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Technical Memorandum

To:	John Rozelle	**From:**	Amy L. Hudson, REM
Company:	Vista Gold Corporation	**Date:**	June 11, 2012
Re:	Waste Rock Dump Design and Drainage Evaluation	**Doc #:**	
CC:	Reese Hastings, Jagrut Jathal (Tetra Tech)		

1.0 Introduction

Vista Gold is proposing a waste rock dump (WRD) with steeper slopes than those originally reported in the Mt Todd Project Preliminary Feasibility Study (PFS) based on additional geotechnical work and review of other operating mines. As a result, a review of the proposed WRD drainage closure conditions was conducted to provide a technical basis for the revised WRD design.

As detailed in the PFS, the WRD included a store and release cover with 3H:1V slopes consisting of a 0.3 meter (m) clay capillary break, 0.6 m fine non-potentially acid generating (Non-PAG or NAG) rock mixed with clay cover, and a shallow layer of growth medium. The cover would be placed over a mantle of coarser crushed Non-PAG waste rock surrounding/covering a potentially acid generating (PAG) material core. The new WRD design under consideration has nine 30 m lifts with eight meter catch benches, a 34 degree interbench slope, and an overall slope of approximately 29 degrees. The proposed closure for the WRD is to place Geosynthetic Clay Liner (GCL) on top of each of the catch benches, and under the next lift (Petticoat Closure Option). The total width of the GCL would be approximately 52 m, which corresponds to the width required to provide full overlap from bench to bench. A one foot layer of fines material will be placed on the GCL to provide confining pressure, and to maintain the GCL's moisture content. A one meter layer of Non-PAG material will be placed over the fines layer to prevent erosion.

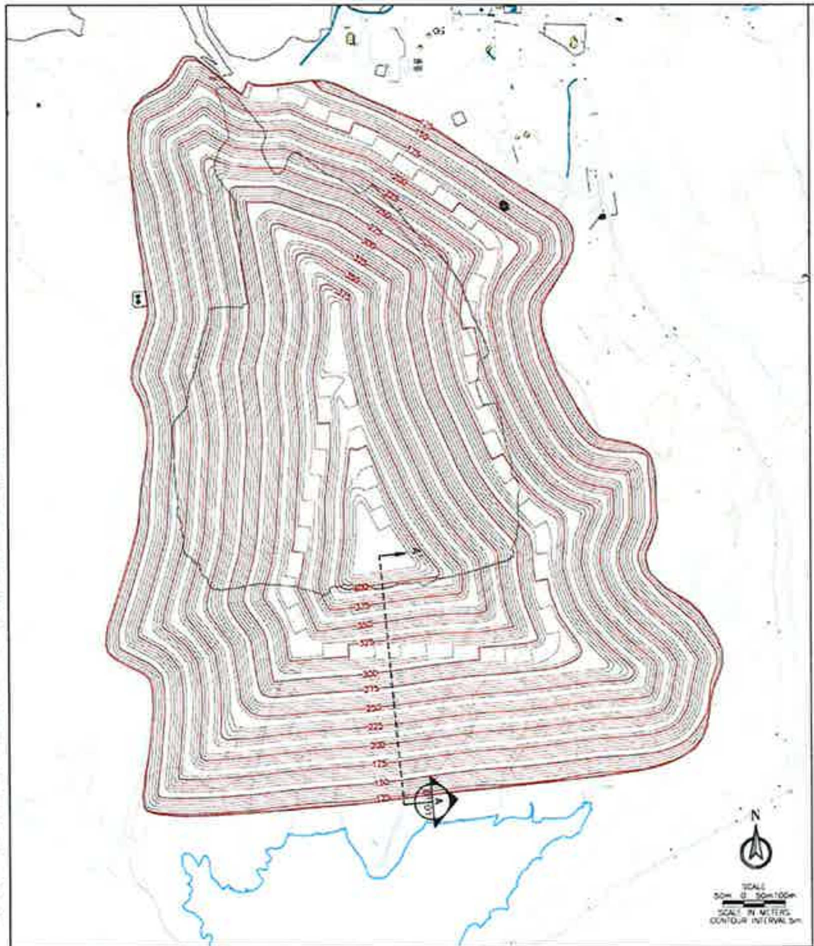
This Technical Memorandum presents the modeling used to assess the drainage conditions and resulting water quality that would likely exist during the closure and post-closure periods. The drainage modeling was completed using the VADOSE/W program from the GeoStudio 2007 software package (GEO-SLOPE, 2007). Modeling was performed on cross-section A-A', which is oriented north-south and cuts through the south facing slope of the WRD (Figure 1). The focus of the modeling was on the interior flow dynamics that could affect the PAG material encapsulated within the interior portion of the facility, and the rate of seepage from the base of the WRD. The geochemical modeling was conducted using the computer code PHREEQC (Parkhurst and Appelo, 1999), a reaction path chemical equilibrium model supplied by the U.S. Geological Survey (USGS).

Proper closure of the WRD and seepage management is critical for preventing impacts to local waters, and to minimize long-term treatment and management costs. Acid rock drainage (ARD) commonly occurs in WRDs with sulphide-enriched mine waste through the oxidation of pyrite (or other sulphide minerals) as it is exposed to oxygen and water. The geochemical characterization program for Mt Todd has determined that 38% of the waste rock will be low sulphur and non-PAG, 15 % of the waste rock is in the uncertain acid generating category, and 47% will be PAG; however, it should be noted that the non-PAG material may not provide excess neutralization capacity. WRDs with significant PAG material and minimal neutralization require further management and control of water to prevent environmental impacts.

2.0 Conceptual Model

The conceptual model provided as Figure 2, shows the components of the WRD water balance including precipitation, evaporation (from soil surface), runoff, infiltration, and seepage. Seepage includes continued draindown of the residual water trapped in the waste rock, as well as any infiltration that reaches the waste rock through the internal and closure cover material. The internal and top closure covers are composed of a thin Geosynthetic Clay Liner (GCL) layer covered by approximately 305 millimeters (mm) (12 inches) of fines material for confining pressure and moisture retention. Details of the GCL closure cover are shown as Figure 3. The internal covers will be placed on top of each the catch bench to limit the flow of water into the encapsulated PAG waste rock. The GCL will be placed from the outer edge of the bench along the horizontal surface, and will be under the buttress of non-PAG material for the next lift. The catch bench surface will be graded to a five degree slope towards the outside of the WRD to ensure drainage of water away from the PAG waste rock material.

Modeling was performed to simulate the closure configuration of the facility. The transient conditions simulated the closure and post-closure conditions. No operational conditions were simulated.



