobek neutralization potential (NP) by hot acid bath and subsequent titration with sodium hydroxide,
  - total carbon by Leco furnace inorganic carbon by Leco furnace,
  - inorganic carbon dioxide by coulometry.

- Calculated parameters:
  - sulphide-sulphur (calculated by subtracting sulphate-sulphur from total-sulphur),
  - barium-bound sulphate-sulphur (calculated from elemental barium analyses),
  - S-del (the fraction of total sulphur that is analytically unaccounted),
  - total-sulphur acid potential (TAP),
  - sulphide-sulphur acid potential (SAP) based on sulphide-sulphur values plus any unaccounted-for sulphur (S-del),
  - adjusted NP calculated by the difference of the Sobek NP and the estimated unavailable NP,
  - Inorganic NP (by mathematical conversion from inorganic carbon),
  - Total Carbon NP (by mathematical conversion from total carbon),
  - Ca CaNP (calculated from elemental calcium concentrations),
  - CaMg CaNP (calculated from elemental calcium and magnesium concentrations),
  - Total Net Potential Ratio (TNPR),
  - Adjusted TNPR,
  - Sulphide Net Potential Ratio (SNPR),
  - Adjusted SNPR (Adj SNPR).

Bedrock outcrop and stream-crossing sediment samples collected during the ML/ARD assessment field work for the TCAR and NTCAR were submitted to Maxxam Analytics ARD Division of Burnaby, BC, for static testing. The same suite of static tests performed for the CCAR were completed.

The above static tests results and calculated parameters were used to determine the acid generation potential of rock samples in order to infer the ML/ARD potential of the road segment(s) near the sampling sites or with similar geological characteristics. The following conservative screening criteria were used for identifying potentially acid generating (PAG) and not-PAG materials (Table 2.2-2). For road segments where outcrop was not available to sample, the median Adj SNPR value of all samples of the same rock-type was applied. Data from 32 rock samples collected near the tunnel portals were included in this calculation and these data are presented in Appendix 2.2-1.

Table 2.2-2. Non-site Specific Criteria for Classification of Acid Generation Potential

Potential for ARD	Initial Screening Criteria	Comments	ML/ARD Potential Ranking
Likely	Adj SNPR < 1	Likely ARD generating unless sulphide minerals are non-reactive.	High
Possible	1 < Adj SNPR < 2	Possibly ARD generating if NP is insufficiently reactive or is depleted at a faster rate than sulphides.	Possible
Low	2 < Adj SNPR < 4	Not potentially ARD generating unless significant preferential exposure of sulphides along fracture planes, or extremely reactive sulphides in combination with insufficiently reactive NP.	Low
None	Adj SNPR > 4	No further testing required unless materials are to be used as a source of alkalinity.	None

Source: Price (1997)

Solid phase elemental analysis was completed to assess the potential for ML and to determine the elemental composition of the rock samples. The analyses completed were:

- Strong 4-acid digestion followed by ICP-MS analysis for 61 elements;
- XRF (X-ray-fluorescence) whole rock oxide analysis.

Solid-phase analyses are provided in box and whisker plots of the minimum, median, and maximum values for selected elements by bedrock type in Section 3.2. For each bedrock sample, the solid-phase elemental concentrations were compared to three times the crustal abundance for shale or basalt (Price 1997). For Quaternary (Qal) unconsolidated overburden materials, regional geochemistry survey (RGS) stream sediment elemental concentrations (BCMEM 1988, 2005) have been used as a comparison basis for identifying trace elements that occur at elevated concentrations. A conservative calculated threshold of the 90th percentile of the RGS dataset has been used to define elevated concentrations for access road ML/ARD assessment purposes.

2.3 STAGE III: CONSTRUCTION PLANNING

McElhanney Consulting Services Ltd. (McElhanney) supplied construction planning information including estimates of cut and fill-material volumes for the road alignments. The data provided by McElhanney were based on a GPS-supported technical survey of the proposed road alignments and construction planning estimates of rock and overburden cut and fill information.

Stage III uses the construction planning information to qualitatively consider the ML/ARD assessment of each 200 m road segment by applying the construction cut to fill ratios to the conclusions drawn from the static laboratory tests of field samples. Professional judgement was used during this evaluation.

ARD potential rankings from Stage II were lowered by one level (i.e. from possible to low) if the road segment was predominated by fill (> 75%). This re-evaluation was based on the critical assumption that any fill material used during construction will have an ARD potential of none or low. The Stage II ARD potential assessment should be considered the final assessment if the ARD potential of fill materials will be unknown or if fill materials will be derived from an area with an ARD potential of possible or high.

3. Results

3.1 STAGE I: DESKTOP STUDY

3.1.1 Regional Geology

This section presents the regional geology of the proposed road alignments.

3.1.1.1 Coulter Creek Access Road (CCAR)

The regional geology of the proposed CCAR between Tom Mackay Lake and the Unuk River consists of the Middle to Upper Jurassic Bowser Lake Group and the Lower to Middle Jurassic Hazelton Group. The Middle to Upper Jurassic Bowser Lake Group is characterized by marine basin turbidites, black siltstone and fine-grained sandstone, and conglomerate. The Lower to Middle Jurassic Hazelton Group, Salmon Formation is characterized by dark grey, well bedded siltstone and minor sandstone, conglomerate, silty limestone, siliceous siltstone, mafic pillow lava, and intermediate distal tuff.

Near Tom Mackay Lake, the rocks are located along the north to north-northeast trending Unuk River synclinorium. This stratigraphic package occurs in the footwall of the Argillite Creek Fault and Coulter Creek Thrust Fault located approximately 2 kilometres to the east. The north to south parallel orientation of the stratigraphy to the proposed CCAR alignment along this section will result in only a very limited number of lithological units being exposed during road construction.

The regional geology of the proposed CCAR east of the Unuk River is comprised of Triassic Stuhini Group and Lower to Middle Jurassic Hazelton Group, Jack Formation, Betty Creek Formation, and Salmon River Formation. Geologic strata along this eastern leg of the proposed CCAR and east of the Unuk River are folded into the broad north-trending McTagg anticlinorium that exposes Stuhini Group rocks in its core and is flanked by Hazelton Group and Bowser Lake Group strata. This portion of the proposed CCAR road alignment runs perpendicular to the general orientation of the north to south trending stratigraphy, resulting in exposure of a greater number of rock units.

The Stuhini Group consists of a dominantly sedimentary lower division and a dominantly volcanic upper division. The lower sedimentary division is comprised of tuffaceous wacke, argillite, limestone, carbonaceous, calcareous siltstone interbedded with fine grained sandstone and minor conglomerate, and maroon volcanic conglomerate with limestone clasts. The upper division consists of grey, green aphanitic tuff, maroon and green (plagioclase or augite) porphyritic volcanic flow breccias, maroon to green plagioclase and lesser augite phyric lapilli to block tuffs, and associated epiclastics (Logan, Koyanagi, and Drobe 1990).

The Jack Formation consists of immature feldspathic sedimentary rocks, volcanic conglomerate and breccia, granitoid cobble to boulder conglomerate. The Betty Creek Formation is locally composed of three members:

- Unuk River Member: andesitic volcanics and volcaniclastic strata consisting of flow and breccias, lapilli to block tuffs and epiclastic sandstone and wacke;
- Brucejack Lake Member: andesitic to dacitic pyroclastic, epiclastic and flow rocks that stratigraphically overlie or are in part lateral equivalents to the Unuk River Member. At Johns Peak, northeast of the confluence of Sulphurets Creek with the Unuk River, the Brucejack Lake Member consists of water-lain crystal and ash tuffs;

- o Treaty Ridge Member: marine sedimentary rocks overlying the Unuk River and Brucejack Lake members comprised of sandstone, conglomerate, turbiditic siltstone, and limestone.

3.1.1.2 Treaty Creek Access Road (TCAR)

The regional geology of the proposed TCAR consists of Middle Jurassic Bowser Lake Group. The Bowser Lake Group consists of siliciclastic sedimentary rocks that concordantly overlap Hazelton Group strata along the northeast edge of the Eskay Creek Mine area. The Bowser Lake Group is comprised of thin to thick bedded shale, siltstone, wacke, and conglomerate. Unconsolidated Quaternary sediments consisting of colluvium (usually debris on slopes below bedrock outcrop) and alluvium are present in valley bottoms along river channels.

The westernmost section of the proposed TCAR alignment is located immediately north of the contact between Bowser Lake Group and Lower to Middle Jurassic Hazelton Group. Near the terminus of the proposed TCAR near the proposed tunnel portals, Hazelton Group strata are undifferentiated or assigned to the upper Betty Creek and Salmon River formations.

3.1.2 Local Geology

Greater geologic detail is provided for the proposed CCAR below as various stratigraphic units and lithologies intersect the road alignment.

3.1.2.1 Coulter Creek Access Road (CCAR)

Only the meta-sedimentary units of the Middle to Upper Jurassic Ritchie-Alger Assemblage Bowser Lake Group (Alldrick et al. 2006) were encountered for the entire section of the CCAR from the southern end of the Eskay Creek Mine Road to the Unuk River bridge (station 20+200; Alldrick et al. 2006). The Ritchie-Alger Assemblage is stratigraphically the oldest of the Bowser Lake Group and consists of alternating units of sandstone, siltstone, shale and rare conglomerates interlayered with abundant turbidite features. The Lower to Middle Jurassic metavolcanics are identified as part of the Eskay Rift Sequence of the Upper Hazelton Group. They occur parallel to the Unuk River and Coulter Creek and lie unconformably on top of the Bowser Lake Group.

Unconsolidated Quaternary sediments consisting of colluvium (usually debris on slopes below bedrock outcrop) and alluvium are present in valley bottoms along river channels.

Various rock types such as maroon weathering volcanics (conglomerate and breccia, epiclastic, polymictic), undifferentiated basal sedimentary unit comprised of clastic sedimentary rocks — sandstone, siltstone, mudstone and granular to pebble conglomerate, dacite and fragmental tuff and amygdaloidal flows of the Mount Dilworth Formation, and basalt, pillow basalt and mafic tuffs of the Lower to Middle Jurassic Hazelton Group are exposed along the CCAR segment parallel to the Sulphurets Creek canyon.

Rock assemblages of the undivided Upper Triassic Stuhini Group with a steep to intermediate dip angle were encountered along the most eastern and final CCAR sections (east of station 28+400). Acidic (high silica content) and plagioclase enriched metavolcanics were the dominant rock types encountered.

Geological information on the last segment (station 32+400) correlates with the hydrogeological drill holes RES–MW-11, 12, 14, 15 logged by Seabridge Gold Inc. geologists. Rock types consisted predominantly of grey to black carbonaceous shale, siltstone, and wacke containing 1 to 2% disseminated pyrite and quartz-calcite veinlets and veins. Minor volcaniclastics are also present.

Structural Geology

The terrestrial to marine clastic meta-sediments and meta-volcanics of the Bowser Lake Group reflect the depositional environment of a Jurassic back arc basin. This formerly highly active tectonic environment is reflected by large scale folds and thrust faults crosscutting the area near the CCAR. Normal faults can be traced and were observed in the field, such as the Mackay Fault, trending east-west and crossing the proposed CCAR near station 7+800. The Mackay Fault appears as the most prominent large scale normal fault structure. A sequence of anticlines and synclines with amplitudes of several hundred metres and north dipping fold axis form the north-south trending ridges and valleys. The Sulphurets Creek canyon with its steeply rising cliffs allows a detailed insight into the structural geology along the eastern portion of the proposed CCAR.

Small scale faults of outcrop scale were observed along the entire proposed CCAR, in particular along the Sulphurets Creek canyon. However, this is most likely primarily related to orientation of the Sulphurets Creek canyon perpendicular to the regional strike direction of the strata. Weakly mineralized narrow faults often cross cut the strata at shallow to steep angles. Because of the very localized extent of these weakly mineralized faults, the potential ARD will be limited.

3.1.3 MINFILE Occurrences

Figure 3.1-1 presents the locations of geoscience data used for this study.

3.1.3.1 Coulter Creek Access Road (CCAR)

A search of the MINFILE database identified 29 mineral occurrence records distributed along the entire length of the CCAR alignment. Twenty-six MINFILE occurrences are sulphide-bearing occurrences, one is an asbestos occurrence, and two are placer gold occurrences. Two occurrences are past producers: the Eskay Creek Mine located near the start of the proposed CCAR, and the Sulphurets Creek placer occurrence located near the end of the proposed CCAR. The remainder of the occurrences are showings or prospects. Sulphide-bearing mineral occurrences include massive sulphide type occurrences (104B 007 Copper King, 104B 008 Eskay Creek, 104B 010 Bench, 104B 011 Cumberland, 104B 125 Chris, 104B 230 Iliad, 104B 234 Mandy Glacier, 104B 385 Corey, 104B 387 HSOV, and 104B 390 Mack-GNC). The remainder of the sulphide-bearing mineral occurrences are vein, disseminated, stocks or unknown.

Sulphide minerals identified in one or more of these sulphide-bearing mineral occurrences include: pyrite, pyrrhotite, marcasite, chalcopyrite, arsenopyrite, sphalerite, galena, and tetrahedrite. Carbonate minerals calcite, dolomite, siderite and ankerite are mentioned in five of the 26 sulphide-bearing mineral occurrences. Siderite is a net neutralizing carbonate under oxygenated conditions, and dolomite, siderite and ankerite are less reactive than calcite in neutralization of acidity generated from sulphide oxidation.

Based on the type, proximity, and abundance of MINFILE occurrences along the proposed CCAR alignment, the likelihood of encountering sulphide mineralization in excavated bedrock is moderate to high.

A list of MINFILE occurrences located near of the proposed CCAR alignment is provided in Table 3.1-1 and further description is presented in Appendix 3.1-1.

3.1.3.2 Treaty Creek Access Road (TCAR)

A search of the MINFILE database identified one mineral occurrence record near the proposed TCAR (Table 3.1-2; Appendix 3.1-1). The occurrence is located on the north side of Treaty Creek to the south-east of the confluence with the North Treaty Tributary. The status of the occurrence is showing, indicating potential economic mineralization. No minerals are identified.

Table 3.1-1. MINFILE Occurrences near the Coulter Creek Access Road Alignment

	MINFILE #	Name	Status
1	104B 007	COPPER KING	Showing
2	104B 008	ESKAY CREEK	Past Producer
3	104B 010	BENCH	Showing
4	104B 011	CUMBERLAND (L.265)	Prospect
5	104B 020	SULPHURETS CREEK	Past Producer
6	104B 083	UNUK (ZONE 1)	Showing
7	104B 072	UNUK RIVER (AP)	Prospect
8	104B 080	HARRYMEL CREEK	Showing
9	104B 081	UNUK (ZONE 4)	Showing
10	104B 085	BARB LAKE	Showing
11	104B 119	HARRYMEL CREEK SOUTH	Showing
12	104B 125	CHRIS	Showing
13	104B 173	IRON CAP GOLD (SULPHURETS)	Prospect
14	104B 175	UNUK (ZONE 3)	Showing
15	104B 226	NORTH FORK	Showing
16	104B 227	SULPHIDE CK. PLACER	Showing
17	104B 233	GFJ	Prospect
18	104B 230	ILIAD	Showing
19	104B 232	TET	Showing
20	104B 234	MANDY GLACIER	Showing
21	104B 240	C-10 (COREY)	Prospect
29	104B 354	TM	Showing
22	104B 355	COREY 34	Showing
23	104B 376	SIB	Prospect
24	104B 383	ESKAY (CANAMERA)	Showing
25	104B 385	COREY (T.V.)	Prospect
26	104B 387	HSOV	Prospect
27	104B 390	MM	Showing

Table 3.1-2. MINFILE Occurrences near the Treaty Creek Access Road

	MINFILE #	Name	Status
1	104A 004	Treaty Creek	Showing

Based on the low abundance of MINFILE occurrences along the proposed TCAR alignment, the likelihood of encountering sulphide mineralization in excavated bedrock is low.

3.1.4 Assessment Reports

Mining activities and/or mineral exploration were identified in the vicinity of the proposed access road alignments through 40 assessment reports near the CCAR and three assessment reports near the TCAR. Appendix 3.1-2 lists all assessment reports filed near the two access road alignments. Table 3.1-3 identifies the number and location of the reports and the likelihood of encountering sulphide mineralization based on the number and abundance of the ARIS reports.

Table 3.1-3. Assessment Reports along Access Road Alignments

Road Alignment	Number of Assessment Reports	Predominant Location	Likelihood of Encountering Sulphide Mineralization
CCAR	40	Kilometres 0-10 Kilometres 24-35	Moderate
TCAR	3	Kilometre 0	Low

3.1.5 British Columbia Rock Geochemistry Database

Six bedrock geochemistry samples were located within five kilometres of the CCAR. Table 3.1-4 provides a summary of these rock geochemistry sample results. The concentrations of gold, silver, arsenic, barium, bismuth, copper, mercury, molybdenum, lead, antimony and zinc were compared to three times average crustal abundances for basalt and shale (Price 1997). Silver, arsenic, copper, lead, and zinc exceeded three times average crustal abundances in three or more samples. The rock geochemistry data indicate that these elements have a potential for ML during weathering that is highly dependent on mineral phases, mineral reactivity, and other site-specific factors.

Table 3.1-4. Provincial Rock Geochemistry: Elements with Elevated Concentrations along the CCAR

Km	Gold ppb	Silver ppm	Arsenic ppm	Barium ppm	Bismuth ppm	Copper ppm	Mercury ppb	Molybdenum ppm	Lead ppm	Antimony ppm	Zinc ppm
0-1	4,300	165	230		5	6,400	107	12	16,700	6,300	35,000
0-1	3,170	65	320		< 5	335	65	< 8	41,800	235	60,000
3-4	80	3	1,300	2,200	< 5	75	720	< 8	77	< 30	186
5	60	1	216		< 5	14	90	< 8	18	< 30	73
6-7	2,760	8	1,500	4,600	< 5	180	2,600	< 8	223	< 30	6,800
8	140	2	1,000	1,700	< 5	8	120	< 8	75	< 30	174

Note: highlighted cells exceed three times the average crustal abundance for basalt and/or shale.

The GEOFILE 2005-14 bedrock geochemistry database did not include samples in the area of the TCAR.

The locations and sample identifications for the rock geochemistry data can be found in Appendix 3.1-3.

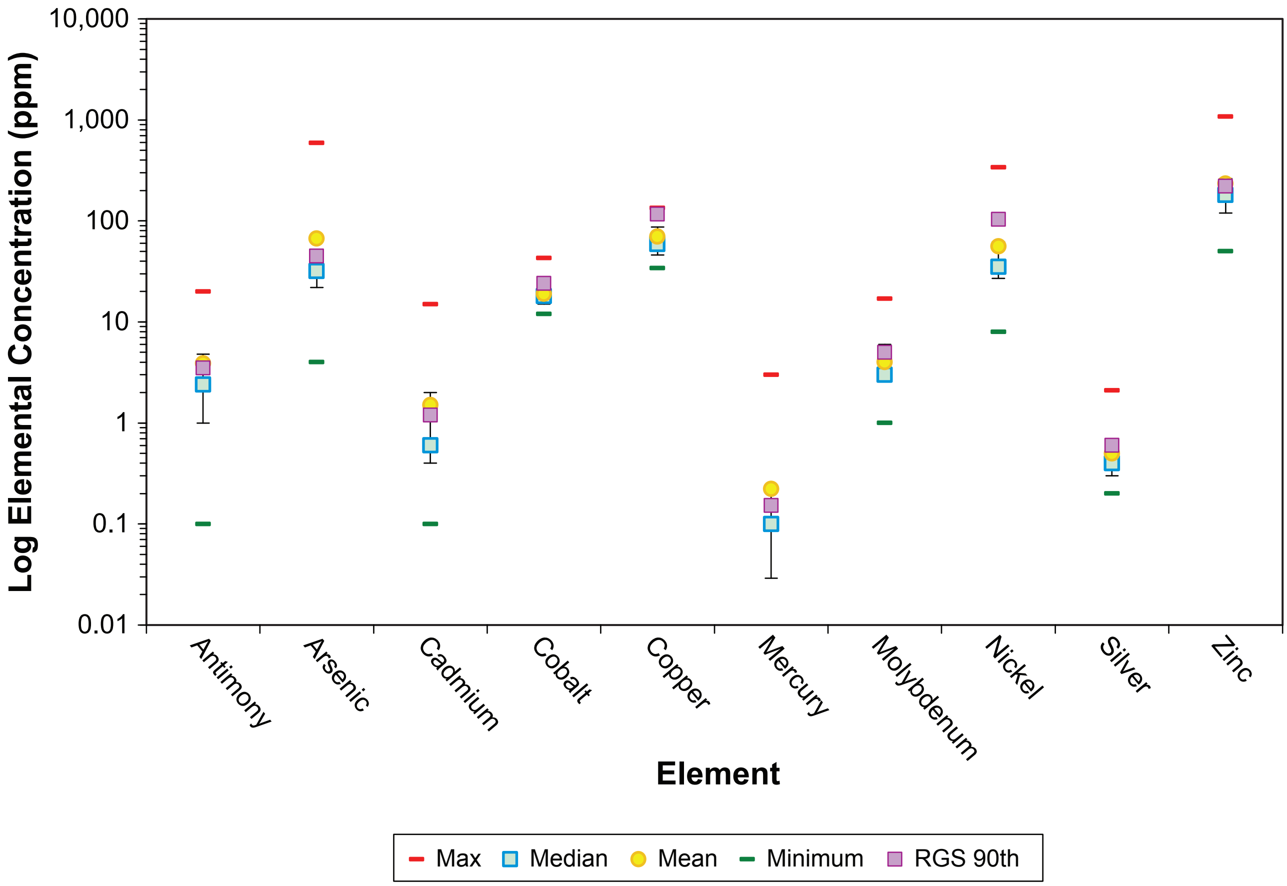
3.1.6 Regional Geochemical Surveys

3.1.6.1 Coulter Creek Access Road (CCAR)

Forty-one sediment samples were collected under the RGS program along the proposed CCAR alignment. Summary statistics for elements where greater than one-third of samples exceeded the 90th percentile of the RGS dataset are presented in Figure 3.1-2 and the complete data is presented in Appendix 3.1-4.

The pH values of stream water samples near the proposed CCAR were typically near-neutral with the exception of three samples that ranged from pH 6.1 to 6.4.

More than one-third of the samples exceeded the 90th percentile of the RGS dataset for antimony, arsenic, cadmium, mercury, and zinc indicating that these parameters are naturally elevated in samples along the proposed CCAR. The sediment elemental concentrations corroborated predictions from the bedrock geochemistry of potential elevated concentrations for arsenic, copper, and zinc.



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Elemental Concentrations of Stream Sediments along the Coulter Creek Access Road

Figure 3.1-2

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3.1.6.2 Treaty Creek Access Road (TCAR)

Twenty-five stream sediment samples were collected under the RGS program along the proposed TCAR. Summary statistics for elements where greater than one-third of samples exceeded the 90th percentile of the RGS dataset are presented in Figure 3.1-3 and the complete data are presented in Appendix 3.1-4.

The pH values of stream water samples near the proposed TCAR were near-neutral to weakly alkaline, ranging from 7.0 to 8.3. Five stream samples had pH values less than the 10th percentile of the RGS dataset. This result indicates that acid rock drainage is not currently adversely affecting streams at the sample areas.

Greater than one-third of samples exceeded the 90th percentile of the RGS dataset for cobalt and nickel indicating that these parameters are naturally elevated in samples along the proposed TCAR.

3.1.7 Stage I ML/ARD Potential Assessment

Based on the publicly available geological and geochemical data near the proposed access road alignments, ML/ARD rankings have been applied (Table 3.1-5). The rankings indicate that the proposed CCAR has moderate ML/ARD potential whereas the proposed TCAR has low ML/ARD potential.

Table 3.1-5. Stage I ML/ARD Potential Rankings

Road Alignment	ML/ARD Potential
CCAR	Moderate
TCAR	Low

Subsequent ML/ARD assessment relied on field sampling which provides site-specific data for the road alignments. These data have been given more significance in the final rankings.

3.2 STAGE II: FIELD SAMPLING AND STATIC TESTING

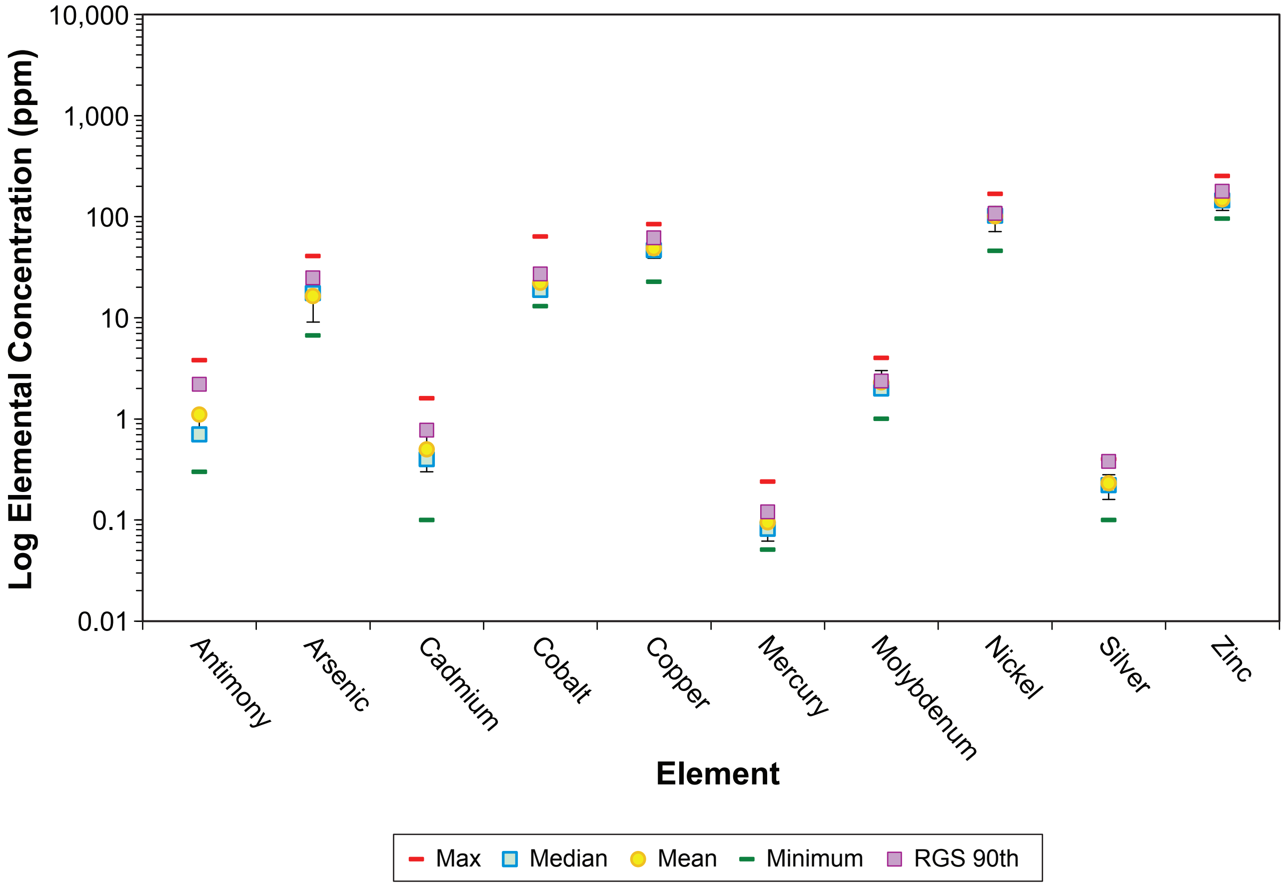
Field samples of bedrock outcrop and stream channel sediments were collected from all four access road alignments: 48 samples along the CCAR and thirteen samples along the TCAR. The complete static test dataset is provided in Appendix 3.2-1 and 3.2-2.

3.2.1 Acid Generation Potential

3.2.1.1 Coulter Creek Access Road (CCAR) Results

Paste pH

The paste pH values of the CCAR bedrock samples varied from a minimum of 5.0 to a maximum of 9.0, with a mean of 7.6. Four of the 48 samples had a paste pH less than 6.0 at the time of testing, indicating that these samples were already acid generating. These four samples were Bowser Lake Group collected along the northern section of the CCAR.



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Elemental Concentrations of Stream Sediments along the Treaty Creek Access Road

Figure 3.1-3

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Sulphur Species

The total sulphur content of the 48 samples collected ranged from a minimum of 0.01% to a maximum of 1.38% with a mean of 0.22%. The sulphide-sulphur content of the 48 samples collected ranged from a minimum of 0.01% to a maximum of 1.15% with a mean of 0.16%. There is a strong correlation between the sulphide-sulphur and total sulphur values, as shown in Figure 3.2-1. The results show that the total sulphur is composed predominantly of sulphide-sulphur; however, a lesser amount of sulphate-sulphur is also present indicating moderate oxidation of the sulphide-sulphur in the samples. This trend is slightly more pronounced in the Bowser Lake Group samples, which included the samples with paste pH values less than 6.0. The sulphate-sulphur content of the CCAR samples ranged from a minimum of 0.01% to a maximum of 0.27% with a mean of 0.03%. Two of the four Bowser Lake Group samples that had paste pH values less than 6.0, also had the highest sulphate-sulphur values which may indicate a greater extent of oxidation. The sulphide-sulphur values have been used for subsequent acid potential and net potential ratio calculations (MEND 2000).

Neutralization Potential

The Neutralization Potential (NP) determined using the Sobek method is an estimate of the total or bulk neutralization potential of a sample material including carbonate and non-carbonate (i.e., alumino-silicate) mineral sources. The NP of the 48 samples was highly variable, ranging from a minimum of 1 kg $CaCO_3$/t to a maximum of 781 kg $CaCO_3$/t with a mean of 53 kg $CaCO_3$/t. The unavailable NP was estimated to be 3 kg $CaCO_3$/t based on the NP of samples with paste pH values less than 6.0. The most conservative unavailable NP value was used for subsequent net potential ratio calculations rather than assessing unavailable NP for the various rock types present along the CCAR alignment. The relationship between paste pH and NP that was used for these calculations is shown in Figure 3.2-2. The calculated unavailable NP was subtracted from the measured NP to calculate the Adjusted NP.

Analysis of the inorganic carbon content of a sample provides an estimate of the amount of NP from carbonate minerals. The relationship between the Inorganic Carbon Neutralization Potential and the Adjusted NP for the CCAR is shown in Figure 3.2-3. The results show a strong correlation between the Inorganic Carbon Neutralization Potential and the Adjusted Sobek Neutralization Potential and indicate that the predominant source of neutralization potential is from carbonate minerals. The inorganic carbon NP values ranged from a minimum of 2 kg $CaCO_3$/t to a maximum of 751 kg $CaCO_3$/t with a mean of 43 kg $CaCO_3$/t. The results also show that the lowest carbonate content and NP occur in the Quaternary sediments. Intermediate and variable carbonate content and NP occurs in the Bowser Lake Group and undifferentiated Lower to Middle Jurassic rocks and the highest carbonate content and NP occurs in the Upper Hazelton and Stuhini Group. The majority of samples have an Inorganic Carbon NP and NP of 50 kg $CaCO_3$/t or less.

Sulphide Net Potential Ratio

The Net Potential Ratio (NPR) was calculated from the ratio of the Adjusted Neutralization Potential (Adj NP) and the Sulphide Acid Potential (SAP), referred to as the Adjusted Sulphide Net Potential Ratio (Adj SNPR). The Adj SNPR values of the 48 samples collected ranged from a minimum of 0 to a maximum of 686 with a mean of 30.

Based on the application of the acid generation potential criteria (Table 2.2-1):

- **Adj SNPR ≤ 1**
  14 of 48 samples including nine Bowser Lake Group samples, three undifferentiated Lower to Middle Jurassic rocks samples, and two Upper Hazelton samples are classified as Potentially Acid Generating (PAG) with a high ML/ARD potential.

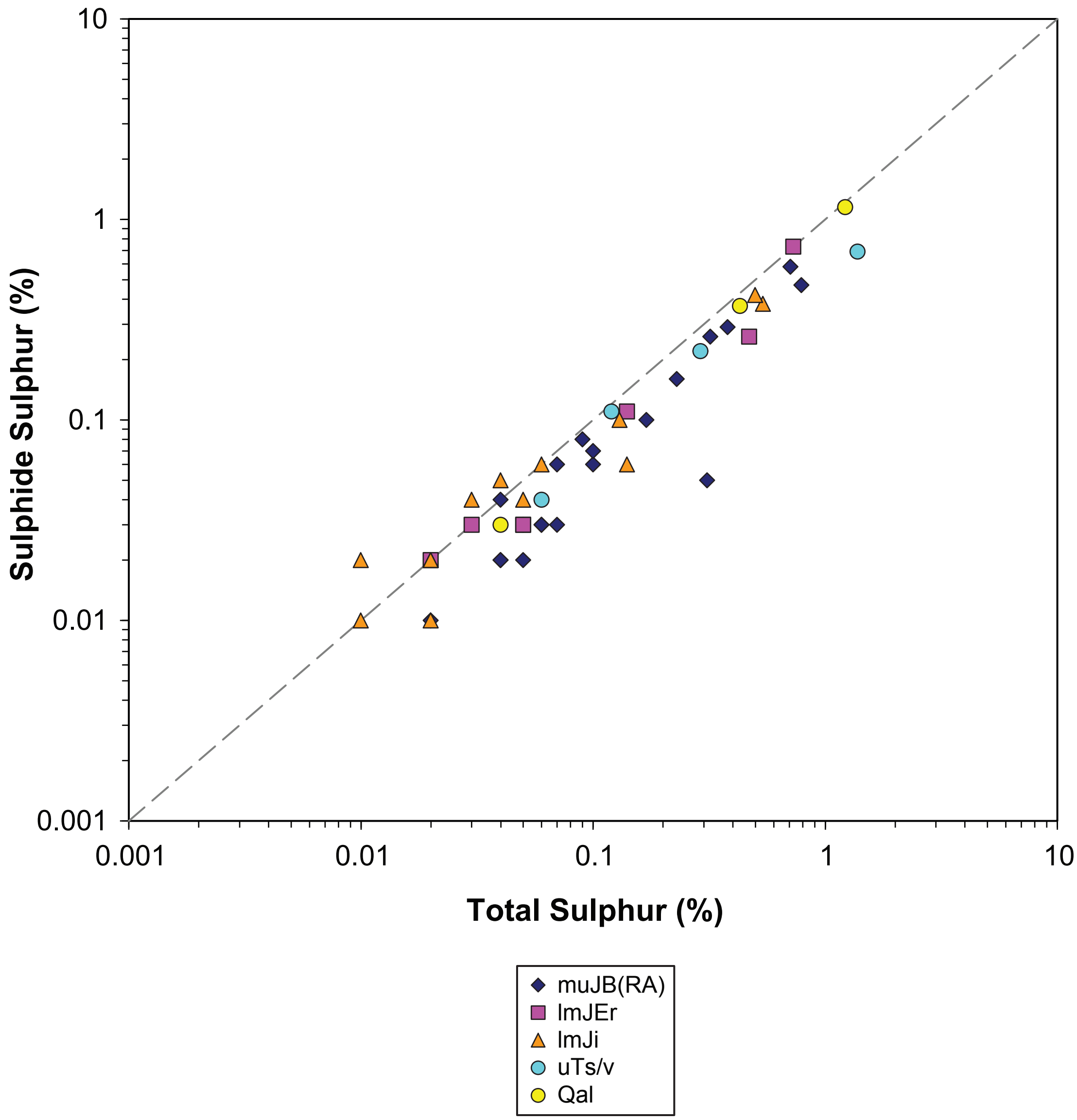

Figure 3.2-1

CCAR Sulphide Sulphur versus Total Sulphur

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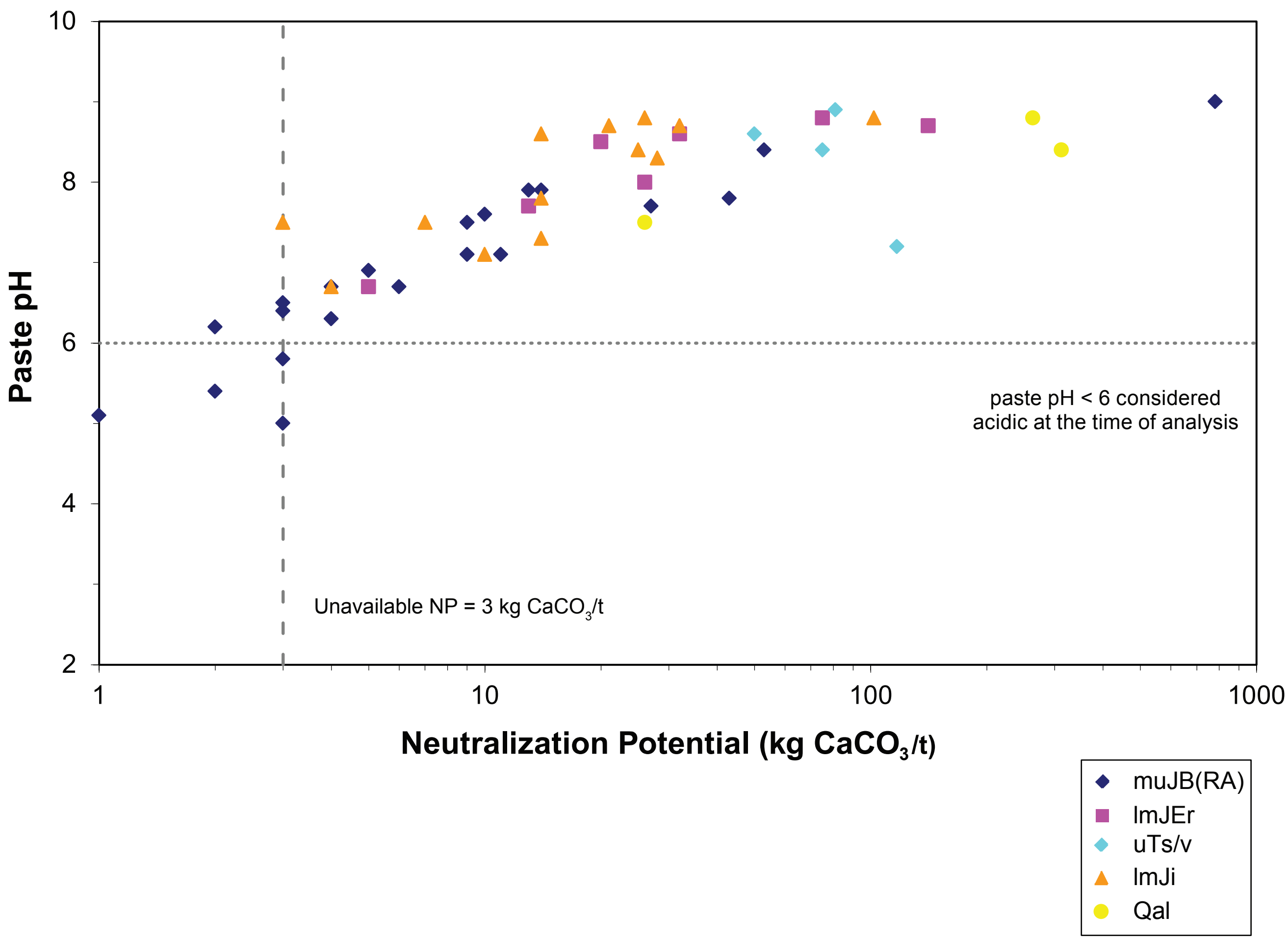
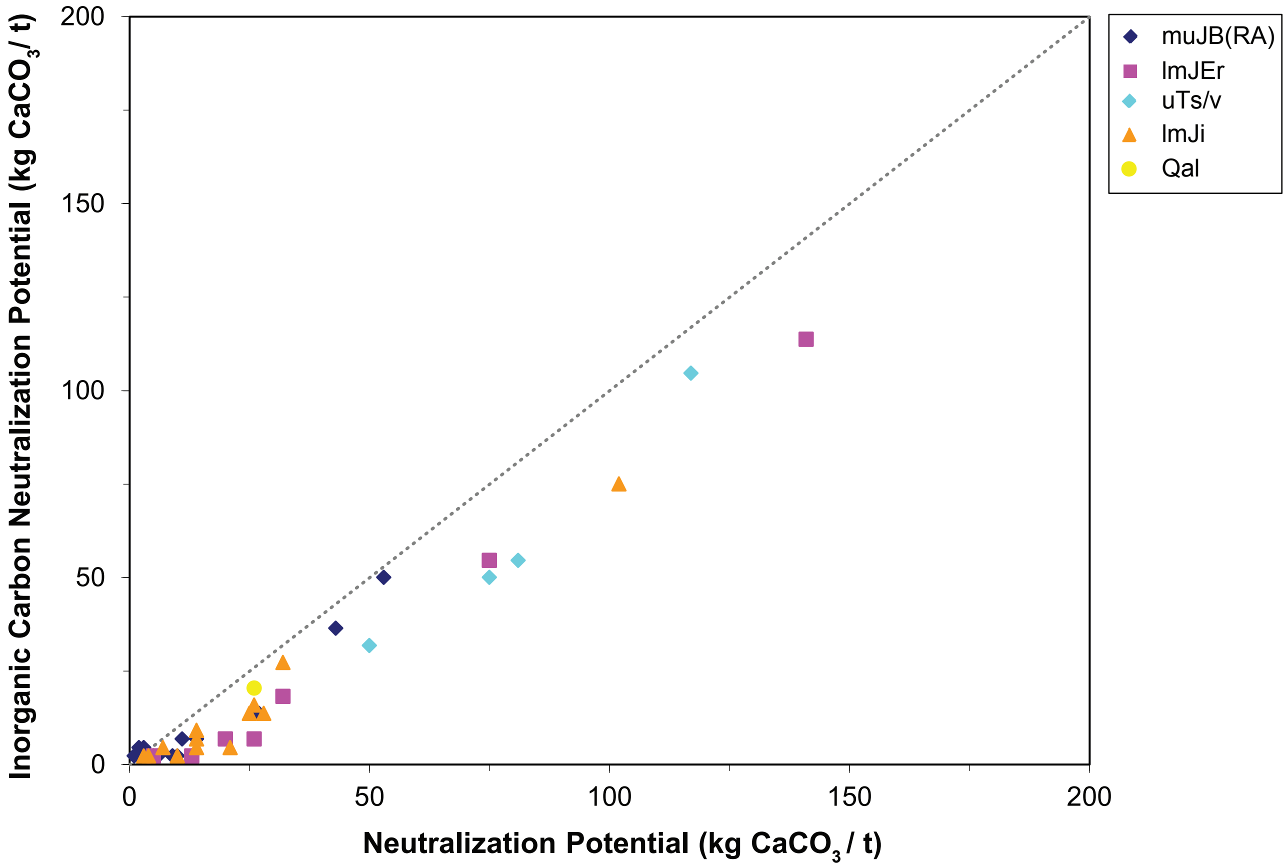


Figure 3.2-2

CCAR Paste pH versus Neutralization Potential



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CCAR Inorganic Carbon Neutralization Potential versus Sobek Neutralization Potential

Figure 3.2-3

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- **1 < Adj SNPR ≤ 2**
  5 of 48 samples including four Bowser Lake Group samples and one undifferentiated Lower to Middle Jurassic rocks sample are classified as PAG but with potentially longer lag times to acid generation. The ML/ARD potential of road segments near these samples is classified as possible.
- **2 < Adj SNPR ≤ 4**
  4 of 48 samples including two Bowser Lake Group samples, one undifferentiated Lower to Middle Jurassic rocks sample, and one Stuhini Group sample are classified as PAG according to these conservative criteria, but may never become acid-generating depending on the reactivity of the sulphide and carbonate minerals. The ML/ARD potential of road segments near these samples is classified as low.
- **Adj SNPR > 4**
  25 of 48 samples including six Bowser Lake Group samples, eight undifferentiated Lower to Middle Jurassic rocks samples, five Upper Hazelton Group samples, three Stuhini Group samples, and three Quaternary sediments samples are classified as not-Potentially Acid Generating (not-PAG) with an ML/ARD potential ranking of none.

