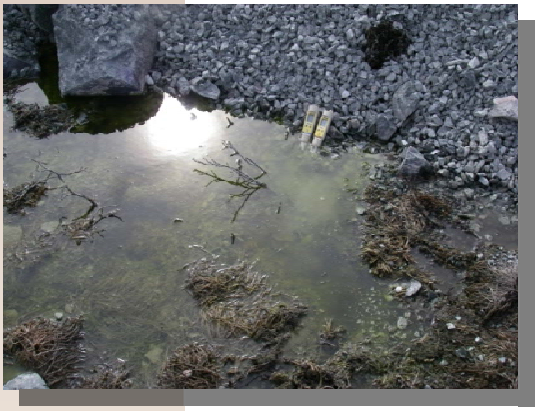
Hope Bay Mining Ltd.

Hope Bay Project
Quarry Monitoring



Prepared for:

Hope Bay Mining Ltd.

Prepared by:

SRK Consulting
Engineers and Scientists

Project Reference Number
SRK 1CH008.023

November 2009

Hope Bay Project

Quarry Monitoring

Hope Bay Mining Ltd.

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SRK Project Number 1CH008.023

November 2009

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1 Introduction

Quarry Rock was excavated during development of the Doris roads, airstrip and camp area (Figure 1). As part of the water licence application, Miramar Hope Bay Ltd. (MHBL) presented verification and monitoring plans to confirm that the potential for ARD and metal leaching from quarry rock used in the construction of the roads, airstrip, and camp area at Doris would be very low. These monitoring commitments were included in the Monitoring and Follow-up Plan for the site and in the current Water Licence (2AM-DOH0713).

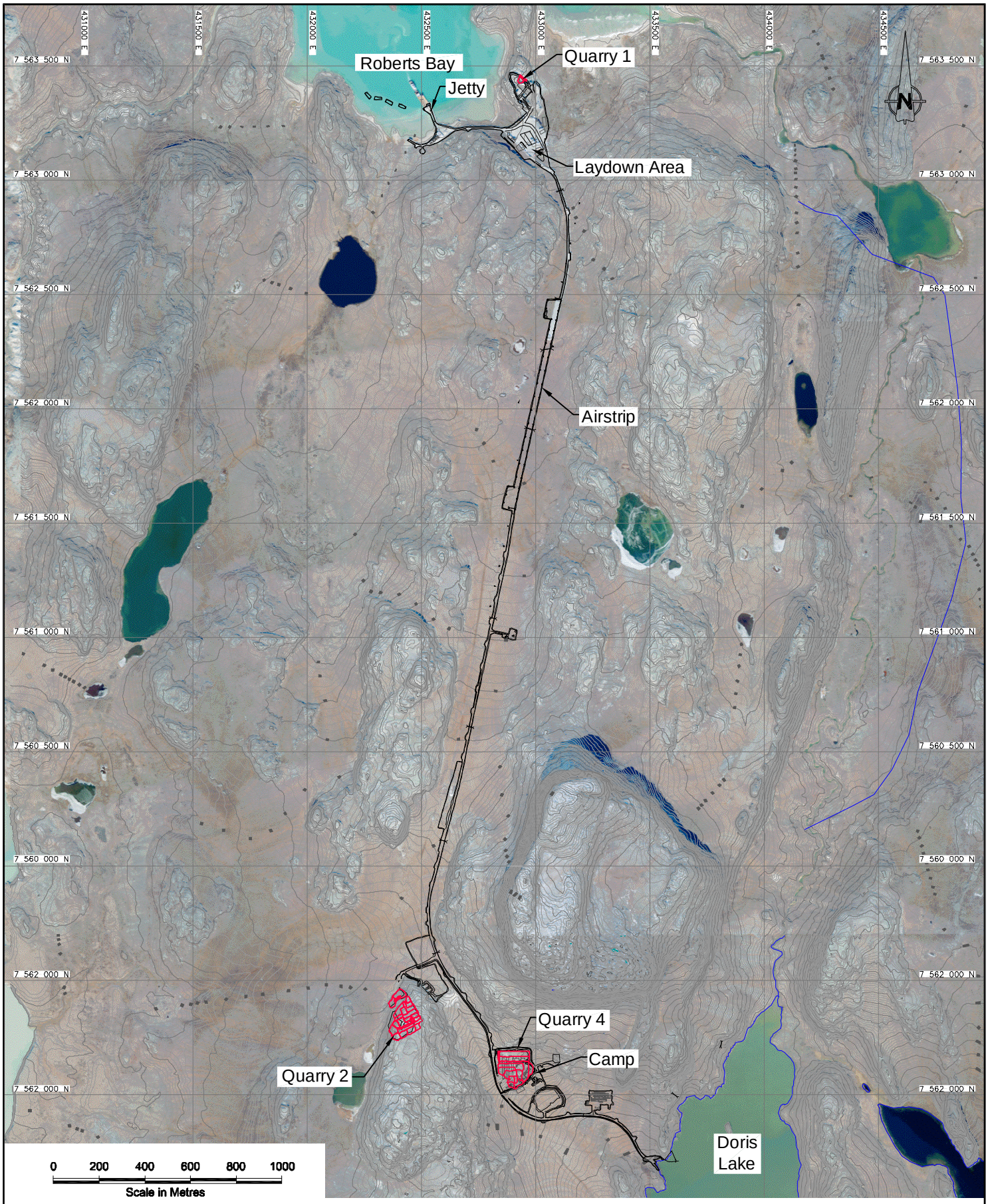
The commitments included:

- A program of check acid base accounting on the quarried rock used in construction, with shake flask extraction tests on a representative subset of samples;
- Seep surveys during the spring freshet along the roadways, airstrip, building pads and quarry sites; and
- Interpretation and reporting of results to the Nunavut Water Board.

During the 2007 construction season, Miramar Hope Bay Mining Ltd. (MHBL) retained Golder Associates to complete monitoring activities associated with the initial phase of construction, including collection of 84 solids samples and a seepage survey along portions of the road that had been constructed prior to July 2007. MHBL subsequently submitted the solids samples for ABA tests and prepared an internal memo documenting the results. More recently, Golder Associates prepared a memo documenting the results of the seepage monitoring.

The second phase of construction started in early 2008 and coincided with the transfer of ownership to Hope Bay Mining Ltd. (HBML). Monitoring activities were not continued during this period, and were subsequently identified as a permit requirement. Prior to the 2009 field season, HBML retained SRK Consulting to address this requirement. A seep survey was completed in June 2009, and additional solids samples were collected and submitted for acid base accounting and shake flask extraction tests in August 2009.

This report summarizes results of all of the available monitoring results and supercedes an earlier version which did not include the latest solids characterization results.



SRK Consulting
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Vancouver B.C.

HOPE BAY MINING LTD.

Hope Bay Gold Project

Quarry Rock Seepage Monitoring

Doris Infrastructure and Quarry Areas

SRK JOB NO.: 1CH008.023.0001

FILE NAME: Doris site-Layout.dwg

DATE:	APPROVED:	FIGURE:
Sep. 2009	–	1

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2 Monitoring of Quarry Rock Geochemistry

2.1 Specific Requirements

Specific requirements for the geochemical monitoring program are outlined in Section 7.1 of the July 2007 Monitoring and Follow-up Plan, and in Part D, Item 9 of the Doris North Water Licence.

The requirements outlined in the Monitoring and Follow Up Plan are as follows:

> *A program of check ABA (acid base accounting) testing will be conducted on the quarried rock used in site construction to verify that all rock used is non acid generating. A target of collecting 100 samples spread equally over the approximately one million tonnes of rock to be quarried has been established for this follow-up program.*
>
> *During construction samples of quarried rockfill will be collected from the various road and pad construction sites and sent to an accredited external lab for acid base accounting analysis. The following information will be collected for each sample collected:*
>
> - *Location of Sample Point;*
> - *GPS Coordinates of sample point;*
> - *Name of Quarry from which the rockfill came from;*
> - *Date rockfill was placed;*
> - *The Name of the person who performed the sampling;*
> - *Date and time of sampling;*
> - *Date of analysis;*
> - *Name of person who performed the analysis;*
> - *Analytical method or techniques used; and*
> - *Results of analysis.*
>
> *The data will be cross-referenced to a site infrastructure map. The objective is to collect ~100 samples from across the site (spread to capture a representative cross-section of all rockfill used in site construction) to verify that the rock used in construction is non-acid generating.*

Part D "Conditions Applying to Construction" Item 9 of the Doris North water license states:

> *The Licensee shall include, in addition to conducting Quarry Rock Construction Monitoring and Management in accordance with the Water License Application. Monitoring and Follow Up Plan, dated July 2007, the following:*
>
> *a. A subset of twenty (20) samples shall be subjected to Shake Flask Extraction (SFE) tests with an emphasis on near surface rock samples; and*

b. Submit to the Board for review no later than 6 month after the collection of samples, a report that presents the data collected from the Quarry Rock Construction Monitoring Program. The report shall include a discussion of the interpretation of the geochemical data.

2.2 Sampling and Testing Programs

2.2.1 2007 Program

Detailed methods and results from the 2007 sampling and testing program are presented in a memo by MHBL, as provided in Appendix A.

A total of 84 quarry rock samples were collected, including 10 samples from the Patch Lake Tank Farm, 24 samples from the Roberts Bay Jetty, 25 samples along the road from the Roberts Bay Jetty to the northern end of the airstrip, and 25 samples from the Roberts Bay Beach Laydown Pad.

All of the samples were submitted to Cantest Ltd. for sulphur analyses by LECO furnace. Samples with greater than 0.1% sulphur were submitted for complete acid base accounting tests, including total inorganic carbon and sulphur speciation, and NP determination using the standard Sobek method.

2.2.2 2009 Program

Detailed methods and results from the 2009 sampling and testing program are presented in Appendix D. A total of 24 samples were collected from along the airstrip (approximately where the 2007 Golder program ended), and along the western edge of the road to Doris Lake (including the crushing facility).

All of the samples were submitted for acid-base accounting (ABA) and elemental analysis. ABA tests were completed using the Modified Sobek method with sulphur speciation and TIC analyses. Metal concentrations were determined using aqua regia digestion with ICP-MS finish. Shake flask extraction (SFE) tests were completed on a subset of 20 samples.

2.3 Results

2.3.1 Acid Base Accounting Results

Results of the 2007 and 2009 acid base accounting tests are presented in Appendix A and Appendix D, respectively, and are summarized below.

The results of the sulphur analyses are summarized in Table 1. The results indicate that all of the samples had low sulphur concentrations, and that most had concentrations of less than 0.2% (equivalent to an acid potential or AP of 6.3 kg $CaCO_3$ eq/tonne). Samples collected in 2007 with sulphur concentrations above 0.1% were submitted for full acid base accounting tests.

Table 1: Distribution of Samples by Sulphur Content

Total Sulphur %	Number of Samples (2007)	Number of Samples (2009)
<0.1%	54	11
0.1 to 0.2%	33	13
0.2 to 0.3%	2	0
>0.3%	1	0

The results of the acid base accounting tests are summarized in Table 2 and Figures 1 and 2.

It should be noted that NP determination for 2007 samples was done using the standard Sobek method; however, other work at the site has shown that the standard Sobek method tends to overestimate NP. Therefore, NP determination for 2009 samples was done by Modified Sobek method. This is why 2009 samples typically have slightly lower NP than 2007 samples (Table 2, Figure 1).

Acid base accounting results showed that all samples contained substantial amounts of neutralization potential. Conventional NP/AP ratios were all greater than 3 (Figure 2), indicating these samples are not potentially acid generating. Total inorganic carbon (TIC) expressed in units of $CaCO_3$ eq/tonne were generally lower than conventional NP, but ratios of carbonate NP/AP (Figure 3) were also all greater than 3 and therefore not potentially acid generating.

Table 2: Summary of Acid Base Accounting Results

	Statistic	Paste pH	Total Sulphur[1] (Wt.%)	Sulphate Sulphur (Wt.%)	AP[3]	NP[2,3]	TIC[3]	NP/AP
2007 Samples	25th percentile	9.37	0.11	<0.01	3.4	104	62	24
	median	9.48	0.15	0.01	4.4	118	75	28
	75th percentile	9.57	0.17	0.01	5.3	141	90	36
	max	9.76	0.32	0.02	9.7	184	161	53
2009 Samples	25th percentile	8.96	0.09	<0.01	2.7	108	84	33
	median	9.00	0.10	<0.01	3.1	121	105	39
	75th percentile	9.12	0.11	<0.01	3.5	126	111	43
	max	9.60	0.14	<0.01	4.4	138	125	51

Notes:
NP = Neutralization Potential, AP = Acid Potential, TIC = Total inorganic carbon
[1] All 2007 samples submitted for full ABA had total sulphur contents of greater than 0.1%.
[2] 2007 NP values were determined by the standard Sobek method, 2009 NP values were determined by Modified Sobek method
[3] AP, NP and TIC are presented in units of $CaCO_3$ eq/tonne.

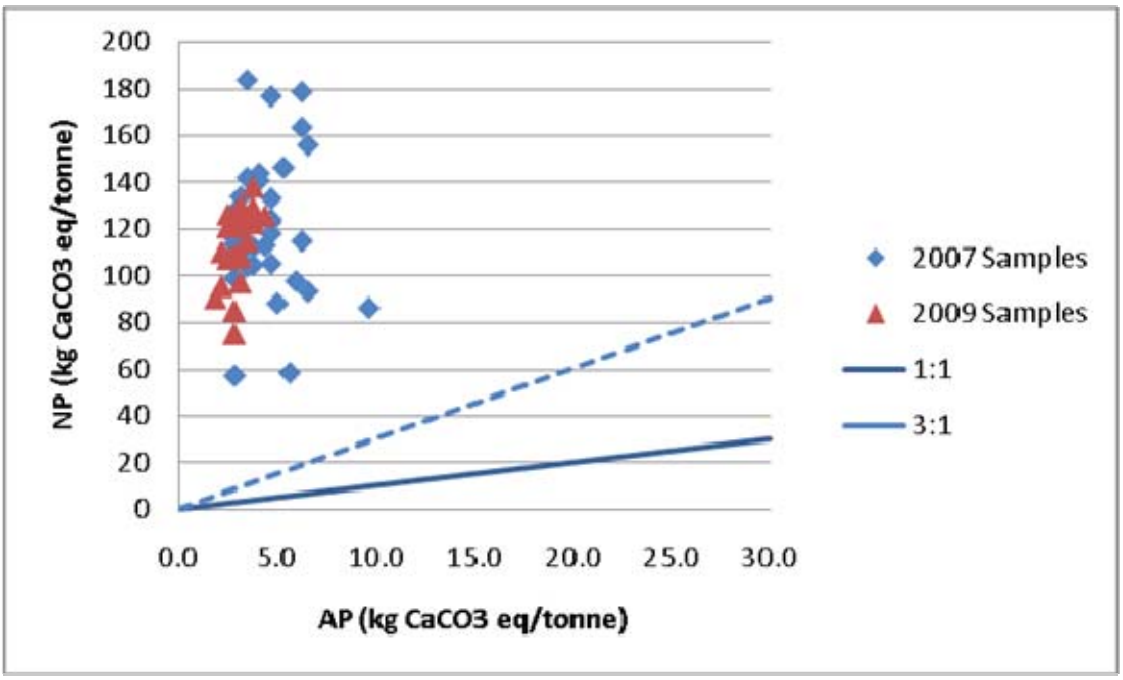

Figure 2: NP* versus AP (*Standard Sobek NP for 2007 samples, Modified Sobek NP for 2009 samples)

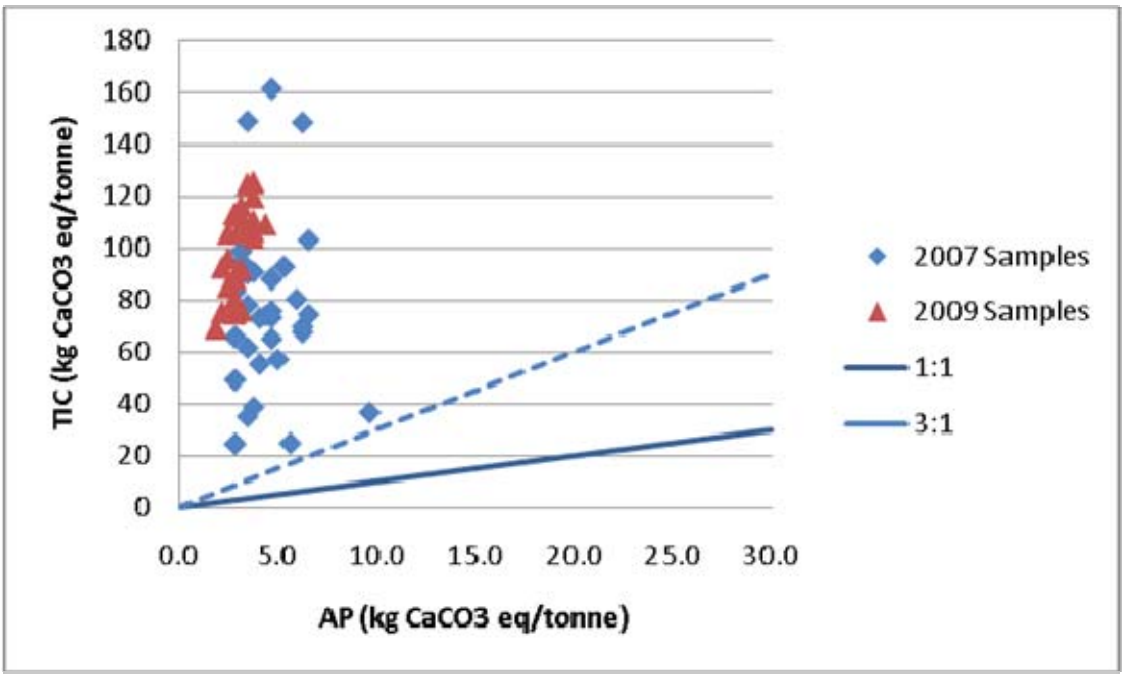

Figure 3: Carbonate NP versus AP

2.3.2 Elemental Analysis

Results of the 2009 elemental analysis are provided in Appendix D. Elemental analysis results were compared to ten times the average crustal abundance for basaltic rocks (Price 1997) to screen for parameters that were elevated in solid phase. None of the samples tested had parameters which exceeded these screening criteria.

2.3.3 Shake Flask Extraction Test Results

Results of the shake flask extractions (SFE) are discussed in Appendix D. All SFE tests had alkaline pH ranging from 8.9 to 9.7. Sulphate concentrations were low (median 13 mg/L) indicating little sulphide oxidation has occurred in the rocks. Shake flask extraction results were compared to ten times the CCME guidelines for the protection of aquatic life (CCME 1999) to screen for parameters that were elevated in the test leachate. Dissolved metal concentrations were generally low with only one sample (09-DORRD-10-1) slightly exceeding the screening criteria for aluminum. This sample also had an anomalously high dissolved iron concentration. These results are within the range established in testing programs completed prior to development (SRK 2007 and 2008), and likely reflect colloidal sized particles entrained in the samples. Aluminum and iron concentrations were consistently low in actual seepage data.

3 Seepage Surveys

3.1 Specific Requirements

Specific requirements for the geochemical monitoring program are outlined in Section 7.1 of the July 2007 Monitoring and Follow-up Plan, and in Part D, Item 9 of the Doris North Water Licence.

The requirements outlined in the Monitoring and Follow-Up Plan are as follows:

> *A seep survey will be conducted in the first spring freshet following the major earthworks construction along the roadways and beside the pads to measure pH levels in the precipitation runoff and snowmelt that comes in contact with this rock. The pH of each seep will be measured using a field pH meter with the following data recorded:*
>
> - *Location of sample point;*
> - *GPS coordinates of sample point;*
> - *Name of the person who performed the sampling;*
> - *Date and time of sampling;*
> - *Date of analysis;*
> - *Name of the person who performed the analysis;*
> - *Analytical method or techniques used; and*
> - *Results of analysis.*
>
> *The data will be cross-referenced to a site infrastructure map. The objective is to collect approximately 100 samples from across the site (spread to capture a representative cross-section of all rockfill used in site construction) to verify that the rock used in construction is non-acid generating. In any location where the field pH s below 5.0 or above 8.0, a water sample will be collected and submitted for analysis for pH, Total Sulphate, Total Ammonia, Nitrate, Alkalinity, Dissolved Al, As, Cd, Cu, Pb, Ni, and Zn.*
>
> *Any potentially acid generating rock located by this means will be tagged for removal and replacement during the next winter season. The material removed will be moved to the temporary waste rock stockpile to be placed underground.*

Part D "Conditions Applying to Construction" Item 21 of the Doris North water license states:

> *The Licensee shall conduct a Quarry Rock Seepage Monitoring and Management program in accordance with the Water Licence Application Monitoring and Follow-Up Plan, dated July 2007 and in accordance with the following:*
>
> *a. The seep survey shall measure pH and Electrical Conductivity (EC) levels in the precipitation runoff and snowmelt that comes into contact with rock along the roadways, building pads and quarry sites;*

b. The seep survey shall measure pH and EC levels at several reference points on the tundra not subject to mine influences;

c. The quarry rock seepage program shall be conducted on any ephemeral seepage present at the time of the quarry rock seepage monitoring program and not at pre-determined seepage stations;

d. A minimum of at least 10% of the total sample set shall be submitted for secondary analysis, regardless of the values of measured field pH and EC; and

e. The Quarry Rock Seepage Monitoring Program shall be expanded beyond the 100 samples to include monitoring of all rock drains.

3.2 Sampling Programs

3.2.1 2007 Program

The 2007 sampling program (Appendix B) included seepage monitoring and sampling around the jetty constructed at Roberts Bay. The program was completed in June/July 2007. At that time, only the quarry, laydown area, road to the jetty and a portion of the main road were completed, and the jetty was in the process of being completed.

Five seepage samples were collected in mid-June 2007 from ephemeral drainages which either emerged from under emplaced construction rock or flowed nearby it. Fourteen samples were collected from Roberts Bay in early to mid-July during, and shortly after construction of the jetty. Jetty construction was conducted within a silt curtain. Samples were collected from various locations inside and outside the silt curtain.

Samples were submitted for analysis of pH, conductivity, nitrite, nitrite + nitrate (in order to calculate nitrate concentrations), ammonia, and total suspended solids. Field pH (but not field conductivity) was measured at a total of 14 reference sites, typically tundra pools, located south of Roberts Bay.

3.2.2 2009 Program

The 2009 seep survey (Appendix C) was carried out during the last week of June 2009. Seep survey locations were established by walking the toes of all roadways, building pads and quarry sites. A total of 125 sites, including 5 reference sites, were established and field pH and electrical conductivity readings were taken. Samples were collected from all ten sites with pHs exceeding 8, seven of the more typical sites with pHs between 7 and 8, and all five reference sites. Samples were submitted to ALS-Chemex, Vancouver BC for analysis of nutrients (ammonia and nitrate) routine parameters (pH, alkalinity and sulphate) and a full suite of dissolved metals by ICP-MS.

3.3 Results

3.3.1 2007 Program

Four of the five freshwater seep samples had pH between 6.9 and 7.0. The sample from Tributary 3 had a pH value of 8.2 (but was not submitted for secondary analysis) and a TSS concentration of 487 mg/L, exceeding the maximum concentration for a grab sample as outlined in the water licence (100 mg/L) and exceeding the CCME guideline (maximum increase of 25 mg/L from background concentrations). Conductivity of the samples ranged from 156 to 197 µS/cm. Ammonia, nitrate and nitrite concentrations were consistently below CCME guidelines.

The samples collected in the vicinity of the Roberts Bay jetty had pH ranging from 7.3 to 7.7. Conductivity ranged from 6680 to 7200 µS/cm. Nitrate concentrations were all below CCME guidelines. One sample (point 8) exceeded CCME guideline for TSS, but this was inside the silt curtain.

Reference site samples had pH ranging from 5.4 (below the CCME lower limit of pH 6.5) to 7.7.

3.3.2 2009 Program

The majority of seepage sites had field pH measurements between 7 to 8 and field conductivity readings less than 500 µS/cm. The range of pHs were similar to that of reference point locations, while conductivities were generally higher at the seepage stations that were associated with quarry rock.

Higher pHs were found in the Roberts Bay/Quarry 1 area and in the general vicinity of Quarry 2. The higher pH may be attributed to the relatively higher proportion of outcrop and exposed rock in these areas, and therefore increased contact of water with carbonate minerals in these rocks.

Nitrate and ammonia were also somewhat elevated in two ponded water samples from Quarry 1 and one flowing seep from Quarry 2. The Quarry 1/Robert's Bay area is currently used for storage of fuel drums and other mining supplies, and Quarry 2 is an active quarry with recent blasting activities. The nitrate and ammonia in these locations is likely to have originated from blasting activities.

Nearly all samples submitted for chemical analysis had dissolved copper concentrations that were slightly greater than CCME guidelines for fresh water aquatic life, including reference locations not influenced by quarry rock or other mining activities. Metal concentrations were generally lower than indicated by shake flask extraction tests completed on test samples prior to development (SRK 2008). Notably, aluminum concentrations in seeps were in the range of 0.0095 to 0.066 mg/L versus 0.17 to 2.17 mg/L in shake flask tests completed on samples from Quarries A to E (SRK 2008), copper concentrations in seeps were 0.0014 to 0.012 mg/L versus 0.001 to 0.031 mg/L in shake flask tests, and iron concentrations in seeps were <0.03 to 0.55 mg/L versus <0.05 to 4.9 mg/L in the shake flask tests.

4 Summary and Conclusions

The results of the acid base accounting tests indicated that all of the quarry samples were non-acid generating. These results are consistent with characterization programs completed prior to permitting and development. Elemental analysis of 2009 samples indicated that quarry rock is not enriched in metals compared to average crustal abundances for basaltic rock. Shake flask extraction results indicated that soluble metal content in the rock is low. The sampling and testing programs have now addressed the outstanding permit requirements for the solids monitoring program.

The results of the seepage surveys indicated near neutral pH conditions in all of the seeps and ponded water samples associated with the quarry rock. Nitrate and ammonia levels were slightly elevated in two seeps located in Quarries 1 and 2. Metal concentrations were generally low with the exception of copper, which was also elevated in reference sites outside of the area of interest. The copper concentrations were generally lower than the values found in shake flask extraction tests completed prior to development.