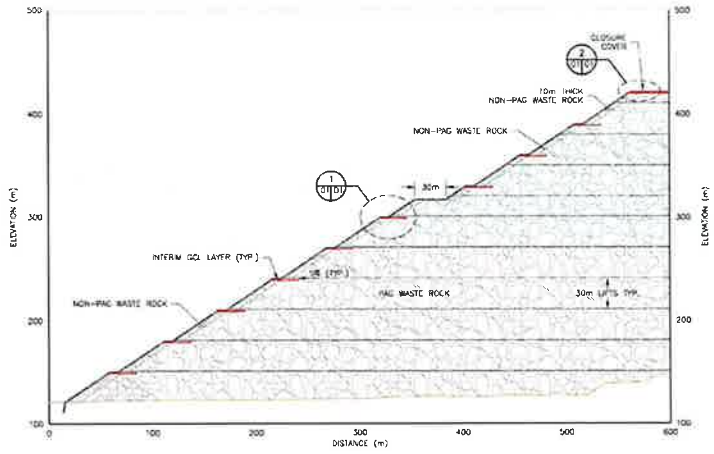
WASTE ROCK DUMP – PLAN

GENERAL LEGEND:

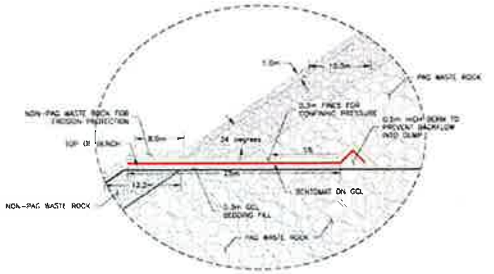
- EXISTING CONTOURS
- 140 PROPOSED CONTOURS
- GEOSYNTHETIC CLAY LINER (GCL)
- GEOTEXTILE
- EXISTING ROADS
- EXISTING HIGHWAY
- EXISTING POWER POLES
- EXISTING FENCELINE
- EXISTING DRAINAGE

NOTES:

1. GEOSYNTHETIC CLAY LINER (GCL) WILL BE BENTOMAT DN OR EQUIVALENT
2. GCL BEDDING FILL MATERIAL TO HAVE MAXIMUM PARTICLE SIZE OF 750mm
3. FINES TO BE PLACED ON TOP OF GCL FOR CONFINING PRESSURE. FINES WILL HAVE MAXIMUM PARTICLE SIZE OF 250mm



A 01|01 **WASTE ROCK DUMP – TYPICAL SECTION**
NOT TO SCALE



1 01|01 **WASTE ROCK DUMP – TYPICAL BENCH DETAIL**
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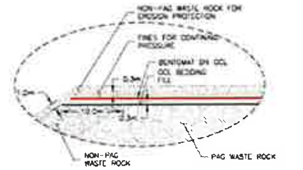


2 01|01 **WASTE ROCK DUMP – TYPICAL TOP CLOSURE DETAIL**
NOT TO SCALE

Issued for:	Issued by:	Title:	
VISTA GOLD CORP.	TETRA TECH	ULTIMATE WASTE ROCK DUMP CROSS SECTION	B REVISION
		Project: MT. TODD GOLD PROJECT DFS TSF2 Project no: 114-311110 Location: NORTHERN TERRITORY, AUSTRALIA Date: 01/12	FIGURE 01

