

APPENDIX L

Geochemistry Program

Mt Todd Gold Project Geochemistry Program Draft Final Report Northern Territory, Australia

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APPENDICES

Appendix A: Supplemental Data

Appendix B: Raw Laboratory Data

EXECUTIVE SUMMARY

Tetra Tech was commissioned by Vista Gold Corp. (Vista) to conduct geochemical characterization studies and predictive modeling in support of the Mt Todd Project prefeasibility and feasibility studies.

Waste rock samples were selected from the three (3) distinct rock units identified from the 18 mapable rock codes, specifically:

- Greywacke
- Shale
- Mixed greywacke/shale (interbedded)

Eighty-seven (87) waste rock samples were subjected to acid-base accounting (ABA). Nine (9) samples, including three (3) samples from each of the three (3) distinct units were selected for kinetic testing using humidity cell tests. Mineralogy by quantitative x-ray diffraction (XRD) was conducted on the nine (9) humidity cell test samples.

The greywacke waste rock sample average nitric acid (HNO_3) extractable (sulphide) sulphur content of 0.19 wt. % was comparatively low with interbedded and shale samples containing 0.51 and 0.31 wt. %, respectively. Hydrochloric acid (HCl) extractable (sulphate) sulphur was largely absent suggesting that minimal sulphide oxidation occurred prior to geochemical characterization. On average, insoluble sulphur made up approximately 30% of the sulphur distribution in the eighty-seven (87) samples that underwent ABA testing. Although the sulphur content of the waste rock samples was relatively low (≤ 0.51 wt. % average HNO_3 extractable sulphide sulphur), the potential for acid formation remains a concern due to the limited amount of neutralization potential (NP). On average, samples contained $\text{NP} \leq 11$ kg CaCO_3 /tonne rock. A neutralizing potential ratio (NPR) ABA screening criteria < 2 suggests that a majority of the waste rock samples are either potentially acid generating or highly likely to generate acid whereas approximately 30% of the samples were highly unlikely to generate acid. The samples contained high insoluble sulphur (> 30 wt. %) which may be from sulphidic species that are resistant to HNO_3 digestion such as sphalerite (ZnS) and/or galena (PbS).

Preliminary sulphur cutoff criteria were developed based on ABA and Net Acid Generation (NAG) pH, to assist with waste rock management and closure planning. The specific sulphur cutoff values are:

- Non-PAG waste rock is defined by total sulphur content from 0.005 wt. % through 0.25 wt. %;
- Waste rock with uncertain acid generation potential ranges from > 0.25 wt. % through 0.4 wt. % total sulphur;
- The total sulphur content of PAG waste rock is > 0.4 wt. %; and
- Waste rock with > 1.5 wt. % sulphur was considered to be likely acid generating.

The cutoffs were used for geochemical modeling of the waste rock dump (WRD) seepage and pit lake wall rock runoff and can be used in combination with the total sulphur block model based on the exploration database to assist with proper routing of waste rock.

The nine (9) waste rock samples selected for kinetic testing were subjected to up to humidity cell testing. Weekly leachate quality results were obtained for pH, acidity, alkalinity, electrical conductivity, and sulphate over the entire test duration. Monthly leachate composites for dissolved constituent concentrations were also obtained over the testing period. Of the nine (9) samples subjected to kinetic testing, a shale sample with 0.43 wt. % HNO_3 extractable sulphide sulphur and low $\text{NP} = 3.7$ kg CaCO_3 /tonne rock produced acidic leachate ($\text{pH} < 6$) from the initiation of testing. Elevated copper, lead, nickel, and zinc levels were observed in leachate from the acid generating cell. Cells producing neutral pH leachate showed comparatively high levels of arsenic and antimony suggesting meteoric water contact could result in release of these constituents.

Geochemical characterization of two (2) tailings samples was also conducted including ABA, mineralogy, water leaching, and supernatant analysis. Humidity cell testing has been initiated on one of the samples.

The samples contain 1.25 wt. % and 1.13 wt. % total sulphur with net acid production potential (NAPP) and NPR values that show the tailings have potential to eventually generate acid. However, the tailings supernatant and water leach testing produced alkaline pH values. Concentrations of some metals/metalloids, major ions, and cyanide in the tailings supernatant were above water quality guidelines, whereas levels were lower in the water leachate but some metals and metalloids and cyanide remained elevated above the guidelines.

Predictive geochemical modeling was conducted to determine the production phase water quality of the water treatment plant (WTP) Equalization Pond. The water quality estimates were used as a basis for the WTP design and further assist with life of mine site water management planning.

Inputs to the Equalization Pond included precipitation and inputs from ponds/facilities from across the site including:

- RP1-Waste Rock Dump (WRD) Pond;
- RP2- Low Grade Ore Stockpile (LGOS) Pond;
- RP3- Batman Pit;
- RP5- Plant Site Runoff Pond;
- HLP- Heap Leach Pad Pond; and
- RP7 or RP8, the Tailings Storage Facilities (TSF1 or TSF2) Ponds.

Biannual water quality estimates suggest the Equalization Pond will predominantly be acidic, with a majority of metal concentrations above the water quality guidelines. Metal concentrations fluctuate depending on the relative input source proportions reporting to the Equalization Pond.

In order for Vista to re-start mining activities, RP3 must be dewatered. Further, emptying RP1 and RP7 would allow redesign of RP1 and construction to expand RP7. However, micronized lime was chosen and has been implemented. Treatment of RP3 by micronized lime has been conducted with success, with pH levels becoming circum neutral with a general decrease in metal concentrations.

1.0 INTRODUCTION

A brief review of information relevant to the Vista Gold Corporation (Vista) Mt Todd Project (Project) site is presented in the following subsections. Additional details are provided in Gustavson Associates, LLC (Gustavson, 2006).

1.1 Project Location

The Project is located approximately 55 kilometers (km) northwest of the city of Katherine, and approximately 250 km southeast of Darwin in the Northern Territory of Australia. Access to the property is via high quality, two-lane paved roads from the Stuart Highway, the main arterial within the Territory. The Project is located in the Edith River Catchment.

1.2 Geology

The Project is situated within the southeastern portion of the Early Proterozoic Pine Creek Geosyncline (PCG). Meta-sediments, granitoids, basic intrusives, and acid and intermediate volcanic rocks occur within this geological province.

The geology of the Batman Deposit consists of a sequence of hornfelsed interbedded greywackes, and shales with minor thin beds of felsic tuff. Bedding is striking consistently at 325°, dipping at 40° to 60° to the southwest. Minor lamprophyre dykes trending north-south pinch and swell, crosscutting the bedding.

The Batman Deposit is similar to other gold deposits of the PCG and is classified as orogenic gold deposits in the subdivision of thermal aureole gold style. The deposit shares some characteristics with intrusion-related gold systems, especially in terms of the association of gold with bismuth and reduced ore mineralogies, which makes the deposit unique in the PCG. The mineralization within the deposit is directly related to the intensity of the north-south trending quartz sulphide veining. The lithological units impact on the orientation and intensity of mineralization.

Sulphide minerals associated with the gold mineralisation are pyrite, pyrrhotite and lesser amounts of chalcopyrite, bismuthinite, and arsenopyrite. Galena and sphalerite are also present but appear to be post-gold mineralisation and are related to calcite veining, bedding, and the east-west trending faults and joints.

1.3 Climate

The Project area has a sub-tropical climate with a distinct hot, humid wet season followed by a hot, dry season. The temperature usually ranges from approximately 20° to 35°C. The wet season falls between October 1 and April 30 with rainfall events during this time being dominated by cyclonic weather patterns during which rainfall can be extreme. For example, on December 23, 2011, approximately 340 mm of rain fell on the site in 12 hours.

1.4 Site History

Intermittent operations at the Mt Todd site took place from 1993 until August 2000, at which time Gold Australia Pty Ltd. (Pegasus), the Northern Territory Government and the Jawoyn Association Aboriginal Corporation held the site in a care and maintenance status. In March 2006, Vista gained the rights to explore and develop the mineral resources of the site. In January 2007, Vista assumed the obligation to operate, care for, and maintain assets held by the Government at the site.

Water management is a primary environmental issue at the site due to the presence of numerous acid rock drainage and metal leaching (ARD/ML) sources. This impacted water has been managed through a combination of evaporation, pumping for containment, and controlled discharge to streams during major flow events. Currently, acidic water containing elevated concentrations of regulated constituents originate or are captured within the following ponds/facilities:

- Waste rock dump and retention pond (RP1);

- Low grade ore stockpile (LGOS) and pond (RP2);
- Batman Pit (RP3);
- The plant runoff pond (RP5);
- The tailings storage facility (TSF) and pond (RP7); and
- The heap leach facility.

Historically, average wet season rainfall in the area results in overflow from RP1, RP2 and RP5 to the Edith River. Other uncontrolled discharges to the Edith River during the wet season include seepage from the heap leach facility and seepage from the TSF dam. RP3 and RP7 have been the primary facilities used to store excess water; therefore, the existing water quality is not necessarily representative of the leachate chemistry associated with the sources (e.g., tailings porewater and wall rock runoff)

1.5 Regulations

The Edith River and its tributaries are protected beneficial use under the Water Act 2000 for aquatic ecosystem protection. The initial Project Waste Discharge License (WDL 135), which was issued for the 2005/2006 season on December 21, 2005 and transferred to Vista (EPA, 2005). The WDL was updated by Nature Resource, Environment, The Arts and Sport (NRETAS) on December 30, 2010 (WDL 178) and allows discharge from RP1 based on the same gauge height of 0.81 m which was equated to a 20,000 fold dilution of the impacted water (NRETAS, 2010). In February 2013 Vista was issued its current Waste Discharge License (WDL 178-2) which authorises Vista to:

- to release water from the mine site subject to the quality of the water and the flow of the Edith River meeting strict environmental controls and monitoring requirements;
- maintain water quality objectives outside of any agreed mixing zone when defined for the receiving waters;
- monitor and report the results of water quality, macro invertebrates and sediment sampling and analysis; and
- monitor just below the mixing zone to ensure water in the Edith River complies with Australian Drinking Water Guidelines for Health.

To meet these requirements, WDL 178-2 allowed controlled discharges from the RP1 siphon that depended on minimum flows in the Edith River; specifically, water could be released from the RP1 discharge point when the Edith River at SW4 was flowing at 12 cubic meters per second (m³/s) and the water level was above 0.81 m. This flow was considered sufficient to ensure downstream compliance with established copper criteria, which in turn diluted other regulated constituents to acceptable levels.

Historic WDL 178 requires development of site-specific trigger values for ecosystem protection within the Edith River. To this end, GHD (2011) developed interim trigger values following Australian and New Zealand Environment and Conservation Council and Agriculture and Resource Management Council of Australia and New Zealand (ANZECC & ARMCANZ, 2000) guidelines (Table 1.1). The interim trigger values are based on the 20th and 80th percentiles for pH and the 80th percentile for all other parameters at SW2, the upstream monitoring point on the Edith River. The 95% species protection trigger values were used when ANZECC & ARMCANZ guidelines were not available or if values were higher than the 80th percentile at SW2. The magnesium and sulphate interim trigger values were developed based on literature values including Elphick et al. (2011) for sulphate and Van Dam et al. (2010) for magnesium (as magnesium sulphate).

Although the interim trigger values are most applicable to the Project and are the current basis by which site water quality is assessed, water quality guidelines that may also be relevant to the Project include:

- The Australian and New Zealand Environment and Conservation Council (ANZECC) and Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ) guidelines for recreational water quality and aesthetics. These guidelines are intended to

protect waters for recreational activities such as swimming and boating and to preserve the aesthetic appeal of water bodies (ANZECC and ANZMARC, 2000).

- The Australian Drinking Water Guidelines (ADWG). These guidelines are intended to provide a framework for good management of drinking water supplies that will assure safety at point of use (NHMRC and NRMCC, 2004).

1.6 Report Objectives

The primary objectives of this report include:

- Presentation of the findings of the Project geochemical characterization of waste rock and tailings;
- Development of waste rock management criteria;
- Predictive modeling to support design of the water treatment plant;
- Summarization of the pre-production phase pit water treatment strategy; and
- Overview of the constructed wetlands for management of impacted water during the post-closure phase.

Table 1.1: Water Quality Guidelines

Test Analyte/Parameter	Units	Recreational Water Quality Guidelines (2000) ^[2]	Australian Drinking Water Guidelines (2004) ^[3]	Interim Site Trigger Values (2011)
BULK PROPERTIES				
pH	pH Units	6.5-8.5	6.5-8.5 ^[1]	6-8
Total Dissolved Solids	mg/L	1000	500 ^[1]	EC: 20-250 µS/cm
Hardness (as CaCO ₃)	mg/L	500	200 ^[1]	
Dissolved Oxygen	mg/L		85% ^[1]	80%
MAJOR/MINOR CATIONS AND ANIONS				
Sodium	mg/L	300	180 ^[1]	-
Iron	mg/L	0.3	0.3 ^[1]	0.300
Chloride	mg/L	400	250 ^[1]	-
Sulphate	mg/L	400	500, 250 ^[1]	129
Fluoride	mg/L	-	1.5	-
Iodide	mg/L	-	0.1	-
Cyanide	mg/L	0.1	0.08	-
Nitrate (as N)	mg/L	10	50 (as nitrate)	-
Nitrite (as N)	mg/L	1	3 (as nitrite)	-
Ammonia (as N)	mg/L	0.01	0.5 ^[1] (as NH ₃)	-
METALS				
Aluminum	mg/L	0.2	0.2 ^[1]	0.149
Antimony	mg/L	-	0.003	-
Arsenic	mg/L	0.05	0.007	-
Barium	mg/L	1	0.7	-
Boron	mg/L	1	4	-
Cadmium	mg/L	0.005	0.002	0.0002
Chromium	mg/L	0.05	0.05 as Cr(VI)	0.0033 as Cr(III) 0.001 as Cr(VI)
Cobalt	mg/L	-	-	0.090
Copper	mg/L	1	2, 1 ^[1]	0.0027
Lead	mg/L	0.05	0.01	0.0034
Magnesium	mg/L			2.5
Manganese	mg/L	0.1	0.5, 0.1 ^[1]	1.9
Mercury	mg/L	0.001	0.001	0.0006
Molybdenum	mg/L	-	0.05	-
Nickel	mg/L	0.1	0.02	0.011
Selenium	mg/L	0.01	0.01	-
Silver	mg/L	0.05	0.1	-
Uranium	mg/L	-	0.02	-
Zinc	mg/L	5	3 ^[1]	0.0095

Notes: [1] aesthetic-related guideline value
[2] ANZECC and ANZMARC, 2000

- No known or applicable guideline at this time

[3] NHMRC and NRMMC, 2004

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2.0 SAMPLING AND ANALYSIS

Sample selection, collection, and preparation are described in the following sections.

2.1 Initial Waste Rock Sample Selection

Eighteen separate, mappable geologic units were identified in the 2006 Preliminary Economic Assessment (Gustavson, 2006). However, only five compositionally distinct lithologies were reported, including:

- Greywacke
- Shale
- Felsic tuff
- Shale/greywacke
- Greywacke/shale

Elemental analyses, including total sulphur, from the exploration database were used to guide selection of samples for humidity cell testing using each of the five compositional rock type distinctions listed above.

The basic approach used to select samples for humidity cell testing is included:

- First, all samples in the exploration database were sorted according to the given rock type (e.g., greywacke), broken down by rock code (mappable units).
- Second, the calcium, magnesium, copper, and zinc concentrations for each coded unit were compared for each rock type using box-and-whisker plots to confirm that the various mappable units (rock codes) were not statistically distinct, on the basis of the selected major and trace elements.
- Third, the average sulphur content of each rock type was determined, as well as the upper one (1) standard deviation for core that was assayed to be below the ore cutoff grade of 0.35 wt. %. Sulphur was used as a proxy for acid generating potential (AGP), which should be proportionally correct. At the time of sample selection, this was the only available ABA estimate.
- Finally, the target intervals were selected by sorting the elemental analyses to locate boreholes and core intervals corresponding to the average and one standard deviation sulphur content for each rock type.

The analysis outlined above showed that only three distinctions needed to be made, based upon elemental analysis, among the 18 rock codes used to describe mappable units. The greywacke rock codes have essentially the same bulk chemical composition. Likewise, the shale codes are similar and, lastly, the units mapped and coded as shale/greywacke and greywacke/shale appear to be geochemically inseparable. Thus, although 18 mappable rock codes are identified in the exploration database, they can be compositionally reduced to greywacke, shale and mixed greywacke/shale (i.e., interbedded). Felsic tuff is considered a distinct rock unit but makes up a small percentage of the total waste rock (~ 2%) that will be generated and only makes up a small quantity of core currently available.

Three boreholes with associated target intervals were identified for each of the three distinct units. Eighteen samples, including six samples from each borehole containing average to average plus one standard deviation sulphur content, were identified for characterization.

2.2 Second Waste Rock Characterization Study Sample Selection

A second characterization study was developed in support of the Project prefeasibility study (PFS) (Tetra Tech, 2011).

The geologic model was used to select twenty-five (25) waste rock samples (< 0.35 wt. % gold) from each of the three (3) principal rock types (75 samples total) that were geospatially distributed throughout the \$600 PFS ultimate pit:

- Greywacke
- Shale
- Mixed greywacke/shale

Samples were selected from drillholes throughout the pit so as to obtain an understanding of the geochemical spatial variability of each rock unit. Samples were selected from VB07 and VB08 drillholes due to the extensive weathering associated with the BD core samples which have been subjected to long term storage requiring extrapolation/estimation to determine the initial geochemical characteristics such as sulphur speciation and potential to generate ARD.

Of the seventy-five (75) samples initially selected, seventy-one (71) samples were collected and submitted to the laboratory (CANTEST Ltd. now Maxxam Analytics). Two (2) samples identified with the same ID were excluded from the program.

2.3 Waste Rock Sample Collection and Preparation

Vista personnel collected quarter core waste rock samples that represented the intervals cited for each unit as identified in Appendix A. The initial waste rock samples are distinguished from second characterization study samples by the date the ABA results were supplied by the Laboratory, December 2008 and September 2009, respectively. Chain of custodies (COC) are provided in Appendix B. Upon arrival at CANTEST, each waste rock sample was cone-crushed to less than 6.3 millimeters (mm) and homogenised. A split of each sample was pulverised for ABA analysis.

2.4 Analytical Methods

Mt Todd Project waste rock samples were subjected to the following tests:

- Acid Base Accounting (ABA) including paste pH, fizz rating and acid neutralizing potential (NP) by a modified Sobek method (Lawrence et al., 1989; CANTEST, 2006a);
 - Total Sulphur by LECO;
 - Sulphur speciation (HCl extractable, HNO₃ extractable and insoluble sulphur) by Modified ASTM D2492-02 Sequential HCl/HNO₃ Extraction (CANTEST, 2006b);
- Humidity cell testing by ASTM D5744-96 (ASTM, 2000; CANTEST, 2004); and
- X-ray diffraction (XRD) with Rietveld analysis.

The analytical methods used for the geochemical analysis of waste rock samples are described below. The tailings characterization is discussed separately in Section 2, Tailings Characterization.

2.4.1 Acid-base Accounting

ABA is a quick and relatively inexpensive chemical test used to estimate the capacity of the material to either produce or neutralize acid. ABA methods compare the maximum potential acidity (MPA) with the acid neutralization capacity (ANC) for a given material using either the total sulphur or sulphide sulphur content.

ABA results were used to determine the Neutralization Potential Ratio ($NPR = ANC/MPA$) and the Net Acid Production Potential (NAPP) where NAPP is the difference between the ANC and MPA (i.e., $NAPP = ANC - MPA$). These criteria are commonly used to categorize material into potentially acid-producing or non-acid-producing material. Many interpretation schemes have been developed to assess the potential

for acid generation using either criterion. Industry standard criteria categorize samples with $\text{NPR} \geq 2$ and $\text{NAPP} \geq 5$ kg of H_2SO_4 per tonne of material (kg H_2SO_4 /tonne) as non-acid-forming (non-PAG) (Table 2.1). In contrast, materials with $\text{NAPP} < 0$ kg H_2SO_4 /tonnes and $\text{NPR} < 1$ are considered potentially acid-generating (PAG). Values between these designations are considered to have uncertain acid-generating characteristics and are generally recommended to undergo additional testing to assess the dissolution rates of acid-generating (e.g., pyrite) and acid-neutralizing (e.g., calcite) minerals.

Table 2.1: Acid-base Accounting Criteria

Criteria	NPR (ANC/MPA) Unit less	NAPP (ANC-MPA) kg H_2SO_4 /tonnes
Potentially acid generating (PAG)	> or equal to 2	> or equal to 5
Uncertain	1 up to 2	0 up to 5
Non-acid generating (non-PAG)	< 1	< 0

Notes:

Neutralization Potential Ratio (NPR)

Net Acidity Production Potential (NAPP)

2.4.2 Humidity Cell Test Procedures

An initial round of kinetic testing was undertaken following evaluation of the exploration database (lithological description, assay data). Six waste rock samples were selected based on lithological division (shale, greywacke, and mixed interbedded greywacke/shale) and total sulfur content (0.38 – 1.16 wt. %) and subjected to humidity cell testing for a period of 27 weeks, as described in Tetra Tech (2012c).

Static testing undertaken on 87 waste rock samples (Tetra Tech, 2012c) derived site-specific management criteria based on the following total sulfur (as determined by ICP-MS) criteria:

- Non-PAG < 0.25 wt%
- Uncertain 0.25-0.40 wt%
- PAG > 0.40 wt. %

Based on these results, long-term kinetic testing (152 weeks) was established on three waste rock samples with total sulfur ranging from 0.34-0.52 wt% to better understand the long-term management requirements of material classified as uncertain by either the site-specific criteria (above) or Acid-Base Accounting Criteria (AMIRA, 2002; Price, 2009). A summary of sample properties are presented in Table 2-2.

2.4.2.1 Physical Preparation

Humidity cells consist of a clear plexiglass cylindrical column with a 20-centimeter (cm) diameter and 12-cm height. A layer of 200 or 400 nylon mesh was added to the bottom of the cell prior to sample loading to act as porous filter. Approximately 1,000-grams (g) of homogenized sample that has been cone-crushed (<6.35mm) is added. The humidity cell for the tailings sample was established in the same manner as for the waste rock samples except the cell was a longer more-narrow cylindrical column with a 12-cm diameter and a 20-cm height.

The test procedure includes weekly cycles comprised of pumping dry air (less than 10% relative humidity) through the waste rock for three days (Day 1-3) and three days of pumping water-saturated air (approximately 95% relative humidity) through the sample (Day 4-6). On Day 7, each sample is leached with 500-milliliters (ml) of deionized water (DI) water using trickle flooding. However, the first leach, designated as the Week 0 leach, differs from the remaining weekly cycles due to use of 750-ml of DI water rather than 500-ml.

2.4.2.2 Analytical Procedure

Weekly, waste rock and tailings humidity cell leachate samples were subjected to the following analyses:

- pH;
- Electrical conductivity (EC);
- Sulfate;
- Total alkalinity;
- Acidity;

A 4-week composited sample of the remaining weekly leachate from each cell was analyzed by Inductively Couple Plasma-Mass Spectrometry (ICP-MS) to quantify dissolved metals on a monthly basis. The following constituents were quantified:

Al, Sb, As, Ba, Be, Bi, B, Cs, Cd, Ca, Cr, Co, Cu, La, Fe, Pb, Li, Mg, Mn, P, Mo, Ni, NO₃, NO₂, Re, K, Rb, Se, Si, Ag, Na, Sr, Te, Tl, Th, Sn, Ti, W, U, V, Zn, and Zr.

2.4.2.3 Data Reduction

Analytical data was plotted versus monthly flush cycles to quantify metal release rates and identify any concentration trends. Metals of interest were summed to quantify total metal loading. Based on the recommendation of Sapsford et al. (2009) steady-state was assumed once constituent leaching reports the same rate of removal for more than four consecutive weeks.

The neutralization potential consumption rate and the sulfate production rate of the long-term HCTs were quantified on a weekly basis to estimate the ratio of neutralization to sulfur oxidation (equations are shown in Table 2.2). The neutralization potential consumption rate measures the weekly consumption of carbonate neutralizing minerals (calcite and dolomite), while the sulfate production rate measures the weekly concentration of sulfate that is likely attributed to oxidation of reduced sulfur species (pyrite and arsenopyrite).

Table 2.2: Equations used in Calculations

Neutralization Potential Consumption Rate (mg CaCO ₃ /kg/wk)
NP Consumption Rate = Carbonate Molar Ratio x Theoretical NP Consumption (mg/kg/wk)
where:
Carbonate Molar Ratio = $[(Ca^{2+} (mg/L)/40.08) + (Mg^{2+} (mg/L)/24.31)] / SO_4^{2-} (mg/L)/96.06$
Theoretical NP Consumption = $[SO_4^{2-} (mg/L) \times \text{Leachate Collected (L)}/\text{Sample Weight (kg)}] \times 100.09 / 96.06$
Sulphate Production Rate (mg/kg/wk)
$SO_4^{2-} \text{ Production Rate} = SO_4^{2-} (mg/L) \times \text{Leachate Collected (L)}/\text{Sample Weight (kg)}$
Remaining Sulphide Sulphur
$\text{Remaining } S^{2-}\text{-S(\% of original)} = \{[\text{Initial } S^{2-}\text{-S(\%)} - (\Sigma SO_4^{2-} \text{ Production Rate (mg/kg)} \times 32.06 / 96.06) / 10000] / \text{Initial } S^{2-}\text{-S(\%)}\} \times 100\%$
Remaining Neutralisation Potential
$\text{Remaining NP (\% of original)} = \{[\text{Initial NP (t CaCO}_3\text{/1000 t)} - (\Sigma \text{ NP Depletion Rate (mg/kg)}/1000)] / \text{Initial NP (t CaCO}_3\text{/1000 t)}\} \times 100\%$

2.4.3 Rietveld X-ray Diffraction

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

A total of eight samples were analyzed by XRD including three shale, three interbedded and two greywacke samples.

2.4.4 NAG Testing

Net Acid Generation (NAG) testing was used to determine the contact pH and acid generation potential of mine rock samples after complete sulphide mineral oxidation using 15% hydrogen peroxide. Each sample is combined with hydrogen peroxide and allowed to react for 24 hours before the pH and acidity was measured. Samples with NAG pH levels below 4.5 are usually classified as acid generating while pH values above 6 are regarded as non-acid generating.

NAG testing was initiated by Vista in 2011 and has been conducted on samples submitted to the assay laboratory (North Australian Laboratories Pty Ltd). Results from drill hole VB11-001 from 0 m to 669 m on 1-m sample intervals are presented in this report.

2.5 Tailings Characterization

Several investigative projects have been undertaken to characterize the tailings solids, porewater, and supernatant, including:

- 1992 EIS study (Zapopan, 1992): Static testing (ABA, elemental analysis) on the solid, supernatant, and kinetic testing on tailings with similar total sulphur content as later tailings.
- 2011 Field investigation (Earth Systems, 2011a, 2011b, 2011c): A site investigation focusing on the solids, porewater and supernatant to assess the affinity for acid generation and migration associated with the current tailings storage facility (RP7/TSF1).
- 2010 PFS program (Tetra Tech, 2011): Static testing included Synthetic Precipitation Leaching Procedure (SPLP), ABA, and XRD assessments on the tailings solid and water quality analysis on the supernatant. This sample (VB07-007 350-362) was produced by Kappes, Cassidy & Associates (KCA) in 2010.
- 2011/2012 FS program (this study): Static testing included SPLP, ABA, and XRD assessments on the tailings solid, water quality analysis on the supernatant, and kinetic humidity cell testing (beginning in January 2012). This sample was produced by ALS AMMTEC in support of the FS.

KCA in Reno, Nevada conducted scoping-level detoxification test work (in 2010) on a Project ore sample obtained from drillhole VB07-007 interval 350 to 362 meters (m) crushed to nominal 19 mm (KCA, 2010). ALS AMMTEC (referred to as the 2011 sample) produced tailings and composited detox liquor (i.e., supernatant) from the optimized detoxification testing in support of the feasibility study (ALS AMMTEC, 2011).

The KCA (2010) tailings sample was subjected to trace metal analysis by aqua regia (As, Bi, Sb, Se, and Te) or four-acid digestion (remaining constituents), ABA and quantitative XRD analyses. The procedures used for XRD analysis of the tailings were identical to those used for the waste rock samples. LECO analyses were utilized for determination of the total, HCl extractable and HNO₃ extractable sulphur following Sobek (1978). A separate portion of the tailings (19% moisture) was analysed for SPLP testing and leachate analysis. The 2012 tailings sample (EP1107934, collected November 2011) from the optimal detoxification tests were subjected to similar quantitative analyses and sample preparation by ALS laboratories.

A split of the tailings sample was subjected to accelerated weathering using the standardized ASTM D5744-96 humidity cell test procedure. The weekly leachate sample was subjected to the following analyses:

- pH
- Electrical conductivity (EC)
- Sulphate
- Total alkalinity
- Acidity

- Cyanide speciation (total cyanide, weak acid dissociable [WAD] cyanide, and thiocyanate)
- Nitrate speciation (nitrate, nitrite and total ammonia)
- Chloride

A 4-week composite of the remaining weekly leachate sample was subjected to the following analysis:

- Dissolved metals by ICP-MS
- Ferrous and ferric iron
- Mercury

3.0 RESULTS AND DISCUSSION

Results from the geochemical characterization of mine rock and tailings are discussed separately in the following sections. Tables and figures are included to provide supporting information. Appendix A contains additional supplemental results and data directly from the laboratories are provided in Appendix B.

3.1 Acid-Base Accounting

A statistical analysis of the ABA results for each rock type is provided in Table 3.1. The total sulphur data from the exploration database is also provided. Total sulphur from the exploration database was initially used to select samples to be subjected to humidity cell testing in lieu of ABA data as detailed in Section 2.1, Initial Waste Rock Sample Selection. Figure 3.1 shows the relationship between total sulphur content determined by CANTEST and the exploration database.

The average HNO_3 extractable sulphide sulphur content of the three rock distinctions (and range of values) is as follows:

- Greywacke sample average = 0.19 wt. % (range = 0.01 to 0.52 wt. %)
- Shale sample average = 0.31 wt. % (range = 0.01 to 1.79 wt. %)
- Interbedded sample average = 0.51 wt. % (range = 0.01 to 3.61 wt. %)

The greywacke samples, including the samples chosen for humidity cell testing, are comparatively low in HNO_3 extractable sulphide sulphur. Approximately 30% of the waste rock samples from each rock type contain low HNO_3 extractable sulphide sulphur (≤ 0.11 wt. %). HCl extractable sulphate sulphur was largely absent from Mt Todd Project waste rock samples (i.e., maximum content of 0.03 wt. %) suggesting that sulphide oxidation prior to humidity cell testing was minimal. The results indicate that on average waste rock samples have a high percentage of insoluble sulphur, specifically:

- Greywacke sample average = 39%
- Shale sample average = 31%
- Interbedded sample average = 37%

The high insoluble sulphur concentrations may be from sulphidic species that are resistant to HNO_3 digestion. Most notably, sphalerite (ZnS) and galena (PbS), which were identified in sample HC-3 (VB07-002 220-224), could be reported as insoluble sulphur. Although speculative, the insoluble sulphur could be highly insoluble sulphate minerals such as barite (BaSO_4); however, Rietveld XRD analysis did not identify any quantifiable presence of barite.

As illustrated in Figure 3.2, the majority of the samples have NAPP values in the uncertain range (>0 to < 5 kg H_2SO_4 /tonne) or are potentially acid generating (< 0 kg H_2SO_4 /tonne). Using the NPR screening criteria also suggests that a majority of the waste rock samples are either potentially acid generating or highly likely to generate acid whereas approximately 40% of the samples are highly unlikely to generate acid (Figure 3.3).

Table 3.1: Acid-base Accounting Results-Statistical Summary

Statistics	Paste pH	Total S wt.%	Exploration Total S wt.%	HCl Extractable S wt.%	HNO ₃ Extractable S wt.%	Insoluble S wt.%	MPA* kg H ₂ SO ₄ / Tonne	ANC kg H ₂ SO ₄ / Tonne	NAPP* kg H ₂ SO ₄ / Tonne	NPR*
Greywacke (n=31)										
Average	8.8	0.36	0.48	0.01	0.19	0.16	6.0	9.2	-3.3	2.4
Median	9.0	0.36	0.46	0.01	0.18	0.10	5.2	7.8	-2.7	1.6
Minimum	7.5	0.01	0.00	0.01	0.01	0.01	0.1	0.8	-18.9	0.6
Maximum	9.2	1.10	1.36	0.03	0.52	0.76	15.9	27.2	4.7	14.3
Shale (n=26)										
Average	8.3	0.47	0.67	0.01	0.31	0.15	9.5	8.5	1.0	3.4
Median	8.5	0.36	0.74	0.01	0.22	0.08	6.7	5.7	-2.2	1.7
Minimum	5.8	0.01	0.01	0.01	0.01	0.00	0.1	0.5	-28.4	0.2
Maximum	9.4	1.82	1.16	0.02	1.79	1.04	54.8	31.8	46.1	14.0
Interbedded (n=30)										
Average	8.6	0.77	0.60	0.01	0.51	0.26	15.5	10.8	4.7	2.0
Median	8.8	0.51	0.48	0.01	0.20	0.14	6.1	6.8	-0.4	1.3
Minimum	6.7	0.01	0.01	0.01	0.01	0.00	0.1	0.7	-65.0	0.0
Maximum	9.4	3.81	1.77	0.02	3.61	1.11	110.6	83.7	106.5	6.9
Tailings										
VB07-007 350-362	7.9	1.25	1.67	0.21	1.04	N/A	31.9	12.1	19.8	0.4
EP110793 4	N/A	1.13	N/A	0.97	0.16	N/A	5.0	1.4	3.6	0.3

*Based on sulphide sulphur
N/A = not analyzed

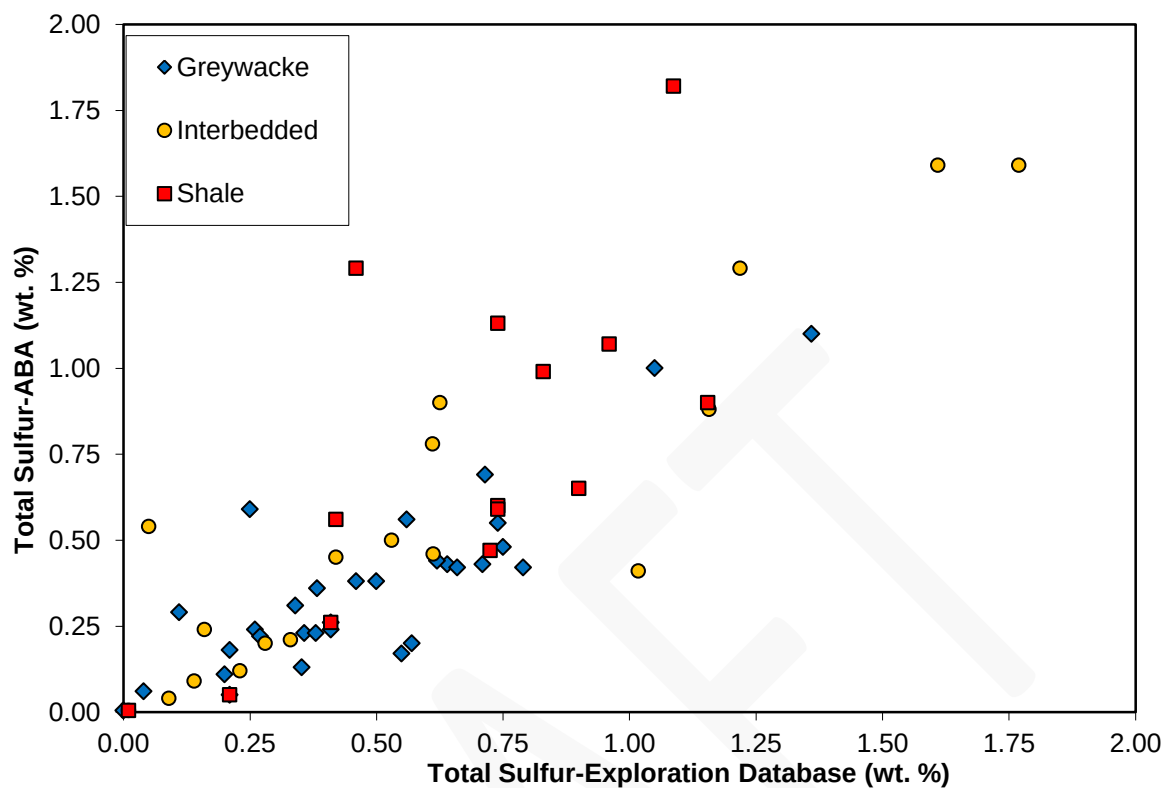


Figure 3.1: Correlation between Total Sulphur by LECO Furnace and from the Exploration Database

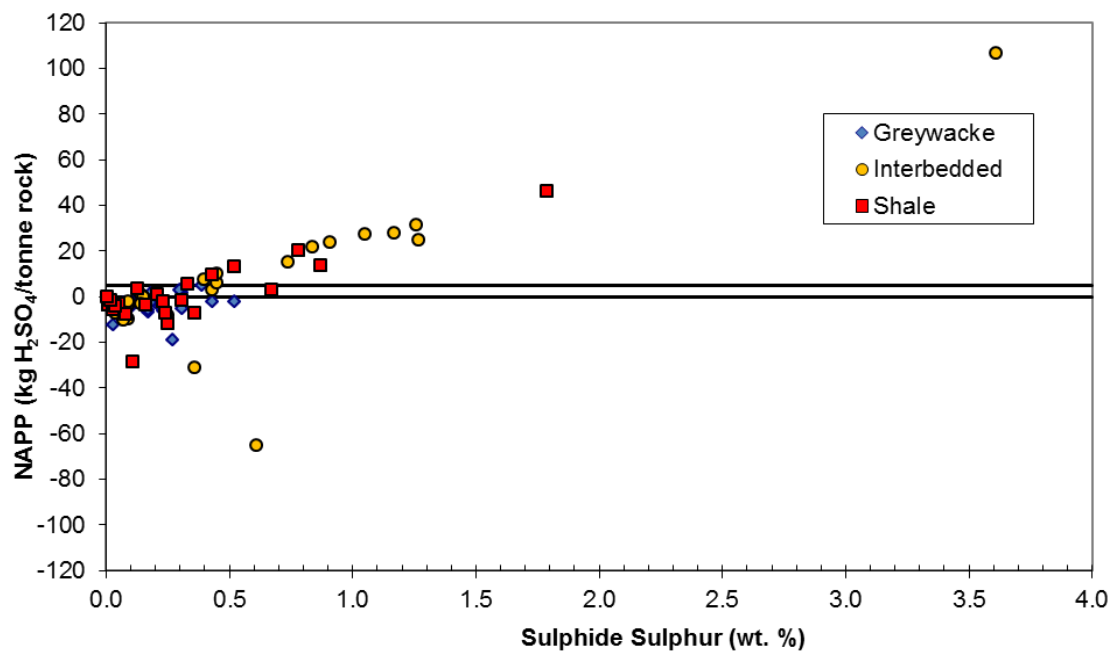


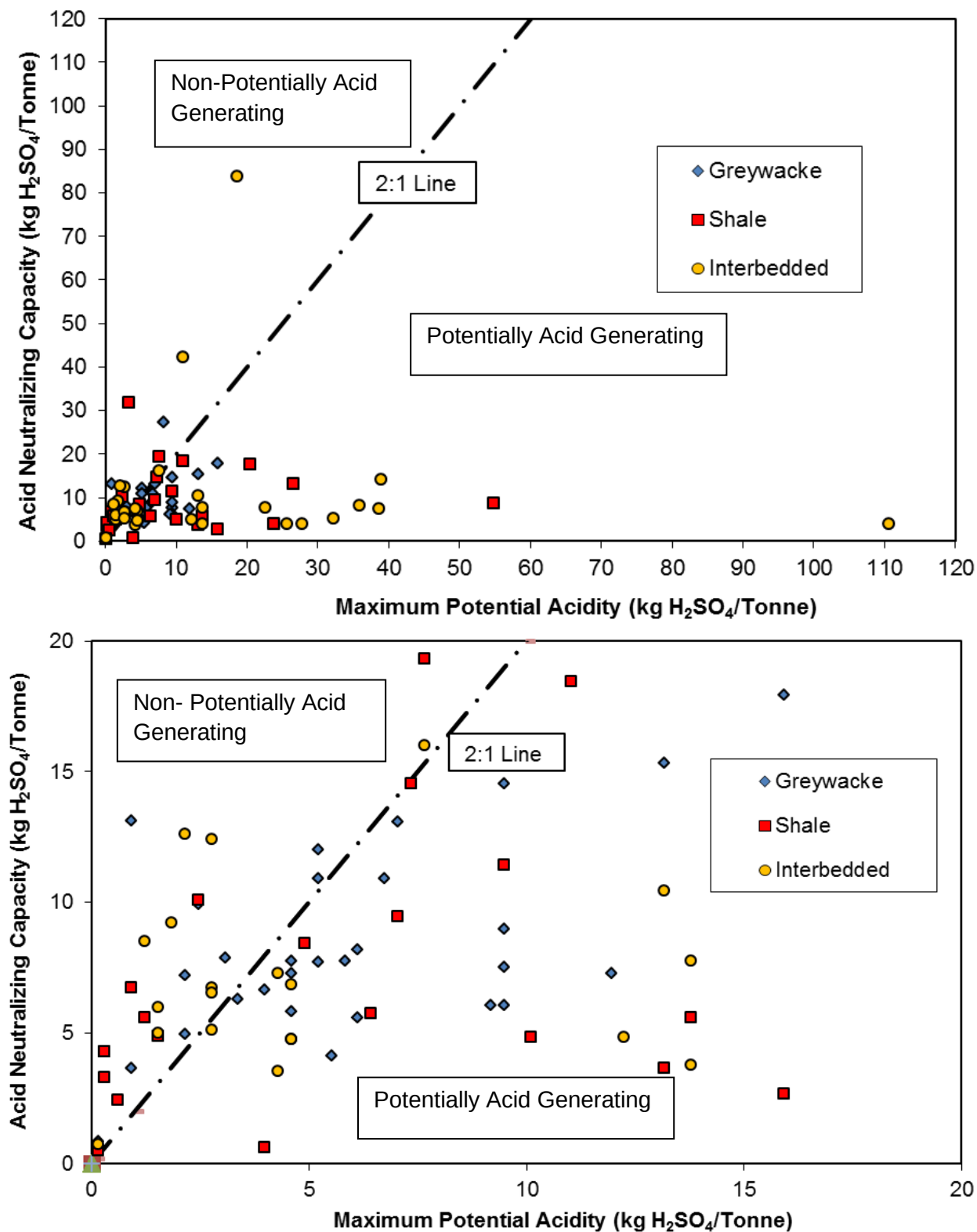
Figure 3.2: Net Acid Production Potential as a function of Total and Sulphide Sulphur Content

Figure 3.3: Acid Neutralization Capacity as a Function of Maximum Potential Acidity

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The six initial humidity cells were selected to contain average to average plus one standard deviation total sulphur content without the benefit of ABA results (Table 3.2). ABA results show that four of the six samples have NPR and NAPP suggestive of either potentially or likely to generate acid. This includes HC-2 (VB-006 44-48 S) which produced acidic leachate in the first week of testing. In contrast, a mixed greywacke/shale sample (VB-002 220-224 I) subjected to humidity cell testing met the NAPP < 0 kg H₂SO₄/tonne criterion with NPR = 3.8 suggesting this sample is highly unlikely to generate acid, consistent with the results of testing. The second characterization study humidity cells, including one sample selected from each rock unit, were selected based on average ABA characteristics that fall in the NPR uncertain range (see Table 3.2).

3.1.1 Waste Rock Management Criteria

The ABA data suggests total sulphur content provides reasonable criteria to assist with waste rock management and closure planning. Figure 3.4 presents the NPR data for each rock type as a function of total sulphur. As a guide to developing management criteria, approximate sulphur cutoffs are suggested base on best fit trendlines (Table 3.3). The non-PAG greywacke and interbedded samples have higher total sulphur cutoffs than the shale samples.

PAG waste rock is associated with relatively low total sulphur content. The use of total sulphur to distinguish PAG/non-PAG cutoffs rather than sulphide adds an additional safety factor because not all sulphur in the project waste rock is considered acid generating as demonstrated by the insoluble sulphur (e.g. non-acid generating sulphides such as sphalerite) present in most Mt Todd Project waste rock samples.

NAG pH testing quantifies the maximum potential acidity that can be generated upon complete oxidization of the sulphide minerals with hydrogen peroxide. Vista has incorporated NAG testing into the exploration database, which also includes total sulphur and metals. Generally, NAG pH values below 4.5 are considered PAG whereas above pH 4.5 samples are considered non-PAG. The NAG pH transition between PAG and non-PAG for waste rock samples (<0.35 wt. % gold) occurs at higher total sulphur content (~0.4 wt. %) than previously used to define non-PAG material using ABA alone (Figure 3.5). Based on the combined ABA and NAG pH results, the specific sulphur cutoff values are:

- Non-PAG waste rock is defined by total sulphur content < 0.25 wt. %;
- Waste rock with uncertain acid generation potential ranges from 0.25 wt. % - 0.4 wt. % total sulphur; and
- The total sulphur content of PAG waste rock is > 0.4 wt. %.

The criteria provided above do not differentiate between the three primary rock types (greywacke, interbedded, and shale) but rather apply to all waste rock. If needed, the rock types can be considered separately for the purposes of routing waste rock. However, at this stage in the project and due to the limited available ABA data it is recommended that the average total sulphur cutoffs for combined waste rock be used.

Identification of waste rock types using the total sulphur block model that is based on the exploration database appears acceptable for waste rock management.

Table 3.2: Waste Rock Humidity Cell Overview and Acid Generation Classification

Sample ID	HCT ID	Rock Type	Exploration Total Sulphur wt %	Total Sulphur wt %	Sulphide Sulphur wt %	NAPP kg H ₂ SO ₄ / Tonne	NPR Unit less	Paste pH Std Units	PAG/non-PAG Criteria		
									HCT pH	NAPP	NPR
Waste Rock											
VB07-009 58-62	HC-1	Greywacke	0.38	0.36	0.31	1.97	0.79	9.23	non-PAG	uncertain	PAG
VB07-009 86-90	HC-6	Greywacke	0.72	0.69	0.08	-7.5	4.06	8.56	non-PAG	non-PAG	non-PAG
VB07-001 173-177	HC-1B	Greywacke	0.34	0.31	0.19	-1.94	1.33	8.95	non-PAG	non-PAG	uncertain
VB07-006 44-48	HC-2	Shale	0.72	0.47	0.43	9.53	0.28	7.94	PAG	PAG	PAG
VB07-011 156-160	HC-4	Shale	1.12	0.90	0.67	2.93	0.86	8.64	non-PAG	uncertain	PAG
VB08-026 332-336	HC-2B	Shale	0.52	0.44	0.31	1.93	1.20	8.95	non-PAG	uncertain	uncertain
VB07-002 220-224	HC-3	Interbedded	0.61	0.78	0.36	-31.3	3.80	8.98	non-PAG	non-PAG	non-PAG
VB07-018 120-124	HC-5	Interbedded	1.16	0.88	0.74	15.1	0.33	8.73	non-PAG	PAG	PAG
VB08-032 180-184	HC-3B	Interbedded	0.37	0.52	0.15	-2.2	1.50	9.06	non-PAG	non-PAG	uncertain

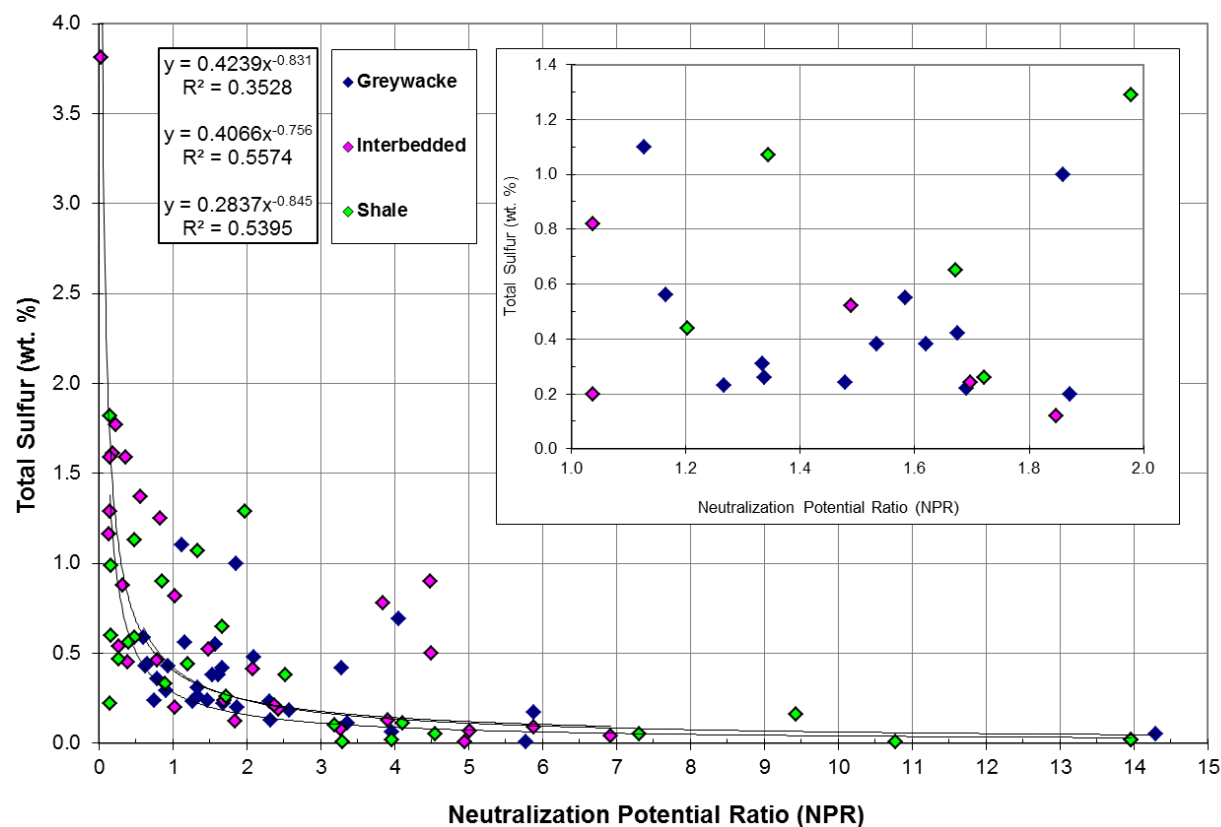


Figure 3.4: Total Sulphur as a function of Neutralization Potential Ratio

Table 3.3: Sulphur Cutoffs from Best Fit Power Function Trendlines

Rock Type	Best Fit Trendline	Non-PAG (NPR=2)	Uncertain (NPR=1)	PAG (NPR< 1)
Greywacke (n=31)	$y = 0.4239x^{-0.831}$	0.24	0.42	>0.42
Interbedded (n=30)	$y = 0.4066x^{-0.756}$	0.24	0.41	>0.41
Shale (n=26)	$y = 0.2837x^{-0.845}$	0.16	0.28	>0.28
AVERAGE All Samples (n=87)		0.21	0.37	>0.37

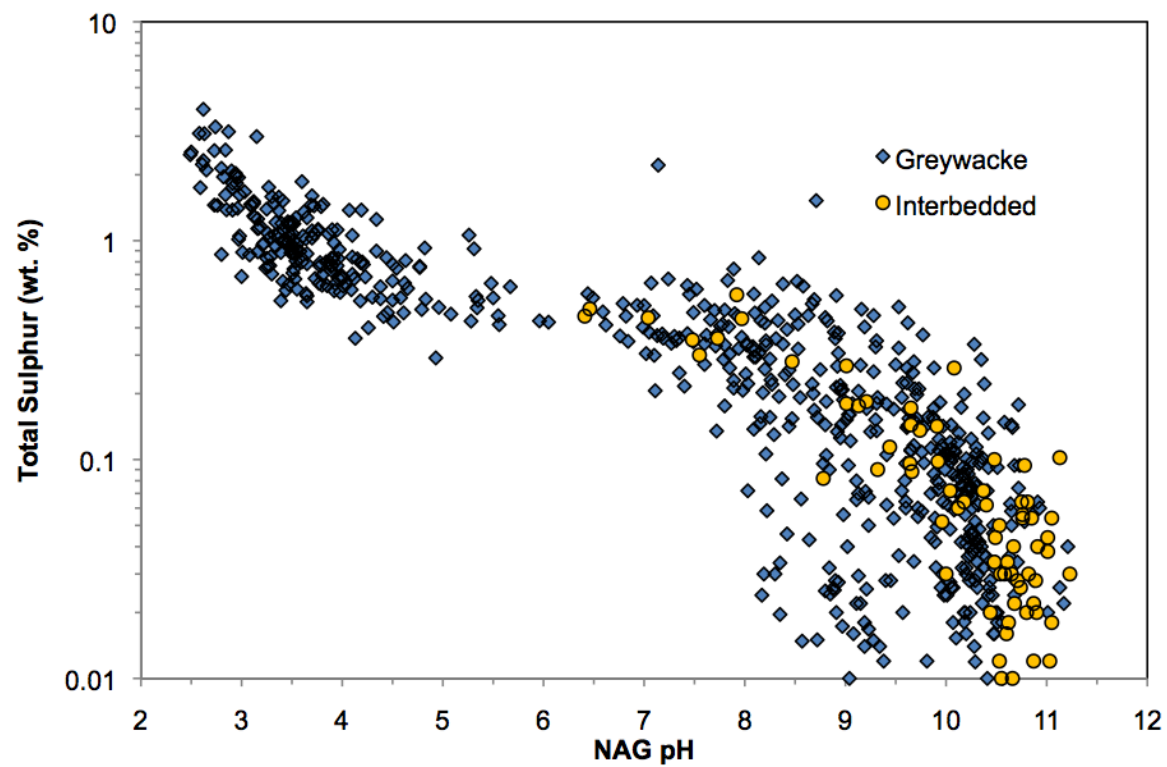


Figure 3.5: Total Sulphur as a function of NAG pH

3.2 Rietveld X-ray Diffraction-Waste Rock

The X-ray diffractograms were analysed 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 3.4. These amounts represent the relative amounts of crystalline phases normalized to 100%. The complete laboratory report including the Rietveld refinement plots is provided in Appendix B.

A total of eight samples were analyzed by x-ray diffraction (XRD) including three shale, three interbedded and two greywacke samples.

The dominant sulphide minerals in VB-002 220-224I HC-3 (interbedded) are sphalerite ((ZnS), arsenopyrite (FeAsS) and galena (PbS), while pyrite was the only sulphidic mineral reported for VB08-032 180-184I. The lead, zinc, and arsenic contents of the other samples are comparatively low with the exception of VB-011 156-160 S, which has similar zinc content. Pyrite and/or pyrrhotite are the dominate sulphides in the remaining samples, with the exception of VB-011 156-160 S (HC-4) which contained pyrite and marcasite which has the same chemical structure as pyrite (FeS_2) but different crystal structure. These mineral abundances are consistent with the elemental analyses obtained from the exploration database in Appendix B.

The major carbonate minerals present in the samples are calcite (CaCO_3), siderite ($\text{Fe}^{2+}\text{CO}_3$) and ankerite/dolomite ($\text{Ca}(\text{Fe}^{2+}, \text{Mg}, \text{Mn})(\text{CO}_3)_2/\text{CaMg}(\text{CO}_3)_2$). The laboratory re-analysed the VB-002 220-224 sample according to a new siderite corrected ABA method. The presence of siderite, ankerite or ferroan dolomite ($\text{Ca}(\text{Mg}, \text{Fe}, \text{Mn})(\text{CO}_3)_2$) can lead to overestimations of NP due to the production of some acidity during the oxidation of the iron present in these mineral phases. The siderite corrected NP result of 42.3 kg H_2SO_4 /tonne compares well to the original value of 43.2 kg H_2SO_4 /tonne, suggesting the quantity of siderite in this sample (2.7 wt. %) is not enough to cause a significant overestimation of NP.

Table 3.4: XRD Quantitative Rietveld Analysis (wt. %)

Mineral	Ideal Formula	VB07-010 301-305 G	VB07-002 220-224 I (HC-3)	VB07-004 279-283 I	VB07-011 156-160 S (HC-4)	VB07-022 340-344 S	VB07-001 173-177 G (HC-1)	VB08-026 332-336 S (HC-2)	VB08-032 180-184 I (HC-3)	Tailings VB07-007 350-362	Tailings EP1107934
Quartz	SiO ₂	27.8	49.5	57.1	39.8	57.5	54.9	58.7	48.1	53.8	75
Clinocllore	(Mg,Fe ²⁺) ₅ Al(Si ₃ Al)O ₁₀ (OH) ₈	16.9	9.3	8.4	12.3	10.3	7.9	7	7.3	9.0	9
Muscovite	KAl ₂ (AlSi ₃ O ₁₀)(OH) ₂		16.4	32.2	42.7	17.4	11.8	20.1	18.8	29.4	8
Biotite	K(Mg,Fe ²⁺) ₃ AlSi ₃ O ₁₀ (OH) ₂	8				1.5	2.1		6.3		
K-feldspar	KAlSi ₃ O ₈	10.3	6.2			5	4.7	5.4	4	3.3	1
Plagioclase	NaAlSi ₃ O ₈ – CaAl ₂ Si ₂ O ₈	26.4	6			4	16.8	6.4	14.8		3
Actinolite	Ca ₂ (Mg,Fe ²⁺) ₅ Si ₈ O ₂₂ (OH) ₂	6.1									
Calcite	CaCO ₃	0.5	1.5	0.3	0.9	0.6			0.3	0.4	
Siderite	Fe ²⁺ CO ₃		2.7								
Dolomite	CaMg(CO ₃) ₂									0.7	
Ankerite/ Dolomite	Ca(Fe ²⁺ ,Mg,Mn)(CO ₃) ₂ /CaMg(CO ₃) ₂		4	1.2	2.4	1.3		0.7			
Pyrite	FeS ₂	1.8			0.8		0.4	0.9	0.3	0.3	0.7
Pyrrhotite	Fe _{1-x} S	2		0.8		2.6				2.9	
Marcasite	FeS ₂				1.2						
Sphalerite	(Zn,Fe)S		0.8								
Arsenopyrite	FeAsS		2.7				0.6				
Galena	PbS		0.8								
Anatase	TiO ₂						0.9	0.8			
Gold?	Au									0.1	
Butschliite	(K ₂ Ca(CO ₃) ₂)										1
Diopside	(Ca(Mg,Al)(Si,Al) ₂ O)										3

3.3 Waste Rock Humidity Cells

3.3.1 Short-term Kinetic Testing Results

Results of the short-term testing are summarized in Figure 3.6. Five of the six samples (HC-1, HC-3, HC-4, HC-5, and HC-6) generated circum-neutral pH values throughout the test period. Sulfate and alkalinity concentrations showed greater variability than pH during the test period. Concentrations for both constituents were low and decreased during the test period with the following additional observations:

- Sulfate concentration was lowest for the sample with the lowest total sulfur (HC-1, 0.38 wt. % S);
- Sulfate concentrations for HC-4, HC-5, HC-6 were similar by week 20 of testing, regardless of sample total sulfur concentration; and
- Alkalinity concentrations were highest for HC-3 (0.61 wt.% S) which contained the most carbonate minerals (1.5 wt.% CaCO_3) of the samples subjected to mineralogical quantification.

The remaining sample (HC-2) produced a steadily decreasing acidic leachate (pH <6) and corresponding high metal leachate concentrations. At termination, the pH of this sample was approximately 4.1 with elevated metal-laden leachate and low alkalinity. Although this sample has a total sulfur concentration near the median value of the sample set, it is classified PAG by all criteria. The very low alkalinity concentrations (<1mg CaCO_3 /L) indicate that the lack of neutralizing capacity in this sample contributes to acid and subsequent metal leachate generation.

One other sample (HC-5) is also classified as PAG by all criteria and contains higher sulfur content (1.16 wt. %S) than HC-2. It appears that this sample contains sufficient neutralizing capacity, at least in the short-term, to off-set acid generation. This dataset, however, does not allow for prediction of long-term rates for both acid-generation and neutralization. As such, long-term kinetic testing was commissioned.

3.3.2 Long-term Kinetic Testing Results

As of December 2012, waste rock samples have undergone 146 weeks of testing. Based on the available data received to date from the three waste rock humidity cell tests, the following observations were made.

3.3.2.1 HC-1B

HC-1B is a greywacke sample with 0.34 wt.% total sulfur (based on ICP-MS) with 0.19 wt.% being attributed to sulfide sulfur (based on ABA analysis). Changes in pH and select analytes over time for this sample are presented in Figure 3.7:

- The leachate has remained near neutral during the testing duration;
- Sulfate concentrations decreased through the first 20 weeks of testing, followed by fluctuations below 10 milligrams per liter (mg/L) during the remainder of the test period;
- Iron and aluminum values have remained stable throughout the test duration with the exception of several spikes, possibly attributed to the dissolution of accumulated secondary soluble hydroxides;
- Total metal concentrations of copper, lead, nickel, and zinc fluctuate near or below 0.001 mg/L;
- Arsenic and antimony show similar trends with initial pulses and slow decreased through time; and
- Alkalinity concentrations are low (<25 mg CaCO_3 /L) throughout the test before stabilizing near 5 mg/L after week 70. Calcium and magnesium concentrations have remained steady throughout the period while manganese has steadily decreased, although concentrations have remained low.

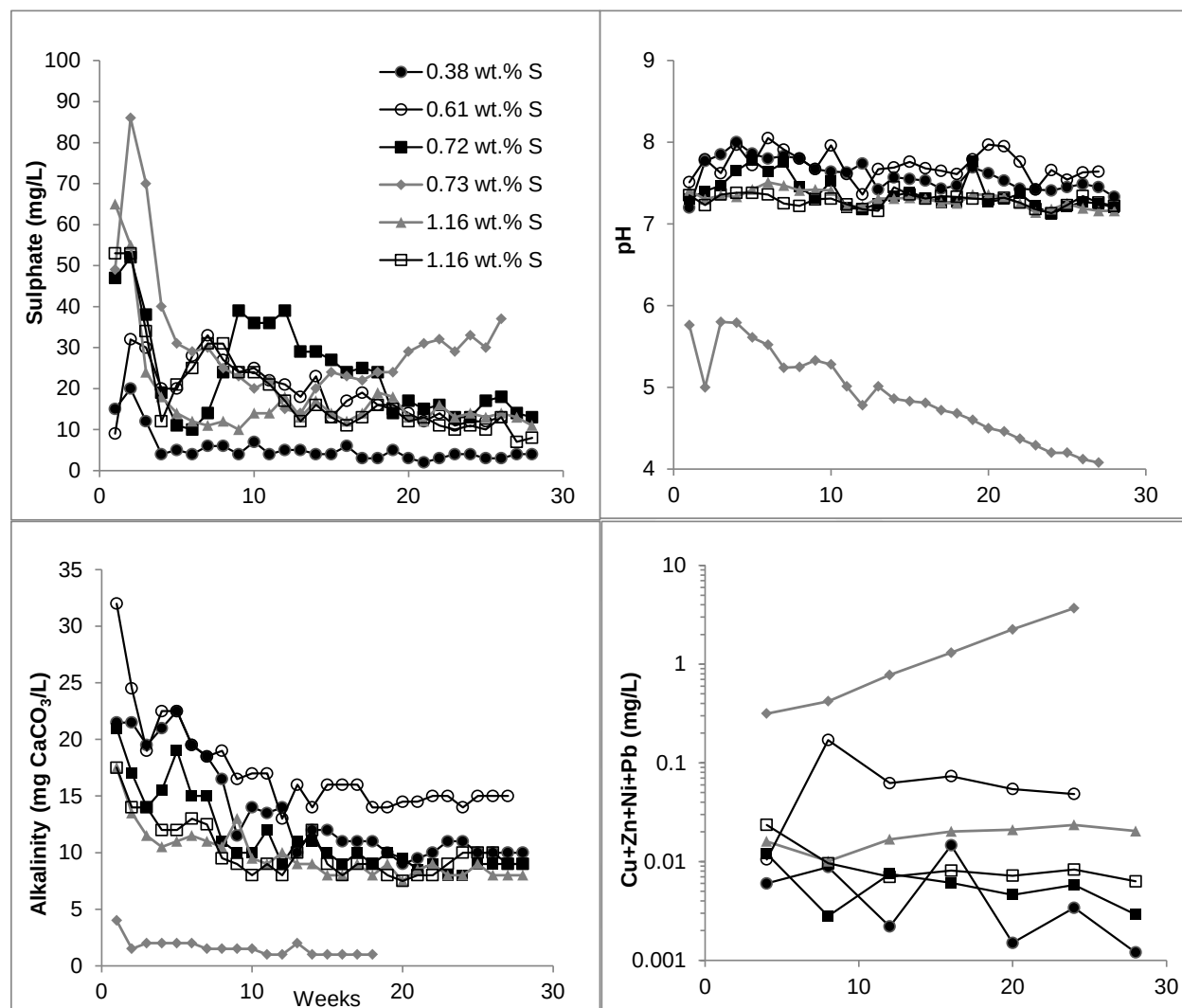


Figure 3.6: Short-Term Kinetic Testing, Total Sulfur Content as determined by ICP-MS

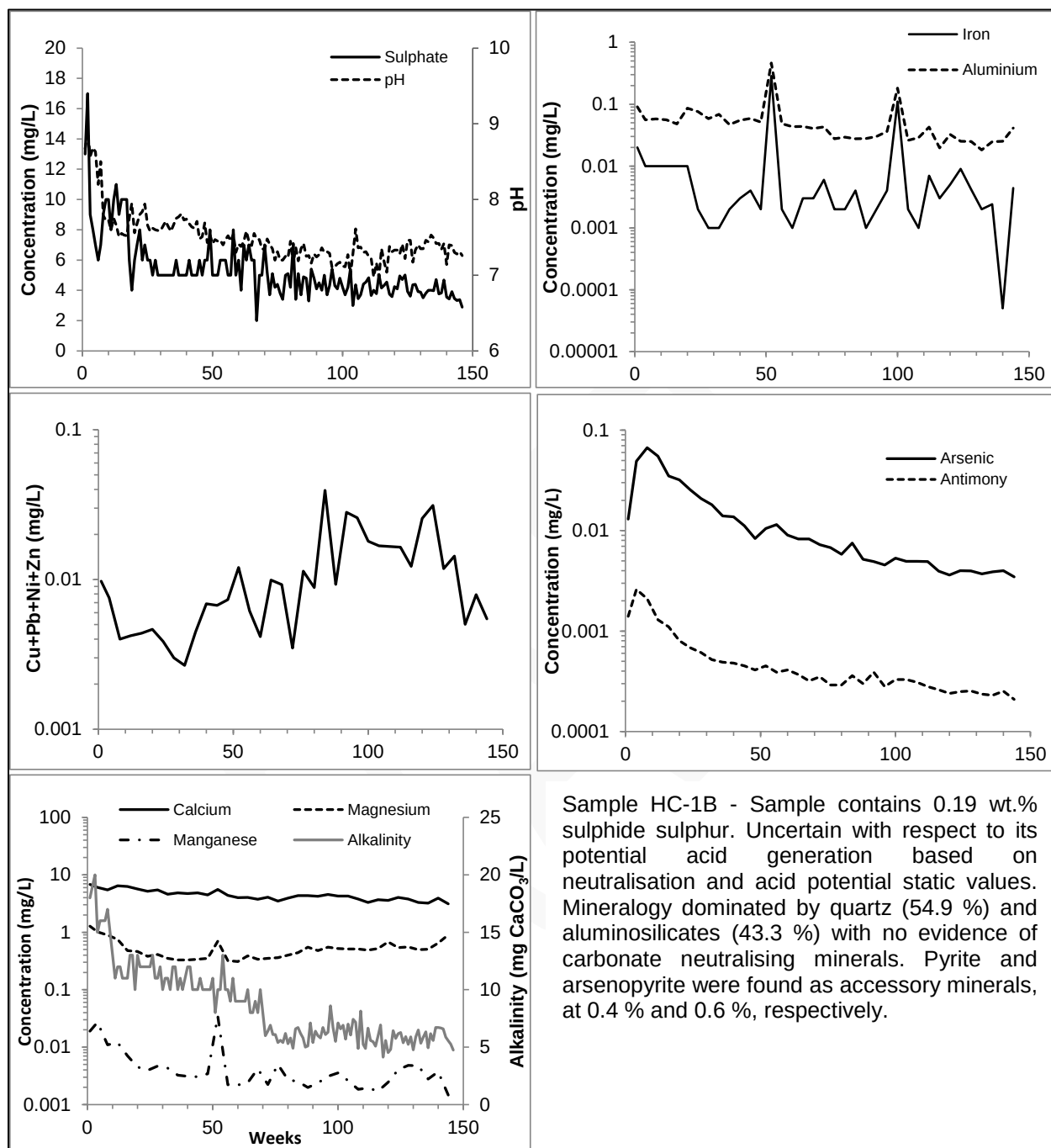


Figure 3.7: Long Term Kinetic Testing, Sample HC-1B (0.34 wt.% Total Sulfur (ICP-MS))

3.3.2.2 HC-2B

HC-2B is a shale sample with approximately 0.52 wt.% total sulfur measured by ICP-MS, with 0.31 wt.% sulfide sulfur based on ABA analyses. Based on the total sulfur concentration this sample is potentially acid generating. Changes in pH and select analytes over time for the shale sample are presented in Figure 3.8:

- pH values remain near neutral throughout the testing duration stabilising around 7.5;
- Sulfate fluctuated during the initial flushes but stabilized after week 30 below 10 mg/L;
- Aluminum concentrations have remained constant below 0.1 mg/L throughout the test duration;
- Iron has fluctuated throughout the test duration, although generally remained below 0.01 mg/L;
- Total metal concentrations of copper, lead, nickel, and zinc have fluctuated from a low of 0.001 mg/L to 0.04 mg/L;
- Arsenic and antimony concentrations showed an initial increase before steadily decreasing to 0.002 mg/L and 0.0001 mg/L, respectively; and
- Alkalinity values were less than 20 mg CaCO₃/L. Calcium and magnesium concentrations were generally constant while manganese concentrations fluctuated below 0.01 mg/L.

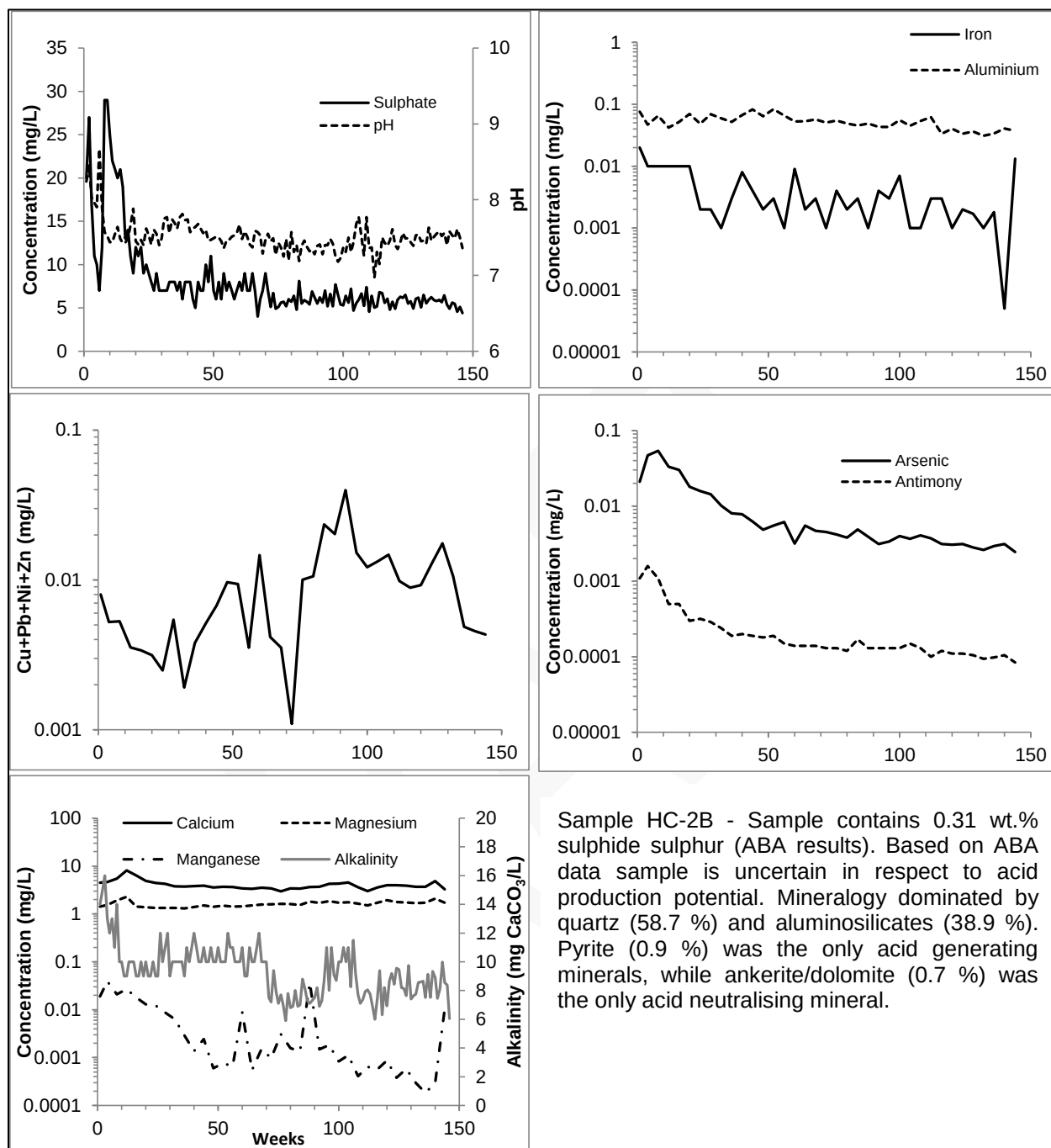


Figure 3.8: Long Term Kinetic Testing, Sample HC-2B (0.52 wt.% Total Sulfur (ICP-MS))

3.3.2.3 HC-3B

HC-3B is an interbedded sample with approximately 0.37 wt.% total sulfur (based on ICP-MS). Changes in pH and select analytes over time for the interbedded sample are presented in Figure 3.9:

- pH in the sample steadily decreased from an initial value of pH 8.9 to pH 6.5 by Week 80. The pH of the sample subsequently fluctuated around this value for the test duration with an overall acidifying trends;
- Although sulfate concentrations are low (<20 mg/L) these have fluctuated between 2-20 mg/L;
- Aluminum generally decreased with time with concentrations decreasing from approximately 0.1 mg/L to 0.01 mg/L;
- Iron concentrations have fluctuated during testing between 0.001 and 0.1 mg/L;
- The sum of metal concentrations of copper, lead, nickel, and zinc increased from 0.001 mg/L to 0.1 mg/L over 100 weeks, before decreasing towards 0.01 mg/L;
- Arsenic and antimony have steadily dropped throughout the test duration after the initial flushes; and
- Alkalinity remains low (<20 mg CaCO₃/L) throughout the testing period and stabilized below 2 mg CaCO₃/L after Week 70.