5 Recommendations

Seepage monitoring should be continued for 2 more years. SRK suggests the following modifications to the program:

- The pH thresholds for laboratory testing are arbitrary and it would be more useful to test samples reflecting the full range of pH and conductivity measurements observed during the survey.

- The monitoring plans and permit requirements specified that at least 100 field readings would be collected during the survey and that readings would be taken from all locations where water comes in contact with the rock. As a result, many of the field readings and samples were collected from small ponds or pools, or were from streams flowing into the waste rock. In general, it is more useful to focus on flowing seeps that originate in or flow through quarry rock areas. This would reduce the number of stations substantially and would allow HBML and NWB to focus on areas which have the greatest potential to affect downstream aquatic resources.

- Neither the 2007 nor 2009 reference sites are ideally situated to represent pre-development conditions along the road. Some of these sites should be moved to the west of the Franklin diabase and onto more marshy tundra.

HBML should seek written approval from NWB before implementing the first two changes.

"This report and the opinions and conclusions contained herein ("Report") contains the expression of the professional opinion of SRK Consulting (Canada) Inc. ("SRK") as to the matters set out herein, subject to the terms and conditions of the agreement dated September 30, 2008 (the "Agreement") between Consultant and Hope Bay Mining Ltd. ("Hope Bay Mining"), the methodology, procedures and sampling techniques used, SRK's assumptions, and the circumstances and constraints under which Services under the Agreement were performed by SRK. This Report is written solely for the purpose stated in the Agreement, and for the sole and exclusive benefit of Hope Bay Mining, whose remedies are limited to those set out in the Agreement. This Report is meant to be read as a whole, and sections or parts thereof should thus not be read or relied upon out of context. In addition, this report is based in part on information not within the control of SRK. Accordingly, use of such report shall be at the user's sole risk. Such use by users other than Hope Bay Mining and its corporate affiliates shall constitute a release and agreement to defend and indemnify SRK from and against any liability (including but not limited to liability for special, indirect or consequential damages) in connection with such use. Such release from and indemnification against liability shall apply in contract, tort (including negligence of SRK whether active, passive, joint or concurrent), strict liability, or other theory of legal liability; provided, however, such release, limitation and indemnity provisions shall be effective to, and only to, the maximum extent, scope or amount allowable by law."

This report, "**1CH008.023– Quarry Rock Seepage Monitoring, Hope Bay Project**," was prepared by SRK Consulting (Canada) Inc.

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Reviewed by

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Principal Environmental Geochemist

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Appendix A

Summer 2007 Doris North Construction Program – ABA Sampling and Testing Summary (MHBL 2007)

MIRAMAR HOPE BAY LTD.

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phone 604-985-2572 fax 604-980-0731

MEMORANDUM

TO: **File**
FROM: **Larry Connell**
DATE: **September 27, 2007**
(*Updated by HBML Sept 15, 2009 to include Figure 2 and Appendix A)*
SUBJECT: **Summer 2007 Doris North Construction Program – ABA Sampling and Testing Summary**

Part D "Conditions Applying to Construction" Item 9 of the Doris North water license states:

> *The Licensee shall include, in addition to conducting Quarry Rock Construction Monitoring and Management in accordance with the Water License Application. Monitoring and Follow Up Plan, dated July 2007, the following:*
>
> a. *A subset of twenty (20) samples shall be subjected to Shake Flask Extraction (SFE) tests with an emphasis on near surface rock samples; and*
> b. *Submit to the Board for review no later than 6 month after the collection of samples, a report that presents the data collected from the Quarry Rock Construction Monitoring Program. The report shall include a discussion of the interpretation of the geochemical data.*

In Section 7.1 of the July 2007 Monitoring and Follow Up Plan, MHBL made the following commitments:

> *In addition, a program of check ABA (acid base accounting) testing will be conducted on the quarried rock used in site construction to verify that all rock used is non acid generating. A target of collecting 100 samples spread equally over the approximately one million tonnes of rock to be quarried has been established for this follow-up program.*
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> *During construction samples of quarried rockfill will be collected from the various road and pad construction sites and sent to an accredited external lab for acid base accounting analysis. The following information will be collected for each sample collected:*
>
> - *Location of Sample Point;*
> - *GPS Coordinates of sample point;*
> - *Name of Quarry from which the rockfill came from;*
> - *Date rockfill was placed;*
> - *The Name of the person who performed the sampling;*
> - *Date and time of sampling;*

- *Date of analysis;*
- *Name of person who performed the analysis;*
- *Analytical method or techniques used; and*
- *Results of analysis.*

The data will be cross-referenced to a site infrastructure map. The objective is to collect ~100 samples from across the site (spread to capture a representative cross-section of all rockfill used in site construction) to verify that the rock used in construction is non-acid generating.

Pre-development construction at the Doris North Project commenced in May of 2007 with the construction of the Roberts Bay jetty, the beach laydown rockfill pad and associated roads (see Figure 1). Samples of rock fill used in this construction were collected by the site environmental construction monitor (a secondment from Golder Associates). The samples were collected from the road way, laydown area or jetty after placement by the construction crews. All of the rock used in the summer 2007 construction program came from Quarry number 1 sited adjacent to Roberts Bay (see Figure 1).

Similar samples were collected of the rockfill used in the construction of the Patch Lake tank farm (part of the Hope Bay Advanced Exploration Project – Water License 2BE-HOP0712).

A total of 84 samples were collected over the 2007 construction period from the follow locations:

- Patch Lake Tank Farm 10 samples
- Roberts Bay Jetty 24 samples
- Roberts Bay Roads 25 samples
- Roberts Bay Beach Laydown Pad 25 samples

A full listing of the samples along with the following information is included in Appendix A. A map showing the location of ther sampling points is attached as Figure2.

- Location of Sample Point;
- GPS Coordinates of sample point;
- Name of Quarry from which the rockfill came from;
- Date rockfill was placed;
- The Name of the person who performed the sampling;
- Date and time of sampling.

All 84 samples were sent to CANTEST Ltd. (Vizon Scitech) for total Sulphur analysis by LECO Furnace. The analytical results are presented in Appendix B along with the QA/QC data from the lab and the sample analysis summary.

- Of the 84 samples tested only 1 sample had a Total Sulphur analysis greater than 0.30 wt% (this sample came from Patch Lake and assayed 0.32 wt% Total Sulphur – Sample E748058);

- Of the 84 samples tested only two samples had Total Sulphur concentrations greater than 0.20 wt% by under 0.30 wt% (one sample came from Patch Lake and assayed 0.21 wt% Toal Sulphur – Sample E748060; the other sample came from the Roberts Bay roadway and assayed 0.22 wt% Total Sulphur – Sample E748105);

- Of the 84 samples tested 33 had Total Sulphur concentrations greater than or equal to 0.10 wt% Total Sulphur. The remaining 54 samples had Total Sulphur concentrations less than 0.10 wt% Total Sulphur.

All 33 samples that assayed greater than or equal to 0.10 wt% Total Sulphur were subjected to Acid Base Accounting testing using the Standard Sobek NP Method. Sulphur speciation was determined and Total Inorganic Carbon was analyzed to allow the Carbonate Neutralization Potential to be calculated. These ABA analytical results are presented in Appendix C along with the QA/QC data from the lab and the sample analysis summary. All of the 33 samples tested were non acid generating:

- All 33 samples had a ratio of neutralizing potential to maximum potential acidity (NPR) of 3:1. The lowest NPR was 8.9 and the highest was 53.5;

- All 33 samples had a ratio of calcium carbonate equivalent neutralizing potential to maximu potential acidity ($CaCO_3$ NPR) of 3:1. The lowest $CaCO_3$ NPR was 3.8 and the highest was 43.3;

- All 33 samples had a Net Neutralization Potential (NNP) of greater than 20 Kg $CaCO_3$ equivalent per tonne. The lowest NNP was 52.6 Kg $CaCO_3$ equivalent per tonne and the highest was 180.1 Kg $CaCO_3$ equivalent per tonne.

As all of the samples (33) with a Total Sulphur concentration greater than or equal to 0.10 wt% were non acid generating it was assumed that the remaining 54 samples with a Total Sulphur concentration less than 0.10 wt% would also be non acid generating. These samples have less potential acidity and come from the same quarry source and are thus likely to be similar in nature from a neutralization potential.

Figure 1: Summer 2007 Pre-development Construction Program at Doris North Project Site

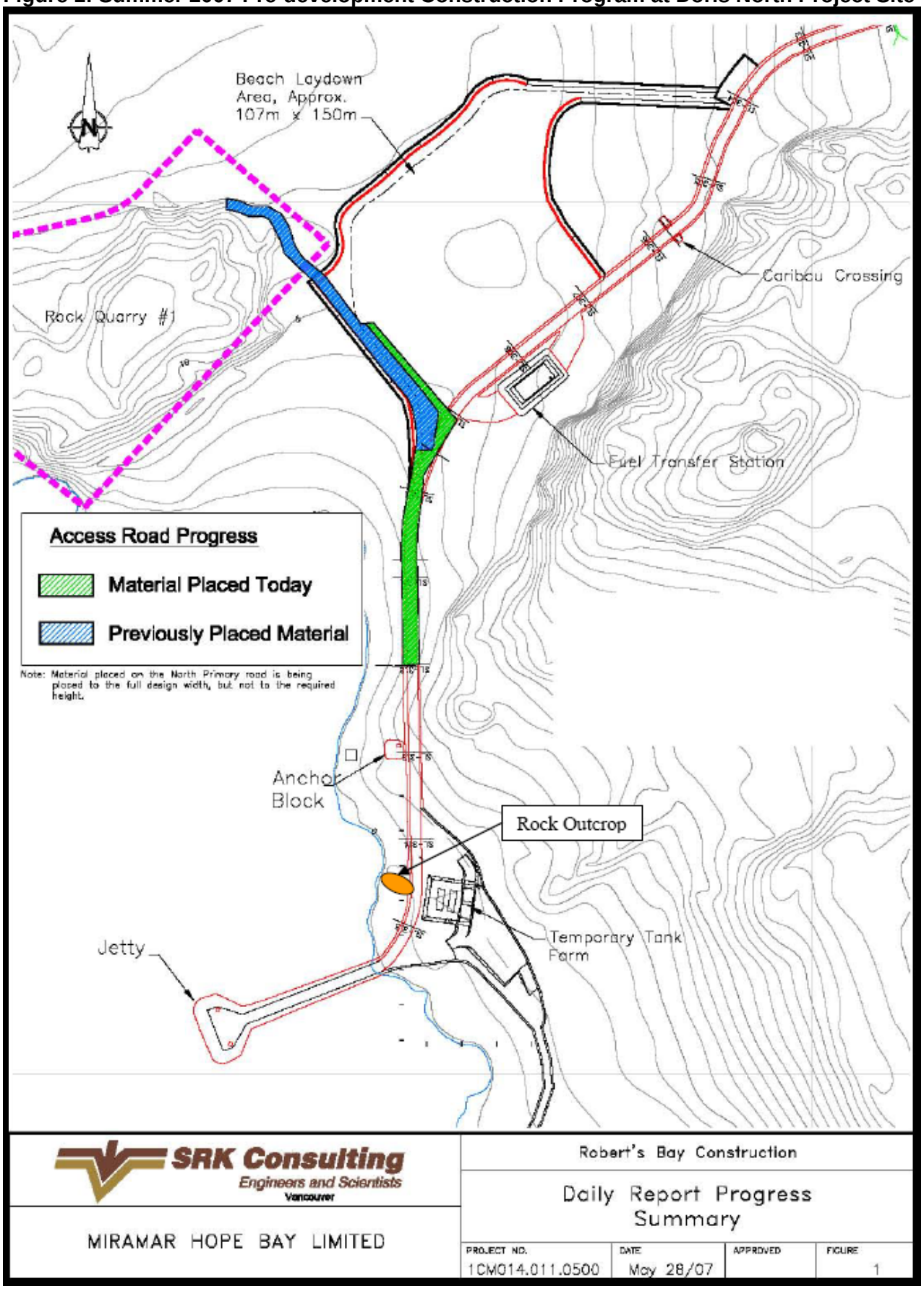
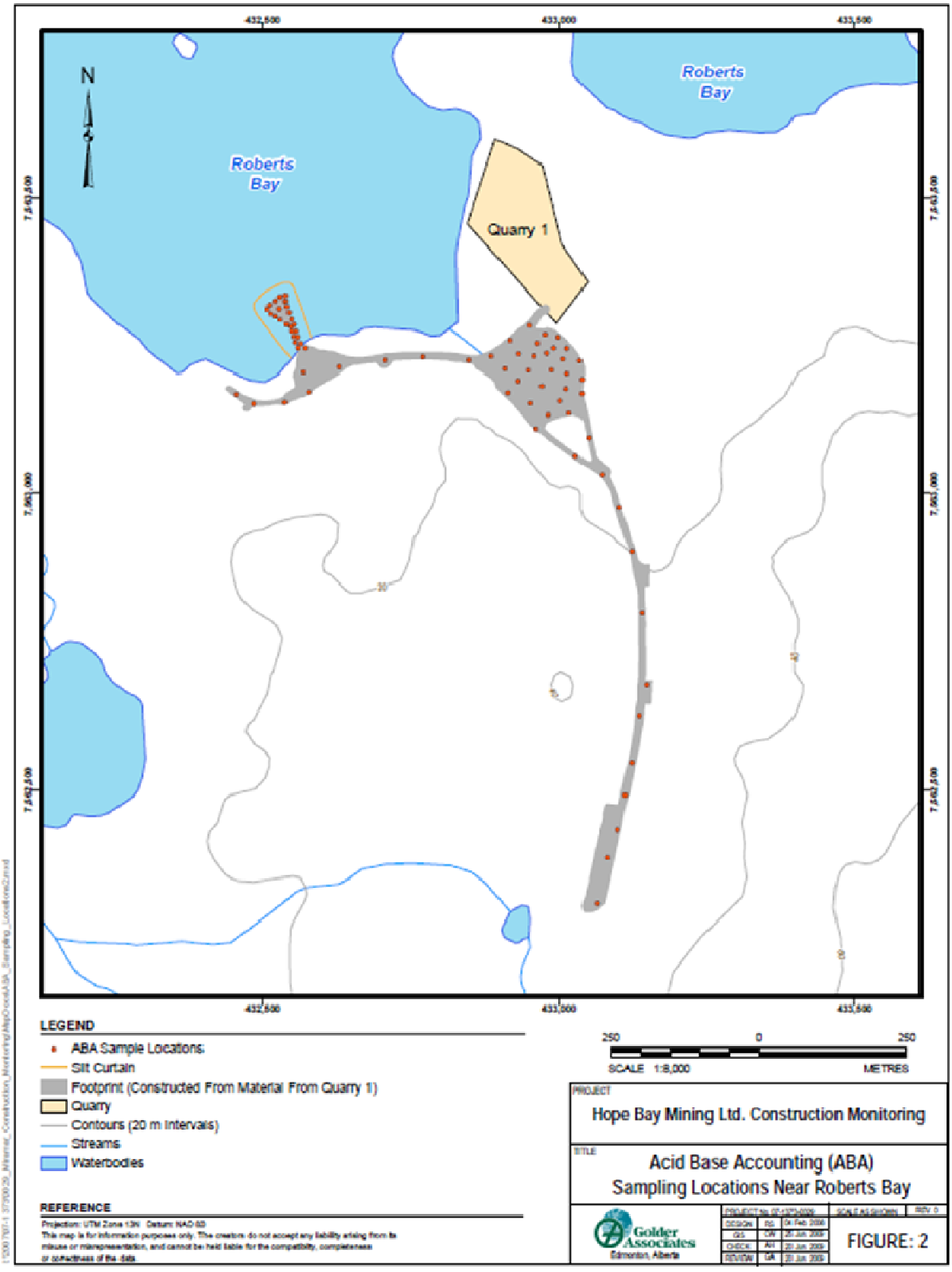


Figure 2: Location of ABA Rockfill Sampling Location



Appendix A – ABA Samples Collected During Pre-Development Construction 2007

Sample #	Location[1]	UTM 13W		Quarry	Date of Rock Placement	Sampling		Date of Analysis	Sampler[2]
		Easting	Northing			Date	Time		
E748051	PLTF	433713	7551930	PLTF	16-May	9-Jun-07	9:37	26-Jul-07	TP
E748052	PLTF	433735	7551887	PLTF	16-May	9-Jun-07	9:43	26-Jul-07	TP
E748053	PLTF	433725	7551886	PLTF	16-May	9-Jun-07	9:45	26-Jul-07	TP
E748054	PLTF	433717	7551881	PLTF	16-May	9-Jun-07	9:48	26-Jul-07	TP
E748055	PLTF	433706	7551892	PLTF	16-May	9-Jun-07	9:51	26-Jul-07	TP
E748057	PLTF	433699	7551905	PLTF	16-May	9-Jun-07	9:53	26-Jul-07	TP
E748058	PLTF	433695	7551921	PLTF	16-May	9-Jun-07	9:56	26-Jul-07	TP
E748059	PLTF	433702	7551929	PLTF	16-May	9-Jun-07	9:59	26-Jul-07	TP
E748060	PLTF	433718	7551919	PLTF	16-May	9-Jun-07	10:00	26-Jul-07	TP
E748061	PLTF	433728	7551906	PLTF	16-May	9-Jun-07	10:01	26-Jul-07	TP
E748073	RBJetty	432558	7563248	Quarry 1	07-Jul	18-Jul-07	11:11	26-Jul-07	RS
E748074	RBJetty	432553	7563257	Quarry 1	08-Jul	18-Jul-07	11:30	26-Jul-07	RS
E748075	RBJetty	432551	7563267	Quarry 1	08-Jul	18-Jul-07	11:44	26-Jul-07	RS
E748076	RBJetty	432547	7563275	Quarry 1	08-Jul	18-Jul-07	11:47	26-Jul-07	RS
E748077	RBJetty	432546	7563282	Quarry 1	09-Jul	18-Jul-07	11:57	26-Jul-07	RS
E748078	RBJetty	432540	7563287	Quarry 1	09-Jul	18-Jul-07	12:10	26-Jul-07	RS
E748079	RBJetty	432528	7563294	Quarry 1	14-Jul	18-Jul-07	13:04	26-Jul-07	RS
E748080	RBJetty	432520	7563301	Quarry 1	14-Jul	18-Jul-07	13:11	26-Jul-07	RS
E748081	RBJetty	432512	7563305	Quarry 1	14-Jul	18-Jul-07	13:14	26-Jul-07	RS
E748082	RBJetty	432506	7563312	Quarry 1	14-Jul	18-Jul-07	13:19	26-Jul-07	RS
E748083	RBJetty	432510	7563320	Quarry 1	14-Jul	18-Jul-07	13:24	26-Jul-07	RS
E748084	RBJetty	432520	7563327	Quarry 1	14-Jul	18-Jul-07	13:36	26-Jul-07	RS
E748085	RBJetty	432528	7563334	Quarry 1	14-Jul	18-Jul-07	13:38	26-Jul-07	RS
E748086	RBJetty	432537	7563336	Quarry 1	14-Jul	18-Jul-07	13:43	26-Jul-07	RS
E748087	RBJetty	432537	7563325	Quarry 1	13-Jul	18-Jul-07	13:49	26-Jul-07	RS
E748088	RBJetty	432539	7563316	Quarry 1	13-Jul	18-Jul-07	13:54	26-Jul-07	RS
E748089	RBJetty	432543	7563306	Quarry 1	10-Jul	18-Jul-07	14:02	26-Jul-07	RS
E748090	RBJetty	432547	7563295	Quarry 1	09-Jul	18-Jul-07	14:03	26-Jul-07	RS
E748091	RBJetty	432551	7563285	Quarry 1	09-Jul	18-Jul-07	14:07	26-Jul-07	RS
E748092	RBJetty	432554	7563275	Quarry 1	08-Jul	18-Jul-07	14:18	26-Jul-07	RS
E748093	RBJetty	432557	7563265	Quarry 1	08-Jul	18-Jul-07	14:19	26-Jul-07	RS
E748094	RBJetty	432563	7563255	Quarry 1	07-Jul	18-Jul-07	14:49	26-Jul-07	RS
E748095	RBJetty	432571	7563247	Quarry 1	07-Jul	18-Jul-07	14:54	26-Jul-07	RS
E748111	RBJetty	432527	7563313	Quarry 1	14-Jul	19-Jul-07	14:14	26-Jul-07	RS
E748062	RBRd	432455	7563169	Quarry 1	04-Jun	16-Jun-07	8:58	26-Jul-07	TP
E748063	RBRd	432627	7563216	Quarry 1	03-Jun	16-Jun-07	9:08	26-Jul-07	TP
E748064	RBRd	432769	7563232	Quarry 1	28-May	16-Jun-07	9:14	26-Jul-07	TP
E748065	RBRd	432913	7563171	Quarry 1	07-Jun	16-Jun-07	9:19	26-Jul-07	TP
E748066	RBRd	432978	7563238	Quarry 1	11-Jun	16-Jun-07	9:23	26-Jul-07	TP
E748067	RBRd	433027	7563063	Quarry 1	08-Jun	16-Jun-07	9:30	26-Jul-07	TP
E748068	RBRd	433102	7562978	Quarry 1	08-Jun	16-Jun-07	9:35	26-Jul-07	TP
E748069	RBRd	433148	7562678	Quarry 1	10-Jun	16-Jun-07	9:43	26-Jul-07	TP
E748070	RBRd	433123	7562547	Quarry 1	12-Jun	16-Jun-07	9:50	26-Jul-07	TP
E748071	RBRd	433099	7562432	Quarry 1	13-Jun	16-Jun-07	9:55	26-Jul-07	TP
E748096	RBRd	433064	7562308	Quarry 1	20-Jun	19-Jul-07	12:40	26-Jul-07	RS
E748097	RBRd	433082	7562386	Quarry 1	23-Jun	19-Jul-07	12:52	26-Jul-07	RS
E748098	RBRd	433112	7562491	Quarry 1	18-Jul	19-Jul-07	12:54	26-Jul-07	RS

Appendix A – ABA Samples Collected During Pre-Development Construction 2007 (Cont.)

Sample #	Location[1]	UTM 13W		Quarry	Date of Rock Placement	Sampling		Date of Analysis	Sampler[2]
		Easting	Northing			Date	Time		
E748099	RBRd	433135	7562626	Quarry 1	17-Jul	19-Jul-07	12:57	26-Jul-07	RS
E748100	RBRd	433140	7562798	Quarry 1	15-Jul	19-Jul-07	13:02	26-Jul-07	RS
E748101	RBRd	433123	7562903	Quarry 1	15-Jul	19-Jul-07	13:09	26-Jul-07	RS
E748102	RBRd	433073	7563033	Quarry 1	25-Jun	19-Jul-07	13:14	26-Jul-07	RS
E748103	RBRd	433050	7563095	Quarry 1	25-Jun	19-Jul-07	13:17	26-Jul-07	RS
E748104	RBRd	432961	7563110	Quarry 1	24-Jun	19-Jul-07	13:22	26-Jul-07	RS
E748105	RBRd	432847	7563226	Quarry 1	05-Jun	19-Jul-07	13:26	26-Jul-07	RS
E748106	RBRd	432705	7563226	Quarry 1	05-Jun	19-Jul-07	13:31	26-Jul-07	RS
E748107	RBRd	432567	7563207	Quarry 1	03-Jun	19-Jul-07	13:35	26-Jul-07	RS
E748108	RBRd	432577	7563173	Quarry 1	31-May	19-Jul-07	14:00	26-Jul-07	RS
E748109	RBRd	432536	7563155	Quarry 1	04-Jun	19-Jul-07	14:04	26-Jul-07	RS
E748110	RBRd	432483	7563152	Quarry 1	04-Jun	19-Jul-07	14:10	26-Jul-07	RS
E748112	RBLA	433016	7563136	Quarry 1	02-Jul	19-Jul-07	14:19	26-Jul-07	RS
E748113	RBLA	433038	7563170	Quarry 1	30-Jun	19-Jul-07	14:27	26-Jul-07	RS
E748114	RBLA	433039	7563193	Quarry 1	29-Jun	19-Jul-07	14:32	26-Jul-07	RS
E748115	RBLA	433034	7563226	Quarry 1	30-Jun	19-Jul-07	14:35	26-Jul-07	RS
E748116	RBLA	433013	7563246	Quarry 1	27-Jun	19-Jul-07	14:40	26-Jul-07	RS
E748117	RBLA	432997	7563265	Quarry 1	18-Jul	19-Jul-07	14:44	26-Jul-07	RS
E748118	RBLA	432975	7563269	Quarry 1	11-Jun	19-Jul-07	14:48	26-Jul-07	RS
E748119	RBLA	432963	7563255	Quarry 1	11-Jun	19-Jul-07	14:51	26-Jul-07	RS
E748120	RBLA	432990	7563246	Quarry 1	11-Jun	19-Jul-07	14:54	26-Jul-07	RS
E748121	RBLA	433006	7563228	Quarry 1	27-Jun	19-Jul-07	14:56	26-Jul-07	RS
E748122	RBLA	433012	7563203	Quarry 1	29-Jun	19-Jul-07	14:59	26-Jul-07	RS
E748123	RBLA	433011	7563177	Quarry 1	30-Jun	19-Jul-07	15:01	26-Jul-07	RS
E748124	RBLA	433001	7563157	Quarry 1	02-Jul	19-Jul-07	15:04	26-Jul-07	RS
E748125	RBLA	432981	7563134	Quarry 1	06-Jul	19-Jul-07	15:06	26-Jul-07	RS
E748126	RBLA	432951	7563154	Quarry 1	21-Jun	19-Jul-07	15:09	26-Jul-07	RS
E748127	RBLA	432970	7563183	Quarry 1	21-Jun	19-Jul-07	15:14	26-Jul-07	RS
E748128	RBLA	432986	7563210	Quarry 1	27-Jun	19-Jul-07	15:17	26-Jul-07	RS
E748129	RBLA	432958	7563233	Quarry 1	23-Jun	19-Jul-07	15:20	26-Jul-07	RS
E748130	RBLA	432917	7563260	Quarry 1	24-Jun	19-Jul-07	15:23	26-Jul-07	RS
E748131	RBLA	432950	7563284	Quarry 1	24-Jun	19-Jul-07	15:26	26-Jul-07	RS
E748132	RBLA	432885	7563233	Quarry 1	24-Jun	19-Jul-07	15:30	26-Jul-07	RS
E748133	RBLA	432907	7563212	Quarry 1	24-Jun	19-Jul-07	15:33	26-Jul-07	RS
E748134	RBLA	432931	7563237	Quarry 1	24-Jun	19-Jul-07	15:39	26-Jul-07	RS
E748135	RBLA	432948	7563209	Quarry 1	23-Jun	19-Jul-07	15:42	26-Jul-07	RS
E748136	RBLA	432930	7563190	Quarry 1	23-Jun	19-Jul-07	15:45	26-Jul-07	RS

