phelps dodge
Tyrone Inc. P. O. Drawer 571, Tyrone, New Mexico 88065 • (505) 538-5331

July 28, 2005

Via Federal Express

Mr. Clint Marshall
New Mexico Environment Department
Mining Environmental Compliance Section
P.O. Box 26110
Santa Fe, New Mexico 87502

Dear Mr. Marshall:

Re: Phelps Dodge Tyrone, Inc., Revised Seepage Investigation of Leach Ore Stockpiles and Waste Rock Stockpiles Interim Report DP-1341 Condition 81

Attached are three hardcopies of the Phelps Dodge Tyrone, Inc. (Tyrone) Revised Seepage Investigation of Leach Ore Stockpiles and Waste Rock Stockpiles Interim Report submitted pursuant to Condition 81 of DP-1341. These copies were sent to your attention by EnviroGroup Limited via Federal Express. An electronic copy of the subject interim report was emailed to all copied parties.

Should you have questions or comments please contact Mr. Mike Jaworski at (505) 538-7181.

Very truly yours,

Ned Hall

E. L. (Ned) Hall, Manager
Environment, Land & Water
New Mexico Operations

ELH:mj
Attachment
20050728-102

cc: Mary Ann Menetrey, NMED
Keith Ehlert, NMED
Holland Shepherd, MMD
David Ohori, MMD
Dusty Earley, EnviroGroup Ltd

Revised Seepage Investigation of Leach Ore Stockpiles and Waste Rock Stockpiles Interim Report
DP-1341 Condition 81

Tyrone Mine

Prepared by:

EnviroGroup Limited
Centennial, Colorado

Prepared for:

Phelps Dodge Tyrone Inc.
Tyrone, New Mexico

July 29, 2005

Project No. PD-0447

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Prepared by | Date

Reviewed by | Date

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LIST OF ACRONYMS

ADTI	Acid Rock Drainage Technical Initiative
ARD	Acid Rock Drainage
COC	Contaminants of Concern
DP	Discharge Permit
EC	Electrical Conductivity
GWB	Geochemists Work Bench
NMED	New Mexico Environment Department
PDTI	Phelps Dodge Tyrone Inc.
MWMP	Meteoric Water Mobility Procedure
Ksat	Saturated hydraulic conductivity
mg/l	milligrams per liter
meq/l	milliequivalents per liter

1.0 INTRODUCTION

This interim report was developed by Phelps Dodge Tyrone Inc. (PDTI) in order to fulfill its requirements as a mine operator in the state of New Mexico. The New Mexico Environment Department (NMED) issued Supplemental Discharge Permit for Closure DP 1341 (April 8, 2003) to PDTI for the Tyrone Mine (Tyrone). Section III of the permit requires PDTI to conduct studies of Tyrone and implement mine closure and closeout actions as a condition of the permit. The Revised Seepage Investigation work plan (Greystone 2004) describes PDTI's proposed supplemental study to fulfill the requirements of Condition 81 of the permit. Condition 81 is written in the permit as follows:

81. Tyrone shall submit a revised seepage investigation report for the Leach Ore Stockpiles and Waste Rock Piles under closure conditions. In accordance with the schedule approved under Condition 74, Tyrone shall submit to NMED for approval a work plan, including an implementation schedule, for a revised seepage investigation for the Leach Ore Stockpiles and Waste Rock Piles. The study shall be designed to consider the data needs for Conditions 82, 83 and 89, and the results of the materials characterization study described in Conditions 80. The purpose of this investigation is to predict, at a minimum, the quantity and quality of seepage from individual Leach Ore Stockpiles and Waste Rock Piles and potential associated impacts to groundwater and surface water following Cessation of Operation.

The primary purposes of this report are to provide the preliminary results of stockpile material and seepage characterization investigations and to describe PDTI's proposed seepage modeling approach. Certain mine facilities, including stockpiles, will be reclaimed prior to the next permit renewal in 2008. PDTI reserves the right to modify the conclusions of this interim and final report based on these reclamation activities. The overall objectives, scope and schedule of this study are stated in sections 1.1, 1.2 and 1.3, respectively. Applicable background information on the Tyrone stockpiles, related reports on stockpile seepage and runoff, and other supporting studies conducted for closure and closeout planning are described in Section 1.4. Section 2 provides the methods used for this interim investigation of the stockpile's hydraulic properties and seepage and runoff quality. PDTI's proposed modeling methods for simulating the stockpile seepage flow and quality during and after mine closure are also provided in this section. Section 3 reports the interim results and Section 4 discusses the ongoing investigations. Section 5 describes the proposed approach for prediction of potential impacts to groundwater and surface water and supporting analyses. The proposed alternatives analysis for this study and coordination of this study with other closure studies is discussed in Section 6. A bibliography of relevant documents is provided in Section 7.

1.1 Objectives

There are four primary objectives of this study. They are:

- Characterize the quality and quantity of seepage and runoff from the existing leach ore and waste rock stockpiles;
- Estimate the quality and quantity of seepage and runoff from the leach ore and waste rock stockpiles during and after mine closure;
- Predict the impacts to groundwater and surface water during and after mine closure; and
- Provide data and analyses to support conditions 80, 82, 83, and 89 of DP-1341.

This study will incorporate additional objectives, as needed, in order to support studies required by other conditions in Permit DP-1341 as they are implemented.

1.2 Scope

The scope of this study includes:

- Document review and database compilation;
- Stockpile seepage and runoff characterization;
- Stockpile and foundation hydraulic testing;
- Evaluation of existing impacts to surface and groundwater quality;
- Stockpile seepage and runoff quantity and quality modeling;
- Prediction of stockpile mass loading to ground and surface water; and
- Prediction of groundwater quality beneath stockpiles.

Seepage and runoff quantity and quality from all existing leach ore and waste rock stockpiles at Tyrone will be evaluated. The leach ore stockpiles that will be evaluated for closure and closeout planning are defined in DP-1341 (NMED 2003) as follows:

- No. 1 Stockpile (presently inactive);
- Nos. 1A and 1B, Stockpiles;
- Nos. 2 and 2A Stockpiles;
- No. 3A Stockpile;
- East Main;
- Gettysburg Out Pit Stockpile; and
- Gettysburg In Pit Stockpile.

The waste rock stockpiles that will be considered in this study are,

- Nos. 1C and 1D Stockpiles;
- No. 3B Stockpile; and
- Portions of the 2B, Savanna and Upper Main Stockpiles.

The locations of these facilities are shown in Figure 1.1. These stockpiles contain the majority of mine materials that will ultimately remain at the Tyrone Mine after closure. Hence, the potential impact to surface water and groundwater, resulting from the construction and leaching of these stockpiles, will be represented by evaluating current impacts from cumulative seepage and runoff discharges through time. In addition to the existing configurations of the stockpiles, selected stockpile regrading and reclamation alternatives (including the DP-1341 alternative) will be evaluated in this study. A range of alternatives will be selected based on the preliminary findings of the feasibility study described in DP-1341, Condition 89 (NMED 2003).

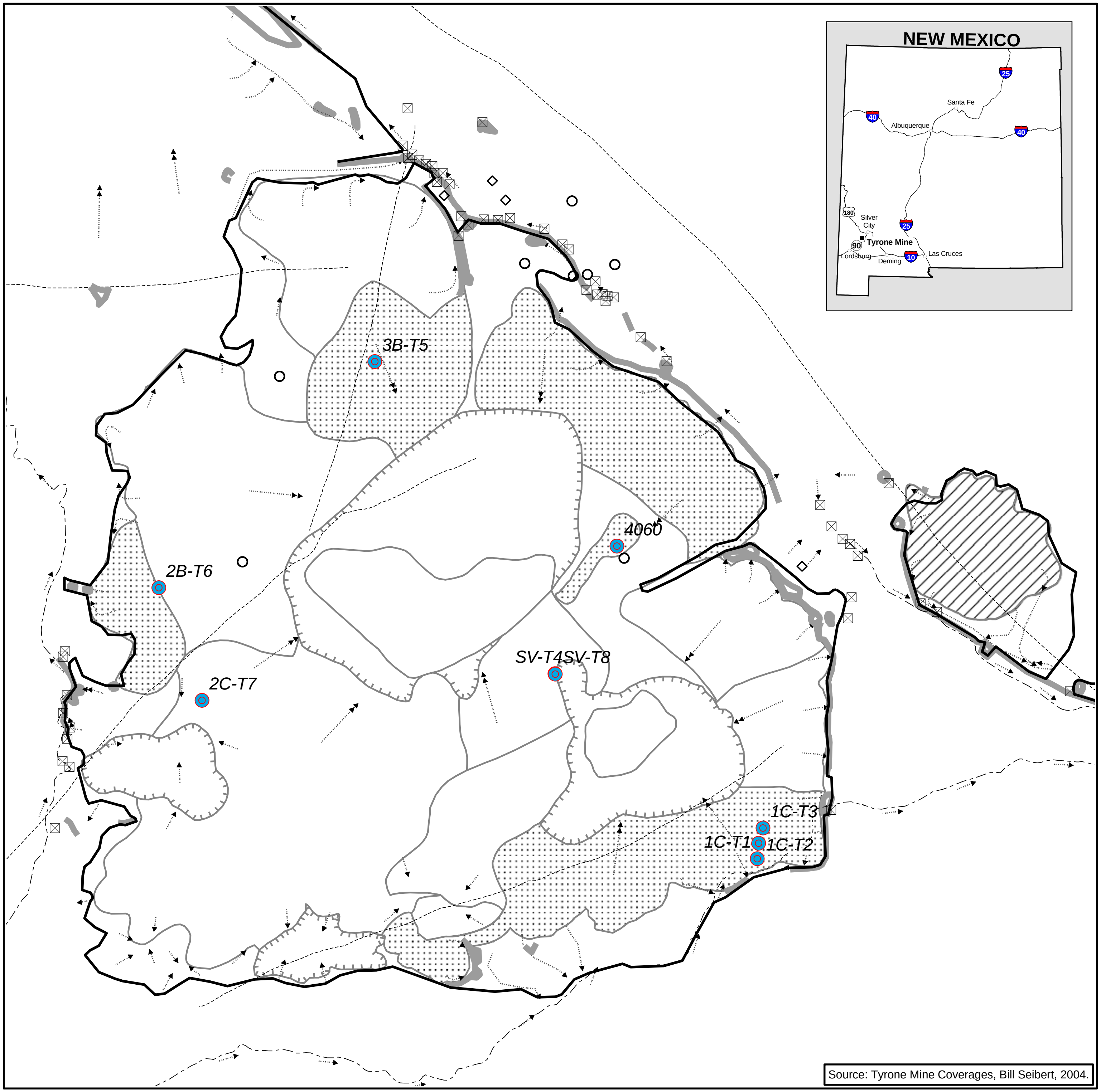
1.3 Implementation and Reporting Schedule

Figure 1.2 presents the implementation schedule and report deliverable dates presented in the Revised Seepage Investigation work plan (Greystone 2004).

This interim report is hereby submitted in accordance with the study's schedule. The results of additional investigations described in the Revised Seepage Investigation work plan will be presented in the final report.

1.4 Background

Tyrone is an open pit copper mine located adjacent to State Highway 90, approximately 10 miles southwest of Silver City in Grant County, New Mexico. The general layout of the existing stockpile facilities at the Tyrone Mine is shown in Figure 1.1. Section 1.4.1 describes the relevant stockpile facilities that will be studied for the revised seepage investigation. Background information for Tyrone is provided in the Tyrone Closure/Closeout Plan (CCP) (M3 2001), which was submitted pursuant to the New Mexico Mining Act and associated rules, the New Mexico Water Quality Act, and the New Mexico Water Quality Control Commission regulations. Baseline and future mine closure design studies were conducted in support of the CCP, including studies of leach ore and waste rock stockpiles. Additional closure studies are required per Condition 74 of Permit DP-1341. Section 1.4.2 summarizes the relevant investigations previously conducted at Tyrone that support the Revised Seepage Investigation.



LEGEND

- Stockpile Sample Locations
- Fault Line
- Facility Boundary
- Stormwater Containment Boundary
- Seepage/Runoff Containment System
- Creek/Canyon
- Runoff Flow Direction
- Waste Water Storage
- Mine Water Storage
- Stormwater Outfall
- Unleached Stockpile
- Inactive Stockpile

phelps dodge Corporation

N
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S

Feet

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EnviroGroup Limited

TYRONE MINE

FIGURE 1.1
EXISTING STOCKPILE FACILITIES AND CONTAINMENTS

ANALYSIS AREA: Tyrone Mine, Grant County, New Mexico

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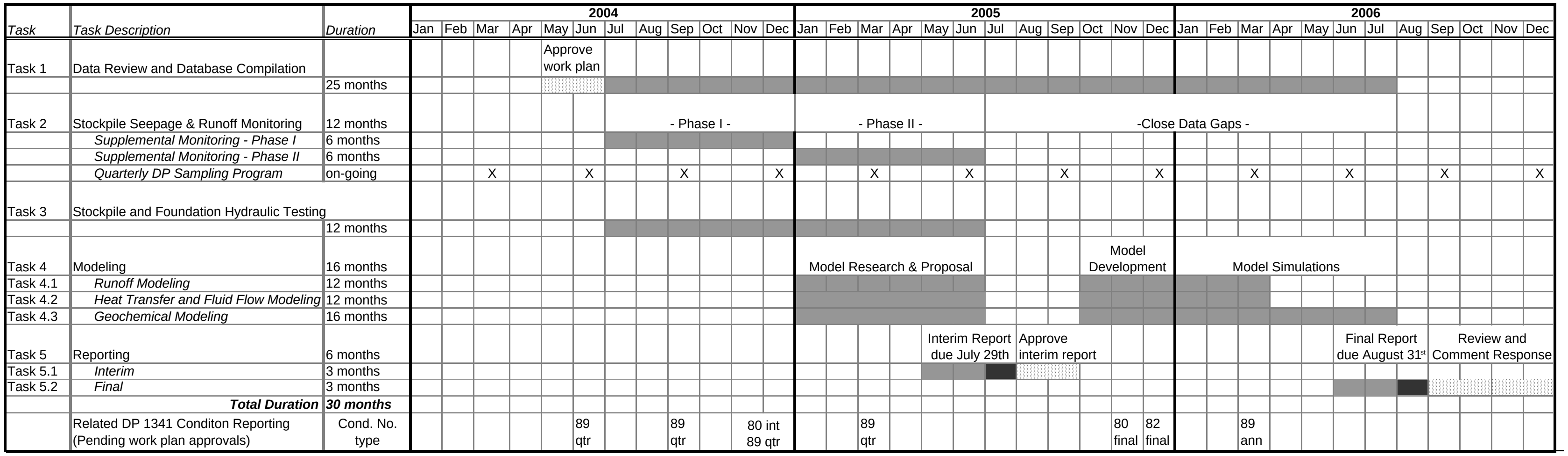


Legend

- Task Progress
- Review, Comment Response & Approval
- X Approximate Time for Quarterly Sampling
- Report Due at End of Month

Note: Deadlines are contingent upon work plan and interim report approval by scheduled dates

Study Implementation and Reporting Schedule

Figure 1.2

1.4.1 Leach Ore and Waste Rock Stockpile Facilities

Solution mining technology (Bartlett, 1992) is used to extract copper from the leach ore stockpiles at Tyrone. The waste rock stockpiles are used to dispose of excavated materials that have sub-economic copper values. Section 2 of the Supplemental Materials Characterization Study Work Plan (Greystone, 2003) presents updated descriptions of stockpile facility construction, operation, and closure methods employed at Tyrone, and the stockpile materials characterization studies previously conducted at the mine. This section summarizes the current stockpile leaching, seepage, and runoff management systems at Tyrone.

As shown on Figure 1.1, the Tyrone Mine contains several stockpiles located near and within the Main and Gettysburg pit areas. Tyrone is permitted to discharge up to 98.3 million gallons per day (gpd) of acidic leach solution (raffinate) on top of the leach ore stockpiles (NMED 2003), however the typical flow rate is substantially lower and averages approximately half of the allowed maximum rate. The raffinate flows through the leach ore stockpile material and dissolves copper from copper-bearing minerals. The copper-bearing, pregnant leach solution (PLS) then flows to the base of the stockpile and reports either to PLS surface collection impoundments located at the toe of the stockpiles within pre-mining drainage systems, to subsurface seepage interceptor systems, or to mine pits. The PLS collection impoundments consist of synthetically-lined, clay-lined, and unlined impoundments and stainless steel tanks. The seepage containment systems consist of constructed trenches that collect PLS, and wells that pump the PLS to the SX/EW plant for copper recovery as copper cathode. Seepage interception systems are located near the No. 3 Stockpile, along Deadman Canyon, in Oak Grove Wash, and in Brick Kiln Gulch (Figure 1.1).

The waste rock stockpiles are not subject to leaching and the seepage from these stockpiles is a result of natural infiltration of meteoric water that falls on the stockpile surfaces and that flows to the base of the stockpile. The interceptor systems also collect and pump perched groundwater contaminated by PLS and seepage from waste stockpiles. Stormwater runoff flows directly into the pits, or is routed via diversions to impoundments located near the toes of the stockpiles in the Deadman Canyon area, below the 1C stockpile, and in Oak Grove Wash (Figure 1.1).

1.4.2 Summary of Stockpile Seepage Studies and Other Relevant Studies

The completed mine closure and closeout supporting studies (M3 2001) that will be used to support this investigation and the types of data and information provided in these studies are listed in Table 1.1.

