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Technical Memorandum

To:	Cynthia Ardito, Intera Inc.	Date:	March 30, 2011
Cc:	Steve Raugust, New Mexico Copper Corporation	From:	Ruth Warrender, Amy Prestia, Rob Bowell,
Subject:	Copper Flat Geochemical Characterization Program: Incorporation of 1997 Static Test Data	Project #:	191000.03

This memorandum has been prepared by SRK Consulting (SRK) to provide Intera Inc. with a comparison of geochemical data from two separate static testwork programs carried out by SRK in both 1997 and 2010. The memorandum also discusses incorporation of the historic (1997) data into the current (2010/2011) geochemical characterization and modeling work.

1 Pre-1996 Testwork Program

As part of the initial planning and baseline studies on behalf of Alta Gold, SRK (US) Inc collected a small suite of samples from drill core, tailings and waste rock for acid base accounting, short term leachate and kinetic testing. The kinetic testing program was only run for 28 weeks. None of the current investigators were involved in this work but Rob Bowell produced a report on the work due to changes in staff in SRK (US) prior to reporting of the study. The review of this testwork was reported in the *Geochemical Review of Waste Rock, Pit Lake Water Quality and Tailings* (SRK, 1996). The testwork results were also utilized to develop predictive geochemical models to assess potential pit lake water quality.

2 1997 Testwork Program

A geochemical sampling and testwork program was carried out by SRK as part of the 1997 Copper Flat Waste Rock Management Plan. The purpose of the program was to produce detailed geological and geochemical maps of the waste rock dumps and pits.. A total of 141 surface grab samples were collected from as part of the 1997 characterization program and these samples were analyzed for field net acid generation (NAG) and paste chemistry. Forty six of these samples were then subject to laboratory Acid Base Accounting (ABA) testwork and 59 samples were submitted for NAG testwork. This work was reported in the *Copper Flat Waste Rock Management Plan* (SRK, 1998). It is important to note that further work was planned but Alta Gold went bankrupt prior to confirming work plan for further kinetic testing and leachate assessment.

3 2010 Testwork Program

Additional samples were collected by SRK representatives during a site visit in April 2010. The purpose of the 2010 sampling and testwork program was to update the previous geochemical characterization and modeling work carried out in 1997. This is based on subsequent revisions to standards outlining the characterization of mine waste, which have become significantly more involved since the previous assessment was carried out. A number of statutory regulations have also been reviewed and modified since this initial assessment, including the modification of BLM and 43 CFR 3809 regulations in addition to changes to the standards applied to both EIS and New Mexico State permit applications.

During the site visit, two types of samples were collected:

1. A total of 50 drill hole samples were collected at depth from recent exploration core holes drilled within the footprint of the Copper Flat pit in 2009 and 2010. The sample intervals were selected to represent the range of waste rock material types that will be encountered in the pit during mining operations.
2. A total of 24 bulk surface grab samples from pit wall exposures, existing waste rock dumps and the tailings impoundment. Sampling these existing waste rock dumps and pit walls provide an opportunity to compare fresh rock samples to weathered rock samples of the same material types that have been exposed to oxygen and water for over 20 years. Coverage of this data set is more comprehensive than the previous studies.

It was anticipated that the samples collected as part of the 2010 characterization program would augment the existing (1997) geochemical dataset and update the geochemical characterization and modeling work to meet current standards.

4 Comparison of 1997 and 2010 Static Test Data

In order to ensure that the geochemical datasets collected in both 1997 and 2010 are comparable, SRK has undertaken a comparison of the testwork results obtained from ABA and NAG tests. This comparison has assessed the two datasets as a whole and has not considered variations within individual material types. This is because the material type designations used in both the 1997 and the 2010 assessments were different, and thus this would not be an appropriate comparison. For example the 1997 geochemical characterization program delineates samples according to oxidation (e.g. sulfide, transitional, oxide), whilst the 2010 program classifies materials according to alteration (e.g. propylitic, argillic, silicic). Nonetheless, the lithology types sampled during both the 1997 and 2010 geochemical characterization programs are comparable (Table 1).

Table 1: Summary of 1997 and 2010 Sampling

1997 sampling		2010 sampling	
Material type	**Number of samples**	**Material type**	**Number of samples**
Quartz Monzonite	94	Quartz Monzonite	39
Quartz Breccia	28	Quartz Monzonite Breccia	25
Andesite	1	Andesite	4
Biotite Breccia	10	Dolerite	2
Quartz Vein	8		

Comparison of the 1997 and 2010 data sets is illustrated on scatter plots and box and whisker plots preseted in Figure 1 to Figure 7**.**

The scatter plot comparing the sulfide sulfur content and net neutralizing potential (NNP) of the 1997 and 2010 samples provided in Figure 1 demonstrates that the two sample sets are broadly comparable, with a similar range in values. However, the 2010 data set generally has more samples that fall within the zone of uncertainty or that are non-acid forming. Conversely, the 1997 data set contains more samples that show potentially acid forming (PAF) characteristics. The box and whisker plot provided in Figure 2 shows the range and median values of NNP for each data set. This demonstrates that the two data sets are comparable in terms of the range of NNP values, but the samples collected in 1997 generally show a trend towards more acid generating characteristics. A reason for this may have been bias in collecting higher sulfide or weathered material on the dumps, whereas a more representative sample set was collected in 2010.

The tendency of the 1997 samples towards acid generating characteristics is also illustrated in the scatter plot of paste pH vs. sulfide sulfur content presented in Figure 3. This shows that the paste pH values for the samples collected in 1997are generally lower in comparison to the 2010 data. This is likely to reflect the nature of the samples themselves, with the 1997 samples being entirely grab samples collected from surface waste rock dumps and the 2010 samples being a mixture of both surface grab samples and also drill core material from depth. The significance of this difference in sample type is that surface grab samples are likely to be characterised by the presence of soluble (and potentially acidic) salts on the material surface, whereas the drill core samples are likely to be largely unweathered. Consideration of the grab samples only (Figure 4) shows a slightly better correlation between the two datasets, but paste pH values are still generally higher than observed in the 1997 dataset.

Comparison of 1997 and 2010 NAG testwork results (Figure 5) shows a fairly significant difference between the two datasets. This is largely due to a difference in testwork methodology, with the 1997 analysis including the determination of NAG values for samples with a NAG pH greater than 4. This is different to the 2010 methodology employed, whereby the NAG value was only determined for samples showing a NAG pH less than 4 s.u. Comparison of the two datasets for only samples with a NAG pH less than 4 shows that the samples are broadly similar in terms of their net acid generating potential (Figure 6 and Figure 7).

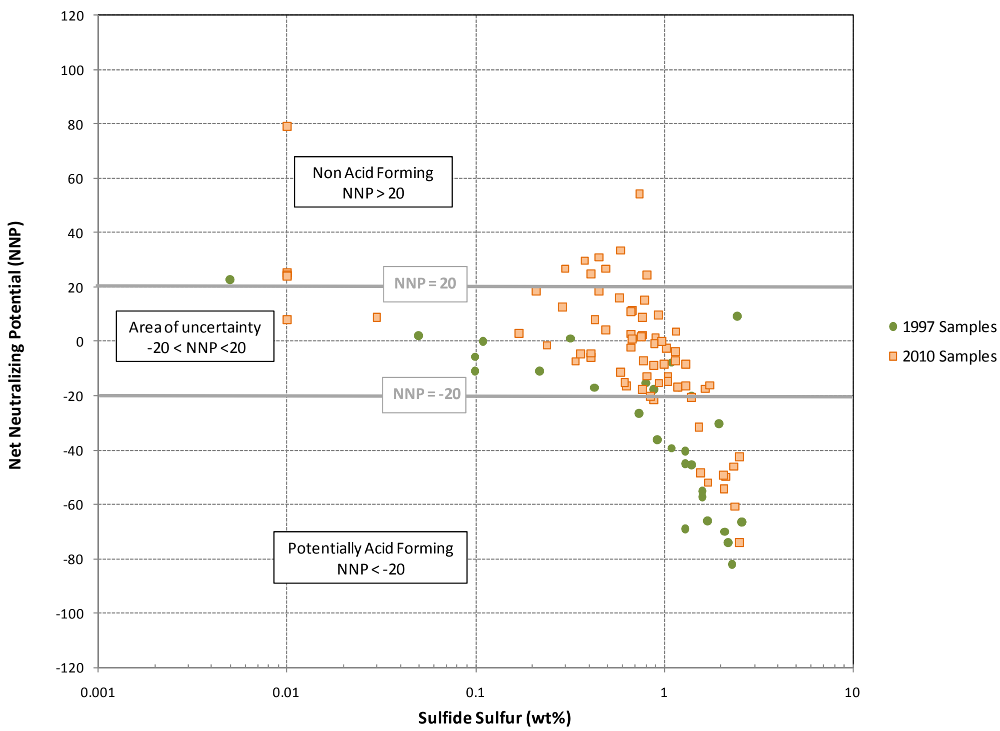


Figure 1: Scatter Plot of Sulfide Sulfur vs. Net Neutralizing Potential (NNP)

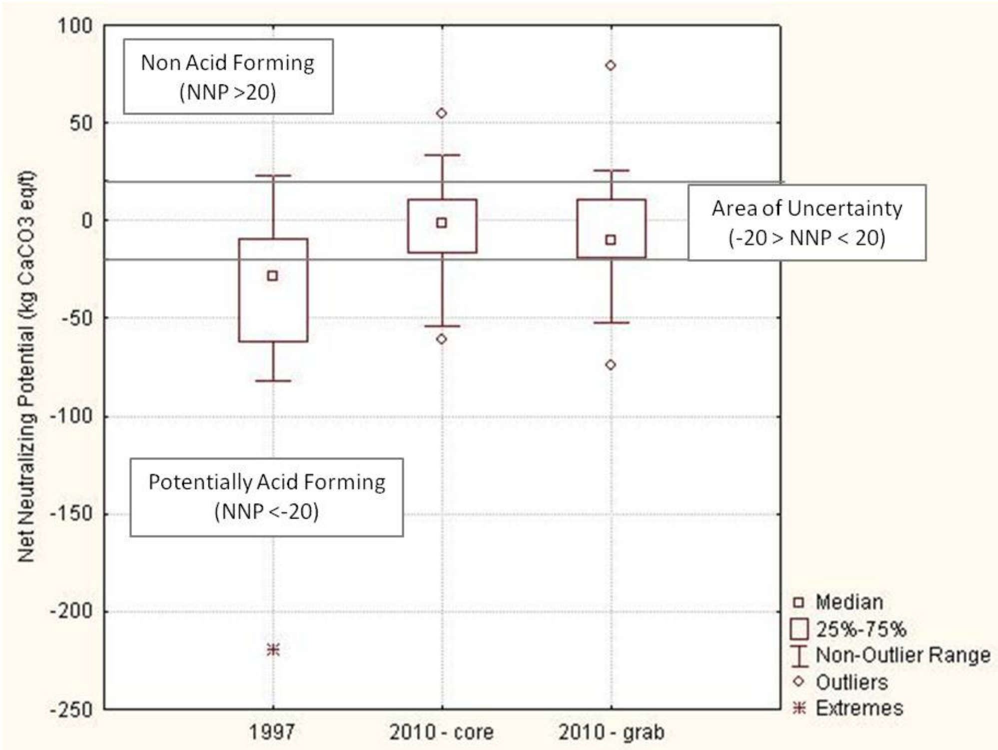


Figure 2: Box and Whisker Plot of Net Neutralizing Potential (NNP)

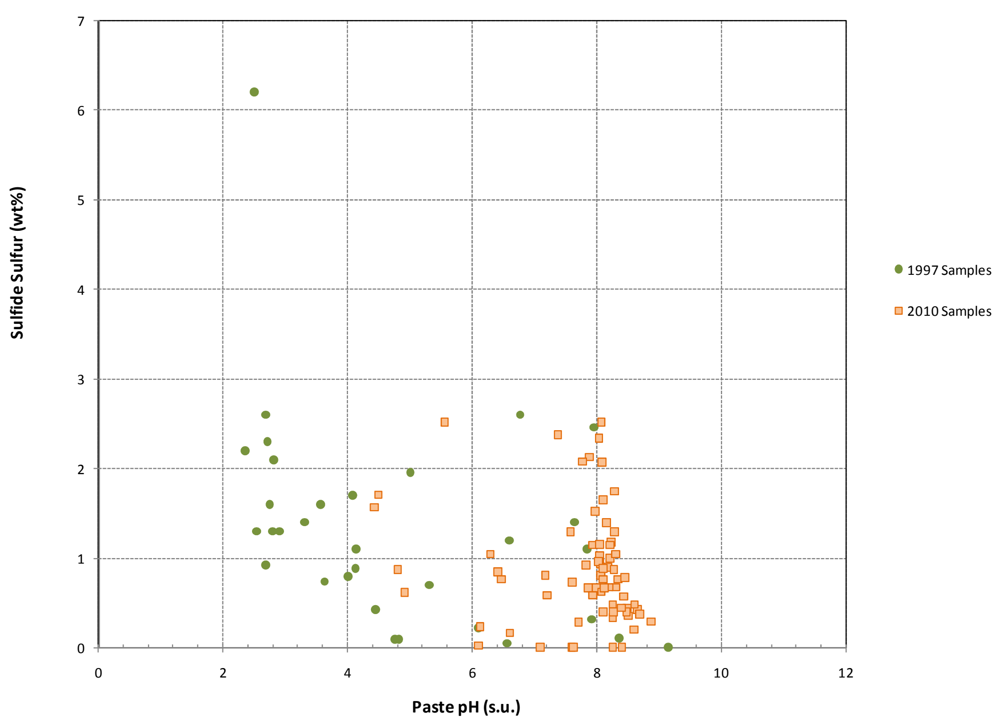


Figure 3: Scatter Plot of Paste pH vs. Sulfide Sulfur Content

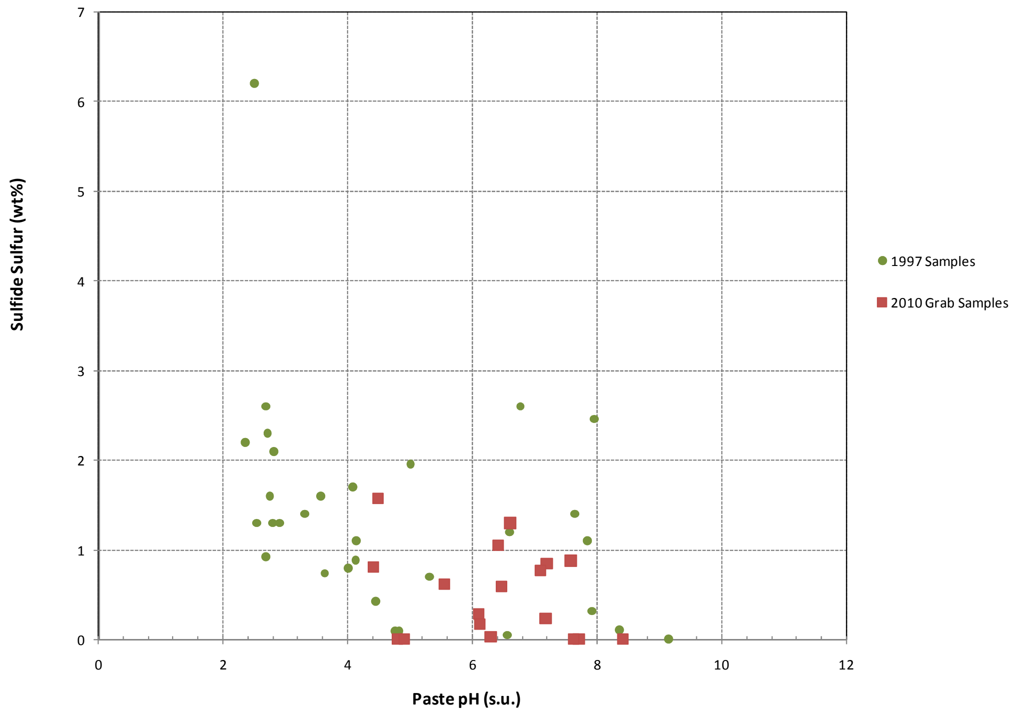


Figure 4: Scatter Plot of Paste pH vs. Sulfide Sulfur Content (grab samples only)

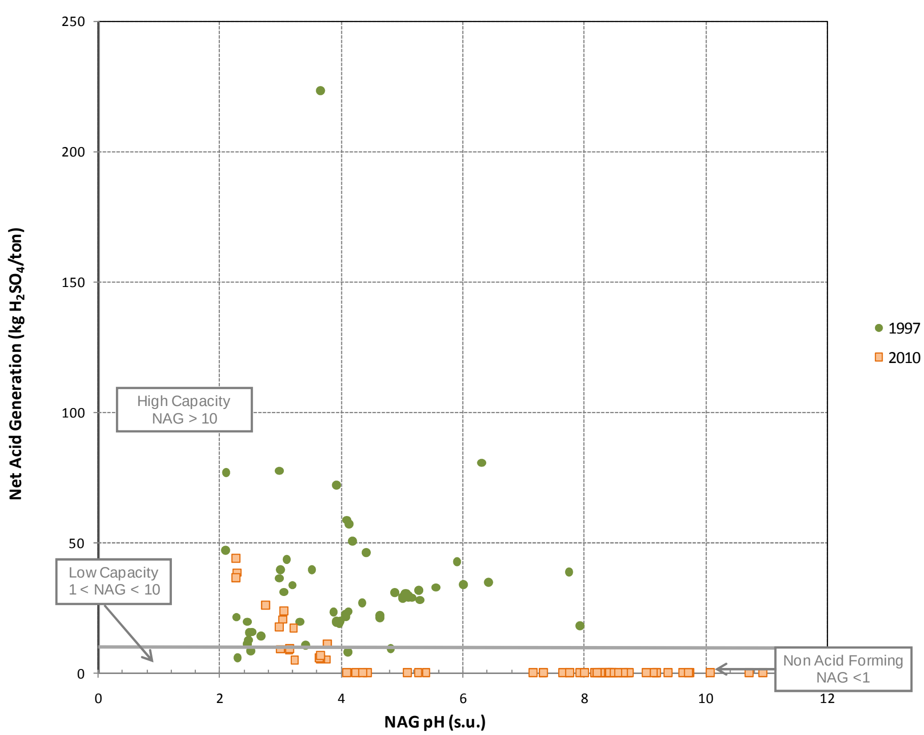


Figure 5: Scatter Plot of NAG pH vs. Net Acid Generation (NAG) value

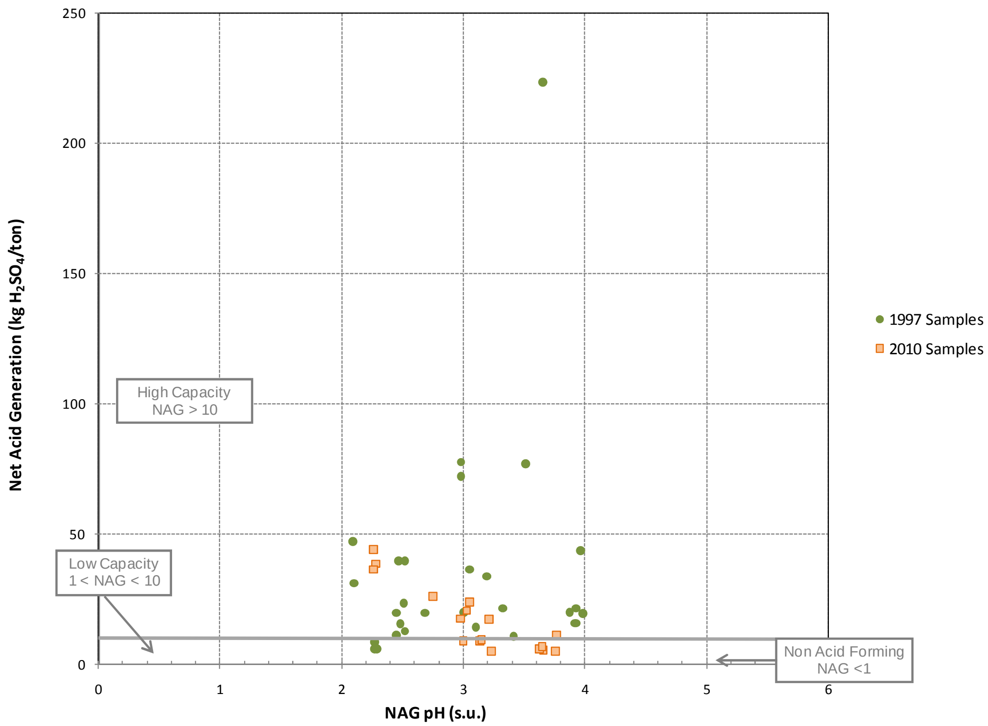


Figure 6: Scatter Plot of NAG pH vs. Net Acid Generation (NAG) value for Samples with NAG pH <4

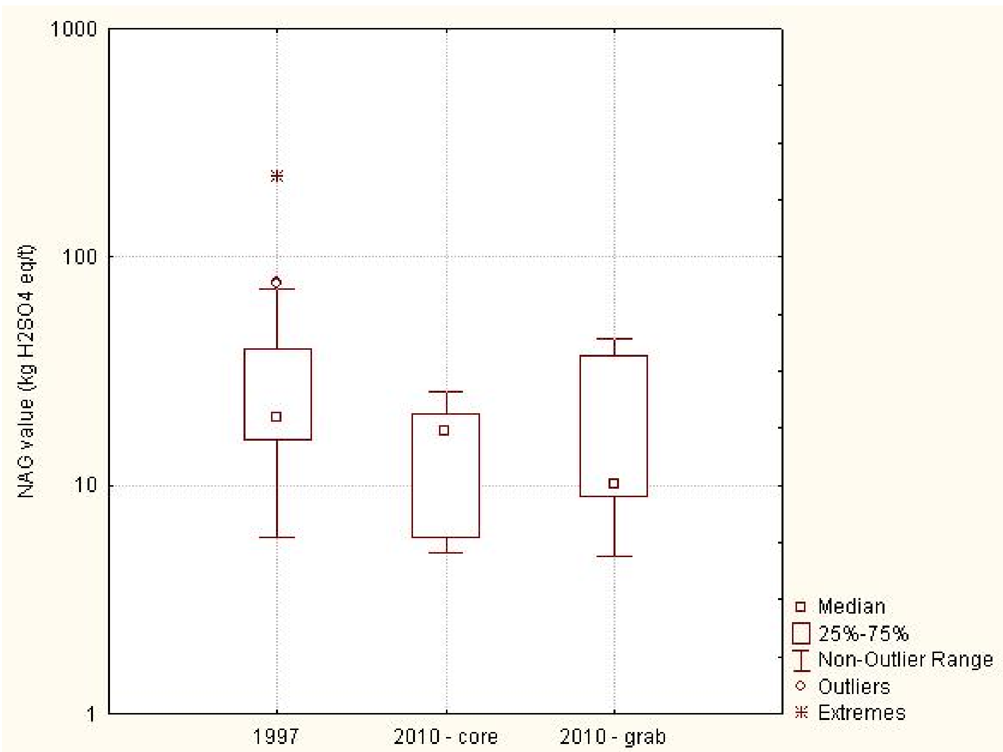


Figure 7: Box and Whisker Plot of NAG value for Samples with NAG pH <4

5 Summary

In general, consideration of both the 1997 and 2010 geochemical databases shows that they are comparable in terms of their geochemical characterization and acid generating potential. However, the samples collected in 1997 show a trend towards having a generally greater acid generating potential, whilst the 2010 dataset contains more samples that show uncertain or non acid forming characteristics. Any significant differences observed between the two datasets are either a function of testwork methodology utilized (in the case of the NAG results) or as a result of the nature of the samples themselves (i.e. grab samples vs. core). Another possible reason for the difference is a bias in the 1997 sample collection (i.e., preferential selection of highest sulfide/weathered materials).

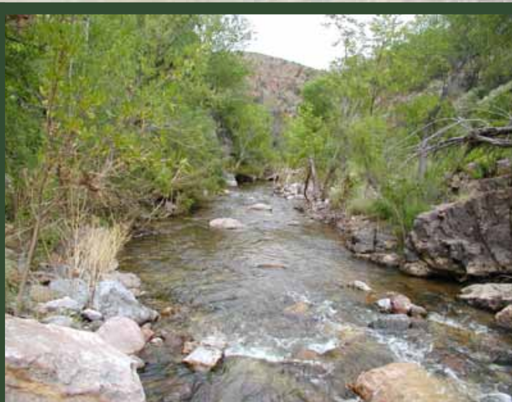
Based on this comparison, the 1997 samples are analogous to waste rock materials that have been exposed to oxygen and water for over 20 years and have developed soluble acidic salts as a result of weathering. Therefore, it is important to incorporate this data into the current investigation in order to capture the range of waste rock behavior associated with the Copper Flat deposit. However, in order to properly utilize these data, the two datasets need to be reconciled with respect to the material type designations. This exercise is currently ongoing.

Appendix G

Quality Assurance Project Plan

New Mexico Copper Corporation
Quality Assurance Project Plan
Copper Flat Mine Site

March 31, 2011



Prepared for:
New Mexico Copper Corporation

Submitted to:
Mining and Minerals Division
New Mexico Energy, Minerals and Natural Resources Department

Prepared by:
INTERA

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Abbreviations and Acronyms

CFR	Code of Federal Regulations
COC	chain of custody
CPR	cardiopulmonary resuscitation
DQA	data quality assessment
EPA	United States Environmental Protection Agency
ER	equipment rinsate
FTL	field team leader
GWQB	Ground Water Quality Bureau
ID number	identification number
INTERA	INTERA Incorporated
LCS	laboratory control sample
MDL	method detection limit
MECS	Mining Environmental Compliance Section
MQO	measurement quality objectives
MS	matrix spike
NMAC	New Mexico Administrative Code
NMCC	New Mexico Copper Corporation
NMED	New Mexico Environment Department
NMWQCC	New Mexico Water Quality Control Commission
OSHA	Occupational Safety and Health Administration
PARCC	precision, accuracy, representativeness, completeness, and comparability
PM	Project Manager
PPE	personal protective equipment
PRRL	project-required reporting limits
QA	quality assurance
QAPP	quality assurance project plan
QC	quality control
RPD	relative percent difference
SAP	sampling and analysis plan
Site	Copper Flat Mine Permit Area
SQL	sample quantitation limits

1 Project Description and Management

This document establishes the quality standards for products and services that have been established within the industry and through government regulations. New Mexico Copper Corporation (NMCC) and its contractors shall meet or exceed these quality standards throughout the duration of this project.

NMCC is currently initiating permitting activities for the re-opening of the Copper Flat Mine located approximately six miles northeast of Hillsboro, New Mexico, in Sierra County (Site). NMCC and its contractors will perform site investigation activities described in the Stage 1 Abatement Plan.

The project organizational flow chart for NMCC's geosciences and engineering contractor, INTERA Incorporated (INTERA) of Albuquerque, New Mexico, identifies key personnel and their functions (Figure 1). The INTERA Program Manager, Cynthia Ardito, is responsible for project direction and quality assurance (QA) for this project. The Project Manager (PM), Peter Castiglia, is responsible for organizing and implementing field activities, project oversight, data management, and report preparation. Mr. Castiglia is also responsible for ensuring that the Quality Assurance Project Plan (QAPP) and the Stage 1 Abatement Plan are appropriately developed and adhered to.

1.1 Project Definition and Background

NMCC has developed a Stage 1 Abatement Plan for the Copper Flat Mine in response to the New Mexico Environment Department (NMED) Ground Water Quality Bureau (GWQB) Mining Environmental Compliance Section (MECS) letters dated August 20, 2008, and March 18, 2009 (Appendix A of the Stage 1 Abatement Plan). This Stage 1 Abatement Plan was prepared in accordance with the provisions of New Mexico Administrative Code (NMAC) 20.6.2.4103 Abatement Standards and Requirements and relevant regulations, and per discussions with the NMED MECS. This QAPP is designed for the site characterization activities described in the Stage 1 Abatement Plan and in accordance with the field procedures developed for the Copper Flat Sampling and Analysis Plan (SAP) (INTERA, 2010).

1.2 Quality Objectives and Criteria

The following sections present the measurement quality objectives (MQO) identified for this project.

1.2.1 Measurement Quality Objectives for Analytical Laboratory Data

All analytical results for water samples will be evaluated in accordance with precision, accuracy, representativeness, completeness, and comparability (PARCC) parameters to document the quality of the data and promote data that are of sufficient quality to meet the project objectives. With regard to these PARCC parameters, precision and accuracy method blanks will be prepared at the frequency prescribed in the individual analytical method, or at a rate of 5 percent of the total samples if a frequency is not prescribed in the method. The subsections below describe each of the PARCC parameters and how they will be assessed for this task.

1.2.1.1 Precision

Precision is the degree of mutual agreement between individual measurements of the same property under similar conditions. Usually, combined field and laboratory precision is evaluated by collecting and analyzing field duplicates and then calculating the variance between the samples, typically as a relative percent difference (RPD).

$$RPD = \frac{|A - B|}{(A + B)} \times 100\%$$

where:

A = First duplicate concentration
B = Second duplicate concentration

Field sampling precision is evaluated by analyzing field duplicates. One duplicate groundwater sample will be collected during the initial groundwater sampling event to establish laboratory analytical precision at the onset of the investigation. The duplicate groundwater sample will be collected by completely filling two separate vials by alternating between the primary sample set and the replicate sample set in the order shown below:

- Fill vial #1 - primary sample set
- Fill vial #1 - replicate sample set
- Fill vial #2 - primary sample set
- Fill vial #2 - replicate sample set

Laboratory analytical precision is evaluated by analyzing matrix (laboratory) duplicates. Results for each laboratory duplicate pair will be used to determine the RPD in order to evaluate precision.

1.2.1.2 Accuracy

A program of sample spiking will be conducted to evaluate laboratory accuracy. This program will include analysis of matrix spike (MS), laboratory control samples (LCS) or blank spikes, and method blanks. The results for the spiked samples will be used to calculate the percent recovery for use in evaluating accuracy.

$$\text{Percent Recovery} = \frac{S - C}{T} \times 100\%$$

where:

S = Measured spike sample concentration
C = Sample concentration
T = True or actual concentration of the spike

Results that fall outside the accuracy goals will be further evaluated on the basis of the results of other quality control (QC) samples.

1.2.1.3 Representativeness

Representativeness expresses the degree to which sample data accurately and precisely represent: (1) the characteristics of a population, (2) variations in a parameter at a sampling point, or (3) an environmental condition that they are intended to represent.

Representativeness of data will also be promoted through the consistent application of established field and laboratory procedures. Equipment rinsate (ER) blanks and laboratory blanks will be evaluated for the presence of contaminants to aid in evaluating the representativeness of sample results. Data determined to be non-representative by comparison with existing data will be used only if accompanied by appropriate qualifiers.

1.2.1.4 Completeness

Completeness is a measure of the percentage of project-specific data that are valid. Valid data will be obtained when samples are collected and analyzed in accordance with QC procedures as outlined in this QAPP and when none of the QC criteria that affect data usability are exceeded. When all data evaluation is completed, the percent completeness value will be calculated by dividing the number of useable sample results by the total number of sample results planned for this investigation.

As discussed further in Section 8.0, completeness will also be evaluated as part of the data quality assessment process (EPA, 2000a). This evaluation will help assess whether any limitations are associated with the decisions to be made based on the data collected.

1.2.1.5 Comparability

Comparability expresses the confidence with which one data set can be compared with another. Comparability of data will be achieved by consistently following standard field and laboratory procedures and by using standard measurement units in reporting analytical data.

1.2.1.6 Detection and Quantitation Limits

The method detection limit (MDL) is the minimum concentration of an analyte that can be reliably distinguished from background noise for a specific analytical method. The quantitation limit represents the lowest concentration of an analyte that can be accurately reproduced in a sample matrix. Project-required reporting limits (PRRL) are contractually specified minimum quantitation limits for specific analytical methods and sample matrices, such as soil or water, and are typically several times the MDL to allow for matrix effects. PRRLs, which are established in the project scope of work for subcontract laboratories, are set to establish minimum criteria for laboratory performance. Actual laboratory quantitation limits may be substantially lower.

For this project, analytical methods have been selected so that the PRRL for each target analyte is below the applicable regulatory screening criteria, the New Mexico Water Quality Control Commission (NMWQCC) Standards for groundwater. Also, sample concentrations will be reported as estimated values if concentrations are less than PRRLs but greater than MDLs. The MDL for each analyte will be listed as the detection limit in the laboratory's electronic data deliverable.

1.3 Project Organization

Table 1 presents the roles and responsibilities for key personnel who will be involved in the Stage 1 Abatement investigations at the Site. In some cases, more than one responsibility has been assigned to one person.

1.4 Special Training and Certification

This section outlines the training and certifications required to complete the activities described in this QAPP. The following sections describe the requirements for personnel working on-site.

1.4.1 Health and Safety Training

INTERA Personnel who collect water and sediment samples from the Site are required to meet the Occupational Safety and Health Administration (OSHA) training requirements defined in Title 29 of the Code of Federal Regulations (CFR) Part 1910.120(e). These requirements include (1) 40 hours of formal off-site instruction, (2) a minimum of three days of actual on-site field experience under the supervision of a trained and experienced field supervisor, and (3) 8 hours of annual refresher training. Field personnel who directly supervise employees engaged in work at the site shall also receive at least 8 additional hours of specialized supervisor training. The supervisor training covers health and safety program requirements, training requirements, personal protective equipment (PPE) requirements, the spill containment program, and health-hazard monitoring procedures and techniques. Every member of the field team will maintain current certification in the American Red Cross "Multimedia First Aid," and "Cardiopulmonary Resuscitation (CPR) Modular," or equivalent.

Copies of health and safety training records, including course completion certificates for the initial and refresher health and safety training, specialized supervisor training, and first aid and CPR training, are maintained in corporate files.

1.5 Documents and Records

Documentation is critical for evaluating the success of any environmental data collection activity. The following sections discuss the requirements for documenting field activities and for preparing laboratory data packages. This section also describes reports that will be generated as a result of this project.

1.5.1 Field Documentation

Field personnel will use permanently bound field logbooks with sequentially numbered pages to record and document field activities. The logbooks will list a contract name and number, the project number, the site name, the names of subcontractors, the client, and the PM. At a minimum, the following will be recorded in the field logbook:

- Names and affiliations of all on-site personnel or visitors
- Weather conditions during the field activity
- Summary of daily activities and significant events
- Notes of conversations with coordinating officials
- References to other field logbooks or forms that contain specific information
- Discussions of problems encountered and their resolutions
- Discussions of deviations from the Stage 1 Abatement Plan, the SAP or other governing documents
- Descriptions of all photographs taken

The field team may also use the field forms during certain sampling or data collection activities to document field activities. The same level of detail will be required for all field forms used during this investigation. Copies of the completed field forms will be stored in the project file.

2 Data Generation and Acquisition

This section describes the requirements for the following:

- Sampling Design (Section 2.1)
- Field Activities (Section 2.2)
- Sample Handling and Custody (Section 2.3)
- Laboratory Quality Assurance/Quality Control (QA/QC) (Section 2.4)
- Equipment Testing, Inspection, Maintenance, and Calibration (Section 2.5)

2.1 Sampling Design

Samples or data will be collected as outlined in the Stage 1 Abatement Plan. The field activities for the Stage 1 Abatement Investigation include: collection of quarterly or one-time field sampling or data collection events that were designed by NMCC and its contractors. Field activities will be implemented to optimize the time spent in the field by adhering to established scientific methods and procedures, leading coordinated field schedules, and sharing data with contractors to minimize duplication of data.

Data collected from these field activities will be used in the mine permitting process. This baseline data will also be useful in the design of mine facilities and as a reference during site reclamation activities.

2.2 Field Activities

Field activities have been broken into two separate activities. These activities, which are outlined in the Stage 1 Abatement Plan and the SAP, will be used to evaluate the need for remedial action and to establish the baseline conditions at the Site:

- Surface water sampling – To characterize the volumetric flow and water quality of seeps, springs, streams, and the pit lake and to evaluate the existing ARD potential at the Site.
- Groundwater sampling – To obtain necessary data to evaluate quantity and quality of all aquifers at the Site that could be impacted by mining activities, address data gaps identified during evaluation of the Draft EIS (BLM, 1996), meet the requirements set forth in the regulations in NMAC Title 19, Chapter 10, Part 6, to meet the guidelines set forth in MMD's draft Guidance Document for Part 6 New Mining Operations Permitting under the New Mexico Mining Act, and to meet the NMED's Stage 1 Abatement requirements identified in 20.6.2.4103 NMAC.

2.3 Sample Handling and Custody

The following section describes sample handling procedures, including sample identification and labeling, documentation, chain of custody (COC), and shipping. This section applies to water, sediment, and geologic samples that are submitted to an analytical laboratory. Other sample handling and custody procedures for vegetation and other resources are described, where appropriate, in the Stage 1 Abatement Plan and the SAP.

Each sample collected at the Site will be identified using a unique sample identification (ID) number. The description of the sample type and the point name will be recorded on the COC form, as well as in the field notes. Note that field duplicates and ERs will be given a unique sample ID. The association between primary, duplicate, and ER samples will be noted on the COC form.

A sample label will be affixed to each sample container. The label will be completed with the following information written in indelible ink: project name and location, sample ID number, date and time of collection, preservative used (if applicable), collector's initials, and analysis requested. After labeling, each sample will be refrigerated or placed in a cooler containing ice.

Documentation of sample collection will be completed in permanent black or blue ink in the field logbook. All entries will be legible. The field team leader (FTL) and sampling personnel are responsible for proper documentation of all Site activities.

Standard sample custody procedures will be used to maintain and document sample integrity during collection, transportation, storage, and analysis. COC procedures provide an accurate written record that traces the possession of individual samples from the time of collection in the field to the time of acceptance at the laboratory.

The COC form will be placed in a waterproof plastic bag and taped to the inside of the shipping container used to transport the samples. The laboratory sample custodian will receive all incoming samples, sign the accompanying COC forms, and retain copies of the forms as permanent record. The laboratory sample custodian will record all pertinent information concerning the samples, including the persons delivering the samples, the date and time received, sample condition at the time of receipt (sealed, unsealed, or broken container; temperature; or other relevant remarks).

All samples will be either hand delivered or shipped to an accredited laboratory. Samples may need to be shipped to the laboratory in order to have them analyzed before the expiration of a particular sample's holding time.

2.4 Laboratory QA/QC

This section applies to water, sediment, and geologic samples submitted to accredited analytical laboratories. To ensure quality of laboratory analysis, the analytical laboratory will be required to analyze QA/QC samples as specified by the analytical methods. The laboratory will analyze method blanks, MSs, and LCSs.

Method blanks will be prepared at the frequency prescribed in the individual analytical method or at a rate of 5 percent of the total samples if a frequency is not prescribed in the method.

MSs will be analyzed at a frequency of 5 percent for soil and aqueous samples. The percent recoveries will be calculated for each of the spiked analytes and used to evaluate analytical accuracy. The RPD between spiked samples will be calculated to evaluate precision.

LCSs, or blank spikes, will be analyzed at the frequency prescribed in the analytical method or at a rate of 5 percent of the total samples if a frequency is not prescribed in the method. If percent recovery results for the LCS or blank spike are outside of the established goals, laboratory-specific protocols will be followed to gauge the usability of the data.

Sample quantitation limits (SQL), also referred to as practical quantitation limits, are PRRLs adjusted for the characteristics of individual samples. The PRRLs are chemical-specific levels that a laboratory should be able to routinely detect and quantitate in a given sample matrix. The PRRL is defined in the analytical method or in laboratory method documentation, and incorporates precision (reproducibility) assumptions for the analysis. The SQL takes into account changes in the preparation and analytical methodology that may alter the ability to detect an analyte, including changes such as use of a smaller sample aliquot or dilution of the sample extract. Physical characteristics such as sample matrix and percent moisture that may alter the ability to detect the analyte are also considered. The laboratory will calculate and report SQLs for all environmental samples.

The laboratory activities are overseen by a comprehensive quality assurance program to assure that laboratory practices and results adhere to its policies. The laboratory will provide a standard QA/QC report with all reports. This includes surrogate recoveries, spike recoveries, and method blanks.

The laboratory participates in the Wibby Environmental, third party, proficiency testing program. Wibby is accredited by A2LA and NIST/NVLAP. Results of all proficiency results are sent, by Wibby, to both the laboratory and to their accrediting authorities. The laboratory will also perform proficiency testing on a semiannual basis for all accredited tests. Water proficiencies in the water supply and water pollution studies will be performed in addition to soil proficiencies in hazardous waste pollution studies.

Proficiency results are reviewed by the laboratory manager and all personnel involved in reporting the data. Results that are marked as "check for error" and "unacceptable" are thoroughly reviewed and corrective actions are written for "unacceptable" data.

2.5 Equipment Testing, Inspection, Maintenance, and Calibration

All equipment used during the investigation will be properly tested, inspected, maintained, and calibrated. Samples collected during this investigation will be analyzed using both field and laboratory equipment. Calibration of the field equipment shall be recorded in the field logbook after each calibration event. The calibration procedure for each piece of field equipment used will be outlined in the final report.

The laboratory's QA plan and written operating procedures describing specific testing, inspection, maintenance, and calibration procedures for equipment will be followed. If required, maintenance procedures and schedules will be performed and documented.

3 Inspection and Acceptance of Supplies and Consumables

PMs have primary responsibility for identifying the types and quantities of supplies and consumables needed to complete projects and are responsible for identifying acceptance criteria for these items.

Supplies and consumables can be received either at the contractor's office or at a work site. When supplies are received at an office, the PM or FTL will sort them according to vendor, check packing slips against purchase orders, and inspect the condition of all supplies before they are accepted for use on a project. If an item does not meet the acceptance criteria, deficiencies will be noted on the packing slip and purchase order and the item will then be returned to the vendor for replacement or repair.

Procedures for receiving supplies and consumables in the field are similar. When supplies are received, the PM or FTL will inspect all items against the acceptance criteria. Any deficiencies or problems will be noted in the field logbook and deficient items will be returned for immediate replacement.

Analytical laboratories are required to provide certified clean containers for all analyses. These containers must meet U.S. Environmental Protection Agency (EPA) standards as described in *Specifications and Guidance for Obtaining Contaminant-Free Sampling Containers* (EPA, 1992).

4 Data Management

All field and analytical data collected during this investigation will be provided to NMED in the Stage 1 Investigation Report. Field data will be recorded in the logbook and/or field forms and will be included in the appendices. Analytical data will be summarized, tabulated, analyzed, and provided in the body of the final report. The original laboratory data will be provided in an appendix of the final report. Some data may be presented graphically.

5 Assessment, Response Actions, and Reports to Management

NMCC and NMED will oversee collection of environmental data using the appropriate assessment and audit activities. Any problems encountered during an assessment of field investigation or laboratory activities will require appropriate corrective action to ensure that the problems are resolved. The corrective actions will be discussed with NMED and will be implemented after approval from NMED is received. NMCC will perform routine audits of their subcontractor's performance. In addition, the subcontractor's project managers will ensure that the work done under their assigned tasks complies with the QAPP and will report non compliance, problems, or other issues to NMCC in a timely manner agreed upon between NMCC and its subcontractors.

Effective management of environmental data collection requires: 1) timely assessment and review of all activities, and 2) open communication, interaction, and feedback among all project participants. NMCC and its contractors will use verbal communication with NMED oversight personnel, electronic communication, and monthly status reports to address any project-specific quality issues and to facilitate timely communication of these issues. NMCC and its contractors will develop a communications protocol to communicate with the NMED and solicit the NMED for concurrence with these communication procedures.

6 Data Evaluation and Usability

This section describes the procedures that are planned to review and evaluate field and laboratory data. This section also discusses procedures for verifying that the data are sufficient to meet MQOs for the project.

Review and evaluation of the data generated during field and laboratory activities are essential to obtaining defensible data of acceptable quality. Project team personnel will review field data to identify inconsistencies or anomalous values. Any inconsistencies discovered will be resolved as soon as possible by seeking clarification from field personnel responsible for data collection. All field personnel will be responsible for following the sampling and documentation procedures described in the Stage 1 Abatement Plan and the SAP so that defensible and justifiable data are obtained.

Data values that are significantly different from the population are called “outliers.” A systematic effort will be made to identify any outliers or errors before field personnel report the data. Outliers can result from improper sampling or measurement methodology, data transcription errors, calculation errors, or natural causes. Outliers that result from errors found during data verification will be identified and corrected; outliers that cannot be attributed to errors in sampling, measurement, transcription, or calculation will be clearly identified in project reports.

6.1 Laboratory Data Verification

Laboratory personnel will verify analytical data at the time of analysis and reporting and through subsequent reviews of the raw data for any nonconformances to the requirements of the analytical method. Laboratory personnel will make a systematic effort to identify any outliers or errors before they report the data. Outliers that result from errors found during data verification will be identified and corrected; outliers that cannot be attributed to errors in analysis, transcription, or calculation will be clearly identified in the case narrative section of the analytical data package.

6.2 Laboratory Data Evaluation and Usability

All laboratory data will be evaluated. The data evaluation strategy will not be a full data validation process, but will determine if the analytical results are within the QC limits set for the project. As part of this evaluation, the data usability will be assessed.

7 Reconciliation with User Requirements

After environmental data have been reviewed and evaluated in accordance with the procedures described in Section 7.0, the data must be further evaluated to assess whether MQOs have been met.

To the extent possible, EPA's data quality assessment (DQA) process will be followed to verify that the type, quality, and quantity of data collected are appropriate for their intended use. DQA methods and procedures are outlined in EPA's *Guidance for Data Quality Assessment, Practical Methods for Data Analysis* (EPA, 2000a). The DQA process includes five steps: (1) review the sampling objectives and sampling design, (2) conduct a preliminary data review, (3) select a statistical test, (4) verify the assumptions of the statistical test, and (5) draw conclusions from the data. In the case of water, sediment, and geologic samples, no statistical analysis is planned at this time.

When the five-step DQA process is not completely followed because the sampling objectives are qualitative, data quality and data usability will be systematically assessed. This assessment will include:

- A review of the sampling design and sampling methods to verify that these were implemented as planned and are adequate to support project objectives.
- A review of project-specific data quality indicators for PARCC and project reporting limits to evaluate whether acceptance criteria have been met.
- A review of project-specific sampling objectives to assess whether they have been achieved by the data collected.
- An evaluation of any limitations associated with the decisions to be made based on the data collected (for example, if data completeness is only 90 percent compared to a project-specific completeness objective of 95 percent, the data may still be usable to support a decision, but at a lower level of confidence).

The final report for the project will discuss any potential impacts of these reviews on data usability and will clearly define any limitations associated with the data.

8 References

Bureau of Land Management (BLM), 1996, Draft environmental impact statement (DEIS), Copper Flat Project: Las Cruces, N. Mex., U.S. Department of the Interior. Prepared by ENSR, Fort Collins, Colo.

Environmental Protection Agency (EPA), 1992, Specifications and guidance for obtaining contaminant-free sampling containers: Washington, DC, Office of Solid Waste and Emergency Response, EPA/A540/R-93/051. December.

———.2000a, Guidance for data quality assessment, practical methods for data analysis, EPA QA/G-9, QA00 Update: Washington, DC, Office of Environmental Information, EPA/600/R-96/084. July.

INTERA, 2010, Sampling and analysis plan for Copper Flat Mine. Prepared for New Mexico Copper Corporation. Submitted to Mining and Minerals Division, New Mexico Energy Minerals and Natural Resources Department. September.

Figure

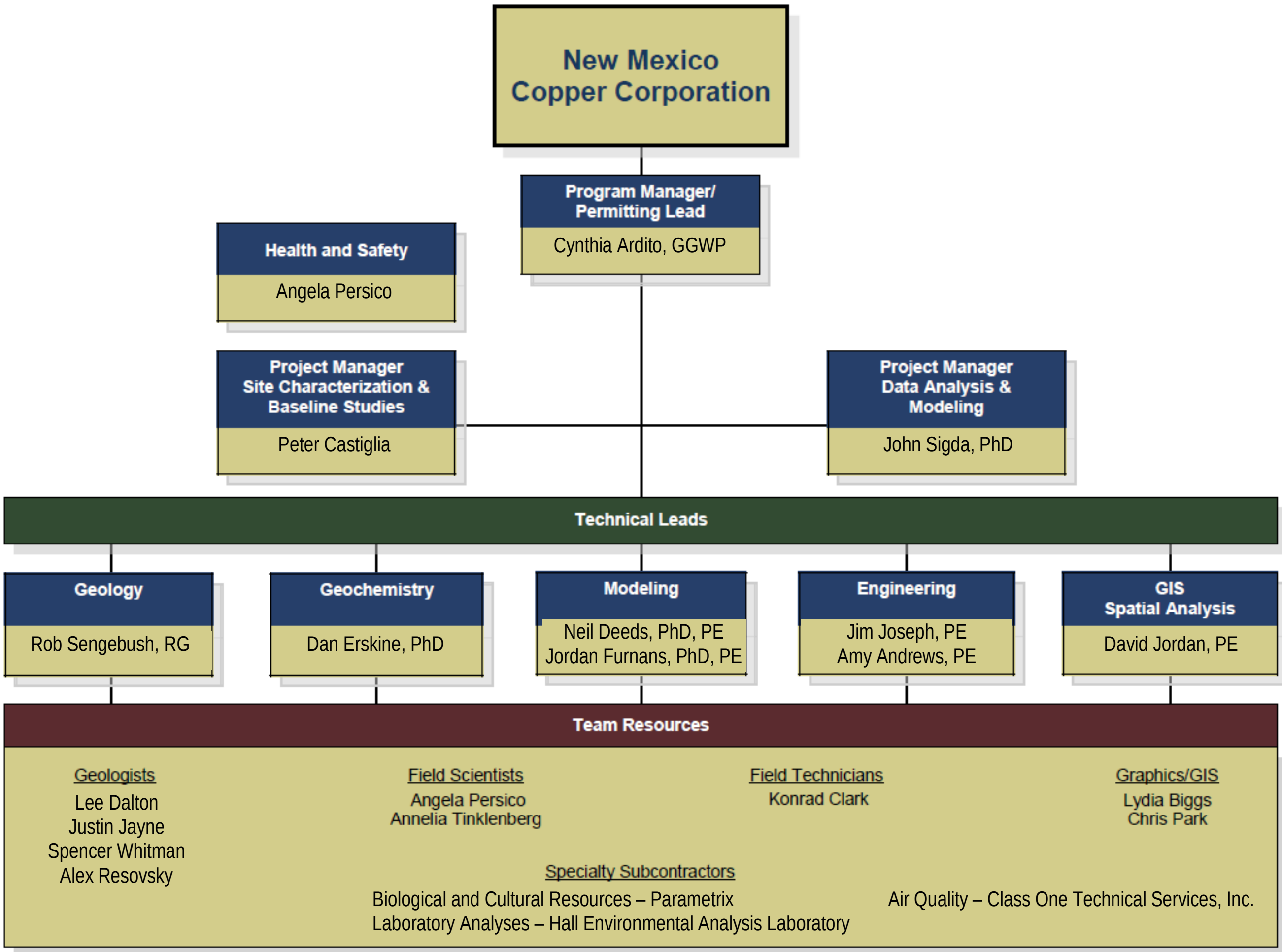

Figure 1. Project Organization

Table

Table 1
INTERA Key Personnel and Responsibilities

Name	Organization	Role	Responsibilities	Contact Information
Ms. Cindy Ardito	INTERA	Program Quality Assurance (QA) Officer	Participates in development of technical approach. Reviews technical deliverables. Provides technical oversight during data collection	INTERA Inc. 6000 Uptown Blvd. NE, Suite 220 Albuquerque, NM 87110 (505) 246-1600, (505) 246-2600 FAX ext. 1206 cardito@intera.com
Mr. Peter Castiglia	INTERA	Project Manager/ Technical Lead	Responsible for overall project execution and for coordination with regulatory agencies and contractors. Actively participates in Data Quality Objective process. Provides management and technical oversight during data collection.	INTERA Inc. 6000 Uptown Blvd. NE, Suite 220 Albuquerque, NM 87110 (505) 246-1600, (505) 246-2600 FAX ext. 1217 pcastiglia@intera.com
Mr. Lee Dalton	INTERA	Field Team Leader (FTL) – Groundwater	Responsible for directing day-to-day field activities conducted by INTERA and subcontractor personnel. Verifies that field sampling and measurement procedures follow the Stage 1 Abatement Plan and the Sampling and Analysis Plan Provides project manager with regular reports on status of field activities.	INTERA Inc. 6000 Uptown Blvd. NE, Suite 220 Albuquerque, NM 87110 (505) 246-1600, (505) 246-2600 FAX ext. 1213 ldalton@intera.com
Mr. Justin Jayne	INTERA	Field Team Leader (FTL) – Surface Water	Responsible for directing day-to-day field activities conducted by INTERA and subcontractor personnel. Verifies that field sampling and measurement procedures follow the Stage 1 Abatement and the Sampling and Analysis Plan Provides project manager with regular reports on status of field activities.	INTERA Inc. 6000 Uptown Blvd. NE, Suite 220 Albuquerque, NM 87110 (505) 246-1600, (505) 246-2600 FAX ext. 1220 jjayne@intera.com
Ms. Angela Persico	INTERA	On-Site Safety Officer	Responsible for implementing health and safety plan for determining appropriate site control measures and personal protection levels. Conducts safety briefings for INTERA and subcontractor personnel and site visitors. Can suspend operations that threaten health and safety.	INTERA Inc. 6000 Uptown Blvd. NE, Suite 220 Albuquerque, NM 87110 (505) 246-1600, (505) 246-2600 FAX ext. 1207 apersico@intera.com
Ms. Angela Persico Mr. Spencer Whitman Mr. Konrad Clark Ms. Annelia Tinklenberg	INTERA	Field Sampler(s)	Responsible for collecting representative samples and conducting necessary field activities specified in Stage 1 Abatement Plan. Works under supervision of field team leader. Ensures proper sampling and handling procedures.	INTERA Inc. 6000 Uptown Blvd. NE, Suite 220 Albuquerque, NM 87110 (505) 246-1600, (505) 246-2600 FAX

Name	Organization	Role	Responsibilities	Contact Information
Mr. Bob Powell	Class One Technical Services, Inc.	Project Manager	Responsible for overall project execution and for coordination with regulatory agencies and contractors. Actively participates in Data Quality Objective process. Provides management and technical oversight during data collection by Class One Technical Services.	Class One Technical Services, Inc. 3500 Comanche Rd. NE Suite G Albuquerque, NM 87107 (505) 830-9680
Mr. Jens Deichmann	Parametrix	Project Manager – Ecological and Cultural Resources	Responsible for coordination with regulatory agencies and contractors. Actively participates in Data Quality Objective process. Provides management and technical oversight during data collection by Parametrix.	Parametrix Incorporated 8801 Jefferson NE; Bldg. 2 Albuquerque, NM 87113 (505) 998-5552 jdeichmann@parametrix.com
Mr. Chris Parrish	Parametrix	FTL - Cultural Resources	Responsible for directing day-to-day field activities conducted for cultural resources by Parametrix and subcontractor personnel. Verifies that field sampling and measurement procedures follow the Sampling and Analysis Plan. Provides project manager with regular reports on status of field activities.	Parametrix Incorporated 8801 Jefferson NE; Bldg. 2 Albuquerque, NM 87113 (505) 821-4700
Mr. Jim Nellessen	Parametrix	FTL – Natural Resources	Responsible for directing day-to-day field activities conducted for natural resources by Parametrix and subcontractor personnel. Verifies that field sampling and measurement procedures follow the Sampling and Analysis Plan. Provides project manager with regular reports on status of field activities.	Parametrix Incorporated 8801 Jefferson NE; Bldg. 2 Albuquerque, NM 87113 (505) 821-4700
Mr. Chad McKenna	Parametrix	Technical Lead – Geographic Information Systems (GIS)	Responsible for directing day-to-day activities conducted for GIS by Parametrix and subcontractor personnel. Verifies that GIS data collection procedures follow the Sampling and Analysis Plan. Provides project manager with regular reports on status of GIS data.	Parametrix Incorporated 8801 Jefferson NE; Bldg. 2 Albuquerque, NM 87113 (505) 821-4700
Mr. Mark Willow	SRK Consulting	Project Manager – Geologic Sampling	Responsible for coordination with regulatory agencies and contractors. Actively participates in Data Quality Objective process. Provides management and technical oversight during data collection by SRK.	SRK Consulting 250 Neil Road, Suite 300 Reno, Nevada 89502 (775) 828-6800 mwillow@srk.com
Dr. Robert Bowell	SRK Consulting	Technical Lead – Geologic Sampling	Responsible for directing day-to-day activities conducted for geologic by SRK and subcontractor personnel. Verifies that geologic data collection procedures follow the Sampling and Analysis Plan. Provides project manager with regular reports on status of geologic data collection and results.	SRK Consulting (UK) Ltd. 5th Floor, Churchill House 17 Churchill Way Cardiff, CF10 2HH, UK +44 (0) 29 2034 8150 egrbowel@srk.co.uk

Appendix H

Site Health and Safety Plan

HEALTH AND SAFETY PLAN

Copper Flat Groundwater and Surface-Water Sampling, Sierra County, New Mexico

Prepared for:

New Mexico Copper Corporation
315 Paseo de Peralta
Santa Fe, New Mexico 87501-2034

Prepared by:

INTERA Incorporated
6000 Uptown Blvd., Suite 220
Albuquerque, New Mexico 87110

March 31, 2011

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Acronyms and Abbreviations

ASTM	American Society for Testing Materials
EPA	U.S. Environmental Protection Agency
HASP	Health and Safety Plan
HazCom	Hazard Communication Plan
HSO	Health and Safety Officer
INTERA	INTERA, Incorporated
mg/kg	milligrams per kilogram
mg/l	milligrams per liter
MSDS	Material Safety Data Sheet
MVNP	Mountain View Nitrate Plume
NIOSH	National Institute for Occupational and Safety and Health
NMED	New Mexico Environment Department
NMWQCC	New Mexico Water Quality Control Commission
OSHA	Occupational Safety and Health Administration
PM	Project Manager
PPE	personal protective equipment
ppm	parts per million
PVC	polyvinyl chloride
RFP	request for proposal
SOW	scope of work
SSO	Site Safety Officer
TDS	total dissolved solids

1.0 Introduction

INTERA Incorporated's (INTERA) Site-Specific Health and Safety Plan (HASP) is a dynamic document and subject to change during the performance of the INTERA scope of work (SOW) designed for the Copper Flat surface water and groundwater sampling program located in Sierra County, New Mexico (Figure 1). This HASP applies to all INTERA and INTERA sub-contracted personnel generally involved with groundwater monitoring activities for the groundwater sampling event.

Program Manager: Cindy Ardito – INTERA (505) 246-1600 ext. 1206

Project Manager: Peter Castiglia – INTERA (505) 246-1600 ext. 1217

Site Safety Officer:

Type of Sampling	**INTERA Site Safety Officer**	**Office Phone**	**Cellular Phone**
Groundwater	Lee Dalton	(505) 246-1600 x. 1213	505-730-7372
Surface Water	Justin Jayne	(505) 246-1600 x. 1220	903-736-2997
Pit Lake	Peter Castiglia	(505) 246-1600 x. 1217	505-280-2889

Field Team Leader:

Sampling	**INTERA Field Team Leader**	**Office Phone**	**Cellular Phone**
Groundwater	Lee Dalton	(505) 246-1600 x. 1213	505-730-7372
Surface Water	Justin Jayne	(505) 246-1600 x. 1220	903-736-2997
Pit Lake	Peter Castiglia	(505) 246-1600 x. 1217	505-280-2889

INTERA On-Site Personnel:

Sampling	**INTERA On-Site Personnel**	**Office Phone**	**Cellular Phone**
Groundwater	Lee Dalton	(505) 246-1600 x. 1213	505-730-7372
Surface Water	Justin Jayne	(505) 246-1600 x. 1220	903-736-2997
Pit Lake	Peter Castiglia	(505) 246-1600 x. 1217	505-280-2889

Corporate Health and Safety Officer: Barbara Rigney – INTERA (512) 425-2097

INTERA Albuquerque Health and Safety Officer: Angela Persico – INTERA (505) 246-1600, ext. 1207

Copper Flat Project Manager: Mr. Steve Raugust (505) 967-9542

HASP Prepared By: Lee Dalton in accordance with applicable provisions of the Occupational Safety and Health Administration (OSHA) 1910.120, updated by Angela Persico

HASP Reviewed By: Peter Castiglia, INTERA

Project Name: Copper Flat Mine Permitting

INTERA Project No.: NMC-001-(See Specific Task)

2.0 Copper Flat Location and Site Description

Copper Flat is located in southwestern New Mexico, approximately 23 miles southwest of Truth or Consequences and 5 miles northeast of Hillsboro. It is a porphyry copper deposit with associated gold, silver, molybdenum, and sulfide minerals. The stock contains a 75 million-year-old quartz monzonite breccia pipe forming the center of an eroded andesite strato-volcano. The breccia pipe is approximately 1,300 feet long, 600 feet wide, and 1,000 feet deep. Records indicated that the Sternberg Mine located at Copper Flat was mined as early as 1911, but it wasn't until 1982 that the mining occurred at a significant scale. Quintana Minerals Corporation mined the property for three months in 1982 producing 7.4 million pounds of copper, 2,306 ounces of gold, and 55,966 ounces of silver. Mining activities ceased because of low copper prices. The mining equipment was dismantled and sold. The Canadian Imperial Bank reclaimed the site. Subsequent efforts to permit mining operations by Gold Express of Denver, Colorado and Alta Gold of Henderson, Nevada were never completed. The property is now owned by Hydro Resources, Inc. of Albuquerque, New Mexico as a combination of fee simple properties and patented mining claims.

The purpose of this investigation is to compile and assess the existing groundwater and surface-water quality in the vicinity of an existing mine pit lake, waste rock piles, and mine tailings impoundment at Copper Flat, Hillsboro district, New Mexico, 25 miles southwest of Truth of Consequences and 5 miles northeast of Hillsboro (Fig. 1).

3.0 Roles and Responsibilities

The responsibilities of the INTERA Project Management team are outlined below:

- Program Manager – Responsible for overall execution of the project and project budget.

- Project Manager – Responsible for any changes in the SOW and oversees all general operations of the project on a day to day basis.
- Field Leader – Serves as the Project Manger in case of the Project Manager's absence.
- Albuquerque Health and Safety Officer (HSO) – Responsible for health and safety of all personnel during the progress of the project, the HSO can stop work regardless of budget or other constraints if an unsafe situation is present on-Site.
- Site Safety Officer (SSO) – Responsible for site health and safety and work operations and monitoring of ambient air in the exclusion zone. The SSO is responsible to report all safety and health concerns to the Project Manager and the HSO.

4.0 Scope of Work and Project Objectives

Water sampling is designed to meet the requirements of the Stage 1 Abatement Plan groundwater and surface water characterization as well as the baseline monitoring requirements of the Mine Permit Application. Work covered under this HASP includes:

- Groundwater quality sampling and water level measurement
- Surface water flow and water quality sampling
- Pit Lake sediment and water quality sampling

The general environmental health and safety hazards at the Site include: heavy equipment/machinery; motorized vehicles; slip, trips, and falls; drilling equipment; electrical equipment; biological hazards (insects, snakes, rodents, infectious diseases), drowning in swift or high water.

- Physical hazards associated with transportation to and from the Site;
- Physical hazards associated with accessing remote areas of the Site;
- Physical hazards associated with working in hot, sunny, conditions;
- Physical hazards associated with rapidly changing weather;
- Physical hazards associated with equipment used by INTERA including submersible pump, take up reel, and hand tools;
- Physical hazards associated with cold weather and warm weather working conditions;
- Physical hazards associated with heavy lifting;
- Physical hazards associated with exposure to electrical charges;

- Physical hazards associated with contact with and working around above or below ground utilities;
- Physical hazards associated with working around heavy equipment;
- Physical hazards associated with noise exposure;
- Physical hazards associated with working in waterways and lakes;
- Biological hazards including stinging insects, snakes, feral domestic animals, and contact with wildlife;
- Biological hazards related to Hanta virus from contact with rodents or rodent excrement;
- Chemical hazards associated with inhalation of organic vapors and/or inorganic contaminants during soil gas sampling activities;
- Chemical hazards associated with skin and eye contact with organic and/or inorganic contaminants;
- Chemical hazards associated with skin and eye contact with sample preservatives;
- Chemical hazards associated with ingestion of organic and/or inorganic contaminants; and
- All on-Site personnel and Site visitors shall be made aware of and protected against the potential hazards listed above.

4.1 Physical Hazards

Driving to and from the Site can be the most dangerous part of any field project. When driving, adhere to all traffic laws, including utilizing a hands-free-device when talking on the cell phone while driving. Drive defensively, taking special care when driving on dirt roads.

Physical hazards due to weather conditions are likely. The average temperatures in the summer months can be above 90F. The signs of dehydration can be muscle and joint pains and fatigue, headaches, and constipation. Constantly drinking water while traveling and performing field tasks will help combat dehydration. Pack a cooler full of cold water, fluid replacing drinks such as Gatorade or coconut water, and snacks. **To combat dehydration drink AT LEAST half of your body weight in ounces of water each day.** When performing field work where you may lose water through sweat, additional water should be consumed.

Weather patterns change rapidly in New Mexico. It is common for a sunny warm day to rapidly become 55F and hailing. Be prepared for anything. **STOP WORK IMMEDIATELY at first sign of a thunderstorm.** The vehicle is a safe place to wait out a thunderstorm.

There is a potential on-Site of physical injury resulting from contact with sampling equipment and tools. Field personnel shall be aware of these hazards and take steps to avoid them. Use of steel-toed boots, reflective vests, and safety glasses shall be required when on the Site. Hard hats shall be worn during drilling activities when heavy equipment is being operated, when there are overhead hazards or activities, and at the discretion of the SSO. Hearing protection shall be used during the operation of heavy equipment or at the discretion of the SSO. Personnel shall be cognizant of the fact that when protective equipment such as respirators, gloves, and protective clothing are worn, visibility, hearing, and manual dexterity are impaired.

In addition to the physical hazards listed above, the protective equipment required for some activities (i.e., respirator use) places a physical strain on the wearer. Heat exhaustion and/or stroke are possible, especially during warm weather. The Exposure Prevention Plan specified in Appendix A shall be implemented to deal with this serious health hazard. The plan outlines heat stress identification, treatment, prevention, and monitoring. Fluids shall be provided on-Site to maintain the body fluid levels of field personnel.

The use of electronic equipment and rechargeable meters present exposure to potential electrical shock. Electrical shock may be avoided by maintaining safe work practices around electrical equipment and connections.

Selected subcontractors shall perform their tasks in accordance with the established safety regulations of the OSHA and all other Federal, State, County, and City regulations. Subcontractors shall follow INTERA's HASP unless their own written health and safety plan has been approved by the INTERA SSO or HSO prior to the initiation of work activities.

4.2 Biological Hazards

During the appropriate season, numerous types of pest organisms may be present at the Site. Bees, spiders, wasps, rodents, reptiles, and feral/domestic animals may be present at the Site. Field personnel are encouraged to avoid exposing hands or other body parts to cool dark areas where these pests are known to dwell. Additionally, exposure to the Hanta virus from contact with rodents and rodent excrement should be avoided at all times. Areas where visible evidence of rodent activity exists are to be strictly avoided. Agitating dried rodent urine or droppings greatly increase the potential for exposure to the Hanta virus. Field personnel are not to approach and are to avoid contact with feral/domestic animals. Authorities should be contacted if an unrestrained animal is exhibiting aggressive behavior toward Site personnel.

4.2.1 Snakes

There are a total of 46 different snakes within New Mexico. Only 8 of which are poisonous, seven species of rattlesnake and one species of coral snake. There are two types of venom toxins: Hemotoxins and Neurotoxins.

Hemotoxins- anticoagulants, can cause hemorrhaging within, degenerates organs, tissue damage. Nausea, disorientation, & headache may be delayed.

Neurotoxins- can lead to respiratory failure, paralysis, cramps, twitching, vomiting, and convulsions.

If bitten by a snake, the severity of the bite will depend on the age of the patient, location of the bite, and potency of the venom. Either way, the patient will most likely swell significantly at the bite site. Venom often is spread throughout the body by the lymphatic system (not the circulatory system). Most healthy individuals will not have severe outcomes; mainly all responses can be psychological. It is important to keep the pt clam. The following steps are recommended steps to treat a poisonous snake bite:

- Stress to the patient the importance of staying calm.
- ABC's first.
- Remove all jewelry and clothing from the bite site due to swelling.
- No ice.
- Apply a light-restricting, 1-2 inches wide, band 3 inches above site. There should be a pulse, and the band should be reapplied periodically.
- Stop profuse bleeding.
- Flush with sterile saline.
- Keep bite site below the heart.
- If splint is required, do so loosely.

Patient must be transported in a timely matter to the nearest hospital where anti-venom is available **(Sierra Vista Hospital stocks anti-venom. See Figure 1 for location map.** Confirmed by phone call to Sierra Vista Hospital Emergency Room on 10/27/10 by P. Castiglia**)**.

4.3 Drowning

Personnel and site visitors may be exposed to drowning hazards in waterways and water bodies. No INTERA personnel should conduct work in a waterway or water body without at least one partner. Staff working in waterways within the mine permit boundary are required to check-in at the project office at the start of each day and sign-out at the end of each day, notifying the project office personnel what time you intend to return, especially if the anticipated return time is past normal business hours. **Prior to conducting any sampling, listen to the weather report and never conduct work if severe weather is predicted or if a storm occurs on site.** Follow these general precautions while conducting the work:

- Park the vehicle in a safe location clear above the ordinary high water mark or well away from the flood-stage of the stream or water way
- Never wade into swift or high water. Do not monitor the waterway if the stream is at flood stage.
- Be very careful when walking in the stream itself. Rocky-bottom streams can be very slippery and can contain deep pools; muddy-bottom streams might also prove treacherous in areas where mud, silt, or sand has accumulated in sink holes. If you must cross a stream, use a wading rod or walking stick to steady yourself and to probe for deep water or much. Your partner(s) should wait on dry land ready to assist you if you fall. Do not attempt to cross streams that are swift and above the knee in depth.
- Wear waders and wading boots, or rubber boots, and rubber gloves in streams suspected of having significant pollution problems.
- Wear a U.S. Coast Guard approved Type III personal flotation device (PFD) if working in streams above the knee.
- **If at any time you feel uncomfortable about the condition of the stream or your surroundings, stop monitoring and leave the site at once. Your safety is more important than the data!**

4.4 Chemical Hazards

Personnel and Site visitors may be exposed to chemical hazards through four routes of exposure: inhalation, ingestion, skin contact, and eye contact.

There may be potential chemical hazards at this Site, acids used to preserve sample containers, and other fluids used to calibrate field equipment. Exposure to concentrations of potential contaminants could occur during field activities at this Site.

Ingestion of chemical hazards shall be controlled on this Site by prohibiting eating, smoking, and drinking in the Exclusion Zone (refer to Section 6.2 for definitions of work zones) and by requiring all field personnel to decontaminate themselves upon leaving the Exclusion Zone.

Skin and eye contact with chemical hazards can cause serious burns, rashes, or irritations. Id skin or eye contact is made with any chemical hazards, especially the acids used as preservatives in sample containers, flush the area with as much fresh water as possible. Eye wash kits are located in the first aid kit. All field personnel shall report any skin or eye contact symptoms to the SSO so a physician can treat personnel and steps can be taken to eliminate similar exposures.

The best assurance of protection against hazardous chemicals is avoidance. Whenever possible, Site personnel shall avoid contact with contaminated (or potentially contaminated) surfaces and walk around suspect liquids and discolored soils or substances. Workers shall not kneel or place equipment on potentially-contaminated ground and shall stay away from known waste whenever possible.

If contact is unavoidable in order to perform a required task, potential hazards are minimized by using appropriate personal protective equipment (PPE) to protect against exposure to toxic materials.

4.5 Personal Protective Equipment

PPE to protect the body against contact with known or anticipated chemical hazards has been divided into four categories by the EPA (i.e., Levels A, B, C, and D) according to the degree of protection afforded. At this Site, the levels of protection selected for activities specified in Section 4.0 are:

- Level D
- Modified Level D
- Level C

Requirements for the levels of protection and their appropriate use are provided below.

PPE Level	Includes	Appropriate for Use
Level D	Coveralls or appropriate work clothes, steel-toed boots, safety glasses or chemical splash goggles, and hard hat (as necessary)	For Site workers performing groundwater investigations.
Modified Level D	Coveralls or appropriate work clothes including Tyvek, Nitrile gloves, rubber boots, safety glasses, and hard hat (as necessary)	Workers who come in direct contact with contaminated soil and/or groundwater shall use Modified Level D PPE. Workers collecting water or sediment samples from the Pit Lake. Modified Level D PPE shall be used if there is a danger of chemical hazard from skin contact but no respiratory hazard (as determined by air monitoring).

PPE Level	Includes	Appropriate for Use
Level C	Tyvek suit, MSHA/NIOSH approved full-face air-purifying respirator with organic vapor/particulate cartridges, Nitrile outer gloves, steel-toe boots, safety glasses, and hard hat (as necessary)	For Site workers required to enter areas were harmful concentrations of petroleum hydrocarbons are detected. Respirators are required when air monitoring indicates a total organic vapor concentration in excess of 100 ppm (see Section 7.0 for discussion of air monitoring).

It is anticipated that all tasks shall be conducted using Level D or Modified Level D PPE.

5.0 General Health and Safety Requirements

Safety equipment and PPE are discussed in this section so that personal protection equipment and its importance can be better understood. The SSO has the authority to make PPE exceptions for Site personnel if he/she deems it in the best interest of the field personnel's well being. Such a PPE exception (i.e., modification to the HASP) shall be based on Site-specific information such as air monitoring data, visual observations, and weather data/observations. One example of such a modification to the HASP would be to decrease the use of respirators, hard hats, or poorly-breathable clothing if heat stress is a primary concern during Site activities and the use of the PPE was intended for a low-risk precaution. Under no circumstances shall the SSO make a PPE exception/modification if personnel shall be without the protection needed to be safe or to properly protect their health. If it appears that proposed PPE is inadequate, Site work shall be suspended until new PPE or planning allows personnel to work safely.

5.1 Safety Equipment

In addition to the personal protective equipment listed below, the following general safety equipment shall be available: cellular or satellite phone (or unimpeded access to a land line phone), OSHA-approved first-aid kit, fire extinguishers, eye wash, insect repellent/treatment, rinse water, and decontamination water. **Table 1 provides a checklist for the health and safety equipment.**

5.1.1 Head Protection

Hard hats shall be worn whenever overhead hazards are present, during operation of heavy equipment, or if otherwise required.

5.1.2 Eye Protection

All personnel working on-Site shall wear safety glasses. Additionally, when personnel are performing activities where the potential exists for increased exposure due to splash, dust, or vapor, etc., safety goggles, face shields, or full-face masks shall be worn.

5.1.3 Skin Protection

Snakes have been observed in surface water drainages at or near the sampling locations in the past. Therefore, all personnel conducting work shall wear snake guards while outside the field vehicle. Snake guards are worn over the shin and are puncture-proof gaiters designed to protect you from snake bites when working in snake country.

When coming in contact with water samples or any sample containers, Site personnel will wear disposable nitrile gloves. When sampling surface water, waders will be worn, in addition to the nitrile gloves. When sampling the pit lake, Site personnel shall be required to wear disposable, chemically resistant clothing such as waterproof Tyvek suits. This PPE shall be disposed of at the decontamination station after each use or when they become worn or punctured. If the disposable protective suits appear to be deteriorating under chemical action, the Site Activities Manager and SSO shall be notified. The seams between the sleeves and gloves and the pant legs and boots shall be taped to prevent exposure in these areas.

Site personnel should also have with them a change of warm, dry cloths to prevent from hypothermia if clothing worn while sampling becomes wet or water-logged. The spare clothing and a warm blanket should be kept on dry land and should be easily accessible should it be needed in response to falling into cold water. **See Appendix A for more information on cold weather hazards, including how to identify and treat hypothermia.**

5.1.4 Footwear

Personnel engaged in field activities at the Site shall wear supportive work boots at all times. Exceptions to this are when working in the streams. Wading boots or supportive sandles (Chacos, Tevas, or Keens) may be worn over the waders. If required by the Site-specific HASP or the SSO, footwear may also need to be chemical resistant.

5.1.5 Personal Flotation Devices

All INTERA personnel are required to wear a U.S. Coast Guard Type III personal flotation device (PFD) if conducting work in a waterway with flowing water above their waste line or working from a boat. The PFD should fit comfortably and snug and should be rated appropriately for the minimum adult buoyancy for the weight of the staff member. All zippers, ties, and straps should be fastened. If you don't wear a PFD, you are risking your life.

Follow these steps to check your PFD:

- Check your PFD often for rips, tears, and holes, and to see that seams, fabric straps, and hardware are okay. There should be no signs of waterlogging, mildew odor, or shrinkage of the buoyant materials.
- Don't forget to test each PFD at the start of each season. Ones that are not in good shape should be cut up and thrown away.

5.1.6 Respiratory Protection

No respiratory protection is anticipated for this project.

5.2 Work Zones

To minimize the movement of contaminants from the Site to uncontaminated areas, three work zone areas are established as needed at Sites where investigation and/or remediation activities are performed. The work zone areas may be revised as contaminant data is collected at the Site. The three work zones include the following:

- Zone 1: Exclusion Zone
- Zone 2: Contamination Reduction Zone
- Zone 3: Clean Zone

Exclusion Zone – The Exclusion Zone is the zone where contamination does or could occur. For example, the area that immediately surrounds a wellhead. All persons entering this zone shall wear the level of protection set forth in Section 5.0, *Site Hazards*. These level-of-protection guidelines are based on the different types of field activities.

Contamination Reduction Zone – Between the Exclusion Zone and the Clean Zone is the personal Contamination Reduction Zone, which provides a transition zone between the contaminated and clean areas of the Site. This zone shall be located directly outside the Exclusion Zone. All personnel shall decontaminate in the Contamination Reduction Zone when leaving the Exclusion Zone. The following steps, some of which are not applicable to Level D PPE, shall be taken for personnel decontamination:

- Deposit equipment that needs to be decontaminated on plastic drop cloths;
- Wash boots and outer gloves with long-handled brushes in a plastic wash tub containing detergent water;

- Rinse boots and outer gloves with long-handled brushes in a plastic wash tub containing clear water or use a sprayer to rinse off boots and gloves if one is available;
- Remove tape and place in drum for disposal;
- Remove disposable outer gloves and place in drum for proper disposal;
- Remove suit and, if disposable, place in drum for disposal;
- Remove respirator and place in plastic for subsequent decontamination;
- Remove inner gloves and place in drum for disposal; and
- Wash hands and face.

Contaminated liquids and clothing from the decontamination area shall be contained in drums and stored at the drum storage area at the Site. Cleaning equipment and supplies shall be provided and used to decontaminate reusable equipment.

Clean Zone – The Clean Zone shall be an uncontaminated area from which operations shall be directed. It is essential that contamination from the Site be kept out of this area.

5.3 Medical Examination/OSHA Training

Before commencing any of the field activities defined in Section 4.0, all INTERA personnel shall have proof of their current participation in the INTERA monitoring program. Subcontractors involved in hazardous field activities shall provide medical examinations for their employees as part of a medical monitoring program. Records of proof of medical examination shall be provided to INTERA by subcontractors and maintained in the project files as needed.

All personnel on-Site shall be 40-hour OSHA HAZWOPER trained. A copy of employees' certificates is kept in a file in the Albuquerque office.

5.4 Site Manager Notification

All field personnel shall inform the Site Manager or his/her designated representative before entering the Site. If any previously unidentified potential hazards are discovered during any fieldwork, personnel shall notify the Site Manager and SSO for further instructions.

5.5 Project Safety Meetings/Compliance Agreement

A safety meeting shall be conducted by the SSO at the start of each field effort, and thereafter, at the beginning of each day, as appropriate, due to changing field conditions or the start of new tasks. Safety concerns associated with that day's activities shall be discussed. An attendance record (refer to the Forms Section for health and safety forms) shall be kept for all safety meetings.

During the first safety meeting or prior to commencement of fieldwork, all personnel shall be provided with a copy of this HASP or easy access to a copy of this HASP. Personnel shall be given the opportunity to review the plan and ask any questions. All personnel working on-Site shall sign a Compliance Agreement stating that they have read and understood the HASP requirements. Signed Compliance Agreement Forms shall be collected by the SSO and placed in the project file. Individuals refusing to sign the form will not be allowed to work on the Site.

Project safety information shall be recorded in a field logbook and/or field forms. As appropriate, safety information shall include the following:

- Names of all INTERA, subcontractor, and visitor personnel;
- Dates and times for entry and exit of all personnel at the Site;
- Lists of all accidents, injuries, illnesses, and incidences of safety infractions;
- Other information related to safety matters.

All accidents, illnesses, and/or other incidents shall be reported immediately to the Project Manager (PM), the SSO, and/or the Project Health and Safety Officer. An Accident/Investigation Form has been provided in the Forms Section.

5.6 Prohibitions

The following activities are prohibited at the Site:

- Smoking, eating, drinking, chewing gum or tobacco, and storing food or food containers in the Exclusion or Contamination Reduction Zones;
- Approach or entry into areas or spaces where toxic or explosive concentrations of gases or dust may exist without proper equipment available to enable safe entry; and
- Unauthorized entry into confined spaces.

Field personnel shall practice good personal hygiene to avoid ingesting contaminants or spreading contaminated materials.

5.7 Site Visitors

Visits involving entry to the Site by persons not directly involved in tasks identified in this HASP or the Work Plan are discouraged. Site Visitors may include employees of the facility or other contractors that are not familiar with the activities being performed, and have not been trained to identify/mitigate potential risks. Persons designated Site Visitors shall be briefed by the INTERA SSO as to on-Site procedures, conditions, and hazards and shall be required to sign the project safety log before entering the Site. Site Visitors shall be accompanied by authorized INTERA personnel at all times while on-Site and shall be expected to follow all directives from the SSO. Site Visitors shall provide their own PPE required for the area that they are visiting and shall be expected to follow all applicable procedures and protocols.

6.0 Air Quality Monitoring

Because air quality is not expected to be impacted during the groundwater and surface water sampling events there is currently no plan to conduct air quality monitoring at the Site during these event.

7.0 Laboratory Considerations

The laboratory directors or contacts shall be informed of any contaminant levels in the samples that would require special handling procedures to prevent risks to the health and safety of laboratory personnel.

8.0 Confined Space Entry

A confined space is a space that by design has limited openings for entry and exit, unfavorable natural ventilation that could contain or produce dangerous air contaminants, and is not intended for employee occupancy without the proper training and procedures. If any confined spaces are encountered, they are not to be entered under any circumstances and shall be reported to the SSO.

9.0 Hazard Communication (HazCom) Program

The Hazard Communication (HazCom) Program is an important component of this HASP. The HazCom Program designates the project personnel responsible for the implementation and maintenance of hazardous chemical labeling, and employee training and information requirements. The HazCom Program also includes the hazardous chemical list for the Site, and describes the labeling and information requirements associated with the hazardous chemicals likely to be used on-Site.

9.1 Roles of Personnel

The SSO shall be the administrator of the Site's HazCom program in coordinating labeling, training, Material Safety Data Sheet (MSDS) information, hazardous chemical listings, subcontractor and client HazCom communications and information exchange, and any necessary trade secret requests. The SSO shall also maintain the Site's written HazCom Program and monitor the implementation and effectiveness of this program. Upon request, The SSO shall also provide the name and phone number of the Company HazCom Program Administrator whose HazCom role, along with management, is defined by the Company HazCom Program (issued to all INTERA employees). Subcontractors are responsible for complying with all applicable INTERA policies on hazardous chemicals and for providing all HazCom information to the SSO for hazardous chemicals brought to the Site; the SSO shall then incorporate the subcontractor HazCom information into the Site's overall HazCom program. All INTERA Site personnel, other than the SSO, are responsible for the following:

- Knowing the Site location of the MSDSs and the HazCom written program;
- Identifying the Site HazCom program administrator;
- Competency in reading a MSDS and a label and knowing how to use the applicable sections for safe job performance;
- Understanding potential hazards associated with chemicals in your work area;
- Sending all received MSDSs to the SSO; and
- Notifying the SSO of products received with no labels or damaged labels or if you are uncertain of whether a MSDS is needed.

9.2 Labeling

The SSO shall be responsible for ensuring that all hazardous chemical containers on-Site are appropriately tagged, marked, or labeled to identify the material and provide the proper hazard warnings. The SSO shall also be responsible for ensuring that the labels are maintained as required. In addition, it is the responsibility of the SSO to check newly-purchased materials for labels prior to use.

9.3 Information and Training

The SSO shall also be responsible for informing and training all on-Site project personnel of the requirements of this plan, and the location and availability of the written HazCom Program including the list of hazardous chemicals and their MSDSs. The SSO shall be responsible for updating the Hazardous Chemicals List and the associated MSDS information.

9.4 Hazardous Chemical List

The chemicals of concern at the Site include acids used for preserving sample containers. In addition to the chemicals of concern, the investigation will involve the use of materials such as equipment calibration fluids (e.g. acids and bases), etc.

9.5 Storage and Labeling

All chemicals produced on-Site shall be properly labeled and disposed of. All chemicals purchased and shipped to the Site shall be stored in their original containers, and the manufacturer's labels shall not be removed. All chemicals that are transferred from a labeled container to another container shall be properly labeled. The label shall identify the material with the proper name that links that chemical to the hazardous chemical list and to the proper MSDS. The label shall also contain a brief hazard warning as to the hazardous effects of the chemical. Labels shall be legible and prominently displayed. The SSO shall review, maintain, and update label information at the beginning of each phase of the project fieldwork and prior to recommencing any fieldwork after a shutdown lasting more than 5 working days.

9.6 Posting Requirements

If a field office is established at the Site due to the duration of a project, a poster shall be displayed which explains the protections and obligations of employees under the OSHA. States with approved plans require that a state poster be displayed as well. The posters shall be displayed in a prominent place at all times. Besides the posters, employers shall post the annual summary of occupational injuries and illnesses each year during the month of February. Notices shall be posted informing employees of OSHA citations for violations, imminent danger rulings, or potential or actual exposures to toxic substances or harmful physical agents. The regulatory reference for these requirements is the Occupational Safety and Health Act of 1970 (P.L. 91-596; U.S. Code, Title 29, Part 651 et seq.).

10.0 Emergencies/Accidents

10.1 On-Site Personnel and Visitors

Illnesses, injuries, and accidents occurring on-Site shall be attended to immediately in the following manner:

- Check the accident scene to determine if you or anyone else is in danger;
- Call the emergency phone number (911) if the emergency or accident appears serious. Emergency numbers are listed in Table 2;
- Begin care for the injured or exposed person(s) by removing them from immediate danger if a neck or back injury is not suspected;
- Render minor first aid as necessary; decontaminate affected personnel as necessary;
- Evacuate other personnel on-Site to a safe place until the SSO determines that it is safe for work to resume;

- Report the accident to the Site Manager, the Project Health and Safety Officer, and the SSO immediately;
- Complete and Incident Investigation Report for all near misses and all injuries requiring medical attention;
- Collaborate with the Project Health and Safety Officer, the SSO, and the PM to develop procedures to prevent a recurrence.

If an emergency Site evacuation becomes necessary for any reason, the SSO shall alert all personnel to leave the Site. The off Site assembly point shall be designated by the SSO at the onset of field activities. Personnel shall not return to the Site until an all-clear notification has been received from the SSO.

10.2 Surrounding Community

In the highly unlikely event that a Site emergency has the potential to affect the community surrounding the Site, the SSO shall be responsible for notifying the police and the fire departments using the telephone numbers listed in Table 2. The SSO shall provide whatever technical assistance is needed by these agencies.

Figures

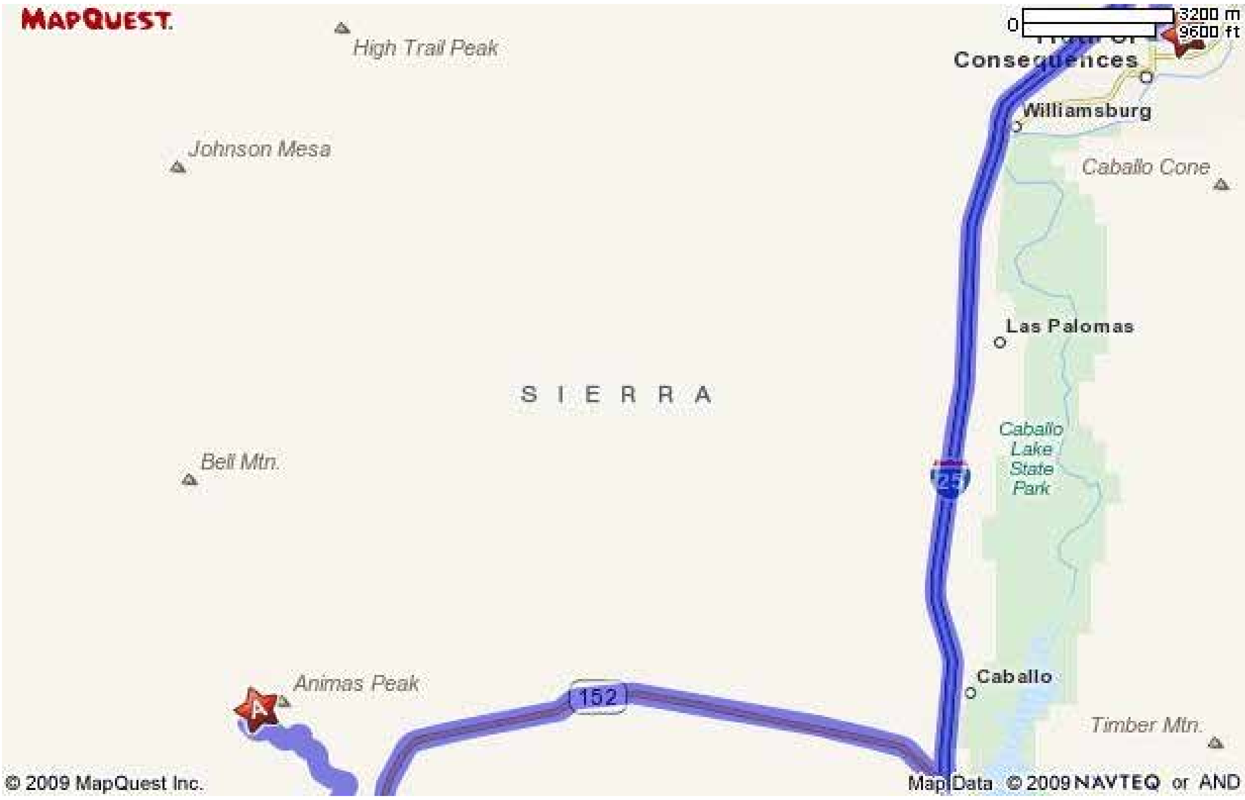

Figure 1 Map to Hospital

Copper Flat Mine
Hillsboro, NM

1. Start out going NORTHEAST.	Map	go 1.1 mi
2. Turn SLIGHT RIGHT.	Map	go 0.6 mi
3. Turn SLIGHT RIGHT.	Map	go 0.8 mi
4. Turn SLIGHT RIGHT.	Map	go 0.7 mi
5. Turn LEFT onto NM-152.	Map	go 12.3 mi
6. Merge onto I-25 N via the ramp on the LEFT.	Map	go 15.2 mi
7. Take the I-25-BL exit, EXIT 79, toward TRUTH OR CONSEQUENCES.	Map	go 0.2 mi
8. Merge onto I-25 BL S / N DATE ST toward TRUTH OR CONSEQUENCES.	Map	go 1.5 mi
9. Turn LEFT onto E 9TH AVE.	Map	go 0.5 mi

10. 800 E 9TH AVE. Map go 0.0 mi

Sierra Vista Hospital - (575) 894-2111
800 E 9th Ave, Truth Or Cnsqncs, NM 87901
Total Travel Estimate : **32.69 miles - about 41 minutes**

Tables

Table 1
Site Health and Safety Equipment Inventory Checklist

Emergency Response
☐ OSHA-Approved Industrial First Aid Kit ☐ Fire Extinguisher (1 Per Field Vehicle) ☐ Eye Wash
Personnel Protection
☐ Insect Repellent ☐ Safety Glasses ☐ Nitrile Gloves (Outer) ☐ Latex Disposable Gloves (Inner) ☐ Chemical-Resistant Coveralls (Tyvek™)/Polycoated Tyvek™ (Syranax™) ☐ Igloo™ Water Cooler/Cups ☐ Gatorade™ ☐ Respirators (half-face and/or full face) ☐ Duct Tape ☐ Steel-Toed Boots ☐ Hard Hat
Personnel Decontamination
☐ 4-mil Plastic Drop Cloths ☐ Plastic Washtubs ☐ Sprayer ☐ Brushes ☐ Trash Bags ☐ Detergent ☐ Potable Or Distilled Water

Table 2
Emergency and Non-Emergency Phone Numbers

Contact	Affiliation	Phone #	Cell #	Address
Sierra Vista Hospital*	Hospital	(575) 894-2111 **Emergency: 911**		Sierra Vista Hospital 800 E 9th Ave Truth Or Cnsqncs, NM 87901
Cindy Ardito	INTERA Program Manager	(505) 246-1600 ext. 1206	(505) 379-7330	
Peter Castiglia	INTERA Project Manager	(505) 246-1600 ext. 1217	(505) 280-0680	
Lee Dalton	INTERA Deputy Project Manager/SSO/Field Team Leader	(505) 246-1600 ext. 1213	(505) 730-7372	
Angela Persico	INTERA Albuquerque Health and Safety Officer	(505) 246-1600, ext. 1207	(505) 228-8201	

***Hospital Route (Map included as Figure 1)**

Forms

FORM 1

HEALTH AND SAFETY PLAN COMPLIANCE AGREEMENT FORM

I have read the Health and Safety Plan and agree to comply with the guidelines and requirements for the safety of personnel.

____

Name

____

Company

____

Signature

____

Date

FORM 2

TAILGATE SAFETY MEETING ATTENDANCE FORM

Page __1___ of ___1___

DATE:________________________ PROJECT NO.:_NMC-001-______

PROJECT TITLE:__Copper Flat Mine Sampling__________________________

PROJECT TASK:____

SAFETY TOPICS PRESENTED

Protective Clothing/Equipment _____________________________________

Emergency Procedures _____________________________________

Chemical Hazards _____________________________________

Physical Hazards _____________________________________

Mobile Phone _____________________________________

ATTENDEES

NAME (PRINTED)

_____________________________ _____________________________

_____________________________ _____________________________

_____________________________ _____________________________

_____________________________ _____________________________

_____________________________ _____________________________

_____________________________ _____________________________

_____________________________ _____________________________

_____________________________ _____________________________

Meeting Conducted by:

__Lee Dalton__________________ _____________________________

Name Printed

FORM 3

SITE PERSONNEL ACKNOWLEDGMENT FORM

By signing the following I acknowledge that I have read, understood, and agree to comply with the provided Site-specific Health and Safety Plan.

Printed Name/Affiliation	Signature	Date

FORM 4

SITE VISITOR'S LOG

Date	Time In/Out	Name	Organization	Purpose of Visit

FORM 5

INCIDENT INVESTIGATION FORM

Name of Employee involved in Incident or Injury
Date/Time of Incident/Injury
Location of Incident/Injury
Description of Incident/Injury and Severity
Task being Performed at time of Incident/Injury
Was Medical Treatment Necessary? (Yes or No)
If Yes, Medical Treatment was Administered at the Following Medical Facility
Location of Medical Facility
Name of Doctor Providing Treatment

Description of Medical Treatment
Expected Length of Medical Time-off for Accident
Suspected or Known Cause of Accident
Methods to be implemented or utilized to prevent future Incidents or Injuries

APPENDIX A

Exposure Prevention Plan

APPENDIX A
Exposure Prevention Plan

1.0 Heat Related Hazards

The increase in ambient air temperature and decreased body ventilation caused by protective outerwear creates an increase in the potential for injury, specifically, heat casualties. Site personnel shall be instructed in the identification of a heat stress victim, the first-aid treatment procedures for the victim, and the prevention of heat stress casualties.

1.1 Identification and Treatment

Heat Exhaustion

Symptoms: Usually begins with muscular weakness, dizziness, nausea, and a staggering gait. Vomiting is frequent. The bowels may move involuntarily. The victim is very pale, his skin is clammy, and he may perspire profusely. The pulse is weak and fast, and breathing is shallow. He may faint unless he lies down. This may pass, but sometimes it remains and death could occur.

First Aid: Immediately remove the victim to Zone 2, Contamination Reduction Zone, in a shady or cool area with good air circulation. Remove all protective outerwear. Call the facility emergency number. Treat the victim for shock (make him lie down, raise his feet 6-12 inches and keep him warm, but loosen all clothing). If the victim is conscious, it may be helpful to give him sips of a salt-water solution (one teaspoon of salt to one glass of water). Transport victim to a medical facility as soon as possible.

Heat Stroke

Symptoms: This is the most serious of heat casualties due to the fact that the body overheats excessively. Body temperatures often are between 107 °F and 110 °F. First, there is often pain in the head, dizziness, nausea, and the skin is dry, red, and hot. Unconsciousness follows quickly and death is imminent if exposure continues. The attack shall usually occur suddenly.

First Aid: Immediately evacuate the victim to a cool and shady area in the Contamination Reduction Zone. Lay the victim on his/her back with the head and shoulders slightly elevated. It is imperative that the body temperature be lowered immediately. This can be done by applying cold wet towels or ice bags to the head. Sponge off the bare skin with cool water or rubbing alcohol, if available, or even place victim in a tub of cool water. The main objective is to cool the victim without chilling. Give no stimulants. Transport the victim to a medical facility as soon as possible.

1.2 Prevention of Heat Stress

One of the major causes of heat casualties is the depletion of body fluids. Personnel shall replace water and salt loss from sweating. Salts can be replaced by either a 0.1 percent salt solution, more heavily salted foods, or commercial mixes such as Gatorade. The commercial mixes are advised for personnel on low sodium diets.

A work schedule shall be established so that the majority of the work shall be performed during the hours of the day when ambient air temperature levels are not at their highest.

A work/rest guideline shall be implemented for personnel required wearing Level C protection. The maximum wearing time guidelines are as follows:

Ambient Temperatures	Maximum Wearing Time
Above 90 °F	½ hour
80 – 90 °F	1 hour
70 – 80 °F	2 hours
60 – 70 °F	3 hours
50 – 60 °F	4 hours
40 – 50 °F	5 hours
30 – 40 °F	6 hours
Below 30 °F	8 hours

A sufficient period shall be allowed for personnel to "cool down." This may require shifts of workers during operations.

1.3 Heat Stress Monitoring

For monitoring the body's recuperative ability under excess heat, one or more of the following techniques shall be used as a screening mechanism.

Heart rate (HR) shall be measured by monitoring the radial pulse for 30 seconds as early as possible in the resting period. The HR at the beginning of the rest period should not exceed 110 beats per minute. If the HR is higher, the next work period shall be shortened by 10 minutes (or 33 percent), while the length of the rest period stays the same. If the pulse rate is 100 beats per minute at the beginning of the next rest period, the following work cycle shall be shortened by 33 percent.

Body temperature shall be measured orally with a clinical thermometer as early as possible in the resting period. Oral temperature (OT) at the beginning of the rest period should not exceed 99° F. If it does, the next work period shall be shortened by 10 minutes (or 33 percent), while the length of the rest period stays the same. However, if the OT exceeds 99.7 °F at the beginning of the next period, the following work cycle shall be further shortened by 33 percent. OT shall be measured again at the end of the rest period to make sure it has dropped below 99 °F.

Monitoring of personnel wearing protective clothing shall commence when the ambient temperature is 70 °F or above. Frequency of monitoring shall increase as the ambient temperature increases or if slow recovery rates are indicated. When temperatures exceed 80 °F, workers shall be monitored for heat stress after every work period.

Ideally, body fluids shall be maintained at a constant level during the workday. This requires replacement of salt lost in sweat as well.

Good hygienic standards shall be maintained by frequent changes of clothing and daily showering. Clothing shall be permitted to dry during rest periods. Persons who notice skin problems shall immediately consult medical personnel.

2.0 Cold Weather Related Hazards

Cold stress can occur when Site personnel are subject to low air temperatures, wind, rain, or wet clothing. When working in these conditions, workers should don wind- and/or water-proof clothing before getting wet or cold, wear wool or polypropylene next to their bodies, and wear layers that can be removed or added as needed. Cold stress is manifest as either hypothermia or frostbite.

Hypothermia

Hypothermia is a cold-induced decrease in the core body temperature, which can decrease attentiveness and manual dexterity. Hypothermia produces shivering, numbness, drowsiness, muscular weakness, and if severe enough, death**. To treat:** Take the victim indoors if possible. Provide rapid but gentle re-warming. Remove wet or cold garments and provide warm, dry clothing or covering. Dry the person thoroughly. If the victim is conscious, give a hot drink. Wrap the victim together with warm water bottles, persons in blankets, or a sleeping bag, if necessary. Call for medical assistance immediately.

Frostbite

Frostbite results from the constriction of blood vessels in the extremities and decreases the supply of warm blood to these areas. The drop in blood supply may result in the formation of ice crystals in the tissues causing tissue damage. The symptoms of frostbite are white or grayish skin, blisters, or numbness. **To treat:** Bring the victim indoors and re-warm the areas quickly in water of 102 °F to 105° F. Give the victim a warm drink, but not caffeinated beverages or alcohol. Do not allow the victim to smoke because it tends to constrict the blood vessels in the skin. Keep the frozen parts in warm water or covered with warm cloths for 30 minutes and then elevate the injured area and protect it from injury. Do not allow the blisters to be broken. Use sterile, soft, dry material to cover the injured areas. Keep the victim warm and get immediate medical care.

THEMAC RESOURCES
New Mexico Copper Corporation

December 29, 2010

New Mexico Copper Corporation
2425 San Pedro Dr, NE, Suite 100
Albuquerque, New Mexico 87110
(505) 382-5770

Mr. Michael Smith
Geologist
US Department of the Interior
Bureau of Land Management
Las Cruces District Office
1800 Marquess Street
Las Cruces, New Mexico 88005

Re: Submittal of the Plan of Operations for the Copper Flat Mine, Sierra County, New Mexico per 43 CFR 3809 Requirements.

Dear Mr. Smith:

New Mexico Copper Corporation (NMCC) is pleased to submit the Copper Flat Mine Plan of Operations (PoO). NMCC is proposing the re-establishment of a polymetallic mine and processing facility located near Hillsboro, New Mexico. The proposed mine would consist of an open pit mine, flotation mill, tailings impoundment, waste rock disposal areas, a low-grade ore stockpile, and ancillary facilities. NMCC is submitting this PoO per the 43 CFR 3809 requirements.

NMCC looks forward to working with the BLM to bring this facility back into production in accordance to all applicable federal and state regulations. Please contact me at 505.382.5770 or steve.raugust@themacreources.com or Mr. Barrett Sleeman, CEO of NMCC at 604.495.6723 or barrettsleeman@hotmail.com for any additional questions, comments, or concerns.

Respectfully,

J. Steven Raugust, PG
Project Manager

Cc: Barrett Sleeman, P.Eng, New Mexico Copper Corporation

THE MAC RESOURCES

New Mexico Copper Corporation

Copper Flat Mine
Plan of Operations

Report Prepared for:

U.S. Department of the Interior
Bureau of Land Management
Las Cruces District Office
1800 Marquess Street
Las Cruces, NM 88005-3370

Report Submitted by:

NEW MEXICO COPPER CORPORATION
2425 San Pedro Dr. Suite 100
Albuquerque, NM 87110
Office: (505) 382-5770

December 2010

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List of Acronyms

amsl	above mean sea level
ARD	acid rock drainage
AWRM	Active Water Resource Management
BATF	Bureau of Alcohol, Tobacco, and Firearms
bgs	below ground surface
BLM	Bureau of Land Management
BMP	Best Management Practice
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFQM	Copper Flat Quartz Monzonite
cfs	cubic feet per second
CO	carbon monoxide
DEIS	Draft Environmental Impact Statement
EA	Environmental Assessment
EAR	Environmental Assessment Report
EIS	Environmental Impact Statement
EMNRD	Energy, Minerals and Natural Resources Department
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
°F	degrees Fahrenheit
FCC	Federal Communications Commission
FEIS	Final Environmental Impact Statement
FLPMA	Federal Land Policy Management Act
ft	feet
gpm	gallons per minute
GWQB	Ground Water Quality Bureau
HSR	Human Systems Research
HSUs	hydrostratigraphic units
IHICS	Integrated Habitat Inventory Classification System
km	kilometers
kWh	kilowatt hours
LRGB	Lower Rio Grande Underground Water Basin
Ma	million years ago
mg/L	milligrams per liter
MMD	Mining and Mineral Division
MSDS	Material Safety Data Sheets
MSF	Middle Santa Fe Group hydrostratigraphic unit
MSHA	Mining Safety and Health Administration
NEPA	National Environmental Policy Act
NMCC	New Mexico Copper Corporation
NMED	New Mexico Environment Department
NMEMNRD	New Mexico Energy, Mineral and Natural Resources Department
NPDES	National Pollution Discharge Elimination System
NRC	National Response Center
NRHP	National Register of Historic Places
O&M	Operation & maintenance
OSE	Office of the State Engineer
PFEIS	Preliminary Final Environmental Impact Statement
PLS	pure live seed
PMP	probable maximum precipitation
PoO	Plan of Operations

ppm	parts per million
RCRA	Resource Conservation and Recovery Act
RMP	Resource Management Plan
ROD	Record of Decision
ROW	rights-of-way
SAG	semi-autogenous
SARA	Superfund Amendments and Reauthorization Act
SCP	Spill Contingency Plan
SCS	Soil Conservation Service
SHPO	State Historic Preservation Office
SMIO	State Mine Inspector's Office
TDS	Total dissolved solids
tpd	tons per day
TPQ	Threshold Planning Quantity
TSF	tailings storage facility
TSP	Total Suspended Particulates
USACE	U.S. Army Corp of Engineers
USF	Upper Santa Fe Group hydrostratigraphic unit
USFS	U.S. Department of Agriculture, Forest Service
USFWS	U.S. Fish and Wildlife Service
WQCC	New Mexico Water Quality Control Commission

1 Project Summary

1.1 Introduction

The Copper Flat Project (Project) is the proposed re-establishment of a poly-metallic mine and processing facility located near Hillsboro, New Mexico. The proposed Project would consist of an open pit mine, flotation mill, tailings impoundment, waste rock disposal areas, a low-grade ore stockpile, and ancillary facilities. In most respects, the facilities, disturbance and operations would be similar to the former operation.

The Project is owned and operated by the New Mexico Copper Corporation (NMCC), a wholly owned subsidiary of THEMAC Resources Group Limited (THEMAC), information for which is provided in Section 2.

1.2 Project Location

The Project is located in Sierra County, New Mexico, approximately 30 miles southwest of Truth or Consequences and five miles northeast of Hillsboro (**Figure 1-1**). The general area can be reached by traveling south 15 miles from Truth or Consequences on Interstate Highway 25, then 12 miles west on New Mexico Highway 152. The Project area lies two miles west-northwest from Highway 152. The regional location of the Project is shown on **Figure 1-2**.

1.3 Project Background

Development of the Copper Flat Project began in the 1970's by Quintana Mineral Corporation. An Environmental Assessment Report (EAR) was prepared for the Project in 1977 (Glover, 1977). The U.S. Department of the Interior, Bureau of Land Management, Las Cruces District Office (BLM) prepared an Environmental Assessment Record to analyze potential impacts resulting from granting rights-of-way (ROW) for utilities and access roads, as well as impacts resulting from the mining Project (BLM, 1978). The ROWs were approved by the BLM in the Environmental Assessment Record. Air quality, tailings discharge, and water discharge permits were issued by the State of New Mexico; however, the air permit was closed in 2002 due to inactivity, the groundwater discharge permit remains open, but cannot be renewed until a Stage 1 Abatement Plan for a small groundwater impact associated with the existing tailings impoundment has been approved by the New Mexico Environment Department (NMED) Ground Water Quality Bureau (GWQB). The New Mexico Energy Minerals and Natural Resources Department (EMNRD), Mining and Mineral Division (MMD) mining permit has also expired.

In 1982, the Copper Flat Partnership, Ltd. developed and operated the Project, which consisted of an open pit copper mine, a 15,000-ton per day flotation mill, and a 515-acre tailings impoundment. The Copper Flat mine officially commenced full, commercial production in April of 1982. In July 1982 the mine was shut down due to low copper prices and other economic considerations. In 1986 all on-site surface facilities were removed and a BLM approved program of non-destructive reclamation was carried out. Most of the property's infrastructure, including building foundations, power lines and water pipelines were preserved for reuse in the future in the event copper prices recovered sufficiently to make re-establishing the Project economically viable.

In 1991, a proposed Plan of Operations was filed with the BLM by Gold Express Corporation to re-establish the Copper Flat Project. The BLM initiated an Environmental Assessment (EA) because federal land would be "newly" disturbed. New archaeological, biologic, threatened and endangered species, air quality, hydrologic and socioeconomic studies were conducted. However, it was determined in 1993 that an Environmental Impact Statement (EIS) would be required for the Project due to concerns related to several water quality issues, and the EA was never completed.

Alta Gold Company (Alta) acquired the Project in early 1994 and proposed to rebuild the Copper Flat mining facility essentially as it existed in 1982. Alta submitted an updated Plan of Operations (PoO), and associated environmental baseline data, to the BLM for initiation of the EIS process. The *Draft Environmental Impact Statement – Copper Flat Project* (DEIS) was completed by the BLM in 1996. A *Preliminary Final Environmental Impact Statement – Copper Flat Project* (PFEIS) was prepared by the BLM in 1999 following public comment on the DEIS. However, the EIS and Record of Decision (ROD) were never finalized due to Alta's declaration of bankruptcy in early 1999.

2 Corporate Information

New Mexico Copper Corporation owns and controls the entire interest in the proposed Copper Flat Project. NMCC contact information is:

New Mexico Copper Corporation
2425 San Pedro, NE, Suite 100
Albuquerque, New Mexico 87110
505.382.5770

THEMAC Resources Group Limited (THEMAC), a Yukon corporation, owns and controls all of the shares of NMCC. THEMAC's contact information is:

THEMAC
1066 West Hastings Street, Suite 2000
Vancouver, British Columbia
Canada, V6E 3X2
604.495.6723

2.1 Name & Business Address of Individual Completing Application

Name:	Barrett G. Sleeman
Title:	Chief Executive Office, President
Business Name:	New Mexico Copper Corporation
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2.2 Corporation Information

Corporation Name:

New Mexico Copper Corporation
2425 San Pedro, NE, Suite 100
Albuquerque, New Mexico 87110
505.382.5770

Corporation Officer's Information:

Chief Executive Officer:	Barrett G. Sleeman
Chief Financial Officer:	Barrett G. Sleeman
Secretary:	Barrett G. Sleeman

2.3 Federal Taxpayer ID Number

Taxpayer ID Number: 80-0612011

2.4 Registered Agent

Registered Resident Agent:

Name: Mark K. Adams

Business Address: 315 Paseo de Peralta
Santa Fe, New Mexico 87501

Telephone Number: 505.954.3902

e-mail: mkadams@rodey.com

2.5 List of BLM Claims and Serial Numbers

Proposed mining and related surface disturbance would be conducted on unpatented lode, placer, and mill-site claims owned or controlled by NMCC on BLM-administered lands or on private land controlled by NMCC. Claim names and BLM serial numbers are provided in

Appendix A.

There are no state lands or U.S. Department of Agriculture, Forest Service (USFS) lands located within the PoO boundary. **Table 2-1** presents the legal description of the project. The land status of the Project (including the existing disturbances attributed to previous operators) is presented on **Figure 2-1**.

Table 2-1: Legal Description of Proposed Project Area

Township	Range	Sections
15 South	7 West	25,26,27, 35, & 36
15 South	6 West	30 & 31
16 South	6 West	6

2.6 Land Status

The Copper Flat Project is comprised of contiguous and noncontiguous lands that include patented and unpatented mining claims (lode, placer, and mill site), and private parcels. The area inside the proposed PoO boundary is 2,190 acres. Activity at the Copper Flat Mine in 1982 disturbed approximately 358 acres of BLM-administered public lands and 331 acres of private lands.

The re-establishment of the Copper Flat Mine would thus affect 1395 acres, 910 acres of which have been previously disturbed and 485 acres which will be newly disturbed land (**Table 2-2**). Overall, the Copper Flat Project would disturb approximately 661 acres of unpatented mining claims on public land and 734 acres of private land controlled by NMCC (**Figure 2-1**). Approximately 65 percent of the area needed for the proposed PoO has been disturbed by prior operations, and approximately 90 percent of the ore would be mined from private land.

Table 2-2: Summary of Proposed Disturbance

Facility[1]	Existing Disturbance			Proposed Incremental Disturbance			Total Disturbance		
	Public	Private	Total	Public	Private	Total	Public	Private	Total
Roads									
Access Road	1.0	1.0	2.0	7.0	3.0	10.0	8.0	4.0	12.0
Haul Roads	5.0	16.0	21.0	2.0	15.0	17.0	7.0	31.0	38.0
Total Roads	**6.0**	**17.0**	**23.0**	**9.0**	**18.0**	**27.0**	**15.0**	**35.0**	**50.0**
Pits, Adits, Trenches									
Pits	11.0	91.0	102.0	1.0	16.0	17.0	12.0	107.0	119.0
Total Pits, Adits, Trenches	**11.0**	**91.0**	**102.0**	**1.0**	**16.0**	**17.0**	**12.0**	**107.0**	**119.0**
Tails									
Tailings Facility	131.0	341.0	472.0	22.0	53.0	75.0	153.0	394.0	547.0
Total Tails	**131.0**	**341.0**	**472.0**	**22.0**	**53.0**	**75.0**	**153.0**	**394.0**	**547.0**
Process Ponds									
Ponds	5.0	1.0	6.0	1.0	10.0	11.0	6.0	11.0	17.0
Total Ponds	**5.0**	**1.0**	**6.0**	**1.0**	**10.0**	**11.0**	**6.0**	**11.0**	**17.0**
Waste Rock Facilities									
Waste Rock Facilities	32.0	1.0	33.0	130.0	15.0	145.0	162.0	16.0	178.0
Total Waste Rock Facilities	**32.0**	**1.0**	**33.0**	**130.0**	**15.0**	**145.0**	**162.0**	**16.0**	**178.0**
Ancillary Facilities									
Misc.	122.0	78.0	200.0	13.0	42.0	55.0	135.0	120.0	255.0
Diversions	25.0	12.0	37.0	8.0	3.0	11.0	33.0	15.0	48.0
Topsoil Stockpiles	1.0	7.0	8.0	17.0	4.0	21.0	18.0	11.0	29.0
Stockpiles (Low-grade Ore)	21.0	1.0	22.0	12.0	0.0	12.0	33.0	1.0	34.0
Building Areas[2]	7.0	0.0	7.0	67.0	4.0	71.0	74.0	4.0	78.0
Total Yards	**176.0**	**98.0**	**274.0**	**117.0**	**53.0**	**170.0**	**293.0**	**151.0**	**444.0**
Exploration									
Roads, Trenches, Drill Pads, etc.	0.0	0.0	0.0	20.0	20.0	40.0	20.0	20.0	40.0
Total Exploration	**0.0**	**0.0**	**0.0**	**20.0**	**20.0**	**40.0**	**20.0**	**20.0**	**40.0**
Total	**361.0**	**549.0**	**910.0**	**300.0**	**185.0**	**485.0**	**661.0**	**734.0**	**1395.0**

Notes:

1. All acres are rounded up to the nearest 1 acre.

2. Mill plant sites, substation, reagent building, primary crusher, process water storage, concentrate storage, thickener facility, coarse ore stockpile, administration building, offices, shops, storage, assay lab, septic system.

Portions of the waste rock disposal areas, and the crushing facility and the mill facility would be located on public land subject to unpatented mining claims controlled by NMCC. Approximately 28 percent of the tailings impoundment and 10 percent of the open pit would be located on public land subject to mining claims controlled by NMCC.

Approximately 56 percent of the proposed disturbance on public land was disturbed by the previous operation. On the private land, approximately 77 percent of the surface needed for the mine has been disturbed by the prior operation. The majority of the tailings storage land is privately owned and controlled by NMCC.

2.7 Permits and Approvals

2.7.1 Federal Permits and Approvals

Alta initiated a National Environmental Policy Act (NEPA) review of the proposed Project in 1994 by notifying the BLM (Las Cruces District Office) that the company had purchased the Project from Gold Express and was assuming legal responsibility for the Plan of Operations initially submitted in 1991. The BLM then began the process of preparing an EIS. The DEIS was completed in 1996, and the PFEIS was completed in 1999. However, neither a Final EIS (FEIS) nor ROD was issued for the Project as a result of Alta's bankruptcy in 1999.

In January 1996, a Biological Assessment (BA) was prepared for submission to the U.S. Fish and Wildlife Service (USFWS) in accordance Section 7 (c) of the Endangered Species Act (ESA). This consultation process is required to ensure that any action authorized, funded or carried out by a federal agency would not adversely affect a federally listed threatened or endangered species. The major federal permits and approvals required are shown in **Table 2-3**.

2.7.2 State Permit and Approvals

A number of state permits would also be required for the Project. The New Mexico Environment Department (NMED) will issue most of these permits, including air quality permits and groundwater discharge permits. Alta submitted an application for a modification to the existing groundwater Discharge Permit (DP-001) for the Project in early 1995. However, DP-001 was suspended until a Stage 1 Abatement Plan for a small groundwater impact associated with the existing tailings impoundment has been submitted and approved. In addition, an application for a revised Air Quality Permit (No. 365-M-1) was also submitted by Alta in early 1995. This permit was closed in 2002 due to inactivity.

In addition to approval by the State under the New Mexico Mining Act, NMCC would secure a number of additional state and federal permits and approvals. These are also listed in **Table 2-3**.

Table 2-3: Major Permits and Approvals Required

Permit/Approval	Granting Agency
Federal	
Approval of Plan of Operations	U.S. Bureau of Land Management (BLM)
National Dredge and Fill Permit (Section 404)	U.S. Army Corp of Engineers (USACE)
FCC License	Federal Communications Commission (FCC)
MSHA Registration	Mining Safety and Health Administration (MSHA)
National Pollution Discharge Elimination System (NPDES), Including Stormwater Discharge	U.S. Environmental Protection Agency (EPA)
Explosives Permit	Bureau of Alcohol, Tobacco, and Firearms (BATF)
State	
Mining Permit	New Mexico Energy, Mineral and Natural Resources Department (NMEMNRD)- Mining Act Reclamation Bureau
Mine Registration	NMEMNRD – Mine Registration, Reporting, and Safeguarding Program
Water Pollution Control Permits	New Mexico Energy, Mineral and Natural Resources Department - Mining Act Reclamation Bureau
Permit to Construct (Air Quality)	New Mexico Environment Department - Air Quality Bureau
Permit to Operate (Air Quality)	New Mexico Environment Department - Air Quality Bureau
Permit to Appropriate Water	New Mexico State Engineer's Office
Permits for Dam Construction and Operations	New Mexico State Engineer's Office
Approval to Operate a Sanitary Landfill	New Mexico Environment Department - Solid Waste Bureau
Liquid Waste System Discharge Permit	New Mexico Environment Department - Groundwater Bureau
Tailings Discharge Permit	New Mexico Environment Department - Groundwater Bureau (DP-001)
Cultural Resources Clearance Surveys Endangered Plant Species Permit, if applicable	State Historic Preservation Office NMEMNRD Forestry Division

3 Proposed Operating Plan

3.1 Introduction

Relevant aspects of the planned operations are summarized in this section. The Proposed Action is the operation as proposed by Gold Express Corporation in 1991, adopted by Alta in 1994 (BLM, 1996), and modified and updated by NMCC in 2010. The proposed facility layout is shown on **Figure 3-1.** A topographic map of the project facilities is provided in **Figure 3-2**.

The operating plan discussed below includes an optional plan for placer mining of the alluvium beneath the proposed tailings storage facility (TSF). The excavated alluvium would be gravity separated to extract coarse gold and stockpiled for later use as reclamation cover material. Additional exploration sampling is being proposed to evaluate the feasibility of this option.

The mine design has many of the same mining plans and elements outlined by Gold Express and Alta Gold; all of these have been previously discussed in the DEIS and PFEIS that was being prepared in the late 1990s related to Alta's mine proposal—mainly focused on reactivating the mine plans and processes of Quintana of the early 1980s. Because most of the foundations of the facility infrastructure from previous operations remains in place and are central to the mining processes, alternate locations of many of the facilities were not considered practical.

The NMCC-proposed operation includes the following activities:

- Expand the project boundary to include additional land controlled by NMCC;
- Provide for exploration over entire proposed plan area;
- Expand the existing open pit;
- Construct haul and secondary mine roads;
- Construct, operate and reclaim three waste rock disposal facilities;
- Construct, operate and reclaim one or more low-grade ore stockpiles;
- Construct, operate and reclaim a mill and associated processing facilities;
- Construct, operate and reclaim a tailings impoundment facility;
- Construct ancillary buildings (administration offices, laboratory, truck shop, reagent building, substation and gatehouse, etc.);
- Secure and construct a suitable water supply network;
- Construct growth media stockpiles; and
- Construct and maintain surface water diversions. **Table 3-1** presents a summary of the proposed total disturbance.

Table 3-1: Summary of NMCC Proposed Disturbance within the Plan Boundary

Disturbance Type	Public Lands	Private Lands	Total
Tailings Storage Facility	153	394	547
Open Pit	12	107	119
Waste Rock Disposal Areas	162	16	178
Haul Roads	7	31	38
Access Roads	8	4	12
Stormwater Diversion Structures	33	15	48
Miscellaneous Areas[1]	260	136	444
Exploration	20	20	40
Total Disturbance	661	734	1395

Notes:
1. Includes mill areas, stockpiles and other miscellaneous disturbance areas (including inter-facility disturbance generally associated with construction activities).

3.2 Proposed Plan

3.2.1 Open Pit

The mining of new ore would entail expansion of the existing open pit. The ore body at Copper Flat is exposed at and near the surface and would be mined by conventional front end loader and shovel open pit methods in a manner similar to the previous operation. The open pit mine is currently proposed to operate on two (2), 10-hour shifts per day, seven (7) days per week, for at least 47 weeks per year. However, this production schedule is subject to change based on future economics of the project. Over the life of the Project, the mine would produce approximately 96 million tons of copper ore, 37 million tons of overburden and waste rock, and 19 million tons of low-grade copper ore (less than 0.20 percent copper). The low-grade copper ore would likely be processed during operations as blend material and/or at the end of the mine life. As such, it will require stockpiling until such time at it is suitable for milling and processing. The operation would process 17,500 short tons per day of ore through the copper sulfide flotation mill using standard technology similar to that of the previous operation. While the operation would focus primarily on copper and molybdenum, other poly-metallic resources, including gold, silver, and possible rare-earth elements, may be economically extractable from the Copper Flat ore. These options resources are currently be evaluated.

Annually, the mining operation would produce an estimated 5.8 million tons of copper ore and 1.1 million tons of low-grade copper material. Waste rock production is estimated to average 2.2 million tons per year (ranging from 100,000 to 6.4 million tons annually), with tailings production estimated at 5.7 million tons annually. An operational life of approximately 17 years is currently projected.

Preproduction stripping of overburden was completed in 1982 during the previous operation. Approximately 3 million tons of overburden material was stripped and over 1.2 million tons of ore were mined from the existing pit during the early 1980s. Under the NMCC proposed PoO, the Copper Flat ore body would be mined by a multiple bench (30 foot high), open pit method. The existing pit would eventually be enlarged to 2,500 feet by 2,500 feet with an ultimate depth of 900 feet. The area of the pit would be expanded from 102 acres to 119 acres. The existing diversion of Greyback Wash south of the pit would not be altered with the proposed pit expansion. The working, inter-bench slope of the pit walls would average 1.1 horizontal:1.0 vertical, but would be optimized based on on-going evaluations of project economics and pit slope engineering. Safety benches would remain, and the overall final pit slope would be about 1.1H:1.0V (1H:1V). A typical cross-section of the proposed open pit is provided in **Figure 3-3**. Because the deposit cannot be mined sequentially, there is no plan to backfill the pit, although some of the overburden and waste rock would be used for pad preparation, plant site development, and in connection with the reclamation of disturbed area.

Material from the pit would be drilled and blasted, loaded and hauled to the primary crusher either in pit or out of pit, and then conveyed to the process mill, where the mineral values would be removed by conventional flotation processes. Future work will determine the viability of belt conveyance (either surface or underground) of crushed material if in pit crushing is chosen over out of pit. Overburden and waste rock would be placed on the ground surface in designated disposal areas, as discussed in Section 3.2.2.

Blasting would be limited to daylight hours and monitored by licensed blasters. Vehicular traffic on adjacent mine roads would be halted during blasting. Rotary diesel driven drills would be used for blast hole drilling. A small, rubber tired, compressed air operated wet drill in conformance with Mining Safety and Health Administration (MSHA) requirements would be used for secondary breakage when required. Safe seismic disturbance and air blast limits would be established to prevent damage to buildings.

Blasting agents would be stored in a secured area in compliance with applicable state and federal regulations. Ammonium nitrate and diesel fuel would be stored on site in bins and tanks. Detonators, detonating cord, boosters, caps and fuses would be stored apart from the batch plant area in secured separate magazines. The storage location for each of these facilities would be in previously disturbed areas between the plant site and the pit; safety and security would be the main factors considered in their final location.

Rock samples would be taken from blast holes. Based upon the assay values of these samples, the broken rock in the pit would be classified as "ore" or "waste." The rock would be loaded onto end dump haul trucks for transport to the primary crusher, low-grade stockpile, or waste rock disposal area(s) depending on the assay classification.

Loading of both ore and waste rock would be accomplished by using diesel powered hydraulic shovels and/or front-end loaders. During the first years of operation, ore and waste rock haulage would be handled by a fleet of end-dump, diesel-powered haulage trucks of minimum 85-ton capacity. Additional units would be added to the fleet as the pit is deepened. A detailed list of mining equipment would be provided to the BLM as the mine plan is finalized.

Noise from the mine equipment would comply with and would be regulated under MSHA. Mining equipment would be fitted with mufflers, spark arresters, and engine enclosures to reduce noise and fire potential.

A 12.8 acre lake currently is located in the existing pit. The pit bottom is at about a 5,380 foot elevation at closure in 1986. Original ground surface elevation at the pit was approximately 5,580 feet. The water level elevation in the pit lake is about 5,420 feet, therefore, pumping of the pit-lake would be necessary prior to mining and continuously throughout the life of the mine. Minor drilling work in 1976 indicated that groundwater in the pit area is localized in larger fractures. Inflow to the pit during the previous operations ranged from 50 to 75 gallons per minute (gpm). As a result of seasonal precipitation, the pit water level has fluctuated by 1 to 5 feet per year; however, the water inflow into the pit would be used as make-up water and for dust suppression on the roads and dumps. If necessary, pit water could be temporarily stored in a reservoir in the plant area. Water removal from the pit would continue over the operational life of the mine through a sump or series of sumps located within the pit. Water removal would end once mining of the pit was completed.

The ultimate depth of the pit is estimated at 900 feet at an elevation of 4,720 feet. After pit-lake pumping activities end, a lake would reform as recharge refilled the local cone of depression developed from pit-lake pumping. The pit-lake would eventually be approximately 640 feet deep and cover about 75 surface acres. The size of the lake would fluctuate annually depending on precipitation and evaporation rates. At an average evaporation rate of 65 inches per year, the maximum water loss from the pit lake would be about 600 acre feet per year. Refilling of the pit would proceed over a number of years at a predicted recharge rate of 50 to 75 gpm or 80 to 120 acre feet per year.

The proposed plan also includes ongoing exploration drilling to define the copper ore body (infill and step out drilling as well as tests for possible deep extensions of the orebody) as well as to test for near-surface coarse gold vein and alluvial gold potential in the area of the mine.

3.2.2 Waste Rock Disposal Area and Low-Grade Stockpile

Waste rock disposal areas (dumps) would be located west, east, and north of the pit area in areas used for waste rock disposal area during previous mining. These disposal areas would be expanded under the current PoO to disturb approximately 178 acres. Prior to the expansion of existing disposal areas into previously undisturbed areas, reclamation materials (including suitable growth media and “topsoil”) would be removed and stockpiled for future use in reclamation. Since a large portion of the waste rock disposal expansions would occur on previously disturbed areas, the amount of reclamation materials available for pre-stripping in these areas may be limited. Water erosion controls, such as berms and diversion ditches, would be installed to divert runoff away from waste rock disposal areas. Water diversion ditches would also be used to control water inflow onto waste rock disposal piles containing partially oxidized and unoxidized material.

Total surface runoff from the waste rock disposal areas using a 25-year storm, 24-hour precipitation of 2.9 inches was estimated (**Appendix B**). These calculations were developed during the previous attempt to re-open the Copper Flat Mine, and would be updated to meet current regulatory requirements and design criteria. Runoff from the waste rock disposal areas and the low-grade ore stockpile would be controlled by diverting the runoff water into a collection ditch and then recycling it into the process water system. No discharge is expected to occur. The final grading plan for the waste rock disposal areas would be designed to eliminate surface water run on, enhance runoff, reduce infiltration, reduce visual impacts, and facilitate revegetation through back-grading or crowned grading. Thirty-foot wide catch benches would be left in place to interrupt surface sheet flow, and regrading would match the adjacent and nearby geomorphic land shapes. By the end of the mine life, the height of the largest disposal area, the East Waste Rock Disposal area, would be 60 feet higher than present at an elevation of 5,620 feet above sea level. Waste rock disposal areas would be designed to facilitate regrading during reclamation; however other constraints may require that portions of dumps be constructed in lift heights other than those corresponding to the vertical separation between slope breaks on the final slope faces. Typical cross-sections of the proposed waste rock disposal areas are provided in **Figure 3-4**.

The waste rock disposal areas would be regraded and surface runoff velocity dissipaters would be constructed to reduce velocities and minimize undue erosion and soil loss. Exact design parameters which are specific to the site climatology and soil conditions would be ascertained during revegetation testing and concurrent reclamation activities. Total material contained in the disposal areas at the end of the expected life of the project would be approximately 37 million tons.

The low-grade stockpile would be located immediately southeast of the open pit and include about 19 million tons of rock assaying less than 0.20 percent copper. This low-grade stockpile is expected to be milled at the end of the mine life.

Particulate dust from the waste rock disposal areas and low-grade stockpile would be controlled by wetting the area down exposed surfaces, as necessary, and is not anticipated to be a problem given the hardness of the rock and the coarseness of the material.

Under the NMCC proposed PoO, the partially oxidized (transitional materials) from the pit may be segregated into the North and West waste rock disposal areas (Figure 3-1), though the exact method of disposal (and possible segregation will be determined through the current geochemical testing program). The East Waste Rock Disposal area would contain only unoxidized waste rock. To minimize oxidation potential post closure, waste rock disposal areas would be covered with a layer of compacted material and suitable reclamation materials, and revegetated. A more detailed discussion of the geochemical characteristics and management of the mine waste materials is provided in **Appendix C**.

Additional monitoring wells may be installed along the toe of the East Waste Rock Disposal area to monitor groundwater quality downgradient of the area.

3.2.3 Ore Processing

Ore from the pit would be trucked to the plant area located to the east of the pit (**Figure 3-1**). The ore would be crushed and ground and organic reagents would be added to create froth and cause the copper minerals to adhere to the bubbles (BLM, 1996). The copper-laden froth would be collected and filtered to form a concentrate. The proposed plant would be a sulfide-flotation plant similar to that originally constructed at the site by Quintana Minerals (Copper Flat Partnership) in 1982, and would be typical of plants used at other similar deposits. It would include a molybdenum processing circuit similar to that designed by Quintana. No leaching processes, including cyanide leaching, would be used.

The plant facilities would be constructed at the site of the original plant and are expected to use most of the original concrete foundations. The plant site would occupy approximately 78 acres and would be located between the open pit and the tailings impoundment area (**Figure 3-1**). The plant site area would incorporate the following primary structures:

- Primary Crusher,
- Coarse Ore Stockpile,
- Concentrator Building,
- Thickener Facility,
- Process Water Storage Area,
- Reagent Building,
- Electrical Substation,
- Administration Office,
- Mine Office/Change House,
- Assay Office,
- Truck Shop/Warehouse,
- Small Vehicle Shop, and
- Gatehouse.

The sulfide flotation plant would be designed to process approximately 5.8 million tons of ore per year at a nominal throughput of 17,500 tons per day (assuming 93% availability). The flowsheet of the process circuit is included as **Figure 3-5**.

Scheduled operating time for the mill is currently proposed to consist of three (3), 8-hour shifts per day, 7 days per week, for at least 350 days/year. Saleable products would be copper concentrate and molybdenum concentrate. The copper concentrate would be shipped by truck to an off-site refinery or port facility. Gold and silver would be recovered as by-products of the hydrometallurgical refining process at the refinery. Molybdenum concentrate would be filtered, dried, packaged in drums, and shipped directly in trucks to purchasers for further refining.

3.2.3.1 *Primary Crushing Facilities*

The primary crusher is currently proposed to be located about 2,500 feet east of the pit (Note: NMCC is currently evaluating the feasibility of conducting in-pit crushing and conveying operations). Ore hauled from the pit would be dumped into a 42 × 65 inch gyratory crusher that would crush the mine run rock to a nominal size of less than 8 inches in diameter. Crusher discharge would be fed by apron feeder onto a belt conveyor for transport to the coarse ore stockpile located near the mill. Delivery of ore by truck would be on a schedule similar to the mining operations, while the crusher would likely operation on the mill schedule, with extra delivery from a nearby surge stockpile with a front end loader. Storage capacity of the coarse ore stockpile would be about 35,000 tons. The crusher would be located below ground level to limit noise and contain dust. Dust emissions would be controlled with suppressants, water, and dust collection equipment (i.e., bag houses) to meet air quality operating permit stipulations and health standards.

3.2.3.2 *Grinding*

Three draw chutes beneath the coarse ore stockpile would direct ore onto apron feeders which would feed it onto a belt conveyor for transport into a large diameter semi-autogenous (SAG) mill and/or roller crushers for the first stage of grinding. Reduction in the SAG mill would be a result of impact between the ore chunks themselves and between the ore chunks and the 5 inch steel grinding balls used in the mill. Reduction would be a combination of crushing and attrition. Water and various reagents would be added to the SAG mill feed to start the conditioning of the ore pulp for subsequent stages of treatment. Tonnage of the primary feed to the SAG mill would be about 17,500 tons per day.

The SAG mill would discharge onto a double deck vibrating screen. Undersize crushed ore from the screen would report to a cyclone feed sump. The oversize ore would be taken by belt conveyor to a cone crusher, where it would be crushed to less than 0.75 inch in diameter and returned by belt conveyor to the SAG mill. Intermediate size product would be returned directly to the SAG mill by conveyors. Ore from the cyclone feed sump would be pumped to a cluster of hydro-cyclones for material sizing. The fines would report to the first stage of flotation, and the oversize ore would report to two large ball mills for further grinding.

Dust control measures would be implemented in compliance with the air quality permit issued by the New Mexico Environment Department (NMED). Control technologies utilized would vary according to specific applications but would include bag houses, sprays and mists, foggers, and enclosed buildings.

3.2.3.3 *Flotation and Concentration*

Cyclone overflow from the feed sump would report to the first stage (rougher) flotation which would consist of ten ±1,500 cubic foot cell tanks connected in series. Each tank would be equipped with a mechanism that would agitate or stir and induce air into the ore pulp as it passed through the tank. Reagents would be added to the pulp to cause the copper bearing sulfide mineral particles to adhere to bubbles created by the induced air and frothing agents. Flotation reagents that would be used in the concentrator are described in Section 3.2.8 . Small amounts of other reagents may be used in the process from time to time as part of an ongoing effort to improve metal recoveries and to cope with changing ore characteristics. The copper bearing sulfide laden bubbles would rise to the top of the cell and would be skimmed off.

The copper concentrate, which would average 28 percent copper, would be dewatered in a settling facility (thickener) to decant water, disk filtered, and stored for shipment. The copper concentrate would be loaded by a front end loader into 25-ton covered trucks with 10 ton towed trailers for transportation to a smelter or off-site copper refiner. Tailings from the copper flotation circuit would continue through the molybdenum flotation circuit where it would undergo a flotation process similar to that described for the copper flotation circuit.

Filtrate from both the copper flotation circuit and the molybdenum flotation circuit would be returned to concentrate thickeners. Thickener overflow would be returned to the plant reclaim water system. No smelting or refining would be conducted at the Copper Flat Project. The molybdenum concentrate would also be dried prior to packing into 55 gallon drums for shipment.

The crushing and concentrating plant complex would also include ancillary buildings such as offices, a truck shop, a substation, and a gatehouse. The ancillary buildings would all be prefabricated, standard, rigid framed structures. The administration building would be approximately 60 feet by 120 feet with a 12 foot eave height. The building would have central heating and air conditioning and would accommodate the plant administration, engineering, accounting, secretarial, and clerical personnel. Appropriate sanitary facilities would be provided for men and women.

The assay and laboratory offices would be 32 feet × 126 feet. Appropriate sanitary facilities would be provided. A small air compressor would be mounted on an exterior concrete pad for furnishing service air to the building. The gate house building would be 8 feet × 12 feet. A parking area for employee vehicles would be located adjacent to the main plant entry gate. The shop and warehouse building would be an equipment servicing facility. The reagent building would be a 60-foot × 72-foot building.

All mechanical, civil, structural and architectural designs would be in accordance with applicable standards and codes. The criteria used for design, equipment selection, layouts and construction were initially derived from the prior operation of Quintana Minerals and information from vendor and consultant recommendations. Equipment and fabricated items would be furnished with manufacturers' standard finish and retouched after erection. Safety painting would be in accordance with MSHA standards and New Mexico mining codes. Buildings and facilities would be painted in neutral colors to blend with the surrounding landscape.

The plant site surface drainage was originally designed to contain or control a 24-hour precipitation of 2.6 inches with a maximum 1 hour intensity of 2.0 inches. These calculations would be updated during the design phase of the project in accordance with current regulatory requirements and design criteria. Surface runoff from the area around the administration/mine office, concentrator, assay building, reagent storage and tailings thickener would be controlled by surface grading and directed to a containment pond.

3.2.3.4 *Tailings Impoundment*

An existing tailings impoundment facility at Copper Flat was constructed by Quintana Minerals to serve their 1982 mining operation. The impoundment received 1.2 million tons of material and was essentially reclaimed in 1986. The tailings impoundment remains in place and is located southeast of the former plant site. NMCC proposes to construct a new lined tailings impoundment facility over the area used by previous operations for tailings disposal. Tailings would be transported from the mill via slurry pipeline and deposited in the new impoundment. Ancillary facilities associated with the tailings impoundment facility would include a tailings slurry delivery system, a tailings solution reclaim and recycling system, and an underdrain seepage return system.

Approximately 95 million tons of tailings are expected to be impounded over the life of the project. Tailings deposition would be at the rate of approximately 17,500 tons per day (tpd). During progressive settlement, water would be decanted from the tailings impoundment and returned to the process circuit. The expected water recovery by reclaim systems would be around 70 percent.

3.2.3.4.1 Tailings Impoundment Design

A conceptual design report (Golder, 2010) for the proposed tailings impoundment is provided in **Appendix D**, and summarized herein. The starter dam from the earlier operations remains in place: however, in order to provide the required increase in storage capacity, while limiting future dam height and maintaining gravity delivery of tailings, the facility would be expanded approximately 1,000 feet to the east of the existing unlined impoundment. NMCC proposes to utilize the existing 1982 starter dam as a borrow source for the new starter embankment construction or allow the old starter dam to remain in place to form cells for more selective tailings disposal and utilize borrow from either mine waste or alluvial material behind the old starter dam to construct the proposed new starter dam. As noted above, this alluvial material is currently being evaluated for potential mineral resources.

Approximately 1.2 million tons of tailings were placed in the north cell of the Quintana tailings impoundment prior to the suspension of operations in 1982. The method of tailings embankment construction selected by Quintana was upstream raise construction with peripheral discharge of spigotted whole tailings. The proposed method of construction for the new tailings storage facility (TSF) is by centerline raises with cycloned tailings sand. The tailings surface would rise approximately 80 feet in the first two years of operation.

Initial construction would include a toe berm to buttress the tailings embankment and a starter dam for placement of the tailings header line and cyclones. Sand (cyclone underflow) would be placed on the embankment while the tailings slimes (cyclone overflow) would be discharged to the impoundment interior. A geomembrane liner would be placed beneath the starter dam and anchored on the crest of the toe berm. An underdrain system consisting of a filter compatible soil and drainage collection pipes would be placed on top of the geomembrane liner, beneath the sand dam footprint, to facilitate drainage and consolidation of the cycloned sand. The underdrain system would extend into the impoundment interior in the area that would underlie the free water pond. Underdrainage would be routed to a lined underdrain collection pond located downstream of the toe berm.

The TSF is intended to be constructed in a phased manner. During initial construction phases, diversion ditches would be constructed to divert stormwater from upstream catchment areas within the area contributory to the impoundment. The contributory area is approximately equivalent to the ultimate TSF footprint, as only minor peripheral areas drain into the TSF. At final build out, minimal potential exists for surface water runon from external areas. Throughout most of the life of the facility, stormwater management requirements would be limited to direct precipitation.

Based on the rules and regulations of the New Mexico State Engineer, the Copper Flat TSF would be classified as a large dam having significant hazard potential. As such, the impoundment has been designed to contain the equivalent of 75 percent of the probable maximum precipitation (PMP) during operations. A spillway capable of passing 75 percent of the PMP would be required upon closure.

3.2.3.4.2 Tailings Impoundment Process

Following the flotation process, the remaining slurry, consisting primarily of non-valuable minerals, pyrite, and miscellaneous unfloated minerals, along with water, would flow into a tailings thickener for partial dewatering. The slurry would enter the tailings thickener at approximately 30 percent solids by weight, water would be removed by decanting, and the tailings would exit the thickener at 50 percent solids. Approximately 57 percent of the process water would be recovered in the tailings thickening operation. NMCC is considering additional water conservation measures and innovations which, if viable, would be added to the current process.

The thickened tailings would then flow by gravity through a 24 inch pipeline into the tailings impoundment. To contain possible spills or leaks, the tailings impoundment pipeline would be constructed between earthen berms. The pipeline foundation materials and berms would be sloped to direct any spillage or leakage to the tailings impoundment. Thickened tailings slurry would be distributed around the periphery of the impoundment by numerous spigots or hydrocyclones, which separate coarse material from the fines in the slurry. The coarse material deposited at the periphery of the impoundment would be used to construct embankment raises from the new starter embankment, while the fine silt and slimes would flow away from the upstream face of the raise toward the pool. As the finer material flows into the impoundment, gravitational settlement of solids would form beaches. Supernatant solution (the residual water in the tailings which seeps to and collects on the surface of the impoundment as the tailings settle and compress) and precipitation run-off would flow towards the impoundment low point formed by the beaches to form the free pool. Tailings deposition would be managed to force the pool away from the embankment towards an ultimate pool location. The tailings used to form the initial beaches would have a coefficient of permeability of approximately 1×10^{-6} cm/sec, after consolidation occurs, due to progressive loading.

Water reporting to the tailings impoundment would be recovered from the pool of water that would form in the impoundment, and returned to the mill process water system for reuse. Surface water resulting from precipitation could also contribute to the volume of water in this pool. The height of the embankment is designed to contain the normal operating volume of water completely within the impoundment, combined with the amount of surface water runoff from the 24-hour, 100-year precipitation event.

The size and location of the impoundment pool would vary during the life of the project. The size of the pool would be affected by predeposition grading in the impoundment, the amount of tailings deposited, precipitation, evaporation rates, seepage rates into the designed embankment seepage collection system, infiltration into underlying soils, and water recycling rates. The location of the pool would migrate within the impoundment area as tailings beaches form. Tailings deposition would be managed to force the pool away from the embankment toward the upstream reaches of the impoundment. The impoundment area would be fenced to restrict access.

3.2.3.5 *Tailings Impoundment Monitoring*

The tailings impoundment would be regulated by the New Mexico State Engineer's Office for safety of operations. The design and operation of the tailings impoundment dam would be subject to approval of the State Engineer's Office including the closure inspection. The State Engineer's Office requires monthly reports of the tonnages deposited into the impoundment along with readings of the piezometers, settlement devices, and settlement monuments that indicate movement.

The Groundwater Bureau of NMED requires a monthly report of tonnages of tails discharged along with analyses of the tailings to identify possible contaminants. Samples of water from new monitor wells proposed for downstream of the tailings dam would be analyzed monthly and the results sent to the Groundwater Bureau. These samples would be used to identify any leakage from the new, lined tailings impoundment. Abatement plans would be implemented should leakage and contamination be detected.

3.2.4 Haul Roads and On-Site Service Roads

For the most part, existing haul roads would be utilized to haul material to the crusher, stockpiles, and waste rock disposal areas. Some minor realignment of these roads may be necessary and road widths would vary. A cross-section of a typical haul road is provided in **Figure 3-6**.

Haul roads are not expected to create new disturbances, as they would be constructed on previously disturbed land. The on-site roads would be designed for easy access and traffic movement within the operations area. Waste rock and ore would be hauled to the disposal areas and mill using 85-ton (net load) haul trucks, depending on mine optimization and scheduling.

During operation of the Copper Flat Project, water trucks would be used, as needed, to control emissions of fugitive dust from the haul roads, as well as other roads within the project area. Wetting agents and binding agents, such as magnesium chloride, also may be used, if conditions warrant, to further control dust emissions.

3.2.5 Project Work Force and Schedule

The construction phase of the project is expected to take approximately 12 to 18 months. During this time, the work force for development of the Copper Flat mine would average about 120 to 130 persons per day during the construction period.

The estimated operational life required to recover the proven minerals (copper, molybdenum, gold, and silver) is 17 years. The maximum work force would be around170. Approximately 80 to 100 people would be employed in the office and mine; 40 to 70 people would be employed in the mill. The reclamation workforce would consist of up to 20 employees. NMCC anticipates hiring over 70 percent of the work force from local communities within a 75-mile radius of the mine. The mine would likely operate on two (2), 10-hour shifts per day, seven (7) days per week, for at least 47 weeks per year. The mill would likely operate on three (3), 8-hour shifts per day, 7 days per week, for at least 50 weeks per year. Administrative personnel would work a standard day shift, five (5) days per week, 50 weeks per year. These schedules are, however, subject to change based on future economics of the project.

3.2.6 Electrical Power

Power for the project would be furnished by the Sierra Electric Cooperative by means of an existing 115 kV transmission line that runs from the Caballo switching station near the junction of Interstate 25 (I-25) and Highway 152, and terminates within 300 feet of the mill facility at the site of the proposed mine substation (**Figure 1-2)**.

The 115-kV line was installed for the 1982 mine due to the limited capacity of the existing lines in the area, which supplied the community of Hillsboro and the surrounding rural areas. The existing 115-kV line is a wooden pole, H frame construction and would be in full accordance with state and federal electric codes. Tri-State Generation and Transmission owns the line and is responsible for maintenance. The substation would be reconstructed in the same area as it was in 1982, and fenced and constructed in accordance with BLM stipulations. NMCC would own the substation equipment and would be responsible for construction and maintenance. From the substation, the voltage would be stepped down by primary transformers and distributed throughout the mine site via an existing buried conduit system.

An existing 25-kV distribution line provides power to the production wells located east of the mine, booster stations on the fresh water pipeline, and the reclaim water pump stations at the tailings dam. Sierra Electric owns this line and is responsible for maintenance. The plant electrical load requirement is tabulated below (**Table 3-2**):

Table 3-2: Summary of Project Electrical Demand

	Demand (kWh/ton)
Primary Crushing	0.25
Total Grinding	17.48
Total Copper Flotation	1.74
Molybdenum Flotation	0.27
Thickening	0.05
Reagent Handling	0.05
Water System	2.05
Ancillaries	0.65
Total	**22.54**

Note: kWh – kilowatt hours

A new substation would need to be constructed at the site. An emergency generator is also included as backup power in the event of power loss to maintain critical systems and to aid in a controlled shut down. NMCC is analyzing the viability of solar power generation to partially offset the mine's energy demand, along with other energy and water conservation measures.

Because the configuration and size of the 25 kV distribution line, standard raptor proof protective designs would be incorporated into the line design and line upgrade, as presented in the Rural Electrification Administration guidelines and in the measures developed by Olendorff *et al*. (1981). This design would be used for the entire length of the distribution line within the mine area.

3.2.7 Water Supply

The total water demand for the Project would be approximately 6,400 gallons per minute (gpm) with the majority of the water used in the mill operation. Of this, about 4,400 gpm would be obtained from reclaimed process water and pit water pumping, and approximately 2,000 gpm would be fresh water make-up from the production wells.

The freshwater supply for the mine would come from four existing high capacity production wells located about eight miles east of the plant site on BLM-administered public land. These wells were drilled to depths of between 957 feet and 1,005 feet. All were 26 inches in diameter and were cased with 16-inch casing with the annular space packed with minus 3/8 inch washed gravel. The projected long-term capacities of the four production wells range from 1,000 to 1,800 gpm (Green and Halpenny, 1976). All roads, electrical supply and pump foundations are intact at the pumping field.

An existing 20-inch welded steel pipeline would transport the water from the booster station(s). The pipeline is buried a minimum of 2 feet deep from the well field to the point of entry to the project area. NMCC is preparing to conduct a detailed inspection and assessment of this pipeline to determine its condition and viability for use in the Project.

Pumping of the pit and reclaim water from the tailings impoundment is expected to provide about 400 to 800 gpm of the Project water requirements and reduce the amount of water withdrawn from the production wells. This water would generally be reused in processing and in dust suppression. The majority of the water from the pit would be used for dust suppression. Pump station #3 is located at the process water reservoir located below the tailings thickener. This station would deliver water to the process water reservoir or to the freshwater storage tank as needed. The process water reservoir would be fed by the tailings thickener overflow, reclaim water pumped back from the tailings barge pump system, and fresh water makeup as needed. It would be pumped from the reservoir to a steady head tank and flows by gravity back to the grinding circuit. A sump and pumping installation would be advanced with the pit excavation to remove infiltrated and surface runoff water collected within the pit. This water would be used in either pit operations or the concentrator.

The area encompassing the mine, mill, tailings impoundment, and water supply wells are within the Lower Rio Grande Underground Water Basin. Water rights are described in declarations, amended declarations, and supporting documents under New Mexico State Engineer File Nos. LRG-4652 through LRG-4652-S-17 and LRG-4654.

Water quality monitoring samples have been collected in the mine area from both surface and groundwater sources since 1976 and would continue to be collected throughout the life of the operation, during closure, and for a post closure period defined in the groundwater Discharge Permit.

3.2.7.1 *Stormwater*

The mining and concentrating process would not involve any discharge to surface water courses. Surface runoff (stormwater) from the mine and plant site area would be collected in containment (settling) ponds and recycled into the process water system. Stormwater outside the plant and mine site would not come in contact with the proposed operation due to existing diversion ditches, dams, and berms.

Sediment control in the mine area would be achieved by the use of seeding and mulching, silt fences, straw bale dams, diversion ditches with energy dissipaters, and rock check dams at appropriate locations during construction and operation. All sediment control structures would be monitored and maintained on a regular basis.

3.2.7.2 *Groundwater*

In 1982, the NMED, Ground Water Bureau, approved Ground Water Discharge Plan, DP 001. On June 26, 1992, the Ground Water Bureau confirmed the need to amend the permit, DP 001, in order to more closely define compliance and remedial actions. On August 20, 2008, the NMED sent a letter to the site owner at that time requiring a Stage 1 Abatement Plan (20.6.2.4101 NMAC). The purpose of the Stage 1 Abatement Plan is to provide the data necessary to select and design an effective abatement alternative. The requirements for the Stage 1 Abatement Plan are described in 20.6.2.4106 NMAC. The abatement plan proposal must include an investigation to define the extent and magnitude of any existing groundwater and surface water contamination and to characterize the hydrogeology of the site. NMED's concerns regarding water resources at the Copper Flat site include:

- Groundwater impacts from the existing unlined tailings impoundment have been documented, but have not been fully characterized.
- Samples of pit lake water quality reveal exceedences of New Mexico Water Quality Control Commission (WQCC)standards, and NMED is concerned about migration of this water away from the pit, causing additional groundwater impacts as well as ongoing contact with wildlife.
- Acid leaching could be occurring due to ongoing ore exposure.

The surface and ground water of the Copper Flat area are described and analyzed in detail in the Hydrologic Assessment Report (Shomaker & Newcomer, 1993) and the Copper Flat Hydrogeological Report (SRK, 1995; ABC, 1996). Ongoing and future groundwater monitoring would be conducted as required by the State of New Mexico. A detailed description of the current baseline monitoring program for groundwater is presented in the report, Sampling and Analysis Plan for Copper Flat Mine (Intera, 2010), provided to the BLM under separate cover. Future monitoring and possible abatement activities would be coordinated with all relevant stakeholders to ensure the protection of groundwater resources.

3.2.8 Fencing and Exclusionary Devices

NMCC would construct BLM-approved barbed wire fencing to prevent livestock from entering the pit, waste rock disposal facilities, and tailing storage facilities, including the seepage collection pond. In areas where a higher level of security is needed, chain-link fences would be erected. Wildlife fences would be constructed around the lined ponds. Gates and/or cattle guards would be installed along roadways within the proposed Project Area as appropriate.

NMCC would monitor the fences on a regular basis and repairs would be made by NMCC as needed. BLM would be contacted immediately in the event that livestock manage to enter the proposed Project Area via a gate or opening in a fence. NMCC would assist as requested in moving these animals out of the proposed Project Area. At the time of closure, a plan would be developed between NMCC and the BLM for responsibility of long-term maintenance of range fences that would be left in place within the Plan boundary.

To the extent practicable, NMCC would investigate and utilize exclusionary devices, including, but not necessarily limited to bird balls and/or netting, to minimize the potential for avian wildlife contacting process pond waters that contain elevated chemical constituents in excess of ecological risk levels.

3.2.9 Growth Media

Available growth media would be salvaged and stored in stockpiles for reclamation. Section 3.4.14 presents further discussion on growth media salvage. Growth media would consist of soils stripped prior to surface disturbance activities. Any growth media remaining in a stockpile for one or more planting seasons would be seeded with an interim seed mix to stabilize the material by reducing erosion and minimizing establishment of undesirable weeds.

3.2.10 Borrow Areas

Construction-related borrow areas would be located within facility footprints. Borrow sources would be required for prepared sub-grade materials, drainage materials, pipe bedding materials, road surfacing materials, retarding layer materials, reclamation materials, growth materials and riprap. Precise locations and anticipated quantities of borrow materials have not yet been determined, but would be provided during the NEPA process, prior to PoO approval. Borrow areas may be revisited over the mine life.

3.2.11 Ancillary Facilities

The process area would also include ancillary buildings such as offices, a truck shop, warehouse, small vehicle shop, an electrical substation, and a gatehouse. The ancillary buildings would all be prefabricated, standard, rigid framed structures. Where practicable and economic, NMCC would consider alternative construction materials and techniques to improve the overall energy efficiency of the project. This may include renewable energy generation (solar, wind, etc.) for certain buildings.

The administration building would be approximately 60 feet by 120 feet with a 12 foot eave height. The building would have central heating and air conditioning and would accommodate the plant administration, engineering, accounting, secretarial, and clerical personnel. Appropriate sanitary facilities would be provided for men and women.

The assay and laboratory offices would be 32 feet by 126 feet. Appropriate sanitary facilities would be provided. A small air compressor would be mounted on an exterior concrete pad for furnishing service air to the building. The gate house building would be 8 feet by 12 feet. A parking area for employee vehicles would be located adjacent to the main plant entry gate. The shop and warehouse building would be an equipment servicing facility. The reagent building would be a 60-foot by 72-foot building.

All mechanical, civil, structural and architectural designs would be in accordance with applicable standards and codes. The criteria used for design, equipment selection, layouts and construction were derived from the prior operation(s) and information from vendor and consultant recommendations. Equipment and fabricated items would be furnished with manufacturers' standard finish and retouched after erection. Safety painting would be in accordance with MSHA standards and New Mexico mining codes. Buildings and facilities would be painted in neutral colors to blend with the surrounding landscape.

3.2.12 Inter-Facility Disturbance

As with most mining facilities, general ground disturbance occurs around and between structures and facilities as a result of construction and operation & maintenance (O&M). This inter-facility disturbance is in addition to the formal footprint created by design. In some cases, NMCC has elected to include disturbance buffer zones surrounding specific facilities (i.e., tailings impoundment, waste rock disposal areas, open pit area, etc.) in order to ensure that the full extent of disturbance associated with these facilities is accounted for, and that appropriate reclamation and bonding of these areas can be facilitated.

3.2.13 Transportation

Access from the site is by three miles of all-weather gravel road and 10 miles of paved highway (State Highway 152) east to I-25, near Caballo Reservoir. The 10 miles on State Highway 152 to I-25 to I-25 is mainly a straight and relatively flat road (and does not include any sharp turns or significantly adverse grades). I-25 is the primary north-south highway. Traffic associated with reestablishment of the Copper Flat Project would be broadly grouped as follows:

- **Concentrate Shipments**: Shipment of concentrates by trucks to smelters and/or port facilities would generally be via hydraulic dump trucks with 25-ton capacity towing 10-ton trailers. Copper concentrate would be thickened, filtered and trucked approximately 41miles to a railhead at Rincon, near Hatch, New Mexico on I-25, (or another site), and then transported by rail to a smelter, most likely in Arizona, and/or to port facilities. Alternatively, a possible rail loading point at the intersection of State Highways 26 and 27 south of the Project could be used. Molybdenum concentrate would be filtered, dried and bagged on site and then transported by truck or rail.
- **Incoming Supplies**: An average of 10 to 15 trips per day by trucks of vendors and equipment and service suppliers. Most deliveries, which would include equipment parts, reagents, oil, and miscellaneous office supplies, would be made during the day shift. Title 49 CFR regulates the transportation of hazardous materials in commerce. Anyone who offers for transportation, transports, packages, loads, unloads, or in any way assumes responsibility for marking, labeling, or handling of any regulated hazardous materials must comply with 49 CFR. In addition, carriers must comply with the Federal Motor Carrier Safety Regulations of the DOT (parts 383, 390 397, and 399). Hazardous materials required for operation of the Copper Flat Project include gasoline, diesel fuel, propane, and other petroleum products, explosives, solvents for degreasing of machinery and equipment, and laboratory chemicals. These materials would be purchased from various vendors and brought to the site by truck. NMCC would ensure that the Hillsboro volunteer fire department and the Sierra County fire district are aware of the nature of the materials routinely being transported to the site, and that they have appropriate response training in the event of a spill or other accident involving hazardous materials.

- **Employees and Visitors**: The majority of employees are expected to commute from Truth or Consequences or Hillsboro. An additional 15 to 20 trips could be expected by visitors and sales representatives. NMCC would encourage employee car pooling.

There are no present plans for a company operated employee transportation system. No railroad access or facilities, airstrips, or helicopter pads are planned in connection with the mine development or operations.

3.3 Exploration Activities

NMCC currently conducts exploration activities within the Plan area under previous authorizations by federal and state agencies. Current exploration and mineral evaluations have been focused on privately-owned, patented lands, within and on previously disturbed lands. Future exploration would generally remain in this same disturbed area, although some future exploration would likely include activities on BLM-administered lands.

Exploration disturbance generally includes access roads, drill pads, sumps, trenches, and staging areas. Exploration methods include both reverse circulation and core drilling, with minor trenching also planned. As part of the current mine PoO, NMCC requests an additional 15,000 linear feet of drill road and 100 drill pads for future exploration of the site. Placement of drillholes would be guided by reserve requirements, geotechnical studies, and geochemical sampling.

3.4 Applicant Committed Environmental Protection Measures and Committed Practices

NMCC would commit to the following practices to prevent undue and unnecessary degradation during the life of the Project. These practices, described briefly below, are to be considered part of the operating plan and procedures. More detailed information would be developed as the Project is advanced to more detailed design stages.

3.4.1 Air Quality

The Copper Flat Project would be designed to control both gaseous and particulate emissions and to meet all regulatory standards. Appropriate air quality permits would be obtained from the New Mexico Environment Department - Air Quality Bureau for the new Project facilities and land disturbance. As per NMED regulations, the project air quality operating permit must be authorized by the NMED prior to project commissioning.

Committed air quality practices would include dust control for mine unit operations. In general, the fugitive dust control program would provide for water application on haul roads and other disturbed areas; chemical dust suppressant application (such as magnesium chloride) where appropriate; and other dust control measures as per accepted and reasonable industry practice. Also, disturbed areas would be seeded with an interim seed mix to minimize fugitive dust emissions from un-vegetated surfaces where appropriate.

Fugitive emissions in the process area would be controlled at the crusher and conveyor drop points through the use of water sprays and dry cartridge filter type dust collectors where necessary. Other process areas requiring dust and/or emission controls include the concentrate drying and packaging circuit, the various process plants, and the laboratory. Appropriate emission control equipment would be installed and operated in accordance with the construction and operating air permits.

The lime storage would be fitted with a baghouse for capture of fugitive dust during loading of the lime bin. The sample preparation lab would be equipped with fans and filters.

Deposition of tailings would be by spigotting and/or cyclone discharge. By this procedure, the surface would be wet, thereby eliminating or reducing fugitive dust. As necessary, control of fugitive dust in the vicinity of the tailings pond would be attained by watering, sprinkling, and vegetation. No gaseous contaminants above allowable standards are expected to be emitted to the atmosphere from the proposed operations.

Drilling operations would be done wet or with other efficient dust control measures as set by MSHA and NM Mine Inspection , and NM mining and exploration permit requirements. At a minimum, haul roads, waste rock disposal areas, and ore transfer points would be wetted down on a regular basis to minimize dust emissions. Dust abatement at the primary crusher, coarse ore stacker, and coarse ore reclaim feeders would utilize NMED and MSHA-approved Sonic Misting Systems (Best Available Control Technology).

Combustion emissions would result from the mobile mining machinery and support vehicles. All combustion equipment emits nitrogen dioxide (NO_2) and carbon monoxide (CO). The mobile mining equipment is diesel fuelled and also would emit particulate matter. Combustion emissions would be controlled by original equipment manufacturer pollution control devices. Fugitive emissions from ore and the flotation equipment are expected to be small due to the low volatility of the sulfur compounds present in the concentrate.

3.4.2 Water Resources

Process components would be designed, constructed, and operated in accordance with NMED regulations. The proposed process facilities would be zero discharge, and the TSF facilities would have engineered liner systems. The waste rock has been evaluated for potential to generate acid and/or mobilize deleterious constituents, and generally been found to produce neutral to slightly alkaline leachates with low concentrations of sulfate and dissolved metals (**Appendix C**). Waste rock with the potential to generate acid and/or mobilize deleterious constituents would be identified through laboratory analyses during mining and managed in the waste rock disposal facilities.

NMCC is in the process of preparing a stormwater management plan to identify more specific control measures and monitoring requirements. The actual locations and numbers of sediment controls would be determined during final design and where appropriate during operations. Larger ponds would be designed and constructed in accordance with the requirements of the New Mexico State Engineer's Office. Sediment removed from the sediment control structures would be placed in the tailings impoundment or other approved locations.

3.4.3 Erosion and Sediment Control

Best management practices (BMPs) would be used to limit erosion and reduce sediment in precipitation runoff from proposed Project facilities and disturbed areas during construction, operations, and initial stages of reclamation. BMPs that would be used during construction and operation to minimize erosion and control sediment runoff and would include:

- Surface stabilization measures – dust control, mulching, riprap, temporary and permanent revegetation/reclamation, and placing growth media;
- Runoff control and conveyance measures – hardened channels, runoff diversions; and,
- Sediment traps and barriers – check dams, grade stabilization structures, sediment detention, sediment/silt fence and straw bale barriers, and sediment traps.

Revegetation of disturbed areas would reduce the potential for wind and water erosion. Following construction activities, areas such as cut and fill embankments and growth media/cover stockpiles would be seeded as soon as practicable and safe. Concurrent reclamation would be maximized to the extent practicable to accelerate revegetation of disturbed areas. All sediment and erosion control measures would be inspected periodically, and repairs performed as needed.

3.4.4 Wildlife

Land clearing and surface disturbance would be timed to prevent destruction of active bird nests or young of birds during the avian breeding season (April 1 to July 31) to comply with the Migratory Bird Treaty Act. If surface disturbing activities are unavoidable during the avian breeding and nesting season, NMCC would have a qualified biologist survey areas proposed for disturbance for the presence of active nests immediately prior to the disturbance. If active nests are located, or if other evidence of nesting is observed (mating pairs, territorial defense, carrying nesting material, transporting of food), the area would be avoided to prevent destruction or disturbance of nests until the birds are no longer present.

Operators would be trained to monitor the mining and process areas for the presence of larger wildlife such as deer and antelope. Mortality information would be collected. NMCC would establish wildlife protection policies that would prohibit feeding or harassment of wildlife.

3.4.5 Cultural Resources

Avoidance is the BLM-preferred treatment for preventing effects to historic properties [a historic property is any prehistoric or historic site eligible to the National Register of Historic Places

(NRHP)] or unevaluated cultural resources. If avoidance is not possible or is not adequate to prevent adverse effects, NMCC would undertake data recovery at any affected historic sites. Development of a treatment plan, data recovery, archeological documentation, and report preparation would be based on the "Secretary of the Interior's Standards and Guidelines for Archeology and Historic Preservation," 48 CFR § 44716 (September 29, 1983), as amended or replaced. If an unevaluated site could not be avoided, additional information would be gathered and the site would be evaluated. If the site does not meet eligibility criteria as defined by the New Mexico State Historic Preservation Office (SHPO), no further cultural work would be performed. If a site meets eligibility criteria, a data recovery plan or appropriate mitigation would be completed.

3.4.6 Protection of Survey Monuments

To the extent practicable, NMCC would protect all survey monuments, witness corners, reference monuments, bearing trees, and line trees against unnecessary or undue destruction or damage. If, in the course of operations, any monuments, corners, or accessories are destroyed, NMCC would immediately report the matter to the authorized officer. Prior to destruction or damage during surface disturbing activities, NMCC would contact the BLM to develop a plan for any necessary restoration or re-establishment activity of the affected monument. NMCC would bear the cost for the restoration or re-establishment activities including the fees for a New Mexico Professional Land Surveyor.

3.4.7 Health and Safety and Emergency Response

The development of the Copper Flat ore body would comply with environmental, and health and safety regulations of all governmental agencies including Mining Safety and Health Administration (MSHA) and the New Mexico Mining Act. The State agencies primarily involved are the NMED, the State Mine Inspector’s Office (SMIO), New Mexico Department of Energy, Minerals, and Natural Resources -Mining and Minerals Division (MMD), and the New Mexico State Engineer’s Office.

NMED has jurisdiction over ambient air quality, discharges to groundwater, surface water impacts, solid waste disposal, liquid waste disposal (sanitary facilities). The SMIO and MSHA have jurisdiction over health and safety within the mine; the State Engineer’s Office is concerned with the tailings dam construction, and operation, and water rights. The MMD is responsible for issuing a mining permit and is concerned with all issues related to the mining operation and reclamation.

As specified under SMIO and MSHA regulations, appropriate dust collection and noise abatement equipment would be installed at the mine. Noise levels in both the mine area and process area would also be subject to MSHA regulations.

All drinking water storage vessels would be enclosed in order to preserve the water's potable quality. Within the mine and mill area and the tailings impoundment, vehicular traffic and human movement would be controlled through the use of fences, locked gates, signs, and supervisory personnel.

Fencing would also discourage access by cattle. Livestock grazing is currently permitted in adjacent areas at the livestock owner's risk and would continue during mine operation in adjacent areas.

3.4.8 Fire Protection

As specified by MSHA, NMCC would institute a fire protection training program and have a rehearsed fire suppression plan. A fire protection system would be installed that would incorporate Sierra County and or State code requirements in the administration and warehouse complexes, truck shop, crushing plant, and process plant. Hydrants would be located near all buildings. A 100,000 gallon fire water reserve would be stored in a water storage tank located sufficiently above and near the mill and crushing area to provide adequate water pressure. A fuel break would be constructed around the facilities. A fire truck and water trucks, used for dust suppression, would be available in the event of a fire. An ambulance would be located on site in the event emergency transportation is required.

NMCC would promptly comply with any emergency directives and requirements of Sierra County and the BLM pertaining to industrial operations during the fire season.

3.4.9 Invasive, Non-native Species

NMCC recognizes the economic and environmental impact that can result from the establishment of noxious weeds and has committed to a proactive approach to weed control. A noxious weed monitoring and control plan would be implemented during construction and continuing through operations. The plan would contain a risk assessment, management strategies, provisions for annual monitoring and treatment evaluation, and provisions for treatment. The results from annual monitoring would be the basis for updating the plan and developing annual treatment programs.

3.4.10 Materials and Waste Management

Operations at the Copper Flat Project would result in the generation of nonhazardous and hazardous waste materials. The majority of waste would be "mine waste," including mill tailings and waste rock, which is currently excluded from regulation under the Resource Conservation and Recovery Act (RCRA). The management of these excluded wastes is discussed in Section 3.2.2. The management of regulated solid and hazardous waste is discussed in the following sections.

3.4.10.1 *Sanitary and Solid Waste Disposal*

Nonhazardous solid wastes that would be generated at the site include waste paper, wood, scrap metal, used tires, and other domestic trash. These materials would be disposed of in a permitted on site Class III sanitary landfill on private land, which would be approved by the State of New Mexico, or by other methods approved by the State and Sierra County.

Sanitary liquid wastes would be handled and disposed of through two existing septic tanks/leach fields permitted by NMED. The septic systems would be slightly modified, including enlargement of the leach fields and placement of larger septic tanks. The washing facility for the mobile equipment would be equipped with a water/oil separator system. Waste oil and lubricants would be collected and transported off site by a buyer/contractor for recycling. Reagent drums would be recycled by the reagent supplier. Scrap metal would be sold to a dealer and transported off site.

Nonhazardous solid wastes from the laboratory would be disposed of in the landfill. Other wastes from the laboratory that exhibit a hazardous waste characteristic, including off specification commercial chemicals and assay wastes would be managed as hazardous waste.

Employee training would include appropriate landfill disposal practices such as the allowable wastes that can be placed in the landfill, management of used filters, oily rags, fluorescent light bulbs, aerosol cans, and other regulated substances. Used solvent, liquids drained from aerosol cans, accumulations of mercury fluorescent lights and used antifreeze may be regulated pursuant to RCRA. NMCC anticipates that the mine would fall in the “small generator” category. Signs would be installed at the landfill sites reminding employees of appropriate disposal practices.

3.4.10.2 ***Reagent Management***

Reagents used as part of the copper/molybdenum concentrating process would include frothers, flotation promoters, flotation collectors, flocculants, flotation reagents, pH regulators, and filter and dewatering aids. These reagents would be delivered by truck from commercial sources to the mine site where facilities would be provided for off loading, storing, mixing, handling, and feeding. Reagents that are received dry would be mixed in agitation tanks and pumped to either outdoor storage tanks or liquid storage tanks inside the mill building from which they would be metered into the concentrating process.

Residual reagent concentrations in the tailings and reclaim water streams are expected to be present at very low levels since they would be added to water in amounts resulting in concentrations of approximately 3 parts per million (ppm). Also, normally 95 percent of the reagents would be adsorbed onto the copper or molybdenum mineral surface and floated off in the mineral froth. The reagent would then be subsequently consumed in the offsite smelting process. Assuming 95 percent of the reagents are adsorbed, the residual reagent reporting to the tailings stream drops to less than 0.15 ppm.

Frother reagents to be used at the mine include methyl isobutyl carbinol (MIBC). MIBC is biodegradable in low concentrations. The dosage rate would be 0.02 pound per ton of mill feed. The bulk of this reagent would report to the concentrate fraction and end up at the smelter. The reagent would be received in 20 ton capacity trucks and stored in a 16,000 gallon tank.

Lime used in alkalinity control in the flotation circuit would be received in pebble form in bulk by 20 ton capacity trucks and stored in a 200-ton capacity storage silo. The lime would then be slaked with water in a small mill and the resulting "milk of lime" would be pumped to the addition points in the grinding and flotation circuits for use as a pH regulator. It is anticipated that lime would be used at a rate of 2.7 pounds per ton of mill feed to control pH of the flotation circuit. During the milling process, most of the lime would react with sulfide minerals to form gypsum.

Either sodium hydrosulfide (NaSH) or ammonium sulfide [$(NH_4)_2S$] would be added to the circuit process as a flotation collector and depressant to affect the copper molybdenum separation. These reagents are rapidly oxidized through contact with copper minerals and air bubbles entrained in flotation pulp and would be received in 500 pound drums either in liquid or dry pellet form. Pellets would be mixed with water and stored in tanks. Approximately 2,800 gallons of these reagents would be stored on-site at a time.

AEROFLOAT 238, used in flotation promoting, would be received in 50-gallon drums and have a plant storage capacity of 2,800 gallons. Flotation reagent Xanthate Z-11/Z-200 would also be used in the flotation process.

Number 1 diesel fuel would be used as a molybdenum collector and stored in one 5,000 gallon bermed above ground tank located onsite. AERODRI 100, used as a filter and dewatering aid, would arrive onsite in 500 pound drums. The reagent would be fed directly from the drums into the milling process. Use of small amounts (<100 pounds) of sulfuric acid would be limited to the laboratory.

Potential reagent spills would be contained by curbs in the reagent mixing and storage areas. A floor sump pump would be used to return the spilled material either to the storage tank or into the milling process as necessary. Material Safety Data Sheets (MSDS) for the reagents to be used would be on file at the site.

3.4.10.3 *Hazardous Materials Management*

The term "hazardous materials" is defined in 49 CFR§172.101; hazardous substances are defined in 40 CFR 302.4 and the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) as amended by the Superfund Amendments and Reauthorization Act (SARA) Title III. Hazardous materials would be transported to the Copper Flat Mine by DOT regulated transporters and stored on site in DOT approved containers. Spill containment structures would be provided for storage containers. Hazardous materials would be managed in accordance with regulations identified in 40 CFR § 262 Standards Applicable to Generators of Hazardous Waste.

Hazardous materials and substances that may be transported, stored, and used at the Copper Flat Mine in quantities less than the Threshold Planning Quantity (TPQ) designated by SARA Title III for emergency planning would include blasting components, petroleum products, and small quantities of solvents for laboratory use. Small quantities of hazardous materials not included in the above list may also be managed at the Copper Flat Project; such materials are contained in commercially produced paints, office products, and automotive maintenance products.

Blasting components, including ammonium nitrate and diesel fuel, would be stored onsite in bins and tanks, respectively. Detonators, detonating cord, boosters, caps, and fuses would be stored away from the batch plant in compliance with MSHA, New Mexico State Mine Inspector’s regulations, and U.S. Department of Homeland Security requirements. Exact locations for these facilities have not been selected, however, safety and security would be the main factors considered in their locations.

Management of hazardous materials at the Copper Flat Project would comply with all applicable federal, state, and local requirements, including the inventorying and reporting requirements of Title III of CERCLA, also known as the Emergency Planning and Community Right to Know Act.

All petroleum products, kerosene, and reagents used in the mill would be stored in above ground tanks within a secondary containment area capable of holding 110 percent of the volume of the largest vessel in the area. A preliminary Spill Contingency Plan (SCP) addressing the general topics presented below is presented in **Appendix E**. The SCP would be reviewed and updated at a minimum of every 3 years and whenever major changes are made in the management of these materials. Inspection and maintenance schedules and procedures for the tanks, as well as all piping connecting the facility with the tailings pond, would be set forth in sections of the SCP addressing hazardous materials and petroleum products.

Hazardous wastes other than those from the laboratory would also be managed in the short term storage facility prior to their shipment to an offsite licensed disposal facility. These materials may include waste paints and thinners. Spent solvents and used oils would be returned to recycling facilities. Waste oil and lubricants would be collected and hauled offsite by a buyer/contractor for recycling. Solvents would be collected by a subcontractor and recycled offsite.

An ongoing inventory of all materials used at the mine site and mill would be provided on a monthly basis to the appropriate federal, state, and local regulatory agencies. The local fire department would be kept informed about materials stored onsite and appropriate emergency response.

3.4.11 Spill Contingency

NMCC has developed a preliminary spill contingency plan (SCP) (**Appendix E**) to prevent and minimize the impacts of a reagent or fuel spill. This plan describes the reporting and response that would take place in the event of a spill, release, or other upset condition, as well as procedures for cleanup and disposal. The plan would be posted and distributed to key site personnel and would be used as a guide in the training of employees. Also, the plan would address mitigation of potential spills associated with project facilities as well as activities of onsite contractors. The use, transportation, and storage of reagents and fuels would be covered in the plan. The emergency reporting procedures would be posted in key locations throughout the project area. Containment structures designed to prevent the migration of a spill are included in the design of the facilities. NMCC would be responsible for events at the mine site, while contract haulers (i.e., trucking companies) would be responsible for accidents and spills along the transportation routes.

Fuel and oil for the diesel and gasoline-powered equipment would be stored in above ground, sealed tanks in the processing facilities area. The tanks would be installed on lined pads and surrounded by berms to contain the volume of the largest tank in the event of rupture.

Reporting spills or releases of certain materials to the environment may be divided into four categories: 1) those requiring internal notification only; 2) those also requiring notification to the State of New Mexico; 3) those also requiring notification to the National Response Center (NRC) and the local Emergency Planning Committee pursuant to CERCLA or Superfund; and 4) those subject to Clean Water Act requirements only. Determining which of the above categories is appropriate for any particular spill or release depends on the material spilled or released, the amount spilled or released, and the circumstances of the spill or release.

3.4.12 Monitoring

Baseline monitoring of current environmental conditions is currently being conducted in accordance with the *Sampling and Analysis Plan – Copper Flat Mine* (Intera, 2010), previously provided to the BLM under separate cover, and was developed to collect local and regional baseline information and provide the basis for monitoring of regional impacts that may result from operation of the mine. The Copper Flat Monitoring Plan would be updated as detailed engineering for the proposed mine facilities is completed, and the monitoring requirements become more defined.

3.4.13 Technical Updates

During the course of operations, NMCC would periodically review and update as necessary the geochemical and hydrogeological predictions, mine waste characterization studies, and pit lake studies to incorporate new information accumulated during operations. NMCC would review the data every five years and make updates as necessary. These updates would provide quantitative predictions of water quality during the operational and post-closure period. Mitigation would be developed as necessary.

3.4.14 Growth Media/Cover Salvage and Storage

Any suitable growth media and cover material disturbed during construction or operation would be salvaged and stockpiled. A growth media management plan would be developed prior to construction activities.

Following stripping, growth media and cover would be stockpiled within the proposed disturbance areas. Growth media/cover stockpiles would be located such that mining operations would not disturb them. The surfaces of the stockpiles would be shaped after construction with overall slopes of 2.7H:1V or shallower to reduce erosion. To further minimize wind and water erosion, the soil stockpiles would be seeded after shaping with an interim seed mix developed in conjunction with the BLM. Diversion channels and/or berms would be constructed around the stockpiles, as needed, to prevent erosion from overland runoff. BMPs such as silt fences or staked straw bales would be used as necessary to contain sediment liberated from direct precipitation.

3.4.15 Sustainability

NMCC recognizes the social and economic impacts from "boom and bust cycles" that sometimes occur in connection with the mining industry. In addition, removal of facilities that may have post-mining uses is not in accordance with the overall environmental practice of conservation. NMCC would work with the local and regional communities to identify post-mining uses of the land and facilities to enhance opportunities to sustain the economy and culture in the post-mining phase of this project.

3.5 Operating Plans

Section 3809.401 of 43 CFR requires that the following operating plans be submitted with the Plan of Operations:

- **Water management**, including stormwater management, is discussed in Sections 3.2.3 and 3.2.7 (among others).
- Mine Waste Management Plan (**Rock Characterization and Handling Plan**) is provided in **Appendix C**;
- **Quality assurance plans**, some of which are located in **Appendix F**. The remaining quality assurance plans would be submitted to BLM prior to Plan of Operations approval;
- **Spill Contingency Plan** (SCP) located in **Appendix E** and briefly discussed in Section 3.4.11;
- **Reclamation Plan** presented in Section 5.5;
- Preliminary **Monitoring Plan** [*Sampling and Analysis Plan – Copper Flat Mine* (Intera, 2010)], previously submitted to the BLM under separate cover; and
- **Interim Management Plan** presented in Section 5.15.

4 Environmental Setting

4.1 Introduction

In accordance with 43 CFR § 3809.401(c), NMCC has prepared the following baseline environmental information to assist the BLM in analyzing potential environmental impacts as required by the NEPA and to determine if the NMCC plan of operations would prevent unnecessary or undue degradation. For the most part, this section contains a summary of the environmental setting of the mine area as described in the Copper Flat DEIS (BLM, 1996) and PFEIS (BLM, 1999). Additional details on the existing environment are provided in the various environmental baseline and impact reports prepared for the site since the mid-1970s, and are available upon request.

4.2 Geology

4.2.1 Regional Geologic Setting

The Copper Flat Mine lies within the Mexican Highlands portion of the Basin and Range Physiographic Province. It is located in the Hillsboro Mining District in the Las Animas Hills, which are part of the Animas Uplift, a horst on the western edge of the Rio Grande valley (Raugust, 2003). The Animas Uplift is separated from the Rio Grande by nearly 20 miles of Santa Fe Group alluvial sediments, referred to as the Palomas Basin of the Rio Grande valley. To the west of the Animas Uplift is the Warm Springs valley, a graben that parallels the Rio Grande valley (BLM, 1999; Raugust, 2003). Further west, the Black Mountains form the backbone of the Continental Divide, rising to about 9,000 feet above mean sea level (amsl). The surface geology of the Copper Flat region is shown in **Figure 4-1**, and a schematic geologic cross section is shown in **Figure 4-2**.

Basement rocks in the area consist of Precambrian granite and Paleozoic and Mesozoic sandstones, shales, limestones, and evaporites. Sedimentary units that crop out within the Animas Uplift include the Ordovician Montoya Limestone, the Silurian Fusselman Dolomite, and the Devonian Percha Shale. The Cretaceous-age Laramide orogeny, which was characterized by the intrusion of magma associated with the subduction of the Farallon plate beneath the North American plate, affected this region between 75 and 50 million years ago (Ma). Volcanic activity during the late Cretaceous and Tertiary periods resulted in localized flows, dikes, and intrusive bodies, some of which were associated with the development of the nearby Tertiary Emory and Good Sight-Cedar Hills cauldrons (**Figure 4-3**); later basaltic flows resulted from the tectonic activity associated with the formation of the Rio Grande rift. Tertiary and Quaternary alluvial sediments of the Santa Fe Group and more recent valley fill overlie the older Paleozoic and Mesozoic units in the area.

The geologic structure of the region is characterized by block and rift faulting (**Figure 4-3**). The Tertiary cauldrons associated with the earlier block faulting formed between 35 and 45 Ma. Rift faulting and associated north-south block faulting associated with continental extension and the formation of the Rio Grande rift began approximately 25 to 30 million years (Ma). The Las Animas

Hills are bounded by faults associated with rifting (Dunn, 1982). Continental extension continues to the present, as evidenced by north-south trending grabens represented by the Rio Grande and Warm Springs valleys.

4.2.2 Geology of Copper Flat Mine Site

4.2.2.1 *Stratigraphy*

As shown in **Figure 4-4**, the dominant geologic feature of the Animas Hills and Hillsboro district is the Copper Flat strato-volcano, a circular body of Cretaceous andesite that is 4 miles in diameter (Raugust, 2003). The andesite is generally fine-grained with phenocrysts of plagioclase (andesine) and amphibole in a groundmass of plagioclase and potassium feldspar and rare quartz. Some agglomerates or flow breccias are locally present, but the andesite is generally massive. Magnetite is a common association with the mafic phenocrysts, and accessory apatite is found in nearly every thin section (Dunn, 1984).

The strato-volcano is eroded to form a topographic low; the total depth of erosion is uncertain (SRK, 2010). To the east of the site, this andesite body is in fault contact with Santa Fe Group sediments, which are at least 2,000 feet (ft) thick in the area. Near-vertical faults characterize the contacts on the remaining perimeter of the andesite body; these faults juxtapose the andesite with Paleozoic sedimentary rocks. Drill holes indicate the andesite is more than 3,000 ft thick. This feature, combined with the concentric fault pattern, indicate that the local geology represents a deeply eroded Cretaceous-age volcanic complex (Dunn, 1982).

The core of the volcanic complex is a Cretaceous-age quartz monzonite stock that intruded into the center of the andesite body. Known as the Copper Flat Quartz Monzonite (CFQM), this irregular-shaped stock underlies a surface area of approximately 0.25 square miles and has been dated to approximately 75 million years before present (Raugust, 2003; BLM, 1999; and McLemore *et al.*, 2000). The monzonite crops out in only a few isolated areas, and the andesite at these contacts shows no obvious signs of contact metamorphism (Dunn, 1984). The CFQM is a medium-to coarse-grained, holocrystalline porphyry composed primarily of potassium feldspar, plagioclase, hornblende, and biotite; trace amounts of magnetite, apatite, zircon, and rutile are also present, along with localized mineralized zones containing pyrite, chalcopyrite, and molybdenite (McLemore *et al.*, 2000). About 15 percent of the monzonite is quartz, which occurs both as small phenocrysts and as part of the groundmass; however, quartz is absent in some parts of the stock (Dunn, 1984).

Numerous dikes, mostly latite, radiate from the CFQM stock, some nearly a mile in length. Most of the dikes trend to the northeast or northwest and represent late stage differentiation of the CFQM stock (Raugust, 2003). Immediately south of the quartz monzonite, the andesite is coarse-grained, perhaps indicating a shallow intrusive phase. An irregular mass of andesite breccia along the northwestern contact of the quartz monzonite contains potassium feldspar phenocrysts and andesitic rock fragments in a matrix of sericite with minor quartz; this may represent a pyroclastic unit. Magnetite, chlorite, epidote, and accessory apatite are also present in the andesite breccia (Dunn, 1984).

The southwestern edge of the andesite body was intruded by the Warm Springs Quartz Monzonite pluton, which dates to approximately 73 Ma (Hedlund, 1974). Unlike the CFQM and the andesite, this monzonite body is not cut by the latite dikes (SRK, 2010), indicating that the dikes were emplaced prior to the Warm Springs Quartz Monzonite.

The Sugarlump Tuff (35 Ma) and the Kneeling Nun Tuff (34 Ma) unconformably overlie the local andesite flows. These tuffs erupted from the Emory caldera, and indicate that the Copper Flat volcanic/intrusive complex was buried during the Oligocene and exhumed during Miocene uplift (around 21.7 ±3.6 Ma) (Kelley and Chapin, 1997). Both the andesite and the quartz monzonite intrusions are cut by black, scoriaceous basalt dikes. These dikes remain unaltered, and appear to be associated with locally abundant Pliocene alkali basalt flows from around 4 Ma (Seager *et al.*, 1984).

4.2.2.2 ***Structure***

Three principal structural zones are present at the site and surrounding area, the most prominent of which is a northeast-striking fault trend that includes the Hunter and parallel faults. In addition, west-northwest striking zones of structural weakness are marked by the Patten and Greer faults, and east-northeast striking zones are marked by the Olympia and Lewellyn faults. All faults have a near-vertical dip; the Hunter fault system dips 80°W, and both the Olympia and Lewellyn fault systems dip between 80°S and 90°S (SRK, 2010; Dunn, 1984). These three major fault zones appear to have been established prior to the emplacement of the CFQM and controlled subsequent igneous events and mineralization (SRK, 2010).

The CFQM emplacement is largely controlled by the three structural zones. The southern contact parallels and is cut by the Greer fault, although the contact is cut by the fault, and the southeastern and northwestern contacts are roughly parallel to the Olympia and Lewellyn faults, respectively. The elongate neck of the stock parallels the Hunter fault system. Whether there was movement along the fault zones before the emplacement of the stock has not been determined (SRK, 2010; Dunn, 1984).

Although the latite dikes strike in all the three principal fracture directions, most of the dikes strike northeast. A narrow zone of fault gouge commonly occurs along the contact between the dikes and the andesite, with the mineralization post-dating fault movement (Harley, 1934). The northeast fault zones contain a high proportion of wet gouge, often with no recognizable rock fragments. Underground exposures of the Hunter fault zone (in previously existing mine workings) material has the same consistency as wet concrete and has been observed to flow in underground headings. However, the material in the east-northeast fault zones contains only highly broken rock and little obvious gouge. The width of the fault zones in both systems varies along strike from less than a foot to nearly 25 ft in the Patten fault east of the Project. Despite intense brecciation, the total displacement along the faults does not appear to exceed a few tens of feet (Dunn, 1984). At the western edge of the site, a younger porphyritic dike was emplaced in a fault that had offset an early latite dike, indicating that fault movement occurred during the time that dikes were being emplaced (Dunn, 1984).

Post-dike movement is evident in all the three principal fault zones, and both the Hunter and Patten fault systems show signs of definite post-mineral movement. Fault movement has smeared sulfide deposits and offset the breccia pipe as well as the zones within the breccia pipe. Post-mineral movement along faults has resulted in wide, strongly brecciated fault zones. Some of the post-mineral dikes have been emplaced within these fault zones (SRK, 2010; Dunn, 1984).

NMCC has mapped the pit area and diversion cuts in detail at 1 inch:40 ft (1:480) and has examined the pre-and post-mineral stress orientations in the andesites and CFQM. Findings indicate no significant difference in the stress fields before and after mineralization (SRK, 2010).

4.2.3 Description of the Ore Body

Copper Flat is an alkalic copper-gold mineralized breccia pipe, associated with and genetically-linked to an alkalic porphyry system. Copper Flat is situated along the eastern edge of the Cretaceous Arizona-Sonora-New Mexico porphyry copper belt, and, along with Tyrone, New Mexico, forms a linear mineralized feature known as the Santa Rita lineament (SRK, 2010; McLemore *et al.*, 2000). Copper Flat is the easternmost and one of the oldest known porphyry deposits in the southwestern U.S. (Hedlund, 1974; Dunn, 1982; Titley, 1982). Analogous deposits include Terrane Metal's Mount Milligan, British Colombia deposit and the Continental breccia pipe located near Hanover in the Central Mining district of New Mexico (SRK, 2010).

4.2.3.1 *Structure and Model*

Mineralization at the site is concentrated in a breccia pipe within the CFQM stock (Raugust, 2003; BLM, 1999). The eastern portion of the breccia pipe is outside the outline of the main mineralization; however, the rest of the breccia pipe is higher grade than the surrounding CFQM, hosting nearly half of the copper at the site, but only about one-third of the total resource tonnage (SRK, 2010). Drillholes spaced approximately 100 ft apart within the center of the deposit indicate the breccia pipe occurs as a single, continuous body, approximately 1,300 ft long by approximately 600 ft wide at the surface with the long axis perpendicular to the predominant northeast fracture direction. It is exposed in only a few places, but extends vertically to over 1,000 ft; veins of coarse pegmatitic material have been found at approximately 1,700 ft below ground surface (bgs) in one drillhole (Dunn, 1984).

Mineralized poly-metallic quartz veins, commonly associated with the dikes that radiate outward from the central stock, have been the target of historical mining activities in the Hillsboro district. The breccia pipe zone has been cut by numerous, randomly oriented, irregular veins that are thicker and coarser grained than the narrow fracture-controlled veinlets in the surrounding stock.

Mineralization appears to have been contemporaneous with pipe formation (SRK, 2010). The lack of rock flour or gouge in the matrix suggests that brecciation was not the result of tectonic movement, while the apparent lack of appreciable movement between the fragments and the gradational contact between the breccia and the zone of stockwork veining indicate that an explosive mechanism was not the source of the brecciation. Likewise, the process of mineralization stoping described by Locke (1926), which would have resulted in appreciable downward movement and mixing of the fragments, is not supported by field observations. Thus the mechanism responsible for the formation of the Copper Flat mineralized breccia pipe appears to be autobrecciation resulting from retrograde boiling, a phenomenon that occurs when the pressure of the mineralizing hydrothermal fluid exceeds the confining pressure (Phillips, 1973). The matrix of the breccia, the irregular veins in the surrounding crackle breccias, and the open space filling in the breccias consist of hydrothermal minerals and part of the second stage mineralization occurred as replacement, which modified the original breccia texture (SRK, 2010).

Unlike most deposits in the southwestern U.S., Copper Flat shows very little supergene enrichment or the symmetrical and telescoped zoning of alteration types that is considered typical of most porphyry copper deposits. Instead, hypogene mineralization and alteration, including the formation of the breccia pipe, was the result of the final crystallization of the CFQM melt and related dikes (SRK, 2010).

The current model used by NMCC for further exploration at the site is based on Richards (2003), who interprets the area as an eroded volcano. According to this model, mineralization occurred at similar depths to that found at El Teniente in Chile; since the Copper Flat breccia pipe now crops out at the surface, this assumption indicates that approximately 0.5 to 2 kilometers (km) of volcanic rocks have been eroded from the central zone of mineralization. Fluid inclusion work by Norman *et al*. (1989) and McLemore *et al*. (2000) suggest that the breccia pipe and veins formed at a depth of 1 to 2 km bgs and at temperatures ranging from 226° to 360°C.

4.2.3.2 *Mineralization*

During the early mining days, a 20-to 50-foot leached oxide zone existed over the ore body, but this material was stripped during the mining activities that occurred in the early 1980s. Most of the remaining ore is unoxidized and consists primarily of chalcopyrite and pyrite with some molybdenite and traces of galena and sphalerite. Appreciable amounts of silver and gold are also present (BLM, 1999; SRK, 2010). The proven and probable reserves are estimated at more than 50 million tons of ore with 0.45 percent copper (Hydro Resources, 2002).

The breccia consists largely of fragments of mineralized CFQM, with locally abundant mineralized latite where dikes exposed in the CFQM projected into the brecciated zone. Andesite occurs only as mixed fragments partially in contact with intrusive CFQM and appears to represent the brecciation of andesite xenoliths in the CFQM (Dunn, 1984). The matrix contains varying proportions of quartz, biotite (phlogopite), potassium feldspar, pyrite, and chalcopyrite, with magnetite, molybdenite, fluorite, anhydrite, and calcite locally common. Apatite is a common accessory mineral. Much of the quartz-feldspar matrix has a pegmatitic texture. Breccia fragments are rimmed with either biotite or potassium feldspar, and the quartz and sulfide minerals have generally formed in the center of the matrix (Dunn, 1984).

The andesite in contact with the CFQM, dikes, and veins is typically altered into one of three types of mineral assemblages: biotite-potassic, potassic, or sericitic alteration (Fowler, 1982). The highest copper grades are associated with the biotite-potassic alteration, which is characterized by hydrothermal biotite, potassium feldspar, quartz, and pyrite, and which occurs in veinlets and as replacement assemblages in the monzonite (McLemore *et al.*, 2000).

The total sulfide content ranges from 1 percent (by volume) in the eastern part of the breccia pipe and the surrounding CFQM to 5 percent in the CFQM to the south and west (SRK, 2010). Sulfide content is highly variable within the breccia, with portions containing as much as 20 percent sulfide minerals. Sulfide mineralization is restricted to the CFQM and breccia pipe, and drops abruptly at the andesite contact. Minor pyrite mineralization extends into the andesite along the pre-mineral dikes (SRK, 2010; Dunn, 1984). Pyrite and chalcopyrite are disseminated within the CFQM and also occur along fracture-controlled veinlets and as disseminations associated with mafic minerals. Typically, pyrite is more abundant than chalcopyrite in two areas (SRK, 2010):

- A narrow zone that surrounds and overlies the western end of the breccia pipe, which has the highest grade CFQM mineralization, characterized by abundant chalcopyrite in quartz-sulfide veinlets; and
- Outcrops to the southeast of the breccia and south of Greyback Wash, where disseminated chalcopyrite is present with no associated pyrite.

Molybdenite occurs occasionally in quartz veins or as thin coatings on fractures. Minor sphalerite and galena are present in both carbonate and quartz veinlets in the CFQM stock (Dunn, 1984).

4.3 Climate

The Copper Flat Mine lies within the belt of mid-latitude westerly winds, where the prevailing direction is from the west. Winds at the Truth or Consequences, New Mexico, airport, located about 30 miles northeast of the site, are generally from the northwest; however, the Black Range and foothills cause local variations in the winds. At Copper Flat, the wind direction is predominantly west to east, and secondarily north to south. Local wind speeds average about 10 to 15 miles per hour, although winds in excess of 50 miles per hour may occur at times. Temperature inversions are rare at Copper Flat, but are more common farther east along the Rio Grande valley, especially during the winter months. Vertical air dilution is generally good because of the area’s high surface temperatures, creating strong daytime thermal mixing. Thermal mixing and moderate winds generally tend to suppress occasional nighttime inversions. The presence of higher winds and the lack of inversions contribute to a relatively clean atmosphere at the site since any pollutants are readily mixed and dispersed (BLM, 1999).

Temperature data for the site show a wide diurnal and seasonal variability, which is typical of dry climates. The warmest temperatures occur in June and July and the coldest temperatures usually occur in December and January. In spring and fall, daily maximum temperatures are moderate, typically averaging 65 to 85 degrees Fahrenheit (°F). Nights are cooler, with low temperatures averaging 32 to 50°F. Winter temperatures are frequently below freezing at night, but can be above 50°F during the day. During summer, temperatures can approach 100°F during the day. Daily temperature fluctuations of 30°F are common throughout the year (BLM, 1999).

Precipitation at the site averages about 13 inches per year (ranging from nearly 3 inches in 1956 to over 20 inches in 1986). As much as half of the annual precipitation occurs in the form of intense thunderstorms during July, August, and September, when moist air enters the region from the Gulf of Mexico. Summer thunderstorms can result in heavy rainfall and flash floods. Average monthly precipitation in January through June is typically 0.50 inch or less. Snowfall is possible from October through April, but most likely (greater than 1 inch) between December through February (BLM, 1996).

Evaporation exceeds precipitation in southwestern New Mexico. Pan evaporation data, the most commonly collected data, are correlated with lake evaporation (i.e., free water surface evaporation) to predict evaporation from reservoirs and lakes. Lake evaporation at the site is estimated to be approximately 58 to 65 inches per year, and pan evaporation is estimated to be approximately 80 to 90 inches per year (SRK, 1995).

4.4 Hydrology

4.4.1 Surface Water

The Copper Flat area falls within the Lower Rio Grande watershed, as defined by the New Mexico Water Quality Control Commission (WQCC). This watershed includes approximately 5,000 square miles in Catron, Socorro, Sierra, and Doña Ana Counties and is dominated by the Rio Grande and its tributaries as well as the two large reservoirs of Elephant Butte and Caballo. Numerous ephemeral tributaries feed into the Rio Grande from the west, but none contribute perennial flow to the Rio Grande.

The following sections provide background information about surface water resources in the vicinity of the Copper Flat Mine, and summarize pertinent historical data related to surface water sampling.

4.4.1.1 *Surface Water Characteristics of Site and Vicinity*

The site is drained by ephemeral streams (arroyos) within the Greenhorn Arroyo drainage basin, a 6th level sub-watershed defined by the Hydrologic Unit classification system (Seaber *et al*., 1987) that drains 29,414 acres of land on the eastern slope of the Animas Uplift to a single outlet into the Rio Grande (**Figure 4-5**). Flows within the Greenhorn Arroyo drainage basin are ephemeral, as they only occur in direct response to precipitation. As a result, this drainage, similar to others in the region, does not contribute any perennial surface water flow to the Rio Grande.

Numerous arroyos contribute to the trunk channel of Greenhorn Arroyo. Of these, Greyback Wash is the primary drainage through the site. Greyback Wash originates west of the site and drains eastward along the site axis until it converges with the trunk channel of Greenhorn Wash approximately 8 miles east of the site boundary (**Figure 4-5**). In pre-mining times, Greyback Wash drained directly through the mine area, but was later re-routed around the southern perimeter of the mine area for flood control purposes (Raugust, 2003). Newcomer and Finch (1993) measured flow rates in Greyback Wash of 12.5 gallons per minute (gpm) in March 1993 at a point east of the pit and former plant site. Three seeps have been identified along Greyback Wash (BLM, 1999). One seep with riparian vegetation is located near a buried storm water collection pond, a second is located downstream from the first seep and supports a small cottonwood/willow stand, and the third is south of the operations area (**Figure 4-5**).

Two creeks drain basins directly to the north and south of the Greenhorn Arroyo drainage basin: Las Animas Creek in the north and Percha Creek to the south (**Figure 4-5**). Both Las Animas and Percha Creeks have ephemeral, intermittent, and perennial reaches. Stream flow in Las Animas Creek varies from perennial to intermittent from the area near sampling site MAS (**Figure 4-5**) to Caballo

Reservoir (BLM, 1999). For example, Davie and Spiegel (1967) show flow rates ranging from about 450 to 900 gpm in the upper reach (T14S R7W, Sections 34 through 36, near sampling sites LAC-A and LAC-B in **Figure 4-5**) and middle reach (within T15S R5W) of the creek; according to Davie and Spiegel, these reaches are "losing reaches" of the creek. Stream flow in Percha Creek is intermittent in the Hillsboro reach and perennial in the area known as the Percha Box, a steep-walled reach of the drainage that has incised into Paleozoic bedrock (BLM, 1996) (**Figure 4-5**). SRK (1995) reported measurable stream flows just east of the Percha Box of roughly 200 to 250 gpm. This was the only reach of Percha Creek with measurable flows during the SRK sampling period. Though both Las Animas Creek and Percha Creek have perennial reaches, neither creek contributes perennial flow to the Lower Rio Grande Basin.

Two springs are located within the Greenhorn Arroyo drainage basin to the north and west of the site (**Figure 4-5**). Other unnamed seeps occur in the pit walls surrounding the pit lake after precipitation events; these are likely the result of fractured flow through the bedrock exposed in the pit wall. Several springs in the Percha Creek basin and one in the Las Animas Creek basin have been identified for sampling, but have been studied less than those within the Greenhorn Arroyo basin. As a result, there is little information on their flow rates or quality, although Newcomer and Finch (1993) did attempt to measure flow.

The open pit that was mined during the early 1980s now contains a lake. Since 1989, the pit lake has been sampled for water quality at various locations and depths, including samples collected by past operators of the mine, state regulatory agencies, and academic researchers studying the mine (BLM, 1999).

4.4.1.2 *Historical Data*

Existing surface water data relevant to the NMCC sampling plan are discussed in this section. Surface water at the site was most recently investigated by SRK (1995), who collected flow and water quality from Percha Creek and Las Animas Creek. Newcomer *et al.* (1993) performed a hydrologic assessment of the Greenhorn Arroyo drainage basin, measuring flow and water quality along Greyback Wash and at a number of seeps and springs. The oldest known surface water investigation at the site was performed by Davie and Spiegel (1967), who collected flow data for Las Animas Creek. Results of these investigations were compiled by Raugust (2003) and are also summarized in PFEIS (BLM, 1999).

4.4.1.2.1 Volumetric Flow

4.4.1.2.1.1 Streams

Flow rate data for streams at the site are limited by the generally intermittent nature of flows. Measurements of flows were made by Newcomer *et al*. (1993) and Adrian Brown Consultants (1996). Additional historical measurements were compiled in the PFEIS (BLM, 1999). These data are summarized in the *Sampling and Analysis Plan – Copper Flat Mine* (Intera, 2010), provided to the BLM under separate cover.

Greyback Wash is an ephemeral stream and generally flows only during periods of snow melt or rain events. Flow rates in Greyback Wash at SWQ-3 (**Figure 4-5**) were measured by Newcomer *et al*. (1993) to be 12.5 gpm (0.028 cubic feet per second [cfs]) in March of 1993.

Two measurements of flow rate are recorded for Las Animas Creek. Davie and Spiegel (1967) reported flows of between 1.0 and 2.0 cfs in the creek's upper reaches and between 1.0 and 1.5 cfs in its middle reaches (BLM, 1999). Adrian Brown Consultants made a single flow measurement of 245 gpm (0.546 cfs) at LAC-E (**Figure 4-5**) in 1996.

Volumetric flow in Percha Creek was measured at 13 locations by Adrian Brown Consultants (1996), from approximately ¼ mile upstream of the entry to Percha Box to approximately 5 miles downstream of the exit from Percha Box. Flow was found to be localized, occurring within and immediately to the east of Percha Box, and ranging from 456 gpm (1.02 cfs) to 119 gpm (0.265 cfs), with many reaches dry or with standing water only.

4.4.1.2.1.2 Springs and Seeps

Spring and seep flow rates are infrequently reported in the available literature for the site and surrounding areas. Several springs and seeps have been identified within the Greenhorn Arroyo drainage basin. Two springs, identified as BG-1 and BG-2, are located to the north and west of the site (**Figure 4-5**) and several unnamed seeps occur in the walls surrounding the pit lake. BG-1 and BG-2 were judged by Newcomer *et al*. (1993) to be ephemeral. The seeps along the pit walls are observed to flow in response to precipitation events, and, as mentioned above, are likely the results of fractured flow through the bedrock exposed in the pit wall. All known springs and seeps in the Greenhorn Arroyo drainage basin are upgradient of the proposed mine water discharge location. Other seeps and springs shown in **Figure 4-5** have not been measured in the past and thus have no associated historical flow information.

4.4.1.2.2 Water Quality

4.4.1.2.2.1 Streams

The surface water chemistry of Greyback Wash was initially investigated in 1977 at three locations as part of an environmental assessment prepared by the BLM in response to an application by Quintana Minerals Corporation for an open pit copper mine at the site (BLM, 1978). The three locations sampled in 1977 generally correspond to the sampling locations proposed in **Figure 4-5**, with one location upstream of the permit boundary, one within the site approximately 300 yards from the mine rim, and a third located where the arroyo leaves the site (BLM, 1978). Water samples were collected in January, March, and July of 1977.

WQCC standards for metals were not exceeded at any location in any of the 1977 sample events. Results for pH (7.6–8.1) were in the same range as samples collected later at these three locations. Total dissolved solids (TDS) results upstream of the site (720–1000 milligrams per liter [mg/L]) were comparable to those of samples collected later, but samples taken at locations within and downstream of the site were comparatively lower (800–1,320 mg/L) than the results for later sampling events such as those conducted by Newcomer *et al.* (1993) at SWQ-1 (upgradient of the pit lake), SWQ-2 (downgradient of the pit lake but within the area of mining disturbance), and SWQ-3 (approximately 1 mile downgradient of the pit lake) (**Figure 4-5**). Field parameters measured by Newcomer *et al*. are shown in Table 8-1 of the *SAP* (Intera, 2010). Water quality in Greyback Wash upstream of the pit lake at SWQ-1 had a pH ranging from 7.4 to 8.3, sodium at 107 milligrams per liter (mg/L), bicarbonate values ranging from 400 to 500 mg/L, sulfate ranging from 275 to 300 mg/L, and TDS ranging from 780 to 965 mg/L. At SWQ-2, sodium concentration increased from the previous sampling event by BLM to 270 mg/L, sulfate increased to between 1,150 and 1,650 mg/L, TDS increased to between 2,300 and 3,300 mg/L, and pH and metal concentrations remained essentially unchanged. Water quality indicators at SWQ-3 fell within the range of values at SWQ-2.

Las Animas Creek water quality was examined by Adrian Brown Consultants (1996) and for the PFEIS (BLM, 1999). Adrian Brown Consultants obtained a single sample at LAC-E, with a pH of 7.81, sulfate concentration of 18 mg/L, and TDS of 300 mg/L. The PFEIS reports that Las Animas Creek water quality is dominated by calcium or sodium bicarbonate, with pH in the range 7.0 to 8.0, sulfate in the range 20 to 70 mg/L, and TDS in the range 300 to 400 mg/L. Occasionally, sodium and chloride are higher, with chloride concentrations as high as 300 to 400 mg/L, possibly due to agricultural practices along the creek (BLM, 1999).

Percha Creek water quality was examined by Adrian Brown Consultants (1996) and for the PFEIS (BLM, 1999). Adrian Brown Consultants sampled Percha Creek at the entry and exit to Percha Box, and 5,000 feet (ft) downstream from the exit from Percha Box, and measured field parameters at all seven locations in which water was found [Table 8-1 of the SAP (Intera, 2010)]. For the three samples submitted for laboratory analysis, pH ranged from 7.62 to 7.82, sulfate ranged from 63 to 71 mg/L, and TDS ranged from 336 to 406 mg/L. The PFEIS (BLM, 1999) reports that surface water flowing in Percha Creek has a chemistry dominated by calcium bicarbonate, with pH in the range of 7.0 to 8.0, sulfate in the range of 20 to 70 mg/L, and TDS in the range of 300 to 400 mg/L.

Sampling of the Caballo Reservoir, the receiving water for these drainages, during November 1994, showed the water to be dominated by sodium bicarbonate with bicarbonate values of 180 mg/L and sulfate values of 110 mg/L (SRK, 1995). As summarized in the PFEIS (BLM, 1999) chloride values were less than 100 mg/L and TDS was 440 mg/L. The water chemistry was within WQCC standards for metals, sulfate, chlorine, pH, and TDS. As a comparison, water samples from the Rio Grande at EI Paso, Texas were sodium sulfate-dominated with high TDS in the range of 800 to 1,000 mg/L, sulfate values of 200 to 340 mg/L, and bicarbonate values of around 100 mg/L (Wilson *et al*., 1981).

4.4.1.2.2.2 Springs and Seeps

Newcomer *et al*. (1993) sampled the BG-1 and BG-2 springs in April 1993 and Adrian Brown Consultants observed and sampled seeps in the pit wall in August 1997 (ABC, 1997). Field parameters and water chemistry analytical data for these locations are presented in Table 8-1 of the *SAP* (Intera, 2010), respectively. Samples from BG and BG-2 had pH ranging from 8.0 to 8.2, sodium ranging from 90 to 124 mg/L, bicarbonate ranging from 411 to 535 mg/L, sulfate ranging from 184 to 228 mg/L, and TDS ranging from 680 to 690 mg/L. The pit wall sample had a pH of 8.16, a sulfate content of 3,100 mg/L and TDS of 5,020 mg/L. On the basis of these results, ABC (1997) judged BG and BG-2 to be qualitatively similar to the Greyback Wash sample location SWQ-

1, while the pit wall location appears to have been subject to a similar process as the locations at SWQ-2 and SWQ-3.

4.4.1.2.2.3 Pit Lake

The 12.8-acre lake that has formed in the existing pit (**Figure 4-6**) is estimated to be about 40 ft deep, based on a pit bottom elevation of 5,380 ft above mean sea level (amsl) and water level elevation of 5,420 ft amsl as measured in 1986 (SRK, 2010). The water quality of the pit lake has been sampled at various depths and locations since the initial samples were collected on April 13, 1989, by the New Mexico Environment Improvement Board (Raugust, 2003); the latest samples were collected in January 2010. Raugust (2003) concluded that the collective data show several trends in the variability of water quality over time, mainly that evapo-concentration and buffering processes are influencing the quality of the lake water. Pit water has historically exceeded the WQCC standards for sulfate, chloride, TDS, manganese, and uranium (20.6.2.4103 of the New Mexico Administrative Code) and has occasionally dropped below the regulatory pH range of 6 to 9 s.u.

Analytical results of samples collected from 1989 to 1998 suggest that sulfate, chloride, TDS, manganese, and pH all increased over this period. For example, sulfate increased from a range of 2,250 to 3,000 mg/L to a range of 3,500 to 4,300 mg/L over this time period. Chloride increased from an average of around 100 mg/L to around 250 mg/L, which may be attributed to lower average annual precipitation and higher annual temperatures during this period (BLM, 1999). However, the sulfate-to-chloride ratio dropped during this time period, suggesting that sulfate rose at a slower rate than chloride due to the formation of gypsum and the subsequent buffering of the sulfate concentration in pit lake water by gypsum (gypsum is observed along the margins of the pit lake during the summer months, when the pit lake level has dropped). TDS ranged from 2,700 mg/L in 1991 (Newcomer *et al*., 1993) to about 6,000 mg/L in 1998 (Raugust, 2003). Manganese ranged from 1.8 to 4.3 mg/L (BLM, 1999). The measured pH values have generally increased over time to about 8.0 s.u. However, in 1992 and again in 2008, pH decreased to 4.4 and 4.5 (NMED GWQB, 2008), respectively, deviating from the overall trend of elevated pH values. The overall rise in the pH may be due to buffering by wall rock or groundwater alkalinity. There is no historical data available for uranium, other than a sample collected in 2004 that showed the water exceeded the WQCC standard (NMED GWQB, 2008).

Variability in the methods, locations, and depths from which samples were collected may explain many of the differences observed in pit water quality results. However, samples collected in January 2010 confirm that concentrations of sulfate, chloride, TDS, and manganese have increased. The 2010 sampling yielded a sulfate concentration of 5,200 mg/L, chloride concentration of 390 mg/L, TDS concentration of 7,770 mg/L, and manganese concentration of 41 mg/L, all of which were higher than previous measurements from the 1989 to 1998 period. In addition, concentrations of aluminum, copper, cobalt, iron, and fluoride in the 2010 sample all exceeded WQCC standards. In contrast, pH, the most widely variable parameter measured during the 1989 to 1998 period, was 6.3 in January 2010, within the acceptable range of 6 to 9.

Other key studies that discuss the water quality are summarized in SRK (1997) and include hydrogeologic and hydrogeochemical studies (SRK, 1995), post-closure pit water balance model calculations (SRK, 1997), water quality and host-rock geochemical studies (SRK, 1997), and post-hearing submittals that followed the 1997 New Mexico Mine Permit public hearing.

4.4.2 Groundwater

Groundwater is a major supply of water for domestic, agricultural, mining, and industrial use in southern New Mexico. The high evaporation rate during the long, hot summers coupled with low average annual precipitation in the area result in surface waters being an unreliable source of water on a year-round basis. The Rio Grande is the only significant nearby surface water resource. Intermittent streams that feed the Rio Grande, such as Las Animas Creek and Percha Creek in the site area, are local sources of water for at least part of the year. The Rio Grande and associated shallow alluvial deposits of its inner valley also served as the ultimate discharge zone for pre-development groundwater flow from the adjacent Greenhorn Arroyo, Las Animas Creek, and Percha Creek drainage basins (Hawley *et al*., 2005, Wilson *et al*. 1981). Additional water comes from shallow domestic and agricultural wells. This section provides a description of the regional and local groundwater along with a proposed sampling and analysis approach to characterizing baseline conditions of groundwater resources.

4.4.2.1 *Regional Hydrogeology*

The site is located in the Lower Rio Grande Underground Water Basin (LRGB), which extends from Elephant Butte Dam to the Texas Border near El Paso and is one of New Mexico's principal agricultural regions (**Figure 4-7**). The LRGB was declared by the NM State Engineer on September 11, 1980. As a result, the underground waters of the LRGB are administered by the State Engineer. A water master district that encompasses the Hot Springs, Las Animas Creek, and Lower Rio Grande Underground Water Basins was created to assist with water administration in the region.

Groundwater in the LRGB generally flows from the highlands on either side of the basin through bedrock and valley alluvium to the center of the basin and to the Rio Grande. **Figure 4-8** illustrates the conceptual model of groundwater flow at the site. The bedrock aquifer in the Paleozoic sedimentary rocks are recharged by rainfall and snowmelt through bedrock faults and bedding planes exposed in the highlands west of the Project site. This water generally flows along a hydraulic gradient toward the approximate center of the Rio Grande Valley. Occasionally, this deep regional flow discharges at the ground surface as springs along faults where the Paleozoic bedrock crops out within the valley. This occurs in at several locations within the Las Animas Creek and Percha Creek drainage basins (**Figure 4-9**). The water table elevation near the existing pit lies at approximately 5,450 to 5,500 feet (ft) above mean sea level (amsl). Groundwater near Caballo Reservoir lies at about 4,200 ft amsl, indicating a drop of 1,300 ft over approximately 14 to 15 miles.

Valley alluvium is generally recharged by precipitation along mountain fronts where the alluvial fans are exposed and by streams that flow out of the highlands and lose water to the alluvium as they flow toward the Rio Grande. Many intermittent streams in the area are "losing streams" over at least part of their courses and provide recharge to the alluvial groundwater system. This alluvial groundwater then flows downgradient to the Rio Grande.

4.4.2.1.1 Hydrogeology of the Permit Area

Three aquifers exist in the project area, as shown schematically on **Figure 4-8**. The deepest aquifer is the crystalline bedrock aquifer that receives water from the highlands to the west of Animas Peak and carries this water along bedding planes, faults, and solution cavities toward the center of the LRGB. The crystalline bedrock aquifer consists of Cretaceous andesite and monzonite breccias underlain by Paleozoic rocks in the Animas Uplift area, Tertiary volcanic rocks to the west of the pit lake in the graben associated with the Animas uplift, and Paleozoic sedimentary rocks to the east of the pit lake area in the Palomas Basin. The Santa Fe Group aquifer system, which consists of interbedded sandstones, silts, and clays, overlies the Paleozoic bedrock units to the east of the pit lake area within the Palomas Basin. This aquifer system receives water from precipitation and from the losing reaches of streams. The uppermost aquifer at the site is the Quaternary alluvial aquifer along Las Animas and Percha Creeks (**Figure 4-9**). This alluvium is up to 40-ft thick in the Las Animas Creek area and carries water that is in hydraulic equilibrium with the water flowing in Las Animas Creek (BLM, 1999). The Percha Creek alluvial aquifer is less studied than the Las Animas Creek alluvial aquifer, and as a result, less historical data about its aquifer characteristics are available. The aquifers of greatest importance in terms of water supply in the area are within the Palomas Basin to the east of the pit lake and include the intermediate Santa Fe Group aquifer system and the alluvial aquifer associated with Las Animas Creek.

Figure 4-10 from the Adrian Brown Consultants (ABC) (1998b) presents a piezometric contour map showing the general configuration of groundwater level elevations at the site as interpreted at that time. Groundwater levels near the existing pit are approximately 5,450 ft amsl, and at Caballo Reservoir, the levels are about 4,200 ft amsl. The map indicates that groundwater flow is generally to the east toward Caballo Reservoir. Hydraulic gradients are relatively large (closely spaced contours) in the western portion of the site, reflecting lower transmissivity in the bedrock aquifer and in the western portion of the Palomas Basin in the Santa Fe Group aquifer system. The wider spacing of contours in the eastern portion of the site suggests that transmissivity of the Santa Fe Group aquifer increases toward Caballo reservoir. The widest spacing of contours (highest transmissivity) appears to occur in the area of the groundwater production well field (wells PW-1, 2, 3, and 4 on **Figure 4-10**). This area coincides with an interpreted graben structure, which reflects an increased thickness of the Santa Fe Group in this area.

4.4.2.1.2 Aquifer Characteristics in the General Plan Area

4.4.2.1.2.1 Crystalline Bedrock Aquifer Characteristics

Groundwater within the Hillsboro Mining District and the area of the present open pit occurs in andesitic volcanic rocks and quartz monzonite breccia intrusive rocks (**Figure 4-8**). The current pit lake was reported by SRK (1997) to be at an elevation of 5,442 ft amsl, which is about 50 to 100 ft below the pre-mining ground elevation [5,500 to 5,540 ft amsl reported in the PFEIS (BLM, 1999)].

Groundwater levels measured in the pit and tailings areas as of 1997 are shown on **Figure 4-11**. Newcomer *et al*. (1993) reported a pre-mining (1981) water level of 5,370 ft amsl in well GWQ-5, which is approximately 4,000 ft east-southeast from the pit and within the old plant site area. These authors also reported a water level of 5,360 ft amsl in the Hillscher West well (GWQ-6), which lies approximately 2,500 ft southeast from well GWQ-5. These limited groundwater elevation data suggest that the groundwater gradient in the andesitic volcanic rocks may be to the east or southeast from the current pit lake area as shown on **Figure 4-11**. Within 500 ft of the pit lake (see **Figure 4-12**), however, groundwater gradients are toward the pit lake, which may act as a local evaporative sink (BLM, 1999).

In January 2010, NMCC resurveyed the pit lake and as many of the groundwater monitoring wells established for the PFEIS as could be located. The pit lake elevation was 5,444 ft amsl in January 2010, revealing that the pit lake elevation remains below the pre-mining water level elevation of 5,500 to 5,540 ft amsl.

4.4.2.1.2.2 Santa Fe Group Aquifer System

Overview

Overlying the crystalline bedrock aquifer at the Project site is the Santa Fe Group aquifer system, a system that is locally represented by two hydrostratigraphic units (HSUs): (1) the Upper Santa Fe Group hydrostratigraphic unit (USF), and (2) the Middle Santa Fe Group hydrostratigraphic unit (MSF). As defined by Hawley and Kennedy (2004), these hydrostratigraphic units are mapable bodies of basin and valley fill that are grouped according to genesis and position in both lithostratigraphic and chronostratigraphic sequences. Informally, these HSUs comprise the major basin-fill aquifer zones, and correspond roughly to the upper (Palomas) and middle (Rincon valley) lithostratigraphic subdivisions of the Santa Fe Group used in local and regional geologic mapping (Hawley and Kennedy, 2004).

The Santa Fe Group is composed chiefly of coalescing alluvial fan deposits that are discontinuous and locally heterogeneous with inter-bedded sandstones, silts, and clays of varying percentages. The Upper Santa Fe Group Palomas Formation (Lozinsky and Hawley, 1986) represents the USF at the site. This formation grades eastward from the Animas Uplift from coarse alluvial fan material to braided-stream and deltaic sands and silts to clays near the Rio Grande. The interfingering with clays begins approximately 3 to 5 miles west of the current position of the Rio Grande and is responsible for the flowing wells common in this part of the site (Murray, 1959; **Figure 4-8**). A basalt flow dated at 4.2 million years before present caps the Palomas Formation gravels near Copper Flat (Seager *et al*., 1984).

The Middle Santa Fe Group Rincon Valley Formation (Seager and Hawley, 1973) is exposed near Hillsboro, New Mexico, where the reddish-brown clays and clayey silts characteristic of this basal unit are interbedded with basalts dated at 28 million years before present (Seager *et al*., 1984). The Rincon Valley Formation represents the MSF at the site and generally contains water, but the yield is low due to the low hydraulic conductivity of the clays. The Rincon Valley Formation lacustrine red clays underlie the Palomas Formation and thicken southward toward Hatch, New Mexico, and the Rincon Basin (Wilson *et al*., 1981).

Tailings Dam Vicinity

The existing tailings impoundment facility overlies the old placer workings of Greyback Wash and Hunkidori Gulch (**Figure 4-9**). A study of these placer workings by Segerstrom and Antweiler (1975) showed that the placers were found in paleo-stream terrace alluvium approximately 25 to 30 ft thick that is underlain by a calcium carbonate horizon and reddish-brown clay. SRK (1995) and SHB (1980) confirmed and expanded the areal extent of this reddish-brown clay layer and determined that the top of the Palomas Formation is stratigraphically below the red clay layer. According to the studies completed by SRK and SHB, the clay layer and the 25 to 30 ft of paleo-stream terrace gravels that lie above the clay, have restricted the downward migration of water draining from the eastern half of the existing tailings. This clay layer has enabled a mound of water beneath the tailings impoundment to develop. This mounding of water, due to drainage of the existing tailings and meteoric infiltration over the years, became evident in some tailings dam monitor wells completed above the clay layer. The central and western sections of the existing tailings facility appear to communicate hydrologically with the USF that lies beneath the tailings area because the clay zone thins and disappears in this area, as shown in **Figure 4-13**. Groundwater issues as a result of tailings deposition by the previous operator are currently being dealt with through the Stage 1 Abatement Plan for the NMED. Further impacts would be mitigated by NMCC's proposed use of a synthetic liner system to prevent the downward migration of tailings seepage water.

The thickness of the Palomas Formation increases locally over a graben structure (labeled Dutch Gulch in **Figure 4-2**), which is reflected in higher transmissivity and relatively low hydraulic gradients in the USF. Based on a 7-day aquifer pumping test (ABC, 1996), the transmissivity of the USF in the tailings dam area is about 187 ft^2/day. East of the tailings area (see **Figure 4-2**) is a 10- to 30-foot thick clayey sand and gravel layer, underlain by a 25- to 100-foot-thick clay layer, which in turn is underlain by a silty sand and gravel layer (SRK, 1995). The lower silty sand and gravel layer is considered by ABC (1996) to be the USF and, based on drilling information, has a thickness of at least 200 ft. The hydraulic gradient in this area is about 30 ft per mile.

East of the graben structure, labeled as Dutch Gulch in **Figure 4-2**, the Palomas Formation (labeled Tsfp) thins and is interpreted to have significantly reduced transmissivity. The hydraulic gradient in this area ranges from about 130 to 330 ft/mile. The contact between the Palomas Formation and the underlying Rincon Valley Formation clay unit (labeled Tsf in **Figure 4-2**) is a highly irregular depositional contact. Locally, the Palomas Formation (USF) may be unsaturated, with the water table existing in the underlying Rincon Valley Formation (MSF) (BLM, 1999).

Production Well Field Vicinity

Farther to the east, the hydraulic gradient decreases from 330 ft/mile to about 34 ft/mile in the vicinity of the production well field (identified as PW wells on **Figure 4-14**). This suggests a progressive increase in transmissivity toward the area of the production well field. A graben structure below the production well field locally increases the thickness of the Palomas Formation to as much as 1,000 ft (**Figure 4-2**). The transmissivity of the USF in the production well field area ranges from about 2,675 to 5,750 ft^2/day (SRK, 1995). Farther to the east, towards Caballo Reservoir, sands and gravels in the Palomas Formation are interbedded with clays of the ancient Rio Grande. As a consequence, the transmissivity decreases slightly and the hydraulic gradient Increases to 45 ft/mile. In this area, the USF appears to be confined, leading to artesian flow in wells along the lower reaches of both Las Animas Creek and Percha Creek.

Although the Palomas Formation is described as “sand and gravel” (Davie and Spiegel, 1967), there exist numerous discontinuous clay layers within the sequence. This causes the bulk vertical hydraulic conductivity of the USF to be much lower than the horizontal conductivity. As a consequence, groundwater in deeper portions of the USF can be semi-confined, leading to relatively high vertical hydraulic gradients. The low vertical hydraulic conductivity has two important effects on the groundwater flow system. First, within about 4 miles of Caballo Reservoir, confinement of groundwater is sufficient to create artesian conditions in deeper portions of the USF. Wells drilled to these depths have groundwater levels aboveground surface and produce flowing wells, the locations of which are shown on **Figure 4-14**. Flow rates for uncapped wells range between a few gallons per minute (gpm) to as high as 40 gpm.

The second effect of low vertical conductivity is to reduce downward leakage between the Quaternary alluvial aquifer in the Las Animas Creek drainage basin and the underlying USF. At the location of monitoring wells MW-9, 10, and 11, north of the production well field, the groundwater level in the USF is some 58 ft lower than the water level in the overlying Quaternary alluvial aquifer (ABC, 1996). This results in a downward vertical hydraulic gradient from the Quaternary alluvial aquifer in the vicinity of Las Animas Creek drainage basin to the USF approaching 1 ft/ft. Such downward gradients are interpreted to occur along a substantial length of Las Animas Creek (ABC, 1996). In spite of these gradients, the amount of surface water loss from the Quaternary alluvial aquifer in the Las Animas Creek drainage basin is not significant; suggesting that vertical hydraulic conductivity in the USF is relatively low. Analytical calculations (ABC, 1997) suggest that if the vertical conductivity were much greater than 1 ft/year (10^{-6} cm/second), the Las Animas surface water system would lose essentially all of its water and become an intermittent stream, which clearly does not occur.

The hydraulic connection between the USF and the alluvial aquifer of the Rio Grande has not been evaluated, but groundwater gradients at the site strongly suggest that water flows from the Palomas Formation to the floodplain alluvium of the Rio Grande.

An aquifer pumping test conducted at the locations of monitor wells MW-9, 10, and 11 suggests that the vertical conductivity of the USF is low in this area (ABC, 1997). Pumping of the wells screened in the USF at this location did not affect a well screened in the Quaternary alluvial aquifer in the Las Animas Creek drainage basin, even though the well screened in the USF had 22 ft of drawdown. Also, monitoring of water levels along Las Animas Creek by Alta (Goff, 1998) for wells screened in both aquifers showed that fluctuations in water levels observed in shallow wells (those screened in the Quaternary alluvial aquifer) are not mirrored in the deeper wells (wells screened in the USF). These data are presented in Appendix A-2 (Table A2-10) of the PFEIS (BLM, 1999).

4.4.2.1.2.3 Quaternary Alluvial Aquifer

The uppermost aquifer at the site is the Quaternary alluvial aquifer, which is composed of channel and floodplain gravels, sands, and silts. Locally, these units are generally 30 to 50 ft thick near the mouths of Las Animas and Percha Creeks (Davie and Spiegel, 1967). Cores from monitoring wells drilled along Las Animas Creek indicate that upper alluvial gravels extend from the surface to a depth of approximately 20 to 60 ft depending on the location along the creek (BLM, 1999). There are fewer data available for the thickness of these deposits in and along Percha Creek.

The Las Animas alluvial aquifer consists of local alluvial deposits adjacent to and underlying Las Animas Creek. Groundwater in this narrow, sinuous aquifer is in direct hydraulic communication with Las Animas Creek surface water. Surface water in the creek and groundwater in the aquifer form a single surface-to-groundwater flow system. Surface water flow from one location to the next may be related, in part, to the proportion of total system flow being carried by the aquifer at each location. Along its course, the Las Animas alluvial aquifer receives recharge by rainfall infiltration. Discharge from the aquifer occurs through evaporation and evapo-transpiration from riparian vegetation and existing well pumping. Between the Saladone well and an area of the Lower Animas Artesian well (**Figure 4-14**), the aquifer loses water to the underlying Palomas Basin alluvial aquifer by slow downward seepage. The total flow rate for surface flow plus flow in the alluvium of the creek drops from around 1,800 to 1,900 gpm to around 1,100 gpm, a loss of 800 gpm over the 8-mile stretch of creek bed. The loss is consistent with slow downward seepage of water at a rate of around 1 foot/year (ABC, 1997). This is the approximate saturated hydraulic conductivity of clay. In the area of the Lower Animas Artesian (**Figure 4-14**) the Las Animas surface/groundwater system may receive recharge from the USF. At Caballo Reservoir, all water in the Las Animas surface/groundwater system discharges to the reservoir. The nature of artesian conditions in the Percha Creek drainage basin have not been studied in as much detail, and therefore less historical data are available.

Upstream of the artesian wells, Las Animas Creek, the alluvial aquifer can be “perched” above the water table in the Santa Fe Group aquifer system by 20 to 60 ft of unsaturated to partially saturated alluvial sediments (SRK, 1995; ABC, 1997). The alluvial aquifer along Las Animas Creek in the lower reaches loses water to the Santa Fe Group aquifer system by slow downward seepage. The upper reach of Las Animas Creek near the Saladone Well (**Figure 4-14**) also may be perched above the intermediate aquifer (Minton, 1961).

4.4.2.1.3 Existing Baseline Groundwater Information

An enormous amount of site characterization data are available for the Project site because the mine was active in the past and was characterized by previous operators that either mined the site or worked on permit applications to mine the site. These historical data would be used in conjunction with the baseline groundwater quality data that would be collected under the procedures set forth in the *SAP* (Intera, 2010) to provide as thorough an understanding as possible of groundwater quality conditions prior to the re-initiation of mining at Copper Flat. Key resources that contain data to be used for the baseline groundwater analysis include: Groundwater monitoring well exceedences provided by SRK (2010); the *SAP* (Intera, 2010); the PFEIS (BLM, 1999); the Hydrologic Assessment, Copper Flat Project Sierra County, New Mexico (Newcomer *et. al*, 1993); and The Natural Defenses of Copper Flat, Sierra County, New Mexico (Raugust, 2003). Proposed monitoring well locations are provided in **Figure 4-15**. A brief summary of the data available in these key reports follows.

The PFEIS (BLM, 1999) provides a summary of groundwater quality data. Summary tables for key wells and key constituents are provided in Table 9-2 of the *SAP* (Intera, 2010). The wells identified in this study are illustrated in **Figure 4-14**. The PFEIS (BLM, 1999) concluded that groundwater quality at the site was good and generally useable for domestic and agricultural purposes. This document also concluded that past mining in the Hillsboro District, the Copper Flat Mine tailings facility drainage, and the presence of an oxidized sulfide-bearing ore body have impacted groundwater within and immediately adjacent to the area of past mining, resulting in elevated total dissolved solids (TDS) and sulfate that exceed New Mexico Water Quality Control Commission (WQCC) Standards. These impacts were found to be localized within the immediate vicinity of the mine features or associated with wells completed in the ore body.

Newcomer *et al.* (1993) determined that the quality of groundwater at the site has changed little since the early 1980s and probably since the 1800s. The authors found that there have been some increases in TDS and sulfate in some wells along Greyback Wash below the mine site and down-gradient of the tailings dam, associated with mining and milling activities in the 1980s. Newcomer *et al*. (1993) determined that the only constituents exceeding the WQCC Standards were barium from a spring sample, and, cadmium and fluoride from a pit lake water sample.

Raugust (2003) compiled historical groundwater data and summarized groundwater quality conditions and, based on his data compilation and analysis, concluded:

- Groundwater pH measurements both up and downgradient of the pit lake range from 7 to 8.2.
- TDS and sulfate values are less than WQCC standards in the wells evaluated for this analysis; however, samples downgradient of the mine have increased gradually over time and are approaching the standards for TDS.
- Historical sampling of well GWQ-5, located east and downgradient of the pit lake, indicates that water quality in the vicinity of the pit lake may have been affected naturally by the presence of the ore body prior to mining in 1982.
- The groundwater upgradient of the mine pit lake is high quality with relatively high proportions of chloride and sulfate. Groundwater downgradient of the pit lake shows relatively higher proportions of bicarbonate and calcium and relatively lower proportions of sulfates.
- Pre-Quintana mining (June 15, 1981) groundwater data collected from wells downgradient of the pit lake show similar anions and cation distributions to post-Quintana mining activities (1996 and 1998). This indicates that groundwater quality downgradient of the ore body reflects the natural weathering of the Copper Flat porphyry system.

4.4.2.1.4 NMED Stage 1 Abatement Plan Requirements

On August 20, 2008, the NMED sent a letter to the site owner at that time requiring a Stage 1 Abatement Plan (20.6.2.4101 NMAC). The purpose of the Stage 1 Abatement Plan is to provide the data necessary to select and design an effective abatement alternative. The requirements for the Stage 1 Abatement Plan are described in 20.6.2.4106 NMAC. The abatement plan proposal must include an investigation to define the extent and magnitude of any existing groundwater and surface water contamination and to characterize the hydrogeology of the site. These requirements are similar to the EMNRD requirements for completing a Baseline Characterization Report, and these efforts would be conducted in parallel; therefore, the surface water and groundwater requirements of this SAP are relevant to both characterization efforts.

NMCC's meetings with the NMED concerning the abatement requirements have revealed the following key concerns on the part of the NMED:

- Groundwater impacts from the existing unlined tailings impoundment have been documented, but have not been fully characterized;
- Samples of pit lake water quality reveal exceedences of WQCC standards, and NMED is concerned about migration of this water away from the pit, causing additional groundwater impacts as well as ongoing contact with wildlife; and
- Acid leaching could be occurring due to ongoing ore exposure.

NMCC is currently working with NMED to address these issues.

4.5 Soils

A successful reclamation program is dependent, in part, upon the quantity and quality of soil available for use during the reclamation process. NMCC assessed the quantity and suitability of topsoil present at the site in two ways. First, NMCC reviewed current literature concerning soil characteristics, and second, NMCC determined site-specific soil characteristics. The findings are summarized in this section of the SAP. In addition, baseline soil surveys were completed on the project area as recently as the late 1990s, and are briefly summarized and referenced in the PFEIS (BLM, 1999).

The term "topsoil" refers to the A master soil horizon (Soil Survey Staff, 1999), which is the uppermost mineral horizon that contains organic matter and can be salvaged from the areas to be disturbed and is capable of supporting vegetation, or other soil material capable of supporting vegetation. This material is often referred to as "suitable top dressing" or "growth media." NMCC has reviewed previous literature describing the results of soil surveys completed at the site (BLM, 1999) and is aware that the presence of an A master soil horizon across the site is limited. The purpose of the soil survey and sampling proposed in this section of the SAP is to evaluate the presence of suitable top dressing. However, in the interest of conforming to the requirements of the Mine Act regulations, the term "topsoil" will be used throughout this section to refer to suitable top dressing and/or growth media.

General information about the soils present at the site was obtained from a Soil Conservation Service (SCS) survey completed by Neher (1984). The SCS (now the Natural Resources Conservation Service) mapped two major soil types that occur in the Copper Flat area:

1. The Luzena-Rock Outcrop association
2. The Scholle-Ildelfonso association

All but the easternmost portion of the proposed site is mapped as Luzena-Rock Outcrop association, which is typically present on the steeper slopes of hills and mountains. These soils are typically shallow, very gravelly and cobbly loams and clay loams. The Scholle-Ildelfonso association occurs on more gentle slopes of the piedmonts and mountain toes and is deep, well-drained, and formed in mixed alluvium. The resulting soil texture in these areas is primarily gravely loams and gravelly clay loams (SRK, 1996). The soils are thin and of low productive capacity. The soil textures are primarily gravelly loams and gravelly clay loams and are subject to continuing wind and water erosion. Along with the natural erosion, much of the Copper Flat landscape has been severely disturbed by historical placer mining and the 1982 mining operation. Over 65 percent of the areas targeted by the proposed operation were disturbed during the 1982 operation. Soils were replaced in the north cell of the tailings impoundment and over a portion of the plant site.

4.6 Vegetation

Plant species inventories were conducted in 1976, 1991, 1992 and 1994; newly initiated studies are being advanced to update and expand these previous surveys and inventories. Plant species lists are included in the 1993 EA (BLM, 1993). The pre-mining vegetation inventory is detailed in the 1977 EAR and the 1978 Environmental Assessment Record (BLM, 1978).

The Copper Flat area is within the Mexican Highlands section of the Basin and Range Physiographic Province, and more specifically defined as Southern Desertic Basins, Plains, and Mountains (NRCS 2010). This elevation transition causes an intermixing of environmental factors which has a direct correlation on the variety of vegetation in the area. The vegetation is composed primarily of two desert associations: Chihuahuan desert scrub and desert grassland. In the vicinity of Copper Flat, the low elevation flats and foothills are characterized by Chihuahuan desert scrub (which can be dominated by creosote bush). The highest elevations are predominantly desert grasslands with some scattering of juniper. The intervening area is dominated by desert grasses with a mixture of shrubs.

Much of the Project area has been disturbed by the mining activities of the prior 1982 operation . The dominant biotic communities within the Copper Flat area consist of creosote bush (i.e. Chihuahuan desert scrub) and desert grassland, on the fringes of some piñon-juniper (or juniper savanna) habitat (BLM, 1996).

4.6.1 Chihuahuan Desert Scrub (or Creosote Bush) Community

Grasses can dominate the landscape and may sometimes grow in pure stands. At the Project site, the grasses are associated with a wide variety of sub-dominant shrubs (yucca, *Yucca* spp.; three-leaf (or lemonade) sumac, *Rhus trilobata*; yerba-de-pasmo, *Baccharis pteronioides*; mesquite, *Prosopis* *glandulosa*; feather dalea, (*Dalea formosa*); creosote bush, *Larrea tridentata*; sage, *Artemisia* spp.; catclaw, *Mimosa* sp.; rabbitbrush, *Chrysothamnus* spp. and broom snakeweed, *Gutierrezia sarothrae*), trees (Gambel oak, *Quercus gambelli*; Emory oak, *Quercus emory*; willow, *Salix gooddingi* and *Salix exigua*; and cottonwood, *Populus* spp.), and forbs (cactus, *Opuntia* spp.; locoweed, *Oxytropis lambertii* and *Astragalus* spp.; *Geranium* sp., *Solanum* spp., and *Haplopappus* sp.).

4.6.2 Desert Grassland

The desert grassland community in the area dominates the higher elevations of the rolling hills, in the gullies, ravines and washes, and on the slopes and low ridges. A number of grass species are characteristic of this community. The major genera are grama grasses (*Bouteloua* spp.), curly mesquite (*Hilaria* spp.), and three-awns (*Aristida* spp.). The grasses dominate the landscape and may grow in pure stands. At the Project site, the grasses are associated with a variety of sub-dominant shrubs (*Yucca* spp.; lemonade sumac, *Rhus trilobata*; *Baccharis pteronioides*; mesquite, *Prosopis glandulosa*; feather dalea (*Dalea formosa*); creosote bush, *Larrea tridentata*; sage, *Artemisia* spp.; catclaw, *Mimosa* sp., rabbitbrush, *Chrysothamnus* spp. and *Gutierrezia* sp.), trees (Gambel oak, *Quercus gambelli*; Emory oak, *Quercus emory*; willow, *Salix gooddingi* and *Salix exigua*; and cottonwood, *Populus* spp.), and forbs (cactus, *Opuntia* spp.; locoweed, *Oxytropis lambertii*; *Geranium* sp., *Solanum* spp., and *Haplopappus* sp.).

4.6.3 Pinion-Juniper Community

The piñon-juniper and juniper savanna communities occur between the desert grasslands and the coniferous forests at an elevation of about 5,500 feet. All of the sites occupied by this community are on the higher knolls, northern aspects, and in steep, rocky terrain. Although this community is represented by one-seed juniper (*Juniperus monosperma*), it is also known for its association with range forage plants.

4.6.4 Aquatic Vegetation

The presence of aquatic plants in the Copper Flat area is severely limited due to the temporary, intermittent character of Greyback Wash and the lack of other water. Isolated, limited quantities of aquatic plants occur at stock watering areas, in abandoned, caved-in mine shafts, in isolated rock crevices along drainages, and at seeps. The production and diversity is severely limited. Cattails (*Typha* sp.), sedges (*Carex* spp.) and algae (*Chlorophyta*, *Cladophora* sp., *Scenedesmus* sp., and *Spriogyra*; *Euglenophyta*, *Euglena viridis*; and *Bacillariophyta*, *Nitzschia* sp. and *Navicula* sp.) can be located in appropriate habitats. The algae exist only when water is present during the warmest summer months.

Three riparian areas associated with seeps in Greyback Gulch were identified in 1995 during the site investigations performed for the EIS (BLM, 1996) process. The first is located east of the East Waste Rock Disposal Area and north of the access road. This area supports a small group of cottonwoods and willows. The second seep is located south of the plant area and is fed by runoff from the road between the pit and plant area. This seep does not support willows or cottonwoods but provides water to wildlife and livestock intermittently during the year. The third seep present in the immediate area of the proposed mine is located in Greyback Wash immediately east of the tailings thickener. The original stormwater collection pond is located adjacent to this area and it is believed that this pond, left open during reclamation activities in 1986 has been acting as a reservoir which has been draining into the riparian area through the original discharge pipe which was left in place. This area supports a small group of cottonwoods, willows and other herbaceous species.

One riparian area of relatively moderate functional value is located approximately 2.8 miles west of the mine site in Warm Spring Canyon (BLM, 1996). This small wetland covers less than 0.1 acre and supports several wetland species, including willow and tamarisk. Riparian habitat associated with Las Animas Creek, a perennial stream located approximately 4 miles northeast of the mine area, supports a variety of trees and shrubs including plains cottonwood, Arizona sycamore, walnut, mesquite, Apache plume, hackberry, Mormon tea and prickly pear. Percha Creek is a perennial stream located approximately 2.2 miles south of the mine site which supports a variety of riparian vegetation. Dominant species along this creek include willow, seep willow, ash, plains cottonwood, locust and walnut.

4.6.5 Vegetative Productivity

Foliar cover and forage productivity estimates for desert grassland and previously disturbed land present within the project area were based on visual observations made during field reconnaissance activities and data provided in the soil survey for the Sierra County area (NRCS 1984). An analysis of 12 vegetation plots was conducted by Glover prior to the 1982 disturbance (Glover, 1977). This work and nearby off-site range transects performed by the SCS (Sierra Soil and Water Conservation District, 1990) provided some historic estimates of the vegetative cover, density and productivity in the permit area prior to mining disturbance. Based on current ecological site descriptions, foliar cover for desert habitats within the general vicinity of the project area would be no more than approximately 30 percent (NRCS 2010). Correspondingly, vegetative productivity would range from a low of 150 pounds/acre in unfavorable years, to 450 or perhaps even 750 pounds/acre of forage during favorable years (NRCS 2010). Consequently, this is a very wide range in potential plant productivity and is highly subject to annual amounts of precipitation. Undisturbed desert grassland occurs in the tailings impoundment area, the East Waste Rock Disposal area, the North Waste Rock Disposal area, and the topsoil stockpiles.

Approximately 63 percent of the project area has been disturbed by previous mining operations. As of 1996, the average foliar cover for previously disturbed land is approximately 5 to 15 percent, with the highest foliar cover of approximately 15 percent occurring in the tailings impoundment area and the lowest foliar cover of less than five percent generally occurring at the pit, the West and North Waste Rock Disposal areas, and the Lean Ore Stockpile (Sierra Soil and Water Conservation District, 1990). The majority of previously disturbed land occurs in the tailings impoundment area, the pit, the Lean Ore Stock Pile area and the West Waste Rock Disposal area.

4.7 Wildlife

Wildlife inventories were conducted in 1976, 1991, 1992 and 1995; newly initiated studies are being advanced to update and expand these previous surveys and inventories. Wildlife species lists are included in the Copper Flat Project DEIS (Sierra Soil and Water Conservation District, 1990). The pre-mining wildlife inventory is detailed in the 1977 EAR (Glover, 1977), 1978 Environmental Assessment Record (BLM, 1978), DEIS, and PFEIS.

4.7.1 Mammals

There are a limited number of mammals occurring in the Copper Flat area, and the major factors believed responsible are: (a) low annual productivity of vegetative food and cover, (b) limited diversity in the plant communities present, and (c) lack of water. No aquatic mammals, amphibians nor fish have been observed in the Copper Flat area. No information is available on the myriad of invertebrates present in the area. Mammals that utilize the area are domestic cattle, deer, horses and several feral-domestic goats.

Mule deer harvest has stabilized since introduction of new regulations over the past 15 years. With the reclamation program of 1986, a small number of mule deer have frequented the mine site to feed on the reseeded grasses but move into the remote hills during the hunting season and into the lowlands during severe winters.

4.7.2 Birds

The numbers and species of birds vary widely with the seasons. Waterfowl sporadically use the existing pit lake, particularly during migration (BLM, 1996). Shorebird use of the lake is limited due to the lack of shallow foraging areas and appropriate habitat (BLM, 1996). A variety of raptors utilize the area of interest and the most common are: red-tailed hawk (*Bueto jamaicensis*), kestrel (*Falco sparverius*) and marsh hawk (or northern harrier) (*Circus cyaneus*). Golden eagles (*Aquila chrysaetos*) have been observed in the Copper Flat area. The Bald eagle (*Haliaeetus leucocephalus*) occasionally visits the Las Animas Creek area (8 km north of the mine site) during the winter and spring seasons. Historically, no active raptor nests nor regular eagle roosting sites were known to occur in the Copper Flat mining area. Based on a recent observation, this may not be true anymore. An active nest of the great horned owl (*Bubo virginianus*) was observed on a cliff face.

4.7.3 Reptiles

Six species of reptiles have been observed in the area; however, approximately 36 species of reptiles and amphibians are expected to occur in the greater district (BLM, 1996). By far, the most numerous are the different lizards. A variety of snakes, including rattlesnakes, are present in the area. The 1977 Environmental Assessment Report (Glover, 1977) and 1978 Environmental Assessment Record (BLM, 1978) present the reptilian species observed during environmental monitoring and probably represent the most abundant species within the area.

4.7.4 Invertebrates

A tremendous variety and abundance of invertebrates occur in the area of interest. The most numerous are beetles (Coleoptera). Other common orders are the bugs (Hemiptera and Homoptera), bees and wasps (Hymenoptera) and centipedes (Chilopoda). Butterflies and moths (Lepidoptera) are seen infrequently.

4.7.5 Fisheries

The only perennial aquatic environment at the mine site is the pit lake. No fish occur in the pit lake (BLM, 1978).

4.8 Threatened, Endangered, or Candidate Species

A Biological Assessment has been prepared in accordance with Section 7(c) of the Endangered Species Act to determine if any sensitive plant or animal species may be impacted by the proposed Project. The BLM, as lead agency for the EIS process, requested a Section 7 consultation from the U.S. Fish and Wildlife Service (USFWS). A total of four federally-listed and 15 federal candidate species were addressed in detail in the 1996 Biological Assessment (BLM, 1996).

Newly initiated threatened and endangered studies are being advanced on the project area to update and expand the previous studies and survey. Most of the species being targeted for review and for potential habitat are species of concern (or sensitive listed species), those that do not have official protection status. There are a couple of officially listed threatened and endangered species to be evaluated, which are discussed in the following sections.

4.8.1 Vegetation

Grama grass cactus (*Pediocactus papyracanthus*) was the only endangered or threatened species whose habitat might include the Copper Flat Project acres (BLM, 1996). The 1976 and 1992 searches and inventories did not reveal the presence of the grama grass cactus or any other sensitive plants (BLM, 1996). A couple of the plant species of concern to assess include Sandberg's pincushion cactus (*Escobaria sandbergii*) and the Pinos Altos fame flower (*Phemeranthus humilis = Talinum humile*). A state of New Mexico endangered cactus, Duncan's pincushion (*Escobaria duncanii = Coryphantha duncanii*) would also need some investigation. One of the only known locations for this cactus species is situated very close to the Copper Flat site.

4.8.2 Wildlife

Mining and other surface disturbance activities may affect species listed by the USFWS and New Mexico Department of Game and Fish as threatened, endangered, or candidate. A list of a number of endangered and threatened fauna that might occur in the assessment area is presented in the 1996 DEIS (BLM, 1996), 1996 BA (BLM, 1996), and 1999 PFEIS.

The peregrine falcon (*Falco peregrinus*) occurs commonly in the Rio Grande Valley and might occasionally be expected to hunt in the foothills east of the Black Range.

Bald eagles were seen flying in the vicinity of the site in 1995 and probably forage along Caballo and Elephant Butte reservoirs. Local riparian areas near the mine site could provide additional forage habitat, however these areas would not be considered optimal foraging habitat for eagles, and no records indicate that bald eagles use them for foraging or roosting.

The loggerhead shrike (*Lanius ludovicianus*) was observed during the field assessment in 1991. This species is very wide spread (habitat comprises 63 percent of BLM land in Sierra County).

The common black hawk has been recorded along Percha Creek; however, no nesting sites have been documented. Las Animas Creek could provide suitable habitat for this species.

The ferruginous hawk historically occupied the region and has been recorded within the creosote upland and grass mountain habitat near the location of the proposed project (IHICS, 1995). The area was surveyed in 1991 for the presence of nesting ferruginous hawks; no sign of nest hawks was observed in or near the Project at that time (Stinnett, 1991).

The northern goshawk is associated with a variety of forest type habitats which do not occur in the Project area. No sightings of this species have been reported in the vicinity of the Project.

Baird’s sparrow, a state of New Mexico threatened species, is migratory in New Mexico and most commonly observed in the fall. This species has been observed in Sierra County, but foraging grassland habitat is limited in the Project area and no sightings have been recorded.

Habitat for six of the seven species of bats studied during the preparation of the EIS exists in the Project area, including the greater western mastiff bat, occult little brown bat, spotted bat, fringed myotis, Yuma myotis and pale Townsend’s big-eared bat; however, some of these habitats would be considered marginal to support these species. The Townsend’s big-eared bat has been documented roosting in the Tony House, located near the tailings facility. The detailed background information and the potential for occurrence pertaining to these seven sensitive bat species is presented in the Biological Assessment prepared for the Project.