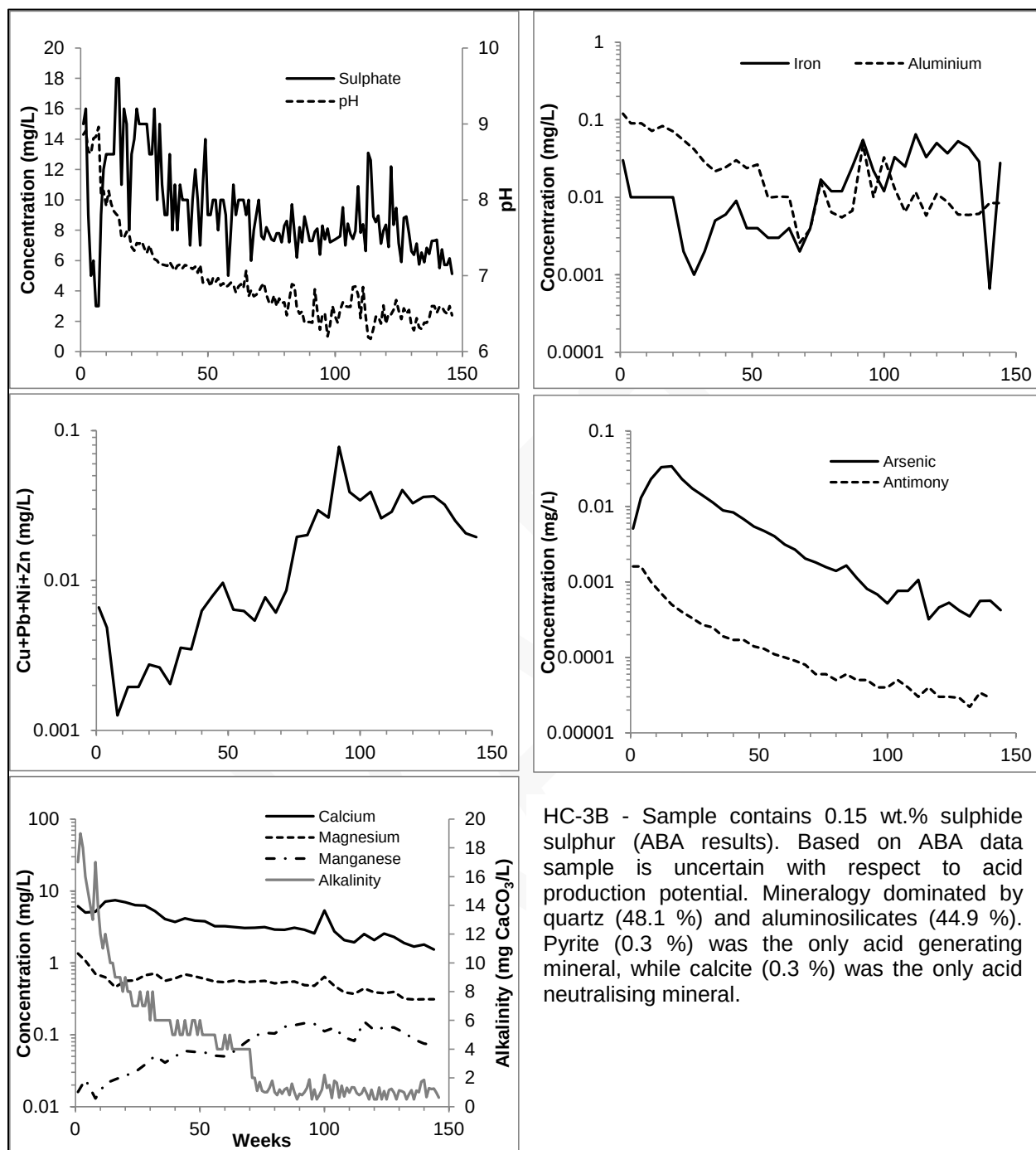


Figure 3.9: Long Term Kinetic Testing, Sample HC-13B (0.37 wt.% Total Sulfur (ICP-MS))

3.3.2.4 Long-term Kinetic Testing Discussion

Sulfate production and Neutralization Potential (NP) consumption rates were determined based on calculations in Table 2.2 and are presented in Figure 3.10. The rates for both sulfate production and NP were similar for samples HC-1B and HC-3B, although NP consumption was occurring at a generally

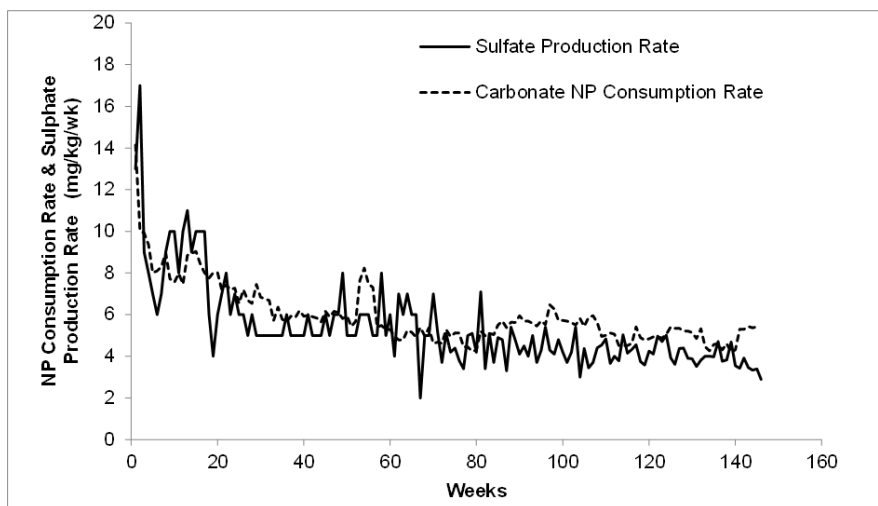
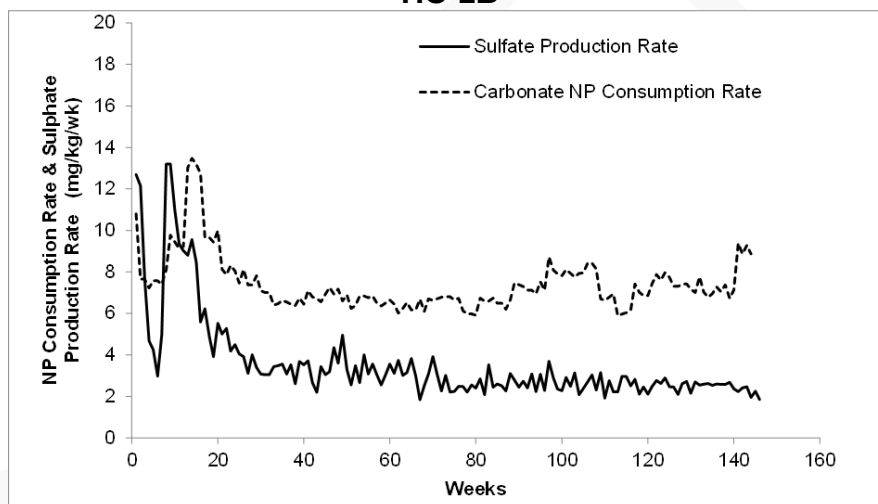
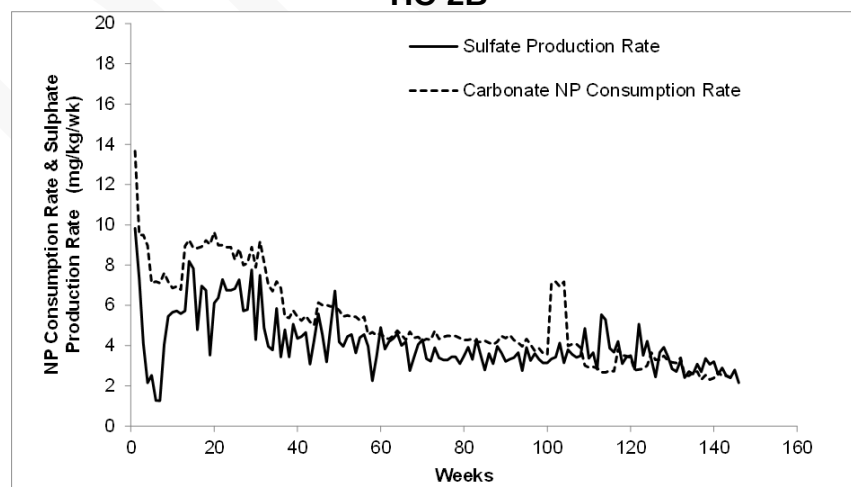
higher rate than sulfate production. NP consumption rates were approximately twice that of sulfate production for sample HC-2B.

Estimations of the cumulative NP consumption and sulfate production based on the initial Acid Neutralization Capacity and Sulfur content of the respective sample (assuming all sulfate is due to oxidization of reduced sulfur) are presented in Table 3.5. The estimates show that the remaining neutralization potential is lower than the associated remaining sulfur in all samples, being greatest for HC-2B that has NP consumption twice that of sulfate production. This suggests that the available buffering capacity is likely to be depleted before the oxidizable sulphur is exhausted. Thus, it is predicted that the HCT cells will eventually produce acidic leachate.

Table 3.5: Neutralization Potential (NP) Consumption and Sulfate Production Rates - Long-Term Kinetic Samples

Sample ID	Cumulative NP Consumption	NP Remaining	Cumulative Sulphate Production	Sulphur Remaining
	mg/kg	%	mg/kg	%
HC-1B	805	90	349	96
HC-2B	1069	76	523	96
HC-3B	751	88	600	97

Comparing the results of Table 3.5 with the ABA criteria supports the Sulfur Cutoff Criteria. Sample HC-2B (PAG classification) will likely generate acidic leachate within the medium to long-term, while samples HC-1B and HC-3B (uncertain classification) will likely generate acidic leachate in the long-term. While all three samples were classified as uncertain by the NPR criteria, samples HC-1B and HC-3B were classified as non-PAG by NAPP criteria. The presence of trace accessory carbonate minerals and dominate silicate mineralogy indicate poor long-term acid neutralization capacity.

**HC-1B****HC-2B****HC-3B****Figure 3.10: Sulfate Production and Neutralization Potential Consumption Rates**

3.4 Tailings

The sections below detail the 2011 sample (AMMTEC EPA1107934 sample) characterization results; with a comparison to the 2010 KCA sample analyses when appropriate. Supplemental and laboratory data are provided in Appendices A and B.

3.4.1 Acid-base Accounting

Reported NPR and NAPP values of 0.3 and 3.6 kg H₂SO₄/tonne, respectively, from the 2011 tailings sample shows the affinity to generate acid. This potential to generate acid is consistent with past tailings characterization (Tetra Tech, 2010; Zapopan, 1992). The 2011 sample, which is more representative of the feasibility production, contains a total sulphur value of 1.13 wt. %, of which 0.16 wt. % was identified as sulphide sulphur with the remaining 0.97 wt. % being reported as sulphate sulphur. The sulphur speciation is currently being investigated to determine if the data was improperly labeled (e.g., sulphate sulphur appears to actually be sulphide sulphur).

3.4.2 Mineralogy

The quantitative phase XRD analysis by Rietveld refinement for the 2010 and 2011 tailings samples are presented above (Table 3.4). The 2011 tailings sample is discussed further, as it is more representative of the feasibility study detoxification process. The dominant mineral phase in the tailings sample is quartz (~75 %), with appreciable amounts of clinocllore and muscovite. Of interest is the presence of potassium calcium carbonate (butschliite) and Mg, Ca-pyroxene (diopside), which were absent in previous tailings samples. Pyrite (~0.7 %) is the only sulphidic species observe. No calcite or dolomite was identified in the sample.

3.4.3 Supernatant

As mentioned above, the supernatant from the 2011 sample is more representative of the expected detoxification process to be used during operations. As such, the analytical results are discussed below and are related to the 2010 sample simply as a means for comparison. The 2011 supernatant data has an alkaline pH of 8.78 and concentrations of metals (Al, Cu, Mo, Ag), metalloids (As, Sb), nonmetals (Cl), total cyanide (CN), and sulphate (SO₄²⁻) above regulatory limits (Table 3.5). Tailings supernatant from the 2010 sample had a similar alkaline pH and contain concentrations of metals (Al, Cd, Cu, Fe, Mo, Ni), metalloids (As, Sb), total CN, WAD CN, and major ions (Na and sulphate) above regulatory limits. These differences, especially in the nitrate and cyanide concentrations, are likely due to the different detoxification processes used.

Pond water data from the tailings storage facility (RP7) data is provided in Earth Systems (2011a, b, c); however, it must be noted that the pond water in RP7 includes inputs other than tailings water and precipitation resulting from the long term water management strategy that included pumping water from RP1 to RP7 between 2000 until mid-2006.

3.4.4 Solid Elemental Analyses

Comparison of the tailings elemental analyses between the 2010 and 2011 samples show significant differences, however these changes are not reflective in the variance observed in the supernatant results. Of interest is the increase in Mo, Ni, Pb, and Zn in the EPA1107934 sample and a decrease in Al, Ba, Cd, Ti, U, and W. Concentrations from the elemental analyses of the two tailings samples are presented in Appendix A.

3.4.5 Water Leaching-SPLP

Leachate quality for a single tailings sample was conducted to determine the potential for metal loading upon contact with water. The SPLP concentrations (which contain residual supernatant) for the KCA sample are provided in Table 3.7. However, these values may not be representative of the feasibility phase process. In general, leachate concentrations are greatly reduced relative to solid elemental

concentrations suggesting the porewater following the first flush is likely to be of more acceptable quality than the tailings supernatant.

3.4.6 Current Understanding of Tailings

Several conclusions can be drawn regarding the tailings material and the associated porewater and supernatant water based on historic and current laboratory and site data as detailed by Earth Systems (2011a, 2011b, 2011c). The presence of sulphidic minerals, the low NPR values, and high NAPP values demonstrate the potential affinity for ARD/ML generation in the tailings materials (Earth Systems, 2011a). Fluctuation in pH and metal loads are influenced by seasonal variability. In general, high pH values and low metal loads are observed during the dry season due to salt formation. The rise in water level and saturation conditions in the wet season causes a decrease in pH and an increase in the dissolved metal load.

A downward migrating oxidation front is currently observed due to the lack of residual alkalinity and carbonate dissolution to neutralize the production of acidity. As TSF1 is being seasonally recharged, the deeper tailings (>3-4 meters) are continually saturated causing limited oxidation and acidity (Earth Systems, 2011b). If left unmanaged, the available neutralization capacity is likely to be exhausted at increasing depths leading to the onset of acidic conditions and higher metal loads. These conclusions are consistent with the decreasing pH and increasing metal concentrations observed during kinetic testing of a 1.4 wt. % total sulphur tailings sample conducted in support of the 1992 EIS which generated acid pH after approximately one (1) year (Zapopan, 1992).

3.4.7 Tailings Kinetic Testing

As of December 2012, the single tailings humidity cell has been running for 32 weeks with the following observations (Figure 3.11):

- pH values have steadily declined and is currently at 7.2;
- Sulfate concentrations dropped after an initial flush of likely soluble sulfate salts to a low of 20 mg/L at week 4 before slowly increasing with time towards 200 mg/L;
- Concentrations of aluminum and iron are steadily decreasing with time. Concentration spikes at Week 10 likely are due to dissolution of hydro(oxide) minerals;
- Total metal concentrations of copper, lead, nickel, and zinc have steady climbed after initially decreasing during the initial flushes. Total metals decreased over the initial four weeks of testing to below 0.01 mg/L, before steadily increasing to 0.1 mg/L;
- Arsenic and antimony concentrations have decreased by an order of after an initial flush;
- Alkalinity values appear to have stabilized after Week 20 near a concentration of 10 mg/L; and
- Thiocyanate and total cyanide have generally decreased during testing with final values reported at 0.2 mg/L and 0.02 mg/L, respectively. Weak Acid Dissolved (WAD) Cyanide has remained constant after the initial flushes and is several orders of magnitude lower than total cyanide.

3.4.7.1 Tailings Discussion

Sulfate production and carbonate consumption rates quickly decreased after the initial weeks and have reported similar values throughout the 32 weeks of testing (Figure 3.12). After Week 32, abundant sulfide sulfur content (95%) still remains, while only an estimated 18% of the neutralization potential remains (Table 3.8).

Table 3.6: Tailings Supernatant Quality

Sample	Units	VB07-007 350-362	EP1107934-001
Parameter		Result	Result
pH	pH Units	8.97	8.78
Total Alkalinity	mg/L	107	188
Alkalinity, Carbonate	mg/L	27	26
Alkalinity, Bicarbonate	mg/L	80	162
Total Dissolved Solids (TDS)	mg/L	4,900	ND
Alkalinity, Hydroxide	mg/L	<2	<1
Aluminum	mg/L	1	0.57
Antimony	mg/L	0.006	0.058
Arsenic	mg/L	0.009	0.489
Barium	mg/L	0.097	0.071
Beryllium	mg/L	<0.004	<0.001
Bismuth	mg/L	<1	<0.001
Boron	mg/L	<0.5	0.21
Cadmium	mg/L	0.012	0.0003
Calcium	mg/L	440	ND
Chloride	mg/L	28	540
Chromium	mg/L	<0.004	<0.005
Cobalt	mg/L	0.19	0.521
Copper	mg/L	31	1.19
Total Cyanide	mg/L	129	26.3
WAD Cyanide	mg/L	39.8	ND
Thiocyanate	mg/L	NA	252
Free Cyanide	mg/L	NA	0.507
Fluoride	mg/L	<1	ND
Gallium	mg/L	<1	0.003
Iron	mg/L	19	0.25 (Fe ²⁺)
Lanthanum	mg/L	<0.5	<0.001
Lead	mg/L	0.006	<0.001
Lithium	mg/L	<1	0.002
Magnesium	mg/L	<5	ND
Manganese	mg/L	0.014	0.007
Mercury	mg/L	<0.0002	<0.0001
Molybdenum	mg/L	0.13	0.297
Nickel	mg/L	0.47	0.004
Nitrate	mg/L	<0.5	14
Phosphorus	mg/L	<0.2	ND
Potassium	mg/L	75	ND
Scandium	mg/L	<0.5	ND
Selenium	mg/L	<0.02	<0.01

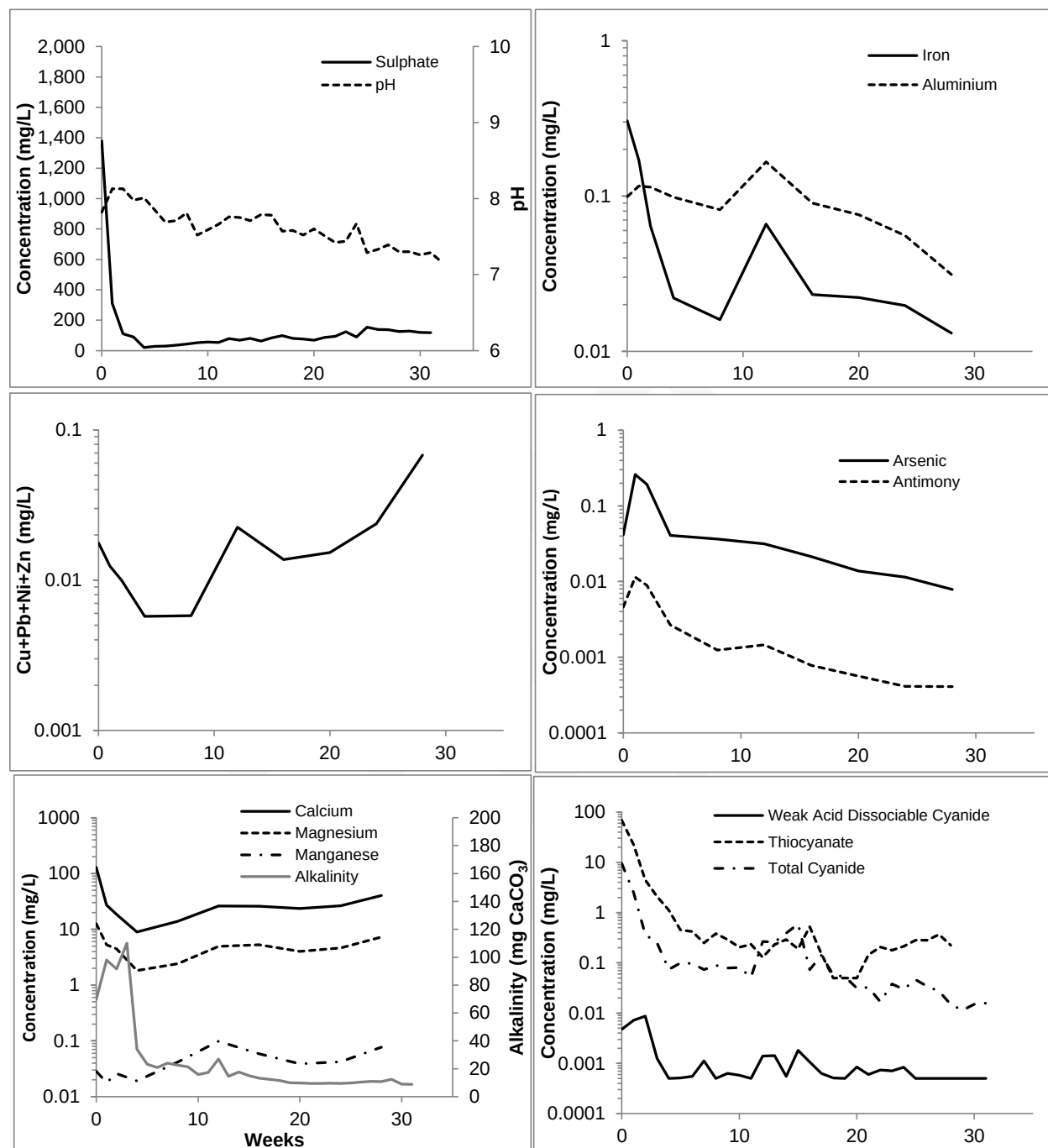
Sample	Units	VB07-007 350-362	EP1107934-001
Parameter		Result	Result
Silver	mg/L	0.076	<i>0.456</i>
Sodium	mg/L	1,090	ND
Strontium	mg/L	<0.5	0.751
Sulphate	mg/L	2,500	<i>1,460</i>
Thallium	mg/L	<0.002	<0.001
Tin	mg/L	<1	<0.001
Titanium	mg/L	<0.5	<.001
Vanadium	mg/L	<0.004	<0.01
Zinc	mg/L	1	0.012

italics represent values that are above the NHMRC and NRMCC (2004) regulatory limit

ND = not determined

Table 3.7: Tailings Water Leachate Testing Summary

Parameter	Units	(VB07-007 350-362)
pH	pH Units	8.33
Total Alkalinity	mg/L	24
Alkalinity, Carbonate	mg/L	<2
Alkalinity, Bicarbonate	mg/L	24
Alkalinity, Hydroxide	mg/L	<2
Aluminum	mg/L	0.78
Antimony	mg/L	0.002
Arsenic	mg/L	0.011
Barium	mg/L	0.007
Beryllium	mg/L	<0.002
Bismuth	mg/L	<0.2
Boron	mg/L	<0.1
Cadmium	mg/L	<0.002
Calcium	mg/L	25
Chloride	mg/L	0.6
Chromium	mg/L	<0.002
Cobalt	mg/L	0.003
Copper	mg/L	0.004
Total Cyanide	mg/L	2.3
WAD Cyanide	mg/L	0.07
Fluoride	mg/L	<0.1
Gallium	mg/L	<0.002
Iron	mg/L	0.88
Lanthanum	mg/L	<0.1
Lead	mg/L	<0.002
Lithium	mg/L	<0.2
Magnesium	mg/L	<1
Manganese	mg/L	<0.002
Mercury	mg/L	<0.0002
Molybdenum	mg/L	0.004
Nickel	mg/L	<0.002
Nitrate	mg/L	<0.05
Phosphorus	mg/L	<0.2
Potassium	mg/L	3.6
Scandium	mg/L	<0.1
Selenium	mg/L	<0.01
Silver	mg/L	0.003
Sodium	mg/L	18
Strontium	mg/L	<0.1
Sulphate	mg/L	65
Thallium	mg/L	<0.001
Tin	mg/L	<0.2
Titanium	mg/L	<0.1
Total Dissolved Solids (TDS)	mg/L	160
Vanadium	mg/L	<0.002
Zinc	mg/L	<0.02

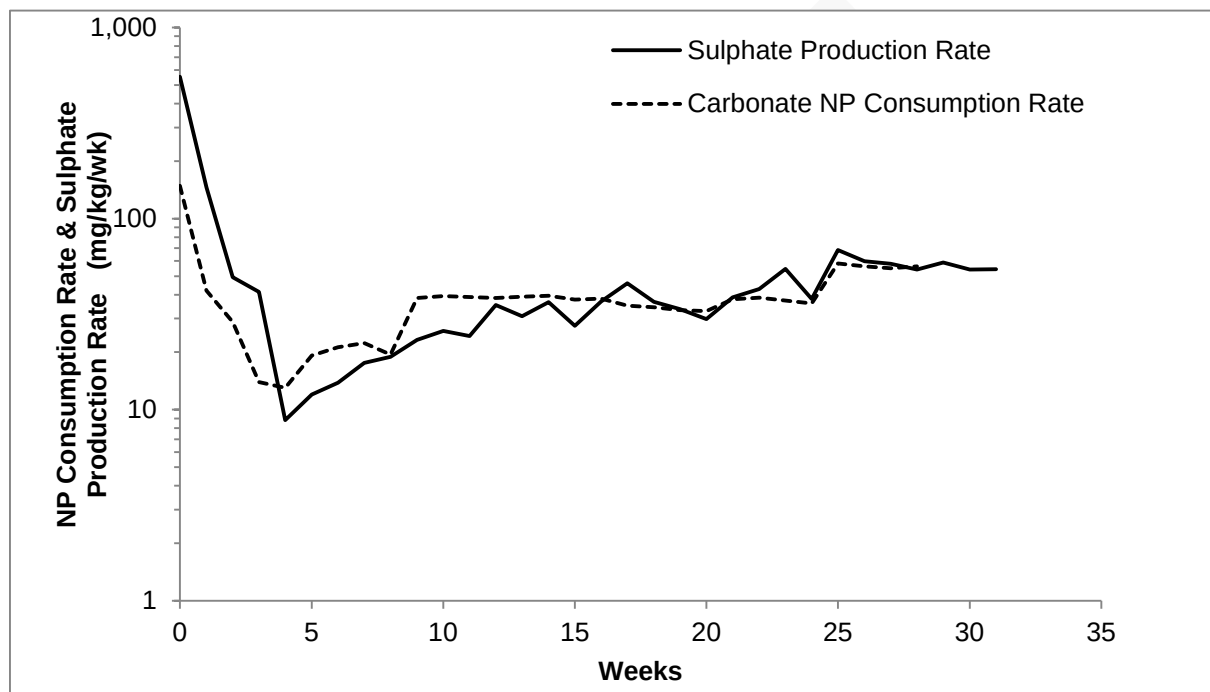


Tailings (HC-4B) – Detox dry tailings sample contains 0.97 wt.% sulphide sulphur and is potentially acid generating based on ABA results. Sulphide species consist of pyrite at 0.7 wt.%, with the sample predominately composed of quartz (75 wt.%).

Figure 3.11: Tailings Kinetic Testing, Tailings Sample HC-4B.

Table 3.8. Summary of Neutralization Potential Consumption and Sulfate Production Rates – Tailings Sample

HCT ID	Cumulative NP depleted	NP Remaining	Cumulative Sulfate Production	Sulfate Remaining
	mg/kg	%	mg/kg	%
HC-4B	1149	18	1828	95

**Figure 3.12: Neutralization Potential Consumption Rate and Sulfate Production Rate Trends - Tailings Sample (HC-4B)**

4.0 WATER QUALITY PREDICTIONS

This section details the geochemical modeling conducted to predict the site wide water quality in support of the water treatment plant (WTP) design that will be operated during production, closure, and into post-closure (Tetra Tech, 2012a). The principal objective of this section is to obtain a more accurate prediction of the WTP Equalization Pond water quality.

To accurately predict the on-site water chemistry, it is imperative that detailed geochemical characterisation be conducted to determine the affinity of ARD/ML for the various rock types at the mine site. The detailed discussion of the Project geochemical characterization program provided above are the foundation for the predictive water quality modeling.

4.1 Conceptual Model

During the production phase, the WTP Equalization Pond will receive water input from up to eight (8) different sources:

- RP1-Waste Rock Dump (WRD) Pond
- RP2- LGOS Pond
- RP3- Batman Pit
- RP5- Plant Runoff Pond
- HLP- Heap Leach Pad Pond
- RP7 or RP8- (TSF1 or TSF2)
- Precipitation

These sources vary in their relative percentages as a function of time with seasonal variability being a primary influence on the flows. The site is characterized by two seasons: a rainy season and a dry season. The rainy season falls between October 1 and April 30. Rainfall events during this time are dominated by cyclonic weather patterns and rainfall can be extreme. These precipitation differences between the wet and dry seasons necessitate biannual inflow percentages for each of the ponds/facilities. Table 4.1 shows the normalised percentages for each of the inputs reporting to the Equalization Pond during the production phase as of April 2012. The site-wide water balance and associated basis for the flows is provided in Tetra Tech (2012b).

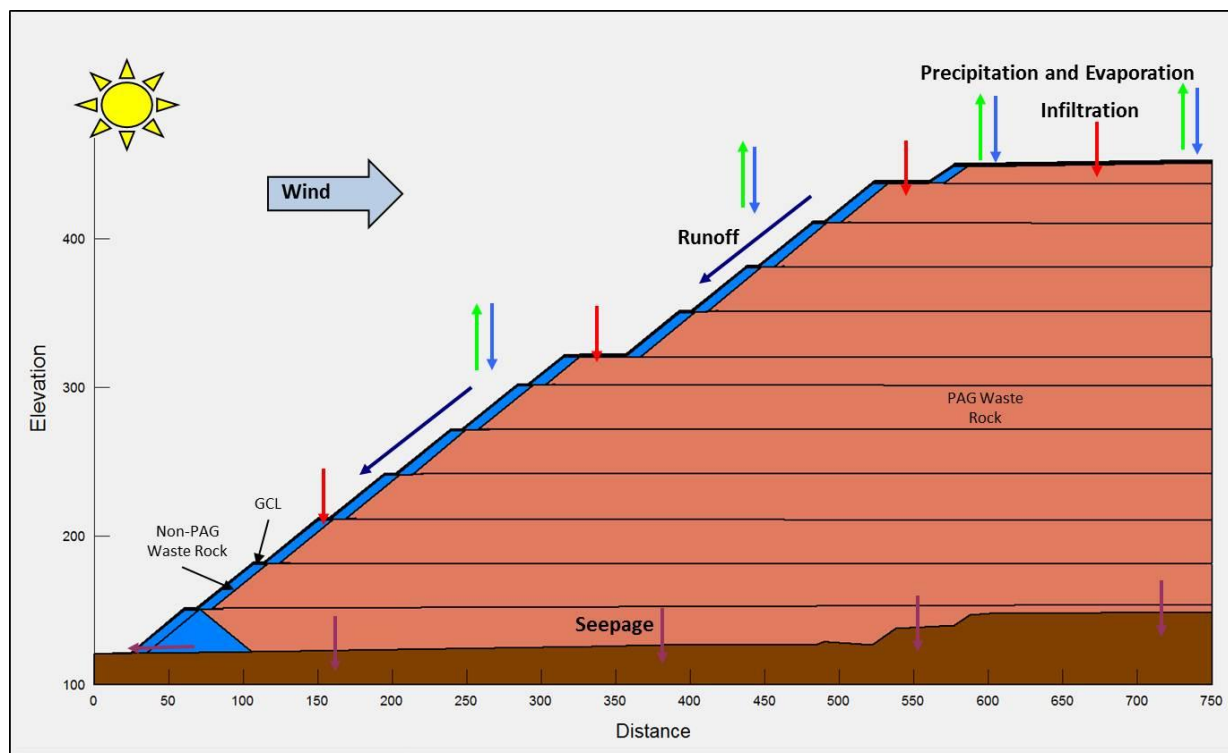
The geochemical models associated with the WRD and RP3 are the most complex and warrant detailed explanations of the various chemical and physical factors.

4.1.1 Waste Rock Dump

The conceptual model for the WRD geochemical model incorporates the water infiltration, runoff, and the composition of the WRD. Due to the complexity of the design and conditions during operation, the conceptual model is based on closure design of the WRD. The current dump design, upon closure, will have an interior predominantly consisting of uncertain and PAG material, with an exterior surface of non-PAG material (Figure 4.1). The non-PAG rind coupled with incremental geosynthetic clay liner (GCL) layers will limit infiltration and lead to increased runoff. Since runoff should only contact non-PAG material and be diverted it was not incorporated in the seepage model. Although mitigated, residual water from the waste rock and infiltration through the non-PAG rind and GCL will lead to downward migrating water through the interior of the dump. This infiltrated water will interact with non-PAG, uncertain and PAG waste rock materials. Therefore, the model assumes that this infiltration will interact with all waste rock materials based on their proportionate tonnages within the ultimate WRD.

Table 4.1: Flows into the Water Treatment Plant Equalization Pond

Date	Year	Season	WRD Seepage	RP2	RP3	HLP	RP5	Fresh-water (Precipitation)	RP7-Detox Liquor	Total
PHREEQCI Solution #			1	2	3	4	5	6	7	
Aug 1-Sep 30	1	DRY	0%	31%	0%	28%	36%	0%	5%	100%
Oct 1-Apr 30		WET	4%	23%	23%	7%	23%	17%	3%	100%
Apr 30-Sep 30	1 and 2	DRY	13%	1%	39%	2%	13%	26%	5%	100%
Oct 1-Apr 30	2	WET	77%	1%	0%	1%	0%	0%	21%	100%
Apr 30-Sep 30	2 and 3	DRY	9%	17%	30%	3%	25%	9%	7%	100%
Oct 1-Apr 30	3	WET	8%	21%	24%	9%	21%	9%	6%	100%
Apr 30-Sep 30	3 and 4	DRY	63%	7%	8%	4%	0%	1%	17%	100%
Oct 1-Apr 30	4	WET	10%	21%	21%	12%	21%	10%	6%	100%
Apr 30-Sep 30	4 and 5	DRY	22%	3%	39%	3%	15%	9%	9%	100%
Oct 1-Apr 30	5	WET	10%	22%	25%	5%	22%	9%	6%	100%
Apr 30-Sep 30	5 and 6	DRY	13%	12%	30%	3%	26%	8%	7%	100%
Oct 1-Apr 30	6	WET	7%	22%	24%	7%	22%	12%	6%	100%
Apr 30-Sep 30	6 and 7	DRY	17%	12%	29%	4%	26%	5%	7%	100%
Oct 1-Apr 30	7	WET	11%	22%	22%	8%	22%	9%	6%	100%
Apr 30-Sep 30	7 and 8	DRY	15%	8%	44%	3%	16%	6%	9%	100%
Oct 1-Apr 30	8	WET	11%	22%	23%	7%	22%	9%	6%	100%
Apr 30-Sep 30	8 and 9	DRY	58%	6%	15%	4%	0%	1%	16%	100%
Oct 1-Apr 30	9	WET	10%	23%	25%	5%	23%	9%	6%	100%
Apr 30-Sep 30	9 and 10	DRY	38%	4%	39%	2%	3%	3%	11%	100%
Oct 1-Apr 30	10	WET	10%	22%	24%	8%	22%	9%	6%	100%
Apr 30-Sep 30	10 and 11	DRY	18%	15%	27%	5%	25%	3%	7%	100%
Oct 1-Apr 30	11	WET	11%	22%	27%	3%	23%	7%	6%	100%
Apr 30-Sep 30	11 and 12	DRY	75%	3%	0%	2%	0%	0%	20%	100%



Source: Tetra Tech, not to scale

Figure 4.1: Waste Rock Dump Conceptual Model

4.1.2 RP3

Due to fracturing of the pit wall from blasting and mining activities, the surface runoff will be exposed to sulphides with unlimited atmospheric oxygen and water, thus having a strong affinity for acid generate. ARD/ML will be accelerated considering the long contact times anticipated in the immediate surface of the pit.

For purposes of this model, RP3 effluent was determined using surface area ratios of the different non-PAG, uncertain and PAG materials that constitute the ultimate pit surface (UPS). Estimated runoff from each of the materials was based on humidity cell leachate (Section 3.3, Waste Rock Humidity Cells and Appendix A). These runoff chemistries were the only source inputs used in the model. Likewise, a filling rate and evaporation/precipitation components were not incorporated.

4.2 Geochemical Model Construction

The geochemical modeling was conducted using the computer code PHREEQCI (Parkhurst and Appelo, 1999), a reaction path chemical equilibrium model supplied by the U.S. Geological Survey (USGS). PHREEQCI is able to process multiple equilibrium and mixing reactions to produce the final chemical speciation. In addition to a computer code, geochemical modeling requires a database of the thermodynamic and kinetic parameters. For this study, the MINTEQ database (Allison et al, 1991) was chosen. However, this database does not include all of the relevant metals; therefore, to obtain a broad range of metals, data for Ti, Th, Bi were added from the Lawrence Livermore National Laboratory database (llnl.dat).

The following sections describe the basic assumptions and the numerous steps used to construct the geochemical models for the WRD, RP3, and the Equalization Pond through the production phase.

4.2.1 Model Oxidation Calibration

Calibration of the geochemical models was accomplished by comparing the model reaction rates with the reaction rates seen during kinetic testing of an ARD generating sample. The reaction rate for the oxidation of pyrite using the following equation has been incorporated into PHREEQC(Williamson and Rimstidt, 1994):

$$R = 10^{-10.19} [O_{2(aq)}]^{0.5} [H^+]^{-0.11}$$

Where:

R= pyrite oxidation rate

$O_{2(aq)}$ = Concentration of dissolved oxygen available to pyrite (in molality)

H^+ = Concentration of hydrogen ions (in molality)

The rate can be adjusted using a scaling factor, a fitting factor for the mole ratio, and by adjusting the oxygen and hydrogen concentrations. The scaling and fitting factors adjust the reaction rate constant ($10^{-10.19}$) to be appropriate for the weatherability and grain size involved. For purposes of this calibration it was not necessary to adjust the oxygen and hydrogen exponents. Only the fitting and scaling factors were manipulated to achieve a representative comparison between the kinetic testing and the calibration model reaction rates.

The kinetic testing was based on shale sample (HC-2), as this is the only humidity cell that has shown a drop in pH. The calibration utilized the pH drop as a starting point after the initial flush. Unfortunately, the humidity cell was stopped after 27 weeks, which made it necessary to project the production rate to continue past the cessation of the test period.

The fitting and scaling factors were adjusted appropriately until the model produced a rate comparable to that seen in the kinetic testing (Figure 4.2). After accurate parameters were determined a best-fit curve was projected to provide the calibration target. Although the model and test curves have different overall shapes and are shifted by approximately a pH unit, the long-term pH reductions and rates are similar in both cases. Considering the length of the dry season at the site, it is more relevant to have the modeling rate emulate the later stages (~ 4-6 months) of the kinetic test. Based on the short interval of kinetic testing available for calibration, it is deemed that the calibration process provided a just indicator of pyritic oxidation over time.

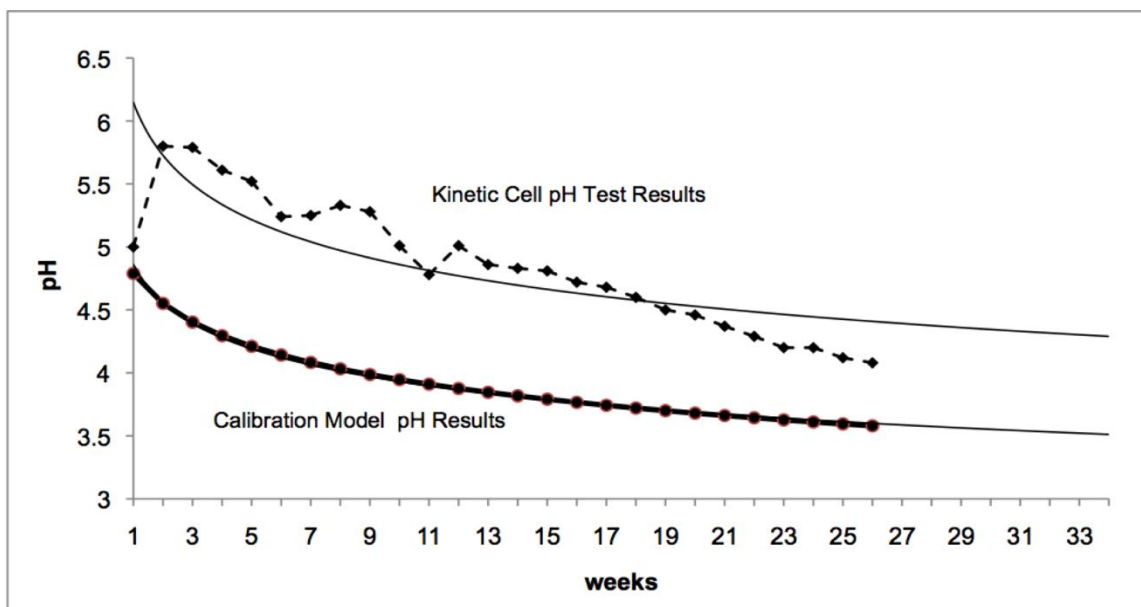


Figure 4.2: Calibration of Pyrite Oxidation-pH as a Function of Time

4.2.2 Model Assumptions

Some general assumptions were used throughout the geochemical modeling of the WRD, RP3 and the Equalization Pond. These general assumptions include:

- Precipitation was limited to only hydrogen and oxygen and is in equilibrium with the atmosphere. The influence of precipitation was only incorporated into the Equalization Pond model.
- The vertical flow paths in the WRD were considered to be uniform and non-variable due to the large pore spaces, high hydraulic conductivity, and homogeneity of the WRD.
- Estimations of the rock tonnages for the WRD were based on the completed design at the end of production.
- A six month pyritic oxidation kinetic time step was used for the WRD and RP3.
- Surface area proportions for RP3 calculations were based on the UPS.
- Oxygen and carbon dioxide were assigned a steady-state concentration equal to atmospheric partial pressures.

4.2.3 Model Source Terms

To model the lithological units that comprise the WRD and UPS it was imperative to determine representative source terms for all the constituents. Source terms are stable leachate concentrations that represent long-term leachate quality. The selection of source terms was based on kinetic leachate concentrations. A description and rationale for the development of source terms is shown below.

Non-PAG source terms were based on the long-term kinetic metal leachate concentrations for each rock type. Several pertinent constituents were used in this determination. Each constituent's effluent concentrations were fitted with a best-fit curve, and assigned a flush (week) in which stable leachate concentrations were reached. Typically, stability was reached during the latter half of kinetic testing. Once stability ranges were acquired for the pertinent constituents, the curves were compared and a single flush (week) was chosen that represented the constant long-term leachate quality of the sample. The selection of a single flush (week) was necessary to satisfy the charge balance requirements for insertion into the geochemical modeling. This systematic process was repeated for each of the non-PAG rock types.

The interbedded non-PAG source term was chosen based on the corresponding Round 2 humidity cell test sample results. Since this sample is trending towards acid generation after approximately two years, representative non-PAG source terms were chosen before this onset.

The most representative long-term leachate quality for the uncertain lithologies is from the initial flush of the relevant humidity cells. These terms will represent a higher metal load than the non-PAG samples. Unfortunately, only a single humidity cell has characteristics of ARD/ML generation and was terminated prior to reaching stable leachate concentrations. Thus, the most characteristic leachate quality for PAG material was from the initial flush. Its validity is due to the environmental conditions and subsequent extended contact time that water will have with PAG material in both the WRD and UPS.

4.2.4 Waste Rock Dump Geochemical Model

The conceptual model described in Section 4.1, Conceptual Model, is the basis for the WRD geochemical model. To simulate the water flow and reactions downward through the dump a mass balance model were established for the non-PAG, uncertain, and PAG materials based on the sulphur concentrations as follows:

- Non-PAG waste rock contains up to 0.25 wt. % total sulphur;
- Uncertain waste rock contains from 0.25 to 0.4 wt. % total sulphur;
- PAG waste rock contains from 0.4 wt. % to 1.5 wt. % total sulphur; and
- ARD/ML waste rock with 1.5 wt. % total sulphur or greater.

The proportions of the lithological units in each of these sulphur classifications were used to develop a representative effluent from the non-PAG, uncertain, PAG, and PAG/ARD material. These waters were then mixed based on their proportionate ratios.

To acquire the proportions of the WRD a systematic series of steps were used. Tonnage estimations were based on the feasibility study ultimate pit design. Micromine[®] software was utilized to cut the pit into the 18 lithologic codes within the block model. The 18 units were then grouped into the three larger rock types (greywacke, shale, interbedded). Tonnages were obtained by querying all waste rock blocks (< 0.4 ppm gold) with 50% in or out of the topographic surface and ultimate pit surface. The tonnages of non-PAG, uncertain, PAG waste rock from each rock types were compiled and quantified (Table 4.2). Ambiguity in the estimated tonnages between the project mine planner and our in-house estimates are due to slight variations in the block selection at the topographic surface. Blocks identified as felsic tuff (~2% of the total tonnages) were not included.

Table 4.2: Waste Rock Dump Tonnage Percentages

	non-PAG	Uncertain	PAG	Sum
Tonnage	229,000,000	101,000,000	233,000,000	562,000,000
Percentage	41%	18%	41%	100%

Tuff tonnages were omitted

In addition to the estimated tonnages several other factors were incorporated to better represent the WRD. These factors were included in the geochemical model. Below is an explanation of the individual impacts and their source term designation:

- The existing WRD tonnages are not represented. Thus, the estimated tonnage of the current dump tonnages (~16 million tonnes, MT) was added to the overall tonnage. The most accurate effluent from this source was deemed to be from the current onsite RP1 water quality.
- Non-PAG material (~229 MT) is schedule to be used for various constructional projects across the mine site, and will not be reported to the WRD. This will significantly lower the final non-PAG tonnage of the ultimate WRD.

- Approximately 1.95 MT of waste rock will have a sulphur concentration greater than 1.5 wt. %. This high sulphur content has a strong affinity to generate acid and metal load requiring a separate input chemistry. The more representative estimation of seepage from this source was reasoned to be from the current RP1 water quality.

Table 4.3: Source Input Ratios used in the WRD Geochemical Model

Input	Non-PAG remaining	Uncertain	PAG		Existing WRD
			>0.4wt %S and <1.5 wt % S)	> 1.5 %S	
Sulphur Criteria	< 0.25%S	< 0.4%S and > 0.25%S			
Tonnage (MT)	86.1	59.3	189.55	1.95	16
Percentage of WRD	24.4%	16.8%	53.7%	0.6%	4.5%

A flow chart showing the construction of the WRD geochemical model is provided in Figure 4.3. Relative proportions for the mixing simulations were based on Table 4.3 above. The model is segregated into two (2) stages. The first stage is the mixing of different rock types based on ABA criteria discussed above. For example, non-PAG greywacke, shale and interbedded solutions (1,2,3) were mixed based on estimated percentages of non-PAG material (simulation 3). Uncertain material was handled in a similar manner (simulation 4). PAG material was simulated to undergo pyrite oxidation over time (simulation 5). The resulting solutions, in addition to the >1.5% sulphur and existing WRD source terms, were mixed based on their percentages (see Table 4.3). The PHREEQCI input file is provided in Appendix A.

4.2.5 RP3 Geochemical Model

Relative proportions of the three rock types and corresponding ABA criteria of the UPS were the basis for the RP3 water quality prediction during the production phase. Determination of the relative proportions of the UPS is discussed below. Only chemical inputs related to surface runoff were used in the model. Source term development for the rock types is discussed in the WRD geochemical modeling description above.

Surface area percentages and PAG classification for the rock types were based on the Project block model. Segregating the UPS based on lithologic composition and PAG criteria was accomplished by taking the individual pit slices from the block model and determining which blocks intersected the pit surface (Figures 4.4). When several blocks partially intersected the surface with the same x-and y-coordinates, the affected blocks were averaged and rounded up to the nearest ABA criterion (i.e., non-PAG, uncertain, PAG). These resulting blocks were used to contour the boundary strings and assign an ABA criterion to the UPS (Figures 4.5 and 4.6). Surface area ratios for the rock types and ABA designation were then calculated (Table 4.4) and used in the PHREEQCI input file.

Figure 4.7 details the PHREEQCI model construction for RP3 effluent during the production phase. The chemical inputs for each of the lithologies from the non-PAG and uncertain material were mixed, respectively, based on their relative proportions of the UPS. The final PAG solution was done by simulating the oxidation of pyrite for a six month period. The three solutions (solutions 8,9, and 10 in Figure 4.7) were mixed in relation to their surface area percentages. The PHREEQCI input file is provided in Appendix A.

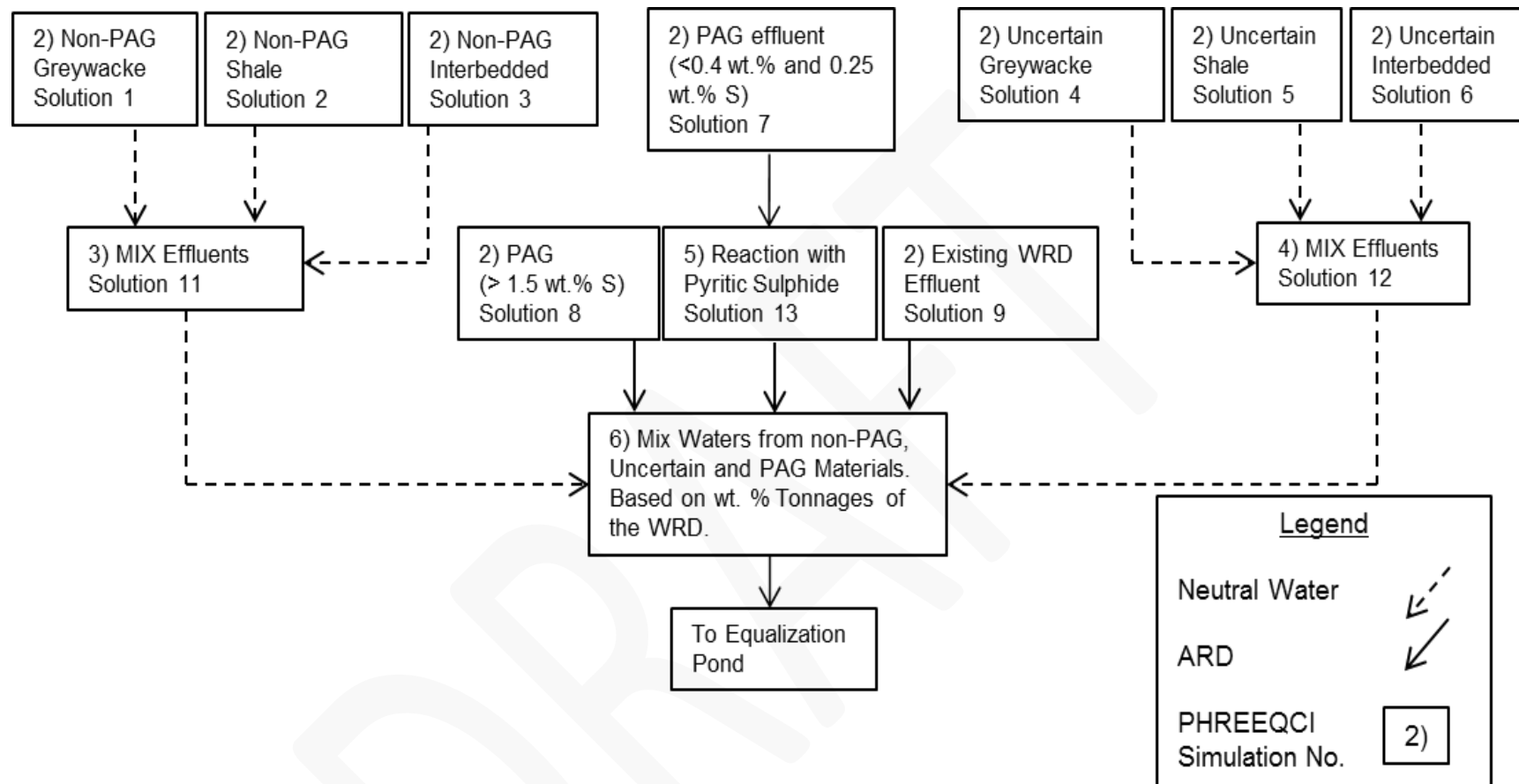


Figure 4.3: Waste Rock Dump Geochemical Model Construction

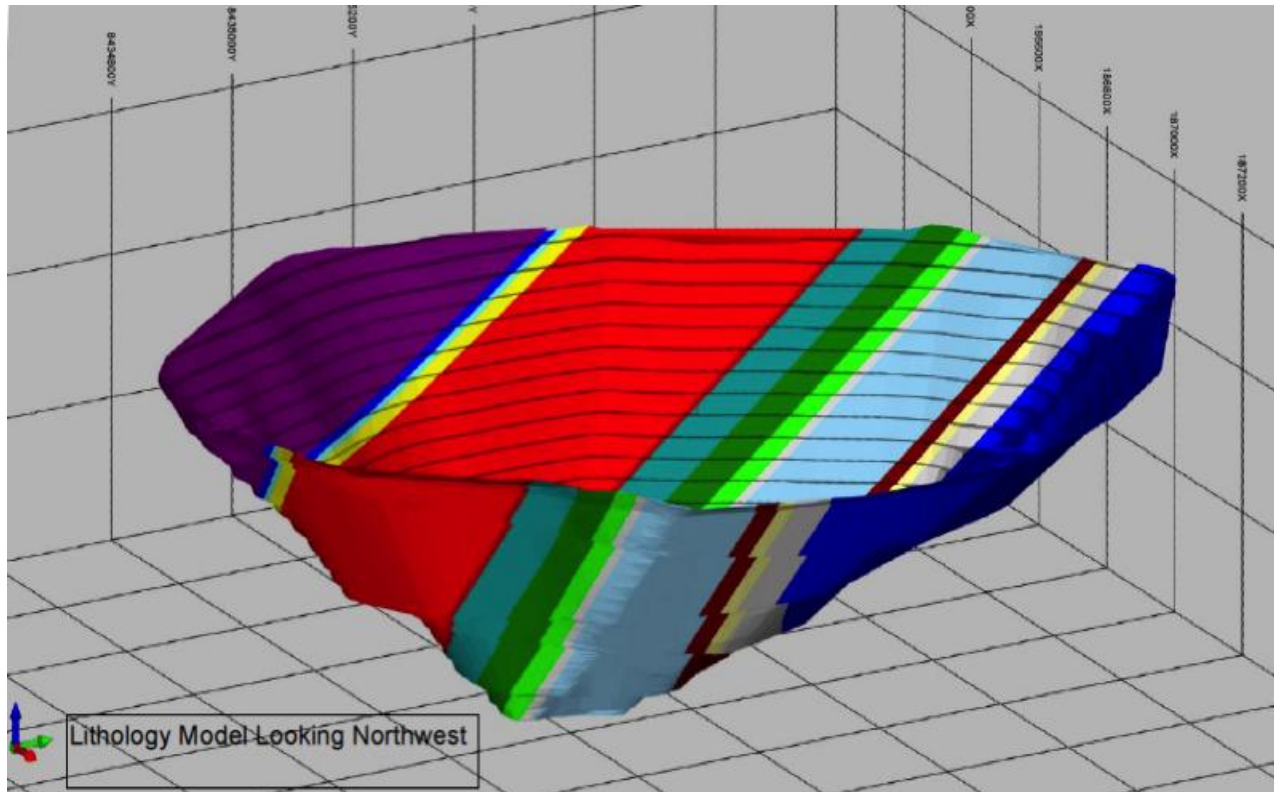


Figure 4.4: Ultimate Pit Surface showing the Block Model Mapable Units– 3D Looking Northwest

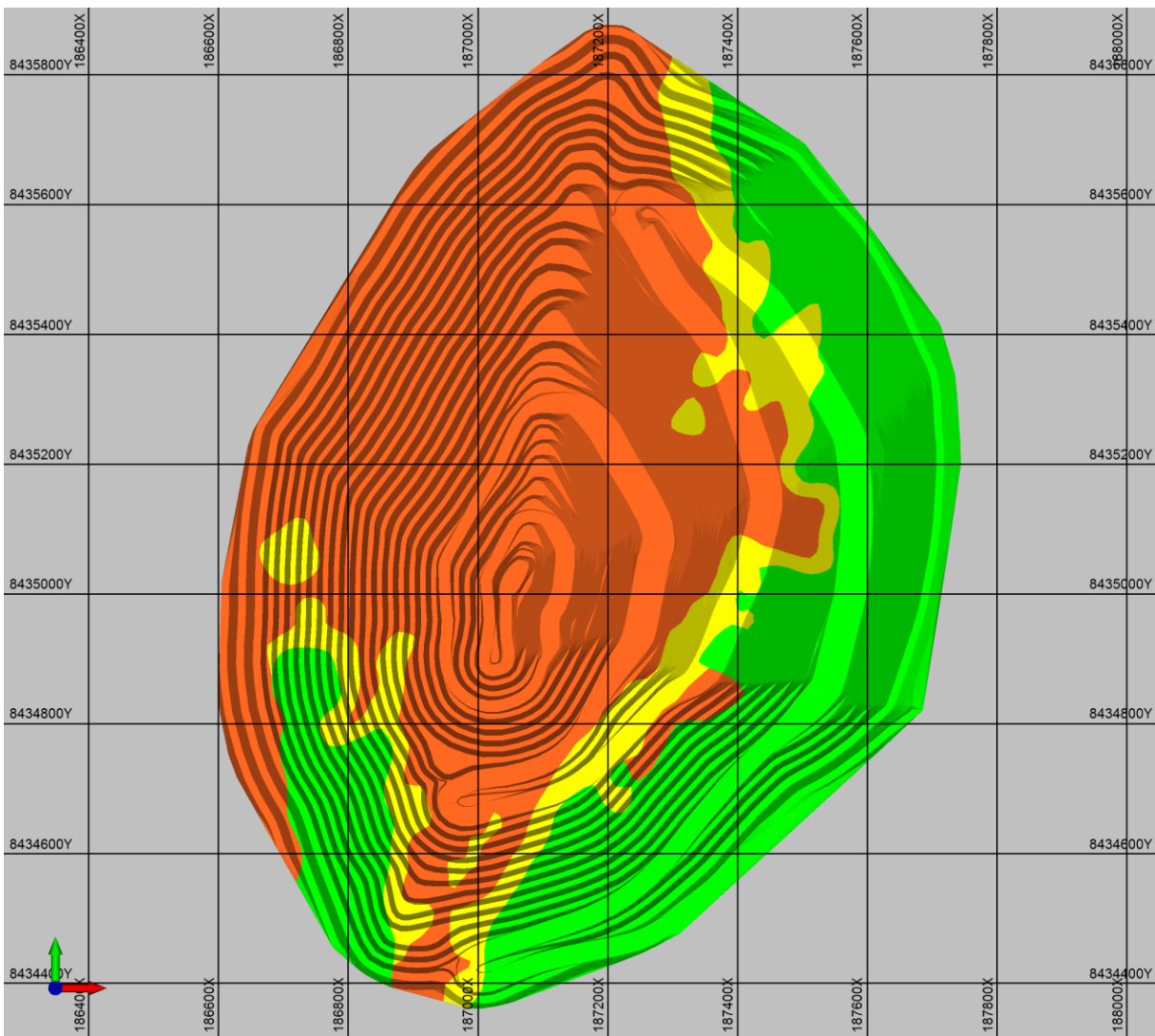


Figure 4.5: Ultimate Pit Surface with Color Coded ABA Criteria-Plan View

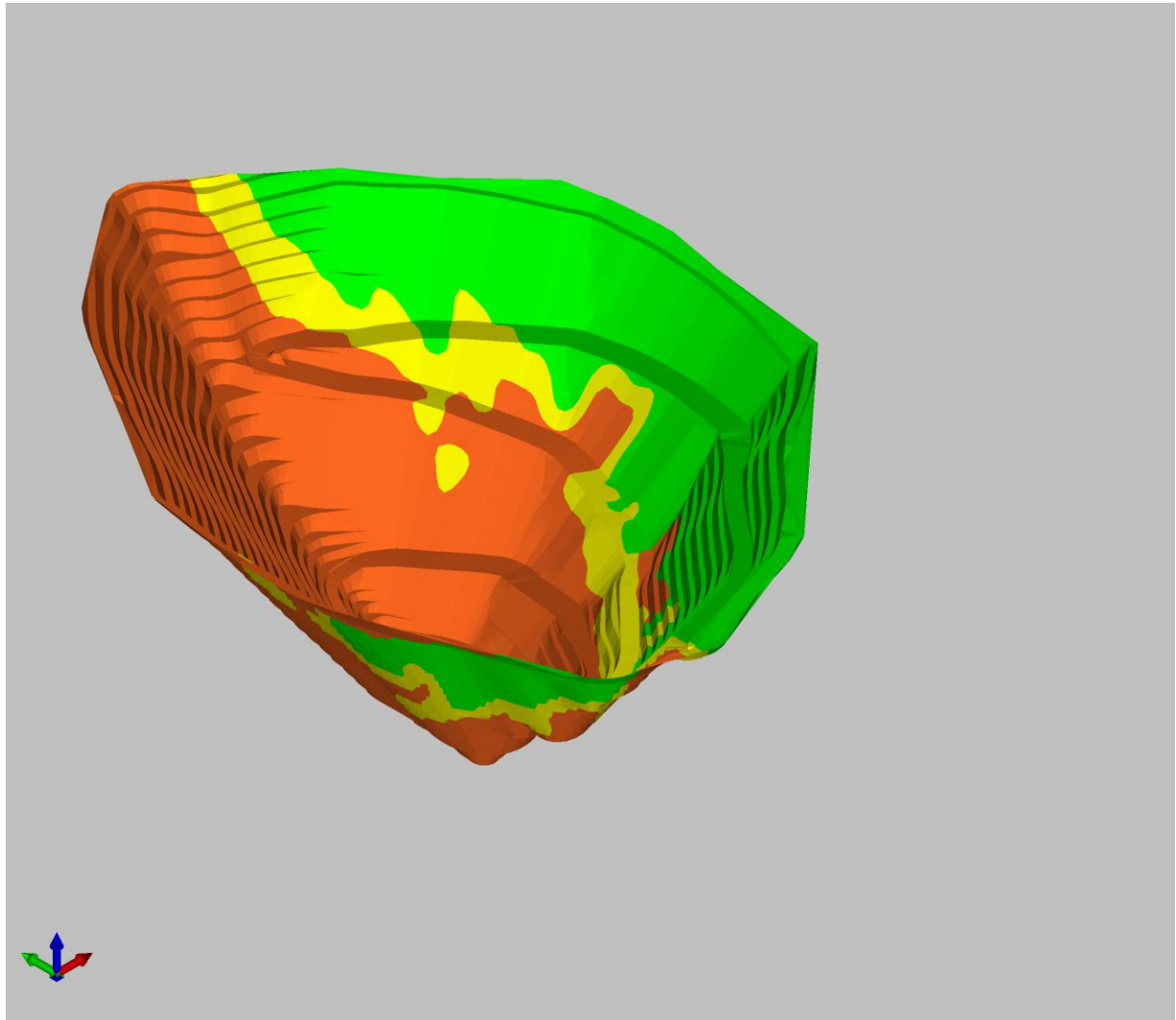


Figure 4.6: Ultimate Pit Surface with Color Coded ABA Criteria-3D Looking Northwest

Table 4.4: UPS Surface Area Ratios Percentages used in Modeling

Lithology	Greywacke	Shale	Interbedded	Sum
Non-PAG (< 0.25 % S)				
surface area	330,314	72,154	211,449	613,917
percentage	53.80%	11.75%	34.45%	100%
PAG (>0.4 % S)				
surface area	367,179	240,109	452,982	1,060,270
percentage	34.63%	22.65%	42.72%	100%
Uncertain (< 0.4 % S and > 0.25 % S)				
surface area	120,429	23,823	94,959	239,211
percentage	50.34%	9.96%	39.70%	100%
non-PAG, PAG, and Uncertain Surface Area Percentages for UPS				
	non-PAG	Uncertain	PAG	
surface area	613,917	239,211	1,060,270	1,913,398
percentage	32.09%	12.50%	55.41%	100%

Surface area units are m²

Tuff surface area = ~2 % of total surface area of UPS (not included in calculations)

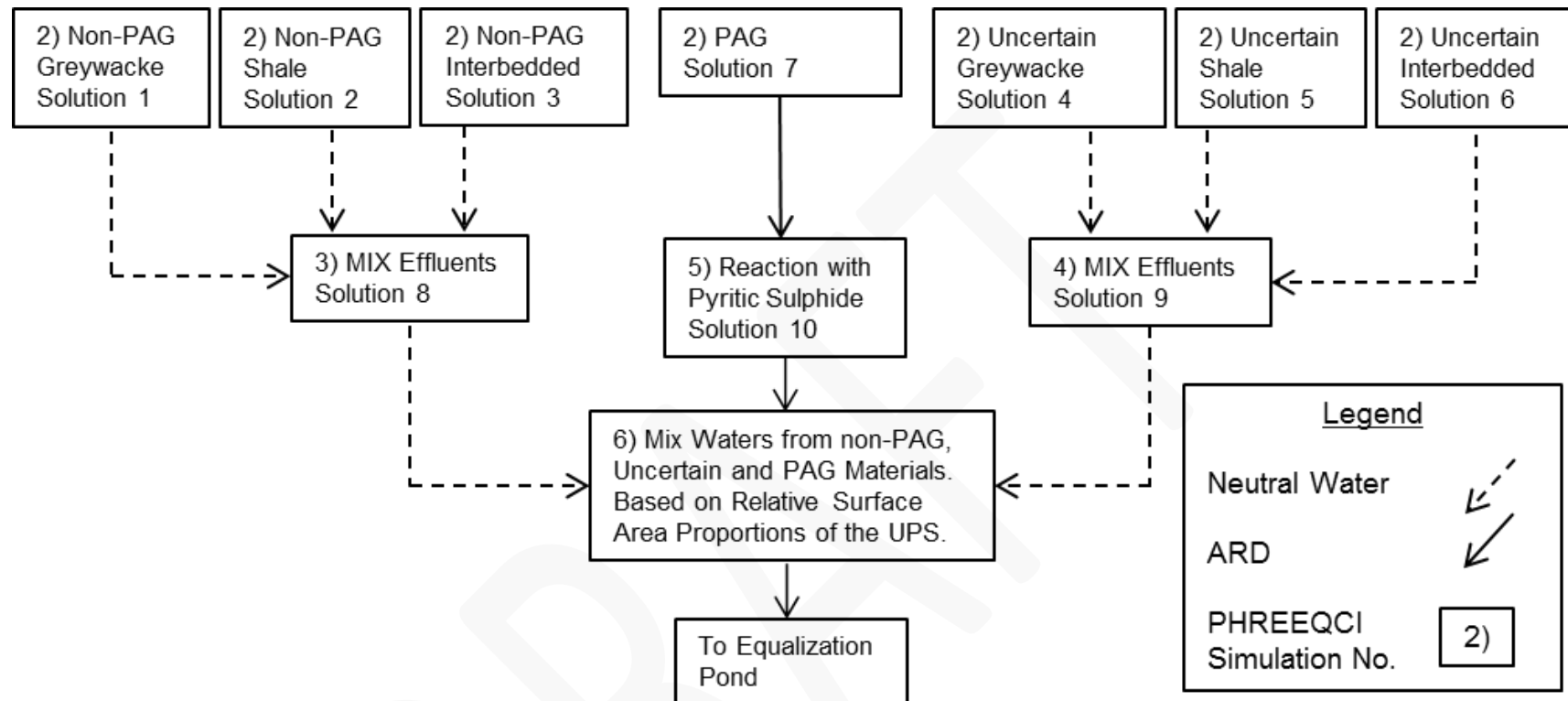


Figure 4.7: RP3 Geochemical Model Construction

4.2.6 Equalization Pond Geochemical Model

The Equalization Pond is a reservoir for storage of water prior to being sent to the WTP. To accurately predict the water chemistry at the Equalization Pond each input requires a representative chemistry. This was done by comparing current and past water quality data. As mentioned above, input chemistries for RP1 and RP3 were based on predictive chemical modeling. Chemical inputs for RP2, RP5, HLP, and the RP7 detox liquor were based on current site data. Representative chemistry concentrations are provided in Appendix A. An explanation of these source terms is provided below:

- RP2 (LGOS pond)- To date, RP2 is collecting seepage from the LGO stockpile and from RP5. Due to the dilution factor from RP5, the current RP2 chemistry does not accurately represent direct seepage from the LGO stockpile. The most representative estimation of the predicted seepage into RP2 was assessed to be from current RP1 site data collected on November 17, 2011 (Vista 2011 site data). Comparison of current RP1 values with RP2 statistics (n=6) from GHD (2011), show that all RP1 concentrations, are slightly greater than the corresponding RP2 values (no less than 57%), which is within reason considering the dilution from RP5.
- RP5 (Plant runoff pond)- Since no augmentation to the current RP5 catchment is anticipated, water samples collected in November 2011 will be used as the representative source input. Comparison between current site data (collected November 17, 2011) and past surface water measurements (GHD, 2011) from RP5 were used to validate the use of current site chemical data. The current site water data was deemed acceptable to use as a representative input source.
- HLP (Heap leach pond)- On site water from the heap leach pond was deemed acceptable as an input source based on comparison from average water quality samples collected by GHD in 2011 (GHD, 2011).
- RP7 (Tailings detox liquor)- Predictive water quality values were determined by comparison of historic and recent water quality concentrations and trends related to the seasonal fluctuations of TSF1. A comparison of these reported values validate the use of the existing 2011 (Vista) concentrations. During the production phase, process water will be incorporated into TSF1 and 2. This will result in more alkaline water quality concentrations and low metal concentrations due to influx of process water. Thus it is acceptable to use current supernatant water as the predictive chemical signature during the production phase of the mine.

The final input source is an estimation of the total amount of precipitation that is estimated to be accumulated in the Equalization Pond. Precipitation predictions were based on past climate data and using dynamic modeling simulation software (Goldsim[®]) to predict biannual precipitation.

Biannual water quality predictions for the Equalization Pond were accomplished using mixing reactions in PHREEQCI (Parkhurst and Apollo). Figure 4.8 details the setup for the geochemical model for the Equalization Pond chemistry. Using the mixing ratios of the seven source inputs (shown in Table 4.1), solution chemistry is attained for the Equalization Pond for both the wet and dry season, respectively. This process is repeated for the following yearly interval, and is repeated throughout the production phase. The PHREEQCI input file is provided in Appendix A.

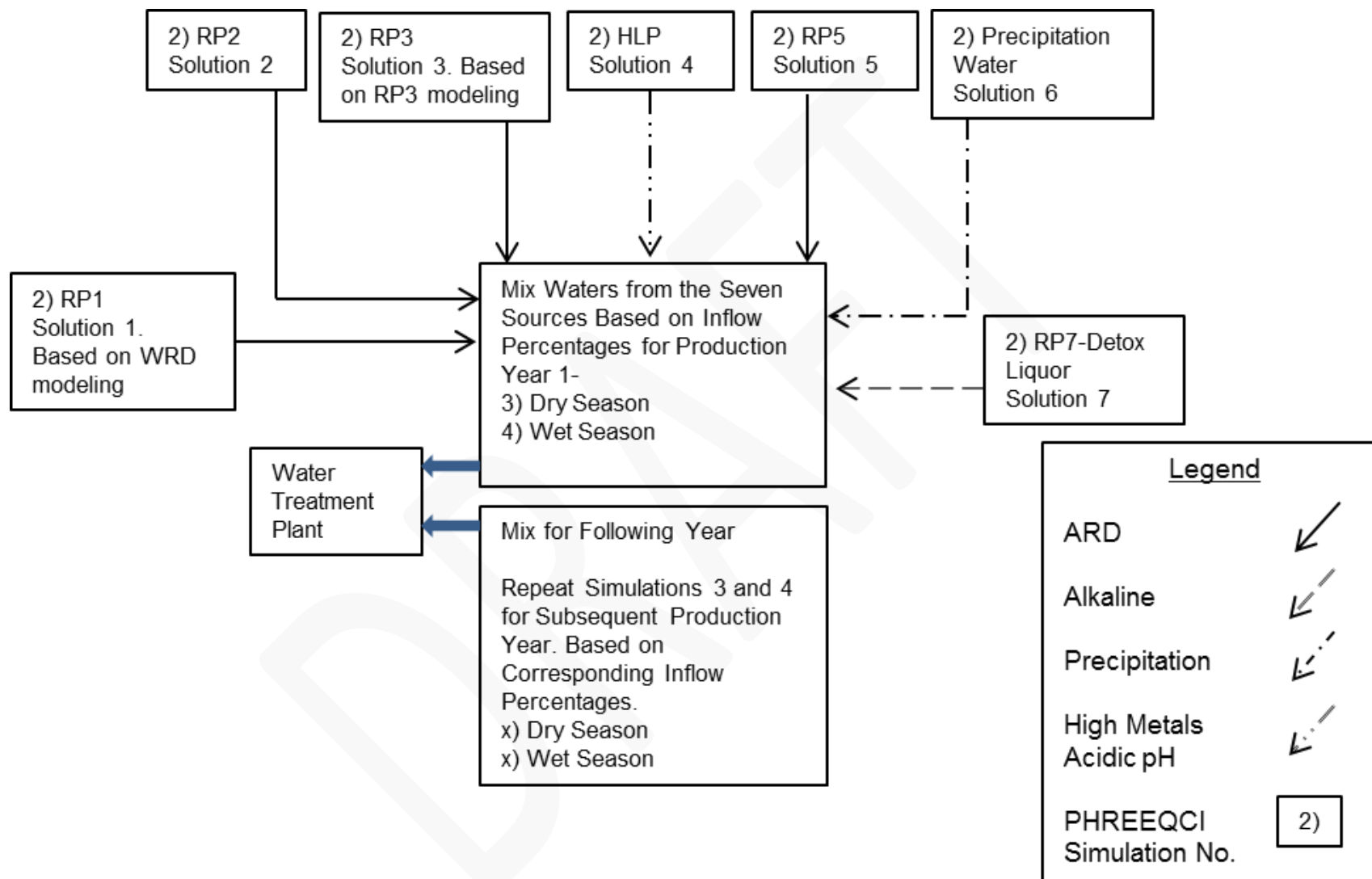


Figure 4.8: Flow Chart of Equalization Pond Geochemical Model Construction

4.3 Predictive Modeling Results

The affinity of the rock types to generate acid, in conjunction with the high percentage of PAG and uncertain material comprising the WRD, is instrumental in the RP1 effluent chemistry. The final solution chemistry for the WRD seepage and subsequent RP1 effluent that will be reporting to the Equalization Pond is shown in Table 4.5. In brief, the WRD and RP1 will be a source of ARD/ML to the Equalization Pond with relatively low concentrations of metals.

