CUMBERLAND
RESOURCES LTD.

MEADOWBANK GOLD PROJECT

ROAD ALIGNMENT QUARRY SITE GEOCHEMISTRY

OCTOBER 2005

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PROJECT LOCATION MAP

SECTION 1 • INTRODUCTION

This memo presents an assessment of acid rock drainage (ARD) and metal leaching (ML) potential of rock from potential quarry sites along the proposed all-weather road that will extend from Baker Lake to the Meadowbank site, which is 115 km to the north. Rock from these quarry sites may be used as sources of aggregate for road construction. The purpose of the geochemical investigation is to assess the potential for environmental effects associated with the aggregate sources proposed for road construction.

SECTION 2 • METHODOLOGY

2.1 SAMPLE COLLECTION

Three composite rock samples weighing 3 to 5 kg each were collected at each potential quarry site situated within 1 km on either side of the proposed access road. Quarry sites and sample locations are shown on Figure 2.1. A total of 53 samples were collected from 18 possible quarry sites. Most quarry site outcrops consisted of one relatively homogeneous rock type. Composite samples were obtained from eight to ten surface grab samples taken at approximately equal intervals along a 20- to 30-m sampling line along the outcrop. The grab sampling method and compositing aimed to capture spatial and compositional variability of the rock type. Each sample was described in terms of rock type, sulphide mineralogy (from visual observations), and weathering characteristics. Samples were labelled, bagged, and submitted to Canadian Environmental and Metallurgical Inc. (CEMI) for chemical analysis. Sample information is presented in Table 2.1.

2.2 ANALYSES

The suite of chemical analyses performed by CEMI includes whole rock and elemental solid phase chemistry, acid-base accounting (ABA), and analysis of metal leaching potential (shake flask extraction). These methods are described in the following sections.

2.2.1 Rock Chemistry

The chemical composition of each of the 53 samples was determined by whole rock analysis (via lithium metaborate fusion and nitric acid digestion), and by multi-acid digestion. All analyses were completed through ICP-MS scans of the digested solutions. Whole rock analysis provides total elemental weight percent compositions as oxides of major rock-forming elements, whereas multi-acid digestion provides elemental concentrations of trace metals.

2.2.2 Acid Base Accounting

Acid-base accounting was performed on each of the 53 samples to evaluate the ARD potential of prospective quarry rock. These tests included determination of the following parameters: paste pH, acid potential (AP) through sulphur species analysis (total sulphur, sulphate sulphur and sulphide sulphur), bulk neutralization potential (NP) by the modified Sobek Method, and carbonate neutralization potential (CaNP) through total inorganic carbon (TIC) analysis. Carbonate NP is used to assess the amount of readily available acid neutralization that can be attributed to reactive carbonate minerals, as opposed to acid neutralization from slowly reacting aluminosilicate minerals.

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7180000 N
7175000 N
7170000 N
7165000 N
7160000 N
7155000 N
7150000 N
7145000 N
7140000 N
7135000 N
7130000 N
620000 E
625000 E
630000 E
635000 E
640000 E
645000 E
650000 E

STATION 11
STATION 11B
STATION 10
STATION 8
STATION 7
STATION 5
STATION 4
STATION 3
STATION 2

LEGEND

ACCESS ROAD

PROPOSED ALTERNATIVE ROAD

STATION 15 STATION ID

0 1000 2000 3000 4000 5000
Scale in Meters

PROJECT
CUMBERLAND RESOURCES LTD.

TITLE
QUARRY SITES AND SAMPLE LOCATIONS - SOUTH

Golder Associates

PROJECT No. 04-1413-086			FILE No. 04-1413-086sk-38	
DESIGN	JK	03OCT05	SCALE AS SHOWN	REV. -
CADD	WLI	03OCT05	FIG 2-1A	
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620000 E
625000 E
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635000 E
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645000 E
650000 E

7220000 N
7215000 N
7210000 N
7205000 N
7200000 N
7195000 N
7190000 N
7185000 N
7180000 N
7175000 N
7170000 N

MEADOWBANK
MINE SITE

STATION 22
STATION 21
STATION 20
STATION 19
STATION 18
STATION 17
STATION 16
STATION 15
STATION 13
STATION 11
STATION 11B

LEGEND

ACCESS ROAD

PROPOSED ALTERNATIVE ROAD

STATION 15 STATION ID

0 1000 2000 3000 4000 5000
Scale in Meters

PROJECT
CUMBERLAND RESOURCES LTD.

TITLE
QUARRY SITES AND SAMPLE LOCATIONS - NORTH

Golder Associates

PROJECT No.	04-1413-086		FILE No.	04-1413-086sk-38	
DESIGN	JK	03OCT05	SCALE	AS SHOWN	REV. -
CADD	WLI	03OCT05			
CHECK	JK	03OCT05			
REVIEW	VB	03OCT05			

FIG 2-1B

Table 2.1: Tehek Lake Access Road Quarry Site Sample Information

Station	Sample ID	Rock Type	UTM Easting	UTM Northing
2	P2-1 P2-2 P2-3	Granite	644423.03	7138286.52
3	P3-1 P3-2 P3-3	Granite	644406.41	7142138.95
4	P4-1 P4-2 P4-3	Granodiorite	642184.30	7147786.18
5	P5-1 P5-2 P5-3	Granite	640144.20	7153108.22
7	P7-1 P7-2 P7-3	Granite	637602.59	7157384.25
8	P8-1 P8-2 P8-3	Quartzite	632127.03	7163486.67
10	P10-1 P10-2 P10-3	Granite/ Gneiss/ Quartzite	629603.46	7168345.97
11	P11-1 P11-2 P11-3	Felsite	627331.65	7173274.47
11B	P11b-1 P11b-2 P11b-3	Andesite	628554.89	7171995.24
13	P13-1 P13-2 P13-3	Metawacke	626109.60	7181610.53
15	P15-1 P15-2 P15-3	Metawacke	626346.94	7187253.35
16	P16-1 P16-2 P16-3	Metawacke	627254.83	7191532.29
17	P17-1 P17-2 P17-3	Mafic wacke/ granite gneiss	626295.35	7196394.00
18	P18-1 P18-2	Mafic volcanic	627478.12	7201768.19
19	P19-1 P19-2 P19-3	Granite	629135.09	7204235.90
20	P20-1 P20-2 P20-3	Granite	629915.19	7206339.46
21	P21-1 P21-2 P21-3	Granite	631131.53	7211751.80
22	P27-1 P27-2 P27-3	Granite	633030.14	7214160.31

2.2.3 Metal Leaching

Shake flask extraction (SFE) testing was performed on a subset of 24 samples to determine the potential of the prospective quarry rock to leach metals to the receiving environment, as per the method outlined in Price (1997). Twenty-four hour SFE tests were conducted on rock samples (crushed to approximately minus 6.35 mm) using a 3:1 liquid-to-solid ratio. Leachates were filtered and analyzed for pH, conductivity, alkalinity, acidity and sulphate, as well as low-level metals by ICP-MS.

2.3 COMPARATIVE GUIDELINES

2.3.1 ARD Potential

Acid-base accounting results were compared to guidelines presented by Indian and Northern Affairs Canada (INAC) (1992) for Northern mine sites (see Table 2.2). The potential of a geologic material to generate ARD is described by comparing the buffering capacity of the rock provided by neutralizing minerals (neutralization potential (bulk NP) in units of equivalent kg of calcium carbonate [$CaCO_3$] per tonne of rock), to the amount of acidity that can be generated by sulphide minerals (AP, same units as NP), present in the rock.

Table 2.2: INAC Guidelines for Waste Rock

	Initial Screening Criteria	ARD Potential
Rock	NPR < 1	Likely Acid Generating (PAG)
	1 < NPR < 2	Uncertain
	2 < NPR	Acid Consuming Not Potentially Acid Generating (non-PAG)

The net neutralization potential (NNP) was also evaluated for each sample (NNP = NP – AP), whereby a negative NNP indicates a potential to generate acidic drainage and a positive NNP represents a propensity to neutralize any acid generated by the aggregate material.

Bulk NP measures the maximum potential buffering capacity, including that which comes from less reactive aluminosilicate minerals such as micas and feldspars. For samples where aluminosilicate are more prevalent than reactive carbonate minerals, the bulk NP measurement can overestimate the effective NP of a sample. For these samples, the carbonate NP (CaNP, obtained from total inorganic carbon content) provides a more appropriate measure of available NP and consequently NPR (or ARD potential).

In addition to determination of ARD potential based on NPR, the relationship between paste pH and sulphide sulphur content was evaluated. Price (1997) suggests that materials having a sulphide sulphur content of less than 0.3 wt% and a paste pH greater than 5.5 may be classified as non-acid-generating except where the rock matrix consists of base poor minerals (e.g., quartz), or where the sulphide minerals contain metals that may leach under weakly acidic to alkaline conditions.

2.3.2 Metal Leaching Potential

Since drainage from quarry rock and road base will contact the receiving environment, metal concentrations in leachate generated by SFE tests are compared to the Canadian Council of Ministers of the Environment's (CCME) Canadian Environmental Quality Guidelines (CEQG; updated 2002) for the protection of freshwater aquatic life. This comparison is an initial screening tool in the identification of potential constituents of concern rather than a representation of future drainage compositions. SFE testing results are used as indicators of which metals have a potential to leach from a particular material. The ratio NPR = NP/AP is the principal indicator of ARD potential (INAC, 1992). The screening criteria are summarized in Table 2.2.

SECTION 3 • RESULTS

3.1 GEOLOGY

Table 3.1 summarizes the lithology, sulphides, and iron staining of samples collected from each of the eighteen sample locations.

Table 3.1: Rock Sample Location & Description

Station ID	Primary Lithology	Visible Sulphides	Iron Staining	Notes on Texture, Fabric, Weathering
2	Granite	None	None	Medium-grained, fresh to slightly weathered
3	Granite	None	traces on fracture surfaces	Medium-grained, fresh to slightly weathered
4	Granite-Granodiorite	None	None to trace	Fine- to medium-grained, fresh locally up to 0.5 cm weathering rind
5	Granite	None	None to trace on some fractures	Fresh, weakly foliated
7	Granite	None	Traces of iron staining, mostly on fractures	Fresh, fine- to medium-grained, weakly foliated
8	Quartzite	None to very minor	Iron staining on some surfaces	Fresh, fine- to medium-grained, weakly foliated
10	Granite/ Gneiss/ Quartzite	None	None to trace	Fresh, medium-grained
11	Felsite	None	None to trace	Fresh to slightly weathered, fine grained
11B	Andesite	-	-	Moderately weathered, fine-grained
13	Metawacke	None	None to trace	Fresh to slightly weathered, fine-grained
15	Metawacke	None	None to trace	Fresh to slightly weathered
16	Metawacke	Trace	Trace	Slightly weathered
17	Mafic wacke/granite gneiss	None	Trace	Slightly weathered
18	Mafic Volcanic	None	Minor to trace	Slightly weathered
19	Granite	None to trace	None to trace	Fresh to slightly weathered
20	Granite	None	Traces on fracture surfaces	Fresh
21	Granite	None	Trace	Fresh
22	Granite	None	Trace	Fresh, weakly foliated

None of the samples exhibited visible sulphides in greater than trace amounts, and iron staining was generally minor.