The Texas horned lizard has been documented in Sierra County and is known to occur in and near the Project site.

The long-fin dace was documented in Percha Creek in 1995. This fish, a federal candidate-category 2 species is believed to have been introduced into Percha Creek, since it does not naturally occur east of the Continental Divide (Bison-M, 1995) (BLM, 1996).

Habitat requirements for a few other wildlife species of concern would be evaluated such as the western burrowing owl (*Athene cunicularia hypugae*), Gunnison’s prairie dog (*Cynomys gunnisoni*), and pocket gophers (*Geomys* spp.).

4.9 Range Resources

Livestock grazing is allowed in areas adjacent to the mine area. However, the grazing Allotment (No. 6079) does not include the Project area at this time because of the need to exclude livestock from the area of mining activity.

4.10 Air Quality

The primary pollutant of interest at the mine site is fugitive dust since the emissions of other pollutants are quite small. Alta installed a PM_{10} monitoring station at the site in 1994 to collect baseline information at the site (Air Sciences, 1995). The DEIS utilized fine particulate data collected at Gold Hill by the New Mexico Air Quality Bureau from 1990 to 1992 to evaluate ambient air quality at Copper Flat (BLM, 1996). Although Gold Hill is located more than 20 miles west of the Project area, operations at Gold Hill are similar to those proposed for Copper Flat and it was assumed that data collected at Gold Hill would be representative of conditions at the Project site (BLM, 1996). High winds sometimes create local dust storms which result in higher short-term concentrations; nonetheless, Sierra County has been designated as an attainment area, which means that the area meets all applicable air quality standards. Because there are no significant pollution sources in the area, the overall air quality in the vicinity of the Project site is good (BLM, 1996).

The primary air quality impacts from the Project would be associated with particulate emissions. Modeling of these impacts indicated that the maximum values for 24-hour and annual concentrations of Total Suspended Particulates (TSP) would occur at the property boundary (BLM, 1996). The nearest Class I area is located more than 30 kilometers west of the Project and the models indicated that levels would fall below $1 \mu g/m^3$ within less than 10 kilometers from the site. Therefore, there would be no significant impact from the Project on any Class I area (BLM, 1996).

NMCC installed one meteorological and two air quality monitoring stations at the site in August 2010 for the purposes of collecting more up-to-date information on current air quality.

4.11 Cultural Resources

Several cultural resources surveys have been conducted at the site since 1976. The initial surveys were conducted for the 1977 and 1978 EARs (Glover, 1977). A subsequent Class III (100-percent pedestrian coverage) cultural resources survey was conducted by Mariah Associates for Gold Express in 1991 (Evaskovich, 1991). In response to comments from the New Mexico State Historic Preservation Officer (SHPO) in August, 1995, Alta contracted with Human Systems Research (HSR) of Las Cruces to resurvey all of the undisturbed portions of the Project not covered by the 1991 survey. The results of this survey were filed with the SHPO in October 1995 (Sechrist, 1995). Because the HSR survey was conducted more than 10 years ago, the lead federal agency (BLM) for cultural resource compliance review and the SHPO would review the previous survey for sufficiency and consistency with current standards for survey investigations. This review would also take into consideration the probability for new sites to have become exposed in the interim, such as through active dune formation/movement. If it is determined that a new pedestrian survey does not need to be conducted prior to construction, then the fieldwork effort for cultural resources likely would be limited to revisiting previously recorded sites to evaluate their current condition, and to reassess potential effects to these resources from the Project.

A number of prehistoric and historic sites eligible for listing in the National Register of Historic Places have been identified at the Project area. Where possible, identified sites would be avoided by modifying the design of project components. For sites which might be impacted by the Project, and for which avoidance is not feasible, NMCC would contract with qualified archaeologists to prepare a recovery plan to collect appropriate data, to minimize and mitigate adverse effects to cultural resources resulting from the Project. Following approval by the BLM and SHPO, the recovery plan would be implemented prior to construction.

5 Reclamation and Closure

5.1 Introduction

The Copper Flat Project site would be reclaimed to achieve a self-sustaining ecosystem appropriate for the climate, environment and land uses of the area. Careful consideration would be given to cooperation with neighbors in their land use requirements including cattle grazing, alternate energy generation such as wind and solar, and reestablishment and enhancement of original botanical and zoological species habitants.

The reclamation plan has been developed to meet the site specific characteristics of the mining operation and Project site. The objective of the reclamation plan is to return the Project site to conditions similar to those present before re-establishment of the mine. The mining operation and reclamation plan have been designed to use the most appropriate technology and BMPs to assure protection of the human health and safety, the environment, wildlife and domestic animals. The Project is designed to meet, without perpetual care, all applicable federal and state environmental requirements following closure.

5.2 Statutory and Regulatory Requirements

Reclamation of disturbed areas caused by the Project would be in compliance with federal and state regulations. Under the Federal Land Policy Management Act (FLPMA), the BLM is responsible for preventing undue or unnecessary degradation of federally-administered public lands which may result from operations authorized by the mining laws (43 CFR 3809). The New Mexico Mining Act requires the preparation of a reclamation plan for submittal and approval by the New Mexico Energy, Minerals and Natural Resources Department (NMEMNRD) and New Mexico Environmental Department (NMED). In addition, closure of the tailings embankment must also comply with requirements of the New Mexico State Engineer's Office.

Reclamation would be conducted concurrently with mining operations where feasible. At closure, final reclamation would be accomplished by a "close out" work force.

5.3 Post-Mining Land Use

Major land uses occurring in the vicinity of the Project site are mining, grazing, wildlife, watershed and recreation. Following closure, the Project area would continue to support mineral development, grazing, wildlife habitat, watershed, and to a lesser degree, recreation. Proposed reclamation of the site should result in a successful program to restore the area to the productive land uses discussed above. All post-closure land uses are in conformance with the previously defined BLM Caballo Planning Unit, the 1985 White Sands Resource Management Plan (RMP) and the Sierra County

Comprehensive Land Use Plan. Currently, the White Sands RMP is being revised, updated, and incorporated into the BLM's Tri-County RMP/EIS. The new Tri-County RMP includes Sierra, Otero, and Doña Ana Counties. This revision process began in 2005 and is still in a draft version going through public review. The BLM's analysis of public comments is scheduled for release in January of 2011.

Following closure, the pit would partially fill with water from sub-surface flow resulting in a permanent impoundment (SRK, 1995). Hydrogeologic and geochemical modeling indicates the post-closure pit lake water quality should be similar to that of the current pit lake (SRK, 1995). Possible post-closure uses for the pit include a water reservoir for agricultural and grazing purposes. The pit lake has also been proposed by the BLM as a possible location for a field-scale aquatic life laboratory, or other possible cultural uses yet to be identified.

5.4 Summary of Disturbance

Reconstruction would involve utilization of existing foundations and previously disturbed land where feasible. For the Proposed Action, approximately 65 percent of the proposed disturbance would take place on areas disturbed during the previous operations. New disturbance of previously undisturbed land would be kept to a minimum. Approximately 90 percent of the new disturbance would be related to the tailings and waste rock facilities.

Areas to be disturbed are divided into the following major mine components: open pit area, waste rock disposal areas and low-grade stockpile, tailings impoundment, and plant site. The utility corridor, access road and surface water diversions were developed during the previous operations and no further disturbance is anticipated associated with these facilities. The majority of the haul roads were also developed during previous operations and only minor additional disturbance would be related to haul road construction.

5.5 Reclamation Plan

The goal of the Copper Flat reclamation program is to minimize disturbance to the environment and to restore disturbed areas to a self-sustaining ecosystem consistent with applicable regulations, the post-mining land use and mine reclamation standards. The objectives of the Copper Flat reclamation program are:

- To meet or exceed applicable state and federal reclamation requirements through application of most appropriate technologies and BMPs.
- To minimize erosion and prevent contribution of suspended solids to streams and other bodies of water through employment of best management practices and contemporaneous reclamation, to the extent appropriate and practicable.
- To protect human health and safety, the environment, wildlife and domestic animals, cultural resources, the hydrologic balance, and extant riparian and wetland areas, including reclamation of any streams that may be impacted by the mining operations.

- To protect the quality of surface and ground water resources by minimizing pollutant formation, and on-site containment of any unavoidable toxicity.
- To preserve suitable topsoil and other approved topdressing material for use in reclamation, employing appropriate and BMPs for sampling, testing, replacement, and stabilization.
- To establish surface soil conditions most conducive to regeneration of a stable plant community through stripping, stockpiling, and reapplication of alluvial or soil material where feasible.
- To revegetate disturbed areas with a diverse mixture of appropriate plant species, in order to achieve a self-sustaining ecosystem or other approved post-mining land use.
- To identify any roads that may be disturbed by mining operations and which are not planned to be returned to use, consistent with the approved post-mining land use and applicable land owner approvals.
- To maintain public safety and site stability through appropriate recontouring and revegetation of disturbed areas within the permit area.
- To work with local and regional communities to identify post-mining uses of the land and facilities to enhance opportunities to sustain the economy and culture in the post-mining phase of this project.

Surface facilities, equipment and buildings related to the mining Project would be removed, foundations covered, and the plant site returned to conditions similar to those present before re-establishment of the mine. The topography, slopes and aspects of the disturbed and reclaimed areas would be developed to blend in with the present, existing physiographic forms of the Copper Flat area, as feasible.

5.6 Implementation

Contemporaneous reclamation of disturbed surface areas would be an integral part of the mining operation. Both public and private land would be reclaimed. At completion of mining activities, the site would be restored to conditions and standards to meet approved post-mining land uses. These uses would include native plant communities similar to surrounding undisturbed areas, wildlife habitat, and grazing land potentially suitable for livestock. The reclamation and restoration must be demonstrated to be sustainable without perpetual care. Closure of the site would be accomplished by the following activities:

- Pre-construction and Permitting: This is the stage wherein baseline data is collected to characterize the existing environment. The baseline data are used to formulate reclamation goals. This stage has been conducted since the late 1970s and currently new studies are being advanced to add to this existing database of studies to expand and update to current requirements.
- Construction: Where feasible, the existing soils and suitable alluvial material would be removed first from major disturbance areas (tailings impoundment, waste rock disposal

areas, etc.), stockpiled, protected, and used in the reclamation process. The revegetation test program would be initiated during this phase of the operation.

- Operations: Reclamation efforts would be implemented at the earliest feasible time in areas where activities are discontinued. This includes recontouring, scarifying, placement of soil, alluvial material, and other approved topdressing material, followed by revegetation. The revegetation test program and concurrent reclamation would be monitored during this phase to provide data that would be utilized to determine final closure methods to be implemented to achieve reclamation goals, subject to regulatory approval.
- Closure: Upon closure of the mining operations, unreclaimed facilities would be reclaimed according to the reclamation plan.
- Post-Closure Monitoring: Following the completion of reclamation and closure activities, the revegetation would be monitored for at least two growing seasons and meet Part 6 requirements under the New Mexico Mining Act. Groundwater would be monitored according to conditions set forth in the Ground Water Discharge Permit, which is currently being prepared by NMCC for submission to NMED.

A tentative project schedule, including reclamation schedule encompassing these five project stages, is presented in **Figure 5-1**. The schedule shown is approximate and could change due to a number of operational and economic conditions.

5.7 Environmental Considerations for Reclamation

The reclamation plan is designed to assure protection of human health and safety, the environment, wildlife and domestic animals.

5.7.1 Signs, Markers and Safeguarding

Measures such as signs, markers, fences and barricades would be used to protect the public, wildlife and domestic animals from potentially dangerous areas associated with the Project. Safety measures associated with the major Project components are discussed in more detail in Section 5.16.

5.7.2 Wildlife and Domestic Animal Protection

Reclamation of the Copper Flat Project would be conducted to achieve a stable configuration and access to unsafe areas would be restricted for protection of the public and animals.

The Project would result in the reclamation of over 910 acres of land disturbed by previous mining activities. This reclamation would be a beneficial impact to wildlife resources. However, because of the long-term loss of woody species, the reclamation of the previously disturbed land would mainly benefit those species typically associated with herbaceous vegetation. It is anticipated that the Project area would support a greater variety of species following closure due to the additional habitat diversity created by the mining and reclamation programs.

5.7.3 Cultural Resources

Cultural resources requiring protection, and any cemeteries or burial grounds (none are anticipated), shall be protected and/or avoided during reclamation activities. This includes any resources identified before or during Project activities.

5.7.4 Hydrologic Balance

Hydrogeologic studies have been completed to estimate the potential impacts to ground water from the tailings impoundment and to surface and ground water from acid mine drainage (ARD) from the overburden and waste rock piles (SRK, 1995). In addition, the predicted elevation and final chemistry of the pit lake was modeled (SRK, 1995). For the reasons set forth below, the potential for ARD from the Project is low.

5.7.4.1 *Acid Rock Drainage*

Although no major impacts have been identified associated with waste rock disposal from the previous operations, the potential for acid generation from some of the rocks has been identified. Studies were completed previously to evaluate the potential for acid generation and metal leaching from the various types of mine overburden, waste rock and tailings materials at the site (SRK, 1995) and additional studies and evaluations are underway to augment and update the information currently available.

The results of the ARD studies indicate that the potential for ARD from the tailings is considered low. The risk of ARD from the bulk of the existing and future waste rock is also considered low; however, some of the waste rock to be extracted would be partially oxidized (transitional) and this material has the potential to generate acid if not disposed of properly. Therefore, the transitional waste rock would be managed and reclaimed to alleviate the potential for ARD. Because of improved project economics, it is estimated that a major portion of the previously identified transitional material would now report to the tailings facility.

Proper waste management has been proven effective in alleviating the potential for ARD. The transitional waste rock would be segregated and placed in the west and north waste rock disposal areas for the Proposed Action as shown on **Figure 3-1**. The surface of the all waste rock disposal areas would be reclaimed in the same manner as proposed for disposal areas containing partially oxidize material. The disposal areas would be contoured to enhance run-off and covered to reduce infiltration.

The waste rock piles would be reclaimed by regrading, dozer compacting the surface and covering this surface with up to 12 inches of native soil. These measures would inhibit infiltration and reduce the quantity of water required to produce drainage. The waste rock disposal areas containing transitional material would be located adjacent to the pit lake. In the unlikely event acid drainage does occur, it would flow into the pit lake where it would be diluted by ground water inflow and prevented from migrating into ground water. The high evaporation of the pit lake water causes ground water to flow into the pit, preventing any surface inflows from entering the ground water.

The quality of the current pit lake water appears to be impacted by oxidation of minerals exposed in the pit wall. Results of pit water sampling indicate that, although the water in the pit meets state surface water quality standards for livestock and wildlife use, it contains elevated concentrations of sulfate, fluoride, calcium, cadmium and manganese. A preliminary study has been completed to determine the post-closure pit water quality (SRK, 1995), and ongoing geochemical characterization work would update this study. The findings of the study indicate that the majority of the transition materials would be removed by the pit expansion, significantly reducing the surface area of these materials exposed in the pit walls in comparison to the present day condition of the open pit.

Run-off from the waste rock disposal areas would be collected in facilities constructed at each area.

5.7.4.2 *Suspended Solids*

Sediment control would be achieved by the use of BMPs. BMPs include regrading, seeding and mulching, silt fences, straw bale dams, diversion ditches with energy dissipaters, and rock check dams at appropriate locations during construction and operation. Diversion structures, including existing structures, would divert run-on away from disturbed areas. New diversion structures and sediment control features for the proposed PoO would be evaluated for 25-year, 24-hour and 100-year, 24-hour storms according to the criteria contained in **Appendix B**. All sediment control structures would be monitored and maintained on a regular basis.

During operations, all run-off from the plant site would be directed into a sediment pond located on the east side of the site adjacent to the make-up water pond. Following reclamation this pond would no longer be necessary for sediment control. The dike separating the sediment pond from the make-up water pond would be removed, the pond regraded to restore conditions similar to those currently existing, and the site revegetated.

5.7.4.3 *Diversions and Overland Flow*

Runoff from particular areas of the Copper Flat Project site was originally estimated using the climate data summarized in Section 4.3. The surface drainage of the Project site was designed to contain or control either a 25-year, 24-hour duration storm of 2.9 inches or a 24-hour precipitation of 2.6 inches with a maximum 1-hour intensity of 2.0 inches, depending on the area (**Appendix B**). NMCC is in the process of re-evaluating these design criteria with respect to current regulations and engineering standards. During reclamation most areas would be regraded and, where possible, the original drainages restored.

The diversions of surface water runoff around the waste rock disposal areas would remain in place. Ditches would be lined with rip rap, as needed, to protect the channels from erosion.

5.7.4.4 *Stream Diversions*

The watershed area to the west of the pit is drained by Greyback Wash, an ephemeral stream which is dry over most of its length except during the rainy season. Greyback Wash used to pass through the pit area. This drainage has been intercepted, diverted around the southern periphery of the pit, and returned to the original channel east of the pit area. This was accomplished by cutting a channel through the ridges and placing diversion dams in the tributary arroyos. Following closure of the previous operation, the diversion was left in place. The diversion would be left in place following closure of the proposed operation.

5.7.5 Impoundments

The tailings impoundment has been designed, constructed and maintained to minimize adverse impacts to the hydrologic balance and adjoining property and to assure the safety of the public. Reclamation and closure of the tailings impoundment is discussed in more detail in Section 5.16.4.

5.7.6 Prevention of Mass Movement

All slopes, impoundment embankments and waste rock disposal areas would be designed, constructed and maintained to prevent the potential for mass movement both during operations and following closure. The existing waste rock disposal areas were designed according to the parameters set forth in **Table 5-1** and were selected to minimize reclamation costs at the end of mine life using a 1.3:1 H:V lift face slope ratio as the constructed as-built slope angle, and a regraded lift slopes of not less than 2.5:1 H:V.

Table 5-1: Waste Rock Disposal Facility Design Parameters

Parameter	Value
Batter Angle (º)	37º
Berm Width (ft)	30 ft
Lift Height (ft)	30 ft
Road Width (ft)	80 ft
Road Grade (%)	10%
Slope (º)	22º

NMCC is currently working on the final designs for the proposed waste rock disposal facilities. To the extent practicable, they would be designed to meet these same criteria.

5.7.7 Riparian Areas

The Copper Flat mine area is primarily a terrestrial habitat. No wetlands and two riparian areas are present in the immediate area of the proposed mine. The riparian areas, located in Greyback Wash immediately south and east of the plant site, did not exist prior to the 1982 operation, as evidenced by photographs. The riparian area south of the plant area is believed to have developed as a result of modifications of the flow in Greyback Gulch from culverts installed in 1983. It is believed that the eastern riparian area was created from flow collected in the stormwater collection pond and alterations of surface water flows in Greyback Gulch resulting from the construction of the land bridge for the tailings pipeline. Because the stormwater pond would be used in the proposed operation, NMCC would supply water from the freshwater supply during operations. Following operations, NMCC would endeavor to restore the storm water collection pond to a condition similar to that existing at present. However, the exact configuration which led to the creation of this wetland is not known and complete restoration may not be possible. As with upland vegetation and plant communities, wetland and riparian plant species would naturally become established at locations that are suitable for their survival, growth, and development. This would occur even if such locations and conditions are generated by human activities. The riparian and “wet” areas would be considered during the environmental evaluations and managed appropriately according to state and federal requirements.

5.7.8 Roads

Access to the site is via an existing county road (Gold Dust Rd./Co. Rd. Bo27) which would remain following closure. Prior to final closure, the State of New Mexico and the BLM would determine which other roads would be left intact around the site in order to conduct post-closure monitoring or provide adjacent landowner access. All other NMCC mine-related roads would be removed.

5.7.9 Surface Facilities or Roads Not Subject to Reclamation

A number of pre-1981, primitive roads currently exist within the proposed project boundary. Some of these roads would not be utilized during the currently proposed operation. As such, they are not subject to reclamation by NMCC.

5.7.10 Drill Hole Plugging and Water Well Abandonment

Mineral exploration and development drill holes, monitoring, and production wells subject to state regulations would be abandoned in accordance with applicable rules and regulations (NMAC 19.27.4 *et seq*.). Boreholes would be sealed to prevent cross contamination between aquifers and required shallow seals would be placed to prevent contamination by surface access.

Monitoring wells around the tailings impoundment would be maintained until NMCC is released from this requirement by the NMED, MMD, and BLM. These wells would then be plugged and abandoned according to applicable requirements.

5.7.11 Post-Closure Monitoring

Monitoring would be ongoing throughout the life of the operation, during closure and for a post-closure period. The BLM and state agencies would set post-closure monitoring requirements at mine closure.

Sampling of the water in the pit after mine closure would continue for a period of not less than five (5) years following mine closure to determine any changes in pit water quality.

The tailings dam/pond would be regulated by the New Mexico State Engineer's Office for safety of operations. A Discharge Permit that requires monitoring for seepage into the ground water would be required from the New Mexico Environmental Department (NMED), Ground Water Bureau. Following closure water samples from monitoring wells located downstream of the tailings dam, and in the plant and pit area would be taken and analyzed on a regular basis and the results sent to the Ground Water Bureau in accordance with monitoring requirements set forth in the Discharge Plan. These samples would identify any seepage from the tailings pond. The Discharge Plan Application contains abatement plans if leakage and contamination occurs.

5.8 Site Stabilization and Configuration

The Project site would be stabilized, to the extent practicable, to minimize future impact to the environment and protect air and water resources. The final surface configurations for the Proposed Action (**Figure 5-2**) would be suitable to achieve the post mining land uses as discussed in Section 5.3. All facilities, slopes, embankments, and roads would be designed, constructed, maintained and reclaimed to achieve stable configurations.

The topography, slopes and aspects of the disturbed areas would be developed to blend in with the surrounding topography as much as practicable. Where possible the size and shape of channels of new drainages would approximate former, natural drainages. All drainage channels, ditches and earthen water control structures would be revegetated and protected from erosion by riprap, sediment traps or other types of BMPs. Alluvial materials suitable for surface treatment would be salvaged from disturbed areas where safe and feasible operation of earthmoving equipment is possible, and would be stockpiled and protected for use in reclamation.

An attempt would be made to favor initial revegetation on north and east aspects of gentle slopes where additional moisture is available. A limited number of slopes might exceed a 2.5H:1V condition but most slopes would be restructured to resemble existing topography. The steeper slopes would be stabilized by physical media (boulders, alluvium, rock) as well as vegetative means to add to general diversity and stability.

Flatter disturbed areas (slopes of 4H:1V or less) would be minimally regraded to restore the natural drainage, and would be revegetated, except those in the tailings impoundment which would be regraded to direct surface water away from the top surface of the reclaimed tailings.

5.9 Plant Growth Media and Cover Materials

5.9.1 Removal and Storage

Suitable soil material available for reclamation from the previously mined and disturbed areas at the Project site is very limited. Efforts would be made to carefully strip, stockpile and improve the remaining growth media available on the site. Because the available soil from newly disturbed area is thin and of low productive capacity, the O and A horizons of soil material would be salvaged, where possible.

The O horizon is the uppermost soil layer and is composed of slightly decomposed organic materials. It contains a high percentage of microbial constituents found in soils which have been determined to be beneficial to plant life. The A horizon is the uppermost zone from which soluble salts and colloids have been leached and in which fully decomposed organic matter has accumulated. In those areas where the A horizon is shallow or indiscernible, suitable B horizon material would also be stripped and stockpiled. The B horizon is the layer in which material leached from the overlying A horizon is accumulated. It usually contains very little organic matter and is lower in microbial activity than the O and A horizons. However, due to the low organic matter content of the A horizon at this site, the A and B horizons do not differ substantially. For these reasons, the B horizon material would not be stockpiled separately from the O and A horizon soils.

Where salvageable soil exists, either on undisturbed or reclaimed areas, NMCC would salvage as much material as can be safely and practically recovered. However, the lack of reclamation cover material available from previously disturbed areas and the poor development of topsoil at the site may require the evaluation of alternative sources and types of materials for use as reclamation cover.

Samples of soil materials were collected and analyzed prior to disturbance in 1977 (Glover, 1977) and in undisturbed areas in 1996. Analyses of the 1977 samples indicate the soils collected were fertile, with the exception of soils from the Waste Rock Disposal Area being low in available phosphate. The 1996 sample taken from the North Waste Rock Disposal Area indicated similar results, but that taken north of the West Waste Rock Disposal Area showed poor fertility. Both samples were low in organic matter (Johnson, 1996).

Sampling in 1996 indicated soil depths of less than four inches exist under the proposed East Waste Rock Disposal Area. This limited thickness and abundant outcrop would preclude the salvage of any appreciable soil quantities from this area. The areas which would be disturbed by the West and North Waste Rock Disposal Areas were observed to have approximately eight inches salvageable soil. Soils in the undisturbed areas of the tailings impoundment were observed to average approximately 18 inches. This material would be salvaged by earthmoving equipment prior to tailings deposition. The estimated volumes of salvageable soil available in areas to be newly disturbed or redisturbed by the Project are shown in **Table** 5-2.

Table 5-2: Estimate of Available Soil from Newly Disturbed Areas

Facility	New Disturbance Footprint Area ($ft^2 \times 10^6$)	Salvage Thickness (inches)	Estimated Volume ($yd^3 \times 10^3$)
Proposed Plan			
West Waste Rock	0.36	~12	13.2
North Waste Rock	1.02	~12	37.8
East Waste Rock	4.98	0	0
Low-Grade Stockpile	0	0	0
Plant Area	7.4	~8	182.8
Tailings Impoundment	3.3	~18	181.5
Roads and Misc.	1.2	~6	21.78
Total	**18.26**		**437.08**

A comparison of estimated quantities of available cover material (**Table** 5-2) and potentially required cover material (**Table 5-3**) indicates that there could be a deficit of over 1.0 million cubic yards of cover material for the currently proposed reclamation plan. As part of the proposed operations, NMCC plans to salvage most of the near-surface alluvial materials from within the limits of the new tailings impoundment to mitigate this soil deficit. These materials are part of the Santa Fe formation gravels and alluvial basin fill and were used in the construction of the original starter embankment. In addition to soil samples, four samples of near surface alluvial materials were collected in the tailings impoundment area at depths between 5 and 20 feet below the original surface. Analyses indicate these materials are low in organic content, phosphorus, nitrogen and potassium. Evaluations are on-going in this area to evaluate this material for structural material (tailings impoundment construction), reclamation material, and mineral content.

Table 5-3: Estimated Reclamation Cover Requirements

Facility	Surface Area ($ft^2 \times 10^6$)	Cover Thickness (inches)	Volume ($yd^3 \times 10^3$)
West Waste Rock	0.8	~12	29.7
North Waste Rock	1.5	~12	56.3
East Waste Rock	5.37	~12	198.8
Low-Grade Stockpile	1.45	~12	53.6
Plant Area	7.4	~8	182.7
Tailings Impoundment	23.8	~12	882.5
Roads and Misc.	11.1	~6	205.7
Total	**51.42**		**1,609.3**

No areas unaffected by mining are currently proposed to be disturbed in order to obtain reclamation cover materials. Several borrow areas currently existing within the limits of the tailings impoundment would be the source of the excavated materials. Mine haul trucks and front end loaders would excavate the required materials during the construction period. Following stripping, suitable growth media and alluvial material would be salvaged and stockpiled. These locations were chosen to minimize haul distances and to limit erosion. The piles would be constructed with slopes varying from angle of repose to 3H:1V and to heights up to 40 feet. The different aspects and slopes of the stockpiles would be used in the test revegetation program to evaluate slope revegetation methods. Existing piles of these materials north of the impoundment demonstrate an ability to retain angle of repose slopes without undue erosion or instability.

Diversion ditches would be constructed around the stockpiles where necessary to minimize run-on erosion. To stabilize the portions of the growth media stockpiles not used in the revegetation test program, and minimize erosion and maintain biological viability, they would be seeded with an interim seed mix as recommended by the BLM. The interim vegetation cover established on the growth media stockpiles would further reduce soil erosion while providing micro-habitats for beneficial soil organisms.

Efforts would be made to salvage the existing vegetation on the areas that would be newly disturbed by the Project. Prior to and during soil salvage, woody plants and vegetation would be removed. The vegetation would be stored with the growth media to increase the organic matter content of the growth media.

5.9.2 Placement

The goal at Copper Flat is to salvage sufficient growth media and alluvial material to provide a 6 to 12-inch cover on areas to be revegetated, if reserves prove sufficient. Less than 12 inches of growth media was placed on the north cell of the tailings impoundment during the previous reclamation efforts. Analysis of the vegetation in that area demonstrates the effectiveness of that thickness of growth media for the purposes of developing a self sustaining ecosystem. Suitable growth media and alluvial materials would be salvaged and stockpiled from all disturbed areas as is feasible. **Table 5-3** shows the required cover volumes by facility.

The final details of the placement and use of these materials in reclamation would be approved by the state and BLM following analysis of the results of a test plot program which would be conducted during the mining operation. Furthermore, concurrent reclamation using this material would provide additional information regarding the success of the approved techniques and allow ongoing modifications to occur.

To ensure good contact with the subsoils, the surface would be roughened by ripping or disking prior to placement of the cover material. The cover material would be spread and graded with care taken to prevent a reduction in bulk density by limiting the number of passes. Following placement, the area would be walked with a dozer to lightly compact the soil.

5.9.3 Amendments

Soils and alluvial materials to be salvaged for reclamation cover are deficient in nitrogen, phosphorus and potassium and would require 4,000 to 8,000 pounds per acre of amendments to create fertile growth media (Johnson, 1996). Aerobically digested sanitized sewer sludge, cotton husks, feedlot cattle waste are possible natural materials which might be used, if available, to amend the growth media prior to placement on reclaimed areas. Composting of materials, if required, would be performed on site to better control the rate and amount of composting.

Other amendments may also be necessary. Ultimately, fertilizer and amendment requirements would be based on chemical analysis of disturbed/replaced soils, and the results of the test revegetation program and contemporaneous reclamation efforts. The application rates would be determined based on the uniformity of the soil characteristics and topography.

The amendments would be incorporated into the top four to six inches of the surface by harrowing. Repeated applications may be required based upon additional testing and vegetation monitoring.

5.10 Revegetation

The revegetation plan is designed to create a stable, self-sustaining plant community, and would be in conformance with the planned post-mining land uses of wildlife and grazing.

The dominant biotic communities of the Copper Flat area are Chihuahuan desert scrub (often dominated by creosote bush) and desert grassland. The desert grassland community is the major community at the site and is dominated by desert grasses with a mixture of shrubs. The Chihuahuan desert scrub community is found on low elevation flats and foothills and occurs on the eastern portion of the site.

Due to the general harshness of the Chihuahuan desert scrub community, most of the animal species using this habitat are small in size, such as reptiles, rodents, and rabbits. The desert grassland community supports a wide diversity of insects and provides suitable habitat for a variety of animals. Most of the grasses are important for livestock forage and provide watershed protection.

Due to the general lack of surface water, the Copper Flat area provides essentially no aquatic environment. Micro-aquatic ecosystems present along the drainage ways are unstable, and community production and diversity is severely limited.

To achieve the post-mining land use of wildlife and grazing, revegetation of the site would consist mainly of the establishment of grass, forb and shrub species characteristic of the desert grassland community. Plant species would be chosen based on their ability to provide satisfactory cover, and on their nutritional value and ability to support wildlife habitat. Riparian and water-loving plant species (willows, cottonwood, cattails, sedges, etc.) may be introduced in drainage channels and in shallow areas near the shoreline of the pit lake.

Diversity of plant species on revegetated, disturbed lands may be less than on undisturbed areas. However, the seed would contain native plant species (grasses, forbs, and shrubs) in a mix approximating adjacent desert grassland community areas. The revegetation of the re-developed Project is anticipated to be similar to the site prior to re-development; however, over time, through the processes of natural plant community succession, the revegetation should approach a density and diversity similar to that of undisturbed areas adjacent to the disturbed land.

5.10.1 Seed Mixtures

The seed mixtures to be used would be determined by seed availability, compatibility with the vegetation of the surrounding areas, the soil and climatic conditions of the area, and by recommendations from the BLM and NMEMNRD. The reclamation success of the previously disturbed areas would be used as a guide in choosing the mixture. Suitable seed materials may be a limiting factor in revegetation of the site. The seed mixes shown in **Table 5-4** are example seed mixes derived from information provided by the NMEMNRD (and the BLM) for revegetation programs in the vicinity of the project. The species included in the list also focus on those that are more readily available. Not all of the species in the immediate vicinity of the project site are readily available from seed suppliers. The list presented herein is for the purposes of reclamation cost estimation and is not intended to represent a final list. The final seed mix would be approved following review of the revegetation test program results and may be modified with approval of the BLM and NMEMNRD.

Table 5-4: Proposed Reclamation Seed Mixes

Species	Application Rate (lbs. PLS/acre)
Drill Seed Mix	
Blue grama (*Bouteloua gracilis*)	0.6
Side-oats grama (*Bouteloua curtipendula*)	1.3
Indian ricegrass (*Oryzopsis hymenoides*)	1.2
New Mexico feathergrass (*Stipa neomexicana*)	1.0
Tobosa grass (*Pleuraphis mutica*)	1.2
Black grama (*Bouteloua eriopoda*)	0.6
Cane bluestem (*Bothriochloa barbinodis*)	1.0
Narrowleaf globemallow (*Sphaeralcea angustifolia*)	0.5
Four-wing saltbush (*Atriplex canescens*)	0.8
Broadcast Seed Mix	
Blue grama (*Bouteloua gracilis*)	0.6
Side-oats grama (*Bouteloua curtipendula*)	1.0
Sand dropseed (*Sporobolus cryptandrus*)	0.5
New Mexico feathergrass (*Stipa neomexicana*)	1.0
Silver bluestem (*Bothriochloa laguroides*)	1.0
Apache plume (*Fallugia paradoxa*)	1.0
Four-wing saltbush (*Atriplex canescens*)	1.0
Blanket flower (*Gaillardia pulchella*)	0.5
Narrowleaf globemallow (*Sphaeralcea angustifolia*)	0.1

5.10.2 Planting Techniques

Seeding would take place immediately after placement of the cover material, depending on when the cover material is put in place. Seeding should take place when summer moisture is available to encourage the warm season grasses. Consequently, soil placement and seeding are planned to occur prior to the monsoon season of July, August, and September. In the event that seeding occurs substantially later than soil placement, any compacted soil areas may require ripping or scarification. If determined necessary, compacted soils would be ripped or scarified to a depth of 6 to 12 inches prior to seeding. Field experience and changes in local precipitation patterns may alter the seeding schedule to other times of the year.

Seeding methods to be utilized at the site would depend on many factors including the topography, soil conditions and seed mixture. Typically, some combination of broadcast seeding, drill seeding and hydro-seeding is used for mine reclamation. It is expected that broadcast seeding, followed by harrowing to bury the seed to the proper depth would be the seeding method of choice. The presence of larger rocks and boulders in the alluvial materials to be used as reclamation cover would decrease the effectiveness of drill seeding and may preclude this method altogether. Alternatively, the presence of some larger rocks and boulders at the soil surface would create and generate micro-sites favorable to the establishment of vegetation. If drill seeding is not utilized, and broadcast seeding is the primary methodology utilized, then the seeding rates shown in **Table 5-4** would need to be summed (i.e. drill component summed to broadcast component), so that the total seeding rate is in the range of 12 to 16 pounds of pure live seed (PLS) per acre, approximately. Hydro-seeding may be used on steep, small areas where larger equipment cannot easily operate.

Mulch may not be required depending on the time of planting and the terrain. If necessary, a protective mulch such as alfalfa pellets or certified weed free straw would be applied. Hydro-mulch may be necessary in areas that required hydro-seeding. If hay mulch is used, it would be mechanically crimped or secured with a chemical tackifier to prevent erosion. Steep slopes may require erosion control matting or netting.

Weed control would be implemented only if necessary. Methods of weed control would be determined upon recommendation from the BLM and/or NMEMNRD.

5.11 Revegetation Success

Revegetation success would be determined by monitoring the vegetation parameters of ground cover, productivity, woody plant density, and plant species diversity. The results of these parameters in reclaimed areas would be compared to the same parameters in reference areas (i.e. control or undisturbed sites) or to an agreed upon revegetation standard. The reference area and revegetation standards would be based on the research program discussed in Section 5.12, and would be established through discussion by the BLM, NMEMNRD, and NMCC. The research program would be ongoing, including the collection of vegetation data. The collected vegetation data, stratified across the various plant communities situated within the permitted boundaries, would be carefully evaluated. The collected vegetation data would eventually function as a guide towards determining ecologically suitable success standards.

Technical guidance procedures published by the NMEMNRD were utilized in the development of a sampling and analysis plan. There are a wide variety of standard and classic sources for field sampling methods in plant ecology (Bonham 1989; Barbour, Burk, and Pitts 1980), including references cited in the technical guidance procedures developed by the NMEMNRD. Any variations of or additions to the vegetation monitoring techniques would go through approval with NMEMNRD and/or BLM as needed. As may be appropriate and necessary to meet NMEMNRD requirements, herbaceous cover and productivity would be established within 90 percent of the reference area with a 90-percent statistical confidence level. Woody species (and at Copper Flat these are essentially all shrubs) would be established to the approved density with an 80 percent confidence level as defined by NMEMNRD. Diversity would be compared to existing reclaimed and/or reference areas relative to the physical environment of the areas to be reclaimed.

Observations would be conducted once per year at approximately the same time each year. Two seasons of successfully attaining the revegetation criteria would determine success of the revegetation program. In the event that an area does not meet the revegetation goals (or criteria), the area would be investigated and steps taken to correct the problem.

Analysis of the revegetation efforts on the north cell of the tailings impoundment demonstrates the effectiveness of the methods proposed here including the thickness of growth media used in this area should meet the objective of developing a self sustaining ecosystem.

5.12 Reclamation Research

As part of the reclamation plan, NMCC would conduct a revegetation test program to determine the most effective methods to meet revegetation standards as defined in their reclamation plan. The program would be flexible enough to allow modifications of proposed methodologies and to test new techniques. Conceptually, the test revegetation program would include test plots designed to evaluate different types and thicknesses of cover material, seed mixes, planting techniques, use of clean tailings fines to enhance water retention of soils, soil amendments and mulches. The program would also include test plots on slopes of different grades and aspects.

In addition, NMCC intends to maximize the amount of concurrent reclamation at the site. This would allow larger-scale testing of regrading, reclamation cover placement and revegetation techniques. The outer face of each raise of the tailings impoundment would be reclaimed by placement of a layer of alluvial cover up to eight inches thick followed by revegetation. It is also anticipated that the west and north waste rock disposal areas and portions of the east and south disposal areas would be completed prior to completion of mining, which would allow for concurrent reclamation of these areas.

5.13 Concurrent Reclamation

Because contemporaneous reclamation reduces erosion, provides early impact mitigation, limits costs and reduces final reclamation work, NMCC is committed to maximize this type of reclamation at the Copper Flat Project. Some of the Project facilities would be constructed in their final configuration. Others, such as individual lifts of the waste rock disposal areas and possibly some roads would be decommissioned prior to final mine closure. Areas such as these would be reclaimed concurrently with the active mining operation where feasible. Descriptions of design features which are intended to facilitate contemporaneous reclamation for specific project components are given below in Section 5.14.

5.14 Interim Reclamation

There is a possibility that continuous, full-scale production might be interrupted for short periods in response to economic considerations or unforeseen circumstances. In this event, interim reclamation would be initiated. Interim reclamation is outlined below.

- Rights-of-Way: The power lines and water pipeline would be inspected regularly and maintained as necessary. None of the facilities would be altered or removed. The main access road would receive regular maintenance. The internal roads would receive minimal maintenance.
- Pit: The pit area would be protected by fencing with a locked access gate. Monitoring of pit water would be ongoing.
- Tailings Facility: The tailings impoundment would be retained for potential future development. Limited care and maintenance of the reclaimed embankment face would be performed as necessary to continue stabilization of the area.
- Diversion Ditches: Diversion ditches would be inspected and maintained as necessary. Surface water runoff would be managed in accordance with the site NPDES permit requirements.
- Buildings: The process buildings, equipment and support facilities would be guarded and maintained as necessary. None of the buildings would be destroyed or modified.

5.15 Interim Management Plan

In accordance with 43 CFR § 3809.401(b)(5), NMCC has prepared the following *Interim Management Plan* to manage the project area during periods of temporary closure (including periods of seasonal closure, if necessary) to prevent unnecessary or undue degradation, and includes:

- Measures to stabilize excavations and workings;
- Measures to isolate and control toxic or deleterious materials;
- Provisions for the storage or removal of equipment, supplies, and structures;

- Measures to maintain the project area in a safe and clean condition;
- Plans for monitoring site conditions during periods of non-operation; and,
- A schedule of anticipated periods of temporary closure during which you would implement the interim management plan, including provisions for notifying BLM of unplanned or extended temporary closures.

This Interim Management Plan (a.k.a., temporary closure plan) is necessarily general due to the lack of detailed design information at the present time, and would be updated as necessary during the preparation of the mine feasibility study and NEPA process. Any updates would be submitted to BLM prior to construction.

5.15.1 Schedule of Anticipated Periods of Temporary Closure

The standard operating schedules at the Copper Flat Project would be 24 hours a day, 365 days a year for the mining activities and processing circuits. No temporary or interim closures of the facility are currently planned. However, it is possible that, due to mechanical or technical difficulties, unfavorable economic conditions, litigation or other unforeseen events, mining and processing facilities may have to be temporarily closed. In the event of an unplanned temporary closure, the following plan would be implemented:

- The BLM and MMD would be notified within 30 days of the temporary closure of the flotation mill and/or the concentrate circuit. This notification would include a description of the procedures and controls that have been or would be initiated to maintain the process components during the temporary closure period.
- NMCC would supply BLM/MMD with a list of supervisory personnel who would oversee the mine facility during the temporary closure period. This list also would include the number of support staff required in each department to maintain the facility during the closure period. Standard security procedures would remain in place for the duration of the temporary closure period. Access to the site would be allowed for appropriate regulatory agency personnel
- If the interim closure period exceeds 90 days, NMCC would begin to evaluate procedures required to carry out a permanent closure of the process components. These procedures would be reviewed and approved by the BLM and MMD. NMCC may petition the BLM and MMD for an extension that would delay permanent closure.

5.15.2 Measures to Stabilize Excavations and Workings

No additional measures would be necessary to stabilize excavations and workings during an unplanned temporary closure. Pit dewatering activities may cease during the temporary closure period, in which case, all dewatering pumps, pipelines and water storage tanks would be drained.

Interim reclamation procedures would be implemented as necessary to stabilize disturbed sites during the temporary closure period. These procedures would be coordinated with the BLM and the MMD.

Adequate storage capacity would be maintained in the process components to accommodate run-off resulting from the design storm event.

5.15.3 Measures to Isolate or Control Toxic or Deleterious Materials

NMCC would follow the waste rock management procedures described in the Plan of Operations to isolate waste rock as necessary during unplanned temporary closure. Explosives would continue to be stored and handled according to federal and state regulations. Hazardous materials would continue to be stored, handled and disposed of according to federal and state regulations.

5.15.4 Storage or Removal of Equipment, Supplies, and Structures

In the event of a temporary closure, it is anticipated that equipment, supplies and structures would not be removed or placed into storage. Some mobile equipment or bulk commodities may be relocated into buildings or covered with tarps to isolate them from the weather, depending on the anticipated duration of the temporary closure. In addition, the following steps would be taken:

- Additional reagents would not be introduced into any process component during the temporary unplanned closure period. Process piping and pumps would be drained if the process circuits are shut down. Stored equipment would be clearly identified as having contained process solutions.
- Any mine equipment remaining in operation during the temporary closure, including haul trucks, shovels, loaders, drills and personal vehicles would continue to be maintained according to standard company procedure.
- Following any temporary closure period, the integrity of the entire fluid management system would be evaluated before start-up is initiated. Solution tanks, pumps and piping would be visually inspected and repaired as necessary. The mineral processing circuit would be charged with process solution and visually inspected for evidence of leaks. Mine equipment would be inspected for compliance with appropriate federal and state mining regulations before mining activities re-commence. Pit dewatering would resume as soon as possible. Mining activities should not be affected by a temporary closure. The mine dewatering system would be visually inspected and repaired as necessary.

5.15.5 Monitoring During Periods of Non-Operation

All provisions of this plan and all other regulatory and permitting requirements would continue to be met during the temporary closure period. This would include all monitoring, notifications and reports submittal. Site monitoring and monitoring of leak detection systems for vessels and piping containing process solution would continue throughout the temporary closure period.

5.16 Facility-Specific Reclamation

5.16.1 Mine Pit

In 1982, approximately 3 million tons of overburden material was stripped and over 1.2 million tons of ore were mined from the open pit. Mining was initiated at the "5600" bench level and excavation had commenced on the "5380" bench at the time of shutdown.

Mining of the ore body would continue by a 30-foot high, multiple bench, open pit method. Under the Proposed Action, the pit would eventually be 2500 feet × 2500 feet) and would reach an ultimate depth of 900 feet at an elevation of 4,720 feet. The working slope of the pit walls would average approximately 1H:1V. Safety benches would remain at 80-foot intervals and the overall final pit slope would be about 1.1H:1.0V.

NMCC does not propose to backfill the pit because the backfilling operation would not allow sequential mining of the deposit and it would be economically unfeasible to backfill the pit following closure of the operation. The primary reason that post-closure backfilling is uneconomic is the time required to backfill the pit following plant closure. In the case of Copper Flat, this would require up to seven years during which no income would be realized. Furthermore, backfilling the pit would cover a mineral resource which could become economic with an increase in metal prices or the development of new processing technologies, and thus hinder future mineral exploration and mining of useful minerals.

Ground water inflow formed a lake in the former pit. The current water level is an elevation of about 5,420 feet; therefore, pit dewatering would again be necessary during operations. Following cessation of dewatering activities, a lake would again form in the pit. The post-closure pit water elevation is estimated to be at an elevation of approximately 5,250 feet. The depth of the lake would fluctuate a few feet depending on precipitation and the evaporation rate. Refilling would proceed over a number of years (SRK, 1995).

Possible post-closure uses for the pit include a water reservoir for agricultural and grazing purposes. Based on studies completed for Alta’s permitting processes of the mid- to late-1990s, pit water quality of the current lake, and modeling of post-closure pit water quality suggest that post-closure water quality should meet New Mexico surface water standards for these uses (SRK, 1995), and possibly also be suitable for other existing cultural uses as well as yet to be considered and otherwise unknown cultural uses. New studies are underway to build on this past work and evaluations.

Reclamation of the pit during operations would be limited to erosion control. At closure stable pit walls would be left in place, and unstable pit walls would be stabilized by blasting or other safe methods. Where safe, alluvial material would be placed on the benches above the projected water level, and the benches seeded. Roads and safety benches would be ripped and water barred to control surface water runoff. Disturbed areas around and adjacent to the pit would be covered with alluvial material and revegetated.

The ramp would be graded or ramps placed at different locations to allow escape routes for wildlife. The pit area and highwalls would be appropriately barricaded with physical barriers or fences and posted according to MSHA and New Mexico Mine Inspectors Office regulations. Access would be limited by a locked gate and the access road blocked with a physical barricade.

5.16.2 Waste Rock Disposal Areas and Low-Grade Stockpile

The primary waste rock disposal area for the Proposed Action is located east-northeast of the mill site on the east side of Animas Peak (**Figure 3-1**). Two smaller waste rock disposal areas would be located adjacent to the pit.

The present height of the east waste rock disposal area is at an elevation of approximately 5,560 feet. By the end of mine life, an upper lift would be developed at an elevation of 5,620 feet and a lower lift would be developed at an elevation of 5,290 feet. The west and north waste rock disposal piles and lean ore stockpile would be constructed by expanding the existing piles from their current elevation and constructing additional lifts at 50-foot intervals. Total waste material contained in the disposal areas at the end of the expected life of the property is estimated to be approximately 51 million tons.

The waste rock disposal areas would be regraded and reclaimed to blend into the surrounding topography to the extent practicable. Three types of waste rock have been identified at the site: oxidized waste rock, transitional waste rock and unoxidized waste rock (SRK, 1995). The potential for acid generation from the bulk of the waste materials is low, primarily due to the relatively low regional precipitation, and except due to exceptional summer storms the virtual lack of any off site runoff and finally-the rapid evaporation and adsorption of any available moisture. However, reclamation and surface water management measures designed for the partially oxidized materials would be used to promote runoff and reduce infiltration for all material types. Horizontal surfaces would be regraded and contoured to reduce infiltration of water and provide positive drainage to sediment collection points. Care would be taken to contour these areas to reduce the potential for ponding and infiltration. This would reduce the potential for oxidation within each disposal facility and the leaching of metals and residual oxidation products.

Partially oxidized waste rock represents the majority of the material in the existing West and North waste rock disposal areas. Testing of this material indicates it can produce acid in the presence of water (SRK, 1995). The majority of waste rock exposed on the East disposal area is unoxidized material.

Unoxidized quartz monzonite would comprise the bulk of future waste rock. Although this material has the potential to generate acid, both field observations and test results indicated that this material is, at most, slowly reactive (SRK, 1995). Transitional zone materials represent a limited portion of the total waste rock volume. The potential for acid generation from these materials is high, requiring special waste management, including, but not necessarily limited to encapsulation and/or blending with alkaline materials. Transitional waste rock would be segregated from the unoxidized waste rock by visual inspection and field testing, if necessary, during mining and disposed of in the West and North disposal areas. NMCC is currently in the process of updating the geochemical characterization of all of these materials in order to more accurately predict their long-term behavior and prescribe suitable ARD mitigation measures, as necessary.

Although the bulk of the waste rock material does not indicate a high risk of environmental degradation, all of the waste rock disposal areas and any lean ore remaining in the lean ore pile would be reclaimed in a manner which has been determined to reduce infiltration and to alleviate the long term risk of acid generation and metals leaching (SRK, 1995). Following regrading, the surface of the disposal areas would be compacted with earthmoving equipment and covered with a layer of alluvial material and revegetated.

A study to determine the effectiveness of various cover materials to minimize infiltration into the waste rock disposal areas indicated that a layer 12 inches thick should reduce infiltration to negligible levels (SRK, 1995). The study utilized computer hydrologic modeling using default and calculated soil properties and synthetically generated climatic data for nearby locations. The effectiveness of the cover materials would be re-evaluated with site specific soil properties and climatological data during construction and operations to determine the optimum cost effective cover materials for the waste rock disposal areas.

During operations, the disposal area would be constructed in 50 foot lifts to facilitate regrading during reclamation such that slope faces do not exceed 2.5H:1V. Benches would be established at the existing lift elevations and, if indicated by the test revegetation program and concurrent reclamation, at intermediate intervals to reduce erosion. As each lift is completed, any portion not needed for access to other lifts would be regraded, covered and revegetated as soon as practicable.

To enhance revegetation, reduce erosion and minimize surface the waste rock disposal areas would be covered with suitable reclamation materials and revegetated contemporaneously with operations. This material would be roughened to reduce surface flow velocities and minimize erosion and sediment loss.

During operations, surface run-off from Animas Peak would be diverted around the disposal area to prevent surface run-on and infiltration into the waste rock. Diversion structures would be revegetated and/or protected by riprap to reduce erosion and left in place following closure.

The lean ore pad is located immediately southeast of the open pit and would include about 11 million tons of rock assaying 0.18 percent copper. Reclamation of this area would depend on the fate of this stock pile. If the low-grade stockpile is milled by the end of mine life, the pad area would be ripped, contoured for drainage control, covered with growth media and revegetated. If the low-grade stockpile remains following closure, the stockpile would be reclaimed in the same manner as the waste rock disposal areas. It would be regraded to slopes of less than 2.5H:1V and shaped to enhance run-off and prevent infiltration and ponding. The surface would be compacted with earth moving equipment, covered with a layer of alluvial material and the surface revegetated.

5.16.3 Plant Site

The plant site would occupy an area of approximately 78 acres and would be located between the open pit and the tailings impoundment area. The sulfide flotation plant would be similar to that constructed at the site for the previous operation. The plant facilities would be constructed at the site of the original plant, and it is expected that most of the original foundations would be used for the facilities, with adjustments being made based on economic considerations. All buildings would be prefabricated, standard, rigid-framed structures. Prior to construction, the material covering the foundations would be stripped and salvaged for future reclamation.

The following primary structures would be located at the plant site:

- Primary Crusher Installation,
- Concentrator Building,
- Reagent Building (60' × 72'),
- Electrical Substation,
- Administration Building (60' × 120' × 12'),
- Mine Office/Change House,
- Assay and Laboratory Offices (32' × 126'),
- Truck Shop/Warehouse Building,
- Small Vehicle Shop, and
- Gate House Building (8' × 12').

At closure, all surface facilities, equipment and buildings would be removed from the area. The concrete building slabs, footings and foundations would be broken and covered with waste rock material. All fuel tanks, reagent storage facilities would be removed from the site according to applicable federal and state laws. The general surface area would be shaped and contoured for surface drainage control, and covered with a minimum of 6 inches of stockpiled alluvium/growth media to conform to the surrounding topography to the extent practicable. Revegetation would occur as discussed in Section 5.10.

The tailings thickener and tailings reclaim pond would be backfilled regraded to minimize ponding prior to placement of alluvial material/growth media and revegetation. The stormwater collection pond is located adjacent to Greyback Wash east of the plant area. This pond, currently backfilled, is believed to be the source of water which created the riparian zone in Greyback Wash adjacent to it. NMCC would endeavor to maintain the riparian zone during operations when the stormwater pond would be used collect stormwater runoff by diverting water from the freshwater supply system. At closure, this pond would remain open with and the discharge pipe left in place in an attempt to recreate the current near surface hydrologic conditions which are supplying water to the riparian zone. The land bridge which conveys the tailings pipeline would also be left in place because this feature may be a contributing factor to the development of the riparian zone. The slopes of the land bridge would be stabilized and the top revegetated during reclamation.

5.16.4 Tailings Impoundment

A tailings impoundment located southeast of the plant site was designed to hold a total of 95 million tons of tailings (including tailings from 11 million tons of low-grade ore). Closure of the tailings impoundment would include:

- Final grading of embankment outslopes to establish erosion controls and controlled surface water drainage (best management practices);
- Placement of a soil or rock cover and revegetation of the embankment outslope;
- Placement of riprap and erosion controls in embankment surface water drainage facilities;
- Regrading or depositional modification of the impoundment surface to promote drainage to a permanent engineered spillway;
- Placement and vegetation of a soil cover over the tailings surface;
- Armoring of surface drainage channels and implementation of best management practices for erosion control; and
- Management of underdrainage.

Final grading of the impoundment surface can be accomplished with earthmoving equipment, or through modification of tailings disposal patterns during the final years of operation. Tailings discharge from selected locations can be used to relocate the supernatant pool to a location adjacent to the post-closure spillway, thereby reducing grading requirements and limiting earthmoving operations in areas where working conditions are expected to be difficult due to the presence of soft and saturated tailings. At the location of the spillway [see Drawing 9 in **Appendix D** (Golder, 2010)], a bedrock foundation is anticipated. If the spillway channel is erodible, grouted riprap or other erosion controls would be applied.

Consolidation seepage into the underdrain system can be anticipated to continue at declining rates for an indefinite period following the cessation of tailings disposal operations. Underdrainage would be pumped from the underdrain collection pond to the surface of the tailings impoundment where it can be evaporated. When underdrainage is reduced to an acceptably low flow rate, the underdrain pipes beneath the embankment can be sealed with grout and the underdrain collection pond can be decommissioned.

5.16.5 Ancillary Project Facilities

In general, all surface pipelines, poles, and commercial signage would be removed. Buried pipelines and electrical conduits would be left in place.

5.16.5.1 *Fences*

The tailings and mine area would be fenced to discourage access by people, wildlife and cattle. Existing fences may be left in place depending on the location and purpose. Fences used to restrict access to potentially hazardous areas would remain in place. Other fences may remain to protect revegetation efforts. The BLM would determine the fate of fences on public lands. The remaining fences would be removed for salvage.

To prevent damage to newly seeded and revegetation areas, these areas would be protected by fencing or other appropriate measures for a period of time until revegetation is successful. It may be necessary to control small mammals as well as deer and domestic livestock. All fencing on public lands would be constructed to meet BLM requirements.

5.16.5.2 *Water Tanks*

The fresh water and process water tanks would be removed, their foundations buried in place and the sidehill cuts recontoured to approximate original topography. Following recontouring, the areas would have alluvial material placed up to 6 inches thick if the replaced fill material would not support vegetation. The areas would then be revegetated as described in Section 5.10.

5.16.5.3 *Roads*

A portion of the access road has been deeded to Sierra County and provides access through the mine site to private and public property adjacent to the west boundary of the Project. From the point where the mine access road leaves the county road north of the tailings impoundment, it would be narrowed to a standard two-lane road with a running surface approximately 30 feet wide. One culvert, located where the road crosses Greyback Wash would be left in place.

Prior to final closure, the State and BLM would determine which auxiliary roads and haul roads would be left intact. At this time, at a minimum, the road to the water tanks, haul roads, waste disposal access roads are expected to undergo reclamation.

Roads to be reclaimed would be recontoured to approximate original topography if constructed on sidehills or contoured and ripped if constructed in flat areas. Typical reclaimed cross-sections of the different road types are shown on **Figure 5-3**. Water bars would be constructed to reduce erosion. Recontoured areas would be covered with up to 6 inches of alluvial material if replace fill material would not support vegetation and revegetated as describe in Section 5.10.

5.16.5.4 *Electrical Power*

Power for the Project would be furnished by means of existing overhead power lines. The overhead lines would be removed from the mill site and disconnected from the 115kV line owned by Sierra Electrical Cooperative by removing the wires of the last span of the line. Pumping stations and electrical substations on the site would be removed, if no other post-closure land use is identified and approved. The disturbance associated with removal would be reclaimed by regrading and seeding. If renewable energy facilities are deployed at specific buildings, these will be removed and associated disturbances regarded and reseeded.

The existing 25 kV line that provides power to the production wells, booster stations on the fresh water pipeline and the reclaim water pump stations at the tailings dam would remain in place. Sierra Electric owns this power line and is responsible for maintenance.

5.16.5.5 *Water Supply*

Water would be supplied to the mine from four production wells located about seven miles east of the plant site. A 20-inch welded steel pipeline transports the water to the mine and is buried at a minimum depth of 2 feet from the well field to the point of entry to the Project area.

The buried pipeline is owned by the BLM and would remain in place. The production wells would remain in a condition suitable for other uses. All roads, power lines and foundations for the production wells are in place. No additional disturbance would occur during the project and the well area would be left as it currently exists after closure of the mine.

5.16.5.6 *Sanitary Solid Waste Disposal*

At closure the septic tanks and leach fields would be decommissioned. All solid wastes remaining on the site would be removed off-site for proper disposal. If a private landfill is permitted for on-site disposal of solid waste, the landfill would be closed according to NMED requirements.

5.17 Estimated Reclamation Costs

A reclamation bond is required by the BLM and State of New Mexico to guarantee the completion of Project reclamation. Following regulatory review of the proposed plan of operations and reclamation techniques presented herein, NMCC would prepare, *at a time specified by the BLM* [43 CFR § 3809.401(d)], a *detailed estimate of the cost to fully reclaim the operations* as required by 43 CFR § 3809.552. The estimated costs would be based on projected actual costs to reclaim the site assuming that all reclamation would occur following operations without the benefit of contemporaneous reclamation. Prior to commencement of operations, financial assurance in the amount of the estimated costs to reclaim the disturbance which would occur during the first five years of operations would be posted with the BLM.

6 Acknowledgment

I certify that I have personally examined and am familiar with the information submitted herein, and based on my inquiry of those individuals responsible for obtaining the information; I believe the submitted information is true, accurate, and complete.

Barrett Sleeman, President
New Mexico Copper Corporation

December 22, 2010
Date

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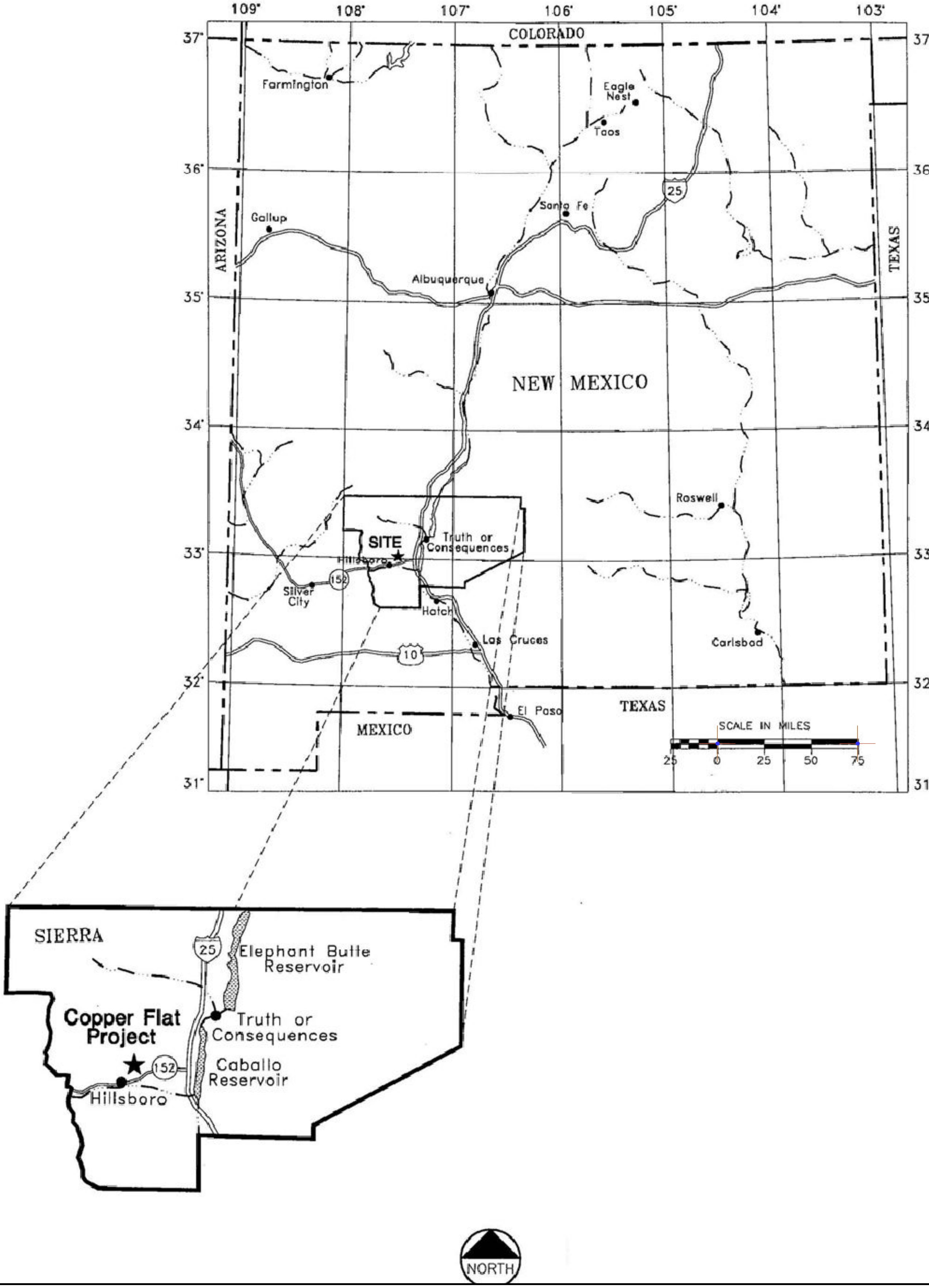

NEW MEXICO COPPER CORPORATION

COPPER FLAT MINE

PROJECT LOCATION

DESIGN: -	DRAWN: -	REVIEWED: -
CHECKED: -	APPROVED: -	DATE: 12/2/2010
FILE NAME PoO_Fig1-01_Location_JQG_20101202		

DRAWING NO.	SHEET	REVISION NO.
FIGURE 1-1	1 OF 28	A
JOB NO. 191000-03		

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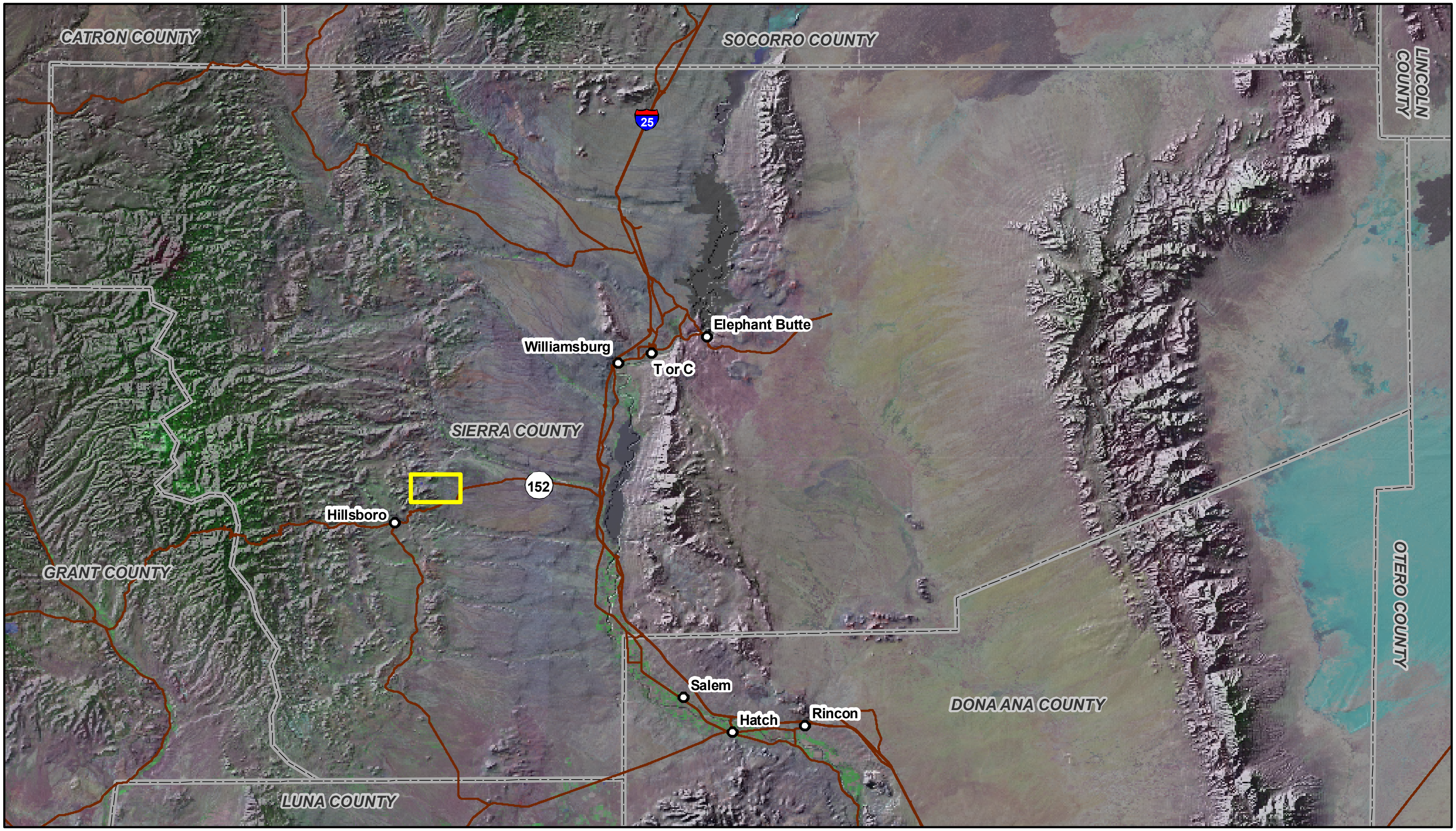

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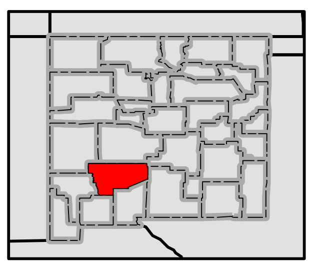
Miles



Imagery Information:
-Landsat Imagery from
University of Maryland NLCD

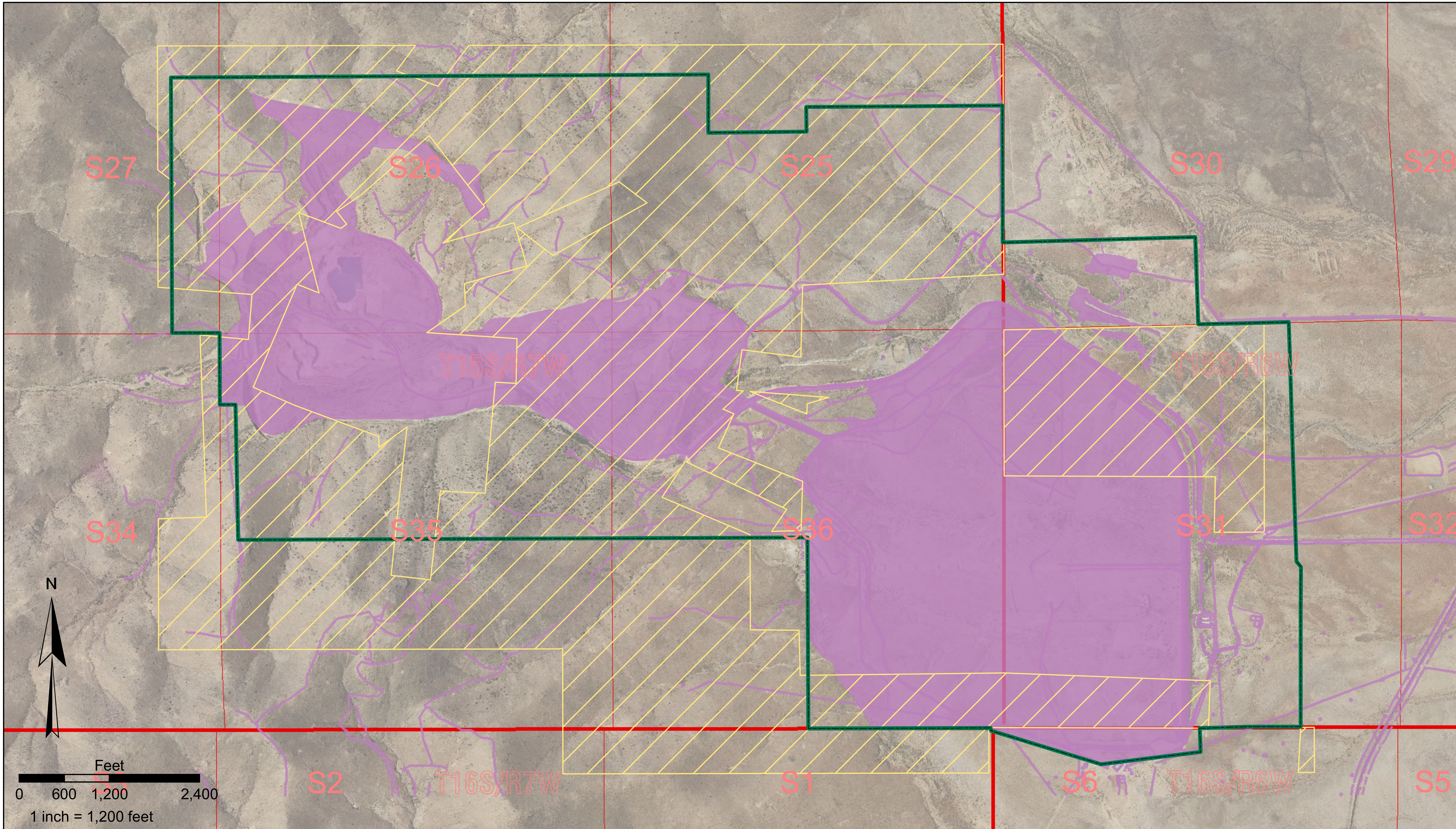
Legend

- City/Town
- Site Location
- Road

INTERA

Figure 1-2
Regional Location
New Mexico Copper Corporation

S:\Projects\NMC-001_New Mexico Copper Corporation\GIS\Maps\SAP_7-2010\1_introduction\1-1_SiteLocationMap.mxd 07/22/2010



EXPLANATION

Public Land | Mine Boundary | Disturbance By Previous Operators (989 acres)

IF THE ABOVE BAR DOES NOT SCALE 1 INCH, THE DRAWING SCALE IS ALTERED

DESIGN: -	DRAWN: -	REVIEWED: -
CHECKED: -	APPROVED: -	DATE: 12/1/2010
FILE NAME: PoO_Fig2-01_Land_JQG_20101123		

NEW MEXICO COPPER CORPORATION

COPPER FLAT MINE

LAND STATUS AND EXISTING DISTURBANCE

DRAWING NO.	SHEET	REVISION NO.
FIGURE 2-1	3 OF 28	A
JOB NO. 191000-03		

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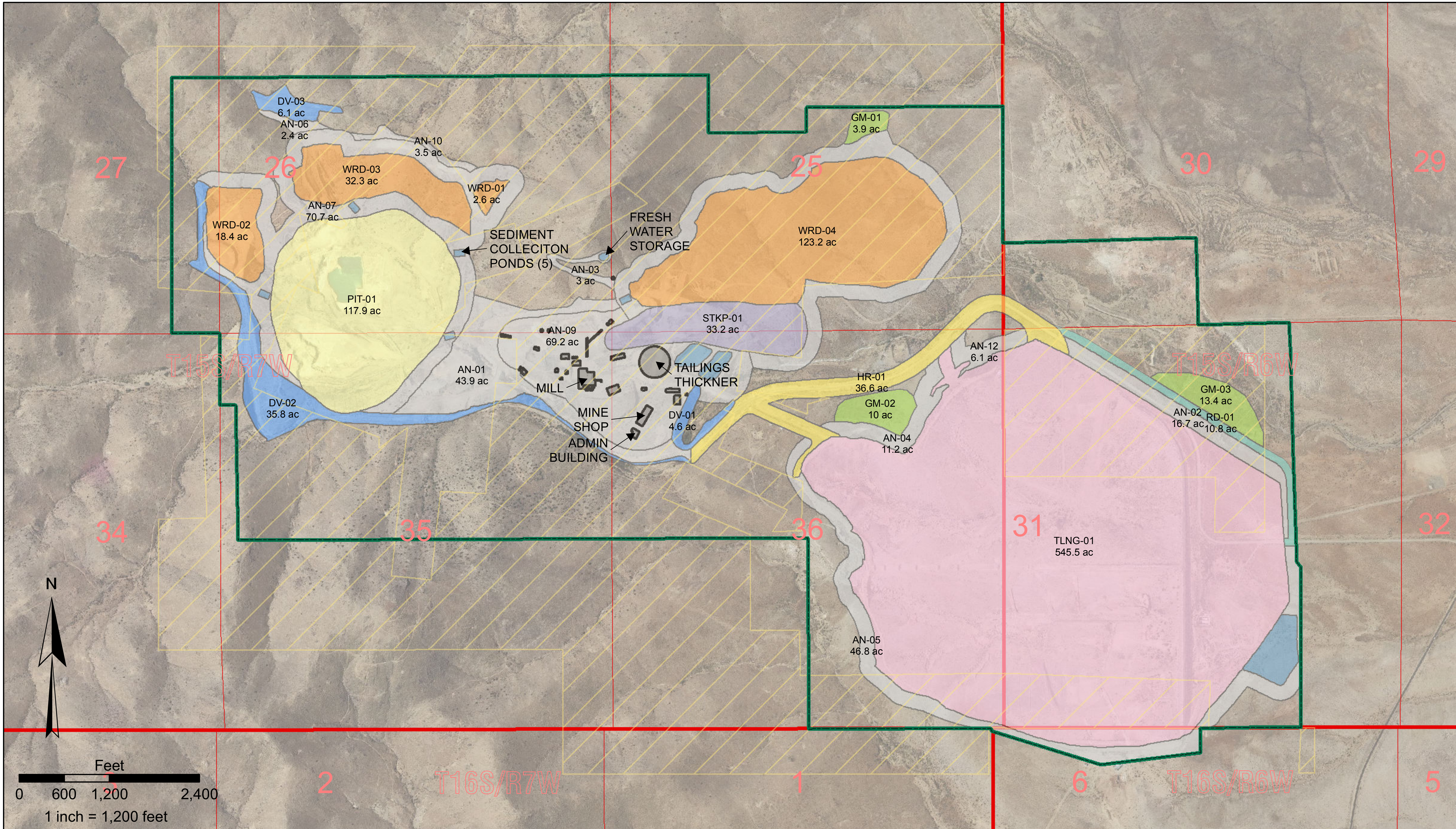


EXPLANATION

Public | Plant Facilities | Waste Rock | Tailings | Pit | Diversion | Access Road
Mine Boundary | Pond | Topsoil Stockpile | Ore Stockpile | Haul Road | Ancillary

IF THE ABOVE BAR DOES NOT SCALE 1 INCH, THE DRAWING SCALE IS ALTERED

DESIGN: - | DRAWN: - | REVIEWED: -
CHECKED: - | APPROVED: - | DATE: 12/1/2010
FILE NAME: PoO_Fig3-01_PropFacilities_JQG_20101123

NEW MEXICO COPPER CORPORATION

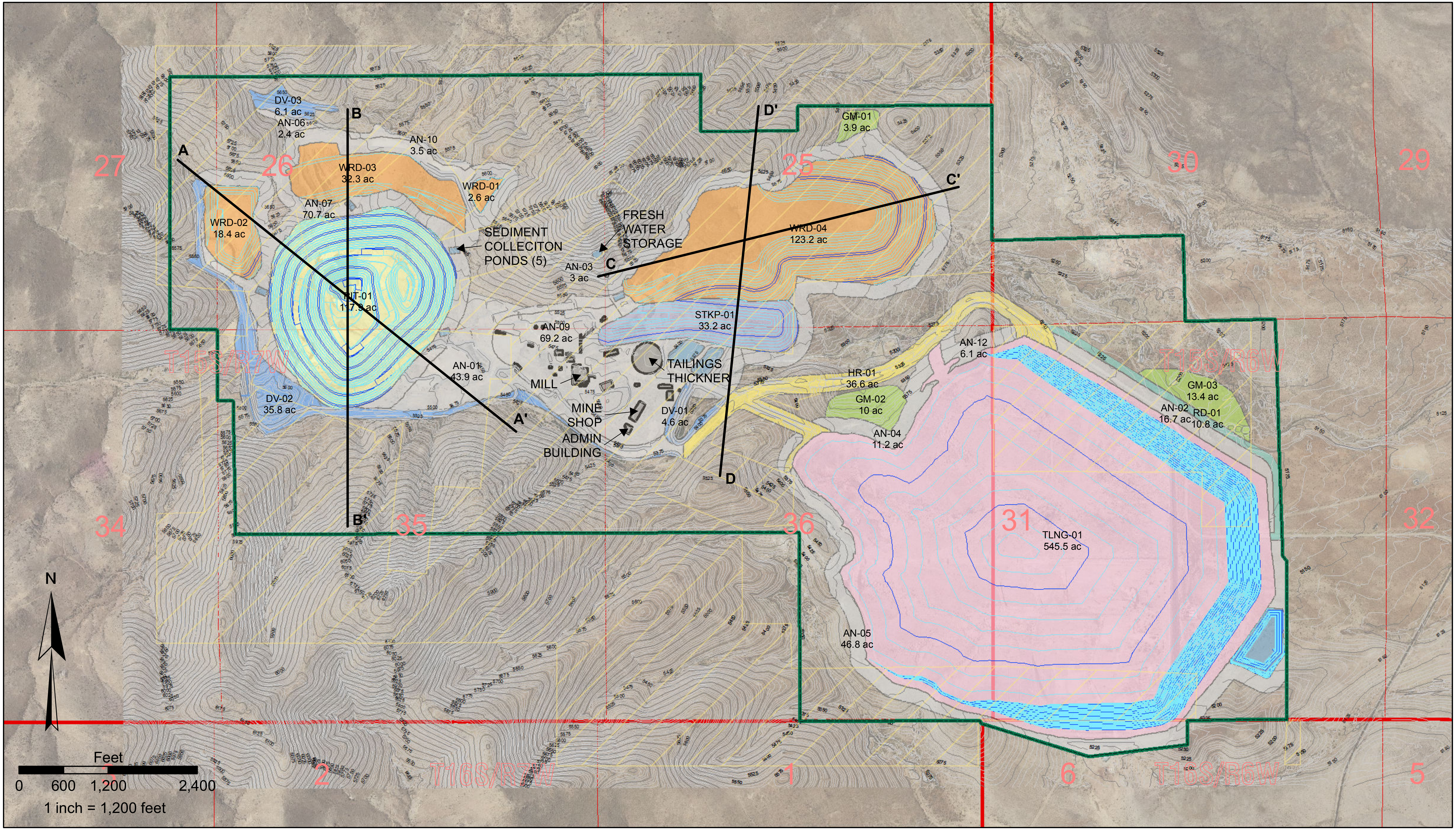
COPPER FLAT MINE

DRAWING TITLE: **PROPOSED FACILITY LAYOUT**

DRAWING NO. **FIGURE 3-1** | SHEET 4 OF 28 | REVISION NO. **A**

JOB NO. **191000-03**

Path: H:\Copper_Flat\New Mexico Copper Corp\191000_03_Copper_Flat_Permitting\040_Drafting\20101115\PoO_Fig3-01_PropFacilities_JQG_20101123.mxd



EXPLANATION

Public	Plant Facilities	Waste Rock	Tailings	Pit	Diversion
Access Road	Mine Boundary	Pond	Topsoil Stockpile	Ore Stockpile	Haul Road
Ancillary					

IF THE ABOVE BAR DOES NOT SCALE 1 INCH, THE DRAWING SCALE IS ALTERED

DESIGN: -	DRAWN: -	REVIEWED: -
CHECKED: -	APPROVED: -	DATE: 12/2/2010
FILE NAME: PoO_Fig3-02_PropTopo_JQG_20101130		

NEW MEXICO COPPER CORPORATION

COPPER FLAT MINE

DRAWING TITLE: **PROPOSED FACILITY TOPOGRAPHY**

DRAWING NO. FIGURE 3-2 | SHEET 5 OF 28 | REVISION NO. A

JOB NO. 191000-03

Path: H:\Copper_Flat\New Mexico Copper Corp\191000_03_Copper_Flat_Permitting\040_Drafting\20101115\PoO_Fig3-02_PropTopo_JQG_20101130.mxd

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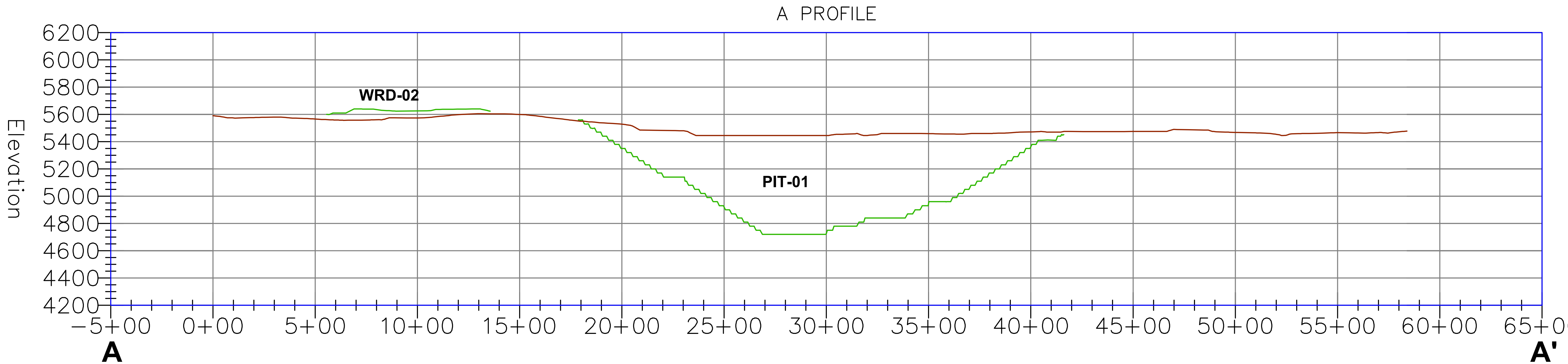

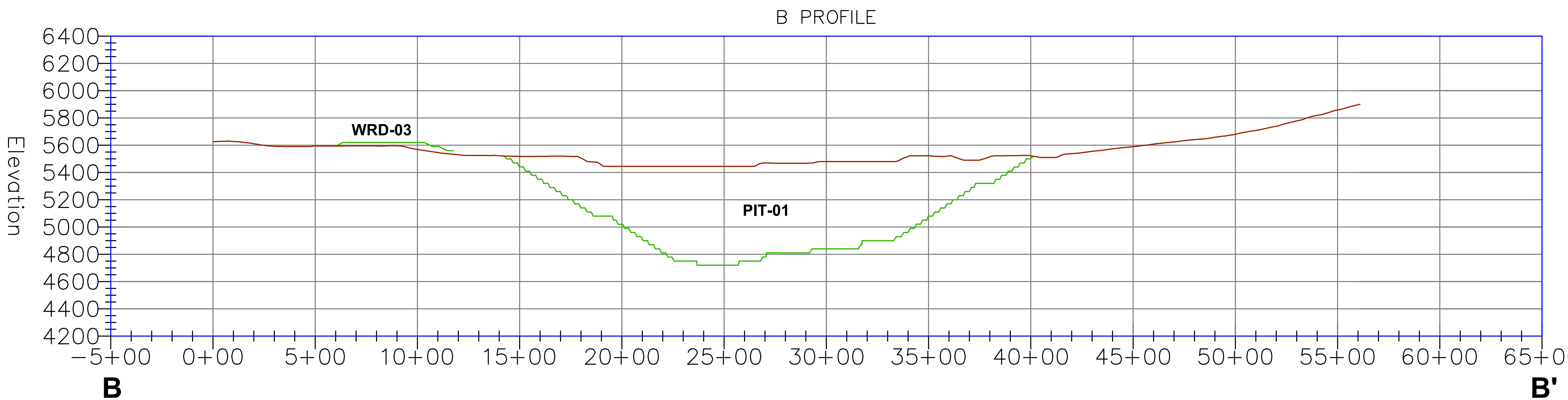

FEET

0 250 500 1000

1 inch equals 500 feet

IF THE ABOVE BAR DOES NOT SCALE 1 INCH, THE DRAWING SCALE IS ALTERED

DESIGN: -	DRAWN: -	REVIEWED: -
CHECKED: -	APPROVED: -	DATE: 12/1/2010
FILE NAME:	PoO_Sections_ML_JQG_20101130.dwg	

NEW MEXICO COPPER CORPORATION

COPPER FLAT MINE

DRAWING TITLE: **OPEN PIT AND WASTE ROCK DUMP CROSS SECTIONS**

DRAWING NAME: FIGURE 3-3

REVISION NO. **A**

JOB NO: 191000-03

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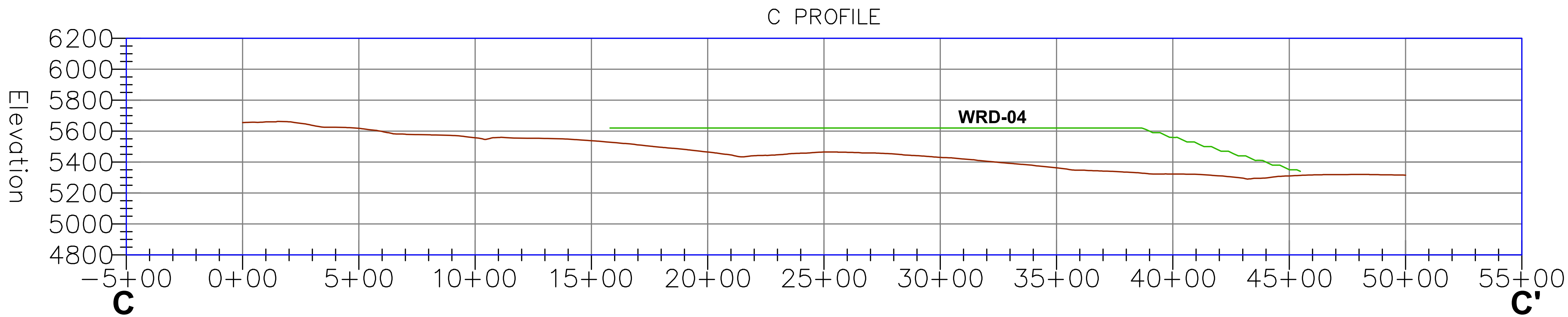

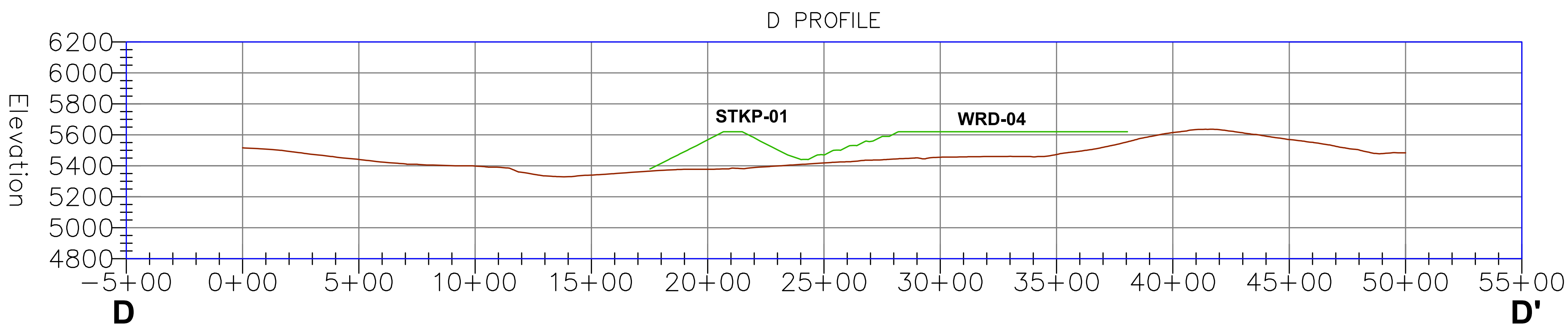

FEET

0 250 500 1000

1 inch equals 500 feet

IF THE ABOVE BAR DOES NOT SCALE 1 INCH, THE DRAWING SCALE IS ALTERED

DESIGN: -	DRAWN: -	REVIEWED: -
CHECKED: -	APPROVED: -	DATE: 11/30/2010
FILE NAME: PoO_Sections_ML_JQG_20101130.dwg		

NEW MEXICO COPPER CORPORATION

COPPER FLAT MINE

DRAWING TITLE:
ORE STOCKPILE AND WASTE ROCK DUMP CROSS SECTIONS

DRAWING NAME: FIGURE 3-4

REVISION NO. **A**

JOB NO: 191000-03

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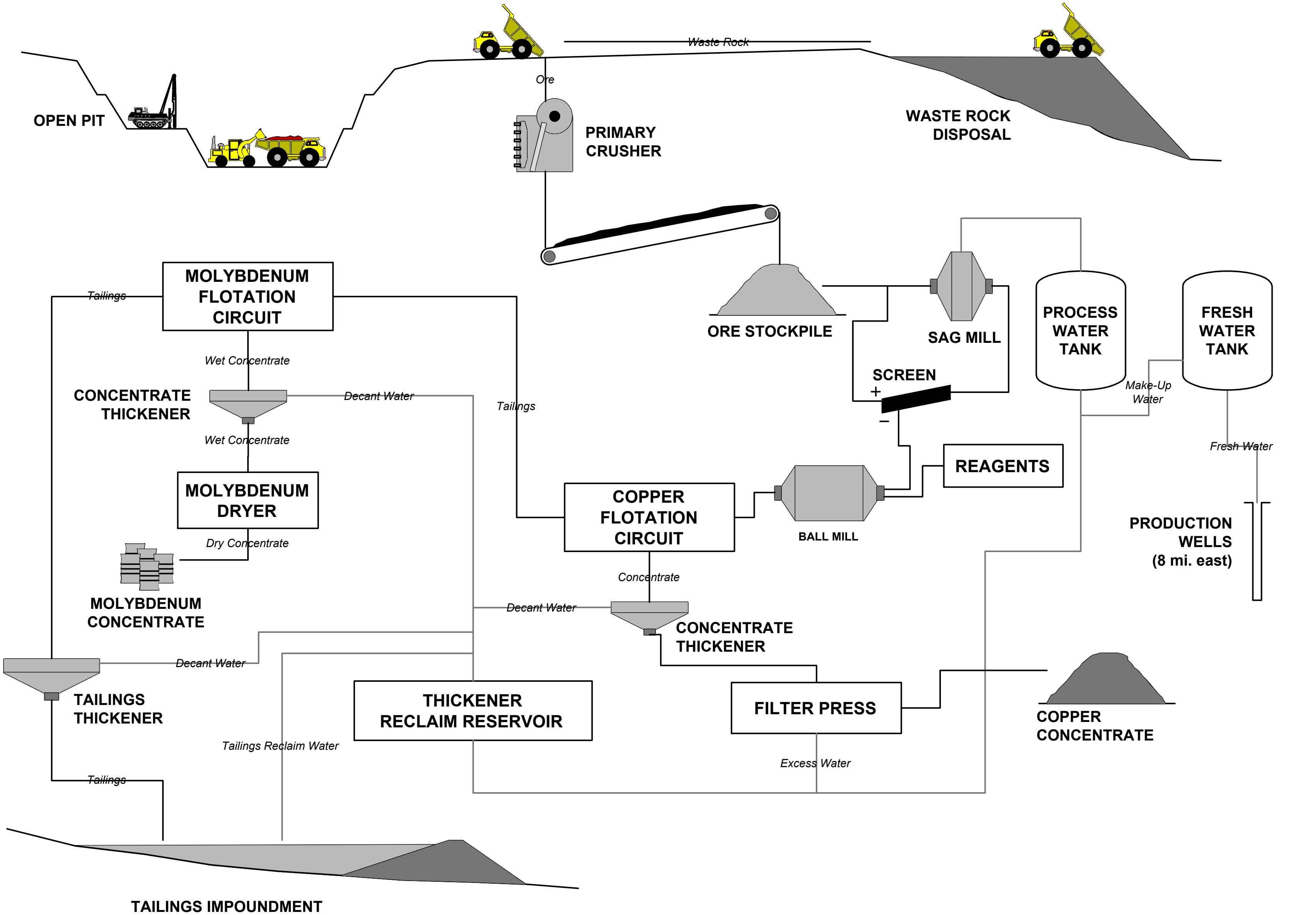

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PREPARED FOR:

NEW MEXICO COPPER CORPORATION

COPPER FLAT PROJECT

DRAWING TITLE: PROPOSED PROCESS CIRCUIT

DRAWING NO. **FIGURE 3-5**

JOB NO. **191000-03**

REVISION NO. **A**

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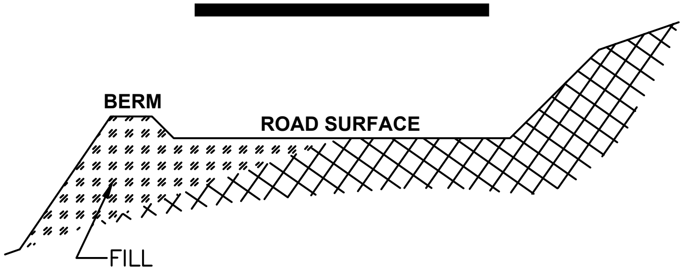
FLAT ROADS

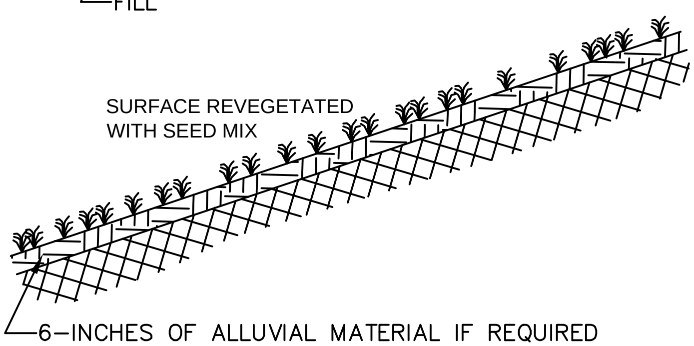
OPERATIONS CONFIGURATION

RECLAIMED CONFIGURATION

SIDEHILL ROADS



OPERATIONS CONFIGURATION



RECLAIMED CONFIGURATION

DESIGN: -	DRAWN: -	REVIEWED: -
CHECKED: -	APPROVED: -	DATE: 12/2/2010
FILE NAME: PoO_Fig3-06_Roads_JQG_20101202.dwg		

PREPARED FOR:

NEW MEXICO COPPER CORP.
COPPER FLAT PROJECT

DRAWING TITLE: ROADS CONFIGURATION

DRAWING NO. **FIGURE 3-6**

JOB NO. **191000-03**

REVISION NO. **A**

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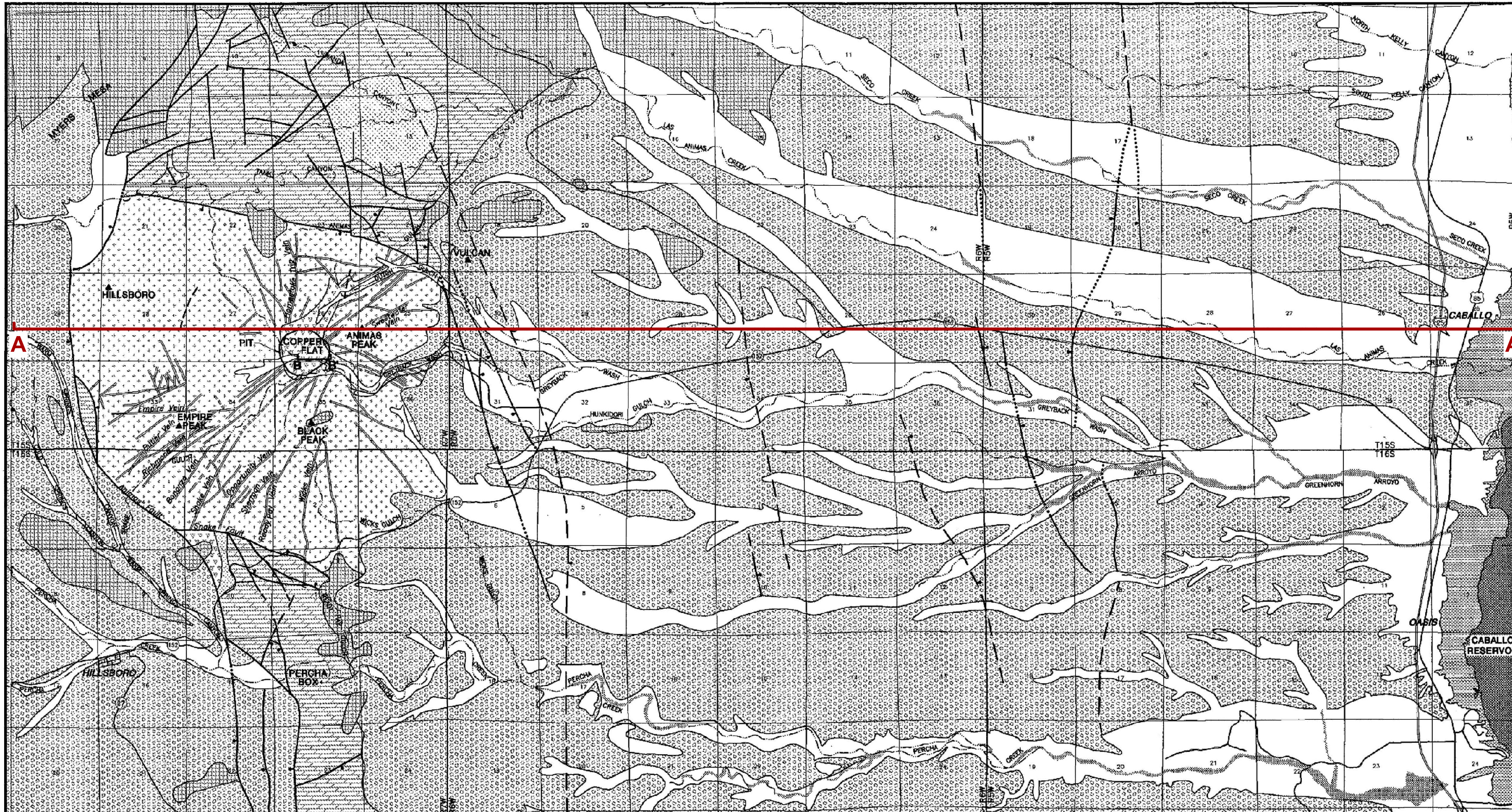

STRATIGRAPHY

TERTIARY - QUATERNARY	CRETACEOUS	PALEOZOIC AND PRECAMBRIAN
Quaternary Alluvium (Qvy+Qvo)	Late Cretaceous – Silicic Intrusives (Kll)	Paleozoic Siliclastic and Carbonate Sedimentary Rocks (pC through PM)
Tertiary Volcanics (TQb+Tv)	Cretaceous Latite – Andesite Intrusives (Kql+Kd+Kls)	
Tertiary Santa Fe Group (Tsfp+Tsf)	Andesite rocks near Copper Flat (Ka)	

LEGEND

NORMAL FAULT, BALL ON DOWNTHROWN SIDE; DASHED WHERE INFERRED, DOTTED WHERE BURIED.

CONTACT

A A' CROSS SECTION LOCATION

SOURCES:
(1) HARLEY (1934)
(2) SEAGER ET AL. (1982)
(3) HEDLUND (1977)
(4) ALMINAS ET AL. (1975)

NORTH

0 5,825 11,650
FEET

(see Figure 7-2 for cross section detail)

INTERA

from BLM, 1999

Figure 4-1
Regional Surface Geology
New Mexico Copper Corporation

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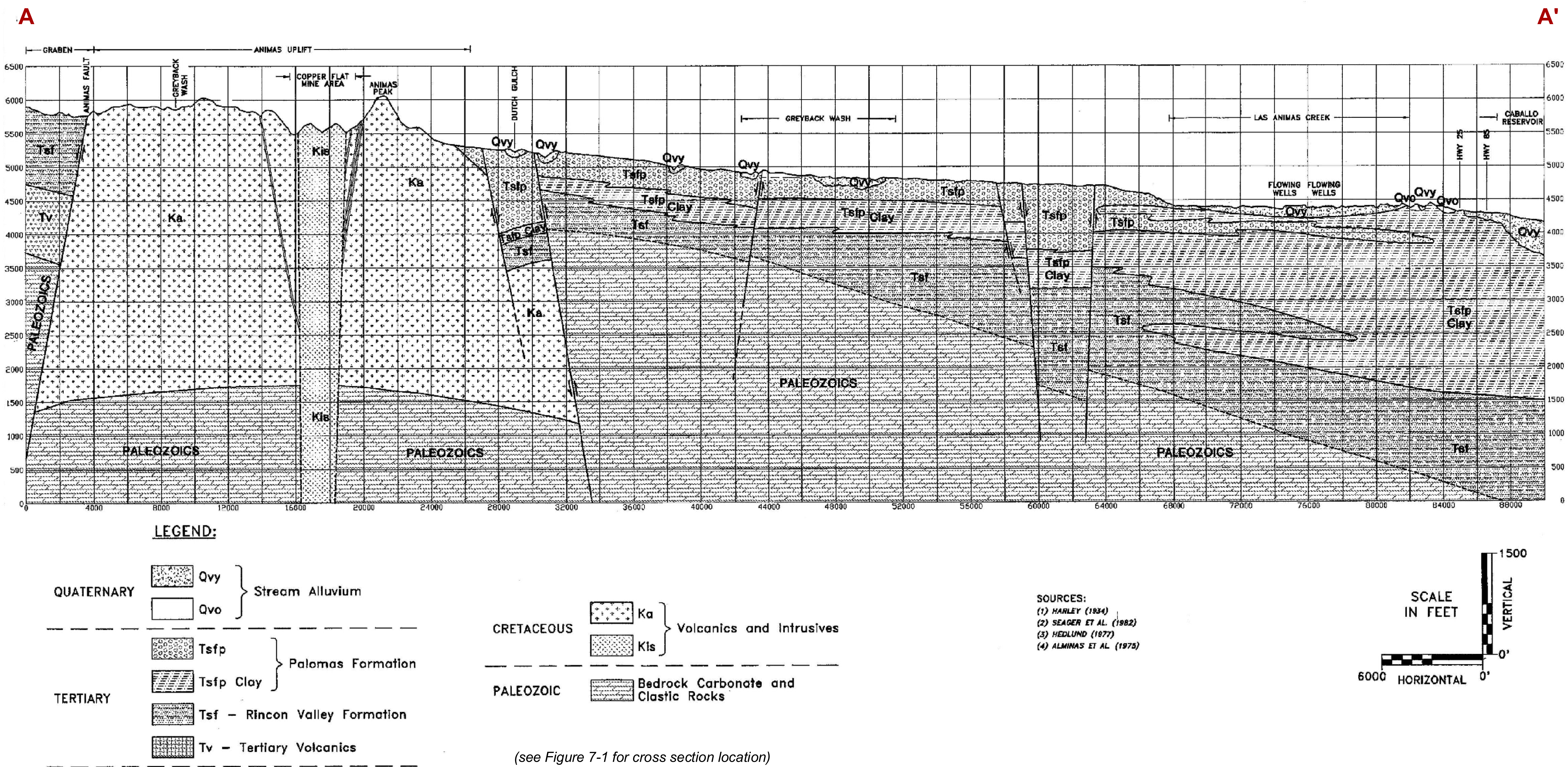
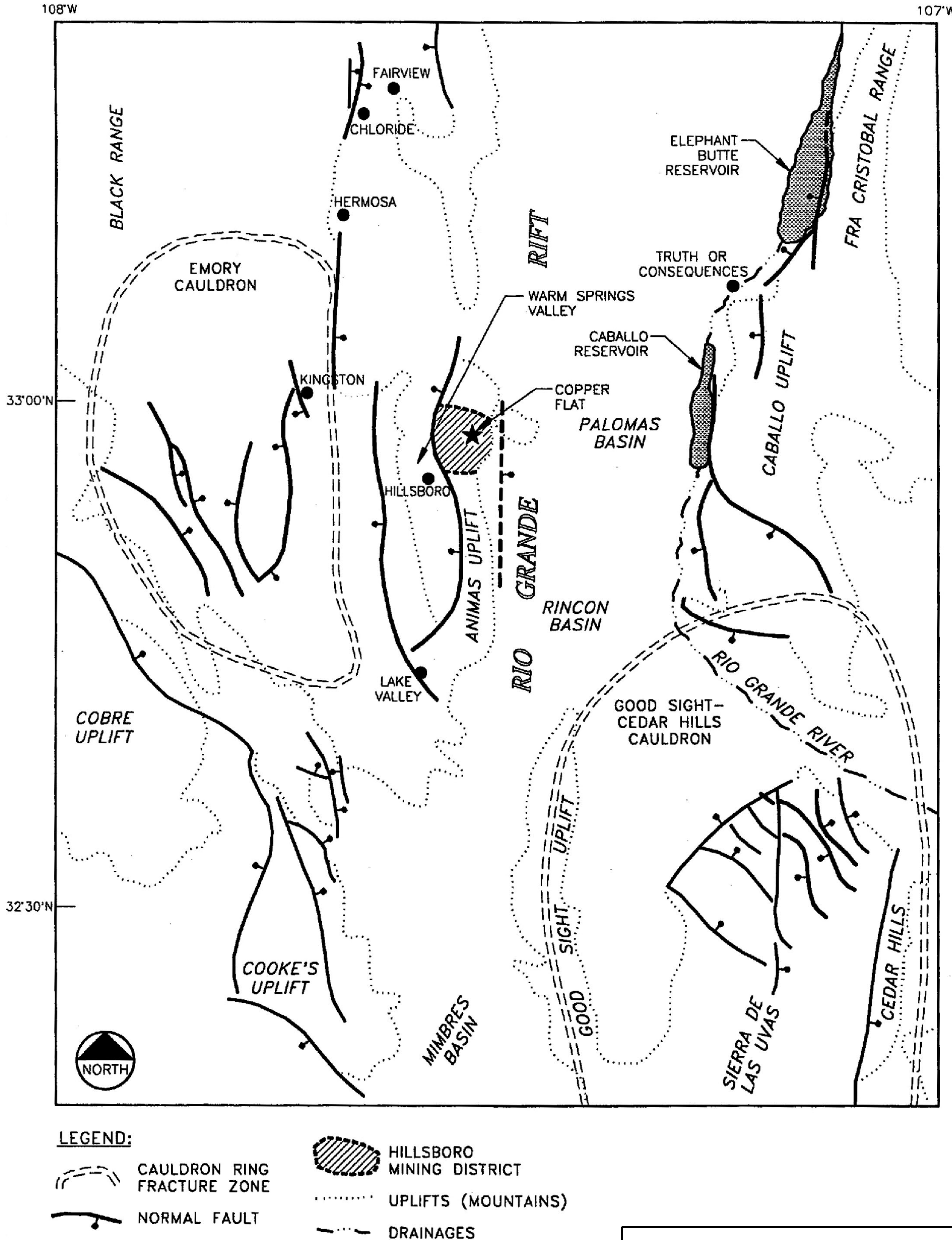


from BLM, 1999

Figure 4-2
Schematic Geologic Cross Section (A-A')
New Mexico Copper Corporation



from BLM, 1999

Figure 4-3
Geologic Structural Features of the Region
New Mexico Copper Corporation

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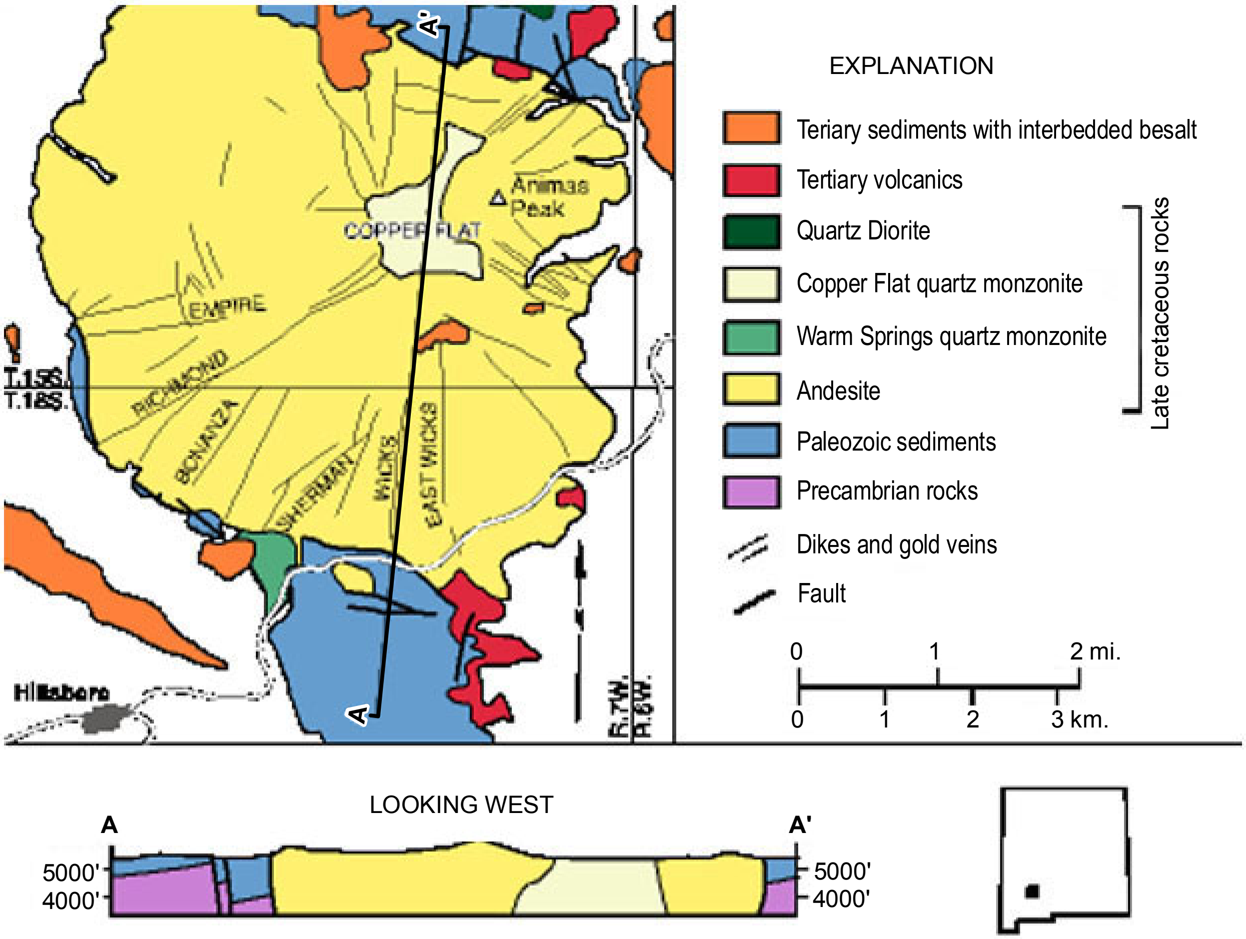
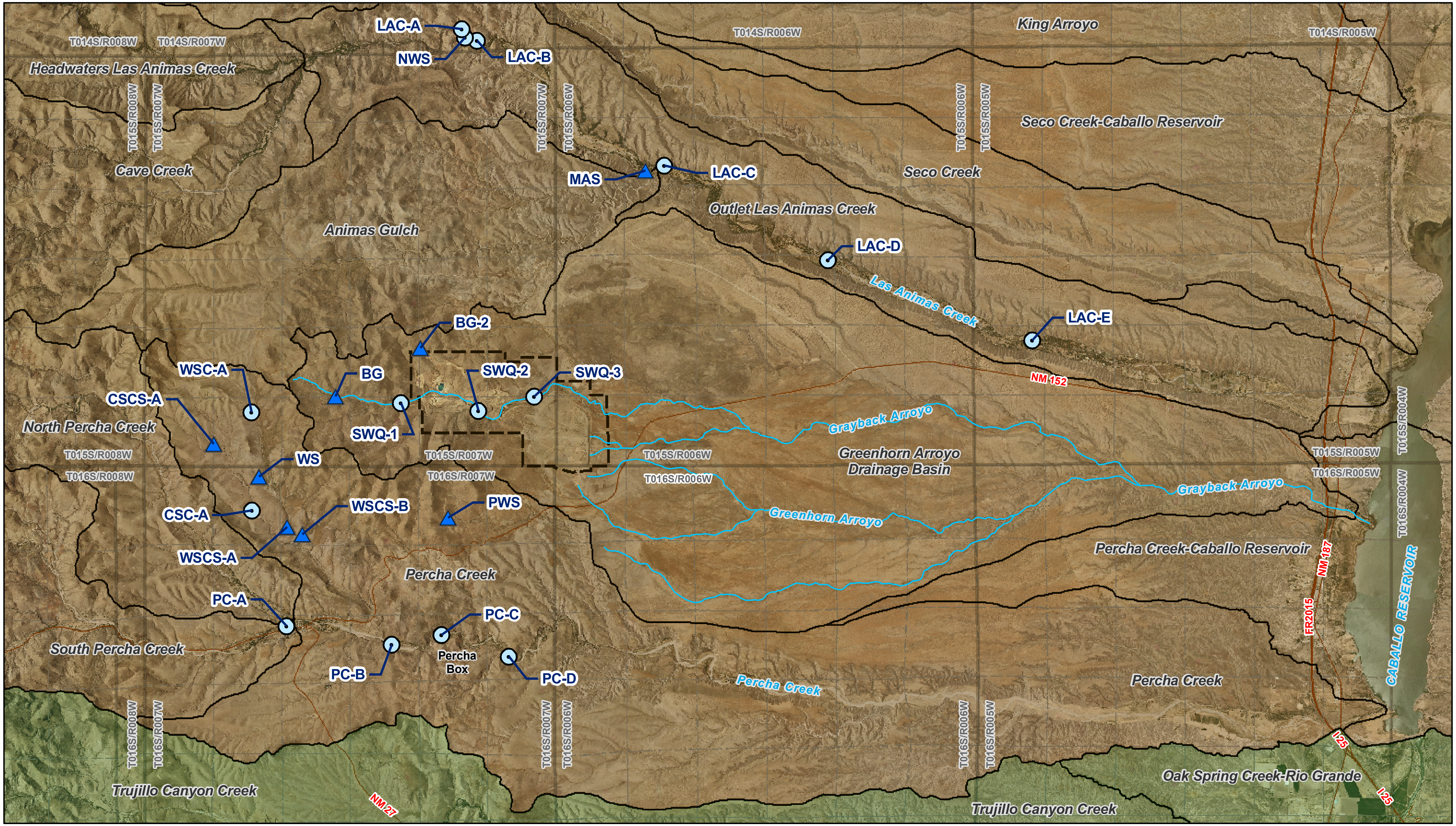


from McLemore et al., 2000; Dunn, 1982; Hedlund, 1985

Figure 4-4
Geologic Schematic of the
Hillsboro Mining District, New Mexico
New Mexico Copper Corporation



Watersheds:
USGS Hydrologic Unit Map
Mine Boundary:
Tom Van Bebber
Imagery Information:
-USGS 7.5-Minutes County DOQQ mosaic
Sierra County, 2009
Projection Information:
-New Mexico State Plane West, NAD 1927

0 3,500 7,000 14,000 21,000
Feet

Legend

- Stream Sample
- Spring Sample
- Proposed Mine Permit Boundary

Watersheds
- Caballo
- El Paso-Las Cruces
- Sub-Watershed

Figure 4-5
Proposed Surface Water Sampling Locations
New Mexico Copper Corporation

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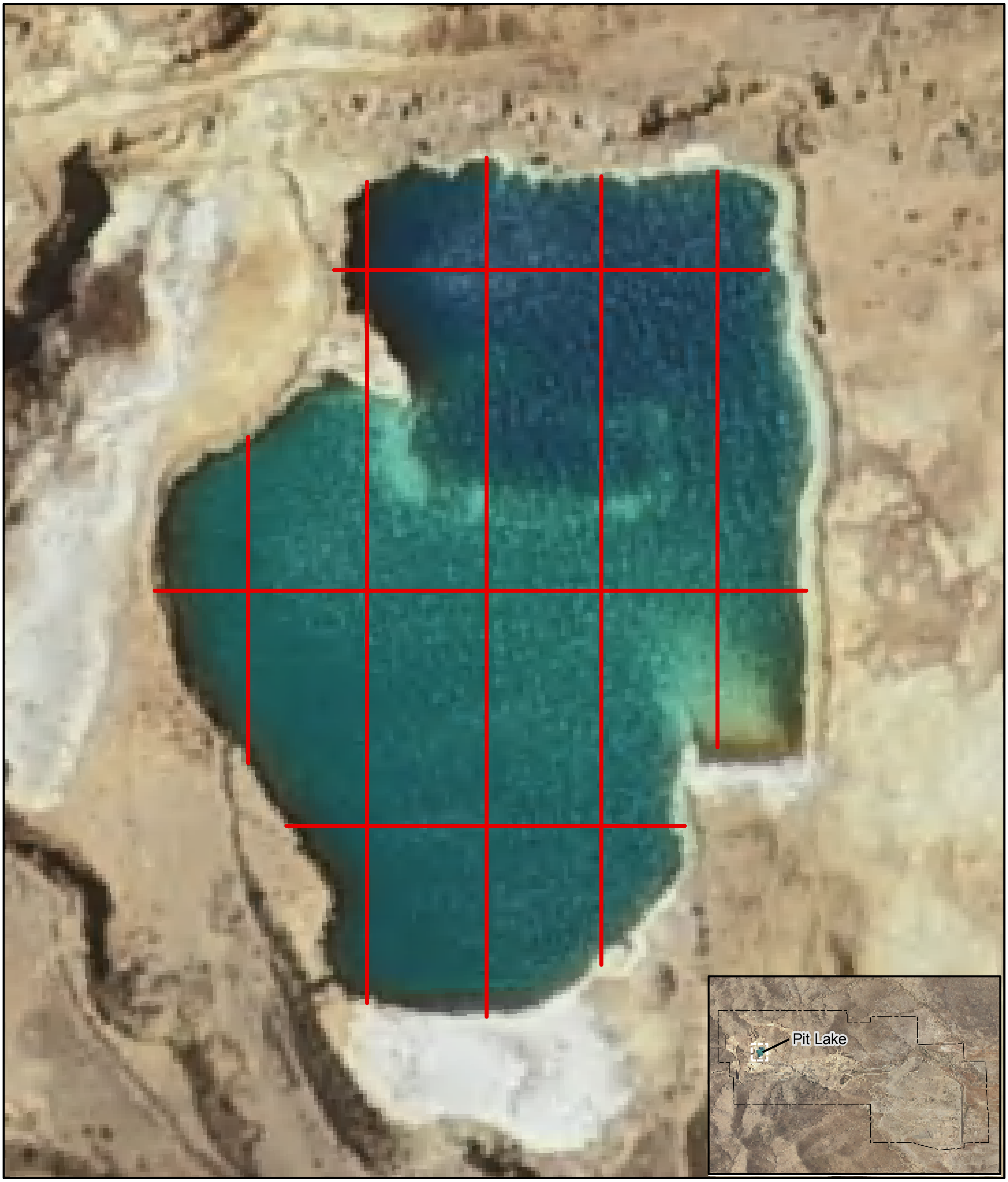


Imagery Information:
-USGS 7.5-Minutes County DOQQ mosaic
Sierra County, 2009
Projection Information:
-New Mexico State Plane West, NAD 1927

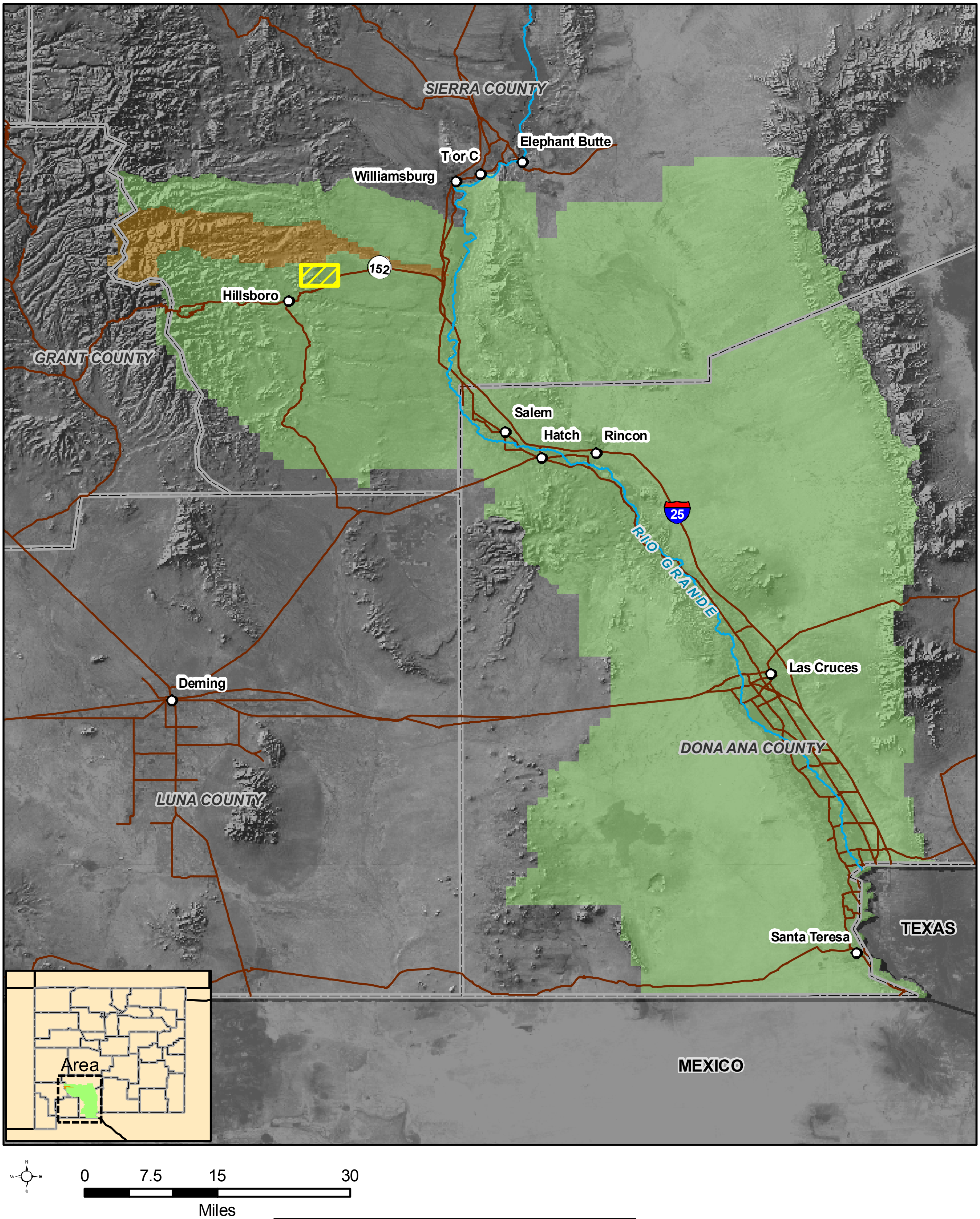
Legend

Profile Line

Figure 4-6
Proposed Parallel Profiles for Pit Lake Survey

New Mexico Copper Corporation

S:\Projects\NMC-001_New Mexico Copper Corporation\GIS\Maps\SAP_7-2010\9_groundwater\9-1_LRG_basins.mxd 07/30/2010



Basin Boundaries:
RGIS website/NMOSE
Imagery Information:
Landsat imagery from
University of Maryland NLCD

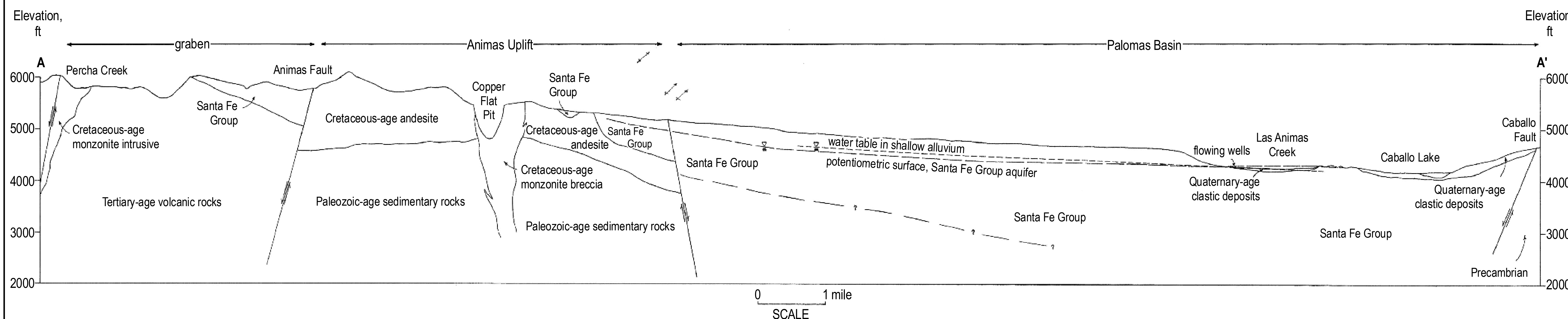
INTERA

Legend

City/Town	OSE Declared Basin
Site Location	Lower Rio Grande
Road	Las Animas

Figure 4-7
Lower Rio Grande Basin
New Mexico Copper Corporation

S:\Projects\NMC-001_New Mexico Copper Corporation\GIS\Maps\SAP_7-2010\9_groundwater\9-1_LRG_basins.mxd 07/30/2010



from John W. Shomaker, Inc., 1993

Figure 4-8
Conceptual Model of Groundwater Flow System
New Mexico Copper Corporation

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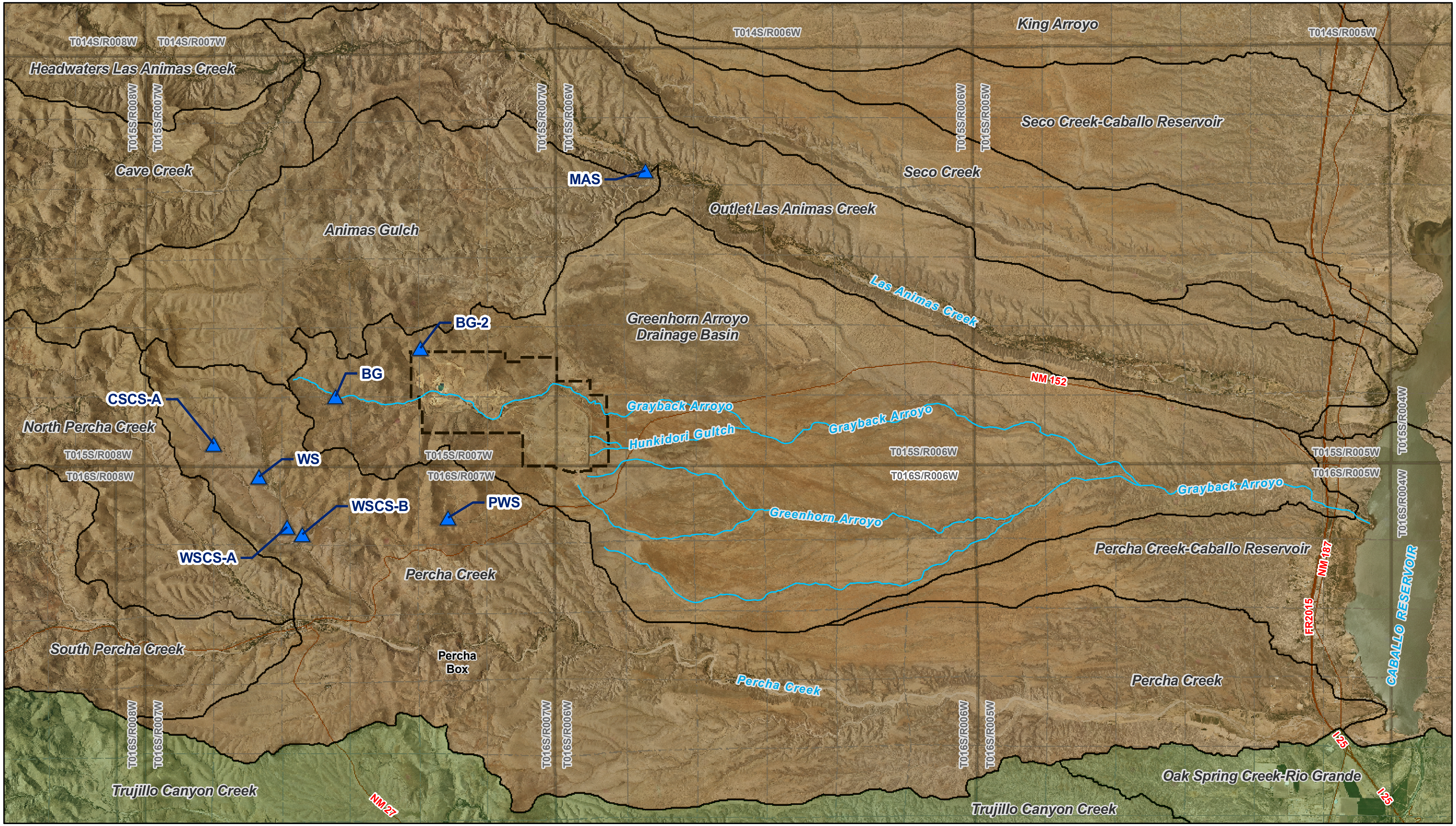

N
W E
S

Watersheds:
USGS Hydrologic Unit Map
Mine Boundary:
Tom Van Bebber
Imagery Information:
-USGS 7.5-Minutes County DOQQ mosaic
Sierra County, 2009
Projection Information:
-New Mexico State Plane West, NAD 1927

INTERA

0 3,500 7,000 14,000 21,000
Feet

Legend

- Identified Spring
- Proposed Mine Permit Boundary
- Watersheds
  - Caballo
  - El Paso-Las Cruces
  - Sub-Watershed

Figure 4-9
Spring and Stream Locations
New Mexico Copper Corporation

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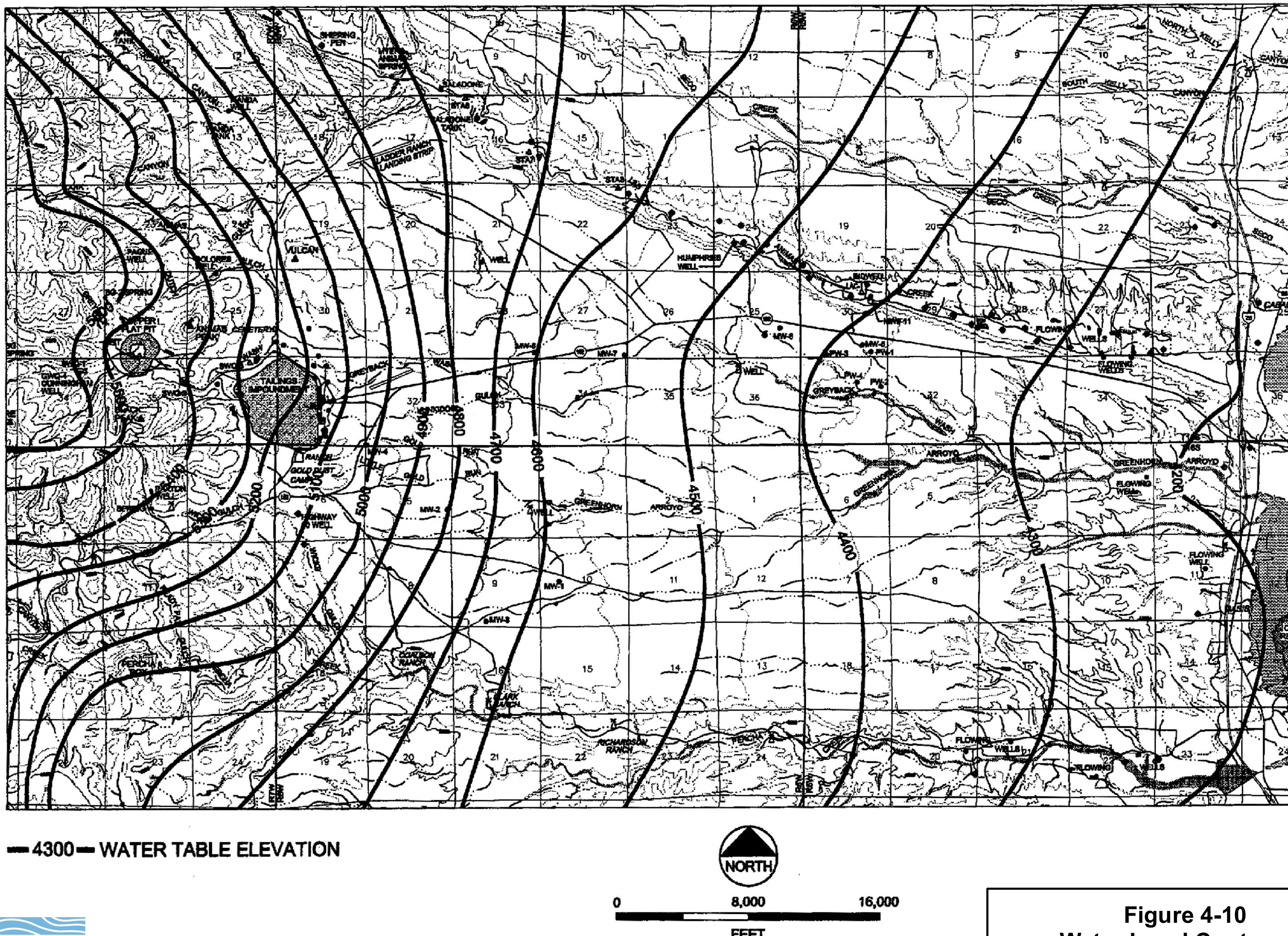
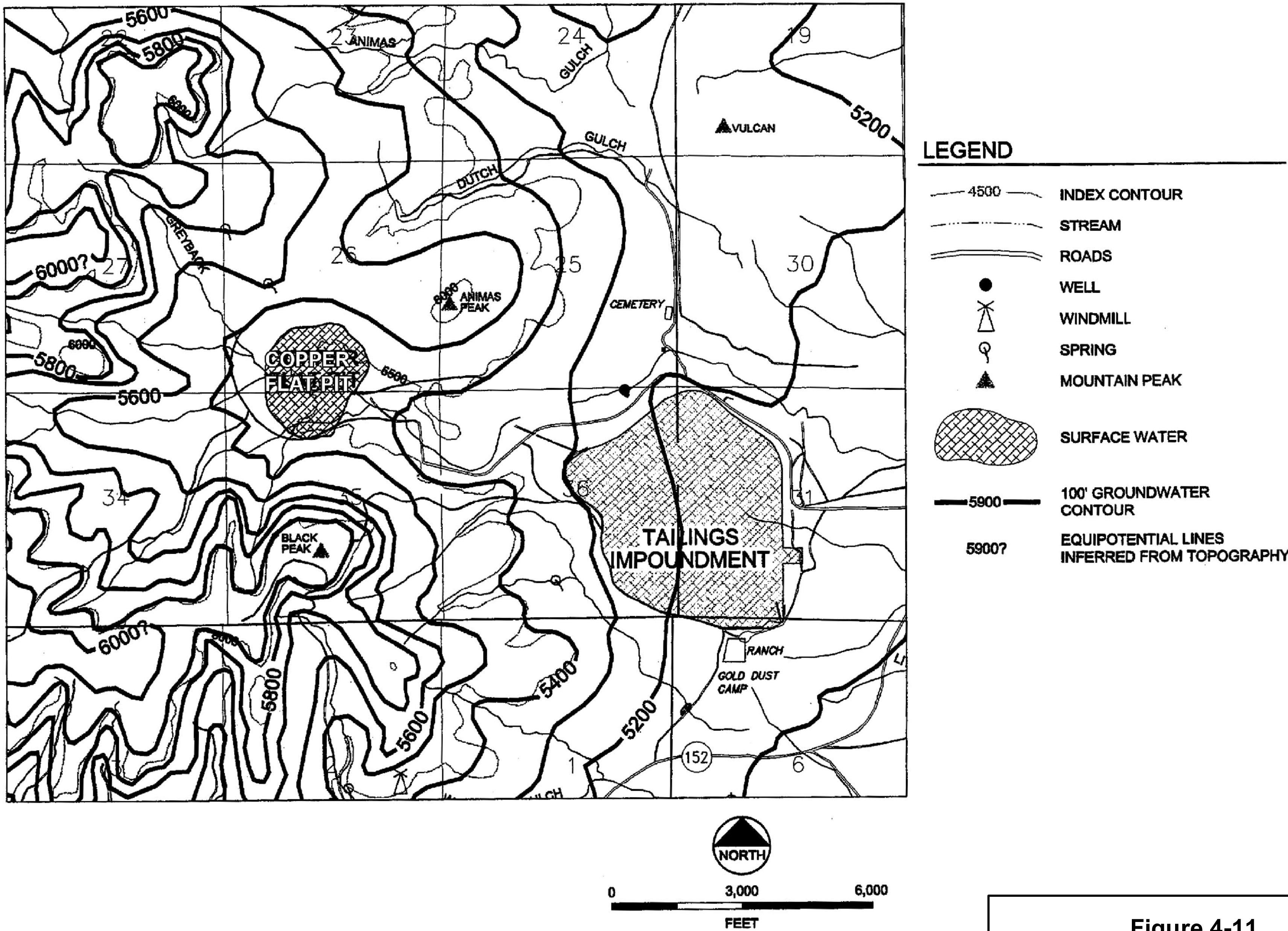


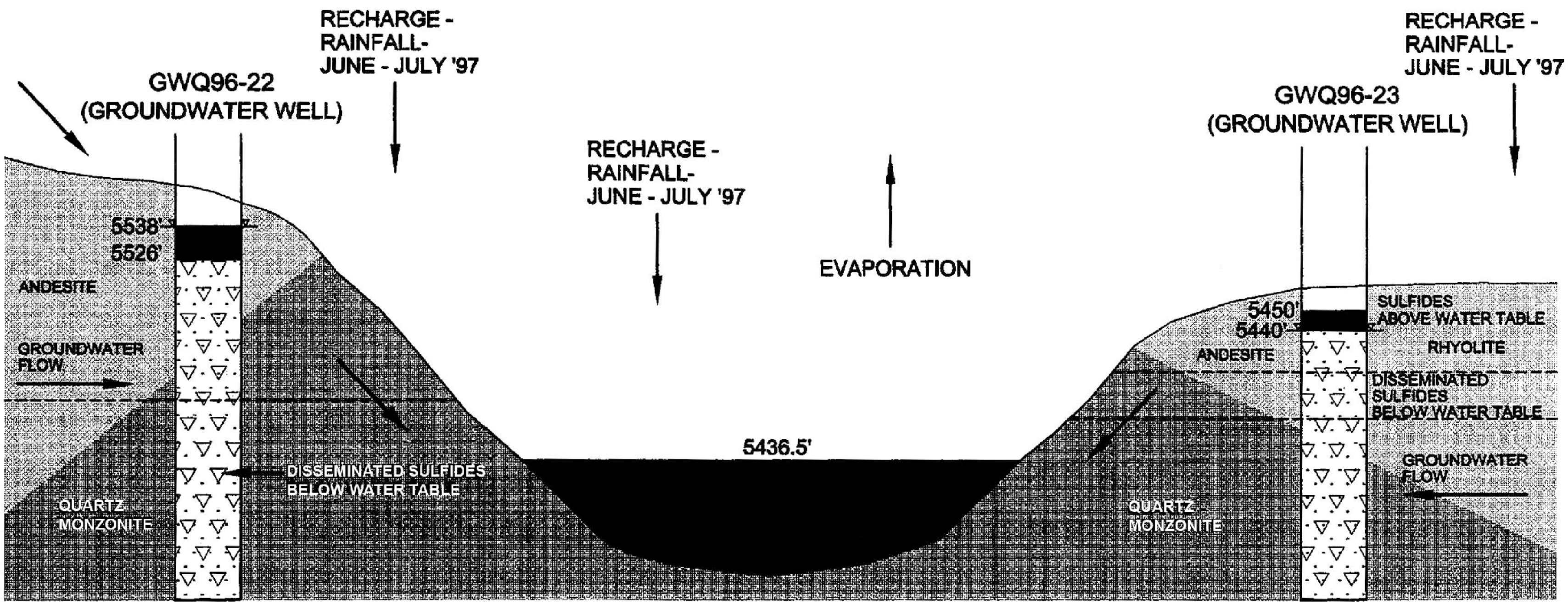
from ABC, 1998B

Figure 4-10
Water Level Contours
New Mexico Copper Corporation



from ABC, 1997

Figure 4-11
Water Level Map of Copper Flat Pit Area
New Mexico Copper Corporation



	GWQ96-22			PIT LAKE			GWQ96-23	
	JULY '96	AUG '97		AUG '95	AUG '97		APR '97	AUG '97
pH	7.5	7.65	pH	8.31	8.16	pH	7.89	7.68
TDS	700	700	TDS	4707	5021	TDS	770	920
SO_4	250	230	SO_4	3170	3100	SO_4	150	410
Cu	<0.025	<0.025	Cu	<0.025	0.050	Cu	<0.025	<0.025
Fe	<0.05	<0.05	Fe	<0.025	<0.05	Fe	6.5	0.82

from SRK, 1998

Figure 4-12
Conceptual Model of Pit Lake Monitoring Well Relationship with Water Quality Reports
New Mexico Copper Corporation

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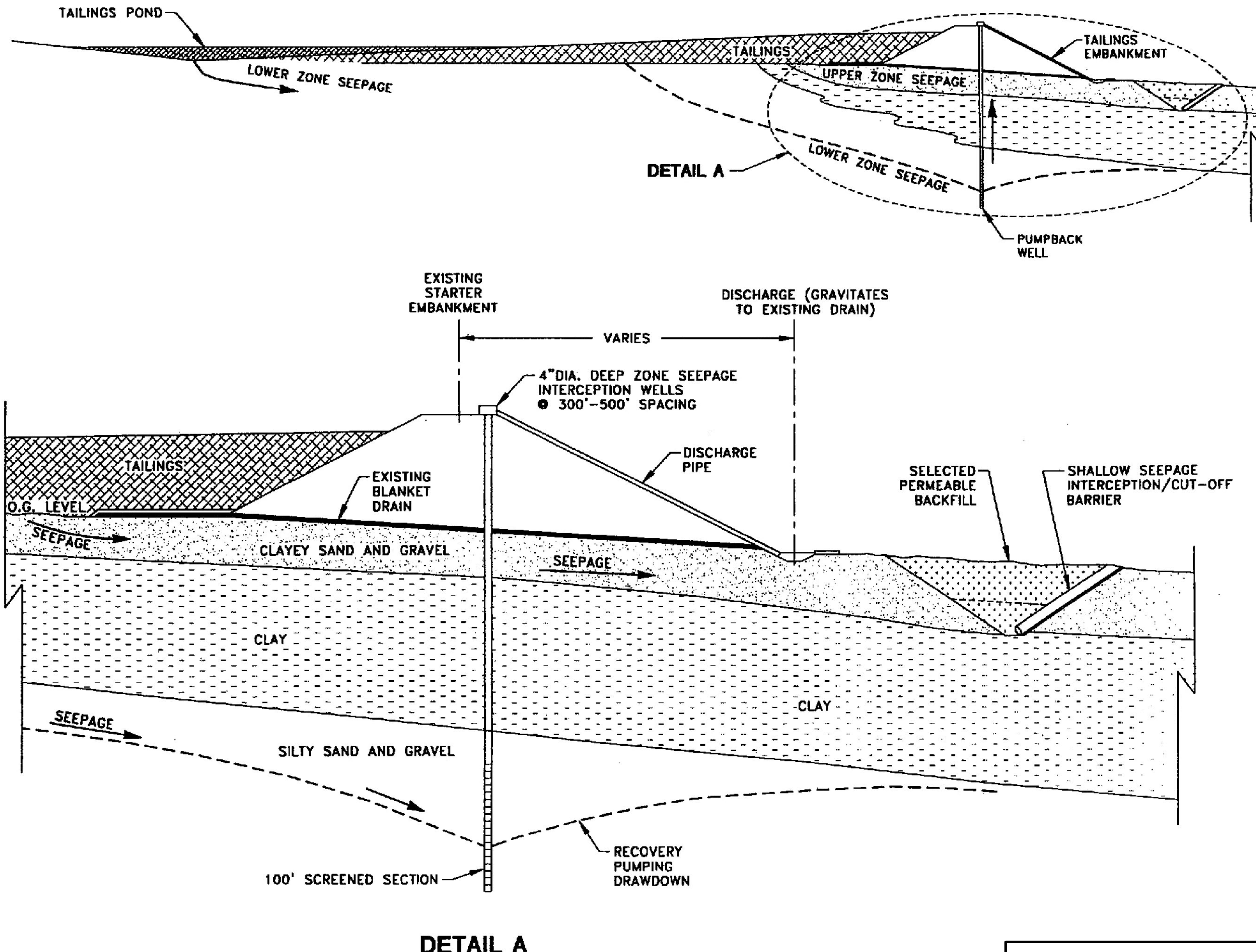
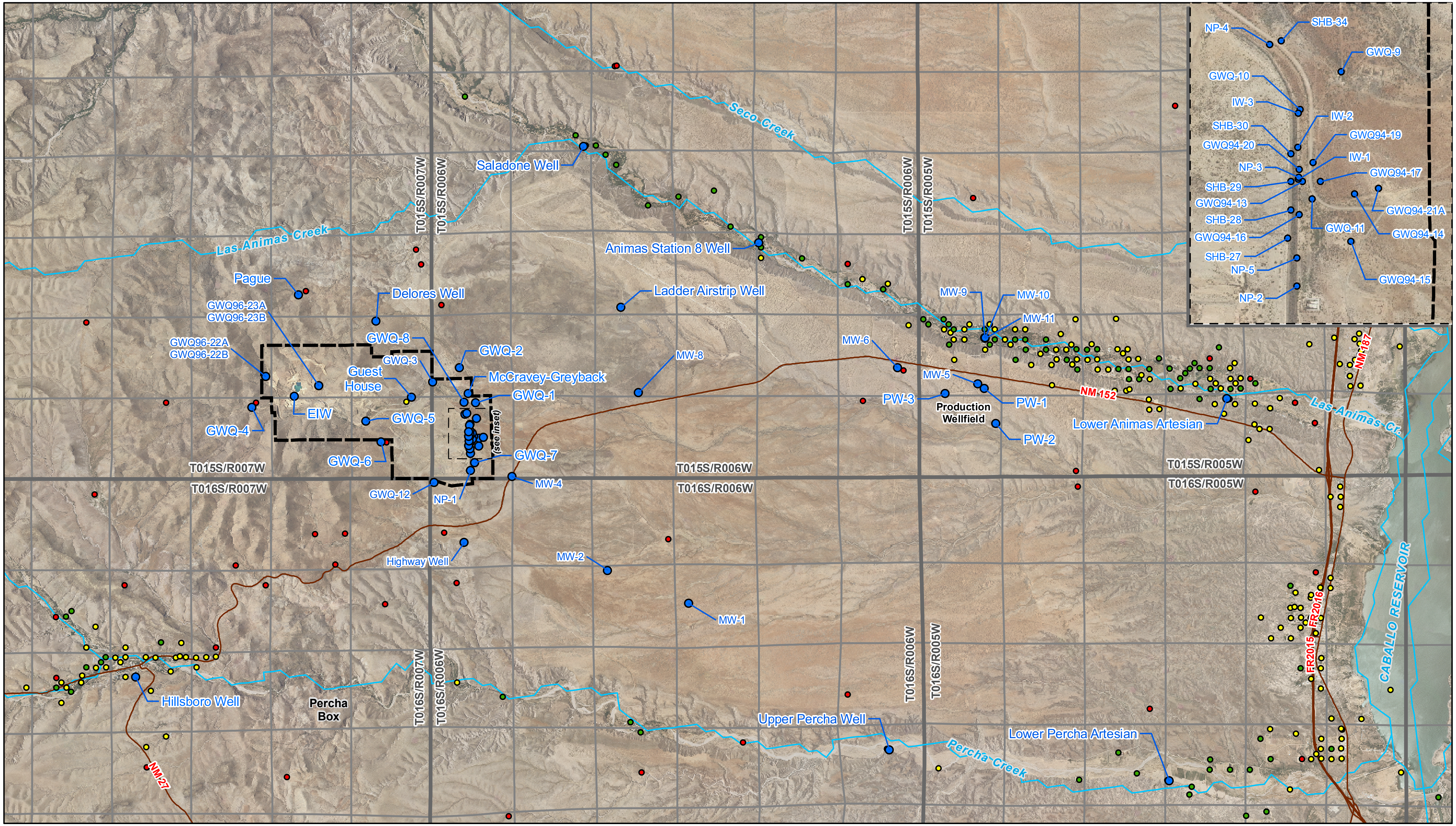


INTERA

from SRK, 1995

Figure 4-13
Conceptual Design,
Tailings Seepage Control

New Mexico Copper Corporation



Well Locations:
SRK or OSE
Mine Boundary:
Tom Van Bebber
Imagery Information:
-USGS 7.5-Minutes County DOQQ mosaic
Sierra County, 2009
Projection Information:
-New Mexico State Plane West, NAD 1927

0 3,000 6,000 12,000 18,000
Feet

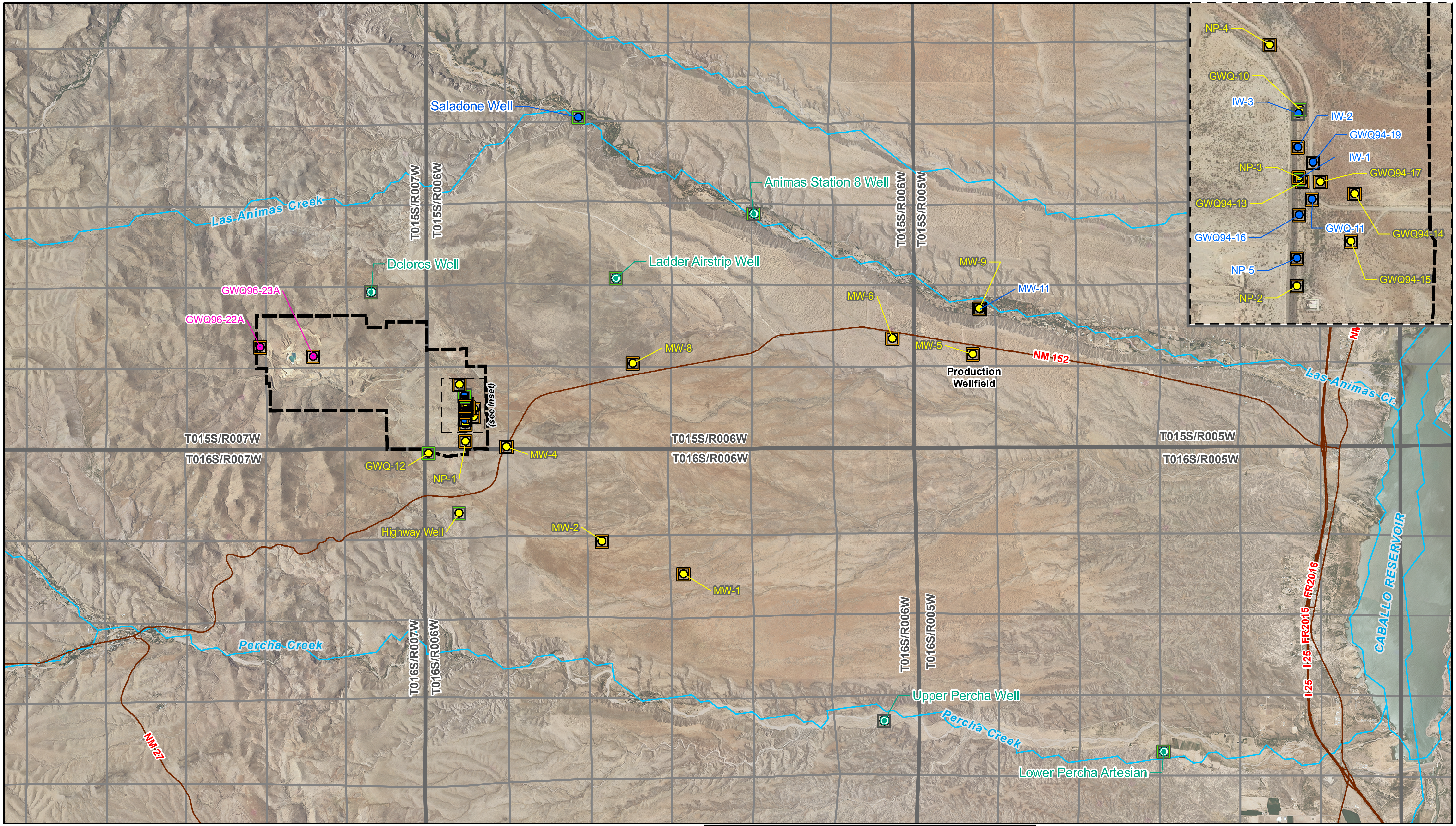
Legend

- Road
- Project Well
- Proposed Mine Permit Boundary

NM OSE Wells (Use)
- Domestic
- Irrigation
- Stock

Figure 4-14
Regional Groundwater Well Locations
New Mexico Copper Corporation

S:\Projects\NMC-001_New Mexico Copper Corporation\GIS\Maps\SAP_7-2010\9_groundwater\9-9_Regional GWwells.mxd 09/07/2010



Well Locations:
SRK or OSE
Mine Boundary:
Tom Van Bebber
Imagery Information:
-USGS 7.5-Minutes County DOQQ mosaic
Sierra County, 2009
Projection Information:
-New Mexico State Plane West, NAD 1927

0 3,000 6,000 12,000 18,000
Feet

Legend

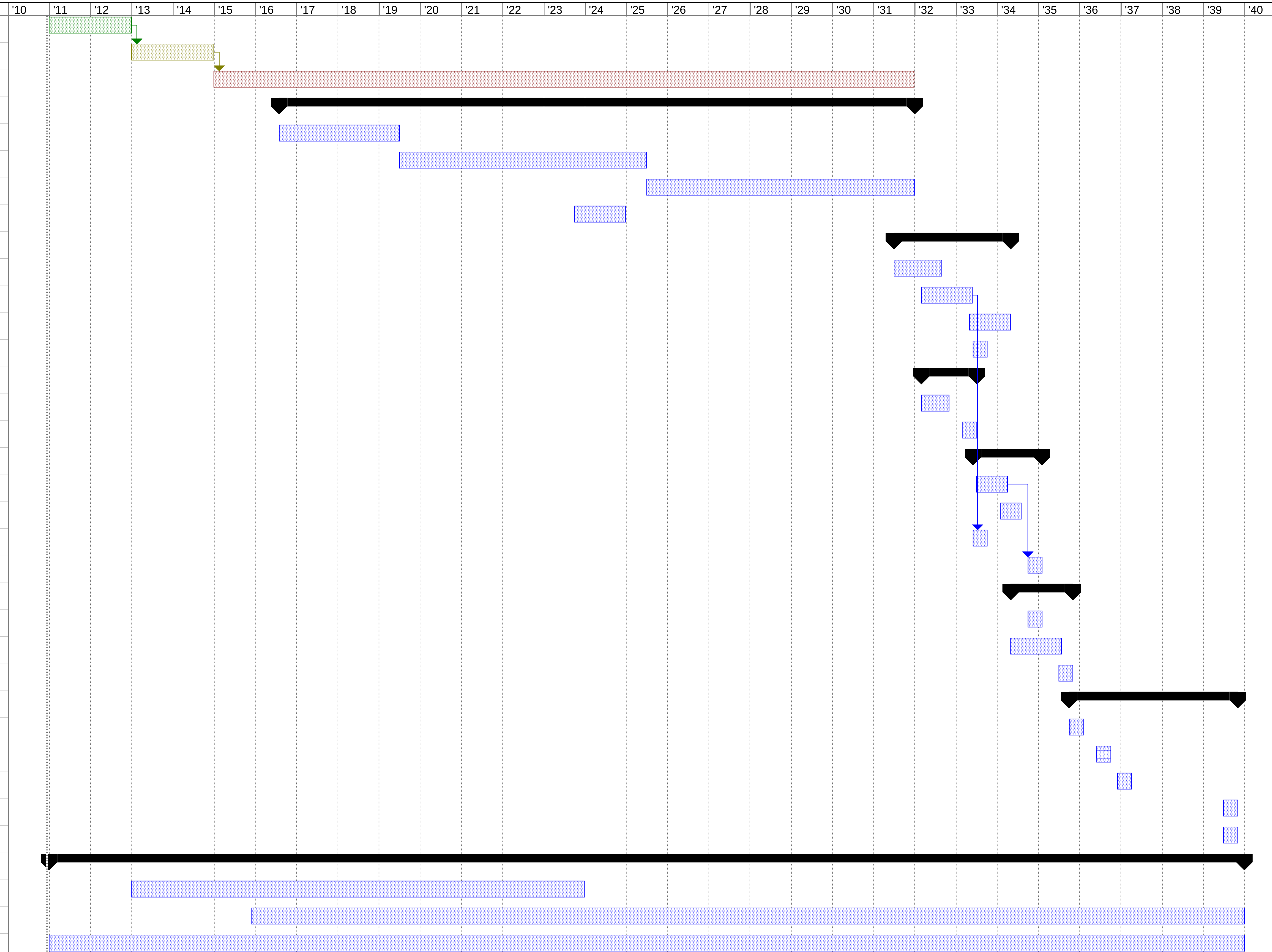
Proposed Monitoring Well
Aquifer
- Crystalline Bedrock
- Qauternary Alluvium
- Santa Fe Group
- Unknown

- Water Level Only
- Water Level & Water Quality
- Proposed Mine Permit Boundary
- Road

Figure 4-15
Proposed Monitoring Well Program
New Mexico Copper Corporation

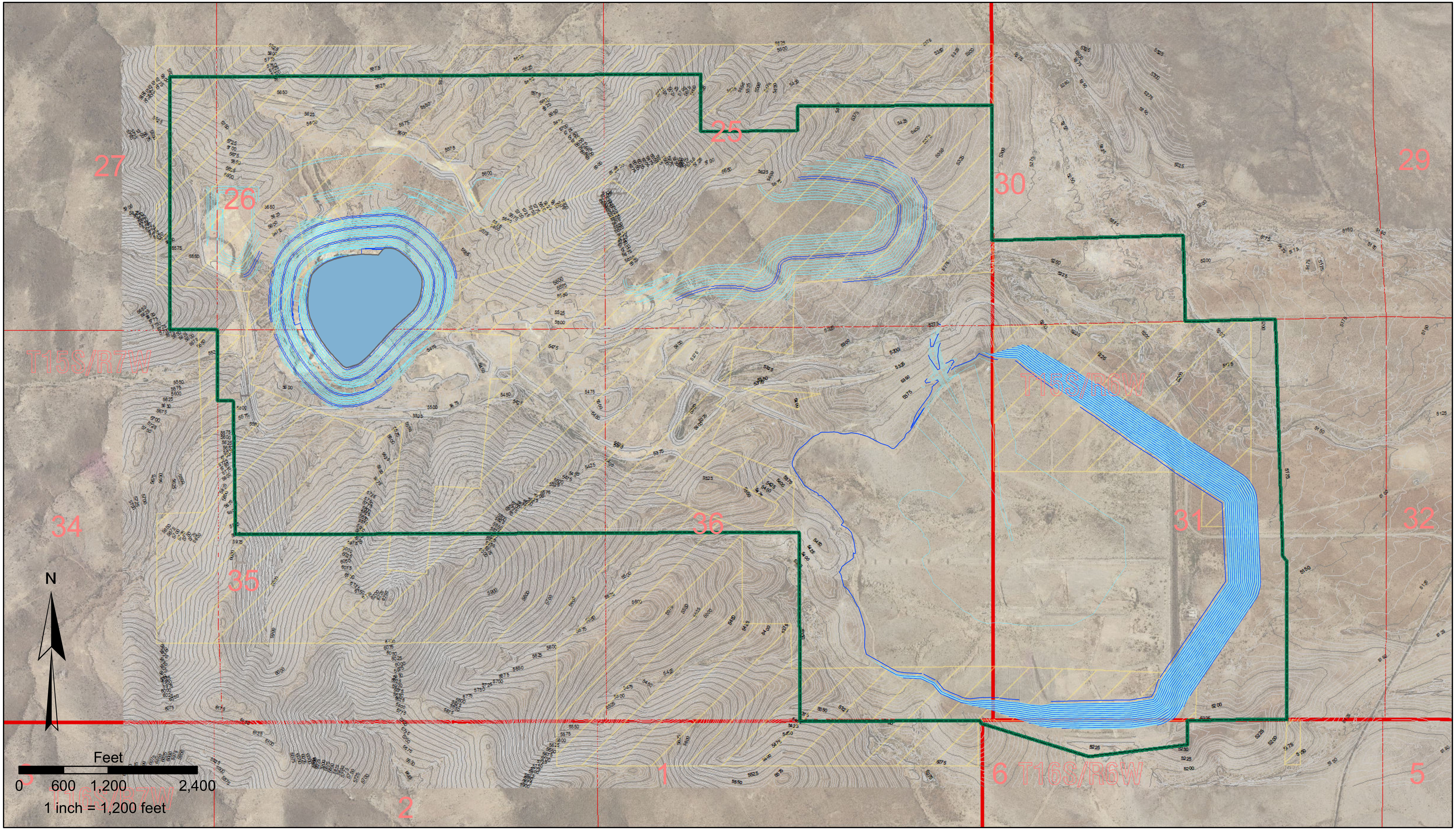
S:\Projects\NMC-001_New Mexico Copper Corporation\GIS\Maps\SAP_7-2010\9_groundwater\9-10_ProposedGWwells.mxd 09/07/2010

ID	Task Name
1	**Mine Permitting (Pre-Construction)**
2	**Mine Construction**
3	**Mine Operation**
4	**Waste Rock Disposal Areas**
5	West Waste Disposal
6	North Waste Disposal
7	East Waste Disposal
8	South Waste Disposal / Low-Grade Stockpile
9	**Tailings Impoundment Reclamation**
10	CoverlRevegetate Outer Embankment
11	Tailings Water Removal
12	GradelCover/RevegetateTailings Surface
13	Surface Pipeline Removal
14	**Pit Closure**
15	Highwall Stabilization
16	RamplHighwali Barricades
17	**Plant Area Reclamation**
18	Structure RemovallFoundation Burial
19	Regrade/Fill
20	Thickener Decommissioning
21	Septic System Decommissioning
22	**Road Reclamation**
23	Reduce Access Road Wdlh
24	Remove / Barricade Haul Roads
25	Recontour / Revegetate Water Storage Road
26	**Utilities Reclamation**
27	Remove Above Ground Water Pipeline
28	Plug Underground Water Supply Pipeline
29	Remove S~e Water Supply Pump Stations
30	Remove Plant Site Powerlines
31	Disconnect 115kV Line
32	**Monitoring/Research Testing**
33	Revegetation Test Program
34	Revegetation Monitoring
35	Groundwater Monitoring



* Schedule approximate and subject to change with approval.

Figure 5-1
COPPER FLAT PROJECT
TENTATIVE SCHEDULE



EXPLANATION

Public

Mine Boundary

IF THE ABOVE BAR DOES NOT SCALE 1 INCH, THE DRAWING SCALE IS ALTERED

DESIGN: -	DRAWN: -	REVIEWED: -
CHECKED: -	APPROVED: -	DATE: 12/2/2010
FILE NAME: PoO_Fig5-02_ReclTopo_JQG_20101202		

NEW MEXICO COPPER CORPORATION

COPPER FLAT MINE

POST-RECLAMATION FACILITY TOPOGRAPHY

DRAWING NO.	SHEET	REVISION NO.
FIGURE 5-2	27 OF 28	A
JOB NO. 191000-03		

Path: H:\Copper_Flat\New Mexico Copper Corp\191000_03_Copper_Flat_Permitting\040_Drafting\20101115\PoO_Fig5-02_ReclTopo_JQG_20101202.mxd

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APPENDIX A

Claims List

Unpatented Lode and Placer Claims:

Claim Name		Recorded Book	Page	B.L.M Serial No.
Olympia		H	761	NM MC 60057
GLUCK AUF		I	327	NM MC 60058
Taurus		J	682	NM MC 60059
Hercules		K	231	NM MC 60060
EL ORO No. 3		P	52	NM MC 60063
Saint Louis Republic		I	80	NM MC 60069
Delores		27	269	NM MC 60070
HIGHLANDS No. 1		T	405	NM MC 60071
HIGHLANDS No. 2		T	405	NM MC 60072
HIGHLANDS No. 3		T	406	NM MC 60073
THE WELLINGTON		T	406	NM MC 60074
Three Boys No. 1		T	176	NM MC 60080
BLUE MOON		R	631	NM MC 60081
The Leone		U	478	NM MC 60082
Dolores Placer		36	13	NM MC 60083
JONES HILL PLACER		27	212	NM MC 60084
Duke No. 1		40	23	NM MC 60085
Duke No. 2		40	24	NM MC 60086
Graveyard Placer		29	424	NM MC 60021
Old Cabin Placer		29	420	NM MC 60022
Rainey Season Placer		33	163	NM MC 60027
Desert Gold Placer		R	359	NM MC 60043
Gray Black Placer		R	554	NM MC 60044
Black Sand Group 9	No. 1 Placer (Amended)	46	173	NM MC 60045
Black Sand Group 10	No. 3 Placer (Amended)	46	185	NM MC 60046
Surprise No. 1 Lode		48	13	NM MC 60052
Surprise No. 2 Lode		48	102	NM MC 60053
Dutch-1 Lode		48	556	NM MC 60054
Dutch-2 Lode		48	558	NM MC 60055
Dutch-3 Lode		48	557	NM MC 60056
Renew No. 1 Lode		58	622	NM MC 106464
Renew No. 2 Lode		58	623	NM MC 106465
M. S. #1		34	146	NM MC 60093
M. S. #2		34	146	NM MC 60094
M. S. #3		34	147	NM MC 60095
M. S. #4		34	147	NM MC 60096
M. S. #5		34	148	NM MC 60097
M. S. #6		34	148	NM MC 60098
M. S. #8		34	149	NM MC 60099
M. S. #10		34	150	NM MC 60101
M. S. #11		34	151	NM MC 60102
M. S. #12		34	151	NM MC 60103
M. S. #13		34	152	NM MC 60104
M. S. #14		34	152	NM MC 60105
M. S. #15		34	153	NM MC 60106
M. S. #16		34	153	NM MC 60107
M. S. #17		34	154	NM MC 60108
M. S. #18		34	154	NM MC 60109
M. S. #20		34	155	NM MC 60110
M. S. #21		34	156	NM MC 60111
M. S. #22		34	156	NM MC 60112
M. S. #23		34	157	NM MC 60113
M. S. #25		34	158	NM MC 60114
M. S. #26		34	158	NM MC 60115
M. S. #29		34	160	NM MC 60118
M. S. #33		34	162	NM MC 60122

Unpatented Lode and Placer Claims:			
	Recorded		B.L.M
Claim Name	Book	Page	Serial No.
M. S. #38	34	164	NM MC 60123
M. S. #48	34	167	NM MC 60129
M. S. #49	34	168	NM MC 60130
M. S. #53	34	168	NM MC 60131
M. S. #102	34	176	NM MC 60138
M. S. #104	34	177	NM MC 60139
M. S. #105	34	276	NM MC 60140
M. S. #106	34	277	NM MC 60141
M. S. #107	34	178	NM MC 60142
M. S. 222	34	543	NM MC 60170
M. S. 223	34	543	NM MC 60171
M. S. 224	34	544	NM MC 60172
M. S. 225	34	544	NM MC 60173
M. S. 228	34	546	NM MC 60176
M. S. 264	34	563	NM MC 60194
M. S. 282	34	572	NM MC 60210
M. S. 288	34	575	NM MC 60216
M. S. 289	34	576	NM MC 60217
M. S. 290	34	576	NM MC 60218
M. S. 291	34	577	NM MC 60219
M. S. 292	34	577	NM MC 60220
M. S. 293	34	578	NM MC 60221
M. S. 316	34	589	NM MC 60240
M. S. 320	34	591	NM MC 60244
M. S. 322	34	592	NM MC 60246
M. S. 329	34	596	NM MC 60253
M. S. 330	34	596	NM MC 60254
M. S. 331	34	597	NM MC 60255
M. S. 337	34	12	NM MC 60261
M. S. 338	34	13	NM MC 60262
M. S. 339	34	13	NM MC 60263
M. S. 340	34	14	NM MC 60264
M. S. 341	34	14	NM MC 60265
M. S. 342	34	15	NM MC 60266
M. S. 345	34	16	NM MC 60267
M. S. 346	34	17	NM MC 60268
M. S. 347	34	17	NM MC 60269
M. S. 438	41	564	NM MC 60312
M. S. 439	41	606	NM MC 60313
M. S. 440	41	607	NM MC 60314
M. S. 441	41	714	NM MC 60315
M. S. 452	45	353	NM MC 60318
M. S. 453	45	354	NM MC 60319
M. S. 454	45	355	NM MC 60320
M. S. 455	45	356	NM MC 60321
M. S. 456	45	357	NM MC 60322
M. S. 458	45	359	NM MC 60324
M. S. 460	45	361	NM MC 60326
M. S. 461	45	362	NM MC 60327
M. S. 462	45	363	NM MC 60328
M. S. 463	45	364	NM MC 60329
M. S. 464	45	365	NM MC 60330
M. S. 465	45	366	NM MC 60331
M. S. 467	45	368	NM MC 60333
M. S. 468	45	369	NM MC 60334
M. S. 469	45	370	NM MC 60335

Unpatented Lode and Placer Claims:			
	Recorded		B.L.M
Claim Name	Book	Page	Serial No.
M. S. 470	45	371	NM MC 60336
M. S. 471	45	372	NM MC 60337
M. S. 472	45	373	NM MC 60338
M. S. 473	45	374	NM MC 60339
M. S. 474	45	375	NM MC 60340
M. S. 475	71	1927	NM MC 163361
M. S. 476	71	1928	NM MC 163362
M. S. 477	71	1929	NM MC 163363
M. S. 478	71	1930	NM MC 163364
ANIMAS #1 Placer	45	443	NM MC 60341
ANIMAS #2 Placer	45	444	NM MC 60342
The Betsy Ross	R	93	NM MC 60344
Wicks Extension No. 1	R	100	NM MC 60346
Anderson Extension No. 2	R	93	NM MC 60348
Crescent 101	41	358	NM MC 60349
Wicks Extension 100	41	359	NM MC 60350
Betsy Ross 101	41	360	NM MC 60351
Portland 101	41	361	NM MC 60352
Ready Pay Apex 100	41	362	NM MC 60353
Anderson Extension 101	41	363	NM MC 60354

Unpantented Millsite			
Claim Name	Book	Page	BLM Serial No.
Greer No. 2	47	611	NM MC 72821
Chatfield	47	521	NM MC 72822
Chatfield No. 3	47	523	NM MC 72823
Chatfield No. 4	47	762	NM MC 72824
Chatfield No. 5	47	763	NM MC 72825
Chatfield No. 6	47	764	NM MC 72826
Chatfield No. 9	53	521	NM MC 81353
Chatfield No. 10	53	522	NM MC 81354
Chatfield No. 25	56	689	NM MC 100695

Newly Located Unpatented Lodes		
Claim Name	**Book**	**Page**
CU 1	116	902
CU2	116	903
CU 3	116	904
CU 4	116	905
CU 5	116	906
CU 6	116	907
CU 7	116	908
CU 8	116	909
CU 9	116	910
CU 10	116	911
CU 11	116	912
CU 12	116	913
CU 13	116	914
CU 14	116	915
CU 15	116	916
CU 16	116	917
CU 17	116	918
CU 18	116	919
CU 19	116	920
CU 20	116	921
CU 21	116	922
CU 22	116	923
CU 23	116	924
CU 24	116	925
CU 25	116	926
CU 26	116	927
CU 27	116	928
CU 28	116	929
CU 29	116	930
CU 30	116	931
CU 31	116	932
CU 32	116	933
CU 33	116	934
CU 34	116	935
CU 35	116	936
CU 36	116	937
CU 37	116	938
CU 38	116	939
CU 39	116	940
CU 40	116	941
CU 41	116	942
CU 42	116	943
CU 43	116	944
CU 44	116	945

Patented Claims	
Claim Name	**Mineral Survey**
Feeder	M.S. 943C
Chance	M.S. 945A
Xmas	M.S. 945B
Extension	M.S. 945D
Smokey Jones	M.S. 1024
Little Jewess	M.S. 1715
Wisconsin	Lot No. 805
Copper King	Lot No. 733A
Ventura	Lot No. 733B
Castle Hill	Lot No. 733C
Copperopolis	Lot No. 736
83	Lot No. 806
Soudan	Lot No. 807
Stenberg	M.S. 2066
Allhutten	M.S. 2066
Craze Martin	M.S. 2066
Coppenhagen	M.S. 2067
Carl Sextus	M.S. 2067
Union Leader	M.S. 2067
Stockholm	M.S. 2067
Grass Flat	M.S. 2068
Sandow	M.S. 2068
Old Mac	M.S. 2068

Fee Lands	Lot
Township 15 South, Range 7 West	
Section 36	Part of Lot 1 (Parcel N)
Section 36	Part of Lot 4 (Parcel M)
Section 36	Part of Lot 6 (Parcel J)
Section 36	Lot 10 (Parcel L)
Section 36	Lot 11 (Parcel K)
Section 36	Part of N½SE¼ (Parcel I)
Section 36	Part of N½S½SE¼ (Parcel H)
Township 15 South, Range 6 West	
Section 31	Lot 3 (Parcel D)
Section 31	Lot 6 (Parcel G)
Section 31	Lot 7 (Parcel C)
Section 31	Part of NE¼SW ¼ (Parcel E)
Section 31	N½SE¼SW¼ (Parcel B)
Section 31	Part of S½SE¼NW¼ (Parcel F)
Section 31	Part of SE1/4 (Parcel A)
Township 16 South, Range 6 West	
Section 6	Part of Lot 3 (Parcel P)
Section 6	Part of Lot 4 (Parcel O)

APPENDIX B

Runoff Calculations

TECHNICAL MEMORANDUM

TO: Jeff Parshley

FROM: Pete Kowalewski

DATE: February 13, 1996

SUBJECT: **Design of Run-on Diversions at Alta Gold's Copper Flat Project using WASHED and FlowMaster (SRK #68603)**

1.0 INTRODUCTION

Alta Gold Company's (Alta) Copper Flat redevelopment project is located approximately 23 miles southwest of Truth or Consequences and 5 miles northeast of Hillsboro, in Sierra County, New Mexico. The mining project will result in the development of 4 waste/overburden disposal areas throughout the life of the mine. The purpose of this memorandum is to present sizing calculations performed for six diversion ditches designed to intercept site "run-on" from undisturbed areas.

The diversion ditches were sized using the programs WASHED and FlowMaster to convey surface water "run-on" to existing drainages where it will bypass the site. The diversion ditches were sized by calculating the catchment hydrologic parameters such as the catchment area, slope, time of concentration, etc...using a 1"=500' scale topographic map of the site. The data were then entered into the WASHED program, and its output was entered into the FlowMaster program to size the ditches. All of the diversion ditches were sized to pass the runoff resulting from the 100-year 24-hour storm while maintaining a minimum of 6 inches of freeboard.

2.0 COMPUTER PROGRAMS USED IN THE ANALYSES

Two computer programs were used in the diversion ditch sizing analyses. The two programs were: FlowMaster and WASHED. The following is a brief description of each of the programs:

FlowMaster is a pipe, ditch, and channel hydraulics utility program developed by Haestad Methods. The program calculates flow velocities, depth of flow, critical slopes, etc... using the Manning Equation for open channel flow, or the Manning or Hazen Williams Equation for pipe flow (not used in this application). Required inputs are the flow (Q), the channel geometry (trapezoidal, triangular, rectangular, etc...), the side slopes of the channel, the channel slope (gradient), and the Manning's roughness coefficient (n). The program will then calculate the resulting depth of flow, wetted perimeter, flow velocity, and whether the flow is sub-critical, critical, or super-critical (based on the calculated Froude Number).

WASHED is a small watershed hydrology program, developed by Hydrologic Systems, used to calculate runoff hydrographs resulting from specific storm events. The program has different options available for the calculation of the hydrographs, but the preferred method is the SCS Method for runoff determination. Multiple catchment areas can be modeled. Required inputs include the catchment area, hydraulic length, overland flow slope, SCS Curve Number (CN) for the catchment, and the distance from the catchment outlet to the point for which the hydrograph is desired.

3.0 SITE CLIMATOLOGY

The Copper Flat region receives approximately 13 inches of precipitation per year, with approximately 40 to 50 percent of the total received as infrequent but intense summer thunderstorms. Winter storms tend to produce limited rainfall due to the "rainshadow" effect of the mountains located to the west of the site.

The storm event used in the diversion design was the 100-year 24-hour storm event. The 100-year 24-hour storm for the Copper Flat site is documented as 4.0 inches of precipitation in Section 2.3 of the *Copper Flat Mine Hydrogeological Studies (05/12/95)* prepared by Steffen, Robertson, and Kirsten (Reno) and Adrian Brown Consultants, Inc.

4.0 DIVERSION DITCH SIZING

Each diversion ditch was sized to pass the flow resulting from the 100-year 24-hour storm occurring at the site, while maintaining a minimum freeboard of 6 inches. The following procedure was used to size the diversions:

1. The computer program, WASHED, was used to determine the peak flow resulting from the 100-year 24-hour storm occurring over the entire catchment area. For the purpose of these analyses, it was assumed that the Soil Conservation Service (SCS) curve number (CN) for each of the catchment areas was 72 (AMC-II).
2. The catchment area was separated into sub-catchments for the purpose of determining the development of flow in the diversion ditch.
3. The flow occurring in each segment was determined by using the peak flow from each contributing sub-catchment area. This assumption should be conservative with respect to determining the peak flow in the ditch, as it is assumed that if two sub-catchment areas are contributing to one segment, their peaks are simultaneous, when in reality, they should differ by the travel time from each of the sub-catchment areas.
4. The average slope of each of the flow segments was determined based on the topographic map of the site (scale 1"=500').
5. A proposed ditch cross-section was then entered into the computer program, FlowMaster. FlowMaster was used for each of the segments to determine the depth of flow and the flow velocity based on the anticipated peak flow for that segment.
6. It is assumed that the diversion ditch bottoms will be founded in rock, which most likely will be "roughened" due to the excavation of the ditches. The velocities in the ditches can therefore be significantly higher in these ditches than in ditches founded in soil material. There will be less erosion in the ditches founded in rock. A Manning's roughness coefficient (n) of 0.035 was used to reflect the roughened rock condition in the ditch bottoms.

The following results were obtained from the diversion ditch sizing analyses:

Northern Diversion - East Waste Rock Disposal Area

Diversion Ditch Contributing Areas	Peak Flow [100-YR 24-HR Storm] (cfs)
1	14.83
1,2	32.49
1,2,3	42.38
All	45.91

Contributing Areas	Ditch Slope (ft/ft)	Manning's n	Flow Depth (ft)	Flow Velocity (fps)
1	0.0200	0.035	0.66	3.99
1,2	0.0200	0.035	1.04	5.15

Northern Diversion - East Waste Rock Disposal Area (cont.)

1,2,3	0.0200	0.035	1.22	5.59
All	0.0229	0.035	1.23	6.00

Southern Diversion - East Waste Rock Disposal Area

Diversion Ditch Contributing Areas	Peak Flow [100-YR 24-HR Storm] (cfs)
1,4	26.49
1,3,4	35.67
1,3,4,5	51.91
All	73.81

Contributing Areas	Ditch Slope (ft/ft)	Manning's n	Flow Depth (ft)	Flow Velocity (fps)
1,4	0.0720	0.035	0.63	7.42
1,3,4	0.0700	0.035	0.76	8.12
1,3,4,5	0.0960	0.035	0.87	10.20
All	0.0960	0.035	1.07	11.40

Northern Diversion - Tailings Impoundment

Diversion Ditch Contributing Areas	Peak Flow [100-YR 24-HR Storm] (cfs)
1	7.42
1,2	14.13
All	18.01

Contributing Areas	Ditch Slope (ft/ft)	Manning's n	Flow Depth (ft)	Flow Velocity (fps)
1	0.0120	0.035	0.51	2.66
1,2	0.0120	0.035	0.74	3.31
All	0.0120	0.035	0.86	3.58

Southern Diversion - Tailings Impoundment

Diversion Ditch Contributing Area	Peak Flow [100-YR 24-HR Storm] (cfs)
1,2	13.42
1,2,3,4	51.91
All	72.40

Southern Diversion - Tailings Impoundment (cont.)

Contributing Area	Ditch Slope (ft/ft)	Manning's n	Flow Depth (ft)	Flow Velocity (fps)
1,2	0.0100	0.035	0.76	3.06
1,2,3,4	0.0100	0.035	1.67	4.65
All	0.0100	0.035	2.02	5.11

Northern Diversion - West Waste Rock Disposal Area

Diversion Ditch Contributing Area	Peak Flow [100-YR 24-HR Storm] (cfs)
1	3.89
1,2	12.01
1,2,3	22.60
All	41.67

Contributing Area	Ditch Slope (ft/ft)	Manning's n	Flow Depth (ft)	Flow Velocity (fps)
1	0.0200	0.035	0.29	2.49
1,2	0.0200	0.035	0.58	3.72
1,2,3	0.0200	0.035	0.84	4.59
All	0.0200	0.035	1.21	5.56

Eastern Diversion - North Waste Rock Disposal Area

Diversion Ditch Contributing Area	Peak Flow [100-YR 24-HR Storm] (cfs)
1	14.83
1,2	32.84
1,2,3	62.86
All	69.22

Contributing Area	Ditch Slope (ft/ft)	Manning's n	Flow Depth (ft)	Flow Velocity (fps)
1	0.0200	0.035	0.66	3.99
1,2	0.0200	0.035	1.05	5.16
1,2,3	0.1820	0.035	0.80	13.47
All	0.1000	0.035	1.02	11.34

Sketches showing the channel geometries and the contributing areas for each of the diversion ditches, as well as the output from the WASHED and FlowMaster programs are included in the Appendices.

5.0 DISCUSSION OF RESULTS

All of the diversions were designed to pass the runoff resulting from the 100-year 24-hour storm occurring over the diversion's entire contributory catchment area while maintaining 6 inches of freeboard. The ditches have all been designed as trapezoidal cross-sections with 1:1 (Horizontal:Vertical) sideslopes and 5-foot bottoms. The maximum required ditch depth is approximately 2.5 feet deep (Southern Diversion - Tailings Impoundment). Other channel geometries can achieve the same flow capacities, however, the trapezoidal cross-section was used for practical construction purposes.

6.0 REFERENCES

Fifield, Jerald S., *Course Notes - Practical* Approaches *For Effective Erosion and Sediment Control*; International Erosion Control Association, Denver, Colorado; February 1993.

Steffen, Robertson, and Kirsten and Adrian Brown Consultants, *Copper Flat Mine Hydrogeological Studies*; Reno, Nevada; May 12, 1995.

APPENDIX C

Mine Waste Management Plan

New Mexico Copper Corporation

Copper Flat Mine
Preliminary Mine Waste Management Plan

Submitted by:

NEW MEXICO COPPER CORPORATION
2425 San Pedro Dr. Suite 100
Albuquerque, NM 87110
Office: (505) 382-5770

December 2010

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF APPENDICES

1 INTRODUCTION

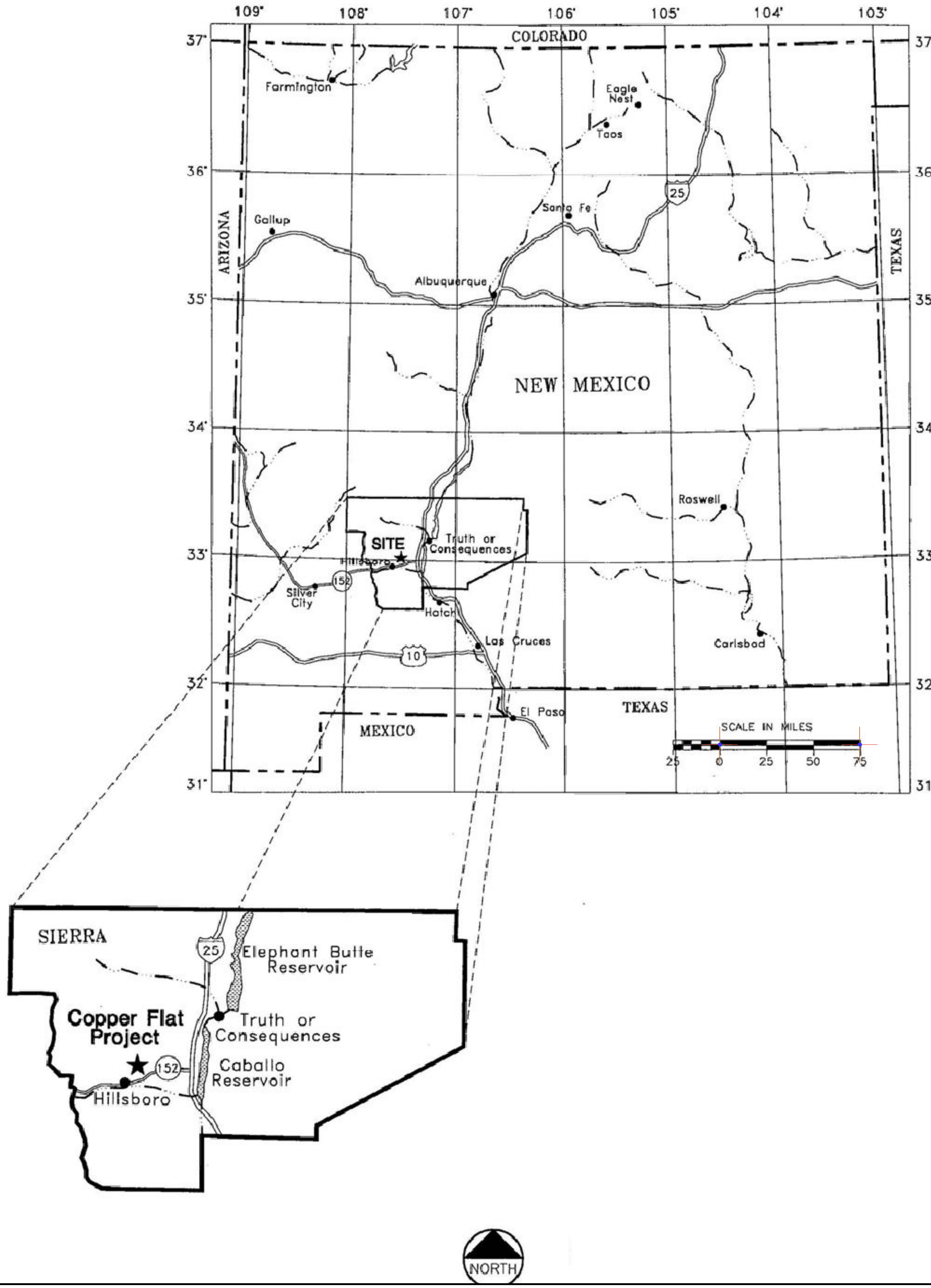
The following preliminary *Mine Waste Management Plan* was originally prepared as part of the Alta Gold Plan of Operations (PoO) submitted in 1998, and was based on geochemical characterization data developed at that time. The current owner and operator of the Copper Flat Mine, New Mexico Copper Corporation (NMCC), has initiated a supplemental geochemical characterization program based on the Nevada Bureau of Land Management (BLM) *Rock Characterization and Water Resources Analysis Guidance for Mining Activities* (Instruction Memorandum No. NV-2010-014, dated January 8, 2010), in order to provide the BLM (Las Cruces District Office) the appropriate rock and water resources data are necessary for the BLM to adequately analyze potential environmental impacts, as required by the National Environmental Policy Act (NEPA), and to determine if a Copper Flat PoO will prevent unnecessary or undue degradation. As these supplemental data are collected and analyzed, this mine waste management plan will be amended accordingly.

1.1 Scope

This report contains a mine waste management plan for the Copper Flat Project, located near Hillsboro, New Mexico. The report presents waste rock and tailings characterization data developed to assess waste behavior, and provides recommendations for operational waste rock classification and handling procedures to be employed at the project. The waste management plan addresses short- and long-term mitigation of acid-rock drainage (ARD) potential.

1.2 Location

The Copper Flat Project is located in southwestern New Mexico, approximately 30 miles southwest of Truth or Consequences and approximately 5 miles northeast of Hillsboro (Figure 1.1). The site is in the low hills between the Rio Grande River to the east and the Black Range Mountains to the west.



DESIGN: -	DRAWN: -	REVIEWED: -			
CHECKED: -	APPROVED: -	DATE: 12/2/2010			
FILE NAME PoO_Fig1-01_Location_JQG_20101202					

NEW MEXICO COPPER CORPORATION

COPPER FLAT MINE

PROJECT LOCATION

DRAWING NO.	SHEET	REVISION NO.
FIGURE 1.1	1 OF 28	A
JOB NO. 191000-03		

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1.3 Background

Under the currently proposed PoO, mining would be expanded in the existing open pit. The ore body would be mined by conventional front end loader and shovel open pit methods in a manner similar to the previous operation. Over the life of the Project, the mine would produce approximately 96 million tons of copper tailings and 37 million tons of overburden and waste rock. Overburden/waste rock production is estimated to average 2.2 million tons per year (ranging from 100,000 to 6.4 million tons annually), with tailings production estimated at 5.7 million tons annually. An operational life expectancy of approximately 17 years is currently projected.

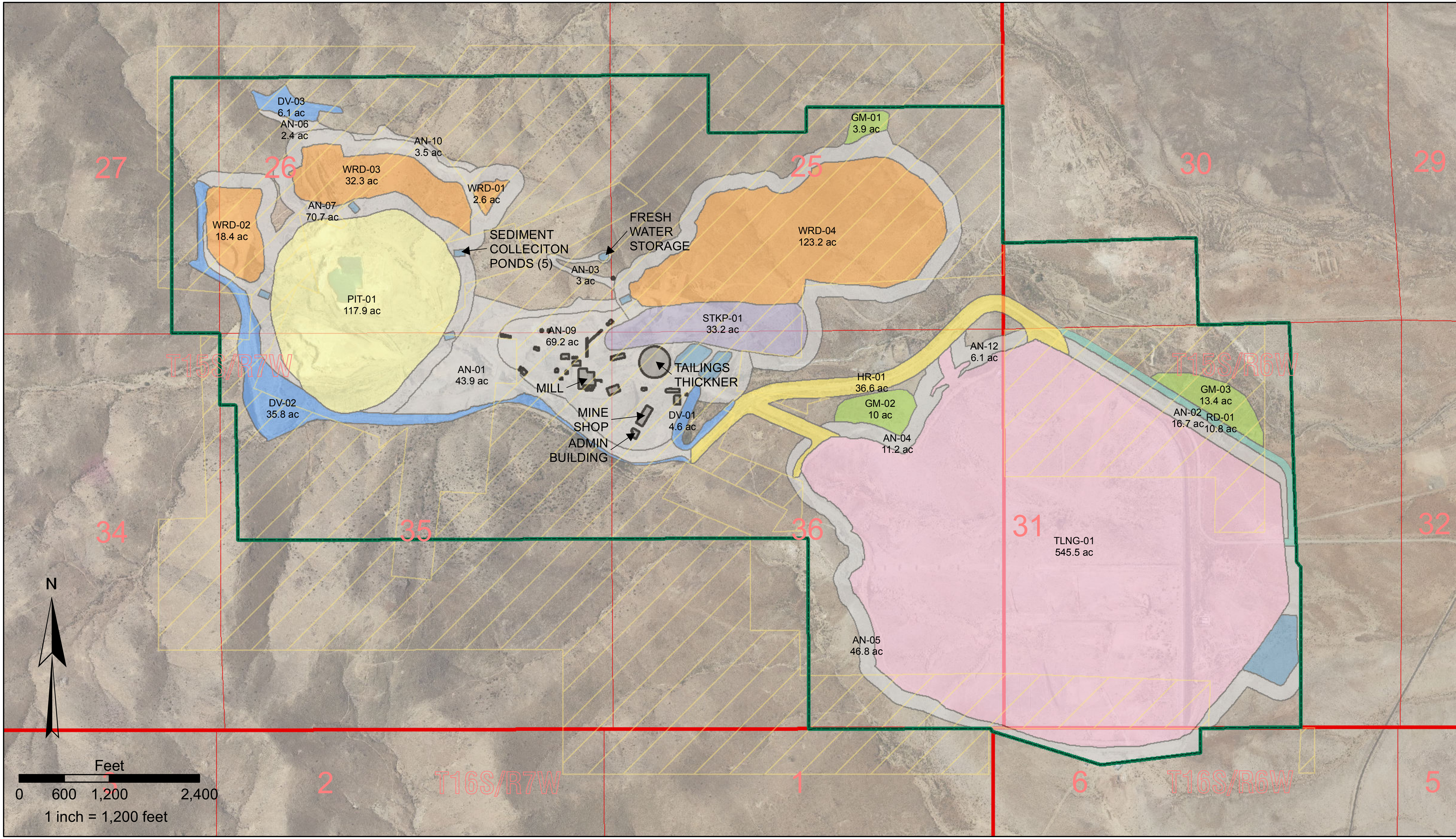
Copper ore excavated from the existing open pit will be processed through a conventional floatation circuit to form a sulfide concentrate. No chemical leaching or roasting will be carried out on site.

Waste rock from the operation will be deposited on existing rock piles located to the west, north, east, and south of the existing pit (Figure 1.2). At the end of mine life all of these rock piles will be reclaimed using a revegetated soil cover.

NMCC proposes to construct a new, lined tailings impoundment facility over the existing unlined impoundment that was constructed in 1982 by the previous mine operator (Figure 1.2); Transport of tailings from the mill to the new impoundment will be via a pipeline. Ancillary facilities associated with the tailings facility will include a slurry and/or cyclone delivery system, a solution reclaim and recycling system, an embankment seepage return system, groundwater monitoring wells and an embankment stability monitoring system.

1.4 Geology

A detailed review of the geology of the Copper Flat deposit and surrounding area was originally presented in the report *Copper Flat Mine Compilation of Pit Lake Studies* (SRK, 1997), and updated in the *NI 43-101 Preliminary Assessment, THEMAC Resources Group Limited, Copper Flat Project, Sierra County, New Mexico* (SRK, 2010) and the *Sampling and Analysis Plan for Copper Flat Mine* (Intera, 2010). A brief summary of this information is presented below.



EXPLANATION

- Public
- Mine Boundary
- Plant Facilities
- Pond
- Waste Rock
- Topsoil Stockpile
- Tailings
- Ore Stockpile
- Pit
- Haul Road
- Diversion
- Ancillary
- Access Road

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NEW MEXICO COPPER CORPORATION

COPPER FLAT MINE

DRAWING TITLE: **PROPOSED FACILITY LAYOUT**

DRAWING NO. **FIGURE 1.2** SHEET 4 OF 28 REVISION NO. **A**

JOB NO. **191000-03**

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The Copper Flat deposit is located within a Cretaceous age caldera that was intruded into the Paleozoic marine sediments and Precambrian basement rocks exposed in the upthrusted Black Range and Animas Hills. Immediately to the east of the deposit, the edge of the Rio Grande Rift forms a major regional physiographic and geologic feature. To the east of the project site, the rift has created a major graben structure, which has been infilled with at least 2000 feet of gravelly alluvium of the Santa Fe Group.

The local geology consists of a near circular block of andesite intruded by a Cretaceous age quartz monzonite stock. Numerous latite dikes crosscut both the andesite and the quartz monzonite. A later andesite dike intruded the quartz monzonite. The bulk of the high-grade mineralization is hosted in a breccia pipe which developed in the quartz monzonite stock.

1.5 Mineralization and Alteration

The majority of the economic mineralization occurs as hypogene sulfides that are predominantly associated with the breccias. The breccias are either biotite or feldspar-rich, and higher chalcopyrite concentrations are associated with the biotite-rich material.

Sulfide content within the quartz monzonite varies from less than 1% up to 10% within the mineralized breccia, and up to 20% within some veins and biotite breccia. Coarse, crystalline pyrite is the most common sulfide. Chalcopyrite ($CuFeS_2$) is the most common copper mineral, with bornite (Cu_5FeS_4), tetrahedrite ($Cu_{10}(Cu, Zn, Fe)_2(As, Sb)_4S_{13}$), enargite ($Cu_3AsS_4$), and covellite (CuS) also present. Molybdenite (MoS_2) is a common accessory sulfide. Gangue minerals associated with the sulfides include quartz, feldspar, and biotite. Accessory minerals include calcite (up to 5%), fluorite, siderite, magnetite, sericite, epidote, and chlorite.

Although Copper Flat is classified as a copper porphyry deposit, it differs from classical porphyries in that it lacks an economic supergene enrichment blanket (Titley and Beane, 1981; Titley, 1982). A central potassic alteration zone, extending from the mineralized breccia south along the contact with the quartz monzonite, is characterized by secondary biotite and potassic feldspar. Anhydrite and, locally, gypsum are present as thin coatings on fractures. The entire monzonite stock and related dikes are argillised. The andesitic rocks exhibit propylitic alteration as evidenced by epidote-chlorite-calcite alteration, and minor disseminated pyrite (<1%).

1.6 Weathering

Despite the lack of a classical supergene enrichment blanket, the deposit does have a thin “oxide” zone, down to 10 feet below the original ground surface, in which all sulfides appear to be oxidized. A “transitional” zone in which sulfides are partially oxidized extends 10 to 20 feet below the oxide zone. Below the transitional zone is a “sulfide” zone in which fresh sulfides are visible.

All the rock below the 5480 bench (20-40 feet below the original surface) in the pit contains largely fresh sulfides, except along the Sternberg lode. The Sternberg lode on the west side of the pit is partially oxidized and is referred to as transitional material. This is a mineralized vein and a zone of structural weakness in which sulfides have been partially oxidized due to preferential weathering, and potentially as a result of historic *in-situ* acid leaching. As a result of natural processes and/or past mining activities, oxidation in the Sternburg lode area has been enhanced. Abundant amorphous to poorly crystalline copper and iron oxy-hydroxy-sulfate salts occur in this area. The salts that are soluble in water at surficial temperatures, are considered to be the main source of acidity at this location.

Some superficial oxidation and wallrock alteration has been observed in the pit walls. Nowhere is oxidation greater than a depth of 30 feet, even within or along faulted contacts (Dunn, 1982).

1.7 Climate

Climate stations for the Project area are located at Caballo Dam, approximately 13 miles east of the Project, and at Hillsboro, approximately 5 miles southwest. The climate at the Project is intermediate between these two locations. In addition, NMCC has installed one climate station with pan evaporation and two PM_{10} monitoring stations on both the east and west sides of the mine site. These have been in operation since August 1, 2010.

The climate at the Copper Flat Project is characterized by warm, sunny summers with daily temperatures commonly reaching 90 degrees Fahrenheit, and mild, sunny winters with high temperatures ranging from 55 to 65 degrees Fahrenheit. In the winter, most nighttime temperatures are below freezing. Daily temperature fluctuations of 30 degrees are common throughout the year.

The average annual precipitation in the region is approximately 13 inches, nearly 50% of which occurs as infrequent but intense summer thundershowers in July, August, and September. Because of their intensity and short duration, these storms generally create large amounts of runoff and little infiltration. Precipitation varies significantly on both a monthly and yearly basis.

Evaporation records for southwestern New Mexico indicate that evaporation exceeds precipitation (NOAA, 1982). These data are based on pan evaporation rates which are applicable to estimating evaporation from wetted surfaces and shallow pools. Pan evaporation rates are calibrated against lake evaporation data at specific sites. For the Project site, the conversion from pan evaporation to lake evaporation is approximately 0.72 (NOAA, 1982). Lake evaporation at the project site is estimated to be approximately 65 inches per year and the pan evaporation is 80-90 inches per year (NOAA, 1982).

2 OPERATIONAL WASTE ROCK MANAGEMENT

2.1 Objectives

The overall objective of this waste rock management plan (WRMP) is to mitigate acid-rock drainage (ARD) potential both during mining and following closure of the Project. Specific objectives of the WRMP are as follows:

- To enable classification of waste rock concurrently with or prior to its removal from the open pit;
- To enable disposal of waste rock according to its classification and management requirements;
- To develop conditions that will facilitate concurrent reclamation as well as end of mine closure and reclamation objectives (i.e., long-term ARD control); and
- To enable identification of materials with low-ARD potential that may be useful for facilities construction and/or site reclamation activities.

2.2 Waste Rock Distribution

The waste rock in the deposit generally comprises five lithologies:

- Quartz monzonite;
- Quartz breccia;
- Biotite breccia;
- Andesite; and
- Quartz veins.

Whereas all of these rock types are represented on the existing waste rock piles, future waste rock will be dominantly comprised of fresh, unoxidized quartz monzonite and, to a lesser extent, andesite.

The classification system is discussed in Section 2.5. Operational waste classification will be conducted primarily by visual methods; however, visual classification will be subject to confirmation testing. Confirmation testing and test frequency are discussed in Section 2.5.

2.3 Summary of Field Observations Concerning Waste Rock Behavior

Field observations indicate little oxidation and acid generation occurs at the site despite exposure of waste rock and pit walls since mining operations were suspended in 1982. Observed conditions are likely influenced by arid conditions. Mineralogical observations also suggest that the sulfides occur in a crystalline form that is less susceptible to oxidation.

The deposit includes a thin oxidized (and partially oxidized) cover over fresh quartz monzonite. Where oxidation of the overlying rock is complete, the waste rock will be inert with respect to acid generation. There are likely to be very limited quantities of oxidized waste rock produced during future operations.

Partially oxidized material occurs in a transition zone beneath the oxidized cover and underlying unoxidized quartz monzonite. This transitional material has been exposed to oxidizing conditions over geologic time. In the field, it typically exhibits a low paste pH and high paste conductivity, and is currently acid generating. This behavior can be observed in both exposed pit walls in the partially oxidized zone, and where the transitional waste was deposited on the waste rock piles.

Where unoxidized quartz monzonite was deposited on the waste rock piles, the material does not exhibit evidence of significant oxidation. Sulfide grains appear fresh. Field paste test results typically indicate near neutral pH and low paste conductivity. Field observations indicate that when exposed to weathering under field conditions, the quartz monzonite are, at most, slow to react. This is a function of:

- Coarse grain size of sulfides
- Crystallinity
- Disseminated texture of sulfides

2.4 Summary of Geochemical Testing

Appendix A contains a detailed discussion of the geochemical testing that was completed to evaluate the waste rock and tailings at Copper Flat. The geochemical test program included site visits and laboratory testing programs conducted in 1994 and 1997. In each phase of investigation, field testing (paste pH and conductivity) was performed. Samples were also collected of samples for laboratory testing that included:

- Acid base accounting;
- Total metals assay;
- Leach testing;
- Kinetic humidity column tests;
- Enhanced oxidation (NAG) tests.

The results of these tests are discussed in detail in Appendix A.

The primary observations that can be made on the basis of the geochemical testing programs are as follows:

- The future waste rock will be composed primarily of quartz monzonite. The majority of this waste rock can be expected to exhibit acid generating potential as indicated by both acid base accounting and NAG tests;
- While static and NAG tests indicate a net acid producing potential, kinetic tests indicate that the unoxidized material is slow to oxidize. Kinetic testing of unoxidized samples produced neutral to slightly alkaline leachates with low concentrations of sulfate and dissolved metals. The laboratory kinetic test behavior is consistent with observed field conditions.
- Partially oxidized material, or the transition waste rock, exhibits low paste pH and high conductivity. Leach testing of the transition material indicates soluble sulfate and metals loads that indicate acid generating behavior. It should be noted, however, that only limited quantities of similar material occur within the future mining area.

2.5 Waste Rock Classification

Results of the 1994 – 1996 field and laboratory testing programs indicated that although the waste rock from the deposit has the potential to generate acid, the majority of the future waste rock (unoxidized quartz monzonite) will be very slow to oxidize and produce acidity. The current testing program is intended to verify these results.

The quartz monzonite that was obtained from below the zone of oxidation and placed on the waste rock piles prior to 1982 exhibits a fresh appearance and generally neutral to alkaline pH. This material requires management to alleviate ARD potential; however, the ARD risks associated with the unoxidized waste rock are long-term risks only. Operationally, the material can be considered as being inert (i.e., on the scale of ~ 20 years).

Low pH values are associated primarily with the transition waste materials that have been exposed to oxidizing conditions over geologic time and are currently generating acidity.

While acidic seepage has been observed at the site, it is believed to be associated with the transition material. It is also correlated, temporally, to periods of unusually heavy rainfall. Although this has the consequence of washing out acid generating metal sulfate salts, a significant dilution effect will also be experienced. The transition waste rock requires management to alleviate ARD potential. Due to its geochemical behavior, ARD mitigation measures for transition waste should be implemented concurrently with disposal

During the course of the waste characterization program, the waste was classified into four types by visual inspection: oxide material, transition material, and unoxidized waste that was further subdivided into low- and high- sulfide material.

The following waste rock classification and management system is proposed:

Waste Rock Type	**ARD Potential**	**Management Goal**
Oxide	Low	Use in concurrent reclamation, stockpile for use
Transition	Generally high	mitigate ARD potential concurrently with disposal
Low sulfide, unoxidized	Low	Use in concurrent reclamation, stockpile for use
High sulfide, unoxidized	Generally high in long term	Concurrent reclamation where feasible, implement long term ARD controls

Brief descriptions of waste classification methods and the frequency at which these methods will be applied are presented below. Detailed descriptions of the test procedures are contained in Appendix A.

2.5.1 Visual Observation

Figure 2.1 presents a flow chart that summarizes the waste rock classification program. All blasthole drill cuttings will be visually inspected by a qualified geologist or trained geological technician prior to blasting and removal from the pit.

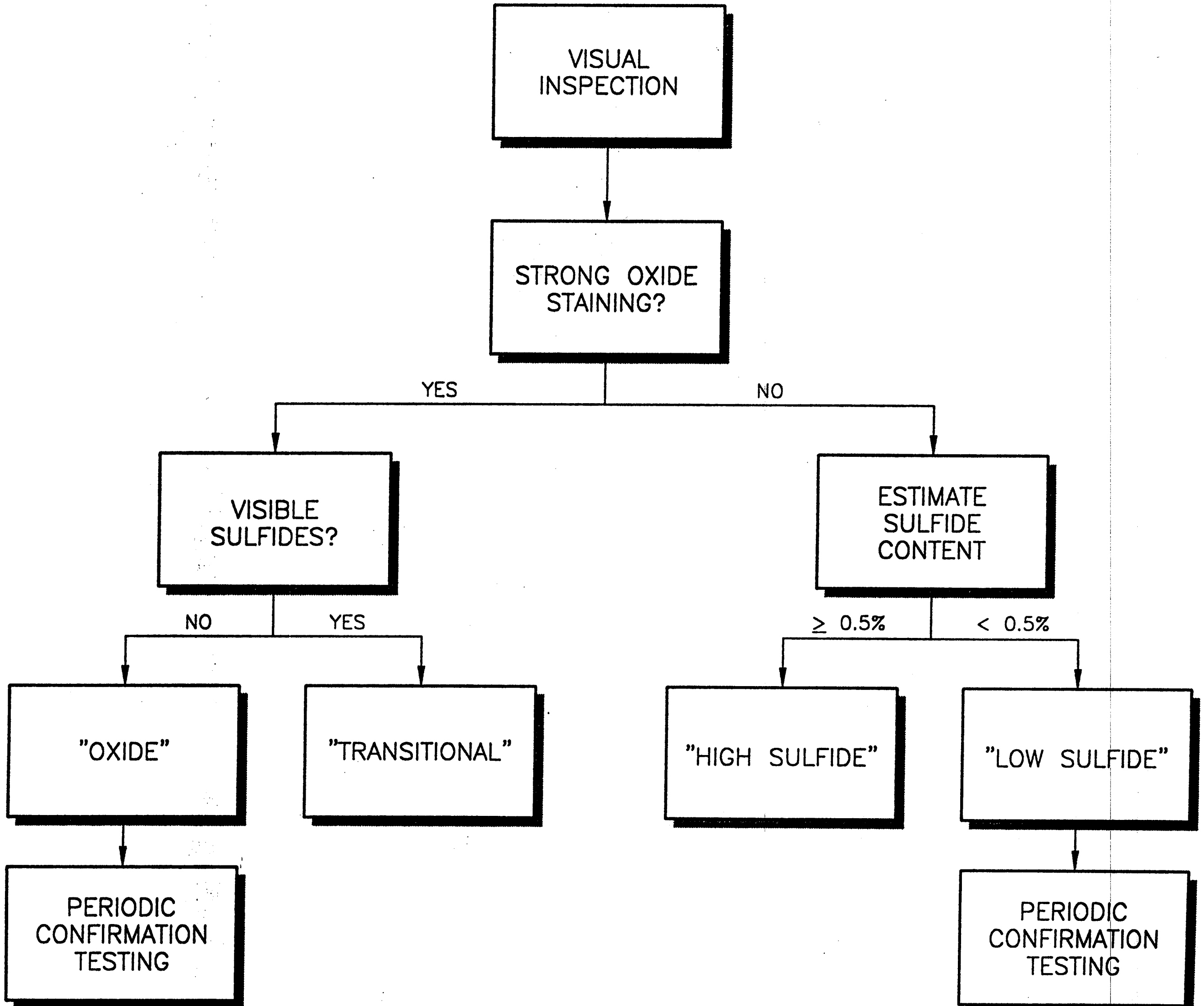
Oxidized and transition waste rock can be distinguished from unoxidized (high and low sulfide) waste rock on the basis of visual characteristics. Both the oxide and transition waste rock exhibit strong iron oxide staining and may exhibit partial to complete destruction of original rock texture. In contrast, the high and low sulfide unoxidized waste rock has a fresh appearance and may contain abundant fresh sulfides.

Waste rock that exhibits an oxidized appearance will also be assessed for amount of visible sulfides in the sample. Transitional material will be any material that appears oxidized but contains sulfides. A lack of visible sulfides will be used to characterize oxide material. Material classified as oxidized will be subject to confirmation testing.

Materials that exhibit a fresh, unoxidized appearance will be subject to visual estimation of sulfide content in order to distinguish between high and low sulfide waste rock. Initially, a conservatively low sulfide content of 0.5 percent will be used as an indicator of low sulfide waste rock. Material classified as low sulfide waste rock will be subject to periodic conformation testing.

2.5.2 Confirmation Testing

Confirmation testing will be performed to confirm the effectiveness of visual waste classification. Confirmation testing will be performed to evaluate both oxide versus transition and low sulfide versus high sulfide designations. Confirmation testing will be completed on-site with a Leco Furnace.



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Consulting Engineers & Scientists

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FIGURE 2.1

OPERATIONAL WASTE CLASSIFICATION FLOWCHART

2.5.2.1 Oxide Versus Transition Waste Rock

To be classified as oxide, the material must exhibit a low sulfide sulfur content. Oxide waste rock samples will be periodically subjected to total sulfur and sulfate sulfur analyses. Based on the test results, the sulfide sulfur content of the sample will be calculated (as total less sulfate sulfur). Because weathering results in the consumption of neutralizing potential as well as oxidation of sulfides, partially oxidized materials with low sulfide sulfur content are commonly capable of acid generation. An initial sulfide sulfur cutoff value of 0.1 percent shall be used as an indicator of oxidized waste rock.

Confirmation testing of oxide versus transition waste rock will initially be conducted at a frequency of one confirmation test for each five blastholes designated as oxide waste rock. Subject to ongoing testing and field observation, this test frequency may be subject to revision.

2.5.2.2 Low Sulfide Unoxidized Versus High Sulfide Unoxidized Waste

A conservatively low total sulfur concentration of 0.2% will be used as a preliminary indicator of low sulfide waste rock. Based on static testing completed to data, a sample containing 0.2% total sulfur will typically exhibit an NP:AP ratio that is greater than 3:1. Subject to further testing and observation, this cutoff value may be adjusted to suit conditions.

Confirmation testing of low versus high sulfide waste rock will initially be conducted at a frequency of one test for each five blasthole samples designated as oxide waste. Subject to ongoing testing and field observation, this test frequency may be revised.

2.6 Waste Handling

2.6.1 Waste Disposal Facilities

Four waste rock disposal facilities will be developed to accommodate future waste rock. The existing West and North Dumps, which contain oxidized, transition and unoxidized waste rock, will be expanded to contain all waste rock types. The south and east disposal areas will be expanded to contain primarily unoxidized waste rock. Waste rock disposal facilities are shown on Figure 1.2.

2.6.2 Waste Rock Management During Operations

Most of the future waste rock will be low and high sulfide waste, with only small amounts of oxide and transition material encountered near the surface of the proposed pit expansion. The waste will primarily be quartz monzonite with lesser andesite. The breccias are primarily ore.

The general approach to waste rock management and the control of ARD is to control the flux of water through the waste rock. Future waste will be placed on existing waste rock piles in a manner that minimizes the potential for leaching of dissolved constituents. Surface water will be managed during operations to promote runoff from the waste rock and prevent surface water runon.

Management of future waste rock will include concurrent reclamation, where feasible, and will incorporate disposal practices that will facilitate reclamation and closure of the waste rock disposal facilities.

2.6.2.1 Oxidized Waste Rock

No restrictions will be imposed on the handling and placement of oxidized waste rock. To the extent practical, oxidized waste rock will be deposited on the outer slopes and surfaces of the waste rock disposal facility. Oxidized waste rock may be stockpiled in selected areas of the waste rock disposal facilities so that it may be used during reclamation. Given the relatively small volume of oxide waste rock that is anticipated to exist within the future pit limits, oxide waste rock may be managed as transition waste without confirmation testing.

2.6.2.2 Transition Waste Rock

Transition waste rock will be managed concurrently with disposal due to its leachable acidity and dissolved metal loads. Transition waste rock will be isolated in one portion of either the West or the North waste disposal area to minimize the footprint that is covered by this material.

A minimum of 6 feet of non-transition waste rock will be placed over transition waste to minimize contact transition material in the short term. Transition waste rock will be mined early in the operation. Consequently disposal areas will be covered with additional waste rock as the waste disposal facilities are developed.

2.6.2.3 Unoxidized High Sulfide Waste Rock

As discussed above, the unoxidized waste rock poses negligible short term risk of ARD or adverse drainage quality. No restrictions will be imposed on the placement of unoxidized waste rock, however, placement will be in a manner that facilitates reclamation. A reclamation cover, as discussed below, will be placed over the unoxidized waste rock.

The unoxidized waste rock will be end dumped in 50-foot lifts. Benches will be created at the base of each end dumped lift to facilitate post-mining regrading. Following regrading to 2.5H:1V slopes, minimum 10-foot wide erosion control benches will remain. All active unoxidized waste rock surfaces will be backsloped to promote drainage of surface water off the active waste rock disposal areas. Runoff will be directed to perimeter surface water collection ditches and sediment collection facilities.

2.6.2.4 Low Sulfide Waste Rock

No restrictions will be imposed on the handling and placement of low sulfide waste rock. Where practical, low-sulfide waste rock will be deposited on the outer slopes and surfaces of the waste rock disposal areas. Low-sulfide waste rock will be stockpiled in selected areas of the waste rock disposal facilities so that it may be used for reclamation.

2.6.2.5 Waste Flagging and Routing

Prior to blasting active benches in the open pit, mine geological staff will visually inspect the cuttings from each blasthole. The rock type, color, degree of oxidation, sulfide content and other pertinent features including blasthole cuttings sample numbers will be noted and transferred to bench plan maps. Where the rock is identified as oxide or low sulfide waste, samples will be collected for confirmation testing. Waste rock boundaries will be plotted on the active bench plans.

When blasting has been completed, waste boundaries will be field flagged on the active bench. Shovel operators will then selectively excavate the waste rock and inform haul truck operators as to the nature of the waste rock and its destination within the active waste rock disposal facilities. The operator will develop a workable waste flagging and routing plan prior to the commencement of mining operations. Mine staff will maintain records of the volume of each waste type mined during each shift and its ultimate location within the waste rock disposal facilities.

2.7 Long-Term Management

Placement of a soil cover over the waste and implementation of permanent surface water management controls will minimize the flux of water through the waste rock and the potential for leaching of oxidation products in the long term. Preliminary cover studies presented in the report, *Hydrologeological Studies, Copper Flat Project* (SRK, 1995), and updated in the report *Copper Flat Mining Act Permit Application, Volume 4* (SRK, 1996) indicated that, for a wide range of cover materials and cover thicknesses, the flux of water through the waste rock piles will occur at a rate of a few gpm (<5gpm). A cover thickness of 12 inches was therefore proposed, based on *Hydrologic Evaluation of Landfill Performance* (HELP) modeling (Appendix C). This cover thickness will be re-evaluated during the supplemental investigations, and tested during operations in field trials, and modified based on the results.

Where possible, cover placement will be completed concurrently with mining. Inactive waste rock slopes will be regraded to 2.5H:1V slopes and compacted by dozer traffic. The cover material will be placed and revegetated, and permanent surface water management facilities will be constructed. At the end of mining, final active waste rock disposal area surfaces will be regraded, covered, and revegetated.

Routing of loaded haul trucks over the upper surface of each lift will mechanically degrade and compact the waste rock, and produce zones of reduced permeability. Permeability testing of a quartz monzonite waste rock sample that was subjected to equipment traffic during previous mining activities exhibited a remolded permeability of 1×10^{-6} cm/sec. The combination of cover placement, evaporation and waste rock compaction is expected to reduce the flux of water through the waste rock to minimal rates and alleviate the potential for significant impacts to water resources. Attenuation of acidity and dissolved constituents in the foundation of the waste rock disposal facilities will further reduce the potential for water quality impacts.

2.8 Quality Assurance Testing

Quality assurance testing will be periodically performed to verify that waste rock is being accurately classified. The operator will randomly select up to 10 archived blasthole samples per month which will be subjected to saturated paste pH, saturated paste conductivity, and acid base accounting testing (totals sulfur, sulfate sulfur and NP testing). This testing will be performed at a state approved laboratory.

The samples will be classified with respect to ARD potential on the basis of NP/AP ratio. The samples will be located on the appropriate bench plan maps and the quality assurance test classification will be compared to the operational waste classification designation. Should the comparison indicate discrepancies in waste classification, a plan to determine the source of waste classification discrepancies and improve classification techniques will be prepared by the operator.

2.9 Field Kinetic Testing

The operator has committed to a program of kinetic testing during the mining operation. These tests will be conducted to support waste management planning, confirm and further refine mine waste geochemical behavior predictions. The proposed plan for ongoing kinetic testing is described in the report, *Copper Flat Closure Field Testing* (SRK, 1998).

2.10 Record Keeping

Maintenance and continuous updating of records for all waste classification, quality assurance, and kinetic testing is considered critical to the effective management of waste rock at Copper Flat. Data collected from blast hole sampling will also be maintained. This data will be important in assessing and modifying the waste rock classification scheme. All test data will be incorporated into monthly and annual reports that will be maintained on site and kept available for inspection.

2.11 Cover Material Testing and Design

Preliminary cover design and performance modeling has been completed to assess closure and reclamation requirements for long-term ARD control and protection of water resources. The operator will conduct field scale test of cover materials and cover designs during the mining operation. Testing programs are defined in *Copper Flat Closure Field Testing* (SRK, 1998). Final reclamation cover design will be based on the results of this work.

2.12 Contingency

Due to the arid conditions that prevail at the site, acidic seeps from the existing waste rock piles have been observed, but only on rare occasions following periods of high rainfall. Surface water will be managed during operations to minimize the potential for seeps to develop. Any affected water that occurs during operations will be collected and utilized in ore processing.

3 OPERATIONAL TAILINGS MANAGEMENT PLAN

Unlike the historic facilities, NMCC proposes to line the future tailings impoundment and embankment in order to eliminate the potential migration of tailings process water into the underlying groundwater system. However, underdrain seepage will require active management until such time as the tailings have consolidated, and a suitable reclamation cover has been constructed to manage surface water runoff. Given the nature of the ore material being processed, surface exposure of sulfide-bearing tailings may require additional management to mitigate the potential production of ARD.

3.1 Tailings Disposal

The proposed Copper Flat tailings embankment will be constructed through cycloned sand deposition. A series of cyclones will be installed on the embankment crest. Cyclone underflow or sand will be deposited on the embankment while the cyclone overflow, consisting of the fine fraction of the tailings and the majority of the process water, will be spigotted into the lined tailings impoundment.

Tailings disposal practices will result in a well drained embankment composed of coarse tailings sand. In the impoundment, a lower-permeability, saturated tailings mass will be created. Geochemical testing (Appendix B) indicates that the tailings, like the waste rock, tend to react slowly when compared to tailings from other known copper deposits, such as Chino Mine (Ford *et al*., 1998; Newcomer *et al.*, 1998). The potential for development of ARD at the surface will be alleviated by covering the tailings, thereby limiting the flux of water into the impoundment.

3.2 Mitigation of ARD Potential

3.2.1 Tailings Embankment

Due to the unsaturated conditions that will be maintained during and after tailings disposal operations, the tailings embankment sand will be more susceptible to oxidation than the tailings slimes in the impoundment. As such, the implementation of ARD mitigation measures for the tailings embankment will be initiated concurrently with mining.

3.2.2 Tailings Impoundment

The fine grained tailings in the impoundment will remain saturated during operation of the tailings disposal facility. Little oxidation of the tailings can occur under these conditions. At closure, the potential for ARD from the tailings impoundment will be alleviated by several factors:

- The tailings overflow of slimes will have a low permeability. Typical fine tailings exhibit a permeability of 1×10^{-6} cm/sec or less following partial consolidation. Upon complete consolidation, the permeability of fine tailings will decrease. The physical properties of the tailings will limit the flux of water into the tailings and the potential for mobilization of oxidation products; and

- Because the tailings will be fine grained, they will exhibit high capillarity and will retain moisture. Moist porous solids are effective barriers to the diffusion of oxygen. The combination of low permeability and resistance to oxygen diffusion will alleviate development of ARD in the impoundment. Placement of the proposed native soil cover over the impoundment will enhance evapotranspiration, control tailings erosion, and further reduce the flux of water through the tailings mass.

3.2.3 Covering of Tailings

A cover composed of native soil materials will be placed on the embankment. As with the waste rock, a soil cover of 12 inches is proposed to limit infiltration to the tailings and promote run-off (Appendix C). Prior to final design, field cover testing and kinetic testing of tailings will be completed as described in *Copper Flat Project Field Testing* (SRK, 1998). Cover thickness and permeability requirements will be determined in conjunction with field testing.

4 CONCLUSIONS

4.1 Waste Rock Characterization

Field and laboratory testwork, completed by the previous project proponent, on waste rock and drill core samples from Copper Flat have been used to classify the material as:

- *Oxide*,
- *Low ARD potential*. All sulfide completely oxidized,
- *Transitional* – High ARD potential. Partial oxidation of sulfides and storage of acid generating and metal leaching capacity in soluble metal-sulfate minerals.
- *High Sulfide* – High potential to generate ARD. Fresh sulfides with little or no oxidation.
- *Low sulfide* – Low potential to generate ARD. Fresh sulfides with little or no oxidation.

Management of these wastes will vary proportional to class and geochemical behavior with respect to potential metal leaching and acid generation.

4.1.1 Waste Rock Management

For permanent mitigation, concurrent reclamation will be ongoing.

- *High Sulfide Waste Rock* – Similar mitigation to the Transition Waste Rock with collection of seepage and where practical concurrent reclamation.
- *Low Sulfide Waste Rock* – This material will be used in concurrent reclamation of more reactive material and adequately covered to mitigate long-term risk.

Full field testing will be undertaken during development for operational and final management of waste rock.

4.1.2 Tailings Characterization

Tailings laboratory characterizations found that, compared to other similar mineral deposits currently being mined, the Copper Flat tailings are considerably less reactive. This is supported by the field observation that, despite nearly 30 years of exposure to atmospheric moisture and oxygen, no significant acid seeps or acid plumes have developed at the site, even though some leaching of the material has occurred.

4.1.3 Tailings Management

Mitigation of potential ARD from the tailings embankment will be undertaken concurrent with mining. Due to their unsaturated nature these tailings are anticipated to have a higher ARD potential than in the main body of the impoundment.

The majority of the tailings in the impoundment will, during the lifetime of the mine, be kept saturated and consequently will have a negligible ARD potential. Upon closure, the impoundment will be adequately covered so as to minimize ARD generation.

5 REFERENCES

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Appendix A

Waste Rock Characterization

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APPENDICES

1 INTRODUCTION

Two phases of waste rock characterization have been completed at the Copper Flat project in New Mexico. A preliminary assessment of the waste was conducted in 1994 for the Environmental Impact Statement (EIS). More detailed work was carried out in 1997 for use in development of this waste management plan. The numbers of tests completed in each phase of the waste rock characterization are listed in Table A.1.1.

1.1 Work Carried Out As Part of the EIS

The initial assessment of the waste rock dumps at Copper Flat (SRK, 1995; DEIS, 1996) was carried out in part to assess the current geochemical characteristics of waste rock from former operation sand to determine whether future waste rock has the potential for acid generation.

Nineteen samples were collected from the existing pit wall rock, waste rock piles, and drill core and cuttings. The locations of the surface samples are shown in Drawing 68612-001. Selected samples were subjected to:

- Paste pH and conductivity measurements to determine whether previous oxidation had produced acidic and/or soluble residues;
- Determination of total metals concentrations;
- Acid Base Accounting to assess the balance between potentially acid generating and potentially acid neutralizing minerals;
- Agitated leach extraction tests to measure the amount of immediately soluble metals;
- Humidity column testing to simulate long-term oxidation of the waste rock and evaluate drainage quality; and,
- Geotechnical testing to estimate the physical and hydraulic properties of compacted waste rock.

The conclusions of this work were that:

- Most of the material on the dumps had only superficial oxidation despite exposure to the atmosphere for over 14 years.

- No evidence of acid seeps was observed during 1994-5, although one seep had been reported in an earlier study (Newcomber et al., 1991) and another seep was identified in August 1997 after unusually heavy rainfall.
- The material on the East, South, and most of the North dumps was essentially “sulfide” material with little or no accumulation of secondary mineral salts. The West waste rock dump and the western portion of the North dump were more complex with a combination of “sulfide” and “transitional” ore.

1.2 Work Carried Out As Part of the Waste Rock Management Plan

In August 1997, field work was carried out with the aim of producing detailed geological and geochemical maps of the waste rock dumps and open pit. One hundred and twelve samples were collected from six-foot long channels along benches on the waste rock dumps. The locations of the 1997 samples are shown on Figure A.1.2. The material was characterized in the field by geological observation and by paste pH and TDS measurements. Twenty-eight samples were analyzed by Acid Base Accounting (ABA) tests and sixty-two samples were analyzed by Net Acid Generation (NAG) testing. Table A.1.2 shows the numbers of samples of each rock type analyzed by each procedure.

2 METHODS

The testing methods for samples collected in the waste rock characterization studies are summarized in the following sections. Detailed protocols are presented in Appendix A.1.

2.1 Paste pH and Conductivity

Paste pH and conductivity tests were conducted by mixing a sample of the fine grained portion of the waste with deionized water in a ratio of 1:2 by volume to produce a saturated paste. Measurements were then taken directly from the paste.

A paste pH greater than pH 7 indicates either that the sample is not generating acid, or that any acidity produced is being neutralized. A paste pH below 5.0 indicates that the material contains soluble acidity from prior oxidation. The conductivity measurement indicates the amount of immediately soluble salts present in the sample. The soluble acidity and salts are normally the products of earlier oxidation reactions. Their presence indicates that water contacting the material could leach oxidation products, even in the absence of further oxidation.

Paste pH and conductivity tests were conducted in the field (1996-1997 data) or at the SRK Laboratory in Lakewood, Colorado (1994-1995 data).

2.2 Total Metals Concentrations

Total metals concentrations in the waste rock were determined by Inductively Coupled Plasma (ICP) following the EPA 3051 digestion (USEPA 1982; 1995a,b). The purpose of the total metal analyses was to determine what metals are present in the waste rock. The ICP analysis does not indicate the amount, if any, of each metal that would be soluble under conditions likely to arise in the field.

ICP analyses were conducted at ACZ Laboratory in Steamboat Springs, Colorado.

2.3 Acid Base Accounting

Acid base accounting (ABA) tests were conducted to assess the potential for the waste rock to become acid generating. ABA tests indicate the balance of potentially acid generating minerals (sulfides) and potentially acid consuming minerals (generally carbonates) present in the rock. The test involves analyzing for total sulfur and sulfur species (total, sulfate, and pyritic sulfur) to determine the acid generation potential

(AP), and then titration with acid to assess the neutralizing potential (NP) of the material. The units of the NP and AP are kg $CaCO_3$ equivalent/ton of material (kg/T), or tons $CaCO_3$ equivalent/kiloton of material (T/KT). The method employed during the 1994 testing was the Sobek method. The modified Sobek technique (Sobek et al., 1978; SRK, 1989) was used to evaluate the 1996 samples.

The ABA characteristics of different samples can be compared using the difference between the NP and the AP values (the net neutralizing potential, or NNP). An NNP of greater than 20 kg/t indicates that a sample contains sufficient NP to buffer the acidity that could be produced as a result of oxidation, and therefore, has a low potential for acid generation. An NNP value of less than –20 kg/T is considered indicative that a sample has the potential for acid generation. Values between +20 kg/T and –20 kg/T have uncertain acid generating potential and may require kinetic testing to evaluate field behavior.

The ratio of NP:AP can also be used to evaluate acid generating potential. As a general guideline, an NP:AP greater than 3:1 indicates that a sample has a low potential for acid generation. A value below 1:1 indicates that, if the sample is exposed to oxidizing conditions, it has the potential for acid generation. Waste rock samples exhibiting NP:AP values between 1 and 3 typically require kinetic testing to evaluate field behavior.

However, both of these methods for evaluating ABA data are guidelines only. Other characteristics of the rock, such as the grain size, sulfide species and morphology and the form and occurrence of the neutralizing minerals, can influence the tendency for the material to produce or neutralize acidity.

A total of 46 ABA tests were conducted during the two phases of the waste characterization program. Testing of 1995 samples was conducted at ACZ Laboratory in Steamboat Springs, Colorado, whereas 1997 samples were analyzed at Sierra Environmental Monitoring Laboratory in Reno, Nevada.

2.4 Net Acid Generation Tests (NAG)

An alternative method for evaluating acid generating potential is the net acid generation (NAG) test. Whereas ABA tests indirectly estimate acid generating potential by comparing the sulfide sulfur content to the acid neutralizing potential of a sample, NAG tests determine the balance without the need for sulfur analyses.

The test is conducted by mixing the sample with hydrogen peroxide, and heating until the mixture stops boiling. After cooling, the pH of the sample is measured to obtain the “NAG pH”. The NAG pH is then an estimate of the final pH of a sample if nearly all the sulfide present were oxidized, and is used in comparing the relative potential for generating acidity. The NAG pH is a qualitative indication of a sample’s potential for acid generation; however, NAG pH values of 4.0 or greater are often indicative of low acid generating potential. The solution can then be titrated to neutrality with a standard base to determine the net acidity or acid generated (NAG) upon complete oxidation of the samples. The NAG is expressed as kg H_2SO_4 equivalent/ton, and is analogous to the NNP. Where the NAG is zero, net acid neutralizing potential is indicated. Positive NAG values indicate net acid generating potential.

The NAG test assumes complete oxidation of all the sulfide in a sample. Although sulfide oxidation is seldom complete, and the NAG test can underestimate the amount of sulfide in a sample, the result provides a realistic indication of the amount of sulfide that would react in field.

NAG tests were conducted on 62 samples representing all the rock types in the deposit. All NAG tests were carried out at the School of Engineering, University College of Wales, Cardiff, United Kingdom.

2.5 Modified EPA 1312 Test

The objective of this procedure is to characterize and quantify the soluble metal and salt content of waste samples. The test involves mixing a pulverized sample with a leaching solution, agitating the mixture, filtering the liquid and analyzing the liquid extract for pH, conductivity, acidity, alkalinity, sulfate and soluble metal concentrations (USEPA, 1994). The EPA test uses a liquid to solids ratio of 20:1. However, at the standard test ratio, constituent concentrations may be diluted and undetectable. The procedure was, therefore, modified to include a 2:1 ratio liquid to solids ratio. Deionized water was also substituted for the standard leach solution (deionized water pH adjusted with nitric and sulfuric acid) to simulate leaching with rain water.

The modified EPA 1312 tests were conducted at ACZ Laboratory in Steamboat Springs, Colorado.

2.6 Humidity Column Tests

Humidity column tests were carried out to simulate long term weathering of waste rock samples. Each sample was placed in a column of PVC pipe. Warm, moist air was passed through the sample for three days, followed by three days of dry air circulation. On the seventh day of each weekly cycle, the sample was irrigated and the leachate was collected. The pH, Eh, conductivity, acidity and alkalinity were measured directly, and a portion of each leachate sample was then sent for analyses of metal concentrations. Testing was continued for 21 weeks.

Humidity column tests were conducted at Cominco Engineering Services Laboratory (CESL) in Vancouver, British Columbia, Canada.

3 RESULTS OF WASTE ROCK TESTING PROGRAM

The following section presents the general findings of the geochemical testing program. Detailed data are presented in Appendices A.2 and A.3.

3.1 Metal Content and Mineralogy

The mineralogy of the samples was determined visually. The most common sulfide was coarse crystalline pyrite, which is present in concentrations of less than 1% throughout the quartz monzonite, and up to 10% to 20% locally within the mineralized breccia and some quartz veins. Other sulfides include chalcopyrite ($CuFeS_2$), the most common copper mineral, bornite ($CuFeS_2$), tetrahedrite ($Cu_{10}(Cu, Fe, Zn)_2(As,Sb)_{-4}S_{13}$), enargite ($Cu_3AsS_4$), and covellite (CuS). Molybdenite (MoS_2) is the most common molybdenum mineral. Gangue minerals associated with the sulfide mineralization include quartz, feldspar, and biotite. Accessory minerals include calcite (up to 5%), fluorite, siderite, magnetite, sericite, epidote, and chlorite.

Table A.3.1 lists the results of ICP analysis of two samples of quartz monzonite waste rock. Sample PW-3 was collected from the northwest wall of the open pit and WD-1 was collected from the west waste rock pile. Both samples show a similar chemistry with high aluminum, manganese, copper, and iron concentrations. Copper, molybdenum, sulfur, silver, zinc and cadmium are enriched in the sample analyzed with respect to crustal abundance.

3.2 EPA 1312

Although the total metals concentrations in the waste rock are important, the concentrations of metal salts that are soluble is often of more concern. Table A.3.2 lists the results of EPA 1312 test on sample WD-1. It should be noted that this sample was selected for EPA method 1312 leach testing because it is a transition waste rock sample that exhibited low field pH. Therefore, the leachable constituent concentrations would be anticipated to be higher than those expected from fresh, unoxidized waste rock samples.

The leachate from the sample had a pH of 3 and high sulfate concentration (3050 mg/L). No alkalinity was detected. The leachate also had higher concentrations of aluminum, copper, and iron, than the other sample, reflecting soluble metals in the solid sample. In addition, nickel and zinc in the solid sample appear to be soluble. However, the soluble metals concentrations are generally low.

3.3 Paste pH and Conductivity

Paste pH was measured on 141 samples from the waste rock dumps. The range of pH values for each rock type is shown in Figure A.3.1. The andesite sample analyzed had a paste pH above 9. All other rock types show a range of values between 2 and 9, indicating that portions of each lithology have undergone varying degrees of sulfide oxidation.

Paste pH is plotted against paste conductivity in Figure A.3.2 and listed in Appendix A.2. There is a strong correlation between low paste pH and high paste conductivity, as would be expected. Conductivity values generally remain below 500 µS/cm above a pH of 6, but increase when pH is lower.

3.4 Acid Base Accounting

NP values are plotted against AP values for the two testing programs in Figure A.3.3. The 1994 samples have higher NP than the 1997 samples. The discrepancy is a result of the use of the more conservative modified Sobek procedure for determining NP on the 1997 samples. For the purposes of this report, only the 1997 data will be used.

Figure A.3.4 shows the relationship data between NP and AP by rock type for the 1997 samples, with the diagonal line indicating where NP is equal to AP. The figure shows that most samples contain less than 3% sulfide (equivalent to an AP of 93kg $CaCO_3$ eq./t), and generally have less NP than AP. Therefore, most samples have a “theoretical” potential for acid generation. The andesite appears to be an exception.

From the correlation of Sulfate/Total Sulfur and paste pH four fields can be identified (Figure A.3.5):

- *Low paste pH, high Sulfate/Total Sulfur Ratio*: This field is characterized by samples that have a high proportion of secondary sulfate salts that are acid generating. As can be observed relatively few samples fall into this field.
- *High paste pH, low Sulfate/Total Sulfur Ratio*: This field is characterized by samples that have a low proportion of secondary sulfate salts but high sulfide content. Whilst having the potential to generate appreciable amounts of acid they are not on immediate reaction acid-generating and require a long period of interaction with air and water in the presence of a catalyst to be so.
- *Low Paste pH, Low Sulfate/Total Sulfur Ratio*: This field is characterized by high sulfide samples.

- *High Paste pH, High Sulfate/Total Sulfur Ratio*: This field delineates the oxide ore samples.

ABA data is presented in Appendix A.2.

3.5 Net Acid Generation (NAG) Testing

NAG tests were conducted on 62 samples and the resulting NAG pH values are plotted according to rock type on Figure A.3.6. Samples of biotite breccia, quartz breccia, and quartz monzonite had NAG values that ranged from acidic to alkaline. This suggests that each of these lithologies contain a wide range of sulfide concentrations. Quartz vein material, in contrast, had NAG values indicating Net Acid Generation, reflecting the common association within the deposit of sulfides with quartz veins. Low paste pH correlates to high NAG and low negative NNP (Figure A.3.7).

NAG test data are presented in Appendix A.2.

3.6 Kinetic Tests

Humidity column tests were conducted on four different quartz monzonite samples and a quartz breccia sample:

- Two samples obtained from the sulfide waste rock stockpiles (SW-1 and LGSSP-2);
- One sample of quartz breccia with jarosite stains from the pit wall (PW-2); and,
- Two samples of unoxidized quartz monzonite waste obtained from archived drill core (IDC 24-22-241 and CF10-190-199).

Sulfide waste samples (SW-1 and LGSSP-2) are representative of previously mined unoxidized materials that have been exposed to weathering conditions since 1982. These samples contain fresh pyrite and chalcopyrite which coat fractures and are disseminated throughout the rock.

The pit wall sample (PW-2) was collected from partially oxidized cap rock located west of the pit. While the sample was highly oxidized, it contained residual disseminated pyrite and, locally, chalcopyrite.

The core samples (IDC 24-22-241 and CF10-190-199) are representative of unoxidized quartz monzonite waste that will be mined during future operations. These samples were obtained from drilling at depth and have not been exposed to weathering or oxidizing conditions in the field. They contained fresh chalcopyrite and abundant fresh pyrite.

Results of ABA tests on the samples used for the humidity column tests are listed in Table A.3.3. Humidity column data are presented in Appendix A.3 and summarized in Figures 3.8 to 3.3.

3.6.1 pH and Eh

Figure A.3.8 illustrates leachate pH with time. For the initial 19 weeks of testing, all unoxidized quartz monzonite samples (all samples except column 2, PW-2) maintained a leachate pH in the range of 7.0 to 8.1. In column test PW-2, pH varied between 5.8 and 6.5 during the initial 19 weeks.

All samples show a sharp decrease in leachate pH in week 20. Because the pH depression was approximately equivalent in all tests, the laboratory was contacted to determine if the pH depression was attributable to laboratory operations as opposed to geochemical conditions. Independent investigations by the laboratory indicated that every column in the laboratory at that time (not just those for this project) experienced a similar leachate pH decrease. It was ultimately determined that the decrease in pH was the result of a decrease in pH of the deionized water used as inflow to the columns. Major servicing of the laboratory deionizing equipment caused the decreased pH of the deionized water in week 20.

The kinetic tests were resumed after a seven-week hiatus during which time the deionizing system was adjusted. The samples remained undisturbed during this period and were exposed to natural airflow that would have allowed oxidation to continue until the weekly cycles were resumed. Results for the last two weeks indicate that oxidation continued to occur at rates similar to those of the first 20 weeks.

3.6.2 Electrical Conductivity

Figure A.3.9 illustrates leachate conductivity versus time. Initially high conductivity was indicated for test LGSSP-2. This material was collected from the surface of the low grade sulfide stockpile and initial high leachate conductivity may result from leaching of secondary oxidation products. All the samples exhibit trends of decreasing leachate conductivity. By week 20, the conductivity of all test leachates was less than 100 μS/cm, suggesting limited oxidation or leaching of metals and sulfate. When the tests were resumed at week 27, samples LGSSP-2 (surface waste) and C10-190-199-2 (fresh sulfide material) exhibited increased conductivities indicating oxidation and production of soluble salts during the hiatus.

3.6.3 Acidity and Alkalinity

Acidity production slowly increased after week 9 in all columns (Figure A.3.10), as alkalinity began decreasing (Figure A.3.10). Figure A.3.10 illustrates the low leachate alkalinity of sample PW-2 throughout the 29-week test due to the oxidized nature of the sample.

3.6.4 Sulfate

The time dependent plot for sulfate (Figure A.3.11) shows a rapid decrease in the sulfate concentration over the first 5 to 10 weeks. This is a result of the flushing of readily soluble sulfate salts present in the waste rock prior to testing. After about week 15 the sulfate concentrations reach a pseudo steady state. As was reflected in the conductivity, leachates from columns containing samples LGSSP-2, and C10-190-199-2 show an increase in sulfate as the result of accumulation of oxidation products during the seven week hiatus during which the columns were not operating. The other columns showed no significant increase, suggesting a slower rate of sulfate production and release.

3.6.5 Metals

After initial flushing of secondary oxidation salts, most metals were produced at a low rate throughout the test period, most below detection limits (Figures A.3.12 and A.3.13).

3.6.6 Assessment of Oxidation and NP Depletion Rates

Sulfate release rates and alkalinity release rates were calculated for each column test to assess the relative oxidation and acid neutralization dynamics. For these calculations it was assumed that 30% of the waste rock in the test columns is contacted by infiltrating waters and that all the sulfide and NP are available for reaction. Average concentrations for weeks 16 to 20, inclusive, were used to calculate rates of depletion of sulfide and NP. The results are summarized in Table A.3.4.

Based on the estimated time to deplete the NP, it will take on the order of several hundred years for the columns to become acid generating under the accelerated laboratory conditions. Field conditions and the designated mitigation measures are anticipated to further prolong NP depletion. The results also suggest that the neutralizing potential originates predominantly from calcium and magnesium based carbonate minerals, with the possible exception of sample PW-2.

Also shown in Table A.3.4 are the specific sulfur release rates. The first rate is based on the specific release rate per unit mass of rock sample while the second rate has been normalized to the sulfide sulfur content of the sample. The release rates are in similar order of magnitude, indicating that all the samples are oxidizing at a slow rate. The most reactive sample appears to be LGSSP-2.

This could be explained by the higher pyrite content of total sulfides and finer grain size in this sample. Sulfate levels are negligible (0.01% out of 0.61% total sulfur) so the effects of secondary sulfates can be ruled out, although the presence of some sulfate indicates that at least a surface alteration has occurred on exposed pyrite.

4 HYDROGEOCHEMISTRY

The following section presents a brief discussion of local surface water and groundwater quality. Hydrogeological data are presented in detail in *Copper Flat Mine Hydrogeological Studies (SRK, 1995)* and *Copper Flat Project Hydrogeolgy Impact Evaluation (ABC, 1996)*.

4.1 Surface water

There are three main water courses in the vicinity of the proposed mine; these are Percha Creek, Las Animas Creek and Greyback Arroyo. Percha Creek lies to the south of the mine and Las Animas to the north. Both of these creeks drain to the Caballo reservoir to the east of the mine. The Greyback Arroyo is currently diverted around the existing pit.

The surface water quality in Las Animas and Percha Creeks and the reservoir is broadly similar. They all contain low dissolved solids (300-440 mg/l) and pH is slightly alkaline (7.2-7.9). The chemistry is dominated by calcium-bicarbonate ions. Sulfate is low (mean of 65 mg/l) and dissolved metal concentrations are below detection limit. The Greyback Arroyo contains somewhat higher calcium concentration (450-510 mg/l, compared to around 60 mg/l in the other surface waters) and sulfate (1410-1740 mg/l). Alkalinity is also elevated (up to 508 mg/l $CaCO_3$ equivalent). Trace element concentrations are close to or less than detection limit. The Greyback Arroyo cuts through the copper porphyry deposit, and therefore may be expected to contain higher sulfate concentrations than the other streams in the region. Greyback is an ephemeral stream, and dissolved constituents will be concentrated by evaporation.

4.2 Pit Lake

The pit lake chemistry is dominated by calcium-sulfate ions; sulfate reaches concentrations of up to 3600 mg/l. The pH is generally slightly alkaline (pH 7-8.5) although pH values of less than 7 (with a minimum of 4.4) were recorded during 1992-93. Most dissolved trace element concentrations are low; however fluoride and manganese are both elevated (with concentrations up to 11 mg/l and 4.9 mg/l respectively). No evidence of stratification was observed on the four occasions that depth samples were collected (SRK, 1997).

The high TDS in the pit lake is probably due to the evaporation accumulation of sulfide oxidation products and dissolution of secondary minerals. Evaporative concentration has increased the dissolved salt load to the point where gypsum (hydrated calcium sulfate) is at saturation.

The lower pH levels reported for a part of the lake (pH 6-6.5) are influenced by the local presence of an acid seep originating from the NW side of the pit wall in the Sternberg lode. The few recorded low pH values may also be related to dissolution of acid volatile salts (such as jarosite) during pit lake level fluctuations.

The climate and nature of the pit lake are such that the pit will act as an evaporative sump, so there will be no groundwater flow out from the lake (ABC, 1996). Surface runoff from the waste rock dumps will be directed to flow into the pit lake, where it will be contained.

4.3 Groundwater

The groundwater at the Copper Flat site is dominated by the bicarbonate ion, providing a high buffering capacity. The pH ranges from 7.5 to 8.15, indicating slightly alkaline water. Sulfate concentrations tend to be low to moderate (80-400 mg/l) and dissolved metal concentrations are also low. Iron and manganese were relatively high in one of the samples (GWQ96-23A) collected in April 1997 (6.5 mg/l iron, 1.425 mg/l manganese). However more recent sampling results (August 1997) indicate very low iron and manganese (<1 mg/l of both elements).

4.4 Seepage

During the August 1997 sampling event, a seep was observed at the east toe of the west waste rock dump. A sample was collected and the results of analysis are tabulated in Table A.4.1. Although the seepage contains very high dissolved metals and low pH it is important to note that the flow was very low (much less than a gallon/minute (measured during sampling at ~0.2 gpm)) and the seepage will therefore be rapidly diluted and buffered by groundwater and/or surface water.

The upper part of the seepage channel was coated by chalcanthite ($CuSO_47H_2O$), langite ($Cu_4SO_4(OH)_6{}^2U_2O$), woodwardite ($Cu_4Al_2SO_4(OH)_{12}$ 2-4H_2O(?)), goethite, cuprocopiapite (($CuFe^{2+)}$ $Fe^{3+}{}_4(SO_4)6(OH)_2$ 2OH_2O) and amorphous Na-Ca-Mg-Cu-Zn--Fe-Mn salts. This indicates active buffering and evaporation, thus limiting metal and acid dispersion.

5 ACID ROCK DRAINAGE CHARACTERISTICS OF THE EXISTING WASTE PILES

5.1 ARD Characteristics of Different Lithologies

From whole rock analysis of waste rock samples (Table A.3.1), the primary constituents are Al, Ca, Fe, Mg and K. Trace metals of significance (> 10 ppm) are Ba, Cu, Co, Mn, Mo and Zn. Several million tons of waste rock are currently piled around the pit and along the southeast slope of Animas Peak. SRK has previously classified the waste rock in the area as oxidized, transitional and unoxidized (SRK, 1995). The basis for classification is the proportion of pyrite observed in the material, as well as its field behavior (as indicated by paste pH and conductivity).

The rock piles were initially classified (Draft EIS, 1996) on the proportion of each type of material present with the west pile being primarily transitional waste, the north rock pile being a combination of unoxidized and oxidized waste and the south and eastern rock piles comprising essentially unoxidized sulfide waste.

The ARD potential by lithology and by waste rock dump are discussed in the following sections.

5.1.1 Quartz Monzonite

The quartz monzonite frequently contains abundant pyrite and therefore may be a potential source of acid rock drainage. The paste pH measurements made on this lithology (94 taken in August 1997) ranged from 2.51 to 8.76 (Figure A.3.1). Several measurements were at the higher end of the range, suggesting that in some cases the monzonite may have some buffering capacity. However, the majority of the measurements were between pH 2 and 7, indicating initial acid generation. The net acid generation (NAG) results varied between 8 and 57 kg/T eq. H_2SO_4 (Figure A.3.6). Over 50 % of the tests generated a NAG value of between 20 and 40 kg/T eq. H_2SO_4. This indicates that the rock has potential to generate acid in certain circumstances. Observations indicate a visible pyrite content of between 0 and 8 %, with most samples containing around 3% (Figure A.5.1). This ties in well with the NAG test results.

5.1.2 Quartz Breccia

The quartz breccia is not as abundant as the quartz monzonite, which will form the bulk of the waste rock. Around 30 samples of this lithology were assessed for paste pH and paste EC (electrical conductivity, a measure of total dissolved solids). Nearly all the paste pH measurements were less than 7, and most of these were between pH 3 and 5 (Figure A.3.1). This was probably due to the dissolution of superficial salts. The NAG test results were similar to those of the quartz monzonite, with most measurements falling between 20 and 40 kg/T eq. H_2SO_4. However, more of the results from the quartz breccia were greater than 80 kg/T eq. H_2SO_4 (Figure A.3.6). One sample yielded a NAG potential of 223 kg/T eq. H_2SO_4, but this was exceptional. The visible sulfide in the quartz breccia was mostly between 3 and 4 %. The quartz breccia generally has a higher acid generating potential than the quartz monzonite.