This study utilizes information from the Stockpile and Tailing Pond Seepage Investigation (DBS&A 1999), Geochemical Evaluation of Tailings and Stockpiles (SARB 2000), Outslope Evaluation Mass Loading Results for the Tyrone Mine (DBS&A 2001), and other references cited in these documents. In addition, relevant data and analyses will be used from other studies compiled in the CCP (M3 2001), and non-closure/closeout-related reports commissioned by PDTI for mine compliance, planning, and operations purposes.

Table 1.1 Reports, Documents and Data

REPORT	REFERENCE	DATA AVAILABLE									
		SITE BACKGROUND	HYDROGEOLOGY	HYDRAULIC PARAMETERS	STOCKPILE CONFIGURATIONS	STOCKPILE COMPOSITIONS	GEOCHEMICAL PARAMETERS	PHYSICAL PARAMETERS	PREDICTIVE MODELING (HYDROLOGY/ GEOCHEMISTRY)	EXISTING IMPACTS	CONTAINMENT MEASURES
Closure/Closeout Plan	M3 2001	X	X		X				X	X	X
Stockpile Outslope Evaluation Mass Loading Results for the Tyrone Mine	DBS&A 2001				X	X	X		X		
Summary of Long-Term Stability Analyses for Stockpiles and Tailing Ponds at the Tyrone Mine	Golder 2001	X			X	X		X			
Prediction of Impact on Water Quality	DBS&A, 2000		X	X					X	X	X
Cover Design Study Status Report	DBS&A 1999a			X			X	X	X		
Stockpile and Tailing Pond Seepage Investigation	DBS&A 1999b		X		X	X	X		X		
Geochemical Evaluation of Tailings and Stockpiles	SARB, 1999				X	X	X		X		
Preliminary Materials Characterization	DBS&A, 1997a				X	X	X				
Supplemental Materials Characterization Study	DBS&A, 1997b				X	X	X				
Borrow Materials Investigation	DBS&A 1997c	X			X	X					

CCP = Closure/Closeout plan
DBS&A = Daniel B. Stephens & Associates, Inc.
Golder = Golder & Associates, Inc

2.0 INVESTIGATION PROCEDURES

This section describes the methods used to characterize stockpile seepage (Section 2.1) and describes the models and modeling methods that PDTI proposes to use to simulate stockpile seepage flow and seepage quality after mine closure (Section 2.2).

2.1 Seepage Characterization

Stockpile seepage is being characterized through field and laboratory investigations as described in sections 2.1.1 and 2.1.2, respectively.

2.1.1 Field Procedures

Eight infiltration (percolation) tests were conducted on the Tyrone stockpiles. The infiltration tests were conducted from March 9th through March 16th 2005 on various stockpile bench surfaces throughout the mine site. Most of the benches were cut into existing stockpiles during remining activities and the test sites had been buried by one or more lifts of material prior to excavation, but one test was conducted on a stockpile top surface that has never been buried. The infiltration tests consisted of seven falling head tests and one constant head test, which are described in greater detail in Appendix A.

2.1.2 Laboratory Procedures

Two types of laboratory tests were used to evaluate stockpile seepage. They included hydraulic testing and meteoric water mobility testing. A brief description of these lab tests is provided below.

Hydraulic Testing

Laboratory hydraulic testing was conducted on stockpile samples collected from the same bench materials subjected to the field infiltration tests. The method used for collection of stockpile samples and the laboratory testing procedures conducted are described in Appendices A and B. Twenty four stockpile samples were tested at the Daniel B. Stephens and Associates laboratory to determine moisture content, bulk density, porosity, saturated and unsaturated hydraulic conductivities, particle-size distributions, and soil-water characteristic curves (Appendix B). These samples were collected for lab testing to characterize the unsaturated as well as saturated hydraulic properties of the matrix materials in the stockpiles for the purpose of seepage modeling. Water percolation through the stockpiles occurs predominately through the finer grained matrix as the oversize materials have relatively low intrinsic hydraulic conductivity (DBS&A 1999a,b).

Meteoric Water Mobility Procedure Testing

In 2004 regrading of the No. 1C stockpile was conducted in accordance with DP-1341 requirements. Stockpile samples were collected from the No. 1C Stockpile bench cuts for the purposes of the DP-1341, Condition 80 and 78 studies. Splits of these samples were subjected to a laboratory static leach test using the Meteoric Water Mobility Procedure (MWMP) according to ASTM E2242-02. This test was developed by the Nevada Department of Environmental Protection [NDEP] (1990) to determine the mobility of chemical constituents from soluble salts generated by leaching and weathering in mined materials. These tests are conducted at a water-to-rock ratio (by weight) of 1 to 1 to simulate the interaction between natural meteoric precipitation and the stockpile material. The leach extracts and any pore waters collected from the boreholes were measured for the following parameters or constituents: pH; EC; TDS; total alkalinity; HCO_3^-; CO_3^{-2} acidity; SO_4^{-2}; and other COCs specified in DP-1341 Condition 56 (a through c). As such, these results are used in geochemical models to provide a preliminary indication of seep water quality from the waste rock stockpiles and supplement data from water quality monitoring occurring at toe collection facilities.

The MWMP test is also being conducted on the stockpile borehole samples collected as part of the DP-1341, Condition 80 study. These more comprehensive results will be presented in the final report for that study and will be available for the Revised Seepage Investigation's ongoing studies

2.2 Seepage Modeling

This section describes PDTI's proposed modeling approach to simulate stockpile seepage quantity and quality for the purpose of NMED review. Computer modeling of reactive transport in waste rock piles is a very complex subject, and a comprehensive review of the subject matter is beyond the scope of this document. The intent of this section is to provide recommendations based on the current modeling practices applied to mine stockpile and acid rock drainage (ARD) systems, as described by researchers in the field and by regulatory precedents. Modeling is necessary to evaluate post-closure seepage from the leach ore stockpile and waste rock stockpiles because the future state of these systems is expected to be different from the current state. However, the models will be calibrated using seepage quality measurements.

2.2.1 Modeling Objectives

The most important part of any modeling study is to formulate well-defined objectives and scope (Alpers and Nordstrom 1999).

PDTI proposes the following modeling objectives:

- Simulate leaching and weathering reactions in stockpiles;
- Simulate leachate and seepage quantity at existing collection systems;
- Simulate post closure leachate and seepage quality at seepage collection systems;
- Calibrate model to observed seepage quantity and quality;

- Estimate post closure stockpile mass loading to groundwater;
- Determine the existing and post closure distribution of mass loading; and
- Evaluate the potential groundwater impacts for alternative closure designs.

The first objective also will support the Supplemental Stability Study which will be used to determine the effects, if any, of rock alteration on stockpile outslope stability. Objectives two through five are requirements of DP-1341, Condition 81. The last objective will be conducted in support of Condition 89.

2.2.2 Modeling Scope

All existing waste rock and leach stockpiles at Tyrone will be evaluated in the modeling study. However, some of these stockpiles will be reclaimed prior to the next permit renewal. The existing boundaries of these facilities are shown on Figure 1.1. In addition to the existing configurations of the stockpiles, selected reclamation alternatives will be evaluated in this study based on the preliminary findings of the feasibility study (DP-1340, Condition 93).

Three distinct post-closure periods will be simulated:

- Mine closure drain down period (approximately 10 years);
- Transition period (approximately 100 years); and
- Steady state period (greater than 100 years).

The constituents to be simulated include those stipulated in Condition 56 (a,b, and c) of DP-1341 provided that sufficient data exists for model calibration.

2.2.3 Model Selection

The following modeling selection criteria are proposed to ensure that the modeling can be feasibly completed according to the investigation schedule presented in the Condition 81 work plan (Greystone, 2004), given the objectives and scope described above.

- Model(s) must be generally accepted by scientists and regulators;
- Code execution with reasonable run-times on a desk-top computer;
- Model input requirements are compatible with existing datasets;
- Efficient post processing such that the input/output can be managed rapidly;
- Graphical capabilities for rapid data display and analysis and communication of results; and
- Output data structure that can be rapidly manipulated into spreadsheet and input files for other computations and simulations.

The last criteria will facilitate incorporation of stockpile mass loading outputs into the Feasibility Study (Condition 89) (Golder, 2004).

The documents listed in Table 2.1 provide guidance on model selection, development and application. These documents also provide recent summaries of computer codes applicable for the modeling of acid rock drainage and mine water quality.

Geochemical and reaction-transport modeling is a rapidly evolving field of study, and the state-of-the-art is always beyond even the most recent modeling reviews by the time that they are published. The Acid Drainage Technology Initiative (ADTI) modeling committee is conducting a literature survey of existing predictive models for acid rock drainage systems, and will write two workbooks or guidance manuals on geochemical modeling and coupled geochemical-transport modeling (ADTI 2003). The ADTI review is still in progress but considers over 50 geochemical transport and geochemical reaction codes that have the capability of simulating the most important processes in ARD formation.

The general comments found in these modeling summaries that are relevant to the

Condition 81 study are:

- The current state of the art allows simulation of stockpile heat and fluid flow and geochemical reaction and reactive transport, but coupling of these processes is demanding in terms of time and resources.
- Mass transfer (geochemical reaction) models coupled with reactive transport are most important for simulating ARD impacts to surface water and groundwater quality.
- Due to the limited number of processes simulated the far post-closure predictive capabilities of “engineering type” models (i.e. empirical models) are limited.

Table 2.1: Modeling Guidance and Summaries

Title	Year	Authors	Publisher
Draft Guidance on the Development, Evaluation, and Application of Regulatory Environmental Models	2003	P. Pascual N. Stiber E. Sunderland	Office of Science Policy, Office of Research and Development
Quality Assurance Project Plans for Modeling	2002		U.S. Environmental Protection Agency
MiMi – Overview of models for biogeochemical modeling of acid mine drainage	1999	S. Salmon	MiMi Research Programme, MiMi Print
Geochemical Modelling – A review of current capabilities and future directions	1999	J. Crawford	Swedish Envrinomental Protection Agency
Geochemical modeling of water-rock interactions in mining environments	1999	C.N. Alpers D.K. Nordstrom	Society of Economic Geologists
Reactive transport in porous media	1996	P.C. Lichtner C.I. Steefel E.H. Oelkers	Mineralogical Society of America
Critical review of geochemical processes and geochemical models adaptable for prediction of acidic drainage from waste rock.	1995	E. Perkins H. Nesbitt W.D. Gunter L.C. St-Arnaud J.R. Mycroft	Mine Environment Neutral Drainage (MEND) Program.

The first general comment recognizes that fully coupled transport codes that can simulate heat and fluid flow and geochemical reactions are at the forefront of computer model development at academic and government research institutions. These codes are not yet commonly used for regulatory decision making because even many of the existing and well established reaction-transport models are prone to numerical problems (Alpers and Nordstron, 1999). This makes it difficult to rapidly conduct sensitivity and uncertainty analysis with fully coupled models, especially when multiple alternatives need to be simulated. Therefore, it is important to simplify models to the degree possible such that they represent the most important system processes without loosing the capability of making meaningful predictions (Pascual et al., 2003).

The second and third comments emphasize that computer modeling efforts should be directed towards simulation of the most important geochemical processes in ARD formation as listed below (Perkins et al., 1995):

- Mineral precipitation and dissolution;
- Chemical diffusion; and
- Surface reactions.

Geochemical reaction kinetics is controlled by chemical diffusion and surface reactions, which also includes pyrite oxidation reactions. These reactions may also be microbiologically catalyzed and mediated. Mineral precipitation is important in waste rock piles because sulfate salts, such as jarosite, may accumulate as pyrite oxidation occurs (Cathles, 1994). These salts contain residual acidity and constituent masses that may affect the water quality of runoff or flushing events caused by rainstorms. Mineral dissolution is also important because weathering of feldspars and other gangue minerals may contribute towards the long-term alkalinity of the system (Nicholson, 2003). The attendant mineral replacement reactions may also affect the physical properties of the stockpiles.

For transport of constituents generated by ARD, the processes shown in Figure 2.1 are the most important, and the relative importance of these processes is dependent upon site-specific conditions like climate and cover design. Drying and wetting are the most important physical processes that affect water chemistry by concentrating aqueous solutions to the point of precipitating solids and subsequently dissolving and removing these solids from solution contact (Perkins, et al., 1995). Drying and wetting occurs as a result of non-steady moisture movement through the stockpile, such as during drain-down of leach solutions from a leach ore stockpile at mine closure.

Based upon its review of the modeling guidance documents, PDTI recommends decoupling the heat and fluid flow models from the geochemical reaction simulations for the practical purpose of stockpile seepage modeling. Geochemical reaction path simulations can be used to determine the transport of constituents along distinct flow paths described by the independent flow model (Zheng and Bennet, 1995). This method avoids the difficulties associated with fully coupled models and allows for rapid simulation with variable input parameters. Therefore, PDTI recommends that the heat and fluid flow modeling and geochemical reaction path or reactive transport modeling be conducted separately as described in Sections 2.2.4 and 2.2.5, respectively.

2.2.4 Runoff and Seepage Modeling

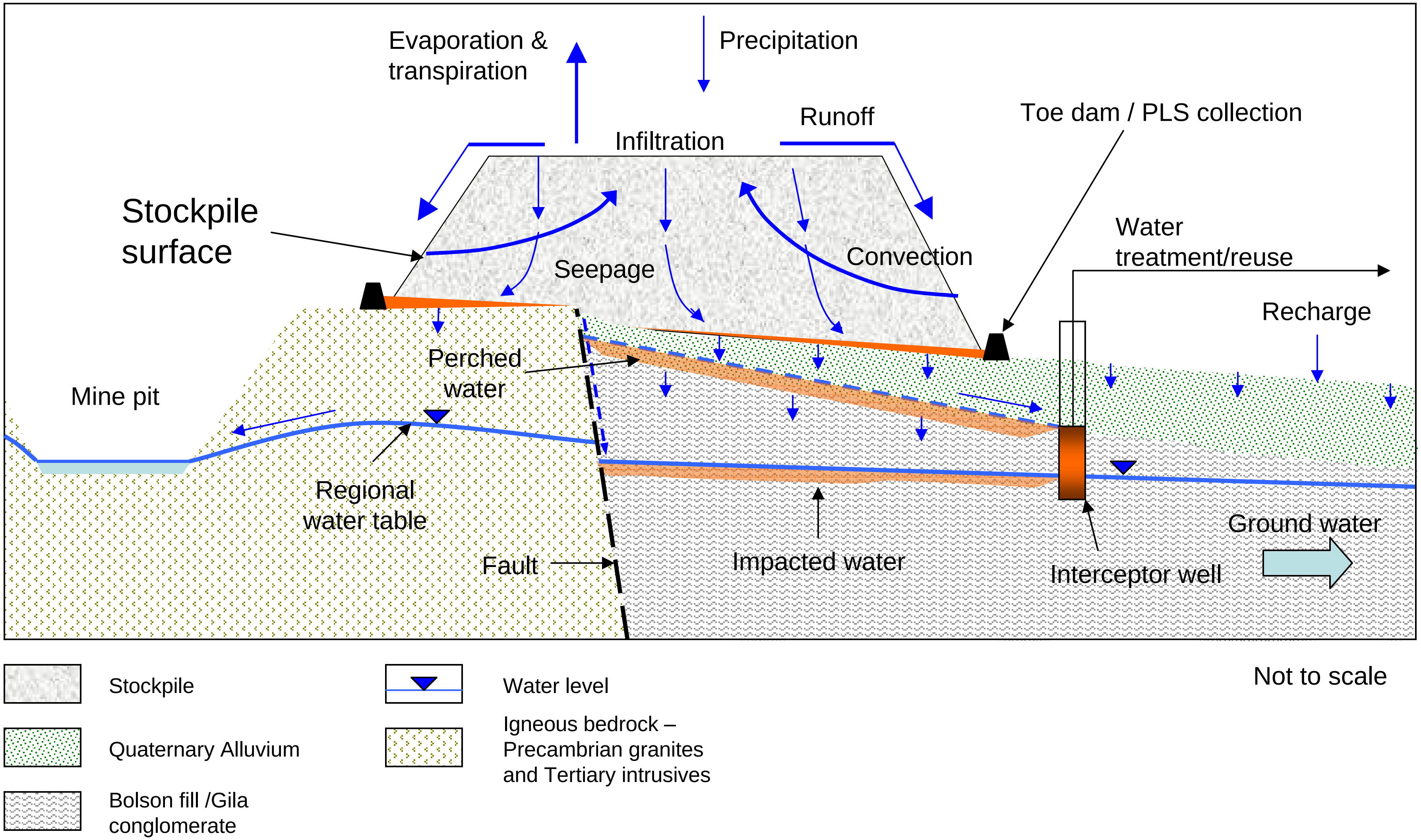
Runoff and seepage modeling may be used to determine the water mass balance and the seepage flow paths in stockpile systems given the following site-specific input parameters:

- Stormwater flow data and weather data;
- Post closure infiltration rates through alternative stockpile covers;
- Alternative post-closure stockpile configurations; and
- Internal temperature, oxygen, and moisture monitoring results.

Constituent mass transfer by runoff and down stream surface and groundwater quality impacts will be mitigated by the cover and storm water containment systems. However the runoff quantity must be estimated in order to predict infiltration. This will be determined as part of the cover design and test plot studies (Conditions 75 and 76). In addition, runoff quantity and quality estimates based upon field measurements will be used for base case modeling and seepage flow calibration for uncovered stockpiles.

Heat transfer and gas flow are also important processes for determining seepage water quantity and flow directions in some sulfide-bearing stockpiles. However, based upon observations of relatively low temperature gradients within most of the leach ore and waste rock stockpiles at Tyrone, heat transfer and gas convection are likely to be a minor processes in the water balance equations and will not be considered in the modeling analysis.