1 Sampling Location Codes
PLTF = Patch Lake Tank Farm
RBJetty = Roberts Bay Jetty
RBRd = Roberts Bay Road
RBLA = Roberts Bay Laydown Area

2 Samples Collected by (Golder Associates Ltd.)
TP = Taylor Peck
RS = Rob Stack

Appendix B - Total Sulphur Analysis Test Results from CANTEST

CANTEST Ltd. 3650 Wesbrook Mall, Vancouver, BC Canada V6S 2L2 Tel: 604 224 4331 Fax: 604 224 0540 www.cantest.com

Table 1: Total Sulphur Results on 84 Doris North Samples - August 2007

S. No:		Sample ID	Total Sulphur (Wt. %)
1	PL	E748051	0.10
2	PL	E748052	0.18
3	PL	E748053	0.20
4	PL	E748054	0.09
5	PL	E748055	0.09
6	PL	E748057	0.17
7	PL	E748058	0.32
8	PL	E748059	0.12
9	PL	E748060	0.21
10	PL	E748061	0.20
11	Rob Rd	E748062	0.06
12	Rob Rd	E748063	0.08
13	Rob Rd	E748064	0.09
14	Rob Rd	E748065	0.10
15	Rob Rd	E748066	0.08
16	Rob Rd	E748067	0.09
17	Rob Rd	E748068	0.11
18	Rob Rd	E748069	0.08
19	Rob Rd	E748070	0.08
20	Rob Rd	E748071	0.07
21	Jetty	E748073	0.04
22	Jetty	E748074	0.06
23	Jetty	E748075	0.20
24	Jetty	E748076	0.08
25	Jetty	E748077	0.16
26	Jetty	E748078	0.08
27	Jetty	E748079	0.04
28	Jetty	E748080	0.06
29	Jetty	E748081	0.05
30	Jetty	E748082	0.15
Detection Limits			*0.02*
CANTEST Method Number			LECO

S. No:		Sample ID	Total Sulphur (Wt. %)
31	Jetty	E748083	0.07
32	Jetty	E748084	0.15
33	Jetty	E748085	0.07
34	Jetty	E748086	0.04
35	Jetty	E748087	0.09
36	Jetty	E748088	0.05
37	Jetty	E748089	0.08
38	Jetty	E748090	0.07
39	Jetty	E748091	0.12
40	Jetty	E748092	0.05
41	Jetty	E748093	0.11
42	Jetty	E748094	0.13
43	Jetty	E748095	0.07
44	Rob Rd	E748096	0.07
45	Rob Rd	E748097	0.08
46	Rob Rd	E748098	0.07
47	Rob Rd	E748099	0.09
48	Rob Rd	E748100	0.16
49	Rob Rd	E748101	0.16
50	Rob Rd	E748102	0.07
51	Rob Rd	E748103	0.10
52	Rob Rd	E748104	0.09
53	Rob Rd	E748105	0.22
54	Rob Rd	E748106	0.06
55	Rob Rd	E748107	0.07
56	Rob Rd	E748108	0.07
57	Rob Rd	E748109	0.09
58	Rob Rd	E748110	0.09
59	Jetty	E748111	0.07
60	Rob L	E748112	0.16
Detection Limits			*0.02*
CANTEST Method Number			LECO

S. No:	
61	Rob L
62	Rob L
63	Rob L
64	Rob L
65	Rob L
66	Rob L
67	Rob L
68	Rob L
69	Rob L
70	Rob L
71	Rob L
72	Rob L
73	Rob L
74	Rob L
75	Rob L
76	Rob L
77	Rob L
78	Rob L
79	Rob L
80	Rob L
81	Rob L
82	Rob L
83	Rob L
84	Rob L
Detection Limits	
CANTEST Method Nu	

Note: Total Sulphur done by LECO furnace

PL	Patch Lake Tank Farm
Rob Rd	Roberts Bay Roads
Jetty	Roberts Bay jetty
Rob L	Roberts Bay Beach Laydown Area

Table 2: QA/QC for Total Sulphur (84 Doris North Samples) - August 2007

Sample ID	Total Sulphur (Wt.%)	Total Sulphur (Wt.%)
Duplicates - Total Sulphur		
E748061	0.20	0.22
E748073	0.04	0.05
E748085	0.07	0.07
E748097	0.08	0.09
E748110	0.09	0.08
E748123	0.11	0.12
E748136	0.13	0.11
CANTEST Ref. (0.11% S)	0.10	0.13
STD CSC (4.19% S)	4.36	4.26
STD CSC (4.19% S)	4.43	4.52
STD CSC (4.19% S)	4.34	4.32

Sample Summary:	Miramar Mining Corp., Doris North 84 Samples, 26-Jul-07 Page 3 of 3
Date Samples Rec'd:	26-Jul-07
Date Instructions Rec'd:	30-Jul-07 (from Larry Connell)
Number of Samples:	84 Samples
Client Project Name:	Doris North
Sample Type:	Construction Rock from Q1
Sample Prep:	Cone Crushed, split and pulverized.
Date of analysis:	Between 20th and 27-Aug-07.

Name of Customer:	Miramar Mining Corporation
Contact Person:	Larry Connell
E-mail Address:	lconnell@miramarmining.com
Address:	899 Harbourside Drive, Suite 300 North Vancouver, BC Canada V7P 3S1
Contact No:	General Office: 604-985-2572 Direct Line: 604-904-5579 Cell No: 604-374-4142
Fax No:	604-980-0731

	Sign:
Report Released by:	Ivy Rajan
Position:	Lab Manager/Project Manager
Report Verified by:	Charmaine Chow
Position:	Lab Coordinator
Report Validated by:	Tim O'Hearn
Position:	Director, ARD Division, CANTEST Ltd.
CANTEST Project No:	2-21-900
Contact No:	604-224-4331 Extn. 230 (Ivy Rajan)
Contact No:	604-224-4331 Extn. 485 (Charmaine Chow)
Contact No:	604-224-4331 Extn. 241 (Tim O'Hearn)

Appendix C – ABA Test Results from CANTEST

CANTEST Ltd. 3650 Wesbrook Mall, Vancouver, BC Canada V6S 2L2 Tel: 604 224 4331 Fax: 604 224 0540 www.cantest.com

Table 1: ABA Test Results for 33 (of set of 84) Doris North Samples - September 2007

S. No:		Sample ID	Paste pH	CO2 (Wt.%)	CaCO3 Equiv. (Kg CaCO3/Tonne)	CaCO3 NPR	Total Sulphur (Wt.%)	Sulphate Sulphur (Wt.%)	Sulphide Sulphur* (Wt.%)	Maximum Potential Acidity** (Kg CaCO3/Tonne)	Neutralization Potential (Kg CaCO3/Tonne)
1	PL	E748051	8.9	1.09	24.8	8.8	0.10	0.01	0.09	2.8	57.0
2	PL	E748052	9.0	1.1	25.0	4.4	0.18	<0.01	0.18	5.6	58.2
3	PL	E748053	8.9	6.5	148.4	23.7	0.20	<0.01	0.20	6.3	178.5
4	PL	E748057	9.0	2.9	65.2	13.9	0.17	0.02	0.15	4.7	105.1
5	PL	E748058	8.9	1.6	36.8	3.8	0.32	0.01	0.31	9.7	86.1
6	PL	E748059	9.1	1.7	38.9	10.4	0.12	<0.01	0.12	3.8	104.4
7	PL	E748060	9.0	4.5	103.2	15.7	0.21	<0.01	0.21	6.6	155.7
8	PL	E748061	8.8	3.0	67.7	10.8	0.20	<0.01	0.20	6.3	114.6
9	Rob Rd	E748065	9.5	3.8	87.3	31.0	0.10	0.01	0.09	2.8	113.3
10	Rob Rd	E748068	9.4	4.4	98.9	31.6	0.11	0.01	0.10	3.1	133.5
11	Jetty	E748075	9.5	3.1	69.8	11.2	0.20	<0.01	0.20	6.3	163.3
12	Jetty	E748077	9.4	7.1	161.4	34.4	0.16	0.01	0.15	4.7	176.6
13	Jetty	E748082	9.5	3.9	88.6	18.9	0.15	<0.01	0.15	4.7	124.1
14	Jetty	E748084	9.6	3.3	74.1	16.9	0.15	0.01	0.14	4.4	112.7
15	Jetty	E748091	9.6	3.4	78.2	22.7	0.12	0.01	0.11	3.4	141.8
16	Jetty	E748093	9.5	1.6	35.2	10.2	0.11	<0.01	0.11	3.4	112.7
17	Jetty	E748094	9.4	2.4	55.5	13.7	0.13	<0.01	0.13	4.1	143.7
18	Rob Rd	E748100	9.5	3.3	75.9	16.2	0.16	0.01	0.15	4.7	132.9
19	Rob Rd	E748101	9.6	3.9	88.0	18.8	0.16	0.01	0.15	4.7	122.8
20	Rob Rd	E748103	9.6	2.9	65.9	23.4	0.10	0.01	0.09	2.8	115.8
21	Rob Rd	E748105	9.5	3.3	74.5	11.4	0.22	0.01	0.21	6.6	93.0
22	Rob L	E748112	9.5	3.2	73.4	15.7	0.16	0.01	0.15	4.7	117.7
23	Rob L	E748113	9.6	2.5	57.3	11.5	0.17	0.01	0.16	5.0	88.0
24	Rob L	E748115	9.5	3.2	73.2	18.0	0.13	<0.01	0.13	4.1	140.5
25	Rob L	E748116	9.4	4.1	93.0	17.5	0.17	<0.01	0.17	5.3	146.2
26	Rob L	E748117	9.7	2.2	49.3	17.5	0.10	0.01	0.09	2.8	98.7
27	Rob L	E748119	9.6	6.6	148.9	43.3	0.12	0.01	0.11	3.4	183.5
28	Rob L	E748121	9.6	3.7	83.4	29.7	0.10	0.01	0.09	2.8	127.2
29	Rob L	E748123	9.8	4.0	90.2	26.2	0.11	<0.01	0.11	3.4	124.1
30	Rob L	E748125	9.5	4.2	94.8	30.3	0.11	0.01	0.10	3.1	123.4
31	Rob L	E748131	9.5	3.5	80.5	13.6	0.20	0.01	0.19	5.9	97.5
32	Rob L	E748135	9.4	2.7	61.8	18.0	0.11	<0.01	0.11	3.4	103.8
33	Rob L	E748136	9.6	4.0	90.9	24.2	0.13	0.01	0.12	3.8	112.0
Detection Limits			*0.1*				*0.02*	*0.01*			
CANTEST Method Number			7160				LECO	7410	Calculation	Calculation	7110

*Based on difference between total sulphur and sulphate-sulphur
**Based on sulphide-sulphur
Total Sulphur by LECO furnace

NP Method Used: Standard Sobek NP Method

PL	Patch Lake Tank Farm
Rob Rd	Roberts Bay Roads
Jetty	Roberts Bay jetty
Rob L	Roberts Bay Beach Laydown Area

Table 2a: QA/QC for Paste pH & NP Determination on 33 (of set of 84) Doris North Samples - September 2007

Sample ID	Paste pH (pH Units)	Paste pH (pH Units)
Duplicates - Paste pH		
E748068	9.4	9.4
E748103	9.6	9.6
E748125	9.5	9.5
Sample ID	**Neutralization Potential (kgCaCO3/Tonne)**	**Neutralization Potential (kgCaCO3/Tonne)**
Duplicates - NP		
E748068	133.5	134.8
E748103	115.8	127.8
E748125	123.4	121.5
KZK-1 Reference (NP = 64.8)	68.4	-

Table 2b: QA/QC for Sulphur Speciation

Sample ID	Total Sulphur (Wt.%)	Total Sulphur (Wt.%)
Duplicates - Total Sulphur		
E748061	0.20	0.22
E748123	0.11	0.12
E748136	0.13	0.11
CANTEST Ref. (0.11% S)	0.10	0.13
STD CSC (4.19% S)	4.26	4.32
Sample ID	**Sulphate Sulphur (Wt.%)**	**Sulphate Sulphur (Wt.%)**
Duplicates - Sulphate Sulphur		
E748068	0.01	0.01
E748103	0.01	0.01
E748125	0.01	<0.01
CANTEST Ref. (0.27% SO4-S)	0.28	-

Table 2c: QA/QC for CO2

Sample ID	CO2 (Wt.%)	CO2 (Wt.%)
Duplicates - CO2		
E748123	3.97	3.93
STD CSC (1.50% CO2)	1.48	-

Sample Summary:	Miramar Mining Corp., Doris North 33 (of 84) Samples, 26-Jul-07 Page 3 of 3
Date Samples Rec'd:	26-Jul-07
Date Instructions Rec'd:	29-Aug-07 (from Larry Connell)
Number of Samples:	33 of 84 Samples rec'd requested for analyses.
Client Project Name:	Doris North
Sample Type:	Construction Rock from Q1
Sample Prep:	Cone Crushed, split and pulverized.
Date of analysis:	SO4-S: 6-Sep-07; ABA: 12-Sep-07.

Name of Customer:	Miramar Mining Corporation
Contact Person:	Larry Connell
E-mail Address:	lconnell@miramarmining.com
Address:	899 Harbourside Drive, Suite 300 North Vancouver, BC Canada V7P 3S1
Contact No:	General Office: 604-985-2572 Direct Line: 604-904-5579 Cell No: 604-374-4142
Fax No:	604-980-0731

	Sign:
Report Released by:	Ivy Rajan
Position:	Lab Manager/Project Manager
Report Verified by:	Charmaine Chow
Position:	Lab Coordinator
Report Validated by:	Tim O'Hearn
Position:	Director, ARD Division, CANTEST Ltd.
CANTEST Project No:	2-21-900
Contact No:	604-224-4331 Extn. 230 (Ivy Rajan)
Contact No:	604-224-4331 Extn. 485 (Charmaine Chow)
Contact No:	604-224-4331 Extn. 241 (Tim O'Hearn)

Appendix B

Summer 2007 Doris North Construction Program – Seepage Monitoring (Golder 2009)

MEMORANDUM

TO Chris Hanks, Hope Bay Mining Ltd. **DATE** 27 August 2009

CC file

FROM Angela Holzapfel and Gary Ash **PROJECT No.** 07-1373-0029

RE: QUARRY ROCK SEEP SURVEY RESULTS

Quarried rock was used in the construction of the road and laydown areas at Roberts Bay in 2007 (Figure 1). Surface water samples from seepage and runoff that had contacted quarried rock, as well as marine water quality samples, near the construction area, during placement of quarried rock in Roberts Bay, were collected in 2007. This memo summarizes results of the 2007 monitoring program.

Environmental sampling requirements were specified in the Nunavut Water Board Water License No: 2AM-DOH0713, as well as within the Miramar Hope Bay Ltd. "Monitoring and Follow-Up Plan"

Water Quality of Seepage in Contact with Quarried Rock Used in Construction

Part D "Conditions Applying to Construction" Item 21 of the Doris North water license states:

> *The Licensee shall conduct a Quarry Rock Seepage Monitoring and Management program in accordance with the Water Licence Application Monitoring and Follow-Up Plan, dated July 2007 and in accordance with the following:*
>
> *a. The seep survey shall measure pH and Electrical Conductivity (EC) levels in the precipitation runoff and snowmelt that comes into contact with rock along the roadways, building pads and quarry sites;*
>
> *b. The seep survey shall measure pH and EC levels at several reference points on the tundra not subject to mine influences;*
>
> *c. The quarry rock seepage program shall be conducted on any ephemeral seepage present at the time of the quarry rock seepage monitoring program and not at pre-determined seepage stations;*
>
> *d. A minimum of at least 10% of the total sample set shall be submitted for secondary analysis, regardless of the values of measured field pH and EC; and*
>
> *e. The Quarry Rock Seepage Monitoring Program shall be expanded beyond the 100 samples to include monitoring of all rock drains.*

In Section 7.1 of the July 2007 Monitoring and Follow-Up Plan, MHBL made the following commitments:

> *A seep survey will be conducted in the first spring freshet following the major earthworks construction along the roadways and beside the pads to measure pH levels in the precipitation runoff and snowmelt that comes in contact with this rock. The pH of each seep will be measured using a field pH meter with the following data recorded:*

- Location of sample point;
- GPS coordinates of sample point;
- Name of the person who performed the sampling;
- Date and time of sampling;
- Date of analysis;
- Name of the person who performed the analysis;
- Analytical method or techniques used; and
- Results of analysis.

The data will be cross-referenced to a site infrastructure map. The objective is to collect approximately 100 samples from across the site (spread to capture a representative cross-section of all rockfill used in site construction) to verify that the rock used in construction is non-acid generating. In any location where the field pH is below 5.0 or above 8.0, a water sample will be collected and submitted for analysis for pH, Total Sulphate, Total Ammonia, Nitrate, Alkalinity, Dissolved Al, As, Cd, Cu, Pb, Ni, and Zn.

Any potentially acid generating rock located by this means will be tagged for removal and replacement during the next winter season. The material removed will be moved to the temporary waste rock stockpile to be placed underground.

Given that pre-development construction at the Doris North Project began in May 2007, prior to the spring snow melt, the seep survey was initiated one year earlier than initially planned. Additionally, samples were collected in Roberts Bay during, and shortly after, construction of the jetty. It should be noted that during the 2007 monitoring program, only the quarry, laydown area, road to the jetty and only a portion of the main road had been constructed prior to snow melt, and the jetty was in the process of being completed. As the remainder of the road was yet to be constructed, the seepage monitoring program was only partially implemented in 2007.

Seepage from snow melt was first observed flowing through rock placed during road construction west of the jetty site on 15 June 2007. Three small, ephemeral drainages (Figure 1), which either emerged from under the placed rock fill, or flowed nearby it, were sampled during the construction season.

Sampling in Roberts Bay was conducted as jetty construction proceeded offshore. Jetty construction was conducted within a silt curtain, which was deployed prior to proceeding with works below the high tide mark. Sampling occurred at various locations inside and outside the silt curtain (Figure 1) between 8 and 16 July.

Samples collected from seeps and in Roberts Bay were analyzed for pH, conductivity, nitrite (NO_2), nitrite+nitrate (NO_2+NO_3), ammonia (NH_3), and total suspended solids (TSS). Nitrate (NO_3) was calculated from the nitrite+nitrate and nitrite concentrations. Analytical methods are presented in Table 1. When the pH is below 5.0 or above 8.0, total sulphate and dissolved metals analyses were required. As there was only one sample above pH 8.0, and no samples below pH 5.0, the sample was not sent for these extra analyses in error.

Figure 1: Water Quality Sampling Locations Near Roberts Bay

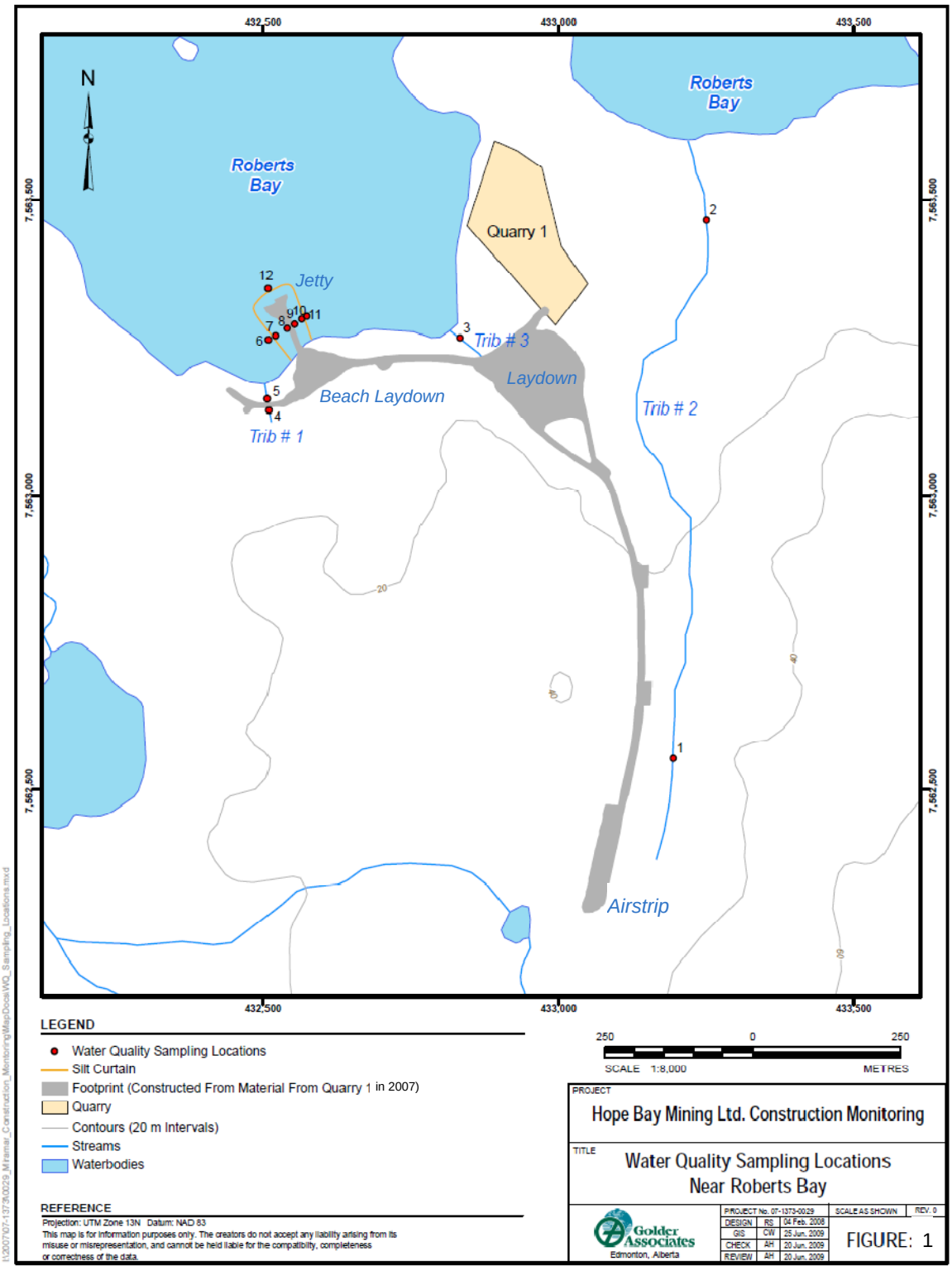


Table 1: Analytical Methods, 2007.

Parameter	Method
Water Temperature (C^o)	In Situ: Horiba U-22X
pH	In Situ: Horiba U-22X
Cond. (uS/cm)	In Situ: Horiba U-22X
NH_3 (mg/L)	APHA 4500-NH3
NO_2 + NO_3 (mg/L)	APHA 4110 B
NO_2 (mg/L)	APHA 4110 B
TSS (mg/L)	APHA 2540 D-Gravimetric

Note: NH_3, NO_2+NO_3, NO_2, and TSS were analyzed by the Alberta Research Council.

In total, 19 water quality samples were collected with respect to seepage from, or near, rock fill placed on the tundra, or placed in Roberts Bay during jetty construction.

- Seepage (roads, laydown area) 5 samples
- Roberts Bay Jetty 14 samples

Additionally, pH was measured at a total of 14 reference sites (tundra pools) located south of Roberts Bay to determine background pH conditions in areas not subject to mine influences (Figure 2).

All five freshwater seeps had pH values within the Canadian Council for the Ministry of the Environment (CCME) guideline (pH 6.5 to 9.0; CCME 1999); however, Tributary 3 had a pH value of 8.2.The sample from Tributary 3 also had a TSS concentration of 487 mg/L, exceeding the maximum concentration (100 mg/L) for a grab sample, as outlined in the WL, and exceeding the CCME guideline (maximum 25 mg/L increase from background concentrations). The remaining 5 seeps had TSS concentrations below the WL guideline. Electrical conductivity ranged from 156 to 197 µS/cm. Ammonia, nitrate, and nitrite were consistently below the CCME guidelines.

All 14 samples collected in the vicinity of the Roberts Bay jetty had pH within the CCME guideline (pH 7.0 to 8.7) (Table 3). Conductivity ranged from 6680 to 7200 µS/cm. Nitrate+nitrate were below the CCME guidelines for nitrate in all samples. Only sample point 8 exceeded the CCME guideline for increases in TSS (maximum 25 mg/L increase from background concentrations, and all TSS concentrations were below the WL limits. Guidelines have not yet been developed for the remaining marine water quality parameters that were measured in Roberts Bay.

The 14 tundra pools only had pH recorded (Table 4). Values at all tundra pools ranged from pH 5.37 (below the CCME lower limit of pH 6.5) to 7.69, which are slightly below, or similar to, the pH values recorded at the freshwater seeps in contact with the quarry rock. Conductivity was not measured in the ponds in error.