5.1.3 Biotite Breccia

Ten measurements of paste pH were made on rock classified as biotite breccia. The paste pH values ranged from 2.45-7.38 (Figure A.3.1). All but one of these readings were less than pH 7 and the majority were less than pH 5. The biotite breccia generally has a greater proportion of sulfide than the other lithologies, with a quarter of the samples containing more than 6% visible sulfide. This is reflected by the NAG test results, which are up to 80 kg/T eq. H_2SO_4 (Figure A.3.6). However, only six NAG measurements were made on biotite breccia samples so it is inappropriate to make generalizations. This rock is considered an ore material and will be handled as such.

5.1.4 Quartz Vein

Six quartz vein samples were assessed for paste pH and percent visible sulfide. Of these only 3 NAG tests were possible. The paste pH measurements were dominated by acidic values, with ½ of the tests exhibiting a pH less than 3 (Figure A.3.1). Most of the samples contained around 5 % visible sulfide, one sample only contained around 1% (Figure A.5.1). The NAG test results were between 10 and 40 kg/t eq. H_2SO_4; these are slightly lower than may be expected for samples with relatively high sulfide content (Figure A.5.4).

5.1.5 Andesite

Only one andesitic sample was available for testwork. This reflects the relative scarcity of this lithology throughout the waste rock dumps. This sample yielded a very high paste pH value of 9.14, which demonstrates its excellent buffering capacity. This sample was not assessed for net acid generation.

5.2 ARD Characteristics of Different Waste Rock Dumps

Locations of samples collected for paste pH and paste conductivity measurements and NAG values are shown on Drawing 68606-001, and the frequency of acid generator indicators, paste pH, conductivity, NAG value and visible sulfide abundance are provided in Figures A.5.2 - A.5.5, respectively.

5.2.1 North Waste Rock Dump

The north waste rock dump contains a mixture of unoxidized, oxidizing and oxidized waste rock. The paste pH measurements are generally lower than those for the other waste rock dumps due to the presence of transitional material. The range of paste pH values are from 2.5 to 6 (significantly, no values above pH 7 were recorded) and more than 50 % of the values were less than pH 3. This suggests a higher proportion of soluble salts relative to material from the other waste rock dumps.

The NAG test results were not exceptionally high although one sample generated a value of 223 kg/t eq. H_2SO_4. The remainder of the samples were between 9 and 75 kg/t eq. H_2SO_4. The sample which generated the high NAG value (NRD 5620 014) was also noted as containing 20 % visible pyrite, which is unusual for the Copper Flat waste rock. Most waste rock samples from this dump contained on the order of <2% visible pyrite.

From the results to date, the north waste rock dump appears to have the greatest potential to generate acid. This is probably because this dump contains a greater proportion of partially oxidized (transition) rocks than the other dumps.

5.2.2 West Waste Rock Dump

The west waste rock dump has been described as containing mostly partially oxidized, transitional waste rock (SRK 1995) but more detailed investigation in 1997 indicated that much of the rock is relatively fresh and the oxidation is very superficial.

The paste pH measurements ranged from pH 2.3 to 7.8. Generally the rocks on this dump were less reactive than those on the other dumps, with nearly 50 % of samples generating a paste pH greater than 5. The NAG test results ranged from 15 to 75 kg/t eq. H_2SO_4, with over 80 % of samples generating a potential of less than 40 kg/t eq.

H_2SO_4. This relates well to the proportion of visible sulfide in the rocks which was less than 2% in nearly 80% of the samples.

Field observations and all the test results to date indicate that the west waste rock dump has the lowest potential to generate acidity.

5.2.3 South Waste Rock Dump or Lean Ore Stockpile

The south waste rock dump reportedly contains rocks with a higher proportion of sulfide compared with the other waste rock dumps. However, the samples collected during August 1997 do not support this. All the samples evaluated contained less than 7 % visible sulfide (estimated) and the acid base accounting (ABA) revealed no samples with a sulfide content greater than 1.5 %. An earlier sampling round (SRK 1994) produced similar results; the highest measured sulfide content was just over 3%.

The NAG potential is relatively low; 90 % of samples evaluated generated a value of less than 40 kg/t eq. H_2SO_4, and the highest potential measured was only 43 kg/t eq. H_2SO_4. This confirms the low sulfide content of the samples analyzed.

The paste pH results ranged from pH 2.5 to 8.8; over a fifth of the samples generated an alkaline paste pH which may indicate some buffering capacity. Most (75%) of the samples showed very low reactivity, generating paste conductivity values of less than 500 μS/cm.

The evidence presented here suggests that the south waste rock dump has an overall low acid generating potential.

5.2.4 East Waste Rock Dump

The samples collected from the east waste rock dump contain on average around 2 % visible sulfide. Sulfide analysis resulted in a similar figure (although fewer samples were evaluated). Ore samples contained up to 10 % sulfides.

The NAG potential of the samples analyzed was relatively small; 80% were less than 30 kg/t eq. H_2SO_4. This reflects the sulfide content of the rocks.

The paste pH range was from 2.71 to 9.14. Most (65%) of the samples generated a pH less than 6. This suggests that there are soluble salts available for dissolution. The average sulfate to total sulfur ratio is around 35%, which indicates a relatively low degree of oxidation.

The east waste rock dump, in common with the south waste rock dump, is likely to have a relatively low potential for acid generation.

6 DISCUSSION

6.1 Soluble Contaminants

Results of the EPA 1312 test indicate that the soluble metal concentrations in transition waste rock are relatively high; however, the sample represents only a limited volume of future waste rock. Leachates from kinetic tests conducted on unoxidized quartz monzonite samples exhibit very low soluble metal and salt concentrations. These leachates are considered more representative of potential unoxidized waste rock drainage quality in the foreseeable future.

Soluble metal concentrations in the tailings can also be used to infer behavior of the waste rock because the tailings are composed of similar material that has been crushed, increasing the surface area that is available to oxidation. Therefore, the soluble concentrations in the tailings exposed to weathering for over 14 years may provide a “worst-case” indication of the soluble load in the waste rock. As can be seen in Table B1.2 in Appendix B, the extractable metal concentrations in the tailings, as determined by modified method 1312 testing, are low.

6.2 Acid Generation

The degree to which material has oxidized, or its “weathering status”, can provide some indication of how the rock must be managed to alleviate ARD potential. The weathering status was identified visually by geologists according to the following classification (Table A.6.1):

- Oxide: No visible sulfides, loss of texture, strong oxide staining;
- Transitional: Visible sulfides, loss of texture, strong oxide staining;
- Low Sulfide: Few visible sulfides, fresh appearance, minor to no oxide staining; and,
- High sulfide: Abundant visible sulfides, fresh appearance, minor to no oxide staining.

Figure A.6.1 plots NP against AP according to weathering status of the material. The figure shows that oxidized material has low potential to generate acid since these samples have AP concentrations below 11, equivalent to a percent sulfide concentration of less than 0.4%.

This is also illustrated in Figure A.6.2. This figure plots the percent sulfur present as sulfide against percent sulfur as sulfate. The diagonal line in the figure is where concentrations of the two sulfur forms are equal. Samples having higher sulfate sulfur than sulfide sulfur are all oxide and transitional material. Samples plotting below the line are low and high sulfide material. This figure, along with Figure A.6.1, suggests that oxidized material will not pose an ARD problem. However, this material may contain soluble metals that could be leached from the rock in the short term.

For the transitional, low and high sulfide materials, there is evidence to suggest that some of the sulfides are less reactive than others. One piece of evidence is the waste rock piles themselves. During the 14 years of exposure, much of the sulfide has been oxidized to metal oxides that are stored in the rock. However, the waste still contains unoxidized sulfides, suggesting that there is some variability in the weathering rates of the sulfides. This is also illustrated in Figure A.3.1 by the wide range of paste pH values for every rock type, except andesite. The biotite breccia, quartz breccia, quartz monzonite, and quartz vein material all have paste pH values ranging from 2 to 9. If all the sulfides are uniformly distributed and had similar reactivity, the range of paste pH values would not be expected to be so broad.

Figure A.6.3 is a plot of NAG pH vs. total sulfur. NAG pH values range from 2 to 8 and have no relation to total sulfur concentrations. For example, samples with total sulfur contents of about 2.9% have NAG pH values either below 3 or greater than 6. This suggests variability in the reactivity of the sulfides contained in the samples.

Finally, of the waste rock humidity cells only LGSSP-2 became acidic during the 27 weeks of testing, despite containing very different materials. Since there is little neutralizing capacity in many of the kinetic test samples, the neutral drainage indicates low rates of sulfide oxidation in the cells. Thus, even under the relatively wet conditions of the humidity columns, the sulfides are slow to oxidize.

6.3 Field Identification of Waste

Results of the geochemical testing program indicate that field methods can be used to identify the different types of waste. The visual classification of oxide, transitional, low sulfide and high sulfide material correlated well to sulfate/total sulfur ratios, as shown in Figure A.6.4. Oxide samples have ratios above 75% and transitional material has ratios between 40% and 75%. Low and high sulfide values fall below 40% SO_4/S(T).

The figure also shows that low and high sulfide can be distinguished by sulfide concentrations. Three of the four low sulfide samples had sulfide concentrations below 0.6%. This means that during operations, low sulfide can be separated from high sulfide material based on visual estimation of sulfide concentration.

While the waste rock can be easily classified on the basis of visual inspection, periodic testing of sulfur content is recommended as a means of confirming the effectiveness of visual classification methods. Confirmation testing is recommended to evaluate the distinction between oxide and transition waste, and between low sulfide and unoxidized waste. Total sulfur analyses by Leco furnace are routinely used in waste management programs at many mine sites. Equating total sulfur content with sulfide sulfur content provides a rapid and highly conservative estimate of acid generating potential.

7 CONCLUSIONS

The primary conclusions of this work are:

- While a significant to moderate potential for acid generation is exhibited by the Copper Flat lithologies, the rate of sulfide oxidation is slow. Sulfide oxidation and acid generation has been and is active at the Copper Flat mine site. However, no environmental impact on surface streams or groundwater has been observed during this or any previous studies. Seasonal acidic and metal-sulfate rich seeps do form but tend to evaporate at the toe of the dumps.

- Available buffering through mineral-water reactions and from groundwater recharge is sufficient to neutralize generated acidity for much of the year. Acid seeps could develop during operations, after periods of heavy rainfall. However, these seeps will drain towards the pit area as either surface or sub-surface flow.

- Metal release from the lithologies is low and all kinetic leachates conformed to all applicable surface water and most groundwater standards.

- Sulfide oxidation is slow from the Copper Flat lithologies as evidenced by the abundance of sulfide minerals on the waste rock dump surfaces despite exposure since 1982.

Environmental concerns regarding waste rock at any mine site are generally two fold: leaching of soluble metals stored in the waste and generation of acidic drainage. At Copper Flat, leachable metals from the waste rock and tailings do not appear to be a concern, with the exception of the transition waste.

The results of the geochemical testing programs indicate that most of the waste rock at the site has the potential to generate acid, given sufficient time and exposure to oxidizing conditions. However, evidence from paste pH tests, NAG tests, and humidity columns suggest that the sulfides are not highly reactive. This is supported by the fact that much of the material on the waste rock dumps is neutral despite having been on the surface since 1982. This may be due to the coarse, crystalline nature of the sulfides at Copper Flat as well as arid site conditions. Crystalline minerals have a lower surface area and a more organized structure so consequently require more energy to oxidize. As a result they tend to be more stable than fine-grained semi-crystalline or subhedral minerals.

The rates of reactivity of the sulfides will need to be confirmed by humidity column tests on new waste rock generated from the pit. In the interim, waste can be managed using a conservative plan that includes visual classification and confirmatory measurement of the total sulfur content of the waste rock prior to its removal from the pit, with waste handling measures that address the short and long term management requirements. Once oxidation rates are obtained from the operational field test program then the humidity column test results reported here can be calibrated to a parameter that can be measured in the field, such as total sulfur, so as to refine the operational waste management plan

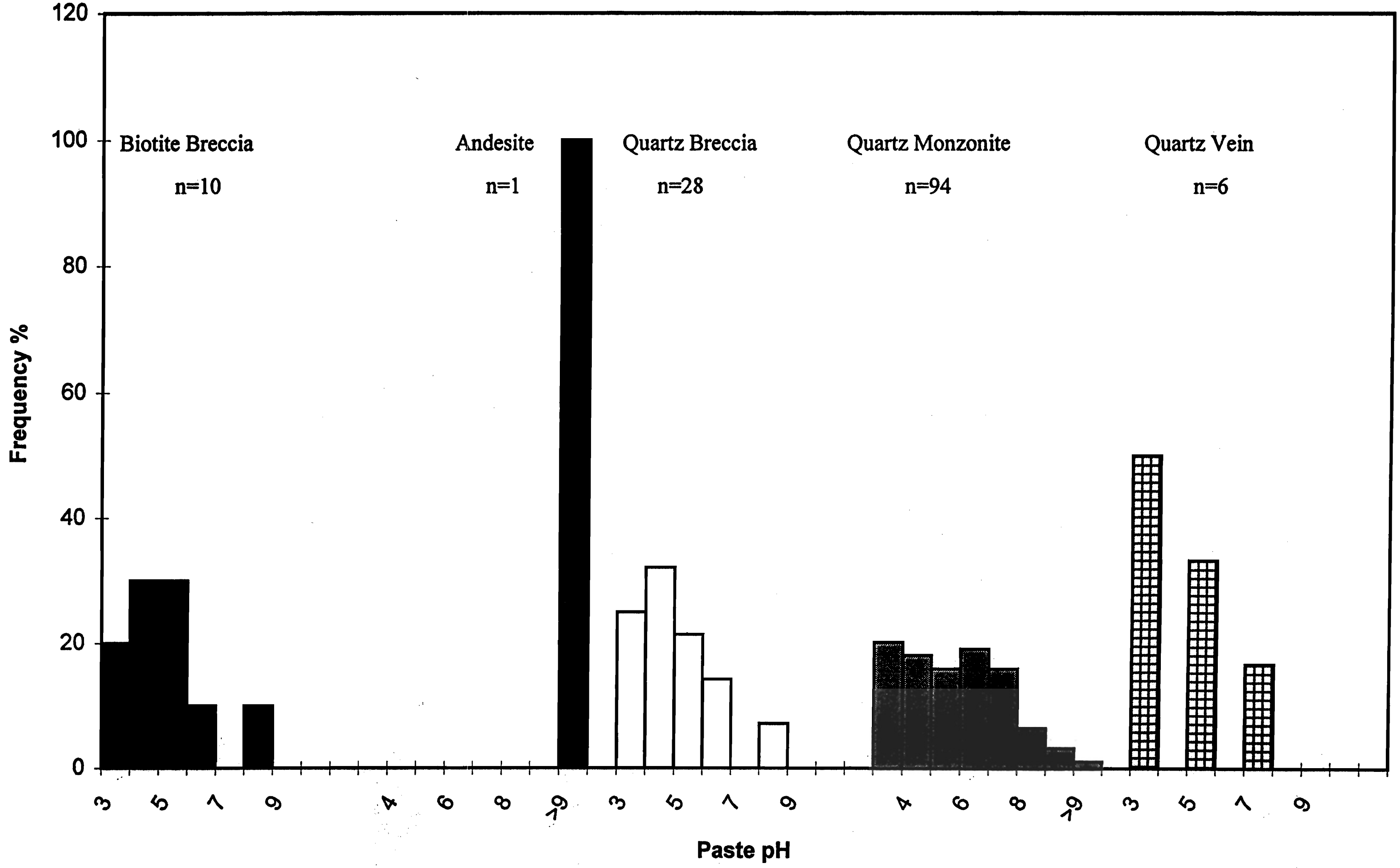


Figure A.3.1. Paste pH Frequency Distribution by Lithology

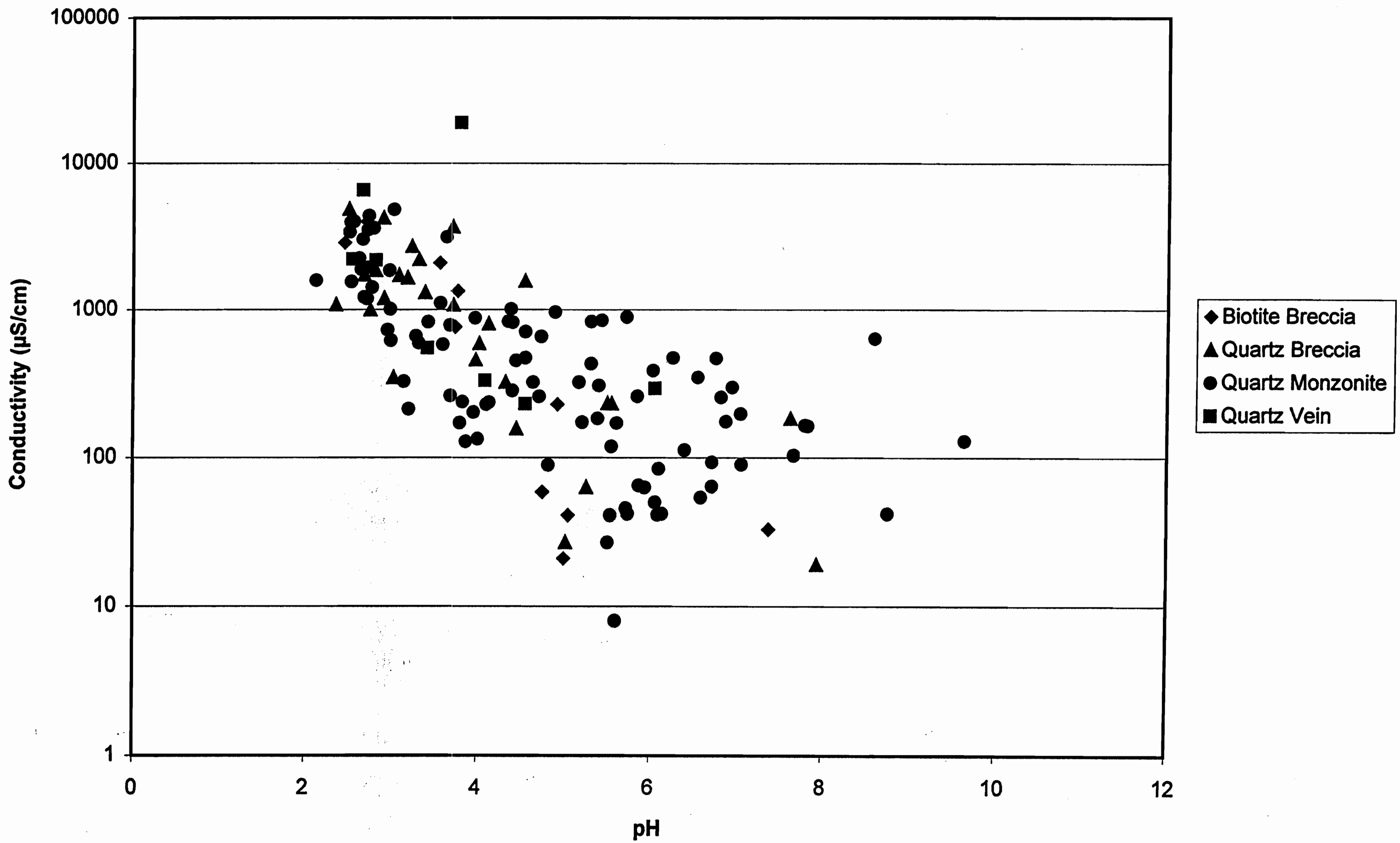


Figure A.3.2 - Paste pH vs. Conductivity

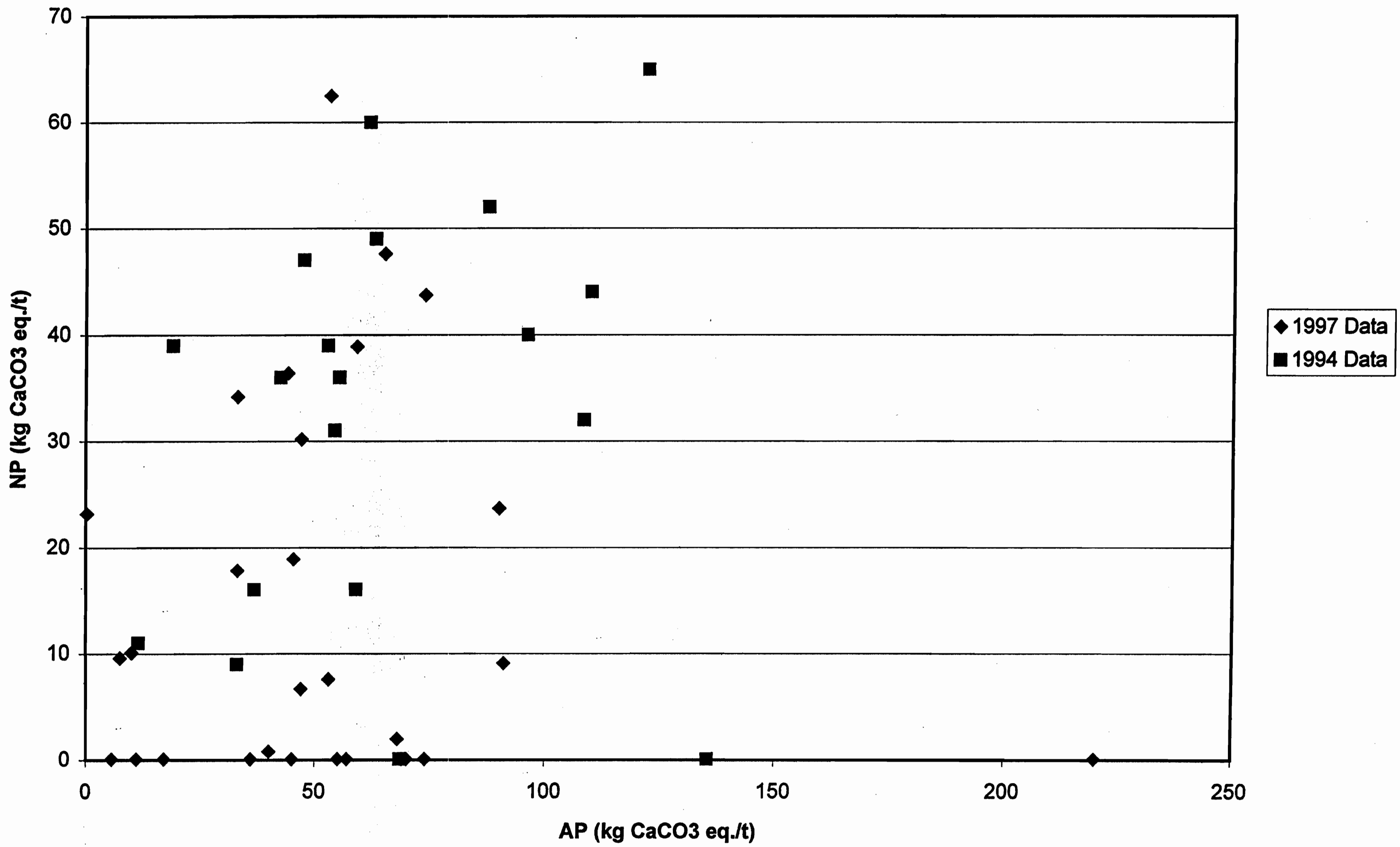


Figure A.3.3 - NP vs. AP for 1994 and 1997 data

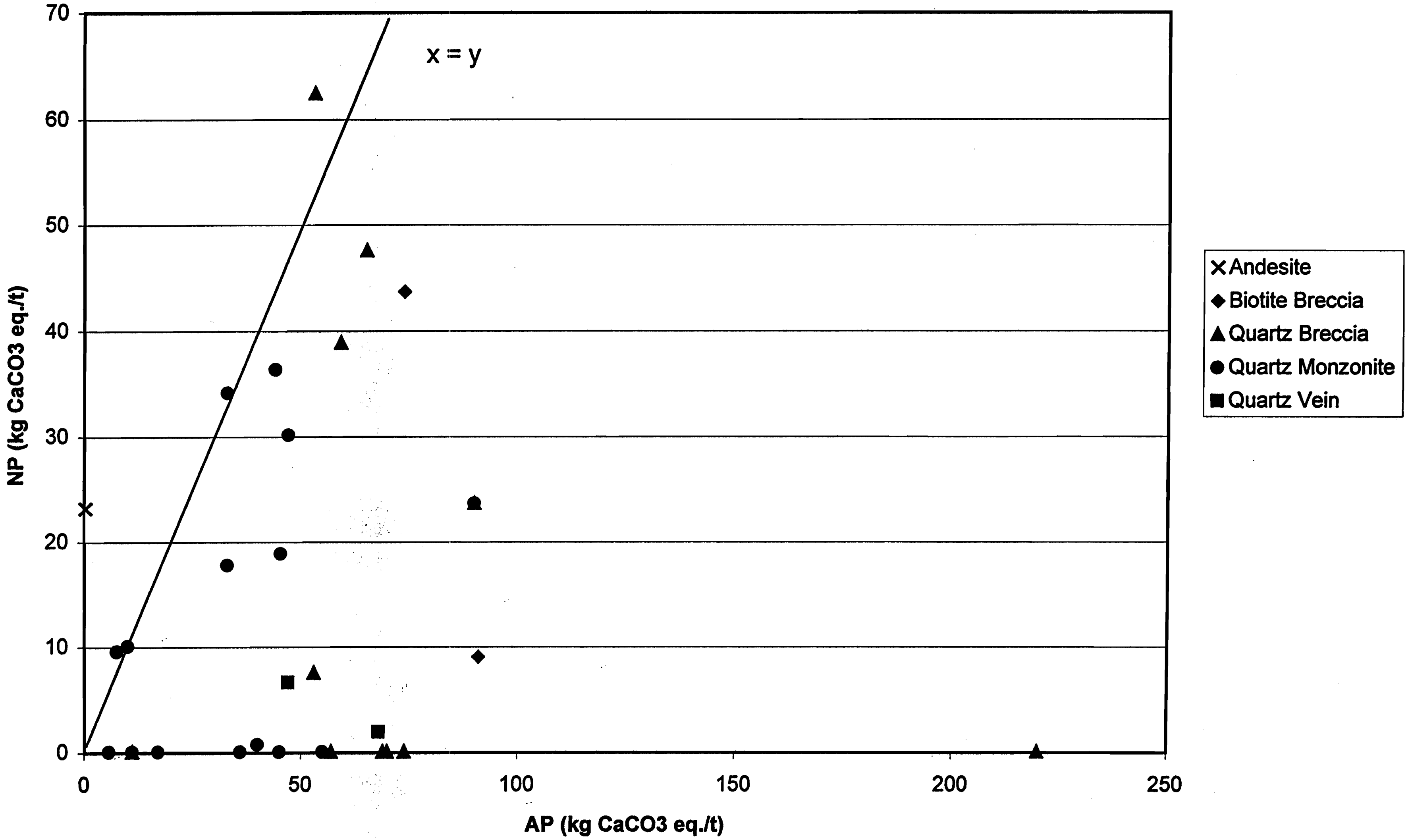


Figure A.3.4 - NP vs. AP

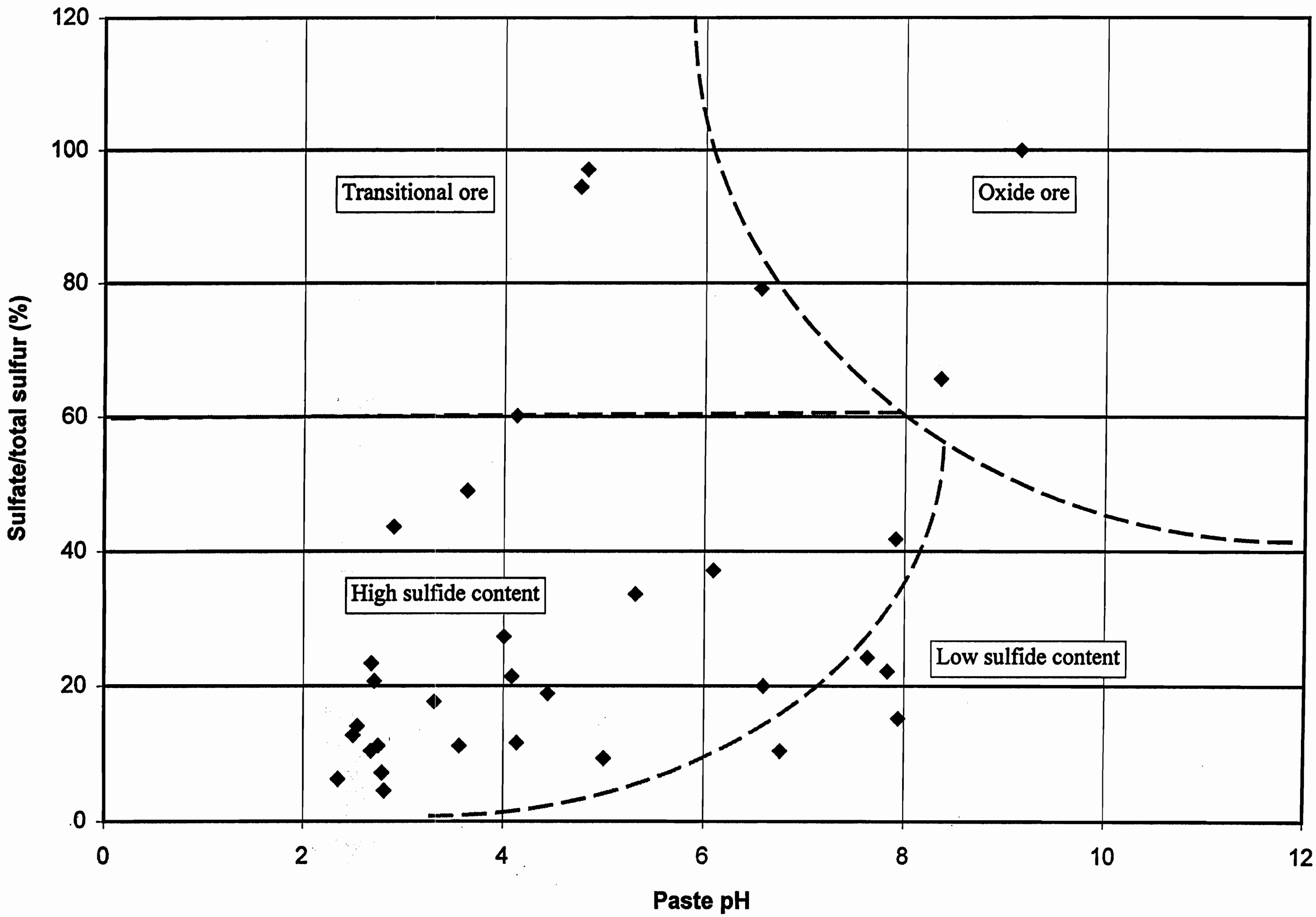


Figure A.3.5 - Total Sufate/Total Sulfur (%) vs. paste pH (SU)

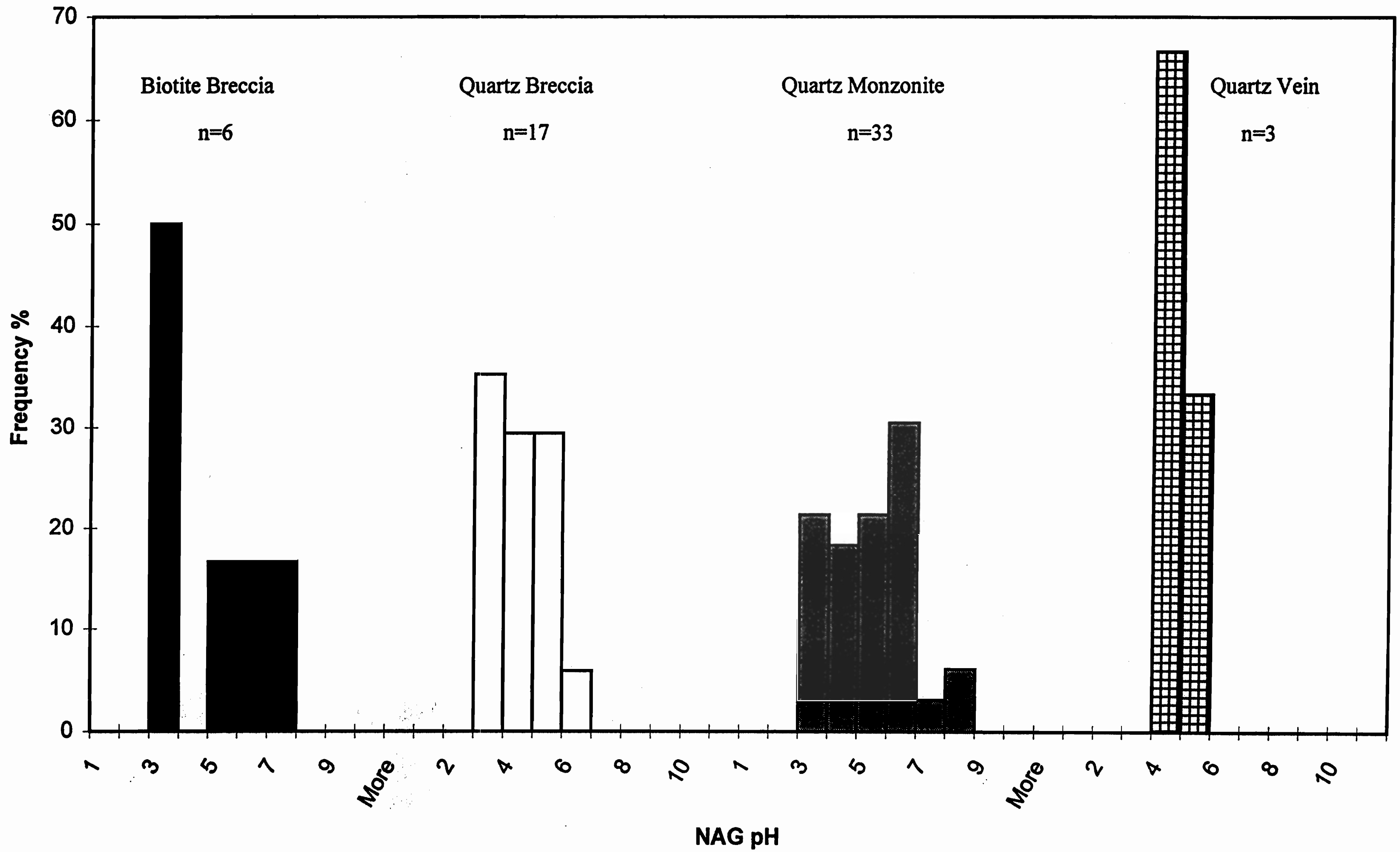


Figure A.3.6 - NAG pH Frequency Distribution by Lithology*

* No samples of andesite were analysed by NAG testing

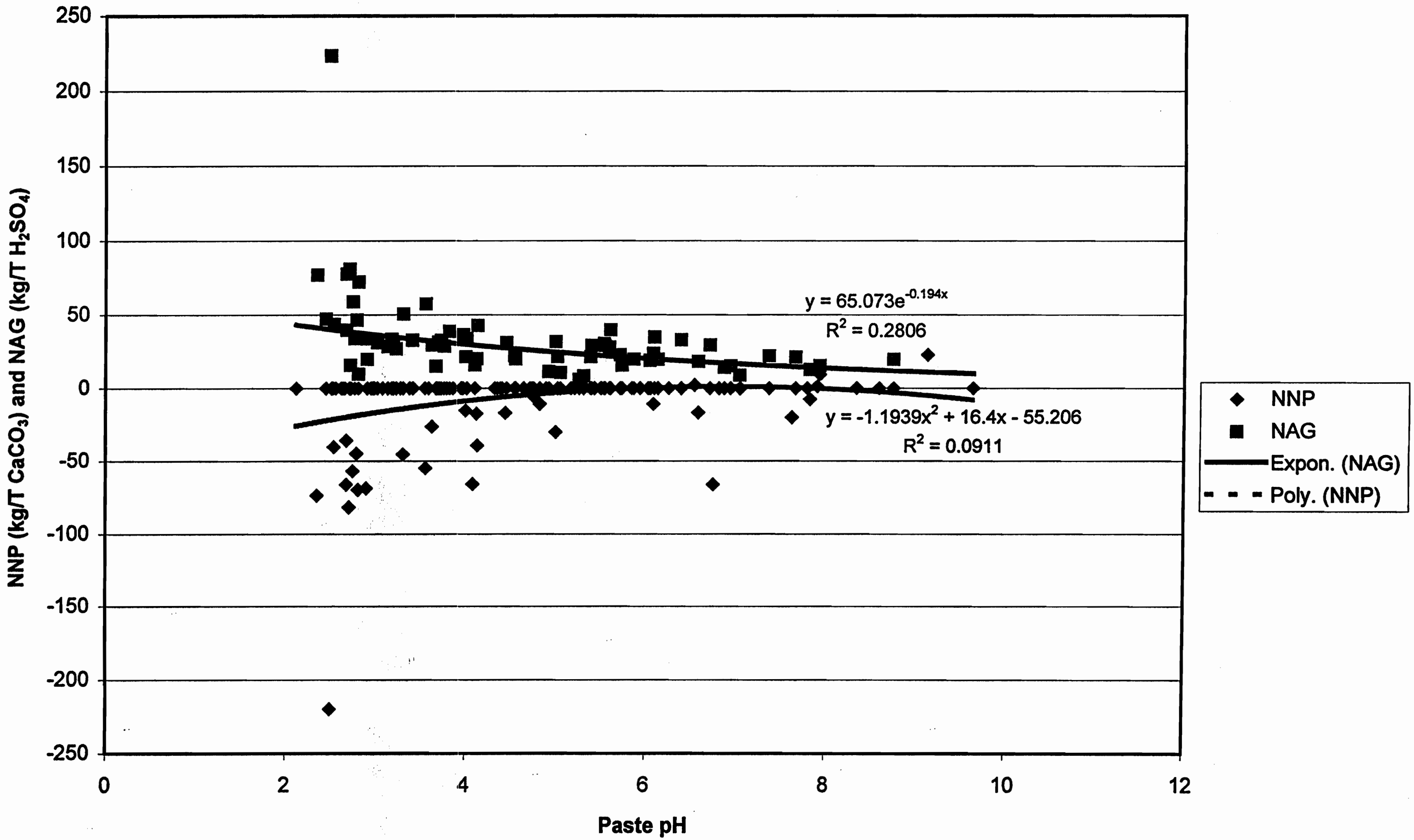


Figure A.3.7 - Paste pH vs. NNP, NAG

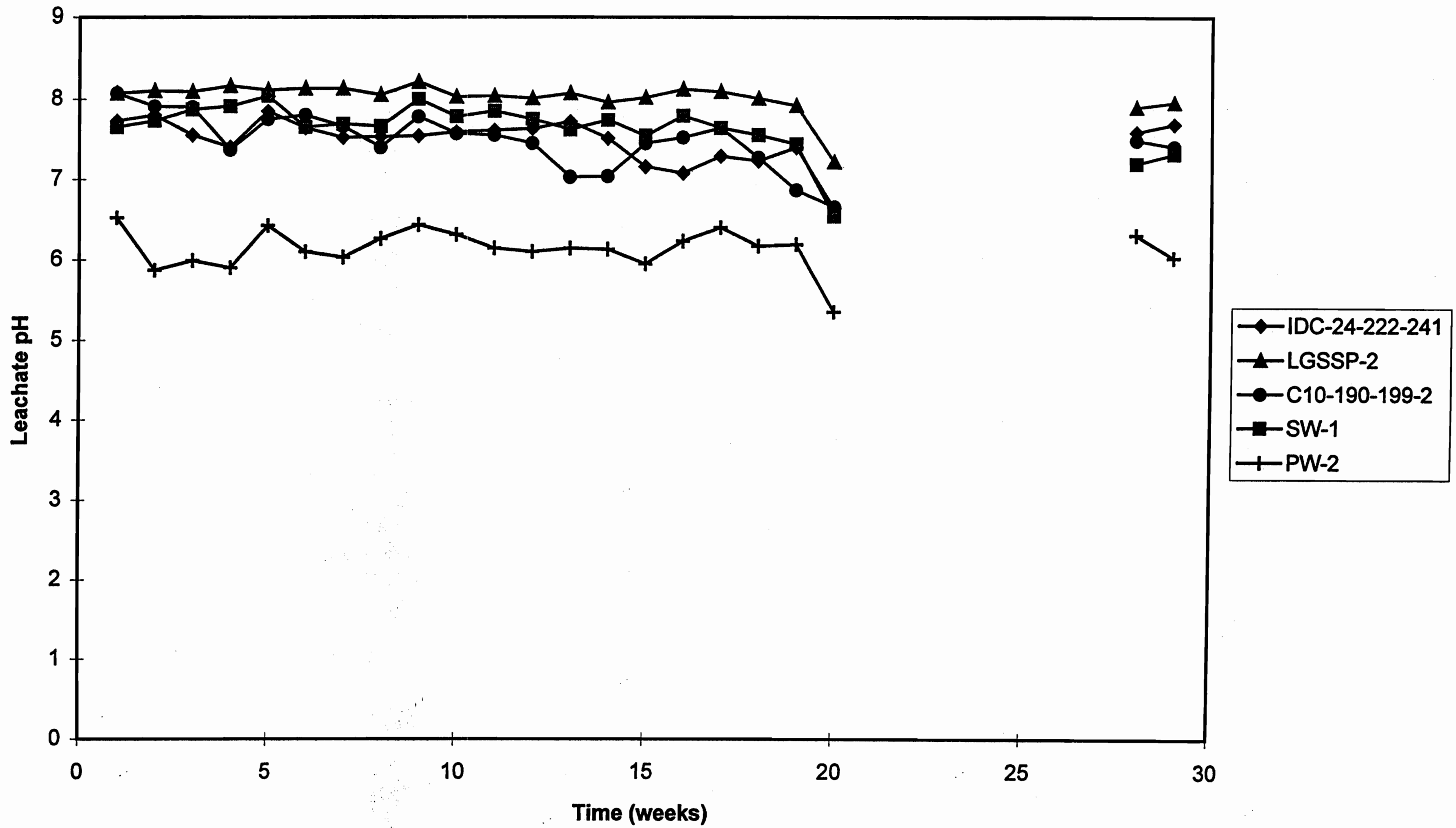


Figure A.3.8 - Kinetic Test Results for pH vs Time

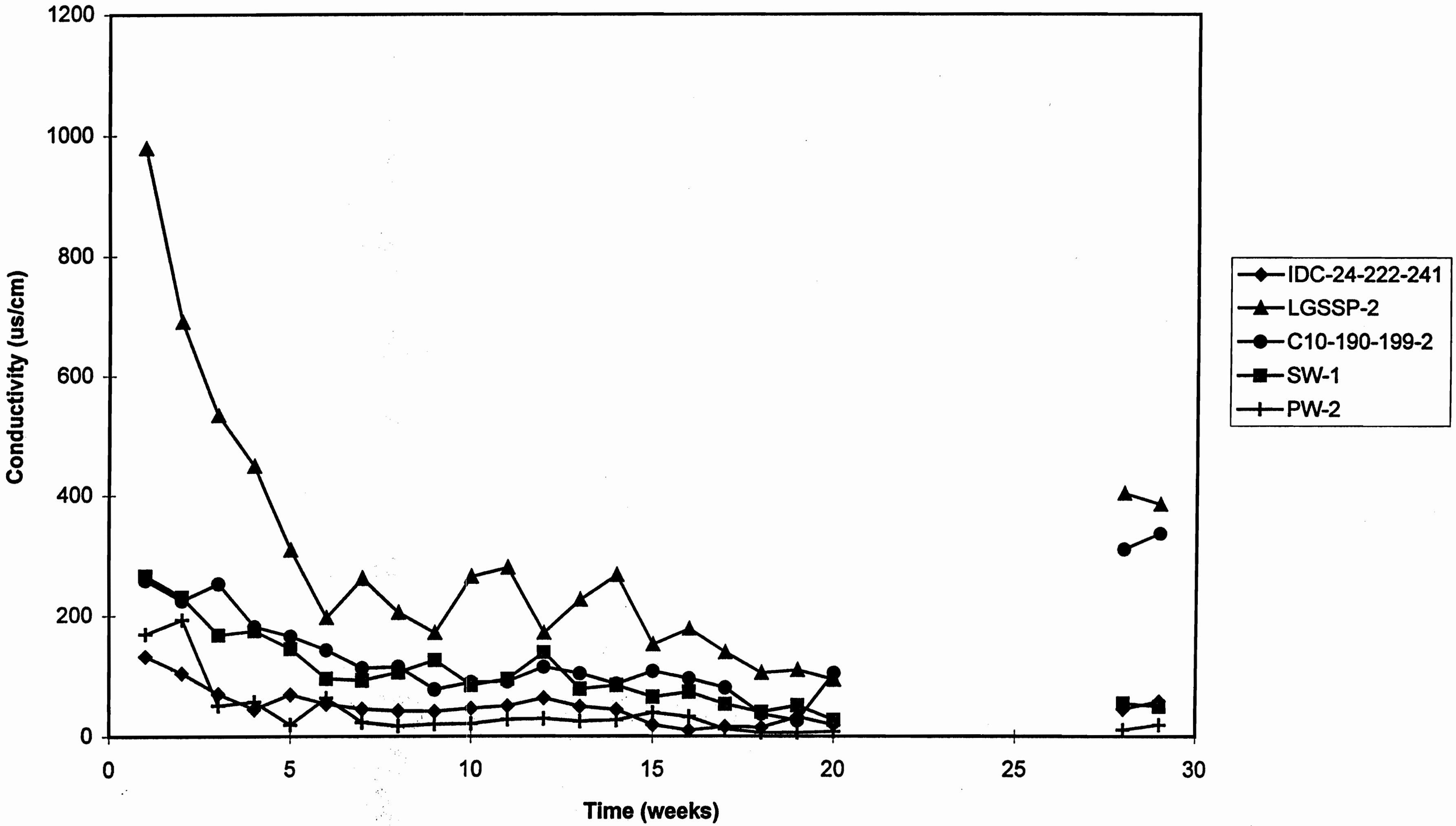
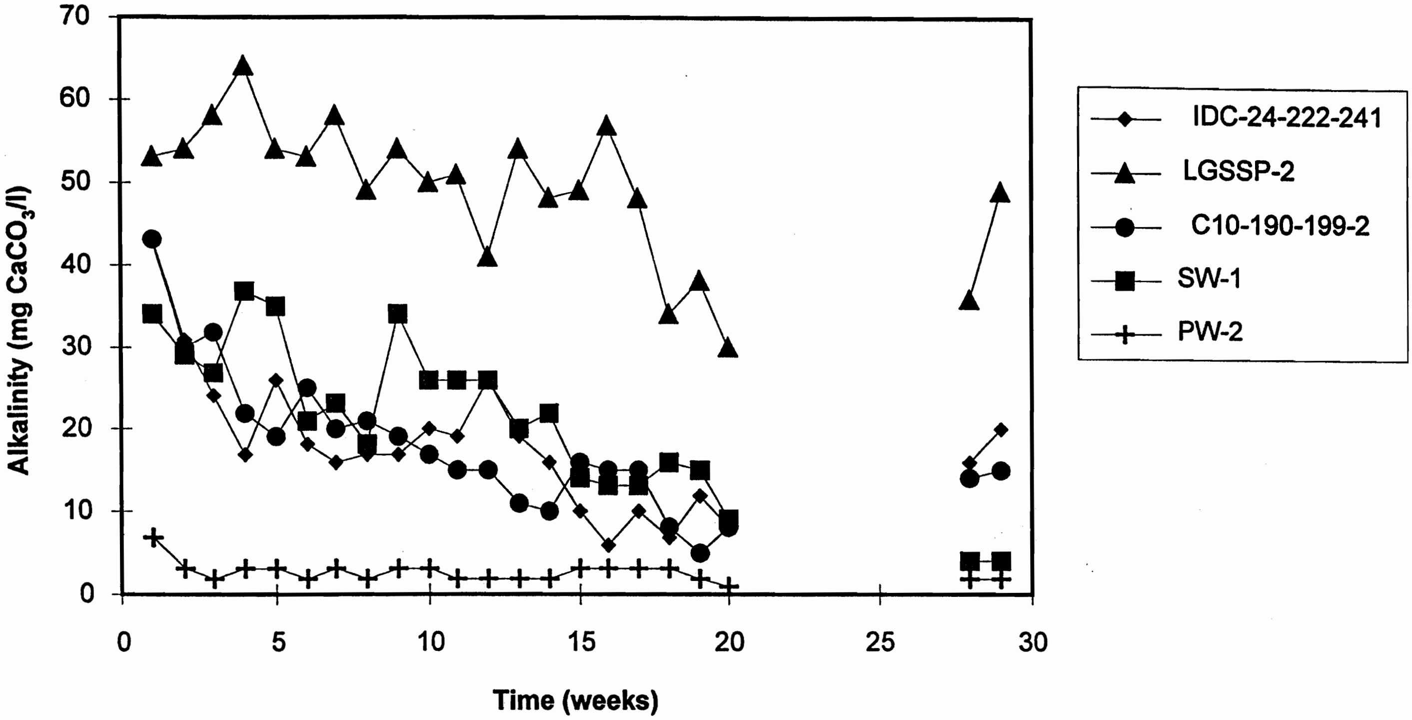


Figure A.3.9 - Kinetic Test Results for Electrical Conductivity vs Time



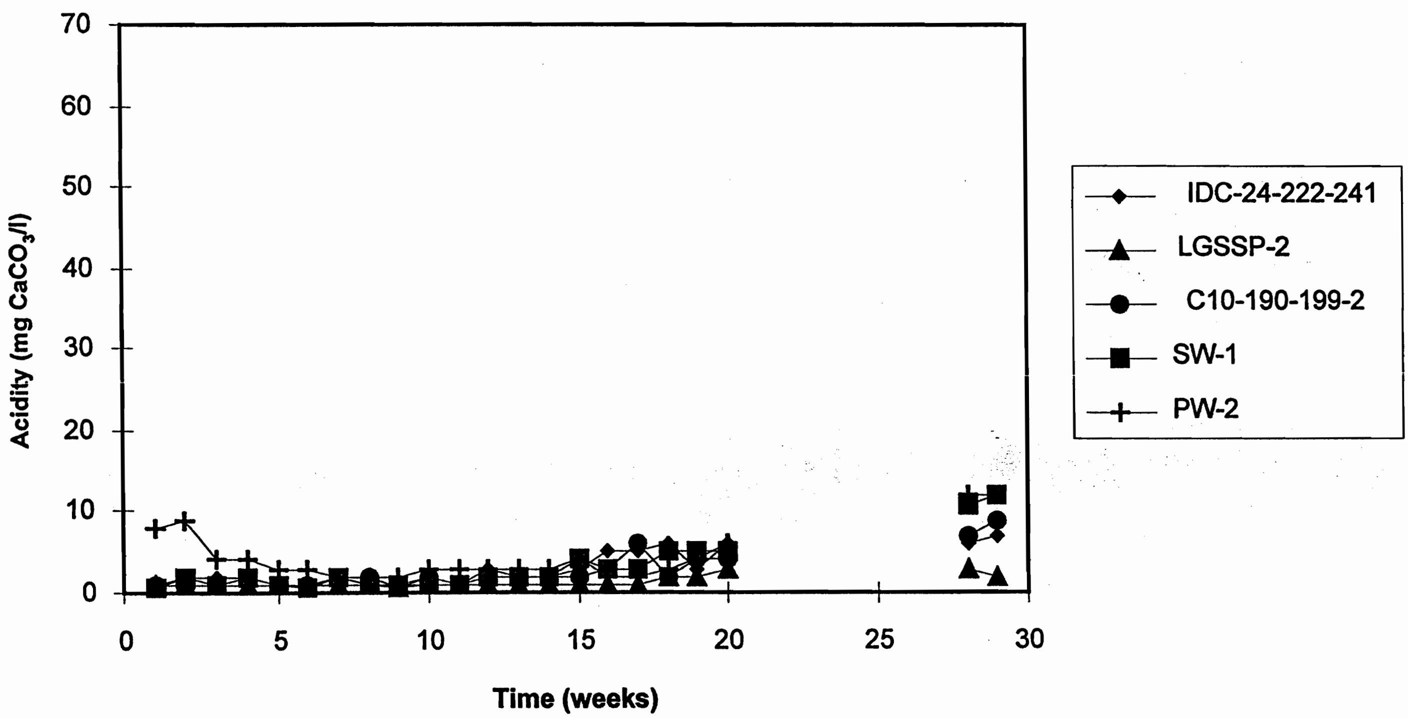


Figure A.3.10 - Kinetic Test Results Alkalinity and Acidity vs Time

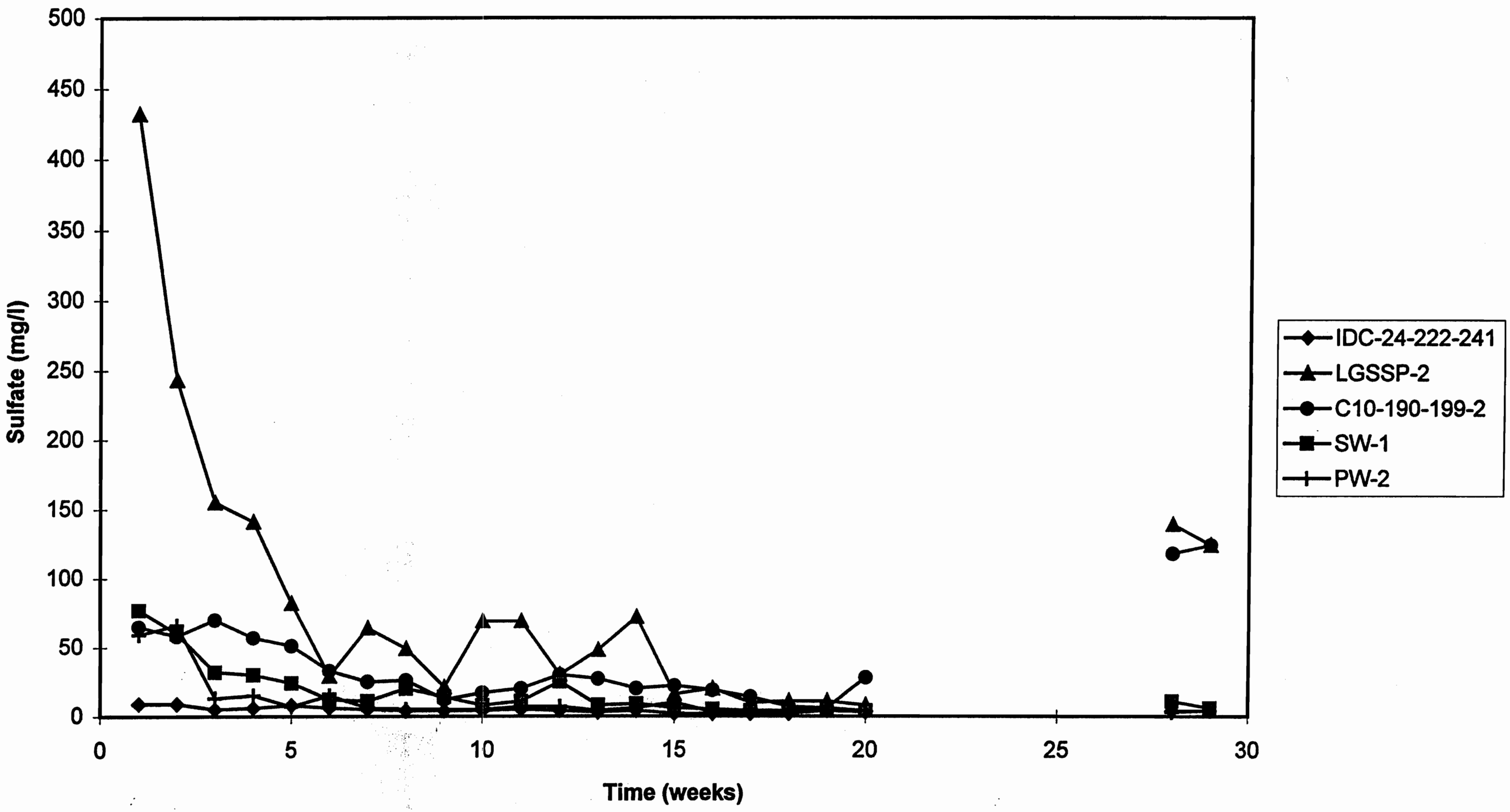


Figure A.3.11 - Kinetic Test Results for Sulfate vs Time

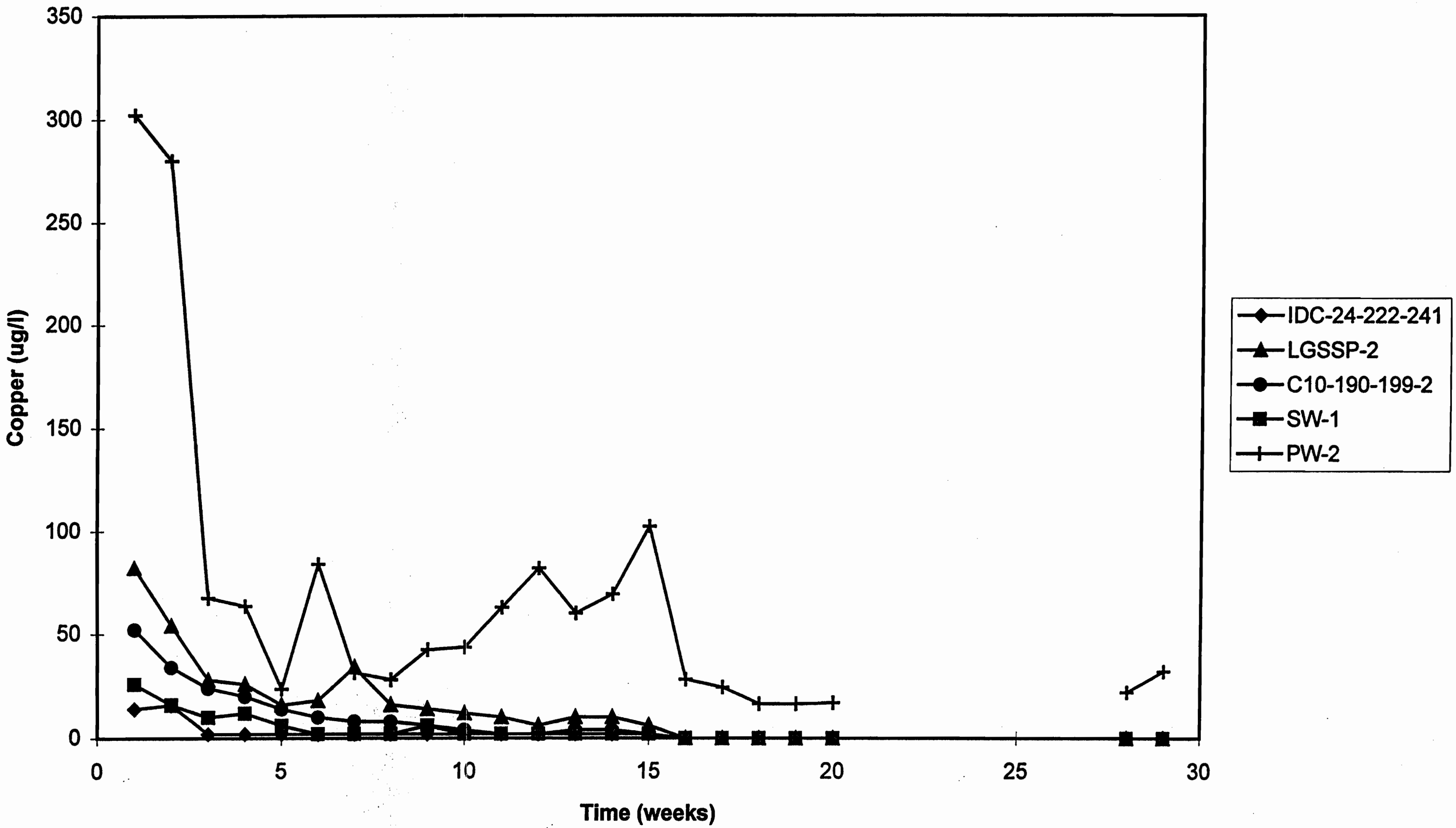


Figure A.3.12 - Kinetic Test Results Copper vs Time

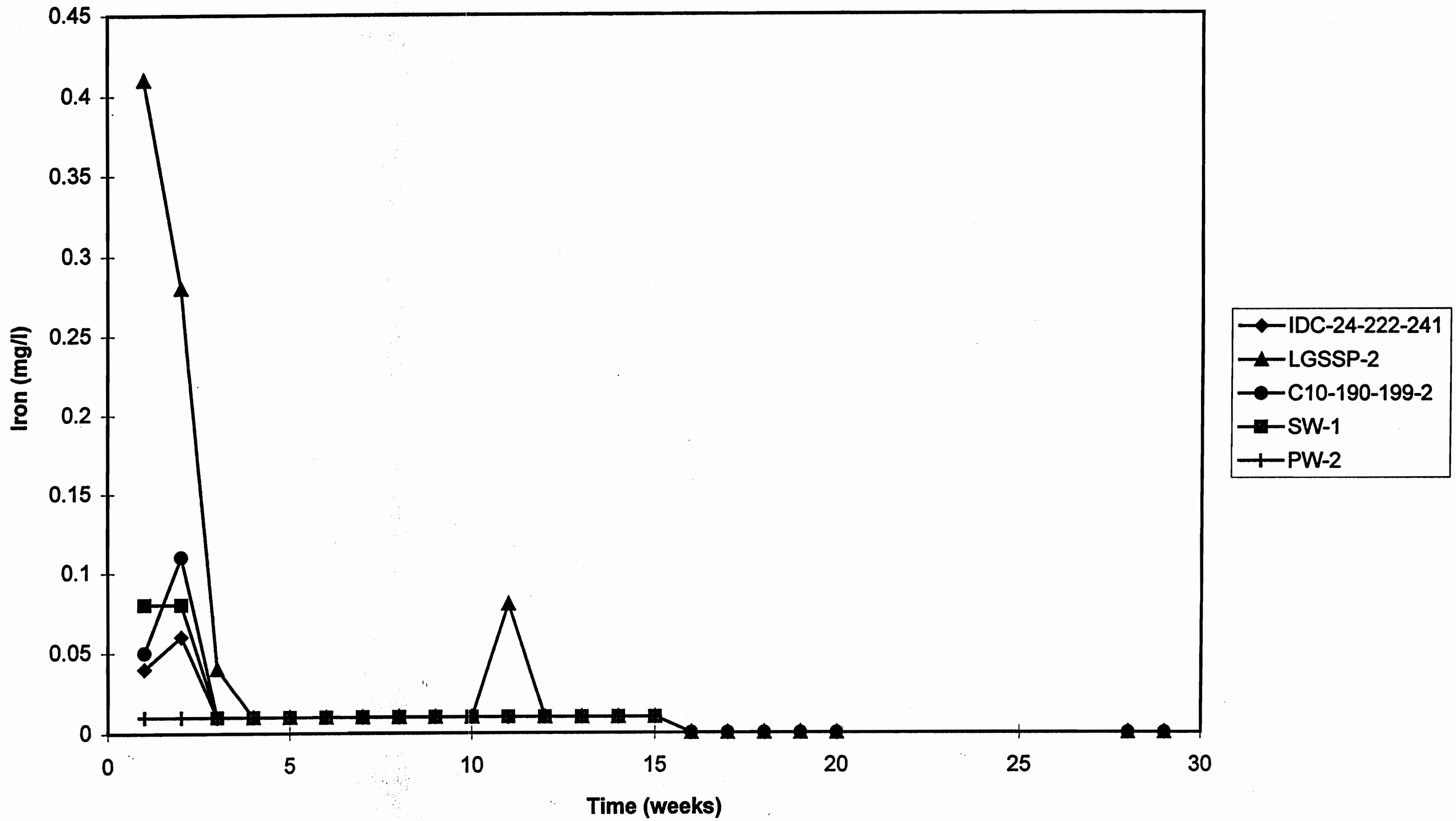


Figure A.3.13 - Kinetic Test Results for Iron vs Time

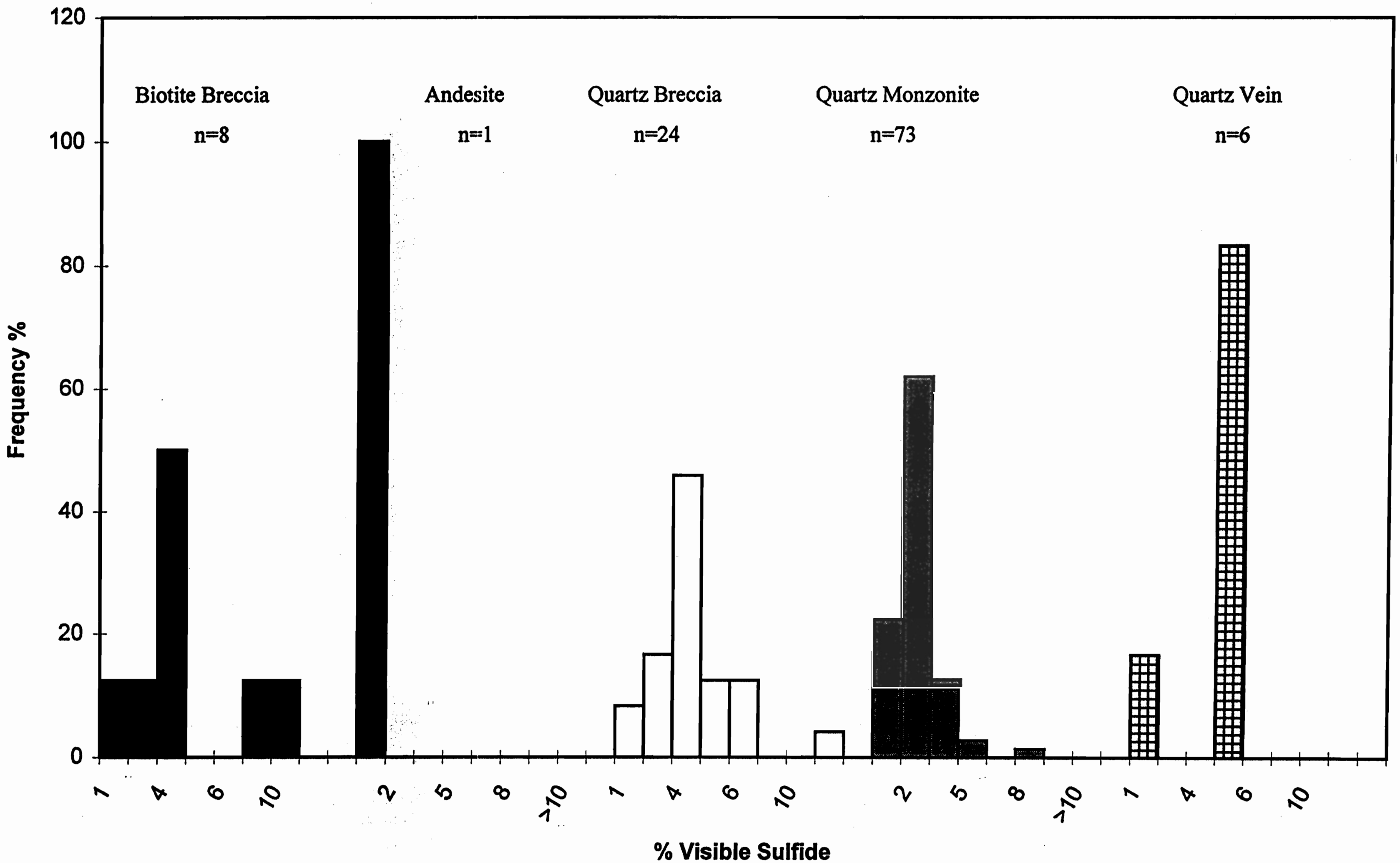


Figure A.5.1 - Percent Visible Sulfide Frequency Distribution by Lithology

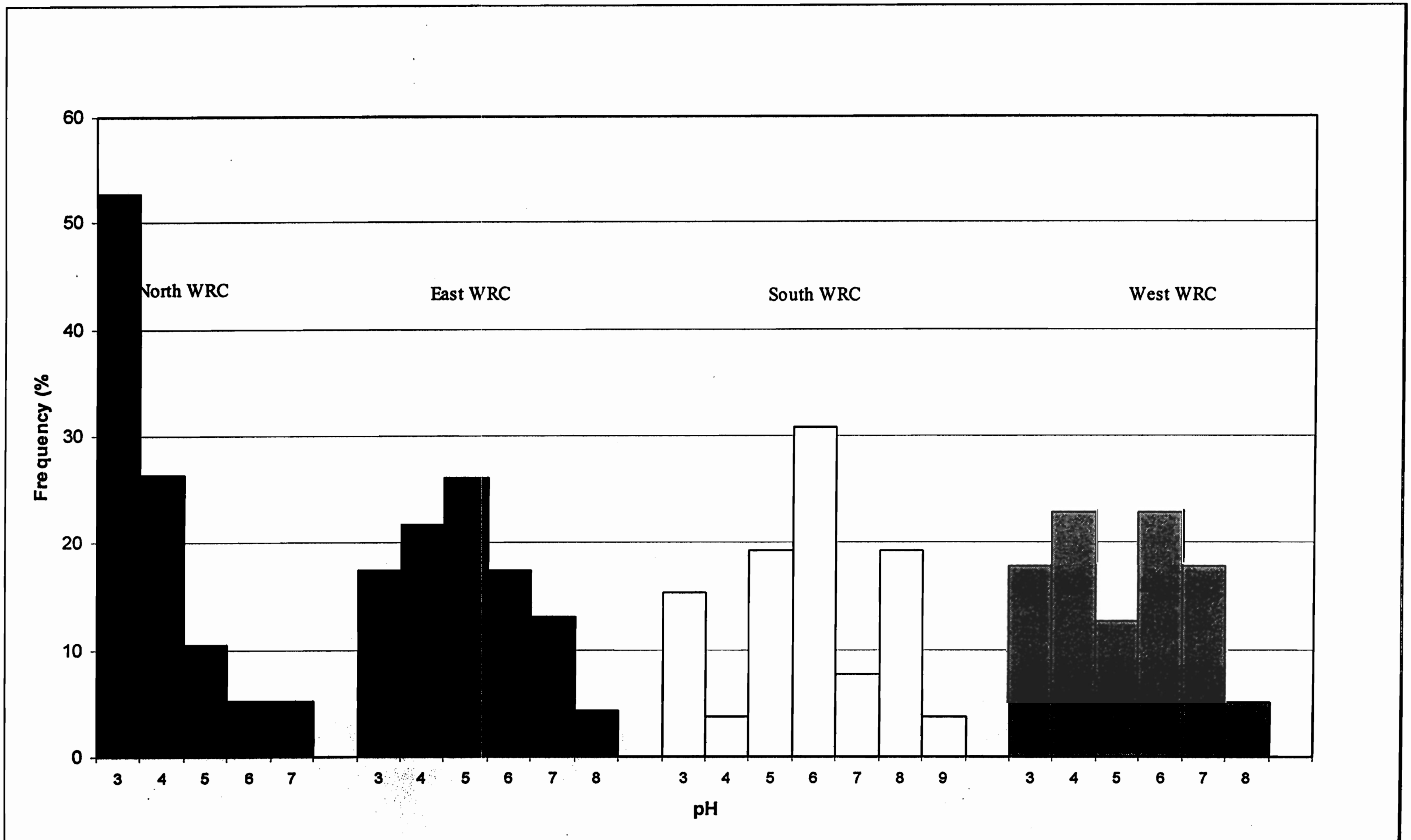


Figure A.5.2 - Histogram of Paste pH for All Dumps

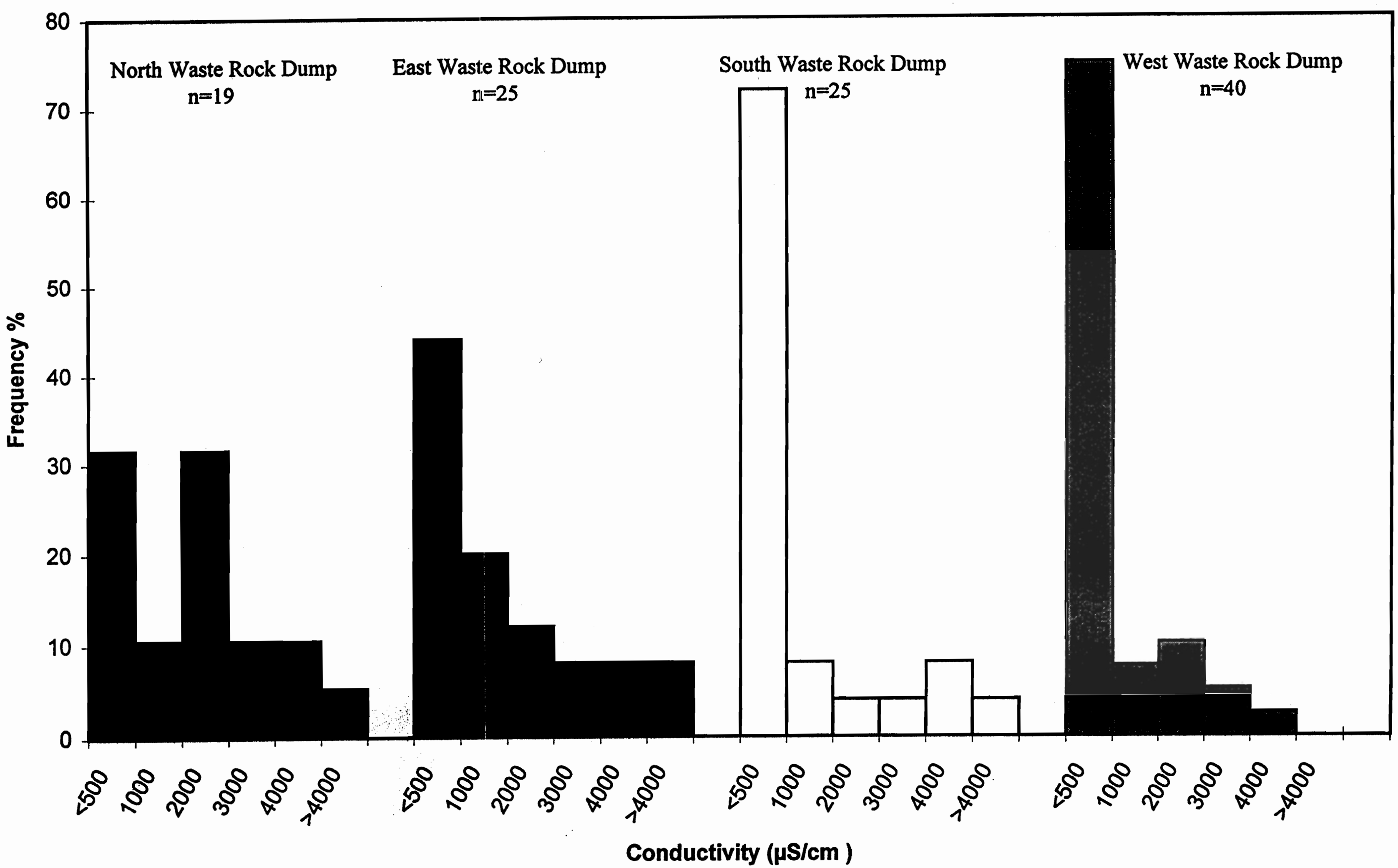


Figure A.5.3 - Paste Conductivity Frequency Distribution by Dump

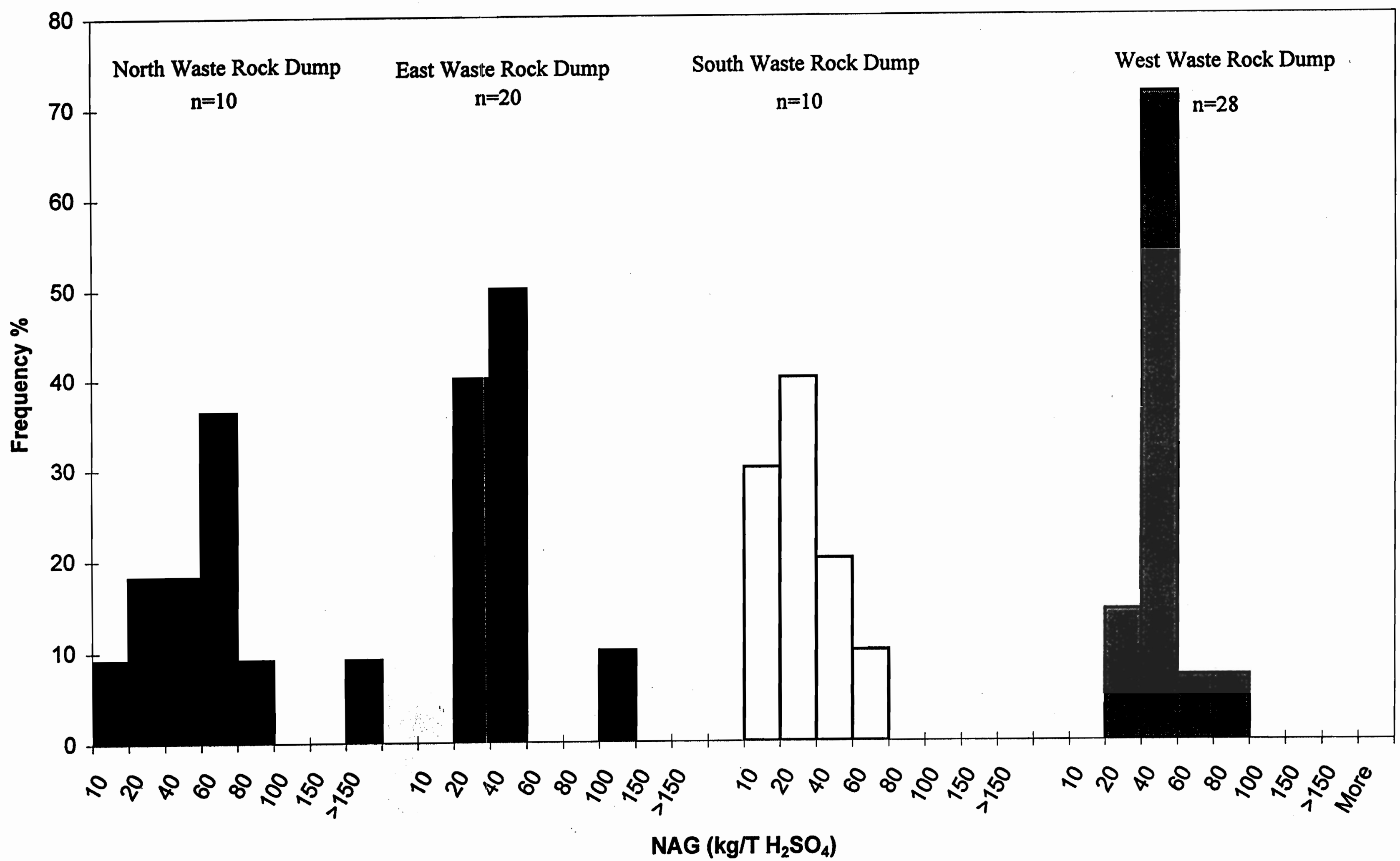


Figure A.5.4 - NAG Frequency Distribution by Dump

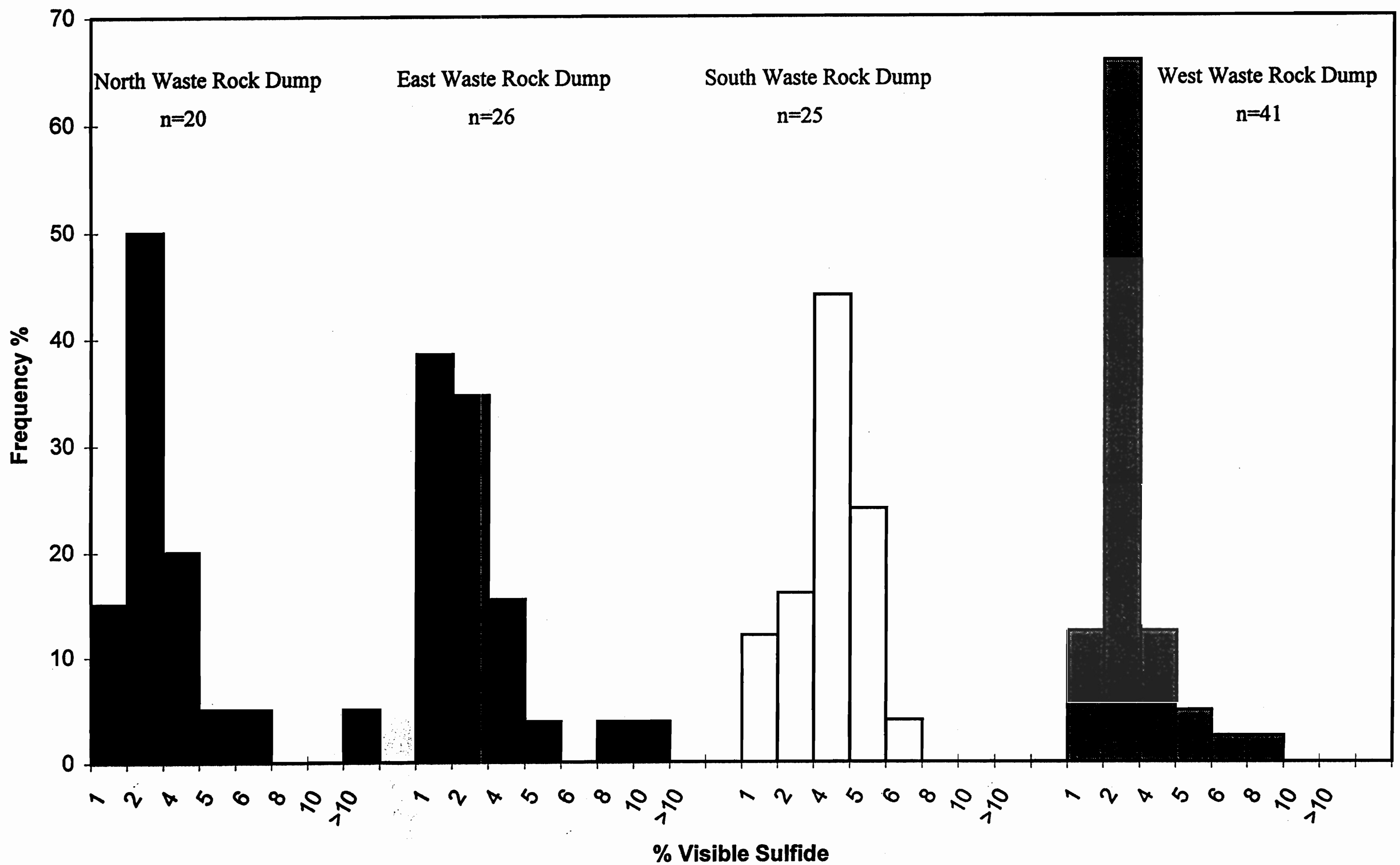


Figure A.5.5 - Percent Visible Sulfide Frequency Distribution by Dump

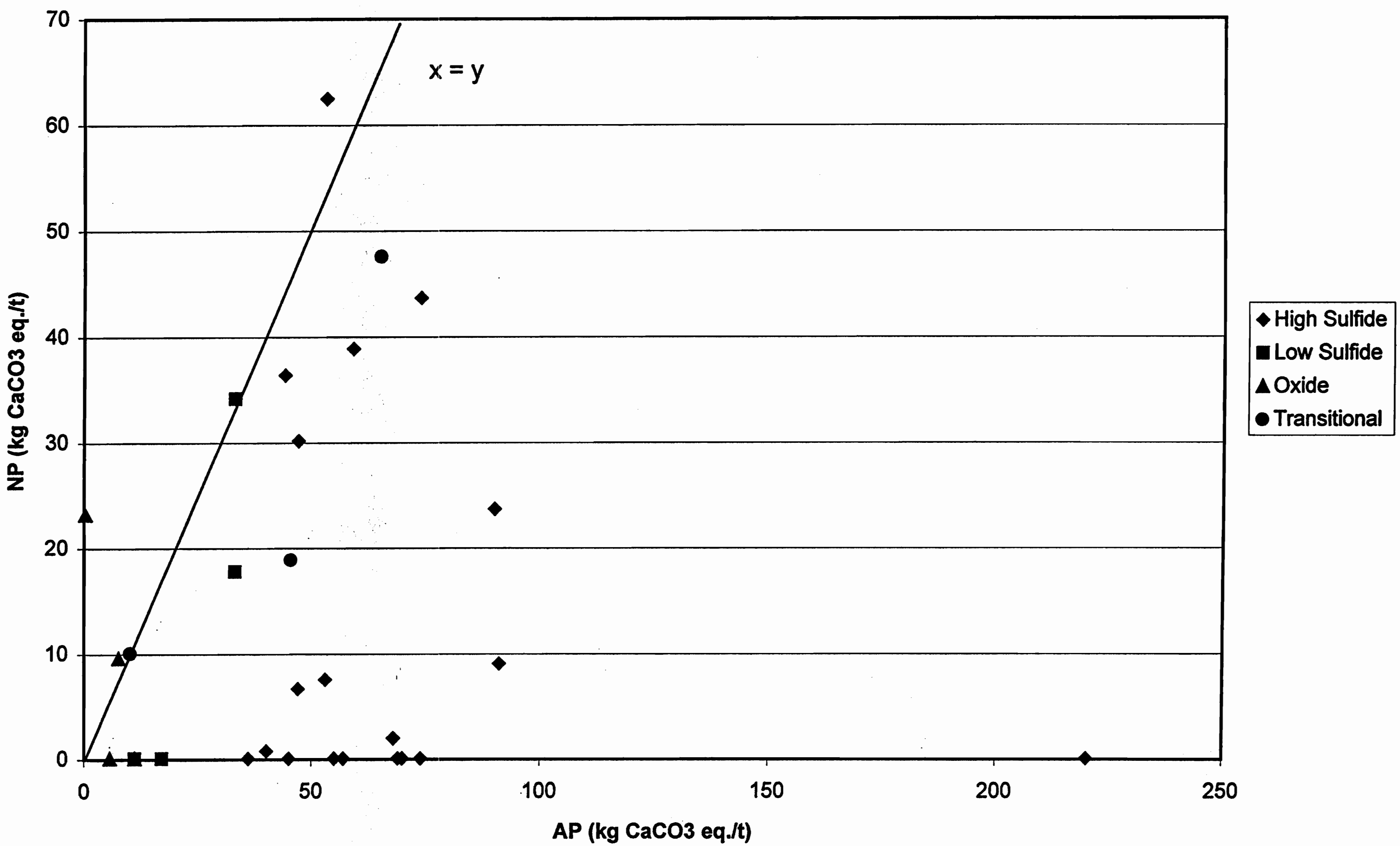


Figure A.6.1 - NP vs. AP by Weathering Status

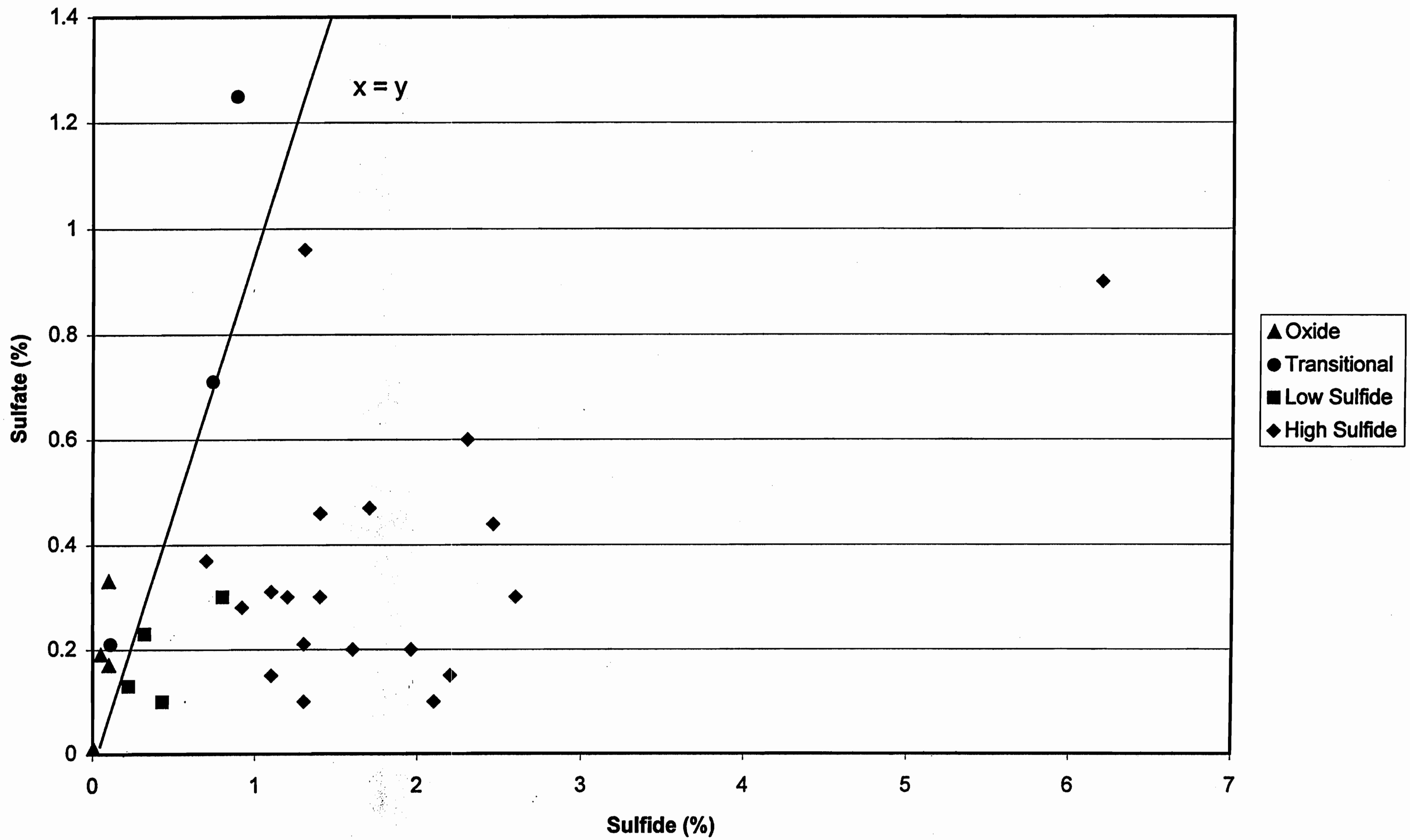


Figure A.6.2 - Sulfide vs. Sulfate by Weathering Status

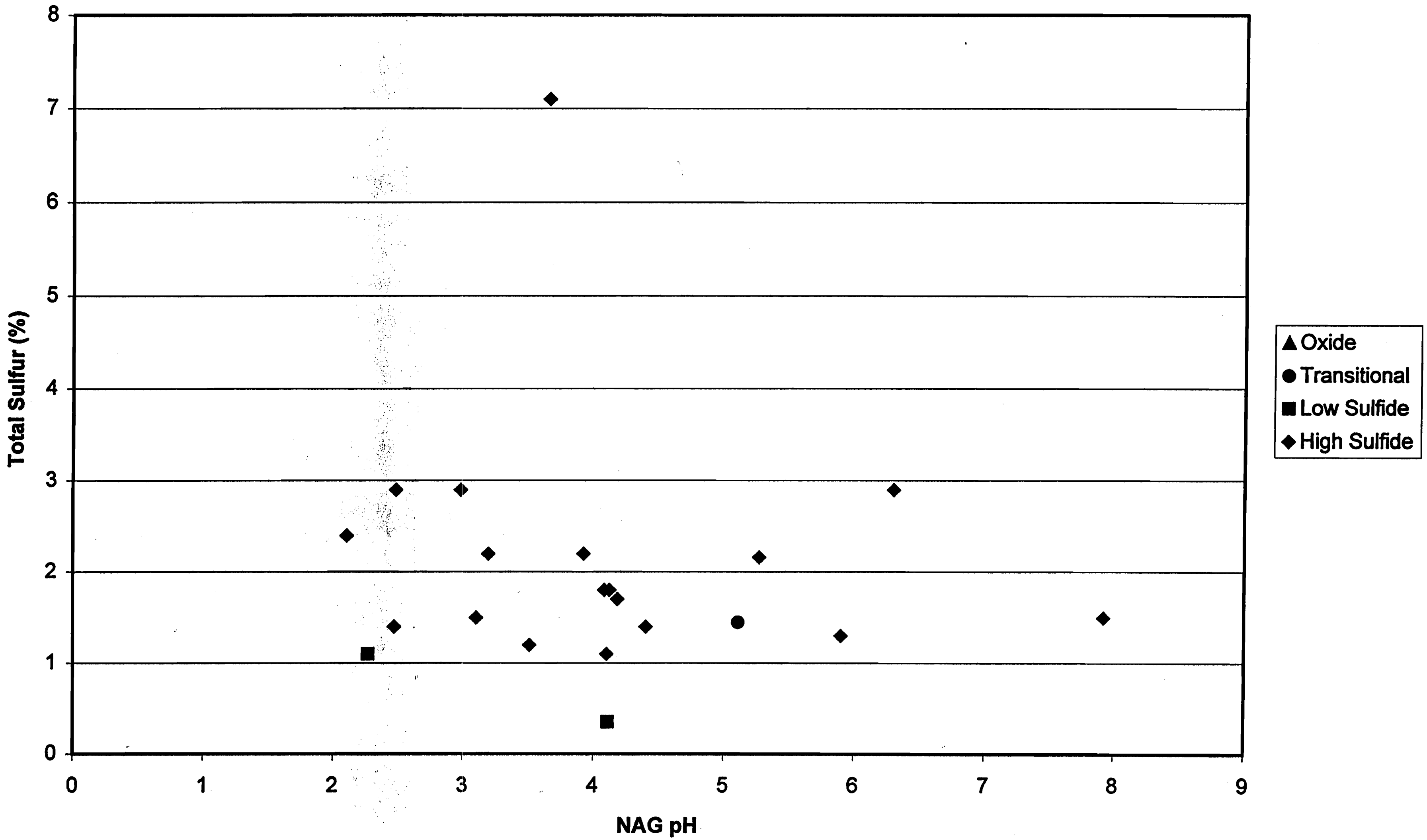


Figure A.6.3 - NAG pH vs. Total Sulfur

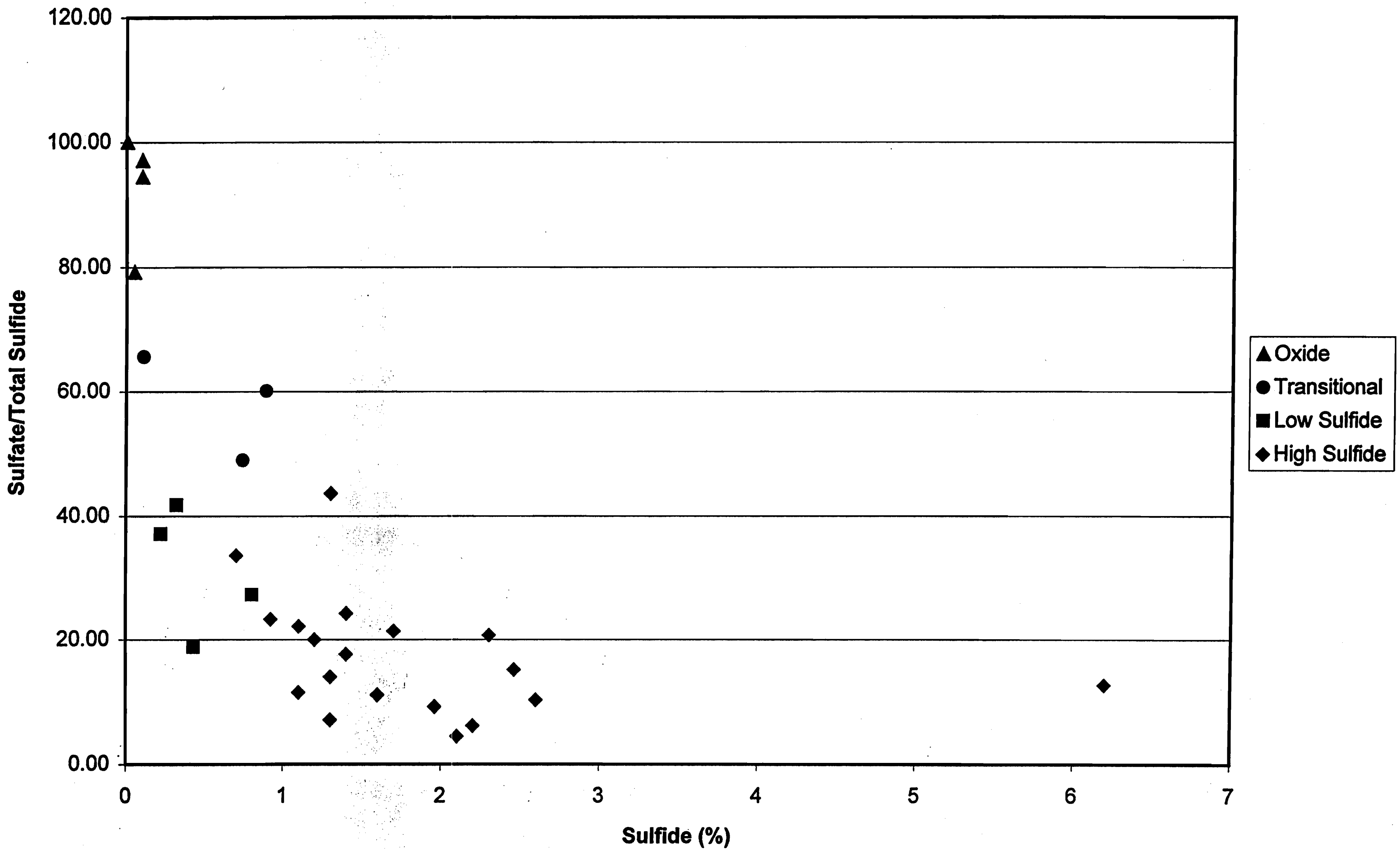


Figure A.6.4 - Sulfate/Total Sulfur vs. Sulfide

Table A.1.1
Numbers of samples analysed in the Waste Rock Characterization Program

Test	Number of Samples Analyzed		
	Phase I EIS	Phase II WMP	Total
Paste pH/Conductivity	19	93	112
Total Metals (ICP)	2	0	2
Acid Base Accounting (ABA)	19	28	47
Net Acid Generating (NAG)	0	59	59
EPA 1312	1	0	1
Kinetic Testing	5	0	5
Physical Tests*	1	0	1

EIS = Environmental Impact Statement
WMP = Waste Management Plan
* Gradation, Modified Proctor, Hydraulic Conductivity

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Numbers of Samples Analyzed in the Waste Rock Characterization Program

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EPA 1312	1	0	1
Kinetic Testing	5	0	5
Physical Tests*	1	0	1

EIS = Environmental Impact Statement
WMP = Waste Management Plan
* Gradation, Modified Proctor, Hydraulic Conductivity

Table A.1.2
Number of Tests on Samples of Each Rock Type

	Rock Type					Total
	Quartz Monzonite	Quartz Breccia	Biotite Breccia	Andesite	Quartz Vein	
Number of Samples	91	8	24	2	6	131
Paste pH/Conductivity	91	8	24	1	6	130
Total Metals (ICP)	2	--	--	--	--	2
Acid Base Accounting (ABA)	31	2	10	1	2	46
Net Acid Generating (NAG)	33	6	17	--	3	59
EPA 1312	1	--	--	--	--	1
Kinetic Testing	5	--	--	--	--	5
Physical Tests*	1	--	--	--	--	1

EIS = Environmental Impact Statement
WMP = Waste Management Plan
* Gradation, Modified Proctor, Hydraulic Conductivity

Table A.3.2
Extractable Metals Concentrations in Waste Rock

Parameters (mg/L)	WD-1
pH	3
Conductivity (mmhos/cm)	5.6
Sulfate	3050
Acidity (as $CaCO_3$)	1050
Alkalinity (as $CaCO_3$)	0
Aluminum	151
Antimony	N/A
Arsenic	< 0.1
Barium	0.09
Boron	0.10
Cadmium	0.019
Calcium	314
Chloride	6
Chromium	0.03
Cobalt	0.29
Copper	13.6
Fluoride	1.2
Iron	102
Lead	< 0.021
Magnesium	23
Manganese	3.35
Mercury	< 0.0002
Molybdenum	<0.01
Nickel	0.11
Potassium	4
Selenium	< 0.1
Silver	< 0.01
Sodium	13
Vanadium	< 0.01
Zinc	0.87

Table A.3.3
Results of ABA Testing of Column Samples

Sample Number	SW-1	PW-2	LGSSP-2	C10-190-199-2	IDC-24-222-241
Rock Type	qm	qb	qm	qm	qm
Classification	oxidized	transitional	oxidized	unoxidized	unoxidized
Total Sulfur (%)	1.36	0.37	0.61	3.59	1.74
Sulfate (%)	0.01	0.01	0.01	0.07	0.01
Sulfide (%)	1.36	0.37	0.61	3.52	1.74
AP	42	11	19	110	54
NP	36	11	39	44	31
NNP	-6	0	20	-66	-23
NP:AP	0.86	1.00	2.05	0.40	0.57

Table A.3.4
Results of Kinetic Test Work

Sample Number	SW-1	PW-2	LGSSP-2	C10-190-199-2	IDC-24-222-241
Total Sulfur (%)	1.36	0.37	0.61	3.59	1.74
Sulfate (%)	0.01	0.01	0.01	0.07	0.01
Sulfide (%)	1.36	0.37	0.61	3.52	1.74
AP	42	11	19	110	54
NP	36	11	39	44	31
NNP	-6	0	20	-66	-23
NP:AP	0.86	1.00	2.05	0.40	0.57
Estimated Time to Depletion (years)					
NP (from stoichiometry)	286	220	126	253	389
AP (from sulfate)	1262	382	263	1051	2842
Pseudo Steady State Release Rate kg CaCO3 eq./tonne/week					

Table A.4.1

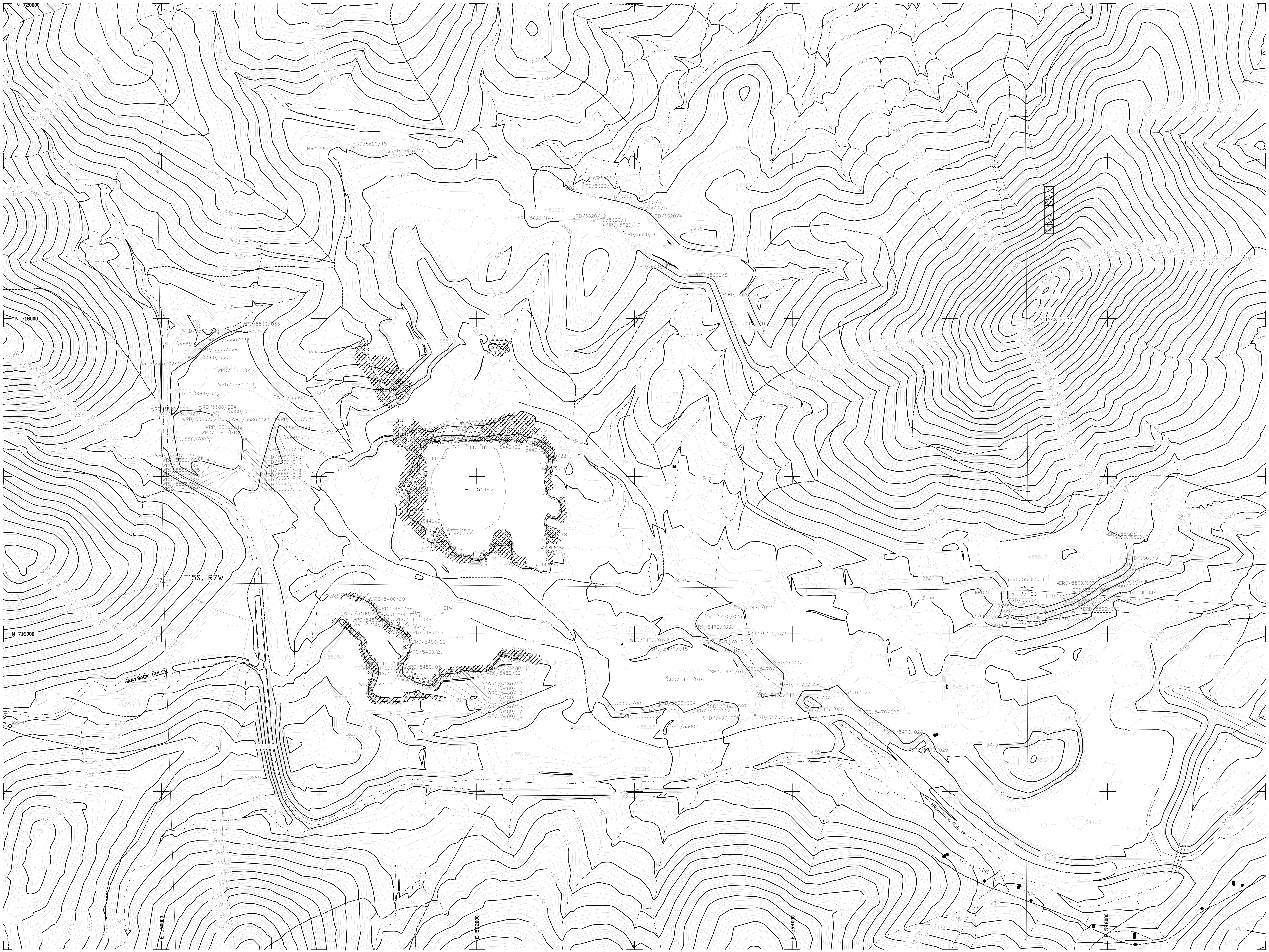
Chemistry of West Dump Seep (August, 1997)

Parameter	W-Waste All in mg/l unless otherwise stated
pH (std. units)	3.03
Alkalinity (mg/l $CaCO_3$ equiv.)	0.
Bicarbonate	0.
Carbonate	0.
Sulfate	22,100.
Total Dissolved Solids	25,440.
Chloride	16.
Fluoride	0.31
Nitrate_N	4.7
Iron	310.
Copper	1,800.
Arsenic	0.14
Aluminium	2,100.
Barium	<0.05
Beryllium	0.49
Boron	0.21
Calcium	410.
Cadmium	0.82
Cobalt	9.9
Nickel	1.3
Thallium	0.02
Manganese	170.
Zinc	38.
Molybdenum	0.28
Selenium	0.11
Magnesium	580.
Sodium	20.
Potassium	<1

Table A.6.1
Copper Flat Project
Waste Rock Classification System

Waste Rock Type	Criteria No. 1 Visual	Criteria No. 2 Paste pH (s.u.)	Criteria No. 3 Paste Conductivity (uS)	Criteria No. 4		Required Criteria
				AP (T/KT)	NAG	
Oxidized	No visible sulfides, loss of texture, strong oxide staining	>5.0	<500	<1.6	0	(1, 2 and 3) or (1 and 4)
Transition	Visible sulfides, loss of texture, strong oxide staining	<5.0	>500	>1.6	>0	1
Unoxidized	Visible sulfides, fresh appearance, minor feox staining	>5.0	<500	>10	>0	1,2 and 3
Low sulfide	Few visible sulfides, fresh appearance	>5.0	<500	<10	0	1 through 4

Notes:
(1) AP criteria for identification of oxidized and transition waste based on a total or sulfide sulfur content of 0.05 percent
(2) NP of unoxidized waste is typically greater than 30 T/KT, therefore AP criteria for low sulfur waste is for an NP:AP ratio near 3:1 and sulfur content of 0.32 percent
(3) Acid producing potential (AP) by syulfur analysis and NAG are alternatives for criteria No. 4



REVISIONS No.	DESCRIPTION	BY	DATE

REFERENCE			
	DESIGNED	JP	12/98
	DRAWN	TAD	12/98
	CHECKED		
	APPROVED		
	APPROVED		

PREPARED FOR:

PREPARED BY: SRK Consulting, Engineers and Scientists

TITLE: COPPER FLAT MINE SAMPLE LOCATIONS AND PIT GEOLOGY

DRAWING No.: 68612-001

SHEET No. 1 OF 1

SCALE: 1"=200'

PROJECT No.: 68612

DRAWING NAME 68612-001

REVISION A

01583

APPENDIX A.1

TESTING PROTOCOLS

Paste pH and TDS

Acid Base Accounting

Modified EPA 1312 test

Humidity Columns

Net Acid Generation (NAG) Test

FIELD PASTE pH and CONDUCTIVITY

Objectives

- To determine the pH and conductivity of the pore water resulting from dissolution of secondary mineral phases on the surfaces of oxidized rock particles.
- To indicate whether oxidation, and accumulation of contaminants in the form of secondary mineral phases, has occurred in the waste rock prior to collection of the sample.

Principles of Test

Water is added to the sample to form a paste or slurry thus mobilizing secondary mineral phases and providing a medium accessible to the pH and conductivity or TDS probe. The probe is placed in the paste or slurry and the pH or conductivity value is read directly from the meter.

Equipment

1. pH meter equipped with a combination pH electrode.
2. Conductivity or TDS meter (in this case a Hanna Instruments field combined pH/ORP/temperature meter).
3. 50 mL beakers, or equivalent (disposable paper cups are recommended).
4. Spatula or stirring rod (eg. plastic coffee stirrers).
5. Litmus paper strips.

Reagents

1. Standard buffer solution, pH 4.00 and pH 7.00.
2. Standard electrolyte solutions (for calibration of conductivity meter).
3. Distilled (or deionized) water.

Procedure

1. Calibrate pH and conductivity or TDS meters using the standard solutions and following the instructions provided with the meters.

2. Obtain approximately 25 g of fines (particles smaller than 1 mm if possible) from the rock sample to be tested, and place in a fresh or decontaminated beaker or testing vessel.

3. Add approximately 25 ml of distilled water to sample. (More water may be required if the sample is very dry or extremely fine.)

4. Stir sample with fresh or cleaned spatula to form a paste or slurry. Paste should slide off spatula easily.

5. Tip the testing container to one side to allow a pool of water or slurry to collect in the corner. Dip each of the probes into the slurry, and allow the meter readings to stabilize. The conductivity reading should, however, be done first, as electrolyte from the combination pH probe may affect the conductivity of the solution.

6. Decontaminate probes and containers using distilled or de-ionized water.

7. Record the measurements in your field notebook along with a description of the rock type tested, and the general appearance of the sample.

Alternatives

For a coarser rock mixture, wet the surface of the rock with distilled water, and mix water with any surface coatings or fines. Place a piece of litmus paper over the wetted area. Compare the color of the litmus with the pH color-coded scale and record pH.

Calculations

Paste TDS is assessed by measuring Electrical Conductivity (EC) and then converting conductivity values to TDS using the equation (Hem, 1985):

$$0.59\left[EC, FScm^{-1}\right] = \left[TDS, mg/l\right]$$

Interpretation

High conductivity (or TDS) levels indicate there is a considerable store of contaminant salts. These are usually sulfates, but can be other metal salts. When a sample is collected over depth, it is not always clear whether the stored salts are due to oxidation at that point in the sediment profile, or if the salts were generated somewhere higher in the profile and moved downwards to the sample location. Look for stains along the flow path that may indicate if this is the case.

Low pH readings indicate oxidation and acid generation has occurred, usually at the location from which the sample was collected. Readings taken on uncrushed samples in the field or lab usually provide a much better indication of the extent of oxidation than crushed samples. This is because crushing can liberate neutralizing minerals thereby increasing the available neutralizing capacity of the sample.

References

Sobek, A.A., Schuller, W.A. Freeman, J.R. and Smith, R.M., 1978, Field and Laboratory Methods Applicable to Overburden and Minesoils, EPA 600/2-78-054, 203pp.

British Columbia AMD Task Force, 1989, Draft Acid Rock Drainage Technical Guide, Vol I, Crown Publications, Victoria, B.C.

MODIFIED ACID BASE ACCOUNTING (ABA)

Objectives

- To determine the balance between acid producing and acid consuming components of mine waste.

Principles of Test

The fundamental principals of acid base accounting comprise two distinct measurements:

1. Determination of the neutralization potential (NP) of a sample.

2. Calculation of the acid potential (AP) of the sample.

The difference between the two values, the net neutralization potential (Net NP), and the ratio (NP:AP) allow classification of the sample as potentially acid consuming or producing. To facilitate comparison of values, NP, AP, and Net NP are all expressed in units of tons $CaCO_3$ equivalent per kiloton.

In the original Sobek method of acid base accounting, the neutralization potential is determined by heating the sample and mixing for two hours. In the modified method, the neutralization potential is determined by treating a sample with excess standardized hydrochloric acid at ambient, or slightly above (25 - 30°C) ambient, temperatures for 24 hours. A fizz test is employed to provide a guide to the amount of acid to be initially added to the test. Acid is added as required during the acid-treatment stage to maintain sufficient acidity for reaction. After treatment, the unconsumed acid is titrated with standardized base to pH 8.3 to allow calculation of the calcium carbonate equivalent for the acid consumed.

For the calculation of the acid potential, the sample is analyzed for total and sulfate sulfur. Sulfide sulfur content is also measured or is calculated by the difference between the other two sulfur numbers. AP is determined from sulfide sulfur number, assuming: 1) total conversion of sulfide to sulfate; and, 2) production of 4 moles H^+ per mole of sulfide oxidized, assuming that all the sulfide is present as pyrite. In some cases, difficulties associated with the analytical procedures for sulfide analysis may influence the estimation of the acid generation potential. For example, sulfate associated with the mineral barite is not readily distinguished from sulfide in a typical sulfate analysis, but does not contribute to the acid potential.

Equipment

1. Aluminum foil.

2. 250 mL Erlenmeyer flask.

3. Reciprocating shaking apparatus or other suitable agitation device.

4. Burette, 50 or 100 mL, one for each of the acid and the base solutions.

5. pH meter, equipped with a combination pH electrode.

Reagents

1. Distilled (or deionized) water, preferably CO2-free (store in container equipped with an ascarite tube)

2. Certified grade, 0.1 N hydrochloric acid, for standardization of bases

3. Approximately 0.1 N sodium hydroxide, standardized.

4. Approximately 0.5 N sodium hydroxide, standardized.

5. Approximately 0.1 N hydrochloric acid, standardized.

6. Approximately 0.5 N hydrochloric acid, standardized.

7. Approximately 25 percent strength hydrochloric acid, for fizz test.

8. Buffer solutions (pH 4.00 and 7.00) for calibration of pH meter.

Procedure

1. Crush and pulverize the sample to a target size of 80 percent minus 60 mesh (Tyler). Tailings samples should be tested at the received particle size.

2. Submit a sample of the test material for total sulfur and sulfate sulfur analyses.

3. Use certified 0.1 N hydrochloric acid to standardize the 0.1 N and 0.5 N sodium hydroxide solutions to standardize the 0.1 N and 0.5 N hydrochloric acid solutions.

4. Place approximately 0.5 g of pulverized sample on a piece of aluminum foil in a small shallow dish. Add one or two drops of 25 percent HCl to the sample. The presence of carbonate will be indicated by a bubbling or an audible "fizz". Rate the "fizz" as indicated in Table 1.

Volume and Normality of HCl for Use in NP

Determination on Basis of Fizz Rating (2g Sample)

Fizz Rating	HCl (mL, Normality)	
None	20	0.1
Slight	40	0.1
Moderate	40	0.5
Strong	80	0.5

5. Weigh 2.00 g of the sample (minus 60 mesh) into a 250 mL Erlenmeyer flask and, as a first approximation, add the volume and normality of HCl as indicated by the "fizz" rating shown above.

6. Agitate the contents of the flask for 24 hours by placing on a shaking apparatus. At least once in the treatment period, and preferably after approximately 6 hours of reaction, check the pH of the pulp. If the pH is above 2.0, add an appropriate volume of hydrochloric acid of the same strength originally added (generally between 1.5 to 2.0 ml). Record the amount added for back titration.

7. At the end of the shaking period, check the pulp pH. If the total volume and strength of acid was appropriate, the end pH will be in the range 1.5 - 2.0. If the pH is above this range, the amount of acid added is judged to be insufficient for reaction. If the pH is below the range, the amount of acid added is judged to be

too high, causing over reaction. In either case, repeat the test using the next higher or lower volume or strength of HCl as appropriate.

8 Titrate the contents of the flask using 0.1 N or 0.5 N NaOH (corresponding to the normality of HCl used in step 4) to pH 8.3. Titrate with NaOH until a constant reading of 8.3 remains for at least 30 seconds.

Calculations

1. The neutralization potential, NP, of the sample is given by:

$$NP = \frac{50a[x-(b/a)y]}{c}$$

where *NP* = neutralization potential in tonnes $CaC0_3$ equivalent per 1000 tonnes of material

a = normality of HCl

b = normality of Na0H

c = sample weight in grams

x = volume of HCl added in mL

y = volume of Na0H added to pH 7.0 in mL

2. The acid potential, AP, of the sample in kg CaC03 equivalent per ton, is given by:

$$AP = \text{Percent sulphide sulfur x } 31.25$$

where,

sulphide sulfur = total sulfur - sulfate sulfur

3. The net neutralization potential, Net NP, in kg CaC03 equivalent per ton of material is given by:

$$Net\ NP = NP - AP$$

Reporting of Results

The results of the test should be tabulated to provide the following information:

Sample description, paste pH, total sulfur analysis (% S_T), sulfate sulfur analysis (% $S(SO_4)$), NP (kg $CaC0_3$ equivalent per ton), AP (kg $CaC0_3$ equivalent per ton), Net NP (kg $CaC0_3$ equivalent per ton).

References

Lawrence, R.W., Poling, G.P. and Marchant, P.B., 1989. Investigation of predictive techniques for acid mine drainage. Report on DSS Contract No. 23440-7-9178/01-SQ, Energy Mines and Resources, Canada, MEND Report 1.16.1 (a).

Sobek, A.A., Schuller, W.A. Freeman, J.R. and Smith, R.M., 1978, Field and Laboratory Methods Applicable to Overburden and Minesoils, EPA 600/2-78-054, 203pp.

STATIC NET ACID GENERATION (NAG) TEST PROCEDURE

Objectives

- To determine the net acid remaining, if any, after complete oxidation of the materials with hydrogen peroxide and allowing complete reaction of the acid formed with the neutralizing components of the material. The NAG test provides a direct assessment of the potential for a material to produce acid after a period of exposure and weathering and is used to refine the results of the theoretical ABA predictions.

Principles of the Tests

After neutralization is completed, by reaction with hydrogen peroxide, the remaining H_2SO_4, if any, is titrated with sodium hydroxide. The amount of NaOH needed is equivalent to the NAG of the material (expressed in kg H_2SO_4/tonne material).

Sample Preparation

Tailings samples can be tested ‘as received’.

Reagents

1. H2O2 - BDH ‘Analar’ Analytical Reagent 30% w/v (100 V), or equivalent, diluted 1:1 with deionized H2O to 15% a.

2. NaOH - 0.50M Standardized Solution.

3. NaOH - 0.10M Standardized Solution.

Procedure:

Add 250 mL of reagent 1 (15% H_2O_2) to 2.5 g of tailings (pulverized sample if testing waste rock) sample in a 500 mL wide mouth conical flask, or equivalent. Cover with a watch glass, and place in a fumehood or well-ventilated area [b]. The H_2O_2 should be at room temperature before commencing test.

Allow sample to react until ‘boiling’ or effervescing ceases. Heat sample on hot plate and gently boil until effervescence stops or for a minimum of 2 hours. Do not allow sample to boil dry - add deionized water if necessary.

Allow solution to cool to room temperature then record final pH (NAGpH).

Rinse the sample that has adhered to the sides of the flask down into the solution with deionized water. Add deionized water to give a final volume of 250 mL.

Titrate solution to pH 4.5 while stirring with appropriate NaOH concentration based on final NAG solution pH as follows:

NAG Solution pH	Reagent	NaOH Concentration
>2	3	0.10 M
$\leq$2	2	0.50 M

[a] The pH of the H_2O_2 used in the NAG test should be checked to ensure it is between pH 4 and 7. If the pH is less than 4 then add dilute NaOH (use a solution made up by adding 1 g NaOH to 100 mL deionized H_2O) until the pH is greater than 4 (aim for a pH between 4 and 6). The pH is adjusted to greater than pH 4 to ensure that the phosphoric acid, used to stabilize H_2O_2 in some brands, is neutralized. The pH of the 15% H_2O_2 should always be checked to ensure that any stabilizing acid is neutralized, otherwise, false positive results may be obtained.

[b] The NAG reaction can be vigorous and sample solutions can 'boil' at temperatures of up to 120^{o}C. Great care must be taken to place samples in a well-ventilated area or fume cupboard.

Calculations

The NAG capacity is determined by titration of the sample to determine the net amount of acid generated by peroxide oxidation.

Net Acid Generation:

$$NAG = \frac{49 \times V \times M}{W}$$

Where:

NAG	= net acid generation (kg H_2SO_4/tonne)
V	= volume of base NaOH titrated (mL)
M	= molarity of base NaOH (moles/L)
W	= weight of sample reacted (g)

NOTE: If NAG value exceeds 25 kg H_2SO_4 per tonne, repeat using a 1.00 g sample.

Interpretations

The NAG capacity is an independent measure of the acid generating potential of a sample. Materials should be classified based on the table given below.

SAMPLE CATEGORY	FINAL NAGpH	NAG VALUE kg H_2SO_4/t	NNP kg/ton $CaCO_3$
POTENTIALLY ACID FORMING			
Higher capacity	<4	>10	positive
Lower capacity	<4	≤10	negative
UNCERTAIN [1]	≥4	0	positive
NON-ACID FORMING [2]	≥4	0	positive

[1] Further evaluation including sulfur forms and mineralogy

[2] Acid consuming materials are identified by NNP values less than approximately -100

References

Miller, S., Robertson, A., and Donohue, T. (1997). Advances in Acid Drainage Prediction Using the Net Acid Generation (NAG) Test. In: *Proceedings of the Fourth International Conference on Acid Rock Drainage, Vancouver, B.C., Canada, 1997*, vol II, pp. 535-547.

Lewis, H.S., Susteyo, W., Miller, S.D., and Jeffery, J.J. (1997). Waste Rock Management Planning and Implementation at P.T. Freeport Indonesia Company's Mining Operations in Irian Jaya. In: *Proceedings of the Fourth International Conference on Acid Rock Drainage, Vancouver, B.C., Canada, 1997*, vol III, pp. 1361-1376.

EPA 1312 Leach Extraction Test

Objectives

- To characterize and quantify the soluble contaminant content of waste rock samples.

Principles of Test

The sample is mixed with distilled water, and is agitated in a flask to allow dissolution of the contained, soluble secondary mineral phases. The solution is collected at the end of the test, filtered, and analysed for immediate parameters (pH, alkalinity, acidity, sulfate, and conductivity) and for contained metals.

This test method is modified from the EPA method 1312 by using a ratio of water to solids of 2:1 or 3:1 rather than 20:1. The less dilution reduces the possibility of metal concentrations below detection.

Equipment

1. Erlenmeyer Flask (500 mL to 1 L, depending on sample size).

2. pH and conductivity meters.

3. Water filtering apparatus and filters.

4. Reciprocating shaking apparatus or other suitable agitation device.

Reagents

1. Distilled Water.

2. Calibration standards for pH and conductivity.

Procedure

1. Split a representative sample of approximately 200 to 500 g from the field sample, and determine exact weight. Place in Erlenmeyer Flask. The amount of sample is at the discretion of the technician, but should be increased if the particle sizes are large or the variation between the different particles is high.

2. Add distilled (or de-ionized) water to the sample to obtain a water to solids ratio of exactly 2:1 by weight. Cap the Erlenmeyer flask and place in agitation device.

3. Agitate the slurry for a total period of 23 hours. Terminate the agitation process and allow suspended solids to settle for one hour prior to termination of the test.

4. Remove the clear decant and filter the solution immediately, using a standard 0.45 µm millepore filter. Remove a small portion of the filtrate and determine the conductivity and pH.

5. Solution samples are submitted for analysis of immediate parameters (pH, alkalinity, acidity Eh, and conductivity) and for constituent concentrations (ICP metal scan and sulfate).

Note:Analytical procedures for radionuclide analyses generally require larger eluate concentrations. Therefore, a larger volume of solid will be required.

Interpretation

Soluble salt and radionuclide contents are calculated from the eluate constituent concentration and volume, and are reported per unit mass of waste rock.

Solubility controls on the solution concentrations should be checked by assessing saturation indices for the contaminants of concern. This may be done rapidly by using a geochemical equilibrium model such as MINTEQA2 or equivalent. Where saturation conditions are indicated, consecutive extraction tests should be performed to determine the total soluble component loading from the cumulative constituent release by the waste rock sample.

References

The field extraction test is modified from a number of different sources, including the EPA series of extraction tests.

Humidity Column Testing

Objectives

The intent of humidity column testing procedures is to simulate as many of the field conditions as is practical. These conditions include:

- representative particle size distributions for the fine fraction (less than 4") within the mine rock; and
- flushing rates encountered under normal circumstances in mine rock piles at the site;
- contact time between the leachate and the rock, usually the flowpath length.

To accomplish this, a large volume of rock is used for the testing, approximately 5 - 8 kg. The rock is graded to represent the 4-inch minus fraction of the rock contained in the rock piles. The site precipitation levels are evaluated on a surface area basis. The diameter of the column is adjusted (within a reasonable limit) to provide enough leachate for the analysis. The flow path (column length) should be approximately 1.5 times greater than the diameter of the column. During the column operation, water is trickled over the rock for 2 days. Air that is humidified by bubbling it through water at a temperature slightly above room temperature, is introduced at the bottom of the column for 5 days of each cycle. Usually the test is carried out for 20 weeks, with weekly analysis of key parameters (pH, alkalinity, acidity, conductivity, Eh, sulfate). Metals are typically measured on a weekly basis until "steady state" conditions have been achieved. After 10 weeks of testing, the frequency of metals analysis can be reduced to every other week, or less, depending on the test results to that time. A typical humidity column is shown in the figure below.

Procedure

1. Examine site precipitation records over a typical yearly period. If there is a seasonal rainy period, determine the average weekly precipitation during that period. Look at the pattern of this rainfall, i.e. is it a steady drizzle over a few days, or heavy rain over a few hours. The water addition rate to the column should follow this pattern as closely as is possible.

2. Calculate the rate of water addition to the column. Start with a minimum column diameter of 30 cm.

eg. rainfall = 10 mm/week over the rainy season
column = 30 cm diameter (0.152 metres radius)
SA column = pr2 = 3.14 (0.152)2 = 0.073
irrigation volume = 0.010 m/wk x 0.073 m2 = 0.00073 m3/wk = 0.73 L/wk

If this volume seems reasonable, use the 30 cm column. If it is not sufficient to satisfy the sample volume requirements for the weekly analyses, the column diameter should be increased until this is satisfied.

3. Once the column diameter has been determined, the rock sample height is obtained by multiplying the diameter by 1.5. The equipment should provide some freeboard above the rock column height (approximately 5 to 10 cm).

   The columns can be constructed out of almost any "inert" plastic cylinder. ABS or PVC pipe provides good strength and durability at a reasonable cost. Plexiglass also works well, but is usually expensive, especially for the large diameter columns.

   As illustrated in Figure D.5.1, the column must have a raised screen constructed about an 2 cm from the bottom, and a solid base through which the leachate is collected. All joints are sealed with a high quality flexible plumbing sealing. (There are supports in the void between the perforated base and the base plate). Humidified air is added through an additional port at the base of the column (not shown). Several layers of Teflon mesh areplaced above the perforated plate to prevent washing of fines from the sample into the collection zone. During the column operation, a clear plexiglass cover is placed over the column to prevent excessive evaporation losses.

4. Water addition

   Water is applied to the column using a peristaltic pump. This can be automated with a timer that pulses water, in a fine spray, over the surface of the rock. Water can also be applied as a continuous drip over one area of the column. Dispersal of water can be achieved in a number of ways, eg. glass rods, plastic tubing, or possibly plastic pellets. (Our experience is that glass wool provides a significant source of alkalinity, and should not be used.)

5. At the start of the test, the dry rock will absorb a considerable amount of water. For the first week, humidified air should be added continuously to the column, to

wet the surfaces of the rock and initiate the oxidation process. Once good water recovery (80%) has been achieved, the regular weekly cycle should commence. A typical cycle is described below.

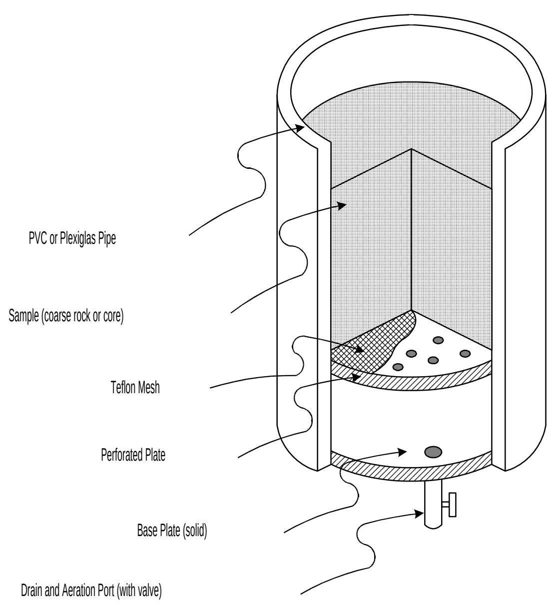
a) Humid Aeration Cycle - for five days, humidified air is added at the base of the columns;

b) Flush Cycle - de-ionized water is added to the column over a two day period. Water is added via a continuous drip dissipated over the top surface of the rock column.

c) Leachate Collection - the column is allowed to drain for 4 hours after the flush cycle is terminated. At the end of the drain cycle the leachate is collected and analyzed.

The test should be run for at least 20 weeks. Test results should be evaluated periodically. After 20 weeks, if the results are inconclusive, the program may need to be extended.

6. Solution samples are submitted for analysis of immediate parameters (pH, alkalinity, acidity Eh, and conductivity) and for constituent concentrations (ICP metal scan and sulfate) on a weekly basis.



Humidity Column Design

APPENDIX A.2

PASTE pH AND CONDUCTIVITY DATA

ACID BASE ACCOUNTING DATA

and

NET ACID GENERATION DATA

1997 Surface Sample Analyses

Sample	Type	Lithology	Visible sulfide %	EC	Paste pH	NAG kg/T H_2SO_4	NAG pH	Sulfate %	Sulfide %	Sulfur Total %	SO_4/S %	AGP	NP	NNP	NP:AP
												m/g $CaCO_3$			
ERD 5500 001	T	QM	1	3140	3.63	29.60	5.11	0.71	0.74	1.45	48.97	45.3	18.9	-26.4	0.42
ERD 5500 002	HS	QB	4	19	7.94	15.48	2.48	0.44	2.46	2.9	15.17	53.1	62.5	9.4	1.18
ERD 5500 004	LS	QM	1	430	5.31										
ERD 5500 005	LS	QM	1	595	3.31										
ERD 5500 006	LS	QM	1.5	891	5.72										
ERD 5500 009	HS	BB	10	4000	2.71	80.75	6.30	0.6	2.3	2.9	20.69	91	9.1	-81.9	0.10
ERD 5500 010	LS	QM	1.5	471	4.55	19.99	3.92								
ERD 5500 012	HS	QM	2	1928	2.71										
ERD 5500 014	HS	QM	2	4370	2.73										
ERD 5510 002	LS	QM	1.5	257	4.71										
ERD 5560 001	O	AN			9.14			0.01	0.005	0.01	100.00	0.3	23.2	22.9	77.33
ERD 5560 002	HS	QM	8	467	6.76			0.3	2.6	2.9	10.34	90	23.7	-66.3	0.26
ERD 5560 006	HS	QB	2	1305	3.38										
ERD 5560 008	HS	QV	5	330	4.08			0.47	1.7	2.2	21.36	68	2	-66	0.03
ERD 5560 010	LS	QM	1.5	708	4.55	23.62	3.87								
ERD 5560 011	HS	QB	3	1565	4.54	22.05	4.07								
ERD 5600 001	LS	QM	1	450	4.44			0.1	0.43	0.53	18.87	17	0.1	-16.9	0.01
ERD 5600 003	HS	QB	3	4230	2.9	33.81	3.19	0.96	1.3	2.2	43.64	69	0.1	-68.9	0.00
ERD 5600 005	T	QB	0.5	2700	3.23	27.05	4.34								
ERD 5600 007	T	QM	0.5	174	6.88	14.31	2.68								
ERD 5600 009	T	QM	0.5	657	4.73										
ERD 5600 011	T	QM	0.5	847	5.43										
ERD 5600 012	T	QM	0.5	254	6.82										
ERD 5600 013	HS	QM	2	321	5.17										
ERD 5600 014	HS	BB	2	2080	3.55										
ERD 5600 070	HS	BB	4	227	4.92	11.27	2.45								
NRD 5620 001	HS	BB	4	41	5.05	10.68	3.41								
NRD 5620 001	HS	QB	5	1193	2.91	19.80	2.45								
NRD 5620 002	HS	QB	6	1717	2.68	77.62	2.98	0.3	2.6	2.9	10.34	90	23.7	-66.3	0.26
NRD 5620 003	HS	QM	4	1111	3.56	57.33	4.12	0.2	1.6	1.8	11.11	55	0.1	-54.9	0.00
NRD 5620 004	O	QM			4.75			0.17	0.1	0.18	94.44	5.6	0.1	-5.5	0.02
NRD 5620 005	T	QV	1	2170	2.81	9.60	4.81								
NRD 5620 006	HS	QM	2	260	3.68										
NRD 5620 007	HS	QM	2	1009	2.98										
NRD 5620 008	HS	QM	3	235	4.13	42.63	5.90	0.15	1.1	1.3	11.54	40	0.8	-39.2	0.02
NRD 5620 009	HS	QM	2	663	3.28										
NRD 5620 010	HS	QM	2	128	3.86										
NRD 5620 011	HS	QM	2	1219	2.68	39.69	3.51	0.28	0.92	1.2	23.33	36	0.1	-35.9	0.00
NRD 5620 012	HS	QB	4	997	2.75	58.80	4.08	0.2	1.6	1.8	11.11	57	0.1	-56.9	0.00
NRD 5620 013	HS	QM	2	2240	2.62										
NRD 5620 014	HS	QB	20	4860	2.5	223.44	3.65	0.9	6.2	7.1	12.68	220	0.1	-219.9	0.00
NRD 5620 015	HS	QB	2	1075	3.71										
NRD 5620 016	HS	QM	2	3390	2.51										

1997 Surface Sample Analyses

Sample	Type	Lithology	Visible sulfide %	EC	Paste pH	NAG kg/T H_2SO_4	NAG pH	Sulfate %	Sulfide %	Sulfur Total %	SO_4/S %	AGP (m/g $CaCO_3$)	NP (m/g $CaCO_3$)	NNP	NP:AP
NRD 5650 017	LS	QM	1	41.4	6.09	23.72	4.11	0.13	0.22	0.35	37.14	11	0.1	-10.9	0.01
NRD 5650 018	HS	QM	2	89	4.82										
NRD 5650 019	HS	QM	2	3620	2.79	46.35	4.40	0.1	1.3	1.4	7.14	45	0.1	-44.9	0.00
SRD 5470 006	HS	QM	2	63	5.94										
SRD 5470 010	LS	QM	1	196	7.05	8.72	2.51								
SRD 5470 011	HS	QV	5	2200	2.54	43.51	3.10	0.21	1.3	1.5	14.00	47	6.7	-40.3	0.14
SRD 5470 012	HS	QB	6	182	7.63			0.46	1.4	1.9	24.21	59	38.9	-20.1	0.66
SRD 5470 013	HS	QM	3	821	4.4										
SRD 5470 014	HS	QB	4	62.9	5.26	5.88	2.29								
SRD 5470 015	HS	QM	3	118.5	5.55										
SRD 5470 016	HS	QM	4	89.6	7.06										
SRD 5470 016	HS	QV	5	6570	2.66										
SRD 5470 017	HS	QB	4	27	5.02	21.56	2.27								
SRD 5470 018	HS	QB	5	1703	3.08										
SRD 5470 019	HS	QV	5	229	4.55										
SRD 5470 020	HS	QM	3	162	7.83	12.74	2.47	0.31	1.1	1.4	22.14	44	36.4	-7.6	0.83
SRD 5470 021	HS	QB	4	321	4.32										
SRD 5470 022	HS	QM	2	386	6.03										
SRD 5470 023	HS	QM	4	27	5.51										
SRD 5470 024	HS	QM	5	3970	2.52										
SRD 5470 025	HS	QM	3	172.2	5.21										
SRD 5470 027	HS	QM	2	3520	2.72	15.78	2.52								
SRD 5490 007	O	QM		42	8.76	19.70	3.32								
SRD 5500 001	HS	QM	2	831	5.31	8.23	4.10	0.37	0.7	1.1	33.64	33	34.2	1.2	1.04
SRD 5500 002	HS	BB	4	33	7.38	22.05	4.63								
SRD 5500 003	O	BB		58.7	4.75										
SRD 5500 004	HS	QB	4	231	5.5										
SRD 5500 005	HS	QV	5	292	6.05	19.01	3.96								
WRC 5440 30	HS	QM	2	227	4.1	15.88									
WRC 5440 31A	LS	QM	0.5		7.91			0.23	0.32	0.55	41.82	33	34.2	1.2	1.04
WRC 5440 31B	T	QM	0.5		8.35			0.21	0.11	0.32	65.63	10	10.1	0.1	1.01
WRC 5440 32	O	QM		347	6.55			0.19	0.05	0.24	79.17	7.5	9.6	2.1	1.28
WRC 5480 006	HS	QB	5	3680	3.7	31.46									
WRC 5480 007	HS	QB	5	1643	3.18	33.52									
WRC 5480 007	HS	QV	5	550	3.41	32.73									
WRC 5480 008	HS	QM	2	785	3.67	15.09									
WRC 5480 009	HS	BB	3	764	3.73	32.54									
WRC 5480 010	HS	BB	4	1338	3.76	28.71									
WRC 5480 012	LS	QB	1	589	4.01	33.81									
WRC 5480 013	LS	QM	1	297	6.95	15.19									
WRC 5480 014	T	QB	0.5	801	4.12	20.19		1.25	0.89	2.08	60.10	65	47.6	-17.4	0.73
WRC 5480 015	HS	QM	2	826	3.42										
WRC 5480 016	LS	QM	1	470	6.26										
WRC 5480 018	HS	QM	2	4840	3.02										

1997 Surface Sample Analyses

Sample	Type	Lithology	Visible sulfide %	EC	Paste pH	NAG kg/T H_2SO_4	NAG pH	Sulfate %	Sulfide %	Sulfur Total %	SO_4/S %	AGP	NP	NNP	NP:AP
												m/g $CaCO_3$			
WRC 5480 019	HS	QM	2	3020	2.66										
WRC 5480 020	HS	QM	2	878	3.96										
WRC 5480 021	HS	QM	2	1009	4.38										
WRC 5480 022	HS	QM	2	1850	2.97										
WRC 5480 023	HS	QM	2	1880	2.64										
WRC 5480 024	HS	QM	1.5	1190	2.71										
WRC 5480 025	LS	QM	1	637	8.6										
WRC 5480 026	LS	QM	1	129	9.65										
WRC 5480 027	HS	QM	2	1580	2.12										
WRC 5480 028	HS	QM	2	964	4.89										
WRC 5480 029	HS	QM	2	580	3.59										
WRC 5480 030	HS	QM	2	258	5.85										
WRC 5580 005	T	QV(Sternberg)pw2	2	19000	3.79										
WRD 4480 010	LS	QM	1	50	6.06										
WRD 5560 020	LS	QM	1	64	6.72										
WRD 5560 027	HS	QM	2	3990	2.56										
WRD 5560 028	HS	QM	2	730	2.95										
WRD 5560 029	HS	QM	2	1552	2.53										
WRD 5560 030	HS	QM	2	321	4.64										
WRD 5560 031	HS	QM	2	282	4.4										
WRD 5560 032	HS	QM	2	620	2.99										
WRD 5560 034	HS	QM	2	201	3.95										
WRD 5560 035	HS	QM	2	833	4.35										
WRD 5560 036	HS	QM	2	171	3.79										
WRD 5560 037	HS	QM	2	164	7.8										
WRD 5560 038	HS	QM	5	54	6.59	18.33	7.92	0.3	1.2	1.5	20.00	47	30.2	-16.8	0.64
WRD 5560 039	HS	QB	6	1848	2.81	72.13	3.92	0.1	2.1	2.2	4.55	70	0.1	-69.9	0.00
WRD 5560 040	HS	QB	3	456	3.97	36.46	2.98								
WRD 5560 041	HS	QB	4	2190	3.31	50.57	4.18	0.3	1.4	1.7	17.65	53	7.6	-45.4	0.14
WRD 5580 001	LS	QM	1	133	4	21.56	2.27	0.3	0.8	1.1	27.27	33	17.8	-15.2	0.54
WRD 5580 002	HS	QM	3	1422	2.77	34.01	6.00								
WRD 5580 004	O	QB			4.82			0.33	0.1	0.34	97.06	11	0.1	-10.9	0.01
WRD 5580 005	LS	QM	2	93	6.72	29.40	5.01								
WRD 5580 006	T	QM	0.5	212	3.2	30.77	5.06								
WRD 5580 007	HS	QB	2	345	3.02	31.07	4.87								
WRD 5580 008	HS	QB	2	230	5.55	29.01	5.15								
WRD 5580 009	HS	QM	2	325	3.14	28.62	5.01								
WRD 5580 011	HS	QM	2	8	5.6	28.03	5.29								
WRD 5580 012	HS	QM	2	305	5.4	29.11	5.1								
WRD 5580 013	HS	BB	7	2860	2.45	47.14	2.09								
WRD 5580 014	HS	BB	4	21	5	31.85	5.27	0.2	1.96	2.16	9.26	73.8	43.7	-30.1	0.59
WRD 5580 015	HS	QB	4	156	4.45	31.16	3.05								
WRD 5580 016	HS	QM	2	45.6	5.72	22.74	4.06								
WRD 5580 017	HS	QM	2	41	5.54	30.48	5.04								

1997 Surface Sample Analyses

Sample	Type	Lithology	Visible sulfide %	EC	Paste pH	NAG kg/T H_2SO_4	NAG pH	Sulfate %	Sulfide %	Sulfur Total %	SO_4/S %	AGP (m/g $CaCO_3$)	NP (m/g $CaCO_3$)	NNP	NP:AP
WRD 5580 018	HS	QM	2	112	6.4	32.93	5.55								
WRD 5580 019	HS	QM	2	42	6.14	19.60	3.91								
WRD 5580 021	HS	QM	2	65	5.87	19.89	3.98								
WRD 5580 022	HS	QM	2	170	5.61	39.79	3.00								
WRD 5580 023	HS	QM	2	103	7.67	21.17	4.63								
WRD 5580 024	HS	QM	1.5	183	5.39	21.56	4.07								
WRD 5580 025	HS	QM	1.5	42	5.74	15.78	2.52								
WRD 5580 026	HS	QM	2	84	6.1	34.79	6.42								
WRD 5580 033	HS	QM	1.5	237	3.82	38.71	7.74								
WRD 5580 042	HS	QB	5	1080	2.35	76.93	2.10	0.15	2.2	2.4	6.25	74	0.1	-73.9	0.00

KEY

Lithology QM= Quartz Monzonite QB= Quartz Breccia BB= Biotite Breccia QV = Quartz Vein AN = Andesite

Visible sulfide (%) = Observed pyrite/sulfide content in hand specimen

Type HS=High Sulfide (>2% visible sulfide) LS= Low Sulfide (<2% visible sulfide) T=Transitional (trace sulfide & acidic paste pH) O=Oxide (no observed sulfide)

NAG (eqkg H2SO4/T)= $\frac{\text{49xVolume of NaOH titrated x molality of NaOH (0.1M)}}{\text{weight of sample (5g)}}$

Copper Flat Project
Static Test on Wall Rock and Drill Core from the Pit Area
1994 Sampling

Sample	Paste PH	Total	Sulfide	Sulfate	NP	AP	NNP	NP/AP
PW-1 SW pitwall transition	6.1	3.61	3.47	0.14	32	108.44	-76.44	0.3
PW-2 Oxidized pitwall	--	0.37	0.365	0.005	11	11.41	-0.41	0.96
PW-3 NW pitwall	2.6	2.2	2.195	0.005	0.1	68.59	-68.49	--
PW-4 NE pitwall	3.9	1.89	1.885	0.005	16	58.91	-42.91	0.27
IDC24-222-241, QM – core	--	1.74	1.735	0.005	31	54.22	-23.22	0.57
CF10-177-190, andesite – core	--	2.86	2.8	0.06	52	87.5	-35.5	0.59
CF10-190-199 QM—core	--	3.59	3.52	0.07	44	110	-66	0.4
CF10-214-220, QM – core	--	3.92	3.915	0.005	65	122.34	-57.34	0.53
H75-53-42, QM - reverse circ.	8.2	1.77	1.765	0.005	36	55.16	-19.16	0.65
H75-64-44, QM - reverse circ.	7.2	1.69	1.685	0.005	39	52.66	-13.66	0.74
H75-51-34, QM - reverse circ.	8.6	2.02	2.015	0.005	49	62.97	-13.97	0.78
H75-48-58, QM - reverse circ.	7.2	1.18	1.175	0.005	16	36.72	-20.72	0.44
H75-48-44, QM - reverse circ.	7.4	1.06	1.055	0.005	9	32.97	-23.97	0.27

SOURCE: *Copper Flat Mine - Compliation of Pit Lake Studies (SRK 1997)*

APPENDIX A.3

HUMIDITY COLUMN TEST DATA

IDC-24-222-241 - Kinetic Test Data

Parameter	Cycle 1	Cycle 2	Cycle 3	Cycle 4	Cycle 5	Cycle 6	Cycle 7	Cycle 8	Cycle 9	Cycle 10	Cycle 11	Cycle 12	Cycle 13	Cycle 14	Cycle 15
Ag ug/l	1.	4.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
Al mg/l	0.03	0.05	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
As ug/l	30.	30.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.
B ug/l	50.	50.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.
Ba ug/l	75.	60.	30.	15.	35.	45.	35.	40.	40.	45.	40.	45.	35.	35.	15.
Be ug/l	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
Bi ug/l	6.	26.	2.	2.	2.	2.	2.	2.	2.	2.	2.	6.	2.	2.	2.
Ca mg/l	30.48	23.76	18.11	12.95	18.44	15.01	13.24	13.16	13.42	15.01	13.19	15.92	13.85	11.87	5.47
Cd ug/l	1.	2.	1.	1.	3.	1.	1.	3.	1.	1.	1.	1.	1.	1.	1.
Co ug/l	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.
Cr ug/l	5.	20.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.
Cu ug/l	14.	16.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.
Fe mg/l	0.04	0.06	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
K mg/l	1.56	1.47	0.65	0.13	0.47	0.61	0.12	0.79	0.9	0.22	0.68	0.94	0.34	0.75	0.18
Li ug/l	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.
Mg mg/l	1.26	1.04	0.59	0.36	0.58	0.42	0.39	0.39	0.37	0.34	0.52	0.65	0.48	0.48	0.18
Mn mg/l	0.07	0.03	0.02	0.02	0.035	0.03	0.025	0.025	0.025	0.02	0.015	0.02	0.015	0.01	0.005
Mo ug/l	6.	4.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	4.
Na mg/l	5.24	4.63	2.19	1.26	2.38	1.79	1.65	1.82	1.27	1.57	2.34	2.98	2.05	2.12	0.52
Ni ug/l	10.	15.	10.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	10.
P ug/l	40.	110.	10.	10.	10.	10.	30.	10.	10.	10.	10.	10.	10.	30.	10.
Pb ug/l	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	8.	10.	2.	2.	2.
Sb ug/l	10.	34.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	4.	2.
Se ug/l	85.	150.	5.	5.	5.	5.	50.	25.	15.	15.	30.	40.	5.	30.	15.
Si mg/l	0.87	0.6	0.53	0.3	0.6	0.39	0.51	0.52	0.5	0.53	0.56	0.73	0.48	0.57	0.28
Sn ug/l	100.	174.	2.	2.	2.	2.	2.	2.	6.	22.	46.	2.	2.	80.	2.
Sr ug/l	124.	104.	50.	28.	44.	32.	32.	34.	34.	32.	34.	46.	36.	34.	18.
Ti ug/l	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.
V ug/l	2.	5.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
Zn ug/l	28.	25.	12.	3.	9.	20.	11.	16.	1.	1.	2.	6.	8.	5.	9.
pH	7.73	7.8	7.55	7.4	7.85	7.64	7.52	7.53	7.54	7.59	7.61	7.63	7.72	7.51	7.16
Redox (mV)	300.	289.	307.	321.	295.	311.	318.	321.	341.	287.	272.	264.	265.	265.	296.
Conductivity (uS/cm)	132.	104.	70.	45.	69.	53.	45.	42.	41.	46.	50.	63.	49.	44.	19.
Alkalinity (mg $CaCO_3$/l)	43.	31.	24.	17.	26.	18.	16.	17.	17.	20.	19.	26.	19.	16.	10.
Acidity (pH 4.5)	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Acidity (pH 8.3)	1.	2.	2.	2.	1.	1.	2.	1.	1.	2.	1.	2.9	2.	2.	3.
Cum Acidity (pH 8.3)	0.1	0.1	0.2	0.3	0.3	0.4	0.5	0.5	0.6	0.7	0.7	0.9	1.	1.1	1.2
Sulphate (mg/l)	9.	9.	5.	6.	8.	6.	5.	4.	4.	4.	5.	4.	3.	4.	2.
Cum Sulphate (mg/kg)	0.5	0.8	1.	1.2	1.6	1.9	2.2	2.4	2.6	2.8	3.	3.2	3.4	3.6	3.7
Water added (L)	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
pH of water added	5.45	6.26	5.98	5.59	6.15	6.03	5.83	5.98	6.15	6.05	5.96	6.04	6.06	6.56	6.23
Leachate collected (L)	0.214	0.144	0.184	0.148	0.188	0.218	0.169	0.23	0.188	0.231	0.189	0.191	0.212	0.21	0.194
Cumulative Iron	0.04	0.1	0.11	0.12	0.13	0.14	0.15	0.16	0.17	0.18	0.19	0.2	0.21	0.22	0.23
Cumulative Copper	14.	30.	32.	34.	36.	38.	40.	42.	44.	46.	48.	50.	52.	54.	56.

IDC-24-222-241 - Kinetic Test Data

Parameter	Cycle 16	Cycle 17	Cycle 18	Cycle 19	Cycle 20	Cycle 21	Cycle 22	Cycle 23	Cycle 24	Cycle 25	Cycle 26	Cycle 27	Cycle 28	Cycle 29
Ag ug/l	<0.015	<0.015	<0.015	<0.015	<0.015								<0.015	<0.015
Al mg/l	<0.20	<0.20	<0.20	<0.20	<0.20								<0.20	<0.20
As ug/l	<0.20	<0.20	<0.20	<0.20	<0.20								<0.20	<0.20
B ug/l	<0.10	<0.10	<0.10	<0.10	<0.10								<0.10	<0.10
Ba ug/l	0.014	0.022	0.018	0.046	0.033								0.061	0.057
Be ug/l	<0.005	<0.005	<0.005	<0.005	<0.005								<0.005	<0.005
Bi ug/l	<0.10	<0.1	<0.1	<0.1	<0.1								<0.1	<0.1
Ca mg/l	1.5	2.75	2.2	4.49	2.7								6.21	8.
Cd ug/l	<0.010	<0.010	<0.010	<0.010	<0.010								<0.010	<0.010
Co ug/l	<0.015	<0.015	<0.015	<0.015	<0.015								<0.015	<0.015
Cr ug/l	<0.015	<0.015	<0.015	<0.015	<0.015								<0.015	<0.015
Cu ug/l	<0.010	<0.010	<0.010	<0.010	<0.010								<0.010	<0.010
Fe mg/l	<0.030	<0.030	<0.030	<0.030	<0.030								<0.030	<0.030
K mg/l	<2.0	<2.0	<2.0	<2.0	<2.0								<2.0	<2.0
Li ug/l	<0.015	<0.015	<0.015	<0.015	<0.015								<0.015	<0.015
Mg mg/l	0.091	0.12	0.12	0.323	0.16								0.453	0.621
Mn mg/l	0.008	0.005	0.005	0.007	<0.005								0.016	0.012
Mo ug/l	<0.030	<0.030	<0.030	<0.030	<0.030								<0.030	<0.030
Na mg/l	<2.0	<2.0	<2.0	<2.0	<2.0								<2.0	<2.0
Ni ug/l	<0.020	<0.020	<0.020	<0.020	<0.020								<0.020	<0.020
P ug/l	<0.30	<0.30	<0.30	<0.30	<0.30								<0.30	<0.30
Pb ug/l	<0.050	<0.050	<0.050	<0.050	<0.050								<0.050	<0.050
Sb ug/l	<0.20	<0.20	<0.20	<0.20	<0.20								<0.20	<0.20
Se ug/l	<0.20	<0.20	<0.20	<0.20	<0.20								<0.20	<0.20
Si mg/l	0.143	0.207	0.171	0.377	0.231								0.432	0.596
Sn ug/l	<0.30	<0.30	<0.30	<0.30	<0.30								<0.30	<0.30
Sr ug/l	0.011	0.016	0.015	0.03	0.022								0.04	0.053
Ti ug/l	<0.010	<0.010	<0.010	<0.010	<0.010								<0.010	<0.010
V ug/l	<0.030	<0.030	<0.030	<0.030	<0.030								<0.030	<0.030
Zn ug/l	0.01	0.006	0.009	0.012	0.015								0.022	0.024
pH	7.08	7.29	7.23	7.4	6.64								7.59	7.69
Redox (mV)	304.	284.	295.	288.	281.								291.	293.
Conductivity (uS/cm)	10.	16.	15.	32.	19.								45.	58.
Alkalinity (mg $CaCO_3$/l)	6.	10.	7.	12.	8.								16.	20.
Acidity (pH 4.5)	0.	0.	0.	0.	0.								0.	0.
Acidity (pH 8.3)	5.	5.	6.	3.	6.								5.9	6.9
Cum Acidity (pH 8.3)	1.4	1.6	1.9	2.1	2.4								2.6	3.
Sulphate (mg/l)	2.	2.	2.	4.	3.								4.	4.
Cum Sulphate (mg/kg)	3.8	3.9	3.9	4.1	4.3								4.5	4.7
Water added (L)	0.2	0.2	0.2	0.2	0.2								0.2	0.2
pH of water added	5.92	5.57	5.66	6.09	5.23								5.93	5.7
Leachate collected (L)	0.151	0.175	0.198	0.181	0.205								0.185	0.216
Cumulative Iron	0.23	0.23	0.23	0.23	0.23								0.23	0.23
Cumulative Copper	56.	56.	56.	56.	56.								56.	56.

Laboratory Equipment Failure
Weeks 21-27
No Samples Collected

LGSSP-2 - Kinetic Test Data

Parameter	Cycle 1	Cycle 2	Cycle 3	Cycle 4	Cycle 5	Cycle 6	Cycle 7	Cycle 8	Cycle 9	Cycle 10	Cycle 11	Cycle 12	Cycle 13	Cycle 14	Cycle 15
Ag ug/l	7.	6.	1.	1.	1.	1.	1.	1.	1.	1.	2.	1.	1.	1.	1.
Al mg/l	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
As ug/l	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.
B ug/l	60.	70.	40.	30.	10.	10.	30.	10.	10.	10.	10.	10.	10.	10.	10.
Ba ug/l	200.	105.	60.	55.	60.	40.	70.	75.	50.	90.	80.	60.	60.	75.	45.
Be ug/l	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
Bi ug/l	6.	26.	2.	2.	2.	2.	2.	2.	2.	2.	8.	2.	2.	2.	2.
Ca mg/l	155.59	115.41	85.41	76.19	55.92	41.91	51.46	44.1	38.78	54.5	52.94	37.69	45.46	51.56	32.69
Cd ug/l	18.	13.	5.	1.	5.	1.	3.	5.	1.	1.	6.	1.	7.	1.	1.
Co ug/l	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.
Cr ug/l	20.	25.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.
Cu ug/l	82.	54.	28.	26.	16.	18.	34.	16.	14.	12.	10.	6.	10.	10.	6.
Fe mg/l	0.41	0.28	0.04	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.08	0.01	0.01	0.01	0.01
K mg/l	7.07	7.1	7.65	7.2	4.99	4.56	5.84	4.95	4.58	4.64	5.79	4.85	5.52	6.79	4.62
Li ug/l	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.
Mg mg/l	16.36	11.17	8.56	7.12	4.48	2.92	4.14	3.22	2.68	4.25	4.34	2.58	3.58	4.32	2.2
Mn mg/l	0.04	0.035	0.02	0.01	0.03	0.015	0.01	0.015	0.005	0.01	0.015	0.01	0.005	0.005	0.005
Mo ug/l	242.	308.	288.	282.	176.	122.	140.	96.	74.	126.	126.	60.	90.	98.	66.
Na mg/l	7.5	7.94	7.2	6.55	3.88	2.91	3.15	2.04	1.79	2.48	2.69	1.54	2.31	2.5	1.63
Ni ug/l	5.	15.	10.	5.	5.	5.	5.	5.	5.	5.	10.	5.	5.	5.	5.
P ug/l	230.	270.	300.	340.	220.	200.	240.	190.	120.	200.	220.	180.	200.	270.	150.
Pb ug/l	32.	20.	2.	2.	2.	2.	2.	2.	2.	2.	2.	6.	12.	2.	2.
Sb ug/l	18.	22.	2.	2.	2.	2.	2.	2.	2.	2.	10.	2.	2.	2.	2.
Se ug/l	530.	405.	285.	245.	125.	30.	210.	145.	160.	225.	170.	110.	125.	115.	70.
Si mg/l	5.53	6.71	7.61	8.57	6.18	7.08	7.17	5.79	6.24	5.6	5.38	4.81	5.66	5.39	5.
Sn ug/l	574.	508.	2.	2.	2.	2.	26.	92.	60.	64.	90.	44.	44.	52.	2.
Sr ug/l	1,018.	680.	492.	418.	270.	178.	252.	204.	168.	262.	234.	142.	216.	224.	126.
Tl ug/l	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.
V ug/l	11.	10.	5.	4.	2.	1.	4.	1.	1.	1.	6.	3.	2.	2.	2.
Zn ug/l	28.	14.	12.	13.	6.	17.	13.	14.	1.	1.	1.	1.	9.	1.	3.
pH	8.07	8.1	8.09	8.16	8.11	8.13	8.13	8.05	8.21	8.03	8.04	8.01	8.07	7.96	8.02
Redox (mV)	325.	306.	318.	330.	310.	322.	335.	337.	344.	294.	281.	271.	268.	269.	296.
Conductivity (uS/cm)	979.	690.	533.	448.	308.	196.	261.	204.	170.	264.	279.	170.	226.	267.	151.
Alkalinity (mg $CaCO_3$/l)	53.	54.	58.	64.	54.	53.	58.	49.	54.	50.	51.	41.	54.	48.	49.
Acidity (pH 4.5)	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Acidity (pH 8.3)	1.	1.	1.	1.	1.	1.	1.	1.	0.5	1.	1.	1.	1.	1.	1.
Cum Acidity (pH 8.3)	0.	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.3	0.3	0.3	0.4	0.4	0.5	0.5
Sulphate (mg/l)	432.	243.	155.	141.	82.	29.	64.	49.	21.	69.	69.	30.	48.	72.	16.
Cum Sulphate (mg/kg)	10.4	17.5	22.6	25.9	28.7	29.6	32.	33.6	34.2	36.8	39.5	40.5	42.3	45.7	46.2
Water added (L)	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
pH of water added	5.45	6.26	5.98	5.59	6.15	6.03	5.83	5.98	6.15	6.05	5.96	6.04	6.06	6.56	6.23
Leachate collected (L)	0.102	0.122	0.139	0.101	0.144	0.119	0.162	0.138	0.112	0.158	0.165	0.153	0.158	0.198	0.127
Cumulative Iron	0.41	0.69	0.73	0.74	0.75	0.76	0.77	0.78	0.79	0.8	0.88	0.89	0.9	0.91	0.92
Cumulative Copper	82.	136.	164.	190.	206.	224.	258.	274.	288.	300.	310.	316.	326.	336.	342.

LGSSP-2 - Kinetic Test Data

Parameter	Cycle 16	Cycle 17	Cycle 18	Cycle 19	Cycle 20	Cycle 21	Cycle 22	Cycle 23	Cycle 24	Cycle 25	Cycle 26	Cycle 27	Cycle 28	Cycle 29
Ag ug/l	<0.015	<0.015	<0.015	<0.015	<0.015								<0.015	<0.015
Al mg/l	<0.20	<0.20	<0.20	<0.20	<0.20								<0.20	<0.20
As ug/l	<0.20	<0.20	<0.20	<0.20	<0.20								<0.20	<0.20
B ug/l	<0.10	<0.10	<0.10	<0.10	<0.10								<0.10	<0.10
Ba ug/l	0.058	0.048	0.037	0.038	0.044								0.101	0.084
Be ug/l	<0.005	<0.005	<0.005	<0.005	<0.005								<0.005	<0.005
Bi ug/l	<0.10	<0.10	<0.10	<0.10	<0.10								<0.10	<0.10
Ca mg/l	27.3	22.4	16.4	17.	14.6								66.2	65.3
Cd ug/l	<0.010	<0.010	<0.010	<0.010	<0.010								<0.010	<0.010
Co ug/l	<0.015	<0.015	<0.015	<0.015	<0.015								<0.015	<0.015
Cr ug/l	<0.015	<0.015	<0.015	<0.015	<0.015								<0.015	<0.015
Cu ug/l	0.019	0.016	0.011	0.011	<0.010								0.014	0.018
Fe mg/l	<0.030	<0.030	<0.030	<0.030	<0.030								<0.030	<0.030
K mg/l	4.	3.4	2.2	2.8	<2.0								4.4	4.2
Li ug/l	<0.015	<0.015	<0.015	<0.015	<0.015								<0.015	<0.015
Mg mg/l	2.7	2.11	1.49	1.55	1.29								6.2	6.19
Mn mg/l	<0.005	<0.005	<0.005	<0.005	<0.005								<0.005	<0.005
Mo ug/l	0.066	0.041	<0.030	0.03	<0.030								0.065	0.093
Na mg/l	<2.0	<2.0	<2.0	<2.0	<2.0								<2.0	<2.0
Ni ug/l	<0.020	<0.020	<0.020	<0.020	<0.020								<0.020	<0.020
P ug/l	<0.30	<0.30	<0.30	<0.30	<0.30								<0.30	<0.30
Pb ug/l	<0.050	<0.050	<0.050	<0.050	<0.050								<0.050	<0.050
Sb ug/l	<0.20	<0.20	<0.20	<0.20	<0.20								<0.20	<0.20
Se ug/l	<0.20	<0.20	<0.20	<0.20	<0.20								<0.20	<0.20
Si mg/l	5.55	4.58	3.18	3.22	2.26								4.12	5.03
Sn ug/l	<0.30	<0.30	<0.30	<0.30	<0.30								<0.30	<0.30
Sr ug/l	0.179	0.14	0.104	0.108	0.093								0.409	0.393
Ti ug/l	<0.010	<0.010	<0.010	<0.010	<0.010								<0.010	<0.010
V ug/l	<0.030	<0.030	<0.030	<0.030	<0.030								<0.030	<0.030
Zn ug/l	0.005	0.009	<0.005	<0.005	<0.005								0.008	0.005
pH	8.12	8.09	8.01	7.92	7.22								7.9	7.96
Redox (mV)	288.	298.	294.	290.	280.								313.	296.
Conductivity (uS/cm)	177.	138.	104.	109.	93.								402.	384.
Alkalinity (mg $CaCO_3$/l)	57.	48.	34.	38.	30.								36.	49.
Acidity (pH 4.5)	0.	0.	0.	0.	0.								0.	0.
Acidity (pH 8.3)	1.	1.	2.	2.	3.								3.	2.
Cum Acidity (pH 8.3)	0.5	0.5	0.6	0.7	0.8								1.	1.
Sulphate (mg/l)	20.	10.	11.	11.	8.								139.	124.
Cum Sulphate (mg/kg)	46.8	47.1	47.5	47.9	48.3								54.4	59.3
Water added (L)	0.2	0.2	0.2	0.2	0.2								0.2	0.2
pH of water added	5.92	5.57	5.66	6.09	5.23								5.93	5.7
Leachate collected (L)	0.127	0.131	0.16	0.158	0.203								0.183	0.67
Cumulative Iron	0.92	0.92	0.92	0.92	0.92								0.92	0.92
Cumulative Copper	342.	342.	342.	342.	342.								342.	342.

Laboratory Equipment Failure
Weeks 21-27
No Samples Collected

C10-190-199-2 - Kinetic Test Data

Parameter	Cycle 1	Cycle 2	Cycle 3	Cycle 4	Cycle 5	Cycle 6	Cycle 7	Cycle 8	Cycle 9	Cycle 10	Cycle 11	Cycle 12	Cycle 13	Cycle 14	Cycle 15
Ag ug/l	5.	5.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
Al mg/l	0.01	0.04	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
As ug/l	10.	30.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.
B ug/l	50.	30.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.
Ba ug/l	50.	30.	45.	35.	15.	25.	15.	15.	15.	25.	20.	35.	35.	15.	30.
Be ug/l	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
Bi ug/l	6.	16.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	8.
Ca mg/l	48.27	40.54	43.47	34.16	32.33	30.47	23.86	25.61	19.7	22.26	20.91	23.92	22.28	18.03	22.24
Cd ug/l	3.	8.	2.	1.	1.	3.	3.	3.	1.	1.	1.	1.	4.	4.	3.
Co ug/l	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.
Cr ug/l	10.	15.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.
Cu ug/l	52.	34.	24.	20.	14.	10.	8.	8.	6.	4.	2.	2.	4.	4.	2.
Fe mg/l	0.05	0.11	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
K mg/l	3.95	3.56	4.39	2.98	2.07	1.51	2.13	2.16	1.36	0.77	1.5	1.78	1.35	1.31	2.1
Li ug/l	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.
Mg mg/l	4.25	3.86	4.68	3.49	3.06	2.59	2.22	2.35	1.47	1.79	1.83	2.5	2.3	2.04	2.4
Mn mg/l	0.11	0.065	0.05	0.035	0.045	0.04	0.035	0.035	0.025	0.025	0.025	0.025	0.025	0.02	0.03
Mo ug/l	10.	12.	6.	4.	6.	2.	2.	2.	2.	2.	2.	4.	2.	4.	4.
Na mg/l	3.83	4.18	4.35	3.16	2.22	2.01	1.98	1.78	1.24	1.01	1.09	1.82	1.61	1.66	1.87
Ni ug/l	5.	10.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.
P ug/l	60.	100.	10.	30.	10.	10.	10.	30.	10.	10.	10.	10.	10.	10.	20.
Pb ug/l	6.	22.	2.	2.	2.	2.	2.	2.	2.	2.	6.	2.	2.	2.	4.
Sb ug/l	14.	22.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.
Se ug/l	205.	200.	80.	75.	40.	5.	50.	95.	95.	75.	15.	70.	10.	35.	60.
Si mg/l	0.85	0.7	1.02	0.82	0.71	0.78	0.9	0.81	0.57	0.53	0.5	0.66	0.3	0.41	0.74
Sn ug/l	66.	316.	2.	2.	148.	2.	18.	66.	24.	50.	2.	2.	8.	58.	2.
Sr ug/l	372.	320.	324.	244.	194.	184.	136.	150.	100.	110.	94.	132.	120.	80.	140.
Tl ug/l	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.
V ug/l	5.	6.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	2.
Zn ug/l	31.	29.	21.	16.	13.	13.	14.	8.	1.	1.	10.	30.	19.	17.	36.
pH	8.07	7.91	7.9	7.37	7.75	7.8	7.66	7.4	7.78	7.57	7.55	7.45	7.03	7.04	7.45
Redox (mV)	306.	297.	315.	327.	303.	320.	326.	329.	346.	292.	279.	276.	277.	281.	304.
Conductivity (uS/cm)	259.	225.	253.	181.	165.	142.	112.	114.	77.	89.	90.	114.	103.	86.	107.
Alkalinity (mg $CaCO_3$/l)	43.	30.	32.	22.	19.	25.	20.	21.	19.	17.	15.	15.	11.	10.	16.
Acidity (pH 4.5)	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Acidity (pH 8.3)	1.	1.	1.	2.	1.	1.	2.	2.	0.5	2.	1.	2.	2.	2.	2.
Cum Acidity (pH 8.3)	0.	0.1	0.1	0.2	0.2	0.3	0.3	0.4	0.4	0.5	0.6	0.7	0.8	0.9	0.9
Sulphate (mg/l)	65.	58.	70.	57.	51.	33.	25.	26.	12.	17.	20.	30.	27.	20.	22.
Cum Sulphate (mg/kg)	3.2	5.5	7.8	9.5	12.	13.4	14.2	15.4	15.9	16.7	17.6	19.	20.3	21.2	22.1
Water added (L)	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
pH of water added	5.45	6.26	5.98	5.59	6.15	6.03	5.83	5.98	6.15	6.05	5.96	6.04	6.06	6.56	6.23
Leachate collected (L)	0.228	0.175	0.149	0.139	0.224	0.19	0.158	0.198	0.195	0.219	0.215	0.208	0.219	0.206	0.194
Cumulative Iron	0.05	0.16	0.17	0.18	0.19	0.2	0.21	0.22	0.23	0.24	0.25	0.26	0.27	0.28	0.29
Cumulative Copper	52.	86.	110.	130.	144.	154.	162.	170.	176.	180.	182.	184.	188.	192.	194.

C10-190-199-2 - Kinetic Test Data

Parameter	Cycle 16	Cycle 17	Cycle 18	Cycle 19	Cycle 20	Cycle 21	Cycle 22	Cycle 23	Cycle 24	Cycle 25	Cycle 26	Cycle 27	Cycle 28	Cycle 29
Ag ug/l	<0.015	<0.015	<0.015	<0.015	<0.015								<0.015	<0.015
Al mg/l	<0.20	<0.20	<0.20	<0.20	<0.20								<0.20	<0.20
As ug/l	<0.20	<0.20	<0.20	<0.20	<0.20								<0.20	<0.20
B ug/l	<0.10	<0.10	<0.10	<0.10	<0.10								<0.10	<0.10
Ba ug/l	0.026	0.022	0.013	0.011	0.023								0.096	0.066
Be ug/l	<0.005	<0.005	<0.005	<0.005	<0.005								<0.005	<0.005
Bi ug/l	<0.10	<0.10	<0.10	<0.10	<0.10								<0.10	<0.10
Ca mg/l	11.8	10.8	4.76	3.15	14.3								45.3	50.7
Cd ug/l	<0.010	<0.010	<0.010	<0.010	<0.010								<0.010	<0.010
Co ug/l	<0.015	<0.015	<0.015	<0.015	<0.015								<0.015	<0.015
Cr ug/l	<0.015	<0.015	<0.015	<0.015	<0.015								<0.015	<0.015
Cu ug/l	0.017	0.015	0.012	0.015	0.016								0.036	0.034
Fe mg/l	<0.030	<0.030	<0.030	<0.030	<0.030								<0.030	<0.030
K mg/l	<2.0	<2.0	<2.0	<2.0	<2.0								<2.0	<2.0
Li ug/l	<0.015	<0.015	<0.015	<0.015	<0.015								<0.015	<0.015
Mg mg/l	2.05	1.75	0.749	0.456	1.48								6.05	7.52
Mn mg/l	0.032	0.029	0.013	0.012	0.035								0.083	0.089
Mo ug/l	<0.030	<0.030	<0.030	<0.030	<0.030								<0.030	<0.030
Na mg/l	<2.0	<2.0	<2.0	<2.0	<2.0								<2.0	<2.0
Ni ug/l	<0.020	<0.020	<0.020	<0.020	<0.020								<0.020	<0.020
P ug/l	<0.30	<0.30	<0.30	<0.30	<0.30								<0.30	<0.30
Pb ug/l	<0.050	<0.050	<0.050	<0.050	<0.050								<0.050	<0.050
Sb ug/l	<0.20	<0.20	<0.20	<0.20	<0.20								<0.20	<0.20
Se ug/l	<0.20	<0.20	<0.20	<0.20	<0.20								<0.20	<0.20
Si mg/l	0.541	0.547	0.275	0.169	0.346								0.614	0.679
Sn ug/l	<0.30	<0.30	<0.30	<0.30	<0.30								<0.30	<0.30
Sr ug/l	0.131	0.108	0.047	0.03	0.112								0.393	0.427
Ti ug/l	<0.010	<0.010	<0.010	<0.010	<0.010								<0.010	<0.010
V ug/l	<0.030	<0.030	<0.030	<0.030	<0.030								<0.030	<0.030
Zn ug/l	0.02	0.02	0.016	0.015	0.041								0.078	0.058
pH	7.52	7.64	7.27	6.87	6.66								7.49	7.41
Redox (mV)	309.	290.	301.	297.	290.								320.	307.
Conductivity (uS/cm)	95.	80.	37.	26.	104.								309.	335.
Alkalinity (mg $CaCO_3$/l)	15.	15.	8.	5.	8.								14.	15.
Acidity (pH 4.5)	0.	0.	0.	0.	0.								0.	0.
Acidity (pH 8.3)	3.	6.	2.	4.	4.								6.9	8.9
Cum Acidity (pH 8.3)	1.1	1.3	1.4	1.6	1.8								2.1	2.5
Sulphate (mg/l)	19.	14.	7.	6.	28.								118.	124.
Cum Sulphate (mg/kg)	22.9	23.5	23.8	24.1	25.3								30.2	35.5
Water added (L)	0.2	0.2	0.2	0.2	0.2								0.2	0.2
pH of water added	5.92	5.57	5.66	6.09	5.23								5.93	5.7
Leachate collected (L)	0.177	0.205	0.194	0.219	0.197								0.188	0.198
Cumulative Iron	0.29	0.29	0.29	0.29	0.29								0.29	0.29
Cumulative Copper	194.	194.	194.	194.	194.								194.	194.

Laboratory Equipment Failure
Weeks 21-27
No Samples Collected

Sample SW-1 - Kinetic Test Data

Parameter	Cycle 1	Cycle 2	Cycle 3	Cycle 4	Cycle 5	Cycle 6	Cycle 7	Cycle 8	Cycle 9	Cycle 10	Cycle 11	Cycle 12	Cycle 13	Cycle 14	Cycle 15
Ag ug/l	2.	4.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
Al mg/l	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
As ug/l	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.
B ug/l	20.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.
Ba ug/l	50.	30.	20.	20.	10.	10.	20.	25.	25.	15.	20.	25.	15.	20.	15.
Be ug/l	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
Bi ug/l	6.	6.	2.	2.	2.	2.	2.	2.	2.	2.	8.	2.	2.	2.	2.
Ca mg/l	53.15	45.51	34.83	36.28	31.01	23.67	23.36	24.87	30.06	23.22	23.31	30.56	20.57	22.22	17.45
Cd ug/l	2.	2.	1.	1.	1.	1.	7.	1.	1.	1.	4.	5.	1.	1.	5.
Co ug/l	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.
Cr ug/l	15.	15.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.
Cu ug/l	26.	16.	10.	12.	6.	2.	2.	2.	6.	2.	2.	2.	2.	2.	2.
Fe mg/l	0.08	0.08	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
K mg/l	2.98	2.71	2.19	2.94	2.35	1.69	1.41	1.07	2.17	0.15	1.7	2.14	1.98	1.47	1.28
Li ug/l	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.
Mg mg/l	4.46	3.72	2.5	2.78	2.19	1.24	1.38	1.49	2.02	1.32	1.42	2.38	1.26	1.37	1.02
Mn mg/l	0.04	0.015	0.01	0.015	0.01	0.005	0.005	0.005	0.015	0.005	0.005	0.005	0.005	0.005	0.005
Mo ug/l	102.	84.	50.	62.	44.	26.	22.	32.	32.	14.	32.	32.	10.	26.	20.
Na mg/l	1.57	1.17	0.82	1.01	0.79	0.28	0.47	0.43	0.66	0.36	0.43	0.7	0.41	0.52	0.34
Ni ug/l	10.	10.	5.	10.	5.	5.	5.	5.	5.	5.	5.	15.	5.	5.	5.
P ug/l	120.	140.	40.	150.	100.	90.	180.	140.	130.	100.	140.	180.	50.	140.	80.
Pb ug/l	4.	8.	2.	2.	2.	2.	2.	2.	2.	2.	6.	2.	4.	2.	12.
Sb ug/l	14.	20.	2.	2.	2.	2.	2.	2.	2.	2.	6.	2.	2.	60.	2.
Se ug/l	210.	155.	65.	110.	25.	5.	80.	45.	80.	40.	70.	85.	20.	2.06	35.
Si mg/l	3.69	3.95	3.56	4.88	4.05	1.99	2.6	1.99	3.74	2.51	2.31	2.82	1.93	2.	1.98
Sn ug/l	300.	376.	2.	2.	2.	2.	80.	2.	44.	12.	2.	8.	50.	60.	2.
Sr ug/l	194.	166.	104.	110.	82.	56.	62.	68.	88.	56.	60.	78.	48.	2.	38.
Ti ug/l	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.
V ug/l	5.	6.	1.	1.	1.	1.	1.	1.	1.	1.	2.	1.	1.	1.	1.
Zn ug/l	27.	9.	7.	7.	4.	8.	4.	9.	1.	1.	7.	3.	11.	1.	4.
pH	7.65	7.73	7.87	7.91	8.04	7.65	7.69	7.66	8.	7.78	7.85	7.75	7.62	7.74	7.54
Redox (mV)	287.	265.	280.	305.	296.	302.	320.	317.	309.	260.	251.	241.	233.	233.	278.
Conductivity (uS/cm)	266.	231.	167.	174.	144.	95.	92.	105.	125.	84.	94.	138.	78.	84.	65.
Alkalinity (mg $CaCO_3$/l)	34.	29.	27.	37.	35.	21.	23.	18.	34.	26.	26.	26.	20.	22.	14.
Acidity (pH 4.5)	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Acidity (pH 8.3)	0.5	2.	1.	2.	1.	0.5	2.	1.	1.	1.	1.	2.	2.	2.	4.
Cum Acidity (pH 8.3)	0.	0.1	0.2	0.2	0.2	0.2	0.3	0.3	0.4	0.4	0.5	0.6	0.6	0.7	0.9
Sulphate (mg/l)	77.	60.	32.	30.	24.	12.	11.	20.	14.	8.	11.	25.	8.	9.	6.
Cum Sulphate (mg/kg)	3.9	6.7	8.2	8.2	8.2	8.8	9.3	10.3	10.7	11.1	11.6	12.9	13.2	13.6	13.9
Water added (L)	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
pH of water added	5.45	6.26	5.98	5.59	6.15	6.03	5.83	5.98	6.15	6.05	5.96	6.04	6.06	6.56	6.23
Leachate collected (L)	0.166	0.207	0.157	0.128	0.181	0.168	0.188	0.194	0.162	0.209	0.198	0.206	0.179	0.186	0.206
Cumulative Iron	0.08	0.16	0.17	0.18	0.19	0.2	0.21	0.22	0.23	0.24	0.25	0.26	0.27	0.28	0.29
Cumulative Copper	26.	42.	52.	64.	70.	72.	74.	76.	82.	84.	86.	88.	90.	92.	94.

Sample SW-1 - Kinetic Test Data

Parameter	Cycle 16	Cycle 17	Cycle 18	Cycle 19	Cycle 20	Cycle 21	Cycle 22	Cycle 23	Cycle 24	Cycle 25	Cycle 26	Cycle 27	Cycle 28	Cycle 29
Ag ug/l	<0.015	<0.015	<0.015	<0.015	<0.015								<0.015	<0.015
Al mg/l	<0.20	<0.20	<0.20	<0.20	<0.20								<0.20	<0.20
As ug/l	<0.20	<0.20	<0.20	<0.20	<0.20								<0.20	<0.20
B ug/l	<0.10	<0.10	<0.10	<0.10	<0.10								<0.10	<0.10
Ba ug/l	0.018	0.014	<0.010	0.012	0.013								0.021	0.021
Be ug/l	<0.005	<0.005	<0.005	<0.005	<0.005								<0.005	<0.005
Bi ug/l	<0.10	<0.10	<0.10	<0.10	<0.10								<0.10	<0.10
Ca mg/l	10.9	8.36	6.44	7.72	4.2								7.65	7.26
Cd ug/l	<0.010	<0.010	<0.010	<0.010	<0.010								<0.010	<0.010
Co ug/l	<0.015	<0.015	<0.015	<0.015	<0.015								<0.015	<0.015
Cr ug/l	<0.015	<0.015	<0.015	<0.015	<0.015								<0.015	<0.015
Cu ug/l	0.011	<0.010	<0.010	0.01	<0.010								0.011	0.012
Fe mg/l	<0.030	<0.031	<0.032	<0.033	<0.034								<0.035	<0.036
K mg/l	<2.0	<2.1	<2.2	<2.3	<2.4								<2.5	<2.6
Li ug/l	<0.015	<0.016	<0.017	<0.018	<0.019								<0.020	<0.021
Mg mg/l	1.14	0.766	0.636	0.782	0.414								0.851	0.775
Mn mg/l	<0.005	<0.005	0.005	0.006	0.007								0.022	0.013
Mo ug/l	<0.030	<0.031	<0.032	<0.033	<0.034								<0.035	<0.036
Na mg/l	<2.0	<2.1	<2.2	<2.3	<2.4								<2.5	<2.6
Ni ug/l	<0.020	<0.020	<0.020	<0.020	<0.020								<0.020	<0.020
P ug/l	<0.30	<0.30	<0.30	<0.30	<0.30								<0.30	<0.30
Pb ug/l	<0.050	<0.050	<0.050	<0.050	<0.050								<0.050	<0.050
Sb ug/l	<0.20	<0.20	<0.20	<0.20	<0.20								<0.20	<0.20
Se ug/l	<0.20	<0.20	<0.20	<0.20	<0.20								<0.20	<0.20
Si mg/l	1.99	1.33	1.25	1.38	0.705								0.581	0.928
Sn ug/l	<0.30	<0.31	<0.32	<0.33	<0.34								<0.35	<0.36
Sr ug/l	0.055	0.044	0.034	0.039	0.026								0.037	0.035
Ti ug/l	<0.010	<0.010	<0.010	<0.010	<0.010								<0.010	<0.010
V ug/l	<0.030	<0.030	<0.030	<0.030	<0.030								<0.030	<0.030
Zn ug/l	0.006	0.005	0.007	0.008	0.011								0.026	0.014
pH	7.79	7.64	7.55	7.44	6.54								7.2	7.32
Redox (mV)	261.	280.	283.	274.	260.								298.	277.
Conductivity (uS/cm)	73.	53.	40.	51.	27.								55.	49.
Alkalinity (mg $CaCO_3$/l)	13.	13.	16.	15.	9.								4.	4.
Acidity (pH 4.5)	0.													
Acidity (pH 8.3)	3.	3.	5.	5.	5.								10.9	11.9
Cum Acidity (pH 8.3)	1.	1.2	1.4	1.6	1.9								2.3	3.
Sulphate (mg/l)	5.	4.	4.	6.	4.								11.	6.
Cum Sulphate (mg/kg)	14.1	14.3	14.5	14.7	14.9								15.4	15.7
Water added (L)	0.2	0.2	0.2	0.2	0.2								0.2	0.2
pH of water added	5.92	5.57	5.66	6.09	5.23								5.93	5.7
Leachate collected (L)	0.171	0.178	0.188	0.177	0.211								0.175	0.22
Cumulative Iron	0.29	0.29	0.29	0.29	0.29								0.29	0.29
Cumulative Copper	94.	94.	94.	94.	94.								94.	94.

Laboratory Equipment Failure
Weeks 21-27
No Samples Collected

Sample PW-2 - Kinetic Test Data

Parameter	Cycle 1	Cycle 2	Cycle 3	Cycle 4	Cycle 5	Cycle 6	Cycle 7	Cycle 8	Cycle 9	Cycle 10	Cycle 11	Cycle 12	Cycle 13	Cycle 14	Cycle 15
Ag ug/l	36.	3.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
Al mg/l	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
As ug/l	30.	20.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.
B ug/l	10.	20.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.
Ba ug/l	110.	75.	25.	45.	15.	60.	25.	25.	25.	30.	35.	60.	30.	35.	35.
Be ug/l	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
Bi ug/l	26.	42.	2.	2.	2.	2.	2.	2.	2.	2.	8.	8.	2.	2.	16.
Ca mg/l	30.55	33.63	9.45	11.3	3.49	12.99	4.86	4.17	3.87	4.01	5.17	5.19	4.91	4.48	7.33
Cd ug/l	26.	25.	12.	1.	1.	8.	7.	7.	1.	1.	4.	1.	4.	1.	1.
Co ug/l	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.
Cr ug/l	5.	10.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.
Cu ug/l	302.2	280.	67.4	63.4	23.6	83.8	31.4	28.	42.4	43.6	62.6	81.8	59.8	69.	102.2
Fe mg/l	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
K mg/l	5.11	5.88	1.53	2.22	0.3	2.22	0.58	0.62	0.01	0.4	1.42	1.26	1.61	1.46	1.51
Li ug/l	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.
Mg mg/l	1.6	2.03	0.44	0.52	0.11	0.58	0.18	0.15	0.13	0.13	0.27	0.26	0.19	0.22	0.37
Mn mg/l	0.1	0.145	0.045	0.055	0.02	0.07	0.03	0.02	0.025	0.03	0.035	0.04	0.035	0.035	0.065
Mo ug/l	24.	14.	8.	10.	2.	6.	2.	2.	2.	2.	6.	4.	2.	4.	6.
Na mg/l	1.29	1.64	0.38	0.55	0.06	0.56	0.18	0.16	0.12	0.13	0.23	0.2	0.2	0.39	0.33
Ni ug/l	5.	10.	5.	5.	5.	5.	5.	5.	5.	5.	5.	10.	5.	5.	5.
P ug/l	70.	80.	10.	10.	30.	30.	20.	30.	10.	10.	40.	10.	10.	10.	70.
Pb ug/l	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	28.	8.	2.	2.	2.
Sb ug/l	2.	16.	2.	2.	2.	2.	2.	2.	2.	2.	8.	2.	2.	2.	2.
Se ug/l	120.	125.	5.	5.	5.	5.	5.	5.	25.	10.	45.	5.	5.	10.	5.
Si mg/l	7.32	9.68	2.54	4.08	1.	4.73	1.54	1.42	1.4	1.46	1.76	1.79	1.28	1.41	1.71
Sn ug/l	2.	328.	88.	2.	2.	2.	2.	2.	58.	50.	2.	2.	34.	12.	2.
Sr ug/l	98.	114.	18.	20.	2.	30.	8.	10.	8.	6.	14.	12.	8.	10.	14.
Ti ug/l	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.
V ug/l	1.	3.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
Zn ug/l	473.	492.	114.	126.	43.	176.	58.	51.	3.	1.	66.	96.	68.	64.	145.
pH	6.52	5.87	5.99	5.9	6.42	6.1	6.03	6.26	6.43	6.31	6.14	6.1	6.14	6.13	5.95
Redox (mV)	367.	332.	306.	321.	281.	335.	310.	316.	362.	297.	315.	307.	312.	315.	352.
Conductivity (uS/cm)	169.	193.	51.	57.	19.	63.	23.	17.	20.	21.	28.	29.	25.	27.	39.
Alkalinity (mg $CaCO_3$/l)	7.	3.	2.	3.	3.	2.	3.	2.	3.	3.	2.	2.	2.	2.	3.
Acidity (pH 4.5)	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Acidity (pH 8.3)	8.	9.	4.	4.	3.	3.	2.	2.	2.	2.9	2.9	2.9	3.	3.	4.
Cum Acidity (pH 8.3)	0.4	0.9	1.	1.2	1.3	1.5	1.6	1.7	1.7	1.9	2.1	2.2	2.4	2.5	2.7
Sulphate (mg/l)	59.	66.	13.	15.	7.	15.	6.	5.	5.	5.	7.	7.	4.	6.	10.
Cum Sulphate (mg/kg)	2.6	6.3	6.9	7.4	7.7	8.4	8.7	9.	9.2	9.5	9.9	10.3	10.4	10.7	11.3
Water added (L)	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
pH of water added	5.45	6.26	5.98	5.59	6.15	6.03	5.83	5.98	6.15	6.05	5.96	6.04	6.06	6.56	6.23
Leachate collected (L)	0.166	0.207	0.157	0.128	0.181	0.168	0.188	0.194	0.162	0.209	0.198	0.206	0.179	0.186	0.206
Cumulative Iron	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09	0.1	0.11	0.12	0.13	0.14	0.15
Cumulative Copper	302.2	582.2	649.6	713.	736.6	820.4	851.8	879.8	922.2	965.8	1,028.4	1,110.2	1,170.	1,239.	1,341.2

Sample PW-2 - Kinetic Test Data

Parameter	Cycle 16	Cycle 17	Cycle 18	Cycle 19	Cycle 20	Cycle 21	Cycle 22	Cycle 23	Cycle 24	Cycle 25	Cycle 26	Cycle 27	Cycle 28	Cycle 29
Ag ug/l	<0.015	<0.015	<0.015	<0.015	<0.015								<0.015	<0.015
Al mg/l	<0.20	<0.20	<0.20	<0.20	<0.20								<0.20	<0.20
As ug/l	<0.20	<0.20	<0.20	<0.20	<0.20								<0.20	<0.20
B ug/l	<0.10	<0.10	<0.10	<0.10	<0.10								<0.10	<0.10
Ba ug/l	0.014	0.015	0.011	0.012	0.015								0.025	0.035
Be ug/l	<0.005	<0.005	<0.005	<0.005	<0.005								<0.005	<0.005
Bi ug/l	<0.10	<0.10	<0.10	<0.10	<0.10								<0.10	<0.10
Ca mg/l	1.06	1.09	0.51	0.548	0.761								1.02	2.02
Cd ug/l	<0.010	<0.010	<0.010	<0.010	<0.010								<0.010	<0.010
Co ug/l	<0.015	<0.015	<0.015	<0.015	<0.015								<0.015	<0.015
Cr ug/l	<0.015	<0.015	<0.015	<0.015	<0.015								<0.015	<0.015
Cu ug/l	28.1	24.4	16.5	16.4	17.								22.	32.
Fe mg/l	<0.030	<0.030	<0.030	<0.030	<0.030								<0.030	<0.030
K mg/l	<2.0	<2.0	<2.0	<2.0	<2.0								<2.0	<2.0
Li ug/l	<0.015	<0.015	<0.015	<0.015	<0.015								<0.015	<0.015
Mg mg/l	0.097	0.101	0.054	<0.050	0.093								0.086	0.188
Mn mg/l	0.02	0.021	0.013	0.017	0.019								0.03	0.044
Mo ug/l	<0.030	<0.030	<0.030	<0.030	<0.030								<0.030	<0.030
Na mg/l	<2.0	<2.0	<2.0	<2.0	<2.0								<2.0	<2.0
Ni ug/l	<0.020	<0.020	<0.020	<0.020	<0.020								<0.020	<0.020
P ug/l	<0.30	<0.30	<0.30	<0.30	<0.30								<0.30	<0.30
Pb ug/l	<0.050	<0.050	<0.050	<0.050	<0.050								<0.050	<0.050
Sb ug/l	<0.20	<0.20	<0.20	<0.20	<0.20								<0.20	<0.20
Se ug/l	<0.20	<0.20	<0.20	<0.20	<0.20								<0.20	<0.20
Si mg/l	0.685	0.991	0.377	0.458	0.567								0.364	0.686
Sn ug/l	<0.30	<0.30	<0.30	<0.30	<0.30								<0.30	<0.30
Sr ug/l	0.008	0.009	0.006	<0.001	0.011								0.007	0.013
Tl ug/l	<0.010	<0.010	<0.010	<0.010	<0.010								<0.010	<0.010
V ug/l	<0.030	<0.030	<0.030	<0.030	<0.030								<0.030	<0.030
Zn ug/l	0.038	0.04	0.023	0.027	0.04								0.058	0.077
pH	6.23	6.4	6.17	6.19	5.35								6.31	6.03
Redox (mV)	327.	326.	316.	308.	294.								340.	332.
Conductivity (uS/cm)	32.	12.	6.	6.	8.								11.	19.
Alkalinity (mg $CaCO_3$/l)	3.	3.	3.	2.	1.								2.	2.
Acidity (pH 4.5)	0.	0.	0.	0.	0.								0.	0.
Acidity (pH 8.3)	2.	2.	3.	4.	6.								11.9	11.9
Cum Acidity (pH 8.3)	2.9	3.	3.1	3.3	3.7								4.3	5.
Sulphate (mg/l)	3.	3.	3.	4.	4.								3.	4.
Cum Sulphate (mg/kg)	11.5	11.6	11.8	12.	12.2								12.4	12.6
Water added (L)	0.2	0.2	0.2	0.2	0.2								0.2	0.2
pH of water added	5.92	5.57	5.66	6.09	5.23								5.93	5.7
Leachate collected (L)	0.171	0.178	0.188	0.177	0.211								0.175	0.22
Cumulative Iron	0.15	0.15	0.15	0.15	0.15								0.15	0.15
Cumulative Copper	1,369.3	1,393.7	1,410.2	1,426.6	1,443.6								1,465.6	1,497.6

Laboratory Equipment Failure
Weeks 21-27
No Samples Collected

Appendix B

Tailings Characterization

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APPENDIX B

GEOCHEMICAL CHARACTERIZATION OF TAILINGS

1.0 TESTING PROGRAM

Tailings from previous mining operations at the Copper Flat project were sampled on two occasions. In conjunction with piezometer installation, two tailings samples were recovered with a split spoon sample in 1994 (T-10-12 and T-5-7). In 1996, five test pits were excavated in the existing impoundment and an additional 11 samples were obtained.

Tailings samples were analyzed for paste pH and conductivity values, and by Acid Base Accounting tests. Results are listed in Table 1.1. The tailings collected in 1996 are grouped according to their appearance in hand specimen. Yellow tailings are assumed to be derived from oxidized or transition materials and are given the label TTLS (transition tailings) while fresh gray tailings that are assumed to have been derived from unoxidized quartz monzonite are labeled UTLS (unoxidized tailings). Black tailings (BTLS) are assumed to be derived from biotite breccia.

The tailings samples are not currently generating acid. Paste pH values for all samples were all above 6.1. Paste conductivity was low and ranged from 298 to 686 μS/cm. On the basis of the paste results, the current reactivity of the existing tailings is low.

Based on ABA results, sulfide sulfur contents averaged 0.72 for the transition tailings and 0.95 for the unoxidized tailings collected in 1996. Based on sulfide sulfur content, five of the samples had NP:AP ratios below 1, indicating that these samples have moderate potential to produce acidity. All other samples show a weak acid producing potential.

The decrease in acid generating potential relative to waste rock samples (i.e. higher NP:AP ratios) is likely a result of sulfide removal during the concentration process. The tailings show no increase in neutralization potential relative to the waste rock samples, indicating that lime added during processing has little impact on the chemistry of the tailings.

Sample T-10-12 was analyzed for total metals concentrations using the EPA 3051 digestion and analysis by ICP. Results, listed in Table 1.2, indicate the sample had high concentrations of aluminum (2,700 ppm), copper (1,600 ppm), iron (19,000), magnesium (1,800 ppm), potassium (1.400 ppm), and zinc (418 ppm). However, results of a modified EPA method 1312 leach indicated that these metals are not easily leached. These results confirm the limited oxidation that has occurred in the tailings, as indicated by the low paste conductivity. Therefore, the color of the tailings exhibited in drill hole and test pit samples is believed to be a result of the source of the materials. The designation of “transition” or “unoxidized” refers only to the nature of the ore from which the tailings were produced.

2.0 CHARACTERISTICS AND BEHAVIOR OF FUTURE TAILINGS

The majority of future ore will be unoxidized quartz monzonite, biotite breccia, and quartz breccia. Future tailings are anticipated to have geochemical properties similar to the UTLS tailings samples shown in Table 1.1. While a potential for acid generation is indicated, no evidence of acid generation was observed following 14 years of weathering under field conditions. Future tailings are anticipated to be equally slow in generating acid and releasing metals.

Table B.1.1
Tailings Geochemical Analysis - 1994 and 1996 Samples

Sample ID	pH (S.U.)	Paste Conductivity (µS/cm)	Sulfur Total (%)	Sulfur Sulfate (%)	Sulfur Sulfide (%)	Sulfur Pyrite (%)	Neutralization Potential (T/KT)	AP (sulfide) (T/KT)	NNP (sulfide) (T/KT)	NP/AP (sulfide)	AP (pyrite) (T/KT)	NNP (pyrite) (T/KT)	NP/AP (pyrite)
Transition Tailings													
P1-TTLS	6.6	466	1.12	0.47	0.65	0.58	36.00	20.31	15.69	1.77	18.13	17.88	1.99
P2-TTLS	7.1	483											
P3-TTLS	7.3	628	1.16	0.52	0.64	0.31	17.00	20.00	-3.00	0.85	9.69	7.31	1.75
P4-TTLS	7.3	651	1.31	0.45	0.86	0.54	27.00	26.88	0.12	1.00	16.88	10.13	1.60
P5-TTLS	7.5	547											
Mean	7.2	555	1.20	0.48	0.72	0.48	26.67	22.40	4.27	1.21	14.90	11.77	1.78
Unoxidized Tailings													
P1-TLS@12"	6.2	486	0.79	0.13	0.66	0.45	26.00	20.63	5.38	1.26	14.06	11.94	1.85
P1-UTLS	6.8	686	1.3	0.25	1.05	0.6	25.00	32.81	-7.81	0.76	18.75	6.25	1.33
P2-UTLS	7.7	643	1.15	0.19	0.96	0.75	25.00	30.00	-5.00	0.83	23.44	1.56	1.07
P3-UTLS	7.6	352											
P4-UTLS	7.2	357											
P5-UTLS	7.6	455	1.19	0.08	1.11	0.72	31.00	34.69	-3.69	0.89	22.50	8.50	1.38
Mean	7.2	497	1.11	0.16	0.95	0.63	26.75	29.53	-2.78	0.94	19.69	7.06	1.41
Black Tailings													
P5-BTLS	7.8	298	0.92	0.27	0.65	0.3	35.00	20.31	14.69	1.72	9.38	25.63	3.73
1994 Tailings Samples													
T-10-12	7.8		1.26	0.03	1.23	0.68	24	38.44	-14.44	0.62	21.25	2.75	1.13
T-5-7	7.5		1.1	0.18	0.92	0.53	31	28.75	2.25	1.08	16.56	14.44	1.87
Mean	7.7		1.18	0.11	1.08	0.61	27.50	33.59	-6.09	0.85	18.91	8.59	1.50

Notes:
Sulfide sulfur equals total sulfur minus sulfate sulfur
NNP equals net neutralization potential (NP-AP)

Table B.1.2
Total and Extractable Metals Concentrations in Tailings

Parameters	Total Metals in Solids ICP ppm	Extractable Metals EPA 1312 (mg/L)
Aluminum	2700	< 0.05
Antimony	< 0.5	N/A
Arsenic	1.3	< 0.1
Barium	52	0.10
Boron	< 2	0.07
Cadmium	1.8	< 0.005
Calcium	8500	300
Chloride	N/A	6
Chromium	5	< 0.01
Cobalt	13	< 0.02
Copper	1600	0.03
Fluoride	N/A	1.4
Iron	19000	< 0.02
Lead	15	< 0.021
Magnesium	1800	22
Manganese	251	1.50
Mercury	< 0.02	< 0.0002
Molybdenum	34	0.19
Nickel	3	< 0.02
Potassium	1400	44
Selenium	< 0.03	< 0.1
Silver	< 1	< 0.01
Sodium	200	44
Sulfate	N/A	940
Vanadium	7	< 0.01
Zinc	418	0.42

Appendix C

Field Scale Reclamation Cover Test Program

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MEMORANDUM

TO: Jeff Parshley, SRK - Reno

FROM: Pete Kowalewski, SRK - Denver

DATE: April 27, 1998

SUBJECT: **Copper Flat Closure Field Testing Program**

PROJ/PROP NO. **68606**

1.0 INTRODUCTION

In accordance with Item 23 of the Conditions for Approval of DP-001, Alta Gold Corporation (Alta) will conduct long term field testing of alternative soil covers to aid in the selection of cover designs for the tailings impoundment and waste rock dumps at the Copper Flat site. In addition to aiding in the selection of the most appropriate soil cover for the tailings and waste rock at the Copper Flat site, the field testing will provide for evaluation of several other issues at the Copper Flat site, including: acid generation potential, phytotoxicity and ecological risk, and the ability to successfully revegetate the alternative soil covers. The following is a conceptual plan detailing the proposed field testing to be performed after the commencement of operations at the site.

2.0 FIELD COVER TESTING

2.1 Test Cell Composition

The field testing will consist of a series of constructed test plots. Alternative covers will be tested over both tailings and, potentially, three different types of waste rock (unoxidized, transitional, and low sulfide), as cover performance and revegetative success may be influenced by the underlying waste material being covered (i.e. fine-grained tailings versus coarse-grained waste rock). Table 1 presents a matrix of all of the combinations of alternative soil covers and underlying waste materials that will be tested in the program.

Table 1. Matrix of Soil Cover and Underlying Waste Materials for Field Testing Program

Soil Cover	Underlying Waste Type			
	Tailings	Unoxidized Waste	Transitional Waste	Low Sulfide Waste
Control (No Cover)	x[2]	x[2]	x[3]	x[3]
12" Alluvium	x[2]	x[2]	x[3]	x[3]
24" Alluvium	x[2]	x[2]	x[3]	x[3]
24" Alluvium / Amended Tailings (Harrowed)[1]	x[2]	x[2]	x[3]	x[3]

Notes:
(1) Amendment of tailings may be achieved by blending lime, limestone, or a soil with high neutralizing potential, if necessary. Alluvium may provide some neutralizing potential for the tailings.
(2) Test cell will be monitored for surface water runoff, percolation, and moisture content
(3) Test cell will be monitored for surface water runoff and percolation only

As can be seen from Table 1, a total of 16 test cells are proposed for the field testing program. Eight of the 16 test plots will be instrumented to quantify runoff and percolation through the cover system only, while runoff, percolation, and moisture content will be measured in the remaining 8 test cells.

2.2 Test Plot Design

Figures 1 through 3 show conceptual plans for an individual test plot. Each test plot will have an area of approximately 300 square feet. Various covers will be placed over a minimum of 10 feet of tailings or waste rock. Both the bottom and surface of each cell will be graded to allow concentration of flow at central collection points on the cell floor and surface. A berm may be constructed on the surface of each plot to facilitate the concentration of surface flows. Grading of the floor of each cell will facilitate concentration of flow into a perforated pipe. Flows will be collected in pipes and routed to collection tanks for measurement of surface runoff and percolation, respectively.

2.3 Test Plot Instrumentation

The test plot will be instrumented to quantify surface runoff from the test plot, percolation occurring through the test plot, and moisture content within the soil profile. Surface runoff will be collected from the test plot and routed to a collection tank for measurement. Percolation occurring through the test plot will be routed to a collection tank as well, where it will be measured. The measurement of surface runoff will be performed after each rainfall at the site, while percolation measurement will be made at least once per week during the testing period. The frequency of recording both percolation and runoff measurement may be increased during wet periods.

Moisture content profiling of the test cells may be performed manually through the use of a nuclear moisture gauge or moisture probe, or in an automated fashion using moisture probes buried at various depths connected to a datalogger. Regardless of the method by which moisture profile data is collected, data will be collected from a minimum of 5 pre-determined depths at least once a week for each test cell identified in Table 1 as requiring moisture profiling.

2.4 Weather Station Instrumentation

A weather station will be installed that is capable of measuring the following parameters: daily precipitation, maximum and minimum daily air temperature, daily maximum and minimum relative humidity, average daily wind speed, wind direction, and average daily incoming solar radiation. It is envisioned that data collection will be automated through the use of a datalogger to facilitate acquisition.

Daily evaporation will be measured through use of a National Weather Service Class A type evaporation pan. Measurements will be made by mine personnel.

2.5 Leachate Quality Testing

Leachate from the cover test plots will be analyzed to evaluate the geochemical behavior of the underlying materials. The first sample of leachate from each cell will be analyzed for pH, alkalinity/acidity, conductivity, sulfate, Eh, as well as a full range of dissolved metals, major cations and major anions. Thereafter, full chemical analyses will be repeated on an annual basis. During the course of testing, pH, alkalinity/acidity, and sulfate analyses will be performed at any point when there is sufficient leachate available for analysis. If leachate is consistently available (minimum volume of 1 liter), this sampling will be conducted quarterly.

2.6 Test Cell Bio-assay

Several tests will be required to assess the revegetative success of the test cells and the ecological risk posed by the uptake or fixation of heavy metals by roots and heavy metal accumulation in plant tissue. The testing proposed for this area of work includes: a random survey to assess live plant cover and total cover (live plant and litter), soil pH, total metals concentration of plant tissue and roots, soil organic matter content, total and plant available nitrogen, and soil fertility (includes analyses for phosphorous, magnesium, and potassium).

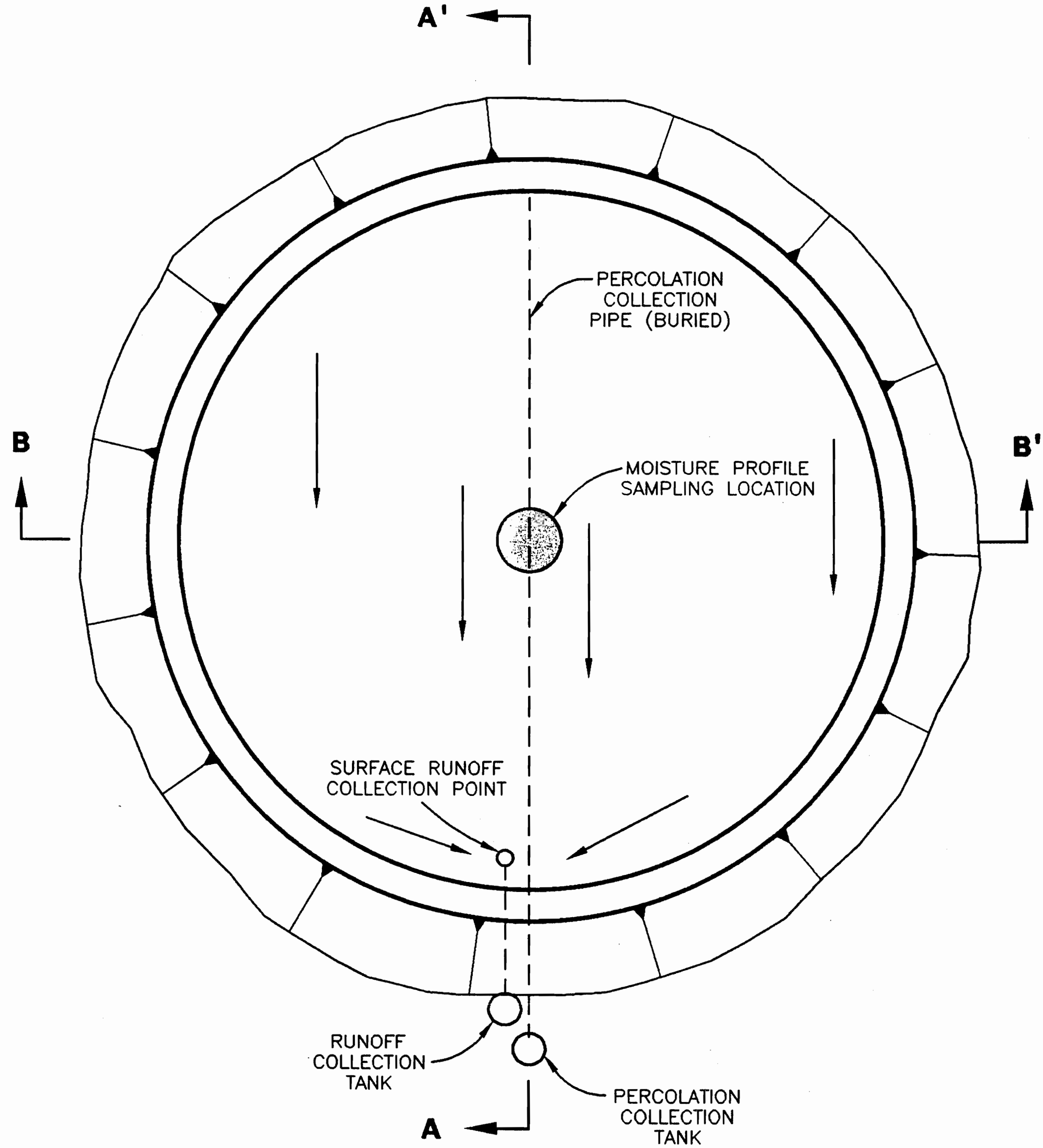
Testing of the plant matter and soil from the field test cells will be conducted once per year, preferably toward the end of the growing season. Samples will be taken from each test cell and send to a certified laboratory to perform the tests mentioned above. A visual survey of each test cell will be conducted toward the end of each growing season to assess the live plant cover and total cover available at each test cell.

2.7 Data Collection

All data collected manually will be recorded in a log book kept on site. Data gathered electronically will be downloaded from the recording device (or devices) and transferred to a diskette. Printed output of the electronic data (hard copies) will be kept in a file on site. Copies of the diskette may be archived for future reference.

3.0 ADDITIONAL TESTING FOR REVEGETATIVE SUCCESS

In addition to sampling the revegetated test cells, test plots will be established on the alluvium stockpiles to assess the ability to revegetate based on slope and aspect as well as seed mixture. The alluvium stockpile test plots will be tested in a manner consistent with the testing of the field test cells. At the commencement of the field testing, a soil sample will be taken from an adjacent area not impacted by mining, and a full suite of soil analyses will be conducted to determine the naturally occurring soil conditions.



NOTE:

1. CELL WILL NOT NECESSARILY BE CIRCULAR IN PLAN; CELL MAY BE SQUARE OR RECTANGLE, WITH MINIMUM SIDE LENGTH TO DEPTH RATIO OF 2:1.

STEFFEN ROBERTSON & KIRSTEN (U.S.)
Consulting Engineers & Scientists

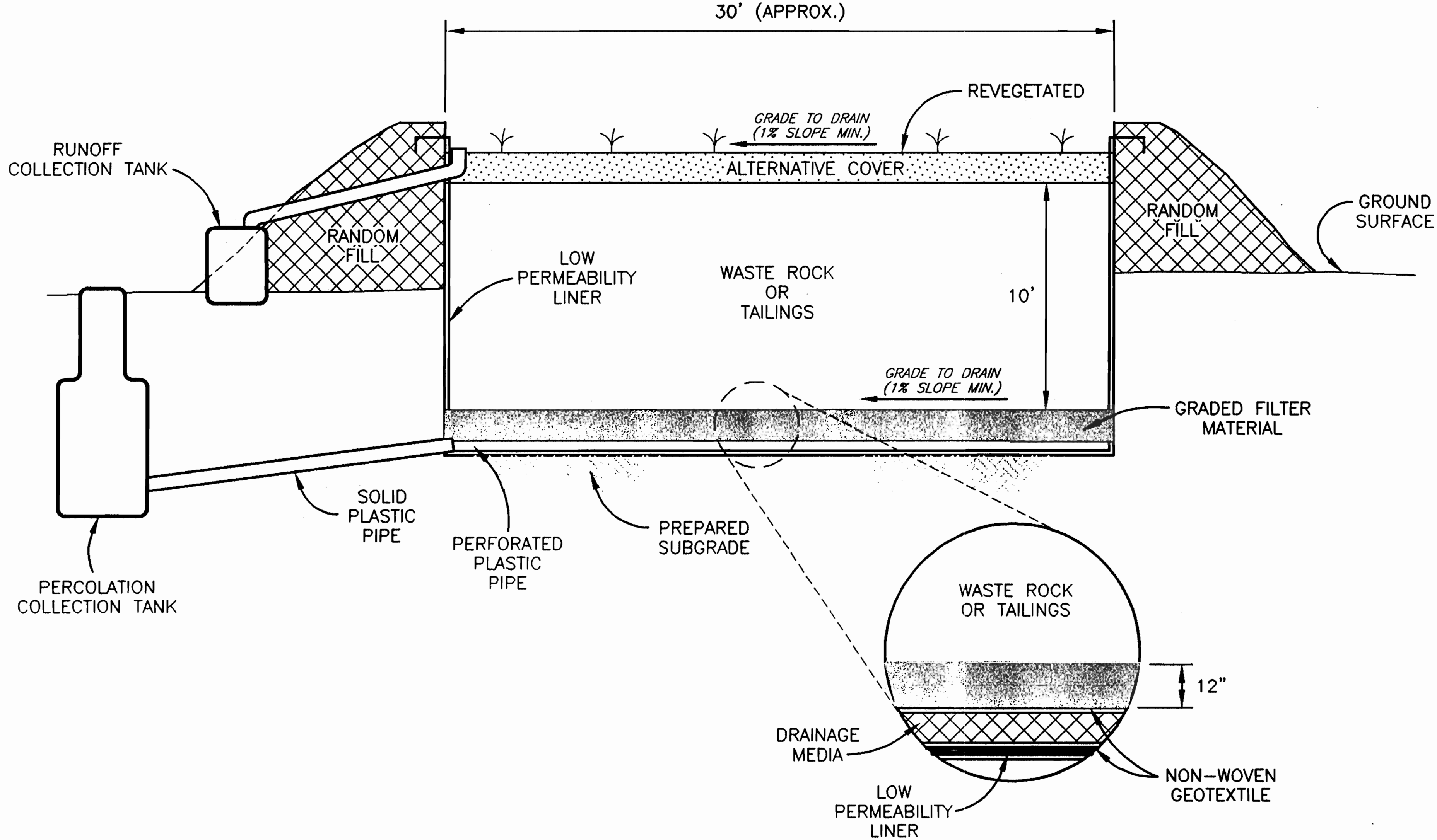
PROJECT NO.	DATE	REVISION
68606	01/98	A

FIGURE 1

TEST CELL CONCEPTUAL DESIGN
PLAN VIEW

* STA.#2 * J:\0686\68606\FIG01.DWG.DWG * NOV 23, 1998 * 3:19:51 PM *

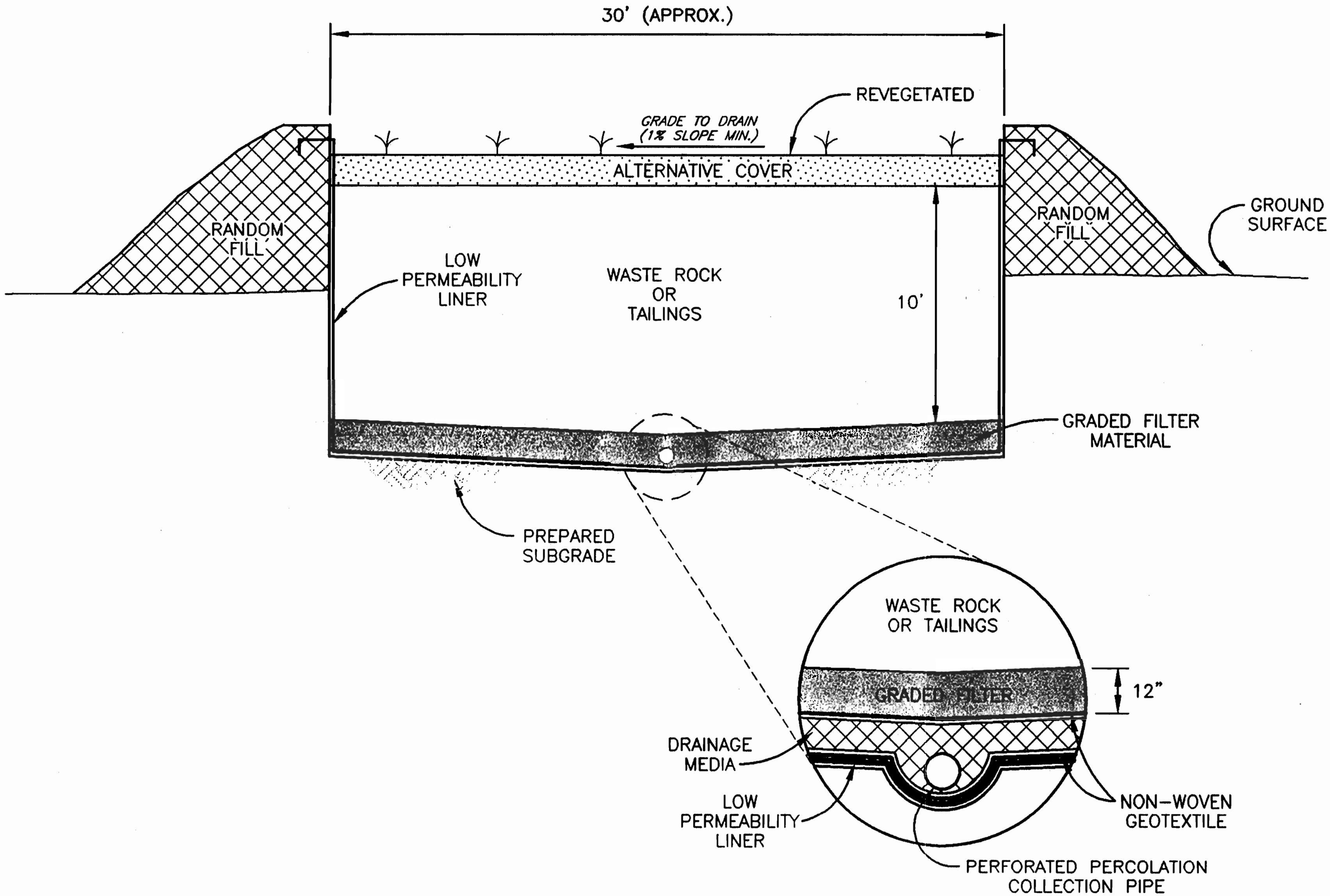
* STA.#2 * J:\0686\68606\FIG02.DWG.DWG * NOV 23, 1998 * 3:21:01 PM *



SRK STEFFEN ROBERTSON & KIRSTEN (U.S.) Consulting Engineers & Scientists			**FIGURE 2** TEST CELL CONCEPTUAL DESIGN SECTION A-A'
PROJECT NO. 68606	DATE 01/98	REVISION A	

01630

* STA.#2 * J:\0686\68606\FIG03.DWG.DWG * NOV 23, 1998 * 3:21:19 PM *



SRK
STEFFEN ROBERTSON & KIRSTEN (U.S.)
Consulting Engineers & Scientists

PROJECT NO.	DATE	REVISION
68606	01/98	A

FIGURE 3

TEST CELL CONCEPTUAL DESIGN
SECTION B–B'

APPENDIX D

Tailings Impoundment Conceptual Design Report (Golder, 2010)

REPORT

COPPER FLAT PROJECT

Conceptual Design Report

Submitted To: New Mexico Copper Corporation
Suite 100 - 2425 San Pedro Dr. NE
Albuquerque, NM 87110

Submitted By: Golder Associates Inc.
4730 N. Oracle Road
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Tucson, AZ, 85705 USA

Distribution:
1 Electronic Copy – New Mexico Copper Corporation
1 Copy – Golder Associates

November 17, 2010 **103-92557**

01633

EXECUTIVE SUMMARY

Copper Flat is a porphyry copper mine that was briefly operated by Quintana Minerals Corp. (Quintana) in 1981 and 1982. After approximately 1 year of operation, mining was halted due to depressed copper prices, and the facility was decommissioned. New Mexico Copper Corporation (NMCC) has acquired an option on the Copper Flat property and is evaluating resuming mining and milling operations. Based on a recent NI 43-101 compliant preliminary economic assessment (PEA, [SRK, 2010]), the ore reserve has been increased from the 60 million tons identified by Quintana, to approximately 100 million tons. Ore will be mined at a rate of 17,500 tons per day (tpd). This report presents the conceptual design of a tailings storage facility (TSF) capable of supporting tailings disposal for the currently identified ore reserve.

During the 1981-82 operating period, high concentrations of total dissolved solids and sulfate were detected in groundwater immediately downgradient from the existing Quintana TSF. Local seepage of contaminated groundwater, which has been attributed to the existence of permeable geologic units in the TSF foundation, allowed process water and tailings seepage to migrate from the impoundment. Existing tailings are now drained and lie above the local groundwater table, however, leaching by meteoric water potentially contributes additional sulfate and dissolved solids to groundwater. Impacted groundwater and tailings from the 1981-82 operations are the subject of ongoing abatement actions. Groundwater compliance issues associated with the Quintana operation have led NMCC to propose construction of a lined TSF for future operations.

The starter dam from the earlier operations remains in place, however, in order to provide the required increase in storage capacity, while limiting future dam height and maintaining gravity delivery of tailings, the facility will be expanded approximately 1,000 feet to the east. It is assumed that the existing starter dam will be used as a borrow source for new embankment construction.

Approximately 1.2 million tons of tailings were placed in the north disposal cell prior to the suspension of operations in 1982. It is assumed that future TSF construction will require the incorporation of measures to mitigate potential groundwater impacts from existing tailings in order to meet groundwater contamination abatement actions. Several options for the management of existing tailings have been considered at a preliminary level. These include:

- Capping existing tailings in-place beneath a low permeability cover such as a geomembrane or composite cover;
- Utilize existing tailings as fine grained bedding fill for the future TSF geomembrane liner; and
- Place existing tailings inside the new TSF on top of the new geomembrane liner.

All options are considered to provide similar benefits relative to mitigating groundwater impacts associated with existing tailings.

The method of tailings embankment construction selected by Quintana was upstream raise construction with peripheral discharge of spigotted whole tailings. The proposed method of construction for the new TSF is by centerline raises with cycloned tailings sand. The tailings surface will rise approximately 80 feet in the first two years of operation. Centerline raising with cycloned sand was selected as the construction method because as a general rule, the tailings rate of rise should be less than 10 feet per year for upstream construction. NMCC's ability to develop a drained and consolidated foundation suitable for upstream raise construction using peripherally spigotted discharge of whole tailings is questionable due to the high rate of rise, which will not drop below 10 feet per year in the first 5 years of operation.

Initial construction will include a toe berm to buttress the tailings embankment and a starter dam for placement of the tailings header line and cyclones. Sand (cyclone underflow) will be placed on the embankment while the tailings slimes (cyclone overflow) will be discharged to the impoundment interior. The TSF geomembrane liner will be placed beneath the starter dam and anchored on the crest of the toe berm. An underdrain system consisting of a filter compatible soil and drainage collection pipes will be placed on top of the geomembrane liner, beneath the sand dam footprint, to facilitate drainage and consolidation of the cycloned sand. The underdrain system will extend into the impoundment interior in the area that will underlie the free water pond. Underdrainage will be routed to a lined underdrain collection pond located downstream of the toe berm.

The TSF can be constructed in a phased manner. During initial construction phases, diversion ditches can be constructed to divert stormwater from upstream catchment areas within the area contributory to the impoundment. The contributory area is approximately equivalent to the ultimate TSF footprint as only minor peripheral areas drain into the TSF. At final buildout, there is minimal potential for surface water runon from external areas. Throughout most of the life of the facility, stormwater management requirements will be limited to direct precipitation.

A review of available aerial photographs indicates no human habitations adjacent to the drainages below the proposed TSF. Based on the rules and regulations of the New Mexico State Engineer, the Copper Flat TSF would be classified as a large dam having significant hazard potential. The impoundment will be required to contain the equivalent of 75 percent of the probable maximum precipitation (PMP) during operations. A spillway capable of passing 75 percent of the PMP will be required upon closure.

Geotechnical investigation (SHB, 1980) of the existing TSF area was extensive, however, a portion of new TSF will occupy ground that has not been evaluated for geotechnical and hydrogeological conditions. A preliminary site investigation plan is presented in this conceptual design report.

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List of Drawings

1.0 INTRODUCTION

1.1 Scope of Work

New Mexico Copper Corporation (NMCC) has acquired an option on the Copper Flat property, located near Hillsboro in Sierra County, New Mexico. Copper Flat is a porphyry copper deposit that was briefly mined by Quintana Resources in 1981 and 1982 before depressed copper prices forced the suspension of mining and milling operations. During the Quintana operation, the identified ore reserve was approximately 60 million tons. Further drilling completed since cessation of mining operations has increased the ore reserve from 60 million to approximately 100 million tons. NMCC has commissioned Golder Associates Inc. (Golder) to develop the conceptual design of a new tailings storage facility (TSF) capable of containing tailings from the expanded mining operation. Conceptual design of the new TSF, as well as plans for geotechnical investigation of the expanded TSF footprint and fulfilling data collection requirements necessary to advance the TSF design to feasibility and construction level are presented in this report.

1.2 Project History

The Quintana operation included open pit mining, conventional milling and off-site shipment of copper concentrate. Tailings were thickened to a solids content of 50 percent by weight (oral communication, Jack Bailey, 10/02/2010) and transported by gravity flow to the existing TSF located approximately 1 mile east of the open pit. Impoundment construction and operation were typical of the industry practices of the day. Whole tailings were discharged into the impoundment via a tailings header line and spigots placed peripheral to the impoundment. The TSF constructed for the Quintana operation remains in-place to this date. Remaining facilities include the starter embankment, internal splitter dikes, concrete decant towers and presumably, buried under drain pipes. Approximately 1.2 million tons of tailings were deposited in the existing north tailings cell.

The tailings thickener is reported to have been partially decommissioned and buried. The tailings delivery system has been removed. The Greyback Wash diversion, electrical supply lines, a water supply well field and water supply pipeline, groundwater monitoring wells and pumpback wells also remain. Milling and processing facilities were decommissioned and removed from the site.

During Quintana operations, elevated sulfate and dissolved solids were detected in groundwater in the vicinity of the existing tailings dam. Permeable foundation materials encountered during site investigation and construction of the TSF have been identified as the potential pathway for seepage from the TSF, Meteoric water leaching of tailings from the Quintana operation potentially contributes additional sulfate and dissolved solids to local groundwater. Impacted groundwater and the existing tailings are the subject of an ongoing abatement action. Management of existing tailings to mitigate existing and ongoing groundwater impacts is considered a parallel objective of TSF design.

2.0 SITE DESCRIPTION

2.1 Existing Conditions

The location of the proposed TSF is shown on Drawings 1 and 2. Elevation in the TSF basin area ranges from approximately 5,160 feet above mean sea level (amsl) near the base of the toe berm to over 5,500 feet on the ridges northwest of the impoundment footprint. Natural slopes range from 2 horizontal to 1 vertical (2H:1V) adjacent to the perimeter ridges to less than 10H:1V in the lower portion of the basin.

Previous disturbance of the TSF area is widespread. Existing features can be seen in the aerial photograph on Drawing 1. Drawing 2 shows the location of the proposed TSF projected on existing topography. Placer mining disturbance that predates the Quintana operation can be seen in most of the drainages in the TSF basin, and other drainages radiating from the mine area. More recent disturbance associated with the Quintana mining operation includes tailings deposits, the old starter dam and splitter dikes, construction material borrow areas and tailings delivery and reclaim water pipeline routes. Two concrete decant towers and concrete reclaim pipe foundations also remain in place and while not visible, buried reclaim water pipes also occur. A series of monitoring wells have been placed around the toe of the old starter dam.

The TSF site is located in the upper reaches of a shallow basin. The basin is bounded by low hills on the southwest, west and north sides such that the ultimate TSF will occupy most of the area that could contribute surface water runoff to the TSF. While diversions will be required in the early stages of the operation to divert stormwater runoff, peripheral areas contributing stormwater runon during the later stages of the future operations will be limited to a few acres on the northwest side of the TSF.

2.2 TSF Area Geology and Foundation Conditions.

The existing TSF site was extensively explored by Sargent, Hauskins and Beckwith (SHB) in 1979 and 1980 as part of the SHB design effort. No additional field work was conducted as part of conceptual design efforts. The upper layer of soils in the vicinity of the existing starter dam consists of sandy materials. Surficial sand is underlain by a wedge of silty clays, clayey and clayey silts that appears to thicken in a easterly direction. Gravels underlie the silts and clays and outcrop in the upper portion of the TSF basin. These gravels appear to have been the borrow source for the existing dam.

Permeable basalt was encountered in the lower portion of the tailings basin. The basalt is presumed to occupy a paleo-drainage cut in the local foundation soils. It can be seen in outcrop and subcrop south of the existing splitter dike and was intercepted in several exploratory boreholes completed in the central starter dam area. Due to its permeable nature, the basalt has been identified as the likely pathway for seepage and contaminants from the existing impoundment. This potential was identified during the design of the existing impoundment, and an attempt was made to cap the basalt with fine grained, low permeability soils to inhibit seepage.

2.3 Climate

The Copper Flat property experiences on the order of 10 to 13 inches per year of precipitation with the majority of rainfall occurring in the summer months associated with short duration, high intensity thunderstorms. Winter rains are associated with Pacific storms that generally migrate from west to east across the desert southwest. Summer temperatures exceed 100 degrees while winters are generally mild with limited snow and ground freezing.

In general, evaporation exceeds precipitation in desert lowlands across the region. It is anticipated that the tailings impoundment will be operated at net negative water balance, with periodic, temporary accumulation of stormwater from direct precipitation. Stormwater will be recovered with tailings supernatant water and reused in milling and processing. The effect of stormwater accumulation will be a reduction in raw make-up water requirements.

3.0 PROPOSED TAILINGS STORAGE FACILITY DESCRIPTION

3.1 TSF Geometry

The proposed method of tailings embankment construction is by the method of centerline raises. The basis for selection of this method is due to the high rate of tailings rise that will be experienced during the first 3 to 4 years of operation. Construction by upstream raises typically requires a rate of tailings rise of approximately 10 feet per year or less in order to allow consolidation and drainage of impounded tailings, and the development of conditions suitable for supporting upstream raises. The centerline method of construction using cycloned sand will allow the embankment to be constructed on a foundation of well drained sand.

A toe berm will be constructed around the periphery of the TSF which will serve as a buttress to the embankment outslopes. An internal starter dam is proposed for placement of the tailings discharge header pipe. Tailings will be delivered at a rate of 17,500 tpd at an anticipated solids content of 50 percent by weight. At 92 percent availability, the annual tailings deposition rate will be 5.88 million tons.

Cyclones on the tailings header line will be used to separate the sand fraction (cyclone underflow) from the whole tailings stream. Tailings sand will be used for embankment construction while the fine fraction of the tailings, the tailing slimes (cyclone overflow), will be discharged into the impoundment interior. The resulting tailings impoundment surface will slope away from the embankment and force tailings supernatant and stormwater into the interior of the impoundment. The locations of the toe berm and starter dam are shown on Drawing 3.

The crest elevation of the starter dam and toe berm have initially been set at 5,220 feet amsl. Adjustments to the height of these structures will be evaluated in detailed design studies. Starter dam height will be determined by the dry freeboard required to maintain stormwater storage capacity and the volume of sand that will be available for dam construction during operations. The availability of sand will be determined by the degree of ore milling. A finer grind will reduce sand content and could require a higher initial starter dam height while a coarser grind will provide more sand and allow an increased rate of sand deposition. Toe berm height will be influenced by the stability of the tailings embankment. The embankment sand and underdrain will be placed over a geomembrane liner. Interface friction at the liner/subgrade and the liner/underdrain interfaces will be reduced relative to the friction developed at a soil to tailings interface. The berm may be required to buttress the embankment toe to enhance stability. Toe berm and initial starter dam heights will be evaluated when tailings products representative of the future processing plan are available for evaluation and geotechnical testing.

Above the elevation of the initial starter dam and toe berm, these structures will be constructed parallel to existing topography with a constant height above foundation level. Progressive lateral extension of the tailings distribution points up the starter dam will enable the dam to be raised in level manner.

Tailings gradation data presented in the various reports prepared for Quintana are somewhat contradictory. Based on metallurgical pilot studies conducted for Quintana and reported by SHB (1980), the sand fraction (the plus 200 standard sieve fraction) of the tailings is approximately 30 percent with 95 percent finer than 65 mesh (208 microns). Measurements collected by Quintana mill personnel between May and June of 1982 (oral communication, Jack Bailey, 10/1/2010) showed a minus 65 mesh fraction of 84 to 89 percent, suggesting a courser tailings grind with a higher sand fraction was produced under operating conditions. The gradation presented in the SHB geohydrological study (SHB, 1981) indicates tailings that are 100 percent finer than 65 mesh with a sand fraction of 55 percent. Preliminary volumetric estimates indicate that embankment construction will require approximately 15 percent of future tailings, suggesting that the centerline approach is feasible. Evaluation of tailings samples produced in pilot or bench scale simulation of future milling and processing will be required to verify sand availability throughout the life of the operation.

The impoundment has been sized based on a post-deposition dry density of 85 pounds per cubic foot (pcf). The estimated maximum final tailings surface elevation is 5,375 feet amsl. The maximum toe to crest height of the tailings embankment will be approximately 215 feet. At final buildout, the TSF and underdrain collection pond will occupy an area of approximately 541 acres. The anticipated configuration of the TSF at the end of mining and milling operations is shown on Drawing 4. TSF cross sections are shown on Drawing 5.

The tailings surface will slope inward from peripheral points of deposition at approximately ½ to 1 percent forming a depression in the interior of the impoundment. The internal depression will serve as a storage area for supernatant solutions and stormwater.

Embankment outslopes shown on the drawings are 2.67H:1V. Outslopes may also be subject to modification based on geotechnical testing of tailings properties.

3.2 Hazard Classification

The rules and regulations of the New Mexico State Engineer indicate that the Copper Flat TSF will be classified as having significant hazard potential. According to the New Mexico Administrative Code (19.25.12.10 B NMAC):

> *Dams assigned the significant hazard potential classification are those dams where failure or misoperation results in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or can impact other concerns. Significant hazard potential classification dams are often located in predominantly rural or agricultural areas but could be located in populated areas with significant infrastructure.*

The TSF lies within the Greyback Wash drainage. Inspection of aerial photographs (Google Earth) indicates no human habitations in or adjacent to Greyback Wash between the TSF facility and Caballo Lake, into which Greyback Wash ultimately discharges. A dam breach and flood routing analysis will be required by the State Engineer (19.25.11.12 C (1) NMAC) to verify this classification.

The spillway design flood for dams with significant hazard potential (19.25.12.11 C(1) (c) is 75 percent of the probable maximum precipitation (PMP). A preliminary estimate of the PMP is on the order of 25 inches. The TSF and ore processing facilities will be operated as a closed, non-discharging system during tailings disposal operations and storage capacity for the design storm event will be maintained within the TSF. A permanent spillway capable of passing the design flood will be required at closure after the tailings surface has been regraded and a reclamation cover is in place.

3.3 Site Preparation

The TSF will be a geomembrane lined structure. Site preparation will include clear and grubbing, salvage and stockpiling of topsoil and grading to prepare a smooth surface for geomembrane liner installation.

It is anticipated that the existing starter dam and associated splitter dikes will be used as a fill material borrow source for the new toe berm and starter dam. Additional borrow areas for structural fill, liner bedding materials and drainage media will be developed within the TSF footprint where possible. Previous geotechnical investigation of the site indicates a range of fine grained soils and granular materials occur within the existing disturbance area.

Approximately 1.2 million tons of tailings were discharged into the existing TSF during the Quintana operation. Existing tailings deposits will be evaluated as a source of liner bedding fill material. If placed or “capped” under a low permeability TSF liner, the potential for leaching sulfate and dissolved solids from existing tailings in the future will be alleviated. Alternatively, existing tailings could be placed on the new TSF liner however, utilization of the tailings as liner bedding fill material is anticipated to be less costly and will provide similar benefits in terms of mitigating leaching potential.

The existing decant towers will be demolished. Demolition debris will be buried locally or placed in a waste rock disposal facility. Demolition requirements for buried decant pipelines will be evaluated as part of ongoing site investigation and design efforts.

Existing wells in the TSF expansion will require abandonment in accordance with New Mexico Environment Department (NMED) Office of the State Engineer (OSE) regulations. For wells that intercept groundwater, this will include removal of casings if possible, and sealing the entire well bore with cement or bentonite grout placed by tremmie pipe. Approximately 18 wells appear to lie within the TSF expansion area.

3.4 TSF Liner System

Proposed liner system details for the TSF and underdrain collection pond are shown on Drawings 6 and 7. The TSF liner will consist of an HDPE geomembrane placed on a minimum 6-inch thick layer of liner bedding fill. Beneath the starter dam and embankment underdrain, an 80 mil (0.080 inches) geomembrane is proposed while within the impoundment interior, the geomembrane thickness will be 60 mil. The underdrain collection pond liner will consist of a lower 60 mil and upper 80 mil HDPE geomembranes separated by a drain net. The drain net will route potential leakage through the upper liner to a leakage collection and recovery sump.

Geomembrane liner will be placed on a minimum 6-inch thick layer of liner bedding fill. As noted above, the liner bedding fill can be constructed with existing tailings if they meet moisture content and compaction requirements. Additional liner bedding fill material can be derived from crushing and/or screening of selected native soils. A minus 3/8-inch material is suitable for protection of the liner.

3.5 Underdrain System

An underdrain will be placed beneath the starter dam and cycloned sand embankment. The underdrain system is shown on Drawing 6. The purpose of the embankment underdrain is to facilitate drainage and consolidation of cycloned sand placed in the tailings embankment. The underdrain will consist of graded sand and gravel that is filter compatible with the tailings sand. A series of perforated drain pipes will be placed within the underdrain layer to carry tailings drainage to the underdrain collection pond.

The under drain will be extended into the impoundment interior beneath the area that will be occupied by the supernatant pool. Production of drainage material that is filter compatible with the tailings slimes discharged into the impoundment interior will not be feasible. The impoundment underdrain will be separated from the tailings slimes by a geotextile filter fabric cover. Impoundment underdrainage will be routed to the underdrain collection pond in a piping system that is separate from the embankment under drain.

The pond layout presented as part of the conceptual design has a capacity of over 40 million gallons and represents the maximum potential construction area required for underdrain pond installation. Water balance and drainage analyses that will be completed during engineering design studies will be used to determine the underdrain collection pond size required to manage tailings underdrainage.

3.6 Water Reclaim

A water reclaim ramp with be constructed on top of the TSF liner system. The ramp will provide access to the free water pool for reclaim of supernatant solution and stormwater. The ramp will be raised and extended as deposition continues and the impoundment surface rises. The reclaim pump works will be progressively moved northward as the operation proceeds.

The ramp will be constructed with borrowed fill or waste rock from the mining operation. A cushioning layer will be placed beneath the initial ramp fill to protect the underlying geomembrane. The ramp presents an opportunity to dispose of potentially acid generating waste rock in an environment where ongoing tailings disposal will result in the ramp fill being encapsulated within low permeability tailings slimes.

3.7 Tailings Distribution

It is anticipated that a new thickener will be constructed at the location of the Quintana thickener (Drawing 2) and a tailings delivery pipeline will be routed to the impoundment through the existing tailings delivery pipeline cut. At the impoundment, a wye in the delivery pipeline will allow the tailings to be directed to the east and west to the starter dam crest. A series of discharge points and cyclones around the periphery of the impoundment will be used to direct cyclone underflow to the tailings embankment and cyclone overflow into the impoundment interior. Discharge will be cycled around the impoundment to raise the embankment in a level manner.

Regrading and compaction of the cycloned sand deposited on the dam crest will be conducted on a regular basis to densify the tailings embankment and achieve the design embankment outslope.

Drawing 8 presents a height versus capacity plot for the new TSF. There is potential to increase the capacity of the TSF beyond that shown on the plot, however, distribution of tailings above the elevation of 5,375 feet amsl is likely to require pumping of the whole tailings slurry. In addition, a tailings booster pump may be required in the later years of operation to maintain adequate pressure for cyclone operation.

3.8 Surface Water, Underdrainage, Stormwater and Supernatant Management

The intent of design is to allow the TSF to be operated as a zero discharge facility. Drainage from the tailings will be collected in an underdrain system, routed to a lined underdrain collection pond and recycled as process water. Potential runon from peripheral contributory areas will be prevented from contacting the tailings and diverted into natural drainages. Stormwater, which will result primarily from direct precipitation and supernatant will be contained within the impoundment.

3.8.1 Surface Water Diversion

During initial construction, perimeter diversions will be constructed across the west periphery of the impoundment. The approximately location of Phase 1 surface water diversions is shown on Drawing 3. As the impoundment is expanded in subsequent construction phases, diversion ditches will be relocated westward.

Potential runoff from peripheral areas west of the impoundment during the later stages of operation will be evaluated during design studies. Where runon is significant, diversion ditches will be investigated.

As noted above, at final buildout the TSF will occupy the majority of the area that can contribute surface water runon into the tailings impoundment. Only limited areas west of the impoundment might require late stage and post-closure diversion.

3.8.2 Stormwater and Supernatant Management

During operations, capacity will be maintained within the TSF for storage of direct precipitation and tailings supernatant. Upon discharge into the impoundment, tailings will form a beach sloping away from the point of discharge at ½ to 1 percent. The resulting depression on the tailings surface in the interior of the impoundment will be used for water storage. Additional storage capacity, if needed, will be developed by maintaining reserve freeboard on the tailings embankment crest.

A detailed water balance will be developed as part of the design studies to evaluate internal storage and embankment freeboard requirements. Water balance inputs include process water inflows, direct precipitation and runon. Losses include process water reclaim, beach and tailings pond evaporation, underdrainage and entrainment of process water within the tailings pore space. The rates of underdrainage, entrainment and tailings supernatantliberation on discharge will be determined through geotechnical testing of representative tailings samples.

Water storage requirements include:

- Dead storage (water that cannot be recovered by the reclaim system);
- Storage of the normal process water inventory to facilitate continuous operations;
- Normal stormwater storage which will vary on a seasonal basis due to changes in monthly precipitation and evaporation rates; and
- Storage for the design storm event, which is currently assumed to be 75 percent of the PMP.

The water balance will be coupled with a discharge model that will track the rate of tailings rise and simulate beach slopes and the topography of the tailings surface. The water balance and discharge model can then be used to estimate internal storage capacity and requirements for embankment freeboard through the life of the facility.

4.0 CLOSURE AND RECLAMATION

The conceptual closure plan for the TSF is illustrated on Drawing 9. The conceptual closure plan includes the following:

- Final grading of embankment outslopes to establish erosion controls and controlled surface water drainage (best management practices);
- Placement of a soil or rock cover and revegetation of the embankment outslope;
- Placement of riprap and erosion controls in embankment surface water drainage facilities;
- Regrading or depositional modification of the impoundment surface to promote drainage to a permanent spillway;
- Placement and vegetation of a soil cover over the tailings surface;
- Armoring of surface drainage channels and implementation of best management practices for erosion control; and
- Management of underdrainage.

Final grading of the impoundment surface can be accomplished with earthmoving equipment, or through modification of tailings disposal patterns during the final years of operation. Tailings discharge from selected locations can be used to relocate the supernatant pool to a location adjacent to the post-closure spillway, thereby reducing grading requirements and limiting earthmoving operations in areas where working conditions are expected to be difficult due to the presence of soft and saturated tailings. At the location of the spillway shown on Drawing 9, a bedrock foundation is anticipated. If the spillway channel is erodible, grouted riprap or other erosion controls will be applied.

Consolidation seepage into the underdrain system can be anticipated to continue at declining rates for an indefinite period following the cessation of tailings disposal operations. Underdrainage will be pumped from the underdrain collection pond to the surface of the tailings impoundment where it can be evaporated or used for reclamation cover irrigation. When underdrainage is reduced to an acceptably low flow rate, the underdrain pipes beneath the embankment can be sealed with grout and the underdrain collection pond can be decommissioned.

5.0 DATA COLLECTION AND DESIGN STUDY REQUIREMENTS FOR ADVANCING TSF DESIGN

The following defines work to be completed to advance the design of the new TSF to feasibility study and construction level.

5.1 Geotechnical Investigation

5.1.1 Existing TSF Area

The area occupied by the Quintana TSF area was extensively investigated by SHB (1980). Approximately 30 boreholes were drilled along the starter dam alignment. The majority of the borings were completed by hollow stem auger (HSA) and locally included in-situ permeability testing and diamond coring. Additional borings were completed in the impoundment interior. Test pits were excavated inside the impoundment on an approximate 500 foot by 500 foot grid.

Additional exploration will be undertaken in the area investigated by SHB to identify borrow areas for liner bedding fill and drainage media. This work is expected to require a test pit exploration program with native soil samples subjected to gradation analysis, Atterburg limits, permeability and compaction testing. This program will include sampling of existing tailings for compaction and permeability testing.

TSF Expansion Area investigation should include the following:

- A seismic velocity survey to evaluate the depth to bedrock and/or competent materials beneath the new embankment axis;
- Hollow stem auger drilling with standard penetration testing to obtain foundation material samples and measure in-situ density. Borehole spacing on the order of 300 to 500 feet is proposed along the new embankment axis.
- Selected HSA borings will be converted to core drilling to enable recovery of bedrock samples and support measurement of in-situ permeability by packer testing.
- Falling head or constant head permeability testing may also be performed in selected borings.
- Shelby tube and split spoon drive ring samples will be collected from selected intervals for analysis of in-situ density, natural moisture content and settlement potential.
- Test pit excavation will be performed in the expansion area to identify potential construction materials outside the previously explored area. Required materials include structural fill for the toe berm and starter dam, liner bedding fill and drain fill.

5.2 Tailings Characterization

NMCC reports that ore processing at Copper Flat will closely follow the process flow sheet developed by Quintana for 1981-82 operations. The characteristics of future tailings will impact operation of the new TSF. There are limited data concerning tailings properties from the Quintana operation, and production records (Oral communication, J. Bailey, 2010) indicate a coarser tailings product was produced during operations than would be predicted based on the pilot study tailings data presented in the original TSF design report (SHB, 1980).

Pilot or bench scale milling and flotation studies are recommended in support of final design studies to determine the physical and geochemical properties of future tailings. The primary objectives of the proposed study include:

- Evaluation of the partitioning of residual sulfides between cyclone underflow and overflow, and assessment of the acid generating and metal leaching potential of both the sand and slimes fractions;
- Determination of the gradation of future whole tailings and the quantity of sand that can be recovered for embankment construction;
- Evaluation of the flow characteristics of the whole tailings slurry;
- Measurement of the shear strength of tailings sand; and
- Measurement of the permeability of tailings sand and slimes under anticipated disposal conditions.

The milling and flotation test work should produce a sufficient quantity of tailings to enable a cyclone simulation to be performed in order to produce samples of both cyclone overflow and underflow. At minimum, the cyclone simulation will require a 55 gallon drum of tailings solids. The sand and slimes fractions produced in the simulation will be sufficient to support a full range of geotechnical and geochemical tests. Tailings should be subjected to the following tests:

- Gradation (sieve and hydrometer), Atterberg Limits, specific gravity (whole tailings, cyclone underflow and overflow);
- Compaction testing (cyclone underflow);
- Slurry consolidation testing (cyclone underflow and overflow);
- Staged triaxial consolidated, undrained shear strength testing with pore pressure measurement (cyclone underflow);
- Air drying (cyclone overflow);
- Shrinkage limit (cyclone overflow); and
- Acid base accounting, net acid generation (NAG), total metals, major oxides by x-ray florescence (XRF), leach extraction testing, and mineralogy by x-ray diffraction (XRD) (cyclone underflow and overflow).

5.3 Hydrogeological Characterization

Local monitoring wells that will be decommissioned during TSF expansion will require replacement in the area below the new toe berm and underdrain collection pond. Water level measurements and in-situ permeability tests conducted concurrently with drilling and well installation can be used in conjunction with existing data to evaluate hydrogeological conditions in the TSF expansion area.

5.4 Climatological Characterization

Estimation of normal precipitation and evaporation rates will be required to develop an impoundment water balance. It is assumed that a climatological model will be developed using a combination of locally collected weather data combined with regional weather records from National Weather Service monitoring stations.

5.5 Engineering Studies

The following is a listing of design studies that will be required to complete the design of the TSF:

- Foundation settlement analyses;
- Tailings drainage analyses;
- Seismic hazard analysis:
- Static and dynamic embankment stability analyses, including estimation of displacement under seismic loading;
- Seismic and static (monotonic loading, flow slide) liquefaction potential analyses;
- Evaluation of tailings sand availability, mass balance and deposition modeling;
- Liner seepage assessment;
- Foundation hydrogeological assessment;
- Water balance;
- Tailings basin hydrologic assessment for surface water diversion sizing;
- Estimation of design storm event (PMP) precipitation;
- Dam breach analysis as per OSE requirements.

6.0 USE OF THIS REPORT

This report has been prepared exclusively for the use of New Mexico Copper Corporation (NMCC) for specific application to the Copper Flat Project. No third party engineer or consultant shall be entitled to rely on any of the information, conclusions, or opinions contained in this report without prior written approval from NMCC or Golder Associates, Inc (Golder).

The conclusions and recommendations in this report have been prepared in a manner consistent with the level of care and skill ordinarily exercised by engineering professionals currently practicing under similar conditions, subject to the time limits and financial and physical constraints imposed on, or otherwise applicable to, Golder's analyses.

In preparing its conclusions and recommendations, Golder has relied upon information provided by the client. Golder is not responsible for errors or omissions in the information provided by NMCC.

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GM/DAK/br

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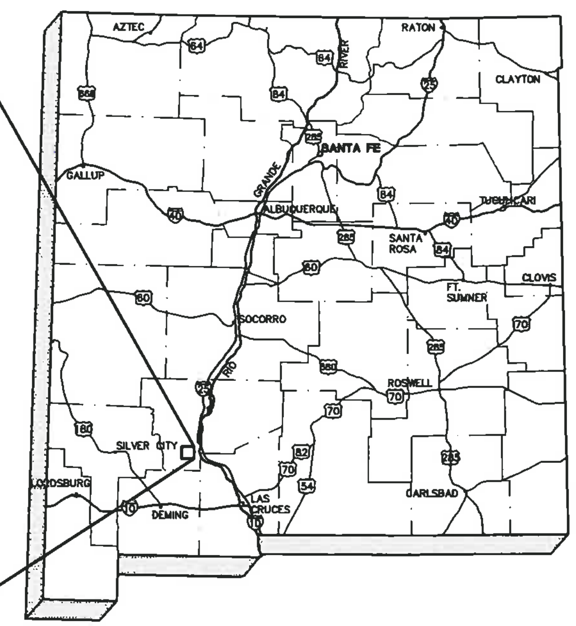
DRAWINGS

COPPER FLAT PROJECT
TAILINGS STORAGE FACILITY
CONCEPTUAL DESIGN STUDY
SIERRA COUNTY, NEW MEXICO

AERIAL PHOTOGRAPH OF PROPOSED TAILINGS DISPOSAL SITE
NOT TO SCALE



STATE OF NEW MEXICO
NOT TO SCALE

LIST OF DRAWINGS

GENERAL NOTES

1. EXISTING FIVE (5) FOOT TOPOGRAPHY AND PERMIT BOUNDARY PROVIDED BY NEW MEXICO COPPER CORPORATION.
2. AERIAL PHOTOGRAPHY © GOOGLE 2010, NMRGIS 2010.
3. DRAWINGS PRESENT THE CONCEPTUAL DESIGN OF A PROPOSED NEW AND EXPANDED TAILINGS STORAGE FACILITY WITH A CAPACITY OF 100 MILLION TONS AT AN ASSUMED DRY DENSITY OF 85 POUND PER CUBIC FOOT.
4. FINAL DESIGN WILL BE COMPLETED IN ACCORDANCE WITH THE RULES AND REGULATIONS OF THE NEW MEXICO STATE ENGINEER, THE NEW MEXICO ENVIRONMENT DEPARTMENT (NMED) AND THE NEW MEXICO MINING AND MINERALS DIVISION (NM MMD).
5. AERIAL PHOTOGRAPH SHOWS EXISTING TAILINGS DISPOSAL AREA DISTURBANCE FROM MINING, MILLING AND TAILINGS DISPOSAL OPERATIONS CONDUCTED BY QUINTANA RESOURCES IN 1981-82.
6. EXISTING TAILINGS FROM THE QUINTANA 1981-82 OPERATIONS ARE THE SUBJECT OF AN ONGOING ABATEMENT ACTION. THE CONCEPTUAL DESIGN CONSIDERS CAPPING EXISTING TAILINGS BENEATH THE FUTURE IMPOUNDMENT LINER SYSTEM THROUGH THEIR INCORPORATION IN THE LINER BEDDING FILL LAYER, OR PLACEMENT OF EXISTING TAILINGS ON THE NEW IMPOUNDMENT LINER. ALTERNATIVES FOR MANAGEMENT OF EXISTING TAILINGS WILL BE DEVELOPED IN CONSULTATION WITH NMED.