The two primary constituent transport mechanisms are fluid flow (advection) and diffusion. In many subsurface systems in the near earth surface, advective transport dominates diffusive transport because of precipitation-induced recharge. However, the cover studies will evaluate the feasibility of reducing the infiltration rate through the stockpiles to less than or equal to 1% of mean annual rainfall. Under very low flow conditions (less than 1 cm per year) the rate of constituent transport by diffusion may become equal to or greater than the rate of transport by advection even for long timeframes. Under these conditions stockpile seepage quality and mass loading will become independent of the rate of infiltration. It is conceivable that these conditions will occur within waste rock stockpiles.



Stockpile Seepage Conceptual Model

Figure 2.1

For leach ore stockpiles, draindown of residual process solutions may be a significant or predominant constituent transport process. Draindown will be estimated from empirical data obtained from leach solution flow rates to toe collections systems, according to the closure designs evaluated by the feasibility study (DP-1341, Condition 89). As draindown proceeds after closure, the downward drainage flux declines asymptotically as water content in the stockpile decreases. Therefore, long term drainage may need to be predicted on the basis of empirical or analytical models such as those that describe internal drainage in soils (Hillel, 1998).

After the preliminary results from the cover design studies are made available, supplemental analyses and scoping modeling runs will be conducted to determine what types of additional analyses and simulation are necessary. If deemed necessary by these analyses, fluid flow models will be developed for distinct hydrogeologic units in each stockpile. These units will generally correspond to the underdump drainage systems as depicted in Figure 2.1. The drainages will be modeled separately where sufficient seepage flow information is available for calibration.

There are several models that simulate fluid flow in unsaturated systems that have been subject to rigorous scientific and regulatory agency reviews (Crawford, 1999). One of the earliest and most widely used models is TOUGH-2 (Pruess, 1991) and modifications to that code. This model was developed by Lawrence Livermore Laboratories for simulation of nuclear waste disposal systems. Recently TOUGH-2 has been adapted for applications in simulations of heat and mass transfer in sulfide mine waste piles (Wels et al., 2003).

PDTI recommends the use of the TOUGH-2 or similar codes if numerical modeling is determined to be necessary to meet the overall objectives of the Condition 81 and related DP-1341 studies. In some stockpile alternatives, where very low infiltration can be demonstrated, fluid flow modeling may not be necessary. Under these conditions, draindown flow estimates and geochemical modeling can be used to predict mass loading to a sufficient level of accuracy to meet the objectives of Condition 81 and related studies.

2.2.5 Geochemical Modeling

Most model reviews do not provide a specific recommendation on computer codes that are most suitable for ARD and mine water quality simulation. Two reviews provide indications of existing codes that have advantageous capabilities in terms of geochemical reaction simulations. The report by Salmon (1999) reviews the relative capabilities and merits of 44 models developed to simulate acid rock drainage (ARD) and predict its impacts on water quality. The models are categorized and the strengths and weaknesses were evaluated and tabulated. Of the 44 models reviewed, five were selected for more detailed analysis for potential applications in predicting ARD. Of these five, two were recommended as having the most potential for ARD prediction:

- The empirical model developed by White and Jeffers (1993); and
- The numerical model EQ3/6 (Wolery, 1992).

The code EQ3/6 has been used as part of the modeling analysis used in the Prediction of Impact on Water Quality study (DBS&A, 2000) and the Outslope Evaluation study (DBS&A, 2001). The EQ3/6-based model used for these studies also used the concept of adjusting the humidity cell data for interstitial water contents typical of field conditions. This methodology is used in the White model (White and Jeffers, 1993).

Salmon describes the EQ3/6 code as being a general geochemical simulator, meaning that it has a wide range of geochemical simulation applications including ARD prediction and prediction of impact on groundwater quality. The model developed by White was not intended to model waste-rock dumps, but rather to model acidic drainage potential for discrete waste-rock types based on drill core and bulk samples (White and Jeffers, 1993). Furthermore, it cannot predict stockpile seepage water quality.

Crawford (1999) recommends the application of mass transfer geochemical models such as EQ6 and PATHARC on well-defined oxidizing waste rock field or laboratory systems. Furthermore, EQ6 is a "path-finding" code (Alpers and Nordstrom, 1999). Path finding codes are advantageous because they are not subject to the bias of a user-defined heterogeneous system. Many of the other models commonly used for mine water simulations, such as PHREEQC, are not path finding codes and the range of outcomes is constrained by the operator's definition of the system. Path finding is especially important for long-term predictions when future stockpile conditions are not known a-priori.

Based upon these reviews PDTI recommends the modeling platform the Geochemists Work Bench (GWB) which has kinetic reaction path simulation and reaction path finding capabilities that are similar to EQ3/6 and utilizes the same thermodynamic databases. These databases are the most comprehensive and have the highest internal consistency of any databases in the world.

GWB is a proprietary package of geochemical modeling software developed by Dr. Bethke at the University of Illinois (Bethke 2004a). The codes in GWB can simulate all of the ARD processes listed in section 3.5.4 above. It also provides rapid input output and graphing capabilities based on a graphical user interface. GWB has the capability to not only simulate reactions paths, but also has rapid path tracing and display capabilities to quickly render output as graphs for rapid and higher quality interpretation. For example, rapid generation of Eh-pH diagrams is a capability of GWB through the use of the model Act2.

The GWB modeling platform is being used for ARD prediction at educational, government, and private institutions. For example, Kim Lappakko's research team at the Minnesota Department of Natural Resources currently uses the GWB to support the laboratory kinetic testing and field application work being conducted at that laboratory (Berndt, 2004).

The Xt software package, included in most recent version of GWB Professional release has numerical reactive transport simulation capabilities in reacting geochemical systems in one and two dimensions (Bethke, 2004b). The capabilities now represented in GWB Professional covers the following processes occurring in stockpiles.

- Mass transport by advection, diffusion and dispersion;
- Fluid discharge at fixed or evolving rates owing to changes in permeability and viscosity;
- Isothermal and polythermal models for all expected temperature ranges ;
- Homogeneous and heterogeneous material domains and initial conditions;
- Specification of kinetic rate laws including catalysis;
- Microbial metabolism and growth;
- Surface complexation and sorption;
- Redox equilibrium and disequilibrium;
- Activity models for high total dissolved solids concentrations;
- Gas buffering; and
- Equilibrium and kinetic heterogeneous reactions.

This extended capability allows for multilayer, stockpile seepage quality simulation and prediction of groundwater quality. The graphical capabilities also allow for direct display of concentration gradients in the system.

For long range modeling predictions, it cannot be assumed that the internal conditions within the stockpiles will remain constant. If the cover used in a semi-arid or arid environment does little to reduce the overall sulfide oxidation rate, then the water consumed in the chemical reactions can become a large fraction of the infiltration rate (Pantelis, et al., 2002). In addition, chemical precipitation of solids, decrepidation and illuvial processes will tend to fill larger voids in the stockpiles with finer particles, which will change the distribution of hydraulic properties within the pile (Murr, 1980). Unlike most geochemical transport models, GWB has the capability of calculating reaction water balance, and predicting changes in hydraulic properties owing to changes in porosity and permeability as a result of chemical reaction feedback mechanisms. The significance of these processes will be considered as part of the modeling task for the Condition 81 study.

2.2.6 Modeling Quality Assurance Plan

Model development, calibration, sensitivity and uncertainty analysis and documentation will follow the guidance documents listed in Table 2.1. A modeling quality assurance plan will be submitted to the NMED prior to the onset of modeling. Because GWB is a proprietary modeling platform the issue of transparency needs to be addressed. However, the model is now widely used and accepted at Universities and research institutions. Therefore, guidelines for evaluating proprietary models will be followed, including cross-checking GWB results with those produced by EQ3/6. A published benchmark geochemical model input dataset and model output, that is applicable to mine site geochemical systems, will be used for cross-checking purposes.

3.0 RESULTS

The results of field testing and laboratory testing are provided in sections 3.1 and 3.2, respectively.

3.1 Field Testing

Table 3.1 provides the saturated hydraulic conductivities (Ksat) calculated for each stockpile infiltration test described in Appendix A. The Ksat values ranged from 2.5 E-05 to 2.4 E-03.

Table 3.1 Summary of Stockpile Infiltration Tests

Test ID	Infiltration Test Type (Falling head/Constant head)	Saturated Hydraulic Conductivity Ksat (cm/sec)
No. 1C Stockpile		
1C-T1	Falling	1.57 E-04
1C-T2	Falling	2.15 E-04
1C-T3	Falling	9.74 E-05
Savanna Stockpile		
Savanna-T4	Constant	2.4 E-03 to 3.9 E-03
Savanna-T8	Falling	4.80 E-04
No. 3B Stockpile		
3B-T5	Falling	4.78 E-05
No. 2B and 2C Stockpiles		
2B-T6	Falling	2.54 E-05
2C-T7	Falling	4.78 E-05

These values are generally lower by one to two orders of magnitude than the range of values measured during earlier field infiltration tests conducted for the Cover Design Study (DBS&A, 1999a). The new tests were conducted primarily within interior sections of the stockpiles that had been previously buried prior to excavation. Only the top surfaces of stockpile materials were tested as part of the Cover Design study. The lower stockpile interior saturated hydraulic conductivities may be attributed to the compaction that occurred as a result of material burial and overburden loading. The saturated hydraulic conductivity measured during one test conducted on the top surface of the No. 3B Stockpile was also low because of very heavy truck traffic and compaction.

3.2 Laboratory Testing

The laboratory results for both hydraulic testing and meteoric water procedure testing are discussed in sections 3.2.1 and 3.2.2, respectively.

3.2.1 Hydraulic Testing

The results of the laboratory hydraulic testing of the stockpile materials are provided in Appendix B. In general the range of hydraulic properties found in these samples is similar to those reported for stockpile materials in the Cover Design Study (DBSA, 1999). The median saturated hydraulic conductivity determined through laboratory testing was one to two orders of magnitude higher or lower than the field test values for the same site. This indicates that larger scale macropores and other field scale structures are controlling flow in the stockpiles. These results will be discussed in more detail in the final report.

3.2.2 Meteoric Water Mobility Procedure Testing

The results of the MWMP testing performed on the No 1C Stockpile cut bench samples are provided in Appendix C. The results for these materials shows that the paste pH ranges between 2.72 and 5.23. The final extract pH ranges between 2.45 and 4.71. The initial pH of the distilled deionized water was approximately 4.83. Therefore all of the materials sampled are capable of producing some acid when meteoric water contacts the rock. The acidity of the extract solution ranged from less than 1 to 10,700 milliequivalents per liter (meq/l). There was no detectable alkalinity in any of the extracts. The calculated TDS of the extracts ranged from 1260 to 17800 milligrams per liter (mg/l) and the sulfate concentrations ranged from 856 to 10700 mg/l. The leach extracts with the highest TDS and sulfate had the lowest extract pH values.

The constituents F, Al, Cd, Co, Cu, Mn, Ni and Zn were detected in all of the extracts. In some of the MWMP extracts B, Ba, Be, Fe, Mo, and Pb were also detected. The concentrations of the constituents F, Al, Cu, Mn, and Zn were consistently high and ranged from a few ppm to over 1000 ppm

The results of additional MWMP testing on stockpile samples collected from boreholes will be discussed in the final report.

4.0 DISCUSSION

This interim report provides some of the preliminary data gathering results which will be discussed in detail in the final report. Section 4.1 describes the seepage flow monitoring that is being conducted to support the seepage flow modeling investigations. Section 4.2 describes the seepage quality monitoring data available for this investigation and calibration of the geochemical model.

4.1 Seepage Flow Monitoring

Seepage and runoff quantity and flow measurements are conducted in accordance with monitoring requirements per PDTI's operational discharge permits. This information is reported to the NMED quarterly and annually. Recognizing the variable nature of stockpile runoff and seepage flow resulting from precipitation events, PDTI will conduct supplemental flow measurements and seepage sampling when and where feasible. The benches of the Tyrone stockpiles are graded so that runoff flows toward the stockpile interior and collects at the break in the stockpile slope when heavy rainfall occurs. For most precipitation events, runoff water infiltrates quickly into the stockpiles and evaporates at the surface.

Daily meteorological data will be recorded per Condition 55, and as specified in the Cover Test Plot Study Work Plan for Condition 76 (Tetra Tech 2003). Flows and quality of seepage into the 5E collection ponds were monitored as part of the Stockpile and Tailing Seepage Investigation (DBS&A 1999b), and similar monitoring systems will be used for this study.

4.2 Seepage Quality Monitoring

In addition to the meteoric water mobility testing on stockpile samples, sampling of water quality data occurs on a quarterly and annual basis in accordance with PDTI's discharge plan (DP) permits. For example, stockpile seepage quality is presently monitored in the No. 3A Leach Stockpile and East Mine areas for existing Discharge Plans 286 and pending DP 896, respectively. Additional seepage sample collection and analysis will be conducted, where needed, to achieve the data quality objectives specified in DP-1341, Condition 43, and other relevant conditions called out in the permit. This data is compiled into the Environmental Data Management System for Phelps Dodge New Mexico operations, which includes the Tyrone mine. This database also includes stockpile seepage water quality monitoring data. This data will be used in the final report's evaluation of seep water quality from leach ore and waste rock stockpiles and for seepage model calibration.

Surface water, including stockpile runoff flow will continue to be monitored according to DP-1341 Condition 48. After rainfall events, water quality samples will be collected directly from the stockpile surfaces along benches and depressions where the runoff water collects.

5.0 PREDICTION OF IMPACTS

A prediction of the potential impacts to groundwater and surface water quality will be based on a stockpile mass loading analysis (Section 5.1) and a source area groundwater transport model (Section 5.2).

5.1 Mass Loading

The mass loading of a constituent from a stockpile facility is equal to the volumetric discharge of seepage from the stockpile times the predicted concentration of a constituent (DBS&A 2001). Mass loading estimates will be used as an indicator of the potential impact to water quality from stockpile seepage and runoff, and in transport models to predict ground and surface water quality. The results of the modeling described in Section 3.3 will be used to calculate revised estimates of mass loading for the Tyrone stockpiles. The runoff and seepage flow modeling will estimate the discharge of seepage from the stockpiles. The geochemical model will estimate the concentration of concern (COCs) in the seepage and runoff.

The distribution of mass loading beneath each stockpile to the top of the water table in its existing and alternative closure configurations will be calculated using a database of the seepage flow and geochemical transport model results for each stockpile. These results will be integrated using a geographic information system (GIS) for the Tyrone stockpiles. The GIS will be used to generate maps that illustrate mass loading distributions across the base of the stockpiles, and these maps will be presented in the final report. The existing masses of dissolved constituents in impacted groundwater will be estimated and used to calibrate the mass loading model. This analysis will also be used to compare the performance of closure alternatives.

5.2 Transport Model

The mass loading inputs will be integrated into a simplified transport model to simulate groundwater quality directly beneath the stockpiles. The extent of the transport domain will be sufficient to provide source area estimates for a more extensive analysis of groundwater quality being conducted for the Supplemental Groundwater Study, per DP-1341, Condition 82 (DBS&A 2003). The stockpiles' mass loading will be dissolved into the vertical groundwater column beneath the stockpiles through simulated mixing and attenuation processes. The zone of impacted water beneath the water table will be varied according to bounding estimates of the thickness of the regional water table and the estimated depth of dissolved mass distribution. The travel time from the base of the stockpile to the water table and loading rate of the constituents will be evaluated based on the depth to the water table, bedrock properties, and other site specific conditions. The travel time estimates and mass flux rates can be used to simulate the transition from present day to a post-closure steady state condition. This condition will be governed largely by the average draindown rate and infiltration rate into the covered or uncovered stockpile surfaces.

Updated water level, groundwater velocity, and porosity data from the Condition 82 study will be used in the transport simulations for existing mine site conditions. In addition, seepage fractions (fraction of stockpile seepage in a surface or groundwater sample) can be estimated using geochemical analyses such as the Mg concentrations in impacted and background groundwater (Bartlett 1992). The estimated seepage fractions can be used to determine the existing seepage and mass loading rates for calibration of the transport model through comparison with existing groundwater quality data.

6.0 ALTERNATIVES EVALUATION

The stockpile closure alternatives to be modeled, including the provisional alternative stipulated by DP-1341, will be developed in conjunction with the Feasibility Study (Condition 89). The long-term mass loading and water quality impacts will be evaluated for a period consistent with the design life of the other facilities associated with mine closure. For example, the bonding requirement associated with water treatment is for 100 years. We will use best methods and current practice to predict mass loading and water quality impacts for a period determined from the closure alternative development process conducted for the Feasibility Study (Condition 89). The overall performance objectives and conceptual designs for closure and reclamation of the major facilities at Tyrone will be based on the outcome of the supplemental supporting studies required in Supplemental Permit DP-1341 (NMED 2003), including this study.

The models will be used to estimate the mass loading and the groundwater quality beneath the stockpiles during and after mine closure for the selected alternative reclamation scenarios. The scope of the alternatives evaluation includes the provisional reclamation guidelines set forth in DP-1341. The results of the evaluation will be presented in the final report and will be incorporated into the Condition 82, 83, and 89 studies in a timely fashion.

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APPENDIX B - LABORATORY HYDRAULIC TESTING

Laboratory Report for

EnviroGroup Limited

Stockpile Infiltration Tests

July 22, 2005

Daniel B. Stephens & Associates, Inc.