Figure 2: Small Tundra Pool pH Measurement Locations

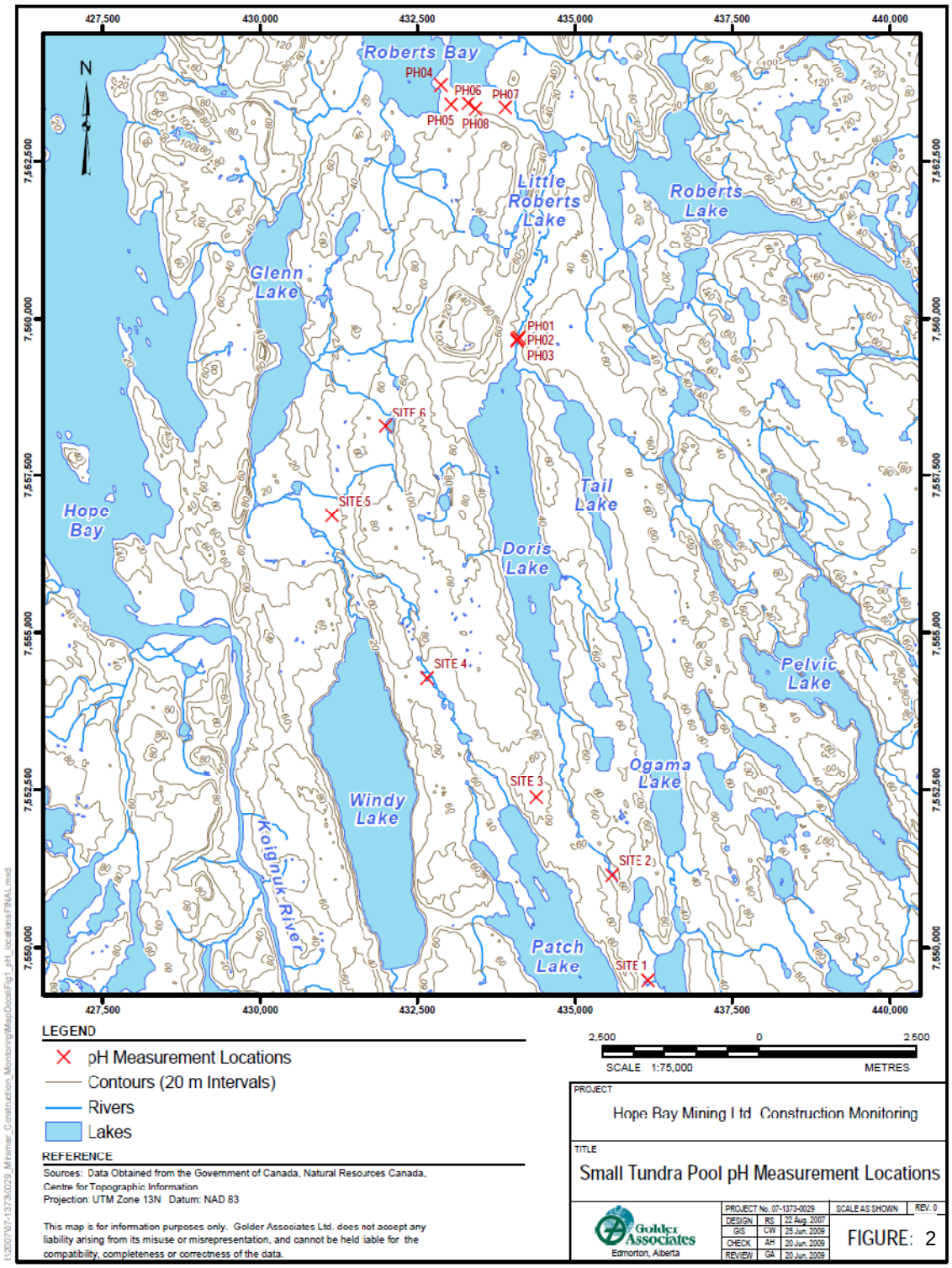


Table 2: Water Quality Data for Meltwater (Freshwater) Seeps in Contact With Quarry Rock Fill During Construction of Roads, Laydown Area, and Jetty in Roberts Bay, 2007.

Waterbody	Sample Point	UTM 13W		Exposure or Control	Field	Sample Collection		Water Temp (C^o)	pH	Cond. (uS/cm)	NH_3 (mg/L)	$NO_2 + NO_3$ (mg/L)	NO_2 (mg/L)	NO_3 (mg/L)	TSS (mg/L)
		Easting	Northing			Date	Time								
Tributary 1	5	432538	7563142	E	d/s	15-Jun	16:00	1	6.96	163	0.017	0.005	0.002	0.003	80
Tributary 1	4	432503	7563177	C	u/s	15-Jun	16:00	1	7.01	156	0.010	0.008	0.002	0.006	2
Tributary 2	2	433172	7563564	E	d/s	22-Jun	17:10	6	6.89	181	0.016	<0.005	0.002	<0.005	na
Tributary 2	1	433164	7562611	C	u/s	22-Jun	16:30	6	7.04	176	0.023	0.005	0.002	0.003	na
Tributary 3	3	432808	7563303	E	d/s	23-Jun	17:10	8	8.20	197	0.161	0.177	0.016	0.161	487

Note: All samples were collected by Rob Stack. All samples were analyzed by the Alberta Research Council. d/s = downstream. u/s = upstream.

Table 3: Water quality data for marine samples collected during construction of jetty using quarry blasted rock fill in Roberts Bay, 2007.

Waterbody	Sample Point	UTM 13W		Exposure or Control	Field	Sample Collection		Water Temp. (^oC)	pH	Cond. (uS/cm)	NH3 (mg/L)	$NO_2 + NO_3$ (mg/L)	NO_2 (mg/L)	NO_3 (mg/L)	TSS (mg/L)
		Easting	Northing			Date	Time								
Roberts Bay	12	432504	7563385	C	OSC	8-Jul	16:30	9	7.72	7160	0.009	<0.005	<0.001	<0.005	4
Roberts Bay	11	432572	7563342	C	OSC	11-Jul	16:30	14	7.37	6730	0.009	<0.005	<0.001	<0.005	2
Roberts Bay	11	432572	7563342	C	OSC	13-Jul	11:00	15	7.53	6830	0.009	<0.005	<0.001	<0.005	3
Roberts Bay	6	432493	7563306	C	ISC	14-Jul	10:30	15	7.42	6910	0.010	0.006	<0.001	0.006	4
Roberts Bay	6	432493	7563306	C	ISC	15-Jul	12:00	17	7.51	6670	0.010	0.013	0.001	0.012	7
Roberts Bay	11	432572	7563342	C	OSC	16-Jul	12:30	17	7.58	6780	0.021	na	na	na	23
Roberts Bay	8	432545	7563331	E	ISC	8-Jul	17:00	12	7.38	7200	0.024	<0.005	<0.001	<0.005	76
Roberts Bay	10	432570	7563341	E	ISC	11-Jul	16:30	14	7.64	6680	0.013	<0.005	<0.001	<0.005	3
Roberts Bay	10	432570	7563341	E	ISC	13-Jul	11:00	15	7.48	6770	0.009	<0.005	<0.001	<0.005	3
Roberts Bay	7	432491	7563305	E	OSC	14-Jul	10:30	15	7.39	6790	0.009	<0.005	<0.001	<0.005	1
Roberts Bay	8	432505	7563308	E	ISC	15-Jul	16:00	19	7.45	6710	0.022	<0.005	<0.001	<0.005	11
Roberts Bay	7	432491	7563305	E	OSC	15-Jul	12:30	17	7.47	6890	0.010	<0.005	<0.001	<0.005	9
Roberts Bay	9	432545	7563331	E	ISC	16-Jul	12:00	19	7.33	6940	0.045	0.035	0.003	0.032	8
Roberts Bay	10	432570	7563341	E	ISC	16-Jul	12:30	17	7.41	6880	0.044	0.032	0.003	0.029	9

Note: All samples were collected by Rob Stack. All samples were analyzed by the Alberta Research Council. OSC = outside silt curtain. ISC = inside silt curtain.

Table 4: Tundra pond pH, 2007.

Site	UTM 13W		Date	Time	pH
	Easting	Northing			
Site 1	430091	7550875	22-Jun-07	11:41	5.37
Site 2	430098	7550872	22-Jun-07	13:56	6.09
Site 3	430038	7551127	22-Jun-07	16:21	6.17
Site 4	430011	7551140	22-Jun-07	9:17	6.51
Site 5	429373	7554957	22-Jun-07	11:16	6.72
Site 6	429364	7555111	22-Jun-07	14:47	6.76
PH01	434114	7559698	23-Jun-07	11:29	6.67
PH02	434084	7559674	24-Jun-07	11:41	7.11
PH03	434079	7559649	25-Jun-07	11:51	7.69
PH04	432874	7563705	26-Jun-07	15:00	7.56
PH05	433038	7563392	27-Jun-07	15:36	7.3
PH06	433306	7563415	28-Jun-07	15:52	6.98
PH07	433894	7563346	29-Jun-07	16:27	6.64
PH08	433424	7563323	30-Jun-07	16:42	6.13

Note: All samples were collected by Paul Emery and Rob Stack.

CLOSURE

We trust that this memo meets your present requirements. Please contact the undersigned at (780) 483-3499 if you have questions or require further information.

GOLDER ASSOCIATES

Angela Holzapfel, M.Sc., P.Biol.
Aquatic Biologist

Gary Ash, M.Sc., P.Biol.
Senior Fisheries Biologist, Principal

CC/AH/GA/cc

REFERENCES

Canadian Council of Ministers of the Environment (CCME). 1999. Canadian Environmental Quality Guidelines. Winnipeg, MB.

Appendix C
2009 Quarry Rock Seepage Monitoring Program (SRK 2009)

Hope Bay Mining Ltd.

Hope Bay Project
Quarry Rock Seepage Monitoring

Prepared for:

Hope Bay Mining Ltd.

Prepared by:

SRK Consulting
Engineers and Scientists

Project Reference Number
SRK 1CH008.023

September 2009

Hope Bay Project

Quarry Rock Seepage Monitoring

Hope Bay Mining Ltd.

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SRK Project Number 1CH008.023

September 2009

Executive Summary

As part of the water licence application, Miramar Hope Bay Ltd. (MHBL) presented verification and monitoring plans to confirm that the potential for ARD and metal leaching from quarry rock used in the construction of the roads, airstrip, and camp area at Doris is very low. These monitoring commitments were included in the Monitoring and Follow-up Plan for the site and in the current Water Licence (2AM-DOH0713). The commitments included a detail seep survey around the roads, airstrip, camp area and quarries in the Doris area.

A seep survey was completed in June 2009. A total of 125 sites, including 5 reference sites were established and field pH and electrical conductivity readings were taken. Samples were collected from all ten sites with pHs exceeding 8, seven of the more typical sites with pHs between 7 and 8, and all five reference sites. These samples were submitted for a full suite of laboratory analyses.

Most of the samples had pHs ranging from 7 to 8 and conductivity readings in the range of 200 to 400 µS/cm. Approximately 10% of the sites had field pHs between 8 and 8.5, and approximately 8% of the sites had pH's between 6.5 and 7. Approximately 25% of the samples had field conductivities greater than 500 µS/cm, and eight of these samples had conductivity readings greater than 1000 µS/cm. Samples with higher conductivity tended to be in areas with little or no flow. Almost all of the conductivity readings from the seepage sites were higher than the results observed for the reference sites. There were relatively few opportunities to take field readings from flows passing through the road and airstrip. However, where this was possible, there was relatively little difference in the upstream and downstream results.

Higher pHs were found in the Roberts Bay/Quarry 1 area and in the general vicinity of Quarry 2. The higher pH may be attributed to the relatively higher proportion of outcrop and exposed rock in these areas, and therefore increased contact of water with carbonate minerals in these rocks.

Nitrate and ammonia were also somewhat elevated in two ponded water samples from Quarry 1 and one flowing seep from Quarry 2. These are likely to have originated from blasting activities in those areas.

Metal concentrations were low and were generally lower than indicated by shake flask extraction tests completed on test samples prior to development (SRK 2008). Copper concentrations were slightly above the CCME guidelines in both the seepage stations and in reference locations not influenced by development activities.

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1 Introduction

As part of the water licence application, Miramar Hope Bay Ltd. (MHBL) presented verification and monitoring plans to confirm that the potential for ARD and metal leaching from quarry rock used in the construction of the roads, airstrip, and camp area at Doris is very low. These monitoring commitments were included in the Monitoring and Follow-up Plan for the site and in the current Water Licence (2AM-DOH0713). The commitments included a detail seep survey around the roads, airstrip, camp area and quarries in the Doris area. The intent was to complete this survey during the first spring freshet following construction, and then for an additional two years.

MHBL completed a seepage survey during the 2007 spring freshet (see accompanying memo by Golder Associates), following the first season of construction. After Hope Bay Mining Ltd. (HBML) assumed ownership of the site, SRK were asked to complete a seepage survey covering the full extent of the infrastructure areas. Due to timing and logistical constraints, the program could not be completed until the 2009 spring freshet.

This report presents results of the 2009 seep survey.

2 Methods

2.1 Water License Requirements

Part D "Conditions Applying to Construction" Item 21 of the Water License states:

> *The Licensee shall conduct a Quarry Rock Seepage Monitoring and Management program in accordance with the Water Licence Application Monitoring and Follow-Up Plan, dated July 2007 and in accordance with the following:*
>
> *a. The seep survey shall measure pH and Electrical Conductivity (EC) levels in the precipitation runoff and snowmelt that comes into contact with rock along the roadways, building pads and quarry sites;*
>
> *b. The seep survey shall measure pH and EC levels at several reference points on the tundra not subject to mine influences;*
>
> *c. The quarry rock seepage program shall be conducted on any ephemeral seepage present at the time of the quarry rock seepage monitoring program and not at pre-determined seepage stations;*
>
> *d. A minimum of at least 10% of the total sample set shall be submitted for secondary analysis, regardless of the values of measured field pH and EC; and*
>
> *e. The Quarry Rock Seepage Monitoring Program shall be expanded beyond the 100 samples to include monitoring of all rock drains.*

The 2007 Monitoring and Follow-up Plan (MHBL 2007) requires that in any location where the field pH is below 5.0 or above 8.0, a water sample will be collected and submitted for analysis of pH, sulphate, total ammonia, nitrate, alkalinity, and dissolved Al, As, Cd, Cu, Pb, Ni and Zn concentrations.

2.2 Seep Survey and Sample Collection

The seep survey was carried out during the last week of June 2009. Seep survey locations were established by walking the toes of all roadways, building pads and quarry sites (Figures 1 to 3). Reference point samples were collected in the vicinity of proposed Quarry A (Figure 4).

A total of 125 sites, including five reference points, were established and field pH and electrical conductivity measurements were taken. Field measurements were taken at all locations where flow was observed flowing into or out of construction rock material. Field measurements were also taken at locations where a "drainage" sign had been placed, presumably indicating that flows have been observed in the past. However, many of these locations were not flowing at the time of the seep survey.

A total of 22 samples, including reference points, were collected and submitted for analysis. Ten of the sites were selected for analysis because they had field pHs greater than 8.0. An additional seven sites representing flowing seeps that clearly originated from quarries or facilities that were constructed using quarry rock were randomly selected for analysis. All five reference sites were selected for analysis.

2.3 Laboratory Analysis

Samples were submitted to ALS-Chemex, Vancouver BC for analysis of nutrients (ammonia and nitrate) routine parameters (pH, alkalinity and sulphate) and a full suite of dissolved metals by ICP-MS.

3 Results

3.1 Field Measurements

A complete record of field measurements is provided in Appendix A.

3.1.1 Seepage Sites

The distribution of samples according to the field pH and conductivity readings is shown in Table 1.

The vast majority of seepage sites had field pH measurements between 7 and 8. Approximately 8% of the sites had pH between 6.5 and 7 and approximately 10% of the sites had field pH between 8 and 8. Samples with field pH between 8 and 8.5 were concentrated in the Quarry 1/ Robert's Bay area (Figure 1) and near Quarry 2 (Figure 3). Samples with field pH between 6.5 and 7 were concentrated in an area immediately south of the airstrip (Figure 2), and in a few isolated locations near Quarry 2 and the road between the camp and Doris Lake (Figure 3). All of the samples pH values between 6.5 and 7 were in areas with very little to no flow.

Field conductivity readings were typically in the range of 200 to 400 µS/cm (median of 286 µS/cm). About a quarter of samples had field conductivity greater than 500 µS/cm and 8 of these samples (or about 7% of the total) had conductivity readings greater than 1000 µS/cm (with a maximum conductivity reading of 6300 µS/cm). All of the sites with conductivity readings greater than 1000 µS/cm were in areas with very little to no flow.

Table 1: Distribution of Samples according to Field pH and Conductivity (EC)

	Number of Samples		
	pH 6.5 to 7	**pH 7 to 8**	**pH 8 to 8.5**
EC > 500 µS/cm	2	23	3
EC ≤ 500 µS/cm	7	78	7

There were relatively few locations where flows were observed on both the upstream and downstream side of the road. Field measurements for these sites are provided in Table 2. The results indicate that pH and conductivity of the water was not significantly affected by flowing through the quarry rock material.

Table 2: Comparison of Upstream and Downstream Samples

Sample ID		Field pH (s.u.)		Field Conductivity (µS/cm)	
Upstream	Downstream	Upstream	Downstream	Upstream	Downstream
HB47	HB48	8.0	7.9	122	123
HB73	HB74	7.7	7.9	227	212
HB95	HB96	7.7	7.6	193	254
HB110	HB111	7.8	7.8	240	287

3.1.2 Reference Sites

Field pH for the five reference sites ranged from 7.6 to 8.3. Field conductivities ranged from 48 to 75 µS. The field conductivities were consistently lower than the range of values observed at the seepage sites.

3.2 Laboratory Analysis

A summary of water quality analyses is presented in Table 3. Complete results are provided in Appendix B.

3.2.1 Samples with Field pH between 8.0 and 8.5

As discussed previously, the water licence specified that all samples with field pH readings greater than 8 should be submitted for laboratory analyses. Laboratory pH values for these samples were consistently less than field pH values, ranging from 7.7 to 8.3. Only 4 of the 10 samples had laboratory pH values greater than 8.0. Alkalinity was the dominant anion in all of these samples, ranging from 31 to 210 mg $CaCO_3$/L, which is typical of water in contact with carbonate minerals. Sulphate concentrations were low to moderate ranging from 0.64 to 81 mg/L (median 10 mg/L). Ion balance calculations for most samples indicated an appreciable deficit of anions (median % difference between anions and cations of 38%). Chloride was not included in the analyses, and may be largely responsible for this difference, potentially exceeding sulphate concentrations in many of the samples. The major cation for 6 of the 10 samples was sodium ranging from 18 to 70 mg/L (followed by calcium ranging from 9 to 29 mg/L). Calcium was the major cation for the remaining 4 samples ranging from 8 to 86 mg/L (followed by sodium ranging from 4 to 70 mg/L). Magnesium concentrations ranged from 0.7 to 18 mg/L and potassium ranged from below the detection limit of 2 mg/L up to 8 mg/L.

Ammonia concentrations ranged from below detection (<0.02 mg N/L) to 1.7 mg/L (median 0.18 mg N/L). Nitrate concentrations ranged from below detection (<0.005 mg N/L) to 5.6 mg/L (median 0.83 mg N/L). Three samples (HB54, HB55 and HB116) had nitrate concentrations greater than CCME guidelines for fresh water aquatic life. One of these (HB116) also had ammonia concentration greater than CCME guidelines. HB54 and HB55 were ponded water samples located in the vicinity of Quarry 1. HB116 was surface flow originating from Quarry 2.

Dissolved metal concentrations were generally low; however, most samples had dissolved copper concentrations greater than CCME guidelines for fresh water aquatic life. Aluminum concentrations ranged from 0.012 to 0.067 mg/L (median 0.029 mg/L), arsenic concentrations ranged from 0.00014 to 0.0015 mg/L (median 0.00047 mg/L) and copper concentrations ranged from 0.0011 to 0.0080 mg/L (median 0.0024 mg/L). Cadmium, lead, nickel and zinc concentrations were near or below detection limit values for all samples.

3.2.2 Typical (pH 7 to 8) Seepage Samples

The more typical seepage samples with field pHs between 7 and 8 had laboratory pH values ranging from 7.4 to 7.8 and alkalinity values ranging from 75 to 120 mg $CaCO_3$/L. Although these concentrations were lower than in the pH 8 to 8.5 samples, alkalinity was still the dominant anion. Sulphate concentrations were generally lower than the pH 8 to 8.5 seeps, and ranged from 2.3 to 35 mg/L (median 3.5 mg/L). Ammonia and nitrate concentrations were also typically lower for these samples, ranging from 0.025 to 0.50 mg/L (median 0.094 mg/L) and 0.019 to 1.7 mg/L (median 0.10 mg/L), respectively. Ion balance calculations for most samples indicated an appreciable deficit of anions (median % difference between anions and cations of 23%). As discussed previously, chloride may be largely responsible for this difference, and if so, could exceed sulphate concentrations in many of the samples.

Calcium was the major cation for all but one sample ranging from 19 to 35 mg/L followed by sodium with concentrations ranging from 9 to 66 mg/L. Magnesium concentrations ranged from 5 to 9 mg/L and potassium concentrations were near or below the detection limit of 2 mg/L.

Dissolved metal concentrations were generally low and similar to concentrations reported for the pH 8 to 8.5 seeps (Section 3.2.1). All samples had copper concentrations greater than CCME guidelines for fresh water aquatic life.

3.2.3 Reference Point Samples

Reported pH values for reference point samples ranged from 7.3 to 7.7. Alkalinity and sulphate concentrations were typically lower for reference point samples compared to seepage samples collected from areas influenced by construction. Alkalinity ranged from 18 to 35 mg $CaCO_3$/L (median 23 mg $CaCO_3$/L) and sulphate ranged from <0.5 to 1.5 mg $CaCO_3$/L. Ammonia and nitrate concentrations were near or below detection limit values (0.02 and 0.005 mg/L, respectively) for all reference point samples. Ion balance calculations were within acceptable limits.

Calcium was the major cation for all samples ranging from 6 to 11 mg/L. Sodium and potassium concentrations were near or below the detection limit of 2 mg/L. Magnesium concentrations ranged from 0.9 to 1.3 mg/L.

Dissolved metal concentrations were very low for all reference point samples; however, all samples had copper concentrations greater than CCME guidelines for fresh water aquatic life.

Table 3: Summary of Water Quality Results

	Sample ID	pH	Alkalinity	SO_4	Ammonia	Nitrate	Al	As	Cd	Cu	Pb	Ni	Zn
	Units	**s.u.**	**mg $CaCO_3$/L**	**mg/L**	**mg N/L**	**mg N/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
	CCME fresh water guideline	**6.5 - 9**			**pH and temperature dependent**	**2.9**	**0.1**	**0.005**	**0.000017**	**0.002 - 0.004**	**0.001**	**0.025**	**0.03**
Samples with field pH > 8.0	HB46	8.34	213	10.4	<0.020	<0.0050	0.0141	0.00097	<0.000017	**0.00435**	<0.000050	0.00147	<0.0010
	HB53	7.85	70.8	4.14	0.037	0.0191	0.0578	0.00016	<0.000017	**0.00226**	0.000115	<0.00050	0.0013
	HB54	8.08	133	55	0.047	**4.28**	0.0426	0.00083	<0.000034	**0.0022**	0.00015	<0.0010	<0.0020
	HB55	7.83	139	80.8	0.735	**5.62**	0.0123	0.00067	<0.000034	**0.00381**	<0.00010	<0.0010	<0.0020
	HB57	7.7	31.3	0.64	0.271	0.185	0.0358	0.00014	<0.000017	0.0011	<0.000050	<0.00050	<0.0010
	HB59	7.9	76.3	10.4	1.03	1.47	0.0289	0.00041	<0.000017	**0.00804**	0.000056	<0.00050	<0.0010
	HB60	7.84	46.6	5.29	0.084	0.0718	0.0293	0.00027	<0.000017	**0.00492**	<0.000050	<0.00050	<0.0010
	HB116	8.17	42.6	20.1	**1.73**	**4.07**	0.0666	0.0015	<0.000017	**0.00257**	<0.000050	<0.00050	<0.0010
	HB118	7.53	37.7	1.98	<0.020	0.0528	0.0183	0.00047	<0.000017	0.00144	<0.000050	<0.00050	<0.0010
	HB119	8.02	209	19.5	0.037	<0.0050	0.0119	<0.0020	<0.000017	0.00212	<0.000050	0.00065	0.001
Typical (pH 7 to 8) Seepage Samples	HB2	7.74	120	35.4	0.498	1.65	0.0145	0.00056	<0.000017	**0.00494**	<0.000050	0.0008	<0.0010
	HB15	7.81	75.7	10.8	0.025	0.0382	0.0134	0.00047	<0.000017	**0.00484**	0.000063	0.00162	<0.0010
	HB36	7.44	75.1	3.51	0.094	0.114	0.0661	0.00154	<0.000017	**0.0118**	0.000086	0.00125	<0.0010
	HB74	7.7	96.3	2.28	0.029	<0.0050	0.0118	0.00026	<0.000017	**0.00453**	<0.000050	0.00093	0.0024
	HB95	7.59	107	2.79	0.297	0.0963	0.019	0.00026	<0.000017	**0.00368**	<0.000050	0.00264	<0.0010
	HB109	7.47	96.6	2.91	0.065	0.0188	0.0175	0.00024	<0.000017	**0.00593**	<0.000050	0.00096	<0.0010
	HB114	7.61	109	3.86	0.186	0.105	0.0095	0.00086	<0.000017	**0.00532**	<0.000050	0.00078	<0.0010
Reference Points	HB121	7.73	30.4	1.45	0.02	<0.0050	0.0093	0.00012	<0.000017	**0.00407**	<0.000050	<0.00050	<0.0010
	HB122	7.47	23.2	0.87	<0.020	<0.0050	0.0098	<0.00010	<0.000017	**0.00466**	<0.000050	<0.00050	<0.0010
	HB123	7.55	35	1.27	0.02	0.0061	0.0389	<0.00010	<0.000017	**0.00727**	<0.000050	0.00065	0.0012
	HB124	7.73	19.4	<0.50	<0.020	<0.0050	0.0145	<0.00010	<0.000017	**0.00619**	0.000312	<0.00050	0.0025
	HB125	7.29	17.8	<0.50	<0.020	<0.0050	0.0076	<0.00010	<0.000017	**0.00354**	<0.000050	<0.00050	<0.0010

4 Discussion

The majority of water in contact with quarry rock had field pH between 7 and 8 and field conductivity less than 500 µS/cm. The range of pHs was similar to that of reference point locations while conductivities were generally higher at the seepage stations that were associated with the quarry rock.

Samples that had pH greater than 8 were concentrated in the Quarry 1/ Robert's Bay area and the Quarry 2 area. These areas generally had higher nitrate and ammonia concentrations as well, with 2 samples having nitrate concentrations above CCME guidelines and one sample having both nitrate and ammonia concentrations above CCME guidelines. The Quarry 1/Robert's Bay area is currently used for storage of fuel drums and other mining supplies, and Quarry 2 is an active quarry with recent blasting activities. The nitrate and ammonia in these locations is likely to have originated from blasting activities. Higher pHs may be attributed to the relatively higher proportion of outcrop and exposed rock in these areas, and therefore increased contact of water with carbonate minerals in the rock.