The relationship between paste pH and the Adj SNPR values is shown in Figure 3.2-4. Overall, there is a general trend of increasing paste pH with increasing Adj SNPR values indicating greater available NP. As noted above, the Bowser Lake Group samples had the highest variability and the highest number of samples with Adj SNPR values less than 1, including four samples considered to already be acid generating. The undifferentiated Lower to Middle Jurassic rocks samples also had high degree of variability but fewer samples below an Adj SNPR of 1. The Upper Hazelton Group and quaternary sediments also had one sample each with an Adj SNPR less than 1 but not yet acid generating at the time of testing.

The relationship between NP and the Adj SNPR values is shown in Figure 3.2-5. Overall, there is general correlation of increasing NP with increasing Adj SNPR values. The results show that samples with Adj SNPR values greater than 4 have NP values of 9.0 kg $CaCO_3$/t or higher. However, for samples with Adj SNPR values less than 2, the NP values range from a minimum of 1 kg $CaCO_3$/t to a maximum of 26 kg $CaCO_3$/t. This result indicates that it would be operationally difficult to separate PAG from not-PAG material on the basis of NP.

<u>Summary</u>

The total sulphur of the bedrock and overburden samples is predominantly sulphide-sulphur. The NP is variable across samples, but is largely carbonate-based. Four bedrock samples collected along the CCAR are already acid generating with a paste pH less than 6.0. Road segments near these samples will be assessed with a high ML/ARD potential. Forty-eight percent of the bedrock samples are classified as PAG, with a low to high ML/ARD potential, based on the Adj SNPR. Thirteen of 19 samples with an Adj SNPR < 2 (PAG) are from the Bowser Lake Group.

3.2.1.2 Treaty Creek Access Road (TCAR)

<u>Paste pH</u>

The paste pH values of the 13 TCAR bedrock samples were near-neutral to alkaline and varied from a minimum of 6.6 to a maximum of 9.3 with a mean of 8.1. None of the samples had a paste pH less than 6.0 at the time of testing.

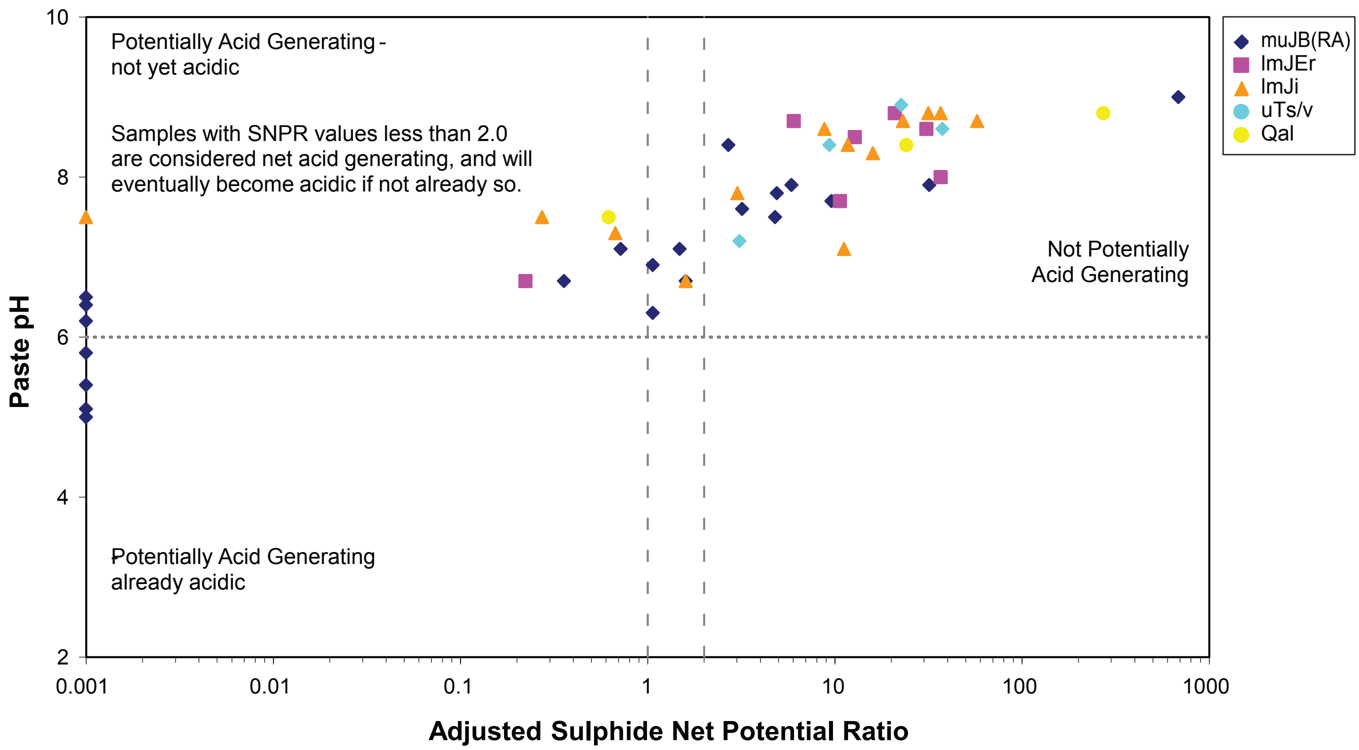

Figure 3.2-4

CCAR Paste pH versus Adjusted Sulphide Net Potential Ratio

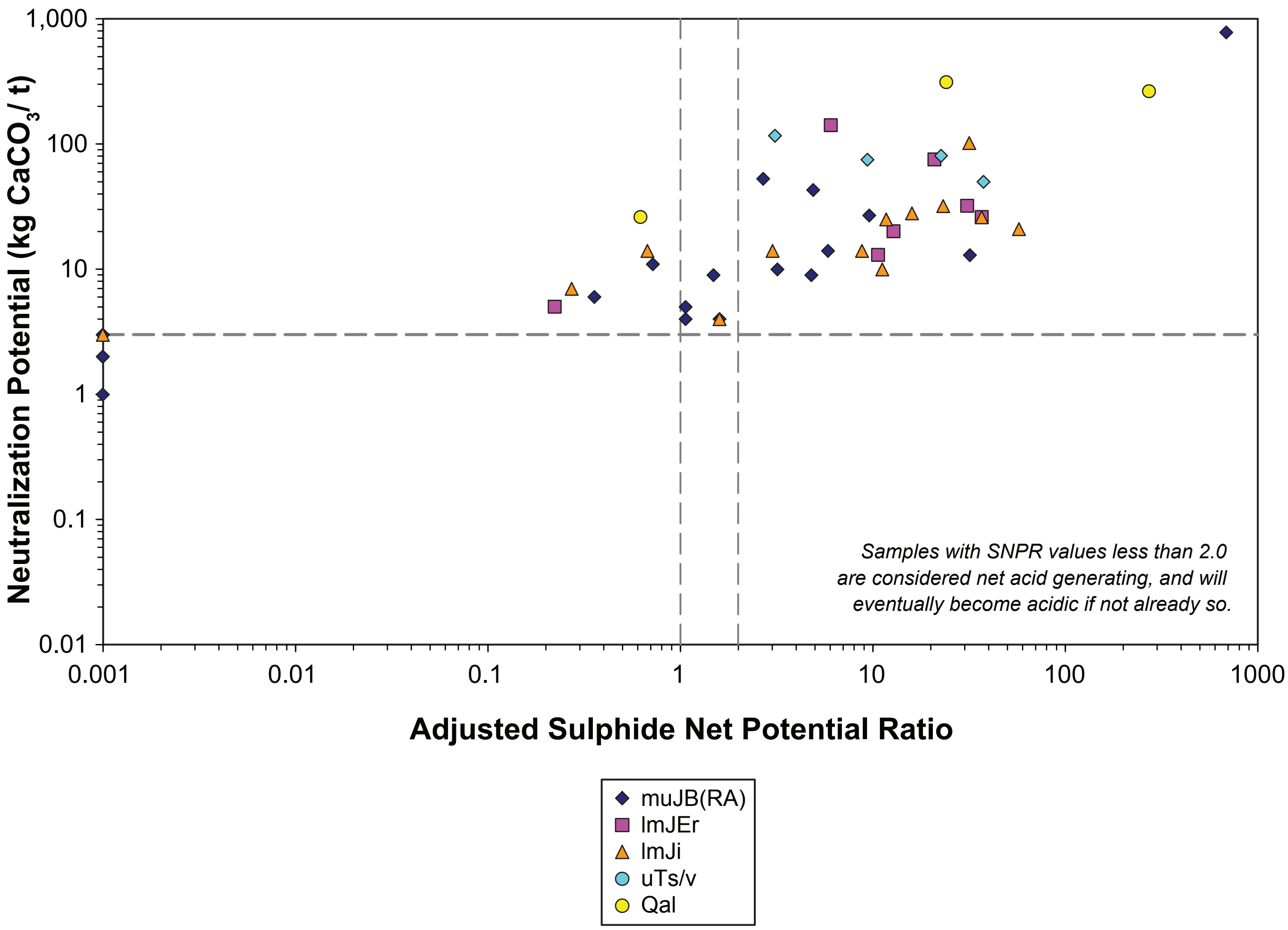

Figure 3.2-5

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CCAR Neutralization Potential versus Adjusted Sulphide Net Potential Ratio

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Sulphur Species

The total sulphur content of the 13 samples collected ranged from a minimum of 0.04% to a maximum of 0.33% with a mean of 0.15%. The sulphide-sulphur content of the 13 samples collected ranged from a minimum of 0.04% to a maximum of 0.31% with a mean of 0.13%. The relationship between the sulphide-sulphur and total sulphur contents is shown in Figure 3.2-6. There is a very strong correlation between the sulphide-sulphur and total sulphur values. The results show that the total sulphur is composed predominantly of sulphide-sulphur. The sulphide-sulphur values have been used instead of total sulphur values for subsequent acid potential and net potential ratio calculations.

Neutralization Potential

The Neutralization Potential (NP) of the 13 samples collected ranged from a minimum of 8.6 kg $CaCO_3$/t to a maximum of 359 kg $CaCO_3$/t with a mean of 76 kg $CaCO_3$/t. The unavailable NP was estimated to be 0 kg $CaCO_3$/t because there were no samples with paste pH values less than 6.0. The relationship between paste pH and NP is shown in Figure 3.2-7.

The relationship between the Inorganic Carbon Neutralization Potential and the Adjusted Sobek Neutralization Potential is shown in Figure 3.2-8. The results show a weak correlation between the Inorganic Carbon Neutralization Potential and the Adjusted Sobek Neutralization Potential above 50 kg $CaCO_3$/t, indicating that both carbonate and non-carbonate minerals (e.g., alumino-silicates) contribute to NP. This result suggests that an unavailable NP of 0 kg $CaCO_3$/t may overestimate the available NP due to the presence of alumino-silicate NP. The inorganic carbon NP values ranged from a minimum of 0.2 kg $CaCO_3$/t to a maximum of 374 kg $CaCO_3$/t with a mean of 45 kg $CaCO_3$/t.

Sulphide Net Potential Ratio

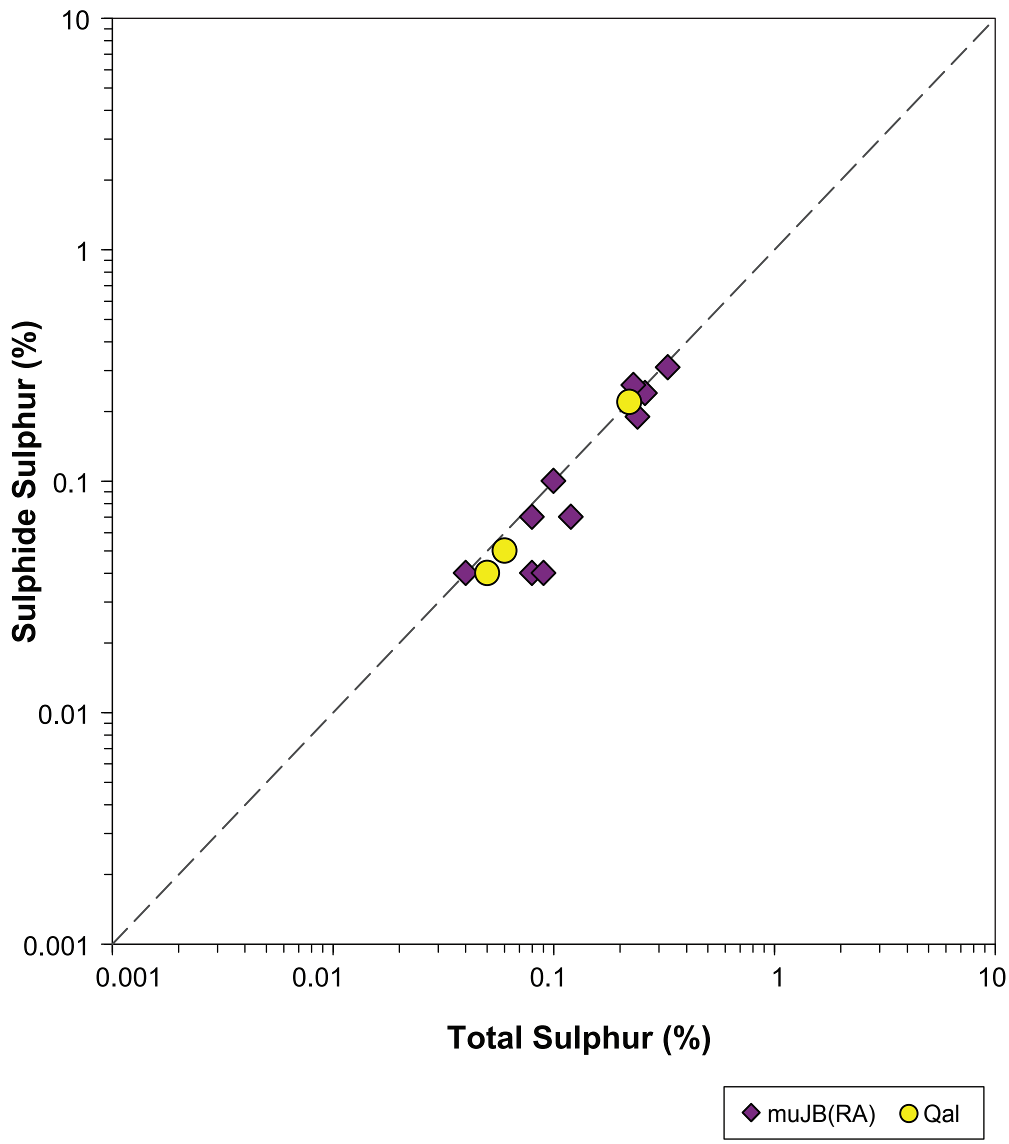
The Adj SNPR values of the 13 TCAR samples collected ranged from a minimum of 0.97 to a maximum of 121 with a mean of 25.9.

Based on the application of the BC non-site specific criteria:

- **Adj SNPR ≤ 1**
  One Bowser Lake Group sample is classified as PAG with a high ML/ARD potential.
- **1 < Adj SNPR ≤ 2**
  No TCAR samples fall within this category.
- **2 < Adj SNPR ≤ 4**
  One Bowser Lake Group sample is classified as PAG according to these conservative criteria, but may never become acid-generating depending on the reactivity of the sulphide and carbonate minerals. The ML/ARD potential of road segments near this sample is classified as low.
- **Adj SNPR > 4**
  Eight Bowser Lake Group samples and three Quaternary sediments samples are classified as not-PAG with an ML/ARD potential of none.

The relationship between paste pH and the Adj SNPR values is shown in Figure 3.2-9. Overall, there is general correlation of increasing paste pH with increasing Adj SNPR values indicating greater available NP.

The relationship between NP and the Adj SNPR values is shown in Figure 3.2-10. Overall, there is general correlation of increasing NP with increasing Adj SNPR values. The NP of the TCAR sample with an Adj SNPR value less than 1 is 9.4 kg $CaCO_3$/t.



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TCAR Sulphide-Sulphur versus Total Sulphur

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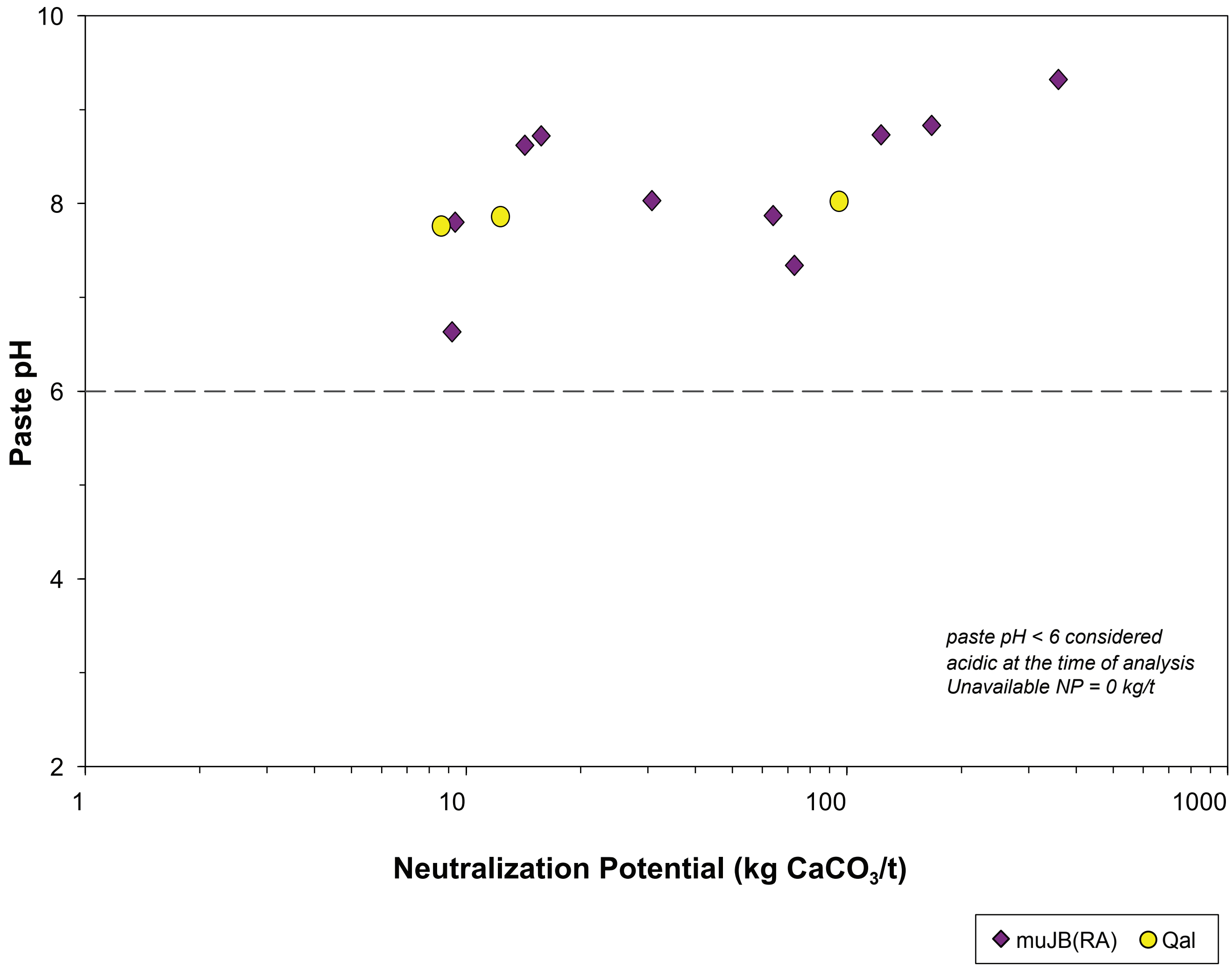

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TCAR Paste pH versus Neutralization Potential

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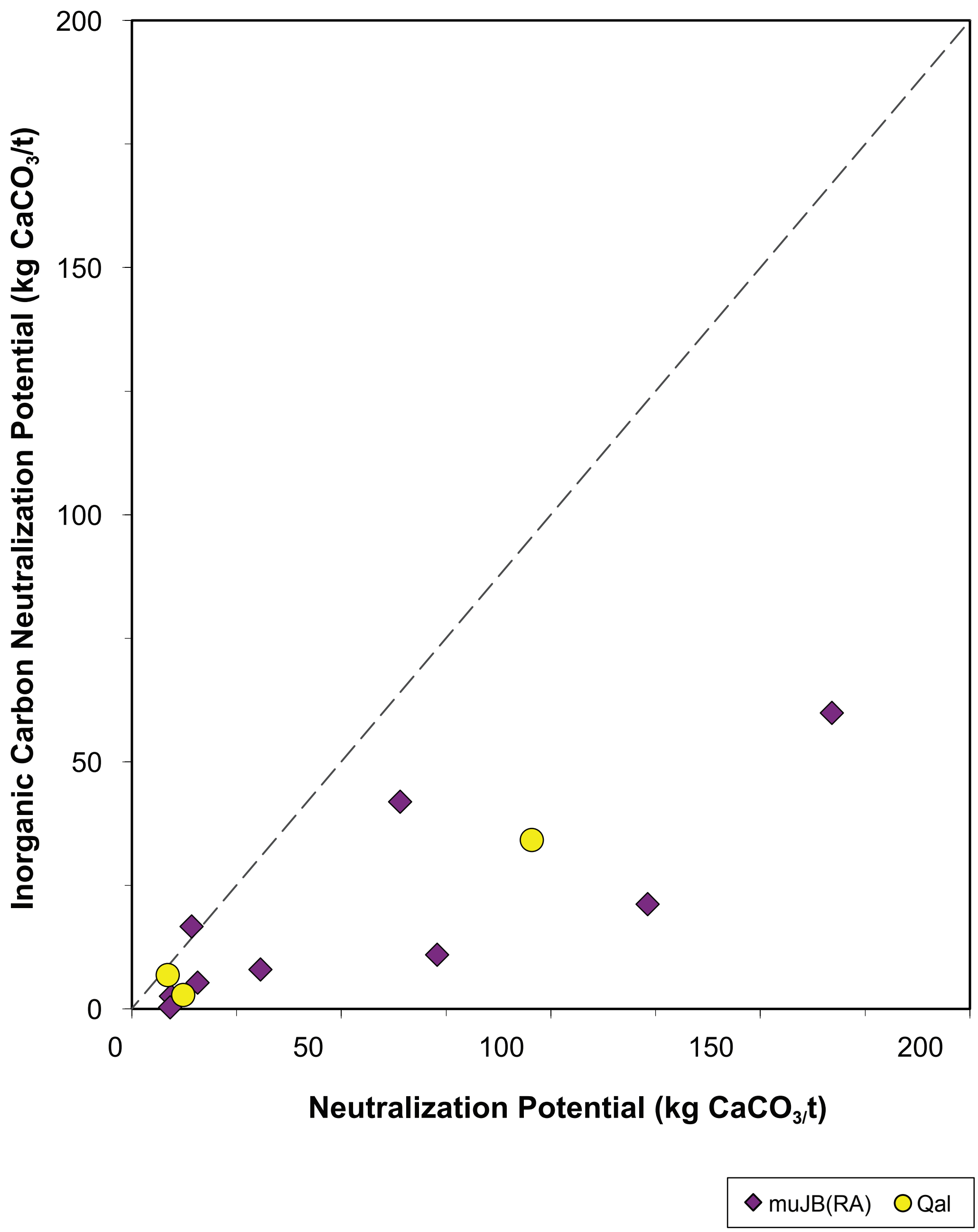

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TCAR Inorganic Carbon Neutralization Potential versus Sobek Neutralization Potential

Figure 3.2-8

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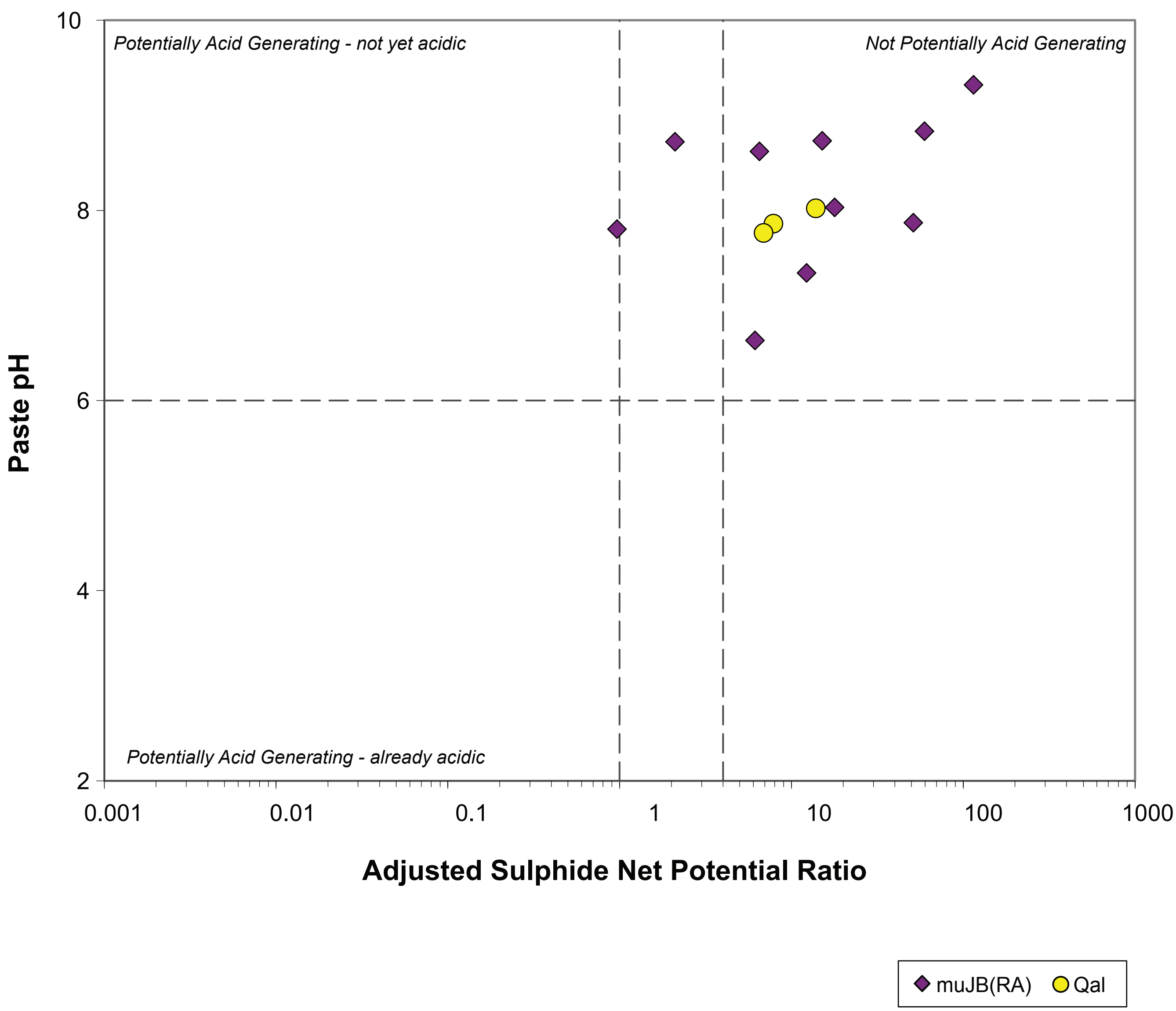
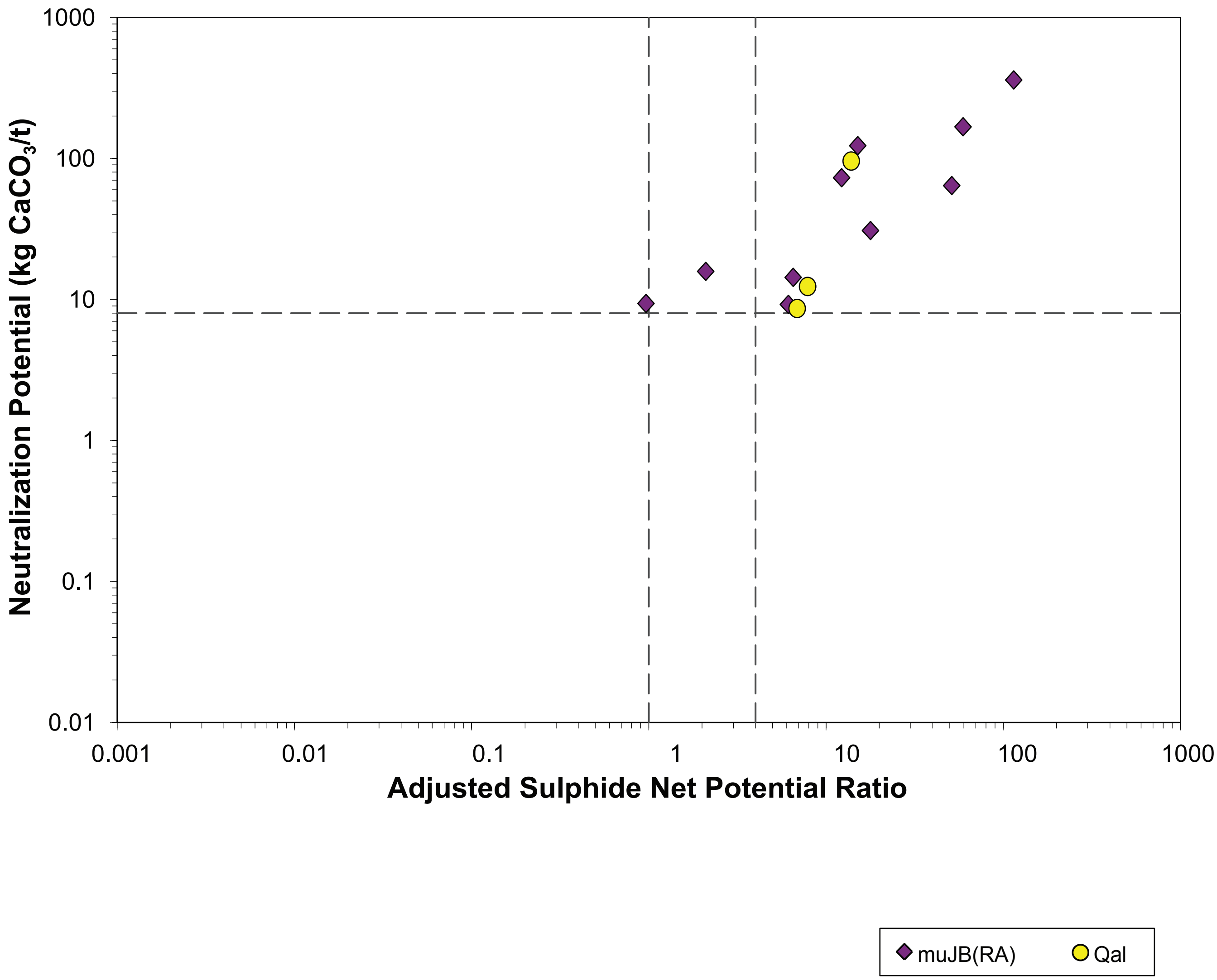


Figure 3.2-9

TCAR Paste pH versus Adjusted Sulphide Net Potential Ratio



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TCAR Neutralization Potential versus Adjusted Sulphide Net Potential Ratio

Figure 3.2-10

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Summary

The total sulphur of the bedrock and overburden samples is predominantly sulphide-sulphur. The NP is not only from carbonate minerals, but likely includes a substantial contribution from alumino-silicates. No bedrock samples collected along the TCAR are already acid generating with a paste pH less than 6.0. Fifteen percent of the samples, all from the Bowser Lake Group, are classified as PAG, with a low to high ML/ARD potential, based on Adj SNPR < 4.

3.2.2 Solid-Phase Elemental Analysis

The solid-phase elemental analyses of rock samples along the access road alignments indicate elements of interest with respect to potential ML. It is important to note that element solubility, and therefore drainage chemistry, varies with mineral form, weathering conditions, exposed surface area, site precipitation, hydrology and other site-specific factors.

3.2.2.1 Coulter Creek Access Road (CCAR)

Table 3.2-1 presents the elements with concentrations that were greater than three times the average crustal abundances of either shale or basalt for rock types along the proposed CCAR alignment. Figures 3.2-11 to 3.2-15 present the distribution of solid-phase elemental concentrations by rock type. The regional geochemistry survey (RGS) identified that arsenic, antimony, cadmium, copper, and zinc are naturally elevated in sediments of streams near the CCAR.

Table 3.2-1. Elements that Exceed Three Times the Average Crustal Abundance along the CCAR

Sample Rock Type	Elements	Reference Rock Type
Bower Lake Group	Silver, arsenic, barium, cadmium, molybdenum, antimony, selenium, zinc	Shale
Lower to Middle Jurassic	Silver, arsenic, barium, cadmium, molybdenum, antimony, selenium, thallium, uranium	Basalt
Upper Hazelton	Arsenic, barium, mercury, antimony, selenium, thallium	Basalt
Stuhini Group	Silver, arsenic, barium, cadmium, molybdenum, lead, antimony, selenium, uranium	Basalt
Quaternary sediments	Arsenic, cadmium, cobalt, copper, iron, manganese, molybdenum, antimony, vanadium, zinc	90th percentile RGS

3.2.2.2 Treaty Creek Access Road (TCAR)

Figures 3.2-16 and 3.2-17 present the distribution of solid-phase elemental concentrations by rock type. Median values of arsenic and selenium exceed three times the crustal abundance for basalt in the Bowser Lake Group but do not exceed for all other metals. The regional geochemistry survey identified that arsenic and nickel are naturally elevated in sediments of streams near the proposed TCAR.

