Geochemical Characterization of Quarry Materials for the Doris-Windy All-Weather Road Hope Bay Project

FINAL

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SRK Project Number: 1CH008.000.300

August 2008

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Hope Bay Project

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Executive Summary

Quarry materials from five proposed quarries for construction of the Doris-Windy all-weather road were geochemically characterized. A total of 120 samples were sampled, providing a spatially and geologically representative set of samples for characterization. The samples were predominantly basalts of varying texture with one sample of granitoid with minor basalt and three of overburden.

The analytical program consisted of acid-base accounting with total inorganic carbon to classify acid rock drainage (ARD) potential (120 samples), elemental analysis by aqua regia digestion followed by 35-parameter ICP-MS to examine elevated solid-phase parameters (120 samples), shake flask extractions on surface samples to assess mineral weathering (8 samples) and quantitative mineralogy by Rietveld-XRD to investigate carbonate composition (9 samples).

Based on the geochemical characterization program, from a ML/ARD perspective, the material from all five quarries is suitable to be used as construction material. The conclusion is based on the following geochemical results:

- The mineralogy, as determined by Rietveld-XRD, established that calcite was the only carbonate mineral. The calcite content was strongly correlated with $NP_{TIC.}$ Silicate minerals that may also contribute to the buffering capacity were inferred by ABA results and identified by mineralogy as an array of calcium and magnesium silicate minerals. Pyrite was not detected in the XRD analyses.
- Sulphide content is low, with fifth and ninety-fifth percentile (P5 and P95) levels of 0.02 and 0.14%, respectively. The potential for acid formation through sulphide oxidation is limited by the small quantities of sulphide.
- There is ample buffering capacity available with P5 and P95 levels of NP_{TIC} at 9.8 and 151.5 kg$CaCO_3$/t, respectively and P5 and P95 levels of Sobek NP at 55.8 and 200.7 kg$CaCO_3$/t, respectively. Sobek NP is consistently higher than NP calculated from TIC (NP_{TIC}) suggesting that in addition to carbonate minerals, the samples also have analytical NP in the form of silicate minerals.
- All 120 samples were classified as not potentially acid generating according to Sobek NP/AP. Using NP_{TIC}/AP, two samples were classified as uncertain with the remainder as not potentially acid generating. Since alumino-silicate minerals dominate the mineralogy, the mineralogical data indicate that NP_{TIC} data should be used for ARD classifications.
- Comparisons of elemental analyses to 10 times the average crustal abundance for basaltic rocks (Price, 1997) determined that elements were not significantly enriched for any parameters regulated in waters.
- Short term leach extraction tests were conducted on surface samples (0 to 1 m) to assess the soluble load due to mineral weathering. Some of the leachate samples were elevated in aluminum, iron and copper with respect to ten times the CCME freshwater guidelines for the

protection of aquatic life. Due to fine grain sizes of the method, elevated concentrations of aluminum and iron are not expected to be as significant in the field. Copper concentrations were elevated in two of the eight samples (up to 0.031 mg/L) with the remaining samples being below or near detection, which is consistent with previous results.

- Results are consistent with detailed studies on mafic rocks (basalt and gabbro) from four quarries in the Doris North area (AMEC, 2005; SRK, 2007). These four quarries have been approved for development. Quarry #2 is a proposed source of material for the Doris-Windy all-weather road. Quarry #3 has not yet been developed while materials have been excavated from Quarries #1 and #4.
- The geochemical consistency of the results from quarries A to E with Doris North quarries #2 and #4 suggest that there is regional consistency in the Mg-tholeite unit and that materials from other areas of this unit would be suitable for construction, provided a verification program is conducted (as outlined in Section 5). Materials from other regional geological units (e.g. diabase and Fe-tholeites) are not recommended as construction material at this time.

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1 Introduction

Hope Bay Mining Ltd (HBML), a wholly owned subsidiary of Newmont Mining Company, has proposed to build an all-weather road between Doris Camp and Windy Camp at their Hope Bay Project site (Hope Bay) in Nunavut, Canada. HBML wishes to source rock from six quarries along the proposed road alignment in order to optimize the construction cost of the road. The rock from one of the quarries (Quarry #2, located in the Doris North area) was previously geochemically characterized (SRK, 2007) and approved for development by relevant regulatory agencies. Five additional quarries have been identified for road construction.

In order to develop any quarry site, HBML needs to apply for a quarry development permit from relevant regulatory agencies. In support of the quarry development permit, SRK was retained by HBML to conduct a geochemical characterization program to assess if the rock from the five proposed quarries would be geochemically suitable for use in road construction. This report presents the results of the geochemical characterization assessment. Results are also compared to previous geochemical characterization programs for quarries at Hope Bay.

2 Previous Studies

Previous geochemical characterization studies on potential quarry materials for the Hope Bay project have been carried out by Rescan (2001), AMEC (2005) and SRK (2007).

During an earlier phase of evaluation, Rescan (2001) carried out a limited amount of geochemical characterization at six potential quarry locations between the Windy and Boston Camps. One of the assessed locations covered the outcropping basalt east of Windy Camp (see Figure 2.1). Three chip samples were collected and sent for ABA analysis. Results showed that the samples contained very low sulphur content and abundant neutralization potential, which resulted in all three samples being classified as not potentially acid generating (Rescan, 2001). The lack of sample IDs for quarry samples in Rescan (2001) did not allow identification of the three chip samples of interest, therefore comparisons were made to the entire sample set.

AMEC (2005) and SRK (2007) conducted geochemical characterization studies on samples from four quarries in the Doris North area to determine their suitability as construction material for infrastructure (primarily roads and laydown areas) at Doris North. The work was conducted in support of the Doris North Project EIS and Water Licence application. Rock at these four widely-separated locations consisted of mafic igneous lithologies (basalt and gabbro) that form part of a regionally-extensive mafic to ultramafic metavolcanic unit. AMEC's preliminary assessment included characterization of chip samples for acid-base accounting (including total inorganic carbon), elemental analysis, shake flask extractions (SFE) and for three quarries, humidity cell tests (HCT). The SRK (2007) studies included detailed characterization of drill core and surface samples for acid-base accounting, elemental analysis and SFE and also microprobe analysis of specific carbonate mineral grains from the AMEC HCT leach residues to determine their mineralogical composition.

Detailed testing of samples collected through drilling and surface sampling showed that these mafic rocks were appropriate for use as construction material. The samples tested were not potentially acid generating and had little potential to leach significant trace metals based on SFE results and the low sulphide and trace metal content of the rock. The HCT results were not interpreted in the context of metal leaching. Microprobe analyses determined that the samples tested had a significant excess of calcium and magnesium carbonate minerals beyond the quantity required to neutralize any acidity that could be generated by oxidation of the contained sulphide minerals. The materials from the four quarries were approved by relevant regulatory agencies for the purposes of construction, and materials have been excavated from two of these quarries (Quarries #1 and #4). Quarry #2 is a proposed source of material for the Doris-Windy All-Weather road while Quarry #3 has not yet been developed.

In general, these results suggest that there is a low risk for acid rock drainage and/or metal leaching from these rock types. However, site specific characterization of any new quarry sites was recommended.

3 Methods

SNC Lavalin reviewed the geology along the alignment of the proposed road alignment and selected six quarry locations to be used as sources of construction rock. The locations were selected to fall on surface exposures of the regional Mg-tholeitic basalt. SRK reviewed the proposed quarry locations and recommended a sampling program to HBML (SRK 2008). The drilling program, sample collection and geological logging were managed by HBML. SRK managed the geochemical characterization program for the samples obtained from HBML.

3.1 Sampling Program

Nine RC drill holes were completed in the five proposed quarries to obtain subsurface quarry samples for geochemical characterization. The quarry locations and drill holes are shown in Figure 2.1. Drilling was to a depth of at least 1 m below projected base elevation of the quarries. A total of 149 samples were collected at continuous 1 metre intervals along the entire length of core. The samples were logged by an HBML geologist (Appendix A).

3.2 Geochemical Sample Set

A total of 120 of the samples were selected by SRK for geochemical characterization (Appendix B). This sampling program is considered extremely comprehensive both spatially and volumetrically for the scope of the program. The samples were selected based on practical estimates of quarry highwall height. For the five drill holes with total depths of 10 m or less, all samples were selected for characterization (Appendix B). For the four holes drilled to 26 m, a subset of samples (typically to a depth of 19 m, which is likely below the maximum extent of excavation) was selected.

Logging determined that the geology was generally uniform with basalt of varying texture representing 97% of the geochemical sample set. The remaining samples included one sample of granitoid with minor basalt and three of overburden.

3.3 Analytical Program

The samples were submitted to the laboratory CANTEST Ltd. in Burnaby, B.C. for geochemical analysis.

3.3.1 Acid-Base Accounting

All 120 samples were analyzed using the Standard Sobek acid-base accounting (ABA) method (Sobek et al., 1978) to determine their acid rock drainage (ARD) potential. Parameters measured include paste pH, total sulphur, sulphate sulphur (by HCl leach), fizz rating, Standard Sobek neutralization potential (NP) and total inorganic carbon (TIC, reported as %CO_2). Sulphide sulphur was determined as the difference between total sulphur and sulphate sulphur.

3.3.2 Elemental Analysis

The solid-phase elemental content was conducted for all 120 samples using an aqua regia digestion with 35-parameter ICP-MS/ES finish. Elemental levels were compared to ten times the average crustal abundances for basaltic rock (Price, 1997) to screen for elevated parameters.

3.3.3 Mineralogy

Nine samples were submitted to the Department of Earth and Ocean Sciences at the University of British Columbia for Rietveld-XRD analyses. The objective of the mineralogical determination was primarily to quantify the forms of carbonate minerals in the quarries. Iron and manganese carbonates, which are ineffective for acid neutralization when compared to carbonate minerals such as calcite and dolomite, have been documented in the region. Accordingly, the mineralogy is being determined to support NP data and therefore ARD classifications. For each hole, the sample with the highest level of TIC was selected to ensure that the carbonate minerals could be detected by XRD.

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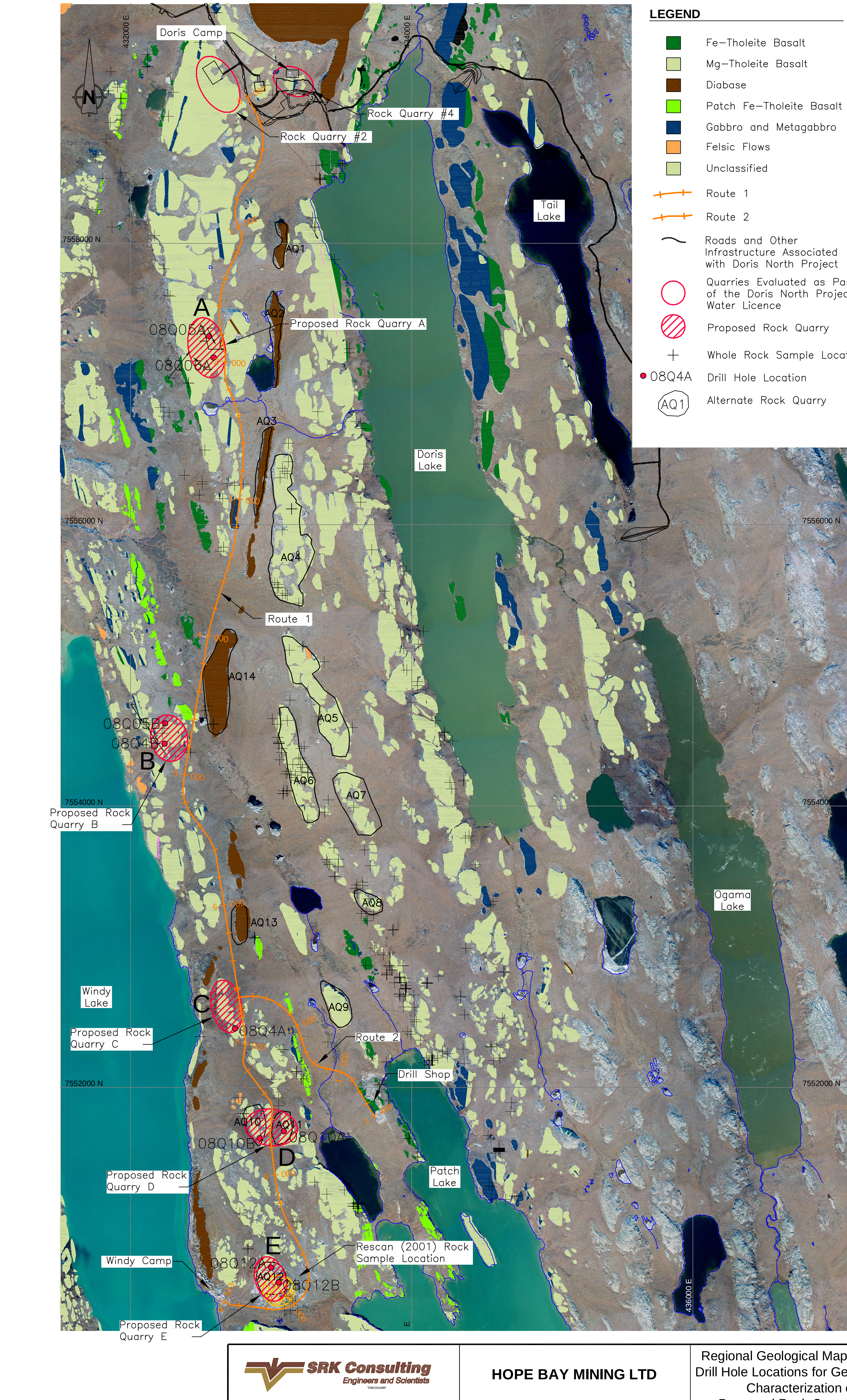

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Regional Geological Map Showing Drill Hole Locations for Geochemical Characterization of Proposed Rock Quarry Sites

Doris Camp - Windy Camp Access Road

SRK JOB NO.: 1CH008.000.300	FILE NAME: 1UN010_P01-1.dwg	DATE: Aug 2008	APPROVED: L.B.	FIGURE: 2.1

3.3.4 Shake Flask Extractions

Shake flask extractions (SFE) provide a measure of soluble components of a solid material. For material such as quarry rock, these soluble components form as a result of mineral weathering, and are likely to be present in the greatest concentrations at or near the exposed bedrock surface. A total of eight samples from the surface interval (0 to 1 m) were submitted for shake flask extractions using the BCMEMPR method (Price, 1997). Trace metals were analyzed using ICP-MS and Hg by cold vapour atomic fluorescence (CVAF).

Due to the absence of a surface sample, there was no SFE conducted for hole 08Q10A (Quarry D). Also, samples were initially selected and analyzed without knowledge of lithology. As a result, samples analyzed from drill holes 08Q06A01 (Quarry A) and 08Q05B01 (Quarry B) were in fact overburden and not quarry rock. Regardless, there are SFE data on rock for each of the five quarries under investigation.

4 Results

4.1.1 Mineralogy

Rietveld-XRD data for the nine samples are presented in Table 4.1 and Appendix C. Samples were generally dominated by chlinochlore (chlorite) ± quartz ± plagioclase ± calcite ± clinozoisite ± actinolite, with minor potassium feldspar ± biotite ± diopside and lesser lepidocrocite ± molybdenite ± andradite(?) ± lizardite(?) ± hematite(?). The presence of lizardite, hematite and andradite is uncertain because of their low concentrations and related limitations of the Rietveld-XRD instrumentation.

Molybdenite was the only sulphide detected and it was present only in one sample. There was no correlation between solid-phase molybdenum (by elemental analysis) and molybdenite (by XRD), with solid-phase molybdenum levels (expressed as percent molybdenite) three orders of magnitude lower than the XRD results. Pyrite was not detected in any of the samples.

Calcite is present in all samples and the only carbonate mineral detected by XRD. Furthermore, calcite levels by XRD have a strong correlation with the TIC measurements determined through ABA, with Rietveld-XRD slightly exceeding the ABA results at higher concentrations (Figure 4.1). The data therefore suggest that there is no or relatively negligible amounts of other carbonate minerals, including those composed of iron and/or manganese. Iron and manganese carbonates, which are ineffective for acid neutralization when compared to carbonate minerals such as calcite and dolomite, have been documented in the Hope Bay Belt. Previous microprobe analyses on quarry samples in the Doris North area also concluded that calcium and magnesium carbonates were dominant in these samples (SRK, 2007).

In addition to carbonates, silicate minerals provide buffering capacity, albeit at much slower rates, and if aluminum-containing, at lower pHs. XRD analyses identified a number of calcium- and magnesium-bearing alumino-silicate minerals (Table 4.1). Previous mineralogical work on materials from other quarry locations at Hope Bay has identified silicates with buffering capacity such as such as potassium feldspar, biotite and sericite (AMEC, 2005; SRK, 2007).

Since alumino-silicate minerals dominate the mineralogy, the mineralogical data indicate that NP_{TIC} data should be used for ARD classifications.

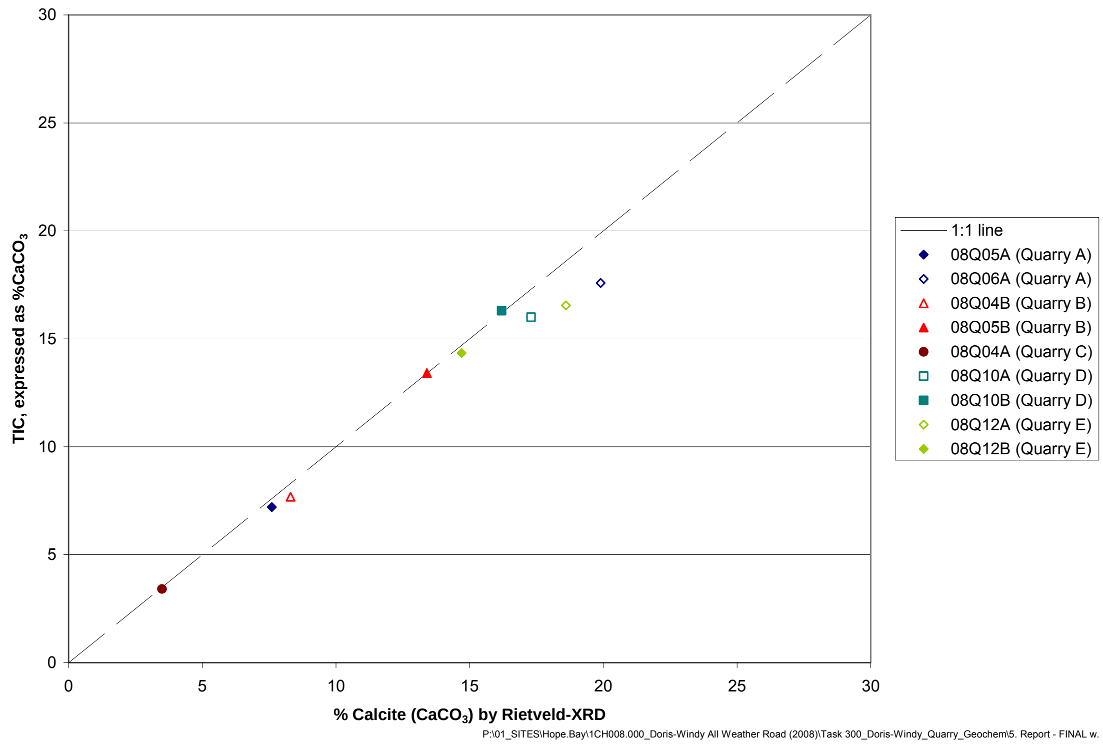

Figure 4.1: Comparison of Total Inorganic Carbon (TIC) Levels from ABA and Calcite Levels by Rietveld-XRD

Table 4.1: Rietveld-XRD Mineralogy Results

Mineral	Ideal Formula	Quarry A		Quarry B		Quarry C	Quarry D		Quarry E	
		08Q05A05	08Q06A09	08Q04B08	08Q05B04	08Q04A09	08Q10A12	08Q10B07	08Q12B02	08Q12A18
Quartz	SiO_2	13.3	10.9	17.4	13.4	2.1	26.6	15	16	24.4
Biotite	$K(Mg,Fe^{2+})_3AlSi_3O_{10}(OH)_2$	1.1						0.8	1.1	
K-feldspar	$KAlSi_3O_8$	4.4	6.7	2.1	3.8	1.5	3.3	1.9	2.1	3.2
Plagioclase	$NaAlSi_3O_8 – CaAl_2Si_2O_8$	20.4	5.6	11.3	24.1	14.5	4.2	14.5	12.6	21.8
Clinochlore	$(Mg,Fe^{2+})_5Al(Si_3Al)O_{10}(OH)_8$	29.6	23.3	19.9	17	26.8	36	17.1	20.6	32
Calcite	$CaCO_3$	7.6	19.9	8.3	13.4	3.5	17.3	16.2	14.7	18.6
Clinozoisite	$Ca_2Al_3(SiO_4)_3(OH)$	11.1	16	16.3	6.7	3.3	4.4	14.5	12.4	
Diopside	$CaMgSi_2O_6$	1.9	2.2	3.2	2.5	2.2	1.4	2.4	3.1	
Actinolite	$Ca_2(Mg,Fe^{2+})_5Si_8O_{22}(OH)_2$	10.2	11.9	21.5	18.5	46.1	6.1	17.6	17.5	
Lizardite ?	$Mg_3Si_2O_5(OH)_4$	0.3					0.7			
Hematite ?	α-Fe_2O_3		1.7							
Lepidocrocite	γ-$Fe^{3+}O(OH)$				0.4					
Molybdenite	MoS_2		0.1							
Andradite ?	$Ca_3Fe_2^{3+}(SiO_4)_3$		1.5							
Total		100	100	100	100	100	100	100	100	100

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Note: ? implies that a pattern may be fitted to the phase but without independent evidence, its presence cannot be confirmed.

4.1.2 Acid-Base Accounting

Acid-base accounting (ABA) results for 120 samples are presented in Appendix D. QA/QC replicate data from the laboratory are presented in Appendix E.

Paste pH results were alkaline for all samples, ranging in value from 8.1 to 9.4.

Overall, total sulphur levels were low, ranging from 0.02% to 0.18%. Sulphate sulphur levels were either below or equal to the analytical detection limit (0.01%), showing that the dominant form of sulphur is sulphide. Accordingly, sulphide levels, calculated as the difference between total sulphur and sulphate, ranged from 0.02% to 0.18%. These levels are comparable to levels reported for samples from Rescan (2001) but lower than SRK (2007).

Results for total inorganic carbon (TIC), a measurement of carbonate minerals, fizz test and Standard Sobek NP suggest that the samples contain high levels buffering capacity, a significant portion which is in the form of carbonate minerals. TIC levels were high, with fifth (P5) and ninety-fifth percentile (P95) levels of 0.43% and 6.7%, respectively. Fizz test ratings for each sample were typically rated as strong. The NP data shows that the fizz test ratings are in agreement with the NP results (Figure 4.2). P5 and P95 values of Sobek NP were 55.8 and 200.7 kg$CaCO_3$/t suggesting high levels of buffering capacity. Values of Sobek NP were consistently higher than NP calculated from TIC (NP_{TIC}) suggesting that in addition to carbonate minerals, the samples also have analytical NP in the form of silicate minerals (Figure 4.3). This is supported by the mineralogy, which includes both silicate and carbonate minerals (Table 4.1). Overall, samples have comparable levels of Sobek NP and slightly lower levels of NP_{TIC} compared to those from SRK (2007).

The ARD potential of samples was assessed by comparing the buffering capacity or NP (both Sobek and TIC) to the acid potential (AP), as calculated from sulphide sulphur, for each sample. ARD classifications were according to DIAND (1992) whereby samples with values of NP/AP <1 are classified as PAG, NP/AP > 3 are classified as non-PAG and 3 > NP/AP > 1 are classified as uncertain.

All 120 samples were classified as non-PAG according to Sobek NP/AP (Figure 4.4). Samples were also typically classified as non-PAG according to NP_{TIC}/AP (Figure 4.5), with the exception of two samples classified as uncertain (08Q05A02, Quarry A; 08Q04A07; Quarry C), which had low sulphide content (0.11% and 0.06%, respectively). These results were consistent with previous characterization programs (AMEC, 2005; SRK, 2007; Rescan, 2001), which concluded that proposed quarry rock is expected to be non-PAG based on conventional NP/AP ratios.