Nearly all samples submitted for chemical analysis had dissolved copper concentrations that were slightly greater than CCME guidelines for fresh water aquatic life, including reference stations that had not been influenced by quarry rock or other mining activities. Metal concentrations were also generally lower than indicated by shake flask extraction tests completed prior to mining. Notably, aluminum concentrations in seeps were in the range of 0.0095 to 0.066 mg/L versus 0.17 to 2.17 mg/L in shake flask tests completed on samples from Quarries A to E (SRK 2008), copper concentrations in seeps were 0.0014 to 0.012 mg/L versus 0.001 to 0.031 mg/L in shake flask tests, and iron concentrations in seeps were <0.03 to 0.55 mg/L versus <0.05 to 4.9 mg/L in the shake flask tests.

"This report and the opinions and conclusions contained herein ("Report") contains the expression of the professional opinion of SRK Consulting (Canada) Inc. ("SRK") as to the matters set out herein, subject to the terms and conditions of the agreement dated September 30, 2008 (the "Agreement") between Consultant and Hope Bay Mining Ltd. ("Hope Bay Mining"), the methodology, procedures and sampling techniques used, SRK's assumptions, and the circumstances and constraints under which Services under the Agreement were performed by SRK. This Report is written solely for the purpose stated in the Agreement, and for the sole and exclusive benefit of Hope Bay Mining, whose remedies are limited to those set out in the Agreement. This Report is meant to be read as a whole, and sections or parts thereof should thus not be read or relied upon out of context. In addition, this report is based in part on information not within the control of SRK. Accordingly, use of such report shall be at the user's sole risk. Such use by users other than Hope Bay Mining and its corporate affiliates shall constitute a release and agreement to defend and indemnify SRK from and against any liability (including but not limited to liability for special, indirect or consequential damages) in connection with such use. Such release from and indemnification against liability shall apply in contract, tort (including negligence of SRK whether active, passive, joint or concurrent), strict liability, or other theory of legal liability; provided, however, such release, limitation and indemnity provisions shall be effective to, and only to, the maximum extent, scope or amount allowable by law."

This final report, "**1CH008.023 – Quarry Rock Seepage Monitoring, Hope Bay Project**," was prepared by SRK Consulting (Canada) Inc.

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5 References

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Nunavut Water Board License Licence No: 2AM-DOH0713. September 19, 2007.

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Figures

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HB46
HB47
HB48
HB49
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HB68
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HB72
HB73
HB74
HB75
HB76
HB79
HB80
Quarry 1
Robert's Bay

Legend:

- 7<pH<8, cond > 500µS
- 7<pH<8, cond < 500µS
- pH>8, cond > 500µS
- pH>8, cond < 500µS
- Sample Submitted for Chemical Analysis

1:5000

0 100 200 300 Meters

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FILE NAME: Doris site-Layout.dwg

HOPE BAY MINING LTD.

Hope Bay Gold Project

Quarry Rock Seepage Monitoring

Seep Survey Locations North

DATE:	APPROVED:	FIGURE:
Sep. 2009	–	1

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Notes:

1. All dimensions and elevations are in Metres.

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Quarry Rock Seepage Monitoring

Seep Survey Locations
Central

DATE:	APPROVED:	FIGURE:
Sep. 2009	–	2

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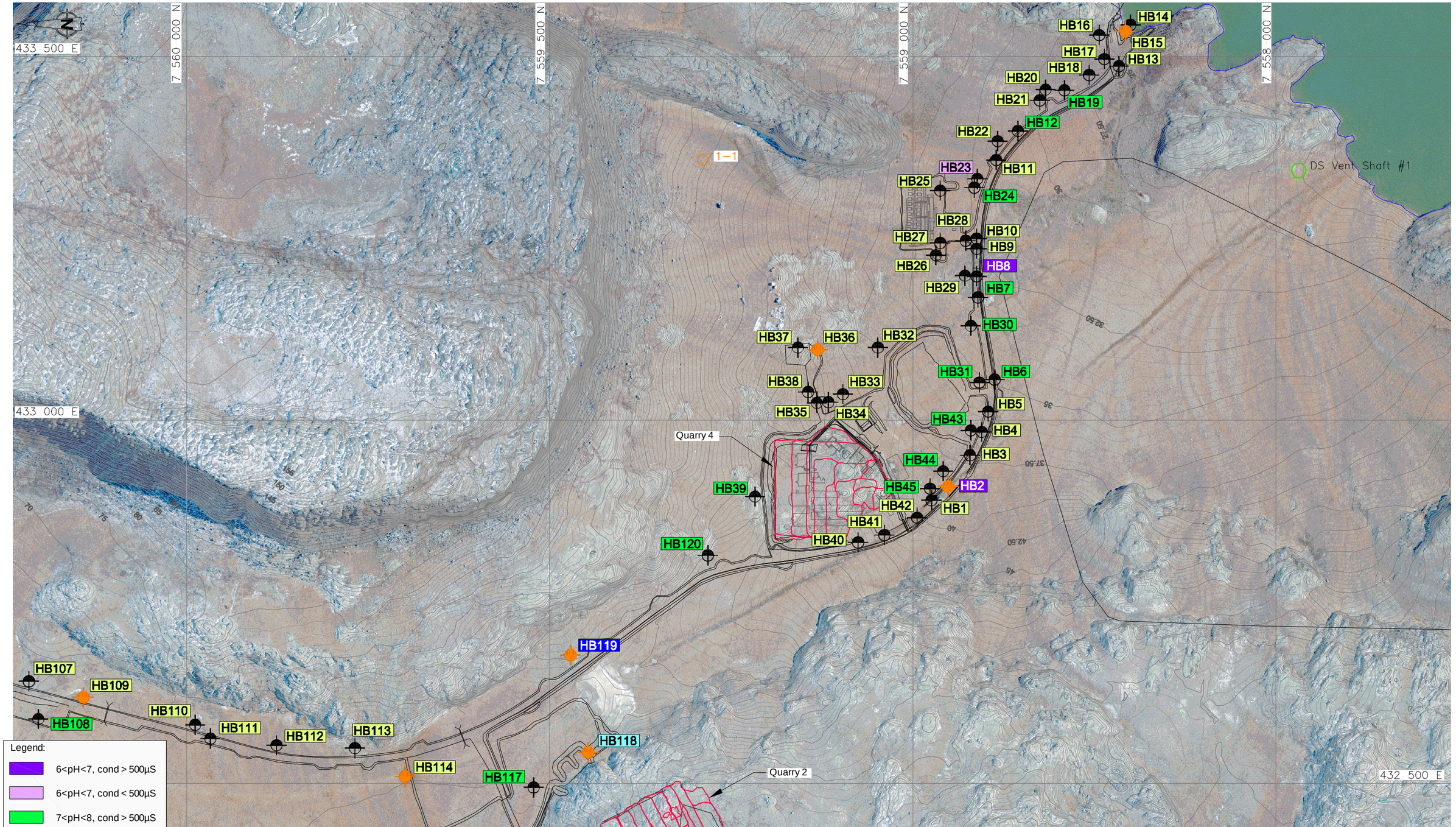

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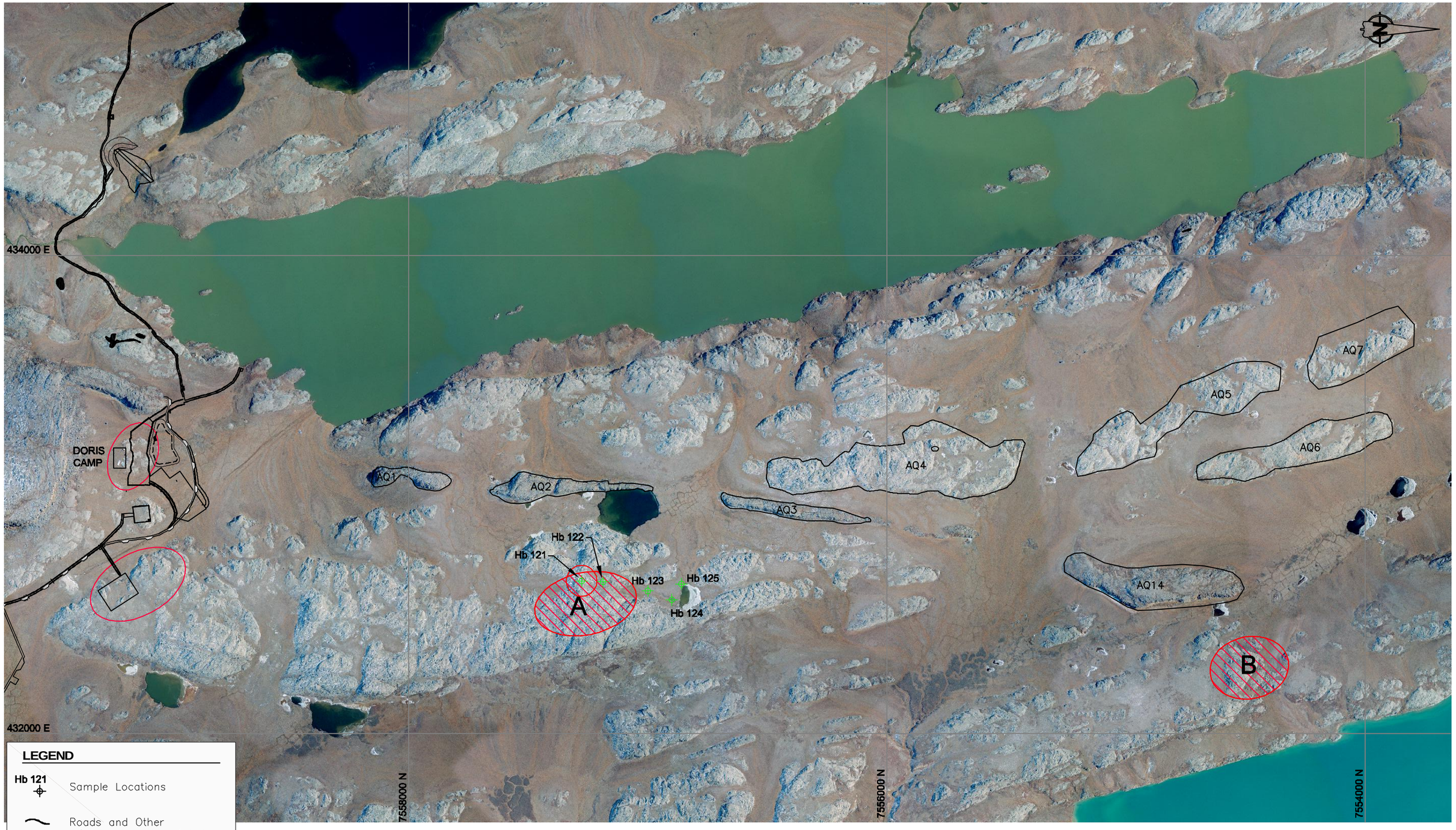
Quarry Rock Seepage Monitoring

Seep Survey Locations South

DATE:	APPROVED:	FIGURE:
Sep. 2009	–	3



LEGEND

- Hb 121 — Sample Locations
- Roads and Other Infrastructure Associated with Doris North Project
- Quarries Evaluated as Part of the Doris North Project Water Licence
- Proposed Rock Quarry

1:15,000

0 100 200 300 400 500 Meters

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SRK JOB NO.: 1CH008.023.0001
FILE NAME: Reference Point Locations.dwg

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Hope Bay Gold Project

Quarry Rock Seepage Monitoring

Reference Point Locations

DATE: Sep: 2009
APPROVED: –
FIGURE: 4

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Appendices

Appendix A
Field Log

Appendix A
Seepage Station Field Log

Sample ID	Location	Easting	Northing	Sampler	Sampling Date	Sampling Time	Field pH	Field Cond (µS)	Temp (°C)	Flow	Sampled	Notes
HB1	Camp Area	432930	7558741	M. Corriveau	27-Jun-09	8:26 AM	7.22	432	3	slight		Trace flow from road material.
HB2	Camp Area	432949	7558718	M. Corriveau	27-Jun-09	8:38 AM	6.98	500	4.7	slight	x	Trace flow from road material. Rusty-coloured
HB3	Camp Area	432992	7558688	M. Corriveau	27-Jun-09	8:42 AM	7.4	208	5.2	slight		Trace flow from road material.
HB4	Camp Area	433024	7558672	M. Corriveau	27-Jun-09	8:46 AM	7.5	208	5.8	none		Large ponded area.
HB5	Camp Area	433052	7558663	M. Corriveau	27-Jun-09	8:50 AM	7.46	328	5.3	none		Ponded area.
HB6	Camp Area	433096	7558654	M. Corriveau	27-Jun-09	8:54 AM	7.17	1282	5.6	slight		Trace flow in flowpath. Bacterial mats at water surface. Rusty-coloured.
HB7	Road - Doris Lake	433209	7558677	M. Corriveau	27-Jun-09	9:00 AM	7.38	1358	6.9	none		Adjacent to drill cuttings and megabags. Ponded water.
HB8	Road - Doris Lake	433238	7558679	M. Corriveau	27-Jun-09	9:03 AM	6.96	2310	9.1	none		Ponded. Rusty-coloured.
HB9	Road - Doris Lake	433276	7558679	M. Corriveau	27-Jun-09	9:07 AM	7.9	193	4.9	good		Good flow from road material
HB10	Road - Doris Lake	433290	7558679	M. Corriveau	27-Jun-09	9:09 AM	7.89	128	3.5	good		Good flow from base of road.
HB11	Road - Doris Lake	433398	7558652	M. Corriveau	27-Jun-09	9:14 AM	7.68	250	2.9	good		Good flow from road material
HB12	Road - Doris Lake	433438	7558622	M. Corriveau	27-Jun-09	9:17 AM	7.4	643	4.1	none		Small ponded area at base of road.
HB13	Road - Doris Lake	433527	7558483	M. Corriveau	27-Jun-09	9:23 AM	7.73	376	3.8	good		Flow from base of road.
HB14	Road - Doris Lake	433584	7558467	M. Corriveau	27-Jun-09	9:28 AM	7.87	339	5.9	good		Substantial flow from under road @ entry to Doris Lake.
HB15	Road - Doris Lake	433575	7558474	M. Corriveau	27-Jun-09	9:32 AM	7.84	333	6.7	good	x	Small amount of water coming through culvert but most seeping directly through road material. Flow ~ 50 L/min
HB16	Road - Doris Lake	433570	7558510	M. Corriveau	27-Jun-09	9:37 AM	7.63	233	6	none		Ponded water on u/s side of pad.
HB17	Road - Doris Lake	433537	7558503	M. Corriveau	27-Jun-09	9:41 AM	7.49	318	4.5	none		Ponded area against base of road.
HB18	Road - Doris Lake	433515	7558524	M. Corriveau	27-Jun-09	9:44 AM	7.53	316	5.1	none		Flow towards and parallel to road, ponded against toe.
HB19	Road - Doris Lake	433494	7558558	M. Corriveau	27-Jun-09	9:49 AM	7.25	822	5.6	none		Ponded area against/under road material.
HB20	Road - Doris Lake	433495	7558584	M. Corriveau	27-Jun-09	9:52 AM	7.65	235	3.2	good		Good flow from toe of road.
HB21	Road - Doris Lake	433480	7558592	M. Corriveau	27-Jun-09	9:56 AM	7.56	165	4	none		Large ponded area.
HB22	Road - Doris Lake	433424	7558650	M. Corriveau	27-Jun-09	10:00 AM	7.63	94	3.1	none		Ponded area at toe of road.
HB23	Road - Doris Lake	433372	7558678	M. Corriveau	27-Jun-09	10:04 AM	6.85	450	5.2	none		Ponded area at toe of road (several similar ponded areas along this stretch).
HB24	Road - Doris Lake	433360	7558682	M. Corriveau	27-Jun-09	10:07 AM	7.34	532	5.9	none		Ponded area. Slightly rusty-coloured.
HB25	Helipad	433356	7558729	M. Corriveau	27-Jun-09	10:11 AM	7.63	225	2.7	good		Flow from toe of helipad.
HB26	Helipad	433267	7558735	M. Corriveau	27-Jun-09	10:22 AM	7.75	105	4.7	slight		Flow is mostly parallel to toe of pad but in contact with rock.
HB27	Helipad	433284	7558729	M. Corriveau	27-Jun-09	10:25 AM	7.71	136	2.6	none		Flow ponded at toe of pad.
HB28	Road - Doris Lake	433287	7558694	M. Corriveau	27-Jun-09	10:28 AM	7.66	142	4.5	none		Large ponded area at intersection of road and helipad access.
HB29	Road - Doris Lake	433239	7558695	M. Corriveau	27-Jun-09	10:31 AM	7.29	457	8.7	none		Large ponded area. Some rusty colouring.
HB30	Road - Doris Lake	433170	7558687	M. Corriveau	27-Jun-09	10:36 AM	7.3	3350	9	none		Ponded area at toe of road. Green algae.
HB31	Camp Area	433092	7558675	M. Corriveau	27-Jun-09	10:40 AM	7.77	6300	10	none		Ponded area at intersection of road and access to camp.
HB32	Camp Area	433140	7558815	M. Corriveau	27-Jun-09	10:49 AM	7.9	270	4.7	slight		Flow from base of pad.
HB33	Camp Area	433076	7558863	M. Corriveau	27-Jun-09	10:54 AM	7.93	273	4.2	none		Ponded area.
HB34	Camp Area	433065	7558883	M. Corriveau	27-Jun-09	10:57 AM	7.82	227	5.3	none		Ponded area.
HB35	Mini Quarry	433064	7558899	M. Corriveau	27-Jun-09	11:00 AM	7.87	199	4	slight		Flow from toe of road out to "Mini Quarry". Bit of rusty colouring and algae growth.
HB36	Mini Quarry	433137	7558898	M. Corriveau	27-Jun-09	11:06 AM	7.84	210	3.5	good	x	Trickle flow (~1 L/min) from toe of Mini Quarry area.
HB37	Mini Quarry	433140	7558925	M. Corriveau	27-Jun-09	11:09 AM	7.94	151	9	none		Large area of ponded water in Mini Quarry.
HB38	Mini Quarry	433079	7558911	M. Corriveau	27-Jun-09	11:13 AM	7.81	193	9.2	slight		Water flowing down road from Mini Quarry.
HB39	Camp Area	432935	7558984	M. Corriveau	27-Jun-09	11:20 AM	7.73	865	10.5	none		Ponded water above camp area. Yellowy-brown in colour.
HB40	Camp Area	432872	7558842	M. Corriveau	27-Jun-09	11:26 AM	7.91	365	9.8	none		Ponded water opposite camp. Rusty-coloured.
HB41	Camp Area	432882	7558806	M. Corriveau	27-Jun-09	11:29 AM	7.85	406	2.3	slight		Slight flow mostly parallel to toe of road.
HB42	Camp Area	432906	7558761	M. Corriveau	27-Jun-09	11:33 AM	7.74	430	5.4	slight		Slight flow from toe of road, mostly parallel to road. Flow parallel to road all along this section.
HB43	Camp Area	433026	7558687	M. Corriveau	27-Jun-09	11:39 AM	7.63	604	9.6	none		Ponded area at toe of road.

Sample ID	Location	Easting	Northing	Sampler	Sampling Date	Sampling Time	Field pH	Field Cond (µS)	Temp (°C)	Flow	Sampled	Notes
HB44	Camp Area	432970	7558725	M. Corriveau	27-Jun-09	11:42 AM	7.56	564	9.7	none		Water pooled in ditch (in contact with road material).
HB45	Camp Area	432946	7558743	M. Corriveau	27-Jun-09	11:44 AM	7.6	680	8.2	none		Water pooled in ditch (in contact with road material). Lots of suspended seds.
HB46	Robert's Bay	432501	7562942	M. Corriveau	27-Jun-09	1:44 PM	8.43	507	17.3	none	x	Pooled area at very end of road. Very difficult to filter.
HB47	Robert's Bay	432569	7562926	M. Corriveau	27-Jun-09	1:49 PM	7.98	122	14.9	u/s		u/s side of drainage through road. Algae growth.
HB48	Robert's Bay	432570	7562937	M. Corriveau	27-Jun-09	1:52 PM	7.9	123	12.5	good		d/s side of HB47. Large flow with several adjacent stream.
HB49	Robert's Bay	432679	7563011	M. Corriveau	27-Jun-09	2:05 PM	7.94	400	1.6	good		Large flow from toe of road.
HB50	Robert's Bay	432808	7563013	M. Corriveau	27-Jun-09	2:11 PM	7.84	396	4.3	slight		Trace flow from d/s side of road (large pool on u/s side).
HB51	Robert's Bay	432826	7563010	M. Corriveau	27-Jun-09	2:15 PM	7.84	482	5	slight		Trace flow, LOTS of green algae.
HB52	Robert's Bay	432900	7563005	M. Corriveau	27-Jun-09	2:19 PM	7.97	272	1.2	good		Flow from toe of road.
HB53	Quarry 1	432998	7563061	M. Corriveau	27-Jun-09	2:26 PM	8.12	117	3.1	good	x	Flow from toe of pad at end of road. Lots of suspended seds and organic matter. Disperse trace flow over 15 m area.
HB54	Quarry 1	432997	7563202	M. Corriveau	27-Jun-09	2:33 PM	8.08	750	11	none	x	Very large pool in Quarry 1. Several drums (of fuel?).
HB55	Quarry 1	433076	7563176	M. Corriveau	27-Jun-09	2:37 PM	8	883	10.5	none	x	Ponded. Organic matter in routine bottle.
HB56	Quarry 1	433091	7563109	M. Corriveau	27-Jun-09	2:43 PM	7.81	507	5.7	none		Water ponded in streambed.
HB57	Quarry 1	433109	7563067	M. Corriveau	27-Jun-09	2:48 PM	8.5	71	2.1	slight	x	Moderate flow (~ 2 L/min). Snowmelt u/s. Lots of suspended seds.
HB58	Robert's Bay	433111	7562997	M. Corriveau	27-Jun-09	2:53 PM	7.92	397	4.1	good		Large flow from toe of pad.
HB59	Robert's Bay	433093	7562949	M. Corriveau	27-Jun-09	2:58 PM	8.31	303	0.6	slight	x	Slight flow from toe of road.
HB60	Robert's Bay	433112	7562838	M. Corriveau	27-Jun-09	3:03 PM	8.3	164	4.5	good	x	Slight flow from toe of road. Several seeps along this stretch (~15 m).
HB61	Robert's Bay	433083	7562822	M. Corriveau	27-Jun-09	3:07 PM	7.96	108	12	none		Ponded area at toe of pad u/s of HB60.
HB62	Robert's Bay	432949	7562919	M. Corriveau	27-Jun-09	3:14 PM	7.85	98.4	11.3	none		Ponded u/s of pad.
HB63	Road - North	433146	7562786	M. Corriveau	27-Jun-09	3:24 PM	7.9	139	9	slight		Moderate flow seeping from toe of road. Several small seeps along this stretch.
HB64	Road - North	433187	7562597	M. Corriveau	27-Jun-09	3:35 PM	7.92	159	3.4	slight		Trickle flow from toe of road. Lots of ponded water in area and flow parallel to road.
HB65	Road - North	433200	7562550	M. Corriveau	27-Jun-09	3:40 PM	7.05	285	16.1	none		Ponded. Rusty-coloured. "Fluffly" precipitates.
HB66	Road - North	433187	7562512	M. Corriveau	27-Jun-09	3:46 PM	7.94	122	2	good		Flow parallel to toe of road.
HB67	Road - North	433185	7562418	M. Corriveau	27-Jun-09	3:52 PM	7.9	455	8	none		Ponded area at toe of road. Several ponded areas along this stretch of road. Flow parallel to toe of road.
HB68	Road - North	433195	7562414	M. Corriveau	27-Jun-09	3:57 PM	7.29	321	12.7	none		Ponded at toe of road. Rusty/brown coloured.
HB69	Airstrip	433148	7562254	M. Corriveau	27-Jun-09	4:04 PM	7.23	1485	15	none		Ponded at toe. Rusty-coloured. Green algae.
HB70	Airstrip	433100	7562249	M. Corriveau	27-Jun-09	4:12 PM	7.67	1334	15	none		Ponded at toe. Rusty-coloured. Green algae.
HB71	Airstrip	433099	7562168	M. Corriveau	27-Jun-09	4:17 PM	7.88	297	12	none		Ponded at toe of pad. Abundant suspended sediments.
HB72	Airstrip	433123	7562061	M. Corriveau	27-Jun-09	4:30 PM	7.71	515	16	none		Ponded water fed by stream u/s of HB74.
HB73	Airstrip	433118	7562041	M. Corriveau	27-Jun-09	4:34 PM	7.69	227	15.9	none		Lots of water flows parallel to road down to this pooled area.
HB74	Airstrip	433085	7562035	M. Corriveau	27-Jun-09	4:37 PM	7.89	212	8.9	good	x	Very large flow (~10 L/min). Seeping from several locations along this stretch (over ~ 15 m). Some rusty colouring.
HB75	Airstrip	433064	7561942	M. Corriveau	27-Jun-09	4:47 PM	7.57	1439	14.4	none		Ponded. Very rusty-coloured.
HB76	Airstrip	432975	7561395	M. Corriveau	27-Jun-09	5:08 PM	7.91	206	11.1	none		Ponded at toe of road. Flows from tundra and 'hits' road and runs parallel to road.
HB77	Airstrip	432959	7561305	M. Corriveau	27-Jun-09	5:13 PM	7.87	256	5.9	slight		Slight flow from toe of road. Several other small seeps along this stretch. Join and flow parallel to road.
HB78	Airstrip	432945	7561323	M. Corriveau	27-Jun-09	5:19 PM	7.85	833	14.5	none		Ponded. Some rusty colouring.
HB79	Airstrip	432908	7561368	M. Corriveau	27-Jun-09	5:23 PM	7.9	217	10.7	slight		Slight flow from pad. Joins with water flowing around corner.
HB80	Airstrip	432916	7561394	M. Corriveau	27-Jun-09	5:31 PM	7.92	125	13.3	slight		Flow mostly parallel to pad.
HB81	Road - South	432933	7561249	M. Corriveau	28-Jun-09	7:57 AM	6.5	340	8.8	none		Ponded. Rusty colouring.
HB82	Road - South	432947	7561246	M. Corriveau	28-Jun-09	8:00 AM	6.82	225	5.8	none		Ponded. Opposite road from HB81.
HB83	Road - South	432936	7561165	M. Corriveau	28-Jun-09	8:06 AM	6.67	429	4.8	none		Ponded. Rusty colouring.