3.2.3 ARD Potential by Rock Type

An overall ARD potential by rock type was calculated based on median values of the Adj SNPR of the rock samples collected along the road alignments and rock samples collected for assessment of the ML/ARD potential of the MTT tunnel portals. The summary statistics and ML/ARD potential are presented in Table 3.2-2. This overall ML/ARD potential by rock type was used to assess road segments for which no field samples were collected.

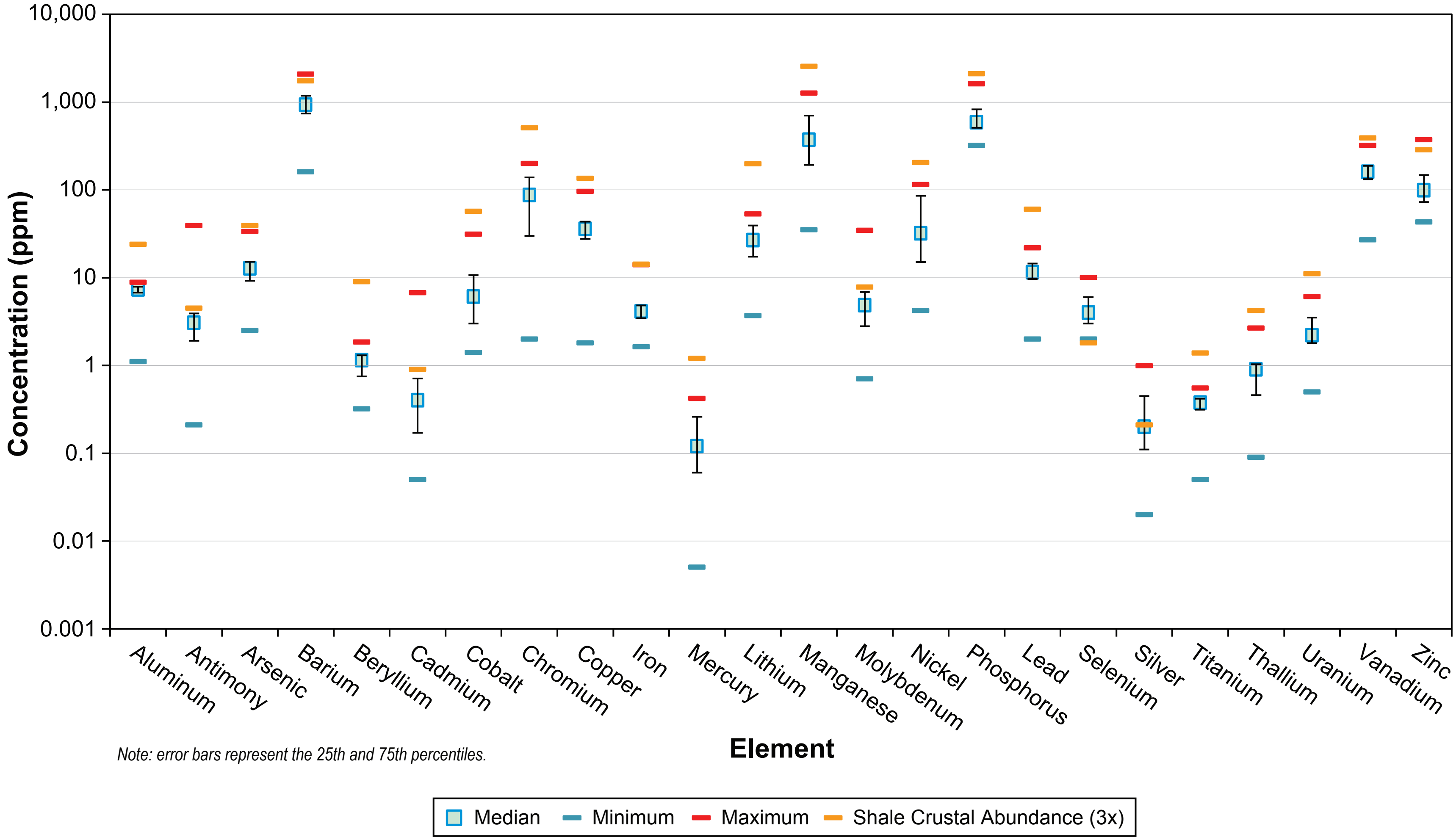

Figure 3.2-11

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Solid-Phase Elemental Concentrations - Coulter Creek Access Road (Bowser Lake Group)

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Figure 3.2-11

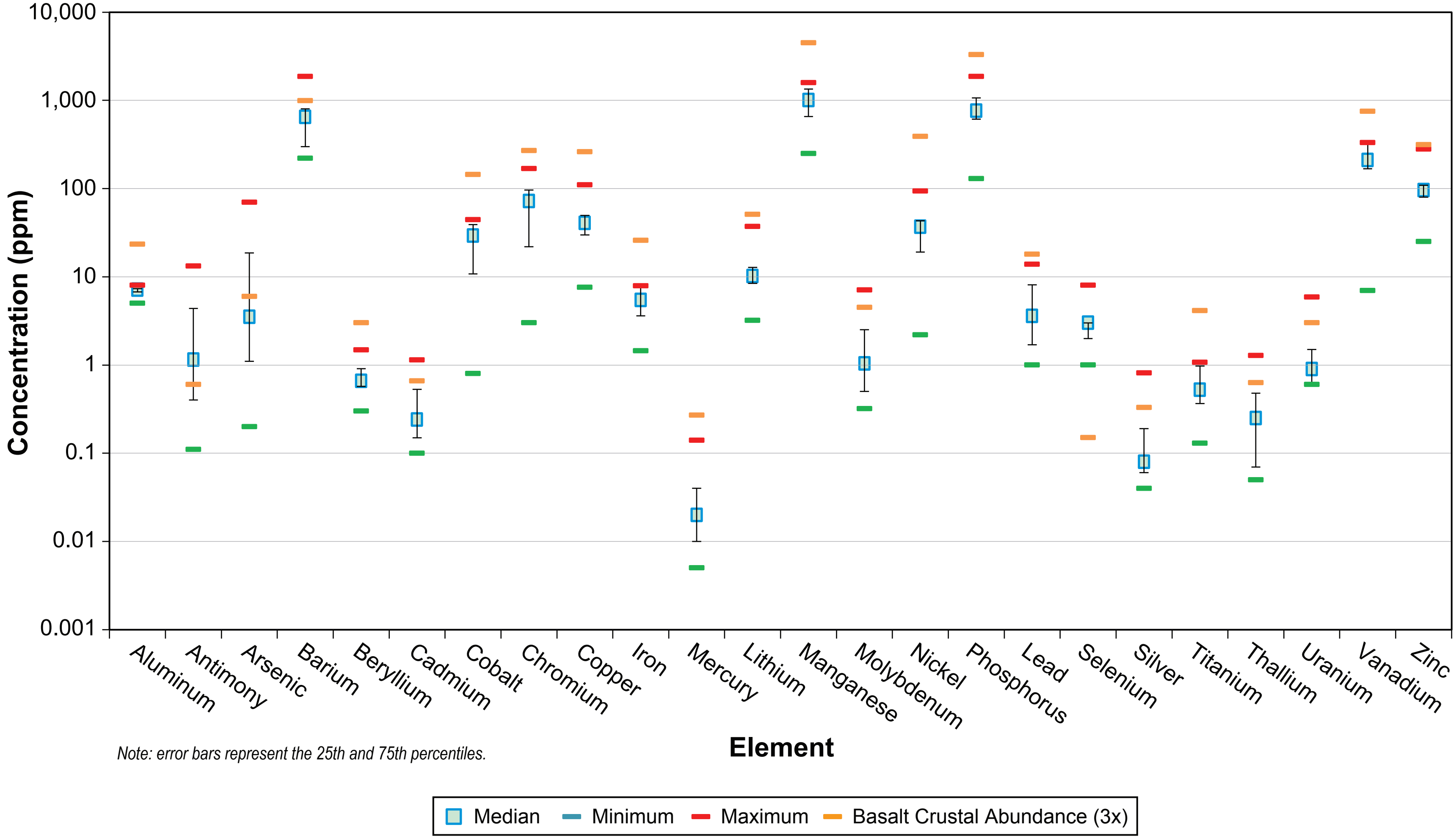

Figure 3.2-12

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Solid-Phase Elemental Concentrations - Coulter Creek Access Road (Lower to Middle Jurassic)

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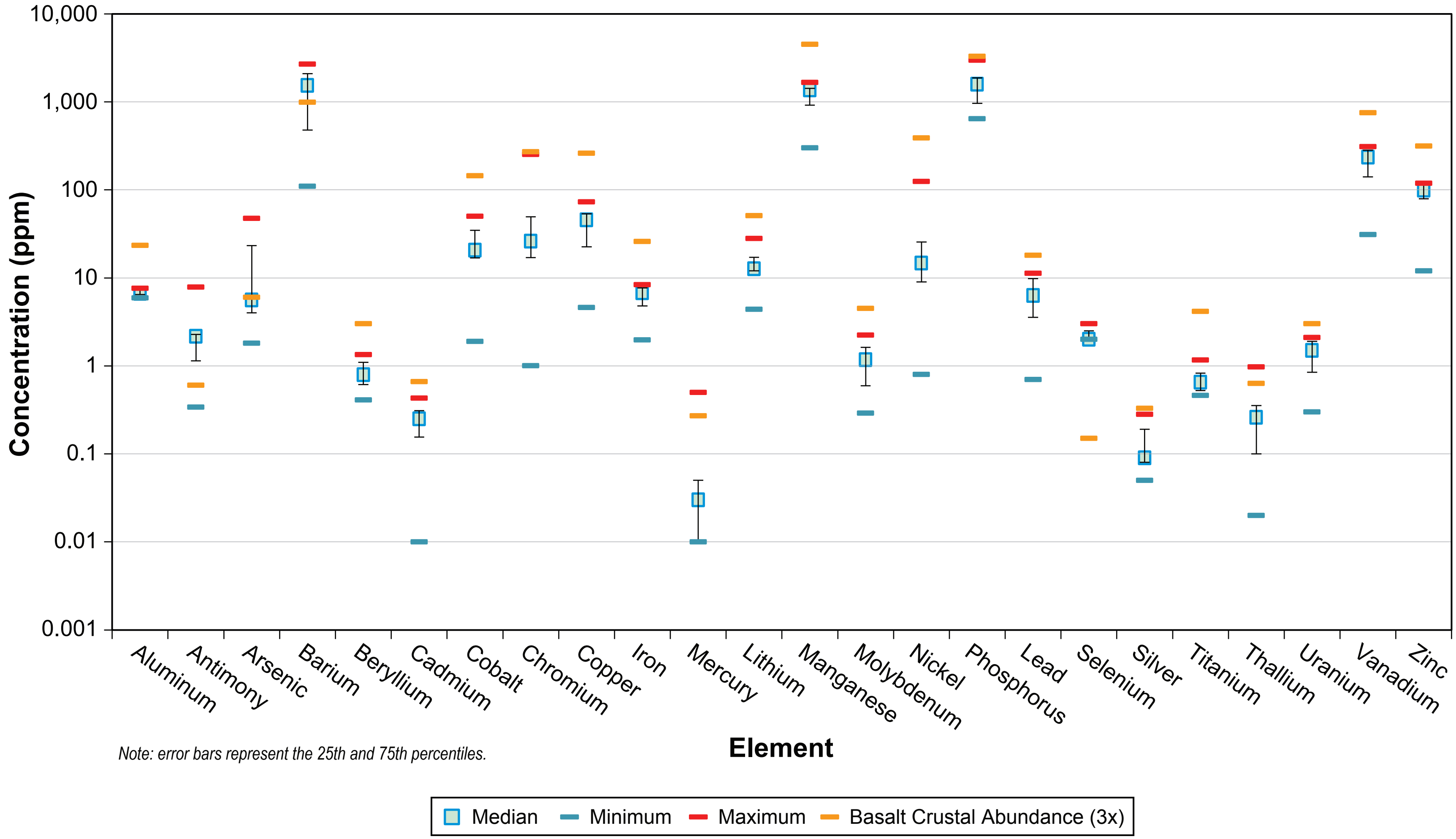

Note: error bars represent the 25th and 75th percentiles.

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Solid-Phase Elemental Concentrations - Coulter Creek Access Road (Upper Hazelton)

Figure 3.2-13

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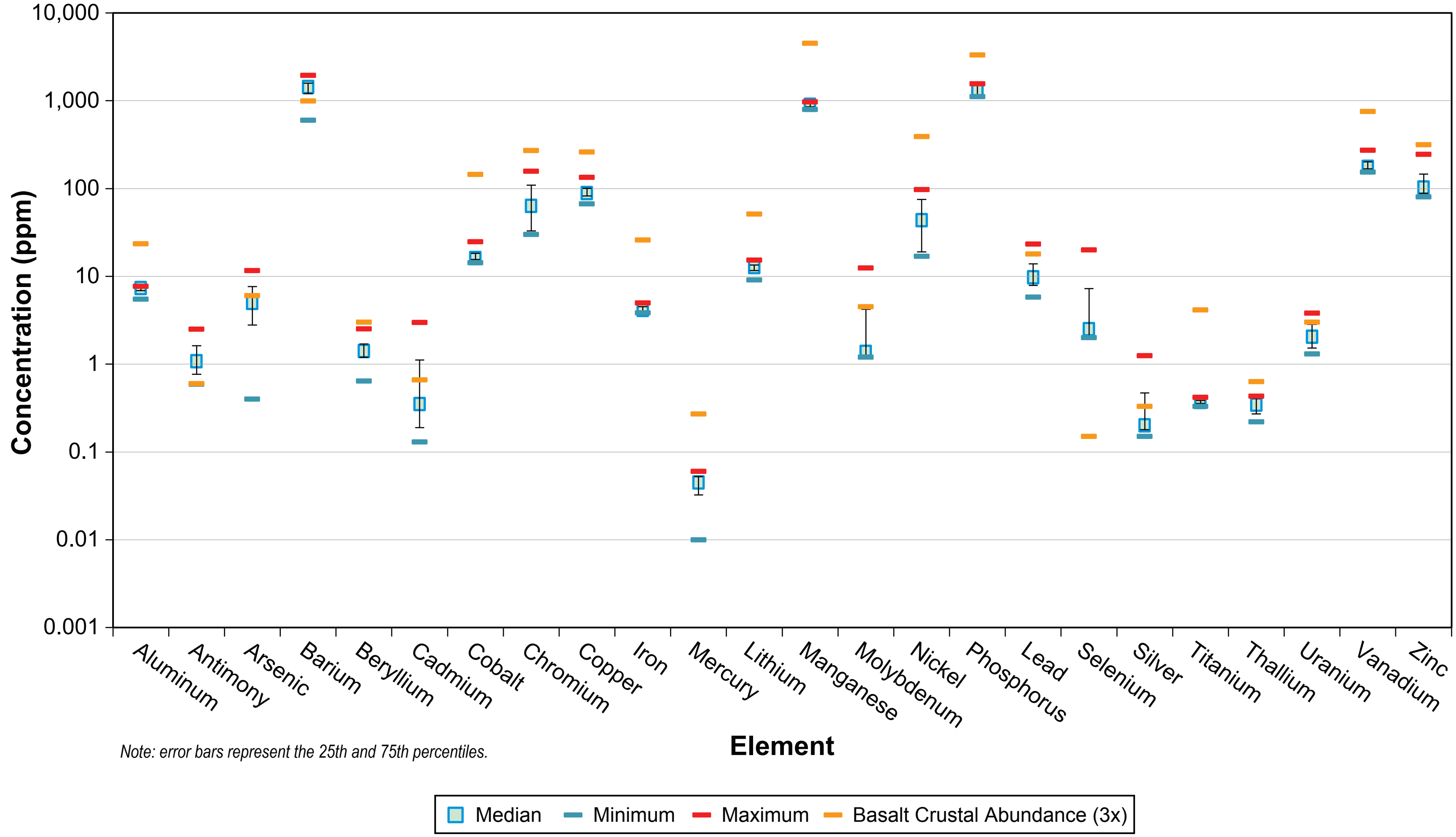

SEABRIDGE GOLD
KSM PROJECT

Solid-Phase Elemental Concentrations - Coulter Creek Access Road (Stuhini Group)

Figure 3.2-14

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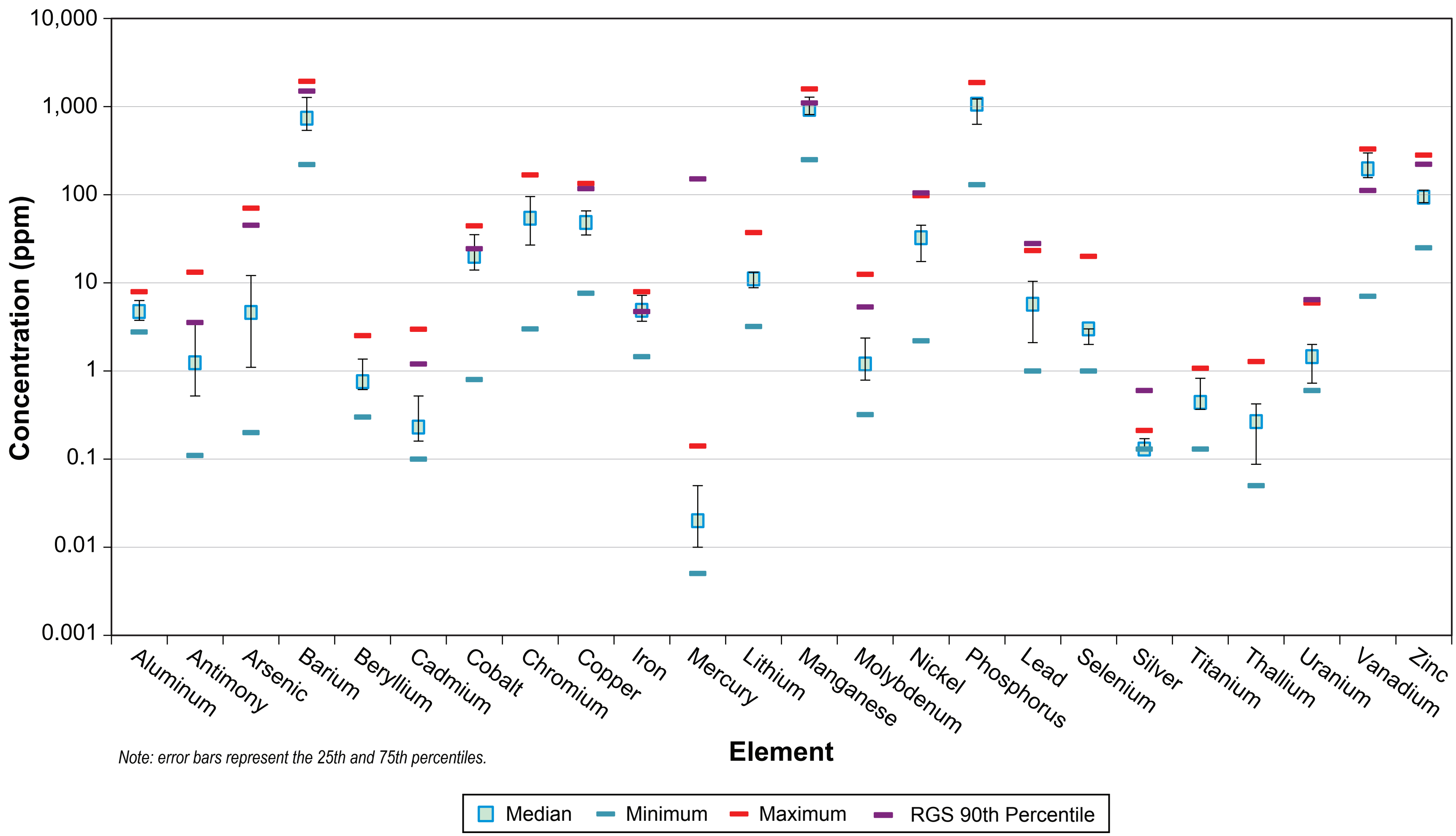

Figure 3.2-15

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Solid-Phase Elemental Concentrations - Coulter Creek Access Road (Quaternary Sediments)

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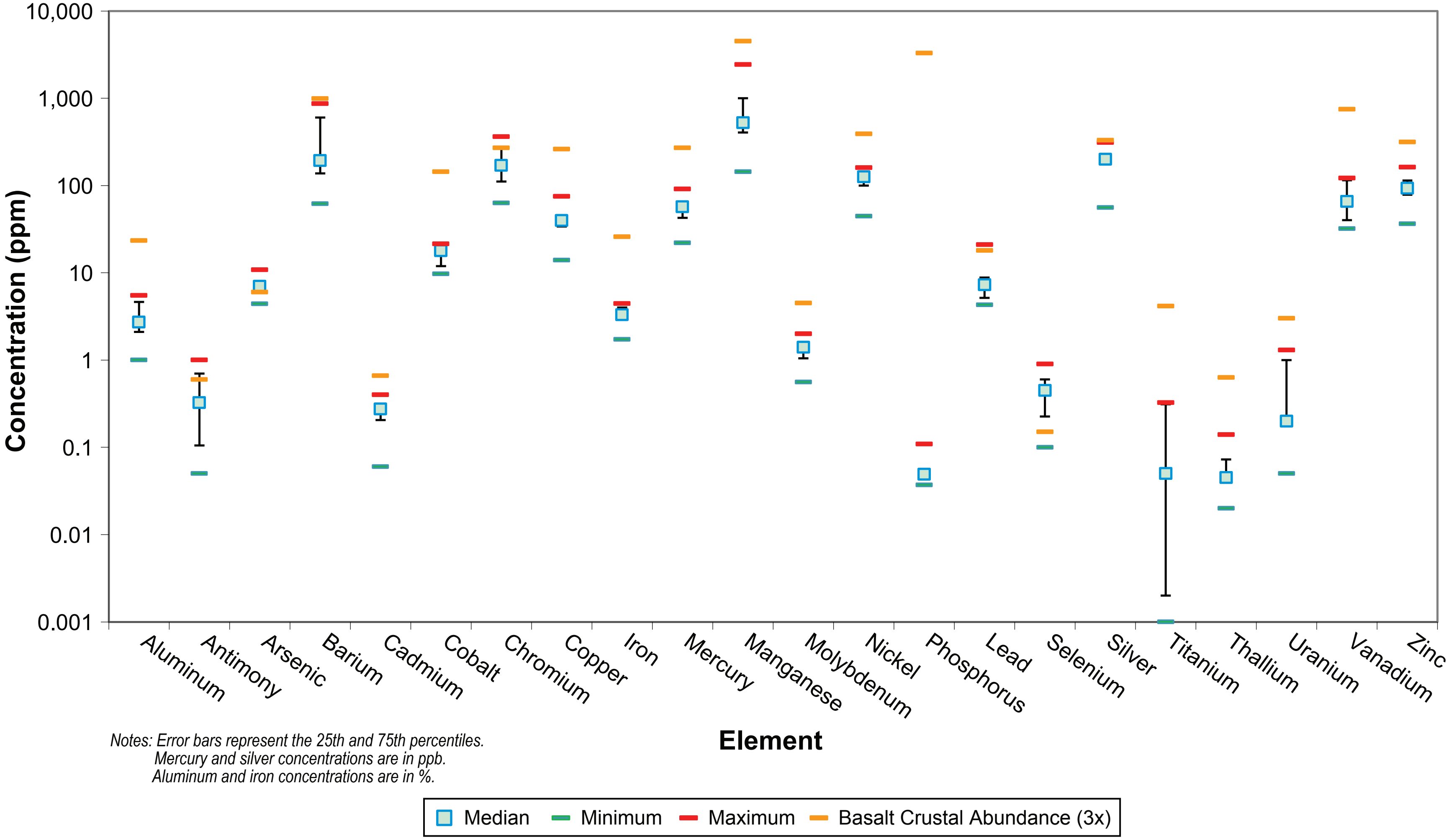


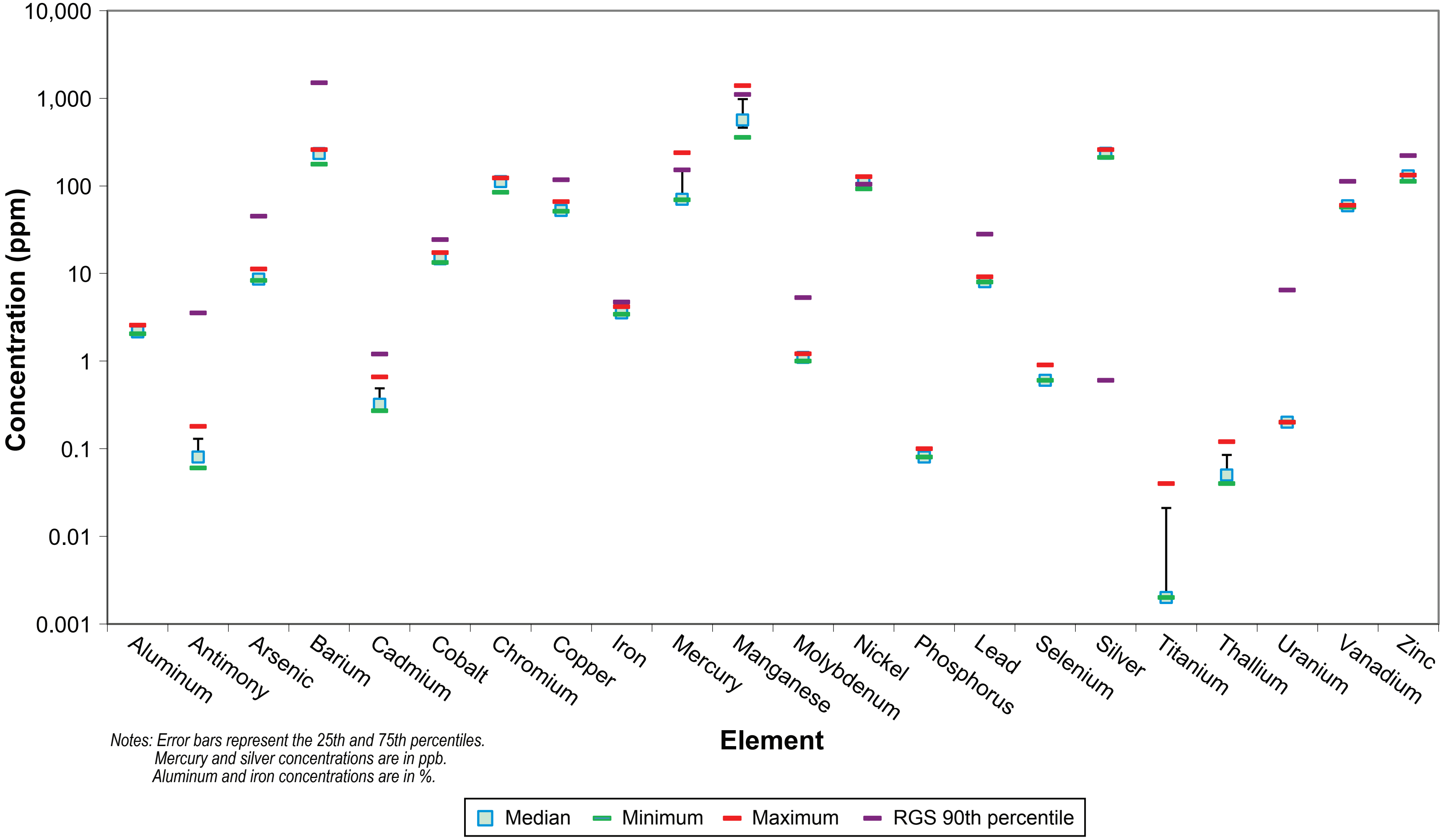
Notes: Error bars represent the 25th and 75th percentiles.
Mercury and silver concentrations are in ppb.
Aluminum and iron concentrations are in %.

SEABRIDGE GOLD
KSM PROJECT

Solid-Phase Elemental Concentrations - Treaty Creek Access Road (Bowser Lake Group)

Figure 3.2-16

Rescan Engineers & Scientists



Notes: Error bars represent the 25th and 75th percentiles.
Mercury and silver concentrations are in ppb.
Aluminum and iron concentrations are in %.

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Solid-Phase Elemental Concentrations - Treaty Creek Access Road (Quaternary Sediments)

Figure 3.2-17

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Table 3.2-2. Summary Statistics of Adjusted SNPR Values of Road Alignment Rock Types

	Count	Minimum	25th Percentile	Mean	Median	75th Percentile	Maximum	ML/ARD Potential
Bowser Lake Group	60	0.0	0.0	8.8	1.7	7.2	121	Possible
Lower to middle Jurassic	13	0.0	1.6	15.6	11.2	23.2	57.6	None
Upper Hazelton	23	0.1	0.9	30.0	6.0	25.9	246.7	None
Stuhini	18	0.4	2.1	53.2	7.3	28.9	316.7	None
Quaternary sediments	6	6.9	8.3	55.2	11.6	19.2	272.2	None

3.2.4 Stage II Access Road ML/ARD Potential Assessment

The Stage II access road ML/ARD potential assessment is based on the results of static tests of field samples. The Stage II assessment is summarized below and a detailed assessment is presented in Appendix 3.2-3 and 3.2-4.

3.2.4.1 Coulter Creek Access Road Alignment

The ML/ARD potential of the northern 20 km of the CCAR alignment along Coulter Creek is possible to high whereas the majority of the south-eastern sections along Sulphurets Creek have no ML/ARD potential. A summary of the distribution of the ML/ARD classification is presented in Table 3.2-3. The 13 segments classified with a high ML/ARD potential largely reflect road segments that cross fault zones or contacts between Bowser Lake Group and Upper Hazelton rock types. The Bowser Lake Group rock type comprises 63% of the CCAR alignment and 100% of the northern 20 km, with a median Adj SNPR of 1.5 and a general ML/ARD potential of possible.

Table 3.2-3. Distribution of Coulter Creek Access Road ML/ARD Classification

ML/ARD Ranking	# of Segments	% of Total
High	13	8%
Possible	86	52%
Low	4	2%
None	61	37%
Total	164	100%

3.2.4.2 Treaty Creek Access Road Alignment

The ML/ARD potential of the TCAR alignment is generally none, reflecting field samples with an Adj SNPR > 4 and the general ML/ARD ranking of Quaternary sediments as none (Table 3.2-4). There is one segment of high ML/ARD potential at station 26+600 as a result of field sample with an Adj SNPR < 1. Between 28+000 and 28+800, the ML/ARD potential is ranked as possible where the alignment crosses Bowser Lake Group rock type with a general ML/ARD potential of possible. There is one road segment at station 16+400 with a low ML/ARD potential ranking with a field sample with an Adj SNPR between 2 and 4.

The ML/ARD potential of the NTCAR alignment is possible or low, reflecting the general ML/ARD ranking of Bowser Lake Group rock type. There are 11 segments of low ML/ARD potential as a result of the four field samples with an Adj SNPR> 4 collected along this northern section of the Treaty Creek alignment.

Table 3.2-4. Distribution of the Treaty Creek Access Road ML/ARD Classification

ML/ARD Ranking	# of Segments	% of Total
High	1	0.5%
Possible	53	24%
Low	1	0.5%
None	163	75%
Total	218	100%

3.3 STAGE III: CONSTRUCTION PLANNING

Information was obtained on estimates of cut and fill material volumes for the road alignments (McElhanney 2011). The percentage of cut material to fill material was considered when applying the final ML/ARD potential ranking. For road segments with greater than 75% fill, the ML/ARD potential was reduced by one level (i.e., from possible to low).

McElhanney estimated material volumes for road construction in 20 m intervals which were combined to create volumes for 200 m segments (Appendix 3.3-1 to 3.3-3). Cut and fill volumes and the relative proportion of cut to fill materials were determined to be the most significant data.

A summary of the cut and fill material volumes is presented in Table 3.3-1. The North Treaty Creek Access Road (NTCAR) is separated in this table for planning purposes.

Table 3.3-1. Distribution of Access Road Cut and Fill Material Volumes

Units: m^3	CCAR	TCAR	NTCAR
Total Rock Cut	703,007	217,355	133,489
Total Earth Cut	1,157,350	217,083	63,696
Total Embankment Fill	896,574	388,596	78,124
Maximum Cut Volume	43,331 station 27+600	20,752 station 9+600	26,968 station 0+200
Maximum Fill Volume	36,423 station 20+400	20,714 station 17+600	13,237 station 8+800

The applications of these cut and fill material volumes to the ML/ARD potential assessment of the CCAR and TCAR alignments is presented in the following Section 4.

4. ML/ARD Potential Assessment

The ML/ARD potential maps are overlain on a topographical base map, and show access road alignment sections in 200 m intervals with related road construction and geoscience information including the following:

- percent rock cut and fill material;
- volume of rock cut and fill material;
- simplified local geology; and
- locations of ML/ARD field work bedrock and colluvium samples.

These maps are presented in Appendix 4-1 and 4-2.

4.1 COULTER CREEK ACCESS ROAD

The distribution of ML/ARD classification for each 200 m segment is provided in Table 4.1-1. Fill material dominated most of the road segments resulting in a reduction of the ML/ARD potential from Stage II assessments, with the most common reassessment from possible to low. Thirty-two percent or 10.6 km of the CCAR alignment has an ML/ARD potential of possible or high.

Table 4.1-1. Distribution of Coulter Creek Access Road ML/ARD Classification

ML/ARD Ranking	# of Segments	% of Total
High	5	3%
Possible	48	29%
Low	49	30%
None	62	38%
Total	164	100%

4.1.1 High ML/ARD Potential

Five road segments composing 3% of the CCAR were categorized with a high ML/ARD ranking and the specific road segments are presented in Table 4.1-2. Road segments with a high ML/ARD potential have an Adj SNPR values less than one. Segments at kilometres 7, 10, 22, and 27 are located at fault zones and at contacts between Bowser Lake Group and Upper Hazelton rock types. Sulphide content for these road segments are in the 90th percentile for field samples collected along all four road alignments. A large volume of high ML/ARD potential material will be exposed at these road segments as road cut volumes near all segments with a high ranking are estimated to be greater than 10,000 m^3. Qualitatively, small cuts do not raise the same level of concern as large cut-and-fill volumes.

4.1.2 Possible ML/ARD Potential

Forty-eight road segments composing 29% of the CCAR was categorized with a possible ML/ARD ranking and the specific road segments are presented in Table 4.1-3. Road segments with a possible ML/ARD ranking have an Adj SNPR value between 1 and 2, or less than 1 but with greater than 75% fill material. The Bowser Lake Group rock type has a general ML/ARD ranking of possible which is reflected in this assessment.

Table 4.1-2. Coulter Creek Access Road Segments with a High ML/ARD Potential

Station	Rock Type
003+600	Bowser Lake Group
007+200	Bowser Lake Group
010+000	Bowser Lake Group
022+200	Bowser Lake Group
27+400	Upper Hazelton

Table 4.1-3. Coulter Creek Access Road Segments with a Possible ML/ARD Potential

Station	Rock Type
000+800	Bowser Lake Group
001+800	Bowser Lake Group
004: +200 to +400	Bowser Lake Group
005+000	Bowser Lake Group
005: +400 to +800	Bowser Lake Group
006+400	Bowser Lake Group
007+000	Bowser Lake Group
007: +400 to +800	Bowser Lake Group
008+800 to 009+400	Bowser Lake Group
009+800	Bowser Lake Group
010+400	Bowser Lake Group
011: +600 to +800	Bowser Lake Group
012+200 to 014+600	Bowser Lake Group
016: +400 to +600	Bowser Lake Group
017: +200 to +400	Bowser Lake Group
018: +000 to +200	Bowser Lake Group
018+600	Bowser Lake Group
019+000	Bowser Lake Group
019+400	Bowser Lake Group
020+000	Bowser Lake Group
020: +600 to +800	Bowser Lake Group
022: +400 to +600	Upper Hazelton
27+600	Upper Hazelton

4.1.3 None to Low ML/ARD Potential

Sixty-eight percent or 111 segments of the proposed CCAR alignment were categorized with an ML/ARD ranking of none to low. Road segments with a low ranking have an Adj SNPR value between 2 and 4, or less than 2 but with > 75% fill material. The rock types, quaternary sediments, Upper Hazelton, undifferentiated Lower to Middle Jurassic, and Stuhini Group have a general ML/ARD ranking of none. Road segments with a ranking of none have an Adj SNPR value greater than 4, or a low ranking but with > 75% fill material.

4.2 TREATY CREEK ACCESS ROAD

The distribution of ML/ARD classification for each 200 m segment of the proposed TCAR and NTCAR is provided in Table 4.2-1. Fill material frequently dominated the TCAR road segments resulting in some reductions of the ML/ARD potential from Stage II assessments. Cut material dominated the NTCAR road segments resulting in only two reductions of the ML/ARD potential from Stage II assessments. No segments of the TCAR or NTCAR alignments have been classified as high ML/ARD potential.

Table 4.2-1. Distribution of the Treaty Creek Access Road ML/ARD Classification

ML/ARD Ranking	# of Segments	% of Total
High	0	0%
Possible	50	23%
Low	5	2%
None	163	75%
Total	218	100%

4.2.1 Possible ML/ARD Potential

Twenty-three percent or 10.0 km, of the TCAR alignment has an ML/ARD potential of possible. The majority, 9.6 km of this possible ranking, is road segments on the NTCAR alignment. This ranking reflects the possible ML/ARD potential ranking of the Bowser Lake Group rock type (Table 4.2-2).

Table 4.2-2. Treaty Creek Access Road Segments with a Possible ML/ARD Potential

Station	Rock Type
TCAR	
026+600	Quaternary sediments
028: +000 to +200	Quaternary sediments
028+600	Quaternary sediments
NTCAR	
000+000 to 006+400	Bowser Lake Group
007+000 to 011+800	Bowser Lake Group

5. Summary

The proposed access roads for the KSM Project transect mountainous terrain in northwest British Columbia. The regional geology consists of strongly tectonically deformed metavolcanic and metasedimentary assemblages of Triassic to Jurassic age. The marine metasedimentary units of the Middle to Upper Jurassic Bowser Lake Group dominate the geology along the Teigen Access Road, Tunnel Divide Portals Spur Road, Treaty Creek Access Road, and northern portion of the Coulter Creek Access Road. The eastern portion of the Coulter Creek Access Road, east of Station 20+600, transects metasedimentary and metavolcanic units of the Middle to Lower Jurassic Hazelton Group and the Upper Triassic Stuhini Group. ML/ARD is possible from rocks from the Bowser Lake Group while there is a low potential for ML/ARD from the other rock types found along the road alignments.

This ML/ARD assessment is based on 1) publicly accessible geology and geochemistry databases, 2) the regional geology, 3) static testing and Acid-Base Accounting on a number of field samples, and 4) construction planning estimates of material excavation volumes.