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DRAWING USE: CONCEPTUAL DESIGN NOT FOR CONSTRUCTION	PROJECT: COPPER FLAT PROJECT TAILINGS STORAGE FACILITY CONCEPTUAL DESIGN STUDY SIERRA COUNTY, NEW MEXICO				
	TITLE: TITLE SHEET				
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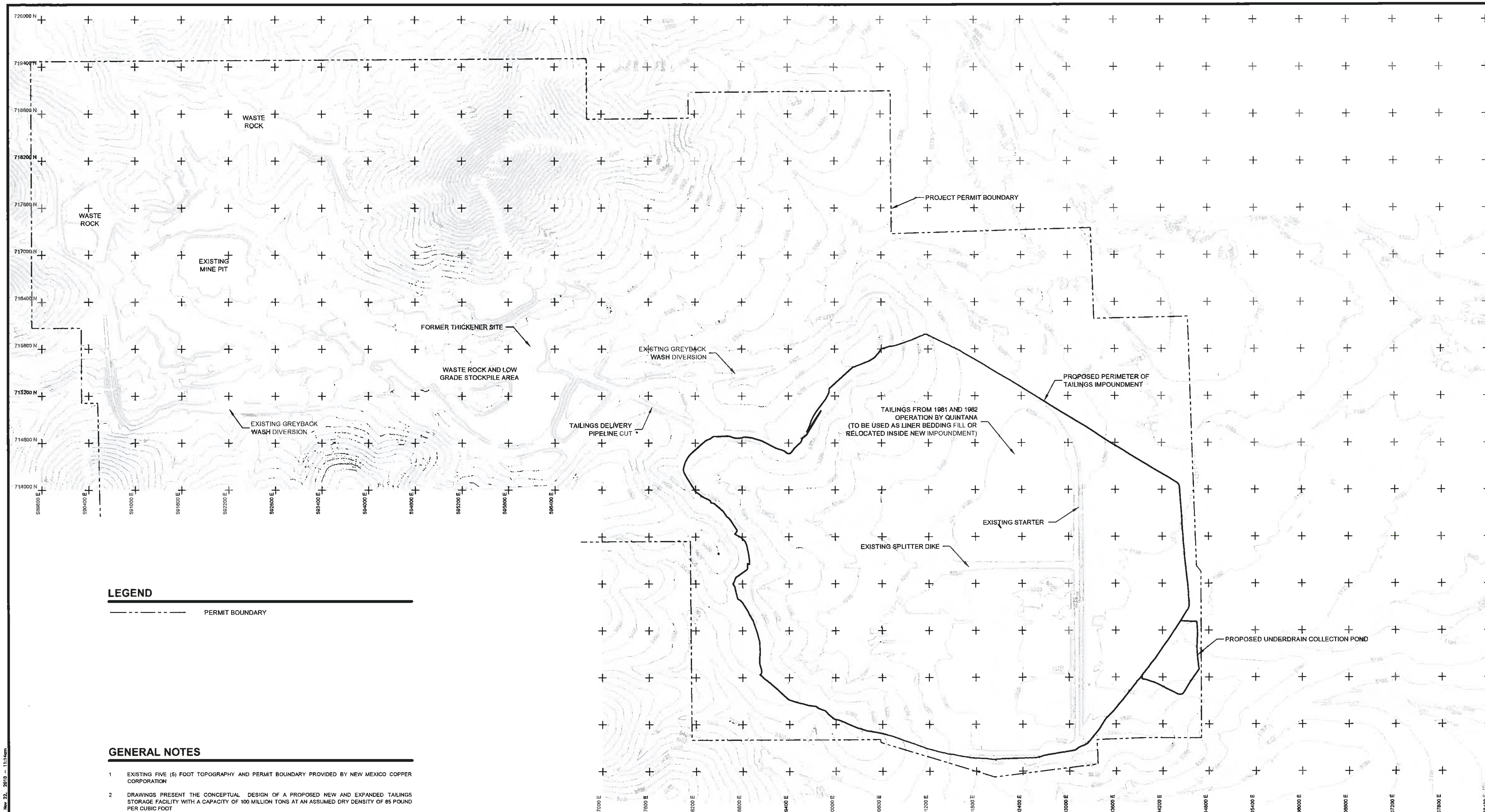
		REVIEW	DAK	11/17/10	



LEGEND

— · — · — PERMIT BOUNDARY

GENERAL NOTES

1. EXISTING FIVE (5) FOOT TOPOGRAPHY AND PERMIT BOUNDARY PROVIDED BY NEW MEXICO COPPER CORPORATION
2. DRAWINGS PRESENT THE CONCEPTUAL DESIGN OF A PROPOSED NEW AND EXPANDED TAILINGS STORAGE FACILITY WITH A CAPACITY OF 100 MILLION TONS AT AN ASSUMED DRY DENSITY OF 85 POUND PER CUBIC FOOT
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4. TOPOGRAPHY IN THE MINE AREA AND TAILINGS STORAGE FACILITY REPRESENTS EXISTING CONDITIONS AND DISTURBANCE ASSOCIATED WITH QUINTANA 1981-82 MINING OPERATIONS
5. PROPOSED TAILINGS STORAGE FACILITY FOOTPRINT IS FOR A NEW FACILITY WITH A CAPACITY OF 100 MILLION TONS AT AN ASSUMED DRY DENSITY OF 85 POUND PER CUBIC FOOT

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SCALE FEET

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DRAWING USE
CONCEPTUAL DESIGN
NOT FOR CONSTRUCTION

PROJECT
COPPER FLAT PROJECT
TAILINGS STORAGE FACILITY
CONCEPTUAL DESIGN STUDY
SIERRA COUNTY, NEW MEXICO

TITLE
GENERAL SITE LAYOUT

Golder Associates

PROJECT No.		103-92557	FILE No. 10392557A002
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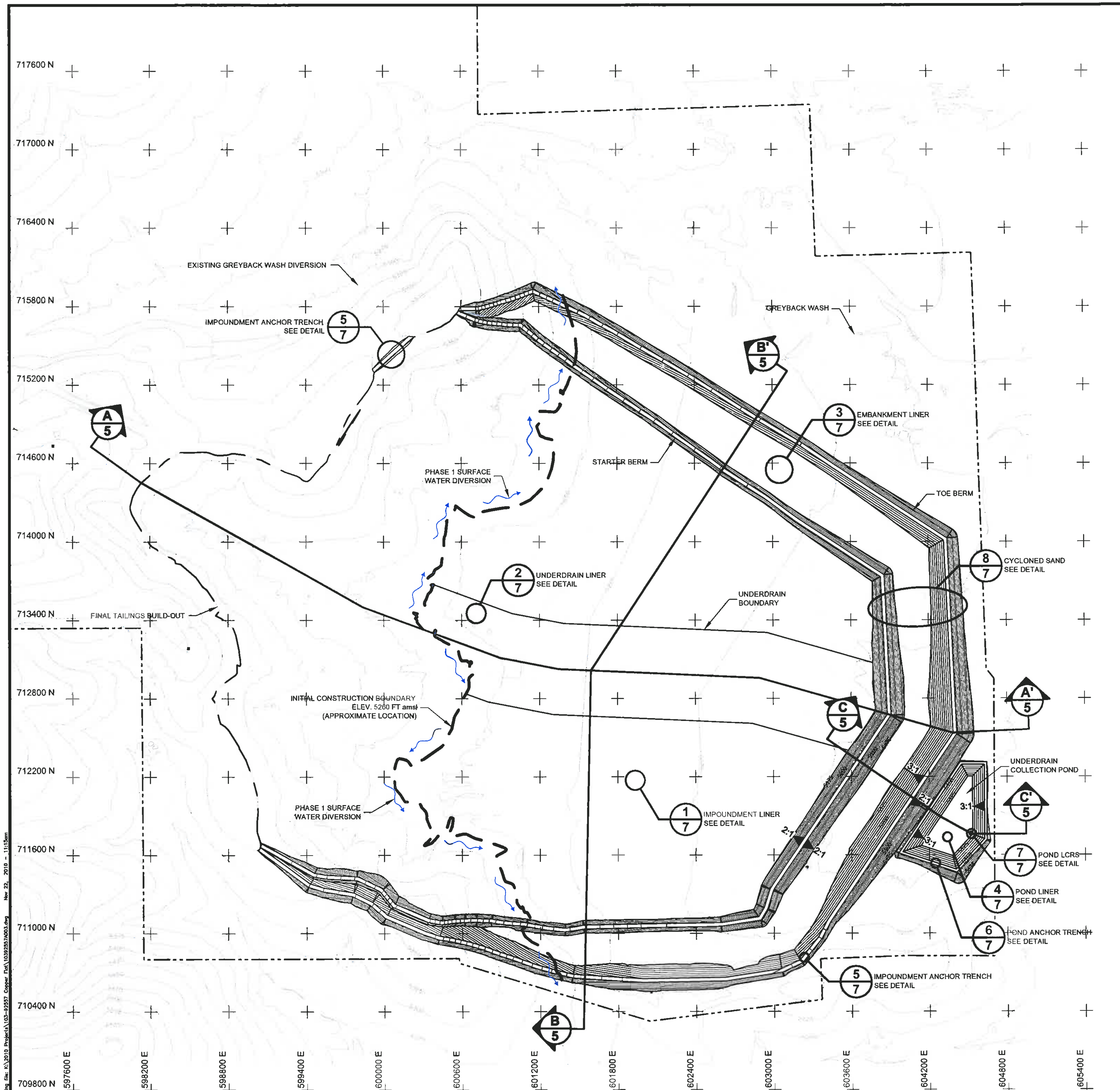
REVIEW	DAK	11/17/10	



LEGEND

- EXISTING CONTOURS
- DESIGN CONTOURS
- PHASE 1 SURFACE WATER DIVERSION FLOW ARROW
- PERMIT BOUNDARY
- INITIAL CONSTRUCTION BOUNDARY
- FINAL TAILINGS BUILD-OUT
- DETAIL CALL-OUT
- CROSS-SECTION CALL-OUT

NOTES

1. DRAWINGS PRESENT THE CONCEPTUAL DESIGN OF A NEW AND EXPANDED TAILINGS STORAGE FACILITY WITH A CAPACITY OF 100 MILLION TONS AT AN ASSUMED DRY DENSITY OF 85 POUND PER CUBIC FOOT.
2. FINAL DESIGN WILL BE COMPLETED IN ACCORDANCE WITH THE RULES AND REGULATIONS OF THE NEW MEXICO STATE ENGINEER, THE NEW MEXICO ENVIRONMENT DEPARTMENT (NMED) AND THE NEW MEXICO MINING AND MINERALS DIVISION (NM MMD).
3. EXISTING FIVE (5) FOOT TOPOGRAPHY AND PERMIT BOUNDARY PROVIDED BY NEW MEXICO COPPER CORPORATION.
4. TOPOGRAPHY IN THE VICINITY OF THE QUNITANA STARTER DAM AND TAILINGS CELLS APPROXIMATED BY GOLDER TO REPRESENT PRECONSTRUCTION TOPOGRAPHY FOLLOWING DEMOLITION (BORROW) OF THE EXISTING STARTER EMBANKMENT, RELOCATION OF EXISTING TAILINGS AND REGRADING IN FORMER BORROW AREAS AND EXISTING DISTURBANCE AREAS. TOPOGRAPHY IN OTHER LOCATIONS REPRESENTS EXISTING CONDITIONS. A SITE WIDE TAILINGS DISPOSAL FACILITY GRADING PLAN WILL BE DEVELOPED IN FUTURE DESIGN STUDIES.
5. EXISTING TAILINGS FROM THE QUINTANA 1981-82 OPERATIONS ARE THE SUBJECT OF AN ONGOING ABATEMENT ACTION. THE CONCEPTUAL DESIGN CONSIDERS CAPPING EXISTING TAILINGS BENEATH THE FUTURE IMPOUNDMENT LINER SYSTEM THROUGH THEIR INCORPORATION IN THE LINER BEDDING FILL LAYER, OR PLACEMENT OF EXISTING TAILINGS ON THE NEW IMPOUNDMENT LINER. ALTERNATIVES FOR MANAGEMENT OF EXISTING TAILINGS WILL BE DEVELOPED IN CONSULTATION WITH NMED.
6. PHASE 1 CONSTRUCTION LIMITS ARE APPROXIMATELY LOCATED. PHASE 1 AND SUBSEQUENT CONSTRUCTION PHASE LIMITS AND SURFACE WATER DIVERSION REQUIREMENTS WILL BE DETERMINED IN FUTURE ENGINEERING DESIGN STUDIES.
7. EMBANKMENT RAISES WILL BE CONSTRUCTED BY THE CENTERLINE RAISE METHOD USING CYCLONE UNDERFLOW (TAILINGS SAND). CYCLONE OVERFLOW (SLIMES) WILL BE DISCHARGED INTO THE INTERIOR OF THE TAILINGS STORAGE FACILITY.
8. DURING OPERATION, STORMWATER WILL BE CONTAINED WITHIN THE TAILINGS STORAGE FACILITY AND UTILIZED AS PROCESS MAKE-UP WATER. A PROJECT WATER BALANCE WILL BE DEVELOPED IN FUTURE ENGINEERING DESIGN STUDIES.

DAVID ALAN KIDD NEW MEXICO 13778 REGISTERED PROFESSIONAL ENGINEER 11-17-10

SCALE 400 0 400 800 FEET

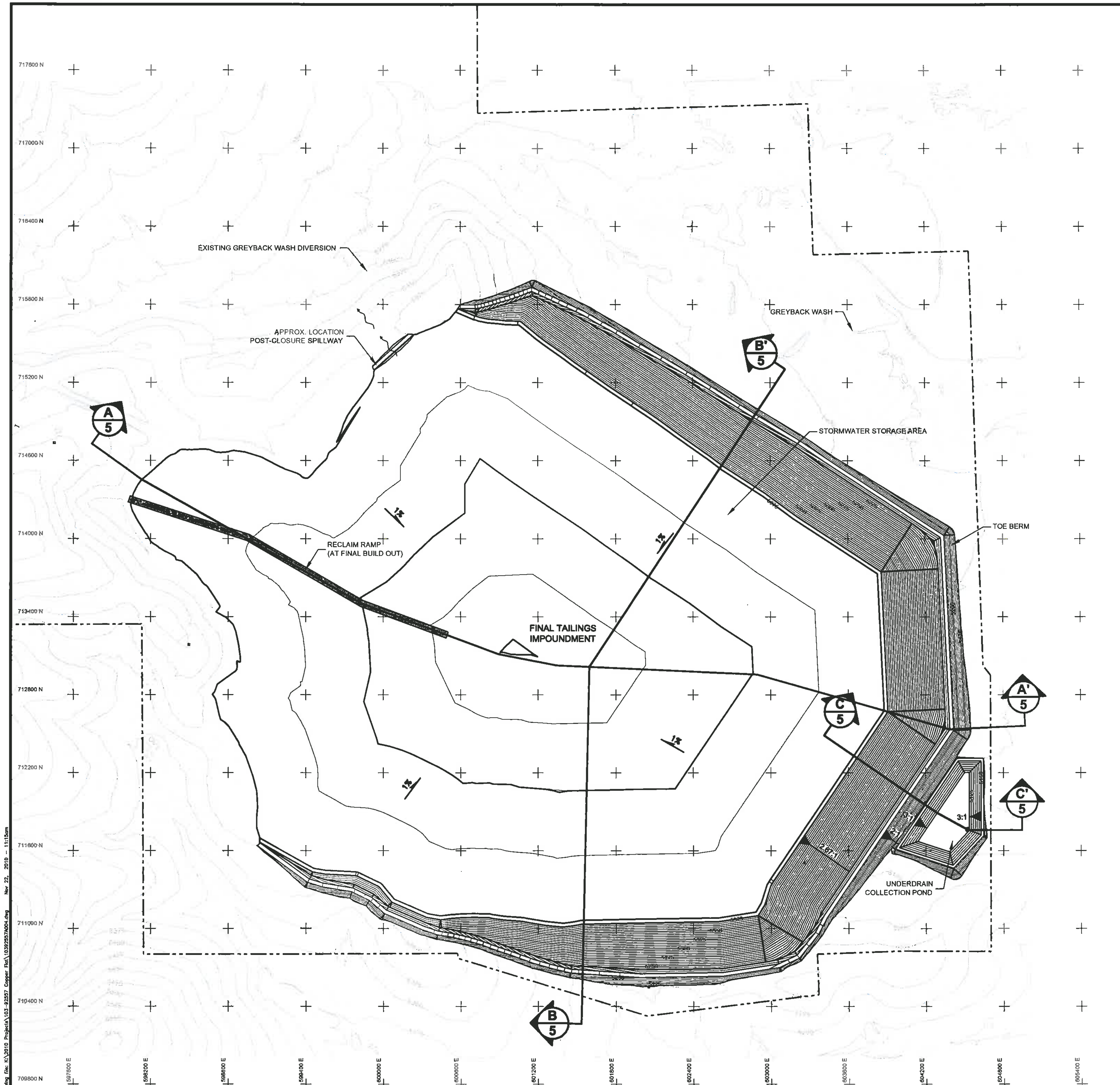
DRAWING USE
CONCEPTUAL DESIGN
NOT FOR CONSTRUCTION

PROJECT
COPPER FLAT PROJECT
TAILINGS STORAGE FACILITY
CONCEPTUAL DESIGN STUDY
SIERRA COUNTY, NEW MEXICO

TITLE
TAILINGS STORAGE FACILITY PLAN

Golder Associates

PROJECT No.		103-92557	FILE No.	10392557A003
DESIGN	CDJ	10/25/10	SCALE AS SHOWN	REV. B
CADD	ANV	10/27/10	DRAWING 3	
CHECK	GM	10/29/10		
REVIEW	DAK	11/17/10		



LEGEND

- EXISTING CONTOURS
- DESIGN CONTOURS
- PERMIT BOUNDARY
- CROSS-SECTION CALL-OUT

NOTES

1. DRAWINGS PRESENT THE CONCEPTUAL DESIGN OF A NEW AND EXPANDED TAILINGS STORAGE FACILITY WITH A CAPACITY OF 100 MILLION TONS AT AN ASSUMED DRY DENSITY OF 85 POUND PER CUBIC FOOT.
2. FINAL DESIGN WILL BE COMPLETED IN ACCORDANCE WITH THE RULES AND REGULATIONS OF THE NEW MEXICO STATE ENGINEER, THE NEW MEXICO ENVIRONMENT DEPARTMENT (NMED) AND THE NEW MEXICO MINING AND MINERALS DIVISION (NM MMD)
3. EXISTING FIVE (5) FOOT TOPOGRAPHY AND PERMIT BOUNDARY PROVIDED BY NEW MEXICO COPPER CORPORATION.
4. FINAL EMBANKMENT CREST HEIGHT WILL BE APPROXIMATELY 5,375 FEET AMSL. TAILINGS SURFACE CONFIGURATION SHOWN REPRESENTS CONDITIONS AT THE CESSATION OF MINING OPERATIONS. APPROXIMATE LOCATION OF A POST-CLOSURE SPILLWAY SHOWN. TAILINGS DISCHARGE LOCATIONS MAY BE MODIFIED IN LATE STAGE OPERATIONS TO GRADE THE IMPOUNDMENT SURFACE AND FACILITATE POST-CLOSURE DRAINAGE TO THE PERMANENT SPILLWAY.
5. SELECTION OF A DESIGN STORM EVENT FOR STORMWATER STORAGE AND SPILLWAY CAPACITY WILL BE IN ACCORDANCE WITH THE REQUIREMENTS OF THE NEW MEXICO STATE ENGINEER.

DAVID ALAN KIDD
NEW MEXICO
13778
REGISTERED PROFESSIONAL ENGINEER
11-17-10

400 0 400 800
SCALE FEET

DRAWING USE
CONCEPTUAL DESIGN
NOT FOR CONSTRUCTION

PROJECT
COPPER FLAT PROJECT
TAILINGS STORAGE FACILITY
CONCEPTUAL DESIGN STUDY
SIERRA COUNTY, NEW MEXICO

TITLE
TAILINGS STORAGE FACILITY AT FINAL BUILD-OUT

Golder Associates

PROJECT No.		103-92557	FILE No.	10392557A004
DESIGN	CDJ	10/25/10	SCALE AS SHOWN	REV. C
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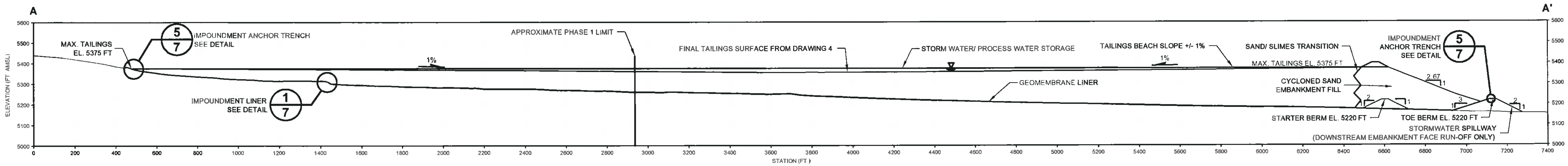
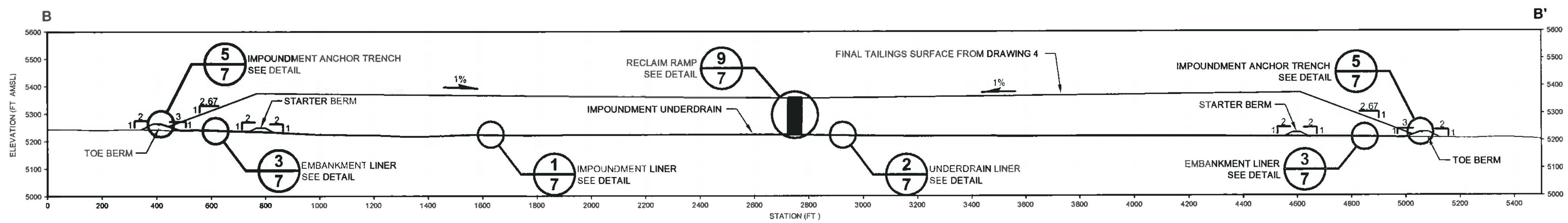
REVIEW	DAK	11/17/10		



CROSS SECTION A-A'

A/5 — SCALE 250 0 250 500 FEET



CROSS SECTION B-B'

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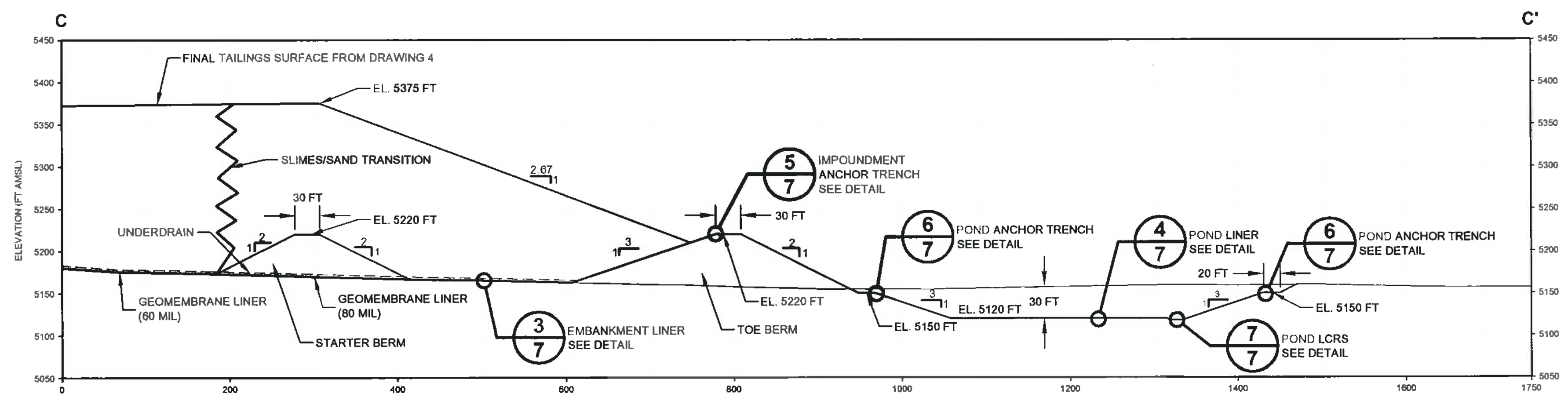

CROSS SECTION C-C'

C/5 — SCALE 100 0 100 200 FEET

DAVID ALAN KIDD — NEW MEXICO — 13778 — REGISTERED PROFESSIONAL ENGINEER — 11-17-10

DRAWING USE	PROJECT
CONCEPTUAL DESIGN NOT FOR CONSTRUCTION	COPPER FLAT PROJECT TAILINGS STORAGE FACILITY CONCEPTUAL DESIGN STUDY SIERRA COUNTY, NEW MEXICO

TITLE

TAILING FACILITY STORAGE CROSS-SECTIONS

Golder Associates

PROJECT No.	103-92557		FILE No.	10392557A005
DESIGN	CDJ	10/25/10	SCALE AS SHOWN	REV. C
CADD	ANV	10/27/10	DRAWING	
CHECK	GM	10/29/10	5	
REVIEW	DAK	11/17/10		

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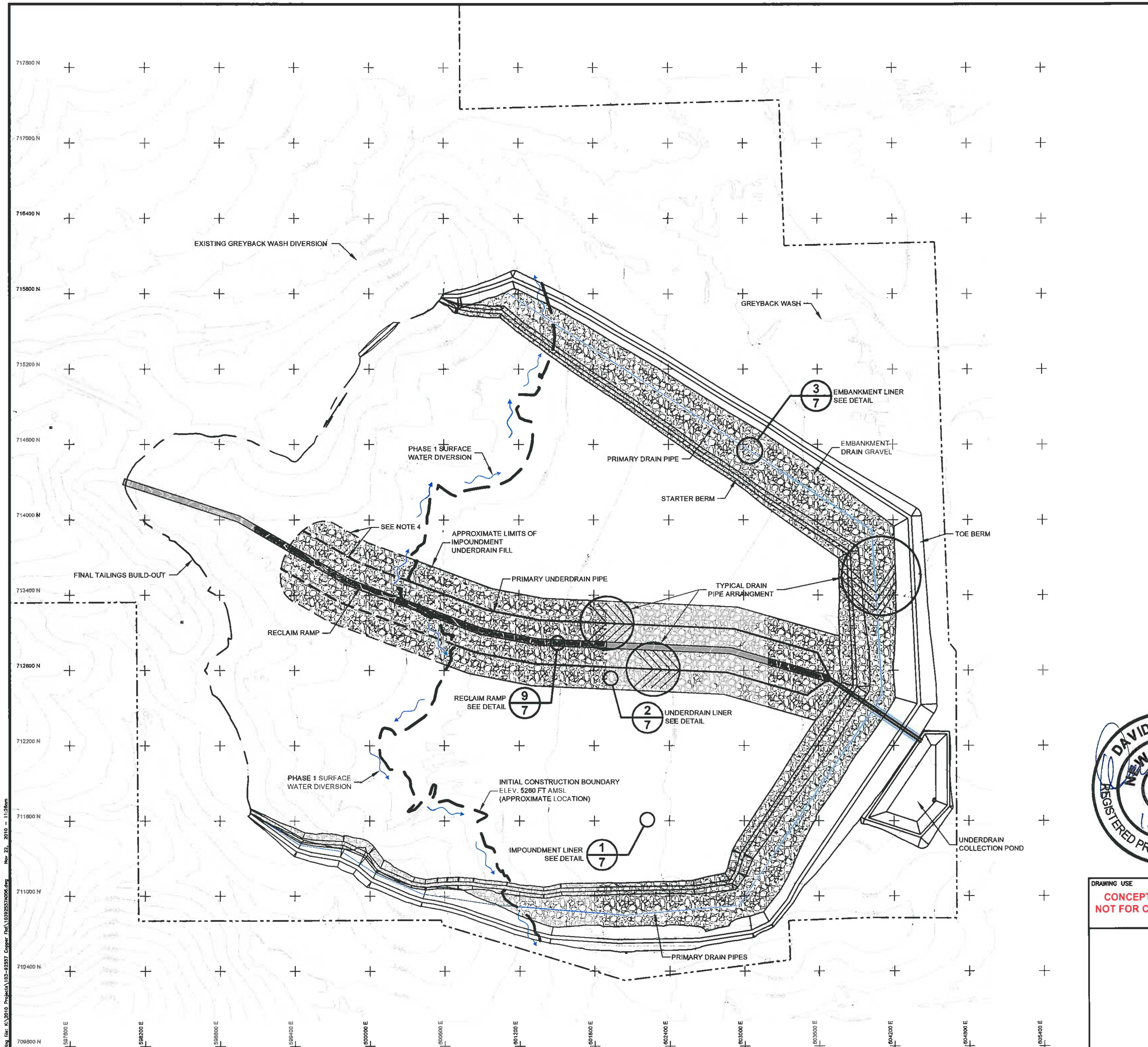
01657



LEGEND

- EXISTING CONTOURS
- DESIGN CONTOURS
- PHASE 1 SURFACE WATER DIVERSION FLOW ARROW
- PERMIT BOUNDARY
- PHASE 1 BOUNDARY
- FINAL TAILINGS BUILD-OUT
- PRIMARY UNDERDRAIN PIPE
- PRIMARY DRAIN PIPE
- UNDERDRAIN FILL
- DETAIL CALL-OUT

NOTES

1. DRAWINGS PRESENT THE CONCEPTUAL DESIGN OF A NEW AND EXPANDED TAILINGS STORAGE FACILITY WITH A CAPACITY OF 100 MILLION TONS AT AN ASSUMED DRY DENSITY OF 85 POUND PER CUBIC FOOT.
2. FINAL DESIGN WILL BE COMPLETED IN ACCORDANCE WITH THE RULES AND REGULATIONS OF THE NEW MEXICO STATE ENGINEER, THE NEW MEXICO ENVIRONMENT DEPARTMENT (NMED) AND THE NEW MEXICO MINING AND MINERALS DIVISION (NM MMD)
3. EXISTING FIVE (5) FOOT TOPOGRAPHY AND PERMIT BOUNDARY PROVIDED BY NEW MEXICO COPPER CORPORATION.
4. APPROXIMATE LIMITS OF UNDER DRAIN SYSTEM SHOWN. EMBANKMENT UNDERDRAIN WILL BE A GRADED SAND AND GRAVEL DRAIN THAT IS FILTER COMPATIBLE WITH CYCLONED TAILINGS SAND. IMPOUNDMENT UNDER DRAIN WILL BE GEOTEXTILE FABRIC WRAPPED. THE IMPOUNDMENT UNDERDRAIN WILL BE EXTENDED DURING PHASED CONSTRUCTION.

DAVID ALAN KIDD
NEW MEXICO
13778
REGISTERED PROFESSIONAL ENGINEER
11-17-10

SCALE 400 0 400 800 FEET

DRAWING USE
CONCEPTUAL DESIGN
NOT FOR CONSTRUCTION

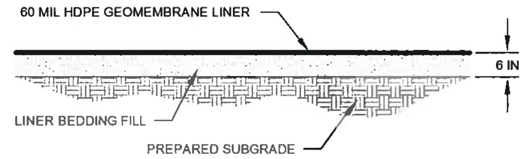
PROJECT
COPPER FLAT PROJECT
TAILINGS STORAGE FACILITY
CONCEPTUAL DESIGN STUDY
SIERRA COUNTY, NEW MEXICO

TITLE
TAILINGS STORAGE FACILITY UNDERDRAIN PLAN

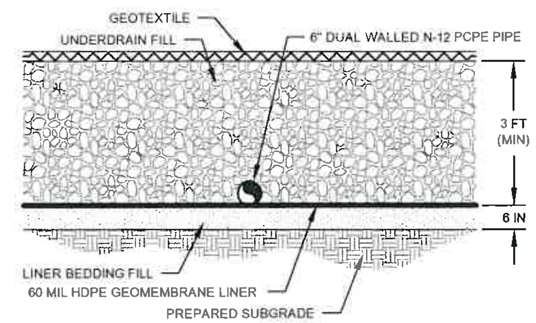
Golder Associates

PROJECT No.		103-92557
DESIGN	CDJ	10/25/10
CADD	ANV	10/27/10
CHECK	GM	10/29/10
REVIEW	DAK	11/17/10

FILE No. 10392557A006
SCALE AS SHOWN REV. B
DRAWING 6



1/7 IMPOUNDMENT LINER DETAIL
NOT TO SCALE



2/7 UNDERDRAIN AREA LINER DETAIL
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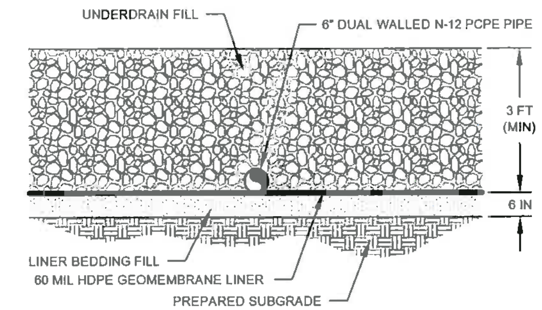

3/7 EMBANKMENT AREA LINER DETAIL
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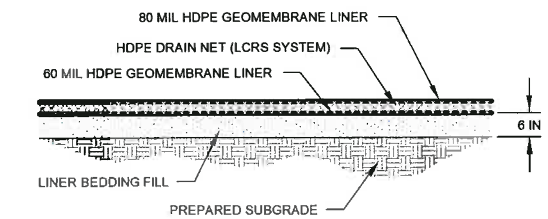
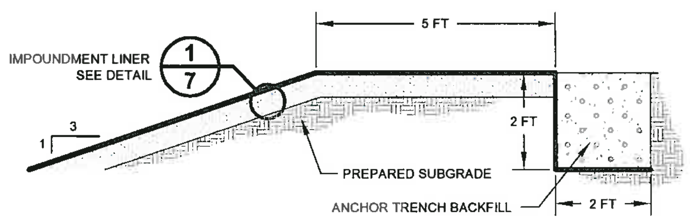
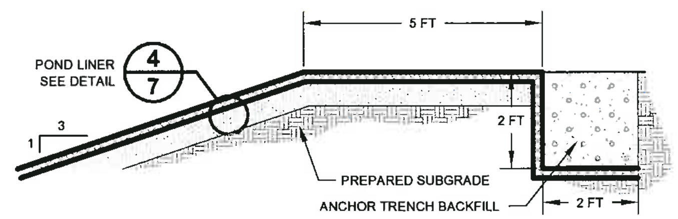


4/7 POND LINER DETAIL
NOT TO SCALE



5/7 IMPOUNDMENT ANCHOR TRENCH DETAIL
NOT TO SCALE



6/7 POND ANCHOR TRENCH DETAIL
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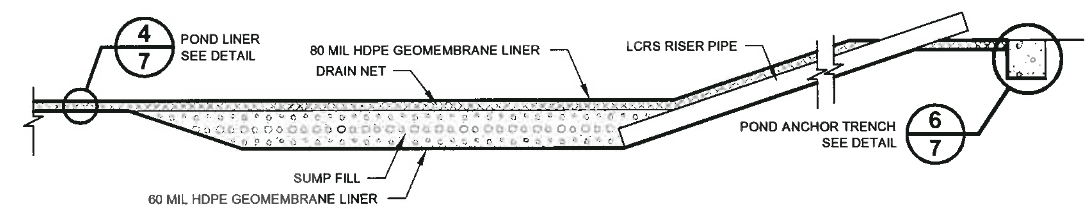
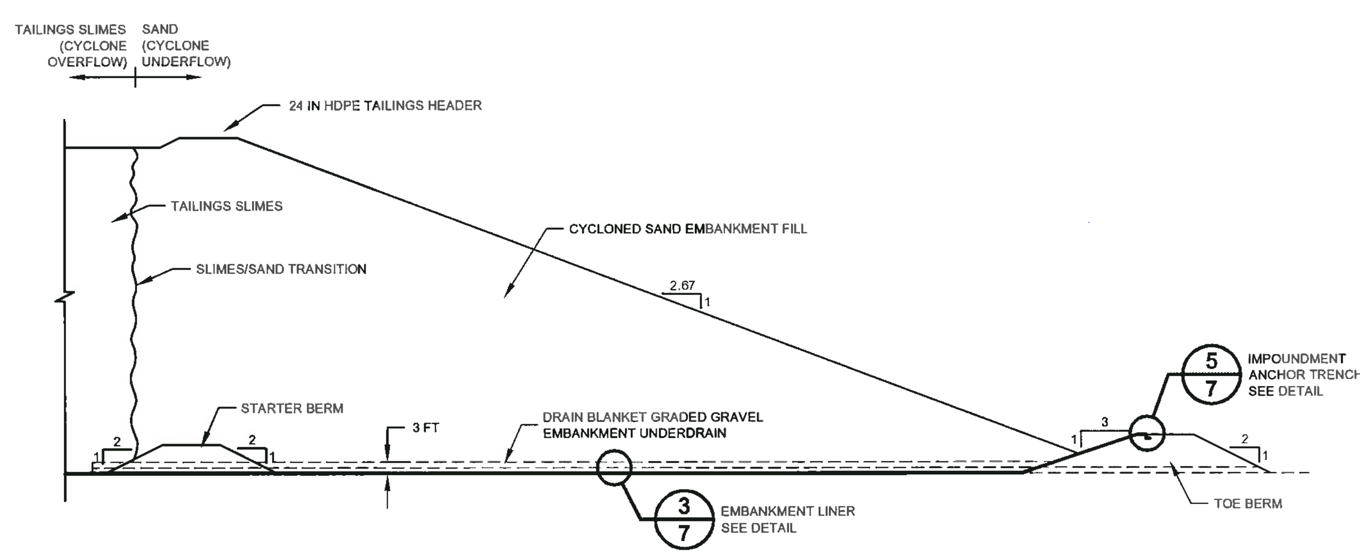
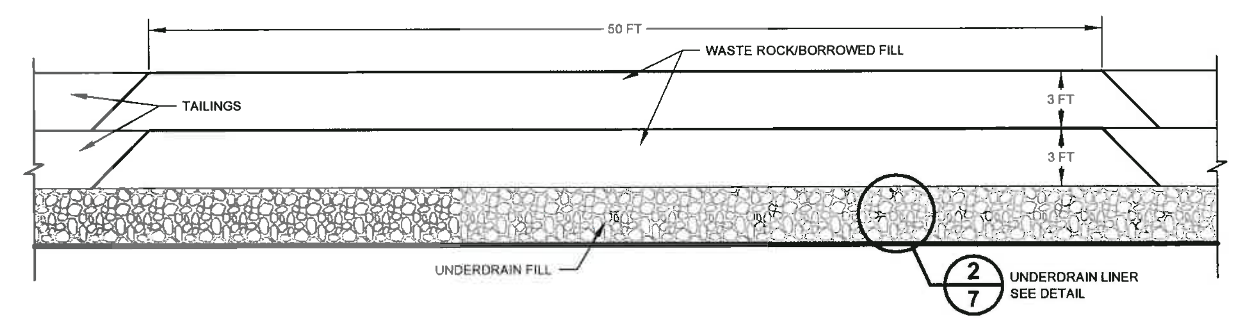


7/7 POND LEAK COLLECTION AND RECOVERY SYSTEM (LCRS) DETAIL
NOT TO SCALE



8/7 CYCLONED SAND EMBANKMENT DETAIL
NOT TO SCALE



9/7 PROCESS WATER RECLAIM RAMP DETAIL
NOT TO SCALE

DAVID ALAN KIDD
NEW MEXICO
13778
REGISTERED PROFESSIONAL ENGINEER
11-17-10

DRAWING USE	PROJECT
CONCEPTUAL DESIGN NOT FOR CONSTRUCTION	COPPER FLAT PROJECT TAILINGS STORAGE FACILITY CONCEPTUAL DESIGN STUDY SIERRA COUNTY, NEW MEXICO

TITLE
TAILINGS STORAGE FACILITY DETAILS

Golder Associates

PROJECT No.	103-92557		FILE No.	10392557A007
DESIGN	CDJ	10/25/10	SCALE AS SHOWN	REV. C
CADD	ANV	10/27/10	DRAWING	
CHECK	GM	10/29/10		7
REVIEW	DAK	11/17/10		

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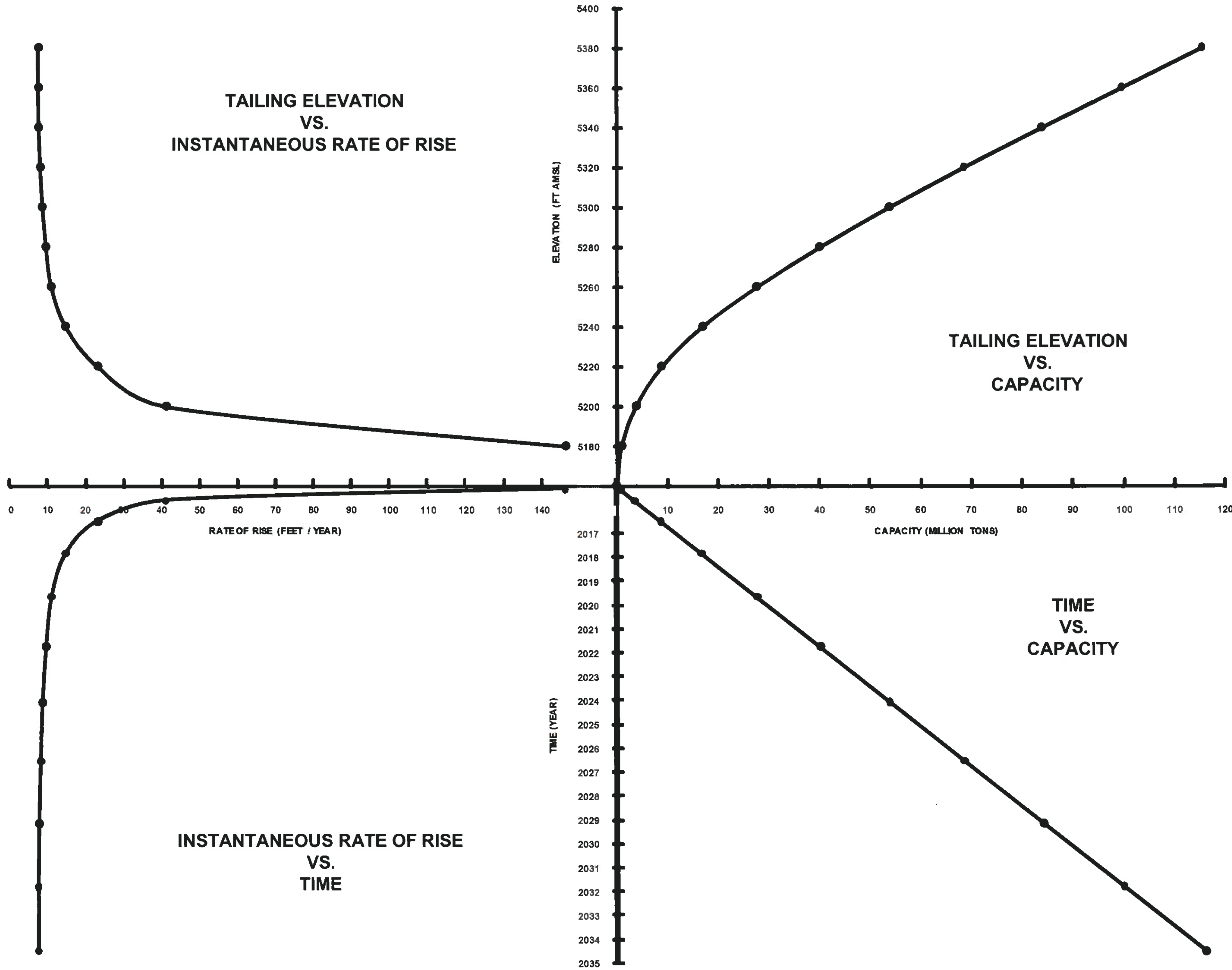

NOTES

1. CAPACITY ESTIMATED USING EXISTING FIVE (5) FOOT TOPOGRAPHY PROVIDED BY NEW MEXICO COPPER CORPORATION AND A DRY DENSITY OF 85 PCF.
2. TAILING MAXIMUM ELEVATION IS 5,375 FT AMSL AT LOCATION OF DISCHARGE POINT.
3. RATE OF RISE IS CALCULATED FROM THE PRODUCTION RATE OF 17,500 TONS PER DAY AT 93% AVAILABILITY FOR AN ANNUAL PRODUCTION OF 5,940,375 TONS.
4. ASSUMED START-UP DATE 2015 ACTUAL START DATE TO BE DETERMINED.

DAVID ALAN KIDD
NEW MEXICO
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11-17-10

DRAWING USE
CONCEPTUAL DESIGN
NOT FOR CONSTRUCTION

PROJECT
COPPER FLAT PROJECT
TAILINGS STORAGE FACILITY
CONCEPTUAL DESIGN STUDY
SIERRA COUNTY, NEW MEXICO

TITLE
HEIGHT VS. CAPACITY PLOT

Golder Associates

PROJECT No.		103-92557	FILE No.	10392557A008
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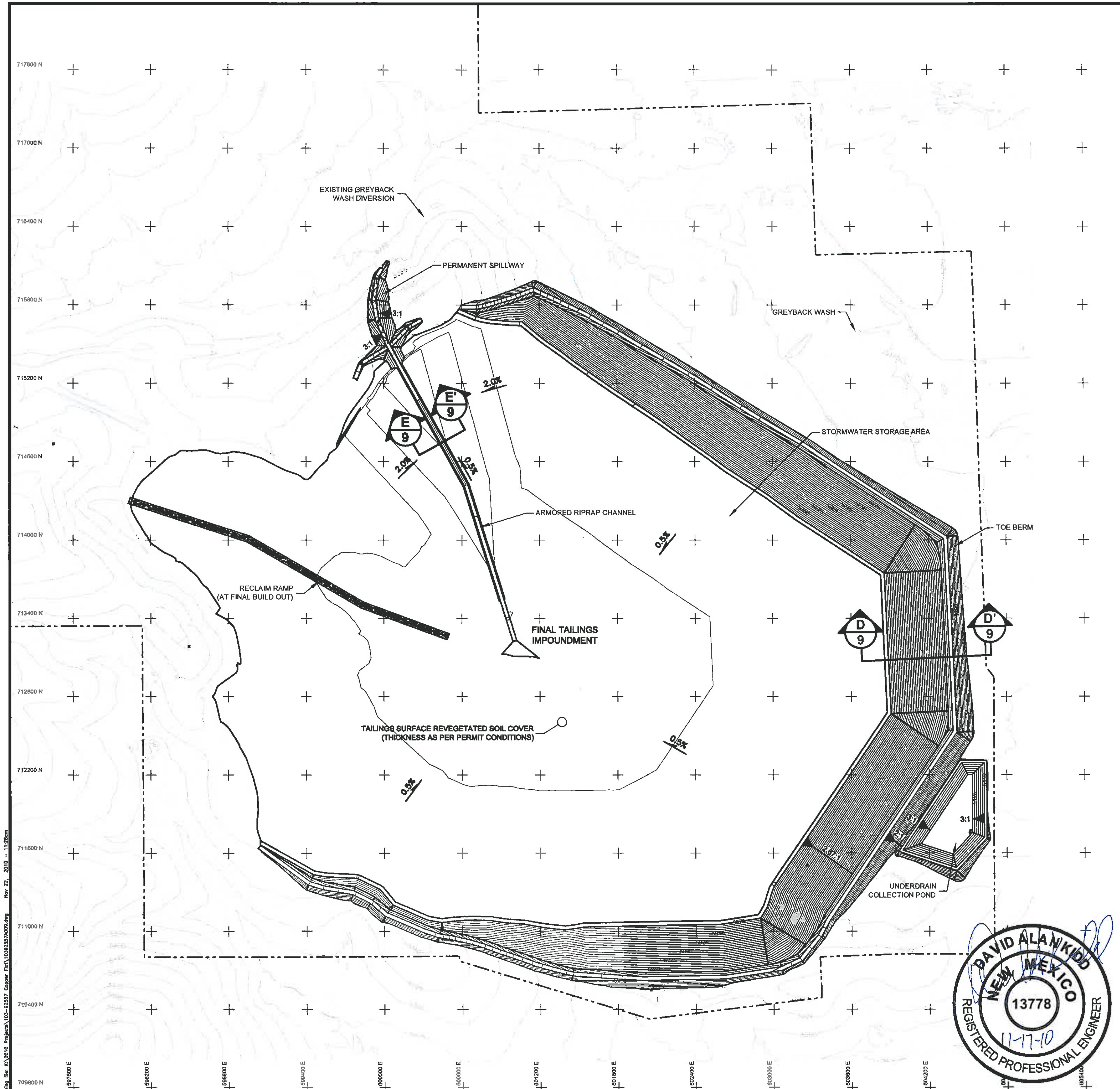
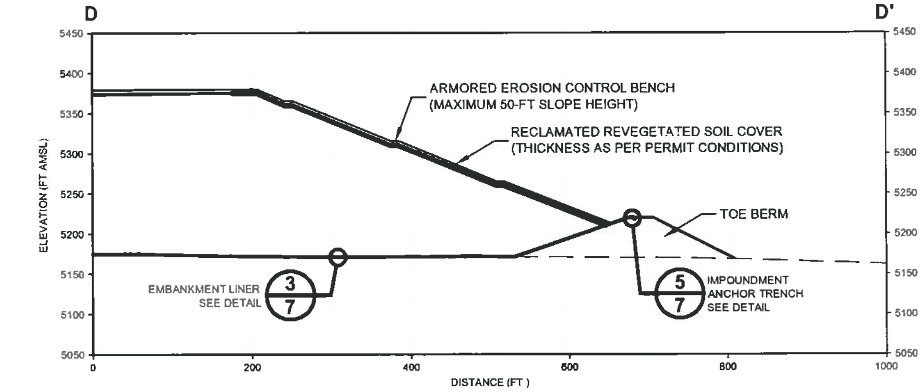
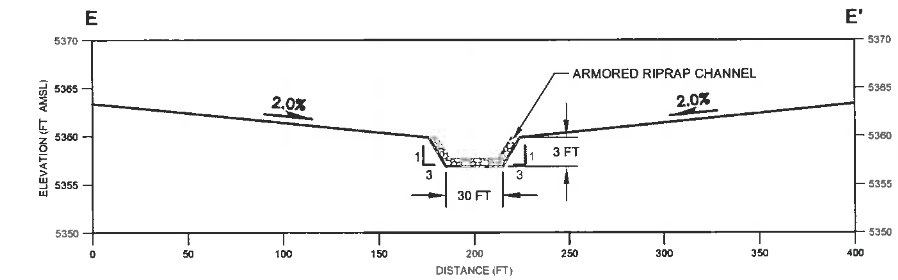




D/9 CROSS SECTION D-D'

120 0 120 240
SCALE FEET



E/9 CROSS SECTION E-E'

50 0 50 100
SCALE (x5 VERTICAL EXAGGERATION) FEET

LEGEND

- EXISTING CONTOURS
- DESIGN CONTOURS
- PERMIT BOUNDARY
- CROSS-SECTION CALL-OUT

NOTES

1. DRAWINGS PRESENT THE CONCEPTUAL DESIGN OF A NEW AND EXPANDED TAILINGS STORAGE FACILITY WITH A CAPACITY OF 100 MILLION TONS AT AN ASSUMED DRY DENSITY OF 85 POUND PER CUBIC FOOT.
2. FINAL DESIGN WILL BE COMPLETED IN ACCORDANCE WITH THE RULES AND REGULATIONS OF THE NEW MEXICO STATE ENGINEER, THE NEW MEXICO ENVIRONMENT DEPARTMENT (NMED) AND THE NEW MEXICO MINING AND MINERALS DIVISION (NM MMD)
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4. FINAL EMBANKMENT CREST HEIGHT WILL BE APPROXIMATELY 5,375 FEET AMSL. TAILINGS SURFACE CONFIGURATION SHOWN REPRESENTS CONDITIONS AT THE CESSATION OF MINING OPERATIONS. APPROXIMATE LOCATION OF A POST-CLOSURE SPILLWAY SHOWN. TAILINGS DISCHARGE LOCATIONS MAY BE MODIFIED IN LATE STAGE OPERATIONS TO GRADE THE IMPOUNDMENT SURFACE AND FACILITATE POST-CLOSURE DRAINAGE TO THE PERMANENT SPILLWAY.
5. SELECTION OF A DESIGN STORM EVENT FOR STORMWATER STORAGE AND SPILLWAY CAPACITY WILL BE IN ACCORDANCE WITH THE REQUIREMENTS OF THE NEW MEXICO STATE ENGINEER.
6. TAILINGS SURFACE REGRADED AT CLOSURE OR TAILINGS DEPOSITION PATTERNS MODIFIED DURING LATE STAGE OPERATION TO CONTOUR THE TAILINGS SURFACE.
7. UNDERDRAINING TO BE COLLECTED AND EVAPORATED ON IMPOUNDMENT SURFACE UNTIL UNDERDRAIN PIPES CAN BE PLUGGED AND UNDERDRAIN COLLECTION POND BACKFILLED.

DAVID ALAN KIDD
NEW MEXICO
13778
REGISTERED PROFESSIONAL ENGINEER
11-17-10

DRAWING USE
CONCEPTUAL DESIGN
NOT FOR CONSTRUCTION

PROJECT
COPPER FLAT PROJECT
TAILINGS STORAGE FACILITY
CONCEPTUAL DESIGN STUDY
SIERRA COUNTY, NEW MEXICO

TITLE
TAILINGS STORAGE FACILITY CONCEPTUAL CLOSURE PLAN

Golder Associates

PROJECT No.		103-92557	FILE No. 10392557A009
DESIGN	CDJ	10/25/10	SCALE AS SHOWN REV. C
CADD	ANV	10/27/10	DRAWING
CHECK	GM	10/29/10	9
REVIEW	DAK	11/17/10	

APPENDIX E

Preliminary Spill Contingency Plan

New Mexico Copper Corporation

Copper Flat Project
Spill Contingency Plan

Report Prepared for:

U.S. Department of the Interior
Bureau of Land Management
Las Cruces District Office
1800 Marquess Street
Las Cruces, NM 88005-3370

Report Submitted by:

NEW MEXICO COPPER CORPORATION
2425 San Pedro Dr. Suite 100
Albuquerque, NM 87110
Office: (505) 382-5770

December 2010

TABLE OF CONTENTS

TABLES

APPENDICES

1 FACILITY INFORMATION AND EMERGENCY RESPONSE

This Spill Contingency Plan has been prepared pursuant to Title 43, Part 3809 of the Code of Federal Regulations (CFR) [43 CFR § 3809.401(b)(2)(vi)] which requires development of a contingency plan as part of the Plan of Operations for mining operations. This Plan establishes procedures for response to oil, fuel and hazardous material spills, including control, cleanup and reporting. NMCC has developed this Contingency Plan to respond to spills and to minimize the impacts from spills of oil, fuel, oil-related products, and hazardous substances to the environment.

NOTE: THIS PLAN WILL BE UPDATED AND RESUBMITTED TO THE BLM AS FINAL DESIGNS OF THE OPERATIONAL FACILITIES ARE COMPLETED, AND PRIOR TO ANY MINE-RELATED ACTIVITY AT THE SITE.

The Environmental Manager (EM) has primary responsibility for implementing the Contingency Plan. The EM or his/her designee will be present at the facility during normal working hours.

Secondary containment structures designed to prevent the migration of a spill are part of the design of Facility components and are included in the Plan. Fuel and oil for the diesel and gas-powered equipment will be stored in above-ground, sealed tanks in the processing area. The tanks will be installed on lined pads and surrounded by berms to contain the volume of the largest tank within the secondary containment in the event of a spill or release.

The Contingency Plan will be posted and distributed to site personnel and will be used as a guide in training employees. Emergency reporting procedures will be posted in key locations throughout the project area. NMCC will be responsible for events at the mine site, while contract haulers (i.e., trucking companies) will be responsible for accidents and spills along the transportation routes.

Reporting spills or releases of oil-related materials or hazardous materials to the environment is divided into four categories:

1) Releases requiring internal notification only;
2) Releases also requiring notification to the State of New Mexico;
3) Releases also requiring notification to the National Response Center (NRC) and the local Emergency Planning Committee pursuant to CERCLA or Superfund; and
4) Releases subject to Clean Water Act requirements only.

Determining which of the above categories is appropriate for any particular spill or release depends on the type of material, the amount released, and the circumstances of the spill or release.

1.1 Emergency Response Action Plan

An Emergency Response Plan, which addresses responses to hazardous material releases, large-scale non-hazardous material releases, and natural disasters, will be prepared for the Facility and maintained in the Environmental Department.

1.2 Facility Information

The Copper Flat Mine Project (Project) is located in Sierra County, New Mexico, approximately 30 miles southwest of Truth or Consequences near Hillsboro. The NMCC mailing address is:

New Mexico Copper Corporation

2425 San Pedro Dr. Suite 100
Albuquerque, NM 87110
Office: (505) 382-5770

The area comprised of mine operations components, the Copper Flat Mine Facility (Facility), is anticipated to use diesel fuel, gasoline, motor oil and other petroleum hydrocarbons and chemical reagents. Oil is anticipated to be stored entirely above-ground.

No navigable waters have been defined at the mine facility; however, an intermittent or ephemeral stream called Greyback Wash passes through the pit area and a few springs or seeps occur west of the pit and up-gradient, all of which are tributaries to the Greyback drainage basin to the west of the pit.

The ore body at the Copper Flat Mine Facility is exposed at the surface and will be mined by conventional open-pit methods. The site is located in a semi-arid region of New Mexico with a mean annual precipitation of about 12 inches.

Ore from the pit will be trucked to the plant area east of the pit. The proposed process involves crushing and grinding followed by the addition of non-toxic organic reagents to create a copper laden froth and filtering to form a concentrate. Ore will be crushed or ground and organic reagents added to create froth. Copper minerals will adhere to the bubbles of the froth. The copper will be collected and filtered to form a concentrate. The proposed mill/concentrator plant is a sulfide flotation plant. No leaching processes, including cyanide leaching, are to be used. No smelting will occur at the Project.

For the purpose of grouping oil containment and storage according to distinct areas, the mine site has been delineated by the following anticipated areas or components:

<u>Fuel Storage Island</u>

Fuel and oil for diesel and gas powered equipment will be stored in above-ground, sealed tanks in the processing facilities area. The tanks will be installed on lined pads, consisting of gravel underlain by a plastic liner. The pad area will be surrounded by berms to provide secondary containment for the largest vessel in case of rupture. Surface piping leads from each tank to the fuel dispensing area. The refueling hoses will be equipped with overflow prevention devices and secondary containment.

<u>Bone Yard</u>

The bone yard will contain empty drums which will have the lids removed. The drums will be labeled as to their former contents. The drum storage areas will have secondary containment systems to minimize the potential for spills of oil and grease to the ground surface.

<u>Truck Shop</u>

A garage at the truck shop will contain lube oil containers and oil and transmission fluid drums. The garage will have a cement floor and a containment wall.

<u>Truck Wash</u>

Truck washing will occur on a cement slab with wash water recycled. Overflows of wash water from the tanks will be minimized.

<u>Shop and Warehouse Building</u>

Numerous drums of unopened/unused oil, antifreeze, transmission fluid and acetone will be stored on racks or pallets in the storage areas of the shop and warehouse building. This building will be prefabricated, standard, rigid-framed equipment servicing facility. Secondary containment will be provided, but the drums will not generally be opened at the site, and are only stored until required by mine staff.

<u>Mobile Tanks</u>

Mobile tanks, consisting of emergency power units/trailers, trailers, and "lube" trucks, may be used to store miscellaneous types of oil and fuel. The trailers and lube trucks are used to service other vehicles and equipment throughout the mine site. Due to the transient nature of the mobile tanks, permanent secondary spill containment is not provided. However, mobile tanks will be positioned in areas that are not subject to periodic flooding or washout.

Explosives

Blasting will be done with primacord, ammonium nitrate and fuel oil (ANFO), and emulsion suitable for use where wet holes are encountered. The blasting contractor will mix the components for each blast on an as needed basis. Mixing of the components will be performed at the batch plant operated by the contractor.

Blasting agents will be stored in compliance with applicable MSHA regulations Ammonium nitrate and diesel fuel will be stored on-site in bins and tanks. Storage of detonators, detonating cord, boosters, caps and fuses will be in accordance with the MSHA and New Mexico State Mine Inspectors regulations for explosives. The storage locations for each of these facilities have not yet been selected, but safety and security will be the main factors considered in their location. An inventory of these components will be made. To avoid potential spills, transfer and loading of explosives will be observed at all times by specialized personnel with appropriate training.

Hazardous Materials

No extremely hazardous substances (as defined by 40 CFR § 355) will be used at the Facility. None of the reagents to be used at the facility milling operations are considered to be hazardous materials by the Comprehensive Environmental Response, Comprehension and Liability Act (CERCLA) definition. Hazardous substances identified in CERCLA include all chemicals on the following regulatory lists:

1. Clean Air Act list of hazardous air pollutants (HAPs).
2. Clean Water Act list of hazardous substances and priority pollutants.
3. Solid Waste Disposal Act list of hazardous wastes.
4. Toxic Substances Control Act list of imminent hazards.

1.3 Emergency Response Information

1.3.1 Notification / Reporting

Proper reporting of spills is very critical and must be done carefully and accurately in a timely manner. A spill event notification flow sheet and a call list with contact names and telephone numbers will be developed and submitted to the BLM prior to commencement of site activities. All spills of any quantity are to be reported to the EM for general reporting guidance.

Records and reports of spills and releases shall be maintained for a period of five years by the EM, and will be made available for inspection upon request by EPA or state agency personnel, as required by SPCC Plan regulations.

How to Report

All spills will be reported in accordance with spill event notification flow sheet (see cover pages of this document), followed by completion of a spill/release record (Appendix C) to be submitted to the EM.

In-House Verbal Reporting

After taking immediate action, the person discovering the spill must notify his/her supervisor. The supervisor will notify the Loss Control Department. Loss Control then notifies the EM. Notification will include the information listed below.

- Date and time of spill;
- Type of material spilled and estimated quantity;
- Location of spill;
- Media impacted (soil, surface water, groundwater);
- Damages or injuries;
- Names and numbers of all persons contacted;
- Reason (cause) for spill;
- Action to prevent recurrence (corrective actions);
- Equipment type, equipment number, and tank number;
- Amount of soil added to approved on-site disposal facility;
- Date cleanup action taken; and,
- Name/position/title of person responsible for cleanup action.

If the Loss Control Leader cannot be reached, the EM must be contacted directly. The EM will determine if it is a reportable spill or discharge. If it is determined to be reportable, the EM will report the event and information to the General Manager as soon as possible.

If the Loss Control, General Manager, EM, Maintenance Superintendent or Production Superintendent cannot be reached, the respondent must call Security, who has company and home phone numbers of these persons and other responsible persons.

The EM will notify the appropriate state and federal agencies concerning spills or releases as required. No one but the EM or designated representative, or the General Manager is authorized to call any government agencies concerning spills. This restriction is needed to ensure that only confirmed, accurate information is provided to the regulatory agencies.

<u>In-House Written Reporting</u>

For any spill or release of oil (oils, gasoline, diesel, etc.) outside of a containment area, a complete written report must be submitted to the Environmental Department as soon as possible (usually within 24 hours of the spill). This written report must address the same components for verbal in-house reporting (above) and any additional issues deemed important by operating personnel. The spill reporting form found in Appendix C has been designed to facilitate such written reporting of spills.

<u>Reporting to State and Federal Agencies</u>

The EM or designated representative will execute all reporting to the agencies under the direction of the General Manager. The EM or designated representative will do the following with respect to regulatory reporting:

1. Report immediately any "reportable" (100 gallons or more) oil spill to the State as well as any spill that enters or threatens to enter any river, stream, canal, sewer, drain, lake or pond.
2. Make necessary written reports to the State, National Response Center and other agencies as required. The National Response Center typically does not require a written report of the spill, although one may be requested in certain situations. Verbal notification to the agencies must be made as soon as possible, but not later than after the first working day after the release. In case the EM or designated representative cannot be contacted by the end of the first working day after the release, the verbal report must be made by the General Manager, giving the data listed for verbal in-house reporting. In New Mexico, reporting procedures are as follows:

- Any spill of oil or hazardous materials, which enters directly into water or has the potential to do so, requires immediate verbal notification. "Immediate" has been defined for this situation as "as soon as possible" after the release. The verbal notification may be made by calling the emergency contact telephone numbers as listed in Appendix E.

  During these calls, the state, federal, or local agencies will determine whether a follow-up written report is required. If required, this report would be due within ten (10) calendar days of the release. The required components of the written report will be discussed during the verbal notification. If required, this written report would go to the following as directed by the State:

  - Releases of oil, which do not enter directly into water and do not have the potential to do so, must be dealt with in the following manner: A release of greater than 100 gallons of oil requires verbal notification by the end of the first working day after the release. The EM or a designated representative performs this notification by calling the emergency contact telephone numbers as listed in Appendix E. All releases which fall into this category may require a written follow up report, due within ten (10) calendar days of the release. The required components of the written report will be discussed during the verbal notification. If required, this written report would go to the following as directed by the State:
  - Releases of oil greater than 1,000 gallons of oil into or upon navigable waters (or in this case, waters of the State) requires additional notification to the EPA Regional Director (40 CFR § 112.4(a)). The EM or a designated representative does this by contacting:

    United States EPA, Region 6
    1445 Ross Avenue (maps)
    Suite 1200
    Dallas, Texas 75202
    (214) 665-6444

    All releases which fall into this category require a written follow-up report, due within sixty (60) calendar days of the release. The required components of the written report will be discussed during the verbal notification.

1.3.2 Response Equipment List

General Spill Cleanup Materials

Spill cleanup materials will be kept in the Warehouse, and include:

- disposable gloves;
- chemical resistant disposable boots, coveralls;
- short-handled brooms;
- adsorbent rags;
- oil sorbent material;
- approved compatible storage container;
- large plastic bags;
- tape;
- floor sweep;
- soda ash
- short-handled shovels; and

- dustpans.

Large Equipment for Cleanup

The Facility will operate 24 hours a day, 365 days per year. Rubber tire loaders, track dozers, motor graders, and backhoes are available and will be dispatched as needed for spill cleanup.

2 HAZARD EVALUATION AND DISCHARGES

2.1 Hazard Evaluation

2.1.1 Reagents Used for Processing

Following the froth flotation process for the tailings, the remaining slurry, consisting primarily of gangue minerals, pyrite and miscellaneous other un-floated minerals, along with water, flows into a tailings thickener for partial dewatering. Surface runoff, including any potential spills, from the areas around the reagent storage and tailings thickener will be controlled by surface grading and directed to the containment pond. Filtrate from both the copper flotation circuit and the molybdenum flotation circuit will be returned to the concentrate thickeners. Thickener overflow will be returned to the plant reclaim water system.

The molybdenum concentrate will be dried prior to packing into 55-gallon drums for shipment off-site. Provisions have been made to enable the tailings to be diverted around the thickener and discharged directly into the disposal ponds in the event of emergency mechanical problems.

A list of the reagents to be used on the site is included in Appendix F. Flotation collectors, frother and flocculants that are received dry will be mixed in agitated tanks and pumped to outdoor storage tanks and day tanks inside the mill building from which they are metered into the process.

Residual reagent concentrations in the tailings and reclaim water streams are expected to be at very low levels. The collector and promoter flotation reagents (a type 1 reagent) will be added in amounts resulting in concentrations of approximately three parts per million (ppm). This is using an addition rate of 0.02 pounds of reagent per ton of ore and two tons of water to the flotation process. Normally, 95 percent of the reagents are adsorbed onto the copper mineral surface and floated off in the mineral froth. This reagent is subsequently consumed in the off-site smelting process thereby adding its BTU's to the reaction. Using this 95 percent adsorption factor, the residual reagent reporting to the tailing stream drops to <0.15 ppm.

The frother reagent MIBC (a Type 2 reagent) is to be biodegradable in low concentrations as stated by the manufacturer (see Union Carbide MSDS for MIBC). The anticipated dosage rate will be 0.02 pounds per ton of mill feed. The bulk of this reagent will also report to the concentrate fraction and end up at the smelter.

The flocculent reagent (a Type 1 reagent), to be added at 0.016 pounds per ton of mill feed, is also classified as being biodegradable and exhibits a low tolerance to exposure to high pH solutions. Given the 10 to 11 pH range this plant will normally operate at, this reagent will rapidly decompose.

Lime (a type 3 reagent) is used at a rate of 2.7 pounds per ton of mill feed to control pH of the flotation circuit, most of which reacts with sulfide minerals to form gypsum.

Sodium Hydrosulfide (NaHS, a type 3 reagent) will be added to the molybdenum circuit process to effect the copper molybdenum separation. This reagent is rapidly oxidized through contact with the copper minerals and air bubbles entrained in the flotation pulp.

2.1.2 Hazard Identification

A list of the reagents anticipated to be used at the facility is provided in Appendix F. Material Safety Data Sheets (MSDS) for the reagents to be used at the facility will be on file at the site. None of the reagents to be used at the facility milling operations are considered to be hazardous materials by the Comprehensive Environmental Response, Comprehension and Liability Act (CERCLA) definition. Hazardous substances identified in CERCLA include all chemicals on the following regulatory lists:

1. Clean Air Act list of hazardous air pollutants (HAPs).

2. Clean Water Act list of hazardous substances and priority pollutants.
3. Solid Waste Disposal Act list of hazardous wastes.
4. Toxic Substances Control Act list of imminent hazards.

Inventories of bulk storage containers and container storage areas, electrical transformers, and mobile service vehicles, including descriptions of secondary containment, are provided in tables in Appendix F.

2.1.3 Vulnerability Analysis

Reagent spills will be contained by curbs in the reagent mixing and storage areas. A floor sump pump will be used to return spilled material either to the storage tank or into the milling process as necessary.

2.1.4 Worst Case Discharge

A worst-case spill scenario would involve total failure of the primary and secondary containment or failure which would otherwise allow discharge of the contents of the primary containment. The volume of discharge from such a failure could potentially equal the total contents of the tank. The rate at which this flow would occur would depend on the type of product in the tank, the depth of product in the tank, and the size/area of the release opening. For the largest tank, it is conceivable that such flow could equal tens or hundreds of gallons per minute.

The possible spill pathways have been estimated based upon a review of the topographic maps and a mine site inspection. The lateral extent of a spill would be a function of the type of product released, amount of product released, whether the spill was concurrent with a precipitation event, adequacy of the secondary containment, and ground surface cover.

2.2 Discharge Detection Systems

2.2.1 Discharge Detection by Personnel

Small leaks and spills that are confined to small areas will be cleaned up as part of the facility's SOPs. In cases where a medium or large (worst-case) leak has occurred but is confined to facility property, cleanup will proceed as follows:

In the case of a medium spill, direct response measures include:

1. Stop the leak by plugging the leak and/or closing the valve and ensure that the spill is totally contained.
2. Clean up the spill in accordance with general spill response procedures (Table 2-1). Facility employees under the direction of the authorized person or direct Supervisor will conduct the cleanup operation.

In the case of a large spill, direct response measures include:

1. Terminate the source of the flow of petroleum or chemical product.
2. Dig a trench or dike or do whatever else is necessary to confine the area of the spill or to stop it from entering a waterway. Never clear away spills with water! Water tends to mobilize a spill. Instead, use the most appropriate oil-absorbent materials, such as those contained in the spill cleanup kits, to prevent petroleum products from flowing into watercourses.
3. Plug floor drains, place sorbent materials around the spill or take other actions to minimize environmental damage. Sorbent materials will be stocked at the main warehouse.

4. Immediately initiate reporting procedures. The Loss Control Department, Mine Manager or EM must be notified (by radio or phone). The Control Room Operator will follow the Dispatch Emergency Communication Procedures (Appendix D).
5. After the response measures and reporting functions have been accomplished, cleanup will begin in accordance with general spill response procedures (Table 2-1). Should facility personnel be unable to perform the appropriate cleanup operation, and it is necessary for cleanup to begin immediately, the General Manager will utilize outside contractors. Unauthorized site personnel must not notify contractors directly. The General Manager has assigned certain individuals the responsibility of contacting outside contractors with a facility contract.

Table 2-1: General Spill Response Procedures

Spill Event:	Incidental (collected within secondary containment)	Significant (breaching of secondary containment)	Significant (available personnel unable to contain spill after attempting direct response measures)
Close Valve/Discharge Equipment	●	●	●
Mobilize Mine Equipment to Containerize Spill		●	
Use Sorbent Materials to Facilitate Containment		●	
Notify General Manager			●
Excavate Contaminated Soil and Transfer to Landfill, Pump Liquid for Off-Site Disposal	●	●	●
Notify Environmental Department for Transfer Approval	●	●	●
Repair/Replace Tank/Piping/ Discharge Equipment as Necessary	●	●	●

3 PLAN IMPLEMENTATION

In the event of an oil, fuel or chemical reagent spill, facility personnel will implement control procedures as summarized in the following table and detailed in the following sections. Response measures have been designed to mitigate the possibility of oil reaching waters of the State. Response measures include containing the spill, stopping the leak, and cleaning up the spill with the most effective means available. Facility employees will undertake these measures immediately when there is any danger of oil entering any waters of the State and in case of any oil spill.

3.1 Response Resources for Small, Medium, and Worst Case Spills

Small leaks and spills that are confined to small areas will be cleaned up as part of the facility's SOPs. In cases where a medium or large (worst-case) leak has occurred but is confined to facility property, cleanup will proceed as indicated in Section 2.3.1. Spill response equipment and materials are listed in Section 1.3.2.

For spills on gravel or soil, it may be possible to absorb some of the liquid with absorptive material or remove some of the liquid before removing the gravel or soil. Following approval of the Environmental Department, all contaminated gravel or soil will be removed and transported to an approved facility for disposal.

Spills on solid surfaces may be collected with absorptive materials and then cleaned thoroughly with rags wetted with a non-hazardous solvent if needed. Sufficient quantities of sorbent material and other cleanup equipment will be maintained at the warehouse facility to provide for cleanup.

If there is a small amount of water with the spilled oil, the water and the oil may be absorbed in sand, sawdust, or commercial adsorbents and disposed of per the Environmental Department's directions. Any residual sediment or sludge will also be cleaned up and also disposed of per the Environmental Department's directions.

3.1.1 Fire Protection

A fire protection system will be installed in the administration and warehouse complexes, truck shop, crushing plant and process plant. This system will incorporate Sierra County Code requirements. Hydrants will be located near all buildings. A 100,000-gallon fire water reserve will be stored in a water storage tank located sufficiently above and near the mill and crushing area to provide adequate water pressure. A fuel break will be constructed around the facilities. Water trucks, used for dust suppression, will be available in the event of a fire. One mine rescue vehicle will be located on-site in the event emergency transportation is required.

NMCC will promptly comply with any emergency directives and requirements of Sierra County, and the BLM requirements pertaining to industrial operations during the fire season.

NMCC will train an in-house fire brigade in the proper use of fire suppression equipment. In addition, the Sierra County Fire Protection Officer will provide advice on methods to maximize the benefit of equipment and to provide assistance in training Project personnel in fire fighting procedures and drills. The Hillsboro Voluntary Fire Department will be advised as the nature of materials that will be transported through town on a routine basis. Sierra County presently has spill response capabilities and all trucking contractors will be in compliance with 49 CFR and U.S. Department of Transportation regulations, to aid in the reducing the potential for spills and accidents and for mitigating releases that may occur during transport of hazardous materials. In the event of a release, the contract transportation company would be responsible for response and cleanup. Additional specialized training is required for drivers of tank trucks, such as those transporting acid.

3.2 Disposal Plans

Spent cleanup material, residual spilled oil, and hydrocarbon-contaminated soil will be properly disposed of in accordance with applicable state and federal regulations either in an on-site facility or at an approved off-site facility authorized to accept the type of waste.

3.3 Containment and Drainage Planning

Spill prevention and spill control requirements for the Facility include the following:

Spill Prevention

- Inspection and maintenance of oil, fuel and chemical reagent storage containers and transfer points;
- Testing of primary storage containers;
- Facility personnel training on SCP Plan implementation;
- Security; and
- Oil and fuel transfer procedures.

Spill Control

- Facility drainage; and
- Structural controls and equipment (diversion and secondary containment).

Storage tanks determined to not be in conformance with appropriate spill prevention guidelines will be corrected as soon as possible. All oil products are to be stored in above-ground steel tanks and provided with secondary containment unless otherwise noted.

At oil or fuel transfer points, vendor personnel are required to remain with the transport vehicle and observe the tank filling at all times. As filling takes place, vendor personnel are required to remain attentive to the tank level indicators to prevent tank overfills. Connection of the tank fill lines takes place before the master flow control valve is opened. Piping to the tanks will be equipped with back flow prevention devices (check-valves). After filling, the master flow control valve will be closed before disconnecting the fill hoses. A bucket will be placed below the fill valves during tank filling to contain any discharge. A service vehicle will then evacuate this bucket, as necessary.

Secondary containment will be provided for all permanently located oil, fuel and chemical reagent storage tanks, as well as for fill and dispenser points, to minimize the potential for a discharge to reach waters of the State. Secondary containment for each storage tank will have sufficient capacity to contain the contents of the largest tank in a containment area and sufficient freeboard to allow for precipitation. The minimum total volume for uncovered secondary containment is the capacity of the largest tank within the secondary containment plus the depth of rain for the 100-year, 24-hour storm event for the site or region. Fill and dispenser points will have incidental spillage containment such as curbed concrete pads and sumps.

3.4 Facility Self-Inspection

The Facility will be inspected frequently for leaks, liquid accumulation, and need for preventive maintenance. Monthly inspection forms are provided in Appendix A. Completed inspection forms will be submitted to the Mine Manager and the EM. The Environmental Department will maintain all completed forms and checklists related to this Plan for a period of at least three years. The EM's designee will ensure each storage/transfer area is inspected monthly with responses to spills or preventative maintenance tasks to be completed as indicated in Table 3-1.

Table 3-1: Inspection Tasks Summary

Observation	Report Spill (Appendix C)	Implement Controls & Countermeasures	Close	Repair & Replace as Necessary	Pump and Transfer Off-Site for Disposal	Notify Environmental Department for Approval
Spill (outside secondary containment area)	●	●				
Open valves/Dispenser equipment			●	●		
Inoperative liquid level gauge				●		
Physical deterioration to tank/foundation/ Piping (i.e., rusting, pitted)				●		
Inadequate tank/pipeline support (i.e., no tank anchor straps)				●		
Ineffective secondary containment (i.e., no anchoring of liner, tear in liner)				●		
Presence of free liquid in secondary containment, overfill containment areas and sumps					●	●

3.4.1 Tank Inspection

All tanks will be visually inspected monthly by personnel designated by the EM. Visual inspections will be conducted with respect to the following:

- Ensure the tank fill valves and dispenser points are in the closed position when not in use.
- Inspect all valves for signs of leakage or deterioration.
- Check inlet and outlet piping, as well as tank flanges for leakage.
- Inspect pipe/tank supports, foundations and anchoring straps for wear.
- Check tank level indicators and dispenser equipment for proper operating condition.
- Inspect the tank shell surfaces for areas of rust or other signs of deterioration. Particular attention will be paid to areas with peeling paint (or other coating), welds, and seams.
- Check the surfaces below tanks and oil transfer points areas for obvious signs of leaks or spills, specifically stained or visibly damp soils.

- Inspect all sumps and other overfill containment areas located below oil transfer points, and empty liquid as necessary. Consider liquid to be oil-contaminated, and following approval of the Environmental Department, remove for off-site disposal/recycling by personnel authorized to conduct this type of activity.
- Examine tank shells, welds, rivets and bolts for wear and discoloration. Examine all above-ground valves and pipelines for the general condition of flange joints, expansion joints, valve glands and bodies, catch pans, pipeline supports, and condition of metal surfaces.
- Tanks or oil storage containers that appear to be unused or inactive shall be verified as such, and if so, any remaining product shall be removed and disposed of, and the tank triple-rinsed in accordance with facility Standard Operating Procedures (SOPs) or with the use of an outside service. The tank will be modified if necessary to prevent physical access, and labeled with a legible sign indicating “empty” and “do not use”. If it is anticipated that the tank will no longer be used, procedures shall be implemented to remove the tank for disposal at an authorized facility.

Each aboveground container is inspected and/or tested for integrity on a regular schedule and whenever material repairs are made. NMCC provides training for personnel on performing container tests and inspections. Examples of integrity tests may include, but are not limited to: visual inspection, hydrostatic testing, radiographic testing, ultrasonic testing, acoustic emissions testing, or other systems of non-destructive testing. The frequency and type of testing and inspections depend on the container size, configuration, and design (e.g., shop-built, field-erected, skid-mounted, elevated, double-walled).

3.4.2 Secondary Containment Inspection

Secondary containments will be inspected on a routine schedule to document the condition of containment structure(s) and indicate any necessary repairs or maintenance.

Prior to draining or pumping any accumulated fluid from an oil storage containment area, verification of possible contamination will be conducted. A visual inspection of the accumulated water to determine whether or not a sheen is present will be considered sufficient verification that no contamination is present.

If a sheen is noted, the water will be collected and off-site disposal arranged as directed by the Environmental Department. If no sheen is observed, the water may be drained or pumped out of the containment area and applied to a designated on-site facility following approval of the Environmental Department.

3.5 Response Training

Key facility employees, who are directly involved with managing oil, fuel and/or chemical reagent storage and transfer operations, are regularly trained in implementing the Contingency Plan to minimize the number of human errors that cause oil spills. Employee training will be performed annually; new employees will be trained within one week of beginning work. An outline used to facilitate training of new employees and refresher training of existing employees is provided in Appendix B.

3.5.1 Personnel Response Training Logs

Records of response training will be maintained in the environmental master files.

4 SECURITY

Only authorized personnel will be allowed to enter the facility property. Tank locations that may require operations at night will be equipped with sufficient lighting to assist in security and provide visibility for operations to be performed. Tanks located in high traffic areas will be barricaded to minimize collisions from occurring.

5 ACRONYMS AND DEFINITIONS

The following definitions are presented below in order to understand the scope of this Plan. The definitions are from, and provided in, 40 CFR §112.2.

Oil: means oil of any kind or in any form, including, but not limited to petroleum, fuel oil, sludge, oil refuse, fats, greases, and oil mixed with other than dredged spoil. At the facility, oils stored include diesel fuel, gasoline, hydraulic oil, miscellaneous lube oils, grease, and motor oils.

Discharge: includes but is not limited to, any spilling, leaking, pumping, pouring, emitting, emptying, or dumping.

Reportable Spill: means a discharge of oil into or upon the navigable waters of the United States or adjoining shorelines in harmful quantities, as defined in 40 CFR §110, which states, discharges of oil that:

- Violate applicable water quality standards, or
- Cause a film or sheen upon or discoloration of the surface of the water or adjoining shorelines or cause a sludge or emulsion to be deposited beneath the surface of the water or upon adjoining shorelines (40 CFR §110.3).

At the facility, visual inspections using the second definition above will be used to determine whether a discharge constitutes a reportable spill event as detailed in Section 4 of the SPCC Plan.

Contract: means:

- A written contractual agreement with an oil spill removal organization(s) that identifies and ensures availability of the necessary personnel and equipment within appropriate response times; and/or
- A written certification by the owner or operator that the necessary personnel and equipment resources, owned or operated by the facility owner or operator, are available to respond to a discharge within appropriate response times.

Reportable spill events are regulated by the NMED, which requires notification within 24 hours if a discharge occurs in such quantity as may with reasonable probability injure or be detrimental to human health. In addition, as indicated in 40 CFR §112.4(a), whenever a facility has discharged more than 1,000 U.S. gallons of oil into or upon the navigable waters of the United States or adjoining shorelines in a single spill event, or discharged more than 42 U.S. gallons of oil in each of two discharges as described in 40 CFR § 112.1(b) into or upon the navigable waters of the United States or adjoining shorelines, occurring within any twelve month period, the owner or operator of such facility shall submit to the Regional Administrator, within 60 days, a detailed spill report.

Navigable waters (as defined in 40 CFR §110.1) are not present at the Copper Flat Mine Facility. Other waters in the vicinity include the intermittent stream Greyback Wash to the west of the pit and a few springs or seeps west of the pit.

Waters of the State, as defined by the State of New Mexico, include all interstate and intrastate waters, including natural ponds and lakes, playa lakes, reservoirs, perennial streams and their tributaries, intermittent streams, sloughs, prairie potholes and wetlands (WQCC 91-1, 1995). This State definition indicates additional waters that must be considered for impact by an oil spill at the facility.

Appendix A

Inspection Checklists and Reporting Forms

(*Pending*)

Appendix B

Training Outline

(*Pending*)

Appendix C

Spill Reporting Procedures

(*Pending*)

Appendix D

Facility Incident Command System

(*Pending*)

Appendix E

Emergency Contacts and Telephone Call List

(*Pending*)

Appendix F

Storage and Containment Inventories

(*Pending*)

APPENDIX F

Quality Assurance Plan

(Intera, 2010)

New Mexico Copper Corporation
Quality Assurance Project Plan
Copper Flat Mine Site

September 2010



Prepared for:
New Mexico Copper Corporation

Submitted to:
Mining and Minerals Division
New Mexico Energy, Minerals and Natural Resources Department

Prepared by:
INTERA

01688

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Abbreviations and Acronyms

CFR	Code of Federal Regulations
COC	chain of custody
CPR	cardiopulmonary resuscitation
DQA	data quality assessment
EPA	United States Environmental Protection Agency
ER	equipment rinsate
FTL	field team leader
ID number	identification number
LCS	laboratory control sample
MDL	method detection limit
MMD	New Mexico Mining and Minerals Division
MQO	measurement quality objectives
MS	matrix spike
NMCC	New Mexico Copper Corporation
NMWQCC	New Mexico Water Quality Control Commission
OSHA	Occupational Safety and Health Administration
PARCC	precision, accuracy, representativeness, completeness, and comparability
PM	Project Manager
PPE	personal protective equipment
PRRL	project-required reporting limits
QA	quality assurance
QAPP	quality assurance project plan
QC	quality control
RPD	relative percent difference
SAP	sampling and analysis plan
Site	Copper Flat Mine Permit Area
SQL	sample quantitation limits

1 Project Description and Management

This document establishes the quality standards for products and services that have been established within the industry and through government regulations. New Mexico Copper Corporation (NMCC) and its contractors shall meet or exceed these quality standards throughout the duration of this project.

NMCC is currently initiating permitting activities for the re-opening of the Copper Flat Mine located approximately six miles northeast of Hillsboro, New Mexico, in Sierra County (Site). NMCC and its contractors will assess baseline conditions of for climate, vegetation, wildlife, topsoil, surface water, groundwater, and historical and cultural properties.

The project organizational flow chart for NMCC's geosciences and engineering contractor, INTERA Incorporated (INTERA) of Albuquerque, New Mexico, identifies key personnel and their functions (Figure 1). The INTERA Incorporated (INTERA) Program Manager, Cynthia Ardito, is responsible for project direction and quality assurance (QA) for this project. The Project Manager (PM), Peter Castiglia, is responsible for organizing and implementing field activities, project oversight, data management, and report preparation. Mr. Castiglia is also responsible for ensuring that the Quality Assurance Project Plan (QAPP) and Sampling and Analysis Plan (SAP) are appropriately developed and adhered to. The PM, Dr. John Sigda, is responsible for data analysis and modeling. Dr. Sigda will also provide technical support and will assist in data management and report preparation. INTERA's subcontractors include Class One Technical Services, Inc. of Albuquerque, New Mexico, for air quality services, and Hall Environmental Analysis Laboratories (HEAL) for analytical laboratory services. Subcontractor PMs will be responsible for QA, project oversight, data management, and coordination of field activities.

NMCC has contracted with Parametrix Incorporated of Albuquerque, New Mexico, for ecological and cultural resources services. Parametrix will be responsible for data collection for these resource areas. An organizational chart is included as Figure 2. The Parametrix PM, Mr. Jens Deichmann, is responsible for data collection and data quality. For geologic sampling, NMCC has contracted with SRK Consulting Engineers (SRK). The SRK PM is Mr. Mark Willow. The principal geochemist supporting Mr. Willow and overseeing the geologic sampling program is Dr. Robert Bowell.

1.1 Project Definition and Background

A 12-month baseline characterization of pre-mining site conditions must be completed prior to submittal of a Mine Permit Application to the New Mexico Energy, Minerals, and Natural Resources Department Mining and Minerals Division (MMD). As noted previously, this baseline characterization involves sampling, analysis, and assessment of site-specific climatic, vegetation, wildlife, soil, surface water, groundwater, and historical and cultural properties conditions. The MMD requires that a SAP be submitted for agency review. The SAP is a detailed work plan that describes how baseline data will be collected. The SAP must thoroughly describe the proposed sampling methodology and frequency, proposed data sources, and proposed sampling locations to document existing resource conditions within the permit boundary.

1.2 Quality Objectives and Criteria

The following sections present the measurement quality objectives (MQO) identified for this project.

1.2.1 Measurement Quality Objectives for Analytical Laboratory Data

All analytical results for water samples will be evaluated in accordance with precision, accuracy, representativeness, completeness, and comparability (PARCC) parameters to document the quality of the data and promote data that are of sufficient quality to meet the project objectives. With regard to these PARCC parameters, precision and accuracy method blanks will be prepared at the frequency prescribed in the individual analytical method, or at a rate of 5 percent of the total samples if a frequency is not prescribed in the method. The subsections below describe each of the PARCC parameters and how they will be assessed for this task.

1.2.1.1 Precision

Precision is the degree of mutual agreement between individual measurements of the same property under similar conditions. Usually, combined field and laboratory precision is evaluated by collecting and analyzing field duplicates and then calculating the variance between the samples, typically as a relative percent difference (RPD).

$$RPD = \frac{|A - B|}{(A + B)} \times 100\%$$

where:

A	=	First duplicate concentration
B	=	Second duplicate concentration

Field sampling precision is evaluated by analyzing field duplicates. One duplicate groundwater sample will be collected during the initial groundwater sampling event to establish laboratory analytical precision at the onset of the investigation. The duplicate groundwater sample will be collected by completely filling two separate vials by alternating between the primary sample set and the replicate sample set in the order shown below:

- Fill vial #1 - primary sample set
- Fill vial #1 - replicate sample set
- Fill vial #2 - primary sample set
- Fill vial #2 - replicate sample set

Laboratory analytical precision is evaluated by analyzing matrix (laboratory) duplicates. Results for each laboratory duplicate pair will be used to determine the RPD in order to evaluate precision.

1.2.1.2 Accuracy

A program of sample spiking will be conducted to evaluate laboratory accuracy. This program will include analysis of matrix spike (MS), laboratory control samples (LCS) or blank spikes, and method blanks. The results for the spiked samples will be used to calculate the percent recovery for use in evaluating accuracy.

$$\text{Percent Recovery} = \frac{S - C}{T} \times 100\%$$

where:

S	=	Measured spike sample concentration
C	=	Sample concentration
T	=	True or actual concentration of the spike

Results that fall outside the accuracy goals will be further evaluated on the basis of the results of other quality control (QC) samples.

1.2.1.3 Representativeness

Representativeness expresses the degree to which sample data accurately and precisely represent: (1) the characteristics of a population, (2) variations in a parameter at a sampling point, or (3) an environmental condition that they are intended to represent.

Representativeness of data will also be promoted through the consistent application of established field and laboratory procedures. Equipment rinsate (ER) blanks and laboratory blanks will be evaluated for the presence of contaminants to aid in evaluating the representativeness of sample results. Data determined to be non-representative by comparison with existing data will be used only if accompanied by appropriate qualifiers.

1.2.1.4 Completeness

Completeness is a measure of the percentage of project-specific data that are valid. Valid data will be obtained when samples are collected and analyzed in accordance with QC procedures as outlined in this QAPP and when none of the QC criteria that affect data usability are exceeded. When all data evaluation is completed, the percent completeness value will be calculated by dividing the number of useable sample results by the total number of sample results planned for this investigation.

As discussed further in Section 8.0, completeness will also be evaluated as part of the data quality assessment process (EPA, 2000b). This evaluation will help assess whether any limitations are associated with the decisions to be made based on the data collected.

1.2.1.5 Comparability

Comparability expresses the confidence with which one data set can be compared with another. Comparability of data will be achieved by consistently following standard field and laboratory procedures and by using standard measurement units in reporting analytical data.

1.2.1.6 Detection and Quantitation Limits

The method detection limit (MDL) is the minimum concentration of an analyte that can be reliably distinguished from background noise for a specific analytical method. The quantitation limit represents the lowest concentration of an analyte that can be accurately reproduced in a sample matrix. Project-required reporting limits (PRRL) are contractually specified minimum quantitation limits for specific analytical methods and sample matrices, such as soil or water, and are typically several times the MDL to allow for matrix effects. PRRLs, which are established in the project scope of work for subcontract laboratories, are set to establish minimum criteria for laboratory performance. Actual laboratory quantitation limits may be substantially lower.

For this project, analytical methods have been selected so that the PRRL for each target analyte is below the applicable regulatory screening criteria, the New Mexico Water Quality Control Commission (NMWQCC) Standards for groundwater. Also, sample concentrations will be reported as estimated values if concentrations are less than PRRLs but greater than MDLs. The MDL for each analyte will be listed as the detection limit in the laboratory's electronic data deliverable.

1.2.2 Measurement Quality Objectives for Meteorological and Air Quality Data

Laboratory and field quality assurance procedures for meteorological and air quality data are described in detail in Section 2 of the Sampling and Analysis Plan (SAP). Please refer to Section 2.8 of this SAP for more information.

1.2.3 Measurement Quality Objectives for Ecological Data

A single field crew chief will be assigned to ensure data collection is consistent between crews. This individual will review a sub-set of the field forms following each field day. Formalized data collection training will also be completed prior to field sampling. All field botanists will be familiar with plant systematics and techniques to identify plants using taxonomic keys. Plant species not readily identifiable in the field will be collected and preserved for identification at the University of New Mexico Herbarium.

Vegetation material produced during the previous growing season will be discarded before placing samples into a paper bag. Rocks, soil, and/or litter will not be placed into sample bags. Biomass production will only be calculated as an actual dry-weight sample. No double sampling or estimations will occur.

Field data entered into an electronic format such as MS Excel or Access will be evaluated for integrity, consistency, and completeness before data analysis. Oversights or incorrect entries will be corrected. A sub-set of the field forms will be compared to the electronic version for an accuracy assessment. If significant differences are identified, a thorough re-evaluation of each of the forms will be completed.

For wildlife data, field biologists will have a minimum of a BA/BS in Biology and five to ten years of field experience conducting a wide variety of animal surveys ranging from reptiles and amphibians, to birds, mammals, insects, and other invertebrates. This includes experience in recognizing and identifying signs of wildlife. All findings and results will be reviewed by senior scientists.

1.2.4 Measurement Quality Objectives for Cultural Resources Data

Reporting will follow the standards in BLM manual H-8100-1, Chapter 1.B.1 and Appendix 2 (2005). In addition, work will be performed in compliance with all aspects of the NMAC, including NMAC 4.10.15.

1.3 Project Organization

Table 1 presents the roles and responsibilities for key personnel who will be involved in the investigation at the Site. In some cases, more than one responsibility has been assigned to one person.

1.4 Special Training and Certification

This section outlines the training and certifications required to complete the activities described in this QAPP. The following sections describe the requirements for personnel working on-site.

1.4.1 Health and Safety Training

INTERA Personnel who collect water and sediment samples from the Site are required to meet the Occupational Safety and Health Administration (OSHA) training requirements defined in Title 29 of the Code of Federal Regulations (CFR) Part 1910.120(e). These requirements include (1) 40 hours of formal off-site instruction, (2) a minimum of three days of actual on-site field experience under the supervision of a trained and experienced field supervisor, and (3) 8 hours of annual refresher training. Field personnel who directly supervise employees engaged in work at the site shall also receive at least 8 additional hours of specialized supervisor training. The supervisor training covers health and safety program requirements, training requirements, personal protective equipment (PPE) requirements, the spill containment program, and health-hazard monitoring procedures and techniques. Every member of the field team will maintain current certification in the American Red Cross "Multimedia First Aid," and "Cardiopulmonary Resuscitation (CPR) Modular," or equivalent.

Copies of health and safety training records, including course completion certificates for the initial and refresher health and safety training, specialized supervisor training, and first aid and CPR training, are maintained in corporate files.

1.5 Documents and Records

Documentation is critical for evaluating the success of any environmental data collection activity. The following sections discuss the requirements for documenting field activities and for preparing laboratory data packages. This section also describes reports that will be generated as a result of this project.

1.5.1 Field Documentation

Field personnel will use permanently bound field logbooks with sequentially numbered pages to record and document field activities. The logbooks will list a contract name and number, the project number, the site name, the names of subcontractors, the client, and the PM. At a minimum, the following will be recorded in the field logbook:

- Names and affiliations of all on-site personnel or visitors
- Weather conditions during the field activity
- Summary of daily activities and significant events
- Notes of conversations with coordinating officials
- References to other field logbooks or forms that contain specific information
- Discussions of problems encountered and their resolutions
- Discussions of deviations from the SAP or other governing documents
- Descriptions of all photographs taken

The field team may also use the field forms during certain sampling or data collection activities to document field activities. The same level of detail will be required for all field forms used during this investigation. Copies of the completed field forms will be stored in the project file.

2 Data Generation and Acquisition

This section describes the requirements for the following:

- Sampling Design (Section 2.1)
- Field Activities (Section 2.2)
- Sample Handling and Custody (Section 2.3)
- Laboratory Quality Assurance/Quality Control (QA/QC) (Section 2.4)
- Equipment Testing, Inspection, Maintenance, and Calibration (Section 2.5)

2.1 Sampling Design

Samples or data will be collected as outlined in the SAP. The SAP for this project is a collection of quarterly or one-time field sampling or data collection events that were prepared by NMCC and its contractors. Field activities will be implemented to optimize the time spent in the field by adhering to established scientific methods and procedures, leading coordinated field schedules, and sharing data with contractors to minimize duplication of data.

Data collected from these field activities will be used in the mine permitting process. This baseline data will also be useful in the design of mine facilities and as a reference during site reclamation activities.

2.2 Field Activities

Field activities have been broken into eight separate activities. These activities, which are outlined in the SAP, will be used to establish the baseline conditions at the Site:

- Climatological factors – The purpose of the monitoring program will be to collect baseline climatological data representative of the Site that satisfies the criteria of the New Mexico Surface Mining Act and the U.S. Environmental Protection Agency (EPA) on-site meteorological program guidance for dispersion modeling
- Vegetation survey – The purpose of the survey is to delineate current vegetation stratified according to disturbance history and to describe specific vegetation attributes for plant communities delineated within the Site. In addition, the survey will identify the presence of potential habitat for threatened and endangered species.
- Wildlife survey – Delineate and map current habitat, describe wildlife use of the area, complete a bird species inventory, complete a threatened or endangered species survey by comparing known records and habitat requirements with current field conditions to determine the likelihood of occurrence of all federal and state listed wildlife species, and determine species distribution by habitat and season.
- Soil survey and sampling – To determine the suitability of in-place soils in areas of proposed disturbance for use as a topdressing material during reclamation.
- Surface water sampling – To characterize the volumetric flow and water quality of seeps, springs, streams, and the pit lake.
- Groundwater sampling – To obtain necessary data to evaluate quantity and quality of all aquifers at the Site that could be impacted by mining activities, address data gaps identified during evaluation of the Draft EIS (BLM, 1996), meet the requirements set forth in the regulations in NMAC Title 19, Chapter 10, Part 6, and to meet the guidelines set forth in MMD's draft Guidance Document for Part 6 New Mining Operations Permitting under the New Mexico Mining Act.
- Historical and cultural properties survey – To locate and assess all cultural resources and historic properties within the area of potential effects.

2.3 Sample Handling and Custody

The following section describes sample handling procedures, including sample identification and labeling, documentation, chain of custody (COC), and shipping. This section applies to water, sediment, and geologic samples that are submitted to an analytical laboratory. Other sample handling and custody procedures for vegetation and other resources are described, where appropriate, in the SAP.

Each sample collected at the Site will be identified using a unique sample identification (ID) number. The description of the sample type and the point name will be recorded on the COC form, as well as in the field notes. Note that field duplicates and ERs will be given a unique sample ID. The association between primary, duplicate, and ER samples will be noted on the COC form.

A sample label will be affixed to each sample container. The label will be completed with the following information written in indelible ink: project name and location, sample ID number, date and time of collection, preservative used (if applicable), collector's initials, and analysis requested. After labeling, each sample will be refrigerated or placed in a cooler containing ice.

Documentation of sample collection will be completed in permanent black or blue ink in the field logbook. All entries will be legible. The field team leader (FTL) and sampling personnel are responsible for proper documentation of all Site activities.

Standard sample custody procedures will be used to maintain and document sample integrity during collection, transportation, storage, and analysis. COC procedures provide an accurate written record that traces the possession of individual samples from the time of collection in the field to the time of acceptance at the laboratory.

The COC form will be placed in a waterproof plastic bag and taped to the inside of the shipping container used to transport the samples. The laboratory sample custodian will receive all incoming samples, sign the accompanying COC forms, and retain copies of the forms as permanent record. The laboratory sample custodian will record all pertinent information concerning the samples, including the persons delivering the samples, the date and time received, sample condition at the time of receipt (sealed, unsealed, or broken container; temperature; or other relevant remarks).

All samples will be either hand delivered or shipped to an accredited laboratory. Samples may need to be shipped to the laboratory in order to have them analyzed before the expiration of a particular sample's holding time.

2.4 Laboratory QA/QC

This section applies to water, sediment, and geologic samples submitted to accredited analytical laboratories. To ensure quality of laboratory analysis, the analytical laboratory will be required to analyze QA/QC samples as specified by the analytical methods. The laboratory will analyze method blanks, MSs, and LCSs.

Method blanks will be prepared at the frequency prescribed in the individual analytical method or at a rate of 5 percent of the total samples if a frequency is not prescribed in the method.

MSs will be analyzed at a frequency of 5 percent for soil and aqueous samples. The percent recoveries will be calculated for each of the spiked analytes and used to evaluate analytical accuracy. The RPD between spiked samples will be calculated to evaluate precision.

LCSs, or blank spikes, will be analyzed at the frequency prescribed in the analytical method or at a rate of 5 percent of the total samples if a frequency is not prescribed in the method. If percent recovery results for the LCS or blank spike are outside of the established goals, laboratory-specific protocols will be followed to gauge the usability of the data.

Sample quantitation limits (SQL), also referred to as practical quantitation limits, are PRRLs adjusted for the characteristics of individual samples. The PRRLs are chemical-specific levels that a laboratory should be able to routinely detect and quantitate in a given sample matrix. The PRRL is defined in the analytical method or in laboratory method documentation, and incorporates precision (reproducibility) assumptions for the analysis. The SQL takes into account changes in the preparation and analytical methodology that may alter the ability to detect an analyte, including changes such as use of a smaller sample aliquot or dilution of the sample extract. Physical characteristics such as sample matrix and percent moisture that may alter the ability to detect the analyte are also considered. The laboratory will calculate and report SQLs for all environmental samples.

The laboratory activities are overseen by a comprehensive quality assurance program to assure that laboratory practices and results adhere to its policies. The laboratory will provide a standard QA/QC report with all reports. This includes surrogate recoveries, spike recoveries, and method blanks.

The laboratory participates in the Wibby Environmental, third party, proficiency testing program. Wibby is accredited by A2LA and NIST/NVLAP. Results of all proficiency results are sent, by Wibby, to both the laboratory and to their accrediting authorities. The laboratory will also perform proficiency testing on a semiannual basis for all accredited tests. Water proficiencies in the water supply and water pollution studies will be performed in addition to soil proficiencies in hazardous waste pollution studies.

Proficiency results are reviewed by the laboratory manager and all personnel involved in reporting the data. Results that are marked as “check for error” and “unacceptable” are thoroughly reviewed and corrective actions are written for “unacceptable” data.

2.5 Equipment Testing, Inspection, Maintenance, and Calibration

All equipment used during the investigation will be properly tested, inspected, maintained, and calibrated. Samples collected during this investigation will be analyzed using both field and laboratory equipment. Calibration of the field equipment shall be recorded in the field logbook after each calibration event. The calibration procedure for each piece of field equipment used will be outlined in the final report.

The laboratory’s QA plan and written operating procedures describing specific testing, inspection, maintenance, and calibration procedures for equipment will be followed. If required, maintenance procedures and schedules will be performed and documented.

3 Inspection and Acceptance of Supplies and Consumables

PMs have primary responsibility for identifying the types and quantities of supplies and consumables needed to complete projects and are responsible for identifying acceptance criteria for these items.

Supplies and consumables can be received either at the contractor’s office or at a work site. When supplies are received at an office, the PM or FTL will sort them according to vendor, check packing slips against purchase orders, and inspect the condition of all supplies before they are accepted for use on a project. If an item does not meet the acceptance criteria, deficiencies will be noted on the packing slip and purchase order and the item will then be returned to the vendor for replacement or repair.

Procedures for receiving supplies and consumables in the field are similar. When supplies are received, the PM or FTL will inspect all items against the acceptance criteria. Any deficiencies or problems will be noted in the field logbook and deficient items will be returned for immediate replacement.

Analytical laboratories are required to provide certified clean containers for all analyses. These containers must meet EPA standards as described in *Specifications and Guidance for Obtaining Contaminant-Free Sampling Containers* (EPA, 1992).

4 Data Management

All field and analytical data collected during this investigation will be provided to MMD in the Baseline Characterization Report. Field data will be recorded in the logbook and/or field forms and will be included in the appendices. Analytical data will be summarized, tabulated, analyzed, and provided in the body of the final report. The original laboratory data will be provided in an appendix of the final report. Some data may be presented graphically.

5 Assessment, Response Actions, and Reports to Management

NMCC and MMD will oversee collection of environmental data using the appropriate assessment and audit activities. Any problems encountered during an assessment of field investigation or laboratory activities will require appropriate corrective action to ensure that the problems are resolved. The corrective actions will be discussed with MMD and will be implemented after approval from MMD is received. NMCC will perform routine audits of their subcontractor's performance. In addition, the subcontractor's project managers will ensure that the work done under their assigned tasks complies with the QAPP and will report non compliance, problems, or other issues to NMCC in a timely manner agreed upon between NMCC and its subcontractors.

Effective management of environmental data collection requires: 1) timely assessment and review of all activities, and 2) open communication, interaction, and feedback among all project participants. NMCC and its contractors will use verbal communication with MMD oversight personnel, electronic communication, and monthly status reports to address any project-specific quality issues and to facilitate timely communication of these issues. NMCC and its contractors will develop a communications protocol to communicate with the MMD and solicit the MMD for concurrence with these communication procedures.

6 Data Evaluation and Usability

This section describes the procedures that are planned to review and evaluate field and laboratory data. This section also discusses procedures for verifying that the data are sufficient to meet MQOs for the project.

Review and evaluation of the data generated during field and laboratory activities are essential to obtaining defensible data of acceptable quality. Project team personnel will review field data to identify inconsistencies or anomalous values. Any inconsistencies discovered will be resolved as soon as possible by seeking clarification from field personnel responsible for data collection. All field personnel will be responsible for following the sampling and documentation procedures described in this SAP so that defensible and justifiable data are obtained.

Data values that are significantly different from the population are called "outliers." A systematic effort will be made to identify any outliers or errors before field personnel report the data. Outliers can result from improper sampling or measurement methodology, data transcription errors, calculation errors, or natural causes. Outliers that result from errors found during data verification will be identified and corrected; outliers that cannot be attributed to errors in sampling, measurement, transcription, or calculation will be clearly identified in project reports.

6.1 Laboratory Data Verification

Laboratory personnel will verify analytical data at the time of analysis and reporting and through subsequent reviews of the raw data for any nonconformances to the requirements of the analytical method. Laboratory personnel will make a systematic effort to identify any outliers or errors before they report the data. Outliers that result from errors found during data verification will be identified and corrected; outliers that cannot be attributed to errors in analysis, transcription, or calculation will be clearly identified in the case narrative section of the analytical data package.

6.2 Laboratory Data Evaluation and Usability

All laboratory data will be evaluated. The data evaluation strategy will not be a full data validation process, but will determine if the analytical results are within the QC limits set for the project. As part of this evaluation, the data usability will be assessed.

7 Reconciliation with User Requirements

After environmental data have been reviewed and evaluated in accordance with the procedures described in Section 7.0, the data must be further evaluated to assess whether MQOs have been met.

To the extent possible, EPA's data quality assessment (DQA) process will be followed to verify that the type, quality, and quantity of data collected are appropriate for their intended use. DQA methods and procedures are outlined in EPA's *Guidance for Data Quality Assessment, Practical Methods for Data Analysis* (EPA, 2000b). The DQA process includes five steps: (1) review the sampling objectives and sampling design, (2) conduct a preliminary data review, (3) select a statistical test, (4) verify the assumptions of the statistical test, and (5) draw conclusions from the data. In the case of water, sediment, and geologic samples, no statistical analysis is planned at this time. Statistical analyses planned for ecological and cultural resources data are defined in Sections 4, 5, and 10 of the SAP.

When the five-step DQA process is not completely followed because the sampling objectives are qualitative, data quality and data usability will be systematically assessed. This assessment will include:

- A review of the sampling design and sampling methods to verify that these were implemented as planned and are adequate to support project objectives.
- A review of project-specific data quality indicators for PARCC and project reporting limits to evaluate whether acceptance criteria have been met.
- A review of project-specific sampling objectives to assess whether they have been achieved by the data collected.
- An evaluation of any limitations associated with the decisions to be made based on the data collected (for example, if data completeness is only 90 percent compared to a project-specific completeness objective of 95 percent, the data may still be usable to support a decision, but at a lower level of confidence).

The final report for the project will discuss any potential impacts of these reviews on data usability and will clearly define any limitations associated with the data.

8 References

American Society for Testing and Materials (ASTM), 2000, Standard practice for description and identification of soils (visual-manual procedure): ASTM Standard D 2488-00.

Bureau of Land Management (BLM), 1996, Draft environmental impact statement (DEIS), Copper Flat Project: Las Cruces, N. Mex., U.S. Department of the Interior. Prepared by ENSR, Fort Collins, Colo.

Environmental Protection Agency (EPA), 1992, Specifications and guidance for obtaining contaminant-free sampling containers: Washington, DC, Office of Solid Waste and Emergency Response, EPA/A540/R-93/051. December.

———.2000a, Data quality objectives process for hazardous waste site investigations, EPA QA/G-4HW: Washington, DC, Office of Environmental Information, EPA/600/R-00/007. January.

———.2000b, Guidance for data quality assessment, practical methods for data analysis, EPA QA/G-9, QA00 Update: Washington, DC, Office of Environmental Information, EPA/600/R-96/084. July.

———.2000c, Guidance for the data quality objectives process, EPA QA/G-4: Washington, DC, Office of Environmental Information, EPA/600/R-96/055. August.

Figures

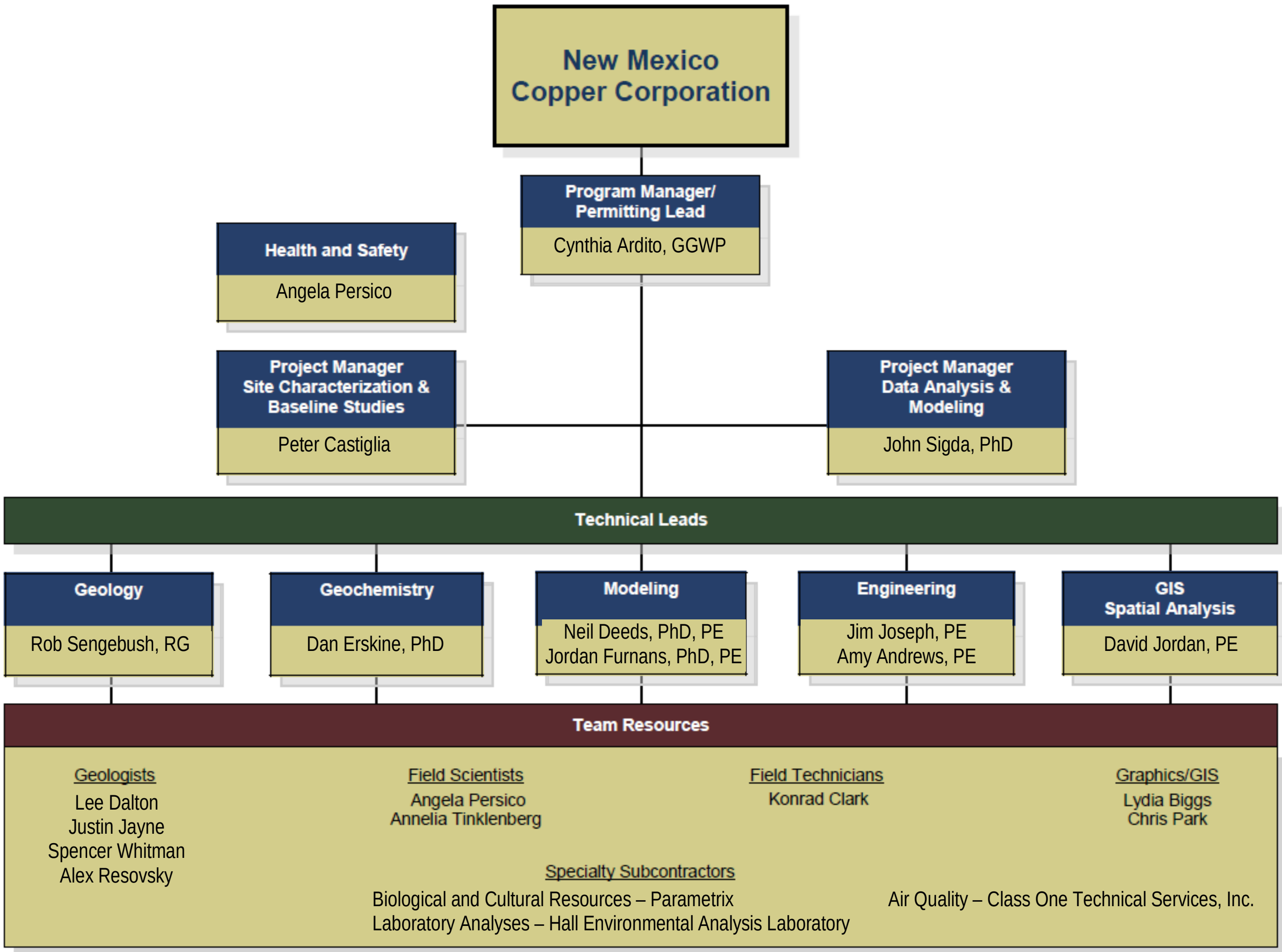

Figure 1. Project Organization

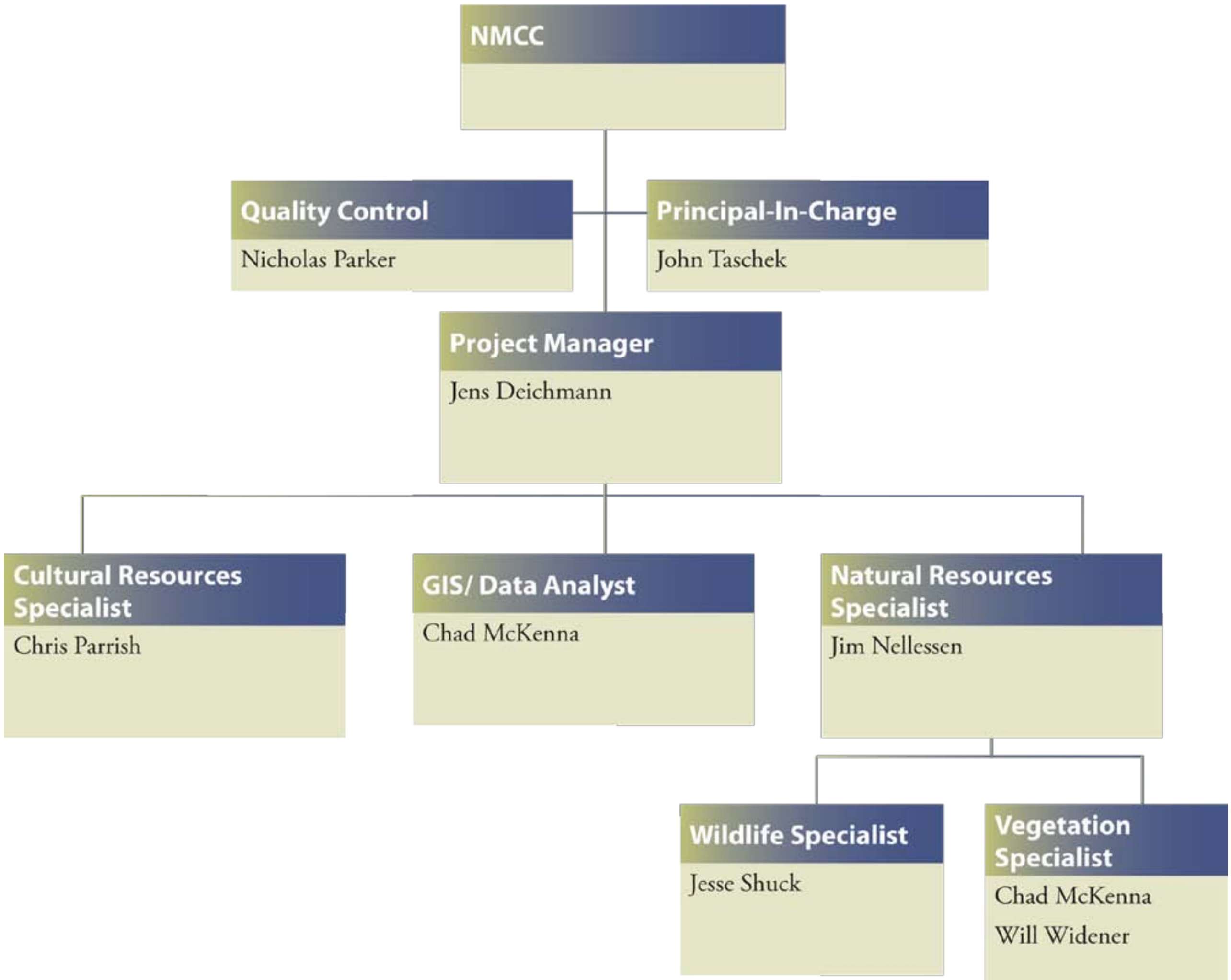

Figure 2. Parametrix Organizational Chart

Table

Table 1
INTERA Key Personnel and Responsibilities

Name	Organization	Role	Responsibilities	Contact Information
Ms. Cindy Ardito	INTERA	Program Quality Assurance (QA) Officer	Participates in development of technical approach. Reviews technical deliverables. Provides technical oversight during data collection	INTERA Inc. 6000 Uptown Blvd. NE, Suite 220 Albuquerque, NM 87110 (505) 246-1600, (505) 246-2600 FAX ext. 1206 cardito@intera.com
Mr. Peter Castiglia	INTERA	Project Manager/ Technical Lead	Responsible for overall project execution and for coordination with regulatory agencies and contractors. Actively participates in Data Quality Objective process. Provides management and technical oversight during data collection.	INTERA Inc. 6000 Uptown Blvd. NE, Suite 220 Albuquerque, NM 87110 (505) 246-1600, (505) 246-2600 FAX ext. 1217 pcastiglia@intera.com
Mr. Lee Dalton	INTERA	Field Team Leader (FTL) – Groundwater	Responsible for directing day-to-day field activities conducted by INTERA and subcontractor personnel. Verifies that field sampling and measurement procedures follow the Sampling and Analysis Plan. Provides project manager with regular reports on status of field activities.	INTERA Inc. 6000 Uptown Blvd. NE, Suite 220 Albuquerque, NM 87110 (505) 246-1600, (505) 246-2600 FAX ext. 1213 ldalton@intera.com
Mr. Justin Jayne	INTERA	Field Team Leader (FTL) – Surface Water	Responsible for directing day-to-day field activities conducted by INTERA and subcontractor personnel. Verifies that field sampling and measurement procedures follow the Sampling and Analysis Plan. Provides project manager with regular reports on status of field activities.	INTERA Inc. 6000 Uptown Blvd. NE, Suite 220 Albuquerque, NM 87110 (505) 246-1600, (505) 246-2600 FAX ext. 1220 jjayne@intera.com
Ms. Angela Persico	INTERA	On-Site Safety Officer	Responsible for implementing health and safety plan for determining appropriate site control measures and personal protection levels. Conducts safety briefings for INTERA and subcontractor personnel and site visitors. Can suspend operations that threaten health and safety.	INTERA Inc. 6000 Uptown Blvd. NE, Suite 220 Albuquerque, NM 87110 (505) 246-1600, (505) 246-2600 FAX ext. 1207 apersico@intera.com
Ms. Angela Persico Mr. Spencer Whitman Mr. Konrad Clark Ms. Annelia Tinklenberg	INTERA	Field Sampler(s)	Responsible for collecting representative samples and conducting necessary field activities specified in Sampling and Analysis Plan. Works under supervision of field team leader. Ensures proper sampling and handling procedures.	INTERA Inc. 6000 Uptown Blvd. NE, Suite 220 Albuquerque, NM 87110 (505) 246-1600, (505) 246-2600 FAX

Name	Organization	Role	Responsibilities	Contact Information
Mr. Bob Powell	Class One Technical Services, Inc.	Project Manager	Responsible for overall project execution and for coordination with regulatory agencies and contractors. Actively participates in Data Quality Objective process. Provides management and technical oversight during data collection by Class One Technical Services.	Class One Technical Services, Inc. 3500 Comanche Rd. NE Suite G Albuquerque, NM 87107 (505) 830-9680
Mr. Jens Deichmann	Parametrix	Project Manager – Ecological and Cultural Resources	Responsible for coordination with regulatory agencies and contractors. Actively participates in Data Quality Objective process. Provides management and technical oversight during data collection by Parametrix.	Parametrix Incorporated 8801 Jefferson NE; Bldg. 2 Albuquerque, NM 87113 (505) 998-5552 jdeichmann@parametrix.com
Mr. Chris Parrish	Parametrix	FTL - Cultural Resources	Responsible for directing day-to-day field activities conducted for cultural resources by Parametrix and subcontractor personnel. Verifies that field sampling and measurement procedures follow the Sampling and Analysis Plan. Provides project manager with regular reports on status of field activities.	Parametrix Incorporated 8801 Jefferson NE; Bldg. 2 Albuquerque, NM 87113 (505) 821-4700
Mr. Jim Nellessen	Parametrix	FTL – Natural Resources	Responsible for directing day-to-day field activities conducted for natural resources by Parametrix and subcontractor personnel. Verifies that field sampling and measurement procedures follow the Sampling and Analysis Plan. Provides project manager with regular reports on status of field activities.	Parametrix Incorporated 8801 Jefferson NE; Bldg. 2 Albuquerque, NM 87113 (505) 821-4700
Mr. Chad McKenna	Parametrix	Technical Lead – Geographic Information Systems (GIS)	Responsible for directing day-to-day activities conducted for GIS by Parametrix and subcontractor personnel. Verifies that GIS data collection procedures follow the Sampling and Analysis Plan. Provides project manager with regular reports on status of GIS data.	Parametrix Incorporated 8801 Jefferson NE; Bldg. 2 Albuquerque, NM 87113 (505) 821-4700
Mr. Mark Willow	SRK Consulting	Project Manager – Geologic Sampling	Responsible for coordination with regulatory agencies and contractors. Actively participates in Data Quality Objective process. Provides management and technical oversight during data collection by SRK.	SRK Consulting 250 Neil Road, Suite 300 Reno, Nevada 89502 (775) 828-6800 mwillow@srk.com
Dr. Robert Bowell	SRK Consulting	Technical Lead – Geologic Sampling	Responsible for directing day-to-day activities conducted for geologic by SRK and subcontractor personnel. Verifies that geologic data collection procedures follow the Sampling and Analysis Plan. Provides project manager with regular reports on status of geologic data collection and results.	SRK Consulting (UK) Ltd. 5th Floor, Churchill House 17 Churchill Way Cardiff, CF10 2HH, UK +44 (0) 29 2034 8150 egrbowel@srk.co.uk

5-13-2014

SUSANA MARTINEZ
Governor
JOHN A. SANCHEZ
Lieutenant Governor

NEW MEXICO ENVIRONMENT DEPARTMENT

Ground Water Quality Bureau

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DAVE MARTIN
Secretary
RAJ SOLOMON, P.E.
Deputy Secretary

May 13, 2011

Jens Deichmann,
Copper Flat Mine
New Mexico Copper Corporation
2425 San Pedro NE Suite100
Albuquerque, NM 87110

RE: Administrative Completeness Determination and Applicant's Public Notice Requirements, DP-1, Copper Flat Mine

Dear Mr. Deichmann:

The New Mexico Environment Department (NMED) received a Ground Water Discharge Permit Application for the above referenced facility on March 31, 2011. Pursuant to Section 20.6.2.3108 NMAC of the New Mexico Water Quality Control Commission Regulations (20.6.2 NMAC), NMED determined on May 3, 2011 that your application is administratively complete.

Within 30 days of receipt of this letter, you must provide public notice. Instructions and materials needed to complete the public notice are enclosed.

A technical reviewer will contact you within the next few months if additional information is needed to process your application. If you have a deadline of concern in the interim or any questions, please call the Ground Water Quality Bureau at (505) 827-2900.

Sincerely,

Felicia [signature]

for William C. Olson, Chief
Ground Water Quality Bureau

enc: Instructions for Completing Public Notice Requirements
Affidavit
Public Notice Flyer
Text for Newspaper Display Ad
Public Notice Sign
Invoice ($15 fee for sign) if not attached, the invoice will be mailed separately

INSTRUCTIONS FOR COMPLETING PUBLIC NOTICE REQUIREMENTS

Discharge Permit DP- 1 ¤ New ¤ Modification X Renewal & Modification

Within 30 days of the date NMED deemed your Discharge Permit application administratively complete, you must provide public notice as follows:

1. **Post sign(s) at the facility.**
   Enclosed is a sign 2 x 3 feet in size (or multiple signs if required) which must be posted **at or near the facility** in a conspicuous location approved by NMED. An invoice for the sign(s) is enclosed. NMED approves the following sign posting location(s):
   At the road pull out on the SE side of the NM Hwy 152, near the Geronimo Trail Scenic Byway sign

2. **Post a public notice flyer off-site.**
   The enclosed public notice flyer which must be posted **off-site** at a location conspicuous to the public and approved by NMED. NMED approves the following flyer posting location:
   Hillsboro Community Center

3. **Mail a public notice flyer to property owners within 1/3 mile.**
   A copy of the enclosed public notice flyer must be sent by 1st class mail to the owners of record of all properties within 1/3 mile from the boundary of the property where the discharge site is located. If there are no properties within 1/3 mile other than properties owned by the applicant, then the flyer must be mailed to the owners of record of the nearest adjacent properties.

   The names and addresses of property owners can be obtained from the county tax assessor's office. The list of property owners' names and addresses must be submitted to NMED.

4. **Mail a public notice flyer to the owner of the discharge site.**
   A copy of the enclosed flyer must be sent via certified mail, return receipt requested, to the owner(s) of the discharge site(s), if the applicant is not the owner. The list of owners' names and addresses and the certified mail receipts must be submitted to NMED.

5. **Place a display ad in the newspaper.**
   A display ad 3 x 4 inches in size must be published for one day in a newspaper of general circulation in the location of the proposed discharge. The ad may **not** be placed in the classified or legal section. The text for the ad is enclosed. NMED approves publishing the ad in the following newspaper:
   Sierra County Sentinel

PROOF OF NOTICE. Within 15 days of completing the above requirements, the applicant must submit the following items as proof of notice to NMED:

Affidavit regarding the sign posting and mailing (form enclosed).
List of names and addresses to whom the public notice flyer was mailed.
List of names and addresses of owners of discharge sites.
Certified mail receipts for mailing to discharge site owner(s), if required.
Copy of newspaper ad.

Send to NMED Ground Water Quality Bureau, PO Box 5469, Santa Fe, NM 87502.

Reviewer's Initials and Date FV 5/10/11

PUBLIC NOTICE

Discharge Permit Application

Copper Flat Mine, DP-1

DP-1, Copper Flat Mine, Jens Deichmann, proposes to renew and modify the Discharge Permit for the discharge of up to 2,875,873 gallons per day of mine tailings, process water, and domestic wastewater to a mine tailing impoundment. Potential contaminants from this type of discharge include sulfate, nitrate, total dissolved solids, and metals. The facility is located approximately 6 miles NE of Hillsboro, in Section 31, T15S, R036W, Sections 25, 26, 27, 35, and 36, T15S, R07W, and Section 6, T16S, R06W, Sierra County. Ground water beneath the site is at a depth of approximately 40 - 50 feet and has a total dissolved solids concentration of approximately 500 - 800 milligrams per liter.

The applicant is seeking a Discharge Permit for the proposed discharge. Provided the applicant has met applicable requirements, the New Mexico Environment Department (NMED) will propose a Discharge Permit containing limitations, monitoring requirements, and other conditions intended to protect ground water quality for present and potential future use. Information in this public notice was provided by the applicant and will be verified by the New Mexico Environment Department during the permit application review process. NMED will accept comments and statements of interest regarding the application and will create a facility specific mailing list for persons who wish to receive future notices.

You may send comments or statements of interest to:

Greg Huey, DP-1
Ground Water Quality Bureau
PO Box 5469
Santa Fe, NM 87502.

For additional information, please call:
505-827-2900

Applicant
Jens Deichmann
Copper Flat Mine
New Mexico Copper Corporation
2425 San Pedro NE Suite 100
Albuquerque, NM 87110

Public Notice Flyer

Public Notice Synopsis, DP-1
(for sign and newspaper display ad)

Newspaper display ad must be at least 3 inches by 4 inches in size and must be published for at least one day in a section other than the classifieds or legals.

PUBLIC NOTICE / NOTICIA PUBLICA

Discharge Permit Application / Aplicación para Permiso para Descargar: For up to 2,875,873 gallons per day of mine tailings,process water, and domestic wastewater to a mine tailing impoundment / Para un máximo de 2.875.873 galones por día de desechos mineras, agua procesada, y aguas residuales domésticas a un embalse de relaves de minas.

Applicant & Discharge Location / Solicitante & Sitio de Descarga:
Copper Flat Mine, approximately 6 miles NE of Hillsboro

For More Information / Para Más Información (DP-1):
Ground Water Quality Bureau / Sección de Agua Subterránea
NM Environment Department / Departamento del Medio Ambiente

(505) 827-2900 www.nmenv.state.nm.us (public notices)

Information in this public notice was provided by the applicants and will be verified by NMED during the permit application review process.

5-30-2011

[illegible]

Huey, Greg, NMENV

From: Jens Deichmann [jens@nmcopper.com]
Sent: Monday, May 30, 2011 10:27 PM
To: Eustice, Chris, EMNRD; Huey, Greg, NMENV; Menetrey, Mary Ann, NMENV; holland.shepard@state.nm.us; Jankowitz, Rachel J., DGF
Subject: Tuesday meeting: 9:30

Good evening. I hope you had a good holiday weekend.
I'm not sure who all will be there so limited the distribution to those I thought might be.
I have a few things I'd like to cover and then available for any questions you might have about progress on the project

1. Open houses next week
2. 3rd party RFP
3. Cooperating agency agreements
4. NMCC - BLM cost recovery agreement
5. Meeting between BLM and cooperating agencies, once agreement signed, to agree on RFP scope, and can we (NMCC and individual state agencies discuss ahead of time particular interests for the SOW?
6. Status of baseline studies by NMCC contractors
7. Status of abatement plan review

Thanks for taking the time to meet tomorrow.
Jens
--
Jens Deichmann
New Mexico Copper Corp.
505-681-2536

5-30-2011

5-31-2011

001

From: Huey, Greg, NMENV
Sent: Tuesday, May 31, 2011 4:51 PM
To: 'maxyeh@windstream.net'
Subject: RE: Comment on NMCC permit for waste water discharge

Mr. Yeh,

Thank you for your participation and sharing your concerns regarding NMCC's application for a discharge permit at the Copper Flat Mine.

The open house meetings to be conducted next week are independently sponsored by NMCC to answer questions that the public may have. NMED is not officially involved with these meetings, but I intend to be present on Tuesday at the Caballo meeting, and I have given my business cards to the NMCC representative and asked him to give my contact information to anyone that may wish to speak with NMED about the process.

New Mexico law provides the opportunity for any person to request a public hearing during the permitting phase of the project approval:
http://www.nmcpr.state.nm.us/nmac/_title20/T20C006.htm

Currently I'm performing the technical review of the Discharge Permit application. Once the draft Discharge Permit has undergone internal review, a second public notice will be published inviting comments on the draft permit. At that time members of the public may petition the NMED Secretary for a public hearing. The second public notice will be issued in a few months, once the permit has undergone the internal review process. I will add you to our concerned parties list and assure that you are notified at that time.

I have added your comments to the public record. However, I do have a few points of clarification based on your statement. Water will not be discharged into the pit lake. Under mining operations, mill tailings and process water are to be discharged to a lined tailing pond. This liner will be constructed from hdpe and designed to prevent any contaminated solutions from contacting ground water. It is actually proposed to remove water from the pit lake and use this water in the milling process.

A comprehensive study is currently underway to determine the present status of surface and ground water in the area. This will involve a water budget that will answer your question about water quantity in the area and how pumping will impact this system.

Please contact me with any further questions. I appreciate your participation and will be sure to keep you informed throughout this process.

Greg Huey
Mining Environmental Compliance Section
NMED - Ground Water Quality Bureau
Office (505) 827-1046
Mobile (505) 670-1878
Fax (505) 827-2965
http://www.nmenv.state.nm.us/gwb/

-----Original Message-----

To: Greg Huey, DP-1
Ground Water Quality Bureau
NM Environment Department
P.O. Box 5469
Santa Fe, NM 87502
From: Max Yeh
P.O. Box 156
Hillsboro, NM 88042
Date: May 28, 2011
Re: Public Comment on NMCC's application for a discharge permit at Copper Flats Mine, Sierra County

The posted announcement of NMCC's application for a discharge permit at Copper Flats Mine states that 2.8 million gallons of toxic water will be discharged into the pit lake a day. I have two concerns about this statement: 1) the possibility that the consequential enlargement of the pit lake will negatively impact both surface water and groundwater quality; and 2) the inordinately large amount of water use, essentially transforming quality groundwater into deteriorated surface water, will impact the quantity of water available for other uses.

1) At present the pit area and the pit lake is only 12.8 acres, with the pit lake much less than 1/5th of that. A discharge of 8.16 acre ft/day would raise the level of the lake at least 2 ft on the first day of such discharge, approaching 1 foot a day as the water spreads out. The enlargement of the surface area increases, of course, evaporation and thus the concentration of toxicity.

It is highly unlikely that the natural alkalinity of the surface minerals will be sufficient to neutralize the acidity of the pit lake, so that the discharge will unbalance the situation described by Raugust and Lemore in 2004. Raugust and Lemore described a historical situation in which groundwater levels of LDS and sulfates were increasing. One can expect such levels to increase further and more rapidly because of the increased size and toxic levels of the pit lake.

Raugust and Lemore note that during the 3-month period of mining in 1981, monitoring showed no adverse effects of the operation, but this is a very problematic conclusion, first, because the period of operation was quite short and the amount of discharge much smaller and second, because there was only one monitoring well in place before 1996, so the data seems insufficient for that claim.

2) My second concern, with the quantity of water this discharge uses, may not be in the purview of the NMED and perhaps should be addressed to the Office of the State Engineer; however, it seems pertinent in considering the issuance of the permit. Some coordination between the departments was one of the recommendations of the Governor's Blue Ribbon Task Force report of 2010 in water issues. There are two concerns in regard to the source of this water. The projected use would increase by 20% of the total groundwater use in Sierra County. It would be the equivalent of increasing the population of Sierra County by 28,000 persons, so that when the mine operates it would be like tripling the population in the County.
If all this amount of water is not withdrawn from the ground source but if part of it is recycled, the water use may be sustainable, but the practice would increase the problem of water degradation since the discharged water would be increasingly more toxic, dedounding on my first concern.

6-6-2011

SUSANA MARTINEZ, GOVERNOR
David Martin, *Cabinet Secretary*
Raj Solomon, P.E., *Deputy Secretary*

NEWS RELEASE
June 6, 2011

Contact: Jill Turner, Communications Coordinator (505)222-9548 / jill.turner@state.nm.us

Environment Department Receives Stage 1 Abatement Plan to Investigate Surface and Ground Water Contamination at Copper Flat Mine near Hillsboro

The New Mexico Environment Department's Ground Water Quality Bureau received a Stage 1 Abatement Plan proposal from New Mexico Copper Corporation to investigate surface and ground water contamination at the Copper Flat Mine. The facility is located approximately 5 miles northeast of Hillsboro on NM Highway 152.

Water quality monitoring of monitoring wells and an open pit pool at the facility showed concentrations of total dissolved solids (TDS), sulfate, chloride, manganese, and uranium in exceedence of New Mexico ground water standards during past investigations. The depth to ground water at the site ranges from 0 to 50 feet. In a letter to New Mexico Copper Corporation, NMED required that an Abatement Plan proposal be submitted within 60 days of notification.

The Stage 1 Abatement Plan submitted by the company proposes collecting soil, surface water and ground water samples and installing additional ground water monitoring wells to define the extent of soil and ground water pollution.

New Mexico Water Quality Control Commission regulations require responsible parties to remediate surface and ground water pollution. After the investigation is completed, a Stage 2 Abatement Plan proposal will be submitted to NMED. A public notice of the Stage 2 Abatement Plan proposal will be issued by New Mexico Copper Corporation within 30 days of submitting the proposal to NMED. The public will have an opportunity to comment on the Stage 2 Abatement Plan proposal and request a hearing or meeting. NMED will seek written comments from the public within 60 days of determining that the cleanup proposal is administratively complete.

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6-17-2011

Huey, Greg, NMENV

From: maxyeh@windstream.net
Sent: Friday, June 17, 2011 5:21 PM
To: Huey, Greg, NMENV
Subject: Re: Exploratory Permit for Copper Flats Mine

Dear Mr. Huey,

Look, I'm sorry I jumped on you for mistaking Benseal and EZ-Mud. I think you associated the two because one of the common practices for plugging drill holes is to mix the two so that as the EZ-Mud emulsion dries out it forms a kind of hardened plastic plug of bentonite. What exercised me was that NMCC's application did not even specify Benseal but some other brand of clay and silicate mixture, so that your reference to Benseal was like just assuming "standard practice" without referring to the application, where in answer to 5b NMCC says it will store the mud and additives and then dump it all back in the hole. Yet the department passed on it, apparently. The application did not mention disposal of the stuff in some other way.

It is not EZ-Mud that bothers me; though you should know that it is not a benign substance. It is a long chain polyacrylimide, and while mining suppliers who want to sell the stuff never mention it in their MSDS, chemical companies who make the stuff put "Associated with cancer" in their MSDS. National and international cancer organizations classify it as a "probable human carcinogen." Lab tests show it is cancer causing in rats.

You may think it benign because, as you mention, it is used in drilling water wells and even in clarifying drinking water, but in both cases its use is mitigated by the fact that its use precedes water treatment. Chlorine breaks it down, and whether that breakdown releases chlorine gas or not, I don't know. That is the reason, I suspect, that when it is used in drilling the refused is removed and properly disposed of. But none of this was in NMCC application and not bothersome to the ED, apparently.

What bothers me is the assumption that "standard practice" is ok and passable. In a comparison of mining company predictions on water quality (in EIS documents) to actual results of hardrock mining, a recent study says that 100% of the company's predictions claimed water quality compliance, of which 76% turned out to exceed quality standards. In these failed predictions, 64% of the mitigation measures failed. That means that of the mines studied, almost 50% became what the ED should consider disasters.

I really think the ED should have standards better than "standard practice," and I hope that you agree.

Max
----- Original Message -----
From: "Huey, Greg, NMENV" <greg.huey@state.nm.us>
To: <maxyeh@windstream.net>
Sent: Tuesday, June 14, 2011 11:00 AM
Subject: RE: Exploratory Permit for Copper Flats Mine

Mr. Yeh,

My apologies, in my response I referred to the Holeplug material by mistake.

You are correct that EZ-Mud is a shale inhibitor. The approval of this chemical by the department is standard practice, as we have no record of ground water contamination resulting from the use of this product. EZ-Mud is a common drilling mud used to coat the bore hole and prevent migration of fluids from the hole into the surrounding aquifer, and it is used in the development of water quality monitoring, drinking water, and production wells in addition to drilling of exploration bore holes. All cuttings are removed from the hole and disposed of in an approved manner, and plugging the hole with bentonite prevents the migration of any residual material.

Please call me at (505) 827-1046 to discuss this matter in greater detail.

Thank you,

Greg Huey
Mining Environmental Compliance Section
NMED - Ground Water Quality Bureau
Office (505) 827-1046
Mobile (505) 670-1878
Fax (505) 827-2965
http://www.nmenv.state.nm.us/gwb/

-----Original Message-----
From: maxyeh@windstream.net [mailto:maxyeh@windstream.net]
Sent: Monday, June 13, 2011 4:19 PM
To: Huey, Greg, NMENV
Cc: Ruiz, Thomas, NMENV
Subject: Re: Exploratory Permit for Copper Flats Mine

Dear Mr. Huey,

Thanks for answering my query to Mr. Ruiz.

I do realize that the permitting process for the Exploration permit is over and done with.

But for the record, I would like to record here that EZ-Mud is NOT Benseal, at least not according to NMCC's application itself. See Appendix C of the application, wherein you will find the MSDS for EZ-Mud. It is not used to seal drill holes but is a shale inhibitor whose substance is (to quote Halliburton) "Hydrotreated light petroleum distillate." Please email fdunexchem@halliburton.com for confirmation. You can assertain for yourself how toxic the substance is for groundwater.

Since writing my concerns to Mr. Ruiz, I have talked to technicians at the company who have assured me that the original application was revised to the effect that EZ-Mud will not be put back into the drill holes but be disposed of in other ways (hopefully without damaging the ground water now or in the future). Whether this is being done or not, I cannot say, but I expect the Environment Department to be on top of these things.

Why, may I ask, was the permit issued by the Department with such an error in it?

Max
----- Original Message -----
From: "Huey, Greg, NMENV" <greg.huey@state.nm.us>

To: <maxyeh@windstream.net>
Sent: Monday, June 13, 2011 3:03 PM
Subject: FW: Exploratory Permit for Copper Flats Mine

Mr. Yeh,

Your message to Mr. Ruiz at the NM Environment Department has been brought to my attention and will be added to the Copper Flat Mine permanent record.

I've attached the Materials Safety Data Sheet for Benseal (i.e. EZ Mud). Benseal is composed of bentonite clay and silica, and is used to seal bore holes to prevent interaction between the ground surface and a ground water aquifer that has been drilled through. There are no petroleum products in this material. The NM State Engineer requires that all bore holes be plugged using this or similar products in order to protect ground water quality from surface contamination.

The methods proposed by New Mexico Copper Corporation for subsurface exploration have been reviewed by the NM State Engineer, NM Environment Department, and NM Mining & Minerals Division, and a permit has been approved for this exploration. You may request to review these records either in person or in writing by contacting each department.

Thank you once again for your interest in this site. I will continue to keep you informed of any developments.

Greg Huey
Mining Environmental Compliance Section
NMED - Ground Water Quality Bureau
Office (505) 827-1046
Mobile (505) 670-1878
Fax (505) 827-2965
http://www.nmenv.state.nm.us/gwb/

-----Original Message-----
From: maxyeh@windstream.net [mailto:maxyeh@windstream.net]
Sent: Wednesday, June 08, 2011 11:24 AM
To: Ruiz, Thomas, NMENV
Subject: Exploratory Permit for Copper Flats Mine

Dear Mr. Ruiz,

I have just looked over the SIO25EM, Copper Flat 2 Project, Exploration Permit Application, and noticed that the issue of ground water is unaddressed in the answers to the questions of the application. This issue is of some concern because the applicant's answer to 5B states that drilling mud and additives will be disposed of in the drill holes. Since ground water is said by the applicant to be at a depth from 5 to 50 feet and since gthe test holes will be much greater, the drilling mud and additives will be into ground water. The applicant proposes using EZ Mud, which is a petroleum distillate which is a pollutant. The applicant also proposes the use of Soda Ash, which is hazardous to aquatic life. I strongly urge that

you bring these facts to the attention of the reviewers of the permit application.
Max

HALLIBURTON

MATERIAL SAFETY DATA SHEET

Product Trade Name: **BENSEAL®**

Revision Date: 25-Mar-2010

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Trade Name: BENSEAL®
Synonyms: None
Chemical Family: Mineral
Application: Viscosifier

Manufacturer/Supplier
Baroid Fluid Services
Product Service Line of Halliburton
P.O. Box 1675
Houston, TX 77251
Telephone: (281) 871-4000
Emergency Telephone: (281) 575-5000

Prepared By
Chemical Compliance
Telephone: 1-580-251-4335
e-mail: fdunexchem@halliburton.com

2. COMPOSITION/INFORMATION ON INGREDIENTS

SUBSTANCE	CAS Number	PERCENT	ACGIH TLV-TWA	OSHA PEL-TWA
Bentonite	1302-78-9	60 - 100%	Not applicable	Not applicable
Crystalline silica, tridymite	15468-32-3	0 - 1%	0.05 mg/m^3	1/2 x $\frac{10\ mg/m^3}{\%SiO2 + 2}$
Crystalline silica, cristobalite	14464-46-1	0 - 1%	0.025 mg/m^3	1/2 x $\frac{10\ mg/m^3}{\%SiO2 + 2}$
Crystalline silica, quartz	14808-60-7	1 - 5%	0.025 mg/m^3	$\frac{10\ mg/m^3}{\%SiO2 + 2}$

More restrictive exposure limits may be enforced by some states, agencies, or other authorities.

3. HAZARDS IDENTIFICATION

Hazard Overview

CAUTION! - ACUTE HEALTH HAZARD
May cause eye and respiratory irritation.

DANGER! - CHRONIC HEALTH HAZARD
Breathing crystalline silica can cause lung disease, including silicosis and lung cancer. Crystalline silica has also been associated with scleroderma and kidney disease.

This product contains quartz, cristobalite, and/or tridymite which may become airborne without a visible cloud. Avoid breathing dust. Avoid creating dusty conditions. Use only with adequate ventilation to keep exposures below recommended exposure limits. Wear a NIOSH certified, European Standard EN 149, or equivalent respirator when using this product. Review the Material Safety Data Sheet (MSDS) for this product, which has been provided to your employer.

4. FIRST AID MEASURES

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Skin Wash with soap and water. Get medical attention if irritation persists.

Eyes In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.

Ingestion Under normal conditions, first aid procedures are not required.

Notes to Physician Treat symptomatically.

5. FIRE FIGHTING MEASURES

Flash Point/Range (F):	Not Determined
Flash Point/Range (C):	Not Determined
Flash Point Method:	Not Determined
Autoignition Temperature (F):	Not Determined
Autoignition Temperature (C):	Not Determined
Flammability Limits in Air - Lower (%):	Not Determined
Flammability Limits in Air - Upper (%):	Not Determined

Fire Extinguishing Media All standard firefighting media.

Special Exposure Hazards Not applicable.

Special Protective Equipment for Fire-Fighters Not applicable.

NFPA Ratings: Health 0, Flammability 0, Reactivity 0
HMIS Ratings: Health 0*, Flammability 0, Reactivity 0

6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures Use appropriate protective equipment. Avoid creating and breathing dust.

Environmental Precautionary Measures None known.

Procedure for Cleaning / Absorption	Collect using dustless method and hold for appropriate disposal. Consider possible toxic or fire hazards associated with contaminating substances and use appropriate methods for collection, storage and disposal.

7. HANDLING AND STORAGE

Handling Precautions	This product contains quartz, cristobalite, and/or tridymite which may become airborne without a visible cloud. Avoid breathing dust. Avoid creating dusty conditions. Use only with adequate ventilation to keep exposure below recommended exposure limits. Wear a NIOSH certified, European Standard En 149, or equivalent respirator when using this product. Material is slippery when wet.
Storage Information	Use good housekeeping in storage and work areas to prevent accumulation of dust. Close container when not in use. Do not reuse empty container. Product has a shelf life of 60 months.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls	Use approved industrial ventilation and local exhaust as required to maintain exposures below applicable exposure limits listed in Section 2.
Personal Protective Equipment	If engineering controls and work practices cannot prevent excessive exposures, the selection and proper use of personal protective equipment should be determined by an industrial hygienist or other qualified professional based on the specific application of this product.
Respiratory Protection	Wear a NIOSH certified, European Standard EN 149, or equivalent respirator when using this product.
Hand Protection	Normal work gloves.
Skin Protection	Wear clothing appropriate for the work environment. Dusty clothing should be laundered before reuse. Use precautionary measures to avoid creating dust when removing or laundering clothing.
Eye Protection	Wear safety glasses or goggles to protect against exposure.
Other Precautions	None known.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State:	Solid
Color:	Various
Odor:	Mild earthy
pH:	8-10
Specific Gravity @ 20 C (Water=1):	2.6
Density @ 20 C (lbs./gallon):	62
Bulk Density @ 20 C (lbs/ft3):	63- 73
Boiling Point/Range (F):	Not Determined
Boiling Point/Range (C):	Not Determined
Freezing Point/Range (F):	Not Determined
Freezing Point/Range (C):	Not Determined
Vapor Pressure @ 20 C (mmHg):	Not Determined
Vapor Density (Air=1):	Not Determined
Percent Volatiles:	Not Determined
Evaporation Rate (Butyl Acetate=1):	Not Determined
Solubility in Water (g/100ml):	Insoluble
Solubility in Solvents (g/100ml):	Not Determined

9. PHYSICAL AND CHEMICAL PROPERTIES

VOCs (lbs./gallon):	Not Determined
Viscosity, Dynamic @ 20 C (centipoise):	Not Determined
Viscosity, Kinematic @ 20 C (centistrokes):	Not Determined
Partition Coefficient/n-Octanol/Water:	Not Determined
Molecular Weight (g/mole):	Not Determined

10. STABILITY AND REACTIVITY

Stability Data:	Stable
Hazardous Polymerization:	Will Not Occur
Conditions to Avoid	None anticipated
Incompatibility (Materials to Avoid)	Hydrofluoric acid.
Hazardous Decomposition Products	Amorphous silica may transform at elevated temperatures to tridymite (870 C) or cristobalite (1470 C).
Additional Guidelines	Not Applicable

11. TOXICOLOGICAL INFORMATION

Principle Route of Exposure	Eye or skin contact, inhalation.
Inhalation	Inhaled crystalline silica in the form of quartz or cristobalite from occupational sources is carcinogenic to humans (IARC, Group 1). There is sufficient evidence in experimental animals for the carcinogenicity of tridymite (IARC, Group 2A). Breathing silica dust may cause irritation of the nose, throat, and respiratory passages. Breathing silica dust may not cause noticeable injury or illness even though permanent lung damage may be occurring. Inhalation of dust may also have serious chronic health effects (See "Chronic Effects/Carcinogenicity" subsection below).
Skin Contact	May cause mechanical skin irritation.
Eye Contact	May cause eye irritation.
Ingestion	None known
Aggravated Medical Conditions	Individuals with respiratory disease, including but not limited to asthma and bronchitis, or subject to eye irritation, should not be exposed to quartz dust.

Chronic Effects/Carcinogenicity

Silicosis: Excessive inhalation of respirable crystalline silica dust may cause a progressive, disabling, and sometimes-fatal lung disease called silicosis. Symptoms include cough, shortness of breath, wheezing, non-specific chest illness, and reduced pulmonary function. This disease is exacerbated by smoking. Individuals with silicosis are predisposed to develop tuberculosis.

Cancer Status: The International Agency for Research on Cancer (IARC) has determined that crystalline silica inhaled in the form of quartz or cristobalite from occupational sources can cause lung cancer in humans (Group 1 - carcinogenic to humans) and has determined that there is sufficient evidence in experimental animals for the carcinogenicity of tridymite (Group 2A - possible carcinogen to humans). Refer to IARC Monograph 68, Silica, Some Silicates and Organic Fibres (June 1997) in conjunction with the use of these minerals. The National Toxicology Program classifies respirable crystalline silica as "Known to be a human carcinogen". Refer to the 9th Report on Carcinogens (2000). The American Conference of Governmental Industrial Hygienists (ACGIH) classifies crystalline silica, quartz, as a suspected human carcinogen (A2).

There is some evidence that breathing respirable crystalline silica or the disease silicosis is associated with an increased incidence of significant disease endpoints such as scleroderma (an immune system disorder manifested by scarring of the lungs, skin, and other internal organs) and kidney disease.

Other Information

For further information consult "Adverse Effects of Crystalline Silica Exposure" published by the American Thoracic Society Medical Section of the American Lung Association, American Journal of Respiratory and Critical Care Medicine, Volume 155, pages 761-768 (1997).

Toxicity Tests

Oral Toxicity:	Not determined
Dermal Toxicity:	Not determined
Inhalation Toxicity:	Not determined
Primary Irritation Effect:	Not determined
Carcinogenicity	Refer to IARC Monograph 68, Silica, Some Silicates and Organic Fibres (June 1997).
Genotoxicity:	Not determined
Reproductive / Developmental Toxicity:	Not determined

12. ECOLOGICAL INFORMATION

Mobility (Water/Soil/Air)	Not determined
Persistence/Degradability	Not determined
Bio-accumulation	Not Determined

Ecotoxicological Information

Acute Fish Toxicity:	TLM96: 10000 ppm (Oncorhynchus mykiss)
Acute Crustaceans Toxicity:	Not determined

Acute Algae Toxicity: Not determined

Chemical Fate Information Not determined

Other Information Not applicable

13. DISPOSAL CONSIDERATIONS

Disposal Method If practical, recover and reclaim, recycle, or reuse by the guidelines of an approved local reuse program. Should contaminated product become a waste, dispose of in a licensed industrial landfill according to federal, state, and local regulations.

Contaminated Packaging Follow all applicable national or local regulations.

14. TRANSPORT INFORMATION

Land Transportation

DOT
Not restricted

Canadian TDG
Not restricted

ADR
Not restricted

Air Transportation

ICAO/IATA
Not restricted

Sea Transportation

IMDG
Not restricted

Other Shipping Information

Labels: None

15. REGULATORY INFORMATION

US Regulations

US TSCA Inventory All components listed on inventory or are exempt.

EPA SARA Title III Extremely Hazardous Substances Not applicable

EPA SARA (311,312) Hazard Class Acute Health Hazard
Chronic Health Hazard

EPA SARA (313) Chemicals This product does not contain a toxic chemical for routine annual "Toxic Chemical Release Reporting" under Section 313 (40 CFR 372).

EPA CERCLA/Superfund Reportable Spill Quantity	Not applicable.
EPA RCRA Hazardous Waste Classification	If product becomes a waste, it does NOT meet the criteria of a hazardous waste as defined by the US EPA.
California Proposition 65	The California Proposition 65 regulations apply to this product.
MA Right-to-Know Law	One or more components listed.
NJ Right-to-Know Law	One or more components listed.
PA Right-to-Know Law	One or more components listed.

Canadian Regulations

Canadian DSL Inventory	All components listed on inventory.
WHMIS Hazard Class	D2A Very Toxic Materials Crystalline silica

16. OTHER INFORMATION

The following sections have been revised since the last issue of this MSDS
Not applicable

Additional Information

For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Material Safety Data Sheet for this or other Halliburton products, contact Chemical Compliance at 1-580-251-4335.

Disclaimer Statement

This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

*****END OF MSDS*****

6-23-2011

NEW MEXICO
ENVIRONMENT DEPARTMENT

Resource Protection Division

Harold Runnels Building
1190 Saint Francis Drive (87505)
P.O. Box 5469, Santa Fe, NM 87502-5469
Phone (505) 827-2855 Fax (505) 827-0310
www.nmenv.state.nm.us

SUSANA MARTINEZ
Governor
JOHN A. SANCHEZ
Lieutenant Governor

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J. Steven Raugust, PG
NM Copper Corp.
2425 San Pedro Dr., NE, S
Albuquerque, NM 87110

PS Form 3800, August 2006

CERTIFIED MAIL-RETURN RECEIPT REQUESTED

June 23, 2011

J. Steven Raugust, PG
New Mexico Copper Corporation
2425 San Pedro Drive NE, Suite 100
Albuquerque, NM 87110

RE: Request for Additional Information: Site-Wide Stage 1 Abatement Plan Proposal for the Copper Flat Mine Facility

Dear Mr. Raugust:

The New Mexico Environment Department (NMED) has reviewed the "Stage 1 Abatement Plan for the Copper Flat Mine" proposal (Proposal), dated March 31, 2011 for the Copper Flat Mine Facility. Pursuant to Section 20.6.2.4109 NMAC of the New Mexico Water Quality Control Commission (WQCC) Regulations, NMED requests additional information be submitted to facilitate final review and approval of the Proposal.

Specific Comments

1. Section 2.3.2.1 (Crystalline Bedrock Aquifer Characteristics) states that the pre-mining **ground elevation** was reported by the BLM in 1999 as ranging from 5,500 to 5,540 ft amsl. It then states that the "pit lake elevation was 5,444 ft amsl in January 2010, revealing that the pit lake elevation remains below the pre-mining **water level elevation** of 5,500 to 5,540 ft amsl." These statements appear to be contradictory and must be clarified. It should also be noted that providing a 60 ft range in water elevation without specific reference to well(s) or data point locations makes interpretation such as this speculative.

2. Section 2 provides a "Site" description, including climate, geologic conditions, and hydrologic conditions. Many conflicting and or generalized comments are present throughout this section. In particular, it is unclear what is defined as the "Site". Based on Figure 1-1, the Site appears to include only the proposed permit area, although following statements such as "The Rio Grande is a significant water resource at the Site," and "The uppermost aquifer at the Site is the Quaternary alluvial aquifer along Las Animas and Percha

Creeks," on page 4 lend confusion. Although regional characterization is important, the Proposal must be refined and clarified to eliminate confusion regarding the area of investigation and concern.

3. Section 2.3 discusses the hydrologic conditions at the Site. Several figures are referenced to illustrate various components of the geologic and hydrologic systems present. Section 2.3.1 states that three aquifers exist in the Site area and that they are shown schematically on Figure 2-4. However, only two aquifers are evident on Figure 2-4, and apparently only one within the mine area although the location of the surface facilities is not shown and the large scale makes interpretation difficult. It is stated that Figure 2-5 is indicative of ground water elevations at the site, although Figure 2-5 and the text fail to indicate which of the three aquifers is represented in this diagram. A similar lack of clarity is provided in Figure 2-6, which is described as representative of the ground water gradient in andesitic rocks. This map shows ground water contours to the east beyond the Tailing Impoundment, yet it is unclear if the andesitic rocks extend this far to the east. Is the crystalline bedrock aquifer coincident with, or in communication with, the Santa Fe Group aquifer? Figure 2-7 is cited as a demonstration of a ground water gradient toward the Pit Lake, however this generalized schematic provides no numerical scale or data supporting the assumption. Although the scale of Figure 2-9 provides a detailed representation of the upper subsurface geology beneath the eastern end of the Tailing Impoundment, it fails to show relevant monitoring wells and screened intervals and which aquifers are present. Clarification of these issues must be provided.

   In addition, Section 4.3 references Figures 4-3, 4-4, and 4-5 as representing ground water wells within the crystalline bedrock aquifer, the Quaternary alluvial aquifer, and the Santa Fe Group aquifer systems. While these figures display the location of existing ground water monitoring wells, no information is given regarding within which aquifer each well is completed.

   NMED requests that NMCC provide cross sections, potentiometric surface maps and ground water monitoring well location maps that clearly show the depth and extent of the various aquifers at the site, the location of surface facilities (Open Pit, Waste Rock Piles, Tailing Impoundment, etc.) geologic units, and the location of pertinent monitoring wells and their screened intervals. Cross sections should be orientated in both north-south and east-west directions. New figures must be provided at a scale that allows for detailed evaluation and interpretation of the existing conditions at the Site, including the limits of known ground water impacts.

4. Section 3.2.1.1 (Streams) lists several sources of surface water data for the area. Data are available from the NMED Surface Water Quality Bureau (SWQB) for Las Animas Creek and Percha Creek, and these data must be incorporated into the "Stage 1 Abatement Investigation Report." Contact James Hogan of the SWQB at (505) 476-3671 to obtain this information.

5. Section 4.1 (Surface Water Monitoring) provides the plans for operation of the automated flow and sampling systems. Transducers are proposed to be programmed to take measurements every 30 minutes and activate the samplers accordingly. Runoff events in this

area are extremely flashy, with short-term peak flows that may last only a matter of hours, depending on patterns and amount of precipitation. Transducer measuring intervals should be reduced to 15 minutes in order to assure the capture of the rising leg and peak of an abrupt precipitation event.

6. Section 4.2 (Pit Lake Characterization) provides a plan for determining whether the Pit Lake is thermally or chemically stratified. The plan proposes to collect up to 3 samples, but then to submit a composite sample of varying depths for analysis. The proposal must provide for submittal of a composite sample for analysis in addition to each of the 3 individual samples when a thermocline is present in the Pit Lake.

7. Section 5.1.2 (Ground Water Impacts in the Tailing Dam Area) proposes one additional well pair to better characterize the lateral extent of the tailing seepage. NMED withholds approval of this well pair location pending review of the detailed figures requested in Specific Comment 3 above. Additional wells may be necessary to fully determine the nature and extent of ground water contamination at the Site.

8. Section 5.3.7 (Fate and Transport Modeling) discusses expansion of the waste rock facilities and proposes modeling efforts to determine the potential for impacts from existing and future waste rock facilities. Additional wells will be necessary to monitor for impacts to water quality from the waste rock facilities. NMED understands that NMCC will conduct exploratory drilling in the area of the existing and proposed waste rock facilities and may convert some of these bore holes into monitoring wells. NMCC should consult with NMED regarding the depth, location and construction of monitoring wells.

   NMCC should be aware that, pending analysis of the ongoing waste rock characterization, liners may be required for new waste rock facilities to prevent leachate from entering the underlying vadose zone. The section makes the comparison between water in the Pit Lake and potential waste rock leachate. These conclusions should be withheld until after completion of waste rock characterization and analysis of those data.

NMED requests that NMCC respond to these Specific Comments within 30 days of the date of this letter. NMED requests that a meeting be arranged at your earliest convenience to discuss these comments. If you have any questions, please contact Greg Huey at (505) 827-1046, or Kurt Vollbrecht at (505) 827-0195.

Sincerely,

James H. Davis, Ph.D.
Director, Resource Protection Division

JHD:gh

cc: Mary Ann Menetrey, Program Manager, GWQB MECS
Tannis Fox, General Council, NMED OGC
Charles Thomas, Director, EMNRD Mining and Minerals Division
James Bearzi, Bureau Chief, NMED SWQB

THEMAC RESOURCES

New Mexico Copper Corporation

December 29, 2010

New Mexico Copper Corporation
2425 San Pedro Dr, NE, Suite 100
Albuquerque, New Mexico 87110
(505) 382-5770

Mr. Michael Smith
Geologist
US Department of the Interior
Bureau of Land Management
Las Cruces District Office
1800 Marquess Street
Las Cruces, New Mexico 88005

Re: Submittal of the Plan of Operations for the Copper Flat Mine, Sierra County, New Mexico per 43 CFR 3809 Requirements.

Dear Mr. Smith:

New Mexico Copper Corporation (NMCC) is pleased to submit the Copper Flat Mine Plan of Operations (PoO). NMCC is proposing the re-establishment of a polymetallic mine and processing facility located near Hillsboro, New Mexico. The proposed mine would consist of an open pit mine, flotation mill, tailings impoundment, waste rock disposal areas, a low-grade ore stockpile, and ancillary facilities. NMCC is submitting this PoO per the 43 CFR 3809 requirements.

NMCC looks forward to working with the BLM to bring this facility back into production in accordance to all applicable federal and state regulations. Please contact me at 505.382.5770 or steve.raugust@themacreources.com or Mr. Barrett Sleeman, CEO of NMCC at 604.495.6723 or barrettsleeman@hotmail.com for any additional questions, comments, or concerns.

Respectfully,

J. Steven Raugust, PG
Project Manager

Cc: Barrett Sleeman, P.Eng, New Mexico Copper Corporation

THEMAC RESOURCES
New Mexico Copper Corporation

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June 24, 2011

New Mexico Copper Corporation
2425 San Pedro Dr, NE, Suite 100
Albuquerque, New Mexico 87110
(505) 382-5770

Mr. Michael Smith
Geologist
US Department of the Interior
Bureau of Land Management
Las Cruces District Office
1800 Marquess Street
Las Cruces, New Mexico 88005

Re: Submittal of the Revised Plan of Operations for the Copper Flat Mine, Sierra County, New Mexico (BLM Reference NMNM 125986)

Dear Mr. Smith:

New Mexico Copper Corporation (NMCC) is pleased to re-submit the Copper Flat Mine Plan of Operations (MPO) originally submitted on December 29, 2010. The project has the BLM Reference Number of NMNM 125986. NMCC has developed resolutions to the BLM comments conveyed to NMCC by certified mail on February 4, 2011. These resolutions are tabulated in the Summary of NMCC Resolutions to the BLM MPO Comments dated February 4, 2011, which is attached to this cover letter NMCC is submitting this revised MPO per the 43 CFR 3809 requirements.

NMCC looks forward to working with the BLM to bring this facility back into production in accordance to all applicable federal and state regulations. Please contact myself or Mr. Ferol Baker, NMCC's General Manager at 505.382.5770 or via steve@nmcopper.com or ferol@nmcopper.com, respectively for any additional questions, comments or concerns.

Respectfully,

J. Steven Raugust, PG
Permitting Manager - Engineering

Cc: Ferol Baker, New Mexico Copper Corporation
Barrett Sleeman, P.Eng, New Mexico Copper Corporation

Summary of NMCC Resolutions to BLM MPO Comments dated February 4, 2011

#	BLM Comment	NMCC Response
1	Placer mining questions - Will any of the proposed placer mining occur on Federal land? If so, provide a detailed description of the proposed operation. Include a description of the area of placer operations, proposed depth of excavation, production and processing equipment requirements, access routes, sources of water, and duration of placer operations. Provide a map of placer activity showing locations of excavation areas, waste sediment stockpiles, processing facilities and access routes.	Proposed facility layout: Discussed in Section 3.1, illustrated in Figures 3-1 and 3-2.
2	Provide general schedule of operations - Provide additional information regarding the general schedule of operations from start to closure. Include the estimated duration of each phase of the mining operations (site preparation, production, mineral benefaction, reclamation, monitoring) during the projected 17-year mine life. At a minimum, reference Figure 5-1 in this section, the addtion of a schedule in table format would also be appropriate.	Project phases presented in Section 3.2.1, detailed schedule in Figure 5-1, additional details in section 5.6
3	Detailed mining equipment list for preliminary equipment inventory - Complete detailed list of mining equipment so a preliminary equipment inventory can be propared. Also include any necessary equipment not discussed in this section, such as dozers and road graders.	Section 3.2.1: Table 3-2 provides a list of major pieces of mining equipment
4	Waste rock disposal and low-grade stockpile: Up-date the runoff calculations to meet regulatory requirements and design criteria. Provide additional details regarding the runoff collection system (ie placement and estimated size of collection ditches, and the method by which water will be diverted into the process water system). Describe short-term (ie, not final reclamation) BMPs to minimize sediment loading from the waste-rock piles (ie, silt fencing, straw application, etc.)	Discussed in Section 3.2.1, detail provided in Appendix B
5	Specific ore processing: Specifiy the dimensions and construction of all buildings planned for the project. Specify the number and exact purpose of the ancillary buildings referred to on page 3-8 and map the locations and purposes of all buildings planned for the operation on figure 3-1.	Discussed in Section 3.2.3, Table 3-3 presents Primary Plant Site Structures and Facilities, Figure 3-2 presents buildings

#	BLM Comment	NMCC Response
6	Ore processes - in-pit crushing and conveying. Plan modifications expected as optimizations and cost refinements are completed. - When does NMCC anticipate completing the feasibility study for in-pit crushing and conveying? Can this be incorporated into the current MPO, or will a plan modification be submitted?	Primary Crushing Facilities described in section 3.2.3.1
7	Tailings impoundment - Complete determinations regarding the source of materials for the new tailings dam and whether the existing dam will remain in place	Discussion of Tailings Impoundment and impoundment design - section 3.2.3.4, 3.2.3.4.1, detail provided in Appendix D
8	Water supply. Provide the legal locations of the eight wells on BLM land proposed for use in the MPO. Also provide a map showing the location of the wells and the 20-inch pipeline (with existing valves and manholes) relative to the proposed operation.	Water supply discussed in Section 3.2.7. Table 3-6 presents Production & Monitoring Well Legal Locations
9	Water supply: complete the planned inspection of the 20 inch pipeline to assure suitability for use	Description of planned waterline testing in Section 3.2.7
10	Water supply: Provide an estimate of total water use and an inventory of projected water use by activity (ie dust suppression, milling, floatation, etc.). Include estimated volumes of make-up water from pit de-watering and thickener overflow recycling.	Table 3-5 Project Water Demand table
11	Exploration activity: Specify if exploration activities on Federal lands will be limited to the permit areas defined on Figures 2-1 and 3-1. If exploratory drilling is planned on Federal surface or mineral estate outside of this boundary, specify the locations of the proposed drillholes and access routes.	Description in Section 3.3, Illustration in Figures 2-2 and 3-1.
12	Invasive species - Provide details on noxious week prevention and monitoring programs. Include information on BMPs to minimize noxious weed infestation, monitoring strategies, mitigation measures if an on-site infestation is detected.	Discussed in 3.4.9
13	Reagents. Specify the planned retaining volume of the berm for the No.1 diesel fuel tank and map the location of reagent mixing and storage area. Describe the construction of the reagent mixing and storage area including the construction of the flooring. Provide details on the plastic liners (composition & thickness) and proposed depth of gravel cover for the fuel tank linings.	Discussed in 3.4.10.2, Table 3-7 presents Copper Flat Project Materials Management
14	Hazardous materials management - Specify the volumes of diesel fuel and ammonia nitrate that will be stored on site, and the number of bins, tanks, and explosive sheds that will be placed on BLM land. Map the locations of these storage facilities.	Diesel volume discussed in section 3.4.10.2, Explosives discussed in section 3.4.10.3, map with location of storage facilities is Figure 3-1

#	BLM Comment	NMCC Response
15	Reclamation: Finalize designs for the proposed waste rock facilities so BLM engineers may evaluate your proposal.	Discussed in Section 5.9.1, Table 5-1 presents Waste rock disposal facility design parameters, Appendix D provides additional detail
16	Reclamation: Complete evaluations of tailings impoundment area to determine if the gravels and allluvial fill will be used for reclamation, impoundment construction, and/or placer operations. If material from the impoundment area will be used for reclamation on Federal lands, describe BMPs to minimize invasive or noxious weed contamination or possible transfer of hazardous materials or contaminated soils to Federal lands.	Discussed in section 5.9.1, Additional detail Appendix D
17	Reclamation: Any natural soil amendments used will have to be certified free of invasive and noxious weeds.	Affirmed, section 5.9.3
18	Reclamation: Proposed seed mix is being evaluated by BLM wildlife and range staff and may be modified if necessary.	Affirmed, section 5.10.1
19	Reclamation:Interim reclamation - Buildings, is this a proposal to maintain an on-site resident security guard during interrruptions in operations?	Affirmed, section 5.14
20	Reclamation: The reference "SRK 1995" is not listed in the bibliography, are you referring to the "Copper Flat Mine Hydrogeologic Studies" report of May 1995? This report does not make a convincing argument that the pit lake level will be below hydrostatic.	Bibliography corrected, pit lake level discussed in Section 5.7.4
21	Plant site: Why is it necessary to leave foundations and footing buried on the public land? What would be the total volume of concrete left on site after operations are completed?	NMCC has agreed to break, excavate, and remove concrete foundations from public land, Section 5.16.3
22	Reclamation: Figure 5-3 need to be included	The correct figure is now included, now Figure 3-6, discussed in section 5.16.5.3
23	Estimated reclamation costs - Reclamation bonding will likely be deferred to the NM MMD	Affirmed, section 5.17

THEMAC RESOURCES
New Mexico Copper Corporation

Copper Flat Mine
Plan of Operations

Report Prepared for:

U.S. Department of the Interior
Bureau of Land Management
Las Cruces District Office
1800 Marquess Street
Las Cruces, NM 88005-3370

Report Submitted by:

NEW MEXICO COPPER CORPORATION
2425 San Pedro Dr. Suite 100
Albuquerque, NM 87110
Office: (505) 382-5770

December 2010
Revised June 2011

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List of Acronyms

amsl	above mean sea level
ARD	acid rock drainage
AWRM	Active Water Resource Management
BATF	Bureau of Alcohol, Tobacco, and Firearms
bgs	below ground surface
BLM	Bureau of Land Management
BMP	Best Management Practice
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFQM	Copper Flat Quartz Monzonite
cfs	cubic feet per second
CO	carbon monoxide
DEIS	Draft Environmental Impact Statement
EA	Environmental Assessment
EAR	Environmental Assessment Report
EIS	Environmental Impact Statement
EMNRD	Energy, Minerals and Natural Resources Department
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
°F	degrees Fahrenheit
FCC	Federal Communications Commission
FEIS	Final Environmental Impact Statement
FLPMA	Federal Land Policy Management Act
ft	feet
gpm	gallons per minute
GWQB	Ground Water Quality Bureau
HSR	Human Systems Research
HSUs	hydrostratigraphic units
IHICS	Integrated Habitat Inventory Classification System
km	kilometers
kWh	kilowatt hours
LRGB	Lower Rio Grande Underground Water Basin
Ma	million years ago
mg/L	milligrams per liter
MMD	Mining and Mineral Division
MSDS	Material Safety Data Sheets
MSF	Middle Santa Fe Group hydrostratigraphic unit
MSHA	Mining Safety and Health Administration
NEPA	National Environmental Policy Act
NMCC	New Mexico Copper Corporation
NMED	New Mexico Environment Department
NMEMNRD	New Mexico Energy, Mineral and Natural Resources Department
NPDES	National Pollution Discharge Elimination System
NRC	National Response Center
NRHP	National Register of Historic Places
O&M	Operation & maintenance
OSE	Office of the State Engineer
PFEIS	Preliminary Final Environmental Impact Statement
PLS	pure live seed
PMP	probable maximum precipitation
MPO	Mine Plan of Operations

ppm	parts per million
RCRA	Resource Conservation and Recovery Act
RMP	Resource Management Plan
ROD	Record of Decision
ROW	rights-of-way
SAG	semi-autogenous
SARA	Superfund Amendments and Reauthorization Act
SCP	Spill Contingency Plan
SCS	Soil Conservation Service
SHPO	State Historic Preservation Office
SMIO	State Mine Inspector's Office
TDS	Total dissolved solids
tpd	tons per day
TPQ	Threshold Planning Quantity
TSF	tailings storage facility
TSP	Total Suspended Particulates
USACE	U.S. Army Corp of Engineers
USF	Upper Santa Fe Group hydrostratigraphic unit
USFS	U.S. Department of Agriculture, Forest Service
USFWS	U.S. Fish and Wildlife Service
WQCC	New Mexico Water Quality Control Commission

1 Project Summary

1.1 Introduction

The Copper Flat Project (Project) is the proposed re-establishment of a poly-metallic mine and processing facility located near Hillsboro, New Mexico. The proposed Project would consist of an open pit mine, flotation mill, tailings impoundment, waste rock disposal areas, a low-grade ore stockpile, and ancillary facilities. In most respects, the facilities, disturbance and operations would be similar to the former operation.

The Project is owned and operated by the New Mexico Copper Corporation (NMCC), a wholly owned subsidiary of THEMAC Resources Group Limited (THEMAC), information for which is provided in Section 2.

1.2 Project Location

The Project is located in Sierra County, New Mexico, approximately 30 miles southwest of Truth or Consequences and five miles northeast of Hillsboro (**Figure 1-1**). The general area can be reached by traveling south 15 miles from Truth or Consequences on Interstate Highway 25, then 12 miles west on New Mexico Highway 152. The Project area lies two miles west-northwest from Highway 152. The regional location of the Project is shown on **Figure 1-2**.

1.3 Project Background

Development of the Copper Flat Project began in the 1970's by Quintana Mineral Corporation. An Environmental Assessment Report (EAR) was prepared for the Project in 1977 (Glover, 1977). The U.S. Department of the Interior, Bureau of Land Management, Las Cruces District Office (BLM) prepared an Environmental Assessment Record to analyze potential impacts resulting from granting rights-of-way (ROW) for utilities and access roads, as well as impacts resulting from the mining Project (BLM, 1978). The ROWs were approved by the BLM in the Environmental Assessment Record and air quality, tailings discharge, and water discharge permits were issued by the State of New Mexico. The air permit was closed in 2002 due to inactivity, and while the groundwater discharge permit remains open, it cannot be renewed until a Stage 1 Abatement Plan for a small groundwater impact associated with the existing tailings impoundment has been approved by the New Mexico Environment Department (NMED) Ground Water Quality Bureau (GWQB). The New Mexico Energy Minerals and Natural Resources Department (EMNRD), Mining and Mineral Division (MMD) mining permit has also expired.

In 1982, the Copper Flat Partnership, Ltd. developed and operated the Project, which consisted of an open pit copper mine, a 15,000-ton per day flotation mill, and a 515-acre tailings impoundment. The Copper Flat mine officially commenced full commercial production in April, 1982. In July 1982 the mine was shut down due to low copper prices and other economic considerations. In 1986 all on-site surface facilities were removed and a BLM approved program of non-destructive reclamation was carried out. Most of the property's infrastructure, including building foundations, power lines and water pipelines were preserved for reuse in the future in the event copper prices recovered sufficiently to make re-establishing the Project economically viable.

In 1991, a proposed Plan of Operations was filed with the BLM by Gold Express Corporation to re-establish the Copper Flat Project. The BLM initiated an Environmental Assessment (EA) because federal land would be "newly" disturbed. New archaeological, biological, threatened and endangered species, air quality, hydrologic and socioeconomic studies were conducted. However, it was determined in 1993 that an Environmental Impact Statement (EIS) would be required for the Project due to concerns related to several water quality issues, and the EA was never completed.

Alta Gold Company (Alta) acquired the Project in early 1994 and proposed to rebuild the Copper Flat mining facility essentially as it existed in 1982. Alta submitted an updated Mine Plan of Operations (MPO) and associated environmental baseline data to the BLM for initiation of the EIS process. The *Draft Environmental Impact Statement – Copper Flat Project* (DEIS) was completed by the BLM in 1996. A *Preliminary Final Environmental Impact Statement – Copper Flat Project* (PFEIS) was prepared by the BLM in 1999 following public comment on the DEIS. However, the EIS and Record of Decision (ROD) were never finalized due to Alta's declaration of bankruptcy in early 1999.

2 Corporate Information

New Mexico Copper Corporation owns and controls the entire interest in the proposed Copper Flat Project. NMCC contact information is:

New Mexico Copper Corporation
2425 San Pedro, NE, Suite 100
Albuquerque, New Mexico 87110
505.382.5770

THEMAC Resources Group Limited (THEMAC), a Yukon corporation, owns and controls all of the shares of NMCC. THEMAC's contact information is:

THEMAC Resources Group, Ltd.
1066 West Hastings Street, Suite 2000
Vancouver, British Columbia
Canada, V6E 3X2
604.806.6110

Name & Business Address of Individual Completing Application

Name:	Barrett G. Sleeman
Title:	Chief Executive Officer and President
Business Name:	New Mexico Copper Corporation
Business Address:	2425 San Pedro, NE, Suite 100
	Albuquerque, New Mexico 87110
Telephone Number:	505.382.5770
e-mail:	barrett@nmcopper.com

2.1 Corporation Information

Corporation Name:

New Mexico Copper Corporation
2425 San Pedro, NE, Suite 100
Albuquerque, New Mexico 87110
505.382.5770

Corporation Officer's Information:

Chief Executive Officer:	Barrett G. Sleeman
Chief Financial Officer:	Steve Vanry
Secretary:	J. Stephen Law and Salvador Miranda

Federal Taxpayer ID Number: 80-0612011

2.2 Registered Agent

Registered Resident Agent:

Name: Mark K. Adams
Business Address: 315 Paseo de Peralta
Santa Fe, New Mexico 87501
Telephone Number: 505.954.3902
e-mail: madams@rodey.com

2.3 List of BLM Claims and Serial Numbers

Proposed mining and related surface disturbance would be conducted on unpatented lode, placer, and mill-site claims owned or controlled by NMCC on BLM-administered lands or on private land controlled by NMCC. Claim names and BLM serial numbers are provided in **Appendix A**.

There are no state lands or U.S. Department of Agriculture, Forest Service (USFS) lands located within the MPO boundary. **Table 2-1** presents the legal description of the project, including the water supply wells and pipeline corridor.

Table 2-1: Legal Description of Proposed Project Area

Township	Range	Sections
15 South	7 West	25,26,27, 35, & 36
15 South	6 West	25, 26, 27, 30, 31, 32, 33, & 34
15 South	5 West	30 & 31
16 South	6 West	6

Note: Project Area includes production water wells and pipeline corridor in addition to mine property boundary.

2.4 Land Status

The Copper Flat Project is comprised of contiguous and noncontiguous lands that include patented and unpatented mining claims (lode, placer, and mill site), and private parcels. In addition, a right-of-way to the east of the mine site is being established for the conveyance of water from the NMCC production wells to the mine site (**Figure 2-1**). The area inside the proposed MPO boundary is 2,190 acres. Activity at the Copper Flat Mine in 1982 disturbed approximately 361 acres of BLM-administered public lands and 549 acres of private lands.

The re-establishment of the Copper Flat Mine would affect nearly 1,586 acres, 910 acres of which have been previously disturbed and 676 acres which would be newly disturbed land (**Table 2-2**). Overall, the Copper Flat Project would disturb approximately 745 acres of unpatented mining claims on public land and 841 acres of private land controlled by NMCC (**Figure 2-2**). Approximately 57 percent of the area needed for the proposed MPO has been disturbed by prior operations, and approximately 90 percent of the ore would be mined from private land.

Table 2-2: Summary of Proposed Disturbance

Facility[(1)]	Existing Disturbance			Proposed Incremental Disturbance			Total Disturbance		
	Public	Private	Total	Public	Private	Total	Public	Private	Total
Roads									
Access Road	1	1	2	6	3	9	7	4	11
Haul Roads	5	16	21	4	22	26	9	38	47
Total Roads	**6**	**17**	**23**	**10**	**25**	**35**	**16**	**42**	**58**
Pits, Adits, Trenches									
Pits	11	91	102	1	16	17	12	107	119
Total Pits, Adits, Trenches	**11**	**91**	**102**	**1**	**16**	**17**	**12**	**107**	**119**
Tails									
Tailings Facility	131	341	472	22	53	75	153	394	547
Total Tails	**131**	**341**	**472**	**22**	**53**	**75**	**153**	**394**	**547**
Process Ponds									
Ponds	5	1	6	1	13	14	6	14	20
Total Ponds	**5**	**1**	**6**	**1**	**13**	**14**	**6**	**14**	**20**
Waste Rock Facilities									
Waste Rock Facilities	32	1	33	128	49	177	160	50	210
Total Waste Rock Facilities	**32**	**1**	**33**	**128**	**49**	**177**	**160**	**50**	**210**
Ancillary Facilities									
Misc.	122	78	200	47	70	117	169	148	317
Diversions	25	12	37	8	3	11	33	15	48
Topsoil Stockpiles	1	7	8	26	37	63	27	44	71
Stockpiles (Low-grade Ore)	21	1	22	45	2	47	66	3	69
Building Areas[(2)]	7	0	7	76	4	80	83	4	87
Total Yards	**176**	**98**	**274**	**202**	**116**	**318**	**378**	**214**	**592**
Exploration									
Roads, Trenches, Drill Pads, etc.	0	0	0	20	20	40	20	20	40
Total Exploration	**0**	**0**	**0**	**20**	**20**	**40**	**20**	**20**	**40**
Total	**361**	**549**	**910**	**384**	**292**	**676**	**745**	**841**	**1586**

Notes:

1. All acres are rounded up to the nearest 1 acre.

2. Mill plant sites, substation, reagent building, primary crusher, process water storage, concentrate storage, thickener facility, coarse ore stockpile, administration building, offices, shops, storage, assay lab, septic system.

Portions of the waste rock disposal areas, as well as the crushing facility and the mill facility, would be located on public land subject to unpatented mining claims controlled by NMCC. Approximately 28 percent of the tailings impoundment and 10 percent of the open pit would be located on public land subject to mining claims controlled by NMCC.

Approximately 49 percent of the proposed disturbance on public land was disturbed by the previous operation. On the private land, approximately 65 percent of the surface needed for the mine has been disturbed by the prior operation. The majority of the tailings storage land is privately owned and controlled by NMCC.

2.5 Permits and Approvals

2.5.1 Federal Permits, Approvals and Consultations

A National Environmental Policy Act (NEPA) review of the proposed Project was initiated in 1994 when Alta Gold notified the BLM (Las Cruces District Office) that the company had purchased the Project from Gold Express and was assuming legal responsibility for the Plan of Operations initially submitted in 1991. The BLM then began the process of preparing an EIS. The DEIS was completed in 1996, and the PFEIS was completed in 1999. However, neither a Final EIS (FEIS) nor ROD was issued for the Project as a result of Alta's bankruptcy in 1999.

. Consultation with the U.S. Fish and Wildlife Service (USFWS), in accordance Section 7 (c) of the Endangered Species Act (ESA), is required to ensure that any action authorized, funded or carried out by a federal agency would not adversely affect a federally listed threatened or endangered species.

The major federal permits and approvals required are shown in **Table 2-3**.

2.5.2 State Permit and Approvals

A number of state permits would also be required for the Project. The New Mexico Environment Department (NMED) would issue most of these permits, including air quality permits and groundwater discharge permits. Alta submitted an application for a modification to the existing groundwater Discharge Permit (DP-001) for the Project in early 1995. However, DP-001 was suspended until a Stage 1 Abatement Plan for a small groundwater impact associated with the existing tailings impoundment has been submitted and approved. In addition, an application for a revised Air Quality Permit (No. 365-M-1) was also submitted by Alta in early 1995. This permit was closed in 2002 due to inactivity.

In addition to approval by the State under the New Mexico Mining Act, NMCC would be required to secure a number of additional state and federal permits and approvals. These are also listed in **Table 2-3**.

Table 2-3: Major Permits and Approvals Required

Permit/Approval	Granting Agency
Federal	
Approval of Plan of Operations	U.S. Bureau of Land Management (BLM)
National Dredge and Fill Permit (Section 404)	U.S. Army Corp of Engineers (USACE)
FCC License	Federal Communications Commission (FCC)
MSHA Registration	Mining Safety and Health Administration (MSHA)
National Pollution Discharge Elimination System (NPDES), Including Stormwater Discharge	U.S. Environmental Protection Agency (EPA)
Explosives Permit	Bureau of Alcohol, Tobacco, and Firearms (BATF)
Endangered Species Surveys	U.S. Fish and Wildlife Service
State	
Mining Permit	New Mexico Energy, Mineral and Natural Resources Department (NMEMNRD)- Mining Act Reclamation Bureau
Mine Registration	NMEMNRD – Mine Registration Reporting, and Safeguarding Program – Mine Registration
Permit to Construct (Air Quality)	New Mexico Environment Department - Air Quality Bureau
Permit to Operate (Air Quality)	New Mexico Environment Department - Air Quality Bureau
Permit to Appropriate Water	New Mexico State Engineer's Office
Permits for Dam Construction and Operations	New Mexico State Engineer's Office
Approval to Operate a Sanitary Landfill	New Mexico Environment Department - Solid Waste Bureau
Liquid Waste System Discharge Permit	New Mexico Environment Department - Groundwater Bureau
Groundwater Discharge Permit	New Mexico Environment Department - Groundwater Bureau (DP-001)
Cultural Resources Clearance Surveys	New Mexico Department of Cultural Affairs - Historic Preservation Division
Endangered Plant Species Surveys	Natural Heritage New Mexico
Endangered Wildlife Species Surveys	New Mexico Department of Game and Fish

3 Proposed Operating Plan

3.1 Introduction

Relevant aspects of the planned operations are summarized in this section. The Proposed Action is the operation as proposed by Gold Express Corporation in 1991, adopted by Alta in 1994 (BLM, 1996), and modified and updated by NMCC in 2010. The proposed project layout is shown on **Figure 3-1**, while a detail of the plant site layout is presented in **Figure 3-2.** A topographic map of the project facilities is provided in **Figure 3-3**.

The mine design has many of the same mining plans and elements outlined by Gold Express and Alta Gold; all of these have been previously discussed in the DEIS and PFEIS that was being prepared in the late 1990s related to Alta's mine proposal—mainly focused on reactivating the mine plans and processes of Quintana of the early 1980s.

The NMCC-proposed operation includes the following activities:

- Expand the project boundary to include additional land controlled by NMCC;
- Provide for exploration over entire proposed plan area;
- Expand the existing open pit;
- Construct haul and secondary mine roads;
- Construct, operate and reclaim waste rock disposal facilities;
- Construct, operate and reclaim low-grade ore stockpiles;
- Construct, operate and reclaim the mill and associated processing facilities;
- Construct, operate and reclaim the tailings impoundment facility;
- Construct ancillary buildings (administration offices, laboratory, truck shop, reagent building, substation and gatehouse, etc.);
- Secure and construct a suitable water supply network;
- Construct growth media stockpiles; and
- Construct and maintain surface water diversions.

Table 3-1: Summary of NMCC Proposed Disturbance within the Plan Boundary

Disturbance Type	Public Lands (acres)	Private Lands (acres)	Total (acres)
Tailings Storage Facility	153	394	547
Open Pit	12	107	119
Waste Rock Disposal Facilities	160	50	210
Haul Roads	9	38	47
Access Roads	7	4	11
Stormwater Diversion Structures	33	15	48
Miscellaneous Areas[1]	351	213	564
Exploration	20	20	40
Total Disturbance	745	841	1586

Notes:

1. Includes mill areas, stockpiles and other miscellaneous disturbance areas (including inter-facility disturbance generally associated with construction activities).

3.2 Proposed Plan

3.2.1 Open Pit

The mining of new ore would entail expansion of the existing open pit. A portion of the ore body at Copper Flat is exposed at and near the surface and would be mined by conventional truck and shovel open pit methods in a manner similar to the previous operation. The open pit mine is currently proposed to operate 24 hours per day, seven days per week, 365 days per year. However, this production schedule is subject to change based on future economics of the project. Over the life of the Project, the mine would produce approximately 96 million tons of copper ore, 37 million tons of waste rock, and 19 million tons of low-grade copper ore (less than 0.20 percent copper). The low-grade copper ore would likely be processed during operations as blend material and/or at the end of the mine life, depending on economic conditions at the time. As such, it would require stockpiling until such time at it is suitable for milling and processing. The operation would process at a nominal throughput of 17,500 short tons per day of ore through the copper sulfide flotation mill using standard technology similar to that of the previous operation. While the operation would focus primarily on copper and molybdenum, other poly-metallic resources, including gold, silver, and possible rare-earth elements, may be economically extractable from the Copper Flat ore. These options resources are currently being evaluated.

Annually, the mining operation would process an estimated 5.8 million tons of copper ore and 1.1 million tons of low-grade copper material. Waste rock production is estimated to average 2.2 million tons per year (ranging from 100,000 to 6.4 million tons annually), with tailings production estimated at 5.7 million tons annually. An operational life of approximately 17 years is currently projected.

The durations of each of the phases of the Copper Flat Project are estimated as follows:

- Pre-construction (Permitting) 2 Years
- Construction (Site preparation) 2 Years
- Operations (Mineral beneficiation) 17 Years
- Closure/Reclamation 3 Years
- Post-Closure Monitoring 12 Years

Post-closure monitoring period includes final abandonment of monitoring wells and reclamation of access roads needed for monitoring. Additional details of the project schedule are discussed in Section 5.6 and illustrated in **Figure 5-1**.

Preproduction stripping of overburden was completed in 1982 during the previous operation. Approximately 3 million tons of overburden material was stripped and over 1.2 million tons of ore were mined from the existing pit during the early 1980s. Under the NMCC proposed MPO, the Copper Flat ore body would be mined by a multiple bench, open pit method. The existing pit would eventually be enlarged to approximately 2,500 feet by 2,500 feet with an ultimate depth of approximately 900 feet. The area of the pit would be expanded from 102 acres to 119 acres. The existing diversion of Greyback Wash south of the pit would not be altered with the proposed pit expansion. The working, inter-bench slope of the pit walls would average 45 degrees, but would be optimized based on on-going evaluations of project economics and pit slope engineering. Safety benches would remain as required by regulation. A typical cross-section of the proposed open pit is provided in **Figure 3-4**. Because the deposit cannot be mined sequentially, there is no plan to backfill the pit, although some benign waste rock would be used for pad preparation, plant site development, and in connection with the reclamation of disturbed area.

Ore material from the pit would be drilled and blasted, loaded and hauled to the primary crusher either in pit or out of pit, and then conveyed to the process mill, where the mineral values would be removed by conventional flotation processes. Future work will determine the viability of belt conveyance (either surface or underground) of crushed material if in-pit crushing is chosen over out-of-pit crushing. Waste rock would be placed on the ground surface in designated disposal areas, as discussed in Section 3.2.2.

Blasting would be limited to daylight hours and performed by licensed blasters. Rotary diesel driven drills, electric powered and/or down the hole hammer drills would be used for blast hole drilling.

Wet drills, in conformance with Mining Safety and Health Administration (MSHA) requirements, would be used for secondary breakage when necessary. Safe seismic disturbance and air blast limits would be established to prevent damage to buildings.

Blasting agents would be stored in a secured area in compliance with applicable state and federal regulations. Ammonium nitrate and diesel fuel would be stored on site in bins and tanks. Detonators, detonating cord, boosters, caps and fuses would be stored apart from the batch plant area in secured separate magazines. The storage location for each of these facilities would be in previously disturbed areas between the plant site and the pit; safety and security would be the main factors considered in their final location.

Cuttings samples would be taken from blast holes. Based upon the assay values of these samples, the broken rock in the pit would be classified as “ore” or “waste.” The broken rock would be loaded onto end dump haul trucks for transport to the primary crusher, low-grade stockpile, or waste rock disposal area(s) depending on the assay classification.

Loading of both ore and waste rock would be accomplished by using hydraulic shovels and/or front-end loaders. During the first years of operation, ore and waste rock haulage would be handled by a fleet of end-dump, diesel-powered haulage trucks of minimum 85-ton capacity. Additional units may be added to the fleet as the pit is deepened. A preliminary equipment inventory is provided in **Table 3-2**.

Noise from the mine equipment would comply with, and would be regulated under MSHA. Mining equipment would be fitted with mufflers, spark arresters, and other fire prevention and safety equipment.

A 12.8 acre lake currently is located in the existing pit. The pit bottom was at about a 5,380 foot elevation at closure in 1986. Original ground surface elevation at the pit was approximately 5,580 feet. The water level elevation in the pit lake is currently about 5,420 feet. Pumping of the pit-lake will be necessary prior to mining and continuously throughout the life of the mine. Minor drilling work in 1976 indicated that groundwater in the pit area is localized in the larger fractures. Inflow to the pit during the previous operations ranged from 50 to 75 gallons per minute (gpm). As a result of seasonal precipitation, the pit water level has fluctuated by 1 to 5 feet per year. The water inflow into the pit will be used as make-up water and for dust suppression on the roads and dumps. If necessary, pit water could be temporarily stored in a reservoir in the plant area. Water removal from the pit will continue over the operational life of the mine through a sump or series of sumps located within the pit. Water removal will end once mining of the pit is completed.

The currently designed ultimate depth of the pit is estimated at 900 feet at an elevation of 4,720 feet. After pit-lake pumping activities end, a lake will reform as recharge refills the local cone of depression developed from pit-lake pumping. The pit-lake will eventually be approximately 640 feet deep and cover 75 surface acres. The size of the lake will fluctuate annually depending on precipitation and evaporation rates. At an average evaporation rate of 65 inches per year, the maximum water loss from the pit lake would be about 600 acre feet per year. Refilling of the pit would proceed over a number of years at a predicted recharge rate of 50 to 75 gpm or 80 to 120 acre feet per year. These estimates will be refined as the geo-hydrology of the area is better understood as a result of studies performed by NMCC.

Table 3-2: Major Pieces of Mining Equipment

Number	Item	Type (or equivalent)
2	Hydraulic Shovels	Terex RH90-C
11	Trucks	Caterpillar 777
1	Loader	Caterpillar 992G
1	Loader	988B
1	Track Dozer	Cat D8 class
2	Tire Dozers	Cat 834 class
1	Grader	Cat 16G class
1	8,000-Gal. Water Truck	773A
1	Backhoe	
2	Blast Holes	
2	Drill Rigs	Atlas Copco DM45
4	Light Plants	
1	1-Ton Flat Bed	
1	Service Truck	
1	Fuel truck	
1	Tire truck	
4	Mechanic's trucks	
8	Pickup trucks	
1	Shop and equipment	
2	Truck-mounted cranes	
1	Modular office building & Equip.	
1	Fire Truck	
1	Office Trailer & Equip.	
1	Crane	
2	Forklifts	
1	834 RT Dozer	
6	Light-Weight Plant Vehicles	
1	Ambulance	

The proposed plan also includes ongoing exploration drilling to define the copper ore body (infill and step out drilling as well as tests for possible deep extensions of the orebody) as well as to test for near-surface coarse gold vein and alluvial gold potential in the area of the mine.

3.2.2 Waste Rock Disposal Area and Low-Grade Stockpile

Waste rock disposal facilities (WRDFs) would be located adjacent to the open pit, in areas used for waste rock disposal by the previous operator. These disposal areas would be expanded under the current MPO to cover approximately 210 acres (**Appendix B)**. Prior to the expansion of existing disposal areas into previously undisturbed areas, reclamation materials (including suitable growth media and "topsoil") would be removed and stockpiled for future use in reclamation. Since a large portion of the waste rock disposal expansions would occur on previously disturbed areas, the amount of reclamation materials available for pre-stripping in these areas may be limited. Water erosion controls, such as berms and diversion ditches, would be installed to divert runoff away from the WRDFs. Water diversion ditches would also be used to control water inflow onto waste rock disposal piles containing partially oxidized and unoxidized material.

Runoff from the WRDFs and the low-grade ore stockpile would be controlled by diverting the runoff water into collection ditches and then recycling it into the process water system. No discharge is expected to occur. The final grading plan for the WRDFs would be designed to eliminate surface water run on, enhance runoff, reduce infiltration, minimize visual impacts, and facilitate revegetation through back-grading or crowned grading. Catch benches would be left in place to interrupt surface sheet flow, and regrading would approximate the adjacent and nearby geomorphic land shapes. At the end of the mine life, the height of the largest disposal area would be 340 feet higher than present, at an elevation of 5,900 feet above sea level. The WRDFs are designed to facilitate regrading during reclamation. Typical cross-sections of the proposed WRDFs are provided in **Appendix B**.

The WRDFs would be regraded and surface runoff velocity dissipaters would be constructed to reduce velocities and minimize undue erosion and soil loss. Exact design parameters which are specific to the site climatology and soil conditions would be ascertained during revegetation testing and concurrent reclamation activities. However, preliminary designs, including additional details regarding the runoff collection systems and best management practices to minimize sediment loading from the WRDFs is presented in **Appendix B.** Total material contained in the disposal areas at the end of the expected life of the project would be approximately 37 million tons.

The low-grade stockpile would cover an area of approximately 69 acres and include about 19 million tons of rock assaying less than 0.20 percent copper. If, for economic reasons this low-grade stockpile is not milled, it will be reclaimed at the end of the mine life.

Particulate dust from the WRDFs and low-grade stockpile is not anticipated to be a problem given the hardness of the rock and the coarseness of the material.

Under the NMCC proposed MPO, the partially oxidized (transitional materials) from the pit may be segregated into the North and West WRDFs (**Figure 3-1**), though the exact method of disposal (and possible segregation) will be determined through the current geochemical testing program. The East WRDF would contain only unoxidized waste rock. To minimize oxidation potential post closure, WRDFs would be covered with a layer of compacted material and suitable reclamation materials, and revegetated. A more detailed discussion of the geochemical characteristics and management of the mine waste materials are provided in **Appendix C**.

Additional monitoring wells may be installed along the toe of the East WRDF area to monitor groundwater quality downgradient of the area.

3.2.3 Ore Processing

Ore from the pit would be trucked to the plant area located to the east of the pit (**Figure 3-1**). The ore would be crushed and ground and organic reagents would be added to create froth and cause the copper minerals to adhere to the bubbles (BLM, 1996). The copper-laden froth would be collected and filtered to form a concentrate. The proposed plant would be a sulfide-flotation plant similar to that originally constructed at the site by Quintana Minerals (Copper Flat Partnership) in 1982, and would be typical of plants used at other similar deposits. It would include a molybdenum processing circuit similar to that designed by Quintana. No leaching processes, including cyanide leaching, would be used.

For the most part, the plant facilities would be constructed at the site of the original Quintana plant site, and, to the extent practicable, would use most of the original concrete foundations (**Figure 3-2**). The plant site would occupy approximately 87 acres and would be located between the open pit and the tailings impoundment area (**Figure 3-1**). **Table 3-3** provides a list of the plant site area primary structures (including approximate dimensions and construction materials).

The sulfide flotation plant would be designed to process approximately 5.8 million tons of ore per year at a nominal throughput of 17,500 tons per day (assuming 93% availability). The flow sheet of the process circuit is included as **Figure 3-5**.

Scheduled operating time for the mill is currently proposed at 24 hours per day, seven days per week, 365 days per year. Saleable products would be copper concentrate and molybdenum concentrate. The copper concentrate would be shipped by truck to an off-site refinery or port facility. Gold and silver would be recovered as by-products of the hydrometallurgical refining process at the refinery. Molybdenum concentrate would be filtered, dried, packaged in drums, and shipped directly in trucks to purchasers for further refining.

Table 3-3: Primary Plant Site Structures and Facilities

Facility	Length (ft)	Width (ft)	Height (ft)	Diameter (ft)	Slab (ft)	Construction Type
Primary Crusher	90	30	103	--	0.83	Metal roof, metal siding
Ball Bins	109	51		--	1.00	Concrete
Electric Substation	94	68		--	1.00	slab only
Concentrator Building – Grinding Area	192	145	32	--	1.00	Metal roof, metal siding
Concentrator Building – Flotation Area	22	26	44	--	0.66	Metal roof, metal siding
Concentrator Building – Maintenance Office	13	12	14	--	0.50	Metal roof, metal siding
Concentrate Thickeners (2)	--	--	--	50	--	Tank walls - metal
Reagent Building	60	50	26	--	0.50	Metal roof, metal siding
Assay & Metallurgical Laboratory	180	40	16	--	0.50	Metal roof, metal siding
Tailings Thickener				350	-	Thickener
Concentrate Stockpile	154	103		--	0.66	Concrete
Wash Pad	58	33	0	--	0.83	Concrete
Change House	180	40	20.5	--	0.50	Metal roof, metal siding
Administration Building	120	60	14	--	0.50	Metal roof, metal siding
Truck Repair Warehouse	340	90		--	1.00	Metal roof, metal siding
Small Vehicle Repair Building	90	30	40	--	0.83	Metal roof, metal siding
Reagent Storage and Lime Handling	100	52	24	--	0.83	Metal roof, block walls
Lime Mill	27	22.5	8.5	--	0.50	Metal roof, metal siding
Lime Silo	18	24	25	20		Metal
Lime Slurry Tank	--	--		11		(18x18)
Shops and Warehouse (1st story)	180	90	25	--	1.00	Metal roof, metal siding
Shops and Warehouse (2nd story)	50	30	48	--	-	Metal roof, metal siding
Mechanical Equipment/Repair Bays and Warehouse	180	90	43	--	1.00	Metal roof, metal siding
Tire/ Lube	90	60	41	--	1.00	Metal roof, metal siding
Flammable Material Storage Bldg.	25	17	9	--	0.67	Metal roof, metal siding
Filter Deck	24	20	33	--	0.66	Metal roof, metal siding
Gatehouse	8	12	10	--	0.50	Metal roof, metal siding
Acid Storage Building	16	12		--	0.50	Metal roof, metal siding
Records & Receiving Office	41	20	12	--	0.50	Metal roof, metal siding
Freshwater/Fire Tank (1)	--	--	24	34		Metal
Diesel Tanks (2)	--	--	24	42	--	3' berm
Process water tank (1)	--	--	26	20		Metal
Fresh water pump station tanks - 6	--	--	18	17		Metal

Equipment in the concentrator building is expected to consist of the following:

- 42 × 65 in. gyratory crusher,
- 32 ft. dia. × 14 ft. long, 10,000 hp semi-autogenous (SAG) mill,
- 2-8 × 20 ft. double deck vibrating screens,
- 4.5 ft omnicone crusher,
- 10-26 in. cyclones,
- 18 ft. dia. × 28 ft. long, 6,000 hp ball mill,
- 10-1,500 ft^3 bulk rougher cells,
- 13-300 ft^3 cleaner cells,
- 50 ft. dia. bulk concentrate thickener with auto-lift rakes,
- 50 ft. dia. copper concentrate thickener with rakes,
- 350 ft. dia. tailings thickener with auto-lift rakes,
- 20 × 18 in., 800 hp cyclone feed pump,
- 12 ft. dia. × 14 ft. drum belt filter (copper),
- 4.5 ft. dia. × 5 ft. drum belt filter (moly),
- 8-100 ft. molybdenum rougher cells,
- KW-100 tower mill-moly regrind,
- 7-24 ft^3 cleaners,
- 5-18 ft^3 cleaners,
- 5-15 ft^3 cleaners,
- 150 tph recycle crusher, and
- UTM-600 tower mill.

3.2.3.1 *Primary Crushing Facilities*

The primary crusher is currently proposed to be located about 2,500 feet east of the pit. Ore hauled from the pit would be dumped into the primary crusher that would crush the mine run rock to a nominal size of less than 8 inches in diameter. Crusher discharge would be fed by apron feeder onto a belt conveyor for transport to the coarse ore stockpile located near the mill. Delivery of ore by truck would be on a schedule similar to the mining operations, while the crusher would likely operate on the mill schedule, with extra delivery from a nearby surge stockpile with a front end loader. Storage capacity of the coarse ore stockpile would be about 35,000 tons. The crusher would be located below ground level to limit noise and contain dust. Dust emissions would be controlled with suppressants, water, and dust collection equipment (i.e., bag houses) to meet air quality operating permit stipulations and health standards.

3.2.3.2 *Grinding*

Three draw chutes beneath the coarse ore stockpile would direct ore onto apron feeders and feed ore onto a belt conveyor for transport into a large diameter semi-autogenous (SAG) mill and/or roller crushers for the first stage of grinding. Reduction in the SAG mill would be a result of impact between the ore chunks themselves and between the ore chunks and the 5 inch steel grinding balls used in the mill. Reduction would be a combination of crushing and attrition. Water and various reagents would be added to the SAG mill feed to start the conditioning of the ore pulp for subsequent stages of treatment. Tonnage of the primary feed to the SAG mill would be a nominal 17,500 tons per day.

The SAG mill would discharge onto a double deck vibrating screen. Undersize crushed ore from the screen would report to a cyclone feed sump. The oversize ore would be taken by belt conveyor to a cone crusher, where it would be crushed to less than 0.75 inch in diameter and returned by belt conveyor to the SAG mill. Intermediate size product would be returned directly to the SAG mill by conveyors. Ore from the cyclone feed sump would be pumped to a cluster of hydro-cyclones for material sizing. The fines would report to the first stage of flotation, and the oversize ore would report to two large ball mills for further grinding.

Dust control measures would be implemented in compliance with the air quality permit issued by the New Mexico Environment Department (NMED). Control technologies utilized would vary according to specific applications but would include bag houses, sprays and mists, foggers, and enclosed buildings.

3.2.3.3 *Flotation and Concentration*

Cyclone overflow from the feed sump would report to the first stage (rougher) flotation cells connected in series. Each cell would be equipped with a mechanism that would agitate or stir and induce air into the ore pulp as it passed through the tank. Reagents would be added to the pulp to cause the copper bearing sulfide mineral particles to adhere to bubbles created by the induced air and frothing agents. Flotation reagents that would be used in the concentrator are described in Section 3.2.8. Small amounts of other reagents may be used in the process from time to time as part of an ongoing effort to improve metal recoveries and to cope with changing ore characteristics. The copper bearing sulfide laden bubbles would rise to the top of the cell to be skimmed off. The copper/molybdenum concentrate floated off of the primary rougher would be routed to the molybdenum plant where the copper would be depressed and the molybdenum would be floated up, graded-filtered, and dried. The copper concentrate, which would average about 28 percent copper, would be dewatered in a settling facility (thickener) to decant water, then disk filtered, and stored for shipment. The copper and molybdenum concentrates would be loaded by a front end loader into covered trucks for transportation to a smelter or off-site refiner. Filtrate from both the copper flotation circuit and the molybdenum flotation circuit would be returned to concentrate thickeners. Thickener overflow would be returned to the plant reclaim water system. No smelting or refining would be conducted at the Copper Flat Project. The molybdenum concentrate would also be dried prior to packing into 55 gallon drums for shipment.

The crushing and concentrating plant complex would include buildings such as offices, a truck shop, a substation, and a gatehouse. The buildings would all be prefabricated, standard, rigid framed structures. The administration building would be approximately 60 feet by 120 feet with a 14 foot eave height. The building would have central heating and air conditioning and would accommodate the plant administration, engineering, accounting, secretarial, and clerical personnel. Appropriate sanitary facilities would be provided for men and women.

The assay and laboratory offices would be 40 feet × 180 feet. Appropriate sanitary facilities would be provided. A small air compressor would be mounted on an exterior concrete pad for furnishing service air to the building. The gate house building would be 8 feet × 12 feet. A parking area for employee vehicles would be located adjacent to the main plant entry gate. The shop and warehouse building would be an equipment servicing facility. The reagent building would be a 60-foot × 50-foot building. See **Table 3-3** for additional details on buildings.

All mechanical, civil, structural and architectural designs would be in accordance with applicable standards and codes. The criteria used for design, equipment selection, layouts and construction were initially derived from the prior operation of Quintana Minerals and information from vendor and consultant recommendations. Equipment and fabricated items would be furnished with manufacturers' standard finish and retouched after erection. Safety painting would be in accordance with MSHA standards and New Mexico mining codes. Buildings and facilities would be painted in neutral colors to blend with the surrounding landscape.

The plant site surface drainage was originally designed to contain or control a 24-hour precipitation event of 2.6 inches with a maximum 1 hour intensity of 2.0 inches. These calculations would be verified during the engineering design phase of the project in accordance with current regulatory requirements and design criteria. Surface runoff from the area around the administration/mine office, concentrator, assay building, reagent storage and tailings thickener would be controlled by surface grading and directed to a containment pond.

3.2.3.4 *Tailings Impoundment*

An existing tailings impoundment facility at Copper Flat was constructed by Quintana Minerals to serve their 1982 mining operation. The impoundment received 1.2 million tons of material and was essentially reclaimed in 1986. The tailings impoundment remains in place and is located southeast of the former plant site. NMCC proposes to construct a new lined tailings impoundment facility over the area used by previous operations for tailings disposal. Tailings would be transported from the mill via slurry pipeline and deposited in the new impoundment. Ancillary facilities associated with the tailings impoundment facility would include a tailings slurry delivery system, a tailings solution reclaim and recycling system (barge pump system), and an underdrain seepage return system.

Approximately 95 million tons of tailings are expected to be impounded over the life of the project. Tailings deposition would be approximately 17,500 tons per day (tpd). During progressive settlement, water would be pumped from the tailings impoundment and returned to the process circuit. The total expected water recovery by reclaim systems (thickener and tailings impoundment recycling) would be a nominal 70 percent.

3.2.3.4.1 Tailings Impoundment Design

A conceptual design report (Golder, 2010) for the proposed tailings impoundment, including determinations regarding the source of materials for the new tailings dam, is provided in **Appendix D**, and summarized herein. The new impoundment would be expanded approximately 1,000 feet to the east of the existing unlined impoundment. NMCC proposes to utilize the existing 1982 starter dam as a borrow source for the new starter embankment construction, and supplemented with mine waste and alluvial material as described in **Appendix D**.

The proposed method of construction for the new tailings storage facility (TSF) is by centerline raises with cycloned tailings sand. The tailings surface would rise approximately 80 feet in the first two years of operation.

Initial construction would include a toe berm to buttress the tailings embankment and a starter dam for placement of the tailings header line and cyclones. Sand (cyclone underflow) would be placed on the embankment while the tailings slimes (cyclone overflow) would be discharged to the impoundment interior. A geomembrane liner would be placed beneath the starter dam and anchored on the crest of the toe berm. An underdrain system consisting of a filter compatible soil and drainage collection pipes would be placed on top of the geomembrane liner and beneath the sand dam footprint to facilitate drainage and consolidation of the cycloned sand. The underdrain system would extend into the impoundment interior in the area that would underlie the free water pond. Underdrainage would be routed to a lined underdrain collection pond located downstream of the toe berm.

The TSF is intended to be constructed in a phased manner. During initial construction phases, diversion ditches would be constructed to divert stormwater from upstream catchment areas within the area contributory to the impoundment. The contributory area is approximately equivalent to the ultimate TSF footprint, as only minor peripheral areas drain into the TSF. At final build out, minimal potential exists for surface water runon from external areas. Throughout most of the life of the facility, stormwater management requirements would be limited to direct precipitation.

Based on the rules and regulations of the New Mexico Office of the State Engineer, the Copper Flat TSF would be classified as a large dam having significant hazard potential. As such, the impoundment has been designed to contain the equivalent of 75 percent of the probable maximum precipitation (PMP) during operations. A spillway capable of passing 75 percent of the PMP would be required upon closure.

3.2.3.4.2 Tailings Impoundment Process

Following the flotation process, the remaining slurry, consisting primarily of non-valuable minerals, pyrite, miscellaneous unfloated minerals and water, would flow into a tailings thickener for partial dewatering. The slurry would enter the tailings thickener at approximately 30 percent solids by weight. Water would be removed by decanting and the tailings would exit the thickener at 50 percent solids. Approximately 57 percent of the process water would be recovered in the tailings thickening operation. NMCC is considering additional water conservation measures and innovations which, if viable, would be added to the current process.

The thickened tailings would then flow by gravity through a 24 inch pipeline into the tailings impoundment. To contain possible spills or leaks, the tailings impoundment pipeline would be constructed between earthen berms. The pipeline foundation materials and berms would be sloped to direct any spillage or leakage to the tailings impoundment. Thickened tailings slurry would be distributed around the periphery of the impoundment by numerous spigots or hydrocyclones, which separate coarse material from the fines in the slurry. The coarse material deposited at the periphery of the impoundment would be used to construct embankment rises from the new starter embankment. The fine silt and slimes would flow away from the upstream face of the raised embankment toward the pool. As the finer material flows into the impoundment, gravitational settlement of solids would form beaches. Supernatant solution (the residual water in the tailings which seeps to and collects on the surface of the impoundment as the tailings settle and compress) and precipitation run-off would flow towards the impoundment low point formed by the beaches to form the free pool. Tailings deposition would be managed to force the pool away from the embankment towards an ultimate pool location. The tailings used to form the initial beaches would have a permeability coefficient of approximately 1×10^{-6} cm/sec, after consolidation occurs, due to progressive loading.

Water reporting to the tailings impoundment would be recovered from the pool of water that would form in the impoundment and be returned to the mill process water system for reuse. Stormwater runoff could also contribute to the volume of water in this pool. The height of the embankment is designed to contain the normal operating volume of water completely within the impoundment, combined with the amount of stormwater runoff from 75 percent of the PMP, which is estimated to be about 25 inches (Golder, 2010 – **Appendix D**).

The size and location of the impoundment pool would vary during the life of the project. The size of the pool would be affected by pre-deposition grading in the impoundment, the amount of tailings deposited, precipitation, evaporation rates, seepage rates into the designed embankment seepage collection system, infiltration into underlying soils, and water recycling rates. The location of the pool would migrate within the impoundment area as tailings beaches form. Tailings deposition would be managed to force the pool away from the embankment toward the upstream reaches of the impoundment. The impoundment area would be fenced to restrict access.

3.2.3.5 *Tailings Impoundment Monitoring*

The tailings impoundment would be regulated by the New Mexico Office of the State Engineer, Dam Safety Bureau for safety of operations. The design and operation of the tailings impoundment dam would be subject to approval of the Office of the State Engineer including the closure inspection. The State Engineer's Office requires monthly reports of the tonnages deposited into the impoundment along with readings of the piezometers, settlement devices, and settlement monuments that monitor movement.

The Groundwater Quality Bureau of NMED requires a monthly report of tonnages of tails discharged along with analyses of the tailings to identify possible contaminants. Samples of water from new monitor wells proposed for downstream of the tailings dam would be analyzed monthly and the results sent to the Groundwater Quality Bureau. These samples would be used to identify any leakage from the new, lined tailings impoundment. Abatement plans would be implemented should leakage and contamination be detected.

3.2.4 Haul Roads and On-Site Service Roads

For the most part, existing haul roads would be utilized to haul material to the crusher, stockpiles, and waste rock disposal areas. Some minor realignment of these roads may be necessary and road widths would vary. A cross-section of a typical haul road is provided in **Figure 3-6**.

Haul roads are not expected to create new disturbances, as they would be constructed on previously disturbed land. The on-site roads would be designed for easy access and traffic movement within the operations area. Waste rock and ore would be hauled to the disposal areas and mill using conventional mining haul trucks, depending on mine optimization and scheduling.

During operation of the Copper Flat Project, water trucks would be used, as needed, to control emissions of fugitive dust from the haul roads, as well as other roads within the project area. Wetting agents and binding agents, such as magnesium chloride, may also be used to control dust if conditions warrant.

3.2.5 Project Work Force and Schedule

The construction phase of the project is expected to take approximately 12 to 18 months. During this time, the work force for development of the Copper Flat mine would average about 120 to 130 persons per day.

The estimated operational life required to recover the proven minerals (copper, molybdenum, gold, and silver) is 17 years. The maximum work force would be around 170. Approximately 80 to 100 people would be employed in the office and mine; 40 to 70 people would be employed in the mill. The reclamation workforce would consist of up to 20 employees. NMCC anticipates hiring over 70 percent of the work force from local communities within a 75-mile radius of the mine. The mine would likely operate 24 hours per day, 7 days per week, 365 days per year. The mill would likely operate on that same schedule. Administrative personnel would work a standard day shift, five (5) days per week, 50 weeks per year. These schedules are subject to change based on future economics of the project.

3.2.6 Electrical Power

Power for the project would be furnished by the Sierra Electric Cooperative by means of an existing 115 kV transmission line that runs from the Caballo switching station near the junction of Interstate 25 (I-25) and Highway 152, and terminates within 300 feet of the mill facility at the site of the proposed mine substation (**Figure 1-2)**.

The 115-kV line was installed for the 1982 mine due to the limited capacity of the existing lines in the area, which supplied the community of Hillsboro and the surrounding rural areas. The existing 115-kV line is a wooden pole, H frame construction and will be in full accordance with state and federal electric codes. Tri-State Generation and Transmission owns the line and is responsible for maintenance. The substation would be reconstructed in the same location it was in 1982, fenced and constructed in accordance with BLM stipulations. NMCC would own the substation equipment and would be responsible for construction and maintenance. From the substation, the voltage would be stepped down by primary transformers and distributed throughout the mine.

An existing 25-kV distribution line provides power to the production wells located east of the mine, booster stations on the fresh water pipeline, and the reclaim water pump stations at the tailings dam. Sierra Electric owns this line and is responsible for maintenance. The plant electrical load requirement is tabulated below (**Table 3-4**):

Table 3-4: Summary of Project Electrical Demand

	Demand (kWh/ton)
Primary Crushing	0.25
Total Grinding	17.48
Total Copper Flotation	1.74
Molybdenum Flotation	0.27
Thickening	0.05
Reagent Handling	0.05
Water System	2.05
Ancillaries	0.65
Total	**22.54**

Note: kWh – kilowatt hours

A new substation would be constructed at the site. An emergency generator is also included as backup power in the event of power loss to maintain critical systems and to aid in a controlled shut down. NMCC is analyzing the viability of solar power generation to partially offset the mine's energy demand, along with other energy and water conservation measures.

Because the configuration and size of the 25 kV distribution line, standard raptor proof protective designs would be incorporated into the line design and line upgrade, as presented in the Rural Electrification Administration guidelines and in the measures developed by Olendorff *et al*. (1981). This design would be used for the entire length of the distribution line within the mine area.

3.2.7 Water Supply

The total water demand for the Project would be approximately 6,400 gallons per minute (gpm) with the majority of the water used in the ore processing operation (**Table 3-5**).

Table 3-5: Project Water Demand

Activity	Demand (gpm)
Ore Processing (17, 500 tpd)	6,268
Dust Suppression (2 truckloads/hr × 12 hr/d × 360 d/yr)	131
Domestic/Sewerage Use	1
TOTAL	**6,400**

Of this demand, approximately 4,400 gpm would be obtained from reclaimed process water (thickener overflow and impoundment recycling) and pit water pumping (dewatering). Approximately 2,000 gpm would be freshwater make-up.

The freshwater supply for the mine would come from four existing high capacity production wells located about eight miles east of the plant site on BLM-administered public land (**Figure 2-1**). These wells were drilled to depths of between 957 feet and 1,005 feet. All are 26 inches in diameter and cased with 16-inch casing with the annular space packed with minus 3/8 inch washed gravel. The projected long-term capacities of the four production wells range from 1,000 to 1,800 gpm (Green and Halpenny, 1976). Most of the roads, electrical supply and pump foundations are intact at the pumping field. The legal locations of the production wells (and monitoring wells) proposed for use in the plan of operations are provided in **Table 3-6**:

Table 3-6: Production and Monitoring Well Legal Locations

Well Name	Designation	Township	Range	Section
PW-1	Production wells	15S	5W	30
PW-2		15S	5W	31
PW-3		15S	5W	30
PW-4		15S	5W	31
GWQ-1	Monitoring Wells	15S	6W	31
GWQ-2		15S	6W	30
GWQ-7		15S	6W	31
GWQ-8		15S	6W	31
GWQ-9		15S	6W	31
Irwin Well		15S	6W	31
MW-1		16S	6W	04
MW-2		16S	6W	09
MW-4		15S	6W	31
MW-5		15S	5W	30
MW-6		15S	6W	25
MW-8		15S	6W	28
Dolores Well		15S	7W	25
McCravey Greyback		15S	6W	30
Pit Lake	Pit Lake	15S	7W	26, 35

An existing 20-inch welded steel pipeline would transport the water from the booster station(s) (**Figure 2-1**). The pipeline is buried a minimum of two feet deep from the well field to the point of entry to the project area. NMCC is preparing to conduct a detailed inspection and assessment of this pipeline to determine its condition and viability for use in the Project. NMCC currently anticipates conducting hydrostatic and possibly ultrasonic testing of the pipeline. NMCC will submit the results of the inspections to the BLM upon completion of the work. If testing indicates the need for repair or replacement of the pipeline, NMCC will do what is necessary to bring the facility into proper working order.

Water pumped from the pit and recycled from the process circuit would reduce the amount of water withdrawn from the production wells. This water would generally be reused in processing and in dust suppression. Pump station #3 is located at the process water reservoir located below the tailings thickener. This station would deliver water to the process water reservoir or to the freshwater storage tank as needed. The process water reservoir would be fed by the tailings thickener overflow, reclaim water pumped back from the tailings barge pump system, and fresh water makeup as needed. It would be pumped from the reservoir to a steady head tank and flows by gravity back to the grinding circuit. A sump and pumping installation would be advanced with the pit excavation to remove infiltrated and surface runoff water collected within the pit. This water would be used in either pit operations or the concentrator.

The area encompassing the mine, mill, tailings impoundment, and water supply wells are within the Lower Rio Grande Underground Water Basin. Water rights are described in declarations, amended declarations, and supporting documents under New Mexico State Engineer File Nos. LRG-4652 through LRG-4652-S-17 and LRG-4654.

Water quality monitoring samples have been collected in the mine area from both surface and groundwater sources since 1976 and would continue to be collected throughout the life of the operation, during closure, and for a post closure period defined in the groundwater Discharge Permit.

3.2.7.1 *Stormwater*

The mining and concentrating process would not involve any discharge to surface water courses. Surface runoff (stormwater) from the mine and plant site area would be collected in containment (settling) ponds and recycled into the process water system. Stormwater outside the plant and mine site would not come in contact with the proposed operation due to existing diversion ditches, dams, and berms.

Sediment control in the mine area would be achieved by the use of seeding and mulching, silt fences, straw bale dams, diversion ditches with energy dissipaters, and rock check dams at appropriate locations during construction and operation. All sediment control structures would be monitored and maintained on a regular basis.

3.2.7.2 *Groundwater*

In 1982, the NMED Ground Water Quality Bureau approved a Ground Water Discharge Plan, DP 001. On June 26, 1992, the Ground Water Quality Bureau confirmed the need to amend the permit, DP 001, in order to more closely define compliance and remedial actions. On August 20, 2008, the NMED sent a letter to the site owner at that time requiring a Stage 1 Abatement Plan (20.6.2.4101 NMAC). The purpose of the Stage 1 Abatement Plan is to provide the data necessary to select and design an effective abatement alternative. The requirements for the Stage 1 Abatement Plan are described in 20.6.2.4106 NMAC. The Abatement Plan proposal must include an investigation to define the extent and magnitude of any existing groundwater and surface water contamination and to characterize the hydrogeology of the site. NMED’s concerns regarding water resources at the Copper Flat site include:

- Groundwater impacts from the existing unlined tailings impoundment have been documented, but have not been fully characterized.
- Samples of pit lake water quality reveal exceedences of New Mexico Water Quality Control Commission (WQCC) standards, and NMED is concerned about migration of this water away from the pit, causing additional groundwater impacts as well as ongoing contact with wildlife.
- Acid leaching could be occurring due to ongoing ore exposure.

The surface and ground water of the Copper Flat area are described and analyzed in detail in the Hydrologic Assessment Report (Shomaker & Newcomer, 1993) and the Copper Flat Hydrogeological Report (SRK, 1995; ABC, 1996). Ongoing and future groundwater monitoring would be conducted as required by the State of New Mexico. A detailed description of the current baseline monitoring program for groundwater is presented in the Sampling and Analysis Plan for Copper Flat Mine (Intera, 2010), provided to the BLM under separate cover. Future monitoring and possible abatement activities would be coordinated with all relevant stakeholders to ensure the protection of groundwater resources.

3.2.8 Fencing and Exclusionary Devices

NMCC would construct BLM-approved barbed wire fencing to prevent livestock from entering the pit, waste rock disposal facilities, and tailing storage facilities, including the seepage collection pond. In areas where a higher level of security is needed, chain-link fences would be erected. Wildlife fences would be constructed around the lined ponds. Gates and/or cattle guards would be installed along roadways within the proposed Project Area as appropriate.

NMCC would monitor the fences on a regular basis and repairs would be made by NMCC as needed. BLM would be contacted immediately in the event that livestock manage to enter the proposed Project Area via a gate or opening in a fence. NMCC would assist as requested in moving these animals out of the proposed Project Area. At the time of closure, if livestock grazing is the approved post-mining land use, a plan would be developed between NMCC and the BLM for responsibility of long-term maintenance of range fences that would be left in place within the Plan boundary.

To the extent practicable, NMCC would investigate and utilize exclusionary devices, including, but not necessarily limited to bird balls and/or netting, to minimize the potential for avian wildlife contacting process pond waters that contain elevated chemical constituents in excess of ecological risk levels.

3.2.9 Growth Media

Available growth media would be salvaged and stored in stockpiles for reclamation. Section 3.4.14 presents further discussion on growth media salvage. Growth media would consist of soils stripped prior to surface disturbance activities. Any growth media remaining in a stockpile for one or more planting seasons would be seeded with an interim seed mix to stabilize the material by reducing erosion and minimizing establishment of undesirable weeds.

3.2.10 Borrow Areas

Construction-related borrow areas would be located within facility footprints (Appendix D, Borrow Sources and Stockpile Evaluations). Borrow sources would be required for prepared sub-grade materials, drainage materials, pipe bedding materials, road surfacing materials, retarding layer materials, reclamation materials, growth materials and riprap. Precise locations and anticipated quantities of borrow materials have not yet been determined, but would be provided during the NEPA process, prior to MPO approval. Borrow areas may be revisited over the mine life.

3.2.11 Ancillary Facilities

The process area would also include several ancillary buildings such as offices, a truck shop, warehouse, small vehicle shop, an electrical substation, and a gatehouse. The buildings would all be prefabricated, standard, rigid framed structures or block walls with metal roofing. Where practicable and economic, NMCC would consider alternative construction materials and techniques to improve the overall energy efficiency of the project. This may include renewable energy generation (solar, wind, etc.) for certain buildings.

The administration building would be approximately 60 feet by 120 feet with a 14 foot eave height. The building would have central heating and air conditioning and would accommodate the plant administration, engineering, accounting, secretarial, and clerical personnel. Appropriate sanitary facilities would be provided for men and women.

The assay and laboratory offices would be 40 feet by 180 feet. Appropriate sanitary facilities would be provided. A small air compressor would be mounted on an exterior concrete pad for furnishing service air to the building. The gate house building would be eight feet by 12 feet. A parking area for employee vehicles would be located adjacent to the main plant entry gate. The shop and warehouse building would be an equipment servicing facility. See **Table 3-3** for additional information on site structures.

All mechanical, civil, structural and architectural designs would be in accordance with applicable standards and codes. The criteria used for design, equipment selection, layouts and construction were derived from the prior operation(s) and information from vendor and consultant recommendations. Equipment and fabricated items would be furnished with manufacturers' standard finish and retouched after erection. Safety painting would be in accordance with MSHA and/or OSHA standards (as applicable) and New Mexico mining codes. Buildings and facilities would be painted in neutral colors to blend with the surrounding landscape.

3.2.12 Inter-Facility Disturbance

As with most mining facilities, general ground disturbance occurs around and between structures and facilities as a result of construction, operation & maintenance (O&M). This inter-facility disturbance is in addition to the formal footprint created by design. In some cases, NMCC has elected to include disturbance buffer zones surrounding specific facilities (i.e., tailings impoundment, waste rock disposal areas, open pit area, etc.) in order to ensure that the full extent of disturbance associated with these facilities is accounted for and that appropriate reclamation and bonding of these areas can be facilitated.

3.2.13 Transportation

Access from the site is by three miles of all-weather gravel road and 10 miles of paved highway (State Highway 152) east to I-25, near Caballo Reservoir. The 10 miles on State Highway 152 to I-25 to I-25 is mainly a straight and relatively flat road (and does not include any sharp turns or significantly adverse grades). I-25 is the primary north-south highway. Traffic associated with reestablishment of the Copper Flat Project would be broadly grouped as follows:

- **Concentrate Shipments**: Shipment of concentrates by trucks to smelters and/or port facilities would generally be via hydraulic dump trucks with 25-ton capacity towing 10-ton trailers. Copper concentrate would be thickened, filtered and trucked approximately 41miles to a railhead at Rincon, near Hatch, New Mexico on I-25, (or another site), and then transported by rail to a smelter, most likely in Arizona, and/or to port facilities. Alternatively, a possible rail loading point at the intersection of State Highways 26 and 27 south of the Project could be used. Molybdenum concentrate would be filtered, dried and bagged on site and then transported by truck or rail.
- **Incoming Supplies**: Venders, equipment and service suppliers are anticipated to take, in total, an average of 10 to 15 trips per day by truck to the mine. Most deliveries, including equipment parts, reagents, oil, and miscellaneous office supplies, would be made during the day shift. Title 49 CFR regulates the transportation of hazardous materials in commerce. Anyone who transports, packages, loads, unloads, or in any way assumes responsibility for marking, labeling, or handling of any regulated hazardous materials must comply with 49 CFR. In addition, carriers must comply with the Federal Motor Carrier Safety Regulations of the DOT (parts 383, 390 397, and 399). Hazardous materials required for operation of the Copper Flat Project include gasoline, diesel fuel, propane, and other petroleum products, explosives, solvents for degreasing of machinery and equipment, and laboratory chemicals. These materials would be purchased from various vendors and brought to the site by truck. NMCC would ensure that the Hillsboro volunteer fire department and the Sierra County fire district are aware of the nature of the materials routinely being transported to the site, and

that they have appropriate response training in the event of a spill or other accident involving hazardous materials.

- **Employees and Visitors**: The majority of employees are expected to commute from Truth or Consequences or Hillsboro. An additional 15 to 20 trips could be expected by visitors and sales representatives. NMCC would encourage car and van pools. .

There are no present plans for a company operated employee transportation system. No railroad access or facilities, airstrips, or helicopter pads are planned in connection with the mine development or operations.

3.3 Exploration Activities

NMCC is currently conducting exploration activities to identify new reserves or expand existing reserves within the Plan area under previous authorizations by federal and state agencies. Current exploration and mineral evaluations have been focused within and on previously disturbed federally-administered land and privately-owned, patented lands. Future exploration would likely include activities outside of the main disturbed lands on BLM-administered lands within the currently proposed Project boundary and permit areas, as defined in **Figures 2-2** and **3-1**. Exploration disturbance would generally include construction of access roads, drill pads, sumps, trenches, surface sampling, bulk sampling, and staging areas. Exploration methods include both reverse circulation and core drilling, with minor trenching also planned. Exploration activities may also include water exploration and monitor well installation.

Exact locations of the exploration disturbance have not been determined. However, as part of the current mine MPO, NMCC requests an additional 15,000 linear feet of drill road (average width of 20 ft) and 100 drill pads (average dimensions of 100 ft × 100 ft), and up to 150 drillholes (average diameter of 5 in.; average depth of 1,200 ft bgs) for future exploration of the site. Placement of drillholes would be guided by reserve requirements, geotechnical studies, and geochemical sampling. The roads and pads would be sited as much as possible to avoid any identified cultural resources. Sections 3.4.4 and 3.4.5 describe the measures that would be undertaken to protect or mitigate impact to biological and cultural resources, respectively. If additional disturbance for exploration activities is necessary, an amendment to the MPO and revision to the reclamation bond cost would be prepared and submitted to BLM for review and approval.

3.4 Applicant Committed Environmental Protection Measures and Committed Practices

NMCC would commit to the following practices to prevent undue and unnecessary degradation during the life of the Project. These practices, described briefly below, are to be considered part of the operating plan and procedures. More detailed information would be developed as the Project is advanced to more detailed design stages.

3.4.1 Air Quality

The Copper Flat Project would be designed to control both gaseous and particulate emissions and to meet all regulatory standards. Appropriate air quality permits would be obtained from the New Mexico Environment Department - Air Quality Bureau for the new Project facilities and land disturbance. As per NMED regulations, the project air quality operating permit must be authorized by the NMED prior to project commissioning.

Committed air quality practices would include dust control for mine unit operations. In general, the fugitive dust control program would provide for water application on haul roads and other disturbed areas; chemical dust suppressant application (such as magnesium chloride) where appropriate; and other dust control measures as per accepted and reasonable industry practice. Also, disturbed areas would be seeded with an interim seed mix to minimize fugitive dust emissions from un-vegetated surfaces where appropriate.

Fugitive emissions in the process area would be controlled at the crusher and conveyor drop points through the use of water sprays and dry cartridge filter type dust collectors where necessary. Other process areas requiring dust and/or emission controls include the concentrate drying and packaging circuit, the various process plants, and the laboratory. Appropriate emission control equipment would be installed and operated in accordance with the construction and operating air permits.

The lime storage would be fitted with a baghouse for capture of fugitive dust during loading of the lime bin. The sample preparation lab would be equipped with fans and filters.

Deposition of tailings would be by spigotting and/or cyclone discharge. By this procedure, the surface would be wet, thereby eliminating or reducing fugitive dust. As necessary, control of fugitive dust in the vicinity of the tailings pond would be attained by watering, sprinkling, and vegetation. No gaseous contaminants above allowable standards are expected to be emitted to the atmosphere from the proposed operations.

Drilling operations would be done wet or with other efficient dust control measures as set by MSHA and NM Mine Inspection , and NM mining and exploration permit requirements. At a minimum, haul roads, waste rock disposal areas, and ore transfer points would be wetted down on a regular basis to minimize dust emissions. Dust abatement at the primary crusher, coarse ore stacker, and coarse ore reclaim feeders would utilize NMED and MSHA-approved Sonic Misting Systems (Best Available Control Technology).

Combustion emissions would result from the mobile mining machinery and support vehicles. All combustion equipment emits nitrogen dioxide (NO_2) and carbon monoxide (CO). The mobile mining equipment is diesel fuelled and also would emit particulate matter. Combustion emissions would be controlled by original equipment manufacturer pollution control devices. Fugitive emissions from ore and the flotation equipment are expected to be small due to the low volatility of the sulfur compounds present in the concentrate.

3.4.2 Water Resources

Process components would be designed, constructed, and operated in accordance with NMED regulations. The proposed process facilities would be zero discharge, and the TSF facilities would have engineered liner systems. The waste rock has been evaluated for potential to generate acid and/or mobilize deleterious constituents, and generally been found to produce neutral to slightly alkaline leachates with low concentrations of sulfate and dissolved metals (**Appendix C**). Waste rock with the potential to generate acid and/or mobilize deleterious constituents would be identified through laboratory analyses during mining and managed in the waste rock disposal facilities.

NMCC is in the process of preparing a stormwater management plan to identify more specific control measures and monitoring requirements. The actual locations and numbers of sediment controls would be determined during final design and where appropriate during operations. Larger ponds would be designed and constructed in accordance with the requirements of the New Mexico State Engineer's Office. Sediment removed from the sediment control structures would be placed in the tailings impoundment or other approved locations.

3.4.3 Erosion and Sediment Control

Best management practices (BMPs) would be used to limit erosion and reduce sediment in precipitation runoff from proposed Project facilities and disturbed areas during construction, operations, and initial stages of reclamation. BMPs that would be used during construction and operation to minimize erosion and control sediment runoff and would include:

- Surface stabilization measures – dust control, mulching, riprap, temporary and permanent revegetation/reclamation, and placing growth media;
- Runoff control and conveyance measures – hardened channels, runoff diversions; and,
- Sediment traps and barriers – check dams, grade stabilization structures, sediment detention, sediment/silt fence and straw bale barriers, and sediment traps.

Revegetation of disturbed areas would reduce the potential for wind and water erosion. Following construction activities, areas such as cut and fill embankments and growth media/cover stockpiles would be seeded as soon as practicable and safe. Concurrent reclamation would be maximized to the extent practicable to accelerate revegetation of disturbed areas. All sediment and erosion control measures would be inspected periodically, and repairs performed as needed.

3.4.4 Wildlife

Land clearing and surface disturbance would be timed to prevent destruction of active bird nests or birds' young during the avian breeding season (March 1 to August 31) to comply with the Migratory Bird Treaty Act. If surface disturbing activities are unavoidable during the avian breeding and nesting season, NMCC would have a qualified biologist survey areas proposed for disturbance for the presence of active nests immediately prior to the disturbance. If active nests are located, or if other evidence of nesting is observed (mating pairs, territorial defense, carrying nesting material, transporting of food), the area would be avoided to prevent destruction or disturbance of nests until the birds are no longer present.

Operators would be trained to monitor the mining and process areas for the presence of larger wildlife such as deer and antelope. Mortality information would be collected. NMCC would establish wildlife protection policies that would prohibit feeding or harassment of wildlife.

3.4.5 Cultural Resources

Avoidance is the BLM-preferred management response for preventing impacts to historic properties [a historic property is any prehistoric or historic site eligible to the National Register of Historic Places (NRHP)] or unevaluated cultural resources. If avoidance is not possible or is not adequate to prevent adverse effects, NMCC would undertake data recovery from such sites. Development of a treatment plan, data recovery, archeological documentation, and report preparation would be based on the Secretary of the Interior's "Standards and Guidelines for Archeology and Historic Preservation," 48 CFR § 44716 (September 29, 1983), as amended or replaced. If an unevaluated site could not be avoided, additional information would be gathered and the site would be evaluated. If the site does not meet eligibility criteria as defined by the New Mexico State Historic Preservation Office (SHPO), no further cultural work would be performed. If a site meets eligibility criteria, a data recovery plan or appropriate mitigation would be completed.

3.4.6 Protection of Survey Monuments

To the extent practicable, NMCC would protect all survey monuments, witness corners, reference monuments, bearing trees, and line trees against unnecessary or undue destruction or damage. If, in the course of operations, any monuments, corners, or accessories are destroyed, NMCC would immediately report the matter to the authorized officer. Prior to destruction or damage during surface disturbing activities, NMCC would contact the BLM to develop a plan for any necessary restoration or re-establishment activity of the affected monument. NMCC would bear the cost for the restoration or re-establishment activities.

3.4.7 Health and Safety and Emergency Response

The development of the Copper Flat ore body would comply with environmental, and health and safety regulations of all governmental agencies including Mining Safety and Health Administration (MSHA) and the New Mexico Mining Act. The State agencies primarily involved are the NMED, the State Mine Inspector's Office (SMIO), New Mexico Department of Energy, Minerals, and Natural Resources -Mining and Minerals Division (MMD), and the New Mexico Office of the State Engineer.

NMED has jurisdiction over ambient air quality, discharges to groundwater, surface water impacts, solid waste disposal, and liquid waste disposal (sanitary facilities). The SMIO and MSHA have jurisdiction over health and safety within the mine; the State Engineer's Office is concerned with the tailings dam construction and operation, and the administration of water rights. The MMD is responsible for issuing a mining permit and is concerned with all issues related to mine operations and reclamation.

As specified under SMIO and MSHA regulations, appropriate dust collection and noise abatement equipment would be installed at the mine. Noise levels in both the mine area and process area would also be subject to MSHA regulations.

All drinking water storage vessels would be enclosed in order to preserve the water's potable quality. Within the mine and mill area and the tailings impoundment, vehicular traffic and human movement would be controlled through the use of fences, locked gates, signs, and supervisory personnel. Fencing would also discourage access by cattle. Livestock grazing is currently permitted in adjacent properties at the livestock owner's risk and would continue during mine operation in adjacent areas.

3.4.8 Fire Protection

As specified by MSHA, NMCC would institute a fire protection training program and have a rehearsed fire suppression plan. A fire protection system would be installed that would incorporate Sierra County and or State code requirements in the administration and warehouse complexes, truck shop, crushing plant, and process plant. Hydrants would be located near all buildings. A 100,000 gallon fire water reserve would be stored in a water storage tank located sufficiently above and near the mill and crushing area to provide adequate water pressure. A fuel break would be constructed around the facilities. A fire truck and water trucks, used for dust suppression, would be available in the event of a fire. An ambulance would be located on site in the event emergency transportation is required.

NMCC would promptly comply with any emergency directives and requirements of Sierra County and the BLM pertaining to industrial operations during the fire season.

3.4.9 Invasive, Non-native Species

NMCC recognizes the economic and environmental impact that can result from the establishment of noxious weeds and has committed to a proactive approach to weed control. A noxious weed survey would be completed prior to any earth moving disturbance. Areas of concern for noxious weed would be flagged by a weed scientist or qualified biologist to alert all personnel to avoid those areas, as practicable. Information and training regarding noxious weeds management and identification would be provided to all personnel affiliated with the implementation and maintenance of the project.

A noxious weed monitoring and control plan would be implemented during construction and continuing through operations. The plan would contain a risk assessment, management strategies, provisions for annual monitoring and treatment evaluation, and provisions for treatment. The results from annual monitoring would be the basis for updating the plan and developing annual treatment programs.

In general, all vehicle and heavy equipment that may have been exposed to noxious weeds would be cleaned with power or high-pressure washer prior to entering or leaving the Project Area. Vehicle cleaning would eliminate the transport of vehicle-borne weed seed, roots, or rhizomes. To eliminate the transport of soil-borne noxious weed seeds, roots or rhizomes infested soils or material would be stockpiled adjacent to the areas from which they were stripped. Appropriate measures would be taken to avoid wind or water erosion of the affected stockpile. All interim and final seed mixes, hay, straw, and hay/straw products would be certified weed-free for New Mexico and BLM-identified noxious weeds.

Weed monitoring would be conducted for the life of the operation or until the site is released and the reclamation financial surety is released. If the spread of noxious weed is noted, weed control procedures would be determined in consultation with BLM personnel and would be in compliance with BLM Handbooks and applicable laws and regulations.

Mixing of herbicides and rinsing of herbicide containers and spray equipment would be conducted only in areas that are a safe distance from environmentally sensitive areas and points of entry to bodies of water (storm drains, irrigation ditches, streams, lakes, or wells).

3.4.10 Materials and Waste Management

Operations at the Copper Flat Project would result in the generation of nonhazardous and hazardous waste materials. The majority of waste would be “mine waste,” including mill tailings and waste rock, which is currently excluded from regulation under the Resource Conservation and Recovery Act (RCRA). The management of these excluded wastes is discussed in Section 3.2.2. The management of regulated solid and hazardous waste is discussed in the following sections.

3.4.10.1 *Sanitary and Solid Waste Disposal*

Nonhazardous solid wastes that would be generated at the site include waste paper, wood, scrap metal, and other domestic trash. These materials would be disposed of in a permitted on site Class III sanitary landfill on private land, which would be approved by the State of New Mexico, or by other methods approved by the State and Sierra County.

Sanitary liquid wastes would be handled and disposed of through two existing septic tanks/leach fields permitted by NMED. The septic systems would be slightly modified, including enlargement of the leach fields and placement of larger septic tanks. The washing facility for the mobile equipment would be equipped with a water/oil separator system. Waste oil and lubricants would be collected and transported off site by a buyer/contractor for recycling. Reagent drums would be recycled by the reagent supplier. Scrap metal would be sold to a dealer and transported off site.

Nonhazardous solid wastes from the laboratory would be disposed of in the landfill. Other wastes from the laboratory that exhibit a hazardous waste characteristic, including off specification commercial chemicals and assay wastes would be managed as hazardous waste.

Employee training would include appropriate landfill disposal practices such as the allowable wastes that can be placed in the landfill, management of used filters, oily rags, fluorescent light bulbs, aerosol cans, and other regulated substances. Used solvent, liquids drained from aerosol cans, accumulations of mercury fluorescent lights and used antifreeze may be regulated pursuant to RCRA. NMCC anticipates that the mine would fall in the "small generator" category. Signs would be installed at the landfill sites reminding employees of appropriate disposal practices.

3.4.10.2 *Reagent Management*

Reagents used as part of the copper/molybdenum concentrating process would include frothers, flotation promoters, flotation collectors, flocculants, flotation reagents, pH regulators, and filter and dewatering aids. A preliminary list of the proposed reagents to be use during operations is provided in **Table 3-7**. These reagents would be delivered by truck from commercial sources to the mine site where facilities would be provided for off loading, storing, mixing, handling, and feeding. Reagents that are received dry would be mixed in agitation tanks and pumped to either outdoor storage tanks or liquid storage tanks inside the mill building from which they would be metered into the concentrating process.

Residual reagent concentrations in the tailings and reclaim water streams are expected to be present at very low levels since they would be added to water in amounts resulting in concentrations of approximately 3 parts per million (ppm). Also, normally 95 percent of the reagents would be adsorbed onto the copper or molybdenum mineral surface and floated off in the mineral froth. The reagent would then be subsequently consumed in the offsite smelting process. Assuming 95 percent of the reagents are adsorbed, the residual reagent reporting to the tailings stream drops to less than 0.15 ppm.

Frother reagents to be used at the mine include methyl isobutyl carbinol (MIBC). MIBC is biodegradable in low concentrations. The dosage rate would be 0.02 pound per ton of mill feed. The bulk of this reagent would report to the concentrate fraction and end up at the smelter. The reagent would be received in 20 ton capacity trucks and stored in a 16,000 gallon tank.

Lime used in alkalinity control in the flotation circuit would be received in pebble form in bulk by 20 ton capacity trucks and stored in a 200-ton capacity storage silo. The lime would then be slaked with water in a small mill and the resulting "milk of lime" would be pumped to the addition points in the grinding and flotation circuits for use as a pH regulator. It is anticipated that lime would be used at a rate of 2.7 pounds per ton of mill feed to control pH of the flotation circuit. During the milling process, most of the lime would react with sulfide minerals to form gypsum.

Table 3-7: Copper Flat Project Materials Management

Reagent	Chemical Abstract Service (CAS #)	Type	Use	Annual Quantity (lbs)
Lime	1305-62-0	Caustic powder; Non-Combustible solid; incompatible with acids	pH Control	15,700,000
Xanthate Z-11/Z-200	140-93-2	Fugitive dust potential	Flotation Reagent	58,000
AEROFLOAT 238 (Sodium Hydroxide)	001310-73-2	Caustic alkali liquid; corrosive; incompatible with strong oxidizing agents and mineral acids	Flotation Promoter	116,000
MIBC (Methyl isobutyl carbinole)	108-11-2	Class II combustible liquid	Moly. Frother	116,000
Ammonium Sulfide[1]	12135-76-1	Poison, corrosive, flammable liquid; incompatible with numerous chemicals[2]	Flotation Reagent	1,400,000
Unnamed Flocculent (similar to SUPERFLOC polyacrylamide or acrylamide-acrylic)	-	Organic Polymer	Flocculent Thickener	17,400
AERODRI 100 (Ethanol, Sodium dioctyl sulfosuccinate, 2-Ethylhenanol)	000064-17-5, 000577-11-7, 000104-76-7	Flammable liquid; incompatible with strong acids, alkalines, and strong oxidizing agents	Filter Aid Dewatering Aid	92,800
Sodium Hydrosulfide[2]	16721-80-5	Highly corrosive; incompatible with chemicals listed for ammonium sulfide	Flotation Reagent Depressant, Cation Exchange	1,400,000
Fuel Oil (Diesel #1) Dryer Fuel (Diesel #1)	8008-20-6	Flammable liquid	Moly. Collection, Truck Operation	150,000
Sulfuric Acid	7664-93-9	Strong Acid	Lab Use	<100
Water Treatment Chemicals & Antiscalant Reagents		NALCO9731 NALCO9735 (or equivalent)		

[1]Either ammonium sulfide or sodium hydrosulfide would be used as a flotation reagent.
[2]Chemicals include acids, alcohols, carbonates, esters, halogenated organics, ketones, organic sulfides, aldehydes, amides, combustibles, flammables, hydrazine isocyanates, organic peroxides, phenols, nitrites, organic nitro compounds, organophosphates, explosives, polymerizable compounds, epoxides, and oxidizing agents.