Sample ID	Location	Easting	Northing	Sampler	Sampling Date	Sampling Time	Field pH	Field Cond (µS)	Temp (°C)	Flow	Sampled	Notes
HB84	Road - South	432910	7561139	M. Corriveau	28-Jun-09	8:10 AM	6.92	223	4.6	none		Ponded and flow parallel to road. Some rusty colouring.
HB85	Road - South	432925	7561109	M. Corriveau	28-Jun-09	8:14 AM	6.83	440	4.7	none		No flow, but evidence of stream bed. d/s of HB86. "Drainage" sign.
HB86	Road - South	432912	7561112	M. Corriveau	28-Jun-09	8:16 AM	7.21	162	4.8	none		u/s of HB85. No flow.
HB87	Road - South	432902	7561070	M. Corriveau	28-Jun-09	8:20 AM	7.09	375	5.7	none		Large area of ponded water. Rusty-coloured.
HB88	Road - South	432903	7561004	M. Corriveau	28-Jun-09	8:26 AM	7.45	270	4.4	none		Ponded. Several similar ponded areas along this stretch. Some rusty-colouring. Areas of slight flow parallel to road.
HB89	Road - South	432878	7560890	M. Corriveau	28-Jun-09	8:32 AM	7.54	267	2.7	slight		Water flowing into base of road. Several flowpaths over ~10 m.
HB90	Road - South	432860	7560870	M. Corriveau	28-Jun-09	8:36 AM	7.35	356	4.6	none		No observed flow. Rusty coloured, "fluffy" and black precipitates.
HB91	Road - South	432848	7560810	M. Corriveau	28-Jun-09	8:40 AM	7.29	345	5.2	none		Ponded. "Fluffy" orange/brown precipitates.
HB92	Road - South	432925	7560780	M. Corriveau	28-Jun-09	9:08 AM	7.75	311	5.4	none		Large pond adjacent to explosives storage pad.
HB93	Road - South	432842	7560717	M. Corriveau	28-Jun-09	9:16 AM	7.45	474	4.4	none		Marked "drainage" but no flow observed. Rusty-coloured.
HB94	Road - South	432821	7560690	M. Corriveau	28-Jun-09	9:19 AM	7.58	234	3.8	none		Large pooled area.Several similar in the area. Some flow parallel to road.
HB95	Road - South	432814	7560594	M. Corriveau	28-Jun-09	9:27 AM	7.64	254	2.8	slight	x	Slight flow from toe of road.
HB96	Road - South	432805	7560612	M. Corriveau	28-Jun-09	9:31 AM	7.73	193	4.3	u/s		Water flowing into base of road.
HB97	Road - South	432785	7560550	M. Corriveau	28-Jun-09	9:36 AM	7.81	221	4	good		Good flow from base of road.
HB98	Road - South	432790	7560474	M. Corriveau	28-Jun-09	9:42 AM	7.79	212	3.9	none		"Drainage" sign but no observed flow except slight flow parallel to road.
HB99	Road - South	432782	7560497	M. Corriveau	28-Jun-09	9:47 AM	7.72	193	4.2	u/s		Large flow into base of road.
HB100	Road - South	432765	7560450	M. Corriveau	28-Jun-09	9:53 AM	7.64	169	4.1	good		Good flow from base of road.
HB101	Road - South	432778	7560423	M. Corriveau	28-Jun-09	9:56 AM	7.39	484	5.1	u/s		"Drainage" sign, u/s of HB100. No observed flow.
HB102	Road - South	432758	7560319	M. Corriveau	28-Jun-09	10:44 AM	7.53	197	8.1	none		Ponded water at toe of road.
HB103	Road - South	432741	7560316	M. Corriveau	28-Jun-09	10:47 AM	7.55	210	6.5	none		Pooled water and flow parallel to road.
HB104	Road - South	432746	7560265	M. Corriveau	28-Jun-09	10:52 AM	7.52	762	5.6	none		Pooled water and flow parallel to road.
HB105	Road - South	432726	7560163	M. Corriveau	28-Jun-09	10:57 AM	7.67	148	4.1	slight		Slight flow from base of road.
HB106	Road - South	432672	7560118	M. Corriveau	28-Jun-09	11:02 AM	7.72	532	5.2	none		Large pools of water (behind Geotech drilling trailers).
HB107	Road - South	432681	7559984	M. Corriveau	28-Jun-09	11:08 AM	7.78	185	6.5	none		Ponded area at toe of road.
HB108	Road - South	432629	7559971	M. Corriveau	28-Jun-09	11:14 AM	7.34	816	5.6	none		Ponded area at toe of road. Rusty-coloured patches and staining on rocks.
HB109	Road - South	432659	7559909	M. Corriveau	28-Jun-09	11:20 AM	7.71	238	4.2	good	x	Several small seeps from toe of road along this ~15m stretch. Some rustry colouring.
HB110	Road - South	432621	7559755	M. Corriveau	28-Jun-09	11:32 AM	7.75	240	8.1	none		Ponded water.
HB111	Road - South	432602	7559734	M. Corriveau	28-Jun-09	11:36 AM	7.8	287	3.5	good		Good flow from toe of road. (Slightly down and across from HB110).
HB112	Road - South	432593	7559643	M. Corriveau	28-Jun-09	11:41 AM	7.61	221	5.6	none		Ponded at toe of road.
HB113	Road - South	432589	7559535	M. Corriveau	28-Jun-09	11:47 AM	7.89	174	7.2	none		Very large ponded area.
HB114	Quarry 2	432550	7559466	M. Corriveau	28-Jun-09	1:16 PM	7.87	242	2.3	good	x	Good flow (~15 L/min) from toe of piled quarry rock.
HB115	Quarry 2	432452	7559302	M. Corriveau	28-Jun-09	1:26 PM	6.98	851	13	none		Ponded water below road. Large ponded area on u/s side of road. Snowmelt u/s.
HB116	Quarry 2	432448	7559258	M. Corriveau	28-Jun-09	1:31 PM	8.2	353	12.5	good	x	Water flowing down road from Quarry 2.
HB117	Quarry 2	432535	7559289	M. Corriveau	28-Jun-09	1:37 PM	7.68	927	11.8	none		Ponded area in Quarry 2.
HB118	Quarry 2	432583	7559214	M. Corriveau	28-Jun-09	1:45 PM	8.26	96	8.7	none	x	Ponded water in Quarry 2 area.
HB119	Road - South	432717	7559238	M. Corriveau	28-Jun-09	6:08 PM	8.17	851	13.8	none	x	Ponded.
HB120	Road - South	432854	7559049	M. Corriveau	28-Jun-09	6:14 PM	7.87	557	12.6	none		Ponded.

Appendix A
Seepage Station Field Log

Sample ID	Location	Easting	Northing	Sampler	Sampling Date	Sampling Time	Field pH	Field Cond (µS)	Temp (°C)	Flow	Sampled	Notes
REFERENCE SITES												
HB121	Proposed Quarry A			M. Corriveau	29-Jun-09	2:40 PM	8.3	75	13.2	none	x	Pooled area at base of rocks.
HB122	Proposed Quarry A			M. Corriveau	29-Jun-09	2:55 PM	7.91	54	10.9	good	x	Stream flowing ~2L/min.
HB123	Proposed Quarry A			M. Corriveau	29-Jun-09	3:15 PM	7.63	69	14	none	x	Ponded.
HB124	Proposed Quarry A			M. Corriveau	29-Jun-09	3:35 PM	8	49	11.5	none	x	Ponded.
HB125	Proposed Quarry A			M. Corriveau	29-Jun-09	3:55 PM	7.98	48	5.8	trace	x	Significant amount of snow u/s of sampling site.

Appendix B
Water Quality Results

	Sample ID	Date Sampled	ALS Sample ID	pH	Hardness	Alkalinity	Ammonia	Nitrate	SO_4	Al	Sb	As	Ba	Be	Bi	B	Cd	Ca	Cr
	Units			s.u.	mg $CaCO_3$/L	mg $CaCO_3$/L	mg N/L	mg N/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Samples with field pH > 8.0	HB46	28-Jun-09	L786052-1	8.34	196	213	<0.020	<0.0050	10.4	0.0141	0.00021	0.00097	0.00599	<0.00050	<0.00050	0.067	<0.000017	48.7	<0.0020
	HB53	28-Jun-09	L786052-2	7.85	41.6	70.8	0.037	0.0191	4.14	0.0578	0.00012	0.00016	0.00262	<0.00050	<0.00050	0.012	<0.000017	8.91	<0.00050
	HB54	28-Jun-09	L786052-3	8.08	113	133	0.047	4.28	55	0.0426	0.00051	0.00083	0.0154	<0.0010	<0.0010	0.25	<0.000034	28.9	0.0011
	HB55	28-Jun-09	L786052-4	7.83	115	139	0.735	5.62	80.8	0.0123	0.0003	0.00067	0.00507	<0.0010	<0.0010	0.212	<0.000034	21.8	<0.0010
	HB57	28-Jun-09	L786052-5	7.7	22	31.3	0.271	0.185	0.64	0.0358	0.0001	0.00014	0.00426	<0.00050	<0.00050	<0.010	<0.000017	7.67	<0.00050
	HB59	28-Jun-09	L786052-6	7.9	66.2	76.3	1.03	1.47	10.4	0.0289	<0.00010	0.00041	0.00199	<0.00050	<0.00050	0.028	<0.000017	16.7	<0.00050
	HB60	28-Jun-09	L786052-7	7.84	42	46.6	0.084	0.0718	5.29	0.0293	<0.00010	0.00027	0.00146	<0.00050	<0.00050	0.021	<0.000017	10.6	<0.00050
	HB116	29-Jun-09	L786052-28	8.17	46.4	42.6	1.73	4.07	20.1	0.0666	0.00022	0.0015	0.00306	<0.00050	<0.00050	0.048	<0.000017	12.4	<0.00050
	HB118	28-Jun-09	L786052-8	7.53	37.4	37.7	<0.020	0.0528	1.98	0.0183	<0.00010	0.00047	0.00375	<0.00050	<0.00050	<0.010	<0.000017	13	<0.00050
	HB119	29-Jun-09	L786052-17	8.02	268	209	0.037	<0.0050	19.5	0.0119	<0.00010	<0.0020	0.0167	<0.00050	<0.00050	0.013	<0.000017	85.9	<0.0030
Additional Seepage Samples	HB2	29-Jun-09	L786052-16	7.74	98.2	120	0.498	1.65	35.4	0.0145	0.00017	0.00056	0.0052	<0.00050	<0.00050	0.077	<0.000017	25.3	<0.00050
	HB15	29-Jun-09	L786052-14	7.81	116	75.7	0.025	0.0382	10.8	0.0134	<0.00010	0.00047	0.00535	<0.00050	<0.00050	0.025	<0.000017	33	0.00066
	HB36	29-Jun-09	L786052-15	7.44	67	75.1	0.094	0.114	3.51	0.0661	0.00015	0.00154	0.00166	<0.00050	<0.00050	0.015	<0.000017	18.9	0.00068
	HB74	29-Jun-09	L786052-9	7.7	102	96.3	0.029	<0.0050	2.28	0.0118	<0.00010	0.00026	0.00385	<0.00050	<0.00050	0.011	<0.000017	31.9	<0.0010
	HB95	29-Jun-09	L786052-10	7.59	102	107	0.297	0.0963	2.79	0.019	<0.00010	0.00026	0.00374	<0.00050	<0.00050	0.01	<0.000017	31	<0.0015
	HB109	29-Jun-09	L786052-11	7.47	112	96.6	0.065	0.0188	2.91	0.0175	<0.00010	0.00024	0.00312	<0.00050	<0.00050	0.011	<0.000017	33.1	<0.0015
	HB114	29-Jun-09	L786052-12	7.61	107	109	0.186	0.105	3.86	0.0095	<0.00010	0.00086	0.00404	<0.00050	<0.00050	0.017	<0.000017	35	<0.0010
Reference Points	HB121	29-Jun-09	L786052-19	7.73	31.1	30.4	0.02	<0.0050	1.45	0.0093	<0.00010	0.00012	0.00108	<0.00050	<0.00050	<0.010	<0.000017	10.3	<0.00050
	HB122	29-Jun-09	L786052-20	7.47	23.5	23.2	<0.020	<0.0050	0.87	0.0098	<0.00010	<0.00010	0.000818	<0.00050	<0.00050	<0.010	<0.000017	7.99	<0.00050
	HB123	29-Jun-09	L786052-21	7.55	32.7	35	0.02	0.0061	1.27	0.0389	<0.00010	<0.00010	0.00154	<0.00050	<0.00050	<0.010	<0.000017	11.4	<0.00050
	HB124	29-Jun-09	L786052-22	7.73	21	19.4	<0.020	<0.0050	<0.50	0.0145	<0.00010	<0.00010	0.000638	<0.00050	<0.00050	<0.010	<0.000017	6.65	<0.00050
	HB125	29-Jun-09	L786052-23	7.29	19.4	17.8	<0.020	<0.0050	<0.50	0.0076	<0.00010	<0.00010	0.0005	<0.00050	<0.00050	<0.010	<0.000017	6.1	<0.00050

	Sample ID	Co	Cu	Fe	Pb	Li	Mg	Mn	Mo	Ni	P	K	Se	Si	Ag	Na	Sr	Tl	Sn	Ti
	Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Samples with field pH > 8.0	HB46	0.00015	0.00435	<0.030	<0.000050	0.0058	18.1	0.0127	0.000525	0.00147	<0.30	6.3	<0.0010	1.82	<0.000010	41.5	0.121	<0.00010	<0.00010	<0.010
	HB53	<0.00010	0.00226	<0.030	0.000115	<0.0050	4.7	0.00568	0.000208	<0.00050	<0.30	<2.0	<0.0010	0.767	<0.000010	20.2	0.0257	<0.00010	<0.00010	<0.010
	HB54	<0.00020	0.0022	<0.030	0.00015	<0.010	10	0.0266	0.00426	<0.0010	<0.30	8.3	<0.0020	1.38	<0.000020	105	0.0644	<0.00020	<0.00020	<0.010
	HB55	0.00032	0.00381	<0.030	<0.00010	<0.010	14.6	0.0292	0.00449	<0.0010	<0.30	7.8	0.0022	1.32	<0.000020	129	0.069	<0.00020	<0.00020	<0.010
	HB57	<0.00010	0.0011	<0.030	<0.000050	<0.0050	0.7	0.0286	0.000108	<0.00050	<0.30	<2.0	<0.0010	0.12	<0.000010	4.4	0.00644	<0.00010	<0.00010	<0.010
	HB59	<0.00010	0.00804	<0.030	0.000056	<0.0050	5.93	0.0104	0.000377	<0.00050	<0.30	2.1	<0.0010	1.19	<0.000010	26.7	0.0298	<0.00010	<0.00010	<0.010
	HB60	<0.00010	0.00492	<0.030	<0.000050	<0.0050	3.78	0.0112	0.000268	<0.00050	<0.30	<2.0	<0.0010	1.1	<0.000010	17.5	0.0182	<0.00010	<0.00010	<0.010
	HB116	0.00037	0.00257	<0.030	<0.000050	<0.0050	3.73	0.00868	0.00107	<0.00050	<0.30	2.8	0.0013	0.47	<0.000010	29.6	0.0261	<0.00010	<0.00010	<0.010
	HB118	<0.00010	0.00144	<0.030	<0.000050	<0.0050	1.22	0.00237	0.00012	<0.00050	<0.30	<2.0	<0.0010	0.5	<0.000010	3.7	0.019	<0.00010	<0.00010	<0.010
	HB119	0.00018	0.00212	0.175	<0.000050	<0.0050	13.1	0.222	0.00036	0.00065	<0.30	4.2	<0.0020	3.24	<0.000010	69.7	0.343	<0.00010	<0.00010	<0.010
Additional Seepage Samples	HB2	0.00031	0.00494	0.227	<0.000050	<0.0050	8.5	0.0558	0.00157	0.0008	<0.30	4.5	<0.0010	1.81	<0.000010	66.3	0.0621	<0.00010	<0.00010	<0.010
	HB15	0.00018	0.00484	0.042	0.000063	<0.0050	8.17	0.0129	0.000279	0.00162	<0.30	2.4	<0.0010	2.34	<0.000010	25.4	0.113	<0.00010	<0.00010	<0.010
	HB36	0.00021	0.0118	0.067	0.000086	<0.0050	4.79	0.0203	0.000282	0.00125	<0.30	<2.0	<0.0010	2.27	<0.000010	10.2	0.0291	<0.00010	<0.00010	<0.010
	HB74	0.00023	0.00453	0.382	<0.000050	<0.0050	5.37	0.0453	0.00012	0.00093	<0.30	<2.0	<0.0010	1.7	<0.000010	10.4	0.0323	<0.00010	<0.00010	<0.010
	HB95	0.00024	0.00368	0.219	<0.000050	<0.0050	6.01	0.0531	0.000208	0.00264	<0.30	<2.0	<0.0010	2.65	<0.000010	12.3	0.0464	<0.00010	<0.00010	<0.010
	HB109	0.0004	0.00593	0.545	<0.000050	<0.0050	7.2	0.121	0.000142	0.00096	<0.30	<2.0	<0.0010	1.49	<0.000010	12.7	0.0648	<0.00010	<0.00010	<0.010
	HB114	0.00035	0.00532	0.16	<0.000050	<0.0050	4.82	0.129	0.000138	0.00078	<0.30	<2.0	<0.0010	1.79	<0.000010	9.3	0.0421	<0.00010	<0.00010	<0.010
Reference Points	HB121	<0.00010	0.00407	<0.030	<0.000050	<0.0050	1.3	0.000451	<0.000050	<0.00050	<0.30	<2.0	<0.0010	0.685	<0.000010	2.5	0.00588	<0.00010	<0.00010	<0.010
	HB122	<0.00010	0.00466	<0.030	<0.000050	<0.0050	0.87	0.000376	<0.000050	<0.00050	<0.30	<2.0	<0.0010	0.447	<0.000010	<2.0	0.00416	<0.00010	<0.00010	<0.010
	HB123	<0.00010	0.00727	<0.030	<0.000050	<0.0050	1.06	0.000861	<0.000050	0.00065	<0.30	<2.0	<0.0010	0.965	<0.000010	2.2	0.00541	<0.00010	<0.00010	<0.010
	HB124	<0.00010	0.00619	<0.030	0.000312	<0.0050	1.07	0.000183	<0.000050	<0.00050	<0.30	<2.0	<0.0010	0.396	<0.000010	<2.0	0.00362	<0.00010	<0.00010	<0.010
	HB125	<0.00010	0.00354	<0.030	<0.000050	<0.0050	1.03	0.000746	<0.000050	<0.00050	<0.30	<2.0	<0.0010	0.318	<0.000010	<2.0	0.00379	<0.00010	<0.00010	<0.010

	Sample ID	U	V	Zn
	Units	mg/L	mg/L	mg/L
Samples with field pH > 8.0	HB46	0.000919	<0.0010	<0.0010
	HB53	0.000015	<0.0010	0.0013
	HB54	0.000149	<0.0020	<0.0020
	HB55	0.000344	<0.0020	<0.0020
	HB57	<0.000010	<0.0010	<0.0010
	HB59	0.00008	<0.0010	<0.0010
	HB60	0.000057	<0.0010	<0.0010
	HB116	0.000285	<0.0010	<0.0010
	HB118	0.000068	<0.0010	<0.0010
	HB119	0.000213	0.0014	0.001
Additional Seepage Samples	HB2	0.000307	<0.0010	<0.0010
	HB15	0.000111	<0.0010	<0.0010
	HB36	0.00012	<0.0010	<0.0010
	HB74	0.000044	<0.0010	0.0024
	HB95	0.000069	<0.0010	<0.0010
	HB109	0.00007	<0.0010	<0.0010
	HB114	0.000136	<0.0010	<0.0010
Reference Points	HB121	<0.000010	<0.0010	<0.0010
	HB122	<0.000010	<0.0010	<0.0010
	HB123	<0.000010	<0.0010	0.0012
	HB124	<0.000010	<0.0010	0.0025
	HB125	<0.000010	<0.0010	<0.0010

Appendix D
2009 Quarry Rock Sample Program (SRK 2009)

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Memo

To:	File	**Date:**	November 6, 2009
cc:		**From:**	Madeleine Corriveau Kelly Sexsmith
Subject:	2009 Quarry Rock Sampling	**Project #:**	1CH008.023

1 Introduction

Quarry Rock was excavated during development of the Doris roads, airstrip and camp area (Figure 1). As part of the water licence application, Miramar Hope Bay Ltd. (MHBL) presented verification and monitoring plans to confirm that the potential for ARD and metal leaching from quarry rock used in the construction of the roads, airstrip, and camp area at Doris would be very low. These monitoring commitments were included in the Monitoring and Follow-up Plan for the site and in the current Water Licence (2AM-DOH0713).

The commitments included a program of check acid base accounting on the quarried rock used in construction, with shake flask extraction tests on a representative subset of samples. During the 2007 construction season, Miramar Hope Bay Mining Ltd. (MHBL) retained Golder Associates to complete monitoring activities associated with the initial phase of construction, including collection of 84 solids samples. MHBL submitted the solids samples for ABA tests and prepared an internal memo documenting the results (MHBL 2007).

The second phase of construction started in early 2008 and coincided with the transfer of ownership to Hope Bay Mining Ltd. (HBML). Monitoring activities were not continued during this period, and were subsequently identified as a permit requirement.

2 Water License Requirements

Specific requirements for the geochemical monitoring program are outlined in Section 7.1 of the July 2007 Monitoring and Follow-up Plan, and in Part D, Item 9 of the Doris North Water Licence. The requirements outlined in the Monitoring and Follow Up Plan are as follows:

> *A program of check ABA (acid base accounting) testing will be conducted on the quarried rock used in site construction to verify that all rock used is non acid generating. A target of collecting 100 samples spread equally over the approximately one million tonnes of rock to be quarried has been established for this follow-up program.*
>
> *During construction samples of quarried rockfill will be collected from the various road and pad construction sites and sent to an accredited external lab for acid base accounting analysis. The following information will be collected for each sample collected:*
>
> - *Location of Sample Point;*
> - *GPS Coordinates of sample point;*
> - *Name of Quarry from which the rockfill came from;*

- *Date rockfill was placed;*
- *The Name of the person who performed the sampling;*
- *Date and time of sampling;*
- *Date of analysis;*
- *Name of person who performed the analysis;*
- *Analytical method or techniques used; and*
- *Results of analysis.*

The data will be cross-referenced to a site infrastructure map. The objective is to collect ~100 samples from across the site (spread to capture a representative cross-section of all rockfill used in site construction) to verify that the rock used in construction is non-acid generating.

Part D "Conditions Applying to Construction" Item 9 of the Doris North water license states:

The Licensee shall include, in addition to conducting Quarry Rock Construction Monitoring and Management in accordance with the Water License Application. Monitoring and Follow Up Plan, dated July 2007, the following:

a. *A subset of twenty (20) samples shall be subjected to Shake Flask Extraction (SFE) tests with an emphasis on near surface rock samples; and*
b. *Submit to the Board for review no later than 6 month after the collection of samples, a report that presents the data collected from the Quarry Rock Construction Monitoring Program. The report shall include a discussion of the interpretation of the geochemical data.*

3 Methods

The 2009 sampling program covered areas of the road that were not represented in the earlier sampling programs. Sampling was performed on August 5 (samples 1 to 10) and August 9 (samples 11 to 20). Samples were collected at approximately 200 to 300 m intervals beginning at the airstrip (approximately where the 2007 Golder program ended). At each site, a sample of crushed material was taken from the surface of the road. The base of the road consisted of material that was too coarse to sample. Where crushed material was present immediately above the base of the road (e.g. on the side of the road), a sample of this material was obtained in addition to the surface sample. Samples from the road surface were typically not sieved because of uniform, fine particle size. Samples collected from the side of the road were sieved to obtain the less than 1 cm fraction. Sample locations are shown in Figure 1 and sample descriptions and locations are provided in Attachment 1.

During sampling, the western base of the road was also inspected for the presence of visual sulphides. Only materials in contact with the tundra were inspected.

A total of 24 samples were submitted to Cantest Laboratories for acid-base accounting (ABA), elemental analysis and shake flask extraction (SFE) tests. ABA tests were completed using the Modified Sobek method with sulphur speciation and TIC analyses. Metal concentrations were determined using aqua regia digestion with ICP-MS finish. SFE tests were completed on the less than 1 cm fraction from a subset of 20 samples.

4 Results

4.1 Visual Observations

On August 5, the first day of the inspection, the weather was sunny. The inspection commenced at the airstrip at a location north of site 09-DORRD-01 (UTM coordinates 433040, 7562281) and ended at the rock crushing area near Quarry 2 (e.g. the facility between 09-DORRD-10 and 09-DORRD-11). Fourteen occurrences of sulphides were documented. Where present, pyrite and/or chalcopyrite were in localized areas of large boulders and at negligible levels (<1%). Exceptions included one occurrence of chalcopyrite at 1 to 2% levels (between sites 09-DORRD-7 and 09-DORRD-8) and one occurrence of trace chalcopyrite in crushed material (between sites 09-DORRD-6 and 09-DORRD-7). Chalcopyrite was typically untarnished, occurring on a millimetre scale as disseminations, blebs or veinlets, and occasionally associated with quartz veining. Pyrite observed was untarnished and present as millimetre scale disseminations or blebs.

On August 10, the inspection was continued from the terminal location on August 5 and ended at the southern extent of the road where it meets Doris Lake. Along this section there were few occurrences of sulphides, but where present, disseminated, fine grain pyrite was present at negligible (<1%) levels.

4.2 ABA

Historically, ABA testing completed at the Hope Bay site, including testing of 2007 quarry rock samples, had NP values determined by the standard Sobek method. However, recent work at the site has shown that the standard Sobek method tends to overestimate NP. Therefore, NP determination for 2009 quarry rock samples was done by Modified Sobek method. In order to demonstrate the difference between the two methods, 3 randomly selected samples were submitted for both standard and modified Sobek NP methods. The results, presented in Table 1, show that the Modifed Sobek results were consistently much lower than the Standard Sobek results.