PAG material is estimated to compose approximately 55% of the UPS. As a result RP3 is predicted to generate poor water quality. The predicted chemical effluent reporting from RP3 is given in Table 4.5. The predicted results of the Equalization Pond chemistry are provided in Table 4.6. In general, the pH of the Equalization Pond is expected to be below 5.0 during both the wet and dry seasons. Additionally, the Equalization Pond is expected to have elevated aluminum, copper, potassium, magnesium, sulphate, and chloride.

4.4 Modeled Versus Current Mine Schedule

The modeled results shown for the Equalization Pond were completed based on a previous mine schedule of 17 years. The current mine schedule anticipates life of mine up to 11 years. However, the change in production schedules in regards to the Equalization Pond modeling should not significantly change the modeled results for the initial 11 years.

Table 4.5: Predictive Solution Chemistries for RP1 and RP3

Analyte	RP1	RP3
pH	4.00	3.98
Ag	0.00007	0.00007
Al	1.74	0.077
As	0.0089	0.0085
B	0.0912	0.0943
Ba	0.0090	0.0093
Be	0.0002	0.0002
Bi	0.0027	0.0028
C	0.1305	0.1305
Ca	9.0681	4.0942
Cd	0.0074	0.0002
Co	0.1368	0.0354
Cr	0.0004	0.0004
Cu	0.5685	0.0064
Fe	0.0005	0.0005
K	6.5199	6.6088
Li	0.0051	0.0052
Mg	17.56	4.86
Mn	0.0127	0.0015
Mo	0.0003	0.0003
Na	2.562	1.602
Ni	0.1733	0.0886
P	0.0879	0.1045
Pb	0.0230	0.0199
SO ₄	115.4	42.728
Sb	0.0005	0.0005
Se	0.0003	0.0003
Si	0.8003	0.8112
Th	0.0001	0.0001
Ti	0.0003	0.0003
U	0.0001	0.0001
V	0.0004	0.0004
Zn	1.748	0.063
Cl	3.987	2.958

Values are in mg/L
pH is in Std Units

Table 4.6: Predicted Equalization Pond Solution Chemistry-Production Phase

Date Range	Season	Year	pH	Ag	Al	As	B	Ba	Be	Bi	C	Ca	Cd	Co	Cr	Cu	Fe	K	Li
Aug 1-Sep 30	DRY	1	3.48	0.023	27.94	0.03	0.011	0.004	0	0	0.13	184.89	0.06	0.684	0.0011	4.66	0.0158	20.38	0.0001
Oct 1-Apr 30	WET		3.56	0.014	19.92	0.02	0.032	0.005	0.0001	0.0008	0.13	67.78	0.039	0.452	0.0007	3.09	0.0083	9.05	0.0015
Apr 30-Sep 30	DRY	1 & 2	3.81	0.023	4.65	0.03	0.06	0.008	0.0001	0.0015	0.13	20.39	0.005	0.079	0.0005	0.48	0.0026	9.26	0.0028
Oct 1-Apr 30	WET	2	7.62	0.096	0	0.11	0.114	0.011	0.0002	0.0022	2.96	23.82	0.008	0.126	0.0003	0.82	0	29.44	0.0043
Apr 30-Sep 30	DRY	2 & 3	3.57	0.032	16.72	0.04	0.051	0.008	0.0001	0.0011	0.13	45.03	0.029	0.349	0.0008	2.43	0.0079	11.3	0.0022
Oct 1-Apr 30	WET	3	3.57	0.028	16.98	0.036	0.043	0.007	0.0001	0.0009	0.13	78.77	0.037	0.44	0.0008	3.01	0.0087	13.32	0.0018
Apr 30-Sep 30	DRY	3 & 4	4.57	0.078	0.13	0.091	0.101	0.009	0.0002	0.002	0.13	41.91	0.016	0.22	0.0008	1.43	0.0003	25.78	0.004
Oct 1-Apr 30	WET	4	3.58	0.027	16.31	0.035	0.041	0.007	0.0001	0.0009	0.13	91.43	0.038	0.443	0.0008	3	0.0087	14.37	0.0017
Apr 30-Sep 30	DRY	4 & 5	3.78	0.041	5.11	0.051	0.076	0.01	0.0002	0.0017	0.13	30.67	0.009	0.13	0.0007	0.85	0.0033	14.17	0.0033
Oct 1-Apr 30	WET	5	3.56	0.028	18.05	0.036	0.046	0.008	0.0001	0.001	0.13	59.19	0.037	0.438	0.0008	3.01	0.0086	11.37	0.002
Apr 30-Sep 30	DRY	5 & 6	3.58	0.032	15.14	0.041	0.055	0.008	0.0001	0.0012	0.13	41.08	0.023	0.279	0.0008	1.94	0.0073	11.53	0.0024
Oct 1-Apr 30	WET	6	3.57	0.027	17.67	0.035	0.042	0.007	0.0001	0.0009	0.13	68.34	0.037	0.438	0.0008	3.02	0.0086	12	0.0017
Apr 30-Sep 30	DRY	6 & 7	3.58	0.032	15.01	0.041	0.058	0.008	0.0001	0.0013	0.13	46.02	0.023	0.286	0.0008	1.97	0.0074	12.13	0.0025
Oct 1-Apr 30	WET	7	3.57	0.027	17.69	0.035	0.043	0.007	0.0001	0.0009	0.13	73.65	0.038	0.448	0.0008	3.06	0.0088	12.65	0.0018
Apr 30-Sep 30	DRY	7 & 8	3.71	0.041	7.54	0.05	0.073	0.009	0.0002	0.0016	0.13	35.19	0.016	0.202	0.0007	1.36	0.0045	14	0.0032
Oct 1-Apr 30	WET	8	3.56	0.027	17.75	0.035	0.044	0.007	0.0001	0.001	0.13	68.66	0.038	0.444	0.0008	3.04	0.0087	12.2	0.0019
Apr 30-Sep 30	DRY	8 & 9	4.55	0.073	0.13	0.086	0.101	0.009	0.0002	0.0021	0.13	40.23	0.014	0.199	0.0008	1.28	0.0003	25.23	0.0041
Oct 1-Apr 30	WET	9	3.55	0.027	18.64	0.035	0.045	0.007	0.0001	0.001	0.13	59.29	0.038	0.447	0.0008	3.08	0.0087	11.19	0.0019
Apr 30-Sep 30	DRY	9 & 10	4.31	0.05	0.42	0.061	0.095	0.011	0.0002	0.0022	0.13	25.64	0.01	0.144	0.0007	0.88	0.0006	17.02	0.0042
Oct 1-Apr 30	WET	10	3.57	0.027	17.5	0.035	0.044	0.007	0.0001	0.001	0.13	72.91	0.038	0.443	0.0008	3.03	0.0087	12.59	0.0019
Apr 30-Sep 30	DRY	10 & 11	3.58	0.032	15.86	0.041	0.057	0.008	0.0001	0.0013	0.13	53.77	0.028	0.338	0.0008	2.31	0.0079	12.66	0.0025
Oct 1-Apr 30	WET	11	3.54	0.032	18.98	0.041	0.05	0.007	0.0001	0.0011	0.13	60.15	0.037	0.441	0.0008	3.04	0.0092	12.44	0.0021
Apr 30-Sep 30	DRY	11 & 12	7.26	0.092	0	0.105	0.11	0.01	0.0002	0.0021	1.37	30.15	0.011	0.16	0.0007	1.04	0	28.83	0.0042

The following constituents were not provided for all solutions and are likely underestimated in the Equalization Pond: Ag, B, Ba, Be, Li, Mo, P, Sb, Se, Si, Th, Ti, U, V
Cyanide concentrations are not presented here: A simple dilution calculation based on the inflows and TSF can be provided. However, the heap leach pad will also contribute cyanide

Date Range	Season	Year	pH	Mg	Mn	Mo	Na	Ni	P	Pb	S(6)	Sb	Se	Si	Th	Ti	U	V	Zn	Cl
Aug 1-Sep 30	DRY	1	3.48	195.3	9.627	0.015	288.5	0.646	0.025	0.0259	2022	0.0029	0.0003	0	0	0.0003	0	0.0003	12.732	59.3
Oct 1-Apr 30	WET		3.56	97.4	5.523	0.009	111.8	0.472	0.043	0.024	906.6	0.0019	0.0002	0.102	0.0001	0.0002	0	0.0003	8.816	34.2
Apr 30-Sep 30	DRY	1 & 2	3.81	21.8	0.75	0.015	90.35	0.101	0.078	0.0135	312.7	0.0032	0.0004	0.198	0.0001	0.0004	0.0001	0.0005	1.148	50.6
Oct 1-Apr 30	WET	2	7.62	20.7	0.302	0.063	266.17	0.153	0.173	0.0185	454.2	0.0126	0.0011	0.288	0.0002	0.0013	0.0001	0.0014	1.722	203.8
Apr 30-Sep 30	DRY	2 & 3	3.57	71.3	4.051	0.021	136	0.381	0.074	0.0229	727.3	0.0043	0.0004	0.147	0.0001	0.0005	0.0001	0.0005	6.827	70.9
Oct 1-Apr 30	WET	3	3.57	101	5.441	0.018	162.52	0.456	0.063	0.0241	1005.7	0.0037	0.0004	0.123	0.0001	0.0004	0	0.0004	8.406	64.6
Apr 30-Sep 30	DRY	3 & 4	4.57	43.7	1.715	0.051	237.59	0.244	0.149	0.0208	599.2	0.0102	0.0009	0.266	0.0002	0.0011	0.0001	0.0011	3.592	166.9
Oct 1-Apr 30	WET	4	3.58	108.3	5.608	0.018	177.12	0.449	0.06	0.0232	1098.8	0.0036	0.0004	0.116	0.0001	0.0004	0	0.0004	8.314	63.5
Apr 30-Sep 30	DRY	4 & 5	3.78	33.1	1.268	0.027	147.76	0.156	0.105	0.0171	465.2	0.0055	0.0006	0.23	0.0001	0.0007	0.0001	0.0007	2.07	89.1
Oct 1-Apr 30	WET	5	3.56	89.7	5.148	0.018	135.8	0.467	0.066	0.0252	857.1	0.0037	0.0004	0.134	0.0001	0.0004	0	0.0004	8.556	63.1
Apr 30-Sep 30	DRY	5 & 6	3.58	60.7	3.208	0.021	137.64	0.307	0.079	0.021	667.7	0.0043	0.0004	0.164	0.0001	0.0005	0.0001	0.0005	5.333	71.2
Oct 1-Apr 30	WET	6	3.57	95	5.317	0.018	147.43	0.46	0.061	0.0241	926.7	0.0036	0.0004	0.117	0.0001	0.0004	0	0.0004	8.502	62.8
Apr 30-Sep 30	DRY	6 & 7	3.58	64.2	3.287	0.021	142.89	0.312	0.08	0.0215	706.3	0.0043	0.0004	0.174	0.0001	0.0005	0.0001	0.0005	5.391	70.9
Oct 1-Apr 30	WET	7	3.57	99	5.428	0.018	154.03	0.467	0.063	0.0247	971.6	0.0036	0.0004	0.125	0.0001	0.0004	0	0.0004	8.613	63.2
Apr 30-Sep 30	DRY	7 & 8	3.71	44.8	2.173	0.027	148.15	0.233	0.103	0.0197	541.7	0.0055	0.0006	0.221	0.0001	0.0006	0.0001	0.0007	3.604	88.7
Oct 1-Apr 30	WET	8	3.56	95.7	5.318	0.018	147.51	0.466	0.064	0.0248	931	0.0037	0.0004	0.128	0.0001	0.0004	0	0.0004	8.572	63
Apr 30-Sep 30	DRY	8 & 9	4.55	40.6	1.534	0.048	225.13	0.225	0.147	0.0204	568.2	0.0097	0.0008	0.274	0.0002	0.001	0.0001	0.0011	3.179	157.2
Oct 1-Apr 30	WET	9	3.55	91	5.25	0.018	134.35	0.476	0.064	0.0255	864.4	0.0036	0.0004	0.131	0.0001	0.0004	0	0.0004	8.75	61.9
Apr 30-Sep 30	DRY	9 & 10	4.31	27.9	1.027	0.033	153.48	0.178	0.129	0.0196	385.2	0.0068	0.0007	0.29	0.0002	0.0008	0.0001	0.0008	2.206	108.7
Oct 1-Apr 30	WET	10	3.57	98	5.374	0.018	152.51	0.463	0.063	0.0246	961.7	0.0036	0.0004	0.127	0.0001	0.0004	0	0.0004	8.512	62.6
Apr 30-Sep 30	DRY	10 & 11	3.58	74.6	3.913	0.021	148.89	0.363	0.079	0.0231	786.8	0.0043	0.0004	0.17	0.0001	0.0005	0.0001	0.0005	6.405	71.5
Oct 1-Apr 30	WET	11	3.54	90.9	5.175	0.021	149.98	0.471	0.073	0.0261	890.2	0.0043	0.0004	0.144	0.0001	0.0005	0.0001	0.0005	8.598	72.1
Apr 30-Sep 30	DRY	11 & 12	7.26	28.7	0.773	0.06	260.75	0.186	0.166	0.0193	510.5	0.012	0.001	0.281	0.0002	0.0013	0.0001	0.0013	2.39	194.7

The following constituents were not provided for all solutions and are likely underestimated in the Equalization Pond: Ag, B, Ba, Be, Li, Mo, P, Sb, Se, Si, Th, Ti, U, V
Cyanide concentrations are not presented here: A simple dilution calculation based on the inflows and TSF can be provided. However, the heap leach pad will also contribute cyanide

5.0 IN-PIT TREATMENT OPTIONS

In order for Vista to re-start mining activities, RP3 must be dewatered. Further, emptying RP1 and RP7 would allow redesign of RP1 and possible construction to RP7. However, the quality of the water on site is not suitable for continuous discharge to nearby streams, which are tributaries to the Edith River.

As such, in-situ treatment of RP3 is being conducted by use of limestone and quicklime (Vista Gold, 2013). Treatment has been undertaken with the goal of producing water that can be discharged at rates that continue to protect the quality of the Edith River. In-situ treatment is being conducted as it allows for discharge of treated water in a suitable timeframe to meet with project schedule requirements. As of Spring 2012, it is estimated that between 12 and 14 giga-liters (GL) of impacted water are currently on site with 11 GL within RP3 and three (3) GL from other sources across the site.

5.1 Water Quality

Water quality within RP3 has varied due to inputs from other ARD/ML sources. It is assumed that water in RP1 and RP7 have the same approximate chemistry as RP3, as water from RP7 will be treated and pumped back into RP3. Table 5.1 shows the current water quality at RP3 as a result of micronized lime treatment (Vista Gold, 2013).

The downstream interim trigger values for the Edith River are presented in Section 1, Introduction. Interim values for cyanide and arsenic were set at Australian Drinking Water Limits (Table 1.1), though these parameters are not specifically included in the WDL 178-2. Arsenic and cyanide may be present in the discharge from RP3, due to pumping of RP7 water into RP3.

Table 5.1: Current RP3 Water Quality (after Treatment)

Analyte	Units	Treated Pit Lake Water
		RP3
Date analyzed	n/a	13-Apr
pH-Field	std units	7.26
Electrical Conductivity (EC) -Field	µS/cm	2661
Temp	°C	26.9
Dissolved Oxygen	% saturation	91.8
Calcium - Dissolved	mg/L	440
Potassium - Dissolved	mg/L	
Sodium - Dissolved	mg/L	49
Magnesium - Dissolved	mg/L	110
Hardness mg CaCO ₃ /L	mg/L	1600
Total Alkalinity as CaCO ₃	mg/L	37
Sulphate, SO ₄ ²⁻	mg/L	1500
Chloride, Cl ⁻	mg/L	8
Total Dissolved Solids	mg/L	1200
Total Suspended Solids	mg/L	<5
Cyanide	mg/L	<0.004
WAD Cyanide	mg/L	-
Aluminum-(0.45µm filtered)	µg/L	230
Cadmium-(0.45µm filtered)	µg/L	5.1
Cobalt-(0.45µm filtered)	µg/L	57
Copper-(0.45µm filtered)	µg/L	27
Chromium-(0.45µm filtered)	µg/L	1
Iron-(0.45µm filtered)	µg/L	<10
Lanthanum -(0.45µm filtered)	µg/L	-
Lead-(0.45µm filtered)	µg/L	1
Manganese-(0.45µm filtered)	µg/L	1500
Mercury-(0.45µm filtered)	µg/L	<0.05
Nickel-(0.45µm filtered)	µg/L	64
Zinc-(0.45µm filtered)	µg/L	210

Notes: Data taken from Vista Gold (2013), April 2013 sampling

5.2 Discharge Limits

Discharge limits for RP3 water were calculated based on the interim trigger values and the projected available dilution from the Edith River (as predicted by a model of the Edith River system created by Envirotech Monitoring) and historic background water quality in the Edith River upstream of the mine discharge. The dilution ratios were calculated for each constituent by analyzing the historic data available for the Edith River for both flow rates and background contaminant concentrations. Because of the great variation in flows during the wet and dry seasons, two different treatment plans were examined: year-round discharge and wet season only discharge. Because there is more dilution available during the wet season, the required effluent quality is less than that of year round discharge. Therefore, two distinct sets of effluent limits were created and are presented in Table 5.2.

The effluent goals are based on a Wet-Season only effluent discharge rate of 1,375 m³/hr and a year-round effluent discharge rate of 800 m³/hr.

A conservative (e.g., no reactivity) water quality model was developed to determine the effluent goals. A mass balance was performed for each constituent, the goal of which was to determine the allowable concentration of each parameter that could be discharged. Inputs into the model included the discharge flow rate, estimated Edith River flow rate, the background water quality concentration in the Edith River, and the interim trigger values for the allowable downstream concentration. Daily calculations of the effluent limits were made by the model, assuming that each parameter was conservative in the river. Effluent limits were determined by finding the median allowable discharge concentration over the full year and over the wet season. The median value was reduced by 20% to provide a safety factor. This calculation resulted in the effluent goals (Table 5.2).

5.3 Micronized Lime

5.3.1 Treatment Methodology

Micronized Lime treatment was investigated by Micronised Mineral Solutions Pty Ltd (MMS) at the request of Vista. MMS issued two reports to Vista in 2011 that summarized the treatment methodology, laboratory results, and expected cost to implement. As described in the MMS report entitled "Acid water neutralization and the production of pollutants and precipitation of heavy metals as insoluble solids" (MMS, 2011a), this treatment technology utilizes very finely ground calcium carbonate (< 150 µm) and quicklime to raise the pH of the impacted water and precipitate metals. Utilization of the finely ground calcium carbonate (limestone) is the key to the treatment effectiveness, as the small grain size serves to extend the reactivity time of the particles by extending the time in which they are suspended in solution prior to settling to the bottom of the pit lake. This is achieved by the reaction between sulphuric acid, a component of the RP3 water, and the calcium carbonate particles. This reaction results in the production of carbon dioxide gas, which in turn provides buoyancy to the calcium carbonate particles. This extended settling time allows for a more efficient use of calcium carbonate and quicklime to raise the pH to the required levels. The treatment methodology includes raising the pH of the water within RP3 to greater than pH 7.0 using calcium carbonate and quicklime in succession to capitalize on the capabilities of the low-cost limestone and minimize the quantity of quicklime required to attain a pH sufficient to precipitate additional metals. Raising the pH to greater than 7.0 will result in the precipitation of the key metals of concern including iron, aluminum, chromium, copper, lead, nickel, cadmium, cobalt, and zinc.

Table 5.2: Pit Lake Water Discharge Criteria

Analyte	Unit	Dilution Ratio	Effluent Goal	
			Wet Season	Year Round
Electrical Conductivity	µS/cm	10.6	1,771	232
Magnesium	mg/L	128	13.6	2.2
Sulphate	mg/L	13.0	987	121
Aluminum	µg/L	1,010	119	119
Cadmium	µg/L	788	1.40	0.19
Cobalt	µg/L	17.0	682	84.5
Chromium (III)	µg/L	-	18.4	2.9
Chromium (VI)	µg/L	-	0.8	0.8
Copper	µg/L	5,500	16.0	2.4
Manganese	µg/L	10.7	14.4	1.7
Nickel	µg/L	159	77.4	10.2
Lead	µg/L	90.3	19.1	3.0
Iron	µg/L	-	-	-
Mercury	µg/L	-	3.9	0.55
Zinc	µg/L	5,110	61.8	8.7
Cyanide	mg/L	-	0.61	0.08
Arsenic	mg/L	-	0.08	0.01

5.3.2 Preliminary Treated Effluent Water Chemistry

Compliance with wet season discharge limits for various constituents is delineated below (Table 5.3). As wet season discharge limits are less restrictive than dry season discharge limits, compliance with the wet season discharge limits represents the best case scenario for treatment discharge compliance.

To meet all of the trigger values, the dilution ratio required (the ratio of river flow to discharged water) is 464:1. For a discharge at the wet season average flow of 1,375 m³/hr, the flow in the Edith River would have to exceed 638,000 m³/hr. The streamflow prediction indicates that this flow rate will only be exceeded three times annually. For a discharge at the year round discharge average flow of 800 m³/hr, the flow in the Edith River would have to exceed 371,200 m³/hr. This is projected to occur only seven times annually.

Table 5.3: Micronized Lime Treated Effluent Water Chemistry

Analyte	Units	Effluent Goal		Micronized Lime	
		Wet Season	Year Round	RP3 Treated Water (April 2013) ⁽²⁾	58137-2 Untreated Water ⁽¹⁾
EC	µS /cm	1,771	232	2661	2,700
pH	S.U.			7.26	3.4
Magnesium	mg/L	13.7	2.24	110	200
Sulphate	mg/L	987	121	1500	1,800
TDS	mg/L			1200	1,300
Ferrous Iron	mg/L				1
Aluminum (D)	µg/L	119	119	230	64,000
Arsenic	mg/L	0.08	0.01		
Cadmium (D)	µg/L	1.40	0.19	5.1	140
Cobalt (D)	µg/L	683	84.5	57	1,600
Copper (D)	µg/L	16.0	2.44	27	12,000
Chromium (D)	µg/L	18.4	2.96	1	2
Chromium(VI)	µg/L	0.80	0.80		< 0.01
Iron (D)	µg/L	NA	NA	<10	750
Lead (D)	µg/L	19.2	3.06	1	220
Manganese (D)	µg/L	14.4	1.78	1500	22,000
Mercury (D)	µg/L	3.91	0.55	<0.05	< 0.1
Nickel (D)	µg/L	77.4	10.2	64	1,600
Zinc (D)	µg/L	61.8	8.71	210	44,000

Notes: (D) Dissolved, sampled with 0.1 µm filter

(1) Excerpted from Micronized Mineral Solution, LTY Acid water neutralization and the production of pollutants and precipitants of heavy metals as insoluble solids (MMS, 2011a)

(2) Data taken from mttodd.com.au, April 2013 sampling

6.0 CONCEPTUAL WETLAND TREATMENT SYSTEM

Vista intends to install constructed wetlands on the site to treat seepage and runoff from facilities that will generate ARD/ML (e.g., RP1) or alkaline but metal laden water (TSF1 and TSF2) once flow rates are reduced to levels that makes passive treatment viable. This section addresses the input water quality, provides the current design basis and makes recommendations for additional study as the project advances.

This section provides an introduction to the mechanisms and processes controlling removal of metals and sulphate within a subsurface constructed wetlands and the primary design criteria.

6.1 Background Information

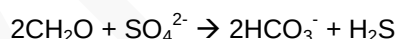
Subsurface constructed wetlands are commonly used passive treatment technology for treatment of mining impacted waters (ITRC, 2003; Gusek, 2000; and Gazea, 1996). Subsurface wetlands, when properly constructed, create an oxygen deficient environment which enables the growth of sulphate-reducing bacteria (SRB). Growth of the SRB is encouraged by the presence of the desired electron acceptor (sulphate) and electron donors (organic carbon substrates), while minimizing the population of other bacteria that would compete for the electron donors. Maintaining an oxygen deficient system is critical in minimizing the population of bacteria that may scavenge the electron donors from the SRB and thereby minimize the growth of the SRB populations.

The presence of the electron acceptor, sulphate, is provided in the Aspen Pond/GP source groundwater. The electron donors in the form of organic carbon substrates must be supplied in the constructed wetland. Common electron donors used in subsurface constructed wetlands include manure (e.g., horse, cow, or sheep), woodchips, straw, or other organic matter. Substrate selection is often based on the availability of materials near the project site, and a wide variety of combinations of substrates have proven effective for treatment. A key to an effective long-term system is that short-chain, or easily metabolized carbon sources, are intermingled with long-chain carbon sources to provide carbon sources over a long time frame (Johnson and Hallberg, 2005).

The key mechanisms for treatment within a subsurface constructed wetland include (Doshi, 2006):

- Sulphate reducing bacteria respire sulphate and transform the sulphate to soluble sulphides (H_2S , HS^- and S^{2-}).
- The soluble sulphides react with cationic metal ions (i.e. Me^{2+} such as Fe, Ni, Cu, Zn) to form highly insoluble metal sulphides.

The reaction can be simplified as follows:



where CH_2O is a simple organic carbon source. In addition, sorption of dissolved metals to negatively charged substrates may result in short-term or long-term immobilization (Halverson, 2004).

6.2 Primary Design Parameters

Design parameters for subsurface constructed wetlands fall into two categories; treatment removal design parameters, hydraulic design parameters, and considerations for construction, operations and maintenance. Treatment removal design parameters stem from design goals to remove key constituents. Treatment removal depends on creating an environment where the mechanisms for removal discussed above are favored.

Hydraulic design parameters include the aspect ratio (length to width) in the wetland, the porosity of the wetland substrate, hydraulic conductivity of the wetland substrate, the Hydraulic Retention Time (HRT) of the mine water in the treatment wetland, and hydraulic gradient of the wetland as constructed. An aspect ratio of 2:1 is often recommended in literature and case studies to mitigate the likelihood of flow moving from the subsurface to the surface. The porosity of the wetland substrate is an important design

parameter, but is difficult to measure as it depends on the compaction of the placed compost, woodchip, and gravel mixture in the wetland. For purposes of design, a void space ratio of 0.35, which is a typical porosity for installed subsurface wetlands, will be targeted. Over time, the porosity may change as a result of bacterial growth and chemical precipitates. The hydraulic conductivity of the wetland also depends on the substrate placement. The HRT depends on the porosity of the wetland cell, as well as the size (volume) of the wetland cell. The width and length of the wetland cells should be maximized while still maintaining the preferred aspect ratio. The hydraulic gradient of the wetland depends both upon the wetland floor slope from inlet to outlet, and the height at which the inlet distribution headers are positioned in relation to the outlet collection structures. A wetland floor slope of up to 2% may be used for design to aid in draining the wetlands for maintenance, if necessary.

The following design factors will assist with construction, operation, and maintenance of the wetland:

- Constructing parallel wetland cells so that one cell may be taken out of service for maintenance while flow is maintained through the second cell;
- Constructing wetland cells so that maintenance can be conducted without disturbing the underlying liners;
- Constructing wetland cells that can be recharged with substrate or chemical additions while minimizing major earthwork required; and
- Constructing hydraulic control structures to provide the maximum allowable control of flow through the wetland systems.

7.0 CONCLUSIONS AND RECOMMENDATIONS

ABA results suggest that approximately 30% of the waste rock samples are highly unlikely to generate acid and a majority of the samples are either potentially acid generating or likely to generate acid. Samples classified as being likely to generate acid have a minimum of 0.20 wt. % HNO_3 extractable sulphide sulphur (≥ 0.22 wt. % total sulphur). Samples grouped under the greywacke rock unit have the lowest HNO_3 extractable sulphide sulphur content. Mixed greywacke/shale samples exhibit the highest average total and HNO_3 extractable sulphide sulphur content as well as the widest range in sulphur content. Insoluble sulphur makes up approximately 30% of the sulphur distribution for each rock unit on average. HCl extractable sulphate sulphur was largely absent suggesting that minimal sulphide oxidation occurred while samples were in storage.

Nine waste rock samples, including three samples from each rock unit, were subjected to humidity cell testing. First round samples were prematurely terminated after 28 weeks, while second round samples have undergone 152 weeks of testing. Weekly leachate quality results were obtained for pH, acidity, alkalinity, electrical conductivity, and sulphate over the entire test duration. The shale sample with low neutralizing potential and 0.43 wt. % HNO_3 extractable sulphide sulphur (VB-006 44-48 S; HC-2, Round 1) produced acidic leachate ($\text{pH} < 6$) from initiation of testing until completion while the remaining humidity cell samples produced leachate with near neutral pH. The second round samples have stabilized at near neutral pH values, however, HC-3B (interbedded) has trended slightly downward before stabilizing at a pH around 6.5. In general, metal loads in the second round samples are below water quality and trigger value guidelines, with exceptions of Mn (HC-3B), Zn (HC-1B, HC-2B, HC-3B), and Ni (HC-3B). Analysis of HC-2 (first round) leachate samples suggest that copper, lead, nickel, and zinc may be of concern at lower pH values. Cells producing neutral pH leachate show comparatively higher levels of arsenic and antimony suggesting that meteoritic water contact could result in release of these oxyanion constituents.

The ABA data and “first flush” leachate results indicate that very little sulphide oxidation took place prior to initiation of the humidity cell program. Elevated trace metal levels were observed in leachate samples from the acid generating shale sample subjected to humidity cell testing. Cells that produced neutral pH leachate showed comparatively high levels of arsenic and antimony, suggesting the presence of aqueous oxyanions that may impact water quality.

ABA results from testing of tailings sample produced in 2010 and 2011 suggest the tailings are likely to eventually generate acid. These results are consistent with the findings in the 1992 EIS. However, the tailings supernatant and water leach testing of the tailings have alkaline pH suggesting that a delay in the onset of acidic conditions will occur.

The results suggest that the tailings are likely to be a source of regulated constituents under both non-acidic and acidic conditions.

Production phase predictive geochemical modeling suggests that RP1 water will have an acidic pH of 4.00 and relatively low metal concentrations. Metals of interest include:

- Cobalt- 0.136 mg/L;
- Copper – 0.57 mg/L;
- Cadmium -0.007 mg/L;
- Sulphate – 115 mg/L;
- Nickel - 0.17 mg/L; and
- Lead – 0.02 mg/L.

Equalization Pond water quality predictions during the production phase incorporated all water inputs sources across the mine site. Biannual estimates suggest the Equalization Pond will be predominantly acidic with a pH between 3.5 and 7.6, with a mean pH value of 4.0. Neutral pH values are the result of the

high RP7 inflow proportion reporting to the Equalization Pond. Metal concentrations fluctuate depending on the input source reporting to the Equalization Pond. Metal concentrations of interest include:

- Sulphate (313 to 2022 mg/L; mean = 782 mg/L);
- Cadmium (0.005 to 0.06 mg/L; mean = 0.028 mg/L);
- Manganese (0.3 to 9.6 mg/L; mean = 3.9 mg/L);
- Zinc (1.1 to 12.7 mg/L; mean = 6.3 mg/L);
- Cobalt (0.08 to 0.68 mg/L; mean = 0.34);
- Magnesium (21 to 195; mean = 74 mg/L);
- Copper (0.48 to 4.6 mg/L; mean = 2.3 mg/L);
- Nickel (0.1 to 0.64 mg/L; mean = 0.36 mg/L);
- Lead (0.014 to 0.027 mg/L; mean = 0.022 mg/L); and
- Aluminum (0.00009 to 27.9 mg/L; mean = 12.98 mg/L).

During the closure phase water reporting to the water treatment plant is expected to have a similar pH and metal concentrations as the production phase Equalization Pond.

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APPENDIX A SUPPLEMENTAL DATA

APPENDIX A SUPPLEMENTAL DATA

Acid-base Accounting Results
Vista Gold Corp.-Mt Todd Gold Project

Sample ID	Paste	CANTEST	Exploration	Sulfate Sulfur	Sulfide Sulfur	Insoluble	Acid Generating Potential	Maximum Potentital Acidity**	Neutralizati on Potential	Acid Neutralizati on Capacity	Net Neutralizati on Potential	Net Acid Production Potential	NPR
	pH	Total Sulfur	Total Sulfur	Sulfur	Sulfur	Sulfur*	(AGP)**	(MPA)	(ANP)	(ANC)	(NNP)	(NAPP)	
		(wt. %)	(wt. %)	(wt. %)	(wt. %)	(wt. %)	(kg CaCO ₃ /Ton ne)	(kg H ₂ SO ₄ /Ton ne)	(kg CaCO ₃ /Ton ne)	(kg H ₂ SO ₄ /Ton ne)	(kg CaCO ₃ /Tonne)		
		Greywacke											
VB07-025 48-52 G	9.12	0.13	0.3525	0.01	0.07	0.05	2.1875	2.14	5.07	4.97	2.89	-2.83	2.32
VB07-025 68-72 G	9.07	0.23	0.3575	0.03	0.17	0.03	5.3125	5.21	12.25	12.01	6.94	-6.80	2.31
VB07-009 58-62 G (HC-1)	9.23	0.36	0.3825	0.01	0.31	0.04	9.6875	9.49	7.67	7.52	-2.01	1.97	0.79
VB07-009 86-90 G (HC-6)	8.56	0.69	0.715	0.01	0.08	0.6	2.5	2.45	10.15	9.95	7.65	-7.50	4.06
VB07-009 102-106 G	8.87	0.43	0.64	0.005	0.31	0.115	9.6875	9.49	6.19	6.06	-3.50	3.43	0.64
VB07-002 352-356 G	9.24	0.48	0.75	0.02	0.17	0.29	5.3125	5.21	11.14	10.92	5.83	-5.71	2.10
VB07-022 324-328 G	8.98	0.26	0.41	0.01	0.2	0.05	6.25	6.13	8.35	8.19	2.10	-2.06	1.34
VB07-022 328-332 G	8.38	0.56	0.56	0.01	0.43	0.12	13.4375	13.17	15.65	15.34	2.21	-2.17	1.16
VB07-009 62-66 G	9.04	0.24	0.26	0.01	0.17	0.06	5.3125	5.21	7.86	7.70	2.54	-2.49	1.48
VB07-009 78-82 G	9.16	0.05	0.21	0.01	0.03	0.01	0.9375	0.92	13.40	13.14	12.47	-12.22	14.30
VB07-001 89-93 G	8.96	0.11	0.2	0.02	0.07	0.02	2.1875	2.14	7.36	7.21	5.17	-5.07	3.36
VB07-001 125-129 G	8.81	0.2	0.57	0.01	0.11	0.08	3.4375	3.37	6.44	6.31	3.00	-2.94	1.87
VB07-001 153-156 G	8.96	0.22	0.27	0.01	0.15	0.06	4.6875	4.59	7.92	7.76	3.23	-3.17	1.69
VB07-001 173-177 G	8.95	0.31	0.34	0.005	0.19	0.12	5.9375	5.82	7.92	7.76	1.98	-1.94	1.33
VB07-001 181-185 G	9	0.38	0.5	0.005	0.31	0.07	9.6875	9.49	14.85	14.55	5.16	-5.06	1.53
VB07-001 189-193 G	9.05	0.42	0.66	0.01	0.27	0.14	8.4375	8.27	27.72	27.17	19.29	-18.90	3.29
VB07-001 193-197 G	8.85	0.38	0.46	0.01	0.22	0.15	6.875	6.74	11.14	10.92	4.26	-4.18	1.62
VB07-020 8-12 G	7.68	0.06	0.04	0.02	0.03	0.01	0.9375	0.92	3.71	3.64	2.78	-2.72	3.96
VB07-020 16-20 G	8.64	0.59	0.25	0.005	0.39	0.2	12.1875	11.94	7.43	7.28	-4.76	4.67	0.61
VB07-022 312-316 G	9.22	0.18	0.21	0.01	0.1	0.07	3.125	3.06	8.04	7.88	4.92	-4.82	2.57
VB07-010 217-221 G	8.84	1	1.05	0.01	0.23	0.76	7.1875	7.04	13.37	13.10	6.18	-6.06	1.86
VB07-010 221-225 G	9.12	0.42	0.79	0.01	0.13	0.28	4.0625	3.98	6.81	6.67	2.74	-2.69	1.68
VB07-010 261-265 G	9.01	0.55	0.74	0.005	0.15	0.4	4.6875	4.59	7.43	7.28	2.74	-2.68	1.58
VB07-010 265-269 G	9.09	0.17	0.55	0.005	0.07	0.1	2.1875	2.14	12.87	12.61	10.68	-10.47	5.88
VB07-010 301-305 G	8.75	1.1	1.36	0.01	0.52	0.57	16.25	15.93	18.32	17.95	2.07	-2.03	1.13
VB07-011 20-24 G	7.45	0.005	0.005	0.005	0.005	0.005	0.15	0.15	0.87	0.85	0.87	-0.70	5.78
VB07-009 24-28 G	8.61	0.23	0.38	0.005	0.15	0.08	4.6875	4.59	5.94	5.82	1.25	-1.23	1.27
VB07-009 26-30 G	8.43	0.24	0.41	0.005	0.18	0.06	5.625	5.51	4.21	4.12	-1.42	1.39	0.75
VB07-009 30-34 G	8.4	0.29	0.11	0.01	0.2	0.08	6.25	6.13	5.69	5.58	-0.56	0.55	0.91
VB07-009 86-90 G	8.66	0.43	0.71	0.01	0.31	0.11	9.6875	9.49	9.16	8.98	-0.53	0.52	0.95
VB07-009 106-110 G	8.82	0.44	0.62	0.005	0.3	0.14	9.375	9.19	6.19	6.06	-3.19	3.12	0.66

Acid-base Accounting Results
Vista Gold Corp.-Mt Todd Gold Project

Sample ID	Paste	CANTEST	Exploratio n	Sulfate Sulfur	Sulfide Sulfur	Insoluble	Acid Generatin g Potential	Maximum Potenital Acidity**	Neutraliza tion Potential	Acid Neutraliza tion Capacity	Net Neutraliza tion Potential	Net Acid Productio n Potential	NPR
	pH	Total Sulfur	Total Sulfur	Sulfur	Sulfur	Sulfur*	(AGP)**	(MPA)	(ANP)	(ANC)	(NNP)	(NAPP)	
		(wt. %)	(wt. %)	(wt. %)	(wt. %)	(wt. %)	(kg CaCO ₃ /To nne)	(kg H ₂ SO ₄ /To nne)	(kg CaCO ₃ /To nne)	(kg H ₂ SO ₄ /To nne)	(kg CaCO ₃ /Tonne)		
		Interbedded											
VB07-002 220-224 I (HC-3)	8.98	0.78	0.611	0.02	0.36	0.4	11.25	11.03	43.19	42.33	31.94	-31.30	3.84
VB07-008 142-146 I	8.84	0.46	0.6125	0.005	0.43	0.025	13.4375	13.17	10.64	10.43	-2.79	2.74	0.79
VB07-018 216-220 I	9.08	0.9	0.6259	0.01	0.61	0.28	19.0625	18.68	85.40	83.69	66.33	-65.01	4.48
VB07-018 120-124 I (HC-5)	8.73	0.88	1.1572	0.01	0.74	0.13	23.125	22.66	7.67	7.52	-15.45	15.14	0.33
VB07-006 72-76 I	7.83	1.29	1.219	0.01	0.84	0.44	26.25	25.73	4.08	4.00	-22.17	21.72	0.16
VB07-002 300-304 I	9.2	0.41	1.0175	0.01	0.25	0.15	7.8125	7.66	16.34	16.01	8.52	-8.35	2.09
VB08-032 180-184 I	9.06	0.52	0.3675	0.005	0.15	0.37	4.6875	4.59	6.98	6.84	2.30	-2.25	1.49
VB08-032 356-360 I	8.47	1.61	0.655	0.005	1.26	0.35	39.375	38.59	7.42	7.27	-31.96	31.32	0.19
VB08-034 44-48 I	9.26	0.08	0.0525	0.01	0.05	0.02	1.5625	1.53	5.11	5.01	3.55	-3.48	3.27
VB08-034 228-232 I	9.32	0.07	0.38	0.005	0.06	0.01	1.875	1.84	9.41	9.23	7.54	-7.39	5.02
VB08-035 176-180 I	9.37	0.19	0.865	0.005	0.09	0.1	2.8125	2.76	6.86	6.72	4.05	-3.96	2.44
VB08-035 220-224 I	9.23	0.13	0.3225	0.005	0.05	0.08	1.5625	1.53	6.11	5.99	4.55	-4.46	3.91
VB08-036 40-44 I	7.97	1.16	0.7	0.01	0.91	0.24	28.4375	27.87	4.11	4.03	-24.32	23.84	0.14
VB08-036 400-404 I	9.16	0.82	0.8425	0.005	0.15	0.67	4.6875	4.59	4.86	4.77	0.18	-0.17	1.04
VB08-038 48-52 I	7.34	3.81	2.695	0.01	3.61	0.19	112.8125	110.56	4.11	4.03	-108.70	106.52	0.04
VB08-039 416-420 I	8.57	1.37	1.33	0.005	0.45	0.92	14.0625	13.78	7.92	7.76	-6.14	6.02	0.56
VB08-028 332-336 I	8.34	1.77	0.79	0.005	1.17	0.6	36.5625	35.83	8.42	8.25	-28.15	27.58	0.23
VB08-030 492-496 I	8.75	1.25	1.25	0.005	0.14	1.11	4.375	4.29	3.62	3.54	-0.76	0.74	0.83
VB07-006 76-80 I	6.83	1.59	1.77	0.02	1.27	0.3	39.6875	38.89	14.40	14.11	-25.29	24.78	0.36
VB07-002 12-16 I	8.31	0.54	0.05	0.01	0.45	0.08	14.0625	13.78	3.87	3.79	-10.20	9.99	0.27
VB07-004 279-283 I	8.58	0.5	0.53	0.01	0.09	0.4	2.8125	2.76	12.66	12.40	9.84	-9.65	4.50
VB07-001 21-25 I	8.66	0.2	0.28	0.01	0.15	0.04	4.6875	4.59	4.86	4.77	0.18	-0.17	1.04
VB07-018 456-460 I	8.78	1.59	1.61	0.005	1.05	0.54	32.8125	32.16	5.20	5.09	-27.61	27.06	0.16
VB07-021 176-180 I	9.4	0.04	0.09	0.005	0.04	0	1.25	1.23	8.66	8.49	7.41	-7.27	6.93
VB07-022 140-144 I	9.41	0.24	0.16	0.005	0.14	0.1	4.375	4.29	7.43	7.28	3.05	-2.99	1.70
VB07-013 67-71 I	9.26	0.21	0.33	0.005	0.09	0.12	2.8125	2.76	6.68	6.55	3.87	-3.79	2.38
VB07-014 69.7-73.7 I	8.55	0.45	0.42	0.01	0.4	0.04	12.5	12.25	4.95	4.85	-7.55	7.40	0.40
VB07-015 8-12 I	8.09	0.12	0.23	0.01	0.09	0.02	2.8125	2.76	5.20	5.09	2.39	-2.34	1.85
VB07-017 6-10 I	6.65	0.005	0.01	0.005	0.005	0.005	0.15	0.15	0.74	0.73	0.74	-0.58	4.95
VB07-010 57-61 I	9.07	0.09	0.14	0.01	0.07	0.01	2.1875	2.14	12.87	12.61	10.68	-10.47	5.88

Acid-base Accounting Results
Vista Gold Corp.-Mt Todd Gold Project

Sample ID	Paste	CANTEST	Exploratio n	Sulfate Sulfur	Sulfide Sulfur	Insoluble	Acid Generatin g Potential	Maximum Potenital Acidity**	Neutraliza tion Potential	Acid Neutraliza tion Capacity	Net Neutraliza tion Potential	Net Acid Productio n Potential	NPR
	pH	Total Sulfur	Total Sulfur	Sulfur	Sulfur	Sulfur*	(AGP)**	(MPA)	(ANP)	(ANC)	(NNP)	(NAPP)	
		(wt. %)	(wt. %)	(wt. %)	(wt. %)	(wt. %)	(kg CaCO ₃ /To nne)	(kg H ₂ SO ₄ /To nne)	(kg CaCO ₃ /To nne)	(kg H ₂ SO ₄ /To nne)	(kg CaCO ₃ /Tonne)		
		Shale											
VB07-003 33-37 S	6.99	1.13	0.74	0.02	0.87	0.24	27.1875	26.64	13.37	13.10	-13.82	13.54	0.49
VB07-018 4-8 S	5.83	0.6	0.74	0.02	0.52	0.06	16.25	15.93	2.72	2.67	-13.53	13.26	0.17
VB07-011 160-164 S	8.51	0.65	0.9	0.005	0.36	0.285	11.25	11.03	18.81	18.44	7.56	-7.41	1.67
VB07-003 41-45 S	7.6	1.82	1.0875	0.01	1.79	0.02	55.9375	54.82	8.91	8.73	-47.03	46.09	0.16
VB07-011 156-160 S (HC-4)	8.64	0.9	1.155	0.005	0.67	0.225	20.9375	20.52	17.95	17.59	-2.99	2.93	0.86
VB08-038 268-272 S	8.8	0.33	0.53	0.005	0.21	0.12	6.5625	6.43	5.86	5.74	-0.70	0.69	0.89
VB08-041 0-4 S	6.38	0.22	0.23	0.005	0.13	0.09	4.0625	3.98	0.62	0.61	-3.44	3.37	0.15
VB08-027 28-32 S	8.72	0.02	0.045	0.01	0.01	0	0.3125	0.31	4.36	4.28	4.05	-3.97	13.97
VB08-027 100-104 S	8.5	0.38	0.09	0.01	0.25	0.12	7.8125	7.66	19.70	19.31	11.89	-11.65	2.52
VB08-028 116-120 S	8.39	0.01	0.145	0.005	0.01	0	0.3125	0.31	3.37	3.30	3.05	-2.99	10.77
VB08-030 24-28 S	8.56	0.02	0.085	0.005	0.01	0.01	0.3125	0.31	4.36	4.28	4.05	-3.97	13.97
VB08-031 48-52 S	8.29	0.1	0.14	0.005	0.05	0.05	1.5625	1.53	4.99	4.89	3.43	-3.36	3.19
VB07-022 340-344 S	8.53	1.29	0.46	0.01	0.24	1.04	7.5	7.35	14.84	14.54	7.34	-7.19	1.98
VB08-026 32-36 S	9.39	0.05	0.0375	0.005	0.03	0.02	0.9375	0.92	6.86	6.72	5.92	-5.80	7.32
VB08-026 332-336 S	8.95	0.44	0.5175	0.01	0.31	0.12	9.6875	9.49	11.66	11.43	1.97	-1.93	1.20
VB08-026 376-380 S	9.36	0.11	0.25	0.005	0.08	0.03	2.5	2.45	10.29	10.08	7.79	-7.63	4.11
VB08-026 412-416 S	9.11	0.16	0.225	0.01	0.11	0.04	3.4375	3.37	32.42	31.77	28.98	-28.40	9.43
VB07-004 115-119 S	8.78	1.07	0.96	0.005	0.23	0.84	7.1875	7.04	9.66	9.47	2.48	-2.43	1.34
VB07-007 12-16 S	8.49	0.26	0.41	0.005	0.16	0.1	5	4.90	8.60	8.43	3.60	-3.53	1.72
VB07-017 206-210 S	8.97	0.59	0.74	0.005	0.33	0.26	10.3125	10.11	4.95	4.85	-5.36	5.25	0.48
VB07-014 229.7-233.7 S	8.87	0.05	0.21	0.01	0.04	0	1.25	1.23	5.69	5.58	4.44	-4.35	4.55
VB07-017 162-166 S	8.25	0.99	0.83	0.01	0.78	0.2	24.375	23.89	3.96	3.88	-20.41	20.01	0.16
VB08-028 20-24 S	7.93	0.02	0.005	0.005	0.02	0	0.625	0.61	2.48	2.43	1.85	-1.81	3.96
VB07-012 2-6 S	6.9	0.005	0.01	0.005	0.005	0.005	0.15	0.15	0.50	0.49	0.50	-0.34	3.30
VB07-009 118-122 S	8.61	0.56	0.42	0.005	0.45	0.11	14.0625	13.78	5.69	5.58	-8.37	8.20	0.40

Humidity Cell and Acid-Base Accounting Sample Summary
Vista Gold Corp.- Mt. Todd Gold Project

Bore Hole	Depth (m)		Total Mass	Sample ID	Static Test ID	Lab Report	Humidity Cell Test
	From	To					
Rock Code: Greywacke (1,3,5,8,18)							
VB07-025	48	52	7	VB-025 48-52 G	15	Dec-08	-
VB07-025	68	72	7	VB-025 68-72 G	16	Dec-08	-
VB07-009	58	62	7.6	VB-009 58-62 G	3	Dec-08	HC-1
VB07-009	86	90	6.9	VB-009 86-90 G	18	Dec-08	HC-6
VB07-009	102	106	4.6	VB-009 102-106 G	4	Dec-08	-
VB07-002	352	356	4.7	VB-002 352-356 G	17	Dec-08	-
VB07-022	324	328	1.38	VB07-022 324-328 G	20	Sept-09	-
VB07-022	328	332	2.51	VB07-022 328-332 G	21	Sept-09	-
VB07-009	62	66	3	VB07-009 62-66 G	30	Sept-09	-
VB07-009	78	82	3.12	VB07-009 78-82 G	31	Sept-09	-
VB07-001	89	93	2.42	VB07-001 89-93 G	35	Sept-09	-
VB07-001	125	129	1.84	VB07-001 125-129 G	36	Sept-09	-
VB07-001	153	156	2.4	VB07-001 153-156 G	37	Sept-09	-
VB07-001	173	177	2.6	VB07-001 173-177 G	38	Sept-09	HC-1B
VB07-001	181	185	2.84	VB07-001 181-185 G	39	Sept-09	-
VB07-001	189	193	2.63	VB07-001 189-193 G	40	Sept-09	-
VB07-001	193	197	2.46	VB07-001 193-197 G	41	Sept-09	-
VB07-020	8	12	2.21	VB07-020 8-12 G	44	Sept-09	-
VB07-020	16	20	2.74	VB07-020 16-20 G	45	Sept-09	-
VB07-022	312	316	1.57	VB07-022 312-316 G	48	Sept-09	-
VB07-010	217	221	2.47	VB07-010 217-221 G	56	Sept-09	-
VB07-010	221	225	1.6	VB07-010 221-225 G	57	Sept-09	-
VB07-010	261	265	2.19	VB07-010 261-265 G	58	Sept-09	-
VB07-010	265	269	2.11	VB07-010 265-269 G	59	Sept-09	-
VB07-010	301	305	1.73	VB07-010 301-305 G	60	Sept-09	-
VB07-011	20	24	3.06	VB07-011 20-24 G	61	Sept-09	-
VB07-009	24	28	2.43	VB07-009 24-28 G	63	Sept-09	-
VB07-009	26	30	2.1	VB07-009 26-30 G	64	Sept-09	-
VB07-009	30	34	2.44	VB07-009 30-34 G	65	Sept-09	-
VB07-009	86	90	2.76	VB07-009 86-90 G	66	Sept-09	-
VB07-009	106	110	2.19	VB07-009 106-110 G	67	Sept-09	-
N/D = Not determined or not available in the geologic model at this time							

Humidity Cell and Acid-Base Accounting Sample Summary
Vista Gold Corp.- Mt. Todd Gold Project

Bore Hole	Depth (m)		Total Mass (kg)	Sample ID	Static Test ID	Lab Report	Humidity Cell Test
	From	To					
Rock Code: Shale (2,9,11,13,15,17)							
VB07-006	44	48	7.5	VB-006 44-48 S	6	Dec-08	HC-2
VB07-003	33	37	7.3	VB-003 33-37 S	5	Dec-08	-
VB07-018	4	8	11.7	VB-018 4-8 S	2	Dec-08	-
VB07-011	160	164	6.4	VB-011 160-164 S	1	Dec-08	-
VB07-003	41	45	8.2	VB-003 41-45 S	10	Dec-08	-
VB07-011	156	160	6.5	VB-011 156-160 S	11	Dec-08	HC-4
VB08-038	268	272	2.3	VB08-038 268-272 S	10	Sept-09	-
VB08-041	0	4	2.69	VB08-041 0-4 S	12	Sept-09	-
VB08-027	28	32	2.54	VB08-027 28-32 S	13	Sept-09	-
VB08-027	100	104	1.36	VB08-027 100-104 S	14	Sept-09	-
VB08-028	116	120	1.94	VB08-028 116-120 S	15	Sept-09	-
VB08-030	24	28	1.72	VB08-030 24-28 S	17	Sept-09	-
VB08-031	48	52	1.73	VB08-031 48-52 S	19	Sept-09	-
VB07-022	340	344	1.92	VB07-022 340-344 S	22	Sept-09	-
VB08-026	32	36	3.41	VB08-026 32-36 S	23	Sept-09	-
VB08-026	332	336	1.53	VB08-026 332-336 S	24	Sept-09	HC-2B
VB08-026	376	380	2.72	VB08-026 376-380 S	25	Sept-09	-
VB08-026	412	416	1.5	VB08-026 412-416 S	26	Sept-09	-
VB07-004	115	119	1.69	VB07-004 115-119 S	27	Sept-09	-
VB07-007	12	16	2.58	VB07-007 12-16 S	29	Sept-09	-
VB07-017	206	210	2.24	VB07-017 206-210 S	42	Sept-09	-
VB07-014	229.7	233.7	1.65	VB07-014 229.7-233.7 S	51	Sept-09	-
VB07-017	162	166	2.33	VB07-017 162-166 S	54	Sept-09	-
VB08-028	20	24	2.66	VB08-028 20-24 S	55	Sept-09	-
VB07-012	2	6	2.27	VB07-012 2-6 S	62	Sept-09	-
VB07-009	118	122	2.05	VB07-009 118-122 S	68	Sept-09	-
N/D = Not determined or not available in the geologic model at this time							

Humidity Cell and Acid-Base Accounting Sample Summary
Vista Gold Corp.- Mt. Todd Gold Project

Bore Hole	Depth (m)		Total Mass (kg)	Sample ID	Static Test ID	Lab Report	Humidity Cell Test
	From	To					
Rock Code: Interbedded-Sh/Gr&Gr/Sh (4,6 & 7,14)							
VB07-002	220	224	4.6	VB-002 220-224 I	7	Dec-08	HC-3
VB07-008	142	146	5.2	VB-008 142-146 I	8	Dec-08	-
VB07-018	216	220	4.8	VB-018 216-220 I	9	Dec-08	-
VB07-018	120	124	4.5	VB-018 120-124 I	14	Dec-08	HC-5
VB07-006	72	76	4.4	VB-006 72-76 I	13	Dec-08	-
VB07-002	300	304	4.6	VB-002 300-304 I	12	Dec-08	-
VB08-032	180	184	2.6	VB08-032 180-184 I	1	Sept-09	HC-3B
VB08-032	356	360	2.26	VB08-032 356-360 I	2	Sept-09	-
VB08-034	44	48	3.02	VB08-034 44-48 I	3	Sept-09	-
VB08-034	228	232	2.1	VB08-034 228-232 I	4	Sept-09	-
VB08-035	176	180	2.1	VB08-035 176-180 I	5	Sept-09	-
VB08-035	220	224	1.85	VB08-035 220-224 I	6	Sept-09	-
VB08-036	40	44	2.12	VB08-036 40-44 I	7	Sept-09	-
VB08-036	400	404	2.19	VB08-036 400-404 I	8	Sept-09	-
VB08-038	48	52	2.5	VB08-038 48-52 I	9	Sept-09	-
VB08-039	416	420	2.51	VB08-039 416-420 I	11	Sept-09	-
VB08-028	332	336	2.9	VB08-028 332-336 I	16	Sept-09	-
VB08-030	492	496	2.45	VB08-030 492-496 I	18	Sept-09	-
VB07-006	76	80	1.85	VB07-006 76-80 I	28	Sept-09	-
VB007-002	12	16	2.59	VB007-002 12-16 I	32	Sept-09	-
VB007-004	279	283	1.9	VB007-004 279-283 I	33	Sept-09	-
VB007-001	21	25	2.73	VB007-001 21-25 I	34	Sept-09	-
VB07-018	456	460	1.86	VB07-018 456-460 I	43	Sept-09	-
VB07-021	176	180	1.04	VB07-021 176-180 I	46	Sept-09	-
VB07-022	140	144	2.23	VB07-022 140-144 I	47	Sept-09	-
VB07-013	67	71	2.28	VB07-013 67-71 I	49	Sept-09	-
VB07-014	69.7	73.7	1.7	VB07-014 69.7-73.7 I	50	Sept-09	-
VB07-015	8	12	2.22	VB07-015 8-12 I	52	Sept-09	-
VB07-017	6	10	2.45	VB07-017 6-10 I	53	Sept-09	-
VB07-010	57	61	3.06	VB07-010 57-61 I	69	Sept-09	-
N/D = Not determined or not available in the geologic model at this time							

Weekly Leachate Quality Summary-1st Round Samples
Vista Gold Corp. - Mt Todd Gold Project

Composite ID	Sample ID:		HC-1		HC-2		HC-3		HC-4		HC-5		HC-6	
	Sampling Date	Cycle No.	Volume of DI Water (ml)		Volume of DI Water (ml)		Volume of DI Water (ml)		Volume of DI Water (ml)		Volume of DI Water (ml)		Volume of DI Water (ml)	
			Input	Output	Input	Output	Input	Output	Input	Output	Input	Output	Input	Output
Detection Limits			5	5	5	5	5	5	5	5	5	5	5	5
C-1	12/24/2008	1	750	635	750	635	750	640	750	670	750	625	750	660
	12/31/2008	2	500	425	500	430	500	440	500	455	500	500	500	460
	1/7/2009	3	500	480	500	495	500	430	500	490	500	480	500	485
	1/14/2009	4	500	450	500	470	500	445	500	470	500	480	500	495
C-2	1/21/2009	5	500	470	500	470	500	465	500	475	500	465	500	470
	1/28/2009	6	500	465	500	460	500	450	500	465	500	490	500	465
	2/4/2009	7	500	465	500	470	500	440	500	470	500	470	500	445
	2/11/2009	8	500	460	500	460	500	445	500	460	500	460	500	440
C-3	2/18/2009	9	500	480	500	470	500	450	500	490	500	460	500	460
	2/25/2009	10	500	465	500	450	500	460	500	470	500	460	500	475
	3/4/2009	11	500	475	500	470	500	460	500	480	500	470	500	460
	3/11/2009	12	500	460	500	440	500	450	500	470	500	475	500	500
C-4	3/18/2009	13	500	445	500	460	500	460	500	460	500	465	500	455
	3/25/2009	14	500	440	500	440	500	450	500	475	500	495	500	450
	4/1/2009	15	500	480	500	470	500	475	500	480	500	480	500	490
	4/8/2009	16	500	470	500	445	500	450	500	455	500	480	500	470
C-5	4/15/2009	17	500	445	500	440	500	470	500	470	500	475	500	460
	4/22/2009	18	500	470	500	440	500	445	500	450	500	465	500	470
	4/29/2009	19	500	440	500	435	500	455	500	480	500	470	500	430
	5/6/2009	20	500	440	500	435	500	435	500	435	500	460	500	440
C-6	5/13/2009	21	500	445	500	455	500	450	500	445	500	435	500	435
	5/20/2009	22	500	460	500	450	500	455	500	475	500	465	500	450
	5/27/2009	23	500	485	500	470	500	470	500	460	500	440	500	440
	6/3/2009	24	500	480	500	455	500	440	500	455	500	465	500	460
C-7	6/10/2009	25	500	455	500	455	500	440	500	460	500	465	500	465
	6/17/2009	26	500	445	500	445	500	460	500	450	500	480	500	450
	6/24/2009	27	500	460	500	450	500	440	500	455	500	465	500	465
	7/1/2009	28	500	470	N/D	N/D	N/D	N/D	500	465	500	475	500	475
N/D = Not Determined														

Weekly Leachate Quality Summary-1st Round Samples
Vista Gold Corp. - Mt Todd Gold Project

Composi te ID	Sample ID:		HC-1	HC-2	HC-3	HC-4	HC-5	HC-6	HC-1	HC-2	HC-3	HC-4	HC-5	HC-6
	Sampling Date	Cycle No.	pH	pH	pH	pH	pH	pH	EC	EC	EC	EC	EC	EC
			Std Units						µs/cm					
Detection Limits			0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
C-1	12/24/2008	1	7.2	5.76	7.51	7.41	7.35	7.31	97	155	112	206	176	174
	12/31/2008	2	7.77	5	7.79	7.3	7.23	7.4	100	203	131	163	171	165
	1/7/2009	3	7.85	5.8	7.62	7.35	7.36	7.47	71	152	105	87	104	90
	1/14/2009	4	8	5.79	7.97	7.33	7.38	7.65	59	101	95	67	76	68
C-2	1/21/2009	5	7.86	5.61	7.72	7.42	7.38	7.78	58	80	93	55	72	64
	1/28/2009	6	7.8	5.52	8.05	7.51	7.36	7.64	52	75	103	52	79	53
	2/4/2009	7	7.83	5.24	7.91	7.47	7.25	7.75	50	71	105	49	89	57
	2/11/2009	8	7.8	5.25	7.8	7.41	7.22	7.45	49	64	100	47	84	76
C-3	2/18/2009	9	7.67	5.33	7.67	7.42	7.3	7.32	48	62	90	55	79	105
	2/25/2009	10	7.64	5.28	7.96	7.41	7.31	7.52	40	53	82	49	71	111
	3/4/2009	11	7.63	5.01	7.61	7.21	7.24	7.2	46	61	85	58	66	108
	3/11/2009	12	7.74	4.78	7.36	7.22	7.18	7.18	57	52	80	61	60	100
C-4	3/18/2009	13	7.42	5.01	7.67	7.31	7.16	7.25	67	46	81	60	62	93
	3/25/2009	14	7.57	4.86	7.69	7.31	7.45	7.34	53	57	78	57	61	93
	4/1/2009	15	7.55	4.83	7.76	7.32	7.36	7.39	49	68	79	57	54	89
	4/8/2009	16	7.53	4.81	7.68	7.31	7.31	7.32	53	58	75	58	53	82
C-5	4/15/2009	17	7.43	4.72	7.65	7.26	7.34	7.26	48	62	74	58	50	82
	4/22/2009	18	7.47	4.68	7.61	7.25	7.33	7.27	57	67	68	55	52	78
	4/29/2009	19	7.69	4.6	7.79	7.36	7.31	7.77	48	65	66	56	48	53
	5/6/2009	20	7.62	4.5	7.97	7.36	7.3	7.27	54	77	61	53	47	63
C-6	5/13/2009	21	7.53	4.46	7.95	7.33	7.32	7.3	55	84	67	57	52	57
	5/20/2009	22	7.43	4.37	7.76	7.25	7.26	7.37	59	87	66	57	49	61
	5/27/2009	23	7.42	4.29	7.42	7.14	7.18	7.22	43	95	62	55	50	57
	6/3/2009	24	7.41	4.2	7.66	7.18	7.13	7.12	46	101	62	58	53	56
C-7	6/10/2009	25	7.45	4.2	7.54	7.25	7.23	7.21	49	103	66	64	54	67
	6/17/2009	26	7.49	4.12	7.63	7.19	7.34	7.27	44	104	60	55	51	60
	6/24/2009	27	7.45	4.08	7.64	7.16	7.26	7.25	58	129	61	62	50	65
	7/1/2009	28	7.33	N/D	N/D	7.16	7.22	7.2	49	N/D	N/D	53	47	57

N/D = Not Determined

Weekly Leachate Quality Summary-1st Round Samples
Vista Gold Corp. - Mt Todd Gold Project

Composite ID	Sample ID:		HC-1	HC-2	HC-3	HC-4	HC-5	HC-6	HC-1	HC-2	HC-3	HC-4	HC-5	HC-6
	Sampling Date	Cycle No.	Total Alkalinity to pH 4.5	Total Alkalinity to pH 4.5	Total Alkalinity to pH 4.5	Total Alkalinity to pH 4.5	Total Alkalinity to pH 4.5	Total Alkalinity to pH 4.5	SO ₄ ²⁻	SO ₄ ²⁻	SO ₄ ²⁻	SO ₄ ²⁻	SO ₄ ²⁻	SO ₄ ²⁻
			mg CaCO3/L											
Detection Limits			0.5	0.5	0.5	0.5	0.5	0.5	1	1	1	1	1	1
C-1	12/24/2008	1	21.5	4	32	17.5	17.5	21	15	49	9	65	53	47
	12/31/2008	2	21.5	1.5	24.5	13.5	14	17	20	86	32	55	53	52
	1/7/2009	3	19.5	2	19	11.5	14	14	12	70	30	24	34	38
	1/14/2009	4	21	2	22.5	10.5	12	15.5	4	40	20	18	12	19
C-2	1/21/2009	5	22.5	2	22.5	11	12	19	5	31	20	14	21	11
	1/28/2009	6	19.5	2	19.5	11.5	13	15	4	29	28	12	25	10
	2/4/2009	7	18.5	1.5	18.5	11	12.5	15	6	30	33	11	31	14
	2/11/2009	8	16.5	1.5	19	10.5	9.5	11	6	25	27	12	31	24
C-3	2/18/2009	9	11.5	1.5	16.5	13	9	10	4	23	24	10	24	39
	2/25/2009	10	14	1.5	17	9.5	8	10	7	20	25	14	24	36
	3/4/2009	11	13.5	1	17	9	9	12	4	22	22	14	21	36
	3/11/2009	12	14	1	13	10	8	9	5	15	21	18	17	39
C-4	3/18/2009	13	10	2	16	9	10	11	5	14	18	13	12	29
	3/25/2009	14	12	1	14	9	12	11	4	20	23	17	16	29
	4/1/2009	15	12	1	16	8	9	10	4	24	13	14	13	27
	4/8/2009	16	11	1	16	8	8	9	6	23	17	12	11	24
C-5	4/15/2009	17	11	1	16	9	9	10	3	22	19	14	13	25
	4/22/2009	18	11	1	14	8	9	9	3	24	16	19	16	24
	4/29/2009	19	10	-1	14	9	8	10	5	24	16	18	15	14
	5/6/2009	20	9	-1	14.5	7.5	7.5	9.5	3	29	14	13	12	17
C-6	5/13/2009	21	9.5	-1	14.5	8.5	8	8.5	2	31	12	12	13	15
	5/20/2009	22	10	N/D	15	9	8	9	3	32	14	16	11	16
	5/27/2009	23	11	N/D	15	8	9	8	4	29	11	13	10	13
	6/3/2009	24	11	N/D	14	8	10	8	4	33	12	14	11	13
C-7	6/10/2009	25	10	N/D	15	9	10	9	3	30	12	13	10	17
	6/17/2009	26	10	N/D	15	8	10	9	3	37	13	14	13	18
	6/24/2009	27	10	N/D	15	8	9	9	4	N/D	N/D	13	7	14
	7/1/2009	28	10	N/D	N/D	8	9	9	4	N/D	N/D	11	8	13
N/D = Not Determined														

Weekly Leachate Quality Summary-1st Round Samples
Vista Gold Corp. - Mt Todd Gold Project

Composite ID	Sample ID:		HC-1	HC-2	HC-3	HC-4	HC-5	HC-6	HC-1	HC-2	HC-3	HC-4	HC-5	HC-6
	Sampling Date	Cycle No.	Acidity to pH 4.5	Acidity to pH 4.5	Acidity to pH 4.5	Acidity to pH 4.5	Acidity to pH 4.5	Acidity to pH 4.5	Acidity to pH 8.3	Acidity to pH 8.3	Acidity to pH 8.3	Acidity to pH 8.3	Acidity to pH 8.3	Acidity to pH 8.3
			mg CaCO3/L											
Detection Limits			0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
C-1	12/24/2008	1	N/D	N/D	N/D	N/D	N/D	N/D	5	4	3	2	2.5	3
	12/31/2008	2	N/D	N/D	N/D	N/D	N/D	N/D	1	4	1	1	2.5	2
	1/7/2009	3	N/D	N/D	N/D	N/D	N/D	N/D	1	3	1	1	1.5	1
	1/14/2009	4	N/D	N/D	N/D	N/D	N/D	N/D	-1	3	1	-1	0.5	1
C-2	1/21/2009	5	N/D	N/D	N/D	N/D	N/D	N/D	1	3	1	1	0.5	1
	1/28/2009	6	N/D	N/D	N/D	N/D	N/D	N/D	-1	2	-1	1	-1.0	1
	2/4/2009	7	N/D	N/D	N/D	N/D	N/D	N/D	1	3	1	1	1.5	-1
	2/11/2009	8	N/D	N/D	N/D	N/D	N/D	N/D	1	3	1	1	1	1
C-3	2/18/2009	9	N/D	N/D	N/D	N/D	N/D	N/D	1	3	1	1	1	1
	2/25/2009	10	N/D	N/D	N/D	N/D	N/D	N/D	-1	3	-1	1	0.5	1
	3/4/2009	11	N/D	N/D	N/D	N/D	N/D	N/D	1	3	1	-1	-1	1
	3/11/2009	12	N/D	N/D	N/D	N/D	N/D	N/D	-1	3	1	-1	1	1
C-4	3/18/2009	13	N/D	N/D	N/D	N/D	N/D	N/D	1	4	1	1	1	1
	3/25/2009	14	N/D	N/D	N/D	N/D	N/D	N/D	1	4	-1	1	1	1
	4/1/2009	15	N/D	N/D	N/D	N/D	N/D	N/D	1	4	-1	1	1	1
	4/8/2009	16	N/D	N/D	N/D	N/D	N/D	N/D	1	4	1	1	1	1
C-5	4/15/2009	17	N/D	N/D	N/D	N/D	N/D	N/D	1	6	1	1	1	1
	4/22/2009	18	N/D	N/D	N/D	N/D	N/D	N/D	1	6	1	1	1	1
	4/29/2009	19	N/D	N/D	N/D	N/D	N/D	N/D	1	6	1	1	1	1
	5/6/2009	20	N/D	N/D	N/D	N/D	N/D	N/D	1	9	1	1	1	1
C-6	5/13/2009	21	N/D	N/D	N/D	N/D	N/D	N/D	1	9	1	1	1	1
	5/20/2009	22	N/D	1	N/D	N/D	N/D	N/D	1	11	1	1	1	1
	5/27/2009	23	N/D	1	N/D	N/D	N/D	N/D	1	13	1	1	1	1
	6/3/2009	24	N/D	1	N/D	N/D	N/D	N/D	1	15	1	1	1	1
C-7	6/10/2009	25	N/D	2	N/D	N/D	N/D	N/D	1	18	1	1	1	1
	6/17/2009	26	N/D	3	N/D	N/D	N/D	N/D	1	22	1	1	1	1
	6/24/2009	27	N/D	4	N/D	N/D	N/D	N/D	1	24	1	1	1	1
	7/1/2009	28	N/D	N/D	N/D	N/D	N/D	N/D	1	N/D	N/D	1	1	1
N/D = Not Determined														

N/D = Not Determined

Humidity Cell Leachate Summary- 1st Round Samples
Vista Gold Corp.- Mt Todd Gold Project