The presence of iron-bearing sulphides, particularly pyrite, is noteworthy since their oxidation results in acid production. The following equation represents the oxidation of pyrite and generation of acidity:

$$FeS_2\,(s) + (7/2)H_2O + (15/4)O_2\,(g) \rightarrow Fe(OH)_3\,(s) + 2SO_4^{2-}\,(aq) + 4H^+\,(aq)$$

This equation shows that pyrite in contact with water and air will produce rust ($Fe(OH)_3$), sulphate (SO_4^{2-}), and acid (H^+). Under acidic conditions, with a lack of buffering, the mobility of most metals in water is enhanced. Common acid buffering minerals include calcium-rich carbonates, such as calcite and dolomite; and silicates, such as feldspars, chlorite, and micas. The latter minerals have some potential to neutralize acid, although they are less reactive than carbonate minerals (Blowes and Ptacek, 1994).

3.2 ROCK CHEMISTRY

Results of whole rock and elemental analyses are shown in Tables 3.2 and 3.3, respectively.

Silica and aluminum contents are variable between rock types, with silica ranging from 47% to 96%, and aluminum ranging from 2% to 17%. Volcanic rocks described as felsite and andesite have the lowest amount of quartz, and quartzite has the highest. The lowest aluminum concentrations are found in quartzite; the remaining lithologies have similar amounts. In all rock types except quartzite, the high concentrations of silica and aluminum can likely be attributed to the presence of aluminosilicate minerals, such as feldspar, chlorite, and mica. In quartzite, the silica content is associated with quartz, which makes up most of this rock type. Its calcium content is low, reflecting a paucity of carbonate minerals.

Metawacke samples have an average CaO concentration of 0.02%, suggesting a low proportion of calcium carbonate minerals. Felsite and andesite samples tend to have elevated levels of calcium, suggesting the presence of calcium-rich carbonate minerals.

3.3 ARD Potential

Results of ABA analyses are provided in Table 3.4. All samples are non-acid-generating (non-PAG), with NPR values ranging between 0.2 and 446. The carbonate NP is generally very similar to bulk NP (Figure 3.1) suggesting that the NP is provided by reactive carbonate minerals. Forty-two of the 53 samples have NPR values above 2 and are considered non-PAG based on their NPR value (Figure 3.2). The 11 samples of quartzite and granite from stations 8, 10, 21, and 22 have NPR values lower than 2, but are also characterized by very low sulphide sulphur, ranging between 0.03% and 0.08%, and near-neutral paste pH. These samples contain mostly base-poor minerals, but even if applying a more restrictive sulphide content of 0.1% to qualify the ARD potential, these samples are still considered non-PAG (Figure 3.3).

3.4 METAL LEACHING

Results of static leach tests are shown in Table 3.5 and are compared to the CCME freshwater CEQG. All stations had at least one exceedance of one or more of the following: pH, Al, Cu, Cr, and/or Se. Table 3.6 summarizes the exceedances noted.

Table 3.2: Tehek Lake Access Road – Whole Rock Analysis Results

Sample ID	Rock Type	SiO_2 (%)	Al_2O_3 (%)	Fe_2O_3 (%)	CaO (%)	MgO (%)	Na_2O (%)	K_2O (%)	TiO_2 (%)	MnO (%)	P_2O_5 (%)	Ba (ppm)	Sr (ppm)	Zr (ppm)	Y (ppm)	Sc (ppm)	LOI (%)	Total (%)
P2-1	Granite	66.13	13.26	6.87	2.67	1.04	3.18	3.92	0.84	0.08	0.26	1255	696	367	29	13	1.09	99.57
P2-2		61.75	14.51	8.57	3.37	1.33	3.32	3.23	1.03	0.10	0.34	1225	1104	427	36	17	1.92	99.75
P2-3		63.46	14.27	7.52	2.98	1.22	3.24	3.74	0.92	0.10	0.31	1273	1053	371	34	14	1.73	99.75
P3-1		68.11	15.23	3.23	1.92	1.50	4.91	2.38	0.37	0.05	0.12	682	1173	159	12	<5	1.34	99.35
P3-2		71.58	13.75	2.45	1.76	0.79	4.29	2.95	0.29	0.03	0.10	741	1386	127	9	<5	1.09	99.32
P3-3		71.74	13.67	2.54	1.83	0.71	3.99	2.96	0.27	0.04	0.11	816	1390	144	6	<5	1.25	99.34
P4-1	Granodiorite	69.37	14.18	3.52	3.37	1.27	4.26	0.91	0.30	0.04	0.13	472	1743	85	<5	<5	1.71	99.30
P4-2		60.79	15.86	6.88	4.89	3.31	4.00	0.51	0.64	0.08	0.18	228	1887	143	8	12	2.30	99.68
P4-3		63.69	16.61	4.59	4.74	1.71	4.87	0.78	0.47	0.06	0.21	386	2284	292	5	7	1.51	99.52
P5-1	Granite	75.44	11.56	1.28	2.07	0.57	3.76	1.56	0.13	0.02	0.08	657	1125	206	<5	<5	2.38	99.05
P5-2		64.51	16.07	4.20	3.57	2.03	4.25	1.75	0.44	0.06	0.15	491	1447	171	7	7	2.34	99.59
P5-3		64.12	14.19	5.79	4.21	2.65	3.67	1.83	0.73	0.08	0.08	459	1311	72	5	9	2.04	99.58
P7-1		58.60	16.42	6.62	3.48	3.55	5.44	1.18	0.74	0.10	0.17	690	1636	128	10	14	3.12	99.67
P7-2		55.59	15.24	7.29	4.62	5.76	4.72	0.82	0.63	0.13	0.25	329	1658	106	12	19	4.45	99.71
P7-3		58.24	15.48	7.14	3.35	3.82	5.14	1.14	0.75	0.09	0.20	474	1297	181	10	16	4.08	99.62
P8-1	Quartzite	94.29	2.44	0.35	<0.01	0.04	0.03	0.46	0.08	<0.01	<0.01	142	660	44	<5	<5	0.68	98.46
P8-2		93.79	3.65	0.52	0.05	0.09	0.07	0.57	0.10	<0.01	0.02	273	963	55	<5	<5	0.61	99.60
P8-3		92.93	4.08	0.53	0.02	0.05	0.09	0.35	0.09	<0.01	0.06	270	2151	149	<5	<5	0.86	99.32
P10-1	Granite/ Gneiss/ Quartzite	94.19	3.07	0.65	0.05	0.05	0.12	0.26	0.07	<0.01	0.04	76	2596	75	<5	<5	0.69	99.47
P10-2		96.01	1.54	0.43	<0.01	0.03	0.07	0.12	0.02	<0.01	0.06	27	2119	36	<5	<5	0.41	98.89
P10-3		95.86	1.73	0.51	<0.01	0.04	0.08	0.23	0.03	<0.01	0.02	37	1776	43	<5	<5	0.54	99.22
P11-1	Felsite	47.29	13.94	10.06	8.06	8.70	2.54	<0.01	0.64	0.16	0.09	75	1898	50	8	37	8.11	99.81
P11-2		49.28	14.33	10.46	9.37	6.70	2.98	<0.01	0.83	0.17	0.11	118	2250	45	11	42	5.41	99.89
P11-3		47.95	13.93	11.21	7.27	7.21	2.50	0.06	0.89	0.16	0.10	91	2028	51	10	40	8.30	99.83
P11b-1	Andesite	51.81	11.07	13.11	9.29	5.47	2.26	0.09	0.98	0.20	0.09	65	624	32	12	43	5.36	99.81
P11b-2		50.81	13.07	14.56	7.83	6.25	2.17	0.06	1.21	0.21	0.11	68	641	66	20	41	3.51	99.87
P11b-3		49.82	12.70	12.13	8.58	6.20	2.67	<0.01	1.12	0.18	0.13	47	1981	75	11	43	6.14	99.89
P13-1	Metawacke	69.00	14.04	3.97	1.43	1.70	3.73	1.97	0.42	0.05	0.17	536	1734	167	<5	8	2.83	99.56
P13-2		68.28	14.08	4.01	1.50	1.84	3.81	2.08	0.44	0.06	0.13	569	1404	148	5	8	2.94	99.38
P13-3		68.87	13.60	4.02	1.85	1.63	3.64	1.91	0.42	0.05	0.13	535	1609	157	<5	8	3.09	99.43
P15-1		67.90	14.39	3.79	1.96	1.33	4.13	2.17	0.43	0.06	0.17	724	1841	157	<5	9	2.91	99.50
P15-2		67.62	14.40	4.16	1.50	1.89	4.44	1.81	0.44	0.06	0.17	627	1916	184	<5	7	2.60	99.37
P15-3		67.75	13.80	3.98	2.21	1.60	4.16	1.65	0.42	0.06	0.20	580	2701	168	7	10	3.07	99.26
P16-1		69.47	13.98	3.85	1.89	1.68	4.12	1.73	0.40	0.05	0.19	754	2926	184	<5	8	1.29	99.05
P16-2		70.53	13.91	3.56	3.39	1.33	1.75	1.69	0.40	0.08	0.18	1753	3448	203	<5	6	2.10	99.47
P16-3		70.28	14.17	3.64	3.02	1.45	2.32	1.54	0.38	0.06	0.23	1341	4226	182	<5	8	1.86	99.52
P17-1	Mafic wacke/ granite gneiss	68.06	16.06	1.30	1.76	1.11	9.30	<0.01	0.16	0.03	0.09	44	4504	306	<5	5	1.13	99.47
P17-2		62.55	10.07	4.18	7.20	6.42	6.05	<0.01	0.27	0.12	0.13	69	3757	1034	7	<5	2.00	99.46
P17-3		83.82	4.42	1.60	2.14	2.47	2.71	<0.01	0.13	0.04	0.10	209	2656	509	<5	<5	0.67	98.43
P18-1	Mafic Volcanic	67.39	14.13	4.81	2.57	2.39	3.24	2.22	0.42	0.07	0.20	873	3678	146	<5	13	1.56	99.47
P18-2		65.16	14.21	5.41	3.29	2.96	3.36	2.05	0.46	0.09	0.27	724	3539	160	<5	14	1.77	99.46
P19-1	Granite	71.72	13.17	2.58	1.29	0.79	3.92	3.81	0.29	0.05	0.18	905	3009	181	7	5	0.88	99.10
P19-2		75.60	12.43	1.46	0.65	0.30	3.65	4.30	0.14	0.03	0.12	516	3101	140	<5	<5	0.51	99.56
P19-3		75.03	11.90	1.71	0.76	0.39	4.07	4.20	0.19	0.03	0.14	605	2518	116	7	<5	0.59	99.34
P20-1		76.84	11.46	1.60	0.53	0.34	3.29	3.90	0.15	0.03	0.13	471	2769	112	<5	<5	0.81	99.41
P20-2		76.53	11.46	1.63	0.42	0.48	3.10	4.12	0.17	0.03	0.13	610	2888	146	<5	<5	0.99	99.44
P20-3		77.78	11.35	0.99	0.22	0.23	3.00	4.44	0.08	0.02	0.16	304	4523	110	<5	<5	0.56	99.33
P21-1		77.15	11.48	1.48	0.33	0.27	3.39	3.88	0.14	0.02	0.13	371	3844	156	<5	<5	0.67	99.38
P21-2		74.74	12.66	1.40	0.33	0.25	3.65	5.02	0.16	0.02	0.08	520	191	86	7	<5	0.80	99.19
P21-3		75.46	12.15	1.30	0.29	0.38	3.30	5.12	0.15	0.03	0.08	501	183	87	6	<5	0.66	99.00
P27-1		80.26	9.70	0.62	0.12	0.15	3.15	4.10	0.05	<0.01	0.04	57	123	45	<5	<5	0.40	98.61
P27-2		77.80	10.98	0.61	0.19	0.13	3.58	4.56	0.06	<0.01	0.04	89	151	53	<5	<5	0.42	98.42
P27-3		78.39	10.88	0.81	0.14	0.16	3.30	4.50	0.07	<0.01	0.05	96	148	133	5	<5	0.46	98.80