6020 Academy NE, Suite 100 • Albuquerque, New Mexico 87109

July 22, 2005

Dusty Earley
EnviroGroup Limited
204 S. Bowen Street, Suite 201
Longmont, CO 80501
(720) 494-2600

Re: DBS&A Laboratory Report for EnviroGroup - Stockpile Infiltration Tests samples

Dear Mr. Earley:

Enclosed is the final report for the EnviroGroup - Stockpile Infiltration Tests samples. Please review this report and provide any comments as samples will be held for a maximum of 30 days. After 30 days samples will be returned or disposed of in an appropriate manner.

All testing results were evaluated subjectively for consistency and reasonableness, and the results appear to be reasonably representative of the material tested. However, DBS&A does not assume any responsibility for interpretations or analyses based on the data enclosed, nor can we guarantee that these data are fully representative of the undisturbed materials at the field site. We recommend that careful evaluation of these laboratory results be made for your particular application.

The testing utilized to generate the enclosed final report employs methods that are standard for the industry. The results do not constitute a professional opinion by DBS&A, nor can the results affect any professional or expert opinions rendered with respect thereto by DBS&A. You have acknowledged that all the testing undertaken by us, and the final report provided, constitutes mere test results using standardized methods, and cannot be used to disqualify DBS&A from rendering any professional or expert opinion, having waived any claim of conflict of interest by DBS&A.

We are pleased to provide this service to EnviroGroup and look forward to future laboratory testing on other projects. If you have any questions about the enclosed data, please do not hesitate to call.

Sincerely,

DANIEL B. STEPHENS & ASSOCIATES, INC.
LABORATORY / TESTING FACILITY

Joleen Hines

Joleen Hines, Laboratory Supervising Manager
Enclosure

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Summaries

Daniel B. Stephens & Associates, Inc.

Summary of Tests Performed

Laboratory Sample Number	Initial Soil Properties[1] (θ, ρ_d, ϕ)	Saturated Hydraulic Conductivity[2]		Moisture Characteristics[3]					Unsaturated Hydraulic Conductivity	Particle Size[4]			Effective Porosity	Particle Density	Air Permeability	1/3, 15 Bar Points and Water Holding Capacity	Atterberg Limits	Proctor Compaction
		CH	FH	HC	PP	TH	WP	RH		DS	WS	H						
2B-T6 (0-3)	X	X		X	X		X	X	X		X	X						
2B-T6 (1-4)	X	X		X	X		X	X	X		X	X						
2B-T6 (3-6)	X		X	X	X		X	X	X		X	X						
3B-T5 (0-3)	X	X		X	X		X	X	X		X	X						
3B-T5 (2-5)	X	X		X	X		X	X	X		X	X						
3B-T5 (3-6)	X	X		X	X		X	X	X		X	X						
1C-T1 (0-3)	X	X		X	X		X	X	X		X	X						
1C-T1 (4-7)	X	X		X	X		X	X	X		X	X						
1C-T1 (10-13)	X	X		X	X		X	X	X		X	X						
1C-T2 (0-3)	X	X		X	X		X	X	X		X	X						
1C-T2 (5-8)	X	X		X	X		X	X	X		X	X						
1C-T2 (11-14)	X	X		X	X		X	X	X		X	X						
1C-T3 (0-3)	X		X	X	X		X	X	X		X	X						
1C-T3 (4-7)	X	X		X	X		X	X	X		X	X						
1C-T3 (7-10)	X		X	X	X		X	X	X		X	X						

[1] θ = Initial moisture content, ρ_d = Dry bulk density, ϕ = Calculated porosity

[2] CH = Constant head, FH = falling head

[3] HC = Hanging column, PP = Pressure plate, TH = Thermocouple psychrometer, WP = Water activity meter, RH = Relative humidity box

[4] DS = Dry sieve, WS = Wet sieve, H = Hydrometer

Daniel B. Stephens & Associates, Inc.

Summary of Tests Performed (Continued)

Laboratory Sample Number	Initial Soil Properties[1] (θ, ρ_d, ϕ)	Saturated Hydraulic Conductivity[2]		Moisture Characteristics[3]					Unsaturated Hydraulic Conductivity	Particle Size[4]			Effective Porosity	Particle Density	Air Permeability	1/3, 15 Bar Points and Water Holding Capacity	Atterberg Limits	Proctor Compaction
		CH	FH	HC	PP	TH	WP	RH		DS	WS	H						
2C-T7 (0-3)	X	X		X	X		X	X	X		X	X						
2C-T7 (1-4)	X	X		X	X		X	X	X		X	X						
2C-T7 (2-5)	X	X		X	X		X	X	X		X	X						
Savannah-T4 (0-3)	X		X	X	X		X	X	X		X	X						
Savannah-T4 (12-15)	X		X	X	X		X	X	X		X	X						
Savannah-T4 (30-33)	X		X	X	X		X	X	X		X	X						
Savannah- T8 (0-3)	X		X	X	X		X	X	X		X	X						
Savannah- T8 (3-6)	X		X	X	X		X	X	X		X	X						
Savannah- T8 (6-9)	X	X		X	X		X	X	X		X	X						

[1] θ = Initial moisture content, ρ_d = Dry bulk density, ϕ = Calculated porosity

[2] CH = Constant head, FH = falling head

[3] HC = Hanging column, PP = Pressure plate, TH = Thermocouple psychrometer, WP = Water activity meter, RH = Relative humidity box

[4] DS = Dry sieve, WS = Wet sieve, H = Hydrometer

Daniel B. Stephens & Associates, Inc.

Sample Prep Summary

Sample Number	Target Remold Densities Provided by Client at As Received Moisture Dry Bulk Density (g/cm^3)	Actual Remold Values Moisture Content (%, g/g)	Actual Remold Values Dry Bulk Density (g/cm^3)	Actual Remold Values % of Target Density (%)
2B-T6 (0-3)	1.80	9.3	1.79	99%
2B-T6 (1-4)	1.80	12.3	1.80	100%
2B-T6 (3-6)	1.80	10.6	1.80	100%
3B-T5 (0-3)	1.80	11.0	1.81	101%
3B-T5 (2-5)	1.80	12.0	1.81	100%
3B-T5 (3-6)	1.80	12.0	1.80	100%
1C-T1 (0-3)	1.80	6.0	1.82	101%
1C-T1 (4-7)	1.80	6.4	1.81	101%
1C-T1 (10-13)	1.80	9.0	1.80	100%
1C-T2 (0-3)	1.80	6.4	1.80	100%
1C-T2 (5-8)	1.80	3.8	1.80	100%
1C-T2 (11-14)	1.80	5.4	1.80	100%
1C-T3 (0-3)	1.80	17.1	1.79	100%
1C-T3 (4-7)	1.80	12.3	1.78	99%
1C-T3 (7-10)	1.80	15.5	1.79	100%
2C-T7 (0-3)	1.80	19.1	1.81	100%
2C-T7 (1-4)	1.80	21.4	1.81	100%
2C-T7 (2-5)	1.80	7.6	1.80	100%
Savannah-T4 (0-3)	2.00	14.9	2.00	100%
Savannah-T4 (12-15)	2.00	11.0	1.99	99%
Savannah-T4 (30-33)	2.00	9.3	1.99	100%
Savannah- T8 (0-3)	2.00	11.7	1.99	99%
Savannah- T8 (3-6)	2.00	10.8	1.98	99%
Savannah- T8 (6-9)	2.00	11.1	1.99	100%

Summary of Initial Moisture Content, Dry Bulk Density Wet Bulk Density and Calculated Porosity

Sample Number	Initial Moisture Content: Gravimetric (%, g/g)	Initial Moisture Content: Volumetric (%, cm^3/cm^3)	Dry Bulk Density (g/cm^3)	Wet Bulk Density (g/cm^3)	Calculated Porosity (%)
2B-T6 (0-3)	9.3	16.7	1.79	1.95	32.5
2B-T6 (1-4)	12.3	22.2	1.80	2.03	31.9
2B-T6 (3-6)	10.6	19.1	1.80	1.99	32.1
3B-T5 (0-3)	11.0	19.9	1.81	2.01	31.6
3B-T5 (2-5)	12.0	21.8	1.81	2.02	31.8
3B-T5 (3-6)	12.0	21.5	1.80	2.02	32.0
1C-T1 (0-3)	6.0	10.9	1.82	1.93	31.2
1C-T1 (4-7)	6.4	11.5	1.81	1.92	31.7
1C-T1 (10-13)	9.0	16.2	1.80	1.96	32.1
1C-T2 (0-3)	6.4	11.5	1.80	1.92	32.0
1C-T2 (5-8)	3.8	6.8	1.80	1.87	32.0
1C-T2 (11-14)	5.4	9.8	1.80	1.90	32.0
1C-T3 (0-3)	17.1	30.7	1.79	2.10	32.3
1C-T3 (4-7)	12.3	22.0	1.78	2.00	32.9
1C-T3 (7-10)	15.5	27.8	1.79	2.07	32.3
2C-T7 (0-3)	19.1	34.6	1.81	2.15	31.8
2C-T7 (1-4)	21.4	38.8	1.81	2.19	31.8
2C-T7 (2-5)	7.6	13.7	1.80	1.94	31.9
Savannah-T4 (0-3)	14.9	29.7	2.00	2.29	24.6

NA = Not analyzed

Summary of Initial Moisture Content, Dry Bulk Density Wet Bulk Density and Calculated Porosity (Continued)

Sample Number	Initial Moisture Content Gravimetric (%, g/g)	Initial Moisture Content Volumetric (%, cm^3/cm^3)	Dry Bulk Density (g/cm^3)	Wet Bulk Density (g/cm^3)	Calculated Porosity (%)
Savannah-T4 (12-15)	11.0	22.0	1.99	2.21	24.9
Savannah-T4 (30-33)	9.3	18.6	1.99	2.18	24.7
Savannah- T8 (0-3)	11.7	23.3	1.99	2.22	25.0
Savannah- T8 (3-6)	10.8	21.3	1.98	2.20	25.2
Savannah- T8 (6-9)	11.1	22.1	1.99	2.21	24.9

NA = Not analyzed

Summary of Saturated Hydraulic Conductivity Tests

Sample Number	K_{sat} (cm/sec)	Method of Analysis: Constant Head	Method of Analysis: Falling Head
2B-T6 (0-3)	4.3E-04	X	
2B-T6 (1-4)	3.2E-04	X	
2B-T6 (3-6)	2.9E-05		X
3B-T5 (0-3)	2.0E-04	X	
3B-T5 (2-5)	1.3E-05	X	
3B-T5 (3-6)	1.2E-04	X	
1C-T1 (0-3)	5.8E-03	X	
1C-T1 (4-7)	9.9E-03	X	
1C-T1 (10-13)	3.9E-02	X	
1C-T2 (0-3)	5.7E-02	X	
1C-T2 (5-8)	1.5E-02	X	
1C-T2 (11-14)	1.9E-02	X	
1C-T3 (0-3)	6.0E-07		X
1C-T3 (4-7)	4.2E-05	X	
1C-T3 (7-10)	9.5E-07		X
2C-T7 (0-3)	2.2E-04	X	
2C-T7 (1-4)	1.1E-04	X	
2C-T7 (2-5)	7.7E-05	X	

Summary of Saturated Hydraulic Conductivity Tests (Continued)

Sample Number	K_{sat} (cm/sec)	Method of Analysis	
		Constant Head	Falling Head
Savannah-T4 (0-3)	1.5E-06		X
Savannah-T4 (12-15)	1.5E-07		X
Savannah-T4 (30-33)	1.9E-06		X
Savannah- T8 (0-3)	8.4E-07		X
Savannah- T8 (3-6)	6.7E-07		X
Savannah- T8 (6-9)	8.9E-06	X	

Summary of Calculated Unsaturated Hydraulic Properties

Sample Number	α (cm^{-1})	N (dimensionless)	θ_r	θ_s
2B-T6 (0-3)	0.0169	1.1942	0.0000	0.3415
2B-T6 (1-4)	0.0096	1.1978	0.0000	0.3180
2B-T6 (3-6)	0.0069	1.2283	0.0000	0.3166
3B-T5 (0-3)	0.0250	1.1690	0.0000	0.3189
3B-T5 (2-5)	0.0084	1.1995	0.0000	0.3079
3B-T5 (3-6)	0.0169	1.1945	0.0000	0.3434
1C-T1 (0-3)	0.1709	1.2569	0.0259	0.3520
1C-T1 (4-7)	0.1577	1.3566	0.0626	0.3575
1C-T1 (10-13)	0.2904	1.1759	0.0054	0.3050
1C-T2 (0-3)	0.0486	1.8834	0.0621	0.2797
1C-T2 (5-8)	0.2994	1.4896	0.0165	0.3260
1C-T2 (11-14)	0.1501	1.4751	0.0416	0.3278
1C-T3 (0-3)	0.0004	1.3300	0.0000	0.3270
1C-T3 (4-7)	0.0078	1.2596	0.0000	0.3611
1C-T3 (7-10)	0.0002	1.4495	0.0000	0.2977
2C-T7 (0-3)	0.0019	1.2933	0.0000	0.3101
2C-T7 (1-4)	0.0033	1.2398	0.0000	0.3237
2C-T7 (2-5)	0.0727	1.1638	0.0000	0.3170
Savannah-T4 (0-3)	0.0005	1.4253	0.0000	0.2740
Savannah-T4 (12-15)	0.0002	1.9374	0.0000	0.2471
Savannah-T4 (30-33)	0.0029	1.2990	0.0000	0.2552
Savannah- T8 (0-3)	0.0002	1.4714	0.0000	0.2522

Summary of Calculated Unsaturated Hydraulic Properties (Continued)

Sample Number	α (cm^{-1})	N (dimensionless)	θ_r	θ_s
Savannah- T8 (3-6)	0.0025	1.3255	0.0000	0.2515
Savannah- T8 (6-9)	0.0009	1.3467	0.0000	0.2590

Summary of Moisture Characteristics of the Initial Drainage Curve

Sample Number	Pressure Head (-cm water)	Moisture Content (%, cm^3/cm^3)
2B-T6 (0-3)	0	35.3
	18	32.7
	46	29.6
	149	26.5
	510	23.9
	19376	12.8
	851293	2.4
2B-T6 (1-4)	0	34.4
	19	30.0
	48	28.2
	149	26.1
	510	24.1
	13971	14.5
	851293	1.9
2B-T6 (3-6)	0	33.9
	24	30.1
	59	28.5
	151	26.6
	510	23.9
	7852	14.7
	851293	1.5
3B-T5 (0-3)	0	33.3
	18	29.5
	45	26.7
	147	24.4
	510	22.8
	19172	13.5
	851293	2.2

Summary of Moisture Characteristics of the Initial Drainage Curve (Continued)

Sample Number	Pressure Head (-cm water)	Moisture Content (%, cm^3/cm^3)
3B-T5 (2-5)	0	32.8
	19	30.0
	44	27.6
	146	25.5
	510	23.9
	14583	13.6
	851293	2.6
3B-T5 (3-6)	0	36.1
	25	31.7
	46	29.3
	147	26.8
	510	24.7
	4895	15.5
	851293	2.8
1C-T1 (0-3)	0	35.0
	24	27.8
	52	17.7
	88	17.2
	510	14.5
	8362	8.7
	851293	3.3
1C-T1 (4-7)	0	35.1
	7	32.4
	42	19.1
	79	17.0
	510	14.3
	16827	10.1
	851293	4.5

Summary of Moisture Characteristics of the Initial Drainage Curve (Continued)

Sample Number	Pressure Head (-cm water)	Moisture Content (%, cm^3/cm^3)
1C-T1 (10-13)	0	30.0
	7	28.3
	33	17.6
	81	16.5
	510	14.9
	17643	8.1
	851293	3.1
1C-T2 (0-3)	0	27.4
	14	25.4
	52	14.4
	88	11.2
	510	10.3
	16827	8.1
	851293	2.6
1C-T2 (5-8)	0	32.6
	14	17.2
	50	8.0
	87	7.7
	510	6.5
	17235	2.1
	851293	0.9
1C-T2 (11-14)	0	32.1
	7	28.9
	27	15.9
	79	12.4
	510	10.4
	6935	5.7
	851293	2.7

Summary of Moisture Characteristics of the Initial Drainage Curve (Continued)

Sample Number	Pressure Head (-cm water)	Moisture Content (%, cm^3/cm^3)
1C-T3 (0-3)	0	34.7
	24	33.4
	123	31.8
	510	29.4
	7037	21.7
	13053	19.3
	851293	3.9
1C-T3 (4-7)	0	38.3
	23	34.7
	48	32.3
	148	29.4
	510	26.5
	16521	10.3
	851293	2.1
1C-T3 (7-10)	0	32.9
	25	29.9
	126	28.6
	510	27.1
	8158	20.9
	16827	17.1
	851293	2.4
2C-T7 (0-3)	0	32.4
	24	30.8
	53	30.3
	149	28.7
	510	26.2
	15603	13.1
	851293	1.2

Summary of Moisture Characteristics of the Initial Drainage Curve (Continued)

Sample Number	Pressure Head (-cm water)	Moisture Content (%, cm^3/cm^3)
2C-T7 (1-4)	0	33.8
	24	31.9
	53	31.2
	149	29.1
	510	26.3
	18356	14.4
	851293	2.1
2C-T7 (2-5)	0	32.3
	24	25.5
	53	24.1
	149	22.0
	510	19.6
	12646	11.5
	851293	2.0
Savannah-T4 (0-3)	0	28.9
	25	28.1
	123	26.6
	510	24.6
	6629	16.9
	14583	11.9
	851293	1.6
Savannah-T4 (12-15)	0	26.9
	28	25.2
	123	23.8
	510	22.8
	8158	16.1
	14889	9.9
	851293	1.5