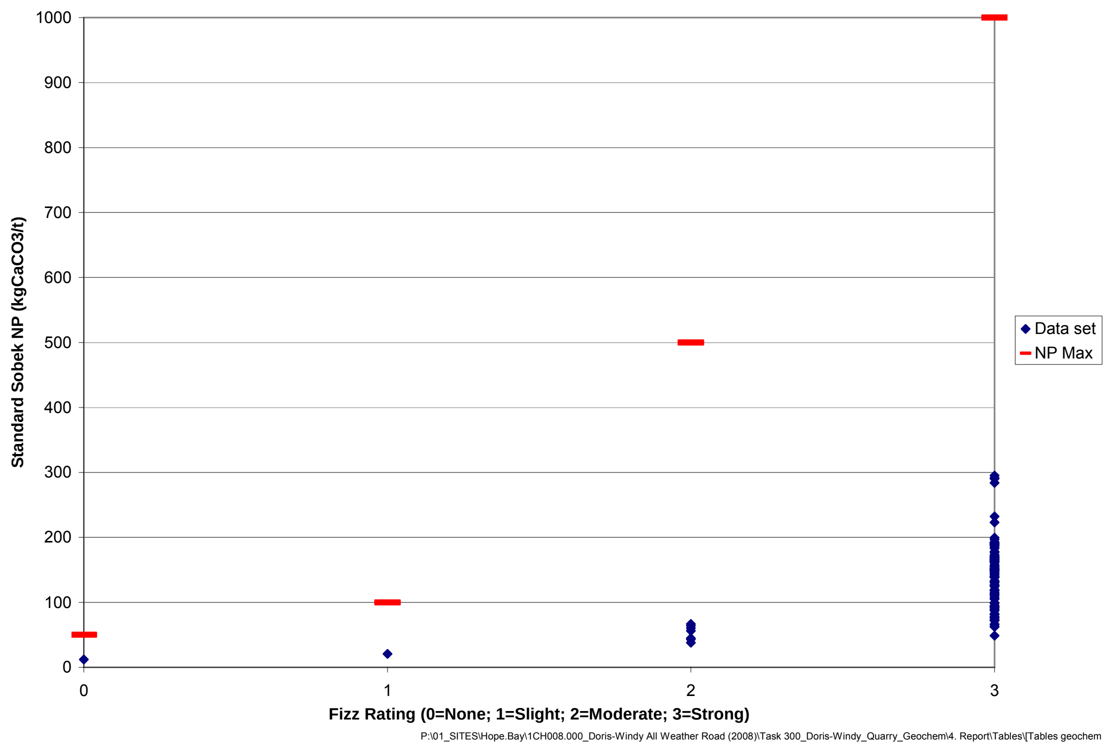

Figure 4.2: Sobek NP and Fizz Test Rating QA/QC

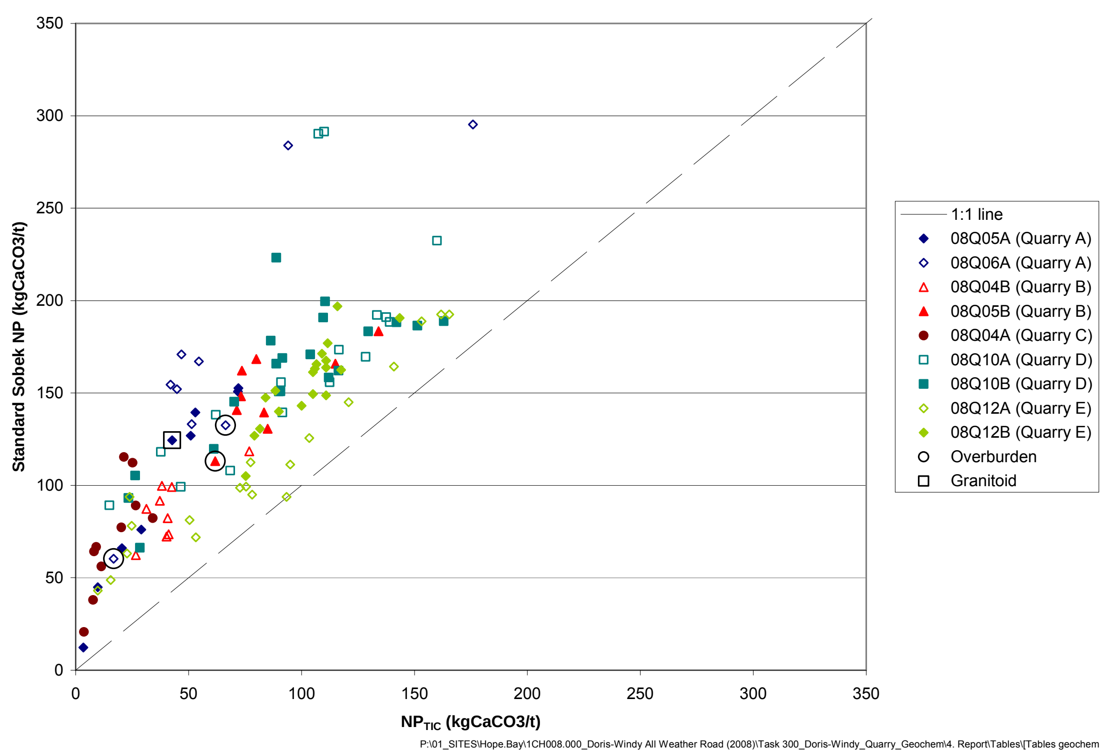

Figure 4.3: Comparison of Sobek NP and NP_{TIC}

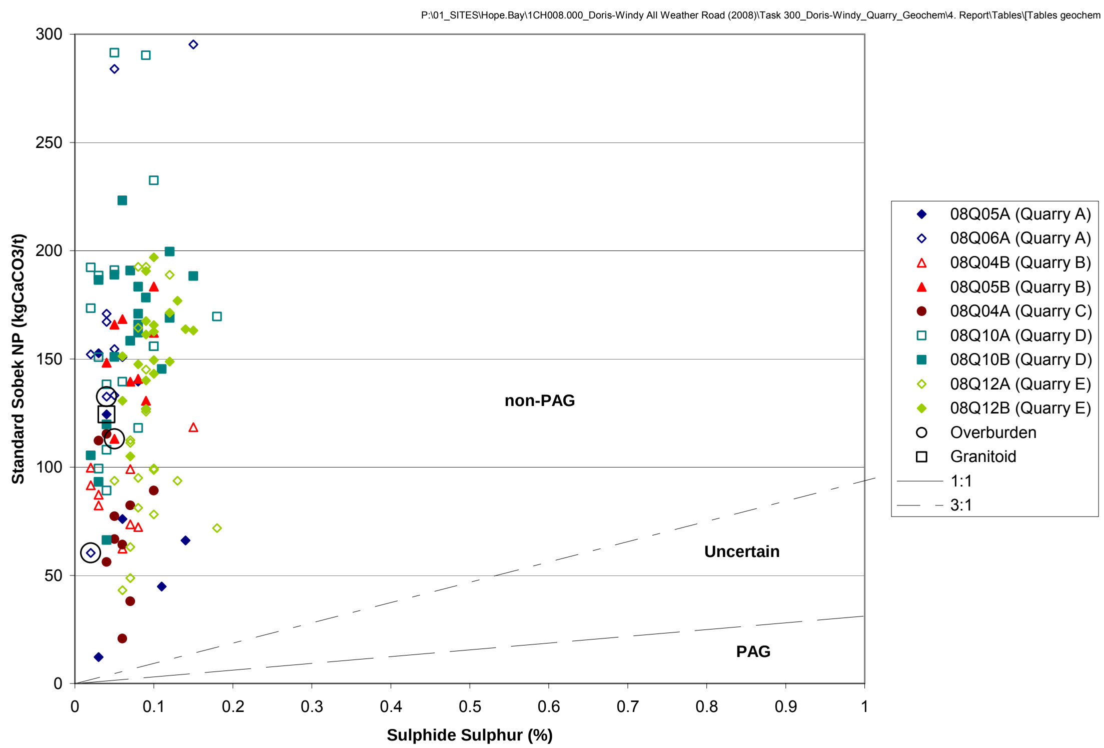

Figure 4.4: ARD Classification According to Sobek NP/AP

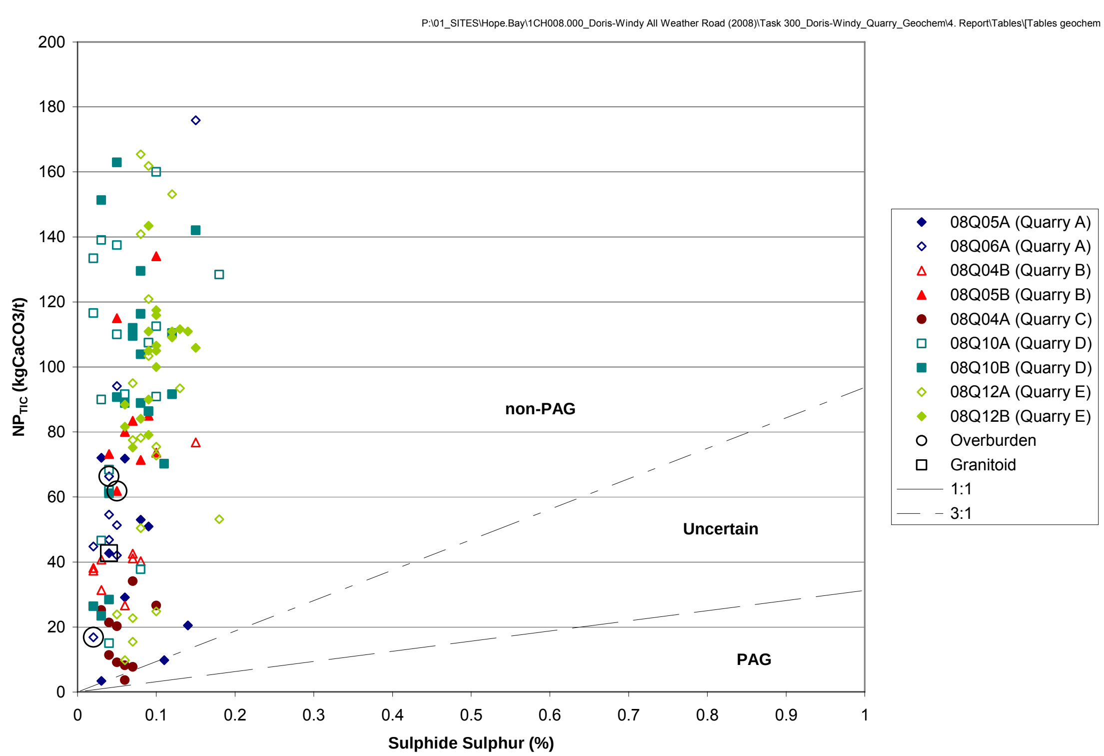

Figure 4.5: ARD Classification According to NP_{TIC}/AP

4.1.3 Elemental Analysis

Data from elemental analyses for 120 samples are presented in Appendix F. Results were compared to ten times the average crustal abundance for basaltic rocks (Price, 1997) to screen for parameters that are anomalously high in solid-phase. Selenium and bismuth detection limits were one and two orders of magnitude higher, respectively, than their corresponding values for the average crustal abundance and could therefore not be appropriately assessed for all samples. For bismuth and selenium, only values above analytical detection and that correlated with total sulphur were assessed.

The majority of samples did not contain any anomalously high elemental concentrations, and only gold and boron were elevated with respect to 10 times the average crustal abundances for basalt in some samples. One sample was elevated in gold in Quarry D and boron was elevated in selected samples in Quarries B, C and D.

In contrast, SRK (2007) reported samples elevated (>10x average crustal abundance) in arsenic, antimony, tin, bismuth, lead and selenium.

4.1.4 Shake Flask Extractions

Shake flask extraction (SFE) data for the eight near surface samples selected for testing are presented in Appendix G. With the exception of pH, results were compared to ten times the CCME freshwater guideline values for the protection of aquatic life to assess for elevated parameters. Mercury was not assessed because detection limits were above CCME guidelines.

The SFE data for the overburden samples was comparable to the basalt samples. The leachates for all samples were characterized by alkaline values of pH, ranging from 7.9 to 9.1, and negligible levels of acidity and sulphate, consistent with the low levels of sulphate and sulphide measured through ABA. Three samples have pH levels of greater than 8.5. The elevated pH is thought to be an artefact of the test procedure, where the small particle size combined with agitation over a 24-hour period led to rapid production of alkalinity from freshly-broken silicate mineral surfaces that are produced during preparation of the sample for testing. These conditions will not be present under rock fill placement scenarios where pH is buffered at lower levels due to interaction with atmospheric CO_2, and where average particle size is much larger.

Aluminum levels are elevated, ranging from 0.17 to 3.3 mg/L. Similar pH conditions and aluminum concentrations were noted in previous leach extraction testing on surface samples (SRK, 2007; AMEC, 2005). Elevated aluminum could be do to either fine colloidal particles that pass through the membranes used for filtering dissolved metals, or to somewhat increased solubility resulting from elevated pH conditions in the test.

Iron (all quarries) is also somewhat elevated with concentrations ranging from <0.05 to 4.91 mg/L. This could also be due to fine colloidal particles as iron tends to form relatively insoluble hydroxide minerals under oxic and alkaline conditions. Lepidocrocite, an iron hydroxide mineral that can be colloidal, was identified using Rietveld-XRD analyses (Table 4.1). Leachate iron levels are similar to those reported by AMEC (2005) (maximum 0.59 mg/L).

The two samples from Quarry A are also elevated in copper, which ranged in concentration from 0.001 to 0.031 mg/L for all samples. This is consistent with previous SFE results for copper, which were primarily below or near detection (AMEC, 2005; SRK, 2007), with elevated levels in selected samples only (up to 0.074 mg/L).

Concentrations of most other metals that would be of concern due to potential impacts to freshwater aquatic life were generally low or below detection. Exceptions include arsenic with a concentration of 0.02 mg/L in one sample, chromium with levels of 0.015 and 0.014 mg/L in two samples and molybdenum with levels of 0.17 and 0.043 mg/L in two samples.

These results suggest that there is relatively little potential for significant metal leaching from this material.

The ion balances for all samples were within acceptable error (±20%) with the exception of sample 08Q12A01 (Quarry A). Results for sample 08Q12A01 were verified by the laboratory.

5 Regional Geology Implications

To date, seven quarry rock sites within the regional Mg-tholeite basalt unit have been geochemically characterized to determine if the materials are suitable as construction material (Figure 2.1). The characterization program for the Doris North rock quarries (#2 and #4) consisted of a total of 45 samples from four drill holes (two per quarry). Three of the four drill holes were geologically logged by HBML geologists as basalt and one drill hole was logged as gabbro (quarry #2).

Overall, the seven quarry sites have been characterized as consistently not potentially acid generating, based on NP_{TIC}/AP values, and having a low risk for metal leaching. Furthermore, sulphide levels were consistently low and carbonate minerals were dominantly calcium- and magnesium- bearing. The geochemical consistency in results suggests there is continuity in the Mg-tholeiitic basalt unit with respect to acid rock drainage and metal leaching potential and that material from other parts of this geological unit (e.g. alternate quarry site AQ6, Figure 2.1) would be suitable to use as construction material provided a verification program is conducted.

If alternate quarry rock sites denoted as within the regional Mg-tholeite basalt unit are to be considered as construction material, the following verification program is recommended:

- Detailed mapping of quarry outcrops to confirm that the rocks are Mg-tholeite, and that there are no other types of rock or structural features that may have altered the geochemistry.

- Prior to quarry development, unweathered samples from the subsurface should be collected for geochemical characterization. These samples could be collected using a backpack drill or other alternate means.

- Upon commencement of quarry development, the blasted rock should be inspected for sulphides.

- The monitoring program outlined in Section 6 should be implemented.

Alternate quarry sites comprised of other geological units (e.g diabase and Fe-tholeite) are not recommended as construction material at the present time due to the limited amount of characterization that has been completed on those materials.

6 Summary and Recommendations

Based on the geochemical characterization program, from a ML/ARD perspective, the material from proposed quarries A, B, C, D and E is sufficient to be used as construction material. The conclusion is based on the following geochemical results:

- The mineralogy, as determined by Rietveld-XRD, established that calcite was the only carbonate mineral. The calcite content was strongly correlated with NP_{TIC}. Silicate minerals that may also contribute to the buffering capacity were inferred by ABA results and identified by mineralogy as an array of calcium and magnesium silicate minerals. Pyrite was not detected in the XRD analyses.
- Sulphide content is low, with fifth and ninety-fifth percentile (P5 and P95) levels of 0.02 and 0.14%, respectively. The potential for acid formation through sulphide oxidation is limited by the small quantities of sulphide.
- There is ample buffering capacity available with P5 and P95 levels of NP_{TIC} at 9.8 and 151.5 kg$CaCO_3$/t, respectively and P5 and P95 levels of Sobek NP at 55.8 and 200.7 kg$CaCO_3$/t, respectively. Sobek NP is consistently higher than NP calculated from TIC (NP_{TIC}) suggesting that in addition to carbonate minerals, the samples also have analytical NP in the form of silicate minerals.
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- Comparisons of elemental analyses to 10 times the average crustal abundance for basaltic rocks (Price, 1997) determined that elements were not significantly enriched for any parameters regulated in waters.
- Short term leach extraction tests were conducted on surface samples (0 to 1 m) to assess the soluble load due to mineral weathering. Some of the leachate samples were elevated in

aluminum, iron and copper with respect to ten times the CCME freshwater guidelines for the protection of aquatic life. Due to fine grain sizes of the method, elevated concentrations of aluminum and iron are not expected to be as significant in the field. Copper concentrations were elevated in two of the eight samples (up to 0.031 mg/L) with the remaining samples being below or near detection, which is consistent with previous results.

- Results are consistent with detailed studies on mafic rocks (basalt and gabbro) from four quarries in the Doris North area (AMEC, 2005; SRK, 2007). These four quarries have been approved for development. Quarry #2 is a proposed source of material for the Doris-Windy all-weather road. Quarry #3 has not yet been developed while materials have been excavated from Quarries #1 and #4.
- The geochemical consistency of the results from quarries A to E with Doris North quarries #2 and #4 suggest that there is regional consistency in the Mg-tholeite unit and that materials from other areas of this unit would be suitable for construction, provided a verification program is conducted (as outlined in Section 5). Materials from other regional geological units (e.g. diabase and Fe-tholeites) are not recommended as construction material at this time.

Monitoring Plan

Monitoring of placed quarry rock will verify the ML/ARD characteristics determined in this study. The plan is based on the Doris North quarry monitoring plan from MHBL (2007) and consists of the following:

1. Visual monitoring of quarry rock by field geologist during excavation to confirm that the expected rock types and disseminated sulphides (e.g. not veins) are being exposed.
2. Obtaining a total of five samples of blasted material (one per quarry) for acid-base accounting (ABA) confirmatory test work. The objective would be to confirm results and also assess the ARD potential of the fine fraction, which tends to concentrate sulphide minerals. For each sample, ABA would be conducted on the fines and the whole sample, for a total of ten ABA analyses.
3. Post-construction monitoring of seepage and runoff of rock fill to confirm that environmentally-significant levels of metal leaching are not occurring. Specifically, annual seep surveys should be conducted during the spring freshet for the first two years after the major earthworks construction of the Doris-Windy all-weather road. Using a field meter, pH will be determined for rock fill seepage and a water quality sample submitted for the analysis of pH, total sulphate, total ammonia, nitrate, alkalinity and an ICP metal scan. The objective is to verify that rock used in construction is non-acid generating and not leaching metals.

This report, **"Geochemical Characterization of Quarry Materials, Doris-Windy All Weather Road, Hope Bay Project"**, was prepared by SRK Consulting (Canada) Inc.

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Appendix A
Geological Logs for Nine Quarry Drill Holes

08Q04A

RC Quarry Program

Signature: ______________

08Q04A

Initials: ______

From	To	Litho	Surface Code	Simple Geo
0.00	1.00		1a	

Light green fine grained basalt. Competent, homogenous, c-type.

STRUCTURES					ALTERATION												VEINS									MINERALIZATION									SAMPLES			
From	To	Struct	CA	Strain	From	To	INT	SR	SIL	DL	CL	TO	AB	FU	CC	EP	From	To	Vn%	QZ%	DL%	CC%	V/m	CA	Septa	From	To	PY%	Style	VG	Min	Min%	Min2	M2%	From	To	Sample	Au g/t
0.00	1.00	NFO L			0.00	1.00	W	-	W	-	W	-	-	-	W	W	0.00	1.00	0.5	0	0					0.00	1.00	0.1	-	-								
					Weak cct alteration												*Fracture surface of cc vein + minor pyrite.*									*Minor fine grained pyrite on one cct vein fracture surface.*												

From	To	Litho	Surface Code	Simple Geo
1.00	2.00		1a	

Light green homogenous basalt similar to above. C-type.

STRUCTURES					ALTERATION												VEINS									MINERALIZATION									SAMPLES			
From	To	Struct	CA	Strain	From	To	INT	SR	SIL	DL	CL	TO	AB	FU	CC	EP	From	To	Vn%	QZ%	DL%	CC%	V/m	CA	Septa	From	To	PY%	Style	VG	Min	Min%	Min2	M2%	From	To	Sample	Au g/t
1.00	2.00	NFO L			1.00	2.00	W	-	W	-	W	-	-	-	W	W	1.00	2.00	0	0	0					1.00	2.00	0	-	-								
																	Unveined.									*Unmineralized.*												

From	To	Litho	Surface Code	Simple Geo
2.00	3.00		1a	

Light green homogenous basalt, similar to above. Minor pyre on fracture surface.

STRUCTURES					ALTERATION												VEINS									MINERALIZATION									SAMPLES			
From	To	Struct	CA	Strain	From	To	INT	SR	SIL	DL	CL	TO	AB	FU	CC	EP	From	To	Vn%	QZ%	DL%	CC%	V/m	CA	Septa	From	To	PY%	Style	VG	Min	Min%	Min2	M2%	From	To	Sample	Au g/t
2.00	3.00	NFO L			2.00	3.00	W	-	W	-	W	-	-	-	W	W	2.00	3.00	0	0	0	0				2.00	3.00	0.1	FG	-								
					Hard, minor epidote on fracture surface.												*Unveined.*									*Minor fine grained pyrite on fracture surface.*												

From	To	Litho	Surface Code	Simple Geo
3.00	4.00		1a	

Light green homogenous basalt similar to above, c-type. Minor qt + py veining. Slickensided epidote on fracture plane..

STRUCTURES					ALTERATION												VEINS									MINERALIZATION									SAMPLES			
From	To	Struct	CA	Strain	From	To	INT	SR	SIL	DL	CL	TO	AB	FU	CC	EP	From	To	Vn%	QZ%	DL%	CC%	V/m	CA	Septa	From	To	PY%	Style	VG	Min	Min%	Min2	M2%	From	To	Sample	Au g/t
3.00	4.00	NFO L			3.00	4.00	W	-	W	-	W	-	-	-	M	W	3.00	4.00	1	100	0	0				3.00	4.00	0.1	FG	-								
					Epidote on fracture plane exhibits slickensides.												*White qtz on vein fracture plane + minor fine grained pyrite.*									*Fine grained pyrite associated with qtz veining.*												

08Q04A

Initials: ________

From	To	Litho	Surface Code	Simple Geo
4.00	5.00		1a	

Green homogenous fine grained basalt, similar to above. Light green altered relict plag? With lesser fine chloritized relict mafic grains?

STRUCTURES					ALTERATION												VEINS									MINERALIZATION									SAMPLES			
From	To	Struct	CA	Strain	From	To	INT	SR	SIL	DL	CL	TO	AB	FU	CC	EP	From	To	Vn%	QZ%	DL%	CC%	V/m	CA	Septa	From	To	PY%	Style	VG	Min	Min%	Min2	M2%	From	To	Sample	Au g/t
4.00	5.00	NFOL			4.00	5.00	W	-	W	-	W	-	-	-	M	W	4.00	5.00	0	0	0	0				4.00	5.00	0	-	-								

Minor epidote on fracture plane. Fine chlorite altered grains through basalt.

Unveined.

Unmineralized.

From	To	Litho	Surface Code	Simple Geo
5.00	6.00		1a	

Green gray pale fine grained basalt, similar to above. C-type.

STRUCTURES					ALTERATION												VEINS									MINERALIZATION									SAMPLES			
From	To	Struct	CA	Strain	From	To	INT	SR	SIL	DL	CL	TO	AB	FU	CC	EP	From	To	Vn%	QZ%	DL%	CC%	V/m	CA	Septa	From	To	PY%	Style	VG	Min	Min%	Min2	M2%	From	To	Sample	Au g/t
5.00	6.00	NFOL			5.00	6.00	W	-	W	-	W	-	-	-	M	W	5.00	6.00	0	0	0	0				5.00	6.00	0	-	-								

Chlorite alteration on fracture.

Unveined.

Unmineralized.

From	To	Litho	Surface Code	Simple Geo
6.00	7.00		1a	

Fine grained light green basalt, similar to above. C-type. Fine preferentially chlorite altered grains.

STRUCTURES					ALTERATION												VEINS									MINERALIZATION									SAMPLES			
From	To	Struct	CA	Strain	From	To	INT	SR	SIL	DL	CL	TO	AB	FU	CC	EP	From	To	Vn%	QZ%	DL%	CC%	V/m	CA	Septa	From	To	PY%	Style	VG	Min	Min%	Min2	M2%	From	To	Sample	Au g/t
6.00	7.00	NFOL			6.00	7.00	W	-	W	-	W	-	-	-	M	W	6.00	7.00	0	0	0					6.00	7.00	0	-	-								

Chlorite, epidote alteration. Silicification.

Unveined

Unveined.

From	To	Litho	Surface Code	Simple Geo
7.00	8.00		1a	

Green fine grained basalt. Similar to above. Fragments of qtz + chl vein. C-type.

STRUCTURES					ALTERATION												VEINS									MINERALIZATION									SAMPLES			
From	To	Struct	CA	Strain	From	To	INT	SR	SIL	DL	CL	TO	AB	FU	CC	EP	From	To	Vn%	QZ%	DL%	CC%	V/m	CA	Septa	From	To	PY%	Style	VG	Min	Min%	Min2	M2%	From	To	Sample	Au g/t
7.00	8.00	NFOL			7.00	8.00	W	-	W	-	W	-	-	-	M	W	7.00	8.00	5	90	0	0	2			7.00	8.00	0	-	-								

T fragments of translucent white qtz + dark black soft chlorite vein.

Unmineralized.

08Q04A

Initials: ________

From	To	Litho	Surface Code	Simple Geo
8.00	9.00		1a	

Light green fine grained basalt. C-type. Similar to above.

STRUCTURES					ALTERATION												VEINS									MINERALIZATION									SAMPLES			
From	To	Struct	CA	Strain	From	To	INT	SR	SIL	DL	CL	TO	AB	FU	CC	EP	From	To	Vn%	QZ%	DL%	CC%	V/m	CA	Septa	From	To	PY%	Style	VG	Min	Min%	Min2	M2%	From	To	Sample	Au g/t
8.00	9.00	NFOL			8.00	9.00	W	-	W	-	W	-	-	-	M	W	8.00	9.00	1	100	0	0				8.00	9.00	0.1	FG	-								

Alteration: *Similar alteration to above.*

Veins: *Qtz vein with minor dark black chlorite, minor pyrite.*

Mineralization: *Minor pyrite associated with qt vein.*

From	To	Litho	Surface Code	Simple Geo
9.00	10.00		1a	

Green fine grained basalt, similar to above. Homogenous. C-type.

STRUCTURES					ALTERATION												VEINS									MINERALIZATION									SAMPLES			
From	To	Struct	CA	Strain	From	To	INT	SR	SIL	DL	CL	TO	AB	FU	CC	EP	From	To	Vn%	QZ%	DL%	CC%	V/m	CA	Septa	From	To	PY%	Style	VG	Min	Min%	Min2	M2%	From	To	Sample	Au g/t
9.00	10.00	NFOL			9.00	10.00	W	-	W	-	W	-	-	-	M	W	9.00	10.00	1	0	0	100	1			9.00	10.00	0.1	-	-								

Alteration: *Similar to above.*

Veins: *Green tinged fine cct vein, minor blocky fine py associated.*

Mineralization: *Minor py with cct vein.*

08Q04B

Hope Bay Mining Drill Log
RC Quarry Program

Signature: ____________________

08Q04B

Initials: ______

From	To	Litho	Surface Code	Simple Geo
0.00	1.00		1a	

Dominantly fine grained green basalt. Fine chloritized (relict mafic?) dark green grains, in a lighter green (relict plag?) matrix. Minor dark mafic rounded pebble (overburden).

STRUCTURES					ALTERATION												VEINS									MINERALIZATION									SAMPLES			
From	To	Struct	CA	Strain	From	To	INT	SR	SIL	DL	CL	TO	AB	FU	CC	EP	From	To	Vn%	QZ%	DL%	CC%	V/m	CA	Septa	From	To	PY%	Style	VG	Min	Min%	Min2	M2%	From	To	Sample	Au g/t
0.00	1.00	NFO L			0.00	1.00	W	-	-	-	W	-	-	-	VW	VW	0.00	1.00	0	0	0					0.00	1.00	0	-	-								

Weak alteration. *Unveined.* *Unmineralized.*

From	To	Litho	Surface Code	Simple Geo
1.00	2.00		1a	

Fine grained green basalt similar to above.

STRUCTURES					ALTERATION												VEINS									MINERALIZATION									SAMPLES			
From	To	Struct	CA	Strain	From	To	INT	SR	SIL	DL	CL	TO	AB	FU	CC	EP	From	To	Vn%	QZ%	DL%	CC%	V/m	CA	Septa	From	To	PY%	Style	VG	Min	Min%	Min2	M2%	From	To	Sample	Au g/t
1.00	2.00	NFO L			1.00	2.00	W	-	-	-	W	-	-	-	VW	VW	1.00	2.00	0	0	0					1.00	2.00	0	-	-								

Similar to above. *Unveined.* *Unmineralized.*

From	To	Litho	Surface Code	Simple Geo
2.00	3.00		1a	

Fine grained green basalt similar to above. Brick red hematite staining on one fracture plane.

STRUCTURES					ALTERATION												VEINS									MINERALIZATION									SAMPLES			
From	To	Struct	CA	Strain	From	To	INT	SR	SIL	DL	CL	TO	AB	FU	CC	EP	From	To	Vn%	QZ%	DL%	CC%	V/m	CA	Septa	From	To	PY%	Style	VG	Min	Min%	Min2	M2%	From	To	Sample	Au g/t
2.00	3.00	NFO L			2.00	3.00	W	-	-	-	W	-	-	-	VW	VW	2.00	3.00	0	0	0	0				2.00	3.00	0	-	-								

Similar to above. *Unveined.* *Unmineralized.*

From	To	Litho	Surface Code	Simple Geo
3.00	4.00		1a	

Light green basalt similar to above, minor epidote alteration.