Analyte	pH	EC	Alkalinity to pH 4.5	Sulphate	Al	Sb	As	Ba	Be	Bi	B	Cd	Cr
Units	Std Units	µs/cm	mg CaCO	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
HC-1 (VB-009 58-62 G) Greywacke													
Mean	7.59	55.7	13.61	5.429	0.052714	0.001071	0.023	0.001129	0.000157	0.000157	0.04	3.14E-05	0.000157
Median	7.56	52.5	11.25	4	0.043	0.0007	0.021	0.0009	0.0001	0.0001	0.02	0.00002	0.0001
Minimum	7.2	40	9	2	0.031	0.0003	0.013	0.0007	0.0001	0.0001	0.01	0.00002	0.0001
Maximum	8	100	22.5	20	0.089	0.003	0.042	0.002	0.0005	0.0005	0.14	0.0001	0.0005
Stand. Dev.	0.19	13.9	4.44	3.939	0.021344	0.000971	0.010599	0.000502	0.000151	0.000151	0.045092	3.02E-05	0.000151
HC-6 (VB-009 86-90 G) Greywacke													
Mean	7.4	81.6	24.036	24.036	0.191333	0.000183	0.001233	0.031667	0.0006	0.000167	0.039167	0.000852	0.000167
Median	7.3	72	21.5	21.5	0.117	0.0001	0.0008	0.033	0.0005	0.0001	0.02	0.00082	0.0001
Minimum	7.1	53	10	10	0.031	0.0001	0.0002	0.016	0.0001	0.0001	0.005	0.0004	0.0001
Maximum	7.8	174	52	52	0.61	0.0005	0.004	0.046	0.0014	0.0005	0.15	0.0016	0.0005
Stand. Dev.	0.2	30.6	11.609	11.609	0.215896	0.00016	0.001378	0.012404	0.000456	0.000163	0.054992	0.000433	0.000163
HC-2 (VB-006 44-48 S) Shale													
Mean	4.89	86.37	31.231	31.231	0.032571	0.002357	0.051571	0.0019	0.000157	0.000157	0.027143	3.14E-05	0.000157
Median	4.82	75	29	29	0.027	0.0013	0.056	0.0013	0.0001	0.0001	0.02	0.00002	0.0001
Minimum	4.08	46	14	14	0.022	0.0007	0.035	0.0006	0.0001	0.0001	0.01	0.00002	0.0001
Maximum	5.8	203	86	86	0.067	0.007	0.06	0.0053	0.0005	0.0005	0.09	0.0001	0.0005
Stand. Dev.	0.53	36.75	15.830	15.830	0.01563	0.002289	0.010147	0.001697	0.000151	0.000151	0.028115	3.02E-05	0.000151
HC-4 (VB-011 156-160 S) Shale													
Mean	7.3	66.57	17.607	17.607	0.018286	0.001943	0.081286	0.002043	0.000157	0.000157	0.051429	7.86E-05	0.000157
Median	7.3	57	14	14	0.017	0.002	0.071	0.0018	0.0001	0.0001	0.02	0.00008	0.0001
Minimum	7.1	47	10	10	0.012	0.001	0.041	0.0012	0.0001	0.0001	0.01	0.00005	0.0001
Maximum	7.5	206	65	65	0.034	0.003	0.133	0.004	0.0005	0.0005	0.22	0.0001	0.0005
Stand. Dev.	0.1	34.58	12.411	12.411	0.007653	0.000776	0.037871	0.000981	0.000151	0.000151	0.075593	2.19E-05	0.000151
HC-3 (VB-002 220-224 I) Interbedded													
Mean	7.72	81.74	19.269	19.269	0.052	0.00485	0.0315	0.00345	0.000167	0.000167	0.036667	0.000185	0.000167
Median	7.7	79	18.5	18.5	0.046	0.00375	0.021	0.00325	0.0001	0.0001	0.025	0.000185	0.0001
Minimum	4.1	60	9	9	0.038	0.002	0.015	0.0022	0.0001	0.0001	0.01	0.0001	0.0001
Maximum	5.8	131	33	33	0.085	0.011	0.091	0.005	0.0005	0.0005	0.11	0.00026	0.0005
Stand. Dev.	0.17	18.59	6.862	6.862	0.017029	0.003316	0.02929	0.001148	0.000163	0.000163	0.036697	6.19E-05	0.000163
HC-5 (VB-018 120-124 I) Interbedded													
Mean	7.3	70	19.179	19.179	0.022286	0.000443	0.011171	0.001657	0.000157	0.000157	0.025714	4.43E-05	0.000157
Median	7.31	57	14	14	0.02	0.0004	0.011	0.0013	0.0001	0.0001	0.02	0.00005	0.0001
Minimum	7.1	47	7	7	0.015	0.0001	0.0066	0.001	0.0001	0.0001	0.01	0.00002	0.0001
Maximum	7.4	176	53	53	0.036	0.001	0.017	0.003	0.0005	0.0005	0.08	0.0001	0.0005
Stand. Dev.	0.08	32.7	11.966	11.966	0.006873	0.000351	0.0038	0.000816	0.000151	0.000151	0.024398	2.88E-05	0.000151

Humidity Cell Leachate Summary- 1st Round Samples
Vista Gold Corp.- Mt Todd Gold Project

Analyte	Co	Cu	Fe	Pb	Mn	Mo	Ni	Se	Ag	Th	U	V	Zn
Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
HC-1 (VB-009 58-62 G) Greywacke													
Mean	0.000443	0.002486	0.007857	0.000214	0.023571	0.000336	0.000471	0.000157	4.29E-05	7.86E-05	7.86E-05	0.000486	0.002214
Median	0.0005	0.0015	0.005	0.0001	0.024	0.0002	0.0004	0.0001	0.000025	0.00005	0.00005	0.0005	0.0005
Minimum	0.0001	0.0003	0.005	0.0001	0.012	0.00005	0.0001	0.0001	0.000025	0.00005	0.00005	0.0003	0.0005
Maximum	0.0007	0.0078	0.025	0.0005	0.031	0.0013	0.001	0.0005	0.00015	0.00025	0.00025	0.0007	0.009
Stand. Dev.	0.000199	0.00284	0.007559	0.000168	0.007044	0.000447	0.000298	0.000151	4.72E-05	7.56E-05	7.56E-05	0.000135	0.003107
HC-6 (VB-009 86-90 G) Greywacke													
Mean	0.093667	0.112667	0.248333	0.675167	0.366167	8.33E-05	0.140333	0.000167	4.58E-05	8.33E-05	0.000225	0.000167	0.531667
Median	0.084	0.053	0.235	0.451	0.331	0.00005	0.133	0.0001	0.000025	0.00005	0.000175	0.0001	0.42
Minimum	0.064	0.01	0.09	0.036	0.296	0.00005	0.112	0.0001	0.000025	0.00005	0.00005	0.0001	0.11
Maximum	0.156	0.408	0.42	1.85	0.56	0.00025	0.191	0.0005	0.00015	0.00025	0.0006	0.0005	1.24
Stand. Dev.	0.034552	0.151826	0.112679	0.706389	0.098583	8.16E-05	0.030787	0.000163	5.1E-05	8.16E-05	0.000212	0.000163	0.428645
HC-2 (VB-006 44-48 S) Shale													
Mean	0.000814	0.001514	0.017143	0.000571	0.085143	0.000807	0.001586	0.000157	4.29E-05	7.86E-05	7.86E-05	0.0003	0.002286
Median	0.0005	0.0009	0.005	0.0006	0.085	0.0005	0.001	0.0001	0.000025	0.00005	0.00005	0.0003	0.002
Minimum	0.0003	0.0003	0.005	0.0001	0.051	0.00005	0.0005	0.0001	0.000025	0.00005	0.00005	0.0001	0.0005
Maximum	0.002	0.0039	0.07	0.001	0.124	0.0026	0.006	0.0005	0.00015	0.00025	0.00025	0.0005	0.004
Stand. Dev.	0.000584	0.001378	0.024471	0.000269	0.029986	0.000872	0.001957	0.000151	4.72E-05	7.56E-05	7.56E-05	0.000153	0.001075
HC-4 (VB-011 156-160 S) Shale													
Mean	0.000871	0.0014	0.007857	0.003071	0.054286	0.004671	0.001671	0.000157	4.29E-05	7.86E-05	7.86E-05	0.000186	0.012143
Median	0.0007	0.0011	0.005	0.0028	0.046	0.0026	0.0009	0.0001	0.000025	0.00005	0.00005	0.0001	0.015
Minimum	0.0006	0.0004	0.005	0.002	0.041	0.0016	0.0007	0.0001	0.000025	0.00005	0.00005	0.0001	0.005
Maximum	0.002	0.003	0.025	0.0046	0.089	0.015	0.006	0.0005	0.00015	0.00025	0.00025	0.0005	0.017
Stand. Dev.	0.000499	0.000957	0.007559	0.00089	0.017066	0.004829	0.001917	0.000151	4.72E-05	7.56E-05	7.56E-05	0.000157	0.00508
HC-3 (VB-002 220-224 I) Interbedded													
Mean	0.002517	0.001017	0.008333	0.054833	0.098167	0.000783	0.001417	0.000167	4.58E-05	8.33E-05	8.33E-05	0.000167	0.012583
Median	0.00265	0.00085	0.005	0.0435	0.102	0.0004	0.0014	0.0001	0.000025	0.00005	0.00005	0.0001	0.0135
Minimum	0.001	0.0005	0.005	0.005	0.046	0.0003	0.0009	0.0001	0.000025	0.00005	0.00005	0.0001	0.0025
Maximum	0.0034	0.0024	0.025	0.153	0.133	0.0027	0.002	0.0005	0.00015	0.00025	0.00025	0.0005	0.02
Stand. Dev.	0.000886	0.000708	0.008165	0.05085	0.02902	0.000945	0.000471	0.000163	5.1E-05	8.16E-05	8.16E-05	0.000163	0.005783
HC-5 (VB-018 120-124 I) Interbedded													
Mean	0.001057	0.001043	0.007857	0.0013	0.054543	0.00035	0.002514	0.000157	4.29E-05	7.86E-05	7.86E-05	0.000157	0.005143
Median	0.0006	0.0009	0.005	0.001	0.062	0.0003	0.0008	0.0001	0.000025	0.00005	0.00005	0.0001	0.005
Minimum	0.0003	0.0004	0.005	0.0005	0.0048	0.00005	0.0004	0.0001	0.000025	0.00005	0.00005	0.0001	0.003
Maximum	0.004	0.002	0.025	0.0034	0.11	0.0012	0.013	0.0005	0.00015	0.00025	0.00025	0.0005	0.008
Stand. Dev.	0.001307	0.00068	0.007559	0.00099	0.03875	0.000398	0.00463	0.000151	4.72E-05	7.56E-05	7.56E-05	0.000151	0.001574

Composite Leachate Dissolved Metal Concentrations Summary-1st Round Samples
Vista Gold Corp. - Mt Todd Gold Project

Sampling Date	ID	Volume of DI Water (ml)		Total Alkalinity to pH 4.5	Sulfate	Weeks	Al	Sb	As
		Input	Output	mg CaCO ₃			mg/L	mg/L	mg/L
Sample ID:		HC-1 (VB-009 58-62 G) Greywacke							
Composite Cycle 0-3	C-1	2250	1990	20.875	12.75	4	0.089	0.003	0.015
Composite Cycle 4-7	C-2	2000	1860	19.25	5.25	8	0.035	0.0017	0.032
Composite Cycle 8-11	C-3	2000	1880	13.25	4.5	12	0.073	0.0009	0.042
Composite Cycle 12-15	C-4	2000	1835	11.25	4.75	16	0.031	0.0007	0.023
Composite Cycle 16-19	C-5	2000	1795	10.25	3.5	20	0.056	0.0005	0.021
Composite Cycle 21-24	C-6	2000	1870	10.375	3.25	24	0.043	0.0004	0.015
Composite Cycle 25-28	C-7	2000	1830	10	3.5	28	0.042	0.0003	0.013
Sample ID:		HC-6 (VB-009 86-90 G) Greywacke							
Composite Cycle 0-3	C-1	2250	2100	16.875	39	4	0.067	0.007	0.059
Composite Cycle 4-7	C-2	2000	1820	15	14.75	8	0.03	0.0037	0.056
Composite Cycle 8-11	C-3	2000	1895	10.25	37.5	12	0.033	0.0019	0.056
Composite Cycle 12-15	C-4	2000	1865	10.25	27.25	16	0.024	0.0013	0.06
Composite Cycle 16-19	C-5	2000	1800	9.625	20	20	0.027	0.0011	0.056
Composite Cycle 21-24	C-6	2000	1785	8.375	14.25	24	0.025	0.0008	0.039
Composite Cycle 25-28	C-7	2000	1855	9	15.5	28	0.022	0.0007	0.035
Sample ID:		HC-2 (VB-006 44-48 S) Shale							
Composite Cycle 0-3	C-1	2250	2030	2.375	61.25	4	0.14	0.0005	0.004
Composite Cycle 4-7	C-2	2000	1860	1.75	28.75	8	0.031	0.0002	0.0007
Composite Cycle 8-11	C-3	2000	1830	1.25	20	12	0.053	0.0001	0.0008
Composite Cycle 12-15	C-4	2000	1815	1.25	20.25	16	0.094	0.0001	0.0009
Composite Cycle 16-19	C-5	2000	1750	1	24.75	20	0.22	0.0001	0.0008
Composite Cycle 21-24	C-6	2000	1830	N/D	31.25	24	0.61	0.0001	0.0002
Composite Cycle 25-28	C-7	1500	1350	N/D	33.5	28	N/D	N/D	N/D
Sample ID:		HC-4 (VB-011 156-160 S) Shale							
Composite Cycle 0-3	C-1	2250	2085	13.25	40.5	4	0.034	0.003	0.13
Composite Cycle 4-7	C-2	2000	1870	11	12.25	8	0.017	0.0027	0.133
Composite Cycle 8-11	C-3	2000	1910	10.375	14	12	0.018	0.0023	0.089
Composite Cycle 12-15	C-4	2000	1870	8.5	14	16	0.013	0.002	0.071
Composite Cycle 16-19	C-5	2000	1835	8.375	16	20	0.021	0.0015	0.06
Composite Cycle 21-24	C-6	2000	1835	8.375	13.75	24	0.013	0.0011	0.045
Composite Cycle 25-28	C-7	2000	1830	8.25	12.75	28	0.012	0.001	0.041
Sample ID:		HC-3 (VB-002 220-224 I) Interbedded							
Composite Cycle 0-3	C-1	2250	1955	24.5	22.75	4	0.085	0.011	0.091
Composite Cycle 4-7	C-2	2000	1800	19.875	27	8	0.043	0.006	0.022
Composite Cycle 8-11	C-3	2000	1820	15.875	23	12	0.054	0.0041	0.023
Composite Cycle 12-15	C-4	2000	1835	15.5	17.75	16	0.038	0.0034	0.02
Composite Cycle 16-19	C-5	2000	1805	14.625	16.25	20	0.048	0.0026	0.018
Composite Cycle 21-24	C-6	2000	1815	14.625	12.25	24	0.044	0.002	0.015
Composite Cycle 25-28	C-7	1500	1340	15	N/A	28	N/D	N/D	N/D
Sample ID:		HC-5 (VB-018 120-124 I) Interbedded							
Composite Cycle 0-3	C-1	2250	2085	14.375	38	4	0.036	0.001	0.017
Composite Cycle 4-7	C-2	2000	1885	11.75	27	8	0.015	0.0008	0.013
Composite Cycle 8-11	C-3	2000	1865	8.5	21.5	12	0.02	0.0005	0.014
Composite Cycle 12-15	C-4	2000	1920	9.75	13	16	0.019	0.0004	0.011
Composite Cycle 16-19	C-5	2000	1870	8.375	14	20	0.025	0.0002	0.0097
Composite Cycle 21-24	C-6	2000	1805	8.75	11.25	24	0.018	0.0001	0.0069
Composite Cycle 25-28	C-7	2000	1885	9.5	9.5	28	0.023	0.0001	0.0066
Results less than the detection limit were converted to half the detection limit and select metals are presented in this table.									

Composite Leachate Dissolved Metal Concentrations Summary-1st Round Samples
Vista Gold Corp. - Mt Todd Gold Project

Sampling Date	ID	Ba	Be	Bi	B	Cd	Cr	Co	Cu	Fe
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
		HC-1 (VB-009 58-62 G) Greywacke								
Composite Cycle 0-3	C-1	0.002	5E-04	5E-04	0.14	0.0001	0.0005	5E-04	0.002	0.025
Composite Cycle 4-7	C-2	0.0016	1E-04	1E-04	0.04	0.00002	0.0001	1E-04	0.0078	0.005
Composite Cycle 8-11	C-3	0.0009	1E-04	1E-04	0.02	0.00002	0.0001	3E-04	0.0015	0.005
Composite Cycle 12-15	C-4	0.0012	1E-04	1E-04	0.03	0.00002	0.0001	6E-04	0.0049	0.005
Composite Cycle 16-19	C-5	0.0007	1E-04	1E-04	0.02	0.00002	0.0001	4E-04	0.0006	0.005
Composite Cycle 21-24	C-6	0.0007	1E-04	1E-04	0.01	0.00002	0.0001	7E-04	0.0003	0.005
Composite Cycle 25-28	C-7	0.0008	1E-04	1E-04	0.02	0.00002	0.0001	5E-04	0.0003	0.005
		HC-6 (VB-009 86-90 G) Greywacke								
Composite Cycle 0-3	C-1	0.003	5E-04	5E-04	0.09	0.0001	0.0005	0.002	0.003	0.025
Composite Cycle 4-7	C-2	0.0053	1E-04	1E-04	0.02	0.00002	0.0001	3E-04	0.0009	0.005
Composite Cycle 8-11	C-3	0.0014	1E-04	1E-04	0.01	0.00002	0.0001	0.001	0.0039	0.005
Composite Cycle 12-15	C-4	0.0013	1E-04	1E-04	0.02	0.00002	0.0001	8E-04	0.0005	0.005
Composite Cycle 16-19	C-5	0.0008	1E-04	1E-04	0.02	0.00002	0.0001	5E-04	0.0012	0.005
Composite Cycle 21-24	C-6	0.0006	1E-04	1E-04	0.01	0.00002	0.0001	5E-04	0.0008	0.07
Composite Cycle 25-28	C-7	0.0009	1E-04	1E-04	0.02	0.00002	0.0001	5E-04	0.0003	0.005
		HC-2 (VB-006 44-48 S) Shale								
Composite Cycle 0-3	C-1	0.016	5E-04	5E-04	0.15	0.0004	0.0005	0.064	0.01	0.23
Composite Cycle 4-7	C-2	0.02	1E-04	1E-04	0.03	0.00047	0.0001	0.067	0.015	0.09
Composite Cycle 8-11	C-3	0.027	3E-04	1E-04	0.02	0.00077	0.0001	0.076	0.042	0.19
Composite Cycle 12-15	C-4	0.039	5E-04	1E-04	0.02	0.00087	0.0001	0.092	0.064	0.32
Composite Cycle 16-19	C-5	0.046	8E-04	1E-04	0.01	0.001	0.0001	0.107	0.137	0.42
Composite Cycle 21-24	C-6	0.042	0.001	1E-04	0.005	0.0016	0.0001	0.156	0.408	0.24
Composite Cycle 25-28	C-7	N/D	N/D	N/D	N/D	N/D	N/D	N/D	N/D	N/D
		HC-4 (VB-011 156-160 S) Shale								
Composite Cycle 0-3	C-1	0.004	5E-04	5E-04	0.22	0.0001	0.0005	0.002	0.002	0.025
Composite Cycle 4-7	C-2	0.0025	1E-04	1E-04	0.05	0.00005	0.0001	7E-04	0.0011	0.005
Composite Cycle 8-11	C-3	0.0018	1E-04	1E-04	0.03	0.00008	0.0001	7E-04	0.003	0.005
Composite Cycle 12-15	C-4	0.0021	1E-04	1E-04	0.02	0.00006	0.0001	7E-04	0.0007	0.005
Composite Cycle 16-19	C-5	0.0014	1E-04	1E-04	0.02	0.00006	0.0001	6E-04	0.0006	0.005
Composite Cycle 21-24	C-6	0.0013	1E-04	1E-04	0.01	0.0001	0.0001	7E-04	0.002	0.005
Composite Cycle 25-28	C-7	0.0012	1E-04	1E-04	0.01	0.0001	0.0001	7E-04	0.0004	0.005
		HC-3 (VB-002 220-224 I) Interbedded								
Composite Cycle 0-3	C-1	0.005	5E-04	5E-04	0.11	0.0001	0.0005	0.001	0.001	0.025
Composite Cycle 4-7	C-2	0.0046	1E-04	1E-04	0.03	0.00014	0.0001	0.003	0.0024	0.005
Composite Cycle 8-11	C-3	0.003	1E-04	1E-04	0.02	0.00016	0.0001	0.003	0.0009	0.005
Composite Cycle 12-15	C-4	0.0035	1E-04	1E-04	0.03	0.00026	0.0001	0.003	0.0008	0.005
Composite Cycle 16-19	C-5	0.0024	1E-04	1E-04	0.02	0.00021	0.0001	0.002	0.0005	0.005
Composite Cycle 21-24	C-6	0.0022	1E-04	1E-04	0.01	0.00024	0.0001	0.002	0.0005	0.005
Composite Cycle 25-28	C-7	N/D	N/D	N/D	N/D	N/D	N/D	N/D	N/D	N/D
		HC-5 (VB-018 120-124 I) Interbedded								
Composite Cycle 0-3	C-1	0.003	5E-04	5E-04	0.08	0.0001	0.0005	0.004	0.002	0.025
Composite Cycle 4-7	C-2	0.0026	1E-04	1E-04	0.02	0.00005	0.0001	6E-04	0.002	0.005
Composite Cycle 8-11	C-3	0.0016	1E-04	1E-04	0.02	0.00005	0.0001	8E-04	0.0009	0.005
Composite Cycle 12-15	C-4	0.0013	1E-04	1E-04	0.02	0.00005	0.0001	7E-04	0.0009	0.005
Composite Cycle 16-19	C-5	0.0011	1E-04	1E-04	0.02	0.00002	0.0001	5E-04	0.0006	0.005
Composite Cycle 21-24	C-6	0.001	1E-04	1E-04	0.01	0.00002	0.0001	5E-04	0.0005	0.005
Composite Cycle 25-28	C-7	0.001	1E-04	1E-04	0.01	0.00002	0.0001	3E-04	0.0004	0.005
Results less than the detection limit were converted to half the detection limit and select metals are presented in this table.										

Composite Leachate Dissolved Metal Concentrations Summary-1st Round Samples
Vista Gold Corp. - Mt Todd Gold Project

Sampling Date	ID	Pb	Mn	Mo	Ni	Se	Ag	Th	U	V	Zn
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
		HC-1 (VB-009 58-62 G) Greywacke									
Composite Cycle 0-3	C-1	0.0005	0.03	0.0013	0.001	0.0005	0.0002	0.0003	3E-04	0.0005	0.0025
Composite Cycle 4-7	C-2	0.0001	0.031	0.0004	0.0004	0.0001	3E-05	5E-05	5E-05	0.0007	0.0005
Composite Cycle 8-11	C-3	0.0001	0.021	0.0003	0.0001	0.0001	3E-05	5E-05	5E-05	0.0006	0.0005
Composite Cycle 12-15	C-4	0.0002	0.029	0.0002	0.0005	0.0001	3E-05	5E-05	5E-05	0.0005	0.009
Composite Cycle 16-19	C-5	0.0001	0.024	5E-05	0.0003	0.0001	3E-05	5E-05	5E-05	0.0004	0.0005
Composite Cycle 21-24	C-6	0.0004	0.018	5E-05	0.0007	0.0001	3E-05	5E-05	5E-05	0.0004	0.002
Composite Cycle 25-28	C-7	0.0001	0.012	5E-05	0.0003	0.0001	3E-05	5E-05	5E-05	0.0003	0.0005
		HC-6 (VB-009 86-90 G) Greywacke									
Composite Cycle 0-3	C-1	0.0005	0.11	0.0026	0.006	0.0005	0.0002	0.0003	3E-04	0.0005	0.005
Composite Cycle 4-7	C-2	0.0006	0.109	0.0012	0.0008	0.0001	3E-05	5E-05	5E-05	0.0005	0.0005
Composite Cycle 8-11	C-3	0.0005	0.124	0.0007	0.0011	0.0001	3E-05	5E-05	5E-05	0.0003	0.002
Composite Cycle 12-15	C-4	0.0006	0.085	0.0005	0.001	0.0001	3E-05	5E-05	5E-05	0.0003	0.004
Composite Cycle 16-19	C-5	0.0007	0.051	0.0003	0.0007	0.0001	3E-05	5E-05	5E-05	0.0002	0.002
Composite Cycle 21-24	C-6	0.001	0.051	0.0003	0.001	0.0001	3E-05	5E-05	5E-05	0.0002	0.003
Composite Cycle 25-28	C-7	0.0001	0.066	5E-05	0.0005	0.0001	3E-05	5E-05	5E-05	0.0001	0.002
		HC-2 (VB-006 44-48 S) Shale									
Composite Cycle 0-3	C-1	0.036	0.56	0.0003	0.16	0.0005	0.0002	0.0003	3E-04	0.0005	0.11
Composite Cycle 4-7	C-2	0.103	0.368	5E-05	0.113	0.0001	3E-05	5E-05	5E-05	0.0001	0.19
Composite Cycle 8-11	C-3	0.304	0.296	5E-05	0.112	0.0001	3E-05	5E-05	5E-05	0.0001	0.32
Composite Cycle 12-15	C-4	0.598	0.311	5E-05	0.125	0.0001	3E-05	5E-05	1E-04	0.0001	0.52
Composite Cycle 16-19	C-5	1.16	0.314	5E-05	0.141	0.0001	3E-05	5E-05	3E-04	0.0001	0.81
Composite Cycle 21-24	C-6	1.85	0.348	5E-05	0.191	0.0001	3E-05	5E-05	6E-04	0.0001	1.24
Composite Cycle 25-28	C-7	N/D	N/D	N/D	N/D	N/D	N/D	N/D	N/D	N/D	N/D
		HC-4 (VB-011 156-160 S) Shale									
Composite Cycle 0-3	C-1	0.002	0.089	0.015	0.006	0.0005	0.0002	0.0003	3E-04	0.0005	0.006
Composite Cycle 4-7	C-2	0.0027	0.064	0.0064	0.0013	0.0001	3E-05	5E-05	5E-05	0.0003	0.005
Composite Cycle 8-11	C-3	0.0028	0.045	0.003	0.001	0.0001	3E-05	5E-05	5E-05	0.0001	0.01
Composite Cycle 12-15	C-4	0.0036	0.044	0.0026	0.0009	0.0001	3E-05	5E-05	5E-05	0.0001	0.015
Composite Cycle 16-19	C-5	0.0035	0.041	0.0021	0.0009	0.0001	3E-05	5E-05	5E-05	0.0001	0.016
Composite Cycle 21-24	C-6	0.0046	0.046	0.002	0.0009	0.0001	3E-05	5E-05	5E-05	0.0001	0.016
Composite Cycle 25-28	C-7	0.0023	0.051	0.0016	0.0007	0.0001	3E-05	5E-05	5E-05	0.0001	0.017
		HC-3 (VB-002 220-224 I) Interbedded									
Composite Cycle 0-3	C-1	0.005	0.046	0.0027	0.002	0.0005	0.0002	0.0003	3E-04	0.0005	0.005
Composite Cycle 4-7	C-2	0.153	0.102	0.0006	0.0019	0.0001	3E-05	5E-05	5E-05	0.0001	0.013
Composite Cycle 8-11	C-3	0.049	0.113	0.0004	0.0014	0.0001	3E-05	5E-05	5E-05	0.0001	0.011
Composite Cycle 12-15	C-4	0.051	0.133	0.0004	0.0014	0.0001	3E-05	5E-05	5E-05	0.0001	0.02
Composite Cycle 16-19	C-5	0.038	0.102	0.0003	0.0009	0.0001	3E-05	5E-05	5E-05	0.0001	0.015
Composite Cycle 21-24	C-6	0.033	0.093	0.0003	0.0009	0.0001	3E-05	5E-05	5E-05	0.0001	0.014
Composite Cycle 25-28	C-7	N/D	N/D	N/D	N/D	N/D	N/D	N/D	N/D	N/D	N/D
		HC-5 (VB-018 120-124 I) Interbedded									
Composite Cycle 0-3	C-1	0.0005	0.11	0.0012	0.013	0.0005	0.0002	0.0003	3E-04	0.0005	0.008
Composite Cycle 4-7	C-2	0.0034	0.084	0.0004	0.0012	0.0001	3E-05	5E-05	5E-05	0.0001	0.003
Composite Cycle 8-11	C-3	0.0013	0.075	0.0003	0.0008	0.0001	3E-05	5E-05	5E-05	0.0001	0.004
Composite Cycle 12-15	C-4	0.0014	0.062	0.0003	0.0008	0.0001	3E-05	5E-05	5E-05	0.0001	0.005
Composite Cycle 16-19	C-5	0.001	0.031	0.0002	0.0006	0.0001	3E-05	5E-05	5E-05	0.0001	0.005
Composite Cycle 21-24	C-6	0.001	0.015	5E-05	0.0008	0.0001	3E-05	5E-05	5E-05	0.0001	0.006
Composite Cycle 25-28	C-7	0.0005	0.0048	5E-05	0.0004	0.0001	3E-05	5E-05	5E-05	0.0001	0.005
Results less than the detection limit were converted to half the detection limit and select metals are presented in this table.											

Humidity Cell Test Preparation Summary
Vista Gold Corp.- Mt Todd Gold Project

LAB ID	Lab Report	Sample ID	Dimensions (cm)		Sample Mass	Column Material	Initial Flush	Weekly	Flush Procedure	Air Temp	Sampling Frequency
			Diameter	Height							
HC-1	Dec-08	VB07-009 58-62 G	20	12	Sep-02	Clear Plexy Glass; 1 layer 400 Nylon mesh	750	500	ASTM-Trickle Leach	18-24	Weekly
HC-2	Dec-08	VB07-006 44-48 S									
HC-3	Dec-08	VB07-002 220-224 I									
HC-4	Dec-08	VB07-011 156-160 S									
HC-5	Dec-08	VB07-018 120-124 I									
HC-6	Dec-08	VB07-009 86-90 G									
HC-1B	Sep-09	VB07-001 173-177 G									
HC-2B	Sep-09	VB08-026 332-336 S									
HC-3B	Sep-09	VB08-032 180-184 I									

Elemental Analysis-Tailings
Vista Gold Corp.-Mt Todd Gold Project

Parameter	Unit	Result	
Tailings Sample		VB07-007 350-362	EP1107934
Al	wt. %	7.18	2.15
Ag	ppm	NA	1.15
As	ppm	109	177
Au	ppm	NA	ND
B	ppm	NA	ND
Ba	ppm	511	60
Be	ppm	NA	0.66
Bi	ppm	20	6.68
Ca	wt. %	0.4	0.36
Cd	ppm	22	2.97
Ce	ppm	NA	70.9
Co	ppm	15	25.3
Cr	ppm	101	374
Cs	ppm	NA	2.81
Cu	ppm	440	525
Fe	wt. %	6.02	5.1
Ga	ppm	NA	6.67
Ge	ppm	NA	0.16
Hf	ppm	NA	0.43
Hg	ppm	0.05	ND
In	ppm	NA	0.086
K	wt. %	3.07	0.41
La	ppm	NA	33.8
Li	ppm	NA	15.9
Mg	wt. %	1.31	1.01
Mn	ppm	359	425
Mo	ppm	1	31.6
Na	wt. %	0.23	0.04
Nb	ppm	NA	0.16
Ni	ppm	86	228
P	wt. %	ND	400
Pb	ppm	56	397
Rb	ppm	NA	28.5
Re	ppm	NA	0.003
S	%	NA	1.06
Sb	ppm	ND	1
Sc	ppm	NA	4.1
Se	ppm	ND	0.6
Sn	ppm	NA	1.5
Sr	ppm	22	8.4
Ta	ppm	13	0.01
Te	ppm	9	0.16
Th	ppm	NA	11.4
Ti	wt. %	0.28	0.026
Tl	ppm	ND	0.19
U	ppm	68	1.46
V	ppm	94	41
W	ppm	13	2.02
Y	ppm	NA	9.72
Zn	ppm	206	933
Zr	ppm	NA	15.4
ND = Not Detected			
NA= Not Analyzed			

Humidity Cell Test- Particle Size Distribution
Vista Gold Corp.-Mt Todd Gold Project

First Round Samples											
HC-1 (Sample ID: VB-009 58-62 G)						HC-4 (Sample ID: VB-011 156-160 S)					
Screen		Mass (g)	% Retained		% Passing	Screen		Mass (g)	% Retained		% Passing
Tyler Mesh	Opening (mm)		Interval	Cumulative		Tyler Mesh	Opening (mm)		Interval	Cumulative	
5	4.00	161.3	64.4	64.4	35.6	5	4.00	184.0	73.8	73.8	26.2
9	2.00	43.1	17.2	81.5	18.5	9	2.00	46.5	18.6	92.4	7.6
20	0.841	23.4	9.3	90.9	9.1	20	0.841	14.6	5.9	98.2	1.8
35	0.425	9.0	3.6	94.5	5.5	35	0.425	3.0	1.2	99.4	0.6
60	0.250	5.0	2.0	96.5	3.5	60	0.250	0.1	0.0	99.5	0.5
115	0.125	0.6	0.2	96.7	3.3	115	0.125	0.2	0.1	99.5	0.5
250	0.063	5.6	2.2	99.0	1.0	250	0.063	0.6	0.2	99.8	0.2
<250	<0.063	2.6	1.0	100.0	0.0	<250	<0.063	0.5	0.2	100.0	0.0
Total		250.6	100.0			Total		249.5	100.0		
HC-2 (Sample ID: VB-006 44-48 S)						HC-5 (Sample ID: VB-018 120-124 I)					
Screen		Mass (g)	% Retained		% Passing	Screen		Mass (g)	% Retained		% Passing
Tyler Mesh	Opening (mm)		Interval	Cumulative		Tyler Mesh	Opening (mm)		Interval	Cumulative	
5	4.00	170.4	68.3	68.3	31.7	5	4.00	172.0	68.8	68.8	31.2
9	2.00	41.3	16.5	84.8	15.2	9	2.00	45.1	18.0	86.9	13.1
20	0.841	22.1	8.9	93.7	6.3	20	0.841	21.8	8.7	95.6	4.4
35	0.425	7.5	3.0	96.7	3.3	35	0.425	6.0	2.4	98.0	2.0
60	0.250	3.3	1.3	98.0	2.0	60	0.250	2.2	0.9	98.8	1.2
115	0.125	0.2	0.1	98.1	1.9	115	0.125	0.1	0.0	98.9	1.1
250	0.063	3.4	1.4	99.4	0.6	250	0.063	2.0	0.8	99.7	0.3
<250	<0.063	1.4	0.6	100.0	0.0	<250	<0.063	0.8	0.3	100.0	0.0
Total		249.7	100.0			Total		250.0	100.0		
HC-3 (Sample ID: VB-002 220-224 I)						HC-6 (Sample ID: VB-009 86-90 G)					
Screen		Mass (g)	% Retained		% Passing	Screen		Mass (g)	% Retained		% Passing
Tyler Mesh	Opening (mm)		Interval	Cumulative		Tyler Mesh	Opening (mm)		Interval	Cumulative	
5	4.00	161.5	64.4	64.4	35.6	5	4.00	160.9	64.8	64.8	35.2
9	2.00	51.7	20.6	85.1	14.9	9	2.00	49.6	20.0	84.8	15.2
20	0.841	23.7	9.5	94.5	5.5	20	0.841	22.8	9.2	93.9	6.1
35	0.425	6.9	2.8	97.3	2.7	35	0.425	7.3	3.0	96.9	3.1
60	0.250	2.9	1.1	98.4	1.6	60	0.250	3.0	1.2	98.1	1.9
115	0.125	0.2	0.1	98.5	1.5	115	0.125	0.2	0.1	98.2	1.8
250	0.063	2.8	1.1	99.6	0.4	250	0.063	3.2	1.3	99.5	0.5
<250	<0.063	1.0	0.4	100.0	0.0	<250	<0.063	1.3	0.5	100.0	0.0
Total		250.6	100.0			Total		248.3	100.0		

**Humidity Cell Test- Particle Size Distribution
Vista Gold Corp.-Mt Todd Gold Project**

Second Round Samples					
HC-1 (Sample ID: VB007-001 173-177 G)					
Screen		Mass (g)	% Retained		% Passing
Tyler Mesh	Opening (mm)		Interval	Cumulative	
5	4.00	165.4	66.4	66.4	33.6
9	2.00	48.1	19.3	85.7	14.3
20	0.841	22.6	9.1	94.8	5.2
35	0.425	7.0	2.8	97.6	2.4
60	0.250	2.8	1.1	98.7	1.3
115	0.125	0.0	0.0	98.7	1.3
250	0.063	1.3	0.5	99.2	0.8
<250	<0.063	1.9	0.8	100.0	0.0
Total		249.1	100.0		
HC-2 (Sample ID: VB08-026 332-336 S)					
Screen		Mass (g)	% Retained		% Passing
Tyler Mesh	Opening (mm)		Interval	Cumulative	
5	4.00	169.4	67.9	67.9	32.1
9	2.00	43.0	17.2	85.1	14.9
20	0.841	21.4	8.6	93.7	6.3
35	0.425	7.3	2.9	96.6	3.4
60	0.250	3.4	1.3	97.9	2.1
115	0.125	0.1	0.0	98.0	2.0
250	0.063	2.3	0.9	98.9	1.1
<250	<0.063	2.8	1.1	100.0	0.0
Total		249.6	100.0		
HC-3 (Sample ID: VB08-032 180-184 I)					
Screen		Mass (g)	% Retained		% Passing
Tyler Mesh	Opening (mm)		Interval	Cumulative	
5	4.00	157.4	63.2	63.2	36.8
9	2.00	44.9	18.0	81.2	18.8
20	0.841	25.0	10.1	91.3	8.7
35	0.425	9.4	3.8	95.1	4.9
60	0.250	4.8	1.9	97.0	3.0
115	0.125	0.0	0.0	97.0	3.0
250	0.063	3.9	1.6	98.6	1.4
<250	<0.063	3.6	1.4	100.0	0.0
Total		249.0	100.0		

Predictive Modeling Source Terms-RP1, RP3

ABA Classification		non-PAG			Uncertain			PAG	
Lithology		Greywacke	Shale	Intebedded	Greywacke	Shale	Interbedded		Shale
Sample		HC-1B	HC-2B	HC-3B	HC-1B	HC-2B	HC-3B	RP1-2011 Site	HC-2 (1st Round)
week chosen		76	96	52	4	4	4		4
pH	Std Units	7.2	7.42	6.97	8.68	7.96	8.61	3.71	5.79
SO ₄ ²⁻	mg/L	4	5	10	8	11	5	1600	61
Al	mg/L	0.0276	0.04300	0.02640	0.05600	0.04700	0.09000	51	0.1400
Sb	mg/L	0.00029	0.00013	0.00013	0.00260	0.00160	0.00160		0.0002
As	mg/L	0.00677	0.00337	0.00473	0.04900	0.04700	0.01300	0.006	0.0040
Ba	mg/L	0.00109	0.00036	0.00088	0.00240	0.00120	0.00210		0.0160
Be	mg/L	0.000005	0.00001	0.00001	0.00005	0.00005	0.00005		0.0003
Bi	mg/L	0.0000025	0.00000	0.00000	0.00005	0.00005	0.00005		0.0050
B	mg/L	0.025	0.02500	0.02500	0.03500	0.01900	0.02400		0.1500
Cd	mg/L	0.000031	0.00001	0.00002	0.00001	0.00001	0.00001	0.14	0.0004
Cr	mg/L	0.0003	0.00030	0.00020	0.00010	0.00010	0.00010	0.001	0.0005
Co	mg/L	0.00038	0.00009	0.00091	0.00030	0.00020	0.00005	2	0.0640
Cu	mg/L	0.00113	0.00133	0.00259	0.00270	0.00320	0.00320	11	0.0100
Fe	mg/L	0.002	0.00300	0.00400	0.00500	0.00500	0.00500	0.3	0.2300
Pb	mg/L	0.000434	0.00004	0.00021	0.00015	0.00003	0.00003	0.07	0.0360
Mn	mg/L	0.00498	0.00183	0.05650	0.02700	0.03900	0.02400	18	0.5600
Mo	mg/L	0.000025	0.00003	0.00008	0.00090	0.00140	0.00100		0.0003
Ni	mg/L	0.00131	0.00104	0.00110	0.00170	0.00100	0.00060	1.7	0.1600
Se	mg/L	0.00002	0.00002	0.00005	0.00010	0.00010	0.00010		0.0005
Ag	mg/L	0.0000025	0.00000	0.00000	0.00002	0.00002	0.00002		0.0001
Th	mg/L	0.0000025	0.00000	0.00000	0.00003	0.00003	0.00003		0.0003
U	mg/L	0.000014	0.00001	0.00001	0.00006	0.00003	0.00003		0.0003
V	mg/L	0.0001	0.00020	0.00010	0.00060	0.00040	0.00050		0.0005
Zn	mg/L	0.0085	0.01280	0.00250	0.00300	0.00100	0.00100	33	0.1100
Ca	mg/L	3.5	4.23	3.79	6.06	4.61	5.01	100	4.0000
Li	mg/L	0.00025	0.00025	0.00025	0.0014	0.001	0.0012		0.0090
Mg	mg/L	0.36	1.85	0.6	1.01	1.53	1.07	250	8.2200
P	mg/L	0.218	0.17	0.151	0.02	0.02	0.02		0.0750
K	mg/L	0.23	0.28	0.86	2.9	4.27	4.38	5.7	10.9000
Si	mg/L	0.3	0.4	0.6	0.88	0.98	0.92		2.7000
Na	mg/L	0.29	0.2	0.24	3.35	5.7	1.49	18	1.6200
Ti	mg/L	0.00025	0.00025	0.00025	0.0001	0.0003	0.0001		0.0005
Cl	mg/L	2	4.5	4.5	15	15	15	12	

Predictive Modeling Source Terms- Equalization Pond

Source		RP2	HPL	RP5
Analyte	Units	2011 RP1 Vista site data	2011 Vista site data	2011 Vista site data
pH	pH units	3.71	5.7	4.18
EC	mg/L	3027	7470	874
Temp	mg/L	33.4	35.6	34.3
SO ₄ ²⁻	mg/L	1600	4100	320
Mg	mg/L	250	340	60
Al	mg/L	51.0	0.42	54
Cd	mg/L	0.14	0.042	0.013
Co	mg/L	1.6	0.46	0.16
Cu	mg/L	11.0	2.4	1.4
Fe	mg/L	0.3	0.017	0.075
Mn	mg/L	18.0	11	2.6
Ni	mg/L	1.7	0.2	0.17
Zn	mg/L	33.0	4.2	3.6
Pb	mg/L	0.065	0.001	0.015
Cr	mg/L	0.001	<.001	<.001
Na	mg/L	18	650	7
K	mg/L	5.7	54	3.8
Ca	mg/L	100	500	29
Cl	mg/L	12	28	3
As	mg/L	0.006	0.008	0.005
Hg	mg/L	<0.0001	<0.0001	<0.0001

DATABASE C:\Program Files (x86)\Phreeqc\Databases\minteq.v5.dat

TITLE input file for Mt Todd Water Balance-WRD

SELECTED_OUTPUT

-solution true
 -distance false
 -time false
 -step false

USER_PUNCH

-headings	Ag_mg/L	Al_mg/L	As_mg/L	B_mg/L	Ba_mg/L	
	Be_mg/L	Bi_mg/L	C_mg/L	Ca_mg/L	Cd_mg/L	Co_mg/L
	Cr_mg/L	Cu_mg/L	Fe_mg/L	K_mg/L	Li_mg/L	Mg_mg/L
	Mn_mg/L	Mo_mg/L	Na_mg/L	Ni_mg/L	P_mg/L	Pb_mg/L
	S(6)_mg/L	Sb_mg/L	Se_mg/L	Si_mg/L	Th_mg/L	Ti_mg/L
	U_mg/L	V_mg/L	Zn_mg/L	Cl_mg/L		

-start

```

5   Ag_ppm = TOT("Ag")*107.87* 1000
10  Al_ppm = TOT("Al") *26.982* 1000
15  As_ppm = TOT("As") *74.922* 1000
20  B_ppm = TOT("B") *10.811* 1000
25  Ba_ppm = TOT("Ba") *137.33* 1000
30  Be_ppm = TOT("Be") *9.0122* 1000
35  Bi_ppm = TOT("Bi") *208.96* 1000
40  C_ppm = TOT("C") *12.011* 1000
45  Ca_ppm = TOT("Ca") *40.078* 1000
50  Cd_ppm = TOT("Cd") *112.41* 1000
55  Co_ppm = TOT("Co") *58.933* 1000
60  Cr_ppm = TOT("Cr") *51.996* 1000
65  Cu_ppm = TOT("Cu") *63.546* 1000
70  Fe_ppm = TOT("Fe") *55.847* 1000
75  K_ppm = TOT("K") *39.083* 1000
80  Li_ppm = TOT("Li") *6.941* 1000
85  Mg_ppm = TOT("Mg") *24.305* 1000
90  Mn_ppm = TOT("Mn") *54.938* 1000
95  Mo_ppm = TOT("Mo") *95.94* 1000
100 Na_ppm = TOT("Na") *22.9898* 1000
105 Ni_ppm = TOT("Ni") *58.693* 1000
110 P_ppm = TOT("P") *30.974* 1000
115 Pb_ppm = TOT("Pb") *207.2* 1000
120 S_ppm = TOT("S") *96.0616* 1000
125 Sb_ppm = TOT("Sb") *121.76* 1000
130 Se_ppm = TOT("Se") *78.96* 1000
135 Si_ppm = TOT("Si") *28.086* 1000
140 Th_ppm = TOT("Th") *232.04* 1000
145 Ti_ppm = TOT("Ti") *47.867* 1000
150 U_ppm = TOT("U") *238.03* 1000
155 V_ppm = TOT("V") *50.942* 1000
160 Zn_ppm = TOT("Zn") *65.39* 1000
165 Cl_ppm = TOT("Cl") *35.453* 1000
170 PUNCH Ag_ppm
175 PUNCH Al_ppm

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180 PUNCH As_ppm
185 PUNCH B_ppm
190 PUNCH Ba_ppm
195 PUNCH Be_ppm
200 PUNCH Bi_ppm
205 PUNCH C_ppm
210 PUNCH Ca_ppm
215 PUNCH Cd_ppm
220 PUNCH Co_ppm
225 PUNCH Cr_ppm
230 PUNCH Cu_ppm
235 PUNCH Fe_ppm
240 PUNCH K_ppm
245 PUNCH Li_ppm
250 PUNCH Mg_ppm
255 PUNCH Mn_ppm
260 PUNCH Mo_ppm
265 PUNCH Na_ppm
270 PUNCH Ni_ppm
275 PUNCH P_ppm
280 PUNCH Pb_ppm
285 PUNCH S_ppm
290 PUNCH Sb_ppm
295 PUNCH Se_ppm
300 PUNCH Si_ppm
305 PUNCH Th_ppm
310 PUNCH Ti_ppm
315 PUNCH U_ppm
320 PUNCH V_ppm
325 PUNCH Zn_ppm
330 PUNCH Cl_ppm
end

```

SOLUTION 1

```

temp 25
pH 7.2
pe 4 O2(g) -0.67
redox pe
units mg/l
density 1
S(6) 4
Al 0.0276
Sb 0.00029
As 0.00677
Ba 0.00109
Be 5e-006
Bi 2.5e-006
B 0.025
Cd 3.1e-005
Cr 0.0003
Co 0.00038

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Cu      0.00113
Fe      0.002
Pb      0.000434
Mn      0.00498
Mo      2.5e-005
Ni      0.00131
Se      2e-005
Ag      2.5e-006
Th      2.5e-006
U       1.4e-005
V       0.0001
Zn      0.0085
Ca      3.5
Li      0.00025
Mg      0.36
P       0.218
K       0.23
Si      0.3
Na      0.29
Ti      0.00025
Cl      2
C       1 CO2(g)   -3.5
O(0)    1 O2(g)    -0.67
-water  1 # kg
SOLUTION 2
temp    25
pH      7.42
pe      4 O2(g) -0.67
redox   pe
units   mg/l
density 1
S(6)    5
Al      0.043
Sb      0.00013
As      0.00337
Ba      0.00036
Be      1e-005
Bi      0
B       0.025
Cd      1e-005
Cr      0.0003
Co      9e-005
Cu      0.00133
Fe      0.003
Pb      4e-005
Mn      0.00183
Mo      3e-005
Ni      0.00104
Se      2e-005
Ag      0
Th      0

```

U	1e-005	
V	0.0002	
Zn	0.0128	
Ca	4.23	
Li	0.00025	
Mg	1.85	
P	0.17	
K	0.28	
Si	0.4	
Na	0.5	
Ti	0.00025	
Cl	4.5	
C	1 CO2(g)	-3.5
O(0)	1 O2(g)	-0.67
-water	1 # kg	

SOLUTION 3

temp	25
pH	6.97
pe	4 O2(g) -0.67
redox	pe
units	mg/l
density	1
S(6)	10
Al	0.0264
Sb	0.00013
As	0.00473
Ba	0.00088
Be	0.0001
Bi	2.5e-006
B	0.025
Cd	2e-005
Cr	0.0002
Co	0.00091
Cu	0.00259
Fe	0.004
Pb	0.00021
Mn	0.0565
Mo	8e-005
Ni	0.0011
Se	5e-005
Ag	2.5e-006
Th	2.5e-006
U	1e-005
V	0.0001
Zn	0.0025
Ca	3.79
Li	0.00025
Mg	0.6
P	0.151
K	0.86

Si 0.6
 Na 2.5
 Ti 2.5e-005
 Cl 4.5
 C 1 CO2(g) -3.5
 O(0) 1 O2(g) -0.67
 -water 1 # kg

SOLUTION 4

temp 25
 pH 8.68
 pe 4 O2(g) -0.67
 redox pe
 units mg/l
 density 1
 S(6) 8
 Al 0.056
 Sb 0.0026
 As 0.049
 Ba 0.0024
 Be 5e-005
 Bi 5e-005
 B 0.035
 Cd 1e-005
 Cr 0.0001
 Co 0.0003
 Cu 0.0027
 Fe 0.005
 Pb 0.00015
 Mn 0.027
 Mo 0.0009
 Ni 0.0017
 Se 0.0001
 Ag 2e-005
 Th 3e-005
 U 6e-005
 V 0.0006
 Zn 0.003
 Ca 6.06
 Li 0.0014
 Mg 1.01
 P 0.02
 K 2.9
 Si 0.88
 Na 3.35
 Ti 0.0001
 Cl 15
 O(0) 1 O2(g) -0.67
 -water 1 # kg

SOLUTION 5

```

temp      25
pH        7.96
pe        4 O2(g) -0.67
redox     pe
units     mg/l
density   1
S(6)      11
Al         0.047
Sb         0.0016
As         0.047
Ba         0.0012
Be         5e-005
Bi         5e-005
B          0.019
Cd         1e-005
Cr         0.0001
Co         0.0002
Cu         0.0032
Pb         3e-005
Mn         0.039
Mo         0.0014
Ni         0.001
Se         0.0001
Ag         2e-005
Th         3e-005
U          3e-005
V          0.0004
Zn         0.001
Ca         4.61
Li         0.001
Mg         1.53
P          0.02
K          4.27
Si         0.98
Na         5.7
Ti         0.0003
Cl         15
O(0)      1 O2(g)   -0.67
-water    1 # kg

```

SOLUTION 6

```

temp      25
pH        8.61
pe        4 O2(g) -0.67
redox     pe
units     mg/l
density   1
S(6)      5
Al         0.09
Sb         0.0016
As         0.013

```

Be	5e-005	
Bi	5e-005	
B	0.024	
Cd	1e-005	
Cr	0.0001	
Co	5e-005	
Cu	0.0032	
Fe	0.005	
Pb	3e-005	
Mn	0.024	
Mo	0.001	
Ni	0.0006	
Se	0.0001	
Ag	2e-005	
Th	3e-005	
U	3e-005	
V	0.0005	
Zn	0.001	
Ca	5.01	
Li	0.0012	
Mg	1.07	
P	0.02	
K	4.38	
Si	0.92	
Na	1.49	
Ti	0.0001	
Cl	15	
O(0)	1 O2(g)	-0.67
-water	1 # kg	

SOLUTION 7

temp	25
pH	5.79
pe	4 O2(g) -0.67
redox	pe
units	mg/l
density	1
S(6)	61
Al	0.14
Sb	0.0002
As	0.004
Ba	0.016
Be	0.0003
Bi	0.005
B	0.15
Cd	0.0004
Ca	4
Cr	0.0005
Co	0.064
Cu	0.01
Fe	0.23

Pb 0.036
 Li 0.009
 Mg 8.22
 Mn 0.56
 Mo 0.00025
 Ni 0.16
 P 0.075
 K 10.9
 Se 0.0005
 Si 2.7
 Ag 0.000125
 Na 1.62
 Sr 0.007
 Tl 0.0002
 Th 0.00025
 Sn 0.0005
 Ti 0.0005
 U 0.00025
 V 0.0005
 Zn 0.11
 O(0) 1 O2(g) -0.67
 -water 1 # kg

SOLUTION 8

temp 25
 pH 3.71
 pe 4 O2(g) -0.67
 redox pe
 units mg/l
 density 1
 S(6) 1600
 Al 51
 As 0.006
 Cd 0.14
 Cr 0.001
 Co 2
 Cu 11
 Fe 0.3
 Pb 0.07
 Mn 18
 Ni 1.7
 Zn 33
 Ca 100
 Mg 250
 K 5.7
 Na 18
 Cl 12
 -water 1 # kg

SOLUTION 9

temp 25

pH 3.71
 pe 4 O2(g) -0.67
 redox pe
 units mg/l
 density 1
 S(6) 1600
 Al 51
 As 0.006
 Cd 0.14
 Cr 0.001
 Co 2
 Cu 11
 Fe 0.3
 Pb 0.07
 Mn 18
 Ni 1.7
 Zn 33
 Ca 100
 Mg 250
 K 5.7
 Na 18
 Cl 12
 -water 1 # kg

SOLUTION 10

temp 22
 pH 5.7
 pe 4 O2(g) -0.67
 redox pe
 units mg/l
 density 1
 C 1 CO2(g) -3.5
 O(0) 1 O2(g) -0.67
 N 0.005
 -water 1 # kg

end

MIX 11 solutions 1,2,3

1 0.4
 2 0.18
 3 0.42

EQUILIBRIUM_PHASES 1

Al(OH)3(am) 0 0
 Alunite 0 0
 Barite 0 0
 Calcite 0 0
 CO2(g) -3.5 1
 Cr(OH)3(am) 0 0
 Diaspore 0 0
 Ferrihydrite 0 0
 Gypsum 0 0

```

Pb(OH)2 0 0
Pyrolusite 0 0
Goethite 0 0
save solution 11
end

```

```

MIX 12 uncertain
4 0.35
5 0.15
6 0.5

```

```

EQUILIBRIUM_PHASES 1
Al(OH)3(am) 0 0
Alunite 0 0
Barite 0 0
Calcite 0 0
CO2(g) -3.5 1
Cr(OH)3(am) 0 0
Diaspore 0 0
Ferrihydrite 0 0
Gypsum 0 0
Pb(OH)2 0 0
Pyrolusite 0 0
Goethite 0 0

```

```

save solution 12
end

```

```

USE solution 7

```

```

RATES
pyrite
-start
10 REM PARM(1) = log 10 (A/V, 1dm) [scaling factor]
20 REM PARM(2) = exp for (M/M0) [fitting factor]
30 REM PARM(3) = exp for O2
40 REM PARM(4) = exp for H+
50 IF(M <= 0) THEN GOTO 100
60 IF(SI("Pyrite") >= 0) THEN GOTO 100
70 lograte = -10.19+PARM(1)+PARM(3)*LM("O2")+PARM(4)*LM("H+")+PARM(2)*(M/M0)
80 moles = (10^lograte)*TIME
90 IF(moles > M) THEN moles = M
100 SAVE moles

```

```

KINETICS 1 PAG dry season
pyrite
-formula FeS2 1
-m 1
-m0 1
-parms 0.05 0.07 0.5 -0.11
-tol 1e-008

```

```
-steps      15724800 in 26 steps # seconds
-step_divide 100
-runge_kutta 3
-bad_step_max 500
-cvode true
-cvode_steps 100
-cvode_order 5
```

EQUILIBRIUM_PHASES 1

```
Al(OH)3(am) 0 0
Alunite 0 0
Barite 0 0
Calcite 0 0
CO2(g) -3.5 1
Cr(OH)3(am) 0 0
Diaspore 0 0
Ferrihydrite 0 0
Goethite 0 0
Gypsum 0 0
Pb(OH)2 0 0
Pyrolusite 0 0
SAVE solution 13
end
```

MIX 14

```
11 0.244
12 0.168
13 0.537
8 0.006
9 0.045
```

EQUILIBRIUM_PHASES 1

```
Al(OH)3(am) 0 0
Alunite 0 0
Barite 0 0
Calcite 0 0
CO2(g) -3.5 1
Cr(OH)3(am) 0 0
Diaspore 0 0
Ferrihydrite 0 0
Gypsum 0 0
Pb(OH)2 0 0
Pyrolusite 0 0
Goethite 0 0
SAVE solution 14
end
```

DATABASE C:\Program Files (x86)\Phreeqc\Databases\minteq.v5.dat

TITLE input file for Mt Todd Water Balance-RP3

SELECTED_OUTPUT

-solution true
 -distance false
 -time false
 -step false

USER_PUNCH

-headings	Ag_mg/L	Al_mg/L	As_mg/L	B_mg/L	Ba_mg/L	
	Be_mg/L	Bi_mg/L	C_mg/L	Ca_mg/L	Cd_mg/L	Co_mg/L
	Cr_mg/L	Cu_mg/L	Fe_mg/L	K_mg/L	Li_mg/L	Mg_mg/L
	Mn_mg/L	Mo_mg/L	Na_mg/L	Ni_mg/L	P_mg/L	Pb_mg/L
	S(6)_mg/L	Sb_mg/L	Se_mg/L	Si_mg/L	Th_mg/L	Ti_mg/L
	U_mg/L	V_mg/L	Zn_mg/L	Cl_mg/L		

-start

```

5   Ag_ppm = TOT("Ag")*107.87* 1000
10  Al_ppm = TOT("Al") *26.982* 1000
15  As_ppm = TOT("As") *74.922* 1000
20  B_ppm = TOT("B") *10.811* 1000
25  Ba_ppm = TOT("Ba") *137.33* 1000
30  Be_ppm = TOT("Be") *9.0122* 1000
35  Bi_ppm = TOT("Bi") *208.96* 1000
40  C_ppm = TOT("C") *12.011* 1000
45  Ca_ppm = TOT("Ca") *40.078* 1000
50  Cd_ppm = TOT("Cd") *112.41* 1000
55  Co_ppm = TOT("Co") *58.933* 1000
60  Cr_ppm = TOT("Cr") *51.996* 1000
65  Cu_ppm = TOT("Cu") *63.546* 1000
70  Fe_ppm = TOT("Fe") *55.847* 1000
75  K_ppm = TOT("K") *39.083* 1000
80  Li_ppm = TOT("Li") *6.941* 1000
85  Mg_ppm = TOT("Mg") *24.305* 1000
90  Mn_ppm = TOT("Mn") *54.938* 1000
95  Mo_ppm = TOT("Mo") *95.94* 1000
100 Na_ppm = TOT("Na") *22.9898* 1000
105 Ni_ppm = TOT("Ni") *58.693* 1000
110 P_ppm = TOT("P") *30.974* 1000
115 Pb_ppm = TOT("Pb") *207.2* 1000
120 S_ppm = TOT("S") *96.0616* 1000
125 Sb_ppm = TOT("Sb") *121.76* 1000
130 Se_ppm = TOT("Se") *78.96* 1000
135 Si_ppm = TOT("Si") *28.086* 1000
140 Th_ppm = TOT("Th") *232.04* 1000
145 Ti_ppm = TOT("Ti") *47.867* 1000

```



```
150  U_ppm = TOT("U") *238.03* 1000
155  V_ppm = TOT("V") *50.942* 1000
160  Zn_ppm = TOT("Zn") *65.39* 1000
165  Cl_ppm = TOT("Cl") *35.453* 1000
170  PUNCH Ag_ppm
175  PUNCH Al_ppm
180  PUNCH As_ppm
185  PUNCH B_ppm
190  PUNCH Ba_ppm
195  PUNCH Be_ppm
200  PUNCH Bi_ppm
205  PUNCH C_ppm
210  PUNCH Ca_ppm
215  PUNCH Cd_ppm
220  PUNCH Co_ppm
225  PUNCH Cr_ppm
230  PUNCH Cu_ppm
235  PUNCH Fe_ppm
240  PUNCH K_ppm
245  PUNCH Li_ppm
250  PUNCH Mg_ppm
255  PUNCH Mn_ppm
260  PUNCH Mo_ppm
265  PUNCH Na_ppm
270  PUNCH Ni_ppm
275  PUNCH P_ppm
280  PUNCH Pb_ppm
285  PUNCH S_ppm
290  PUNCH Sb_ppm
295  PUNCH Se_ppm
300  PUNCH Si_ppm
305  PUNCH Th_ppm
310  PUNCH Ti_ppm
315  PUNCH U_ppm
320  PUNCH V_ppm
325  PUNCH Zn_ppm
330  PUNCH Cl_ppm
end
```

SOLUTION 1

```
temp    25
pH      7.2
pe      4 O2(g) -0.67
redox   pe
```

```

units    mg/l
density  1
S(6)     4
Al        0.0276
Sb        0.00029
As        0.00677
Ba        0.00109
Be        5e-006
Bi        2.5e-006
B         0.025
Cd        3.1e-005
Cr        0.0003
Co        0.00038
Cu        0.00113
Fe        0.002
Pb        0.000434
Mn        0.00498
Mo        2.5e-005
Ni        0.00131
Se        2e-005
Ag        2.5e-006
Th        2.5e-006
U         1.4e-005
V         0.0001
Zn        0.0085
Ca        3.5
Li        0.00025
Mg        0.36
P         0.218
K         0.23
Si        0.3
Na        0.29
Ti        0.00025
Cl        2
C         1 CO2(g)  -3.5
O(0)     1 O2(g)   -0.67
-water   1 # kg

```

SOLUTION 2

```

temp     25
pH       7.42
pe       4 O2(g) -0.67
redox    pe
units    mg/l

```

```

density 1
S(6) 5
Al 0.043
Sb 0.00013
As 0.00337
Ba 0.00036
Be 1e-005
Bi 0
B 0.025
Cd 1e-005
Cr 0.0003
Co 9e-005
Cu 0.00133
Fe 0.003
Pb 4e-005
Mn 0.00183
Mo 3e-005
Ni 0.00104
Se 2e-005
Ag 0
Th 0
U 1e-005
V 0.0002
Zn 0.0128
Ca 4.23
Li 0.00025
Mg 1.85
P 0.17
K 0.28
Si 0.4
Na 0.5
Ti 0.00025
Cl 4.5
C 1 CO2(g) -3.5
O(0) 1 O2(g) -0.67
-water 1 # kg

```

SOLUTION 3

```

temp 25
pH 6.97
pe 4 O2(g) -0.67
redox pe
units mg/l
density 1

```

S(6) 10
 Al 0.0264
 Sb 0.00013
 As 0.00473
 Ba 0.00088
 Be 0.0001
 Bi 2.5e-006
 B 0.025
 Cd 2e-005
 Cr 0.0002
 Co 0.00091
 Cu 0.00259
 Fe 0.004
 Pb 0.00021
 Mn 0.0565
 Mo 8e-005
 Ni 0.0011
 Se 5e-005
 Ag 2.5e-006
 Th 2.5e-006
 U 1e-005
 V 0.0001
 Zn 0.0025
 Ca 3.79
 Li 0.00025
 Mg 0.6
 P 0.151
 K 0.86
 Si 0.6
 Na 2.5
 Ti 2.5e-005
 Cl 4.5
 C 1 CO2(g) -3.5
 O(0) 1 O2(g) -0.67
 -water 1 # kg

SOLUTION 4

temp 25
 pH 8.68
 pe 4 O2(g) -0.67
 redox pe
 units mg/l
 density 1
 S(6) 8

Al	0.056	
Sb	0.0026	
As	0.049	
Ba	0.0024	
Be	5e-005	
Bi	5e-005	
B	0.035	
Cd	1e-005	
Cr	0.0001	
Co	0.0003	
Cu	0.0027	
Fe	0.005	
Pb	0.00015	
Mn	0.027	
Mo	0.0009	
Ni	0.0017	
Se	0.0001	
Ag	2e-005	
Th	3e-005	
U	6e-005	
V	0.0006	
Zn	0.003	
Ca	6.06	
Li	0.0014	
Mg	1.01	
P	0.02	
K	2.9	
Si	0.88	
Na	3.35	
Ti	0.0001	
Cl	15	
O(0)	1 O2(g)	-0.67
-water	1 # kg	

SOLUTION 5

temp	25
pH	7.96
pe	4 O2(g) -0.67
redox	pe
units	mg/l
density	1
S(6)	11
Al	0.047
Sb	0.0016

As	0.047	
Ba	0.0012	
Be	5e-005	
Bi	5e-005	
B	0.019	
Cd	1e-005	
Cr	0.0001	
Co	0.0002	
Cu	0.0032	
Pb	3e-005	
Mn	0.039	
Mo	0.0014	
Ni	0.001	
Se	0.0001	
Ag	2e-005	
Th	3e-005	
U	3e-005	
V	0.0004	
Zn	0.001	
Ca	4.61	
Li	0.001	
Mg	1.53	
P	0.02	
K	4.27	
Si	0.98	
Na	5.7	
Ti	0.0003	
Cl	15	
O(0)	1 O2(g)	-0.67
-water	1 # kg	

SOLUTION 6

temp	25
pH	8.61
pe	4 O2(g) -0.67
redox	pe
units	mg/l
density	1
S(6)	5
Al	0.09
Sb	0.0016
As	0.013
Be	5e-005
Bi	5e-005

B	0.024	
Cd	1e-005	
Cr	0.0001	
Co	5e-005	
Cu	0.0032	
Fe	0.005	
Pb	3e-005	
Mn	0.024	
Mo	0.001	
Ni	0.0006	
Se	0.0001	
Ag	2e-005	
Th	3e-005	
U	3e-005	
V	0.0005	
Zn	0.001	
Ca	5.01	
Li	0.0012	
Mg	1.07	
P	0.02	
K	4.38	
Si	0.92	
Na	1.49	
Ti	0.0001	
Cl	15	
O(0)	1 O2(g)	-0.67
-water	1 # kg	

SOLUTION 7

temp	25
pH	5.79
pe	4 O2(g) -0.67
redox	pe
units	mg/l
density	1
S(6)	61
Al	0.14
Sb	0.0002
As	0.004
Ba	0.016
Be	0.0003
Bi	0.005
B	0.15
Cd	0.0004

```

Ca      4
Cr      0.0005
Co      0.064
Cu      0.01
Fe      0.23
Pb      0.036
Li      0.009
Mg      8.22
Mn      0.56
Mo      0.00025
Ni      0.16
P       0.075
K       10.9
Se      0.0005
Si      2.7
Ag      0.000125
Na      1.62
Sr      0.007
Tl      0.0002
Th      0.00025
Sn      0.0005
Ti      0.0005
U       0.00025
V       0.0005
Zn      0.11
O(0)    1 O2(g)    -0.67
-water  1 # kg
end

```

```

MIX 8 solutions 1,2,3

```

```

1  0.54
2  0.12
3  0.34

```

```

EQUILIBRIUM_PHASES 1

```

```

Al(OH)3(am) 0 0
Alunite 0 0
Barite 0 0
Calcite 0 0
CO2(g) -3.5 1
Cr(OH)3(am) 0 0
Diaspore 0 0
Ferrihydrite 0 0
Gypsum 0 0
Pb(OH)2 0 0

```



```

Pyrolusite 0 0
Goethite 0 0
SAVE solution 8
end

```

```

MIX 9 uncertain
4 0.5
5 0.1
6 0.4

```

```

EQUILIBRIUM_PHASES 1
Al(OH)3(am) 0 0
Alunite 0 0
Barite 0 0
Calcite 0 0
CO2(g) -3.5 1
Cr(OH)3(am) 0 0
Diaspore 0 0
Ferrihydrite 0 0
Gypsum 0 0
Pb(OH)2 0 0
Pyrolusite 0 0
Goethite 0 0
SAVE solution 9
end

```

```

USE solution 7

```

```

RATES
pyrite
-start
10 REM PARM(1) = log 10 (A/V, 1dm) [scaling factor]
20 REM PARM(2) = exp for (M/M0) [fitting factor]
30 REM PARM(3) = exp for O2
40 REM PARM(4) = exp for H+
50 IF(M <= 0) THEN GOTO 100
60 IF(SI("Pyrite") >= 0) THEN GOTO 100
70 lograte = -10.19+PARM(1)+PARM(3)*LM("O2")+PARM(4)*LM("H+")+PARM(2)*(M/M0)
80 moles = (10^lograte)*TIME
90 IF(moles > M) THEN moles = M
100 SAVE moles

```

```

KINETICS 1 PAG
pyrite

```

```

-formula FeS2 1
-m      1
-m0     1
-parms  0.05 0.07 0.5 -0.11
-tol    1e-008
-steps   15724800 in 26 steps # seconds
-step_divide 100
-runge_kutta 3
-bad_step_max 500
-cvode true
-cvode_steps 100
-cvode_order 5

```

EQUILIBRIUM_PHASES 1

```

alunite 0 0
Anglesite 0 0
Barite 0 0
CO2(g) -3.5 1
Diaspore 0 0
Ferrihydrite 0 0
Gypsum 0 0
O2(g) -0.67 1
pyrolusite 0 0
SAVE solution 10
end

```

MIX 11

```

8 0.32
9 0.13
10 0.55

```

EQUILIBRIUM_PHASES 1

```

Al(OH)3(am) 0 0
Alunite 0 0
Barite 0 0
Calcite 0 0
CO2(g) -3.5 1
Cr(OH)3(am) 0 0
Diaspore 0 0
Ferrihydrite 0 0
Gypsum 0 0
Pb(OH)2 0 0
Pyrolusite 0 0
Goethite 0 0

```

```
SAVE solution 11  
end
```

DATABASE C:\Program Files (x86)\Phreeqc\Databases\minteq.v5.dat

TITLE input file for Mt Todd Water Balance- Equalization Pond

SELECTED_OUTPUT

-solution true
-distance false
-time false
-step false

USER_PUNCH

-headings	Ag_mg/L	Al_mg/L	As_mg/L	B_mg/L	Ba_mg/L	
	Be_mg/L	Bi_mg/L	C_mg/L	Ca_mg/L	Cd_mg/L	Co_mg/L
	Cr_mg/L	Cu_mg/L	Fe_mg/L	K_mg/L	Li_mg/L	Mg_mg/L
	Mn_mg/L	Mo_mg/L	Na_mg/L	Ni_mg/L	P_mg/L	Pb_mg/L
	S(6)_mg/L	Sb_mg/L	Se_mg/L	Si_mg/L	Th_mg/L	Ti_mg/L
	U_mg/L	V_mg/L	Zn_mg/L	Cl_mg/L		

-start

```

5   Ag_ppm = TOT("Ag")*107.87* 1000
10  Al_ppm = TOT("Al") *26.982* 1000
15  As_ppm = TOT("As") *74.922* 1000
20  B_ppm = TOT("B") *10.811* 1000
25  Ba_ppm = TOT("Ba") *137.33* 1000
30  Be_ppm = TOT("Be") *9.0122* 1000
35  Bi_ppm = TOT("Bi") *208.96* 1000
40  C_ppm = TOT("C") *12.011* 1000
45  Ca_ppm = TOT("Ca") *40.078* 1000
50  Cd_ppm = TOT("Cd") *112.41* 1000
55  Co_ppm = TOT("Co") *58.933* 1000
60  Cr_ppm = TOT("Cr") *51.996* 1000
65  Cu_ppm = TOT("Cu") *63.546* 1000
70  Fe_ppm = TOT("Fe") *55.847* 1000
75  K_ppm = TOT("K") *39.083* 1000
80  Li_ppm = TOT("Li") *6.941* 1000
85  Mg_ppm = TOT("Mg") *24.305* 1000
90  Mn_ppm = TOT("Mn") *54.938* 1000
95  Mo_ppm = TOT("Mo") *95.94* 1000
100 Na_ppm = TOT("Na") *22.9898* 1000
105 Ni_ppm = TOT("Ni") *58.693* 1000
110 P_ppm = TOT("P") *30.974* 1000
115 Pb_ppm = TOT("Pb") *207.2* 1000
120 S_ppm = TOT("S") *96.0616* 1000
125 Sb_ppm = TOT("Sb") *121.76* 1000
130 Se_ppm = TOT("Se") *78.96* 1000
135 Si_ppm = TOT("Si") *28.086* 1000
140 Th_ppm = TOT("Th") *232.04* 1000

```

```

145  Ti_ppm = TOT("Ti") *47.867* 1000
150  U_ppm = TOT("U") *238.03* 1000
155  V_ppm = TOT("V") *50.942* 1000
160  Zn_ppm = TOT("Zn") *65.39* 1000
165  Cl_ppm = TOT("Cl") *35.453* 1000
170  PUNCH Ag_ppm
175  PUNCH Al_ppm
180  PUNCH As_ppm
185  PUNCH B_ppm
190  PUNCH Ba_ppm
195  PUNCH Be_ppm
200  PUNCH Bi_ppm
205  PUNCH C_ppm
210  PUNCH Ca_ppm
215  PUNCH Cd_ppm
220  PUNCH Co_ppm
225  PUNCH Cr_ppm
230  PUNCH Cu_ppm
235  PUNCH Fe_ppm
240  PUNCH K_ppm
245  PUNCH Li_ppm
250  PUNCH Mg_ppm
255  PUNCH Mn_ppm
260  PUNCH Mo_ppm
265  PUNCH Na_ppm
270  PUNCH Ni_ppm
275  PUNCH P_ppm
280  PUNCH Pb_ppm
285  PUNCH S_ppm
290  PUNCH Sb_ppm
295  PUNCH Se_ppm
300  PUNCH Si_ppm
305  PUNCH Th_ppm
310  PUNCH Ti_ppm
315  PUNCH U_ppm
320  PUNCH V_ppm
325  PUNCH Zn_ppm
330  PUNCH Cl_ppm

```

End

SOLUTION 1

```

temp    25
pH      4

```

```

pe      4 O2(g) -0.67
redox   pe
units   mg/l
density 1
Ag      7.1e-005
Al      1.737
As      0.0089
B       0.091
Ba      0.00898
Be      0.000181
Bi      0.00269
Ca      9.06
Cd      0.0074
Co      0.137
Cr      0.0004
Cu      0.569
Fe      0.00049
K       6.52
Li      0.0051
Mg      17.557
Mn      0.01265
Mo      0.0003
Na      2.56
Ni      0.173
P       0.0879
Pb      0.023
S(6)    115.4
Sb      0.00048
Si      0.8
Th      0.00014
Ti      0.00033
U       0.00014
V       0.000385
Zn      1.748
Cl      3.987
O(0)    1 O2(g)   -0.67
C       1 CO2(g)  -3.5
-water  1 # kg
SOLUTION 2

temp    25
pH      3.71
pe      4 O2(g) -0.67
redox   pe

```

```

units    mg/l
density  1
S(6)     1600
Mg        250
Al        51
Cd        0.14
Co        1.6
Cu        11
Fe        0.3
Mn        18
Ni        1.7
Zn        33
Pb        0.065
Cr        0.001
Na        18
K         5.7
Ca        100
Cl        12
As        0.006
C         1 CO2(g)  -3.5
O(0)     1 O2(g)   -0.67
-water   1 # kg