Table 1: Comparison of Standard and Modified Sobek NP Determinations

Sample ID	Standard Sobek NP (kg CaCO3/tonne)	Modified Sobek NP (kg CaCO3/tonne)
09-DORRD-05-2	214.6	130.1
09-DORRD-16-2	194.4	129.4
09-DORRD-20-2	157.8	107.3

Complete ABA results are provided as Attachment 1 and are summarized in Table 2 and Figures 1 and 2. Acid base accounting results showed that all samples contained substantial amounts of neutralization potential. Conventional NP/AP ratios were all greater than 3 (Figure 2), indicating these samples are not potentially acid generating. Total inorganic carbon (TIC) expressed in units of $CaCO_3$ eq/tonne were generally lower than conventional NP, but ratios of carbonate NP/AP (Figure 3) were also all greater than 3 and therefore not potentially acid generating.

Table 2: Summary of Acid Base Accounting Results

Statistic	Paste pH	Total Sulphur (Wt.%)	Sulphate Sulphur (Wt.%)	AP*	NP*	TIC*	NP/AP
25th percentile	8.96	0.09	<0.01	2.7	108	84	33
median	9.00	0.10	<0.01	3.1	121	105	39
75th percentile	9.12	0.11	<0.01	3.5	126	111	43
max	9.60	0.14	<0.01	4.4	138	125	51

Notes: NP = Neutralization Potential, AP = Acid Potential, TIC = Total inorganic carbon
*AP, NP and TIC are presented in units of $CaCO_3$ eq/tonne.

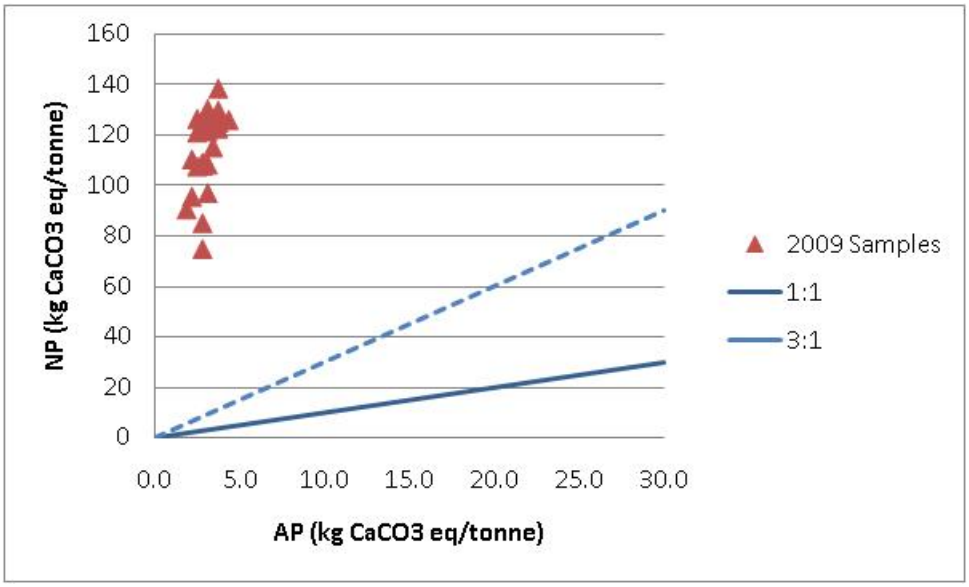


Figure 1: NP versus AP

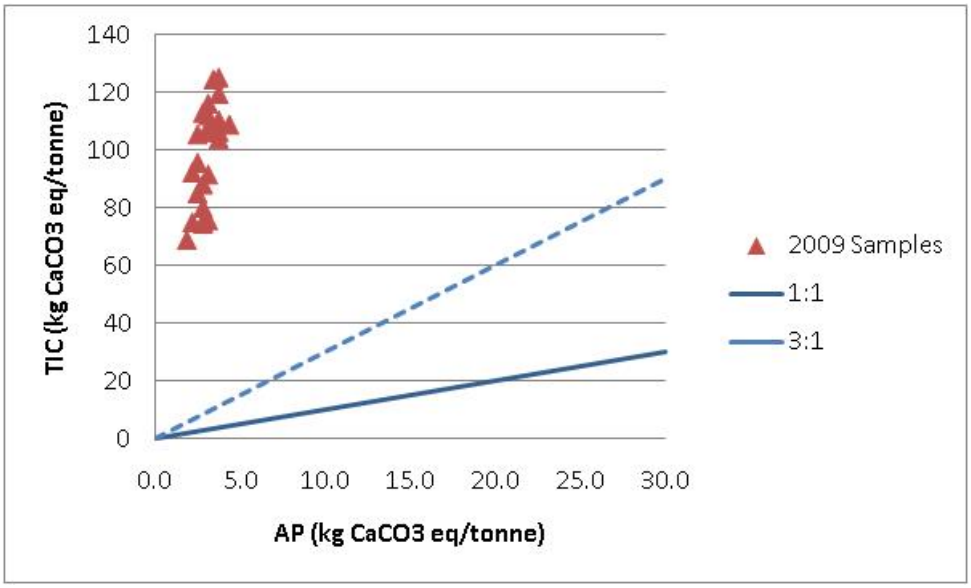


Figure 2: Carbonate NP versus AP

4.3 Elemental Analysis

Complete results of the 2009 elemental analysis are provided in Attachment 2 and are summarized in Table 3. Elemental analysis results were compared to ten times the average crustal abundance for basaltic rocks (Price 1997) to screen for parameters that were elevated in solid phase. None of the samples tested had parameters which exceeded this screening criterion.

4.4 Shake Flask Extraction

Complete results of the shake flask extractions (SFE) are provided as Attachment 3 and are summarized in Table 4. Shake flask extractions used a 3:1 liquid to solid ratio. Under field conditions, rocks typically contact less water than in shake flask extractions, and therefore test results may be more dilute than rinse water (or seepage) found under field conditions. On the other hand, the laboratory tests are completed on material with a finer grain size distribution (and therefore greater surface area) and higher temperatures, and they provide a more complete degree of contact than expected in the field. For these reasons, the results do not provide a direct indication of field conditions. Shake flask extraction results were compared to ten times the CCME guidelines for the protection of aquatic life (CCME 1999) to screen for parameters that were elevated in the test leachate.

All SFE tests had alkaline pH ranging from 8.9 to 9.7. Sulphate concentrations were low (median 13 mg/L) indicating little sulphide oxidation has occurred in the rocks. Dissolved metal concentrations were generally low with only one sample (09-DORRD-10-1) slightly exceeding the screening criteria for aluminum. This sample also had an anomalously high dissolved iron concentration. These results are within the range established in testing programs completed prior to development (SRK 2007 and 2008), and likely reflect colloidal sized particles entrained in the samples. Aluminum and iron concentrations were consistently low in actual seepage data.

Table 3: Summary of Elemental Analysis

Parameter	Units	Waste Rock				*Average Crustal Abundance for Basaltic Rocks*
		P25	Median	P75	Maximum	
Ag	ppm	<0.1	<0.1	<0.1	0.2	*0.1*
As	ppm	2.1	3.0	3.6	8.2	*2*
Au	ppb	1.4	1.8	2.7	4.9	*4*
Ba	ppm	8	12	14	18	*330*
Ca	%	4.5	5.3	5.6	6.4	*7.6*
Cd	ppm	<0.1	0.1	0.13	0.3	*0.2*
Co	ppm	39	41	43	49	*48*
Cr	ppm	154	170	185	360	*170*
Cu	ppm	132	136	142	158	*87*
Fe	%	5.5	5.9	6.2	7.3	*8.65*
Hg	ppm	<0.01	<0.01	<0.01	<0.01	*0.00009*
Mg	%	2.3	2.7	2.9	4.2	*4.6*
Mn	ppm	1141	1203	1315	1463	*1500*
Mo	ppm	0.2	0.3	0.3	0.6	*1.5*
Ni	ppm	67	74	85	212	*130*
P	%	0.029	0.033	0.035	0.045	*0.11*
Pb	ppm	2.1	3.2	6.3	33	*6*
Sb	ppm	<0.1	<0.1	0.1	0.9	*0.2*
Se	ppm	<0.5	<0.5	<0.5	0.6	*0.05*
Sr	ppm	20	24	26	31	*465*
U	ppm	<0.1	<0.1	<0.1	<0.1	*1*
V	ppm	143	151	168	215	*250*
W	ppm	<0.1	<0.1	<0.1	<0.1	*0.7*
Zn	ppm	68	77	82	98	*105*

Table 4: Summary of SFE Results Compared to 10x CCME Guidelines

Parameter	Units	P25	Median	P75	Max	*CCME Guideline x10*
pH	pH Units	9.2	9.3	9.5	9.7	
Conductivity	µS/cm	87	98	116	174	
Alkalinity (to pH 4.5)	mg $CaCO_3$/L	25	26	28	31	
Sulphate	mg/L	9.8	13	23	42	
Dissolved Chloride Cl	mg/L	1.0	1.3	1.8	15	
Dissolved Nitrate	mg/L	0.05	0.05	0.06	0.36	*29.3*
Dissolved Nitrite	mg/L	0.015	0.023	0.030	0.047	*0.06*
Total Ammonia	mg/L	0.04	0.07	0.12	0.16	
Dissolved Metals						
Dissolved Aluminum Al	mg/L	0.34	0.44	0.49	1.3	*1*
Dissolved Antimony Sb	mg/L	0.0004	0.0007	0.00115	0.0028	
Dissolved Arsenic As	mg/L	0.000875	0.0012	0.0015	0.0046	*0.05*
Dissolved Barium Ba	mg/L	0.001975	0.00405	0.005825	0.012	
Dissolved Boron B	mg/L	0.04	0.045	0.05	0.07	
Dissolved Cadmium Cd	mg/L	<0.00004	<0.00004	<0.00004	<0.00004	*0.00017*
Dissolved Calcium Ca	mg/L	7.0	7.9	9.0	16	
Dissolved Chromium Cr	mg/L	<0.0002	<0.0002	0.0003	0.0043	*0.089*
Dissolved Cobalt Co	mg/L	<0.0002	<0.0002	<0.0002	0.001	
Dissolved Copper Cu	mg/L	0.002675	0.00365	0.004675	0.0075	*0.04*
Dissolved Iron Fe	mg/L	<0.01	<0.01	0.018	1.8	*3*
Dissolved Lithium Li	mg/L	<0.0002	<0.0002	0.0003	0.0006	
Dissolved Magnesium Mg	mg/L	1.2	1.4	1.7	3.7	
Dissolved Manganese Mn	mg/L	0.0006	0.0007	0.00145	0.053	
Dissolved Molybdenum Mo	mg/L	0.000775	0.0009	0.00125	0.0024	*0.73*
Dissolved Nickel Ni	mg/L	<0.0002	0.0002	0.000325	0.0026	*0.15*
Dissolved Potassium K	mg/L	1.3	1.6	2.0	2.3	
Dissolved Selenium Se	mg/L	<0.0002	0.0005	0.0008	0.004	*0.01*
Dissolved Silicon Si	mg/L	1.9	2.3	2.8	3.8	
Dissolved Silver Ag	mg/L	<0.00005	<0.00005	<0.00005	<0.00005	
Dissolved Sodium Na	mg/L	5.9	6.7	8.1	15	
Dissolved Strontium Sr	mg/L	0.021	0.03	0.046	0.13	
Dissolved Titanium Ti	mg/L	0.00038	0.0004	0.0012	0.049	
Dissolved Vanadium V	mg/L	0.0043	0.0050	0.0074	0.013	
Dissolved Zinc Zn	mg/L	<0.001	<0.001	<0.001	0.004	*0.3*

SFE results are compared to CCME Guidelines for illustration purposes only. CCME Guidelines apply only to receiving environments and to do not apply to mine water.

5 References

Canadian Council of Ministries of the Environment 2007. Canadian Water Quality Guidelines for the Protection of Aquatic Life Update 7.0 September 2007.

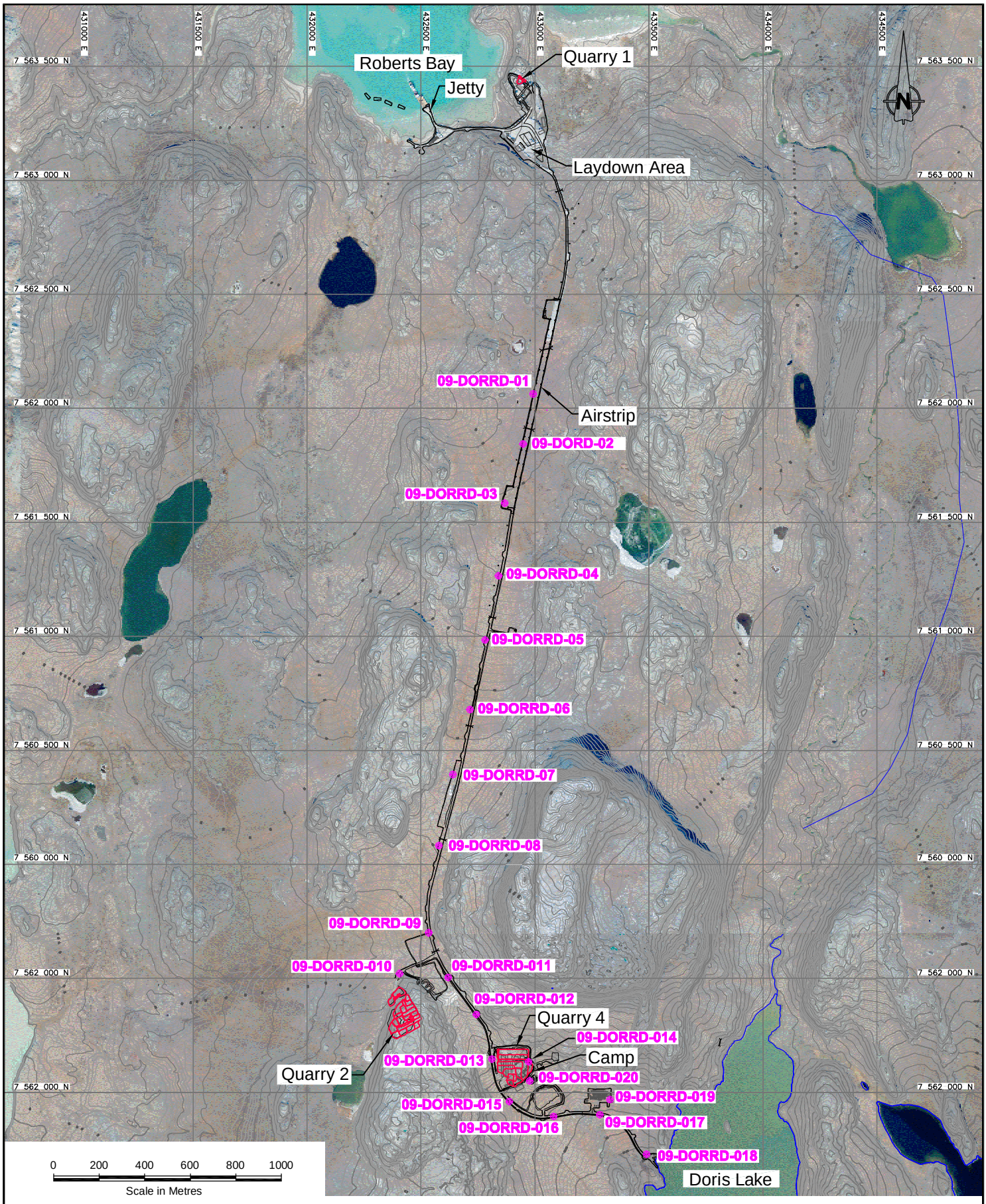
Miramar Hope Bay Ltd. 2007. Monitoring and Follow-Up Plan Doris North Project, Nunavut. April 2007.

Nunavut Water Board License Licence No: 2AM-DOH0713 September 19, 2007.

SRK Consulting (Canada) Inc. 2007. Geochemical Characterization of Quarry Materials, Doris North Project, Hope Bay, Nunavut, Canada (Revised March 2007). Prepared for Miramar Hope Bay Limited, March 2007.

SRK Consulting, 2008. Geochemical Characterization of Quarry Materials for the Doris-Windy All-Weather Road, Hope Bay Project. Report 1CH008.000.300 prepared for Hope Bay Mining Ltd., August 2008.

Figure



SRK Consulting
Engineers and Scientists
Vancouver B.C.

HOPE BAY MINING LTD.

Hope Bay Gold Project

Quarry Rock Seepage Monitoring

2009 Quarry Rock Sample Locations

SRK JOB NO.: 1CH008.023.0001

FILE NAME: Doris site-Layout.dwg

DATE: Oct. 2009

APPROVED: –

FIGURE: 1

J:\01_SITES\Hope Bay\ACAD\2009 Drawings\Doris site-Layout.dwg

Attachment 1
Sample Information

Attachment 1: Sample Information

Sample ID	Location	Description	Date	Time	Easting	Northing
09-DORRD-01A	Sideof airstrip; west side	Crushed material (< 1 cm). Mafic volcanic. No visible sulphides	5-Aug-09	2:57:08PM	432993	7562064
09-DORRD-01B	Surface of airstrip; east side	Crushed material (< 1 cm). Mafic volcanic. Rare (<1%) disseminated, very fine grain silver-grey sulphide mineral.	5-Aug-09	2:57:08PM	432993	7562064
09-DORRD-02A	Sideof airstrip; west side	Mafic volcanic. No visible sulphides.	5-Aug-09	3:23:53PM	432949	7561845
09-DORRD-02B	Surface of airstrip; east side	Mafic volcanic. Negligible (<1%) disseminated very fine grain pyrite.	5-Aug-09	3:23:53PM	432949	7561845
09-DORRD-03A	Surface of road; east side	Mafic volcanic. No visible sulphides.	5-Aug-09	3:50:28PM	432868	7561585
09-DORRD-03B	Sideof road; west side	Mafic volcanic. Rare (<1%) disseminated, very fine grain pyrite.	5-Aug-09	3:50:28PM	432868	7561585
09-DORRD-04	Surface of road	Mafic volcanic. No visible sulphides.	5-Aug-09	4:12:19PM	432841	7561266
09-DORRD-05	Surface of road at cutout	Mafic volcanic. <1% sulphides, including very fine grain disseminated white-grey sulphide and fine grain diesseminated blebs of chalcopyrite.	5-Aug-09	5:40:10PM	432782	7560985
09-DORRD-06	Surface of road at pullout	Mafic volcanic. <1% sulphides but occurrence is higher than previous samples. Sulphides include very fine grain and fine grain disseminated pyrite (untarnished) and disseminated fine grain chalcopyrite.	5-Aug-09	6:04:27PM	432716	7560680
09-DORRD-07A	Surface of road at laydown area	Mafic volcanic. Negligible (<1%) disseminated very fine grain grey-white sulphide.	5-Aug-09	6:24:01PM	432641	7560395
09-DORRD-07B	Surface of road; east side	Mafic volcanic. Negligible (<1%) disseminated very fine grain cubic pyrite.				
09-DORRD-08	Surface of road	Mafic volcanic. Negligible (<1%) disseminated, very fine grain sulphide.	5-Aug-09	6:52:29PM	432579	7560083
09-DORRD-09	Surface of road	Mafic volcanic. Negligible (<1%) very fine grain, disseminated pyrite.	5-Aug-09	7:12:10PM	432535	7559701
09-DORRD-10	Surface of road	Mafic volcanic. No visible sulphides.	5-Aug-09	7:34:06PM	432407	7559522
09-DORRD-11	Surface of road	Mafic volcanic. No visible sulphides.	9-Aug-09	8:54:54AM	432620	7559505
09-DORRD-12	Surface of road	Mafic volcanic. Neglible (<1%) diseeminated very fine grain pyrite, occassionally 2mm scale blebs.	9-Aug-09	9:14:52AM	432744	7559343

Attachment 1: Sample Information

Sample ID	Location	Description	Date	Time	Easting	Northing
09-DORRD-13	Surface of road	Mafic volcanic. Negligible (<1%) very fine grain, disseminated pyrite.	9-Aug-09	9:27:48AM	432812	7559147
09-DORRD-14	Surface of camp pad	Mafic volcanic. Rare (<1%) disseminations of 1mm blocky pyrite.	9-Aug-09	9:42:31AM	432973	7559135
09-DORRD-15	Surface of road	Mafic volcanic. No visible sulphides.	9-Aug-09	9:58:01AM	432888	7558961
09-DORRD-16	Surface of road	Mafic volcanic. Negligible (<1%) very fine grain, disseminated pyrite.	9-Aug-09	10:31:40AM	433083	7558895
09-DORRD-17	Surface of road	Mafic volcanic. Rare (<1%) disseminated, ~2mm scale pyrite.	9-Aug-09	10:51:53AM	433285	7558903
09-DORRD-18	Surface of road	Mafic volcanic. No visible sulphides.	9-Aug-09	11:17:11AM	433490	7558730
09-DORRD-19	Surface of camp pad adjacent to helipads.	Mafic volcanic. No visible sulphides.	9-Aug-09	11:30:59AM	433330	7558969
09-DORRD-20	Camp pad near geology offices	Mafic volcanic. No visible sulphides.	9-Aug-09	1:39:29PM	432978	7559051

Samples taken by Lisa Barazzuol
Coordinates are NAD83

Attachment 2
2009 ABA Data

Attachment 2
2009 Quarry Rock ABA Results

S. No.	Sample ID	Paste pH	Acme CO2 (Wt.%)	CaCO3 Equiv.* (Kg CaCO3/Tonne)	Acme Total Sulphur (Wt.%)	Sulphate Sulphur (Wt.%)	Sulphide Sulphur** (Wt.%)	Maximum Potential Acidity*** (Kg CaCO3/Tonne)	Mod. ABA NP Neutralization Potential (Kg CaCO3/Tonne)	Net Neutralization Potential**** (Kg CaCO3/Tonne)	Fizz Rating	Std. Sobek NP Neutralization Potential (Kg CaCO3/Tonne)
1	09-DORRD-01A	9.1	4.75	108.0	0.10	<0.01	0.10	3.1	121.2	118.1	Strong	
2	09-DORRD-01B-2	9.0	4.57	103.9	0.12	<0.01	0.12	3.8	122.4	118.7	Strong	
3	09-DORRD-02B	9.1	3.30	75.0	0.07	<0.01	0.07	2.2	95.4	93.2	Strong	
4	09-DORRD-03A	9.2	3.28	74.5	0.09	<0.01	0.09	2.8	74.6	71.8	Strong	
5	09-DORRD-03B-2	9.0	5.48	124.5	0.11	<0.01	0.11	3.4	115.0	111.6	Strong	
6	09-DORRD-04-2	9.1	4.97	113.0	0.09	<0.01	0.09	2.8	124.8	121.9	Strong	
7	09-DORRD-05-2	9.0	4.68	106.4	0.10	<0.01	0.10	3.1	**130.1**	127.0	Strong	**214.6**
8	09-DORRD-06-2	9.1	5.11	116.1	0.10	<0.01	0.10	3.1	127.3	124.2	Strong	
9	09-DORRD-07A-2	9.2	5.51	125.2	0.12	<0.01	0.12	3.8	138.2	134.4	Strong	
10	09-DORRD-07B	9.2	3.52	80.0	0.09	<0.01	0.09	2.8	108.8	106.0	Strong	
11	09-DORRD-08-2	9.6	4.06	92.3	0.07	<0.01	0.07	2.2	110.1	107.9	Strong	
12	09-DORRD-SRK-09-2	9.0	3.88	88.2	0.09	<0.01	0.09	2.8	107.7	104.9	Strong	
13	09-DORRD-10-2	9.0	3.30	75.0	0.09	<0.01	0.09	2.8	84.9	82.1	Strong	
14	09-DORRD-11-2	9.0	4.64	105.5	0.08	<0.01	0.08	2.5	120.9	118.4	Strong	
15	09-DORRD-12-2	9.0	3.03	68.9	0.06	<0.01	0.06	1.9	90.4	88.5	Strong	
16	09-DORRD-13-2	9.1	4.03	91.6	0.10	<0.01	0.10	3.1	108.2	105.0	Strong	
17	09-DORRD-14-2	9.0	4.21	95.7	0.08	<0.01	0.08	2.5	126.3	123.8	Strong	
18	09-DORRD-15-2	9.0	4.68	106.4	0.12	<0.01	0.12	3.8	124.8	121.0	Strong	
19	09-DORRD-16-2	8.8	5.26	119.5	0.12	<0.01	0.12	3.8	**129.4**	125.6	Strong	**194.4**
20	09-DORRD-17-2	8.9	4.86	110.5	0.12	<0.01	0.12	3.8	126.5	122.7	Strong	
21	09-DORRD-18-2	9.0	3.33	75.7	0.10	<0.01	0.10	3.1	96.8	93.7	Strong	
22	09-DORRD-19-2	9.0	4.79	108.9	0.14	<0.01	0.14	4.4	125.7	121.4	Strong	
23	09-DORRD-20-2	9.1	3.74	85.0	0.08	<0.01	0.08	2.5	**107.3**	104.8	Strong	**157.8**
24	09-DORRD-SRK-04-2 PD	9.0	4.93	112.0	0.10	<0.01	0.10	3.1	126.5	123.3	Strong	
Detection Limits		*0.5*	*0.02*	*0.5*	*0.02*	*0.01*	*0.02*	*0.6*				
CANTEST SOP No:		7160	LECO	Calculation	LECO	7410	Calculation	Calculation	7150	Calculation	7150	7110

Notes:
Total sulphur and carbonate carbon (CO2-HCl direct method: By Leco done at Acme Labs.
Calculations:
*CaCO3 equivalents is based on carbonate carbon.
**Sulphide sulphur is based on difference between total sulphur and sulphate sulphur.
***MPA (Maximum Potential Acidity) is based on sulphide sulphur .
**** NNP (Net Neutralization Potential) is based on difference between Neutralization Potential (NP) and MPA.
References:
Reference for Mod ABA NP method (SOP No. 7150): MEND Acid Rock Drainage Prediction Manual, MEND Project 1.16.1b (pages 6.2-11 to 17), March 1991.
Reference for Std. Sobek NP method (Cantest SOP No. 7110): Sobek NP Method (EPA 600 Method - described in Sobek et al. 1978)