Summary of Moisture Characteristics of the Initial Drainage Curve (Continued)

Sample Number	Pressure Head (-cm water)	Moisture Content (%, cm^3/cm^3)
Savannah-T4 (30-33)	0	26.4
	25	25.7
	121	22.4
	510	20.9
	9586	9.7
	27229	7.0
	851293	1.5
Savannah- T8 (0-3)	0	27.9
	24	25.5
	59	24.9
	151	24.2
	510	23.2
	17948	13.9
	851293	2.0
Savannah- T8 (3-6)	0	28.5
	24	23.8
	58	23.0
	150	22.2
	510	21.4
	16215	7.4
	851293	1.8
Savannah- T8 (6-9)	0	28.8
	27	25.4
	121	23.9
	510	22.7
	7954	15.0
	15297	9.2
	851293	1.6

Summary of Calculated Unsaturated Hydraulic Properties with Gravel Corrections

Sample Number	Ksat	α (cm^{-1})	N (dimensionless)	θ_i	θ_r	θ_s
2B-T6 (0-3)	3.4E-04	0.0169	1.1942	0.1309	0.0000	0.2664
2B-T6 (1-4)	2.3E-04	0.0096	1.1978	0.1619	0.0000	0.2319
2B-T6 (3-6)	2.0E-05	0.0069	1.2283	0.1305	0.0000	0.2163
3B-T5 (0-3)	1.5E-04	0.0250	1.1690	0.1514	0.0000	0.2426
3B-T5 (2-5)	1.0E-05	0.0084	1.1995	0.1734	0.0000	0.2449
3B-T5 (3-6)	1.0E-04	0.0169	1.1945	0.1872	0.0000	0.2990
1C-T1 (0-3)	4.4E-03	0.6698	1.1656	0.0827	0.0197	0.2672
1C-T1 (4-7)	7.8E-03	0.1577	1.3566	0.0909	0.0495	0.2825
1C-T1 (10-13)	3.2E-02	0.2904	1.1759	0.1347	0.0045	0.2536
1C-T2 (0-3)	4.4E-02	46.4459	1.1053	0.0895	0.0483	0.2177
1C-T2 (5-8)	6.7E-03	6.5822	1.2214	0.0305	0.0059	0.1463
1C-T2 (11-14)	1.3E-02	0.1501	1.4751	0.0659	0.0280	0.2206
1C-T3 (0-3)	4.7E-07	0.0004	1.3300	0.2429	0.0000	0.2587
1C-T3 (4-7)	2.2E-05	0.0078	1.2596	0.1131	0.0000	0.1857
1C-T3 (7-10)	6.3E-07	0.0002	1.4495	0.1837	0.0000	0.1967
2C-T7 (0-3)	1.6E-04	0.0019	1.2933	0.2562	0.0000	0.2296
2C-T7 (1-4)	8.1E-05	0.0033	1.2398	0.2873	0.0000	0.2397
2C-T7 (2-5)	5.0E-04	0.0727	1.1638	0.0890	0.0000	0.2059

Summary of Calculated Unsaturated Hydraulic Properties with Gravel Corrections

Sample Number	Ksat	α (cm^{-1})	N (dimensionless)	θ_i	θ_r	θ_s
Savannah-T4 (0-3)	1.1E-06	0.0005	1.4253	0.2226	0.0000	0.2054
Savannah-T4 (12-15)	4.4E-08	0.0002	1.9374	0.0640	0.0000	0.0719
Savannah-T4 (30-33)	9.5E-07	0.0029	1.2990	0.0931	0.0000	0.1277
Savannah- T8 (0-3)	6.9E-07	0.0002	1.4714	0.1907	0.0000	0.2064
Savannah- T8 (3-6)	3.6E-07	0.0025	1.3255	0.1129	0.0000	0.1333
Savannah- T8 (6-9)	5.8E-06	0.0009	1.3467	0.1451	0.0000	0.1701

Summary of Particle Size Characteristics

Sample Number	d_{10} (mm)	d_{50} (mm)	d_{60} (mm)	C_u	C_c	Method	ASTM Classification	USDA Classification
2B-T6 (0-3)	0.0020	2.0	4.0	2000	2.8	WS/H	Classification by ASTM 2487 requires Atterberg test	Sandy Loam †
2B-T6 (1-4)	0.0026	2.7	5.6	2154	5.8	WS/H	Classification by ASTM 2487 requires Atterberg test	Sandy Clay Loam †
2B-T6 (3-6)	0.0027	1.9	3.9	1444	3.1	WS/H	Classification by ASTM 2487 requires Atterberg test	Sandy Loam †
3B-T5 (0-3)	0.0024	1.1	2.0	833	6.8	WS/H	Classification by ASTM 2487 requires Atterberg test	Sandy Loam †
3B-T5 (2-5)	0.0025	0.94	1.8	720	8.0	WS/H	Classification by ASTM 2487 requires Atterberg test	Sandy Loam †
3B-T5 (3-6)	0.0026	0.88	2.1	808	3.1	WS/H	Classification by ASTM 2487 requires Atterberg test	Sandy Loam †
1C-T1 (0-3)	0.059	4.4	6.8	115	4.9	WS/H	Classification by ASTM 2487 requires Atterberg test	Sandy Loam †
1C-T1 (4-7)	0.052	1.7	2.4	46	2.8	WS/H	Classification by ASTM 2487 requires Atterberg test	Loamy Sand †
1C-T1 (10-13)	0.15	2.9	4.1	27	2.7	WS/H	Classification by ASTM 2487 requires Atterberg test	Loamy Sand †
1C-T2 (0-3)	0.66	6.0	7.7	12	1.8	WS/H	Well-graded gravel with sand	Sand †
1C-T2 (5-8)	1.4	10.0	12	8.6	1.9	WS/H	Well-graded gravel with sand	Sand †

d_{50} = Median particle diameter

Est = Reported values for d_{10}, C_u, C_c, and soil classification are estimates, since extrapolation was required to obtain the d_{10} diameter

$$C_u = \frac{d_{60}}{d_{10}}$$

$$C_c = \frac{(d_{30})^2}{(d_{10})(d_{60})}$$

DS = Dry sieve

H = Hydrometer

WS = Wet sieve

† Greater than 10% of sample is coarse material

Summary of Particle Size Characteristics (Continued)

Sample Number	d_{10} (mm)	d_{50} (mm)	d_{60} (mm)	C_u	C_c	Method	ASTM Classification	USDA Classification
1C-T2 (11-14)	0.58	8.2	11	19	2.3	WS/H	Well-graded gravel with sand	Loamy Sand †
1C-T3 (0-3)	0.0038	2.5	5.0	1316	2.8	WS/H	Classification by ASTM 2487 requires Atterberg test	Sandy Loam †
1C-T3 (4-7)	0.0074	3.8	8.7	1176	3.3	WS/H	Classification by ASTM 2487 requires Atterberg test	Sandy Loam †
1C-T3 (7-10)	0.0024	1.7	4.3	1792	1.9	WS/H	Classification by ASTM 2487 requires Atterberg test	Sandy Loam †
2C-T7 (0-3)	0.00083	1.1	2.6	3133	4.0	WS/H	Classification by ASTM 2487 requires Atterberg test	Sandy Clay Loam † (Est)
2C-T7 (1-4)	0.0025	1.7	3.3	1320	2.4	WS/H	Classification by ASTM 2487 requires Atterberg test	Sandy Loam †
2C-T7 (2-5)	0.058	5.8	8.4	145	14	WS/H	Classification by ASTM 2487 requires Atterberg test	Sandy Loam †
Savannah-T4 (0-3)	0.016	3.7	5.8	363	13	WS/H	Classification by ASTM 2487 requires Atterberg test	Sandy Loam †
Savannah-T4 (12-15)	0.064	20	31	484	7.3	WS/H	Classification by ASTM 2487 requires Atterberg test	Sandy Loam †
Savannah-T4 (30-33)	0.038	8.3	14	368	7.5	WS/H	Classification by ASTM 2487 requires Atterberg test	Sandy Loam †
Savannah- T8 (0-3)	0.0074	3.0	4.8	649	8.2	WS/H	Classification by ASTM 2487 requires Atterberg test	Sandy Loam †

d_{50} = Median particle diameter

Est = Reported values for d_{10}, C_u, C_c, and soil classification are estimates, since extrapolation was required to obtain the d_{10} diameter

$$C_u = \frac{d_{60}}{d_{10}}$$

$$C_c = \frac{(d_{30})^2}{(d_{10})(d_{60})}$$

DS = Dry sieve

H = Hydrometer

WS = Wet sieve

† Greater than 10% of sample is coarse material

Summary of Particle Size Characteristics (Continued)

Sample Number	d_{10} (mm)	d_{50} (mm)	d_{60} (mm)	C_u	C_c	Method	ASTM Classification	USDA Classification
Savannah- T8 (3-6)	0.011	4.2	8.5	773	6.2	WS/H	Classification by ASTM 2487 requires Atterberg test	Sandy Loam †
Savannah- T8 (6-9)	0.014	4.8	9.3	664	9.3	WS/H	Classification by ASTM 2487 requires Atterberg test	Sandy Loam †

d_{50} = Median particle diameter

Est = Reported values for d_{10}, C_u, C_c, and soil classification are estimates, since extrapolation was required to obtain the d_{10} diameter

$$C_u = \frac{d_{60}}{d_{10}}$$

$$C_c = \frac{(d_{30})^2}{(d_{10})(d_{60})}$$

DS = Dry sieve

H = Hydrometer

WS = Wet sieve

† Greater than 10% of sample is coarse material

APPENDIX A - STOCKPILE INFILTRATION TESTING

Summary Field Report
Tyrone Stockpile Infiltration Tests
Tyrone Mine, New Mexico

Table of Contents

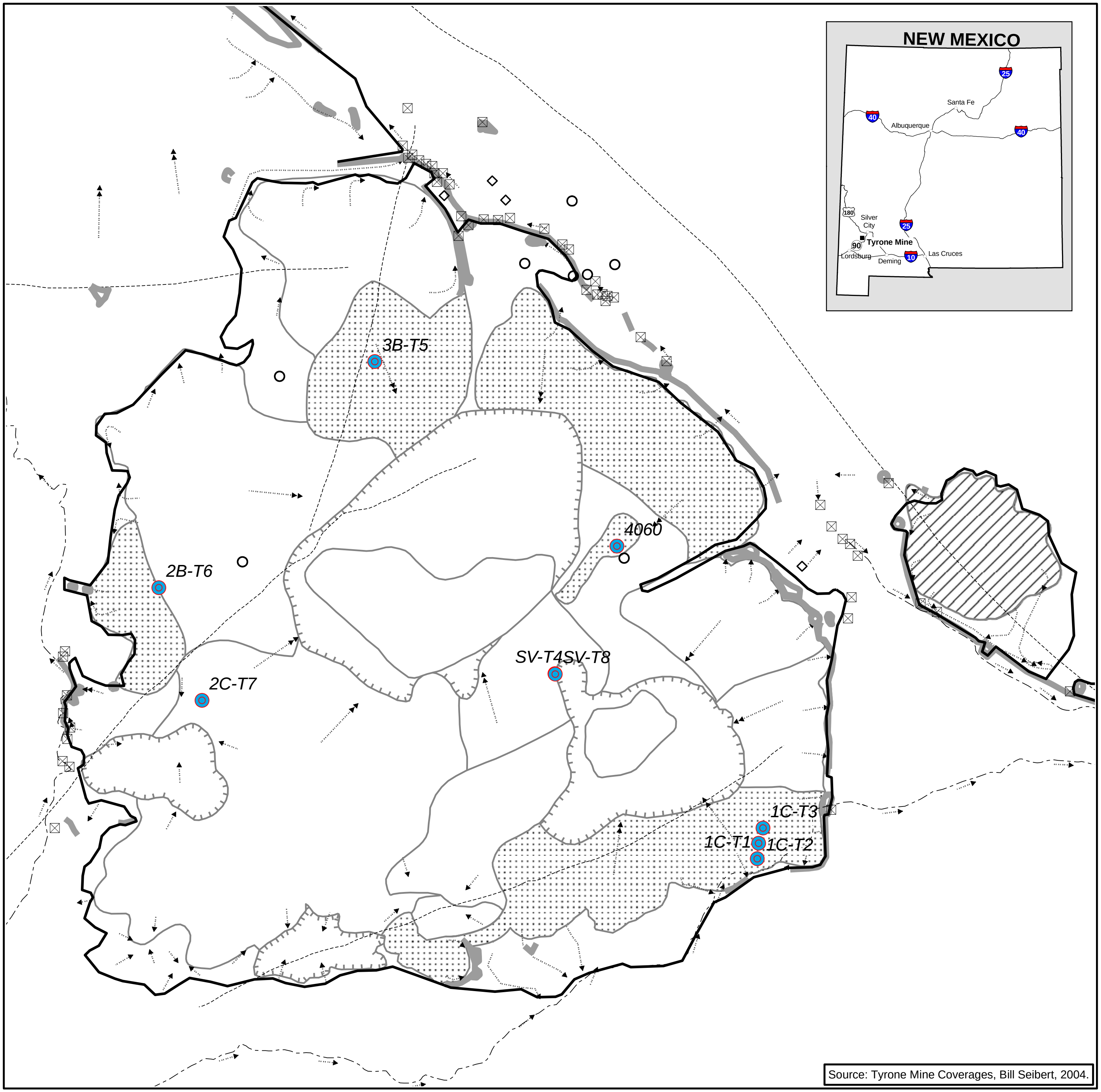
1.0 INTRODUCTION

Eight infiltration (percolation) tests were conducted at the Phelps Dodge Tyrone Mine located in Tyrone, New Mexico. The infiltration tests were conducted from March 9th through March 16th 2005 on various stockpile bench surfaces throughout the mine site. The antecedent ground conditions were very moist as a result of heavy rains that had fallen in the winter months prior to testing. Most of the benches were cut into existing stockpiles during re-mining activities and the test sites had been buried by one or more lifts of material prior to excavation. One test (3B-T5) was conducted on a stockpile top surface that has never been buried but had seen heavy truck traffic.

The infiltration tests consisted of seven falling head tests and one constant head test, which are listed below. The first identifier of the infiltration test ID is the stockpile number where the test was conducted, followed by the test number. Figure 1.1 provides the test site locations. Two falling head tests, 1C-T1 and 1C-T2, were conducted on top of bedrock that was exposed beneath stockpile material and the remaining tests were conducted on benches cut into stockpile materials.

<u>Infiltration Test Sites</u>

1C-T1
1C-T2
1C-T3
Savanna-T4 (constant head)
3B-T5
2B-T6
2C-T7
Savanna-T8



LEGEND

- Stockpile Sample Locations
- Fault Line
- Facility Boundary
- Stormwater Containment Boundary
- Seepage/Runoff Containment System
- Creek/Canyon
- Runoff Flow Direction
- Waste Water Storage
- Mine Water Storage
- Stormwater Outfall
- Unleached Stockpile
- Inactive Stockpile

phelps dodge Corporation

N
W
E
S

Feet

0 1,000 2,000 3,000 4,000

EnviroGroup Limited

TYRONE MINE

FIGURE 1.1
EXISTING STOCKPILE FACILITIES AND CONTAINMENTS

ANALYSIS AREA: Tyrone Mine, Grant County, New Mexico

Date: 4/22/04 | Drawn By: JMR

File: EGL(r)\PD-0447(phelps-Dodge\X-drive \1490\gis\tyrone\arcmap\newstockpiles2.mxd

2.0 PROCEDURES

The following sections describe the procedures that were used to complete the infiltration tests.

2.1 INFILTRATION TEST PROCEDURES (Falling and Constant Head)

After the initial test set up on 1C-T1 to determine the best method for conducting the infiltration tests, each test was set up in a similar manner and was completed on the same day.

Each test site was excavated to a depth ranging from approximately 8 inches to 1 foot below the existing ground surface. The horizontal dimensions of each test site were approximately 8 foot x 8 foot (square). The upper (top) section of a plastic tank was used as the ring for these tests. The modified tank was approximately 7 feet in diameter and approximately 2 feet tall. Each test area was leveled before placing the modified tank directly in the excavated area. After placing the tank at each test site, dry bentonite pellets were packed around the outside of the tank. The area outside the tank was backfilled with native soils to the existing ground surface and the tank was filled with water to approximately 1 to 1.5 feet above the base of the tank. The flow of water was carefully monitored while filling the tank to avoid any possible scouring of soils. Bentonite was hydrated and usually sealed within 30 minutes, as most of the seepage slowed from initial rates (observed by wet soil on surface or visible flows on the surface) or stopped due to the sealing properties of the bentonite. Once seepage appeared to slow or visible observations could no longer detect seepage, the tank was filled with water to the desired height to conduct the infiltration test.

Seven of the eight tests conducted were falling head tests and the following paragraph describes the procedure for those tests. The constant head test procedure is described following the falling head test procedure.

Falling Head Test - Water level (head) measurements were observed from a pre-marked location on the tank (top of water elevation in tank) and were recorded in tenths to the nearest hundredth of a foot (i.e. 1.05') as the water in the tank infiltrated the soils beneath the tank (falling head). The appearance of the water in most tests was tan to brown in color, cloudy, very turbid and contained some organic debris.

After the water elevation measurements were recorded and the test was completed, water remaining in the tank was drained by excavating an area in close proximity to the tank. Once all water was drained, the tank was removed and the area below the test was excavated using a backhoe. The wetted zone beneath each test site (below bentonite layer or top of ponding surface) was observed and recorded as well as the general lithologic description of the stockpiled soils or bedrock.