Either sodium hydrosulfide (NaSH) or ammonium sulfide [$(NH_4)_2S$] would be added to the circuit process as a flotation collector and depressant to affect the copper molybdenum separation. These reagents are rapidly oxidized through contact with copper minerals and air bubbles entrained in flotation pulp. These reagents would be transferred from a delivery truck to an appropriate on-site holding tank. Number 1 diesel fuel would be used as a molybdenum collector. Diesel fuel tanks onsite would be installed in conformance with applicable New Mexico Environment Department Petroleum Storage Tank Bureau regulations for New Storage Tank Systems in 20.5.4 NMAC. The expected volume of diesel for the site is less than 500,000 gallons, to be contained in two (2) 248,690 gallon above ground storage tanks (ASTs), 24 feet high, with a diameter of 42 feet. As required, secondary containment shall be constructed with a capacity of at least 110% of the size of the largest

AST in the containment area plus the volume displaced by the other AST(s). The geo-synthetic membrane for secondary containment shall have a minimum thickness of 60 mils.

Fuel oil would be kept in a 7,106 gallon capacity tank, 10 ft tall with an 11-ft diameter, also surrounded by secondary containment according to 20.5.4 NMAC. The geo-synthetic membrane for secondary containment shall have a minimum thickness of 60 mils.

NMCC plans to store less than 2,000 gallons of antiscalants in appropriate ASTs that meet industry standards. The antiscalants proposed would likely be NALCO9731 or NALCO9735 (or equivalent).

Reagents would be maintained in the reagent building, a structure made with 8" concrete block walls and a metal roof, 3,000 ft^2 in size, slab on grade construction, with a 6-inch concrete floor. On-site reagent storage is expected to be similar to the storage and processing employed by Quintana in 1982, as follows:

Lime storage: A 200-ton capacity silo, 24-ft tall and 20-ft in diameter would funnel lime into a lime feed pump tank and from there into two holding tanks;

Xantate (K.Amyl) (or equivalent): Flotation reagent Xanthate would be kept in drums and transferred to a mixing tank, then to a holding tank, and finally to the head tank;

AEROFLOAT 238 (or equivalent): used in flotation promoting, would be received in 50-gallon drums and have a plant storage capacity of 2,800 gallons. Aerofloat would be kept in drums and transferred to a mixing tank, then to a holding tank, and finally to a head tank.

MIBC (or equivalent): MIBC would be transferred from trucks to a holding tank, and, as needed, to a head tank.

AERODRI 100, used as a filter and dewatering aid, would arrive onsite in 500 pound drums. The reagent would be fed directly from the drums into the milling process. Use of small amounts (<100 pounds) of sulfuric acid would be limited to the laboratory.

Potential reagent spills would be contained by curbs in the reagent mixing and storage areas. A floor sump pump would be used to return the spilled material either to the storage tank or into the milling process as necessary. Material Safety Data Sheets (MSDS) for the reagents to be used would be readily available, in accordance with MSHA's *Hazard Communication for the Mining Industry* (30 CFR Part 47).

3.4.10.3 *Hazardous Materials Management*

The term "hazardous materials" is defined in 49 CFR§172.101; hazardous substances are defined in 40 CFR 302.4 and the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) as amended by the Superfund Amendments and Reauthorization Act (SARA) Title III. Hazardous materials would be transported to the Copper Flat Mine by DOT regulated transporters and stored on site in DOT approved containers. Spill containment structures would be provided for storage containers. Hazardous materials would be managed in accordance with regulations identified in 40 CFR § 262 Standards Applicable to Generators of Hazardous Waste.

Hazardous materials and substances that may be transported, stored, and used at the Copper Flat Mine in quantities less than the Threshold Planning Quantity (TPQ) designated by SARA Title III for emergency planning would include blasting components, petroleum products, and small quantities of solvents for laboratory use. Small quantities of hazardous materials not included in the above list may also be managed at the Copper Flat Project; such materials are contained in commercially produced paints, office products, and automotive maintenance products.

Blasting components, including ammonium nitrate and diesel fuel, would be stored onsite in bins and tanks (see above), respectively. NMCC currently anticipates utilizing two explosives magazines (one for boosters and one for blasting caps), each no larger than 8 ft × 8 ft, with 1,000-pound capacities. In addition, NMCC would utilize one, 75-ton capacity, 3,000 ft^3 silo for storage of ammonium nitrate. All explosive materials would be stored away from the plant site in compliance with MSHA, New Mexico State Mine Inspector's regulations, and U.S. Department of Homeland Security requirements. The location of these facilities is indicated on **Figure 3-1**.

Management of hazardous materials at the Copper Flat Project would comply with all applicable federal, state, and local requirements, including the inventorying and reporting requirements of Title III of CERCLA, also known as the Emergency Planning and Community Right to Know Act.

All petroleum products, kerosene, and reagents used in the mill would be stored in above ground tanks within a secondary containment area capable of holding 110 percent of the volume of the largest vessel in the area. A preliminary Spill Contingency Plan (SCP) addressing the general topics presented below is presented in **Appendix E**. The SCP would be reviewed and updated at a minimum of every 3 years and whenever major changes are made in the management of these materials. Inspection and maintenance schedules and procedures for the tanks, as well as all piping connecting the facility with the tailings pond, would be set forth in sections of the SCP addressing hazardous materials and petroleum products.

Fuel and oil for diesel and gas powered equipment would be stored in above-ground, sealed tanks in the processing facilities area. The tanks would be installed on lined pads, consisting of gravel underlain by a plastic liner. The pad area would be surrounded by berms to provide secondary containment for the largest vessel in case of rupture. Surface piping leads from each tank to the fuel dispensing area. The refueling hoses would be equipped with overflow prevention devices and secondary containment.

Hazardous wastes other than those from the laboratory would also be managed in the short term storage facility prior to their shipment to an offsite licensed disposal facility. These materials may include waste paints and thinners. Spent solvents and used oils would be returned to recycling facilities. Waste oil and lubricants would be collected and hauled offsite by a buyer/contractor for recycling. Solvents would be collected by a subcontractor and recycled offsite.

An ongoing inventory of all materials used at the mine site and mill would be provided on a monthly basis to the appropriate federal, state, and local regulatory agencies. The local fire department would be kept informed about materials stored onsite and appropriate emergency response.

3.4.11 Spill Contingency

NMCC has developed a preliminary spill contingency plan (SCP) (**Appendix E**) to prevent and minimize the impacts of a reagent or fuel spill. This plan describes the reporting and response that would take place in the event of a spill, release, or other upset condition, as well as procedures for cleanup and disposal. The plan would be posted and distributed to key site personnel and would be used as a guide in the training of employees. Also, the plan would address mitigation of potential spills associated with project facilities as well as activities of onsite contractors. The use, transportation, and storage of reagents and fuels would be covered in the plan. The emergency reporting procedures would be posted in key locations throughout the project area. Containment structures designed to prevent the migration of a spill are included in the design of the facilities. NMCC would be responsible for events at the mine site, while contract haulers (i.e., trucking companies) would be responsible for accidents and spills along the transportation routes.

Fuel and oil for the diesel and gasoline-powered equipment would be stored in above ground, sealed tanks in the processing facilities area. The tanks would be installed on lined pads and surrounded by berms to contain the volume of the largest tank in the event of rupture.

Reporting spills or releases of certain materials to the environment may be divided into four categories: 1) those requiring internal notification only; 2) those also requiring notification to the State of New Mexico; 3) those also requiring notification to the National Response Center (NRC) and the local Emergency Planning Committee pursuant to CERCLA or Superfund; and 4) those subject to Clean Water Act requirements only. Determining which of the above categories is appropriate for any particular spill or release depends on the material spilled or released, the amount spilled or released, and the circumstances of the spill or release.

3.4.12 Monitoring

Baseline monitoring of current environmental conditions is currently being conducted in accordance with the *Sampling and Analysis Plan – Copper Flat Mine* (Intera, 2010), previously provided to the BLM under separate cover, and was developed to collect local and regional baseline information and provide the basis for monitoring of regional impacts that may result from operation of the mine. The Copper Flat Monitoring Plan would be updated as detailed engineering for the proposed mine facilities is completed, and the monitoring requirements become more defined.

3.4.13 Technical Updates

During the course of operations, NMCC would periodically review and update as necessary the geochemical and hydrogeological predictions, mine waste characterization studies, and pit lake studies to incorporate new information accumulated during operations. NMCC would review the data every five years and make updates as necessary. These updates would provide quantitative predictions of water quality during the operational and post-closure period. Mitigation would be developed as necessary.

3.4.14 Growth Media/Cover Salvage and Storage

Any suitable growth media and cover material disturbed during construction or operation would be salvaged and stockpiled. A growth media management plan would be developed prior to construction activities.

Following stripping, growth media and cover would be stockpiled within the proposed disturbance areas. Growth media/cover stockpiles would be located such that mining operations would not disturb them. The surfaces of the stockpiles would be shaped after construction with overall slopes of 2.7H:1V or shallower to reduce erosion. To further minimize wind and water erosion, the soil stockpiles would be seeded after shaping with an interim seed mix developed in conjunction with the BLM. Diversion channels and/or berms would be constructed around the stockpiles, as needed, to prevent erosion from overland runoff. BMPs such as silt fences or staked straw bales would be used as necessary to contain sediment liberated from direct precipitation.

3.4.15 Sustainability

NMCC recognizes the social and economic impacts from “boom and bust cycles” that sometimes occur in connection with the mining industry. In addition, removal of facilities that may have post-mining uses is not in accordance with the overall environmental practice of conservation. NMCC would work with the local and regional communities to identify post-mining uses of the land and facilities to enhance opportunities to sustain the economy and culture in the post-mining phase of this project.

3.5 Operating Plans

Section 3809.401 of 43 CFR requires that the following operating plans be submitted with the Plan of Operations:

- **Water management**, including stormwater management, is discussed in Sections 3.2.3 and 3.2.7 (among others).
- Mine Waste Management Plan (**Rock Characterization and Handling Plan**) is provided in **Appendix C**;
- **Quality assurance plans**, some of which are located in **Appendix F**. The remaining quality assurance plans would be submitted to BLM prior to Plan of Operations approval;
- **Spill Contingency Plan** (SCP) located in **Appendix E** and briefly discussed in Section 3.4.11;
- **Reclamation Plan** presented in Section 5.5;
- Preliminary **Monitoring Plan** [*Sampling and Analysis Plan – Copper Flat Mine* (Intera, 2010)], previously submitted to the BLM under separate cover; and
- **Interim Management Plan** presented in Section 5.15.

4 Environmental Setting

4.1 Introduction

In accordance with 43 CFR § 3809.401(c), NMCC has prepared the following baseline environmental information to assist the BLM in analyzing potential environmental impacts as required by the NEPA and to determine if the NMCC plan of operations would prevent unnecessary or undue degradation. For the most part, this section contains a summary of the environmental setting of the mine area as described in the Copper Flat DEIS (BLM, 1996) and PFEIS (BLM, 1999). Additional details on the existing environment are provided in the various environmental baseline and impact reports prepared for the site since the mid-1970s, and are available upon request.

4.2 Geology

4.2.1 Regional Geologic Setting

The Copper Flat Mine lies within the Mexican Highlands portion of the Basin and Range Physiographic Province. It is located in the Hillsboro Mining District in the Las Animas Hills, which are part of the Animas Uplift, a horst on the western edge of the Rio Grande valley (Raugust, 2003). The Animas Uplift is separated from the Rio Grande by nearly 20 miles of Santa Fe Group alluvial sediments, referred to as the Palomas Basin of the Rio Grande valley. To the west of the Animas Uplift is the Warm Springs valley, a graben that parallels the Rio Grande valley (BLM, 1999; Raugust, 2003). Further west, the Black Mountains form the backbone of the Continental Divide, rising to about 9,000 feet above mean sea level (amsl). The surface geology of the Copper Flat region is shown in **Figure 4-1**, and a schematic geologic cross section is shown in **Figure 4-2**.

Basement rocks in the area consist of Precambrian granite and Paleozoic and Mesozoic sandstones, shales, limestones, and evaporites. Sedimentary units that crop out within the Animas Uplift include the Ordovician Montoya Limestone, the Silurian Fusselman Dolomite, and the Devonian Percha Shale. The Cretaceous-age Laramide orogeny, which was characterized by the intrusion of magma associated with the subduction of the Farallon plate beneath the North American plate, affected this region between 75 and 50 million years ago (Ma). Volcanic activity during the late Cretaceous and Tertiary periods resulted in localized flows, dikes, and intrusive bodies, some of which were associated with the development of the nearby Tertiary Emory and Good Sight-Cedar Hills cauldrons (**Figure 4-3**); later basaltic flows resulted from the tectonic activity associated with the formation of the Rio Grande rift. Tertiary and Quaternary alluvial sediments of the Santa Fe Group and more recent valley fill overlie the older Paleozoic and Mesozoic units in the area.

The geologic structure of the region is characterized by block and rift faulting (**Figure 4-3**). The Tertiary cauldrons associated with the earlier block faulting formed between 35 and 45 Ma. Rift faulting and associated north-south block faulting associated with continental extension and the formation of the Rio Grande rift began approximately 25 to 30 million years (Ma). The Las Animas

Hills are bounded by faults associated with rifting (Dunn, 1982). Continental extension continues to the present, as evidenced by north-south trending grabens represented by the Rio Grande and Warm Springs valleys.

4.2.2 Geology of Copper Flat Mine Site

4.2.2.1 *Stratigraphy*

As shown in **Figure 4-4**, the dominant geologic feature of the Animas Hills and Hillsboro district is the Copper Flat strato-volcano, a circular body of Cretaceous andesite that is 4 miles in diameter (Raugust, 2003). The andesite is generally fine-grained with phenocrysts of plagioclase (andesine) and amphibole in a groundmass of plagioclase and potassium feldspar and rare quartz. Some agglomerates or flow breccias are locally present, but the andesite is generally massive. Magnetite is a common association with the mafic phenocrysts, and accessory apatite is found in nearly every thin section (Dunn, 1984).

The strato-volcano is eroded to form a topographic low; the total depth of erosion is uncertain (SRK, 2010). To the east of the site, this andesite body is in fault contact with Santa Fe Group sediments, which are at least 2,000 feet (ft) thick in the area. Near-vertical faults characterize the contacts on the remaining perimeter of the andesite body; these faults juxtapose the andesite with Paleozoic sedimentary rocks. Drill holes indicate the andesite is more than 3,000 ft thick. This feature, combined with the concentric fault pattern, indicate that the local geology represents a deeply eroded Cretaceous-age volcanic complex (Dunn, 1982).

The core of the volcanic complex is a Cretaceous-age quartz monzonite stock that intruded into the center of the andesite body. Known as the Copper Flat Quartz Monzonite (CFQM), this irregular-shaped stock underlies a surface area of approximately 0.25 square miles and has been dated to approximately 75 million years before present (Raugust, 2003; BLM, 1999; and McLemore *et al.*, 2000). The monzonite crops out in only a few isolated areas, and the andesite at these contacts shows no obvious signs of contact metamorphism (Dunn, 1984). The CFQM is a medium-to coarse-grained, holocrystalline porphyry composed primarily of potassium feldspar, plagioclase, hornblende, and biotite; trace amounts of magnetite, apatite, zircon, and rutile are also present, along with localized mineralized zones containing pyrite, chalcopyrite, and molybdenite (McLemore *et al.*, 2000). About 15 percent of the monzonite is quartz, which occurs both as small phenocrysts and as part of the groundmass; however, quartz is absent in some parts of the stock (Dunn, 1984).

Numerous dikes, mostly latite, radiate from the CFQM stock, some nearly a mile in length. Most of the dikes trend to the northeast or northwest and represent late stage differentiation of the CFQM stock (Raugust, 2003). Immediately south of the quartz monzonite, the andesite is coarse-grained, perhaps indicating a shallow intrusive phase. An irregular mass of andesite breccia along the northwestern contact of the quartz monzonite contains potassium feldspar phenocrysts and andesitic rock fragments in a matrix of sericite with minor quartz; this may represent a pyroclastic unit. Magnetite, chlorite, epidote, and accessory apatite are also present in the andesite breccia (Dunn, 1984).

The southwestern edge of the andesite body was intruded by the Warm Springs Quartz Monzonite pluton, which dates to approximately 73 Ma (Hedlund, 1974). Unlike the CFQM and the andesite, this monzonite body is not cut by the latite dikes (SRK, 2010), indicating that the dikes were emplaced prior to the Warm Springs Quartz Monzonite.

The Sugarlump Tuff (35 Ma) and the Kneeling Nun Tuff (34 Ma) unconformably overlie the local andesite flows. These tuffs erupted from the Emory caldera, and indicate that the Copper Flat volcanic/intrusive complex was buried during the Oligocene and exhumed during Miocene uplift (around 21.7 ±3.6 Ma) (Kelley and Chapin, 1997). Both the andesite and the quartz monzonite intrusions are cut by black, scoriaceous basalt dikes. These dikes remain unaltered, and appear to be associated with locally abundant Pliocene alkali basalt flows from around 4 Ma (Seager *et al.*, 1984).

4.2.2.2 *Structure*

Three principal structural zones are present at the site and surrounding area, the most prominent of which is a northeast-striking fault trend that includes the Hunter and parallel faults. In addition, west-northwest striking zones of structural weakness are marked by the Patten and Greer faults, and east-northeast striking zones are marked by the Olympia and Lewellyn faults. All faults have a near-vertical dip; the Hunter fault system dips 80°W, and both the Olympia and Lewellyn fault systems dip between 80°S and 90°S (SRK, 2010; Dunn, 1984). These three major fault zones appear to have been established prior to the emplacement of the CFQM and controlled subsequent igneous events and mineralization (SRK, 2010).

The CFQM emplacement is largely controlled by the three structural zones. The southern contact parallels and is cut by the Greer fault, although the contact is cut by the fault, and the southeastern and northwestern contacts are roughly parallel to the Olympia and Lewellyn faults, respectively. The elongate neck of the stock parallels the Hunter fault system. Whether there was movement along the fault zones before the emplacement of the stock has not been determined (SRK, 2010; Dunn, 1984).

Although the latite dikes strike in all the three principal fracture directions, most of the dikes strike northeast. A narrow zone of fault gouge commonly occurs along the contact between the dikes and the andesite, with the mineralization post-dating fault movement (Harley, 1934). The northeast fault zones contain a high proportion of wet gouge, often with no recognizable rock fragments. Underground exposures of the Hunter fault zone (in previously existing mine workings) material has the same consistency as wet concrete and has been observed to flow in underground headings. However, the material in the east-northeast fault zones contains only highly broken rock and little obvious gouge. The width of the fault zones in both systems varies along strike from less than a foot to nearly 25 ft in the Patten fault east of the Project. Despite intense brecciation, the total displacement along the faults does not appear to exceed a few tens of feet (Dunn, 1984). At the western edge of the site, a younger porphyritic dike was emplaced in a fault that had offset an early latite dike, indicating that fault movement occurred during the time that dikes were being emplaced (Dunn, 1984).

Post-dike movement is evident in all the three principal fault zones, and both the Hunter and Patten fault systems show signs of definite post-mineral movement. Fault movement has smeared sulfide deposits and offset the breccia pipe as well as the zones within the breccia pipe. Post-mineral movement along faults has resulted in wide, strongly brecciated fault zones. Some of the post-mineral dikes have been emplaced within these fault zones (SRK, 2010; Dunn, 1984).

NMCC has mapped the pit area and diversion cuts in detail at 1 inch:40 ft (1:480) and has examined the pre-and post-mineral stress orientations in the andesites and CFQM. Findings indicate no significant difference in the stress fields before and after mineralization (SRK, 2010).

4.2.3 Description of the Ore Body

Copper Flat is an alkalic copper-gold mineralized breccia pipe, associated with and genetically-linked to an alkalic porphyry system. Copper Flat is situated along the eastern edge of the Cretaceous Arizona-Sonora-New Mexico porphyry copper belt, and, along with Tyrone, New Mexico, forms a linear mineralized feature known as the Santa Rita lineament (SRK, 2010; McLemore *et al.*, 2000). Copper Flat is the easternmost and one of the oldest known porphyry deposits in the southwestern U.S. (Hedlund, 1974; Dunn, 1982; Titley, 1982). Analogous deposits include Terrane Metal's Mount Milligan, British Colombia deposit and the Continental breccia pipe located near Hanover in the Central Mining district of New Mexico (SRK, 2010).

4.2.3.1 *Structure and Model*

Mineralization at the site is concentrated in a breccia pipe within the CFQM stock (Raugust, 2003; BLM, 1999). The eastern portion of the breccia pipe is outside the outline of the main mineralization; however, the rest of the breccia pipe is higher grade than the surrounding CFQM, hosting nearly half of the copper at the site, but only about one-third of the total resource tonnage (SRK, 2010). Drillholes spaced approximately 100 ft apart within the center of the deposit indicate the breccia pipe occurs as a single, continuous body, approximately 1,300 ft long by approximately 600 ft wide at the surface with the long axis perpendicular to the predominant northeast fracture direction. It is exposed in only a few places, but extends vertically to over 1,000 ft; veins of coarse pegmatitic material have been found at approximately 1,700 ft below ground surface (bgs) in one drillhole (Dunn, 1984).

Mineralized poly-metallic quartz veins, commonly associated with the dikes that radiate outward from the central stock, have been the target of historical mining activities in the Hillsboro district. The breccia pipe zone has been cut by numerous, randomly oriented, irregular veins that are thicker and coarser grained than the narrow fracture-controlled veinlets in the surrounding stock.

Mineralization appears to have been contemporaneous with pipe formation (SRK, 2010). The lack of rock flour or gouge in the matrix suggests that brecciation was not the result of tectonic movement, while the apparent lack of appreciable movement between the fragments and the gradational contact between the breccia and the zone of stockwork veining indicate that an explosive mechanism was not the source of the brecciation. Likewise, the process of mineralization stoping described by Locke (1926), which would have resulted in appreciable downward movement and mixing of the fragments, is not supported by field observations. Thus the mechanism responsible for the formation of the Copper Flat mineralized breccia pipe appears to be autobrecciation resulting from retrograde boiling, a phenomenon that occurs when the pressure of the mineralizing hydrothermal fluid exceeds the confining pressure (Phillips, 1973). The matrix of the breccia, the irregular veins in the surrounding crackle breccias, and the open space filling in the breccias consist of hydrothermal minerals and part of the second stage mineralization occurred as replacement, which modified the original breccia texture (SRK, 2010).

Unlike most deposits in the southwestern U.S., Copper Flat shows very little supergene enrichment or the symmetrical and telescoped zoning of alteration types that is considered typical of most porphyry copper deposits. Instead, hypogene mineralization and alteration, including the formation of the breccia pipe, was the result of the final crystallization of the CFQM melt and related dikes (SRK, 2010).

The current model used by NMCC for further exploration at the site is based on Richards (2003), who interprets the area as an eroded volcano. According to this model, mineralization occurred at similar depths to that found at El Teniente in Chile; since the Copper Flat breccia pipe now crops out at the surface, this assumption indicates that approximately 0.5 to 2 kilometers (km) of volcanic rocks have been eroded from the central zone of mineralization. Fluid inclusion work by Norman *et al*. (1989) and McLemore *et al*. (2000) suggest that the breccia pipe and veins formed at a depth of 1 to 2 km bgs and at temperatures ranging from 226° to 360°C.

4.2.3.2 *Mineralization*

During the early mining days, a 20-to 50-foot leached oxide zone existed over the ore body, but this material was stripped during the mining activities that occurred in the early 1980s. Most of the remaining ore is unoxidized and consists primarily of chalcopyrite and pyrite with some molybdenite and traces of galena and sphalerite. Appreciable amounts of silver and gold are also present (BLM, 1999; SRK, 2010). The proven and probable reserves are estimated at more than 50 million tons of ore with 0.45 percent copper (Hydro Resources, 2002).

The breccia consists largely of fragments of mineralized CFQM, with locally abundant mineralized latite where dikes exposed in the CFQM projected into the brecciated zone. Andesite occurs only as mixed fragments partially in contact with intrusive CFQM and appears to represent the brecciation of andesite xenoliths in the CFQM (Dunn, 1984). The matrix contains varying proportions of quartz, biotite (phlogopite), potassium feldspar, pyrite, and chalcopyrite, with magnetite, molybdenite, fluorite, anhydrite, and calcite locally common. Apatite is a common accessory mineral. Much of the quartz-feldspar matrix has a pegmatitic texture. Breccia fragments are rimmed with either biotite or potassium feldspar, and the quartz and sulfide minerals have generally formed in the center of the matrix (Dunn, 1984).

The andesite in contact with the CFQM, dikes, and veins is typically altered into one of three types of mineral assemblages: biotite-potassic, potassic, or sericitic alteration (Fowler, 1982). The highest copper grades are associated with the biotite-potassic alteration, which is characterized by hydrothermal biotite, potassium feldspar, quartz, and pyrite, and which occurs in veinlets and as replacement assemblages in the monzonite (McLemore *et al.*, 2000).

The total sulfide content ranges from 1 percent (by volume) in the eastern part of the breccia pipe and the surrounding CFQM to 5 percent in the CFQM to the south and west (SRK, 2010). Sulfide content is highly variable within the breccia, with portions containing as much as 20 percent sulfide minerals. Sulfide mineralization is restricted to the CFQM and breccia pipe, and drops abruptly at the andesite contact. Minor pyrite mineralization extends into the andesite along the pre-mineral dikes (SRK, 2010; Dunn, 1984). Pyrite and chalcopyrite are disseminated within the CFQM and also occur along fracture-controlled veinlets and as disseminations associated with mafic minerals. Typically, pyrite is more abundant than chalcopyrite in two areas (SRK, 2010):

- A narrow zone that surrounds and overlies the western end of the breccia pipe, which has the highest grade CFQM mineralization, characterized by abundant chalcopyrite in quartz-sulfide veinlets; and
- Outcrops to the southeast of the breccia and south of Greyback Wash, where disseminated chalcopyrite is present with no associated pyrite.

Molybdenite occurs occasionally in quartz veins or as thin coatings on fractures. Minor sphalerite and galena are present in both carbonate and quartz veinlets in the CFQM stock (Dunn, 1984).

4.3 Climate

The Copper Flat Mine lies within the belt of mid-latitude westerly winds, where the prevailing direction is from the west. Winds at the Truth or Consequences, New Mexico, airport, located about 30 miles northeast of the site, are generally from the northwest; however, the Black Range and foothills cause local variations in the winds. At Copper Flat, the wind direction is predominantly west to east, and secondarily north to south. Local wind speeds average about 10 to 15 miles per hour, although winds in excess of 50 miles per hour may occur at times. Temperature inversions are rare at Copper Flat, but are more common farther east along the Rio Grande valley, especially during the winter months. Vertical air dilution is generally good because of the area’s high surface temperatures, creating strong daytime thermal mixing. Thermal mixing and moderate winds generally tend to suppress occasional nighttime inversions. The presence of higher winds and the lack of inversions contribute to a relatively clean atmosphere at the site since any pollutants are readily mixed and dispersed (BLM, 1999).

Temperature data for the site show a wide diurnal and seasonal variability, which is typical of dry climates. The warmest temperatures occur in June and July and the coldest temperatures usually occur in December and January. In spring and fall, daily maximum temperatures are moderate, typically averaging 65 to 85 degrees Fahrenheit (°F). Nights are cooler, with low temperatures averaging 32 to 50°F. Winter temperatures are frequently below freezing at night, but can be above 50°F during the day. During summer, temperatures can approach 100°F during the day. Daily temperature fluctuations of 30°F are common throughout the year (BLM, 1999).

Precipitation at the site averages about 13 inches per year (ranging from nearly 3 inches in 1956 to over 20 inches in 1986). As much as half of the annual precipitation occurs in the form of intense thunderstorms during July, August, and September, when moist air enters the region from the Gulf of Mexico. Summer thunderstorms can result in heavy rainfall and flash floods. Average monthly precipitation in January through June is typically 0.50 inch or less. Snowfall is possible from October through April, but most likely (greater than 1 inch) between December through February (BLM, 1996).

Evaporation exceeds precipitation in southwestern New Mexico. Pan evaporation data, the most commonly collected data, are correlated with lake evaporation (i.e., free water surface evaporation) to predict evaporation from reservoirs and lakes. Lake evaporation at the site is estimated to be approximately 58 to 65 inches per year, and pan evaporation is estimated to be approximately 80 to 90 inches per year (SRK, 1995).

4.4 Hydrology

4.4.1 Surface Water

The Copper Flat area falls within the Lower Rio Grande watershed, as defined by the New Mexico Water Quality Control Commission (WQCC). This watershed includes approximately 5,000 square miles in Catron, Socorro, Sierra, and Doña Ana Counties and is dominated by the Rio Grande and its tributaries as well as the two large reservoirs of Elephant Butte and Caballo. Numerous ephemeral tributaries feed into the Rio Grande from the west, but none contribute perennial flow to the Rio Grande.

The following sections provide background information about surface water resources in the vicinity of the Copper Flat Mine, and summarize pertinent historical data related to surface water sampling.

4.4.1.1 *Surface Water Characteristics of Site and Vicinity*

The site is drained by ephemeral streams (arroyos) within the Greenhorn Arroyo drainage basin, a 6th level sub-watershed defined by the Hydrologic Unit classification system (Seaber *et al*., 1987) that drains 29,414 acres of land on the eastern slope of the Animas Uplift to a single outlet into the Rio Grande (**Figure 4-5**). Flows within the Greenhorn Arroyo drainage basin are ephemeral, as they only occur in direct response to precipitation. As a result, this drainage, similar to others in the region, does not contribute any perennial surface water flow to the Rio Grande.

Numerous arroyos contribute to the trunk channel of Greenhorn Arroyo. Of these, Greyback Wash is the primary drainage through the site. Greyback Wash originates west of the site and drains eastward along the site axis until it converges with the trunk channel of Greenhorn Wash approximately 8 miles east of the site boundary (**Figure 4-5**). In pre-mining times, Greyback Wash drained directly through the mine area, but was later re-routed around the southern perimeter of the mine area for flood control purposes (Raugust, 2003). Newcomer and Finch (1993) measured flow rates in Greyback Wash of 12.5 gallons per minute (gpm) in March 1993 at a point east of the pit and former plant site. Three seeps have been identified along Greyback Wash (BLM, 1999). One seep with riparian vegetation is located near a buried storm water collection pond, a second is located downstream from the first seep and supports a small cottonwood/willow stand, and the third is south of the operations area (**Figure 4-5**).

Two creeks drain basins directly to the north and south of the Greenhorn Arroyo drainage basin: Las Animas Creek in the north and Percha Creek to the south (**Figure 4-5**). Both Las Animas and Percha Creeks have ephemeral, intermittent, and perennial reaches. Stream flow in Las Animas Creek varies from perennial to intermittent from the area near sampling site MAS (**Figure 4-5**) to Caballo

Reservoir (BLM, 1999). For example, Davie and Spiegel (1967) show flow rates ranging from about 450 to 900 gpm in the upper reach (T14S R7W, Sections 34 through 36, near sampling sites LAC-A and LAC-B in **Figure 4-5**) and middle reach (within T15S R5W) of the creek; according to Davie and Spiegel, these reaches are "losing reaches" of the creek. Stream flow in Percha Creek is intermittent in the Hillsboro reach and perennial in the area known as the Percha Box, a steep-walled reach of the drainage that has incised into Paleozoic bedrock (BLM, 1996) (**Figure 4-5**). SRK (1995) reported measurable stream flows just east of the Percha Box of roughly 200 to 250 gpm. This was the only reach of Percha Creek with measurable flows during the SRK sampling period. Though both Las Animas Creek and Percha Creek have perennial reaches, neither creek contributes perennial flow to the Lower Rio Grande Basin.

Two springs are located within the Greenhorn Arroyo drainage basin to the north and west of the site (**Figure 4-5**). Other unnamed seeps occur in the pit walls surrounding the pit lake after precipitation events; these are likely the result of fractured flow through the bedrock exposed in the pit wall. Several springs in the Percha Creek basin and one in the Las Animas Creek basin have been identified for sampling, but have been studied less than those within the Greenhorn Arroyo basin. As a result, there is little information on their flow rates or quality, although Newcomer and Finch (1993) did attempt to measure flow.

The open pit that was mined during the early 1980s now contains a lake. Since 1989, the pit lake has been sampled for water quality at various locations and depths, including samples collected by past operators of the mine, state regulatory agencies, and academic researchers studying the mine (BLM, 1999).

4.4.1.2 *Historical Data*

Existing surface water data relevant to the NMCC sampling plan are discussed in this section. Surface water at the site was most recently investigated by SRK (1995), who collected flow and water quality from Percha Creek and Las Animas Creek. Newcomer *et al.* (1993) performed a hydrologic assessment of the Greenhorn Arroyo drainage basin, measuring flow and water quality along Greyback Wash and at a number of seeps and springs. The oldest known surface water investigation at the site was performed by Davie and Spiegel (1967), who collected flow data for Las Animas Creek. Results of these investigations were compiled by Raugust (2003) and are also summarized in PFEIS (BLM, 1999).

4.4.1.2.1 Volumetric Flow

4.4.1.2.1.1 Streams

Flow rate data for streams at the site are limited by the generally intermittent nature of flows. Measurements of flows were made by Newcomer *et al*. (1993) and Adrian Brown Consultants (1996). Additional historical measurements were compiled in the PFEIS (BLM, 1999). These data are summarized in the *Sampling and Analysis Plan – Copper Flat Mine* (Intera, 2010), provided to the BLM under separate cover.

Greyback Wash is an ephemeral stream and generally flows only during periods of snow melt or rain events. Flow rates in Greyback Wash at SWQ-3 (**Figure 4-5**) were measured by Newcomer *et al*. (1993) to be 12.5 gpm (0.028 cubic feet per second [cfs]) in March of 1993.

Two measurements of flow rate are recorded for Las Animas Creek. Davie and Spiegel (1967) reported flows of between 1.0 and 2.0 cfs in the creek's upper reaches and between 1.0 and 1.5 cfs in its middle reaches (BLM, 1999). Adrian Brown Consultants made a single flow measurement of 245 gpm (0.546 cfs) at LAC-E (**Figure 4-5**) in 1996.

Volumetric flow in Percha Creek was measured at 13 locations by Adrian Brown Consultants (1996), from approximately ¼ mile upstream of the entry to Percha Box to approximately 5 miles downstream of the exit from Percha Box. Flow was found to be localized, occurring within and immediately to the east of Percha Box, and ranging from 456 gpm (1.02 cfs) to 119 gpm (0.265 cfs), with many reaches dry or with standing water only.

4.4.1.2.1.2 Springs and Seeps

Spring and seep flow rates are infrequently reported in the available literature for the site and surrounding areas. Several springs and seeps have been identified within the Greenhorn Arroyo drainage basin. Two springs, identified as BG and BG-2, are located to the north and west of the site (**Figure 4-5**) and several unnamed seeps occur in the walls surrounding the pit lake. BG and BG-2 were judged by Newcomer *et al*. (1993) to be ephemeral. The seeps along the pit walls are observed to flow in response to precipitation events, and, as mentioned above, are likely the results of fractured flow through the bedrock exposed in the pit wall. All known springs and seeps in the Greenhorn Arroyo drainage basin are upgradient of the proposed mine water discharge location. Other seeps and springs shown in **Figure 4-5** have not been measured in the past and thus have no associated historical flow information.

4.4.1.2.2 Water Quality

4.4.1.2.2.1 Streams

The surface water chemistry of Greyback Wash was initially investigated in 1977 at three locations as part of an environmental assessment prepared by the BLM in response to an application by Quintana Minerals Corporation for an open pit copper mine at the site (BLM, 1978). The three locations sampled in 1977 generally correspond to the sampling locations proposed in **Figure 4-5**, with one location upstream of the permit boundary, one within the site approximately 300 yards from the mine rim, and a third located where the arroyo leaves the site (BLM, 1978). Water samples were collected in January, March, and July of 1977.

WQCC standards for metals were not exceeded at any location in any of the 1977 sample events. Results for pH (7.6–8.1) were in the same range as samples collected later at these three locations. Total dissolved solids (TDS) results upstream of the site (720–1000 milligrams per liter [mg/L]) were comparable to those of samples collected later, but samples taken at locations within and downstream of the site were comparatively lower (800–1,320 mg/L) than the results for later sampling events such as those conducted by Newcomer *et al.* (1993) at SWQ-1 (upgradient of the pit lake), SWQ-2 (downgradient of the pit lake but within the area of mining disturbance), and SWQ-3 (approximately 1 mile downgradient of the pit lake) (**Figure 4-5**). Field parameters measured by Newcomer *et al*. are shown in Table 8-1 of the *SAP* (Intera, 2010). Water quality in Greyback Wash upstream of the pit lake at SWQ-1 had a pH ranging from 7.4 to 8.3, sodium at 107 milligrams per liter (mg/L), bicarbonate values ranging from 400 to 500 mg/L, sulfate ranging from 275 to 300 mg/L, and TDS ranging from 780 to 965 mg/L. At SWQ-2, sodium concentration increased from the previous sampling event by BLM to 270 mg/L, sulfate increased to between 1,150 and 1,650 mg/L, TDS increased to between 2,300 and 3,300 mg/L, and pH and metal concentrations remained essentially unchanged. Water quality indicators at SWQ-3 fell within the range of values at SWQ-2.

Las Animas Creek water quality was examined by Adrian Brown Consultants (1996) and for the PFEIS (BLM, 1999). Adrian Brown Consultants obtained a single sample at LAC-E, with a pH of 7.81, sulfate concentration of 18 mg/L, and TDS of 300 mg/L. The PFEIS reports that Las Animas Creek water quality is dominated by calcium or sodium bicarbonate, with pH in the range 7.0 to 8.0, sulfate in the range 20 to 70 mg/L, and TDS in the range 300 to 400 mg/L. Occasionally, sodium and chloride are higher, with chloride concentrations as high as 300 to 400 mg/L, possibly due to agricultural practices along the creek (BLM, 1999).

Percha Creek water quality was examined by Adrian Brown Consultants (1996) and for the PFEIS (BLM, 1999). Adrian Brown Consultants sampled Percha Creek at the entry and exit to Percha Box, and 5,000 feet (ft) downstream from the exit from Percha Box, and measured field parameters at all seven locations in which water was found [Table 8-1 of the SAP (Intera, 2010)]. For the three samples submitted for laboratory analysis, pH ranged from 7.62 to 7.82, sulfate ranged from 63 to 71 mg/L, and TDS ranged from 336 to 406 mg/L. The PFEIS (BLM, 1999) reports that surface water flowing in Percha Creek has a chemistry dominated by calcium bicarbonate, with pH in the range of 7.0 to 8.0, sulfate in the range of 20 to 70 mg/L, and TDS in the range of 300 to 400 mg/L.

Sampling of the Caballo Reservoir, the receiving water for these drainages, during November 1994, showed the water to be dominated by sodium bicarbonate with bicarbonate values of 180 mg/L and sulfate values of 110 mg/L (SRK, 1995). As summarized in the PFEIS (BLM, 1999) chloride values were less than 100 mg/L and TDS was 440 mg/L. The water chemistry was within WQCC standards for metals, sulfate, chlorine, pH, and TDS. As a comparison, water samples from the Rio Grande at EI Paso, Texas were sodium sulfate-dominated with high TDS in the range of 800 to 1,000 mg/L, sulfate values of 200 to 340 mg/L, and bicarbonate values of around 100 mg/L (Wilson *et al*., 1981).

4.4.1.2.2.2 Springs and Seeps

Newcomer *et al*. (1993) sampled the BG and BG-2 springs in April 1993 and Adrian Brown Consultants observed and sampled seeps in the pit wall in August 1997 (ABC, 1997). Field parameters and water chemistry analytical data for these locations are presented in Table 8-1 of the *SAP* (Intera, 2010), respectively. Samples from BG and BG-2 had pH ranging from 8.0 to 8.2, sodium ranging from 90 to 124 mg/L, bicarbonate ranging from 411 to 535 mg/L, sulfate ranging from 184 to 228 mg/L, and TDS ranging from 680 to 690 mg/L. The pit wall sample had a pH of 8.16, a sulfate content of 3,100 mg/L and TDS of 5,020 mg/L. On the basis of these results, ABC (1997) judged BG and BG-2 to be qualitatively similar to the Greyback Wash sample location SWQ-

1, while the pit wall location appears to have been subject to a similar process as the locations at SWQ-2 and SWQ-3.

4.4.1.2.2.3 Pit Lake

The 12.8-acre lake that has formed in the existing pit (**Figure 4-6**) is estimated to be about 40 ft deep, based on a pit bottom elevation of 5,380 ft above mean sea level (amsl) and water level elevation of 5,420 ft amsl as measured in 1986 (SRK, 2010). The water quality of the pit lake has been sampled at various depths and locations since the initial samples were collected on April 13, 1989, by the New Mexico Environment Improvement Board (Raugust, 2003); the latest samples were collected in January 2010. Raugust (2003) concluded that the collective data show several trends in the variability of water quality over time, mainly that evapo-concentration and buffering processes are influencing the quality of the lake water. Pit water has historically exceeded the WQCC standards for sulfate, chloride, TDS, manganese, and uranium (20.6.2.4103 of the New Mexico Administrative Code) and has occasionally dropped below the regulatory pH range of 6 to 9 s.u.

Analytical results of samples collected from 1989 to 1998 suggest that sulfate, chloride, TDS, manganese, and pH all increased over this period. For example, sulfate increased from a range of 2,250 to 3,000 mg/L to a range of 3,500 to 4,300 mg/L over this time period. Chloride increased from an average of around 100 mg/L to around 250 mg/L, which may be attributed to lower average annual precipitation and higher annual temperatures during this period (BLM, 1999). However, the sulfate-to-chloride ratio dropped during this time period, suggesting that sulfate rose at a slower rate than chloride due to the formation of gypsum and the subsequent buffering of the sulfate concentration in pit lake water by gypsum (gypsum is observed along the margins of the pit lake during the summer months, when the pit lake level has dropped). TDS ranged from 2,700 mg/L in 1991 (Newcomer *et al*., 1993) to about 6,000 mg/L in 1998 (Raugust, 2003). Manganese ranged from 1.8 to 4.3 mg/L (BLM, 1999). The measured pH values have generally increased over time to about 8.0 s.u. However, in 1992 and again in 2008, pH decreased to 4.4 and 4.5 (NMED GWQB, 2008), respectively, deviating from the overall trend of elevated pH values. The overall rise in the pH may be due to buffering by wall rock or groundwater alkalinity. There is no historical data available for uranium, other than a sample collected in 2004 that showed the water exceeded the WQCC standard (NMED GWQB, 2008).

Variability in the methods, locations, and depths from which samples were collected may explain many of the differences observed in pit water quality results. However, samples collected in January 2010 confirm that concentrations of sulfate, chloride, TDS, and manganese have increased. The 2010 sampling yielded a sulfate concentration of 5,200 mg/L, chloride concentration of 390 mg/L, TDS concentration of 7,770 mg/L, and manganese concentration of 41 mg/L, all of which were higher than previous measurements from the 1989 to 1998 period. In addition, concentrations of aluminum, copper, cobalt, iron, and fluoride in the 2010 sample all exceeded WQCC standards. In contrast, pH, the most widely variable parameter measured during the 1989 to 1998 period, was 6.3 in January 2010, within the acceptable range of 6 to 9.

Other key studies that discuss the water quality are summarized in SRK (1997) and include hydrogeologic and hydrogeochemical studies (SRK, 1995), post-closure pit water balance model calculations (SRK, 1997), water quality and host-rock geochemical studies (SRK, 1997), and post-hearing submittals that followed the 1997 New Mexico Mine Permit public hearing.

4.4.2 Groundwater

Groundwater is a major supply of water for domestic, agricultural, mining, and industrial use in southern New Mexico. The high evaporation rate during the long, hot summers coupled with low average annual precipitation in the area result in surface waters being an unreliable source of water on a year-round basis. The Rio Grande is the only significant nearby surface water resource. Intermittent streams that feed the Rio Grande, such as Las Animas Creek and Percha Creek in the site area, are local sources of water for at least part of the year. The Rio Grande and associated shallow alluvial deposits of its inner valley also served as the ultimate discharge zone for pre-development groundwater flow from the adjacent Greenhorn Arroyo, Las Animas Creek, and Percha Creek drainage basins (Hawley *et al*., 2005, Wilson *et al*. 1981). Additional water comes from shallow domestic and agricultural wells. This section provides a description of the regional and local groundwater along with a proposed sampling and analysis approach to characterizing baseline conditions of groundwater resources.

4.4.2.1 *Regional Hydrogeology*

The site is located in the Lower Rio Grande Underground Water Basin (LRGB), which extends from Elephant Butte Dam to the Texas Border near El Paso and is one of New Mexico's principal agricultural regions (**Figure 4-7**). The LRGB was declared by the NM State Engineer on September 11, 1980. As a result, the underground waters of the LRGB are administered by the State Engineer. A water master district that encompasses the Hot Springs, Las Animas Creek, and Lower Rio Grande Underground Water Basins was created to assist with water administration in the region.

Groundwater in the LRGB generally flows from the highlands on either side of the basin through bedrock and valley alluvium to the center of the basin and to the Rio Grande. **Figure 4-8** illustrates the conceptual model of groundwater flow at the site. The bedrock aquifer in the Paleozoic sedimentary rocks are recharged by rainfall and snowmelt through bedrock faults and bedding planes exposed in the highlands west of the Project site. This water generally flows along a hydraulic gradient toward the approximate center of the Rio Grande Valley. Occasionally, this deep regional flow discharges at the ground surface as springs along faults where the Paleozoic bedrock crops out within the valley. This occurs in at several locations within the Las Animas Creek and Percha Creek drainage basins (**Figure 4-9**). The water table elevation near the existing pit lies at approximately 5,450 to 5,500 feet (ft) above mean sea level (amsl). Groundwater near Caballo Reservoir lies at about 4,200 ft amsl, indicating a drop of 1,300 ft over approximately 14 to 15 miles.

Valley alluvium is generally recharged by precipitation along mountain fronts where the alluvial fans are exposed and by streams that flow out of the highlands and lose water to the alluvium as they flow toward the Rio Grande. Many intermittent streams in the area are "losing streams" over at least part of their courses and provide recharge to the alluvial groundwater system. This alluvial groundwater then flows downgradient to the Rio Grande.

4.4.2.1.1 Hydrogeology of the Permit Area

Three aquifers exist in the project area, as shown schematically on **Figure 4-8**. The deepest aquifer is the crystalline bedrock aquifer that receives water from the highlands to the west of Animas Peak and carries this water along bedding planes, faults, and solution cavities toward the center of the LRGB. The crystalline bedrock aquifer consists of Cretaceous andesite and monzonite breccias underlain by Paleozoic rocks in the Animas Uplift area, Tertiary volcanic rocks to the west of the pit lake in the graben associated with the Animas uplift, and Paleozoic sedimentary rocks to the east of the pit lake area in the Palomas Basin. The Santa Fe Group aquifer system, which consists of interbedded sandstones, silts, and clays, overlies the Paleozoic bedrock units to the east of the pit lake area within the Palomas Basin. This aquifer system receives water from precipitation and from the losing reaches of streams. The uppermost aquifer at the site is the Quaternary alluvial aquifer along Las Animas and Percha Creeks (**Figure 4-9**). This alluvium is up to 40-ft thick in the Las Animas Creek area and carries water that is in hydraulic equilibrium with the water flowing in Las Animas Creek (BLM, 1999). The Percha Creek alluvial aquifer is less studied than the Las Animas Creek alluvial aquifer, and as a result, less historical data about its aquifer characteristics are available. The aquifers of greatest importance in terms of water supply in the area are within the Palomas Basin to the east of the pit lake and include the intermediate Santa Fe Group aquifer system and the alluvial aquifer associated with Las Animas Creek.

Figure 4-10 from the Adrian Brown Consultants (ABC) (1998b) presents a piezometric contour map showing the general configuration of groundwater level elevations at the site as interpreted at that time. Groundwater levels near the existing pit are approximately 5,450 ft amsl, and at Caballo Reservoir, the levels are about 4,200 ft amsl. The map indicates that groundwater flow is generally to the east toward Caballo Reservoir. Hydraulic gradients are relatively large (closely spaced contours) in the western portion of the site, reflecting lower transmissivity in the bedrock aquifer and in the western portion of the Palomas Basin in the Santa Fe Group aquifer system. The wider spacing of contours in the eastern portion of the site suggests that transmissivity of the Santa Fe Group aquifer increases toward Caballo reservoir. The widest spacing of contours (highest transmissivity) appears to occur in the area of the groundwater production well field (wells PW-1, 2, 3, and 4 on **Figure 4-10**). This area coincides with an interpreted graben structure, which reflects an increased thickness of the Santa Fe Group in this area.

4.4.2.1.2 Aquifer Characteristics in the General Plan Area

4.4.2.1.2.1 Crystalline Bedrock Aquifer Characteristics

Groundwater within the Hillsboro Mining District and the area of the present open pit occurs in andesitic volcanic rocks and quartz monzonite breccia intrusive rocks (**Figure 4-8**). The current pit lake was reported by SRK (1997) to be at an elevation of 5,442 ft amsl, which is about 50 to 100 ft below the pre-mining ground elevation [5,500 to 5,540 ft amsl reported in the PFEIS (BLM, 1999)]. Groundwater levels measured in the pit and tailings areas as of 1997 are shown on **Figure 4-11**.

Newcomer *et al*. (1993) reported a pre-mining (1981) water level of 5,370 ft amsl in well GWQ-5, which is approximately 4,000 ft east-southeast from the pit and within the old plant site area. These authors also reported a water level of 5,360 ft amsl in the Hillscher West well (GWQ-6), which lies approximately 2,500 ft southeast from well GWQ-5. These limited groundwater elevation data suggest that the groundwater gradient in the andesitic volcanic rocks may be to the east or southeast from the current pit lake area as shown on **Figure 4-11**. Within 500 ft of the pit lake (see **Figure 4-12**), however, groundwater gradients are toward the pit lake, which may act as a local evaporative sink (BLM, 1999).

In January 2010, NMCC resurveyed the pit lake and as many of the groundwater monitoring wells established for the PFEIS as could be located. The pit lake elevation was 5,444 ft amsl in January 2010, revealing that the pit lake elevation remains below the pre-mining water level elevation of 5,500 to 5,540 ft amsl.

4.4.2.1.2.2 Santa Fe Group Aquifer System

Overview

Overlying the crystalline bedrock aquifer at the Project site is the Santa Fe Group aquifer system, a system that is locally represented by two hydrostratigraphic units (HSUs): (1) the Upper Santa Fe Group hydrostratigraphic unit (USF), and (2) the Middle Santa Fe Group hydrostratigraphic unit (MSF). As defined by Hawley and Kennedy (2004), these hydrostratigraphic units are mapable bodies of basin and valley fill that are grouped according to genesis and position in both lithostratigraphic and chronostratigraphic sequences. Informally, these HSUs comprise the major basin-fill aquifer zones, and correspond roughly to the upper (Palomas) and middle (Rincon valley) lithostratigraphic subdivisions of the Santa Fe Group used in local and regional geologic mapping (Hawley and Kennedy, 2004).

The Santa Fe Group is composed chiefly of coalescing alluvial fan deposits that are discontinuous and locally heterogeneous with inter-bedded sandstones, silts, and clays of varying percentages. The Upper Santa Fe Group Palomas Formation (Lozinsky and Hawley, 1986) represents the USF at the site. This formation grades eastward from the Animas Uplift from coarse alluvial fan material to braided-stream and deltaic sands and silts to clays near the Rio Grande. The interfingering with clays begins approximately 3 to 5 miles west of the current position of the Rio Grande and is responsible for the flowing wells common in this part of the site (Murray, 1959; **Figure 4-8**). A basalt flow dated at 4.2 million years before present caps the Palomas Formation gravels near Copper Flat (Seager *et al*., 1984).

The Middle Santa Fe Group Rincon Valley Formation (Seager and Hawley, 1973) is exposed near Hillsboro, New Mexico, where the reddish-brown clays and clayey silts characteristic of this basal unit are interbedded with basalts dated at 28 million years before present (Seager *et al*., 1984). The Rincon Valley Formation represents the MSF at the site and generally contains water, but the yield is low due to the low hydraulic conductivity of the clays. The Rincon Valley Formation lacustrine red clays underlie the Palomas Formation and thicken southward toward Hatch, New Mexico, and the Rincon Basin (Wilson *et al*., 1981).

Tailings Impoundment Vicinity

The existing tailings impoundment facility overlies the old placer workings of Greyback Wash and Hunkidori Gulch (**Figure 4-9**). A study of these placer workings by Segerstrom and Antweiler (1975) showed that the placers were found in paleo-stream terrace alluvium approximately 25 to 30 ft thick that is underlain by a calcium carbonate horizon and reddish-brown clay. SRK (1995) and SHB (1980) confirmed and expanded the areal extent of this reddish-brown clay layer and determined that the top of the Palomas Formation is stratigraphically below the red clay layer. According to the studies completed by SRK and SHB, the clay layer and the 25 to 30 ft of paleo-stream terrace gravels that lie above the clay, have restricted the downward migration of water draining from the eastern half of the existing tailings. This clay layer has enabled a mound of water beneath the tailings impoundment to develop. This mounding of water, due to drainage of the existing tailings and meteoric infiltration over the years, became evident in some tailings dam monitor wells completed above the clay layer. The central and western sections of the existing tailings facility appear to communicate hydrologically with the USF that lies beneath the tailings area because the clay zone thins and disappears in this area, as shown in **Figure 4-13**. Groundwater issues as a result of tailings deposition by the previous operator are currently being dealt with through the Stage 1 Abatement Plan for the NMED. Further impacts would be mitigated by NMCC's proposed use of a synthetic liner system to prevent the downward migration of tailings seepage water.

The thickness of the Palomas Formation increases locally over a graben structure (labeled Dutch Gulch in **Figure 4-2**), which is reflected in higher transmissivity and relatively low hydraulic gradients in the USF. Based on a 7-day aquifer pumping test (ABC, 1996), the transmissivity of the USF in the tailings dam area is about 187 ft^2/day. East of the tailings area (see **Figure 4-2**) is a 10- to 30-foot thick clayey sand and gravel layer, underlain by a 25- to 100-foot-thick clay layer, which in turn is underlain by a silty sand and gravel layer (SRK, 1995). The lower silty sand and gravel layer is considered by ABC (1996) to be the USF and, based on drilling information, has a thickness of at least 200 ft. The hydraulic gradient in this area is about 30 ft per mile.

East of the graben structure, labeled as Dutch Gulch in **Figure 4-2**, the Palomas Formation (labeled Tsfp) thins and is interpreted to have significantly reduced transmissivity. The hydraulic gradient in this area ranges from about 130 to 330 ft/mile. The contact between the Palomas Formation and the underlying Rincon Valley Formation clay unit (labeled Tsf in **Figure 4-2**) is a highly irregular depositional contact. Locally, the Palomas Formation (USF) may be unsaturated, with the water table existing in the underlying Rincon Valley Formation (MSF) (BLM, 1999).

Production Well Field Vicinity

Farther to the east, the hydraulic gradient decreases from 330 ft/mile to about 34 ft/mile in the vicinity of the production well field (identified as PW wells on **Figure 4-14**). This suggests a progressive increase in transmissivity toward the area of the production well field. A graben structure below the production well field locally increases the thickness of the Palomas Formation to as much as 1,000 ft (**Figure 4-2**). The transmissivity of the USF in the production well field area ranges from about 2,675 to 5,750 ft^2/day (SRK, 1995). Farther to the east, towards Caballo Reservoir, sands and gravels in the Palomas Formation are interbedded with clays of the ancient Rio Grande. As a consequence, the transmissivity decreases slightly and the hydraulic gradient Increases to 45 ft/mile. In this area, the USF appears to be confined, leading to artesian flow in wells along the lower reaches of both Las Animas Creek and Percha Creek.

Although the Palomas Formation is described as "sand and gravel" (Davie and Spiegel, 1967), there exist numerous discontinuous clay layers within the sequence. This causes the bulk vertical hydraulic conductivity of the USF to be much lower than the horizontal conductivity. As a consequence, groundwater in deeper portions of the USF can be semi-confined, leading to relatively high vertical hydraulic gradients. The low vertical hydraulic conductivity has two important effects on the groundwater flow system. First, within about 4 miles of Caballo Reservoir, confinement of groundwater is sufficient to create artesian conditions in deeper portions of the USF. Wells drilled to these depths have groundwater levels aboveground surface and produce flowing wells, the locations of which are shown on **Figure 4-14**. Flow rates for uncapped wells range between a few gallons per minute (gpm) to as high as 40 gpm.

The second effect of low vertical conductivity is to reduce downward leakage between the Quaternary alluvial aquifer in the Las Animas Creek drainage basin and the underlying USF. At the location of monitoring wells MW-9, 10, and 11, north of the production well field, the groundwater level in the USF is some 58 ft lower than the water level in the overlying Quaternary alluvial aquifer (ABC, 1996). This results in a downward vertical hydraulic gradient from the Quaternary alluvial aquifer in the vicinity of Las Animas Creek drainage basin to the USF approaching 1 ft/ft. Such downward gradients are interpreted to occur along a substantial length of Las Animas Creek (ABC, 1996). In spite of these gradients, the amount of surface water loss from the Quaternary alluvial aquifer in the Las Animas Creek drainage basin is not significant; suggesting that vertical hydraulic conductivity in the USF is relatively low. Analytical calculations (ABC, 1997) suggest that if the vertical conductivity were much greater than 1 ft/year (10^{-6} cm/second), the Las Animas surface water system would lose essentially all of its water and become an intermittent stream, which clearly does not occur.

The hydraulic connection between the USF and the alluvial aquifer of the Rio Grande has not been evaluated, but groundwater gradients at the site strongly suggest that water flows from the Palomas Formation to the floodplain alluvium of the Rio Grande.

An aquifer pumping test conducted at the locations of monitor wells MW-9, 10, and 11 suggests that the vertical conductivity of the USF is low in this area (ABC, 1997). Pumping of the wells screened in the USF at this location did not affect a well screened in the Quaternary alluvial aquifer in the Las Animas Creek drainage basin, even though the well screened in the USF had 22 ft of drawdown. Also, monitoring of water levels along Las Animas Creek by Alta (Goff, 1998) for wells screened in both aquifers showed that fluctuations in water levels observed in shallow wells (those screened in the Quaternary alluvial aquifer) are not mirrored in the deeper wells (wells screened in the USF). These data are presented in Appendix A-2 (Table A2-10) of the PFEIS (BLM, 1999).

4.4.2.1.2.3 Quaternary Alluvial Aquifer

The uppermost aquifer at the site is the Quaternary alluvial aquifer, which is composed of channel and floodplain gravels, sands, and silts. Locally, these units are generally 30 to 50 ft thick near the mouths of Las Animas and Percha Creeks (Davie and Spiegel, 1967). Cores from monitoring wells drilled along Las Animas Creek indicate that upper alluvial gravels extend from the surface to a depth of approximately 20 to 60 ft depending on the location along the creek (BLM, 1999). There are fewer data available for the thickness of these deposits in and along Percha Creek.

The Las Animas alluvial aquifer consists of local alluvial deposits adjacent to and underlying Las Animas Creek. Groundwater in this narrow, sinuous aquifer is in direct hydraulic communication with Las Animas Creek surface water. Surface water in the creek and groundwater in the aquifer form a single surface-to-groundwater flow system. Surface water flow from one location to the next may be related, in part, to the proportion of total system flow being carried by the aquifer at each location. Along its course, the Las Animas alluvial aquifer receives recharge by rainfall infiltration. Discharge from the aquifer occurs through evaporation and evapo-transpiration from riparian vegetation and existing well pumping. Between the Saladone well and an area of the Lower Animas Artesian well (**Figure 4-14**), the aquifer loses water to the underlying Palomas Basin alluvial aquifer by slow downward seepage. The total flow rate for surface flow plus flow in the alluvium of the creek drops from around 1,800 to 1,900 gpm to around 1,100 gpm, a loss of 800 gpm over the 8-mile stretch of creek bed. The loss is consistent with slow downward seepage of water at a rate of around 1 foot/year (ABC, 1997). This is the approximate saturated hydraulic conductivity of clay. In the area of the Lower Animas Artesian (**Figure 4-14**) the Las Animas surface/groundwater system may receive recharge from the USF. At Caballo Reservoir, all water in the Las Animas surface/groundwater system discharges to the reservoir. The nature of artesian conditions in the Percha Creek drainage basin have not been studied in as much detail, and therefore less historical data are available.

Upstream of the artesian wells, Las Animas Creek, the alluvial aquifer can be "perched" above the water table in the Santa Fe Group aquifer system by 20 to 60 ft of unsaturated to partially saturated alluvial sediments (SRK, 1995; ABC, 1997). The alluvial aquifer along Las Animas Creek in the lower reaches loses water to the Santa Fe Group aquifer system by slow downward seepage. The upper reach of Las Animas Creek near the Saladone Well (**Figure 4-14**) also may be perched above the intermediate aquifer (Minton, 1961).

4.4.2.1.3 Existing Baseline Groundwater Information

An enormous amount of site characterization data are available for the Project site because the mine was active in the past and was characterized by previous operators that either mined the site or worked on permit applications to mine the site. These historical data would be used in conjunction with the baseline groundwater quality data that would be collected under the procedures set forth in the *SAP* (Intera, 2010) to provide as thorough an understanding as possible of groundwater quality conditions prior to the re-initiation of mining at Copper Flat. Key resources that contain data to be used for the baseline groundwater analysis include: Groundwater monitoring well exceedences provided by SRK (2010); the *SAP* (Intera, 2010); the PFEIS (BLM, 1999); the Hydrologic

Assessment, Copper Flat Project Sierra County, New Mexico (Newcomer *et. al*, 1993); and The Natural Defenses of Copper Flat, Sierra County, New Mexico (Raugust, 2003). Proposed monitoring well locations are provided in **Figure 4-15**. A brief summary of the data available in these key reports follows.

The PFEIS (BLM, 1999) provides a summary of groundwater quality data. Summary tables for key wells and key constituents are provided in Table 9-2 of the *SAP* (Intera, 2010). The wells identified in this study are illustrated in **Figure 4-14**. The PFEIS (BLM, 1999) concluded that groundwater quality at the site was good and generally useable for domestic and agricultural purposes. This document also concluded that past mining in the Hillsboro District, the Copper Flat Mine tailings facility drainage, and the presence of an oxidized sulfide-bearing ore body have impacted groundwater within and immediately adjacent to the area of past mining, resulting in elevated total dissolved solids (TDS) and sulfate that exceed New Mexico Water Quality Control Commission (WQCC) Standards. These impacts were found to be localized within the immediate vicinity of the mine features or associated with wells completed in the ore body.

Newcomer *et al.* (1993) determined that the quality of groundwater at the site has changed little since the early 1980s and probably since the 1800s. The authors found that there have been some increases in TDS and sulfate in some wells along Greyback Wash below the mine site and down-gradient of the tailings dam, associated with mining and milling activities in the 1980s. Newcomer *et al*. (1993) determined that the only constituents exceeding the WQCC Standards were barium from a spring sample, and, cadmium and fluoride from a pit lake water sample.

Raugust (2003) compiled historical groundwater data and summarized groundwater quality conditions and, based on his data compilation and analysis, concluded:

- Groundwater pH measurements both up and downgradient of the pit lake range from 7 to 8.2.
- TDS and sulfate values are less than WQCC standards in the wells evaluated for this analysis; however, samples downgradient of the mine have increased gradually over time and are approaching the standards for TDS.
- Historical sampling of well GWQ-5, located east and downgradient of the pit lake, indicates that water quality in the vicinity of the pit lake may have been affected naturally by the presence of the ore body prior to mining in 1982.
- The groundwater upgradient of the mine pit lake is high quality with relatively high proportions of chloride and sulfate. Groundwater downgradient of the pit lake shows relatively higher proportions of bicarbonate and calcium and relatively lower proportions of sulfates.
- Pre-Quintana mining (June 15, 1981) groundwater data collected from wells downgradient of the pit lake show similar anions and cation distributions to post-Quintana mining activities (1996 and 1998). This indicates that groundwater quality downgradient of the ore body reflects the natural weathering of the Copper Flat porphyry system.

4.4.2.1.4 NMED Stage 1 Abatement Plan Requirements

On August 20, 2008, the NMED sent a letter to the site owner at that time requiring a Stage 1 Abatement Plan (20.6.2.4101 NMAC). The purpose of the Stage 1 Abatement Plan is to provide the data necessary to select and design an effective abatement alternative. The requirements for the Stage 1 Abatement Plan are described in 20.6.2.4106 NMAC. The abatement plan proposal must include an investigation to define the extent and magnitude of any existing groundwater and surface water contamination and to characterize the hydrogeology of the site. These requirements are similar to the EMNRD requirements for completing a Baseline Characterization Report, and these efforts would be conducted in parallel; therefore, the surface water and groundwater requirements of this SAP are relevant to both characterization efforts.

NMCC's meetings with the NMED concerning the abatement requirements have revealed the following key concerns on the part of the NMED:

- Groundwater impacts from the existing unlined tailings impoundment have been documented, but have not been fully characterized;
- Samples of pit lake water quality reveal exceedences of WQCC standards, and NMED is concerned about migration of this water away from the pit, causing additional groundwater impacts as well as ongoing contact with wildlife; and
- Acid leaching could be occurring due to ongoing ore exposure.

NMCC is currently working with NMED to address these issues.

4.5 Soils

A successful reclamation program is dependent, in part, upon the quantity and quality of soil available for use during the reclamation process. NMCC assessed the quantity and suitability of topsoil present at the site in two ways. First, NMCC reviewed current literature concerning soil characteristics, and second, NMCC determined site-specific soil characteristics. The findings are summarized in this section of the SAP. In addition, baseline soil surveys were completed on the project area as recently as the late 1990s, and are briefly summarized and referenced in the PFEIS (BLM, 1999).

The term "topsoil" refers to the A master soil horizon (Soil Survey Staff, 1999), which is the uppermost mineral horizon that contains organic matter and can be salvaged from the areas to be disturbed and is capable of supporting vegetation, or other soil material capable of supporting vegetation. This material is often referred to as "suitable top dressing" or "growth media." NMCC has reviewed previous literature describing the results of soil surveys completed at the site (BLM, 1999) and is aware that the presence of an A master soil horizon across the site is limited. The purpose of the soil survey and sampling proposed in this section of the SAP is to evaluate the presence of suitable top dressing. However, in the interest of conforming to the requirements of the Mine Act regulations, the term "topsoil" is used throughout this section to refer to suitable top dressing and/or growth media.

General information about the soils present at the site was obtained from a Soil Conservation Service (SCS) survey completed by Neher (1984). The SCS (now the Natural Resources Conservation Service) mapped two major soil types that occur in the Copper Flat area:

1. The Luzena-Rock Outcrop association
2. The Scholle-Ildelfonso association

All but the easternmost portion of the proposed site is mapped as Luzena-Rock Outcrop association, which is typically present on the steeper slopes of hills and mountains. These soils are typically shallow, very gravelly and cobbly loams and clay loams. The Scholle-Ildelfonso association occurs on more gentle slopes of the piedmonts and mountain toes and is deep, well-drained, and formed in mixed alluvium. The resulting soil texture in these areas is primarily gravely loams and gravelly clay loams (SRK, 1996). The soils are thin and of low productive capacity. The soil textures are primarily gravelly loams and gravelly clay loams and are subject to continuing wind and water erosion. Along with the natural erosion, much of the Copper Flat landscape has been severely disturbed by historical placer mining and the 1982 mining operation. Over 65 percent of the areas targeted by the proposed operation were disturbed during the 1982 operation. Soils were replaced in the north cell of the tailings impoundment and over a portion of the plant site.

4.6 Vegetation

Plant species inventories were conducted in 1976, 1991, 1992 and 1994; newly initiated studies are being advanced to update and expand these previous surveys and inventories. Plant species lists are included in the 1993 EA (BLM, 1993). The pre-mining vegetation inventory is detailed in the 1977 EAR and the 1978 Environmental Assessment Record (BLM, 1978).

The Copper Flat area is within the Mexican Highlands section of the Basin and Range Physiographic Province, and more specifically defined as Southern Desertic Basins, Plains, and Mountains (NRCS 2010). This elevation transition causes an intermixing of environmental factors which has a direct correlation on the variety of vegetation in the area. The vegetation is composed primarily of two desert associations: Chihuahuan desert scrub and desert grassland. In the vicinity of Copper Flat, the low elevation flats and foothills are characterized by Chihuahuan desert scrub (which can be dominated by creosote bush). The highest elevations are predominantly desert grasslands with some scattering of juniper. The intervening area is dominated by desert grasses with a mixture of shrubs.

Much of the Project area has been disturbed by the mining activities of the prior 1982 operation. The dominant biotic communities within the Copper Flat area consist of creosote bush (i.e. Chihuahuan desert scrub) and desert grassland, on the fringes of some piñon-juniper (or juniper savanna) habitat (BLM, 1996).

4.6.1 Chihuahuan Desert Scrub (or Creosote Bush) Community

Grasses can dominate the landscape and may sometimes grow in pure stands. At the Project site, the grasses are associated with a wide variety of sub-dominant shrubs (yucca, *Yucca* spp.; three-leaf (or lemonade) sumac, *Rhus trilobata*; yerba-de-pasmo, *Baccharis pteronioides*; mesquite, *Prosopis glandulosa*; feather dalea, (*Dalea formosa*); creosote bush, *Larrea tridentata*; sage, *Artemisia* spp.; catclaw, *Mimosa* sp.; rabbitbrush, *Chrysothamnus* spp. and broom snakeweed, *Gutierrezia sarothrae*), trees (Gambel oak, *Quercus gambelli*; Emory oak, *Quercus emory*; willow, *Salix gooddingi* and *Salix exigua*; and cottonwood, *Populus* spp.), and forbs (cactus, *Opuntia* spp.; locoweed, *Oxytropis lambertii* and *Astragalus* spp.; *Geranium* sp., *Solanum* spp., and *Haplopappus* sp.).

4.6.2 Desert Grassland

The desert grassland community in the area dominates the higher elevations of the rolling hills, in the gullies, ravines and washes, and on the slopes and low ridges. A number of grass species are characteristic of this community. The major genera are grama grasses (*Bouteloua* spp.), curly mesquite (*Hilaria* spp.), and three-awns (*Aristida* spp.). The grasses dominate the landscape and may grow in pure stands. At the Project site, the grasses are associated with a variety of sub-dominant shrubs (*Yucca* spp.; lemonade sumac, *Rhus trilobata*; *Baccharis pteronioides*; mesquite, *Prosopis glandulosa*; feather dalea (*Dalea formosa*); creosote bush, *Larrea tridentata*; sage, *Artemisia* spp.; catclaw, *Mimosa* sp., rabbitbrush, *Chrysothamnus* spp. and *Gutierrezia* sp.), trees (Gambel oak, *Quercus gambelli*; Emory oak, *Quercus emory*; willow, *Salix gooddingi* and *Salix exigua*; and cottonwood, *Populus* spp.), and forbs (cactus, *Opuntia* spp.; locoweed, *Oxytropis lambertii*; *Geranium* sp., *Solanum* spp., and *Haplopappus* sp.).

4.6.3 Pinion-Juniper Community

The piñon-juniper and juniper savanna communities occur between the desert grasslands and the coniferous forests at an elevation of about 5,500 feet. All of the sites occupied by this community are on the higher knolls, northern aspects, and in steep, rocky terrain. Although this community is represented by one-seed juniper (*Juniperus monosperma*), it is also known for its association with range forage plants.

4.6.4 Aquatic Vegetation

The presence of aquatic plants in the Copper Flat area is severely limited due to the temporary, intermittent character of Greyback Wash and the lack of other water. Isolated, limited quantities of aquatic plants occur at stock watering areas, in abandoned, caved-in mine shafts, in isolated rock crevices along drainages, and at seeps. The production and diversity is severely limited. Cattails (*Typha* sp.), sedges (*Carex* spp.) and algae (*Chlorophyta*, *Cladophora* sp., *Scenedesmus* sp., and *Spriogyra*; *Euglenophyta*, *Euglena viridis*; and *Bacillariophyta*, *Nitzschia* sp. and *Navicula* sp.) can be located in appropriate habitats. The algae exist only when water is present during the warmest summer months.

Three riparian areas associated with seeps in Greyback Gulch were identified in 1995 during the site investigations performed for the EIS (BLM, 1996) process. The first is located east of the East Waste Rock Disposal Area and north of the access road. This area supports a small group of cottonwoods and willows. The second seep is located south of the plant area and is fed by runoff from the road between the pit and plant area. This seep does not support willows or cottonwoods but provides water to wildlife and livestock intermittently during the year. The third seep present in the immediate area of the proposed mine is located in Greyback Wash immediately east of the tailings thickener. The original stormwater collection pond is located adjacent to this area and it is believed that this pond, left open during reclamation activities in 1986 has been acting as a reservoir which has been draining into the riparian area through the original discharge pipe which was left in place. This area supports a small group of cottonwoods, willows and other herbaceous species.

One riparian area of relatively moderate functional value is located approximately 2.8 miles west of the mine site in Warm Spring Canyon (BLM, 1996). This small wetland covers less than 0.1 acre and supports several wetland species, including willow and tamarisk. Riparian habitat associated with Las Animas Creek, a perennial stream located approximately 4 miles northeast of the mine area, supports a variety of trees and shrubs including plains cottonwood, Arizona sycamore, walnut, mesquite, Apache plume, hackberry, Mormon tea and prickly pear. Percha Creek is a perennial stream located approximately 2.2 miles south of the mine site which supports a variety of riparian vegetation. Dominant species along this creek include willow, seep willow, ash, plains cottonwood, locust and walnut.

4.6.5 Vegetative Productivity

Foliar cover and forage productivity estimates for desert grassland and previously disturbed land present within the project area were based on visual observations made during field reconnaissance activities and data provided in the soil survey for the Sierra County area (NRCS, 1984). An analysis of 12 vegetation plots was conducted by Glover prior to the 1982 disturbance (Glover, 1977). This work and nearby off-site range transects performed by the SCS (Sierra Soil and Water Conservation District, 1990) provided some historic estimates of the vegetative cover, density and productivity in the permit area prior to mining disturbance. Based on current ecological site descriptions, foliar cover for desert habitats within the general vicinity of the project area would be no more than approximately 30 percent (NRCS, 2010). Correspondingly, vegetative productivity would range from a low of 150 pounds/acre in unfavorable years, to 450 or perhaps even 750 pounds/acre of forage during favorable years (NRCS, 2010). Consequently, this is a very wide range in potential plant productivity and is highly subject to annual amounts of precipitation. Undisturbed desert grassland occurs in the tailings impoundment area, the East Waste Rock Disposal area, the North Waste Rock Disposal area, and the topsoil stockpiles.

Approximately 65 percent of the project area has been disturbed by previous mining operations. As of 1996, the average foliar cover for previously disturbed land is approximately 5 to 15 percent, with the highest foliar cover of approximately 15 percent occurring in the tailings impoundment area and the lowest foliar cover of less than five percent generally occurring at the pit, the West and North Waste Rock Disposal areas, and the Lean Ore Stockpile (Sierra Soil and Water Conservation District, 1990). The majority of previously disturbed land occurs in the tailings impoundment area, the pit, the Lean Ore Stock Pile area and the West Waste Rock Disposal area.

4.7 Wildlife

Wildlife inventories were conducted in 1976, 1991, 1992 and 1995; newly initiated studies are being advanced to update and expand these previous surveys and inventories. Wildlife species lists are included in the Copper Flat Project DEIS (Sierra Soil and Water Conservation District, 1990). The pre-mining wildlife inventory is detailed in the 1977 EAR (Glover, 1977), 1978 Environmental Assessment Record (BLM, 1978), DEIS, and PFEIS.

4.7.1 Mammals

There are a limited number of mammals occurring in the Copper Flat area, and the major factors believed responsible are: (a) low annual productivity of vegetative food and cover, (b) limited diversity in the plant communities present, and (c) lack of water. No aquatic mammals, amphibians nor fish have been observed in the Copper Flat area. No information is available on the myriad of invertebrates present in the area. Mammals that utilize the area are domestic cattle, deer, horses and several feral-domestic goats.

Mule deer harvest has stabilized since introduction of new regulations over the past 15 years. With the reclamation program of 1986, a small number of mule deer have frequented the mine site to feed on the reseeded grasses but move into the remote hills during the hunting season and into the lowlands during severe winters.

4.7.2 Birds

The numbers and species of birds vary widely with the seasons. Waterfowl sporadically use the existing pit lake, particularly during migration (BLM, 1996). Shorebird use of the lake is limited due to the lack of shallow foraging areas and appropriate habitat (BLM, 1996). A variety of raptors utilize the area of interest and the most common are: red-tailed hawk (*Bueto jamaicensis*), kestrel (*Falco sparverius*) and marsh hawk (or northern harrier) (*Circus cyaneus*). Golden eagles (*Aquila chrysaetos*) have been observed in the Copper Flat area. The Bald eagle (*Haliaeetus leucocephalus*) occasionally visits the Las Animas Creek area (8 km north of the mine site) during the winter and spring seasons. Historically, no active raptor nests nor regular eagle roosting sites were known to occur in the Copper Flat mining area. Based on a recent observation, this may not be true anymore. An active nest of the great horned owl (*Bubo virginianus*) was observed on a cliff face.

4.7.3 Reptiles

Six species of reptiles have been observed in the area; however, approximately 36 species of reptiles and amphibians are expected to occur in the greater district (BLM, 1996). By far, the most numerous are the different lizards. A variety of snakes, including rattlesnakes, are present in the area. The 1977

Environmental Assessment Report (Glover, 1977) and 1978 Environmental Assessment Record (BLM, 1978) present the reptilian species observed during environmental monitoring and probably represent the most abundant species within the area.

4.7.4 Invertebrates

A tremendous variety and abundance of invertebrates occur in the area of interest. The most numerous are beetles (Coleoptera). Other common orders are the bugs (Hemiptera and Homoptera), bees and wasps (Hymenoptera) and centipedes (Chilopoda). Butterflies and moths (Lepidoptera) are seen infrequently.

4.7.5 Fisheries

The only perennial aquatic environment at the mine site is the pit lake. No fish occur in the pit lake (BLM, 1978).

4.8 Threatened, Endangered, or Candidate Species

A Biological Assessment has been prepared in accordance with Section 7(c) of the Endangered Species Act to determine if any sensitive plant or animal species may be impacted by the proposed Project. The BLM, as lead agency for the EIS process, requested a Section 7 consultation from the U.S. Fish and Wildlife Service (USFWS). A total of four federally-listed and 15 federal candidate species were addressed in detail in the 1996 Biological Assessment (BLM, 1996).

Newly initiated threatened and endangered studies are being advanced on the project area to update and expand the previous studies and survey. Most of the species being targeted for review and for potential habitat are species of concern (or sensitive listed species), those that do not have official protection status. There are a couple of officially listed threatened and endangered species to be evaluated, which are discussed in the following sections.

4.8.1 Vegetation

Grama grass cactus (*Pediocactus papyracanthus*) was the only endangered or threatened species whose habitat might include the Copper Flat Project acres (BLM, 1996). The 1976 and 1992 searches and inventories did not reveal the presence of the grama grass cactus or any other sensitive plants (BLM, 1996). A couple of the plant species of concern to assess include Sandberg’s pincushion cactus (*Escobaria sandbergii*) and the Pinos Altos fame flower (*Phemeranthus humilis = Talinum humile*). A state of New Mexico endangered cactus, Duncan’s pincushion (*Escobaria duncanii = Coryphantha duncanii*) would also need some investigation. One of the only known locations for this cactus species is situated very close to the Copper Flat site.

4.8.2 Wildlife

Mining and other surface disturbance activities may affect species listed by the USFWS and New Mexico Department of Game and Fish as threatened, endangered, or candidate. A list of a number of endangered and threatened fauna that might occur in the assessment area is presented in the 1996 DEIS (BLM, 1996), 1996 BA (BLM, 1996), and 1999 PFEIS.

The peregrine falcon (*Falco peregrinus*) occurs commonly in the Rio Grande Valley and might occasionally be expected to hunt in the foothills east of the Black Range.

Bald eagles were seen flying in the vicinity of the site in 1995 and probably forage along Caballo and Elephant Butte reservoirs. Local riparian areas near the mine site could provide additional forage habitat, however these areas would not be considered optimal foraging habitat for eagles, and no records indicate that bald eagles use them for foraging or roosting.

The loggerhead shrike (*Lanius ludovicianus*) was observed during the field assessment in 1991. This species is very wide spread (habitat comprises 63 percent of BLM land in Sierra County).

The common black hawk has been recorded along Percha Creek; however, no nesting sites have been documented. Las Animas Creek could provide suitable habitat for this species.

The ferruginous hawk historically occupied the region and has been recorded within the creosote upland and grass mountain habitat near the location of the proposed project (IHICS, 1995). The area was surveyed in 1991 for the presence of nesting ferruginous hawks; no sign of nest hawks was observed in or near the Project at that time (Stinnett, 1991).

The northern goshawk is associated with a variety of forest type habitats which do not occur in the Project area. No sightings of this species have been reported in the vicinity of the Project.

Baird’s sparrow, a state of New Mexico threatened species, is migratory in New Mexico and most commonly observed in the fall. This species has been observed in Sierra County, but foraging grassland habitat is limited in the Project area and no sightings have been recorded.

Habitat for six of the seven species of bats studied during the preparation of the EIS exists in the Project area, including the greater western mastiff bat, occult little brown bat, spotted bat, fringed myotis, Yuma myotis and pale Townsend’s big-eared bat; however, some of these habitats would be considered marginal to support these species. The Townsend’s big-eared bat has been documented roosting in the Tony House, located near the tailings facility. The detailed background information and the potential for occurrence pertaining to these seven sensitive bat species is presented in the Biological Assessment prepared for the Project.

The Texas horned lizard has been documented in Sierra County and is known to occur in and near the Project site.

The long-fin dace was documented in Percha Creek in 1995. This fish, a federal candidate-category 2 species is believed to have been introduced into Percha Creek, since it does not naturally occur east of the Continental Divide (Bison-M, 1995) (BLM, 1996).

Habitat requirements for a few other wildlife species of concern would be evaluated such as the western burrowing owl (*Athene cunicularia hypugae*), Gunnison’s prairie dog (*Cynomys gunnisoni*), and pocket gophers (*Geomys* spp.).

4.9 Range Resources

Livestock grazing is allowed in areas adjacent to the mine area. However, the grazing Allotment (No. 6079) does not include the Project area at this time because of the need to exclude livestock from the area of mining activity.

4.10 Air Quality

The primary pollutant of interest at the mine site is fugitive dust since the emissions of other pollutants are quite small. Alta installed a PM_{10} monitoring station at the site in 1994 to collect baseline information at the site (Air Sciences, 1995). The DEIS utilized fine particulate data collected at Gold Hill by the New Mexico Air Quality Bureau from 1990 to 1992 to evaluate ambient air quality at Copper Flat (BLM, 1996). Although Gold Hill is located more than 20 miles west of the Project area, operations at Gold Hill are similar to those proposed for Copper Flat and it was assumed that data collected at Gold Hill would be representative of conditions at the Project site (BLM, 1996). High winds sometimes create local dust storms which result in higher short-term concentrations; nonetheless, Sierra County has been designated as an attainment area, which means that the area meets all applicable air quality standards. Because there are no significant pollution sources in the area, the overall air quality in the vicinity of the Project site is good (BLM, 1996).

The primary air quality impacts from the Project would be associated with particulate emissions. Modeling of these impacts indicated that the maximum values for 24-hour and annual concentrations of Total Suspended Particulates (TSP) would occur at the property boundary (BLM, 1996). The nearest Class I area is located more than 30 kilometers west of the Project and the models indicated that levels would fall below $1 \mu g/m^3$ within less than 10 kilometers from the site. Therefore, there would be no significant impact from the Project on any Class I area (BLM, 1996).

NMCC installed one meteorological and two air quality monitoring stations at the site in August 2010 for the purposes of collecting more up-to-date information on current air quality.

4.11 Cultural Resources

Several cultural resources surveys have been conducted at the site since 1976. The initial surveys were conducted for the 1977 and 1978 EARs (Glover, 1977). A subsequent Class III (100-percent pedestrian coverage) cultural resources survey was conducted by Mariah Associates for Gold Express in 1991 (Evaskovich, 1991). In response to comments from the New Mexico State Historic Preservation Officer (SHPO) in August, 1995, Alta contracted with Human Systems Research (HSR) of Las Cruces to resurvey all of the undisturbed portions of the Project not covered by the 1991 survey. The results of this survey were filed with the SHPO in October 1995 (Sechrist, 1995). Because the HSR survey was conducted more than 10 years ago, the lead federal agency (BLM) for cultural resource compliance review and the SHPO would review the previous survey for sufficiency and consistency with current standards for survey investigations. This review would also take into consideration the probability for new sites to have become exposed in the interim, such as through active dune formation/movement. If it is determined that a new pedestrian survey does not need to be conducted prior to construction, then the fieldwork effort for cultural resources likely would be limited to revisiting previously recorded sites to evaluate their current condition, and to reassess potential effects to these resources from the Project.

A number of prehistoric and historic sites eligible for listing in the National Register of Historic Places have been identified at the Project area. Where possible, identified sites would be avoided by modifying the design of project components. For sites which might be impacted by the Project, and for which avoidance is not feasible, NMCC would contract with qualified archaeologists to prepare a recovery plan to collect appropriate data, to minimize and mitigate adverse effects to cultural resources resulting from the Project. Following approval by the BLM and SHPO, the recovery plan would be implemented prior to construction.

5 Reclamation and Closure

5.1 Introduction

The Copper Flat Project site would be reclaimed to achieve a self-sustaining ecosystem appropriate for the climate, environment and land uses of the area. Careful consideration would be given to cooperation with neighbors in their land use requirements including cattle grazing, alternate energy generation such as wind and solar, and reestablishment and enhancement of original botanical and zoological species habitants.

The reclamation plan has been developed to meet the site specific characteristics of the mining operation and Project site. The objective of the reclamation plan is to return the Project site to conditions similar to those present before re-establishment of the mine. The mining operation and reclamation plan have been designed to use the most appropriate technology and BMPs to assure protection of the human health and safety, the environment, wildlife and domestic animals. The Project is designed to meet, without perpetual care, all applicable federal and state environmental requirements following closure.

5.2 Statutory and Regulatory Requirements

Reclamation of disturbed areas caused by the Project would be in compliance with federal and state regulations. Under the Federal Land Policy Management Act (FLPMA), the BLM is responsible for preventing undue or unnecessary degradation of federally-administered public lands which may result from operations authorized by the mining laws (43 CFR 3809). The New Mexico Mining Act requires the preparation of a reclamation plan for submittal and approval by the New Mexico Energy, Minerals and Natural Resources Department (NMEMNRD) and New Mexico Environmental Department (NMED). In addition, closure of the tailings embankment must also comply with requirements of the New Mexico State Engineer’s Office.

Reclamation would be conducted concurrently with mining operations where feasible. At closure, final reclamation would be accomplished by a “close out” work force.

5.3 Post-Mining Land Use

Major land uses occurring in the vicinity of the Project site are mining, grazing, wildlife, watershed and recreation. Following closure, the Project area would continue to support mineral development, grazing, wildlife habitat, watershed, and to a lesser degree, recreation. Proposed reclamation of the site should result in a successful program to restore the area to the productive land uses discussed above. All post-closure land uses are in conformance with the previously defined BLM Caballo Planning Unit, the 1985 White Sands Resource Management Plan (RMP) and the Sierra County Comprehensive Land Use Plan. Currently, the White Sands RMP is being revised, updated, and incorporated into the BLM’s Tri-County RMP/EIS. The new Tri-County RMP includes Sierra, Otero, and Doña Ana Counties. This revision process began in 2005; the Preliminary Draft EIS was issued in September 2011.

Following closure, the pit would partially fill with water from sub-surface flow resulting in a permanent impoundment (SRK, 1995). Hydrogeologic and geochemical modeling indicates the post-closure pit lake water quality should be similar to that of the current pit lake (SRK, 1995). Possible post-closure uses for the pit include a water reservoir for agricultural and grazing purposes. The pit lake has also been proposed by the BLM as a possible location for a field-scale aquatic life laboratory, or other possible cultural uses yet to be identified.

5.4 Summary of Disturbance

Reconstruction would involve utilization of existing foundations and previously disturbed land where feasible. For the Proposed Action, approximately 57 percent of the proposed disturbance would take place on areas disturbed during the previous operations. New disturbance of previously undisturbed land would be kept to a minimum. Approximately 37 percent of the new disturbance would be related to the tailings and waste rock facilities.

Areas to be disturbed are divided into the following major mine components: open pit area, waste rock disposal areas and low-grade stockpile, tailings impoundment, and plant site. The utility corridor, access road and surface water diversions were developed during the previous operations and no further disturbance is anticipated associated with these facilities. The majority of the haul roads were also developed during previous operations and only minor additional disturbance would be related to haul road construction.

5.5 Reclamation Plan

The goal of the Copper Flat reclamation program is to minimize disturbance to the environment and to restore disturbed areas to a self-sustaining ecosystem consistent with applicable regulations, the post-mining land use and mine reclamation standards. The objectives of the Copper Flat reclamation program are:

- To meet or exceed applicable state and federal reclamation requirements through application of most appropriate technologies and BMPs.
- To minimize erosion and prevent contribution of suspended solids to streams and other bodies of water through employment of best management practices and contemporaneous reclamation, to the extent appropriate and practicable.
- To protect human health and safety, the environment, wildlife and domestic animals, cultural resources, the hydrologic balance, and extant riparian and wetland areas, including reclamation of any streams that may be impacted by the mining operations.
- To protect the quality of surface and ground water resources by minimizing pollutant formation, and on-site containment of any unavoidable toxicity.

- To preserve suitable topsoil and other approved topdressing material for use in reclamation, employing appropriate and BMPs for sampling, testing, replacement, and stabilization.
- To establish surface soil conditions most conducive to regeneration of a stable plant community through stripping, stockpiling, and reapplication of alluvial or soil material where feasible.
- To revegetate disturbed areas with a diverse mixture of appropriate plant species, in order to achieve a self-sustaining ecosystem or other approved post-mining land use.
- To identify any roads that may be disturbed by mining operations and which are not planned to be returned to use, consistent with the approved post-mining land use and applicable land owner approvals.
- To maintain public safety and site stability through appropriate recontouring and revegetation of disturbed areas within the permit area.
- To work with local and regional communities to identify post-mining uses of the land and facilities to enhance opportunities to sustain the economy and culture in the post-mining phase of this project.

Surface facilities, equipment and buildings related to the mining Project would be removed, foundations covered, and the plant site returned to conditions similar to those present before re-establishment of the mine. The topography, slopes and aspects of the disturbed and reclaimed areas would be developed to blend in with the present, existing physiographic forms of the Copper Flat area, as feasible.

5.6 Implementation

Contemporaneous reclamation of disturbed surface areas would be an integral part of the mining operation. Both public and private land would be reclaimed. At completion of mining activities, the site would be restored to conditions and standards to meet approved post-mining land uses. These uses would include native plant communities similar to surrounding undisturbed areas, wildlife habitat, and grazing land potentially suitable for livestock. The reclamation and restoration must be demonstrated to be sustainable without perpetual care. Closure of the site would be accomplished by the following activities:

- <u>Pre-construction and Permitting</u>: This is the stage wherein baseline data is collected to characterize the existing environment. The baseline data are used to formulate reclamation goals. This stage has been conducted since the late 1970s and currently new studies are being advanced to add to this existing database of studies to expand and update to current requirements.
- <u>Construction</u>: Where feasible, the existing soils and suitable alluvial material would be removed first from major disturbance areas (tailings impoundment, waste rock disposal areas, etc.), stockpiled, protected, and used in the reclamation process. The revegetation test program would be initiated during this phase of the operation.

- Operations: Reclamation efforts would be implemented at the earliest feasible time in areas where activities are discontinued. This includes recontouring, scarifying, placement of soil, alluvial material, and other approved topdressing material, followed by revegetation. The revegetation test program and concurrent reclamation would be monitored during this phase to provide data that would be utilized to determine final closure methods to be implemented to achieve reclamation goals, subject to regulatory approval.
- Closure: Upon closure of the mining operations, unreclaimed facilities would be reclaimed according to the reclamation plan.
- Post-Closure Monitoring: Following the completion of reclamation and closure activities, the revegetation would be monitored for at least two growing seasons and meet Part 6 requirements under the New Mexico Mining Act. Groundwater would be monitored according to conditions set forth in the Ground Water Discharge Permit, which was prepared by NMCC for submission to NMED, and is currently undergoing technical review.

A tentative project schedule, including reclamation schedule encompassing these five project stages, is presented in **Figure 5-1**. The schedule shown is approximate and could change due to a number of operational and economic conditions.

5.7 Environmental Considerations for Reclamation

The reclamation plan is designed to assure protection of human health and safety, the environment, wildlife and domestic animals.

5.7.1 Signs, Markers and Safeguarding

Measures such as signs, markers, fences and barricades would be used to protect the public, wildlife and domestic animals from potentially dangerous areas associated with the Project. Safety measures associated with the major Project components are discussed in more detail in Section 5.16.

5.7.2 Wildlife and Domestic Animal Protection

Reclamation of the Copper Flat Project would be conducted to achieve a stable configuration and access to unsafe areas would be restricted for protection of the public and animals.

The Project would result in the reclamation of over 910 acres of land disturbed by previous mining activities. This reclamation would be a beneficial impact to wildlife resources. However, because of the long-term loss of woody species, the reclamation of the previously disturbed land would mainly benefit those species typically associated with herbaceous vegetation. It is anticipated that the Project area would support a greater variety of species following closure due to the additional habitat diversity created by the mining and reclamation programs.

5.7.3 Cultural Resources

Cultural resources requiring protection, and any cemeteries or burial grounds (none are anticipated), shall be protected and/or avoided during reclamation activities. This includes any resources identified before or during Project activities.

5.7.4 Hydrologic Balance

Preliminary hydrogeologic studies were completed in the 1990's to estimate the potential impacts to groundwater from the tailings impoundment and to surface and groundwater from acid mine drainage (ARD) from the waste rock piles (SRK, 1995). In addition, the predicted elevation and final chemistry of the pit lake was modeled (SRK, 1995). Like many pit lakes in the arid American Southwest, the Copper Flat pit lake is expected to act as an evaporative sink such that groundwater flows into the pit and only leaves by evaporation to the atmosphere. The hydrologic impact assessment report, currently being updated by NMCC, will directly address the future hydraulic relationship between the pit lake and adjacent aquifers through the site conceptual model, including a pit water balance study. Simulation of time-varying groundwater heads, pit water level and flow rates between the adjacent aquifers and the pit lake will be conducted using a numerical flow model to be constructed from the conceptual model. The pit water balance and history of measured water levels in the existing pit will be used to help calibrate the numerical model. Predictive simulations will simulate the ultimate pit and adjacent aquifers from cessation of mine operations to re-establishment of the equilibrium pit lake stage.

For the reasons set forth below, the potential for ARD from the Project is considered low.

5.7.4.1 *Acid Rock Drainage*

Although no major impacts have been identified associated with waste rock disposal from the previous operations, the potential for acid generation from some of the rocks has been identified. Studies were completed previously to evaluate the potential for acid generation and metal leaching from the various types of mine overburden, waste rock and tailings materials at the site (SRK, 1995) and additional studies and evaluations are underway to augment and update the information currently available.

The results of the ARD studies indicate that the potential for ARD from the tailings is considered low. The risk of ARD from the bulk of the existing and future waste rock is also considered low; however, some of the waste rock to be extracted would be partially oxidized (transitional) and this material has the potential to generate acid if not disposed of properly. Therefore, the transitional waste rock would be managed and reclaimed to alleviate the potential for ARD. Because of improved project economics, it is estimated that a major portion of the previously identified transitional material would now report to the tailings facility.

Proper waste management has been proven effective in alleviating the potential for ARD. The transitional waste rock would be segregated and placed in the west and north waste rock disposal areas for the Proposed Action as shown on **Figure 3-1**. The surface of the all waste rock disposal areas would be reclaimed in the same manner as proposed for disposal areas containing partially oxidize material. The disposal areas would be contoured to enhance run-off and covered to reduce infiltration.

The waste rock piles would be reclaimed by regrading, dozer compacting the surface and covering this surface with up to 12 inches of native soil. These measures would inhibit infiltration and reduce the quantity of water required to produce drainage. The waste rock disposal areas containing transitional material would be located adjacent to the pit lake. In the unlikely event acid drainage does occur, it would flow into the pit lake where it would be diluted by ground water inflow and prevented from migrating into ground water. The high evaporation of the pit lake water causes ground water to flow into the pit, preventing any surface inflows from entering the ground water.

The quality of the current pit lake water appears to be impacted by oxidation of minerals exposed in the pit wall. Results of pit water sampling indicate that, although the water in the pit meets state surface water quality standards for livestock and wildlife use, it contains elevated concentrations of sulfate, fluoride, calcium, cadmium and manganese. A preliminary study has been completed to determine the post-closure pit water quality (SRK, 1995), and ongoing geochemical characterization work would update this study. The findings of the study indicate that the majority of the transition materials would be removed by the pit expansion, significantly reducing the surface area of these materials exposed in the pit walls in comparison to the present day condition of the open pit.

Run-off from the waste rock disposal areas would be collected in facilities constructed at each area.

5.7.4.2 *Suspended Solids*

Sediment control would be achieved by the use of BMPs. BMPs include regrading, seeding and mulching, silt fences, straw bale dams, diversion ditches with energy dissipaters, and rock check dams at appropriate locations during construction and operation. Diversion structures, including existing structures, would divert run-on away from disturbed areas. New diversion structures and sediment control features for the proposed MPO would be evaluated according to the criteria contained in **Appendix B**. All sediment control structures would be monitored and maintained on a regular basis.

During operations, all run-off from the plant site would be directed into a sediment pond located on the east side of the site adjacent to the make-up water pond. Following reclamation this pond would no longer be necessary for sediment control. The dike separating the sediment pond from the make-up water pond would be removed, the pond regraded to restore conditions similar to those currently existing, and the site revegetated.

5.7.4.3 *Diversions and Overland Flow*

Runoff from particular areas of the Copper Flat Project site was originally estimated using the climate data summarized in Section 4.3. The surface drainage of the Project site was designed to contain or control the 100-year/24-hour storm event (**Appendix B**). NMCC is in the process of re-evaluating these design criteria with respect to current regulations and engineering standards. During reclamation most areas would be regraded and, where possible, the original drainages restored.

The diversions of surface water runoff around the waste rock disposal areas would remain in place. Ditches would be lined with rip rap, as needed, to protect the channels from erosion.

5.7.4.4 *Stream Diversions*

The watershed area to the west of the pit is drained by Greyback Wash, an ephemeral stream which is dry over most of its length except during the rainy season. Greyback Wash used to pass through the pit area. This drainage has been intercepted, diverted around the southern periphery of the pit, and returned to the original channel east of the pit area. This was accomplished by cutting a channel through the ridges and placing diversion dams in the tributary arroyos. Following closure of the previous operation, the diversion was left in place. The diversion would be left in place following closure of the proposed operation.

5.7.5 Impoundments

The tailings impoundment has been designed, constructed and maintained to minimize adverse impacts to the hydrologic balance and adjoining property and to assure the safety of the public. Reclamation and closure of the tailings impoundment is discussed in more detail in Section 5.16.4.

5.7.6 Prevention of Mass Movement

All slopes, impoundment embankments and WRDFs would be designed, constructed and maintained to prevent the potential for mass movement both during operations and following closure. Details of WRDF design are presented in **Appendix B**; and for the tailings impoundment in **Appendix D**.

5.7.7 Riparian Areas

The Copper Flat mine area is primarily a terrestrial habitat. No wetlands and two riparian areas are present in the immediate area of the proposed mine. The riparian areas, located in Greyback Wash immediately south and east of the plant site, did not exist prior to the 1982 operation, as evidenced by photographs. The riparian area south of the plant area is believed to have developed as a result of modifications of the flow in Greyback Gulch from culverts installed in 1983. It is believed that the eastern riparian area was created from flow collected in the stormwater collection pond and alterations of surface water flows in Greyback Gulch resulting from the construction of the land bridge for the tailings pipeline. Because the stormwater pond would be used in the proposed operation, NMCC would supply water from the freshwater supply during operations. Following operations, NMCC would endeavor to restore the storm water collection pond to a condition similar to that existing at present. However, the exact configuration which led to the creation of this wetland is not known and complete restoration may not be possible. As with upland vegetation and plant communities, wetland and riparian plant species would naturally become established at locations that are suitable for their survival, growth, and development. This would occur even if such locations and conditions are generated by human activities. The riparian and "wet" areas would be considered during the environmental evaluations and managed appropriately according to state and federal requirements.

5.7.8 Roads

Access to the site is via an existing county road (Gold Dust Rd./Co. Rd. Bo27) which would remain following closure. Prior to final closure, the State of New Mexico and the BLM would determine which other roads would be left intact around the site in order to conduct post-closure monitoring or provide adjacent landowner access. All other NMCC mine-related roads would be removed.

5.7.9 Surface Facilities or Roads Not Subject to Reclamation

A number of pre-1981, primitive roads currently exist within the proposed project boundary. Some of these roads would not be utilized during the currently proposed operation. As such, they are not subject to reclamation by NMCC.

5.7.10 Drill Hole Plugging and Water Well Abandonment

Mineral exploration and development drill holes, monitoring, and production wells subject to state regulations would be abandoned in accordance with applicable rules and regulations (NMAC 19.27.4 *et seq*.). Boreholes would be sealed to prevent cross contamination between aquifers and required shallow seals would be placed to prevent contamination by surface access.

Monitoring wells around the tailings impoundment would be maintained until NMCC is released from this requirement by the NMED, MMD, and BLM. These wells would then be plugged and abandoned according to applicable requirements.

5.7.11 Post-Closure Monitoring

Monitoring would be ongoing throughout the life of the operation, during closure and for a post-closure period. The BLM and state agencies would set post-closure monitoring requirements at mine closure.

Sampling of the water in the pit after mine closure would continue for a period of not less than twelve (12) years following mine closure to determine any changes in pit water quality.

The tailings dam/pond would be regulated by the New Mexico State Engineer's Office for safety of operations. A Discharge Permit that requires monitoring for seepage into the ground water would be required from the New Mexico Environmental Department (NMED), Ground Water Bureau. Following closure water samples from monitoring wells located downstream of the tailings dam, and in the plant and pit area would be taken and analyzed on a regular basis and the results sent to the Ground Water Bureau in accordance with monitoring requirements set forth in the Discharge Plan.

These samples would identify any seepage from the tailings pond. The Discharge Plan Application contains abatement plans if leakage and contamination occurs.

5.8 Site Stabilization and Configuration

The Project site would be stabilized, to the extent practicable, to minimize future impact to the environment and protect air and water resources. The final surface configurations for the Proposed Action (**Figure 5-2**) would be suitable to achieve the post mining land uses as discussed in Section 5.3. All facilities, slopes, embankments, and roads would be designed, constructed, maintained and reclaimed to achieve stable configurations.

The topography, slopes and aspects of the disturbed areas would be developed to blend in with the surrounding topography as much as practicable. Where possible the size and shape of channels of new drainages would approximate former, natural drainages. All drainage channels, ditches and earthen water control structures would be revegetated and protected from erosion by riprap, sediment traps or other types of BMPs. Alluvial materials suitable for surface treatment would be salvaged from disturbed areas where safe and feasible operation of earthmoving equipment is possible, and would be stockpiled and protected for use in reclamation.

An attempt would be made to favor initial revegetation on north and east aspects of gentle slopes where additional moisture is available. A limited number of slopes might exceed a 3H:1V condition but most slopes would be restructured to resemble existing topography. The steeper slopes would be stabilized by physical media (boulders, alluvium, rock) as well as vegetative means to add to general diversity and stability.

Flatter disturbed areas (slopes of 4H:1V or less) would be minimally regraded to restore the natural drainage, and would be revegetated, except those in the tailings impoundment which would be regraded to direct surface water away from the top surface of the reclaimed tailings.

5.9 Plant Growth Media and Cover Materials

5.9.1 Removal and Storage

Suitable soil material available for reclamation from the previously mined and disturbed areas at the Project site is very limited. Efforts would be made to carefully strip, stockpile and improve the remaining growth media available on the site. Because the available soil from newly disturbed areas is thin and of low productive capacity, the O and A horizons of soil material would be salvaged, where possible.

The O horizon is the uppermost soil layer and is composed of slightly decomposed organic materials. It contains a high percentage of microbial constituents found in soils which have been determined to be beneficial to plant life. The A horizon is the uppermost zone from which soluble salts and colloids have been leached and in which fully decomposed organic matter has accumulated. In those areas where the A horizon is shallow or indiscernible, suitable B horizon material would also be stripped and stockpiled. The B horizon is the layer in which material leached from the overlying A horizon is accumulated. It usually contains very little organic matter and is lower in microbial activity than the O and A horizons. However, due to the low organic matter content of the A horizon at this site, the A and B horizons do not differ substantially. For these reasons, the B horizon material would not be stockpiled separately from the O and A horizon soils.

Where salvageable soil exists, either on undisturbed or reclaimed areas, NMCC would salvage as much material as can be safely and practically recovered. However, the lack of reclamation cover material available from previously disturbed areas and the poor development of topsoil (top dressing) at the site will require the evaluation of alternative sources and types of materials for use as reclamation cover. A preliminary evaluation of cover material sources and stockpile alternatives is provided in Appendix D, following the tailings impoundment conceptual design.

Samples of soil materials were collected and analyzed prior to disturbance in 1977 (Glover, 1977) and in undisturbed areas in 1996. Analyses of the 1977 samples indicate the soils collected were fertile, with the exception of soils from the WRDFs being low in available phosphate. The 1996 sample taken from the North WRDF indicated similar results, but that taken north of the West WRDF showed poor fertility. Both samples were low in organic matter (Johnson, 1996).

The estimated volumes of salvageable cover material available in areas to be newly disturbed or redisturbed by the Project are shown in

Table 5-1: Estimated Available Topsoil from Newly Disturbed Areas

Facility	Surface Area (acres)	Estimated Available Cover Material (yd^3)
West WRDF	16.3	3,538
North WRDF	69.9	21,384
East WRDF	122	99,072
Low-Grade Stockpile	64.3	37,913
Plant Area	78	182,800
Tailings Impoundment	547	542,000
Roads and Misc.	50	21,780
Total	**911.5**	**908,487**

A comparison of estimated quantities of available cover material (**Table 5-1**) and potentially required cover material (**Table 5-2**) indicates that there could be a deficit of almost 2.0 million cubic yards of cover material for the currently proposed reclamation plan. As part of the proposed operations, NMCC plans to salvage most of the near-surface alluvial materials from within the limits of the tailings impoundment to mitigate this soil deficit. These materials are part of the Santa Fe formation gravels and alluvial basin fill and were used in the construction of the original starter embankment. An evaluation of the borrow sources and stockpile alternatives for reclamation cover materials is provided in **Appendix D**, following the conceptual tailings design.

Table 5-2: Estimated Reclamation Cover Requirements

Facility	Surface Area (acres)	Top Dressing Cover Requirement (yd^3)	Reclamation Cover Requirement (yd^3)
West WRDF	16.3	13,151	65,755
North WRDF	69.9	56,400	282,005
East WRDF	122	99,072	495,360
Low-Grade Stockpile	64.3	54,611*	--
Plant Area	78	62,920	--
Tailings Impoundment	547	438,000	2,062,509**
Roads and Misc.	50	40,333	--
Total	**911.5**	**764,487**	**2,905,629**

*The Low-Grade Stockpile does not require reclamation cover, as it is anticipated to be processed and removed at the end of mining; however, the disturbance footprint of the stockpile would require some top dressing in order to facilitate revegetation.

** (Golder, 2011a)

No areas unaffected by mining are currently proposed to be disturbed in order to obtain reclamation cover materials. Several borrow areas currently existing within the limits of the tailings impoundment would be the source of the excavated materials. Mine haul trucks and front end loaders would excavate the required materials during the construction period. Following stripping, suitable growth media and alluvial material would be salvaged and stockpiled. These locations were chosen to minimize haul distances and to limit erosion. The piles would be constructed with 3H:1V slopes. The different aspects and slopes of the stockpiles would be used in the test revegetation program to evaluate slope revegetation methods.

Diversion ditches would be constructed around the reclamation material stockpiles, where necessary, to minimize run-on erosion. To stabilize the portions of the stockpiles not used in the revegetation test program, and minimize erosion and maintain biological viability, they would be seeded with an interim, weed-free seed mix as recommended by the BLM. The interim vegetation cover established on the growth media stockpiles would further reduce soil erosion while providing micro-habitats for beneficial soil organisms. In addition, the interim revegetation of the stockpiles would minimize the potential for the establishment of invasive, non-native weed species.

Efforts would be made to salvage the existing vegetation on the areas that would be newly disturbed by the Project. Prior to and during soil salvage, woody plants and vegetation would be removed. The vegetation would be stored with the growth media to increase the organic matter content of the growth media.

5.9.2 Placement

The goal at Copper Flat is to salvage sufficient growth media and alluvial material to provide a 6 to 12-inch cover on areas to be revegetated, if reserves prove sufficient. Less than 12 inches of growth media was placed on the north cell of the tailings impoundment during the previous reclamation efforts. Analysis of the vegetation in that area demonstrates the effectiveness of that thickness of growth media for the purposes of developing a self sustaining ecosystem. Suitable growth media and alluvial materials would be salvaged and stockpiled from all disturbed areas as is feasible. **Table 5-2** shows the required cover volumes by facility.

The final details of the placement and use of these materials in reclamation would be approved by the state and BLM following analysis of the results of a test-plot program which would be conducted during the mining operation. Furthermore, concurrent reclamation using this material would provide additional information regarding the success of the approved techniques and allow ongoing modifications to occur.

To ensure good contact with the subsoils, the surface would be roughened by ripping or disking prior to placement of the cover material. The cover material would be spread and graded with care taken to prevent a reduction in bulk density by limiting the number of passes. Following placement, the area would be walked with a dozer to lightly compact the soil.

5.9.3 Amendments

Soils and alluvial materials to be salvaged for reclamation cover are deficient in nitrogen, phosphorus and potassium and would require 4,000 to 8,000 pounds per acre of amendments to create fertile growth media (Johnson, 1996). Aerobically digested sanitized sewer sludge, cotton husks, feedlot cattle waste are possible natural materials which might be used, if available, to amend the growth media prior to placement on reclaimed areas. Composting of materials, if required, would be performed on site to better control the rate and amount of composting. Any natural soil amendments used would be certified free of invasive and noxious weeds.

Other amendments may also be necessary. Ultimately, fertilizer and amendment requirements would be based on chemical analysis of disturbed/replaced soils, and the results of the test revegetation program and contemporaneous reclamation efforts. The application rates would be determined based on the uniformity of the soil characteristics and topography.

The amendments would be incorporated into the top four to six inches of the surface by harrowing. Repeated applications may be required based upon additional testing and vegetation monitoring.

5.10 Revegetation

The revegetation plan is designed to create a stable, self-sustaining plant community, and would be in conformance with the planned post-mining land uses of wildlife and grazing.

The dominant biotic communities of the Copper Flat area are Chihuahuan desert scrub (often dominated by creosote bush) and desert grassland. The desert grassland community is the major community at the site and is dominated by desert grasses with a mixture of shrubs. The Chihuahuan desert scrub community is found on low elevation flats and foothills and occurs on the eastern portion of the site.

Due to the general harshness of the Chihuahuan desert scrub community, most of the animal species using this habitat are small in size, such as reptiles, rodents, and rabbits. The desert grassland community supports a wide diversity of insects and provides suitable habitat for a variety of animals. Most of the grasses are important for livestock forage and provide watershed protection.

Due to the general lack of surface water, the Copper Flat area provides essentially no aquatic environment. Micro-aquatic ecosystems present along the drainage ways are unstable, and community production and diversity is severely limited.

To achieve the post-mining land use of wildlife and grazing, revegetation of the site would consist mainly of the establishment of grass, forb and shrub species characteristic of the desert grassland community. Plant species would be chosen based on their ability to provide satisfactory cover, and on their nutritional value and ability to support wildlife habitat. Riparian and water-loving plant species (willows, cottonwood, cattails, sedges, etc.) may be introduced in drainage channels and in shallow areas near the shoreline of the pit lake.

Diversity of plant species on revegetated, disturbed lands may be less than on undisturbed areas. However, the seed would contain native plant species (grasses, forbs, and shrubs) in a mix approximating adjacent desert grassland community areas. The revegetation of the re-developed Project is anticipated to be similar to the site prior to re-development; however, over time, through the processes of natural plant community succession, the revegetation should approach a density and diversity similar to that of undisturbed areas adjacent to the disturbed land.

5.10.1 Seed Mixtures

The seed mixtures to be used would be determined by seed availability, compatibility with the vegetation of the surrounding areas, the soil and climatic conditions of the area, and by recommendations from the BLM and NMEMNRD. The reclamation success of the previously disturbed areas would be used as a guide in choosing the mixture. Suitable seed materials may be a limiting factor in revegetation of the site. The seed mixes shown in **Table 5-3 a**re example seed mixes derived from information provided by the NMEMNRD (and the BLM) for revegetation programs in the vicinity of the project. The species included in the list also focus on those that are more readily available. Not all of the species in the immediate vicinity of the project site are readily available from seed suppliers. The list presented is for the purpose of reclamation cost estimation and is not intended to represent a final list. The final seed mix would be approved following review of the revegetation test program results and may be modified with approval of the BLM and NMEMNRD.

Table 5-3: Proposed Reclamation Seed Mixes

Species	Application Rate (lbs. PLS/acre)
Drill Seed Mix	
Blue grama (*Bouteloua gracilis*)	0.6
Side-oats grama (*Bouteloua curtipendula*)	1.3
Indian ricegrass (*Oryzopsis hymenoides*)	1.2
New Mexico feathergrass (*Stipa neomexicana*)	1.0
Tobosa grass (*Pleuraphis mutica*)	1.2
Black grama (*Bouteloua eriopoda*)	0.6
Cane bluestem (*Bothriochloa barbinodis*)	1.0
Narrowleaf globemallow (*Sphaeralcea angustifolia*)	0.5
Four-wing saltbush (*Atriplex canescens*)	0.8
Broadcast Seed Mix	
Blue grama (*Bouteloua gracilis*)	0.6
Side-oats grama (*Bouteloua curtipendula*)	1.0
Sand dropseed (*Sporobolus cryptandrus*)	0.5
New Mexico feathergrass (*Stipa neomexicana*)	1.0
Silver bluestem (*Bothriochloa laguroides*)	1.0
Apache plume (*Fallugia paradoxa*)	1.0
Four-wing saltbush (*Atriplex canescens*)	1.0
Blanket flower (*Gaillardia pulchella*)	0.5
Narrowleaf globemallow (*Sphaeralcea angustifolia*)	0.1

5.10.2 Planting Techniques

Seeding would take place immediately after placement of the cover material, depending on when the cover material is put in place. Seeding should take place when summer moisture is available to encourage the warm season grasses. Consequently, soil placement and seeding are planned to occur prior to the monsoon season of July, August, and September. In the event that seeding occurs substantially later than soil placement, any compacted soil areas may require ripping or scarification. If determined necessary, compacted soils would be ripped or scarified to a depth of 6 to 12 inches prior to seeding. Field experience and changes in local precipitation patterns may alter the seeding schedule to other times of the year.

Seeding methods to be utilized at the site would depend on many factors including the topography, soil conditions and seed mixture. Typically, some combination of broadcast seeding, drill seeding and hydro-seeding is used for mine reclamation. It is expected that broadcast seeding, followed by harrowing to bury the seed to the proper depth would be the seeding method of choice. The presence of larger rocks and boulders in the alluvial materials to be used as reclamation cover would decrease the effectiveness of drill seeding and may preclude this method altogether. Alternatively, the presence of some larger rocks and boulders at the soil surface would create and generate micro-sites favorable to the establishment of vegetation. If drill seeding is not utilized, and broadcast seeding is the primary methodology utilized, then the seeding rates shown in **Table 5-3** would need to be summed (i.e. drill component summed to broadcast component), so that the total seeding rate is in the range of 12 to 16 pounds of pure live seed (PLS) per acre, approximately. Hydro-seeding may be used on steep, small areas where larger equipment cannot easily operate.

Mulch may not be required depending on the time of planting and the terrain. If necessary, a protective mulch such as alfalfa pellets or certified weed free straw would be applied. Hydro-mulch may be necessary in areas that required hydro-seeding. If hay mulch is used, it would be mechanically crimped or secured with a chemical tackifier to prevent erosion. Steep slopes may require erosion control matting or netting.

Weed control would be implemented only if necessary. Methods of weed control would be determined upon recommendation from the BLM and/or NMEMNRD.

5.11 Revegetation Success

Revegetation success would be determined by monitoring the vegetation parameters of ground cover, productivity, woody plant density, and plant species diversity. The results of these parameters in reclaimed areas would be compared to the same parameters in reference areas (i.e. control or undisturbed sites) or to an agreed upon revegetation standard. The reference area and revegetation standards would be based on the research program discussed in Section 5.12, and would be established through discussion by the BLM, NMEMNRD, and NMCC. The research program would be ongoing, including the collection of vegetation data. The collected vegetation data, stratified across the various plant communities situated within the permitted boundaries, would be carefully evaluated. The collected vegetation data would eventually function as a guide towards determining ecologically suitable success standards.

Technical guidance procedures published by the NMEMNRD were utilized in the development of a sampling and analysis plan. There are a wide variety of standard and classic sources for field sampling methods in plant ecology (Bonham 1989; Barbour, Burk, and Pitts 1980), including references cited in the technical guidance procedures developed by the NMEMNRD. Any variations of or additions to the vegetation monitoring techniques would go through approval with NMEMNRD and/or BLM as needed. As may be appropriate and necessary to meet NMEMNRD requirements, herbaceous cover and productivity would be established within 90 percent of the reference area with a 90-percent statistical confidence level. Woody species (and at Copper Flat these are essentially all shrubs) would be established to the approved density with an 80 percent confidence level as defined by NMEMNRD. Diversity would be compared to existing reclaimed and/or reference areas relative to the physical environment of the areas to be reclaimed.

Observations would be conducted once per year at approximately the same time each year. Two seasons of successfully attaining the revegetation criteria would determine success of the revegetation program. In the event that an area does not meet the revegetation goals (or criteria), the area would be investigated and steps taken to correct the problem.

Analysis of the revegetation efforts on the north cell of the tailings impoundment demonstrates the effectiveness of the methods proposed here including the thickness of growth media used in this area should meet the objective of developing a self sustaining ecosystem.

5.12 Reclamation Research

As part of the reclamation plan, NMCC would conduct a revegetation test program to determine the most effective methods to meet revegetation standards as defined in their reclamation plan. The program would be flexible enough to allow modifications of proposed methodologies and to test new techniques. Conceptually, the test revegetation program would include test plots designed to evaluate different types and thicknesses of cover material, seed mixes, planting techniques, use of clean tailings fines to enhance water retention of soils, soil amendments and mulches. The program would also include test plots on slopes of different grades and aspects.

In addition, NMCC intends to maximize the amount of concurrent reclamation at the site. This would allow larger-scale testing of regrading, reclamation cover placement and revegetation techniques. The outer face of each raise of the tailings impoundment would be reclaimed by placement of a layer of alluvial cover up to eight inches thick followed by revegetation. It is also anticipated that the west and north waste rock disposal areas and portions of the east and south disposal areas would be completed prior to completion of mining, which would allow for concurrent reclamation of these areas.

5.13 Concurrent Reclamation

Because contemporaneous reclamation reduces erosion, provides early impact mitigation, limits costs and reduces final reclamation work, NMCC is committed to maximize this type of reclamation at the Copper Flat Project. Some of the Project facilities would be constructed in their final configuration. Others, such as individual lifts of the waste rock disposal areas and possibly some roads would be decommissioned prior to final mine closure. Areas such as these would be reclaimed concurrently with the active mining operation where feasible. Descriptions of design features which are intended to facilitate contemporaneous reclamation for specific project components are given below in Section 5.14.

5.14 Interim Reclamation

There is a possibility that continuous, full-scale production might be interrupted for short periods in response to economic considerations or unforeseen circumstances. In this event, interim reclamation would be initiated. Interim reclamation is outlined below.

- Rights-of-Way: The power lines and water pipeline would be inspected regularly and maintained as necessary. None of the facilities would be altered or removed. The main access road would receive regular maintenance. The internal roads would receive minimal maintenance.
- Pit: The pit area would be protected by fencing with a locked access gate. Monitoring of pit water would be ongoing.
- Tailings Facility: The tailings impoundment would be retained for potential future development. Limited care and maintenance of the reclaimed embankment face would be performed as necessary to continue stabilization of the area.
- Diversion Ditches: Diversion ditches would be inspected and maintained as necessary. Surface water runoff would be managed in accordance with the site NPDES permit requirements.
- Buildings: The process buildings, equipment and support facilities would be guarded by an on-site resident security guard and maintained as necessary. None of the buildings would be destroyed or modified.

5.15 Interim Management Plan

In accordance with 43 CFR § 3809.401(b)(5), NMCC has prepared the following *Interim Management Plan* to manage the project area during periods of temporary closure (including periods of seasonal closure, if necessary) to prevent unnecessary or undue degradation, and includes:

- Measures to stabilize excavations and workings;
- Measures to isolate and control toxic or deleterious materials;
- Provisions for the storage or removal of equipment, supplies, and structures;
- Measures to maintain the project area in a safe and clean condition;
- Plans for monitoring site conditions during periods of non-operation; and,
- A schedule of anticipated periods of temporary closure during which you would implement the interim management plan, including provisions for notifying BLM of unplanned or extended temporary closures.

This Interim Management Plan (a.k.a., temporary closure plan) is necessarily general due to the lack of detailed design information at the present time, and would be updated as necessary during the preparation of the mine feasibility study and NEPA process. Any updates would be submitted to BLM prior to construction.

5.15.1 Schedule of Anticipated Periods of Temporary Closure

The standard operating schedules at the Copper Flat Project would be 24 hours a day, 365 days a year for the mining activities and processing circuits. No temporary or interim closures of the facility are currently planned. However, it is possible that, due to mechanical or technical difficulties, unfavorable economic conditions, litigation or other unforeseen events, mining and processing facilities may have to be temporarily closed. In the event of an unplanned temporary closure, the following plan would be implemented:

- The BLM, MMD and NMED would be notified within 30 days of the temporary closure of the flotation mill and/or the concentrate circuit. This notification would include a description of the procedures and controls that have been or would be initiated to maintain the process components during the temporary closure period.
- NMCC would supply BLM/MMD/NMED with a list of supervisory personnel who would oversee the mine facility during the temporary closure period. This list also would include the number of support staff required in each department to maintain the facility during the closure period. Standard security procedures would remain in place for the duration of the temporary closure period. Access to the site would be allowed for appropriate regulatory agency personnel
- If the interim closure period exceeds 90 days, NMCC would begin to evaluate procedures required to carry out a permanent closure of the process components. These procedures would be reviewed and approved by the BLM and MMD. NMCC may petition the BLM, MMD and NMED for an extension that would delay permanent closure.

5.15.2 Measures to Stabilize Excavations and Workings

No additional measures would be necessary to stabilize excavations and workings during an unplanned temporary closure. Pit dewatering activities may cease during the temporary closure period, in which case, all dewatering pumps, pipelines and water storage tanks would be drained.

Interim reclamation procedures would be implemented as necessary to stabilize disturbed sites during the temporary closure period. These procedures would be coordinated with the BLM, MMD and NMED.

Adequate storage capacity would be maintained in the process components to accommodate run-off resulting from the design storm event.

5.15.3 Measures to Isolate or Control Toxic or Deleterious Materials

NMCC would follow the waste rock management procedures described in the Plan of Operations to isolate waste rock as necessary during unplanned temporary closure. Contract explosives handlers would remove all explosives from site in accordance with federal and state regulations. Hazardous materials would continue to be stored, handled and disposed of according to federal and state regulations.

5.15.4 Storage or Removal of Equipment, Supplies, and Structures

In the event of a temporary closure, it is anticipated that equipment, supplies and structures would not be removed or placed into storage. Some mobile equipment or bulk commodities may be relocated into buildings or covered with tarps to isolate them from the weather, depending on the anticipated duration of the temporary closure. In addition, the following steps would be taken:

- Additional reagents would not be introduced into any process component during the temporary unplanned closure period. Process piping and pumps would be drained if the process circuits are shut down. Stored equipment would be clearly identified as having contained process solutions.
- Any mine equipment remaining in operation during the temporary closure, including haul trucks, shovels, loaders, drills and personnel vehicles would continue to be maintained according to standard company procedure.
- Following any temporary closure period, the integrity of the entire fluid management system would be evaluated before start-up is initiated. Solution tanks, pumps and piping would be visually inspected and repaired as necessary. The mineral processing circuit would be charged with process solution and visually inspected for evidence of leaks. Mine equipment would be inspected for compliance with appropriate federal and state mining regulations before mining activities re-commence. Pit dewatering would resume as soon as possible. Mining activities should not be affected by a temporary closure. The mine dewatering system would be visually inspected and repaired as necessary.

5.15.5 Monitoring During Periods of Non-Operation

All provisions of this plan and all other regulatory and permitting requirements would continue to be met during the temporary closure period. This would include all monitoring, notifications and reports submittal. Site monitoring and monitoring of leak detection systems for vessels and piping containing process solution would continue throughout the temporary closure period.

5.16 Facility-Specific Reclamation

5.16.1 Mine Pit

In 1982, approximately 3 million tons of overburden material was stripped and over 1.2 million tons of ore were mined from the open pit. Mining was initiated at the “5600” bench level and excavation had commenced on the “5380” bench at the time of shutdown.

Mining of the ore body would continue by a 30-foot high, multiple bench, open pit method. Under the Proposed Action, the pit would eventually be 2500 feet × 2500 feet) and would reach an ultimate depth of 900 feet at an elevation of 4,720 feet. The working slope of the pit walls would average approximately 1H:1V. Safety benches would remain at 80-foot intervals and the overall final pit slope would be about 1.1H:1.0V.

NMCC does not propose to backfill the pit. Backfilling operation would not allow sequential mining of the deposit, may cover future mineral resources, and it would be economically unfeasible following closure of the operation. The primary reason that post-closure backfilling is uneconomic is the time required to backfill the pit following plant closure. In the case of Copper Flat, this would require up to seven years during which no income would be realized. Furthermore, backfilling the pit would cover a mineral resource which could become economic with an increase in metal prices or the development of new processing technologies, and thus hinder future mineral exploration and mining of useful minerals.

Ground water inflow formed a lake in the former pit. The current water level is an elevation of about 5,420 feet; therefore, pit dewatering would again be necessary during operations. Following cessation of dewatering activities, a lake would again form in the pit. The post-closure pit water elevation is estimated to be at an elevation of approximately 5,250 feet. The depth of the lake would fluctuate a few feet depending on precipitation and the evaporation rate. Refilling would proceed over a number of years (SRK, 1995).

Possible post-closure uses for the pit include a water reservoir for agricultural and grazing purposes. Based on studies completed for Alta's permitting processes of the mid- to late-1990s, pit water quality of the current lake, and modeling of post-closure pit water quality suggest that post-closure water quality should meet New Mexico surface water standards for these uses (SRK, 1995), and possibly also be suitable for other existing cultural uses as well as yet to be considered and otherwise unknown cultural uses. New studies are underway to build on this past work and evaluations.

Reclamation of the pit during operations would be limited to erosion control. At closure stable pit walls would be left in place, and unstable pit walls would be stabilized by blasting or other safe methods. Where safe, alluvial material would be placed on the benches above the projected water level, and the benches seeded. Roads and safety benches would be ripped and water barred to control surface water runoff. Disturbed areas around and adjacent to the pit would be covered with alluvial material and revegetated.

The ramp would be graded or ramps placed at different locations to allow escape routes for wildlife. The pit area and highwalls would be appropriately barricaded with physical barriers or fences and posted according to MSHA and New Mexico Mine Inspectors Office regulations. Access would be limited by a locked gate and the access road blocked with a physical barricade.

5.16.2 Waste Rock Disposal Areas and Low-Grade Stockpile

The primary waste rock disposal facility for the Proposed Action is located east-northeast of the mill site on the east side of Animas Peak (**Figure 3-1**). Two smaller WRDFs would be located adjacent to the pit.

The present height of the East WRDF is at an elevation of approximately 5,560 feet. By the end of mine life, an upper lift would be developed at an elevation of 5,630 feet and a lower lift would be developed at an elevation of 5,320 feet. The West and North WRDFs would be constructed by expanding the existing piles from their current elevation and constructing additional lifts up to 200-ft thick (Golder, 2011b). Total waste material contained in the disposal areas at the end of the expected life of the property is estimated to be approximately 37 million tons.

The waste rock disposal areas would be regraded and reclaimed to blend into the surrounding topography to the extent practicable. Three types of waste rock have been identified at the site: oxidized waste rock, transitional waste rock and unoxidized waste rock (SRK, 1995). The potential for acid generation from the bulk of the waste materials is low, primarily due to the relatively low regional precipitation, and except due to exceptional summer storms the virtual lack of any off site runoff and finally-the rapid evaporation and adsorption of any available moisture. However, reclamation and surface water management measures designed for the partially oxidized materials would be used to promote runoff and reduce infiltration for all material types. Horizontal surfaces would be regraded and contoured to reduce infiltration of water and provide positive drainage to sediment collection points. Care would be taken to contour these areas to reduce the potential for ponding and infiltration. This would reduce the potential for oxidation within each disposal facility and the leaching of metals and residual oxidation products.

Partially oxidized waste rock represents the majority of the material in the existing West and North WRDFs. Testing of this material indicates it can produce acid in the presence of water (SRK, 1995). The majority of waste rock exposed on the East WRDF is unoxidized material.

Unoxidized quartz monzonite would comprise the bulk of future waste rock. Although this material has the potential to generate acid, both field observations and test results indicated that this material is, at most, slowly reactive (SRK, 1995). Transitional zone materials represent a limited portion of the total waste rock volume. The potential for acid generation from these materials is high, requiring special waste management, including, but not necessarily limited to encapsulation and/or blending with alkaline materials. Transitional waste rock would be segregated from the unoxidized waste rock by visual inspection and field testing, if necessary, during mining and disposed of in the West and North WRDFs. NMCC is currently in the process of updating the geochemical characterization of all of these materials in order to more accurately predict their long-term behavior and prescribe suitable ARD mitigation measures, as necessary.

Although the bulk of the waste rock material does not indicate a high risk of environmental degradation, all of the WRDFs and any low-grade ore remaining in the low-grade ore stockpile would be reclaimed in a manner which has been determined to reduce infiltration and to alleviate the long-term risk of acid generation and metals leaching (SRK, 1995). Following regrading, the surface of the disposal areas would be compacted with earthmoving equipment and covered with a layer of alluvial material and revegetated.

During operations, the WRDFs would be constructed in up to 200-ft lifts to facilitate regrading during reclamation such that overall slope faces do not exceed 3.0H:1.0V. Benches would be established at the existing lift elevations and, if indicated by the test revegetation program and concurrent reclamation, at intermediate intervals to reduce erosion. As each lift is completed, any portion not needed for access to other lifts would be regraded, covered and revegetated as soon as practicable.

To enhance revegetation, reduce erosion and minimize surface the waste rock disposal areas would be covered with suitable reclamation materials and revegetated contemporaneously with operations. This material would be roughened to reduce surface flow velocities and minimize erosion and sediment loss.

During operations, surface run-off from Animas Peak would be diverted around the disposal area to prevent surface run-on and infiltration into the waste rock. Diversion structures would be revegetated and/or protected by riprap to reduce erosion and left in place following closure.

The low-grade ore stockpile is located immediately north of the process plant area and would include about 19 million tons of rock assaying lower than 0.20 percent copper. Reclamation of this area would depend on the fate of this stockpile. If the low-grade ore stockpile is milled by the end of mine life, the pad area would be ripped, contoured for drainage control, covered with growth media and revegetated. If the low-grade stockpile remains following closure, the stockpile would be reclaimed in the same manner as the WRDFs; it would be regraded to overall slopes of 3.0H:1.0V and shaped to enhance run-off and prevent infiltration and ponding. The surface would be compacted with earth moving equipment, covered with a layer of alluvial material and the surface revegetated.

5.16.3 Plant Site

At closure, all surface facilities, equipment and buildings would be removed from the area. For buildings located on public land administered by the BLM, the concrete foundations would be broken, excavated, and disposed of is a suitable location on adjacent private land. The concrete building slabs, footings and foundations for facilities located on private land controlled by NMCC would be broken, covered with waste rock material and available growth media, regraded, and revegetated. All fuel tanks, reagent storage facilities would be removed from the site according to applicable federal and state laws. The general surface area would be shaped and contoured for surface drainage control, and covered with a minimum of 6 inches of stockpiled alluvium/growth media to conform to the surrounding topography to the extent practicable. Revegetation would occur as discussed in Section 5.10.

The tailings thickener and tailings reclaim pond would be backfilled regraded to minimize ponding prior to placement of alluvial material/growth media and revegetation. The stormwater collection pond is located adjacent to Greyback Wash east of the plant area. This pond, currently backfilled, is believed to be the source of water which created the riparian zone in Greyback Wash adjacent to it. NMCC would endeavor to maintain the riparian zone during operations when the stormwater pond would be used collect stormwater runoff by diverting water from the freshwater supply system. At closure, this pond would remain open with and the discharge pipe left in place in an attempt to recreate the current near surface hydrologic conditions which are supplying water to the riparian zone. The land bridge which conveys the tailings pipeline would also be left in place because this feature may be a contributing factor to the development of the riparian zone. The slopes of the land bridge would be stabilized and the top revegetated during reclamation.

5.16.4 Tailings Impoundment

A tailings impoundment located southeast of the plant site was designed to hold a total of 95 million tons of tailings (including tailings from 11 million tons of low-grade ore). Closure of the tailings impoundment would include:

- Final grading of embankment outslopes to establish erosion controls and controlled surface water drainage (best management practices);
- Placement of a soil or rock cover and revegetation of the embankment outslope;
- Placement of riprap and erosion controls in embankment surface water drainage facilities;
- Regrading or depositional modification of the impoundment surface to promote drainage to a permanent engineered spillway;
- Placement and vegetation of a soil cover over the tailings surface;
- Armoring of surface drainage channels and implementation of best management practices for erosion control; and
- Management of underdrainage.

Final grading of the impoundment surface can be accomplished with earthmoving equipment, or through modification of tailings disposal patterns during the final years of operation. Tailings discharge from selected locations can be used to relocate the supernatant pool to a location adjacent to the post-closure spillway, thereby reducing grading requirements and limiting earthmoving operations in areas where working conditions are expected to be difficult due to the presence of soft and saturated tailings. At the location of the spillway [see Drawing 9 in **Appendix D** (Golder, 2010)], a bedrock foundation is anticipated. If the spillway channel is erodible, grouted riprap or other erosion controls would be applied.

Consolidation seepage into the underdrain system can be anticipated to continue at declining rates for an indefinite period following the cessation of tailings disposal operations. Underdrainage would be pumped from the underdrain collection pond to the surface of the tailings impoundment where it can be evaporated. When underdrainage is reduced to an acceptably low flow rate, the underdrain pipes beneath the embankment can be sealed with grout and the underdrain collection pond can be decommissioned.

5.16.5 Ancillary Project Facilities

In general, all surface pipelines, poles, and commercial signage would be removed. Buried pipelines and electrical conduits would be left in place.

5.16.5.1 *Fences*

The tailings and mine area would be fenced to discourage access by people, wildlife and cattle. Existing fences may be left in place depending on the location and purpose. Fences used to restrict access to potentially hazardous areas would remain in place. Other fences may remain to protect revegetation efforts. The BLM would determine the fate of fences on public lands. The remaining fences would be removed for salvage.

To prevent damage to newly seeded and revegetation areas, these areas would be protected by fencing or other appropriate measures for a period of time until revegetation is successful. It may be necessary to control small mammals as well as deer and domestic livestock. All fencing on public lands would be constructed to meet BLM requirements.

5.16.5.2 *Water Tanks*

The fresh water and process water tanks would be removed, their foundations buried in place and the sidehill cuts recontoured to approximate original topography. Following recontouring, the areas would have alluvial material placed up to 6 inches thick if the replaced fill material would not support vegetation. The areas would then be revegetated as described in Section 5.10.

5.16.5.3 *Roads*

A portion of the access road has been deeded to Sierra County and provides access through the mine site to private and public property adjacent to the west boundary of the Project. From the point where the mine access road leaves the county road north of the tailings impoundment, it would be narrowed to a standard two-lane road with a running surface approximately 30 feet wide. One culvert, located where the road crosses Greyback Wash would be left in place.

Prior to final closure, the State and BLM would determine which auxiliary roads and haul roads would be left intact. At this time, at a minimum, the road to the water tanks, haul roads, waste disposal access roads are expected to undergo reclamation.

Roads to be reclaimed would be recontoured to approximate original topography if constructed on sidehills or contoured and ripped if constructed in flat areas. Typical reclaimed cross-sections of the different road types are shown on **Figure 3-6**. Water bars would be constructed to reduce erosion.

Recontoured areas would be covered with up to 6 inches of alluvial material if replace fill material would not support vegetation and revegetated as describe in Section 5.10.

5.16.5.4 *Electrical Power*

Power for the Project would be furnished by means of existing overhead power lines. The overhead lines would be removed from the mill site and disconnected from the 115kV line owned by Sierra Electrical Cooperative by removing the wires of the last span of the line. Pumping stations and electrical substations on the site would be removed, if no other post-closure land use is identified and approved. The disturbance associated with removal would be reclaimed by regrading and seeding. If renewable energy facilities are deployed at specific buildings, these would be removed and associated disturbances regarded and reseeded.

The existing 25 kV line that provides power to the production wells, booster stations on the fresh water pipeline and the reclaim water pump stations at the tailings dam would remain in place. Sierra Electric owns this power line and is responsible for maintenance.

5.16.5.5 *Water Supply*

Water would be supplied to the mine from four production wells located about seven miles east of the plant site. A 20-inch welded steel pipeline transports the water to the mine and is buried at a minimum depth of 2 feet from the well field to the point of entry to the Project area.

The buried pipeline is owned by the BLM and would remain in place. The production wells would remain in a condition suitable for other uses. All roads, power lines and foundations for the production wells are in place. No additional disturbance would occur during the project and the well area would be left as it currently exists after closure of the mine.

5.16.5.6 *Sanitary Solid Waste Disposal*

At closure the septic tanks and leach fields would be decommissioned. All solid wastes remaining on the site would be removed off-site for proper disposal. If a private landfill is permitted for on-site disposal of solid waste, the landfill would be closed according to NMED requirements.

5.17 Estimated Reclamation Costs

A reclamation bond is required by the BLM and State of New Mexico to guarantee the completion of Project reclamation. Following regulatory review of the proposed plan of operations and reclamation techniques presented herein, NMCC would prepare, *at a time specified by the BLM* [43 CFR § 3809.401(d)], a *detailed estimate of the cost to fully reclaim the operations* as required by 43 CFR § 3809.552. The estimated costs would be based on projected actual costs to reclaim the site assuming that all reclamation would occur following operations without the benefit of contemporaneous reclamation. Prior to commencement of operations, financial assurance in the amount of the estimated costs to reclaim the disturbance which would occur during the first five years of operations would be posted with the New Mexico Energy, Minerals and Natural Resources Department, Mining and Minerals Division.

6 Acknowledgment

I certify that I have personally examined and am familiar with the information submitted herein, and based on my inquiry of those individuals responsible for obtaining the information; I believe the submitted information is true, accurate, and complete.

Barrett Sleeman, President
New Mexico Copper Corporation

December 22, 2010
Date

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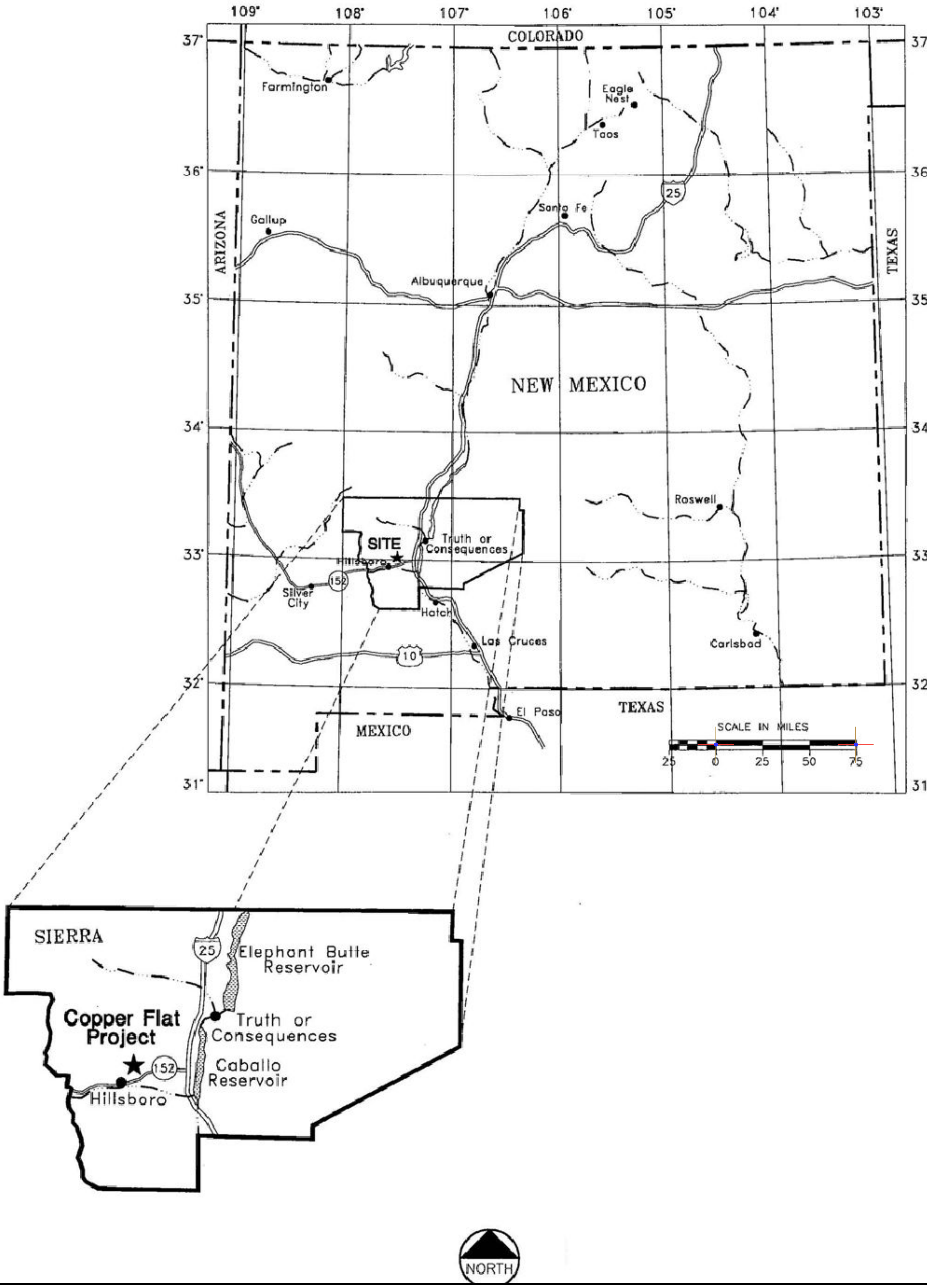

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CHECKED: -	APPROVED: -	DATE: 12/2/2010
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NEW MEXICO COPPER CORPORATION

COPPER FLAT MINE

PROJECT LOCATION

DRAWING NO.	SHEET	REVISION NO.
FIGURE 1-1	1 OF 28	A
JOB NO. 191000-03		

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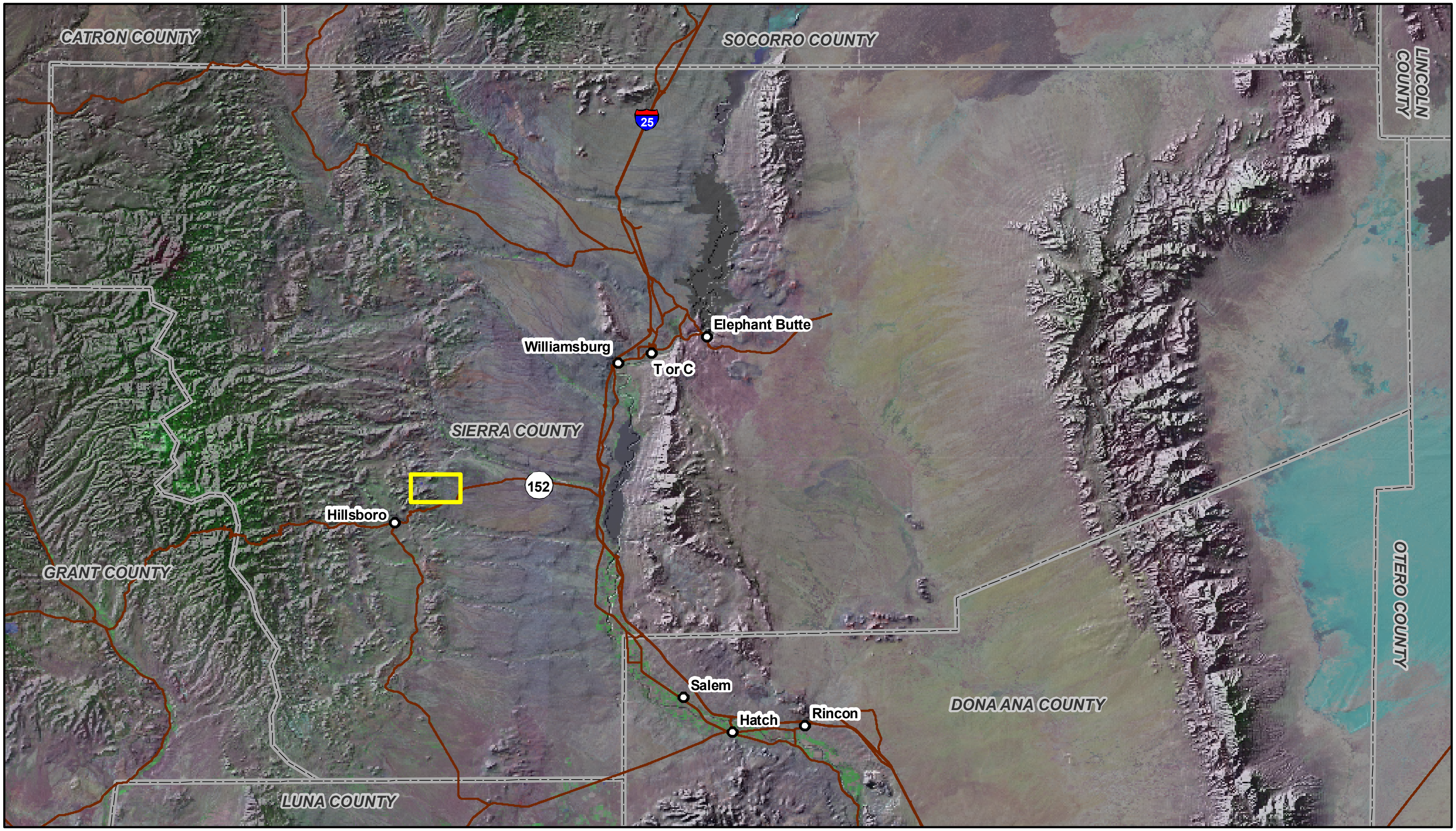

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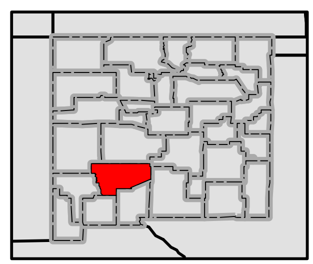
Miles



Imagery Information:
-Landsat Imagery from
University of Maryland NLCD

INTERA

Legend

- City/Town
- Site Location
- Road

Figure 1-2
Regional Location
New Mexico Copper Corporation

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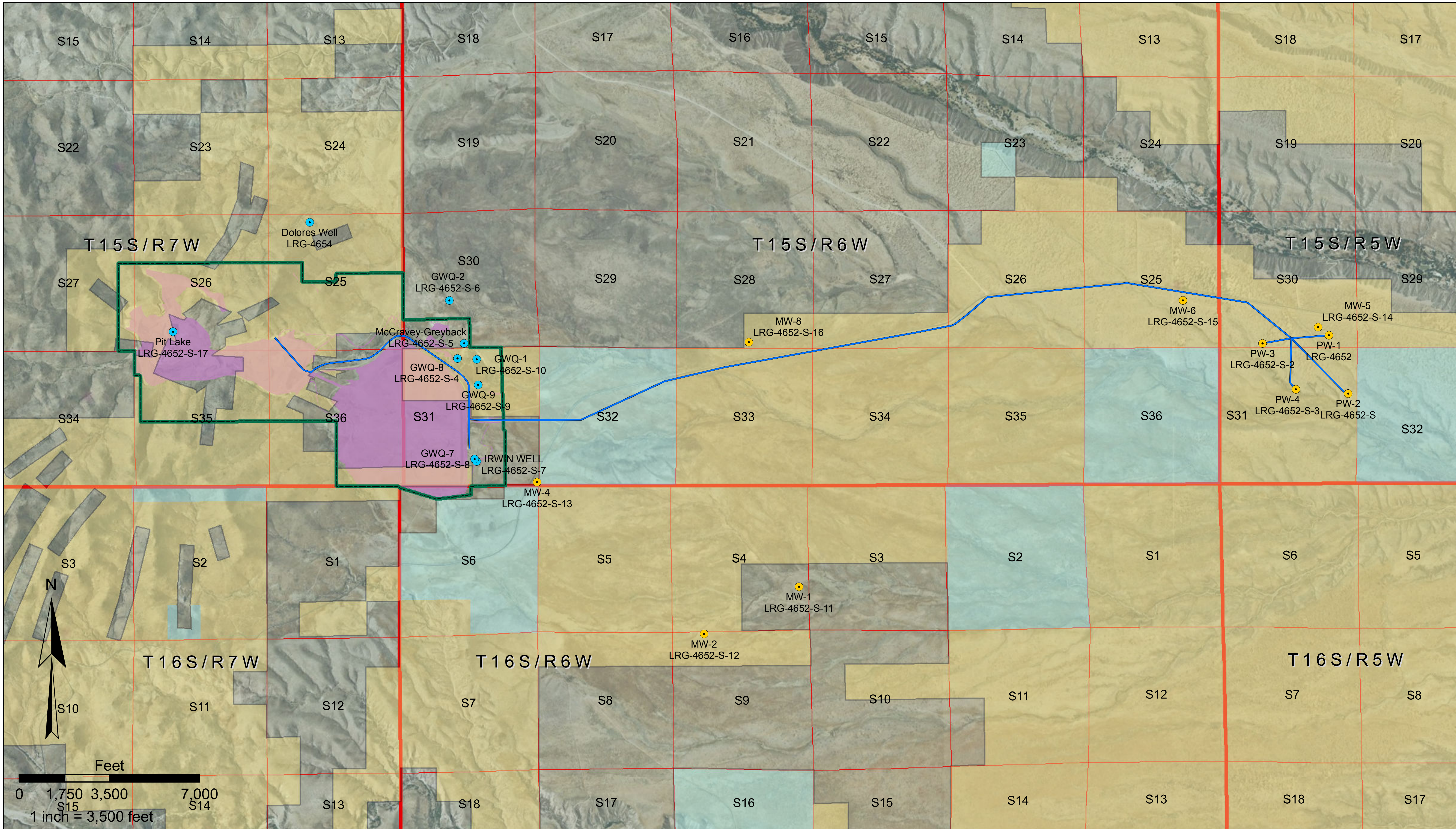

Land Owner
- Private
- Public - BLM
- State - New Mexico

- Mine Plan Boundary
- Disturbance By Previous Operators (989 acres)
- Pipeline

Well and Water Rights Owner
- Frost & Gray
- Hydro

IF THE ABOVE BAR DOES NOT SCALE 1 INCH, THE DRAWING SCALE IS ALTERED

DESIGN: -	DRAWN: -	REVIEWED: -
CHECKED: -	APPROVED: -	DATE: 5/6/2011
FILE NAME PoO_Fig2-01_Regional_JQG_20110421		

NEW MEXICO COPPER CORPORATION

COPPER FLAT MINE

LOCAL AREA LAYOUT

DRAWING NO. FIGURE 2-1 | SHEET | REVISION NO. A

JOB NO. 191000-03

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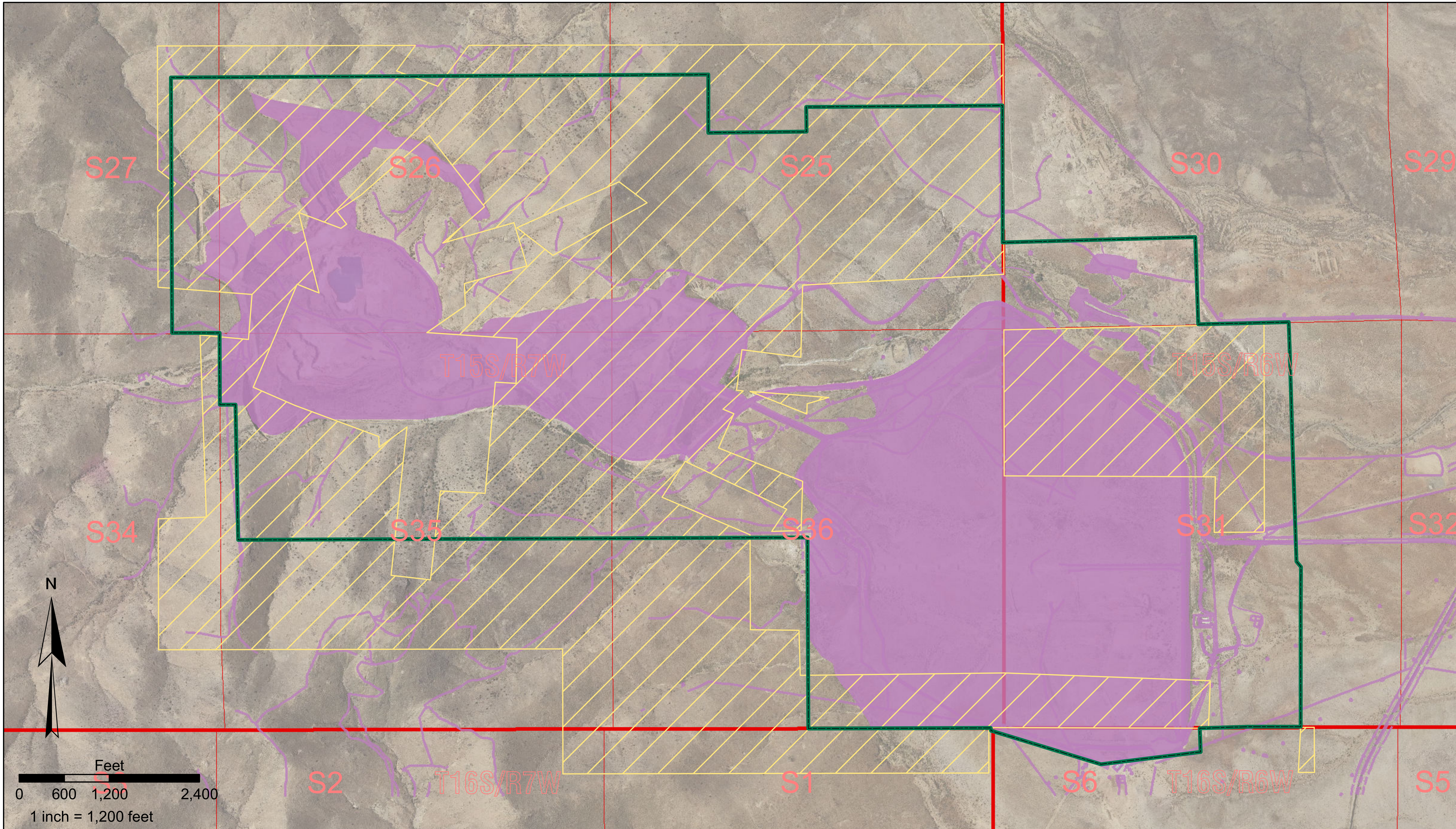

EXPLANATION

Public Land | Mine Boundary | Disturbance By Previous Operators (989 acres)

IF THE ABOVE BAR DOES NOT SCALE 1 INCH, THE DRAWING SCALE IS ALTERED

DESIGN: -	DRAWN: -	REVIEWED: -
CHECKED: -	APPROVED: -	DATE: 4/15/2011
FILE NAME: PoO_Fig2-02_Land_JQG_20110415		

NEW MEXICO COPPER CORPORATION

COPPER FLAT MINE

LAND STATUS AND EXISTING DISTURBANCE

DRAWING NO. **FIGURE 2-2** SHEET

REVISION NO. **A**

JOB NO. **191000-03**

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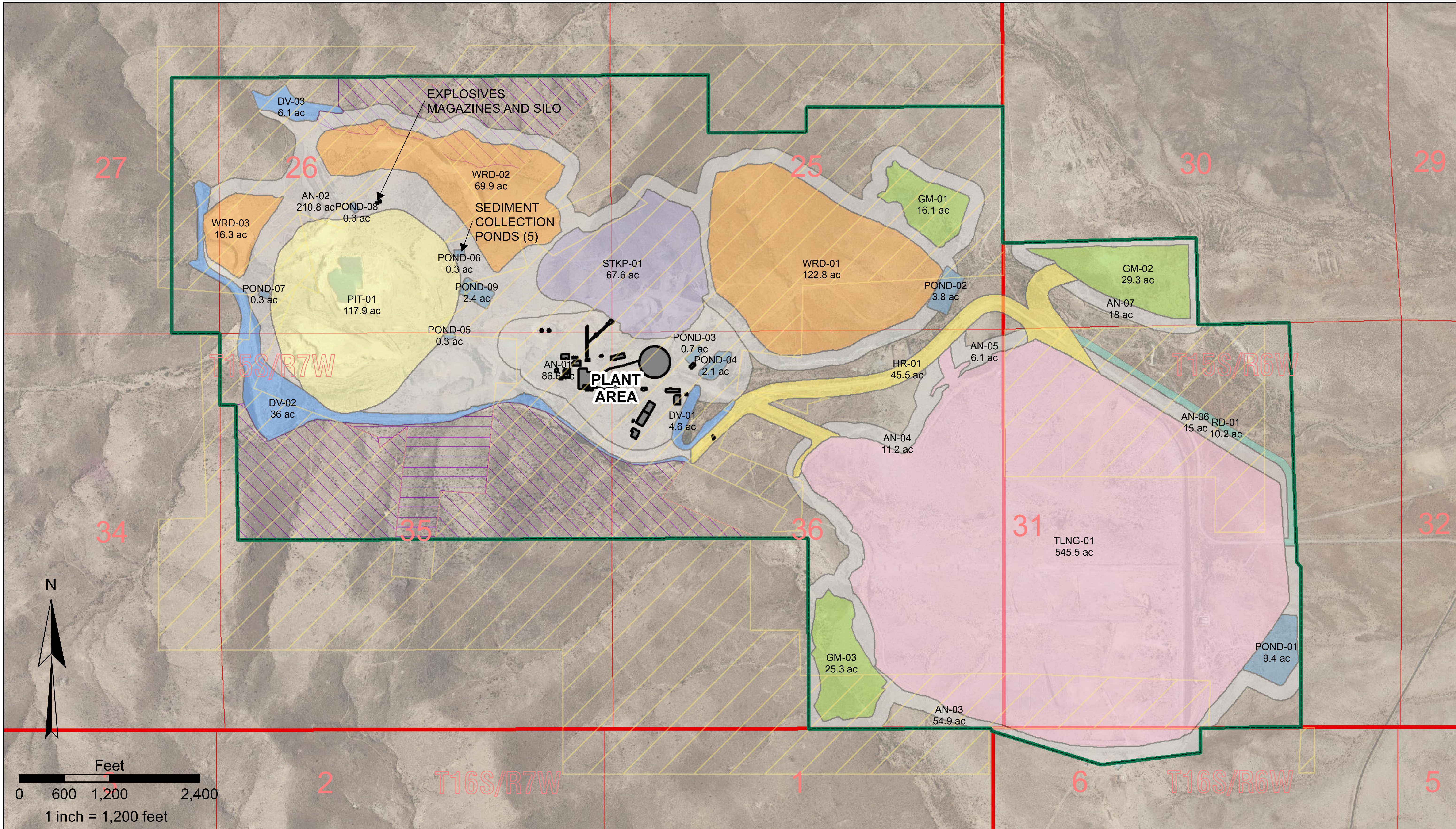

EXPLANATION

Public	Plant Facilities	Topsoil Stockpile	Pit	Ancillary	Private Exploration Area
Mine Boundary	Pond	Tailings	Haul Road	Access Road	Public Exploration Area
	Waste Rock	Ore Stockpile	Diversion		

IF THE ABOVE BAR DOES NOT SCALE 1 INCH, THE DRAWING SCALE IS ALTERED

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CHECKED: -	APPROVED: -	DATE: 6/22/2011

FILE NAME: PoO_Fig3-01_PropFacilities_JQG_20110622

NEW MEXICO COPPER CORPORATION

COPPER FLAT MINE

DRAWING TITLE: **PROPOSED FACILITY LAYOUT**

DRAWING NO. **FIGURE 3-1**

REVISION NO. **A**

JOB NO. **191000-03**

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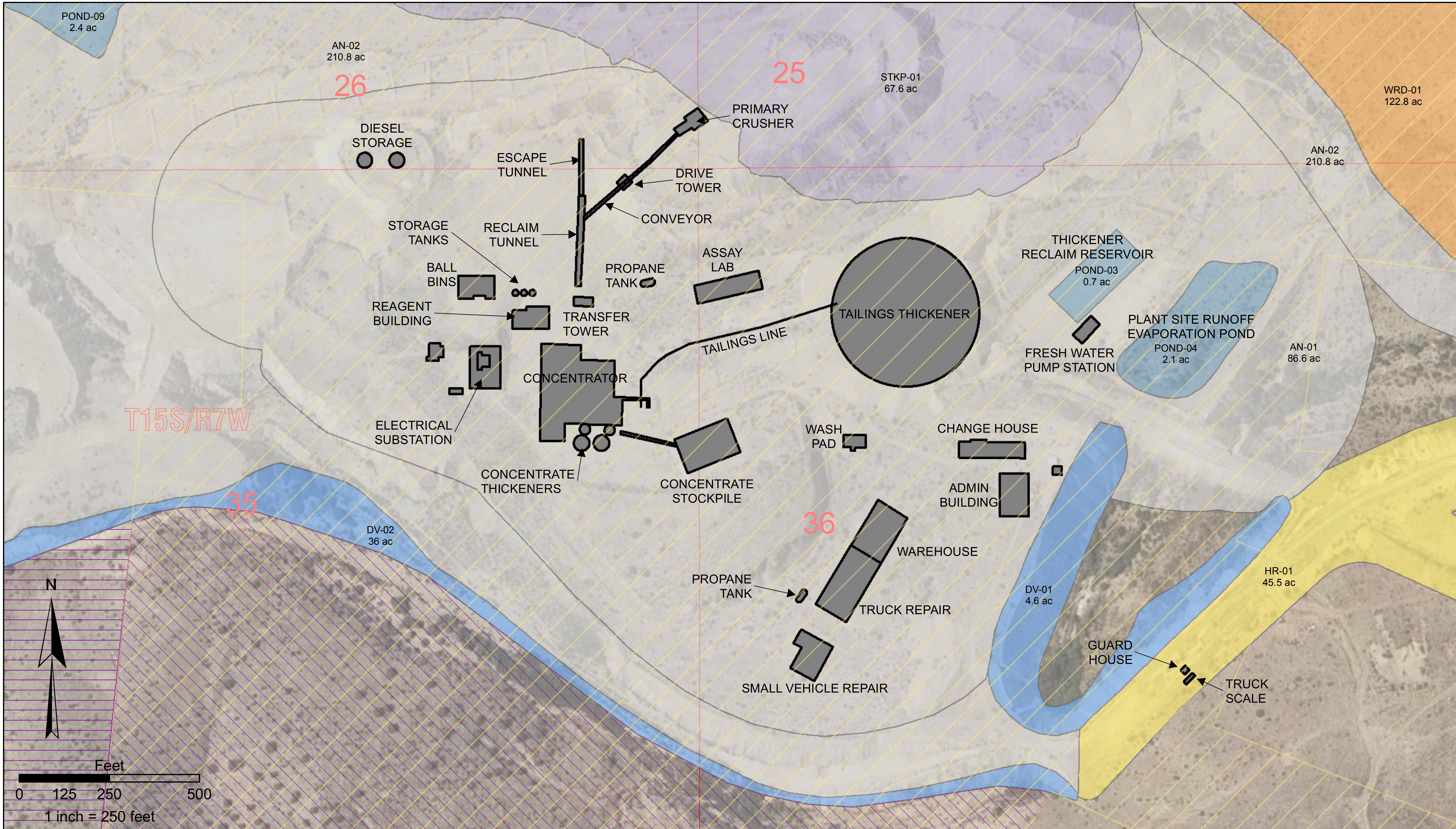

EXPLANATION

Public
Plant Facilities
Topsoil Stockpile
Pit
Ancillary
Private Exploration Area
Mine Boundary
Pond
Tailings
Haul Road
Access Road
Public Exploration Area
Waste Rock
Ore Stockpile
Diversion

IF THE ABOVE BAR DOES NOT SCALE 1 INCH, THE DRAWING SCALE IS ALTERED

DESIGN: -	DRAWN: -	REVIEWED: -
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FILE NAME: PoO_Fig3-02_Plant_JQG_20110622		

NEW MEXICO COPPER CORPORATION

COPPER FLAT MINE

DRAWING TITLE: **PROPOSED PLANT SITE LAYOUT**

DRAWING NO. **FIGURE 3-2**

REVISION NO. **A**

JOB NO. **191000-03**

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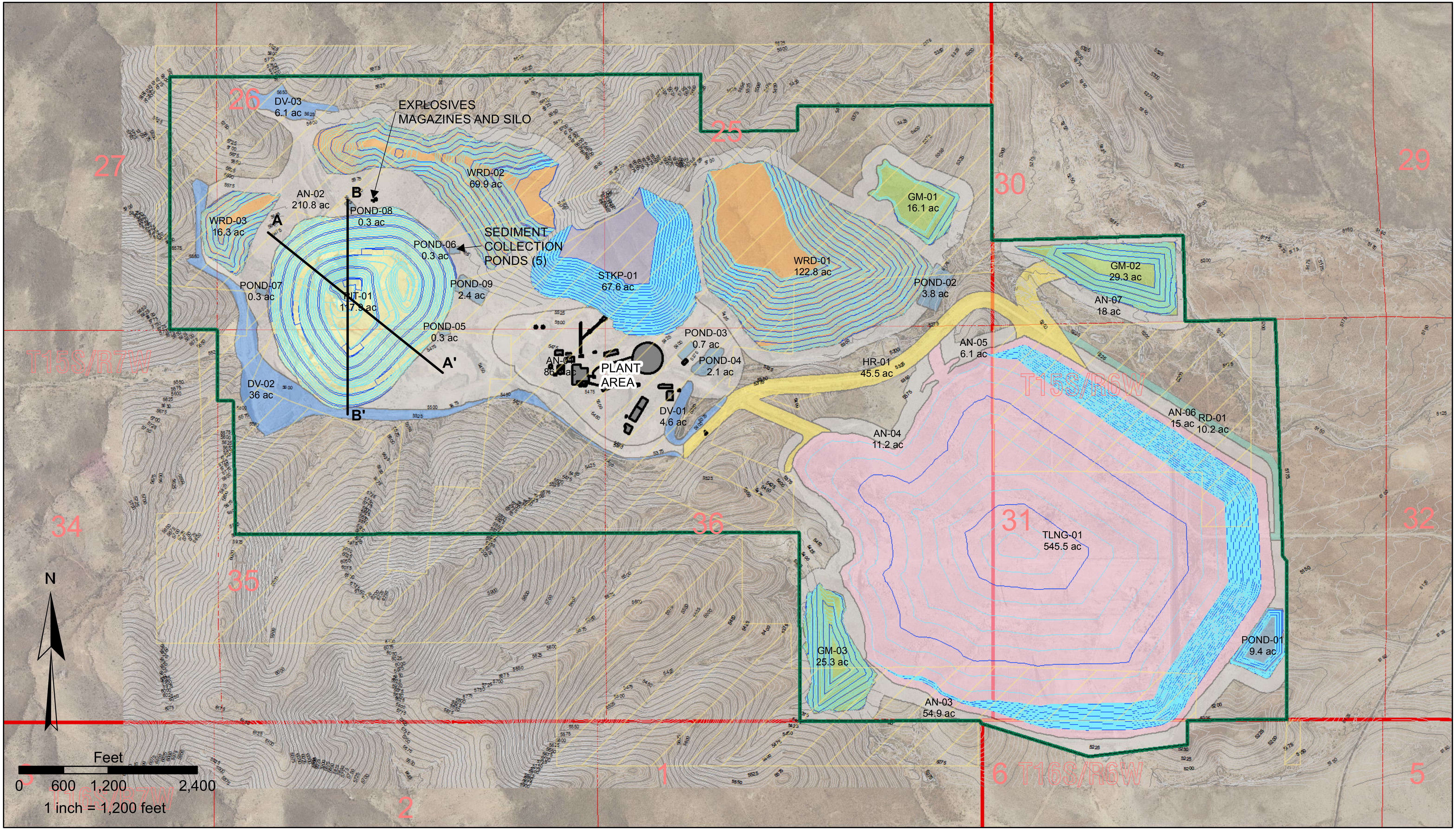

EXPLANATION

Public
Mine Boundary
Plant Facilities
Pond
Waste Rock
Topsoil Stockpile
Tailings
Ore Stockpile
Pit
Haul Road
Diversion
Ancillary
Access Road

IF THE ABOVE BAR DOES NOT SCALE 1 INCH, THE DRAWING SCALE IS ALTERED

DESIGN: -	DRAWN: -	REVIEWED: -
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FILE NAME: PoO_Fig3-03_PropTopo_JQG_20110622		

NEW MEXICO COPPER CORPORATION

COPPER FLAT MINE

DRAWING TITLE: **PROPOSED FACILITY TOPOGRAPHY**

DRAWING NO. FIGURE 3-3

REVISION NO. A

JOB NO. 191000-03

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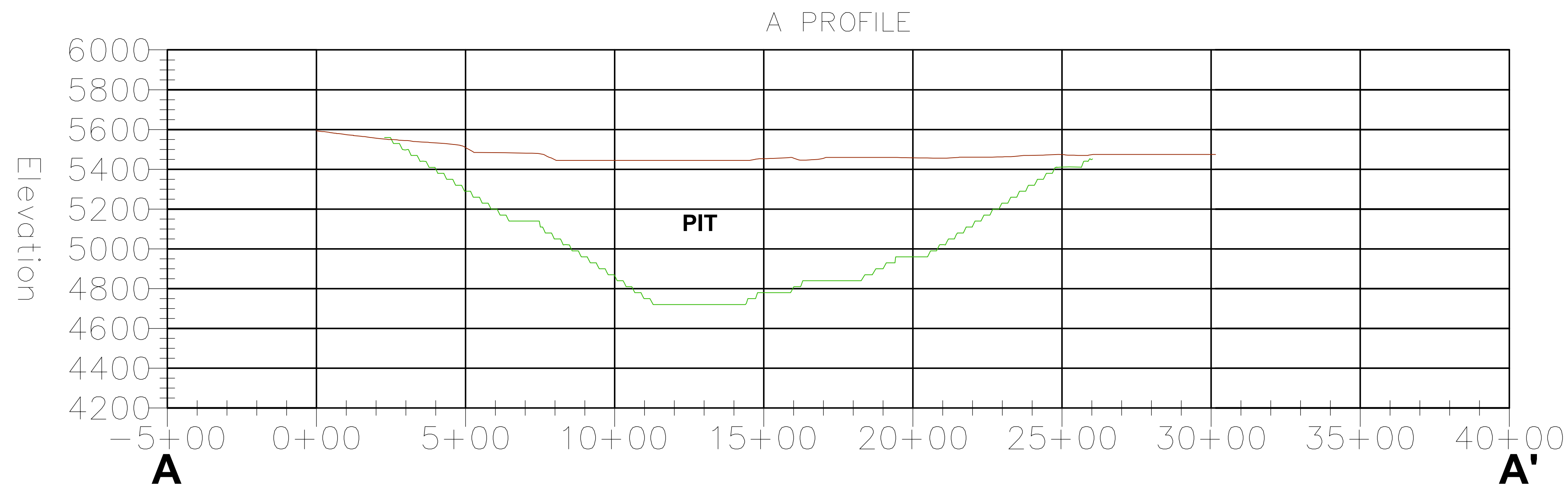

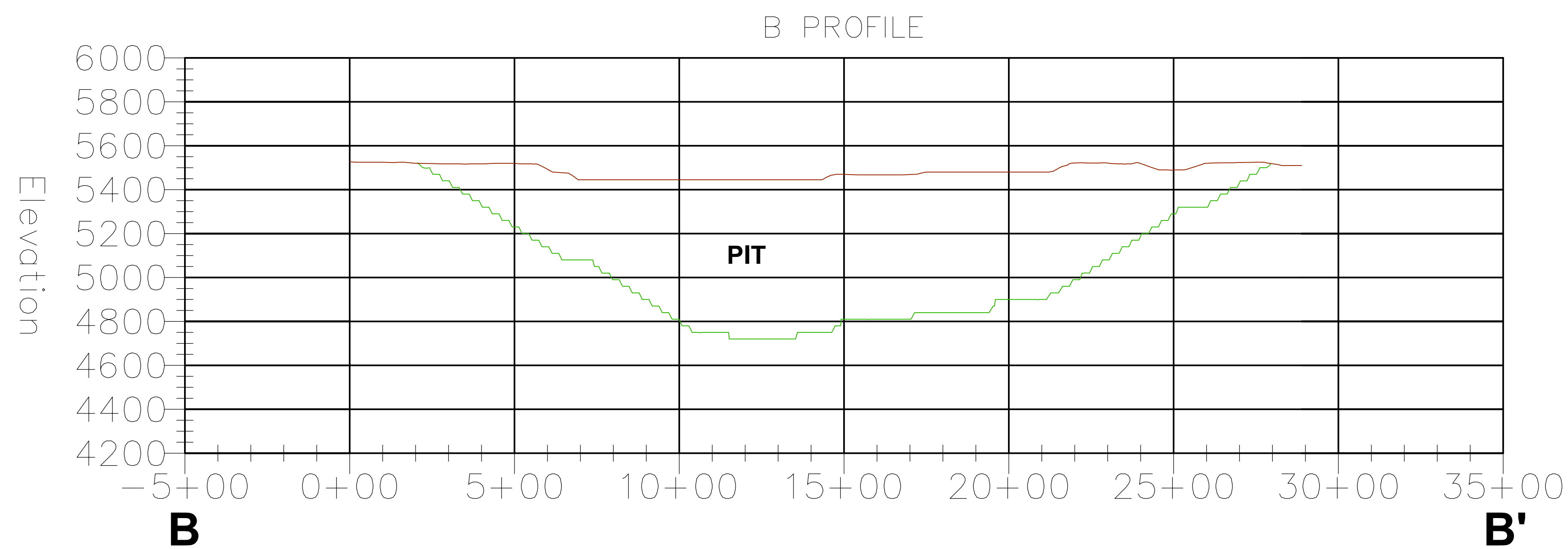

FEET

0 250 500 1000

1 inch equals 500 feet

IF THE ABOVE BAR DOES NOT SCALE 1 INCH, THE DRAWING SCALE IS ALTERED

DESIGN: -	DRAWN: -	REVIEWED: -
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FILE NAME: PoO_Fig3-04_Sections_JQG_20110622.dwg		

NEW MEXICO COPPER CORPORATION

COPPER FLAT MINE

DRAWING TITLE: **OPEN PIT CROSS SECTIONS**

DRAWING NAME: FIGURE 3-4

JOB NO: 191000-03

REVISION NO. **A**

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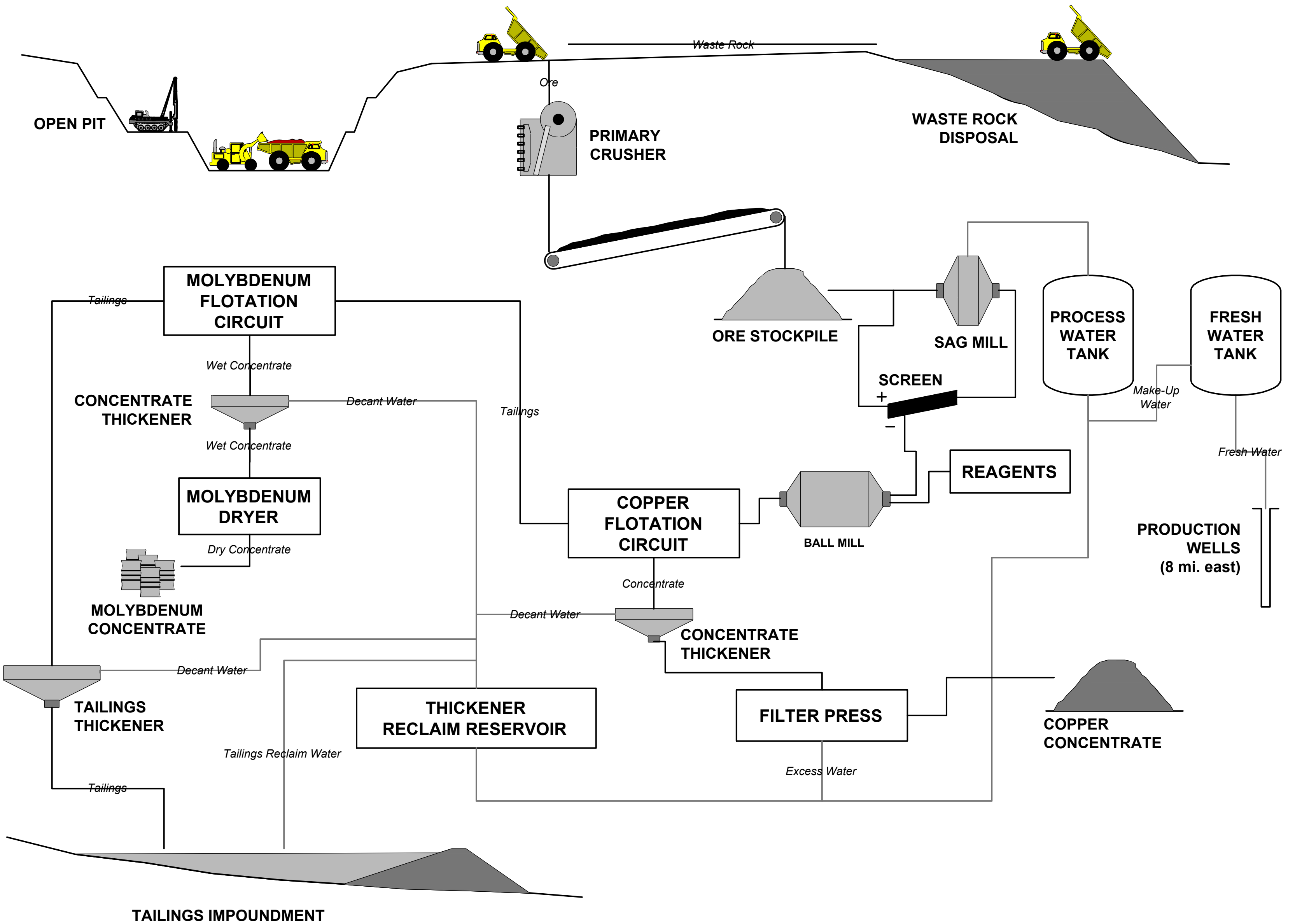

			PREPARED FOR: NEW MEXICO COPPER CORPORATION	DRAWING TITLE: PROPOSED PROCESS CIRCUIT		
DESIGN: -	DRAWN: -	REVIEWED: -		DRAWING NO. FIGURE 3-5		REVISION NO. A
CHECKED: -	APPROVED: -	DATE: 6/22/2011	COPPER FLAT PROJECT	JOB NO. 191000-03		
FILE NAME: PoO_Fig3-05_ProcessCircuit_JQG_20110622.dwg						

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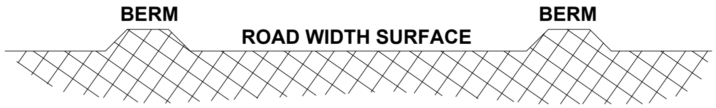
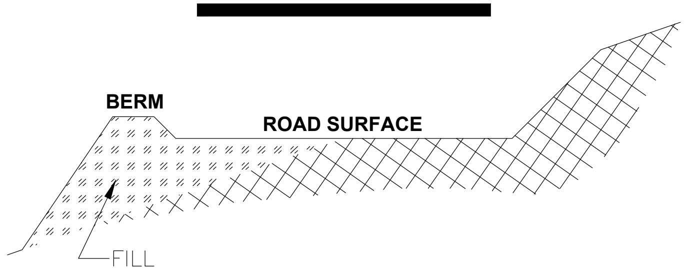
FLAT ROADS



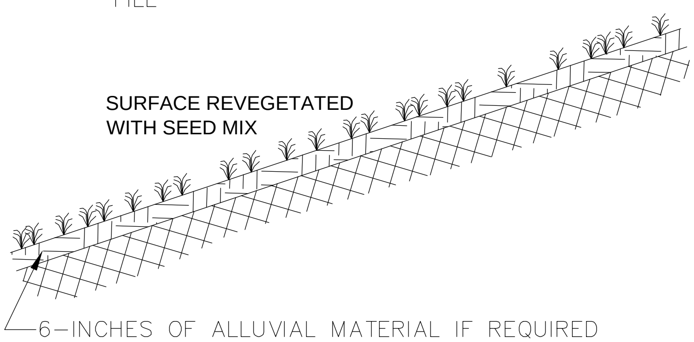
OPERATIONS CONFIGURATION

RECLAIMED CONFIGURATION

SIDEHILL ROADS



OPERATIONS CONFIGURATION



RECLAIMED CONFIGURATION

DESIGN: -	DRAWN: -	REVIEWED: -	PREPARED FOR: NEW MEXICO COPPER CORP. COPPER FLAT PROJECT	DRAWING TITLE: TYPICAL ROAD CONFIGURATION AND RECLAMATION	
CHECKED: -	APPROVED: -	DATE: 6/22/2011		DRAWING NO. FIGURE 3-6	REVISION NO. A
FILE NAME: PoO_Fig3-06_Roads_JQG_20110622.dwg				JOB NO. 191000-03	

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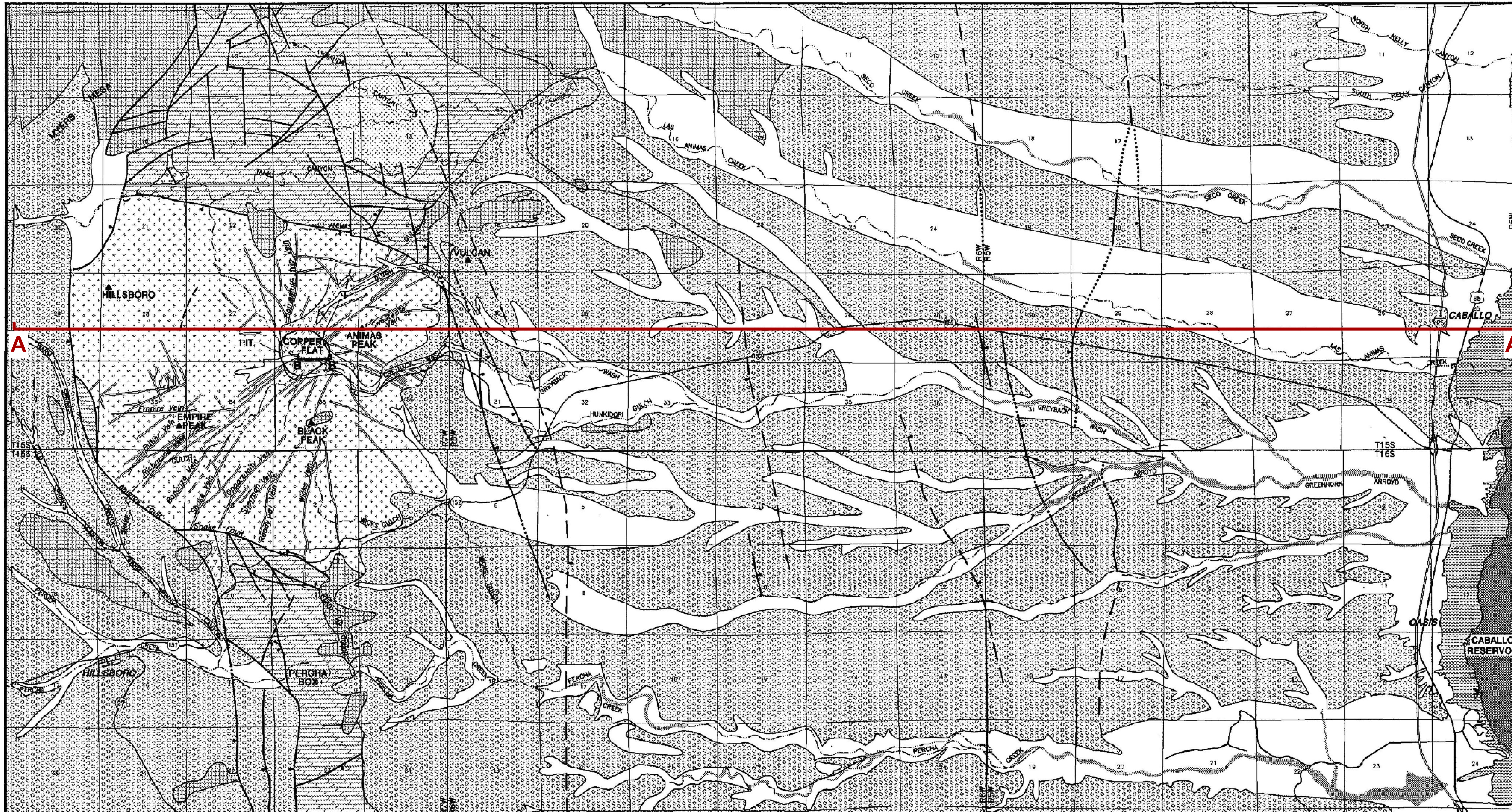

STRATIGRAPHY

TERTIARY - QUATERNARY	CRETACEOUS	PALEOZOIC AND PRECAMBRIAN
Quaternary Alluvium (Qvy+Qvo)	Late Cretaceous – Silicic Intrusives (Kll)	Paleozoic Siliclastic and Carbonate Sedimentary Rocks (pC through PM)
Tertiary Volcanics (TQb+Tv)	Cretaceous Latite – Andesite Intrusives (Kql+Kd+Kls)	
Tertiary Santa Fe Group (Tsfp+Tsf)	Andesite rocks near Copper Flat (Ka)	

LEGEND

NORMAL FAULT, BALL ON DOWNTHROWN SIDE; DASHED WHERE INFERRED, DOTTED WHERE BURIED.

CONTACT

A A' CROSS SECTION LOCATION

SOURCES:
(1) HARLEY (1934)
(2) SEAGER ET AL. (1982)
(3) HEDLUND (1977)
(4) ALMINAS ET AL. (1975)

NORTH

0 5,825 11,650
FEET

(see Figure 7-2 for cross section detail)

INTERA

from BLM, 1999

Figure 4-1
Regional Surface Geology
New Mexico Copper Corporation

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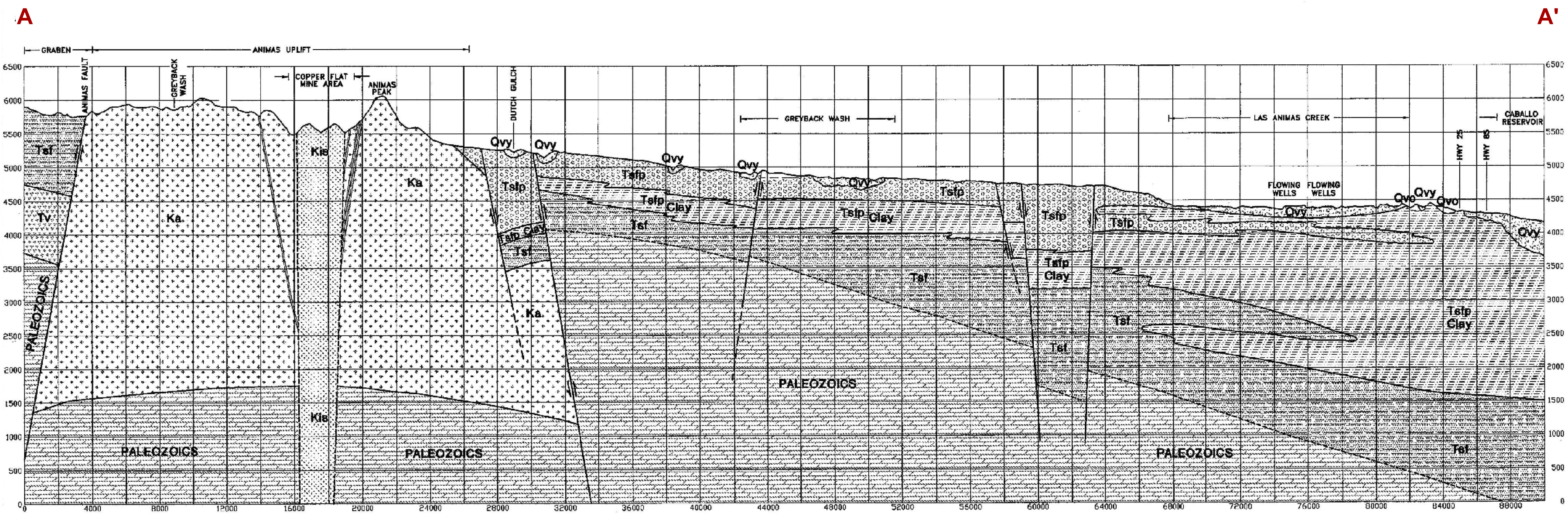


LEGEND:

QUATERNARY
- Qvy } Stream Alluvium
- Qvo

TERTIARY
- Tsfp } Palomas Formation
- Tsfp Clay
- Tsf – Rincon Valley Formation
- Tv – Tertiary Volcanics

CRETACEOUS
- Ka } Volcanics and Intrusives
- Kis

PALEOZOIC
- Bedrock Carbonate and Clastic Rocks

SOURCES:
(1) HARLEY (1934)
(2) SEAGER ET AL. (1982)
(3) HEDLUND (1977)
(4) ALMINAS ET AL. (1975)

SCALE IN FEET

VERTICAL 1500 – 0'

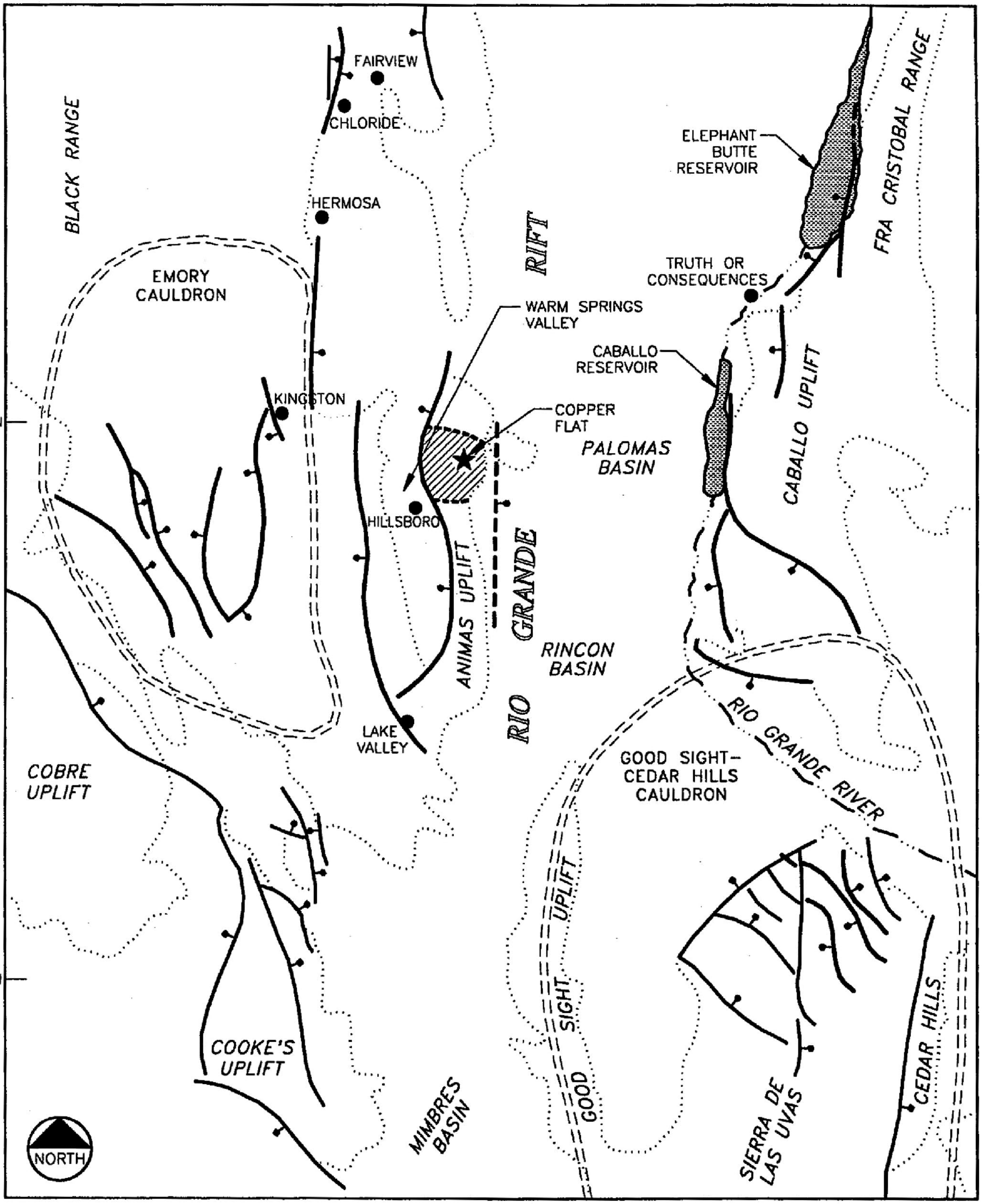
HORIZONTAL 6000 – 0'

(see Figure 7-1 for cross section location)

INTERA

from BLM, 1999

Figure 4-2
Schematic Geologic Cross Section (A-A')
New Mexico Copper Corporation



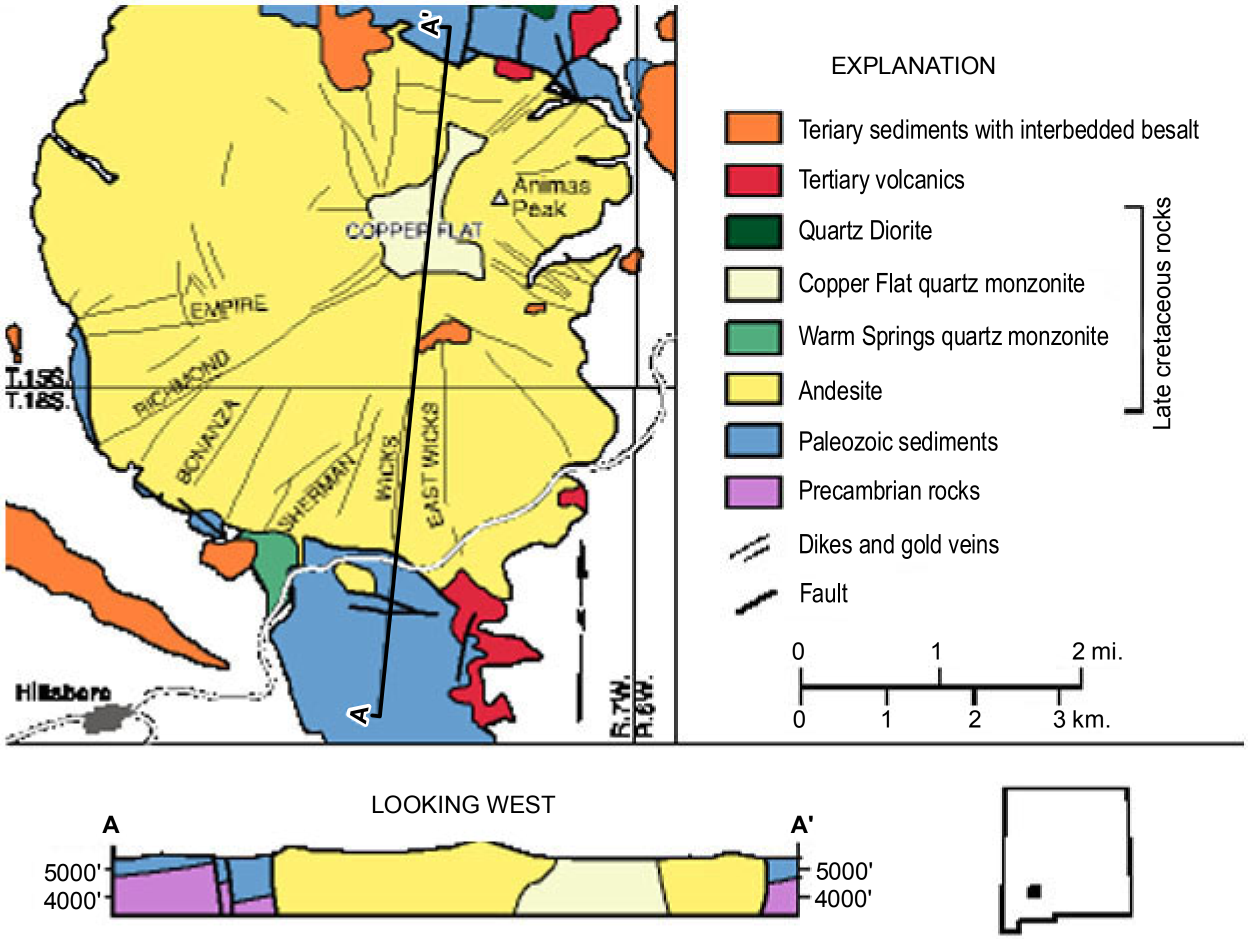
LEGEND:

- CAULDRON RING FRACTURE ZONE
- NORMAL FAULT
- HILLSBORO MINING DISTRICT
- UPLIFTS (MOUNTAINS)
- DRAINAGES

INTERA

from BLM, 1999

Figure 4-3
Geologic Structural Features of the Region
New Mexico Copper Corporation



from McLemore et al., 2000; Dunn, 1982; Hedlund, 1985

Figure 4-4
Geologic Schematic of the Hillsboro Mining District, New Mexico
New Mexico Copper Corporation

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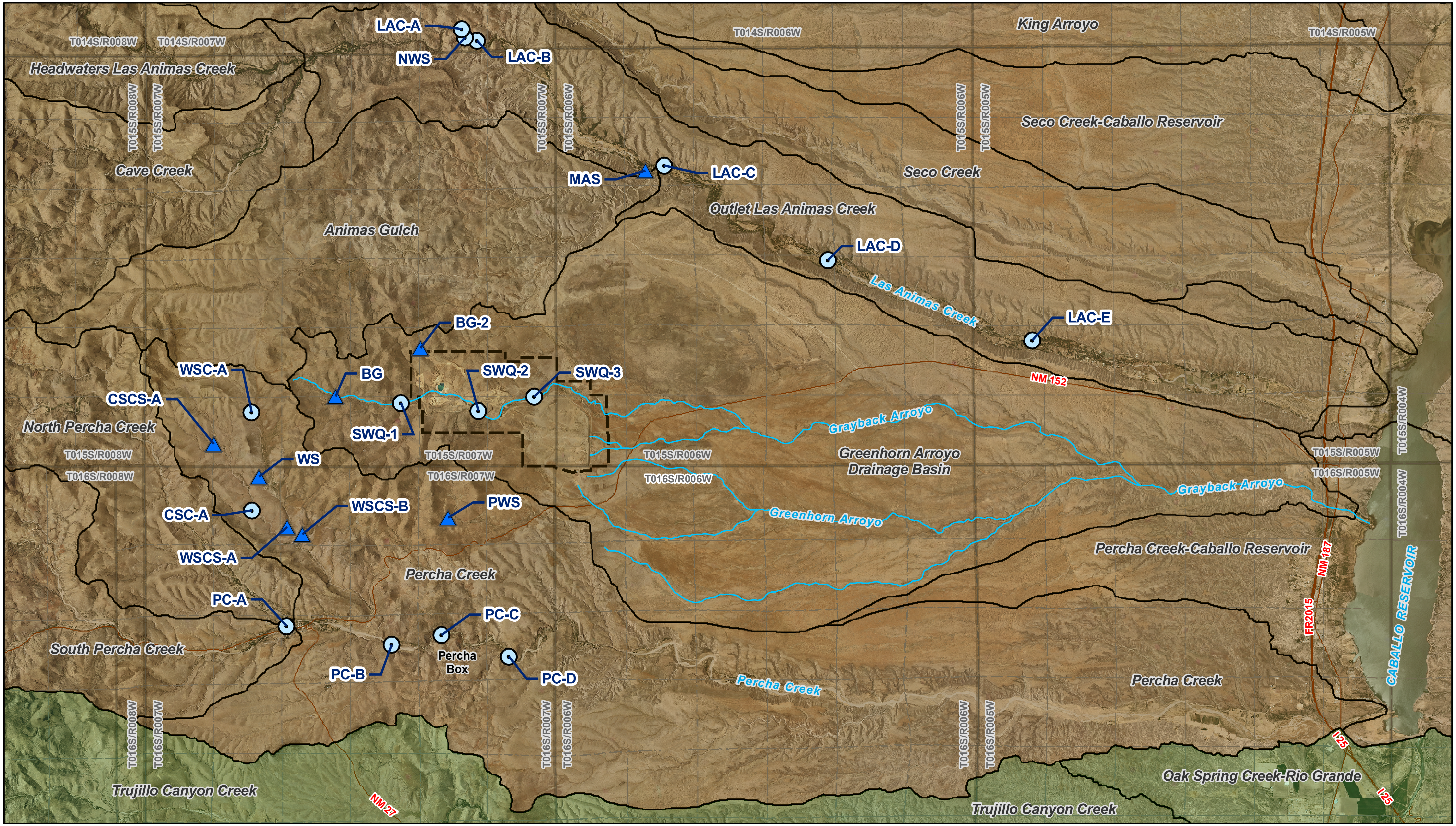


Watersheds:
USGS Hydrologic Unit Map
Mine Boundary:
Tom Van Bebber
Imagery Information:
-USGS 7.5-Minutes County DOQQ mosaic
Sierra County, 2009
Projection Information:
-New Mexico State Plane West, NAD 1927

0 3,500 7,000 14,000 21,000
Feet

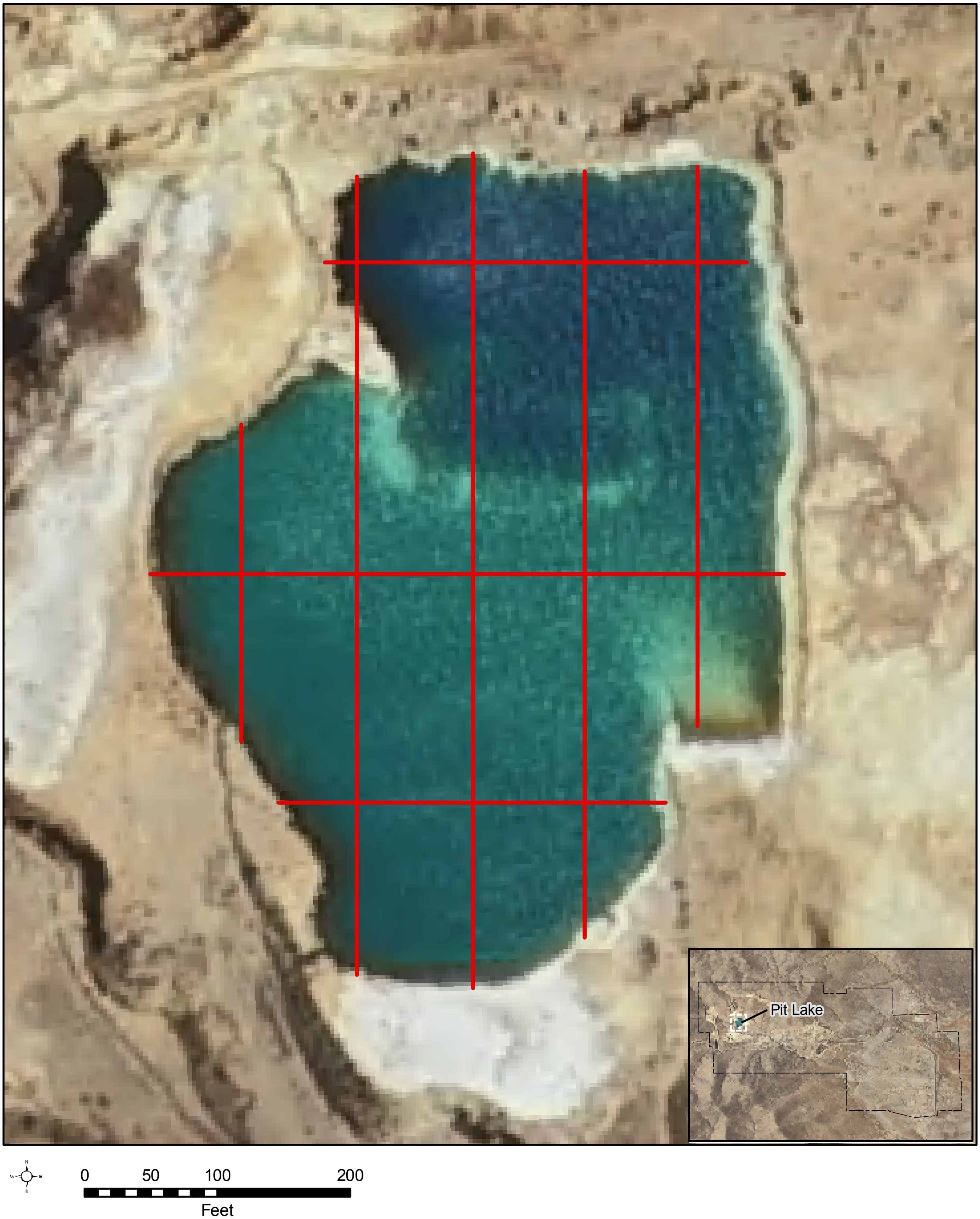
Legend

- Stream Sample
- Spring Sample
- Proposed Mine Permit Boundary

Watersheds
- Caballo
- El Paso-Las Cruces
- Sub-Watershed

Figure 4-5
Proposed Surface Water Sampling Locations
New Mexico Copper Corporation

S:\Projects\NMC-001_New Mexico Copper Corporation\GIS\Maps\SAP_7-2010\8-SurfaceWater\8-1_surface_wtr_locations.mxd 08/31/2010



Imagery Information:
-USGS 7.5-Minutes County DOQQ mosaic
Sierra County, 2009
Projection Information:
-New Mexico State Plane West, NAD 1927

Legend

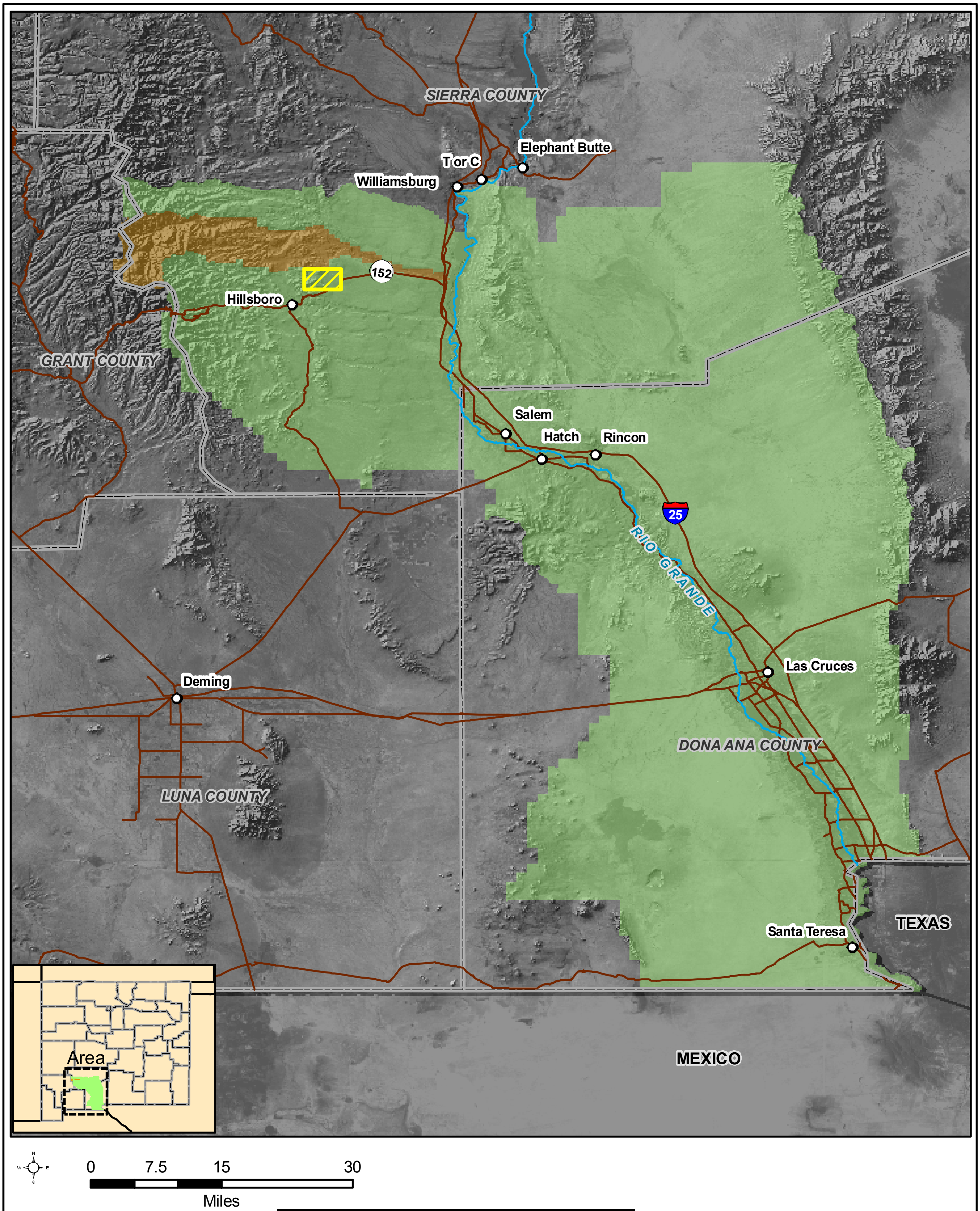
Profile Line

INTERA

Figure 4-6
Proposed Parallel Profiles for Pit Lake Survey

New Mexico Copper Corporation

S:\Projects\NMC-001_New Mexico Copper Corporation\GIS\Maps\SAP_7-2010\9_groundwater\9-1_LRG_basins.mxd 07/30/2010

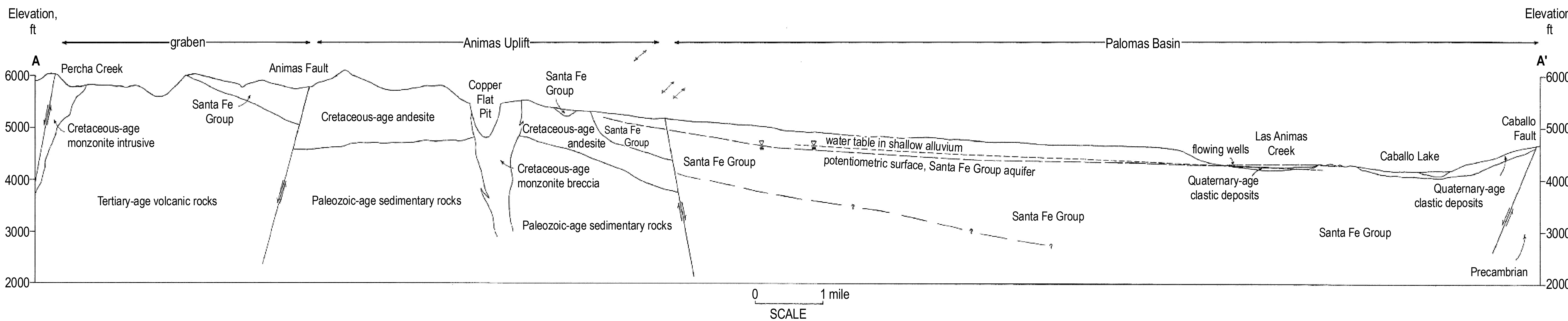


Basin Boundaries:
RGIS website/NMOSE
Imagery Information:
Landsat imagery from
University of Maryland NLCD

INTERA

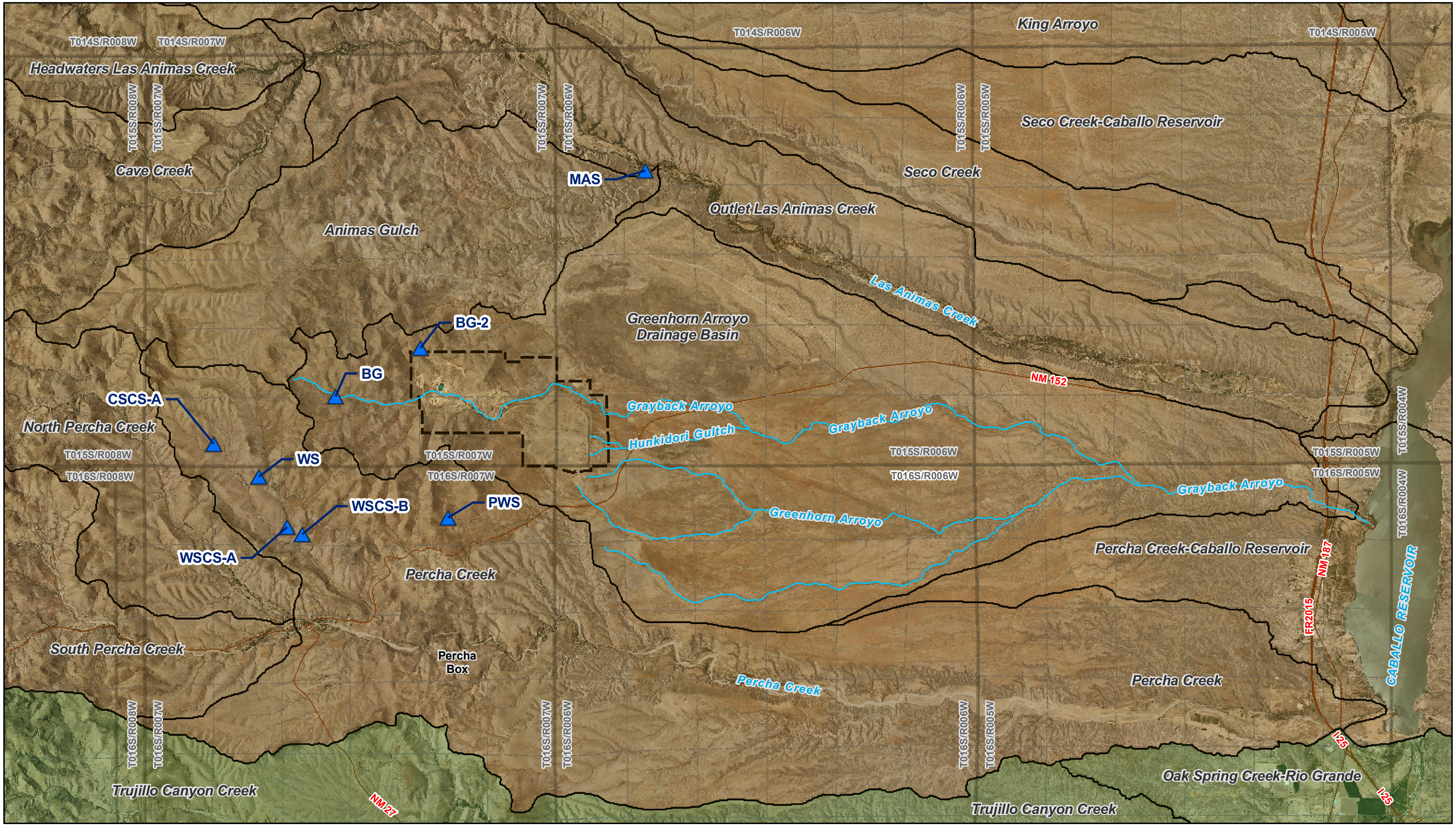
Figure 4-7
Lower Rio Grande Basin
New Mexico Copper Corporation

S:\Projects\NMC-001_New Mexico Copper Corporation\GIS\Maps\SAP_7-2010\9_groundwater\9-1_LRG_basins.mxd 07/30/2010



from John W. Shomaker, Inc., 1993

Figure 4-8
Conceptual Model of Groundwater Flow System
New Mexico Copper Corporation



N
W E
S

Watersheds:
USGS Hydrologic Unit Map
Mine Boundary:
Tom Van Bebber
Imagery Information:
-USGS 7.5-Minutes County DOQQ mosaic
 Sierra County, 2009
Projection Information:
-New Mexico State Plane West, NAD 1927

0 3,500 7,000 14,000 21,000
Feet

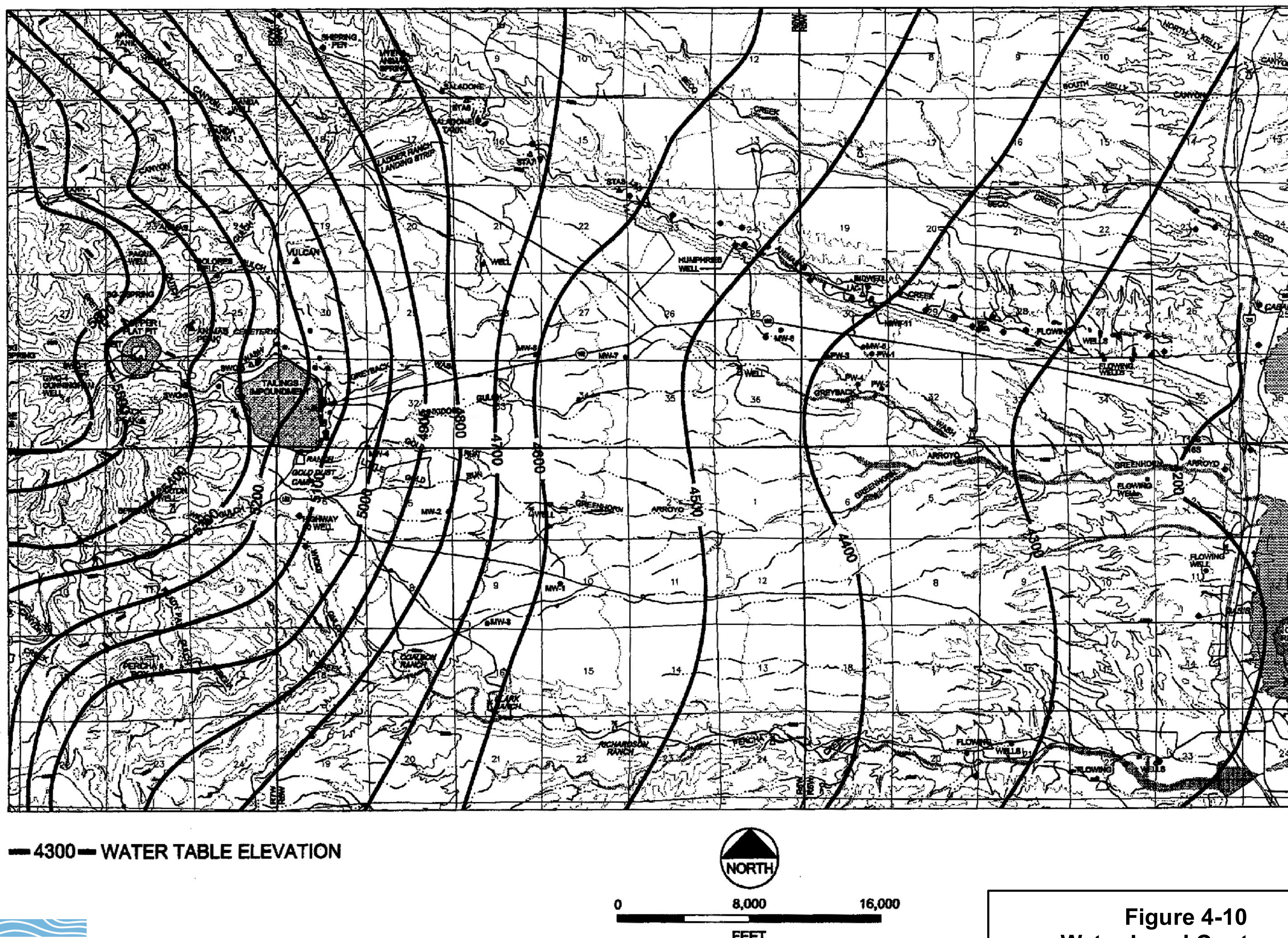
Legend

- Identified Spring
- Proposed Mine Permit Boundary

Watersheds
- Caballo
- El Paso-Las Cruces
- Sub-Watershed

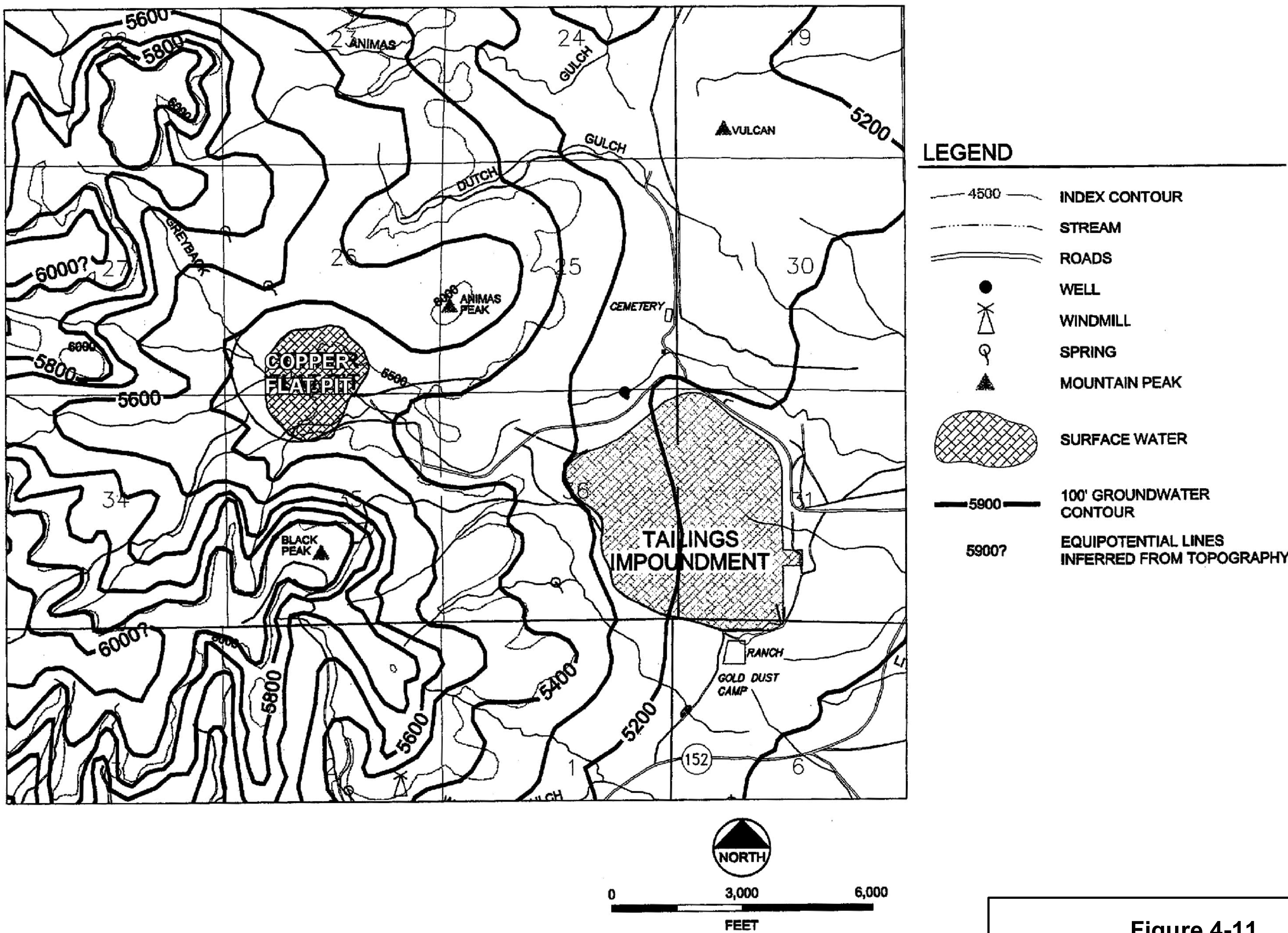
Figure 4-9
Spring and Stream Locations
New Mexico Copper Corporation

S:\Projects\NMC-001_New Mexico Copper Corporation\GIS\Maps\SAP_7-2010\8-SurfaceWater\8-1_surface_wtr_locations.mxd 08/26/2010



from ABC, 1998B

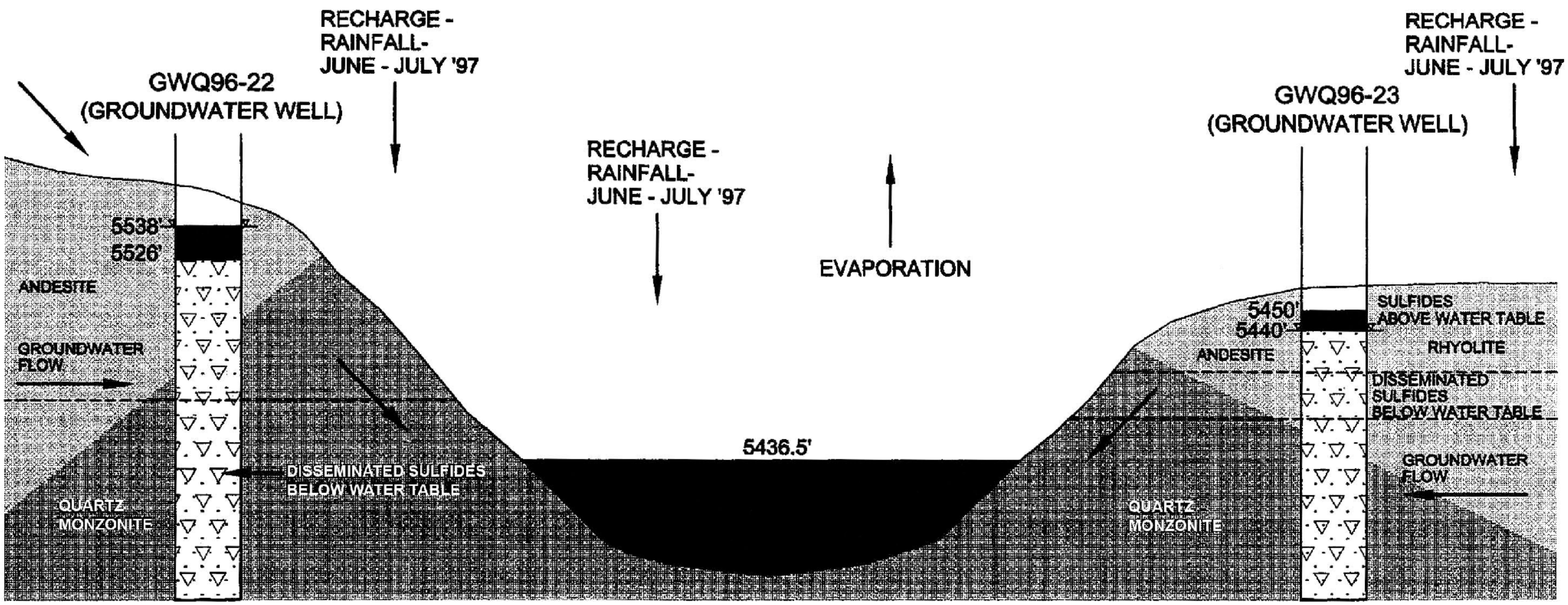
Figure 4-10
Water Level Contours
New Mexico Copper Corporation



INTERA

from ABC, 1997

Figure 4-11
Water Level Map of Copper Flat Pit Area
New Mexico Copper Corporation



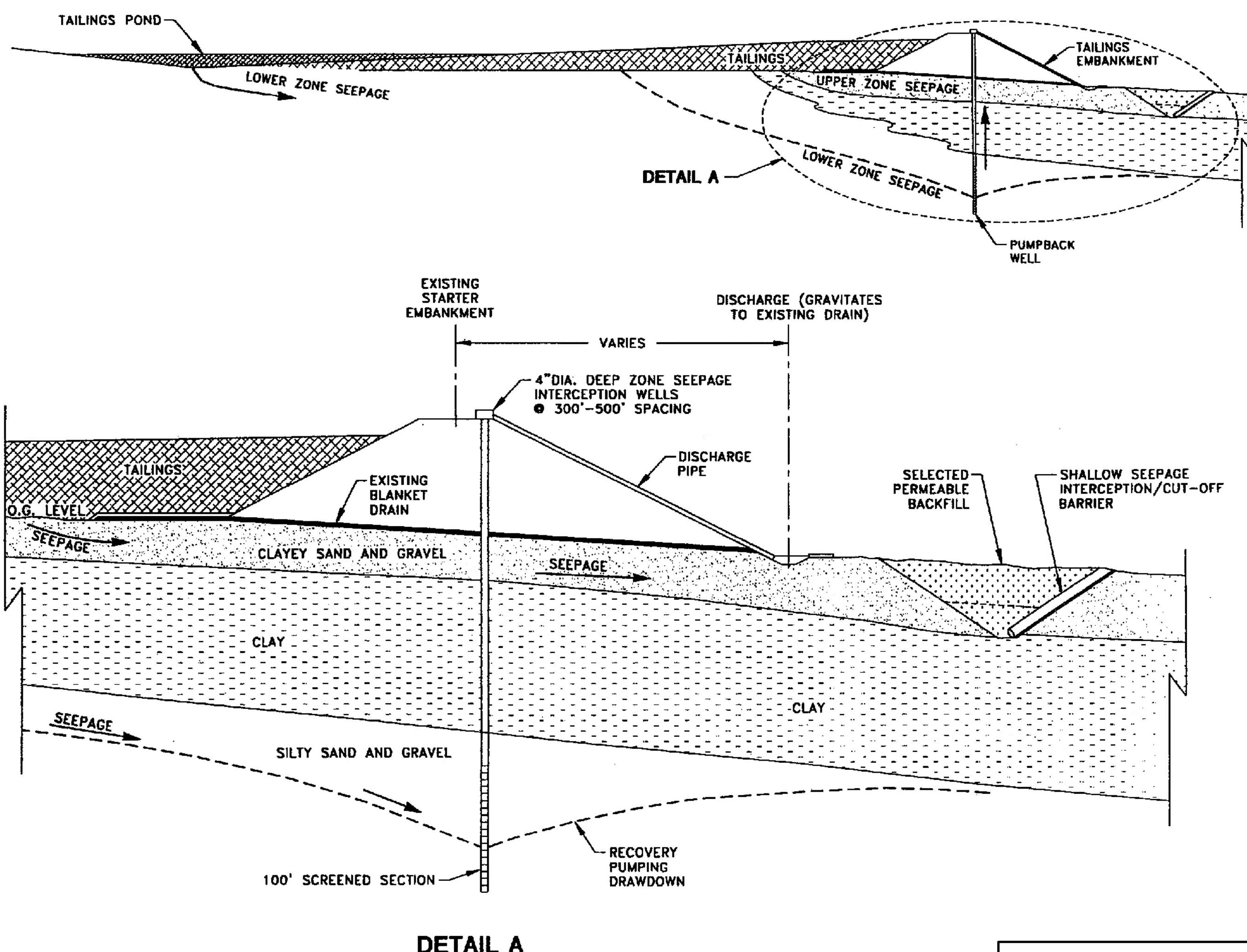
	GWQ96-22		PIT LAKE		GWQ96-23	
	JULY '96	AUG '97	AUG '95	AUG '97	APR '97	AUG '97
pH	7.5	7.65	8.31	8.16	7.89	7.68
TDS	700	700	4707	5021	770	920
SO_4	250	230	3170	3100	150	410
Cu	<0.025	<0.025	<0.025	0.050	<0.025	<0.025
Fe	<0.05	<0.05	<0.025	<0.05	6.5	0.82

INTERA

from SRK, 1998

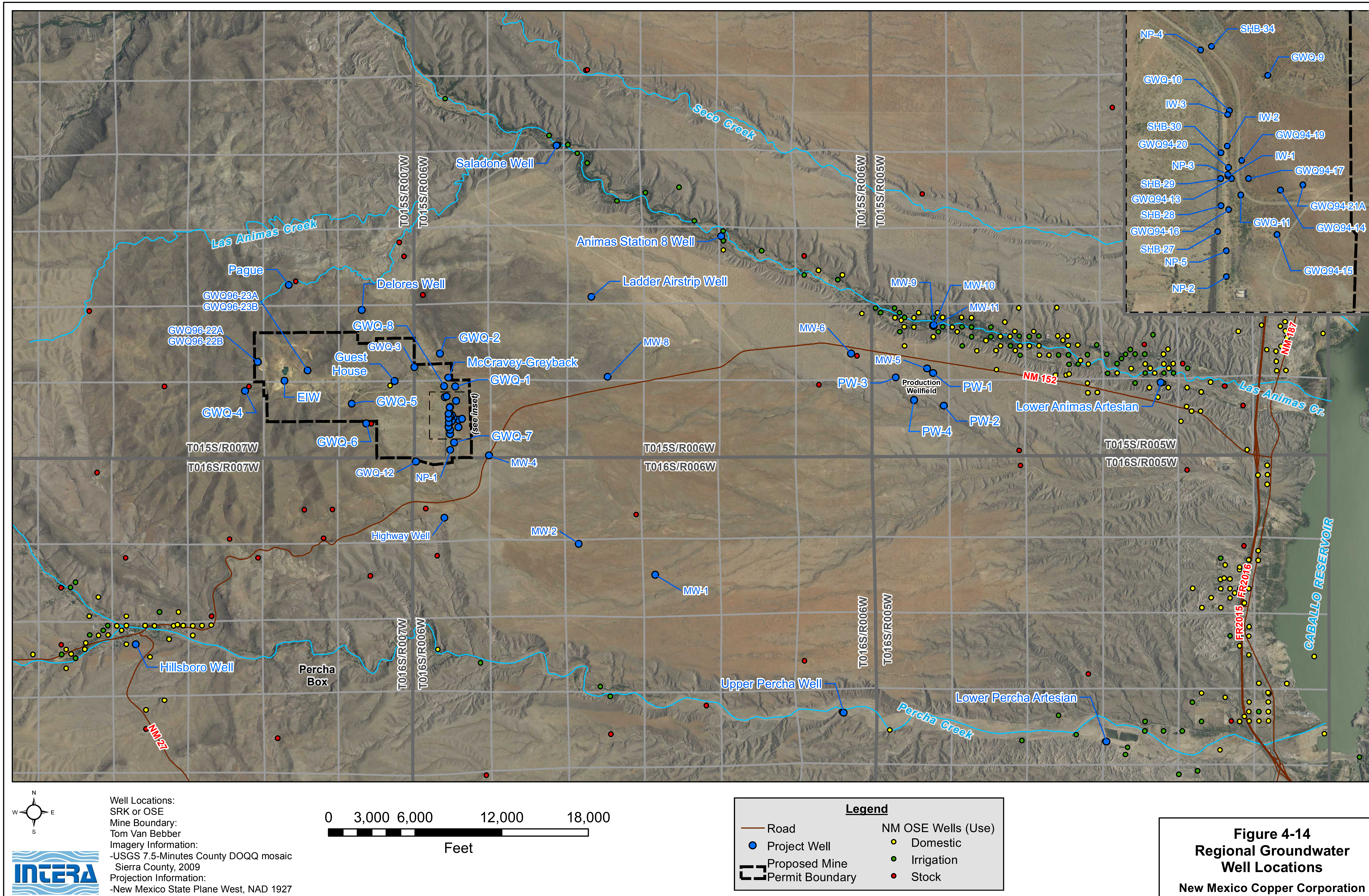
Figure 4-12
Conceptual Model of Pit Lake Monitoring Well Relationship with Water Quality Reports
New Mexico Copper Corporation

S:\Projects\NMC-001_New Mexico Copper Corporation\GIS\Maps\SAP_7-2010\9_groundwater\9-6_well_WQReports.mxd 07/29/2010



from SRK, 1995

Figure 4-13
Conceptual Design,
Tailings Seepage Control
New Mexico Copper Corporation

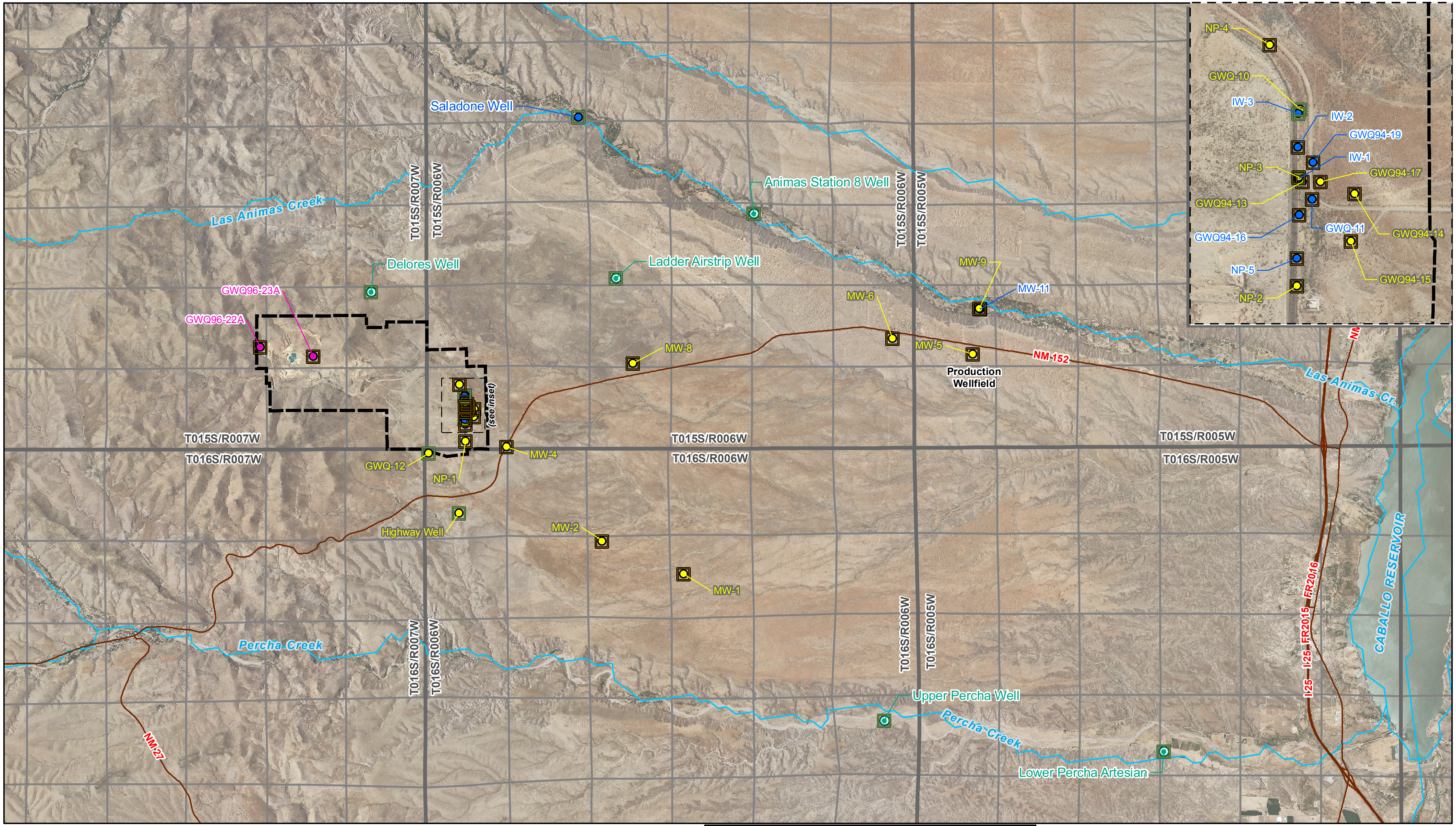


Well Locations:
SRK or OSE
Mine Boundary:
Tom Van Bebber
Imagery Information:
-USGS 7.5-Minutes County DOQQ mosaic
Sierra County, 2009
Projection Information:
-New Mexico State Plane West, NAD 1927

INTERA

Figure 4-14
Regional Groundwater Well Locations
New Mexico Copper Corporation

S:\Projects\NMC-001_New Mexico Copper Corporation\GIS\Maps\SAP_7-2010\9_groundwater\9-9_Regional GWwells.mxd 09/07/2010



Well Locations:
SRK or OSE
Mine Boundary:
Tom Van Bebber
Imagery Information:
-USGS 7.5-Minutes County DOQQ mosaic
Sierra County, 2009
Projection Information:
-New Mexico State Plane West, NAD 1927

0 3,000 6,000 12,000 18,000
Feet

Legend

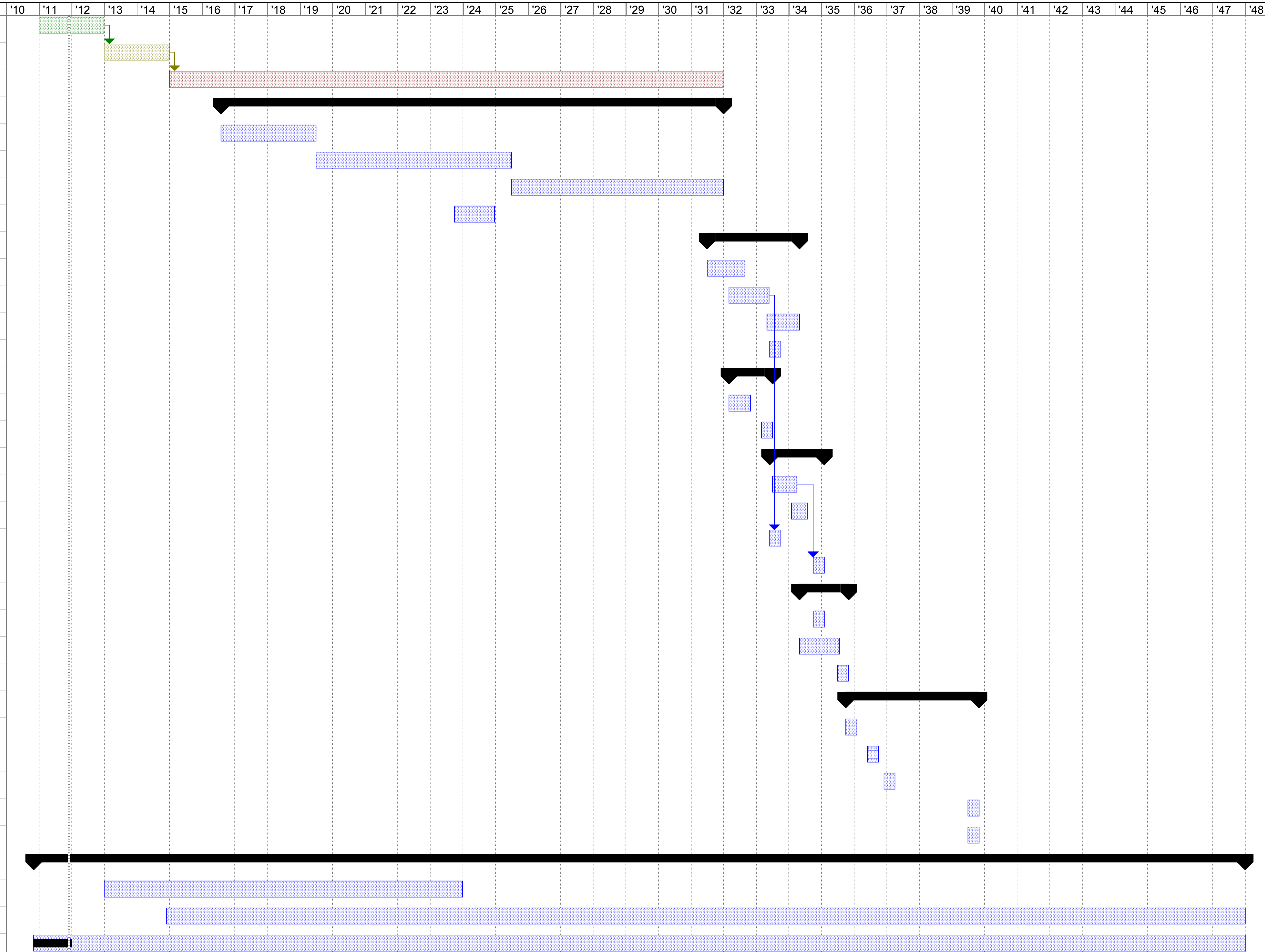
Proposed Monitoring Well
Aquifer
- Crystalline Bedrock
- Qauternary Alluvium
- Santa Fe Group
- Unknown

- Water Level Only
- Water Level & Water Quality
- Proposed Mine Permit Boundary
- Road

Figure 4-15
Proposed Monitoring Well Program
New Mexico Copper Corporation

S:\Projects\NMC-001_New Mexico Copper Corporation\GIS\Maps\SAP_7-2010\9_groundwater\9-10_ProposedGWwells.mxd 09/07/2010

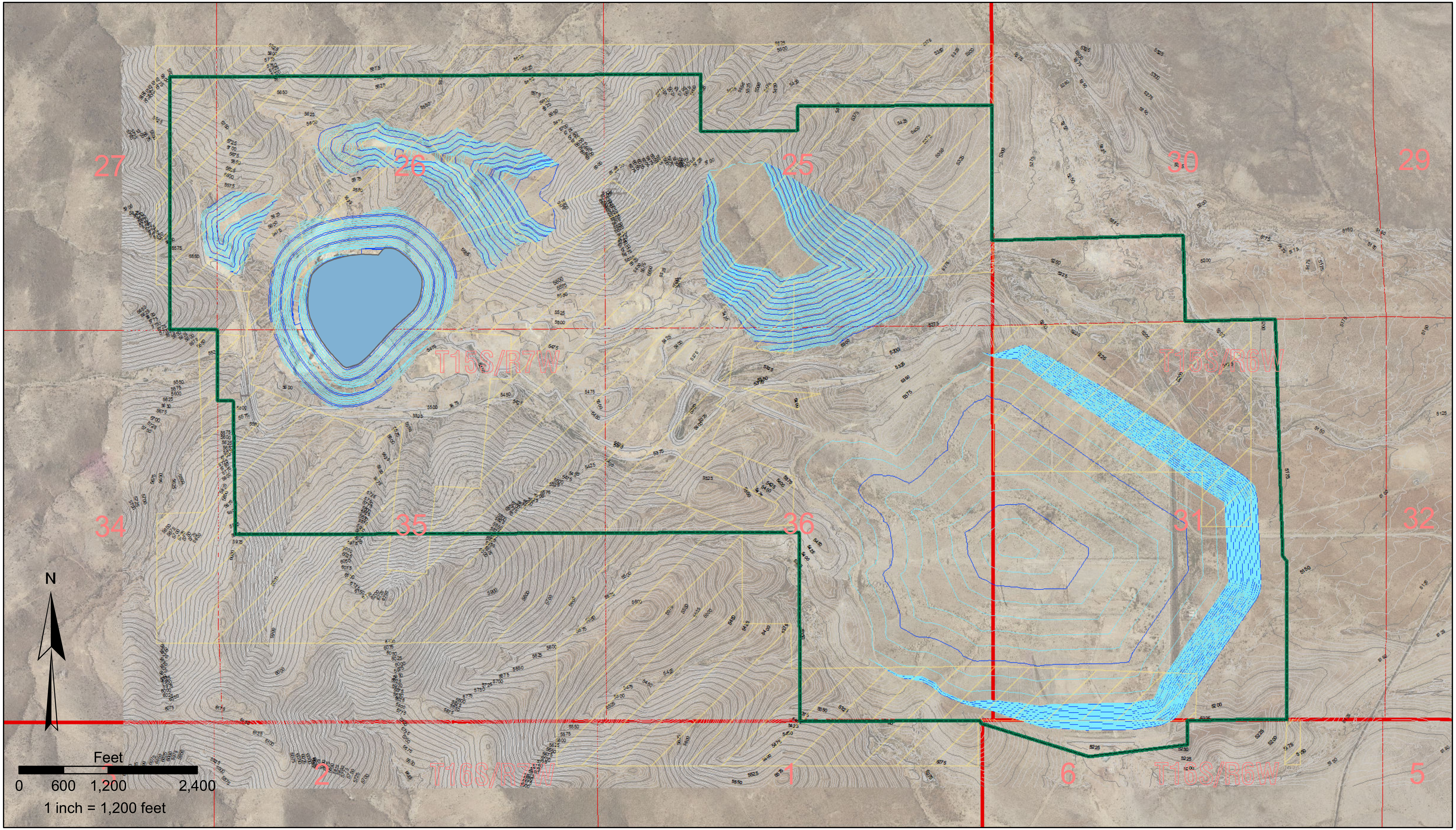
ID	Task Name
1	**Mine Permitting (Pre-Construction)**
2	**Mine Construction**
3	**Mine Operation**
4	**Waste Rock Disposal Areas**
5	West Waste Disposal
6	North Waste Disposal
7	East Waste Disposal
8	South Waste Disposal / Low-Grade Stockpile
9	**Tailings Impoundment Reclamation**
10	CoverlRevegetate Outer Embankment
11	Tailings Water Removal
12	GradelCover/RevegetateTailings Surface
13	Surface Pipeline Removal
14	**Pit Closure**
15	Highwall Stabilization
16	RamplHighwali Barricades
17	**Plant Area Reclamation**
18	Structure RemovallFoundation Burial
19	Regrade/Fill
20	Thickener Decommissioning
21	Septic System Decommissioning
22	**Road Reclamation**
23	Reduce Access Road Width
24	Remove / Barricade Haul Roads
25	Recontour / Revegetate Water Storage Road
26	**Utilities Reclamation**
27	Remove Above Ground Water Pipeline
28	Plug Underground Water Supply Pipeline
29	Remove S~e Water Supply Pump Stations
30	Remove Plant Site Powerlines
31	Disconnect 115kV Line
32	**Monitoring/Research Testing**
33	Revegetation Test Program
34	Revegetation Monitoring
35	Groundwater Monitoring



* Schedule approximate and subject to change with approval.