The ML/ARD potential rankings of the CCAR are relatively evenly distributed among possible, low, and none. Road segments of the CCAR with a high ML/ARD potential (3% of the alignment) are frequently associated with fault zones and geological contacts, as well as those sections where cut dominates fill. The ML/ARD potential of the northern 20 km of the CCAR alignment along Coulter Creek is possible to high and the majority of the south-eastern sections along Sulphurets Creek have an ML/ARD potential of none.

The ML/ARD potential ranking of the TCAR is predominantly low to none with a few segments of high or possible ML/ARD potential. This ranking reflects the alignment on alluvial and colluvial sediments.

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Map Pocket

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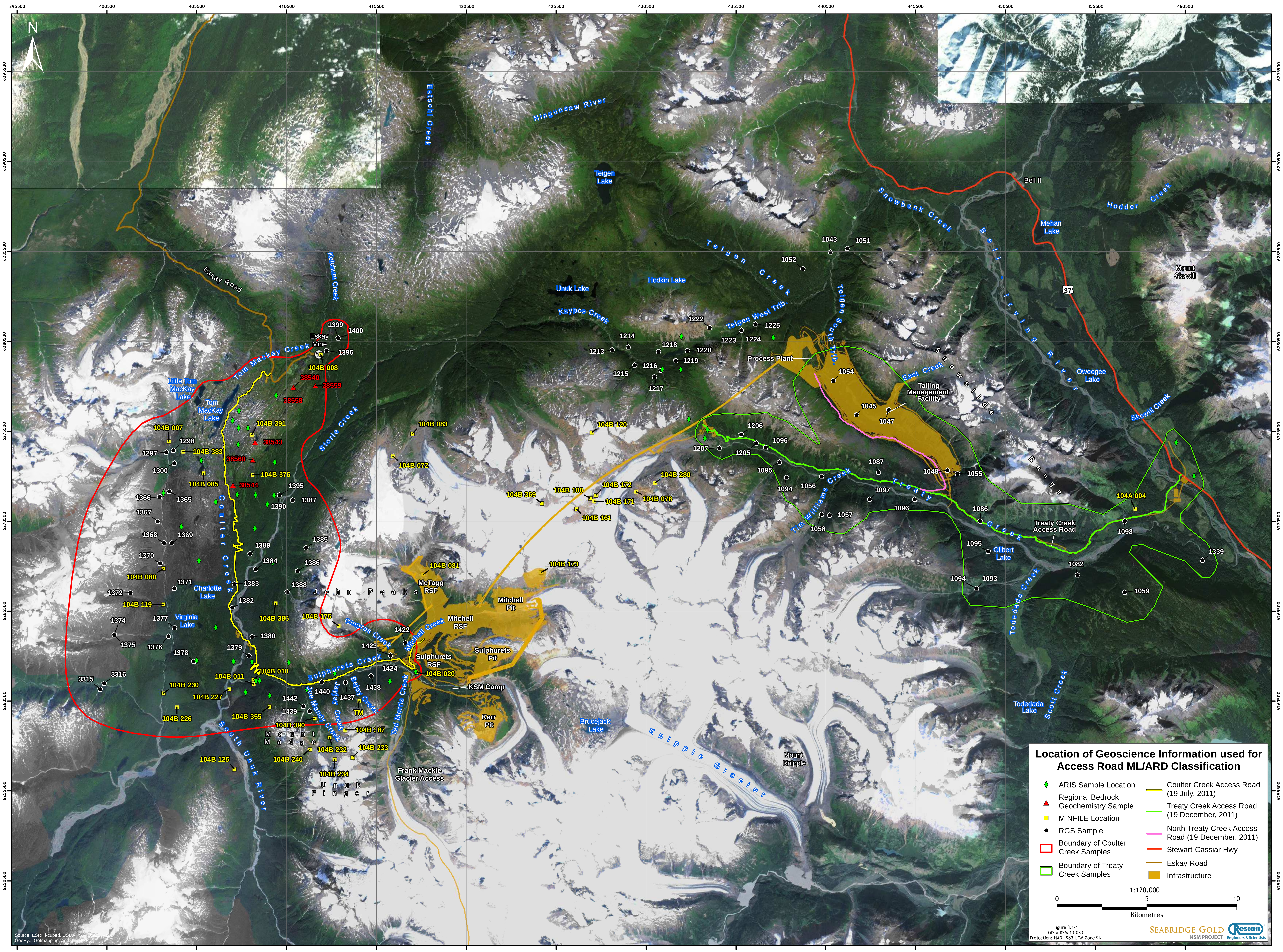

Location of Geoscience Information used for Access Road ML/ARD Classification
ARIS Sample Location
Regional Bedrock Geochemistry Sample
MINFILE Location
RGS Sample
Boundary of Coulter Creek Samples
Boundary of Treaty Creek Samples
Coulter Creek Access Road (19 July, 2011)
Treaty Creek Access Road (19 December, 2011)
North Treaty Creek Access Road (19 December, 2011)
Stewart-Cassiar Hwy
Eskay Road
Infrastructure
1:120,000
0
5
10
Kilometres
Figure 3.1-1
GIS # KSM-13-033
Projection: NAD 1983 UTM Zone 9N
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Ningunsaw River
Estschi Creek
Teigen Lake
Unuk Lake
Hodkin Lake
Kaypos Creek
Teigen Creek
Teigen West Trib.
Snowbank Creek
Bell-Irving River
Bell II
Mehan Lake
Hodder Creek
Mount Skowill
Oweegee Lake
Skowill Creek
Process Plant
Tailing Management Facility
East Creek
Treaty Creek
Treaty Creek Access Road
Tim Williams Creek
Gilbert Lake
Todedada Creek
Todedada Lake
Scott Creek
Eskay Road
Ketchum Creek
Eskay Mine
Tom MacKay Creek
Little Tom MacKay Lake
Tom MacKay Lake
Storie Creek
Coulter Creek
Charlotte Lake
Virginia Lake
John Peaks
Gingras Creek
Mitchell Creek
McTagg RSF
Mitchell RSF
Mitchell Pit
Sulphurets Pit
Sulphurets RSF
Sulphurets Creek
KSM Camp
Kerr Pit
Ted Morris Creek
Frank Mackie Glacier Access
Brucejack Lake
Knipple Glacier
Mount Knipple
Mount Madge
Unuk Finger
South Unuk River
37
Source: ESRI, i-cubed, USDA, GeoEye, Getmapping

Appendix 2.2-1

Sulphide Net Potential Ratios of Rock Samples near Tunnel Portals

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Appendix 2.2-1. Sulphide Net Potential Ratios of Rock Samples near Tunnel Portals

Sample ID	Rock Type	SNPR
Res-008	muJB(RA)	0.4
Res-016	muJB(RA)	2.3
Res-009	lmJEr/d	141.7
Res-010	lmJEr/d	41.1
Res-011	lmJEr/d	13.3
Res-012	lmJEr/d	246.7
Res-013	lmJEr/d	3.5
Res-014	lmJEr/d	2.0
Res-019	lmJEr/d	0.1
Res-020	lmJEr/d	91.7
Res-021	lmJEr/d	4.8
Res-022	lmJEr/d	0.1
M-001	lmJEr/d	0.9
M-002	lmJEr/d	21.8
M-004	lmJEr/d	27.7
M-007	lmJEr/d	3.0
M-008	lmJEr/d	0.9
M-008a	lmJEr/d	0.5
Res-001	uTs/v	3.1
Res-002	uTs/v	15.0
Res-003	uTs/v	19.0
Res-004	uTs/v	9.5
Res-005	uTs/v	4.8
Res-006	uTs/v	1.0
Res-007	uTs/v	295.0
Res-015	uTs/v	190.0
Res-017	uTs/v	5.0
Res-018	uTs/v	0.4
M-003	uTs/v	316.7
M-005	uTs/v	1.7
M-005a	uTs/v	0.4
M-006	uTs/v	0.9

Appendix 3.1-1

MINFILE Occurrences within 2 Kilometres of the Access Road Alignments

Appendix 3.1-1. MINFILE Occurences within 2 Kilometres of the Access Road Alignments

MINFILE #	Name	Status	Location NTS Map	Coordinates Zone	Easting	Northing	Deposit Type	Character	Commodities	Host Rock Type	Group	Formation	Lithologies	Minerology Sulphides	Carbonates	Description
104B 007	COPPER KING	Showing	104B10E	09 (NAD 83)	403939	6274946	G04: Besshi massive sulphide Cu-Zn, I02: Intrusion-related Au pyrrhotite veins	Vein, Massive	Copper, Iron, Gold	Volcanic	Hazelton, Stuhini	Unuk River, Undefined Formation	Flow Breccia, Felsite, Andesitic Flow, Andesite, Siltstone, Argillite, Limestone, Cataclasite, Biotite Chlorite Epidote Schist	Pyrite		A north trending fault zone which dips 60 to 85 degrees west hosts mineralization. To the west of the fault zone, laminated flow breccias and felsite flows occur. Limestone, argillite, and siltstone are underlain by laminated felsite and andesitic flows grading into massive andesitic flows and breccias. The showing generally comprises small replacement bodies of massive fine-grained pyrrhotite and chalcopyrite which occur along the western edge of the fault zone and in felsite lenses which are 3 to 9 m long and 0.3 m wide. In addition, small stringers of pyrite on the eastern side of the fault zone also contain pyrrhotite and chalcopyrite.
104B 008	ESKAY CREEK	Past Producer	104B09W	09 (NAD 83)	412397	6279772	G07: Subaqueous hot spring Ag-Au, G06: Noranda/Kuroko massive sulphide Cu-Pb-Zn	Stratabound, Massive, Disseminated, Stockwork	Gold, Silver, Zinc, Copper, Lead	Sedimentary	Hazelton	Salmon River, Mount Dilworth	Carbonaceous Mudstone, Rhyolite Mudstone Breccia, Rhyolite Breccia, Andesite Flow, Rhyolite, Andesite, Tuffaceous Mudstone, Pillow Basalt	Sphalerite, Tetrahedrite, Boulangerite, Bournonite, Galena, Pyrite, Stibnite, Realgar, Orpiment, Chalcopyrite, Aktashite, Wurtzite, Arsenopyrite	Calcite, Dolomite	Eskay Creek host rock is divided into 6 lithostratigraphic sequences, from oldest to youngest: (1) lower volcano-sedimentary unit: inferred basement to the footwall dacite unit including the oldest rocks on the property; (2) footwall dacite unit: dacite lapilli, crystal and lithic tuffs interbedded with black mudstone and waterlain tuff (includes the "datum dacite" member; (3) rhyolite unit: rhyolite breccia and tuff; minor mudstone; (4) contact unit: basal rhyolite-mudstone breccia ("transition zone") grading upwards into carbonaceous mudstone; (5) hanging. wall andesite unit: pillowed andesite flows and breccias with thin carbonaceous mudstone interbeds; and (6) upper sedimentary unit: thin-bedded siltstone and fine sandstone with minor arenite-conglomerate beds.
104B 010	BENCH	Showing	104B08W	09 (NAD 83)	408633	6261697	G06: Noranda/Kuroko massive sulphide Cu-Pb-Zn	Disseminated, Podiform	Zinc, Lead	Volcanic	Hazelton	Salmon River, Mount Dilworth	Rhyolite, Breccia, Mudstone, Andesite, Lithic Tuff, Crystal Tuff, Argillite, Basalt	Sphalerite, Pyrite, Galena		Little outcrop mineralization has been encountered at the Bench zone. Disseminated sphalerite, galena and pyrite were found in one location in sediments of the Troy Ridge Member. Elsewhere, discontinuous disseminated to semi-massive lenses of pyrite and pyrrhotite have been locally observed along contacts between sediments (Troy Ridge Member) and mafic volcanics (John Peaks Member) in the eastern portion of the Bench zone. Up to 10% disseminated pyrite and pyrrhotite are locally encountered within tuffaceous sediments throughout the area . No significant assays have been returned from any of these sulfide occurrences.
104B 011	CUMBERLAND (L.265)	Prospect	104B08W	09 (NAD 83)	408662	6261449	G06: Noranda/Kuroko massive sulphide Cu-Pb-Zn, I02: Intrusion-related Au pyrrhotite veins	Vein, Breccia, Disseminated, Massive	Gold, Silver, Zinc, Copper, Lead, Barite	Volcanic	Hazelton	Salmon River	Pillow Basalt, Rhyolite Breccia, Andesitic Breccia, Andesite, Rhyolite, Tuff, Tuffaceous Mudstone, Argillite, Conglomerate	Arsenopyrite, Chalcopyrite, Sphalerite, Galena, Tetrahedrite, Pyrargyrite, Pyrite, Pyrrhotite, Stibnite	Calcite	Locally, andesite, tuff-volcanic breccia, argillite and conglomerate are the most common rock types. The eastern part of the claim is underlain by pillowed andesite, dark grey to green in color, and forms a massive cliff 30 to 40 m in height. The tuff is grey to green in color with poorly sorted angular fragments with some flow banding. The volcanic breccia is similar to the tuff with larger unsorted angular fragments. Sediments in contact with the volcanics include a dark green-grey, massive chert and argillic conglomerate, which is characterized by a sandy matrix with rounded cobbles to boulders. A sheared and brecciated zone in the volcanics contains small, irregular lenses and stringers of quartz, barite and calcite. In an adit driven along the north side of a dike that cuts the shear zone, is a vein of quartz, calcite and barite which hosts pyrite, galena, sphalerite, tetrahedrite, stibnite and some argentite. To the northeast of this adit, a quartz replacement zone consists of veinlets and lenses of quartz with stringers and blebs of chalcopyrite, pyrrhotite, pyrite, sphalerite and galena. A 0.5 to 0.75 m shear zone was mapped at the Cumberland adit entrance. The host rock in the vicinity of the showing consists of highly fractured andesite with thin quartz-pyrite fracture fillings. Other sulphides include chalcopyrite, sphalerite and traces of galena.
104B 020	SULPHURETS CREEK	Past Producer	104B08W	09 (NAD 83)	417726	6262098	C01: Surficial placers	Unconsolidated	Gold	Sedimentary			Gravel			
104B 083	UNUK (ZONE 1)	Showing	104B09W	09 (NAD 83)	417490	6275370	I05: Polymetallic veins Ag-Pb-Zn+/-Au, I01: Au-quartz veins	Unknown	Gold, Silver, Zinc, Copper	Volcanic	Hazelton	Betty Creek, Salmon River	Dacite, Rhyolite, Siltstone, Greywacke, Sandstone, Volcanic Breccia, Conglomerate, Tuff, Limestone, Chert	Pyrite, Galena, Chalcopyrite		Galena and magnetite are reported to occur in outcrop, west of the toe of Jack Glacier, just south of the headwaters of Storie Creek (Newmont Exploration Geology Map). Several hundred metres north of this showing at the tip of the glacier's toe, pieces of float containing abundant stringers of pyrite and carbonate were collected. This float assayed 31.5 grams per tonne silver, 0.0157% arsenic, 0.0116% lead and 0.0061% zinc (Assessment Report 15961). Another area of east trending mineralization occurs about 700 m to the southwest. Several samples of volcanic rock were taken with one sample identified as dacite and another as rhyolite. These rocks are reported to contain up to 60% sulphides with pyrite being the main sulphide along with lesser chalcopyrite and galena. One sample contained 3.16 grams per tonne gold. Silver values range from 0.2 to 74.1 grams per tonne (Assessment Report 17087).
104B 072	UNUK RIVER (AP)	Prospect	104B09W	09 (NAD 83)	416391	6274124		Disseminated, Shear	Gold, Silver, Zinc, Lead, Copper	Volcanic	Hazelton	Betty Creek, Mount Dilworth	Welded Tuff, Tuffaceous Mudstone, Argillaceous Sediment/Sedimentary, Felsic Volcanic, Intermediate Volcanic, Diabase Dike	Galena, Sphalerite, Pyrite, Arsenopyrite, Chalcopyrite	Unknown	The AP zone is a moderately strong, continuous crosscutting zone of brecciation, silicification, carbonatization and related galena-sphalerite-pyrite- arsenopyrite-(chalcopyrite) mineralization. It is hosted by welded tuffs, tuffaceous mudstones and argillaceous sediments within felsic volcanic rocks of the Betty Creek and possibly Mount Dilworth formations. A multitude of crosscutting, anastomosing diabase dikes occur throughout the zone. The zone extends over 300 metres along strike and may join with other mineralized structures in the area (see Unuk (Zone 1), 104B 083 and Unuk (Zone 2), 104B 344).
104B 080	HARRYMEL CREEK	Showing	104B10E	09 (NAD 83)	403641	6267870	G04: Besshi massive sulphide Cu-Zn, J01: Polymetallic manto Ag-Pb-Zn	Stratiform, Disseminated	Copper	Metamorphic	Hazelton, Stuhini	Unuk River, Undefined Formation	Quartz Epidote Schist, Biotite Chlorite Epidote Schist, Cataclasite, Greywacke, Siliceous Siltstone, Carbonatized Siltstone, Greenstone, Graphitic Schist	Chalcopyrite, Pyrrhotite, Pyrite	Unknown	Mineralization occurs within schist in this cataclasite zone near a north trending fault that dips 60 to 85 degrees west. The occurrence consists of a well mineralized zone within quartz-epidote schist which hosts abundant pyrite, chalcopyrite and some pyrrhotite. West of the showing, the Stuhini Group rocks consist of epidotized and sheared greywacke with silicified epidotized and carbonate altered argillite. East of the north trending fault, the Unuk River Formation rocks consist mainly of graphitic schists and silicified greenstones.

Appendix 3.1-1. MINFILE Occurences within 2 Kilometres of the Access Road Alignments

MINFILE #	Name	Status	Location NTS Map	Coordinates Zone	Easting	Northing	Deposit Type	Character	Commodities	Host Rock Type	Group	Formation	Lithologies	Minerology Sulphides	Carbonates	Description
104B 081	UNUK (ZONE 4)	Showing	104B09W	09 (NAD 83)	418088	6267534	G04: Besshi massive sulphide Cu-Zn, I05: Polymetallic veins Ag-Pb-Zn+/-Au	Unknown	Copper	Meta-sedimentary	Stuhini	Undefined Formation	Argillaceous Phyllite, Argillite	Chalcopyrite, Pyrite		Two small showings in McTagg Creek valley were originally recorded by Newmont Exploration Ltd. One consists of copper staining (malachite?) associated with quartz-sericitic and siliceous alteration, including jasper and pyrite, of argillaceous phyllite. The other consists of pyritiferous quartz stringers along fractures in similar rock. Later work outlined a north trending alteration zone (Zone 4), within argillitic rock, composed of up to 30% sulphides, mainly pyrite. The altered argillites are cut by quartz veins. Chalcopyrite was reported at one location. The highest assay came from a rusty quartz vein hosting fine-grained pyrite and contained 0.071 grams per tonne gold and 8.4 grams per tonne silver across a width of 10 cm. An average value of 14 samples taken is 0.017 grams per tonne gold and 2.1 grams per tonne silver (Assessment Report 17087).
104B 085	BARB LAKE	Showing	104B10E	09 (NAD 83)	405878	6273170	I05: Polymetallic veins Ag-Pb-Zn+/-Au	Disseminated	Copper	Plutonic	Hazelton	Unuk River	Hornblende Diorite, Greywacke, Andesite, Siliceous Andesite	Pyrrhotite, Chalcopyrite, Pyrite		Lower Jurassic Hazelton Group, Unuk River Formation rocks are intruded by a Lower Jurassic or younger hornblende diorite intrusion along the east shores of Barb Lake. Disseminated pyrite, pyrrhotite and chalcopyrite occur within the hornblende diorite near the contact with gritty greywacke of the Unuk River Formation. Just south-southeast of this showing silicified and pyritized andesite of the Unuk River Formation hosts abundant disseminated pyrite. This area is characterized by oxidized and silicified rocks.
104B 119	HARRYMEL CREEK SOUTH	Showing	104B10E	09 (NAD 83)	403630	6265891	J01: Polymetallic manto Ag-Pb-Zn, G04: Besshi massive sulphide Cu-Zn	Disseminated	Copper, Silver	Meta-sedimentary	Hazelton, Stuhini	Unuk River, Undefined Formation	Gossan, Epidote Schist, Biotite Chlorite Epidote Schist, Greywacke, Siliceous Schist, Limestone, Cataclasite, Greenstone, Graphitic Schist	Chalcopyrite, Pyrrhotite, Galena, Sphalerite, Pyrite, Silver Sulphides		Lower Jurassic Hazelton Group volcanics and sediments of the Unuk Formation, located on the east side of Harrymel Creek are in fault contact with the Upper Triassic Stuhini Group sediments to the west. The contact between the Triassic and Lower Jurassic rocks is marked by an extensive north-northwest trending cataclasite zone, known as the South Unuk Zone, which contains biotite-chlorite-epidote schist (Bulletin 63, Figure 13). Mineralization occurs within schists in this cataclasite zone along the west side of Harrymel Creek, near a north trending fault. Pyrrhotite and chalcopyrite occur within a gossanous zone in epidotized greywacke and epidote bands within the schist. To the west of this showing epidotized limestone and silicified schists are in contact with sheared and epidotized greywacke and argillite that are part of the Stuhini Group sediments.
104B 125	CHRIS	Showing	104B08W, 104B07E	09 (NAD 83)	407584	6256709	K01: Cu skarn, K04: Au skarn, K03: Fe skarn	Massive, Stratiform, Disseminated	Iron, Copper, Silver, Gold, Magnetite	Sedimentary	Stuhini	Undefined Formation	Limestone, Diorite Dike, Andesite Tuff, Siltstone, Feldspar Porphyry, Sandstone	Pyrrhotite, Chalcopyrite, Pyrite		The most abundant rock types are fine to medium-grained chloritic andesitic tuff, tuffaceous siltstone, and minor massive greenstone. The tuff is usually thin-bedded to laminated, and has a weak to locally strong foliation usually parallel to bedding. A recrystallized limestone occurs interbedded with the tuff and appears laminated as a result of shearing. Feldspathic sandstone occurs interbedded with the tuffaceous units and feldspar porphyry also occurs as a conformable sill or flow. Minor diorite dikes and offshoots from the Triassic and younger "Max" diorite body cut the rocks. The "Max" diorite occurs over 2 km to the west and is associated with the Max (104B 013) iron deposit. Mineralization consists of massive magnetite and pyrrhotite, with chalcopyrite occurring in one to three limestone horizons. Magnetite occurs as layers in relatively pure limestone, whereas the sulphides occur in thin beds of green chloritic limestone that have almost completely been replaced. Chalcopyrite occurs as streaks and disseminations in massive magnetite and pyrrhotite, and locally in commonly siliceous tuff units that underlie massive sulphide layers.
104B 173	IRON CAP GOLD (SULPHURETS)	Prospect	104B09E	09 (NAD 83)	424651	6267659	G07: Subaqueous hot spring Ag-Au, I02: Intrusion-related Au pyrrhotite veins	Stockwork, Vein	Gold, Silver, Copper, Molybdenum, Zinc, Lead	Volcanic	Hazelton	Unuk River	Volcanic, Volcaniclastic, Quartz Sericite Schist, Chlorite Schist, Hornblende Porphyry	Pyrite, Tetrahedrite, Molybdenite, Chalcopyrite, Sphalerite, Galena,		The host rocks consist of quartz sericite schist or chlorite schist. Alteration consists of pervasive silicification, pyritization and lesser sericitization and chloritization. The rocks typically contain from 3 to 5% pyrite. Three major parallel sets of quartz-pyrite veins and stockwork occur over a total length of 700 m and a vertical extent of 400 m. These vein zones range in width from 0.5 to 6 m. The Iron Cap West vein is the westernmost of the veins. It is exposed for 300 m horizontally along length and 140 m vertically. The vein strikes from 10 to 25 degrees and dips vertically to steeply east. The lower half of the vein averages 5 m in width; the upper half averages 3 m. The vein is controlled by a prominent fault set; the south end terminates abruptly and the north end may splits into two or three veins and is offset by numerous cross-faults. The veins consist of massive quartz and from 5 to 10% pyrite. Minor amounts of tetrahedrite and trace amounts of molybdenite, chalcopyrite, sphalerite, galena, hematite and magnetite also occur.
104B 175	UNUK (ZONE 3)	Showing	104B09W	09 (NAD 83)	413383	6264690	M06: Ultramafic-hosted asbestos	Unknown	Asbestos, Copper	Volcanic	Hazelton	Unuk River	Volcanic Breccia, Conglomerate, Sandstone, Diorite			Two showings of asbestos, one with magnetite and some copper mineralization, occur within a kilometre of each other (Property File: Geology Map-Newmont Expl. of Canada Ltd.). Showings of magnetite are reported west and northeast of these asbestos showing. The nature of how the mineralization occurs and the host rock in which it occurs were not reported.
104B 226	NORTH FORK	Showing	104B07E	09 (NAD 83)	404390	6260182	L04: Porphyry Cu +/- Mo +/- Au	Disseminated	Copper	Plutonic	Stuhini	Undefined Formation	Medium Grained Diorite, Diorite, Quartz Diorite, Banded Dioritic Schist, Chlorite Epidote Phyllite, Volcanic Sandstone, Siltstone, Volcaniclastic	Chalcopyrite		A Triassic or younger quartz diorite stock intrudes the Upper Triassic Stuhini Group volcanic sandstone, siltstone, conglomerate and breccia. The diorite is medium grained,partly epidotized and hosts minor disseminated magnetite. Malachite staining and minor chalcopyrite occur within the diorite. The contact zone between the diorite and Stuhini Group rocks is marked by sheared and banded dioritic schist with associated chlorite-epidote phyllites.
104B 227	SULPHIDE CK. PLACER	Showing	104B07E	09 (NAD 83)	407287	6261169	C01: Surficial placers	Unconsolidated	Gold	Sedimentary	Hazelton	Unuk River	Gravel			The area around the junction of Sulphurets Creek and the Unuk River is underlain by Lower Jurassic Hazelton Group volcanics and volcaniclastics of the Unuk River Formation. The rocks are comprised of altered tuffs and lithic tuffs with minor chert, andesite and chloritic schists.

Appendix 3.1-1. MINFILE Occurences within 2 Kilometres of the Access Road Alignments

MINFILE #	Name	Status	Location NTS Map	Coordinates Zone	Easting	Northing	Deposit Type	Character	Commodities	Host Rock Type	Group	Formation	Lithologies	Minerology Sulphides	Carbonates	Description
104B 233	GFJ	Prospect	104B08W	09 (NAD 83)	414175	6257375	I05: Polymetallic veins Ag-Pb-Zn+/-Au	Vein	Gold, Silver, Copper, Zinc	Volcanic	Hazelton	Salmon River	Andesitic Ash Tuff, Schistose Siltstone, Amphibolite, Andesite Breccia	Arsenopyrite, Pyrite, Sphalerite, Chalcopyrite, Tetrahedrite	Siderite	Mineralization at the GFJ showing is largely hosted by andesite block breccias and tuffs of the Middle Jurassic Hazelton Group, Salmon River Formation. The hosting unit is in thrust contact with overlying undifferentiated andesite and epiclastic rocks also of the Salmon River Formation. In general, mineralization trends west-southwest from the thrust contact for about 1.5 km. The GFJ prospect occurs in variably foliated andesitic ash tuffs with thin interbeds of foliated to schistose siltstone. The occurrence consists of flat-lying, zoned, siderite-quartz-sulphide veins. The veins are poorly exposed. Vein margins are 1 to 2 cm of thin white quartz layers separated by hairline accumulations of very fine-grained tin-white sulphide, probably arsenopyrite. The core is a very coarse-grained intergrowth of siderite, milky quartz, and cubes and clusters of pyrite with lesser amounts of sphalerite and chalcopyrite as crystals and irregular masses. Rare tetrahedrite and visible gold have been observed. A showing consisting of 10% pyrite and some chalcopyrite occuring in chloritic amphibolite is located about 400 m northwest of the high-grade GFJ sample.
104B 230	ILIAD	Showing	104B07E	09 (NAD 83)	403637	6260942	G04: Besshi massive sulphide Cu-Zn	Vein, Disseminated	Zinc, Iron, Magnetite	Volcanic	Stuhini	Undefined Formation	Gossan, Volcaniclastic, Andesitic Tuff, Chert, Argillite, Banded Dioritic Schist, Diorite, Quartz Diorite	Sphalerite, Pyrite		The area is underlain by Upper Triassic Stuhini Group volcanic siltstone, sandstone, conglomerate and breccia. On the east side of Harrymel Creek, the Stuhini Group rocks are intruded by a Triassic or younger quartz diorite stock. A north trending fault parallels Harrymel Creek and separates the altered volcaniclastics from silicified and banded dioritic schist which marks the contact between the diorite intrusions and Stuhini Group rocks. A gossanous zone occurs along the fault and hosts disseminated and fracture fillings of sphalerite, specular hematite, pyrite and about 10% magnetite. The gossanous rocks on the west side of the fault vary from altered andesitic tuff, silicified chert to argillite.
104B 232	TET	Showing	104B08W	09 (NAD 83)	412879	6258484	I05: Polymetallic veins Ag-Pb-Zn+/-Au	Vein	Gold, Silver, Copper	Volcanic	Hazelton	Unuk River	Tuff, Volcaniclastic, Pillow Lava, Argillite, Diorite	Tetrahedrite		Host rocks consist of thick-bedded epicalstic volcanic rocks and lithic tuffs with closely associated pillow lavas, carbonate lenses and thin bedded silstones. A small diorite stock has intruded these rocks 2 km to the west of the showing. Tetrahedrite occurs in a a fault zone that cuts unspecified rock types. Alteration and deformation in the area are complex.
104B 234	MANDY GLACIER	Showing	104B08W	09 (NAD 83)	413179	6257271	L04: Porphyry Cu +/- Mo +/- Au, G04: Besshi	Vein	Copper	Volcanic	Hazelton	Unuk River	Volcanic Rock, Sediment/Sedimentary, Hornblende Diorite	Chalcopyrite, Pyrrhotite		The Unuk River Formation consists mainly of volcanic breccia, conglomerate, sandstone and silt-stone. Alteration and deformation in the area are complex.
104B 240	C-10 (COREY)	Prospect	104B08W	09 (NAD 83)	411787	6257826	I05: Polymetallic veins Ag-Pb-Zn+/-Au	Stockwork, Vein, Podiform, Disseminated	Gold, Silver, Copper, Zinc, Lead	Meta-volcanic	Hazelton	Unuk River, Salmon River	Chlorite Sericite Schist, Tuff, Monzonite, Feldspar Phyric Volcanic, Andesite Breccia	Pyrite, Chalcopyrite, Sphalerite, Pyrrhotite, Galena, Arsenopyrite, Tetrahedrite	Ankerite, Siderite	Alteration of a tuffaceous volcanic to sericite schist contain up to 30% quartz veinlets and lenses. This zone was reported to contain up to 10% pyrite with minor fine-grained sphalerite. The C-10 area is thought to be part of a northwest-trending pyrite-sericite schist alteration zone extending as much as 6.5 km and 0.8 to 1.6 km in width. Silicification in this zone increases with depth, as well as towards the east. Silicification in the C-10 zone comprises quartz veinlets and stockworks. A sulfide stringer zone up to 800 m in width occurs along the east margin of the pyrite-sericite schist band, consisting of numerous sub-horizontal stringers, pods and lenses containing siderite, chalcopyrite, pyrite, sphalerite, galena and arsenopyrite. The zone is a large argillic alteration and shear zone in rocks of intermediate composition feldspar-phyric volcanic rocks cut by numerous monzonite dikes. Samples were collected from rocks described as ankeritic quartz-rich lenses containing tetrahedrite, pyrite, pyrrhotite and scorodite, as well as from phyllitic andesitic tuff.
104B 355	COREY 34	Showing	104B08W	09 (NAD 83)	409525	6260193		Unknown	Silver	Volcanic	Hazelton	Unuk River	Andesitic Breccia, Andesite, Tuff, Argillite, Conglomerate			The area near the junction of Sulphurets Creek and the Unuk River is underlain by a series of north to northwest trending Hazelton Group intermediate (dacite/andesite) composition volcanic flows, pyroclastics and pillow lavas of the Lower Jurassic Unuk River Formation. Locally, they consist of red, green and purple volcanic breccia, conglomerate, sandstone, argillaceous siltstone with intercalated crystal and lithic tuffs. The stratigraphic and structural relationships are not well-defined but the regional strike is to the northeast with an east dip.
104B 376	SIB	Prospect	104B09W	09 (NAD 83)	408589	6273080	I02: Intrusion-related Au pyrrhotite veins, I09: Stibnite veins and disseminations	Disseminated, Stockwork	Gold, Silver, Antimony, Zinc	Sedimentary	Hazelton	Mount Dilworth, Betty Creek	Mudstone, Felsic Volcanic, Andesitic Lapilli Tuff, Agglomerate, Chert, Siltstone, Greywacke, Granodiorite Dike	Pyrite, Stibnite, Sphalerite, Pyrargyrite, Arsenopyrite		Along the eastern side of the Sib property, Betty Creek Formation lithologies predominate. These include a 396 to 1,828-m thick section of tan weathering, pale green andesitic plagioclase porphyritic lapilli tuff and agglomerate containing lesser amounts of interbedded crystal tuff and black mudstone. A mudstone unit comprises sedimentary-epiclastic rocks interbedded with minor tuffaceous and volcanic fragmental rocks. The unit is from 48 to 914 m thick and includes interbedded mudstone, sandstone, conglomerate and ash and crystal tuff. An andesitic conglomerate unit occurs as a 487-m long and up to 91-m wide lens. Mount Dilworth Formation rocks occur along the western half of the property. A felsic volcanic unit, ranging in width from 121 m to greater than 396 m, comprises massive, banded and brecciated grey to white cherty felsic rock and includes several interbeds of mudstone-looking rock. Black, variably siliceous, carbonaceous mudstone up to 20 m thick occur as interbeds in the felsic rocks. The Lulu zone mineralization occurs in this mudstone. A mudstone approximately 149 m lower in the stratigraphic section than the "Lulu mudstone" hosts the Marguerite zone mineralization. Overlying the Mount Dilworth lithologies are Salmon River Formation interbedded black cherts, carbonaceous mudstone and siltstone, and banded greywacke and siltstone.

Appendix 3.1-1. MINFILE Occurences within 2 Kilometres of the Access Road Alignments

MINFILE #	Name	Status	Location NTS Map	Coordinates Zone	Easting	Northing	Deposit Type	Character	Commodities	Host Rock Type	Group	Formation	Lithologies	Minerology Sulphides	Carbonates	Description
104B 376 *(cont'd)*																Granodiorite dykes/sills are subparallel to stratigraphy within Mount Dilworth felsic rocks and occur in the northwest end of the property. The dikes or sills are up to 24 m thick and 304 m long and comprise grey to grey-green aphanitic to augite-feldspar porphyritic granodiorite. Bowser Lake Group sediments comprised of moderate northwest dipping siltstone, sandstone and conglomerate occur in the extreme northwest corner of the property and are in fault contact with underlying Salmon River Formation rocks. In general, the rocks on the Sib property form a simple homoclinal sequence trending approximately 35 degrees and dipping 20-80 degrees northwest. Two distinct parallel zones of alteration occur concordant with stratigraphy at Sib. The eastern zone (or Central Anomalous zone) includes a 9-km long linear trend of conspicuous gossans situated along the western margin of the Betty Creek Formation volcanics, and extends north to the Eskay Creek property. This trend encompasses the North, Battleship Knoll, Adit, 1100, South and Meadow zones at Sib. Alteration along this zone comprises intensely potassium metasomatized, brecciated, quartz flooded, pyritized andesitic tuffs with intermittent zones of discontinuous quartz-potassium feldspar-sulphide veins, vein breccias and stockworks. In 1990, all but one of 20 drill holes testing the eastern zone intersected stockworks carrying gold concentrations of 0.34 to 4.29 grams per tonne over widths of up to 19 m. The western zone of alteration occurs west of the eastern zone within the felsic rocks of the Mount Dilworth Formation. The alteration comprises extensive and locally intense pervasive silicification and sodium metasomatism. Albitites have also been extensively developed. Drill holes targeted at mudstone interbedded in the felsic assemblage intersected gold and silver mineralization over wide intervals. Below, an extensive interval of silicified and albitized felsic strata, drill hole 90-30 intersected 21 m of black siliceous carbonaceous mudstone (Lulu mudstone). A 14 m interval of the mudstone is mineralized with disseminated pyrite, framboidal pyrite, laminar pyrite and disseminated and fracture- controlled stibnite and sphalerite.
104B 383	ESKAY (CANAMERA)	Showing	104B10E	09 (NAD 83)	404728	6274371	I02: Intrusion-related Au pyrrhotite veins	Stockwork, Shear	Gold, Silver	Volcanic	Hazelton	Undefined Formation	Crystal Lithic Tuff, Felsic Volcanic, Argillaceous Siltstone	Pyrite	Calcite	A repetitive sequence of two north-trending units, felsic volcanics and argillitic siltstones, are cut by east-west shears. The felsic volcanics consist of pale to dark grey crystal lithic tuffs, silicified and brecciated, with 2 to 3% disseminated euhedral pyrite and minor massive layered pyrite bands. The sedimentary unit consists of black, schistose argillitic siltstone/mudstone containing trace to 2% disseminated fine-grained pyrite and rare 1 mm thick fine grained pyrite bands.
104B 385	COREY (T.V.)	Prospect	104B09W	09 (NAD 83)	409887	6265938	G06: Noranda/Kuroko massive sulphide Cu-Pb-Zn, I02: Intrusion-related Au pyrrhotite veins	Disseminated, Massive, Stratabound	Gold, Silver, Lead, Zinc	Volcanic	Hazelton	Salmon River	Rhyolite, Breccia, Black Mudstone, Black Shale	Pyrite, Galena, Arsenopyrite, Sphalerite, Pyrargyrite, Stibnite		Rock units had been assigned to the Salmon River Formation felsic and mafic volcanic sequence with interbedded sediments. Rock types observed include amygdaloidal andesite or dacite, flow-banded feldspar-phyric dacite tuff, autobreccia and lapilli tuff and black mudstone. All units are strongly overprinted with orthoclase feldspar and sericite alteration (potassic alteration). Mineralization comprises pyrite, galena, arsenopyrite, with traces of sphalerite, ruby silver and possibly stibnite. Sulphides occur as disseminated grains, veinlets and colloform in-fillings in breccia, rhyolite and black mudstone. The TV zone has been traced up to 1,500 m on strike with widths over 90 m (Information Circular 1996-1, page 25). The Kumiko showing is located on the south bank of Kumiko Creek at an elevation of 700 m. The showing consists of a sheared zone of intermediate volcanics, approximately 2 metres in width with a trend of about 170 degrees. Discontinuous lenses and veins of quartz occur throughout and mineralization is spotty. Mineralization consists of pyrite, chalcopyrite, galena with minor malachite and azurite staining.
104B 387	HSOV	Prospect	104B08W	09 (NAD 83)	413743	6258899	G06: Noranda/Kuroko massive sulphide Cu-Pb-Zn, G07: Subaqueous hot spring Ag-Au	Disseminated, Massive	Zinc, Gold, Silver, Copper	Volcanic	Hazelton	Betty Creek, Salmon River	Rhyolite Breccia, Rhyolite, Black Shale, Mudstone, Andesite, Basalt, Volcaniclastic Geological Setting	Sphalerite, Pyrite, Marcasite		The showing lies at the contact between rhyolite breccias and black shales; the horizon has been traced for one kilometre along strike and 500 m down dip. Mineralization consists of a zone of semi-massive to massive marcasite and pyrite, with minor gypsum, anhydrite and sphalerite in a black, sooty matrix. The sulfide body is exposed over a length of 35 m and is up to 3.5 m thick. A left-lateral fault offsets sulfide mineralization 110 m to the east, where another 30 m of mineralization up to 1 m thick is exposed. Blocky altered mudstone and felsic volcanic clasts are supported within a sponge like matrix of sulphides and sulphosalts along with gypsum associated with sulphidic tubules. Strong shearing and associated thrust faulting has complicated stratigraphy, however it remains that the mineralization is located at or near the mudstone/felsic breccia contact.
104B 390	MM	Showing	104B08W	09 (NAD 83)	412045	6259552	I05: Polymetallic veins Ag-Pb-Zn+/-Au	Disseminated, Vein	Gold, Silver, Copper, Zinc	Volcanic	Hazelton	Betty Creek, Unuk River	Andesitic Tuff, Andesite	Sphalerite, Galena, Arsenopyrite, Pyrite, Chalcopyrite, Tetrahedrite		Alteration is intense, with pervasive bands and pods of ankerite, fuchsite, quartz-carbonate, sericite and pyrite. These rocks host sulphide mineralization as disseminations, vein stockworks and bands of sphalerite, galena, arsenopyrite, minor chalcopyrite, trace tetrahedrite and pyrite. Peripheral alteration consists of chlorite and ferrous carbonate. Cross cutting zones of shearing trends both parallel and at right angles to Mandy Creek.