Constant Head Test - Water level (head) measurements were observed from a pre-marked location on the tank (top of water elevation in tank) and were recorded in tenths to the nearest hundredth of a foot (i.e. 1.05') as the water in the tank infiltrated the soils beneath the tank. Constant head conditions were obtained (as best that could practically be obtained) as water flowed from a water truck, via a hose, through a flow meter, which measured flow in gallons per minute to the nearest tenth of a gallon (i.e. 2.1 gallons per minute) then into the tank. Changing water flow (velocity) was also recorded while constant head conditions were obtained. The appearance of water in the constant head test was tan to brown in color, cloudy, very turbid and contained organic debris.

After the water elevation measurements were recorded and the test was completed, water remaining in the tank was drained by excavating an area in close proximity to the tank. Once all water was drained the tank was removed and the area below the test was excavated using a backhoe. The wetted zone beneath each test site was observed and recorded as well as the general lithologic description of the stockpiled soils or bedrock.

2.2 SOIL SAMPLING AND ANALYSIS

Soil samples from each test site were typically collected from representative zones at 3 discrete depths below the base of the tank. One sample was collected from the wetted zone, with the second sample usually collected from the area directly below the wetted zone and the third sample usually collected below the second sample location (depth) or lowest interval of each excavated area.

Each soil sample was placed into a gallon size Ziploc bag, double bagged, labeled, documented on a chain of custody (COC) and placed in a shipping container. The samples were hand delivered to Daniel B. Stephens & Associates Laboratory located in Albuquerque, New Mexico at the completion of all infiltration testing. Soil samples were requested to be analyzed for particle size analysis (PSA - sieve + hydrometer) by ASTM D422, saturated hydraulic conductivity by ASTM D2434/D5084, initial volumetric water content by ASTM D2216/D4643, dry bulk density by ASTM D2937/MOSA Chp.13, calculated total porosity by MOSA Chp.18, moisture characteristic (7 points) by ASTM D6836/ASTMD2325/MOSA Chp.26, calculated unsaturated hydraulic conductivity by ASTM D6836/SSSAJ, 1980. The samples were remolded to the estimated bulk density of the material prior to stockpile excavations and exposure of the test sites.

2.3 CLEANUP

At the completion of infiltration testing, the sites were back-filled with the excavated material from the test site, compacted, and leveled. At each site a flagged lathe, labeled with the site ID was located in the general area of the test site for surveying purposes.

2.4 SURVEY

Pam Pinson of Phelps Dodge arranged for a land survey, which will provide the location of each sample site.

3.0 RESULTS

Listed below are the infiltration test ID's and the depth of the wetted front (zone) for each test site.

1C-T1 (6-7 inches)
1C-T2 (4 inches)
1C-T3 (4 inches)
Savanna-T4 (3 feet)
3B-T5 (1 to 4 inches)
2B-T6 (1 to 4 inches)
2C-T7 (1 to 4 inches)
Savanna-T8 (1 to 10 inches)

Table 1 provides the calculated hydraulic conductivity (Ksat) for each infiltration test using Darcy's Law. The Ksat values ranged from 9.74 E-05 to 2.4 E-03.

Table 1: Calculated Hydraulic Conductivity (Ksat) Results

Test ID	Infiltration Test Type (Falling head /Constant head)	Saturated Hydraulic Conductivity Ksat (cm/sec)
1C-T1	Falling	1.57 E-04
1C-T2	Falling	2.15 E-04
1C-T3	Falling	9.74 E-05
Savanna-T4	Constant	2.4 E-03 to 3.9 E-03
3B-T5	Falling	4.78 E-05
2B-T6	Falling	2.54 E-05
2C-T7	Falling	4.78 E-05
Savanna-T8	Falling	4.80 E-04

APPENDIX C - METEORIC WATER MOBILITY TESTING

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NDEP PROFILE II REPORT MWMP

PHELPS DODGE - TYRONE
GA04-TY-1-GT
Sampled:

PARAMETERS	RESULTS	UNITS	STANDARDS	DATE
Alkalinity (Total)		mg/L	-	
Aluminum	15.0	mg/L	0.05--0.2	10/11/04
Antimony		mg/L	0.006	
Arsenic	<0.050*	mg/L	0.05	10/11/04
Barium	0.0270	mg/L	2.0	10/11/04
Beryllium	<0.010*	mg/L	0.004	10/11/04
Bismuth		mg/L	-	
Boron	<0.20*	mg/L	-	10/11/04
Cadmium	0.311	mg/L	0.005	10/11/04
Calcium	164	mg/L	-	10/11/04
Chloride	12.0	mg/L	250--400	10/08/04
Chromium	<0.030*	mg/L	0.1	10/11/04
Cobalt	0.348	mg/L	-	10/11/04
Copper	67.3	mg/L	1.3	10/11/04
Fluoride	15.2	mg/L	2.0--4.0	10/08/04
Gallium		mg/L	-	
Iron	<0.10*	mg/L	0.3--0.6	10/11/04
Lead	0.0341	mg/L	0.015	10/11/04
Lithium		mg/L	-	
Magnesium	79.6	mg/L	125--150	10/11/04
Manganese	76.4	mg/L	0.05--0.1	10/11/04
Mercury		mg/L	0.002	
Molybdenum	0.0440	mg/L	-	10/11/04
Nickel	0.110	mg/L	0.1	10/11/04
Nitrate as N		mg/L	10.0	
pH (units)	4.33	S.U.	6.5--8.5	10/07/04
Phosphorous		mg/L	-	
Potassium	22.0	mg/L	-	10/11/04
Scandium		mg/L	-	
Selenium	<0.050*	mg/L	0.05	10/11/04
Silver	<0.0250*	mg/L	0.1	10/11/04
Sodium	21.6	mg/L	-	10/11/04
Strontium		mg/L	-	
Sulfate	1340	mg/L	250--500	10/07/04
Thallium	<0.050*	mg/L	0.002	10/11/04
Tin		mg/L	-	
Titanium		mg/L	-	
TDS		mg/L	500--1000	
Vanadium	<0.0250*	mg/L	-	10/11/04
WAD Cyanide		mg/L	0.2	
Zinc	35.1	mg/L	5.0	10/11/04

Sample Receipt: 9/23/04
SVL JOB No.:113471
SVL SAMPLE No.:414925
Matrix: ESOIL
Extraction: MWMP

MWMP EXTRACTION PARAMETERS

Extraction Fluid pH: 4.83
Final fluid pH: 4.33
Sample Weight: 5244.0g

Feed Moisture: 4.88 %
Retained Moisture: 14.54 %
Extraction Time: 31 Hrs
Extraction Type:
SINGLE PASS COLUMN

Analytical Results are for EXTRACT

Acid/Base Accounting:

Paste pH:	4.62
AGP:	12.8 *
ANP:	<0.30 *
ABP: -	12.8 *

*Tons CaCO3/kTon Material

Sulfur Forms:

TOTAL:	1.35 %
PYRITIC:	0.410 %
SULFATE:	0.320 %
NON-EXT:	0.620 %

CATION SUM:	27.95 meq/L
ANION SUM:	29.12 meq/L
C/A BALANCE:	-2.05 %

*Elevated detection limit due to matrix interference.

Reviewed By: [signature] Date 10/25/04
10/25/04 12:15

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NDEP PROFILE II REPORT

MWMP

PHELPS DODGE - TYRONE
GA04-TY-1-GT Sampled:

ADDITIONAL PARAMETERS

PARAMETERS	RESULTS	UNITS	STANDARDS	DATE
+2" Sieve	7	%		10/05/04
ACIDITY	586	mg/L Ext		10/08/04
Spec. Cond.	2200	umhos/cm		10/07/04
ELECTRICAL COND.	3.07	mmhos/cm		10/08/04
Eh (mV)	+359	mV		10/07/04
SPEC GRAVITY +10	2.12	%		10/22/04
SPEC GRAVITY -10	2.15	%		10/22/04
Silica	15.3	mg/L Ext		10/11/04

*Elevated detection limit due to matrix interference.
Certificate: ID ID00019

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NDEP PROFILE II REPORT MWMP

PHELPS DODGE - TYRONE
GA04-TY-2-GT Sampled:

PARAMETERS	RESULTS	UNITS	STANDARDS	DATE
Alkalinity (Total)	<1.0	mg/L	-	10/07/04
Aluminum	2.51	mg/L	0.05--0.2	10/11/04
Antimony		mg/L	0.006	
Arsenic	<0.010	mg/L	0.05	10/11/04
Barium	0.0343	mg/L	2.0	10/11/04
Beryllium	0.0022	mg/L	0.004	10/11/04
Bismuth		mg/L	-	
Boron	0.070	mg/L	-	10/11/04
Cadmium	0.0770	mg/L	0.005	10/11/04
Calcium	184	mg/L	-	10/11/04
Chloride	33.8	mg/L	250--400	10/08/04
Chromium	<0.0060	mg/L	0.1	10/11/04
Cobalt	0.0810	mg/L	-	10/11/04
Copper	19.7	mg/L	1.3	10/11/04
Fluoride	1.84	mg/L	2.0--4.0	10/08/04
Gallium		mg/L	-	
Iron	<0.020	mg/L	0.3--0.6	10/11/04
Lead	<0.0050	mg/L	0.015	10/11/04
Lithium		mg/L	-	
Magnesium	66.2	mg/L	125--150	10/11/04
Manganese	9.91	mg/L	0.05--0.1	10/11/04
Mercury		mg/L	0.002	
Molybdenum	0.0118	mg/L	-	10/11/04
Nickel	0.043	mg/L	0.1	10/11/04
Nitrate as N		mg/L	10.0	
pH (units)	4.71	S.U.	6.5--8.5	10/07/04
Phosphorous		mg/L	-	
Potassium	14.0	mg/L	-	10/11/04
Scandium		mg/L	-	
Selenium	<0.010	mg/L	0.05	10/11/04
Silver	<0.0050	mg/L	0.1	10/11/04
Sodium	51.7	mg/L	-	10/11/04
Strontium		mg/L	-	
Sulfate	856	mg/L	250--500	10/07/04
Thallium	<0.010	mg/L	0.002	10/11/04
Tin		mg/L	-	
Titanium		mg/L	-	
TDS		mg/L	500--1000	
Vanadium	<0.0050	mg/L	-	10/11/04
WAD Cyanide		mg/L	0.2	
Zinc	11.2	mg/L	5.0	10/11/04

Sample Receipt: 9/23/04
SVL JOB No.:113471
SVL SAMPLE No.:414926
Matrix: ESOIL
Extraction: MWMP

MWMP EXTRACTION PARAMETERS	
Extraction Fluid pH:	4.83
Final fluid pH:	4.71
Sample Weight:	5178.0g
Feed Moisture:	3.56 %
Retained Moisture:	15.06 %
Extraction Time:	29 Hrs
Extraction Type:	SINGLE PASS COLUMN

Analytical Results are for EXTRACT

Acid/Base Accounting:	
Paste pH:	5.08
AGP:	3.75 *
ANP:	<0.30 *
ABP:	- 3.75 *

*Tons CaCO3/kTon Material

Sulfur Forms:	
TOTAL:	0.670 %
PYRITIC:	0.120 %
SULFATE:	0.250 %
NON-EXT:	0.300 %

CATION SUM:	18.84 meq/L
ANION SUM:	18.87 meq/L
C/A BALANCE:	-0.08 %

Certificate: ID ID00019

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NDEP PROFILE II REPORT

MWMP

PHELPS DODGE - TYRONE
GA04-TY-2-GT

Sampled:

ADDITIONAL PARAMETERS

PARAMETERS	RESULTS	UNITS	STANDARDS	DATE
+2" Sieve	0	%		10/05/04
CO3, CaCO3	<1.0	mg/L Ext		10/07/04
Spec. Cond.	1680	umhos/cm		10/07/04
ELECTRICAL COND.	2.28	mmhos/cm		10/08/04
Eh (mV)	+349	mV		10/07/04
Alkalinity (HCO3)	<1.0	mg/L Ext		10/07/04
SPEC GRAVITY +10	2.19	%		10/22/04
SPEC GRAVITY -10	2.10	%		10/22/04
Silica	18.4	mg/L Ext		10/11/04

Certificate: ID ID00019

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NDEP PROFILE II REPORT MWMP

PHELPS DODGE - TYRONE
GA04-TY-3-GT
Sampled:

PARAMETERS	RESULTS	UNITS	STANDARDS	DATE
Alkalinity (Total)		mg/L	-	
Aluminum	535	mg/L	0.05--0.2	10/12/04
Antimony		mg/L	0.006	
Arsenic	<0.10*	mg/L	0.05	10/11/04
Barium	<0.020*	mg/L	2.0	10/11/04
Beryllium	0.0210	mg/L	0.004	10/11/04
Bismuth		mg/L	-	
Boron	<0.40*	mg/L	-	10/11/04
Cadmium	0.0370	mg/L	0.005	10/11/04
Calcium	171	mg/L	-	10/11/04
Chloride	<5.00*	mg/L	250--400	10/08/04
Chromium	<0.060*	mg/L	0.1	10/11/04
Cobalt	1.13	mg/L	-	10/11/04
Copper	420	mg/L	1.3	10/11/04
Fluoride	5.37	mg/L	2.0--4.0	10/08/04
Gallium		mg/L	-	
Iron	1030	mg/L	0.3--0.6	10/11/04
Lead	<0.050*	mg/L	0.015	10/11/04
Lithium		mg/L	-	
Magnesium	86.2	mg/L	125--150	10/11/04
Manganese	73.2	mg/L	0.05--0.1	10/11/04
Mercury		mg/L	0.002	
Molybdenum	<0.080*	mg/L	-	10/11/04
Nickel	0.240	mg/L	0.1	10/12/04
Nitrate as N		mg/L	10.0	
pH (units)	2.45	S.U.	6.5--8.5	10/07/04
Phosphorous		mg/L	-	
Potassium	<10*	mg/L	-	10/11/04
Scandium		mg/L	-	
Selenium	<0.10*	mg/L	0.05	10/11/04
Silver	<0.050*	mg/L	0.1	10/11/04
Sodium	<5.0*	mg/L	-	10/11/04
Strontium		mg/L	-	
Sulfate	7540	mg/L	250--500	10/07/04
Thallium	<0.10*	mg/L	0.002	10/11/04
Tin		mg/L	-	
Titanium		mg/L	-	
TDS		mg/L	500--1000	
Vanadium	<0.050*	mg/L	-	10/11/04
WAD Cyanide		mg/L	0.2	
Zinc	14.2	mg/L	5.0	10/11/04

Sample Receipt: 9/23/04
SVL JOB No.:113471
SVL SAMPLE No.:414927
Matrix: ESOIL
Extraction: MWMP

MWMP EXTRACTION PARAMETERS

Extraction Fluid pH: 4.83
Final fluid pH: 2.45
Sample Weight: 5282.0g

Feed Moisture: 5.64 %
Retained Moisture: 11.16 %
Extraction Time: 27 Hrs
Extraction Type:
SINGLE PASS COLUMN

Analytical Results
are for EXTRACT

Acid/Base Accounting:

Paste pH:	3.25
AGP:	63.4 *
ANP:	<0.30 *
ABP:	- 63.4 *

*Tons CaCO3/kTon Material

Sulfur Forms:

TOTAL:	3.03 %
PYRITIC:	2.03 %
SULFATE:	0.760 %
NON-EXT:	0.240 %

CATION SUM: 169.89 meq/L
ANION SUM: 157.35 meq/L
C/A BALANCE: 3.83 %

*Elevated detection limit due to matrix interference.
Certificate: ID ID00019

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NDEP PROFILE II REPORT MWMP

PHELPS DODGE - TYRONE
GA04-TY-3-GT Sampled:

ADDITIONAL PARAMETERS

PARAMETERS	RESULTS	UNITS	STANDARDS	DATE
+2" Sieve	11.85	%		10/05/04
ACIDITY	7710	mg/L Ext		10/08/04
Spec. Cond.	6330	umhos/cm		10/07/04
ELECTRICAL COND.	11.7	mmhos/cm		10/08/04
Eh (mV)	+523	mV		10/07/04
SPEC GRAVITY +10	2.35	%		10/22/04
SPEC GRAVITY -10	2.11	%		10/22/04
Silica	14.5	mg/L Ext		10/11/04

*Elevated detection limit due to matrix interference.
Certificate: ID ID00019

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NDEP PROFILE II REPORT MWMP

PHELPS DODGE - TYRONE
GA04-TY-4-GT Sampled:

PARAMETERS	RESULTS	UNITS	STANDARDS	DATE
Alkalinity (Total)	<1.0	mg/L	-	10/07/04
Aluminum	32.3	mg/L	0.05--0.2	10/12/04
Antimony		mg/L	0.006	
Arsenic	<0.10*	mg/L	0.05	10/11/04
Barium	0.0250	mg/L	2.0	10/11/04
Beryllium	0.0330	mg/L	0.004	10/11/04
Bismuth		mg/L	-	
Boron	<0.40*	mg/L	-	10/11/04
Cadmium	0.595	mg/L	0.005	10/11/04
Calcium	282	mg/L	-	10/11/04
Chloride	<5.00*	mg/L	250--400	10/08/04
Chromium	<0.060*	mg/L	0.1	10/11/04
Cobalt	1.52	mg/L	-	10/11/04
Copper	30.3	mg/L	1.3	10/11/04
Fluoride	45.3	mg/L	2.0--4.0	10/08/04
Gallium		mg/L	-	
Iron	0.210	mg/L	0.3--0.6	10/11/04
Lead	0.275	mg/L	0.015	10/11/04
Lithium		mg/L	-	
Magnesium	183	mg/L	125--150	10/11/04
Manganese	775	mg/L	0.05--0.1	10/11/04
Mercury		mg/L	0.002	
Molybdenum	0.0850	mg/L	-	10/11/04
Nickel	0.290	mg/L	0.1	10/12/04
Nitrate as N		mg/L	10.0	
pH (units)	4.88	S.U.	6.5--8.5	10/07/04
Phosphorous		mg/L	-	
Potassium	17.0	mg/L	-	10/11/04
Scandium		mg/L	-	
Selenium	<0.10*	mg/L	0.05	10/11/04
Silver	<0.050*	mg/L	0.1	10/11/04
Sodium	14.3	mg/L	-	10/11/04
Strontium		mg/L	-	
Sulfate	3210	mg/L	250--500	10/07/04
Thallium	<0.10*	mg/L	0.002	10/11/04
Tin		mg/L	-	
Titanium		mg/L	-	
TDS		mg/L	500--1000	
Vanadium	<0.050*	mg/L	-	10/11/04
WAD Cyanide		mg/L	0.2	
Zinc	158	mg/L	5.0	10/11/04