Note: < = less than detection limit. ppm (parts per million) = mg/kg.

Table 3.3: Road Alignment – Trace Element Chemistry

Sample ID	Rock Type	Ag (ppm)	Al (%)	As (ppm)	Ba (ppm)	Be (ppm)	Bi (ppm)	Ca (%)	Cd (ppm)	Co (ppm)	Cr (ppm)	Cu (ppm)	Fe (%)	Hg (ppb)	K (%)	Mg (%)	Mn (ppm)	Mo (ppm)	Na (%)	Ni (ppm)	P (ppm)	Pb (ppm)	Sb (ppm)	Sr (ppm)	Ti (%)	V (ppm)	W (ppm)	Zn (ppm)
P2-1	Granite	<1	7.41	1	1523	<0.5	<5	2.04	<1	20	247	<1	5.42	<5	3.43	0.60	709	3	2.58	10	1128	24	<0.2	312	0.47	59	<10	122
P2-2		<1	7.93	4	1398	<0.5	<5	2.58	<1	26	211	<1	6.58	<5	2.83	0.79	849	<2	2.66	12	1422	25	0.2	360	0.58	75	<10	146
P2-3		<1	6.91	3	1419	<0.5	<5	2.24	<1	22	239	<1	5.84	10	3.04	0.62	778	3	2.54	10	1213	19	<0.2	309	0.51	70	<10	127
P3-1	Granite	<1	8.51	1	807	<0.5	<5	1.47	<1	9	218	<1	2.61	5	2.23	0.93	363	2	3.88	11	514	5	<0.2	351	0.19	39	<10	64
P3-2		<1	8.01	<1	923	<0.5	<5	1.42	<1	7	265	<1	2.02	10	2.72	0.51	311	3	3.30	8	396	14	<0.2	407	0.16	32	<10	55
P3-3		<1	8.16	<1	1043	0.6	<5	1.52	<1	7	295	<1	2.03	<5	2.86	0.47	316	3	3.21	10	409	21	<0.2	430	0.15	33	<10	55
P4-1	Granodiorite	<1	8.26	<1	575	<0.5	<5	2.80	<1	11	306	<1	2.68	<5	0.97	0.80	369	3	3.45	10	443	5	<0.2	606	0.16	57	<10	48
P4-2		<1	8.55	<1	253	<0.5	<5	3.38	<1	25	288	2	5.18	<5	0.51	1.97	654	<2	2.95	41	666	<2	<0.2	725	0.30	107	<10	110
P4-3		<1	9.11	<1	446	<0.5	<5	3.38	<1	14	242	2	3.37	<5	0.80	1.00	484	<2	3.65	12	734	2	<0.2	847	0.22	71	<10	63
P5-1	Granite	<1	7.48	1	909	<0.5	<5	1.84	<1	4	226	14	1.21	<5	1.57	0.39	222	3	3.24	9	220	7	<0.2	311	0.07	20	<10	22
P5-2		<1	8.80	3	577	<0.5	<5	2.80	<1	16	231	30	3.34	<5	1.54	1.19	531	<2	3.31	27	560	<2	<0.2	458	0.23	77	<10	55
P5-3		<1	8.05	3	551	<0.5	<5	3.37	<1	30	238	55	4.67	<5	1.77	1.65	655	<2	2.98	62	300	11	<0.2	398	0.43	98	<10	78
P7-1	Granite	<1	9.05	4	778	<0.5	<5	2.69	<1	30	180	12	5.13	<5	1.05	2.16	811	<2	4.04	48	628	<2	<0.2	483	0.39	139	<10	107
P7-2		<1	8.54	3	377	<0.5	<5	3.61	<1	34	246	<1	5.66	<5	0.81	3.55	1049	<2	3.69	103	948	<2	<0.2	509	0.36	142	<10	132
P7-3		<1	8.48	10	551	<0.5	<5	2.52	<1	31	207	51	5.32	<5	1.02	2.19	778	<2	3.82	51	731	10	<0.2	356	0.25	141	<10	113
P8-1	Quartzite	<1	1.40	3	216	<0.5	<5	0.02	<1	<1	375	<1	0.36	<5	0.52	0.02	17	7	0.07	6	38	12	<0.2	20	<0.01	7	<10	5
P8-2		<1	1.64	4	336	<0.5	<5	<0.01	<1	<1	392	<1	0.34	<5	0.57	0.02	15	7	0.07	7	29	8	<0.2	25	<0.01	8	<10	3
P8-3		<1	1.74	2	359	<0.5	<5	0.01	<1	<1	383	<1	0.46	<5	0.59	0.02	14	7	0.07	6	47	17	0.2	28	<0.01	9	<10	2
P10-1	Granite/ Gneiss/ Quartzite	<1	1.50	12	101	<0.5	<5	0.06	<1	<1	437	<1	0.52	<5	0.50	0.02	17	8	0.10	9	41	8	0.2	35	<0.01	13	<10	<2
P10-2		<1	1.02	4	50	<0.5	<5	0.01	<1	<1	501	<1	0.43	<5	0.38	0.01	17	9	0.05	8	27	8	<0.2	23	<0.01	5	<10	<2
P10-3		<1	1.07	6	56	<0.5	<5	0.01	<1	1	517	<1	0.50	<5	0.41	0.02	18	8	0.07	9	23	5	0.2	22	<0.01	6	<10	<2
P11-1	Felsite	<1	8.38	29	104	<0.5	<5	6.19	<1	51	264	65	7.63	<5	0.27	5.42	1352	<2	2.25	132	196	<2	0.4	297	0.29	241	<10	77
P11-2		<1	8.40	11	142	<0.5	<5	7.23	<1	49	168	104	7.98	<5	0.23	4.21	1424	<2	2.52	61	247	<2	0.4	394	0.43	331	<10	71
P11-3		<1	8.15	11	132	<0.5	<5	5.74	<1	57	197	276	8.67	<5	0.40	4.57	1386	<2	2.34	78	249	<2	0.3	242	0.44	453	<10	92
P11b-1	Andesite	<1	6.60	2	84	<0.5	<5	7.44	<1	64	47	44	10.11	15	0.22	3.54	1695	<2	2.16	38	293	<2	0.4	377	0.58	436	<10	80
P11b-2		<1	7.75	6	101	<0.5	<5	6.16	<1	71	77	81	11.12	<5	0.23	4.02	1783	<2	2.11	52	441	<2	0.6	311	0.69	410	<10	102
P11b-3		<1	7.57	8	57	<0.5	<5	6.83	<1	61	149	62	9.43	<5	0.18	4.02	1540	<2	2.52	66	339	<2	0.5	222	0.63	376	<10	83
P13-1	Metawacke	<1	8.18	6	747	0.7	<5	1.20	<1	11	170	21	3.17	<5	2.10	1.11	467	<2	3.17	28	505	2	<0.2	273	0.08	79	<10	67
P13-2		<1	7.92	23	786	0.7	<5	1.23	<1	14	160	17	3.18	<5	2.15	1.18	488	<2	3.19	29	498	13	<0.2	240	0.08	79	<10	73
P13-3		<1	8.19	11	762	0.8	<5	1.56	<1	14	159	21	3.30	10	2.07	1.10	457	<2	3.13	30	529	21	<0.2	265	0.06	83	<10	75
P15-1	Metawacke	<1	8.48	1	993	<0.5	<5	1.67	<1	18	149	33	3.17	<5	2.38	0.88	574	<2	3.62	31	637	16	<0.2	335	0.23	84	<10	64
P15-2		<1	8.41	<1	845	<0.5	<5	1.32	<1	19	187	36	3.44	<5	2.03	1.22	504	<2	3.84	28	597	12	<0.2	352	0.21	87	<10	74
P15-3		<1	7.86	<1	750	<0.5	<5	1.87	<1	17	214	44	3.18	<5	1.88	1.01	542	<2	3.51	29	585	30	<0.2	384	0.18	86	<10	78
P16-1	Metawacke	<1	8.52	1	1064	<0.5	<5	1.65	<1	17	206	19	3.18	<5	2.13	1.14	498	<2	3.59	30	577	36	<0.2	379	0.24	80	<10	167
P16-2		<1	8.56	1	2436	<0.5	<5	2.92	1	14	208	20	3.05	<5	2.09	0.90	772	<2	1.63	25	550	43	0.3	415	0.24	77	<10	630
P16-3		<1	8.51	<1	1846	<0.5	<5	2.69	<1	16	233	24	3.03	<5	2.08	0.97	600	4	2.14	26	542	42	<0.2	408	0.24	77	<10	237
P17-1	Mafic wacke/ granite gneiss	<1	9.50	<1	68	1.9	<5	1.58	<1	9	206	<1	1.12	<5	0.10	0.74	256	<2	>5.00	15	109	10	<0.2	702	0.10	19	<10	57
P17-2		2	6.01	1	93	7.4	<5	6.07	<1	41	317	<1	3.31	<5	0.08	4.32	1008	<2	>5.00	42	181	22	<0.2	326	0.16	62	<10	257
P17-3		1	2.91	<1	304	2.0	<5	1.94	<1	17	546	2	1.44	<5	0.06	1.75	372	7	2.38	29	115	13	<0.2	139	0.08	24	<10	101
P18-1	Mafic Volcanic	<1	8.92	<1	1219	<0.5	<5	2.31	<1	23	322	36	4.01	<5	2.73	1.65	693	4	3.01	53	546	33	0.3	484	0.27	101	<10	100
P18-2		<1	9.01	1	1023	1.2	<5	3.01	<1	26	343	37	4.58	<5	2.75	2.04	871	3	3.11	68	754	34	<0.2	598	0.30	112	<10	105
P19-1	Granite	<1	7.83	1	1202	1.4	<5	1.14	<1	6	276	<1	2.04	<5	3.86	0.51	448	4	3.29	8	437	20	0.3	339	0.16	30	<10	46
P19-2		<1	8.23	<1	784	3.1	<5	0.69	<1	3	295	<1	1.34	<5	4.82	0.20	272	4	3.44	6	191	42	<0.2	229	0.09	13	<10	27
P19-3		<1	8.18	<1	956	1.4	<5	0.78	<1	4	314	<1	1.58	<5	4.42	0.30	335	11	3.66	6	270	24	<0.2	253	0.12	17	112	34
P20-1	Granite	<1	7.70	<1	716	3.4	<5	0.57	<1	3	385	<1	1.47	<5	4.25	0.25	334	7	3.01	7	229	28	<0.2	201	0.07	15	<10	33
P20-2		<1	7.86	1	956	3.7	<5	0.47	<1	3	333	15	1.53	<5	4.47	0.37	292	4	2.87	8	294	16	<0.2	225	0.07	17	<10	89
P20-3		<1	7.50	<1	481	3.4	<5	0.26	<1	1	325	<1	0.93	<5	4.97	0.15	209	6	2.70	5	119	22	<0.2	115	0.03	8	<10	22
P21-1	Granite	3	7.47	<1	561	2.2	<5	0.37	<1	2	350	1	1.27	<5	4.31	0.19	241	8	3.02	8	197	21	<0.2	123	0.08	12	<10	26
P21-2		<1	7.30	1	607	2.1	<5	0.28	<1	3	284	7	1.14	<5	4.36	0.16	182	6	2.85	6	182	27	<0.2	112	0.08	11	<10	32
P21-3		<1	6.86	<1	570	1.8	<5	0.26	<1	2	272	3	1.02	<5	4.45	0.24	229	5	2.56	8	176	24	<0.2	98	0.06	10	<10	31
P27-1	Granite	<1	5.80	<1	79	2.0	<5	0.12	<1	1	329	11	0.53	<5	3.61	0.10	86	8	2.49	4	19	52	<0.2	21	0.02	5	<10	23
P27-2		<1	7.14	<1	127	3.2	<5	0.18	<1	1	268	8	0.56	<5	4.47	0.09	68	5	3.11	5	30	29	<0.2	34	0.03	5	<10	19
P27-3		<1	6.67	2	129	2.1	<5	0.14	<1	1	343	13	0.68	<5	4.14	0.11	89	6	2.77	5	36	46	0.2	28	0.03	6	<10	21