STRUCTURES					ALTERATION												VEINS									MINERALIZATION									SAMPLES			
From	To	Struct	CA	Strain	From	To	INT	SR	SIL	DL	CL	TO	AB	FU	CC	EP	From	To	Vn%	QZ%	DL%	CC%	V/m	CA	Septa	From	To	PY%	Style	VG	Min	Min%	Min2	M2%	From	To	Sample	Au g/t
3.00	4.00	NFO L			3.00	4.00	W	-	-	-	W	-	-	-	VW	W	3.00	4.00	0.5	0	0	100	1			3.00	4.00	0	-	-								

Weak epidote alteration. *Fracture along cct vein plane.* *Unmineralized.*

From	To	Litho	Surface Code	Simple Geo
4.00	5.00		1a	

Light green basalt similar to above. Pistachio green epidote band.

STRUCTURES					ALTERATION												VEINS									MINERALIZATION									SAMPLES			
From	To	Struct	CA	Strain	From	To	INT	SR	SIL	DL	CL	TO	AB	FU	CC	EP	From	To	Vn%	QZ%	DL%	CC%	V/m	CA	Septa	From	To	PY%	Style	VG	Min	Min%	Min2	M2%	From	To	Sample	Au g/t
4.00	5.00	NFOL			4.00	5.00	W	-	-	-	W	-	-	-	VW	M	4.00	5.00	0	0	0	0				4.00	5.00	0	-	-								
					Moderate pistachio green epidote alteration.												Unveined.									Unmineralized.												

From	To	Litho	Surface Code	Simple Geo
5.00	6.00		1a	

Pale grey green aphanitic basalt.

STRUCTURES					ALTERATION												VEINS									MINERALIZATION									SAMPLES			
From	To	Struct	CA	Strain	From	To	INT	SR	SIL	DL	CL	TO	AB	FU	CC	EP	From	To	Vn%	QZ%	DL%	CC%	V/m	CA	Septa	From	To	PY%	Style	VG	Min	Min%	Min2	M2%	From	To	Sample	Au g/t
5.00	6.00	NFOL			5.00	6.00	W	-	M	-	-	-	-	-	-	W	5.00	6.00	0	0	0	0				5.00	6.00	0	-	-								
					Weak alteration, hard (silicification?)												Unveined.									Unmineralized.												

From	To	Litho	Surface Code	Simple Geo
6.00	7.00		1a	

Pale green grey aphanitic basalt, similar to above interval. Minor pyrite on fracture plane.

STRUCTURES					ALTERATION												VEINS									MINERALIZATION									SAMPLES			
From	To	Struct	CA	Strain	From	To	INT	SR	SIL	DL	CL	TO	AB	FU	CC	EP	From	To	Vn%	QZ%	DL%	CC%	V/m	CA	Septa	From	To	PY%	Style	VG	Min	Min%	Min2	M2%	From	To	Sample	Au g/t
6.00	7.00	NFOL			6.00	7.00	W	-	M	-	-	-	-	-	-	W	6.00	7.00	0.5	100	0	0	1			6.00	7.00	0.1	FG	-								
																	Milky white qtz vein.									Minor pyrite on fracture plane.												

From	To	Litho	Surface Code	Simple Geo
7.00	8.00		1a	

Light grey aphanitic basalt, minor chlorite, epidote local alteration.

STRUCTURES					ALTERATION												VEINS									MINERALIZATION									SAMPLES			
From	To	Struct	CA	Strain	From	To	INT	SR	SIL	DL	CL	TO	AB	FU	CC	EP	From	To	Vn%	QZ%	DL%	CC%	V/m	CA	Septa	From	To	PY%	Style	VG	Min	Min%	Min2	M2%	From	To	Sample	Au g/t
7.00	8.00	NFOL			7.00	8.00	W	-	M	-	M	-	-	-	-	M	7.00	8.00	0.1	100	0	0	0			7.00	8.00	0.1	FG	-								
					Moderate local dark black chlorite, pistachio green epidote alteration.												Minor milky qtz vein fragment.									Minor pyrite associated with qtz vein.												

Initials: ________

From	To	Litho	Surface Code	Simple Geo
8.00	9.00			

light green grey fine grained basalt.

STRUCTURES

From	To	Struct	CA	Strain
8.00	9.00	NFOL		

ALTERATION

From	To	INT	SR	SIL	DL	CL	TO	AB	FU	CC	EP
8.00	9.00	W	-	M	-	-	-	-	-	W	-

Weak alteration.

VEINS

From	To	Vn%	QZ%	DL%	CC%	V/m	CA	Septa
8.00	9.00	0	0	0				

Unveined.

MINERALIZATION

From	To	PY%	Style	VG	Min	Min%	Min2	M2%
8.00	9.00	0	-	-				

Unmineralized.

SAMPLES

From	To	Sample	Au g/t

08Q05A

Hope Bay Mining Drill Log

RC Quarry Program

Signature: ____________________

Initials: ______

08Q05A

From	To	Litho	Surface Code	Simple Geo
0.00	1.00		1a	

Green to light green fine grained basalt. Patchy epidote alteration. C-type.

STRUCTURES

From	To	Struct	CA	Strain
0.00	1.00	NFO L		

ALTERATION

From	To	INT	SR	SIL	DL	CL	TO	AB	FU	CC	EP
0.00	1.00	W	-	-	-	W	-	-	-	S	M

patchy pistachio epidote alteration.

VEINS

From	To	Vn%	QZ%	DL%	CC%	V/m	CA	Septa
0.00	1.00	0.5	100	0	0			

One small fragment of qtz vein on basalt.

MINERALIZATION

From	To	PY%	Style	VG	Min	Min%	Min2	M2%
0.00	1.00	0.1	FG	-				

Trace py disseminated in basalt.

SAMPLES

From	To	Sample	Au g/t

From	To	Litho	Surface Code	Simple Geo
1.00	4.00		1a	

Green fine grained basalt. Similar to above. C-type. Minor granitoid overburden fragments.

STRUCTURES

From	To	Struct	CA	Strain
1.00	4.00	NFO L		

ALTERATION

From	To	INT	SR	SIL	DL	CL	TO	AB	FU	CC	EP
1.00	4.00	W	-	-	-	M	-	-	-	M	-

Pervasive chlorite, calcite alteration.

VEINS

From	To	Vn%	QZ%	DL%	CC%	V/m	CA	Septa
1.00	4.00	0	0	0	0	0		

Unveined.

MINERALIZATION

From	To	PY%	Style	VG	Min	Min%	Min2	M2%
1.00	4.00	0	-	-				

Unmineralized.

SAMPLES

From	To	Sample	Au g/t

From	To	Litho	Surface Code	Simple Geo
4.00	5.00		1a	

Green fine grained basalt. Similar to above. C-type. Trace pyrite. Minor rounded/broken granitoid overburden fragments.

STRUCTURES

From	To	Struct	CA	Strain
4.00	5.00	NFO L		

ALTERATION

From	To	INT	SR	SIL	DL	CL	TO	AB	FU	CC	EP
4.00	5.00	W	-	-	-	M	-	-	-	M	-

Minor alteration.

VEINS

From	To	Vn%	QZ%	DL%	CC%	V/m	CA	Septa
4.00	5.00	0	0	0	0			

Unveined.

MINERALIZATION

From	To	PY%	Style	VG	Min	Min%	Min2	M2%
4.00	5.00	0.1	FG	-				

Trace fine grained pyrite disseminated in basalt.

SAMPLES

From	To	Sample	Au g/t

From	To	Litho	Surface Code	Simple Geo
5.00	6.00		1a	

Green fine grained basalt. Similar to above. C-type. Minor rounded/broken granitoid overburden fragments.

STRUCTURES

From	To	Struct	CA	Strain
5.00	6.00	NFO L		

ALTERATION

From	To	INT	SR	SIL	DL	CL	TO	AB	FU	CC	EP
5.00	6.00	W	-	-	-	M	-	-	-	M	W

Weak patchy epidote alteration.

VEINS

From	To	Vn%	QZ%	DL%	CC%	V/m	CA	Septa
5.00	6.00	1	0	0	100			

Fractured calcite vein planes.

MINERALIZATION

From	To	PY%	Style	VG	Min	Min%	Min2	M2%
5.00	6.00	0	-	-				

Unmineralized.

SAMPLES

From	To	Sample	Au g/t

From	To	Litho	Surface Code	Simple Geo
6.00	8.00		1a	

Green to dark green fine grained basalt. Minor rounded/broken granitoid/late sedimentary overburden pebble fragments. One qtz vein fragment, though possibly contamination. No in situ veining.

STRUCTURES				
From	To	Struct	CA	Strain
6.00	8.00	NFOL		

ALTERATION											
From	To	INT	SR	SIL	DL	CL	TO	AB	FU	CC	EP
6.00	8.00	W	-	-	-	M	-	-	-	M	W

Weak epidote altn, patchy chlorite altn.

VEINS								
From	To	Vn%	QZ%	DL%	CC%	V/m	CA	Septa
6.00	8.00	0	0	0	0			

Unveined.

MINERALIZATION								
From	To	PY%	Style	VG	Min	Min%	Min2	M2%
6.00	8.00	0	-	-				

Unmineralized.

SAMPLES			
From	To	Sample	Au g/t

From	To	Litho	Surface Code	Simple Geo
8.00	9.00		1a	

Mostly rounded pebble and pebble fragment chips, granitoid and late sedimentary. Few fine grained green basalt chips w/ weak epidote altn.

STRUCTURES				
From	To	Struct	CA	Strain
8.00	9.00	NFOL		

ALTERATION											
From	To	INT	SR	SIL	DL	CL	TO	AB	FU	CC	EP
8.00	9.00	W	-	-	-	M	-	-	-	M	W

Weak epidote altn, only on few chips but pervasive.

VEINS								
From	To	Vn%	QZ%	DL%	CC%	V/m	CA	Septa
8.00	9.00	0	0	0	0			

Unveined.

MINERALIZATION								
From	To	PY%	Style	VG	Min	Min%	Min2	M2%
8.00	9.00	0	-	-				

Unmineralized.

SAMPLES			
From	To	Sample	Au g/t

08Q05B

Hope Bay Mining Drill Log

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08Q05B

From	To	Litho	Surface Code	Simple Geo
0.00	1.00		15c	

Wet soil, overburden. Reliable chips not recovered.

STRUCTURES				
From	To	Struct	CA	Strain

ALTERATION											
From	To	INT	SR	SIL	DL	CL	TO	AB	FU	CC	EP

VEINS								
From	To	Vn%	QZ%	DL%	CC%	V/m	CA	Septa

MINERALIZATION								
From	To	PY%	Style	VG	Min	Min%	Min2	M2%

SAMPLES			
From	To	Sample	Au g/t

From	To	Litho	Surface Code	Simple Geo
1.00	2.00		1p	

Light green grey aphanitic basalt, with lesser dark green basalt. One fragment is reminiscent of chl epd altered inter pillow beccia. One cct veined fragment, epidote on fracture planes.

STRUCTURES				
From	To	Struct	CA	Strain
1.00	2.00	NFOL		

ALTERATION											
From	To	INT	SR	SIL	DL	CL	TO	AB	FU	CC	EP
1.00	2.00	W	-	-	-	W	-	-	-	M	W

Weak pervasive epidote, strong on fracture plane.

VEINS								
From	To	Vn%	QZ%	DL%	CC%	V/m	CA	Septa
1.00	2.00	5	0	0	100	1		

One fragment of >60% cct vein.

MINERALIZATION								
From	To	PY%	Style	VG	Min	Min%	Min2	M2%
1.00	2.00	0	-	-				

Unmineralized.

SAMPLES			
From	To	Sample	Au g/t

From	To	Litho	Surface Code	Simple Geo
2.00	3.00		1p	

Light green grey aphanitic basalt, with lesser dark green basalt. Similar to above. C-type. One fragment is reminiscent of chl epd altered pillow selvedge.

STRUCTURES				
From	To	Struct	CA	Strain
2.00	3.00	NFOL		

ALTERATION											
From	To	INT	SR	SIL	DL	CL	TO	AB	FU	CC	EP
2.00	3.00	W	-	-	-	W	-	-	-	M	W

Local moderate epidote alteration.

VEINS								
From	To	Vn%	QZ%	DL%	CC%	V/m	CA	Septa
2.00	3.00	0	0	0	0			

Unveined.

MINERALIZATION								
From	To	PY%	Style	VG	Min	Min%	Min2	M2%
2.00	3.00	0.5	FG	-				

Minor fine grained pyrite on fracture plane.

SAMPLES			
From	To	Sample	Au g/t

From	To	Litho	Surface Code	Simple Geo
3.00	6.00		1pv	

Light grey green aphanitic pillow basalt. Small ~2mm varioles, strongly coalescing to form completely coalesced light green grey basalt. Fine pyrite on fracture planes.

STRUCTURES				
From	To	Struct	CA	Strain
3.00	6.00	NFOL		

ALTERATION											
From	To	INT	SR	SIL	DL	CL	TO	AB	FU	CC	EP
3.00	6.00	W	-	-	-	W	-	-	-	S	W

Weak alteration, strong cct flooding. Epidote on fracture planes.

VEINS								
From	To	Vn%	QZ%	DL%	CC%	V/m	CA	Septa
3.00	4.00	1	0	0	100	1		

Green tinged buff cct vein.

MINERALIZATION								
From	To	PY%	Style	VG	Min	Min%	Min2	M2%
3.00	4.00	0.5	FG	-				

Minor pyrite on fracture planes.

SAMPLES			
From	To	Sample	Au g/t

From	To	Litho	Surface Code	Simple Geo
3.00	6.00		1pv	

(Continued from previous page)

STRUCTURES

From	To	Struct	CA	Strain

ALTERATION

From	To	INT	SR	SIL	DL	CL	TO	AB	FU	CC	EP

VEINS

From	To	Vn%	QZ%	DL%	CC%	V/m	CA	Septa
4.00	5.00	5	90	0	10	2		
	One large milky qtz fragment, cct vein fracture plane.							
5.00	6.00	1	0	0	100	2		
	Cct vein fracture planes.							

MINERALIZATION

From	To	PY%	Style	VG	Min	Min%	Min2	M2%
4.00	6.00	0.1	FG	-				
	Trace py.							

SAMPLES

From	To	Sample	Au g/t

From	To	Litho	Surface Code	Simple Geo
6.00	7.00		1p	

Light grey green aphanitic basalt. Weak to moderate epidote alteration, red hematite staining on one chip.

STRUCTURES

From	To	Struct	CA	Strain
6.00	7.00	NFOL		

ALTERATION

From	To	INT	SR	SIL	DL	CL	TO	AB	FU	CC	EP
6.00	7.00	W	-	-	-	W	-	-	-	S	M
	Moderate local epidote alteration.										

VEINS

From	To	Vn%	QZ%	DL%	CC%	V/m	CA	Septa
6.00	7.00	0.5	0	0	100	2		
	Dull white minor cct veining.							

MINERALIZATION

From	To	PY%	Style	VG	Min	Min%	Min2	M2%
6.00	7.00	0.5	FG	-	CP	2		
	Minor pyrite, blebs of cpy associated with cct veining.							

SAMPLES

From	To	Sample	Au g/t

From	To	Litho	Surface Code	Simple Geo
7.00	9.00		1pv	

Light grey green variolitic pillow basalt. Varioles are strongly coalescing, mm+. Minor red brick hematite altn.

STRUCTURES

From	To	Struct	CA	Strain
7.00	9.00	NFOL		

ALTERATION

From	To	INT	SR	SIL	DL	CL	TO	AB	FU	CC	EP
7.00	9.00	W	-	-	-	W	-	-	-	S	M
	Chlorite, patchy moderate epidote alteration.										

VEINS

From	To	Vn%	QZ%	DL%	CC%	V/m	CA	Septa
7.00	9.00	0.5	0	0	100	1		
	Minor cct vein fracture plane.							

MINERALIZATION

From	To	PY%	Style	VG	Min	Min%	Min2	M2%
7.00	8.00	0	-	-				
	Unmineralized.							
8.00	9.00	0.5	FG	-				
	Minor blocky py mineralization.							

SAMPLES

From	To	Sample	Au g/t

From	To	Litho	Surface Code	Simple Geo
8.00	9.00			

STRUCTURES

From	To	Struct	CA	Strain

ALTERATION

From	To	INT	SR	SIL	DL	CL	TO	AB	FU	CC	EP

VEINS

From	To	Vn%	QZ%	DL%	CC%	V/m	CA	Septa

MINERALIZATION

From	To	PY%	Style	VG	Min	Min%	Min2	M2%

SAMPLES

From	To	Sample	Au g/t

08Q06A

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08Q06A

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From	To	Litho	Surface Code	Simple Geo
0.00	1.00		15c	

Wet soil and overburden. Reliable chips not recovered.

STRUCTURES				
From	To	Struct	CA	Strain

ALTERATION											
From	To	INT	SR	SIL	DL	CL	TO	AB	FU	CC	EP

VEINS								
From	To	Vn%	QZ%	DL%	CC%	V/m	CA	Septa

MINERALIZATION								
From	To	PY%	Style	VG	Min	Min%	Min2	M2%

SAMPLES			
From	To	Sample	Au g/t

From	To	Litho	Surface Code	Simple Geo
1.00	2.00		15c	

Light grey green basalt and subangular to subrounded granitic pebbles and lithic clasts. Unreliable for chips, overburden.

STRUCTURES				
From	To	Struct	CA	Strain

ALTERATION											
From	To	INT	SR	SIL	DL	CL	TO	AB	FU	CC	EP

VEINS								
From	To	Vn%	QZ%	DL%	CC%	V/m	CA	Septa

MINERALIZATION								
From	To	PY%	Style	VG	Min	Min%	Min2	M2%

SAMPLES			
From	To	Sample	Au g/t

From	To	Litho	Surface Code	Simple Geo
2.00	3.00		1a	

Minor subrounded granitoid and mafic pebbles, dominantly angular green to grey green basalt fragments.

STRUCTURES				
From	To	Struct	CA	Strain
2.00	3.00	NFOL		

ALTERATION											
From	To	INT	SR	SIL	DL	CL	TO	AB	FU	CC	EP
2.00	3.00	W	-	-	-	W	-	-	-	M	W

Weak epidote, chlorite alteration.

VEINS								
From	To	Vn%	QZ%	DL%	CC%	V/m	CA	Septa
2.00	3.00	1	0	0	100	1		

Dull translucent cct vein.

MINERALIZATION								
From	To	PY%	Style	VG	Min	Min%	Min2	M2%
2.00	3.00	0	-	-				

Unmineralized.

SAMPLES			
From	To	Sample	Au g/t

From	To	Litho	Surface Code	Simple Geo
3.00	7.00		1a	

Green to dark green fine grained basalt. Featureless. Minor hematite on fractures.

STRUCTURES				
From	To	Struct	CA	Strain
3.00	7.00	NFOL		

ALTERATION											
From	To	INT	SR	SIL	DL	CL	TO	AB	FU	CC	EP
3.00	5.00	W	-	-	-	M	-	-	-	M	VW
5.00	6.00	W	-	-	-	M	-	-	-	M	W

3.00–5.00: *Soft dark chlorite alteration.*
5.00–6.00: *Weak local epidote altn.*

VEINS								
From	To	Vn%	QZ%	DL%	CC%	V/m	CA	Septa
3.00	5.00	0	0	0	0			
5.00	6.00	0.5	0	0	100	1		

3.00–5.00: *Unveined.*
5.00–6.00: *Cct vein fracture plane.*

MINERALIZATION								
From	To	PY%	Style	VG	Min	Min%	Min2	M2%
3.00	6.00	0	-	-				

Unmineralized.

SAMPLES			
From	To	Sample	Au g/t

From	To	Litho	Surface Code	Simple Geo
3.00	7.00		1a	

(Continued from previous page)

STRUCTURES					ALTERATION												VEINS									MINERALIZATION									SAMPLES			
From	To	Struct	CA	Strain	From	To	INT	SR	SIL	DL	CL	TO	AB	FU	CC	EP	From	To	Vn%	QZ%	DL%	CC%	V/m	CA	Septa	From	To	PY%	Style	VG	Min	Min%	Min2	M2%	From	To	Sample	Au g/t
					6.00	7.00	W	-	-	-	M	-	-	-	M	VW	6.00	7.00	1	100	0	0	1			6.00	7.00	0.1	FG	-								

Soft dark chlorite alteration.

Qtz vein, minor pyrite on qtz vein margin plane.

Minor pyrite on qtz vein margin plane.

From	To	Litho	Surface Code	Simple Geo
7.00	8.00		1aj	

Dominantly green fine grained basalt fragments, minor fragments of dark grey/black siltstone? With conchoidal fracture, clastic appearing texture.

STRUCTURES					ALTERATION												VEINS									MINERALIZATION									SAMPLES			
From	To	Struct	CA	Strain	From	To	INT	SR	SIL	DL	CL	TO	AB	FU	CC	EP	From	To	Vn%	QZ%	DL%	CC%	V/m	CA	Septa	From	To	PY%	Style	VG	Min	Min%	Min2	M2%	From	To	Sample	Au g/t
7.00	8.00	NFOL			7.00	8.00	W	-	-	-	W	-	-	-	W	VW	7.00	8.00	0	0	0	0				7.00	8.00	0	-	-								

Weak chlorite alteration

Unveined.

Unmineralized..

From	To	Litho	Surface Code	Simple Geo
8.00	9.00		1a	

Dark green fine grained basalt. Minor cct veining

STRUCTURES					ALTERATION												VEINS									MINERALIZATION									SAMPLES			
From	To	Struct	CA	Strain	From	To	INT	SR	SIL	DL	CL	TO	AB	FU	CC	EP	From	To	Vn%	QZ%	DL%	CC%	V/m	CA	Septa	From	To	PY%	Style	VG	Min	Min%	Min2	M2%	From	To	Sample	Au g/t
8.00	9.00	NFOL			8.00	9.00	W	-	-	-	M	-	-	-	W	VW	8.00	9.00	2	0	0	100	1			8.00	9.00	0	-	-								

Weak alteration.

Translucent cct vein.

Unmineralized.

08Q10A

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From	To	Litho	Surface Code	Simple Geo
1.00	3.00		1p	

Light grey green very fine grained basalt.

STRUCTURES					ALTERATION												VEINS									MINERALIZATION									SAMPLES			
From	To	Struct	CA	Strain	From	To	INT	SR	SIL	DL	CL	TO	AB	FU	CC	EP	From	To	Vn%	QZ%	DL%	CC%	V/m	CA	Septa	From	To	PY%	Style	VG	Min	Min%	Min2	M2%	From	To	Sample	Au g/t
2.00	3.00	NFOL			2.00	3.00	W	-	-	-	W	-	-	-	S	-	2.00	3.00	0	0	0	0				2.00	3.00	0	-	-								
																		Unveined.								Unmineralized.												

From	To	Litho	Surface Code	Simple Geo
3.00	4.00		1pv	

Green to light green grey variolitic pillow basalt. Varioles are ~3mm.

STRUCTURES					ALTERATION												VEINS									MINERALIZATION									SAMPLES			
From	To	Struct	CA	Strain	From	To	INT	SR	SIL	DL	CL	TO	AB	FU	CC	EP	From	To	Vn%	QZ%	DL%	CC%	V/m	CA	Septa	From	To	PY%	Style	VG	Min	Min%	Min2	M2%	From	To	Sample	Au g/t
3.00	4.00	NFOL			3.00	4.00	W	-	-	-	W	-	-	-	S	VW	3.00	4.00	0	0	0	0				3.00	4.00	0	-	-								
					Weak chlorite altn.													Unveined.								Unmineralized.												

From	To	Litho	Surface Code	Simple Geo
4.00	11.00		1pv	

Light green grey fine grained basalt. Minor epidote on fracture plane. Varioles on darker chlorite altered fragments. Appears that varioles become strongly coalesced to form a majority light green grey basalt, with lesser green chlorite altered basalt +- light green grey varioles from pillow margins.

STRUCTURES					ALTERATION												VEINS									MINERALIZATION									SAMPLES			
From	To	Struct	CA	Strain	From	To	INT	SR	SIL	DL	CL	TO	AB	FU	CC	EP	From	To	Vn%	QZ%	DL%	CC%	V/m	CA	Septa	From	To	PY%	Style	VG	Min	Min%	Min2	M2%	From	To	Sample	Au g/t
																	4.00	5.00	0	0	0	0				4.00	5.00	0	-	-								
																		Unveined.								Unmineralized.												
4.00	10.00	NFOL																																				
					4.00	11.00	W	-	-	-	W	-	-	-	S	W																						
					Epidote on fracture plane.																																	
																	5.00	6.00	2	100	0	0	1			5.00	6.00	0.1	FG	-								
																		Planar qtz vein with trace pyrite.								Trace py.												
																	6.00	8.00	0	0	0	0																
																		Unveined.																				

08Q10A

Initials: ________

From	To	Litho	Surface Code	Simple Geo
4.00	11.00		1pv	

(Continued from previous page)

STRUCTURES

From	To	Struct	CA	Strain
10.00	11.00	FOL		VW
	Very weak fabric developing in chips.			

ALTERATION

From	To	INT	SR	SIL	DL	CL	TO	AB	FU	CC	EP

VEINS

From	To	Vn%	QZ%	DL%	CC%	V/m	CA	Septa
8.00	9.00	0.5	0	0	100	1		
	Minor white buff cct vein.							
9.00	11.00	0	0	0	0			
	Unveined.							

MINERALIZATION

From	To	PY%	Style	VG	Min	Min%	Min2	M2%
6.00	11.00	0	-	-				
	Unmineralized.							

SAMPLES

From	To	Sample	Au g/t

From	To	Litho	Surface Code	Simple Geo
11.00	12.00		1a	

Green to dark green basalt, weakly developed foliation.

STRUCTURES

From	To	Struct	CA	Strain
11.00	12.00	FOL		W
	Weak fabric.			

ALTERATION

From	To	INT	SR	SIL	DL	CL	TO	AB	FU	CC	EP
11.00	12.00	W	-	-	-	W	-	-	-	S	W

VEINS

From	To	Vn%	QZ%	DL%	CC%	V/m	CA	Septa
11.00	12.00	0.5	0	0	100			
	Buff green tinged cct vein.							

MINERALIZATION

From	To	PY%	Style	VG	Min	Min%	Min2	M2%
11.00	12.00	0	-	-				
	Unmineralized.							

SAMPLES

From	To	Sample	Au g/t

From	To	Litho	Surface Code	Simple Geo
12.00	15.00		1a	

Green to light green fine grained basalt. Weak fabric developed.

STRUCTURES

From	To	Struct	CA	Strain
12.00	14.00	FOL		W
14.00	15.00	NFOL		
	Loss of fabric.			

ALTERATION

From	To	INT	SR	SIL	DL	CL	TO	AB	FU	CC	EP
12.00	15.00	W	-	-	-	W	-	-	-	S	W
	Pervasive cct alteration.										

VEINS

From	To	Vn%	QZ%	DL%	CC%	V/m	CA	Septa
12.00	15.00	0	0	0	0			
	Unveined.							

MINERALIZATION

From	To	PY%	Style	VG	Min	Min%	Min2	M2%
12.00	15.00	0	-	-				
	Unmineralized.							

SAMPLES

From	To	Sample	Au g/t

08Q10A

Initials: ________

From	To	Litho	Surface Code	Simple Geo
15.00	24.00		1pv	

Dark green to light grey green variolitic fine grained pillow basalt. Similar to above. Varioles are ~2mm but up to 6mm, strongly coalescing to form completely coalesced light grey green basalt. Minor red hematite on fracture plane.