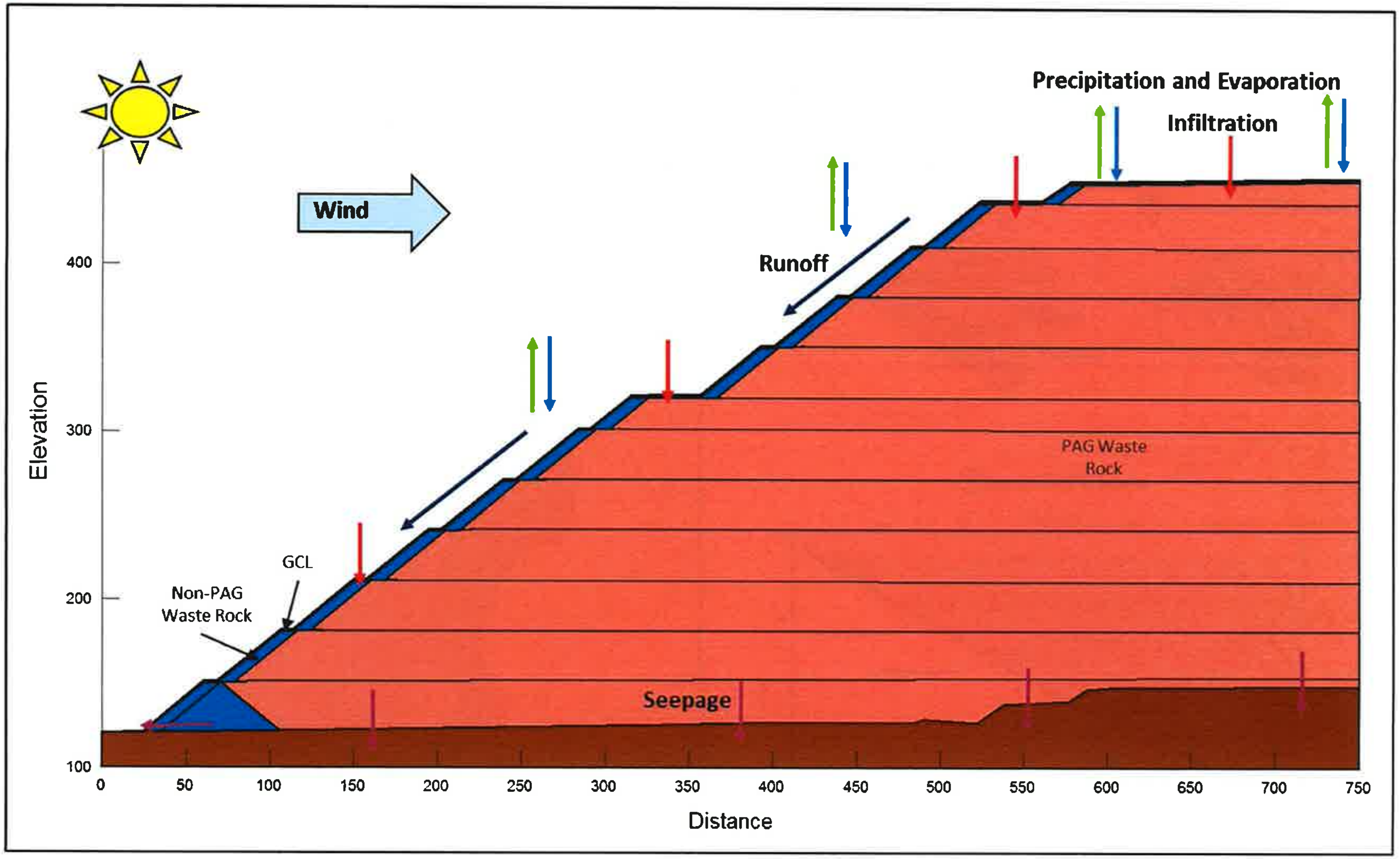


Figure 2 Waste Rock Dump Conceptual Model

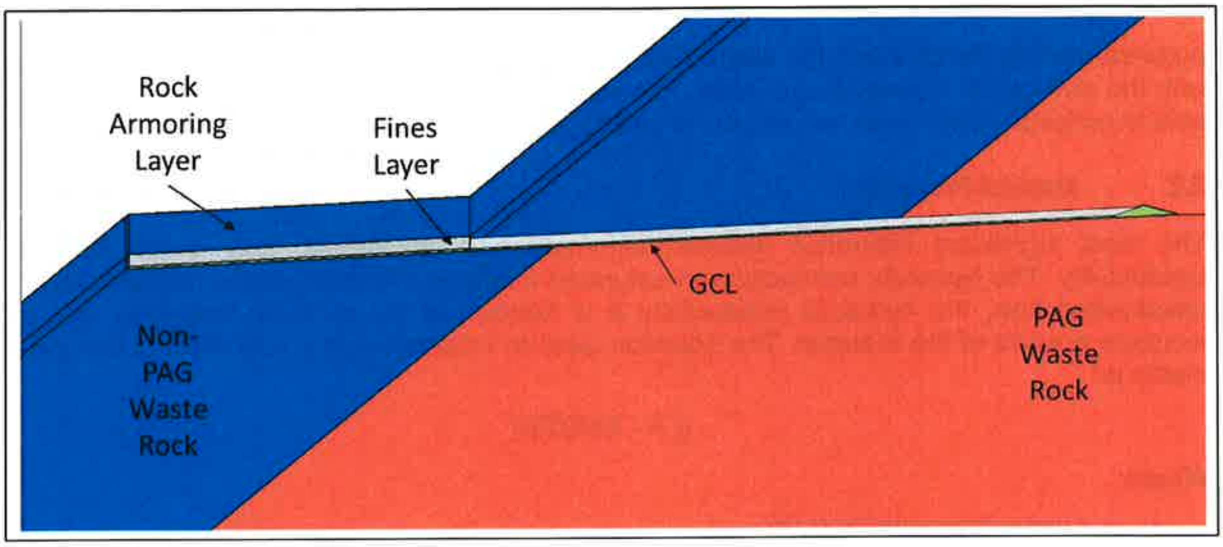


Figure 3 GCL and Fine Layer Details

2.1 Model Input Parameters

The following subsections present the data that was used in the seepage assessment.

2.1.1 Climate Data

Climate data from the Australian Government Bureau of Meteorology Katherine Aviation Museum meteorological station (http://www.bom.gov.au/climate/averages/tables/cw_014903_All.shtml) was used in the model to evaluate the infiltration of precipitation and seepage from the waste rock. The parameters in the climate data file included:

- Minimum and maximum daily temperature;
- Daily precipitation;
- Minimum and maximum daily humidity;
- Daily evaporation or net radiation; and
- Average daily wind speed.

The Katherine Aviation Museum meteorological station is located approximately 50 kilometers south of the mine. The dataset applied to the modeling utilizes the daily data from October 2010 to September 2011. By applying actual daily data versus average data, a more realistic distribution of precipitation events can be applied to the modeling, including the distinct wet and dry seasons of the site.

The water balance for the site is net negative (more evaporation than precipitation). The climate file used for the modeling has precipitation of approximately 1,652 mm and an annual pan evaporation of approximately 2,104 mm. The average annual precipitation for this meteorological station is 1,131 mm and the highest rainfall measured for a one year period is 1,773 mm. The data used for this modeling is above average and provides a conservative evaluation of the behavior of the WRD when conditions are most ideal for the formation of potential wetting fronts within the waste rock material. The model was run for a ten year period with the climate file repeating each year, to minimize the "noise" in the model results and to be able to consider multiple full wet and dry season cycles.

2.2 Material Properties

The most significant difference between saturated and unsaturated flow is the hydraulic conductivity. The hydraulic conductivity in saturated media is a function of the material type. In unsaturated flow, the hydraulic conductivity is a function of the material properties and the moisture content of the material. The equation used to calculate water flow within unsaturated media is:

$$q = - K(\theta)\nabla H$$

Where:

- q = water flow velocity (L^2/t)
- K(θ) = hydraulic conductivity as a function of soil (or rock) moisture content (L/t)
- ∇H = hydraulic head (L)

The relationship between moisture content and hydraulic conductivity is non-linear, which further complicates the flow dynamics. In saturated material, the physics of flow are relatively simple and are driven by Darcy's Law where the flow is proportional to the saturated hydraulic conductivity, gravity, and pressure gradients. In simple terms, water flows downhill (downward pressure gradient) and flows faster through coarse material than fine material. However, in unsaturated flow, additional controlling forces include matric pressure (matric suction), absorption, and electrostatic forces.

Matric pressure (matric suction) is the suction created by capillary forces and the interaction of water, air, and solid surfaces. Matric pressure can be observed by placing a thin straw into a body of water. Driven by the surface tension forces, the water rises inside the straw, defying the force of gravity. The thinner the straw, the stronger the suction force will be and the higher the column of water will rise in the tube. The same process occurs in the voids between material particles in a WRD.

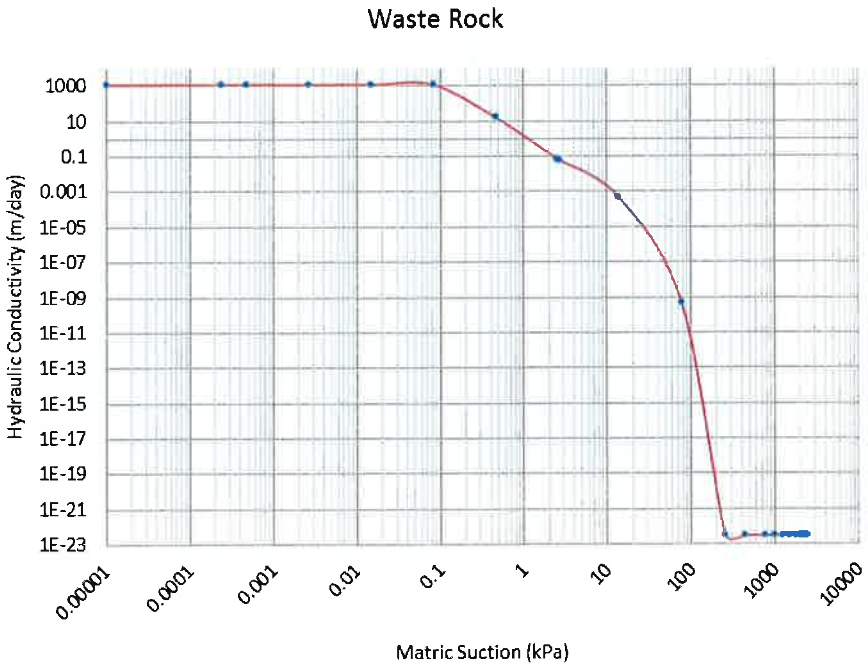
One of the most unusual properties of unsaturated zone flow is that different materials are preferentially conductive with varying moisture contents. Under high moisture conditions, pores are saturated and their suction decreases significantly. In this case, gravity is the strongest force and water will flow downhill from pore space to pore space. At low moisture conditions, the preferential flow changes, and the suction forces become stronger than gravitational forces. In this case, the tight materials are the most conductive with small voids that literally suck water through them. Under low moisture conditions, clay is more conductive than the sandy material.