Note: < = less than detection limit. ppm (parts per million) = mg/kg

Table 3.4: Road Alignment – Acid-Base Accounting Results

Sample ID	Rock Type	Paste pH	S(T) (%)	$S(SO_4)$ (%)	S(S2-) (%)	AP	NP	NET NP	NP/AP	TIC (%)	Carbonate NP	ARD Potential* NPR
P2-1	Granite	8.9	0.04	<0.01	0.04	1.3	7.7	6.5	6.2	0.02	1.7	non-PAG
P2-2		8.9	0.05	<0.01	0.05	1.6	10.9	9.3	7.0	0.08	6.7	non-PAG
P2-3		8.8	0.03	<0.01	0.03	0.9	8.7	7.8	9.3	0.05	4.2	non-PAG
P3-1	Granite	9.5	<0.01	<0.01	<0.01	<0.3	7.3	7.3	48.7	0.04	3.3	non-PAG
P3-2		9.6	0.02	<0.01	0.02	0.6	5.8	5.2	9.3	0.03	2.5	non-PAG
P3-3		9.4	0.03	<0.01	0.03	0.9	5.6	4.7	6.0	0.04	3.3	non-PAG
P4-1	Granodiorite	9.5	0.04	<0.01	0.04	1.3	15.1	13.9	12.1	0.14	11.7	non-PAG
P4-2		9.1	0.09	<0.01	0.09	2.8	11.1	8.3	3.9	0.05	4.2	non-PAG
P4-3		9.4	0.07	<0.01	0.07	2.2	10.4	8.2	4.8	0.07	5.8	non-PAG
P5-1	Granite	9.8	0.03	<0.01	0.03	0.9	29.1	28.2	31.0	0.34	28.3	non-PAG
P5-2		9.7	0.06	<0.01	0.06	1.9	19.6	17.7	10.5	0.19	15.8	non-PAG
P5-3		9.5	0.10	<0.01	0.10	3.1	18.2	15.1	5.8	0.17	14.2	non-PAG
P7-1	Granite	9.6	0.04	<0.01	0.04	1.3	23.8	22.6	19.0	0.21	17.5	non-PAG
P7-2		9.6	0.04	<0.01	0.04	1.3	43.7	42.5	35.0	0.46	38.3	non-PAG
P7-3		9.4	0.23	<0.01	0.23	7.2	43.2	36.0	6.0	0.45	37.5	non-PAG
P8-1	Quartzite	8.3	0.02	<0.01	0.02	0.6	0.6	0.0	1.0	<0.01	<0.8	non-PAG
P8-2		7.2	0.03	<0.01	0.03	0.9	0.5	-0.4	0.5	<0.01	<0.8	non-PAG
P8-3		6.3	0.03	<0.01	0.03	0.9	0.4	-0.5	0.4	<0.01	<0.8	non-PAG
P10-1	Granite/ Gneiss/ Quartzite	8.4	0.03	<0.01	0.03	0.9	1.1	0.2	1.2	0.01	0.8	non-PAG
P10-2		8.0	0.03	<0.01	0.03	0.9	0.5	-0.4	0.5	<0.01	<0.8	non-PAG
P10-3		6.8	0.03	<0.01	0.03	0.9	0.2	-0.7	0.2	<0.01	<0.8	non-PAG
P11-1	Felsite	8.9	0.07	<0.01	0.07	2.2	89.2	87.0	40.8	1.01	84.2	non-PAG
P11-2		8.8	0.10	0.01	0.09	2.8	58.4	55.6	20.8	0.66	55.0	non-PAG
P11-3		9.0	0.16	<0.01	0.16	5.0	98.9	93.9	19.8	1.14	95.0	non-PAG
P11b-1	Andesite	9.0	<0.01	<0.01	<0.01	<0.3	66.9	66.9	446.0	0.75	62.5	non-PAG
P11b-2		9.1	0.17	<0.01	0.17	5.3	17.0	11.7	3.2	0.14	11.7	non-PAG
P11b-3		9.0	0.08	<0.01	0.08	2.5	71.4	68.9	28.6	0.80	66.7	non-PAG
P13-1	Metawacke	9.5	0.16	<0.01	0.16	5.0	24.6	19.6	4.9	0.26	21.7	non-PAG
P13-2		9.4	0.16	<0.01	0.16	5.0	27.4	22.4	5.5	0.31	25.8	non-PAG
P13-3		9.7	0.11	<0.01	0.11	3.4	33.1	29.7	9.6	0.67	55.8	non-PAG

Table 3.4 – Continued

Sample ID	Rock Type	Paste pH	S(T) (%)	$S(SO_4)$ (%)	S(S2-) (%)	AP	NP	NET NP	NP/AP	TIC (%)	Carbonate NP	ARD Potential* NPR
P15-1	Metawacke	9.6	0.04	<0.01	0.04	1.3	36.6	35.4	29.3	0.43	35.8	non-PAG
P15-2		9.3	0.08	<0.01	0.08	2.5	27.6	25.1	11.0	0.32	26.7	non-PAG
P15-3		9.5	0.12	0.03	0.09	2.8	42.4	39.6	15.1	0.50	41.7	non-PAG
P16-1	Metawacke	9.3	0.02	<0.01	0.02	0.6	7.6	7.0	12.2	0.05	4.2	non-PAG
P16-2		8.6	0.07	<0.01	0.07	2.2	6.2	4.0	2.8	0.04	3.3	non-PAG
P16-3		9.0	0.07	<0.01	0.07	2.2	11.1	8.9	5.1	0.08	6.7	non-PAG
P17-1	Mafic wacke/ granite gneiss	10.1	<0.01	<0.01	<0.01	<0.3	16.9	16.9	112.7	0.18	15.0	non-PAG
P17-2		9.7	<0.01	<0.01	<0.01	<0.3	24.1	24.1	160.7	0.24	20.0	non-PAG
P17-3		9.6	<0.01	<0.01	<0.01	<0.3	3.9	3.9	26.0	0.01	0.8	non-PAG
P18-1	Mafic Volcanic	9.3	0.01	<0.01	0.01	0.3	5.7	5.4	18.2	<0.01	<0.8	non-PAG
P18-2		9.1	0.02	<0.01	0.02	0.6	5.6	5.0	9.0	<0.01	<0.8	non-PAG
P19-1	Granite	9.2	<0.01	<0.01	<0.01	<0.3	3.4	3.4	22.7	<0.01	<0.8	non-PAG
P19-2		9.4	<0.01	<0.01	<0.01	<0.3	2.9	2.9	19.3	<0.01	<0.8	non-PAG
P19-3		9.3	<0.01	<0.01	<0.01	<0.3	3.0	3.0	20.0	<0.01	<0.8	non-PAG
P20-1	Granite	7.9	<0.01	<0.01	<0.01	<0.3	2.4	2.4	16.0	<0.01	<0.8	non-PAG
P20-2		7.8	<0.01	<0.01	<0.01	<0.3	2.0	2.0	13.3	<0.01	<0.8	non-PAG
P20-3		8.3	<0.01	<0.01	<0.01	<0.3	1.4	1.4	9.3	<0.01	<0.8	non-PAG
P21-1	Granite	7.9	<0.01	<0.01	<0.01	<0.3	1.5	1.5	10.0	<0.01	<0.8	non-PAG
P21-2		7.7	0.04	<0.01	0.04	1.3	1.7	0.5	1.4	<0.01	<0.8	non-PAG
P21-3		8.3	0.05	<0.01	0.05	1.6	1.9	0.3	1.2	<0.01	<0.8	non-PAG
P27-1	Granite	8.2	0.03	<0.01	0.03	0.9	1.0	0.1	1.1	<0.01	<0.8	non-PAG
P27-2		8.8	0.06	<0.01	0.06	1.9	2.4	0.5	1.3	<0.01	<0.8	non-PAG
P27-3		7.7	0.08	<0.01	0.08	2.5	1.2	-1.3	0.5	<0.01	<0.8	non-PAG
	Method Detection Limit											
CEMI		0.01	0.01	0.01	-	0.3	-	-	-	0.01	0.8*	-