```

SOLUTION 3

```

temp      25
pH        3.98
pe        4 O2(g) -0.67
redox     pe
units     mg/l
density   1
Ag        7.2e-005
Al        0.077
As        0.00848
B         0.0943
Ba        0.00927
Be        0.00018
Bi        0.00276
Ca        4.0942
Cd        0.00023
Co        0.0354
Cr        0.000373
Cu        0.0064
Fe        0.00051
K         6.609

```

```

Li      0.0052
Mg      4.86
Mn      0.00155
Mo      0.00028
Na      1.602
Ni      0.0885
P       0.104
Pb      0.0199
S(6)    42.728
Sb      0.000452
Se      0.000298
Si      0.811
Th      0.00014
Ti      0.000346
U       0.00014
V       0.000381
Zn      0.063
Cl      2.9581
O(0)    1 O2(g)  -0.67
C       1 CO2(g) -3.5
-water  1 # kg
SOLUTION 4

```

```

temp    25
pH      5.7
pe      4 O2(g) -0.67
redox   pe
units   mg/l
density 1
S(6)    4100
Mg      340
Al      0.42
Cd      0.042
Co      0.46
Cu      2.4
Fe      0.017
Mn      11
Ni      0.2
Zn      4.2
Pb      0.001
Cr      0.001
Na      650
K       54
Ca      500

```


Cl 28
 As 0.008
 C 1 CO2(g) -3.5
 O(0) 1 O2(g) -0.67
 -water 1 # kg

SOLUTION 5

temp 25
 pH 4.18
 pe 4 O2(g) -0.67
 redox pe
 units mg/l
 density 1
 S(6) 874
 Mg 60
 Al 54
 Cd 0.013
 Co 0.16
 Cu 1.4
 Fe 0.075
 Mn 2.6
 Ni 0.17
 Zn 3.6
 Pb 0.015
 Cr 0.001
 Na 107
 K 3.8
 Ca 29
 Cl 0
 As 0.005
 O(0) 1 O2(g) -0.67
 C 1 CO2(g) -3.5
 -water 1 # kg

SOLUTION 6

temp 25
 pH 5.7
 pe 4 O2(g) -0.67
 redox pe
 units mg/l
 density 1
 C 1 CO2(g) -3.5
 O(0) 1 O2(g) -0.67
 N 0.005

-water 1 # kg

SOLUTION 7

temp 25
 pH 8.78
 pe 4 O2(g) -0.67
 redox pe
 units mg/l
 density 1
 Alkalinity 188 as Ca.5(CO3).5
 Al 0.57
 Sb 0.058
 As 0.489
 Ba 0.071
 Be 0.0005
 Bi 0.0005
 B 0.21
 Cd 0.0003
 Ca 51.25
 Cyanide 26.3
 Pb 0.0005
 Li 0.002
 Mg 5.9
 Mn 0.007
 Hg 5e-005
 Mo 0.297
 Ni 0.004
 N(5) 14
 P 0.5
 K 113
 Se 0.005
 Ag 0.456
 Na 1221
 Sr 0.751
 S(6) 1460
 Th 0.0005
 Sn 0.0005
 Ti 0.005
 V 0.005
 Zn 0.012
 N(3) 0.2
 N(-3) 114
 Cl 950
 O(0) 1 O2(g) -0.67

Cr 0.0025
 Cu 1.19
 S(-2) 0.26
 Fe(2) 0.25
 Fe(3) 0.025
 -water 1 # kg
 END

MIX 1 Year 1- Dry

1 0
 2 31
 3 0
 4 28
 5 36
 6 0
 7 5

EQUILIBRIUM_PHASES 1

Al(OH)3(am) 0 0
 Alunite 0 0
 Barite 0 0
 Calcite 0 0
 CO2(g) -3.5 1
 Cr(OH)3(am) 0 0
 Diaspore 0 0
 Ferrihydrite 0 0
 Gypsum 0 0
 Pb(OH)2 0 0
 Pyrolusite 0 0
 Goethite 0 0

save solution 10

END

MIX 1 Year 1- Wet

1 4
 2 23
 3 23
 4 7
 5 23
 6 17
 7 3

EQUILIBRIUM_PHASES 1

Al(OH)₃(am) 0 0
 Alunite 0 0
 Barite 0 0
 Calcite 0 0
 CO₂(g) -3.5 1
 Cr(OH)₃(am) 0 0
 Diaspore 0 0
 Ferrihydrite 0 0
 Gypsum 0 0
 Pb(OH)₂ 0 0
 Pyrolusite 0 0
 Goethite 0 0

save solution 11
 END

MIX 2 Year 2- Dry

1 13
 2 1
 3 39
 4 2
 5 13
 6 26
 7 5

EQUILIBRIUM_PHASES 1

Al(OH)₃(am) 0 0
 Alunite 0 0
 Barite 0 0
 Calcite 0 0
 CO₂(g) -3.5 1
 Cr(OH)₃(am) 0 0
 Diaspore 0 0
 Ferrihydrite 0 0
 Gypsum 0 0
 Pb(OH)₂ 0 0
 Pyrolusite 0 0
 Goethite 0 0

SAVE solution 12

END

MIX 2 Year 2-Wet

1 77
 2 1

3 0
4 1
5 0
6 0
7 21

EQUILIBRIUM_PHASES 1

Al(OH)₃(am) 0 0
Alunite 0 0
Barite 0 0
Calcite 0 0
CO₂(g) -3.5 1
Cr(OH)₃(am) 0 0
Diaspore 0 0
Ferrihydrite 0 0
Gypsum 0 0
Pb(OH)₂ 0 0
Pyrolusite 0 0
Goethite 0 0

SAVE solution 13
end

MIX 3 Year 3- Dry

1 9
2 17
3 30
4 3
5 25
6 9
7 7

EQUILIBRIUM_PHASES 1

Al(OH)₃(am) 0 0
Alunite 0 0
Barite 0 0
Calcite 0 0
CO₂(g) -3.5 1
Cr(OH)₃(am) 0 0
Diaspore 0 0
Ferrihydrite 0 0
Gypsum 0 0
Pb(OH)₂ 0 0
Pyrolusite 0 0

Goethite 0 0
SAVE solution 15

END

MIX 3 Year 2-Wet

1 8
2 21
3 24
4 9
5 21
6 9
7 6

EQUILIBRIUM_PHASES 1

Al(OH)₃(am) 0 0
Alunite 0 0
Barite 0 0
Calcite 0 0
CO₂(g) -3.5 1
Cr(OH)₃(am) 0 0
Diaspore 0 0
Ferrihydrite 0 0
Gypsum 0 0
Pb(OH)₂ 0 0
Pyrolusite 0 0
Goethite 0 0

SAVE solution 16
end

MIX 4 Year 4- Dry

1 63
2 7
3 8
4 4
5 0
6 1
7 17

EQUILIBRIUM_PHASES 1

Al(OH)₃(am) 0 0
Alunite 0 0
Barite 0 0
Calcite 0 0

CO2(g) -3.5 1
 Cr(OH)3(am) 0 0
 Diaspore 0 0
 Ferrihydrite 0 0
 Gypsum 0 0
 Pb(OH)2 0 0
 Pyrolusite 0 0
 Goethite 0 0

SAVE solution 17
 end

MIX 4 Year 4- Wet

1 10
 2 21
 3 21
 4 12
 5 21
 6 10
 7 6

EQUILIBRIUM_PHASES 1

Al(OH)3(am) 0 0
 Alunite 0 0
 Barite 0 0
 Calcite 0 0
 CO2(g) -3.5 1
 Cr(OH)3(am) 0 0
 Diaspore 0 0
 Ferrihydrite 0 0
 Gypsum 0 0
 Pb(OH)2 0 0
 Pyrolusite 0 0
 Goethite 0 0

SAVE solution 18
 end

MIX 5 Year 5- Dry

1 22
 2 3
 3 39
 4 3
 5 15

6 9
7 9

EQUILIBRIUM_PHASES 1

Al(OH)₃(am) 0 0
Alunite 0 0
Barite 0 0
Calcite 0 0
CO₂(g) -3.5 1
Cr(OH)₃(am) 0 0
Diaspore 0 0
Ferrihydrite 0 0
Gypsum 0 0
Pb(OH)₂ 0 0
Pyrolusite 0 0
Goethite 0 0

SAVE solution 19
end

MIX 5 Year 5- Wet

1 10
2 22
3 25
4 5
5 22
6 9
7 6

EQUILIBRIUM_PHASES 1

Al(OH)₃(am) 0 0
Alunite 0 0
Barite 0 0
Calcite 0 0
CO₂(g) -3.5 1
Cr(OH)₃(am) 0 0
Diaspore 0 0
Ferrihydrite 0 0
Gypsum 0 0
Pb(OH)₂ 0 0
Pyrolusite 0 0
Goethite 0 0

SAVE solution 20

end

MIX 6 Year 6-Dry

1 13
2 12
3 30
4 3
5 26
6 8
7 7

EQUILIBRIUM_PHASES 1

Al(OH)₃(am) 0 0
Alunite 0 0
Barite 0 0
Calcite 0 0
CO₂(g) -3.5 1
Cr(OH)₃(am) 0 0
Diaspore 0 0
Ferrihydrite 0 0
Gypsum 0 0
Pb(OH)₂ 0 0
Pyrolusite 0 0
Goethite 0 0

SAVE solution 21

end

MIX 6 Year 6-Wet

1 7
2 22
3 24
4 7
5 22
6 12
7 6

EQUILIBRIUM_PHASES 1

Al(OH)₃(am) 0 0
Alunite 0 0
Barite 0 0
Calcite 0 0
CO₂(g) -3.5 1
Cr(OH)₃(am) 0 0

Diaspore 0 0
Ferrihydrite 0 0
Gypsum 0 0
Pb(OH)₂ 0 0
Pyrolusite 0 0
Goethite 0 0

SAVE solution 22
end

MIX 7 Year 7-Dry

1 17
2 12
3 29
4 4
5 26
6 5
7 7

EQUILIBRIUM_PHASES 1

Al(OH)₃(am) 0 0
Alunite 0 0
Barite 0 0
Calcite 0 0
CO₂(g) -3.5 1
Cr(OH)₃(am) 0 0
Diaspore 0 0
Ferrihydrite 0 0
Gypsum 0 0
Pb(OH)₂ 0 0
Pyrolusite 0 0
Goethite 0 0

SAVE solution 23
end

MIX 7 Year 7-Wet

1 11
2 22
3 22
4 8

5 22
6 9
7 6

EQUILIBRIUM_PHASES 1

Al(OH)₃(am) 0 0
Alunite 0 0
Barite 0 0
Calcite 0 0
CO₂(g) -3.5 1
Cr(OH)₃(am) 0 0
Diaspore 0 0
Ferrihydrite 0 0
Gypsum 0 0
Pb(OH)₂ 0 0
Pyrolusite 0 0
Goethite 0 0

SAVE solution 24
end

MIX 8 Year 8-Dry

1 15
2 8
3 44
4 3
5 16
6 6
7 9

EQUILIBRIUM_PHASES 1

Al(OH)₃(am) 0 0
Alunite 0 0
Barite 0 0
Calcite 0 0
CO₂(g) -3.5 1
Cr(OH)₃(am) 0 0
Diaspore 0 0
Ferrihydrite 0 0
Gypsum 0 0
Pb(OH)₂ 0 0
Pyrolusite 0 0
Goethite 0 0

SAVE solution 25
end

MIX 8 Year 8-Wet

1	11
2	22
3	23
4	7
5	22
6	9
7	6

EQUILIBRIUM_PHASES 1

Al(OH)3(am)	0	0
Alunite	0	0
Barite	0	0
Calcite	0	0
CO2(g)	-3.5	1
Cr(OH)3(am)	0	0
Diaspore	0	0
Ferrihydrite	0	0
Gypsum	0	0
Pb(OH)2	0	0
Pyrolusite	0	0
Goethite	0	0

SAVE solution 26
end

MIX 9 Year 9-Dry

1	58
2	6
3	15
4	4
5	0
6	1
7	16

EQUILIBRIUM_PHASES 1

Al(OH)3(am)	0	0
Alunite	0	0
Barite	0	0
Calcite	0	0
CO2(g)	-3.5	1

Cr(OH)3(am) 0 0
 Diaspore 0 0
 Ferrihydrite 0 0
 Gypsum 0 0
 Pb(OH)2 0 0
 Pyrolusite 0 0
 Goethite 0 0

SAVE solution 27
 end

MIX 9 Year 9-Wet

1 10
 2 23
 3 25
 4 5
 5 23
 6 9
 7 6

EQUILIBRIUM_PHASES 1

Al(OH)3(am) 0 0
 Alunite 0 0
 Barite 0 0
 Calcite 0 0
 CO2(g) -3.5 1
 Cr(OH)3(am) 0 0
 Diaspore 0 0
 Ferrihydrite 0 0
 Gypsum 0 0
 Pb(OH)2 0 0
 Pyrolusite 0 0
 Goethite 0 0

SAVE solution 28
 end

MIX 10 Year 10-Dry

1 38
 2 4
 3 39
 4 2
 5 3
 6 3

7 11

EQUILIBRIUM_PHASES 1

Al(OH)₃(am) 0 0
 Alunite 0 0
 Barite 0 0
 Calcite 0 0
 CO₂(g) -3.5 1
 Cr(OH)₃(am) 0 0
 Diaspore 0 0
 Ferrihydrite 0 0
 Gypsum 0 0
 Pb(OH)₂ 0 0
 Pyrolusite 0 0
 Goethite 0 0

SAVE solution 29
 end

MIX 10 Year 10-Wet

1 10
 2 22
 3 24
 4 8
 5 22
 6 9
 7 6

EQUILIBRIUM_PHASES 1

Al(OH)₃(am) 0 0
 Alunite 0 0
 Barite 0 0
 Calcite 0 0
 CO₂(g) -3.5 1
 Cr(OH)₃(am) 0 0
 Diaspore 0 0
 Ferrihydrite 0 0
 Gypsum 0 0
 Pb(OH)₂ 0 0
 Pyrolusite 0 0
 Goethite 0 0

SAVE solution 30
 end

MIX 11 Year 11-Dry

1 18
2 15
3 27
4 5
5 25
6 3
7 7

EQUILIBRIUM_PHASES 1

Al(OH)₃(am) 0 0
Alunite 0 0
Barite 0 0
Calcite 0 0
CO₂(g) -3.5 1
Cr(OH)₃(am) 0 0
Diaspore 0 0
Ferrihydrite 0 0
Gypsum 0 0
Pb(OH)₂ 0 0
Pyrolusite 0 0
Goethite 0 0

SAVE solution 31

end

MIX 11 Year 11-Wet

1 11
2 22
3 27
4 5
5 25
6 3
7 7

EQUILIBRIUM_PHASES 1

Al(OH)₃(am) 0 0
Alunite 0 0
Barite 0 0
Calcite 0 0
CO₂(g) -3.5 1
Cr(OH)₃(am) 0 0
Diaspore 0 0

Ferrihydrite 0 0
 Gypsum 0 0
 Pb(OH)₂ 0 0
 Pyrolusite 0 0
 Goethite 0 0

SAVE solution 32
 end

MIX 12 Year 12-Dry

1 75
 2 3
 3 0
 4 2
 5 0
 6 0
 7 20

EQUILIBRIUM_PHASES 1

Al(OH)₃(am) 0 0
 Alunite 0 0
 Barite 0 0
 Calcite 0 0
 CO₂(g) -3.5 1
 Cr(OH)₃(am) 0 0
 Diaspore 0 0
 Ferrihydrite 0 0
 Goethite 0 0
 Gypsum 0 0
 Pb(OH)₂ 0 0
 Pyrolusite 0 0

SAVE solution 33
 end

MIX 12 Year 12-Wet

1 11
 2 22
 3 24
 4 5
 5 22
 6 10
 7 6

EQUILIBRIUM_PHASES 1

Al(OH)₃(am) 0 0
 Alunite 0 0
 Barite 0 0
 Calcite 0 0
 CO₂(g) -3.5 1
 Cr(OH)₃(am) 0 0
 Diaspore 0 0
 Ferrihydrite 0 0
 Gypsum 0 0
 Pb(OH)₂ 0 0
 Pyrolusite 0 0
 Goethite 0 0

SAVE solution 34
 end

MIX 13 Year 13-Dry

1 17
 2 13
 3 30
 4 3
 5 26
 6 4
 7 7

EQUILIBRIUM_PHASES 1

Al(OH)₃(am) 0 0
 Alunite 0 0
 Barite 0 0
 Calcite 0 0
 CO₂(g) -3.5 1
 Cr(OH)₃(am) 0 0
 Diaspore 0 0
 Ferrihydrite 0 0
 Gypsum 0 0
 Pb(OH)₂ 0 0
 Pyrolusite 0 0
 Goethite 0 0

SAVE solution 35
 end

MIX 13 Year 13-Wet

1 10

2 22
3 24
4 8
5 22
6 9
7 6

EQUILIBRIUM_PHASES 1

Al(OH)₃(am) 0 0
Alunite 0 0
Barite 0 0
Calcite 0 0
CO₂(g) -3.5 1
Cr(OH)₃(am) 0 0
Diaspore 0 0
Ferrihydrite 0 0
Gypsum 0 0
Pb(OH)₂ 0 0
Pyrolusite 0 0
Goethite 0 0

SAVE solution 36
end

MIX 14 Year 14-Dry

1 15
2 22
3 27
4 6
5 22
6 1
7 6

EQUILIBRIUM_PHASES 1

Al(OH)₃(am) 0 0
Alunite 0 0
Barite 0 0
Calcite 0 0
CO₂(g) -3.5 1
Cr(OH)₃(am) 0 0
Diaspore 0 0
Ferrihydrite 0 0
Gypsum 0 0
Pb(OH)₂ 0 0

Pyrolusite 0 0
Goethite 0 0

SAVE solution 37
end

MIX 14 Year 14-Wet

1 10
2 22
3 24
4 6
5 22
6 9
7 6

EQUILIBRIUM_PHASES 1

Al(OH)₃(am) 0 0
Alunite 0 0
Barite 0 0
Calcite 0 0
CO₂(g) -3.5 1
Cr(OH)₃(am) 0 0
Diaspore 0 0
Ferrihydrite 0 0
Gypsum 0 0
Pb(OH)₂ 0 0
Pyrolusite 0 0
Goethite 0 0

SAVE solution 38
end

MIX 15 Year 15-Dry

1 40
2 4
3 38
4 2
5 5
6 0
7 11

EQUILIBRIUM_PHASES 1

Al(OH)₃(am) 0 0
Alunite 0 0

Barite 0 0
 Calcite 0 0
 CO2(g) -3.5 1
 Cr(OH)3(am) 0 0
 Diaspore 0 0
 Ferrihydrite 0 0
 Gypsum 0 0
 Pb(OH)2 0 0
 Pyrolusite 0 0
 Goethite 0 0

SAVE solution 39
 end

MIX 15 Year 15-Wet

1 4
 2 22
 3 24
 4 8
 5 22
 6 15
 7 6

EQUILIBRIUM_PHASES 1

Al(OH)3(am) 0 0
 Alunite 0 0
 Barite 0 0
 Calcite 0 0
 CO2(g) -3.5 1
 Cr(OH)3(am) 0 0
 Diaspore 0 0
 Ferrihydrite 0 0
 Gypsum 0 0
 Pb(OH)2 0 0
 Pyrolusite 0 0
 Goethite 0 0

SAVE solution 40
 end

MIX 16 Year 16-Dry

1 71
 2 1
 3 7

4 3
5 0
6 0
7 19

EQUILIBRIUM_PHASES 1

Al(OH)₃(am) 0 0
Alunite 0 0
Barite 0 0
Calcite 0 0
CO₂(g) -3.5 1
Cr(OH)₃(am) 0 0
Diaspore 0 0
Ferrihydrite 0 0
Gypsum 0 0
Pb(OH)₂ 0 0
Pyrolusite 0 0
Goethite 0 0

SAVE solution 41
end

MIX 16 Year 16-Wet

1 3
2 17
3 34
4 4
5 24
6 11
7 6

EQUILIBRIUM_PHASES 1

Al(OH)₃(am) 0 0
Alunite 0 0
Barite 0 0
Calcite 0 0
CO₂(g) -3.5 1
Cr(OH)₃(am) 0 0
Diaspore 0 0
Ferrihydrite 0 0
Gypsum 0 0
Pb(OH)₂ 0 0
Pyrolusite 0 0
Goethite 0 0

```
SAVE solution 42
end
MIX 17 Year 17-Dry
  1  3
  2  20
  3  31
  4  3
  5  24
  6  12
  7  6
```

```
EQUILIBRIUM_PHASES 1
  Al(OH)3(am) 0 0
  Alunite  0 0
  Barite  0 0
  Calcite  0 0
  CO2(g)  -3.5 1
  Cr(OH)3(am) 0 0
  Diaspore 0 0
  Ferrihydrite 0 0
  Gypsum  0 0
  Pb(OH)2  0 0
  Pyrolusite 0 0
  Goethite 0 0
```

```
SAVE solution 43
End
```

```
MIX 17 Year 17-Wet
  1  0
  2  0
  3  0
  4  0
  5  0
  6  0
  7  100
```

```
EQUILIBRIUM_PHASES 1
  Al(OH)3(am) 0 0
  Alunite  0 0
  Barite  0 0
  Calcite  0 0
  CO2(g)  -3.5 1
```

Cr(OH)3(am) 0 0
Diaspore 0 0
Ferrihydrite 0 0
Gypsum 0 0
Pb(OH)2 0 0
Pyrolusite 0 0
Goethite 0 0

SAVE solution 44
end

APPENDIX B LABORATORY DATA

APPENDIX B

RAW LABORATORY DATA



Environmental Division

CERTIFICATE OF ANALYSIS

Work Order	: EP1107934	Page	: 1 of 8
Client	: AMMTEC LTD	Laboratory	: Environmental Division Perth
Contact	: MR WAYNE HARDING	Contact	: Scott James
Address	: 6 MACADAM PLACE BALCATT WESTERN AUSTRALIA 2416	Address	: 10 Hod Way Malaga WA Australia 6090
E-mail	: Wayne.Harding@ammtec.com.au	E-mail	: perth.enviro.services@alsglobal.com
Telephone	: +61 08 9344 2416	Telephone	: +61-8-9209 7655
Facsimile	: +61 08 9345 4688	Facsimile	: +61-8-9209 7600
Project	: Tetrattech	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Order number	: 098212	Date Samples Received	: 15-NOV-2011
C-O-C number	: ----	Issue Date	: 02-DEC-2011
Sampler	: ----	No. of samples received	: 2
Site	: ----	No. of samples analysed	: 2
Quote number	: EP/570/11		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results



NATA Accredited Laboratory 825

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Accredited for compliance with ISO/IEC 17025.

Signatories

This document has been electronically signed by the authorized signatories indicated below. Electronic signing has been carried out in compliance with procedures specified in 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Canhuang Ke	Metals Instrument Chemist	Perth Inorganics
Chas Tucker	Inorganic Chemist	Perth Inorganics
Daniel Fisher	Inorganics Analyst	Perth Inorganics
Kim McCabe	Senior Inorganic Chemist	Brisbane Acid Sulphate Soils
Kim McCabe	Senior Inorganic Chemist	Stafford Minerals - AY
Leanne Cooper	Acid Sulfate Soils Supervisor	Perth ASS
Sarah Millington	Senior Inorganic Chemist	Sydney Inorganics
Wisam Marassa	Inorganics Coordinator	Sydney Inorganics



General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.

LOR = Limit of reporting

^ = This result is computed from individual analyte detections at or above the level of reporting

- **ASS: EA029 (SPOCAS):** Liming rate is calculated and reported on a dry weight basis assuming use of fine agricultural lime (CaCO_3) and using a safety factor of 1.5 to allow for non-homogeneous mixing and poor reactivity of lime. For conversion of Liming Rate from kg/t dry weight to kg/m³ in-situ soil, multiply reported results x wet bulk density of soil in t/m³.
- **ASS: EA033 (CRS Suite):** Liming rate is calculated and reported on a dry weight basis assuming use of fine agricultural lime (CaCO_3) and using a safety factor of 1.5 to allow for non-homogeneous mixing and poor reactivity of lime. For conversion of Liming Rate from 'kg/t dry weight' to 'kg/m³ in-situ soil', multiply 'reported results' x 'wet bulk density of soil in t/m³'.
- **EG020:** LCS recoveries for particular element(s) fall outside ALS Dynamic control limit, however, they are within the acceptance criteria based on ALS DQO. No further action is required.
- **EG020:** LOR for Chromium has been raised in particular sample(s) due to matrix interference(s).



Analytical Results

Sub-Matrix: **SOIL**

Client sample ID

Client sampling date / time

				DETOX RESIDUE				
				[15-NOV-2011]				
Compound	CAS Number	LOR	Unit	EP1107934-002				
EA011: Net Acid Generation								
pH (OX)	----	0.1	pH Unit	2.7	----	----	----	----
NAG (pH 4.5)	----	0.1	kg H2SO4/t	11.6	----	----	----	----
NAG (pH 7.0)	----	0.1	kg H2SO4/t	18.2	----	----	----	----
EA023 : TOS-ASS								
S (HCL)	----	0.02	%	0.97	----	----	----	----
Total Oxidisable Sulphur (ASS)	----	0.02	%	0.16	----	----	----	----
EA029-A: pH Measurements								
pH KCl (23A)	----	0.1	pH Unit	9.5	----	----	----	----
pH OX (23B)	----	0.1	pH Unit	2.9	----	----	----	----
EA029-B: Acidity Trail								
Titrateable Actual Acidity (23F)	----	2	mole H+ / t	<2	----	----	----	----
Titrateable Peroxide Acidity (23G)	----	2	mole H+ / t	199	----	----	----	----
Titrateable Sulfidic Acidity (23H)	----	2	mole H+ / t	199	----	----	----	----
sulfidic - Titrateable Actual Acidity (s-23F)	----	0.005	% pyrite S	<0.005	----	----	----	----
sulfidic - Titrateable Peroxide Acidity (s-23G)	----	0.005	% pyrite S	0.32	----	----	----	----
sulfidic - Titrateable Sulfidic Acidity (s-23H)	----	0.005	% pyrite S	0.32	----	----	----	----
EA029-C: Sulfur Trail								
KCl Extractable Sulfur (23Ce)	----	0.005	% S	0.04	----	----	----	----
Peroxide Sulfur (23De)	----	0.005	% S	0.63	----	----	----	----
Peroxide Oxidisable Sulfur (23E)	----	0.005	% S	0.60	----	----	----	----
acidity - Peroxide Oxidisable Sulfur (a-23E)	----	5	mole H+ / t	371	----	----	----	----
EA029-D: Calcium Values								
KCl Extractable Calcium (23Vh)	----	0.005	% Ca	0.10	----	----	----	----
Peroxide Calcium (23Wh)	----	0.005	% Ca	0.22	----	----	----	----
Acid Reacted Calcium (23X)	----	0.005	% Ca	0.13	----	----	----	----
acidity - Acid Reacted Calcium (a-23X)	----	5	mole H+ / t	61	----	----	----	----
sulfidic - Acid Reacted Calcium (s-23X)	----	0.005	% S	0.11	----	----	----	----
EA029-E: Magnesium Values								
KCl Extractable Magnesium (23Sm)	----	0.005	% Mg	0.04	----	----	----	----
Peroxide Magnesium (23Tm)	----	0.005	% Mg	0.09	----	----	----	----
Acid Reacted Magnesium (23U)	----	0.005	% Mg	0.06	----	----	----	----
Acidity - Acid Reacted Magnesium (a-23U)	----	5	mole H+ / t	46	----	----	----	----
sulfidic - Acid Reacted Magnesium (s-23U)	----	0.005	% S	0.07	----	----	----	----
EA029-H: Acid Base Accounting								



Analytical Results

Sub-Matrix: SOIL

Client sample ID

Client sampling date / time

				DETOX RESIDUE				
				[15-NOV-2011]				
Compound	CAS Number	LOR	Unit	EP1107934-002				
EA029-H: Acid Base Accounting - Continued								
ANC Fineness Factor	----	0.5	-	1.5	----	----	----	----
Net Acidity (sulfur units)	----	0.02	% S	0.41	----	----	----	----
Net Acidity (acidity units)	----	10	mole H+ / t	256	----	----	----	----
Liming Rate	----	1	kg CaCO3/t	19	----	----	----	----
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	0.60	----	----	----	----
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	371	----	----	----	----
Liming Rate excluding ANC	----	1	kg CaCO3/t	28	----	----	----	----
EA033-A: Actual Acidity								
pH KCl (23A)	----	0.1	pH Unit	9.5	----	----	----	----
Titrateable Actual Acidity (23F)	----	2	mole H+ / t	<2	----	----	----	----
sulfidic - Titrateable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	----	----	----	----
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	----	0.005	% S	0.900	----	----	----	----
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	561	----	----	----	----
EA033-C: Acid Neutralising Capacity								
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	1.44	----	----	----	----
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	287	----	----	----	----
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	0.46	----	----	----	----
EA033-E: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	1.5	----	----	----	----
Net Acidity (sulfur units)	----	0.02	% S	0.59	----	----	----	----
Net Acidity (acidity units)	----	10	mole H+ / t	370	----	----	----	----
Liming Rate	----	1	kg CaCO3/t	28	----	----	----	----
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	0.90	----	----	----	----
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	561	----	----	----	----
Liming Rate excluding ANC	----	1	kg CaCO3/t	42	----	----	----	----
EA055: Moisture Content								
Moisture Content (dried @ 103°C)	----	1.0	%	<1.0	----	----	----	----
ED040T : Total Sulfate by ICPAES								
Sulfate as SO4 2-	14808-79-8	100	mg/kg	26000	----	----	----	----
ED042T: Total Sulfur by LECO								
Sulfur - Total as S (LECO)	----	0.01	%	1.13	----	----	----	----
EK085M: Sulfide as S2-								
Sulfide as S	----	0.01	%	0.26	----	----	----	----



Analytical Results

Sub-Matrix: **WATER**

Client sample ID

Client sampling date / time

				DETOX LIQUOR				
				[15-NOV-2011]				
Compound	CAS Number	LOR	Unit	EP1107934-001				
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	8.78	----	----	----	----
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	5570	----	----	----	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	----	----	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	26	----	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	162	----	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L	188	----	----	----	----
ED038A: Acidity								
Acidity as CaCO3	----	1	mg/L	<1	----	----	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	1460	----	----	----	----
ED045G: Chloride Discrete analyser								
Chloride	16887-00-6	1	mg/L	540	----	----	----	----
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	0.57	----	----	----	----
Dysprosium	7429-91-6	0.001	mg/L	<0.001	----	----	----	----
Silver	7440-22-4	0.001	mg/L	0.456	----	----	----	----
Arsenic	7440-38-2	0.001	mg/L	0.489	----	----	----	----
Bismuth	7440-69-9	0.001	mg/L	<0.001	----	----	----	----
Erbium	7440-52-0	0.001	mg/L	<0.001	----	----	----	----
Boron	7440-42-8	0.05	mg/L	0.21	----	----	----	----
Europium	7440-53-1	0.001	mg/L	<0.001	----	----	----	----
Strontium	7440-24-6	0.001	mg/L	0.751	----	----	----	----
Barium	7440-39-3	0.001	mg/L	0.071	----	----	----	----
Gadolinium	7440-54-2	0.001	mg/L	<0.001	----	----	----	----
Titanium	7440-32-6	0.01	mg/L	<0.01	----	----	----	----
Beryllium	7440-41-7	0.001	mg/L	<0.001	----	----	----	----
Gallium	7440-55-3	0.001	mg/L	0.003	----	----	----	----
Cadmium	7440-43-9	0.0001	mg/L	0.0003	----	----	----	----
Hafnium	7440-58-6	0.01	mg/L	<0.01	----	----	----	----
Tellurium	22541-49-7	0.005	mg/L	<0.005	----	----	----	----
Cobalt	7440-48-4	0.001	mg/L	0.521	----	----	----	----
Holmium	7440-60-0	0.001	mg/L	<0.001	----	----	----	----
Uranium	7440-61-1	0.001	mg/L	0.002	----	----	----	----
Caesium	7440-46-2	0.001	mg/L	<0.001	----	----	----	----
Chromium	7440-47-3	0.001	mg/L	<0.005	----	----	----	----



Analytical Results

Sub-Matrix: **WATER**

Client sample ID

Client sampling date / time

				DETOX LIQUOR				
				[15-NOV-2011]				
Compound	CAS Number	LOR	Unit	EP1107934-001				
EG020F: Dissolved Metals by ICP-MS - Continued								
Indium	7440-74-6	0.001	mg/L	<0.001				
Copper	7440-50-8	0.001	mg/L	1.19				
Lanthanum	7439-91-0	0.001	mg/L	<0.001				
Rubidium	7440-17-7	0.001	mg/L	0.013				
Lithium	7439-93-2	0.001	mg/L	0.002				
Lutetium	7439-94-3	0.001	mg/L	<0.001				
Thorium	7440-29-1	0.001	mg/L	<0.001				
Cerium	7440-45-1	0.001	mg/L	<0.001				
Manganese	7439-96-5	0.001	mg/L	0.007				
Neodymium	7440-00-8	0.001	mg/L	<0.001				
Molybdenum	7439-98-7	0.001	mg/L	0.297				
Praseodymium	7440-10-0	0.001	mg/L	<0.001				
Nickel	7440-02-0	0.001	mg/L	0.004				
Samarium	7440-19-9	0.001	mg/L	<0.001				
Lead	7439-92-1	0.001	mg/L	<0.001				
Terbium	7440-27-9	0.001	mg/L	<0.001				
Antimony	7440-36-0	0.001	mg/L	0.058				
Thulium	7440-30-4	0.001	mg/L	<0.001				
Selenium	7782-49-2	0.01	mg/L	<0.01				
Ytterbium	7440-64-4	0.001	mg/L	<0.001				
Tin	7440-31-5	0.001	mg/L	<0.001				
Yttrium	7440-65-5	0.001	mg/L	<0.001				
Thallium	7440-28-0	0.001	mg/L	<0.001				
Zirconium	7440-67-7	0.005	mg/L	<0.005				
Vanadium	7440-62-2	0.01	mg/L	<0.01				
Zinc	7440-66-6	0.005	mg/L	0.012				
Iron	7439-89-6	0.05	mg/L	<0.05				
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001				
EG051G: Ferrous Iron by Discrete Analyser								
Ferrous Iron	----	0.05	mg/L	0.25				
EG053FG-MS: Dissolved Ferric Iron by ICPMS and DA								
Ferric Iron	----	0.05	mg/L	<0.05				
EK025G: Free cyanide by Discrete Analyser								
Free Cyanide	----	0.004	mg/L	0.507				
EK026G: Total Cyanide By Discrete Analyser								
Total Cyanide	57-12-5	0.004	mg/L	26.3				



Analytical Results

Sub-Matrix: WATER				Client sample ID	DETOX LIQUOR	----	----	----	----
				Client sampling date / time	[15-NOV-2011]	----	----	----	----
Compound	CAS Number	LOR	Unit		EP1107934-001	----	----	----	----
EK027: Thiocyanate									
Thiocyanate	463-56-9	0.1	mg/L		252	----	----	----	----
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L		114	----	----	----	----
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	----	0.01	mg/L		0.20	----	----	----	----
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L		14.0	----	----	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		14.2	----	----	----	----

PH11244918 - Finalized

CLIENT : "ALSENV - ALS Environmental"

of SAMPLES : 1

DATE RECEIVED : 2011-11-24 DATE FINALIZED : 2011-11-29

PROJECT : " "

CERTIFICATE COMMENTS : "ME-MS41:Gold determinations by this method are semi-quantitative due to the small sample weight used (0.5g). "

PO NUMBER : "295415"

SAMPLE DESCRIPTION	ME-MS41 Ag ppm	ME-MS41 Al %	ME-MS41 As ppm	ME-MS41 Au ppm	ME-MS41 B ppm	ME-MS41 Ba ppm	ME-MS41 Be ppm	ME-MS41 Bi ppm	
EP1107934 002-AC	1.15	2.15	177	<0.2	<10		60	0.66	6.68
	ME-MS41 Ca %	ME-MS41 Cd ppm	ME-MS41 Ce ppm	ME-MS41 Co ppm	ME-MS41 Cr ppm	ME-MS41 Cs ppm	ME-MS41 Cu ppm	ME-MS41 Fe %	
	0.36	2.97	70.9	25.3	374	2.81	525	5.1	
	ME-MS41 Ga ppm	ME-MS41 Ge ppm	ME-MS41 Hf ppm	ME-MS41 Hg ppm	ME-MS41 In ppm	ME-MS41 K %	ME-MS41 La ppm	ME-MS41 Li ppm	
	6.76	0.16	0.43	<0.01	0.086	0.41	33.8	15.9	
	ME-MS41 Mg %	ME-MS41 Mn ppm	ME-MS41 Mo ppm	ME-MS41 Na %	ME-MS41 Nb ppm	ME-MS41 Ni ppm	ME-MS41 P ppm	ME-MS41 Pb ppm	
	1.01	425	31.6	0.04	0.16	228	400	397	
	ME-MS41 Rb ppm	ME-MS41 Re ppm	ME-MS41 S %	ME-MS41 Sb ppm	ME-MS41 Sc ppm	ME-MS41 Se ppm	ME-MS41 Sn ppm	ME-MS41 Sr ppm	
	28.5	0.003	1.06	1	4.1	0.6	1.5	8.4	
	ME-MS41 Ta ppm	ME-MS41 Te ppm	ME-MS41 Th ppm	ME-MS41 Ti %	ME-MS41 Tl ppm	ME-MS41 U ppm	ME-MS41 V ppm	ME-MS41 W ppm	
	0.01	0.16	11.4	0.026	0.19	1.46	41	2.02	
	ME-MS41 Y ppm	ME-MS41 Zn ppm	ME-MS41 Zr ppm						
	9.72	933	15.4						

Client: ALS
Job number: 11_854
Sample: 11_854_01
Client ID: EP1107934-002 15/11/11
Date: 30/11/11
Analysis: Semi-quantitative mineralogical analysis by x-ray diffraction (XRD)

Sample Preparation

The sample was supplied to Microanalysis Australia on 24/11/11. A representative sub-sample was removed and lightly ground such that 90% was passing 20 µm. Grinding to this size helps eliminate preferred orientation.

Analysis

Only crystalline material present in the sample will give peaks in the XRD scan. Amorphous (non crystalline) material will add to the background. The search match software used was Xplot. An up to date ICDD card set was used. The x-ray source was cobalt radiation.

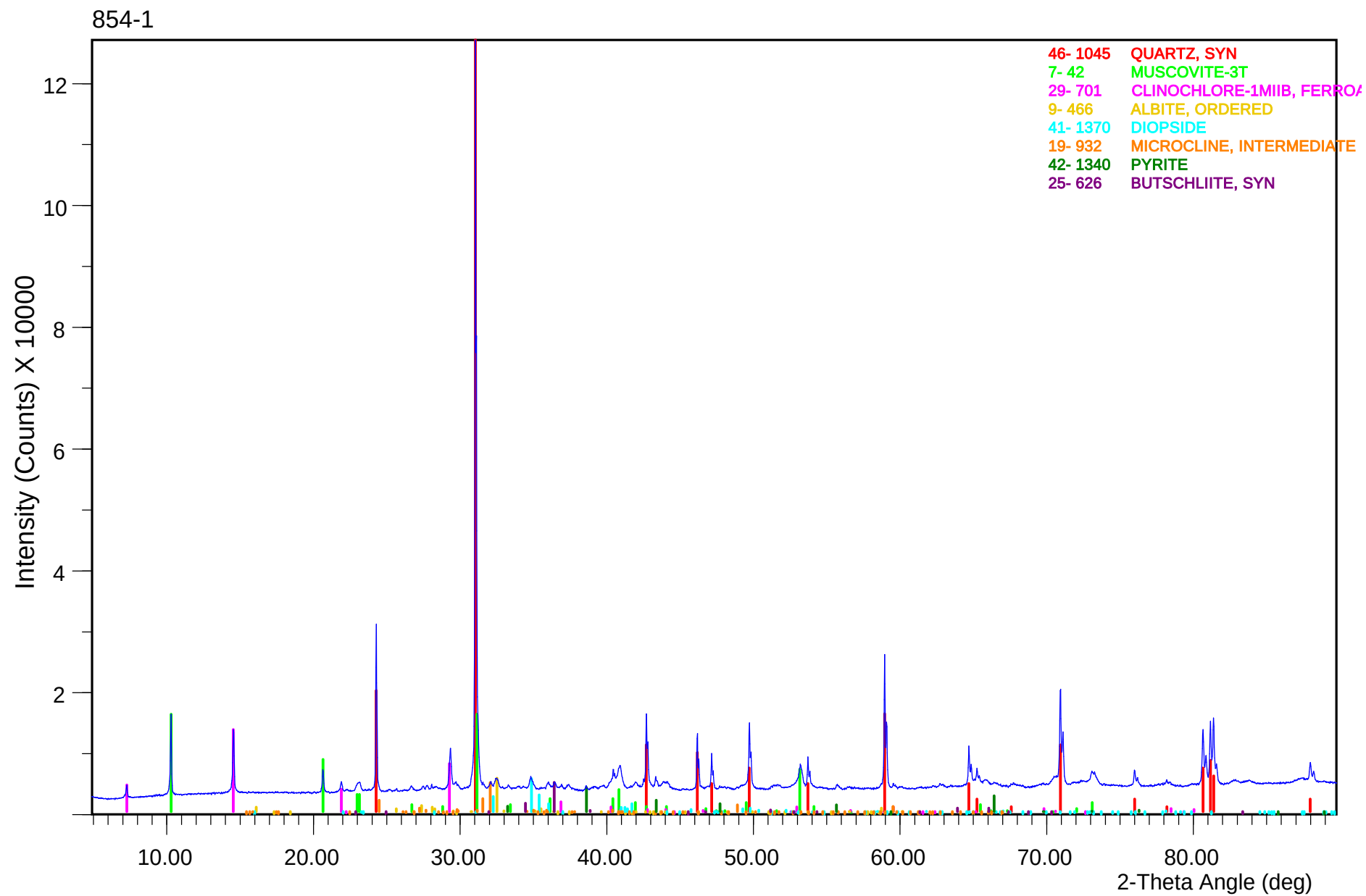
No standards were used in the quantification process. The concentrations were calculated using the peak area integration method where the area of the 100 % peak for each mineral phase is summed and the relative percentages of each phase calculated based on the relative contribution to the sum. This method allows for some attention to be paid to preferred orientation but is limited in considering substitution and lattice strain.

Summary

The phases are listed below:

Mineral phase	Concentration (%w/w)	ICDD match probability
Quartz (SiO ₂)	75	good
Muscovite-3T ((K,Na)(Al,Mg,Fe) ₂ (Si _{3.1} Al _{0.9})O ₁₀ (OH) ₂)	8	good
Clinochlore, ferroan ((Mg,Fe) ₆ (Si,Al) ₄ O ₁₀ (OH) ₈)	9	good
Albite, ordered (NaAlSi ₃ O ₈)	3	medium
Diopside (Ca(Mg,Al)(Si,Al) ₂ O)	3	low
Microcline, intermediate (KAlSi ₃ O ₈)	1	low
Pyrite (FeS ₂)	0.7	low
Butschliite (K ₂ Ca(CO ₃) ₂)	1	low

The ICDD match probability is reported as an indication as to how well the peak positions and relative intensities for the sample matched those in the published literature (www.icdd.org) for that particular compound.





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06 May 2010

Mt. Todd Project Report of Tailings Characterization Test Work

1.0 Summary of Test Work

On 23 November 2009, the laboratory facility of Kappes, Cassiday & Associates (KCA) in Reno, Nevada, received one 5-gallon bucket of material from the Mt. Todd Project of Vista Gold Corporation. The material received was identified as Hole VB07-007, 350'-362' and further described as a light gray material crushed to nominal 19 millimeters.

The received material was previously utilized by KCA for metallurgical testing including a head screen analysis with assays by size fraction for gold and silver content, milling studies and agitated leach test work with tail screen analyses. This work was reported in the Mt. Todd Report dated 14 January 2010.

In this test program, leached tailings were utilized for scoping detoxification test work followed by characterization and environmental testing on the detoxified tailings.

2.0 Cyanide Leach Testing

To provide material for detoxification, 1,000 gram portions of crushed material were separately milled and leached according to the conditions reported previously by KCA.

Leach Slurry Conditions:
Target 80% passing 0.075 millimeters
1,000 grams solids
1,500 grams water
3.5 grams $\text{Ca}(\text{OH})_2$ (added during milling)
1.0 grams per liter NaCN
96 hours of leach time

The tailings from the leach tests were not analyzed for gold or silver as the purpose of the tests was to provide material for detoxification testing.

3.0 Detoxification Testing

3.1 Scoping Testing

Preliminary detoxification tests were conducted to determine the reagent additions necessary to achieve target detoxified levels by means of the INCO/SO₂ detoxification process. Target detoxified conditions were provided by Mr. Thomas DeMull (Vista Gold Corp.).

Feed pulp density:	50% solids
CN WAD after detox:	<50 ppm

The slurry from the milled leach tests was decanted to adjust the pulp density to the target level of 50% solids. The slurry was detoxified using the INCO/SO₂ process (The International Nickel Company's (INCO) sulfur dioxide/air process) with sodium metabisulfite (Na₂S₂O₅), hydrated copper sulfate (CuSO₄·5H₂O) as required and sulfuric acid (H₂SO₄)/Calcium Oxide (CaO) to maintain the target pH level. The target Cu:Fe ratio was 4, which was calculated initially based on the copper and iron in the detoxification feed solution.

A set of ten (10) initial scoping tests was conducted to determine the detoxification conditions. Each scoping test was conducted utilizing a 400 gram slurry sample (200 grams solids + 200 grams solution). No copper was added during the scoping tests as the feed slurry contained a sufficient level of copper (Cu:Fe ≥ 4) based on the initial concentrations of copper and iron.

Five (5) different sodium metabisulfite (SMBS) addition levels were tested: 0.9, 2.4, 3.2, 4.1 and 6.0 grams per gram total cyanide. To ensure that subsequent detoxification tests had sufficiently low WAD cyanide values, the 2.3 gram SMBS per gram total CN addition was selected as optimal. The 0.9 gram per gram addition was not selected as it may not consistently produce detoxified levels below the target 50 ppm WAD cyanide.

Higher levels of SMBS with additional reaction time were added in the test series to observe the effects on the WAD cyanide. The solution assays indicated that the additional reagents and time did not significantly affect the WAD cyanide. Though the total cyanide concentration may have been lowered by the additional reagents and time, the selection of the optimal conditions was determined based on the WAD cyanide numbers.

The conditions for scoping test 3 were selected as the optimum of this test series.

The initial conditions of the feed slurry to the detoxification tests are summarized in Table 3-1. The parameters for the different scoping tests are presented in Table 3-2. Results of the scoping detoxification tests are presented in Table 3-3.

Table 3-1.
Mt. Todd Project
Scoping Detoxification Feed Slurry Conditions

Soln., mLs	Solids, gms	pH	CN _{Total} , mg/L	Fe, mg/L	Cu, mg/L	"Free" NaCN, gpL	Free CN, mg/L
200	200	11.8	466	1.18	66.9	0.85	451

Table 3-2.
Mt. Todd Project
Detoxification Scoping Test Parameters

KCA Test No.	Test No.	Na ₂ S ₂ O ₅	pH	Initial Cu	Time
		gms/gm CN _{Total}	(adj. w/ H ₂ SO ₄)	gms Cu/gm Fe	Hours
44306 A	1	0.9	8	57	2
44306 B	2	2.4	8	57	2
44306 C	3	2.4	8	57	2
44306 D	4	0.9	8	57	2
44306 E	5	3.2	8	57	4
44306 F	6	6.0	8	57	4
44306 G	7	6.0	8	57	3
44306 H	8	3.2	8	57	2
44306 I	9	4.1	8	57	3
44306 J	10	4.1	8	57	4

Table 3-3.
Mt. Todd Project
Scoping Detoxification Test Results

KCA Test No.	Test No.	Time Hours	Na ₂ S ₂ O ₅ gms/gm CN ⁻ _{Total}	Product				
				Assayed WAD Cyanide, mg/L	Final "Free" NaCN, gm/L	Final Total Fe, mg/L	Final Total Cu, mg/L	Final pH
44306 A	1	2	0.9	46.37	0.0212	29.3	77.9	8.0
44306 B	2	2	2.4	6.66	0.0067	25.8	58.1	7.9
44306 C	3	2	2.4	28.55	<0.0001	31.0	63.8	8.1
44306 D	4	2	0.9	66.65	0.0229	33.9	69.7	8.0
44306 E	5	4	3.2	34.83	<0.0001	11.4	68.3	8.0
44306 F	6	4	6.0	28.85	<0.0001	12.5	53.0	8.0
44306 G	7	3	6.0	29.50	<0.0001	23.6	67.3	8.0
44306 H	8	2	3.2	49.50	0.0234	33.1	69.0	8.0
44306 I	9	3	4.1	35.69	<0.0001	22.9	65.7	8.1
44306 J	10	4	4.1	29.98	<0.0001	16.9	65.2	8.0

(1) WAD results are inconsistent with other test results.

3.2 Iron Analysis

During the scoping phase of the detoxification test work, high levels of iron were noted. The levels of iron detected in the detoxified solution were higher than the initial iron levels in the final leach solution. To more accurately determine the pH at which iron dissolution starts, acid was incrementally added to a sample of the leached slurry (before detoxification). The pH, iron and copper concentrations at the various stages of acid addition were noted.

The solution analyses for the iron dissolution test are presented in Table 3-4.

Table 3-4.
Mt. Todd Project
Iron Dissolution Analyses

Cum. Reaction Time, min	pH	Cum. 10% H ₂ SO ₄ Added, mLs	Cu, mg/L	Fe, mg/L
0	11.8	0.0	54.4	1.19
15	11.0	0.5	59.0	18.4
30	10.5	0.8	68.7	17.6
45	10.0	1.0	69.1	18.6
60	9.5	1.2	66.0	21.5
75	9.0	1.5	61.4	24.1

The solution analyses from the progressive acidification of the slurry showed the iron concentrations significantly increasing as the pH dropped below the initial value. As the pH was lowered, the iron in solution concentration continued to slowly rise.

The scoping detoxification tests were conducted at a target pH of 8. From the iron dissolution analyses, it was determined that lower pH values may increase iron dissolution; therefore, the target pH of subsequent cyanide detoxification tests was raised from 8 to 9. A higher pH was not considered to avoid adversely affecting cyanide detoxification. Overall results were determined by the WAD cyanide concentration.

Sufficient copper was available in solution from the sample to exceed the target copper/iron ratio based on the initial conditions; however, as the iron concentration significantly increased with the lower pH values, additional copper was required. Therefore, copper was added to the subsequent tests based on an estimated iron solution concentration to maintain the target ratio ($\text{Cu:Fe} \geq 4$).

3.3 Optimum Detoxification Testing

Based on the conditions determined in the scoping tests and the iron dissolution analyses, the optimum conditions were applied to larger samples (1,000 grams solids + 1,000 grams solution). The detoxified material and solution was then utilized for further analyses.

Acceptably low WAD cyanide values were achieved with a SMBS addition level of 2.3 grams per gram total cyanide. With a residence time of 2 hours and a copper addition of 0.039 grams per liter a WAD cyanide level of 39.8 was achieved. Though copper was not added during the scoping tests, it was added in the optimal tests to compensate for the expected iron leached from the tailings. The target pH of the optimal tests was adjusted to 9.

The conditions of the scoping and optimal tests are presented in Table 3-5.

Table 3-5.
Mt. Todd Project
Optimal Detoxification Conditions

KCA Test No.	Test No.	Na2S2O5	pH	Cu	Time	Feed		Tail
		gms/gm	(adj. w/ H2SO4)	gms Cu/gm Fe	Hours	Soln., mLs	Solids, gms	CN ^{WAD} , mg/L
		CN ^{Total}						
Scoping Tests								
44306 A	1	0.9	8	3	2	200	200	46.4
44306 B	2	2.4	8	2	2	200	200	6.7
44306 C	3	2.4	8	2	2	200	200	28.6
44306 D	4	0.9	8	2	2	200	200	66.7
44306 E	5	3.2	8	6	4	200	200	34.8
44306 F	6	6.0	8	4	4	200	200	28.9
44306 G	7	6.0	8	3	3	200	200	29.5
44306 H	8	3.2	8	2	2	200	200	49.5
44306 I	9	4.1	8	3	3	200	200	35.7
44306 J	10	4.1	8	4	4	200	200	30.0
Optimized Tests								
44311	11	2.3	9	4	2	1000	1000	39.8
44312	12	2.3	9	4	2	1000	1000	

Note: Conditions for optimized tests based on Test 3.

Final solution from the optimal detoxification tests was utilized for a NDEP Profile II analysis. Tailings from the optimal detoxification tests were submitted for multi-element, acid-base accounting (ABA) and x-ray diffraction (XRD) analyses. A separate portion of the tailings was utilized for a Synthetic Precipitation Leaching Procedure (SPLP) test with a Profile II analysis on the final solution.

Results from the Profile II analysis on the detoxified solution are presented in Table 3-6. The results of the multi-element analysis are presented in Table 3-7. The results of the XRD analysis are presented in Table 3-8.

Table 3-6.
Mt. Todd Project
NDEP Profile II Analysis of Detoxified Solution

Constituent	Unit	KCA Sample No. 44313 Detoxified Solution
Alkalinity, Total	mg/L CaCO ₃	107
Alkalinity, Bicarbonate	mg/L CaCO ₃	80
Alkalinity, Carbonate	mg/L CaCO ₃	27
Alkalinity, Hydroxide	mg/L CaCO ₃	<2
Aluminum	mg/L	1.0
Antimony	mg/L	0.006
Arsenic	mg/L	0.009
Barium	mg/L	0.097
Beryllium	mg/L	<0.004
Bismuth	mg/L	<1
Boron	mg/L	<0.5
Cadmium	mg/L	0.012
Calcium	mg/L	440
Chloride	mg/L	28
Chromium	mg/L	<0.004
Cobalt	mg/L	0.19
Copper	mg/L	31
Cyanide, Total	mg/L	129
Cyanide, WAD	mg/L	39.8
Fluoride	mg/L	<1
Gallium	mg/L	<1
Iron	mg/L	19
Lanthanum	mg/L	<0.5
Lead	mg/L	0.006
Lithium	mg/L	<1
Magnesium	mg/L	<5
Manganese	mg/L	0.014
Mercury	mg/L	<0.0002
Molybdenum	mg/L	0.13
Nickel	mg/L	0.47
Nitrate	mg/L N	<0.5
pH	pH	8.97
pH - Temperature	°C	19.8
Phosphorus	mg/L	<0.2
Potassium	mg/L	75
Scandium	mg/L	<0.5
Selenium	mg/L	<0.02
Silver	mg/L	0.076
Sodium	mg/L	1080
Strontium	mg/L	<0.5
Sulfate	mg/L	2500
Thallium	mg/L	<0.002
Tin	mg/L	<1
Titanium	mg/L	<0.5
Total Dissolved Solids	mg/L	4900
Vanadium	mg/L	<0.004
Zinc	mg/L	1.0

Table 3-7.
Mt. Todd Project
Multi-element Analysis of Detoxified Tailings

Constituent	Unit	KCA Sample No. 43311 Detoxified Tailings
Al	%	7.18
As	mg/kg	109
Ba	mg/kg	511
Bi	mg/kg	20
Ca	%	0.40
Cd	mg/kg	22
Co	mg/kg	15
Cr	mg/kg	101
Cu	mg/kg	440
Fe	%	6.02
Hg	mg/kg	0.05
K	%	3.07
Mg	%	1.31
Mn	mg/kg	359
Mo	mg/kg	1
Na	%	0.23
Ni	mg/kg	86
P	%	ND
Pb	mg/kg	56
Sb	mg/kg	<2
Se	mg/kg	ND
Sr	mg/kg	22
Ta	mg/kg	13
Te	mg/kg	9
Ti	%	0.28
Tl	mg/kg	ND
U	mg/kg	68
V	mg/kg	94
W	mg/kg	13
Zn	mg/kg	206

Table 3-8.
Mt. Todd Project
XRD Analysis of Detoxified Tailings

Mineral	Ideal Formula	KCA 44311
Quartz	SiO ₂	53.8
Clinochlore	(Mg,Fe ²⁺) ₅ Al(Si ₃ Al)O ₁₀ (OH) ₈	9.0
Muscovite	KAl ₂ AlSi ₃ O ₁₀ (OH) ₂	29.4
K-feldspar	KAlSi ₃ O ₈	3.3
Calcite	CaCO ₃	0.4
Dolomite	CaMg(CO ₃) ₂	0.7
Pyrite	FeS ₂	0.3
Pyrrhotite	Fe _{1-x} S	2.9
Gold ?	Au	0.1
Total		100.0

3.4 Description of ABA Testing

Acid-base accounting is a static test to determine the acid producing or acid neutralizing potential of a material. It is a general analysis for the elements of acid generation and does not indicate the potential rate at which generation or neutralization may occur.

Two parameters form the basis for the evaluation of a material, the neutralization potential (NP) and the acid potential (AP). These values are then utilized to calculate the net neutralization potential (NNP) and the neutralization potential/acid potential ratio (NPR). The calculated values provide a basic guideline in determining the potential for a material to generate or neutralize acid. The NP, AP and NNP are expressed in units of metric tonnes CaCO_3 equivalent per 1000 metric tonnes of material.

The tailings were treated as follows:

1. To determine the neutralization potential (NP) the sample was treated with an excess of standardized hydrochloric acid (HCl) at ambient temperature for a 24 hour period. During this period, the pH of the sample was checked to insure that sufficient acid was available for consumption reaction. After the test period, the un-reacted acid was titrated with a standardized base to a neutral pH to calculate the calcium carbonate equivalent of the acid consumed.
2. To determine the acid potential (AP) the sample was analyzed for the percentage of total sulfur, sulfate sulfur, and sulfide sulfur. Standards and blanks were used in the sample set to insure accuracy. The acid potential of the sample in tonnes CaCO_3 equivalent per 1000 tonnes was given by,

$$\text{AP} = \text{Percent "Sulfur"} \times 31.25$$

This assumes that 31.25 tonnes of CaCO_3 was needed to neutralize the acid, potentially generated, from 1 tonne of material containing 1% sulfur.

3. The net neutralization potential (NNP) in tonnes CaCO_3 equivalent per 1000 tonnes of material was given by the difference of the neutralization potential and the acid potential.

$$\text{NNP} = \text{NP} - \text{AP}$$

4. The neutralization potential/ acid potential ratio was calculated by the division of the neutralization potential by the acid potential. The resulting number is unitless.

$$\text{NPR} = \text{NP}/\text{AP}$$

LECO analyses were utilized for total, sulfate and sulfide sulfur speciation. Acid digestion, according to Sobek et al. (1978), was utilized for pyritic sulfur speciation.

The results of the ABA testing are presented in Table 3-9.

Table 3-9.
Mt. Todd Project
Acid-Base Accounting Analysis of Detoxified Tailings

KCA Sample No.	Description	P ₈₀ Grind Size, mm	Paste pH	Total Sulfur, %	Sulfate Sulfur, %	Sulfide Sulfur, %	Pyritic Sulfur, %	AP-1 (Total Sulfur), MT/1,000MT	AP-2 (Sulfate Sulfur), MT/1,000MT	AP-3 (Sulfide Sulfur), MT/1,000MT	AP-4 (Pyrite Sulfur), MT/1,000MT
44311	Hole VB07-007, 350'-362'	0.075	7.9	1.25	0.21	1.04	0.03	39.06	6.41	32.34	1.03

KCA Sample No.	Description	Fizz Rating	NP, MT/1,000MT	NNP-1 (Total Sulfur), MT/1,000MT	NNP-2 (Sulfate Sulfur), MT/1,000MT	NNP-3 (Sulfide Sulfur), MT/1,000MT	NNP-4 (Pyritic Sulfur), MT/1,000MT	NP/AP Ratio-1 (Total Sulfur)	NP/AP Ratio-2 (Sulfate Sulfur)	NP/AP Ratio-3 (Sulfide Sulfur)	NP/AP Ratio-4 (Pyritic Sulfur)
44311	Hole VB07-007, 350'-362'	None	12.3	-26.8	5.9	-20.0	11.3	0.3	1.9	0.4	11.9

Notes: Net NP (NNP) = NP-AP (1, 2, 3 and 4)

Neutralizing potential (NP) determined by hydrochloric acid addition and back titration with base.

AP, NP, NNP units reported as MT CaCO₃ equivalents/1,000 MT of material.

3.5 SPLP on Detoxified Tailings

A portion of the filtered wet tailings detoxified under the optimal conditions was utilized for a synthetic precipitation leaching procedure test according to EPA Method 1312. The sample was leached with reagent water to allow for cyanide analyses on the final solution. Leaching was conducted using the procedure for samples without volatiles. The final leach solution was analyzed for the Profile II constituents.

According to the procedure, a portion of the material was diluted to a liquid to solid ratio of 20:1 by weight. The moisture content of the SPLP feed cake was 19%.

The analysis of the final SPLP solution is presented in Table 3-10.

Table 3-10.
Mt. Todd Project
NDEP Profile II Analysis of SPLP Solution

Constituent	Unit	KCA Sample No. 44333 SPLP Solution
Alkalinity, Total	mg/L CaCO ₃	24
Alkalinity, Bicarbonate	mg/L CaCO ₃	24
Alkalinity, Carbonate	mg/L CaCO ₃	<2
Alkalinity, Hydroxide	mg/L CaCO ₃	<2
Aluminum	mg/L	0.78
Antimony	mg/L	0.002
Arsenic	mg/L	0.011
Barium	mg/L	0.007
Beryllium	mg/L	<0.002
Bismuth	mg/L	<0.2
Boron	mg/L	<0.1
Cadmium	mg/L	<0.002
Calcium	mg/L	25
Chloride	mg/L	0.6
Chromium	mg/L	<0.002
Cobalt	mg/L	0.003
Copper	mg/L	0.004
Cyanide, Total	mg/L	2.3
Cyanide, WAD	mg/L	0.07
Fluoride	mg/L	<0.1
Gallium	mg/L	<0.2
Iron	mg/L	0.88
Lanthanum	mg/L	<0.1
Lead	mg/L	<0.002
Lithium	mg/L	<0.2
Magnesium	mg/L	<1
Manganese	mg/L	<0.002
Mercury	mg/L	<0.0002
Molybdenum	mg/L	0.004
Nickel	mg/L	<0.002
Nitrate	mg/L N	<0.05
pH	pH	8.33
pH - Temperature	°C	18.2
Phosphorus	mg/L	<0.2
Potassium	mg/L	3.6
Scandium	mg/L	<0.1
Selenium	mg/L	<0.01
Silver	mg/L	0.003
Sodium	mg/L	18
Strontium	mg/L	<0.1
Sulfate	mg/L	65
Thallium	mg/L	<0.001
Tin	mg/L	<0.2
Titanium	mg/L	<0.1
Total Dissolved Solids	mg/L	160
Vanadium	mg/L	<0.002
Zinc	mg/L	<0.02

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

Client: Vista Gold
Consulting Client: Tetra Tech
Client Project Name: Mt. Todd
Cantest Project No: 2-21-954
Cantest Internal Reference No: R 73588

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October 27, 2009

EXPERIMENTAL METHOD

The five samples of **Project Vista Gold – Mt. Todd** were reduced to the optimum grain-size range for quantitative X-ray analysis ($<10\ \mu\text{m}$) by grinding under ethanol in a vibratory McCrone Micronising Mill for 7 minutes. Step-scan X-ray powder-diffraction data were collected over a range $3\text{--}80^\circ 2\theta$ with CoK α radiation on a Bruker D8 Focus Bragg-Brentano diffractometer equipped with an Fe monochromator foil, 0.6 mm (0.3°) divergence slit, incident- and diffracted-beam Soller slits and a LynxEye 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 – 5.

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

Mineral	Ideal Formula	VB07-010 301-305 G	VB-011 156- 160 S (HC-4)	VB-002 220- 224 I (HC-3)	VB007-004 279-283 I	VB07-022 340- 344 S
Quartz	SiO ₂	27.8	39.8	49.5	57.1	57.5
Clinochlore	(Mg,Fe ²⁺) ₅ Al(Si ₃ Al)O ₁₀ (OH) ₈	16.9	12.3	9.3	8.4	10.3
Muscovite	KAl ₂ (AlSi ₃ O ₁₀)(OH) ₂		42.7	16.4	32.2	17.4
Biotite	K(Mg,Fe ²⁺) ₃ AlSi ₃ O ₁₀ (OH) ₂	8.0				1.5
K-feldspar	KAlSi ₃ O ₈	10.3		6.2		5.0
Plagioclase	NaAlSi ₃ O ₈ – CaAl ₂ Si ₂ O ₈	26.4		6.0		4.0
Actinolite	Ca ₂ (Mg,Fe ²⁺) ₅ Si ₈ O ₂₂ (OH) ₂	6.1				
Calcite	CaCO ₃	0.5	0.9	1.5	0.3	0.6
Siderite	Fe ²⁺ CO ₃			2.7		
Ankerite/Dolomite	Ca(Fe ²⁺ ,Mg,Mn)(CO ₃) ₂ /CaMg(CO ₃) ₂		2.4	4.0	1.2	1.3
Pyrite	FeS ₂	1.8	0.8			
Marcasite	FeS ₂		1.2			
Sphalerite	(Zn,Fe)S			0.8		
Arsenopyrite	FeAsS			2.7		
Galena	PbS			0.8		
Pyrrhotite	Fe _{1-x} S	2.0			0.8	2.6
Total		100.0	100.0	100.0	100.0	100.0

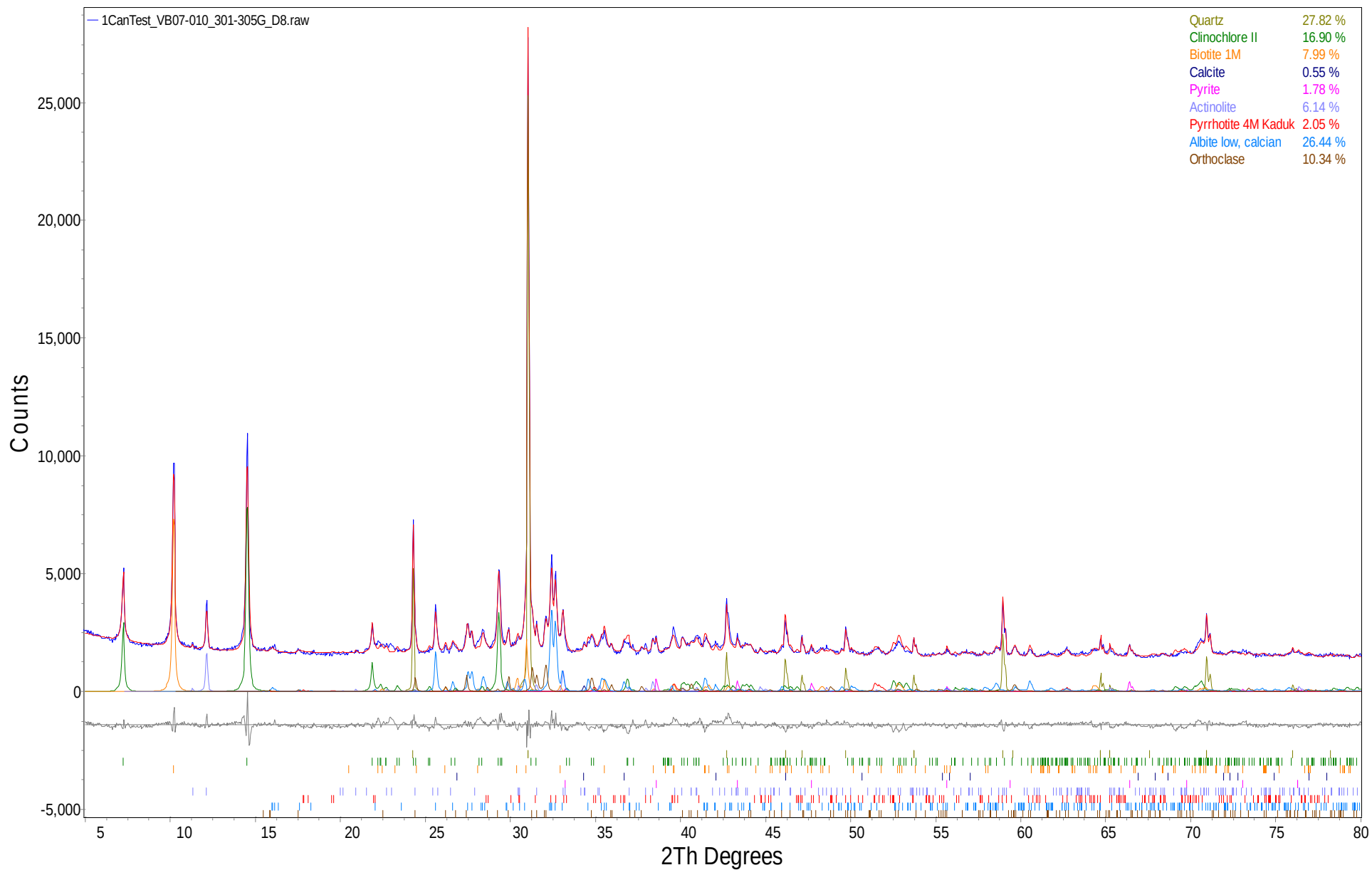


Figure 1. Rietveld refinement plot of sample “**VB07-010 301-305 G**” (blue line - observed intensity at each step; red line - calculated pattern; solid grey line below – difference between observed and calculated intensities; vertical bars, positions of all Bragg reflections). Coloured lines are individual diffraction patterns of all phases.

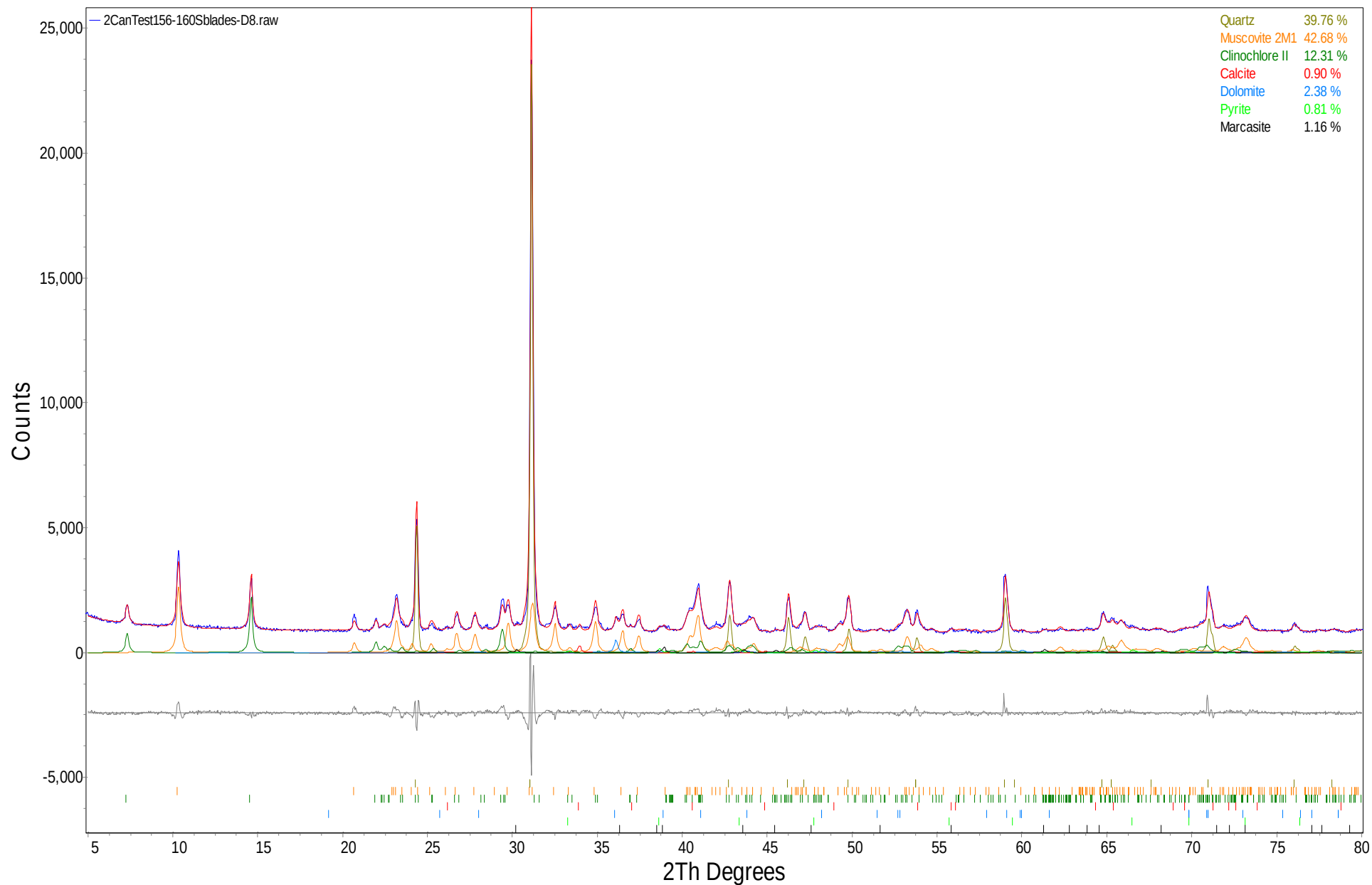


Figure 2. Rietveld refinement plot of sample **“VB-011 156-160 S (HC-4)”** (blue line - observed intensity at each step; red line - calculated pattern; solid grey line below – difference between observed and calculated intensities; vertical bars, positions of all Bragg reflections). Coloured lines are individual diffraction patterns of all phases.