STRUCTURES

From	To	Struct	CA	Strain
15.00	24.00	NFOL		

ALTERATION

From	To	INT	SR	SIL	DL	CL	TO	AB	FU	CC	EP
15.00	24.00	W	-	-	-	W	-	-	-	S	W
	Pervasive cct alteration, minor chlorite alteration.										

VEINS

From	To	Vn%	QZ%	DL%	CC%	V/m	CA	Septa
15.00	16.00	0	0	0	0			
	Unveined.							
16.00	17.00	0.5	100	0	0	1		
	Mm scale planar qtz vein.							
17.00	18.00	0	0	0	0			
	Unveined.							
18.00	19.00	0.5	0	0	100	1		
	Translucent cct vein.							
19.00	22.00	0	0	0	0			
	Unveined.							
22.00	24.00	0.5	0	0	100	1		
	Buff cct veining w/ minor py.							

MINERALIZATION

From	To	PY%	Style	VG	Min	Min%	Min2	M2%
15.00	22.00	0	-	-				
	Unmineralized.							
22.00	24.00	0.1	FG	-				
	Trace py associated with cct vein.							

SAMPLES

From	To	Sample	Au g/t

From	To	Litho	Surface Code	Simple Geo
24.00	26.00		1a	

Green to dark green fine grained featureless basalt. Weak fabric developed. Minor brick red hematite on fracture plane.

STRUCTURES

From	To	Struct	CA	Strain
24.00	26.00	FOL		W
	Weak foliation.			

ALTERATION

From	To	INT	SR	SIL	DL	CL	TO	AB	FU	CC	EP
24.00	26.00	W	-	-	-	W	-	-	-	S	-
	Pervasive cct, chl alteration.										

VEINS

From	To	Vn%	QZ%	DL%	CC%	V/m	CA	Septa
24.00	26.00	0	0	0	0			
	Unveined.							

MINERALIZATION

From	To	PY%	Style	VG	Min	Min%	Min2	M2%
24.00	26.00	0	-	-				
	Unmineralized.							

SAMPLES

From	To	Sample	Au g/t

08Q10B

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From	To	Litho	Surface Code	Simple Geo
0.00	**1.00**		**1pv**	

Green to light grey green variolitic fine grianed pillow basalt. Varioles are oclaescing, to 1cm. Minor hematite on fracture planes.

STRUCTURES

From	To	Struct	CA	Strain
0.00	1.00	NFOL		

ALTERATION

From	To	INT	SR	SIL	DL	CL	TO	AB	FU	CC	EP
0.00	1.00	W	-	-	-	W	-	-	-	S	W

Pervaisve cct alteration.

VEINS

From	To	Vn%	QZ%	DL%	CC%	V/m	CA	Septa
0.00	1.00	0	0	0	0			

Unviened

MINERALIZATION

From	To	PY%	Style	VG	Min	Min%	Min2	M2%
0.00	1.00	0	-	-				

Unmineralized.

SAMPLES

From	To	Sample	Au g/t

From	To	Litho	Surface Code	Simple Geo
1.00	**5.00**		**1a**	

Green homogenous fine grianed basalt.

STRUCTURES

From	To	Struct	CA	Strain
1.00	5.00	NFOL		

ALTERATION

From	To	INT	SR	SIL	DL	CL	TO	AB	FU	CC	EP
1.00	5.00	W	-	-	-	W	-	-	-	M	-

VEINS

From	To	Vn%	QZ%	DL%	CC%	V/m	CA	Septa
1.00	2.00	0.5	0	0	100			
Thin cct vein fracture plane.								
2.00	4.00	0	0	0	0			
Unviened.								
4.00	5.00	0.5	0	0	100			
Thin cct vein fracture plane.								

MINERALIZATION

From	To	PY%	Style	VG	Min	Min%	Min2	M2%
1.00	5.00	0	-	-				

Unmineralized.

SAMPLES

From	To	Sample	Au g/t

From	To	Litho	Surface Code	Simple Geo
5.00	**26.00**		**1pv**	

Green to light grey green variolitic fine grianed pillow basalt similar to above.. Varioles are colaescing, ~0.5cm. Minor hematite on fracture planes throughout.
From 14-16m and 20-21m are strong moderate hematite stianing on chip fracture planes.

STRUCTURES

From	To	Struct	CA	Strain
5.00	26.00	NFOL		

ALTERATION

From	To	INT	SR	SIL	DL	CL	TO	AB	FU	CC	EP
5.00	26.00	W	-	-	-	W	-	-	-	S	W

VEINS

From	To	Vn%	QZ%	DL%	CC%	V/m	CA	Septa
5.00	6.00	0	0	0	0			

Unveined.

MINERALIZATION

From	To	PY%	Style	VG	Min	Min%	Min2	M2%
5.00	7.00	0	-	-				

Unmineralized.

SAMPLES

From	To	Sample	Au g/t

From	To	Litho	Surface Code	Simple Geo
5.00	26.00		1pv	

(Continued from previous page)

STRUCTURES

From	To	Struct	CA	Strain

ALTERATION

From	To	INT	SR	SIL	DL	CL	TO	AB	FU	CC	EP

VEINS

From	To	Vn%	QZ%	DL%	CC%	V/m	CA	Septa
6.00	7.00	2	0	0	100	2		
	Dull trnaslucent cct veining, fractured along vein planes.							
7.00	9.00	0	0	0	0			
	Unviened.							
9.00	10.00	2	100	0	0			
	Milky qtz vien.							
10.00	12.00	1	0	0	100	1		
	Dull cct vein.							
12.00	13.00	0	0	0	0			
	Unviened.							
13.00	15.00	1	0	0	100			
	Euhedral cct vein, hematite stianing on margins.							
15.00	16.00	0.5	0	0	100	1		
	mm cct vein.							
16.00	26.00	0	0	0	0			
	Unveined.							

MINERALIZATION

From	To	PY%	Style	VG	Min	Min%	Min2	M2%
7.00	8.00	0	-	-	SP	3		
	Large bleb of honey fine sphalerite in chlorite altered baslat fragment.							
8.00	26.00	0	-	-				
	Unmineralized.							

SAMPLES

From	To	Sample	Au g/t

08Q12A

RC Quarry Program

Signature: ______________________

Initials: ______

08Q12A

From	To	Litho	Surface Code	Simple Geo
0.00	6.00		1a	

Green fine grained basalt. Homogenous. Minor hematite staining on fracture planes.

STRUCTURES

From	To	Struct	CA	Strain
0.00	6.00	NFOL		

ALTERATION

From	To	INT	SR	SIL	DL	CL	TO	AB	FU	CC	EP
0.00	6.00	W	-	W	-	W	-	-	-	M	-

Pervasive cct, chl alteration.

VEINS

From	To	Vn%	QZ%	DL%	CC%	V/m	CA	Septa
0.00	6.00	0	0	0	0	0		

Unveined.

MINERALIZATION

From	To	PY%	Style	VG	Min	Min%	Min2	M2%
0.00	5.00	0	-	-				
5.00	6.00	0.5	FG	-				

0.00–5.00: *Unmineralized.*

5.00–6.00: *Minor fine pyrite on fracture plane.*

SAMPLES

From	To	Sample	Au g/t

From	To	Litho	Surface Code	Simple Geo
6.00	21.00		1pv	

Green fine grained variolitic basalt. Varioles are to 1cm, weakly coalescing. Dominantly green basalt fragments. Varioles are minor. Minor hematite fracture staining.

STRUCTURES

From	To	Struct	CA	Strain
6.00	16.00	NFOL		

ALTERATION

From	To	INT	SR	SIL	DL	CL	TO	AB	FU	CC	EP
6.00	18.00	W	-	W	-	W	-	-	-	M	VW

Local weak epidote. Pervasive chlorite and cct alteration.

VEINS

From	To	Vn%	QZ%	DL%	CC%	V/m	CA	Septa
6.00	7.00	3	0	0	100	1		
7.00	12.00	0	0	0	0			
12.00	13.00	5	100	0	0	1		

6.00–7.00: *Buff dull green tinged cct vein.*

7.00–12.00: *Unveined.*

12.00–13.00: *Large milky white qtz vein fragment.*

MINERALIZATION

From	To	PY%	Style	VG	Min	Min%	Min2	M2%
6.00	10.00	0	-	-				
10.00	11.00	0.1	FG	-				
11.00	21.00	0	-	-				

6.00–10.00: *Unmineralized.*

10.00–11.00: *Minor pyrite on hem stained fracture.*

11.00–21.00: *Unmineralized.*

SAMPLES

From	To	Sample	Au g/t

From	To	Litho	Surface Code	Simple Geo
6.00	21.00		1pv	

(Continued from previous page)

STRUCTURES

From	To	Struct	CA	Strain
16.00	21.00	FOL		W
Weak fabric developed.				

ALTERATION

From	To	INT	SR	SIL	DL	CL	TO	AB	FU	CC	EP
18.00	21.00	W	-	W	-	M	-	-	-	M	VW
Stronger chlorite alteration.											

VEINS

From	To	Vn%	QZ%	DL%	CC%	V/m	CA	Septa
13.00	14.00	0.5	0	0	100	1		
White buff cct vein margin fracture plane.								
14.00	20.00	0	0	0	0			
Unveined.								
20.00	21.00	0.5	0	0	100	1		
White buff cct vein.								

MINERALIZATION

From	To	PY%	Style	VG	Min	Min%	Min2	M2%

SAMPLES

From	To	Sample	Au g/t

From	To	Litho	Surface Code	Simple Geo
21.00	26.00		1a	

Light yellow green weakly foliated, weakly to moderately sericite altered basalt. Minor disseminated blocky pyrite. Minor milky qtz + fine pyrite veining. 25-26m are brick red hematite stained fragments.

STRUCTURES

From	To	Struct	CA	Strain
21.00	26.00	FOL		W
Weakly developed foliation.				

ALTERATION

From	To	INT	SR	SIL	DL	CL	TO	AB	FU	CC	EP
21.00	22.00	W	VW	M	VW	-	-	-	-	-	VW
Pick up very weak yellow green sericite alteration, dolomite alteration											
22.00	23.00	W	W	M	VW	-	-	-	-	-	VW
Weak to moderate sericite alteration.											

VEINS

From	To	Vn%	QZ%	DL%	CC%	V/m	CA	Septa
21.00	22.00	0	0	0	0			
Unveined.								
22.00	23.00	20	100	0	0	3		
Dull grey to milky white irregular qtz veining, weak chlorite on margins. Blocky pyrite associated with and in qtz veining.								
23.00	24.00	0	0	0	0			
Fine pyrite.								

MINERALIZATION

From	To	PY%	Style	VG	Min	Min%	Min2	M2%
21.00	22.00	0	-	-				
Unmineralized.								
22.00	23.00	1	BY	-				
Blocky pyrite disseminated in basalt and associated with veining.								
23.00	25.00	0.5	FG	-				
Minor fine to blocky fine pyrite.								

SAMPLES

From	To	Sample	Au g/t

From	To	Litho	Surface Code	Simple Geo
21.00	26.00		1a	

(Continued from previous page)

STRUCTURES

From	To	Struct	CA	Strain

ALTERATION

From	To	INT	SR	SIL	DL	CL	TO	AB	FU	CC	EP
23.00	26.00	W	VW	M	VW	-	-	-	-	-	W

Very weak sericite, epidote alteration. Decreases down interval.

VEINS

From	To	Vn%	QZ%	DL%	CC%	V/m	CA	Septa
24.00	25.00	10	100	0	0	1		
25.00	26.00	0	0	0	0			

24.00–25.00: *Milky white qtz vein fragment, dull grey qtz vein in basalt.*

25.00–26.00: *Unveined.*

MINERALIZATION

From	To	PY%	Style	VG	Min	Min%	Min2	M2%
25.00	26.00	0	-	-				

Unmineralized.

SAMPLES

From	To	Sample	Au g/t

From	To	Litho	Surface Code	Simple Geo
25.00	26.00			

STRUCTURES

From	To	Struct	CA	Strain

ALTERATION

From	To	INT	SR	SIL	DL	CL	TO	AB	FU	CC	EP

VEINS

From	To	Vn%	QZ%	DL%	CC%	V/m	CA	Septa

MINERALIZATION

From	To	PY%	Style	VG	Min	Min%	Min2	M2%

SAMPLES

From	To	Sample	Au g/t

08Q12B

Hope Bay Mining Drill Log
RC Quarry Program

Signature: ____________________

08Q12B

Initials: ________

From	To	Litho	Surface Code	Simple Geo
0.00	26.00		1pv	

Light grey green to green fine grained variolitic pillow basalt. Varioles are <1cm, coalescing. Minor buff cct veining.

STRUCTURES

From	To	Struct	CA	Strain
0.00	26.00	NFOL		

ALTERATION

From	To	INT	SR	SIL	DL	CL	TO	AB	FU	CC	EP
0.00	19.00	W	-	W	-	W	-	-	-	S	VW
Pervasive cct alteration, local epidote alteration.											
19.00	23.00	W	-	W	-	M	-	-	-	S	-
Dark moderate chlorite altered fragments. Minor associated pyrite.											

VEINS

From	To	Vn%	QZ%	DL%	CC%	V/m	CA	Septa
0.00	5.00	0	0	0	0	0		
Unveined.								
5.00	7.00	1	0	0	100	1		
Buff cct fractured veining plane.								
7.00	13.00	0	0	0	0			
Unveined.								
13.00	14.00	1	0	0	100	1		
Buff cct veining.								
14.00	16.00	0	0	0	0			
Unveined.								
16.00	18.00	1	0	0	100	1		
Buff cct veining.								
18.00	21.00	0	0	0	0			
Unveined.								
21.00	23.00	0.5	0	0	100	1		
Minor buff cct vein.								

MINERALIZATION

From	To	PY%	Style	VG	Min	Min%	Min2	M2%
0.00	19.00	0	-	-				
Unmineralized.								
19.00	20.00	1	FG	-				
Fine grained pyrite in dark black chlorite altered fragments.								
20.00	21.00	0	-	-				
Unmineralized.								

SAMPLES

From	To	Sample	Au g/t

08Q12B

Initials: ________

From	To	Litho	Surface Code	Simple Geo
0.00	26.00		1pv	

(Continued from previous page)

STRUCTURES

From	To	Struct	CA	Strain

ALTERATION

From	To	INT	SR	SIL	DL	CL	TO	AB	FU	CC	EP
23.00	26.00	W	-	W	-	W	-	-	-	S	W

Pervasive cct, chl alteration. Weak epidote alteration

VEINS

From	To	Vn%	QZ%	DL%	CC%	V/m	CA	Septa
23.00	26.00	0	0	0	0			

Unveined.

MINERALIZATION

From	To	PY%	Style	VG	Min	Min%	Min2	M2%
21.00	24.00	0.5	FG	-				
24.00	26.00	0	-	-				

21.00–24.00: *Minor disseminated fine grained pyite.*

24.00–26.00: *Unmineralized.*

SAMPLES

From	To	Sample	Au g/t

Appendix B
Geochemical Sample Set

Sample ID	Rock Type	Depth (m)		Drill Hole	
		From	To	ID	
08Q05A01	Basalt	0.0	1.0	08Q05A	Quarry A
08Q05A02	Basalt	1.0	2.0	08Q05A	Quarry A
08Q05A03	Basalt	2.0	3.0	08Q05A	Quarry A
08Q05A04	Basalt	3.0	4.0	08Q05A	Quarry A
08Q05A05	Basalt	4.0	5.0	08Q05A	Quarry A
08Q05A06	Basalt	5.0	6.0	08Q05A	Quarry A
08Q05A07	Basalt	6.0	7.0	08Q05A	Quarry A
08Q05A08	Basalt	7.0	8.0	08Q05A	Quarry A
08Q05A09	Granitoid	8.0	9.0	08Q05A	Quarry A
08Q06A01	Overburden	0.0	1.0	08Q06A	Quarry A
08Q06A02	Overburden w. basalt chips	1.0	2.0	08Q06A	Quarry A
08Q06A03	Basalt	2.0	3.0	08Q06A	Quarry A
08Q06A04	Basalt	3.0	4.0	08Q06A	Quarry A
08Q06A05	Basalt	4.0	5.0	08Q06A	Quarry A
08Q06A06	Basalt	5.0	6.0	08Q06A	Quarry A
08Q06A07	Basalt	6.0	7.0	08Q06A	Quarry A
08Q06A08	Basalt	7.0	8.0	08Q06A	Quarry A
08Q06A09	Basalt	8.0	9.0	08Q06A	Quarry A
08Q04B01	Basalt	0.0	1.0	08Q04B	Quarry B
08Q04B02	Basalt	1.0	2.0	08Q04B	Quarry B
08Q04B03	Basalt	2.0	3.0	08Q04B	Quarry B
08Q04B04	Basalt	3.0	4.0	08Q04B	Quarry B
08Q04B05	Basalt	4.0	5.0	08Q04B	Quarry B
08Q04B06	Basalt	5.0	6.0	08Q04B	Quarry B
08Q04B07	Basalt	6.0	7.0	08Q04B	Quarry B
08Q04B08	Basalt	7.0	8.0	08Q04B	Quarry B
08Q04B09	Basalt	8.0	9.0	08Q04B	Quarry B
08Q05B01	Overburden	0.0	1.0	08Q05B	Quarry B
08Q05B02	Basalt	1.0	2.0	08Q05B	Quarry B
08Q05B03	Basalt	2.0	3.0	08Q05B	Quarry B
08Q05B04	Basalt	3.0	4.0	08Q05B	Quarry B
08Q05B05	Basalt	4.0	5.0	08Q05B	Quarry B
08Q05B06	Basalt	5.0	6.0	08Q05B	Quarry B
08Q05B07	Basalt	6.0	7.0	08Q05B	Quarry B
08Q05B08	Basalt	7.0	8.0	08Q05B	Quarry B
08Q05B09	Basalt	8.0	9.0	08Q05B	Quarry B

Sample ID	Rock Type	Depth (m)		Drill Hole	
		From	To	ID	
08Q04A01	Basalt	0.0	1.0	08Q04A	Quarry C
08Q04A02	Basalt	1.0	2.0	08Q04A	Quarry C
08Q04A03	Basalt	2.0	3.0	08Q04A	Quarry C
08Q04A04	Basalt	3.0	4.0	08Q04A	Quarry C
08Q04A05	Basalt	4.0	5.0	08Q04A	Quarry C
08Q04A06	Basalt	5.0	6.0	08Q04A	Quarry C
08Q04A07	Basalt	6.0	7.0	08Q04A	Quarry C
08Q04A08	Basalt	7.0	8.0	08Q04A	Quarry C
08Q04A09	Basalt	8.0	9.0	08Q04A	Quarry C
08Q04A10	Basalt	9.0	10.0	08Q04A	Quarry C
08Q10A02	Basalt	1.0	2.0	08Q10A	Quarry D
08Q10A03	Basalt	2.0	3.0	08Q10A	Quarry D
08Q10A04	Basalt	3.0	4.0	08Q10A	Quarry D
08Q10A05	Basalt	4.0	5.0	08Q10A	Quarry D
08Q10A06	Basalt	5.0	6.0	08Q10A	Quarry D
08Q10A07 REP	Basalt	6.0	7.0	08Q10A	Quarry D
08Q10A08	Basalt	7.0	8.0	08Q10A	Quarry D
08Q10A09	Basalt	8.0	9.0	08Q10A	Quarry D
08Q10A10	Basalt	9.0	10.0	08Q10A	Quarry D
08Q10A11	Basalt	10.0	11.0	08Q10A	Quarry D
08Q10A12	Basalt	11.0	12.0	08Q10A	Quarry D
08Q10A13	Basalt	12.0	13.0	08Q10A	Quarry D
08Q10A14	Basalt	13.0	14.0	08Q10A	Quarry D
08Q10A15	Basalt	14.0	15.0	08Q10A	Quarry D
08Q10A16	Basalt	15.0	16.0	08Q10A	Quarry D
08Q10A17	Basalt	16.0	17.0	08Q10A	Quarry D
08Q10A18	Basalt	17.0	18.0	08Q10A	Quarry D
08Q10B01	Basalt	0.0	1.0	08Q10B	Quarry D
08Q10B02	Basalt	1.0	2.0	08Q10B	Quarry D
08Q10B03	Basalt	2.0	3.0	08Q10B	Quarry D
08Q10B04	Basalt	3.0	4.0	08Q10B	Quarry D
08Q10B05	Basalt	4.0	5.0	08Q10B	Quarry D
08Q10B06	Basalt	5.0	6.0	08Q10B	Quarry D
08Q10B07	Basalt	6.0	7.0	08Q10B	Quarry D
08Q10B08	Basalt	7.0	8.0	08Q10B	Quarry D
08Q10B09	Basalt	8.0	9.0	08Q10B	Quarry D
08Q10B10	Basalt	9.0	10.0	08Q10B	Quarry D
08Q10B11	Basalt	10.0	11.0	08Q10B	Quarry D
08Q10B12	Basalt	11.0	12.0	08Q10B	Quarry D
08Q10B13	Basalt	12.0	13.0	08Q10B	Quarry D
08Q10B14	Basalt	13.0	14.0	08Q10B	Quarry D
08Q10B15	Basalt	14.0	15.0	08Q10B	Quarry D
08Q10B16	Basalt	15.0	16.0	08Q10B	Quarry D
08Q10B17	Basalt	16.0	17.0	08Q10B	Quarry D
08Q10B18	Basalt	17.0	18.0	08Q10B	Quarry D
08Q10B19	Basalt	18.0	19.0	08Q10B	Quarry D

Sample ID	Rock Type	Depth (m)		Drill Hole	
		From	To	ID	
08Q12A01	Basalt	0.0	1.0	08Q12A	Quarry E
08Q12A02	Basalt	1.0	2.0	08Q12A	Quarry E
08Q12A03	Basalt	2.0	3.0	08Q12A	Quarry E
08Q12A04	Basalt	3.0	4.0	08Q12A	Quarry E
08Q12A05	Basalt	4.0	5.0	08Q12A	Quarry E
08Q12A06	Basalt	5.0	6.0	08Q12A	Quarry E
08Q12A07	Basalt	6.0	7.0	08Q12A	Quarry E
08Q12A08	Basalt	7.0	8.0	08Q12A	Quarry E
08Q12A09	Basalt	8.0	9.0	08Q12A	Quarry E
08Q12A10	Basalt	9.0	10.0	08Q12A	Quarry E
08Q12A11	Basalt	10.0	11.0	08Q12A	Quarry E
08Q12A12	Basalt	11.0	12.0	08Q12A	Quarry E
08Q12A13	Basalt	12.0	13.0	08Q12A	Quarry E
08Q12A14	Basalt	13.0	14.0	08Q12A	Quarry E
08Q12A15	Basalt	14.0	15.0	08Q12A	Quarry E
08Q12A16	Basalt	15.0	16.0	08Q12A	Quarry E
08Q12A17	Basalt	16.0	17.0	08Q12A	Quarry E
08Q12A18	Basalt	17.0	18.0	08Q12A	Quarry E
08Q12A19	Basalt	18.0	19.0	08Q12A	Quarry E
08Q12B01	Basalt	0.0	1.0	08Q12B	Quarry E
08Q12B02	Basalt	1.0	2.0	08Q12B	Quarry E
08Q12B03	Basalt	2.0	3.0	08Q12B	Quarry E
08Q12B04	Basalt	3.0	4.0	08Q12B	Quarry E
08Q12B05	Basalt	4.0	5.0	08Q12B	Quarry E
08Q12B06	Basalt	5.0	6.0	08Q12B	Quarry E
08Q12B07	Basalt	6.0	7.0	08Q12B	Quarry E
08Q12B08	Basalt	7.0	8.0	08Q12B	Quarry E
08Q12B09	Basalt	8.0	9.0	08Q12B	Quarry E
08Q12B10	Basalt	9.0	10.0	08Q12B	Quarry E
08Q12B11	Basalt	10.0	11.0	08Q12B	Quarry E
08Q12B12	Basalt	11.0	12.0	08Q12B	Quarry E
08Q12B13	Basalt	12.0	13.0	08Q12B	Quarry E
08Q12B14	Basalt	13.0	14.0	08Q12B	Quarry E
08Q12B15	Basalt	14.0	15.0	08Q12B	Quarry E
08Q12B16	Basalt	15.0	16.0	08Q12B	Quarry E
08Q12B17	Basalt	16.0	17.0	08Q12B	Quarry E
08Q12B18	Basalt	17.0	18.0	08Q12B	Quarry E
08Q12B19	Basalt	18.0	19.0	08Q12B	Quarry E

Appendix C
Rietveld-XRD Report

QUANTITATIVE PHASE ANALYSIS OF 9 POWDER SAMPLES USING THE RIETVELD METHOD AND X-RAY POWDER DIFFRACTION DATA.

Project: SRK – Hope Bay
Cantest Project No: 2-21-900
Internal reference No: R 72139

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June 13, 2008

EXPERIMENTAL METHODS

The nine samples of **Project SRK-Hope Bay** were reduced to the optimum grain-size range for quantitative X-ray analysis (<10 μm) by grinding under ethanol in a vibratory McCrone Micronising Mill for 7 minutes. Fine grain-size is an important factor in reducing micro-absorption contrast between phases.

Step-scan X-ray powder-diffraction data were collected over a range 3-80°2θ with CoKα radiation on a standard Siemens (Bruker) D5000 Bragg-Brentano diffractometer equipped with an Fe monochromator foil, 0.6 mm (0.3°) divergence slit, incident- and diffracted-beam Soller slits and a Vantec-1 strip detector. The long fine-focus Co X-ray tube was operated at 35 kV and 40 mA, using a take-off angle of 6°

RESULTS

The X-ray diffractograms were analyzed using the International Centre for Diffraction Database PDF-4 using Search-Match software by Siemens (Bruker). X-ray powder-diffraction data of the samples were refined with Rietveld program Topas 3 (Bruker AXS). The results of quantitative phase analysis by Rietveld refinements are given in Table 1. These amounts represent the relative amounts of crystalline phases normalized to 100%. The Rietveld refinement plots are shown in Figures 1-9.

Lizardite, hematite and andradite were tentatively identified in some samples without independent evidence, their presence cannot be confirmed (Table 1).

Table 1. Results of quantitative phase analysis (wt.%)

Mineral	Ideal Formula	08Q12B02	08Q12A18	08Q10B07	08Q04A09	08Q04B08	08Q05A05	08Q05B04	08Q06A09	08Q10A12
Quartz	SiO_2	16.0	24.4	15.0	2.1	17.4	13.3	13.4	10.9	26.6
Biotite	$K(Mg,Fe^{2+})_3AlSi_3O_{10}(OH)_2$	1.1		0.8			1.1			
K-feldspar	$KAlSi_3O_8$	2.1	3.2	1.9	1.5	2.1	4.4	3.8	6.7	3.3
Plagioclase	$NaAlSi_3O_8 – CaAl_2Si_2O_8$	12.6	21.8	14.5	14.5	11.3	20.4	24.1	5.6	4.2
Clinochlore	$(Mg,Fe^{2+})_5Al(Si_3Al)O_{10}(OH)_8$	20.6	32.0	17.1	26.8	19.9	29.6	17.0	23.3	36.0
Calcite	$CaCO_3$	14.7	18.6	16.2	3.5	8.3	7.6	13.4	19.9	17.3
Clinozoisite	$Ca_2Al_3(SiO_4)_3(OH)$	12.4		14.5	3.3	16.3	11.1	6.7	16.0	4.4
Diopside	$CaMgSi_2O_6$	3.1		2.4	2.2	3.2	1.9	2.5	2.2	1.4
Actinolite	$Ca_2(Mg,Fe^{2+})_5Si_8O_{22}(OH)_2$	17.5		17.6	46.1	21.5	10.2	18.5	11.9	6.1
Lizardite ?	$Mg_3Si_2O_5(OH)_4$						0.3			0.7
Hematite ?	α-Fe_2O_3								1.7	
Lepidocrocite	γ-$Fe^{3+}O(OH)$							0.4		
Molybdenite	MoS_2								0.1	
Andradite ?	$Ca_3Fe_2^{3+}(SiO_4)_3$								1.5	
Total		100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Note: ? implies that a pattern may be fitted to the phase but without independent evidence, its presence cannot be confirmed.