Note: AP = Acid potential in tonnes $CaCO_3$ equivalent per 1000 tonnes of material. AP is determined from calculated sulphide sulphur content: S(T) - S(S04), assuming total conversion of sulphide to sulphate. NP = Neutralization potential in tonnes $CaCO_3$ equivalent per 1000 tonnes of material. NET NP = Net neutralization potential = Tonnes $CaCO_3$ equivalent per 1000 tonnes of material. TIC = Total Inorganic Carbon as %C. PAG = Potentially acid generating; non-PAG non acid generating. Where $S(SO_4)$ is reported as <0.01%, it is assumed to be zero for the AP calculation (i.e., if $S(SO_4)$ is less than 0.01%,AP is calculated from S(T) only). Carbonate NP calculated from total inorganic carbon (TIC) assay. TIC value of 0.01 is used in calculation if TIC <0.01%. Non-detect values assumed to be equal to one half the detection limit in calculations of average, median and standard deviation, where applicable. * Classification of ARD potential based on guidelines provided by INAC (1992) and Price (1997). Samples having <0.1% total sulphur are considered non-PAG

Figure 3.1: Neutralization Potential Bulk NP vs. Carbonate Neutralization Potential

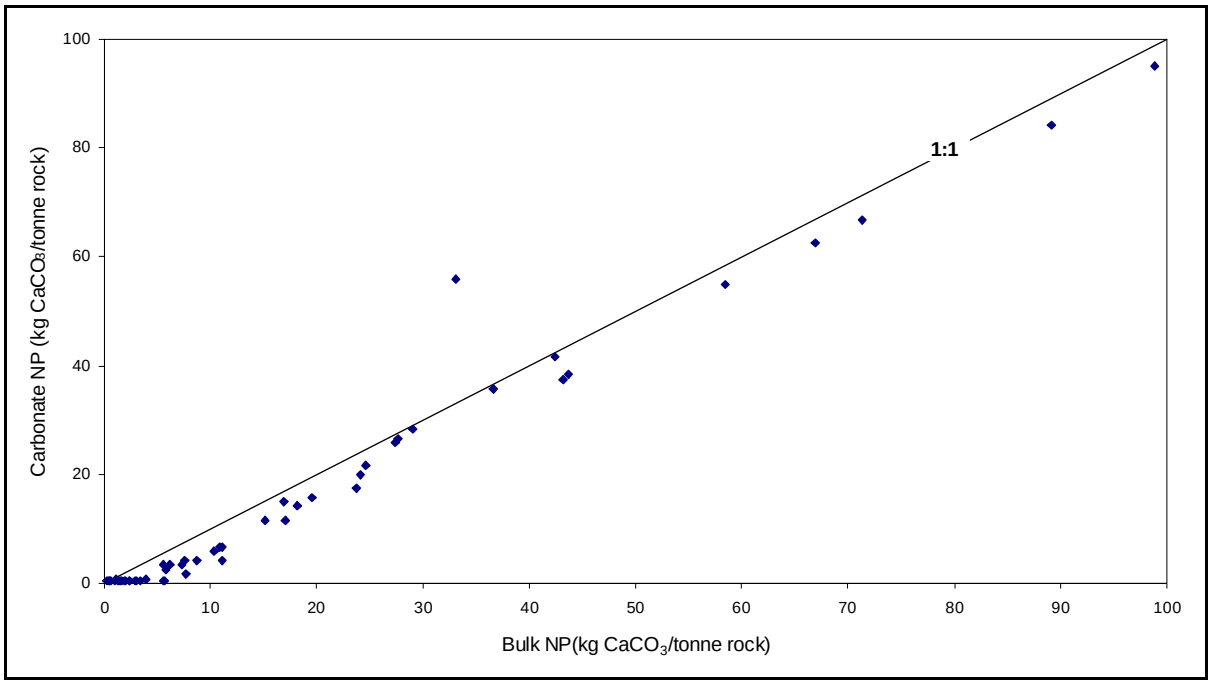

Figure 3.2: Neutralization Potential (NP) vs. Acid Potential (AP)

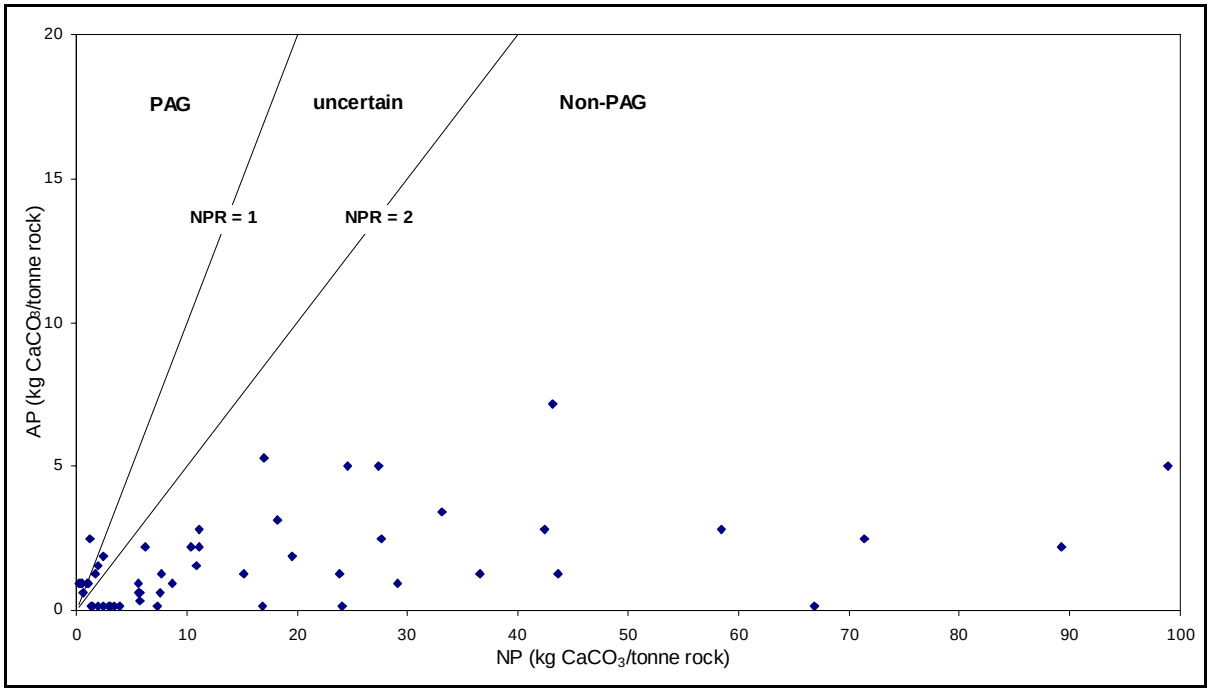

Figure 3.3: Total Sulphur (%) vs. Neutralization Potential Ratio (NPR=NP/AP)