Appendix 3.1-2

Assessment Reports (ARIS) within 2 Kilometres of the Access Road Alignments

Engineers and Scientists

Appendix 3.1-2A. Assessment Reports (ARIS) within 2 Kilometres of the Coulter Creek Access Road (CCAR)

AR Number	Kilometre	Easting	Northing
24608	0-2	409913	6277505
17817	3	407848	6276653
23493	3	407848	6276653
27075	4	407495	6276104
25869	4	407828	6275694
18376	4	408339	6275683
25258	5	407807	6274767
24176	5	407807	6274767
19347	6-7	405741	6273885
23157	6-7	409833	6273795
20633	8	403652	6272076
20624	8	404634	6270198
27370	8	407746	6271985
19548	8	407746	6271985
30726	8	408770	6271962
21334	8	408770	6271962
21749	8-9	409794	6271940
28338	8-9	409425	6271453
26734	8-9	406560	6271578
23226	9	407746	6271985
22591	10-11	408730	6270107
23181	10-11	408730	6270107
23237	14	405616	6268320
20907	14	409714	6268230
19653	14	409714	6268230
18929	17-18	406559	6264588
20732	19-20	405492	6262756
30282	19-20	407543	6262710
23757	20	408569	6262688
0347	20	408569	6262688
17205	23-24	408991	6261627
30131	23-24	408786	6261632
25384	23-24	408208	6260995
24373	24-25	410621	6262644
12255	24-25	409556	6260811
18691	25	410621	6262644
16318	26-27	411616	6261139
8769	28-29	413174	6262034
20620	31-32	416245	6261601
9233	33	417693	6262129

Appendix 3.1-2B. Assessment Reports (ARIS) within 2 Kilometres of the Treaty Creek Access Road (TCAR)

AR Number	Kilometre	Easting	Northing
24966	0	459990	6274876
26225	0	460995	6273011
24967	0	460995	6273011

Appendix 3.1-3

Provincial Rock Geochemistry within 2 Kilometres of the CCAR

Appendix 3.1-3. Provincial Rock Geochemistry within 2 Kilometres of the CCAR

ID Number	Kilometre	Easting	Northing
38540	0-1	410887	6277949
38558	0-1	410852	6277924
38559	0-1	412092	6278054
38543	5	408737	6274899
38560	6-7	408612	6273919
38544	8	407512	6272514

Appendix 3.1-4

Regional Geochemistry Surveys

Engineers and Scientists

Appendix 3.1-4. Regional Geochemistry Surveys

No.	Sample_ID	NTS_MAP	UTME_83	UTMN_83	ELEV__m_	pH (water)	Ag	As	Au	Ba	Cd	Co	Cu	Fe	Hg	Pb	Mn	Mo	Ni	Sb	Sn	U	V	W	Zn	LOI
Coulter Creek Access Road																										
1	104B871297	104B10	403799	6274337	762	6.9	0.2	4	4	1000	0.4	17	41	3.8	5	9	600	2	22	0.1	1.0	2.1	74	2	112	1.9
2	104B871298	104B10	404198	6274440	640	6.9	0.2	10	5	930	0.3	20	53	4.0	25	9	700	2	40	0.2	1.0	1.9	95	3	107	2.0
3	104B871300	104B10	404251	6273731	650	7.3	**1.1**	**590**	18	860	0.6	13	44	3.4	**3000**	28	970	3	25	**20.0**	1.0	3.3	50	2	180	6.8
4	104B871365	104B10	403965	6272170	550	7.2	**0.8**	**48**	11	970	**1.8**	18	68	4.6	**215**	**32**	1100	3	31	**3.8**	3.0	3.3	54	4	**262**	7.8
5	104B871366	104B10	403440	6271877	700	7.0	0.4	24	2	1200	0.6	**28**	87	4.4	5	16	650	3	91	1.0	2.0	2.9	104	3	137	3.8
6	104B871367	104B10	403323	6270494	685	6.9	0.2	7	8	850	0.1	18	39	3.1	5	6	410	3	27	0.2	2.0	4.5	84	2	50	2.0
7	104B871368	104B10	403683	6269297	487	7.5	0.3	41	15	1000	0.6	**27**	75	4.1	30	20	740	1	**138**	0.8	3.0	1.8	93	4	174	2.1
8	104B871369	104B10	404107	6269305	488	7.6	0.4	38	13	1000	1.2	17	50	4.0	115	19	1100	3	46	2.1	1.0	2.7	57	2	**222**	10.9
9	104B871370	104B10	403459	6268162	610	7.6	0.5	**50**	5	1200	0.5	20	**118**	**5.4**	45	**30**	780	**11**	59	**5.0**	1.0	3.9	**139**	2	181	14.1
10	104B871371	104B10	404250	6266777	595	7.4	**2.1**	**300**	32	960	1.2	14	40	4.4	**205**	**31**	**1300**	**7**	35	**7.8**	2.0	3.5	33	2	212	13.4
11	104B871372	104B10	401810	6266533	855	7.6	0.3	29	10	**1600**	0.4	13	46	3.6	55	14	680	3	27	2.2	2.0	3.0	63	2	120	2.4
12	104B871374	104B10	400893	6264197	792	7.1	0.4	21	10	1300	0.4	16	43	3.8	60	13	620	3	30	0.8	3.0	2.3	83	3	116	1.2
13	104B871375	104B10	400893	6264197	792	7.0	0.5	20	32	1300	0.4	16	46	3.8	50	12	630	4	31	0.8	2.0	2.7	80	2	101	1.1
14	104B871376	104B10	403923	6264107	365	7.3	0.4	20	28	1300	0.3	18	48	4.1	75	14	710	3	34	0.7	1.0	2.3	88	3	110	1.2
15	104B871377	104B10	404257	6264590	396	7.3	0.6	25	1	1400	**2.5**	**43**	**128**	**4.8**	55	9	880	3	**340**	1.0	3.0	1.5	**143**	3	**430**	11.2
16	104B871378	104B10	405329	6262704	762	7.1	**0.9**	28	**343**	1000	**1.6**	15	35	3.8	**290**	17	**1200**	4	52	3.0	3.0	2.8	62	2	**240**	13.6
17	104B871379	104B09	408402	6263026	268	6.7	0.4	**210**	4	960	**2.0**	17	36	4.1	150	10	890	4	51	**10.0**	1.0	2.2	93	4	**280**	11.4
18	104B871380	104B09	408576	6264085	272	6.8	0.3	31	**145**	**1600**	0.6	14	59	3.7	**190**	12	480	3	42	1.8	1.0	2.1	96	2	140	2.6
19	104B871382	104B10	407467	6265704	245	7.1	**0.8**	32	14	970	**2.7**	19	50	4.0	**350**	20	900	4	83	**5.6**	1.0	3.3	47	3	**340**	8.2
20	104B871383	104B10	407589	6267029	265	6.8	**1.0**	45	8	1100	**15.0**	20	89	**4.9**	**165**	18	615	**9**	98	**5.4**	1.0	4.1	44	4	**1080**	4.5
21	104B871384	104B09	408778	6267845	300	7.0	0.3	44	8	1100	**1.7**	18	83	**4.9**	**245**	16	**1200**	4	29	2.6	1.0	2.6	50	4	**242**	10.5
22	104B871385	104B09	411576	6269034	350	6.8	0.3	**46**	8	1400	**2.2**	14	64	4.3	**240**	15	**1200**	**7**	30	**3.7**	1.0	3.1	88	2	**308**	8.9
23	104B871386	104B09	411105	6267745	870	6.4	0.2	13	4	1300	0.1	12	34	4.2	30	8	550	2	8	0.7	1.0	2.9	72	4	89	1.3
24	104B871387	104B09	410837	6271694	315	6.9	0.5	**95**	5	1500	**4.2**	15	41	**5.1**	**425**	11	**1500**	**17**	48	**12.0**	1.0	4.2	77	4	**570**	12.8
25	104B871388	104B09	410526	6266577	732	6.6	0.4	30	41	1500	1.2	12	39	4.7	140	12	870	**6**	13	1.7	2.0	3.0	68	2	191	7.2
26	104B871389	104B09	408452	6268706	286	7.3	0.2	41	19	1200	0.3	19	105	**5.3**	**440**	18	640	3	31	2.4	1.0	2.6	43	2	160	5.2
27	104B871390	104B09	410101	6271970	305	7.1	**0.7**	**80**	9	1200	**2.1**	24	55	**6.0**	**500**	24	**1700**	**7**	34	**7.5**	1.0	3.3	67	2	**415**	11.9
28	104B871395	104B09	410101	6271970	305	7.2	0.4	37	6	1200	**7.3**	24	55	**4.8**	**500**	24	745	**7**	98	**4.8**	1.0	3.3	67	2	**730**	7.2
29	104B871396	104B09	412710	6279992	670	6.5	0.4	**51**	7		**2.4**		63	4.2			380		**124**	**17.0**					**386**	4.9
30	104B871399	104B09	413361	6280691	700	6.3	0.3	22	4		0.4		53	4.6			605		**110**	1.0					192	4.7
31	104B871400	104B09	413361	6280691	700	6.1	0.3	22	5		0.4		51	4.5			610		**108**	1.2					191	4.8
32	104B871422	104B09	412584	6278020	720	7.6	**1.0**	25	18	**1800**	**2.0**	19	**126**	4.7	125	8	1000	**8**	63	**4.8**	1.0	2.5	87	3	**230**	4.7
33	104B871423	104B09	416275	6263059	550	7.3	0.2	18	1	1500	0.1	13	62	3.5	45	6	600	2	15	0.7	1.0	2.3	96	2	79	1.4
34	104B871424	104B09	416275	6263059	550	7.1	0.2	19	6	**1600**	0.1	14	67	3.6	40	6	616	1	15	0.7	1.0	1.9	110	2	76	1.4
35	104B871437	104B08	413764	6261554	457	7.5	0.4	**91**	47	**1800**	0.4	18	73	**4.9**	**190**	24	780	3	13	**7.4**	1.0	2.6	65	3	148	2.1
36	104B871438	104B08	415189	6261902	520	7.5	**0.7**	**62**	24	1500	0.9	18	**134**	3.6	50	15	805	4	21	2.4	1.0	2.2	72	3	140	1.9
37	104B871439	104B08	411773	6259956	610	7.1	0.6	**250**	**444**	1400	0.5	22	80	3.9	85	15	770	2	26	1.4	1.0	2.2	62	3	120	1.8
38	104B871440	104B08	412446	6261569	457	7.4	0.6	**100**	**204**	**1600**	0.4	24	**123**	4.3	80	20	965	2	30	1.7	3.0	2.1	87	4	118	3.1
39	104B871442	104B08	411417	6260222	640	7.3	**1.2**	**78**	**160**	**1600**	0.8	22	109	**4.9**	140	21	1020	3	35	**4.8**	3.0	2.1	90	2	154	2.5
40	104B873315	104B07	400111	6261164	396	7.3	0.6	29	18	1400	0.7	18	104	4.3	40	16	960	4	62	**4.3**	1.0	2.2	108	4	185	3.9
41	104B873316	104B07	400338	6261488	390	7.3	**0.8**	28	24	1300	**2.0**	24	**134**	4.4	70	22	**1200**	**6**	61	**3.6**	2.0	3.3	**113**	**5**	**300**	13.7
Treaty Creek Access Road																										
1	104A041059	104A	457127	6266559		7.0	275	12		**600**	**0.8**	**63**	23	**5.4**	**128**	6	**9208**	**3**	76	0.3		**1.3**	47		144	23.3
2	104A041094	104A	448881	6266761		8.0	124	21	4	**1000**	**1.2**	17	41	3.7	104	8	858	2	65	2.1		**2.1**	36		**180**	2.5
3	104A041093	104A	448881	6266761		8.1	131	**25**	4	**1100**	**1.6**	17	40	3.7	114	10	870	2	62	**2.3**		**2.4**	37		**216**	2.1
4	104A041082	104A	454500	6267529		7.4	248	22	**18**	**1100**	0.8	18	48	3.8	110	13	955	2	64	2.2		**2.5**	47		140	5.0
5	104A041339	104A	461462	6268352		7.3	251	7	3	**660**	0.4	18	32	2.6	78	6	1147		71	0.4		**1.6**	42		125	15.6
6	104A041095	104A	449528	6268822		7.7	123	11	4	**880**	0.3	19	34	3.4	51	7	807	1	102	0.6		**2.1**	39		106	4.2
7	104A041086	104A	449083	6270520		7.8	220	12	5	**920**	0.3	19	57	3.6	82	10	606	2	**109**	0.8		**1.9**	44		121	4.6
8	104A041098	104A	457127	6270520		7.8	185	10	5	**880**	0.2	15	49	3.4	51	7	530	2	102	0.6		**1.8**	46		108	3.5
9	104A041057	104A	440716	6270844		7.8	278	14	5	**930**	0.5	**31**	**74**	**4.7**	79	10	**1926**	**3**	**127**	1.0		**2.4**	47		**182**	2.9
10	104A041058	104A	440271	6270884		8.3	194	19	--	**1100**	**1.1**	15	41	4.1	**132**	13	673	**3**	53	**2.7**		**2.7**	43		151	2.1
11	104A041097	104A	442939	6271733		7.9	276	21	5	**950**	0.7	**34**	**84**	**5.2**	88	10	1714	**3**	**168**	1.1		**2.2**	51		**216**	3.9
12	104A041096	104A	445445	6271733		7.8	268	18	4	**1000**	0.6	**29**	**70**	**4.8**	71	9	**2094**	**3**	**134**	1.0		**2.3**	52		**215**	3.7
13	104A041056	104A	440271	6272986		8.2	**395**	**41**	**43**	**1600**	**1.2**	16	56	4.0	**240**	**18**	911	**3**	46	**3.8**		**2.4**	48	0	148	2.4
14	104A041055	104A	447830	6273148		7.6	180	7	5	**970**	0.2	14	44	3.2	60	7	543	1	95	0.5		**1.7**	48		102	2.7
15	104A041087	104A	443424	6273229		7.6	160	8	4	**640**	0.2	20	37	3.1	58	8	657	1	99	0.6		**1.7**	45		115	11.2
16	104A041048	104A	447264	6273350		7.8	155	7	3	**890**	0.4	17	39	3.2	62	6	1333	2	96	0.5		**1.8**	48		116	5.7
17	104A041045	104A	442211	6276422		7.7	132	8	3	**760**	0.3	19	37	3.1	62	6	640	2	**112**	0.6		**1.7**	43		102	2.9
18	104A041047	104A	443990	6276705		7.6	196	9	4	**940**	0.3	16	47	3.0	61	7	597	2	102	0.6		**1.7**	46		96	2.6
19	104A041054	104A	440918	6278322		7.8	218	7	5	**720**	0.4	21	42	3.1	86	8	735	1	104	0.6		**1.8**	45		96	6.3
20	104B871207	104B09	434574	6274579	885	7.8	100	20	2	**1100**	0.3	13	36	3.2	65	12	400	2	65	1.0	1.0	**2.3**	29	3	120	2.5
4	104B871205	104B09	436634	6274852	800	7.8	300	23	5	**1200**	0.5	25	52	4.1	**150**	10	620	**4**	**156**	0.6	1.0	**2.6**	38	3	**182**	4.6
5	104B871206	104B09	435789	6275337	870	8.0	**400**	**25**	1	**1200**	0.4	24	52	4.3	**130**	10	525	**3**	**145**	0.6	1.0	**2.3**	33	2	168	4.2
23	104B871094	104B09	438314	6272938	850	7.5	300	**25**	4	**990**	0.7	**36**	**79**	4.5	**125**	17	**2000**	**3**	**126**	1.5	3.0	**2.0**	48	3	**252**	8.2
24	104B871095	104B09	437924	6273792	730	7.0	300	19	1	**870**	0.2	19	48	3.1	80	10	1000	**3**	88	0.7	5.0	**1.9**	39	3	150	2.8
25	104B871096	104B09	437148	6274607	770		300	20	4	**820**	0.1	23	54	4.4	110	8	640	**3**	**154**	1.0	4.0	**1.8**	53	4	150	3.8

Values in red are above the 90th percentile of the RGS data for the mapsheet

All concentrations are in ppm with the following exceptions: Au, Hg ppb; Fe %

Appendix 3.2-1

CCAR Laboratory Static Test Results

Engineers and Scientists

Appendix 3.2-1. CCAR Laboratory Static Test Results

Station	Sample ID	Weight	Paste pH	Total S	Sulphide-S	Sulphide-S Calc.	Sulphide-S + S_Del	Sulphate-S (Na_2CO_3)	Sulphate-S (HCl)	S_BaSO_4	S_Del	S_Del Calc.	TAP	SAP	NP	NP_Adj	Total C	Inorganic C
2+700	S 001	2.62	6.7	0.04	0.02	0.04	0.02	0.02	0.005	0.02	-0.01	0.00	1.3	0.6	4	1	0.97	0.025
3+100	S 002	2.88	7.1	0.17	0.10	0.15	0.13	0.04	0.02	0.02	0.03	0.03	5.3	4.0	9	6	0.59	0.025
3+300	S 003	2.36	5.8	0.79	0.47	0.61	0.60	0.2	0.18	0.01	0.13	0.13	24.7	18.7	3	0	1.68	0.025
3+300	S 004	2.14	9.0	0.06	0.03	0.04	0.04	0.01	0.02	0.00	0.01	0.01	1.9	1.1	781	778	10.80	9
3+600	S 005	2.48	6.9	0.10	0.06	0.07	0.06	0.06	0.03	0.03	-0.02	0.00	3.1	1.9	5	2	0.87	0.025
3+900	S 006	2.46	6.3	0.06	0.03	0.04	0.03	0.03	0.02	0.02	-0.01	0.00	1.9	0.9	4	1	1.55	0.025
4+300	S 007	1.12	5.4	0.31	0.05	0.04	0.05	0.29	0.27	0.02	-0.03	0.00	9.7	1.6	2	0	2.66	0.025
6+500	S 008	1.82	7.6	0.10	0.07	0.08	0.07	0.03	0.02	0.02	-0.01	0.00	3.1	2.2	10	7	0.39	0.025
6+800	S 009	2.18	6.4	0.04	0.02	0.02	0.02	0.01	0.02	0.02	-0.02	0.00	1.3	0.6	3	0	1.32	0.025
7+100	S 010	1.42	6.2	0.07	0.03	0.06	0.03	0.04	0.01	0.03	0.00	0.00	2.2	1.0	2	0	1.51	0.025
8+000	S 011	1.66	6.5	0.05	0.02	0.02	0.02	0.03	0.03	0.02	-0.02	0.00	1.6	0.6	3	0	1.37	0.025
8+400	S 012	2.30	8.4	0.71	0.58	0.61	0.59	0.1	0.1	0.02	0.01	0.01	22.2	18.5	53	50	1.67	0.6
8+700	S 013	1.86	7.8	0.32	0.26	0.31	0.26	0.01	0.01	0.05	0.00	0.00	10.0	8.2	43	40	1.22	0.43
9+900	S 014	1.88	6.7	0.29	0.22	0.29	0.27	0.04	0.005	0.02	0.05	0.05	9.1	8.4	6	3	0.93	0.025
14+500	S 015	2.36	5.1	0.23	0.16	0.23	0.19	0.05	0.005	0.03	0.03	0.03	7.2	6.0	1	0	1.84	0.025
16+600	S 016	2.10	7.1	0.38	0.29	0.38	0.36	0.03	0.005	0.02	0.07	0.07	11.9	11.1	11	8	1.41	0.09
17+000	S 017	2.56	7.7	0.09	0.08	0.06	0.08	0.005	0.03	0.02	-0.04	0.00	2.8	2.5	27	24	0.94	0.15
18+400	S 018	1.66	5.0	0.05	0.03	0.05	0.03	0.03	0.005	0.03	-0.01	0.00	1.6	0.9	3	0	1.46	0.025
18+500	S 019	1.78	7.9	0.07	0.06	0.04	0.06	0.01	0.03	0.03	-0.05	0.00	2.2	1.9	14	11	0.29	0.08
20+100	S 020	2.12	7.5	0.04	0.04	0.03	0.04	0.005	0.01	0.04	-0.05	0.00	1.3	1.3	9	6	0.16	0.025
20+400	S 022	1.80	7.9	0.02	0.01	0.01	0.01	0.005	0.01	0.01	-0.01	0.00	0.6	0.3	13	10	0.13	0.025
23+800	S 023	2.14	8.0	0.02	0.02	-0.01	0.02	0.005	0.03	0.01	-0.04	0.00	0.6	0.6	26	23	0.38	0.09
23+200	S 024	2.16	7.7	0.05	0.03	0.03	0.03	0.005	0.02	0.02	-0.02	0.00	1.6	0.9	13	10	0.16	0.025
25+300	S 037	2.60	8.7	0.73	0.73	0.72	0.73	0.005	0.01	0.04	-0.05	0.00	22.8	22.8	141	138	1.65	1.37
25+300	S 038	3.10	8.5	0.05	0.03	0.05	0.04	0.005	0.005	0.00	0.01	0.01	1.6	1.3	20	17	0.14	0.08
26+300	S 040	1.94	6.7	0.47	0.26	0.35	0.29	0.14	0.12	0.06	0.03	0.03	14.7	9.0	5	2	0.09	0.025
27+600	S 046	2.62	8.6	0.03	0.03	0.02	0.03	0.005	0.01	0.06	-0.07	0.00	0.9	0.9	32	29	0.55	0.22
27+600	S 047	1.64	8.8	0.14	0.11	0.13	0.11	0.005	0.01	0.04	-0.02	0.00	4.4	3.4	75	72	0.89	0.66
25+900	S 039	2.60	8.8	0.13	0.10	0.13	0.10	0.005	0.005	0.04	-0.02	0.00	4.1	3.1	102	99	1.04	0.91
23+600	S 025	1.94	7.1	0.02	0.02	0.00	0.02	0.005	0.02	0.01	-0.03	0.00	0.6	0.6	10	7	0.55	0.025
23+300	S 026	3.08	8.7	0.02	0.01	0.01	0.01	0.005	0.01	0.01	-0.01	0.00	0.6	0.3	21	18	0.15	0.06
22+200	S 027	2.02	7.3	0.54	0.38	0.54	0.52	0.03	0.005	0.01	0.14	0.14	16.9	16.3	14	11	1.71	0.12
21+900	S 028	2.26	8.3	0.04	0.05	0.04	0.05	0.005	0.005	0.01	-0.03	0.00	1.3	1.6	28	25	0.26	0.17
21+000	S 029	1.96	8.4	0.06	0.06	0.06	0.06	0.02	0.005	0.02	-0.02	0.00	1.9	1.9	25	22	0.20	0.17
21+900	S 030	1.04	6.7	0.02	0.02	0.02	0.02	0.01	0.005	0.02	-0.02	0.00	0.6	0.6	4	1	1.05	0.025
22+200	S 031	2.18	8.6	0.05	0.04	0.04	0.04	0.01	0.01	0.02	-0.02	0.00	1.6	1.3	14	11	0.16	0.09
23+000	S 032	2.26	7.5	0.01	0.01	0.00	0.01	0.005	0.01	0.02	-0.03	0.00	0.3	0.3	3	0	0.21	0.025
23+200	S 033	2.44	7.5	0.50	0.42	0.49	0.47	0.01	0.01	0.02	0.05	0.05	15.6	14.7	7	4	0.66	0.06
24+400	S 034	1.84	8.8	0.01	0.02	0.00	0.02	0.005	0.01	0.01	-0.03	0.00	0.3	0.6	26	23	0.25	0.2
24+500	S 035	1.80	7.8	0.14	0.06	0.14	0.12	0.02	0.005	0.02	0.06	0.06	4.4	3.6	14	11	0.21	0.07
25+100	S 036	2.52	8.7	0.03	0.04	0.03	0.04	0.005	0.005	0.01	-0.02	0.00	0.9	1.3	32	29	0.44	0.32
29+350	S 041	2.34	8.6	0.06	0.04	0.04	0.04	0.02	0.02	0.05	-0.05	0.00	1.9	1.3	50	47	0.69	0.38
29+800	S 042	2.46	8.9	0.12	0.11	0.12	0.11	0.01	0.005	0.03	-0.03	0.00	3.8	3.4	81	78	0.85	0.65
31+100	S 043	1.76	7.2	1.38	0.69	1.19	1.18	0.25	0.19	0.01	0.49	0.49	43.1	36.7	117	114	3.11	1.25
32+500	S 048	3.70	8.4	0.29	0.22	0.28	0.25	0.01	0.01	0.03	0.03	0.03	9.1	7.7	75	72	0.86	0.6
18+800	S 021	1.90	8.8	0.04	0.03	0.04	0.03	0.02	0.005	0.00	0.00	0.00	1.3	1.0	263	260	3.59	2.29
31+900	S 044	2.78	7.5	1.22	1.15	1.21	1.19	0.06	0.01	0.02	0.04	0.04	38.1	37.1	26	23	2.45	0.24
31+950	S 045	3.04	8.4	0.43	0.37	0.43	0.41	0.005	0.005	0.02	0.04	0.04	13.4	12.8	312	309	5.92	3.74

Appendix 3.2-1. CCAR Laboratory Static Test Results

Station	Sample ID	C_Inorg_DL	CO_2_Inorg	C_Del	C_Del Calc.	CANP_TTL	CANP_INORG	CANP_Ca	CANP_CaMg	TNNP	TNNP_ADJ	SNNP	SNNP_ADJ	TCNNP	TNPR	TNPR_ADJ	SNPR	SNPR_ADJ	FIZZ	FIZZ_CHECK
2+700	S 001	0.05	0.1	0.95	0.95	80.8	2.3	0.3	6.7	2.8	-0.3	3.4	0.4	1.0	3.2	0.8	6.4	1.6	1	Agree
3+100	S 002	0.05	0.1	0.57	0.57	49.2	2.3	0.5	7.1	3.7	0.7	5.0	2.0	-3.0	1.7	1.1	2.2	1.5	1	Agree
3+300	S 003	0.05	0.2	1.66	1.66	140.0	4.5	0.9	5.3	-21.7	-24.7	-15.7	-18.7	-20.1	0.1	0.0	0.2	0.0	1	Agree
3+300	S 004	0.05	33	1.80	1.80	900.1	750.5	38.5	98.6	779.1	776.1	779.9	776.9	748.6	416.5	414.9	689.1	686.5	4	Agree
3+600	S 005	0.05	0.1	0.85	0.85	72.5	2.3	0.4	6.8	1.9	-1.1	3.1	0.1	-0.9	1.6	0.6	2.7	1.1	1	Agree
3+900	S 006	0.05	0.1	1.53	1.53	129.2	2.3	0.3	5.4	2.1	-0.9	3.1	0.1	0.4	2.1	0.5	4.3	1.1	1	Agree
4+300	S 007	0.05	0.2	2.64	2.64	221.7	4.5	0.4	2.6	-7.7	-9.7	0.4	-1.6	-5.1	0.2	0.0	1.3	0.0	1	Agree
6+500	S 008	0.05	0.1	0.37	0.37	32.5	2.3	1.0	7.6	6.9	3.9	7.8	4.8	-0.9	3.2	2.2	4.6	3.2	1	Agree
6+800	S 009	0.05	0.1	1.30	1.30	110.0	2.3	0.2	3.7	1.8	-1.3	2.4	-0.6	1.0	2.4	0.0	4.8	0.0	1	Agree
7+100	S 010	0.05	0.1	1.49	1.49	125.8	2.3	0.1	4.1	-0.2	-2.2	1.0	-1.0	0.1	0.9	0.0	2.0	0.0	1	Agree
8+000	S 011	0.05	0.1	1.35	1.35	114.2	2.3	0.2	4.4	1.4	-1.6	2.4	-0.6	0.7	1.9	0.0	4.8	0.0	1	Agree
8+400	S 012	0.05	2.2	1.07	1.07	139.2	50.0	3.6	7.7	30.8	27.8	34.5	31.5	27.8	2.4	2.3	2.9	2.7	2	Agree
8+700	S 013	0.05	1.6	0.79	0.79	101.7	36.4	3.4	10.0	33.0	30.0	34.8	31.8	26.4	4.3	4.0	5.3	4.9	2	Disagree
9+900	S 014	0.05	0.1	0.91	0.91	77.5	2.3	0.8	3.8	-3.1	-6.1	-2.4	-5.4	-6.8	0.7	0.3	0.7	0.4	1	Agree
14+500	S 015	0.05	0.1	1.82	1.82	153.3	2.3	0.2	2.7	-6.2	-7.2	-5.0	-6.0	-4.9	0.1	0.0	0.2	0.0	1	Agree
16+600	S 016	0.05	0.3	1.32	1.32	117.5	6.8	1.0	4.6	-0.9	-3.9	-0.1	-3.1	-5.1	0.9	0.7	1.0	0.7	1	Agree
17+000	S 017	0.05	0.6	0.79	0.79	78.3	13.6	2.7	12.4	24.2	21.2	24.5	21.5	10.8	9.6	8.5	10.8	9.6	2	Disagree
18+400	S 018	0.05	0.1	1.44	1.44	121.7	2.3	0.4	4.6	1.4	-1.6	2.1	-0.9	0.7	1.9	0.0	3.2	0.0	1	Agree
18+500	S 019	0.05	0.3	0.21	0.21	24.2	6.8	1.4	6.0	11.8	8.8	12.1	9.1	4.6	6.4	5.0	7.5	5.9	2	Disagree
20+100	S 020	0.05	0.1	0.14	0.14	13.3	2.3	1.1	5.4	7.8	4.8	7.8	4.8	1.0	7.2	4.8	7.2	4.8	1	Agree
20+400	S 022	0.05	0.1	0.11	0.11	10.8	2.3	2.7	21.0	12.4	9.4	12.7	9.7	1.6	20.8	16.0	41.6	32.0	1	Agree
23+800	S 023	0.05	0.3	0.29	0.29	31.7	6.8	7.4	20.9	25.4	22.4	25.4	22.4	6.2	41.6	36.8	41.6	36.8	2	Disagree
23+200	S 024	0.05	0.1	0.14	0.14	13.3	2.3	12.2	29.0	11.4	8.4	12.1	9.1	0.7	8.3	6.4	13.9	10.7	1	Agree
25+300	S 037	0.05	5	0.28	0.28	137.5	113.7	12.4	27.2	118.2	115.2	118.2	115.2	90.9	6.2	6.0	6.2	6.0	3	Agree
25+300	S 038	0.05	0.3	0.06	0.06	11.7	6.8	14.5	41.3	18.4	15.4	18.7	15.7	5.3	12.8	10.9	15.1	12.8	2	Disagree
26+300	S 040	0.05	0.1	0.07	0.07	7.5	2.3	0.5	1.9	-9.7	-12.7	-4.0	-7.0	-12.4	0.3	0.1	0.6	0.2	1	Agree
27+600	S 046	0.05	0.8	0.33	0.33	45.8	18.2	3.4	12.4	31.1	28.1	31.1	28.1	17.3	34.1	30.9	34.1	30.9	2	Disagree
27+600	S 047	0.05	2.4	0.23	0.23	74.2	54.6	9.0	20.4	70.6	67.6	71.6	68.6	50.2	17.1	16.5	21.8	20.9	3	Disagree
25+900	S 039	0.05	3.3	0.13	0.13	86.7	75.1	8.0	26.0	97.9	94.9	98.9	95.9	71.0	25.1	24.4	32.6	31.7	3	Agree
23+600	S 025	0.05	0.1	0.53	0.53	45.8	2.3	12.4	32.5	9.4	6.4	9.4	6.4	1.6	16.0	11.2	16.0	11.2	1	Agree
23+300	S 026	0.05	0.2	0.09	0.09	12.5	4.5	8.6	22.3	20.4	17.4	20.7	17.7	3.9	33.6	28.8	67.2	57.6	2	Disagree
22+200	S 027	0.05	0.4	1.59	1.59	142.5	9.1	2.5	7.7	-2.9	-5.9	-2.3	-5.3	-7.8	0.8	0.7	0.9	0.7	1	Agree
21+900	S 028	0.05	0.6	0.09	0.09	21.7	13.6	11.8	31.5	26.8	23.8	26.4	23.4	12.4	22.4	20.0	17.9	16.0	2	Disagree
21+000	S 029	0.05	0.6	0.03	0.03	16.7	13.6	9.9	32.4	23.1	20.1	23.1	20.1	11.8	13.3	11.7	13.3	11.7	1	Agree
21+900	S 030	0.05	0.1	1.03	1.03	87.5	2.3	0.4	3.7	3.4	0.4	3.4	0.4	1.6	6.4	1.6	6.4	1.6	1	Agree
22+200	S 031	0.05	0.3	0.07	0.07	13.3	6.8	1.7	6.7	12.4	9.4	12.8	9.8	5.3	9.0	7.0	11.2	8.8	1	
23+000	S 032	0.05	0.1	0.19	0.19	17.5	2.3	0.3	1.3	2.7	-0.3	2.7	-0.3	2.0	9.6	0.0	9.6	0.0	1	Agree
23+200	S 033	0.05	0.2	0.60	0.60	55.0	4.5	1.6	4.6	-8.6	-11.6	-7.7	-10.7	-11.1	0.4	0.3	0.5	0.3	1	Agree
24+400	S 034	0.05	0.7	0.05	0.05	20.8	15.9	15.7	39.6	25.7	22.7	25.4	22.4	15.6	83.2	73.6	41.6	36.8	2	Disagree
24+500	S 035	0.05	0.2	0.14	0.14	17.5	4.5	14.3	34.8	9.6	6.6	10.4	7.4	0.2	3.2	2.5	3.8	3.0	1	Agree
25+100	S 036	0.05	1.2	0.12	0.12	36.7	27.3	12.2	30.6	31.1	28.1	30.8	27.8	26.4	34.1	30.9	25.6	23.2	2	Disagree
29+350	S 041	0.05	1.4	0.31	0.31	57.5	31.8	4.7	12.3	48.1	45.1	48.8	45.8	30.0	26.7	25.1	40.0	37.6	3	Disagree
29+800	S 042	0.05	2.4	0.20	0.20	70.8	54.6	11.4	30.4	77.3	74.3	77.6	74.6	50.8	21.6	20.8	23.6	22.7	3	Disagree
31+100	S 043	0.05	4.6	1.86	1.86	259.2	104.6	13.4	26.4	73.9	70.9	80.3	77.3	61.5	2.7	2.6	3.2	3.1	3	Agree
32+500	S 048	0.05	2.2	0.26	0.26	71.7	50.0	8.2	20.3	65.9	62.9	67.3	64.3	41.0	8.3	7.9	9.8	9.4	3	Disagree
18+800	S 021	0.05	8.4	1.30	1.30	299.2	191.0	15.2	32.4	261.8	258.8	262.0	259.0	189.8	210.4	208.0	275.3	272.2	3	Agree
31+900	S 044	0.05	0.9	2.21	2.21	204.2	20.5	3.0	9.2	-12.1	-15.1	-11.1	-14.1	-17.7	0.7	0.6	0.7	0.6	2	Disagree
31+950	S 045	0.05	13.7	2.18	2.18	493.4	311.6	30.8	53.6	298.6	295.6	299.2	296.2	298.1	23.2	23.0	24.4	24.1	3	Agree