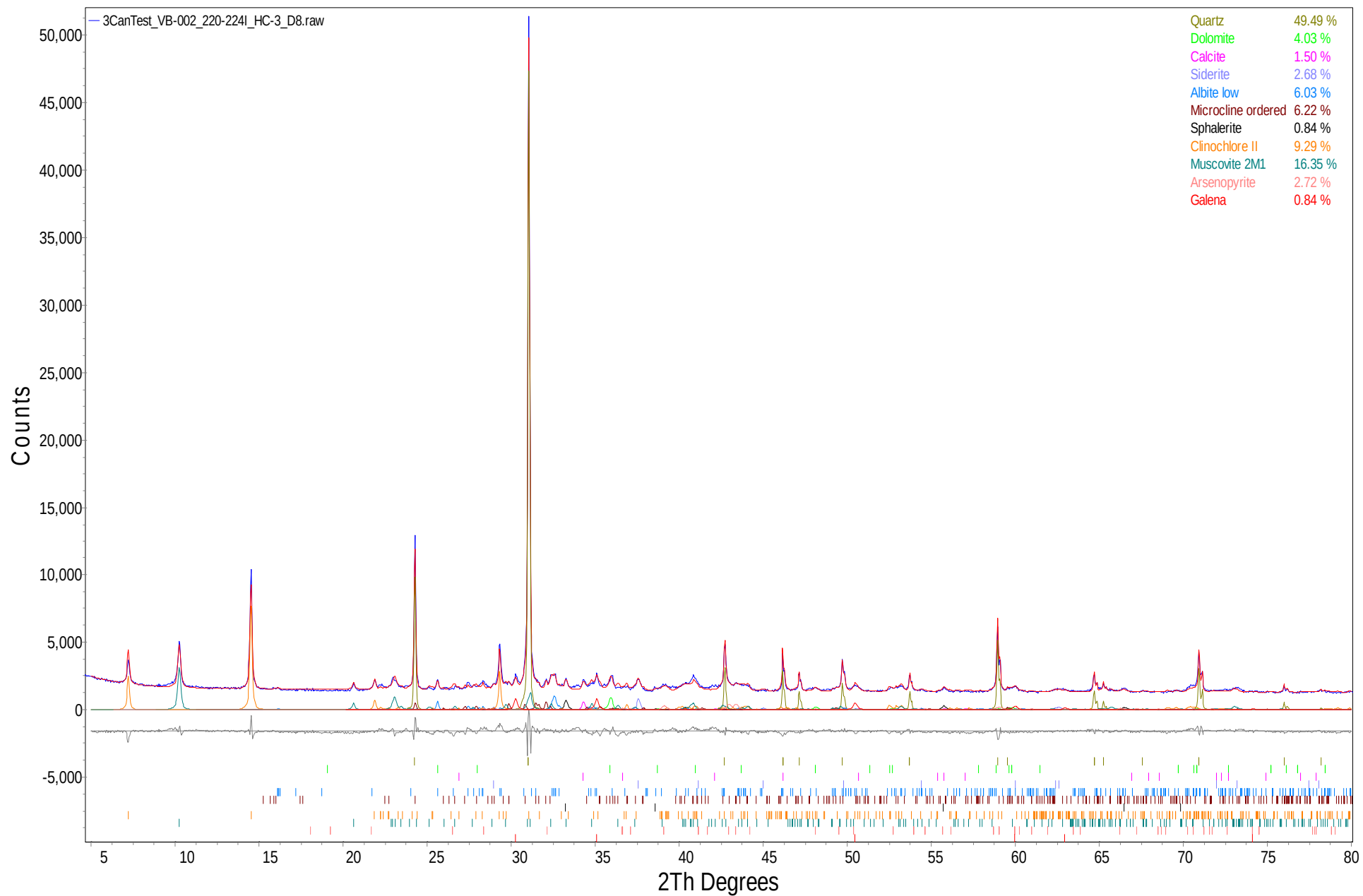


Figure 3. Rietveld refinement plot of sample “**VB-002 220-224 I (HC-3)**” (blue line - observed intensity at each step; red line - calculated pattern; solid grey line below – difference between observed and calculated intensities; vertical bars, positions of all Bragg reflections). Coloured lines are individual diffraction patterns of all phases.

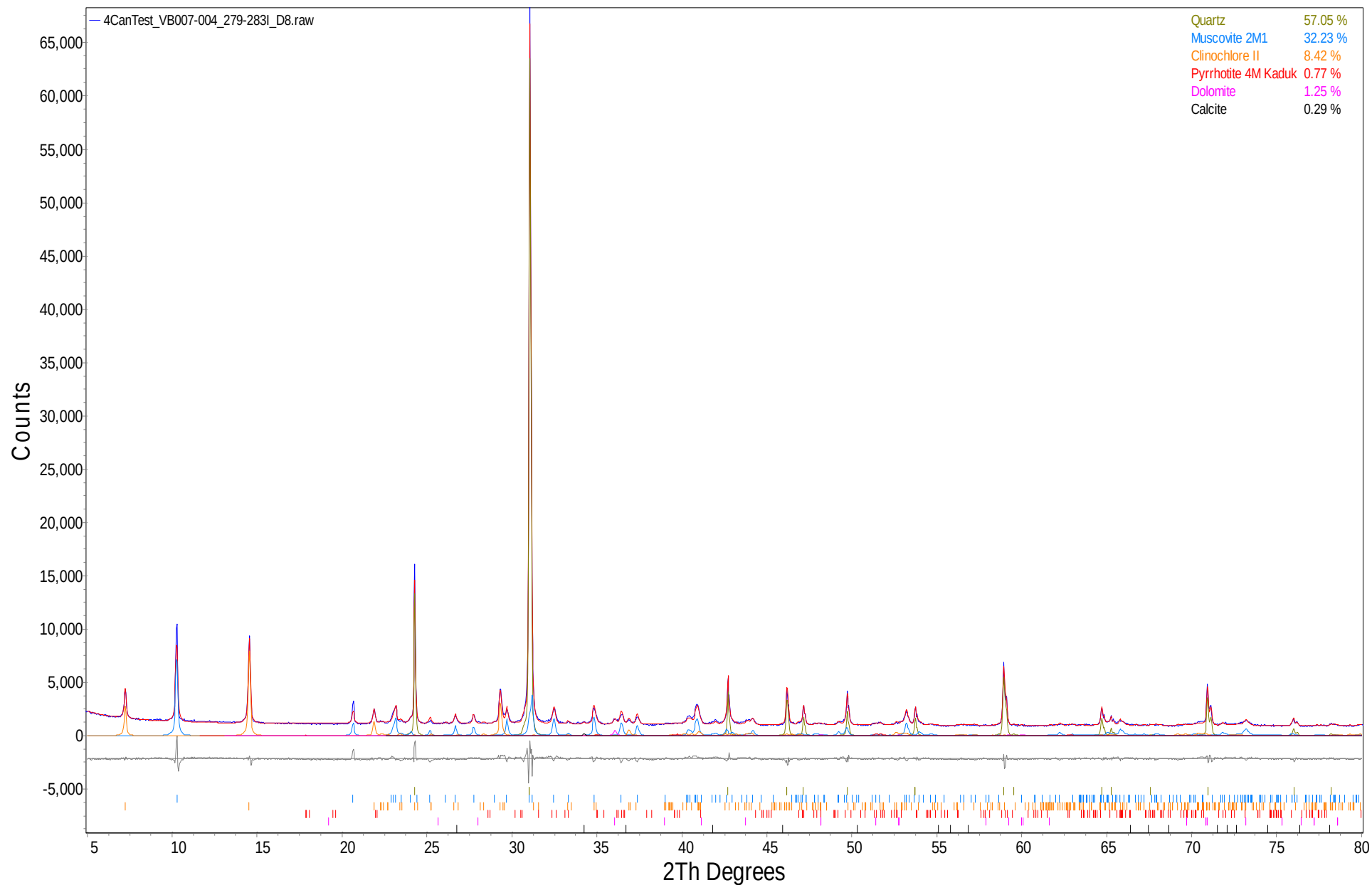


Figure 4. Rietveld refinement plot of sample “**VB007-004 279-283 I**” (blue line - observed intensity at each step; red line - calculated pattern; solid grey line below – difference between observed and calculated intensities; vertical bars, positions of all Bragg reflections). Coloured lines are individual diffraction patterns of all phases.

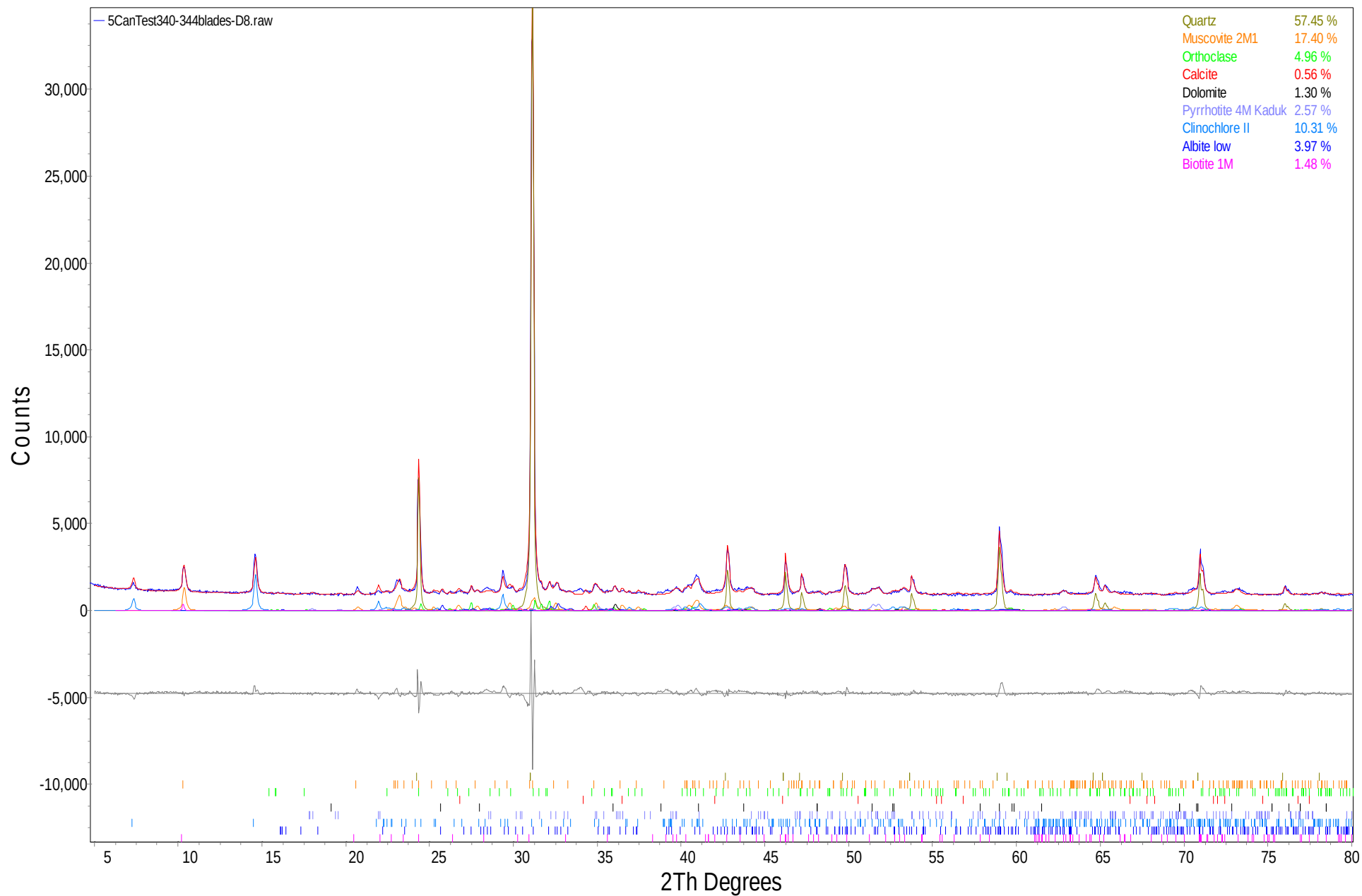
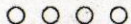


Figure 5. Rietveld refinement plot of sample “VB07-022 340-344 S” (blue line - observed intensity at each step; red line - calculated pattern; solid grey line below – difference between observed and calculated intensities; vertical bars, positions of all Bragg reflections). Coloured lines are individual diffraction patterns of all phases.



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ARD SAMPLE REQUISITION and CHAIN OF CUSTODY FORM

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Company: Tetra Tech		Project: Mt. Todd		Analysis Requested																								
Address: 350 Indiana Street, Suite 500 Golden, CO 80401 USA				Static NAG	Static NAG duplicate for ICP-MS scan and SO42- (to discuss)	Sobek ABA Package (Paste pH, Total S, NP)	Modified ABA Package (Paste pH, Sulfide S, NP)	ASTM Sulphur Speciation	Sulphate Sulphur only	Carbonate Carbon (CO2)	Metals: ☐ Aqua Regia Group 1DX ☐ 4-Acid Group 1EX	Metals: Ultratrace Group 1F-MS	Whole Rock - Majors by Lithium Borate Fusion	Whole Rock - Majors by XRF	Mineralogy: ☐ Rietveld XRD ☐ Standard XRD	Mineralogy: ☐ Optical Microscopy on polished thin sections	Water Extraction: ☐ BCMEM SFE Extraction ☐ ICP-MS scan	Water Extraction: ☐ SPLP (Method 1312) ☐ ICP-MS scan ☐ Anions (Cl-, F-, alkalinity)	Water Extraction: ☐ MWWP ☐ ICP-MS scan	Supernatant other (pH, acidity, EC, TDS, alkalinity, F-, SO4, NO3-, NO2-, Cl-)	Waters: Total Metals ☐ ICP-MS scan	Waters: Dissolved Metals ☐ ICP-MS scan	Waters: ☐ T-CN ☐ WAD-CN ☐ free CN ☐ Hg	Waters: ☐ T-Thiosalts	Humidity Cell Testing	Column Testing		
Telephone: 720 881-5815	Fax: 303 217-5705																											
Email: patsy.moran@tetrattech.com																												
Sample ID	Sample wt	# of Cont.																										
1	VB-025 48-52 G	~3 kg	1				X	X																				
2	VB-025 68-72 G	~3 kg	1				X	X																				
3	VB-009 58-62 G	~3 kg	1				X	X																				
4	VB-009 102-106 G	~3 kg	1				X	X																				
5	VB-009 86-90 G	~3 kg	1				X	X																				
6	VB-002 352-356 G	~3 kg	1				X	X																				
7	VB-006 44-48 S	~3 kg	1				X	X																				
8	VB-003 33-37 S	~3 kg	1				X	X																				
9	VB-018 4-8 S	~3 kg	1				X	X																				
10	VB-011 160-164 S	~3 kg	1				X	X																				
11	VB-003 41-45 S	~3 kg	1				X	X																				
12	VB-011 156-160 S	~3 kg	1				X	X																				
13	VB-002 220-224 I	~3 kg	1				X	X																				
14	VB-008 142-146 I	~3 kg	1				X	X																				
15	VB-018 216-220 I	~3 kg	1				X	X																				
16	VB-018 120-124 I	~3 kg	1				X	X																				
17	VB-006 72-76 I	~3 kg	1				X	X																				
18	VB-002 300-304 I	~3 kg	1				X	X																				
19																												
20																												
21																												
22																												
23																												
24																												
25																												
26																												
27																												
28																												
Relinquished by:		Date:																										
Received by:		Date:																										
Relinquished by:		Date:																										
Received by:		Date:																										
Sample conditions upon receipt (For Lab Use Only):										Storage Instructions:																		
Frozen:	☐	Method of Shipment:								☐ Return after analysis																		
Cold:	☐									☒ Hold rocks for 1 year then discard																		
Ambient:	☐	Shipment condition: (e.g. breakage, leakage):								☐ Return after one year to client																		
N/A:	☐																											



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ARD SAMPLE REQUISITION and CHAIN OF CUSTODY FORM



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Page 1 of 1

Company: Tetra Tech		Project: Mt. Todd		Analysis Requested																									
Address: 350 Indiana Street, Suite 500 Golden, CO 80401 USA				Static NAG	Static NAG duplicate for ICP-MS scan and SO42-	Sobek ABA Package (Paste pH, Total S, NP)	Modified ABA Package (Paste pH, Total S, NP)	Sobek (EPA-600) Sulphur Speciation	Sulphate Sulphur only	Carbonate Carbon (CO2)	Metals: ☐ Aqua Regia Group 1DX ☐ 4-Acid Group 1EX	Metals: Ultratrace Group 1F-MS	Whole Rock - Majors by Lithium Borate Fusion	Whole Rock - Majors by XRF	Mineralogy: ☒ Rietveld XRD ☐ Standard XRD	Mineralogy: ☐ Optical Microscopy on polished thin sections	Water Extraction: ☐ BCMEM SFE Extraction ☐ ICP-MS scan	Water Extraction: ☐ SPLP (Method 1312) ☐ ICP-MS scan ☐ Anions (Cl-, F-, alkalinity)	Water Extraction: ☐ MWWP ☐ ICP-MS scan	Supernatant other (pH, acidity, EC, TDS, alkalinity, F-, SO4, NO3-, NO2-, Cl-)	Waters: Total Metals ☐ ICP-MS scan	Waters: Dissolved Metals ☐ ICP-MS scan	Waters: ☐ T-CN ☐ WAD-CN ☐ free CN ☐ Hg	Waters: ☐ T-Thiosalts	Humidity Cell Testing	Column Testing			
Sample ID	Sample wt	# of Cont.																											
Telephone: 720 881-5815	Fax: 303 217-5705	Email: patsy.moran@tetrattech.com																											
1	VB07-010 301-305 G		1												X														
2	VB-011 156-160 S (HC-4)		1												X														
3	VB-002 220-224 I (HC-3)		1												X														
4	VB007-004 279-283 I		1												X														
5	VB07-022 340-344 S		1												X														
6																													
7																													
8																													
9																													
10																													
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27																													
28																													
Relinquished by:		Date:																											
Received by:		Date:																											
Relinquished by:		Date:																											
Received by:		Date:																											
Sample conditions upon receipt (For Lab Use Only):												Storage Instructions:																	
Frozen: ☐ Method of Shipment: _____												☐ Return after analysis																	
Cold: ☐ _____												☒ Hold rocks for 1 year then discard																	
Ambient: ☐ Shipment condition: (e.g. breakage, leakage): _____												☐ Return after one year to client																	
N/A: ☐ _____																													



ARD SAMPLE REQUISITION and CHAIN OF CUSTODY FORM

CANTEST Ltd., 4606 Canada Way, Burnaby, BC V5G 1K5

Attn: Tim O'Hearn and Ivy Rajan

Total 75 Samples

Phone: (604) 734-7276 Fax: (604) 731-2386

E-mail: tohearn@cantest.com**Page 1 of 3**

Company: Tetra Tech				Project: Mt. Todd				Analysis Requested																			
Address: 350 Indiana Street, Suite 500 Golden, CO 80401 USA																											
Telephone: 720 881-5815				Fax: 303 217-5705																							
Email: patsy.moran@tetratech.com																											
	Sample ID	Sample wt	# of Cont.	Static NAG	Static NAG duplicate for ICP-MS scan and SO42- (to discuss)	Sobek ABA Package (Paste pH, Total S, NP)	Modified ABA Package (Paste pH, Sulfide S, NP)	ASTM Sulphur Speciation	Sulphate Sulphur only	Carbonate Carbon (CO2)	Metals: ☐ Aqua Regia Group 1DX ☐ 4-Acid Group 1EX	Metals: Ultratrace Group 1F-MS	Whole Rock - Majors by Lithium Borate Fusion	Whole Rock - Majors by XRF	Mineralogy: ☐ Rietveld XRD ☐ Standard XRD	Mineralogy: ☐ Optical Microscopy on polished thin sections	Water Extraction: ☐ BCMEM SFE Extraction ☐ ICP-MS scan	Water Extraction: ☐ SPLP (Method 1312) ☐ ICP-MS scan ☐ Anions (Cl ⁻ , F ⁻ , alkalinity)	Water Extraction: ☐ MMMP ☐ ICP-MS scan	Supernatant other	Waters: Total Metals ☐ ICP-MS scan	Waters: Dissolved Metals ☐ ICP-MS scan	Waters: ☐ T-CN ☐ WAD-CN ☐ trace CN ☐ Hg	Waters: ☐ T-Thiosalts	Humidity Cell Testing	Column Testing	
1	VB07-001 21 -25 M	~2 kg	1				X	X																			
2	VB07-001 89 -93 G	~2 kg	1				X	X																			
3	VB07-001 125 -129 G	~2 kg	1				X	X																			
4	VB07-001 152 -156 G	~2 kg	1				X	X																			
5	VB07-001 173 -177 G	~2 kg	1				X	X																			
6	VB07-001 181-185 G	~2 kg	1				X	X																			
7	VB07-001 189-193 G	~2 kg	1				X	X																			
8	VB07-001 193-197 G	~2 kg	1				X	X																			
9	VB07-001 197 -201 G	~2 kg	1				X	X																			
10	VB07-002 2 -16 M	~2 kg	1				X	X																			
11	VB07-004 115 -119 S	~2 kg	1				X	X																			
12	VB07-004 279 -283M	~2 kg	1				X	X																			
13	VB07-006 76 -80M	~2 kg	1				X	X																			
14	VB07-007 12 -16S	~2 kg	1				X	X																			
15	VB07-007 180 - 184 MISSING FROM TRAY	~2 kg	1				X	X																			
16	VB07-009 24 - 28 G	~2 kg	1				X	X																			
17	VB07 - 009 26 - 30 G	~2 kg	1				X	X																			
18	VB07-009 30 - 34 G	~2 kg	1				X	X																			
19	VB07-009 62 - 66 G	~2 kg	1				X	X																			
20	VB07 -009 78 - 82 G	~2 kg	1				X	X																			
21	VB07-009 86 - 90 G	~2 kg	1				X	X																			
22	VB07-009 106 - 110 G	~2 kg	1				X	X																			
23	VB07-009 118 - 122 S	~2 kg	1				X	X																			
24	VB07-010 57 - 61 M	~2 kg	1				X	X																			
25	VB07-010 217 - 221 G	~2 kg	1				X	X																			
Relinquished by:		Date:																									
Received by:		Date:																									
Relinquished by:		Date:																									
Received by:		Date:																									
Sample conditions upon receipt (For Lab Use Only):												Storage Instructions:															
Frozen: ☐ Method of Shipment: _____												☐ Return after analysis															
Cold: ☐ _____												☒ Hold rocks for 1 year then discard															
Ambient: ☐ Shipment condition: (e.g. breakage, leakage): _____												☐ Return after one year to client															
N/A ☐																											



ARD SAMPLE REQUISITION and CHAIN OF CUSTODY FORM

CANTEST Ltd., 4606 Canada Way, Burnaby, BC V5G 1K5

Attn: Tim O'Hearn and Ivy Rajan

Total 75 Samples

Phone: (604) 734-7276 Fax: (604) 731-2386

E-mail: tohearn@cantest.com**Page 2 of 3**

Company: Tetra Tech				Project: Mt. Todd				Analysis Requested																		
Address: 350 Indiana Street, Suite 500 Golden, CO 80401 USA																										
Telephone: 720 881-5815				Fax: 303 217-5705																						
Email: patsy.moran@tetratech.com																										
	Sample ID	Sample wt	# of Cont.	Static NAG	Static NAG duplicate for ICP-MS scan and SO42- (to discuss)	Sobek ABA Package (Paste pH, Total S, NP)	Modified ABA Package (Paste pH, Sulfide S, NP)	ASTM Sulphur Speciation	Sulphate Sulphur only	Carbonate Carbon (CO2)	Metals: ☐ Aqua Regia Group 1DX ☐ 4-Acid Group 1EX	Metals: Ultratrace Group 1F-MS	Whole Rock - Majors by Lithium Borate Fusion	Whole Rock - Majors by XRF	Mineralogy: ☐ Rietveld XRD ☐ Standard XRD	Mineralogy: ☐ Optical Microscopy on polished thin sections	Water Extraction: ☐ BCMEM SFE Extraction ☐ ICP-MS scan	Water Extraction: ☐ SPLP (Method 1312) ☐ ICP-MS scan ☐ Anions (Cl-, F-, alkalinity)	Water Extraction: ☐ MMMP ☐ ICP-MS scan	Supernatant other	Waters: Total Metals ☐ ICP-MS scan	Waters: Dissolved Metals ☐ ICP-MS scan	Waters: ☐ T-CN ☐ WAD-CN ☐ trace CN ☐ Hg	Waters: ☐ T-Thiosalts	Humidity Cell Testing	Column Testing
1	VB07-010 221 - 225 G	~2 kg	1				X	X																		
2	VB07-010 261 - 265 G	~2 kg	1				X	X																		
3	VB07-10 201 - 305 G	~2 kg	1				X	X																		
4	VB07-011 20 - 24 G	~2 kg	1				X	X																		
5	VB07-012 2 - 6 S	~2 kg	1				X	X																		
6	VB07-013 67 - 71 M	~2 kg	1				X	X																		
7	VB07-014 69.7 - 73.7 M	~2 kg	1				X	X																		
8	VB07-014 229.7 - 233.7 S	~2 kg	1				X	X																		
9	VB07-015 8 - 12 M	~2 kg	1				X	X																		
10	VB07-017 6 - 10 M	~2 kg	1				X	X																		
11	VB07-017 162 - 166 S	~2 kg	1				X	X																		
12	VB07-017 206 - 210 S	~2 kg	1				X	X																		
13	VB07-018 456 - 460 M	~2 kg	1				X	X																		
14	VB07-020 8 - 12 G	~2 kg	1				X	X																		
15	VB07-020 16 - 20 G	~2 kg	1				X	X																		
16	VB07-021 176 - 180 M	~2 kg	1				X	X																		
17	VB07-022 140 - 144 M	~2 kg	1				X	X																		
18	VB07-022 312 - 316 G	~2 kg	1				X	X																		
19	VB07-022 324 - 328 G	~2 kg	1				X	X																		
20	VB07-022 328 - 332 G	~2 kg	1				X	X																		
21	VB07-022 340 - 344 S	~2 kg	1				X	X																		
22	VB08-026 32 - 36 S	~2 kg	1				X	X																		
23	VB08-026 332 - 336 S	~2 kg	1				X	X																		
24	VB08-026 376 - 380 S	~2 kg	1				X	X																		
25	VB08-026 412 - 416 S	~2 kg	1				X	X																		
Relinquished by:		Date:																								
Received by:		Date:																								
Relinquished by:		Date:																								
Received by:		Date:																								
Sample conditions upon receipt (For Lab Use Only):												Storage Instructions:														
Frozen: ☐ Method of Shipment: _____												☐ Return after analysis														
Cold: ☐ _____												☒ Hold rocks for 1 year then discard														
Ambient: ☐ Shipment condition: (e.g. breakage, leakage): _____												☐ Return after one year to client														
N/A ☐																										



ARD SAMPLE REQUISITION and CHAIN OF CUSTODY FORM

CANTEST Ltd., 4606 Canada Way, Burnaby, BC V5G 1K5

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Telephone: 720 881-5815				Fax: 303 217-5705																						
Email: patsy.moran@tetratech.com																										
	Sample ID	Sample wt	# of Cont.	Static NAG	Static NAG duplicate for ICP-MS scan and SO42- (to discuss)	Sobek ABA Package (Paste pH, Total S, NP)	Modified ABA Package (Paste pH, Sulfide S, NP)	ASTM Sulphur Speciation	Sulphate Sulphur only	Carbonate Carbon (CO2)	Metals: ☐ Aqua Regia Group 1DX ☐ 4-Acid Group 1EX	Metals: Ultratrace Group 1F-MS	Whole Rock - Majors by Lithium Borate Fusion	Whole Rock - Majors by XRF	Mineralogy: ☐ Rietveld XRD ☐ Standard XRD	Mineralogy: ☐ Optical Microscopy on polished thin sections	Water Extraction: ☐ BCMEM SFE Extraction ☐ ICP-MS scan	Water Extraction: ☐ SPLP (Method 1312) ☐ ICP-MS scan ☐ Anions (Cl ⁻ , F ⁻ , alkalinity)	Water Extraction: ☐ MMMP ☐ ICP-MS scan	Supernatant other	Waters: Total Metals ☐ ICP-MS scan	Waters: Dissolved Metals ☐ ICP-MS scan	Waters: ☐ T-CN ☐ WAD-CN ☐ trace CN ☐ Hg	Waters: ☐ T-Thiosalts	Humidity Cell Testing	Column Testing
1	VB08-027 28 - 32 S	~2 kg	1				X	X																		
2	VB08-027 100 - 104 S	~2 kg	1				X	X																		
3	VB08-028 20 - 24 S	~2 kg	1				X	X																		
4	VB08-028 116 - 120 S	~2 kg	1				X	X																		
5	VB08-028 332 - 336 M	~2 kg	1				X	X																		
6	VB08-030 24 - 28 M	~2 kg	1				X	X																		
7	VB08-030 492 - 496 M	~2 kg	1				X	X																		
8	VB08-031 48 - 52 S	~2 kg	1				X	X																		
9	VB08-031 256 - 260 M	~2 kg	1				X	X																		
10	VB08-032 24 - 28 S	~2 kg	1				X	X																		
11	VB08-032 180 - 184 S	~2 kg	1				X	X																		
12	VB08-032 356 - 360 M	~2 kg	1				X	X																		
13	VB08-034 44 - 48 S	~2 kg	1				X	X																		
14	VB08-034 228 - 232 M	~2 kg	1				X	X																		
15	VB08-035 176 - 180 M	~2 kg	1				X	X																		
16	VB08-035 220 - 224 M	~2 kg	1				X	X																		
17	VB08-036 40 - 44 M	~2 kg	1				X	X																		
18	VB08-036 400 - 404 M	~2 kg	1				X	X																		
19	VB08-037 320 - 324 M	~2 kg	1				X	X																		
20	VB08-037 424 - 428 M	~2 kg	1				X	X																		
21	VB08-038 48 - 52 M	~2 kg	1				X	X																		
22	VB08-038 268 - 272 S	~2 kg	1				X	X																		
23	VB08-039 416 - 420 M	~2 kg	1				X	X																		
24	VB08-041 0 - 4 S	~2 kg	1				X	X																		
25		~2 kg	1				X	X																		
Relinquished by:		Date:																								
Received by:		Date:																								
Relinquished by:		Date:																								
Received by:		Date:																								
Sample conditions upon receipt (For Lab Use Only):												Storage Instructions:														
Frozen: ☐ Method of Shipment: _____												☐ Return after analysis														
Cold: ☐ _____												☒ Hold rocks for 1 year then discard														
Ambient: ☐ Shipment condition: (e.g. breakage, leakage): _____												☐ Return after one year to client														
N/A ☐																										

Table 1: ABA Test Results for 18 Mt. Todd Rock Samples - January 2009

S. No:	Sample ID	Paste pH (pH Units)	Total Sulphur (Wt.%)	Modified ASTM D2492-02 Method			Maximum Potential Acidity* (Kg CaCO3/tonne)	Mod. ABA NP	Net Neutralization Potential** (Kg CaCO3/tonne)	Fizz Rating
				HCl Extractable Sulphur (Wt.%)	HNO3 Extractable Sulphur (Wt.%)	Insoluble Sulphur (Wt.%)		Neutralization Potential (Kg CaCO3/tonne)		
1	VB-011 160-164 S	8.51	0.65	<0.01	0.36	0.29	11.3	18.8	7.6	Slight
2	VB-018 4-8 S	5.83	0.60	0.02	0.52	0.06	16.3	2.7	-13.5	None
3	VB-009 58-62 G	9.23	0.36	0.01	0.31	0.04	9.7	7.7	-2.0	None
4	VB-009 102-106 G	8.87	0.43	<0.01	0.31	0.12	9.7	6.2	-3.5	None
5	VB-003 33-37 S	6.99	1.13	0.02	0.87	0.24	27.2	13.4	-13.8	Slight
6	VB-006 44-48 S	7.94	0.47	<0.01	0.43	0.04	13.4	3.7	-9.7	None
7	VB-002 220-224 I	8.98	0.78	0.02	0.36	0.40	11.3	43.2	31.9	Strong
8	VB-008 142-146 I	8.84	0.46	<0.01	0.43	0.03	13.4	10.6	-2.8	None
9	VB-018 216-220 I	9.08	0.90	0.01	0.61	0.28	19.1	85.4	66.3	Strong
10	VB-003 41-45 S	7.60	1.82	0.01	1.79	0.02	55.9	8.9	-47.0	None
11	VB-011 156-160 S	8.64	0.90	<0.01	0.67	0.23	20.9	17.9	-3.0	Slight
12	VB-002 300-304 I	9.20	0.41	0.01	0.25	0.15	7.8	16.3	8.5	Moderate
13	VB-006 72-76 I	7.83	1.29	0.01	0.84	0.44	26.3	4.1	-22.2	None
14	VB-018 120-124 I	8.73	0.88	0.01	0.74	0.13	23.1	7.7	-15.5	None
15	VB-025 48-52 G	9.12	0.13	0.01	0.07	0.05	2.2	5.1	2.9	None
16	VB-025 68-72 G	9.07	0.23	0.03	0.17	0.03	5.3	12.3	6.9	Slight
17	VB-002 352-356 G	9.24	0.48	0.02	0.17	0.29	5.3	11.1	5.8	Slight
18	VB-009 86-90 G	8.56	0.69	0.01	0.08	0.60	2.5	10.1	7.6	Slight
<i>Detection Limits</i>		0.1	0.01	0.01	0.01	0.01	0.3	0.1		
CANTEST SOP Number		7160	LECO	7450	7450	Calculation	Calculation	7150	Calculation	7150

Note:

Total Sulphur by LECO furnace (done at IPL)

Sulphur Speciation (SOP No. 7450): By Modified ASTM D2492-02 Method.

*Maximum Potential Acidity (MPA) is based on HNO3 extractable sulphur (i.e. sulphide sulphur).

**Net Neutralization Potential (NNP) is based on difference between Neutralization Potential (NP) and Maximum Potential Acidity (MPA).

Reference for Mod ABA NP method (SOP No. 7150): MEND Acid Rock Drainage Prediction Manual, MEND Project 1.16.1b (pages 6.2-11 to 17), March 1991.

Tetra Tech-Mt. Todd, 2-Dec-08

Page 2 of 5

**Table 2a: QA/QC for Paste pH & NP Determination - January 2009
(for 18 Mt. Todd Rock Samples)**

Sample ID	Paste pH (pH Units)	
Duplicates - Paste pH		
VB-003 41-45 S	7.6	7.6
Sample ID	Neutralization Potential (Kg CaCO3/tonne)	
Duplicates - Modified ABA NP		
VB-003 41-45 S	8.9	9.7
KZK-1 Reference (NP = 58.9)	57.4	

Table 2b: QA/QC for Sulphur Speciation

Sample ID	Sulphur (Wt.%)	
Duplicates - Total Sulphur		
VB-002 352-356 G	0.48	0.48
Duplicates - Mod. ASTM D2492-02 HCl Extractable Sulphur		
VB-003 41-45 S	0.01	0.01
KZK-1 STD (0.01% sulphate-sulphur)	0.01	
Duplicates- Mod. ASTM D2492-02 HNO3 Extractable Sulphur		
VB-003 41-45 S	1.79	1.73
KZK-1 (0.37% sulphide-sulphur)	0.37	

Table 3: Sample List + Compositing Details (for 18 Mt. Todd Rock Samples)

Bucket No.	S. No.	Sample ID	Dry Sample Wt. (Kg)	Sample Type & Condition	Composite ID	No. of Samples for Testing
From Bucket # 1	1	VB07-011-160-161-S	1.6	Dry Rock	VB-011 160-164 S	1
	2	VB07-011-161-162-S	1.6	Dry Rock		
	3	VB07-011-162-163-S	1.4	Dry Rock		
	4	VB07-011-163-164-S	1.8	Dry Rock		
	Sum		6.4			
	5	VB07-018-4-4.5-S	1.6	Dry Rock	VB-018 4-8 S	2
	6	VB07-018-4.5-5-S	2.1	Dry Rock		
	7	VB07-018-5-5.5-S	2.1	Dry Rock		
	8	VB07-018-5.5-6-S	2	Dry Rock		
	9	VB07-018-6-7-S	1.9	Dry Rock		
	10	VB07-018-7-8-S	2	Dry Rock		
	Sum		11.7			
From Bucket # 2	11	VB07-009-58-59-G	2.2	Dry Rock	VB-009 58-62 G	3
	12	VB07-009-59-60-G	1.8	Dry Rock		
	13	VB07-009-60-61-G	1.7	Dry Rock		
	14	VB07-009-61-62-G	1.9	Dry Rock		
	Sum		7.6			
	15	VB07-009-102-103-G	1	Dry Rock	VB-009 102-106 G	4
	16	VB07-009-103-104-G	1.4	Dry Rock		
	17	VB07-009-104-105-G	1.1	Dry Rock		
	18	VB07-009-105-106-G	1.1	Dry Rock		
	Sum		4.6			
	19	VB07-003-33-34-S	1.4	Dry Rock	VB-003 33-37 S	5
	20	VB07-003-34-35-S	2.4	Dry Rock		
	21	VB07-003-35-36-S	2.1	Dry Rock		
	22	VB07-003-36-37-S	1.4	Dry Rock		
	Sum		7.3			
From Bucket # 3	23	VB07-006-44-45-S	1.8	Dry Rock	VB-006 44-48 S	6
	24	VB07-006-45-46-S	1.7	Dry Rock		
	25	VB07-006-46-47-S	2.3	Dry Rock		
	26	VB07-006-47-48-S	1.7	Dry Rock		
	Sum		7.5			
	27	VB07-002-220-221.2-I	1.3	Dry Rock	VB-002 220-224 I	7
	28	VB07-002-221.2-221.7-I	1	Dry Rock		
	29	VB07-002-221.7-223-I	1.1	Dry Rock		
	30	VB07-002-223-224-I	1.2	Dry Rock		
	Sum		4.6			
From Bucket # 4	31	VB07-008-142-143-I	1.5	Dry Rock	VB-008 142-146 I	8
	32	VB07-008-143-144-I	1.1	Dry Rock		
	33	VB07-008-144-145-I	1.2	Dry Rock		
	34	VB07-008-145-146-I	1.4	Dry Rock		
	Sum		5.2			
	35	VB07-018-216-217-I	1	Dry Rock	VB-018 216-220 I	9
	36	VB07-018-217-218-I	1.3	Dry Rock		
	37	VB07-018-218-218.85-I	0.92	Dry Rock		
	38	VB07-018-218.85-220-I	1.6	Dry Rock		
	Sum		4.82			

S. No.	Composite ID	Composited Wts. (Kg)
1	VB-011 160-164 S	6.40
2	VB-018 4-8 S	11.70
3	VB-009 58-62 G	7.60
4	VB-009 102-106 G	4.60
5	VB-003 33-37 S	7.30
6	VB-006 44-48 S	7.50
7	VB-002 220-224 I	4.60
8	VB-008 142-146 I	5.20
9	VB-018 216-220 I	4.82
10	VB-003 41-45 S	8.20
11	VB-011 156-160 S	6.50
12	VB-002 300-304 I	4.60
13	VB-006 72-76 I	4.44
14	VB-018 120-124 I	4.50
15	VB-025 48-52 G	7.00
16	VB-025 68-72 G	7.00
17	VB-002 352-356 G	4.70
18	VB-009 86-90 G	6.90

Client: Tetra Tech
Project Name: Mt. Todd
Cantest Project No: 2-21-907
Date Samples Rec'd: 2 Dec 2008
No. of Samples Rec'd: 74 Samples

Table 3: Sample List + Compositing Details (for 18 Mt. Todd Rock Samples)

From Bucket # 5	39	VB07-003-41-42-S	1.6	Dry Rock	VB-003 41-45 S	10
	40	VB07-003-42-43-S	1.9	Dry Rock		
	41	VB07-003-43-44-S	2.4	Dry Rock		
	42	VB07-003-44-45-S	2.3	Dry Rock		
	Sum		8.2			
	43	VB07-011-156-157-S	1.5	Dry Rock	VB-011 156-160 S	11
	44	VB07-011-157-158-S	1.5	Dry Rock		
	45	VB07-011-158-159-S	1.9	Dry Rock		
From Bucket # 6	46	VB07-011-159-160-S	1.6	Dry Rock		
	Sum		6.5			
	47	VB07-002-300-301-I	1.1	Dry Rock	VB-002 300-304 I	12
	48	VB07-002-301-302-I	1.3	Dry Rock		
	49	VB07-002-302-303-I	0.9	Dry Rock		
	50	VB07-002-303-304-I	1.3	Dry Rock		
	Sum		4.6			
	51	VB07-006-72-73-I	1.2	Dry Rock	VB-006 72-76 I	13
	52	VB07-006-73-74-I	0.94	Dry Rock		
	53	VB07-006-74-75-I	1.1	Dry Rock		
From Bucket # 7	54	VB07-006-75-76-I	1.2	Dry Rock		
	Sum		4.44			
	55	VB07-018-120-121-1-I	1.3	Dry Rock	VB-018 120-124 I	14
	56	VB07-018-121-1-122-I	1.2	Dry Rock		
	57	VB07-018-122-123-I	1	Dry Rock		
	58	VB07-018-123-124-I	1	Dry Rock		
	Sum		4.5			
	59	VB07-025-48-49-G	1.9	Dry Rock	VB-025 48-52 G	15
	60	VB07-025-49-50-G	1.8	Dry Rock		
	61	VB07-025-50-51-G	1.5	Dry Rock		
From Bucket # 8	62	VB07-025-51-52-G	1.8	Dry Rock		
	Sum		7			
	63	VB07-025-68-69-G	1.9	Dry Rock	VB-025 68-72 G	16
	64	VB07-025-69-70-G	1.9	Dry Rock		
	65	VB07-025-70-71-G	1.5	Dry Rock		
	66	VB07-025-71-72-G	1.7	Dry Rock		
	Sum		7			
	67	VB07-002-352-353-G	1.4	Dry Rock	VB-002 352-356 G	17
From Bucket # 8	68	VB07-002-353-354-G	1.2	Dry Rock		
	69	VB07-002-354-355-G	1	Dry Rock		
	70	VB07-002-355-356-G	1.1	Dry Rock		
	Sum		4.7			
	71	VB07-009-86-87-G	1.9	Dry Rock	VB-009 86-90 G	18
	72	VB07-009-87-88-G	2.1	Dry Rock		
	73	VB07-009-88-89-G	1.9	Dry Rock		
	74	VB07-009-89-90-G	1	Dry Rock		
	Sum		6.9			
Total Wt =			220.22			

Cost Quote for Tetra Tech for Mt. Todd Static Testing - December 2008

Task	Unit Cost \$USD	Units	Total Cost \$USD
ABA package (paste pH, TS & NP)	\$65.00	18	\$1,170.00
Sulphur speciation - sulphide S, sulphate S & insoluble S	\$45.00	18	\$810.00
WRA by XRF	\$27.00	0	\$0.00
Trace metals	\$15.00	0	\$0.00
Inorganic carbon (CO2)	\$15.00	0	\$0.00
Rietveld XRD	\$225.00	0	\$0.00
Optical microscopy	\$260.00	0	\$0.00
Total Cost			\$1,980.00

Note:

All grey out analyses not requested.

Cost Quote for Tetra Tech for Mt. Todd HCT Testing - December 2008

Task	Unit Cost \$USD	Units	Total Cost \$USD
Based on 18 HCTs for 26 weeks			
Set-up Charges			
Sample prep (<2 kg)	\$16.00	1	\$16.00
Set up (1 time charge)	\$30.00	1	\$30.00
Particle size analysis	\$45.00	1	\$45.00
Labour and Analysis			
Sampling & sample prep - weekly	\$22.00	20	\$440.00
Reporting & liaison	\$15.00	20	\$300.00
pH - weekly	\$7.00	20	\$140.00
EC- weekly	\$7.00	20	\$140.00
Sulphate - weekly	\$13.00	20	\$260.00
Acidity - weekly	\$13.00	20	\$260.00
Alkalinity - weekly	\$13.00	20	\$260.00
ICP-MS scan - every 4 wks on composite	\$100.00	5	\$500.00
Low level Hg by CVAF - every 4 wks on composite	\$15.00	0	\$0.00
Total cost per HCT for 26 weeks			\$2,391.00
Total cost for 18 HCTs for 26 weeks			\$43,038.00

Cancelled



CANTEST Ltd. 4606 Canada Way, Burnaby, BC Canada V5G 1K5 Tel: 604 734 7276 Fax: 604 731 2386 www.cantest.com

Sample Summary: Tetra Tech-Mt. Todd, 2-Dec-08
Page 4 of 5

Date Samples Received: 2-Dec-08
Number of Samples Received: 74 Samples. Compositing 18 samples in all from 74 individual samples.
(See compositing list for details)

Instructions Received From: Patsy Moran

Sample Prep: ABA & SO4-S: Cone crushed, split & pulverized to <80% of <200 mesh.

Date of Analysis: ABA: 22/23-Jan-09; S-Spec: 15-Jan-09.

Other Analyses Requested: 6 (of 18 Comp.) x HCT Testing (ASTM Method) with:
Weekly sampling; weekly pH, EC, acidity, alkalinity & SO4. ICP-MS scan on every 4 wks on composite.

Name of Customer: Tetra Tech
Client Project Name/No: Mt. Todd

Contact Person: Patsy Moran

E-mail Address: patsy.moran@tetrattech.com

Address: 350 Indiana Street, Suite 500
Golden, Colorado 80401, USA

Contact No: **Office:** 720 881-5815

Fax No: 303 217-5705

Sign:

Report Released by: Ivy Rajan
Position: Lab Manager and Project Manager, ARD Division

Report Verified by: John Chiang
Position: Senior Analyst, ARD Division

Report Validated by: Tim O'Hearn
Position: Director, ARD Division, CANTEST Ltd.

CANTEST Project No: 2-21-944

Contact No: 604-734-7276 x5029; Direct: 604-638-5029 (Ivy Rajan)
Contact No: 604-734-7276 x5031; Direct: 604-638-5031 (Tim O'Hearn)

Table 1: ABA Test Results for 69 (of 71) Mt. Todd Rock Samples - October 2009

S. No:	Sample ID	Paste pH (pH Units)	AC	Modified ASTM D2492-02 Method			Maximum Potential Acidity* (Kg CaCO3/tonne)	Mod. ABA NP	Net Neutralization Potential** (Kg CaCO3/Tonne)	Fizz Rating
			Total Sulphur (Wt.%)	HCl Extractable Sulphur (Wt.%)	HNO3 Extractable Sulphur (Wt.%)	Insoluble Sulphur (Wt.%)		Neutralization Potential (Kg CaCO3/Tonne)		
1	VB08-032 180-184 I	9.06	0.52	<0.01	0.15	0.37	4.7	7.0	2.3	None
2	VB08-032 356-360 I	8.47	1.61	<0.01	1.26	0.35	39.4	7.4	-32.0	Slight
3	VB08-034 44-48 I	9.26	0.08	0.01	0.05	0.02	1.6	5.1	3.5	None
4	VB08-034 228-232 I	9.32	0.07	<0.01	0.06	0.01	1.9	9.4	7.5	Slight
5	VB08-035 176-180 I	9.37	0.19	<0.01	0.09	0.10	2.8	6.9	4.0	None
6	VB08-035 220-224 I	9.23	0.13	<0.01	0.05	0.08	1.6	6.1	4.5	None
7	VB08-036 40-44 I	7.97	1.16	0.01	0.91	0.24	28.4	4.1	-24.3	None
8	VB08-036 400-404 I	9.16	0.82	<0.01	0.15	0.67	4.7	4.9	0.2	None
9	VB08-038 48-52 I	7.34	3.81	0.01	3.61	0.19	112.8	4.1	-108.7	None
10	VB08-038 268-272 S	8.80	0.33	<0.01	0.21	0.12	6.6	5.9	-0.7	None
11	VB08-039 416-420 I	8.57	1.37	<0.01	0.45	0.92	14.1	7.9	-6.1	Slight
12	VB08-041 0-4 S	6.38	0.22	<0.01	0.13	0.09	4.1	0.6	-3.4	None
13	VB08-027 28-32 S	8.72	0.02	0.01	0.01	0.00	0.3	4.4	4.1	None
14	VB08-027 100-104 S	8.50	0.38	0.01	0.25	0.12	7.8	19.7	11.9	Moderate
15	VB08-028 116-120 S	8.39	0.01	<0.01	0.01	0.00	0.3	3.4	3.1	None
16	VB08-028 332-336 I	8.34	1.77	<0.01	1.17	0.60	36.6	8.4	-28.1	Slight
17	VB08-030 24-28 S	8.56	0.02	<0.01	0.01	0.01	0.3	4.4	4.1	None
18	VB08-030 492-496 I	8.75	1.25	<0.01	0.14	1.11	4.4	3.6	-0.8	None
19	VB08-031 48-52 S	8.29	0.10	<0.01	0.05	0.05	1.6	5.0	3.4	None
20	VB07-022 324-328 G	8.98	0.26	0.01	0.20	0.05	6.3	8.4	2.1	None
21	VB07-022 328-332 G	8.38	0.56	0.01	0.43	0.12	13.4	15.6	2.2	Slight
22	VB07-022 340-344 S	8.53	1.29	0.01	0.24	1.04	7.5	14.8	7.3	Moderate
23	VB08-026 32-36 S	9.39	0.05	<0.01	0.03	0.02	0.9	6.9	5.9	None
24	VB08-026 332-336 S	8.95	0.44	0.01	0.31	0.12	9.7	11.7	2.0	Slight
25	VB08-026 376-380 S	9.36	0.11	<0.01	0.08	0.03	2.5	10.3	7.8	Slight
26	VB08-026 412-416 S	9.11	0.16	0.01	0.11	0.04	3.4	32.4	29.0	Moderate
27	VB07-004 115-119 S	8.78	1.07	<0.01	0.23	0.84	7.2	9.7	2.5	Slight
28	VB07-006 76-80 I	6.83	1.59	0.02	1.27	0.30	39.7	14.4	-25.3	Slight
29	VB07-007 12-16 S	8.49	0.26	<0.01	0.16	0.10	5.0	8.6	3.6	None
30	VB07-009 62-66 G	9.04	0.24	0.01	0.17	0.06	5.3	7.9	2.5	None
31	VB07-009 78-82 G	9.16	0.05	0.01	0.03	0.01	0.9	13.4	12.5	Slight
32	VB007-002 12-16 I	8.31	0.54	0.01	0.45	0.08	14.1	3.9	-10.2	None
33	VB007-004 279-283 I	8.58	0.50	0.01	0.09	0.40	2.8	12.7	9.8	Slight
34	VB007-001 21-25 I	8.66	0.20	0.01	0.15	0.04	4.7	4.9	0.2	None
35	VB007-001 89-93 G	8.96	0.11	0.02	0.07	0.02	2.2	7.4	5.2	None
36	VB007-001 125-129 G	8.81	0.20	0.01	0.11	0.08	3.4	6.4	3.0	None
37	VB007-001 153-156 G	8.96	0.22	0.01	0.15	0.06	4.7	7.9	3.2	None
38	VB007-001 173-177 G	8.95	0.31	<0.01	0.19	0.12	5.9	7.9	2.0	None
39	VB007-001 181-185 G	9.00	0.38	<0.01	0.31	0.07	9.7	14.9	5.2	Slight
40	VB007-001 189-193 G	9.05	0.42	0.01	0.27	0.14	8.4	27.7	19.3	Moderate
41	VB007-001 193-197 G	8.85	0.38	0.01	0.22	0.15	6.9	11.1	4.3	Slight
42	VB07-017 206-210 S	8.97	0.59	<0.01	0.33	0.26	10.3	5.0	-5.4	None
43	VB07-018 456-460 I	8.78	1.59	<0.01	1.05	0.54	32.8	5.2	-27.6	None
44	VB07-020 8-12 G	7.68	0.06	0.02	0.03	0.01	0.9	3.7	2.8	None
45	VB07-020 16-20 G	8.64	0.59	<0.01	0.39	0.20	12.2	7.4	-4.8	None
46	VB07-021 176-180 I	9.40	0.04	<0.01	0.04	0.00	1.3	8.7	7.4	None
47	VB07-022 140-144 I	9.41	0.24	<0.01	0.14	0.10	4.4	7.4	3.1	None
48	VB07-022 312-316 G	9.22	0.18	0.01	0.10	0.07	3.1	8.0	4.9	None
49	VB07-013 67-71 I	9.26	0.21	<0.01	0.09	0.12	2.8	6.7	3.9	None
50	VB07-014 69.7-73.7 I	8.55	0.45	0.01	0.40	0.04	12.5	5.0	-7.5	None
51	VB07-014 229.7-233.7 S	8.87	0.05	0.01	0.04	0.00	1.3	5.7	4.4	None
52	VB07-015 8-12 I	8.09	0.12	0.01	0.09	0.02	2.8	5.2	2.4	None
53	VB07-017 6-10 I	6.65	<0.01	<0.01	<0.01	<0.01	<0.3	0.7	0.7	None
54	VB07-017 162-166 S	8.25	0.99	0.01	0.78	0.20	24.4	4.0	-20.4	None
55	VB08-028 20-24 S	7.93	0.02	<0.01	0.02	0.00	0.6	2.5	1.9	None
56	VB07-010 217-221 G	8.84	1.00	0.01	0.23	0.76	7.2	13.4	6.2	Slight
57	VB07-010 221-225 G	9.12	0.42	0.01	0.13	0.28	4.1	6.8	2.7	None
58	VB07-010 261-265 G	9.01	0.55	<0.01	0.15	0.40	4.7	7.4	2.7	None
59	VB07-010 265-269 G	9.09	0.17	<0.01	0.07	0.10	2.2	12.9	10.7	None
60	VB07-010 301-305 G	8.75	1.10	0.01	0.52	0.57	16.3	18.3	2.1	Slight
61	VB07-011 20-24 G	7.45	<0.01	<0.01	<0.01	<0.01	<0.3	0.9	0.9	None
62	VB07-012 2-6 S	6.90	<0.01	<0.01	<0.01	<0.01	<0.3	0.5	0.5	None
63	VB07-009 24-28 G	8.61	0.23	<0.01	0.15	0.08	4.7	5.9	1.3	None
64	VB07-009 26-30 G	8.43	0.24	<0.01	0.18	0.06	5.6	4.2	-1.4	None
65	VB07-009 30-34 G	8.40	0.29	0.01	0.20	0.08	6.3	5.7	-0.6	None
66	VB07-009 86-90 G	8.66	0.43	0.01	0.31	0.11	9.7	9.2	-0.5	None
67	VB07-009 106-110 G	8.82	0.44	<0.01	0.30	0.14	9.4	6.2	-3.2	None
68	VB07-009 118-122 S	8.61	0.56	<0.01	0.45	0.11	14.1	5.7	-8.4	None
69	VB07-010 57-61 I	9.07	0.09	0.01	0.07	0.01	2.2	12.9	10.7	Slight
Detection Limits		0.5	0.01	0.01	0.01	0.01	0.3			
CANTEST SOP Number		7160	LECO	7450	7450	Calculation	Calculation	7150	Calculation	7150

Note:

Total Sulphur by Leco furnace (done at Assayers Canada)

Sulphur Speciation (SOP No. 7450): By Modified ASTM D2492-02 Method.

*Maximum Potential Acidity (MPA) is based on HNO3 extractable sulphur (i.e. sulphide sulphur).

**Net Neutralization Potential (NNP) is based on difference between Neutralization Potential (NP) and Maximum Potential Acidity (MPA).

Reference for Mod ABA NP method (SOP No. 7150): MEND Acid Rock Drainage Prediction Manual, MEND Project 1.16.1b (pages 6.2-11 to 17), March 1991.

Table 2: QA/QC for 69 (of 71) Mt. Todd Rock Samples - October 2009

Table 2a: QA/QC for Rinse pH, Paste pH & NP Determination

Sample ID	Paste pH (pH Units)	
Duplicates - Paste pH		
VB08-038 268-272 S	8.8	8.9
VB07-022 324-328 G	9.0	9.0
VB07-009 62-66 G	9.0	9.2
VB007-001 189-193 G	9.1	9.0
VB07-014 69.7-73.7 I	8.6	8.6
VB07-010 301-305 G	8.8	8.4
Sample ID	Neutralization Potential (Kg CaCO3/Tonne)	
NP		
VB08-038 268-272 S	5.9	6.1
VB07-022 324-328 G	8.4	8.2
VB07-009 62-66 G	7.9	8.9
VB007-001 189-193 G	27.7	28.1
VB07-014 69.7-73.7 I	5.0	5.0
VB07-010 301-305 G	18.3	18.8
Reference Material		
KZK-1 Reference (NP = 58.9) for slight fizz rating	55.1	56.6

Table 2b: QA/QC for Sulphur Speciation

Sample	ID	Total Sulphur (Wt.%)	
Duplicates - Total Sulphur (Acme)			
VB08-032 180-184I		0.52	0.51
VB08-038 268-272S		0.33	0.31
VB07-022 324-328G		0.26	0.26
VB08-026 376-380S		0.11	0.11
VB007-001 21-25I		0.20	0.23
VB07-020 8-12G		0.06	0.06
VB07-013 67-71I		0.21	0.23
VB07-010 261-265G		0.55	0.53
VB07-009 118-122S		0.56	0.58
Reference Material			
RTS-1 Ref. STD (1.66 ± 0.04% S)		1.68	1.69
RTS-1 Ref. STD (1.66 ± 0.04% S)		1.65	
Sample	ID	Sulphate Sulphur (Wt.%)	
Duplicates - Mod. ASTM D2492-02 HCl Extractable Sulphur			
VB08-038 268-272 S		<0.01	0.01
VB07-022 324-328 G		0.01	<0.01
VB07-009 62-66 G		0.01	0.02
VB007-001 189-193 G		0.01	0.01
VB07-014 69.7-73.7 I		0.01	0.01
VB07-010 301-305 G		0.01	0.01
Reference Material			
KZK-1 STD (0.01% sulphate-sulphur)		0.01	0.01
Sample	ID	Sulphide Sulphur (Wt.%)	
Duplicates - Mod. ASTM D2492-02 HNO3 Extractable Sulphur			
VB08-038 268-272 S		0.21	0.17
VB07-022 324-328 G		0.20	0.18
VB07-009 62-66 G		0.17	0.16
VB007-001 189-193 G		0.27	0.24
VB07-014 69.7-73.7 I		0.40	0.39
VB07-010 301-305 G		0.52	0.55
Reference Material			
KZK-1 (0.37% sulphide-sulphur)		0.39	0.38

S. No.	Sample ID	Sample Wt. (kg)	Sample Type & Condition
Pail #1 of 10			
1	VB08-032 180-184 M	2.60	Dry Rock Core
2	VB08-032 356-360 M	2.26	Dry Rock Core
3	VB08-034 44-48 M	3.02	Dry Rock Core
4	VB08-034 228-232 M	2.10	Dry Rock Core
5	VB08-035 176-180 M	2.10	Dry Rock Core
6	VB08-035 220-224 M	1.85	Dry Rock Core
7	VB08-036 40-44 M	2.12	Dry Rock Core
Pail #2 of 10			
8	VB08-036 400-404 M	2.19	Dry Rock Core
	VB08-037 320-324 M*	2.12	Dry Rock Core
	VB08-037 320-324 M*	2.11	Dry Rock Core
9	VB08-038 48-52 M	2.50	Dry Rock Core
10	VB08-038 268-272 S	2.30	Dry Rock Core
11	VB08-039 416-420 M	2.51	Dry Rock Core
12	VB08-041 0-4 S	2.69	Dry Rock Core
Pail #3 of 10			
13	VB08-027 28-32 S	2.54	Dry Rock Core
14	VB08-027 100-104 S	1.36	Dry Rock Core
15	VB08-028 116-120 S	1.94	Dry Rock Core
16	VB08-028 332-336 M	2.90	Dry Rock Core
17	VB08-030 24-28 S	1.72	Dry Rock Core
18	VB08-030 492-496 M	2.45	Dry Rock Core
19	VB08-031 48-52 S	1.73	Dry Rock Core
Pail #4 of 10			
20	VB07-022 324-328 G	1.38	Dry Rock Core
21	VB07-022 328-332 G	2.51	Dry Rock Core
22	VB07-022 340-344 S	1.92	Dry Rock Core
23	VB08-026 32-36 S	3.41	Dry Rock Core
24	VB08-026 332-336 S	1.53	Dry Rock Core
25	VB08-026 376-380 S	2.72	Dry Rock Core
26	VB08-026 412-416 S	1.50	Dry Rock Core
Pail #5 of 10			
27	VB07-004 115-119 S	1.69	Dry Rock Core
28	VB07-006 76-80 M	1.85	Dry Rock Core
29	VB07-007 12-16 S	2.58	Dry Rock Core
30	VB07-009 62-66 G	3.00	Dry Rock Core
31	VB07-009 78-82 G	3.12	Dry Rock Core
32	VB007-002 12-16 M	2.59	Dry Rock Core
33	VB007-004 279-283 M	1.90	Dry Rock Core
Pail #6 of 10			
34	VB007-001 21-25 M	2.73	Dry Rock Core
35	VB007-001 89-93 G	2.42	Dry Rock Core
36	VB007-001 125-129 G	1.84	Dry Rock Core
37	VB007-001 153-156 G	2.40	Dry Rock Core
38	VB007-001 173-177 G	2.60	Dry Rock Core
39	VB007-001 181-185 G	2.84	Dry Rock Core
40	VB007-001 189-193 G	2.63	Dry Rock Core
41	VB007-001 193-197 G	2.46	Dry Rock Core

[illegible]

Pail #7 of 10			
42	VB07-017 206-210 S	2.24	Dry Rock Core
43	VB07-018 456-460 M	1.86	Dry Rock Core
44	VB07-020 8-12 G	2.21	Dry Rock Core
45	VB07-020 16-20 G	2.74	Dry Rock Core
46	VB07-021 176-180 M	1.04	Dry Rock Core
47	VB07-022 140-144 M	2.23	Dry Rock Core
48	VB07-022 312-316 G	1.57	Dry Rock Core
Pail #8 of 10			
49	VB07-013 67-71 M	2.28	Dry Rock Core
50	VB07-014 69.7-73.7 M	1.70	Dry Rock Core
51	VB07-014 229.7-233.7 S	1.65	Dry Rock Core
52	VB07-015 8-12 M	2.22	Dry Rock Core
53	VB07-017 6-10 M	2.45	Dry Rock Core
54	VB07-017 162-166 S	2.33	Dry Rock Core
55	VB08-028 20-24 S	2.66	Dry Rock Core
Pail #9 of 10			
56	VB07-010 217-221 G	2.47	Dry Rock Core
57	VB07-010 221-225 G	1.60	Dry Rock Core
58	VB07-010 261-265 G	2.19	Dry Rock Core
59	VB07-010 265-269 G	2.11	Dry Rock Core
60	VB07-010 301-305 G	1.73	Dry Rock Core
61	VB07-011 20-24 G	3.06	Dry Rock Core
62	VB07-012 2-6 S	2.27	Dry Rock Core
Pail #10 of 10			
63	VB07-009 24-28 G	2.43	Dry Rock Core
64	VB07-009 26-30 G	2.10	Dry Rock Core
65	VB07-009 30-34 G	2.44	Dry Rock Core
66	VB07-009 86-90 G	2.76	Dry Rock Core
67	VB07-009 106-110 G	2.19	Dry Rock Core
68	VB07-009 118-122 S	2.05	Dry Rock Core
69	VB07-010 57-61 M	3.06	Dry Rock Core

Total Wt. of Sample Rec'd:	156.1

Wt. of Sample >71Kg (for 71 samples):	87.1

* Two bags have same Sample ID removed from test program.

See Patsy Moran's email dated 15-Sep-09.

Sample Summary: Vista Gold-Mt. Todd, 8-Sep-09
Page 4 of 4

Date Samples Received: 8-Sep-09
Date Instructions Received: From Patsy Moran by email dated 15-Sep-09.
Number of Samples Received: 71 Rock samples. 69 requested for analyses.

Sample Prep: ABA & S-Spec: Cone crushed, split & pulverized to >80% of <200 mesh.

Date of Analysis: ABA: 28 to 30-Sep-09; S-Spec: 28-Sep-09 to 2-Oct-09.

Other Analyses Requested: None.

Client: Vista Gold
Consulting Client: Tetra Tech
Client Project Name: Mt. Todd
Client Project No: #N/A
PO No: #N/A

Contact Person: Patsy Moran

E-mail Address: patsy.moran@tetrattech.com

Invoicing Address: **Attn: Mr. Fred Earnest**
Vista Gold Corp. , 7961 Shaffer Parkway, Suite 5, Littleton, CO, USA 80127.

Consulting Client Address: **Patsy Moran:** 350 Indiana Street, Suite 500, Golden, Colorado 80401, USA.

Contact No: **Office:** 720 881-5815

Fax No: 303 217-5705

Sign:

Report Released by: Ivy Rajan
Position: Lab Manager and Project Manager, ARD Division

Report Verified by: John Chiang
Position: Senior Analyst, ARD Divison

Report Validated by: Tim O'Hearn
Position: Director, ARD Division, CANTEST Ltd.

CANTEST Project No: 2-21-954

Contact No: 604-734-7276 x5029; Direct: 604-638-5029 (Ivy Rajan)
Contact No: 604-734-7276 x2219 (John Chiang)
Contact No: 604-734-7276 x5031; Direct: 604-638-5031 (Tim O'Hearn)



Project Name: Mt. Todd
Cantest Project No: 2-21-944
HC-1; Sample ID: VB-009 58-62 G

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Method:				pH Meter	EC Meter	Auto Turbidimetry	Tiration & Calculation		
Sampling Date	Week No.	Volume (ml)		pH (pH Units)	EC (µS/cm)	Sulphate (mg/L)	Acidity CaCO3/L (mg)		Total Alkalinity (mg CaCO3/L)
		Input	Output				to pH 4.5	to pH 8.3	
Detection Limits		5	5	0.5	0.5	1	0.5	0.5	0.5
24-Dec-08	1	750	635	7.20	97	15	#N/A	5	22
31-Dec-08	2	500	425	7.77	100	20	#N/A	1	22
7-Jan-09	3	500	480	7.85	71	12	#N/A	1	20
14-Jan-09	4	500	450	8.00	59	4	#N/A	-1	21
Comp; week 1 to 4						13			21
21-Jan-09	5	500	470	7.86	58	5	#N/A	1	23
28-Jan-09	6	500	465	7.80	52	4	#N/A	-1	20
4-Feb-09	7	500	465	7.83	50	6	#N/A	1	19
11-Feb-09	8	500	460	7.80	49	6	#N/A	1	17
Comp; week 5 to 8						5			19
18-Feb-09	9	500	480	7.67	48	4	#N/A	1	12
25-Feb-09	10	500	465	7.64	40	5	#N/A	-1	14
4-Mar-09	11	500	475	7.63	46	4	#N/A	1	14
11-Mar-09	12	500	460	7.74	57	5	#N/A	-1	14
Comp; week 9 to 12						5			13
18-Mar-09	13	500	445	7.42	67	5	#N/A	1	10
25-Mar-09	14	500	440	7.57	53	4	#N/A	1	12
1-Apr-09	15	500	480	7.55	49	4	#N/A	1	12
8-Apr-09	16	500	470	7.53	53	6	#N/A	1	11
Comp; week 13 to 16						5			11
15-Apr-09	17	500	445	7.43	48	3	#N/A	1	11
22-Apr-09	18	500	470	7.47	57	3	#N/A	1	11
29-Apr-09	19	500	440	7.69	48	5	#N/A	1	10
6-May-09	20	500	440	7.62	54	3	#N/A	1	9
Comp; week 17 to 20						4			10
13-May-09	21	500	445	7.53	55	2	#N/A	1	10
20-May-09	22	500	460	7.43	59	3	#N/A	1	10
27-May-09	23	500	485	7.42	43	4	#N/A	1	11
3-Jun-09	24	500	480	7.41	46	4	#N/A	1	11
Comp; week 21 to 24						3			10
10-Jun-09	25	500	455	7.45	49	3	#N/A	1	10
17-Jun-09	26	500	445	7.49	44	3	#N/A	1	10
24-Jun-09	27	500	460	7.45	58	4	#N/A	1	10
1-Jul-09	28	500	470	7.33	49	4	#N/A	1	10
Comp; week 25 to 28						4			10

Notes:

Proposed number of weeks = 20 weeks.

Continue until further notice; as per email from Pasty Moran dated 6-May-09.

Last sampling on 1-Jul-09 (week 28).

Dissolved Metals by ICP-MS at Cantest													
Al (mg/L)	Sb (mg/L)	As (mg/L)	Ba (mg/L)	Be (mg/L)	Bi (mg/L)	B (mg/L)	Cd (mg/L)	Ca (mg/L)	Cr (mg/L)	Co (mg/L)	Cu (mg/L)	Fe (mg/L)	Pb (mg/L)
0.005	0.001	0.001	0.001	0.001	0.001	0.05	0.0002	0.05	0.001	0.001	0.001	0.05	0.001
0.089	0.003	0.015	0.002	-0.001	-0.001	0.14	-0.0002	6.92	-0.001	-0.001	0.002	-0.05	-0.001
0.035	0.0017	0.032	0.0016	-0.0002	-0.0002	0.04	-0.00004	6.48	-0.0002	-0.0002	0.0078	-0.01	-0.0002
0.073	0.0009	0.042	0.0009	-0.0002	-0.0002	0.02	-0.00004	6.08	-0.0002	0.0003	0.0015	-0.01	-0.0002
0.031	0.0007	0.023	0.0012	-0.0002	-0.0002	0.03	-0.00004	7.3	-0.0002	0.001	0.0049	-0.01	0.0002
0.056	0.0005	0.021	0.0007	-0.0002	-0.0002	0.02	-0.00004	6.56	-0.0002	0.0004	0.0006	-0.01	-0.0002
0.043	0.0004	0.015	0.0007	-0.0002	-0.0002	0.01	-0.00004	5.99	-0.0002	0.0007	0.0003	-0.01	0.0004
Last cycle													
0.042	0.0003	0.013	0.0008	-0.0002	-0.0002	0.02	-0.00004	6.12	-0.0002	0.001	0.0003	-0.01	-0.0002

Li (mg/L)	Mg (mg/L)	Mn (mg/L)	Mo (mg/L)	Ni (mg/L)	P (mg/L)	K (mg/L)	Se (mg/L)	Si (mg/L)	Ag (mg/L)	Na (mg/L)	Sr (mg/L)	Te (mg/L)
0.001	0.05	0.001	0.0005	0.001	0.15	0.1	0.001	0.25	0.00025	0.05	0.001	0.001
0.002	1.76	0.03	0.0013	0.001	-0.15	6.2	-0.001	1.1	-0.00025	1.82	0.01	-0.001
0.001	1.23	0.031	0.0004	0.0004	-0.03	2.27	-0.0002	1.01	-0.00005	0.36	0.0067	-0.0002
0.0007	0.93	0.021	0.0003	-0.0002	-0.03	1.33	-0.0002	0.92	-0.00005	0.19	0.0052	-0.0002
0.0005	0.9	0.029	0.0002	0.0005	-0.03	0.98	-0.0002	0.83	-0.00005	0.15	0.0056	-0.0002
0.0003	0.75	0.024	-0.0001	0.0003	-0.03	0.85	-0.0002	0.81	-0.00005	0.1	0.0044	0.000
0.0003	0.59	0.018	-0.0001	0.0007	-0.03	0.66	-0.0002	0.83	-0.00005	0.09	0.004	0.000
-0.0002	0.54	0.012	-0.0001	0.0003	0.03	0.54	-0.0002	0.75	-0.00005	0.1	0.004	0.000

Tl (mg/L)	Th (mg/L)	Sn (mg/L)	Ti (mg/L)	U (mg/L)	V (mg/L)	Zn (mg/L)	Zr (mg/L)
0.0001	0.0005	0.001	0.001	0.0005	0.001	0.005	0.01
0.0001	-0.0005	-0.001	-0.001	-0.0005	-0.001	-0.005	-0.01
-0.00002	-0.0001	-0.0002	-0.0002	-0.0001	0.001	-0.001	-0.002
-0.00002	-0.0001	-0.0002	-0.0002	-0.0001	0.001	-0.001	-0.002
-0.00002	-0.0001	-0.0002	-0.0002	-0.0001	0.001	-0.001	-0.002
-0.00002	-0.0001	-0.0002	-0.0002	-0.0001	0.0004	-0.001	-0.002
-0.00002	-0.0001	-0.0002	-0.0002	-0.0001	0.0004	0.002	-0.002
-0.00002	-0.0001	0.000	0.000	-0.0001	0.000	-0.001	-0.002

Ion Balance		
Anions	Cations	Balance %
0.68	0.73	-3.51%
0.49	0.50	-0.35%
0.36	0.43	-8.54%
0.32	0.47	-18.20%
0.28	0.42	-19.96%
0.28	0.37	-14.48%
0.27	0.37	-14.80%



Project Name: Mt. Todd
Cantest Project No: 2-21-944
HC-2; Sample ID: VB-006 44-48 S

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Method:				pH Meter	EC Meter	Auto Turbidimetry	Tiration & Calculation		
Sampling Date	Week No.	Volume (ml)		pH (pH Units)	EC (µS/cm)	Sulphate (mg/L)	Acidity (mg CaCO3/L)		Total Alkalinity (mg CaCO3/L)
		Input	Output				to pH 4.5	to pH 8.3	to pH 4.5
Detection Limits		5	5	0.5	0.5	1	0.5	0.5	0.5
24-Dec-08	1	750	635	5.76	155	49	#N/A	4	4
31-Dec-08	2	500	430	5.00	203	86	#N/A	4	2
7-Jan-09	3	500	495	5.80	152	70	#N/A	3	2
14-Jan-09	4	500	470	5.79	101	40	#N/A	3	2
Comp; week 1 to 4						61			2
21-Jan-09	5	500	470	5.61	80	31	#N/A	3	2
28-Jan-09	6	500	460	5.52	75	29	#N/A	2	2
4-Feb-09	7	500	470	5.24	71	30	#N/A	3	2
11-Feb-09	8	500	460	5.25	64	25	#N/A	3	2
Comp; week 5 to 8						29			2
18-Feb-09	9	500	470	5.33	62	23	#N/A	3	2
25-Feb-09	10	500	450	5.28	53	20	#N/A	3	2
4-Mar-09	11	500	470	5.01	61	22	#N/A	3	1
11-Mar-09	12	500	440	4.78	52	15	#N/A	3	1
Comp; week 9 to 12						20			1
18-Mar-09	13	500	460	5.01	46	14	#N/A	4	2
25-Mar-09	14	500	440	4.86	57	20	#N/A	4	1
1-Apr-09	15	500	470	4.83	68	24	#N/A	4	1
8-Apr-09	16	500	445	4.81	58	23	#N/A	4	1
Comp; week 13 to 16						20			1
15-Apr-09	17	500	440	4.72	62	22	#N/A	6	1
22-Apr-09	18	500	440	4.68	67	24	#N/A	6	1
29-Apr-09	19	500	435	4.60	65	24	#N/A	6	-1
6-May-09	20	500	435	4.50	77	29	#N/A	9	-1
Comp; week 17 to 20						25			1
13-May-09	21	500	455	4.46	84	31	#N/A	9	-1
20-May-09	22	500	450	4.37	87	32	1	11	#N/A
27-May-09	23	500	470	4.29	95	29	1	13	#N/A
3-Jun-09	24	500	455	4.20	101	33	1	15	#N/A
Comp; week 21 to 24						31			#N/A
10-Jun-09	25	500	455	4.20	103	30	2	18	#N/A
17-Jun-09	26	500	445	4.12	104	37	3	22	#N/A
24-Jun-09	27	500	450	4.08	129	not done	4	24	#N/A

Notes:

Continue until further notice; as per email from Pasty Moran dated 6-May-09.