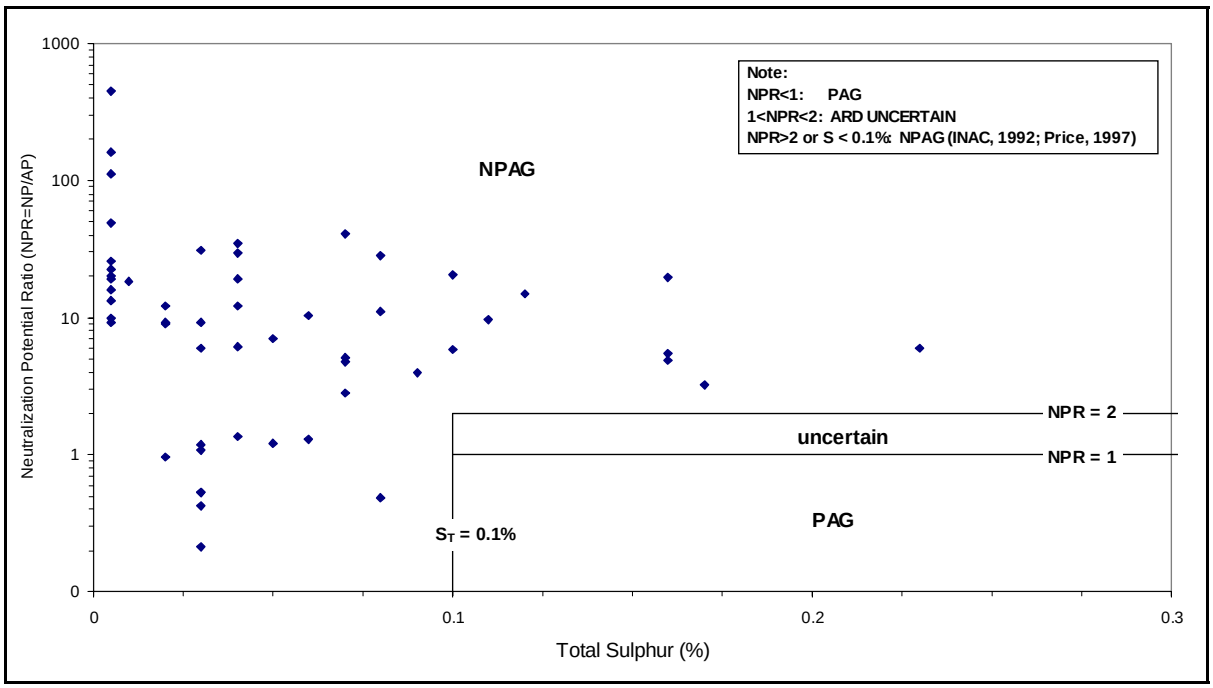

Table 3.5: Road Alignment – Shake Flask Extraction Results

Sample ID	Rock Type	pH (s.u.)	Conductivity (uS/cm)	Acidity - pH 4.5 (mg/L as CaCO3)	Acidity - pH 8.3 (mg/L as CaCO3)	Alkalinity (mg/L as CaCO3)	Sulphate (mg/L)	Calculated Hardness (mg/L as CaCO3)	Ag* (mg/L)	Al[1] (mg/L)	As (mg/L)	B (mg/L)
CCME (CEQG) (freshwater aquatic life)** (mg/L)		6.5 - 9.0							0.00010	0.005 - 0.1	0.005	
Metal Mine Effluent Regulation (MMER)[8]** (mg/L)		6.0-9.5									0.5	
P2-2	Granite	7.8	95	<1.0	5.8	46.0	3	40.6	< 0.00025	**0.140**	0.001	< 0.05
P3-2		7.7	57	<1.0	2.5	33.0	<1	25.7	< 0.00025	**0.120**	< 0.001	< 0.05
P4-2	Granodiorite	7.7	68	<1.0	3.3	33.5	4	34.7	< 0.00025	0.099	< 0.001	< 0.05
P5-2	Granite	7.8	82	<1.0	3.0	48.0	<1	39.6	< 0.00025	**0.190**	0.001	< 0.05
P7-2		7.9	88	<1.0	0.8	48.5	<1	44.3	< 0.00025	**0.170**	0.001	< 0.05
P8-2	Quartzite	**6.0**	3	<1.0	4.5	2.5	<1	0.2	< 0.00025	0.005	0.001	< 0.05
P8-3		**5.5**	6	<1.0	2.0	3.5	<1	0.3	< 0.00025	**0.007**	< 0.001	< 0.05
P10-2	Granite/ Gneiss/ Quartzite	**5.7**	4	<1.0	2.0	2.5	<1	0.2	< 0.00025	**0.031**	0.003	< 0.05
P10-3		**4.4**	15	2.8	1.8	<1.0	<1	1.1	< 0.00025	**0.048**	< 0.001	< 0.05
P11-2	Felsite	7.9	126	<1.0	2.0	51.5	16	60.0	< 0.00025	**0.150**	**0.008**	< 0.05
P11-3		8.0	106	<1.0	2.5	63.0	<1	55.2	< 0.00025	**0.240**	0.002	< 0.05
P11b-2	Andesite	7.9	97	<1.0	1.8	52.0	<1	50.8	< 0.00025	**0.160**	0.002	< 0.05
P11b-3		8.0	105	<1.0	2.5	57.8	<1	53.8	< 0.00025	**0.160**	**0.006**	< 0.05
P13-2	Metawacke	7.9	91	<1.0	3.3	38.8	<1	45.0	< 0.00025	**0.160**	0.003	< 0.05
P15-2		7.8	137	<1.0	1.8	51.3	23	58.0	< 0.00025	**0.160**	< 0.001	< 0.05
P15-3		7.7	110	<1.0	2.8	57.8	3	50.4	< 0.00025	**0.180**	< 0.001	< 0.05
P16-2		7.4	138	<1.0	2.8	31.5	38	57.4	< 0.00025	0.078	< 0.001	< 0.05
P17-2	Mafic wacke/ Granite gneiss	7.9	109	<1.0	3.3	59.0	3	53.8	< 0.00025	0.023	0.001	< 0.05
P17-3		7.3	56	<1.0	3.0	32.0	3	30.1	< 0.00025	0.021	< 0.001	< 0.05
P18-2	Mafic Volcanic	7.4	31	<1.0	2.5	12.3	1	8.1	< 0.00025	0.068	< 0.001	< 0.05
P19-2	Granite	6.7	8	<1.0	1.5	4.5	<1	1.1	< 0.00025	0.026	< 0.001	< 0.05
P20-2		**5.8**	4	<1.0	2.0	3.5	<1	0.2	< 0.00025	**0.048**	< 0.001	< 0.05
P21-2		**5.9**	12	<1.0	2.3	3.0	<1	0.2	< 0.00025	**0.071**	< 0.001	< 0.05
P27-2		**5.4**	21	<1.0	3.8	2.5	<1	1.0	< 0.00025	**0.270**	< 0.001	< 0.05

Dissolved Metals (mg/L)

Sample ID	Ba (mg/L)	Be (mg/L)	Bi (mg/L)	Ca (mg/L)	Cd[3,*] (mg/L)	Co (mg/L)	Cr[2] (mg/L)	Cu[3] (mg/L)	Fe (mg/L)	Hg* (mg/L)	K (mg/L)	Li (mg/L)	Mg (mg/L)	Mn (mg/L)
CCME (CEQG) (freshwater aquatic life)** (mg/L)					0.000017		0.001 / 0.0089	0.002 - 0.004	0.3	0.00010				
Metal Mine Effluent Regulation (MMER)[8]** (mg/L)								0.3						
P2-2	0.005	< 0.001	< 0.001	15.4	< 0.0002	< 0.001	< 0.001	**0.007**	< 0.05	< 0.02	4.4	0.003	0.50	0.009
P3-2	0.003	< 0.001	< 0.001	9.69	< 0.0002	< 0.001	< 0.001	0.002	< 0.05	< 0.02	2.1	< 0.001	0.37	0.018
P4-2	0.006	< 0.001	< 0.001	12.6	< 0.0002	< 0.001	< 0.001	**0.013**	< 0.05	< 0.02	1.5	< 0.001	0.79	0.012
P5-2	0.003	< 0.001	< 0.001	15.3	< 0.0002	< 0.001	< 0.001	**0.010**	< 0.05	< 0.02	1.9	< 0.001	0.34	0.022
P7-2	0.004	< 0.001	< 0.001	16.7	< 0.0002	< 0.001	< 0.001	**0.005**	< 0.05	< 0.02	1.0	< 0.001	0.63	0.010
P8-2	< 0.001	< 0.001	< 0.001	< 0.05	< 0.0002	< 0.001	< 0.001	**0.003**	< 0.05	< 0.02	0.9	< 0.001	< 0.05	< 0.001
P8-3	0.026	< 0.001	< 0.001	0.09	< 0.0002	< 0.001	< 0.001	**0.009**	< 0.05	< 0.02	1.4	0.001	< 0.05	0.002
P10-2	< 0.001	< 0.001	< 0.001	< 0.05	< 0.0002	< 0.001	< 0.001	**0.013**	< 0.05	< 0.02	1.1	< 0.001	< 0.05	< 0.001
P10-3	0.025	< 0.001	< 0.001	0.29	< 0.0002	0.001	< 0.001	**0.010**	0.24	< 0.02	1.3	< 0.001	0.09	0.011
P11-2	0.020	< 0.001	< 0.001	20.9	< 0.0002	< 0.001	< 0.001	**0.012**	< 0.05	< 0.02	1.3	0.001	1.90	0.007
P11-3	0.033	< 0.001	< 0.001	19.2	< 0.0002	< 0.001	< 0.001	**0.009**	< 0.05	< 0.02	1.0	0.002	1.75	0.007
P11b-2	0.083	< 0.001	< 0.001	18.0	< 0.0002	< 0.001	< 0.001	**0.004**	< 0.05	< 0.02	1.0	< 0.001	1.42	0.007
P11b-3	0.016	< 0.001	< 0.001	19.5	< 0.0002	< 0.001	< 0.001	**0.013**	< 0.05	< 0.02	0.7	< 0.001	1.24	0.007
P13-2	0.010	< 0.001	< 0.001	15.9	< 0.0002	< 0.001	< 0.001	**0.006**	< 0.05	< 0.02	2.3	< 0.001	1.27	0.024
P15-2	0.007	< 0.001	< 0.001	21.1	< 0.0002	< 0.001	< 0.001	**0.025**	< 0.05	< 0.02	5.1	0.001	1.29	0.039
P15-3	0.005	< 0.001	< 0.001	18.4	< 0.0002	< 0.001	< 0.001	**0.018**	< 0.05	< 0.02	3.9	0.001	1.08	0.035
P16-2	0.025	< 0.001	< 0.001	20.4	< 0.0002	< 0.001	< 0.001	**0.016**	< 0.05	< 0.02	4.1	0.002	1.55	0.037
P17-2	0.120	< 0.001	< 0.001	14.1	< 0.0002	< 0.001	**0.002**	**0.010**	< 0.05	< 0.02	0.5	0.001	4.52	0.008
P17-3	0.180	< 0.001	< 0.001	8.62	< 0.0002	< 0.001	**0.003**	**0.012**	< 0.05	< 0.02	0.5	< 0.001	2.08	0.009
P18-2	0.003	< 0.001	< 0.001	1.61	< 0.0002	< 0.001	< 0.001	**0.005**	< 0.05	< 0.02	3.3	0.002	1.00	0.011
P19-2	0.001	< 0.001	< 0.001	0.32	< 0.0002	< 0.001	< 0.001	0.001	< 0.05	< 0.02	0.7	< 0.001	0.08	0.005
P20-2	< 0.001	< 0.001	< 0.001	< 0.05	< 0.0002	< 0.001	< 0.001	**0.004**	< 0.05	< 0.02	0.4	< 0.001	< 0.05	0.002
P21-2	< 0.001	< 0.001	< 0.001	< 0.05	< 0.0002	< 0.001	< 0.001	**0.003**	< 0.05	< 0.02	0.6	< 0.001	< 0.05	< 0.001
P27-2	0.003	< 0.001	< 0.001	0.25	< 0.0002	< 0.001	< 0.001	**0.003**	< 0.05	< 0.02	1.2	< 0.001	0.08	0.009

Dissolved Metals (mg/L)