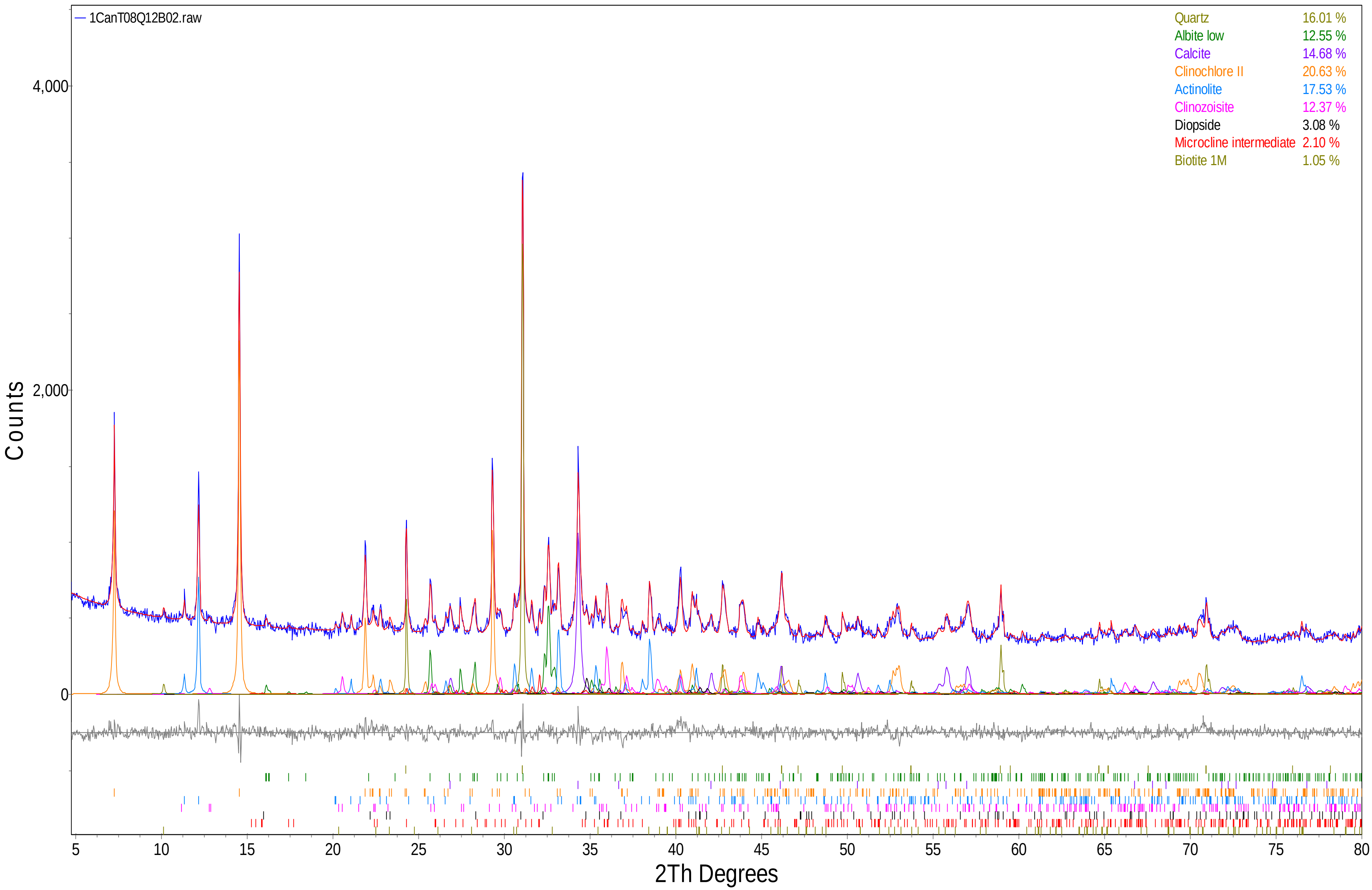

Figure 1. Rietveld refinement plot of sample **08Q12B02** (blue line - observed intensity at each step; red line - calculated pattern; solid grey line below – difference between observed and calculated intensities; vertical bars, positions of all Bragg reflections). Coloured lines are individual diffraction patterns of all phases.

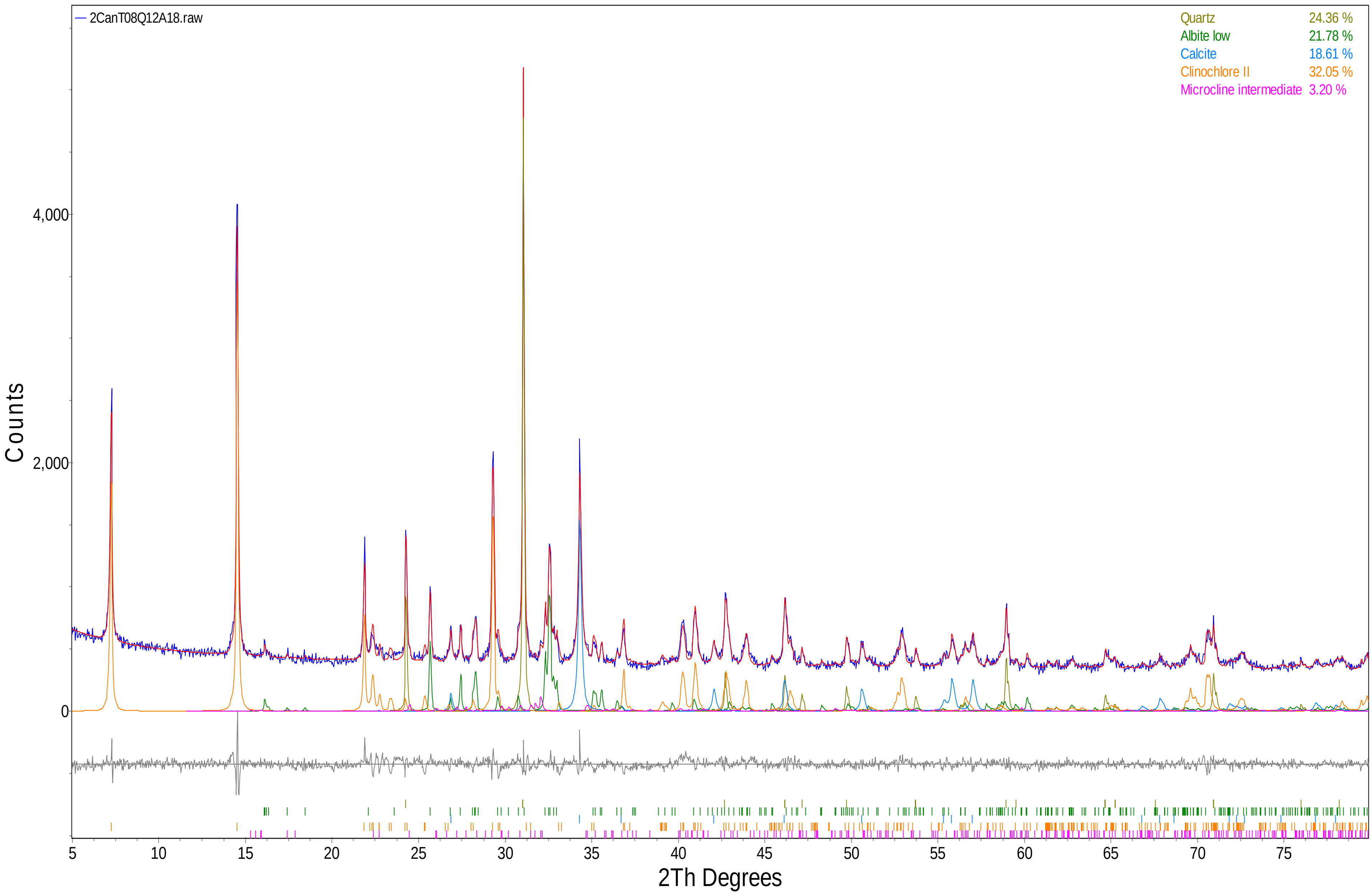

Figure 2. Rietveld refinement plot of sample **08Q12A18** (blue line - observed intensity at each step; red line - calculated pattern; solid grey line below – difference between observed and calculated intensities; vertical bars, positions of all Bragg reflections). Coloured lines are individual diffraction patterns of all phases.

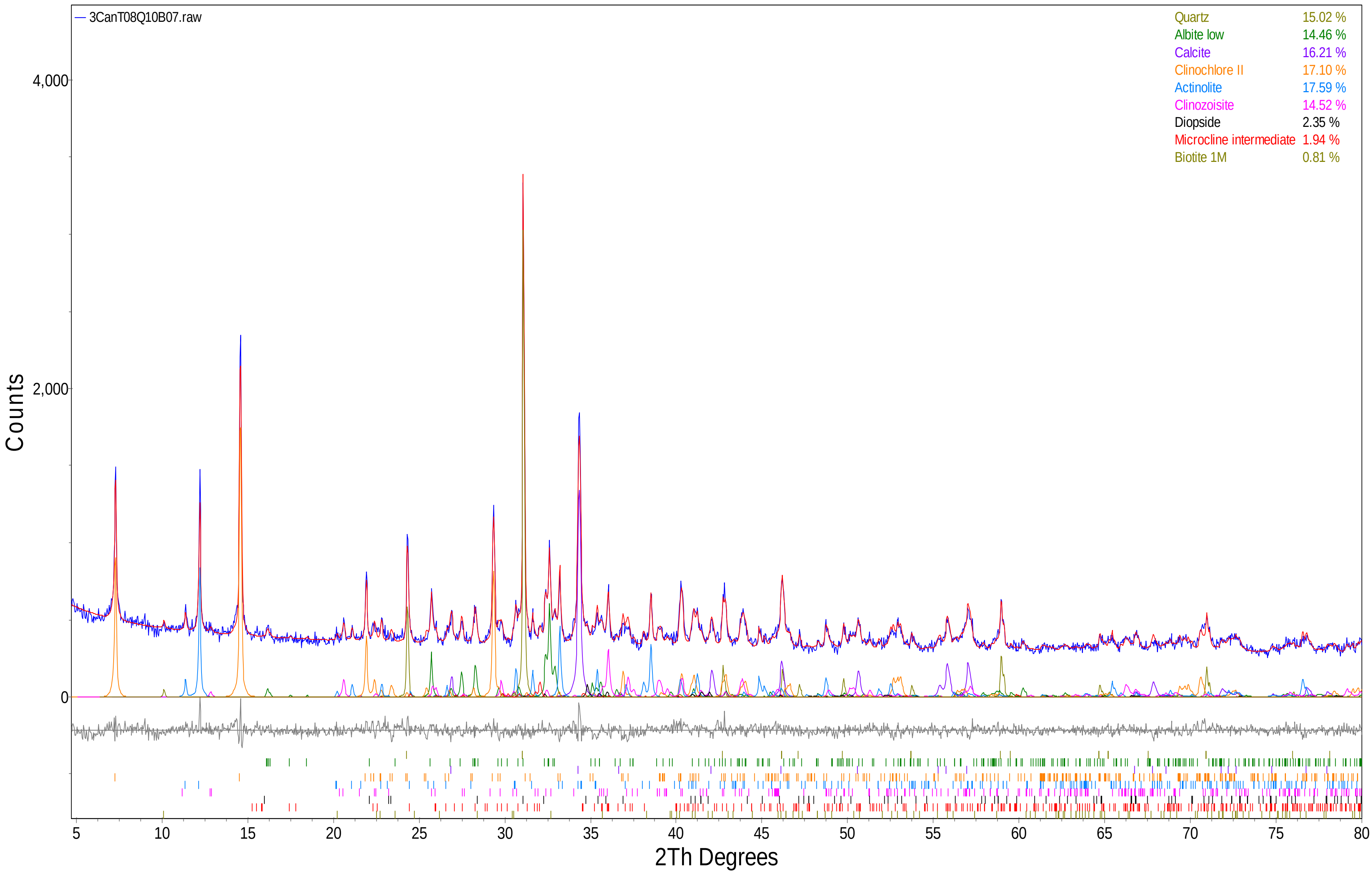

Figure 3. Rietveld refinement plot of sample **08Q10B07** (blue line - observed intensity at each step; red line - calculated pattern; solid grey line below – difference between observed and calculated intensities; vertical bars, positions of all Bragg reflections). Coloured lines are individual diffraction patterns of all phases.

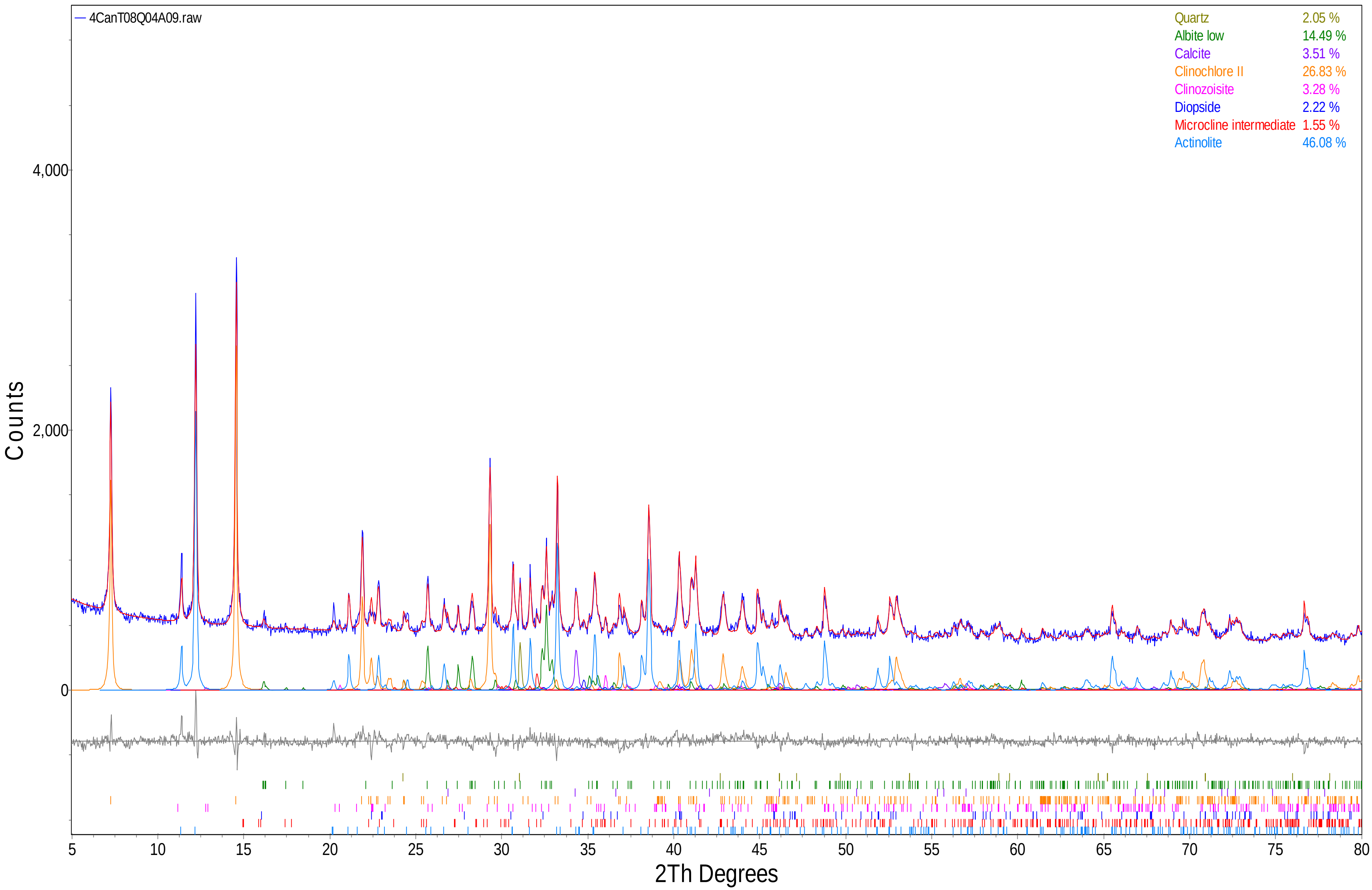

Figure 4. Rietveld refinement plot of sample **08Q04A09** (blue line - observed intensity at each step; red line - calculated pattern; solid grey line below – difference between observed and calculated intensities; vertical bars, positions of all Bragg reflections). Coloured lines are individual diffraction patterns of all phases.

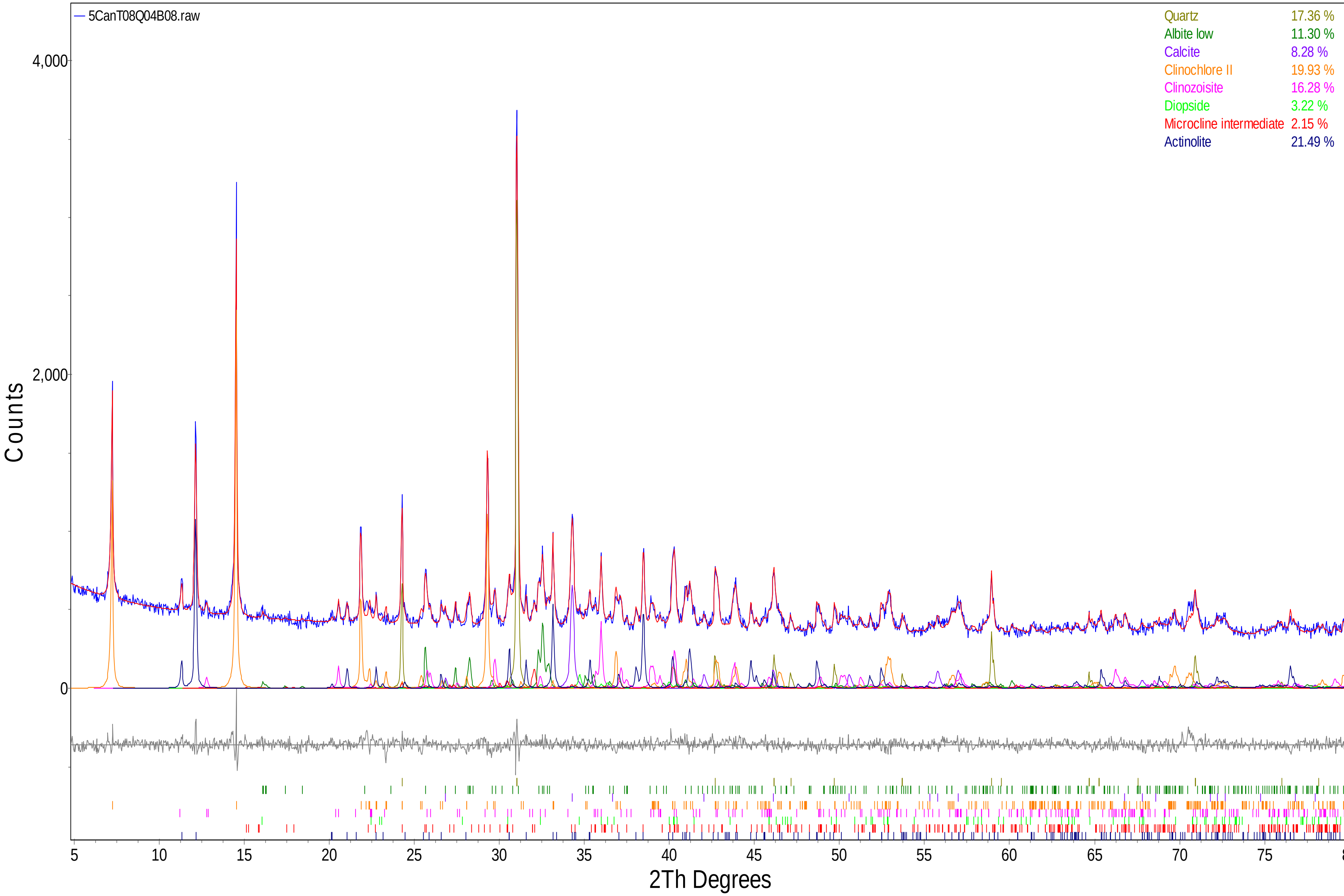

Figure 5. Rietveld refinement plot of sample **08Q04B08** (blue line - observed intensity at each step; red line - calculated pattern; solid grey line below – difference between observed and calculated intensities; vertical bars, positions of all Bragg reflections). Coloured lines are individual diffraction patterns of all phases.

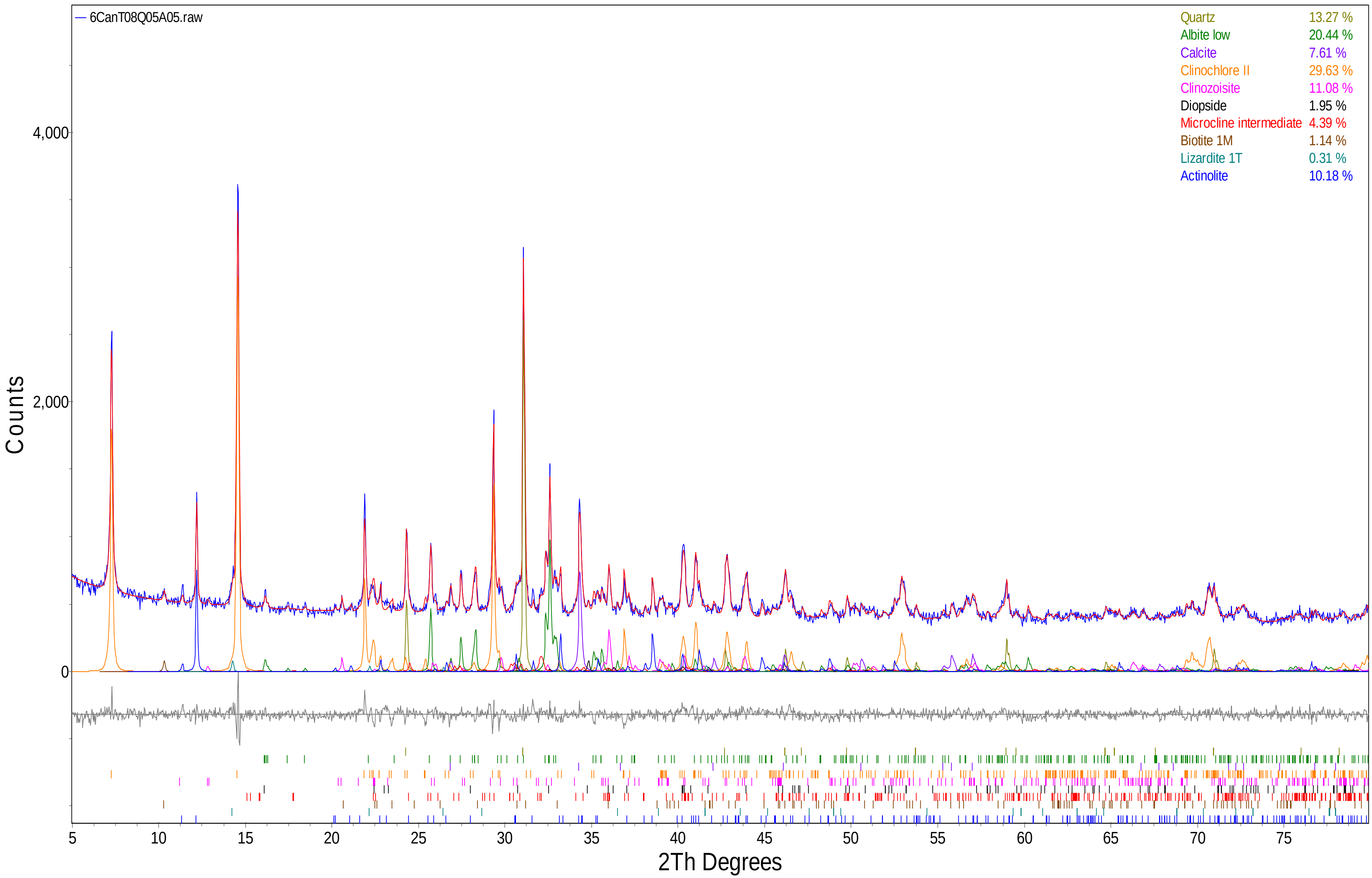

Figure 6. Rietveld refinement plot of sample **08Q05A05** (blue line - observed intensity at each step; red line - calculated pattern; solid grey line below – difference between observed and calculated intensities; vertical bars, positions of all Bragg reflections). Coloured lines are individual diffraction patterns of all phases.

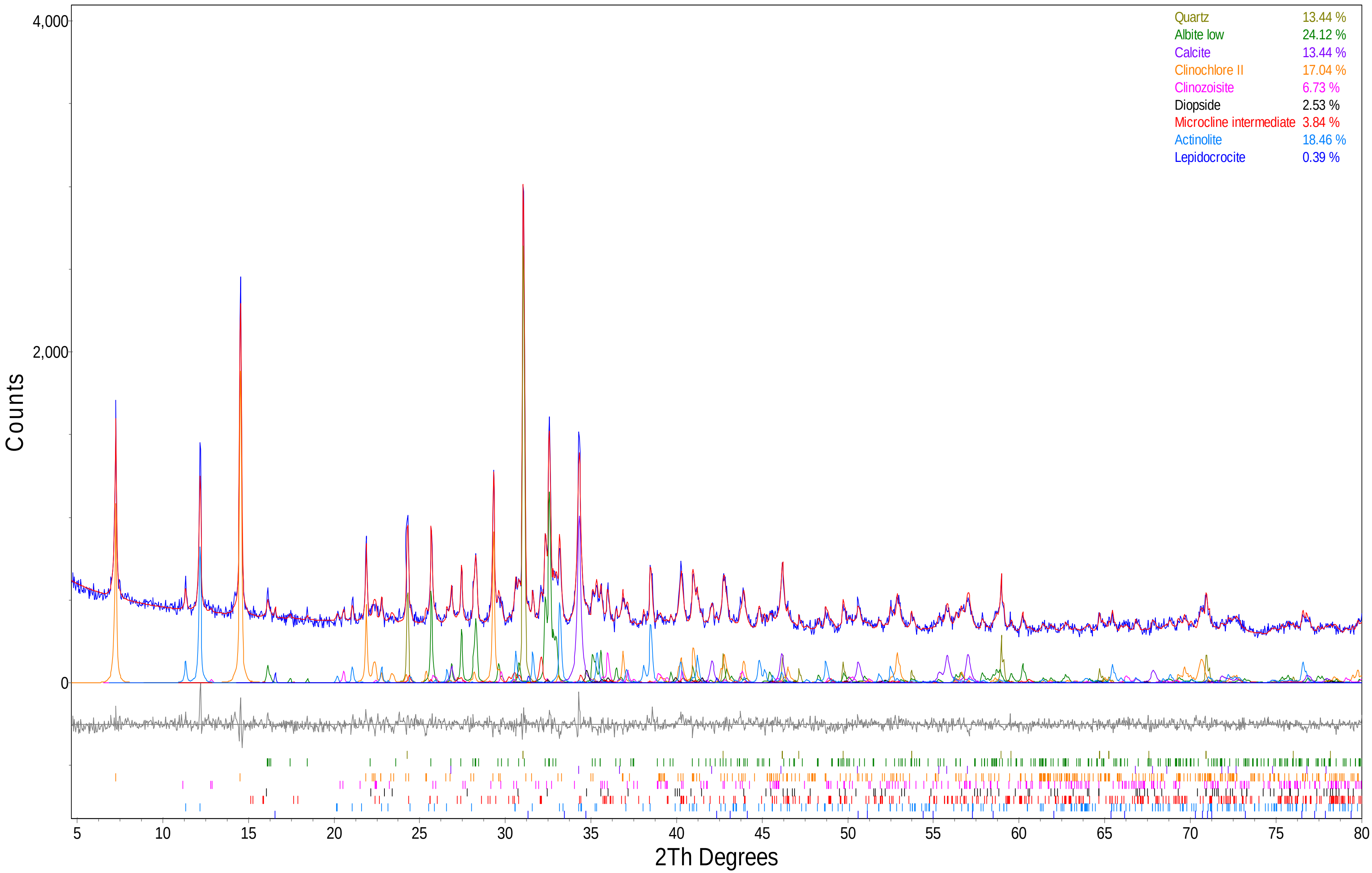

Figure 7. Rietveld refinement plot of sample **08Q05B04** (blue line - observed intensity at each step; red line - calculated pattern; solid grey line below – difference between observed and calculated intensities; vertical bars, positions of all Bragg reflections). Coloured lines are individual diffraction patterns of all phases.