Appendix 3.2-1. CCAR Laboratory Static Test Results

Station	Sample ID	AG_PPM	AL_PC	AS_PPM	BA_PPM	BE_PPM	BI-PPM	CA_PC	CD_PPM	CE-PPM	CO_PPM	CR_PPM	CS_PPM	CU_PPM	FE_PC	GA_PPM	GE_PPM	HF_PPM	HG_PPM	IN_PPM	K_PC	LA_PPM	LI_PPM	MG_PC
2+700	S 001	0.19	8.40	12.5	1050	1.49	0.24	0.11	0.4	40.7	13.2	147	5.87	69.1	4.96	21.3	0.14	2.5	0.14	0.077	1.95	20.2	44.3	1.51
3+100	S 002	0.16	7.16	8.7	890	1.15	0.13	0.2	1.08	34.3	10.7	161	3.81	41.5	4.26	17.85	0.11	1.9	0.16	0.053	1.47	17.6	39.2	1.53
3+300	S 003	0.27	7.92	13.7	470	0.68	0.19	0.35	0.14	30.0	6.9	30	3.12	27.7	5.52	18.45	0.14	2.2	0.17	0.055	0.72	13.4	26.8	0.93
3+300	S 004	0.02	1.10	<5	160	0.32	<0.01	15.4	0.56	4.5	1.6	3	0.38	6.9	1.63	2.35	0.05	0.4	0.01	0.009	0.19	2.5	3.7	8.56
3+600	S 005	0.2	7.92	10.4	1180	1.39	0.14	0.17	0.42	38.1	9.4	188	5.47	47.3	4.52	21.5	0.13	2.7	0.36	0.068	1.81	18.7	44.9	1.48
3+900	S 006	0.33	7.38	13.6	740	1.29	0.15	0.14	1.27	32.9	12.1	117	3.8	64.0	3.71	19.55	0.13	2.7	0.26	0.064	1.49	15.8	46.3	1.17
4+300	S 007	0.45	5.29	21.4	750	0.75	0.13	0.15	0.43	21.5	1.9	87	5.03	96.1	13.95	15.9	0.22	2.5	0.42	0.063	1.36	11.0	9	0.47
6+500	S 008	0.09	6.45	5.9	930	0.92	0.05	0.42	0.17	32.6	10.2	139	2.37	23.7	3.45	16.15	0.1	2.1	0.06	0.037	1.10	18.0	33.5	1.43
6+800	S 009	0.09	7.66	12.7	980	1.16	0.16	0.07	0.09	41.5	3.9	128	3.78	32.8	3.49	21	0.13	2.7	0.12	0.062	1.77	21.7	21.8	0.83
7+100	S 010	0.1	8.22	14.1	1170	1.30	0.21	0.04	0.07	39.7	3.7	82	4.47	39.6	4.13	22.9	0.13	2.9	0.26	0.076	2.20	20.0	27.8	0.95
8+000	S 011	0.14	8.81	16.3	1010	1.22	0.21	0.07	0.05	48.1	1.4	100	5.22	33.3	3.68	24.6	0.13	3.4	0.31	0.071	1.94	24.1	32.2	1.01
8+400	S 012	0.99	5.16	13.9	750	0.66	0.05	1.44	6.72	17.9	2.8	23	2.93	28.0	2.48	9.6	0.12	1.9	0.26	0.054	0.79	7.6	13.2	0.42
8+700	S 013	0.23	7.35	8.3	2090	1.85	0.17	1.37	1.13	59.0	11.1	40	3.59	74.4	4.36	20.1	0.16	2.9	0.11	0.051	3.94	32.8	26.7	1.07
9+900	S 014	0.7	5.25	11.8	700	0.64	0.07	0.34	0.2	26.8	4.1	28	1.81	27.4	3.64	12.2	0.13	1.6	0.15	0.056	0.88	16.4	14.5	0.59
14+500	S 015	0.99	6.80	15.7	1460	1.05	0.11	0.08	0.09	23.3	1.6	38	5.68	33.1	2.72	18.25	0.12	2.2	0.06	0.066	2.68	13.5	14.7	0.57
16+600	S 016	0.58	6.75	15.2	820	1.20	0.15	0.4	1.92	35.6	6.1	68	3.37	24.8	3.13	17.65	0.14	2.2	0.09	0.053	1.53	18.6	32.1	0.71
17+000	S 017	0.75	7.31	11.9	690	1.32	0.13	1.07	0.71	47.5	13.6	174	3.53	39.1	4.84	19.25	0.14	1.9	0.08	0.064	1.30	24.7	52.9	1.94
18+400	S 018	0.23	7.13	17.4	1240	1.02	0.11	0.15	0.25	30.6	4.1	110	6.64	43.4	4.54	19.8	0.14	2	0.08	0.07	2.14	17.4	17.3	0.96
18+500	S 019	0.11	7.98	3.9	1430	1.51	0.07	0.57	0.55	68.7	3.0	2	1.99	1.8	2.79	18.95	0.12	4.4	0.01	0.04	1.00	40.8	22.2	0.88
20+100	S 020	0.16	8.36	33.4	1910	1.10	0.07	0.44	0.27	30.5	10.3	18	4.03	43.3	5.03	20.8	0.13	1.7	0.01	0.047	2.27	15.5	22.1	0.87
20+400	S 022	0.07	7.40	9.2	300	0.50	<0.01	1.07	0.3	16.5	31.1	199	0.71	35.8	5.95	17.15	0.13	1.8	<0.01	0.049	0.19	7.4	45.1	4.02
23+800	S 023	0.09	5.92	2.5	220	0.57	0.02	2.95	0.36	21.4	27.9	67	1.34	16.4	6.78	15.45	0.17	2.9	0.01	0.079	0.43	9.7	11.8	2.12
23+200	S 024	0.09	7.60	1.8	740	0.79	0.03	4.89	0.43	35.8	41.8	26	1.12	45.6	8.33	22.5	0.21	4.7	0.01	0.107	0.84	16.2	12.3	2.15
25+300	S 037	0.21	6.36	47.5	1600	0.66	0.03	4.96	0.25	30.8	18.6	14	2.16	28.7	7.35	17.85	0.15	0.8	<0.1	0.078	1.60	15.6	20.8	1.65
25+300	S 038	0.05	7.34	23.5	110	0.41	0.01	5.81	0.1	11.6	50.0	252	0.26	45.4	7.98	15.85	0.14	2.3	0.01	0.087	0.06	4.4	27.9	4.22
26+300	S 040	0.07	6.61	5.5	2690	1.25	0.03	0.19	<0.02	33.0	1.9	1	1.48	4.6	1.97	18.7	0.09	2.3	0.5	0.062	3.22	17.5	4.4	0.26
27+600	S 046	0.17	6.65	23.1	2600	0.95	0.03	1.37	0.26	58.7	20.6	20	0.47	73.1	4.85	18.15	0.13	1.9	0.03	0.047	1.04	34.8	12.7	1.64
27+600	S 047	0.28	7.44	5.6	1530	1.34	0.07	3.62	0.21	34.5	15.1	32	2	61.4	4.77	19.15	0.15	2.1	0.05	0.059	2.49	17.9	13.4	1.33
25+900	S 039	0.09	7.28	3.5	1860	0.75	0.01	3.22	0.12	20.0	23.8	21	1.67	110.5	6.56	16.25	0.13	0.4	0.02	0.057	2.54	10.2	15.6	3.09
23+600	S 025	0.06	6.93	1.2	280	0.57	0.02	4.97	0.35	18.8	39.5	140	0.64	47.3	7.79	18.3	0.16	3.1	0.02	0.094	0.36	7.9	12.8	2.92
23+300	S 026	0.04	4.99	0.4	290	0.30	0.02	3.45	0.14	13.3	29.3	22	0.35	40.9	5.14	11.4	0.11	1.7	0.01	0.054	0.28	6.0	7.2	1.97
22+200	S 027	0.81	6.51	29.6	530	0.61	0.06	1	0.53	26.9	13.9	72	2.2	26.7	3.39	12.4	0.13	1.9	0.04	0.064	0.63	13.8	10.2	0.86
21+900	S 028	0.08	7.32	1.0	560	0.37	0.02	4.72	0.46	24.1	42.2	87	0.53	60.2	7.59	17.95	0.16	3.4	0.01	0.096	0.57	10.6	8.4	2.93
21+000	S 029	0.08	7.15	1.1	800	0.63	0.03	3.95	0.19	21.0	36.0	168	1.3	49.6	5.45	17.35	0.12	2.4	0.01	0.055	0.38	10.1	20.1	3.93
21+900	S 030	0.34	6.31	30.2	650	0.91	0.12	0.16	0.89	29.7	8.3	85	3.55	40.6	3.62	16.4	0.13	1.8	0.14	0.063	1.80	15.7	37.3	0.74
22+200	S 031	0.19	8.03	6.2	870	1.16	0.06	0.7	0.6	31.0	10.8	5	1.91	20.5	3.62	17.8	0.12	2	0.01	0.046	1.56	15.4	11.6	0.92
23+000	S 032	0.08	6.74	70.1	690	1.48	1.38	0.11	0.1	76.1	0.8	3	1.91	7.6	1.45	16.4	0.11	3.7	<0.01	0.039	2.93	45.5	3.2	0.2
23+200	S 033	0.68	6.82	18.7	890	1.40	0.14	0.64	1.14	37.3	5.2	26	2.12	29.8	2.91	17.35	0.11	2.6	0.02	0.075	2.11	16.3	7.2	0.47
24+400	S 034	0.06	7.52	0.2	300	0.52	0.02	6.29	0.24	19.9	44.3	131	0.76	62.9	7.90	18.75	0.17	3.1	<0.1	0.097	0.36	8.3	9.4	3.33
24+500	S 035	0.05	7.46	1.1	790	0.66	0.02	5.73	0.22	29.8	32.8	36	0.34	33.1	7.43	17.9	0.16	3	0.01	0.09	0.32	13.9	10.5	2.72
25+100	S 036	0.06	7.32	12.3	220	0.76	0.03	4.89	0.15	27.1	39.0	96	1.31	42.2	7.59	20.7	0.16	3.4	<0.1	0.097	0.89	11.6	8.7	2.54
29+350	S 041	0.21	7.66	11.6	1940	2.52	0.15	1.87	0.13	28.4	14.3	30	0.75	89.1	3.90	20.2	0.13	2	0.01	0.044	3.17	14.3	12.5	1.12
29+800	S 042	0.15	7.31	3.6	1400	1.43	0.07	4.58	0.49	32.3	24.8	157	0.55	87.4	4.96	17.9	0.16	1.1	<0.1	0.053	2.03	18.3	15.3	2.8
31+100	S 043	1.25	5.50	0.4	600	0.64	0.11	5.37	2.98	24.5	16.0	93	0.65	134.0	3.84	14.25	0.18	1	0.06	0.058	1.15	17.2	9.1	1.05
32+500	S 048	0.19	7.38	6.3	1460	1.38	0.05	3.28	0.21	27.4	16.2	34	1.34	66.6	4.37	17.95	0.12	1.5	0.04	0.052	2.39	14.3	12.9	1.65
18+800	S 021	0.13	2.77	14.1	190	0.37	<0.01	6.07	0.29	18.4	3.6	23	0.74	18.9	3.33	4.98	0.09	0.9	0.08	0.029	0.45	9.9	32.1	1.8
31+900	S 044	0.21	7.91	11.2	1040	0.98	0.11	1.2	0.4	14.5	5.5	16	4.4	33.4	3.95	18.8	0.1	1.5	0.37	0.07	1.79	6.5	18.4	1.03
31+950	S 045	0.13	4.73	<5	650	0.75	0.04	12.35	2	27.8	2.8	8	2.81	23.9	2.30	11.5	0.09	1.2	0.12	0.068	1.09	13.8	14.5	0.68

Appendix 3.2-1. CCAR Laboratory Static Test Results

Station	Sample ID	MN_PPM	MO_PPM	NA_PC	NB_PPM	NI_PPM	P_PPM	PB_PPM	RB_PPM	RE_PPM	S_PC	SB_PPM	SC_PPM	SE-PPM	SN_PPM	SR_PPM	TA_PPM	TE-PPM	TH_PPM	TI_PC	TL_PPM	U_PPM	V_PPM	W_PPM
2+700	S 001	193	3.48	1.09	8.9	114.5	720	14.5	86.7	0.002	0.04	1.91	20.5	3	1.5	102	0.55	0.08	6	0.434	0.96	2.3	188	1.4
3+100	S 002	429	2.55	1.76	7.1	106.5	550	9.7	65.2	<0.002	0.18	1.83	15.4	3	1.2	157	0.47	0.07	5	0.344	0.57	1.8	133	1.1
3+300	S 003	300	22.4	3.87	9.2	22.3	1230	21.9	35.8	0.007	0.84	1.95	16.2	7	1.5	351	0.64	0.11	6.5	0.436	0.46	2.2	135	0.7
3+300	S 004	873	1.36	0.39	0.8	6.7	320	2.0	10.2	0.003	0.06	0.21	2.6	3	0.2	762	0.05	<0.05	0.4	0.05	0.12	0.5	27	0.1
3+600	S 005	208	5.4	1.41	8.1	103.0	590	12.4	83.2	0.004	0.10	2.12	19.8	3	1.5	127	0.56	0.08	6.1	0.419	0.98	2.9	165	1.3
3+900	S 006	372	15.9	1.47	6.4	88.9	710	11.5	78.1	0.014	0.06	3.32	17.1	6	1.4	104	0.45	0.1	5.9	0.354	1.81	4.2	226	1
4+300	S 007	35	34.5	0.68	5.3	31.2	350	10.2	65.3	0.030	0.33	7.55	14.6	10	1.2	54	0.37	0.11	4.2	0.301	2.66	6.1	321	0.9
6+500	S 008	538	1.62	2.03	6.3	67.1	520	6.4	52.5	<0.002	0.11	0.80	11.7	2	1.1	246	0.48	<0.05	4.5	0.316	0.31	1.9	103	0.8
6+800	S 009	138	6.82	1.60	8.3	50.4	530	14.5	81.8	0.004	0.04	3.06	17.0	4	1.4	165	0.55	0.08	7.3	0.399	1.03	3.3	177	1.4
7+100	S 010	173	6.36	1.16	8.1	31.9	510	17.3	104.0	0.005	0.07	2.38	18.0	3	1.6	109	0.55	0.08	7.7	0.393	1.37	3.5	157	1.6
8+000	S 011	121	9.16	1.95	9.5	21.1	510	17.0	95.4	0.007	0.05	3.92	18.6	4	1.7	173	0.63	0.08	9.3	0.426	1.32	5.3	161	1.6
8+400	S 012	1060	4.86	2.49	3.1	12.1	360	6.0	31.4	0.013	0.66	7.13	9.6	8	0.9	282	0.22	<0.05	1.7	0.166	0.48	1.4	116	0.6
8+700	S 013	702	2.8	1.16	14.7	21.3	1310	19.4	105.0	0.002	0.35	2.75	17.1	3	1.4	500	0.9	0.05	9.8	0.362	0.9	3.9	225	1.3
9+900	S 014	864	4	1.75	3.7	15.1	830	10.4	36.6	0.004	0.31	3.51	11.7	5	1.0	151	0.25	0.08	1.8	0.234	0.36	1.1	113	0.7
14+500	S 015	269	4.08	1.10	6.1	7.1	500	10.8	86.7	0.017	0.25	39.20	13.9	7	1.4	106	0.42	0.1	3.4	0.313	0.98	1.8	159	1.3
16+600	S 016	351	6.86	1.92	6.3	39.6	580	14.3	59.4	0.007	0.38	4.85	14.2	5	1.2	185	0.38	0.06	4.8	0.294	0.92	2.4	140	1
17+000	S 017	510	3.09	1.64	7.2	85.4	1610	11.5	63.5	0.003	0.11	3.21	18.0	4	1.3	218	0.46	0.07	4.2	0.415	0.77	2	169	0.9
18+400	S 018	139	7.37	0.75	6.7	41.1	1230	9.6	91.0	0.005	0.06	5.33	19.4	6	1.4	69	0.5	0.07	4.3	0.432	1.5	1.8	212	0.9
18+500	S 019	1260	5.69	3.93	16.8	4.2	740	13.2	43.7	0.005	0.08	0.75	7.2	2	1.5	593	1.19	<0.05	9.9	0.377	0.37	5	40	1.1
20+100	S 020	633	0.7	2.64	8.1	7.9	1190	10.0	74.0	<0.002	0.06	3.38	14.9	2	1.2	299	0.51	0.09	3.8	0.408	0.59	1.9	163	1.3
20+400	S 022	1000	0.79	2.61	6.5	92.9	700	3.3	1.3	<0.002	0.01	0.79	23.9	2	0.9	333	0.41	<0.05	1.4	0.55	0.09	0.6	190	0.5
23+800	S 023	1660	0.61	2.02	5.7	24.9	1030	6.3	18.0	0.002	0.02	7.84	30.3	2	0.9	119	0.34	<0.05	1.5	0.82	0.11	0.9	260	0.2
23+200	S 024	1420	1.37	2.30	11.3	26.3	1830	3.4	31.1	0.004	0.05	0.34	43.0	3	1.6	110	0.71	<0.05	3	1.16	0.26	2	310	0.3
25+300	S 037	1420	1.17	0.06	7.3	6.3	1930	10.4	54.1	<0.002	0.83	2.17	20.2	2	1.0	166	0.46	<0.05	1.7	0.532	0.36	0.8	129	1.2
25+300	S 038	1370	0.29	1.63	3.4	124.5	640	0.7	0.4	<0.002	0.04	0.86	43.7	2	0.9	164	0.23	<0.05	0.6	0.834	0.02	0.3	305	0.1
26+300	S 040	299	2.24	2.35	12.4	0.8	900	9.2	82.5	<0.002	0.49	2.24	12.7	2	1.6	106	0.78	<0.05	3.5	0.518	0.97	1.5	31	1.3
27+600	S 046	911	0.58	2.43	33.6	11.7	2980	3.7	19.7	<0.002	0.03	2.30	18.7	2	1.2	198	1.72	<0.05	5.6	0.649	0.09	1.8	236	0.5
27+600	S 047	932	1.88	2.72	8.3	14.7	1580	11.3	69.4	0.004	0.15	1.42	17.0	3	1.1	580	0.53	<0.05	3.8	0.46	0.35	2.1	152	0.9
25+900	S 039	1140	0.37	1.65	3.3	11.9	1870	3.6	47.1	<0.002	0.13	1.15	36.5	1	0.6	266	0.22	<0.05	1.3	0.397	0.26	0.6	299	0.7
23+600	S 025	1340	0.5	2.90	5.2	43.1	1060	1.5	11.9	0.002	0.02	0.40	44.1	3	1.0	164	0.34	<0.05	1.1	1.01	0.08	0.6	331	0.1
23+300	S 026	1010	0.45	2.10	3.4	22.7	620	1.4	7.1	<0.002	0.02	0.11	29.3	2	0.7	176	0.22	<0.05	1.3	0.522	0.06	0.6	203	0.1
22+200	S 027	383	6.74	3.08	4.1	36.9	610	11.1	28.4	0.010	0.53	13.20	25.0	8	1.0	391	0.26	0.07	1.2	0.572	0.27	1.5	210	1.4
21+900	S 028	1330	0.32	2.99	7.0	42.2	1230	1.8	13.7	0.004	0.05	0.28	46.4	3	1.2	196	0.44	<0.05	1.5	1.075	0.11	0.7	325	0.2
21+000	S 029	927	0.75	2.89	6.2	93.8	670	5.0	2.7	<0.002	0.07	1.02	26.6	2	0.8	363	0.39	<0.05	1.8	0.497	0.07	0.8	168	0.2
21+900	S 030	250	7.09	1.11	6.2	40.4	390	13.9	64.3	0.005	0.02	9.73	18.9	8	1.2	91	0.43	0.06	3.6	0.367	1.28	2	189	1
22+200	S 031	909	1.04	3.31	9.6	6.1	760	5.6	71.0	<0.002	0.05	4.36	7.9	2	1.0	238	0.64	<0.05	4.1	0.271	0.48	2	72	0.8
23+000	S 032	413	2.9	0.70	24.4	2.2	130	9.2	128.0	<0.002	0.01	7.22	2.5	2	1.6	83	1.86	<0.05	19.6	0.13	0.88	5.9	7	0.8
23+200	S 033	658	2.52	1.34	5.5	19.1	430	8.1	78.6	0.007	0.51	3.30	12.0	5	1.5	210	0.39	0.07	3.3	0.238	0.56	1.5	110	0.8
24+400	S 034	1590	1.19	2.82	5.2	46.0	1070	1.0	12.7	0.004	0.01	0.29	47.5	3	1.1	220	0.33	<0.05	1.1	0.978	0.07	0.6	331	0.2
24+500	S 035	1340	1.06	2.55	7.2	27.8	1220	1.7	10.0	<0.002	0.15	0.50	41.6	3	1.0	85	0.44	<0.05	1.8	0.908	0.05	0.9	328	0.2
25+100	S 036	1530	0.9	2.31	8.2	54.4	920	3.0	33.9	0.002	0.04	3.87	39.8	3	1.6	185	0.58	<0.05	3	0.976	0.25	1.4	295	0.4
29+350	S 041	870	1.29	2.88	15.1	16.9	1110	23.3	88.2	<0.002	0.07	0.83	10.6	2	1.0	784	0.86	0.09	4.7	0.331	0.43	2.5	153	1.3
29+800	S 042	965	1.47	2.23	9.0	97.3	1550	8.6	54.7	0.002	0.13	0.59	18.1	2	1.0	851	0.55	0.05	3.1	0.419	0.29	1.3	173	0.8
31+100	S 043	794	12.45	1.38	5.6	67.5	1140	5.8	40.6	0.066	1.46	2.49	13.8	20	1.0	293	0.4	0.18	2.2	0.366	0.4	3.8	272	0.3
32+500	S 048	928	1.2	3.08	8.7	19.6	1540	10.8	55.2	0.003	0.31	1.33	18.7	3	0.9	780	0.59	0.05	3	0.373	0.22	1.6	178	0.8
18+800	S 021	978	1.3	1.00	3.2	12.9	360	11.3	19.0	<0.002	0.05	14.85	5.5	2	0.3	611	0.21	<0.05	1.6	0.108	0.11	0.7	35	0.9
31+900	S 044	579	24.6	1.74	4.7	19.1	820	10.0	58.8	0.029	1.29	2.43	22.2	5	1.4	188	0.31	0.05	2.3	0.451	3.34	2.6	158	0.8
31+950	S 045	1740	7.65	0.61	3.4	15.3	530	3.3	37.4	0.018	0.49	0.81	10.2	3	1.0	160	0.23	<0.05	2.2	0.207	2.19	2.3	74	0.6

Appendix 3.2-1. CCAR Laboratory Static Test Results

Station	Sample ID	Y_PPM	ZN_PPM	ZR_PPM	AL_2O_3_PC	BAO_PC	CAO_PC	CR_2O_3_PC	FE_2O_3_PC	MNO_PC	NA_2O_PC	P_2O_5_PC	SIO_2_PC	SRO_PC	TIO_2_PC	LOI_PC	TOTAL_PC
2+700	S 001	18.8	148	92	16.52	0.11	0.14	0.02	7.01	0.03	1.58	0.165	62.43	0.02	0.78	6.03	94.84
3+100	S 002	12.6	156	71.2	14.57	0.09	0.25	0.03	6.04	0.06	2.56	0.125	66.50	0.02	0.65	4.37	95.27
3+300	S 003	10.6	53	87.4	16.28	0.05	0.46	<0.01	7.80	0.04	5.51	0.277	58.70	0.04	0.83	7.08	97.07
3+300	S 004	4.8	60	17	1.99	0.02	25.04	<0.01	2.46	0.12	0.51	0.080	16.50	0.08	0.1	37.30	84.20
3+600	S 005	15.4	123	99.2	16.57	0.13	0.17	0.03	6.57	0.03	2.11	0.141	62.54	0.01	0.8	5.85	94.95
3+900	S 006	14.9	156	98	15.01	0.07	0.18	0.02	5.22	0.05	2.20	0.167	65.70	0.02	0.67	6.50	95.81
4+300	S 007	14.3	264	94.4	10.44	0.08	0.19	0.01	21.02	<0.01	1.05	0.089	51.53	<0.01	0.56	12.00	96.97
6+500	S 008	11.6	69	77	12.54	0.09	0.56	0.02	4.82	0.07	2.97	0.122	69.90	0.03	0.57	3.39	95.08
6+800	S 009	12.1	97	99.5	16.04	0.11	0.08	0.02	5.14	0.02	2.46	0.126	65.50	0.02	0.75	5.81	96.08
7+100	S 010	14.2	117	104.5	17.29	0.12	0.03	0.01	5.95	0.02	1.77	0.119	62.50	0.02	0.73	6.49	95.05
8+000	S 011	14.1	48	118	18.65	0.11	0.08	0.02	5.36	0.02	2.90	0.123	61.20	0.02	0.78	6.18	95.44
8+400	S 012	16.1	371	71.8	10.28	0.48	2.05	<0.01	3.74	0.14	3.69	0.088	72.76	0.04	0.33	4.43	98.03
8+700	S 013	17	99	102.5	14.72	0.23	1.91	<0.01	6.21	0.09	1.65	0.289	62.35	0.06	0.64	4.81	92.96
9+900	S 014	19.3	73	60.8	10.63	0.07	0.47	<0.01	5.39	0.11	2.69	0.196	74.02	0.02	0.44	3.48	97.52
14+500	S 015	12.7	43	81.3	14.38	0.16	0.1	<0.01	3.96	0.04	1.74	0.119	67.82	0.01	0.61	5.50	94.44
16+600	S 016	14	154	77.1	14.40	0.09	0.57	0.01	4.61	0.05	2.95	0.140	68.14	0.03	0.57	4.94	96.50
17+000	S 017	16.6	128	76.4	15.80	0.08	1.67	0.03	7.27	0.07	2.48	0.373	60.15	0.03	0.82	5.74	94.51
18+400	S 018	13.5	135	74.7	14.93	0.14	0.2	0.02	6.72	0.02	1.18	0.284	63.33	0.01	0.82	7.25	94.90
18+500	S 019	22	74	177	17.10	0.16	0.83	<0.01	4.11	0.17	5.71	0.168	64.85	0.08	0.71	3.03	96.92
20+100	S 020	14.1	87	64.1	16.97	0.21	0.6	<0.01	7.27	0.08	3.72	0.265	62.53	0.03	0.75	3.03	95.46
20+400	S 022	15.9	80	53.3	17.05	0.03	1.56	0.03	8.97	0.13	3.76	0.165	54.25	0.04	1.04	4.78	91.81
23+800	S 023	35.4	110	92.4	11.60	0.02	4.24	0.01	9.95	0.23	2.83	0.228	61.21	0.02	1.5	3.66	95.50
23+200	S 024	53.9	119	141	15.70	0.09	7.4	<0.01	13.15	0.2	3.22	0.423	47.85	0.01	2.2	3.65	93.89
25+300	S 037	18.6	119	25.5	12.63	0.20	7.24	<0.01	11.03	0.2	0.16	0.426	53.21	0.02	1.05	7.66	93.83
25+300	S 038	35.4	99	66.6	16.85	0.01	8.88	0.06	12.74	0.2	2.29	0.156	44.87	0.02	1.6	4.08	91.76
26+300	S 040	14.4	12	70.9	14.36	0.34	0.25	0.01	3.28	0.05	3.60	0.212	69.35	0.01	0.99	2.12	94.57
27+600	S 046	15	74	66.6	13.10	0.31	1.89	<0.01	7.09	0.12	3.43	0.635	64.00	0.03	1.45	3.69	95.75
27+600	S 047	24.3	85	67.4	15.13	0.18	5.02	<0.01	6.80	0.12	3.61	0.332	57.85	0.06	0.83	4.54	94.47
25+900	S 039	10.5	91	12.9	14.91	0.23	4.8	<0.01	9.95	0.16	2.40	0.423	50.20	0.03	0.85	6.73	90.68
23+600	S 025	41.1	105	86.6	14.00	0.03	7.46	0.03	11.86	0.19	3.99	0.246	50.10	0.02	1.89	3.70	93.52
23+300	S 026	24.8	61	49.1	10.00	0.03	5.15	<0.01	7.82	0.14	3.04	0.147	66.20	0.02	0.99	1.99	95.53
22+200	S 027	19.5	96	61.5	13.66	0.06	1.45	0.01	5.22	0.05	4.59	0.146	66.01	0.04	1.07	5.06	97.37
21+900	S 028	46.4	118	97.9	14.72	0.06	7.08	0.02	11.62	0.19	4.15	0.281	50.25	0.03	1.99	3.20	93.59
21+000	S 029	19.7	64	79	16.33	0.09	5.93	0.03	8.35	0.13	3.99	0.161	51.05	0.04	0.92	4.80	91.82
21+900	S 030	14.1	281	63.4	13.39	0.07	0.21	0.02	5.41	0.04	1.70	0.097	69.00	0.02	0.67	5.56	96.19
22+200	S 031	17.7	86	65.3	18.21	0.10	1.05	<0.01	5.50	0.13	4.89	0.175	62.06	0.03	0.51	3.12	95.78
23+000	S 032	13.9	25	114.5	14.16	0.08	0.13	<0.01	2.06	0.05	1.09	0.038	74.79	0.02	0.23	2.60	95.25
23+200	S 033	28.3	116	75	13.73	0.10	0.86	0.01	4.24	0.09	1.95	0.101	70.87	0.03	0.41	3.71	96.10
24+400	S 034	46.2	109	92.1	14.96	0.03	9.22	0.03	11.80	0.22	3.82	0.244	48.25	0.03	1.8	2.96	93.36
24+500	S 035	38.9	80	94.4	14.94	0.09	8.47	0.01	11.18	0.19	3.45	0.276	49.63	0.01	1.66	4.08	93.99
25+100	S 036	45.8	99	90.9	15.35	0.02	7.45	0.02	11.74	0.22	3.27	0.214	49.46	0.02	1.87	4.23	93.86
29+350	S 041	16.9	91	65.7	17.43	0.23	2.74	0.04	5.84	0.12	4.08	0.251	57.53	0.10	0.59	4.01	92.96
29+800	S 042	19.8	114	31.1	14.71	0.17	6.72	0.03	7.35	0.14	3.10	0.341	54.02	0.09	0.76	4.80	92.23
31+100	S 043	29.5	244	33.7	10.61	0.11	7.68	0.02	5.60	0.11	1.94	0.250	59.66	0.04	0.67	9.26	95.95
32+500	S 048	17.6	80	43.6	15.84	0.18	4.7	0.01	6.38	0.13	4.27	0.336	56.30	0.09	0.7	4.37	93.31
18+800	S 021	11.9	62	35.7	5.20	0.02	8.69	<0.01	4.80	0.13	1.41	0.089	62.50	0.07	0.18	12.75	95.84
31+900	S 044	17	85	45.8	16.58	0.12	1.67	<0.01	5.91	0.08	2.54	0.186	60.56	0.02	0.84	7.13	95.64
31+950	S 045	18.6	153	40.3	8.76	0.07	17.66	<0.01	3.30	0.24	0.83	0.122	48.28	0.02	0.37	16.95	96.60

Appendix 3.2-2

TCAR Laboratory Static Test Results

Engineers and Scientists

Appendix 3.2-2. TCAR Laboratory Static Test Results

Station	Sample ID	UTM_NORTH	UTM_EAST	LAB_ID	DATE	LITH	TYPE	Weight	Paste pH	Total S	Sulphide-S Calc.	Sulphate-S (HCl)	S_BaSO_4	TAP
	KSM TAR 01	6276621	435537	1	12-Oct-11	muJB(RA)	Wet coarse rock	2.13	7.9	0.04	0.04	0.005	0.00	1.25
	KSM TAR 02	6275020	433041	2	12-Oct-11	muJB(RA)	Wet coarse rock	1.80	9.3	0.10	0.10	0.005	0.00	3.13
	KSM TAR 03	6274978	435669	3	12-Oct-11	muJB(RA)	Wet coarse rock	1.95	7.3	0.24	0.19	0.05	0.01	7.50
	KSM TAR 04	6273678	437414	4	12-Oct-11	muJB(RA)	Wet coarse rock	2.58	7.8	0.33	0.31	0.02	0.00	10.31
	KSM TAR 05	6273121	441605	5	12-Oct-11	muJB(RA)	Wet coarse rock	2.18	8.6	0.08	0.07	0.01	0.00	2.50
	KSM TAR 06	6271391	445330	6	12-Oct-11	muJB(RA)	Wet coarse rock	2.25	8.7	0.26	0.24	0.02	0.00	8.13
	KSM TAR 07	6272492	459980	7	12-Oct-11	Qal	Wet soil/sediment	1.46	8.0	0.22	0.22	0.005	0.00	6.88
	KSM TAR 08	6270745	457107	8	12-Oct-11	Qal	Wet soil/sediment	1.77	7.9	0.06	0.05	0.01	0.01	1.88
	KSM TAR 09	6270434	449034	9	12-Oct-11	Qal	Wet Fine Rock	2.78	7.8	0.05	0.04	0.01	0.01	1.56
	KSMNTAR01	6276373	441320	DX1795	1-Jul-12	muJB(RA)	Wet coarse rock	2.83	8.7	0.23	0.26	0.02	0.02	7.19
	KSMNTAR02	6274455	444594	DX1796	1-Jul-12	muJB(RA)	Wet coarse rock	3.05	8.0	0.08	0.04	0.01	0.01	2.50
	KSMNTAR03	6273671	446302	DX1797	1-Jul-12	muJB(RA)	Wet coarse rock	2.77	8.8	0.12	0.07	0.01	0.02	3.75
	KSMNTAR04	6273420	446696	DX1798	1-Jul-12	muJB(RA)	Wet coarse rock	3.31	6.6	0.09	0.04	0.03	0.01	2.81

Station	Sample ID	SAP	NP	NP_Adj	Total C	CO_2_Inorg	CANP_TTL	CANP_INORG	CANP_Ca	CANP_CaMg	TNNP	TNNP_ADJ	SNNP	SNNP_ADJ	TCNNP	TNPR
	KSM TAR 01	1.09	64.1	64.1	0.98	1.84	81.67	41.85	28.72	76.17	62.8	62.8	63.0	63.0	40.60	51.26
	KSM TAR 02	2.97	359.3	359.3	4.35	16.43	362.52	373.66	263.71	321.85	356.2	356.2	356.3	356.3	370.54	114.97
	KSM TAR 03	5.94	72.9	72.9	0.72	0.48	60.00	10.92	11.49	48.97	65.4	65.4	66.9	66.9	3.42	9.72
	KSM TAR 04	9.69	9.4	9.4	0.43	0.11	35.84	2.50	4.25	53.83	-1.0	-1.0	-0.3	-0.3	-7.81	0.91
	KSM TAR 05	2.19	14.3	14.3	0.35	0.73	29.17	16.60	8.24	36.08	11.8	11.8	12.1	12.1	14.10	5.71
	KSM TAR 06	7.50	15.8	15.8	0.19	0.23	15.83	5.23	10.24	76.45	7.6	7.6	8.3	8.3	-2.89	1.94
	KSM TAR 07	6.88	95.5	95.5	1.06	1.50	88.34	34.11	36.21	78.17	88.6	88.6	88.6	88.6	27.24	13.89
	KSM TAR 08	1.88	12.3	12.3	0.51	0.12	42.50	2.73	7.24	48.11	10.4	10.4	10.4	10.4	0.85	6.57
	KSM TAR 09	1.56	8.6	8.6	0.77	0.30	64.17	6.82	9.74	58.70	7.1	7.1	7.1	7.1	5.26	5.52
	KSMNTAR01	8.13	123.1	123.1	0.68	0.93	56.67	21.15	32.46	101.94	115.9	115.9	115.0	115.0	13.96	17.13
	KSMNTAR02	1.73	30.8	30.8	0.43	0.35	35.84	7.96	12.99	67.01	28.3	28.3	29.1	29.1	5.46	12.32
	KSMNTAR03	2.81	167.1	167.1	1.37	2.63	114.17	59.81	82.66	141.46	163.4	163.4	164.3	164.3	56.06	44.56
	KSMNTAR04	1.50	9.2	9.2	0.38	0.01	31.67	0.23	2.75	52.12	6.4	6.4	7.7	7.7	-2.59	3.27

Station	Sample ID	TNPR_ADJ	SNPR	SNPR_ADJ	FIZZ	AG_PPB	AL_PC	AS_PPM	AU_PPB	B_PPM	BA_PPM	BI-PPM	CA_PC	CD_PPM	CO_PPM	CR_PPM	CU_PPM
	KSM TAR 01	51.26	58.58	58.58	Moderate	192	2.07	7.6	1.0	52	162.1	0.12	1.15	0.26	10.6	104.3	52.46
	KSM TAR 02	114.97	121.03	121.03	Strong	56	1.00	4.4	<0.2	<20	143.5	0.04	10.56	0.06	9.7	89.5	13.94
	KSM TAR 03	9.72	12.27	12.27	Moderate	311	2.20	10.5	1.9	<20	223.2	0.11	0.46	0.20	18.4	130.6	34.23
	KSM TAR 04	0.91	0.97	0.97	None	270	2.60	10.8	2.2	<20	95.4	0.16	0.17	0.29	18.9	62.9	75.16
	KSM TAR 05	5.71	6.53	6.53	None	121	1.57	6.3	2.0	<20	136.2	0.06	0.33	0.22	18.6	135.4	23.82
	KSM TAR 06	1.94	2.10	2.10	None	194	2.83	7.0	1.1	<20	61.8	0.06	0.41	0.29	21.5	205.7	42.87
	KSM TAR 07	13.89	13.89	13.89	Moderate	258	2.05	11.2	1.2	<20	175.8	0.10	1.45	0.66	17.3	84.1	52.35
	KSM TAR 08	6.57	6.57	6.57	None	210	2.14	8.6	1.3	<20	232.8	0.13	0.29	0.27	14.7	122.4	51.26
	KSM TAR 09	5.52	5.52	5.52	None	235	2.57	8.3	0.9	<20	258.7	0.17	0.39	0.32	13.3	111.2	66.02
	KSMNTAR01	17.13	15.15	15.15	Strong	0.2	5.51	7			686	0.05	1.3	0.4	18.8	363	44
	KSMNTAR02	12.32	17.84	17.84	Slight	0.2	4.61	7			632	0.05	0.52	0.3	15.9	350	36.4
	KSMNTAR03	44.56	59.55	59.55	Strong	0.2	5.49	7			866	0.05	3.31	0.3	17.3	254	46.3
	KSMNTAR04	3.27	6.14	6.14	None	0.2	4.63	7			518	0.05	0.11	0.2	10.5	286	33.7

Appendix 3.2-2. TCAR Laboratory Static Test Results

Station	Sample ID	FE_PC	GA_PPM	HG_PPB	K_PC	LA_PPM	MG_PC	MN_PPM	MO_PPM	NA_PC	NI_PPM	P_PPM	PB_PPM	S_PC	SB_PPM	SC_PPM	SE-PPM	SR_PPM
	KSM TAR 01	3.20	5.6	67	0.19	1.9	1.51	581	1	0.012	92.7	0.045	7.33	0.04	0.08	4.1	0.3	100.6
	KSM TAR 02	1.72	3.1	22	0.15	7.1	0.68	2434	0.56	0.023	44.4	0.046	5.09	0.10	0.24	4.2	0.1	719.9
	KSM TAR 03	3.79	6.8	91	0.18	4.7	1.25	429	1.5	0.018	106.0	0.055	21.00	0.24	0.41	4.1	0.6	59.6
	KSM TAR 04	4.45	7.3	56	0.14	16.0	1.71	1097	1.52	0.019	97.4	0.039	7.22	0.35	0.12	3.7	0.9	16.9
	KSM TAR 05	2.78	5.1	38	0.20	2.1	0.93	144	0.56	0.017	120.3	0.037	10.64	0.07	0.05	4.1	0.2	42.5
	KSM TAR 06	4.14	8.4	58	0.11	8.1	2.26	399	1.58	0.022	138.6	0.050	8.83	0.29	0.10	5.6	0.6	24.3
	KSM TAR 07	3.54	6.1	239	0.20	7.7	1.28	1388	1.21	0.017	92.2	0.083	8.02	0.25	0.18	5.8	0.9	70.8
	KSM TAR 08	3.41	6.3	70	0.25	4.3	1.39	563	1	0.015	106.9	0.075	7.95	0.06	0.08	6.2	0.6	34.1
	KSM TAR 09	4.16	7.1	69	0.25	3.7	1.66	356	1.1	0.011	127	0.098	9.13	0.06	0.06	8.1	0.6	42.1
	KSMNTAR01	4.08			1.09	9	2.26	716	2	1.31	160	0.076	5.1	0.2	1	12		190
	KSMNTAR02	3.14			0.98	9.7	1.82	469	1.3	1.34	148	0.048	4.3	0.05	0.7	10		105
	KSMNTAR03	3.01			1.26	13.4	1.63	2140	2	1.63	140	0.109	8.8	0.1	1	11		287
	KSMNTAR04	3.4			1.01	7.5	1.71	357	1.2	1.27	132	0.051	5.4	0.05	0.7	11		55