Sample ID	Mo (mg/L)	Na (mg/L)	Ni[3] (mg/L)	PO4 (mg/L)	Pb[3] (mg/L)	Sb (mg/L)	Se (mg/L)	Si (mg/L)	Sn (mg/L)	Sr (mg/L)	Te (mg/L)	Th (mg/L)	Ti (mg/L)	Tl (mg/L)	U (mg/L)	V (mg/L)	Zn (mg/L)	Zr (mg/L)
CCME (CEQG) (freshwater aquatic life)** (mg/L)	0.073		0.025 - 0.15		0.001 - 0.007		0.001							0.0008			0.03	
Metal Mine Effluent Regulation (MMER)[8]** (mg/L)			0.5		0.2												0.5	
P2-2	0.0034	1.37	< 0.001	< 0.15	< 0.001	< 0.001	0.001	2.1	< 0.001	0.032	< 0.001	< 0.0005	< 0.001	< 0.0001	0.001	< 0.001	< 0.005	< 0.01
P3-2	< 0.0005	1.36	< 0.001	< 0.15	< 0.001	< 0.001	**0.002**	2.3	< 0.001	0.018	< 0.001	< 0.0005	< 0.001	< 0.0001	< 0.0005	< 0.001	< 0.005	< 0.01
P4-2	< 0.0005	1.34	< 0.001	< 0.15	< 0.001	< 0.001	**0.002**	2.3	< 0.001	0.023	< 0.001	< 0.0005	< 0.001	< 0.0001	< 0.0005	< 0.001	< 0.005	< 0.01
P5-2	< 0.0005	0.91	< 0.001	< 0.15	< 0.001	< 0.001	**0.002**	1.9	< 0.001	0.026	< 0.001	< 0.0005	< 0.001	< 0.0001	< 0.0005	< 0.001	< 0.005	< 0.01
P7-2	< 0.0005	0.54	< 0.001	< 0.15	< 0.001	< 0.001	**0.002**	1.4	< 0.001	0.054	< 0.001	< 0.0005	< 0.001	< 0.0001	< 0.0005	< 0.001	< 0.005	< 0.01
P8-2	< 0.0005	0.17	< 0.001	< 0.15	< 0.001	< 0.001	**0.002**	1.4	< 0.001	< 0.001	< 0.001	< 0.0005	< 0.001	< 0.0001	< 0.0005	< 0.001	0.020	< 0.01
P8-3	< 0.0005	0.10	< 0.001	< 0.15	< 0.001	< 0.001	**0.002**	1.2	< 0.001	0.003	< 0.001	< 0.0005	< 0.001	< 0.0001	< 0.0005	< 0.001	< 0.005	< 0.01
P10-2	< 0.0005	0.20	< 0.001	< 0.15	< 0.001	< 0.001	**0.002**	1.1	< 0.001	< 0.001	< 0.001	< 0.0005	< 0.001	< 0.0001	< 0.0005	< 0.001	< 0.005	< 0.01
P10-3	< 0.0005	0.14	0.002	< 0.15	< 0.001	< 0.001	**0.002**	0.8	< 0.001	0.004	< 0.001	< 0.0005	< 0.001	< 0.0001	< 0.0005	< 0.001	0.012	< 0.01
P11-2	< 0.0005	0.99	< 0.001	< 0.15	< 0.001	0.002	**0.002**	2.2	< 0.001	0.040	< 0.001	< 0.0005	< 0.001	< 0.0001	< 0.0005	0.002	< 0.005	< 0.01
P11-3	< 0.0005	0.94	< 0.001	< 0.15	< 0.001	< 0.001	**0.002**	1.7	< 0.001	0.054	< 0.001	< 0.0005	< 0.001	< 0.0001	< 0.0005	0.002	< 0.005	< 0.01
P11b-2	< 0.0005	0.92	< 0.001	< 0.15	< 0.001	0.002	**0.002**	2.4	< 0.001	0.035	< 0.001	< 0.0005	< 0.001	< 0.0001	< 0.0005	0.002	< 0.005	< 0.01
P11b-3	0.0088	0.84	< 0.001	< 0.15	< 0.001	0.001	**0.002**	2.1	< 0.001	0.025	< 0.001	< 0.0005	< 0.001	< 0.0001	< 0.0005	0.002	< 0.005	< 0.01
P13-2	0.0028	0.75	< 0.001	< 0.15	< 0.001	< 0.001	**0.002**	2.3	< 0.001	0.110	< 0.001	< 0.0005	< 0.001	< 0.0001	< 0.0005	< 0.001	< 0.005	< 0.01
P15-2	0.0030	2.11	< 0.001	< 0.15	< 0.001	< 0.001	**0.002**	2.8	< 0.001	0.140	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0015	< 0.001	< 0.005	< 0.01
P15-3	0.0019	1.54	< 0.001	< 0.15	< 0.001	< 0.001	**0.002**	2.5	< 0.001	0.120	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0016	< 0.001	< 0.005	< 0.01
P16-2	0.0011	1.23	0.001	< 0.15	< 0.001	< 0.001	**0.002**	3.0	< 0.001	0.044	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0009	< 0.001	< 0.005	< 0.01
P17-2	< 0.0005	2.59	< 0.001	< 0.15	< 0.001	< 0.001	**0.002**	12.4	< 0.001	0.100	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0092	0.002	< 0.005	< 0.01
P17-3	< 0.0005	1.68	< 0.001	< 0.15	< 0.001	< 0.001	**0.002**	7.9	< 0.001	0.100	< 0.001	< 0.0005	0.001	< 0.0001	0.0009	0.001	< 0.005	< 0.01
P18-2	0.0087	2.15	< 0.001	< 0.15	< 0.001	< 0.001	**0.002**	2.9	< 0.001	0.012	< 0.001	< 0.0005	0.001	< 0.0001	< 0.0005	< 0.001	< 0.005	< 0.01
P19-2	< 0.0005	0.92	< 0.001	< 0.15	< 0.001	0.003	**0.002**	1.3	< 0.001	0.002	< 0.001	< 0.0005	< 0.001	< 0.0001	< 0.0005	< 0.001	< 0.005	< 0.01
P20-2	< 0.0005	0.46	< 0.001	< 0.15	< 0.001	< 0.001	**0.002**	1.0	< 0.001	< 0.001	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0008	< 0.001	< 0.005	< 0.01
P21-2	< 0.0005	1.08	< 0.001	< 0.15	< 0.001	< 0.001	**0.002**	2.9	< 0.001	< 0.001	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0015	< 0.001	< 0.005	< 0.01
P27-2	< 0.0005	1.00	< 0.001	< 0.15	< 0.001	< 0.001	**0.002**	1.4	< 0.001	< 0.001	< 0.001	< 0.0005	< 0.001	< 0.0001	< 0.0005	< 0.001	< 0.005	< 0.01

Method Detection Limit	pH (s.u.)	Conductivity (uS/cm)	Acidity - pH 4.5 (mg/L as CaCO3)	Acidity - pH 8.3 (mg/L as CaCO3)	Alkalinity (mg/L as CaCO3)	Sulphate (mg/L)	Hardness (mg/L as CaCO3)	Ag (mg/L)	Al[1] (mg/L)	As (mg/L)	B (mg/L)	Ba (mg/L)	Be (mg/L)	Bi (mg/L)	Ca (mg/L)	Cd[3] (mg/L)	Co (mg/L)	Cr[2] (mg/L)	Cu[3] (mg/L)	Fe (mg/L)
CEMI	0.01	2	1.0	1.0	1.0	1.0	-	0.00025	0.001	0.001	0.05	0.001	0.001	0.001	0.05	0.0002	0.001	0.001	0.001	0.05

Method Detection Limit	Hg (mg/L)	K (mg/L)	Li (mg/L)	Mg (mg/L)	Mn (mg/L)	Mo (mg/L)	Na (mg/L)	Ni[3] (mg/L)	PO4 (mg/L)	Pb[3] (mg/L)	Sb (mg/L)	Se (mg/L)	Si (mg/L)	Sn (mg/L)	Sr (mg/L)	Te (mg/L)	Th (mg/L)	Ti (mg/L)	Tl (mg/L)	U (mg/L)	V (mg/L)	Zn (mg/L)	Zr (mg/L)
CEMI	0.02	1.0	0.001	0.05	0.001	0.0005	1.00	0.001	0.15	0.001	0.001	0.001	0.05	0.001	0.001	0.001	0.0005	0.001	0.0001	0.0005	0.001	0.005	0.01

Notes: 1. Freshwater Aquatic Life Guideline is pH, calcium, and DOC dependent. Exceedances identified apply pH criterion. **2.** Freshwater Aquatic Life Guideline for chromium depends on valence of chromium ion (Cr(III) = 0.0089 mg/L, Cr(VI) = 0.001 mg/L). **3.** Freshwater Aquatic Life Guideline is hardness dependent. **4.** Freshwater Aquatic Life Guideline listed for inorganic fluorides. **5.** CEQG stipulates that concentrations that stimulate weed growth should be avoided. **6.** Maximum authorized monthly mean concentration (based on total concentration). CEQG Freshwater Guidelines and Criteria are based on total metal concentrations, except for aluminum (dissolved aluminum criteria). < = less than the analytical detection limit.
* Laboratory detection limit exceeds the CEQG. Non-detect values assumed to be equal to one half the detection limit in calculations of average, median and standard deviation, where applicable.

Table 3.6: Summary of Exceedances

Station	Sample ID	Rock Type	CCME Exceedances	ARD Potential (INAC, 1992)
2	P2-2	Granite	Al, Cu	non-PAG
3	P3-2	Granite	Al, Cu, Se	non-PAG
4	P4-2	Granodiorite	Cu, Se	non-PAG
5	P5-2	Granite	Al, Cu, Se	non-PAG
7	P7-2	Granite	Al, Cu, Se	non-PAG
8	P8-2	Quartzite	pH, Cu, Se	non-PAG
	P8-3		pH, Al, Cu, Se	non-PAG
10	P10-2	Granite/ Gneiss/ Quartzite	pH, Al, Cu, Se	non-PAG
	P10-3		pH, Al, Cu, Se	non-PAG
11	P11-2	Felsite	Al, As, Cu, Se	non-PAG
	P11-3		Al, Cu, Se	non-PAG
11B	P11b-2	Andesite	Al, Cu, Se	non-PAG
	P11b-3		Al, As, Cu, Se	non-PAG
13	P13-2	Metawacke	Al, Cu, Se	non-PAG
15	P15-2	Metawacke	Al, Cu, Se	non-PAG
	P15-3		Al, Cu, Se	non-PAG
16	P16-2	Metawacke	Cu, Se	non-PAG
17	P17-2	Mafic wacke/ Granite gneiss	Cr, Cu, Se	non-PAG
	P17-3		Cr, Cu, Se	non-PAG
18	P18-2	Mafic Volcanic	Cu, Se	non-PAG
19	P19-2	Granite	Se	non-PAG
20	P20-2	Granite	pH, Al, Cu, Se	non-PAG
21	P21-2	Granite	pH, Al, Cu, Se	non-PAG
22	P27-2	Granite	pH, Al, Cu, Se	non-PAG

SECTION 4 • SUMMARY & RECOMMENDATIONS

The objective of this assessment was to evaluate the ARD and ML potential of the rock to be used as aggregate during the construction of the Tehek Lake access road for the Meadowbank Gold project, Nunavut. A total of 53 samples were collected from <1 km on either side of the proposed access road route, including samples of both intrusive and extrusive igneous rocks, and metasedimentary rocks. Samples from stations 8, 16, and 19 contained trace amounts of visible sulphides, while the remaining samples did not.

Results of whole rock and elemental analyses confirm an abundance of aluminosilicate minerals within the majority of the rock types. Aluminosilicates, such as feldspar and mica, which are typically present in the rock types being studied, provide some amount of acid-neutralization potential, although they are less reactive (slower reaction kinetics and lower buffering pH) than carbonate minerals such as calcite or dolomite.

ABA results indicate that all samples are non-acid-generating, based on their neutralization potential ratio (NPR above two as per INAC (1992) guidelines), or based on their very low sulphide sulphur content.

Rock leachate pH values range from acidic to alkaline. Six of 24 samples are outside of the freshwater CEQG range for pH. The following metals exceed the freshwater CEQG for at least two samples: aluminum, arsenic, chromium, copper, and selenium. These exceedances do not necessarily imply non-compliance of actual on-site drainage water quality. Concentrations of these constituents are expected to decrease with time, as soluble salts are flushed from the excavated rock.