Figure 5-1
COPPER FLAT PROJECT
TENTATIVE SCHEDULE

01873



EXPLANATION

- Public
- Mine Boundary

IF THE ABOVE BAR DOES NOT SCALE 1 INCH, THE DRAWING SCALE IS ALTERED

DESIGN: -	DRAWN: -	REVIEWED: -
CHECKED: -	APPROVED: -	DATE: 6/22/2011
FILE NAME PoO_Fig5-02_ReclTopo_JQG_20100622		

NEW MEXICO COPPER CORPORATION

COPPER FLAT MINE

POST-RECLAMATION FACILITY TOPOGRAPHY

DRAWING NO.	SHEET	REVISION NO.
FIGURE 5-2	27 OF 28	A
JOB NO. 191000-03		

Path: H:\Copper_Flat\New Mexico Copper Corp\191000_03_Copper_Flat_Permitting\040_Drafting\20110621_Response_to_Comments\PoO_Fig5-02_ReclTopo_JQG_20100622.mxd

APPENDIX A

Claims List

Unpatented Lode and Placer Claims:				
		Recorded		B.L.M
Claim Name		Book	Page	Serial No.
Olympia		H	761	NM MC 60057
GLUCK AUF		I	327	NM MC 60058
Taurus		J	682	NM MC 60059
Hercules		K	231	NM MC 60060
EL ORO No. 3		P	52	NM MC 60063
Saint Louis Republic		I	80	NM MC 60069
Delores		27	269	NM MC 60070
HIGHLANDS No. 1		T	405	NM MC 60071
HIGHLANDS No. 2		T	405	NM MC 60072
HIGHLANDS No. 3		T	406	NM MC 60073
THE WELLINGTON		T	406	NM MC 60074
Three Boys No. 1		T	176	NM MC 60080
BLUE MOON		R	631	NM MC 60081
The Leone		U	478	NM MC 60082
Dolores Placer		36	13	NM MC 60083
JONES HILL PLACER		27	212	NM MC 60084
Duke No. 1		40	23	NM MC 60085
Duke No. 2		40	24	NM MC 60086
Graveyard Placer		29	424	NM MC 60021
Old Cabin Placer		29	420	NM MC 60022
Rainey Season Placer		33	163	NM MC 60027
Desert Gold Placer		R	359	NM MC 60043
Gray Black Placer		R	554	NM MC 60044
Black Sand Group 9	No. 1 Placer (Amended)	46	173	NM MC 60045
Black Sand Group 10	No. 3 Placer (Amended)	46	185	NM MC 60046
Surprise No. 1 Lode		48	13	NM MC 60052
Surprise No. 2 Lode		48	102	NM MC 60053
Dutch-1 Lode		48	556	NM MC 60054
Dutch-2 Lode		48	558	NM MC 60055
Dutch-3 Lode		48	557	NM MC 60056
Renew No. 1 Lode		58	622	NM MC 106464
Renew No. 2 Lode		58	623	NM MC 106465
M. S. #1		34	146	NM MC 60093
M. S. #2		34	146	NM MC 60094
M. S. #3		34	147	NM MC 60095
M. S. #4		34	147	NM MC 60096
M. S. #5		34	148	NM MC 60097
M. S. #6		34	148	NM MC 60098
M. S. #8		34	149	NM MC 60099
M. S. #10		34	150	NM MC 60101
M. S. #11		34	151	NM MC 60102
M. S. #12		34	151	NM MC 60103
M. S. #13		34	152	NM MC 60104
M. S. #14		34	152	NM MC 60105
M. S. #15		34	153	NM MC 60106
M. S. #16		34	153	NM MC 60107
M. S. #17		34	154	NM MC 60108
M. S. #18		34	154	NM MC 60109
M. S. #20		34	155	NM MC 60110
M. S. #21		34	156	NM MC 60111
M. S. #22		34	156	NM MC 60112
M. S. #23		34	157	NM MC 60113
M. S. #25		34	158	NM MC 60114
M. S. #26		34	158	NM MC 60115
M. S. #29		34	160	NM MC 60118
M. S. #33		34	162	NM MC 60122

Unpatented Lode and Placer Claims:			
	Recorded		B.L.M
Claim Name	Book	Page	Serial No.
M. S. #38	34	164	NM MC 60123
M. S. #48	34	167	NM MC 60129
M. S. #49	34	168	NM MC 60130
M. S. #53	34	168	NM MC 60131
M. S. #102	34	176	NM MC 60138
M. S. #104	34	177	NM MC 60139
M. S. #105	34	276	NM MC 60140
M. S. #106	34	277	NM MC 60141
M. S. #107	34	178	NM MC 60142
M. S. 222	34	543	NM MC 60170
M. S. 223	34	543	NM MC 60171
M. S. 224	34	544	NM MC 60172
M. S. 225	34	544	NM MC 60173
M. S. 228	34	546	NM MC 60176
M. S. 264	34	563	NM MC 60194
M. S. 282	34	572	NM MC 60210
M. S. 288	34	575	NM MC 60216
M. S. 289	34	576	NM MC 60217
M. S. 290	34	576	NM MC 60218
M. S. 291	34	577	NM MC 60219
M. S. 292	34	577	NM MC 60220
M. S. 293	34	578	NM MC 60221
M. S. 316	34	589	NM MC 60240
M. S. 320	34	591	NM MC 60244
M. S. 322	34	592	NM MC 60246
M. S. 329	34	596	NM MC 60253
M. S. 330	34	596	NM MC 60254
M. S. 331	34	597	NM MC 60255
M. S. 337	34	12	NM MC 60261
M. S. 338	34	13	NM MC 60262
M. S. 339	34	13	NM MC 60263
M. S. 340	34	14	NM MC 60264
M. S. 341	34	14	NM MC 60265
M. S. 342	34	15	NM MC 60266
M. S. 345	34	16	NM MC 60267
M. S. 346	34	17	NM MC 60268
M. S. 347	34	17	NM MC 60269
M. S. 438	41	564	NM MC 60312
M. S. 439	41	606	NM MC 60313
M. S. 440	41	607	NM MC 60314
M. S. 441	41	714	NM MC 60315
M. S. 452	45	353	NM MC 60318
M. S. 453	45	354	NM MC 60319
M. S. 454	45	355	NM MC 60320
M. S. 455	45	356	NM MC 60321
M. S. 456	45	357	NM MC 60322
M. S. 458	45	359	NM MC 60324
M. S. 460	45	361	NM MC 60326
M. S. 461	45	362	NM MC 60327
M. S. 462	45	363	NM MC 60328
M. S. 463	45	364	NM MC 60329
M. S. 464	45	365	NM MC 60330
M. S. 465	45	366	NM MC 60331
M. S. 467	45	368	NM MC 60333
M. S. 468	45	369	NM MC 60334
M. S. 469	45	370	NM MC 60335

Unpatented Lode and Placer Claims:			
	Recorded		B.L.M
Claim Name	**Book**	**Page**	**Serial No.**
M. S. 470	45	371	NM MC 60336
M. S. 471	45	372	NM MC 60337
M. S. 472	45	373	NM MC 60338
M. S. 473	45	374	NM MC 60339
M. S. 474	45	375	NM MC 60340
M. S. 475	71	1927	NM MC 163361
M. S. 476	71	1928	NM MC 163362
M. S. 477	71	1929	NM MC 163363
M. S. 478	71	1930	NM MC 163364
ANIMAS #1 Placer	45	443	NM MC 60341
ANIMAS #2 Placer	45	444	NM MC 60342
The Betsy Ross	R	93	NM MC 60344
Wicks Extension No. 1	R	100	NM MC 60346
Anderson Extension No. 2	R	93	NM MC 60348
Crescent 101	41	358	NM MC 60349
Wicks Extension 100	41	359	NM MC 60350
Betsy Ross 101	41	360	NM MC 60351
Portland 101	41	361	NM MC 60352
Ready Pay Apex 100	41	362	NM MC 60353
Anderson Extension 101	41	363	NM MC 60354

Unpantented Millsite			
Claim Name	**Book**	**Page**	**BLM Serial No.**
Greer No. 2	47	611	NM MC 72821
Chatfield	47	521	NM MC 72822
Chatfield No. 3	47	523	NM MC 72823
Chatfield No. 4	47	762	NM MC 72824
Chatfield No. 5	47	763	NM MC 72825
Chatfield No. 6	47	764	NM MC 72826
Chatfield No. 9	53	521	NM MC 81353
Chatfield No. 10	53	522	NM MC 81354
Chatfield No. 25	56	689	NM MC 100695

Newly Located Unpatented Lodes		
Claim Name	**Book**	**Page**
CU 1	116	902
CU2	116	903
CU 3	116	904
CU 4	116	905
CU 5	116	906
CU 6	116	907
CU 7	116	908
CU 8	116	909
CU 9	116	910
CU 10	116	911
CU 11	116	912
CU 12	116	913
CU 13	116	914
CU 14	116	915
CU 15	116	916
CU 16	116	917
CU 17	116	918
CU 18	116	919
CU 19	116	920
CU 20	116	921
CU 21	116	922
CU 22	116	923
CU 23	116	924
CU 24	116	925
CU 25	116	926
CU 26	116	927
CU 27	116	928
CU 28	116	929
CU 29	116	930
CU 30	116	931
CU 31	116	932
CU 32	116	933
CU 33	116	934
CU 34	116	935
CU 35	116	936
CU 36	116	937
CU 37	116	938
CU 38	116	939
CU 39	116	940
CU 40	116	941
CU 41	116	942
CU 42	116	943
CU 43	116	944
CU 44	116	945

Patented Claims	
Claim Name	**Mineral Survey**
Feeder	M.S. 943C
Chance	M.S. 945A
Xmas	M.S. 945B
Extension	M.S. 945D
Smokey Jones	M.S. 1024
Little Jewess	M.S. 1715
Wisconsin	Lot No. 805
Copper King	Lot No. 733A
Ventura	Lot No. 733B
Castle Hill	Lot No. 733C
Copperopolis	Lot No. 736
83	Lot No. 806
Soudan	Lot No. 807
Stenberg	M.S. 2066
Allhutten	M.S. 2066
Craze Martin	M.S. 2066
Coppenhagen	M.S. 2067
Carl Sextus	M.S. 2067
Union Leader	M.S. 2067
Stockholm	M.S. 2067
Grass Flat	M.S. 2068
Sandow	M.S. 2068
Old Mac	M.S. 2068

Fee Lands	Lot
Township 15 South, Range 7 West	
Section 36	Part of Lot 1 (Parcel N)
Section 36	Part of Lot 4 (Parcel M)
Section 36	Part of Lot 6 (Parcel J)
Section 36	Lot 10 (Parcel L)
Section 36	Lot 11 (Parcel K)
Section 36	Part of N½SE¼ (Parcel I)
Section 36	Part of N½S½SE¼ (Parcel H)
Township 15 South, Range 6 West	
Section 31	Lot 3 (Parcel D)
Section 31	Lot 6 (Parcel G)
Section 31	Lot 7 (Parcel C)
Section 31	Part of NE¼SW ¼ (Parcel E)
Section 31	N½SE¼SW¼ (Parcel B)
Section 31	Part of S½SE¼NW¼ (Parcel F)
Section 31	Part of SE1/4 (Parcel A)
Township 16 South, Range 6 West	
Section 6	Part of Lot 3 (Parcel P)
Section 6	Part of Lot 4 (Parcel O)

APPENDIX B

Preliminary Design Report:
Copper Flat Waste Rock Disposal Facilities

REPORT

PRELIMINARY DESIGN REPORT

Copper Flat Waste Rock Disposal Facilities

Submitted To: New Mexico Copper Corp
Suite 100 - 2425 San Pedro Dr. NE
Albuquerque, NM 87110

Submitted By: Golder Associates Inc.
4730 N. Oracle Road, Suite 210
Tucson, AZ 85705 USA

Distribution:
2 Copies – New Mexico Copper Corp.
2 Copies – Golder Associates Inc.

June 22, 2011 **103-92557.004 Rev. 2**

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Table of Contents

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1.0 INTRODUCTION

1.1 Scope

This report presents the preliminary design of the waste rock disposal facilities (WRDFs) and low grade ore stockpile at the Copper Flat Project. The WRDFs are sized to contain future waste rock and low grade ore based on quantities presented in the Copper Flat Mine Plan of Operations (NMCC, 2010). The report presents WRDF layouts and surface water management planning. Reclamation planning and reclamation construction material management are also discussed. Designs have been developed to preliminary level in an attempt to supplement information presented in the Mine Plan of Operations (MPO). WRDF designs will be advanced when site investigation activities have been completed and detailed engineering studies are commissioned.

1.2 Background Information

The Copper Flat project was briefly operated by Quintana Minerals Corporation in the period between 1982 and 1986. During this time, open pit pre-stripping operations were completed and waste rock disposal was initiated in the existing West and North WRDFs. Low grade ore was also stockpiled in the existing low grade ore stockpile. Existing facilities will be operated and expanded under the current MPO, and a new East WRDF will be developed when the West and North WRDFs reach capacity.

Future operations will result in the placement of approximately 37 million tons of waste rock in existing and new WRDFs. Approximately 19 million tons of low grade ore will be temporarily placed in the low grade ore stockpile and milled at the end of open pit mining operations. Estimated waste rock and low grade ore quantities cover future operations and do not include materials placed during the 1982-96 mining operation. Mine waste and low grade ore quantities are based on the mine plan presented in *NI 43-101 Preliminary Assessment, THEMAC Resources Group Limited, Copper Flat Project, Sierra County, New Mexico* (SRK, 2010). Facilities capable of containing estimated waste rock and low grade ore quantities and surface water management facilities required to divert external runoff away from disturbance areas and convey WRDF runoff to stormwater and sediment collection ponds are presented in this report.

2.0 WRDF DESIGN

2.1 WRDF Geometry and Capacity

The location of the Copper Flat Project and the current arrangement of facilities are shown on Figure 1. Topography shown on Figure 1 represents existing conditions and shows the site as it remains following closure of the 1982-86 mining operations. The existing West and North WRDFs, and the low grade ore stockpile are shown. Other disturbance areas from the previous mining operation include the open pit and the process facilities area.

Layouts for the proposed West, North and East WRDFs are shown on Figure 2. The capacities of the future waste rock disposal facilities are summarized in Table 1. A swell factor of 25 percent is assumed for WRDF sizing.

Table 1: Summary of WRDF Storage Capacity

Facility	Storage Capacity (tons)
West WRDF	1,180,000
North WRDF	7,090,000
East WRDF	28,850,000
Total WRDF Storage Capacity	**37,120,000**
Low Grade Ore Stockpile	19,000,000

Notes:
1) Contingency capacity of 20 percent included in design layouts.
2) Capacities do not include existing waste rock and reflect future storage requirements.

Waste rock disposal facilities are designed with overall slopes of 3 horizontal to 1 vertical (3H:1V) to facilitate regrading at closure. WRDF cross sections are shown on Figure 3. It is assumed that waste rock will be placed in lifts up to 200-feet high at angle of repose with bench setbacks to maintain the overall slope 3H:1V slope to facilitate regrading at closure. Construction in this manner will require bottom-up development of the WRDFs and will facilitate progressive reclamation. In addition, construction in this manner could reduce stockpiling requirements by allowing materials from higher elevation in the WRDFs be transported directly to completed lower slopes where reclamation cover can be placed progressively.

2.2 Site Preparation

Site preparation activities are anticipated to include clearing, top dressing stripping and reclamation cover material borrowing.

2.2.1 Top Dressing Stripping

Topsoil resources at Copper Flat are limited due to extensive disturbance during previous mining operations. Top dressing will consist of available topsoil plus additional alluvial and colluvial materials that will be used to supplement available topsoil and support revegetation efforts. Supplemental top dressing material is anticipated to be collected from alluvial and colluvial materials, such as those that occur in the footprint of the East WRDF.

Top dressing will be recovered from all previously undisturbed areas beneath the expanded footprint of the WRDFs. Little topsoil is likely to be present in the vicinity of the West and North WRDFs where slopes are steep, the depth to bedrock is limited, and disturbance from the 1982-1986 mining operation is relatively extensive. Estimated topsoil recovery volumes summarized in Table 2 assume stripping of the upper 6 inches in undisturbed areas. Top dressing requirements are summarized in Table 3.

Table 2: Estimated top dressing stripping quantities

Facility	Existing Disturbance (ac)	Projected Ultimate Footprint Area (ac)	Estimated Topsoil Salvage (cy)
West WRDF	11.9	16.3	3,538
North WRDF	20.5	69.9	21,384
East WRDF	0	122	99,072
Low Grade Ore Stockpile	20.7	67.7	37,913
Total			

Notes:
1) cy = cubic yards
2) ac= acres
3) No topsoil salvage assumed in existing disturbance area

2.2.2 Reclamation Cover Salvage

Future closure requirements for the WRDFs at Copper Flat are assumed to be similar to those currently applied at Tyrone, New Mexico, where a 2.5 to 3-foot thick native material cover is being placed. Reclamation cover requirements for Copper Flat assume a cover consisting of 6-inches of top dressing over 2.5-feet of native alluvial or colluvial cover fill. It is assumed that reclamation cover materials will be preferentially recovered from undisturbed WRDF footprint areas. As noted above, the depth to bedrock is anticipated to be minimal in the West and North WRDF areas and little reclamation cover material is expected to be available. Thicker alluvial and colluvial deposits are anticipated to occur in the vicinity of the East WRDF, and it is assumed that most cover material will be borrowed from the foundation of the East WRDF.

Table 3: Summary of top dressing and reclamation cover requirements

Facility	Top Dressing Cover Requirements (cy)	Reclamation Cover Requirements (cy)
West WRDF	13,151	65,755
North WRDF	56,400	282,005
East WRDF	99,072	495,360
Low Grade Ore Stockpile	54,611	To be processed
Total	223,234	843,120

Notes:
1) cy = cubic yards
2) Assumes 6 inches of top dressing cover over 2.5 feet of reclamation cover
3) Reclamation cover requirements assumes 2.5 feet of native material cover

Availability of waste rock cover material will be verified during site investigation activities. Estimated reclamation cover requirements for the WRDF's are summarized in Table 3. It is assumed that the low grade ore stockpile will be processed when mining operations in the pit have been completed. If economic conditions preclude processing, the low grade ore stockpile will be regraded to a stable configuration and reclamation cover will be applied.

2.3 WRDF and Low Grade Ore Stockpile Sequencing

Initial waste rock disposal operations will be conducted in the West WRDF followed by the North WRDF which lies closest to the open pit. When the West and North WRDFs reach capacity, waste rock disposal will commence in the East WRDF. The anticipated sequence of construction and reclamation of the WRDF's and low grade ore stockpile is summarized below:

- Salvage top dressing and reclamation cover material from the West WRDF and the low grade ore stockpile. Stockpile salvaged material in the vicinity of East WRDF.
- Commence waste rock disposal in the West WRDF, commence low grade ore stockpiling.
- When the West WRDF nears capacity, commence top dressing and cover material salvage in the North WRDF. Reclamation materials will be stockpiled in the vicinity of the East WRDF.
- Initiate waste rock disposal in the North WRDF. Regrade and reclaim the west WRDF.
- When the North WRDF nears capacity, commence top dressing and cover material salvage in the East Stockpile. Reclamation materials will be stockpiled in the vicinity of the East WRDF.
- Commence waste rock disposal in the East WRD, regrade and reclaim the North WRDF.
- Commence recovery and processing of low grade ore, regrade and reclaim the East WRDF.
- Place top dressing in the footprint of the low grade ore stockpile.

2.4 Reclamation Material Stockpiles

It is assumed that any top dressing and reclamation cover materials salvaged from the West and North WRDFs can be temporarily stockpiled within the footprint of the East WRDF. These materials will be recovered during progressive reclamation of the West and North WRDFs as they near ultimate capacity.

Prior to initiation of waste rock disposal in the East WRDF, top dressing salvage operations will be completed within the proposed footprint. Given the relative scarcity of potential borrow areas within the permit area, it is assumed that the majority of the reclamation cover material required for closure of the WRDFs will be obtained from within the East WRDF and low grade ore stockpile footprints.

A stockpile will be required for all or a portion of the top dressing and reclamation cover materials for the East WRFD and low grade ore stockpile. Based on the estimated material quantities presented in Table 3, reclamation of the East WRDF and low grade ore stockpile will require approximately 649,000 cubic yards (cy) of top dressing and cover material. It is assumed that reclamation materials for the West and North WRDFs will not require a life of mine stockpile outside areas that will be disturbed by waste rock disposal and low grade ore placement. Therefore, the WRDF reclamation material stockpile has been sized to contain materials required for the East WRDF and low grade ore stockpile. The WRDF reclamation material stockpile as shown on Figure 2 has the capacity to contain approximately 700,000 cy of material. Progressive reclamation of WRDF slopes may allow a reduction in the amount of material requiring storage in the stockpile.

3.0 SURFACE WATER MANAGEMENT

The proposed surface water management plan for the WRDFs and low grade ore stockpile is shown on Figure 4. Stormwater contacting waste rock and generated sediment will be routed to either the open pit or constructed stormwater and sediment collection ponds. Collected water will be utilized as process make-up water. Surface water runoff from upgradient catchment areas contributory to the WRDFs will be diverted away from the waste rock where diversion is feasible and released. Runoff from minor undisturbed areas that cannot be diverted will be collected in the conveyance ditches and routed to the stormwater ponds.

3.1.1 Methodology

Preliminary sizing for runoff diversion and stormwater conveyance ditches is based on carrying the 100-year storm discharge with a dry freeboard of one foot. Because the contributory catchments in the WRDF areas are relatively small, short duration, high intensity precipitation events will result in peak discharge rates. Diversion ditch capacity is based on the 100-year storm duration that is equivalent to the time of concentration for each individual catchment. Peak flow estimates for diversion and conveyance structures were estimated using the rational method and precipitation depth versus duration estimates presented in the National Oceanic and Atmospheric Administration (NOAA) Atlas 14, Version 5.

Preliminary stormwater pond capacity is based on the runoff associated with the 100-year, 24-hour storm event. At Copper Flat, the NOAA estimated 100-year, 24-hour storm depth is 3.73 inches at the 90 percent confidence level. HEC-HMS (U.S. Army Corps of Engineers, 2008) was used to estimate runoff volumes for the 100-year, 24-hour storm.

3.1.2 Runon Control

Runoff diversion ditches will be located as shown on Figure 4. Runoff from the West and East diversions will be released into the Greyback Wash diversion. Runoff north of West and North WRDFs will be released into natural drainages.

Table 4 summarizes catchment area, time of concentration, rainfall intensity and peak discharge estimates for WRDF area diversion ditches. Hydrologic calculations are contained in Appendix 1. Diversion ditch dimensions are shown on Figure 5.

Table 4: Summary of peak 100-yr storm flow estimates for conveyance and diversion structures

Facility	Catchment Area (ac)	Time of Concentration (minutes)	Rainfall Intensity for Peak Discharge (in/hr)	Peak Discharge (cfs)
Diversion 1	8.9	4.4	8.51	32.3
Diversion 2	122.1	24.9	3.84	199.3
Diversion 3	61.6	18.9	4.35	113.9
Conveyance 1	18.0	34.4	3.10	19.5
Conveyance 2	60.0	58.8	2.23	52.7
Conveyance 3	16.5	12.6	5.62	35.5
Conveyance 4	33.4	12.6	5.62	75.0
Conveyance 5	213.0	55.6	2.23	171.7
Conveyance 6	46.5	35.2	3.10	50.4

Notes:
1) ac = acres
2) in/hr = inches per hour
3) cfs = cubic feet per second

Diversions 1 and 2 will divert runoff from upgradient undisturbed areas around the West and North WRDFs. Diversion 1 will discharge into the existing Greyback Wash Diversion while Diversion 2 will discharge to an unnamed drainage to the north. Diversion 3 will divert undisturbed area runoff from the east side of the East WRDF and discharge into the Greyback Wash Diversion. Diversion ditches will be riprap lined where they are constructed over erodible materials.

3.1.3 Stormwater and Sediment Collection

Stormwater conveyance ditches and collection pond locations are shown on Figure 4. Conveyance ditch dimensions and a typical stormwater pond section are shown on Figure 5. Stormwater pond and conveyance ditch capacity may be modified during final design studies, however, the general arrangement of surface water management facilities is expected to remain as shown.

During mining operations, local groundwater drawdown associated with pit dewatering will result in the pit acting as a groundwater sink. Runoff from portions of the West and North WRDFs will be intercepted in Conveyance Ditches 1 and 2 and routed to the open pit. Waste rock runoff reporting to the pit will be recovered as part of normal pit dewatering operations. In the event of a 100-year, 24-hour storm, these areas will contribute approximately 14.2 acre-feet (ac-ft) of runoff to the open pit. During future feasibility and design studies, trade-off analyses will be performed to compare the capital and operating costs of pumping stormwater from the open pit versus constructing additional stormwater ponds.

Waste rock runoff that does not report to the open pit will be collected in stormwater ponds and utilized as process make-up water. Conveyance Ditches 3 and 4 will intercept runoff from portions of the North WRDF and low grade ore stockpile which will be routed to Stormwater Pond 1. Conveyance Ditches

5 and 6 will intercept runoff from the low grade ore stockpile and East WRDF which will be routed to Stormwater Pond 2. Peak discharge estimates for conveyance ditches are shown in Table 4. Conveyance ditches will be riprap lined where they are constructed over erodible materials.

3.1.4 Stormwater Pond Design

There are no prescriptive design criteria for the construction of retention structures for runoff from waste rock disposal facilities in New Mexico. Stormwater ponds at Copper Flat are assumed to be unlined structures equipped with a reclaim pump. Unlined ponds will facilitate equipment entry and periodic removal of sediment to maintain stormwater storage capacity. It is assumed that collected stormwater will be pumped to the process facilities for use as process make-up water after suspended solids have been allowed to settle. Details of stormwater pond reclaim works will be developed during final design studies.

Table 5: Summary of Stormwater Pond Storage Requirements

Facility	Catchment Area (ac)	100-Year 24-Hour Storm Runoff Volume (ac-ft)
Stormwater Pond 1	**77.2**	9.2
Stormwater Pond 2	213.0	22.5

Notes:
1) ac = acres
2) ac-ft = acre-feet

Preliminary layouts for stormwater ponds are shown on Figure 4. Table 5 includes a summary of storage capacity requirements for stormwater ponds shown on Figure 4. Figure 5 contains typical stormwater pond construction details. Ponds will be constructed with berm/embankment heights that do not require a dam safety permit.

4.0 USE OF THIS REPORT

This preliminary design document has been prepared exclusively for the use of New Mexico Copper Corporation (NMCC) for the specific application to the Copper Flat Project. No third-party engineer or consultant shall be entitled to rely on any of the information, conclusions, or opinions contained in this report without the written approval of Golder Associates Inc. or NMCC.

Golder Associates Inc. sincerely appreciates the opportunity to support NMCC on the Copper Flat Project. Please contact either of the undersigned with any questions or comments on the information contained in this report.

GOLDER ASSOCIATES INC.

DAVID ALAN KIDD
NEW MEXICO
13778
6-22-11
REGISTERED PROFESSIONAL ENGINEER

David A. Kidd, PE
Principal/Practice Leader

Gene Muller
Senior Engineer

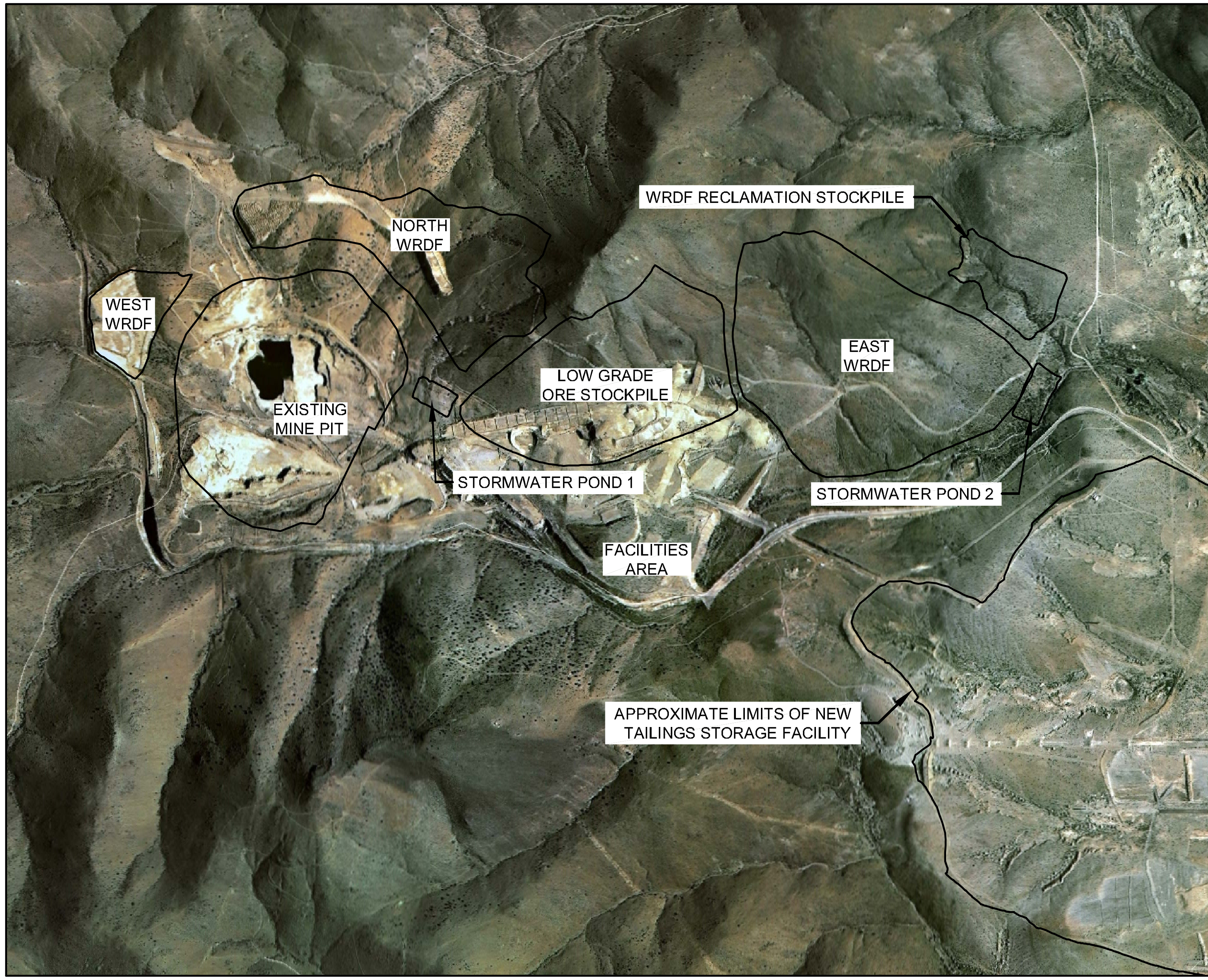
DAK/GM/br

5.0 REFERENCES

New Mexico Copper Corporation, 2010. *Copper Flat Mine Plan of Operations*. Report prepared for the USDA, BLM, December, 2010

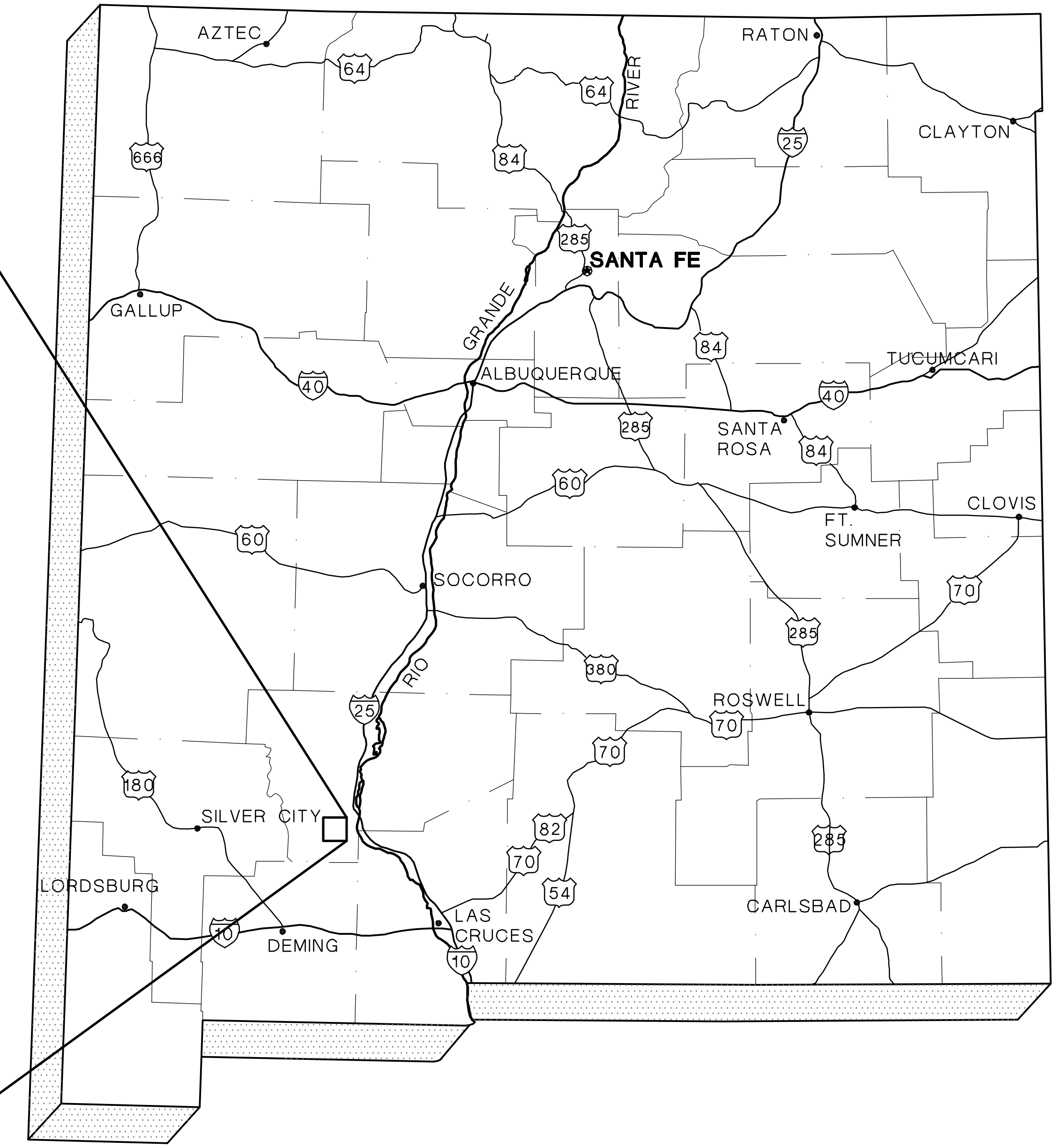
SRK Consulting Inc., 2010. *NI 43-101 Preliminary Assessment, THEMAC Resources Group Limited, Copper Flat Project, Sierra County, New Mexico*. Report prepared for New Mexico Copper Corporation, May 6, 2010.

FIGURES



AERIAL PHOTOGRAPH OF PROPOSED MINE AND WASTE ROCK DISPOSAL FACILITIES

NOT TO SCALE



STATE OF NEW MEXICO

NOT TO SCALE

REFERENCES

1. JULY 1, 2005 AERIAL PHOTOGRAPHY © GOOGLE 2010, NMRGIS 2011.

PROJECT

New Mexico Copper Corporation

COPPER FLAT PROJECT
WASTE ROCK DISPOSAL FACILITIES
PRELIMINARY DESIGN
SIERRA COUNTY, NEW MEXICO

TITLE

SITE LOCATION PLAN

Golder Associates

PROJECT No.		103-92557	FILE No.	10392557C001
DESIGN	WK	06/13/11	SCALE	NOT TO SCALE
CADD	NIL	06/13/11		
CHECK	GM	06/15/11	FIGURE 1	
REVIEW	DAK	06/15/11		

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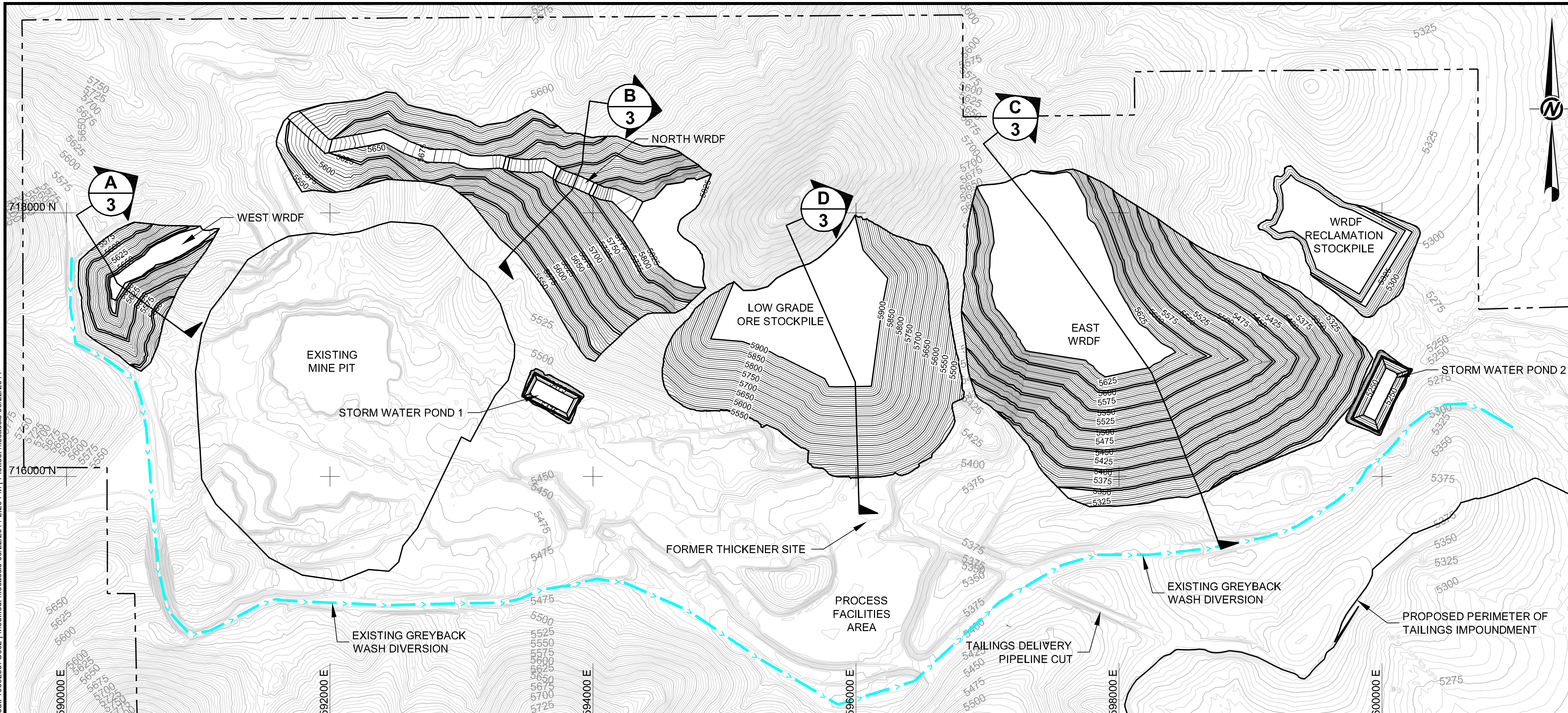

LEGEND

5200	EXISTING CONTOURS
— · —	PERMIT BOUNDARY
5200	DESIGN CONTOURS
——	DESIGN BREAKLINES
— < —	EXISTING SURFACE WATER DIVERSION DITCH
A / 3	SECTION CALL-OUT SECTION ID SECTION LOCATION

NOTES

1. WASTE ROCK DISPOSAL FACILITIES ARE SHOWN IN APPROXIMATE POST-RECLAMATION/REGRADED CONFIGURATION.

REFERENCES

1. 5-FT. CONTOUR INTERVAL SURFACE TOPOGRAPHY PROVIDED BY NEW MEXICO COPPER CORPORATION, INC.

750 0 750
SCALE FEET

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New Mexico Copper Corporation
COPPER FLAT PROJECT
WASTE ROCK DISPOSAL FACILITIES
PRELIMINARY DESIGN
SIERRA COUNTY, NEW MEXICO

TITLE

WASTE ROCK DISPOSAL FACILITY PLAN

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PROJECT No.		103-92557	FILE No.	10392557C002
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CADD	NIL	06/13/11		
CHECK	GM	06/15/11	FIGURE 2	
REVIEW	DAK	06/15/11		

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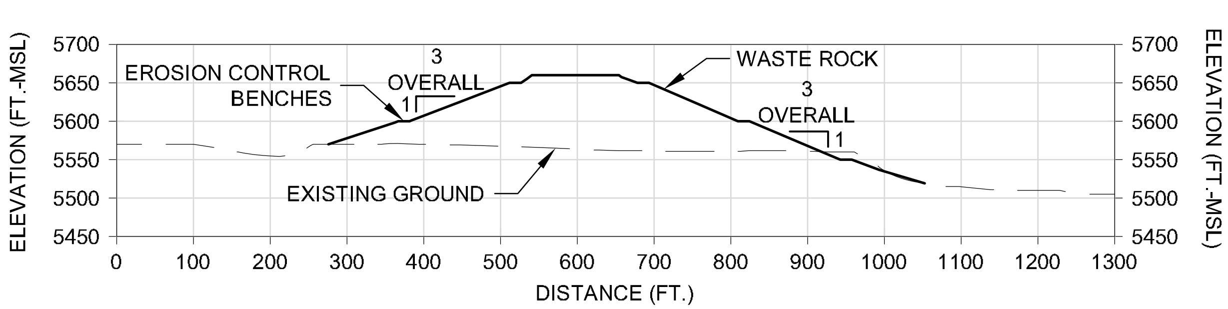

A / 3 **WEST WRDF CROSS-SECTION A**

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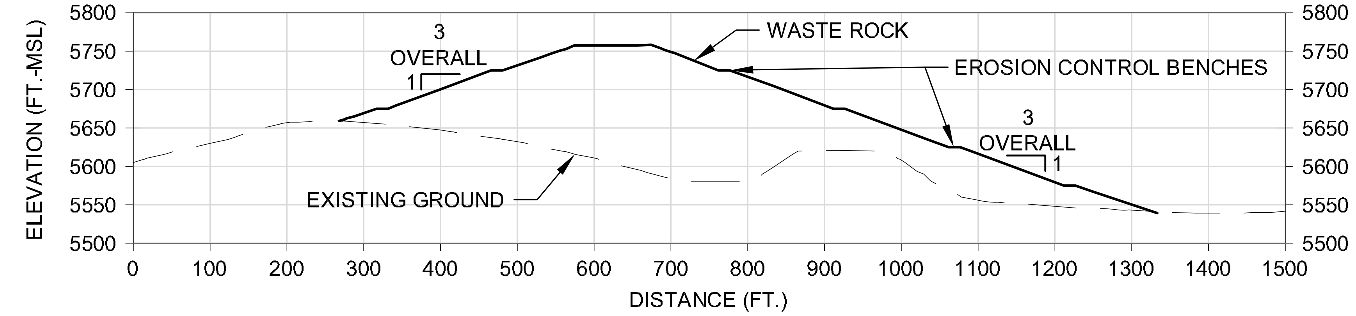

B / 3 **NORTH WRDF CROSS-SECTION B**

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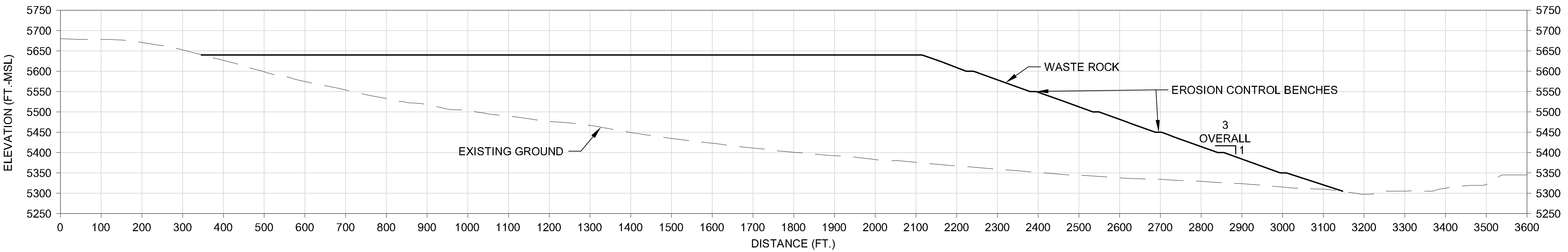
SCALE FEET



C / 3 **EAST WRDF CROSS-SECTION C**

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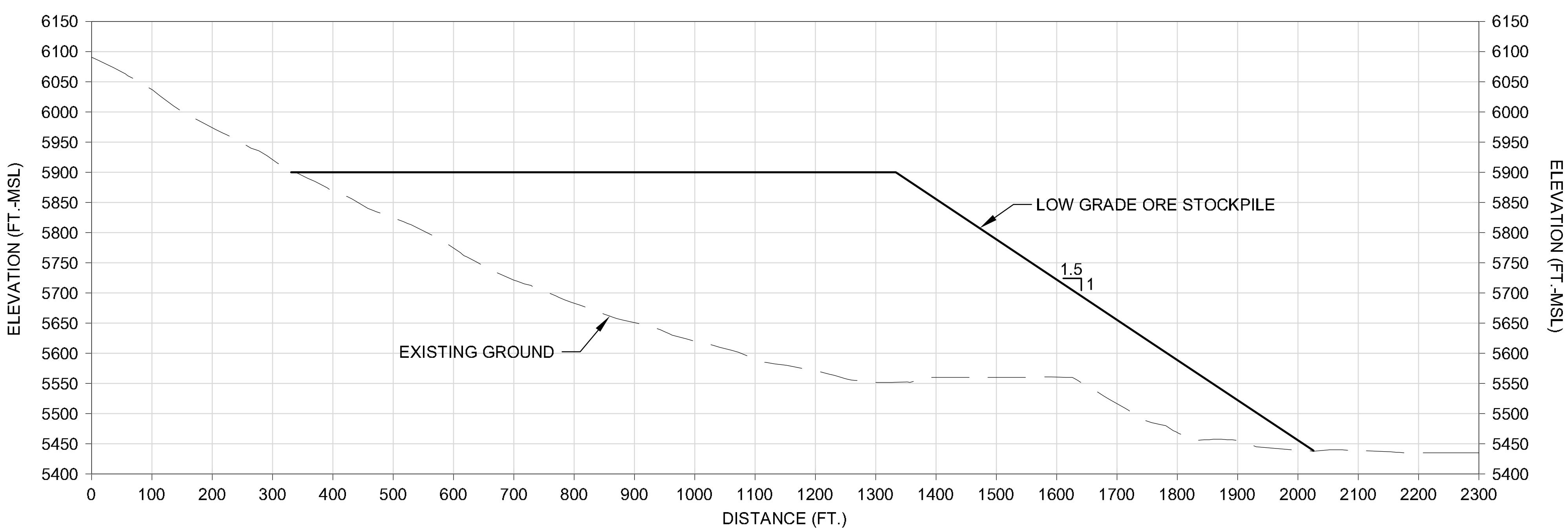
SCALE FEET



D / 3 **LOW GRADE ORE STOCKPILE CROSS-SECTION D**

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SCALE FEET

NOTES

1. WASTE ROCK DISPOSAL FACILITIES AS SHOWN IN CROSS-SECTIONS ARE IN APPROXIMATE POST-RECLAMATION/REGRADED CONFIGURATION.

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TITLE
WASTE ROCK DISPOSAL FACILITY CROSS-SECTIONS

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PROJECT No.		103-92557	FILE No.	10392557C003
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REVIEW	DAK	06/15/11		

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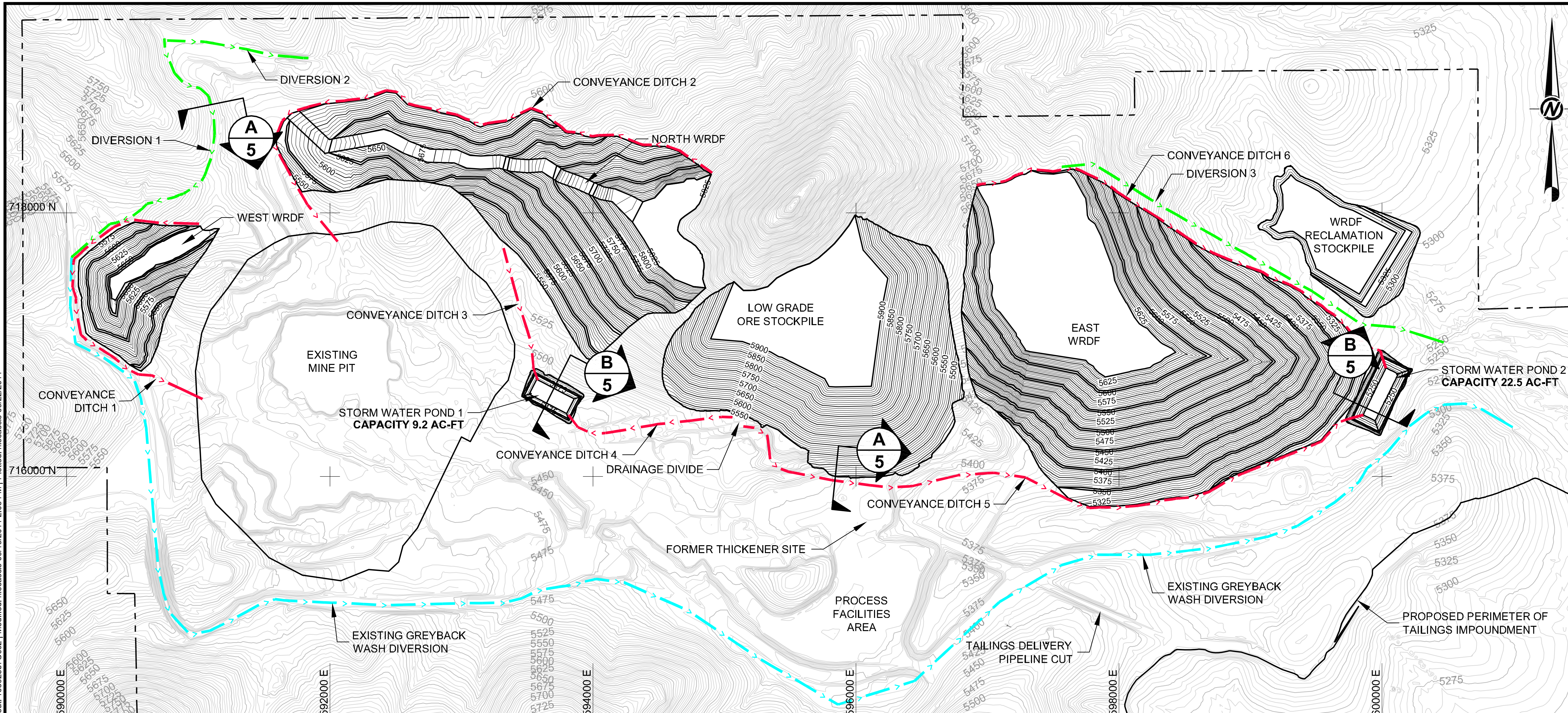

LEGEND

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	PERMIT BOUNDARY
5200	DESIGN CONTOURS
	DESIGN BREAKLINES
	EXISTING SURFACE WATER DIVERSION DITCH
	PROPOSED SURFACE WATER DIVERSION DITCH
	PROPOSED STORM WATER CONVEYANCE DITCH

REFERENCES

1. 5-FT. CONTOUR INTERVAL SURFACE TOPOGRAPHY PROVIDED BY NEW MEXICO COPPER CORPORATION, INC.

750 0 750
SCALE FEET

PROJECT
New Mexico Copper Corporation
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WASTE ROCK DISPOSAL FACILITIES
PRELIMINARY DESIGN
SIERRA COUNTY, NEW MEXICO

TITLE
SURFACE WATER MANAGEMENT PLAN

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PROJECT No.		103-92557	FILE No.	10392557C004
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REVIEW	DAK	06/15/11		

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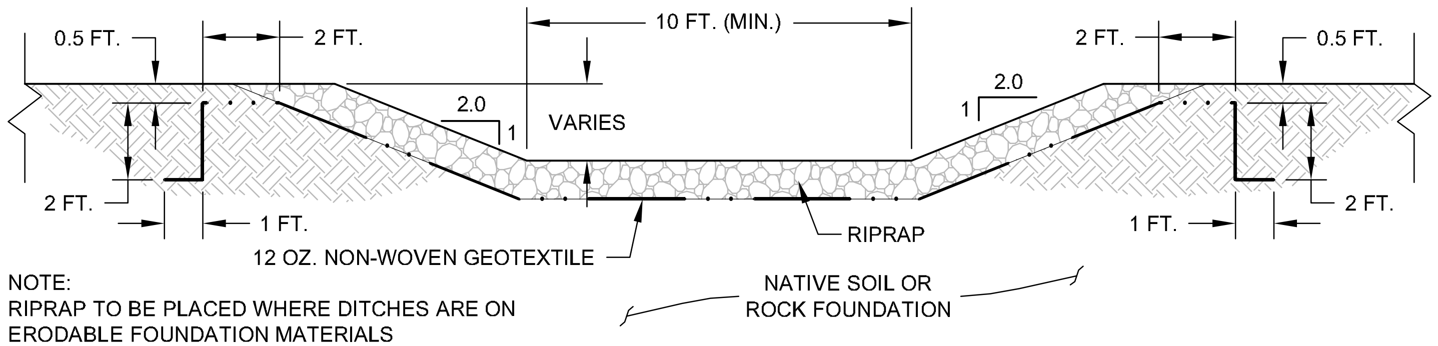
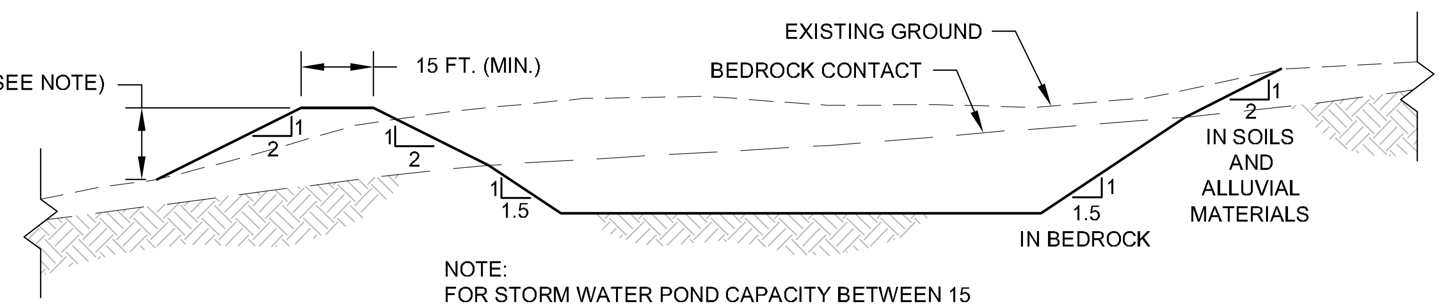


NOTE:
RIPRAP TO BE PLACED WHERE DITCHES ARE ON ERODABLE FOUNDATION MATERIALS

Channel ID	Peak Discharge (cfs)	Max Normal Flow Depth (ft)	Construction Depth (ft)
Diversion 1	32.3	0.7	1.7
Diversion 2	199.3	2.1	3.1
Diversion 3	113.9	1.5	2.5
Conveyance 1	19.5	0.6	1.6
Conveyance 2	52.7	1.0	2.0
Conveyance 3	35.5	0.8	1.8
Conveyance 4	75.0	1.2	2.2
Conveyance 5	171.7	1.9	2.9
Conveyance 6	50.4	1.0	2.0

Notes: 1.) Bottom Width 10 ft
2.) Side Slopes 2H:1V

A/5 TYPICAL DIVERSION AND CONVEYANCE DETAIL



NOTE:
FOR STORM WATER POND CAPACITY BETWEEN 15 AND 50 ACRE-FEET, H SHALL BE LESS THAN 25 FT.

B/5 TYPICAL STORMWATER POND SECTION

K:\2010 Projects\103-92557 Copper Flat\C-Preliminary Design\10392557C005.dwg | Layout: 5 SURFACE WATER MANAGEMENT DETAILS | Modified: nlocascio 06/16/2011 2:18 PM | Plotted: nlocascio 06/16/2011

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New Mexico Copper Corporation
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TITLE
SURFACE WATER MANAGEMENT DETAILS

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PROJECT No.		103-92557	FILE No.	10392557C005
DESIGN	WK	06/13/11	SCALE	NOT TO SCALE
CADD	NIL	06/13/11		
CHECK	GM	06/15/11	FIGURE 5	
REVIEW	DAK	06/15/11		

APPENDIX A
HYDROLOGIC DATA AND CALCULATIONS

APPENDIX A.1
STORMWATER POND SIZING CALCULATIONS

Date:	April 12, 2011	**Made by:**	WK
Project No.:	103-92557	**Checked by:**	GM
Subject:	WRDF Surface Water Hydrology	**Reviewed by:**	DAK
Project Short Title:	**COPPER FLAT APPENDIX A.1**		

1.0 OBJECTIVE

Perform a hydrologic analysis of the Copper Flat WRDF areas to determine stormwater storage requirements for the 100-year design storm event. Stormwater ponds are shown on Figure 3 of the preliminary Design Report Copper Flat Waste Rock Disposal Facilities (Golder Associates, 2011), and Figure A.1.

2.0 METHOD

- Sub-basin areas were determined using topography provided by New Mexico Copper Corporation., 2009 (5' contours) - see Sub-Basin Areas on Figure A.1, Page 3.
- SCS LAG Equation.
- SCS Curve Number method.
- Peak discharge values were calculated using HEC-HMS computer model.

3.0 ASSUMPTIONS

- 100-year, 24-hour Precipitation Depth: 3.73 inches (*NOAA On-line Atlas* pages 4-7)
- Curve Numbers: (*TR-55*)
  - Undisturbed Native Ground – 85
  - Compacted Cover – 92
  - Stockpile Areas – 70
- Antecedent Moisture Conditions II
- Hydraulic Length and Slope extracted from topography.

4.0 CALCULATIONS`

- Lag time was calculated for each Sub-basin.
  - $t_L = [L^{0.8} (s+1)^{0.7}] / [1900 (Y)^{0.5}]$
    - L = Length of the longest drainage path in feet.
    - S = (1000/CN) - 10
    - CN =curve number
    - Y = The average watershed slope in %

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- Time of concentration (t_C) calculated for each sub-basin concentration point (CP). See lag time and curve number calculation sheet on pages 8-9.
  - $t_L = 0.6 * t_C$
- SCS Type II storm distribution was used to determine peak flow and volume of runoff for the different concentration points.

5.0 CONCLUSIONS

- See HEC-HMS schematic and results on pages 10.

TABLE 1: HEC-HMS RESULTS

Location	Sub-Basin Area (sq. mi)	Curve Number	Lag Time (min)	Volume (acre-ft)
SWP-1	0.12055	74.4	8	9.18
SWP-2	0.33282	71.9	34	22.50

6.0 REFERENCES

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National Weather Service, 2011. *National Oceanic and Atmospheric Administration Atlas 14, Volume 1, Version 5*. Retrieved May 11, 2011 from<http://hdsc.nws.noaa.gov/hdsc/pfds/pfds_printpage.html?lat=32.9751&lon=-107.5225&data=depth&units=english&series=pds#top/>.

U.S. Army Corps of Engineers, 2008. *Hydrologic Modeling System*, *Version 3.4.0*, Hydrologic Engineering Center (USACE). August, 2009.

NOAA Atlas 14, Volume 1, Version 5
Location name: New Mexico, US*
Coordinates: 32.9751, -107.5225
Elevation: 5871ft*
* source: Google Maps

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval(years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.222 (0.196-0.250)	0.286 (0.255-0.322)	0.382 (0.339-0.430)	0.454 (0.403-0.511)	0.553 (0.489-0.622)	0.630 (0.556-0.709)	0.709 (0.624-0.802)	0.792 (0.695-0.899)	0.903 (0.788-1.03)	0.993 (0.862-1.14)
10-min	0.339 (0.299-0.380)	0.436 (0.388-0.490)	0.581 (0.516-0.654)	0.691 (0.614-0.777)	0.842 (0.744-0.948)	0.959 (0.846-1.08)	1.08 (0.949-1.22)	1.21 (1.06-1.37)	1.38 (1.20-1.57)	1.51 (1.31-1.74)
15-min	0.420 (0.370-0.472)	0.540 (0.481-0.607)	0.720 (0.639-0.811)	0.857 (0.761-0.964)	1.04 (0.923-1.17)	1.19 (1.05-1.34)	1.34 (1.18-1.51)	1.50 (1.31-1.70)	1.70 (1.49-1.95)	1.87 (1.63-2.15)
30-min	0.566 (0.499-0.635)	0.728 (0.648-0.818)	0.970 (0.861-1.09)	1.15 (1.02-1.30)	1.41 (1.24-1.58)	1.60 (1.41-1.80)	1.80 (1.59-2.04)	2.01 (1.77-2.28)	2.30 (2.00-2.62)	2.52 (2.19-2.90)
60-min	0.700 (0.618-0.786)	0.901 (0.802-1.01)	1.20 (1.07-1.35)	1.43 (1.27-1.61)	1.74 (1.54-1.96)	1.98 (1.75-2.23)	2.23 (1.96-2.52)	2.49 (2.19-2.83)	2.84 (2.48-3.24)	3.12 (2.71-3.59)
2-hr	0.805 (0.721-0.905)	1.03 (0.926-1.16)	1.37 (1.22-1.53)	1.64 (1.46-1.83)	2.00 (1.77-2.24)	2.30 (2.03-2.57)	2.62 (2.28-2.92)	2.96 (2.56-3.29)	3.42 (2.92-3.81)	3.80 (3.21-4.24)
3-hr	0.867 (0.783-0.970)	1.10 (0.997-1.24)	1.44 (1.30-1.62)	1.72 (1.53-1.92)	2.09 (1.86-2.33)	2.40 (2.13-2.67)	2.73 (2.39-3.03)	3.07 (2.67-3.41)	3.55 (3.05-3.96)	3.95 (3.36-4.41)
6-hr	1.00 (0.910-1.11)	1.27 (1.15-1.41)	1.63 (1.47-1.81)	1.91 (1.72-2.12)	2.31 (2.07-2.55)	2.62 (2.33-2.89)	2.96 (2.61-3.26)	3.30 (2.89-3.64)	3.78 (3.27-4.18)	4.17 (3.58-4.62)
12-hr	1.15 (1.04-1.27)	1.45 (1.32-1.60)	1.84 (1.67-2.03)	2.15 (1.94-2.37)	2.57 (2.30-2.83)	2.89 (2.59-3.18)	3.24 (2.88-3.57)	3.60 (3.17-3.97)	4.07 (3.55-4.50)	4.46 (3.86-4.95)
24-hr	1.37 (1.22-1.54)	1.72 (1.53-1.93)	2.15 (1.91-2.41)	2.49 (2.21-2.79)	2.96 (2.61-3.31)	3.34 (2.93-3.73)	3.73 (3.26-4.17)	4.14 (3.59-4.64)	4.70 (4.05-5.30)	5.15 (4.40-5.83)
2-day	1.56 (1.39-1.75)	1.96 (1.75-2.19)	2.44 (2.17-2.73)	2.83 (2.52-3.16)	3.37 (2.98-3.77)	3.79 (3.34-4.24)	4.24 (3.71-4.76)	4.71 (4.09-5.30)	5.36 (4.60-6.06)	5.88 (5.00-6.70)
3-day	1.70 (1.51-1.90)	2.12 (1.89-2.37)	2.64 (2.35-2.96)	3.06 (2.72-3.42)	3.64 (3.22-4.07)	4.10 (3.61-4.59)	4.58 (4.01-5.14)	5.08 (4.41-5.73)	5.79 (4.97-6.56)	6.36 (5.40-7.25)
4-day	1.83 (1.63-2.05)	2.28 (2.04-2.55)	2.84 (2.53-3.18)	3.29 (2.93-3.67)	3.91 (3.46-4.37)	4.40 (3.88-4.93)	4.92 (4.30-5.52)	5.46 (4.74-6.15)	6.22 (5.34-7.06)	6.83 (5.81-7.81)
7-day	2.15 (1.93-2.38)	2.68 (2.41-2.98)	3.31 (2.97-3.68)	3.81 (3.42-4.23)	4.50 (4.01-5.00)	5.04 (4.48-5.61)	5.60 (4.94-6.24)	6.18 (5.42-6.92)	6.98 (6.06-7.86)	7.62 (6.54-8.63)
10-day	2.42 (2.17-2.69)	3.02 (2.71-3.37)	3.75 (3.35-4.18)	4.32 (3.86-4.83)	5.12 (4.55-5.72)	5.75 (5.08-6.43)	6.41 (5.62-7.18)	7.09 (6.18-7.97)	8.04 (6.93-9.11)	8.79 (7.51-10.0)
20-day	3.09 (2.78-3.42)	3.85 (3.47-4.27)	4.72 (4.25-5.23)	5.38 (4.83-5.96)	6.26 (5.61-6.94)	6.93 (6.18-7.70)	7.62 (6.76-8.48)	8.30 (7.33-9.27)	9.22 (8.07-10.4)	9.93 (8.63-11.2)
30-day	3.77 (3.41-4.14)	4.69 (4.25-5.16)	5.69 (5.17-6.27)	6.46 (5.85-7.11)	7.45 (6.73-8.22)	8.19 (7.37-9.05)	8.94 (8.01-9.90)	9.68 (8.63-10.7)	10.6 (9.44-11.9)	11.4 (10.0-12.7)
45-day	4.60 (4.16-5.08)	5.71 (5.18-6.31)	6.87 (6.22-7.60)	7.73 (6.99-8.55)	8.83 (7.96-9.78)	9.63 (8.66-10.7)	10.4 (9.34-11.6)	11.2 (9.98-12.5)	12.2 (10.8-13.7)	12.9 (11.4-14.6)
60-day	5.34 (4.83-5.90)	6.64 (6.01-7.34)	7.99 (7.22-8.82)	8.97 (8.10-9.91)	10.2 (9.21-11.3)	11.1 (10.0-12.3)	12.0 (10.8-13.3)	12.9 (11.5-14.3)	14.0 (12.4-15.6)	14.8 (13.0-16.6)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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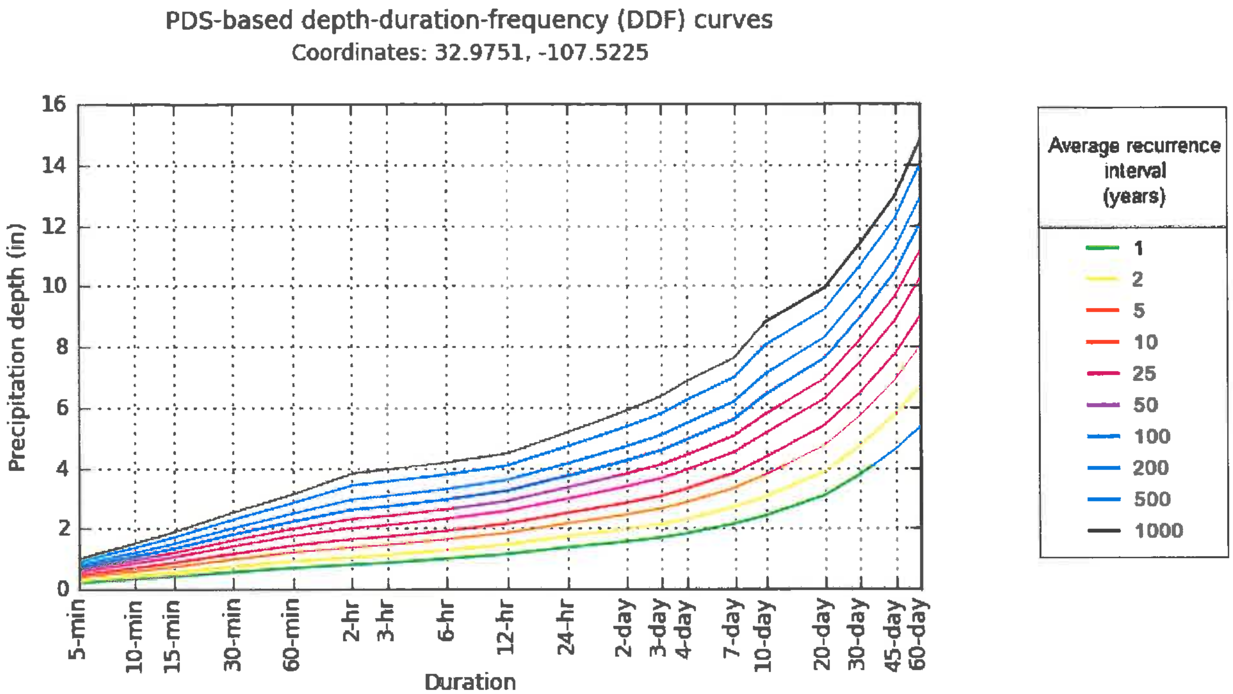
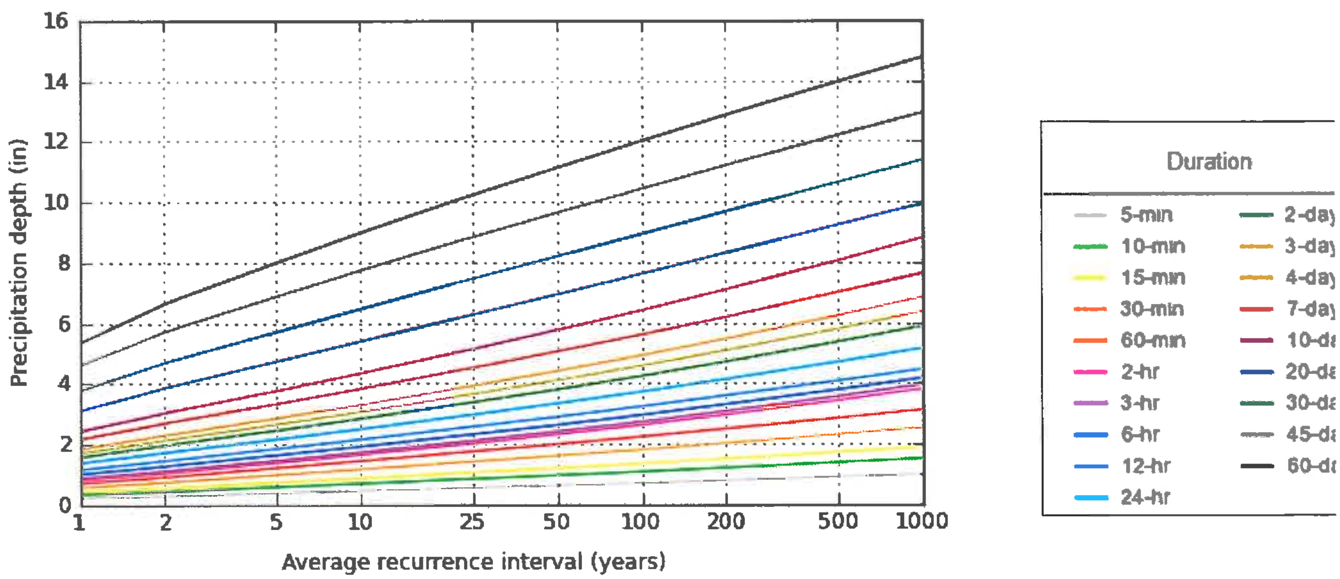
PF graphical





NOAA/NWS/OHD/HDSC Created (GMT): Wed May 11 22:59:37 2011

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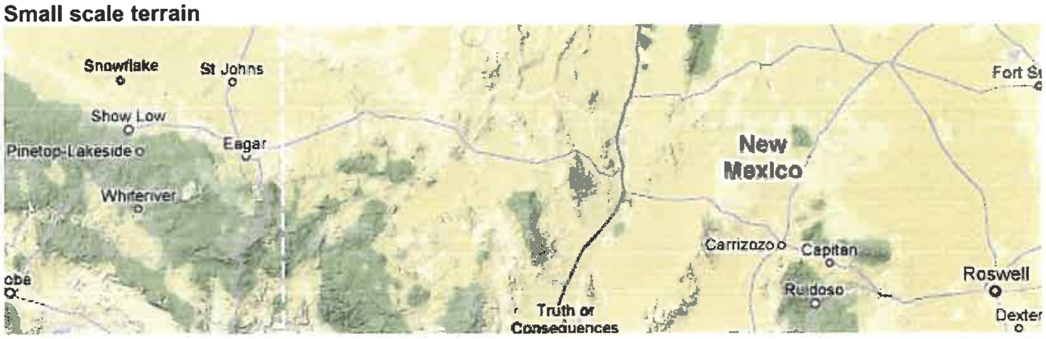
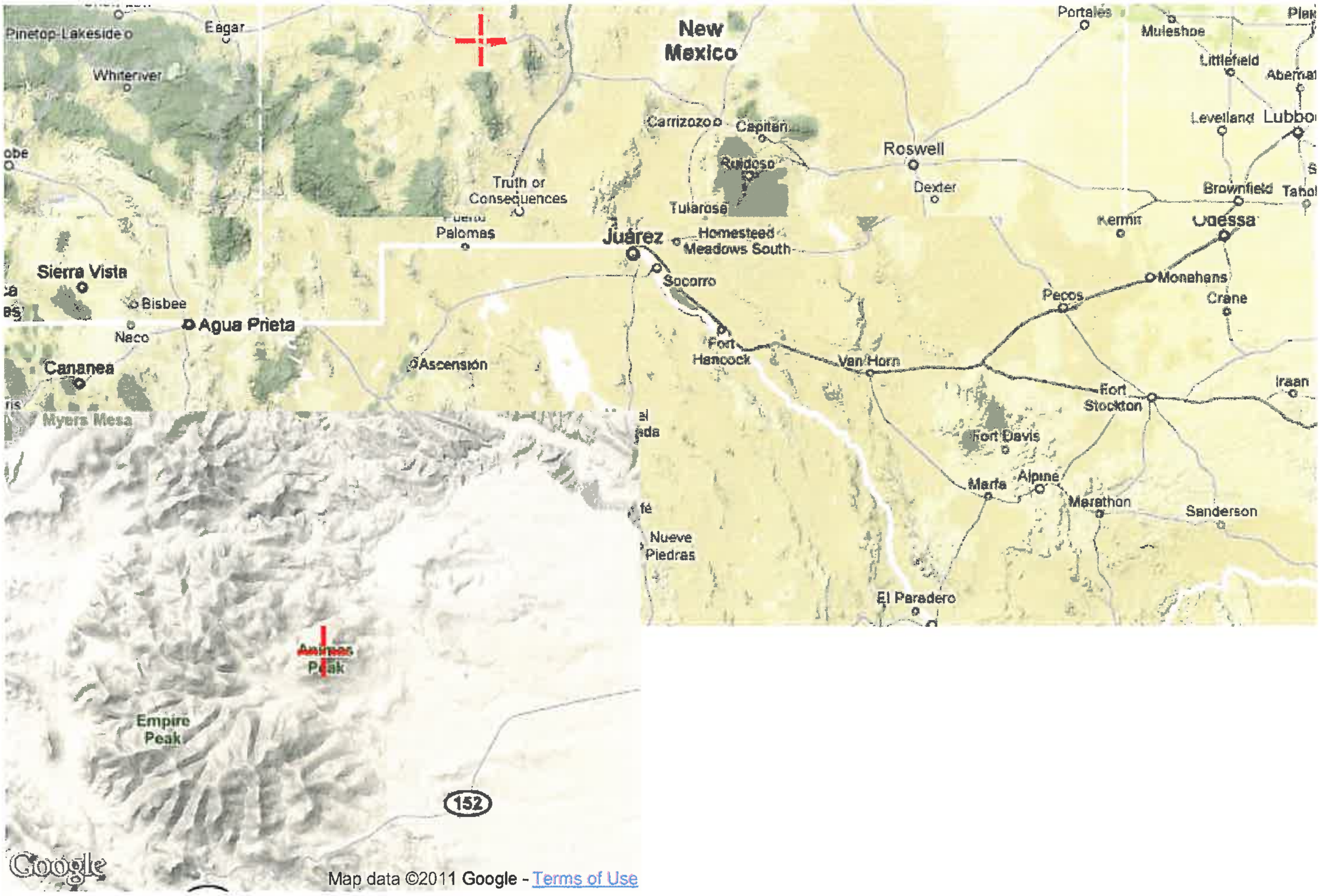
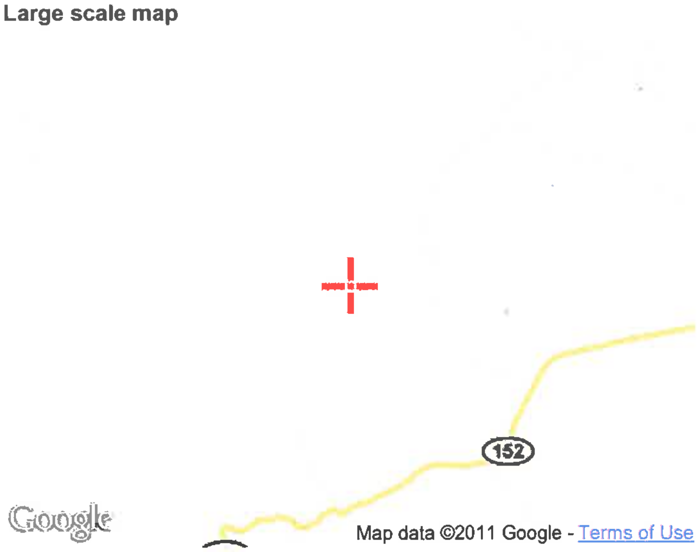
Maps & aerials

Small scale terrain

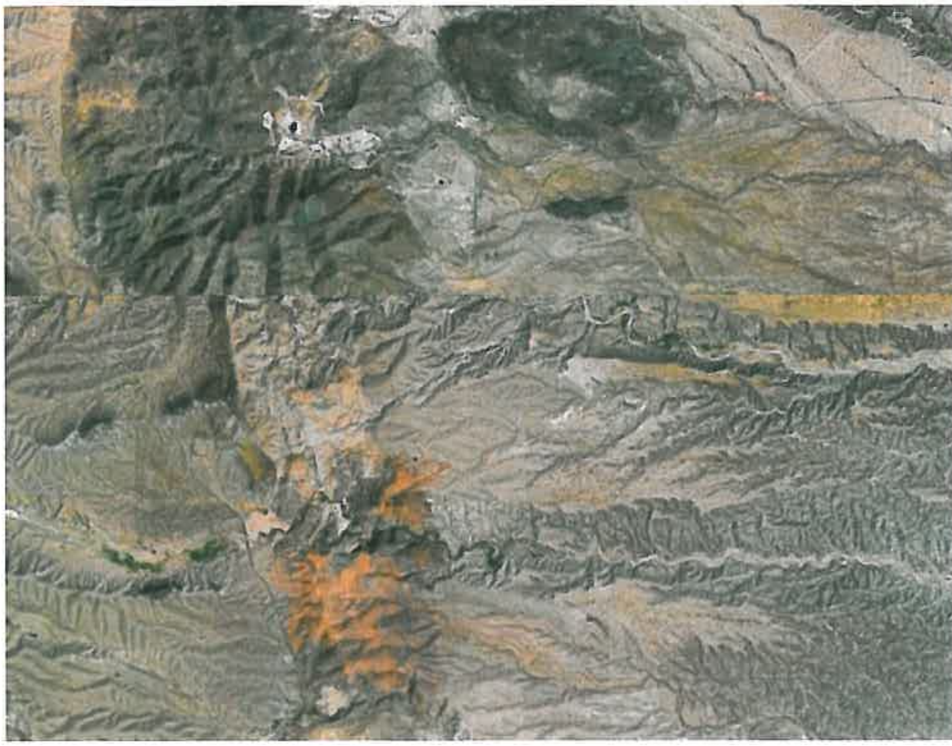




Large scale map



Large scale aerial



COPPER FLAT
HYDROLOGIC AND HYDRAULIC CALCULATIONS

CALCULATION OF TIME OF CONCENTRATION (t_c)
COPPER FLAT, NEW MEXICO

AMC II MOISTURE CONDITIONS

Sub-Basin ID	Undisturbed Area (ac)	Undisturbed CN	Compacted Cover Area (ac)	Compacted Cover CN	Stockpile Area (ac)	Stockpile CN	Wt. CN	S	L (ft)	H1 (ft)	H2 (ft)	Y (%)	Lag (hr)	t_c (hr)	t_c (min)	Lag (min)	Area (mi^2)
W-1	0.00	85	0.00	92	17.95	70	70.0	4.286	2,212	5,660	5,540	5.42	0.34	0.57	34.4	21	0.02804
N-1	0.00	85	23.20	92	37.43	70	78.4	2.752	5,668	5,830	5,530	5.29	0.58	0.97	58.1	35	0.09474
N-2	0.00	85	0.00	92	3.49	70	70.0	4.286	798	5,825	5,750	9.40	0.12	0.19	11.5	7	0.00546
SWP-1	22.40	85	0.00	92	54.75	70	74.4	3.449	2,317	6,165	5,475	29.78	0.13	0.22	13.5	8	0.12055
SWP-2	26.91	85	0.00	92	186.09	70	71.9	3.909	7,245	6,165	5,280	12.21	0.56	0.94	56.2	34	0.33282

Curve Number Estimation:

Undisturbed Native Ground		*Compacted Cover*		*Stockpile*	
Arid and semiarid rangelands		Arid and semiarid rangelands		Ore	
Cover type =	Desert Shrub / Pinyon-Juniper	Cover type =	Fill	Cover type =	Development Rock
Antecedent condition =	II	Antecedent condition =	II	Antecedent condition =	II
Hydrologic condition =	Poor	Hydrologic condition =	Poor	Hydrologic condition =	Poor
Hydrologic soil group =	C	Hydrologic soil group =	D	Hydrologic soil group =	D
Curve number =	**85**	Curve number =	**92**	Curve number =	**70**

Notes:

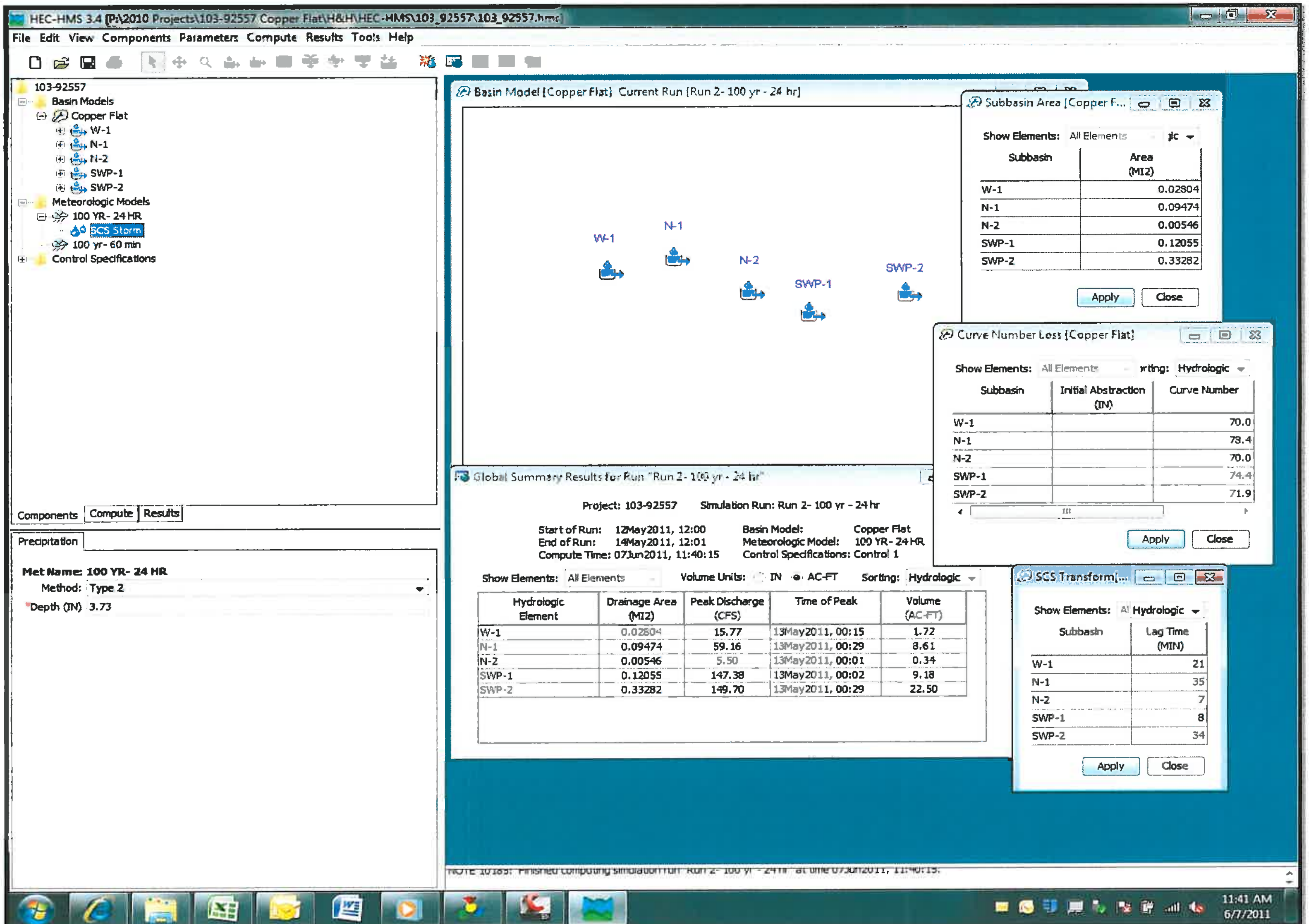
ac = acres
CN = curve number
Wt. CN =weighted curve number
S = soil and cover parameter
L = length of longest flow path (feet)
H1 = elevation at top of longest flow path (feet)
H2 = elevation at bottom of longest flow path (feet)
Y = H1-H2/L x 100 = slope (%)
Lag = Lag time (hours)
t_c = time of concentration (hr or min)

Hydrologic Condition:
Poor: <30% ground cover
Fair: 30 to 70% ground cover
Good: >70% ground cover

COPPER FLAT
HYDROLOGIC AND HYDRAULIC CALCULATIONS

Sub-basin ID	Terrain	Concentration Point ID	Area (ft^2)	Area (acres)	Area (mi^2)
WEST WRDF	Stockpile	W-1	781,703.65	17.95	0.0280
NORTH WRDF-1	Compacted	N-1	1,010,717.94	23.20	0.0363
NORTH WRDF-2	Stockpile	N-1	1,630,438.36	37.43	0.0585
NORTH WRDF-3	Stockpile	N-2	152,153.74	3.49	0.0055
NORTH WRDF-4	Stockpile	SWP-1	1,190,371.95	27.33	0.0427
NORTH WRDF-5	Undisturbed Native	SWP-1	975,914.83	22.40	0.0350
EAST WRDF-1	Undisturbed Native	SWP-2	907,173.19	20.83	0.0325
EAST WRDF-2	Stockpile	SWP-2	5,530,069.13	126.95	0.1984
EAST WRDF-3	Undisturbed Native	SWP-2	265,000.60	6.08	0.0095
LGOS-1	Stockpile	SWP-1	1,194,564.86	27.42	0.0428
LGOS-2	Stockpile	SWP-2	2,576,136.51	59.14	0.0924
DIV-3	Undisturbed Native	GREYBACK	2,683,966.00	61.62	0.0963

COPPER FLAT
HYDROLOGIC AND HYDRAULIC CALCULATIONS
100YR-24HR STORM VOLUMES

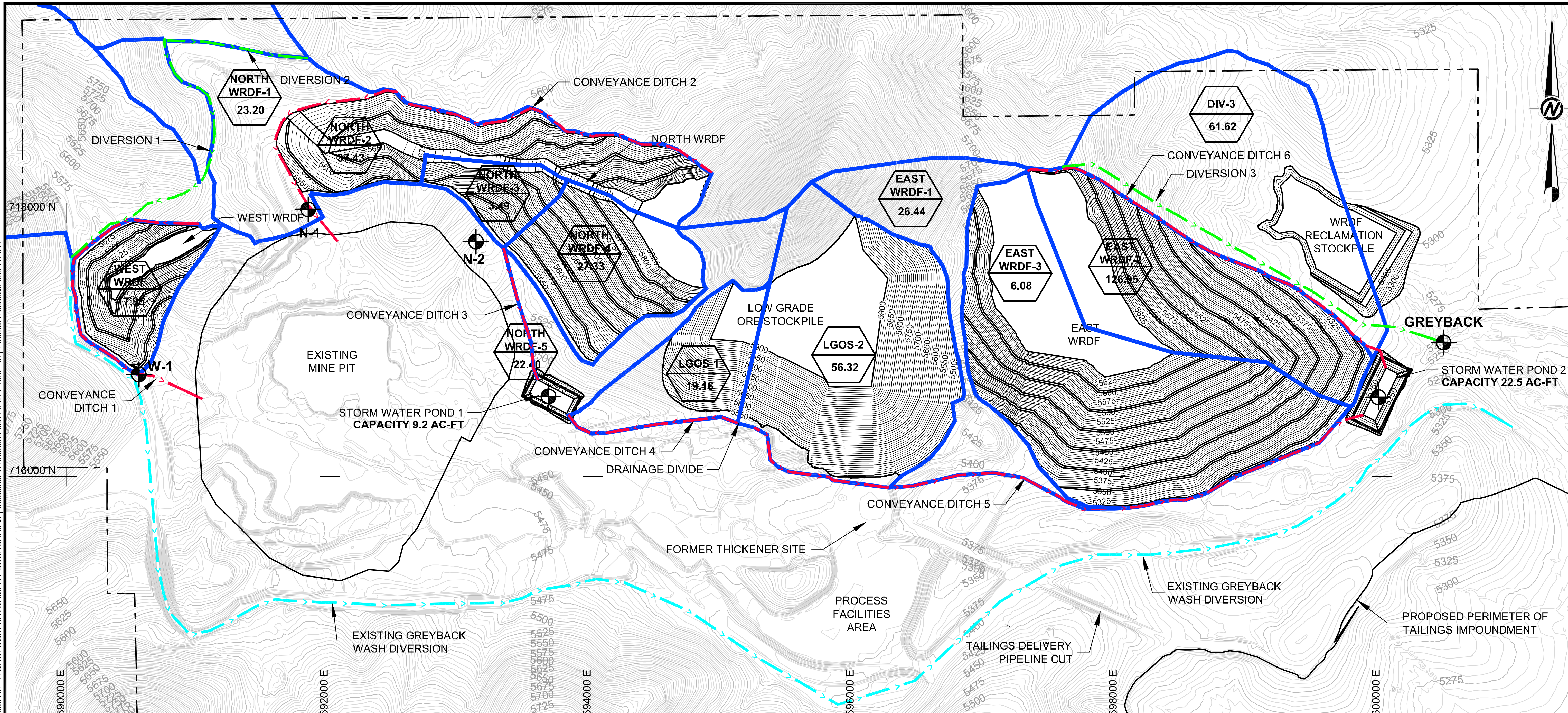


Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
W-1	0.02804	15.77	13May2011, 00:15	1.72
N-1	0.09474	59.16	13May2011, 00:29	8.61
N-2	0.00546	5.50	13May2011, 00:01	0.34
SWP-1	0.12055	147.38	13May2011, 00:02	9.18
SWP-2	0.33282	149.70	13May2011, 00:29	22.50

Subbasin	Area (MI2)
W-1	0.02804
N-1	0.09474
N-2	0.00546
SWP-1	0.12055
SWP-2	0.33282

Subbasin	Initial Abstraction (IN)	Curve Number
W-1		70.0
N-1		78.4
N-2		70.0
SWP-1		74.4
SWP-2		71.9

Subbasin	Lag Time (MIN)
W-1	21
N-1	35
N-2	7
SWP-1	8
SWP-2	34



LEGEND

5200	EXISTING CONTOURS
	PERMIT BOUNDARY
5200	DESIGN CONTOURS
	SUB-BASIN BOUNDARY LINE
	EXISTING SURFACE WATER DIVERSION DITCH
	PROPOSED SURFACE WATER DIVERSION DITCH
	PROPOSED STORM WATER CONVEYANCE DITCH
LGOS-1 / 19.16	EXISTING SUB-BASIN IDENTIFIER (HEC MODEL) / SUB-BASIN AREA (ACRES)
W-1	CONCENTRATION POINT

REFERENCES

1. 5-FT. CONTOUR INTERVAL SURFACE TOPOGRAPHY PROVIDED BY NEW MEXICO COPPER CORPORATION, INC.

750 0 750
SCALE FEET

PROJECT
New Mexico Copper Corporation
COPPER FLAT PROJECT
WASTE ROCK DISPOSAL FACILITIES
PRELIMINARY DESIGN
SIERRA COUNTY, NEW MEXICO

TITLE
HYDROLOGIC CATCHMENT BOUNDARIES

Golder Associates

PROJECT No.		103-92557	FILE No.	10392557C101
DESIGN	WK	06/13/11	SCALE	AS SHOWN
CADD	NIL	06/13/11		
CHECK	GM	06/15/11	FIGURE A.1	
REVIEW	DAK	06/15/11		

K:\2010 Projects\103-92557 Copper Flat\C-Preliminary Design\10392557C101.dwg | Layout: A.1 HYDROLOGIC CATCHMENT BOUNDARIES | Modified: WKnudson 06/22/2011 4:03 PM | Plotted: nlocascio 06/22/2011

APPENDIX A.2
CONVEYANCE AND DIVERSION DITCH SIZING

Golder Associates

CALCULATIONS

Date:	June 12, 2011	**Made by:**	WK
Project No.:	103-92557	**Checked by:**	GM
Subject:	WRDF Diversion Channel Design	**Reviewed by:**	DAK
Project Short Title:	**COPPER FLAT APPENDIX A.2**		

1.0 OBJECTIVE

Determine peak flow rates for diversion and stormwater conveyance ditches at the Copper Flat Project waste rock disposal facility. Ditch locations are shown on Figure 3 of the preliminary Design Report Copper Flat Waste Rock Disposal Facilities (Golder Associates, 2011), anf Figure A.1.

2.0 METHOD

- Sub-basin areas were determined using topography provided by New Mexico Copper Corporation., 2009 (5' contours) - see Sub-Basin Areas on Figure A.1.
- SCS Lag Equation
- Rational Method to determine 100 year peak discharge rates.
- Manning's Equation for channel sizing.

3.0 ASSUMPTIONS

- Time of concentration was calculated using SCS lag equation, see lag time and curve number calculation sheet on pages 4-5.
- Point Precipitation Frequency Estimates: 100 year recurrence interval (*NOAA On-line Atlas* pages 6-10)
- Rational Method basin Coefficients (conservative estimates):
  - Undisturbed Native Ground – 0.43
  - Compacted Cover – 0.46
  - Stockpile Areas – 0.35
- Channels:
  - Manning's "N" = 0.041 (Riprap).
  - Bottom width 10 ft.
  - Side Slopes = 2H: 1V.
  - Minimum channel bed slopes for ditch sizing - 2%.

4.0 CALCULATIONS

- Lag time was calculated for each Sub-basin.
  - $t_L = [L^{0.8} (s+1)^{0.7}] / [1900 (Y)^{0.5}]$

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4730 N. Oracle Road, Suite 210
Tucson, AZ 85705 USA
Tel: (520) 888-8818 Fax: (520) 888-8817 www.golder.com

- L = Length of the longest drainage path in feet.
- S = (1000/CN) - 10
- CN =curve number .
- Y = The average watershed slope in %

- Time of concentration (t_C) calculated for each sub-basin concentration point (CP).
  - $t_L = 0.6 * t_C$
- Rational Method was used to determine peak flow of runoff for the different concentration points.
  - Q = CiA
    - Q = peak flow rate (cfs)
    - C = Basin Coefficient
    - i = rainfall intensity (inches/hour), the point precipitation in inches divided by the storm duration in hours.
    - A = Area (acres)
- Storm duration ≥ t_C
- Maximum water surface elevations and maximum capacity were calculated for each diversion channel using Bentley FlowMaster. See FlowMaster outputs on page 11.

5.0 CONCLUSIONS / RESULTS

5.1 Channel Flow Rates

Facility	Catchment Area (ac)	Time of Concentration (minutes)	Rainfall Intensity for Peak Discharge (in/hr)	Peak Discharge (cfs)
Diversion 1	8.9	4.4	8.51	32.27
Diversion 2	122.1	24.9	3.84	199.27
Diversion 3	61.62	18.9	4.35	113.91
Conveyance 1	18.0	34.4	3.10	19.47
Conveyance 2	60.6	58.8	2.23	52.73
Conveyance 3	16.5	12.6	5.62	35.49
Conveyance 4	33.4	12.6	5.62	71.90
Conveyance 5	213.0	55.6	2.23	171.71
Conveyance 6	46.5	35.2	3.10	50.44

5.2 Channel Sizing

Channel ID	Max Normal Flow Depth (ft)	Construction Depth (ft)
Diversion 1	0.7	1.7
Diversion 2	2.1	3.1
Diversion 3	1.5	2.5
Conveyance 1	0.6	1.6
Conveyance 2	1.0	2.0
Conveyance 3	0.8	1.8
Conveyance 4	1.2	2.2
Conveyance 5	1.9	2.9
Conveyance 6	1.0	2.0

Notes: 1.) Bottom width 10-feet 2.) Side slopes 2H:1V
3.) Constructed depth includes a minimum of 1 foot of freeboard

6.0 REFERENCES

Bentley Flowmaster, Bentley Systems Inc. Service Version 8i, 2009.

Chow, Maidment & Mays. 1988. Applied Hydrology, McGraw-Hill Inc.

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U.S. Army Corps of Engineers, 2008. *Hydrologic Modeling System*, *Version 3.4.0*, Hydrologic Engineering Center (USACE). August, 2009.

COPPER FLAT
HYDROLOGIC AND HYDRAULIC CALCULATIONS

CALCULATION OF TIME OF CONCENTRATION (t_c)
COPPER FLAT, NEW MEXICO

RATIONAL METHOD

	Undisturbed												Rational method Inputs			
Sub-Basin ID	Area (ac)	Wt. CN	S	L (ft)	H1 (ft)	H2 (ft)	Y (%)	Lag (hr)	t_c (hr)	t_c (min)	Lag (min)	Area (mi^2)	Area (acre)	C	Intensity (in/hr)	Q (cfs)
DIVERSION 1	8.92	85.0	1.765	622	5,754	5,645	17.53	0.04	0.07	4.4	3	0.01394	8.92	0.43	8.51	32.27
DIVERSION 2	122.10	85.0	1.765	4,530	6,250	5,655	13.14	0.25	0.41	24.9	15	0.19078	122.10	0.43	3.84	199.27
DIVERSION 3	61.62	85.0	1.765	3,000	5,640	5,285	11.83	0.19	0.31	18.9	11	0.09627	61.62	0.43	4.35	113.91
Conveyance 1	17.95	70.0	4.286	2,212	5,660	5,540	5.42	0.34	0.57	34.4	21	0.02804	17.95	0.35	3.10	19.47
Conveyance 2	60.63	78.0	2.821	5,668	5,830	5,530	5.29	0.59	0.98	58.8	35	0.09474	60.63	0.39	2.23	52.73
Conveyance 3	16.47	76.7	3.038	2,317	6,165	5,475	29.78	0.13	0.21	12.6	8	0.02573	16.47	0.38	5.62	35.49
Conveyance 4	33.36	76.7	3.038	2,317	6,165	5,475	29.78	0.13	0.21	12.6	8	0.05213	33.36	0.38	5.62	71.90
Conveyance 5	213.00	72.3	3.831	7,245	6,165	5,280	12.21	0.56	0.93	55.6	33	0.33282	213.00	0.36	2.23	171.71
Conveyance 6	46.49	70.0	4.286	3,441	5,640	5,280	10.46	0.35	0.59	35.2	21	0.07264	46.49	0.35	3.10	50.44

Curve Number Estimation:

Undisturbed Native Ground

Arid and semiarid rangelands

Cover type =	Desert Shrub / Pinyon-Juniper
Antecedent condition =	II
Hydrologic condition =	Poor
Hydrologic soil group =	C
C =	**0.43**

Compacted Cover

Arid and semiarid rangelands

Cover type =	Fill
Antecedent condition =	II
Hydrologic condition =	Poor
Hydrologic soil group =	D
C =	**0.46**

Stockpile

Ore

Cover type =	Broken Rock
Antecedent condition =	II
Hydrologic condition =	Poor
Hydrologic soil group =	D
C =	**0.35**

Notes:

ac	= acres
C	= Rational Methon coefficient
Wt. CN	=weighted curve number
S	= soil and cover parameter
L	= length of longest flow path (feet)
H1	= elevation at top of longest flow path (feet)
H2	= elevation at bottom of longest flow path (feet)
Y	= H1-H2/L x 100 = slope (%)
Lag	= Lag time (hours)
t_c	= time of concentration (hr or min)

Hydrologic Condition:

Poor: <30% ground cover

Fair: 30 to 70% ground cover

Good: >70% ground cover

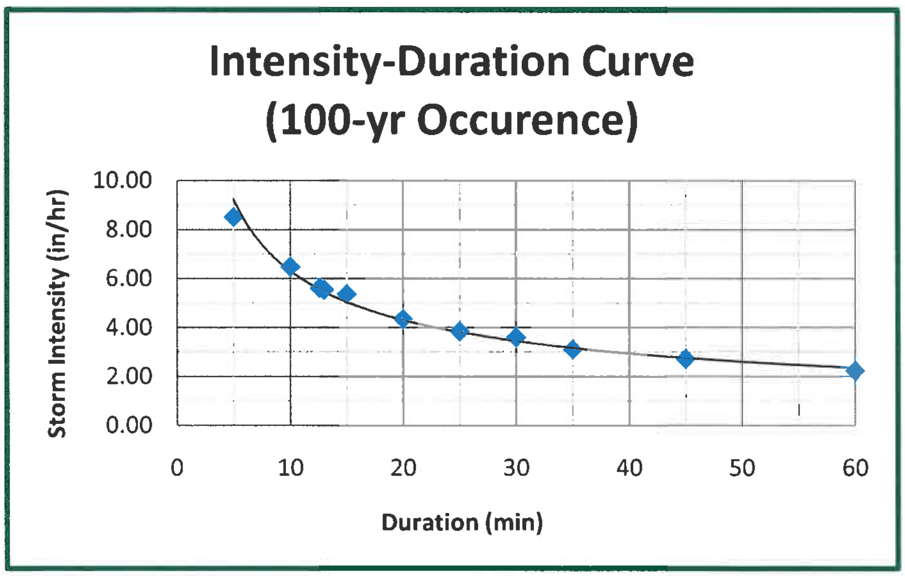
COPPER FLAT
HYDROLOGIC AND HYDRAULIC CALCULATIONS

Sub-basin ID	Terrain	Concentration Point ID	Area (ft^2)	Area (acres)	Area (mi^2)
DIVERSION 1	Undisturbed Native	DIVERSION 1	388,665.74	8.92	0.0139
DIVERSION 2	Undisturbed Native	DIVERSION 2	5,318,693.82	122.10	0.1908
DIVERSION 3	Undisturbed Native	DIVERSION 3	2,683,966.00	61.62	0.0963
Conveyance 1	Stockpile	Conveyance 1	781,703.65	17.95	0.0280
Conveyance 2	Undisturbed Native	Conveyance 2	2,641,154.69	60.63	0.0947
Conveyance 3	Undisturbed Native	Conveyance 3	717,306.98	16.47	0.0257
Conveyance 4	Stockpile	Conveyance 4	1,453,214.08	33.36	0.0521
Conveyance 5	Undisturbed Native	Conveyance 5	9,278,414.76	213.00	0.3328
Conveyance 6	Stockpile	Conveyance 6	2,025,112.43	46.49	0.0726

PRECIPITATION VALUES
COPPER FLAT, NEW MEXICO

100-YEAR STORM EVENT

Inputs				NOAA
Time (min)	Time (hr)	P (in)	Intensity (i) (in/hr)	Intensity (i) (in/hr)
5	0.08	0.709	8.51	8.51
10	0.17	1.08	6.48	6.47
12.6	0.21	1.18	5.62	
13	0.22	1.2	5.54	
15	0.25	1.34	5.36	5.35
20	0.33	1.45	4.35	
25	0.42	1.6	3.84	
30	0.50	1.8	3.60	3.6
35	0.58	1.81	3.10	
45	0.75	2.04	2.72	
60	1	2.23	2.23	2.23
1440	24	3.73	na	



Note: Intensity based on NOAA Point Precipitation Frequency Estimate (attached)

NOAA Atlas 14, Volume 1, Version 5
Location name: New Mexico, US*
Coordinates: 32.9751, -107.5225
Elevation: 5871ft*
* source: Google Maps

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches/hour)[1]

Duration	Average recurrence interval(years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	2.66 (2.35-3.00)	3.43 (3.06-3.86)	4.58 (4.07-5.16)	5.45 (4.84-6.13)	6.64 (5.87-7.46)	7.56 (6.67-8.51)	8.51 (7.49-9.62)	9.50 (8.34-10.8)	10.8 (9.46-12.4)	11.9 (10.3-13.7)
10-min	2.03 (1.79-2.28)	2.62 (2.33-2.94)	3.49 (3.10-3.92)	4.15 (3.68-4.66)	5.05 (4.46-5.69)	5.75 (5.08-6.47)	6.47 (5.69-7.33)	7.24 (6.34-8.21)	8.25 (7.19-9.41)	9.07 (7.88-10.4)
15-min	1.68 (1.48-1.89)	2.16 (1.92-2.43)	2.88 (2.56-3.24)	3.43 (3.04-3.86)	4.17 (3.69-4.70)	4.76 (4.19-5.35)	5.35 (4.70-6.06)	5.98 (5.24-6.78)	6.82 (5.94-7.78)	7.50 (6.51-8.61)
30-min	1.13 (0.998-1.27)	1.46 (1.30-1.64)	1.94 (1.72-2.18)	2.31 (2.05-2.60)	2.81 (2.48-3.16)	3.20 (2.82-3.60)	3.60 (3.17-4.08)	4.03 (3.53-4.57)	4.59 (4.00-5.24)	5.05 (4.38-5.80)
60-min	0.700 (0.618-0.786)	0.901 (0.802-1.01)	1.20 (1.07-1.35)	1.43 (1.27-1.61)	1.74 (1.54-1.96)	1.98 (1.75-2.23)	2.23 (1.96-2.52)	2.49 (2.19-2.83)	2.84 (2.48-3.24)	3.12 (2.71-3.59)
2-hr	0.402 (0.360-0.452)	0.516 (0.463-0.580)	0.683 (0.612-0.764)	0.818 (0.728-0.912)	1.00 (0.885-1.12)	1.15 (1.01-1.28)	1.31 (1.14-1.46)	1.48 (1.28-1.64)	1.71 (1.46-1.91)	1.90 (1.60-2.12)
3-hr	0.289 (0.261-0.323)	0.367 (0.332-0.411)	0.481 (0.432-0.538)	0.571 (0.510-0.638)	0.697 (0.620-0.777)	0.800 (0.708-0.888)	0.907 (0.795-1.01)	1.02 (0.890-1.14)	1.18 (1.02-1.32)	1.32 (1.12-1.47)
6-hr	0.168 (0.152-0.186)	0.212 (0.192-0.235)	0.272 (0.246-0.301)	0.319 (0.287-0.353)	0.386 (0.345-0.426)	0.438 (0.389-0.482)	0.493 (0.435-0.544)	0.551 (0.483-0.608)	0.631 (0.545-0.698)	0.697 (0.597-0.772)
12-hr	0.095 (0.087-0.106)	0.120 (0.109-0.133)	0.153 (0.138-0.169)	0.178 (0.161-0.196)	0.213 (0.191-0.235)	0.240 (0.215-0.264)	0.269 (0.239-0.296)	0.298 (0.263-0.329)	0.338 (0.295-0.374)	0.371 (0.321-0.411)
24-hr	0.057 (0.051-0.064)	0.072 (0.064-0.080)	0.090 (0.080-0.100)	0.104 (0.092-0.116)	0.123 (0.109-0.138)	0.139 (0.122-0.155)	0.155 (0.136-0.174)	0.172 (0.150-0.193)	0.196 (0.169-0.221)	0.215 (0.183-0.243)
2-day	0.033 (0.029-0.036)	0.041 (0.036-0.046)	0.051 (0.045-0.057)	0.059 (0.052-0.066)	0.070 (0.062-0.078)	0.079 (0.070-0.088)	0.088 (0.077-0.099)	0.098 (0.085-0.110)	0.112 (0.096-0.126)	0.123 (0.104-0.139)
3-day	0.024 (0.021-0.026)	0.029 (0.026-0.033)	0.037 (0.033-0.041)	0.043 (0.038-0.047)	0.051 (0.045-0.056)	0.057 (0.050-0.064)	0.064 (0.056-0.071)	0.071 (0.061-0.080)	0.080 (0.069-0.091)	0.088 (0.075-0.101)
4-day	0.019 (0.017-0.021)	0.024 (0.021-0.027)	0.030 (0.026-0.033)	0.034 (0.030-0.038)	0.041 (0.036-0.045)	0.046 (0.040-0.051)	0.051 (0.045-0.058)	0.057 (0.049-0.064)	0.065 (0.056-0.074)	0.071 (0.061-0.081)
7-day	0.013 (0.011-0.014)	0.016 (0.014-0.018)	0.020 (0.018-0.022)	0.023 (0.020-0.025)	0.027 (0.024-0.030)	0.030 (0.027-0.033)	0.033 (0.029-0.037)	0.037 (0.032-0.041)	0.042 (0.036-0.047)	0.045 (0.039-0.051)
10-day	0.010 (0.009-0.011)	0.013 (0.011-0.014)	0.016 (0.014-0.017)	0.018 (0.016-0.020)	0.021 (0.019-0.024)	0.024 (0.021-0.027)	0.027 (0.023-0.030)	0.030 (0.026-0.033)	0.033 (0.029-0.038)	0.037 (0.031-0.042)
20-day	0.006 (0.006-0.007)	0.008 (0.007-0.009)	0.010 (0.009-0.011)	0.011 (0.010-0.012)	0.013 (0.012-0.014)	0.014 (0.013-0.016)	0.016 (0.014-0.018)	0.017 (0.015-0.019)	0.019 (0.017-0.022)	0.021 (0.018-0.023)
30-day	0.005 (0.005-0.006)	0.007 (0.006-0.007)	0.008 (0.007-0.009)	0.009 (0.008-0.010)	0.010 (0.009-0.011)	0.011 (0.010-0.013)	0.012 (0.011-0.014)	0.013 (0.012-0.015)	0.015 (0.013-0.016)	0.016 (0.014-0.018)
45-day	0.004 (0.004-0.005)	0.005 (0.005-0.006)	0.006 (0.006-0.007)	0.007 (0.006-0.008)	0.008 (0.007-0.009)	0.009 (0.008-0.010)	0.010 (0.009-0.011)	0.010 (0.009-0.012)	0.011 (0.010-0.013)	0.012 (0.011-0.014)
60-day	0.004 (0.003-0.004)	0.005 (0.004-0.005)	0.006 (0.005-0.006)	0.006 (0.006-0.007)	0.007 (0.006-0.008)	0.008 (0.007-0.009)	0.008 (0.007-0.009)	0.009 (0.008-0.010)	0.010 (0.009-0.011)	0.010 (0.009-0.012)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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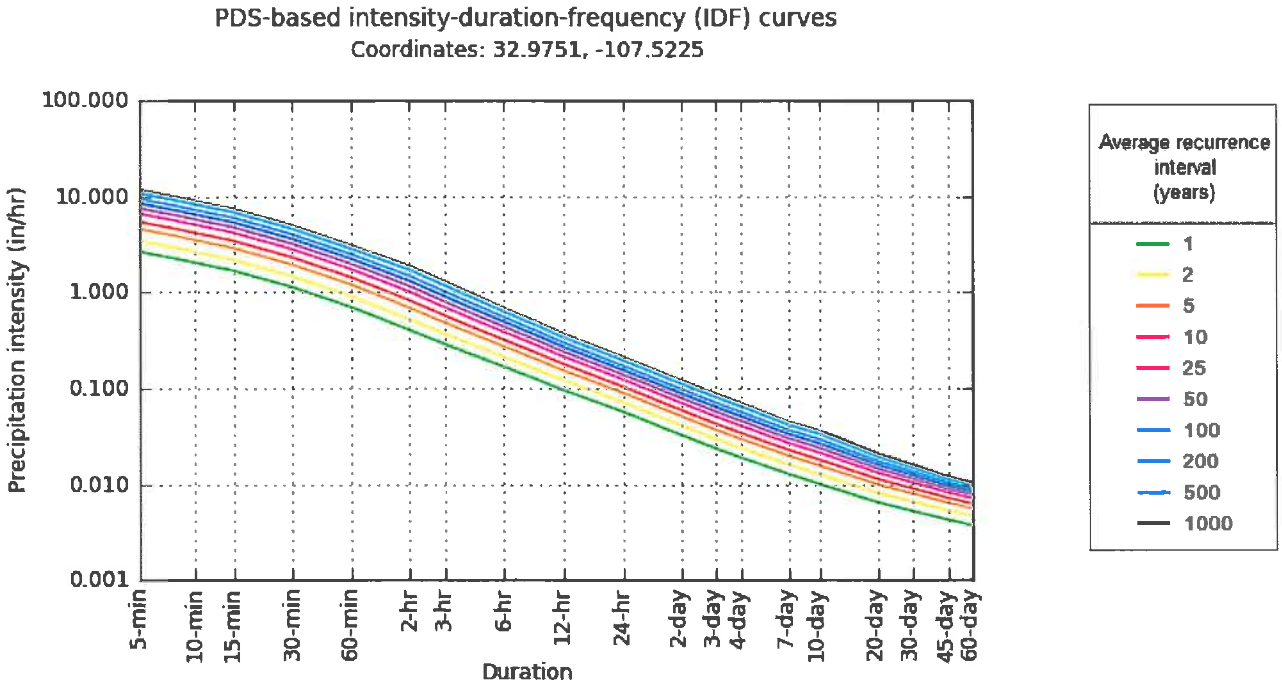
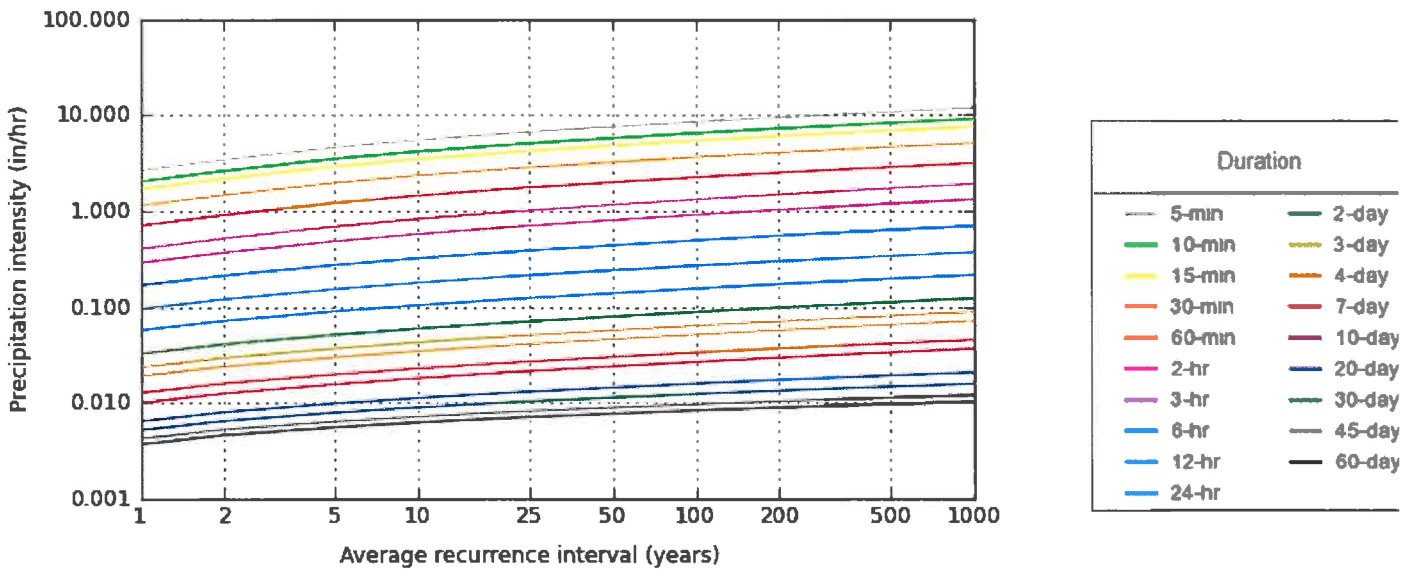
PF graphical





NOAA/NWS/OHD/HDSC

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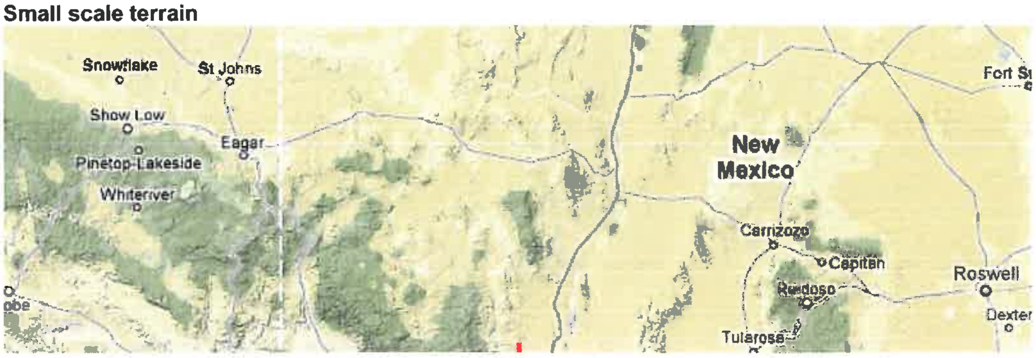
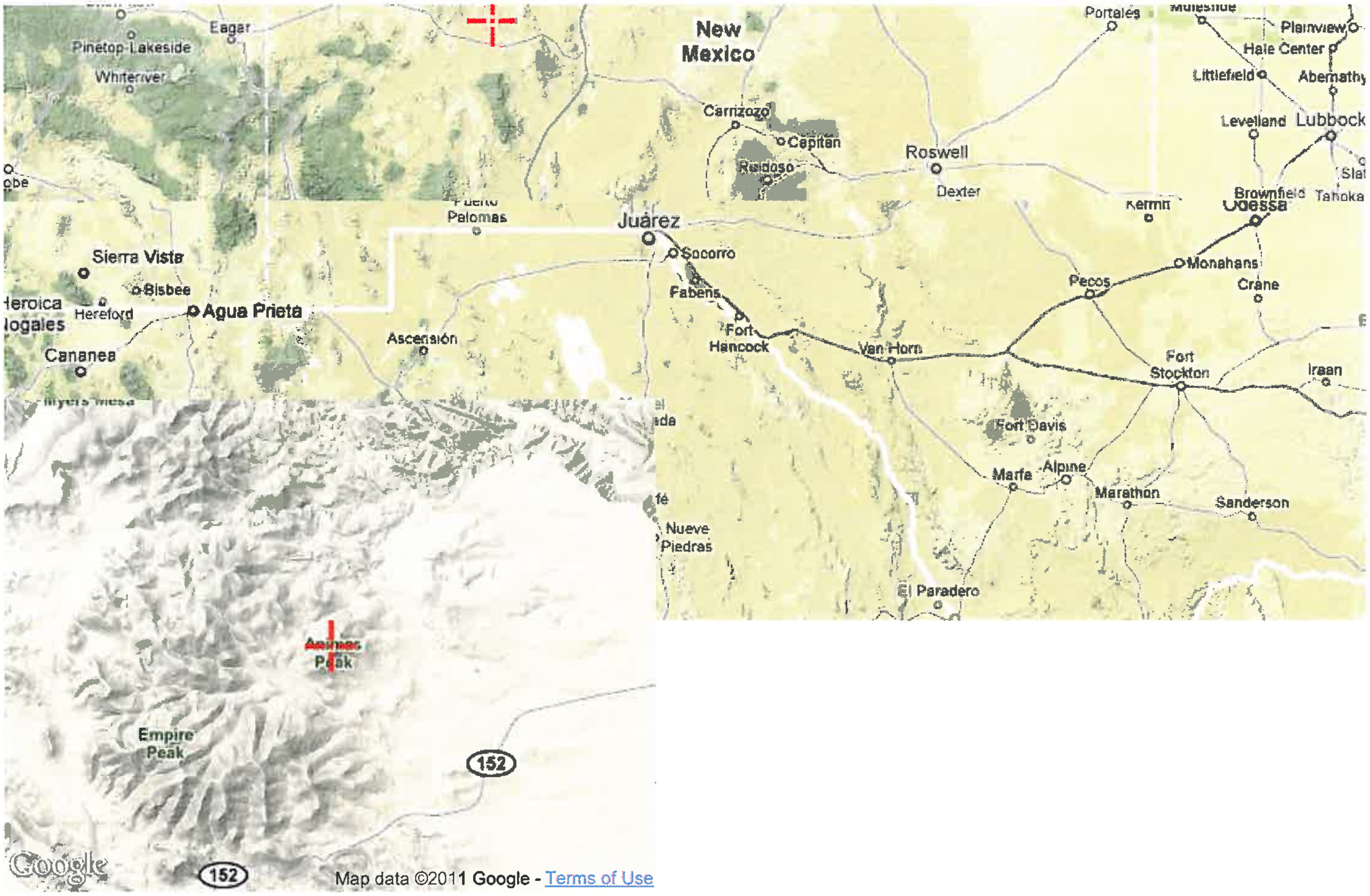
Maps & aerials

Small scale terrain

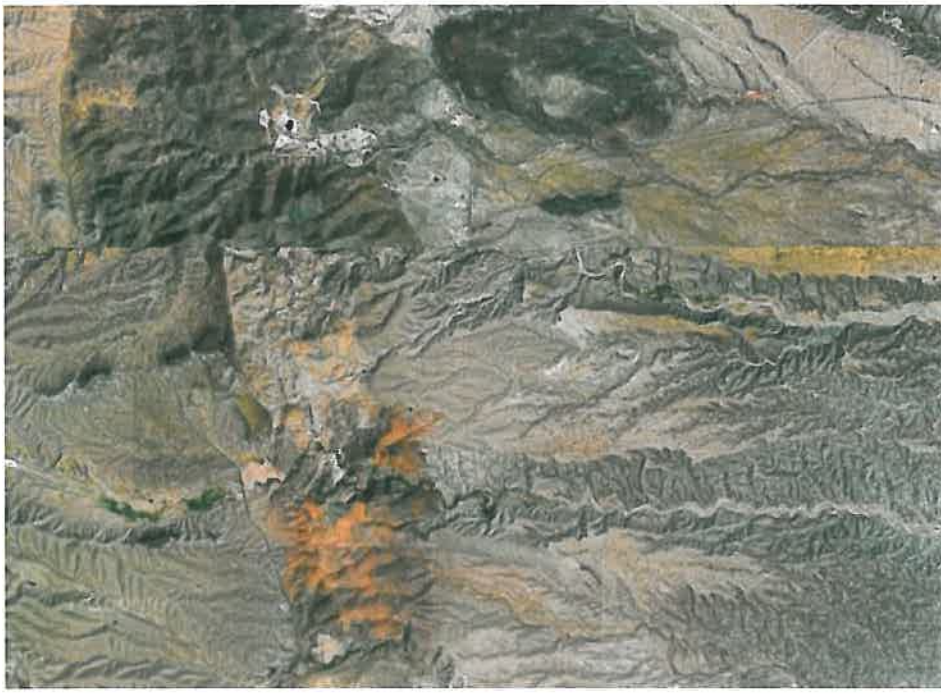




Large scale map

Large scale aerial

01921



Trapezoidal Channel (103-92557 Copper Flat.fm8) Report

Label	Discharge (ft³/s)	Normal Depth (ft)	Velocity (ft/s)	Flow Type
Diversion 1	32.27	0.74	3.80	Subcritical
Diversion 2	199.27	2.08	6.78	Subcritical
Diversion 3	113.91	1.52	5.73	Subcritical
Conveyance Ditch 1	19.47	0.55	3.19	Subcritical
Conveyance Ditch 2	52.73	0.98	4.48	Subcritical
Conveyance Ditch 3	35.49	0.78	3.92	Subcritical
Conveyance Ditch 4	74.97	1.20	5.02	Subcritical
Conveyance Ditch 5	171.70	1.91	6.49	Subcritical
Conveyance Ditch 6	50.44	0.96	4.42	Subcritical

Roughness Coefficient	Channel Slope (ft/ft)	Left Side Slope (ft/ft (H:V))	Right Side Slope (ft/ft (H:V))	Bottom Width (ft)
0.041	0.02000	2.00	2.00	10.00
0.041	0.02000	2.00	2.00	10.00
0.041	0.02000	2.00	2.00	10.00
0.041	0.02000	2.00	2.00	10.00
0.041	0.02000	2.00	2.00	10.00
0.041	0.02000	2.00	2.00	10.00
0.041	0.02000	2.00	2.00	10.00
0.041	0.02000	2.00	2.00	10.00
0.041	0.02000	2.00	2.00	10.00

APPENDIX C

Mine Waste Management Plan

New Mexico Copper Corporation

Copper Flat Mine
Preliminary Mine Waste Management Plan

Submitted by:

NEW MEXICO COPPER CORPORATION
2425 San Pedro Dr. Suite 100
Albuquerque, NM 87110
Office: (505) 382-5770

December 2010

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Appendix A: Waste Characterization Program
Appendix B: Tailings Characterization Program
Appendix C: Memo Regarding Soil Cover Performance Testing

1 INTRODUCTION

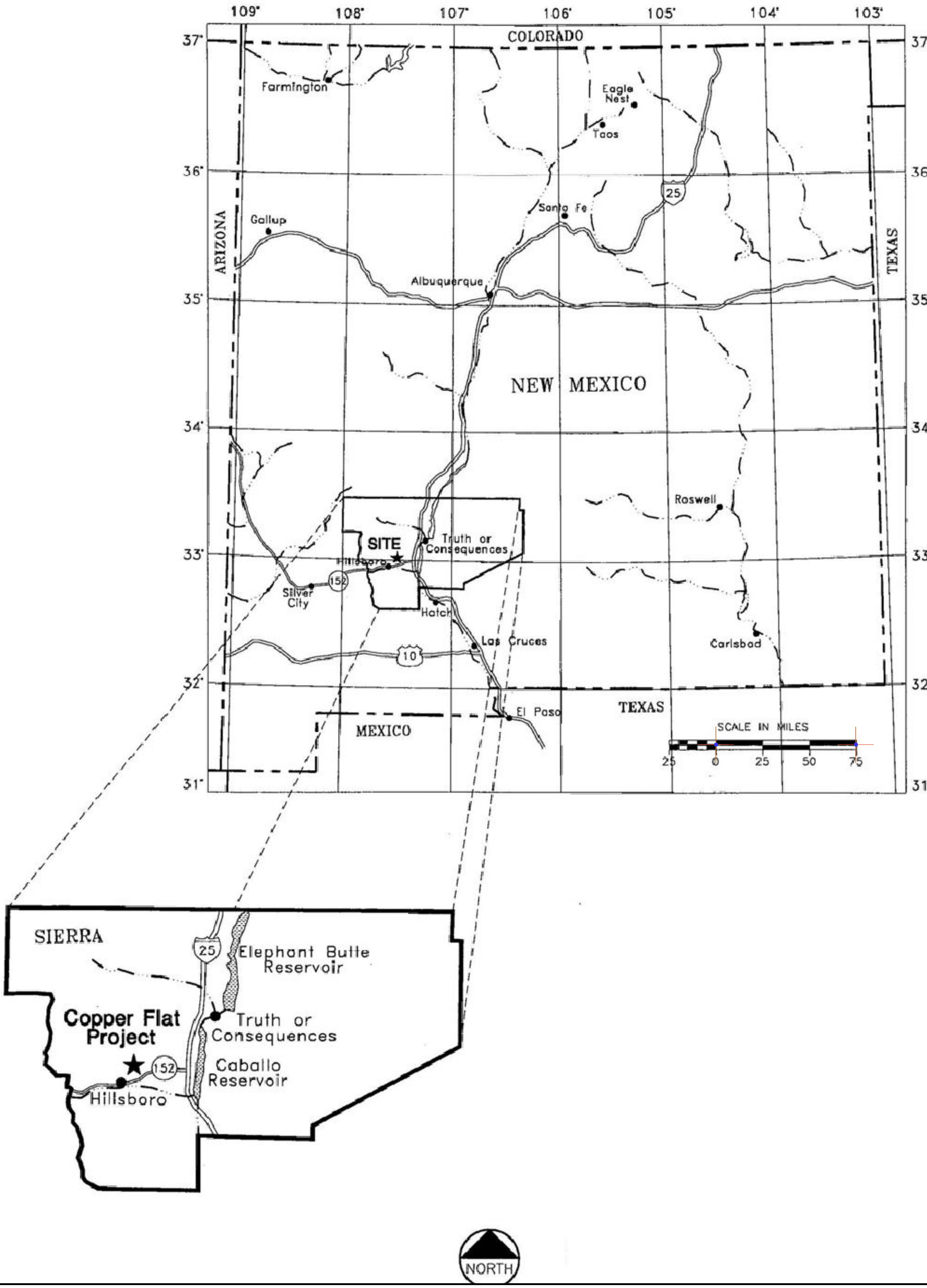
The following preliminary *Mine Waste Management Plan* was originally prepared as part of the Alta Gold Plan of Operations (PoO) submitted in 1998, and was based on geochemical characterization data developed at that time. The current owner and operator of the Copper Flat Mine, New Mexico Copper Corporation (NMCC), has initiated a supplemental geochemical characterization program based on the Nevada Bureau of Land Management (BLM) *Rock Characterization and Water Resources Analysis Guidance for Mining Activities* (Instruction Memorandum No. NV-2010-014, dated January 8, 2010), in order to provide the BLM (Las Cruces District Office) the appropriate rock and water resources data are necessary for the BLM to adequately analyze potential environmental impacts, as required by the National Environmental Policy Act (NEPA), and to determine if a Copper Flat PoO will prevent unnecessary or undue degradation. As these supplemental data are collected and analyzed, this mine waste management plan will be amended accordingly.

1.1 Scope

This report contains a mine waste management plan for the Copper Flat Project, located near Hillsboro, New Mexico. The report presents waste rock and tailings characterization data developed to assess waste behavior, and provides recommendations for operational waste rock classification and handling procedures to be employed at the project. The waste management plan addresses short- and long-term mitigation of acid-rock drainage (ARD) potential.

1.2 Location

The Copper Flat Project is located in southwestern New Mexico, approximately 30 miles southwest of Truth or Consequences and approximately 5 miles northeast of Hillsboro (Figure 1.1). The site is in the low hills between the Rio Grande River to the east and the Black Range Mountains to the west.



NEW MEXICO COPPER CORPORATION

COPPER FLAT MINE

PROJECT LOCATION

DESIGN: -	DRAWN: -	REVIEWED: -
CHECKED: -	APPROVED: -	DATE: 12/2/2010
FILE NAME PoO_Fig1-01_Location_JQG_20101202		

DRAWING NO. FIGURE 1.1

SHEET 1 OF 28

REVISION NO. A

JOB NO. 191000-03

Path: H:\Copper_Flat\New Mexico Copper Corp\191000_03_Copper_Flat_Permitting\040_Drafting\20101115\PoO_Fig1-01_Location_JQG_20101202.mxd

1.3 Background

Under the currently proposed PoO, mining would be expanded in the existing open pit. The ore body would be mined by conventional front end loader and shovel open pit methods in a manner similar to the previous operation. Over the life of the Project, the mine would produce approximately 96 million tons of copper tailings and 37 million tons of overburden and waste rock. Overburden/waste rock production is estimated to average 2.2 million tons per year (ranging from 100,000 to 6.4 million tons annually), with tailings production estimated at 5.7 million tons annually. An operational life expectancy of approximately 17 years is currently projected.

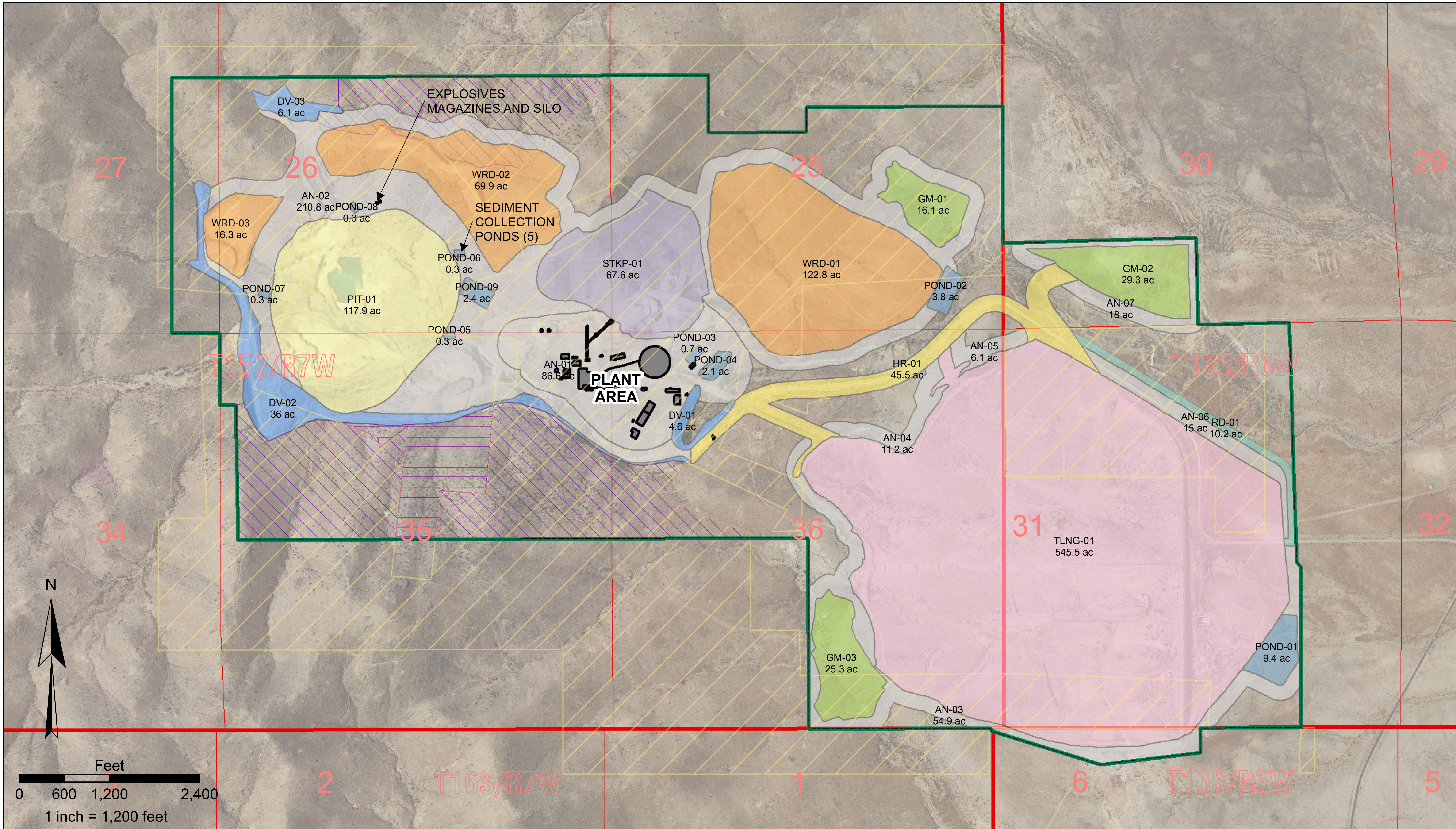
Copper ore excavated from the existing open pit will be processed through a conventional floatation circuit to form a sulfide concentrate. No chemical leaching or roasting will be carried out on site.

Waste rock from the operation will be deposited on existing rock piles located to the west, north, east, and south of the existing pit (Figure 1.2). At the end of mine life all of these rock piles will be reclaimed using a revegetated soil cover.

NMCC proposes to construct a new, lined tailings impoundment facility over the existing unlined impoundment that was constructed in 1982 by the previous mine operator (Figure 1.2); Transport of tailings from the mill to the new impoundment will be via a pipeline. Ancillary facilities associated with the tailings facility will include a slurry and/or cyclone delivery system, a solution reclaim and recycling system, an embankment seepage return system, groundwater monitoring wells and an embankment stability monitoring system.

1.4 Geology

A detailed review of the geology of the Copper Flat deposit and surrounding area was originally presented in the report *Copper Flat Mine Compilation of Pit Lake Studies* (SRK, 1997), and updated in the *NI 43-101 Preliminary Assessment, THEMAC Resources Group Limited, Copper Flat Project, Sierra County, New Mexico* (SRK, 2010) and the *Sampling and Analysis Plan for Copper Flat Mine* (Intera, 2010). A brief summary of this information is presented below.



EXPLANATION

Public	Plant Facilities	Topsoil Stockpile	Pit	Ancillary	Private Exploration Area
Mine Boundary	Pond	Tailings	Haul Road	Access Road	Public Exploration Area
	Waste Rock	Ore Stockpile	Diversion		

IF THE ABOVE BAR DOES NOT SCALE 1 INCH, THE DRAWING SCALE IS ALTERED

DESIGN: -	DRAWN: -	REVIEWED: -
CHECKED: -	APPROVED: -	DATE: 6/22/2011

FILE NAME: PoO_Fig3-01_PropFacilities_JQG_20110622

NEW MEXICO COPPER CORPORATION

COPPER FLAT MINE

DRAWING TITLE: **PROPOSED FACILITY LAYOUT**

DRAWING NO. **FIGURE 1.2**

REVISION NO. **A**

JOB NO. **191000-03**

Path: H:\Copper_Flat\New Mexico Copper Corp\191000_03_Copper_Flat_Permitting\040_Drafting\20110621_Response_to_Comments\PoO_Fig3-01_PropFacilities_JQG_20110622.mxd

The Copper Flat deposit is located within a Cretaceous age caldera that was intruded into the Paleozoic marine sediments and Precambrian basement rocks exposed in the upthrusted Black Range and Animas Hills. Immediately to the east of the deposit, the edge of the Rio Grande Rift forms a major regional physiographic and geologic feature. To the east of the project site, the rift has created a major graben structure, which has been infilled with at least 2000 feet of gravelly alluvium of the Santa Fe Group.

The local geology consists of a near circular block of andesite intruded by a Cretaceous age quartz monzonite stock. Numerous latite dikes crosscut both the andesite and the quartz monzonite. A later andesite dike intruded the quartz monzonite. The bulk of the high-grade mineralization is hosted in a breccia pipe which developed in the quartz monzonite stock.

1.5 Mineralization and Alteration

The majority of the economic mineralization occurs as hypogene sulfides that are predominantly associated with the breccias. The breccias are either biotite or feldspar-rich, and higher chalcopyrite concentrations are associated with the biotite-rich material.

Sulfide content within the quartz monzonite varies from less than 1% up to 10% within the mineralized breccia, and up to 20% within some veins and biotite breccia. Coarse, crystalline pyrite is the most common sulfide. Chalcopyrite ($CuFeS_2$) is the most common copper mineral, with bornite (Cu_5FeS_4), tetrahedrite ($Cu_{10}(Cu, Zn, Fe)_2 (As, Sb)_4S_{13}$), enargite ($Cu_3AsS_4$), and covellite (CuS) also present. Molybdenite (MoS_2) is a common accessory sulfide. Gangue minerals associated with the sulfides include quartz, feldspar, and biotite. Accessory minerals include calcite (up to 5%), fluorite, siderite, magnetite, sericite, epidote, and chlorite.

Although Copper Flat is classified as a copper porphyry deposit, it differs from classical porphyries in that it lacks an economic supergene enrichment blanket (Titley and Beane, 1981; Titley, 1982). A central potassic alteration zone, extending from the mineralized breccia south along the contact with the quartz monzonite, is characterized by secondary biotite and potassic feldspar. Anhydrite and, locally, gypsum are present as thin coatings on fractures. The entire monzonite stock and related dikes are argillised. The andesitic rocks exhibit propylitic alteration as evidenced by epidote-chlorite-calcite alteration, and minor disseminated pyrite (<1%).

1.6 Weathering

Despite the lack of a classical supergene enrichment blanket, the deposit does have a thin "oxide" zone, down to 10 feet below the original ground surface, in which all sulfides appear to be oxidized. A "transitional" zone in which sulfides are partially oxidized extends 10 to 20 feet below the oxide zone. Below the transitional zone is a "sulfide" zone in which fresh sulfides are visible.

All the rock below the 5480 bench (20-40 feet below the original surface) in the pit contains largely fresh sulfides, except along the Sternberg lode. The Sternberg lode on the west side of the pit is partially oxidized and is referred to as transitional material. This is a mineralized vein and a zone of structural weakness in which sulfides have been partially oxidized due to preferential weathering, and potentially as a result of historic *in-situ* acid leaching. As a result of natural processes and/or past mining activities, oxidation in the Sternburg lode area has been enhanced. Abundant amorphous to poorly crystalline copper and iron oxy-hydroxy-sulfate salts occur in this area. The salts that are soluble in water at surficial temperatures, are considered to be the main source of acidity at this location.

Some superficial oxidation and wallrock alteration has been observed in the pit walls. Nowhere is oxidation greater than a depth of 30 feet, even within or along faulted contacts (Dunn, 1982).

1.7 Climate

Climate stations for the Project area are located at Caballo Dam, approximately 13 miles east of the Project, and at Hillsboro, approximately 5 miles southwest. The climate at the Project is intermediate between these two locations. In addition, NMCC has installed one climate station with pan evaporation and two PM_{10} monitoring stations on both the east and west sides of the mine site. These have been in operation since August 1, 2010.

The climate at the Copper Flat Project is characterized by warm, sunny summers with daily temperatures commonly reaching 90 degrees Fahrenheit, and mild, sunny winters with high temperatures ranging from 55 to 65 degrees Fahrenheit. In the winter, most nighttime temperatures are below freezing. Daily temperature fluctuations of 30 degrees are common throughout the year.

The average annual precipitation in the region is approximately 13 inches, nearly 50% of which occurs as infrequent but intense summer thundershowers in July, August, and September. Because of their intensity and short duration, these storms generally create large amounts of runoff and little infiltration. Precipitation varies significantly on both a monthly and yearly basis.

Evaporation records for southwestern New Mexico indicate that evaporation exceeds precipitation (NOAA, 1982). These data are based on pan evaporation rates which are applicable to estimating evaporation from wetted surfaces and shallow pools. Pan evaporation rates are calibrated against lake evaporation data at specific sites. For the Project site, the conversion from pan evaporation to lake evaporation is approximately 0.72 (NOAA, 1982). Lake evaporation at the project site is estimated to be approximately 65 inches per year and the pan evaporation is 80-90 inches per year (NOAA, 1982).

2 OPERATIONAL WASTE ROCK MANAGEMENT

2.1 Objectives

The overall objective of this waste rock management plan (WRMP) is to mitigate acid-rock drainage (ARD) potential both during mining and following closure of the Project. Specific objectives of the WRMP are as follows:

- To enable classification of waste rock concurrently with or prior to its removal from the open pit;
- To enable disposal of waste rock according to its classification and management requirements;
- To develop conditions that will facilitate concurrent reclamation as well as end of mine closure and reclamation objectives (i.e., long-term ARD control); and
- To enable identification of materials with low-ARD potential that may be useful for facilities construction and/or site reclamation activities.

2.2 Waste Rock Distribution

The waste rock in the deposit generally comprises five lithologies:

- Quartz monzonite;
- Quartz breccia;
- Biotite breccia;
- Andesite; and
- Quartz veins.

Whereas all of these rock types are represented on the existing waste rock piles, future waste rock will be dominantly comprised of fresh, unoxidized quartz monzonite and, to a lesser extent, andesite.

The classification system is discussed in Section 2.5. Operational waste classification will be conducted primarily by visual methods; however, visual classification will be subject to confirmation testing. Confirmation testing and test frequency are discussed in Section 2.5.

2.3 Summary of Field Observations Concerning Waste Rock Behavior

Field observations indicate little oxidation and acid generation occurs at the site despite exposure of waste rock and pit walls since mining operations were suspended in 1982. Observed conditions are likely influenced by arid conditions. Mineralogical observations also suggest that the sulfides occur in a crystalline form that is less susceptible to oxidation.

The deposit includes a thin oxidized (and partially oxidized) cover over fresh quartz monzonite. Where oxidation of the overlying rock is complete, the waste rock will be inert with respect to acid generation. There are likely to be very limited quantities of oxidized waste rock produced during future operations.

Partially oxidized material occurs in a transition zone beneath the oxidized cover and underlying unoxidized quartz monzonite. This transitional material has been exposed to oxidizing conditions over geologic time. In the field, it typically exhibits a low paste pH and high paste conductivity, and is currently acid generating. This behavior can be observed in both exposed pit walls in the partially oxidized zone, and where the transitional waste was deposited on the waste rock piles.

Where unoxidized quartz monzonite was deposited on the waste rock piles, the material does not exhibit evidence of significant oxidation. Sulfide grains appear fresh. Field paste test results typically indicate near neutral pH and low paste conductivity. Field observations indicate that when exposed to weathering under field conditions, the quartz monzonite are, at most, slow to react. This is a function of:

- Coarse grain size of sulfides
- Crystallinity
- Disseminated texture of sulfides

2.4 Summary of Geochemical Testing

Appendix A contains a detailed discussion of the geochemical testing that was completed to evaluate the waste rock and tailings at Copper Flat. The geochemical test program included site visits and laboratory testing programs conducted in 1994 and 1997. In each phase of investigation, field testing (paste pH and conductivity) was performed. Samples were also collected of samples for laboratory testing that included:

- Acid base accounting;
- Total metals assay;
- Leach testing;
- Kinetic humidity column tests;
- Enhanced oxidation (NAG) tests.

The results of these tests are discussed in detail in Appendix A.

The primary observations that can be made on the basis of the geochemical testing programs are as follows:

- The future waste rock will be composed primarily of quartz monzonite. The majority of this waste rock can be expected to exhibit acid generating potential as indicated by both acid base accounting and NAG tests;
- While static and NAG tests indicate a net acid producing potential, kinetic tests indicate that the unoxidized material is slow to oxidize. Kinetic testing of unoxidized samples produced neutral to slightly alkaline leachates with low concentrations of sulfate and dissolved metals. The laboratory kinetic test behavior is consistent with observed field conditions.
- Partially oxidized material, or the transition waste rock, exhibits low paste pH and high conductivity. Leach testing of the transition material indicates soluble sulfate and metals loads that indicate acid generating behavior. It should be noted, however, that only limited quantities of similar material occur within the future mining area.

2.5 Waste Rock Classification

Results of the 1994 – 1996 field and laboratory testing programs indicated that although the waste rock from the deposit has the potential to generate acid, the majority of the future waste rock (unoxidized quartz monzonite) will be very slow to oxidize and produce acidity. The current testing program is intended to verify these results.

The quartz monzonite that was obtained from below the zone of oxidation and placed on the waste rock piles prior to 1982 exhibits a fresh appearance and generally neutral to alkaline pH. This material requires management to alleviate ARD potential; however, the ARD risks associated with the unoxidized waste rock are long-term risks only. Operationally, the material can be considered as being inert (i.e., on the scale of ~ 20 years).

Low pH values are associated primarily with the transition waste materials that have been exposed to oxidizing conditions over geologic time and are currently generating acidity.

While acidic seepage has been observed at the site, it is believed to be associated with the transition material. It is also correlated, temporally, to periods of unusually heavy rainfall. Although this has the consequence of washing out acid generating metal sulfate salts, a significant dilution effect will also be experienced. The transition waste rock requires management to alleviate ARD potential. Due to its geochemical behavior, ARD mitigation measures for transition waste should be implemented concurrently with disposal

During the course of the waste characterization program, the waste was classified into four types by visual inspection: oxide material, transition material, and unoxidized waste that was further subdivided into low- and high- sulfide material.

The following waste rock classification and management system is proposed:

Waste Rock Type	**ARD Potential**	**Management Goal**
Oxide	Low	Use in concurrent reclamation, stockpile for use
Transition	Generally high	mitigate ARD potential concurrently with disposal
Low sulfide, unoxidized	Low	Use in concurrent reclamation, stockpile for use
High sulfide, unoxidized	Generally high in long term	Concurrent reclamation where feasible, implement long term ARD controls

Brief descriptions of waste classification methods and the frequency at which these methods will be applied are presented below. Detailed descriptions of the test procedures are contained in Appendix A.

2.5.1 Visual Observation

Figure 2.1 presents a flow chart that summarizes the waste rock classification program. All blasthole drill cuttings will be visually inspected by a qualified geologist or trained geological technician prior to blasting and removal from the pit.

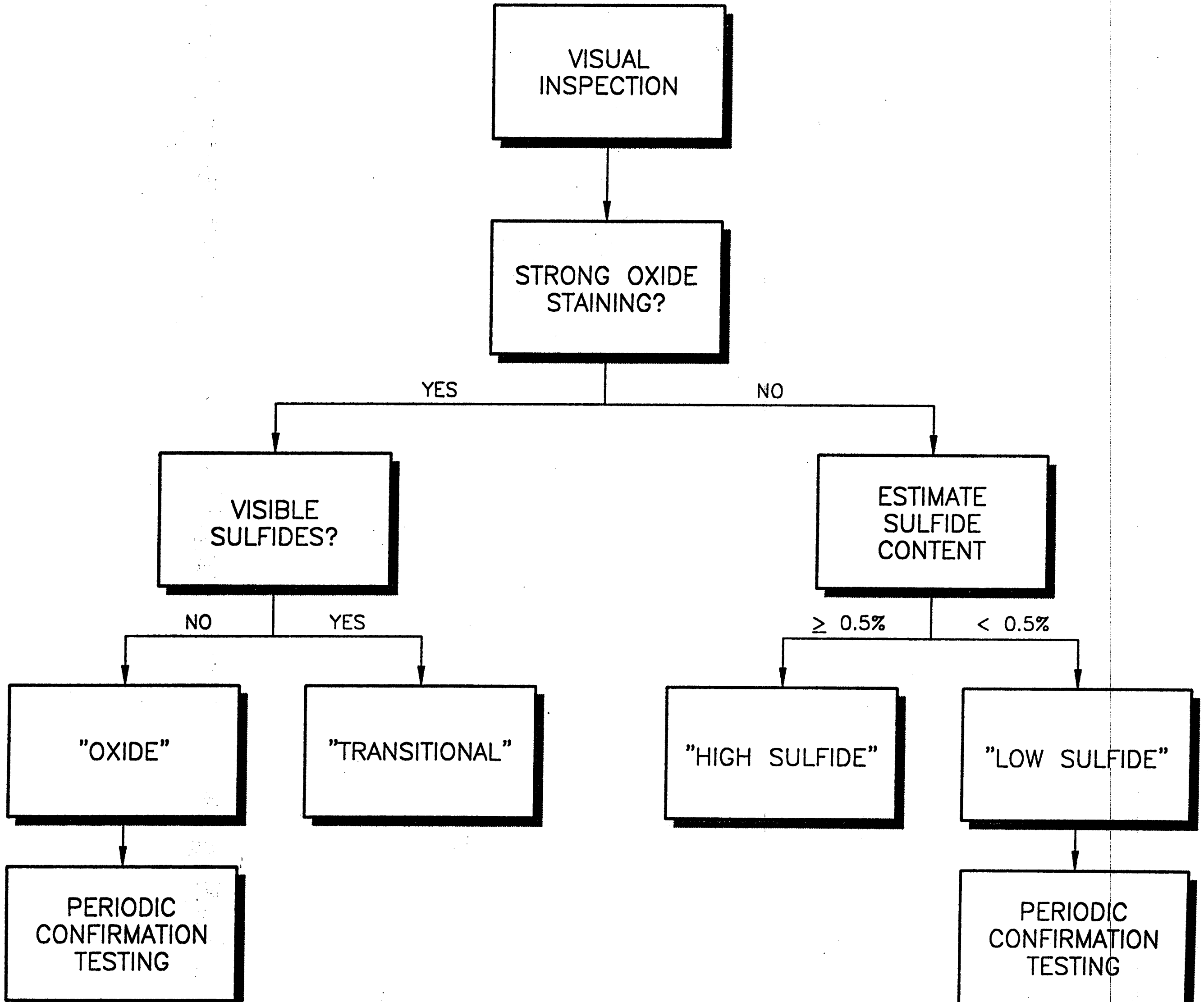
Oxidized and transition waste rock can be distinguished from unoxidized (high and low sulfide) waste rock on the basis of visual characteristics. Both the oxide and transition waste rock exhibit strong iron oxide staining and may exhibit partial to complete destruction of original rock texture. In contrast, the high and low sulfide unoxidized waste rock has a fresh appearance and may contain abundant fresh sulfides.

Waste rock that exhibits an oxidized appearance will also be assessed for amount of visible sulfides in the sample. Transitional material will be any material that appears oxidized but contains sulfides. A lack of visible sulfides will be used to characterize oxide material. Material classified as oxidized will be subject to confirmation testing.

Materials that exhibit a fresh, unoxidized appearance will be subject to visual estimation of sulfide content in order to distinguish between high and low sulfide waste rock. Initially, a conservatively low sulfide content of 0.5 percent will be used as an indicator of low sulfide waste rock. Material classified as low sulfide waste rock will be subject to periodic conformation testing.

2.5.2 Confirmation Testing

Confirmation testing will be performed to confirm the effectiveness of visual waste classification. Confirmation testing will be performed to evaluate both oxide versus transition and low sulfide versus high sulfide designations. Confirmation testing will be completed on-site with a Leco Furnace.



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PROJECT NO.	DATE	REVISION
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FIGURE 2.1

OPERATIONAL WASTE CLASSIFICATION FLOWCHART

2.5.2.1 Oxide Versus Transition Waste Rock

To be classified as oxide, the material must exhibit a low sulfide sulfur content. Oxide waste rock samples will be periodically subjected to total sulfur and sulfate sulfur analyses. Based on the test results, the sulfide sulfur content of the sample will be calculated (as total less sulfate sulfur). Because weathering results in the consumption of neutralizing potential as well as oxidation of sulfides, partially oxidized materials with low sulfide sulfur content are commonly capable of acid generation. An initial sulfide sulfur cutoff value of 0.1 percent shall be used as an indicator of oxidized waste rock.

Confirmation testing of oxide versus transition waste rock will initially be conducted at a frequency of one confirmation test for each five blastholes designated as oxide waste rock. Subject to ongoing testing and field observation, this test frequency may be subject to revision.

2.5.2.2 Low Sulfide Unoxidized Versus High Sulfide Unoxidized Waste

A conservatively low total sulfur concentration of 0.2% will be used as a preliminary indicator of low sulfide waste rock. Based on static testing completed to data, a sample containing 0.2% total sulfur will typically exhibit an NP:AP ratio that is greater than 3:1. Subject to further testing and observation, this cutoff value may be adjusted to suit conditions.

Confirmation testing of low versus high sulfide waste rock will initially be conducted at a frequency of one test for each five blasthole samples designated as oxide waste. Subject to ongoing testing and field observation, this test frequency may be revised.

2.6 Waste Handling

2.6.1 Waste Disposal Facilities

Four waste rock disposal facilities will be developed to accommodate future waste rock. The existing West and North Dumps, which contain oxidized, transition and unoxidized waste rock, will be expanded to contain all waste rock types. The south and east disposal areas will be expanded to contain primarily unoxidized waste rock. Waste rock disposal facilities are shown on Figure 1.2.

2.6.2 Waste Rock Management During Operations

Most of the future waste rock will be low and high sulfide waste, with only small amounts of oxide and transition material encountered near the surface of the proposed pit expansion. The waste will primarily be quartz monzonite with lesser andesite. The breccias are primarily ore.

The general approach to waste rock management and the control of ARD is to control the flux of water through the waste rock. Future waste will be placed on existing waste rock piles in a manner that minimizes the potential for leaching of dissolved constituents. Surface water will be managed during operations to promote runoff from the waste rock and prevent surface water runon.

Management of future waste rock will include concurrent reclamation, where feasible, and will incorporate disposal practices that will facilitate reclamation and closure of the waste rock disposal facilities.

2.6.2.1 Oxidized Waste Rock

No restrictions will be imposed on the handling and placement of oxidized waste rock. To the extent practical, oxidized waste rock will be deposited on the outer slopes and surfaces of the waste rock disposal facility. Oxidized waste rock may be stockpiled in selected areas of the waste rock disposal facilities so that it may be used during reclamation. Given the relatively small volume of oxide waste rock that is anticipated to exist within the future pit limits, oxide waste rock may be managed as transition waste without confirmation testing.

2.6.2.2 Transition Waste Rock

Transition waste rock will be managed concurrently with disposal due to its leachable acidity and dissolved metal loads. Transition waste rock will be isolated in one portion of either the West or the North waste disposal area to minimize the footprint that is covered by this material.

A minimum of 6 feet of non-transition waste rock will be placed over transition waste to minimize contact transition material in the short term. Transition waste rock will be mined early in the operation. Consequently disposal areas will be covered with additional waste rock as the waste disposal facilities are developed.

2.6.2.3 Unoxidized High Sulfide Waste Rock

As discussed above, the unoxidized waste rock poses negligible short term risk of ARD or adverse drainage quality. No restrictions will be imposed on the placement of unoxidized waste rock, however, placement will be in a manner that facilitates reclamation. A reclamation cover, as discussed below, will be placed over the unoxidized waste rock.

The unoxidized waste rock will be end dumped in 50-foot lifts. Benches will be created at the base of each end dumped lift to facilitate post-mining regrading. Following regrading to 2.5H:1V slopes, minimum 10-foot wide erosion control benches will remain. All active unoxidized waste rock surfaces will be backsloped to promote drainage of surface water off the active waste rock disposal areas. Runoff will be directed to perimeter surface water collection ditches and sediment collection facilities.

2.6.2.4 Low Sulfide Waste Rock

No restrictions will be imposed on the handling and placement of low sulfide waste rock. Where practical, low-sulfide waste rock will be deposited on the outer slopes and surfaces of the waste rock disposal areas. Low-sulfide waste rock will be stockpiled in selected areas of the waste rock disposal facilities so that it may be used for reclamation.

2.6.2.5 Waste Flagging and Routing

Prior to blasting active benches in the open pit, mine geological staff will visually inspect the cuttings from each blasthole. The rock type, color, degree of oxidation, sulfide content and other pertinent features including blasthole cuttings sample numbers will be noted and transferred to bench plan maps. Where the rock is identified as oxide or low sulfide waste, samples will be collected for confirmation testing. Waste rock boundaries will be plotted on the active bench plans.

When blasting has been completed, waste boundaries will be field flagged on the active bench. Shovel operators will then selectively excavate the waste rock and inform haul truck operators as to the nature of the waste rock and its destination within the active waste rock disposal facilities. The operator will develop a workable waste flagging and routing plan prior to the commencement of mining operations. Mine staff will maintain records of the volume of each waste type mined during each shift and its ultimate location within the waste rock disposal facilities.

2.7 Long-Term Management

Placement of a soil cover over the waste and implementation of permanent surface water management controls will minimize the flux of water through the waste rock and the potential for leaching of oxidation products in the long term. Preliminary cover studies presented in the report, *Hydrologeological Studies, Copper Flat Project* (SRK, 1995), and updated in the report *Copper Flat Mining Act Permit Application, Volume 4* (SRK, 1996) indicated that, for a wide range of cover materials and cover thicknesses, the flux of water through the waste rock piles will occur at a rate of a few gpm (<5gpm). A cover thickness of 12 inches was originally proposed, based on *Hydrologic Evaluation of Landfill Performance* (HELP) modeling (Appendix C). The current understanding is that a cover thickness of three (3) feet may be necessary for most facilities. This cover thickness will be re-evaluated during the supplemental investigations, and tested during operations in field trials, and modified based on the results.

Where possible, cover placement will be completed concurrently with mining. Inactive waste rock slopes will be regraded to 3H:1V slopes and compacted by dozer traffic. The cover material will be placed and revegetated, and permanent surface water management facilities will be constructed. At the end of mining, final active waste rock disposal area surfaces will be regraded, covered, and revegetated.

Routing of loaded haul trucks over the upper surface of each lift will mechanically degrade and compact the waste rock, and produce zones of reduced permeability. Permeability testing of a quartz monzonite waste rock sample that was subjected to equipment traffic during previous mining activities exhibited a remolded permeability of 1×10^{-6} cm/sec. The combination of cover placement, evaporation and waste rock compaction is expected to reduce the flux of water through the waste rock to minimal rates and alleviate the potential for significant impacts to water resources. Attenuation of acidity and dissolved constituents in the foundation of the waste rock disposal facilities will further reduce the potential for water quality impacts.

2.8 Quality Assurance Testing

Quality assurance testing will be periodically performed to verify that waste rock is being accurately classified. The operator will randomly select up to 10 archived blasthole samples per month which will be subjected to saturated paste pH, saturated paste conductivity, and acid base accounting testing (totals sulfur, sulfate sulfur and NP testing). This testing will be performed at a state approved laboratory.

The samples will be classified with respect to ARD potential on the basis of NP/AP ratio. The samples will be located on the appropriate bench plan maps and the quality assurance test classification will be compared to the operational waste classification designation. Should the comparison indicate discrepancies in waste classification, a plan to determine the source of waste classification discrepancies and improve classification techniques will be prepared by the operator.

2.9 Field Kinetic Testing

The operator has committed to a program of kinetic testing during the mining operation. These tests will be conducted to support waste management planning, confirm and further refine mine waste geochemical behavior predictions. The proposed plan for ongoing kinetic testing is described in the report, *Copper Flat Closure Field Testing* (SRK, 1998).

2.10 Record Keeping

Maintenance and continuous updating of records for all waste classification, quality assurance, and kinetic testing is considered critical to the effective management of waste rock at Copper Flat. Data collected from blast hole sampling will also be maintained. This data will be important in assessing and modifying the waste rock classification scheme. All test data will be incorporated into monthly and annual reports that will be maintained on site and kept available for inspection.

2.11 Cover Material Testing and Design

Preliminary cover design and performance modeling has been completed to assess closure and reclamation requirements for long-term ARD control and protection of water resources. The operator will conduct field scale test of cover materials and cover designs during the mining operation. Testing programs are defined in *Copper Flat Closure Field Testing* (SRK, 1998). Final reclamation cover design will be based on the results of this work.

2.12 Contingency

Due to the arid conditions that prevail at the site, acidic seeps from the existing waste rock piles have been observed, but only on rare occasions following periods of high rainfall. Surface water will be managed during operations to minimize the potential for seeps to develop. Any affected water that occurs during operations will be collected and utilized in ore processing.

3 OPERATIONAL TAILINGS MANAGEMENT PLAN

Unlike the historic facilities, NMCC proposes to line the future tailings impoundment and embankment in order to eliminate the potential migration of tailings process water into the underlying groundwater system. However, underdrain seepage will require active management until such time as the tailings have consolidated, and a suitable reclamation cover has been constructed to manage surface water runoff. Given the nature of the ore material being processed, surface exposure of sulfide-bearing tailings may require additional management to mitigate the potential production of ARD.

3.1 Tailings Disposal

The proposed Copper Flat tailings embankment will be constructed through cycloned sand deposition. A series of cyclones will be installed on the embankment crest. Cyclone underflow or sand will be deposited on the embankment while the cyclone overflow, consisting of the fine fraction of the tailings and the majority of the process water, will be spigotted into the lined tailings impoundment.

Tailings disposal practices will result in a well drained embankment composed of coarse tailings sand. In the impoundment, a lower-permeability, saturated tailings mass will be created. Geochemical testing (Appendix B) indicates that the tailings, like the waste rock, tend to react slowly when compared to tailings from other known copper deposits, such as Chino Mine (Ford *et al*., 1998; Newcomer *et al.,* 1998). The potential for development of ARD at the surface will be alleviated by covering the tailings, thereby limiting the flux of water into the impoundment.

3.2 Mitigation of ARD Potential

3.2.1 Tailings Embankment

Due to the unsaturated conditions that will be maintained during and after tailings disposal operations, the tailings embankment sand will be more susceptible to oxidation than the tailings slimes in the impoundment. As such, the implementation of ARD mitigation measures for the tailings embankment will be initiated concurrently with mining.

3.2.2 Tailings Impoundment

The fine grained tailings in the impoundment will remain saturated during operation of the tailings disposal facility. Little oxidation of the tailings can occur under these conditions. At closure, the potential for ARD from the tailings impoundment will be alleviated by several factors:

- The tailings overflow of slimes will have a low permeability. Typical fine tailings exhibit a permeability of 1×10^{-6} cm/sec or less following partial consolidation. Upon complete consolidation, the permeability of fine tailings will decrease. The physical properties of the tailings will limit the flux of water into the tailings and the potential for mobilization of oxidation products; and

- Because the tailings will be fine grained, they will exhibit high capillarity and will retain moisture. Moist porous solids are effective barriers to the diffusion of oxygen. The combination of low permeability and resistance to oxygen diffusion will alleviate development of ARD in the impoundment. Placement of the proposed native soil cover over the impoundment will enhance evapotranspiration, control tailings erosion, and further reduce the flux of water through the tailings mass.

3.2.3 Covering of Tailings

A cover composed of native soil materials will be placed on the embankment. As with the waste rock, a soil cover of 12 inches is proposed to limit infiltration to the tailings and promote run-off (Appendix C). Prior to final design, field cover testing and kinetic testing of tailings will be completed as described in *Copper Flat Project Field Testing* (SRK, 1998). Cover thickness and permeability requirements will be determined in conjunction with field testing.

4 CONCLUSIONS

4.1 Waste Rock Characterization

Field and laboratory testwork, completed by the previous project proponent, on waste rock and drill core samples from Copper Flat have been used to classify the material as:

- *Oxide*,
- *Low ARD potential*. All sulfide completely oxidized,
- *Transitional* – High ARD potential. Partial oxidation of sulfides and storage of acid generating and metal leaching capacity in soluble metal-sulfate minerals.
- *High Sulfide* – High potential to generate ARD. Fresh sulfides with little or no oxidation.
- *Low sulfide* – Low potential to generate ARD. Fresh sulfides with little or no oxidation.

Management of these wastes will vary proportional to class and geochemical behavior with respect to potential metal leaching and acid generation.

4.1.1 Waste Rock Management

For permanent mitigation, concurrent reclamation will be ongoing.

- *High Sulfide Waste Rock* – Similar mitigation to the Transition Waste Rock with collection of seepage and where practical concurrent reclamation.
- *Low Sulfide Waste Rock* – This material will be used in concurrent reclamation of more reactive material and adequately covered to mitigate long-term risk.

Full field testing will be undertaken during development for operational and final management of waste rock.

4.1.2 Tailings Characterization

Tailings laboratory characterizations found that, compared to other similar mineral deposits currently being mined, the Copper Flat tailings are considerably less reactive. This is supported by the field observation that, despite nearly 30 years of exposure to atmospheric moisture and oxygen, no significant acid seeps or acid plumes have developed at the site, even though some leaching of the material has occurred.

4.1.3 Tailings Management

Mitigation of potential ARD from the tailings embankment will be undertaken concurrent with mining. Due to their unsaturated nature these tailings are anticipated to have a higher ARD potential than in the main body of the impoundment.

The majority of the tailings in the impoundment will, during the lifetime of the mine, be kept saturated and consequently will have a negligible ARD potential. Upon closure, the impoundment will be adequately covered so as to minimize ARD generation.

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Appendix A

Waste Rock Characterization

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APPENDICES

1 INTRODUCTION

Two phases of waste rock characterization have been completed at the Copper Flat project in New Mexico. A preliminary assessment of the waste was conducted in 1994 for the Environmental Impact Statement (EIS). More detailed work was carried out in 1997 for use in development of this waste management plan. The numbers of tests completed in each phase of the waste rock characterization are listed in Table A.1.1.

1.1 Work Carried Out As Part of the EIS

The initial assessment of the waste rock dumps at Copper Flat (SRK, 1995; DEIS, 1996) was carried out in part to assess the current geochemical characteristics of waste rock from former operation sand to determine whether future waste rock has the potential for acid generation.

Nineteen samples were collected from the existing pit wall rock, waste rock piles, and drill core and cuttings. The locations of the surface samples are shown in Drawing 68612-001. Selected samples were subjected to:

- Paste pH and conductivity measurements to determine whether previous oxidation had produced acidic and/or soluble residues;
- Determination of total metals concentrations;
- Acid Base Accounting to assess the balance between potentially acid generating and potentially acid neutralizing minerals;
- Agitated leach extraction tests to measure the amount of immediately soluble metals;
- Humidity column testing to simulate long-term oxidation of the waste rock and evaluate drainage quality; and,
- Geotechnical testing to estimate the physical and hydraulic properties of compacted waste rock.

The conclusions of this work were that:

- Most of the material on the dumps had only superficial oxidation despite exposure to the atmosphere for over 14 years.

- No evidence of acid seeps was observed during 1994-5, although one seep had been reported in an earlier study (Newcomber et al., 1991) and another seep was identified in August 1997 after unusually heavy rainfall.
- The material on the East, South, and most of the North dumps was essentially “sulfide” material with little or no accumulation of secondary mineral salts. The West waste rock dump and the western portion of the North dump were more complex with a combination of “sulfide” and “transitional” ore.

1.2 Work Carried Out As Part of the Waste Rock Management Plan

In August 1997, field work was carried out with the aim of producing detailed geological and geochemical maps of the waste rock dumps and open pit. One hundred and twelve samples were collected from six-foot long channels along benches on the waste rock dumps. The locations of the 1997 samples are shown on Figure A.1.2. The material was characterized in the field by geological observation and by paste pH and TDS measurements. Forty-six samples were analyzed by Acid Base Accounting (ABA) tests and fifty-nine samples were analyzed by Net Acid Generation (NAG) testing. Table A.1.2 shows the numbers of samples of each rock type analyzed by each procedure.

2 METHODS

The testing methods for samples collected in the waste rock characterization studies are summarized in the following sections. Detailed protocols are presented in Appendix A.1.

2.1 Paste pH and Conductivity

Paste pH and conductivity tests were conducted by mixing a sample of the fine grained portion of the waste with deionized water in a ratio of 1:2 by volume to produce a saturated paste. Measurements were then taken directly from the paste.

A paste pH greater than pH 7 indicates either that the sample is not generating acid, or that any acidity produced is being neutralized. A paste pH below 5.0 indicates that the material contains soluble acidity from prior oxidation. The conductivity measurement indicates the amount of immediately soluble salts present in the sample. The soluble acidity and salts are normally the products of earlier oxidation reactions. Their presence indicates that water contacting the material could leach oxidation products, even in the absence of further oxidation.

Paste pH and conductivity tests were conducted in the field (1996-1997 data) or at the SRK Laboratory in Lakewood, Colorado (1994-1995 data).

2.2 Total Metals Concentrations

Total metals concentrations in the waste rock were determined by Inductively Coupled Plasma (ICP) following the EPA 3051 digestion (USEPA 1982; 1995a,b). The purpose of the total metal analyses was to determine what metals are present in the waste rock. The ICP analysis does not indicate the amount, if any, of each metal that would be soluble under conditions likely to arise in the field.

ICP analyses were conducted at ACZ Laboratory in Steamboat Springs, Colorado.

2.3 Acid Base Accounting

Acid base accounting (ABA) tests were conducted to assess the potential for the waste rock to become acid generating. ABA tests indicate the balance of potentially acid generating minerals (sulfides) and potentially acid consuming minerals (generally carbonates) present in the rock. The test involves analyzing for total sulfur and sulfur species (total, sulfate, and pyritic sulfur) to determine the acid generation potential

(AP), and then titration with acid to assess the neutralizing potential (NP) of the material. The units of the NP and AP are kg $CaCO_3$ equivalent/ton of material (kg/T), or tons $CaCO_3$ equivalent/kiloton of material (T/KT). The method employed during the 1994 testing was the Sobek method. The modified Sobek technique (Sobek et al., 1978; SRK, 1989) was used to evaluate the 1996 samples.

The ABA characteristics of different samples can be compared using the difference between the NP and the AP values (the net neutralizing potential, or NNP). An NNP of greater than 20 kg/t indicates that a sample contains sufficient NP to buffer the acidity that could be produced as a result of oxidation, and therefore, has a low potential for acid generation. An NNP value of less than –20 kg/T is considered indicative that a sample has the potential for acid generation. Values between +20 kg/T and –20 kg/T have uncertain acid generating potential and may require kinetic testing to evaluate field behavior.

The ratio of NP:AP can also be used to evaluate acid generating potential. As a general guideline, an NP:AP greater than 3:1 indicates that a sample has a low potential for acid generation. A value below 1:1 indicates that, if the sample is exposed to oxidizing conditions, it has the potential for acid generation. Waste rock samples exhibiting NP:AP values between 1 and 3 typically require kinetic testing to evaluate field behavior.

However, both of these methods for evaluating ABA data are guidelines only. Other characteristics of the rock, such as the grain size, sulfide species and morphology and the form and occurrence of the neutralizing minerals, can influence the tendency for the material to produce or neutralize acidity.

A total of 46 ABA tests were conducted during the two phases of the waste characterization program. Testing of 1995 samples was conducted at ACZ Laboratory in Steamboat Springs, Colorado, whereas 1997 samples were analyzed at Sierra Environmental Monitoring Laboratory in Reno, Nevada.

2.4 Net Acid Generation Tests (NAG)

An alternative method for evaluating acid generating potential is the net acid generation (NAG) test. Whereas ABA tests indirectly estimate acid generating potential by comparing the sulfide sulfur content to the acid neutralizing potential of a sample, NAG tests determine the balance without the need for sulfur analyses.

The test is conducted by mixing the sample with hydrogen peroxide, and heating until the mixture stops boiling. After cooling, the pH of the sample is measured to obtain the "NAG pH". The NAG pH is then an estimate of the final pH of a sample if nearly all the sulfide present were oxidized, and is used in comparing the relative potential for generating acidity. The NAG pH is a qualitative indication of a sample's potential for acid generation; however, NAG pH values of 4.0 or greater are often indicative of low acid generating potential. The solution can then be titrated to neutrality with a standard base to determine the net acidity or acid generated (NAG) upon complete oxidation of the samples. The NAG is expressed as kg H_2SO_4 equivalent/ton, and is analogous to the NNP. Where the NAG is zero, net acid neutralizing potential is indicated. Positive NAG values indicate net acid generating potential.

The NAG test assumes complete oxidation of all the sulfide in a sample. Although sulfide oxidation is seldom complete, and the NAG test can underestimate the amount of sulfide in a sample, the result provides a realistic indication of the amount of sulfide that would react in field.

NAG tests were conducted on 59 samples representing all the rock types in the deposit. All NAG tests were carried out at the School of Engineering, University College of Wales, Cardiff, United Kingdom.

2.5 Modified EPA 1312 Test

The objective of this procedure is to characterize and quantify the soluble metal and salt content of waste samples. The test involves mixing a pulverized sample with a leaching solution, agitating the mixture, filtering the liquid and analyzing the liquid extract for pH, conductivity, acidity, alkalinity, sulfate and soluble metal concentrations (USEPA, 1994). The EPA test uses a liquid to solids ratio of 20:1. However, at the standard test ratio, constituent concentrations may be diluted and undetectable. The procedure was, therefore, modified to include a 2:1 ratio liquid to solids ratio. Deionized water was also substituted for the standard leach solution (deionized water pH adjusted with nitric and sulfuric acid) to simulate leaching with rain water.

The modified EPA 1312 tests were conducted at ACZ Laboratory in Steamboat Springs, Colorado.

2.6 Humidity Column Tests

Humidity column tests were carried out to simulate long term weathering of waste rock samples. Each sample was placed in a column of PVC pipe. Warm, moist air was passed through the sample for three days, followed by three days of dry air circulation. On the seventh day of each weekly cycle, the sample was irrigated and the leachate was collected. The pH, Eh, conductivity, acidity and alkalinity were measured directly, and a portion of each leachate sample was then sent for analyses of metal concentrations. Testing was continued for 21 weeks.

Humidity column tests were conducted at Cominco Engineering Services Laboratory (CESL) in Vancouver, British Columbia, Canada.

3 RESULTS OF WASTE ROCK TESTING PROGRAM

The following section presents the general findings of the geochemical testing program. Detailed data are presented in Appendices A.2 and A.3.

3.1 Metal Content and Mineralogy

The mineralogy of the samples was determined visually. The most common sulfide was coarse crystalline pyrite, which is present in concentrations of less than 1% throughout the quartz monzonite, and up to 10% to 20% locally within the mineralized breccia and some quartz veins. Other sulfides include chalcopyrite ($CuFeS_2$), the most common copper mineral, bornite ($CuFeS_2$), tetrahedrite ($Cu_{10}(Cu, Fe, Zn)_2(As,Sb)_{-4}S_{13}$), enargite ($Cu_3AsS_4$), and covellite (CuS). Molybdenite (MoS_2) is the most common molybdenum mineral. Gangue minerals associated with the sulfide mineralization include quartz, feldspar, and biotite. Accessory minerals include calcite (up to 5%), fluorite, siderite, magnetite, sericite, epidote, and chlorite.

Table A.3.1 lists the results of ICP analysis of two samples of quartz monzonite waste rock. Sample PW-3 was collected from the northwest wall of the open pit and WD-1 was collected from the west waste rock pile. Both samples show a similar chemistry with high aluminum, manganese, copper, and iron concentrations. Copper, molybdenum, sulfur, silver, zinc and cadmium are enriched in the sample analyzed with respect to crustal abundance.

3.2 EPA 1312

Although the total metals concentrations in the waste rock are important, the concentrations of metal salts that are soluble is often of more concern. Table A.3.2 lists the results of EPA 1312 test on sample WD-1. It should be noted that this sample was selected for EPA method 1312 leach testing because it is a transition waste rock sample that exhibited low field pH. Therefore, the leachable constituent concentrations would be anticipated to be higher than those expected from fresh, unoxidized waste rock samples.

The leachate from the sample had a pH of 3 and high sulfate concentration (3050 mg/L). No alkalinity was detected. The leachate also had higher concentrations of aluminum, copper, and iron, than the other sample, reflecting soluble metals in the solid sample. In addition, nickel and zinc in the solid sample appear to be soluble. However, the soluble metals concentrations are generally low.

3.3 Paste pH and Conductivity

Paste pH was measured on 141 samples from the waste rock dumps. The range of pH values for each rock type is shown in Figure A.3.1. The andesite sample analyzed had a paste pH above 9. All other rock types show a range of values between 2 and 9, indicating that portions of each lithology have undergone varying degrees of sulfide oxidation.

Paste pH is plotted against paste conductivity in Figure A.3.2 and listed in Appendix A.2. There is a strong correlation between low paste pH and high paste conductivity, as would be expected. Conductivity values generally remain below 500 µS/cm above a pH of 6, but increase when pH is lower.

3.4 Acid Base Accounting

NP values are plotted against AP values for the two testing programs in Figure A.3.3. The 1994 samples have higher NP than the 1997 samples. The discrepancy is a result of the use of the more conservative modified Sobek procedure for determining NP on the 1997 samples. For the purposes of this report, only the 1997 data will be used.

Figure A.3.4 shows the relationship data between NP and AP by rock type for the 1997 samples, with the diagonal line indicating where NP is equal to AP. The figure shows that most samples contain less than 3% sulfide (equivalent to an AP of 93kg $CaCO_3$ eq./t), and generally have less NP than AP. Therefore, most samples have a "theoretical" potential for acid generation. The andesite appears to be an exception.

From the correlation of Sulfate/Total Sulfur and paste pH four fields can be identified (Figure A.3.5):

- *Low paste pH, high Sulfate/Total Sulfur Ratio*: This field is characterized by samples that have a high proportion of secondary sulfate salts that are acid generating. As can be observed relatively few samples fall into this field.
- *High paste pH, low Sulfate/Total Sulfur Ratio*: This field is characterized by samples that have a low proportion of secondary sulfate salts but high sulfide content. Whilst having the potential to generate appreciable amounts of acid they are not on immediate reaction acid-generating and require a long period of interaction with air and water in the presence of a catalyst to be so.
- *Low Paste pH, Low Sulfate/Total Sulfur Ratio*: This field is characterized by high sulfide samples.

- *High Paste pH, High Sulfate/Total Sulfur Ratio*: This field delineates the oxide ore samples.

ABA data is presented in Appendix A.2.

3.5 Net Acid Generation (NAG) Testing

NAG tests were conducted on 59 samples and the resulting NAG pH values are plotted according to rock type on Figure A.3.6. Samples of biotite breccia, quartz breccia, and quartz monzonite had NAG values that ranged from acidic to alkaline. This suggests that each of these lithologies contain a wide range of sulfide concentrations. Quartz vein material, in contrast, had NAG values indicating Net Acid Generation, reflecting the common association within the deposit of sulfides with quartz veins. Low paste pH correlates to high NAG and low negative NNP (Figure A.3.7).

NAG test data are presented in Appendix A.2.

3.6 Kinetic Tests

Humidity column tests were conducted on five samples; four (4) different quartz monzonite samples and one (1) quartz breccia sample:

- Two samples obtained from the sulfide waste rock stockpiles (SW-1 and LGSSP-2);
- One sample of quartz breccia with jarosite stains from the pit wall (PW-2); and,
- Two samples of unoxidized quartz monzonite waste obtained from archived drill core (IDC 24-22-241 and CF10-190-199).

Sulfide waste samples (SW-1 and LGSSP-2) are representative of previously mined unoxidized materials that have been exposed to weathering conditions since 1982. These samples contain fresh pyrite and chalcopyrite which coat fractures and are disseminated throughout the rock.

The pit wall sample (PW-2) was collected from partially oxidized cap rock located west of the pit. While the sample was highly oxidized, it contained residual disseminated pyrite and, locally, chalcopyrite.

The core samples (IDC 24-22-241 and CF10-190-199) are representative of unoxidized quartz monzonite waste that will be mined during future operations. These samples were obtained from drilling at depth and have not been exposed to weathering or oxidizing conditions in the field. They contained fresh chalcopyrite and abundant fresh pyrite.

Results of ABA tests on the samples used for the humidity column tests are listed in Table A.3.3. Humidity column data are presented in Appendix A.3 and summarized in Figures 3.8 to 3.13.

3.6.1 pH and Eh

Figure A.3.8 illustrates leachate pH with time. For the initial 19 weeks of testing, all unoxidized quartz monzonite samples (all samples except column 2, PW-2) maintained a leachate pH in the range of 7.0 to 8.1. In column test PW-2, pH varied between 5.8 and 6.5 during the initial 19 weeks.

All samples show a sharp decrease in leachate pH in week 20. Because the pH depression was approximately equivalent in all tests, the laboratory was contacted to determine if the pH depression was attributable to laboratory operations as opposed to geochemical conditions. Independent investigations by the laboratory indicated that every column in the laboratory at that time (not just those for this project) experienced a similar leachate pH decrease. It was ultimately determined that the decrease in pH was the result of a decrease in pH of the deionized water used as inflow to the columns. Major servicing of the laboratory deionizing equipment caused the decreased pH of the deionized water in week 20.

The kinetic tests were resumed after a seven-week hiatus during which time the deionizing system was adjusted. The samples remained undisturbed during this period and were exposed to natural airflow that would have allowed oxidation to continue until the weekly cycles were resumed. Results for the last two weeks indicate that oxidation continued to occur at rates similar to those of the first 20 weeks.

3.6.2 Electrical Conductivity

Figure A.3.9 illustrates leachate conductivity versus time. Initially high conductivity was indicated for test LGSSP-2. This material was collected from the surface of the low grade sulfide stockpile and initial high leachate conductivity may result from leaching of secondary oxidation products. All the samples exhibit trends of decreasing leachate conductivity. By week 20, the conductivity of all test leachates was less than 100 µS/cm, suggesting limited oxidation or leaching of metals and sulfate. When the tests were resumed at week 27, samples LGSSP-2 (surface waste) and C10-190-199-2 (fresh sulfide material) exhibited increased conductivities indicating oxidation and production of soluble salts during the hiatus.

3.6.3 Acidity and Alkalinity

Acidity production slowly increased after week 9 in all columns (Figure A.3.10), as alkalinity began decreasing (Figure A.3.10). Figure A.3.10 illustrates the low leachate alkalinity of sample PW-2 throughout the 29-week test due to the oxidized nature of the sample.

3.6.4 Sulfate

The time dependent plot for sulfate (Figure A.3.11) shows a rapid decrease in the sulfate concentration over the first 5 to 10 weeks. This is a result of the flushing of readily soluble sulfate salts present in the waste rock prior to testing. After about week 15 the sulfate concentrations reach a pseudo steady state. As was reflected in the conductivity, leachates from columns containing samples LGSSP-2, and C10-190-199-2 show an increase in sulfate as the result of accumulation of oxidation products during the seven week hiatus during which the columns were not operating. The other columns showed no significant increase, suggesting a slower rate of sulfate production and release.

3.6.5 Metals

After initial flushing of secondary oxidation salts, most metals were produced at a low rate throughout the test period, most below detection limits (Figures A.3.12 and A.3.13).

3.6.6 Assessment of Oxidation and NP Depletion Rates

Sulfate release rates and alkalinity release rates were calculated for each column test to assess the relative oxidation and acid neutralization dynamics. For these calculations it was assumed that 30% of the waste rock in the test columns is contacted by infiltrating waters and that all the sulfide and NP are available for reaction. Average concentrations for weeks 16 to 20, inclusive, were used to calculate rates of depletion of sulfide and NP. The results are summarized in Table A.3.4.

Based on the estimated time to deplete the NP, it will take on the order of several hundred years for the columns to become acid generating under the accelerated laboratory conditions. Field conditions and the designated mitigation measures are anticipated to further prolong NP depletion. The results also suggest that the neutralizing potential originates predominantly from calcium and magnesium based carbonate minerals, with the possible exception of sample PW-2.

Also shown in Table A.3.4 are the specific sulfur release rates. The first rate is based on the specific release rate per unit mass of rock sample while the second rate has been normalized to the sulfide sulfur content of the sample. The release rates are in similar order of magnitude, indicating that all the samples are oxidizing at a slow rate. The most reactive sample appears to be LGSSP-2.

This could be explained by the higher pyrite content of total sulfides and finer grain size in this sample. Sulfate levels are negligible (0.01% out of 0.61% total sulfur) so the effects of secondary sulfates can be ruled out, although the presence of some sulfate indicates that at least a surface alteration has occurred on exposed pyrite.

4 HYDROGEOCHEMISTRY

The following section presents a brief discussion of local surface water and groundwater quality. Hydrogeological data are presented in detail in *Copper Flat Mine Hydrogeological Studies (SRK, 1995)* and *Copper Flat Project Hydrogeolgy Impact Evaluation (ABC, 1996)*.

4.1 Surface water

There are three main water courses in the vicinity of the proposed mine; these are Percha Creek, Las Animas Creek and Greyback Arroyo. Percha Creek lies to the south of the mine and Las Animas to the north. Both of these creeks drain to the Caballo reservoir to the east of the mine. The Greyback Arroyo is currently diverted around the existing pit.

The surface water quality in Las Animas and Percha Creeks and the reservoir is broadly similar. They all contain low dissolved solids (300-440 mg/l) and pH is slightly alkaline (7.2-7.9). The chemistry is dominated by calcium-bicarbonate ions. Sulfate is low (mean of 65 mg/l) and dissolved metal concentrations are below detection limit. The Greyback Arroyo contains somewhat higher calcium concentration (450-510 mg/l, compared to around 60 mg/l in the other surface waters) and sulfate (1410-1740 mg/l). Alkalinity is also elevated (up to 508 mg/l $CaCO_3$ equivalent). Trace element concentrations are close to or less than detection limit. The Greyback Arroyo cuts through the copper porphyry deposit, and therefore may be expected to contain higher sulfate concentrations than the other streams in the region. Greyback is an ephemeral stream, and dissolved constituents will be concentrated by evaporation.

4.2 Pit Lake

The pit lake chemistry is dominated by calcium-sulfate ions; sulfate reaches concentrations of up to 3600 mg/l. The pH is generally slightly alkaline (pH 7-8.5) although pH values of less than 7 (with a minimum of 4.4) were recorded during 1992-93. Most dissolved trace element concentrations are low; however fluoride and manganese are both elevated (with concentrations up to 11 mg/l and 4.9 mg/l respectively). No evidence of stratification was observed on the four occasions that depth samples were collected (SRK, 1997).

The high TDS in the pit lake is probably due to the evaporation accumulation of sulfide oxidation products and dissolution of secondary minerals. Evaporative concentration has increased the dissolved salt load to the point where gypsum (hydrated calcium sulfate) is at saturation.

The lower pH levels reported for a part of the lake (pH 6-6.5) are influenced by the local presence of an acid seep originating from the NW side of the pit wall in the Sternberg lode. The few recorded low pH values may also be related to dissolution of acid volatile salts (such as jarosite) during pit lake level fluctuations.

The climate and nature of the pit lake are such that the pit will act as an evaporative sump, so there will be no groundwater flow out from the lake (ABC, 1996). Surface runoff from the waste rock dumps will be directed to flow into the pit lake, where it will be contained.

4.3 Groundwater

The groundwater at the Copper Flat site is dominated by the bicarbonate ion, providing a high buffering capacity. The pH ranges from 7.5 to 8.15, indicating slightly alkaline water. Sulfate concentrations tend to be low to moderate (80-400 mg/l) and dissolved metal concentrations are also low. Iron and manganese were relatively high in one of the samples (GWQ96-23A) collected in April 1997 (6.5 mg/l iron, 1.425 mg/l manganese). However more recent sampling results (August 1997) indicate very low iron and manganese (<1 mg/l of both elements).

4.4 Seepage

During the August 1997 sampling event, a seep was observed at the east toe of the west waste rock dump. A sample was collected and the results of analysis are tabulated in Table A.4.1. Although the seepage contains very high dissolved metals and low pH it is important to note that the flow was very low (much less than a gallon/minute (measured during sampling at ~0.2 gpm)) and the seepage will therefore be rapidly diluted and buffered by groundwater and/or surface water.

The upper part of the seepage channel was coated by chalcanthite ($CuSO_47H_2O$), langite ($Cu_4SO_4(OH)_6{}^2U_2O$), woodwardite ($Cu_4Al_2SO_4(OH)_{12}$ 2-4H_2O(?)), goethite, cuprocopiapite (($CuFe^{2+)}$ $Fe^{3+}{}_4(SO_4)6(OH)_2$ 2OH_2O) and amorphous Na-Ca-Mg-Cu-Zn--Fe-Mn salts. This indicates active buffering and evaporation, thus limiting metal and acid dispersion.

5 ACID ROCK DRAINAGE CHARACTERISTICS OF THE EXISTING WASTE PILES

5.1 ARD Characteristics of Different Lithologies

From whole rock analysis of waste rock samples (Table A.3.1), the primary constituents are Al, Ca, Fe, Mg and K. Trace metals of significance (> 10 ppm) are Ba, Cu, Co, Mn, Mo and Zn. Several million tons of waste rock are currently piled around the pit and along the southeast slope of Animas Peak. SRK has previously classified the waste rock in the area as oxidized, transitional and unoxidized (SRK, 1995). The basis for classification is the proportion of pyrite observed in the material, as well as its field behavior (as indicated by paste pH and conductivity).

The rock piles were initially classified (Draft EIS, 1996) on the proportion of each type of material present with the west pile being primarily transitional waste, the north rock pile being a combination of unoxidized and oxidized waste and the south and eastern rock piles comprising essentially unoxidized sulfide waste.

The ARD potential by lithology and by waste rock dump are discussed in the following sections.

5.1.1 Quartz Monzonite

The quartz monzonite frequently contains abundant pyrite and therefore may be a potential source of acid rock drainage. The paste pH measurements made on this lithology (94 taken in August 1997) ranged from 2.51 to 8.76 (Figure A.3.1). Several measurements were at the higher end of the range, suggesting that in some cases the monzonite may have some buffering capacity. However, the majority of the measurements were between pH 2 and 7, indicating initial acid generation. The net acid generation (NAG) results varied between 8 and 57 kg/T eq. H_2SO_4 (Figure A.3.6). Over 50 % of the tests generated a NAG value of between 20 and 40 kg/T eq. H_2SO_4. This indicates that the rock has potential to generate acid in certain circumstances. Observations indicate a visible pyrite content of between 0 and 8 %, with most samples containing around 3% (Figure A.5.1). This ties in well with the NAG test results.

5.1.2 Quartz Breccia

The quartz breccia is not as abundant as the quartz monzonite, which will form the bulk of the waste rock. Around 30 samples of this lithology were assessed for paste pH and paste EC (electrical conductivity, a measure of total dissolved solids). Nearly all the paste pH measurements were less than 7, and most of these were between pH 3 and 5 (Figure A.3.1). This was probably due to the dissolution of superficial salts. The NAG test results were similar to those of the quartz monzonite, with most measurements falling between 20 and 40 kg/T eq. H_2SO_4. However, more of the results from the quartz breccia were greater than 80 kg/T eq. H_2SO_4 (Figure A.3.6). One sample yielded a NAG potential of 223 kg/T eq. H_2SO_4, but this was exceptional. The visible sulfide in the quartz breccia was mostly between 3 and 4 %. The quartz breccia generally has a higher acid generating potential than the quartz monzonite.

5.1.3 Biotite Breccia

Ten measurements of paste pH were made on rock classified as biotite breccia. The paste pH values ranged from 2.45-7.38 (Figure A.3.1). All but one of these readings were less than pH 7 and the majority were less than pH 5. The biotite breccia generally has a greater proportion of sulfide than the other lithologies, with a quarter of the samples containing more than 6% visible sulfide. This is reflected by the NAG test results, which are up to 80 kg/T eq. H_2SO_4 (Figure A.3.6). However, only six NAG measurements were made on biotite breccia samples so it is inappropriate to make generalizations. This rock is considered an ore material and will be handled as such.

5.1.4 Quartz Vein

Six quartz vein samples were assessed for paste pH and percent visible sulfide. Of these only 3 NAG tests were possible. The paste pH measurements were dominated by acidic values, with ½ of the tests exhibiting a pH less than 3 (Figure A.3.1). Most of the samples contained around 5 % visible sulfide, one sample only contained around 1% (Figure A.5.1). The NAG test results were between 10 and 40 kg/t eq. H_2SO_4; these are slightly lower than may be expected for samples with relatively high sulfide content (Figure A.5.4).

5.1.5 Andesite

Only one andesitic sample was available for testwork. This reflects the relative scarcity of this lithology throughout the waste rock dumps. This sample yielded a very high paste pH value of 9.14, which demonstrates its excellent buffering capacity. This sample was not assessed for net acid generation.

5.2 ARD Characteristics of Different Waste Rock Dumps

Locations of samples collected for paste pH and paste conductivity measurements and NAG values are shown on Drawing 68606-001, and the frequency of acid generator indicators, paste pH, conductivity, NAG value and visible sulfide abundance are provided in Figures A.5.2 - A.5.5, respectively.

5.2.1 North Waste Rock Dump

The north waste rock dump contains a mixture of unoxidized, oxidizing and oxidized waste rock. The paste pH measurements are generally lower than those for the other waste rock dumps due to the presence of transitional material. The range of paste pH values are from 2.5 to 6 (significantly, no values above pH 7 were recorded) and more than 50 % of the values were less than pH 3. This suggests a higher proportion of soluble salts relative to material from the other waste rock dumps.

The NAG test results were not exceptionally high although one sample generated a value of 223 kg/t eq. H_2SO_4. The remainder of the samples were between 9 and 75 kg/t eq. H_2SO_4. The sample which generated the high NAG value (NRD 5620 014) was also noted as containing 20 % visible pyrite, which is unusual for the Copper Flat waste rock. Most waste rock samples from this dump contained on the order of <2% visible pyrite.

From the results to date, the north waste rock dump appears to have the greatest potential to generate acid. This is probably because this dump contains a greater proportion of partially oxidized (transition) rocks than the other dumps.

5.2.2 West Waste Rock Dump

The west waste rock dump has been described as containing mostly partially oxidized, transitional waste rock (SRK 1995) but more detailed investigation in 1997 indicated that much of the rock is relatively fresh and the oxidation is very superficial.

The paste pH measurements ranged from pH 2.3 to 7.8. Generally the rocks on this dump were less reactive than those on the other dumps, with nearly 50 % of samples generating a paste pH greater than 5. The NAG test results ranged from 15 to 75 kg/t eq. H_2SO_4, with over 80 % of samples generating a potential of less than 40 kg/t eq.

H_2SO_4. This relates well to the proportion of visible sulfide in the rocks which was less than 2% in nearly 80% of the samples.

Field observations and all the test results to date indicate that the west waste rock dump has the lowest potential to generate acidity.

5.2.3 South Waste Rock Dump or Lean Ore Stockpile

The south waste rock dump reportedly contains rocks with a higher proportion of sulfide compared with the other waste rock dumps. However, the samples collected during August 1997 do not support this. All the samples evaluated contained less than 7 % visible sulfide (estimated) and the acid base accounting (ABA) revealed no samples with a sulfide content greater than 1.5 %. An earlier sampling round (SRK 1994) produced similar results; the highest measured sulfide content was just over 3%.

The NAG potential is relatively low; 90 % of samples evaluated generated a value of less than 40 kg/t eq. H_2SO_4, and the highest potential measured was only 43 kg/t eq. H_2SO_4. This confirms the low sulfide content of the samples analyzed.

The paste pH results ranged from pH 2.5 to 8.8; over a fifth of the samples generated an alkaline paste pH which may indicate some buffering capacity. Most (75%) of the samples showed very low reactivity, generating paste conductivity values of less than 500 µS/cm.

The evidence presented here suggests that the south waste rock dump has an overall low acid generating potential.

5.2.4 East Waste Rock Dump

The samples collected from the east waste rock dump contain on average around 2 % visible sulfide. Sulfide analysis resulted in a similar figure (although fewer samples were evaluated). Ore samples contained up to 10 % sulfides.

The NAG potential of the samples analyzed was relatively small; 80% were less than 30 kg/t eq. H_2SO_4. This reflects the sulfide content of the rocks.

The paste pH range was from 2.71 to 9.14. Most (65%) of the samples generated a pH less than 6. This suggests that there are soluble salts available for dissolution. The average sulfate to total sulfur ratio is around 35%, which indicates a relatively low degree of oxidation.

The east waste rock dump, in common with the south waste rock dump, is likely to have a relatively low potential for acid generation.

6 DISCUSSION

6.1 Soluble Contaminants

Results of the EPA 1312 test indicate that the soluble metal concentrations in transition waste rock are relatively high; however, the sample represents only a limited volume of future waste rock. Leachates from kinetic tests conducted on unoxidized quartz monzonite samples exhibit very low soluble metal and salt concentrations. These leachates are considered more representative of potential unoxidized waste rock drainage quality in the foreseeable future.

Soluble metal concentrations in the tailings can also be used to infer behavior of the waste rock because the tailings are composed of similar material that has been crushed, increasing the surface area that is available to oxidation. Therefore, the soluble concentrations in the tailings exposed to weathering for over 14 years may provide a "worst-case" indication of the soluble load in the waste rock. As can be seen in Table B1.2 in Appendix B, the extractable metal concentrations in the tailings, as determined by modified method 1312 testing, are low.

6.2 Acid Generation

The degree to which material has oxidized, or its "weathering status", can provide some indication of how the rock must be managed to alleviate ARD potential. The weathering status was identified visually by geologists according to the following classification (Table A.6.1):

- Oxide: No visible sulfides, loss of texture, strong oxide staining;
- Transitional: Visible sulfides, loss of texture, strong oxide staining;
- Low Sulfide: Few visible sulfides, fresh appearance, minor to no oxide staining; and,
- High sulfide: Abundant visible sulfides, fresh appearance, minor to no oxide staining.

Figure A.6.1 plots NP against AP according to weathering status of the material. The figure shows that oxidized material has low potential to generate acid since these samples have AP concentrations below 11, equivalent to a percent sulfide concentration of less than 0.4%.

This is also illustrated in Figure A.6.2. This figure plots the percent sulfur present as sulfide against percent sulfur as sulfate. The diagonal line in the figure is where concentrations of the two sulfur forms are equal. Samples having higher sulfate sulfur than sulfide sulfur are all oxide and transitional material. Samples plotting below the line are low and high sulfide material. This figure, along with Figure A.6.1, suggests that oxidized material will not pose an ARD problem. However, this material may contain soluble metals that could be leached from the rock in the short term.

For the transitional, low and high sulfide materials, there is evidence to suggest that some of the sulfides are less reactive than others. One piece of evidence is the waste rock piles themselves. During the 14 years of exposure, much of the sulfide has been oxidized to metal oxides that are stored in the rock. However, the waste still contains unoxidized sulfides, suggesting that there is some variability in the weathering rates of the sulfides. This is also illustrated in Figure A.3.1 by the wide range of paste pH values for every rock type, except andesite. The biotite breccia, quartz breccia, quartz monzonite, and quartz vein material all have paste pH values ranging from 2 to 9. If all the sulfides are uniformly distributed and had similar reactivity, the range of paste pH values would not be expected to be so broad.

Figure A.6.3 is a plot of NAG pH vs. total sulfur. NAG pH values range from 2 to 8 and have no relation to total sulfur concentrations. For example, samples with total sulfur contents of about 2.9% have NAG pH values either below 3 or greater than 6. This suggests variability in the reactivity of the sulfides contained in the samples.

Finally, of the waste rock humidity cells only LGSSP-2 became acidic during the 27 weeks of testing, despite containing very different materials. Since there is little neutralizing capacity in many of the kinetic test samples, the neutral drainage indicates low rates of sulfide oxidation in the cells. Thus, even under the relatively wet conditions of the humidity columns, the sulfides are slow to oxidize.

6.3 Field Identification of Waste

Results of the geochemical testing program indicate that field methods can be used to identify the different types of waste. The visual classification of oxide, transitional, low sulfide and high sulfide material correlated well to sulfate/total sulfur ratios, as shown in Figure A.6.4. Oxide samples have ratios above 75% and transitional material has ratios between 40% and 75%. Low and high sulfide values fall below 40% SO_4/S(T).

The figure also shows that low and high sulfide can be distinguished by sulfide concentrations. Three of the four low sulfide samples had sulfide concentrations below 0.6%. This means that during operations, low sulfide can be separated from high sulfide material based on visual estimation of sulfide concentration.

While the waste rock can be easily classified on the basis of visual inspection, periodic testing of sulfur content is recommended as a means of confirming the effectiveness of visual classification methods. Confirmation testing is recommended to evaluate the distinction between oxide and transition waste, and between low sulfide and unoxidized waste. Total sulfur analyses by Leco furnace are routinely used in waste management programs at many mine sites. Equating total sulfur content with sulfide sulfur content provides a rapid and highly conservative estimate of acid generating potential.

7 CONCLUSIONS

The primary conclusions of this work are:

- While a significant to moderate potential for acid generation is exhibited by the Copper Flat lithologies, the rate of sulfide oxidation is slow. Sulfide oxidation and acid generation has been and is active at the Copper Flat mine site. However, no environmental impact on surface streams or groundwater has been observed during this or any previous studies. Seasonal acidic and metal-sulfate rich seeps do form but tend to evaporate at the toe of the dumps.

- Available buffering through mineral-water reactions and from groundwater recharge is sufficient to neutralize generated acidity for much of the year. Acid seeps could develop during operations, after periods of heavy rainfall. However, these seeps will drain towards the pit area as either surface or sub-surface flow.

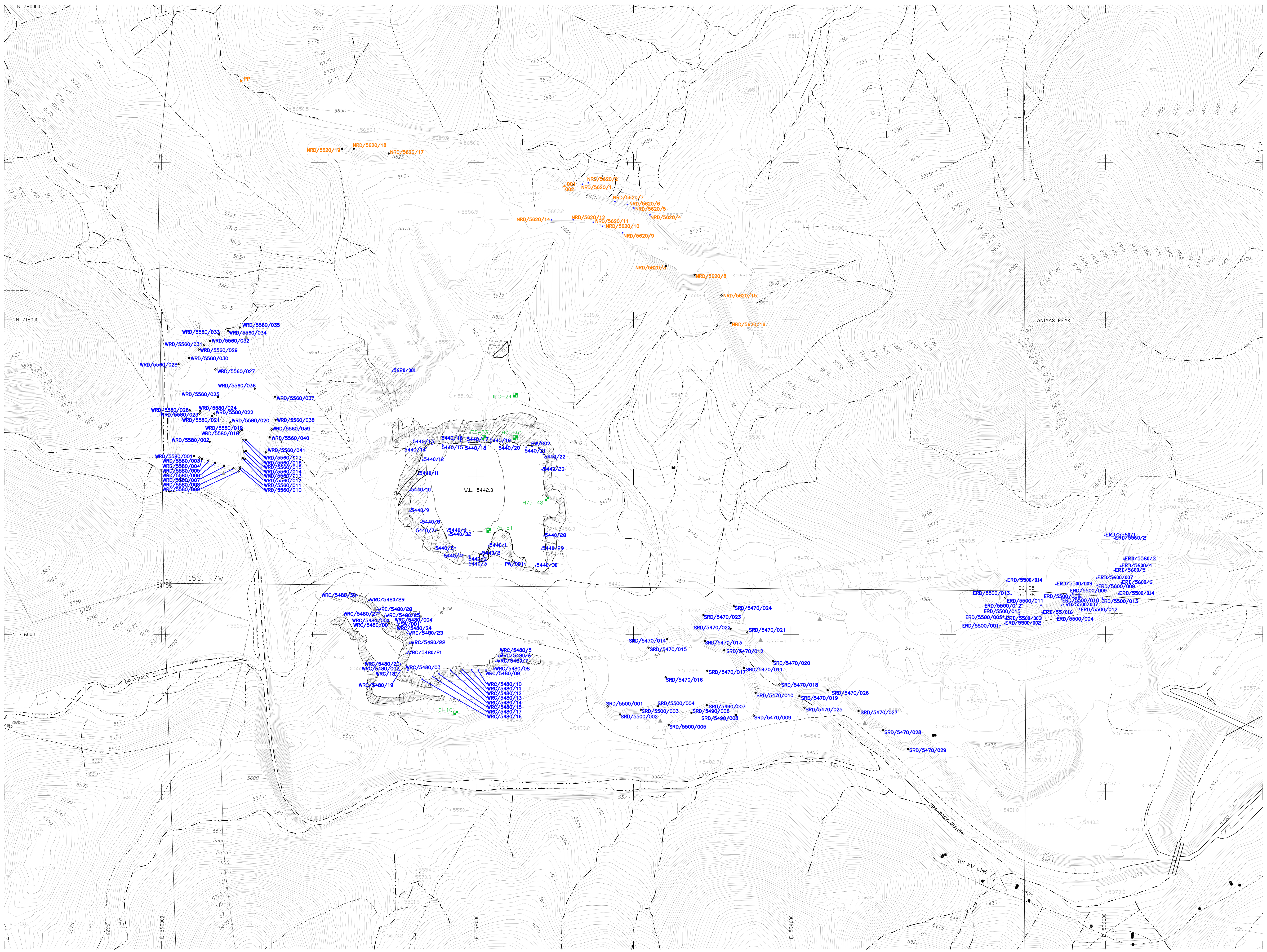
- Metal release from the lithologies is low and all kinetic leachates conformed to all applicable surface water and most groundwater standards.

- Sulfide oxidation is slow from the Copper Flat lithologies as evidenced by the abundance of sulfide minerals on the waste rock dump surfaces despite exposure since 1982.

Environmental concerns regarding waste rock at any mine site are generally two fold: leaching of soluble metals stored in the waste and generation of acidic drainage. At Copper Flat, leachable metals from the waste rock and tailings do not appear to be a concern, with the exception of the transition waste.

The results of the geochemical testing programs indicate that most of the waste rock at the site has the potential to generate acid, given sufficient time and exposure to oxidizing conditions. However, evidence from paste pH tests, NAG tests, and humidity columns suggest that the sulfides are not highly reactive. This is supported by the fact that much of the material on the waste rock dumps is neutral despite having been on the surface since 1982. This may be due to the coarse, crystalline nature of the sulfides at Copper Flat as well as arid site conditions. Crystalline minerals have a lower surface area and a more organized structure so consequently require more energy to oxidize. As a result they tend to be more stable than fine-grained semi-crystalline or subhedral minerals.

The rates of reactivity of the sulfides will need to be confirmed by humidity column tests on new waste rock generated from the pit. In the interim, waste can be managed using a conservative plan that includes visual classification and confirmatory measurement of the total sulfur content of the waste rock prior to its removal from the pit, with waste handling measures that address the short and long term management requirements. Once oxidation rates are obtained from the operational field test program then the humidity column test results reported here can be calibrated to a parameter that can be measured in the field, such as total sulfur, so as to refine the operational waste management plan



L E G E N D

- H75-51 SAMPLED DRILL HOLE COLLAR LOCATION (APPROXIMATE)
- PW-1 SURFACE GRAB SAMPLE LOCATION
- SAMPLE LOCATION

PREPARED FOR:	ALTA GOLD COMPANY
PREPARED BY:	SRK Consulting Engineers and Scientists
TITLE:	WASTE ROCK SAMPLE LOCATION MAP
SCALE:	AS SHOWN
DRAWING No.:	FIGURE A.1.2
REVISION	A
PROJECT No.:	68606
DESIGNED	10/98
DRAWN	10/98
CHECKED	10/98
APPROVED	10/98
APPROVED	

ENGINEER	No.	DESCRIPTION	BY	DATE

REVISIONS

REFERENCE

01981

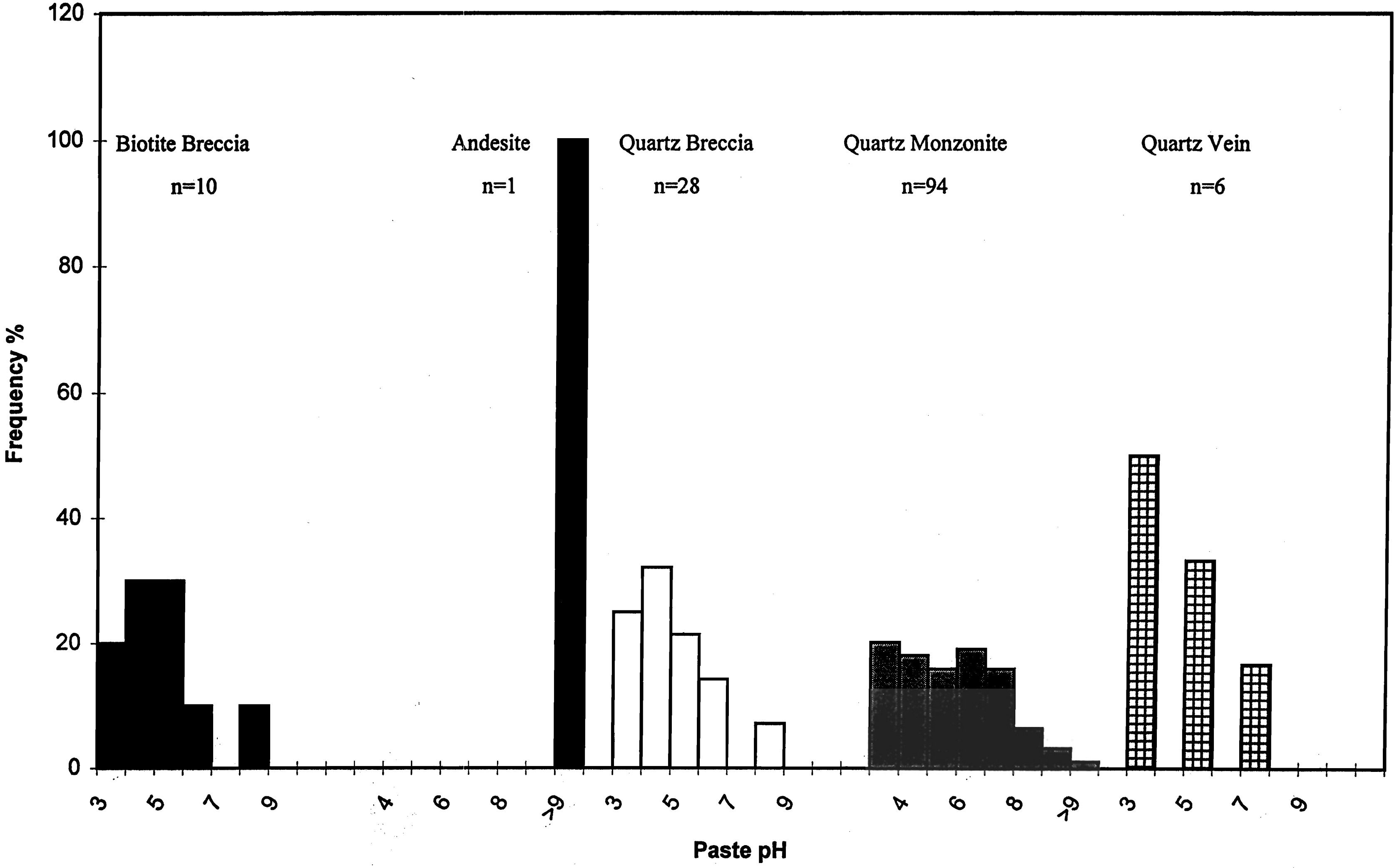


Figure A.3.1. Paste pH Frequency Distribution by Lithology

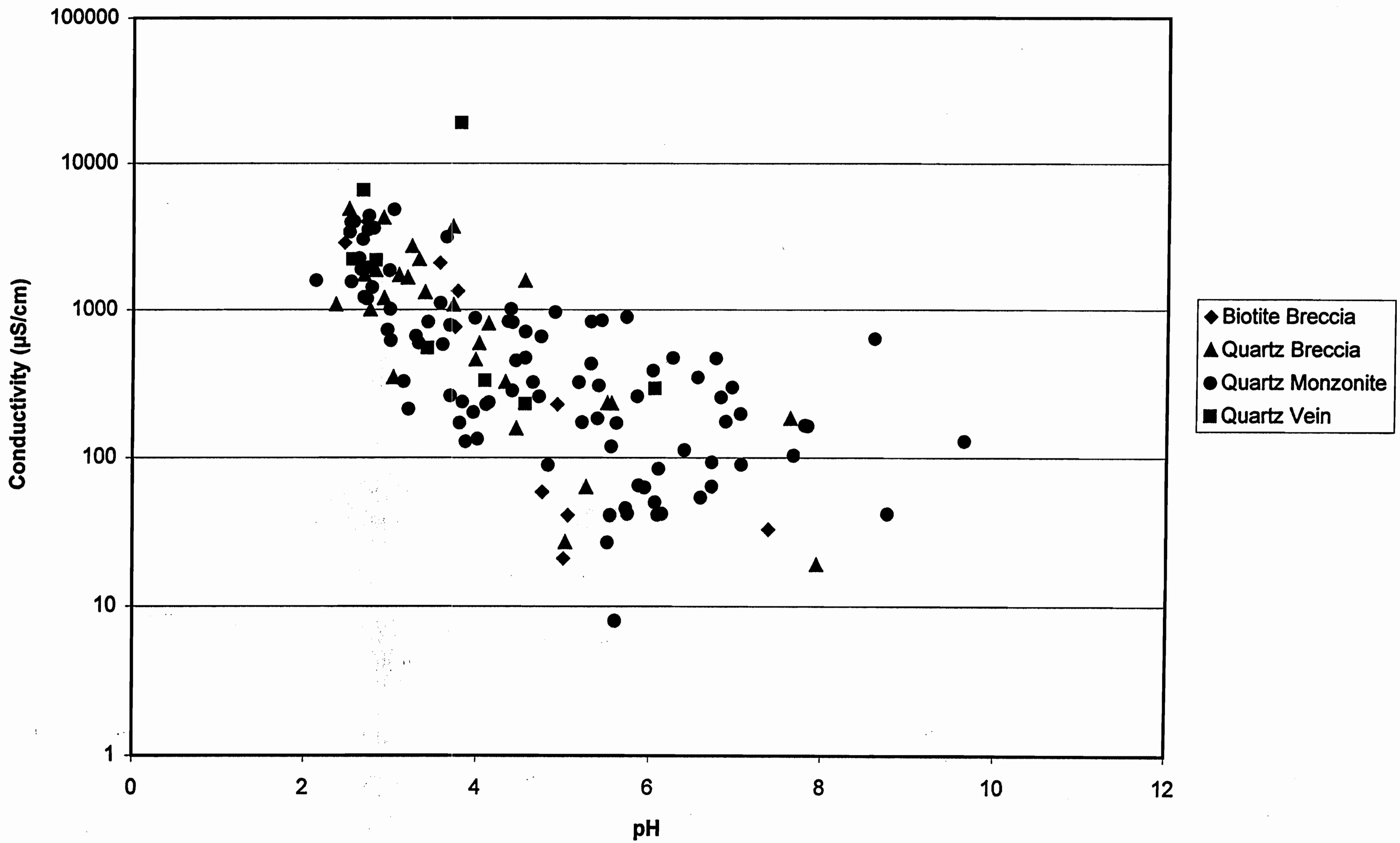


Figure A.3.2 - Paste pH vs. Conductivity

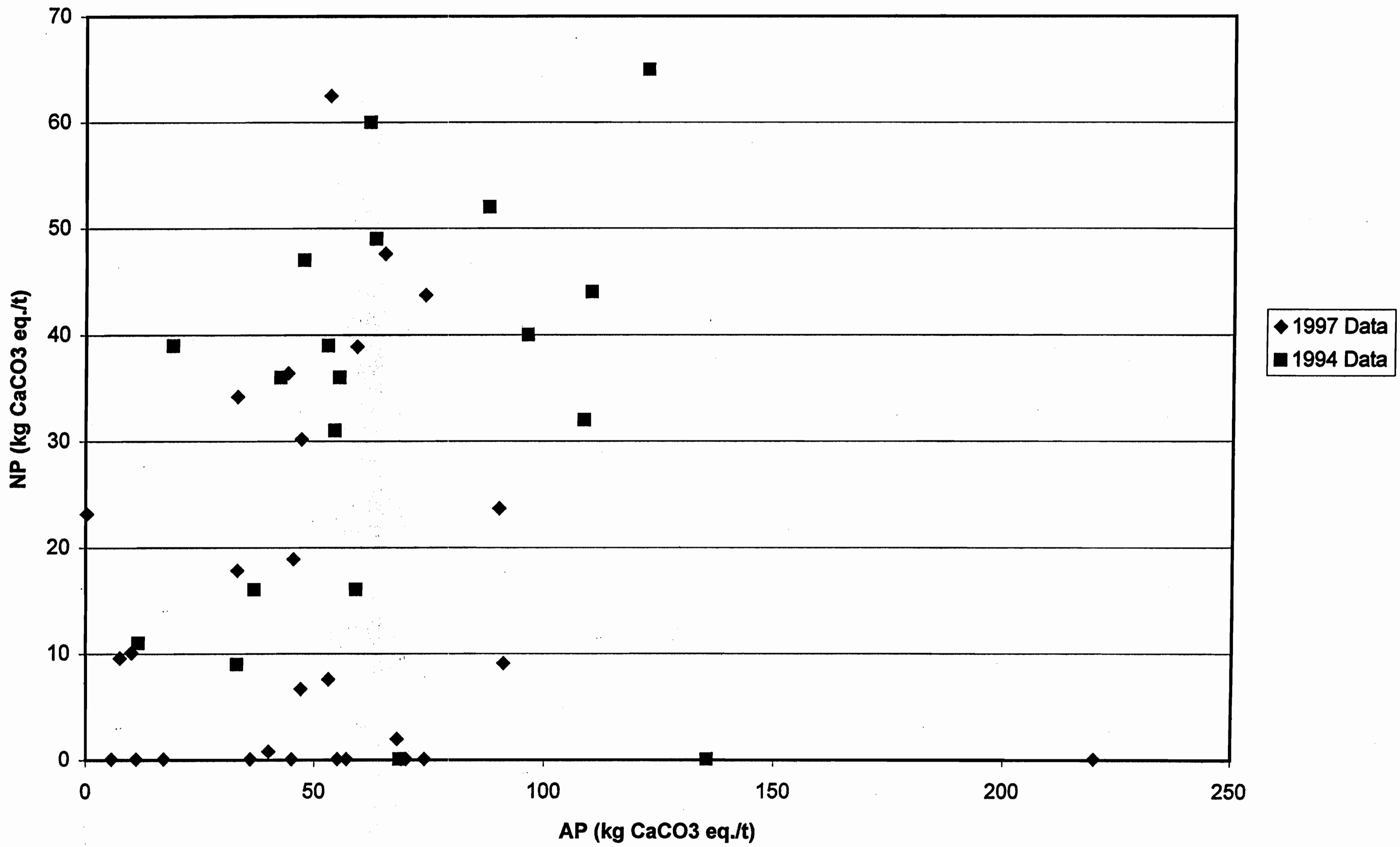


Figure A.3.3 - NP vs. AP for 1994 and 1997 data

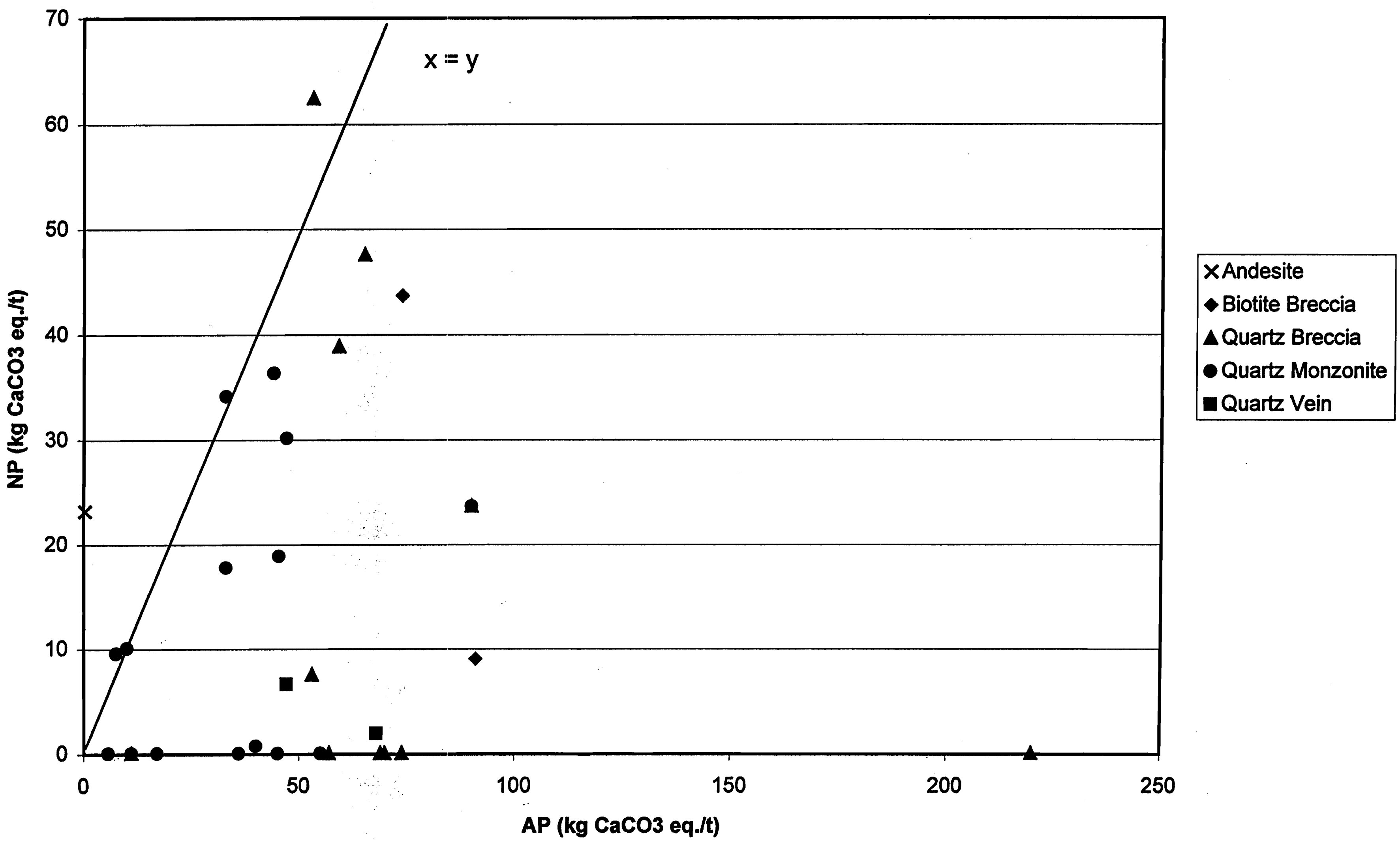


Figure A.3.4 - NP vs. AP

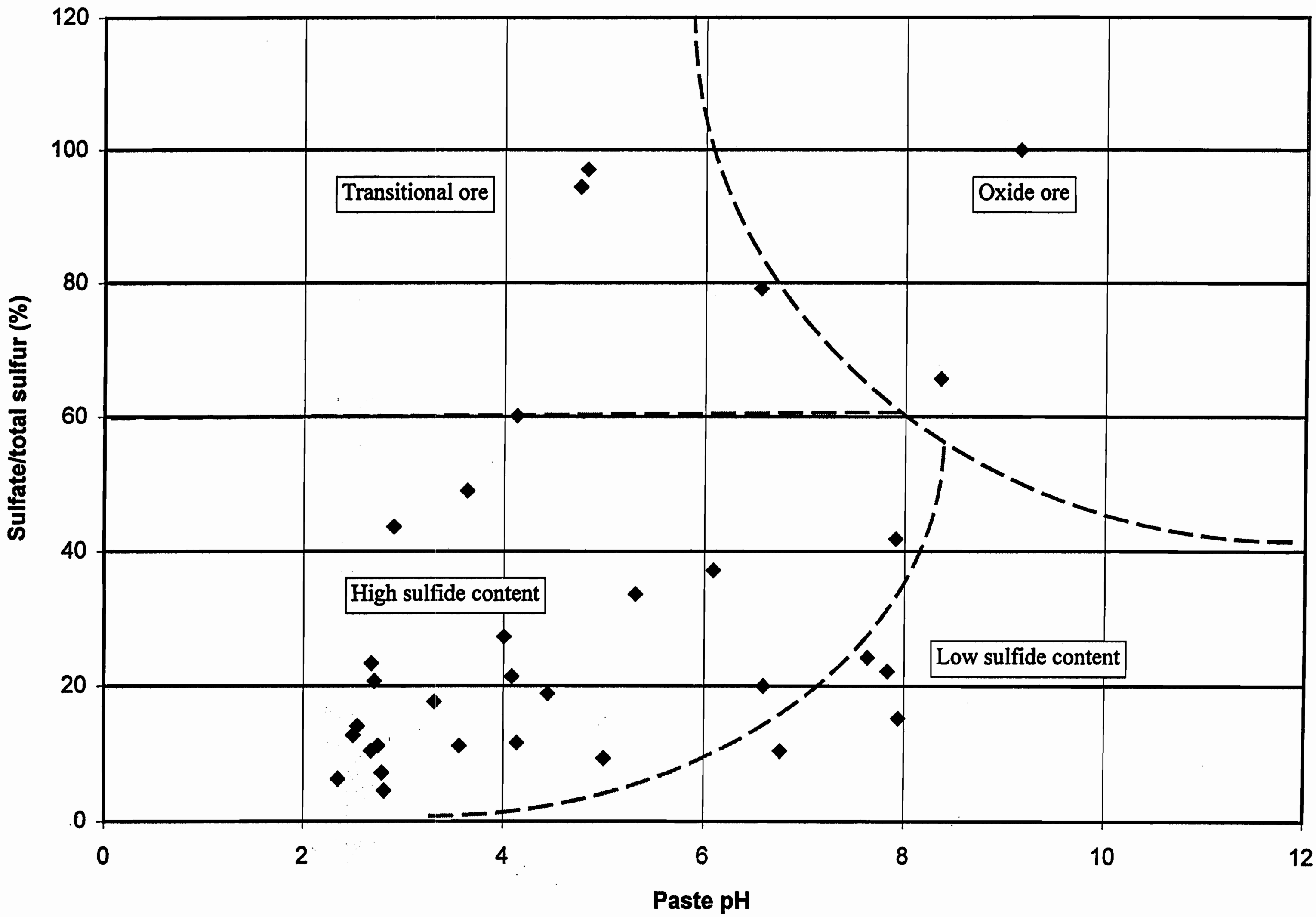


Figure A.3.5 - Total Sufate/Total Sulfur (%) vs. paste pH (SU)

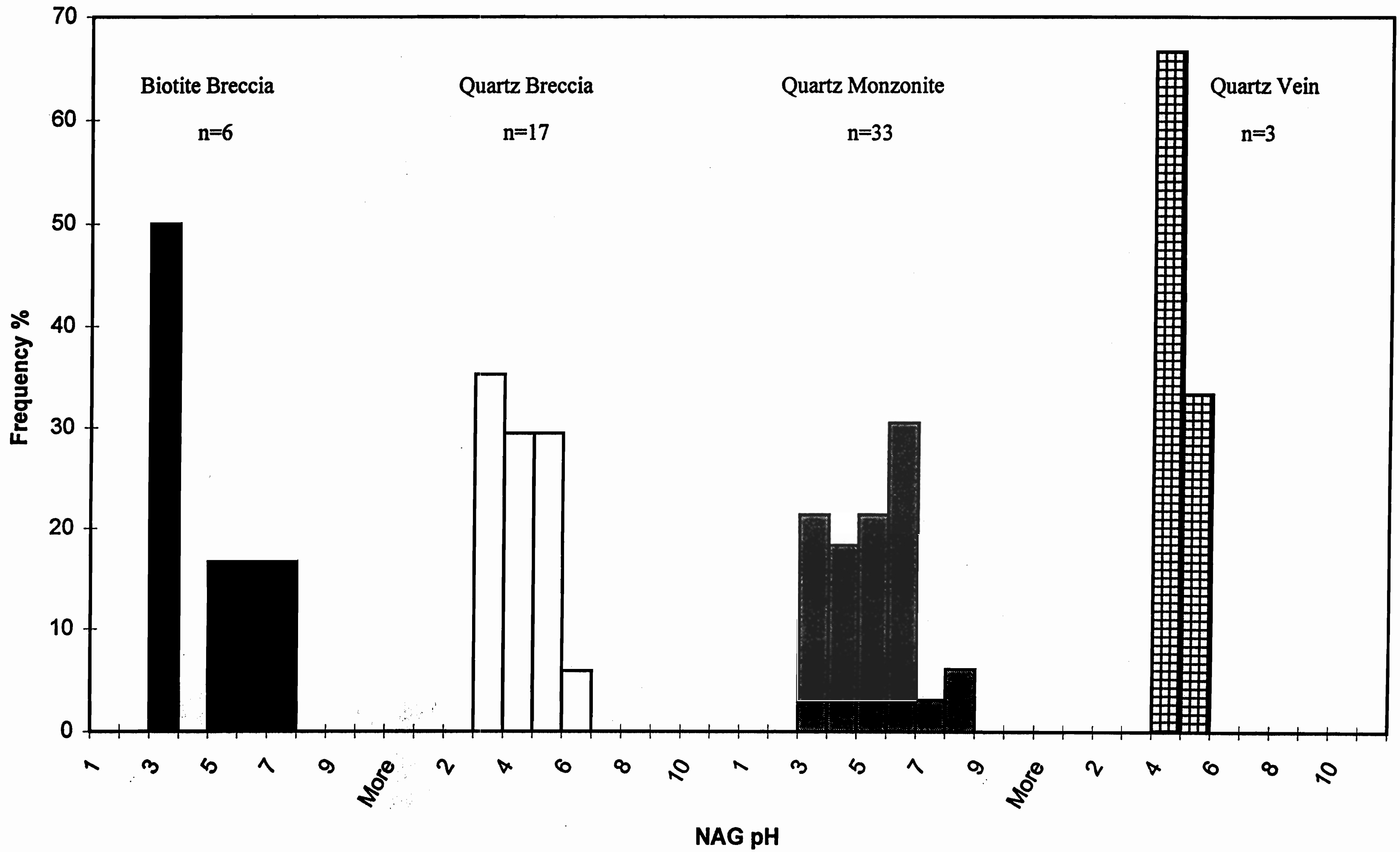


Figure A.3.6 - NAG pH Frequency Distribution by Lithology*

* No samples of andesite were analysed by NAG testing

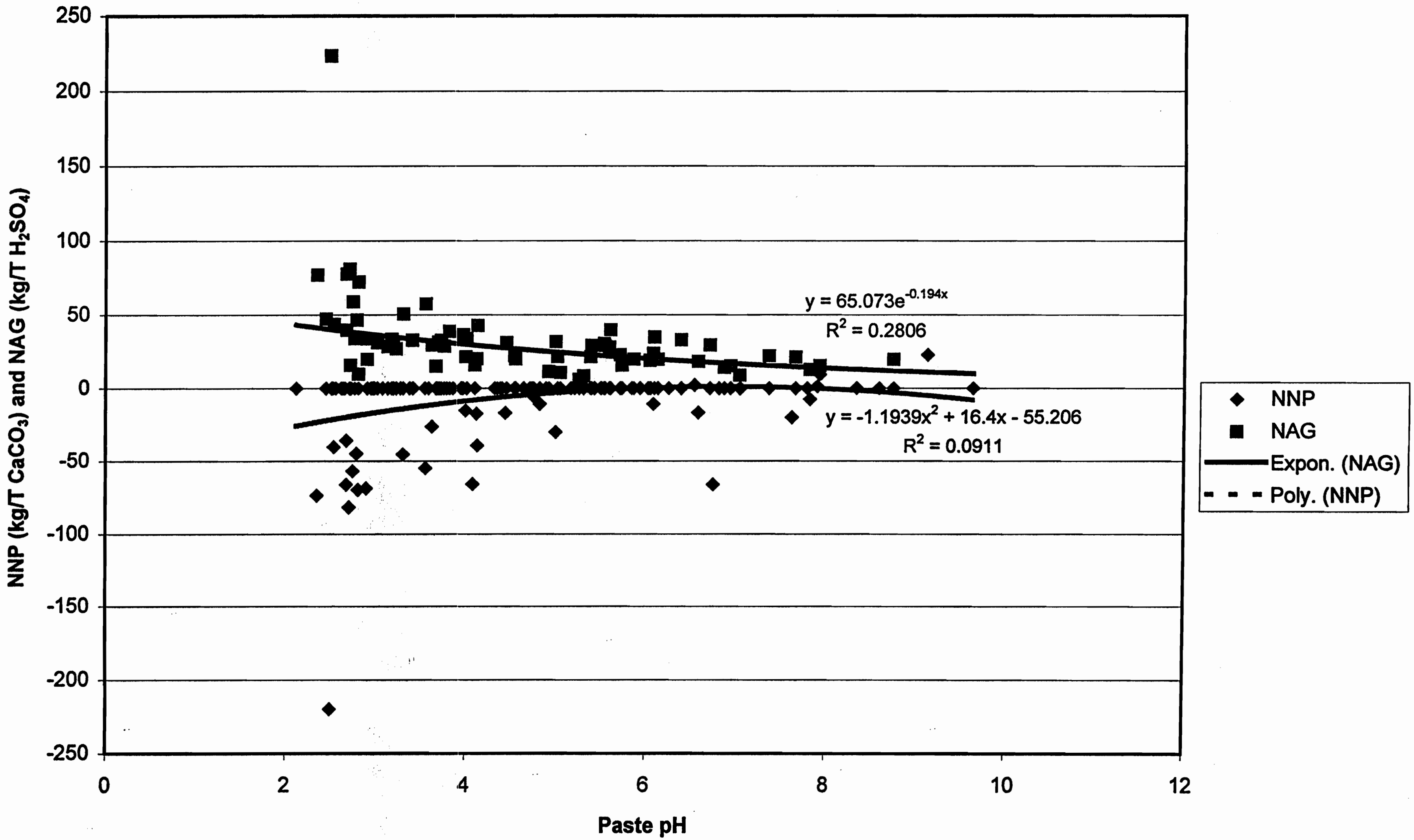


Figure A.3.7 - Paste pH vs. NNP, NAG

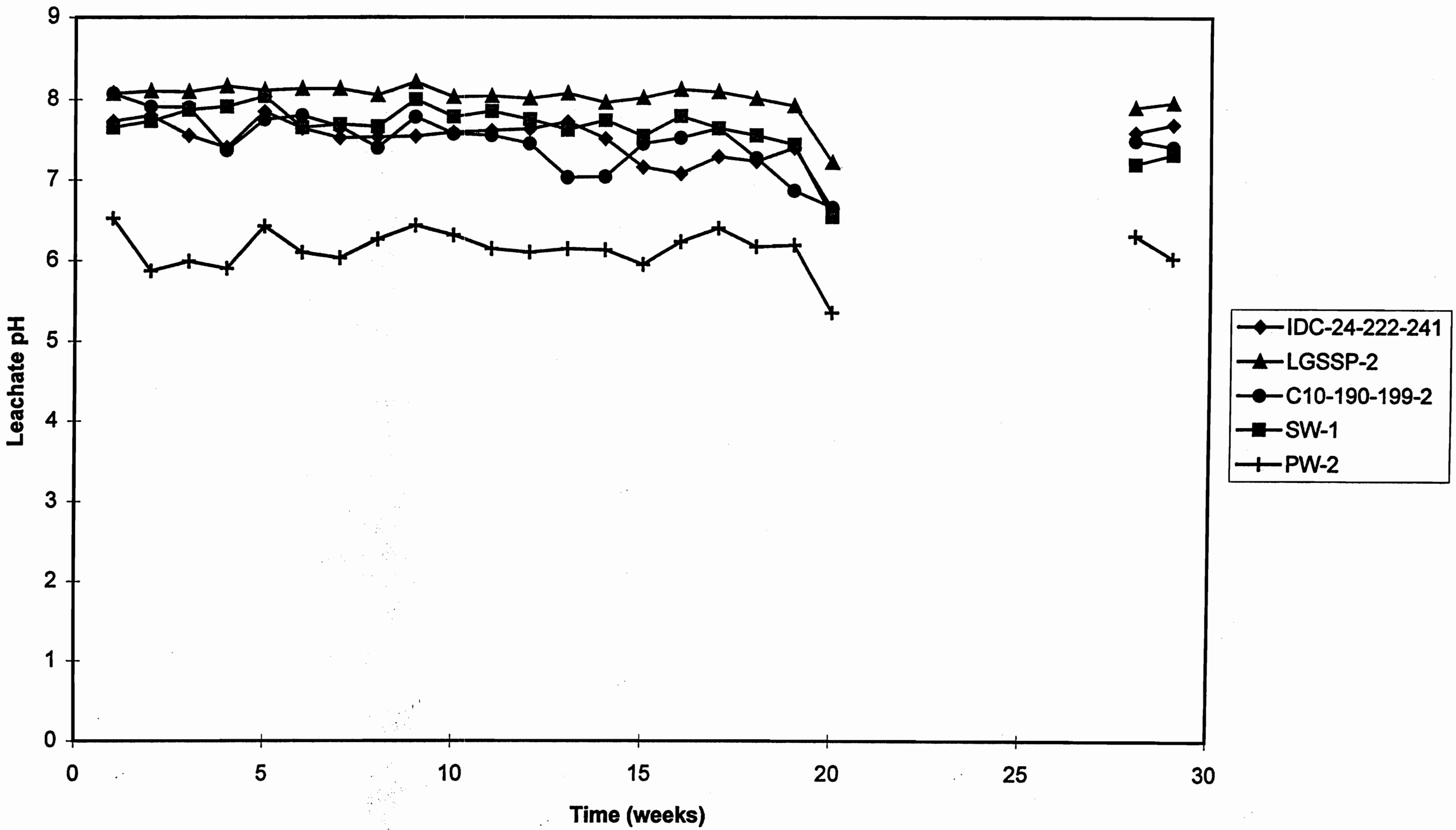


Figure A.3.8 - Kinetic Test Results for pH vs Time

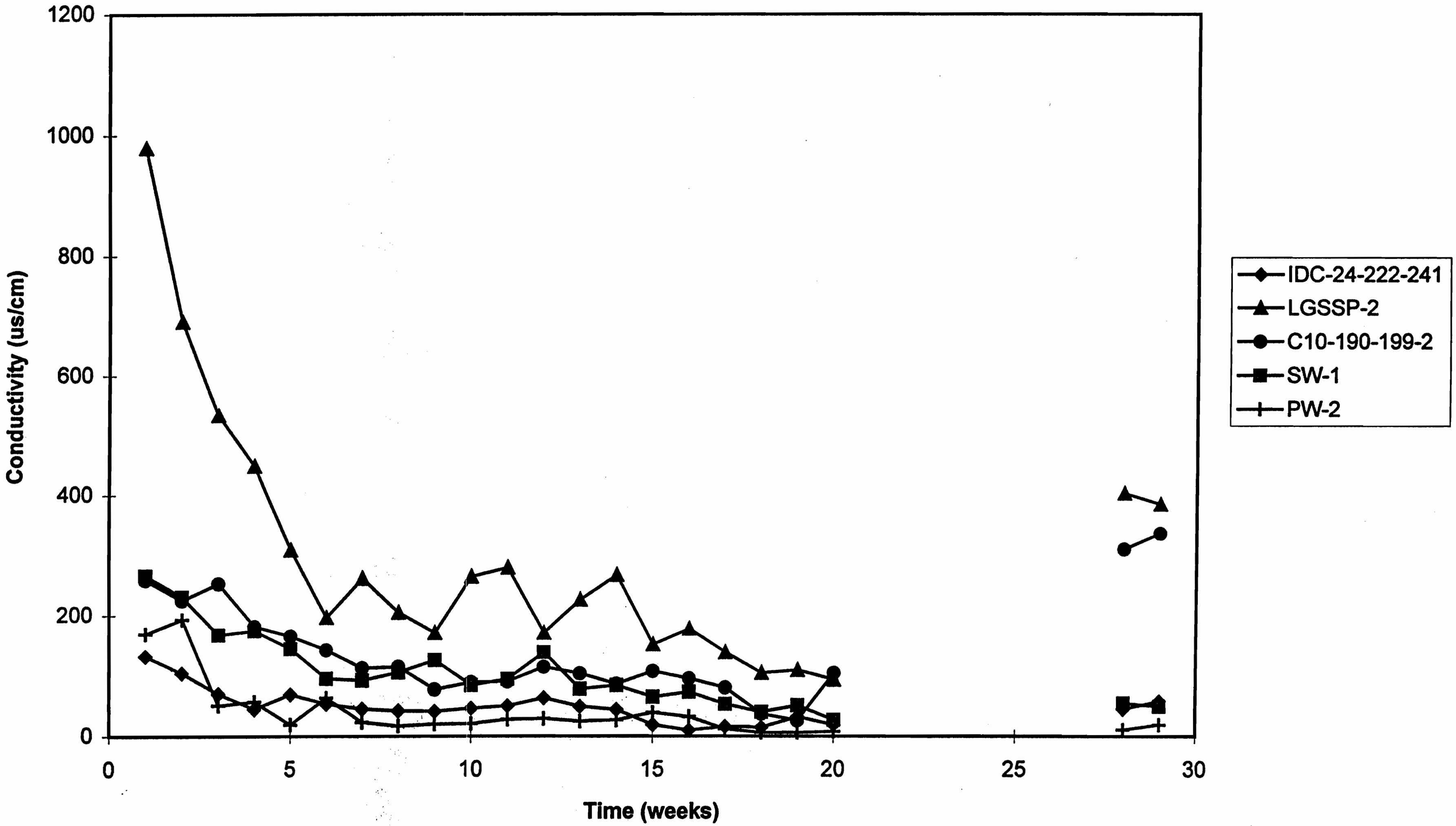
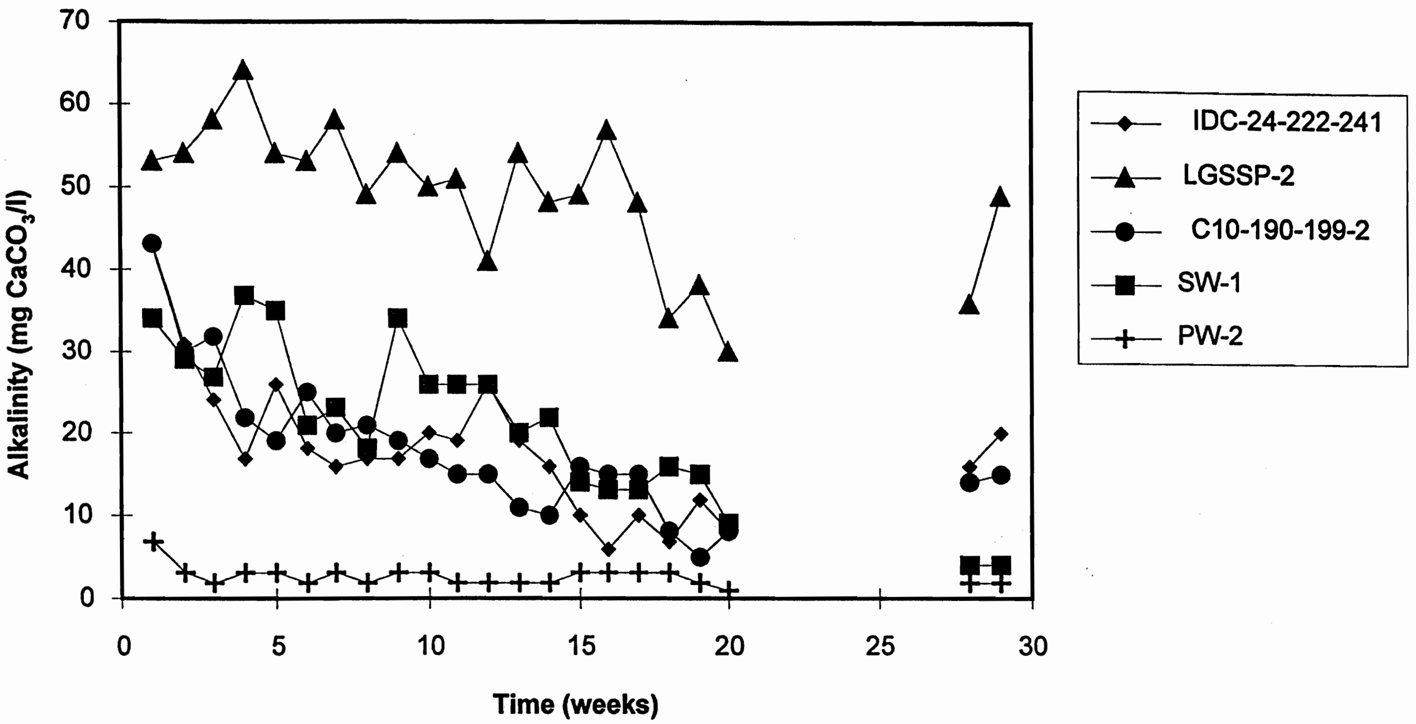