Sample Receipt: 9/23/04
SVL JOB No.:113471
SVL SAMPLE No.:414928
Matrix: ESOIL
Extraction: MWMP

MWMP EXTRACTION PARAMETERS

Extraction Fluid pH: 4.83
Final fluid pH: 4.88
Sample Weight: 5067.0g

Feed Moisture: 1.34 %
Retained Moisture: 8.12 %
Extraction Time: 32 Hrs
Extraction Type:
SINGLE PASS COLUMN

Analytical Results
are for EXTRACT

Acid/Base Accounting:

Paste pH:	5.23
AGP:	30.3 *
ANP:	<0.30 *
ABP: -	30.3 *

*Tons CaCO3/kTon Material

Sulfur Forms:

TOTAL:	1.19 %
PYRITIC:	0.970 %
SULFATE:	0.200 %
NON-EXT:	0.020 %

CATION SUM:	67.77 meq/L
ANION SUM:	69.17 meq/L
C/A BALANCE:	-1.02 %

*Elevated detection limit due to matrix interference.
Certificate: ID ID00019

Reviewed By: [signature] Date 10/25/04
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NDEP PROFILE II REPORT

MWMP

PHELPS DODGE - TYRONE
GA04-TY-4-GT Sampled:

ADDITIONAL PARAMETERS

PARAMETERS	RESULTS	UNITS	STANDARDS	DATE
+2" Sieve	18.3	%		10/05/04
CO3, CaCO3	<1.0	mg/L Ext		10/07/04
Spec. Cond.	4180	umhos/cm		10/07/04
ELECTRICAL COND.	6.10	mmhos/cm		10/08/04
Eh (mV)	+358	mV		10/07/04
Alkalinity (HCO3)	<1.0	mg/L Ext		10/07/04
SPEC GRAVITY +10	2.53	%		10/22/04
SPEC GRAVITY -10	2.33	%		10/22/04
Silica	7.60	mg/L Ext		10/11/04

*Elevated detection limit due to matrix interference.
Certificate: ID ID00019

Reviewed By: [signature] Date 10/25/04
10/25/04 12:15

SVL ANALYTICAL, INC.

One Government Gulch ▪ P.O. Box 929 ▪ Kellogg, Idaho 83837-0929 ▪ Phone: (208)784-1258 ▪ Fax: (208)783-089

NDEP PROFILE II REPORT MWMP

PHELPS DODGE - TYRONE

GA04-TY-5-GT Sampled:

PARAMETERS	RESULTS	UNITS	STANDARDS	DATE
Alkalinity (Total)		mg/L	-	
Aluminum	380	mg/L	0.05--0.2	10/12/04
Antimony		mg/L	0.006	
Arsenic	<0.20*	mg/L	0.05	10/11/04
Barium	<0.040*	mg/L	2.0	10/11/04
Beryllium	0.0480	mg/L	0.004	10/11/04
Bismuth		mg/L	-	
Boron	<0.80*	mg/L	-	10/11/04
Cadmium	1.35	mg/L	0.005	10/11/04
Calcium	315	mg/L	-	10/11/04
Chloride	12.0	mg/L	250--400	10/08/04
Chromium	<0.120*	mg/L	0.1	10/11/04
Cobalt	4.55	mg/L	-	10/11/04
Copper	2110	mg/L	1.3	10/11/04
Fluoride	14.9	mg/L	2.0--4.0	10/08/04
Gallium		mg/L	-	
Iron	15.2	mg/L	0.3--0.6	10/11/04
Lead	0.320	mg/L	0.015	10/11/04
Lithium		mg/L	-	
Magnesium	193	mg/L	125--150	10/11/04
Manganese	444	mg/L	0.05--0.1	10/11/04
Mercury		mg/L	0.002	
Molybdenum	<0.160*	mg/L	-	10/11/04
Nickel	0.980	mg/L	0.1	10/12/04
Nitrate as N		mg/L	10.0	
pH (units)	3.33	S.U.	6.5--8.5	10/07/04
Phosphorous		mg/L	-	
Potassium	<20*	mg/L	-	10/11/04
Scandium		mg/L	-	
Selenium	<0.20*	mg/L	0.05	10/11/04
Silver	0.120	mg/L	0.1	10/11/04
Sodium	<10*	mg/L	-	10/11/04
Strontium		mg/L	-	
Sulfate	8300	mg/L	250--500	10/07/04
Thallium	<0.20*	mg/L	0.002	10/11/04
Tin		mg/L	-	
Titanium		mg/L	-	
TDS		mg/L	500--1000	
Vanadium	<0.10*	mg/L	-	10/11/04
WAD Cyanide		mg/L	0.2	
Zinc	158	mg/L	5.0	10/11/04

Sample Receipt: 9/23/04
SVL JOB No.:113471
SVL SAMPLE No.:414929
Matrix: ESOIL
Extraction: MWMP

MWMP EXTRACTION PARAMETERS

Extraction Fluid pH: 4.83
Final fluid pH: 3.33
Sample Weight: 5311.0g

Feed Moisture: 6.22 %
Retained Moisture: 14.68 %
Extraction Time: 27 Hrs
Extraction Type:
SINGLE PASS COLUMN

Analytical Results are for EXTRACT

Acid/Base Accounting:

Paste pH: 3.92
AGP: 22.8 *
ANP: <0.30 *
ABP: - 22.8 *
*Tons CaCO3/kTon Material

Sulfur Forms:

TOTAL: 1.34 %
PYRITIC: 0.730 %
SULFATE: 0.550 %
NON-EXT: 0.060 %

CATION SUM: 154.03 meq/L
ANION SUM: 174.01 meq/L
C/A BALANCE: -6.09 %

*Elevated detection limit due to matrix interference.
Certificate: ID ID00019

Reviewed By: ____________ Date 10/25/04

10/25/04 12:15

SVL ANALYTICAL, INC.
One Government Gulch ▪ P.O. Box 929 ▪ Kellogg, Idaho 83837-0929 ▪ Phone: (208)784-1258 ▪ Fax: (208)783-0891

NDEP PROFILE II REPORT

MWMP

PHELPS DODGE - TYRONE
GA04-TY-5-GT

Sampled:

ADDITIONAL PARAMETERS

PARAMETERS	RESULTS	UNITS	STANDARDS	DATE
+2" Sieve	9.1	%		10/05/04
ACIDITY	6120	mg/L Ext		10/08/04
Spec. Cond.	7700	umhos/cm		10/07/04
ELECTRICAL COND.	6.68	mmhos/cm		10/08/04
Eh (mV)	+427	mV		10/07/04
SPEC GRAVITY +10	2.64	%		10/22/04
SPEC GRAVITY -10	2.31	%		10/22/04
Silica	11.4	mg/L Ext		10/11/04

*Elevated detection limit due to matrix interference.
Certificate: ID ID00019

Reviewed By: [signature] Date 10/25/04

10/25/04 12:15

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NDEP PROFILE II REPORT MWMP

PHELPS DODGE - TYRONE
GA04-TY-6-GT Sampled:

PARAMETERS	RESULTS	UNITS	STANDARDS	DATE
Alkalinity (Total)		mg/L	-	
Aluminum	598	mg/L	0.05--0.2	10/12/04
Antimony		mg/L	0.006	
Arsenic	<0.10*	mg/L	0.05	10/11/04
Barium	<0.020*	mg/L	2.0	10/11/04
Beryllium	0.0400	mg/L	0.004	10/11/04
Bismuth		mg/L	-	
Boron	<0.40*	mg/L	-	10/11/04
Cadmium	1.17	mg/L	0.005	10/11/04
Calcium	290	mg/L	-	10/11/04
Chloride	7.16	mg/L	250--400	10/08/04
Chromium	<0.060	mg/L	0.1	10/11/04
Cobalt	2.31	mg/L	-	10/11/04
Copper	780	mg/L	1.3	10/11/04
Fluoride	19.2	mg/L	2.0--4.0	10/08/04
Gallium		mg/L	-	
Iron	4.60	mg/L	0.3--0.6	10/11/04
Lead	0.0900	mg/L	0.015	10/11/04
Lithium		mg/L	-	
Magnesium	319	mg/L	125--150	10/11/04
Manganese	232	mg/L	0.05--0.1	10/11/04
Mercury		mg/L	0.002	
Molybdenum	0.103	mg/L	-	10/11/04
Nickel	0.660	mg/L	0.1	10/12/04
Nitrate as N		mg/L	10.0	
pH (units)	3.14	S.U.	6.5--8.5	10/07/04
Phosphorous		mg/L	-	
Potassium	<10*	mg/L	-	10/11/04
Scandium		mg/L	-	
Selenium	<0.10*	mg/L	0.05	10/11/04
Silver	<0.050*	mg/L	0.1	10/11/04
Sodium	9.00	mg/L	-	10/11/04
Strontium		mg/L	-	
Sulfate	7700	mg/L	250--500	10/07/04
Thallium	<0.10*	mg/L	0.002	10/11/04
Tin		mg/L	-	
Titanium		mg/L	-	
TDS		mg/L	500--1000	
Vanadium	<0.050*	mg/L	-	10/11/04
WAD Cyanide		mg/L	0.2	
Zinc	118	mg/L	5.0	10/11/04

Sample Receipt: 9/23/04
SVL JOB No.:113471
SVL SAMPLE No.:414930
Matrix: ESOIL
Extraction: MWMP

MWMP EXTRACTION PARAMETERS

Extraction Fluid pH: 4.83
Final fluid pH: 3.14
Sample Weight: 5324.0g

Feed Moisture: 6.48 %
Retained Moisture: 14.82 %
Extraction Time: 27 Hrs
Extraction Type:
SINGLE PASS COLUMN

Analytical Results are for EXTRACT

Acid/Base Accounting:

Paste pH: 3.72
AGP: 11.9 *
ANP: <0.30 *
ABP: - 11.9 *
*Tons CaCO3/kTon Material

Sulfur Forms:

TOTAL: 1.02 %
PYRITIC: 0.380 %
SULFATE: 0.490 %
NON-EXT: 0.150 %

CATION SUM: 160.28 meq/L
ANION SUM: 161.52 meq/L
C/A BALANCE: -0.39 %

*Elevated detection limit due to matrix interference.
Certificate: ID ID00019

Reviewed By: [signature] Date 10/25/04
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NDEP PROFILE II REPORT MWMP

PHELPS DODGE - TYRONE
GA04-TY-6-GT Sampled:

ADDITIONAL PARAMETERS

PARAMETERS	RESULTS	UNITS	STANDARDS	DATE
+2" Sieve	8.1	%		10/05/04
ACIDITY	5960	mg/L Ext		10/08/04
Spec. Cond.	7080	umhos/cm		10/07/04
ELECTRICAL COND.	8.31	mmhos/cm		10/08/04
Eh (mV)	+463	mV		10/07/04
SPEC GRAVITY +10	2.33	%		10/22/04
SPEC GRAVITY -10	2.11	%		10/22/04
Silica	13.6	mg/L Ext		10/11/04

*Elevated detection limit due to matrix interference.
Certificate: ID ID00019

Reviewed By: [signature] Date 10/25/04
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NDEP PROFILE II REPORT MWMP

PHELPS DODGE - TYRONE
GA04-TY-7-GT Sampled:

PARAMETERS	RESULTS	UNITS	STANDARDS	DATE
Alkalinity (Total)		mg/L	-	
Aluminum	1080	mg/L	0.05--0.2	10/12/04
Antimony		mg/L	0.006	
Arsenic	<0.050*	mg/L	0.05	10/11/04
Barium	0.0180	mg/L	2.0	10/11/04
Beryllium	0.0650	mg/L	0.004	10/11/04
Bismuth		mg/L	-	
Boron	<0.20*	mg/L	-	10/11/04
Cadmium	0.226	mg/L	0.005	10/11/04
Calcium	401	mg/L	-	10/11/04
Chloride	<5.00*	mg/L	250--400	10/08/04
Chromium	0.163	mg/L	0.1	10/11/04
Cobalt	2.54	mg/L	-	10/11/04
Copper	454	mg/L	1.3	10/11/04
Fluoride	32.9	mg/L	2.0--4.0	10/08/04
Gallium		mg/L	-	
Iron	239	mg/L	0.3--0.6	10/11/04
Lead	0.0442	mg/L	0.015	10/11/04
Lithium		mg/L	-	
Magnesium	196	mg/L	125--150	10/11/04
Manganese	219	mg/L	0.05--0.1	10/11/04
Mercury		mg/L	0.002	
Molybdenum	0.0570	mg/L	-	10/11/04
Nickel	1.14	mg/L	0.1	10/12/04
Nitrate as N		mg/L	10.0	
pH (units)	2.52	S.U.	6.5--8.5	10/07/04
Phosphorous		mg/L	-	
Potassium	<5.0*	mg/L	-	10/11/04
Scandium		mg/L	-	
Selenium	<0.050*	mg/L	0.05	10/11/04
Silver	0.0266	mg/L	0.1	10/11/04
Sodium	<2.5*	mg/L	-	10/11/04
Strontium		mg/L	-	
Sulfate	10700	mg/L	250--500	10/07/04
Thallium	<0.050*	mg/L	0.002	10/11/04
Tin		mg/L	-	
Titanium		mg/L	-	
TDS		mg/L	500--1000	
Vanadium	<0.0250*	mg/L	-	10/11/04
WAD Cyanide		mg/L	0.2	
Zinc	67.9	mg/L	5.0	10/11/04

Sample Receipt: 9/23/04
SVL JOB No.:113471
SVL SAMPLE No.:414931
Matrix: ESOIL
Extraction: MWMP

MWMP EXTRACTION PARAMETERS

Extraction Fluid pH: 4.83
Final fluid pH: 2.52
Sample Weight: 5403.0g

Feed Moisture: 8.06 %
Retained Moisture: 14.24 %
Extraction Time: 30 Hrs
Extraction Type:
SINGLE PASS COLUMN

Analytical Results are for EXTRACT

Acid/Base Accounting:

Paste pH: 3.11
AGP: 20.3 *
ANP: <0.30 *
ABP: - 20.3 *
*Tons CaCO3/kTon Material

Sulfur Forms:

TOTAL: 1.38 %
PYRITIC: 0.650 %
SULFATE: 0.590 %
NON-EXT: 0.140 %

CATION SUM: 249.17 meq/L
ANION SUM: 225.50 meq/L
C/A BALANCE: 4.99 %

*Elevated detection limit due to matrix interference.
Certificate: ID ID00019

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NDEP PROFILE II REPORT

MWMP

PHELPS DODGE - TYRONE
GA04-TY-7-GT

Sampled:

ADDITIONAL PARAMETERS

PARAMETERS	RESULTS	UNITS	STANDARDS	DATE
+2" Sieve	1.1	%		10/05/04
ACIDITY	10700	mg/L Ext		10/08/04
Spec. Cond.	8730	umhos/cm		10/07/04
ELECTRICAL COND.	4.61	mmhos/cm		10/08/04
Eh (mV)	+542	mV		10/07/04
SPEC GRAVITY +10	2.32	%		10/22/04
SPEC GRAVITY -10	2.11	%		10/22/04
Silica	17.1	mg/L Ext		10/11/04

*Elevated detection limit due to matrix interference.
Certificate: ID ID00019

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NDEP PROFILE II REPORT MWMP

PHELPS DODGE - TYRONE
GA04-TY-8-GT Sampled:

PARAMETERS	RESULTS	UNITS	STANDARDS	DATE
Alkalinity (Total)		mg/L	-	
Aluminum	804	mg/L	0.05--0.2	10/12/04
Antimony		mg/L	0.006	
Arsenic	<0.10*	mg/L	0.05	10/11/04
Barium	<0.020*	mg/L	2.0	10/11/04
Beryllium	0.0290	mg/L	0.004	10/11/04
Bismuth		mg/L	-	
Boron	<0.40*	mg/L	-	10/11/04
Cadmium	0.427	mg/L	0.005	10/11/04
Calcium	75.3	mg/L	-	10/11/04
Chloride	6.40	mg/L	250--400	10/08/04
Chromium	0.188	mg/L	0.1	10/11/04
Cobalt	1.70	mg/L	-	10/11/04
Copper	665	mg/L	1.3	10/11/04
Fluoride	5.60	mg/L	2.0--4.0	10/08/04
Gallium		mg/L	-	
Iron	261	mg/L	0.3--0.6	10/11/04
Lead	<0.050*	mg/L	0.015	10/11/04
Lithium		mg/L	-	
Magnesium	84.6	mg/L	125--150	10/11/04
Manganese	67.3	mg/L	0.05--0.1	10/11/04
Mercury		mg/L	0.002	
Molybdenum	<0.080*	mg/L	-	10/11/04
Nickel	0.620	mg/L	0.1	10/12/04
Nitrate as N		mg/L	10.0	
pH (units)	2.73	S.U.	6.5--8.5	10/07/04
Phosphorous		mg/L	-	
Potassium	<10*	mg/L	-	10/11/04
Scandium		mg/L	-	
Selenium	<0.10*	mg/L	0.05	10/11/04
Silver	<0.050*	mg/L	0.1	10/11/04
Sodium	<5.0*	mg/L	-	10/11/04
Strontium		mg/L	-	
Sulfate	7210	mg/L	250--500	10/07/04
Thallium	<0.10*	mg/L	0.002	10/11/04
Tin		mg/L	-	
Titanium		mg/L	-	
TDS		mg/L	500--1000	
Vanadium	0.281	mg/L	-	10/11/04
WAD Cyanide		mg/L	0.2	
Zinc	64.5	mg/L	5.0	10/11/04