Although quarry sites 8, 10, 21, and 22 have a sulphide content that is expected to be too low to generate ARD, consideration should be given to avoiding these quarry sites as a precautionary measure. The quality of runoff contacting the open quarry sites and the excavated rock should be monitored during construction to document the effect of exposure of the quarry rock on receiving water quality.

SECTION 5 • REFERENCES

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SECTION 6 • LIST OF ABBREVIATIONS

AEMP	Aquatic Effects management program
Anadromous fish	Fish that spend at least part of their adult lives feeding in marine water and making annual or semi-annual migrations into freshwater lakes to over winter and reproduce.
Aquatic	Pertaining to plants or animals that live in freshwater or marine environments
Arctic	The Arctic is a geographic region that is circumpolar in extent and generally characterized as being north of the treeline, in an area of continuous permafrost.
Baseline studies	Initial scientific investigations that determine the present condition of an area to establish a basic reference for future studies. These studies have been conducted to document pre-project conditions.
Benthic	Pertaining to the bottom region of a water body, such as a lake.
Benthic invertebrates / Benthos	Assemblage of organisms living in or on the bottom sediment of a water body and dependent upon the decomposition cycle for most, if not all, of their food supply.
Biomass	The total mass of living organisms usually expressed as a weight per unit area or volume (e.g., mg/m3 of water).
Bivalves	Molluscs with shells consisting of two halves (i.e., valves) such as clams.
CCME	Canadian Council for Ministers of the Environment
Chironomids	Midges (two-winged insects) in the order Diptera. The aquatic larval form of this insect is typically the most abundant and diverse group of insects found in lakes.
Core monitoring	Consists of general monitoring for water and sediment quality, periphyton, benthic invertebrates, and fish—tailored based on our understanding of mine construction, operation, and infrastructure (e.g., dikes, effluents, stream crossings, roads, etc.). Core monitoring will be implemented prior to and during construction and operation of the mine and will be conducted each year, until closure. Core monitoring is integrated with and complemented by targeted monitoring.

Density of organisms	A term that describes abundance. The total number of living organisms expressed per unit area (e.g., no./m2) or volume (#/m3).
Dipteran insects	Insects of the Order Diptera, consisting of flies having two-wings that includes chironomids, flies, and mosquitoes.
Dissolved concentrations (water)	The concentration of chemical parameters in water filtered through a 0.45 µm glass fibre filter. This is operationally defined as the dissolved fraction in water.
Diversity	A measure (e.g., Shannon-Weaver index) of the variety of living organisms in an area (e.g., number or richness of species).
Drainage basin	The term given to a geographic area that contributes surface and groundwater to a particular lake, river, or stream (also see watershed).
Ecosystem	A community of interacting organisms considered together with the chemical and physical factors that make up their environment.
EEM	Environmental effects monitoring
Effect	A change to an ecosystem component due to human activities. The effect may have a negative, positive, or neutral impact.
Environment	Components of the earth including land, water, air, and all layers of the atmosphere. Also included are organic and inorganic matter, living organisms, and all interacting natural systems.
Environmental Impact Assessment (EIA)	A quantitative approach to environmental studies designed to identify, predict, and interpret information about the potential geographic and temporal scale and magnitude of impacts caused by industrial activities directly and indirectly associated with an industrial development on ecological health, and human health and well-being.
Eutrophic	Nutrient-rich waters with high primary productivity.
Fish	The definition of fish in the Fisheries Act (Section 2) includes: “Shellfish, crustaceans, marine animals, the eggs, sperm, spawn, spat and juvenile stages of fish, shellfish, crustaceans, and marine animals.”
Food chain	Organisms that are linked together in a series that, by consuming lower level organisms, transfer nutrients and energy from one group to another.
Food web	The concept used to describe the relationships of organisms within an ecosystem that are interconnected through various feeding linkages, resulting in the transfer of nutrients and energy.

Freshet	The increased flow of water over a relatively short period of time, usually during spring, caused by snowmelt.
Global Positioning System (GPS)	A sophisticated system used to define a precise geographic location with the aid of a satellite system. Units are typically expressed as UTM (Universal Transverse Mercator) or in latitude and longitude.
Groundwater	Water found in soil or in pores, and crevices under the ground.
Habitat	The Fisheries Act (Section 34) defines fish habitat as: "spawning grounds and nursery, rearing, food supply and migration areas on which fish depend directly or indirectly in order to carry out their life processes." (see also definition of fish)
Hydrology	The study of the properties of water and its movements in relation to land.
Impact	An effect, either positive or negative, of an activity or process on ecological components of a receiving environment.
Invertebrates	A collective term for all animals without a backbone or spinal column and includes all aquatic animal organisms except fish.
Larva	The immature stage, between egg and pupa, of an insect with complete metamorphosis. Many insect larvae are aquatic, including chironomids, mayflies, stoneflies, and caddisflies.
Limnology	The study of freshwater lakes including biological, geological, physical, and chemical aspects.
Littoral	The region of a lake, including water and sediment, from the surface to a depth at which photosynthesis ceases, usually within the upper 10m of the water column.
Meadowbank project Area lakes	Those lakes that are potentially directly or indirectly affected by mine development and include Third Portage, Second Portage, Turn, Tehek, Vault & Wally lakes.
Micro (µ)	A unit of measurement denoting a factor of one-millionth, such as µg/g.
Milligram (mg)	A unit of measurement denoting a factor of one-thousandth, such as mg/g.
Mitigation	An activity aimed at avoiding, controlling, or reducing the severity or duration of adverse physical, biological, and/or socio-economic impacts of a project activity.
MMER	Metal Mining Effluent Regulations

NIRB	Nunavut Impact Review Board
NNL	No Net (Habitat) Loss
NTU	Nephrolometric turbidity units (a measure of turbidity)
Nutrient	Any substance that provides essential nourishment for the maintenance of life (e.g., carbon, nitrogen, and phosphorous).
Nutrient enrichment	The enhancement of nutrients in a water body over and above the concentration that will be considered typical for the region.
Oligochaetes	True worms from the Phylum Annelida (segmented worms) that are common in sediment of freshwater habitats.
Oligotrophic	Nutrient deficient waters with low productivity. The vast majority of Arctic lakes are oligotrophic.
Organic Carbon (sediments)	The non-mineral fraction of the sediments that consists of organic carbon, expressed as a percent (%) of the total weight of sediment. This includes all forms of carbon except carbonates.
Periphyton	The collective name given to the community of algae that exists attached to underwater surfaces, such as rocks, in lakes and streams.
Permafrost	Subsoil that has been frozen for at least two years.
Phytoplankton	Microscopic or small floating plants suspended in the water column of aquatic ecosystems.
Piscivore	Any animal that feeds on fish (e.g., lake trout).
Planktonic	Referring to organisms with limited mobility that are free-floating and living in the water column.
Predator	Any organism that consumes another organism.
Prey	Any organism that is consumed by another organism.
Primary consumers	Organisms such as zooplankton that feed on primary producers (e.g., phytoplankton) for their source of nutrients and energy.
Primary production	Production by photosynthetic organisms, such as algae, phytoplankton and periphyton. Photosynthetic organisms comprise the bottom of the food chain.

Primary productivity	A term given to the rate at which new biomass (i.e., plant tissue) is generated by photosynthetic organisms (i.e., plants) using energy captured from the sun.
Quality Assurance / Quality Control [QA/QC]	Sampling and analytical procedures (such as lab replicate sample analysis) that are integrated in field collection and analytical procedures to ensure acceptable data quality.
Reference lakes	Lakes that are used as controls for comparison to project lakes and include an internal reference lake (Third Portage Lake south basin) and an external reference lake (Inuggugayualik Lake).
Residual effects	Effects that persist after mitigation measures have been applied.
Richness	The number of unique taxa (e.g., species) found at a particular location.
Sampling and analysis plan (SAP)	A detailed description of the approach and methods for sampling, including: goals, rationale/approach, statistical design, sampling schedule, operating plans and procedures, quality assurance/quality control, and a plan for interpretation and evaluation.
Secchi disc	An eight-inch disk with black and white quadrants used to determine water clarity.
Secondary consumer	Organisms such as forage fish that consume primary consumers (e.g., zooplankton) for their source of nutrients and energy.
Secondary productivity	The rate of increase in biomass of organisms that consume plants or other primary producers.
Sediment grain size	Refers to the size and relative size distribution of the particles that make up the sediment. Typically, they are divided into four groups including clay, silt, sand, and gravel.
Sediment Quality Guidelines [ISQG]	Reference concentrations of contaminants in sediments that, if exceeded, indicate that organism-level effects may occur.
SOPC	Stressor of potential concern; stressors are any physical, chemical or biological entity that can induce an adverse effect on environmental systems.
Stratification	Vertical differences in water temperature, causing a density difference between warm, less dense surface water and cold, more dense bottom water, retarding or preventing mixing of surface and bottom water.

Targeted monitoring	Targeted studies are specific studies that typically have narrower temporal or spatial bounds (than core monitoring studies) or are designed to address specific questions related to particular components of mine development during construction or operation. Targeted monitoring is integrated with and complementary to the core monitoring design.
Total metals concentrations (water)	The total concentration of a metal in the water, which includes both freely dissolved and particle-bound forms of the metal.
Total Suspended Solids [TSS]	The weight of solids that are suspended in a given volume of water, expressed as weight per unit volume (e.g., mg/L).
Trophic Levels	A functional classification of organisms in an ecosystem according to feeding relationships, from primary producers through primary consumers, through secondary consumers.
Tundra	Habitat typically found in the Arctic north of the treeline that is characterized by cold temperatures, a short growing season, and low precipitation. Typical tundra vegetation includes moss, lichen, Labrador tea, and small shrubs.
Turbidity	A condition of reduced transparency in water caused by suspended colloidal or particulate material; measured by a turbidimeter and recorded as nephrelometric turbidity units (NTU).
Ultra-oligotrophic	Lakes with extremely low nutrient levels, high water clarity, low primary productivity, and a dominance of small unicellular phytoplankton species. Total phosphorous concentrations are typically <0.005 ug/L in these lakes (Vollenweider 1968).
VECs	Valued Ecosystem Components; In the NIRB Terms of Reference it states "Valued Ecosystem Components (VECs) have been identified in consultation with regulatory authorities and members of the local community. They include fish and wildlife species populations, habitat, air quality, water quality, surface water quantity and distribution, vegetation cover, and permafrost."
Water Quality Guidelines	Reference concentrations of contaminants in water (e.g., CCME guidelines) that, if exceeded, indicates that organism-level effects may occur.
Watershed	An entire geographic area that contributes surface and groundwater to a particular lake, river, or stream.
Zooplankton	Small, floating, or weakly swimming animals found in fresh and marine waters, such as copepods and cladocerans.