Proposed number of weeks = 20 weeks

Terminated as per client's request (Patsy Moran) by email dated 26-Jun-09. Last sampled on 24-Jun-09 (week-27).

Dissolved Metals by ICP-MS at Cantest

Al (mg/L)	Sb (mg/L)	As (mg/L)	Ba (mg/L)	Be (mg/L)	Bi (mg/L)	B (mg/L)	Cd (mg/L)	Ca (mg/L)	Cr (mg/L)	Co (mg/L)	Cu (mg/L)	Fe (mg/L)
0.005	0.001	0.001	0.001	0.001	0.001	0.05	0.0002	0.05	0.001	0.001	0.001	0.05

Table 1. Chemical composition of the studied samples (mg/L)												
Pb (mg/L)	Li (mg/L)	Mg (mg/L)	Mn (mg/L)	Mo (mg/L)	Ni (mg/L)	P (mg/L)	K (mg/L)	Se (mg/L)	Si (mg/L)	Ag (mg/L)	Na (mg/L)	Sr (mg/L)
0.001	0.001	0.05	0.001	0.0005	0.001	0.15	0.1	0.001	0.25	0.00025	0.05	0.001
0.036	0.009	8.22	0.56	-0.0005	0.16	-0.15	10.9	-0.001	2.7	-0.00025	1.62	0.007
0.103	0.0043	3.8	0.368	-0.0001	0.113	-0.03	3.88	-0.0002	2.68	-0.00005	0.22	0.0039
0.304	0.0036	2.72	0.296	-0.0001	0.112	-0.03	2.59	-0.0002	2.22	-0.00005	0.11	0.0027
0.598	0.0042	2.59	0.311	-0.0001	0.125	-0.03	1.95	-0.0002	1.64	-0.00005	0.08	0.0027
1.16	0.0038	2.85	0.314	-0.0001	0.141	-0.03	1.83	-0.0002	1.48	-0.00005	0.06	0.0024
1.85	0.0039	2.99	0.348	-0.0001	0.191	-0.03	1.61	-0.0002	2.16	-0.00005	0.06	0.003

Te (mg/L)	Tl (mg/L)	Th (mg/L)	Sn (mg/L)	Ti (mg/L)	U (mg/L)	V (mg/L)	Zn (mg/L)	Zr (mg/L)	Ion Balance		
0.001	0.0001	0.0005	0.001	0.001	0.0005	0.001	0.005	0.01	Anions	Cations	Balance %
-0.001	0.0002	-0.0005	-0.001	-0.001	-0.0005	-0.001	0.11	-0.01	1.32	1.27	1.96%
-0.0002	0.0001	-0.0001	-0.0002	-0.0002	-0.0001	-0.0002	0.19	-0.002	0.63	0.55	7.15%
-0.0002	0.00011	-0.0001	-0.0002	-0.0002	-0.0001	-0.0002	0.32	-0.002	0.44	0.40	4.58%
-0.0002	0.00011	-0.0001	-0.0002	-0.0002	0.0001	-0.0002	0.52	-0.002	0.45	0.38	7.72%
-0.0002	0.00011	-0.0001	-0.0002	-0.0002	0.0003	-0.0002	0.81	-0.002	0.54	0.42	11.66%
-0.0002	0.00012	-0.0001	-0.0002	-0.0002	0.0006	-0.0002	1.24	-0.002	0.65	0.49	13.82%



Project Name: Mt. Todd
Cantest Project No: 2-21-944
HC-3; Sample ID: VB-002 220-224 I

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Method:				pH Meter	EC Meter	Auto Turbidimetry	Titration & Calculation		
Sampling Date	Week No.	Volume (ml)		pH (pH Units)	EC (µS/cm)	Sulphate (mg/L)	Acidity (mg CaCO ₃ /L)		Total Alkalinity (mg CaCO ₃ /L)
		Input	Output				to pH 4.5	to pH 8.3	
Detection Limits		5	5	0.5	0.5	1	0.5	0.5	0.5
24-Dec-08	1	750	640	7.51	112	9	#N/A	3	32
31-Dec-08	2	500	440	7.79	131	32	#N/A	1	25
7-Jan-09	3	500	430	7.62	105	30	#N/A	1	19
14-Jan-09	4	500	445	7.97	95	20	#N/A	1	23
Comp; week 1 to 4						23			25
21-Jan-09	5	500	465	7.72	93	20	#N/A	1	23
28-Jan-09	6	500	450	8.05	103	28	#N/A	-1	20
4-Feb-09	7	500	440	7.91	105	33	#N/A	1	19
11-Feb-09	8	500	445	7.80	100	27	#N/A	1	19
Comp; week 5 to 8						27			20
18-Feb-09	9	500	450	7.67	90	24	#N/A	1	17
25-Feb-09	10	500	460	7.96	82	25	#N/A	-1	17
4-Mar-09	11	500	460	7.61	85	22	#N/A	1	17
11-Mar-09	12	500	450	7.36	80	21	#N/A	1	13
Comp; week 9 to 12						23			16
18-Mar-09	13	500	460	7.67	81	18	#N/A	1	16
25-Mar-09	14	500	450	7.69	78	23	#N/A	-1	14
1-Apr-09	15	500	475	7.76	79	13	#N/A	-1	16
8-Apr-09	16	500	450	7.68	75	17	#N/A	1	16
Comp; week 13 to 16						18			16
15-Apr-09	17	500	470	7.65	74	19	#N/A	1	16
22-Apr-09	18	500	445	7.61	68	16	#N/A	1	14
29-Apr-09	19	500	455	7.79	66	16	#N/A	1	14
6-May-09	20	500	435	7.97	61	14	#N/A	1	15
Comp; week 17 to 20						16			15
13-May-09	21	500	450	7.95	67	12	#N/A	1	15
20-May-09	22	500	455	7.76	66	14	#N/A	1	15
27-May-09	23	500	470	7.42	62	11	#N/A	1	15
3-Jun-09	24	500	440	7.66	62	12	#N/A	1	14
Comp; week 21 to 24						12			15
10-Jun-09	25	500	440	7.54	66		#N/A	1	15
17-Jun-09	26	500	460	7.63	60		#N/A	1	15
24-Jun-09	27	500	440	7.64	61	not done	#N/A	1	15

Notes:

Continue until further notice; as per email from Pasty Moran dated 6-May-09.

Proposed number of weeks = 20 weeks

Terminated as per client's request (Patsy Moran) by email dated 26-Jun-09. Last sampled on 24-Jun-09 (week-27).

Dissolved Metals by ICP-MS at Cantest											
Al (mg/L)	Sb (mg/L)	As (mg/L)	Ba (mg/L)	Be (mg/L)	Bi (mg/L)	B (mg/L)	Cd (mg/L)	Ca (mg/L)	Cr (mg/L)	Co (mg/L)	Cu (mg/L)
0.005	0.001	0.001	0.001	0.001	0.001	0.05	0.0002	0.05	0.001	0.001	0.001
0.085	0.011	0.091	0.005	-0.001	-0.001	0.11	-0.0002	7.56	-0.001	0.001	0.001
0.043	0.006	0.022	0.0046	-0.0002	-0.0002	0.03	0.00014	11.9	-0.0002	0.003	0.0024
0.054	0.0041	0.023	0.003	-0.0002	-0.0002	0.02	0.00016	10.9	-0.0002	0.003	0.0009
0.038	0.0034	0.02	0.0035	-0.0002	-0.0002	0.03	0.00026	10.7	-0.0002	0.003	0.0008
0.048	0.0026	0.018	0.0024	-0.0002	-0.0002	0.02	0.00021	8.76	-0.0002	0.0023	0.0005
0.044	0.002	0.015	0.0022	-0.0002	-0.0002	0.01	0.00024	7.9	-0.0002	0.0022	0.0005
Last cycle											

Table 1. Chemical composition of the studied soils (mg/L)												
Fe (mg/L)	Pb (mg/L)	Li (mg/L)	Mg (mg/L)	Mn (mg/L)	Mo (mg/L)	Ni (mg/L)	P (mg/L)	K (mg/L)	Se (mg/L)	Si (mg/L)	Ag (mg/L)	Na (mg/L)
0.05	0.001	0.001	0.05	0.001	0.0005	0.001	0.15	0.1	0.001	0.25	0.00025	0.05
-0.05	0.005	0.003	1.95	0.046	0.0027	0.002	-0.15	4.4	-0.001	1	-0.00025	8.7
-0.01	0.153	0.0026	2.22	0.102	0.0006	0.0019	-0.03	1.94	-0.0002	0.88	-0.00005	2.49
-0.01	0.049	0.0016	1.62	0.113	0.0004	0.0014	-0.03	1.31	-0.0002	0.87	-0.00005	1.12
-0.01	0.051	0.001	1.23	0.133	0.0004	0.0014	-0.03	0.89	-0.0002	0.85	-0.00005	0.72
-0.01	0.038	0.0007	1.04	0.102	0.0003	0.0009	-0.03	0.8	-0.0002	0.74	-0.00005	0.5
-0.01	0.033	0.0005	0.82	0.093	0.0003	0.0009	-0.03	0.65	-0.0002	0.7	-0.00005	0.36

Sr (mg/L)	Te (mg/L)	Tl (mg/L)	Th (mg/L)	Sn (mg/L)	Ti (mg/L)	U (mg/L)	V (mg/L)	Zn (mg/L)	Zr (mg/L)	Ion Balance		
0.001	0.001	0.0001	0.0005	0.001	0.001	0.0005	0.001	0.005	0.01	Anions	Cations	Balance %
0.021	-0.001	-0.0001	-0.0005	-0.001	-0.001	-0.0005	-0.001	-0.005	-0.01	0.96	1.03	-3.46%
0.028	-0.0002	-0.00002	-0.0001	-0.0002	-0.0002	-0.0001	-0.0002	0.013	-0.002	0.96	0.93	1.45%
0.02	-0.0002	-0.00002	-0.0001	-0.0002	-0.0002	-0.0001	-0.0002	0.011	-0.002	0.80	0.76	2.36%
0.016	-0.0002	-0.00002	-0.0001	-0.0002	-0.0002	-0.0001	-0.0002	0.02	-0.002	0.68	0.69	-0.67%
0.011	-0.0002	-0.00002	-0.0001	-0.0002	-0.0002	-0.0001	-0.0002	0.015	-0.002	0.63	0.57	5.41%
0.0091	-0.0002	-0.00002	-0.0001	-0.0002	-0.0002	-0.0001	-0.0002	0.014	-0.002	0.55	0.50	5.02%



Project Name: Mt. Todd
Cantest Project No: 2-21-944
HC-4; Sample ID: VB-011 156-160 S

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Method:				pH Meter	EC Meter	Auto Turbidimetry	Titration & Calculation		
Sampling Date	Week No.	Volume (ml)		pH (pH Units)	EC (µS/cm)	Sulphate (mg/L)	Acidity (mg CaCO ₃ /L)		Total Alkalinity (mg CaCO ₃ /L)
		Input	Output				to pH 4.5	to pH 8.3	to pH 4.5
Detection Limits		5	5	0.5	0.5	1	0.5	0.5	0.5
24-Dec-08	1	750	670	7.41	206	65	#N/A	2	18
31-Dec-08	2	500	455	7.30	163	55	#N/A	1	14
7-Jan-09	3	500	490	7.35	87	24	#N/A	1	12
14-Jan-09	4	500	470	7.33	67	18	#N/A	-1	11
Comp; week 1 to 4						41			13
21-Jan-09	5	500	475	7.42	55	14	#N/A	1	11
28-Jan-09	6	500	465	7.51	52	12	#N/A	1	12
4-Feb-09	7	500	470	7.47	49	11	#N/A	1	11
11-Feb-09	8	500	460	7.41	47	12	#N/A	1	11
Comp; week 5 to 8						12			11
18-Feb-09	9	500	490	7.42	55	10	#N/A	1	13
25-Feb-09	10	500	470	7.41	49	14	#N/A	1	10
4-Mar-09	11	500	480	7.21	58	14	#N/A	-1	9
11-Mar-09	12	500	470	7.22	61	18	#N/A	-1	10
Comp; week 9 to 12						14			10
18-Mar-09	13	500	460	7.31	60	13	#N/A	1	9
25-Mar-09	14	500	475	7.31	57	17	#N/A	1	9
1-Apr-09	15	500	480	7.32	57	14	#N/A	1	8
8-Apr-09	16	500	455	7.31	58	12	#N/A	1	8
Comp; week 13 to 16						14			9
15-Apr-09	17	500	470	7.26	58	14	#N/A	1	9
22-Apr-09	18	500	450	7.25	55	19	#N/A	1	8
29-Apr-09	19	500	480	7.36	56	18	#N/A	1	9
6-May-09	20	500	435	7.36	53	13	#N/A	1	8
Comp; week 17 to 20						16			8
13-May-09	21	500	445	7.33	57	12	#N/A	1	9
20-May-09	22	500	475	7.25	57	16	#N/A	1	9
27-May-09	23	500	460	7.14	55	13	#N/A	1	8
3-Jun-09	24	500	455	7.18	58	14	#N/A	1	8
Comp; week 21 to 24						14			8
10-Jun-09	25	500	460	7.25	64	13	#N/A	1	9
17-Jun-09	26	500	450	7.19	55	14	#N/A	1	8
24-Jun-09	27	500	455	7.16	62	13	#N/A	1	8
1-Jul-09	28	500	465	7.16	53	11	#N/A	1	8
Comp; week 25 to 28						13			8

Notes:

Proposed number of weeks = 20 weeks.

Continue until further notice; as per email from Pasty Moran dated 6-May-09.

Last sampling on 1-Jul-09 (week 28).

Dissolved Metals by ICP-MS at Cantest											
Al (mg/L)	Sb (mg/L)	As (mg/L)	Ba (mg/L)	Be (mg/L)	Bi (mg/L)	B (mg/L)	Cd (mg/L)	Ca (mg/L)	Cr (mg/L)	Co (mg/L)	Cu (mg/L)
0.005	0.001	0.001	0.001	0.001	0.001	0.05	0.0002	0.05	0.001	0.001	0.001
0.034	0.003	0.13	0.004	-0.001	-0.001	0.22	-0.0002	8.65	-0.001	0.002	0.002
0.017	0.0027	0.133	0.0025	-0.0002	-0.0002	0.05	0.00005	4.31	-0.0002	0.001	0.0011
0.018	0.0023	0.089	0.0018	-0.0002	-0.0002	0.03	0.00008	4.62	-0.0002	0.001	0.003
0.013	0.002	0.071	0.0021	-0.0002	-0.0002	0.02	0.00006	4.68	-0.0002	0.001	0.0007
0.021	0.0015	0.06	0.0014	-0.0002	-0.0002	0.02	0.00006	4.39	-0.0002	0.0006	0.0006
0.013	0.0011	0.045	0.0013	-0.0002	-0.0002	0.01	0.0001	4.13	-0.0002	0.001	0.002
Last cycle											
0.012	0.001	0.041	0.0012	0.000	0.000	0.01	0.0001	4.33	-0.0002	0.001	0.0004

Fe (mg/L)	Pb (mg/L)	Li (mg/L)	Mg (mg/L)	Mn (mg/L)	Mo (mg/L)	Ni (mg/L)	P (mg/L)	K (mg/L)	Se (mg/L)	Si (mg/L)	Ag (mg/L)	Na (mg/L)
0.05	0.001	0.001	0.05	0.001	0.0005	0.001	0.15	0.1	0.001	0.25	0.00025	0.05
-0.05	0.002	0.006	5.79	0.089	0.015	0.006	-0.15	6	-0.001	0.9	-0.00025	2.22
-0.01	0.0027	0.0022	2.6	0.064	0.0064	0.0013	-0.03	1.92	-0.0002	0.81	-0.00005	0.22
-0.01	0.0028	0.0018	2.67	0.045	0.003	0.001	-0.03	1.29	-0.0002	0.78	-0.00005	0.09
-0.01	0.0036	0.0016	2.65	0.044	0.0026	0.0009	-0.03	0.88	-0.0002	0.74	-0.00005	0.06
-0.01	0.0035	0.0011	2.66	0.041	0.0021	0.0009	-0.03	0.72	-0.0002	0.72	-0.00005	0.04
-0.01	0.0046	0.0007	2.37	0.046	0.002	0.0009	-0.03	0.52	-0.0002	0.63	-0.00005	0.02
-0.01	0.0023	0.0007	2.41	0.051	0.0016	0.0007	0.05	0.4	-0.0002	0.55	-0.00005	0.07

Sr (mg/L)	Te (mg/L)	Tl (mg/L)	Th (mg/L)	Sn (mg/L)	Ti (mg/L)	U (mg/L)	V (mg/L)	Zn (mg/L)	Zr (mg/L)	Ion Balance		
0.001	0.001	0.0001	0.0005	0.001	0.001	0.0005	0.001	0.005	0.01	Anions	Cations	Balance %
0.012	-0.001	-0.0001	-0.0005	-0.001	-0.001	-0.0005	-0.001	0.006	-0.01	1.11	1.16	-2.16%
0.0048	-0.0002	-0.00002	-0.0001	-0.0002	-0.0002	-0.0001	0.0003	0.005	-0.002	0.48	0.49	-1.35%
0.0051	-0.0002	-0.00002	-0.0001	-0.0002	-0.0002	-0.0001	-0.0002	0.01	-0.002	0.50	0.49	1.25%
0.005	-0.0002	-0.00002	-0.0001	-0.0002	-0.0002	-0.0001	-0.0002	0.015	-0.002	0.46	0.48	-1.50%
0.0041	-0.0002	-0.00002	-0.0001	-0.0002	-0.0002	-0.0001	-0.0002	0.016	-0.002	0.50	0.46	4.45%
0.0039	-0.0002	-0.00002	-0.0001	-0.0002	-0.0002	-0.0001	-0.0002	0.016	-0.002	0.45	0.41	4.50%
0.004	0.000	-0.00002	-0.0001	0.000	0.000	-0.0001	0.000	0.017	-0.002	0.43	0.43	0.41%



Project Name: Mt. Todd
 Cantest Project No: 2-21-944
 HC-5; Sample ID: VB-018 120-124 I

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Method:				pH Meter	EC Meter	Auto Turbidimetry	Tiration & Calculation		
Sampling Date	Week No.	Volume (ml)		pH (pH Units)	EC (µS/cm)	Sulphate (mg/L)	Acidity (mg CaCO3/L)		Total Alkalinity (mg CaCO3/L)
		Input	Output				to pH 4.5	to pH 8.3	to pH 4.5
Detection Limits		5	5	0.5	0.5	1	0.5	0.5	0.5
24-Dec-08	1	750	625	7.35	176	53	#N/A	2.5	18
31-Dec-08	2	500	500	7.23	171	53	#N/A	2.5	14
7-Jan-09	3	500	480	7.36	104	34	#N/A	1.5	14
14-Jan-09	4	500	480	7.38	76	12	#N/A	0.5	12
Comp; week 1 to 4						38			14
21-Jan-09	5	500	465	7.38	72	21	#N/A	0.5	12
28-Jan-09	6	500	490	7.36	79	25	#N/A	-1.0	13
4-Feb-09	7	500	470	7.25	89	31	#N/A	1.5	13
11-Feb-09	8	500	460	7.22	84	31	#N/A	1.0	10
Comp; week 5 to 8						27			12
18-Feb-09	9	500	460	7.30	79	24	#N/A	1.0	9
25-Feb-09	10	500	460	7.31	71	24	#N/A	0.5	8
4-Mar-09	11	500	470	7.24	66	21	#N/A	-1.0	9
11-Mar-09	12	500	475	7.18	60	17	#N/A	1.0	8
Comp; week 9 to 12						22			9
18-Mar-09	13	500	465	7.16	62	12	#N/A	1.0	10
25-Mar-09	14	500	495	7.45	61	16	#N/A	1.0	12
1-Apr-09	15	500	480	7.36	54	13	#N/A	1.0	9
8-Apr-09	16	500	480	7.31	53	11	#N/A	1.0	8
Comp; week 13 to 16						13			10
15-Apr-09	17	500	475	7.34	50	13	#N/A	1.0	9
22-Apr-09	18	500	465	7.33	52	16	#N/A	1.0	9
29-Apr-09	19	500	470	7.31	48	15	#N/A	1.0	8
6-May-09	20	500	460	7.30	47	12	#N/A	1.0	8
Comp; week 17 to 20						14			8
13-May-09	21	500	435	7.32	52	13	#N/A	1.0	8
20-May-09	22	500	465	7.26	49	11	#N/A	1.0	8
27-May-09	23	500	440	7.18	50	10	#N/A	1.0	9
3-Jun-09	24	500	465	7.13	53	11	#N/A	1.0	10
Comp; week 21 to 24						11			9
10-Jun-09	25	500	465	7.23	54	10	#N/A	1.0	10
17-Jun-09	26	500	480	7.34	51	13	#N/A	1.0	10
24-Jun-09	27	500	465	7.26	50	7	#N/A	1.0	9
1-Jul-09	28	500	475	7.22	47	8	#N/A	1.0	9
Comp; week 25 to 28						10			10

Notes:

Proposed number of weeks = 20 weeks.

Continue until further notice; as per email from Pasty Moran dated 6-May-09.

Last sampling on 1-Jul-09 (week 28).

Dissolved Metals by ICP-MS at Cantest												
Al (mg/L)	Sb (mg/L)	As (mg/L)	Ba (mg/L)	Be (mg/L)	Bi (mg/L)	B (mg/L)	Cd (mg/L)	Ca (mg/L)	Cr (mg/L)	Co (mg/L)	Cu (mg/L)	Fe (mg/L)
0.005	0.001	0.001	0.001	0.001	0.001	0.05	0.0002	0.05	0.001	0.001	0.001	0.05
0.036	0.001	0.017	0.003	-0.001	-0.001	0.08	-0.0002	10.6	-0.001	0.004	0.002	-0.05
0.015	0.0008	0.013	0.0026	-0.0002	-0.0002	0.02	0.00005	9.15	-0.0002	0.001	0.002	-0.01
0.02	0.0005	0.014	0.0016	-0.0002	-0.0002	0.02	0.00005	8.47	-0.0002	0.001	0.0009	-0.01
0.019	0.0004	0.011	0.0013	-0.0002	-0.0002	0.02	-0.00004	7.41	-0.0002	0.001	0.0009	-0.01
0.025	0.0002	0.0097	0.0011	-0.0002	-0.0002	0.02	-0.00004	5.79	-0.0002	0.0005	0.0006	-0.01
0.018	-0.0002	0.0069	0.001	-0.0002	-0.0002	0.01	-0.00004	5.49	-0.0002	0.001	0.0005	-0.01
Last cycle												
0.023	-0.0002	0.0066	0.001	0.000	0.000	0.01	-0.00004	5.65	-0.0002	0.000	0.0004	-0.01

Pb (mg/L)	Li (mg/L)	Mg (mg/L)	Mn (mg/L)	Mo (mg/L)	Ni (mg/L)	P (mg/L)	K (mg/L)	Se (mg/L)	Si (mg/L)	Ag (mg/L)	Na (mg/L)	Sr (mg/L)
0.001	0.001	0.05	0.001	0.0005	0.001	0.15	0.1	0.001	0.25	0.00025	0.05	0.001
-0.001	0.004	4.36	0.11	0.0012	0.013	-0.15	6.2	-0.001	1.2	-0.00025	2.43	0.024
0.0034	0.0016	2.14	0.084	0.0004	0.0012	-0.03	1.85	-0.0002	1.04	-0.00005	0.38	0.015
0.0013	0.001	1.52	0.075	0.0003	0.0008	-0.03	1.18	-0.0002	0.97	-0.00005	0.2	0.012
0.0014	0.0007	1.16	0.062	-0.0001	0.0008	-0.03	0.69	-0.0002	0.95	-0.00005	0.13	0.0084
0.001	0.0005	1	0.031	-0.0001	0.0006	-0.03	0.6	-0.0002	0.83	-0.00005	0.11	0.0059
0.001	0.0003	0.94	0.015	-0.0001	0.0008	-0.03	0.46	-0.0002	0.77	-0.00005	0.08	0.0055
0.0005	0.0003	0.99	0.0048	-0.0001	0.0004	0.04	0.37	-0.0002	0.7	-0.00005	0.11	0.0053

Te (mg/L)	Tl (mg/L)	Th (mg/L)	Sn (mg/L)	Ti (mg/L)	U (mg/L)	V (mg/L)	Zn (mg/L)	Zr (mg/L)	Ion Balance		
0.001	0.0001	0.0005	0.001	0.001	0.0005	0.001	0.005	0.01	Anions	Cations	Balance %
-0.001	-0.0001	-0.0005	-0.001	-0.001	-0.0005	-0.001	0.008	-0.01	1.08	1.15	-3.21%
-0.0002	-0.00002	-0.0001	-0.0002	-0.0002	-0.0001	-0.0002	0.003	-0.002	0.80	0.69	6.99%
-0.0002	-0.00002	-0.0001	-0.0002	-0.0002	-0.0001	-0.0002	0.004	-0.002	0.62	0.58	2.81%
-0.0002	-0.00002	-0.0001	-0.0002	-0.0002	-0.0001	-0.0002	0.005	-0.002	0.47	0.49	-2.16%
-0.0002	-0.00002	-0.0001	-0.0002	-0.0002	-0.0001	-0.0002	0.005	-0.002	0.46	0.39	8.12%
-0.0002	-0.00002	-0.0001	-0.0002	-0.0002	-0.0001	-0.0002	0.006	-0.002	0.41	0.36	5.83%
0.000	-0.00002	-0.0001	0.000	0.000	-0.0001	0.000	0.005	-0.002	0.39	0.38	1.64%



Project Name: Mt. Todd
Cantest Project No: 2-21-944
HC-6; Sample ID: VB-009 86-90 G

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Method:				pH Meter	EC Meter	Auto Turbidimetry	Tiration & Calculation		
Sampling Date	Week No.	Volume (ml)		pH (pH Units)	EC (µS/cm)	Sulphate (mg/L)	Acidity (mg CaCO ₃ /L)		Total Alkalinity (mg CaCO ₃ /L)
		Input	Output				to pH 4.5	to pH 8.3	to pH 4.5
Detection Limits		5	5	0.5	0.5	1	0.5	0.5	0.5
24-Dec-08	1	750	660	7.31	174	47	#N/A	3	21
31-Dec-08	2	500	460	7.40	165	52	#N/A	2	17
7-Jan-09	3	500	485	7.47	90	38	#N/A	1	14
14-Jan-09	4	500	495	7.65	68	19	#N/A	1	16
Comp; week 1 to 4						39			17
21-Jan-09	5	500	470	7.78	64	11	#N/A	1	19
28-Jan-09	6	500	465	7.64	53	10	#N/A	1	15
4-Feb-09	7	500	445	7.75	57	14	#N/A	-1	15
11-Feb-09	8	500	440	7.45	76	24	#N/A	1	11
Comp; week 5 to 8						15			15
18-Feb-09	9	500	460	7.32	105	39	#N/A	1	10
25-Feb-09	10	500	475	7.52	111	36	#N/A	1	10
4-Mar-09	11	500	460	7.20	108	36	#N/A	1	12
11-Mar-09	12	500	500	7.18	100	39	#N/A	1	9
Comp; week 9 to 12						38			10
18-Mar-09	13	500	455	7.25	93	29	#N/A	1	11
25-Mar-09	14	500	450	7.34	93	29	#N/A	1	11
1-Apr-09	15	500	490	7.39	89	27	#N/A	1	10
8-Apr-09	16	500	470	7.32	82	24	#N/A	1	9
Comp; week 13 to 16						27			10
15-Apr-09	17	500	460	7.26	82	25	#N/A	1	10
22-Apr-09	18	500	470	7.27	78	24	#N/A	1	9
29-Apr-09	19	500	430	7.77	53	14	#N/A	1	10
6-May-09	20	500	440	7.27	63	17	#N/A	1	10
Comp; week 17 to 20						20			10
13-May-09	21	500	435	7.30	57	15	#N/A	1	9
20-May-09	22	500	450	7.37	61	16	#N/A	1	9
27-May-09	23	500	440	7.22	57	13	#N/A	1	8
3-Jun-09	24	500	460	7.12	56	13	#N/A	1	8
Comp; week 21 to 24						14			8
10-Jun-09	25	500	465	7.21	67	17	#N/A	1	9
17-Jun-09	26	500	450	7.27	60	18	#N/A	1	9
24-Jun-09	27	500	465	7.25	65	14	#N/A	1	9
1-Jul-09	28	500	475	7.20	57	13	#N/A	1	9
Comp; week 25 to 28						16			9

Notes:

Proposed number of weeks = 20 weeks.

Continue until further notice; as per email from Pasty Moran dated 6-May-09.

Last sampling on 1-Jul-09 (week 28).

Dissolved Metals by ICP-MS at Cantest												
Al (mg/L)	Sb (mg/L)	As (mg/L)	Ba (mg/L)	Be (mg/L)	Bi (mg/L)	B (mg/L)	Cd (mg/L)	Ca (mg/L)	Cr (mg/L)	Co (mg/L)	Cu (mg/L)	Fe (mg/L)
0.005	0.001	0.001	0.001	0.001	0.001	0.05	0.0002	0.05	0.001	0.001	0.001	0.05
0.067	0.007	0.059	0.003	-0.001	-0.001	0.09	-0.0002	10.1	-0.001	0.002	0.003	-0.05
0.03	0.0037	0.056	0.0053	-0.0002	-0.0002	0.02	-0.00004	7.15	-0.0002	0.0003	0.0009	-0.01
0.033	0.0019	0.056	0.0014	-0.0002	-0.0002	0.01	-0.00004	13	-0.0002	0.001	0.0039	-0.01
0.024	0.0013	0.06	0.0013	-0.0002	-0.0002	0.02	-0.00004	10.7	-0.0002	0.001	0.0005	-0.01
0.027	0.0011	0.056	0.0008	-0.0002	-0.0002	0.02	-0.00004	7.73	-0.0002	0.0005	0.0012	-0.01
0.025	0.0008	0.039	0.0006	-0.0002	-0.0002	0.01	-0.00004	5.96	-0.0002	0.001	0.0008	0.07
Last cycle												
0.022	0.0007	0.035	0.0009	0.000	0.000	0.02	-0.00004	6.13	-0.0002	0.001	0.0003	-0.01

Pb (mg/L)	Li (mg/L)	Mg (mg/L)	Mn (mg/L)	Mo (mg/L)	Ni (mg/L)	P (mg/L)	K (mg/L)	Se (mg/L)	Si (mg/L)	Ag (mg/L)	Na (mg/L)	Sr (mg/L)
0.001	0.001	0.05	0.001	0.0005	0.001	0.15	0.1	0.001	0.25	0.00025	0.05	0.001
-0.001	0.003	3.6	0.11	0.0026	0.006	-0.15	6.3	-0.001	1.2	-0.00025	2.58	0.021
0.001	0.001	2.04	0.109	0.0012	0.0008	-0.03	1.75	-0.0002	1.04	-0.00005	0.37	0.011
0.0005	0.0011	2.69	0.124	0.0007	0.0011	-0.03	1.31	-0.0002	1.06	-0.00005	0.21	0.016
0.0006	0.0006	2.2	0.085	0.0005	0.001	-0.03	0.74	-0.0002	0.96	-0.00005	0.14	0.011
0.0007	0.0003	1.83	0.051	0.0003	0.0007	-0.03	0.63	-0.0002	0.86	-0.00005	0.11	0.0068
0.001	0.0002	1.47	0.051	0.0003	0.001	-0.03	0.46	-0.0002	0.74	-0.00005	0.07	0.0052
-0.0002	-0.0002	1.69	0.066	-0.0001	0.0005	0.04	0.34	-0.0002	0.68	-0.00005	0.1	0.0056

Te (mg/L)	Tl (mg/L)	Th (mg/L)	Sn (mg/L)	Ti (mg/L)	U (mg/L)	V (mg/L)	Zn (mg/L)	Zr (mg/L)
0.001	0.0001	0.0005	0.001	0.001	0.0005	0.001	0.005	0.01
-0.001	-0.0001	-0.0005	-0.001	-0.001	-0.0005	-0.001	-0.005	-0.01
-0.0002	-0.00002	-0.0001	-0.0002	-0.0002	-0.0001	0.001	-0.001	-0.002
-0.0002	-0.00002	-0.0001	-0.0002	-0.0002	-0.0001	0.0003	0.002	-0.002
-0.0002	-0.00002	-0.0001	-0.0002	-0.0002	-0.0001	0.0003	0.004	-0.002
-0.0002	-0.00002	-0.0001	-0.0002	-0.0002	-0.0001	0.0002	0.002	-0.002
-0.0002	-0.00002	-0.0001	-0.0002	-0.0002	-0.0001	0.0002	0.003	-0.002
0.000	-0.00002	-0.0001	0.000	0.000	-0.0001	0.000	0.002	-0.002

Ion Balance		
Anions	Cations	Balance %
1.15	1.08	3.31%
0.61	0.59	1.74%
0.99	0.91	4.04%
0.77	0.74	2.41%
0.61	0.56	4.62%
0.46	0.43	3.54%
0.50	0.46	4.73%



Client: Vista Gold Corporation

Client Project Name: Mt. Todd

Cantest Project No: 2-21-954

HC-1 (Sample ID: VB007-001 173-177 G)

Method:				pH Meter	EC Meter	Auto Turbidity	Titration & Calculation	
Sampling Date	Week No.	Input Vol.	Output Vol.	pH	EC	Sulphate	Acidity (mg CaCO ₃ /L)	
Units		ml	ml	pH Units	µS/cm	mg/L	to pH 4.5	to pH 8.3
Detection Limits		5	5	0.5	0.5	1	0.5	0.5
18-Nov-09	1	750	635	8.67	88	13	#N/A	#N/A
25-Nov-09	2	500	450	8.90	83	17	#N/A	#N/A
2-Dec-09	3	500	445	8.57	62	9	#N/A	#N/A
9-Dec-09	4	500	420	8.68	43	8	#N/A	#N/A
Comp; week 1 to 4		12						
16-Dec-09	5	500	415	8.63	44	7	#N/A	#N/A
23-Dec-09	6	500	420	8.20	49	6	#N/A	<1
30-Dec-09	7	500	430	8.50	46	7	#N/A	#N/A
6-Jan-10	8	500	465	7.79	53	9	#N/A	1
Comp; week 5 to 8		7						
13-Jan-10	9	500	445	7.72	54	10	#N/A	1
20-Jan-10	10	500	435	7.73	49	10	#N/A	1
27-Jan-10	11	500	460	7.60	44	8	#N/A	1
3-Feb-10	12	500	430	7.75	47	10	#N/A	1
Comp; week 9 to 12		10						
10-Feb-10	13	500	460	7.66	47	11	#N/A	1
17-Feb-10	14	500	465	7.51	41	9	#N/A	1
24-Feb-10	15	500	470	7.55	41	10	#N/A	1
3-Mar-10	16	500	440	7.53	40	10	#N/A	1
Comp; week 13 to 16		10						
10-Mar-10	17	500	455	7.52	42	10	#N/A	1
17-Mar-10	18	500	440	7.76	41	6	#N/A	1
24-Mar-10	19	500	455	7.95	37	4	#N/A	1
31-Mar-10	20	500	455	7.56	42	6	#N/A	1
Comp; week 17 to 20		7						
7-Apr-10	21	500	450	7.68	40	7	#N/A	1
14-Apr-10	22	500	465	7.80	41	8	#N/A	1
21-Apr-10	23	500	450	7.84	40	6	#N/A	1
28-Apr-10	24	500	455	7.94	40	7	#N/A	1
Comp; week 21 to 24		7						
5-May-10	25	500	450	7.66	38	6	#N/A	1

Method:				pH Meter	EC Meter	Auto Turbidity	Titration & Calculation	
Sampling Date	Week No.	Input Vol.	Output Vol.	pH	EC	Sulphate	Acidity (mg CaCO3/L)	
Units		ml	ml	pH Units	µS/cm	mg/L	to pH 4.5	to pH 8.3
Detection Limits		5	5	0.5	0.5	1	0.5	0.5
12-May-10	26	500	495	7.58	40	6	#N/A	1
19-May-10	27	500	460	7.62	35	5	#N/A	1
26-May-10	28	500	450	7.60	35	6	#N/A	1
Comp; week 25 to 28		6						
2-Jun-10	29	500	485	7.59	37	5	#N/A	1
9-Jun-10	30	500	445	7.59	31	5	#N/A	1
16-Jun-10	31	500	440	7.65	33	5	#N/A	1
23-Jun-10	32	500	435	7.71	33	5	#N/A	1
Comp; week 29 to 32		5						
30-Jun-10	33	500	445	7.64	33	5	#N/A	<1
7-Jul-10	34	500	495	7.58	37	5	#N/A	1
14-Jul-10	35	500	450	7.66	27	5	#N/A	1
21-Jul-10	36	500	440	7.75	28	6	#N/A	1
Comp; week 33 to 36		5						
28-Jul-10	37	500	440	7.77	32	5	#N/A	1
4-Aug-10	38	500	435	7.81	29	5	#N/A	<1
11-Aug-10	39	500	460	7.73	32	5	#N/A	1
18-Aug-10	40	500	440	7.74	34	5	#N/A	1
Comp; week 37 to 40		5						
25-Aug-10	41	500	455	7.68	39	6	#N/A	1
1-Sep-10	42	500	450	7.64	30	5	#N/A	1
8-Sep-10	43	500	445	7.62	30	5	#N/A	1
15-Sep-10	44	500	430	7.71	28	5	#N/A	1
Comp; week 41 to 44		5						
22-Sep-10	45	500	455	7.48	32	6	#N/A	1
29-Sep-10	46	500	435	7.51	27	5	#N/A	1
6-Oct-10	47	500	455	7.69	28	6	#N/A	1
13-Oct-10	48	500	450	7.43	33	6	#N/A	1
Comp; week 45 to 48		6						
20-Oct-10	49	500	460	7.53	38	8	#N/A	1
27-Oct-10	50	500	470	7.42	37	5	#N/A	1
3-Nov-10	51	500	430	7.47	37	5	#N/A	1
10-Nov-10	52	500	450	7.45	33	5	#N/A	1
Comp; week 49 to 52		6						
17-Nov-10	53	500	455	7.46	34	6	#N/A	1
24-Nov-10	54	500	490	7.40	39	6	#N/A	1
1-Dec-10	55	500	445	7.47	32	6	#N/A	1

Method:				pH Meter	EC Meter	Auto Turbidity	Titration & Calculation	
Sampling Date	Week No.	Input Vol.	Output Vol.	pH	EC	Sulphate	Acidity (mg CaCO3/L)	
Units		ml	ml	pH Units	µS/cm	mg/L	to pH 4.5	to pH 8.3
Detection Limits		5	5	0.5	0.5	1	0.5	0.5
8-Dec-10	56	500	435	7.52	32	5	#N/A	1
Comp; week 53 to 56		6						
15-Dec-10	57	500	440	7.45	31	5	#N/A	1
22-Dec-10	58	500	445	7.54	32	8	#N/A	1
29-Dec-10	59	500	430	7.30	29	5	#N/A	1
5-Jan-11	60	500	430	7.41	32	6	#N/A	1
Comp; week 57 to 60		6						
12-Jan-11	61	500	440	7.38	37	4	#N/A	1
19-Jan-11	62	500	425	7.45	32	7	#N/A	1
26-Jan-11	63	500	425	7.58	33	6	#N/A	1
2-Feb-11	64	500	465	7.45	32	7	#N/A	1
Comp; week 61 to 64		6						
9-Feb-11	65	500	440	7.39	31	6	#N/A	1
16-Feb-11	66	500	420	7.55	31	6	#N/A	1
23-Feb-11	67	500	460	7.48	32	2	#N/A	<1
2-Mar-11	68	500	425	7.47	31	5	#N/A	<1
Comp; week 65 to 68		5						
9-Mar-11	69	500	500	7.35	39	5	#N/A	1
16-Mar-11	70	500	430	7.34	30	7	#N/A	1
23-Mar-11	71	500	435	7.48	33	5	<0.5	<0.5
30-Mar-11	72	500	430	7.41	30	4	<0.5	1
Comp; week 69 to 72		5						
6-Apr-11	73	500	455	7.35	32	5	<0.5	<0.5
13-Apr-11	74	500	425	7.20	31	4	<0.5	<0.5
20-Apr-11	75	500	440	7.31	29	4	<0.5	<0.5
27-Apr-11	76	500	440	7.20	28	4	<0.5	<0.5
Comp; week 73 to 76		4						
4-May-11	77	500	435	7.20	29	3	<0.5	<0.5
11-May-11	78	500	435	7.25	28	5	<0.5	<0.5
18-May-11	79	500	415	7.23	27	5	<0.5	<0.5
25-May-11	80	500	420	7.45	26	4	<0.5	<0.5
Comp; week 77 to 80		4						
1-Jun-11	81	500	455	7.15	34	7	<0.5	<0.5
8-Jun-11	82	500	435	7.37	26	3	<0.5	<0.5
15-Jun-11	83	500	445	7.19	29	5	<0.5	<0.5
22-Jun-11	84	500	440	7.35	31	4	<0.5	1
Comp; week 81 to 84		5						

Method:				pH Meter	EC Meter	Auto Turbidity	Titration & Calculation	
Sampling Date	Week No.	Input Vol.	Output Vol.	pH	EC	Sulphate	Acidity (mg CaCO ₃ /L)	
Units		ml	ml	pH Units	µS/cm	mg/L	to pH 4.5	to pH 8.3
Detection Limits		5	5	0.5	0.5	1	0.5	0.5
29-Jun-11	85	500	435	7.42	31	5	<0.5	<0.5
6-Jul-11	86	500	450	7.25	30	5	<0.5	<0.5
13-Jul-11	87	500	425	7.26	28	3	<0.5	<0.5
20-Jul-11	88	500	445	7.16	38	5	<0.5	1
Comp; week 85 to 88						5		
27-Jul-11	89	500	430	7.28	36	5	<0.5	<0.5
3-Aug-11	90	500	455	7.24	38	4	<0.5	<0.5
10-Aug-11	91	500	435	7.27	34	5	<0.5	<0.5
17-Aug-11	92	500	435	7.36	33	4	<0.5	<0.5
Comp; week 89 to 92						4		
24-Aug-11	93	500	445	7.30	38	5	<0.5	2
31-Aug-11	94	500	435	7.31	38	4	<0.5	<0.5
7-Sep-11	95	500	455	7.29	30	4	<0.5	<0.5
14-Sep-11	96	500	440	7.10	30	5	<0.5	<0.5
Comp; week 93 to 96						5		
21-Sep-11	97	500	475	7.11	34	4	<0.5	<0.5
28-Sep-11	98	500	460	7.15	33	4	<0.5	<0.5
5-Oct-11	99	500	420	7.17	30	5	<0.5	<0.5
12-Oct-11	100	500	420	7.12	35	4	<0.5	<0.5
Comp; week 97 to 100						4		
19-Oct-11	101	500	445	7.11	35	4	<0.5	<0.5
26-Oct-11	102	500	440	7.27	35	4	<0.5	<0.5
2-Nov-11	103	500	430	7.00	37	5	<0.5	0.6
9-Nov-11	104	500	455	7.28	35	3	<0.5	<0.5
Comp; week 101 to 104						4		
16-Nov-11	105	500	425	7.61	37			
23-Nov-11	106	500	460	7.36	38			
30-Nov-11	107	500						
7-Dec-11	108	500						
Comp; week 105 to 108								

Note: Proposed no of weeks of testing is 28 weeks

Continue until further notice as per email from Patsy Moran dated 10-Nov-10.

Leachates stored in cold room to be run remember to charge on Mar invoice (email Patsy Moran 26-Mar-11)

Please also analyze the additional metal leachates as they are produced (email Patsy Moran 26-Mar-11)

Sulphate (by Colourimetry), Acidity & Alkalinity (by PC Titrator) is now done by water lab at Maxxam from 23-Mar-11.

Titration & Calculation	Calculated from Ca & Mg	Dissolved Metals by ICP-MS					
Total Alkalinity (to pH 4.5)	Hardness as CaCO3	Al	Sb	As	Ba	Be	Bi
mg CaCO3/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
0.5	0.2	0.001	0.0001	0.0002	0.0002	0.0001	0.0001
18	22.3	0.091	0.0014	0.013	0.002	<0.0001	<0.0001
19							
20							
15							
18	19	0.056	0.0026	0.049	0.0024	<0.0001	<0.0001
16							
16							
16							
17							
16	17	0.058	0.0021	0.067	0.0011	<0.0001	<0.0001
15							
13							
11							
12							
13	19	0.056	0.0013	0.055	0.001	<0.0001	<0.0001
12							
11							
11							
11							
11	18	0.048	0.0011	0.035	0.0008	<0.0001	<0.0001
13							
13							
10							
13							
12	16	0.086	0.0008	0.032	0.001	<0.0001	<0.0001
12							
12							
12							
12							
12	15	0.076	0.00068	0.0254	0.00087	<0.00001	<0.000005
12							

Titration & Calculation	Calculated from Ca & Mg	Dissolved Metals by ICP-MS					
Total Alkalinity (to pH 4.5)	Hardness as CaCO3	Al	Sb	As	Ba	Be	Bi
mg CaCO3/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
0.5	0.2	0.001	0.0001	0.0002	0.0002	0.0001	0.0001
13							
11							
11							
12	15	0.0583	0.00061	0.0208	0.00101	<0.00001	<0.000005
12							
10							
11							
11							
11	13	0.0686	0.00052	0.0181	0.00538	<0.00001	<0.000005
10							
12							
12							
10							
11	13	0.0466	0.00049	0.014	0.00051	<0.00001	<0.000005
11							
10							
11							
12							
11	13	0.0549	0.00048	0.0137	0.00069	<0.00001	<0.000005
12							
10							
10							
10							
11	14	0.0586	0.00045	0.0112	0.00301	<0.00001	<0.000005
11							
10							
10							
10							
10	13	0.0515	0.00041	0.00836	0.00133	<0.00001	0.000008
10							
11							
8							
10							
10	17	0.462	0.00045	0.0105	0.0251	0.00004	0.00001
10							
13							
10							

Titration & Calculation	Calculated from Ca & Mg	Dissolved Metals by ICP-MS					
Total Alkalinity (to pH 4.5)	Hardness as CaCO3	Al	Sb	As	Ba	Be	Bi
mg CaCO3/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
0.5	0.2	0.001	0.0001	0.0002	0.0002	0.0001	0.0001
10							
11	12	0.0483	0.00039	0.0115	0.00056	<0.00001	<0.000005
9							
11							
9							
9							
10	11	0.0432	0.00041	0.00904	0.00202	<0.00001	<0.000005
9							
9							
9							
10							
9	12	0.0435	0.00037	0.00824	0.0013	<0.00001	<0.000005
8							
8							
9							
8							
8	11	0.0406	0.00032	0.00825	0.00239	<0.00001	<0.000005
10							
8							
6							
6							
8	12	0.0428	0.00035	0.00726	0.00045	<0.00001	0.000007
7							
6							
6							
5							
6	10	0.0276	0.00029	0.00677	0.00109	<0.00001	<0.000005
6							
5							
6							
5							
6	12	0.0294	0.00029	0.00582	0.00217	<0.00001	<0.000005
6							
5							
7							
7							
6	13	0.0275	0.00036	0.00752	0.00133	<0.00001	0.000012

Titration & Calculation	Calculated from Ca & Mg	Dissolved Metals by ICP-MS					
Total Alkalinity (to pH 4.5)	Hardness as CaCO3	Al	Sb	As	Ba	Be	Bi
mg CaCO3/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
0.5	0.2	0.001	0.0001	0.0002	0.0002	0.0001	0.0001
6							
6							
5							
5							
6	13	0.0279	0.0003	0.00518	0.00081	<0.00001	<0.000005
7							
5							
6							
6							
6	12.5	0.0301	0.00039	0.00493	0.00037	<0.00001	<0.000005
6							
7							
6							
6							
6	13.6	0.0363	0.00028	0.00456	0.00048	<0.00001	0.000019
9							
7							
6							
7							
7	12.8	0.182	0.00033	0.00531	0.0412	<0.00001	<0.000005
7							
7							
6							
7							
7	12.8	0.0261	0.00033	0.00494	0.00079	<0.00001	<0.000005

B	Cs	Cd	Ca	Cr	Co	Cu	La	Fe
mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
0.005	0.0001	0.00001	0.01	0.0002	0.0001	0.0001	0.0001	0.01
0.09	0.0002	<0.00001	6.810	0.0003	0.0003	0.0023	<0.0001	0.02
0.035	0.0001	<0.00001	6.06	<0.0002	0.0003	0.0027	<0.0001	<0.01
0.02	<0.0001	<0.00001	5.48	<0.0002	0.0003	0.0019	<0.0001	<0.01
0.02	<0.0001	0.00001	6.46	<0.0002	0.0004	0.0009	<0.0001	<0.01
0.028	<0.0001	0.00002	6.26	<0.0002	0.0004	0.0012	<0.0001	<0.01
0.028	<0.0001	<0.00001	5.64	0.0002	0.0003	0.0022	<0.0001	<0.01
<0.05	0.00009	0.000037	5.19	<0.0001	0.000206	0.0007	<0.00005	0.002

B	Cs	Cd	Ca	Cr	Co	Cu	La	Fe
mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
0.005	0.0001	0.00001	0.01	0.0002	0.0001	0.0001	0.0001	0.01
<0.05	0.00007	0.000008	5.48	<0.0001	0.000241	0.00045	<0.00005	<0.001
<0.05	<0.00005	0.00002	4.57	0.0001	0.000183	0.00049	<0.00005	<0.001
<0.05	<0.00005	0.000017	4.85	0.0002	0.000193	0.00105	<0.00005	0.002
<0.05	<0.00005	0.000024	4.71	0.0001	0.000182	0.00205	<0.00005	0.003
<0.05	<0.00005	0.000012	4.86	0.0001	0.000205	0.00221	<0.00005	0.004
<0.05	0.00006	0.000021	4.48	0.0001	0.000178	0.00075	<0.00005	0.002
<0.05	0.00005	0.000025	5.57	0.0002	0.000404	0.0054	0.0004	0.286

B	Cs	Cd	Ca	Cr	Co	Cu	La	Fe
mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
0.005	0.0001	0.00001	0.01	0.0002	0.0001	0.0001	0.0001	0.01
<0.05	<0.00005	0.000047	4.4	0.0002	0.000155	0.00075	<0.00005	0.002
<0.05	<0.00005	0.00001	4	0.0001	0.00012	0.00043	<0.00005	<0.001
<0.05	<0.00005	0.000019	4.05	0.0002	0.00015	0.0013	<0.00005	0.003
<0.05	<0.00005	0.000028	3.74	0.0003	0.000242	0.00175	<0.00005	0.003
<0.05	<0.00005	0.000016	4.08	<0.0001	0.000178	0.00045	<0.00005	0.006
<0.05	<0.00005	0.000031	3.5	0.0003	0.000377	0.00113	<0.00005	0.002
<0.05	<0.00005	0.000019	3.93	0.0001	0.000174	0.0009	<0.00005	0.002
<0.05	<0.00005	0.000061	4.34	0.0001	0.00026	0.00372	<0.00005	0.004

Pb	Li	Mg	Mn	P	Mo	Ni	Re	K
mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
0.00005	0.0001	0.005	0.0001	0.015	0.0001	0.0002	0.0001	0.01
0.00034	0.0018	1.28	0.019	<0.015	0.0008	0.0031	<0.0001	5.19
0.00015	0.0014	1.01	0.027	0.02	0.0009	0.0017	<0.0001	2.9
0.0006	0.001	0.89	0.011	0.03	0.0003	0.0005	<0.0001	1.3
0.00071	0.0008	0.75	0.012	<0.015	0.0002	0.0006	<0.0001	0.95
0.00078	0.0003	0.48	0.0071	<0.015	0.0002	0.0004	<0.0001	0.82
0.00045	0.0006	0.46	0.0045	<0.015	<0.0001	<0.0002	<0.0001	0.69
0.000523	<0.0005	0.38	0.00394	0.005	0.00008	0.00024	#N/A	0.57

Pb	Li	Mg	Mn	P	Mo	Ni	Re	K
mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
0.00005	0.0001	0.005	0.0001	0.015	0.0001	0.0002	0.0001	0.01
0.000569	<0.0005	0.41	0.0047	0.021	0.00007	0.00038	#N/A	0.47
0.0004	<0.0005	0.35	0.0043	0.016	0.00012	0.00018	#N/A	0.37
0.000461	<0.0005	0.33	0.00325	0.032	0.00008	0.00046	#N/A	0.34
0.000437	<0.0005	0.33	0.00311	0.024	0.00007	0.00199	#N/A	0.34
0.000586	<0.0005	0.34	0.00305	0.027	0.00049	0.00053	#N/A	0.32
0.000802	<0.0005	0.35	0.00344	0.08	0.00017	0.00038	#N/A	0.29
0.000909	0.0008	0.7	0.0346	0.189	0.00112	0.00052	#N/A	0.59

Pb	Li	Mg	Mn	P	Mo	Ni	Re	K
mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
0.00005	0.0001	0.005	0.0001	0.015	0.0001	0.0002	0.0001	0.01
0.00249	<0.0005	0.32	0.00221	0.079	0.00011	0.00033	#N/A	0.25
0.000325	<0.0005	0.31	0.0022	0.018	0.00009	0.0003	#N/A	0.25
0.000538	<0.0005	0.39	0.00241	0.194	0.00005	0.00059	#N/A	0.29
0.000481	<0.0005	0.34	0.00419	0.301	0.00005	0.00092	#N/A	0.25
0.00115	<0.0005	0.35	0.00224	<0.002	<0.00005	0.00018	#N/A	0.22
0.000434	<0.0005	0.36	0.00498	0.218	<0.00005	0.00131	#N/A	0.23
0.000448	<0.0005	0.4	0.0027	0.089	0.00012	0.00038	#N/A	0.22
0.000662	<0.0005	0.44	0.00252	0.268	0.00006	0.00168	#N/A	0.8

Rb	Se	Si	Ag	Na	Sr	Te	Tl
mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
0.0001	0.0002	0.05	0.00004	0.005	0.0001	0.0002	0.00002
0.0096	0.000	0.84	<0.00004	5.490	0.026	<0.0002	<0.00002
0.0053	<0.0002	0.88	<0.00004	3.35	0.017	<0.0002	<0.00002
0.003	<0.0002	0.81	<0.00004	1.47	0.012	<0.0002	<0.00002
0.0024	<0.0002	0.72	<0.00004	0.79	0.012	<0.0002	<0.00002
0.0023	<0.0002	0.62	<0.00004	0.45	0.012	<0.0002	<0.00002
0.0022	<0.0002	0.67	<0.00004	0.36	0.0084	<0.0002	<0.00002
0.00189	<0.00004	0.7	<0.000005	0.28	0.00875	<0.00002	0.000003

Rb	Se	Si	Ag	Na	Sr	Te	Tl
mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
0.0001	0.0002	0.05	0.00004	0.005	0.0001	0.0002	0.00002
0.00151	<0.00004	0.7	<0.000005	0.27	0.00767	<0.00002	0.000003
0.00118	<0.00004	0.6	<0.000005	0.22	0.00699	<0.00002	0.000002
0.00107	<0.00004	0.5	<0.000005	0.21	0.00676	<0.00002	<0.000002
0.00096	<0.00004	0.5	<0.000005	0.2	0.0248	<0.00002	<0.000002
0.00091	<0.00004	0.6	<0.000005	0.2	0.0449	<0.00002	0.000002
0.00081	<0.00004	0.5	<0.000005	0.24	0.0246	<0.00002	0.000013
0.00276	0.00008	1.1	0.000008	0.65	0.581	<0.00002	0.000005

Rb	Se	Si	Ag	Na	Sr	Te	Tl
mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
0.0001	0.0002	0.05	0.00004	0.005	0.0001	0.0002	0.00002
0.00061	0.00009	0.5	<0.000005	0.22	0.00466	<0.00002	<0.000002
0.0007	<0.00004	0.4	<0.000005	0.15	0.00416	<0.00002	<0.000002
0.00064	<0.00004	0.4	<0.000005	0.3	0.00424	<0.00002	<0.000002
0.00082	<0.00004	0.4	<0.000005	0.35	0.0841	<0.00002	<0.000002
0.00076	<0.00004	0.4	<0.000005	0.11	0.00397	<0.00002	<0.000002
0.00067	<0.00004	0.3	<0.000005	0.29	0.00361	<0.00002	0.000006
0.00083	<0.00004	0.4	<0.000005	0.25	0.00382	<0.00002	0.000004
0.00123	<0.00004	0.4	<0.000005	0.65	0.0043	<0.00002	0.000002

Th	Sn	Ti	W	U	V	Zn	Zr
mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
0.00005	0.0001	0.0002	0.0001	0.00005	0.0001	0.001	0.0001
0.0001	<0.0001	0.0006	0.0009	0.00006	0.0006	0.004	<0.0001
<0.00005	<0.0001	<0.0002	0.0004	0.00006	0.0006	0.003	<0.0001
<0.00005	<0.0001	<0.0002	<0.0001	0.00008	0.0005	0.001	<0.0001
<0.00005	<0.0001	0.0002	<0.0001	<0.00005	0.0002	0.002	<0.0001
<0.00005	<0.0001	<0.0002	<0.0001	<0.00005	0.0002	0.002	<0.0001
<0.00005	<0.0001	<0.0002	<0.0001	<0.00005	0.0002	0.002	<0.0001
<0.000005	0.00009	<0.0005	0.00003	0.000014	<0.0002	0.0024	<0.0001

Th	Sn	Ti	W	U	V	Zn	Zr
mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
0.00005	0.0001	0.0002	0.0001	0.00005	0.0001	0.001	0.0001
<0.000005	0.00007	<0.0005	0.00003	0.000008	<0.0002	0.0016	<0.0001
<0.000005	0.00005	<0.0005	0.00003	0.000011	<0.0002	0.0016	<0.0001
<0.000005	0.00003	<0.0005	0.00003	0.00001	<0.0002	0.0025	<0.0001
<0.000005	0.00002	<0.0005	0.00003	0.000012	<0.0002	0.0024	<0.0001
<0.000005	0.00002	<0.0005	0.00003	0.000008	<0.0002	0.0034	<0.0001
<0.000005	0.00003	<0.0005	0.00004	0.000008	<0.0002	0.0054	<0.0001
0.000027	0.00025	0.007	0.00003	0.000097	0.0011	0.0052	<0.0001

Th	Sn	Ti	W	U	V	Zn	Zr
mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
0.00005	0.0001	0.0002	0.0001	0.00005	0.0001	0.001	0.0001
<0.000005	0.00001	<0.0005	0.00004	0.000007	<0.0002	0.0026	<0.0001
<0.000005	0.00002	<0.0005	0.00003	0.000004	<0.0002	0.0031	<0.0001
<0.000005	0.00002	<0.0005	0.00002	0.000006	<0.0002	0.0075	<0.0001
<0.000005	0.00002	<0.0005	0.00002	0.000004	<0.0002	0.0061	<0.0001
<0.000005	<0.00001	<0.0005	0.00002	0.000009	<0.0002	0.0017	<0.0001
<0.000005	0.00002	<0.0005	0.00003	0.000014	<0.0002	0.0085	<0.0001
<0.000005	0.00047	<0.0005	0.00001	0.000006	<0.0002	0.0071	<0.0001
<0.000005	0.00009	<0.0005	0.00003	0.000006	0.0002	0.0333	<0.0001

Ion Balance		
Anions	Cations	Balance (%)
0.63	0.83	-13.57
0.60	0.61	-0.70
0.48	0.45	2.66
0.45	0.45	0.31
0.43	0.40	4.16
0.38	0.36	2.34
0.39	0.33	8.37

Ion Balance		
Anions	Cations	Balance (%)
0.36	0.34	3.47
0.32	0.28	6.57
0.33	0.29	5.86
0.32	0.29	6.18
0.32	0.29	4.03
0.32	0.28	8.00
0.31	0.43	-15.74

Ion Balance		
Anions	Cations	Balance (%)
0.34	0.27	12.23
0.32	0.24	12.82
0.31	0.26	8.72
0.26	0.24	4.44
0.26	0.25	2.50
0.21	0.23	-2.96
0.20	0.25	-9.87
0.22	0.31	-16.27

Ion Balance		
Anions	Cations	Balance
		(%)

0.21 0.28 -15.17

0.22 0.27 -11.26

0.22 0.29 -14.13

0.23 0.29 -11.72

0.22 0.27 -12.02



Client: Vista Gold Corporation

Client Project Name: Mt. Todd

Cantest Project No: 2-21-954

HC-2 (Sample ID: VB08-026 332-336 S)

Method:				pH Meter	EC Meter	Auto Turbidity	Titration & Calculation	
Sampling Date	Week No.	Input Vol.	Output Vol.	pH	EC	Sulphate	Acidity (mg CaCO ₃ /L)	
Units		ml	ml	pH Units	µS/cm	mg/L	to pH 4.5	to pH 8.3
Detection Limits		5	5	0.5	0.5	1	0.5	0.5
18-Nov-09	1	750	635	8.24	103	20	#N/A	<1
25-Nov-09	2	500	450	8.45	107	27	#N/A	#N/A
2-Dec-09	3	500	450	8.03	71	17	#N/A	<1
9-Dec-09	4	500	425	7.96	51	11	#N/A	<1
Comp; week 1 to 4		19						
16-Dec-09	5	500	425	7.90	47	10	#N/A	1
23-Dec-09	6	500	425	8.67	48	7	#N/A	#N/A
30-Dec-09	7	500	415	7.89	65	12	#N/A	1
6-Jan-10	8	500	455	7.57	93	29	#N/A	1
Comp; week 5 to 8		15						
13-Jan-10	9	500	455	7.52	90	29	#N/A	1
20-Jan-10	10	500	440	7.44	83	25	#N/A	1
27-Jan-10	11	500	425	7.44	74	22	#N/A	1
3-Feb-10	12	500	430	7.55	69	21	#N/A	1
Comp; week 9 to 12		24						
10-Feb-10	13	500	440	7.64	68	20	#N/A	1
17-Feb-10	14	500	455	7.48	63	21	#N/A	1
24-Feb-10	15	500	445	7.43	59	19	#N/A	1
3-Mar-10	16	500	430	7.43	52	13	#N/A	1
Comp; week 13 to 16		18						
10-Mar-10	17	500	445	7.50	50	14	#N/A	1
17-Mar-10	18	500	445	7.66	48	11	#N/A	1
24-Mar-10	19	500	435	7.88	44	9	#N/A	1
31-Mar-10	20	500	460	7.45	50	12	#N/A	1
Comp; week 17 to 20		12						
7-Apr-10	21	500	455	7.41	45	11	#N/A	1
14-Apr-10	22	500	440	7.47	45	12	#N/A	1
21-Apr-10	23	500	465	7.40	43	9	#N/A	1
28-Apr-10	24	500	450	7.62	42	10	#N/A	1
Comp; week 21 to 24		11						
5-May-10	25	500	450	7.53	40	9	#N/A	1

Method:				pH Meter	EC Meter	Auto Turbidity	Titration & Calculation	
Sampling Date	Week No.	Input Vol.	Output Vol.	pH	EC	Sulphate	Acidity (mg CaCO3/L)	
Units		ml	ml	pH Units	µS/cm	mg/L	to pH 4.5	to pH 8.3
Detection Limits		5	5	0.5	0.5	1	0.5	0.5
12-May-10	26	500	490	7.41	43	8	#N/A	1
19-May-10	27	500	445	7.60	38	7	#N/A	1
26-May-10	28	500	445	7.55	38	9	#N/A	1
Comp; week 25 to 28		9						
2-Jun-10	29	500	485	7.40	42	7	#N/A	1
9-Jun-10	30	500	440	7.49	35	7	#N/A	1
16-Jun-10	31	500	435	7.75	37	7	#N/A	1
23-Jun-10	32	500	435	7.77	38	7	#N/A	1
Comp; week 29 to 32		7						
30-Jun-10	33	500	430	7.56	38	8	#N/A	1
7-Jul-10	34	500	435	7.74	37	8	#N/A	1
14-Jul-10	35	500	445	7.69	29	8	#N/A	1
21-Jul-10	36	500	440	7.62	31	7	#N/A	1
Comp; week 33 to 36		8						
28-Jul-10	37	500	440	7.77	32	8	#N/A	1
4-Aug-10	38	500	435	7.81	29	6	#N/A	<1
11-Aug-10	39	500	460	7.73	32	8	#N/A	1
18-Aug-10	40	500	440	7.74	34	8	#N/A	1
Comp; week 37 to 40		8						
25-Aug-10	41	500	465	7.57	43	8	#N/A	1
1-Sep-10	42	500	445	7.62	33	6	#N/A	1
8-Sep-10	43	500	440	7.64	34	5	#N/A	1
15-Sep-10	44	500	430	7.68	33	8	#N/A	1
Comp; week 41 to 44		7						
22-Sep-10	45	500	435	7.62	34	7	#N/A	1
29-Sep-10	46	500	455	7.56	33	7	#N/A	1
6-Oct-10	47	500	435	7.60	32	10	#N/A	1
13-Oct-10	48	500	450	7.46	34	8	#N/A	1
Comp; week 45 to 48		8						
20-Oct-10	49	500	450	7.47	40	11	#N/A	1
27-Oct-10	50	500	470	7.49	40	7	#N/A	1
3-Nov-10	51	500	425	7.51	37	6	#N/A	1
10-Nov-10	52	500	435	7.50	36	8	#N/A	1
Comp; week 49 to 52		8						
17-Nov-10	53	500	445	7.45	37	6	#N/A	1
24-Nov-10	54	500	445	7.36	42	9	#N/A	1
1-Dec-10	55	500	440	7.46	33	7	#N/A	1

Method:				pH Meter	EC Meter	Auto Turbidity	Titration & Calculation	
Sampling Date	Week No.	Input Vol.	Output Vol.	pH	EC	Sulphate	Acidity (mg CaCO3/L)	
Units		ml	ml	pH Units	µS/cm	mg/L	to pH 4.5	to pH 8.3
Detection Limits		5	5	0.5	0.5	1	0.5	0.5
8-Dec-10	56	500	445	7.47	40	8	#N/A	1
Comp; week 53 to 56		8						
15-Dec-10	57	500	435	7.51	39	7	#N/A	1
22-Dec-10	58	500	425	7.53	38	6	#N/A	1
29-Dec-10	59	500	435	7.56	37	7	#N/A	1
5-Jan-11	60	500	445	7.67	39	8	#N/A	1
Comp; week 57 to 60		7						
12-Jan-11	61	500	445	7.48	40	7	#N/A	1
19-Jan-11	62	500	415	7.58	41	9	#N/A	1
26-Jan-11	63	500	430	7.51	42	7	#N/A	1
2-Feb-11	64	500	450	7.41	41	7	#N/A	1
Comp; week 61 to 64		8						
9-Feb-11	65	500	425	7.37	38	9	#N/A	1
16-Feb-11	66	500	425	7.59	41	7	#N/A	1
23-Feb-11	67	500	460	7.57	44	4	#N/A	1
2-Mar-11	68	500	420	7.53	38	6	#N/A	<1
Comp; week 65 to 68		7						
9-Mar-11	69	500	440	7.29	44	7	#N/A	1
16-Mar-11	70	500	435	7.47	37	9	#N/A	1
23-Mar-11	71	500	440	7.55	44	7	<0.5	<0.5
30-Mar-11	72	500	445	7.45	38	5	<0.5	1
Comp; week 69 to 72		7						
6-Apr-11	73	500	450	7.49	43	7	<0.5	<0.5
13-Apr-11	74	500	450	7.27	39	5	<0.5	<0.5
20-Apr-11	75	500	440	7.43	35	5	<0.5	<0.5
27-Apr-11	76	500	445	7.37	39	6	<0.5	<0.5
Comp; week 73 to 76		6						
4-May-11	77	500	435	7.25	38	6	<0.5	<0.5
11-May-11	78	500	425	7.48	35	5	<0.5	<0.5
18-May-11	79	500	425	7.20	37	6	<0.5	<0.5
25-May-11	80	500	420	7.57	35	6	<0.5	<0.5
Comp; week 77 to 80		6						
1-Jun-11	81	500	445	7.31	39	6	<0.5	<0.5
8-Jun-11	82	500	435	7.40	35	5	<0.5	<0.5
15-Jun-11	83	500	435	7.19	38	8	<0.5	<0.5
22-Jun-11	84	500	445	7.39	39	6	<0.5	1
Comp; week 81 to 84		6						

Method:				pH Meter	EC Meter	Auto Turbidity	Titration & Calculation	
Sampling Date	Week No.	Input Vol.	Output Vol.	pH	EC	Sulphate	Acidity (mg CaCO3/L)	
Units		ml	ml	pH Units	µS/cm	mg/L	to pH 4.5	to pH 8.3
Detection Limits		5	5	0.5	0.5	1	0.5	0.5
29-Jun-11	85	500	440	7.46	38	6	<0.5	2
6-Jul-11	86	500	440	7.38	39	6	<0.5	<0.5
13-Jul-11	87	500	420	7.32	34	5	<0.5	<0.5
20-Jul-11	88	500	450	7.34	48	7	<0.5	<0.5
Comp; week 85 to 88						6		
27-Jul-11	89	500	450	7.28	43	6	<0.5	<0.5
3-Aug-11	90	500	445	7.39	48	6	<0.5	<0.5
10-Aug-11	91	500	440	7.41	42	6	<0.5	1
17-Aug-11	92	500	430	7.28	46	6	<0.5	<0.5
Comp; week 89 to 92						6		
24-Aug-11	93	500	440	7.40	49	7	<0.5	2
31-Aug-11	94	500	430	7.40	46	5	<0.5	<0.5
7-Sep-11	95	500	465	7.48	45	7	<0.5	<0.5
14-Sep-11	96	500	440	7.42	38	5	<0.5	<0.5
Comp; week 93 to 96						6		
21-Sep-11	97	500	480	7.25	52	8	<0.5	1
28-Sep-11	98	500	445	7.18	49	7	<0.5	<0.5
5-Oct-11	99	500	435	7.23	40	5	<0.5	<0.5
12-Oct-11	100	500	430	7.37	46	5	<0.5	1
Comp; week 97 to 100						6		
19-Oct-11	101	500	455	7.31	51	6	<0.5	<0.5
26-Oct-11	102	500	445	7.50	51	6	<0.5	<0.5
2-Nov-11	103	500	435	7.31	51	7	<0.5	<0.5
9-Nov-11	104	500	445	7.44	46	5	<0.5	<0.5
Comp; week 101 to 104						6		
16-Nov-11	105	500	430	7.68	46			
23-Nov-11	106	500	455	7.77	54			
30-Nov-11	107	500						
7-Dec-11	108	500						
Comp; week 105 to 108								

Note: Proposed no of weeks of testing is 28 weeks

Continue until further notice as per email from Patsy Moran dated 10-Nov-10.

Lechates stored in cold room to be run remember to charge on Mar invoice (email from Patsy Moran 26-Mar-11)

Please also analyze the additional metal leachates for Mt Todd as they are produced (email Patsy Moran 26-Mar-11)

Sulphate (by Colourimetry), Acidity & Alkalinity (by PC Titrator) is now done by water lab at Maxxam from 23-Mar-11.