Sample Receipt: 9/23/04
SVL JOB No.:113471
SVL SAMPLE No.:414932
Matrix: ESOIL
Extraction: MWMP

MWMP EXTRACTION PARAMETERS

Extraction Fluid pH: 4.83
Final fluid pH: 2.73
Sample Weight: 5294.0g

Feed Moisture: 5.88 %
Retained Moisture: 14.68 %
Extraction Time: 30 Hrs
Extraction Type:
SINGLE PASS COLUMN

Analytical Results are for EXTRACT

Acid/Base Accounting:

Paste pH: 2.72
AGP: 30.0 *
ANP: <0.30 *
ABP: - 30.0 *
*Tons CaCO3/kTon Material

Sulfur Forms:

TOTAL: 1.69 %
PYRITIC: 0.960 %
SULFATE: 0.650 %
NON-EXT: 0.080 %

CATION SUM: 142.95 meq/L
ANION SUM: 150.67 meq/L
C/A BALANCE: -2.63 %

*Elevated detection limit due to matrix interference.
Certificate: ID ID00019

Reviewed By: ______________ Date 10/25/04
10/25/04 12:15

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NDEP PROFILE II REPORT

MWMP

PHELPS DODGE - TYRONE
GA04-TY-8-GT Sampled:

ADDITIONAL PARAMETERS

PARAMETERS	RESULTS	UNITS	STANDARDS	DATE
+2" Sieve	7.7	%		10/05/04
ACIDITY	6610.7	mg/L Ext		10/08/04
Spec. Cond.	6330	umhos/cm		10/07/04
ELECTRICAL COND.	7.72	mmhos/cm		10/08/04
Eh (mV)	+431	mV		10/07/04
SPEC GRAVITY +10	2.49	%		10/22/04
SPEC GRAVITY -10	2.20	%		10/22/04
Silica	6.40	mg/L Ext		10/11/04

*Elevated detection limit due to matrix interference.
Certificate: ID ID00019

Reviewed By: [signature] Date 10/25/04
10/25/04 12:15

SVL ANALYTICAL, INC.

Quality Control Report
Part I Prep Blank and Laboratory Control Sample

Client :PHELPS DODGE - TYRONE

SVL JOB No: 13471

Analyte	Method	Matrix	Units	Prep Blank	True —LCS—	—Found	LCS %R	Analysis Date
Silver	200.7	ESOIL	mg/L Ext	<0.0050	1.00	0.992	99.2	10/11/04
Aluminum	200.7	ESOIL	mg/L Ext	<0.020	1.00	0.999	99.9	10/11/04
Arsenic	200.7	ESOIL	mg/L Ext	<0.010	1.00	0.985	98.5	10/11/04
Boron	200.7	ESOIL	mg/L Ext	<0.040	1.00	1.02	102.0	10/11/04
Barium	200.7	ESOIL	mg/L Ext	<0.0020	1.00	1.00	100.0	10/11/04
Beryllium	200.7	ESOIL	mg/L Ext	<0.0020	1.00	1.00	100.0	10/11/04
Calcium	200.7	ESOIL	mg/L Ext	<0.040	20.0	20.4	102.0	10/11/04
Cadmium	200.7	ESOIL	mg/L Ext	<0.0020	1.00	1.00	100.0	10/11/04
Cobalt	200.7	ESOIL	mg/L Ext	<0.0060	1.00	0.993	99.3	10/11/04
Chromium	200.7	ESOIL	mg/L Ext	<0.0060	1.00	1.01	101.0	10/11/04
Copper	200.7	ESOIL	mg/L Ext	<0.0030	1.00	0.995	99.5	10/11/04
Iron	200.7	ESOIL	mg/L Ext	<0.020	10.0	9.67	96.7	10/11/04
Potassium	200.7	ESOIL	mg/L Ext	<1.0	30.0	30.5	101.7	10/11/04
Magnesium	200.7	ESOIL	mg/L Ext	<0.040	20.0	20.1	100.5	10/11/04
Manganese	200.7	ESOIL	mg/L Ext	<0.0020	1.00	1.02	102.0	10/11/04
Molybdenum	200.7	ESOIL	mg/L Ext	<0.0080	1.00	1.04	104.0	10/11/04
Sodium	200.7	ESOIL	mg/L Ext	<0.50	20.0	20.2	101.0	10/11/04
Nickel	200.7	ESOIL	mg/L Ext	<0.010	1.00	0.922	92.2	10/11/04
Lead	200.7	ESOIL	mg/L Ext	<0.0050	1.00	1.00	100.0	10/11/04
Selenium	200.7	ESOIL	mg/L Ext	<0.010	1.00	0.950	95.0	10/11/04
Silica	200.7	ESOIL	mg/L Ext	<0.171	10.7	11.2	104.7	10/11/04
Thallium	200.7	ESOIL	mg/L Ext	<0.010	1.00	0.991	99.1	10/11/04
Vanadium	200.7	ESOIL	mg/L Ext	<0.0050	1.00	1.04	104.0	10/11/04
Zinc	200.7	ESOIL	mg/L Ext	<0.0050	1.00	1.01	101.0	10/11/04
Chloride	300.0	ESOIL	mg/L Ext	<0.20	5.00	4.99	99.8	10/07/04
Fluoride	300.0	ESOIL	mg/L Ext	<0.10	2.50	2.67	106.8	10/07/04
Sulfate, SO4	300.0	ESOIL	mg/L Ext	<0.30	10.0	10.0	100.0	10/07/04
ALKALINITY	2320B	ESOIL	mg/L Ext	<1.0	47.0	52.4	111.5	10/07/04
pH	150.1	ESOIL		5.59	5.40	5.37	99.4	10/07/04
Spec. Cond.	120.1	ESOIL	umhos/cm	0.252	298	290	97.3	10/07/04
ELECTRICAL COND.	ASA M9	ESOIL	mmhos/cm	<0.010	0.298	0.292	98.0	10/08/04
Eh (mV)	2580	ESOIL	mV	N/A	+228	+228	100.0	10/07/04
Acid Generating	EPA600	ESOIL	TCaCO3/k	N/A	9.36	9.63	102.9	10/07/04
Acid Neut. Pot.	EPA600	ESOIL	TCaCO3/k	N/A	52.0	51.4	98.8	10/07/04
pH Paste	ASA M9	ESOIL		5.50	8.45	8.34	98.7	10/07/04
Non-Ext Sulfur,S	LECO	ESOIL	%	<0.010	N/A		N/A	10/07/04
Pyritic Sulfur,S	LECO	ESOIL	%	<0.010	N/A		N/A	10/07/04
Sulfate Sulfur,S	LECO	ESOIL	%	<0.010	N/A		N/A	10/07/04
Total Sulfur, S	LECO	ESOIL	%	<0.010	0.298	0.310	104.0	10/07/04
ACIDITY	2310B	ESOIL	mg/L Ext	<1.0	0.50	0.526	105.2	10/08/04

LEGEND:
LCS = Laboratory Control Sample
LCS %R = LCS Percent Recovery
N/A = Not Applicable

10/22/04 16:56

SVL ANALYTICAL, INC.

Quality Control Report
Part II Duplicate and Spike Analysis

Client :PHELPS DODGE - TYRONE

SVL JOB No: 113471

Test	Method	Mtx	QC SAMPLE ID Units	Result	Duplicate or Found	MSD RPD%	Matrix Spike Result	SPK ADD	%R	Analysis Date
Ag	200.7	E 1	mg/L Ex	<0.0250*	<0.0250*	UDL	4.68	5.00	93.6	10/11/04
Al	200.7	E 1	mg/L Ex	15.0	16.2	7.7	15.5	1.00	R >4S	10/11/04
As	200.7	E 1	mg/L Ex	<0.050*	<0.050*	UDL	0.995	1.00	99.5	10/11/04
B	200.7	E 1	mg/L Ex	<0.20*	<0.20*	UDL	0.940	1.00	94.0	10/11/04
Ba	200.7	E 1	mg/L Ex	0.0270	0.0270	0.0	1.05	1.00	102.3	10/11/04
Be	200.7	E 1	mg/L Ex	<0.010*	<0.010*	UDL	0.854	1.00	85.4	10/11/04
Ca	200.7	E 1	mg/L Ex	164	188	13.6	178	20.0	R >4S	10/11/04
Cd	200.7	E 1	mg/L Ex	0.311	0.312	0.3	1.36	1.00	104.9	10/11/04
Co	200.7	E 1	mg/L Ex	0.348	0.350	0.6	1.38	1.00	103.2	10/11/04
Cr	200.7	E 1	mg/L Ex	<0.030*	<0.030*	UDL	1.04	1.00	104.0	10/11/04
Cu	200.7	E 1	mg/L Ex	67.3	68.2	1.3	64.5	1.00	R >4S	10/11/04
Fe	200.7	E 1	mg/L Ex	<0.10*	<0.10*	UDL	8.86	10.0	88.6	10/11/04
K	200.7	E 1	mg/L Ex	22.0	24.8	12.0	46.8	30.0	82.7	10/11/04
Mg	200.7	E 1	mg/L Ex	79.6	90.8	13.1	178	100	98.4	10/11/04
Mn	200.7	E 1	mg/L Ex	76.4	86.9	12.9	75.2	1.00	R >4S	10/11/04
Mo	200.7	E 1	mg/L Ex	0.0440	0.0420	4.7	1.09	1.00	104.6	10/11/04
Na	200.7	E 1	mg/L Ex	21.6	24.6	13.0	38.1	20.0	82.5	10/11/04
Ni	200.7	E 1	mg/L Ex	0.110	0.102	7.5	1.08	1.00	97.0	10/11/04
Pb	200.7	E 1	mg/L Ex	0.0341	<0.0250*	200.0	1.08	1.00	104.6	10/11/04
Se	200.7	E 1	mg/L Ex	<0.050*	<0.050*	UDL	0.991	1.00	99.1	10/11/04
SiO2	200.7	E 1	mg/L Ex	15.3	16.6	8.2	25.1	10.7	91.6	10/11/04
Tl	200.7	E 1	mg/L Ex	<0.050*	<0.050*	UDL	1.05	1.00	105.0	10/11/04
V	200.7	E 1	mg/L Ex	<0.0250*	<0.0250*	UDL	1.05	1.00	105.0	10/11/04
Zn	200.7	E 1	mg/L Ex	35.1	35.5	1.1	34.9	1.00	R >4S	10/11/04
Cl	300.0	E 1	mg/L Ex	12.0	11.4	5.1	22.7	10.0	107.0	10/08/04
F	300.0	E 1	mg/L Ex	15.2	15.4	1.3	24.6	10.0	94.0	10/08/04
SO4	300.0	E 1	mg/L Ex	1340	1350	0.7	1850	500	102.0	10/07/04
pH	150.1	E 1		4.33	4.34	0.2	N/A	N/A	N/A	10/07/04
COND	120.1	E 1	umhos/c	2200	2210	0.5	N/A	N/A	N/A	10/07/04
EC	ASA M9	E 1	mmhos/c	3.07	3.08	0.3	N/A	N/A	N/A	10/08/04
Eh	2580	E 1	mV	+359	+358	0.3	N/A	N/A	N/A	10/07/04
ABP	EPA600	E 1	TCaCO3/	-12.8	-12.8	0.0	N/A	N/A	N/A	10/07/04
AGP	EPA600	E 1	TCaCO3/	12.8	12.8	0.0	N/A	N/A	N/A	10/07/04
ANP	EPA600	E 1	TCaCO3/	<0.30	<0.30	UDL	N/A	N/A	N/A	10/07/04
pH Pst	ASA M9	E 1		4.62	4.58	0.9	N/A	N/A	N/A	10/07/04
S N-EX	LECO	E 1	%	0.620	0.630	1.6	N/A	N/A	N/A	10/07/04
S-PYR	LECO	E 1	%	0.410	0.410	0.0	N/A	N/A	N/A	10/07/04
S-SO4	LECO	E 1	%	0.320	0.320	0.0	N/A	N/A	N/A	10/07/04
S-TOT	LECO	E 1	%	1.35	1.36	0.7	N/A	N/A	N/A	10/07/04
ACID	2310B	E 1	mg/L Ex	586	597	1.9	N/A	N/A	N/A	10/08/04

LEGEND:

RPD% = (|SAM - DUP|/((SAM + DUP)/2) * 100) UDL = Both SAM & DUP not detected. *Result or *Found: Interference required dilution.

RPD% = (|SPK - MSD|/((SPK + MSD)/2) * 100) M in Duplicate/MSD column indicates MSD.

SPIKE ADD column, A = Post Digest Spike; %R = Percent Recovery N/A = Not Analyzed; R > 4S = Result more than 4X the Spike Added

QC limits for MS recoveries apply only if the spike is at least 1/4 the concentration of the analyte in the sample.

Control limits for the RPD apply only if the concentration of the analyte in the sample is at least five times the reporting limit.

QC Sample 1: SVL SAM No.: 414925 Client Sample ID: GA04-TY-1-GT

10/22/04 16:56

Requested Analyses:
XRF Analysis, Major elements
XRF Analysis, Trace Elements

SVL will select another 250 – 500 gram subsplit for mineralogical characterization and ship to:

Pittsburg Mineral and Environmental Technology Inc. (PMET)
700 Fifth Avenue
New Brighton, PA 15066-1837
Tel. 724-843-5000
Fax 724-843-5353
pmet@pmet-inc.com

Requested Analyses:

- Quanititative X-ray Diffraction (XRD) and IR Mineralogical Analyses
  - Bulk sample mineralogy
  - Amorphous and semi-crystalline material content
  - Clay fraction mineralogy

The analytical labs will return any remaining sample masses to the point of origin (Tyrone Mine).

If possible, the electronic data should be in a **flat file format**. For more detail on this specification please contact Greystone's database specialist John Rodgers at 303-544-0043 (jrodgers@greystone.us).

GA04-TY-3-6E is "Blind Duplicate"
JBM
10/15/04

SVL ANALYTICAL, INC.
Government Gulch - Kellogg, ID 83837-0929

SAMPLE RECEIPT CONFIRMATION

SVL JOB No: 113471
Received: 9/23/04
Expected Due date: 10/07/04

nc	By	Received	Sample Comments
		9/23/04	
		9/23/04	
		9/23/04	
		9/23/04	
		9/23/04	
		9/23/04	
		9/23/04	
		9/23/04	

'Container temp not measured upon receipt.
)ST CODING INFORMATION
MPLE LABEL IDs END WITH "GC"
NTAINERS SENT, SVL RECEIVED 1 BUCKET EACH

after job completion.
, then you will receive a letter requesting disposal options.

you have questions regarding the receipt of these samples. 9/23/04 16:47

TRANSMISSION VERIFICATION REPORT

TIME : 09/25/2004 13:22
NAME : SVL ANALYTICAL
FAX : 2087830891
TEL : 2087841258
SER.# : BROF3J496071

DATE,TIME	09/25 13:21
FAX NO./NAME	915053885773
DURATION	00:00:20
PAGE(S)	01
RESULT	OK
MODE	FINE ECM

113471

Chain of Custody Record

COC No. PamPinson091504-

Project Name: DP 1341 Condition 84	Project Manager: Chuck Thompson	GA04-TY-3-GC sent as "Blind Duplicate" S.M. 10/15/04
Project Location: PD Tyrone 1 CStockpile		
Tom Wythes with Golder, Inc.		instructions according to Dusty Earley PO# 043-2572

Analytical Parameters

Chino Mines Company
ELWD.
P.O. Box 7
Hurley, N.M. 88043

Date	time	Grab	(Field ID)		Containers	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Chain of Custody Seal#
~~GA04-Ty~~				Soil/Sed	1	X																				
			GA04-Ty-1-GT	Soil/Sed	2	X																				All samples
			" -2- "	Soil/Sed	2	X																				End in
			" -3- "	Soil/Sed	2	X																				
			" -4- "	Soil/Sed	2	X																				GC instead
			" -5- "	Soil/Sed	2	X																				of GT
			" -6- "	Soil/Sed	2	X																				CRS
			" 7 "	Soil/Sed	2	X																				9/23/04
			" 8 "	" "	2	X																				

Signatures		Date & Time	Shipping Details
Relinquished by:	Pam Pinson	9/15/04 4:00 pm	Method of Shipment: Freight
Received by:	Javier Molinar/6pks	9-15-04	Airbill No.
Relinquished by:			Lab Addresses: ATTN: Chris Myer
Received for Laboratory by:	L Pekarski	9-23-04	Denver Soils Lab, 12860 W. Cedar Dr. Suite 206, Lakewood, CO 80228 — Phone: Fax:

Special Instructions

As specified by Drummond Early, Greystone Environmental Consultants

OK Golder!