Attachment 3
2009 Elemental Analysis

Attachment 3
2009 Quarry Rock Elemental Analysis Results

S. No.	Sample ID	Ag ppm	Al %	As ppm	Au ppb	B ppm	Ba ppm	Bi ppm	Ca %	Cd ppm	Co ppm	Cr ppm	Cu ppm	Fe %	Ga ppm	Hg ppm	K %	La ppm	Mg %	Mn ppm	Mo ppm	Na %
1	09-DORRD-01A	<0.1	3.88	2.3	1.4	<20	12	<0.1	5.37	0.1	44.2	149	139.1	6.99	10	<0.01	0.04	2	2.80	1463	0.3	0.031
2	09-DORRD-01B-2	<0.1	3.63	2.1	1.3	<20	10	<0.1	5.67	<0.1	43.3	178	144.4	6.34	9	<0.01	0.03	2	2.73	1349	0.2	0.048
3	09-DORRD-02B	0.1	3.23	3.7	2.7	<20	8	<0.1	3.98	<0.1	38.2	174	126.2	5.58	8	<0.01	0.03	3	2.55	1148	0.2	0.051
4	09-DORRD-03A	<0.1	3.54	3.4	1.3	<20	8	<0.1	4.11	0.3	41.3	169	125.0	6.13	9	<0.01	0.04	2	2.88	1200	0.2	0.056
5	09-DORRD-03B-2	<0.1	3.87	3.0	1.8	<20	16	<0.1	5.77	0.1	42.9	119	135.8	7.26	11	<0.01	0.06	3	2.82	1454	0.2	0.023
6	09-DORRD-04-2	<0.1	3.29	1.5	2.3	<20	12	<0.1	5.70	0.1	38.9	154	137.5	5.66	7	<0.01	0.03	2	2.37	1226	0.3	0.038
7	09-DORRD-05-2	<0.1	3.60	3.1	4.9	<20	13	0.1	5.48	0.1	42.0	180	141.1	6.16	8	<0.01	0.03	2	2.87	1308	0.2	0.031
8	09-DORRD-06-2	<0.1	3.63	3.1	3.7	<20	15	<0.1	5.63	<0.1	42.5	158	132.4	6.43	10	<0.01	0.05	2	2.87	1371	0.2	0.032
9	09-DORRD-07A-2	<0.1	3.13	1.6	1.8	<20	12	<0.1	6.41	0.2	38.6	150	141.1	5.40	7	<0.01	0.04	3	2.25	1202	0.4	0.036
10	09-DORRD-07B	<0.1	3.88	6.7	2.8	<20	15	<0.1	3.82	<0.1	49.1	360	120.1	6.27	9	<0.01	0.02	4	4.17	1136	0.3	0.040
11	09-DORRD-08-2	<0.1	2.76	5.9	1.4	<20	14	<0.1	5.24	<0.1	37.0	154	145.2	4.99	8	<0.01	0.04	2	2.09	1053	0.4	0.075
12	09-DORRD-SRK-09-2	<0.1	2.98	1.0	<1.6	<20	5	<0.1	4.57	<0.1	38.7	154	134.4	5.34	6	<0.01	0.02	1	2.20	1142	0.2	0.038
13	09-DORRD-10-2	<0.1	3.25	2.0	3.1	<20	5	<0.1	3.80	0.1	40.1	178	134.6	5.81	7	<0.01	0.02	2	2.61	1162	0.3	0.037
14	09-DORRD-11-2	0.2	3.77	4.6	2.4	<20	13	<0.1	5.23	0.1	44.3	226	126.2	6.22	9	<0.01	0.05	4	3.30	1216	0.6	0.038
15	09-DORRD-12-2	0.1	2.93	8.2	2.0	<20	17	<0.1	3.40	0.1	37.0	193	136.0	4.96	8	<0.01	0.05	5	2.59	923	0.3	0.052
16	09-DORRD-13-2	0.1	2.61	6.5	1.9	<20	11	<0.1	4.72	0.1	35.7	159	153.8	4.70	7	<0.01	0.03	2	2.04	959	0.3	0.061
17	09-DORRD-14-2	<0.1	3.61	3.0	4.5	<20	15	<0.1	4.79	0.1	43.9	228	128.5	6.10	8	<0.01	0.04	4	2.97	1229	0.3	0.044
18	09-DORRD-15-2	<0.1	3.21	1.3	1.0	<20	7	<0.1	5.81	0.1	40.8	161	156.2	5.51	7	<0.01	0.03	2	2.33	1203	0.2	0.051
19	09-DORRD-16-2	<0.1	3.33	3.5	1.0	<20	14	0.1	5.57	0.2	39.7	148	137.1	5.92	8	<0.01	0.04	2	2.62	1278	0.2	0.035
20	09-DORRD-17-2	<0.1	3.97	2.1	1.1	<20	11	<0.1	5.55	0.2	46.3	219	133.6	6.86	9	<0.01	0.03	3	3.20	1393	0.3	0.034
21	09-DORRD-18-2	<0.1	3.15	3.5	3.3	<20	8	<0.1	3.59	<0.1	40.9	217	158.4	5.39	7	<0.01	0.03	3	2.78	1074	0.6	0.052
22	09-DORRD-19-2	<0.1	3.58	2.2	1.7	<20	7	<0.1	5.69	0.2	42.5	182	150.8	6.15	8	<0.01	0.02	1	2.70	1337	0.2	0.040
23	09-DORRD-20-2	<0.1	3.12	2.5	1.8	<20	18	<0.1	4.84	0.2	39.1	170	132.2	5.48	7	<0.01	0.06	2	2.34	1127	0.3	0.054
24	09-DORRD-SRK-04-2 PD	<0.1	3.21	1.5	1.7	<20	12	<0.1	5.53	<0.1	38.7	151	132.1	5.51	7	<0.01	0.03	2	2.32	1199	0.2	0.038
QAQC																						
Reference Material (1)																						
STD OREAS45PA		0.2	3.17	4.7	43.7	<20	186	0.2	0.23	0.1	113.5	803	598.3	16.69	17	0.02	0.07	16	0.10	1154	1.0	0.006
True Value STD OREAS45PA		**0.3**	**3.34**	**4.2**	**43**		**187**	**0.18**	**0.2411**	**0.09**	**104**	**873**	**600**	**16.559**	**16.8**	**0.03**	**0.0665**	**16.2**	**0.095**	**1130**	**0.9**	**0.011**
Percent Difference		-33.3	-5.1	11.9	1.6		-0.5	11.1	-4.6	11.1	9.1	-8.0	-0.3	0.8	1.2	-33.3	5.3	-1.2	5.3	2.1	11.1	-45.5
Reference Material (2)																						
STANDARD DS7		0.8	1.02	49.6	44.9	37	403	4.5	0.96	6.4	9.2	197	107.5	2.40	4	0.17	0.42	11	1.04	599	19.9	0.094
True Value STD DS7		**0.9**	**1.0**	**48.2**	**70.0**	**39**	**370**	**4.5**	**0.9**	**6.4**	**9.7**	**179**	**109**	**2.4**	**4.6**	**0.2**	**0.4**	**11.7**	**1.1**	**627**	**20.5**	**0.1**
Percent Difference		-10.1	6.4	2.9	-35.9	-5.1	8.8	-0.2	3.2	0.3	-5.2	10.1	-1.4	0.4	-13.0	-15.0	-4.5	-6.0	-1.0	-4.5	-2.9	5.6
Detection Limits		0.1	0.01	0.5	0.5	20	1	0.1	0.01	0.1	0.1	1	0.1	0.01	1	0.01	0.01	1	0.01	1	0.1	0.001
Method		1DX	1DX	1DX	1DX	1DX	1DX	1DX	1DX	1DX	1DX	1DX	1DX	1DX	1DX	1DX	1DX	1DX	1DX	1DX	1DX	1DX

Note:
Analysis done at Acme Labs.

Attachment 3
2009 Quarry Rock Elemental Analysis Results

S. No.	Sample ID	Ni ppm	P %	Pb ppm	S %	Sb ppm	Sc ppm	Se ppm	Sr ppm	Th ppm	Ti %	Tl ppm	U ppm	V ppm	W ppm	Zn ppm
1	09-DORRD-01A	69.6	0.036	2.1	0.10	<0.1	14.0	<0.5	25	0.2	0.276	<0.1	<0.1	215	<0.1	91
2	09-DORRD-01B-2	74.2	0.034	2.4	0.12	<0.1	11.0	<0.5	24	0.2	0.342	<0.1	<0.1	182	<0.1	79
3	09-DORRD-02B	78.0	0.034	3.8	0.06	<0.1	9.5	<0.5	24	0.2	0.316	<0.1	<0.1	152	<0.1	67
4	09-DORRD-03A	77.3	0.033	2.7	0.09	<0.1	10.5	<0.5	22	0.2	0.324	<0.1	<0.1	167	<0.1	93
5	09-DORRD-03B-2	63.4	0.035	1.7	0.11	<0.1	14.8	<0.5	27	0.3	0.204	<0.1	<0.1	213	<0.1	98
6	09-DORRD-04-2	60.0	0.028	2.7	0.09	<0.1	8.3	<0.5	20	0.3	0.326	<0.1	<0.1	154	<0.1	74
7	09-DORRD-05-2	74.7	0.031	1.6	0.1	<0.1	9.8	<0.5	20	0.3	0.301	<0.1	<0.1	166	<0.1	80
8	09-DORRD-06-2	75.9	0.033	2.0	0.09	<0.1	12.1	<0.5	25	0.3	0.268	<0.1	<0.1	188	<0.1	83
9	09-DORRD-07A-2	63.1	0.027	3.3	0.11	<0.1	7.1	<0.5	22	0.5	0.328	<0.1	<0.1	136	<0.1	78
10	09-DORRD-07B	212.2	0.042	3.1	0.08	<0.1	8.7	<0.5	27	0.4	0.233	<0.1	<0.1	139	<0.1	72
11	09-DORRD-08-2	60.3	0.027	1.8	0.08	0.1	9.0	<0.5	26	0.2	0.352	<0.1	<0.1	148	<0.1	63
12	09-DORRD-SRK-09-2	64.9	0.027	1.2	0.09	<0.1	5.5	<0.5	16	0.1	0.336	<0.1	<0.1	129	<0.1	66
13	09-DORRD-10-2	81.7	0.034	1.9	0.08	<0.1	7.7	<0.5	20	0.2	0.314	<0.1	<0.1	145	<0.1	68
14	09-DORRD-11-2	119.8	0.043	32.9	0.08	0.9	9.4	<0.5	31	0.5	0.258	<0.1	<0.1	148	<0.1	75
15	09-DORRD-12-2	96.5	0.045	29.5	<0.05	0.8	8.5	<0.5	28	0.4	0.235	<0.1	<0.1	131	<0.1	66
16	09-DORRD-13-2	73.9	0.032	23.1	0.09	0.7	7.3	<0.5	26	0.3	0.293	<0.1	<0.1	128	<0.1	59
17	09-DORRD-14-2	116.6	0.040	13.8	0.07	0.2	9.0	<0.5	28	0.4	0.296	<0.1	<0.1	157	<0.1	79
18	09-DORRD-15-2	69.2	0.029	12.3	0.11	0.3	7.0	<0.5	20	0.2	0.373	<0.1	<0.1	144	<0.1	68
19	09-DORRD-16-2	68.2	0.031	5.8	0.10	0.1	10.4	<0.5	24	0.3	0.299	<0.1	<0.1	168	<0.1	82
20	09-DORRD-17-2	108.7	0.037	5.0	0.12	<0.1	11.4	<0.5	26	0.3	0.293	<0.1	<0.1	185	<0.1	88
21	09-DORRD-18-2	107.4	0.035	3.9	0.08	0.1	7.3	<0.5	25	0.3	0.289	<0.1	<0.1	141	<0.1	65
22	09-DORRD-19-2	74.0	0.029	4.1	0.12	<0.1	8.7	<0.5	19	0.1	0.338	<0.1	<0.1	168	<0.1	85
23	09-DORRD-20-2	70.4	0.031	7.8	0.09	0.1	8.4	0.6	21	0.3	0.355	<0.1	<0.1	149	<0.1	82
24	09-DORRD-SRK-04-2 PD	62.0	0.028	2.6	0.09	<0.1	7.7	<0.5	20	0.3	0.311	<0.1	<0.1	148	<0.1	73
QAQC																
Reference Material (1)																
STD OREAS45PA		289.2	0.035	19.0	<0.05	0.2	42.2	<0.5	13	6.6	0.127	<0.1	1.2	230	<0.1	118
True Value STD OREAS45PA		**281**	**0.034**	**19**	**0.03**	**0.13**	**43**	**0.54**	**14**	**6**	**0.124**	**0.07**	**1.2**	**221**	**0.011**	**119**
Percent Difference		2.9	2.9	0.0	<0.05	53.8	-1.9	<0.5	-7.1	10.0	2.4	<0.1	0.0	4.1	<0.1	-0.8
Reference Material (2)																
STANDARD DS7		56.3	0.076	65.4	0.20	4.5	2.3	3.5	69	4.2	0.114	4.0	5.0	83	3.6	386
True Value STD DS7		**56.0**	**0.1**	**70.6**	**0.2**	**4.6**	**2.5**	**3.5**	**68.7**	**4.4**	**0.1**	**4.2**	**4.9**	**84.0**	**3.4**	**411**
Percent Difference		0.5	-5.0	-7.4	5.3	-2.2	-8.0	0.0	0.4	-4.5	-8.1	-4.5	2.0	-1.2	5.9	-6.1
Detection Limits		0.1	0.001	0.1	0.05	0.1	0.1	0.5	1	0.1	0.001	0.1	0.1	2	0.1	1
Method		1DX	1DX	1DX	1DX	1DX	1DX	1DX	1DX	1DX	1DX	1DX	1DX	1DX	1DX	1DX

Note:
Analysis done at Acme Labs.

Attachment 4
2009 SFE Results

Attachment 4:
2009 Quarry Rock Shake Flask Extraction Results

Serial No:				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Parameter	**Units**	**Method**	**Detection Limit**	**Sample ID**															
				09-DORRD-01B-1	**09-DORRD-02A-1**	**09-DORRD-03B-1**	**09-DORRD-04-1**	**09-DORRD-05-1**	**09-DORRD-06-1**	**09-DORRD-07A-1**	**09-DORRD-08-1**	**09-DORRD-09-1**	**09-DORRD-10-1**	**09-DORRD-11-1**	**09-DORRD-12-1**	**09-DORRD-13-1**	**09-DORRD-14-1**	**09-DORRD-15-1**	**09-DORRD-16-1**
Wt. of sample used	g	Weighing Scale	0.01	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250
Volume of DI water used	ml	Graduated Cylinder	5	750	750	750	750	750	750	750	750	750	750	750	750	750	750	750	750
On filtered samples																			
pH	pH Units	pH Meter	0.5	8.9	9.3	9.2	9.0	9.5	9.3	9.2	9.1	9.3	9.5	9.2	9.5	9.3	9.5	9.7	9.2
Conductivity	µS/cm	Conductivity Meter	0.5	174	104	98	130	96	87	93	145	109	157	97	122	114	87	78	98
Alkalinity (to pH 4.5)	mg CaCO3/L	Titration/Calculation	1.0	24	25	25	26	24	29	31	29	24	24	28	26	24	26	25	31
Sulphate	mg/L	Auto Turbidity	1.0	42	16	13	28	15	6	10	30	12	23	14	26	24	12	8	11
Dissolved Chloride Cl	mg/L	IC	0.2	2.25	1.44	1.28	1.32	1.17	0.91	1.01	1.94	6.34	14.6	1.76	2.28	1.15	0.92	0.96	1.59
Dissolved Nitrate	mg/L	IC	0.05	0.05	0.06	< 0.05	< 0.05	< 0.05	< 0.05	0.06	< 0.05	0.23	0.36	0.06	< 0.05	< 0.05	< 0.05	< 0.05	0.06
Dissolved Nitrite	mg/L	Colorimetric	0.002	0.007	0.017	0.02	0.024	0.016	0.038	0.029	0.024	0.01	0.007	0.047	0.024	0.026	0.034	0.01	0.016
Total Ammonia	mg/L	Colorimetric	0.01	0.16	0.07	0.07	0.15	0.13	0.12	0.14	0.09	0.08	0.14	0.04	0.12	0.05	0.07	0.02	0.05
Dissolved Metals by ICP-MS																			
Hardness CaCO3	mg/L	Calculation from Ca & Mg	0.2	55	28.6	30.5	44.4	24.8	25	26.3	35	25.1	45	23.7	23	29.3	22.6	17.3	26.5
Dissolved Aluminum Al	mg/L	ICP-MS	0.001	0.23	0.39	0.48	0.35	0.45	0.44	0.46	0.22	0.53	1.29	0.36	0.3	0.3	0.3	0.61	0.44
Dissolved Antimony Sb	mg/L	ICP-MS	0.0001	0.0008	0.0004	0.0004	0.0006	0.0004	0.0003	0.0004	0.0013	0.0004	0.0004	0.0004	0.0015	0.0021	0.0015	0.0005	0.0011
Dissolved Arsenic As	mg/L	ICP-MS	0.0002	0.0032	0.0015	0.0008	0.0013	0.0012	0.0009	0.0006	0.0044	0.0009	0.0013	0.0012	0.0046	0.0028	0.0015	0.0006	0.0012
Dissolved Barium Ba	mg/L	ICP-MS	0.0002	0.0046	0.0016	0.0019	0.0081	0.0054	0.0038	0.0019	0.012	0.0021	0.0039	0.0055	0.0098	0.0069	0.0057	0.0006	0.0042
Dissolved Beryllium Be	mg/L	ICP-MS	0.0001	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Dissolved Bismuth Bi	mg/L	ICP-MS	0.0001	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Dissolved Boron B	mg/L	ICP-MS	0.005	0.04	0.04	0.03	0.04	0.04	0.04	0.07	0.05	0.06	0.05	0.05	0.04	0.05	0.05	0.04	0.05
Dissolved Cadmium Cd	mg/L	ICP-MS	0.00001	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Dissolved Calcium Ca	mg/L	ICP-MS	0.01	16	8.63	9.54	13.5	7.95	7.56	7.81	10.3	8.04	14.3	7.14	7.04	8.87	6.79	5.63	7.91
Dissolved Chromium Cr	mg/L	ICP-MS	0.0002	0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	0.0003	< 0.0002	0.0002	0.0043	< 0.0002	0.0003	< 0.0002	0.0004	< 0.0002	< 0.0002
Dissolved Cobalt Co	mg/L	ICP-MS	0.0001	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	0.001	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Dissolved Copper Cu	mg/L	ICP-MS	0.0001	0.0072	0.001	0.003	0.0034	0.0028	0.0049	0.0019	0.0022	0.0046	0.0075	0.0031	0.0051	0.0036	0.0023	0.0023	0.0045
Dissolved Iron Fe	mg/L	ICP-MS	0.01	0.01	0.01	< 0.01	< 0.01	< 0.01	0.01	0.04	< 0.01	0.01	1.77	< 0.01	< 0.01	< 0.01	0.06	< 0.01	< 0.01
Dissolved Lead Pb	mg/L	ICP-MS	0.00005	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	0.0006	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Dissolved Lithium Li	mg/L	ICP-MS	0.0001	0.0003	< 0.0002	< 0.0002	0.0003	< 0.0002	0.0002	0.0004	0.0005	< 0.0002	0.0006	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	0.0002
Dissolved Magnesium Mg	mg/L	ICP-MS	0.005	3.67	1.7	1.62	2.59	1.2	1.47	1.65	2.25	1.2	2.23	1.42	1.3	1.74	1.35	0.78	1.64
Dissolved Manganese Mn	mg/L	ICP-MS	0.0001	0.0013	0.0007	0.0006	0.0007	0.0002	0.0007	0.0019	0.001	0.0011	0.053	0.0007	0.0006	0.0006	0.0024	0.0008	0.0003
Dissolved Phosphorus P	mg/L	ICP-MS	0.015	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	0.05	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Dissolved Molybdenum Mo	mg/L	ICP-MS	0.0001	0.0014	0.0008	0.0009	0.0012	0.0007	0.0009	0.0008	0.0011	0.0009	0.0014	0.0015	0.0016	0.0011	0.0008	0.0004	0.0024
Dissolved Nickel Ni	mg/L	ICP-MS	0.0002	< 0.0002	< 0.0002	< 0.0002	0.0002	< 0.0002	< 0.0002	0.0002	< 0.0002	0.0006	0.0026	< 0.0002	0.0004	0.0002	0.0003	< 0.0002	0.0005
Dissolved Potassium K	mg/L	ICP-MS	0.01	1.43	2.05	1.89	1.33	1.26	1.55	1.94	2.14	1.39	1.95	1.97	2.26	1.67	1.22	0.84	1.77
Dissolved Selenium Se	mg/L	ICP-MS	0.0002	0.004	0.0007	0.0005	0.0012	0.0006	0.0005	< 0.0002	0.0032	0.0004	0.0007	0.0005	0.0011	0.0013	0.0004	< 0.0002	< 0.0002
Dissolved Silicon Si	mg/L	ICP-MS	0.05	2.58	2.22	1.56	1.93	2.29	1.8	1.99	2.94	1.96	3.8	2.09	3.26	2.52	2.86	2.78	1.83
Dissolved Silver Ag	mg/L	ICP-MS	0.00004	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Dissolved Sodium Na	mg/L	ICP-MS	0.005	8.68	6.82	4.65	4.69	6.61	5.31	6.29	11.2	8.86	14.8	7.11	11.5	7.88	6.31	6.78	6.39
Dissolved Strontium Sr	mg/L	ICP-MS	0.0001	0.133	0.043	0.037	0.088	0.04	0.028	0.021	0.055	0.023	0.04	0.032	0.054	0.061	0.024	0.013	0.024
Dissolved Tellurium Te	mg/L	ICP-MS	0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Dissolved Thallium Tl	mg/L	ICP-MS	0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	0.00002	< 0.00002
Dissolved Thorium Th	mg/L	ICP-MS	0.00005	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Dissolved Tin Sn	mg/L	ICP-MS	0.0001	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Dissolved Titanium Ti	mg/L	ICP-MS	0.0002	0.0003	0.0005	0.0003	0.0003	0.0004	0.0003	0.0015	0.0005	0.0011	0.049	0.0004	0.0004	0.0004	0.0015	0.001	0.0003
Dissolved Uranium U	mg/L	ICP-MS	0.00005	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Dissolved Vanadium V	mg/L	ICP-MS	0.0001	0.0025	0.0053	0.003	0.0031	0.0072	0.0043	0.0046	0.0036	0.0059	0.011	0.0043	0.0085	0.0045	0.0068	0.013	0.0044
Dissolved Zinc Zn	mg/L	ICP-MS	0.001	0.004	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.003	< 0.001	0.002	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Dissolved Zirconium Zr	mg/L	ICP-MS	0.0001	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
Dissolved Mercury Hg	µg/L	CVAF	0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02

Notes:
Extraction Method Used: Rotary Extractor for 24h.
Liquid:Solid ratio used: 3:1; 750 ml DI H2O:250g of samples screened to <1cm fractions

Attachment 4:
2009 Quarry Rock Shake Flask Extraction Results

	Serial No:	17	18	19	20
Parameter	**Units**	**09-DORRD-17-1**	**09-DORRD-18-1**	**09-DORRD-19-1**	**09-DORRD-20-1**
Wt. of sample used	g	250	250	250	250
Volume of DI water used	ml	750	750	750	750
On filtered samples					
pH	pH Units	9.3	9.6	9.5	9.6
Conductivity	µS/cm	86	73	76	88
Alkalinity (to pH 4.5)	mg CaCO3/L	29	25	26	28
Sulphate	mg/L	10	8	8	9
Dissolved Chloride Cl	mg/L	1.06	0.91	0.86	1.28
Dissolved Nitrate	mg/L	< 0.05	< 0.05	< 0.05	< 0.05
Dissolved Nitrite	mg/L	0.035	0.009	0.022	0.039
Total Ammonia	mg/L	0.04	0.04	0.03	0.04
Dissolved Metals by ICP-MS					
Hardness CaCO3	mg/L	23.8	19.4	18.6	20.2
Dissolved Aluminum Al	mg/L	0.48	0.41	0.56	0.54
Dissolved Antimony Sb	mg/L	0.0008	0.0009	0.0008	0.0028
Dissolved Arsenic As	mg/L	0.0004	0.0009	0.0005	0.0012
Dissolved Barium Ba	mg/L	0.002	0.0021	0.001	0.0062
Dissolved Beryllium Be	mg/L	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Dissolved Bismuth Bi	mg/L	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Dissolved Boron B	mg/L	0.04	0.04	0.05	0.06
Dissolved Cadmium Cd	mg/L	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Dissolved Calcium Ca	mg/L	7.35	6.07	6	6.34
Dissolved Chromium Cr	mg/L	< 0.0002	0.0004	< 0.0002	0.0009
Dissolved Cobalt Co	mg/L	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Dissolved Copper Cu	mg/L	0.0052	0.0039	0.0044	0.0037
Dissolved Iron Fe	mg/L	< 0.01	0.09	< 0.01	0.26
Dissolved Lead Pb	mg/L	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Dissolved Lithium Li	mg/L	< 0.0002	< 0.0002	< 0.0002	0.0003
Dissolved Magnesium Mg	mg/L	1.32	1.03	0.88	1.05
Dissolved Manganese Mn	mg/L	< 0.0002	0.0031	0.0004	0.009
Dissolved Phosphorus P	mg/L	< 0.03	0.05	0.03	0.05
Dissolved Molybdenum Mo	mg/L	0.0008	0.0006	0.0006	0.0007
Dissolved Nickel Ni	mg/L	< 0.0002	0.0003	< 0.0002	0.0005
Dissolved Potassium K	mg/L	1.51	0.88	0.74	2.1
Dissolved Selenium Se	mg/L	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Dissolved Silicon Si	mg/L	1.66	2.57	1.91	2.82
Dissolved Silver Ag	mg/L	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Dissolved Sodium Na	mg/L	5.55	5.43	6.01	7.94
Dissolved Strontium Sr	mg/L	0.019	0.015	0.011	0.017
Dissolved Tellurium Te	mg/L	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Dissolved Thallium Tl	mg/L	< 0.00002	< 0.00002	< 0.00002	< 0.00002
Dissolved Thorium Th	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Dissolved Tin Sn	mg/L	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Dissolved Titanium Ti	mg/L	0.0004	0.002	0.0004	0.0068
Dissolved Uranium U	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Dissolved Vanadium V	mg/L	0.0042	0.0078	0.0064	0.011
Dissolved Zinc Zn	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Dissolved Zirconium Zr	mg/L	< 0.002	< 0.002	< 0.002	< 0.002
Dissolved Mercury Hg	µg/L	< 0.02	< 0.02	< 0.02	< 0.02

Notes:
Extraction Method Used: Rotary Extractor for 2
Liquid:Solid ratio used: 3:1; 750 ml DI H2O:25(