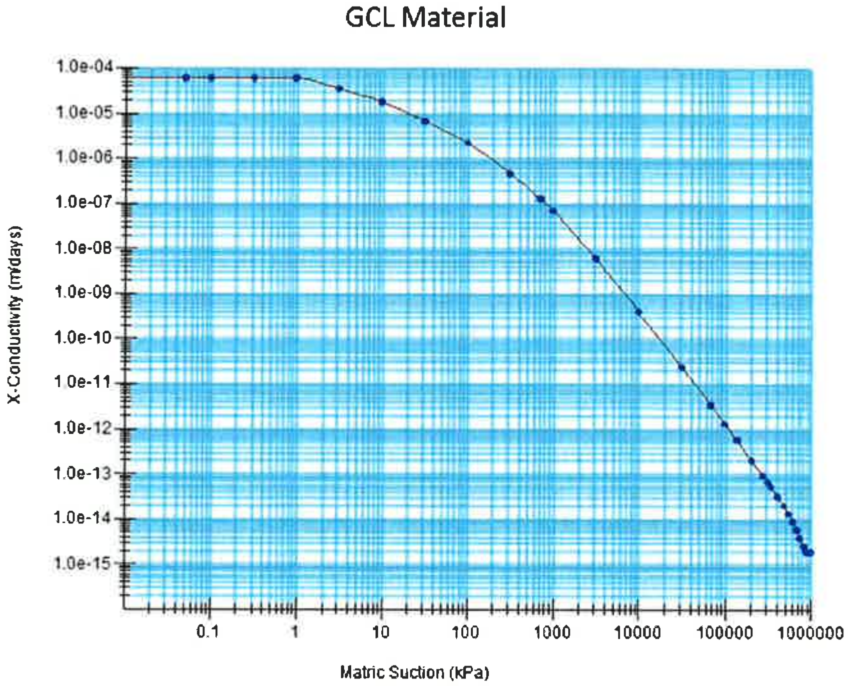
The material properties used in the VADOSE/W (GEO-SLOPE, 2007) models were based on literature values and functions developed using past experience with mined materials. The material property used to represent the waste rock was from laboratory testing of a similar hard, competent waste rock with a limited amount of fine material. The GCL was simulated as a well graded high clay, and the fines layer was simulated as a uniform silt. Figure 4 presents the hydraulic conductivity functions of the waste rock, GCL, and fines layer materials. Figure 5 presents the water content functions of the same materials. The units used in these figures are those utilized by the modeling software.

The waste rock is expected to be very hard, competent material with a minimal amount of fines. This characterization is based on the current observations of an existing WRD from previous site operations. The function used to simulate this material has a saturated hydraulic conductivity of 4.2 centimeters per second (cm/sec) with a rapid, but smooth decrease with increased matrix suction. The hydraulic conductivity of the GCL layer was simulated as 10^{-6} cm/sec. This is higher (more conductive) than the specifications of this type of material, which is designed to be at 10^{-9} cm/sec. However, work completed by Benson and Meer (2009) suggests that GCL that will be exposed to high levels of sodium and/or magnesium in solution will be subject to ion exchange processes. Their research showed that the GCL composition will be altered by exchanging sodium and/or magnesium for the calcium. When also subjected to multiple wetting and drying cycles, the hydraulic conductivity can increase by several orders of magnitude. The leachate from the non-PAG waste rock is estimated to have 20 milligrams per liter (mg/L) sodium (Na) and 200 mg/L magnesium (Mg), which could be drawn up into the GCL during evaporation processes. The saturated hydraulic conductivity value used in this modeling is higher than the design specs, but lower than the worst case observed by Benson and Meer (2009) and provides a conservative, but reasonable estimate of GCL conditions during closure and post-closure. For this modeling, the fines layer that will be placed over the GCL is assumed to be uniform silt with a saturated hydraulic conductivity of approximately 10^{-5} cm/sec.

2.2.1 Boundary Conditions

The boundary conditions used in this modeling were limited to a zero pressure boundary at the base of the model, initial moisture (establish non-zero starting conditions), and the climate file. A climate file was used in this modeling to ensure an evaluation of the long term behavior of the waste rock and the cover under actual climatic conditions.