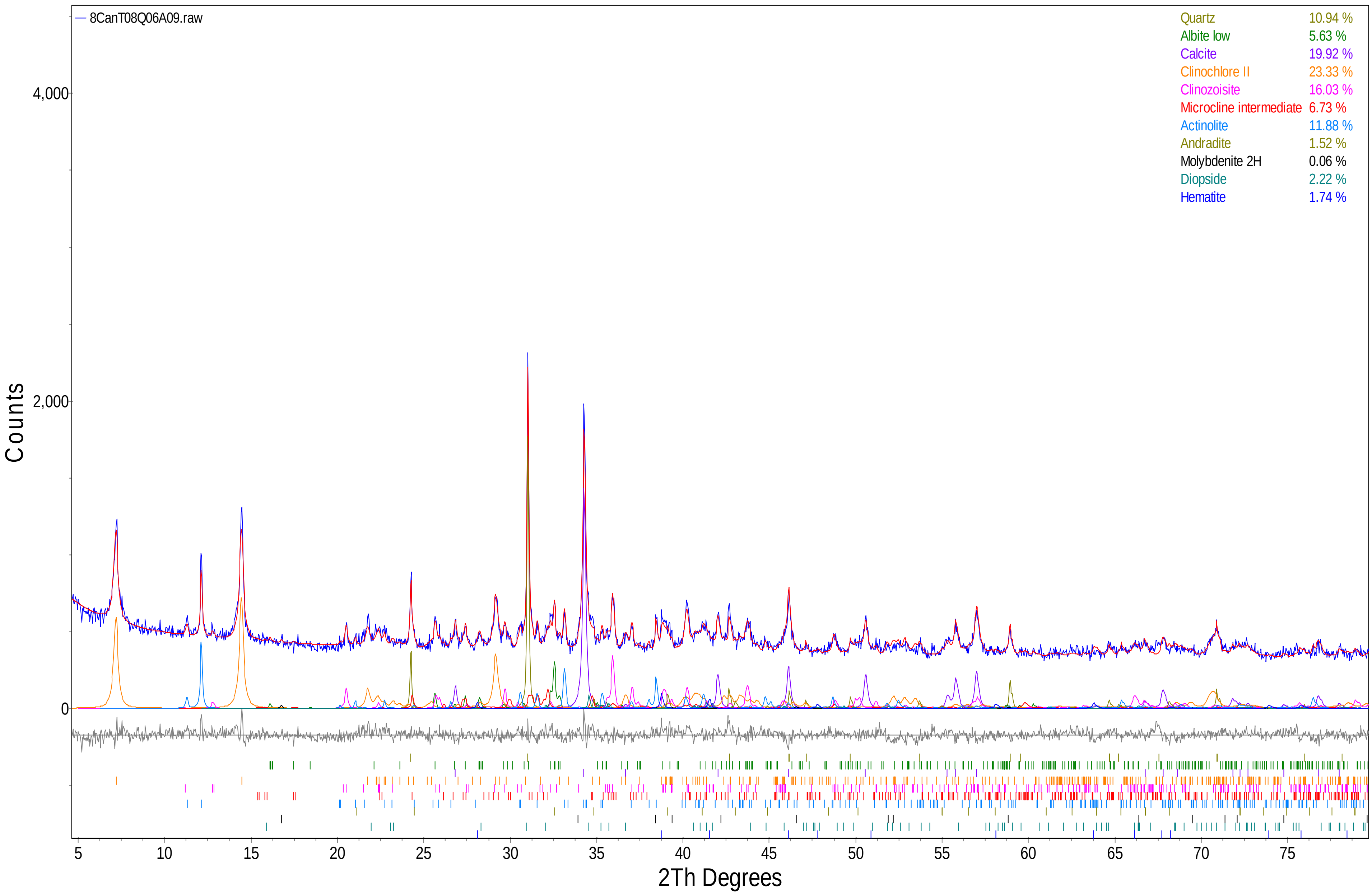

Figure 8. Rietveld refinement plot of sample **08Q06A09** (blue line - observed intensity at each step; red line - calculated pattern; solid grey line below – difference between observed and calculated intensities; vertical bars, positions of all Bragg reflections). Coloured lines are individual diffraction patterns of all phases.

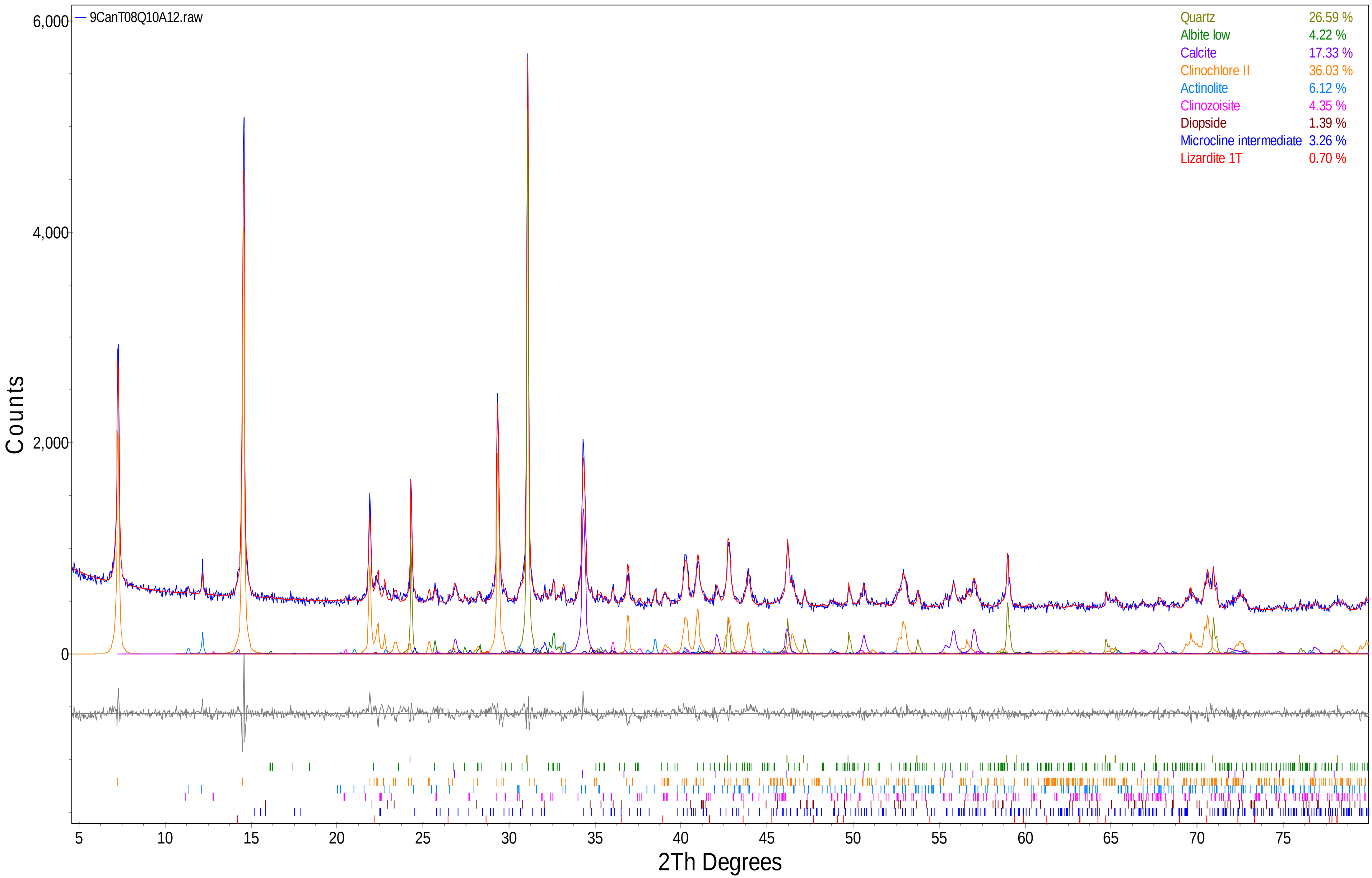

Figure 9. Rietveld refinement plot of sample **08Q10A12** (blue line - observed intensity at each step; red line - calculated pattern; solid grey line below – difference between observed and calculated intensities; vertical bars, positions of all Bragg reflections). Coloured lines are individual diffraction patterns of all phases.

Appendix D
Acid-Base Accounting Data

	Sample ID	Rock Type	Paste pH	Acid Potential				Neutralization Potential				NP/AP	
				Total Sulphur (Wt.%)	Sulphate Sulphur (Wt.%)	Sulphide Sulphur (Wt.%)	Acid Potential (AP)[1] (Kg CaCO3/Tonne)	Fizz Rating	TIC (CO2) (Wt.%)	NP (TIC) (Kg CaCO3/Tonne)	Standard Sobek NP (Kg CaCO3/Tonne)	NP (TIC)/AP	NP (Sobek)/AP
Quarry A	08Q05A01	Basalt	8.2	0.03	<0.01	0.03	0.9	none	0.15	3.4	12.3	3.8	13.6
	08Q05A02	Basalt	8.6	0.11	<0.01	0.11	3.4	Moderate	0.43	9.8	44.9	2.9	13.2
	08Q05A03	Basalt	8.9	0.14	<0.01	0.14	4.4	Strong	0.90	20.5	66.1	4.6	15.0
	08Q05A04	Basalt	8.8	0.06	<0.01	0.06	1.9	Strong	1.28	29.1	76.1	15.3	40.0
	08Q05A05	Basalt	8.8	0.03	<0.01	0.03	0.9	Strong	3.17	72.0	152.6	80.1	169.6
	08Q05A06	Basalt	9.0	0.09	<0.01	0.09	2.8	Strong	2.24	50.9	126.9	18.2	45.3
	08Q05A07	Basalt	9.0	0.08	<0.01	0.08	2.5	Strong	2.33	53.0	139.4	21.2	55.8
	08Q05A08	Basalt	9.3	0.06	<0.01	0.06	1.9	Strong	3.16	71.8	150.8	37.8	79.3
	08Q05A09	Granitoid	9.1	0.04	<0.01	0.04	1.3	Strong	1.88	42.7	124.4	32.9	95.7
	08Q06A01	OB	8.1	0.03	0.01	0.02	0.6	Moderate	0.74	16.8	60.3	28.0	100.5
	08Q06A02	OB w. basalt	8.5	0.04	<0.01	0.04	1.3	Strong	2.92	66.4	132.5	51.0	102.0
	08Q06A03	Basalt	8.7	0.05	<0.01	0.05	1.6	Strong	2.26	51.4	133.2	32.1	83.2
	08Q06A04	Basalt	9.0	0.05	<0.01	0.05	1.6	Strong	4.14	94.1	283.9	58.8	177.4
	08Q06A05	Basalt	9.0	0.02	<0.01	0.02	0.6	Strong	1.97	44.8	152.0	74.6	253.4
	08Q06A06	Basalt	9.1	0.04	<0.01	0.04	1.3	Strong	2.40	54.5	167.1	42.0	128.5
	08Q06A07	Basalt	9.1	0.04	<0.01	0.04	1.3	Strong	2.06	46.8	170.9	36.0	131.4
	08Q06A08	Basalt	9.2	0.05	<0.01	0.05	1.6	Strong	1.85	42.0	154.5	26.3	96.6
	08Q06A09	Basalt	9.2	0.15	<0.01	0.15	4.7	Strong	7.74	175.9	295.2	37.4	62.8
Quarry B	08Q04B01	Basalt	8.7	0.06	<0.01	0.06	1.9	Strong	1.17	26.6	62.3	14.0	32.8
	08Q04B02	Basalt	8.5	0.03	<0.01	0.03	0.9	Strong	1.79	40.7	82.3	45.2	91.4
	08Q04B03	Basalt	9.1	0.03	<0.01	0.03	0.9	Strong	1.38	31.4	87.3	34.8	97.0
	08Q04B04	Basalt	9.2	<0.02	<0.01	<0.02	<0.6	Strong	1.68	38.2	99.8	63.6	166.3
	08Q04B05	Basalt	9.2	0.02	<0.01	0.02	0.6	Strong	1.64	37.3	91.6	62.1	152.7
	08Q04B06	Basalt	9.3	0.07	<0.01	0.07	2.2	Strong	1.87	42.5	99.1	19.3	45.1
	08Q04B07	Basalt	9.1	0.08	<0.01	0.08	2.5	Strong	1.77	40.2	72.3	16.1	28.9
	08Q04B08	Basalt	9.0	0.15	<0.01	0.15	4.7	Strong	3.38	76.8	118.5	16.3	25.2
	08Q04B09	Basalt	9.1	0.07	<0.01	0.07	2.2	Strong	1.81	41.1	73.6	18.7	33.4
	08Q05B01	OB	8.9	0.05	<0.01	0.05	1.6	Strong	2.72	61.8	113.1	38.6	70.7
	08Q05B02	Basalt	8.8	0.05	<0.01	0.05	1.6	Strong	5.06	115.0	165.8	71.9	103.6
	08Q05B03	Basalt	8.9	0.04	<0.01	0.04	1.3	Strong	3.22	73.2	148.2	56.3	114.0
	08Q05B04	Basalt	9.1	0.10	<0.01	0.10	3.1	Strong	5.90	134.1	183.4	43.3	59.2
	08Q05B05	Basalt	9.2	0.09	<0.01	0.09	2.8	Strong	3.74	85.0	130.7	30.4	46.7
	08Q05B06	Basalt	9.0	0.10	<0.01	0.10	3.1	Strong	3.24	73.6	162.1	23.8	52.3
	08Q05B07	Basalt	9.1	0.06	<0.01	0.06	1.9	Strong	3.52	80.0	168.3	42.1	88.6
	08Q05B08	Basalt	9.1	0.07	<0.01	0.07	2.2	Strong	3.67	83.4	139.4	37.9	63.4
	08Q05B09	Basalt	9.1	0.08	<0.01	0.08	2.5	Strong	3.14	71.4	140.7	28.5	56.3
Quarry C	08Q04A01	Basalt	9.2	0.10	<0.01	0.10	3.1	Strong	1.17	26.6	89.2	8.6	28.8
	08Q04A02	Basalt	9.3	0.07	<0.01	0.07	2.2	Moderate	0.34	7.7	38.0	3.5	17.3
	08Q04A03	Basalt	9.3	0.06	<0.01	0.06	1.9	Moderate	0.36	8.2	64.2	4.3	33.8
	08Q04A04	Basalt	9.3	0.04	<0.01	0.04	1.3	Strong	0.94	21.4	115.3	16.4	88.7
	08Q04A05	Basalt	9.2	0.03	<0.01	0.03	0.9	Strong	1.11	25.2	112.2	28.0	124.7
	08Q04A06	Basalt	9.4	0.05	<0.01	0.05	1.6	Moderate	0.40	9.1	66.7	5.7	41.7
	08Q04A07	Basalt	9.4	0.06	<0.01	0.06	1.9	slight	0.16	3.6	20.8	1.9	10.9
	08Q04A08	Basalt	9.2	0.04	<0.01	0.04	1.3	Moderate	0.50	11.4	56.1	8.7	43.2
	08Q04A09	Basalt	9.2	0.07	<0.01	0.07	2.2	Strong	1.50	34.1	82.3	15.5	37.4
	08Q04A10	Basalt	9.3	0.05	<0.01	0.05	1.6	Strong	0.89	20.2	77.3	12.6	48.3

	Sample ID	Rock Type	Paste pH	Acid Potential				Neutralization Potential				NP/AP	
				Total Sulphur (Wt.%)	Sulphate Sulphur (Wt.%)	Sulphide Sulphur (Wt.%)	Acid Potential (AP)[1] (Kg CaCO3/Tonne)	Fizz Rating	TIC (CO2) (Wt.%)	NP (TIC) (Kg CaCO3/Tonne)	Standard Sobek NP (Kg CaCO3/Tonne)	NP (TIC)/AP	NP (Sobek)/AP
Quarry D	08Q10A02	??	8.9	0.10	<0.01	0.10	3.1	Strong	4.95	112.5	155.8	36.3	50.3
	08Q10A03	Basalt	8.8	0.04	<0.01	0.04	1.3	Strong	2.73	62.0	138.2	47.7	106.3
	08Q10A04	Basalt	9.1	0.05	<0.01	0.05	1.6	Strong	4.84	110.0	291.5	68.8	182.2
	08Q10A05	Basalt	9.0	0.06	<0.01	0.06	1.9	Strong	4.03	91.6	139.4	48.2	73.4
	08Q10A06	Basalt	9.0	0.10	<0.01	0.10	3.1	Strong	4.00	90.9	155.8	29.3	50.3
	08Q10A07 REP	Basalt	9.1	0.18	<0.01	0.18	5.6	Strong	5.65	128.4	169.6	22.9	30.3
	08Q10A08	Basalt	9.1	0.03	<0.01	0.03	0.9	Strong	3.96	90.0	150.8	100.0	167.5
	08Q10A09	Basalt	9.1	0.02	<0.01	0.02	0.6	Strong	5.13	116.6	173.4	194.3	288.9
	08Q10A10	Basalt	9.0	0.02	<0.01	0.02	0.6	Strong	5.87	133.4	192.2	222.3	320.4
	08Q10A11	Basalt	8.9	0.05	<0.01	0.05	1.6	Strong	6.05	137.5	191.0	85.9	119.3
	08Q10A12	Basalt	8.8	0.10	<0.01	0.10	3.1	Strong	7.04	160.0	232.4	51.6	75.0
	08Q10A13	Basalt	9.0	0.03	<0.01	0.03	0.9	Strong	6.12	139.1	188.4	154.5	209.4
	08Q10A14	Basalt	9.0	0.09	<0.01	0.09	2.8	Strong	4.73	107.5	290.2	38.4	103.6
	08Q10A15	Basalt	9.2	0.04	<0.01	0.04	1.3	Strong	3.01	68.4	108.0	52.6	83.1
	08Q10A16	Basalt	9.2	0.08	<0.01	0.08	2.5	Strong	1.66	37.7	118.1	15.1	47.2
	08Q10A17	Basalt	9.3	0.04	<0.01	0.04	1.3	Strong	0.66	15.0	89.2	11.5	68.6
	08Q10A18	Basalt	9.3	0.03	<0.01	0.03	0.9	Strong	2.05	46.6	99.2	51.8	110.3
	08Q10B01	Basalt	8.7	0.04	<0.01	0.04	1.3	Strong	1.25	28.4	66.3	21.9	51.0
	08Q10B02	Basalt	9.1	0.03	<0.01	0.03	0.9	Strong	1.03	23.4	93.1	26.0	103.5
	08Q10B03	Basalt	9.4	<0.02	<0.01	<0.02	<0.6	Strong	1.16	26.4	105.4	43.9	175.6
	08Q10B04	Basalt	9.2	0.04	<0.01	0.04	1.3	Strong	2.69	61.1	119.7	47.0	92.1
	08Q10B05	Basalt	9.2	0.07	<0.01	0.07	2.2	Strong	4.93	112.0	158.4	50.9	72.0
	08Q10B06	Basalt	9.3	0.05	<0.01	0.05	1.6	Strong	3.99	90.7	150.9	56.7	94.3
	08Q10B07	Basalt	9.3	0.05	<0.01	0.05	1.6	Strong	7.17	163.0	188.9	101.8	118.1
	08Q10B08	Basalt	9.3	0.12	<0.01	0.12	3.8	Strong	4.03	91.6	169.0	24.1	44.5
	08Q10B09	Basalt	9.0	0.11	<0.01	0.11	3.4	Strong	3.09	70.2	145.3	20.7	42.7
	08Q10B10	Basalt	9.3	0.03	<0.01	0.03	0.9	Strong	6.66	151.4	186.4	168.2	207.1
	08Q10B11	Basalt	9.2	0.08	<0.01	0.08	2.5	Strong	5.70	129.5	183.3	51.8	73.3
	08Q10B12	Basalt	9.0	0.15	<0.01	0.15	4.7	Strong	6.25	142.0	188.3	30.2	40.1
	08Q10B13	Basalt	9.1	0.08	<0.01	0.08	2.5	Strong	4.57	103.9	170.8	41.5	68.3
	08Q10B14	Basalt	9.1	0.08	<0.01	0.08	2.5	Strong	3.91	88.9	165.8	35.5	66.3
	08Q10B15	Basalt	9.4	0.06	<0.01	0.06	1.9	Strong	3.91	88.9	223.2	46.8	117.5
	08Q10B16	Basalt	9.2	0.12	<0.01	0.12	3.8	Strong	4.86	110.5	199.5	29.1	52.5
	08Q10B17	Basalt	9.2	0.07	<0.01	0.07	2.2	Strong	4.82	109.5	190.8	49.8	86.7
	08Q10B18	Basalt	9.1	0.08	<0.01	0.08	2.5	Strong	5.12	116.4	162.1	46.5	64.8
	08Q10B19	Basalt	9.1	0.09	<0.01	0.09	2.8	Strong	3.80	86.4	178.3	30.8	63.7

	Sample ID	Rock Type	Paste pH	Acid Potential: Total Sulphur (Wt.%)	Acid Potential: Sulphate Sulphur (Wt.%)	Acid Potential: Sulphide Sulphur (Wt.%)	Acid Potential: Acid Potential (AP)[1] (Kg CaCO3/Tonne)	Neutralization Potential: Fizz Rating	Neutralization Potential: TIC (CO2) (Wt.%)	Neutralization Potential: NP (TIC) (Kg CaCO3/Tonne)	Neutralization Potential: Standard Sobek NP (Kg CaCO3/Tonne)	NP/AP: NP (TIC)/AP	NP/AP: NP (Sobek)/AP
Quarry E	08Q12A01	Basalt	8.3	0.07	<0.01	0.07	2.2	Strong	1.00	22.7	63.1	10.3	28.7
	08Q12A02	Basalt	8.8	0.07	<0.01	0.07	2.2	Strong	0.68	15.5	48.8	7.0	22.2
	08Q12A03	Basalt	9.0	0.10	<0.01	0.10	3.1	Strong	1.09	24.8	78.1	8.0	25.2
	08Q12A04	Basalt	9.2	0.05	<0.01	0.05	1.6	Strong	1.05	23.9	93.8	14.9	58.6
	08Q12A05	Basalt	9.1	0.06	<0.01	0.06	1.9	Moderate	0.43	9.8	43.1	5.1	22.7
	08Q12A06	Basalt	9.0	0.18	<0.01	0.18	5.6	Strong	2.34	53.2	71.9	9.5	12.8
	08Q12A07	Basalt	9.0	0.07	<0.01	0.07	2.2	Strong	3.41	77.5	112.5	35.2	51.1
	08Q12A08	Basalt	8.9	0.10	<0.01	0.10	3.1	Strong	3.20	72.7	98.8	23.5	31.9
	08Q12A09	Basalt	9.0	0.08	<0.01	0.08	2.5	Strong	2.22	50.5	81.3	20.2	32.5
	08Q12A10	Basalt	8.9	0.10	<0.01	0.10	3.1	Strong	3.32	75.5	99.4	24.3	32.1
	08Q12A11	Basalt	8.9	0.08	<0.01	0.08	2.5	Strong	3.44	78.2	95.0	31.3	38.0
	08Q12A12	Basalt	8.8	0.09	<0.01	0.09	2.8	Strong	5.32	120.9	145.0	43.2	51.8
	08Q12A13	Basalt	8.9	0.07	<0.01	0.07	2.2	Strong	4.18	95.0	111.3	43.2	50.6
	08Q12A14	Basalt	8.9	0.09	<0.01	0.09	2.8	Strong	4.55	103.4	125.6	36.9	44.9
	08Q12A15	Basalt	9.0	0.08	<0.01	0.08	2.5	Strong	6.20	140.9	164.4	56.4	65.8
	08Q12A16	Basalt	9.2	0.13	<0.01	0.13	4.1	Strong	4.11	93.4	93.8	22.8	22.9
	08Q12A17	Basalt	8.7	0.09	<0.01	0.09	2.8	Strong	7.12	161.8	192.5	57.8	68.8
	08Q12A18	Basalt	8.9	0.08	<0.01	0.08	2.5	Strong	7.28	165.5	192.5	66.2	77.0
	08Q12A19	Basalt	8.8	0.12	<0.01	0.12	3.8	Strong	6.74	153.2	188.8	40.3	49.7
	08Q12B01	Basalt	8.4	0.07	<0.01	0.07	2.2	Strong	3.31	75.2	105.0	34.2	47.7
	08Q12B02	Basalt	8.8	0.09	<0.01	0.09	2.8	Strong	6.31	143.4	190.6	51.2	68.1
	08Q12B03	Basalt	9.0	0.09	<0.01	0.09	2.8	Strong	4.62	105.0	161.3	37.5	57.6
	08Q12B04	Basalt	9.3	0.09	<0.01	0.09	2.8	Strong	3.96	90.0	140.0	32.1	50.0
	08Q12B05	Basalt	9.1	0.06	<0.01	0.06	1.9	Strong	3.89	88.4	151.3	46.5	79.6
	08Q12B06	Basalt	9.1	0.10	<0.01	0.10	3.1	Strong	4.40	100.0	143.1	32.3	46.2
	08Q12B07	Basalt	9.1	0.09	<0.01	0.09	2.8	Strong	3.48	79.1	126.9	28.2	45.3
	08Q12B08	Basalt	9.3	0.13	<0.01	0.13	4.1	Strong	4.91	111.6	176.9	27.2	43.1
	08Q12B09	Basalt	9.0	0.14	<0.01	0.14	4.4	Strong	4.88	110.9	163.8	25.2	37.2
	08Q12B10	Basalt	9.1	0.12	<0.01	0.12	3.8	Strong	4.88	110.9	148.8	29.2	39.1
	08Q12B11	Basalt	8.9	0.11	0.01	0.10	3.1	Strong	5.10	115.9	196.9	37.4	63.5
	08Q12B12	Basalt	9.1	0.12	<0.01	0.12	3.8	Strong	4.80	109.1	171.3	28.7	45.1
	08Q12B13	Basalt	9.0	0.10	<0.01	0.10	3.1	Strong	4.62	105.0	149.4	33.9	48.2
	08Q12B14	Basalt	8.9	0.09	<0.01	0.09	2.8	Strong	4.88	110.9	167.5	39.6	59.8
	08Q12B15	Basalt	9.1	0.08	<0.01	0.08	2.5	Strong	3.70	84.1	147.5	33.6	59.0
	08Q12B16	Basalt	8.9	0.10	<0.01	0.10	3.1	Strong	4.69	106.6	165.6	34.4	53.4
	08Q12B17	Basalt	8.8	0.15	<0.01	0.15	4.7	Strong	4.66	105.9	163.1	22.5	34.7
	08Q12B18	Basalt	9.0	0.06	<0.01	0.06	1.9	Strong	3.59	81.6	130.6	42.9	68.8
	08Q12B19	Basalt	9.0	0.10	<0.01	0.10	3.1	Strong	5.17	117.5	162.5	37.9	52.4
	Detection Limit		*0.1*	*0.02*	*0.01*	*0.02*	*0.6*		*0.02*	*0.5*			
	Method		7160	LECO	7410	Calculation	Calculation	7110	LECO	Calculation	7110	Calculation	Calculation

OB = Overburden

[1]AP calculated from sulphide sulphur.