Station	Sample ID	TE-PPM	TH_PPM	TI_PC	TL_PPM	U_PPM	V_PPM	W_PPM	ZN_PPM	AL_2O_3_PC	BAO_PC	CAO_PC	CR_2O_3_PC	FE_2O_3_PC	K_2O_PC	MGO_PC
	KSM TAR 01	0.04	1.3	<0.001	0.08	0.2	39	<0.1	78.9	13.60	0.09	1.70	0.03	5.02	2.05	3.09
	KSM TAR 02	<0.02	1.3	0.002	0.02	0.2	32	<0.1	36.4	8.71	0.08	19.43	0.04	2.64	1.24	1.41
	KSM TAR 03	0.03	1.7	0.003	0.05	0.2	43	<0.1	88.8	15.25	0.10	0.72	0.05	5.71	1.97	2.43
	KSM TAR 04	0.05	1.6	0.002	0.14	<0.1	64	<0.1	162.6	14.48	0.09	0.26	0.02	6.72	1.88	3.20
	KSM TAR 05	<0.02	1.2	0.001	0.04	0.2	32	<0.1	78.5	14.21	0.08	0.54	0.06	4.22	2.05	1.98
	KSM TAR 06	<0.02	0.9	0.097	0.04	0.2	67	<0.1	115.1	13.65	0.04	0.89	0.06	6.20	1.02	3.93
	KSM TAR 07	0.04	1.1	0.040	0.12	0.2	60	<0.1	132.5	12.57	0.08	2.28	0.03	5.50	1.67	2.58
	KSM TAR 08	0.04	1.3	0.002	0.05	0.2	57	<0.1	112.6	11.77	0.08	0.47	0.05	5.44	1.83	2.88
	KSM TAR 09	0.04	1.8	0.002	0.04	0.2	59	<0.1	129.6	13.78	0.10	0.61	0.03	6.46	2.14	3.39
	KSMNTAR01		2.6	0.326		1	122	0.7	137							
	KSMNTAR02		2.6	0.294		1	106	0.7	97							
	KSMNTAR03		3.2	0.321		1.3	119	0.7	110							
	KSMNTAR04		2.4	0.318		1.1	118	0.8	60							

Station	Sample ID	MNO_PC	NA_2O_PC	P_2O_5_PC	SIO_2_PC	TIO_2_PC	LOI_PC	TOTAL_PC
	KSM TAR 01	0.08	2.20	0.11	65.50	0.64	5.73	100
	KSM TAR 02	0.32	2.64	0.11	47.40	0.35	16.42	101
	KSM TAR 03	0.06	3.12	0.13	66.10	0.61	4.38	101
	KSM TAR 04	0.15	2.40	0.09	67.00	0.67	3.76	101
	KSM TAR 05	0.02	2.79	0.09	70.00	0.54	3.72	100
	KSM TAR 06	0.06	3.25	0.12	66.60	0.68	3.54	100
	KSM TAR 07	0.18	2.54	0.20	66.00	0.61	5.45	100
	KSM TAR 08	0.08	1.79	0.18	70.9	0.61	4.42	100
	KSM TAR 09	0.05	1.83	0.23	65.6	0.76	5.14	100
	KSMNTAR01							
	KSMNTAR02							
	KSMNTAR03							
	KSMNTAR04							

Appendix 3.2-3

CCAR Stage II ML/ARD Assessment

Rescan™
Engineers and Scientists

Appendix 3.2-3. CCAR Stage II ML/ARD Assessment

Station	ML/ARD Potential
000+200	Possible
000+400	Possible
000+600	Possible
000+800	Possible
001+000	Possible
001+200	Possible
001+400	Possible
001+600	Possible
001+800	Possible
002+000	Possible
002+200	Possible
002+400	Possible
002+600	Possible
002+800	Possible
003+000	Possible
003+200	Possible
003+400	Possible
003+600	High
003+800	Possible
004+000	Possible
004+200	Possible
004+400	High
004+600	Possible
004+800	Possible
005+000	Possible
005+200	Possible
005+400	Possible
005+600	Possible
005+800	Possible
006+000	Possible
006+200	Possible
006+400	Possible
006+600	Low
006+800	Possible
007+000	High
007+200	High
007+400	Possible
007+600	Possible
007+800	High
008+000	Possible
008+200	Possible
008+400	Low
008+600	None
008+800	Possible
009+000	Possible
009+200	Possible
009+400	Possible
009+600	Possible
009+800	High
010+000	High
010+200	Possible
010+400	Possible
010+600	Possible
010+800	Possible
011+000	Possible
011+200	Possible
011+400	Possible
011+600	Possible
011+800	Possible
012+000	Possible
012+200	Possible
012+400	Possible
012+600	Possible

Station	ML/ARD Potential
012+800	Possible
013+000	Possible
013+200	Possible
013+400	Possible
013+600	Possible
013+800	Possible
014+000	Possible
014+200	Possible
014+400	Possible
014+600	Possible
014+800	Possible
015+000	Possible
015+200	Possible
015+400	Possible
015+600	Possible
015+800	Possible
016+000	Possible
016+200	Possible
016+400	High
016+600	Possible
016+800	Possible
017+000	None
017+200	Possible
017+400	Possible
017+600	Possible
017+800	Possible
018+000	Possible
018+200	High
018+400	None
018+600	Possible
018+800	None
019+000	Possible
019+200	None
019+400	Possible
019+600	Possible
019+800	None
020+000	Possible
020+200	Possible
020+400	None
020+600	High
020+800	Possible
021+000	None
021+200	None
021+400	None
021+600	None
021+800	None
022+000	None
022+200	High
022+400	Possible
022+600	Possible
022+800	None
023+000	None
023+200	None
023+400	None
023+600	None
023+800	None
024+000	None
024+200	None
024+400	None
024+600	Low
024+800	None
025+000	None
025+200	None

Station	ML/ARD Potential
025+400	None
025+600	None
025+800	None
026+000	None
026+200	None
026+400	None
026+600	None
026+800	None
027+000	None
027+200	None
027+400	High
027+600	High
027+800	None
028+000	None
028+200	None
028+400	None
028+600	None
028+800	None
029+000	None
029+200	None
029+400	None
029+600	None
029+800	None
030+000	None
030+200	None
030+400	None
030+600	None
030+800	None
031+000	None
031+200	Low
031+400	None
031+600	None
031+800	None
032+000	None
032+200	None
032+400	None
032+600	None
032+800	None
033+000	None

Appendix 3.2-4

TCAR Stage II ML/ARD Assessment

Engineers and Scientists

Appendix 3.2-4. TCAR Stage II ML/ARD Assessment

TCAR	
Station	ML/ARD Assessment
000+200	None
000+400	None
000+600	None
000+800	None
001+000	None
001+200	None
001+400	None
001+600	None
001+800	None
002+000	None
002+200	None
002+400	None
002+600	None
002+800	None
003+000	None
003+200	None
003+400	None
003+600	None
003+800	None
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004+200	None
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004+600	None
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009+800	None
010+000	None
010+200	None
010+400	None
010+600	None
010+800	None
011+000	None
011+200	None
011+400	None
011+600	None
011+800	None
012+000	None
012+200	None
012+400	None
012+600	None
012+800	None
013+000	None

TCAR	
Station	ML/ARD Assessment
013+200	None
013+400	None
013+600	None
013+800	None
014+000	None
014+200	None
014+400	None
014+600	None
014+800	None
015+000	None
015+200	None
015+400	None
015+600	None
015+800	None
016+000	None
016+200	None
016+400	Low
016+600	None
016+800	None
017+000	None
017+200	None
017+400	None
017+600	None
017+800	None
018+000	None
018+200	None
018+400	None
018+600	None
018+800	None
019+000	None
019+200	None
019+400	None
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019+800	None
020+000	None
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022+800	None
023+000	None
023+200	None
023+400	None
023+600	None
023+800	None
024+000	None
024+200	None
024+400	None
024+600	None
024+800	None
025+000	None
025+200	None
025+400	None
025+600	None
025+800	None
026+000	None

TCAR	
Station	ML/ARD Assessment
026+200	None
026+400	None
026+600	High
026+800	None
027+000	None
027+200	None
027+400	None
027+600	None
027+800	None
028+000	Possible
028+200	Possible
028+400	Possible
028+600	Possible
028+800	Possible
029+000	None
029+200	None
029+400	None
029+600	None
029+800	None
030+000	None
030+200	None
030+400	None
030+600	None
030+800	None
031+000	None
031+200	None
031+400	None
031+600	None
031+800	None

NTCAR	
Station	ML/ARD Assessment
000+200	Possible
000+400	Possible
000+600	Possible
000+800	Possible
001+000	Possible
001+200	Possible
001+400	Possible
001+600	Possible
001+800	Possible
002+000	Possible
002+200	Possible
002+400	Possible
002+600	Possible
002+800	Possible
003+000	Possible
003+200	Possible
003+400	Possible
003+600	Possible
003+800	Possible
004+000	Possible
004+200	Possible
004+400	Possible
004+600	Possible
004+800	Possible
005+000	Possible
005+200	Possible
005+400	Possible
005+600	Possible
005+800	Possible
006+000	Possible
006+200	Possible
006+400	Possible
006+600	Possible
006+800	Possible
007+000	Possible
007+200	Possible
007+400	Possible
007+600	Possible
007+800	Possible
008+000	Possible
008+200	Possible
008+400	Possible
008+600	Possible
008+800	Possible
009+000	Possible
009+200	Possible
009+400	Possible
009+600	Possible
009+800	Possible
010+000	Possible
010+200	Possible
010+400	Possible
010+600	Possible
010+800	Possible
011+000	Possible
011+200	Possible
011+400	Possible
011+600	Possible
011+800	Possible

Appendix 3.3-1

Cut and Fill Material Volumes for the Coulter Creek Access Road

Engineers and Scientists

Appendix 3.3-1. Cut and Fill Material Volumes for the Coulter Creek Access Road

Station	Area Type	Interval Volume (m³)	Cumulative Volume (m³)	Cut Percentage	Fill Percentage
Station: 0+200.000	Earth Cut	2,406	2,406	76%	24%
	Embankment Fill	757	757		
	Rock Cut	0	0		
Station: 0+400.000	Earth Cut	8,290	10,696	91%	9%
	Embankment Fill	847	1,604		
	Rock Cut	198	198		
Station: 0+600.000	Earth Cut	5,540	16,236	60%	40%
	Embankment Fill	4,614	6,218		
	Rock Cut	1,411	1,609		
Station: 0+800.000	Earth Cut	8,804	25,040	100%	0%
	Embankment Fill	26	6,244		
	Rock Cut	2,134	3,743		
Station: 1+000.000	Earth Cut	3,962	29,001	78%	22%
	Embankment Fill	1,148	7,393		
	Rock Cut	10	3,753		
Station: 1+200.000	Earth Cut	4,406	33,407	100%	0%
	Embankment Fill	0	7,393		
	Rock Cut	526	4,279		
Station: 1+400.000	Earth Cut	2,652	36,059	96%	4%
	Embankment Fill	98	7,490		
	Rock Cut	0	4,279		
Station: 1+600.000	Earth Cut	3,022	39,081	64%	36%
	Embankment Fill	1,691	9,182		
	Rock Cut	0	4,279		
Station: 1+800.000	Earth Cut	10,871	49,952	99%	1%
	Embankment Fill	71	9,253		
	Rock Cut	184	4,463		
Station: 2+000.000	Earth Cut	15,565	65,517	68%	32%
	Embankment Fill	7,588	16,841		
	Rock Cut	902	5,364		
Station: 2+200.000	Earth Cut	6,028	71,545	61%	39%
	Embankment Fill	4,026	20,866		
	Rock Cut	164	5,528		
Station: 2+400.000	Earth Cut	2,464	74,009	58%	42%
	Embankment Fill	1,751	22,617		
	Rock Cut	0	5,528		
Station: 2+600.000	Earth Cut	2,124	76,132	40%	60%
	Embankment Fill	3,241	25,858		
	Rock Cut	0	5,528		
Station: 2+800.000	Earth Cut	4,800	80,932	88%	12%
	Embankment Fill	634	26,492		
	Rock Cut	0	5,528		

Station	Area Type	Interval Volume (m³)	Cumulative Volume (m³)	Cut Percentage	Fill Percentage
Station: 5+600.000	Earth Cut	1,217	170,232	86%	14%
	Embankment Fill	2,515	71,611		
	Rock Cut	13,747	34,526		
Station: 5+800.000	Earth Cut	12,646	182,878	93%	7%
	Embankment Fill	1,039	72,650		
	Rock Cut	1,498	36,024		
Station: 6+000.000	Earth Cut	8,635	191,513	89%	11%
	Embankment Fill	1,069	73,719		
	Rock Cut	131	36,155		
Station: 6+200.000	Earth Cut	4,849	196,363	91%	9%
	Embankment Fill	506	74,225		
	Rock Cut	0	36,155		
Station: 6+400.000	Earth Cut	11,192	207,554	98%	2%
	Embankment Fill	219	74,444		
	Rock Cut	2,212	38,367		
Station: 6+600.000	Earth Cut	8,938	216,492	98%	2%
	Embankment Fill	206	74,650		
	Rock Cut	473	38,840		
Station: 6+800.000	Earth Cut	7,007	223,499	94%	6%
	Embankment Fill	447	75,097		
	Rock Cut	59	38,899		
Station: 7+000.000	Earth Cut	186	223,685	5%	95%
	Embankment Fill	3,895	78,992		
	Rock Cut	0	38,899		
Station: 7+200.000	Earth Cut	130	223,815	80%	20%
	Embankment Fill	1,986	80,978		
	Rock Cut	7,896	46,795		
Station: 7+400.000	Earth Cut	289	224,104	99%	1%
	Embankment Fill	167	81,145		
	Rock Cut	26,901	73,697		
Station: 7+600.000	Earth Cut	7,677	231,781	98%	2%
	Embankment Fill	205	81,350		
	Rock Cut	4,959	78,656		
Station: 7+800.000	Earth Cut	390	232,171	4%	96%
	Embankment Fill	9,765	91,115		
	Rock Cut	0	78,656		
Station: 8+000.000	Earth Cut	1,829	234,000	5%	95%
	Embankment Fill	36,110	127,225		
	Rock Cut	0	78,656		
Station: 8+200.000	Earth Cut	3,807	237,807	92%	8%
	Embankment Fill	344	127,569		
	Rock Cut	2	78,658		

Appendix 3.3-1. Cut and Fill Material Volumes for the Coulter Creek Access Road

Station	Area Type	Interval Volume (m³)	Cumulative Volume (m³)	Cut Percentage	Fill Percentage
Station: 3+000.000	Earth Cut	5,964	86,896	48%	52%
	Embankment Fill	6,388	32,881		
	Rock Cut	15	5,544		
Station: 3+200.000	Earth Cut	12,025	98,921	65%	35%
	Embankment Fill	6,983	39,864		
	Rock Cut	1,211	6,754		
Station: 3+400.000	Earth Cut	2,504	101,425	64%	36%
	Embankment Fill	1,539	41,402		
	Rock Cut	208	6,963		
Station: 3+600.000	Earth Cut	626	102,051	99%	1%
	Embankment Fill	76	41,479		
	Rock Cut	8,177	15,140		
Station: 3+800.000	Earth Cut	10,354	112,405	84%	16%
	Embankment Fill	2,087	43,566		
	Rock Cut	267	15,406		
Station: 4+000.000	Earth Cut	4,812	117,217	77%	23%
	Embankment Fill	1,495	45,060		
	Rock Cut	59	15,465		
Station: 4+200.000	Earth Cut	7,297	124,514	89%	11%
	Embankment Fill	972	46,032		
	Rock Cut	802	16,268		
Station: 4+400.000	Earth Cut	6,080	130,594	83%	17%
	Embankment Fill	1,233	47,265		
	Rock Cut	4	16,272		
Station: 4+600.000	Earth Cut	5,745	136,339	56%	44%
	Embankment Fill	4,799	52,064		
	Rock Cut	284	16,556		
Station: 4+800.000	Earth Cut	6,376	142,715	36%	64%
	Embankment Fill	11,803	63,868		
	Rock Cut	187	16,743		
Station: 5+000.000	Earth Cut	10,208	152,924	97%	3%
	Embankment Fill	378	64,245		
	Rock Cut	2,199	18,943		
Station: 5+200.000	Earth Cut	7,554	160,477	75%	25%
	Embankment Fill	2,734	66,980		
	Rock Cut	677	19,619		
Station: 5+400.000	Earth Cut	8,539	169,016	82%	18%
	Embankment Fill	2,116	69,096		
	Rock Cut	1,160	20,779		
Station: 11+000.000	Earth Cut	6,977	363,238	97%	3%
	Embankment Fill	209	197,921		
	Rock Cut	20	112,404		

Station	Area Type	Interval Volume (m³)	Cumulative Volume (m³)	Cut Percentage	Fill Percentage
Station: 8+400.000	Earth Cut	9,133	246,940	97%	3%
	Embankment Fill	311	127,880		
	Rock Cut	695	79,353		
Station: 8+600.000	Earth Cut	9,488	256,429	40%	60%
	Embankment Fill	17,218	145,099		
	Rock Cut	1,803	81,156		
Station: 8+800.000	Earth Cut	13,175	269,603	83%	17%
	Embankment Fill	3,537	148,636		
	Rock Cut	4,182	85,338		
Station: 9+000.000	Earth Cut	7,315	276,918	84%	16%
	Embankment Fill	1,615	150,251		
	Rock Cut	1,307	86,644		
Station: 9+200.000	Earth Cut	10,220	287,138	100%	0%
	Embankment Fill	11	150,262		
	Rock Cut	1,411	88,056		
Station: 9+400.000	Earth Cut	8,592	295,730	55%	45%
	Embankment Fill	12,906	163,169		
	Rock Cut	7,262	95,317		
Station: 9+600.000	Earth Cut	3,929	299,660	51%	49%
	Embankment Fill	3,703	166,872		
	Rock Cut	0	95,317		
Station: 9+800.000	Earth Cut	1,516	301,176	19%	81%
	Embankment Fill	6,639	173,511		
	Rock Cut	0	95,317		
Station: 10+000.000	Earth Cut	20,433	321,609	98%	2%
	Embankment Fill	618	174,129		
	Rock Cut	12,563	107,881		
Station: 10+200.000	Earth Cut	6,963	328,572	54%	46%
	Embankment Fill	7,031	181,160		
	Rock Cut	1,295	109,175		
Station: 10+400.000	Earth Cut	13,670	342,242	98%	2%
	Embankment Fill	394	181,554		
	Rock Cut	2,901	112,076		
Station: 10+600.000	Earth Cut	10,149	352,391	92%	8%
	Embankment Fill	939	182,493		
	Rock Cut	308	112,384		
Station: 10+800.000	Earth Cut	3,869	356,260	20%	80%
	Embankment Fill	15,219	197,712		
	Rock Cut	0	112,384		
Station: 16+400.000	Earth Cut	0	465,390	0%	100%
	Embankment Fill	3,346	291,275		
	Rock Cut	0	216,194		

Appendix 3.3-1. Cut and Fill Material Volumes for the Coulter Creek Access Road

Station	Area Type	Interval Volume (m³)	Cumulative Volume (m³)	Cut Percentage	Fill Percentage
Station: 11+200.000	Earth Cut	5,901	369,139	60%	40%
	Embankment Fill	4,144	202,066		
	Rock Cut	229	112,633		
Station: 11+400.000	Earth Cut	3,195	372,334	72%	28%
	Embankment Fill	1,265	203,331		
	Rock Cut	0	112,633		
Station: 11+600.000	Earth Cut	7,751	380,085	99%	1%
	Embankment Fill	98	203,429		
	Rock Cut	176	112,809		
Station: 11+800.000	Earth Cut	7,077	387,161	97%	3%
	Embankment Fill	269	203,698		
	Rock Cut	637	113,445		
Station: 12+000.000	Earth Cut	9,845	397,006	97%	3%
	Embankment Fill	353	204,051		
	Rock Cut	115	113,560		
Station: 12+200.000	Earth Cut	12,388	409,394	95%	5%
	Embankment Fill	963	205,014		
	Rock Cut	4,459	118,019		
Station: 12+400.000	Earth Cut	5,239	414,633	56%	44%
	Embankment Fill	6,555	211,570		
	Rock Cut	3,107	121,126		
Station: 12+600.000	Earth Cut	219	414,852	90%	10%
	Embankment Fill	1,860	213,430		
	Rock Cut	16,885	138,011		
Station: 12+800.000	Earth Cut	200	415,052	95%	5%
	Embankment Fill	385	213,815		
	Rock Cut	7,606	145,616		
Station: 13+000.000	Earth Cut	196	415,248	65%	35%
	Embankment Fill	9,422	223,237		
	Rock Cut	17,006	162,622		
Station: 13+200.000	Earth Cut	190	415,438	92%	8%
	Embankment Fill	545	223,782		
	Rock Cut	6,060	168,682		
Station: 13+400.000	Earth Cut	192	415,630	85%	15%
	Embankment Fill	1,671	225,453		
	Rock Cut	9,635	178,317		
Station: 13+600.000	Earth Cut	173	415,802	71%	29%
	Embankment Fill	2,829	228,282		
	Rock Cut	6,600	184,917		
Station: 13+800.000	Earth Cut	188	415,990	87%	13%
	Embankment Fill	886	229,167		
	Rock Cut	5,608	190,526		

Station	Area Type	Interval Volume (m³)	Cumulative Volume (m³)	Cut Percentage	Fill Percentage
Station: 16+620.000	Earth Cut	64	465,454	45%	55%
	Embankment Fill	4,238	295,514		
	Rock Cut	3,338	219,531		
Station: 16+800.000	Earth Cut	69	465,522	18%	82%
	Embankment Fill	20,686	316,200		
	Rock Cut	4,411	223,942		
Station: 17+000.000	Earth Cut	161	465,683	52%	48%
	Embankment Fill	9,234	325,433		
	Rock Cut	9,950	233,893		
Station: 17+200.000	Earth Cut	269	465,952	100%	0%
	Embankment Fill	2	325,435		
	Rock Cut	20,055	253,947		
Station: 17+400.000	Earth Cut	133	466,085	29%	71%
	Embankment Fill	29,444	354,880		
	Rock Cut	11,773	265,721		
Station: 17+600.000	Earth Cut	4,881	470,966	29%	71%
	Embankment Fill	12,202	367,081		
	Rock Cut	39	265,760		
Station: 17+800.000	Earth Cut	7,654	478,620	53%	47%
	Embankment Fill	6,881	373,963		
	Rock Cut	33	265,792		
Station: 18+000.000	Earth Cut	14,333	492,953	100%	0%
	Embankment Fill	1	373,963		
	Rock Cut	2,107	267,899		
Station: 18+200.000	Earth Cut	7,067	500,020	79%	21%
	Embankment Fill	1,904	375,868		
	Rock Cut	138	268,038		
Station: 18+400.000	Earth Cut	2,041	502,062	11%	89%
	Embankment Fill	16,276	392,144		
	Rock Cut	26	268,064		
Station: 18+600.000	Earth Cut	11,762	513,824	100%	0%
	Embankment Fill	0	392,144		
	Rock Cut	2,188	270,252		
Station: 18+800.000	Earth Cut	129	513,952	35%	65%
	Embankment Fill	7,828	399,972		
	Rock Cut	4,032	274,284		
Station: 19+000.000	Earth Cut	200	514,152	69%	31%
	Embankment Fill	6,233	406,205		
	Rock Cut	13,829	288,113		
Station: 19+200.000	Earth Cut	172	514,324	47%	53%
	Embankment Fill	9,842	416,047		
	Rock Cut	8,646	296,759		

Appendix 3.3-1. Cut and Fill Material Volumes for the Coulter Creek Access Road

Station	Area Type	Interval Volume (m³)	Cumulative Volume (m³)	Cut Percentage	Fill Percentage
Station: 14+000.000	Earth Cut	165	416,155	86%	14%
	Embankment Fill	1,224	230,392		
	Rock Cut	7,489	198,014		
Station: 14+200.000	Earth Cut	139	416,294	49%	51%
	Embankment Fill	7,660	238,051		
	Rock Cut	7,138	205,152		
Station: 14+400.000	Earth Cut	135	416,430	25%	75%
	Embankment Fill	10,674	248,726		
	Rock Cut	3,490	208,642		
Station: 14+600.000	Earth Cut	384	416,813	73%	27%
	Embankment Fill	1,877	250,603		
	Rock Cut	4,586	213,228		
Station: 14+800.000	Earth Cut	7,268	424,081	93%	7%
	Embankment Fill	562	251,165		
	Rock Cut	1	213,229		
Station: 15+000.000	Earth Cut	7,728	431,809	67%	33%
	Embankment Fill	3,888	255,053		
	Rock Cut	88	213,317		
Station: 15+200.000	Earth Cut	16,569	448,378	72%	28%
	Embankment Fill	7,061	262,114		
	Rock Cut	1,584	214,900		
Station: 15+400.000	Earth Cut	12,522	460,900	72%	28%
	Embankment Fill	5,341	267,455		
	Rock Cut	1,028	215,929		
Station: 15+600.000	Earth Cut	4,490	465,390	61%	39%
	Embankment Fill	3,065	270,520		
	Rock Cut	265	216,194		
Station: 15+800.000	Earth Cut	0	465,390	0%	100%
	Embankment Fill	3,952	274,473		
	Rock Cut	0	216,194		
Station: 16+000.000	Earth Cut	0	465,390	0%	100%
	Embankment Fill	6,945	281,418		
	Rock Cut	0	216,194		
Station: 16+200.000	Earth Cut	0	465,390	0%	100%
	Embankment Fill	6,512	287,930		
	Rock Cut	0	216,194		
Station: 21+800.000	Earth Cut	8,825	624,722	100%	0%
	Embankment Fill	0	545,337		
	Rock Cut	9,062	388,655		
Station: 22+000.000	Earth Cut	144	624,866	43%	57%
	Embankment Fill	7,921	553,258		
	Rock Cut	5,847	394,502		

Station	Area Type	Interval Volume (m³)	Cumulative Volume (m³)	Cut Percentage	Fill Percentage
Station: 19+400.000	Earth Cut	317	514,641	100%	0%
	Embankment Fill	123	416,170		
	Rock Cut	27,523	324,282		
Station: 19+600.000	Earth Cut	160	514,801	3%	97%
	Embankment Fill	26,513	442,682		
	Rock Cut	707	324,989		
Station: 19+800.000	Earth Cut	16,827	531,628	94%	6%
	Embankment Fill	1,251	443,933		
	Rock Cut	2,287	327,276		
Station: 20+000.000	Earth Cut	17,964	549,591	80%	20%
	Embankment Fill	5,453	449,386		
	Rock Cut	3,931	331,207		
Station: 20+200.000	Earth Cut	0	549,591	0%	100%
	Embankment Fill	36,423	485,809		
	Rock Cut	0	331,207		
Station: 20+400.000	Earth Cut	11,681	561,273	52%	48%
	Embankment Fill	13,510	499,319		
	Rock Cut	3,061	334,269		
Station: 20+600.000	Earth Cut	84	561,357	16%	84%
	Embankment Fill	25,187	524,506		
	Rock Cut	4,701	338,970		
Station: 20+800.000	Earth Cut	262	561,619	100%	0%
	Embankment Fill	5	524,511		
	Rock Cut	15,635	354,604		
Station: 21+000.000	Earth Cut	1,815	563,433	34%	66%
	Embankment Fill	19,646	544,157		
	Rock Cut	8,235	362,839		
Station: 21+200.000	Earth Cut	28,982	592,415	100%	0%
	Embankment Fill	0	544,157		
	Rock Cut	13,867	376,706		
Station: 21+400.000	Earth Cut	8,639	601,054	90%	10%
	Embankment Fill	1,180	545,337		
	Rock Cut	2,050	378,756		
Station: 21+600.000	Earth Cut	14,842	615,896	100%	0%
	Embankment Fill	0	545,337		
	Rock Cut	836	379,593		
Station: 27+200.000	Earth Cut	11,337	782,889	54%	46%
	Embankment Fill	10,276	757,776		
	Rock Cut	673	627,031		
Station: 27+400.000	Earth Cut	22,457	805,346	74%	26%
	Embankment Fill	15,485	773,261		
	Rock Cut	20,874	647,904		

Appendix 3.3-1. Cut and Fill Material Volumes for the Coulter Creek Access Road

Station	Area Type	Interval Volume (m³)	Cumulative Volume (m³)	Cut Percentage	Fill Percentage
Station: 22+200.000	Earth Cut	167	625,033	62%	38%
	Embankment Fill	6,014	559,272		
	Rock Cut	9,778	404,280		
Station: 22+400.000	Earth Cut	125	625,158	58%	42%
	Embankment Fill	7,953	567,225		
	Rock Cut	10,764	415,045		
Station: 22+600.000	Earth Cut	261	625,419	95%	5%
	Embankment Fill	799	568,024		
	Rock Cut	15,194	430,238		
Station: 22+800.000	Earth Cut	137	625,556	15%	85%
	Embankment Fill	29,597	597,621		
	Rock Cut	5,259	435,497		
Station: 23+000.000	Earth Cut	249	625,805	93%	7%
	Embankment Fill	1,410	599,031		
	Rock Cut	17,713	453,210		
Station: 23+200.000	Earth Cut	136	625,941	32%	68%
	Embankment Fill	11,995	611,025		
	Rock Cut	5,456	458,666		
Station: 23+400.000	Earth Cut	347	626,288	100%	0%
	Embankment Fill	0	611,025		
	Rock Cut	36,748	495,414		
Station: 23+600.000	Earth Cut	195	626,484	85%	15%
	Embankment Fill	1,941	612,966		
	Rock Cut	11,071	506,485		
Station: 23+800.000	Earth Cut	265	626,749	100%	0%
	Embankment Fill	0	612,966		
	Rock Cut	15,982	522,467		
Station: 24+000.000	Earth Cut	290	627,039	100%	0%
	Embankment Fill	0	612,966		
	Rock Cut	24,155	546,622		
Station: 24+200.000	Earth Cut	281	627,321	100%	0%
	Embankment Fill	0	612,966		
	Rock Cut	20,272	566,894		
Station: 24+400.000	Earth Cut	231	627,552	93%	7%
	Embankment Fill	1,165	614,131		
	Rock Cut	15,077	581,971		
Station: 24+600.000	Earth Cut	254	627,806	93%	7%
	Embankment Fill	1,362	615,493		
	Rock Cut	19,120	601,091		
Station: 24+800.000	Earth Cut	6,124	633,930	24%	76%
	Embankment Fill	30,242	645,734		
	Rock Cut	3,209	604,299		

Station	Area Type	Interval Volume (m³)	Cumulative Volume (m³)	Cut Percentage	Fill Percentage
Station: 27+600.000	Earth Cut	14,579	819,925	46%	54%
	Embankment Fill	19,397	792,658		
	Rock Cut	2,102	650,006		
Station: 27+800.000	Earth Cut	18,008	837,933	97%	3%
	Embankment Fill	521	793,179		
	Rock Cut	759	650,766		
Station: 28+000.000	Earth Cut	17,731	855,664	96%	4%
	Embankment Fill	773	793,952		
	Rock Cut	933	651,699		
Station: 28+200.000	Earth Cut	14,219	869,883	63%	37%
	Embankment Fill	9,942	803,894		
	Rock Cut	2,972	654,671		
Station: 28+400.000	Earth Cut	13,524	883,406	61%	39%
	Embankment Fill	9,148	813,043		
	Rock Cut	1,084	655,754		
Station: 28+600.000	Earth Cut	10,867	894,274	85%	15%
	Embankment Fill	1,991	815,034		
	Rock Cut	99	655,854		
Station: 28+800.000	Earth Cut	7,685	901,958	73%	27%
	Embankment Fill	2,977	818,011		
	Rock Cut	167	656,020		
Station: 29+000.000	Earth Cut	8,988	910,946	96%	4%
	Embankment Fill	428	818,438		
	Rock Cut	202	656,223		
Station: 29+200.000	Earth Cut	9,729	920,675	65%	35%
	Embankment Fill	5,271	823,710		
	Rock Cut	125	656,347		
Station: 29+400.000	Earth Cut	15,815	936,490	83%	17%
	Embankment Fill	3,297	827,007		
	Rock Cut	473	656,820		
Station: 29+600.000	Earth Cut	15,622	952,112	92%	8%
	Embankment Fill	1,396	828,403		
	Rock Cut	609	657,429		
Station: 29+800.000	Earth Cut	23,059	975,171	97%	3%
	Embankment Fill	873	829,275		
	Rock Cut	4,478	661,907		
Station: 30+000.000	Earth Cut	13,756	988,927	53%	47%
	Embankment Fill	14,965	844,240		
	Rock Cut	3,456	665,362		
Station: 30+200.000	Earth Cut	7,979	996,906	85%	15%
	Embankment Fill	1,434	845,674		
	Rock Cut	444	665,806		

Appendix 3.3-1. Cut and Fill Material Volumes for the Coulter Creek Access Road

Station	Area Type	Interval Volume (m³)	Cumulative Volume (m³)	Cut Percentage	Fill Percentage
Station: 25+000.000	Earth Cut	12,789	646,719	41%	59%
	Embankment Fill	34,910	680,644		
	Rock Cut	11,042	615,341		
Station: 25+200.000	Earth Cut	6,615	653,334	30%	70%
	Embankment Fill	17,142	697,787		
	Rock Cut	575	615,916		
Station: 25+400.000	Earth Cut	15,072	668,406	68%	32%
	Embankment Fill	7,368	705,155		
	Rock Cut	455	616,372		
Station: 25+600.000	Earth Cut	13,917	682,323	88%	12%
	Embankment Fill	1,858	707,013		
	Rock Cut	302	616,673		
Station: 25+800.000	Earth Cut	12,371	694,694	62%	38%
	Embankment Fill	7,798	714,811		
	Rock Cut	511	617,184		
Station: 26+000.000	Earth Cut	15,329	710,023	75%	25%
	Embankment Fill	5,457	720,268		
	Rock Cut	962	618,146		
Station: 26+200.000	Earth Cut	11,678	721,701	86%	14%
	Embankment Fill	2,220	722,488		
	Rock Cut	1,413	619,559		
Station: 26+400.000	Earth Cut	7,999	729,700	53%	47%
	Embankment Fill	7,067	729,555		
	Rock Cut	49	619,609		
Station: 26+600.000	Earth Cut	19,941	749,641	98%	2%
	Embankment Fill	607	730,161		
	Rock Cut	5,371	624,979		
Station: 26+800.000	Earth Cut	6,832	756,473	34%	66%
	Embankment Fill	15,599	745,760		
	Rock Cut	1,051	626,030		
Station: 27+000.000	Earth Cut	15,080	771,552	90%	10%
	Embankment Fill	1,739	747,499		
	Rock Cut	327	626,357		
Station: 32+600.000	Earth Cut	1,176	1,012,823	68%	32%
	Embankment Fill	5,277	875,216		
	Rock Cut	10,167	681,463		
Station: 32+800.000	Earth Cut	7,903	1,020,726	72%	28%
	Embankment Fill	4,245	879,461		
	Rock Cut	3,287	684,750		
Station: 33+000.000	Earth Cut	6,543	1,027,269	95%	5%
	Embankment Fill	346	879,807		
	Rock Cut	0	684,750		

Station	Area Type	Interval Volume (m³)	Cumulative Volume (m³)	Cut Percentage	Fill Percentage
Station: 30+400.000	Earth Cut	1,301	998,207	12%	88%
	Embankment Fill	9,840	855,514		
	Rock Cut	0	665,806		
Station: 30+600.000	Earth Cut	44	998,250	2%	98%
	Embankment Fill	2,827	858,341		
	Rock Cut	0	665,806		
Station: 30+800.000	Earth Cut	169	998,420	33%	67%
	Embankment Fill	343	858,684		
	Rock Cut	0	665,806		
Station: 31+000.000	Earth Cut	1,177	999,596	58%	42%
	Embankment Fill	855	859,539		
	Rock Cut	0	665,806		
Station: 31+200.000	Earth Cut	2,406	1,002,002	98%	2%
	Embankment Fill	48	859,587		
	Rock Cut	0	665,806		
Station: 31+400.000	Earth Cut	2,848	1,004,850	92%	8%
	Embankment Fill	244	859,831		
	Rock Cut	0	665,806		
Station: 31+600.000	Earth Cut	170	1,005,020	26%	74%
	Embankment Fill	474	860,304		
	Rock Cut	0	665,806		
Station: 31+800.000	Earth Cut	981	1,006,001	96%	4%
	Embankment Fill	45	860,349		
	Rock Cut	0	665,806		
Station: 32+000.000	Earth Cut	3,709	1,009,710	44%	56%
	Embankment Fill	4,749	865,098		
	Rock Cut	21	665,827		
Station: 32+200.000	Earth Cut	1,797	1,011,507	50%	50%
	Embankment Fill	1,912	867,011		
	Rock Cut	119	665,946		
Station: 32+400.000	Earth Cut	140	1,011,647	65%	35%
	Embankment Fill	2,928	869,939		
	Rock Cut	5,350	671,296		
Station: 34+000.000	Earth Cut	11,511	1,080,237	98%	2%
	Embankment Fill	216	892,983		
	Rock Cut	454	690,962		
Station: 34+200.000	Earth Cut	7,422	1,087,659	80%	20%
	Embankment Fill	1,922	894,905		
	Rock Cut	150	691,112		
Station: 34+400.000	Earth Cut	24,562	1,112,221	100%	0%
	Embankment Fill	21	894,926		
	Rock Cut	4,518	695,630		

Appendix 3.3-1. Cut and Fill Material Volumes for the Coulter Creek Access Road

Station	Area Type	Interval Volume (m³)	Cumulative Volume (m³)	Cut Percentage	Fill Percentage
Station: 33+200.000	Earth Cut	14,971	1,042,241	100%	0%
	Embankment Fill	0	879,807		
	Rock Cut	1,081	685,831		
Station: 33+400.000	Earth Cut	11,089	1,053,330	98%	2%
	Embankment Fill	274	880,081		
	Rock Cut	2,905	688,737		
Station: 33+600.000	Earth Cut	4,795	1,058,125	33%	67%
	Embankment Fill	12,517	892,598		
	Rock Cut	1,253	689,990		
Station: 33+800.000	Earth Cut	10,601	1,068,725	99%	1%
	Embankment Fill	169	892,767		
	Rock Cut	519	690,508		