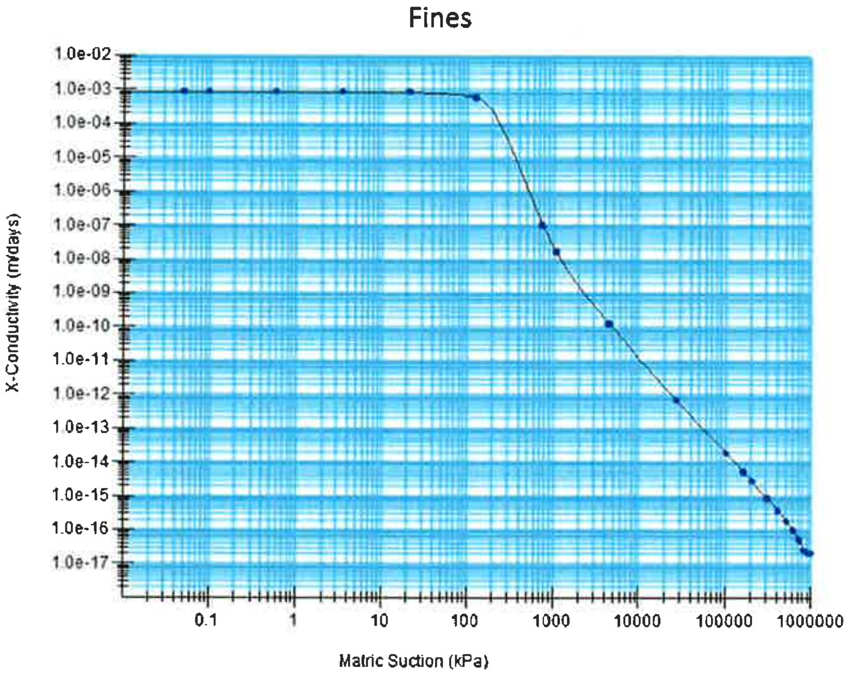
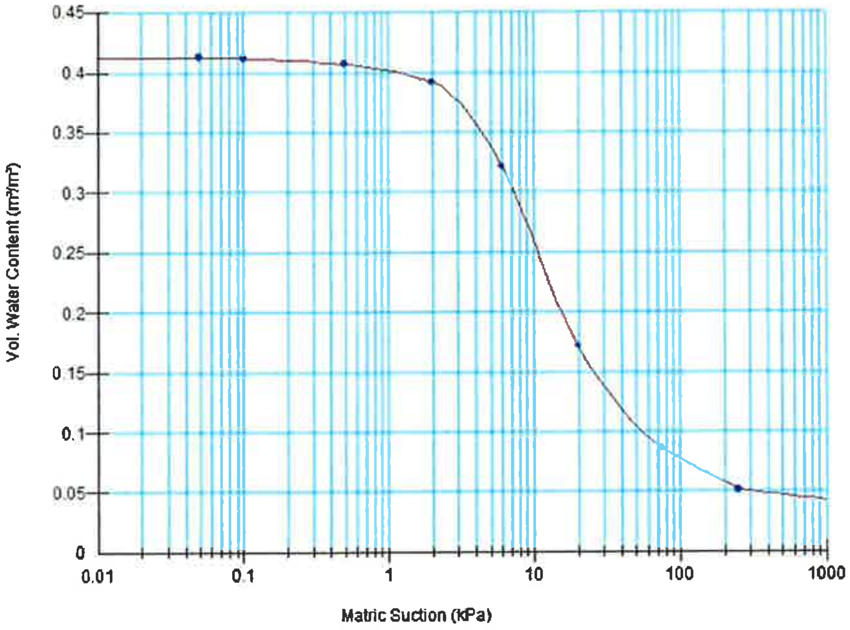
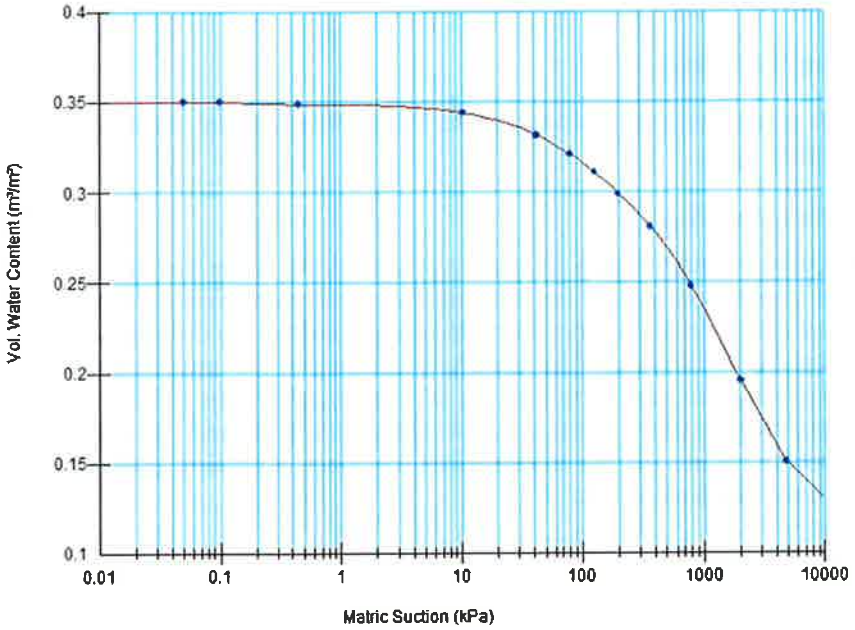


Figure 4 Hydraulic Conductivity Functions

Waste Rock



GCL Material



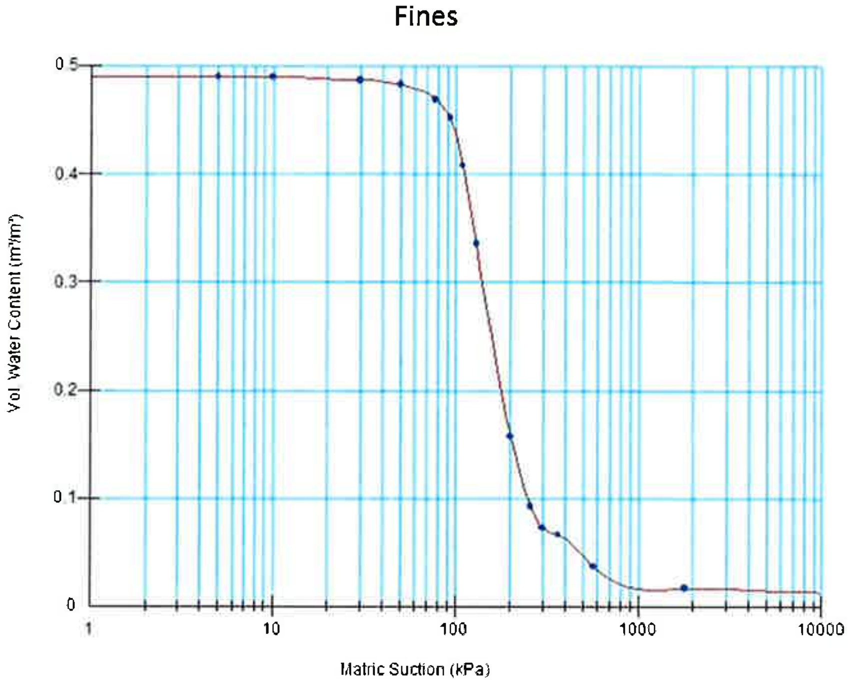


Figure 5 Soil Water Characteristic Curves

2.3 Modeling Technique

The modeling was completed as a steady state model followed by transient models to simulate the climate conditions.

2.3.1 Steady State Modeling

Steady state modeling is challenging when analyzing mining sites because the facilities change quickly and do not reach true steady state conditions until mine closure. To account for this, the WRD was modeled using an initial non-zero moisture condition to define the starting point of the facility at the completion of mining. The moisture content of the steady state model was in the range of 5% to 15% by volume. The results of the steady state model have been generally calibrated to site conditions (flow rates observed at Weirs 1, 2, and 3), but are only intended to offer non-zero starting values for the subsequent transient modeling scenarios and to evaluate the seepage rate from the waste rock.

2.3.2 Transient Modeling

Transient modeling provides a reasonable simulation of flow conditions within the WRD material. The upper most layer of these models is a surface region representing the top surface layer of the facility (the GCL, fines layer, and rock armor cover). It is in this part of the model that atmospheric conditions and soil come in contact, driving the water balance. The water within the facility then moves according to the rules of unsaturated flow physics through the waste rock material. Finally, and if applicable, the water reaches the base of the modeled region, where it moves to the model discharge point.

2.3.2.1 Transient Model Scenarios

This study focused on one transient scenario that represents the preferred construction and closure alternative. The preferred alternative has interbench slopes of 34 degrees (overall slope of approximately 29 degrees) and the Petticoat cover option – GCL and fines layer on horizontal surfaces between the lifts of waste rock and on the top surface of the WRD.

2.3.2.2 Surface Layer

VADOSE/W (Geo-Slope, 2007) simulates the dynamics of the facility surface by considering climate and soil interactions. VADOSE/W (Geo-Slope, 2007) simulates precipitation using time increments with a maximum step size of two (2) hours. The daily precipitation data is distributed according to a sinusoidal function that peaks at noon (normal distribution). This distribution pattern was compared with the constant averaged and the sloped averaged distribution patterns, and it was determined that the sinusoidal pattern resulted in the most mathematically stable calculation of the results. Potential evaporation or net radiation measurements are used to calculate the actual evaporation that is possible based on the conditions provided in the surface layer of the model. Evaporation is calculated from the following climate and soil factors:

- Air temperature;
- Soil temperature and thermal properties;
- Relative humidity;
- Solar intensity (from latitude);
- Soil temperature;
- Soil moisture content;
- Wind speed; and
- Measured pan evaporation.