Appendix E
ABA QA/QC Laboratory Replicates

S. No.	Sample ID	Paste pH (pH Units)		Relative Percent Difference (RPD %)
Duplicates - Paste pH				
1	08Q12B10	9.1	9.0	0.11%
2	08Q12A01	8.3	8.3	0.48%
3	08Q12A11	8.9	8.9	0.34%
4	08Q10B02	9.1	9.1	0.22%
5	08Q10B12	9.0	9.0	0.22%
6	08Q04A03	9.3	9.2	0.43%
7	08Q04B03	9.1	9.1	0.22%
8	08Q05A04	8.8	8.9	0.68%
9	08Q05B05	9.2	9.2	0.11%
10	08Q06A06	9.1	9.0	0.11%
11	08Q10A08	9.1	9.1	0.00%
12	08Q10A18	9.3	9.4	0.32%
S. No.	**Sample ID**	**Neutralization Potential (kgCaCO3/Tonne)**		**Relative Percent Difference (RPD %)**
Duplicates - Std. Sobek NP				
1	08Q12B10	148.8	151.3	1.67%
2	08Q12A01	63.1	61.3	3.02%
3	08Q12A11	95.0	98.8	3.87%
4	08Q10B02	93.1	87.5	6.23%
5	08Q10B12	188.3	187.0	0.66%
6	08Q04A03	64.2	59.2	8.08%
7	08Q04B03	87.3	82.3	5.88%
8	08Q05A04	76.1	69.8	8.55%
9	*08Q05B05*	130.7	131.9	0.96%
10	*08Q06A06*	167.1	169.0	1.12%
11	08Q10A08	150.8	152.6	1.24%
12	08Q10A18	99.2	98.0	1.27%
KZK-1 Reference (NP = 64.8) for moderate/strong fizz		70.6	69.2	
KZK-1 Reference (NP = 64.8) for moderate/strong fizz		66.0	-	

S. No.	Sample ID	Total Sulphur (Wt.%)		Relative Percent Difference (RPD %)
Duplicates - Total Sulphur				
1	08Q12B14	0.09	0.09	0.00%
2	08Q12B08	0.13	0.11	16.67%
3	08Q12A03	0.10	0.09	10.53%
4	88Q10B05	0.07	0.08	13.33%
5	88Q04B04	<0.02	0.02	0.00%
6	88Q10B10	0.03	0.04	28.57%
7	88Q10A05	0.06	0.07	15.38%
8	88Q10A09	0.02	0.03	40.00%
CANTEST Ref. (0.11% S)		0.12	0.12	0.00%
CANTEST Ref. (0.11% S)		0.12	0.10	18.18%
STD CSC (4.19% S)		4.17	4.15	0.48%
STD CSC (4.19% S)		4.18	4.13	1.20%

S. No.	Sample ID	Sulphate Sulphur (Wt.%)		Relative Percent Difference (RPD %)
Duplicates - Sulphate Sulphur				
1	08Q12B10	<0.01	<0.01	0.00%
2	08Q12A01	<0.01	<0.01	0.00%
3	08Q12A11	<0.01	<0.01	0.00%
4	08Q10B02	<0.01	<0.01	0.00%
5	08Q10B12	<0.01	<0.01	0.00%
6	08Q04A03	<0.01	<0.01	0.00%
7	08Q04B03	<0.01	<0.01	0.00%
8	08Q05A04	<0.01	<0.01	0.00%
9	08Q05B05	<0.01	<0.01	0.00%
10	08Q06A06	<0.01	<0.01	0.00%
11	08Q10A08	<0.01	<0.01	0.00%
12	08Q10A18	<0.01	<0.01	0.00%
CANTEST Ref. (0.27% SO4-S)		0.24	0.28	
CANTEST Ref. (0.27% SO4-S)		0.24	-	

S. No.	Sample ID	CO2 (Wt.%)		Relative Percent Difference (RPD %)
Duplicates - CO2				
1	08Q12B08	4.91	5.06	3.01%
2	08Q12A03	1.09	0.71	42.22%
3	08Q12A17	7.12	7.16	0.56%
4	88Q10A07 REP	5.65	5.76	1.93%
5	88Q04B04	1.68	1.67	0.60%
6	88Q10A02	4.95	5.17	4.35%
7	88Q10B13	4.57	4.68	2.38%
STD CSC (1.50% CO2)		1.52	1.58	
STD CSC (1.50% CO2)		1.53	1.56	
STD CSC (1.50% CO2)		1.55	-	

Appendix F
Elemental Analysis by Aqua Regia Digestion with ICP Finish

Quarry	Sample ID	Mo ppm	Cu ppm	Pb ppm	Zn ppm	Ag ppm	Ni ppm	Co ppm	Mn ppm	Fe %	As ppm	U ppm	Au ppb	Th ppm	Sr ppm	Cd ppm	Sb ppm	Bi ppm	V ppm	Ca %	P %	La ppm	Cr ppm	Mg %	Ba ppm	Ti %	B ppm	Al %	Na %	K %	W ppm	Hg ppm	Sc ppm	Tl ppm	Ga ppm	Se ppm
Quarry A	08Q05A01	1.8	62	2.4	52	0.1	51.40	22.2	645	3.6	1.7	0.20	2.1	1.7	11.00	0.1	0.10	0.1	69.0	0.46	0.023	6	109	1.59	15.0	0.1	20.0	1.94	0.0	0.1	0.10	0.0	3.8	0.1	5.0	0.5
	08Q05A02	1.8	89.4	1.9	49	0.1	67.10	28.2	721	3.98	0.8	0.10	1.5	0.7	14.00	0.1	0.10	0.1	72.0	0.75	0.025	3	131	1.84	9.0	0.1	20.0	2.21	0.0	0.0	0.20	0.0	3.7	0.1	5.0	0.5
	08Q05A03	1.1	105.5	1.4	56	0.1	78.00	34.1	874	4.94	4.7	0.10	1.2	0.4	11.00	0.1	0.10	0.1	93.0	1.07	0.024	1	155	2.39	4.0	0.2	20.0	2.63	0.0	0.0	0.10	0.0	4.0	0.1	5.0	**0.6**
	08Q05A04	1.1	119.6	0.9	48	0.1	78.20	33.1	835	4.79	1.9	0.10	0.5	0.2	16.00	0.1	0.10	0.1	93.0	1.45	0.024	2	158	2.68	2.0	0.2	20.0	2.86	0.0	0.0	0.10	0.0	4.9	0.1	6.0	0.5
	08Q05A05	1.2	73.3	0.5	58	0.1	84.00	38.1	972	5.93	0.6	0.10	2.9	0.4	16.00	0.1	0.10	0.1	126.0	3.03	0.024	2	183	3.36	3.0	0.2	20.0	3.57	0.0	0.0	0.10	0.0	8.2	0.1	7.0	0.5
	08Q05A06	1.1	90.6	1.3	58	0.1	81.20	34.7	849	5.1	0.5	0.10	0.8	0.3	12.00	0.1	0.10	0.1	107.0	2.17	0.025	1	167	2.78	2.0	0.2	20.0	2.98	0.0	0.0	0.10	0.0	6.3	0.1	7.0	0.5
	08Q05A07	1.1	98.3	0.8	40	0.1	75.40	33.1	735	4.58	0.5	0.10	0.5	0.2	13.00	0.1	0.10	0.1	102.0	2.19	0.022	1	145	2.91	2.0	0.2	20.0	2.72	0.0	0.0	0.10	0.0	6.5	0.1	6.0	0.5
	08Q05A08	1.5	94.8	1	43	0.1	76.30	33.6	878	5.01	0.5	0.10	0.5	0.1	13.00	0.1	0.10	0.1	121.0	2.54	0.022	2	160	3.39	2.0	0.1	20.0	3.04	0.0	0.0	0.10	0.0	8.6	0.1	7.0	0.5
	08Q05A09	1.1	97.9	0.9	42	0.1	73.10	33.6	756	4.56	0.5	0.10	0.9	0.2	11.00	0.1	0.10	0.1	106.0	1.80	0.022	1	141	3.13	2.0	0.2	20.0	2.91	0.0	0.0	0.10	0.0	7.6	0.1	6.0	0.5
	08Q06A01	2.7	66	5.3	39	0.1	45.50	20.0	466	2.96	1.4	0.30	1.4	1.9	13.00	0.1	0.10	0.1	59.0	1.04	0.022	7	103	1.35	22.0	0.1	20.0	1.56	0.0	0.1	2.50	0.0	2.9	0.1	4.0	0.5
	08Q06A02	1.2	137	1.1	42	0.1	77.50	34.9	688	4.52	0.6	0.10	1.3	0.6	19.00	0.1	0.10	0.1	88.0	2.91	0.021	3	137	2.32	9.0	0.2	20.0	2.38	0.0	0.0	0.40	0.0	3.4	0.1	5.0	0.5
	08Q06A03	1.1	108.2	0.8	44	0.1	85.10	37.1	777	5.1	0.5	0.10	1.3	0.2	17.00	0.1	0.10	0.1	108.0	2.28	0.023	1	155	2.60	5.0	0.2	20.0	2.66	0.0	0.0	0.20	0.0	3.3	0.1	6.0	0.5
	08Q06A04	2.4	123.4	0.5	39	0.1	78.60	33.2	661	4.24	0.5	0.10	1.3	0.1	27.00	0.1	0.10	0.1	90.0	4.07	0.021	1	147	2.31	2.0	0.2	20.0	2.37	0.0	0.0	0.80	0.0	4.5	0.1	5.0	0.5
	08Q06A05	1.2	130.1	0.2	50	0.1	87.90	42.9	884	6.37	0.5	0.10	0.9	0.1	17.00	0.1	0.10	0.1	138.0	2.10	0.025	1	182	3.38	4.0	0.3	20.0	3.48	0.1	0.0	0.10	0.0	5.4	0.1	8.0	0.5
	08Q06A06	0.9	147.7	0.3	37	0.1	83.00	34.2	690	5.72	0.5	0.10	1.1	0.1	20.00	0.1	0.10	0.1	124.0	2.58	0.023	1	162	3.20	5.0	0.3	20.0	3.06	0.1	0.0	0.10	0.0	5.3	0.1	7.0	0.5
	08Q06A07	0.6	180.7	0.8	28	0.1	77.80	32.4	532	5.42	0.5	0.10	1.5	0.1	22.00	0.1	0.10	0.1	116.0	2.21	0.022	1	140	3.18	6.0	0.2	20.0	2.93	0.1	0.1	0.10	0.0	5.2	0.1	7.0	**0.6**
	08Q06A08	0.6	260.8	0.8	27	0.1	64.70	36.1	536	5.68	0.6	0.10	1.5	0.3	26.00	0.1	0.10	0.1	170.0	2.32	0.046	5	100	2.85	15.0	0.3	20.0	2.62	0.1	0.1	0.10	0.0	5.0	0.1	9.0	0.5
	08Q06A09	0.9	658.8	0.3	23	0.1	70.90	47.9	652	5.64	0.9	0.10	4.4	0.1	30.00	0.1	0.10	0.1	96.0	7.47	0.02	1	122	3.05	5.0	0.2	20.0	2.77	0.1	0.0	0.10	0.0	5.9	0.1	7.0	**1.9**
Quarry B	08Q04B01	1	97.3	0.6	52	0.1	83.80	30.9	711	4.15	2	0.10	1.1	0.3	11.00	0.1	0.10	0.1	84.0	1.32	0.021	2	317	2.30	3.0	0.2	20.0	2.58	0.0	0.0	0.30	0.0	2.8	0.1	5.0	0.5
	08Q04B02	1.2	105.5	1.1	49	0.1	71.60	30.0	724	3.94	0.5	0.10	0.9	0.3	16.00	0.1	0.10	0.1	81.0	2.00	0.021	2	270	2.22	5.0	0.2	22.0	2.47	0.0	0.0	0.20	0.0	2.9	0.1	5.0	0.5
	08Q04B03	0.8	103.2	0.5	62	0.1	80.50	31.0	775	4.28	0.5	0.10	2.6	0.1	11.00	0.1	0.10	0.1	88.0	1.73	0.022	1	302	2.40	2.0	0.2	20.0	2.7	0.0	0.0	0.30	0.0	3.1	0.1	5.0	0.5
	08Q04B04	0.5	104.9	0.2	50	0.1	74.80	27.8	752	3.96	0.5	0.10	0.5	0.1	16.00	0.1	0.10	0.1	85.0	1.95	0.026	1	280	2.18	1.0	0.2	26.0	2.52	0.0	0.0	0.20	0.0	3.1	0.1	5.0	**0.6**
	08Q04B05	0.6	96.6	0.2	51	0.1	75.10	28.9	750	3.87	0.5	0.10	0.6	0.1	14.00	0.1	0.10	0.1	81.0	2.02	0.023	1	285	2.02	1.0	0.2	**59.0**	2.45	0.0	0.0	0.40	0.0	3.0	0.1	4.0	0.5
	08Q04B06	0.5	101.5	0.3	50	0.1	69.60	29.0	819	4.14	0.5	0.10	1.4	0.1	14.00	0.1	0.10	0.1	80.0	2.20	0.021	1	199	2.06	1.0	0.3	49.0	2.5	0.0	0.0	0.40	0.0	3.2	0.1	4.0	0.5
	08Q04B07	0.6	116.1	0.4	38	0.1	61.60	27.6	612	3.21	0.5	0.10	0.5	0.1	17.00	0.1	0.10	0.1	50.0	1.97	0.018	1	173	1.43	1.0	0.2	20.0	1.89	0.0	0.0	0.70	0.0	2.4	0.1	3.0	0.5
	08Q04B08	0.6	115.6	0.6	54	0.1	83.90	38.2	957	4.95	0.5	0.10	0.9	0.1	9.00	0.1	0.10	0.1	70.0	3.42	0.018	1	211	2.27	1.0	0.2	**175.0**	2.86	0.0	0.0	0.20	0.0	2.7	0.1	4.0	**0.7**
	08Q04B09	0.5	111.1	0.6	52	0.1	71.30	33.6	856	4.46	0.5	0.10	1.2	0.1	9.00	0.1	0.10	0.1	66.0	1.95	0.018	1	207	2.06	2.0	0.2	**87.0**	2.53	0.0	0.0	0.20	0.0	2.3	0.1	4.0	0.5
	08Q05B01	0.8	84.6	1	52	0.1	81.20	34.6	921	4.56	0.7	0.10	1.0	0.1	10.00	0.1	0.10	0.1	97.0	2.58	0.022	1	225	2.58	2.0	0.2	20.0	2.82	0.0	0.0	0.30	0.0	3.7	0.1	6.0	0.5
	08Q05B02	0.6	90.3	0.3	54	0.1	77.80	33.9	1032	4.77	0.5	0.10	13.3	0.1	11.00	0.1	0.10	0.1	88.0	4.53	0.021	1	231	2.69	1.0	0.2	20.0	2.89	0.0	0.0	0.20	0.0	3.2	0.1	5.0	0.5
	08Q05B03	0.7	79.5	0.4	56	0.1	87.30	39.0	1078	5.49	0.5	0.10	0.9	0.1	12.00	0.1	0.10	0.1	117.0	2.90	0.022	1	257	3.09	2.0	0.3	20.0	3.32	0.0	0.0	0.30	0.0	4.0	0.1	7.0	0.5
	08Q05B04	0.7	79.9	1.4	44	0.1	69.40	30.7	934	4.11	0.5	0.10	0.5	0.1	10.00	0.1	0.10	0.1	108.0	5.34	0.021	1	222	2.04	1.0	0.2	20.0	2.37	0.0	0.0	0.30	0.0	4.6	0.1	7.0	0.5
	08Q05B05	0.6	87.1	0.6	47	0.1	78.50	34.9	899	4.39	0.5	0.10	0.5	0.1	12.00	0.1	0.10	0.1	93.0	3.44	0.021	1	233	2.46	1.0	0.2	20.0	2.74	0.0	0.0	0.50	0.0	3.4	0.1	6.0	0.5
	08Q05B06	0.6	82.7	0.5	69	0.1	93.40	44.5	1281	6.5	0.5	0.10	0.5	0.1	9.00	0.1	0.10	0.1	148.0	3.09	0.022	1	293	3.50	1.0	0.3	**70.0**	3.95	0.0	0.0	0.10	0.0	6.3	0.1	8.0	0.5
	08Q05B07	0.4	95.9	0.2	50	0.1	78.60	36.6	1055	5.3	0.5	0.10	1.0	0.1	10.00	0.1	0.10	0.1	124.0	3.41	0.021	1	248	2.92	1.0	0.3	**556.0**	3.14	0.0	0.0	0.10	0.0	3.7	0.1	7.0	0.5
	08Q05B08	0.5	79.9	0.6	55	0.1	78.30	33.8	967	4.61	0.5	0.10	2.2	0.1	11.00	0.1	0.10	0.1	92.0	3.36	0.022	1	225	2.48	1.0	0.2	20.0	2.83	0.0	0.0	0.30	0.0	3.3	0.1	6.0	0.5
	08Q05B09	0.5	98.9	0.4	54	0.1	86.40	35.2	931	4.69	0.5	0.10	0.5	0.1	13.00	0.1	0.10	0.1	85.0	2.97	0.022	1	239	2.44	1.0	0.2	**53.0**	2.82	0.0	0.0	0.30	0.0	3.2	0.1	5.0	0.5
Quarry C	08Q04A01	0.4	117.8	0.6	48	0.1	209.10	39.3	753	4.22	0.5	0.10	5.5	0.1	6.00	0.1	0.20	0.1	76.0	1.30	0.018	1	583	3.02	3.0	0.1	20.0	2.85	0.0	0.0	0.10	0.0	2.4	0.1	6.0	0.5
	08Q04A02	0.3	103.3	0.2	53	0.1	249.80	43.2	840	4.68	0.5	0.10	0.5	0.1	4.00	0.1	0.10	0.1	83.0	0.61	0.019	1	708	3.61	2.0	0.1	**58.0**	3.29	0.0	0.0	0.10	0.0	2.4	0.1	7.0	**0.7**
	08Q04A03	0.2	95.7	0.2	52	0.1	241.80	39.8	804	4.54	0.5	0.10	0.5	0.1	4.00	0.1	0.10	0.1	77.0	0.57	0.019	1	673	3.33	5.0	0.1	**71.0**	3.1	0.0	0.0	0.10	0.0	2.1	0.1	6.0	0.5
	08Q04A04	0.2	88	0.3	53	0.1	234.70	38.6	823	4.53	0.5	0.10	0.5	0.1	4.00	0.1	0.10	0.1	77.0	1.00	0.019	1	697	3.39	4.0	0.1	20.0	3.14	0.0	0.0	0.10	0.0	1.7	0.1	6.0	0.5
	08Q04A05	0.3	98.3	0.2	53	0.1	251.70	42.2	884	4.64	0.5	0.10	1.4	0.1	4.00	0.1	0.10	0.1	83.0	1.25	0.017	1	780	3.58	2.0	0.2	**91.0**	3.35	0.0	0.0	0.10	0.0	2.0	0.1	7.0	0.5
	08Q04A06	0.3	104.4	0.1	52	0.1	232.10	38.2	791	4.42	0.5	0.10	2.6	0.1	5.00	0.1	0.10	0.1	76.0	0.73	0.019	1	661	3.20	1.0	0.2	37.0	3.08	0.0	0.0	0.10	0.0	1.9	0.1	5.0	0.5
	08Q04A07	0.5	93	0.4	49	0.1	219.60	37.6	728	4.18	0.5	0.10	0.5	0.1	5.00	0.1	0.10	0.1	66.0	0.41	0.019	1	660	3.02	3.0	0.1	20.0	2.85	0.0	0.0	0.10	0.0	1.4	0.1	5.0	0.5
	08Q04A08	0.3	97.1	0.2	48	0.1	230.30	39.3	750	4.33	0.5	0.10	0.5	0.1	5.00	0.1	0.10	0.1	72.0	0.72	0.019	1	662	3.21	1.0	0.1	**117.0**	3.01	0.0	0.0	0.10	0.0	1.7	0.1	5.0	0.5
	08Q04A09	0.2	104.4	0.5	60	0.1	254.90	41.5	787	4.52	0.5	0.10	1.3	0.1	4.00	0.1	0.10	0.1	79.0	1.52	0.019	1	739	3.38	1.0	0.1	28.0	3.15	0.0	0.0	0.10	0.0	1.8	0.1	7.0	0.5
	08Q04A10	0.2	89.2	0.4	55	0.1	240.60	39.3	788	4.46	0.5	0.10	1.6	0.1	4.00	0.1	0.10	0.1	75.0	1.02	0.018	1	699	3.37	1.0	0.1	23.0	3.12	0.0	0.0	0.10	0.0	1.6	0.1	6.0	0.5
Quarry D	08Q10A02	0.6	106.6	0.6	48	0.1	71.40	31.3	1147	4.25	0.5	0.10	18.4	0.1	11.00	0.1	0.10	0.1	98.0	4.56	0.022	1	298	2.26	2.0	0.2	20.0	2.58	0.0	0.0	0.10	0.0	5.1	0.1	5.0	**0.6**
	08Q10A03	0.5	106.8	0.1	57	0.1	77.60	37.8	1603	6.21	0.9	0.10	1.3	0.1	8.00	0.1	0.10	0.1	106.0	2.59	0.019	1	305	3.46	2.0	0.2	20.0	3.89	0.0	0.0	0.10	0.0	3.5	0.1	7.0	0.5
	08Q10A04	0.5	110.1	0.1	53	0.1	88.20	35.5	1210	4.5	0.5	0.10	0.5	0.1	15.00	0.1	0.10	0.1	95.0	4.76	0.021	1	350	2.36	2.0	0.2	**85.0**	2.81	0.0	0.0	0.20	0.0	5.0	0.1	5.0	0.5
	08Q10A05	0.6	113.9	0.3	58	0.1	94.60	36.4	1190	4.65	0.5	0.10	0.6	0.1	14.00	0.1	0.10	0.1	104.0	3.85	0.02	1	377	2.56	2.0	0.2	**69.0**	2.96	0.0	0.0	0.20	0.0	4.9	0.1	5.0	0.5
	08Q10A06	0.6	112.9	0.2	61	0.1	79.10	36.5	1270	4.97	0.5	0.10	2.4	0.1	13.00	0.2	0.10	0.1	94.0	3.93	0.021	1	301	2.54	2.0	0.2	20.0	3.02	0.0	0.0	0.10	0.0	4.3	0.1	5.0	0.5
	08Q10A07 REP	0.5	106.1	0.3	54	0.1	78.90	35.5	1286	4.95	0.6	0.10	**45.3**	0.1	13.00	0.2	0.10	0.1	88.0	5.27	0.018	1	286	2.38	2.0	0.2	20.0	2.9	0.0	0.0	0.10	0.0	3.7	0.1	5.0	**0.8**
	08Q10A08	0.4	114.9	0.5	58	0.1	81.60	34.6	1441	5.32	0.5	0.10	2.9	0.1	10.00	0.1	0.10	0.1	105.0	3.74	0.02	1	337	2.87	2.0	0.2	20.0	3.29	0.0	0.0	0.10	0.0	3.8	0.1	6.0	0.5
	08Q10A09	0.3	108.8	0.5	49	0.1	74.90	33.4	1521	4.97	0.5	0.10	2.9	0.1	11.00	0.1	0.10	0.1	113.0	4.74	0.02	1	332	2.64	2.0	0.2	20.0	3.16	0.0	0.0	0.10	0.0	4.5	0.1	6.0	0.5
	08Q10A10	0.4	104.2	0.5	56	0.1	76.70	33.2	1957	6.18	0.5	0.10	3.4	0.1	11.00	0.1	0.10	0.1	127.0	5.28	0.021	1	313	3.07	2.0	0.2	20.0	3.71	0.0	0.0	0.10	0.0	4.7	0.1	6.0	0.5
	08Q10A11	0.3	100.7	0.4	64	0.1	79.50	35.7	2464	7.39	0.5	0.10	2.3	0.1	9.00	0.1	0.10	0.1	135.0	5.55	0.02	1	286	3.45	1.0	0.2	20.0	4.17	0.0	0.0	0.10	0.0	4.8	0.1	7.0	0.5
	08Q10A12	0.5	97.3	0.4	70	0.1	122.00	46.4	2701	9.16	0.5	0.10	33.6	0.1	8.00	0.1	0.10	0.1	165.0	6.07	0.018	1	440	3.65	1.0	0.2	20.0	5.06	0.0	0.0	0.10	0.0	8.1	0.1	10.0	0.5
	08Q10A13	0.5	110.1	0.4	67	0.1	222.00	61.5	1911	6.08	0.6	0.10	2.7	0.1	10.00	0.1	0.10	0.1	177.0	5.55	0.021	1	496	3.44	3.0	0.2	20.0	3.84	0.0	0.0	0.10	0.0	7.9	0.1	9.0	0.5
	08Q10A14	0.7	117.7	0.5	64	0.1	142.70	49.5	1303	4.88	0.5	0.10	8.2	0.1	12.00	0.1	0.10	0.1	131.0	4.91	0.021	1	369	2.82	4.0	0.2	20.0	3.25	0.0	0.0	0.10	0.0	5.7	0.1	6.0	0.5
	08Q10A15	0.5	112.5	0.4	49	0.1	94.60	36.1	977	4.27	0.5	0.10	2.6	0.1	14.00	0.1	0.10	0.1	104.0	3.28	0.019	1	315	2.44	4.0	0.3	20.0	2.81	0.0	0.0	0.10	0.0	4.8	0.1	5.0	0.5
	08Q10A16	0.3	122.8	0.5	64	0.1	110.70	45.4	1500	7.44	0.8	0.10	1.7	0.1	6.00	0.1	0.10	0.1	130.0	1.74	0.019	1	340	4.08	2.0	0.3	20.0	4.68	0.0	0.0	0.10	0.0	3.7	0.1	8.0	0.5
	08Q10A17	0.5	115.3	0.3	57	0.1	90.60	37.1	1207	5.64	0.5	0.10	1.6	0.1	8.00	0.1	0.10	0.1	84.0	1.05	0.018	1	300	3.51	14.0	0.3	20.0	3.76	0.0	0.1	0.10	0.0	2.7	0.1	6.0	0.5
	08Q10A18	0.6	111.6	0.3	44	0.1	87.20	34.6	923	4.31	0.5	0.10	3.2	0.1	9.00	0.1	0.10	0.1	81.0	2.28	0.019	1	273	2.55	13.0	0.2	20.0	2.83	0.0	0.0	0.20	0.0	3.0	0.1	5.0	0.5