Station	Area Type	Interval Volume (m³)	Cumulative Volume (m³)	Cut Percentage	Fill Percentage
Station: 34+600.000	Earth Cut	9,745	1,121,966	87%	13%
	Embankment Fill	1,492	896,418		
	Rock Cut	440	696,070		
Station: 34+800.000	Earth Cut	23,682	1,145,648	100%	0%
	Embankment Fill	0	896,418		
	Rock Cut	6,916	702,986		
Station: 35+000.000	Earth Cut	11,702	1,157,350	99%	1%
	Embankment Fill	157	896,574		
	Rock Cut	21	703,007		

Appendix 3.3-2

Cut and Fill Material Volumes for the Treaty Creek Access Road

Appendix 3.3-2. Cut and Fill Material Volumes for the Treaty Creek Access Road

Station	Area Type	Interval Volume (m³)	Cumulative Volume (m³)	Cut Percentage	Fill Percentage
Station: 0+200.000	Earth Cut	79	79	4%	96%
	Embankment Fill	2,148	2,148		
	Rock Cut	0	0		
Station: 0+400.000	Earth Cut	178	257	18%	82%
	Embankment Fill	801	2,949		
	Rock Cut	0	0		
Station: 0+600.000	Earth Cut	0	257	0%	100%
	Embankment Fill	7,856	10,806		
	Rock Cut	0	0		
Station: 0+800.000	Earth Cut	2,648	2,905	45%	55%
	Embankment Fill	3,219	14,025		
	Rock Cut	0	0		
Station: 1+000.000	Earth Cut	3,584	6,489	96%	4%
	Embankment Fill	130	14,155		
	Rock Cut	0	0		
Station: 1+200.000	Earth Cut	402	6,891	41%	59%
	Embankment Fill	584	14,739		
	Rock Cut	0	0		
Station: 1+400.000	Earth Cut	726	7,617	56%	44%
	Embankment Fill	572	15,311		
	Rock Cut	0	0		
Station: 1+600.000	Earth Cut	1,260	8,877	36%	64%
	Embankment Fill	2,279	17,590		
	Rock Cut	0	0		
Station: 1+800.000	Earth Cut	614	9,491	31%	69%
	Embankment Fill	1,343	18,933		
	Rock Cut	0	0		
Station: 2+000.000	Earth Cut	1,043	10,534	36%	64%
	Embankment Fill	1,830	20,763		
	Rock Cut	0	0		
Station: 2+200.000	Earth Cut	2,721	13,255	74%	26%
	Embankment Fill	972	21,735		
	Rock Cut	0	0		
Station: 2+400.000	Earth Cut	15,248	15,506	42%	58%
	Embankment Fill	20,705	23,654		
	Rock Cut	0	0		
Station: 2+600.000	Earth Cut	16,252	16,509	54%	46%
	Embankment Fill	13,992	24,798		
	Rock Cut	0	0		
Station: 2+800.000	Earth Cut	15,398	18,303	58%	42%
	Embankment Fill	11,282	25,307		
	Rock Cut	0	0		
Station: 5+600.000	Earth Cut	1,629	31,475	40%	60%
	Embankment Fill	3,425	59,143		
	Rock Cut	622	798		
Station: 5+800.000	Earth Cut	1,426	32,901	45%	55%
	Embankment Fill	2,471	61,614		
	Rock Cut	579	1,377		
Station: 6+000.000	Earth Cut	436	33,337	8%	92%
	Embankment Fill	5,974	67,589		
	Rock Cut	80	1,457		
Station: 6+200.000	Earth Cut	1,204	34,541	47%	53%
	Embankment Fill	1,922	69,510		
	Rock Cut	507	1,964		
Station: 6+400.000	Earth Cut	900	35,441	23%	77%
	Embankment Fill	3,069	72,579		
	Rock Cut	3	1,966		
Station: 6+600.000	Earth Cut	40	35,481	1%	99%
	Embankment Fill	5,956	78,535		
	Rock Cut	0	1,966		
Station: 6+800.000	Earth Cut	1,069	36,550	29%	71%
	Embankment Fill	2,599	81,134		
	Rock Cut	0	1,967		
Station: 7+000.000	Earth Cut	1,835	38,386	94%	6%
	Embankment Fill	116	81,250		
	Rock Cut	0	1,967		
Station: 7+200.000	Earth Cut	1,266	39,652	29%	71%
	Embankment Fill	3,159	84,409		
	Rock Cut	4	1,971		
Station: 7+400.000	Earth Cut	870	40,522	21%	79%
	Embankment Fill	4,284	88,693		
	Rock Cut	299	2,269		
Station: 7+600.000	Earth Cut	92	40,614	3%	97%
	Embankment Fill	5,312	94,005		
	Rock Cut	79	2,349		
Station: 7+800.000	Earth Cut	1,094	41,708	32%	68%
	Embankment Fill	3,680	97,685		
	Rock Cut	628	2,977		
Station: 8+000.000	Earth Cut	476	42,184	14%	86%
	Embankment Fill	3,515	101,200		
	Rock Cut	80	3,056		
Station: 8+200.000	Earth Cut	171	42,355	6%	94%
	Embankment Fill	4,410	105,610		
	Rock Cut	99	3,155		

Appendix 3.3-2. Cut and Fill Material Volumes for the Treaty Creek Access Road

Station	Area Type	Interval Volume (m³)	Cumulative Volume (m³)	Cut Percentage	Fill Percentage
Station: 3+000.000	Earth Cut	13,439	19,928	52%	48%
	Embankment Fill	12,328	26,483		
	Rock Cut	0	0		
Station: 3+200.000	Earth Cut	14,651	21,542	54%	46%
	Embankment Fill	12,423	27,162		
	Rock Cut	0	0		
Station: 3+400.000	Earth Cut	14,742	22,359	53%	47%
	Embankment Fill	13,260	28,571		
	Rock Cut	0	0		
Station: 3+600.000	Earth Cut	16,214	25,091	56%	44%
	Embankment Fill	12,803	30,393		
	Rock Cut	19	19		
Station: 3+800.000	Earth Cut	16,344	25,835	49%	51%
	Embankment Fill	16,847	35,780		
	Rock Cut	0	19		
Station: 4+000.000	Earth Cut	15,587	26,121	48%	52%
	Embankment Fill	16,901	37,664		
	Rock Cut	0	19		
Station: 4+200.000	Earth Cut	13,419	26,674	45%	55%
	Embankment Fill	16,292	38,027		
	Rock Cut	0	19		
Station: 4+400.000	Earth Cut	11,636	27,141	44%	56%
	Embankment Fill	14,921	38,575		
	Rock Cut	0	19		
Station: 4+600.000	Earth Cut	10,849	27,358	37%	63%
	Embankment Fill	18,466	43,263		
	Rock Cut	0	19		
Station: 4+800.000	Earth Cut	0	27,358	0%	100%
	Embankment Fill	7,650	50,914		
	Rock Cut	0	19		
Station: 5+000.000	Earth Cut	275	27,632	7%	93%
	Embankment Fill	3,607	54,521		
	Rock Cut	0	19		
Station: 5+200.000	Earth Cut	576	28,208	75%	25%
	Embankment Fill	196	54,717		
	Rock Cut	0	19		
Station: 5+400.000	Earth Cut	1,639	29,847	64%	36%
	Embankment Fill	1,002	55,718		
	Rock Cut	157	176		

Station	Area Type	Interval Volume (m³)	Cumulative Volume (m³)	Cut Percentage	Fill Percentage
Station: 8+400.000	Earth Cut	89	42,444	3%	97%
	Embankment Fill	8,856	114,466		
	Rock Cut	180	3,335		
Station: 8+600.000	Earth Cut	124	42,568	2%	98%
	Embankment Fill	7,873	122,340		
	Rock Cut	10	3,345		
Station: 8+800.000	Earth Cut	1,010	43,578	18%	82%
	Embankment Fill	5,564	127,904		
	Rock Cut	203	3,549		
Station: 9+000.000	Earth Cut	1,258	44,836	35%	65%
	Embankment Fill	2,911	130,815		
	Rock Cut	324	3,872		
Station: 9+200.000	Earth Cut	847	45,683	72%	28%
	Embankment Fill	1,557	132,372		
	Rock Cut	3,175	7,047		
Station: 9+400.000	Earth Cut	851	46,534	95%	5%
	Embankment Fill	401	132,773		
	Rock Cut	7,514	14,561		
Station: 9+600.000	Earth Cut	548	47,082	100%	0%
	Embankment Fill	41	132,813		
	Rock Cut	19,337	33,898		
Station: 9+800.000	Earth Cut	553	47,635	100%	0%
	Embankment Fill	37	132,850		
	Rock Cut	20,199	54,097		
Station: 10+000.000	Earth Cut	506	48,141	99%	1%
	Embankment Fill	131	132,982		
	Rock Cut	14,689	68,786		
Station: 10+200.000	Earth Cut	2,226	50,368	76%	24%
	Embankment Fill	2,233	135,215		
	Rock Cut	4,712	73,498		
Station: 10+400.000	Earth Cut	1,074	51,441	66%	34%
	Embankment Fill	580	135,795		
	Rock Cut	77	73,575		
Station: 10+600.000	Earth Cut	3,568	55,009	53%	47%
	Embankment Fill	3,348	139,143		
	Rock Cut	178	73,753		
Station: 10+800.000	Earth Cut	4,153	59,162	76%	24%
	Embankment Fill	1,927	141,069		
	Rock Cut	2,063	75,816		

Appendix 3.3-2. Cut and Fill Material Volumes for the Treaty Creek Access Road

Station	Area Type	Interval Volume (m³)	Cumulative Volume (m³)	Cut Percentage	Fill Percentage
Station: 11+000.000	Earth Cut	2,533	61,695	90%	10%
	Embankment Fill	1,312	142,381		
	Rock Cut	9,148	84,964		
Station: 11+200.000	Earth Cut	1,587	63,281	72%	28%
	Embankment Fill	2,126	144,507		
	Rock Cut	3,906	88,869		
Station: 11+400.000	Earth Cut	1,880	65,162	32%	68%
	Embankment Fill	7,732	152,239		
	Rock Cut	1,700	90,569		
Station: 11+600.000	Earth Cut	1,181	66,343	51%	49%
	Embankment Fill	1,741	153,980		
	Rock Cut	621	91,190		
Station: 11+800.000	Earth Cut	1,105	67,448	28%	72%
	Embankment Fill	3,856	157,835		
	Rock Cut	400	91,590		
Station: 12+000.000	Earth Cut	967	68,416	18%	82%
	Embankment Fill	5,569	163,404		
	Rock Cut	236	91,826		
Station: 12+200.000	Earth Cut	717	69,133	19%	81%
	Embankment Fill	3,486	166,890		
	Rock Cut	92	91,918		
Station: 12+400.000	Earth Cut	1,142	70,275	45%	55%
	Embankment Fill	1,719	168,609		
	Rock Cut	251	92,168		
Station: 12+600.000	Earth Cut	1,459	71,734	68%	32%
	Embankment Fill	820	169,430		
	Rock Cut	274	92,442		
Station: 12+800.000	Earth Cut	1,447	73,181	71%	29%
	Embankment Fill	944	170,373		
	Rock Cut	822	93,264		
Station: 13+000.000	Earth Cut	1,461	74,642	67%	33%
	Embankment Fill	1,432	171,806		
	Rock Cut	1,507	94,770		
Station: 13+200.000	Earth Cut	1,383	76,025	39%	61%
	Embankment Fill	3,869	175,674		
	Rock Cut	1,127	95,898		
Station: 13+400.000	Earth Cut	3,109	79,134	60%	40%
	Embankment Fill	3,189	178,863		
	Rock Cut	1,710	97,608		
Station: 13+600.000	Earth Cut	4,845	83,979	72%	28%
	Embankment Fill	3,395	182,258		
	Rock Cut	3,958	101,566		

Station	Area Type	Interval Volume (m³)	Cumulative Volume (m³)	Cut Percentage	Fill Percentage
Station: 16+400.000	Earth Cut	2,767	111,629	92%	8%
	Embankment Fill	560	232,352		
	Rock Cut	3,554	132,646		
Station: 16+620.000	Earth Cut	2,917	114,546	72%	28%
	Embankment Fill	3,165	235,517		
	Rock Cut	5,093	137,739		
Station: 16+800.000	Earth Cut	2,323	116,869	64%	36%
	Embankment Fill	4,056	239,573		
	Rock Cut	4,965	142,704		
Station: 17+000.000	Earth Cut	345	117,214	4%	96%
	Embankment Fill	9,396	248,969		
	Rock Cut	79	142,783		
Station: 17+200.000	Earth Cut	4,448	121,662	90%	10%
	Embankment Fill	1,558	250,527		
	Rock Cut	9,500	152,283		
Station: 17+400.000	Earth Cut	5,407	127,069	97%	3%
	Embankment Fill	500	251,027		
	Rock Cut	10,166	162,450		
Station: 17+600.000	Earth Cut	3,000	130,069	86%	14%
	Embankment Fill	1,613	252,640		
	Rock Cut	6,810	169,259		
Station: 17+800.000	Earth Cut	208	130,277	1%	99%
	Embankment Fill	20,714	273,354		
	Rock Cut	90	169,350		
Station: 18+000.000	Earth Cut	15	130,292	0%	100%
	Embankment Fill	9,116	282,470		
	Rock Cut	0	169,350		
Station: 18+200.000	Earth Cut	2,476	132,768	36%	64%
	Embankment Fill	9,633	292,103		
	Rock Cut	2,846	172,196		
Station: 18+400.000	Earth Cut	2,378	135,146	40%	60%
	Embankment Fill	4,829	296,932		
	Rock Cut	854	173,050		
Station: 18+600.000	Earth Cut	3,151	138,296	64%	36%
	Embankment Fill	1,870	298,803		
	Rock Cut	212	173,262		
Station: 18+800.000	Earth Cut	3,086	141,382	65%	35%
	Embankment Fill	2,086	300,888		
	Rock Cut	711	173,973		
Station: 19+000.000	Earth Cut	1,884	143,266	54%	46%
	Embankment Fill	2,916	303,805		
	Rock Cut	1,563	175,536		

Appendix 3.3-2. Cut and Fill Material Volumes for the Treaty Creek Access Road

Station	Area Type	Interval Volume (m³)	Cumulative Volume (m³)	Cut Percentage	Fill Percentage
Station: 13+800.000	Earth Cut	700	84,679	8%	92%
	Embankment Fill	10,661	192,920		
	Rock Cut	208	101,773		
Station: 14+000.000	Earth Cut	4,766	89,445	89%	11%
	Embankment Fill	846	193,765		
	Rock Cut	1,863	103,636		
Station: 14+200.000	Earth Cut	1,289	90,734	62%	38%
	Embankment Fill	4,156	197,921		
	Rock Cut	5,356	108,992		
Station: 14+400.000	Earth Cut	2,467	93,201	55%	45%
	Embankment Fill	4,368	202,289		
	Rock Cut	2,955	111,947		
Station: 14+600.000	Earth Cut	1,092	94,293	25%	75%
	Embankment Fill	3,502	205,791		
	Rock Cut	96	112,043		
Station: 14+800.000	Earth Cut	65	94,358	1%	99%
	Embankment Fill	9,870	215,660		
	Rock Cut	0	112,043		
Station: 15+000.000	Earth Cut	1,859	96,217	44%	56%
	Embankment Fill	2,495	218,155		
	Rock Cut	89	112,132		
Station: 15+200.000	Earth Cut	3,169	99,386	85%	15%
	Embankment Fill	601	218,757		
	Rock Cut	126	112,258		
Station: 15+400.000	Earth Cut	1,846	101,232	56%	44%
	Embankment Fill	1,458	220,215		
	Rock Cut	5	112,264		
Station: 15+600.000	Earth Cut	1,138	102,369	35%	65%
	Embankment Fill	3,349	223,563		
	Rock Cut	703	112,967		
Station: 15+800.000	Earth Cut	1,014	103,384	71%	29%
	Embankment Fill	1,356	224,919		
	Rock Cut	2,257	115,223		
Station: 16+000.000	Earth Cut	3,804	107,187	97%	3%
	Embankment Fill	477	225,396		
	Rock Cut	10,723	125,946		
Station: 16+200.000	Earth Cut	1,674	108,862	43%	57%
	Embankment Fill	6,396	231,791		
	Rock Cut	3,146	129,092		

Station	Area Type	Interval Volume (m³)	Cumulative Volume (m³)	Cut Percentage	Fill Percentage
Station: 19+200.000	Earth Cut	2,484	145,750	64%	36%
	Embankment Fill	1,701	305,506		
	Rock Cut	573	176,108		
Station: 19+400.000	Earth Cut	2,457	148,207	45%	55%
	Embankment Fill	3,182	308,688		
	Rock Cut	117	176,225		
Station: 19+600.000	Earth Cut	2,426	150,633	54%	46%
	Embankment Fill	2,122	310,810		
	Rock Cut	112	176,337		
Station: 19+800.000	Earth Cut	881	151,514	17%	83%
	Embankment Fill	4,529	315,339		
	Rock Cut	24	176,361		
Station: 20+000.000	Earth Cut	1,135	152,649	32%	68%
	Embankment Fill	2,430	317,769		
	Rock Cut	11	176,372		
Station: 20+200.000	Earth Cut	2,442	155,091	50%	50%
	Embankment Fill	2,803	320,572		
	Rock Cut	396	176,767		
Station: 20+400.000	Earth Cut	1,996	157,088	45%	55%
	Embankment Fill	2,764	323,335		
	Rock Cut	242	177,009		
Station: 20+600.000	Earth Cut	1,817	158,904	36%	64%
	Embankment Fill	3,548	326,883		
	Rock Cut	154	177,163		
Station: 20+800.000	Earth Cut	2,642	161,546	44%	56%
	Embankment Fill	3,772	330,655		
	Rock Cut	351	177,514		
Station: 21+000.000	Earth Cut	3,459	165,005	76%	24%
	Embankment Fill	1,289	331,943		
	Rock Cut	663	178,177		
Station: 21+200.000	Earth Cut	1,198	166,203	20%	80%
	Embankment Fill	4,947	336,890		
	Rock Cut	75	178,253		
Station: 21+400.000	Earth Cut	2,366	168,569	67%	33%
	Embankment Fill	1,219	338,109		
	Rock Cut	93	178,346		
Station: 21+600.000	Earth Cut	1,355	169,924	37%	63%
	Embankment Fill	2,345	340,454		
	Rock Cut	23	178,369		

Appendix 3.3-2. Cut and Fill Material Volumes for the Treaty Creek Access Road

Station	Area Type	Interval Volume (m³)	Cumulative Volume (m³)	Cut Percentage	Fill Percentage
Station: 21+800.000	Earth Cut	787	170,712	40%	60%
	Embankment Fill	1,323	341,777		
	Rock Cut	112	178,481		
Station: 22+000.000	Earth Cut	857	171,569	28%	72%
	Embankment Fill	2,647	344,424		
	Rock Cut	187	178,668		
Station: 22+200.000	Earth Cut	273	171,841	10%	90%
	Embankment Fill	2,391	346,815		
	Rock Cut	0	178,668		
Station: 22+400.000	Earth Cut	319	172,160	9%	91%
	Embankment Fill	3,174	349,989		
	Rock Cut	0	178,668		
Station: 22+600.000	Earth Cut	718	172,878	19%	81%
	Embankment Fill	3,048	353,037		
	Rock Cut	0	178,668		
Station: 22+800.000	Earth Cut	1,644	174,522	39%	61%
	Embankment Fill	3,041	356,078		
	Rock Cut	267	178,934		
Station: 23+000.000	Earth Cut	3,331	177,853	72%	28%
	Embankment Fill	2,081	358,159		
	Rock Cut	2,066	181,000		
Station: 23+200.000	Earth Cut	4,726	182,579	81%	19%
	Embankment Fill	2,118	360,277		
	Rock Cut	4,151	185,152		
Station: 23+400.000	Earth Cut	2,599	185,178	65%	35%
	Embankment Fill	1,557	361,834		
	Rock Cut	272	185,424		
Station: 23+600.000	Earth Cut	3,010	188,189	53%	47%
	Embankment Fill	3,055	364,889		
	Rock Cut	379	185,803		
Station: 23+800.000	Earth Cut	703	188,892	19%	81%
	Embankment Fill	2,954	367,843		
	Rock Cut	0	185,803		
Station: 24+000.000	Earth Cut	819	189,711	81%	19%
	Embankment Fill	1,221	369,063		
	Rock Cut	4,353	190,156		
Station: 24+200.000	Earth Cut	3,844	193,555	72%	28%
	Embankment Fill	2,691	371,755		
	Rock Cut	3,051	193,207		
Station: 24+400.000	Earth Cut	3,458	197,013	74%	26%
	Embankment Fill	1,330	373,085		
	Rock Cut	395	193,602		

Station	Area Type	Interval Volume (m³)	Cumulative Volume (m³)	Cut Percentage	Fill Percentage
Station: 27+000.000	Earth Cut	180	224,181	5%	95%
	Embankment Fill	3,794	417,274		
	Rock Cut	0	225,560		
Station: 27+200.000	Earth Cut	425	224,606	18%	82%
	Embankment Fill	1,963	419,237		
	Rock Cut	0	225,560		
Station: 27+400.000	Earth Cut	66	224,672	1%	99%
	Embankment Fill	5,702	424,939		
	Rock Cut	0	225,560		
Station: 27+600.000	Earth Cut	56	224,728	1%	99%
	Embankment Fill	7,831	432,770		
	Rock Cut	0	225,560		
Station: 27+800.000	Earth Cut	765	225,493	31%	69%
	Embankment Fill	1,724	434,494		
	Rock Cut	0	225,560		
Station: 28+000.000	Earth Cut	1,339	226,832	56%	44%
	Embankment Fill	1,070	435,564		
	Rock Cut	1	225,561		
Station: 28+200.000	Earth Cut	879	227,711	40%	60%
	Embankment Fill	1,325	436,889		
	Rock Cut	0	225,561		
Station: 28+400.000	Earth Cut	235	227,946	7%	93%
	Embankment Fill	2,956	439,846		
	Rock Cut	0	225,561		
Station: 28+600.000	Earth Cut	1,584	229,530	63%	37%
	Embankment Fill	1,419	441,264		
	Rock Cut	850	226,410		
Station: 28+800.000	Earth Cut	339	229,868	7%	93%
	Embankment Fill	4,527	445,791		
	Rock Cut	0	226,410		
Station: 29+000.000	Earth Cut	275	230,143	3%	97%
	Embankment Fill	7,916	453,707		
	Rock Cut	0	226,410		
Station: 29+200.000	Earth Cut	343	230,486	9%	91%
	Embankment Fill	3,731	457,438		
	Rock Cut	10	226,420		
Station: 29+400.000	Earth Cut	253	230,739	48%	52%
	Embankment Fill	5,482	462,921		
	Rock Cut	4,730	231,150		
Station: 29+600.000	Earth Cut	215	230,954	36%	64%
	Embankment Fill	5,389	468,309		
	Rock Cut	2,837	233,987		

Appendix 3.3-2. Cut and Fill Material Volumes for the Treaty Creek Access Road

Station	Area Type	Interval Volume (m³)	Cumulative Volume (m³)	Cut Percentage	Fill Percentage
Station: 24+600.000	Earth Cut	1,853	198,866	68%	32%
	Embankment Fill	872	373,957		
	Rock Cut	17	193,619		
Station: 24+800.000	Earth Cut	5,098	203,965	91%	9%
	Embankment Fill	615	374,572		
	Rock Cut	1,471	195,091		
Station: 25+000.000	Earth Cut	3,521	207,485	63%	37%
	Embankment Fill	2,480	377,052		
	Rock Cut	785	195,876		
Station: 25+200.000	Earth Cut	1,697	209,182	31%	69%
	Embankment Fill	4,113	381,165		
	Rock Cut	150	196,026		
Station: 25+400.000	Earth Cut	1,281	210,464	37%	63%
	Embankment Fill	5,985	387,150		
	Rock Cut	2,264	198,291		
Station: 25+600.000	Earth Cut	2,281	212,744	93%	7%
	Embankment Fill	485	387,635		
	Rock Cut	4,469	202,760		
Station: 25+800.000	Earth Cut	2,737	215,481	95%	5%
	Embankment Fill	515	388,150		
	Rock Cut	6,448	209,208		
Station: 26+056.482	Earth Cut	1,601	217,083	96%	4%
	Embankment Fill	446	388,596		
	Rock Cut	8,147	217,355		
Station: 26+200.000	Earth Cut	333	217,416	98%	2%
	Embankment Fill	137	388,733		
	Rock Cut	5,358	222,713		
Station: 26+400.000	Earth Cut	4,320	221,736	75%	25%
	Embankment Fill	2,351	391,083		
	Rock Cut	2,664	225,377		
Station: 26+600.000	Earth Cut	1,223	222,959	9%	91%
	Embankment Fill	14,236	405,319		
	Rock Cut	148	225,525		
Station: 26+800.000	Earth Cut	1,042	224,001	12%	88%
	Embankment Fill	8,160	413,479		
	Rock Cut	35	225,560		
Station: 29+800.000	Earth Cut	103	231,057	5%	95%
	Embankment Fill	9,187	477,496		
	Rock Cut	372	234,359		
Station: 30+000.000	Earth Cut	843	231,900	27%	73%
	Embankment Fill	5,299	482,796		
	Rock Cut	1,082	235,441		
Station: 30+200.000	Earth Cut	231	232,132	34%	66%
	Embankment Fill	4,156	486,951		
	Rock Cut	1,949	237,390		
Station: 30+400.000	Earth Cut	225	232,356	38%	62%
	Embankment Fill	2,987	489,938		
	Rock Cut	1,606	238,996		
Station: 30+600.000	Earth Cut	205	232,561	74%	26%
	Embankment Fill	882	490,820		
	Rock Cut	2,264	241,260		
Station: 30+800.000	Earth Cut	100	232,661	2%	98%
	Embankment Fill	5,226	496,046		
	Rock Cut	0	241,260		
Station: 31+000.000	Earth Cut	293	232,954	57%	43%
	Embankment Fill	1,261	497,307		
	Rock Cut	1,376	242,636		
Station: 31+200.000	Earth Cut	158	233,112	27%	73%
	Embankment Fill	2,291	499,597		
	Rock Cut	670	243,305		
Station: 31+400.000	Earth Cut	1,392	234,504	84%	16%
	Embankment Fill	444	500,041		
	Rock Cut	871	244,176		
Station: 31+600.000	Earth Cut	1,302	235,806	61%	39%
	Embankment Fill	1,478	501,519		
	Rock Cut	980	245,156		
Station: 31+800.000	Earth Cut	756	236,562	35%	65%
	Embankment Fill	2,146	503,666		
	Rock Cut	415	245,572		
Station: 32+000.000	Earth Cut	321	236,883	40%	60%
	Embankment Fill	1,507	505,173		
	Rock Cut	703	246,274		

Appendix 3.3-3

Cut and Fill Material Volumes for the North Treaty Creek Access Road

Engineers and Scientists

Appendix 3.3-3. Cut and Fill Material Volumes for the North Treaty Creek Access Road

Station	Area Type	Interval Volume (m^3)	Cumulative Volume (m^3)	Cut Percentage	Fill Percentage
Station: 0+200.000	Earth Cut	7,940	7,940	100%	0%
	Embankment Fill	32	32		
	Rock Cut	19,028	19,028		
Station: 0+400.000	Earth Cut	4,488	12,428	88%	12%
	Embankment Fill	1,055	1,088		
	Rock Cut	3,267	22,295		
Station: 0+600.000	Earth Cut	2,041	14,469	82%	18%
	Embankment Fill	1,244	2,332		
	Rock Cut	3,693	25,988		
Station: 0+800.000	Earth Cut	3,340	17,809	92%	8%
	Embankment Fill	607	2,939		
	Rock Cut	3,339	29,327		
Station: 1+000.000	Earth Cut	1,887	19,696	99%	1%
	Embankment Fill	122	3,061		
	Rock Cut	9,610	38,937		
Station: 1+200.000	Earth Cut	682	20,378	98%	2%
	Embankment Fill	372	3,433		
	Rock Cut	14,268	53,206		
Station: 1+400.000	Earth Cut	2,467	22,845	93%	7%
	Embankment Fill	375	3,807		
	Rock Cut	2,353	55,558		
Station: 1+600.000	Earth Cut	2,727	25,572	88%	12%
	Embankment Fill	653	4,461		
	Rock Cut	2,038	57,596		
Station: 1+800.000	Earth Cut	4,153	29,725	87%	13%
	Embankment Fill	959	5,420		
	Rock Cut	2,217	59,813		
Station: 2+000.000	Earth Cut	3,410	33,136	97%	3%
	Embankment Fill	369	5,789		
	Rock Cut	8,512	68,325		
Station: 2+200.000	Earth Cut	1,258	34,394	95%	5%
	Embankment Fill	624	6,413		
	Rock Cut	9,794	78,119		
Station: 2+400.000	Earth Cut	2,440	36,834	78%	22%
	Embankment Fill	1,652	8,065		
	Rock Cut	3,325	81,444		
Station: 2+600.000	Earth Cut	3,483	40,317	99%	1%
	Embankment Fill	169	8,234		
	Rock Cut	10,941	92,385		
Station: 2+800.000	Earth Cut	927	41,244	98%	2%
	Embankment Fill	207	8,441		
	Rock Cut	10,710	103,095		

Station	Area Type	Interval Volume (m^3)	Cumulative Volume (m^3)	Cut Percentage	Fill Percentage
Station: 5+600.000	Earth Cut	1,805	10,217	72%	28%
	Embankment Fill	1,298	10,368		
	Rock Cut	1,575	73,389		
Station: 5+800.000	Earth Cut	2,375	12,593	91%	9%
	Embankment Fill	641	11,009		
	Rock Cut	4,320	77,709		
Station: 6+000.000	Earth Cut	1,708	14,301	78%	22%
	Embankment Fill	729	11,739		
	Rock Cut	887	78,596		
Station: 6+200.000	Earth Cut	1,380	15,681	67%	33%
	Embankment Fill	866	12,605		
	Rock Cut	389	78,985		
Station: 6+400.000	Earth Cut	2,060	17,742	86%	14%
	Embankment Fill	957	13,561		
	Rock Cut	3,587	82,572		
Station: 6+600.000	Earth Cut	626	18,367	17%	83%
	Embankment Fill	3,429	16,991		
	Rock Cut	84	82,656		
Station: 6+800.000	Earth Cut	712	19,079	20%	80%
	Embankment Fill	3,217	20,208		
	Rock Cut	94	82,750		
Station: 7+000.000	Earth Cut	1,672	20,751	84%	16%
	Embankment Fill	430	20,638		
	Rock Cut	585	83,335		
Station: 7+200.000	Earth Cut	1,662	22,413	46%	54%
	Embankment Fill	2,909	23,548		
	Rock Cut	782	84,117		
Station: 7+400.000	Earth Cut	2,556	24,969	83%	17%
	Embankment Fill	1,668	25,215		
	Rock Cut	5,721	89,838		
Station: 7+600.000	Earth Cut	3,264	28,233	99%	1%
	Embankment Fill	69	25,285		
	Rock Cut	6,028	95,866		
Station: 7+800.000	Earth Cut	2,244	30,476	90%	10%
	Embankment Fill	530	25,815		
	Rock Cut	2,421	98,287		
Station: 8+000.000	Earth Cut	2,264	32,740	96%	4%
	Embankment Fill	310	26,126		
	Rock Cut	5,374	103,662		
Station: 8+200.000	Earth Cut	2,645	35,385	94%	6%
	Embankment Fill	428	26,553		
	Rock Cut	3,893	107,555		

Appendix 3.3-3. Cut and Fill Material Volumes for the North Treaty Creek Access Road

Station	Area Type	Interval Volume (m³)	Cumulative Volume (m³)	Cut Percentage	Fill Percentage
Station: 3+000.000	Earth Cut	2,769	44,013	100%	0%
	Embankment Fill	64	8,505		
	Rock Cut	12,288	115,383		
Station: 3+200.000	Earth Cut	1,183	45,196	98%	2%
	Embankment Fill	147	8,651		
	Rock Cut	5,433	120,816		
Station: 3+400.000	Earth Cut	1,445	46,641	90%	10%
	Embankment Fill	1,209	9,860		
	Rock Cut	9,027	129,843		
Station: 3+600.000	Earth Cut	405	47,046	89%	11%
	Embankment Fill	1,394	11,254		
	Rock Cut	10,521	140,364		
Station: 3+800.000	Earth Cut	515	47,561	100%	0%
	Embankment Fill	45	11,299		
	Rock Cut	16,173	156,537		
Station: 4+000.000	Earth Cut	258	258	89%	11%
	Embankment Fill	509	509		
	Rock Cut	4,067	4,067		
Station: 4+200.000	Earth Cut	513	771	92%	8%
	Embankment Fill	813	1,322		
	Rock Cut	8,780	12,846		
Station: 4+400.000	Earth Cut	455	1,227	89%	11%
	Embankment Fill	1,722	3,044		
	Rock Cut	13,031	25,878		
Station: 4+600.000	Earth Cut	653	1,879	98%	2%
	Embankment Fill	305	3,350		
	Rock Cut	13,333	39,210		
Station: 4+800.000	Earth Cut	421	2,300	91%	9%
	Embankment Fill	681	4,031		
	Rock Cut	6,845	46,056		
Station: 5+000.000	Earth Cut	2,270	4,571	90%	10%
	Embankment Fill	1,605	5,636		
	Rock Cut	11,956	58,012		
Station: 5+200.000	Earth Cut	1,895	6,466	75%	25%
	Embankment Fill	2,718	8,354		
	Rock Cut	6,274	64,286		
Station: 5+400.000	Earth Cut	1,947	8,413	93%	7%
	Embankment Fill	716	9,070		
	Rock Cut	7,528	71,814		

Station	Area Type	Interval Volume (m³)	Cumulative Volume (m³)	Cut Percentage	Fill Percentage
Station: 8+400.000	Earth Cut	2,715	38,100	94%	6%
	Embankment Fill	393	26,946		
	Rock Cut	3,211	110,766		
Station: 8+600.000	Earth Cut	2,675	40,775	85%	15%
	Embankment Fill	1,162	28,109		
	Rock Cut	3,721	114,487		
Station: 8+800.000	Earth Cut	2,698	43,472	94%	6%
	Embankment Fill	373	28,482		
	Rock Cut	3,216	117,703		
Station: 9+000.000	Earth Cut	1,832	45,304	26%	74%
	Embankment Fill	13,237	41,719		
	Rock Cut	2,787	120,490		
Station: 9+200.000	Earth Cut	844	46,148	26%	74%
	Embankment Fill	3,912	45,631		
	Rock Cut	535	121,025		
Station: 9+400.000	Earth Cut	1,981	48,129	45%	55%
	Embankment Fill	3,714	49,345		
	Rock Cut	1,001	122,026		
Station: 9+600.000	Earth Cut	852	48,981	69%	31%
	Embankment Fill	1,731	51,076		
	Rock Cut	2,933	124,959		
Station: 9+800.000	Earth Cut	2,131	51,111	28%	72%
	Embankment Fill	11,337	62,414		
	Rock Cut	2,362	127,321		
Station: 9+960.000	Earth Cut	1,460	52,571	72%	28%
	Embankment Fill	1,226	63,640		
	Rock Cut	1,661	128,982		
Station: 10+200.000	Earth Cut	1,205	53,776	42%	58%
	Embankment Fill	2,282	65,922		
	Rock Cut	421	129,403		
Station: 10+400.000	Earth Cut	1,666	55,442	55%	45%
	Embankment Fill	2,332	68,254		
	Rock Cut	1,182	130,584		
Station: 10+600.000	Earth Cut	969	56,411	59%	41%
	Embankment Fill	1,434	69,688		
	Rock Cut	1,117	131,702		
Station: 10+800.000	Earth Cut	1,133	57,544	46%	54%
	Embankment Fill	1,716	71,404		
	Rock Cut	356	132,057		

Appendix 3.3-3. Cut and Fill Material Volumes for the North Treaty Creek Access Road

Station	Area Type	Interval Volume (m^3)	Cumulative Volume (m^3)	Cut Percentage	Fill Percentage
Station: 11+000.000	Earth Cut	1,411	58,955	59%	41%
	Embankment Fill	1,356	72,760		
	Rock Cut	554	132,611		
Station: 11+200.000	Earth Cut	1,046	60,001	47%	53%
	Embankment Fill	1,467	74,227		
	Rock Cut	237	132,848		
Station: 11+400.000	Earth Cut	1,190	61,191	53%	47%
	Embankment Fill	1,229	75,456		
	Rock Cut	180	133,028		

Station	Area Type	Interval Volume (m^3)	Cumulative Volume (m^3)	Cut Percentage	Fill Percentage
Station: 11+600.000	Earth Cut	901	62,091	32%	68%
	Embankment Fill	2,233	77,689		
	Rock Cut	160	133,188		
Station: 11+820.000	Earth Cut	1,605	63,696	81%	19%
	Embankment Fill	436	78,124		
	Rock Cut	300	133,489		

Appendix 4-1

Coulter Creek Access Road ML/ARD Potential Assessment

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ML/ARD Potential Assessment -
Coulter Creek Access Road
ARD Sampling Location
20 m Contour
100 m Contour
Fault
Inferred Fault
Thrust Fault
NTS mapsheet
ARD Potential
High
Possible
Low
None
Not Defined
Cut and Fill Volume
< 200 m³
200 m³ - 5000 m³
5000 m³ - 10000 m³
> 10000 m³
Fill percentage
Cut percentage
Coulter Creek Access Road (19 July, 2011)
1 km Chainage
Geology
Intrusive
uTs/v
muJB(RA)
lmJEr
lmJi
mJHvb
lJHva
lJSTs
TrJg
Qal
1:15,000
0
1
2
Kilometres
Figure 4.1-1
GIS # KSM-13-034
Projection: NAD 1983 UTM Zone 9N
SEABRIDGE GOLD
KSM PROJECT
Rescan
Engineers & Scientists

Appendix 4-2

Treaty Creek Access Road ML/ARD Potential Assessment


ML/ARD Potential - Treaty Creek Access Road
ARD Sampling Points
Treaty Creek Access Road (19 December, 2011)
North Treaty Creek Access Road (19 December, 2011)
200 m Chainage
100 ft Contour
1000 ft Contour
Fault
Inferred Fault
Normal Fault
Thrust Fault
NTS mapsheet
ARD Potential
High
Possible
Low
None
Not Defined
Cut and Fill Volume
< 200 m³
200 m³ - 5000 m³
5000 m³ - 10000 m³
> 10000 m³
Cut percentage
Fill percentage
Geology
muJHs
muJHM
lJHva
muJBRA
Qal
muJHSsf
uTrSsv
1:20,000
0 1 2
Kilometres
Figure 4.2-1
GIS # KSM-13-035
Projection: NAD 1983 UTM Zone 9N
SEABRIDGE GOLD
KSM PROJECT
Rescan
Engineers & Scientists
Process Plant
Tailing Management Facility
North Treaty Creek Access Road
Treaty Creek Access Road