Figure A.3.9 - Kinetic Test Results for Electrical Conductivity vs Time



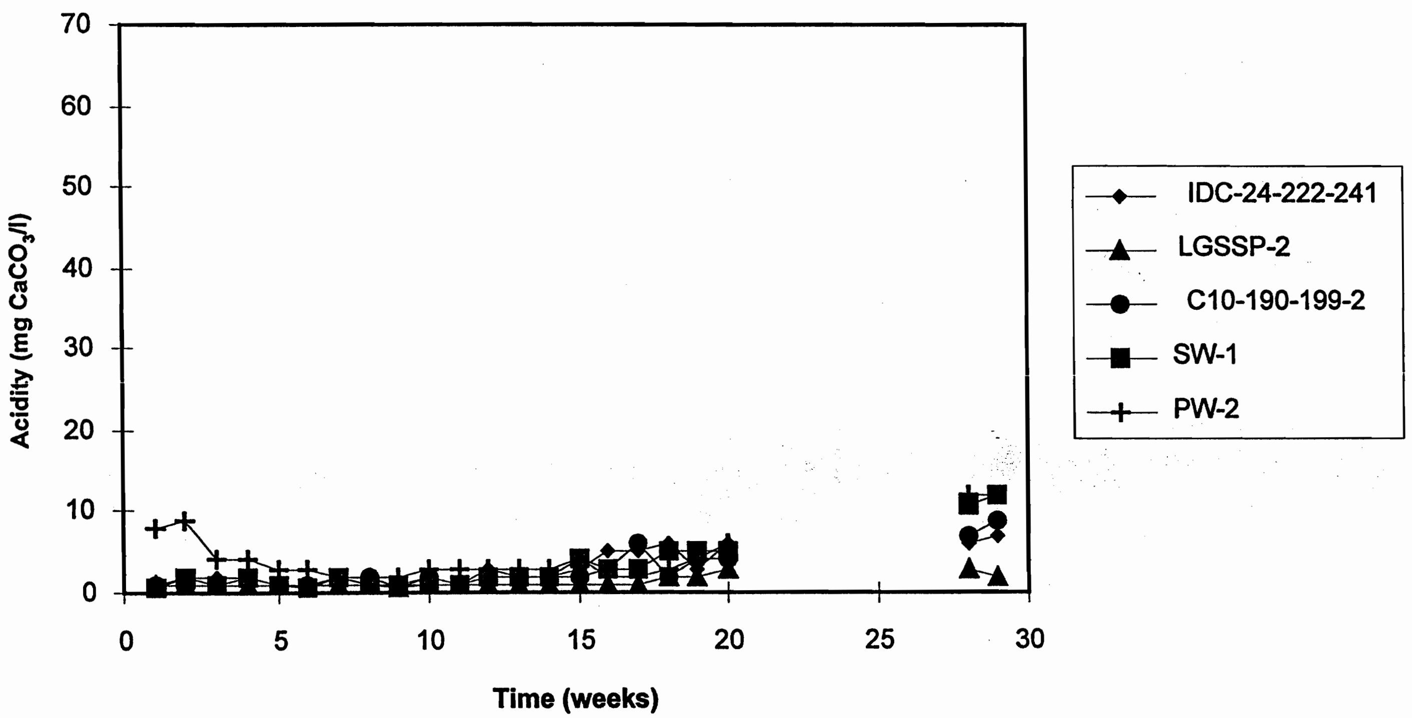


Figure A.3.10 - Kinetic Test Results Alkalinity and Acidity vs Time

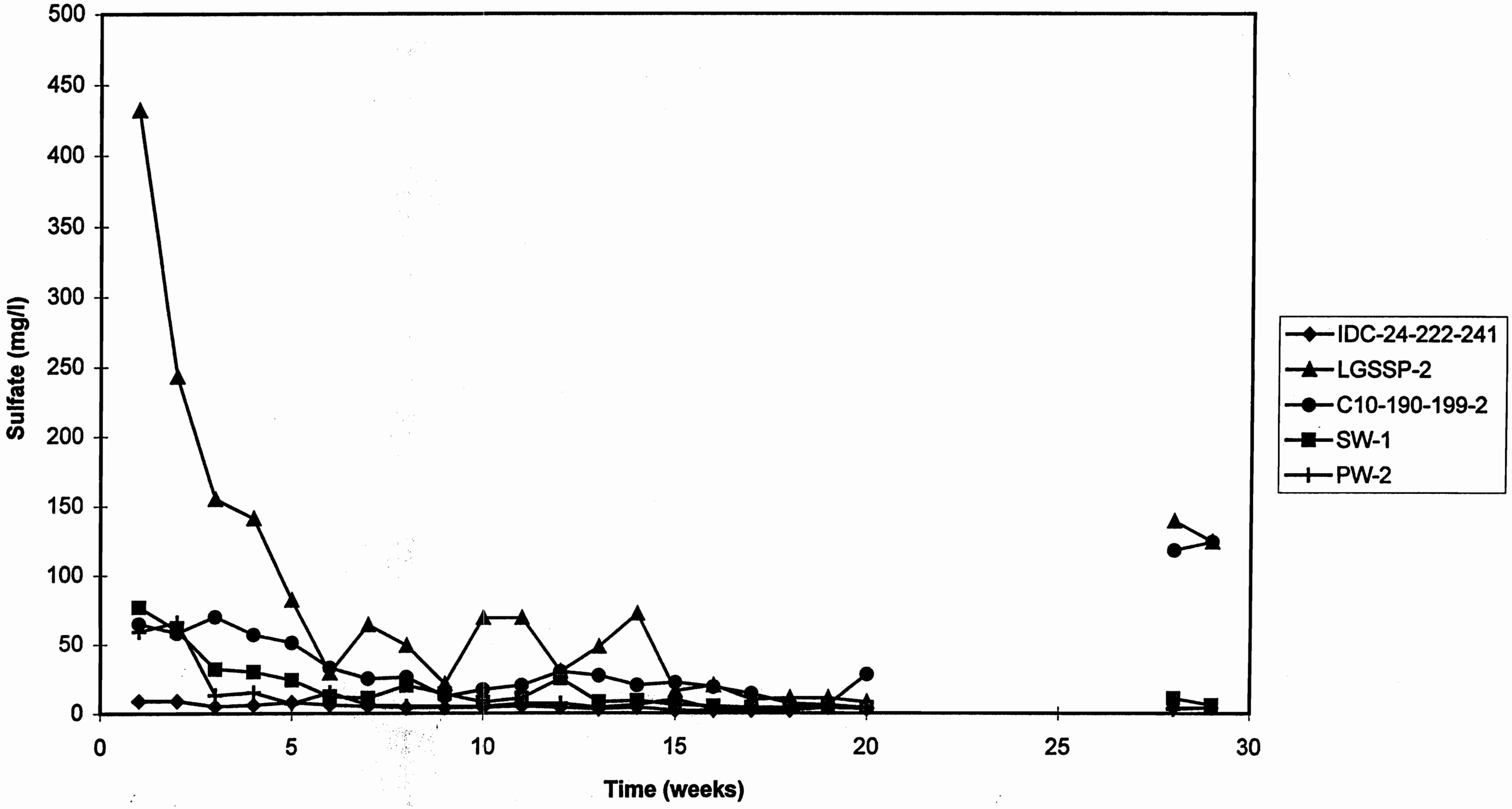


Figure A.3.11 - Kinetic Test Results for Sulfate vs Time

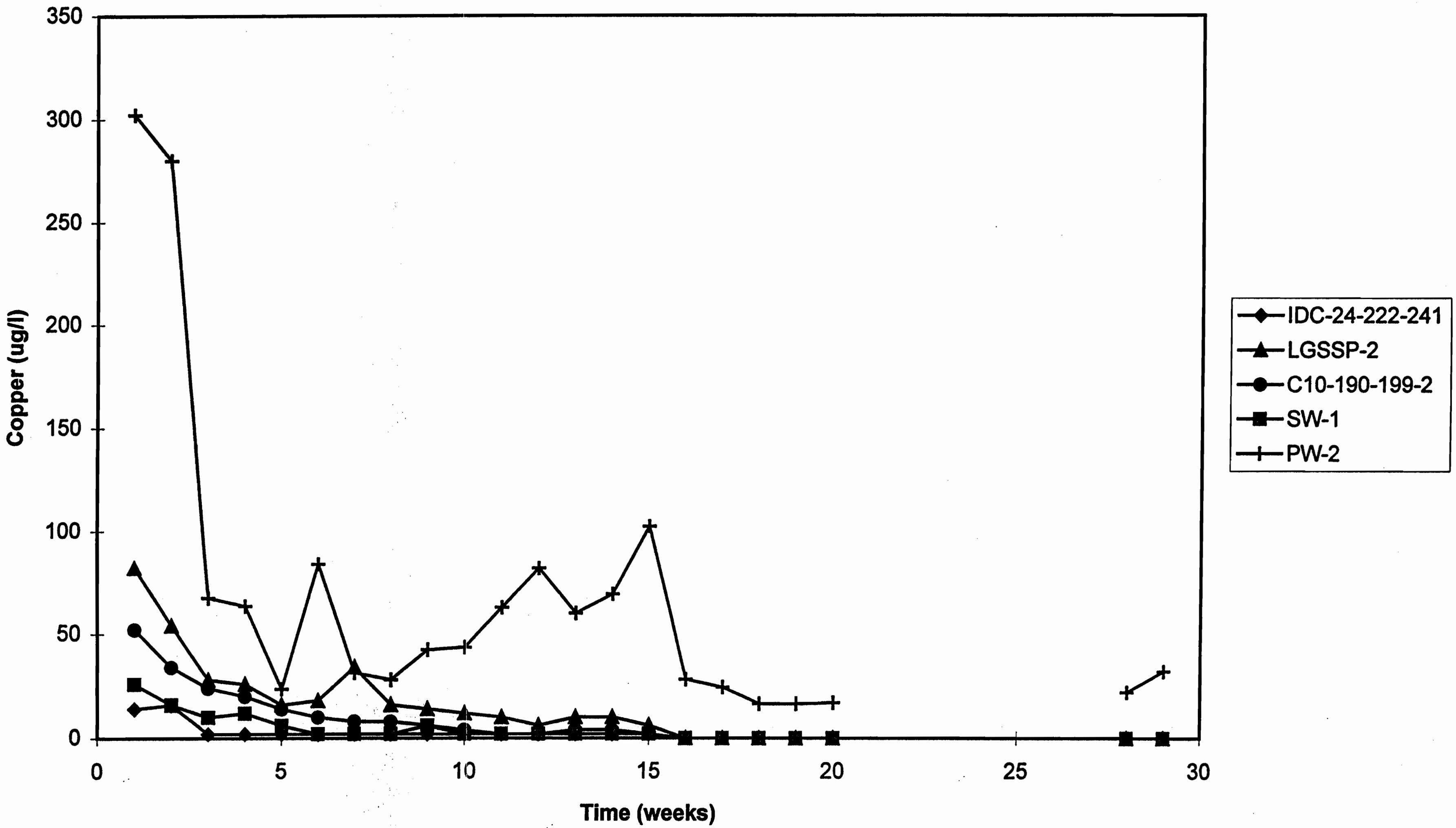


Figure A.3.12 - Kinetic Test Results Copper vs Time

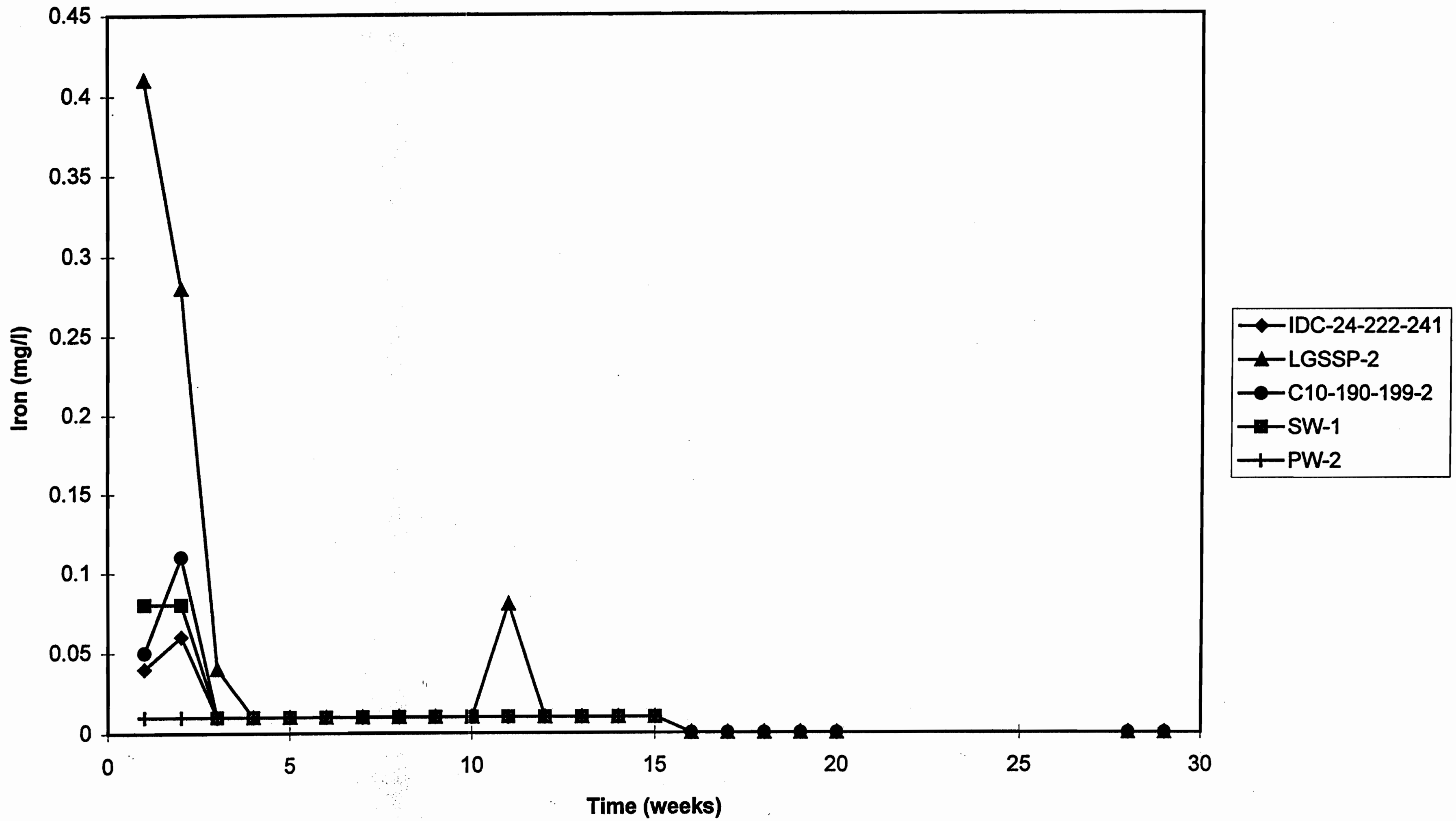


Figure A.3.13 - Kinetic Test Results for Iron vs Time

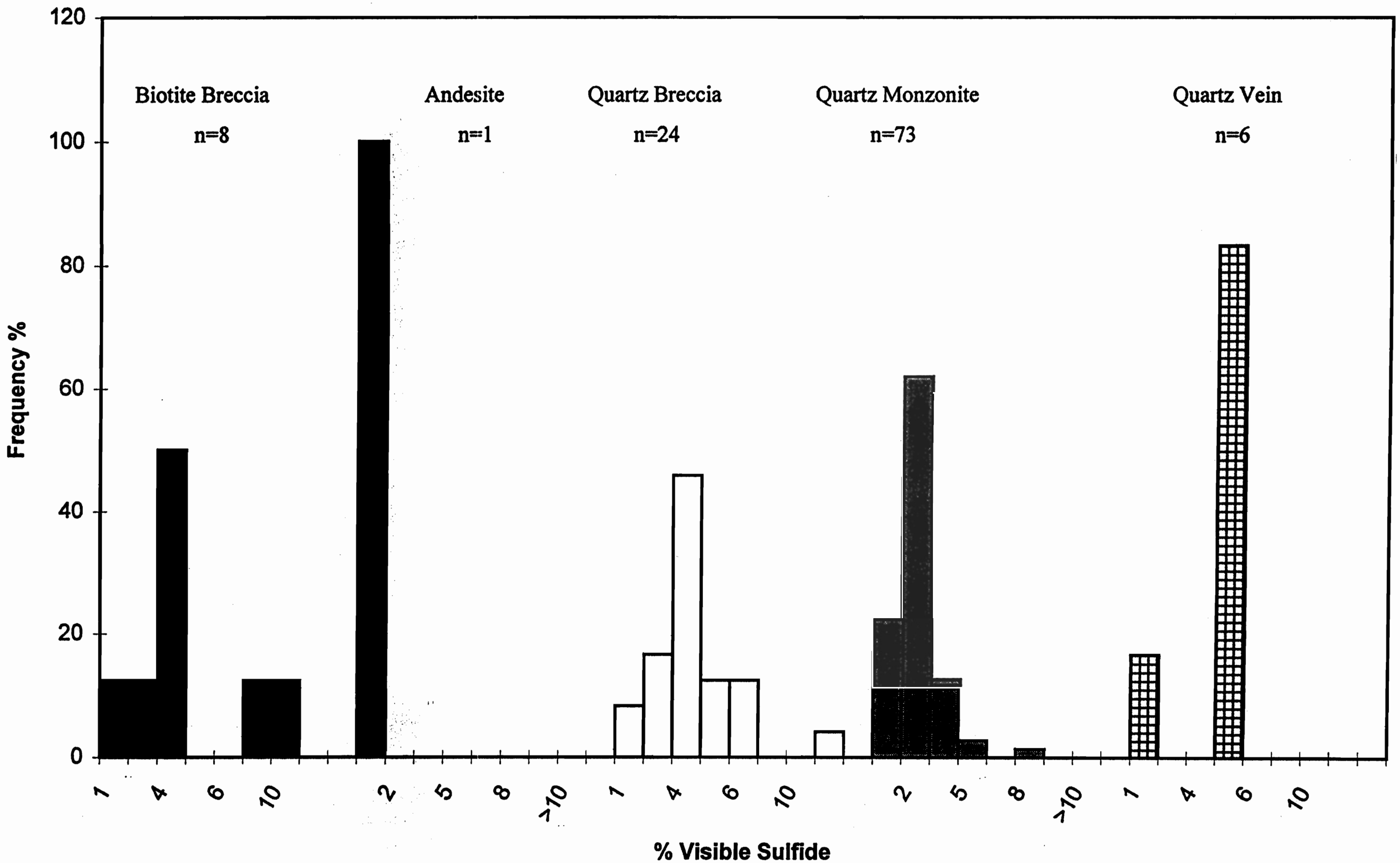


Figure A.5.1 - Percent Visible Sulfide Frequency Distribution by Lithology

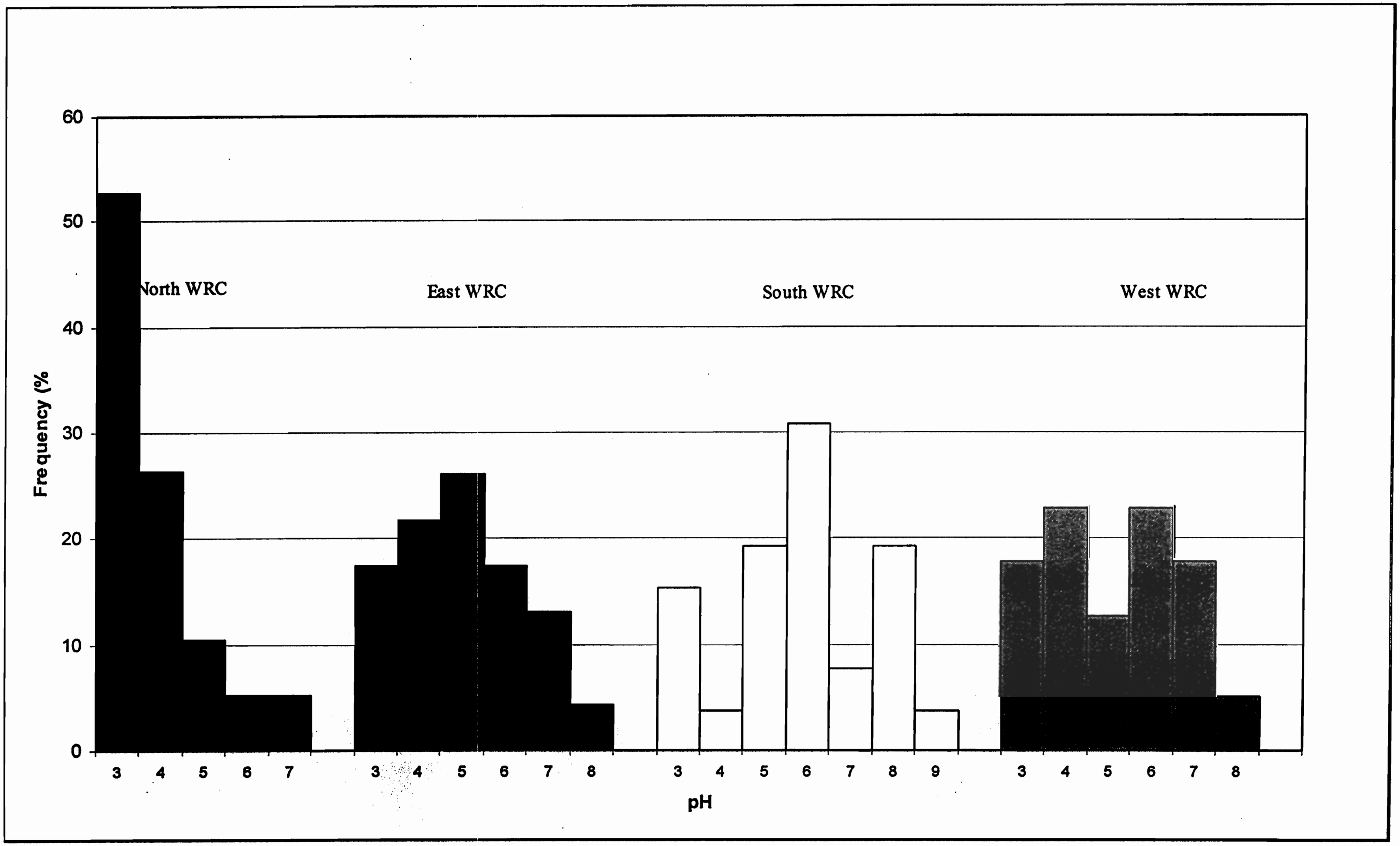


Figure A.5.2 - Histogram of Paste pH for All Dumps

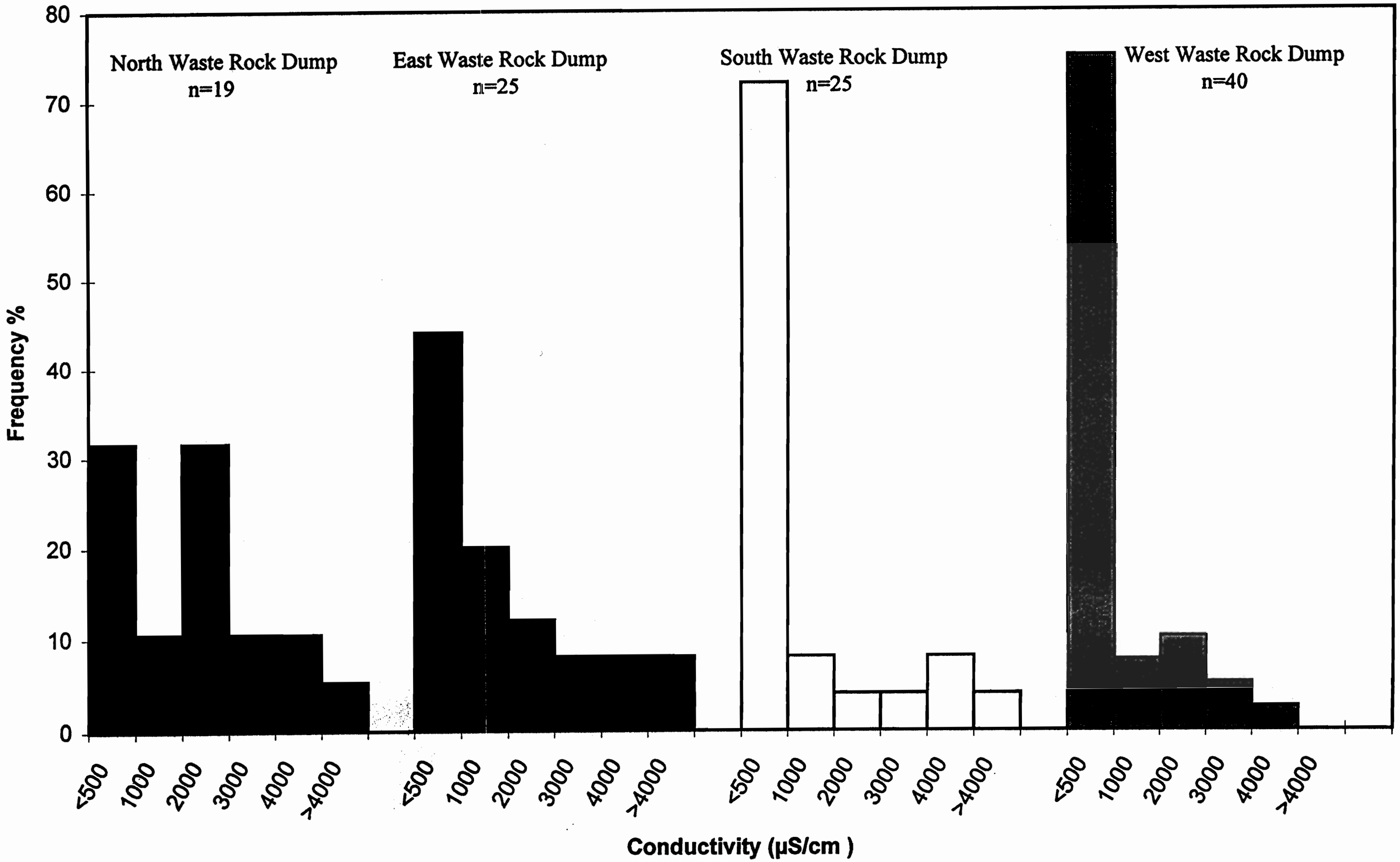


Figure A.5.3 - Paste Conductivity Frequency Distribution by Dump

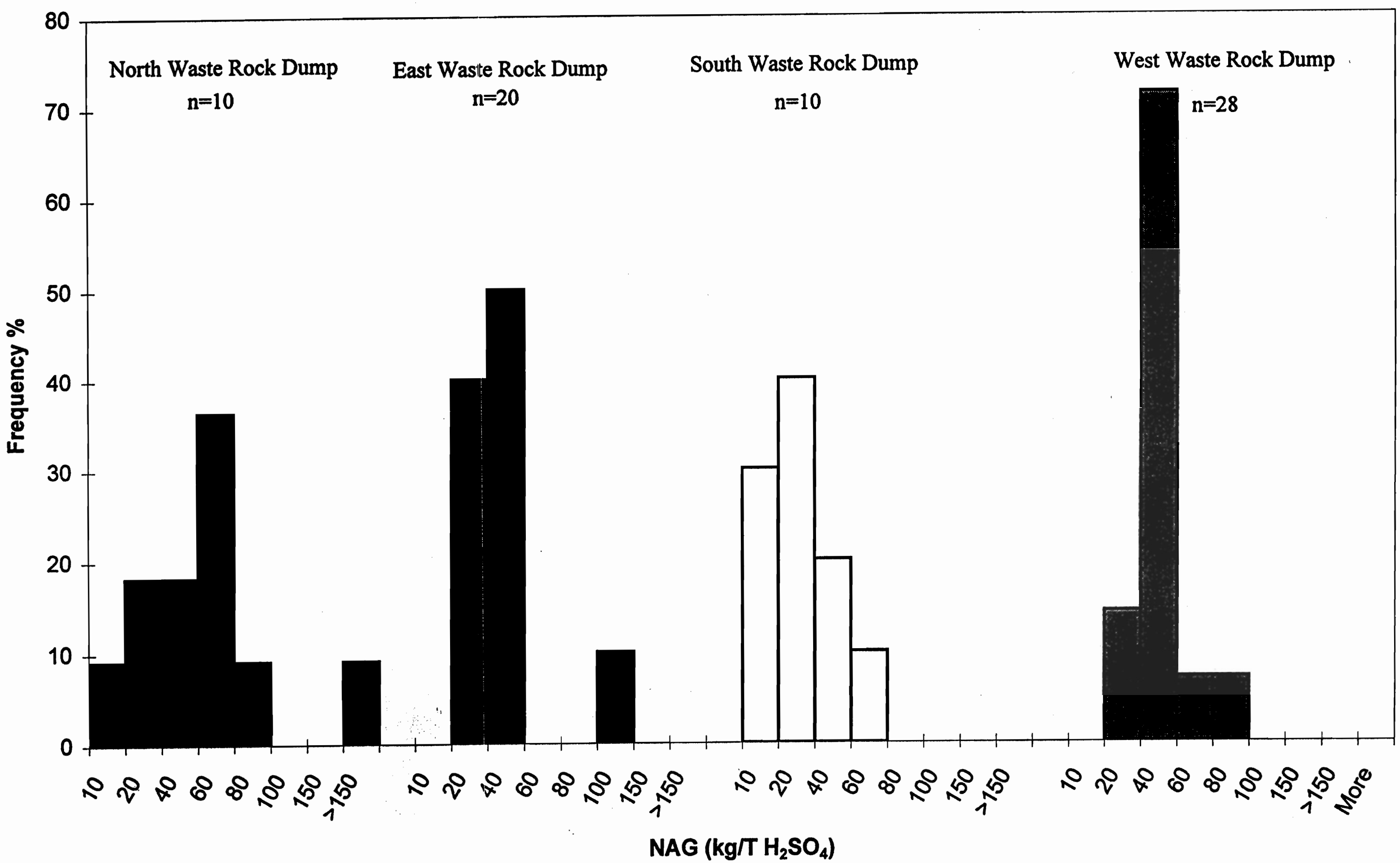


Figure A.5.4 - NAG Frequency Distribution by Dump

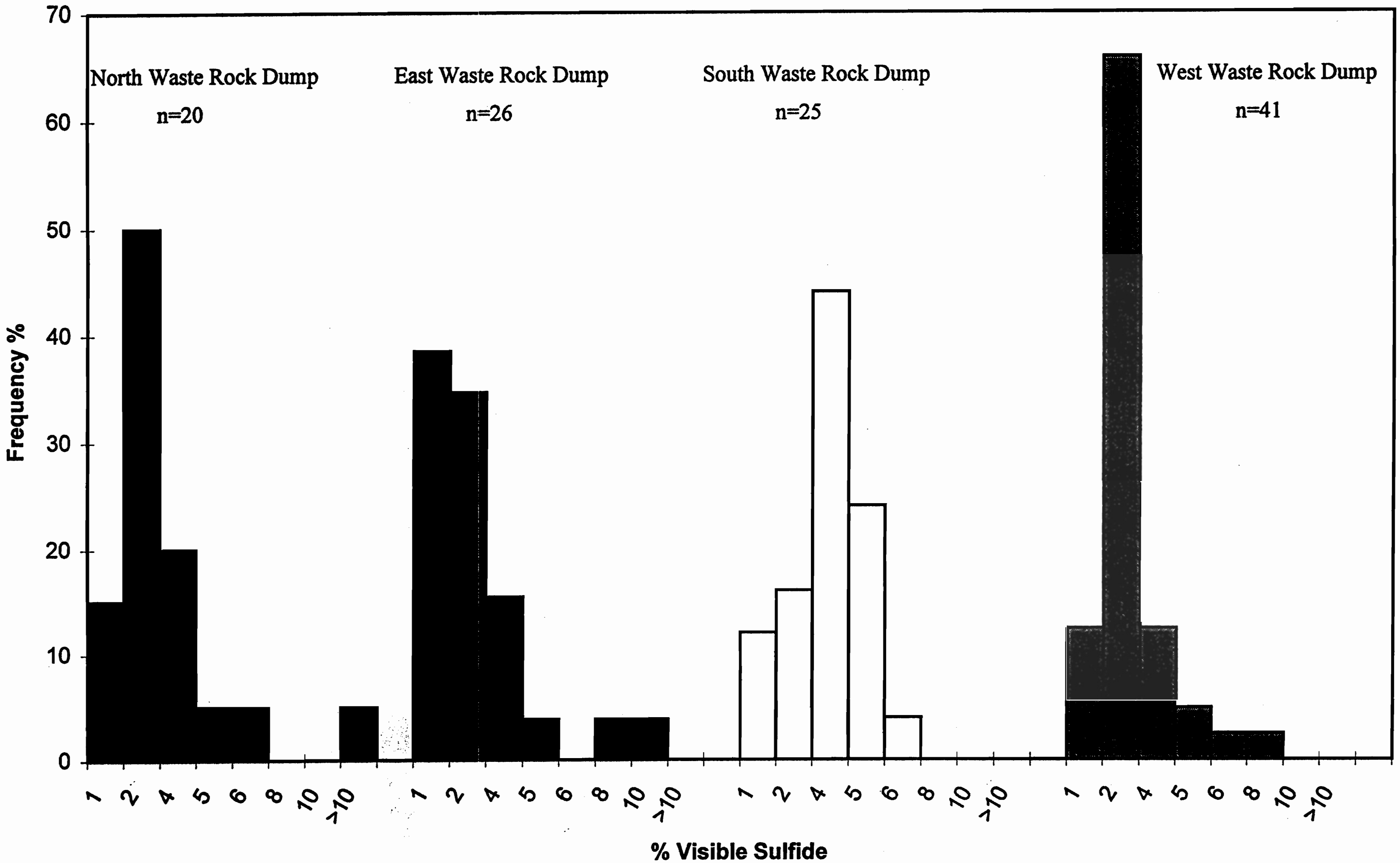


Figure A.5.5 - Percent Visible Sulfide Frequency Distribution by Dump

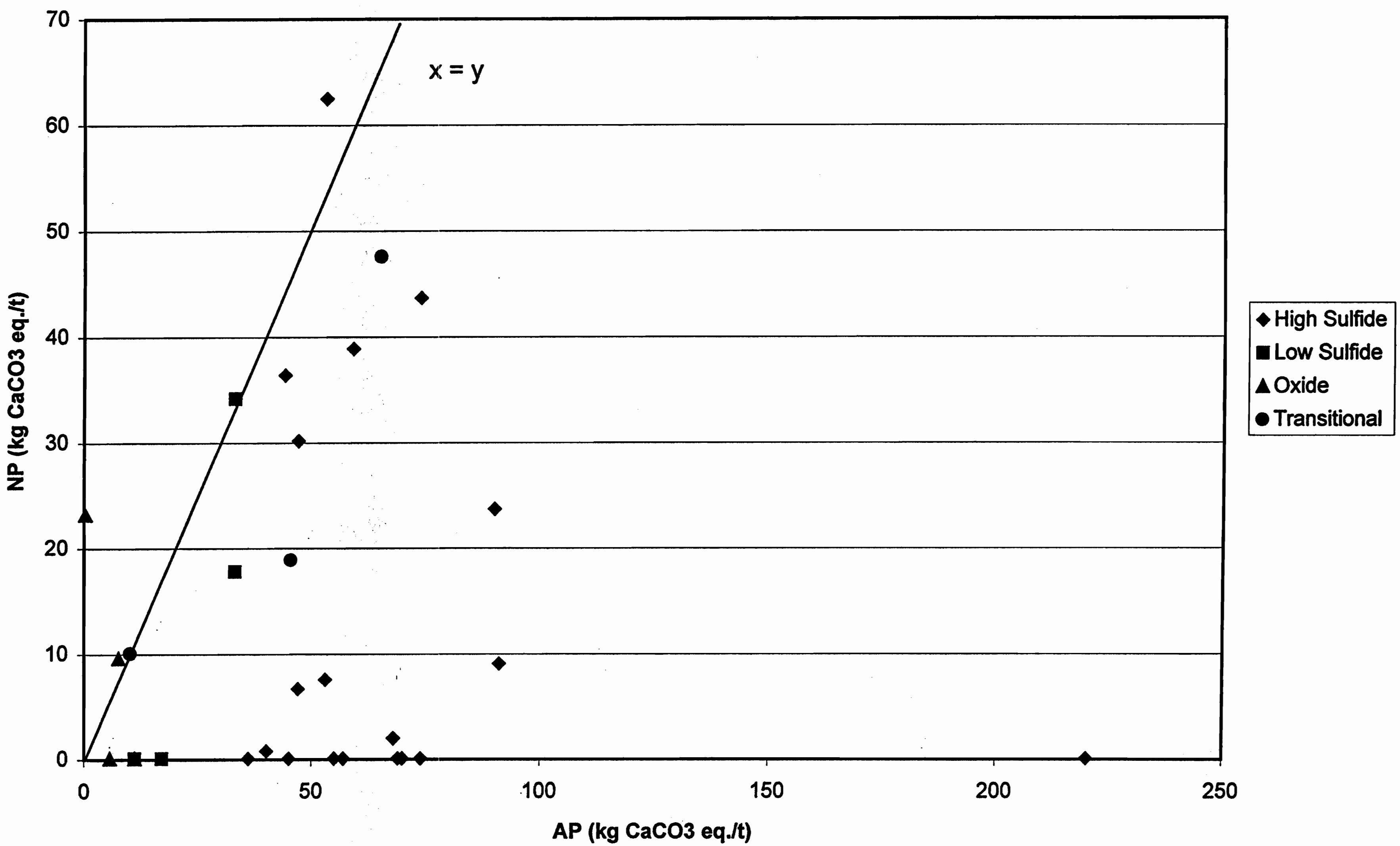


Figure A.6.1 - NP vs. AP by Weathering Status

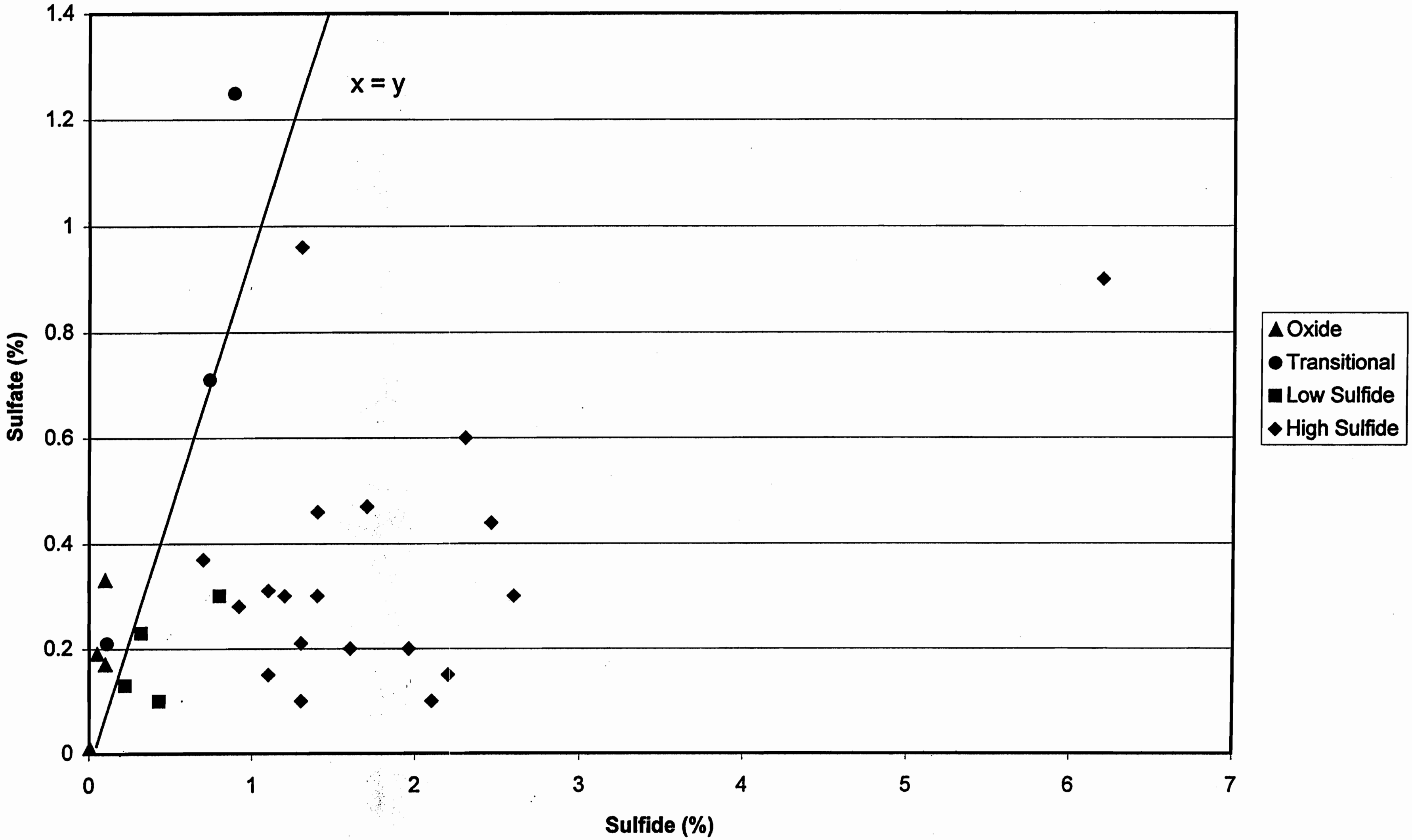


Figure A.6.2 - Sulfide vs. Sulfate by Weathering Status

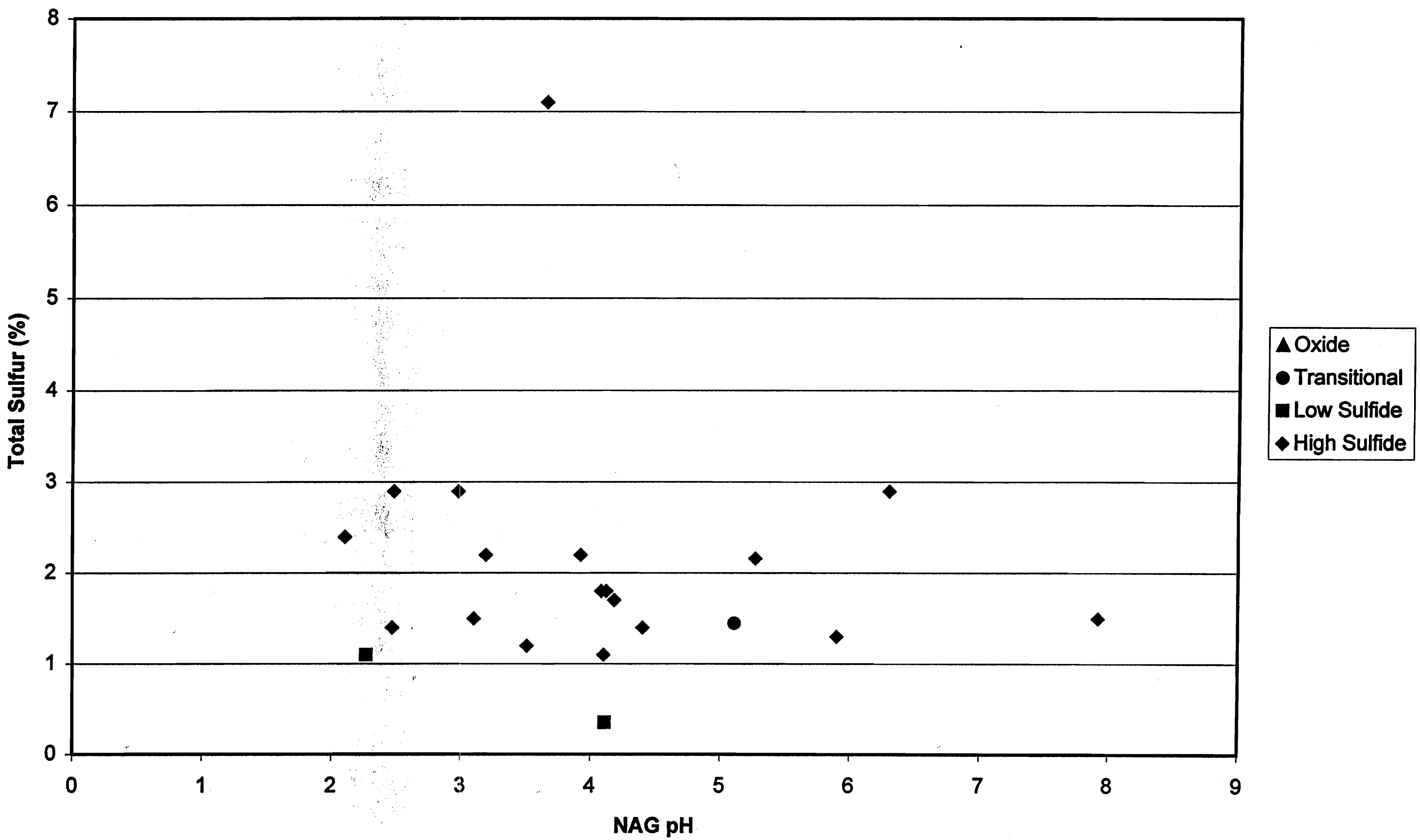


Figure A.6.3 - NAG pH vs. Total Sulfur

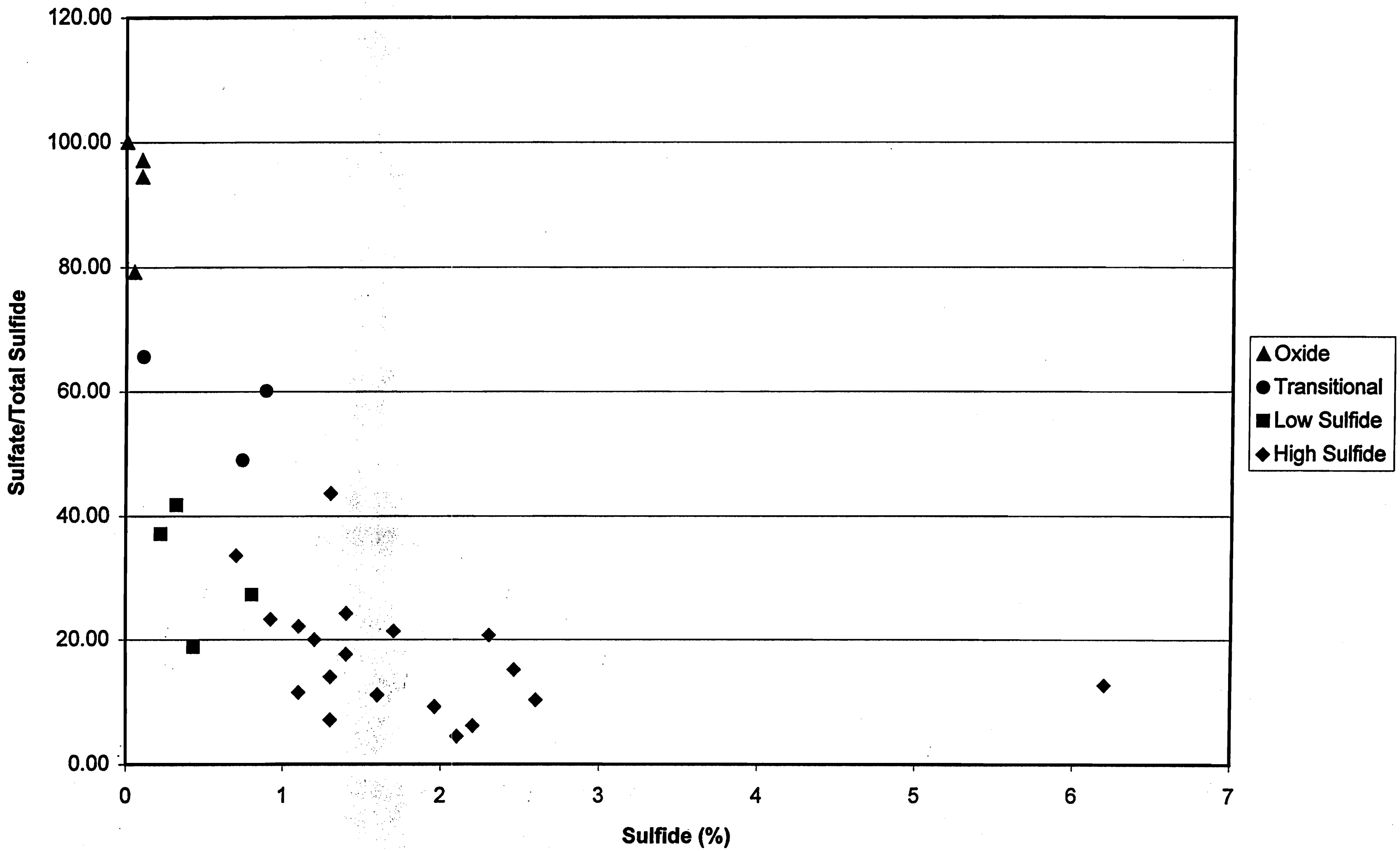


Figure A.6.4 - Sulfate/Total Sulfur vs. Sulfide

Table A.1.1
Numbers of samples analysed in the Waste Rock Characterization Program

Test	Number of Samples Analyzed		
	Phase I EIS	Phase II WMP	Total
Paste pH/Conductivity	19	93	112
Total Metals (ICP)	2	0	2
Acid Base Accounting (ABA)	19	28	47
Net Acid Generating (NAG)	0	59	59
EPA 1312	1	0	1
Kinetic Testing	5	0	5
Physical Tests*	1	0	1

EIS = Environmental Impact Statement
WMP = Waste Management Plan
* Gradation, Modified Proctor, Hydraulic Conductivity

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EPA 1312	1	0	1
Kinetic Testing	5	0	5
Physical Tests*	1	0	1

EIS = Environmental Impact Statement
WMP = Waste Management Plan
* Gradation, Modified Proctor, Hydraulic Conductivity

Table A.1.2
Number of Tests on Samples of Each Rock Type

	Rock Type					Total
	Quartz Monzonite	Quartz Breccia	Biotite Breccia	Andesite	Quartz Vein	
Number of Samples	91	8	24	2	6	131
Paste pH/Conductivity	91	8	24	1	6	130
Total Metals (ICP)	2	--	--	--	--	2
Acid Base Accounting (ABA)	31	2	10	1	2	46
Net Acid Generating (NAG)	33	6	17	--	3	59
EPA 1312	1	--	--	--	--	1
Kinetic Testing	5	--	--	--	--	5
Physical Tests*	1	--	--	--	--	1

EIS = Environmental Impact Statement
WMP = Waste Management Plan
* Gradation, Modified Proctor, Hydraulic Conductivity

Table A.3.1
Total Metals Concentrations in Waste Rock

Parameters (ppm)	Sample Number	
	WD-1	**PW-3**
Aluminum	1890	2950
Antimony	< 0.10	<0.10
Arsenic	0.4	1.9
Barium	10	24
Boron	<2	<2
Cadmium	<0.5	<0.5
Calcium	700	700
Chromium	<1	<1
Cobalt	11	9
Copper	186	226
Iron	41600	40800
Lead	2	4
Magnesium	200	800
Manganese	8	39
Mercury	<0.02	<0.02
Molybdenum	7	57
Nickel	<2	3
Phosphorus (%)	0.01	0.04
Potassium	1200	1300
Selenium	3.9	9.0
Silver	<1	<1
Sodium	200	200
Vanadium	1	5
Zinc	7	14

Table A.3.2
Extractable Metals Concentrations in Waste Rock

Parameters (mg/L)	WD-1
pH	3
Conductivity (mmhos/cm)	5.6
Sulfate	3050
Acidity (as $CaCO_3$)	1050
Alkalinity (as $CaCO_3$)	0
Aluminum	151
Antimony	N/A
Arsenic	< 0.1
Barium	0.09
Boron	0.10
Cadmium	0.019
Calcium	314
Chloride	6
Chromium	0.03
Cobalt	0.29
Copper	13.6
Fluoride	1.2
Iron	102
Lead	< 0.021
Magnesium	23
Manganese	3.35
Mercury	< 0.0002
Molybdenum	<0.01
Nickel	0.11
Potassium	4
Selenium	< 0.1
Silver	< 0.01
Sodium	13
Vanadium	< 0.01
Zinc	0.87

Table A.3.3
Results of ABA Testing of Column Samples

Sample Number	SW-1	PW-2	LGSSP-2	C10-190-199-2	IDC-24-222-241
Rock Type	qm	qb	qm	qm	qm
Classification	oxidized	transitional	oxidized	unoxidized	unoxidized
Total Sulfur (%)	1.36	0.37	0.61	3.59	1.74
Sulfate (%)	0.01	0.01	0.01	0.07	0.01
Sulfide (%)	1.36	0.37	0.61	3.52	1.74
AP	42	11	19	110	54
NP	36	11	39	44	31
NNP	-6	0	20	-66	-23
NP:AP	0.86	1.00	2.05	0.40	0.57

Table A.3.4
Results of Kinetic Test Work

Sample Number	SW-1	PW-2	LGSSP-2	C10-190-199-2	IDC-24-222-241
Total Sulfur (%)	1.36	0.37	0.61	3.59	1.74
Sulfate (%)	0.01	0.01	0.01	0.07	0.01
Sulfide (%)	1.36	0.37	0.61	3.52	1.74
AP	42	11	19	110	54
NP	36	11	39	44	31
NNP	-6	0	20	-66	-23
NP:AP	0.86	1.00	2.05	0.40	0.57
Estimated Time to Depletion (years)					
NP (from stoichiometry)	286	220	126	253	389
AP (from sulfate)	1262	382	263	1051	2842
Pseudo Steady State Release Rate kg CaCO3 eq./tonne/week					

Table A.4.1

Chemistry of West Dump Seep (August, 1997)

Parameter	W-Waste All in mg/l unless otherwise stated
pH (std. units)	3.03
Alkalinity (mg/l $CaCO_3$ equiv.)	0.
Bicarbonate	0.
Carbonate	0.
Sulfate	22,100.
Total Dissolved Solids	25,440.
Chloride	16.
Fluoride	0.31
Nitrate_N	4.7
Iron	310.
Copper	1,800.
Arsenic	0.14
Aluminium	2,100.
Barium	<0.05
Beryllium	0.49
Boron	0.21
Calcium	410.
Cadmium	0.82
Cobalt	9.9
Nickel	1.3
Thallium	0.02
Manganese	170.
Zinc	38.
Molybdenum	0.28
Selenium	0.11
Magnesium	580.
Sodium	20.
Potassium	<1

Table A.6.1
Copper Flat Project
Waste Rock Classification System

Waste Rock Type	Criteria No. 1 Visual	Criteria No. 2 Paste pH (s.u.)	Criteria No. 3 Paste Conductivity (uS)	Criteria No. 4 AP (T/KT)	Criteria No. 4 NAG	Required Criteria
Oxidized	No visible sulfides, loss of texture, strong oxide staining	>5.0	<500	<1.6	0	(1, 2 and 3) or (1 and 4)
Transition	Visible sulfides, loss of texture, strong oxide staining	<5.0	>500	>1.6	>0	1
Unoxidized	Visible sulfides, fresh appearance, minor feox staining	>5.0	<500	>10	>0	1,2 and 3
Low sulfide	Few visible sulfides, fresh appearance	>5.0	<500	<10	0	1 through 4

Notes:
(1) AP criteria for identification of oxidized and transition waste based on a total or sulfide sulfur content of 0.05 percent
(2) NP of unoxidized waste is typically greater than 30 T/KT, therefore AP criteria for low sulfur waste is for an NP:AP ratio near 3:1 and sulfur content of 0.32 percent
(3) Acid producing potential (AP) by syulfur analysis and NAG are alternatives for criteria No. 4

APPENDIX A.1

TESTING PROTOCOLS

Paste pH and TDS

Acid Base Accounting

Modified EPA 1312 test

Humidity Columns

Net Acid Generation (NAG) Test

FIELD PASTE pH and CONDUCTIVITY

Objectives

- To determine the pH and conductivity of the pore water resulting from dissolution of secondary mineral phases on the surfaces of oxidized rock particles.
- To indicate whether oxidation, and accumulation of contaminants in the form of secondary mineral phases, has occurred in the waste rock prior to collection of the sample.

Principles of Test

Water is added to the sample to form a paste or slurry thus mobilizing secondary mineral phases and providing a medium accessible to the pH and conductivity or TDS probe. The probe is placed in the paste or slurry and the pH or conductivity value is read directly from the meter.

Equipment

1. pH meter equipped with a combination pH electrode.
2. Conductivity or TDS meter (in this case a Hanna Instruments field combined pH/ORP/temperature meter).
3. 50 mL beakers, or equivalent (disposable paper cups are recommended).
4. Spatula or stirring rod (eg. plastic coffee stirrers).
5. Litmus paper strips.

Reagents

1. Standard buffer solution, pH 4.00 and pH 7.00.
2. Standard electrolyte solutions (for calibration of conductivity meter).
3. Distilled (or deionized) water.

Procedure

1. Calibrate pH and conductivity or TDS meters using the standard solutions and following the instructions provided with the meters.

2. Obtain approximately 25 g of fines (particles smaller than 1 mm if possible) from the rock sample to be tested, and place in a fresh or decontaminated beaker or testing vessel.

3. Add approximately 25 ml of distilled water to sample. (More water may be required if the sample is very dry or extremely fine.)

4. Stir sample with fresh or cleaned spatula to form a paste or slurry. Paste should slide off spatula easily.

5. Tip the testing container to one side to allow a pool of water or slurry to collect in the corner. Dip each of the probes into the slurry, and allow the meter readings to stabilize. The conductivity reading should, however, be done first, as electrolyte from the combination pH probe may affect the conductivity of the solution.

6. Decontaminate probes and containers using distilled or de-ionized water.

7. Record the measurements in your field notebook along with a description of the rock type tested, and the general appearance of the sample.

Alternatives

For a coarser rock mixture, wet the surface of the rock with distilled water, and mix water with any surface coatings or fines. Place a piece of litmus paper over the wetted area. Compare the color of the litmus with the pH color-coded scale and record pH.

Calculations

Paste TDS is assessed by measuring Electrical Conductivity (EC) and then converting conductivity values to TDS using the equation (Hem, 1985):

$$0.59\left[EC, FScm^{-1}\right] = \left[TDS, mg/l\right]$$

Interpretation

High conductivity (or TDS) levels indicate there is a considerable store of contaminant salts. These are usually sulfates, but can be other metal salts. When a sample is collected over depth, it is not always clear whether the stored salts are due to oxidation at that point in the sediment profile, or if the salts were generated somewhere higher in the profile and moved downwards to the sample location. Look for stains along the flow path that may indicate if this is the case.

Low pH readings indicate oxidation and acid generation has occurred, usually at the location from which the sample was collected. Readings taken on uncrushed samples in the field or lab usually provide a much better indication of the extent of oxidation than crushed samples. This is because crushing can liberate neutralizing minerals thereby increasing the available neutralizing capacity of the sample.

References

Sobek, A.A., Schuller, W.A. Freeman, J.R. and Smith, R.M., 1978, Field and Laboratory Methods Applicable to Overburden and Minesoils, EPA 600/2-78-054, 203pp.

British Columbia AMD Task Force, 1989, Draft Acid Rock Drainage Technical Guide, Vol I, Crown Publications, Victoria, B.C.

MODIFIED ACID BASE ACCOUNTING (ABA)

Objectives

- To determine the balance between acid producing and acid consuming components of mine waste.

Principles of Test

The fundamental principals of acid base accounting comprise two distinct measurements:

1. Determination of the neutralization potential (NP) of a sample.

2. Calculation of the acid potential (AP) of the sample.

The difference between the two values, the net neutralization potential (Net NP), and the ratio (NP:AP) allow classification of the sample as potentially acid consuming or producing. To facilitate comparison of values, NP, AP, and Net NP are all expressed in units of tons $CaCO_3$ equivalent per kiloton.

In the original Sobek method of acid base accounting, the neutralization potential is determined by heating the sample and mixing for two hours. In the modified method, the neutralization potential is determined by treating a sample with excess standardized hydrochloric acid at ambient, or slightly above (25 - 30°C) ambient, temperatures for 24 hours. A fizz test is employed to provide a guide to the amount of acid to be initially added to the test. Acid is added as required during the acid-treatment stage to maintain sufficient acidity for reaction. After treatment, the unconsumed acid is titrated with standardized base to pH 8.3 to allow calculation of the calcium carbonate equivalent for the acid consumed.

For the calculation of the acid potential, the sample is analyzed for total and sulfate sulfur. Sulfide sulfur content is also measured or is calculated by the difference between the other two sulfur numbers. AP is determined from sulfide sulfur number, assuming: 1) total conversion of sulfide to sulfate; and, 2) production of 4 moles H^+ per mole of sulfide oxidized, assuming that all the sulfide is present as pyrite. In some cases, difficulties associated with the analytical procedures for sulfide analysis may influence the estimation of the acid generation potential. For example, sulfate associated with the mineral barite is not readily distinguished from sulfide in a typical sulfate analysis, but does not contribute to the acid potential.

Equipment

1. Aluminum foil.
2. 250 mL Erlenmeyer flask.
3. Reciprocating shaking apparatus or other suitable agitation device.
4. Burette, 50 or 100 mL, one for each of the acid and the base solutions.
5. pH meter, equipped with a combination pH electrode.

Reagents

1. Distilled (or deionized) water, preferably CO2-free (store in container equipped with an ascarite tube)
2. Certified grade, 0.1 N hydrochloric acid, for standardization of bases
3. Approximately 0.1 N sodium hydroxide, standardized.
4. Approximately 0.5 N sodium hydroxide, standardized.
5. Approximately 0.1 N hydrochloric acid, standardized.
6. Approximately 0.5 N hydrochloric acid, standardized.
7. Approximately 25 percent strength hydrochloric acid, for fizz test.
8. Buffer solutions (pH 4.00 and 7.00) for calibration of pH meter.

Procedure

1. Crush and pulverize the sample to a target size of 80 percent minus 60 mesh (Tyler). Tailings samples should be tested at the received particle size.
2. Submit a sample of the test material for total sulfur and sulfate sulfur analyses.

3. Use certified 0.1 N hydrochloric acid to standardize the 0.1 N and 0.5 N sodium hydroxide solutions to standardize the 0.1 N and 0.5 N hydrochloric acid solutions.

4. Place approximately 0.5 g of pulverized sample on a piece of aluminum foil in a small shallow dish. Add one or two drops of 25 percent HCl to the sample. The presence of carbonate will be indicated by a bubbling or an audible "fizz". Rate the "fizz" as indicated in Table 1.

Volume and Normality of HCl for Use in NP

Determination on Basis of Fizz Rating (2g Sample)

Fizz Rating	HCl (mL, Normality)	
None	20	0.1
Slight	40	0.1
Moderate	40	0.5
Strong	80	0.5

5. Weigh 2.00 g of the sample (minus 60 mesh) into a 250 mL Erlenmeyer flask and, as a first approximation, add the volume and normality of HCl as indicated by the "fizz" rating shown above.

6. Agitate the contents of the flask for 24 hours by placing on a shaking apparatus. At least once in the treatment period, and preferably after approximately 6 hours of reaction, check the pH of the pulp. If the pH is above 2.0, add an appropriate volume of hydrochloric acid of the same strength originally added (generally between 1.5 to 2.0 ml). Record the amount added for back titration.

7. At the end of the shaking period, check the pulp pH. If the total volume and strength of acid was appropriate, the end pH will be in the range 1.5 - 2.0. If the pH is above this range, the amount of acid added is judged to be insufficient for reaction. If the pH is below the range, the amount of acid added is judged to be

too high, causing over reaction. In either case, repeat the test using the next higher or lower volume or strength of HCl as appropriate.

8 Titrate the contents of the flask using 0.1 N or 0.5 N NaOH (corresponding to the normality of HCl used in step 4) to pH 8.3. Titrate with NaOH until a constant reading of 8.3 remains for at least 30 seconds.

Calculations

1. The neutralization potential, NP, of the sample is given by:

$$NP = \frac{50a[x-(b/a)y]}{c}$$

where NP = neutralization potential in tonnes $CaC0_3$ equivalent per 1000 tonnes of material

a = normality of HCl

b = normality of Na0H

c = sample weight in grams

x = volume of HCl added in mL

y = volume of Na0H added to pH 7.0 in mL

2. The acid potential, AP, of the sample in kg CaC03 equivalent per ton, is given by:

$$AP = \text{Percent sulphide sulfur x } 31.25$$

where,

sulphide sulfur = total sulfur - sulfate sulfur

3. The net neutralization potential, Net NP, in kg CaC03 equivalent per ton of material is given by:

$$Net\ NP = NP - AP$$

Reporting of Results

The results of the test should be tabulated to provide the following information:

Sample description, paste pH, total sulfur analysis (% S_T), sulfate sulfur analysis (% $S(SO_4)$, NP (kg $CaC0_3$ equivalent per ton), AP (kg $CaC0_3$ equivalent per ton), Net NP (kg $CaC0_3$ equivalent per ton).

References

Lawrence, R.W., Poling, G.P. and Marchant, P.B., 1989. Investigation of predictive techniques for acid mine drainage. Report on DSS Contract No. 23440-7-9178/01-SQ, Energy Mines and Resources, Canada, MEND Report 1.16.1 (a).

Sobek, A.A., Schuller, W.A. Freeman, J.R. and Smith, R.M., 1978, Field and Laboratory Methods Applicable to Overburden and Minesoils, EPA 600/2-78-054, 203pp.

STATIC NET ACID GENERATION (NAG) TEST PROCEDURE

Objectives

- To determine the net acid remaining, if any, after complete oxidation of the materials with hydrogen peroxide and allowing complete reaction of the acid formed with the neutralizing components of the material. The NAG test provides a direct assessment of the potential for a material to produce acid after a period of exposure and weathering and is used to refine the results of the theoretical ABA predictions.

Principles of the Tests

After neutralization is completed, by reaction with hydrogen peroxide, the remaining H_2SO_4, if any, is titrated with sodium hydroxide. The amount of NaOH needed is equivalent to the NAG of the material (expressed in kg H_2SO_4/tonne material).

Sample Preparation

Tailings samples can be tested ‘as received’.

Reagents

1. H2O2 - BDH ‘Analar’ Analytical Reagent 30% w/v (100 V), or equivalent, diluted 1:1 with deionized H2O to 15% a.

2. NaOH - 0.50M Standardized Solution.

3. NaOH - 0.10M Standardized Solution.

Procedure:

Add 250 mL of reagent 1 (15% H_2O_2) to 2.5 g of tailings (pulverized sample if testing waste rock) sample in a 500 mL wide mouth conical flask, or equivalent. Cover with a watch glass, and place in a fumehood or well-ventilated area [b]. The H_2O_2 should be at room temperature before commencing test.

Allow sample to react until ‘boiling’ or effervescing ceases. Heat sample on hot plate and gently boil until effervescence stops or for a minimum of 2 hours. Do not allow sample to boil dry - add deionized water if necessary.

Allow solution to cool to room temperature then record final pH (NAGpH).

Rinse the sample that has adhered to the sides of the flask down into the solution with deionized water. Add deionized water to give a final volume of 250 mL.

Titrate solution to pH 4.5 while stirring with appropriate NaOH concentration based on final NAG solution pH as follows:

NAG Solution pH	Reagent	NaOH Concentration
>2	3	0.10 M
≤2	2	0.50 M

[a] The pH of the H_2O_2 used in the NAG test should be checked to ensure it is between pH 4 and 7. If the pH is less than 4 then add dilute NaOH (use a solution made up by adding 1 g NaOH to 100 mL deionized H_2O) until the pH is greater than 4 (aim for a pH between 4 and 6). The pH is adjusted to greater than pH 4 to ensure that the phosphoric acid, used to stabilize H_2O_2 in some brands, is neutralized. The pH of the 15% H_2O_2 should always be checked to ensure that any stabilizing acid is neutralized, otherwise, false positive results may be obtained.

[b] The NAG reaction can be vigorous and sample solutions can 'boil' at temperatures of up to 120^{o}C. Great care must be taken to place samples in a well-ventilated area or fume cupboard.

Calculations

The NAG capacity is determined by titration of the sample to determine the net amount of acid generated by peroxide oxidation.

Net Acid Generation:

$$NAG = \frac{49 \times V \times M}{W}$$

Where:

NAG	= net acid generation (kg H_2SO_4/tonne)
V	= volume of base NaOH titrated (mL)
M	= molarity of base NaOH (moles/L)
W	= weight of sample reacted (g)

NOTE: If NAG value exceeds 25 kg H_2SO_4 per tonne, repeat using a 1.00 g sample.

Interpretations

The NAG capacity is an independent measure of the acid generating potential of a sample. Materials should be classified based on the table given below.

SAMPLE CATEGORY	FINAL NAGpH	NAG VALUE kg H_2SO_4/t	NNP kg/ton $CaCO_3$
POTENTIALLY ACID FORMING			
Higher capacity	<4	>10	positive
Lower capacity	<4	≤10	negative
UNCERTAIN [1]	≥4	0	positive
NON-ACID FORMING [2]	≥4	0	positive

[1] Further evaluation including sulfur forms and mineralogy

[2] Acid consuming materials are identified by NNP values less than approximately -100

References

Miller, S., Robertson, A., and Donohue, T. (1997). Advances in Acid Drainage Prediction Using the Net Acid Generation (NAG) Test. In: *Proceedings of the Fourth International Conference on Acid Rock Drainage, Vancouver, B.C., Canada, 1997*, vol II, pp. 535-547.

Lewis, H.S., Susteyo, W., Miller, S.D., and Jeffery, J.J. (1997). Waste Rock Management Planning and Implementation at P.T. Freeport Indonesia Company's Mining Operations in Irian Jaya. In: *Proceedings of the Fourth International Conference on Acid Rock Drainage, Vancouver, B.C., Canada, 1997*, vol III, pp. 1361-1376.

EPA 1312 Leach Extraction Test

Objectives

- To characterize and quantify the soluble contaminant content of waste rock samples.

Principles of Test

The sample is mixed with distilled water, and is agitated in a flask to allow dissolution of the contained, soluble secondary mineral phases. The solution is collected at the end of the test, filtered, and analysed for immediate parameters (pH, alkalinity, acidity, sulfate, and conductivity) and for contained metals.

This test method is modified from the EPA method 1312 by using a ratio of water to solids of 2:1 or 3:1 rather than 20:1. The less dilution reduces the possibility of metal concentrations below detection.

Equipment

1. Erlenmeyer Flask (500 mL to 1 L, depending on sample size).
2. pH and conductivity meters.
3. Water filtering apparatus and filters.
4. Reciprocating shaking apparatus or other suitable agitation device.

Reagents

1. Distilled Water.
2. Calibration standards for pH and conductivity.

Procedure

1. Split a representative sample of approximately 200 to 500 g from the field sample, and determine exact weight. Place in Erlenmeyer Flask. The amount of sample is at the discretion of the technician, but should be increased if the particle sizes are large or the variation between the different particles is high.
2. Add distilled (or de-ionized) water to the sample to obtain a water to solids ratio of exactly 2:1 by weight. Cap the Erlenmeyer flask and place in agitation device.
3. Agitate the slurry for a total period of 23 hours. Terminate the agitation process and allow suspended solids to settle for one hour prior to termination of the test.

4. Remove the clear decant and filter the solution immediately, using a standard 0.45 µm millepore filter. Remove a small portion of the filtrate and determine the conductivity and pH.

5. Solution samples are submitted for analysis of immediate parameters (pH, alkalinity, acidity Eh, and conductivity) and for constituent concentrations (ICP metal scan and sulfate).

Note:Analytical procedures for radionuclide analyses generally require larger eluate concentrations. Therefore, a larger volume of solid will be required.

Interpretation

Soluble salt and radionuclide contents are calculated from the eluate constituent concentration and volume, and are reported per unit mass of waste rock.

Solubility controls on the solution concentrations should be checked by assessing saturation indices for the contaminants of concern. This may be done rapidly by using a geochemical equilibrium model such as MINTEQA2 or equivalent. Where saturation conditions are indicated, consecutive extraction tests should be performed to determine the total soluble component loading from the cumulative constituent release by the waste rock sample.

References

The field extraction test is modified from a number of different sources, including the EPA series of extraction tests.

Humidity Column Testing

Objectives

The intent of humidity column testing procedures is to simulate as many of the field conditions as is practical. These conditions include:

- representative particle size distributions for the fine fraction (less than 4") within the mine rock; and
- flushing rates encountered under normal circumstances in mine rock piles at the site;
- contact time between the leachate and the rock, usually the flowpath length.

To accomplish this, a large volume of rock is used for the testing, approximately 5 - 8 kg. The rock is graded to represent the 4-inch minus fraction of the rock contained in the rock piles. The site precipitation levels are evaluated on a surface area basis. The diameter of the column is adjusted (within a reasonable limit) to provide enough leachate for the analysis. The flow path (column length) should be approximately 1.5 times greater than the diameter of the column. During the column operation, water is trickled over the rock for 2 days. Air that is humidified by bubbling it through water at a temperature slightly above room temperature, is introduced at the bottom of the column for 5 days of each cycle. Usually the test is carried out for 20 weeks, with weekly analysis of key parameters (pH, alkalinity, acidity, conductivity, Eh, sulfate). Metals are typically measured on a weekly basis until "steady state" conditions have been achieved. After 10 weeks of testing, the frequency of metals analysis can be reduced to every other week, or less, depending on the test results to that time. A typical humidity column is shown in the figure below.

Procedure

1. Examine site precipitation records over a typical yearly period. If there is a seasonal rainy period, determine the average weekly precipitation during that period. Look at the pattern of this rainfall, i.e. is it a steady drizzle over a few days, or heavy rain over a few hours. The water addition rate to the column should follow this pattern as closely as is possible.

2. Calculate the rate of water addition to the column. Start with a minimum column diameter of 30 cm.

eg. rainfall = 10 mm/week over the rainy season
column = 30 cm diameter (0.152 metres radius)
SA column = pr2 = 3.14 (0.152)2 = 0.073
irrigation volume = 0.010 m/wk x 0.073 m2 = 0.00073 m3/wk = 0.73 L/wk

If this volume seems reasonable, use the 30 cm column. If it is not sufficient to satisfy the sample volume requirements for the weekly analyses, the column diameter should be increased until this is satisfied.

3. Once the column diameter has been determined, the rock sample height is obtained by multiplying the diameter by 1.5. The equipment should provide some freeboard above the rock column height (approximately 5 to 10 cm).

   The columns can be constructed out of almost any "inert" plastic cylinder. ABS or PVC pipe provides good strength and durability at a reasonable cost. Plexiglass also works well, but is usually expensive, especially for the large diameter columns.

   As illustrated in Figure D.5.1, the column must have a raised screen constructed about an 2 cm from the bottom, and a solid base through which the leachate is collected. All joints are sealed with a high quality flexible plumbing sealing. (There are supports in the void between the perforated base and the base plate). Humidified air is added through an additional port at the base of the column (not shown). Several layers of Teflon mesh areplaced above the perforated plate to prevent washing of fines from the sample into the collection zone. During the column operation, a clear plexiglass cover is placed over the column to prevent excessive evaporation losses.

4. Water addition

   Water is applied to the column using a peristaltic pump. This can be automated with a timer that pulses water, in a fine spray, over the surface of the rock. Water can also be applied as a continuous drip over one area of the column. Dispersal of water can be achieved in a number of ways, eg. glass rods, plastic tubing, or possibly plastic pellets. (Our experience is that glass wool provides a significant source of alkalinity, and should not be used.)

5. At the start of the test, the dry rock will absorb a considerable amount of water. For the first week, humidified air should be added continuously to the column, to

wet the surfaces of the rock and initiate the oxidation process. Once good water recovery (80%) has been achieved, the regular weekly cycle should commence. A typical cycle is described below.

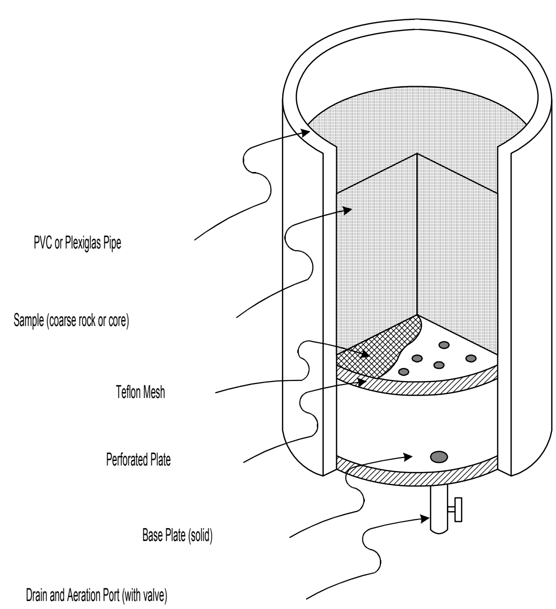
a) Humid Aeration Cycle - for five days, humidified air is added at the base of the columns;

b) Flush Cycle - de-ionized water is added to the column over a two day period. Water is added via a continuous drip dissipated over the top surface of the rock column.

c) Leachate Collection - the column is allowed to drain for 4 hours after the flush cycle is terminated. At the end of the drain cycle the leachate is collected and analyzed.

The test should be run for at least 20 weeks. Test results should be evaluated periodically. After 20 weeks, if the results are inconclusive, the program may need to be extended.

6. Solution samples are submitted for analysis of immediate parameters (pH, alkalinity, acidity Eh, and conductivity) and for constituent concentrations (ICP metal scan and sulfate) on a weekly basis.



Humidity Column Design

APPENDIX A.2

PASTE pH AND CONDUCTIVITY DATA

ACID BASE ACCOUNTING DATA

and

NET ACID GENERATION DATA

1997 Surface Sample Analyses

Sample	Type	Lithology	Visible sulfide %	EC	Paste pH	NAG kg/T H_2SO_4	NAG pH	Sulfate %	Sulfide %	Sulfur Total %	SO_4/S %	AGP	NP	NNP	NP:AP
												m/g $CaCO_3$			
ERD 5500 001	T	QM	1	3140	3.63	29.60	5.11	0.71	0.74	1.45	48.97	45.3	18.9	-26.4	0.42
ERD 5500 002	HS	QB	4	19	7.94	15.48	2.48	0.44	2.46	2.9	15.17	53.1	62.5	9.4	1.18
ERD 5500 004	LS	QM	1	430	5.31										
ERD 5500 005	LS	QM	1	595	3.31										
ERD 5500 006	LS	QM	1.5	891	5.72										
ERD 5500 009	HS	BB	10	4000	2.71	80.75	6.30	0.6	2.3	2.9	20.69	91	9.1	-81.9	0.10
ERD 5500 010	LS	QM	1.5	471	4.55	19.99	3.92								
ERD 5500 012	HS	QM	2	1928	2.71										
ERD 5500 014	HS	QM	2	4370	2.73										
ERD 5510 002	LS	QM	1.5	257	4.71										
ERD 5560 001	O	AN			9.14			0.01	0.005	0.01	100.00	0.3	23.2	22.9	77.33
ERD 5560 002	HS	QM	8	467	6.76			0.3	2.6	2.9	10.34	90	23.7	-66.3	0.26
ERD 5560 006	HS	QB	2	1305	3.38										
ERD 5560 008	HS	QV	5	330	4.08			0.47	1.7	2.2	21.36	68	2	-66	0.03
ERD 5560 010	LS	QM	1.5	708	4.55	23.62	3.87								
ERD 5560 011	HS	QB	3	1565	4.54	22.05	4.07								
ERD 5600 001	LS	QM	1	450	4.44			0.1	0.43	0.53	18.87	17	0.1	-16.9	0.01
ERD 5600 003	HS	QB	3	4230	2.9	33.81	3.19	0.96	1.3	2.2	43.64	69	0.1	-68.9	0.00
ERD 5600 005	T	QB	0.5	2700	3.23	27.05	4.34								
ERD 5600 007	T	QM	0.5	174	6.88	14.31	2.68								
ERD 5600 009	T	QM	0.5	657	4.73										
ERD 5600 011	T	QM	0.5	847	5.43										
ERD 5600 012	T	QM	0.5	254	6.82										
ERD 5600 013	HS	QM	2	321	5.17										
ERD 5600 014	HS	BB	2	2080	3.55										
ERD 5600 070	HS	BB	4	227	4.92	11.27	2.45								
NRD 5620 001	HS	BB	4	41	5.05	10.68	3.41								
NRD 5620 001	HS	QB	5	1193	2.91	19.80	2.45								
NRD 5620 002	HS	QB	6	1717	2.68	77.62	2.98	0.3	2.6	2.9	10.34	90	23.7	-66.3	0.26
NRD 5620 003	HS	QM	4	1111	3.56	57.33	4.12	0.2	1.6	1.8	11.11	55	0.1	-54.9	0.00
NRD 5620 004	O	QM			4.75			0.17	0.1	0.18	94.44	5.6	0.1	-5.5	0.02
NRD 5620 005	T	QV	1	2170	2.81	9.60	4.81								
NRD 5620 006	HS	QM	2	260	3.68										
NRD 5620 007	HS	QM	2	1009	2.98										
NRD 5620 008	HS	QM	3	235	4.13	42.63	5.90	0.15	1.1	1.3	11.54	40	0.8	-39.2	0.02
NRD 5620 009	HS	QM	2	663	3.28										
NRD 5620 010	HS	QM	2	128	3.86										
NRD 5620 011	HS	QM	2	1219	2.68	39.69	3.51	0.28	0.92	1.2	23.33	36	0.1	-35.9	0.00
NRD 5620 012	HS	QB	4	997	2.75	58.80	4.08	0.2	1.6	1.8	11.11	57	0.1	-56.9	0.00
NRD 5620 013	HS	QM	2	2240	2.62										
NRD 5620 014	HS	QB	20	4860	2.5	223.44	3.65	0.9	6.2	7.1	12.68	220	0.1	-219.9	0.00
NRD 5620 015	HS	QB	2	1075	3.71										
NRD 5620 016	HS	QM	2	3390	2.51										

1997 Surface Sample Analyses

Sample	Type	Lithology	Visible sulfide %	EC	Paste pH	NAG kg/T H_2SO_4	NAG pH	Sulfate %	Sulfide %	Sulfur Total %	SO_4/S %	AGP (m/g $CaCO_3$)	NP (m/g $CaCO_3$)	NNP	NP:AP
NRD 5650 017	LS	QM	1	41.4	6.09	23.72	4.11	0.13	0.22	0.35	37.14	11	0.1	-10.9	0.01
NRD 5650 018	HS	QM	2	89	4.82										
NRD 5650 019	HS	QM	2	3620	2.79	46.35	4.40	0.1	1.3	1.4	7.14	45	0.1	-44.9	0.00
SRD 5470 006	HS	QM	2	63	5.94										
SRD 5470 010	LS	QM	1	196	7.05	8.72	2.51								
SRD 5470 011	HS	QV	5	2200	2.54	43.51	3.10	0.21	1.3	1.5	14.00	47	6.7	-40.3	0.14
SRD 5470 012	HS	QB	6	182	7.63			0.46	1.4	1.9	24.21	59	38.9	-20.1	0.66
SRD 5470 013	HS	QM	3	821	4.4										
SRD 5470 014	HS	QB	4	62.9	5.26	5.88	2.29								
SRD 5470 015	HS	QM	3	118.5	5.55										
SRD 5470 016	HS	QM	4	89.6	7.06										
SRD 5470 016	HS	QV	5	6570	2.66										
SRD 5470 017	HS	QB	4	27	5.02	21.56	2.27								
SRD 5470 018	HS	QB	5	1703	3.08										
SRD 5470 019	HS	QV	5	229	4.55										
SRD 5470 020	HS	QM	3	162	7.83	12.74	2.47	0.31	1.1	1.4	22.14	44	36.4	-7.6	0.83
SRD 5470 021	HS	QB	4	321	4.32										
SRD 5470 022	HS	QM	2	386	6.03										
SRD 5470 023	HS	QM	4	27	5.51										
SRD 5470 024	HS	QM	5	3970	2.52										
SRD 5470 025	HS	QM	3	172.2	5.21										
SRD 5470 027	HS	QM	2	3520	2.72	15.78	2.52								
SRD 5490 007	O	QM		42	8.76	19.70	3.32								
SRD 5500 001	HS	QM	2	831	5.31	8.23	4.10	0.37	0.7	1.1	33.64	33	34.2	1.2	1.04
SRD 5500 002	HS	BB	4	33	7.38	22.05	4.63								
SRD 5500 003	O	BB		58.7	4.75										
SRD 5500 004	HS	QB	4	231	5.5										
SRD 5500 005	HS	QV	5	292	6.05	19.01	3.96								
WRC 5440 30	HS	QM	2	227	4.1	15.88									
WRC 5440 31A	LS	QM	0.5		7.91			0.23	0.32	0.55	41.82	33	34.2	1.2	1.04
WRC 5440 31B	T	QM	0.5		8.35			0.21	0.11	0.32	65.63	10	10.1	0.1	1.01
WRC 5440 32	O	QM		347	6.55			0.19	0.05	0.24	79.17	7.5	9.6	2.1	1.28
WRC 5480 006	HS	QB	5	3680	3.7	31.46									
WRC 5480 007	HS	QB	5	1643	3.18	33.52									
WRC 5480 007	HS	QV	5	550	3.41	32.73									
WRC 5480 008	HS	QM	2	785	3.67	15.09									
WRC 5480 009	HS	BB	3	764	3.73	32.54									
WRC 5480 010	HS	BB	4	1338	3.76	28.71									
WRC 5480 012	LS	QB	1	589	4.01	33.81									
WRC 5480 013	LS	QM	1	297	6.95	15.19									
WRC 5480 014	T	QB	0.5	801	4.12	20.19		1.25	0.89	2.08	60.10	65	47.6	-17.4	0.73
WRC 5480 015	HS	QM	2	826	3.42										
WRC 5480 016	LS	QM	1	470	6.26										
WRC 5480 018	HS	QM	2	4840	3.02										

1997 Surface Sample Analyses

Sample	Type	Lithology	Visible sulfide %	EC	Paste pH	NAG kg/T H_2SO_4	NAG pH	Sulfate %	Sulfide %	Sulfur Total %	SO_4/S %	AGP (m/g $CaCO_3$)	NP (m/g $CaCO_3$)	NNP	NP:AP
WRC 5480 019	HS	QM	2	3020	2.66										
WRC 5480 020	HS	QM	2	878	3.96										
WRC 5480 021	HS	QM	2	1009	4.38										
WRC 5480 022	HS	QM	2	1850	2.97										
WRC 5480 023	HS	QM	2	1880	2.64										
WRC 5480 024	HS	QM	1.5	1190	2.71										
WRC 5480 025	LS	QM	1	637	8.6										
WRC 5480 026	LS	QM	1	129	9.65										
WRC 5480 027	HS	QM	2	1580	2.12										
WRC 5480 028	HS	QM	2	964	4.89										
WRC 5480 029	HS	QM	2	580	3.59										
WRC 5480 030	HS	QM	2	258	5.85										
WRC 5580 005	T	QV(Sternberg)pw2	2	19000	3.79										
WRD 4480 010	LS	QM	1	50	6.06										
WRD 5560 020	LS	QM	1	64	6.72										
WRD 5560 027	HS	QM	2	3990	2.56										
WRD 5560 028	HS	QM	2	730	2.95										
WRD 5560 029	HS	QM	2	1552	2.53										
WRD 5560 030	HS	QM	2	321	4.64										
WRD 5560 031	HS	QM	2	282	4.4										
WRD 5560 032	HS	QM	2	620	2.99										
WRD 5560 034	HS	QM	2	201	3.95										
WRD 5560 035	HS	QM	2	833	4.35										
WRD 5560 036	HS	QM	2	171	3.79										
WRD 5560 037	HS	QM	2	164	7.8										
WRD 5560 038	HS	QM	5	54	6.59	18.33	7.92	0.3	1.2	1.5	20.00	47	30.2	-16.8	0.64
WRD 5560 039	HS	QB	6	1848	2.81	72.13	3.92	0.1	2.1	2.2	4.55	70	0.1	-69.9	0.00
WRD 5560 040	HS	QB	3	456	3.97	36.46	2.98								
WRD 5560 041	HS	QB	4	2190	3.31	50.57	4.18	0.3	1.4	1.7	17.65	53	7.6	-45.4	0.14
WRD 5580 001	LS	QM	1	133	4	21.56	2.27	0.3	0.8	1.1	27.27	33	17.8	-15.2	0.54
WRD 5580 002	HS	QM	3	1422	2.77	34.01	6.00								
WRD 5580 004	O	QB			4.82			0.33	0.1	0.34	97.06	11	0.1	-10.9	0.01
WRD 5580 005	LS	QM	2	93	6.72	29.40	5.01								
WRD 5580 006	T	QM	0.5	212	3.2	30.77	5.06								
WRD 5580 007	HS	QB	2	345	3.02	31.07	4.87								
WRD 5580 008	HS	QB	2	230	5.55	29.01	5.15								
WRD 5580 009	HS	QM	2	325	3.14	28.62	5.01								
WRD 5580 011	HS	QM	2	8	5.6	28.03	5.29								
WRD 5580 012	HS	QM	2	305	5.4	29.11	5.1								
WRD 5580 013	HS	BB	7	2860	2.45	47.14	2.09								
WRD 5580 014	HS	BB	4	21	5	31.85	5.27	0.2	1.96	2.16	9.26	73.8	43.7	-30.1	0.59
WRD 5580 015	HS	QB	4	156	4.45	31.16	3.05								
WRD 5580 016	HS	QM	2	45.6	5.72	22.74	4.06								
WRD 5580 017	HS	QM	2	41	5.54	30.48	5.04								

1997 Surface Sample Analyses

Sample	Type	Lithology	Visible sulfide %	EC	Paste pH	NAG kg/T H_2SO_4	NAG pH	Sulfate %	Sulfide %	Sulfur Total %	SO_4/S %	AGP	NP	NNP	NP:AP
												m/g $CaCO_3$			
WRD 5580 018	HS	QM	2	112	6.4	32.93	5.55								
WRD 5580 019	HS	QM	2	42	6.14	19.60	3.91								
WRD 5580 021	HS	QM	2	65	5.87	19.89	3.98								
WRD 5580 022	HS	QM	2	170	5.61	39.79	3.00								
WRD 5580 023	HS	QM	2	103	7.67	21.17	4.63								
WRD 5580 024	HS	QM	1.5	183	5.39	21.56	4.07								
WRD 5580 025	HS	QM	1.5	42	5.74	15.78	2.52								
WRD 5580 026	HS	QM	2	84	6.1	34.79	6.42								
WRD 5580 033	HS	QM	1.5	237	3.82	38.71	7.74								
WRD 5580 042	HS	QB	5	1080	2.35	76.93	2.10	0.15	2.2	2.4	6.25	74	0.1	-73.9	0.00

KEY

Lithology QM= Quartz Monzonite QB= Quartz Breccia BB= Biotite Breccia QV = Quartz Vein AN = Andesite

Visible sulfide (%) = Observed pyrite/sulfide content in hand specimen

Type HS=High Sulfide (>2% visible sulfide) LS= Low Sulfide (<2% visible sulfide) T=Transitional (trace sulfide & acidic paste pH) O=Oxide (no observed sulfide)

NAG (eqkg H2SO4/T)= $\frac{\text{49xVolume of NaOH titrated x molality of NaOH (0.1M)}}{\text{weight of sample (5g)}}$

Copper Flat Project
Static Test on Wall Rock and Drill Core from the Pit Area
1994 Sampling

Sample	Paste PH	Total	Sulfide	Sulfate	NP	AP	NNP	NP/AP
PW-1 SW pitwall transition	6.1	3.61	3.47	0.14	32	108.44	-76.44	0.3
PW-2 Oxidized pitwall	--	0.37	0.365	0.005	11	11.41	-0.41	0.96
PW-3 NW pitwall	2.6	2.2	2.195	0.005	0.1	68.59	-68.49	--
PW-4 NE pitwall	3.9	1.89	1.885	0.005	16	58.91	-42.91	0.27
IDC24-222-241, QM – core	--	1.74	1.735	0.005	31	54.22	-23.22	0.57
CF10-177-190, andesite – core	--	2.86	2.8	0.06	52	87.5	-35.5	0.59
CF10-190-199 QM—core	--	3.59	3.52	0.07	44	110	-66	0.4
CF10-214-220, QM – core	--	3.92	3.915	0.005	65	122.34	-57.34	0.53
H75-53-42, QM - reverse circ.	8.2	1.77	1.765	0.005	36	55.16	-19.16	0.65
H75-64-44, QM - reverse circ.	7.2	1.69	1.685	0.005	39	52.66	-13.66	0.74
H75-51-34, QM - reverse circ.	8.6	2.02	2.015	0.005	49	62.97	-13.97	0.78
H75-48-58, QM - reverse circ.	7.2	1.18	1.175	0.005	16	36.72	-20.72	0.44
H75-48-44, QM - reverse circ.	7.4	1.06	1.055	0.005	9	32.97	-23.97	0.27

SOURCE: *Copper Flat Mine - Compliation of Pit Lake Studies (SRK 1997)*

APPENDIX A.3

HUMIDITY COLUMN TEST DATA

IDC-24-222-241 - Kinetic Test Data

Parameter	Cycle 1	Cycle 2	Cycle 3	Cycle 4	Cycle 5	Cycle 6	Cycle 7	Cycle 8	Cycle 9	Cycle 10	Cycle 11	Cycle 12	Cycle 13	Cycle 14	Cycle 15
Ag ug/l	1.	4.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
Al mg/l	0.03	0.05	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
As ug/l	30.	30.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.
B ug/l	50.	50.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.
Ba ug/l	75.	60.	30.	15.	35.	45.	35.	40.	40.	45.	40.	45.	35.	35.	15.
Be ug/l	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
Bi ug/l	6.	26.	2.	2.	2.	2.	2.	2.	2.	2.	2.	6.	2.	2.	2.
Ca mg/l	30.48	23.76	18.11	12.95	18.44	15.01	13.24	13.16	13.42	15.01	13.19	15.92	13.85	11.87	5.47
Cd ug/l	1.	2.	1.	1.	3.	1.	1.	3.	1.	1.	1.	1.	1.	1.	1.
Co ug/l	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.
Cr ug/l	5.	20.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.
Cu ug/l	14.	16.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.
Fe mg/l	0.04	0.06	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
K mg/l	1.56	1.47	0.65	0.13	0.47	0.61	0.12	0.79	0.9	0.22	0.68	0.94	0.34	0.75	0.18
Li ug/l	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.
Mg mg/l	1.26	1.04	0.59	0.36	0.58	0.42	0.39	0.39	0.37	0.34	0.52	0.65	0.48	0.48	0.18
Mn mg/l	0.07	0.03	0.02	0.02	0.035	0.03	0.025	0.025	0.025	0.02	0.015	0.02	0.015	0.01	0.005
Mo ug/l	6.	4.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	4.
Na mg/l	5.24	4.63	2.19	1.26	2.38	1.79	1.65	1.82	1.27	1.57	2.34	2.98	2.05	2.12	0.52
Ni ug/l	10.	15.	10.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	10.
P ug/l	40.	110.	10.	10.	10.	10.	30.	10.	10.	10.	10.	10.	10.	30.	10.
Pb ug/l	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	8.	10.	2.	2.	2.
Sb ug/l	10.	34.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	4.	2.
Se ug/l	85.	150.	5.	5.	5.	5.	50.	25.	15.	15.	30.	40.	5.	30.	15.
Si mg/l	0.87	0.6	0.53	0.3	0.6	0.39	0.51	0.52	0.5	0.53	0.56	0.73	0.48	0.57	0.28
Sn ug/l	100.	174.	2.	2.	2.	2.	2.	2.	6.	22.	46.	2.	2.	80.	2.
Sr ug/l	124.	104.	50.	28.	44.	32.	32.	34.	34.	32.	34.	46.	36.	34.	18.
Ti ug/l	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.
V ug/l	2.	5.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
Zn ug/l	28.	25.	12.	3.	9.	20.	11.	16.	1.	1.	2.	6.	8.	5.	9.
pH	7.73	7.8	7.55	7.4	7.85	7.64	7.52	7.53	7.54	7.59	7.61	7.63	7.72	7.51	7.16
Redox (mV)	300.	289.	307.	321.	295.	311.	318.	321.	341.	287.	272.	264.	265.	265.	296.
Conductivity (uS/cm)	132.	104.	70.	45.	69.	53.	45.	42.	41.	46.	50.	63.	49.	44.	19.
Alkalinity (mg $CaCO_3$/l)	43.	31.	24.	17.	26.	18.	16.	17.	17.	20.	19.	26.	19.	16.	10.
Acidity (pH 4.5)	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Acidity (pH 8.3)	1.	2.	2.	2.	1.	1.	2.	1.	1.	2.	1.	2.9	2.	2.	3.
Cum Acidity (pH 8.3)	0.1	0.1	0.2	0.3	0.3	0.4	0.5	0.5	0.6	0.7	0.7	0.9	1.	1.1	1.2
Sulphate (mg/l)	9.	9.	5.	6.	8.	6.	5.	4.	4.	4.	5.	4.	3.	4.	2.
Cum Sulphate (mg/kg)	0.5	0.8	1.	1.2	1.6	1.9	2.2	2.4	2.6	2.8	3.	3.2	3.4	3.6	3.7
Water added (L)	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
pH of water added	5.45	6.26	5.98	5.59	6.15	6.03	5.83	5.98	6.15	6.05	5.96	6.04	6.06	6.56	6.23
Leachate collected (L)	0.214	0.144	0.184	0.148	0.188	0.218	0.169	0.23	0.188	0.231	0.189	0.191	0.212	0.21	0.194
Cumulative Iron	0.04	0.1	0.11	0.12	0.13	0.14	0.15	0.16	0.17	0.18	0.19	0.2	0.21	0.22	0.23
Cumulative Copper	14.	30.	32.	34.	36.	38.	40.	42.	44.	46.	48.	50.	52.	54.	56.

IDC-24-222-241 - Kinetic Test Data

Parameter	Cycle 16	Cycle 17	Cycle 18	Cycle 19	Cycle 20	Cycle 21	Cycle 22	Cycle 23	Cycle 24	Cycle 25	Cycle 26	Cycle 27	Cycle 28	Cycle 29
Ag ug/l	<0.015	<0.015	<0.015	<0.015	<0.015								<0.015	<0.015
Al mg/l	<0.20	<0.20	<0.20	<0.20	<0.20								<0.20	<0.20
As ug/l	<0.20	<0.20	<0.20	<0.20	<0.20								<0.20	<0.20
B ug/l	<0.10	<0.10	<0.10	<0.10	<0.10								<0.10	<0.10
Ba ug/l	0.014	0.022	0.018	0.046	0.033								0.061	0.057
Be ug/l	<0.005	<0.005	<0.005	<0.005	<0.005								<0.005	<0.005
Bi ug/l	<0.10	<0.1	<0.1	<0.1	<0.1								<0.1	<0.1
Ca mg/l	1.5	2.75	2.2	4.49	2.7								6.21	8.
Cd ug/l	<0.010	<0.010	<0.010	<0.010	<0.010								<0.010	<0.010
Co ug/l	<0.015	<0.015	<0.015	<0.015	<0.015								<0.015	<0.015
Cr ug/l	<0.015	<0.015	<0.015	<0.015	<0.015								<0.015	<0.015
Cu ug/l	<0.010	<0.010	<0.010	<0.010	<0.010								<0.010	<0.010
Fe mg/l	<0.030	<0.030	<0.030	<0.030	<0.030								<0.030	<0.030
K mg/l	<2.0	<2.0	<2.0	<2.0	<2.0								<2.0	<2.0
Li ug/l	<0.015	<0.015	<0.015	<0.015	<0.015								<0.015	<0.015
Mg mg/l	0.091	0.12	0.12	0.323	0.16								0.453	0.621
Mn mg/l	0.008	0.005	0.005	0.007	<0.005								0.016	0.012
Mo ug/l	<0.030	<0.030	<0.030	<0.030	<0.030								<0.030	<0.030
Na mg/l	<2.0	<2.0	<2.0	<2.0	<2.0								<2.0	<2.0
Ni ug/l	<0.020	<0.020	<0.020	<0.020	<0.020								<0.020	<0.020
P ug/l	<0.30	<0.30	<0.30	<0.30	<0.30								<0.30	<0.30
Pb ug/l	<0.050	<0.050	<0.050	<0.050	<0.050								<0.050	<0.050
Sb ug/l	<0.20	<0.20	<0.20	<0.20	<0.20								<0.20	<0.20
Se ug/l	<0.20	<0.20	<0.20	<0.20	<0.20								<0.20	<0.20
Si mg/l	0.143	0.207	0.171	0.377	0.231								0.432	0.596
Sn ug/l	<0.30	<0.30	<0.30	<0.30	<0.30								<0.30	<0.30
Sr ug/l	0.011	0.016	0.015	0.03	0.022								0.04	0.053
Ti ug/l	<0.010	<0.010	<0.010	<0.010	<0.010								<0.010	<0.010
V ug/l	<0.030	<0.030	<0.030	<0.030	<0.030								<0.030	<0.030
Zn ug/l	0.01	0.006	0.009	0.012	0.015								0.022	0.024
pH	7.08	7.29	7.23	7.4	6.64								7.59	7.69
Redox (mV)	304.	284.	295.	288.	281.								291.	293.
Conductivity (uS/cm)	10.	16.	15.	32.	19.								45.	58.
Alkalinity (mg $CaCO_3$/l)	6.	10.	7.	12.	8.								16.	20.
Acidity (pH 4.5)	0.	0.	0.	0.	0.								0.	0.
Acidity (pH 8.3)	5.	5.	6.	3.	6.								5.9	6.9
Cum Acidity (pH 8.3)	1.4	1.6	1.9	2.1	2.4								2.6	3.
Sulphate (mg/l)	2.	2.	2.	4.	3.								4.	4.
Cum Sulphate (mg/kg)	3.8	3.9	3.9	4.1	4.3								4.5	4.7
Water added (L)	0.2	0.2	0.2	0.2	0.2								0.2	0.2
pH of water added	5.92	5.57	5.66	6.09	5.23								5.93	5.7
Leachate collected (L)	0.151	0.175	0.198	0.181	0.205								0.185	0.216
Cumulative Iron	0.23	0.23	0.23	0.23	0.23								0.23	0.23
Cumulative Copper	56.	56.	56.	56.	56.								56.	56.

Laboratory Equipment Failure
Weeks 21-27
No Samples Collected

LGSSP-2 - Kinetic Test Data

Parameter	Cycle 1	Cycle 2	Cycle 3	Cycle 4	Cycle 5	Cycle 6	Cycle 7	Cycle 8	Cycle 9	Cycle 10	Cycle 11	Cycle 12	Cycle 13	Cycle 14	Cycle 15
Ag ug/l	7.	6.	1.	1.	1.	1.	1.	1.	1.	1.	2.	1.	1.	1.	1.
Al mg/l	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
As ug/l	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.
B ug/l	60.	70.	40.	30.	10.	10.	30.	10.	10.	10.	10.	10.	10.	10.	10.
Ba ug/l	200.	105.	60.	55.	60.	40.	70.	75.	50.	90.	80.	60.	60.	75.	45.
Be ug/l	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
Bi ug/l	6.	26.	2.	2.	2.	2.	2.	2.	2.	2.	8.	2.	2.	2.	2.
Ca mg/l	155.59	115.41	85.41	76.19	55.92	41.91	51.46	44.1	38.78	54.5	52.94	37.69	45.46	51.56	32.69
Cd ug/l	18.	13.	5.	1.	5.	1.	3.	5.	1.	1.	6.	1.	7.	1.	1.
Co ug/l	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.
Cr ug/l	20.	25.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.
Cu ug/l	82.	54.	28.	26.	16.	18.	34.	16.	14.	12.	10.	6.	10.	10.	6.
Fe mg/l	0.41	0.28	0.04	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.08	0.01	0.01	0.01	0.01
K mg/l	7.07	7.1	7.65	7.2	4.99	4.56	5.84	4.95	4.58	4.64	5.79	4.85	5.52	6.79	4.62
Li ug/l	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.
Mg mg/l	16.36	11.17	8.56	7.12	4.48	2.92	4.14	3.22	2.68	4.25	4.34	2.58	3.58	4.32	2.2
Mn mg/l	0.04	0.035	0.02	0.01	0.03	0.015	0.01	0.015	0.005	0.01	0.015	0.01	0.005	0.005	0.005
Mo ug/l	242.	308.	288.	282.	176.	122.	140.	96.	74.	126.	126.	60.	90.	98.	66.
Na mg/l	7.5	7.94	7.2	6.55	3.88	2.91	3.15	2.04	1.79	2.48	2.69	1.54	2.31	2.5	1.63
Ni ug/l	5.	15.	10.	5.	5.	5.	5.	5.	5.	5.	10.	5.	5.	5.	5.
P ug/l	230.	270.	300.	340.	220.	200.	240.	190.	120.	200.	220.	180.	200.	270.	150.
Pb ug/l	32.	20.	2.	2.	2.	2.	2.	2.	2.	2.	2.	6.	12.	2.	2.
Sb ug/l	18.	22.	2.	2.	2.	2.	2.	2.	2.	2.	10.	2.	2.	2.	2.
Se ug/l	530.	405.	285.	245.	125.	30.	210.	145.	160.	225.	170.	110.	125.	115.	70.
Si mg/l	5.53	6.71	7.61	8.57	6.18	7.08	7.17	5.79	6.24	5.6	5.38	4.81	5.66	5.39	5.
Sn ug/l	574.	508.	2.	2.	2.	2.	26.	92.	60.	64.	90.	44.	44.	52.	2.
Sr ug/l	1,018.	680.	492.	418.	270.	178.	252.	204.	168.	262.	234.	142.	216.	224.	126.
Ti ug/l	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.
V ug/l	11.	10.	5.	4.	2.	1.	4.	1.	1.	1.	6.	3.	2.	2.	2.
Zn ug/l	28.	14.	12.	13.	6.	17.	13.	14.	1.	1.	1.	1.	9.	1.	3.
pH	8.07	8.1	8.09	8.16	8.11	8.13	8.13	8.05	8.21	8.03	8.04	8.01	8.07	7.96	8.02
Redox (mV)	325.	306.	318.	330.	310.	322.	335.	337.	344.	294.	281.	271.	268.	269.	296.
Conductivity (uS/cm)	979.	690.	533.	448.	308.	196.	261.	204.	170.	264.	279.	170.	226.	267.	151.
Alkalinity (mg $CaCO_3$/l)	53.	54.	58.	64.	54.	53.	58.	49.	54.	50.	51.	41.	54.	48.	49.
Acidity (pH 4.5)	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Acidity (pH 8.3)	1.	1.	1.	1.	1.	1.	1.	1.	0.5	1.	1.	1.	1.	1.	1.
Cum Acidity (pH 8.3)	0.	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.3	0.3	0.3	0.4	0.4	0.5	0.5
Sulphate (mg/l)	432.	243.	155.	141.	82.	29.	64.	49.	21.	69.	69.	30.	48.	72.	16.
Cum Sulphate (mg/kg)	10.4	17.5	22.6	25.9	28.7	29.6	32.	33.6	34.2	36.8	39.5	40.5	42.3	45.7	46.2
Water added (L)	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
pH of water added	5.45	6.26	5.98	5.59	6.15	6.03	5.83	5.98	6.15	6.05	5.96	6.04	6.06	6.56	6.23
Leachate collected (L)	0.102	0.122	0.139	0.101	0.144	0.119	0.162	0.138	0.112	0.158	0.165	0.153	0.158	0.198	0.127
Cumulative Iron	0.41	0.69	0.73	0.74	0.75	0.76	0.77	0.78	0.79	0.8	0.88	0.89	0.9	0.91	0.92
Cumulative Copper	82.	136.	164.	190.	206.	224.	258.	274.	288.	300.	310.	316.	326.	336.	342.

LGSSP-2 - Kinetic Test Data

Parameter	Cycle 16	Cycle 17	Cycle 18	Cycle 19	Cycle 20	Cycle 21	Cycle 22	Cycle 23	Cycle 24	Cycle 25	Cycle 26	Cycle 27	Cycle 28	Cycle 29
Ag ug/l	<0.015	<0.015	<0.015	<0.015	<0.015								<0.015	<0.015
Al mg/l	<0.20	<0.20	<0.20	<0.20	<0.20								<0.20	<0.20
As ug/l	<0.20	<0.20	<0.20	<0.20	<0.20								<0.20	<0.20
B ug/l	<0.10	<0.10	<0.10	<0.10	<0.10								<0.10	<0.10
Ba ug/l	0.058	0.048	0.037	0.038	0.044								0.101	0.084
Be ug/l	<0.005	<0.005	<0.005	<0.005	<0.005								<0.005	<0.005
Bi ug/l	<0.10	<0.10	<0.10	<0.10	<0.10								<0.10	<0.10
Ca mg/l	27.3	22.4	16.4	17.	14.6								66.2	65.3
Cd ug/l	<0.010	<0.010	<0.010	<0.010	<0.010								<0.010	<0.010
Co ug/l	<0.015	<0.015	<0.015	<0.015	<0.015								<0.015	<0.015
Cr ug/l	<0.015	<0.015	<0.015	<0.015	<0.015								<0.015	<0.015
Cu ug/l	0.019	0.016	0.011	0.011	<0.010								0.014	0.018
Fe mg/l	<0.030	<0.030	<0.030	<0.030	<0.030								<0.030	<0.030
K mg/l	4.	3.4	2.2	2.8	<2.0								4.4	4.2
Li ug/l	<0.015	<0.015	<0.015	<0.015	<0.015								<0.015	<0.015
Mg mg/l	2.7	2.11	1.49	1.55	1.29								6.2	6.19
Mn mg/l	<0.005	<0.005	<0.005	<0.005	<0.005								<0.005	<0.005
Mo ug/l	0.066	0.041	<0.030	0.03	<0.030								0.065	0.093
Na mg/l	<2.0	<2.0	<2.0	<2.0	<2.0								<2.0	<2.0
Ni ug/l	<0.020	<0.020	<0.020	<0.020	<0.020								<0.020	<0.020
P ug/l	<0.30	<0.30	<0.30	<0.30	<0.30								<0.30	<0.30
Pb ug/l	<0.050	<0.050	<0.050	<0.050	<0.050								<0.050	<0.050
Sb ug/l	<0.20	<0.20	<0.20	<0.20	<0.20								<0.20	<0.20
Se ug/l	<0.20	<0.20	<0.20	<0.20	<0.20								<0.20	<0.20
Si mg/l	5.55	4.58	3.18	3.22	2.26								4.12	5.03
Sn ug/l	<0.30	<0.30	<0.30	<0.30	<0.30								<0.30	<0.30
Sr ug/l	0.179	0.14	0.104	0.108	0.093								0.409	0.393
Ti ug/l	<0.010	<0.010	<0.010	<0.010	<0.010								<0.010	<0.010
V ug/l	<0.030	<0.030	<0.030	<0.030	<0.030								<0.030	<0.030
Zn ug/l	0.005	0.009	<0.005	<0.005	<0.005								0.008	0.005
pH	8.12	8.09	8.01	7.92	7.22								7.9	7.96
Redox (mV)	288.	298.	294.	290.	280.								313.	296.
Conductivity (uS/cm)	177.	138.	104.	109.	93.								402.	384.
Alkalinity (mg $CaCO_3$/l)	57.	48.	34.	38.	30.								36.	49.
Acidity (pH 4.5)	0.	0.	0.	0.	0.								0.	0.
Acidity (pH 8.3)	1.	1.	2.	2.	3.								3.	2.
Cum Acidity (pH 8.3)	0.5	0.5	0.6	0.7	0.8								1.	1.
Sulphate (mg/l)	20.	10.	11.	11.	8.								139.	124.
Cum Sulphate (mg/kg)	46.8	47.1	47.5	47.9	48.3								54.4	59.3
Water added (L)	0.2	0.2	0.2	0.2	0.2								0.2	0.2
pH of water added	5.92	5.57	5.66	6.09	5.23								5.93	5.7
Leachate collected (L)	0.127	0.131	0.16	0.158	0.203								0.183	0.67
Cumulative Iron	0.92	0.92	0.92	0.92	0.92								0.92	0.92
Cumulative Copper	342.	342.	342.	342.	342.								342.	342.

Laboratory Equipment Failure
Weeks 21-27
No Samples Collected

C10-190-199-2 - Kinetic Test Data

Parameter	Cycle 1	Cycle 2	Cycle 3	Cycle 4	Cycle 5	Cycle 6	Cycle 7	Cycle 8	Cycle 9	Cycle 10	Cycle 11	Cycle 12	Cycle 13	Cycle 14	Cycle 15
Ag ug/l	5.	5.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
Al mg/l	0.01	0.04	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
As ug/l	10.	30.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.
B ug/l	50.	30.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.
Ba ug/l	50.	30.	45.	35.	15.	25.	15.	15.	15.	25.	20.	35.	35.	15.	30.
Be ug/l	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
Bi ug/l	6.	16.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	8.
Ca mg/l	48.27	40.54	43.47	34.16	32.33	30.47	23.86	25.61	19.7	22.26	20.91	23.92	22.28	18.03	22.24
Cd ug/l	3.	8.	2.	1.	1.	3.	3.	3.	1.	1.	1.	1.	4.	4.	3.
Co ug/l	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.
Cr ug/l	10.	15.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.
Cu ug/l	52.	34.	24.	20.	14.	10.	8.	8.	6.	4.	2.	2.	4.	4.	2.
Fe mg/l	0.05	0.11	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
K mg/l	3.95	3.56	4.39	2.98	2.07	1.51	2.13	2.16	1.36	0.77	1.5	1.78	1.35	1.31	2.1
Li ug/l	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.
Mg mg/l	4.25	3.86	4.68	3.49	3.06	2.59	2.22	2.35	1.47	1.79	1.83	2.5	2.3	2.04	2.4
Mn mg/l	0.11	0.065	0.05	0.035	0.045	0.04	0.035	0.035	0.025	0.025	0.025	0.025	0.025	0.02	0.03
Mo ug/l	10.	12.	6.	4.	6.	2.	2.	2.	2.	2.	2.	4.	2.	4.	4.
Na mg/l	3.83	4.18	4.35	3.16	2.22	2.01	1.98	1.78	1.24	1.01	1.09	1.82	1.61	1.66	1.87
Ni ug/l	5.	10.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.
P ug/l	60.	100.	10.	30.	10.	10.	10.	30.	10.	10.	10.	10.	10.	10.	20.
Pb ug/l	6.	22.	2.	2.	2.	2.	2.	2.	2.	2.	6.	2.	2.	2.	4.
Sb ug/l	14.	22.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.
Se ug/l	205.	200.	80.	75.	40.	5.	50.	95.	95.	75.	15.	70.	10.	35.	60.
Si mg/l	0.85	0.7	1.02	0.82	0.71	0.78	0.9	0.81	0.57	0.53	0.5	0.66	0.3	0.41	0.74
Sn ug/l	66.	316.	2.	2.	148.	2.	18.	66.	24.	50.	2.	2.	8.	58.	2.
Sr ug/l	372.	320.	324.	244.	194.	184.	136.	150.	100.	110.	94.	132.	120.	80.	140.
Tl ug/l	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.
V ug/l	5.	6.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	2.
Zn ug/l	31.	29.	21.	16.	13.	13.	14.	8.	1.	1.	10.	30.	19.	17.	36.
pH	8.07	7.91	7.9	7.37	7.75	7.8	7.66	7.4	7.78	7.57	7.55	7.45	7.03	7.04	7.45
Redox (mV)	306.	297.	315.	327.	303.	320.	326.	329.	346.	292.	279.	276.	277.	281.	304.
Conductivity (uS/cm)	259.	225.	253.	181.	165.	142.	112.	114.	77.	89.	90.	114.	103.	86.	107.
Alkalinity (mg $CaCO_3$/l)	43.	30.	32.	22.	19.	25.	20.	21.	19.	17.	15.	15.	11.	10.	16.
Acidity (pH 4.5)	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Acidity (pH 8.3)	1.	1.	1.	2.	1.	1.	2.	2.	0.5	2.	1.	2.	2.	2.	2.
Cum Acidity (pH 8.3)	0.	0.1	0.1	0.2	0.2	0.3	0.3	0.4	0.4	0.5	0.6	0.7	0.8	0.9	0.9
Sulphate (mg/l)	65.	58.	70.	57.	51.	33.	25.	26.	12.	17.	20.	30.	27.	20.	22.
Cum Sulphate (mg/kg)	3.2	5.5	7.8	9.5	12.	13.4	14.2	15.4	15.9	16.7	17.6	19.	20.3	21.2	22.1
Water added (L)	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
pH of water added	5.45	6.26	5.98	5.59	6.15	6.03	5.83	5.98	6.15	6.05	5.96	6.04	6.06	6.56	6.23
Leachate collected (L)	0.228	0.175	0.149	0.139	0.224	0.19	0.158	0.198	0.195	0.219	0.215	0.208	0.219	0.206	0.194
Cumulative Iron	0.05	0.16	0.17	0.18	0.19	0.2	0.21	0.22	0.23	0.24	0.25	0.26	0.27	0.28	0.29
Cumulative Copper	52.	86.	110.	130.	144.	154.	162.	170.	176.	180.	182.	184.	188.	192.	194.

Parameter	Cycle 16	Cycle 17	Cycle 18	Cycle 19	Cycle 20	Cycle 21	Cycle 22	Cycle 23	Cycle 24	Cycle 25	Cycle 26	Cycle 27	Cycle 28	Cycle 29
Ag ug/l	<0.015	<0.015	<0.015	<0.015	<0.015								<0.015	<0.015
Al mg/l	<0.20	<0.20	<0.20	<0.20	<0.20								<0.20	<0.20
As ug/l	<0.20	<0.20	<0.20	<0.20	<0.20								<0.20	<0.20
B ug/l	<0.10	<0.10	<0.10	<0.10	<0.10								<0.10	<0.10
Ba ug/l	0.026	0.022	0.013	0.011	0.023								0.096	0.066
Be ug/l	<0.005	<0.005	<0.005	<0.005	<0.005								<0.005	<0.005
Bi ug/l	<0.10	<0.10	<0.10	<0.10	<0.10								<0.10	<0.10
Ca mg/l	11.8	10.8	4.76	3.15	14.3								45.3	50.7
Cd ug/l	<0.010	<0.010	<0.010	<0.010	<0.010								<0.010	<0.010
Co ug/l	<0.015	<0.015	<0.015	<0.015	<0.015								<0.015	<0.015
Cr ug/l	<0.015	<0.015	<0.015	<0.015	<0.015								<0.015	<0.015
Cu ug/l	0.017	0.015	0.012	0.015	0.016								0.036	0.034
Fe mg/l	<0.030	<0.030	<0.030	<0.030	<0.030								<0.030	<0.030
K mg/l	<2.0	<2.0	<2.0	<2.0	<2.0								<2.0	<2.0
Li ug/l	<0.015	<0.015	<0.015	<0.015	<0.015								<0.015	<0.015
Mg mg/l	2.05	1.75	0.749	0.456	1.48								6.05	7.52
Mn mg/l	0.032	0.029	0.013	0.012	0.035								0.083	0.089
Mo ug/l	<0.030	<0.030	<0.030	<0.030	<0.030								<0.030	<0.030
Na mg/l	<2.0	<2.0	<2.0	<2.0	<2.0								<2.0	<2.0
Ni ug/l	<0.020	<0.020	<0.020	<0.020	<0.020								<0.020	<0.020
P ug/l	<0.30	<0.30	<0.30	<0.30	<0.30								<0.30	<0.30
Pb ug/l	<0.050	<0.050	<0.050	<0.050	<0.050								<0.050	<0.050
Sb ug/l	<0.20	<0.20	<0.20	<0.20	<0.20								<0.20	<0.20
Se ug/l	<0.20	<0.20	<0.20	<0.20	<0.20								<0.20	<0.20
Si mg/l	0.541	0.547	0.275	0.169	0.346								0.614	0.679
Sn ug/l	<0.30	<0.30	<0.30	<0.30	<0.30								<0.30	<0.30
Sr ug/l	0.131	0.108	0.047	0.03	0.112								0.393	0.427
Ti ug/l	<0.010	<0.010	<0.010	<0.010	<0.010								<0.010	<0.010
V ug/l	<0.030	<0.030	<0.030	<0.030	<0.030								<0.030	<0.030
Zn ug/l	0.02	0.02	0.016	0.015	0.041								0.078	0.058
pH	7.52	7.64	7.27	6.87	6.66								7.49	7.41
Redox (mV)	309.	290.	301.	297.	290.								320.	307.
Conductivity (uS/cm)	95.	80.	37.	26.	104.								309.	335.
Alkalinity (mg $CaCO_3$/l)	15.	15.	8.	5.	8.								14.	15.
Acidity (pH 4.5)	0.	0.	0.	0.	0.								0.	0.
Acidity (pH 8.3)	3.	6.	2.	4.	4.								6.9	8.9
Cum Acidity (pH 8.3)	1.1	1.3	1.4	1.6	1.8								2.1	2.5
Sulphate (mg/l)	19.	14.	7.	6.	28.								118.	124.
Cum Sulphate (mg/kg)	22.9	23.5	23.8	24.1	25.3								30.2	35.5
Water added (L)	0.2	0.2	0.2	0.2	0.2								0.2	0.2
pH of water added	5.92	5.57	5.66	6.09	5.23								5.93	5.7
Leachate collected (L)	0.177	0.205	0.194	0.219	0.197								0.188	0.198
Cumulative Iron	0.29	0.29	0.29	0.29	0.29								0.29	0.29
Cumulative Copper	194.	194.	194.	194.	194.								194.	194.

Laboratory Equipment Failure
Weeks 21-27
No Samples Collected

Sample SW-1 - Kinetic Test Data

Parameter	Cycle 1	Cycle 2	Cycle 3	Cycle 4	Cycle 5	Cycle 6	Cycle 7	Cycle 8	Cycle 9	Cycle 10	Cycle 11	Cycle 12	Cycle 13	Cycle 14	Cycle 15
Ag ug/l	2.	4.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
Al mg/l	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
As ug/l	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.
B ug/l	20.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.
Ba ug/l	50.	30.	20.	20.	10.	10.	20.	25.	25.	15.	20.	25.	15.	20.	15.
Be ug/l	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
Bi ug/l	6.	6.	2.	2.	2.	2.	2.	2.	2.	2.	8.	2.	2.	2.	2.
Ca mg/l	53.15	45.51	34.83	36.28	31.01	23.67	23.36	24.87	30.06	23.22	23.31	30.56	20.57	22.22	17.45
Cd ug/l	2.	2.	1.	1.	1.	1.	7.	1.	1.	1.	4.	5.	1.	1.	5.
Co ug/l	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.
Cr ug/l	15.	15.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.
Cu ug/l	26.	16.	10.	12.	6.	2.	2.	2.	6.	2.	2.	2.	2.	2.	2.
Fe mg/l	0.08	0.08	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
K mg/l	2.98	2.71	2.19	2.94	2.35	1.69	1.41	1.07	2.17	0.15	1.7	2.14	1.98	1.47	1.28
Li ug/l	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.
Mg mg/l	4.46	3.72	2.5	2.78	2.19	1.24	1.38	1.49	2.02	1.32	1.42	2.38	1.26	1.37	1.02
Mn mg/l	0.04	0.015	0.01	0.015	0.01	0.005	0.005	0.005	0.015	0.005	0.005	0.005	0.005	0.005	0.005
Mo ug/l	102.	84.	50.	62.	44.	26.	22.	32.	32.	14.	32.	32.	10.	26.	20.
Na mg/l	1.57	1.17	0.82	1.01	0.79	0.28	0.47	0.43	0.66	0.36	0.43	0.7	0.41	0.52	0.34
Ni ug/l	10.	10.	5.	10.	5.	5.	5.	5.	5.	5.	5.	15.	5.	5.	5.
P ug/l	120.	140.	40.	150.	100.	90.	180.	140.	130.	100.	140.	180.	50.	140.	80.
Pb ug/l	4.	8.	2.	2.	2.	2.	2.	2.	2.	2.	6.	2.	4.	2.	12.
Sb ug/l	14.	20.	2.	2.	2.	2.	2.	2.	2.	2.	6.	2.	2.	60.	2.
Se ug/l	210.	155.	65.	110.	25.	5.	80.	45.	80.	40.	70.	85.	20.	2.06	35.
Si mg/l	3.69	3.95	3.56	4.88	4.05	1.99	2.6	1.99	3.74	2.51	2.31	2.82	1.93	2.	1.98
Sn ug/l	300.	376.	2.	2.	2.	2.	80.	2.	44.	12.	2.	8.	50.	60.	2.
Sr ug/l	194.	166.	104.	110.	82.	56.	62.	68.	88.	56.	60.	78.	48.	2.	38.
Ti ug/l	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.
V ug/l	5.	6.	1.	1.	1.	1.	1.	1.	1.	1.	2.	1.	1.	1.	1.
Zn ug/l	27.	9.	7.	7.	4.	8.	4.	9.	1.	1.	7.	3.	11.	1.	4.
pH	7.65	7.73	7.87	7.91	8.04	7.65	7.69	7.66	8.	7.78	7.85	7.75	7.62	7.74	7.54
Redox (mV)	287.	265.	280.	305.	296.	302.	320.	317.	309.	260.	251.	241.	233.	233.	278.
Conductivity (uS/cm)	266.	231.	167.	174.	144.	95.	92.	105.	125.	84.	94.	138.	78.	84.	65.
Alkalinity (mg $CaCO_3$/l)	34.	29.	27.	37.	35.	21.	23.	18.	34.	26.	26.	26.	20.	22.	14.
Acidity (pH 4.5)	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Acidity (pH 8.3)	0.5	2.	1.	2.	1.	0.5	2.	1.	1.	1.	1.	2.	2.	2.	4.
Cum Acidity (pH 8.3)	0.	0.1	0.2	0.2	0.2	0.2	0.3	0.3	0.4	0.4	0.5	0.6	0.6	0.7	0.9
Sulphate (mg/l)	77.	60.	32.	30.	24.	12.	11.	20.	14.	8.	11.	25.	8.	9.	6.
Cum Sulphate (mg/kg)	3.9	6.7	8.2	8.2	8.2	8.8	9.3	10.3	10.7	11.1	11.6	12.9	13.2	13.6	13.9
Water added (L)	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
pH of water added	5.45	6.26	5.98	5.59	6.15	6.03	5.83	5.98	6.15	6.05	5.96	6.04	6.06	6.56	6.23
Leachate collected (L)	0.166	0.207	0.157	0.128	0.181	0.168	0.188	0.194	0.162	0.209	0.198	0.206	0.179	0.186	0.206
Cumulative Iron	0.08	0.16	0.17	0.18	0.19	0.2	0.21	0.22	0.23	0.24	0.25	0.26	0.27	0.28	0.29
Cumulative Copper	26.	42.	52.	64.	70.	72.	74.	76.	82.	84.	86.	88.	90.	92.	94.

Sample SW-1 - Kinetic Test Data

Parameter	Cycle 16	Cycle 17	Cycle 18	Cycle 19	Cycle 20	Cycle 21	Cycle 22	Cycle 23	Cycle 24	Cycle 25	Cycle 26	Cycle 27	Cycle 28	Cycle 29
Ag ug/l	<0.015	<0.015	<0.015	<0.015	<0.015								<0.015	<0.015
Al mg/l	<0.20	<0.20	<0.20	<0.20	<0.20								<0.20	<0.20
As ug/l	<0.20	<0.20	<0.20	<0.20	<0.20								<0.20	<0.20
B ug/l	<0.10	<0.10	<0.10	<0.10	<0.10								<0.10	<0.10
Ba ug/l	0.018	0.014	<0.010	0.012	0.013								0.021	0.021
Be ug/l	<0.005	<0.005	<0.005	<0.005	<0.005								<0.005	<0.005
Bi ug/l	<0.10	<0.10	<0.10	<0.10	<0.10								<0.10	<0.10
Ca mg/l	10.9	8.36	6.44	7.72	4.2								7.65	7.26
Cd ug/l	<0.010	<0.010	<0.010	<0.010	<0.010								<0.010	<0.010
Co ug/l	<0.015	<0.015	<0.015	<0.015	<0.015								<0.015	<0.015
Cr ug/l	<0.015	<0.015	<0.015	<0.015	<0.015								<0.015	<0.015
Cu ug/l	0.011	<0.010	<0.010	0.01	<0.010								0.011	0.012
Fe mg/l	<0.030	<0.031	<0.032	<0.033	<0.034								<0.035	<0.036
K mg/l	<2.0	<2.1	<2.2	<2.3	<2.4								<2.5	<2.6
Li ug/l	<0.015	<0.016	<0.017	<0.018	<0.019								<0.020	<0.021
Mg mg/l	1.14	0.766	0.636	0.782	0.414								0.851	0.775
Mn mg/l	<0.005	<0.005	0.005	0.006	0.007								0.022	0.013
Mo ug/l	<0.030	<0.031	<0.032	<0.033	<0.034								<0.035	<0.036
Na mg/l	<2.0	<2.1	<2.2	<2.3	<2.4								<2.5	<2.6
Ni ug/l	<0.020	<0.020	<0.020	<0.020	<0.020								<0.020	<0.020
P ug/l	<0.30	<0.30	<0.30	<0.30	<0.30								<0.30	<0.30
Pb ug/l	<0.050	<0.050	<0.050	<0.050	<0.050								<0.050	<0.050
Sb ug/l	<0.20	<0.20	<0.20	<0.20	<0.20								<0.20	<0.20
Se ug/l	<0.20	<0.20	<0.20	<0.20	<0.20								<0.20	<0.20
Si mg/l	1.99	1.33	1.25	1.38	0.705								0.581	0.928
Sn ug/l	<0.30	<0.31	<0.32	<0.33	<0.34								<0.35	<0.36
Sr ug/l	0.055	0.044	0.034	0.039	0.026								0.037	0.035
Ti ug/l	<0.010	<0.010	<0.010	<0.010	<0.010								<0.010	<0.010
V ug/l	<0.030	<0.030	<0.030	<0.030	<0.030								<0.030	<0.030
Zn ug/l	0.006	0.005	0.007	0.008	0.011								0.026	0.014
pH	7.79	7.64	7.55	7.44	6.54								7.2	7.32
Redox (mV)	261.	280.	283.	274.	260.								298.	277.
Conductivity (uS/cm)	73.	53.	40.	51.	27.								55.	49.
Alkalinity (mg $CaCO_3$/l)	13.	13.	16.	15.	9.								4.	4.
Acidity (pH 4.5)	0.													
Acidity (pH 8.3)	3.	3.	5.	5.	5.								10.9	11.9
Cum Acidity (pH 8.3)	1.	1.2	1.4	1.6	1.9								2.3	3.
Sulphate (mg/l)	5.	4.	4.	6.	4.								11.	6.
Cum Sulphate (mg/kg)	14.1	14.3	14.5	14.7	14.9								15.4	15.7
Water added (L)	0.2	0.2	0.2	0.2	0.2								0.2	0.2
pH of water added	5.92	5.57	5.66	6.09	5.23								5.93	5.7
Leachate collected (L)	0.171	0.178	0.188	0.177	0.211								0.175	0.22
Cumulative Iron	0.29	0.29	0.29	0.29	0.29								0.29	0.29
Cumulative Copper	94.	94.	94.	94.	94.								94.	94.

Laboratory Equipment Failure
Weeks 21-27
No Samples Collected

Sample PW-2 - Kinetic Test Data

Parameter	Cycle 1	Cycle 2	Cycle 3	Cycle 4	Cycle 5	Cycle 6	Cycle 7	Cycle 8	Cycle 9	Cycle 10	Cycle 11	Cycle 12	Cycle 13	Cycle 14	Cycle 15
Ag ug/l	36.	3.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
Al mg/l	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
As ug/l	30.	20.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.
B ug/l	10.	20.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.
Ba ug/l	110.	75.	25.	45.	15.	60.	25.	25.	25.	30.	35.	60.	30.	35.	35.
Be ug/l	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
Bi ug/l	26.	42.	2.	2.	2.	2.	2.	2.	2.	2.	8.	8.	2.	2.	16.
Ca mg/l	30.55	33.63	9.45	11.3	3.49	12.99	4.86	4.17	3.87	4.01	5.17	5.19	4.91	4.48	7.33
Cd ug/l	26.	25.	12.	1.	1.	8.	7.	7.	1.	1.	4.	1.	4.	1.	1.
Co ug/l	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.
Cr ug/l	5.	10.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.
Cu ug/l	302.2	280.	67.4	63.4	23.6	83.8	31.4	28.	42.4	43.6	62.6	81.8	59.8	69.	102.2
Fe mg/l	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
K mg/l	5.11	5.88	1.53	2.22	0.3	2.22	0.58	0.62	0.01	0.4	1.42	1.26	1.61	1.46	1.51
Li ug/l	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.
Mg mg/l	1.6	2.03	0.44	0.52	0.11	0.58	0.18	0.15	0.13	0.13	0.27	0.26	0.19	0.22	0.37
Mn mg/l	0.1	0.145	0.045	0.055	0.02	0.07	0.03	0.02	0.025	0.03	0.035	0.04	0.035	0.035	0.065
Mo ug/l	24.	14.	8.	10.	2.	6.	2.	2.	2.	2.	6.	4.	2.	4.	6.
Na mg/l	1.29	1.64	0.38	0.55	0.06	0.56	0.18	0.16	0.12	0.13	0.23	0.2	0.2	0.39	0.33
Ni ug/l	5.	10.	5.	5.	5.	5.	5.	5.	5.	5.	5.	10.	5.	5.	5.
P ug/l	70.	80.	10.	10.	30.	30.	20.	30.	10.	10.	40.	10.	10.	10.	70.
Pb ug/l	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	28.	8.	2.	2.	2.
Sb ug/l	2.	16.	2.	2.	2.	2.	2.	2.	2.	2.	8.	2.	2.	2.	2.
Se ug/l	120.	125.	5.	5.	5.	5.	5.	5.	25.	10.	45.	5.	5.	10.	5.
Si mg/l	7.32	9.68	2.54	4.08	1.	4.73	1.54	1.42	1.4	1.46	1.76	1.79	1.28	1.41	1.71
Sn ug/l	2.	328.	88.	2.	2.	2.	2.	2.	58.	50.	2.	2.	34.	12.	2.
Sr ug/l	98.	114.	18.	20.	2.	30.	8.	10.	8.	6.	14.	12.	8.	10.	14.
Ti ug/l	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.
V ug/l	1.	3.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
Zn ug/l	473.	492.	114.	126.	43.	176.	58.	51.	3.	1.	66.	96.	68.	64.	145.
pH	6.52	5.87	5.99	5.9	6.42	6.1	6.03	6.26	6.43	6.31	6.14	6.1	6.14	6.13	5.95
Redox (mV)	367.	332.	306.	321.	281.	335.	310.	316.	362.	297.	315.	307.	312.	315.	352.
Conductivity (uS/cm)	169.	193.	51.	57.	19.	63.	23.	17.	20.	21.	28.	29.	25.	27.	39.
Alkalinity (mg $CaCO_3$/l)	7.	3.	2.	3.	3.	2.	3.	2.	3.	3.	2.	2.	2.	2.	3.
Acidity (pH 4.5)	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Acidity (pH 8.3)	8.	9.	4.	4.	3.	3.	2.	2.	2.	2.9	2.9	2.9	3.	3.	4.
Cum Acidity (pH 8.3)	0.4	0.9	1.	1.2	1.3	1.5	1.6	1.7	1.7	1.9	2.1	2.2	2.4	2.5	2.7
Sulphate (mg/l)	59.	66.	13.	15.	7.	15.	6.	5.	5.	5.	7.	7.	4.	6.	10.
Cum Sulphate (mg/kg)	2.6	6.3	6.9	7.4	7.7	8.4	8.7	9.	9.2	9.5	9.9	10.3	10.4	10.7	11.3
Water added (L)	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
pH of water added	5.45	6.26	5.98	5.59	6.15	6.03	5.83	5.98	6.15	6.05	5.96	6.04	6.06	6.56	6.23
Leachate collected (L)	0.166	0.207	0.157	0.128	0.181	0.168	0.188	0.194	0.162	0.209	0.198	0.206	0.179	0.186	0.206
Cumulative Iron	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09	0.1	0.11	0.12	0.13	0.14	0.15
Cumulative Copper	302.2	582.2	649.6	713.	736.6	820.4	851.8	879.8	922.2	965.8	1,028.4	1,110.2	1,170.	1,239.	1,341.2

Sample PW-2 - Kinetic Test Data

Parameter	Cycle 16	Cycle 17	Cycle 18	Cycle 19	Cycle 20	Cycle 21	Cycle 22	Cycle 23	Cycle 24	Cycle 25	Cycle 26	Cycle 27	Cycle 28	Cycle 29
Ag ug/l	<0.015	<0.015	<0.015	<0.015	<0.015								<0.015	<0.015
Al mg/l	<0.20	<0.20	<0.20	<0.20	<0.20								<0.20	<0.20
As ug/l	<0.20	<0.20	<0.20	<0.20	<0.20								<0.20	<0.20
B ug/l	<0.10	<0.10	<0.10	<0.10	<0.10								<0.10	<0.10
Ba ug/l	0.014	0.015	0.011	0.012	0.015								0.025	0.035
Be ug/l	<0.005	<0.005	<0.005	<0.005	<0.005								<0.005	<0.005
Bi ug/l	<0.10	<0.10	<0.10	<0.10	<0.10								<0.10	<0.10
Ca mg/l	1.06	1.09	0.51	0.548	0.761								1.02	2.02
Cd ug/l	<0.010	<0.010	<0.010	<0.010	<0.010								<0.010	<0.010
Co ug/l	<0.015	<0.015	<0.015	<0.015	<0.015								<0.015	<0.015
Cr ug/l	<0.015	<0.015	<0.015	<0.015	<0.015								<0.015	<0.015
Cu ug/l	28.1	24.4	16.5	16.4	17.								22.	32.
Fe mg/l	<0.030	<0.030	<0.030	<0.030	<0.030								<0.030	<0.030
K mg/l	<2.0	<2.0	<2.0	<2.0	<2.0								<2.0	<2.0
Li ug/l	<0.015	<0.015	<0.015	<0.015	<0.015								<0.015	<0.015
Mg mg/l	0.097	0.101	0.054	<0.050	0.093								0.086	0.188
Mn mg/l	0.02	0.021	0.013	0.017	0.019								0.03	0.044
Mo ug/l	<0.030	<0.030	<0.030	<0.030	<0.030								<0.030	<0.030
Na mg/l	<2.0	<2.0	<2.0	<2.0	<2.0								<2.0	<2.0
Ni ug/l	<0.020	<0.020	<0.020	<0.020	<0.020								<0.020	<0.020
P ug/l	<0.30	<0.30	<0.30	<0.30	<0.30								<0.30	<0.30
Pb ug/l	<0.050	<0.050	<0.050	<0.050	<0.050								<0.050	<0.050
Sb ug/l	<0.20	<0.20	<0.20	<0.20	<0.20								<0.20	<0.20
Se ug/l	<0.20	<0.20	<0.20	<0.20	<0.20								<0.20	<0.20
Si mg/l	0.685	0.991	0.377	0.458	0.567								0.364	0.686
Sn ug/l	<0.30	<0.30	<0.30	<0.30	<0.30								<0.30	<0.30
Sr ug/l	0.008	0.009	0.006	<0.001	0.011								0.007	0.013
Tl ug/l	<0.010	<0.010	<0.010	<0.010	<0.010								<0.010	<0.010
V ug/l	<0.030	<0.030	<0.030	<0.030	<0.030								<0.030	<0.030
Zn ug/l	0.038	0.04	0.023	0.027	0.04								0.058	0.077
pH	6.23	6.4	6.17	6.19	5.35								6.31	6.03
Redox (mV)	327.	326.	316.	308.	294.								340.	332.
Conductivity (uS/cm)	32.	12.	6.	6.	8.								11.	19.
Alkalinity (mg $CaCO_3$/l)	3.	3.	3.	2.	1.								2.	2.
Acidity (pH 4.5)	0.	0.	0.	0.	0.								0.	0.
Acidity (pH 8.3)	2.	2.	3.	4.	6.								11.9	11.9
Cum Acidity (pH 8.3)	2.9	3.	3.1	3.3	3.7								4.3	5.
Sulphate (mg/l)	3.	3.	3.	4.	4.								3.	4.
Cum Sulphate (mg/kg)	11.5	11.6	11.8	12.	12.2								12.4	12.6
Water added (L)	0.2	0.2	0.2	0.2	0.2								0.2	0.2
pH of water added	5.92	5.57	5.66	6.09	5.23								5.93	5.7
Leachate collected (L)	0.171	0.178	0.188	0.177	0.211								0.175	0.22
Cumulative Iron	0.15	0.15	0.15	0.15	0.15								0.15	0.15
Cumulative Copper	1,369.3	1,393.7	1,410.2	1,426.6	1,443.6								1,465.6	1,497.6

Laboratory Equipment Failure
Weeks 21-27
No Samples Collected

Appendix B

Tailings Characterization

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APPENDIX B

GEOCHEMICAL CHARACTERIZATION OF TAILINGS

1.0 TESTING PROGRAM

Tailings from previous mining operations at the Copper Flat project were sampled on two occasions. In conjunction with piezometer installation, two tailings samples were recovered with a split spoon sample in 1994 (T-10-12 and T-5-7). In 1996, five test pits were excavated in the existing impoundment and an additional 11 samples were obtained.

Tailings samples were analyzed for paste pH and conductivity values, and by Acid Base Accounting tests. Results are listed in Table 1.1. The tailings collected in 1996 are grouped according to their appearance in hand specimen. Yellow tailings are assumed to be derived from oxidized or transition materials and are given the label TTLS (transition tailings) while fresh gray tailings that are assumed to have been derived from unoxidized quartz monzonite are labeled UTLS (unoxidized tailings). Black tailings (BTLS) are assumed to be derived from biotite breccia.

The tailings samples are not currently generating acid. Paste pH values for all samples were all above 6.1. Paste conductivity was low and ranged from 298 to 686 μS/cm. On the basis of the paste results, the current reactivity of the existing tailings is low.

Based on ABA results, sulfide sulfur contents averaged 0.72 for the transition tailings and 0.95 for the unoxidized tailings collected in 1996. Based on sulfide sulfur content, five of the samples had NP:AP ratios below 1, indicating that these samples have moderate potential to produce acidity. All other samples show a weak acid producing potential.

The decrease in acid generating potential relative to waste rock samples (i.e. higher NP:AP ratios) is likely a result of sulfide removal during the concentration process. The tailings show no increase in neutralization potential relative to the waste rock samples, indicating that lime added during processing has little impact on the chemistry of the tailings.

Sample T-10-12 was analyzed for total metals concentrations using the EPA 3051 digestion and analysis by ICP. Results, listed in Table 1.2, indicate the sample had high concentrations of aluminum (2,700 ppm), copper (1,600 ppm), iron (19,000), magnesium (1,800 ppm), potassium (1.400 ppm), and zinc (418 ppm). However, results of a modified EPA method 1312 leach indicated that these metals are not easily leached. These results confirm the limited oxidation that has occurred in the tailings, as indicated by the low paste conductivity. Therefore, the color of the tailings exhibited in drill hole and test pit samples is believed to be a result of the source of the materials. The designation of “transition” or “unoxidized” refers only to the nature of the ore from which the tailings were produced.

2.0 CHARACTERISTICS AND BEHAVIOR OF FUTURE TAILINGS

The majority of future ore will be unoxidized quartz monzonite, biotite breccia, and quartz breccia. Future tailings are anticipated to have geochemical properties similar to the UTLS tailings samples shown in Table 1.1. While a potential for acid generation is indicated, no evidence of acid generation was observed following 14 years of weathering under field conditions. Future tailings are anticipated to be equally slow in generating acid and releasing metals.

Table B.1.1
Tailings Geochemical Analysis - 1994 and 1996 Samples

Sample ID	pH (S.U.)	Paste Conductivity (µS/cm)	Sulfur Total (%)	Sulfur Sulfate (%)	Sulfur Sulfide (%)	Sulfur Pyrite (%)	Neutralization Potential (T/KT)	AP (sulfide) (T/KT)	NNP (sulfide) (T/KT)	NP/AP (sulfide)	AP (pyrite) (T/KT)	NNP (pyrite) (T/KT)	NP/AP (pyrite)
Transition Tailings													
P1-TTLS	6.6	466	1.12	0.47	0.65	0.58	36.00	20.31	15.69	1.77	18.13	17.88	1.99
P2-TTLS	7.1	483											
P3-TTLS	7.3	628	1.16	0.52	0.64	0.31	17.00	20.00	-3.00	0.85	9.69	7.31	1.75
P4-TTLS	7.3	651	1.31	0.45	0.86	0.54	27.00	26.88	0.12	1.00	16.88	10.13	1.60
P5-TTLS	7.5	547											
Mean	7.2	555	1.20	0.48	0.72	0.48	26.67	22.40	4.27	1.21	14.90	11.77	1.78
Unoxidized Tailings													
P1-TLS@12"	6.2	486	0.79	0.13	0.66	0.45	26.00	20.63	5.38	1.26	14.06	11.94	1.85
P1-UTLS	6.8	686	1.3	0.25	1.05	0.6	25.00	32.81	-7.81	0.76	18.75	6.25	1.33
P2-UTLS	7.7	643	1.15	0.19	0.96	0.75	25.00	30.00	-5.00	0.83	23.44	1.56	1.07
P3-UTLS	7.6	352											
P4-UTLS	7.2	357											
P5-UTLS	7.6	455	1.19	0.08	1.11	0.72	31.00	34.69	-3.69	0.89	22.50	8.50	1.38
Mean	7.2	497	1.11	0.16	0.95	0.63	26.75	29.53	-2.78	0.94	19.69	7.06	1.41
Black Tailings													
P5-BTLS	7.8	298	0.92	0.27	0.65	0.3	35.00	20.31	14.69	1.72	9.38	25.63	3.73
1994 Tailings Samples													
T-10-12	7.8		1.26	0.03	1.23	0.68	24	38.44	-14.44	0.62	21.25	2.75	1.13
T-5-7	7.5		1.1	0.18	0.92	0.53	31	28.75	2.25	1.08	16.56	14.44	1.87
Mean	7.7		1.18	0.11	1.08	0.61	27.50	33.59	-6.09	0.85	18.91	8.59	1.50

Notes:
Sulfide sulfur equals total sulfur minus sulfate sulfur
NNP equals net neutralization potential (NP-AP)

Table B.1.2
Total and Extractable Metals Concentrations in Tailings

Parameters	Total Metals in Solids ICP ppm	Extractable Metals EPA 1312 (mg/L)
Aluminum	2700	< 0.05
Antimony	< 0.5	N/A
Arsenic	1.3	< 0.1
Barium	52	0.10
Boron	< 2	0.07
Cadmium	1.8	< 0.005
Calcium	8500	300
Chloride	N/A	6
Chromium	5	< 0.01
Cobalt	13	< 0.02
Copper	1600	0.03
Fluoride	N/A	1.4
Iron	19000	< 0.02
Lead	15	< 0.021
Magnesium	1800	22
Manganese	251	1.50
Mercury	< 0.02	< 0.0002
Molybdenum	34	0.19
Nickel	3	< 0.02
Potassium	1400	44
Selenium	< 0.03	< 0.1
Silver	< 1	< 0.01
Sodium	200	44
Sulfate	N/A	940
Vanadium	7	< 0.01
Zinc	418	0.42

Appendix C

Field Scale Reclamation Cover Test Program

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MEMORANDUM

TO: Jeff Parshley, SRK - Reno

FROM: Pete Kowalewski, SRK - Denver

DATE: April 27, 1998

SUBJECT: **Copper Flat Closure Field Testing Program**

PROJ/PROP NO. **68606**

1.0 INTRODUCTION

In accordance with Item 23 of the Conditions for Approval of DP-001, Alta Gold Corporation (Alta) will conduct long term field testing of alternative soil covers to aid in the selection of cover designs for the tailings impoundment and waste rock dumps at the Copper Flat site. In addition to aiding in the selection of the most appropriate soil cover for the tailings and waste rock at the Copper Flat site, the field testing will provide for evaluation of several other issues at the Copper Flat site, including: acid generation potential, phytotoxicity and ecological risk, and the ability to successfully revegetate the alternative soil covers. The following is a conceptual plan detailing the proposed field testing to be performed after the commencement of operations at the site.

2.0 FIELD COVER TESTING

2.1 Test Cell Composition

The field testing will consist of a series of constructed test plots. Alternative covers will be tested over both tailings and, potentially, three different types of waste rock (unoxidized, transitional, and low sulfide), as cover performance and revegetative success may be influenced by the underlying waste material being covered (i.e. fine-grained tailings versus coarse-grained waste rock). Table 1 presents a matrix of all of the combinations of alternative soil covers and underlying waste materials that will be tested in the program.

Table 1. Matrix of Soil Cover and Underlying Waste Materials for Field Testing Program

Soil Cover	Underlying Waste Type			
	Tailings	Unoxidized Waste	Transitional Waste	Low Sulfide Waste
Control (No Cover)	x[2]	x[2]	x[3]	x[3]
12" Alluvium	x[2]	x[2]	x[3]	x[3]
24" Alluvium	x[2]	x[2]	x[3]	x[3]
24" Alluvium / Amended Tailings (Harrowed)[1]	x[2]	x[2]	x[3]	x[3]

Notes:
(1) Amendment of tailings may be achieved by blending lime, limestone, or a soil with high neutralizing potential, if necessary. Alluvium may provide some neutralizing potential for the tailings.
(2) Test cell will be monitored for surface water runoff, percolation, and moisture content
(3) Test cell will be monitored for surface water runoff and percolation only

As can be seen from Table 1, a total of 16 test cells are proposed for the field testing program. Eight of the 16 test plots will be instrumented to quantify runoff and percolation through the cover system only, while runoff, percolation, and moisture content will be measured in the remaining 8 test cells.

2.2 *Test Plot Design*

Figures 1 through 3 show conceptual plans for an individual test plot. Each test plot will have an area of approximately 300 square feet. Various covers will be placed over a minimum of 10 feet of tailings or waste rock. Both the bottom and surface of each cell will be graded to allow concentration of flow at central collection points on the cell floor and surface. A berm may be constructed on the surface of each plot to facilitate the concentration of surface flows. Grading of the floor of each cell will facilitate concentration of flow into a perforated pipe. Flows will be collected in pipes and routed to collection tanks for measurement of surface runoff and percolation, respectively.

2.3 *Test Plot Instrumentation*

The test plot will be instrumented to quantify surface runoff from the test plot, percolation occurring through the test plot, and moisture content within the soil profile. Surface runoff will be collected from the test plot and routed to a collection tank for measurement. Percolation occurring through the test plot will be routed to a collection tank as well, where it will be measured. The measurement of surface runoff will be performed after each rainfall at the site, while percolation measurement will be made at least once per week during the testing period. The frequency of recording both percolation and runoff measurement may be increased during wet periods.

Moisture content profiling of the test cells may be performed manually through the use of a nuclear moisture gauge or moisture probe, or in an automated fashion using moisture probes buried at various depths connected to a datalogger. Regardless of the method by which moisture profile data is collected, data will be collected from a minimum of 5 pre-determined depths at least once a week for each test cell identified in Table 1 as requiring moisture profiling.

2.4 Weather Station Instrumentation

A weather station will be installed that is capable of measuring the following parameters: daily precipitation, maximum and minimum daily air temperature, daily maximum and minimum relative humidity, average daily wind speed, wind direction, and average daily incoming solar radiation. It is envisioned that data collection will be automated through the use of a datalogger to facilitate acquisition.

Daily evaporation will be measured through use of a National Weather Service Class A type evaporation pan. Measurements will be made by mine personnel.

2.5 Leachate Quality Testing

Leachate from the cover test plots will be analyzed to evaluate the geochemical behavior of the underlying materials. The first sample of leachate from each cell will be analyzed for pH, alkalinity/acidity, conductivity, sulfate, Eh, as well as a full range of dissolved metals, major cations and major anions. Thereafter, full chemical analyses will be repeated on an annual basis. During the course of testing, pH, alkalinity/acidity, and sulfate analyses will be performed at any point when there is sufficient leachate available for analysis. If leachate is consistently available (minimum volume of 1 liter), this sampling will be conducted quarterly.

2.6 Test Cell Bio-assay

Several tests will be required to assess the revegetative success of the test cells and the ecological risk posed by the uptake or fixation of heavy metals by roots and heavy metal accumulation in plant tissue. The testing proposed for this area of work includes: a random survey to assess live plant cover and total cover (live plant and litter), soil pH, total metals concentration of plant tissue and roots, soil organic matter content, total and plant available nitrogen, and soil fertility (includes analyses for phosphorous, magnesium, and potassium).

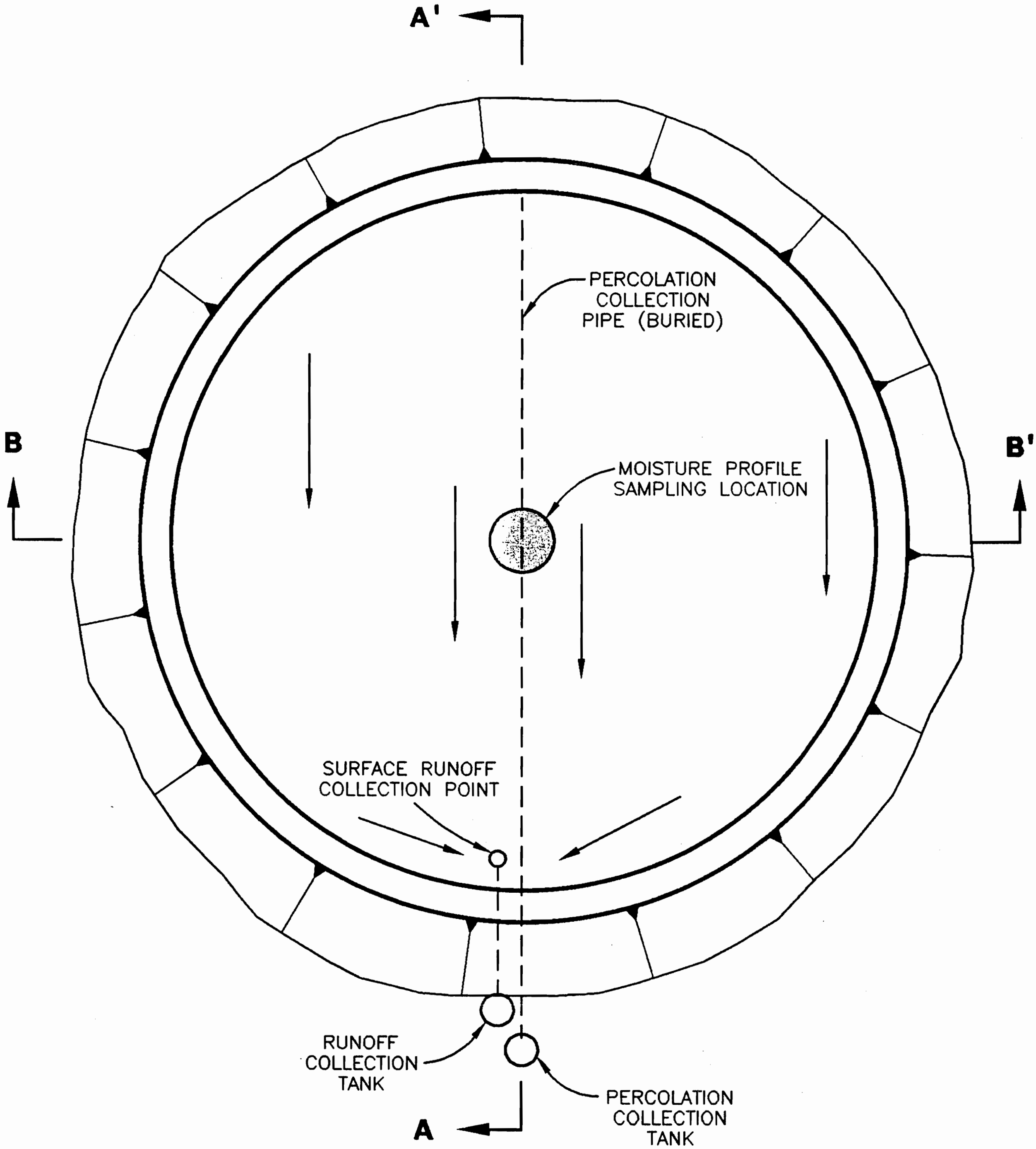
Testing of the plant matter and soil from the field test cells will be conducted once per year, preferably toward the end of the growing season. Samples will be taken from each test cell and send to a certified laboratory to perform the tests mentioned above. A visual survey of each test cell will be conducted toward the end of each growing season to assess the live plant cover and total cover available at each test cell.

2.7 Data Collection

All data collected manually will be recorded in a log book kept on site. Data gathered electronically will be downloaded from the recording device (or devices) and transferred to a diskette. Printed output of the electronic data (hard copies) will be kept in a file on site. Copies of the diskette may be archived for future reference.

3.0 ADDITIONAL TESTING FOR REVEGETATIVE SUCCESS

In addition to sampling the revegetated test cells, test plots will be established on the alluvium stockpiles to assess the ability to revegetate based on slope and aspect as well as seed mixture. The alluvium stockpile test plots will be tested in a manner consistent with the testing of the field test cells. At the commencement of the field testing, a soil sample will be taken from an adjacent area not impacted by mining, and a full suite of soil analyses will be conducted to determine the naturally occurring soil conditions.



NOTE:

1. CELL WILL NOT NECESSARILY BE CIRCULAR IN PLAN; CELL MAY BE SQUARE OR RECTANGLE, WITH MINIMUM SIDE LENGTH TO DEPTH RATIO OF 2:1.

* STA.#2 * J:\0686\68606\FIG01.DWG.DWG * NOV 23, 1998 * 3:19:51 PM *

STEFFEN ROBERTSON & KIRSTEN (U.S.)
Consulting Engineers & Scientists

PROJECT NO.	DATE	REVISION
68606	01/98	A

FIGURE 1

TEST CELL CONCEPTUAL DESIGN
PLAN VIEW

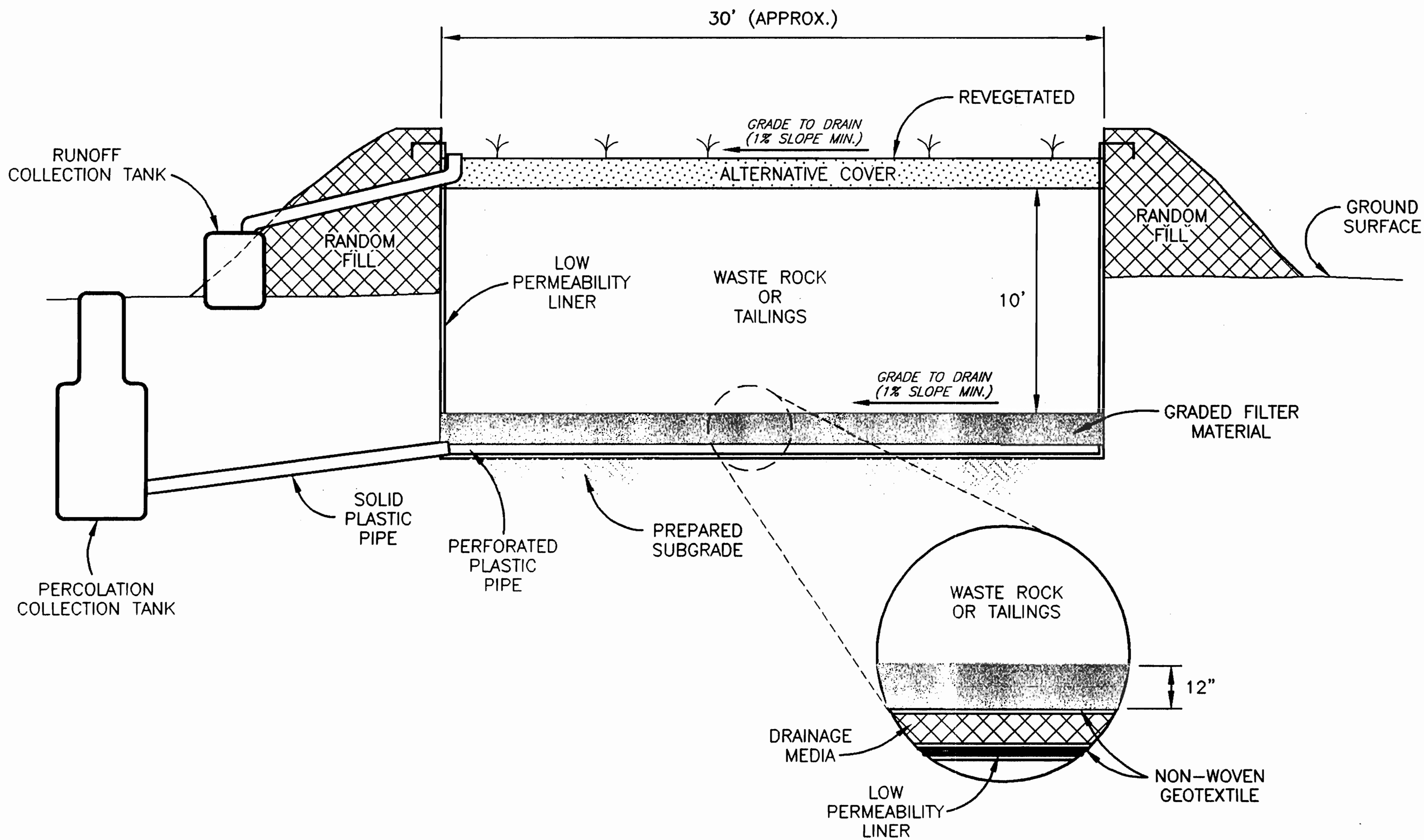


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FIGURE 2

TEST CELL CONCEPTUAL DESIGN
SECTION A–A'

* STA.#2 * J:\0686\68606\FIG03.DWG.DWG * NOV 23, 1998 * 3:21:19 PM *

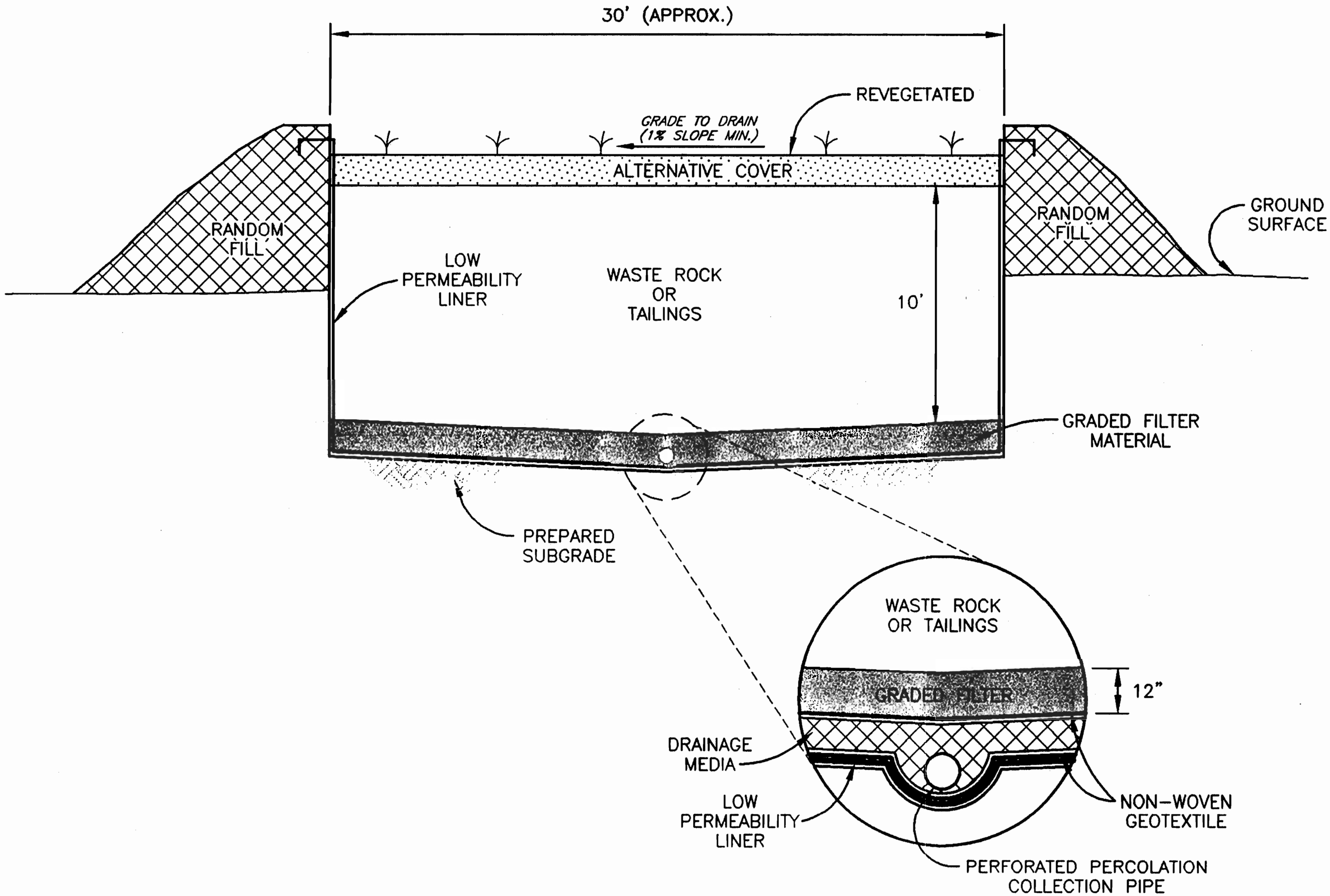

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FIGURE 3

TEST CELL CONCEPTUAL DESIGN
SECTION B–B'

APPENDIX D

Tailings Impoundment

Conceptual Design Report (Golder, 2010)

Borrow Sources and Stockpile Evaluations

REPORT

COPPER FLAT PROJECT

Conceptual Design Report

Submitted To: New Mexico Copper Corporation
Suite 100 - 2425 San Pedro Dr. NE
Albuquerque, NM 87110

Submitted By: Golder Associates Inc.
4730 N. Oracle Road
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Tucson, AZ, 85705 USA

Distribution:
1 Electronic Copy – New Mexico Copper Corporation
1 Copy – Golder Associates

November 17, 2010 **103-92557**

02062

EXECUTIVE SUMMARY

Copper Flat is a porphyry copper mine that was briefly operated by Quintana Minerals Corp. (Quintana) in 1981 and 1982. After approximately 1 year of operation, mining was halted due to depressed copper prices, and the facility was decommissioned. New Mexico Copper Corporation (NMCC) has acquired an option on the Copper Flat property and is evaluating resuming mining and milling operations. Based on a recent NI 43-101 compliant preliminary economic assessment (PEA, [SRK, 2010]), the ore reserve has been increased from the 60 million tons identified by Quintana, to approximately 100 million tons. Ore will be mined at a rate of 17,500 tons per day (tpd). This report presents the conceptual design of a tailings storage facility (TSF) capable of supporting tailings disposal for the currently identified ore reserve.

During the 1981-82 operating period, high concentrations of total dissolved solids and sulfate were detected in groundwater immediately downgradient from the existing Quintana TSF. Local seepage of contaminated groundwater, which has been attributed to the existence of permeable geologic units in the TSF foundation, allowed process water and tailings seepage to migrate from the impoundment. Existing tailings are now drained and lie above the local groundwater table, however, leaching by meteoric water potentially contributes additional sulfate and dissolved solids to groundwater. Impacted groundwater and tailings from the 1981-82 operations are the subject of ongoing abatement actions. Groundwater compliance issues associated with the Quintana operation have led NMCC to propose construction of a lined TSF for future operations.

The starter dam from the earlier operations remains in place, however, in order to provide the required increase in storage capacity, while limiting future dam height and maintaining gravity delivery of tailings, the facility will be expanded approximately 1,000 feet to the east. It is assumed that the existing starter dam will be used as a borrow source for new embankment construction.

Approximately 1.2 million tons of tailings were placed in the north disposal cell prior to the suspension of operations in 1982. It is assumed that future TSF construction will require the incorporation of measures to mitigate potential groundwater impacts from existing tailings in order to meet groundwater contamination abatement actions. Several options for the management of existing tailings have been considered at a preliminary level. These include:

- Capping existing tailings in-place beneath a low permeability cover such as a geomembrane or composite cover;
- Utilize existing tailings as fine grained bedding fill for the future TSF geomembrane liner; and
- Place existing tailings inside the new TSF on top of the new geomembrane liner.

All options are considered to provide similar benefits relative to mitigating groundwater impacts associated with existing tailings.

The method of tailings embankment construction selected by Quintana was upstream raise construction with peripheral discharge of spigotted whole tailings. The proposed method of construction for the new TSF is by centerline raises with cycloned tailings sand. The tailings surface will rise approximately 80 feet in the first two years of operation. Centerline raising with cycloned sand was selected as the construction method because as a general rule, the tailings rate of rise should be less than 10 feet per year for upstream construction. NMCC's ability to develop a drained and consolidated foundation suitable for upstream raise construction using peripherally spigotted discharge of whole tailings is questionable due to the high rate of rise, which will not drop below 10 feet per year in the first 5 years of operation.

Initial construction will include a toe berm to buttress the tailings embankment and a starter dam for placement of the tailings header line and cyclones. Sand (cyclone underflow) will be placed on the embankment while the tailings slimes (cyclone overflow) will be discharged to the impoundment interior. The TSF geomembrane liner will be placed beneath the starter dam and anchored on the crest of the toe berm. An underdrain system consisting of a filter compatible soil and drainage collection pipes will be placed on top of the geomembrane liner, beneath the sand dam footprint, to facilitate drainage and consolidation of the cycloned sand. The underdrain system will extend into the impoundment interior in the area that will underlie the free water pond. Underdrainage will be routed to a lined underdrain collection pond located downstream of the toe berm.

The TSF can be constructed in a phased manner. During initial construction phases, diversion ditches can be constructed to divert stormwater from upstream catchment areas within the area contributory to the impoundment. The contributory area is approximately equivalent to the ultimate TSF footprint as only minor peripheral areas drain into the TSF. At final buildout, there is minimal potential for surface water runon from external areas. Throughout most of the life of the facility, stormwater management requirements will be limited to direct precipitation.

A review of available aerial photographs indicates no human habitations adjacent to the drainages below the proposed TSF. Based on the rules and regulations of the New Mexico State Engineer, the Copper Flat TSF would be classified as a large dam having significant hazard potential. The impoundment will be required to contain the equivalent of 75 percent of the probable maximum precipitation (PMP) during operations. A spillway capable of passing 75 percent of the PMP will be required upon closure.

Geotechnical investigation (SHB, 1980) of the existing TSF area was extensive, however, a portion of new TSF will occupy ground that has not been evaluated for geotechnical and hydrogeological conditions. A preliminary site investigation plan is presented in this conceptual design report.

Table of Contents

List of Drawings

1.0 INTRODUCTION

1.1 Scope of Work

New Mexico Copper Corporation (NMCC) has acquired an option on the Copper Flat property, located near Hillsboro in Sierra County, New Mexico. Copper Flat is a porphyry copper deposit that was briefly mined by Quintana Resources in 1981 and 1982 before depressed copper prices forced the suspension of mining and milling operations. During the Quintana operation, the identified ore reserve was approximately 60 million tons. Further drilling completed since cessation of mining operations has increased the ore reserve from 60 million to approximately 100 million tons. NMCC has commissioned Golder Associates Inc. (Golder) to develop the conceptual design of a new tailings storage facility (TSF) capable of containing tailings from the expanded mining operation. Conceptual design of the new TSF, as well as plans for geotechnical investigation of the expanded TSF footprint and fulfilling data collection requirements necessary to advance the TSF design to feasibility and construction level are presented in this report.

1.2 Project History

The Quintana operation included open pit mining, conventional milling and off-site shipment of copper concentrate. Tailings were thickened to a solids content of 50 percent by weight (oral communication, Jack Bailey, 10/02/2010) and transported by gravity flow to the existing TSF located approximately 1 mile east of the open pit. Impoundment construction and operation were typical of the industry practices of the day. Whole tailings were discharged into the impoundment via a tailings header line and spigots placed peripheral to the impoundment. The TSF constructed for the Quintana operation remains in-place to this date. Remaining facilities include the starter embankment, internal splitter dikes, concrete decant towers and presumably, buried under drain pipes. Approximately 1.2 million tons of tailings were deposited in the existing north tailings cell.

The tailings thickener is reported to have been partially decommissioned and buried. The tailings delivery system has been removed. The Greyback Wash diversion, electrical supply lines, a water supply well field and water supply pipeline, groundwater monitoring wells and pumpback wells also remain. Milling and processing facilities were decommissioned and removed from the site.

During Quintana operations, elevated sulfate and dissolved solids were detected in groundwater in the vicinity of the existing tailings dam. Permeable foundation materials encountered during site investigation and construction of the TSF have been identified as the potential pathway for seepage from the TSF, Meteoric water leaching of tailings from the Quintana operation potentially contributes additional sulfate and dissolved solids to local groundwater. Impacted groundwater and the existing tailings are the subject of an ongoing abatement action. Management of existing tailings to mitigate existing and ongoing groundwater impacts is considered a parallel objective of TSF design.

2.0 SITE DESCRIPTION

2.1 Existing Conditions

The location of the proposed TSF is shown on Drawings 1 and 2. Elevation in the TSF basin area ranges from approximately 5,160 feet above mean sea level (amsl) near the base of the toe berm to over 5,500 feet on the ridges northwest of the impoundment footprint. Natural slopes range from 2 horizontal to 1 vertical (2H:1V) adjacent to the perimeter ridges to less than 10H:1V in the lower portion of the basin.

Previous disturbance of the TSF area is widespread. Existing features can be seen in the aerial photograph on Drawing 1. Drawing 2 shows the location of the proposed TSF projected on existing topography. Placer mining disturbance that predates the Quintana operation can be seen in most of the drainages in the TSF basin, and other drainages radiating from the mine area. More recent disturbance associated with the Quintana mining operation includes tailings deposits, the old starter dam and splitter dikes, construction material borrow areas and tailings delivery and reclaim water pipeline routes. Two concrete decant towers and concrete reclaim pipe foundations also remain in place and while not visible, buried reclaim water pipes also occur. A series of monitoring wells have been placed around the toe of the old starter dam.

The TSF site is located in the upper reaches of a shallow basin. The basin is bounded by low hills on the southwest, west and north sides such that the ultimate TSF will occupy most of the area that could contribute surface water runoff to the TSF. While diversions will be required in the early stages of the operation to divert stormwater runoff, peripheral areas contributing stormwater runon during the later stages of the future operations will be limited to a few acres on the northwest side of the TSF.

2.2 TSF Area Geology and Foundation Conditions.

The existing TSF site was extensively explored by Sargent, Hauskins and Beckwith (SHB) in 1979 and 1980 as part of the SHB design effort. No additional field work was conducted as part of conceptual design efforts. The upper layer of soils in the vicinity of the existing starter dam consists of sandy materials. Surficial sand is underlain by a wedge of silty clays, clayey and clayey silts that appears to thicken in a easterly direction. Gravels underlie the silts and clays and outcrop in the upper portion of the TSF basin. These gravels appear to have been the borrow source for the existing dam.

Permeable basalt was encountered in the lower portion of the tailings basin. The basalt is presumed to occupy a paleo-drainage cut in the local foundation soils. It can be seen in outcrop and subcrop south of the existing splitter dike and was intercepted in several exploratory boreholes completed in the central starter dam area. Due to its permeable nature, the basalt has been identified as the likely pathway for seepage and contaminants from the existing impoundment. This potential was identified during the design of the existing impoundment, and an attempt was made to cap the basalt with fine grained, low permeability soils to inhibit seepage.

2.3 Climate

The Copper Flat property experiences on the order of 10 to 13 inches per year of precipitation with the majority of rainfall occurring in the summer months associated with short duration, high intensity thunderstorms. Winter rains are associated with Pacific storms that generally migrate from west to east across the desert southwest. Summer temperatures exceed 100 degrees while winters are generally mild with limited snow and ground freezing.

In general, evaporation exceeds precipitation in desert lowlands across the region. It is anticipated that the tailings impoundment will be operated at net negative water balance, with periodic, temporary accumulation of stormwater from direct precipitation. Stormwater will be recovered with tailings supernatant water and reused in milling and processing. The effect of stormwater accumulation will be a reduction in raw make-up water requirements.

3.0 PROPOSED TAILINGS STORAGE FACILITY DESCRIPTION

3.1 TSF Geometry

The proposed method of tailings embankment construction is by the method of centerline raises. The basis for selection of this method is due to the high rate of tailings rise that will be experienced during the first 3 to 4 years of operation. Construction by upstream raises typically requires a rate of tailings rise of approximately 10 feet per year or less in order to allow consolidation and drainage of impounded tailings, and the development of conditions suitable for supporting upstream raises. The centerline method of construction using cycloned sand will allow the embankment to be constructed on a foundation of well drained sand.

A toe berm will be constructed around the periphery of the TSF which will serve as a buttress to the embankment outslopes. An internal starter dam is proposed for placement of the tailings discharge header pipe. Tailings will be delivered at a rate of 17,500 tpd at an anticipated solids content of 50 percent by weight. At 92 percent availability, the annual tailings deposition rate will be 5.88 million tons.

Cyclones on the tailings header line will be used to separate the sand fraction (cyclone underflow) from the whole tailings stream. Tailings sand will be used for embankment construction while the fine fraction of the tailings, the tailing slimes (cyclone overflow), will be discharged into the impoundment interior. The resulting tailings impoundment surface will slope away from the embankment and force tailings supernatant and stormwater into the interior of the impoundment. The locations of the toe berm and starter dam are shown on Drawing 3.

The crest elevation of the starter dam and toe berm have initially been set at 5,220 feet amsl. Adjustments to the height of these structures will be evaluated in detailed design studies. Starter dam height will be determined by the dry freeboard required to maintain stormwater storage capacity and the volume of sand that will be available for dam construction during operations. The availability of sand will be determined by the degree of ore milling. A finer grind will reduce sand content and could require a higher initial starter dam height while a coarser grind will provide more sand and allow an increased rate of sand deposition. Toe berm height will be influenced by the stability of the tailings embankment. The embankment sand and underdrain will be placed over a geomembrane liner. Interface friction at the liner/subgrade and the liner/underdrain interfaces will be reduced relative to the friction developed at a soil to tailings interface. The berm may be required to buttress the embankment toe to enhance stability. Toe berm and initial starter dam heights will be evaluated when tailings products representative of the future processing plan are available for evaluation and geotechnical testing.

Above the elevation of the initial starter dam and toe berm, these structures will be constructed parallel to existing topography with a constant height above foundation level. Progressive lateral extension of the tailings distribution points up the starter dam will enable the dam to be raised in level manner.

Tailings gradation data presented in the various reports prepared for Quintana are somewhat contradictory. Based on metallurgical pilot studies conducted for Quintana and reported by SHB (1980), the sand fraction (the plus 200 standard sieve fraction) of the tailings is approximately 30 percent with 95 percent finer than 65 mesh (208 microns). Measurements collected by Quintana mill personnel between May and June of 1982 (oral communication, Jack Bailey, 10/1/2010) showed a minus 65 mesh fraction of 84 to 89 percent, suggesting a courser tailings grind with a higher sand fraction was produced under operating conditions. The gradation presented in the SHB geohydrological study (SHB, 1981) indicates tailings that are 100 percent finer than 65 mesh with a sand fraction of 55 percent. Preliminary volumetric estimates indicate that embankment construction will require approximately 15 percent of future tailings, suggesting that the centerline approach is feasible. Evaluation of tailings samples produced in pilot or bench scale simulation of future milling and processing will be required to verify sand availability throughout the life of the operation.

The impoundment has been sized based on a post-deposition dry density of 85 pounds per cubic foot (pcf). The estimated maximum final tailings surface elevation is 5,375 feet amsl. The maximum toe to crest height of the tailings embankment will be approximately 215 feet. At final buildout, the TSF and underdrain collection pond will occupy an area of approximately 541 acres. The anticipated configuration of the TSF at the end of mining and milling operations is shown on Drawing 4. TSF cross sections are shown on Drawing 5.

The tailings surface will slope inward from peripheral points of deposition at approximately ½ to 1 percent forming a depression in the interior of the impoundment. The internal depression will serve as a storage area for supernatant solutions and stormwater.

Embankment outslopes shown on the drawings are 2.67H:1V. Outslopes may also be subject to modification based on geotechnical testing of tailings properties.

3.2 Hazard Classification

The rules and regulations of the New Mexico State Engineer indicate that the Copper Flat TSF will be classified as having significant hazard potential. According to the New Mexico Administrative Code (19.25.12.10 B NMAC):

> *Dams assigned the significant hazard potential classification are those dams where failure or misoperation results in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or can impact other concerns. Significant hazard potential classification dams are often located in predominantly rural or agricultural areas but could be located in populated areas with significant infrastructure.*

The TSF lies within the Greyback Wash drainage. Inspection of aerial photographs (Google Earth) indicates no human habitations in or adjacent to Greyback Wash between the TSF facility and Caballo Lake, into which Greyback Wash ultimately discharges. A dam breach and flood routing analysis will be required by the State Engineer (19.25.11.12 C (1) NMAC) to verify this classification.

The spillway design flood for dams with significant hazard potential (19.25.12.11 C(1) (c) is 75 percent of the probable maximum precipitation (PMP). A preliminary estimate of the PMP is on the order of 25 inches. The TSF and ore processing facilities will be operated as a closed, non-discharging system during tailings disposal operations and storage capacity for the design storm event will be maintained within the TSF. A permanent spillway capable of passing the design flood will be required at closure after the tailings surface has been regraded and a reclamation cover is in place.

3.3 Site Preparation

The TSF will be a geomembrane lined structure. Site preparation will include clear and grubbing, salvage and stockpiling of topsoil and grading to prepare a smooth surface for geomembrane liner installation.

It is anticipated that the existing starter dam and associated splitter dikes will be used as a fill material borrow source for the new toe berm and starter dam. Additional borrow areas for structural fill, liner bedding materials and drainage media will be developed within the TSF footprint where possible. Previous geotechnical investigation of the site indicates a range of fine grained soils and granular materials occur within the existing disturbance area.

Approximately 1.2 million tons of tailings were discharged into the existing TSF during the Quintana operation. Existing tailings deposits will be evaluated as a source of liner bedding fill material. If placed or “capped” under a low permeability TSF liner, the potential for leaching sulfate and dissolved solids from existing tailings in the future will be alleviated. Alternatively, existing tailings could be placed on the new TSF liner however, utilization of the tailings as liner bedding fill material is anticipated to be less costly and will provide similar benefits in terms of mitigating leaching potential.

The existing decant towers will be demolished. Demolition debris will be buried locally or placed in a waste rock disposal facility. Demolition requirements for buried decant pipelines will be evaluated as part of ongoing site investigation and design efforts.

Existing wells in the TSF expansion will require abandonment in accordance with New Mexico Environment Department (NMED) Office of the State Engineer (OSE) regulations. For wells that intercept groundwater, this will include removal of casings if possible, and sealing the entire well bore with cement or bentonite grout placed by tremmie pipe. Approximately 18 wells appear to lie within the TSF expansion area.

3.4 TSF Liner System

Proposed liner system details for the TSF and underdrain collection pond are shown on Drawings 6 and 7. The TSF liner will consist of an HDPE geomembrane placed on a minimum 6-inch thick layer of liner bedding fill. Beneath the starter dam and embankment underdrain, an 80 mil (0.080 inches) geomembrane is proposed while within the impoundment interior, the geomembrane thickness will be 60 mil. The underdrain collection pond liner will consist of a lower 60 mil and upper 80 mil HDPE geomembranes separated by a drain net. The drain net will route potential leakage through the upper liner to a leakage collection and recovery sump.

Geomembrane liner will be placed on a minimum 6-inch thick layer of liner bedding fill. As noted above, the liner bedding fill can be constructed with existing tailings if they meet moisture content and compaction requirements. Additional liner bedding fill material can be derived from crushing and/or screening of selected native soils. A minus 3/8-inch material is suitable for protection of the liner.

3.5 Underdrain System

An underdrain will be placed beneath the starter dam and cycloned sand embankment. The underdrain system is shown on Drawing 6. The purpose of the embankment underdrain is to facilitate drainage and consolidation of cycloned sand placed in the tailings embankment. The underdrain will consist of graded sand and gravel that is filter compatible with the tailings sand. A series of perforated drain pipes will be placed within the underdrain layer to carry tailings drainage to the underdrain collection pond.

The under drain will be extended into the impoundment interior beneath the area that will be occupied by the supernatant pool. Production of drainage material that is filter compatible with the tailings slimes discharged into the impoundment interior will not be feasible. The impoundment underdrain will be separated from the tailings slimes by a geotextile filter fabric cover. Impoundment underdrainage will be routed to the underdrain collection pond in a piping system that is separate from the embankment under drain.

The pond layout presented as part of the conceptual design has a capacity of over 40 million gallons and represents the maximum potential construction area required for underdrain pond installation. Water balance and drainage analyses that will be completed during engineering design studies will be used to determine the underdrain collection pond size required to manage tailings underdrainage.

3.6 Water Reclaim

A water reclaim ramp with be constructed on top of the TSF liner system. The ramp will provide access to the free water pool for reclaim of supernatant solution and stormwater. The ramp will be raised and extended as deposition continues and the impoundment surface rises. The reclaim pump works will be progressively moved northward as the operation proceeds.

The ramp will be constructed with borrowed fill or waste rock from the mining operation. A cushioning layer will be placed beneath the initial ramp fill to protect the underlying geomembrane. The ramp presents an opportunity to dispose of potentially acid generating waste rock in an environment where ongoing tailings disposal will result in the ramp fill being encapsulated within low permeability tailings slimes.

3.7 Tailings Distribution

It is anticipated that a new thickener will be constructed at the location of the Quintana thickener (Drawing 2) and a tailings delivery pipeline will be routed to the impoundment through the existing tailings delivery pipeline cut. At the impoundment, a wye in the delivery pipeline will allow the tailings to be directed to the east and west to the starter dam crest. A series of discharge points and cyclones around the periphery of the impoundment will be used to direct cyclone underflow to the tailings embankment and cyclone overflow into the impoundment interior. Discharge will be cycled around the impoundment to raise the embankment in a level manner.

Regrading and compaction of the cycloned sand deposited on the dam crest will be conducted on a regular basis to densify the tailings embankment and achieve the design embankment outslope.

Drawing 8 presents a height versus capacity plot for the new TSF. There is potential to increase the capacity of the TSF beyond that shown on the plot, however, distribution of tailings above the elevation of 5,375 feet amsl is likely to require pumping of the whole tailings slurry. In addition, a tailings booster pump may be required in the later years of operation to maintain adequate pressure for cyclone operation.

3.8 Surface Water, Underdrainage, Stormwater and Supernatant Management

The intent of design is to allow the TSF to be operated as a zero discharge facility. Drainage from the tailings will be collected in an underdrain system, routed to a lined underdrain collection pond and recycled as process water. Potential runon from peripheral contributory areas will be prevented from contacting the tailings and diverted into natural drainages. Stormwater, which will result primarily from direct precipitation and supernatant will be contained within the impoundment.

3.8.1 Surface Water Diversion

During initial construction, perimeter diversions will be constructed across the west periphery of the impoundment. The approximately location of Phase 1 surface water diversions is shown on Drawing 3. As the impoundment is expanded in subsequent construction phases, diversion ditches will be relocated westward.

Potential runoff from peripheral areas west of the impoundment during the later stages of operation will be evaluated during design studies. Where runon is significant, diversion ditches will be investigated.

As noted above, at final buildout the TSF will occupy the majority of the area that can contribute surface water runon into the tailings impoundment. Only limited areas west of the impoundment might require late stage and post-closure diversion.

3.8.2 Stormwater and Supernatant Management

During operations, capacity will be maintained within the TSF for storage of direct precipitation and tailings supernatant. Upon discharge into the impoundment, tailings will form a beach sloping away from the point of discharge at ½ to 1 percent. The resulting depression on the tailings surface in the interior of the impoundment will be used for water storage. Additional storage capacity, if needed, will be developed by maintaining reserve freeboard on the tailings embankment crest.

A detailed water balance will be developed as part of the design studies to evaluate internal storage and embankment freeboard requirements. Water balance inputs include process water inflows, direct precipitation and runon. Losses include process water reclaim, beach and tailings pond evaporation, underdrainage and entrainment of process water within the tailings pore space. The rates of underdrainage, entrainment and tailings supernatantliberation on discharge will be determined through geotechnical testing of representative tailings samples.

Water storage requirements include:

- Dead storage (water that cannot be recovered by the reclaim system);
- Storage of the normal process water inventory to facilitate continuous operations;
- Normal stormwater storage which will vary on a seasonal basis due to changes in monthly precipitation and evaporation rates; and
- Storage for the design storm event, which is currently assumed to be 75 percent of the PMP.

The water balance will be coupled with a discharge model that will track the rate of tailings rise and simulate beach slopes and the topography of the tailings surface. The water balance and discharge model can then be used to estimate internal storage capacity and requirements for embankment freeboard through the life of the facility.

4.0 CLOSURE AND RECLAMATION

The conceptual closure plan for the TSF is illustrated on Drawing 9. The conceptual closure plan includes the following:

- Final grading of embankment outslopes to establish erosion controls and controlled surface water drainage (best management practices);
- Placement of a soil or rock cover and revegetation of the embankment outslope;
- Placement of riprap and erosion controls in embankment surface water drainage facilities;
- Regrading or depositional modification of the impoundment surface to promote drainage to a permanent spillway;
- Placement and vegetation of a soil cover over the tailings surface;
- Armoring of surface drainage channels and implementation of best management practices for erosion control; and
- Management of underdrainage.

Final grading of the impoundment surface can be accomplished with earthmoving equipment, or through modification of tailings disposal patterns during the final years of operation. Tailings discharge from selected locations can be used to relocate the supernatant pool to a location adjacent to the post-closure spillway, thereby reducing grading requirements and limiting earthmoving operations in areas where working conditions are expected to be difficult due to the presence of soft and saturated tailings. At the location of the spillway shown on Drawing 9, a bedrock foundation is anticipated. If the spillway channel is erodible, grouted riprap or other erosion controls will be applied.

Consolidation seepage into the underdrain system can be anticipated to continue at declining rates for an indefinite period following the cessation of tailings disposal operations. Underdrainage will be pumped from the underdrain collection pond to the surface of the tailings impoundment where it can be evaporated or used for reclamation cover irrigation. When underdrainage is reduced to an acceptably low flow rate, the underdrain pipes beneath the embankment can be sealed with grout and the underdrain collection pond can be decommissioned.

5.0 DATA COLLECTION AND DESIGN STUDY REQUIREMENTS FOR ADVANCING TSF DESIGN

The following defines work to be completed to advance the design of the new TSF to feasibility study and construction level.

5.1 Geotechnical Investigation

5.1.1 Existing TSF Area

The area occupied by the Quintana TSF area was extensively investigated by SHB (1980). Approximately 30 boreholes were drilled along the starter dam alignment. The majority of the borings were completed by hollow stem auger (HSA) and locally included in-situ permeability testing and diamond coring. Additional borings were completed in the impoundment interior. Test pits were excavated inside the impoundment on an approximate 500 foot by 500 foot grid.

Additional exploration will be undertaken in the area investigated by SHB to identify borrow areas for liner bedding fill and drainage media. This work is expected to require a test pit exploration program with native soil samples subjected to gradation analysis, Atterburg limits, permeability and compaction testing. This program will include sampling of existing tailings for compaction and permeability testing.

TSF Expansion Area investigation should include the following:

- A seismic velocity survey to evaluate the depth to bedrock and/or competent materials beneath the new embankment axis;
- Hollow stem auger drilling with standard penetration testing to obtain foundation material samples and measure in-situ density. Borehole spacing on the order of 300 to 500 feet is proposed along the new embankment axis.
- Selected HSA borings will be converted to core drilling to enable recovery of bedrock samples and support measurement of in-situ permeability by packer testing.
- Falling head or constant head permeability testing may also be performed in selected borings.
- Shelby tube and split spoon drive ring samples will be collected from selected intervals for analysis of in-situ density, natural moisture content and settlement potential.
- Test pit excavation will be performed in the expansion area to identify potential construction materials outside the previously explored area. Required materials include structural fill for the toe berm and starter dam, liner bedding fill and drain fill.

5.2 Tailings Characterization

NMCC reports that ore processing at Copper Flat will closely follow the process flow sheet developed by Quintana for 1981-82 operations. The characteristics of future tailings will impact operation of the new TSF. There are limited data concerning tailings properties from the Quintana operation, and production records (Oral communication, J. Bailey, 2010) indicate a coarser tailings product was produced during operations than would be predicted based on the pilot study tailings data presented in the original TSF design report (SHB, 1980).

Pilot or bench scale milling and flotation studies are recommended in support of final design studies to determine the physical and geochemical properties of future tailings. The primary objectives of the proposed study include:

- Evaluation of the partitioning of residual sulfides between cyclone underflow and overflow, and assessment of the acid generating and metal leaching potential of both the sand and slimes fractions;
- Determination of the gradation of future whole tailings and the quantity of sand that can be recovered for embankment construction;
- Evaluation of the flow characteristics of the whole tailings slurry;
- Measurement of the shear strength of tailings sand; and
- Measurement of the permeability of tailings sand and slimes under anticipated disposal conditions.

The milling and flotation test work should produce a sufficient quantity of tailings to enable a cyclone simulation to be performed in order to produce samples of both cyclone overflow and underflow. At minimum, the cyclone simulation will require a 55 gallon drum of tailings solids. The sand and slimes fractions produced in the simulation will be sufficient to support a full range of geotechnical and geochemical tests. Tailings should be subjected to the following tests:

- Gradation (sieve and hydrometer), Atterberg Limits, specific gravity (whole tailings, cyclone underflow and overflow);
- Compaction testing (cyclone underflow);
- Slurry consolidation testing (cyclone underflow and overflow);
- Staged triaxial consolidated, undrained shear strength testing with pore pressure measurement (cyclone underflow);
- Air drying (cyclone overflow);
- Shrinkage limit (cyclone overflow); and
- Acid base accounting, net acid generation (NAG), total metals, major oxides by x-ray florescence (XRF), leach extraction testing, and mineralogy by x-ray diffraction (XRD) (cyclone underflow and overflow).

5.3 Hydrogeological Characterization

Local monitoring wells that will be decommissioned during TSF expansion will require replacement in the area below the new toe berm and underdrain collection pond. Water level measurements and in-situ permeability tests conducted concurrently with drilling and well installation can be used in conjunction with existing data to evaluate hydrogeological conditions in the TSF expansion area.

5.4 Climatological Characterization

Estimation of normal precipitation and evaporation rates will be required to develop an impoundment water balance. It is assumed that a climatological model will be developed using a combination of locally collected weather data combined with regional weather records from National Weather Service monitoring stations.

5.5 Engineering Studies

The following is a listing of design studies that will be required to complete the design of the TSF:

- Foundation settlement analyses;
- Tailings drainage analyses;
- Seismic hazard analysis:
- Static and dynamic embankment stability analyses, including estimation of displacement under seismic loading;
- Seismic and static (monotonic loading, flow slide) liquefaction potential analyses;
- Evaluation of tailings sand availability, mass balance and deposition modeling;
- Liner seepage assessment;
- Foundation hydrogeological assessment;
- Water balance;
- Tailings basin hydrologic assessment for surface water diversion sizing;
- Estimation of design storm event (PMP) precipitation;
- Dam breach analysis as per OSE requirements.

6.0 USE OF THIS REPORT

This report has been prepared exclusively for the use of New Mexico Copper Corporation (NMCC) for specific application to the Copper Flat Project. No third party engineer or consultant shall be entitled to rely on any of the information, conclusions, or opinions contained in this report without prior written approval from NMCC or Golder Associates, Inc (Golder).

The conclusions and recommendations in this report have been prepared in a manner consistent with the level of care and skill ordinarily exercised by engineering professionals currently practicing under similar conditions, subject to the time limits and financial and physical constraints imposed on, or otherwise applicable to, Golder's analyses.

In preparing its conclusions and recommendations, Golder has relied upon information provided by the client. Golder is not responsible for errors or omissions in the information provided by NMCC.

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Senior Engineer

David A. Kidd, P.E.
Principal, Geotechnical Practice Leader

GM/DAK/br

7.0 REFERENCES

Jack Bailey, October 1, 2010. Oral Communication, milling records, 65 mesh fraction, Quintana Minerals Corp, April through June 1982.

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Sargent Hauskins and Beckwith (SHB), 1981. *Geohydrological Evaluation for Submission of Discharge Plan, Copper Flat Project, Quintana Minerals Corporation, Sierra County, New Mexico*. SHB Report E80-194, June 21, 1981.

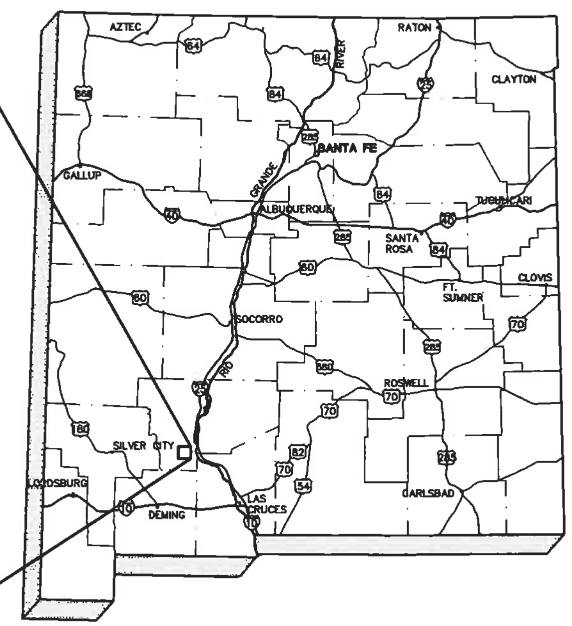
Sargent Hauskins and Beckwith (SHB), 1980. Tailings Dam and Disposal Area, Quintana Minerals Corporation, Copper Flats Project, Gold Dust, New Mexico (Final Geotechnical and Design Development Report), SHB Report E80-1030B, October 14, 1980.

SRK Consulting Inc., 2010. *NI 43-101 Preliminary Economic Assessment, THEMAC Resources Group Limited, Copper Flat Project, Sierra County, New Mexico*, SRK Report No. 191000.020, June 30, 2010

DRAWINGS

COPPER FLAT PROJECT
TAILINGS STORAGE FACILITY
CONCEPTUAL DESIGN STUDY
SIERRA COUNTY, NEW MEXICO

AERIAL PHOTOGRAPH OF PROPOSED TAILINGS DISPOSAL SITE
NOT TO SCALE



STATE OF NEW MEXICO
NOT TO SCALE

LIST OF DRAWINGS

DWG No.	DRAWING TITLE
1	TITLE SHEET
2	GENERAL SITE LAYOUT
3	TAILINGS STORAGE FACILITY PLAN
4	TAILINGS STORAGE FACILITY PLAN AT FINAL BUILD-OUT
5	TAILINGS STORAGE FACILITY CROSS-SECTIONS
6	TAILINGS STORAGE FACILITY UNDERDRAIN PLAN
7	TAILINGS STORAGE FACILITY DETAILS
8	TAILINGS STORAGE FACILITY HEIGHT VS CAPACITY PLOT
9	TAILINGS STORAGE FACILITY CONCEPTUAL CLOSURE PLAN

GENERAL NOTES

1. EXISTING FIVE (5) FOOT TOPOGRAPHY AND PERMIT BOUNDARY PROVIDED BY NEW MEXICO COPPER CORPORATION.
2. AERIAL PHOTOGRAPHY © GOOGLE 2010, NMRGIS 2010.
3. DRAWINGS PRESENT THE CONCEPTUAL DESIGN OF A PROPOSED NEW AND EXPANDED TAILINGS STORAGE FACILITY WITH A CAPACITY OF 100 MILLION TONS AT AN ASSUMED DRY DENSITY OF 85 POUND PER CUBIC FOOT.
4. FINAL DESIGN WILL BE COMPLETED IN ACCORDANCE WITH THE RULES AND REGULATIONS OF THE NEW MEXICO STATE ENGINEER, THE NEW MEXICO ENVIRONMENT DEPARTMENT (NMED) AND THE NEW MEXICO MINING AND MINERALS DIVISION (NM MMD).
5. AERIAL PHOTOGRAPH SHOWS EXISTING TAILINGS DISPOSAL AREA DISTURBANCE FROM MINING, MILLING AND TAILINGS DISPOSAL OPERATIONS CONDUCTED BY QUINTANA RESOURCES IN 1981-82.
6. EXISTING TAILINGS FROM THE QUINTANA 1981-82 OPERATIONS ARE THE SUBJECT OF AN ONGOING ABATEMENT ACTION. THE CONCEPTUAL DESIGN CONSIDERS CAPPING EXISTING TAILINGS BENEATH THE FUTURE IMPOUNDMENT LINER SYSTEM THROUGH THEIR INCORPORATION IN THE LINER BEDDING FILL LAYER, OR PLACEMENT OF EXISTING TAILINGS ON THE NEW IMPOUNDMENT LINER. ALTERNATIVES FOR MANAGEMENT OF EXISTING TAILINGS WILL BE DEVELOPED IN CONSULTATION WITH NMED.

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DRAWING USE	PROJECT
CONCEPTUAL DESIGN NOT FOR CONSTRUCTION	COPPER FLAT PROJECT TAILINGS STORAGE FACILITY CONCEPTUAL DESIGN STUDY SIERRA COUNTY, NEW MEXICO
	TITLE: TITLE SHEET

Golder Associates

PROJECT No.		103-92557	FILE No.	10392557A001
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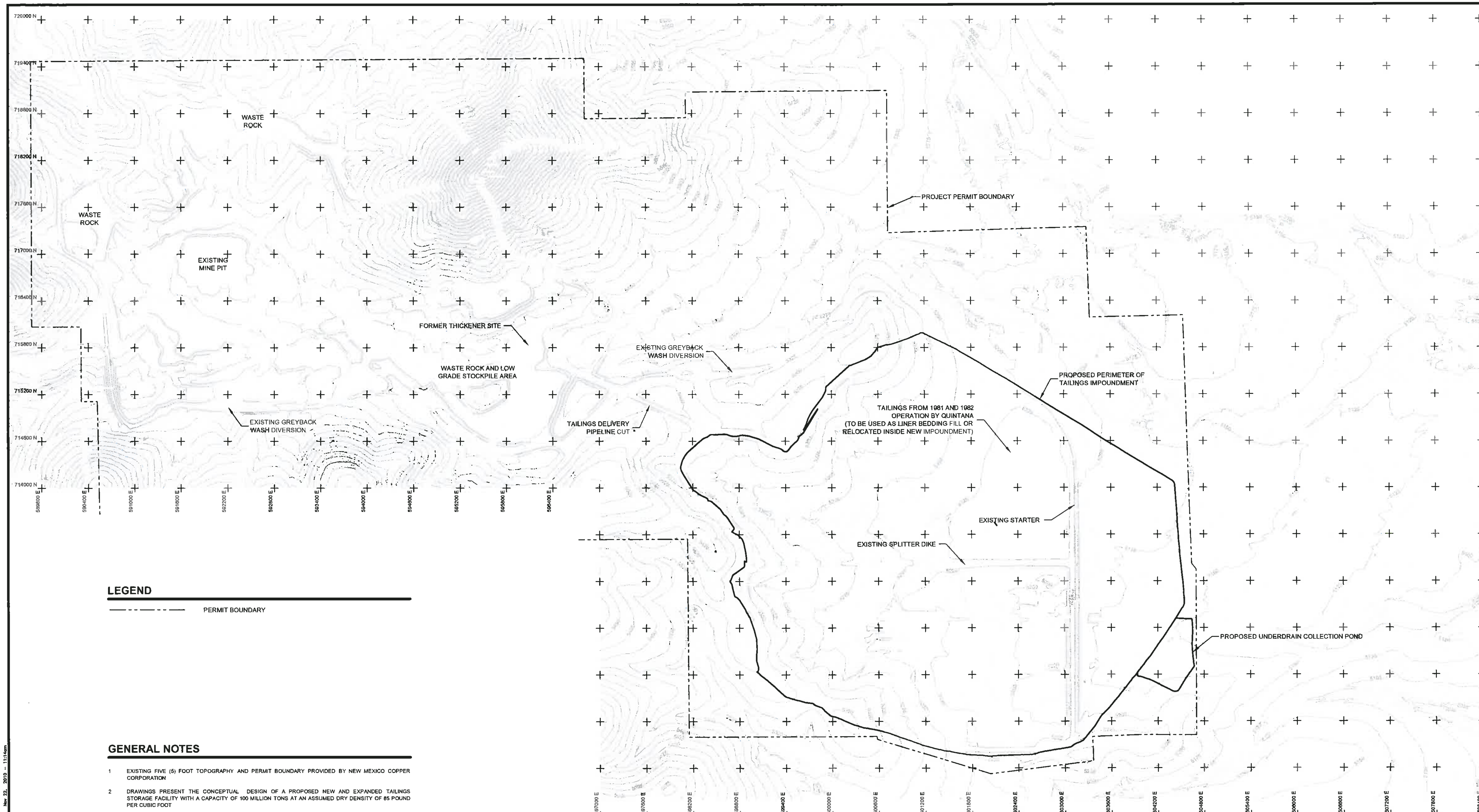

GENERAL NOTES

1. EXISTING FIVE (5) FOOT TOPOGRAPHY AND PERMIT BOUNDARY PROVIDED BY NEW MEXICO COPPER CORPORATION
2. DRAWINGS PRESENT THE CONCEPTUAL DESIGN OF A PROPOSED NEW AND EXPANDED TAILINGS STORAGE FACILITY WITH A CAPACITY OF 100 MILLION TONS AT AN ASSUMED DRY DENSITY OF 85 POUND PER CUBIC FOOT
3. FINAL DESIGN WILL BE COMPLETED IN ACCORDANCE WITH THE RULES AND REGULATIONS OF THE NEW MEXICO STATE ENGINEER, THE NEW MEXICO ENVIRONMENT DEPARTMENT (NMED) AND THE NEW MEXICO MINING AND MINERALS DIVISION (NM MMD)
4. TOPOGRAPHY IN THE MINE AREA AND TAILINGS STORAGE FACILITY REPRESENTS EXISTING CONDITIONS AND DISTURBANCE ASSOCIATED WITH QUINTANA 1981-82 MINING OPERATIONS
5. PROPOSED TAILINGS STORAGE FACILITY FOOTPRINT IS FOR A NEW FACILITY WITH A CAPACITY OF 100 MILLION TONS AT AN ASSUMED DRY DENSITY OF 85 POUND PER CUBIC FOOT

600 0 600 1200
SCALE FEET

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DRAWING USE
CONCEPTUAL DESIGN
NOT FOR CONSTRUCTION

PROJECT
COPPER FLAT PROJECT
TAILINGS STORAGE FACILITY
CONCEPTUAL DESIGN STUDY
SIERRA COUNTY, NEW MEXICO

TITLE
GENERAL SITE LAYOUT

Golder Associates

PROJECT No.		103-92557	FILE No.	10392557A002
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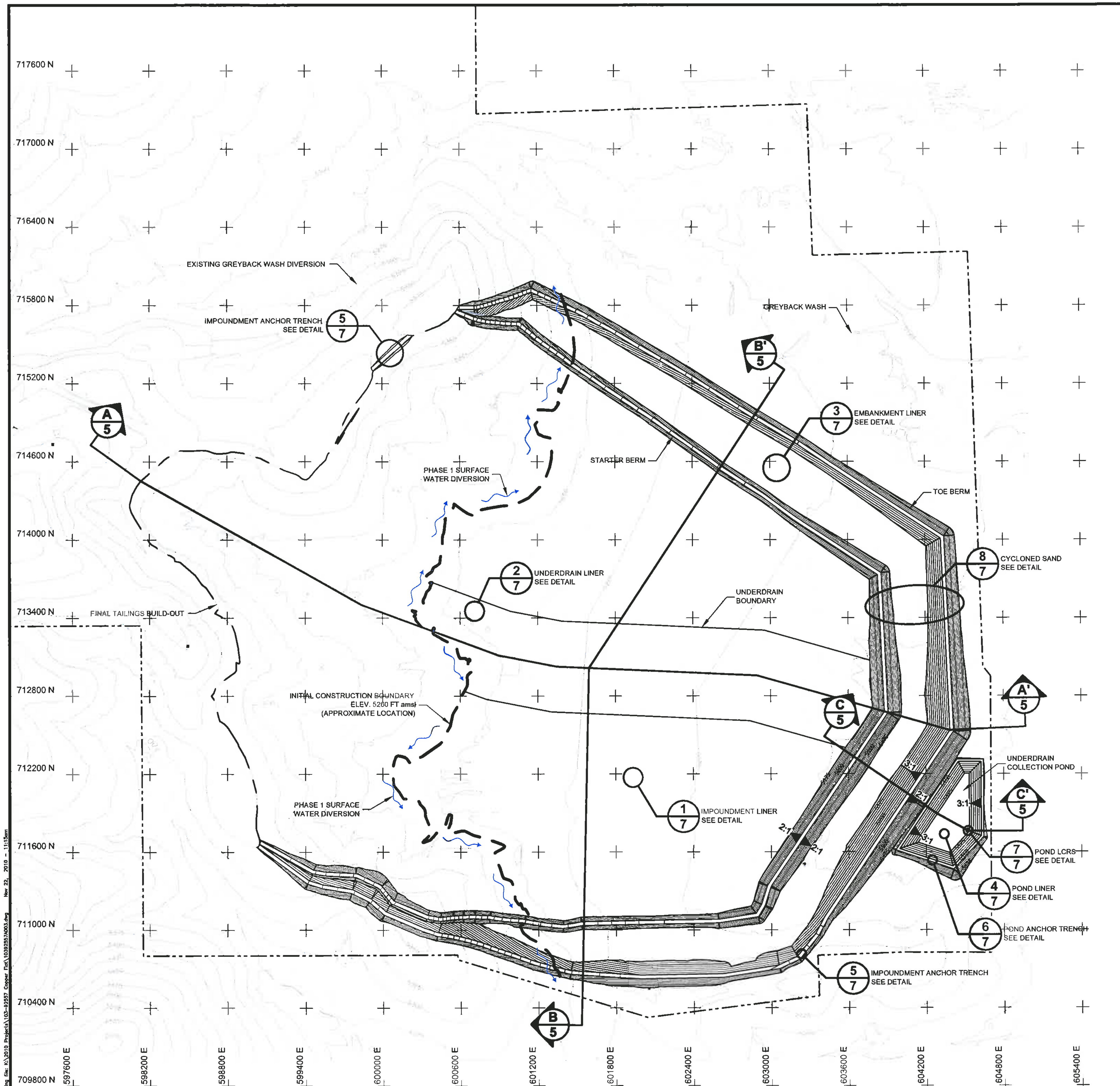

LEGEND

- EXISTING CONTOURS
- DESIGN CONTOURS (5200)
- PHASE 1 SURFACE WATER DIVERSION FLOW ARROW
- PERMIT BOUNDARY
- INITIAL CONSTRUCTION BOUNDARY
- FINAL TAILINGS BUILD-OUT
- DETAIL CALL-OUT (3/7)
- CROSS-SECTION CALL-OUT (A/5)

NOTES

1. DRAWINGS PRESENT THE CONCEPTUAL DESIGN OF A NEW AND EXPANDED TAILINGS STORAGE FACILITY WITH A CAPACITY OF 100 MILLION TONS AT AN ASSUMED DRY DENSITY OF 85 POUND PER CUBIC FOOT.
2. FINAL DESIGN WILL BE COMPLETED IN ACCORDANCE WITH THE RULES AND REGULATIONS OF THE NEW MEXICO STATE ENGINEER, THE NEW MEXICO ENVIRONMENT DEPARTMENT (NMED) AND THE NEW MEXICO MINING AND MINERALS DIVISION (NM MMD).
3. EXISTING FIVE (5) FOOT TOPOGRAPHY AND PERMIT BOUNDARY PROVIDED BY NEW MEXICO COPPER CORPORATION.
4. TOPOGRAPHY IN THE VICINITY OF THE QUNITANA STARTER DAM AND TAILINGS CELLS APPROXIMATED BY GOLDER TO REPRESENT PRECONSTRUCTION TOPOGRAPHY FOLLOWING DEMOLITION (BORROW) OF THE EXISTING STARTER EMBANKMENT, RELOCATION OF EXISTING TAILINGS AND REGRADING IN FORMER BORROW AREAS AND EXISTING DISTURBANCE AREAS. TOPOGRAPHY IN OTHER LOCATIONS REPRESENTS EXISTING CONDITIONS. A SITE WIDE TAILINGS DISPOSAL FACILITY GRADING PLAN WILL BE DEVELOPED IN FUTURE DESIGN STUDIES.
5. EXISTING TAILINGS FROM THE QUINTANA 1981-82 OPERATIONS ARE THE SUBJECT OF AN ONGOING ABATEMENT ACTION. THE CONCEPTUAL DESIGN CONSIDERS CAPPING EXISTING TAILINGS BENEATH THE FUTURE IMPOUNDMENT LINER SYSTEM THROUGH THEIR INCORPORATION IN THE LINER BEDDING FILL LAYER, OR PLACEMENT OF EXISTING TAILINGS ON THE NEW IMPOUNDMENT LINER. ALTERNATIVES FOR MANAGEMENT OF EXISTING TAILINGS WILL BE DEVELOPED IN CONSULTATION WITH NMED.
6. PHASE 1 CONSTRUCTION LIMITS ARE APPROXIMATELY LOCATED. PHASE 1 AND SUBSEQUENT CONSTRUCTION PHASE LIMITS AND SURFACE WATER DIVERSION REQUIREMENTS WILL BE DETERMINED IN FUTURE ENGINEERING DESIGN STUDIES.
7. EMBANKMENT RAISES WILL BE CONSTRUCTED BY THE CENTERLINE RAISE METHOD USING CYCLONE UNDERFLOW (TAILINGS SAND). CYCLONE OVERFLOW (SLIMES) WILL BE DISCHARGED INTO THE INTERIOR OF THE TAILINGS STORAGE FACILITY.
8. DURING OPERATION, STORMWATER WILL BE CONTAINED WITHIN THE TAILINGS STORAGE FACILITY AND UTILIZED AS PROCESS MAKE-UP WATER. A PROJECT WATER BALANCE WILL BE DEVELOPED IN FUTURE ENGINEERING DESIGN STUDIES.

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SCALE 400 0 400 800 FEET

DRAWING USE: CONCEPTUAL DESIGN NOT FOR CONSTRUCTION

PROJECT: COPPER FLAT PROJECT
TAILINGS STORAGE FACILITY
CONCEPTUAL DESIGN STUDY
SIERRA COUNTY, NEW MEXICO

TITLE

TAILINGS STORAGE FACILITY PLAN

Golder Associates

PROJECT No.		103-92557	FILE No.	10392557A003
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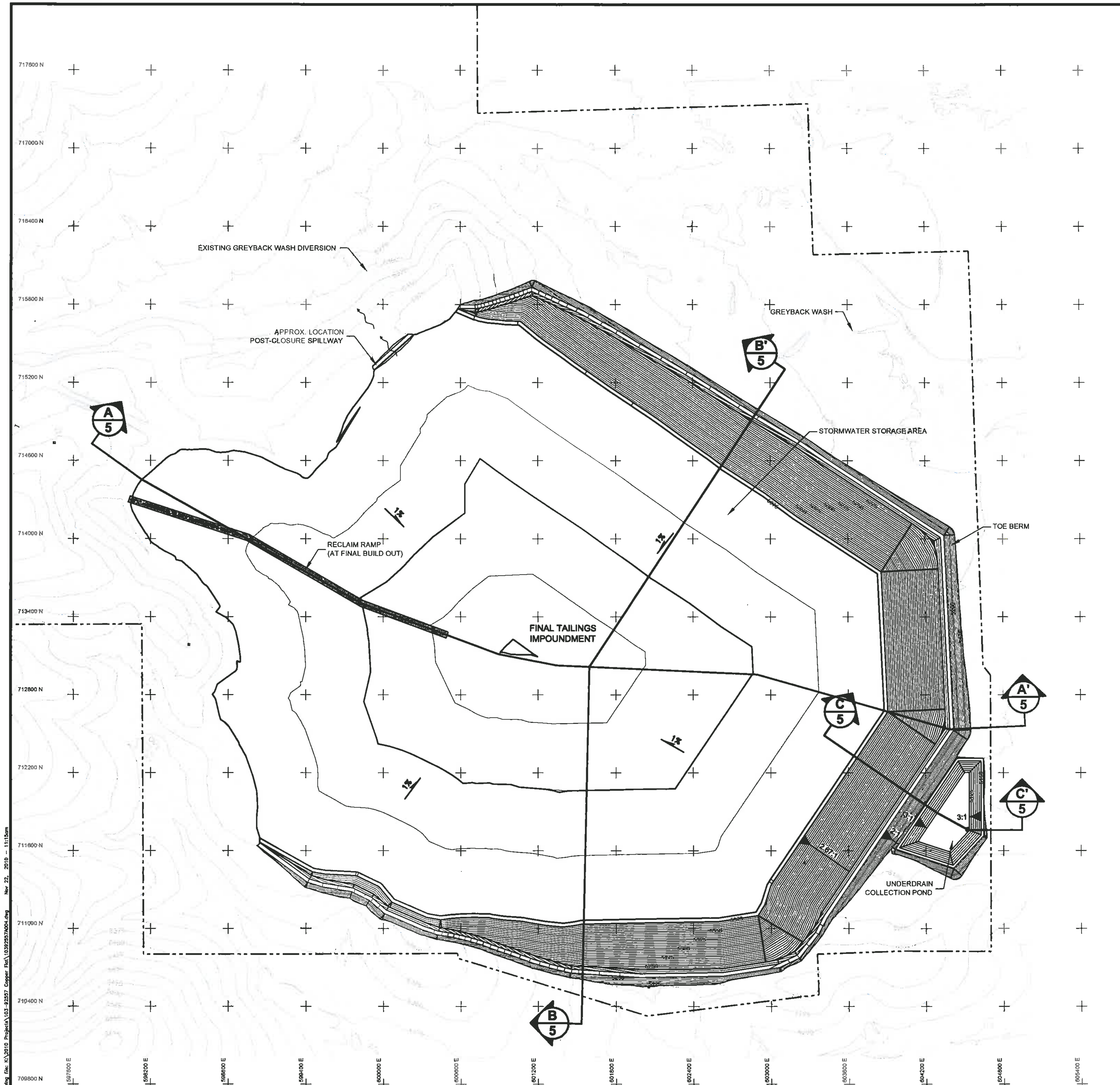
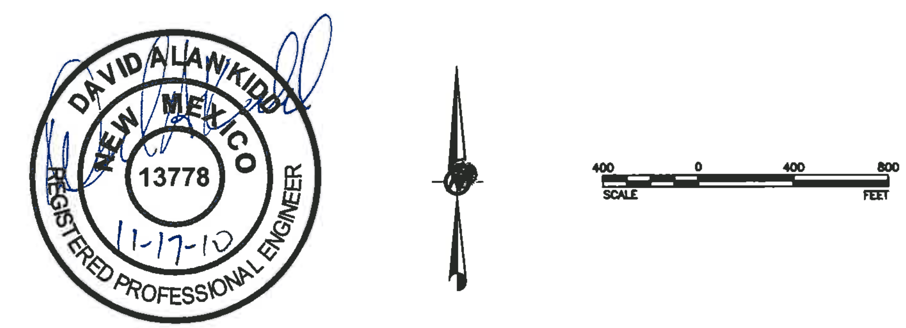


LEGEND

- EXISTING CONTOURS
- DESIGN CONTOURS
- PERMIT BOUNDARY
- CROSS-SECTION CALL-OUT

NOTES

1. DRAWINGS PRESENT THE CONCEPTUAL DESIGN OF A NEW AND EXPANDED TAILINGS STORAGE FACILITY WITH A CAPACITY OF 100 MILLION TONS AT AN ASSUMED DRY DENSITY OF 85 POUND PER CUBIC FOOT.
2. FINAL DESIGN WILL BE COMPLETED IN ACCORDANCE WITH THE RULES AND REGULATIONS OF THE NEW MEXICO STATE ENGINEER, THE NEW MEXICO ENVIRONMENT DEPARTMENT (NMED) AND THE NEW MEXICO MINING AND MINERALS DIVISION (NM MMD)
3. EXISTING FIVE (5) FOOT TOPOGRAPHY AND PERMIT BOUNDARY PROVIDED BY NEW MEXICO COPPER CORPORATION.
4. FINAL EMBANKMENT CREST HEIGHT WILL BE APPROXIMATELY 5,375 FEET AMSL. TAILINGS SURFACE CONFIGURATION SHOWN REPRESENTS CONDITIONS AT THE CESSATION OF MINING OPERATIONS. APPROXIMATE LOCATION OF A POST-CLOSURE SPILLWAY SHOWN. TAILINGS DISCHARGE LOCATIONS MAY BE MODIFIED IN LATE STAGE OPERATIONS TO GRADE THE IMPOUNDMENT SURFACE AND FACILITATE POST-CLOSURE DRAINAGE TO THE PERMANENT SPILLWAY.
5. SELECTION OF A DESIGN STORM EVENT FOR STORMWATER STORAGE AND SPILLWAY CAPACITY WILL BE IN ACCORDANCE WITH THE REQUIREMENTS OF THE NEW MEXICO STATE ENGINEER.



DRAWING USE
CONCEPTUAL DESIGN
NOT FOR CONSTRUCTION

PROJECT
COPPER FLAT PROJECT
TAILINGS STORAGE FACILITY
CONCEPTUAL DESIGN STUDY
SIERRA COUNTY, NEW MEXICO

TITLE
TAILINGS STORAGE FACILITY AT FINAL BUILD-OUT

Golder Associates

PROJECT No.		103-92557	FILE No.	10392557A004
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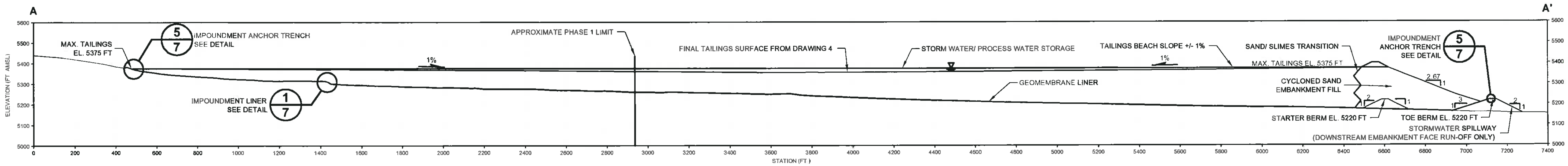

CROSS SECTION A-A'

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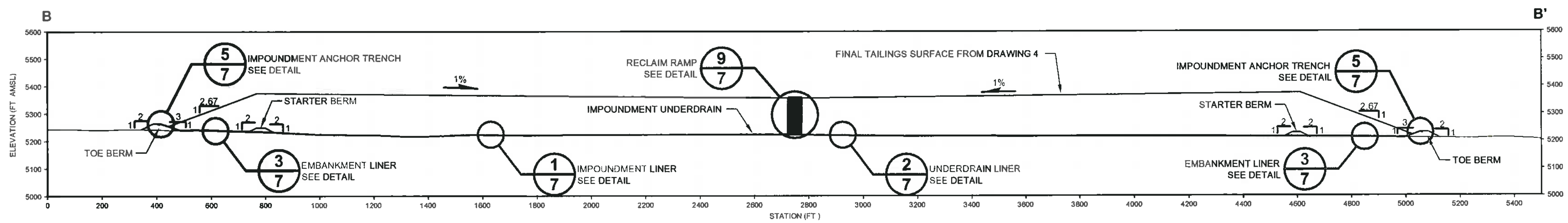

CROSS SECTION B-B'

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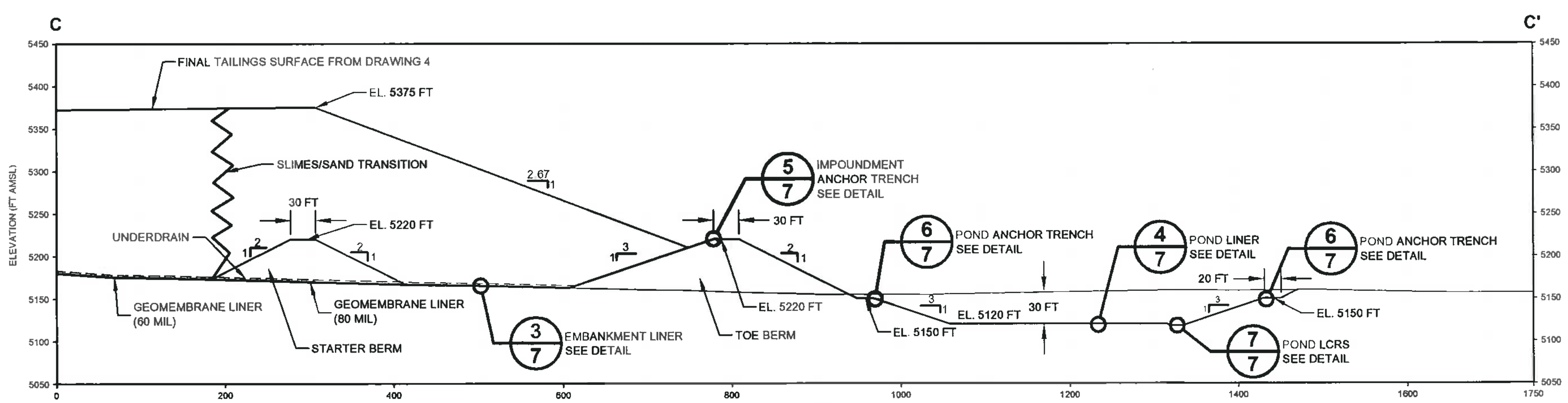

CROSS SECTION C-C'

C/5 — SCALE 100 0 100 200 FEET

DAVID ALAN KIDD — NEW MEXICO — 13778 — REGISTERED PROFESSIONAL ENGINEER — 11-17-10

DRAWING USE	PROJECT
CONCEPTUAL DESIGN NOT FOR CONSTRUCTION	COPPER FLAT PROJECT TAILINGS STORAGE FACILITY CONCEPTUAL DESIGN STUDY SIERRA COUNTY, NEW MEXICO

TITLE

TAILING FACILITY STORAGE CROSS-SECTIONS

Golder Associates

PROJECT No.	103-92557		FILE No.	10392557A005
DESIGN	CDJ	10/25/10	SCALE AS SHOWN	REV. C
CADD	ANV	10/27/10	DRAWING	
CHECK	GM	10/29/10		5
REVIEW	DAK	11/17/10		

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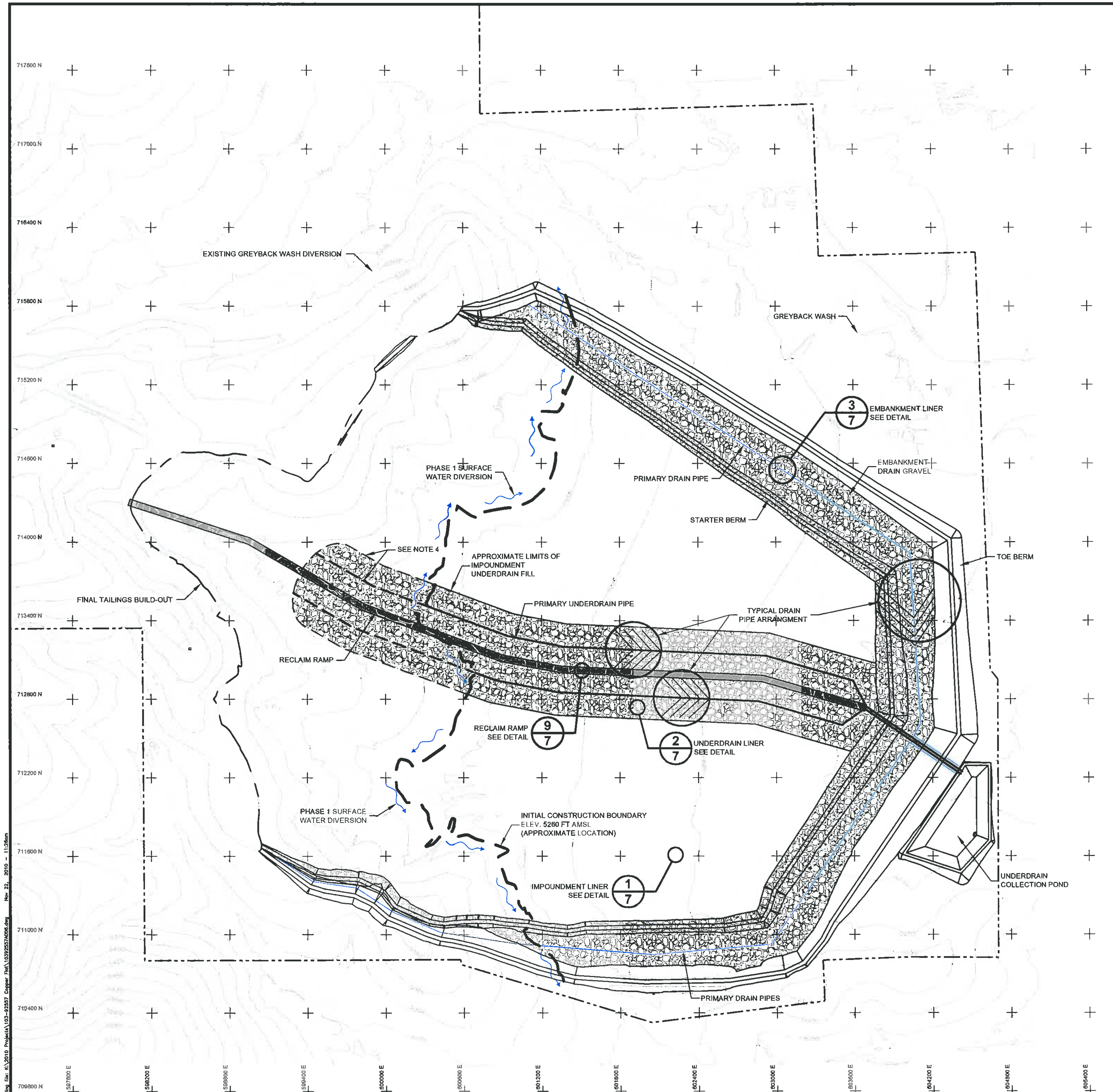

LEGEND

- EXISTING CONTOURS
- DESIGN CONTOURS
- PHASE 1 SURFACE WATER DIVERSION FLOW ARROW
- PERMIT BOUNDARY
- PHASE 1 BOUNDARY
- FINAL TAILINGS BUILD-OUT
- PRIMARY UNDERDRAIN PIPE
- PRIMARY DRAIN PIPE
- UNDERDRAIN FILL
- DETAIL CALL-OUT

NOTES

1. DRAWINGS PRESENT THE CONCEPTUAL DESIGN OF A NEW AND EXPANDED TAILINGS STORAGE FACILITY WITH A CAPACITY OF 100 MILLION TONS AT AN ASSUMED DRY DENSITY OF 85 POUND PER CUBIC FOOT.
2. FINAL DESIGN WILL BE COMPLETED IN ACCORDANCE WITH THE RULES AND REGULATIONS OF THE NEW MEXICO STATE ENGINEER, THE NEW MEXICO ENVIRONMENT DEPARTMENT (NMED) AND THE NEW MEXICO MINING AND MINERALS DIVISION (NM MMD)
3. EXISTING FIVE (5) FOOT TOPOGRAPHY AND PERMIT BOUNDARY PROVIDED BY NEW MEXICO COPPER CORPORATION.
4. APPROXIMATE LIMITS OF UNDER DRAIN SYSTEM SHOWN. EMBANKMENT UNDERDRAIN WILL BE A GRADED SAND AND GRAVEL DRAIN THAT IS FILTER COMPATIBLE WITH CYCLONED TAILINGS SAND. IMPOUNDMENT UNDER DRAIN WILL BE GEOTEXTILE FABRIC WRAPPED. THE IMPOUNDMENT UNDERDRAIN WILL BE EXTENDED DURING PHASED CONSTRUCTION.

DAVID ALAN KIDD NEW MEXICO 13778 REGISTERED PROFESSIONAL ENGINEER 11-17-10

SCALE 400 0 400 800 FEET

DRAWING USE
CONCEPTUAL DESIGN
NOT FOR CONSTRUCTION

PROJECT
COPPER FLAT PROJECT
TAILINGS STORAGE FACILITY
CONCEPTUAL DESIGN STUDY
SIERRA COUNTY, NEW MEXICO

TITLE

TAILINGS STORAGE FACILITY UNDERDRAIN PLAN

Golder Associates

PROJECT No.		103-92557
DESIGN	CDJ	10/25/10
CADD	ANV	10/27/10
CHECK	GM	10/29/10
REVIEW	DAK	11/17/10

FILE No. 10392557A006
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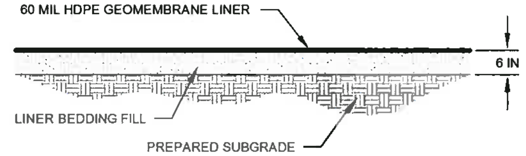
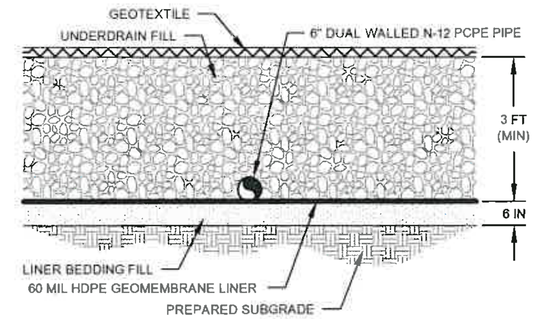
DRAWING 6



1/7 IMPOUNDMENT LINER DETAIL
NOT TO SCALE



2/7 UNDERDRAIN AREA LINER DETAIL
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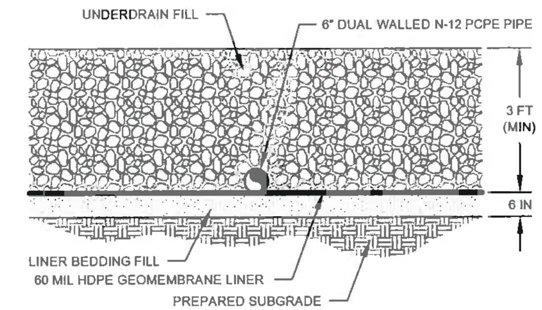

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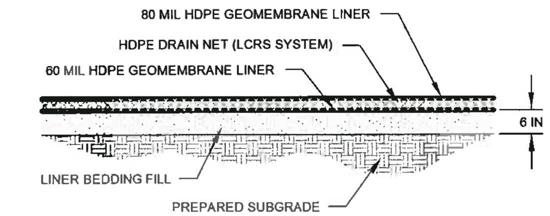

4/7 POND LINER DETAIL
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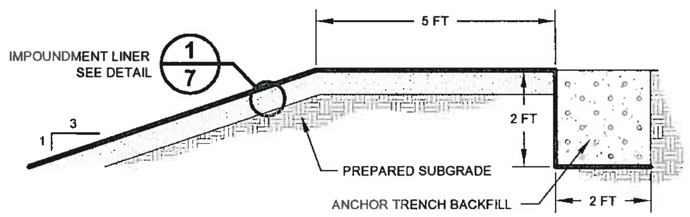

5/7 IMPOUNDMENT ANCHOR TRENCH DETAIL
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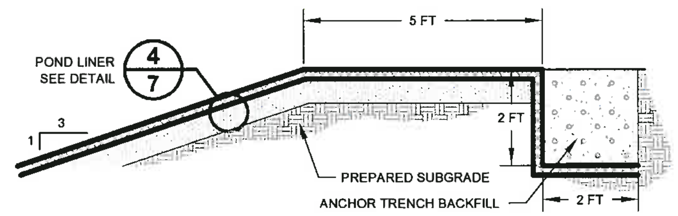

6/7 POND ANCHOR TRENCH DETAIL
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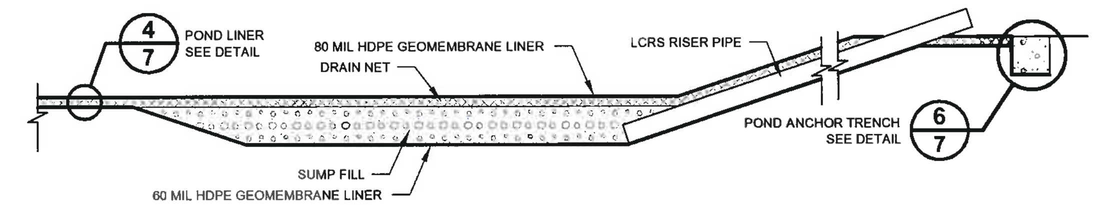

7/7 POND LEAK COLLECTION AND RECOVERY SYSTEM (LCRS) DETAIL
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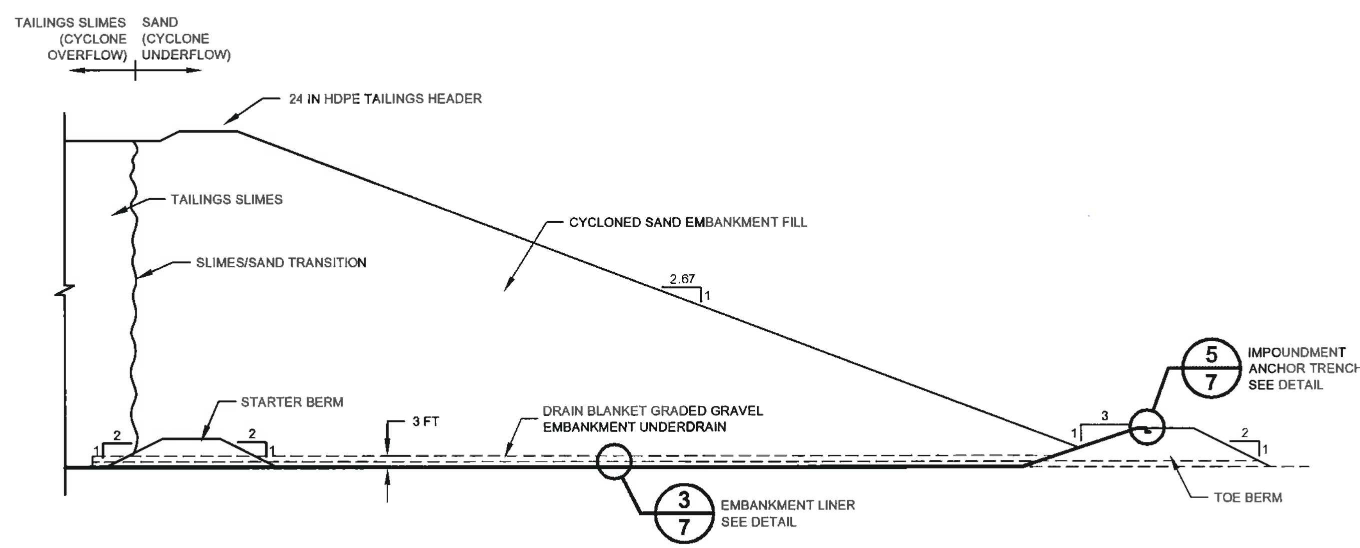

8/7 CYCLONED SAND EMBANKMENT DETAIL
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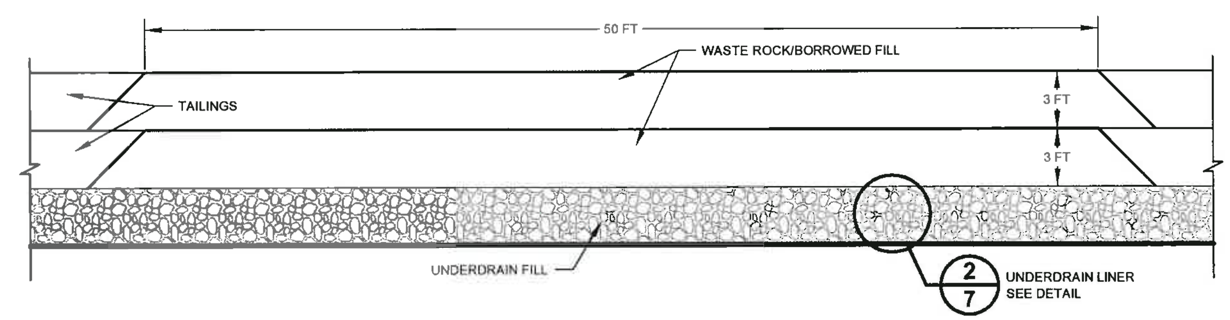

9/7 PROCESS WATER RECLAIM RAMP DETAIL
NOT TO SCALE

DAVID ALAN KIDD
NEW MEXICO
13778
REGISTERED PROFESSIONAL ENGINEER
11-17-10

DRAWING USE	CONCEPTUAL DESIGN NOT FOR CONSTRUCTION
PROJECT	COPPER FLAT PROJECT TAILINGS STORAGE FACILITY CONCEPTUAL DESIGN STUDY SIERRA COUNTY, NEW MEXICO
TITLE	TAILINGS STORAGE FACILITY DETAILS

Golder Associates

PROJECT No.	103-92557		FILE No.	10392557A007
DESIGN	CDJ	10/25/10	SCALE AS SHOWN	REV. C
CADD	ANV	10/27/10	DRAWING	
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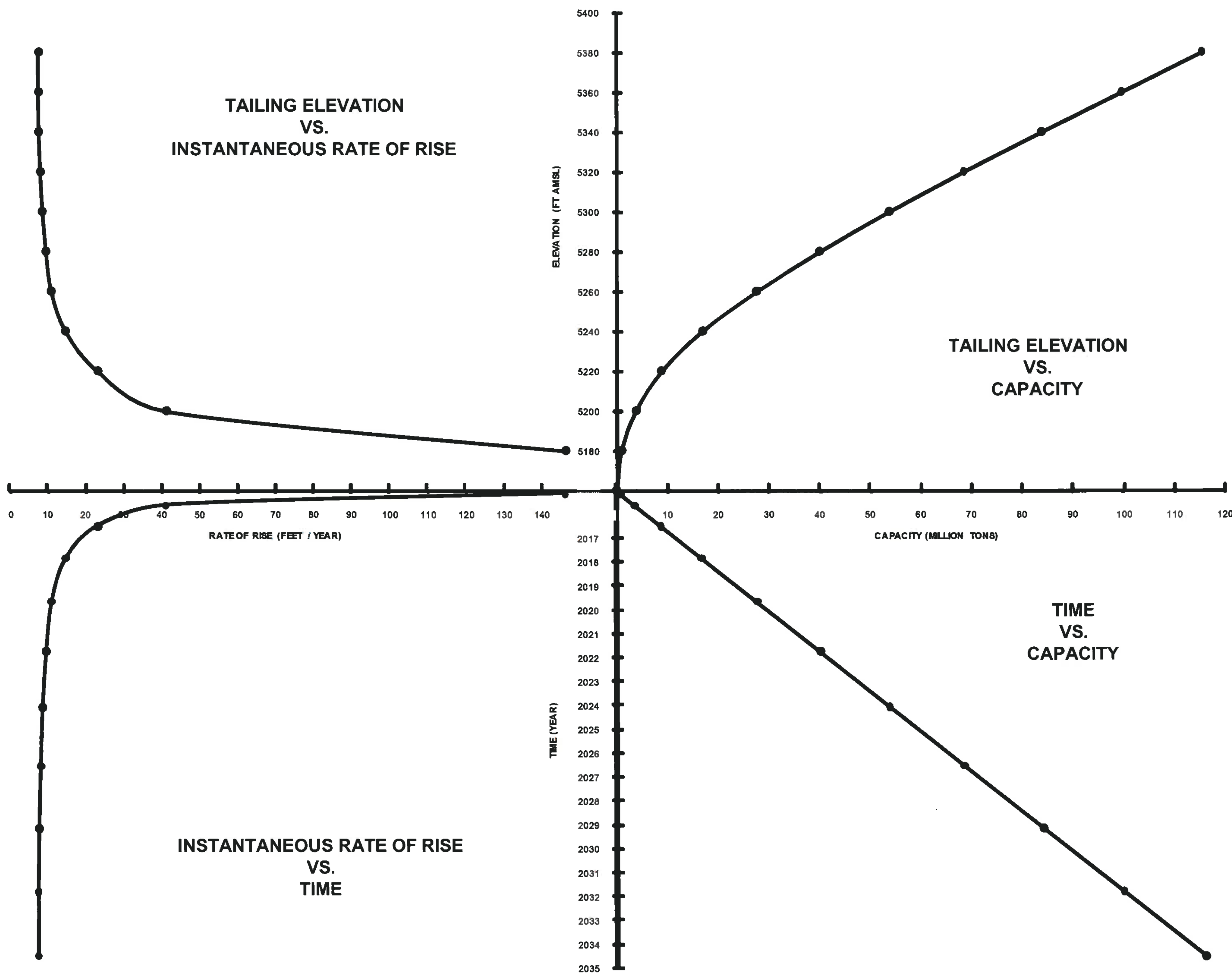
REVIEW	DAK	11/17/10		



NOTES

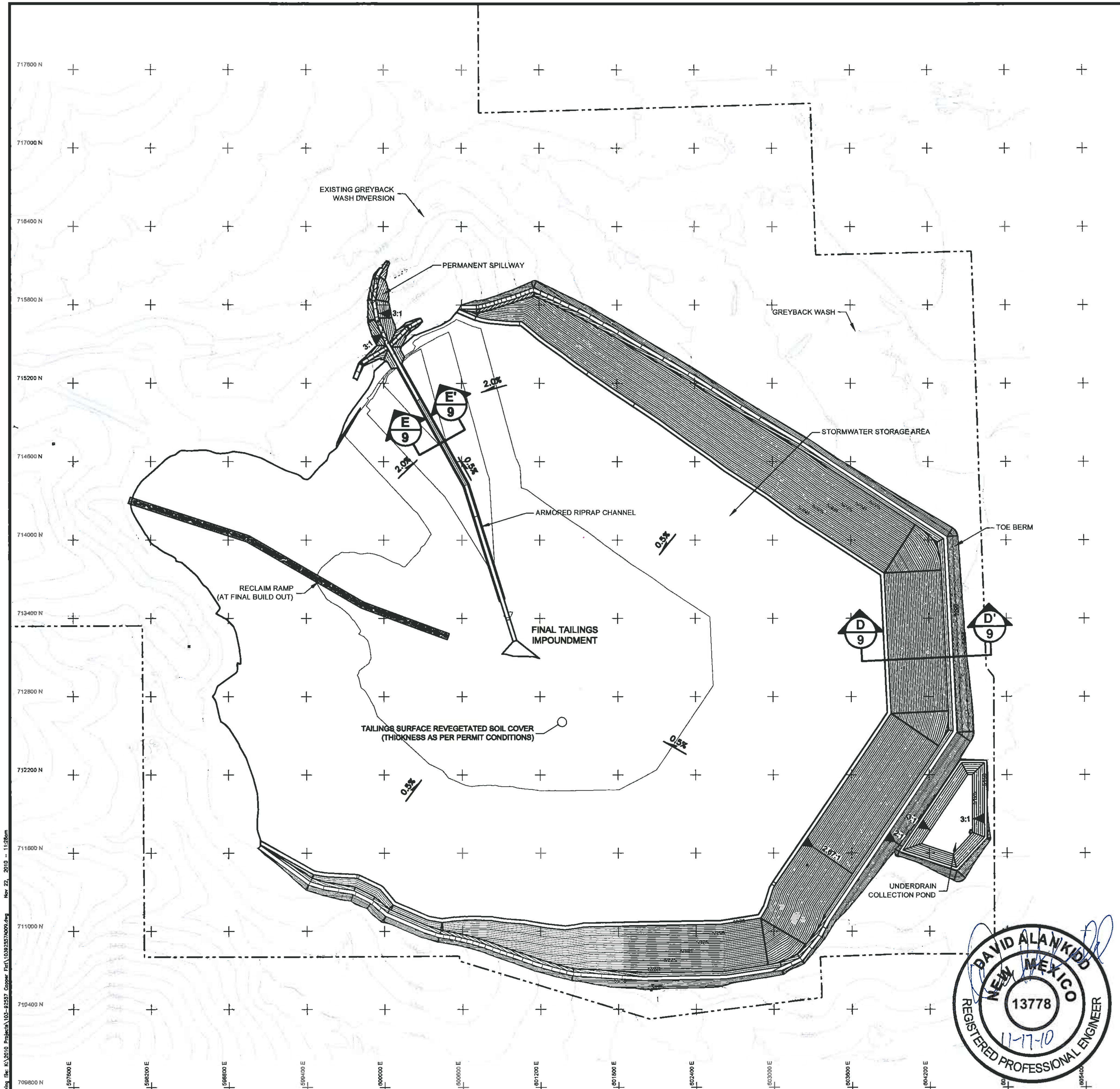
1. CAPACITY ESTIMATED USING EXISTING FIVE (5) FOOT TOPOGRAPHY PROVIDED BY NEW MEXICO COPPER CORPORATION AND A DRY DENSITY OF 85 PCF.
2. TAILING MAXIMUM ELEVATION IS 5,375 FT AMSL AT LOCATION OF DISCHARGE POINT.
3. RATE OF RISE IS CALCULATED FROM THE PRODUCTION RATE OF 17,500 TONS PER DAY AT 93% AVAILABILITY FOR AN ANNUAL PRODUCTION OF 5,940,375 TONS.
4. ASSUMED START-UP DATE 2015 ACTUAL START DATE TO BE DETERMINED.

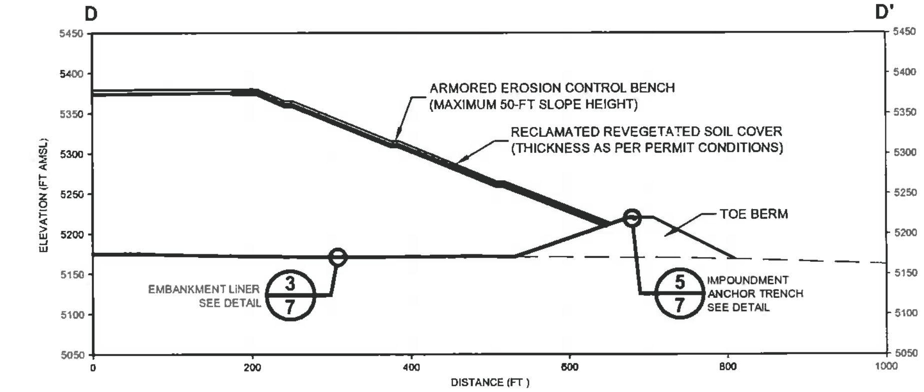
DAVID ALAN KIDD
NEW MEXICO
13778
REGISTERED PROFESSIONAL ENGINEER
11-17-10

DRAWING USE	CONCEPTUAL DESIGN NOT FOR CONSTRUCTION
PROJECT	COPPER FLAT PROJECT TAILINGS STORAGE FACILITY CONCEPTUAL DESIGN STUDY SIERRA COUNTY, NEW MEXICO
TITLE	HEIGHT VS. CAPACITY PLOT

Golder Associates

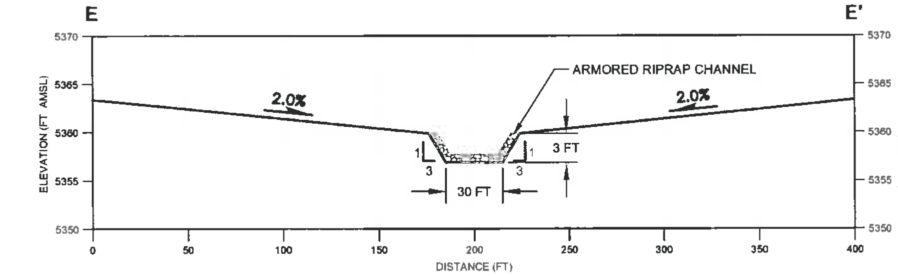
PROJECT No.		103-92557	FILE No.	10392557A008
DESIGN	CDJ	10/25/10	SCALE N.T.S.	REV. C
CADD	ANV	10/27/10	DRAWING	8
CHECK	GM	10/29/10		
REVIEW	DAK	11/17/10		





CROSS SECTION D-D'

SCALE 120 0 120 240 FEET



CROSS SECTION E-E'

SCALE (x5 VERTICAL EXAGGERATION) 50 0 50 100 FEET

LEGEND

- EXISTING CONTOURS
- DESIGN CONTOURS
- PERMIT BOUNDARY
- CROSS-SECTION CALL-OUT

NOTES

1. DRAWINGS PRESENT THE CONCEPTUAL DESIGN OF A NEW AND EXPANDED TAILINGS STORAGE FACILITY WITH A CAPACITY OF 100 MILLION TONS AT AN ASSUMED DRY DENSITY OF 85 POUND PER CUBIC FOOT.
2. FINAL DESIGN WILL BE COMPLETED IN ACCORDANCE WITH THE RULES AND REGULATIONS OF THE NEW MEXICO STATE ENGINEER, THE NEW MEXICO ENVIRONMENT DEPARTMENT (NMED) AND THE NEW MEXICO MINING AND MINERALS DIVISION (NM MMD)
3. EXISTING FIVE (5) FOOT TOPOGRAPHY AND PERMIT BOUNDARY PROVIDED BY NEW MEXICO COPPER CORPORATION.
4. FINAL EMBANKMENT CREST HEIGHT WILL BE APPROXIMATELY 5,375 FEET AMSL. TAILINGS SURFACE CONFIGURATION SHOWN REPRESENTS CONDITIONS AT THE CESSATION OF MINING OPERATIONS. APPROXIMATE LOCATION OF A POST-CLOSURE SPILLWAY SHOWN. TAILINGS DISCHARGE LOCATIONS MAY BE MODIFIED IN LATE STAGE OPERATIONS TO GRADE THE IMPOUNDMENT SURFACE AND FACILITATE POST-CLOSURE DRAINAGE TO THE PERMANENT SPILLWAY.
5. SELECTION OF A DESIGN STORM EVENT FOR STORMWATER STORAGE AND SPILLWAY CAPACITY WILL BE IN ACCORDANCE WITH THE REQUIREMENTS OF THE NEW MEXICO STATE ENGINEER.
6. TAILINGS SURFACE REGRADED AT CLOSURE OR TAILINGS DEPOSITION PATTERNS MODIFIED DURING LATE STAGE OPERATION TO CONTOUR THE TAILINGS SURFACE.
7. UNDERDRAINING TO BE COLLECTED AND EVAPORATED ON IMPOUNDMENT SURFACE UNTIL UNDERDRAIN PIPES CAN BE PLUGGED AND UNDERDRAIN COLLECTION POND BACKFILLED.

SCALE 400 0 400 800 FEET

DAVID ALAN KIDD NEW MEXICO 13778 REGISTERED PROFESSIONAL ENGINEER 11-17-10

DRAWING USE: CONCEPTUAL DESIGN NOT FOR CONSTRUCTION

PROJECT: COPPER FLAT PROJECT
TAILINGS STORAGE FACILITY
CONCEPTUAL DESIGN STUDY
SIERRA COUNTY, NEW MEXICO

TITLE: TAILINGS STORAGE FACILITY CONCEPTUAL CLOSURE PLAN

Golder Associates

PROJECT No.	103-92557	FILE No.	10392557A009
DESIGN	CDJ	10/25/10	SCALE AS SHOWN REV. C
CADD	ANV	10/27/10	DRAWING
CHECK	GM	10/29/10	9
REVIEW	DAK	11/17/10	

Golder Associates

TECHNICAL MEMORANDUM

Date: June 16, 2011
To: Mr. Steve Raugust
Project No.: 103-92557.005
Company: New Mexico Copper Corp
Suite 100 - 2425 San Pedro Dr. NE
Albuquerque, NM 87110

From: Gene Muller, Senior Engineer
David A. Kidd, P.E.

RE: **COPPER FLAT PROJECT - BORROW SOURCE AND STOCKPILE EVALUATION**

DAVID ALAN KIDD
NEW MEXICO
13778
REGISTERED PROFESSIONAL ENGINEER
6-16-11

1.0 INTRODUCTION

1.1 Background Information

The Copper Flat project is a proposed porphyry copper mining operation located in Sierra County, New Mexico, east of the town of Hillsboro. The location of the project is shown on Figure 1. Site investigation of the tailings storage facility (TSF) was initiated in 1979 on behalf of Quintana Minerals Corporation (Quintana). Quintana initiated mining operations at the property in 1982 and in 1986, after completing mine pre-stripping operations and processing approximately 1.2 million tons of ore, the operation was closed for economic reasons.

An extensive site investigation study was conducted by Sergent Hauskins and Beckwith (SHB) in 1979 and 1980 (SHB, 1980) for the TSF in the configuration required for the then approved Mine Plan of Operations (MPO). Quintana constructed the initial phase of the tailings storage facility, consisting of a starter dam and central splitter dike, and deposited approximately 1.2 million tons of tailings in the north impoundment cell. The TSF was reclaimed but the starter dam and splitter dike remain in place in the configurations that existed in 1986 following project shut down.

New Mexico Copper Corp (NMCC) proposes initiating mining operations at Copper Flat with limited changes to the MPO developed by Quintana. Changes include an increase in mineable ore reserves from 60 to approximately 100 million tons, and a corresponding increase in waste rock disposal requirements. These changes will necessitate enlargement and redesign of the TSF, and expansion of the waste rock disposal facilities and low grade ore stockpile.