The combination of the factors listed above provides a reasonable estimate of water lost from the system through evaporative processes. Infiltration is based on the unsaturated hydraulic conductivity of the material at a given time and the moisture content of the material. Excess precipitation that has not evaporated, transpired, or infiltrated is tabulated as runoff. The surface region for the model was constructed with three layers to simulate the materials of the petticoat cover design.

2.3.2.3 Transient Flow within the Facilities

The transient flow dynamics within the tailings material are simulated over time and space. The model accounts for transitions between material types and produces the following data sets:

- Water flux within the model domain;
- Moisture content;
- Water flow velocity; and
- Seepage discharge, if applicable (out of the model domain).

The following sections present the infiltration and seepage model results.

3.0 Model Results

Table 1 presents the key components of the modeled facility water balance as a percentage of total annual precipitation. The petticoat closure cover limits the amount of precipitation that is able to infiltrate into the PAG waste rock to approximately 7% of annual precipitation compared to no cover, which allows approximately 21% of annual precipitation to infiltrate. Additionally, the petticoat design also increases the runoff by approximately 20% over the uncovered facility. The disadvantage with this design is that water infiltrates along the uncovered waste rock slopes. However, a closer investigation of the modeled results show that the precipitation that readily infiltrates into the waste rock slopes, is quickly evaporated back out of the WRD. Any water that infiltrates and is not quickly lost to evaporation travels vertically until it encounters the GCL and fines layer between the waste rock lifts. Once the infiltrated water reaches the GCL and fines layer, it travels laterally. Because the GCL layer is graded away from the center of the facility, the lateral flow is toward the outer edge of the facility and will minimize infiltration of some water into the PAG waste rock.

Table 1 Water Balance of Model Scenarios

	Cumulative Infiltration	Cumulative Runoff Mesh	Cumulative Storage	Cumulative Surface Evaporation
No Closure Cover	21%	13%	9%	67%
34 degree - Petticoat cover	7%	33%	-40%	61%

The draindown rate of the WRD was also considered and is presented in Figure 6. The amount of water that will travel through the facility is minimal (reaches a steady state rate of 1.5 cubic meters per hour [m^3/hr] at the end of year three after closure), and will be captured and treated through a passive engineered wetland system. This type of treatment design requires that some moisture flow into the engineered wetland system on a continuous basis to prevent the system from drying out and to help maintain a healthy bacterial population.

During the wet season, the WRD could have a significant amount of water flushed from the waste rock in response to large storm events, as is illustrated by the spike seen in year 6 of the Petticoat Cover option model. The uncovered dump model has several years where the wet season results in an increase in seepage. The uncovered facility never really reaches a near steady state condition like the Petticoat Closure Option simulation.

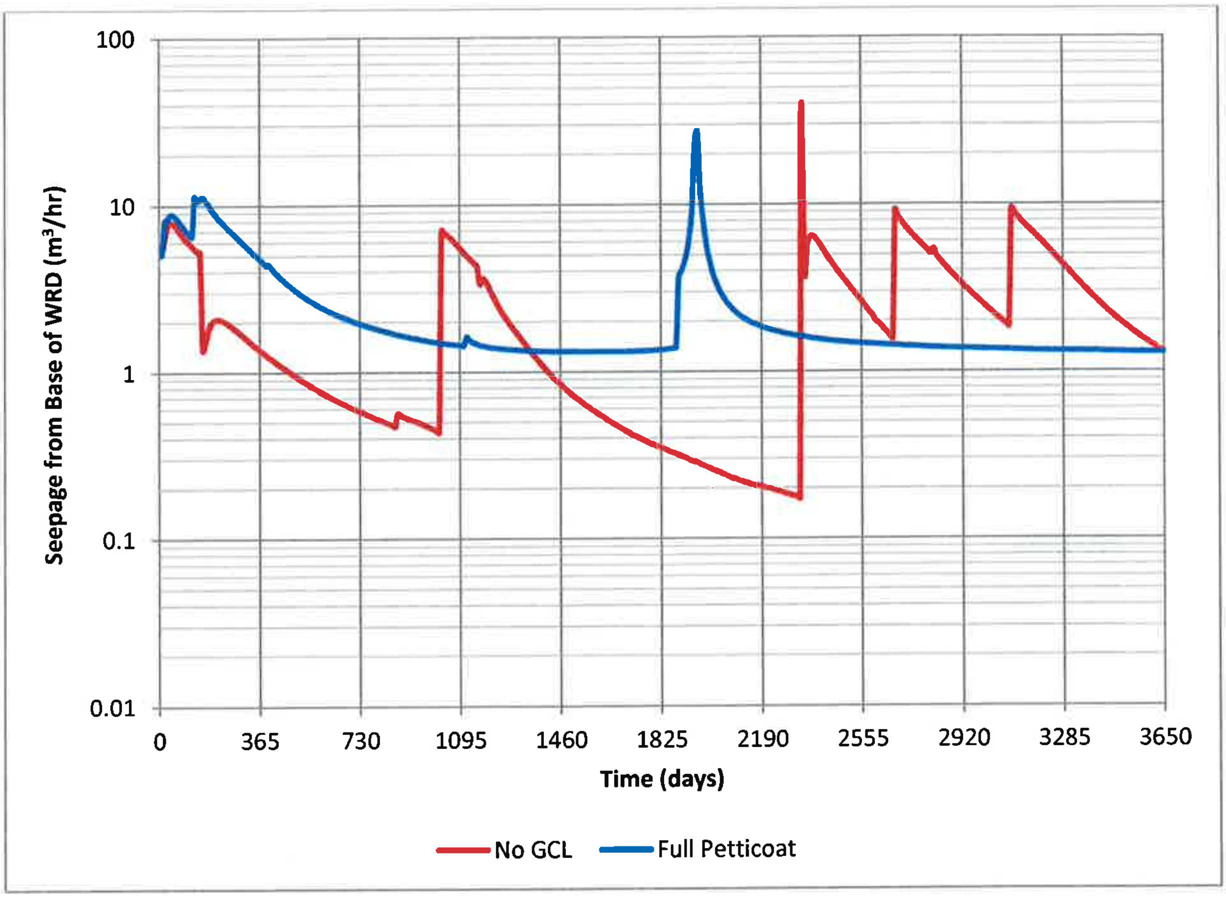


Figure 6 Draindown Flux Rate of WRD

Even though the waste rock material is quite hard and competent, the WRD will still be a dual porosity system. The primary porosity is the space between the pieces of rock. The secondary source of porosity is the fractures present in the rock that will "relax" and potentially open once the confining pressure of overlying rocks is removed. The secondary porosity is difficult to define and could allow ARD to happen in isolated fractures, that could be flushed by a passing wetting front, creating significantly impacted drainage water. These conditions need to be further defined as additional data is collected and site observations are made.