	Sample ID	Mo ppm	Cu ppm	Pb ppm	Zn ppm	Ag ppm	Ni ppm	Co ppm	Mn ppm	Fe %	As ppm	U ppm	Au ppb	Th ppm	Sr ppm	Cd ppm	Sb ppm	Bi ppm	V ppm	Ca %	P %	La ppm	Cr ppm	Mg %	Ba ppm	Ti %	B ppm	Al %	Na %	K %	W ppm	Hg ppm	Sc ppm	Tl ppm	Ga ppm	Se ppm
Quarry D	08Q10B01	0.7	92.5	0.8	59	0.1	55.50	28.2	757	4.38	1.2	0.10	1.4	0.5	8.00	0.1	0.10	0.1	81.0	1.24	0.024	2	162	2.26	5.0	0.1	20.0	2.59	0.0	0.0	0.30	0.0	3.4	0.1	6.0	0.5
	08Q10B02	0.9	103.4	0.4	51	0.1	58.80	27.4	637	3.88	0.5	0.10	1.2	0.1	12.00	0.1	0.10	0.1	71.0	1.86	0.022	1	158	2.14	2.0	0.1	20.0	2.47	0.0	0.0	0.40	0.0	3.0	0.1	5.0	0.5
	08Q10B03	0.8	95	0.2	59	0.1	77.00	32.1	779	4.53	0.5	0.10	0.5	0.1	8.00	0.1	0.10	0.1	79.0	1.31	0.022	1	221	2.55	2.0	0.2	20.0	2.86	0.0	0.0	0.30	0.0	2.9	0.1	6.0	0.5
	08Q10B04	1.1	105.9	0.2	52	0.1	60.60	28.5	743	3.98	0.5	0.10	0.8	0.1	15.00	0.1	0.10	0.1	78.0	2.69	0.021	1	198	2.04	1.0	0.2	**83.0**	2.42	0.0	0.0	0.70	0.0	3.0	0.1	5.0	0.5
	08Q10B05	0.8	110.2	0.3	52	0.1	63.20	29.2	794	3.65	0.5	0.10	1.7	0.1	13.00	0.1	0.10	0.1	75.0	4.62	0.021	1	182	1.76	1.0	0.2	20.0	2.21	0.0	0.0	0.60	0.0	3.1	0.1	4.0	0.5
	08Q10B06	0.8	118.9	0.4	57	0.1	57.40	34.1	991	4.58	0.5	0.10	1.6	0.1	11.00	0.1	0.10	0.1	80.0	3.69	0.021	1	177	2.47	1.0	0.2	20.0	2.93	0.0	0.0	0.40	0.0	3.3	0.1	5.0	**0.6**
	08Q10B07	0.6	99	0.6	47	0.1	50.40	28.3	1010	3.88	0.5	0.10	1.9	0.1	13.00	0.1	0.10	0.1	85.0	5.96	0.018	1	173	2.10	2.0	0.2	20.0	2.45	0.0	0.0	0.30	0.0	4.2	0.1	5.0	0.5
	08Q10B08	0.5	112.4	0.4	60	0.1	58.70	36.6	1094	5.16	0.5	0.10	1.2	0.1	8.00	0.1	0.10	0.1	105.0	3.64	0.02	1	201	2.88	1.0	0.2	20.0	3.29	0.0	0.0	0.30	0.0	3.7	0.1	6.0	0.5
	08Q10B09	0.5	114.5	0.2	66	0.1	55.50	35.7	1172	5.7	0.6	0.10	1.4	0.1	6.00	0.1	0.10	0.1	93.0	2.83	0.021	1	187	2.99	1.0	0.2	48.0	3.47	0.0	0.0	0.20	0.0	2.9	0.1	6.0	**0.7**
	08Q10B10	0.5	104	0.4	55	0.1	47.50	27.1	1081	3.91	0.5	0.10	3.8	0.1	11.00	0.1	0.10	0.1	91.0	5.60	0.022	1	161	2.07	1.0	0.2	20.0	2.45	0.0	0.0	0.20	0.0	3.6	0.1	5.0	**0.7**
	08Q10B11	0.5	105.1	0.6	54	0.1	47.60	28.1	943	4.01	0.5	0.10	0.7	0.1	11.00	0.1	0.10	0.1	91.0	5.00	0.021	1	153	2.12	1.0	0.2	20.0	2.46	0.0	0.0	0.20	0.0	3.5	0.1	5.0	**0.7**
	08Q10B12	0.5	102.7	0.3	64	0.1	52.50	30.1	1123	4.63	0.5	0.10	3.0	0.1	11.00	0.1	0.10	0.1	93.0	5.28	0.021	1	172	2.37	1.0	0.2	20.0	2.76	0.0	0.0	0.20	0.0	3.4	0.1	5.0	**0.7**
	08Q10B13	0.6	108	2.2	55	0.1	51.50	30.8	919	4.18	0.5	0.10	6.3	0.1	12.00	0.1	0.10	0.1	95.0	4.20	0.022	1	185	2.36	1.0	0.2	20.0	2.68	0.0	0.0	0.30	0.0	4.6	0.1	5.0	0.5
	08Q10B14	0.7	120.4	4.6	56	0.1	61.90	35.5	1092	5.02	0.5	0.10	3.3	0.2	14.00	0.1	0.10	0.1	139.0	3.35	0.023	3	216	3.43	5.0	0.2	34.0	3.16	0.0	0.0	0.20	0.0	10.4	0.1	8.0	0.5
	08Q10B15	0.3	109	1	64	0.1	70.10	43.4	1329	7.28	0.8	0.10	2.1	0.1	9.00	0.1	0.10	0.1	224.0	3.42	0.02	3	253	5.81	1.0	0.3	41.0	4.67	0.1	0.0	0.10	0.0	22.5	0.1	12.0	0.5
	08Q10B16	0.6	97.7	1.1	50	0.1	58.70	33.9	1218	5.25	0.9	0.10	0.6	0.1	15.00	0.1	0.10	0.1	153.0	4.12	0.024	2	212	3.75	2.0	0.2	30.0	3.34	0.0	0.0	0.10	0.0	11.6	0.1	8.0	0.5
	08Q10B17	0.9	103.9	1.2	53	0.1	55.40	31.1	981	4.15	0.5	0.10	2.0	0.1	11.00	0.1	0.10	0.1	102.0	4.33	0.021	1	183	2.44	1.0	0.2	20.0	2.59	0.0	0.0	0.40	0.0	4.8	0.1	5.0	0.5
	08Q10B18	0.7	105.9	0.6	60	0.1	53.00	32.9	1036	4.14	0.5	0.10	1.4	0.1	11.00	0.1	0.10	0.1	89.0	4.63	0.022	1	179	2.18	1.0	0.2	20.0	2.54	0.0	0.0	0.50	0.0	3.9	0.1	5.0	0.5
	08Q10B19	0.5	102.5	6.9	68	0.1	62.50	36.4	1174	5.41	0.5	0.10	0.8	0.1	7.00	0.1	0.10	0.1	109.0	3.25	0.02	1	188	3.41	3.0	0.1	20.0	3.51	0.0	0.0	0.10	0.0	5.2	0.1	7.0	0.5
Quarry E	08Q12A01	1.1	106.7	1.2	65	0.1	50.10	30.4	703	4.38	0.5	0.20	1.7	1.2	22.00	0.3	0.10	0.1	81.0	1.44	0.028	4	133	2.30	13.0	0.2	30.0	2.73	0.1	0.1	0.40	0.0	3.6	0.1	5.0	0.5
	08Q12A02	1.8	88.1	0.6	55	0.1	57.80	28.5	625	4.04	0.5	0.10	7.3	0.3	29.00	0.2	0.10	0.1	74.0	1.27	0.024	2	141	2.40	5.0	0.2	20.0	2.55	0.0	0.0	0.50	0.0	3.2	0.1	5.0	0.5
	08Q12A03	0.9	86	0.4	56	0.1	134.30	38.9	776	4.71	0.5	0.10	1.4	0.2	15.00	0.1	0.10	0.1	65.0	1.00	0.024	1	195	3.17	2.0	0.1	20.0	2.98	0.0	0.0	0.10	0.0	2.8	0.1	6.0	0.5
	08Q12A04	0.7	95.1	0.4	64	0.1	156.90	41.7	898	5.25	0.5	0.10	1.3	0.2	16.00	0.1	0.10	0.1	77.0	1.27	0.024	2	266	3.65	2.0	0.2	20.0	3.49	0.0	0.0	0.10	0.0	2.4	0.1	7.0	0.5
	08Q12A05	0.9	101.4	0.5	59	0.1	122.60	37.2	778	4.6	0.5	0.10	0.8	0.2	23.00	0.1	0.10	0.1	68.0	0.92	0.025	2	238	2.91	3.0	0.2	20.0	2.95	0.0	0.0	0.10	0.0	2.4	0.1	5.0	0.5
	08Q12A06	0.9	111.1	0.6	53	0.1	96.30	37.5	803	4.45	0.9	0.10	1.2	0.3	17.00	0.1	0.10	0.1	86.0	2.50	0.026	2	258	2.32	4.0	0.2	20.0	2.66	0.0	0.0	0.30	0.0	2.9	0.1	6.0	0.5
	08Q12A07	1.2	103.2	0.5	53	0.1	65.20	31.3	885	4.41	0.5	0.10	0.9	0.2	19.00	0.1	0.10	0.1	85.0	3.32	0.022	1	206	2.28	3.0	0.2	20.0	2.79	0.0	0.0	0.30	0.0	3.0	0.1	5.0	0.5
	08Q12A08	0.6	113.3	0.6	61	0.1	61.20	34.0	819	4.84	0.5	0.10	2.6	0.3	15.00	0.1	0.10	0.1	103.0	3.22	0.027	2	224	2.38	3.0	0.3	20.0	2.94	0.0	0.0	0.10	0.0	3.6	0.1	6.0	0.5
	08Q12A09	0.6	111.9	0.5	62	0.1	64.80	33.1	795	4.86	0.5	0.10	1.7	0.2	15.00	0.1	0.10	0.1	92.0	2.34	0.025	1	200	2.40	3.0	0.2	20.0	2.94	0.0	0.0	0.20	0.0	3.5	0.1	5.0	0.5
	08Q12A10	0.7	109.8	0.5	57	0.1	87.70	38.8	858	4.61	2.1	0.10	4.5	0.2	16.00	0.1	0.10	0.1	99.0	3.38	0.025	1	298	2.39	3.0	0.2	20.0	2.93	0.0	0.0	0.10	0.0	3.7	0.1	5.0	0.5
	08Q12A11	0.9	110.5	0.4	62	0.1	74.80	37.4	928	4.77	3.5	0.10	2.9	0.2	18.00	0.1	0.10	0.1	107.0	3.47	0.025	1	222	2.43	3.0	0.3	20.0	2.98	0.0	0.0	0.10	0.0	4.0	0.1	5.0	0.5
	08Q12A12	0.4	115.7	0.2	68	0.1	52.50	36.6	1067	5.39	8.1	0.10	1.9	0.1	12.00	0.1	0.10	0.1	135.0	5.05	0.024	1	168	2.55	3.0	0.2	20.0	3.18	0.0	0.0	0.10	0.0	4.1	0.1	7.0	0.5
	08Q12A13	0.5	111.9	0.3	63	0.1	49.50	33.7	893	4.96	8	0.10	1.8	0.2	16.00	0.1	0.10	0.1	116.0	3.89	0.026	1	170	2.61	3.0	0.2	20.0	2.98	0.0	0.0	0.10	0.0	3.9	0.1	7.0	0.5
	08Q12A14	0.4	97.1	0.3	54	0.1	99.90	36.9	908	4.61	2.4	0.10	1.8	0.1	20.00	0.1	0.10	0.1	98.0	4.45	0.025	1	362	2.56	2.0	0.2	20.0	2.86	0.0	0.0	0.10	0.0	2.9	0.1	6.0	0.5
	08Q12A15	0.5	104.9	0.3	58	0.1	93.10	40.1	1009	5.16	2.3	0.10	1.3	0.1	25.00	0.1	0.20	0.1	145.0	5.22	0.023	1	270	2.81	2.0	0.2	20.0	3.16	0.0	0.0	0.10	0.0	7.5	0.1	7.0	0.5
	08Q12A16	0.4	109.7	0.3	55	0.1	74.00	38.3	1004	4.91	1.8	0.10	4.6	0.1	26.00	0.1	0.20	0.1	144.0	4.02	0.023	1	229	2.81	1.0	0.2	20.0	2.99	0.0	0.0	0.10	0.0	6.0	0.1	7.0	0.5
	08Q12A17	0.4	97.4	0.3	58	0.1	88.00	42.4	1375	6.13	5.6	0.10	1.7	0.1	33.00	0.1	0.10	0.1	197.0	5.50	0.023	2	242	3.62	2.0	0.2	20.0	3.85	0.0	0.0	0.10	0.0	18.7	0.1	9.0	0.5
	08Q12A18	0.2	96.6	0.3	64	0.1	86.60	40.0	1311	6.5	2.1	0.10	1.3	0.1	45.00	0.1	0.10	0.1	211.0	6.09	0.023	2	255	3.35	2.0	0.2	20.0	3.94	0.0	0.0	0.10	0.0	23.6	0.1	10.0	0.5
	08Q12A19	0.4	109.2	0.4	66	0.1	79.30	41.0	1331	6.42	5.2	0.10	3.1	0.1	44.00	0.1	0.10	0.1	220.0	5.44	0.022	2	258	3.65	3.0	0.1	20.0	4.23	0.0	0.0	0.10	0.0	23.8	0.1	10.0	0.5
	08Q12B01	2.1	85.8	1.9	52	0.1	49.10	26.7	747	3.65	3.4	0.20	5.5	1.5	14.00	0.1	0.10	0.1	78.0	3.15	0.027	4	160	1.64	21.0	0.1	20.0	2.12	0.0	0.1	0.60	0.0	3.5	0.1	5.0	0.5
	08Q12B02	0.9	108.2	0.6	63	0.1	59.20	33.8	1299	5.44	0.8	0.10	2.9	0.1	11.00	0.1	0.10	0.1	98.0	6.19	0.023	1	191	2.44	4.0	0.2	25.0	3.24	0.0	0.0	0.10	0.0	3.9	0.1	6.0	0.5
	08Q12B03	0.7	112	0.5	65	0.1	62.80	34.2	1077	4.79	0.8	0.10	3.9	0.1	11.00	0.1	0.10	0.1	96.0	4.28	0.023	1	169	2.23	3.0	0.2	20.0	2.93	0.0	0.0	0.10	0.0	3.9	0.1	6.0	0.5
	08Q12B04	0.8	107.5	0.8	61	0.1	62.40	35.8	1129	5.18	4.5	0.10	2.1	0.1	10.00	0.1	0.10	0.1	107.0	3.73	0.023	1	202	2.60	4.0	0.2	20.0	3.23	0.0	0.0	0.10	0.0	4.7	0.1	6.0	0.5
	08Q12B05	0.8	108.6	0.2	59	0.1	64.10	34.6	1065	4.81	1.6	0.10	0.9	0.1	12.00	0.1	0.10	0.1	90.0	3.80	0.022	1	189	2.36	4.0	0.2	20.0	3.07	0.0	0.0	0.20	0.0	3.6	0.1	5.0	0.5
	08Q12B06	0.7	110	0.1	56	0.1	59.00	34.8	1152	4.89	3.2	0.10	1.5	0.1	10.00	0.1	0.10	0.1	94.0	4.13	0.022	1	186	2.40	3.0	0.2	20.0	3.07	0.0	0.0	0.20	0.0	3.7	0.1	6.0	**0.7**
	08Q12B07	0.6	106.9	0.2	52	0.1	61.30	33.1	926	4.53	1	0.10	1.4	0.1	9.00	0.1	0.10	0.1	90.0	3.12	0.022	1	184	2.22	6.0	0.2	20.0	2.88	0.0	0.0	0.10	0.0	3.5	0.1	5.0	0.5
	08Q12B08	0.6	104.8	0.5	62	0.1	62.80	35.2	1268	5.74	0.5	0.10	2.0	0.1	9.00	0.2	0.10	0.1	108.0	4.67	0.022	1	202	2.80	5.0	0.2	20.0	3.49	0.0	0.0	0.10	0.0	4.3	0.1	6.0	0.5
	08Q12B09	0.5	110.3	0.5	63	0.1	68.20	37.1	1062	4.79	0.5	0.10	2.9	0.1	10.00	0.1	0.10	0.1	114.0	4.70	0.025	1	204	2.30	6.0	0.2	20.0	2.97	0.0	0.0	0.10	0.0	4.8	0.1	6.0	0.5
	08Q12B10	0.5	109.1	0.5	60	0.1	68.30	35.4	1002	4.36	0.5	0.10	1.9	0.1	11.00	0.1	0.10	0.1	100.0	4.63	0.024	1	198	2.05	3.0	0.2	20.0	2.77	0.0	0.0	0.20	0.0	4.1	0.1	5.0	0.5
	08Q12B11	0.4	106.5	0.5	59	0.1	58.00	34.9	1120	4.94	0.5	0.10	1.1	0.1	9.00	0.1	0.10	0.1	103.0	4.48	0.022	1	177	2.28	3.0	0.2	20.0	3.03	0.0	0.0	0.10	0.0	3.8	0.1	6.0	0.5
	08Q12B12	0.3	108.3	0.7	59	0.1	59.90	35.4	1161	5.2	0.5	0.10	0.6	0.1	9.00	0.1	0.10	0.1	108.0	4.34	0.023	1	180	2.50	3.0	0.2	20.0	3.19	0.0	0.0	0.10	0.0	3.8	0.1	6.0	0.5
	08Q12B13	0.5	108	0.4	56	0.1	57.10	32.4	949	4.42	0.5	0.10	1.8	0.1	10.00	0.1	0.10	0.1	94.0	4.22	0.022	1	169	2.13	3.0	0.2	20.0	2.8	0.0	0.0	0.20	0.0	3.7	0.1	5.0	0.5
	08Q12B14	0.4	104.1	2	86	0.1	62.70	34.4	937	4.42	2.9	0.10	3.0	0.1	11.00	1.5	0.10	0.1	101.0	4.31	0.022	1	204	2.24	2.0	0.2	20.0	2.75	0.0	0.0	0.10	0.0	4.4	0.1	5.0	0.5
	08Q12B15	0.5	107.6	1.3	64	0.1	56.30	34.6	916	4.7	0.7	0.10	1.3	0.1	11.00	0.3	0.10	0.1	98.0	3.60	0.023	1	170	2.32	3.0	0.2	20.0	2.88	0.0	0.0	0.10	0.0	4.3	0.1	5.0	0.5
	08Q12B16	0.4	110.5	0.5	65	0.1	61.20	35.9	1022	4.86	0.5	0.10	1.8	0.1	11.00	0.1	0.10	0.1	99.0	4.42	0.024	1	172	2.32	4.0	0.2	20.0	2.97	0.0	0.0	0.10	0.0	4.0	0.1	6.0	0.5
	08Q12B17	0.5	106	0.5	58	0.1	55.50	32.9	1067	4.97	0.5	0.10	2.3	0.1	10.00	0.1	0.10	0.1	90.0	4.31	0.023	1	177	2.28	3.0	0.2	20.0	2.92	0.0	0.0	0.10	0.0	3.7	0.1	5.0	0.5
	08Q12B18	0.5	109.4	0.3	59	0.1	54.20	32.6	945	4.51	0.9	0.10	2.1	0.1	12.00	0.1	0.10	0.1	86.0	3.50	0.022	1	170	2.15	3.0	0.2	20.0	2.81	0.0	0.0	0.10	0.0	3.6	0.1	5.0	0.5
	08Q12B19	0.6	130.1	1.7	60	0.1	56.40	34.0	1003	4.64	0.7	0.10	2.2	0.1	13.00	0.2	0.10	0.1	106.0	4.62	0.023	1	176	2.28	3.0	0.2	20.0	2.92	0.0	0.0	0.20	0.0	4.2	0.1	5.0	0.5
Average Crustal Abundance for Basaltic Rocks																																				
		1.5	87	6	105	0.11	130	48	1500	8.65	2	1	4	4	465	0.22	0.2	0.007	250	7.6	0.11	15	170	4.6	330	1.38	5	7.8	1.8	0.83	0.7	0.09	30	0.21	17	0.05
QA/QC (Duplicates)																																				
	08Q12A11	0.6	111	0.3	59	0.1	70.8	35.3	891	4.46	3.4	0.1	2.7	0.2	16	0.1	0.1	0.1	94	3.42	0.025	1	212	2.28	3	0.229	20	2.72	0.025	0.01	0.1	0.01	3.5	0.1	5	0.5
	88Q10B05	0.8	114.2	0.3	49	0.1	60.8	29.6	769	3.73	0.5	0.1	0.8	0.1	13	0.1	0.1	0.1	77	4.52	0.02	1	183	1.78	1	0.206	20	2.27	0.021	0.01	0.5	0.01	3	0.1	4	0.5
	88Q10A03	0.5	112	0.1	60	0.1	80.2	38.4	1599	6.42	0.8	0.1	0.6	0.1	8	0.1	0.1	0.1	111	2.67	0.019	1	316	3.49	2	0.243	20	3.88	0.01	0.01	0.1	0.01	3.8	0.1	7	0.5
Detection Limits		0.1	0.1	0.1	1	0.1	0.1	0.1	1	0.01	0.5	0.1	0.5	0.1	1	0.1	0.1	*0.1*	2	0.01	0.001	1	1	0.01	1	0.001	1	0.01	0.001	0.01	0.1	0.01	0.1	0.1	1	*0.5*

NB: DLs for Bi and Se higher than respective value for 10x crustal abundance for basaltic rock.

Appendix G
Shake Flask Extraction Data

Parameter	Units	Method	Detection Limit	Quarry A		Quarry B		Quarry C	Quarry D	Quarry E		Method Blank	CCME[1] (Protection of Aquatic Life)
				08Q05A01	08Q06A01	08Q04B01	08Q05B01	08Q04A01	08Q10B01	08Q12A01	08Q12B01		
				Basalt	Overburden	Basalt	Overburden	Basalt	Basalt	Basalt	Basalt		
pH	pH Units	pH Meter	0.5	8.13	7.91	9.14	9.17	9.7	8.76	8.9	8.69	5.79	6.5-9
Conductivity	µS/cm	Conductivity Meter	0.5	107	189.5	84	90.1	105	135	980	133	0.6	
Acidity	mg CaCO3/L	Titration/Calculation	0.5	0.5	2	--	--	--	--	--	--	-	
Alkalinity	mg CaCO3/L	Titration/Calculation	0.5	50	82	37	32.5	35.5	60.5	44	52	-	
Sulphate	mg/L	Auto Turbidity	1	<1	11	2	5	6	3	40	9	-	
Hardness CaCO3	mg/L	Calculation from Mg/Ca	0.2	49	89	34	27	17	44	68	48	-	
Dissolved Metals													
Aluminum Al	mg/L	ICP-MS	0.005	**2.17**	**1.15**	**1.29**	0.4	0.77	**3.29**	0.17	**1.05**	-	0.1
Antimony Sb	mg/L	ICP-MS	0.001	<0.001	<0.001	<0.001	<0.001	0.02	<0.001	0.001	0.001	-	--
Arsenic As	mg/L	ICP-MS	0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.002	-	0.005
Barium Ba	mg/L	ICP-MS	0.001	0.008	0.013	0.002	<0.001	0.002	0.006	0.003	0.008	-	--
Beryllium Be	mg/L	ICP-MS	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	--
Bismuth Bi	mg/L	ICP-MS	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	--
Boron B	mg/L	ICP-MS	0.05	<0.05	<0.05	0.12	0.08	0.25	0.1	0.53	0.06	-	--
Cadmium Cd	mg/L	ICP-MS	0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	-	0.000017
Calcium Ca	mg/L	ICP-MS	0.05	13.9	29.6	8.05	7.24	3.75	8.14	11.9	13.8	-	--
Chromium Cr	mg/L	ICP-MS	0.001	0.006	0.003	0.009	<0.001	0.015	0.014	<0.001	0.002	-	0.0089
Cobalt Co	mg/L	ICP-MS	0.001	0.005	0.002	0.002	<0.001	<0.001	0.003	<0.001	0.001	-	--
Copper Cu	mg/L	ICP-MS	0.001	**0.031**	**0.026**	0.005	0.004	0.003	0.008	0.001	0.007	-	0.002
Iron Fe	mg/L	ICP-MS	0.05	**3.51**	1.46	1.7	<0.05	1.09	**4.91**	<0.05	1.27	-	0.3
Lead Pb	mg/L	ICP-MS	0.001	0.003	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	0.001
Lithium Li	mg/L	ICP-MS	0.001	0.001	0.001	<0.001	<0.001	<0.001	0.002	<0.001	<0.001	-	--
Magnesium Mg	mg/L	ICP-MS	0.05	3.59	3.56	3.28	2.24	1.73	5.62	9.39	3.34	-	--
Manganese Mn	mg/L	ICP-MS	0.001	0.3	0.082	0.041	<0.001	0.02	0.13	0.002	0.032	-	--
Molybdenum Mo	mg/L	ICP-MS	0.0005	0.0011	0.043	0.0009	0.0027	0.0007	0.0014	0.017	0.0035	-	0.073
Nickel Ni	mg/L	ICP-MS	0.001	0.006	0.003	0.003	<0.001	0.004	0.006	<0.001	0.002	-	0.025
Phosphorus P	mg/L	ICP-MS	0.15	0.2	0.2	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	-	--
Potassium K	mg/L	ICP-MS	0.15	1.6	1.3	1.1	1.1	1.7	1.8	9.3	4	-	--
Selenium Se	mg/L	ICP-MS	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	0.001
Silicon Si	mg/L	ICP-MS	0.15	3.9	5.2	4	2.1	6.3	5.8	3	3	-	--
Silver Ag	mg/L	ICP-MS	0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	-	0.0001
Sodium Na	mg/L	ICP-MS	0.25	5.94	5.64	6.36	7.01	17.2	20.3	164	9.22	-	--
Strontium Sr	mg/L	ICP-MS	0.001	0.01	0.021	0.015	0.013	0.012	0.018	0.063	0.032	-	--
Tellurium Te	mg/L	ICP-MS	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	--
Thallium Tl	mg/L	ICP-MS	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	-	0.0008
Thorium Th	mg/L	ICP-MS	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	-	--
Tin Sn	mg/L	ICP-MS	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	--
Titanium Ti	mg/L	ICP-MS	0.001	0.05	0.051	0.037	<0.001	0.018	0.099	<0.001	0.02	-	--
Uranium U	mg/L	ICP-MS	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0012	-	--
Vanadium V	mg/L	ICP-MS	0.001	0.009	0.005	0.012	0.006	0.033	0.018	0.006	0.006	-	--
Zinc Zn	mg/L	ICP-MS	0.005	0.01	<0.005	<0.005	<0.005	<0.005	0.01	<0.005	<0.005	-	0.03
Zirconium Zr	mg/L	ICP-MS	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	--
Mercury Hg	ug/L	CVAA	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	-	0.000026
Ion Balance (%)				-12%	-5%	-11%	-8%	-15%	-17%	-67%	-9%	-	

[1]CCME guidelines are based on total metal concentrations.

Bolded values are 10x the CCME guideline value.

Liquid:Solid Ratio Used = 3:1; 750 mL DI H2O:250g cone crushed sample (<9.5 mm).

Extraction Method Used: Bottle: Using Rotary Extractor for 24h.