Titration & Calculation	Calculated from Ca & Mg	Dissolved Metals by ICP-MS					
Total Alkalinity (to pH 4.5)	Hardness as CaCO ₃	Al	Sb	As	Ba	Be	Bi
mg CaCO ₃ /L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
0.5	0.2	0.001	0.0001	0.0002	0.0002	0.0001	0.0001
14	17	0.076	0.0011	0.021	0.001	<0.0001	<0.0001
15							
16							
13							
15	18	0.047	0.0016	0.047	0.0012	<0.0001	<0.0001
12							
13							
11							
14							
13	21	0.065	0.0011	0.054	0.0007	<0.0001	<0.0001
10							
10							
9							
9							
10	30	0.042	0.0005	0.033	0.0007	<0.0001	<0.0001
10							
10							
10							
9							
10	22	0.052	0.0005	0.03	0.0006	<0.0001	<0.0001
9							
10							
9							
10							
10	18	0.07	0.0003	0.018	0.0004	<0.0001	<0.0001
9							
9							
10							
9							
9	17	0.0485	0.00032	0.0158	0.00047	<0.00001	<0.000005
9							

Titration & Calculation	Calculated from Ca & Mg	Dissolved Metals by ICP-MS					
Total Alkalinity (to pH 4.5)	Hardness as CaCO3	Al	Sb	As	Ba	Be	Bi
mg CaCO3/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
0.5	0.2	0.001	0.0001	0.0002	0.0002	0.0001	0.0001
12							
10							
11							
11	16	0.0689	0.00029	0.0143	0.00084	<0.00001	<0.000005
12							
9							
10							
10							
10	15	0.0594	0.00024	0.0101	0.00087	<0.00001	<0.000005
10							
10							
10							
9							
10	15	0.0521	0.00019	0.00798	0.0003	<0.00001	<0.000005
11							
10							
11							
12							
11	15	0.0669	0.0002	0.00776	0.00106	<0.00001	<0.000005
11							
10							
10							
11							
11	16	0.0824	0.00019	0.00623	0.00085	<0.00001	<0.000005
10							
10							
11							
10							
10	15	0.064	0.00018	0.00484	0.00394	<0.00001	<0.000005
10							
11							
10							
10							
10	15	0.0832	0.00019	0.00547	0.00403	<0.00001	<0.000005
10							
12							
11							

Titration & Calculation	Calculated from Ca & Mg	Dissolved Metals by ICP-MS					
Total Alkalinity (to pH 4.5)	Hardness as CaCO3	Al	Sb	As	Ba	Be	Bi
mg CaCO3/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
0.5	0.2	0.001	0.0001	0.0002	0.0002	0.0001	0.0001
11							
11	15	0.066	0.00015	0.00614	0.00048	<0.00001	<0.000005
10							
10							
10							
11							
10	14	0.0529	0.00014	0.00318	0.00233	<0.00001	<0.000005
9							
9							
11							
10							
10	15	0.0531	0.00014	0.00547	0.00136	<0.00001	<0.000005
10							
11							
12							
10							
11	15	0.0571	0.00014	0.00468	0.00201	<0.00001	<0.000005
10							
10							
8							
7							
9	15	0.0506	0.00013	0.00451	0.00035	<0.00001	<0.000005
9							
8							
7							
8							
8	14	0.0548	0.00013	0.00418	0.00078	<0.00001	<0.000005
7							
6							
8							
7							
7	15	0.0488	0.00012	0.0038	0.00159	<0.00001	<0.000005
7							
8							
7							
7							
7	15	0.0454	0.00017	0.00487	0.00075	<0.00001	<0.000005

Titration & Calculation	Calculated from Ca & Mg	Dissolved Metals by ICP-MS					
Total Alkalinity (to pH 4.5)	Hardness as CaCO3	Al	Sb	As	Ba	Be	Bi
mg CaCO3/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
0.5	0.2	0.001	0.0001	0.0002	0.0002	0.0001	0.0001
9							
8							
7							
7							
8	17	0.0487	0.00013	0.0039	0.00091	<0.00001	<0.000005
7							
8							
8							
7							
7	16.2	0.043	0.00013	0.00313	0.00043	<0.00001	<0.000005
7							
9							
11							
8							
9	18.2	0.043	0.00013	0.00337	0.00036	<0.00001	<0.000005
11							
9							
9							
10							
10	17.8	0.0556	0.00013	0.00399	0.00624	<0.00001	<0.000005
10							
11							
10							
11							
11	18.5	0.0451	0.00015	0.00367	0.00053	<0.00001	<0.000005

B	Cs	Cd	Ca	Cr	Co	Cu	La	Fe
mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
0.005	0.0001	0.00001	0.01	0.0002	0.0001	0.0001	0.0001	0.01
0.038	0.0003	<0.00001	4.47	0.0002	0.0003	0.0019	<0.0001	0.02
0.019	0.0001	<0.00001	4.61	<0.0002	0.0002	0.0032	<0.0001	<0.01
0.012	0.0001	<0.00001	5.43	<0.0002	0.0003	0.0038	<0.0001	<0.01
0.008	0.0001	<0.00001	8.12	<0.0002	0.0004	0.0009	<0.0001	<0.01
0.008	0.0001	0.00002	6.35	<0.0002	0.0003	0.001	<0.0001	<0.01
<0.005	<0.0001	<0.00001	4.88	0.0003	0.0002	0.0009	<0.0001	<0.01
<0.05	0.00012	<0.000005	4.43	<0.0001	0.000168	0.00132	<0.00005	0.002

B	Cs	Cd	Ca	Cr	Co	Cu	La	Fe
mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
0.005	0.0001	0.00001	0.01	0.0002	0.0001	0.0001	0.0001	0.01
<0.05	0.0001	<0.000005	4.26	<0.0001	0.000136	0.00452	<0.00005	0.002
<0.05	0.00007	<0.000005	3.75	0.0003	0.000122	0.00088	<0.00005	0.001
<0.05	0.00005	0.000006	3.71	<0.0001	0.000083	0.00206	<0.00005	0.003
<0.05	<0.00005	0.000029	3.82	0.0001	0.000057	0.00271	<0.00005	0.008
<0.05	<0.00005	0.000018	3.89	<0.0001	0.000156	0.00348	<0.00005	0.004
<0.05	<0.00005	0.000017	3.55	0.0002	0.00006	0.0008	<0.00005	0.002
<0.05	<0.00005	0.000011	3.7	0.0001	0.000111	0.00479	<0.00005	0.003

B	Cs	Cd	Ca	Cr	Co	Cu	La	Fe
mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
0.005	0.0001	0.00001	0.01	0.0002	0.0001	0.0001	0.0001	0.01
<0.05	<0.00005	0.000035	3.63	0.0001	0.000049	0.00068	<0.00005	0.001
<0.05	<0.00005	0.000084	3.43	0.0002	0.000159	0.00206	<0.00005	0.009
<0.05	<0.00005	<0.000005	3.34	0.0001	0.000037	0.00086	<0.00005	0.002
<0.05	<0.00005	0.000043	3.51	0.0003	0.00072	0.00078	<0.00005	0.003
<0.05	<0.00005	<0.000005	3.43	<0.0001	0.000045	0.00052	<0.00005	<0.001
<0.05	<0.00005	0.000013	2.95	0.0002	0.000184	0.00117	<0.00005	0.004
<0.05	<0.00005	0.000008	3.41	0.0003	0.000059	0.00107	<0.00005	0.002
<0.05	<0.00005	0.000034	3.39	0.0001	0.000091	0.00211	<0.00005	0.003

Pb	Li	Mg	Mn	P	Mo	Ni	Re	K
mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
0.00005	0.0001	0.005	0.0001	0.015	0.0001	0.0002	0.0001	0.01
0.0001	0.0013	1.42	0.019	<0.015	0.0009	0.006	<0.0001	7.73
<0.00005	0.001	1.53	0.039	0.02	0.0014	0.001	<0.0001	4.27
0.00069	0.001	1.92	0.021	0.02	0.0005	0.0008	<0.0001	2.01
<0.00005	0.0008	2.27	0.027	<0.015	0.0001	0.0006	<0.0001	1.49
0.00009	0.0004	1.42	0.018	<0.015	0.0001	0.0003	<0.0001	1.12
<0.00005	0.0004	1.38	0.013	<0.015	<0.0001	0.0002	<0.0001	0.85
0.000027	<0.0005	1.34	0.0123	0.007	0.00008	0.00024	#N/A	0.68

Pb	Li	Mg	Mn	P	Mo	Ni	Re	K
mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
0.00005	0.0001	0.005	0.0001	0.015	0.0001	0.0002	0.0001	0.01
0.00004	<0.0005	1.33	0.00877	0.039	0.00007	0.00036	#N/A	0.58
0.000028	<0.0005	1.34	0.0064	0.021	0.00013	0.00021	#N/A	0.51
0.000102	<0.0005	1.31	0.00289	0.033	0.00005	0.00034	#N/A	0.45
0.000365	<0.0005	1.39	0.00137	0.031	0.00007	0.00055	#N/A	0.45
0.000117	<0.0005	1.51	0.00243	0.026	0.00023	0.00084	#N/A	0.44
0.00368	<0.0005	1.41	0.0006	0.094	0.00012	0.00037	#N/A	0.41
0.000247	<0.0005	1.49	0.00076	0.145	0.00012	0.00085	#N/A	0.42

Pb	Li	Mg	Mn	P	Mo	Ni	Re	K
mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
0.00005	0.0001	0.005	0.0001	0.015	0.0001	0.0002	0.0001	0.01
0.000887	<0.0005	1.43	0.00067	0.028	0.0001	0.00026	#N/A	0.37
0.000277	<0.0005	1.44	0.00882	0.025	0.00006	0.0004	#N/A	0.37
0.000044	<0.0005	1.5	0.00055	0.166	0.00006	0.00036	#N/A	0.36
0.000046	<0.0005	1.57	0.00152	0.285	0.00019	0.00041	#N/A	0.34
0.000017	<0.0005	1.59	0.00097	<0.002	<0.00005	0.00016	#N/A	0.36
0.000047	<0.0005	1.63	0.00307	0.233	0.00008	0.00101	#N/A	0.29
0.00004	<0.0005	1.61	0.00157	0.163	0.00007	0.00047	#N/A	0.28
0.000194	<0.0005	1.53	0.00136	0.242	0.00006	0.00094	#N/A	0.56

Rb	Se	Si	Ag	Na	Sr	Te	Tl
mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
0.0001	0.0002	0.05	0.00004	0.005	0.0001	0.0002	0.00002
0.014	0.000	0.92	<0.00004	8.08	0.014	<0.0002	<0.00002
0.0079	<0.0002	0.98	<0.00004	5.7	0.01	<0.0002	<0.00002
0.005	<0.0002	0.94	<0.00004	1.94	0.0097	<0.0002	<0.00002
0.004	<0.0002	0.84	<0.00004	0.85	0.011	<0.0002	<0.00002
0.0034	<0.0002	0.75	<0.00004	0.41	0.0094	<0.0002	<0.00002
0.003	<0.0002	0.72	<0.00004	0.33	0.0053	<0.0002	<0.00002
0.00286	<0.00004	0.7	<0.000005	0.26	0.0051	<0.00002	0.000004

Rb	Se	Si	Ag	Na	Sr	Te	Tl
mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
0.0001	0.0002	0.05	0.00004	0.005	0.0001	0.0002	0.00002
0.00081	0.00006	0.5	<0.000005	0.11	0.00285	<0.00002	<0.000002
0.00105	<0.00004	0.5	<0.000005	0.11	0.00271	<0.00002	0.000003
0.00082	<0.00004	0.4	<0.000005	0.2	0.00292	<0.00002	<0.000002
0.00087	<0.00004	0.5	<0.000005	0.28	0.0285	<0.00002	0.000002
0.00079	<0.00004	0.4	<0.000005	0.07	0.00242	<0.00002	<0.000002
0.00088	<0.00004	0.4	<0.000005	0.25	0.00273	<0.00002	0.000005
0.00071	<0.00004	0.4	<0.000005	0.2	0.00234	<0.00002	<0.000002
0.00083	<0.00004	0.4	<0.000005	0.45	0.00244	<0.00002	0.000002

Th	Sn	Ti	W	U	V	Zn	Zr
mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
0.00005	0.0001	0.0002	0.0001	0.00005	0.0001	0.001	0.0001
<0.00005	<0.0001	0.0008	0.0002	<0.00005	0.0004	<0.001	0.0003
<0.00005	<0.0001	0.0003	<0.0001	<0.00005	0.0004	0.001	<0.0001
<0.00005	<0.0001	0.0003	<0.0001	0.00013	0.0006	<0.001	<0.0001
<0.00005	<0.0001	<0.0002	<0.0001	<0.00005	0.0003	0.002	<0.0001
<0.00005	<0.0001	<0.0002	<0.0001	<0.00005	0.0003	0.002	0.0001
<0.00005	<0.0001	<0.0002	<0.0001	<0.00005	0.0003	0.002	<0.0001
<0.000005	0.00011	<0.0005	0.00002	0.000023	0.0002	0.0009	<0.0001

Th	Sn	Ti	W	U	V	Zn	Zr
mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
0.00005	0.0001	0.0002	0.0001	0.00005	0.0001	0.001	0.0001
<0.000005	0.00018	<0.0005	0.00002	0.00003	0.0003	0.0005	<0.0001
<0.000005	0.00015	<0.0005	0.00001	0.000029	0.0002	0.0008	<0.0001
<0.000005	0.00002	<0.0005	<0.00001	0.000025	0.0003	0.0013	<0.0001
<0.000005	<0.00001	<0.0005	0.00001	0.00003	0.0002	0.0015	<0.0001
<0.000005	0.00002	<0.0005	0.00001	0.000021	0.0002	0.0023	<0.0001
<0.000005	0.00003	<0.0005	<0.00001	0.000014	<0.0002	0.0048	<0.0001
<0.000005	0.00003	<0.0005	<0.00001	0.000018	<0.0002	0.0035	<0.0001

Th	Sn	Ti	W	U	V	Zn	Zr
mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
0.00005	0.0001	0.0002	0.0001	0.00005	0.0001	0.001	0.0001
<0.000005	0.00002	<0.0005	<0.00001	0.000026	<0.0002	0.0017	<0.0001
<0.000005	0.00001	<0.0005	0.00007	0.000018	<0.0002	0.0119	<0.0001
<0.000005	0.00003	<0.0005	<0.00001	0.000011	<0.0002	0.0029	<0.0001
<0.000005	0.00002	<0.0005	0.0031	0.000017	<0.0002	0.0023	<0.0001
<0.000005	<0.00001	<0.0005	<0.00001	0.000005	<0.0002	0.0004	<0.0001
<0.000005	0.00002	<0.0005	<0.00001	0.000018	<0.0002	0.0078	<0.0001
<0.000005	0.00016	<0.0005	<0.00001	0.000011	<0.0002	0.009	<0.0001
<0.000005	0.00006	<0.0005	0.00002	0.000013	0.0003	0.0202	<0.0001

Th	Sn	Ti	W	U	V	Zn	Zr
mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
0.00005	0.0001	0.0002	0.0001	0.00005	0.0001	0.001	0.0001
<0.000005	0.00025	<0.0005	0.00003	0.000016	<0.0002	0.0173	<0.0001
<0.000005	0.00001	<0.0005	0.00002	0.000013	0.0002	0.0092	<0.0001
<0.000005	0.00004	<0.0005	<0.00001	0.000014	0.0002	0.0128	<0.0001
<0.000005	0.00005	<0.0005	<0.00001	0.000019	<0.0002	0.0103	<0.0001
<0.000005	0.00014	<0.0005	0.00003	0.000016	0.0002	0.0113	<0.0001

Ion Balance		
Anions	Cations	Balance
		(%)
0.70	0.90	-12.70
0.68	0.72	-2.83
0.55	0.57	-1.89
0.70	0.67	1.58
0.58	0.49	8.27
0.43	0.40	3.32
0.40	0.37	4.85

Ion Balance		
Anions	Cations	Balance (%)
0.39	0.35	4.71
0.35	0.33	3.34
0.36	0.32	5.80
0.38	0.33	6.39
0.35	0.35	0.67
0.37	0.32	7.60
0.37	0.34	4.76

Ion Balance		
Anions	Cations	Balance (%)
0.38	0.32	8.95
0.35	0.31	6.04
0.35	0.31	5.54
0.35	0.33	2.69
0.32	0.32	-0.07
0.28	0.31	-5.11
0.26	0.32	-11.98
0.27	0.34	-10.18

Ion Balance		
Anions	Cations	Balance (%)
0.28	0.36	-11.65
0.27	0.34	-11.69
0.30	0.38	-12.40
0.32	0.38	-7.46
0.33	0.40	-9.31



Client: Vista Gold Corporation

Client Project Name: Mt. Todd

Cantest Project No: 2-21-954

HC-3 (Sample ID: VB08-032 180-184 I)

Method:				pH Meter	EC Meter	Auto Turbidity	Titration & Calculation	
Sampling Date	Week No.	Input Vol.	Output Vol.	pH	EC	Sulphate	Acidity (mg CaCO ₃ /L)	
Units		ml	ml	pH Units	µS/cm	mg/L	to pH 4.5	to pH 8.3
Detection Limits		5	5	0.5	0.5	1	0.5	0.5
18-Nov-09	1	750	655	8.86	85	15	#N/A	#N/A
25-Nov-09	2	500	455	8.91	81	16	#N/A	#N/A
2-Dec-09	3	500	455	8.64	63	9	#N/A	#N/A
9-Dec-09	4	500	430	8.61	43	5	#N/A	#N/A
Comp; week 1 to 4						11		
16-Dec-09	5	500	420	8.81	41	6	#N/A	#N/A
23-Dec-09	6	500	425	8.83	38	3	#N/A	#N/A
30-Dec-09	7	500	420	8.96	34	3	#N/A	#N/A
6-Jan-10	8	500	450	8.06	54	9	#N/A	1
Comp; week 5 to 8						5		
13-Jan-10	9	500	455	8.12	53	12	#N/A	1
20-Jan-10	10	500	435	7.92	56	13	#N/A	1
27-Jan-10	11	500	440	8.12	50	13	#N/A	1
3-Feb-10	12	500	430	7.95	54	13	#N/A	1
Comp; week 9 to 12						13		
10-Feb-10	13	500	440	7.85	57	13	#N/A	1
17-Feb-10	14	500	455	7.81	56	18	#N/A	1
24-Feb-10	15	500	435	7.78	56	18	#N/A	1
3-Mar-10	16	500	435	7.51	49	11	#N/A	1
Comp; week 13 to 16						15		
10-Mar-10	17	500	435	7.50	54	16	#N/A	1
17-Mar-10	18	500	450	7.58	55	15	#N/A	1
24-Mar-10	19	500	440	7.55	43	8	#N/A	1
31-Mar-10	20	500	470	7.38	57	13	#N/A	1
Comp; week 17 to 20						13		
7-Apr-10	21	500	455	7.33	50	14	#N/A	1
14-Apr-10	22	500	455	7.43	52	16	#N/A	1
21-Apr-10	23	500	450	7.42	52	15	#N/A	1
28-Apr-10	24	500	450	7.45	50	15	#N/A	1
Comp; week 21 to 24						15		
5-May-10	25	500	455	7.36	49	15	#N/A	1

Method:				pH Meter	EC Meter	Auto Turbidity	Titration & Calculation	
Sampling Date	Week No.	Input Vol.	Output Vol.	pH	EC	Sulphate	Acidity (mg CaCO3/L)	
Units		ml	ml	pH Units	µS/cm	mg/L	to pH 4.5	to pH 8.3
Detection Limits		5	5	0.5	0.5	1	0.5	0.5
12-May-10	26	500	485	7.30	54	15	#N/A	1
19-May-10	27	500	440	7.40	45	13	#N/A	1
26-May-10	28	500	445	7.30	42	13	#N/A	1
Comp; week 25 to 28		14						
2-Jun-10	29	500	485	7.22	54	16	#N/A	1
9-Jun-10	30	500	430	7.20	34	10	#N/A	1
16-Jun-10	31	500	500	7.15	52	15	#N/A	1
23-Jun-10	32	500	445	7.15	40	11	#N/A	1
Comp; week 29 to 32		13						
30-Jun-10	33	500	440	7.14	32	9	#N/A	1
7-Jul-10	34	500	420	7.13	35	9	#N/A	1
14-Jul-10	35	500	450	7.18	33	13	#N/A	1
21-Jul-10	36	500	430	7.12	31	8	#N/A	1
Comp; week 33 to 36		10						
28-Jul-10	37	500	435	7.07	35	11	#N/A	1
4-Aug-10	38	500	430	7.13	29	8	#N/A	1
11-Aug-10	39	500	460	7.15	35	11	#N/A	1
18-Aug-10	40	500	435	7.10	34	10	#N/A	1
Comp; week 37 to 40		10						
25-Aug-10	41	500	445	7.14	41	10	#N/A	1
1-Sep-10	42	500	465	7.13	34	10	#N/A	1
8-Sep-10	43	500	440	7.11	32	7	#N/A	1
15-Sep-10	44	500	425	7.09	32	10	#N/A	1
Comp; week 41 to 44		9						
22-Sep-10	45	500	465	7.12	36	12	#N/A	1
29-Sep-10	46	500	455	7.04	33	10	#N/A	1
6-Oct-10	47	500	455	7.14	29	7	#N/A	1
13-Oct-10	48	500	450	6.91	34	11	#N/A	1
Comp; week 45 to 48		10						
20-Oct-10	49	500	480	6.93	38	14	#N/A	2
27-Oct-10	50	500	465	6.95	38	9	#N/A	1
3-Nov-10	51	500	440	6.86	37	9	#N/A	1
10-Nov-10	52	500	445	6.97	35	10	#N/A	1
Comp; week 49 to 52		11						
17-Nov-10	53	500	455	6.92	34	10	#N/A	1
24-Nov-10	54	500	455	6.97	36	8	#N/A	1

Method:				pH Meter	EC Meter	Auto Turbidity	Titration & Calculation	
Sampling Date	Week No.	Input Vol.	Output Vol.	pH	EC	Sulphate	Acidity (mg CaCO3/L)	
Units		ml	ml	pH Units	µS/cm	mg/L	to pH 4.5	to pH 8.3
Detection Limits		5	5	0.5	0.5	1	0.5	0.5
1-Dec-10	55	500	440	6.87	36	10	#N/A	1
8-Dec-10	56	500	455	6.90	38	10	#N/A	1
Comp; week 53 to 56		10						
15-Dec-10	57	500	440	6.85	34	9	#N/A	1
22-Dec-10	58	500	450	6.87	36	5	#N/A	2
29-Dec-10	59	500	435	6.91	32	8	#N/A	1
5-Jan-11	60	500	445	6.88	34	11	#N/A	1
Comp; week 57 to 60		8						
12-Jan-11	61	500	425	6.78	37	9	#N/A	1
19-Jan-11	62	500	420	6.86	34	10	#N/A	1
26-Jan-11	63	500	435	6.89	36	10	#N/A	1
2-Feb-11	64	500	460	6.84	35	10	#N/A	1
Comp; week 61 to 64		10						
9-Feb-11	65	500	445	7.07	31	9	#N/A	1
16-Feb-11	66	500	420	6.73	32	10	#N/A	1
23-Feb-11	67	500	460	6.81	36	6	#N/A	1
2-Mar-11	68	500	430	6.73	32	8	#N/A	1
Comp; week 65 to 68		8						
9-Mar-11	69	500	450	6.75	35	9	#N/A	1
16-Mar-11	70	500	430	6.79	30	10	#N/A	1
23-Mar-11	71	500	440	6.86	33	8	<0.5	<0.5
30-Mar-11	72	500	435	6.90	32	7	<0.5	1
Comp; week 69 to 72		9						
6-Apr-11	73	500	475	6.75	32	8	<0.5	<0.5
13-Apr-11	74	500	435	6.65	31	8	<0.5	<0.5
20-Apr-11	75	500	445	6.63	30	7	<0.5	<0.5
27-Apr-11	76	500	450	6.74	31	7	<0.5	<0.5
Comp; week 73 to 76		8						
4-May-11	77	500	440	6.60	30	8	<0.5	<0.5
11-May-11	78	500	440	6.70	28	8	<0.5	<0.5
18-May-11	79	500	430	6.64	26	7	<0.5	<0.5
25-May-11	80	500	420	6.65	27	8	<0.5	<0.5
Comp; week 77 to 80		8						
1-Jun-11	81	500	455	6.48	30	9	<0.5	<0.5
8-Jun-11	82	500	460	6.68	27	7	<0.5	<0.5
15-Jun-11	83	500	445	6.89	28	10	<0.5	<0.5

Method:				pH Meter	EC Meter	Auto Turbidity	Titration & Calculation	
Sampling Date	Week No.	Input Vol.	Output Vol.	pH	EC	Sulphate	Acidity (mg CaCO3/L)	
Units		ml	ml	pH Units	µS/cm	mg/L	to pH 4.5	to pH 8.3
Detection Limits		5	5	0.5	0.5	1	0.5	0.5
22-Jun-11	84	500	445	6.87	29	8	<0.5	1
Comp; week 81 to 84		9						
29-Jun-11	85	500	450	6.57	27	6	<0.5	1
6-Jul-11	86	500	440	6.50	29	8	<0.5	1
13-Jul-11	87	500	430	6.53	26	7	<0.5	1
20-Jul-11	88	500	445	6.38	32	9	<0.5	<0.5
Comp; week 85 to 88		8						
27-Jul-11	89	500	450	6.39	29	8	<0.5	<0.5
3-Aug-11	90	500	440	6.39	31	7	<0.5	<0.5
10-Aug-11	91	500	455	6.38	29	7	<0.5	<0.5
17-Aug-11	92	500	430	6.82	28	8	<0.5	<0.5
Comp; week 89 to 92		8						
24-Aug-11	93	500	450	6.54	30	8	<0.5	1
31-Aug-11	94	500	430	6.29	28	6	<0.5	<0.5
7-Sep-11	95	500	470	6.49	25	8	<0.5	1
14-Sep-11	96	500	440	6.50	23	7	<0.5	1
Comp; week 93 to 96		8						
21-Sep-11	97	500	445	6.20	31	8	<0.5	1
28-Sep-11	98	500	460	6.35	30	7	<0.5	<0.5
5-Oct-11	99	500	430	6.60	26	7	<0.5	<0.5
12-Oct-11	100	500	425	6.46	30	7	<0.5	<0.5
Comp; week 97 to 100		8						
19-Oct-11	101	500	445	6.38	30	8	<0.5	1
26-Oct-11	102	500	4.5	6.55	30	8	<0.5	<0.5
2-Nov-11	103	500	435	6.65	31	10	<0.5	<0.5
9-Nov-11	104	500	450	6.60	29	7	<0.5	<0.5
Comp; week 101 to 104		8						
16-Nov-11	105	500	450	6.59	35			
23-Nov-11	106	500	460	6.59	34			
30-Nov-11	107	500						
7-Dec-11	108	500						
Comp; week 105 to 108								

Note: Proposed no of weeks of testing is 28 weeks

Continue until further notice as per email from Patsy Moran dated 10-Nov-10.

Lechates stored in cold room to be run remember to charge on Mar invoice (email Patsy Moran 26-Mar-11)

Please also analyze the additional metal leachates as they are produced (email Patsy Moran 26-Mar-11)

Sulphate (by Colourimetry), Acidity & Alkalinity (by PC Titrator) is now done by water lab at Maxxam from 23-Mar-11.

Titration & Calculation	Calculated from Ca & Mg	Dissolved Metals by ICP-MS				
Total Alkalinity (to pH 4.5)	Hardness as CaCO ₃	Al	Sb	As	Ba	Be
mg CaCO ₃ /L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
0.5	0.2	0.001	0.0001	0.0002	0.0002	0.0001
17	20.9	0.12	0.0016	0.0051	0.002	<0.0001
19						
18						
16						
18	17	0.09	0.0016	0.013	0.0021	<0.0001
15						
14						
13						
17						
15	16	0.09	0.001	0.023	0.0007	<0.0001
14						
12						
11						
12						
12	20	0.072	0.0007	0.033	0.0007	<0.0001
11						
10						
10						
9						
10	20	0.083	0.0005	0.034	0.0006	<0.0001
9						
9						
8						
9						
9	20	0.071	0.0004	0.023	0.0008	<0.0001
8						
8						
7						
7						
8	18	0.0547	0.00033	0.0173	0.00075	<0.00001
7						

Titration & Calculation	Calculated from Ca & Mg	Dissolved Metals by ICP-MS				
Total Alkalinity (to pH 4.5)	Hardness as CaCO3	Al	Sb	As	Ba	Be
mg CaCO3/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
0.5	0.2	0.001	0.0001	0.0002	0.0002	0.0001
8						
7						
7						
7	18	0.0415	0.00027	0.014	0.00067	<0.00001
8						
6						
8						
6						
7	16	0.0283	0.00025	0.0113	0.0022	<0.00001
6						
6						
6						
6						
6	12	0.0217	0.00019	0.00886	0.00055	<0.00001
6						
6						
5						
5						
6	12	0.0245	0.00017	0.00831	0.00073	<0.00001
6						
5						
5						
6						
6	13	0.0301	0.00017	0.00676	0.003	<0.00001
5						
5						
6						
6						
6	12	0.0238	0.00014	0.0054	0.00133	<0.00001
5						
6						
5						
5						
5	12	0.0264	0.00013	0.00473	0.00088	<0.00001
5						
5						

Titration & Calculation	Calculated from Ca & Mg	Dissolved Metals by ICP-MS				
Total Alkalinity (to pH 4.5)	Hardness as CaCO3	Al	Sb	As	Ba	Be
mg CaCO3/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
0.5	0.2	0.001	0.0001	0.0002	0.0002	0.0001
5						
5						
5	10	0.0099	0.00011	0.00404	0.00133	<0.00001
4						
4						
4						
5						
4	10	0.0102	0.0001	0.00313	0.00216	<0.00001
4						
5						
4						
4						
4	10	0.0101	0.00009	0.00267	0.00129	<0.00001
4						
4						
4						
4						
4	10	0.0026	0.00008	0.00204	0.00087	<0.00001
4						
4						
2						
2						
3	10	0.0039	0.00006	0.00181	0.00109	<0.00001
1						
2						
1						
1						
1	10	0.0158	0.00006	0.00157	0.00383	<0.00001
1						
1						
2						
1						
1	9	0.0064	0.00005	0.0014	0.00212	<0.00001
1						
1						
1						

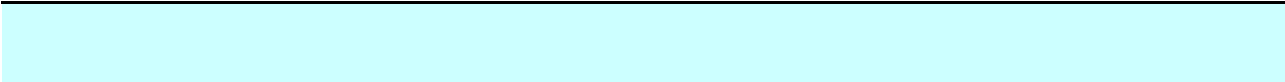
Titration & Calculation	Calculated from Ca & Mg	Dissolved Metals by ICP-MS				
Total Alkalinity (to pH 4.5)	Hardness as CaCO3	Al	Sb	As	Ba	Be
mg CaCO3/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
0.5	0.2	0.001	0.0001	0.0002	0.0002	0.0001
1						
1	9	0.0055	0.00006	0.00165	0.0023	<0.00001
1						
1						
2						
1						
1	10	0.0067	0.00005	0.00113	0.00277	<0.00001
<0.5						
1						
1						
1						
1	9.2	0.0478	0.00005	0.00081	0.00271	<0.00001
1						
2						
1						
1						
1	8.4	0.01	0.00004	0.00068	0.00349	0.00002
<0.5						
1						
1						
2						
1	16	0.0327	0.00004	0.00052	0.0429	0.00001
1						
2						
1						
2						
1	8.9	0.0131	0.00005	0.00076	0.0042	0.00001

Bi	B	Cs	Cd	Ca	Cr	Co	Cu	La
mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
0.0001	0.005	0.0001	0.00001	0.01	0.0002	0.0001	0.0001	0.0001
<0.0001	0.06	0.0002	<0.00001	6.13	0.0004	0.0002	0.0027	<0.0001
<0.0001	0.024	<0.0001	<0.00001	5.01	<0.0002	<0.0001	0.0032	<0.0001
<0.0001	0.02	<0.0001	<0.00001	5.16	<0.0002	<0.0001	0.001	<0.0001
<0.0001	0.021	<0.0001	<0.00001	7.1	<0.0002	0.0002	0.0005	<0.0001
<0.0001	0.02	<0.0001	<0.00001	7.45	<0.0002	0.0002	0.0006	<0.0001
<0.0001	0.019	<0.0001	<0.00001	6.99	0.0002	0.0003	0.0005	<0.0001
<0.000005	<0.05	0.00006	0.000023	6.34	<0.0001	0.000345	0.00055	<0.00005

Fe	Pb	Li	Mg	Mn	P	Mo	Ni	Re
mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
0.01	0.00005	0.0001	0.005	0.0001	0.015	0.0001	0.0002	0.0001
0.03	0.00022	0.0012	1.35	0.016	<0.015	0.0006	0.0017	<0.0001
<0.01	<0.00005	0.0012	1.07	0.024	0.02	0.001	0.0006	<0.0001
<0.01	0.00006	0.0006	0.7	0.013	0.03	0.0004	0.0002	<0.0001
<0.01	<0.00005	0.0005	0.63	0.021	<0.015	0.0001	0.0004	<0.0001
<0.01	<0.00005	<0.0001	0.46	0.024	<0.015	<0.0001	0.0003	<0.0001
<0.01	<0.00005	0.0006	0.56	0.027	<0.015	<0.0001	0.0002	<0.0001
0.002	0.00007	<0.0005	0.57	0.0304	0.009	<0.00005	0.00041	#N/A

Fe	Pb	Li	Mg	Mn	P	Mo	Ni	Re
mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
0.01	0.00005	0.0001	0.005	0.0001	0.015	0.0001	0.0002	0.0001
0.001	0.000079	<0.0005	0.67	0.0383	0.037	<0.00005	0.00049	#N/A
0.002	0.000053	<0.0005	0.71	0.051	0.014	<0.00005	0.00057	#N/A
0.005	0.00011	<0.0005	0.56	0.0409	0.025	<0.00005	0.00065	#N/A
0.006	0.000083	<0.0005	0.61	0.0502	0.028	<0.00005	0.0023	#N/A
0.009	0.000923	<0.0005	0.69	0.0593	0.024	0.00009	0.00087	#N/A
0.004	0.000614	<0.0005	0.65	0.058	0.09	<0.00005	0.00099	#N/A
0.004	0.000205	<0.0005	0.6	0.0565	0.151	0.00008	0.0011	#N/A

Fe	Pb	Li	Mg	Mn	P	Mo	Ni	Re
mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
0.01	0.00005	0.0001	0.005	0.0001	0.015	0.0001	0.0002	0.0001
0.003	0.0017	<0.0005	0.55	0.051	0.033	<0.00005	0.0013	#N/A
0.003	0.000063	<0.0005	0.54	0.05	0.017	<0.00005	0.00152	#N/A
0.004	0.000126	<0.0005	0.57	0.0594	0.233	<0.00005	0.00224	#N/A
0.002	0.000015	<0.0005	0.54	0.0765	<0.002	<0.00005	0.00296	#N/A
0.004	0.000059	<0.0005	0.55	0.0969	<0.002	<0.00005	0.00388	#N/A
0.017	0.00017	<0.0005	0.56	0.106	0.209	<0.00005	0.00724	#N/A
0.012	0.000106	0.0005	0.52	0.104	0.137	<0.00005	0.0064	#N/A



K	Rb	Se	Si	Ag	Na	Sr	Te	Tl
mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
0.01	0.0001	0.0002	0.05	0.00004	0.005	0.0001	0.0002	0.00002
8	0.016	0.000	1.06	<0.00004	3.03	0.020	<0.0002	<0.00002
4.38	0.009	<0.0002	0.92	<0.00004	1.49	0.014	<0.0002	<0.00002
1.58	0.0047	<0.0002	0.76	<0.00004	0.43	0.0087	<0.0002	<0.00002
1.3	0.0036	<0.0002	0.69	<0.00004	0.3	0.0094	<0.0002	<0.00002
1.09	0.0034	<0.0002	0.59	<0.00004	0.19	0.01	<0.0002	<0.00002
0.89	0.0031	<0.0002	0.64	<0.00004	0.2	0.0076	<0.0002	<0.00002
0.65	0.00286	<0.00004	0.7	<0.000005	0.14	0.00733	<0.00002	0.000004

K	Rb	Se	Si	Ag	Na	Sr	Te	Tl
mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
0.01	0.0001	0.0002	0.05	0.00004	0.005	0.0001	0.0002	0.00002
0.63	0.0023	<0.00004	0.7	<0.000005	0.15	0.00651	<0.00002	0.000004
0.75	0.00216	<0.00004	0.7	<0.000005	0.17	0.00591	<0.00002	0.000004
0.73	0.0023	<0.00004	0.6	<0.000005	0.14	0.00447	<0.00002	0.000004
0.68	0.00214	<0.00004	0.5	<0.000005	0.15	0.0071	<0.00002	0.000005
0.82	0.00191	<0.00004	0.7	<0.000005	0.17	0.0117	<0.00002	0.000005
0.86	0.00212	<0.00004	0.6	<0.000005	0.24	0.0106	<0.00002	0.000011
0.86	0.00212	0.00005	0.6	<0.000005	0.24	0.0133	<0.00002	0.000006

K	Rb	Se	Si	Ag	Na	Sr	Te	Tl
mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
0.01	0.0001	0.0002	0.05	0.00004	0.005	0.0001	0.0002	0.00002
0.78	0.00215	0.00005	0.5	<0.000005	0.14	0.00377	<0.00002	0.000004
0.73	0.00254	<0.00004	0.5	<0.000005	0.12	0.00376	<0.00002	0.000007
0.64	0.00265	<0.00004	0.5	<0.000005	0.27	0.00386	<0.00002	0.000007
0.57	0.00246	<0.00004	0.5	<0.000005	0.08	0.00356	<0.00002	0.000008
0.56	0.00243	<0.00004	0.6	<0.000005	0.09	0.00364	<0.00002	0.000009
0.49	0.00256	<0.00004	0.6	<0.000005	0.29	0.00354	<0.00002	0.000011
0.42	0.00246	<0.00004	0.5	<0.000005	0.18	0.00326	<0.00002	0.000007

K	Rb	Se	Si	Ag	Na	Sr	Te	Tl
mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
0.01	0.0001	0.0002	0.05	0.00004	0.005	0.0001	0.0002	0.00002
0.45	0.00249	<0.00004	0.6	<0.000005	0.21	0.00349	<0.00002	0.000011
0.42	0.00227	<0.00004	0.7	<0.000005	0.19	0.00332	<0.00002	0.00001
0.37	0.00207	0.0001	0.6	<0.000005	0.21	0.0041	<0.00002	0.000011
0.33	0.00224	<0.00004	0.6	<0.000005	0.18	0.00283	<0.00002	0.000012
0.63	0.00447	0.00018	0.6	<0.000005	0.34	0.986	<0.00002	0.000011
0.32	0.00216	<0.00004	0.7	<0.000005	0.44	0.00263	<0.00002	0.00001

Th	Sn	Ti	W	U	V	Zn	Zr
mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
0.00005	0.0001	0.0002	0.0001	0.00005	0.0001	0.001	0.0001
<0.00005	0.0008	0.0013	0.0003	<0.00005	0.0006	0.002	<0.0001
<0.00005	<0.0001	<0.0002	<0.0001	<0.00005	0.0005	0.001	<0.0001
<0.00005	<0.0001	<0.0002	<0.0001	0.00006	0.0006	<0.001	<0.0001
<0.00005	<0.0001	<0.0002	<0.0001	<0.00005	0.0005	0.001	<0.0001
<0.00005	<0.0001	<0.0002	<0.0001	<0.00005	0.0003	0.001	<0.0001
<0.00005	<0.0001	<0.0002	<0.0001	<0.00005	0.0003	0.002	<0.0001
<0.000005	0.00011	<0.0005	0.00001	0.000009	0.0003	0.0016	<0.0001

Th	Sn	Ti	W	U	V	Zn	Zr
mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
0.00005	0.0001	0.0002	0.0001	0.00005	0.0001	0.001	0.0001
<0.000005	0.00005	<0.0005	<0.00001	0.000008	<0.0002	0.0011	<0.0001
<0.000005	0.00022	<0.0005	<0.00001	0.00001	<0.0002	0.0015	<0.0001
<0.000005	0.00005	<0.0005	<0.00001	0.000006	0.0002	0.0017	<0.0001
<0.000005	0.00002	<0.0005	0.00001	0.000009	0.0002	0.0018	<0.0001
<0.000005	0.00002	<0.0005	<0.00001	0.000005	<0.0002	0.0034	<0.0001
<0.000005	0.00004	<0.0005	<0.00001	0.000005	<0.0002	0.0067	<0.0001
<0.000005	0.00004	<0.0005	0.00002	0.000005	<0.0002	0.0025	<0.0001

Th	Sn	Ti	W	U	V	Zn	Zr
mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
0.00005	0.0001	0.0002	0.0001	0.00005	0.0001	0.001	0.0001
<0.000005	<0.00001	<0.0005	<0.00001	0.000002	<0.0002	0.0028	<0.0001
<0.000005	0.00002	<0.0005	0.00005	<0.000002	<0.0002	0.0034	<0.0001
<0.000005	0.00002	<0.0005	<0.00001	<0.000002	<0.0002	0.0045	<0.0001
<0.000005	<0.00001	<0.0005	0.00002	<0.000002	<0.0002	0.0029	<0.0001
<0.000005	<0.00001	<0.0005	<0.00001	<0.000002	<0.0002	0.0042	<0.0001
<0.000005	0.00002	<0.0005	0.00002	0.000007	<0.0002	0.011	<0.0001
<0.000005	0.00006	<0.0005	<0.00001	<0.000002	<0.0002	0.0123	<0.0001

Th	Sn	Ti	W	U	V	Zn	Zr
mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
0.00005	0.0001	0.0002	0.0001	0.00005	0.0001	0.001	0.0001
<0.000005	0.00002	<0.0005	0.00002	0.000004	0.0002	0.0189	<0.0001
<0.000005	0.00002	<0.0005	<0.00001	0.000005	<0.0002	0.0151	<0.0001
<0.000005	0.00002	<0.0005	0.00002	0.000016	0.0003	0.0276	<0.0001
<0.000005	0.00004	<0.0005	0.00005	0.000011	0.0002	0.0248	<0.0001
<0.000005	0.00011	<0.0005	<0.00001	0.000051	<0.0002	0.0227	<0.0001
<0.000005	0.00008	<0.0005	0.00002	0.000012	0.0002	0.0254	<0.0001

Ion Balance		
Anions	Cations	Balance (%)
0.65	0.77	-8.20
0.58	0.53	5.22
0.40	0.39	2.43
0.51	0.46	5.00
0.51	0.46	5.76
0.45	0.44	1.12
0.46	0.39	8.01

Ion Balance		
Anions	Cations	Balance (%)
0.44	0.40	5.78
0.41	0.35	7.84
0.32	0.28	7.36
0.32	0.26	9.28
0.30	0.30	0.73
0.32	0.28	5.54
0.32	0.28	7.88

Ion Balance		
Anions	Cations	Balance (%)
0.31	0.24	12.78
0.26	0.23	4.79
0.29	0.24	10.06
0.25	0.22	7.17
0.24	0.22	3.37
0.18	0.23	-12.01
0.19	0.21	-6.09

Ion Balance		
Anions	Cations	Balance (%)
0.20	0.22	-3.08
0.18	0.22	-10.24
0.17	0.22	-11.00
0.18	0.19	-2.57
0.18	0.36	-32.11
0.18	0.21	-6.85



Client: Vista Gold Corporation

Client Project Name: Mt. Todd

Cantest Project No: 2-21-954

HC-1 (Sample ID: VB007-001 173-177 G)

Method:				pH Meter	EC Meter	Auto Turbidity	Titrat Calcu
Sampling Date	Week No.	Input Vol.	Output Vol.	pH	EC	Sulphate	Acid (mg Ca)
Units		ml	ml	pH Units	µS/cm	mg/L	to pH 4.5
Detection Limits		5	5	0.5	0.5	1	0.5
Comp; week 101 to 104						4	
16-Nov-11	105	500	425	7.61	37	4	<0.5
23-Nov-11	106	500	460	7.36	38	3	<0.5
30-Nov-11	107	500	465	7.37	37	4	<0.5
7-Dec-11	108	500	440	7.30	37	4	<0.5
Comp; week 105 to 108						4	
14-Dec-11	109	500	430	7.31	42	5	<0.5
21-Dec-11	110	500	435	7.25	34	5	<0.5
28-Dec-11	111	500	445	7.22	31	4	<0.5
4-Jan-12	112	500	440	6.98	29	4	<0.5
Comp; week 109 to 112						4	
11-Jan-12	113	500	440	7.16	32	4	<0.5
18-Jan-12	114	500	440	6.97	30	5	<0.5
25-Jan-12	115	500	440	7.35	26	4	<0.5
1-Feb-12	116	500	450	7.17	33	4	<0.5
Comp; week 113 to 116						4	
8-Feb-12	117	500	475	7.04	33	5	<0.5
15-Feb-12	118	500	430	7.38	31	4	<0.5
22-Feb-12	119	500	420	7.31	32	4	<0.5
29-Feb-12	120	500	425	7.33	22	4	<0.5
Comp; week 117 to 120						4	
7-Mar-12	121	500	420	7.33	21	4	<0.5
14-Mar-12	122	500	420	7.28	26	5	<0.5
21-Mar-12	123	500	415	7.41	27	5	<0.5
28-Mar-12	124	500	430	7.22	26	5	<0.5
Comp; week 121 to 124						5	
4-Apr-12	125	500	440	7.46	26	4	<0.5
11-Apr-12	126	500	435	7.46	27	4	<0.5
18-Apr-12	127	500	435	7.17	21	4	<0.5
25-Apr-12	128	500	425	7.33	29	4	<0.5
Comp; week 125 to 128						4	
2-May-12	129	500	445	7.40	30	4	<0.5

9-May-12	130	500	440	7.35	30	4	<0.5
16-May-12	131	500	415	7.35	31	4	<0.5
23-May-12	132	500	455	7.46	30	4	<0.5
Comp; week 129 to 132							4
30-May-12	133	500	435	7.44	29	4	<0.5
6-Jun-12	134	500	415	7.53	29	4	<0.5
13-Jun-12	135	500	445	7.49	28	4	<0.5
20-Jun-12	136	500	450	7.42	30	5	<0.5
Comp; week 133 to 136							4
27-Jun-12	137	500	425	7.42	30	4	<0.5
4-Jul-12	138	500	455	7.34	32	4	<0.5
11-Jul-12	139	500	415	7.42	34	5	<0.5
18-Jul-12	140	500	425	7.14	35	4	<0.5
Comp; week 137 to 140							4
25-Jul-12	141	500	425	7.40	36	3	<0.5
1-Aug-12	142	500	425	7.39	25	4	<0.5
8-Aug-12	143	500	435	7.30	30	3	<0.5
15-Aug-12	144	500	430	7.28	30	3	<0.5
Comp; week 141 to 144							4
22-Aug-12	145	500	470	7.31	29	3	<0.5
29-Aug-12	146	500	415	7.26	29	3	<0.5
5-Sep-12	147	500	425	7.26	30	4	<0.5
12-Sep-12	148	500	445	7.27	33	4	<0.5
Comp; week 145 to 148							3
19-Sep-12	149	500	455	7.19	30	3	<0.5
26-Sep-12	150	500	425	7.20	26	4	<0.5
3-Oct-12	151	500	420	7.32	24	5	<0.5
10-Oct-12	152	500	485	7.30	34	5	<0.5
Comp; week 149 to 152							4
17-Oct-12	153	500	430	7.15	27	5	<0.5
24-Oct-12	154	500	415	7.55	26	4	<0.5
31-Oct-12	155	500	435	7.34	28	5	<0.5
7-Nov-12	156	500	420	7.40	22	3	<0.5
Comp; week 153 to 156							4
14-Nov-12	157	500	415	7.25	22	4	<0.5
21-Nov-12	158	500	420	6.92	21	4	<0.5
28-Nov-12	159	500	450	6.84	24	4	<0.5
5-Dec-12	160	500	460	7.28	24	4	<0.5
Comp; week 157 to 160							4
12-Dec-12	161	500	485	7.25	24	4	<0.5
19-Dec-12	162	500	435	7.19	18	4	<0.5
26-Dec-12	163	500	445	7.25	21	5	<0.5
2-Jan-13	164	500	430	7.15	17	5	<0.5

Comp; week 161 to 164						4	
9-Jan-13	165	500	415	7.26	17	3	<0.5
16-Jan-13	166	500	490	7.22	23	4	<0.5
23-Jan-13	167	500	490	7.24	20	3	<0.5
30-Jan-13	168	500	440	7.16	18	4	<0.5
Comp; week 165 to 168						3	
6-Feb-13	169	500	425	7.25	17	3	<0.5
13-Feb-13	170	500	435	7.19	17	4	<0.5
20-Feb-13	171	500	425	7.17	17	3	<0.5
27-Feb-13	172	500	435	7.20	17	4	<0.5
Comp; week 169 to 172						4	
6-Mar-13	173	500	410	7.20	18	3	<0.5
13-Mar-13	174	500	430	7.16	19	4	<0.5
20-Mar-13	175	500	425	6.98	19	4	<0.5
27-Mar-13	176	500	420	7.17	25	6	<0.5
Comp; week 173 to 176						4	
3-Apr-13	177	500	445	7.31	25	4	<0.5
10-Apr-13	178	500	430	7.46	22	4	<0.5
17-Apr-13	179	500	420	7.37	16	3	<0.5
24-Apr-13	180	500	430	7.32	20	4	<0.5
Comp; week 177 to 180						4	
1-May-13	181	500	425	7.16	21	4	<0.5
8-May-13	182	500					
15-May-13	183	500					
22-May-13	184	500					
Comp; week 181 to 184							

Continue until further notice as per email from Patsy Moran dated 10-Nov-10.

Note: Proposed no of weeks of testing is 28 weeks

Lechates stored in cold room to be run remember to charge on Mar invoice (email from
Please also analyze the additional metal leachates for Mt Todd as they are produced (en
Sulphate (by Colourimetry), Acidity & Alkalinity (by PC Titrator) is now done by water lab at Ma

ion & lation	Titration & Calculation	Calculated from Ca & Mg	Dissolved Metals by ICP-MS				
dity CO3/L)	Total Alkalinity (to pH 4.5)	Hardness as CaCO3	Al	Sb	As	Ba	Be
to pH 8.3	mg CaCO3/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
0.5	0.5	0.2	0.001	0.0001	0.0002	0.0002	0.0001
	7	13	0.0261	0.00033	0.00494	0.00079	<0.00001
<0.5	6						
<0.5	7						
<0.5	7						
<0.5	5						
	6	12	0.0289	0.00031	0.00494	0.00567	<0.00001
<0.5	8						
<0.5	5						
<0.5	5						
0.5	7						
	6	10	0.0427	0.00028	0.00491	0.00043	<0.00001
<0.5	6						
<0.5	5						
2	5						
<0.5	6						
	6	11	0.0197	0.00026	0.00395	0.00053	<0.00001
<0.5	7						
1	4						
<0.5	6						
<0.5	5						
	5	12	0.0325	0.00024	0.00362	0.00055	<0.00001
<0.5	5						
<0.5	6						
<0.5	6						
<0.5	6						
	6	12	0.0251	0.00025	0.004	0.00103	<0.00001
<0.5	6						
<0.5	5						
<0.5	6						
0.9	5						
	6	12	0.0249	0.00025	0.00397	0.00048	<0.00001
<0.5	6						

<0.5	5						
<0.5	6						
<0.5	7						
	6	10	0.0182	0.00024	0.0037	0.00046	<0.00001
<0.5	5						
<0.5	6						
<0.5	6						
<0.5	5						
	6	10	0.0248	0.00023	0.00389	0.00037	<0.000010
0.67	6						
0.95	6						
0.55	7						
<0.5	7						
	6	13	0.0251	0.00025	0.004	0.00079	<0.000010
<0.5	7						
<0.5	7						
<0.5	6						
<0.5	6						
	6	12	0.0412	0.00021	0.00346	0.00047	<0.000010
<0.5	5						
0.7	5						
<0.5	5						
<0.5	6						
	5	11	0.0245	0.00024	0.00287	0.00203	<0.000010
<0.5	5						
0.6	6						
<0.5	5						
<0.5	7						
	6	14	0.0386	0.00026	0.00303	0.00081	<0.000010
<0.5	5						
<0.5	6						
<0.5	6						
<0.5	4						
	5	13	0.0262	0.00021	0.00303	0.0007	<0.000010
<0.5	6						
<0.5	5						
<0.5	8						
0.5	7						
	6	10	0.0216	0.00018	0.00218	0.0021	<0.000010
<0.5	8						
<0.5	4						
<0.5	6						
<0.5	5						

	6	9	0.027	0.00021	0.00279	0.00046	<0.000010
<0.5	5						
<0.5	7						
<0.5	7						
<0.5	4						
	6	10	0.0226	0.00019	0.00282	0.00045	<0.000010
<0.5	4						
<0.5	4						
<0.5	4						
<0.5	5						
	4	8	0.0242	0.00018	0.0026	0.00029	<0.000010
<0.5	5						
0.7	5						
<0.5	4						
<0.5	6						
	5	10	0.049	0.0002	0.00245	0.00053	<0.000010
<0.5	8						
<0.5	6						
<0.5	6						
<0.5	6						
	6	9	0.0217	0.00023	0.00261	0.00078	<0.000010
<0.5	5						

Patsy Moran 26-Mar-11)
nail from Patsy Moran 26-Mar-11)
xxam from 23-Mar-11.

<0.000005	<0.05	0.000133	0.0000175	3.29	<0.0001	0.00015	0.00092
<0.0000050	<0.050	0.000161	0.0000159	3.22	<0.00010	0.000111	0.00054
<0.0000050	<0.050	0.00019	0.000019	3.93	0.0002	0.000155	0.00183
<0.0000050	<0.050	0.00019	0.000014	3.13	<0.00010	0.000067	0.00084
<0.0000050	<0.050	0.000142	0.000021	3.43	0.00017	0.000158	0.00089
<0.0000050	<0.050	0.000075	0.000026	4.74	0.00022	0.000226	0.00084
0.000005	<0.050	0.000078	0.000017	4.23	0.00013	0.000197	0.00082
<0.0000050	<0.050	0.000082	0.00004	3.01	0.00012	0.00403	0.00123

<0.0000050	<0.050	0.000066	0.000018	2.72	0.00027	0.000258	0.00051

<0.0000050	<0.050	0.00007	0.000021	3.05	0.00011	0.000146	0.00059

<0.0000050	<0.050	0.000061	0.000017	2.55	0.00015	0.000165	0.00104

0.000015	<0.050	0.000077	0.000027	2.99	0.00028	0.000253	0.00127

<0.0000050	<0.050	0.00006	0.000021	2.92	<0.00010	0.000125	0.00074

La	Fe	Pb	Li	Mg	Mn	P	Mo	Ni
mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
0.0001	0.01	0.00005	0.0001	0.005	0.0001	0.015	0.0001	0.0002
<0.00005	0.002	0.000738	<0.0005	0.51	0.00262	0.111	0.00005	0.00044
<0.00005	0.001	0.000652	<0.0005	0.51	0.00185	0.061	0.00006	0.00027
0.00005	0.007	0.00146	<0.0005	0.49	0.00194	<0.002	0.00005	0.00025
<0.00005	0.003	0.00046	<0.0005	0.52	0.00172	0.084	0.00016	0.00038
<0.00005	0.005	0.000644	<0.0005	0.68	0.00245	0.059	0.00021	0.00049
<0.00005	0.009	0.0007	<0.0005	0.54	0.00403	0.064	0.0001	0.00112
<0.00005	0.0042	0.000794	<0.0005	0.554	0.00482	0.0604	0.000151	0.00063

<0.00005 0.002 0.000539 <0.0005 0.496 0.00471 0.0458 <0.00005 0.00039

<0.000050 0.0024 0.000514 <0.00050 0.506 0.00277 0.0479 <0.000050 0.00037

0.003 <0.000050 0.00057 <0.00050 0.647 0.00372 0.0442 0.000064 0.00078

<0.000050 0.0044 0.000309 <0.00050 0.903 0.00146 0.0021 0.000141 0.00031

0.0064 <0.000050 0.000603 <0.00050 0.569 0.00285 0.0448 <0.000050 0.00071

<0.000050 0.006 0.000626 <0.00050 0.542 0.00644 0.102 0.000061 0.00063

<0.000050 0.0078 0.000728 <0.00050 0.525 0.00698 0.0079 0.000236 0.00064

0.000289 0.0045 0.0002 0.00078 0.53 0.0399 0.0703 0.000583 0.00536

<0.000050	0.0046	0.000649	<0.00050	0.459	0.00498	0.0052	0.000069	0.00058

<0.000050	0.003	0.000448	<0.00050	0.517	0.00601	0.0281	<0.000050	0.00049

<0.000050	0.0058	0.000614	<0.00050	0.419	0.00566	0.0435	<0.000050	0.00037

0.000077	0.036	0.00271	<0.00050	0.551	0.00861	0.0024	0.000056	0.00052

<0.000050	0.0033	0.000345	<0.00050	0.509	0.0052	0.0031	<0.000050	0.00047

Re	K	Rb	Se	Si	Ag	Na	Sr	Te
mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
0.0001	0.01	0.0001	0.0002	0.05	0.00004	0.005	0.0001	0.0002
#N/A	0.23	0.00079	<0.00004	0.4	<0.000005	0.22	0.00376	<0.00002
#N/A	0.29	0.00194	<0.00004	0.3	<0.000005	0.25	0.00405	<0.00002
#N/A	0.41	0.00212	<0.00004	0.5	0.00001	0.1	0.00365	<0.00002
#N/A	0.26	0.00202	<0.00004	0.3	<0.000005	0.19	0.00363	<0.00002
#N/A	0.26	0.00188	<0.00004	0.3	<0.000005	0.3	0.00315	<0.00002
#N/A	0.27	0.00192	<0.00004	0.3	<0.000005	0.18	0.0044	<0.00002
#N/A	0.255	0.00193	<0.00004	0.37	<0.000005	0.177	0.00299	<0.00002

#N/A	0.201	0.00158	<0.00004	0.3	<0.000005	0.115	0.00286	<0.00002

#N/A	0.339	0.00148	<0.000040	0.3	<0.0000050	0.111	0.0025	<0.000020

#N/A	0.29	0.00246	<0.000040	0.32	<0.0000050	0.15	0.004	<0.000020

#N/A	0.24	0.00202	<0.000040	0.3	<0.0000050	0.088	0.00293	<0.000020

#N/A	0.183	0.0017	<0.000040	0.27	0.000021	0.272	0.00293	<0.000020

#N/A	0.189	0.00129	<0.000040	0.4	0.000008	0.237	0.0246	<0.000020

#N/A	0.183	0.00117	<0.000040	0.42	<0.0000050	0.349	0.00402	<0.000020

#N/A	0.196	0.00121	<0.000040	0.33	<0.0000050	0.168	0.00464	<0.000020

#N/A	0.145	0.00097	<0.000040	0.23	<0.0000050	0.172	0.00223	<0.000020

#N/A	0.157	0.00099	<0.000040	0.28	<0.0000050	0.118	0.00246	<0.000020

#N/A	0.145	0.00098	<0.000040	0.24	<0.0000050	0.124	0.00197	<0.000020

#N/A	4.55	0.00124	<0.000040	0.3	0.000011	0.101	0.00221	<0.000020

#N/A	0.186	0.00094	<0.000040	0.32	<0.0000050	0.084	0.00228	<0.000020

0.0000043	<0.000005	<0.0002	<0.0005	0.000013	0.000007	<0.0002	0.0125

0.0000035	<0.0000050	<0.00020	<0.00050	0.000027	0.0000077	0.00032	0.00361

0.000005	<0.0000050	<0.00020	<0.00050	0.000014	0.000005	<0.00020	0.00473

0.000004	<0.0000050	0.00022	<0.00050	0.000016	0.000007	<0.00020	0.004

0.000004	<0.0000050	<0.00020	0.00075	0.000019	0.000006	<0.00020	0.0053

0.000002	<0.0000050	<0.00020	<0.00050	0.000027	0.000096	<0.00020	0.0112

0.000002	<0.0000050	<0.00020	0.00088	0.000033	0.000014	<0.00020	0.0119

0.000006	<0.0000050	<0.00020	<0.00050	0.000015	0.00002	<0.00020	0.022

0.000003	<0.0000050	<0.00020	<0.00050	0.000018	0.000005	<0.00020	0.0127

0.000004	<0.0000050	<0.00020	<0.00050	0.00001	0.000003	<0.00020	0.00443

0.000003	<0.0000050	<0.00020	<0.00050	0.00002	0.000006	<0.00020	0.00275

0.000006	<0.0000050	0.00026	<0.00050	0.000013	0.000008	<0.00020	0.0049

0.000002	<0.0000050	<0.00020	<0.00050	0.000017	0.000012	<0.00020	0.00738

Zr
mg/L
0.0001

<0.0001

<0.0001

<0.0001

<0.0001

<0.0001

<0.0001

<0.0001

Ion Balance		
Anions	Cations	Balance (%)

0.22

0.27

-12.02

0.21

0.25

-9.06

0.21

0.23

-2.79

0.20

0.25

-10.01

0.19

0.26

-15.45

0.21

0.26

-10.61

0.20

0.25

-11.66

<0.0001	0.19 0.22 -5.84
<0.00010	0.20 0.22 -4.76
<0.00010	0.21 0.27 -12.33
<0.00010	0.20 0.25 -10.94
<0.00010	0.18 0.24 -14.59
<0.00010	0.20 0.30 -19.27
<0.00010	0.19 0.28 -18.16
<0.00010	0.21 0.21 0.16

0.00031	0.21	0.19	4.61
<0.00010	0.19	0.21	-5.46
<0.00010	0.16	0.17	-4.28
<0.00010	0.19	0.32	-25.72
<0.00010	0.20	0.20	0.47



Client: Vista Gold Corporation

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Client Project Name: Mt. Todd

Cantest Project No: 2-21-954

Sampling Date	Week	DI Water		Temperature °C
		pH (pH Units)	EC (µS/cm)	
Detection Limits		0.5	0.5	N/A
18-Nov-09	1	5.71	0.64	20.8
25-Nov-09	2	5.94	0.64	21.3
2-Dec-09	3	5.81	0.71	20.8
9-Dec-09	4	5.80	0.58	21.6
16-Dec-09	5	5.81	0.65	20.5
23-Dec-09	6	5.89	0.58	20.5
30-Dec-09	7	5.61	0.60	20.1
6-Jan-10	8	5.80	0.60	20.3
13-Jan-10	9	5.79	0.70	21.6
20-Jan-10	10	5.80	0.65	20.4
27-Jan-10	11	5.70	0.66	20.2
3-Feb-10	12	5.75	0.66	20.7
10-Feb-10	13	5.85	0.78	20.4
17-Feb-10	14	5.80	0.72	20.9
24-Feb-10	15	5.84	0.77	20.8
3-Mar-10	16	5.84	0.70	20.7
10-Mar-10	17	5.76	0.66	20.8
17-Mar-10	18	5.66	0.63	20.7
24-Mar-10	19	5.68	0.68	21.0
31-Mar-10	20	5.71	0.70	20.7
7-Apr-10	21	5.74	0.76	20.3
14-Apr-10	22	5.82	0.67	20.5
21-Apr-10	23	5.75	0.79	21.1
28-Apr-10	24	5.70	0.59	20.7
5-May-10	25	5.75	0.63	20.4
12-May-10	26	5.68	0.63	20.2
19-May-10	27	5.78	0.76	20.4
26-May-10	28	5.82	0.98	20.3
2-Jun-10	29	5.25	0.65	21.3
9-Jun-10	30	5.70	0.71	20.7
16-Jun-10	31	5.98	0.63	20.9
23-Jun-10	32	5.78	0.64	20.9
30-Jun-10	33	5.80	0.52	21.3
7-Jul-10	34	5.86	0.58	21.3
14-Jul-10	35	5.79	0.34	21.3
21-Jul-10	36	5.84	0.39	20.1
28-Jul-10	37	5.82	0.67	20.6

4-Aug-10	38	5.77	0.64	20.8
11-Aug-10	39	5.83	0.60	20.5
18-Aug-10	40	5.77	0.69	20.4
25-Aug-10	41	5.70	0.67	20.2
1-Sep-10	42	5.72	0.71	21.7
8-Sep-10	43	5.70	0.85	20.7
15-Sep-10	44	5.75	0.72	20.5
22-Sep-10	45	5.66	0.86	20.4
29-Sep-10	46	5.66	0.63	20.5
6-Oct-10	47	5.80	0.49	20.9
13-Oct-10	48	5.82	0.90	20.4
20-Oct-10	49	5.68	1.03	20.4
27-Oct-10	50	5.60	0.75	21.0
3-Nov-10	51	5.56	0.86	21.0
10-Nov-10	52	5.75	0.90	20.6
17-Nov-10	53	5.64	0.90	20.3
24-Nov-10	54	5.82	0.81	20.2
1-Dec-10	55	5.60	0.76	21.1
8-Dec-10	56	5.85	0.89	21.3
15-Dec-10	57	5.87	0.93	20.5
22-Dec-10	58	5.94	0.80	20.7
29-Dec-10	59	4.97	1.27	20.2
5-Jan-11	60	5.89	1.02	20.9
12-Jan-11	61	5.88	0.86	21.1
19-Jan-11	62	5.85	0.69	21.1
26-Jan-11	63	5.90	0.77	21.0
2-Feb-11	64	5.67	1.18	20.5
9-Feb-11	65	5.66	1.01	20.5
16-Feb-11	66	5.92	1.03	20.3
23-Feb-11	67	5.93	0.91	21.2
2-Mar-11	68	5.81	0.96	20.2
9-Mar-11	69	6.03	0.89	21.1
16-Mar-11	70	5.84	0.95	20.9
23-Mar-11	71	6.27	1.01	21.0
30-Mar-11	72	6.01	1.15	21.3
6-Apr-11	73	5.96	1.06	21.3
13-Apr-11	74	5.67	0.92	21.3
20-Apr-11	75	5.67	0.95	21.1
27-Apr-11	76	5.69	1.00	20.7
4-May-11	77	5.66	0.87	20.5
11-May-11	78	5.90	0.97	21.2
18-May-11	79	5.90	0.72	21.2
25-May-11	80	5.91	0.67	21.8
1-Jun-11	81	5.83	0.75	20.8
8-Jun-11	82	5.67	1.02	21.2
15-Jun-11	83	5.79	0.73	21.0
22-Jun-11	84	5.80	0.78	21.0
29-Jun-11	85	5.98	0.87	20.1

6-Jul-11	86	5.76	0.79	20.9
13-Jul-11	87	5.70	0.71	20.3
20-Jul-11	88	5.97	0.81	20.3
27-Jul-11	89	5.69	0.77	20.2
3-Aug-11	90	5.76	0.93	20.4
10-Aug-11	91	5.50	0.97	20.5
17-Aug-11	92	5.58	0.89	20.6
24-Aug-11	93	5.62	0.89	20.5
31-Aug-11	94	5.77	0.96	20.7
7-Sep-11	95	5.72	0.93	22.0
14-Sep-11	96	5.76	0.93	20.9
21-Sep-11	97	5.79	0.92	20.2
28-Sep-11	98	5.65	0.96	20.2
5-Oct-11	99	5.57	0.68	21.0
12-Oct-11	100	5.70	0.84	21.1
19-Oct-11	101	5.61	0.97	21.2
26-Oct-11	102	5.80	0.70	20.7
2-Nov-11	103	5.94	0.99	21.0
9-Nov-11	104	5.82	0.99	21.1
16-Nov-11	105	5.76	1.00	21.1
23-Nov-11	106	5.72	0.93	20.1
30-Nov-11	107			
7-Dec-11	108			

Sample List (sample IDs revised by client)

S. No.	Sample ID	Sample Wt. (kg)	Sample Type & Condition
Pail #1 of 10			
1	VB08-032 180-184 M	2.60	Dry Rock Core
2	VB08-032 356-360 M	2.26	Dry Rock Core
3	VB08-034 44-48 M	3.02	Dry Rock Core
4	VB08-034 228-232 M	2.10	Dry Rock Core
5	VB08-035 176-180 M	2.10	Dry Rock Core
6	VB08-035 220-224 M	1.85	Dry Rock Core
7	VB08-036 40-44 M	2.12	Dry Rock Core
Pail #2 of 10			
8	VB08-036 400-404 M	2.19	Dry Rock Core
	VB08-037 320-324 M*	2.12	Dry Rock Core
	VB08-037 320-324 M*	2.11	Dry Rock Core
9	VB08-038 48-52 M	2.50	Dry Rock Core
10	VB08-038 268-272 S	2.30	Dry Rock Core
11	VB08-039 416-420 M	2.51	Dry Rock Core
12	VB08-041 0-4 S	2.69	Dry Rock Core
Pail #3 of 10			
13	VB08-027 28-32 S	2.54	Dry Rock Core
14	VB08-027 100-104 S	1.36	Dry Rock Core
15	VB08-028 116-120 S	1.94	Dry Rock Core
16	VB08-028 332-336 M	2.90	Dry Rock Core
17	VB08-030 24-28 S	1.72	Dry Rock Core
18	VB08-030 492-496 M	2.45	Dry Rock Core
19	VB08-031 48-52 S	1.73	Dry Rock Core
Pail #4 of 10			
20	VB07-022 324-328 G	1.38	Dry Rock Core
21	VB07-022 328-332 G	2.51	Dry Rock Core
22	VB07-022 340-344 S	1.92	Dry Rock Core
23	VB08-026 32-36 S	3.41	Dry Rock Core
24	VB08-026 332-336 S	1.53	Dry Rock Core
25	VB08-026 376-380 S	2.72	Dry Rock Core
26	VB08-026 412-416 S	1.50	Dry Rock Core
Pail #5 of 10			
27	VB07-004 115-119 S	1.69	Dry Rock Core
28	VB07-006 76-80 M	1.85	Dry Rock Core
29	VB07-007 12-16 S	2.58	Dry Rock Core
30	VB07-009 62-66 G	3.00	Dry Rock Core
31	VB07-009 78-82 G	3.12	Dry Rock Core
32	VB007-002 12-16 M	2.59	Dry Rock Core

33	VB007-004 279-283 M	1.90	Dry Rock Core
Pail #6 of 10			
34	VB007-001 21-25 M	2.73	Dry Rock Core
35	VB007-001 89-93 G	2.42	Dry Rock Core
36	VB007-001 125-129 G	1.84	Dry Rock Core
37	VB007-001 153-156 G	2.40	Dry Rock Core
38	VB007-001 173-177 G	2.60	Dry Rock Core
39	VB007-001 181-185 G	2.84	Dry Rock Core
40	VB007-001 189-193 G	2.63	Dry Rock Core
41	VB007-001 193-197 G	2.46	Dry Rock Core
Pail #7 of 10			
42	VB07-017 206-210 S	2.24	Dry Rock Core
43	VB07-018 456-460 M	1.86	Dry Rock Core
44	VB07-020 8-12 G	2.21	Dry Rock Core
45	VB07-020 16-20 G	2.74	Dry Rock Core
46	VB07-021 176-180 M	1.04	Dry Rock Core
47	VB07-022 140-144 M	2.23	Dry Rock Core
48	VB07-022 312-316 G	1.57	Dry Rock Core
Pail #8 of 10			
49	VB07-013 67-71 M	2.28	Dry Rock Core
50	VB07-014 69.7-73.7 M	1.70	Dry Rock Core
51	VB07-014 229.7-233.7 S	1.65	Dry Rock Core
52	VB07-015 8-12 M	2.22	Dry Rock Core
53	VB07-017 6-10 M	2.45	Dry Rock Core
54	VB07-017 162-166 S	2.33	Dry Rock Core
55	VB08-028 20-24 S	2.66	Dry Rock Core
Pail #9 of 10			
56	VB07-010 217-221 G	2.47	Dry Rock Core
57	VB07-010 221-225 G	1.60	Dry Rock Core
58	VB07-010 261-265 G	2.19	Dry Rock Core
59	VB07-010 265-269 G	2.11	Dry Rock Core
60	VB07-010 301-305 G	1.73	Dry Rock Core
61	VB07-011 20-24 G	3.06	Dry Rock Core
62	VB07-012 2-6 S	2.27	Dry Rock Core
Pail #10 of 10			
63	VB07-009 24-28 G	2.43	Dry Rock Core
64	VB07-009 26-30 G	2.10	Dry Rock Core
65	VB07-009 30-34 G	2.44	Dry Rock Core
66	VB07-009 86-90 G	2.76	Dry Rock Core
67	VB07-009 106-110 G	2.19	Dry Rock Core
68	VB07-009 118-122 S	2.05	Dry Rock Core
69	VB07-010 57-61 M	3.06	Dry Rock Core

Total Wt. of Sample Rec'd: 156.1

Wt. of Sample >69Kg (for 69 samples) **87.1**

* Two bags have same Sample ID removed from test program.

See Patsy Moran's email dated 15-Sep-09.

Revised Sample ID	Cantest HC ID
VB08-032 180-184 I	HC-3
VB08-032 356-360 I	
VB08-034 44-48 I	
VB08-034 228-232 I	
VB08-035 176-180 I	
VB08-035 220-224 I	
VB08-036 40-44 I	
VB08-036 400-404 I	
VB08-037 320-324 M	remove from program
VB08-037 320-324 M	remove from program
VB08-038 48-52 I	
SAME	
VB08-039 416-420 I	
VB08-041 0-4 S	
SAME	
SAME	
SAME	
VB08-028 332-336 I	
SAME	
VB08-030 492-496 I	
SAME	
SAME	
SAME	
SAME	
SAME	
SAME	HC-2
SAME	
SAME	
SAME	
VB07-006 76-80 I	
SAME	
SAME	
SAME	
VB007-002 12-16 I	

VB007-004 279-283 I	
VB007-001 21-25 I	
SAME	
SAME	
SAME	
SAME	HC-1
SAME	
SAME	
SAME	
SAME	
VB07-018 456-460 I	
SAME	
SAME	
VB07-021 176-180 I	
VB07-022 140-144 I	
SAME	
VB07-013 67-71 I	
VB07-014 69.7-73.7 I	
SAME	
VB07-015 8-12 I	
VB07-017 6-10 I	
SAME	
SAME	
SAME	
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SAME	
SAME	
VB07-010 57-61 I	



Client: Vista Gold Corporation

Client Project Name: Mt. Todd

Cantest Project No: 2-21-954

**Particle Size Analysis on traction Size
Used for HCT Testing**

HC-1 (Sample ID: VB007-001 173-177 G)					
Screen		Mass (g)	% Retained		% Passing
Tyler Mesh	Opening (mm)		Interval	Cumulative	
5	4.00	165.4	66.4	66.4	33.6
9	2.00	48.1	19.3	85.7	14.3
20	0.841	22.6	9.1	94.8	5.2
35	0.425	7.0	2.8	97.6	2.4
60	0.250	2.8	1.1	98.7	1.3
115	0.125	0.0	0.0	98.7	1.3
250	0.063	1.3	0.5	99.2	0.8
<250	<0.063	1.9	0.8	100.0	0.0
Total		249.14	100.0		

HC-2 (Sample ID: VB08-026 332-336 S)					
Screen		Mass (g)	% Retained		% Passing
Tyler Mesh	Opening (mm)		Interval	Cumulative	
5	4.00	169.41	67.9	67.9	32.1
9	2.00	43.01	17.2	85.1	14.9
20	0.841	21.39	8.6	93.7	6.3
35	0.425	7.26	2.9	96.6	3.4
60	0.250	3.35	1.3	97.9	2.1
115	0.125	0.12	0.0	98.0	2.0
250	0.063	2.26	0.9	98.9	1.1
<250	<0.063	2.78	1.1	100.0	0.0
Total		249.58	100.0		

HC-3 (Sample ID: VB08-032 180-184 I)					
Screen		Mass (g)	% Retained		% Passing
Tyler Mesh	Opening (mm)		Interval	Cumulative	
5	4.00	157.4	63.2	63.2	36.8
9	2.00	44.9	18.0	81.2	18.8
20	0.841	25.0	10.1	91.3	8.7
35	0.425	9.4	3.8	95.1	4.9
60	0.250	4.8	1.9	97.0	3.0
115	0.125	0.0	0.0	97.0	3.0
250	0.063	3.9	1.6	98.6	1.4
<250	<0.063	3.6	1.4	100.0	0.0
Total		249.03	100.0		