4.0 Water Quality Assessments

The water quality modeling approach and results are provided in the following subsections. Input parameters are summarized in Attachment 1.

4.1 Modeling Code and Database

The geochemical modeling was conducted using the computer code PHREEQC (Parkhurst and Appelo, 1999), a reaction path chemical equilibrium model supplied by the U.S. Geological Survey (USGS). PHREEQC is able to process multiple equilibria and mixing reactions to produce the final chemical speciation of a system. In addition to a computer code, geochemical modeling requires a database of the thermodynamic and kinetic parameters. For this study, the MINTEQ.V5 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).

4.2 Geochemical Conceptual Model

The water quality estimates are based on three probable vertical flow paths that the infiltration water is likely to take within the WRD (Figure 6). In summary:

- Flow Path A represents the optimal scenario with regard to limiting ARD formation such as the scenario that could be envisioned for the outer portion of the lower most lift where water will contact non-PAG rock first (~50%), interact with PAG/uncertain rock within the core (~35%) and contact non-PAG rock again (~15%) before reporting to RP1.
- The horizontal flow induced by the petticoat option would be similar to Flow Path B, and would result in contact with non-PAG rock (~33.3%), followed by PAG/uncertain rock (66.6%).
- Flow Path C represents percolation through the GCL and into the PAG/uncertain rock core only. This worst case scenario represents a scenario without flow through a non-PAG cover.

4.3 Modeling Approach

The geochemical models were constructed as a series of mixing and reaction steps that represent the flow paths shown in Figure 7. The percentages of each waste rock type to be placed in the WRD and the associated potential to generate acid are based on the geochemical characterization program described in Tetra Tech (2011a) and the sulphur cutoffs based on the sulfur block model described in Tetra Tech (2011b).

Tonnages are based on the feasibility study ultimate pit design provided by the project mine planner (Tom Dyer). Micromine software was utilized to cut the pit into the 18 lithologic codes within the block model. Non-PAG, uncertain and PAG criteria were based on the total 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; and
- PAG waste rock contains greater than 0.4 wt. % total sulphur.

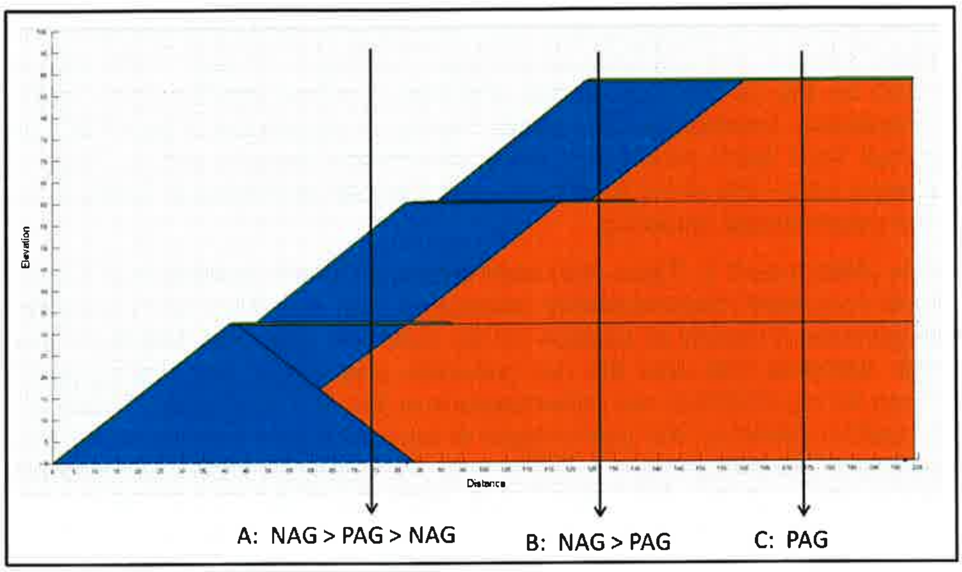


Figure 6 Expected Flow Paths and Material Contacts

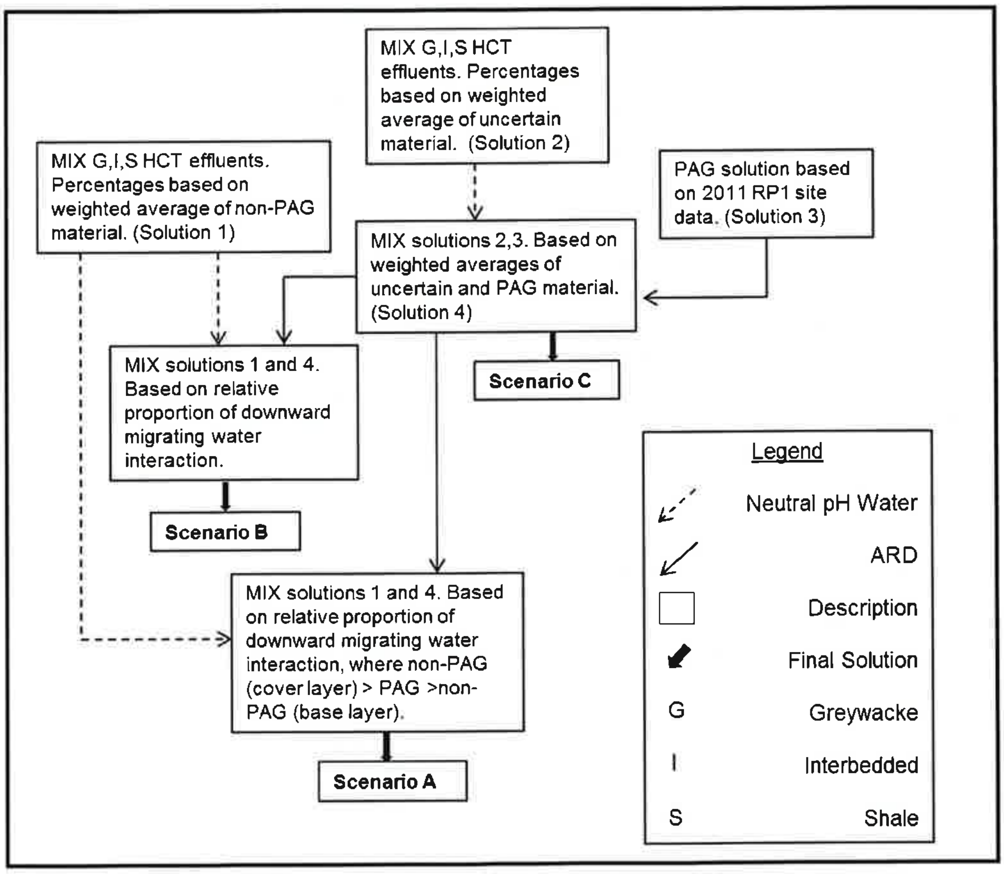


Figure 7 Geochemical Conceptual Model

Tonnages were obtained by querying all waste rock blocks (< 0.4 ppm Au) with 50% in or out of the topographic surface and ultimate pit surface. Tonnages of each rock type were initially compiled based on the 18 lithologic codes and then grouped into the three larger rock types defined as greywacke, interbedded and shale. Finally, the tonnages of non-PAG, uncertain and PAG waste rock from each rock types were determined (Attachment 1, Table A-1). Blocks identified as felsic tuff (~ 2% of the total tonnages) are also presented in Table A-1 but were not included in the geochemical modeling.

Initial solutions (Attachment 1, Table A-2) were based on kinetic humidity cell test (HCT) results including stable long-term concentrations associated with non-PAG and uncertain waste rock samples that generated neutral to alkaline pH for over one year and "first flush" concentrations from uncertain samples that also did not generate acid during the testing period. Alkalinity values less than 30 mg $CaCO_3$/L are commonplace in the HCT leachates. These initial solutions were mixed together based on the percentages of each rock type with the same acid-generating potential characteristics (Attachment 1, Table A-3). For example, stable concentrations from the non-PAG greywacke, shale and interbedded HCT leachates were mixed at a ratio of 0.4:0.18:0.42, to make solution 1. Likewise, solution 2 is comprised of first flush HCT concentrations of greywacke, shale and interbedded HCT leachates at a ratio of 0.35:0.15:0.5. Solution 3 was based on results from the November 2011 RP1 sampling event and represents ARD from PAG rock without consideration of rock type.

The seepage quality is based on stable long-term and first flush concentrations from the laboratory kinetic testing or ARD from RP1. Therefore, the model is considered to approximate water quality at the onset of the wet season when flushing of constituents will be the highest. The water quality predictions to be conducted for the water balance study will include kinetic oxidation of pyrite

4.4 Model Results

The geochemical model scenario results are summarized in Table 2. The results show that even partial encapsulation with non-PAG rock (scenario A) does not result in seepage with acceptable water quality as defined by the interim site specific trigger values (Table 3). The non-PAG rock primarily acts as a source of dilution of the regulated constituents. However, acidic pH remains because the alkalinity emanating from the non-PAG rock is insufficient to neutralize the acidity generated by the PAG rock. The model results show that acceptable pH (6 – 8) and associated decrease in constituent concentrations will require a source of neutralization potential (e.g., limestone).

5.0 Conclusions and Recommendations

The primary conclusions that can be drawn from this preliminary assessment of the drainage conditions and the water quality associated with different configurations of stacking and covering include:

- The petticoat option for both the 35° and 20° slopes limits the amount of precipitation that is able to infiltrate; however, water that infiltrates along the uncovered waste rock slopes interacts with the PAG waste rock unless the GCL layer is graded away from the center of the WRD.

- The beanie option performed the worst of the scenarios considered because only the top surface of the WRD is cover and the uncovered slopes and benches receive a significant amount of infiltration.
- The most protective option investigated is to fully cover the WRD; however, this option does not appear technically feasible for the 35° slopes.
- The non-PAG rock largely acts to dilute the ARD from the PAG rock because it does not contribute much to the regulated constituent load (e.g., metals, sulphate) but also is not a significant source of alkalinity.
- All three scenarios produce acidic pH solutions due to the minimal available alkalinity in the non-PAG rock to neutralize the acidity generated by the PAG rock. Addition of a neutralization potential source will be needed to prevent/minimize ARD.

Based on the findings of this study, the following recommendations should be considered to advance the current understanding of the drainage conditions associated with Vista Gold's preferred WRD closure configuration:

- Confirm that the WRD design chosen for the feasibility study is geotechnically stable.
- Confirm the composition and hydraulic properties of the fines material that will be placed to obtain the confining pressures.
- Quantify the concentrations of sodium and magnesium associated with the fines material and rainwater due to the potential for elevated sodium and magnesium concentrations to increase the GCL permeability these ions to impact the hydraulic permeability of the GCL. The heap leach pad residues have high sodium and magnesium concentrations compared to the non-PAG waste rock.
- Confirm the viability of an engineered wetland to treat ARD emanating from the WRD and prevent impacts to local waters.

Table 2 Summary of Model Results

Description	Scenario C	Scenario B	Scenario A
	PAG/Uncertain Only (100%)	Non-PAG>PAG/ Uncertain (33.3%, 66.6%)	Non-PAG>PAG>Non-PAG (50%, 37%, 13%)
pH	3.79	3.83	3.95
Sulphate	1220	816	448
Al	38.83	22.33	6.73
As	0.0119	0.0097	0.0078
Ca	77.4	52.9	31.0
Cd	0.107	0.071	0.039
Cl	9.21	7.64	6.24
Co	1.52	1.02	0.56
Cr	0.00079	0.00061	0.00045
Cu	8.38	5.59	3.10
Fe	0.000060	0.000040	0.000022
K	5.26	3.68	0.60
Mg	191	127	71
Mn	0.0067	0.0045	0.0022
Mo	0.00025	0.00018	0.00012
Na	22.9	15.8	9.4
Ni	12.9	8.64	4.79
Pb	0.053	0.036	0.020
Zn	25.13	16.76	9.30

Table 3 Proposed Interim Site Specific Trigger Values

Parameter	Units	Interim Trigger Values	Source (See GHD, 2011)
		Edith River	
pH	pH Units	6 - 8	ANZECC & ARMCANZ Table 3.3.4
Electrical Conductivity	uS/cm	20-250	ANZECC & ARMCANZ Table 3.3.5
Magnesium	mg/L	2.5	Van Dam et al 2010 Environ Toxicol Chem 29(2):410-421
Sulphate	mg/L	129	Elphick et al 2011 Environ Toxicol Chem 30 (1):247-253
Aluminum	mg/L	0.149	Site derived 80th %ile
Cadmium	mg/L	0.2	High reliability TV ANZECC & ARMCANZ Table 3.4.1
Cobalt	mg/L	0.09	Moderate reliability TV ANZECC & ARMCANZ pg 8.3 - 118
Chromium(III)	mg/L	0.0033	Low reliability TV ANZECC & ARMCANZ pg 8.3 - 116
Chromium(VI)	mg/L	0.001	High reliability TV ANZECC & ARMCANZ Table 3.4.1
Copper	mg/L	0.0027	ERISS (2005) NOEC Value
Manganese	mg/L	1.9	Moderate reliability TV ANZECC & ARMCANZ Table 3.4.1
Nickel	mg/L	0.011	High reliability TV ANZECC & ARMCANZ Table 3.4.1
Lead	mg/L	0.0034	High reliability TV ANZECC & ARMCANZ Table 3.4.1
Iron	mg/L	0.3	Canadian Guideline ANZECC & ARMCANZ pg 8.3-123
Mercury	mg/L	0.0006	High reliability TV ANZECC & ARMCANZ Table 3.4.1
Zinc	mg/L	0.0095	ERISS (2005) NOEC Value

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