To date, requirements for the new TSF have been evaluated at conceptual design level (Golder, 2010). Site investigation activities to support TSF design and expansion are planned, however, access to public lands for subsurface exploration and geotechnical investigation has not yet been granted. The footprint of the expanded TSF will be extended to the south approximately 1000 feet while the north, east and west boundaries will correspond to those of the 1980 design.

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1.2 Scope

This report presents an evaluation of borrow material availability for construction and reclamation of the expanded TSF at Copper Flat. Stockpiles required to store the various construction materials through the life of the operation are also presented. The report addresses the following anticipated material requirements:

- Structural fill materials for toe berm and starter dam construction;
- Drainage materials to enhance dam stability and promote tailings consolidation;
- Liner bedding fill to protect the impoundment geomembrane liner;
- Reclamation cover material; and
- Top dressing.

Stockpiles required to contain selected construction and reclamation materials that must be recovered from the TFS area prior to liner placement and burial with tailings are identified.

1.3 Bases Considered in Borrow Material Evaluation

Material requirements for TSF construction and reclamation are based on a material take-off of the conceptual TSF design (Golder, 2010) as presented in the Copper Flat Mine Plan of Operations (NMCC, 2010).

Access to the public land in the TSF expansion has not been granted and geotechnical investigation activities in the TSF expansion area have not been completed. Therefore, borrow sources have been identified on the basis of site investigation and geotechnical testing completed by SHB in 1980 (SHB, 1980).

Reclamation construction and associated fill material requirements for the TSF are assumed to be similar to those approved for TSF reclamation in Tyrone, New Mexico, where a 2.5 to 3-foot thick reclamation cover has been required.

Drainage material requirements are based on the conceptual design and review of the Office of the New Mexico State Engineer (OSE) dam safety regulations.

1.4 Contingency

It is recognized that construction material quantities estimated on the basis of the conceptual design may vary when final design studies are completed, however, the primary change would be associated with structural fill requirements for starter dam and toe berm construction. Locating borrow sources for structural fill materials is not considered problematic at Copper Flat, as suitable granular materials occur extensively within the construction footprint.

Changes in the configuration of the starter dam and toe berm should not significantly impact the quantities of other materials (drainage material, liner bedding and reclamation cover) that will be needed through the life of the facility. Little change in the ultimate footprint is expected as a result of modification to the toe berm or starter dam configurations.

It is also recognized that site investigation in the tailings expansion area may identify additional sources of construction and reclamation materials within the TSF permit area and footprint. While additional or alternative borrow areas may be identified within the TSF footprint, the need to stockpile materials outside the TSF will not change.

2.0 BORROW SOURCE EVALUATION

Figure 2 presents the TSF area in its current configuration with the existing starter dam and splitter dike, Tailings from the 1982 to 1986 operation were placed to the north of the splitter dike. Exploration sites from the SHB site investigation conducted in 1979 and 1980 are shown overlain on current topography.

SHP completed approximately 30 exploration bore holes in the starter dam area and approximately 70 test pits in the area located upstream from the starter dam. Under the 1982 design, borrow requirements for TSF construction consisted primarily of structural embankment fill and drainage materials. Earthwork requirements for the proposed, redesigned and enlarged TSF include:

- Top dressing;
- Reclamation cover material;
- Liner bedding fill;
- Structural embankment fill;
- Drainage materials (drain gravel); and
- Riprap and Erosion control materials.

Table 1: Schedule of Construction Material Requirements

Material	Phase 1 Cubic Yards	To Final Buildout Cubic Yards	Total	Notes
Topsoil	207,946	334,742	542,688	Place in North and West Stockpiles until reclamation
Reclamation Cover	See Note 2	2,062,509	2,062,509	Place in North and West Stockpiles until reclamation
Liner Bedding Fill	429,930	395,074	825,004	Stockpile Internally, stockpiled quantities subject to material requirements
Structural Embankment Fill	2,124,450	324,511	2,448,961	Available all construction phases in TSF area
Drainage Materials	483,333	77,778	561,111	Available all construction phases in TSF area

Notes:
1 Approximately 882,000 cubic yards of Phase 1 structural fill will be recovered from the existing starter dam.
2 Reclamation Cover material is assumed to be derived from inside the TSF. Reclamation cover can be collected during one or more construction phases.

Table 1 presents a summary of construction material requirements for TSF construction and reclamation based on the conceptual design. The borrow sources and handling of the various construction and reclamation materials are discussed in the following report sections.

2.1 Top Dressing Salvage and Stockpiling

The footprint of the proposed TSF and underdrain collection pond will cover approximately 550 acres at final build-out. Areas disturbed by the 1982-1986 operations cover approximately 105 acres. These include the footprint areas of the old starter dam and splitter dike and the south cell tailings disposal area.

Assuming 6-inches of top dressing over the entire TSF at closure, approximately 438,000 cubic yards (cy) of top dressing will be required. The majority of top dressing stripping operations will be required in the initial construction phase. Additional topdressing salvage will be required as the tailings surface rises and the TSF liner system is extended westward. A top dressing stockpile will be required outside the TSF footprint until reclamation commences.

It is assumed that top dressing will be recovered from undisturbed areas to avoid potential contamination with tailings from the Quintana operation. During site investigation activities, the location of old tailings deposits will be confirmed and areas where top dressing stripping is to be undertaken will be delineated. Stripping up to a depth of nine inches in undisturbed areas will generate approximately 542,000 cy of topdressing, a quantity sufficient to cover the TSF and potentially supplement shortages in other areas disturbed during the Quintana operation.

2.2 Reclamation Cover Fill

As noted above, reclamation cover requirements for TSF reclamation are assumed to be similar to those approved for use at Tyrone, New Mexico, which consist of a 2.5 to 3-foot thick cover of native soils (Gila Conglomerate) over the TSF. Cover material estimates and stockpile requirements for the Copper Flat TSF assume a 3-foot thick cover consisting of 6-inches of top dressing and 2.5-feet of alluvial and colluvial cover fill. Alluvial and colluvial gravels suitable for reclamation cover occur over approximately 70 percent of the surface area inside the existing TSF footprint.

Because the TSF dam will be constructed by centerline methods, reclamation material cannot be placed on the dam, or tailings surface, until tailings deposition is complete. At final build-out of the TSF will cover an area of approximately 511 acres and will require approximately 2.06 million cy of alluvial/colluvial cover material. It is assumed that reclamation cover material will be collected and stockpiled outside the TSF footprint during one or more construction phases because there are limited borrow sources outside the TSF and within the project permit area.

If NMCC expands the permit area to include external borrow sources for reclamation fill, stockpiling reclamation cover fill will not be necessary.

2.3 Liner Bedding Fill Material

To date, a lined tailings disposal facility has not been constructed in the State of New Mexico and no precedent exists on which to base the thickness, gradation and hydraulic conductivity requirements for a bedding layer for a TSF geomembrane liner.

The thickness of a liner bedding layer is anticipated to range from 6 to 12 inches and be dependent upon the function of the bedding layer (i.e., liner protection or hydraulic barrier).

If NMCC will be required to construct a composite liner system consisting of a geomembrane and low permeability soil bedding layer, typical requirements for gold heap leach pads and process solution ponds include 12-inches of material with a maximum hydraulic conductivity of 10^{-6} centimeters per second (cm/sec). To achieve hydraulic conductivity requirements, bedding fill will need to be composed of clayey soils with a fines fraction (minus 200 standard sieve) of approximately 40 percent coupled with moderate plasticity.

Bedding layers that serve only as a geomembrane protective layer can be constructed with granular materials. Arizona mandates a minimum 6-inch layer of minus 3/8-inch material as a protective layer for lined non-stormwater ponds. These materials are typically produced by crushing and/or screening of local borrows materials.

Materials suitable for either liner bedding requirement occur within the area explored by SHB in 1979-80. Silty clays occur in the area immediately west of the existing starter dam while clays of moderate to high plasticity occur near the south abutment and south of the splitter dike along the centerline of the existing starter dam. Materials suitable for construction of granular bedding can be produced by selective borrowing and screening of alluvial and colluvial materials that cover much of the existing TSF area.

Regardless of the material properties and source of the liner bedding fill layer, some stockpiling of liner bedding fill will be required during construction of the TSF. However, since the material will be utilized during phased construction, temporary liner bedding fill stockpiles inside the TSF footprint can be utilized.

2.4 Structural Embankment Fill

The majority of structural fill required to construct the starter dam and toe berm will be required during initial Phase 1 construction. Based on the conceptual TSF design, starter dam and toe berm will require approximately 2.12 million cy for initial construction, and approximately 0.33 million cy to extend the perimeter berm and starter in subsequent construction phases. It is assumed that the old starter dam and splitter dike will be used as a source of structural fill, thereby reducing new Phase 1 borrow source requirements to approximately 1.2 million cy.

Structural fill materials are readily available within the TSF footprint. It is anticipated that additional borrow sources will be identified in the TSF expansion area when site exploration activities are completed.

The need to stockpile structural fill materials is not anticipated as suitable materials occur westward across the TSF footprint. These materials will be exposed and available throughout phased construction.

2.5 Riprap and Erosion Control Materials

While detailed design of diversion ditches, permanent conveyance channels, energy dissipation structures and spillways has not been performed, it is anticipated that these structures will require armoring for temporary and permanent erosion control. To date, sources suitable for providing riprap have not been identified in the TSF. It is assumed that these materials will be obtained from unmineralized waste rock or the proposed permanent spillway cut. No significant stockpile requirements are expected for erosion control materials.

3.0 STOCKPILES

To summarize the borrow material discussion, external stockpiles will be required for reclamation cover fill and top dressing obtained from within the TSF. These stockpiles will remain active until reclamation construction has been completed. Depending upon the material property requirements of the liner bedding fill layer, an internal stockpile may be required to temporarily store liner bedding fill obtained from borrow sources inside initial construction areas. Drainage materials and structural fill are not anticipated to require permanent or temporary stockpiles.

The material storage requirements for top dressing and reclamation fill are a combined 2.61 million cy. Two external stockpile locations have been identified in the vicinity of the TSF within the permit area. The West Stockpile lies in a small drainage and will require an underdrain system to permit runoff from upgradient areas to pass beneath the stockpile. As shown on Figure 2, the capacity of the West Stockpile is approximately 2.1 million cy. The North Stockpile lies north of Greyback Wash and has a capacity of approximately 1.9 million cy as shown.

To minimize haul distance, it is anticipated that the stockpiles will contain both top dressing and reclamation cover material and will therefore require zoned construction to facilitate recovery of selected materials as needed during reclamation construction. Stockpile design will be completed as part of final TSF design when detailed material storage estimates can be produced.

4.0 DISPOSITION OF EXISTING TAILINGS

Approximately 1.2 million tons of tailings were placed in the north cell of the old TSF between 1982 and 1986. This disposition of old tailings has not been determined, however, two alternatives have been identified in which the tailings can be utilized as construction material while mitigating potential impacts associated with leaching of sulfate:

- Utilize the tailings as fine grained liner bedding fill; or
- Incorporate the tailings in the structural fill for the starter dam.

If used as liner bedding fill, placement under the geomembrane liner will effectively cap the old tailings and minimize their exposure to infiltration and leaching. Because the new starter dam will be constructed over the future liner system, incorporation of the old tailings the structural fill will put the old tailings within the new containment.

The proposed site exploration plan includes collection of old tailings samples. Use of the tailings as liner bedding or structural fill will be evaluated by geotechnical testing.

5.0 CLOSING

Construction material availability will be reevaluated when geotechnical investigation of the expanded TSF site has been completed. Suitable and sufficient materials for TSF construction exist within the area explored by SHB in 1979-80. More convenient borrow locations may be identified in the TSF expansion area. External stockpile requirements are not expected to change if additional internal borrow sources are identified.

6.0 REFERENCES

Golder Associates Inc., 2010, Copper Flat project Conceptual Design Report. Report prepared for New Mexico Copper Corporation, November, 2010

New Mexico Copper Corporation. 2010, Copper Flat Mine Plan of Operations, Report prepared for U.S. Department of the Interior, Bureau of Land Management

Sergent, Hauskins and Beckwith, 1980, Final Geotechnical and Design Development Report. Report prepared for Quintana Minerals Corporation

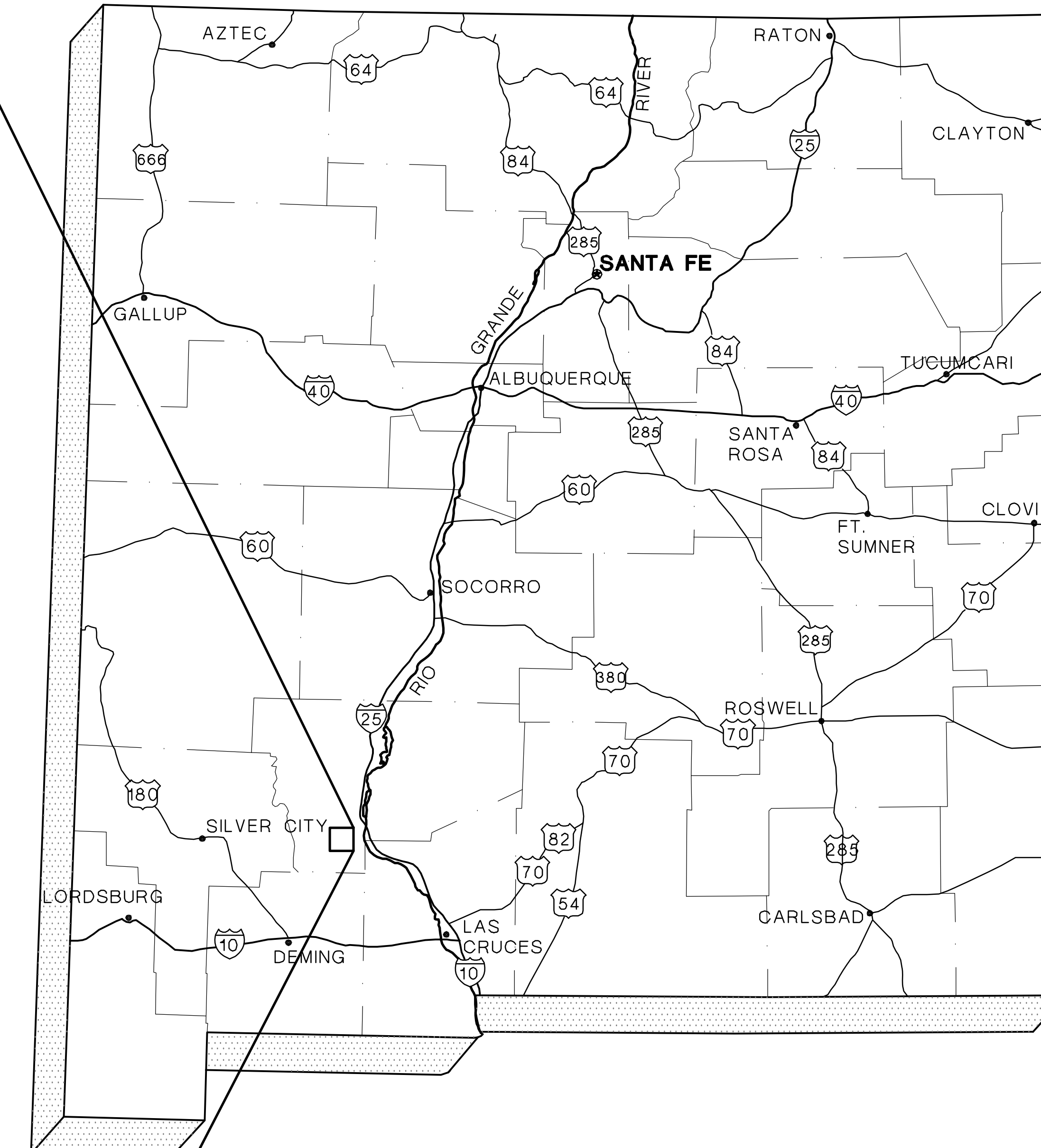
Attachments: Figure 1 - Site Location Plan
Figure 2 - Tailings Impoundment Borrow Source and Stockpile Plan

GM/DAK/br

FIGURES

AERIAL PHOTOGRAPH OF PROPOSED TAILINGS DISPOSAL SITE

NOT TO SCALE



STATE OF NEW MEXICO

NOT TO SCALE

PROJECT	
	COPPER FLAT PROJECT TAILINGS STORAGE FACILITY BORROW SOURCE EVALUATION SIERRA COUNTY, NEW MEXICO
TITLE	SITE LOCATION MAP

PROJECT No.		103-92557	FILE No.	10392557B003
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CHECK	GM	06/02/11		1
REVIEW	DAK	06/02/11		

Golder Associates

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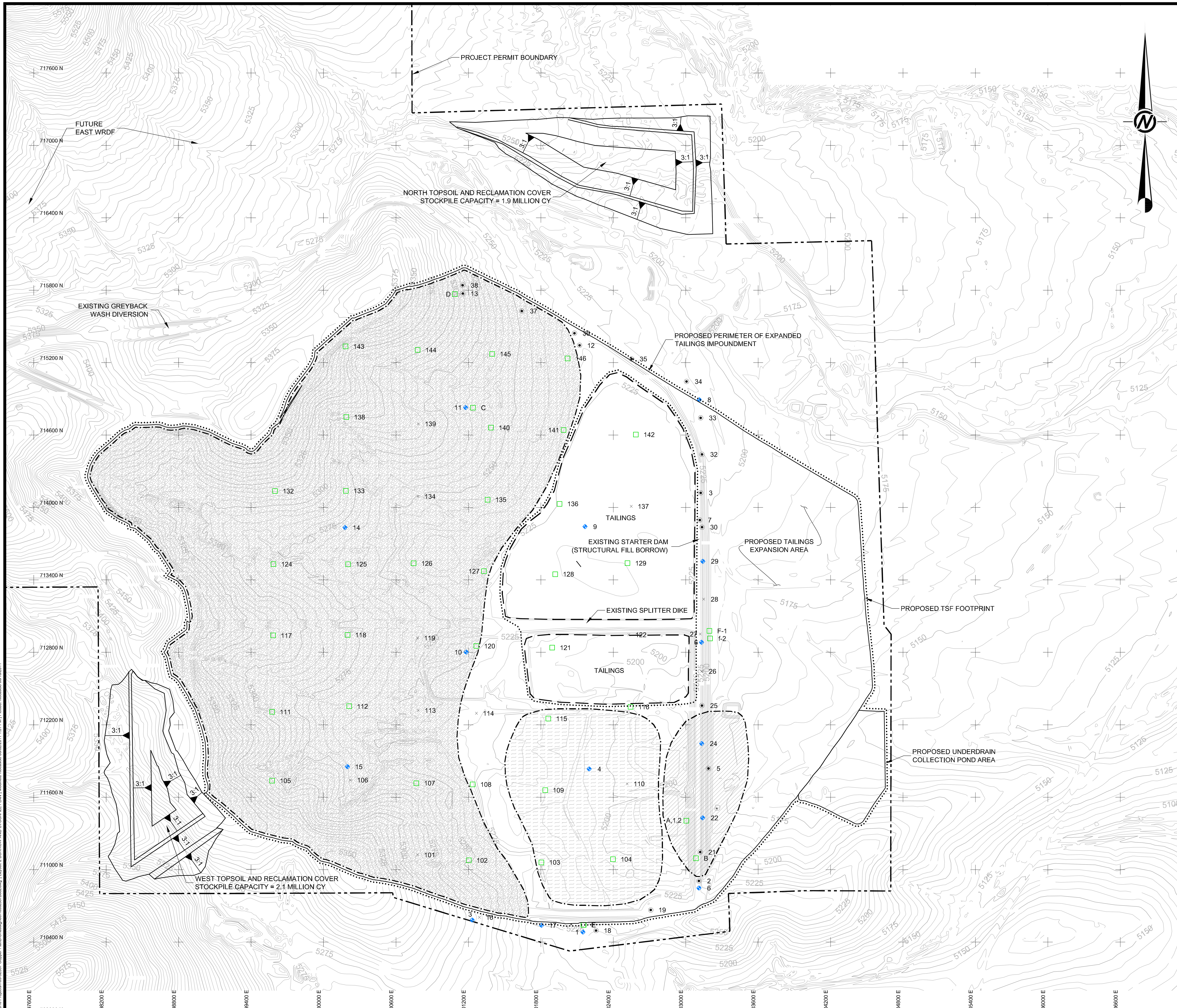

LEGEND

- EXISTING GROUND CONTOUR (FT. AMSL)
- PERMIT BOUNDARY
- GEOTECHNICAL DRILL HOLE (BY OTHERS)
- TEST PIT (BY OTHERS)
- PAIRED TEST PIT AND GEOTECHNICAL DRILL HOLE (BY OTHERS)
- GEOTECHNICAL DRILL HOLE WITH FALLING HEAD TEST (BY OTHERS)
- TSF FOOTPRINT
- 3:1 SLOPE INDICATOR
- TAILINGS FROM 1982 TO 1986 OPERATIONS (NO TOP DRESSING STRIPPING)
- FUTURE TOP DRESSING STRIPPING LIMITS
- BORROW AREA - HIGH PLASTICITY CLAYS
- BORROW AREA - FINE GRAVELS, SILTY GRAVELS
- BORROW AREA - STRUCTURAL FILL, RECLAMATION COVER FILL, DRAIN GRAVELS

NOTES

1. TOPOGRAPHY IN THE MINE AREA AND TAILINGS STORAGE FACILITY REPRESENTS EXISTING CONDITIONS AND DISTURBANCE ASSOCIATED WITH QUINTANA 1981-82 MINING OPERATIONS.
2. LINER BEDDING FILL CAN BE STOCKPILED WITHIN THE TSF CONSTRUCTION LIMITS.
3. AREAS SUBJECT TO 1982-1986 TAILINGS DEPOSITION WILL BE EXCLUDED FROM TOP DRESSING STRIPPING OPERATIONS. EXTENT OF TAILINGS TO BE VERIFIED DURING SITE INVESTIGATION FOR EXPANDED FACILITY.

REFERENCES

1. EXISTING FIVE (5) FOOT TOPOGRAPHY AND PERMIT BOUNDARY PROVIDED BY NEW MEXICO COPPER CORPORATION.
2. SITE EXPLORATION LOCATIONS FROM FINAL DESIGN DEVELOPMENT AND GEOTECHNICAL REPORT, SERGENT HAUSKINS AND BECKWITH, 1980. EXPLORATION SITES ARE PROJECTED ON CURRENT TOPOGRAPHY.
3. BORROW MATERIAL REQUIREMENTS BASED ON CONCEPTUAL DESIGN REPORT, GOLDER ASSOCIATES INC., NOVEMBER 2010.

400 0 400 800
SCALE FEET

PROJECT
COPPER FLAT PROJECT
TAILINGS STORAGE FACILITY
BORROW SOURCE EVALUATION
SIERRA COUNTY, NEW MEXICO

TITLE
BORROW AND STOCKPILE PLAN

Golder Associates

PROJECT No.		103-92557	FILE No.	10392557B002
DESIGN	GM	06/02/11	SCALE	AS SHOWN
CADD	NIL	06/01/11	FIGURE	
CHECK	GM	06/02/11		2
REVIEW	DAK	06/02/11		

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APPENDIX E

Preliminary Spill Contingency Plan

New Mexico Copper Corporation

Copper Flat Project
Spill Contingency Plan

Report Prepared for:

U.S. Department of the Interior
Bureau of Land Management
Las Cruces District Office
1800 Marquess Street
Las Cruces, NM 88005-3370

Report Submitted by:

NEW MEXICO COPPER CORPORATION
2425 San Pedro Dr. Suite 100
Albuquerque, NM 87110
Office: (505) 382-5770

December 2010

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TABLES

APPENDICES

1 FACILITY INFORMATION AND EMERGENCY RESPONSE

This Spill Contingency Plan has been prepared pursuant to Title 43, Part 3809 of the Code of Federal Regulations (CFR) [43 CFR § 3809.401(b)(2)(vi)] which requires development of a contingency plan as part of the Plan of Operations for mining operations. This Plan establishes procedures for response to oil, fuel and hazardous material spills, including control, cleanup and reporting. NMCC has developed this Contingency Plan to respond to spills and to minimize the impacts from spills of oil, fuel, oil-related products, and hazardous substances to the environment.

NOTE: THIS PLAN WILL BE UPDATED AND RESUBMITTED TO THE BLM AS FINAL DESIGNS OF THE OPERATIONAL FACILITIES ARE COMPLETED, AND PRIOR TO ANY MINE-RELATED ACTIVITY AT THE SITE.

The Environmental Manager (EM) has primary responsibility for implementing the Contingency Plan. The EM or his/her designee will be present at the facility during normal working hours.

Secondary containment structures designed to prevent the migration of a spill are part of the design of Facility components and are included in the Plan. Fuel and oil for the diesel and gas-powered equipment will be stored in above-ground, sealed tanks in the processing area. The tanks will be installed on lined pads and surrounded by berms to contain the volume of the largest tank within the secondary containment in the event of a spill or release.

The Contingency Plan will be posted and distributed to site personnel and will be used as a guide in training employees. Emergency reporting procedures will be posted in key locations throughout the project area. NMCC will be responsible for events at the mine site, while contract haulers (i.e., trucking companies) will be responsible for accidents and spills along the transportation routes.

Reporting spills or releases of oil-related materials or hazardous materials to the environment is divided into four categories:

1) Releases requiring internal notification only;
2) Releases also requiring notification to the State of New Mexico;
3) Releases also requiring notification to the National Response Center (NRC) and the local Emergency Planning Committee pursuant to CERCLA or Superfund; and
4) Releases subject to Clean Water Act requirements only.

Determining which of the above categories is appropriate for any particular spill or release depends on the type of material, the amount released, and the circumstances of the spill or release.

1.1 Emergency Response Action Plan

An Emergency Response Plan, which addresses responses to hazardous material releases, large-scale non-hazardous material releases, and natural disasters, will be prepared for the Facility and maintained in the Environmental Department.

1.2 Facility Information

The Copper Flat Mine Project (Project) is located in Sierra County, New Mexico, approximately 30 miles southwest of Truth or Consequences near Hillsboro. The NMCC mailing address is:

New Mexico Copper Corporation

2425 San Pedro Dr. Suite 100
Albuquerque, NM 87110
Office: (505) 382-5770

The area comprised of mine operations components, the Copper Flat Mine Facility (Facility), is anticipated to use diesel fuel, gasoline, motor oil and other petroleum hydrocarbons and chemical reagents. Oil is anticipated to be stored entirely above-ground.

No navigable waters have been defined at the mine facility; however, an intermittent or ephemeral stream called Greyback Wash passes through the pit area and a few springs or seeps occur west of the pit and up-gradient, all of which are tributaries to the Greyback drainage basin to the west of the pit.

The ore body at the Copper Flat Mine Facility is exposed at the surface and will be mined by conventional open-pit methods. The site is located in a semi-arid region of New Mexico with a mean annual precipitation of about 12 inches.

Ore from the pit will be trucked to the plant area east of the pit. The proposed process involves crushing and grinding followed by the addition of non-toxic organic reagents to create a copper laden froth and filtering to form a concentrate. Ore will be crushed or ground and organic reagents added to create froth. Copper minerals will adhere to the bubbles of the froth. The copper will be collected and filtered to form a concentrate. The proposed mill/concentrator plant is a sulfide flotation plant. No leaching processes, including cyanide leaching, are to be used. No smelting will occur at the Project.

For the purpose of grouping oil containment and storage according to distinct areas, the mine site has been delineated by the following anticipated areas or components:

<u>Fuel Storage Island</u>

Fuel and oil for diesel and gas powered equipment will be stored in above-ground, sealed tanks in the processing facilities area. The tanks will be installed on lined pads, consisting of gravel underlain by a plastic liner. The pad area will be surrounded by berms to provide secondary containment for the largest vessel in case of rupture. Surface piping leads from each tank to the fuel dispensing area. The refueling hoses will be equipped with overflow prevention devices and secondary containment.

<u>Bone Yard</u>

The bone yard will contain empty drums which will have the lids removed. The drums will be labeled as to their former contents. The drum storage areas will have secondary containment systems to minimize the potential for spills of oil and grease to the ground surface.

<u>Truck Shop</u>

A garage at the truck shop will contain lube oil containers and oil and transmission fluid drums. The garage will have a cement floor and a containment wall.

<u>Truck Wash</u>

Truck washing will occur on a cement slab with wash water recycled. Overflows of wash water from the tanks will be minimized.

<u>Shop and Warehouse Building</u>

Numerous drums of unopened/unused oil, antifreeze, transmission fluid and acetone will be stored on racks or pallets in the storage areas of the shop and warehouse building. This building will be prefabricated, standard, rigid-framed equipment servicing facility. Secondary containment will be provided, but the drums will not generally be opened at the site, and are only stored until required by mine staff.

<u>Mobile Tanks</u>

Mobile tanks, consisting of emergency power units/trailers, trailers, and "lube" trucks, may be used to store miscellaneous types of oil and fuel. The trailers and lube trucks are used to service other vehicles and equipment throughout the mine site. Due to the transient nature of the mobile tanks, permanent secondary spill containment is not provided. However, mobile tanks will be positioned in areas that are not subject to periodic flooding or washout.

Explosives

Blasting will be done with primacord, ammonium nitrate and fuel oil (ANFO), and emulsion suitable for use where wet holes are encountered. The blasting contractor will mix the components for each blast on an as needed basis. Mixing of the components will be performed at the batch plant operated by the contractor.

Blasting agents will be stored in compliance with applicable MSHA regulations Ammonium nitrate and diesel fuel will be stored on-site in bins and tanks. Storage of detonators, detonating cord, boosters, caps and fuses will be in accordance with the MSHA and New Mexico State Mine Inspectors regulations for explosives. The storage locations for each of these facilities have not yet been selected, but safety and security will be the main factors considered in their location. An inventory of these components will be made. To avoid potential spills, transfer and loading of explosives will be observed at all times by specialized personnel with appropriate training.

Hazardous Materials

No extremely hazardous substances (as defined by 40 CFR § 355) will be used at the Facility. None of the reagents to be used at the facility milling operations are considered to be hazardous materials by the Comprehensive Environmental Response, Comprehension and Liability Act (CERCLA) definition. Hazardous substances identified in CERCLA include all chemicals on the following regulatory lists:

1. Clean Air Act list of hazardous air pollutants (HAPs).
2. Clean Water Act list of hazardous substances and priority pollutants.
3. Solid Waste Disposal Act list of hazardous wastes.
4. Toxic Substances Control Act list of imminent hazards.

1.3 Emergency Response Information

1.3.1 Notification / Reporting

Proper reporting of spills is very critical and must be done carefully and accurately in a timely manner. A spill event notification flow sheet and a call list with contact names and telephone numbers will be developed and submitted to the BLM prior to commencement of site activities. All spills of any quantity are to be reported to the EM for general reporting guidance.

Records and reports of spills and releases shall be maintained for a period of five years by the EM, and will be made available for inspection upon request by EPA or state agency personnel, as required by SPCC Plan regulations.

How to Report

All spills will be reported in accordance with spill event notification flow sheet (see cover pages of this document), followed by completion of a spill/release record (Appendix C) to be submitted to the EM.

In-House Verbal Reporting

After taking immediate action, the person discovering the spill must notify his/her supervisor. The supervisor will notify the Loss Control Department. Loss Control then notifies the EM. Notification will include the information listed below.

- Date and time of spill;
- Type of material spilled and estimated quantity;
- Location of spill;
- Media impacted (soil, surface water, groundwater);
- Damages or injuries;
- Names and numbers of all persons contacted;
- Reason (cause) for spill;
- Action to prevent recurrence (corrective actions);
- Equipment type, equipment number, and tank number;
- Amount of soil added to approved on-site disposal facility;
- Date cleanup action taken; and,
- Name/position/title of person responsible for cleanup action.

If the Loss Control Leader cannot be reached, the EM must be contacted directly. The EM will determine if it is a reportable spill or discharge. If it is determined to be reportable, the EM will report the event and information to the General Manager as soon as possible.

If the Loss Control, General Manager, EM, Maintenance Superintendent or Production Superintendent cannot be reached, the respondent must call Security, who has company and home phone numbers of these persons and other responsible persons.

The EM will notify the appropriate state and federal agencies concerning spills or releases as required. No one but the EM or designated representative, or the General Manager is authorized to call any government agencies concerning spills. This restriction is needed to ensure that only confirmed, accurate information is provided to the regulatory agencies.

In-House Written Reporting

For any spill or release of oil (oils, gasoline, diesel, etc.) outside of a containment area, a complete written report must be submitted to the Environmental Department as soon as possible (usually within 24 hours of the spill). This written report must address the same components for verbal in-house reporting (above) and any additional issues deemed important by operating personnel. The spill reporting form found in Appendix C has been designed to facilitate such written reporting of spills.

Reporting to State and Federal Agencies

The EM or designated representative will execute all reporting to the agencies under the direction of the General Manager. The EM or designated representative will do the following with respect to regulatory reporting:

1. Report immediately any "reportable" (100 gallons or more) oil spill to the State as well as any spill that enters or threatens to enter any river, stream, canal, sewer, drain, lake or pond.
2. Make necessary written reports to the State, National Response Center and other agencies as required. The National Response Center typically does not require a written report of the spill, although one may be requested in certain situations. Verbal notification to the agencies must be made as soon as possible, but not later than after the first working day after the release. In case the EM or designated representative cannot be contacted by the end of the first working day after the release, the verbal report must be made by the General Manager, giving the data listed for verbal in-house reporting. In New Mexico, reporting procedures are as follows:

- Any spill of oil or hazardous materials, which enters directly into water or has the potential to do so, requires immediate verbal notification. "Immediate" has been defined for this situation as "as soon as possible" after the release. The verbal notification may be made by calling the emergency contact telephone numbers as listed in Appendix E.

  During these calls, the state, federal, or local agencies will determine whether a follow-up written report is required. If required, this report would be due within ten (10) calendar days of the release. The required components of the written report will be discussed during the verbal notification. If required, this written report would go to the following as directed by the State:

  - Releases of oil, which do not enter directly into water and do not have the potential to do so, must be dealt with in the following manner: A release of greater than 100 gallons of oil requires verbal notification by the end of the first working day after the release. The EM or a designated representative performs this notification by calling the emergency contact telephone numbers as listed in Appendix E. All releases which fall into this category may require a written follow up report, due within ten (10) calendar days of the release. The required components of the written report will be discussed during the verbal notification. If required, this written report would go to the following as directed by the State:

    New Mexico Environment Department
    PO Box 5469
    Santa Fe, New Mexico 87502-5469

  - Releases of oil greater than 1,000 gallons of oil into or upon navigable waters (or in this case, waters of the State) requires additional notification to the EPA Regional Director (40 CFR § 112.4(a)). The EM or a designated representative does this by contacting:

    United States EPA, Region 6
    1445 Ross Avenue (maps)
    Suite 1200
    Dallas, Texas 75202
    (214) 665-6444

    All releases which fall into this category require a written follow-up report, due within sixty (60) calendar days of the release. The required components of the written report will be discussed during the verbal notification.

1.3.2 Response Equipment List

General Spill Cleanup Materials: Spill cleanup materials will be kept in the Warehouse, and include:

- disposable gloves;
- chemical resistant disposable boots, coveralls;
- short-handled brooms;
- adsorbent rags;
- oil sorbent material;
- approved compatible storage container;
- large plastic bags;
- tape;
- floor sweep;
- soda ash
- short-handled shovels; and

- dustpans.

Large Equipment for Cleanup

The Facility will operate 24 hours a day, 365 days per year. Rubber tire loaders, track dozers, motor graders, and backhoes are available and will be dispatched as needed for spill cleanup.

2 HAZARD EVALUATION AND DISCHARGES

2.1 Hazard Evaluation

2.1.1 Reagents Used for Processing

Following the froth flotation process for the tailings, the remaining slurry, consisting primarily of gangue minerals, pyrite and miscellaneous other un-floated minerals, along with water, flows into a tailings thickener for partial dewatering. Surface runoff, including any potential spills, from the areas around the reagent storage and tailings thickener will be controlled by surface grading and directed to the containment pond. Filtrate from both the copper flotation circuit and the molybdenum flotation circuit will be returned to the concentrate thickeners. Thickener overflow will be returned to the plant reclaim water system.

The molybdenum concentrate will be dried prior to packing into 55-gallon drums for shipment off-site. Provisions have been made to enable the tailings to be diverted around the thickener and discharged directly into the disposal ponds in the event of emergency mechanical problems.

A list of the reagents to be used on the site is included in Appendix F. Flotation collectors, frother and flocculants that are received dry will be mixed in agitated tanks and pumped to outdoor storage tanks and day tanks inside the mill building from which they are metered into the process.

Residual reagent concentrations in the tailings and reclaim water streams are expected to be at very low levels. The collector and promoter flotation reagents (a type 1 reagent) will be added in amounts resulting in concentrations of approximately three parts per million (ppm). This is using an addition rate of 0.02 pounds of reagent per ton of ore and two tons of water to the flotation process. Normally, 95 percent of the reagents are adsorbed onto the copper mineral surface and floated off in the mineral froth. This reagent is subsequently consumed in the off-site smelting process thereby adding its BTU's to the reaction. Using this 95 percent adsorption factor, the residual reagent reporting to the tailing stream drops to <0.15 ppm.

The frother reagent MIBC (a Type 2 reagent) is to be biodegradable in low concentrations as stated by the manufacturer (see Union Carbide MSDS for MIBC). The anticipated dosage rate will be 0.02 pounds per ton of mill feed. The bulk of this reagent will also report to the concentrate fraction and end up at the smelter.

The flocculent reagent (a Type 1 reagent), to be added at 0.016 pounds per ton of mill feed, is also classified as being biodegradable and exhibits a low tolerance to exposure to high pH solutions. Given the 10 to 11 pH range this plant will normally operate at, this reagent will rapidly decompose.

Lime (a type 3 reagent) is used at a rate of 2.7 pounds per ton of mill feed to control pH of the flotation circuit, most of which reacts with sulfide minerals to form gypsum.

Sodium Hydrosulfide (NaHS, a type 3 reagent) will be added to the molybdenum circuit process to effect the copper molybdenum separation. This reagent is rapidly oxidized through contact with the copper minerals and air bubbles entrained in the flotation pulp.

2.1.2 Hazard Identification

A list of the reagents anticipated to be used at the facility is provided in Appendix F. Material Safety Data Sheets (MSDS) for the reagents to be used at the facility will be on file at the site. None of the reagents to be used at the facility milling operations are considered to be hazardous materials by the Comprehensive Environmental Response, Comprehension and Liability Act (CERCLA) definition. Hazardous substances identified in CERCLA include all chemicals on the following regulatory lists:

1. Clean Air Act list of hazardous air pollutants (HAPs).

2. Clean Water Act list of hazardous substances and priority pollutants.
3. Solid Waste Disposal Act list of hazardous wastes.
4. Toxic Substances Control Act list of imminent hazards.

Inventories of bulk storage containers and container storage areas, electrical transformers, and mobile service vehicles, including descriptions of secondary containment, are provided in tables in Appendix F.

2.1.3 Vulnerability Analysis

Reagent spills will be contained by curbs in the reagent mixing and storage areas. A floor sump pump will be used to return spilled material either to the storage tank or into the milling process as necessary.

2.1.4 Worst Case Discharge

A worst-case spill scenario would involve total failure of the primary and secondary containment or failure which would otherwise allow discharge of the contents of the primary containment. The volume of discharge from such a failure could potentially equal the total contents of the tank. The rate at which this flow would occur would depend on the type of product in the tank, the depth of product in the tank, and the size/area of the release opening. For the largest tank, it is conceivable that such flow could equal tens or hundreds of gallons per minute.

The possible spill pathways have been estimated based upon a review of the topographic maps and a mine site inspection. The lateral extent of a spill would be a function of the type of product released, amount of product released, whether the spill was concurrent with a precipitation event, adequacy of the secondary containment, and ground surface cover.

2.2 Discharge Detection Systems

2.2.1 Discharge Detection by Personnel

Small leaks and spills that are confined to small areas will be cleaned up as part of the facility's SOPs. In cases where a medium or large (worst-case) leak has occurred but is confined to facility property, cleanup will proceed as follows:

In the case of a medium spill, direct response measures include:

1. Stop the leak by plugging the leak and/or closing the valve and ensure that the spill is totally contained.
2. Clean up the spill in accordance with general spill response procedures (Table 2-1). Facility employees under the direction of the authorized person or direct Supervisor will conduct the cleanup operation.

In the case of a large spill, direct response measures include:

1. Terminate the source of the flow of petroleum or chemical product.
2. Dig a trench or dike or do whatever else is necessary to confine the area of the spill or to stop it from entering a waterway. Never clear away spills with water! Water tends to mobilize a spill. Instead, use the most appropriate oil-absorbent materials, such as those contained in the spill cleanup kits, to prevent petroleum products from flowing into watercourses.
3. Plug floor drains, place sorbent materials around the spill or take other actions to minimize environmental damage. Sorbent materials will be stocked at the main warehouse.

4. Immediately initiate reporting procedures. The Loss Control Department, Mine Manager or EM must be notified (by radio or phone). The Control Room Operator will follow the Dispatch Emergency Communication Procedures (Appendix D).
5. After the response measures and reporting functions have been accomplished, cleanup will begin in accordance with general spill response procedures (Table 2-1). Should facility personnel be unable to perform the appropriate cleanup operation, and it is necessary for cleanup to begin immediately, the General Manager will utilize outside contractors. Unauthorized site personnel must not notify contractors directly. The General Manager has assigned certain individuals the responsibility of contacting outside contractors with a facility contract.

Table 2-1: General Spill Response Procedures

Spill Event:	Incidental (collected within secondary containment)	Significant (breaching of secondary containment)	Significant (available personnel unable to contain spill after attempting direct response measures)
Close Valve/Discharge Equipment	●	●	●
Mobilize Mine Equipment to Containerize Spill		●	
Use Sorbent Materials to Facilitate Containment		●	
Notify General Manager			●
Excavate Contaminated Soil and Transfer to Landfill, Pump Liquid for Off-Site Disposal	●	●	●
Notify Environmental Department for Transfer Approval	●	●	●
Repair/Replace Tank/Piping/ Discharge Equipment as Necessary	●	●	●

3 PLAN IMPLEMENTATION

In the event of an oil, fuel or chemical reagent spill, facility personnel will implement control procedures as summarized in the following table and detailed in the following sections. Response measures have been designed to mitigate the possibility of oil reaching waters of the State. Response measures include containing the spill, stopping the leak, and cleaning up the spill with the most effective means available. Facility employees will undertake these measures immediately when there is any danger of oil entering any waters of the State and in case of any oil spill.

3.1 Response Resources for Small, Medium, and Worst Case Spills

Small leaks and spills that are confined to small areas will be cleaned up as part of the facility's SOPs. In cases where a medium or large (worst-case) leak has occurred but is confined to facility property, cleanup will proceed as indicated in Section 2.3.1. Spill response equipment and materials are listed in Section 1.3.2.

For spills on gravel or soil, it may be possible to absorb some of the liquid with absorptive material or remove some of the liquid before removing the gravel or soil. Following approval of the Environmental Department, all contaminated gravel or soil will be removed and transported to an approved facility for disposal.

Spills on solid surfaces may be collected with absorptive materials and then cleaned thoroughly with rags wetted with a non-hazardous solvent if needed. Sufficient quantities of sorbent material and other cleanup equipment will be maintained at the warehouse facility to provide for cleanup.

If there is a small amount of water with the spilled oil, the water and the oil may be absorbed in sand, sawdust, or commercial adsorbents and disposed of per the Environmental Department's directions. Any residual sediment or sludge will also be cleaned up and also disposed of per the Environmental Department's directions.

3.1.1 Fire Protection

A fire protection system will be installed in the administration and warehouse complexes, truck shop, crushing plant and process plant. This system will incorporate Sierra County Code requirements. Hydrants will be located near all buildings. A 100,000-gallon fire water reserve will be stored in a water storage tank located sufficiently above and near the mill and crushing area to provide adequate water pressure. A fuel break will be constructed around the facilities. Water trucks, used for dust suppression, will be available in the event of a fire. One mine rescue vehicle will be located on-site in the event emergency transportation is required.

NMCC will promptly comply with any emergency directives and requirements of Sierra County, and the BLM requirements pertaining to industrial operations during the fire season.

NMCC will train an in-house fire brigade in the proper use of fire suppression equipment. In addition, the Sierra County Fire Protection Officer will provide advice on methods to maximize the benefit of equipment and to provide assistance in training Project personnel in fire fighting procedures and drills. The Hillsboro Voluntary Fire Department will be advised as the nature of materials that will be transported through town on a routine basis. Sierra County presently has spill response capabilities and all trucking contractors will be in compliance with 49 CFR and U.S. Department of Transportation regulations, to aid in the reducing the potential for spills and accidents and for mitigating releases that may occur during transport of hazardous materials. In the event of a release, the contract transportation company would be responsible for response and cleanup. Additional specialized training is required for drivers of tank trucks, such as those transporting acid.

3.2 Disposal Plans

Spent cleanup material, residual spilled oil, and hydrocarbon-contaminated soil will be properly disposed of in accordance with applicable state and federal regulations either in an on-site facility or at an approved off-site facility authorized to accept the type of waste.

3.3 Containment and Drainage Planning

Spill prevention and spill control requirements for the Facility include the following:

Spill Prevention

- Inspection and maintenance of oil, fuel and chemical reagent storage containers and transfer points;
- Testing of primary storage containers;
- Facility personnel training on SCP Plan implementation;
- Security; and
- Oil and fuel transfer procedures.

Spill Control

- Facility drainage; and
- Structural controls and equipment (diversion and secondary containment).

Storage tanks determined to not be in conformance with appropriate spill prevention guidelines will be corrected as soon as possible. All oil products are to be stored in above-ground steel tanks and provided with secondary containment unless otherwise noted.

At oil or fuel transfer points, vendor personnel are required to remain with the transport vehicle and observe the tank filling at all times. As filling takes place, vendor personnel are required to remain attentive to the tank level indicators to prevent tank overfills. Connection of the tank fill lines takes place before the master flow control valve is opened. Piping to the tanks will be equipped with back flow prevention devices (check-valves). After filling, the master flow control valve will be closed before disconnecting the fill hoses. A bucket will be placed below the fill valves during tank filling to contain any discharge. A service vehicle will then evacuate this bucket, as necessary.

Secondary containment will be provided for all permanently located oil, fuel and chemical reagent storage tanks, as well as for fill and dispenser points, to minimize the potential for a discharge to reach waters of the State. Secondary containment for each storage tank will have sufficient capacity to contain the contents of the largest tank in a containment area and sufficient freeboard to allow for precipitation. The minimum total volume for uncovered secondary containment is the capacity of the largest tank within the secondary containment plus the depth of rain for the 100-year, 24-hour storm event for the site or region. Fill and dispenser points will have incidental spillage containment such as curbed concrete pads and sumps.

3.4 Facility Self-Inspection

The Facility will be inspected frequently for leaks, liquid accumulation, and need for preventive maintenance. Monthly inspection forms are provided in Appendix A. Completed inspection forms will be submitted to the Mine Manager and the EM. The Environmental Department will maintain all completed forms and checklists related to this Plan for a period of at least three years. The EM's designee will ensure each storage/transfer area is inspected monthly with responses to spills or preventative maintenance tasks to be completed as indicated in Table 3-1.

Table 3-1: Inspection Tasks Summary

Observation	Report Spill (Appendix C)	Implement Controls & Countermeasures	Close	Repair & Replace as Necessary	Pump and Transfer Off-Site for Disposal	Notify Environmental Department for Approval
Spill (outside secondary containment area)	●	●				
Open valves/Dispenser equipment			●	●		
Inoperative liquid level gauge				●		
Physical deterioration to tank/foundation/ Piping (i.e., rusting, pitted)				●		
Inadequate tank/pipeline support (i.e., no tank anchor straps)				●		
Ineffective secondary containment (i.e., no anchoring of liner, tear in liner)				●		
Presence of free liquid in secondary containment, overfill containment areas and sumps					●	●

3.4.1 Tank Inspection

All tanks will be visually inspected monthly by personnel designated by the EM. Visual inspections will be conducted with respect to the following:

- Ensure the tank fill valves and dispenser points are in the closed position when not in use.
- Inspect all valves for signs of leakage or deterioration.
- Check inlet and outlet piping, as well as tank flanges for leakage.
- Inspect pipe/tank supports, foundations and anchoring straps for wear.
- Check tank level indicators and dispenser equipment for proper operating condition.
- Inspect the tank shell surfaces for areas of rust or other signs of deterioration. Particular attention will be paid to areas with peeling paint (or other coating), welds, and seams.
- Check the surfaces below tanks and oil transfer points areas for obvious signs of leaks or spills, specifically stained or visibly damp soils.

- Inspect all sumps and other overfill containment areas located below oil transfer points, and empty liquid as necessary. Consider liquid to be oil-contaminated, and following approval of the Environmental Department, remove for off-site disposal/recycling by personnel authorized to conduct this type of activity.
- Examine tank shells, welds, rivets and bolts for wear and discoloration. Examine all above-ground valves and pipelines for the general condition of flange joints, expansion joints, valve glands and bodies, catch pans, pipeline supports, and condition of metal surfaces.
- Tanks or oil storage containers that appear to be unused or inactive shall be verified as such, and if so, any remaining product shall be removed and disposed of, and the tank triple-rinsed in accordance with facility Standard Operating Procedures (SOPs) or with the use of an outside service. The tank will be modified if necessary to prevent physical access, and labeled with a legible sign indicating "empty" and "do not use". If it is anticipated that the tank will no longer be used, procedures shall be implemented to remove the tank for disposal at an authorized facility.

Each aboveground container is inspected and/or tested for integrity on a regular schedule and whenever material repairs are made. NMCC provides training for personnel on performing container tests and inspections. Examples of integrity tests may include, but are not limited to: visual inspection, hydrostatic testing, radiographic testing, ultrasonic testing, acoustic emissions testing, or other systems of non-destructive testing. The frequency and type of testing and inspections depend on the container size, configuration, and design (e.g., shop-built, field-erected, skid-mounted, elevated, double-walled).

3.4.2 Secondary Containment Inspection

Secondary containments will be inspected on a routine schedule to document the condition of containment structure(s) and indicate any necessary repairs or maintenance.

Prior to draining or pumping any accumulated fluid from an oil storage containment area, verification of possible contamination will be conducted. A visual inspection of the accumulated water to determine whether or not a sheen is present will be considered sufficient verification that no contamination is present.

If a sheen is noted, the water will be collected and off-site disposal arranged as directed by the Environmental Department. If no sheen is observed, the water may be drained or pumped out of the containment area and applied to a designated on-site facility following approval of the Environmental Department.

3.5 Response Training

Key facility employees, who are directly involved with managing oil, fuel and/or chemical reagent storage and transfer operations, are regularly trained in implementing the Contingency Plan to minimize the number of human errors that cause oil spills. Employee training will be performed annually; new employees will be trained within one week of beginning work. An outline used to facilitate training of new employees and refresher training of existing employees is provided in Appendix B.

3.5.1 Personnel Response Training Logs

Records of response training will be maintained in the environmental master files.

4 SECURITY

Only authorized personnel will be allowed to enter the facility property. Tank locations that may require operations at night will be equipped with sufficient lighting to assist in security and provide visibility for operations to be performed. Tanks located in high traffic areas will be barricaded to minimize collisions from occurring.

5 ACRONYMS AND DEFINITIONS

The following definitions are presented below in order to understand the scope of this Plan. The definitions are from, and provided in, 40 CFR §112.2.

Oil: means oil of any kind or in any form, including, but not limited to petroleum, fuel oil, sludge, oil refuse, fats, greases, and oil mixed with other than dredged spoil. At the facility, oils stored include diesel fuel, gasoline, hydraulic oil, miscellaneous lube oils, grease, and motor oils.

Discharge: includes but is not limited to, any spilling, leaking, pumping, pouring, emitting, emptying, or dumping.

Reportable Spill: means a discharge of oil into or upon the navigable waters of the United States or adjoining shorelines in harmful quantities, as defined in 40 CFR §110, which states, discharges of oil that:

- Violate applicable water quality standards, or
- Cause a film or sheen upon or discoloration of the surface of the water or adjoining shorelines or cause a sludge or emulsion to be deposited beneath the surface of the water or upon adjoining shorelines (40 CFR §110.3).

At the facility, visual inspections using the second definition above will be used to determine whether a discharge constitutes a reportable spill event as detailed in Section 4 of the SPCC Plan.

Contract: means:

- A written contractual agreement with an oil spill removal organization(s) that identifies and ensures availability of the necessary personnel and equipment within appropriate response times; and/or
- A written certification by the owner or operator that the necessary personnel and equipment resources, owned or operated by the facility owner or operator, are available to respond to a discharge within appropriate response times.

Reportable spill events are regulated by the NMED, which requires notification within 24 hours if a discharge occurs in such quantity as may with reasonable probability injure or be detrimental to human health. In addition, as indicated in 40 CFR §112.4(a), whenever a facility has discharged more than 1,000 U.S. gallons of oil into or upon the navigable waters of the United States or adjoining shorelines in a single spill event, or discharged more than 42 U.S. gallons of oil in each of two discharges as described in 40 CFR § 112.1(b) into or upon the navigable waters of the United States or adjoining shorelines, occurring within any twelve month period, the owner or operator of such facility shall submit to the Regional Administrator, within 60 days, a detailed spill report.

Navigable waters (as defined in 40 CFR §110.1) are not present at the Copper Flat Mine Facility. Other waters in the vicinity include the intermittent stream Greyback Wash to the west of the pit and a few springs or seeps west of the pit.

Waters of the State, as defined by the State of New Mexico, include all interstate and intrastate waters, including natural ponds and lakes, playa lakes, reservoirs, perennial streams and their tributaries, intermittent streams, sloughs, prairie potholes and wetlands (WQCC 91-1, 1995). This State definition indicates additional waters that must be considered for impact by an oil spill at the facility.

Appendix A

Inspection Checklists and Reporting Forms

(*Pending*)

Appendix B

Training Outline

(*Pending*)

Appendix C

Spill Reporting Procedures

(*Pending*)

Appendix D

Facility Incident Command System

(*Pending*)

Appendix E

Emergency Contacts and Telephone Call List

(*Pending*)

Appendix F

Storage and Containment Inventories

(*Pending*)

APPENDIX F

Quality Assurance Plan

(Intera, 2010)

New Mexico Copper Corporation

Quality Assurance Project Plan

Copper Flat Mine Site

September 2010

Prepared for:
New Mexico Copper Corporation

Submitted to:
Mining and Minerals Division
New Mexico Energy, Minerals and Natural Resources Department

Prepared by:

INTERA

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Abbreviations and Acronyms

CFR	Code of Federal Regulations
COC	chain of custody
CPR	cardiopulmonary resuscitation
DQA	data quality assessment
EPA	United States Environmental Protection Agency
ER	equipment rinsate
FTL	field team leader
ID number	identification number
LCS	laboratory control sample
MDL	method detection limit
MMD	New Mexico Mining and Minerals Division
MQO	measurement quality objectives
MS	matrix spike
NMCC	New Mexico Copper Corporation
NMWQCC	New Mexico Water Quality Control Commission
OSHA	Occupational Safety and Health Administration
PARCC	precision, accuracy, representativeness, completeness, and comparability
PM	Project Manager
PPE	personal protective equipment
PRRL	project-required reporting limits
QA	quality assurance
QAPP	quality assurance project plan
QC	quality control
RPD	relative percent difference
SAP	sampling and analysis plan
Site	Copper Flat Mine Permit Area
SQL	sample quantitation limits

1 Project Description and Management

This document establishes the quality standards for products and services that have been established within the industry and through government regulations. New Mexico Copper Corporation (NMCC) and its contractors shall meet or exceed these quality standards throughout the duration of this project.

NMCC is currently initiating permitting activities for the re-opening of the Copper Flat Mine located approximately six miles northeast of Hillsboro, New Mexico, in Sierra County (Site). NMCC and its contractors will assess baseline conditions of for climate, vegetation, wildlife, topsoil, surface water, groundwater, and historical and cultural properties.

The project organizational flow chart for NMCC's geosciences and engineering contractor, INTERA Incorporated (INTERA) of Albuquerque, New Mexico, identifies key personnel and their functions (Figure 1). The INTERA Incorporated (INTERA) Program Manager, Cynthia Ardito, is responsible for project direction and quality assurance (QA) for this project. The Project Manager (PM), Peter Castiglia, is responsible for organizing and implementing field activities, project oversight, data management, and report preparation. Mr. Castiglia is also responsible for ensuring that the Quality Assurance Project Plan (QAPP) and Sampling and Analysis Plan (SAP) are appropriately developed and adhered to. The PM, Dr. John Sigda, is responsible for data analysis and modeling. Dr. Sigda will also provide technical support and will assist in data management and report preparation. INTERA's subcontractors include Class One Technical Services, Inc. of Albuquerque, New Mexico, for air quality services, and Hall Environmental Analysis Laboratories (HEAL) for analytical laboratory services. Subcontractor PMs will be responsible for QA, project oversight, data management, and coordination of field activities.

NMCC has contracted with Parametrix Incorporated of Albuquerque, New Mexico, for ecological and cultural resources services. Parametrix will be responsible for data collection for these resource areas. An organizational chart is included as Figure 2. The Parametrix PM, Mr. Jens Deichmann, is responsible for data collection and data quality. For geologic sampling, NMCC has contracted with SRK Consulting Engineers (SRK). The SRK PM is Mr. Mark Willow. The principal geochemist supporting Mr. Willow and overseeing the geologic sampling program is Dr. Robert Bowell.

1.1 Project Definition and Background

A 12-month baseline characterization of pre-mining site conditions must be completed prior to submittal of a Mine Permit Application to the New Mexico Energy, Minerals, and Natural Resources Department Mining and Minerals Division (MMD). As noted previously, this baseline characterization involves sampling, analysis, and assessment of site-specific climatic, vegetation, wildlife, soil, surface water, groundwater, and historical and cultural properties conditions. The MMD requires that a SAP be submitted for agency review. The SAP is a detailed work plan that describes how baseline data will be collected. The SAP must thoroughly describe the proposed sampling methodology and frequency, proposed data sources, and proposed sampling locations to document existing resource conditions within the permit boundary.

1.2 Quality Objectives and Criteria

The following sections present the measurement quality objectives (MQO) identified for this project.

1.2.1 Measurement Quality Objectives for Analytical Laboratory Data

All analytical results for water samples will be evaluated in accordance with precision, accuracy, representativeness, completeness, and comparability (PARCC) parameters to document the quality of the data and promote data that are of sufficient quality to meet the project objectives. With regard to these PARCC parameters, precision and accuracy method blanks will be prepared at the frequency prescribed in the individual analytical method, or at a rate of 5 percent of the total samples if a frequency is not prescribed in the method. The subsections below describe each of the PARCC parameters and how they will be assessed for this task.

1.2.1.1 Precision

Precision is the degree of mutual agreement between individual measurements of the same property under similar conditions. Usually, combined field and laboratory precision is evaluated by collecting and analyzing field duplicates and then calculating the variance between the samples, typically as a relative percent difference (RPD).

$$RPD = \frac{|A - B|}{(A + B)} \times 100\%$$

where:

A	=	First duplicate concentration
B	=	Second duplicate concentration

Field sampling precision is evaluated by analyzing field duplicates. One duplicate groundwater sample will be collected during the initial groundwater sampling event to establish laboratory analytical precision at the onset of the investigation. The duplicate groundwater sample will be collected by completely filling two separate vials by alternating between the primary sample set and the replicate sample set in the order shown below:

- Fill vial #1 - primary sample set
- Fill vial #1 - replicate sample set
- Fill vial #2 - primary sample set
- Fill vial #2 - replicate sample set

Laboratory analytical precision is evaluated by analyzing matrix (laboratory) duplicates. Results for each laboratory duplicate pair will be used to determine the RPD in order to evaluate precision.

1.2.1.2 Accuracy

A program of sample spiking will be conducted to evaluate laboratory accuracy. This program will include analysis of matrix spike (MS), laboratory control samples (LCS) or blank spikes, and method blanks. The results for the spiked samples will be used to calculate the percent recovery for use in evaluating accuracy.

$$\text{Percent Recovery} = \frac{S - C}{T} \times 100\%$$

where:

S	=	Measured spike sample concentration
C	=	Sample concentration
T	=	True or actual concentration of the spike

Results that fall outside the accuracy goals will be further evaluated on the basis of the results of other quality control (QC) samples.

1.2.1.3 Representativeness

Representativeness expresses the degree to which sample data accurately and precisely represent: (1) the characteristics of a population, (2) variations in a parameter at a sampling point, or (3) an environmental condition that they are intended to represent.

Representativeness of data will also be promoted through the consistent application of established field and laboratory procedures. Equipment rinsate (ER) blanks and laboratory blanks will be evaluated for the presence of contaminants to aid in evaluating the representativeness of sample results. Data determined to be non-representative by comparison with existing data will be used only if accompanied by appropriate qualifiers.

1.2.1.4 Completeness

Completeness is a measure of the percentage of project-specific data that are valid. Valid data will be obtained when samples are collected and analyzed in accordance with QC procedures as outlined in this QAPP and when none of the QC criteria that affect data usability are exceeded. When all data evaluation is completed, the percent completeness value will be calculated by dividing the number of useable sample results by the total number of sample results planned for this investigation.

As discussed further in Section 8.0, completeness will also be evaluated as part of the data quality assessment process (EPA, 2000b). This evaluation will help assess whether any limitations are associated with the decisions to be made based on the data collected.

1.2.1.5 Comparability

Comparability expresses the confidence with which one data set can be compared with another. Comparability of data will be achieved by consistently following standard field and laboratory procedures and by using standard measurement units in reporting analytical data.

1.2.1.6 Detection and Quantitation Limits

The method detection limit (MDL) is the minimum concentration of an analyte that can be reliably distinguished from background noise for a specific analytical method. The quantitation limit represents the lowest concentration of an analyte that can be accurately reproduced in a sample matrix. Project-required reporting limits (PRRL) are contractually specified minimum quantitation limits for specific analytical methods and sample matrices, such as soil or water, and are typically several times the MDL to allow for matrix effects. PRRLs, which are established in the project scope of work for subcontract laboratories, are set to establish minimum criteria for laboratory performance. Actual laboratory quantitation limits may be substantially lower.

For this project, analytical methods have been selected so that the PRRL for each target analyte is below the applicable regulatory screening criteria, the New Mexico Water Quality Control Commission (NMWQCC) Standards for groundwater. Also, sample concentrations will be reported as estimated values if concentrations are less than PRRLs but greater than MDLs. The MDL for each analyte will be listed as the detection limit in the laboratory's electronic data deliverable.

1.2.2 Measurement Quality Objectives for Meteorological and Air Quality Data

Laboratory and field quality assurance procedures for meteorological and air quality data are described in detail in Section 2 of the Sampling and Analysis Plan (SAP). Please refer to Section 2.8 of this SAP for more information.

1.2.3 Measurement Quality Objectives for Ecological Data

A single field crew chief will be assigned to ensure data collection is consistent between crews. This individual will review a sub-set of the field forms following each field day. Formalized data collection training will also be completed prior to field sampling. All field botanists will be familiar with plant systematics and techniques to identify plants using taxonomic keys. Plant species not readily identifiable in the field will be collected and preserved for identification at the University of New Mexico Herbarium.

Vegetation material produced during the previous growing season will be discarded before placing samples into a paper bag. Rocks, soil, and/or litter will not be placed into sample bags. Biomass production will only be calculated as an actual dry-weight sample. No double sampling or estimations will occur.

Field data entered into an electronic format such as MS Excel or Access will be evaluated for integrity, consistency, and completeness before data analysis. Oversights or incorrect entries will be corrected. A sub-set of the field forms will be compared to the electronic version for an accuracy assessment. If significant differences are identified, a thorough re-evaluation of each of the forms will be completed.

For wildlife data, field biologists will have a minimum of a BA/BS in Biology and five to ten years of field experience conducting a wide variety of animal surveys ranging from reptiles and amphibians, to birds, mammals, insects, and other invertebrates. This includes experience in recognizing and identifying signs of wildlife. All findings and results will be reviewed by senior scientists.

1.2.4 Measurement Quality Objectives for Cultural Resources Data

Reporting will follow the standards in BLM manual H-8100-1, Chapter 1.B.1 and Appendix 2 (2005). In addition, work will be performed in compliance with all aspects of the NMAC, including NMAC 4.10.15.

1.3 Project Organization

Table 1 presents the roles and responsibilities for key personnel who will be involved in the investigation at the Site. In some cases, more than one responsibility has been assigned to one person.

1.4 Special Training and Certification

This section outlines the training and certifications required to complete the activities described in this QAPP. The following sections describe the requirements for personnel working on-site.

1.4.1 Health and Safety Training

INTERA Personnel who collect water and sediment samples from the Site are required to meet the Occupational Safety and Health Administration (OSHA) training requirements defined in Title 29 of the Code of Federal Regulations (CFR) Part 1910.120(e). These requirements include (1) 40 hours of formal off-site instruction, (2) a minimum of three days of actual on-site field experience under the supervision of a trained and experienced field supervisor, and (3) 8 hours of annual refresher training. Field personnel who directly supervise employees engaged in work at the site shall also receive at least 8 additional hours of specialized supervisor training. The supervisor training covers health and safety program requirements, training requirements, personal protective equipment (PPE) requirements, the spill containment program, and health-hazard monitoring procedures and techniques. Every member of the field team will maintain current certification in the American Red Cross "Multimedia First Aid," and "Cardiopulmonary Resuscitation (CPR) Modular," or equivalent.

Copies of health and safety training records, including course completion certificates for the initial and refresher health and safety training, specialized supervisor training, and first aid and CPR training, are maintained in corporate files.

1.5 Documents and Records

Documentation is critical for evaluating the success of any environmental data collection activity. The following sections discuss the requirements for documenting field activities and for preparing laboratory data packages. This section also describes reports that will be generated as a result of this project.

1.5.1 Field Documentation

Field personnel will use permanently bound field logbooks with sequentially numbered pages to record and document field activities. The logbooks will list a contract name and number, the project number, the site name, the names of subcontractors, the client, and the PM. At a minimum, the following will be recorded in the field logbook:

- Names and affiliations of all on-site personnel or visitors
- Weather conditions during the field activity
- Summary of daily activities and significant events
- Notes of conversations with coordinating officials
- References to other field logbooks or forms that contain specific information
- Discussions of problems encountered and their resolutions
- Discussions of deviations from the SAP or other governing documents
- Descriptions of all photographs taken

The field team may also use the field forms during certain sampling or data collection activities to document field activities. The same level of detail will be required for all field forms used during this investigation. Copies of the completed field forms will be stored in the project file.

2 Data Generation and Acquisition

This section describes the requirements for the following:

- Sampling Design (Section 2.1)
- Field Activities (Section 2.2)
- Sample Handling and Custody (Section 2.3)
- Laboratory Quality Assurance/Quality Control (QA/QC) (Section 2.4)
- Equipment Testing, Inspection, Maintenance, and Calibration (Section 2.5)

2.1 Sampling Design

Samples or data will be collected as outlined in the SAP. The SAP for this project is a collection of quarterly or one-time field sampling or data collection events that were prepared by NMCC and its contractors. Field activities will be implemented to optimize the time spent in the field by adhering to established scientific methods and procedures, leading coordinated field schedules, and sharing data with contractors to minimize duplication of data.

Data collected from these field activities will be used in the mine permitting process. This baseline data will also be useful in the design of mine facilities and as a reference during site reclamation activities.

2.2 Field Activities

Field activities have been broken into eight separate activities. These activities, which are outlined in the SAP, will be used to establish the baseline conditions at the Site:

- Climatological factors – The purpose of the monitoring program will be to collect baseline climatological data representative of the Site that satisfies the criteria of the New Mexico Surface Mining Act and the U.S. Environmental Protection Agency (EPA) on-site meteorological program guidance for dispersion modeling
- Vegetation survey – The purpose of the survey is to delineate current vegetation stratified according to disturbance history and to describe specific vegetation attributes for plant communities delineated within the Site. In addition, the survey will identify the presence of potential habitat for threatened and endangered species.
- Wildlife survey – Delineate and map current habitat, describe wildlife use of the area, complete a bird species inventory, complete a threatened or endangered species survey by comparing known records and habitat requirements with current field conditions to determine the likelihood of occurrence of all federal and state listed wildlife species, and determine species distribution by habitat and season.
- Soil survey and sampling – To determine the suitability of in-place soils in areas of proposed disturbance for use as a topdressing material during reclamation.
- Surface water sampling – To characterize the volumetric flow and water quality of seeps, springs, streams, and the pit lake.
- Groundwater sampling – To obtain necessary data to evaluate quantity and quality of all aquifers at the Site that could be impacted by mining activities, address data gaps identified during evaluation of the Draft EIS (BLM, 1996), meet the requirements set forth in the regulations in NMAC Title 19, Chapter 10, Part 6, and to meet the guidelines set forth in MMD's draft Guidance Document for Part 6 New Mining Operations Permitting under the New Mexico Mining Act.
- Historical and cultural properties survey – To locate and assess all cultural resources and historic properties within the area of potential effects.

2.3 Sample Handling and Custody

The following section describes sample handling procedures, including sample identification and labeling, documentation, chain of custody (COC), and shipping. This section applies to water, sediment, and geologic samples that are submitted to an analytical laboratory. Other sample handling and custody procedures for vegetation and other resources are described, where appropriate, in the SAP.

Each sample collected at the Site will be identified using a unique sample identification (ID) number. The description of the sample type and the point name will be recorded on the COC form, as well as in the field notes. Note that field duplicates and ERs will be given a unique sample ID. The association between primary, duplicate, and ER samples will be noted on the COC form.

A sample label will be affixed to each sample container. The label will be completed with the following information written in indelible ink: project name and location, sample ID number, date and time of collection, preservative used (if applicable), collector's initials, and analysis requested. After labeling, each sample will be refrigerated or placed in a cooler containing ice.

Documentation of sample collection will be completed in permanent black or blue ink in the field logbook. All entries will be legible. The field team leader (FTL) and sampling personnel are responsible for proper documentation of all Site activities.

Standard sample custody procedures will be used to maintain and document sample integrity during collection, transportation, storage, and analysis. COC procedures provide an accurate written record that traces the possession of individual samples from the time of collection in the field to the time of acceptance at the laboratory.

The COC form will be placed in a waterproof plastic bag and taped to the inside of the shipping container used to transport the samples. The laboratory sample custodian will receive all incoming samples, sign the accompanying COC forms, and retain copies of the forms as permanent record. The laboratory sample custodian will record all pertinent information concerning the samples, including the persons delivering the samples, the date and time received, sample condition at the time of receipt (sealed, unsealed, or broken container; temperature; or other relevant remarks).

All samples will be either hand delivered or shipped to an accredited laboratory. Samples may need to be shipped to the laboratory in order to have them analyzed before the expiration of a particular sample's holding time.

2.4 Laboratory QA/QC

This section applies to water, sediment, and geologic samples submitted to accredited analytical laboratories. To ensure quality of laboratory analysis, the analytical laboratory will be required to analyze QA/QC samples as specified by the analytical methods. The laboratory will analyze method blanks, MSs, and LCSs.

Method blanks will be prepared at the frequency prescribed in the individual analytical method or at a rate of 5 percent of the total samples if a frequency is not prescribed in the method.

MSs will be analyzed at a frequency of 5 percent for soil and aqueous samples. The percent recoveries will be calculated for each of the spiked analytes and used to evaluate analytical accuracy. The RPD between spiked samples will be calculated to evaluate precision.

LCSs, or blank spikes, will be analyzed at the frequency prescribed in the analytical method or at a rate of 5 percent of the total samples if a frequency is not prescribed in the method. If percent recovery results for the LCS or blank spike are outside of the established goals, laboratory-specific protocols will be followed to gauge the usability of the data.

Sample quantitation limits (SQL), also referred to as practical quantitation limits, are PRRLs adjusted for the characteristics of individual samples. The PRRLs are chemical-specific levels that a laboratory should be able to routinely detect and quantitate in a given sample matrix. The PRRL is defined in the analytical method or in laboratory method documentation, and incorporates precision (reproducibility) assumptions for the analysis. The SQL takes into account changes in the preparation and analytical methodology that may alter the ability to detect an analyte, including changes such as use of a smaller sample aliquot or dilution of the sample extract. Physical characteristics such as sample matrix and percent moisture that may alter the ability to detect the analyte are also considered. The laboratory will calculate and report SQLs for all environmental samples.

The laboratory activities are overseen by a comprehensive quality assurance program to assure that laboratory practices and results adhere to its policies. The laboratory will provide a standard QA/QC report with all reports. This includes surrogate recoveries, spike recoveries, and method blanks.

The laboratory participates in the Wibby Environmental, third party, proficiency testing program. Wibby is accredited by A2LA and NIST/NVLAP. Results of all proficiency results are sent, by Wibby, to both the laboratory and to their accrediting authorities. The laboratory will also perform proficiency testing on a semiannual basis for all accredited tests. Water proficiencies in the water supply and water pollution studies will be performed in addition to soil proficiencies in hazardous waste pollution studies.

Proficiency results are reviewed by the laboratory manager and all personnel involved in reporting the data. Results that are marked as “check for error” and “unacceptable” are thoroughly reviewed and corrective actions are written for “unacceptable” data.

2.5 Equipment Testing, Inspection, Maintenance, and Calibration

All equipment used during the investigation will be properly tested, inspected, maintained, and calibrated. Samples collected during this investigation will be analyzed using both field and laboratory equipment. Calibration of the field equipment shall be recorded in the field logbook after each calibration event. The calibration procedure for each piece of field equipment used will be outlined in the final report.

The laboratory’s QA plan and written operating procedures describing specific testing, inspection, maintenance, and calibration procedures for equipment will be followed. If required, maintenance procedures and schedules will be performed and documented.

3 Inspection and Acceptance of Supplies and Consumables

PMs have primary responsibility for identifying the types and quantities of supplies and consumables needed to complete projects and are responsible for identifying acceptance criteria for these items.

Supplies and consumables can be received either at the contractor’s office or at a work site. When supplies are received at an office, the PM or FTL will sort them according to vendor, check packing slips against purchase orders, and inspect the condition of all supplies before they are accepted for use on a project. If an item does not meet the acceptance criteria, deficiencies will be noted on the packing slip and purchase order and the item will then be returned to the vendor for replacement or repair.

Procedures for receiving supplies and consumables in the field are similar. When supplies are received, the PM or FTL will inspect all items against the acceptance criteria. Any deficiencies or problems will be noted in the field logbook and deficient items will be returned for immediate replacement.

Analytical laboratories are required to provide certified clean containers for all analyses. These containers must meet EPA standards as described in *Specifications and Guidance for Obtaining Contaminant-Free Sampling Containers* (EPA, 1992).

4 Data Management

All field and analytical data collected during this investigation will be provided to MMD in the Baseline Characterization Report. Field data will be recorded in the logbook and/or field forms and will be included in the appendices. Analytical data will be summarized, tabulated, analyzed, and provided in the body of the final report. The original laboratory data will be provided in an appendix of the final report. Some data may be presented graphically.

5 Assessment, Response Actions, and Reports to Management

NMCC and MMD will oversee collection of environmental data using the appropriate assessment and audit activities. Any problems encountered during an assessment of field investigation or laboratory activities will require appropriate corrective action to ensure that the problems are resolved. The corrective actions will be discussed with MMD and will be implemented after approval from MMD is received. NMCC will perform routine audits of their subcontractor's performance. In addition, the subcontractor's project managers will ensure that the work done under their assigned tasks complies with the QAPP and will report non compliance, problems, or other issues to NMCC in a timely manner agreed upon between NMCC and its subcontractors.

Effective management of environmental data collection requires: 1) timely assessment and review of all activities, and 2) open communication, interaction, and feedback among all project participants. NMCC and its contractors will use verbal communication with MMD oversight personnel, electronic communication, and monthly status reports to address any project-specific quality issues and to facilitate timely communication of these issues. NMCC and its contractors will develop a communications protocol to communicate with the MMD and solicit the MMD for concurrence with these communication procedures.

6 Data Evaluation and Usability

This section describes the procedures that are planned to review and evaluate field and laboratory data. This section also discusses procedures for verifying that the data are sufficient to meet MQOs for the project.

Review and evaluation of the data generated during field and laboratory activities are essential to obtaining defensible data of acceptable quality. Project team personnel will review field data to identify inconsistencies or anomalous values. Any inconsistencies discovered will be resolved as soon as possible by seeking clarification from field personnel responsible for data collection. All field personnel will be responsible for following the sampling and documentation procedures described in this SAP so that defensible and justifiable data are obtained.

Data values that are significantly different from the population are called "outliers." A systematic effort will be made to identify any outliers or errors before field personnel report the data. Outliers can result from improper sampling or measurement methodology, data transcription errors, calculation errors, or natural causes. Outliers that result from errors found during data verification will be identified and corrected; outliers that cannot be attributed to errors in sampling, measurement, transcription, or calculation will be clearly identified in project reports.

6.1 Laboratory Data Verification

Laboratory personnel will verify analytical data at the time of analysis and reporting and through subsequent reviews of the raw data for any nonconformances to the requirements of the analytical method. Laboratory personnel will make a systematic effort to identify any outliers or errors before they report the data. Outliers that result from errors found during data verification will be identified and corrected; outliers that cannot be attributed to errors in analysis, transcription, or calculation will be clearly identified in the case narrative section of the analytical data package.

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6.2 Laboratory Data Evaluation and Usability

All laboratory data will be evaluated. The data evaluation strategy will not be a full data validation process, but will determine if the analytical results are within the QC limits set for the project. As part of this evaluation, the data usability will be assessed.

7 Reconciliation with User Requirements

After environmental data have been reviewed and evaluated in accordance with the procedures described in Section 7.0, the data must be further evaluated to assess whether MQOs have been met.

To the extent possible, EPA's data quality assessment (DQA) process will be followed to verify that the type, quality, and quantity of data collected are appropriate for their intended use. DQA methods and procedures are outlined in EPA's *Guidance for Data Quality Assessment, Practical Methods for Data Analysis* (EPA, 2000b). The DQA process includes five steps: (1) review the sampling objectives and sampling design, (2) conduct a preliminary data review, (3) select a statistical test, (4) verify the assumptions of the statistical test, and (5) draw conclusions from the data. In the case of water, sediment, and geologic samples, no statistical analysis is planned at this time. Statistical analyses planned for ecological and cultural resources data are defined in Sections 4, 5, and 10 of the SAP.

When the five-step DQA process is not completely followed because the sampling objectives are qualitative, data quality and data usability will be systematically assessed. This assessment will include:

- A review of the sampling design and sampling methods to verify that these were implemented as planned and are adequate to support project objectives.
- A review of project-specific data quality indicators for PARCC and project reporting limits to evaluate whether acceptance criteria have been met.
- A review of project-specific sampling objectives to assess whether they have been achieved by the data collected.
- An evaluation of any limitations associated with the decisions to be made based on the data collected (for example, if data completeness is only 90 percent compared to a project-specific completeness objective of 95 percent, the data may still be usable to support a decision, but at a lower level of confidence).

The final report for the project will discuss any potential impacts of these reviews on data usability and will clearly define any limitations associated with the data.

8 References

American Society for Testing and Materials (ASTM), 2000, Standard practice for description and identification of soils (visual-manual procedure): ASTM Standard D 2488-00.

Bureau of Land Management (BLM), 1996, Draft environmental impact statement (DEIS), Copper Flat Project: Las Cruces, N. Mex., U.S. Department of the Interior. Prepared by ENSR, Fort Collins, Colo.

Environmental Protection Agency (EPA), 1992, Specifications and guidance for obtaining contaminant-free sampling containers: Washington, DC, Office of Solid Waste and Emergency Response, EPA/A540/R-93/051. December.

———.2000a, Data quality objectives process for hazardous waste site investigations, EPA QA/G-4HW: Washington, DC, Office of Environmental Information, EPA/600/R-00/007. January.

———.2000b, Guidance for data quality assessment, practical methods for data analysis, EPA QA/G-9, QA00 Update: Washington, DC, Office of Environmental Information, EPA/600/R-96/084. July.

———.2000c, Guidance for the data quality objectives process, EPA QA/G-4: Washington, DC, Office of Environmental Information, EPA/600/R-96/055. August.

Figures

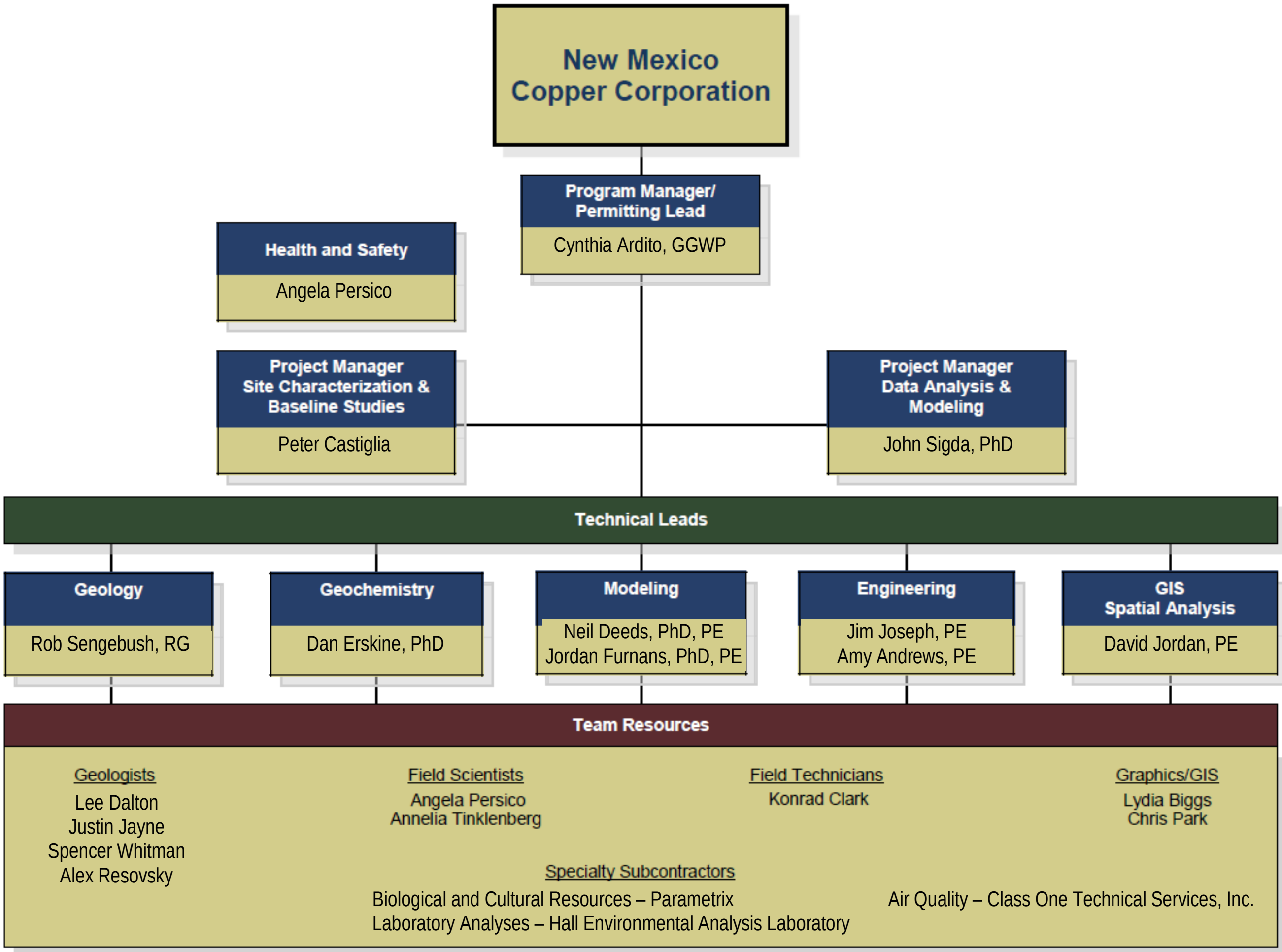

Figure 1. Project Organization

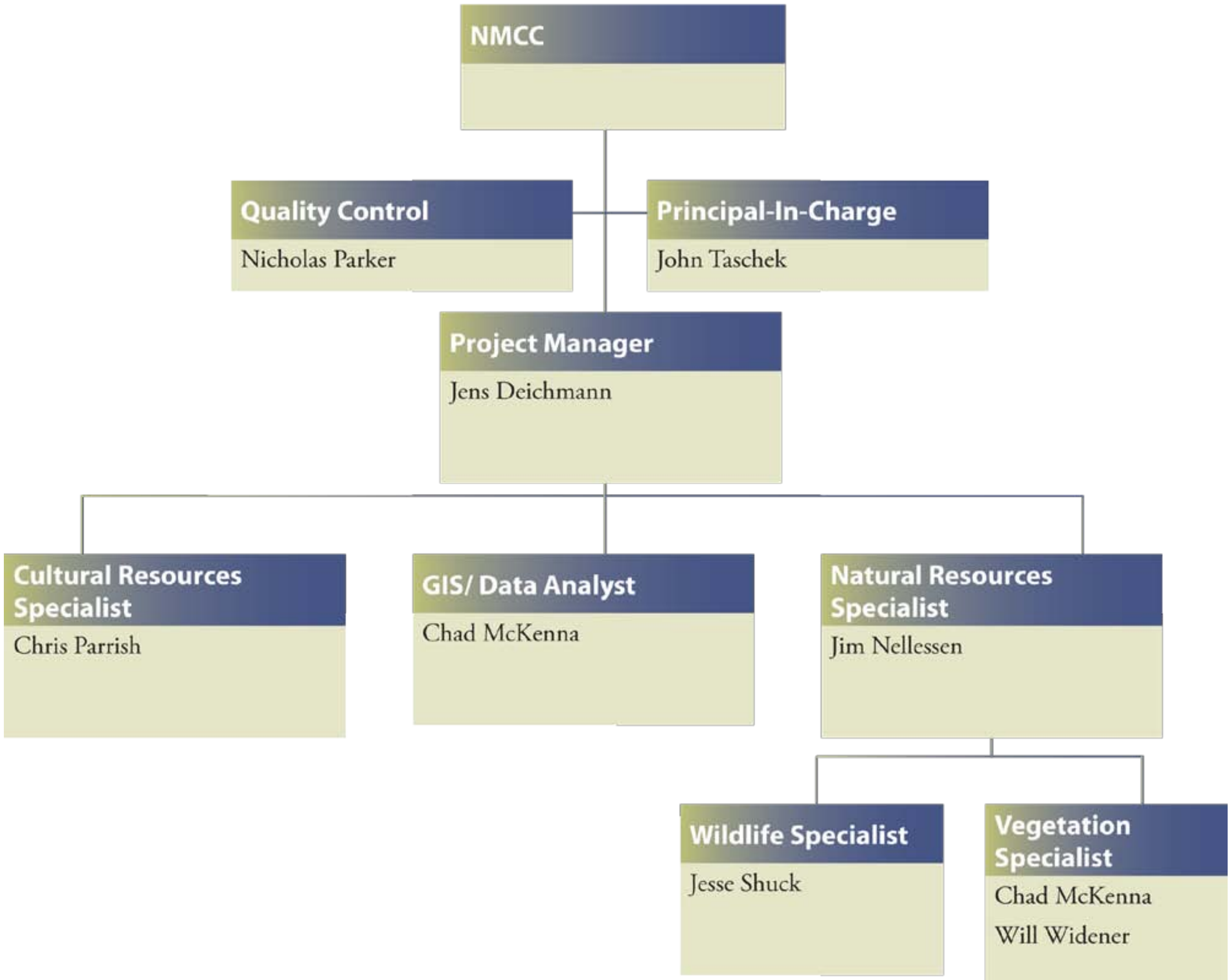

Figure 2. Parametrix Organizational Chart

Table

Table 1
INTERA Key Personnel and Responsibilities

Name	Organization	Role	Responsibilities	Contact Information
Ms. Cindy Ardito	INTERA	Program Quality Assurance (QA) Officer	Participates in development of technical approach. Reviews technical deliverables. Provides technical oversight during data collection	INTERA Inc. 6000 Uptown Blvd. NE, Suite 220 Albuquerque, NM 87110 (505) 246-1600, (505) 246-2600 FAX ext. 1206 cardito@intera.com
Mr. Peter Castiglia	INTERA	Project Manager/ Technical Lead	Responsible for overall project execution and for coordination with regulatory agencies and contractors. Actively participates in Data Quality Objective process. Provides management and technical oversight during data collection.	INTERA Inc. 6000 Uptown Blvd. NE, Suite 220 Albuquerque, NM 87110 (505) 246-1600, (505) 246-2600 FAX ext. 1217 pcastiglia@intera.com
Mr. Lee Dalton	INTERA	Field Team Leader (FTL) – Groundwater	Responsible for directing day-to-day field activities conducted by INTERA and subcontractor personnel. Verifies that field sampling and measurement procedures follow the Sampling and Analysis Plan. Provides project manager with regular reports on status of field activities.	INTERA Inc. 6000 Uptown Blvd. NE, Suite 220 Albuquerque, NM 87110 (505) 246-1600, (505) 246-2600 FAX ext. 1213 ldalton@intera.com
Mr. Justin Jayne	INTERA	Field Team Leader (FTL) – Surface Water	Responsible for directing day-to-day field activities conducted by INTERA and subcontractor personnel. Verifies that field sampling and measurement procedures follow the Sampling and Analysis Plan. Provides project manager with regular reports on status of field activities.	INTERA Inc. 6000 Uptown Blvd. NE, Suite 220 Albuquerque, NM 87110 (505) 246-1600, (505) 246-2600 FAX ext. 1220 jjayne@intera.com
Ms. Angela Persico	INTERA	On-Site Safety Officer	Responsible for implementing health and safety plan for determining appropriate site control measures and personal protection levels. Conducts safety briefings for INTERA and subcontractor personnel and site visitors. Can suspend operations that threaten health and safety.	INTERA Inc. 6000 Uptown Blvd. NE, Suite 220 Albuquerque, NM 87110 (505) 246-1600, (505) 246-2600 FAX ext. 1207 apersico@intera.com
Ms. Angela Persico Mr. Spencer Whitman Mr. Konrad Clark Ms. Annelia Tinklenberg	INTERA	Field Sampler(s)	Responsible for collecting representative samples and conducting necessary field activities specified in Sampling and Analysis Plan. Works under supervision of field team leader. Ensures proper sampling and handling procedures.	INTERA Inc. 6000 Uptown Blvd. NE, Suite 220 Albuquerque, NM 87110 (505) 246-1600, (505) 246-2600 FAX

Name	Organization	Role	Responsibilities	Contact Information
Mr. Bob Powell	Class One Technical Services, Inc.	Project Manager	Responsible for overall project execution and for coordination with regulatory agencies and contractors. Actively participates in Data Quality Objective process. Provides management and technical oversight during data collection by Class One Technical Services.	Class One Technical Services, Inc. 3500 Comanche Rd. NE Suite G Albuquerque, NM 87107 (505) 830-9680
Mr. Jens Deichmann	Parametrix	Project Manager – Ecological and Cultural Resources	Responsible for coordination with regulatory agencies and contractors. Actively participates in Data Quality Objective process. Provides management and technical oversight during data collection by Parametrix.	Parametrix Incorporated 8801 Jefferson NE; Bldg. 2 Albuquerque, NM 87113 (505) 998-5552 jdeichmann@parametrix.com
Mr. Chris Parrish	Parametrix	FTL - Cultural Resources	Responsible for directing day-to-day field activities conducted for cultural resources by Parametrix and subcontractor personnel. Verifies that field sampling and measurement procedures follow the Sampling and Analysis Plan. Provides project manager with regular reports on status of field activities.	Parametrix Incorporated 8801 Jefferson NE; Bldg. 2 Albuquerque, NM 87113 (505) 821-4700
Mr. Jim Nellessen	Parametrix	FTL – Natural Resources	Responsible for directing day-to-day field activities conducted for natural resources by Parametrix and subcontractor personnel. Verifies that field sampling and measurement procedures follow the Sampling and Analysis Plan. Provides project manager with regular reports on status of field activities.	Parametrix Incorporated 8801 Jefferson NE; Bldg. 2 Albuquerque, NM 87113 (505) 821-4700
Mr. Chad McKenna	Parametrix	Technical Lead – Geographic Information Systems (GIS)	Responsible for directing day-to-day activities conducted for GIS by Parametrix and subcontractor personnel. Verifies that GIS data collection procedures follow the Sampling and Analysis Plan. Provides project manager with regular reports on status of GIS data.	Parametrix Incorporated 8801 Jefferson NE; Bldg. 2 Albuquerque, NM 87113 (505) 821-4700
Mr. Mark Willow	SRK Consulting	Project Manager – Geologic Sampling	Responsible for coordination with regulatory agencies and contractors. Actively participates in Data Quality Objective process. Provides management and technical oversight during data collection by SRK.	SRK Consulting 250 Neil Road, Suite 300 Reno, Nevada 89502 (775) 828-6800 mwillow@srk.com
Dr. Robert Bowell	SRK Consulting	Technical Lead – Geologic Sampling	Responsible for directing day-to-day activities conducted for geologic by SRK and subcontractor personnel. Verifies that geologic data collection procedures follow the Sampling and Analysis Plan. Provides project manager with regular reports on status of geologic data collection and results.	SRK Consulting (UK) Ltd. 5th Floor, Churchill House 17 Churchill Way Cardiff, CF10 2HH, UK +44 (0) 29 2034 8150 egrbowel@srk.co.uk

6-28-2011

NEW MEXICO
ENVIRONMENT DEPARTMENT

Ground Water Quality Bureau

PUBLIC RECORDS RELEASE FORM

* Please complete a form for each facility requested.

Pre-Review

Reviewers Name: Judy Majoras **Facility requested:** Copper Flat **DP#** 1

Number of files given out: C- 1-7 **M-** 1-3 **Maps, designs, etc.:** DP 1 APP & Application, 2011

Records Inspection (On-site)

Date: 6/28/11 **Time:** 1:20 am/pm **Company:** Percha/Animas Watershed Association **Phone #:** 575 895 5113

Name: Judy Majoras **Signature:** Judy Majoras

I acknowledge I have read and agree to the attached Notice of Right to Inspect Records

Copy Service (Off-site)

N/A

Records Check-Out:

Date: ________ **Time:** ______ am/pm **Company:** ______________ **Phone #:** __________

Name: ______________________ **Signature:** ____________________________

I acknowledge I have read and agree to the attached Notice of Right to Inspect Records

Estimated date of return: ____________________________

Records Check-In:

Date: ________ **Time:** ______ am/pm **Company:** ______________ **Phone #:** __________

Name: ______________________ **Signature:** ____________________________

Post-Review

Reviewers Name: Judy Majoras **Facility requested:** Copper Flat **DP#** 1

Number of files given out: C- 1-7 **M-** 1-3 **Maps, designs, etc.:** DP & APP application 2011

Documents returned in good condition (circle)? __(Yes)/No____________

[signature]

02150

6-28-2011

New Mexico Environmental Department
Ground Water Quality Bureau

Acknowledgement of Receipt

Acknowledgement of Receipt of Check/Cash

I hereby acknowledge receipt of Check No. #2135 Dated. 6/28/11
or cash, received in the amount of $ 15.00 from NM Copper Corp
for Copper Flat Mine DP-1 1535
(Facility Name) (DP No.) (AI ID)

GROUND WATE
JUN 29 2011
BUREAU

Copy Made for Check Processing ________ Date ________
For Central File Activity ________

Submitted to ASD by: ________ Date: ________

Received in ASD by: ________ Date: ________

Filing Fee [ ] New Facility [ ] Renewal [ ]

Modification [ ] Other [X] (Explain) Poster Fee

Organization Code ________ Application FY ________

To be Deposited in the Ground Water Section Discharge Plan Fees.

Full Payment [ ] or Annual Increment [ ]

THIS CHECK IS DELIVERED IN CONNECTION WITH THE FOLLOWING ACCOUNT (S)

DATE		AMOUNT
	TOTAL OF INVOICES	
	LESS — % DISCOUNT	
	LESS	
	TOTAL DEDUCTIONS	
	AMOUNT OF CHECK	

NEW MEXICO COPPER CORP
2425 SAN PEDRO DR NE SUITE 100
ALBUQUERQUE, NM 87110

2135
95-681/1070

DATE 6/28/2011

PAY TO THE ORDER OF State of New Mexico Environment Dept $ 15.00

Fifteen dollars & zero cents DOLLARS

Security Features Details on Back.

BANK OF THE WEST Coronado Office 1-800-488-2265

FOR Groundwater public notice poster fee

MP

02152

6-28-2011

gh

GROUND WATER
JUN 29 2011
BUREAU

AFFIDAVIT OF PUBLIC NOTICE COMPLETION
New Permit or Permit Modification

DP- 1

I certify, under penalty of law, that I have fulfilled the Ground Water Discharge Permit public notice requirements of Section 20.6.2.3108(B) NMAC.

- ✓ I posted a sign for 30 days displaying a synopsis of the public notice in English and in Spanish at or near the proposed facility in a conspicuous public location (or multiple locations) approved by NMED.
- ✓ I posted a public notice flyer at a conspicuous off-site location approved by NMED.
- ✓ I placed a synopsis of the public notice in English and in Spanish in a newspaper approved by NMED. A copy of the newspaper page containing the synopsis is enclosed.
- ✓ I sent the public notice flyer via 1st class mail to *(check box)*:
  - ☑ owners of all properties within a 1/3 mile of the boundary of the property of the proposed discharge locations – mailing list is enclosed.
  - ☐ owners of all adjacent property (if applicant owns all property within 1/3 mile) – mailing list is enclosed.
  - ☐ owner of the property of the proposed discharge locations (if applicant is not the owner) – mailing address is enclosed.

I am aware that there are significant penalties for false certification including the possibility of fines.

[signature]
Signature of Applicant

Jens W. Deichmann
Printed Name

Permitting Manager - Regulatory
Title

28 June 2011
Date

REMINDER: *Please remit the bottom portion of the poster fee invoice and a check ($15) for the poster fee with this affidavit.*

Land Owners within 0.3 miles of mine boundary, sent public notice re: discharge permit via Fist Class Mail on 5-25-11 and 5-27-11

Ladder Ranch
Atten: Steve Dobrott
HC 31, Box 95
Caballo, NM 87931

Hillsboro Pitchfork Ranch, LLC
Atten: Mr. Cunningham
10571 Oral Zumwalt Way
Missoula MT, 59803

Ryan and Wendy Fancher
PO Box 344
Radium Springs, NM 88054

Ryan and Wendy Fancher
(a 2nd mailing to a 2nd address because Mark Adams didn't know which was better)
12400 Fort Bayard Rd.
Las Cruces, NM 88007

Landowners of Sections 23 and 26, T15S, R7W:

NV Brower and WL Easton,
308 Ave F
Redondo Beach, CA 90277

RETURNED: 5-28-11
ATTEMPTED, UNABLE TO FORWARD

BLM
Las Cruces District Office
Atten: Mike Smith
1800 Marquess Street
Las Cruces, NM 88005-3370

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In the end, the state serves only itself, and demands that you serve it too. Like any parasite, it will happily kill its host to feed itself. The only possible escape is to pry its rotten teeth out of our collective hides, throw it to the ground, and stomp on it. Hard.

-0-

On the local front, have you seen our roads lately? Pretty pathetic, if you ask me. Except for that nice stretch along Main and Broadway that the state had re-surfaced last year, it's not safe to drive small vehicles on in some places without the fear of falling through to whatever's on the other side of the planet from New Mexico.

Truth or Consequences has one of the highest tax rates in the state. I'd like to know what we're getting for our hard-earned money that the city so blithely takes from us. Hopefully, with the commission discussing a budget to send to Santa Fe soon, a serious effort will be made to address the deteriorating condition of our streets. - PK

Veggies & More

and feel good?

What is it about ourselves that leaves that impression on people? I think it has to do with your heart. The love you have to share. The relationship you have with Christ that comes out of you.

The hard part is to practice the art of oozing with everyone, not just the select few. We have to leave our judgments behind. We don't know what it is like to walk in someone else's shoes, so we have to be sensitive to their feelings.. .even when we don't feel like it. We have to be considerate to all, even those that may not "get it."

I'm sure you know the people I am talking about; the ones who catch you at church or the store and start talking to you when you are obviously in a hurry, the people who provide extremely poor customer service and treat you badly, and let's not forget the people

Classifieds Get Results

for a possible career change.

PUBLIC NOTICE / NOTICIA PUBLICA

Discharge Permit Application / Aplicación para Permiso para Descargar: For up to 2,875,873 gallons per day of mine tailings, process water, and domestic wastewater to a mine tailing impoundment / Para un máximo de 2.875.873 galones por día de desechos mineras, agua procesada, y aguas residuales domésticas a un embalse de relaves de minas.

Applicant & Discharge Location / Solicitante & Sitio de Descarga:
Copper Flat Mine, approximately 6 miles NE of Hillsboro

For More Information / Para Más Información (DP-1):
Ground Water Quality Bureau / Sección de Agua Subterránea
NM Environment Department / Departamento del Medio Ambiente

(505) 827-2900 www.nmenv.state.nm.us (public notices)

Information in this public notice was provided by the applicants and will be verified by NMED during the permit application review process.

6/3

02156

7-6-2011

THEMAC RESOURCES
New Mexico Copper Corporation
2425 San Pedro, NE, Suite 100
Albuquerque, New Mexico 87110

July 6, 2011

Greg Huey
NMED/Ground Water Bureau
Harold Runnels Bldg.
1190 St Francis Drive
PO Box 5469
Santa Fe, NM 87502-5469

RE: Response to NMED June 23, 2011 Request for Additional Information: Site-Wide Stage I Abatement Plan Proposal for the Copper Flat Mine Facility

Mr. Huey:

Thank you for taking the time to meet with us regarding NMED's request for additional information for the above-referenced Stage I Abatement Plan Proposal yesterday, July 5, 2011. We understand that this meeting to discuss comments fulfills NMED's requirement that NMCC respond within 30 days of your June 23rd letter.

As we discussed, NMCC will prepare an Amendment to our Proposed Stage I Abatement Plan Proposal to address outstanding information requests. We will plan to submit this Amendment within 60 days the date of this letter. Our Amendment will address NMED Specific Comments based on available data, to include:

1. Clarification of the pre-mining ground elevation and pre-mining water level elevations with specific reference to wells or data point locations.
2. Clarification of the definition of the "site" vs. the region in the Abatement Plan.
3. Additional figures at a more appropriate scale for evaluation of the site including, as available within our 60 day timeframe:
    a. Cross sections
    b. Potentiometric surface maps and well location maps that clearly allow for evaluation of the different aquifer characteristics at the site
    c. Any other maps or figures that will better assist you in evaluating our proposal.
4. Verification that we have obtained surface water data for the area from the Surface Water Quality Bureau and will reference it in relevant reports.
5. Further clarification regarding our plans to keep automated flow and sampling systems at the site programmed to take measurements every 15 minutes during the heaviest rainfall season of the year.

6. Clarification on the sampling plan for Pit Lake Characterization and on collected pit lake data.
7. Iso-contour maps for known ground water impact near the tailing dam and further clarification on the location of the additional well proposed to better characterize the lateral extent of the tailing seepage.
8. Clarification regarding NMCC plans to monitor waste rock disposal facilities.

Thank you again for your time. If you have any questions or clarifications regarding these responses, please do not hesitate to contact me at 505-400-7925.

Best regards,

Katie Lee

Katie Lee
Project Scientist
New Mexico Copper Corporation

7-13-2011

Huey, Greg, NMENV

From: Huey, Greg, NMENV
Sent: Wednesday, July 13, 2011 3:16 PM
To: 'Katie Lee'
Cc: Vollbrecht, Kurt, NMENV
Subject: RE: NMCC Stage I Abatement Plan RFI response

Katie,

NMED hereby grants an extension to NMCC until September 15, 2011 for submittal of the Stage 1 Abatement Plan Amendment.

Thank you,

Greg Huey
Mining Environmental Compliance Section
NMED - Ground Water Quality Bureau
Office (505) 827-1046
Mobile (505) 670-1878
Fax (505) 827-2965
http://www.nmenv.state.nm.us/gwb/

From: Katie Lee [mailto:katie@nmcopper.com]
Sent: Tuesday, July 12, 2011 4:09 PM
To: Huey, Greg, NMENV; Vollbrecht, Kurt, NMENV; Steve Raugust
Subject: NMCC Stage I Abatement Plan RFI response

Greg and Kurt,

With this email, NMCC would like to respectfully request an extension to allow the submission of our Stage I Abatement Plan Amendment to be turned in to you on September 15, 2011. This will give our consultant needed time to prepare the information NMED requested in your June 23, 2011 letter.

Best regards,

--

Katie Lee
Project Scientist
New Mexico Copper Corporation
(a wholly owned subsidiary of THEMAC Resources Group, LTD.)

Mobile: 505.400.7925
www.themacresourcesgroup.com

Huey, Greg, NMENV

From:	mikesmit@blm.gov
Sent:	Friday, August 19, 2011 12:53 PM
To:	Huey, Greg, NMENV; Vollbrecht, Kurt, NMENV; jamontoy@blm.gov; Eustice, Chris, EMNRD; Mathis, Patrick L., DGF
Subject:	Copper Flat Coordination meeting, August 31 1300 - 1430 at BLM Socorro Office.

Everyone has said they can meet on August 31 instead of August 30, so let's set the meeting for 1300-1430 on Wednesday, August 31. I've spoken to the Socorro FO and they will only have the Fire Ready-Room available on that day, so let's all hope a wildfire doesn't start in the Socorro District.

To reiterate our goals - we are near the point of starting the Environmental Impact Analysis for this project, so we need to start defining resource areas that will have to be addressed. At the end of this meeting, the BLM and Co-Ops should have defined the parameters for a Statement of Work (SOW) that will allow the development of a detailed RFP to address the issues identified. There will be the usual issues such as archeology, wildlife, T&E species etc. and some specifics related to mining in general and this project in particular. Here are some preliminary issues I can think of:

1. Water use - the effect of planned drawdowns on private wells, stream baseflow, etc.
2. Potential for acid rock drainage
3. Increased traffic on SR 152
4. Long-term effects of pit lake to wildlife (migratory birds, etc.)

Regards,

Michael Smith
Geologist - BLM
Las Cruces District Office
1800 Marquess Street
Las Cruces, NM 88005
575-525-4421
mikesmit@blm.gov

9-1-2011

Huey, Greg, NMENV

From: Huey, Greg, NMENV
Sent: Thursday, September 01, 2011 11:32 AM
To: 'Katie Lee'; Vollbrecht, Kurt, NMENV
Cc: Steve Finch; Steve Raugust
Subject: RE: NMCC Stage I Abatement Plan Amendment

Katie,

The October 14, 2011 deadline for the State 1 Abatement Plan Amendment for the Copper Flat Mine is approved.

Thank you,

Greg Huey
Mining Environmental Compliance Section
NMED - Ground Water Quality Bureau
Office (505) 827-1046
Mobile (505) 670-1878
Fax (505) 827-2965
http://www.nmenv.state.nm.us/gwb/

From: Katie Lee [mailto:klee@themacresourcesgroup.com]
Sent: Thursday, September 01, 2011 9:02 AM
To: Vollbrecht, Kurt, NMENV; Huey, Greg, NMENV
Cc: Steve Finch; Steve Raugust
Subject: NMCC Stage I Abatement Plan Amendment

Kurt and Greg,

As I just discussed with Greg, we are respectfully requesting an extension on the deadline to turn in our Stage I Abatement Plan Amendment for the New Mexico Copper Flat. Due to some difficulty with the architecture of our database and a datum issue with our newest survey data, we would like to submit our Amendment on Friday, October 14, 2011.

If this would not cause any inconvenience, it will give us some time to compile all of our data and present it in a copacetic and consistent manner. In addition, we would greatly appreciate your flexibility.

Best regards,

--

Katie Lee
Project Scientist
Copper Flat Mine
THEMAC Resources Group, Ltd.

Mobile: 505.400.7925
www.themacresourcesgroup.com

9-9-2011

BLM MOU NM-NML0000-2011-004

MEMORANDUM OF UNDERSTANDING

between:
U.S. Department of the Interior - Bureau of Land Management,
Las Cruces District Office
and
New Mexico Environment Department

concerning:
Relationship as a Cooperating Agency
for the Copper Flat Mine Environmental Impact Statement

I. Purpose. This Memorandum of Understanding (MOU) establishes a cooperating agency relationship between the Bureau of Land Management's Las Cruces District Office (BLM) and New Mexico Environment Department (Cooperator) for the purpose of preparing the Copper Flat Mine Environmental Impact Statement (EIS). The BLM is the lead Federal agency for development of the Copper Flat Mine EIS. The BLM acknowledges that the Cooperator has jurisdiction by State law and special expertise applicable to the EIS effort, as defined at 40 CFR 1508.15 and 1508.26. This MOU describes responsibilities and procedures agreed to by the New Mexico Environment Department as a Cooperating Agency and the BLM (the Parties).

The cooperating agency relationship established through this MOU shall be governed by all applicable statutes, regulations, and policies, including the Council on Environmental Quality's National Environmental Policy Act (NEPA) regulations (in particular, 40 CFR 1501.6 and 1508.5), the BLM's planning regulations (in particular, 43 CFR 1601.0-5, 1610.3-1, and 1610.4), the Department of the Interior Manual (516 DM 2.5) and applicable New Mexico law.

II. Objective. The objectives of this MOU are:

A. To designate the New Mexico Environment Department as a Cooperating Agency in the EIS process.

B. To provide a framework for cooperation and coordination between the BLM and the Cooperator that will ensure successful completion of the EIS, in a timely, efficient, and thorough manner.

C. To recognize that the BLM is the lead agency with responsibility for the completion of the EIS and the Record of Decision.

D. To describe the respective responsibilities, jurisdictional authority, and expertise of each of the Parties in the EIS process.

III. Authority.

A. The authorities of the BLM to enter into and engage in the activities described within this MOU include, but are not limited to:

a. National Environmental Policy Act of 1969 (42 U.S.C. 4321 et seq.)
b. Federal Land Policy and Management Act of 1976 (43 U.S.C. 1701 et seq.)

B. Regulations implementing the above authorities:

a. Council on Environmental Quality regulations (40 CFR 1501 et seq.)
b. Bureau of Land Management planning regulations (43 CFR 1601 et seq.)

C. The authorities of the New Mexico Environment Department to enter into this MOU include, but are not limited to, the Water Quality Act , NMSA 1978, §§ 74-6-1 to 17 and the Water Quality Control Commission (WQCC) Regulations outlined in Title 20 Chapter 6 Part 2 of the New Mexico Administrative Code.

IV. Procedure.

A. BLM Responsibilities:

1. As lead agency, the BLM retains final responsibility for the content of all NEPA documents, which include the Draft EIS, the Proposed Final EIS, and the Record of Decision. The BLM's responsibilities include determining the purpose of and need for the EIS, selecting alternatives for analysis, identifying effects of the proposed alternatives, selecting the preferred alternative, and determining appropriate mitigation measures. In meeting these responsibilities, the BLM will follow all applicable statutory and regulatory requirements.

2. To the fullest extent consistent with its responsibilities as lead agency, the BLM will consider the comments, recommendations, data, or analyses provided by the Cooperator in the EIS process, giving particular consideration to those topics on which the Cooperator is acknowledged to possess jurisdiction by law or special expertise.

3. To the fullest extent practicable, after consideration of the effect such releases may have on the BLM's ability to withhold this information from other parties, the BLM will provide the Cooperator with copies of documents underlying the EIS relevant to the Cooperator's responsibilities, including technical reports, data, analyses, comments received, working drafts related to environmental reviews, and Draft and Final EISs. The BLM will provide the Cooperator with the planning schedule, including review time frames, and with any changes to the schedule as early as practicable. The Cooperator will review the Draft and proposed Final EIS during the public review of these documents.

4. BLM will carefully consider whether proposed meetings or other activities would waive the Unfunded Mandates Reform Act exception to the Federal Advisory Committee Act (2 U.S.C. 1534(b) and 5 U.S.C App.).

B. Cooperating Agency Responsibilities:

The New Mexico Environment Department is a Cooperating Agency in this EIS process and is recognized to have jurisdiction by law and special expertise in the following areas:

a. The New Mexico Environment Department Ground Water Quality Bureau (GWQB) conducts all of the discharge permitting, spill response, water pollution abatement and public participation activities for mining facilities in New Mexico in accordance with the Water Quality Act NMSA 1978, §§ 74-6-1 to 17 and the WQCC Regulations outlined in Title 20 Chapter 6 Part 2 of the New Mexico Administrative Code.

b. The New Mexico Environment Department GWQB has extensive relevant expertise due to its legislative authority and statutory mandate to protect New Mexico's public health and the environment through regulation and pollution prevention, and special expertise in evaluating proposed mining operations with the goal of ensuring that water quality standards are met.

1. The Cooperator will provide information, comments, and technical expertise to the BLM regarding those elements of the EIS, and the data and analyses supporting them, in which it has jurisdiction or special expertise or for which the BLM requests its assistance. In particular, the Cooperator will provide information on the following topics:

    a. Ground water quality, ground water quality monitoring and pollution prevention;

    b. Mine operations, mine closure and post mining reclamation;

    c. Other such information that is relevant to planning issues or data needs.

2. The Cooperator will request periodic briefings on the status and progress of the EIS. The Cooperator will provide comments and input in their areas of jurisdictional responsibility or special expertise, including, but not limited to, providing guidance on public involvement strategies, identifying data needs, suggesting management actions to resolve issues, identifying effects of alternatives, suggesting mitigation measures, and providing comments on working drafts of the EIS and supporting documents. Comments and input will be in writing to the extent possible.

C. Responsibilities of the Parties:

1. The Parties agree to participate in this EIS process in good faith and make all reasonable efforts to resolve disagreements.

2. The Parties agree to develop and comply with the schedules, which include dates for EIS milestones and timeframes for Cooperator's reviews and submissions.

3. Each Party agrees to fund its own expenses associated with the Copper Flat Mine EIS process, except that the BLM may contract with a Cooperator for technical studies within its jurisdiction or special expertise.

V. Other Provisions.

A. Authorities Not Altered. Nothing in this MOU alters, limits, or supersedes the authorities and responsibilities of any Party on any matter within their respective jurisdictions. Nothing in this MOU shall require any of the Parties to perform beyond its respective authority.

B. Financial Obligations. Nothing in this MOU shall require any of the Parties to assume any obligation or expend any sum in excess of authorization and appropriations available.

C. Immunity and Defenses Retained. Each Party retains all immunities and defenses provided by law with respect to any action based on or occurring as a result of this MOU.

D. Conflict of Interest. The Parties agree not to utilize any individual or organization for purposes of EIS development, environmental analysis, or Cooperator representation, including officials, employees, or third party contractors, having a financial interest in the outcome of the Copper Flat Mine EIS. Questions regarding potential conflicts of interest should be referred to BLM HQ or Field Ethics Counselors for resolution.

E. Documenting Disagreement or Inconsistency. Where the BLM and one or more Cooperators disagree on substantive elements of the EIS (such as designation of the alternatives to be analyzed or analysis of effects), and these disagreements cannot be resolved, the BLM will include a summary of the Cooperator's views in the Draft EIS and the Proposed Final EIS. The BLM will also describe substantial inconsistencies between its proposed action(s) and the objectives of State, local, or tribal land use plans and policies.

F. Management of Information. The Cooperator acknowledges that all supporting materials and draft documents may become part of the administrative record and may be subject to the requirements of the Freedom of Information Act (FOIA) and other Federal statutes. The BLM acknowledges that the Cooperator's treatment of these materials and drafts may be subject to the requirements of the New Mexico

Inspection of Public Records Act, NMSA 1978, Sections 14-2-1 to -12 (IPRA). The Parties agree that the BLM will share supporting materials and draft documents with the Cooperator. The Cooperator generally believes that IPRA does not require disclosure of draft documents, including certain supporting materials depending on their contents. The Cooperator shall notify BLM of any IPRA request for, or that includes, supporting materials or draft documents. Cooperator shall provide such notice as soon as practicable and in any event prior to disclosure of such materials or documents. If such disclosure by Cooperator takes place, thenceforward the BLM at its discretion may withhold from the Cooperator those documents that might be available for public release under IPRA. Notwithstanding any of the foregoing, nothing in this section or in this Agreement shall be interpreted so as to interfere with Cooperator's ability to obtain from any third party or contractor involved in EIS development information that is necessary or desirable for the performance or understanding of, or that is relied upon or referred to in, the New Mexico Environment Department Discharge Application.

G. Conflict Resolution. The Parties agree to make reasonable efforts to resolve procedural or substantive conflicts, and may agree to initiate an Alternative Dispute Resolution (ADR) process. The Parties acknowledge that BLM retains final responsibility for the decisions identified in the Copper Flat Mine EIS and Record of Decision.

H. Coordination with NEPA Contractor. Cooperators may provide information and comments directly to the NEPA contractor and collaborate with contractor's technical staff and subcontractors on matters within the Cooperator's jurisdiction or special expertise. The Cooperator acknowledges that it is not authorized to provide technical or policy direction regarding the performance of this contract, with regard to the development of the EIS. The BLM acknowledges that the work that the contractor will do for the development of and analysis in the EIS may overlap with the work that must be done in the development of the ground water Discharge Permit. The Parties agree that the Cooperator may use the contractor for technical review of portions of the ground water discharge permit application or Stage 1 Abatement Plan; and that the work done by the contractor in service of the development of and analysis in the EIS may be used by contractor or Cooperator in the development of and analysis of a ground water Discharge Permit or Stage 1 Abatement Plan.

VI. <u>Agency Representatives</u>.

Each Party will designate a representative and alternate representative to ensure coordination between the Cooperator and the BLM during the EIS process. Each Party may change its representative at will by providing written notice to the other Party.

NMED Representative
Name: Greg Huey, Environmental Scientist
Phone Number: (505) 827-1046
Email Address: greg.huey@state.nm.us
Mailing Address: 1190 Saint Francis Drive, Santa Fe, NM 87502

NMED Alternate Representative
Name: Kurt Vollbrecht, Geologist
Phone Number: (505) 827-0195
Email Address: kurt.vollbrecht@state.nm.us
Mailing Address: 1190 Saint Francis Drive, Santa Fe, NM 87502

NMED Alternate Representative
Name: Clint Marshall, Geologist
Phone Number: (505) 827-0027
Email Address: clint.marshall@state.nm.us
Mailing Address: 1190 Saint Francis Drive, Santa Fe, NM 87502

BLM Representative
Name: Mike Smith
Phone Number: 575-525-4421
Email Address: mikesmith@blm.gov
Mailing Address: 1800 Marquess St. Las Cruces, NM 88005

BLM Alternate Representative
Name: Jennifer Montoya
Phone Number: 575-525-4316
Email Address: jamontoya@blm.gov
Mailing Address: 1800 Marquess St. Las Cruces, NM 88005

VII. Administration.

A. Approval. This MOU becomes effective upon signature by the authorized officials of the BLM and the Cooperator.

B. Amendment. This MOU may be amended through written agreement of the signatories.

C. Termination. If not terminated earlier, this MOU will end when the Record of Decision for the Copper Flat Mine EIS is approved by the BLM State Director. Any Party may end its participation in this MOU by providing written notice to the other Party.

APPROVED:

F. David Martin (signature) 9-9-11

F. David Martin, Secretary
New Mexico Environment Department

Date

Bill Childress (signature) August 30, 2011

Bill Childress, District Manager
Bureau of Land Management
Las Cruces District Office

Date

9-13-2011

SUSANA MARTINEZ
Governor
JOHN A. SANCHEZ
Lieutenant Governor

**NEW MEXICO
ENVIRONMENT DEPARTMENT**

Ground Water Quality Bureau

1190 St. Francis Drive
P.O. Box 5469, Santa Fe, NM 87502
Phone (505) 827-2918 Fax (505) 827-2965
www.nmenv.state.nm.us

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Mike Smith, Geologis
Bureau of Land Mana
1800 Marquess St.
Las Cruces, NM 880

PS Form 3800, August 2006

CERTIFIED MAIL – RETURN RECIEPT REQUESTED

September 13, 2011

Mike Smith
Geologist
Bureau of Land Management
1800 Marquess Street
Las Cruces, NM 88005

RE: Memorandum of Understanding between NMED and BLM for the Copper Flat Mine Environmental Impact Statement

Dear Mr. Smith,

The Memorandum of Understanding between the New Mexico Environment Department and the Bureau of Land Management for development of an Environmental Impact Statement at the Copper Flat Mine, signed September 9, 2011, is attached. Thank you for your cooperation in developing the document. I look forward to working with you on this project.

Sincerely,

Gregory Huey
Copper Flat Mine Permit Lead
Mining Environmental Compliance Section
Ground Water Quality Bureau

cc: Chris Eustice, Chino Permit Lead, MMD

MEMORANDUM OF UNDERSTANDING

between:
U.S. Department of the Interior - Bureau of Land Management,
Las Cruces District Office
and
New Mexico Environment Department

concerning:
Relationship as a Cooperating Agency
for the Copper Flat Mine Environmental Impact Statement

I. Purpose. This Memorandum of Understanding (MOU) establishes a cooperating agency relationship between the Bureau of Land Management's Las Cruces District Office (BLM) and New Mexico Environment Department (Cooperator) for the purpose of preparing the Copper Flat Mine Environmental Impact Statement (EIS). The BLM is the lead Federal agency for development of the Copper Flat Mine EIS. The BLM acknowledges that the Cooperator has jurisdiction by State law and special expertise applicable to the EIS effort, as defined at 40 CFR 1508.15 and 1508.26. This MOU describes responsibilities and procedures agreed to by the New Mexico Environment Department as a Cooperating Agency and the BLM (the Parties).

The cooperating agency relationship established through this MOU shall be governed by all applicable statutes, regulations, and policies, including the Council on Environmental Quality's National Environmental Policy Act (NEPA) regulations (in particular, 40 CFR 1501.6 and 1508.5), the BLM's planning regulations (in particular, 43 CFR 1601.0-5, 1610.3-1, and 1610.4), the Department of the Interior Manual (516 DM 2.5) and applicable New Mexico law.

II. Objective. The objectives of this MOU are:

A. To designate the New Mexico Environment Department as a Cooperating Agency in the EIS process.

B. To provide a framework for cooperation and coordination between the BLM and the Cooperator that will ensure successful completion of the EIS, in a timely, efficient, and thorough manner.

C. To recognize that the BLM is the lead agency with responsibility for the completion of the EIS and the Record of Decision.

D. To describe the respective responsibilities, jurisdictional authority, and expertise of each of the Parties in the EIS process.

III. Authority.

A. The authorities of the BLM to enter into and engage in the activities described within this MOU include, but are not limited to:

a. National Environmental Policy Act of 1969 (42 U.S.C. 4321 et seq.)
b. Federal Land Policy and Management Act of 1976 (43 U.S.C. 1701 et seq.)

B. Regulations implementing the above authorities:

a. Council on Environmental Quality regulations (40 CFR 1501 et seq.)
b. Bureau of Land Management planning regulations (43 CFR 1601 et seq.)

C. The authorities of the New Mexico Environment Department to enter into this MOU include, but are not limited to, the Water Quality Act , NMSA 1978, §§ 74-6-1 to 17 and the Water Quality Control Commission (WQCC) Regulations outlined in Title 20 Chapter 6 Part 2 of the New Mexico Administrative Code.

IV. Procedure.

A. BLM Responsibilities:

1. As lead agency, the BLM retains final responsibility for the content of all NEPA documents, which include the Draft EIS, the Proposed Final EIS, and the Record of Decision. The BLM's responsibilities include determining the purpose of and need for the EIS, selecting alternatives for analysis, identifying effects of the proposed alternatives, selecting the preferred alternative, and determining appropriate mitigation measures. In meeting these responsibilities, the BLM will follow all applicable statutory and regulatory requirements.

2. To the fullest extent consistent with its responsibilities as lead agency, the BLM will consider the comments, recommendations, data, or analyses provided by the Cooperator in the EIS process, giving particular consideration to those topics on which the Cooperator is acknowledged to possess jurisdiction by law or special expertise.

3. To the fullest extent practicable, after consideration of the effect such releases may have on the BLM's ability to withhold this information from other parties, the BLM will provide the Cooperator with copies of documents underlying the EIS relevant to the Cooperator's responsibilities, including technical reports, data, analyses, comments received, working drafts related to environmental reviews, and Draft and Final EISs. The BLM will provide the Cooperator with the planning schedule, including review time frames, and with any changes to the schedule as early as practicable. The Cooperator will review the Draft and proposed Final EIS during the public review of these documents.

4. BLM will carefully consider whether proposed meetings or other activities would waive the Unfunded Mandates Reform Act exception to the Federal Advisory Committee Act (2 U.S.C. 1534(b) and 5 U.S.C App.).

B. Cooperating Agency Responsibilities:

The New Mexico Environment Department is a Cooperating Agency in this EIS process and is recognized to have jurisdiction by law and special expertise in the following areas:

a. The New Mexico Environment Department Ground Water Quality Bureau (GWQB) conducts all of the discharge permitting, spill response, water pollution abatement and public participation activities for mining facilities in New Mexico in accordance with the Water Quality Act NMSA 1978, §§ 74-6-1 to 17 and the WQCC Regulations outlined in Title 20 Chapter 6 Part 2 of the New Mexico Administrative Code.

b. The New Mexico Environment Department GWQB has extensive relevant expertise due to its legislative authority and statutory mandate to protect New Mexico's public health and the environment through regulation and pollution prevention, and special expertise in evaluating proposed mining operations with the goal of ensuring that water quality standards are met.

1. The Cooperator will provide information, comments, and technical expertise to the BLM regarding those elements of the EIS, and the data and analyses supporting them, in which it has jurisdiction or special expertise or for which the BLM requests its assistance. In particular, the Cooperator will provide information on the following topics:

    a. Ground water quality, ground water quality monitoring and pollution prevention;

    b. Mine operations, mine closure and post mining reclamation;

    c. Other such information that is relevant to planning issues or data needs.

2. The Cooperator will request periodic briefings on the status and progress of the EIS. The Cooperator will provide comments and input in their areas of jurisdictional responsibility or special expertise, including, but not limited to, providing guidance on public involvement strategies, identifying data needs, suggesting management actions to resolve issues, identifying effects of alternatives, suggesting mitigation measures, and providing comments on working drafts of the EIS and supporting documents. Comments and input will be in writing to the extent possible.

C. Responsibilities of the Parties:

1. The Parties agree to participate in this EIS process in good faith and make all reasonable efforts to resolve disagreements.

2. The Parties agree to develop and comply with the schedules, which include dates for EIS milestones and timeframes for Cooperator's reviews and submissions.

3. Each Party agrees to fund its own expenses associated with the Copper Flat Mine EIS process, except that the BLM may contract with a Cooperator for technical studies within its jurisdiction or special expertise.

V. Other Provisions.

A. Authorities Not Altered. Nothing in this MOU alters, limits, or supersedes the authorities and responsibilities of any Party on any matter within their respective jurisdictions. Nothing in this MOU shall require any of the Parties to perform beyond its respective authority.

B. Financial Obligations. Nothing in this MOU shall require any of the Parties to assume any obligation or expend any sum in excess of authorization and appropriations available.

C. Immunity and Defenses Retained. Each Party retains all immunities and defenses provided by law with respect to any action based on or occurring as a result of this MOU.

D. Conflict of Interest. The Parties agree not to utilize any individual or organization for purposes of EIS development, environmental analysis, or Cooperator representation, including officials, employees, or third party contractors, having a financial interest in the outcome of the Copper Flat Mine EIS. Questions regarding potential conflicts of interest should be referred to BLM HQ or Field Ethics Counselors for resolution.

E. Documenting Disagreement or Inconsistency. Where the BLM and one or more Cooperators disagree on substantive elements of the EIS (such as designation of the alternatives to be analyzed or analysis of effects), and these disagreements cannot be resolved, the BLM will include a summary of the Cooperator's views in the Draft EIS and the Proposed Final EIS. The BLM will also describe substantial inconsistencies between its proposed action(s) and the objectives of State, local, or tribal land use plans and policies.

F. Management of Information. The Cooperator acknowledges that all supporting materials and draft documents may become part of the administrative record and may be subject to the requirements of the Freedom of Information Act (FOIA) and other Federal statutes. The BLM acknowledges that the Cooperator's treatment of these materials and drafts may be subject to the requirements of the New Mexico

Inspection of Public Records Act, NMSA 1978, Sections 14-2-1 to -12 (IPRA). The Parties agree that the BLM will share supporting materials and draft documents with the Cooperator. The Cooperator generally believes that IPRA does not require disclosure of draft documents, including certain supporting materials depending on their contents. The Cooperator shall notify BLM of any IPRA request for, or that includes, supporting materials or draft documents. Cooperator shall provide such notice as soon as practicable and in any event prior to disclosure of such materials or documents. If such disclosure by Cooperator takes place, thenceforward the BLM at its discretion may withhold from the Cooperator those documents that might be available for public release under IPRA. Notwithstanding any of the foregoing, nothing in this section or in this Agreement shall be interpreted so as to interfere with Cooperator's ability to obtain from any third party or contractor involved in EIS development information that is necessary or desirable for the performance or understanding of, or that is relied upon or referred to in, the New Mexico Environment Department Discharge Application.

G. Conflict Resolution. The Parties agree to make reasonable efforts to resolve procedural or substantive conflicts, and may agree to initiate an Alternative Dispute Resolution (ADR) process. The Parties acknowledge that BLM retains final responsibility for the decisions identified in the Copper Flat Mine EIS and Record of Decision.

H. Coordination with NEPA Contractor. Cooperators may provide information and comments directly to the NEPA contractor and collaborate with contractor's technical staff and subcontractors on matters within the Cooperator's jurisdiction or special expertise. The Cooperator acknowledges that it is not authorized to provide technical or policy direction regarding the performance of this contract, with regard to the development of the EIS. The BLM acknowledges that the work that the contractor will do for the development of and analysis in the EIS may overlap with the work that must be done in the development of the ground water Discharge Permit. The Parties agree that the Cooperator may use the contractor for technical review of portions of the ground water discharge permit application or Stage 1 Abatement Plan; and that the work done by the contractor in service of the development of and analysis in the EIS may be used by contractor or Cooperator in the development of and analysis of a ground water Discharge Permit or Stage 1 Abatement Plan.

VI. Agency Representatives.

Each Party will designate a representative and alternate representative to ensure coordination between the Cooperator and the BLM during the EIS process. Each Party may change its representative at will by providing written notice to the other Party.

NMED Representative
Name: Greg Huey, Environmental Scientist
Phone Number: (505) 827-1046
Email Address: greg.huey@state.nm.us
Mailing Address: 1190 Saint Francis Drive, Santa Fe, NM 87502

NMED Alternate Representative
Name: Kurt Vollbrecht, Geologist
Phone Number: (505) 827-0195
Email Address: kurt.vollbrecht@state.nm.us
Mailing Address: 1190 Saint Francis Drive, Santa Fe, NM 87502

NMED Alternate Representative
Name: Clint Marshall, Geologist
Phone Number: (505) 827-0027
Email Address: clint.marshall@state.nm.us
Mailing Address: 1190 Saint Francis Drive, Santa Fe, NM 87502

BLM Representative
Name: Mike Smith
Phone Number: 575-525-4421
Email Address: mikesmith@blm.gov
Mailing Address: 1800 Marquess St. Las Cruces, NM 88005

BLM Alternate Representative
Name: Jennifer Montoya
Phone Number: 575-525-4316
Email Address: jamontoya@blm.gov
Mailing Address: 1800 Marquess St. Las Cruces, NM 88005

VII. Administration.

A. Approval. This MOU becomes effective upon signature by the authorized officials of the BLM and the Cooperator.

B. Amendment. This MOU may be amended through written agreement of the signatories.

C. Termination. If not terminated earlier, this MOU will end when the Record of Decision for the Copper Flat Mine EIS is approved by the BLM State Director. Any Party may end its participation in this MOU by providing written notice to the other Party.

APPROVED:

F. David Martin
F. David Martin, Secretary
New Mexico Environment Department

9-9-11
Date

Bill Childress
Bill Childress, District Manager
Bureau of Land Management
Las Cruces District Office

August 30, 2011
Date

10/4/11

10-4-2011

SHARE# 12-521-0600-0019

BLM MOU NM-NML0000-2011-005

MEMORANDUM OF UNDERSTANDING

between:
U.S. Department of the Interior - Bureau of Land Management,
Las Cruces District Office
and
New Mexico Energy, Minerals and Natural Resources Department

concerning:
Relationship as a Cooperating Agency
for the Copper Flat Mine Environmental Impact Statement

I. Purpose. This Memorandum of Understanding (MOU) establishes a cooperating agency relationship between the Bureau of Land Management's Las Cruces District Office (BLM) and New Mexico Energy, Minerals and Natural Resources Department (Cooperator) for the purpose of preparing the Copper Flat Mine Environmental Impact Statement (EIS). The BLM is the lead Federal agency for development of the Copper Flat Mine EIS. The BLM acknowledges that the Cooperator has jurisdiction by State law and special expertise applicable to the EIS effort, as defined at 40 CFR 1508.15 and 1508.26. Cooperator also is required to conduct an environmental evaluation (EE) pursuant to 19.10.6.605(D) NMAC. This MOU describes responsibilities and procedures agreed to by the New Mexico Energy, Minerals and Natural Resources Department as a Cooperating Agency and the BLM (the Parties).

The cooperating agency relationship established through this MOU shall be governed by all applicable statutes, regulations, and policies, including the Council on Environmental Quality's National Environmental Policy Act (NEPA) regulations (in particular, 40 CFR 1501.6 and 1508.5), the BLM's planning regulations (in particular, 43 CFR 1601.0-5, 1610.3-1, and 1610.4), the Department of the Interior Manual (516 DM 2.5) and applicable New Mexico law.

II. Objective. The objectives of this MOU are:

A. To designate New Mexico Energy, Minerals and Natural Resources Department as a Cooperating Agency in the EIS process.

B. To provide a framework for cooperation and coordination between the BLM and the Cooperator that will ensure successful completion of the EIS, hydrologic balance, and EE, in a timely, efficient, and thorough manner.

C. To recognize that the BLM is the lead agency with responsibility for the completion of the EIS and the Record of Decision.

D. To describe the respective responsibilities, jurisdictional authority, and expertise of each of the Parties in the EIS process.

III. Authority.

A. The authorities of the BLM to enter into and engage in the activities described within this MOU include, but are not limited to:

1. National Environmental Policy Act of 1969 (42 U.S.C. 4321 et seq.)
2. Federal Land Policy and Management Act of 1976 (43 U.S.C. 1701 et seq.)

B. Regulations implementing the above authorities:

1. Council on Environmental Quality regulations (40 CFR 1501 et seq.)
2. Bureau of Land Management planning regulations (43 CFR 1601 et seq.)

C. The authorities of New Mexico Energy, Minerals and Natural Resources Department to enter into this MOU include, but are not limited to:

1. NMSA 1978, §§ 69-36-1 to 20 (New Mexico Mining Act)
2. Title 19, Chapter 10 NMAC (New Mexico Rules)

IV. Procedure.

A. BLM Responsibilities:

1. As lead agency, the BLM retains final responsibility for the content of all NEPA documents, which include the Draft EIS, the Proposed Final EIS, and the Record of Decision. The BLM's responsibilities include determining the purpose of and need for the EIS, selecting alternatives for analysis, identifying effects of the proposed alternatives, selecting the preferred alternative, and determining appropriate mitigation measures. In meeting these responsibilities, the BLM will follow all applicable statutory and regulatory requirements.

2. To the fullest extent consistent with its responsibilities as lead agency, the BLM will consider the comments, recommendations, data, or analyses provided by the Cooperator in the EIS process, giving particular consideration to those topics on which the Cooperator is acknowledged to possess jurisdiction by law or special expertise.

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including review time frames, and with any changes to the schedule as early as practicable. The Cooperator will review the Draft and proposed Final EIS during the public review of these documents.

B. Cooperating Agency Responsibilities:

1. New Mexico Energy, Minerals and Natural Resources Department is a Cooperating Agency in this EIS process and is recognized to have jurisdiction by law and special expertise in the following area:

   a. Environmental effects of exploration and mining;

   b. Reclamation of lands that have been subject to same.

2. The Cooperator will provide information, comments, and technical expertise to the BLM regarding those elements of the EIS, and the data and analyses supporting them, in which it has jurisdiction or special expertise or for which the BLM requests its assistance. In particular, the Cooperator will provide information on the following topics:

   a. Soils, vegetation, hydrology, erosional and mass stability;

   b. Reclamation costs and financial assurance;

   c. Post mine land use.

3. The Cooperator will request periodic briefings on the status and progress of the EIS. The Cooperator will provide comments and input in their areas of jurisdictional responsibility or special expertise during and after these briefings. Comments and input will be in writing to the extent possible.

C. Responsibilities of the Parties:

1. The Parties agree to participate in this EIS process in good faith and make all reasonable efforts to resolve disagreements.

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V. Other Provisions.

A. Authorities Not Altered. Nothing in this MOU alters, limits, or supersedes the authorities and responsibilities of any Party on any matter within their respective jurisdictions. Nothing in this MOU shall require either of the Parties to perform beyond its respective authority.

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F. Management of Information. The Cooperator acknowledges that all supporting materials and draft documents may become part of the administrative record and may be subject to the requirements of the Freedom of Information Act (FOIA) and other Federal statutes. The BLM acknowledges that the Cooperator's treatment of these materials and drafts may be subject to the requirements of the New Mexico Inspection of Public Records Act, NMSA 1978, Sections 14-2-1 to -12 (IPRA). While the Cooperator believes that IPRA does not require disclosure of draft documents or, depending on their content, certain of the supporting materials, if a court of competent jurisdiction or the Governor of the State of New Mexico or her designee instructs the Cooperator to do so, the Cooperator will disclose such documents and materials. The Parties agree that the BLM will share with the Cooperator supporting materials and drafts documents, but that if such disclosure by Cooperator takes place, thenceforward the BLM at its discretion may withhold from the Cooperator those documents that might be available for public release under IPRA. Notwithstanding any of the foregoing, nothing in this section or in this Agreement shall be interpreted so as to interfere with Cooperator's ability to obtaining from any third party or contractor involved in EIS or EE development information that is necessary or desirable for the performance or understanding of, or that is relied upon or referred to in, the EE.

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VI. Agency Representatives.

Each Party will designate a representative and alternate representative to ensure coordination between the Cooperator and the BLM during the EIS process. Each Party may change its representative at will by providing written notice to the other Party.

Cooperative Agency Representative
Name: Holland Shepherd
Phone Number: (505) 476-3437
Email Address: holland.shepherd@state.nm.us
Mailing Address: 1220 South St. Francis Drive, Santa Fe, NM 87505

Cooperative Agency Alternate Representative
Name: Chris Eustice
Phone Number: (505) 476-3438
Email Address: chris.eustice@state.nm.us
Mailing Address: 1220 South St. Francis Drive, Santa Fe, NM 87505

BLM Representative
Name: Mike Smith
Phone Number: (575) 525-4421
Email Address: msmith@blm.gov
Mailing Address: 1800 Marquess St., Las Cruces, NM 88005

BLM Alternate Representative
Name: Jennifer Montoya
Phone Number: (575) 525-4316
Email Address: jamontoya@blm.gov
Mailing Address: 1800 Marquess St., Las Cruces, NM 88005

VII. Administration.

A. Approval. This MOU becomes effective upon signature by the authorized officials of the BLM and the Cooperator.

B. Amendment. This MOU may be amended through written agreement of the signatories.

C. Termination. If not terminated earlier, this MOU will end when the Record of Decision for the Copper Flat Mine EIS is approved by the BLM State Director. Either Party may end its participation in this MOU by providing written notice to the other Party.

APPROVED:

[signature]	10-4-11
Cabinet Secretary or Designee New Mexico Energy, Minerals and Natural Resources Department Mining and Minerals Division	Date

[signature: Bill Childress]	9/21/2011
Bill Childress, District Manager Bureau of Land Management Las Cruces District Office	Date

10-14-2011

THEMAC RESOURCES

October 14, 2011

Greg Huey
New Mexico Environment Department
GWQB-MECS
Harold L. Runnels Building
1190 St Francis Drive
Santa Fe, New Mexico 87505

Re: New Mexico Copper Corporation's Amendment to the Stage I Abatement Plan Proposal for the Copper Flat Mine

Mr. Huey,

We are pleased to submit the attached Amendment to the Stage I Abatement Plan for the Copper Flat Mine. This report amends our previously proposed plan dated March 31, 2011 and titled *Stage I Abatement Plan for the Copper Flat Mine*. We believe this submission will satisfy NMED's June 23, 2011 request for additional information.

If you have any questions, please do not hesitate to contact me at 505-400-7925. We look forward to working with you.

Best regards,

Katie Lee

Katie Lee
Project Scientist
THEMAC Resources Group, Ltd.

Attachments

THEMAC Resources Group, Ltd | 2425 San Pedro Drive NE, Suite 100 | Albuquerque, NM 87110

AMENDMENT TO THE STAGE I ABATEMENT PLAN PROPOSAL FOR THE COPPER FLAT MINE

prepared by

JOHN SHOMAKER & ASSOCIATES, INC.
Water-Resource and Environmental Consultants
2611 Broadbent Parkway NE
Albuquerque, New Mexico 87107
505-345-3407
www.shomaker.com

prepared for

New Mexico Copper Corporation
2425 San Pedro Dr. NE, Suite 100
Albuquerque, New Mexico 87110

October 14, 2011

AMENDMENT TO THE STAGE I ABATEMENT PLAN PROPOSAL FOR THE COPPER FLAT MINE

prepared by

JOHN SHOMAKER & ASSOCIATES, INC.
Water-Resource and Environmental Consultants
2611 Broadbent Parkway NE
Albuquerque, New Mexico 87107
505-345-3407
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prepared for

New Mexico Copper Corporation
2425 San Pedro Dr. NE, Suite 100
Albuquerque, New Mexico 87110

October 14, 2011

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TABLES

ILLUSTRATIONS
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APPENDICES
(follow illustrations)

AMENDMENT TO THE STAGE I ABATEMENT PLAN PROPOSAL FOR THE COPPER FLAT MINE

A. INTRODUCTION

New Mexico Copper Corporation (NMCC) submitted a Stage 1 Abatement Plan proposal for the Copper Flat Mine to the New Mexico Environment Department (NMED). A general location map of the Copper Flat Mine is shown as Figure 1. The proposed plan was prepared by INTERA on March 31, 2011 and titled *Stage 1 Abatement Plan for the Copper Flat Mine*. On June 23, 2011, the NMED requested additional information before approving the proposed plan.

NMCC contracted John Shomaker & Associates, Inc. (JSAI) to address NMED requests for additional information and to amend the proposed Stage 1 Abatement Plan for the Copper Flat Mine.

A.1 Proposed Amendments

The following amendments were made to the Stage 1 Abatement Plan proposal:

1. Identify the proposed Stage 1 Abatement Plan area of investigation. The area of investigation is the NMCC permit area plus a 1-mile buffer. Figure 2 shows the proposed Stage 1 Abatement Plan area of investigation.
2. Provide maps and illustrations that better define the extent of known vadose zone and groundwater contamination.
3. Revise Section 2.3 (hydrogeologic description of site).
4. Amended and supplemented Section 4 (ongoing investigation activities) with a revised monitoring plan specific to the proposed Stage 1 Abatement Plan area of investigation.
5. Amended and supplemented Section 5 (proposed characterization activities) with a revised investigation plan specific to the proposed Stage 1 Abatement Plan area of investigation.

There are components of the proposed Stage 1 Abatement Plan prepared by INTERA (2011) that are revised and replaced by this amendment. Table 1 is a list referencing which sections from the original Stage 1 Abatement proposal and this amendment report fulfill the requirements of NMAC 20.6.2.4106 C (Stage 1 Abatement Plan contents).

Table 1. References for final Stage 1 Abatement Plan proposal

SECTION (NMAC 20.6.2.4106 C)	REFERENCE	
	original INTERA proposal (March 31, 2011)	JSAI amendments (October 4, 2011)
C.(1) Description of Site	Sections 2.1, 2.2, and *2.3*	Section B amendment replaces INTERA Section 2.3)
C.(2) Site Investigation Workplan (a) Site Hydrogeology (b) Surface Water Hydrology	*Section 5.0*	Section C amendment replaces INTERA Section 5.0
C.(3) Monitoring Program	*Section 4.0*	Section D amendment replaces INTERA Section 4.0
C.(4) Quality Assurance Plan	Section 6.0	no amendments
C.(5) Site Health and Safety Plan	Section 7.0	no amendments
C.(6) Stage 1 Abatement Plan Schedule	Sections 8.0 and 9.0	Section D amendment replaces INTERA Sections 8.0 and 9.0
C.(1), (2), and (3)	*Tables 4.1 – 4.3 and Appendix B*	Appendix A Tables A-1 – A-3 replace INTERA Tables 4.1 – 4.3 and Appendix B

italic items listed were replaced with amendments

A summary of items removed from the original Stage 1 Abatement Plan proposal includes the following:

1. Groundwater and surface water monitoring outside of the proposed Stage 1 Abatement Plan area of investigation shown on Figure 2.
2. Geochemical modeling of pit lake system will be replaced by water-quality characterization.
3. Analysis of pit lake hydraulics: this task is already completed (see Section B).
4. Geologic block model of tailings impoundment: this task is completed and included as cross-sections presented in this amendment (Figs. 7 and 8).

A summary of items added to the proposed Stage 1 Abatement Plan includes the following:

1. Proposed monitoring well drilling and testing.
2. Proposed monitoring plan for each facility (pit, waste rock piles, and tailings impoundment).
3. Pit lake water balance and water-quality characterization.
4. Use data collected from the proposed monitoring plan to refine the hydrogeologic conceptual model for each facility. Rate of potential transport will be addressed in the refined conceptual model.

B. AMENDED SECTION 2.3 - HYDROLOGIC CONDITIONS

The hydrologic setting and hydrogeologic conditions at Copper Flat Mine have been described in detail by previous studies performed by Newcomer and Finch (1993), SRK (1996), Adrian-Brown Consultants (1996), and Raugust (2003). In addition, there are numerous geologic reports, such as Harley (1934), Hedlund (1975), and Dunn (1982) that provide good detail on the structure and subsurface geology. Previous studies were combined with the analysis of recent data collected by INTERA (2010 to current) and JSAI (2011) to amend Section 2.3 of the Copper Flat Mine Stage 1 Abatement Plan.

B.1 Area of Investigation

The area of investigation is defined as the area within a 1-mile buffer zone of the current Copper Flat Mine permit boundary (Fig. 2). The site map, shown as Figure 2, also shows the locations of monitoring points used for the Stage 1 Abatement Plan, existing mine facilities, and other geographic features. Figure 1 distinguishes the region from the area of investigation. The area of investigation includes all existing mine facilities, the potential area of impact, and adequate area of investigation upgradient and downgradient of the potential areas of impact. For the Copper Flat Mine property, potential areas of impact include tailings impoundment, waste rock piles, and pit lake.

B.2 Hydrogeologic Setting

The area of investigation is encompassed in the upper watershed of Grayback Arroyo (Fig. 2). There are two hydrogeologic regions shown on Figures 1 and 3, and described below:

1) Andesite volcano within the Animas Uplift. The center of the andesite volcano contains a monzonite intrusion, which is referred to as Copper Flat (Harley, 1934). The Copper Flat open pit was excavated in 1982 by Quintana Minerals. The associated waste rock facilities are placed on andesite rocks (Figs. 2 and 3).
2) The Palomas Basin contains the Santa Fe Group sediments. The Palomas (geologic) Basin is part of the sediment-filled down-dropped blocks formed by the Rio Grande Rift. The tailings impoundment facility is located on the western margin of the Palomas Basin.

The area of investigation contains three established surface-water monitoring points along Grayback Arroyo, pit-lake monitoring, and 47 wells (Fig. 2). The wells can be grouped into monitoring wells and water-supply wells (domestic, stock, mine supply, etc.). Table 2 is a list of wells and their specifics.

Table 2. Summary of wells and well data for the Stage 1 Abatement Plan area of investigation, Copper Flat Mine, Sierra County, New Mexico

well name	well type	facility area	year drilled	casing diameter (inches)	total depth (ft bmp)	screen interval (ft bgl)	measuring-point elevation (2011 survey) (ft amsl)	geologic unit	depth to water measurement date	depth to water (ft bmp)	water-level elevation (ft amsl)
GWQ-1	supply	background region	1972	12 + 14	401	na	5,195.24	Santa Fe Group	6/15/1981	72.00	5,123.24
GWQ-2	supply	background region	1932	8	500	na	5,227.44	Santa Fe Group	11/15/1982	60.00	5,167.44
GWQ-3	supply	waste rock pile	1932	40 x 43	33	na	5,252.60	alluvium/andesite	9/29/2011	18.71	5,233.89
GWQ-4	supply	background region	1948	5	150	na	5,565.85	andesite	11/10/1982	35.00	5,530.85
GWQ-5R	monitoring	waste rock pile	2011	4	120	in progress	*5,410.00*	andesite	9/29/2011	98.91	*5,311.09*
GWQ-6(N)	supply	background region			85		5,395.36	andesite	6/9/1981	26.95	5,368.41
GWQ-6(S)	supply	background region					5,382.77	andesite			
GWQ-7	supply	tailings impoundment	1932	8	500	na	5,181.60	Santa Fe Group	6/15/1981	77.00	5,104.60
GWQ-8	supply	background region	1931	8	157	na	5,216.94	Santa Fe Group	11/15/1982	68.00	5,148.94
GWQ-9	supply	tailings impoundment	1971	14 + 16	767	na	5,208.13	Santa Fe Group	4/15/1972	60.00	5,148.13
GWQ-10	monitoring	tailings impoundment	1981	3	120	na	5,213.29	Santa Fe Group	9/27/2010	23.19	5,190.10
GWQ-11	monitoring	tailings impoundment	1981	3	70	na	5,196.44	alluvium/Santa Fe Group	5/4/2011	20.02	5,176.42
GWQ-12	monitoring	tailings impoundment	1981	3	137	na	5,237.28	Santa Fe Group	5/4/2011	79.71	5,157.57
GWQ94-13	monitoring	tailings impoundment	1994	5	106	74 to 104.5	5,200.47	Santa Fe Group	5/4/2011	13.02	5,187.45
GWQ94-14	monitoring	tailings impoundment	1994	5	159	127.5 to 157.5	5,192.69	Santa Fe Group	5/4/2011	6.42	5,186.27
GWQ94-15	monitoring	tailings impoundment	1994	5	149	112 to 142	5,183.07	Santa Fe Group	5/4/2011	4.92	5,178.15
GWQ94-16	monitoring	tailings impoundment	1994	5	46	25 to 45	5,197.41	alluvium	5/4/2011	21.76	5,175.65
GWQ94-17	monitoring	tailings impoundment	1994	5	151	120 to 150	5,198.13	Santa Fe Group	9/27/2010	10.11	5,188.02
GWQ94-18	monitoring	tailings impoundment	1994	4	51	10 to 50	5,194.83	alluvium	10/15/1994	dry	
GWQ94-19	monitoring	tailings impoundment	1994	4	53	10 to 50	5,203.36	alluvium	9/27/2010	52.22	5,151.14
GWQ94-20	monitoring	tailings impoundment	1994	4	338	288 to 338	5,203.49	Santa Fe Group	1/27/2010	18.05	5,185.44
GWQ94-21A	monitoring	tailings impoundment	1996	2	263	213 to 263	5,192.71	Santa Fe Group	11/7/1994	4.58	5,188.13
GWQ94-21B	monitoring	tailings impoundment	1996	2	315	285 to 315	5,192.22	Santa Fe Group	11/7/1994	3.95	5,188.27
GWQ96-22A	monitoring	pit/waste rock pile	1996	2	244	174 to 244	5,596.17	andesite	8/28/2011	54.63	5,541.54
GWQ96-22B	monitoring	pit/waste rock pile	1996	2	380	340 to 380	5,595.95	andesite	8/28/2011	54.59	5,541.36
GWQ96-23A	monitoring	pit/waste rock pile	1996	2	101	50 to 100	5,489.84	monzonite	8/28/2011	40.71	5,449.13
GWQ96-23B	monitoring	pit/waste rock pile	1996	2	251	150 to 250	5,489.70	monzonite	8/28/2011	40.87	5,448.83
GWQ11-24A	monitoring	pit/waste rock pile	2011	2	90	60 to 90	*5,514.80*	andesite	8/28/2011	49.86	*5,464.94*
GWQ11-24B	monitoring	pit/waste rock pile	2011	2	250	230 to 250	*5,514.80*	andesite	8/28/2011	56.69	*5,458.11*
GWQ11-25A	monitoring	pit/waste rock pile	2011	2	100	70 to 100	*5,532.00*	monzonite	8/28/2011	50.91	*5,481.09*
GWQ11-25B	monitoring	pit/waste rock pile	2011	2	242	222 to 242	*5,532.00*	monzonite	8/28/2011	62.90	*5,469.10*
IW-1	monitoring	tailings impoundment	1982	4	49	__ to 49	5,198.99	alluvium	6/24/2010	dry	
IW-2	monitoring	tailings impoundment	1982	4	46	__ to 45	5,208.01	alluvium	5/4/2011	39.01	5,169.00
IW-3	monitoring	tailings impoundment	1982	4	45	__ to 45	5,213.17	alluvium	6/24/2010	dry	
NP-1	monitoring	tailings impoundment	1981	4	106	__ to 106	5,188.75	Santa Fe Group	5/4/2011	30.8	5,157.95
NP-2	monitoring	tailings impoundment	1981	4	110	__ to 110	5,192.54	Santa Fe Group	5/4/2011	32.92	5,159.62
NP-3	monitoring	tailings impoundment	1981	4	100	__ to 100	5,199.73	Santa Fe Group	5/4/2011	12.02	5,187.71
NP-4	monitoring	tailings impoundment	1981	4	117	__ to 117	5,225.73	Santa Fe Group	5/4/2011	35.22	5,190.51
NP-5	monitoring	tailings impoundment	1981	4	39	24 to 39	5,198.81	basalt	5/4/2011	22.63	5,176.18
MW-4	supply	background region	1975	6	1,500	123 to 1,500	*5,125.00*	Santa Fe Group	6/9/1981	123.27	5,001.73
Pague	supply	background region			26		5,550.81	andesite	5/4/2011	11.69	5,539.12
Dolores	supply	background region			56		5,397.51	andesite	11/10/1982	29.7	5,367.81
Paxton Well	supply	background region	1932	40 x 40	30		5,500.00	andesite	11/10/1982	7.6	5,492.40
LRG-4156	supply	background region	1956	6	150		5,431.06	andesite	1956	60	5,371.06
LRG-4158	supply	background region	1955	6	150	na	5,533.03	limestone	11/11/2010	47.01	5,486.02
McCravey-G	supply	background region	1931	8	500	na	5,201.53	Santa Fe Group	11/15/1982	40	5,161.53
LRG-4159	supply	background region	2002	6	200	5 to 200	5,719.70	andesite	11/4/2010	13.56	5,706.14

ft bmp - feet below measuring point
italic measuring-point elevations are estimated
ft bgl - feet below ground level
na - not available
ft amsl - feet above mean sea level

B.2.1 Surface Water and Recharge

Precipitation and evaporation in the study area are examined using data from regional meteorological stations. The station at Hillsboro, New Mexico has over 80 years of record and is located about 4 miles from the Copper Flat Mine pit. The Hillsboro station is also at a similar elevation (5,270 ft amsl) to the Copper Flat Mine site. The range of variability of annual precipitation between wet and dry climatic conditions ranges from about 5 to 20 inches per year (in./yr). The average annual precipitation is approximately 13 inches.

The frequency and magnitude of rainfall-runoff events is examined in the statistical distribution of daily precipitation at the Hillsboro station. Daily precipitation of 1 inch or more occurs, on average, twice per year. Storm events of magnitude 2 inches can be expected to occur every 5 years, and the 100-year storm event is about 3.5 inches. Daily precipitation data from the Hillsboro station is shown on Figure 4.

Evaporation has previously been estimated to range between 60 and 65 in./yr. NMCC has installed a weather station and Class A evaporation pan at the mine site. The data will be used to further understand frequency and magnitude of storm-water runoff and to develop water budgets for the mine site and associated facilities.

The area of investigation is within Grayback Arroyo watershed. Grayback Arroyo is an ephemeral stream channel that drains the andesite rock of the Hillsboro Hills and is the primary drainage for the Copper Flat Mine pit area (Fig. 2). Some alluvium can be found along Grayback Arroyo east of Copper Flat Mine pit (Fig. 3). Storm-water runoff from Grayback Arroyo infiltrates alluvium and Santa Fe Group sediments east of Copper Flat. A diversion channel was constructed to divert storm-water around the Copper Flat Mine pit (Fig. 2).

After mining, the pit partially filled with storm water and groundwater. From available water-level data and aerial photographs, it appears the Copper Flat Mine pit filled to its current water level within a few years after mining stopped. A significant portion of the pit filling was related to storm-water runoff and above-average precipitation. Details regarding the pit lake can be referenced from Newcomer and Finch (1993), Shomaker (1993), SRK (1997), and Raugust (2003).

Surface-water monitoring points within the area of investigation include SWQ-1, SWQ-2, SWQ-3, pit lake, and pit wall seepage (Fig. 2). Historical data have been collected from each of these surface-water monitoring points (see Appendix A). SWQ-1 is located upstream of the mine facilities in Grayback Arroyo. SWQ-2 and SWQ-3 are in Grayback Arroyo below the mine pit and waste rock facilities. The pit lake and pit wall seepage monitoring points are within the pit footprint.

B.2.2 Geologic Units and Structure

There are three hydrogeologic units within the Copper Flat Mine site area:

1. alluvium along Grayback Arroyo and colluvium
2. Santa Fe Group sediments
3. andesite and monzonite rocks of the Animas Uplift

A summary of the geologic units and their characteristics is presented in Table 3. The distribution of geologic units is shown on Figure 3, and the subsurface conditions are illustrated on the hydrogeologic cross-sections presented as Figures 5 through 8.

Table 3. Geologic units and their characteristics

geologic unit	description	thickness (ft)	range in estimated hydraulic conductivity (ft/day)
alluvium [1]	sand and gravel in Grayback Arroyo	< 50	10 to 100
colluvium [2]	fan deposits of poorly sorted angular sand and gravel	< 50	1 to 10
Santa Fe Group sediments [3]	highly stratified gravel, sand, silt, and clay	1 to 2,000	0.01 to 10
andesite [4]	fine-grained porphyritic rock with plagioclase phenocrysts	> 3,000	<0.01
monzonite [4]	quartz monzonite with fracture controlled sulfide mineralization; other common minerals include magnetite, fluorite, calcite, and apatite	> 3,000	0.01 to 0.1

[1] - Dunn (1982); Finch et al. (2008)
[2] - Hedlund (1975)
[3] - Seager et al. (1982); Hawley and Kennedy (2004)
[4] - Dunn (1982); SRK (1997); JSAI (work in progress)

The principal water-bearing sediments of the Palomas Basin are (1) alluvial-fan deposits, and fluvial sands and gravels of the Santa Fe Group, and (2) saturated alluvium in the principal drainages. Alluvium is found east of the Copper Flat Mine in Grayback arroyo, and primarily consists of sand and gravel. Thickness of the alluvium ranges between 5 and 50 ft. Alluvium may be locally and seasonally saturated north of the tailings impoundment, and downgradient of the waste rock piles along Grayback Arroyo. Colluvium overlies the andesite and Santa Fe Group sediments, but is only known to be locally saturated near the center of the tailings dam.

The sediments of the Santa Fe Group are stratified, contain a wide variety of grain sizes, and, in general, dip to the east. This distribution of fine-grained sand and clay and of coarser sand and gravel is reflected in the logs of wells in the tailings facility area. North-to-south and east-to-west hydrogeologic cross-sections of the tailings facility area were constructed (see Figs. 7 and 8). The Santa Fe Group sediments are over 500 ft thick beneath the tailings facility.

Hydrogeologic conditions beneath the tailings dam are complicated by varying thickness of colluviums, thick clay layers in the Santa Fe Group sediments, and basalt and volcaniclastics interbedded in the Santa Fe Group sediments (see Figs. 7 and 8). These varying lithologies and sediment grain sizes create preferential flow paths and barriers to groundwater flow. The preferential flow paths are primarily related to coarser-grained colluvium and Santa Fe Group sediments.

The hills surrounding Copper Flat Mine, referred to as Hillsboro Hills, consists of Cretaceous-age andesite flows, breccias, and volcaniclastic rocks that were erupted from an andesite volcano (McLemore, 2001; Raugust and McLemore, 2004). The andesite is a near circular body approximately 4 miles in diameter and over 3,000 ft in depth (Dunn, 1982). The Copper Flat Mine quartz monzonite porphyry intruded the vent of the volcano, and then dikes and mineralized veins intruded the monzonite porphyry and radiate outwards from the porphyry into fault and fracture zones in the andesite. The porphyry copper deposit is a low-grade deposit that is concentrated within a breccia pipe in the Copper Flats quartz monzonite stock and contains copper sulfide and oxide minerals. Distribution of the monzonite can be referenced from the geologic map (Fig. 3) and pit lake cross-sections (Figs. 5 and 6). The permeability of the andesite is extremely low, where as the permeability of the monzonite rocks averages 0.1 ft/day due to localized secondary porosity from fracturing (see Section B.2.4).

B.2.3 Groundwater Flow Direction

The direction of groundwater flow is from west to east, except in the vicinity of the Copper Flat pit lake where a hydrologic sink exists due to evaporative losses. Groundwater-elevation contours are shown on Figure 9, and data used to construct the water-level elevation contours are listed in Table 2. The groundwater-elevation contours indicate groundwater flow from the andesite to the alluvium and Santa Fe Group sediments. Groundwater contours around the pit lake and direction of groundwater flow are shown on Figure 10. Between June and September 2011, evaporative effects decreased the pit lake elevation from 5,443.80 to 5,442.74 ft amsl. The four nested piezometers around the pit provide the data needed to prove the pit lake is a hydrologic sink; two of the nested piezometers were drilled in 2011 (GWQ11-24(A,B) located south of the pit lake and GWQ11-25(A,B) north of the pit lake (Figs. 2 and 10)). There appears to be a hydraulic discontinuity east of the tailings impoundment dam (Figs. 8 and 9).

Depth to water varies significantly due to topography and geologic unit (see Fig. 11). Monitoring wells surrounding the pit lake and waste rock piles typically have a depth to water of 40 to 80 ft. Depth to water in the Grayback Arroyo is approximately 10 to 20 ft bgl, as indicated by GWQ-3, which is a 3.3 ft by 3.6 ft hand-dug concrete cistern (Figs. 2 and 16). Water levels beneath the tailings impoundment significantly rose during operation in 1983; see hydrograph for monitoring wells NP-1 through NP-5 presented as Figure 12. The water-level rise beneath the tailings impoundment is the result of a groundwater mound created by infiltration at the tailings dam and the north to south trending fault approximately 800 ft east of the tailings impoundment. The fault acts as a barrier to groundwater flow (Fig. 8).

B.2.4 Aquifer Characteristics

Source of aquifer test data come from 1) pumping and specific-capacity tests performed on supply wells, 2) injection and slug tests performed on Copper Flat Mine pit lake piezometers, and 3) pumping test performed by Adrian-Brown Consultants (1994) on monitoring wells below the tailings dam.

Hydraulic conductivity values were derived from slug tests performed on wells GWQ96-22 and GWQ96-23 (SRK, 1997). The slug test analysis estimated an extremely low range in hydraulic conductivity of 0.00003 to 0.003 ft/day for the unfractured andesite and quartz monzonite rocks. JSAI (in progress) has evaluated injection tests performed on GWQ-5R (Fig. 2), GWQ11-24, and GWQ11-25 (Figs. 2 and 10). A summary of the hydraulic conductivity estimates is presented as Table 4, and construction diagrams can be referenced from Appendix B.

Table 4. Summary of hydraulic conductivity (permeability) estimates from wells in the vicinity of the pit and waste rock piles

borehole and zone	depth interval (ft)	geologic unit	apparent permeability	
			(cm/sec)	(ft/day)
GWQ-5R, Zone 1	64-100	andesite	~0	~0
GWQ11-24, Zone 1	100-147	monzonite	7×10^{-6}	0.02
GWQ11-24, Zone 2	150-197	monzonite	3.0×10^{-5}	0.085
GWQ11-24, Zone 3	204-251	monzonite	4.9×10^{-5}	0.14
GWQ11-25, Zone 1	100-148	monzonite	~0	~0
GWQ11-25, Zone 2	150-198	monzonite	2.9×10^{-5}	0.081
GWQ11-25, Zone 3	207-251	monzonite	2.6×10^{-5}	0.074

cm/sec - centimeters per second

A representative range of effective bulk hydraulic conductivity for the fractured rock surrounding the pit lake is about 0.05 to 0.1 ft/day. The andesite rocks appear to have an order of magnitude lower hydraulic conductivity than the fractured monzonite as evidenced by the slow recovery of GWQ-5R, which was dry upon well completion on September 6, 2011, but has recovered to an elevation of 5,311 ft amsl on September 29, 2011 (or approximately 23 feet of recovery).

Pumping and specific capacity tests were performed on mine-supply wells MW-4 (Water Development Corporation, 1975), GWQ-1 (Water Development Corporation, 1980), GWQ-7 (W.K. Summers & Associates, 1981), GWQ-9 (Water Development Corporation, 1980). All of these wells are in the vicinity of the tailings facility (Fig. 2). A summary of the hydraulic properties derived from the wells tested in the tailings impoundment area is listed in Table 5.

Table 5. Summary of hydraulic properties estimated from wells in the vicinity of the tailings impoundment

well	pumping rate (gpm)	specific capacity (gpm/ft)	aquifer thickness tested (ft)	transmissivity (ft^2/day)	horizontal hydraulic conductivity (ft/day)
MW-4	60	0.24	1,377	80	0.06
GWQ-1	119	1.57	328	1,540	4.7
GWQ-7	21	2.33	423	440	1.0
GWQ-9	60	0.44	700	1,710	2.4
GWQ94-17	23	0.19	146	200	1.4

gpm - gallons per minute

Adrian-Brown Consultants (1994) performed a 76-hour constant-rate pumping test on GWQ94-17 located below the tailings impoundment (Fig. 2). Neighboring monitoring wells were used as observation wells during the pumping test. The pumping well, GWQ94-17 was pumped at a rate of 23 gallons per minute (gpm). The water levels in the pumping and observation wells never fully recovered to the pre-pumping level, indicating boundary effects from dewatering the groundwater mound observed beneath the tailings dam. Furthermore, the pumping test data confirmed the clay zones observed in the upper Santa Fe Group sediments (see Figs. 7 and 8) act as vertical barriers to groundwater flow.

B.2.5 Water-Quality Trends

Water-quality trends for the Copper Flat Mine area are best identified by changes in sulfate and total dissolved solids (TDS) concentrations. The primary areas of interest for water-quality trends include 1) the pit lake, 2) surface-water runoff in Grayback Arroyo, 3) alluvium and fractured rock along Grayback Arroyo downstream of the waste rock piles, and 4) downgradient of the tailings impoundment.

As shown by time-series graphs presented in Raugust (2003) and the Stage 1 Abatement Plan (INTERA, 2011), the sulfate and TDS concentrations in the pit lake have increased since the late 1980s. The increase in pit lake sulfate and TDS concentrations since the early 1990s is due to evaporation instead of pit wall seepage. Figure 13 is a plot of pit lake sulfate and chloride concentrations. The observed trend between sulfate and chloride increases linearly with respect to time. If the increasing sulfate concentrations were due to pit wall seepage, sulfate concentrations would increase without an increase in chloride (pit wall seepage has low chloride concentration; see Appendix A). Furthermore, if the increase in sulfate concentrations was due to pit wall seepage and evaporation, the trend on Figure 13 would show sulfate concentrations increasing at a rate greater than the chloride concentrations.

Surface water quality monitoring points SWQ-2 and SWQ-3 have shown increases in sulfate concentration over the last several decades. Figure 14 is a sulfate concentration time-series graph for SWQ-1, SWQ-2, SWQ-3, and GWQ-3. From Figure 14 it appears sulfate concentration has increased over time in Grayback Arroyo surface water downstream of the waste rock piles. However, an increase sulfate concentration is also observed in upgradient monitoring point SWQ-1.

Well GWQ-3 is downstream of SWQ-3 and the waste rock piles, and should be representative of groundwater along Grayback Arroyo. GWQ-3 sulfate concentrations resembled similar values to SWQ-2 in the early 1980s (Fig. 14), but there are no recent data to determine if sulfate concentrations have changed since the 1980s.

Monitoring well NP-3 is located directly downgradient of the tailings impoundment, and has good historical dataset for evaluating trends. Figure 15 is a sulfate and TDS concentration time-series plot for monitoring well NP-3. After the construction and operation of the tailings impoundment in 1983, sulfate and TDS concentrations increased in NP-3 (Fig. 15). As indicated by the 2010 and 2011 sampling events, sulfate and TDS concentrations have remained fairly constant in NP-3. The groundwater mound created by the tailings impoundment (Fig. 11) shows a similar pattern of stability. The lack of change in depth to water and sulfate concentrations are evidence that the sulfate-rich groundwater mound is relatively stable and has not moved.

B.3 Extent of Groundwater Impacts

The extent of groundwater impacts can be identified using data from the existing monitoring network. Available water-quality data for the wells surrounding the mine facilities are listed in Appendix A tables. Table A1 lists water-quality data from the pit lake, Table A2 lists surface-water-quality data, and Table A3 lists groundwater-quality data.

B.3.1 Pit Lake

The pit lake quality has been affected by minor influxes of pit wall seepage and concentration of dissolved constituents from evaporation. The pit lake has buffering capacity to maintain neutral pH (6.00 to 7.72), although high precipitation periods and subsequent pit wall seepage can temporarily exceed the pit lake buffering capacity (see 1990s data in Appendix A). Table 6 lists the constituents of concern (COC) identified from the pit lake chemistry data in Appendix A. The primary COCs are TDS, sulfate, and pH. Pit lake chemistry data from 2010 and 2011 demonstrate that the pit lake is not stratified, and that depth sampling is not necessary (see Appendix A).

Piezometer nests GWQ96-22(A,B) and GWQ96-23(A,B) provide adequate monitoring of upgradient (GWQ96-22(A,B)) and downgradient (GWQ96-23(A,B)) groundwater-quality conditions. Figures 5 and 6 show the distribution of 2011 sulfate concentrations, and, along with the water-level elevation contours (Fig. 10), indicate the pit lake is a hydraulic sink with no impacts to groundwater. Recently constructed nested piezometers GWQ11-24(A,B) and GWQ11-25(A,B) have not been sampled, so the groundwater quality north and south of the pit has not be characterized.

Table 6. Identified constituents of concern for the pit lake

constituent of concern	range in observed concentration (mg/L)
aluminum	0.13 to 5.5
cadmium	0.056 to 0.064
cobalt	0.34 to 0.39
copper	0.11 to 11.0
manganese	39 to 45
selenium	0.019 to 0.030
zinc	5.0 to 6.8
alkalinity	< 20 to 41
chloride	380 to 420
fluoride	15 to 18
sulfate	5,200 to 6,200
total dissolved solids (TDS)	7,770 to 8,700

mg/L - milligrams per liter

B.3.2 Waste Rock Pile(s)

Surface water quality sampling points SWQ-2 and SWQ-3 may provide an indication of water-quality impacts from the waste rock piles. A statistical analysis of the data would need to be performed to determine if a statistically significant increase in concentration has occurred and to determine the difference between pre- and post-mining concentrations from Copper Flat Mine. The primary COCs are sulfate, TDS, and pH. Metal concentrations in surface-water samples have been low or not detectable, and pH has been above neutral in the 7 to 8 range (see Appendix A).

Discharges to groundwater from potential waste rock pile leachate would occur via storm-water runoff. Figure 16 shows the current potential storm-water runoff and migration pathways for each waste rock pile and mill site fill. The pit footprint will capture runoff from nearby waste rock piles to the north and northwest, and Grayback Arroyo will receive runoff from the waste rock piles east of the pit capture area. GWQ-3 is located in Grayback Arroyo, and is the best location downstream of the waste rock pile for detecting discharges to groundwater from the waste rock piles. All of the available data from GWQ-3 were collected in the 1980s, and additional data are needed to determine if groundwater-quality conditions have changed. For future mining operations, the surface runoff from the waste rock piles will be controlled as shown in the Mine Plan of Operations submitted to the Bureau of Land Management (BLM) in June 2011 and currently under review by the NMED.

B.3.3 Tailings Impoundment

The groundwater monitoring network for the tailings impoundment has adequately defined the horizontal and vertical extent of groundwater impacts, except for the lateral extent on the east and downgradient side (see Figs. 7, 8, and 14). The eastern most monitoring wells, GWQ94-21A and GWQ94-21B are completed too deep to characterize the lateral extent of groundwater impacts.

B.4 Hydrogeologic Conceptual Model

The hydrogeologic conceptual model for the Stage 1 Abatement area of investigation can be divided into two segments 1) pit and waste rock piles area underlain by low permeability andesite and monzonite rocks, and 2) the tailings impoundment area underlain by alluvium and Santa Fe Group sediments.

The pit lake is a hydrologic sink with no discharges to groundwater. The andesite rocks acts as a hydraulic container for the more fractured monzonite rocks. Prior to the pit lake, groundwater discharged from the andesite and monzonite rocks due to the alluvium along Grayback Arroyo. The waste rock piles are more permeable than the underlying rock, and infiltrated precipitation will drain off at the waste rock-bedrock interface. The runoff from the waste rock piles will be intercepted by the mine pit and the mill site fill to Grayback Arroyo. As a result, the waste rock and mill site fill may be contributing to increased TDS in downgradient surface-water quality, but significant discharges to groundwater have not been adequately evaluated from the existing groundwater monitoring network (see data for GWQ-3 and GWQ-8 in Appendix A).

The tailings impoundment created a groundwater mound and discharges of increased sulfate and TDS to groundwater. Preferential pathways for the seepage include the alluvium, fractured basalt, and coarser-grained Santa Fe Group sediments. Clay layers in the Santa Fe Group sediments act as vertical barriers to groundwater flow. The sulfate plume appears to be stable (the groundwater mound has not subsided) and downgradient migration is limited by a barrier boundary fault.

C. PROPOSED SITE INVESTIGATION WORKPLAN

A good portion of the proposed site investigation workplan has been completed in 2010 and 2011, such as the drilling and testing of piezometer nests in the pit lake area, collection of additional water-level and water-quality data in the area of investigation, and evaluation of current hydrogeologic conditions (such as Section B of this amendment report). The proposed site investigation workplan is designed to characterize potential water-quality issues and define extent of impacts related to the existing mine facilities (pit, waste rock piles, and tailings impoundment).

C.1 Pit Lake

In addition to the two existing piezometer nests, in 2011 NMCC had two more piezometer nests installed north and south of the pit lake (Fig. 2). The four piezometer nests (GWQ96-22(A,B), GWQ96-23(A,B), GWQ11-24(A,B), and GWQ11-25(A,B)) allow for monitoring upgradient, offgradient, and downgradient of the pit lake, as well as with respect to aquifer depth. No additional drilling is proposed for pit lake characterization.

The proposed pit lake investigation includes the following:

1. Collect four quarters of water-quality data from the pit lake, pit wall seepage, and surrounding piezometers.

2. Collect four quarters of water-level data from the pit lake and surrounding piezometer nests.

3. Develop a revised water balance for the pit lake using water-quality data, on-site climate data, and pit lake elevation data.

4. Perform an analysis of the pit lake chemistry to determine if there are past, current, and future issues with meeting the applicable surface water-quality standards.

C.2 Waste Rock Pile(s)

A preliminary waste rock pile characterization study was performed by Newcomer and Finch (1993), and more detailed evaluations of waste-rock characterization were performed by SRK (1998). Currently SRK is finishing where it left off in 1998 by performing material tests on 70 samples collected in 2010. Details of the SRK waste rock pile characterization can be referenced from appendix f in the proposed Stage 1 Abatement Plan (INTERA, 2011).

The proposed waste rock investigation plan includes the following:

1. Results from the waste rock characterization will be compared to water-quality results obtained from surface-water runoff samples SWQ-1, SWQ-2, SWQ-3, and groundwater sampled from the pit area piezometer nests and downgradient wells GWQ-1, GWQ-3, GWQ-5R, and GWQ-8.

2. The historical surface water quality data will be statistically evaluated for significant increases in concentrations of TDS and sulfate. Trend analysis and geochemical analysis of other water-quality parameters will be used to verify statistically significant increases in sulfate and TDS. The purpose of the investigation is to determine if the increases in sulfate and TDS in surface water and downgradient groundwater are attributed to the waste rock pile(s) or some other influence such as climate, salt build up in soils, etc. Characterization of background chemistry will be incorporated into the analysis.

3. Collect samples from GWQ-1, GWQ-3, GWQ-5R, and GWQ-8. The groundwater-quality data will help characterize the extent of lateral and vertical groundwater impacts if the leachate from the waste rock piles is determined to be associated with increases of sulfate and TDS in downgradient groundwater.

NMCC is currently working on BLM access for the wells GWQ-1 and GWQ-8. NMCC will also have to establish BLM access to GWQ-3, now that this report has identified it as potential aid in assessing and monitoring water quality downgradient of the mine site. NMCC will not be able to gauge or sample these wells until the BLM access has been granted and in the case of GWQ-8, a cultural resources evaluation completed.

C.3 Tailings Impoundment Facility

Proposed investigation for the tailings impoundment facility includes the drilling of one or two monitoring wells downgradient of the known extent of the sulfate plume. Downgradient monitoring wells GWQ94-14 and GWQ94-21 are too deep to assess the lateral extent of the sulfate plume (Fig. 7). Proposed monitoring well locations are shown on Figures 7 and 17; the actual locations may depend on land ownership and access, and may slightly vary from the proposed location.

The proposed tailings impoundment investigation plan includes:

1. Install the first monitoring well (proposed monitoring well A) located east of GWQ94-21, but west of the fault zone shown on Figure 7. If proposed monitoring well A does not define the eastward extent of the sulfate plume, proposed monitoring well B will be drilled east of the projected fault zone. A 60-ft screen interval is proposed for monitoring well A to accommodate the possibility of the groundwater mound lowered to the pre-tailings water-level elevation.

2. Data from existing and proposed monitoring wells will be used to assess the sulfate plume extent and stability. Known aquifer properties, water-level trends, and vertical head distribution will be used to assess the stability of the sulfate plume and potential tracer velocity under current conditions.

D. PROPOSED MONITORING PLAN

Sampling methods and protocol defined in the NMCC Sampling and Analysis Plan (SAP), prepared for baseline studies, will be employed. The proposed Stage 1 Abatement monitoring plan is based on the identified COCs, and the need for further characterization within the area of investigation.

D.1 Pit Lake

Monitoring plan includes collection of data from 1) pit lake, 2) surrounding piezometer nests, and 3) on site weather station. Four quarters of data are needed from the new wells GWQ11-24(A,B), GWQ11-25(A,B). The proposed pit lake monitoring plan includes sample analyses for pH, acidity, general chemistry, and the remaining constituents listed in Table 6. The proposed pit lake area monitoring plan is summarized in Table 7. Another 6 months of weather station data collection will help define the pit lake water balance.

Table 7. Proposed monitoring plan for Copper Flat pit lake area

monitoring point	4th QTR 2011	1st QTR 2012	2nd QTR 2012	3rd QTR 2012
GWQ96-22(A,B)	WL, WQ	WL	WL	WL
GWQ96-23(A,B)	WL, WQ	WL	WL	WL
GWQ11-24(A,B)	WL, WQ	WL, WQ	WL, WQ	WL, WQ
GWQ11-25(A,B)	WL, WQ	WL, WQ	WL, WQ	WL, WQ
pit lake	WL, WQ	WL, WQ	WL, WQ	WL, WQ
pit wall seepage (if present)	WQ	WQ	WQ	WQ

WQ - water-quality analysis (Table 6 constituents plus calcium, magnesium, sodium, potassium, and field parameters of temperature, specific conductance, and pH)
WL - water level

D.2 Waste Rock Pile(s)

Most of the proposed waste rock pile investigation will be based on existing data and results from studies already in progress by SRK. However, there is a need for current data from downgradient wells. Table 8 lists the proposed groundwater monitoring program for the waste rock pile investigation. Proposed data collected from the pit lake area (Table 7) would also be incorporated into the waste rock pile investigation.

NMCC also has automated samplers for collection of storm-water runoff from SWQ-1, SWQ-2, and SWQ-3. If events occur and are samples collected, the data will be incorporated into the investigation.

Table 8. Proposed monitoring plan for Copper Flat waste rock pile area

monitoring point	4th QTR 2011*	1st QTR 2012*	2nd QTR 2012*	3rd QTR 2012*
GWQ-5R	WL, WQ	WL, WQ	WL, WQ	WL, WQ
GWQ-3	WL, WQ	WL, WQ	WL, WQ	WL, WQ
GWQ-1	WL, WQ	WL, WQ	WL, WQ	WL, WQ
GWQ-8	WL, WQ	WL, WQ	WL, WQ	WL, WQ

* access and schedule dependent on land owner permission or BLM right-of-way permitting (including evaluation of cultural resource issues, etc.)
WQ - water-quality analysis (total dissolved solids (TDS), sulfate, chloride, alkalinity, calcium, magnesium, sodium, potassium, and field parameters of temperature, specific conductance, and pH)
WL - water level

D.3 Tailings Impoundment Facility

There are numerous monitoring wells in the vicinity of the tailings impoundment, and many of these are no longer needed for characterization and investigation of the sulfate plume. The proposed sampling plan for the tailings impoundment investigation includes the wells and parameters listed in Table 9. Several of the wells listed in Table 9 are currently dry, but data would be needed from these points if water were present. Access to MW-4 will depend on permitting from the land owner, and drilling, construction, and data collection from proposed monitoring well B is dependent on what is found at proposed monitoring well A.

Table 9. Proposed monitoring plan for Copper Flat Mine tailings impoundment area

monitoring point	4th QTR 2011*	1st QTR 2012*	2nd QTR 2012*	3rd QTR 2012*
IW-1	WL, WQ	WL, WQ	WL, WQ	WL, WQ
IW-2	WL, WQ	WL, WQ	WL, WQ	WL, WQ
IW-3	WL, WQ	WL, WQ	WL, WQ	WL, WQ
GWQ94-13	WL, WQ	WL, WQ	WL, WQ	WL, WQ
GWQ94-14	WL, WQ	WL, WQ	WL, WQ	WL, WQ
GWQ94-16	WL, WQ	WL, WQ	WL, WQ	WL, WQ
GWQ94-18	WL, WQ	WL, WQ	WL, WQ	WL, WQ
GWQ94-19	WL, WQ	WL, WQ	WL, WQ	WL, WQ
NP-3	WL, WQ	WL, WQ	WL, WQ	WL, WQ
MW-4	WL, WQ	WL, WQ	WL, WQ	WL, WQ
proposed MW-A	WL, WQ	WL, WQ	WL, WQ	WL, WQ
proposed MW-B	WL, WQ	WL, WQ	WL, WQ	WL, WQ

* access and schedule dependent on land owner permission or BLM right-of-way permitting (including evaluation of cultural resource issues, etc.)
WQ - water-quality analysis (total dissolved solids (TDS), sulfate, chloride, alkalinity, calcium, magnesium, sodium, potassium, and field parameters of temperature, specific conductance, and pH)
WL - water level

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ILLUSTRATIONS

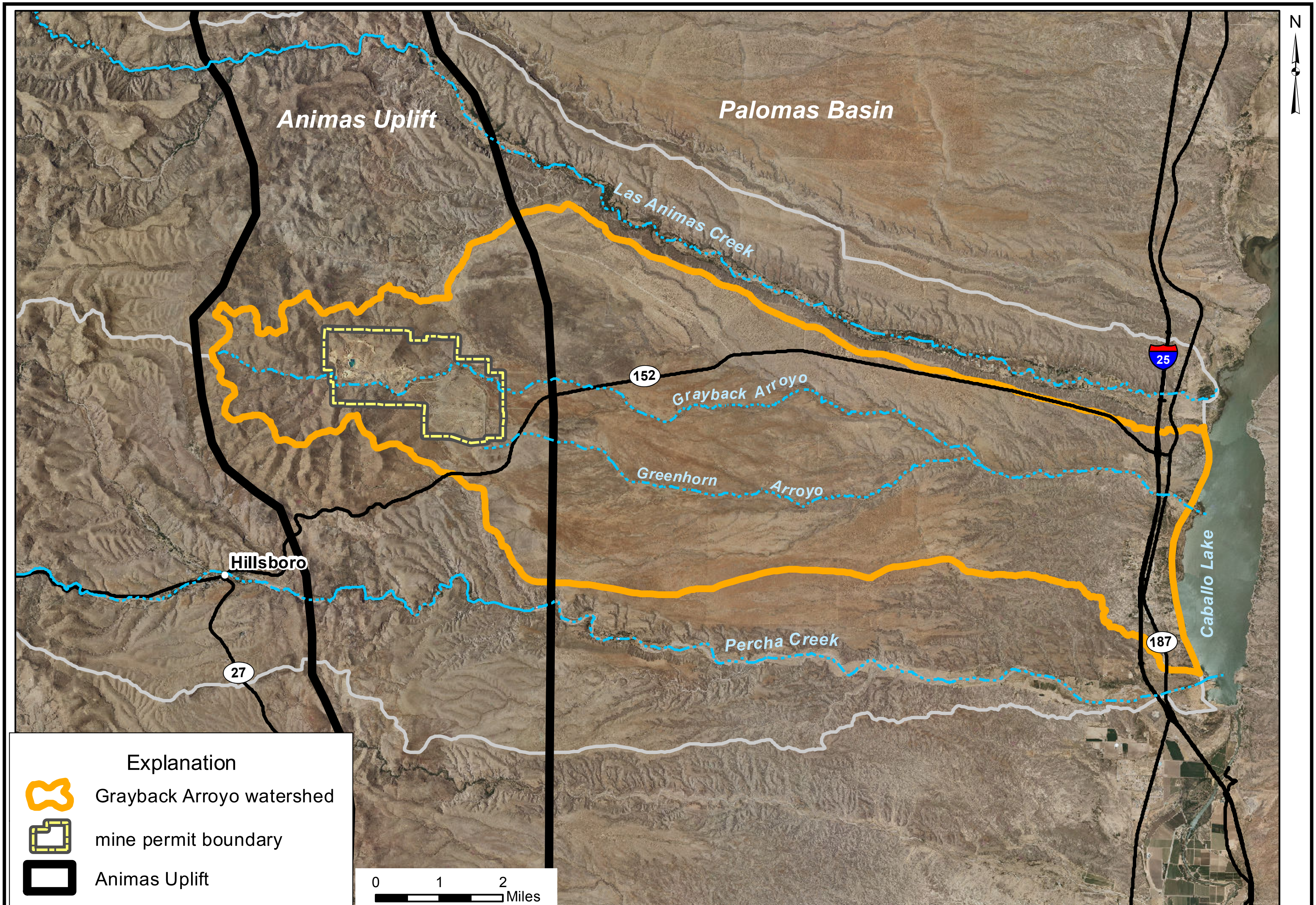

Figure 1. Regional map showing locations of Copper Flat Mine permit area, watersheds, and geographical features, Sierra County, New Mexico.

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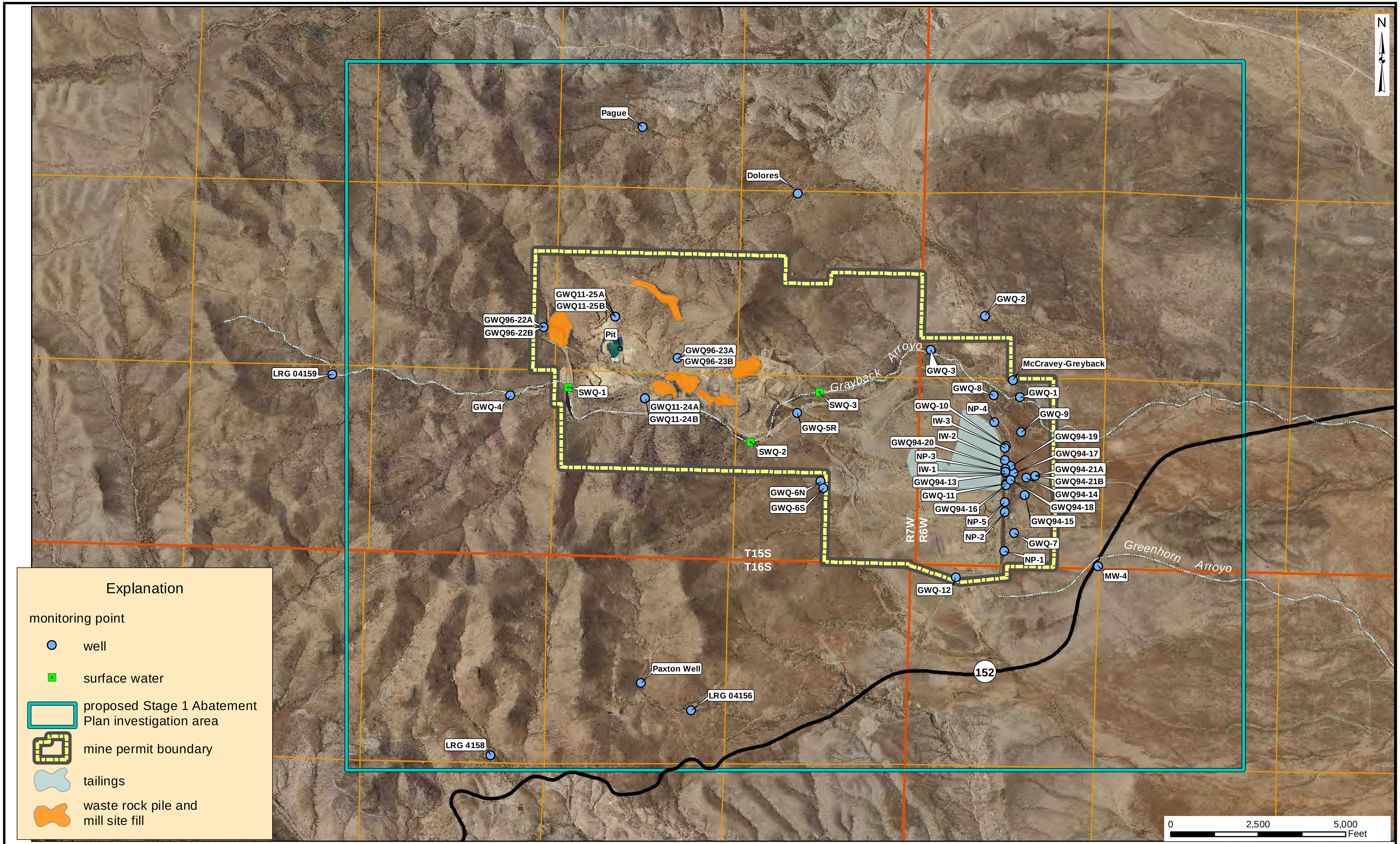

Figure 2. Map of proposed Stage 1 Abatement Plan area of investigation, Copper Flat Mine facilities, and monitoring point locations, Copper Flat Mine, Sierra County, New Mexico.

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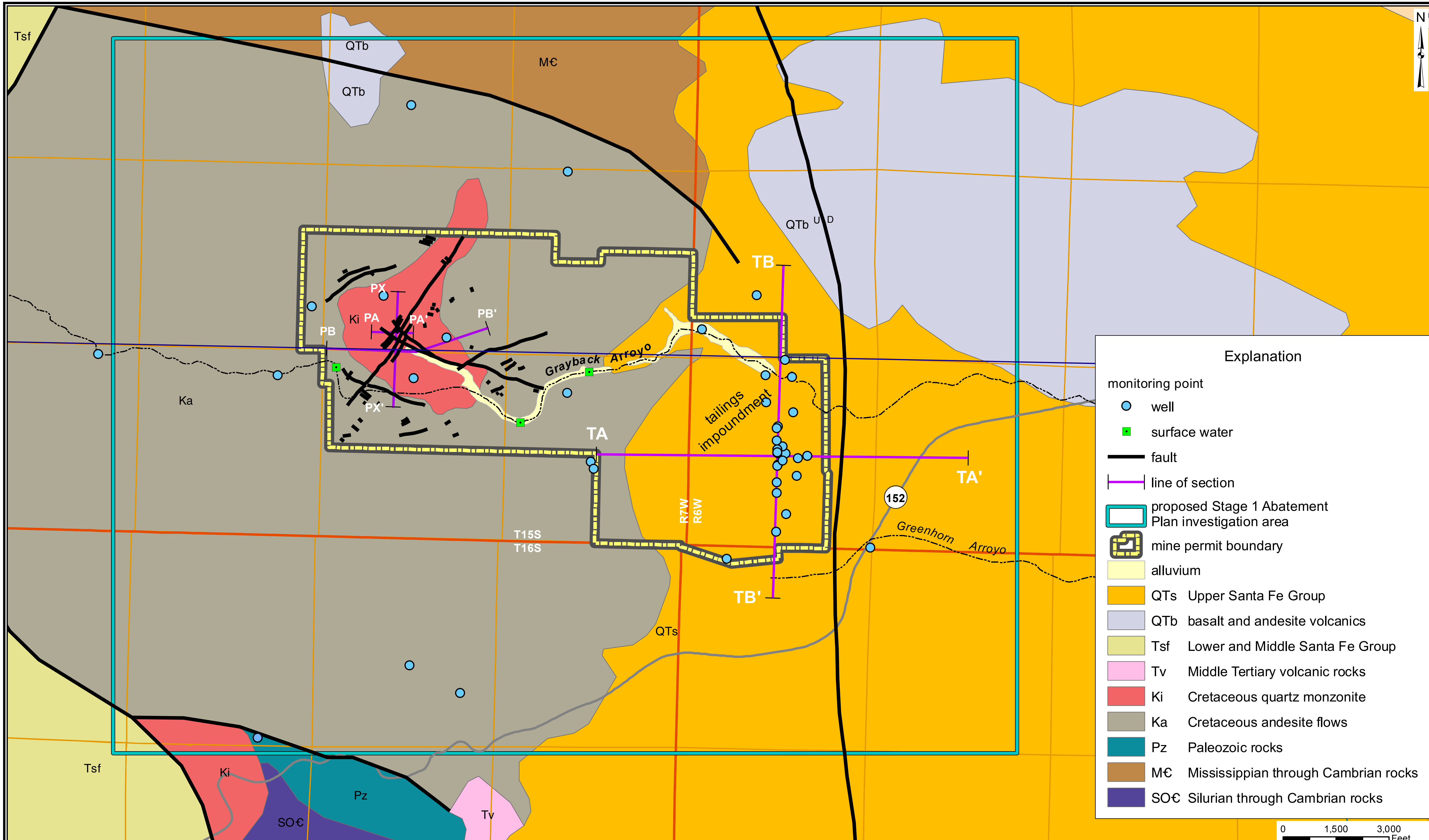

Figure 3. Geologic map showing distribution of hydrogeologic units within the area of investigation and lines of section for tailings impoundment area, Copper Flat Mine, Sierra County, New Mexico.

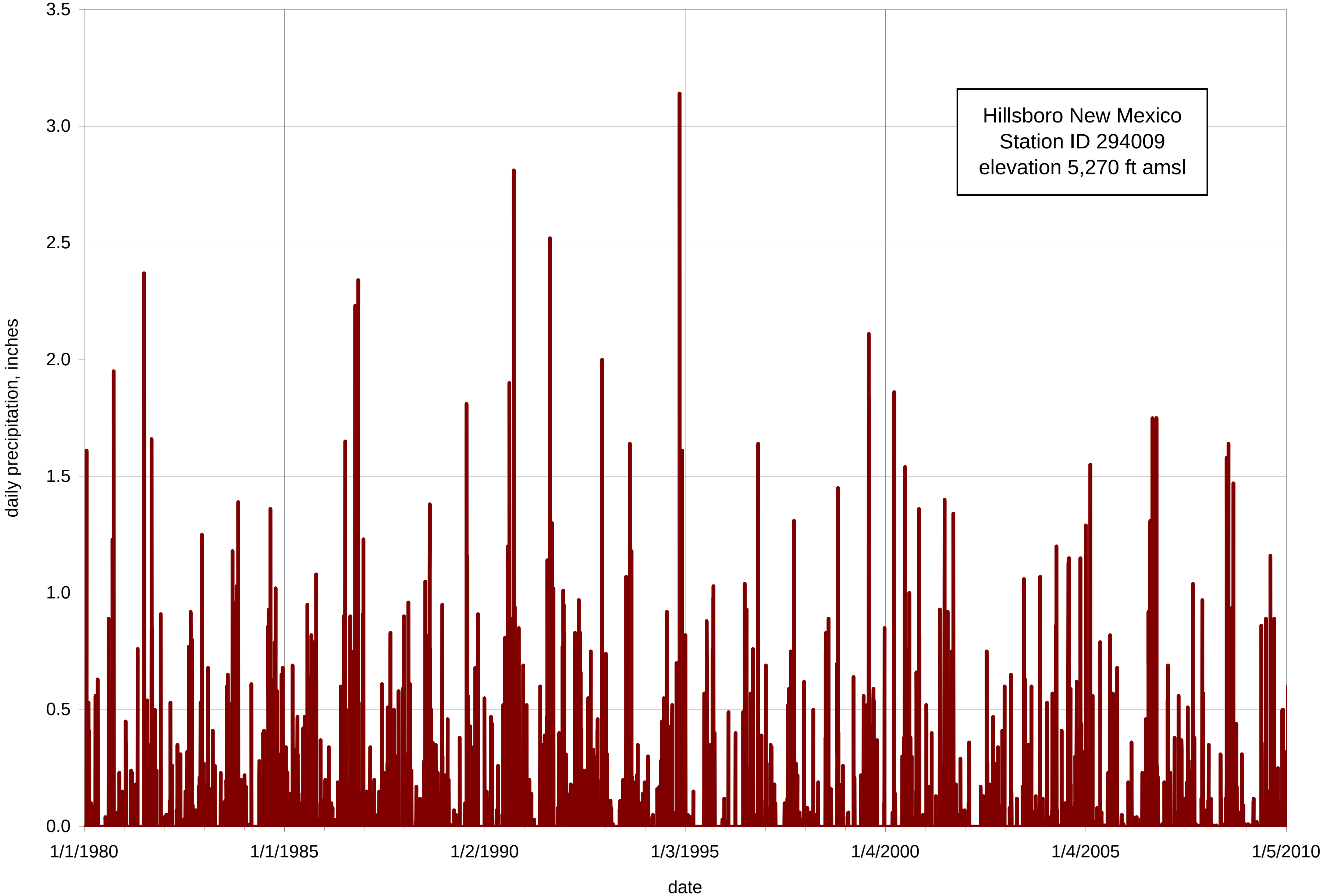

Figure 4. Graph of daily precipitation at Hillsboro, New Mexico for the time period 1980 to 2010.

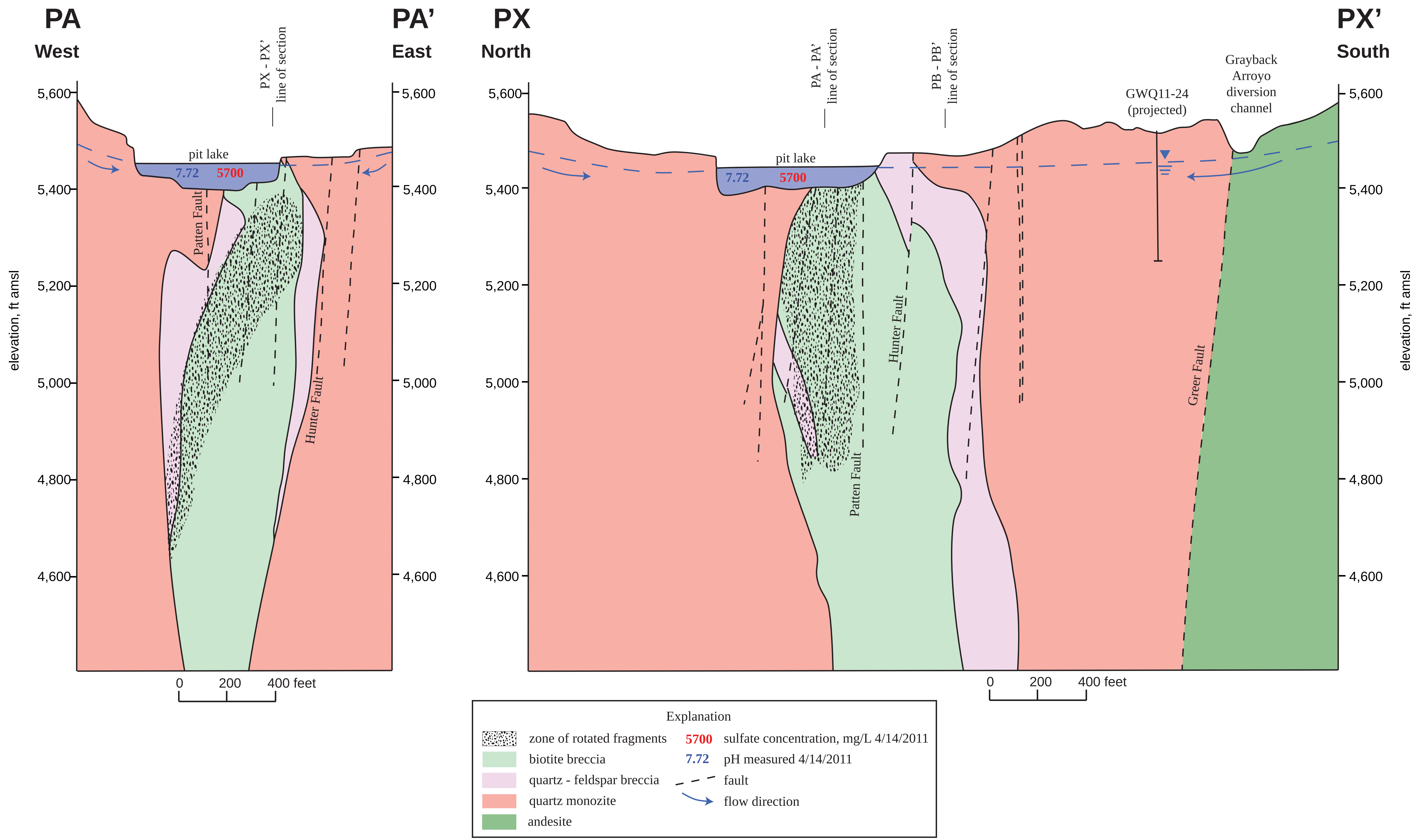

Figure 5. Hydrogeologic cross-sections PA-PA' and PX-PX', Copper Flat Mine pit lake area, Sierra County, New Mexico.

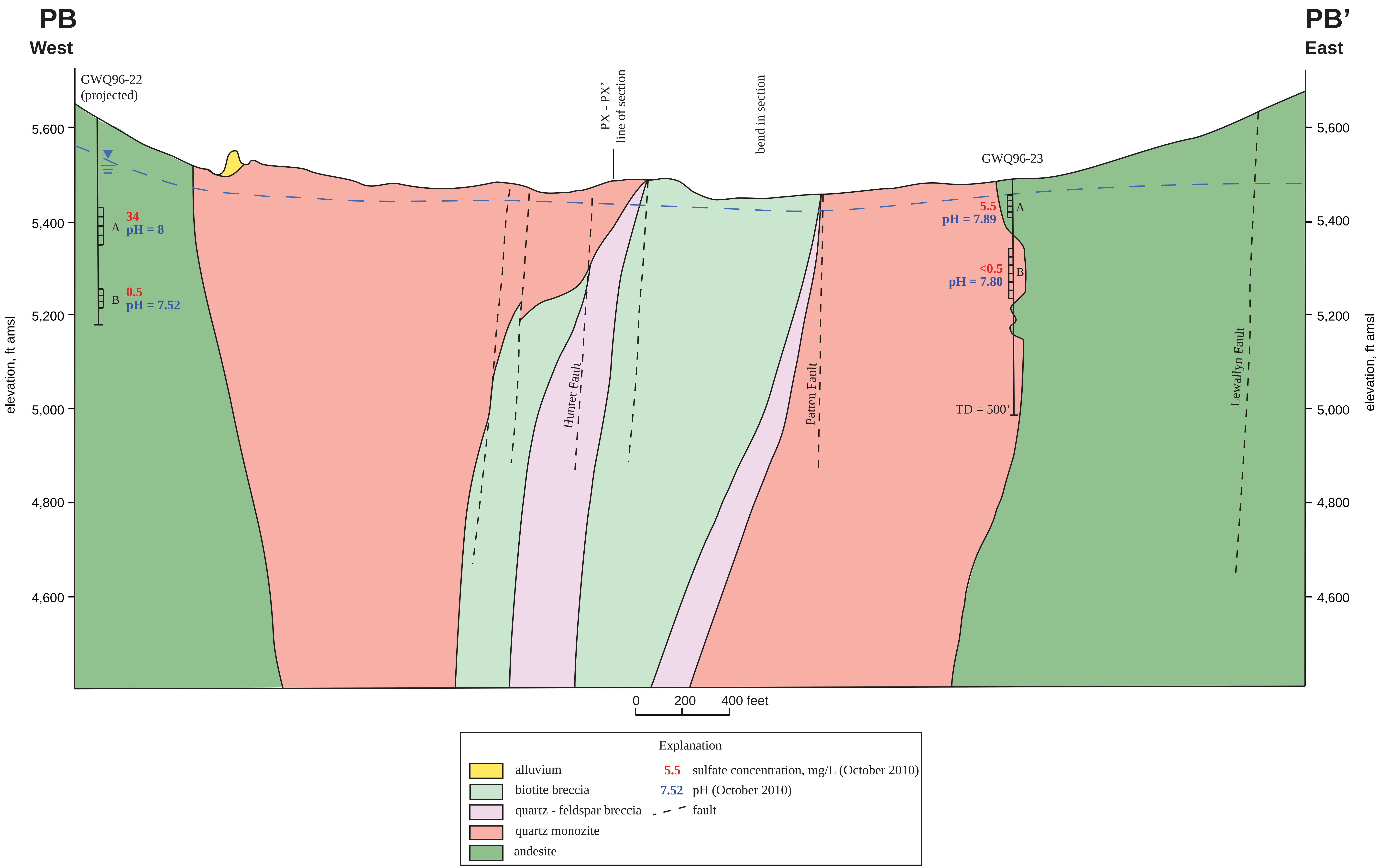

Figure 6. Hydrogeologic cross-section PB-PB', Copper Flat Mine pit lake area, Sierra County, New Mexico.

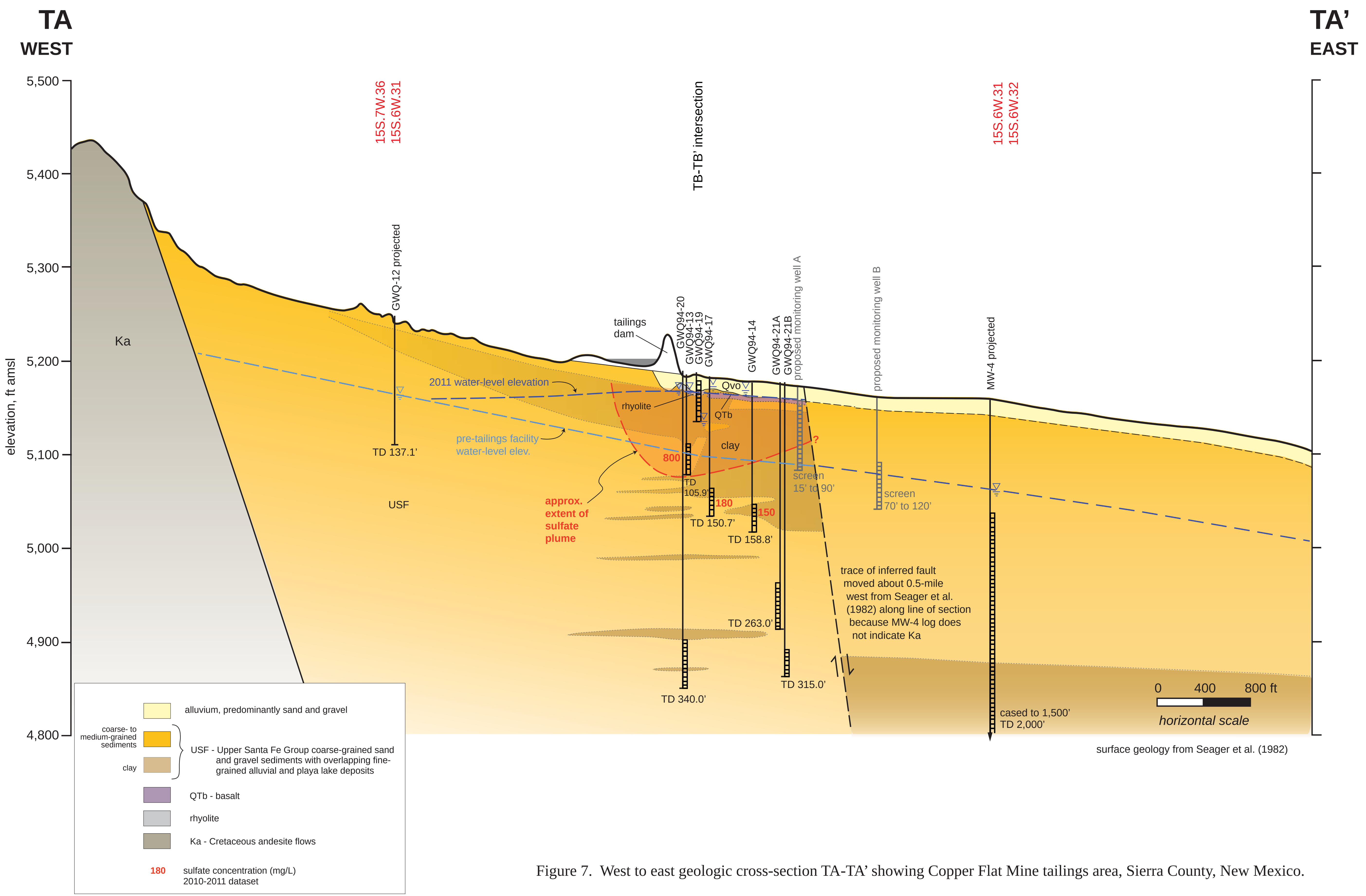

Figure 7. West to east geologic cross-section TA-TA' showing Copper Flat Mine tailings area, Sierra County, New Mexico.

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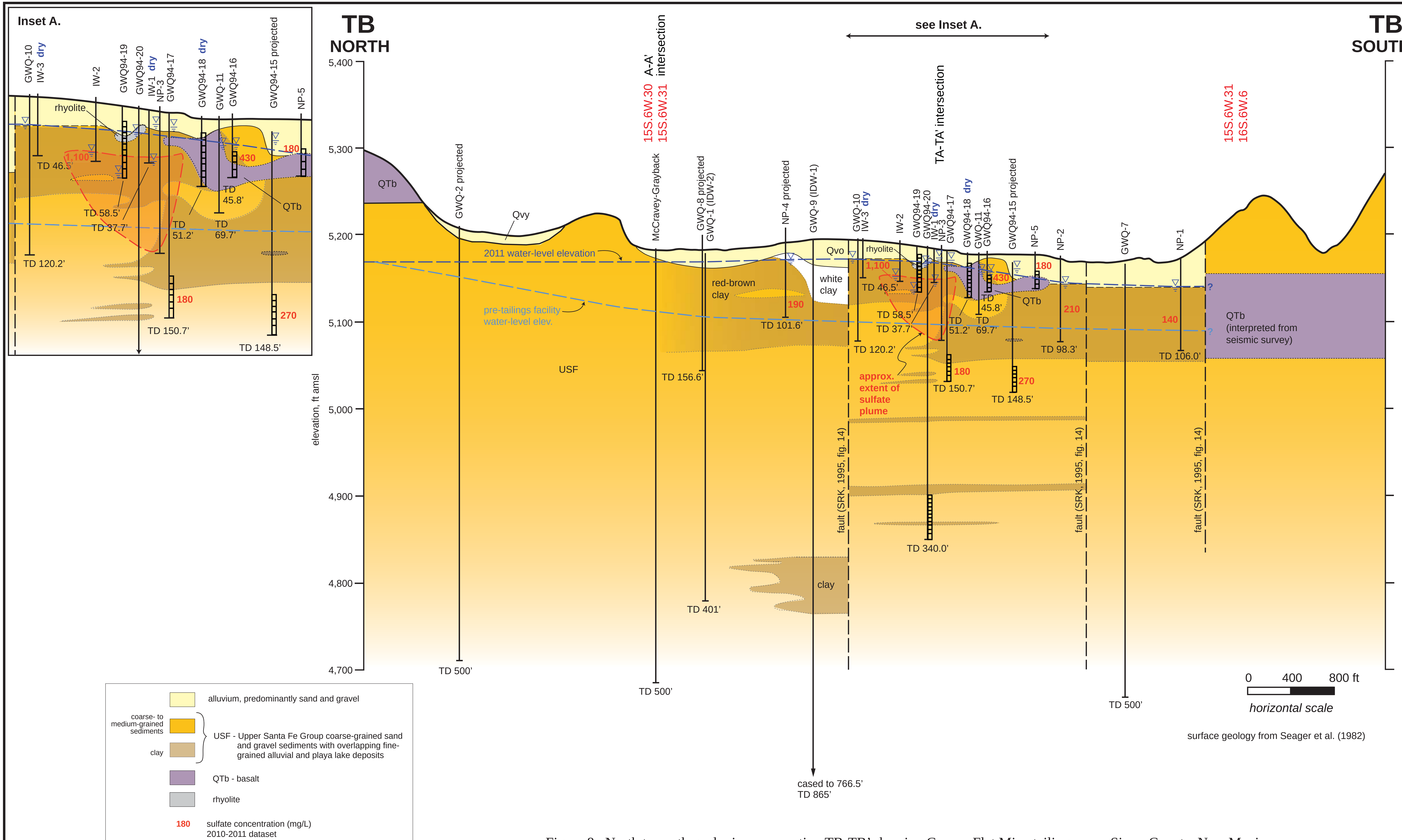

Figure 8. North to south geologic cross-section TB-TB' showing Copper Flat Mine tailings area, Sierra County, New Mexico.

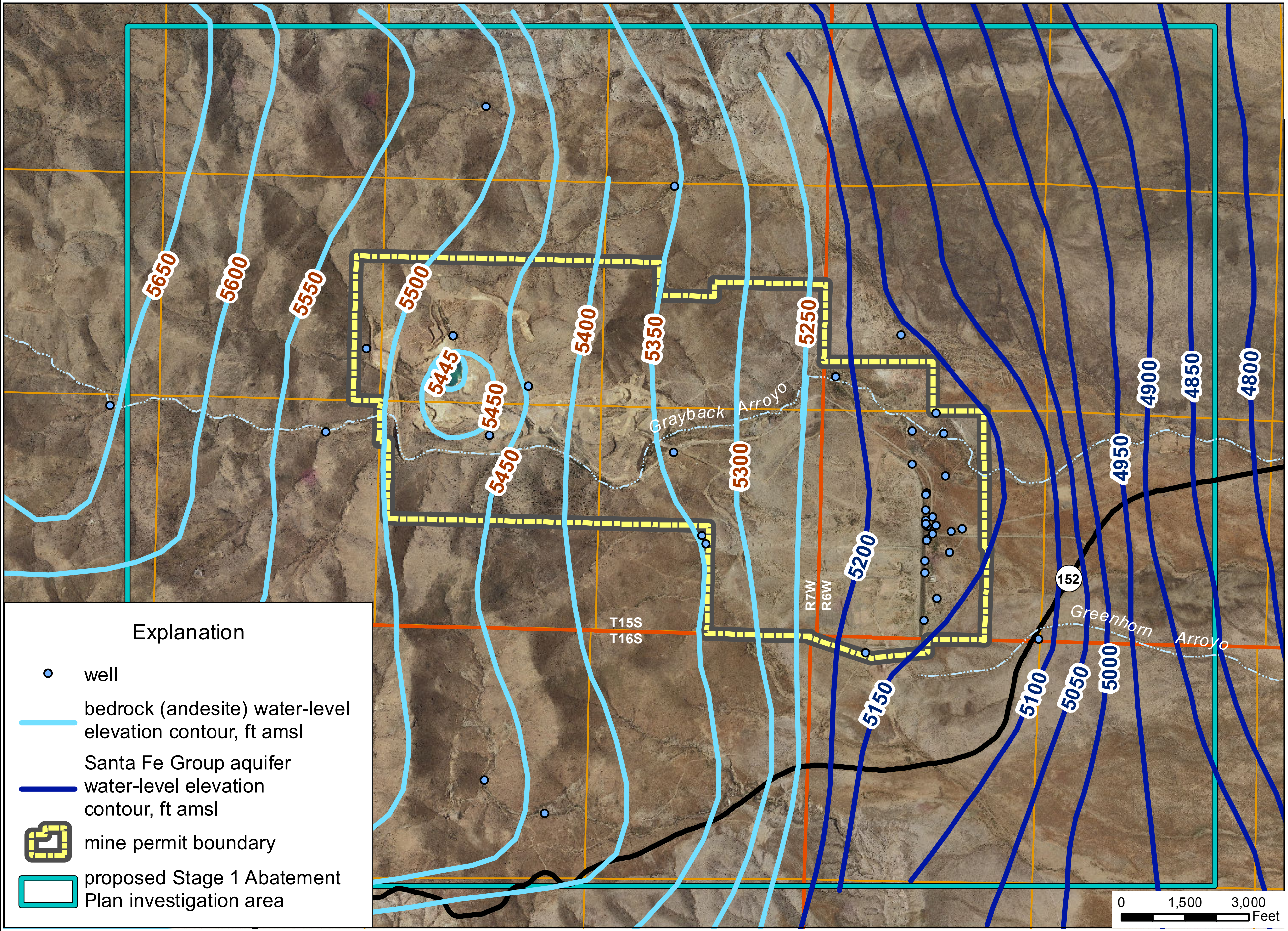

Figure 9. Water-level elevation contour map for Stage 1 Abatement Plan area of investigation, Copper Flat Mine, Sierra County, New Mexico.

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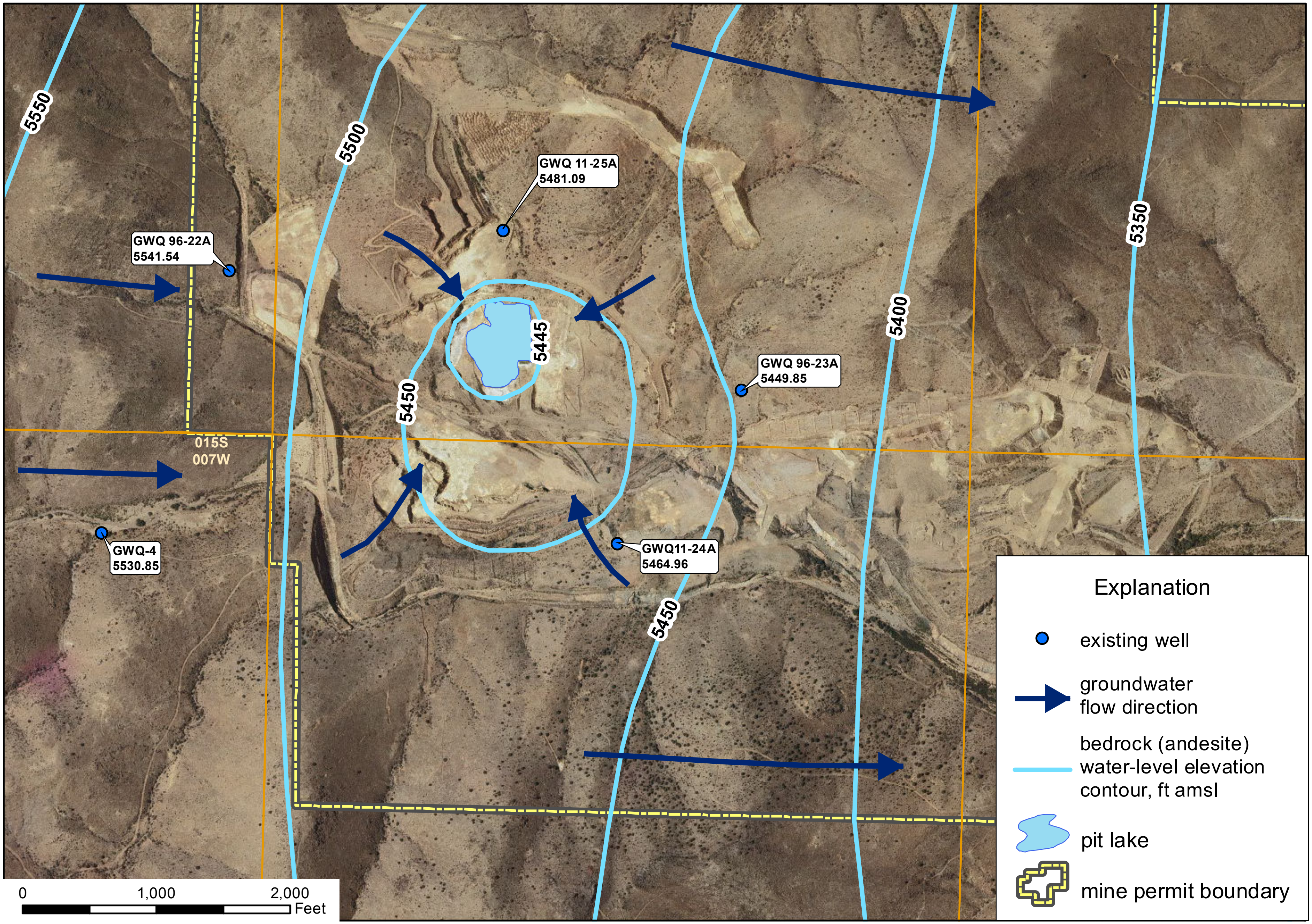

Figure 10. Aerial photograph showing water-level elevation contours and direction of groundwater flow for the Copper Flat Mine pit lake area, Sierra County, New Mexico.

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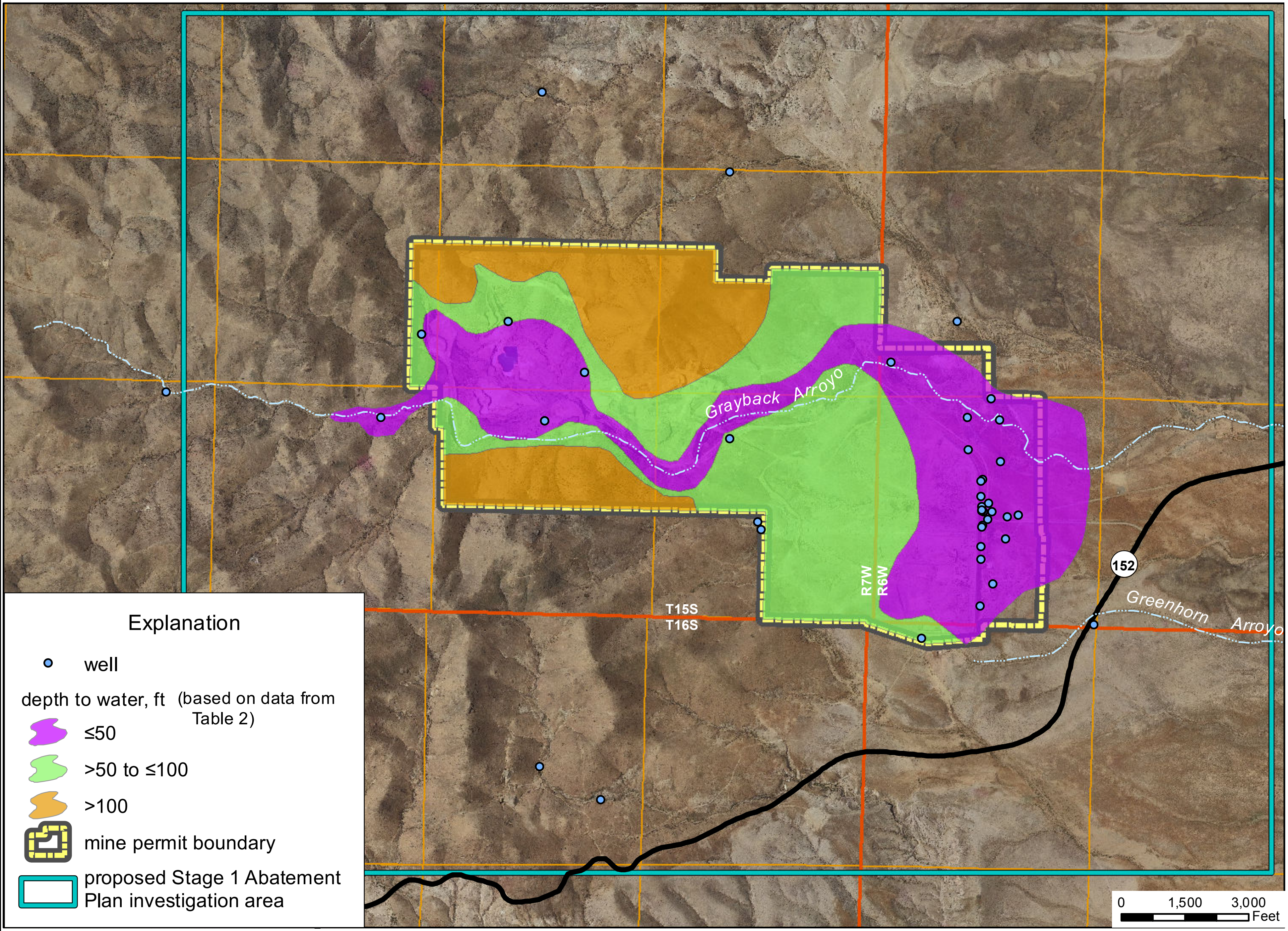

Figure 11. Map showing depth to water in the Copper Flat Mine permit boundary facilities, Sierra County, New Mexico.

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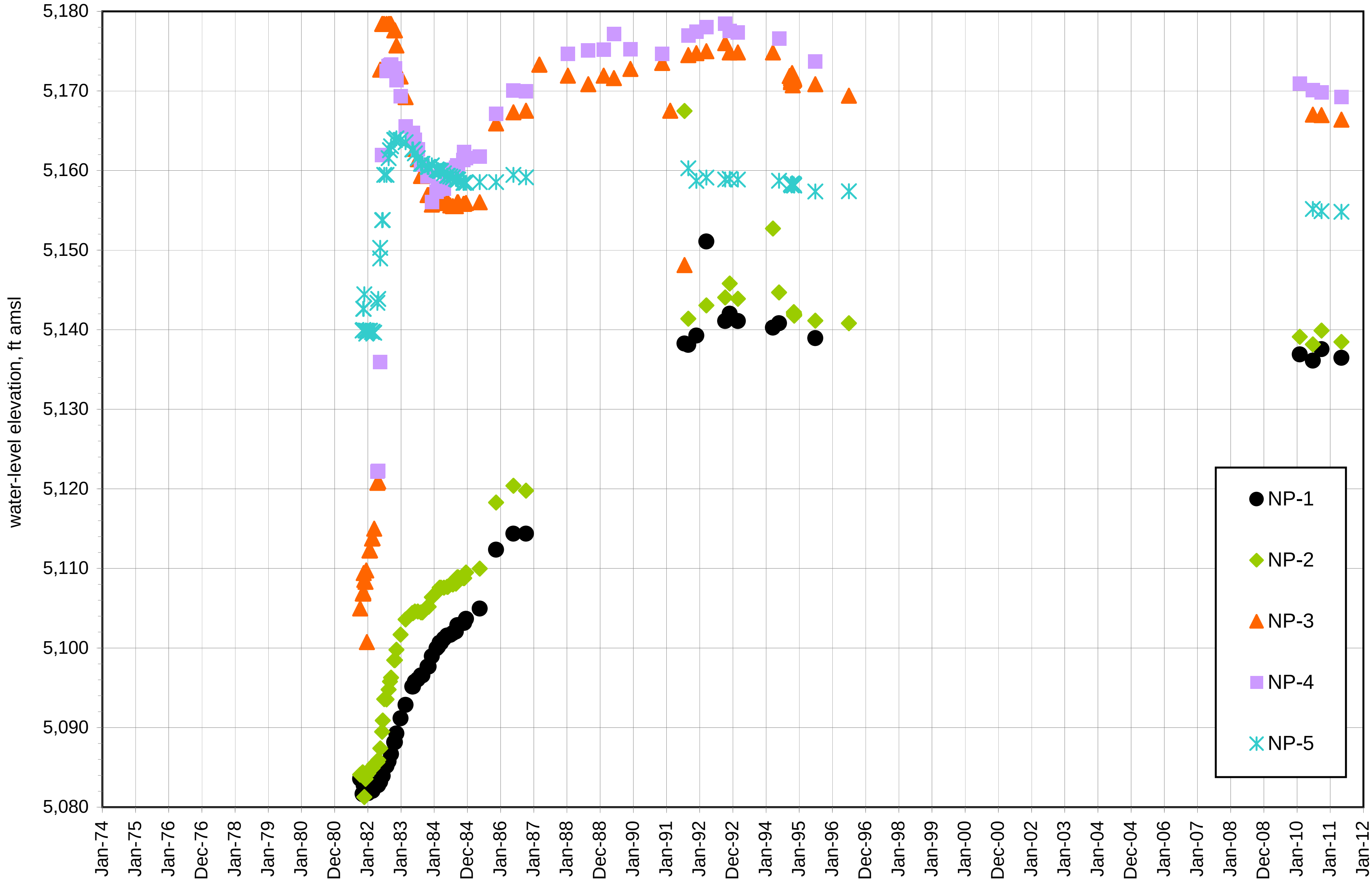

Figure 12. Graph showing historical water levels for monitoring wells NP-1 through NP-5, Copper Flat Mine tailings facility, Sierra County, New Mexico.

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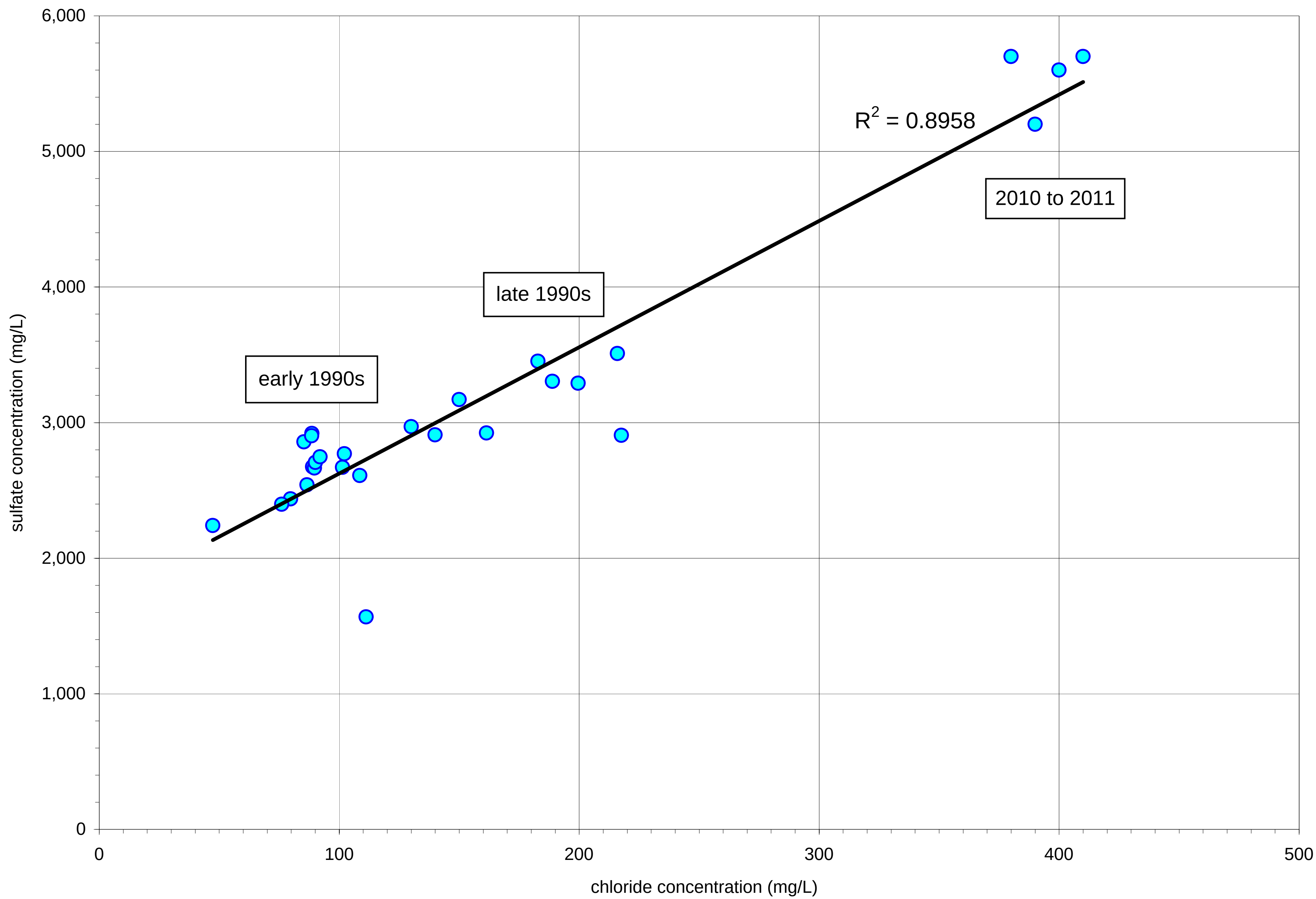

Figure 13. Graph of sulfate versus chloride concentrations for Copper Flat Mine pit lake, Sierra County, New Mexico.

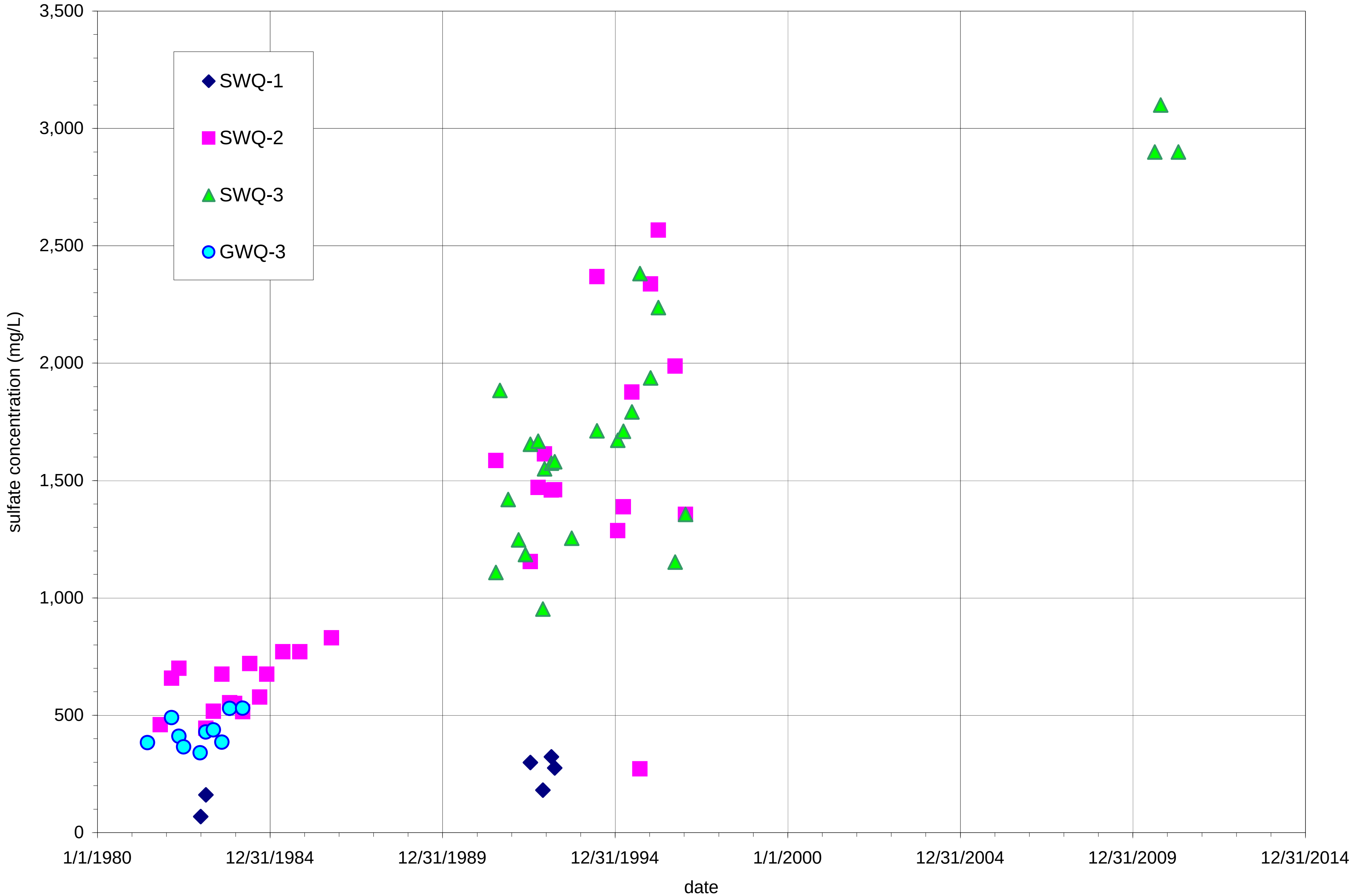

Figure 14. Time-series sulfate concentration plot for SWQ-1, SWQ-2, SWQ-3, and GWQ-3, Copper Flat Mine, Sierra County, New Mexico.

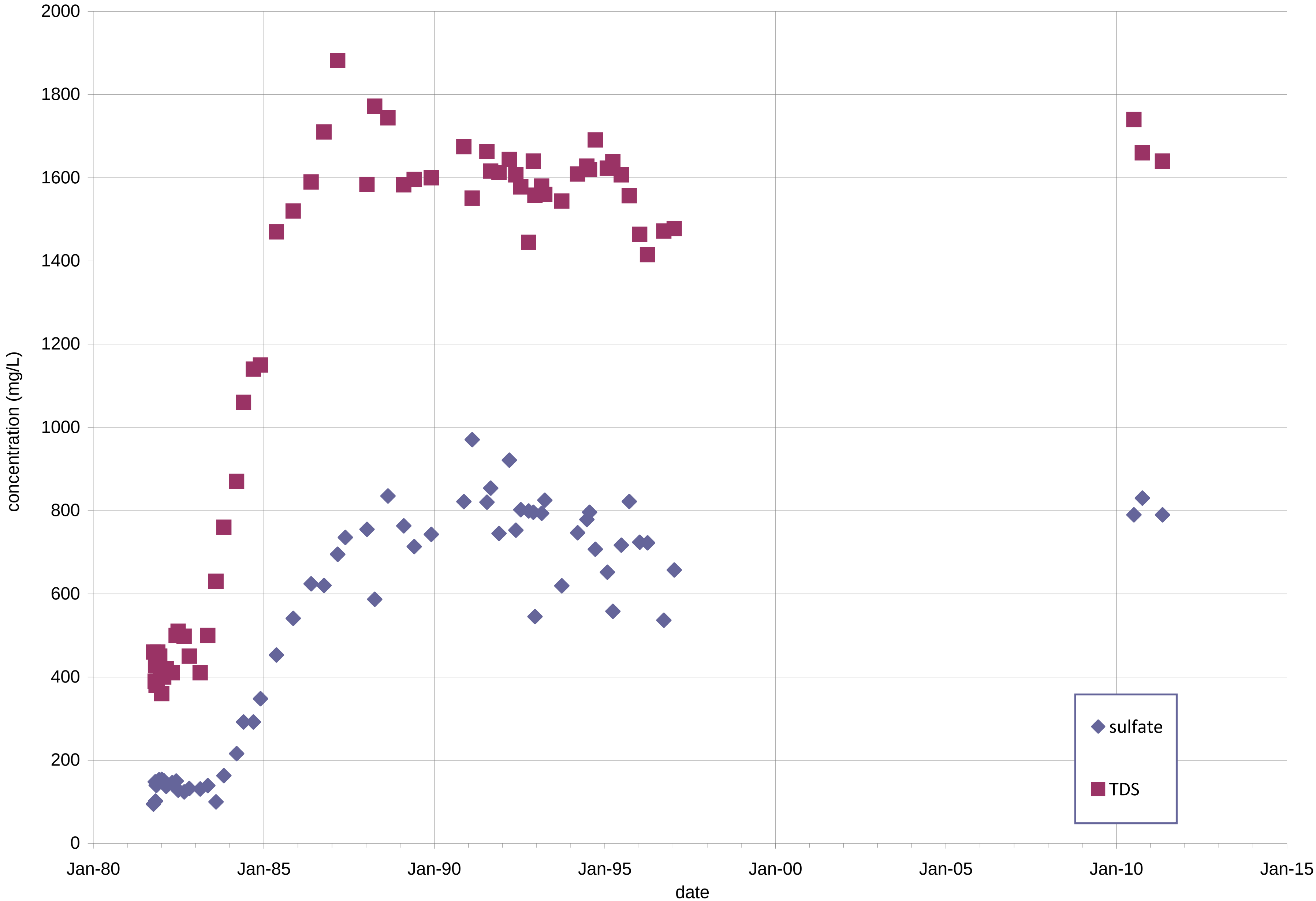

Figure 15. Time-series sulfate and total dissolved solids (TDS) concentrations plot for monitoring well NP-3, Copper Flat Mine tailings impoundment area, Sierra County, New Mexico.

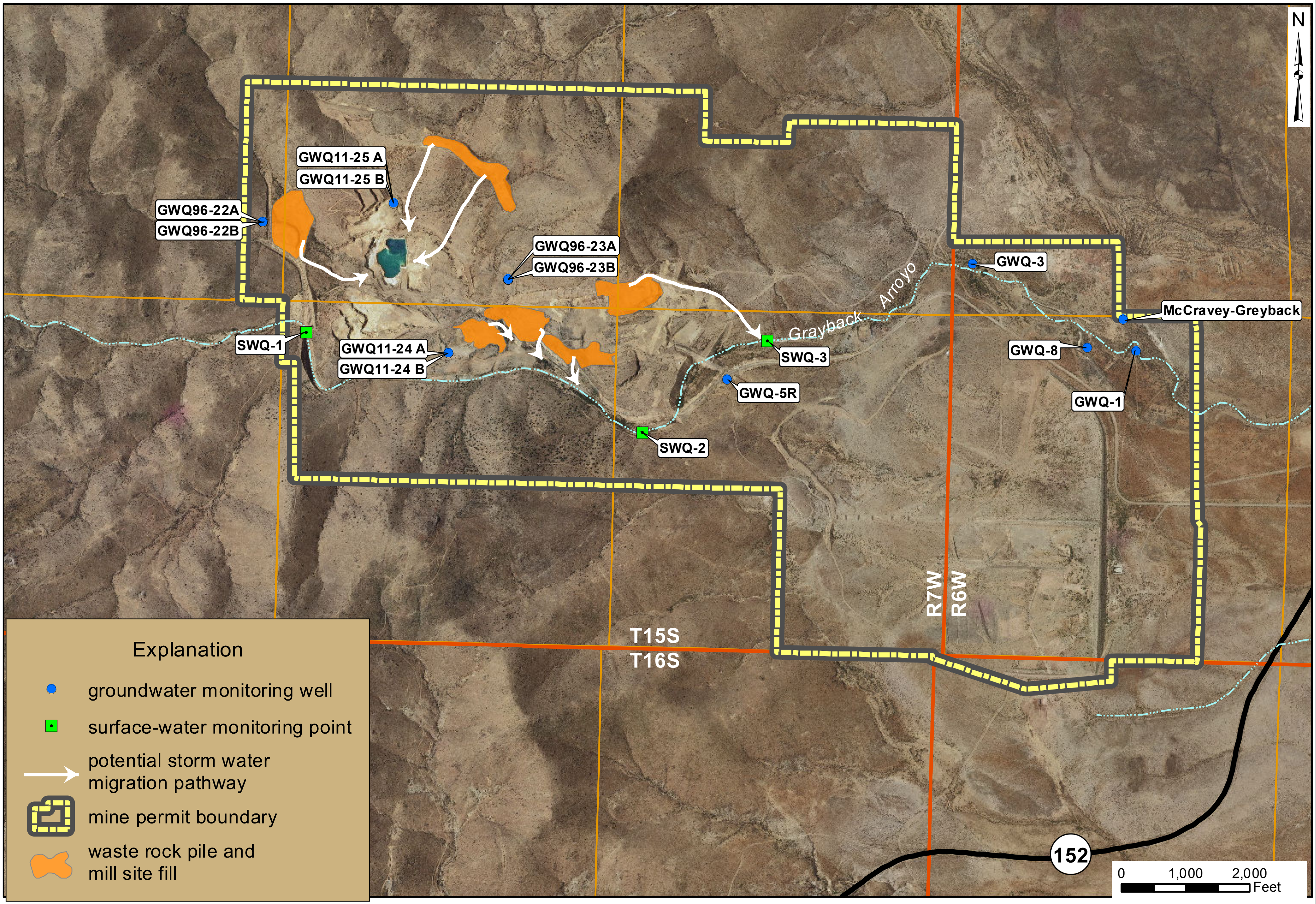

Figure 16. Map showing locations of waste-rock piles, surface-water and groundwater monitoring points, and potential waste-rock leachate migration pathways, Copper Flat Mine, Sierra County, New Mexico.

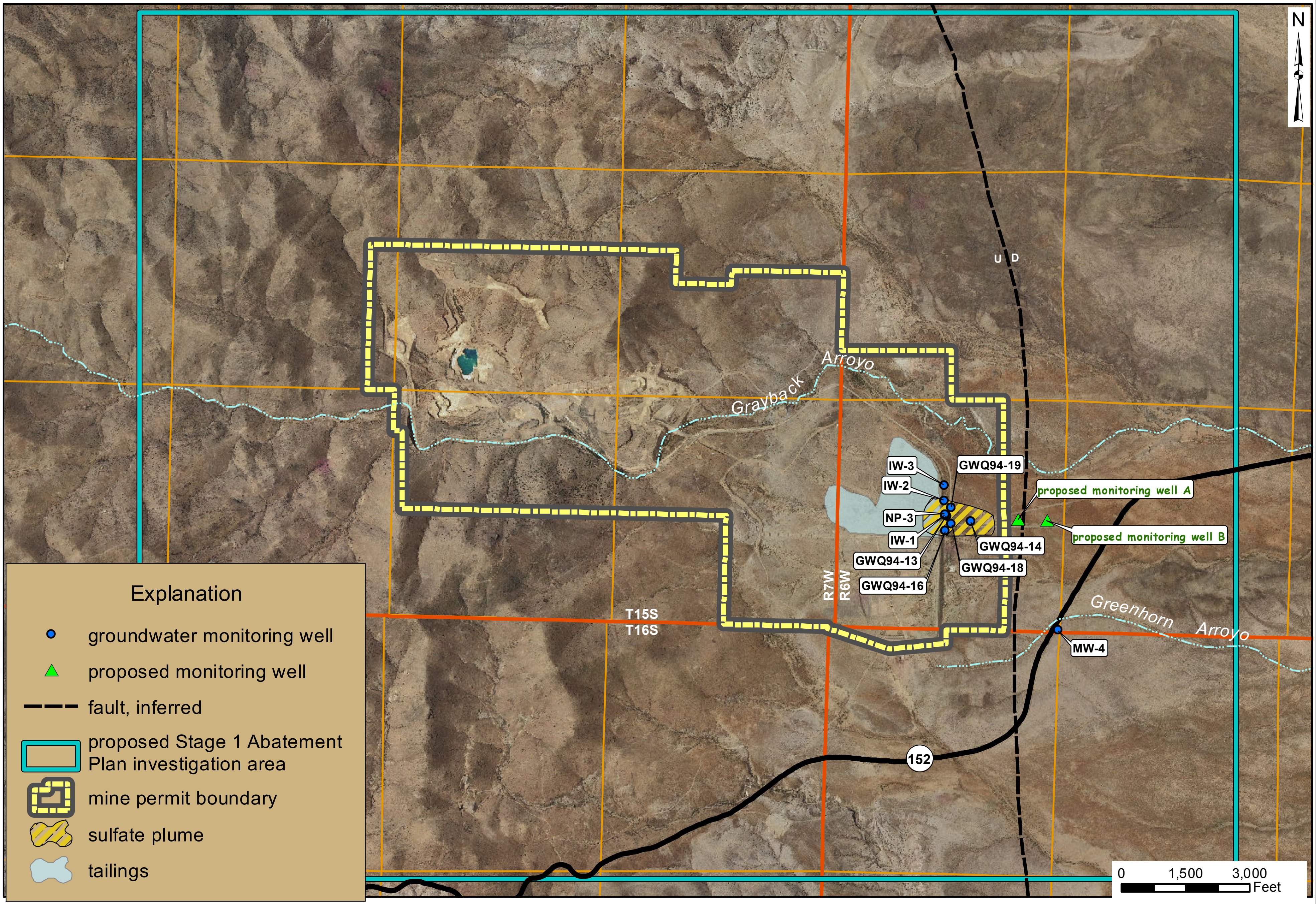

Figure 17. Map showing lateral extent of sulfate plume associated with Copper Flat Mine tailings impoundment facility and proposed monitoring wells, Sierra County, New Mexico.

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APPENDICES

Appendix A.

Revised tables from Stage 1 Abatement Plan dated March 31, 2011 (INTERA, 2011)
Table A-1. Pit lake water-quality data
Table A-2. Surface-water-quality data
Table A-3. Groundwater-quality data

Appendix A.
Table A-1. Pit lake water-quality data

sample location	analysis date	silver (mg/L)	aluminum (mg/L)	arsenic (mg/L)	barium (mg/L)	beryllium (mg/L)	boron (mg/L)	cadmium (mg/L)	cobalt (mg/L)	chromium (mg/L)	copper (mg/L)	iron (mg/L)	mercury (mg/L)	manganese (mg/L)	molybdenum (mg/L)	nickel (mg/L)	lead (mg/L)	antimony (mg/L)	selenium (mg/L)	thallium (mg/L)
PL-WQ	4/3/1989	<0.1	<0.1		<0.1	<0.1	<0.1	<0.1	<0.05	<0.1	<0.1	<0.1		1.10	<0.1	<0.1	<0.1			
PL-WQ	11/14/1990																			
PL-WQ	2/11/1991	0.03		<0.001	<0.01			0.035		0.06		0.18	0.0004	1.84			0.006		<0.001	
PL-WQ	7/19/1991	<0.02		<0.002	<0.01			<0.005		<0.02		0.27	<0.0002	2.03			<0.005		<0.001	
PL-WQ	8/29/1991										0.64									
PL-WQ	11/26/1991										0.08									
PL-WQ	3/15/1992																			
PL-WQ	5/25/1992																			
PL-WQ	7/16/1992																			
PL-WQ	10/8/1992																			
PL-WQ	11/27/1992																			
PL-WQ	12/15/1992										3.21									
PL-WQ	2/25/1993																			
PL-WQ	9/23/1993										0.00			0.02						
PL-WQ	3/17/1994	<0.02									0.09			4.43						
PL-WQ	9/22/1994																			
PL-WQ	12/12/1994	<0.025	<0.05	<0.005	<0.1	<0.002	<0.1	0.017	<0.05	<0.025	0.03	<0.05	<0.001	3.60	<0.05	<0.05	<0.005	<0.005	<0.005	<0.005
PL-WQ	12/19/1994	<0.025	<0.05	<0.005	<0.1	<0.002	<0.1	0.017	<0.05	<0.025	0.03	<0.05	<0.001	3.40	<0.05	<0.05	<0.005	<0.005	<0.005	<0.005
PL-WQ	1/29/1995																			
PL-WQ	3/29/1995																			
PL-WQ	6/27/1995																			
PL-WQ	9/21/1995	<0.025	0.13	<0.005	<0.05	<0.002	<0.1	0.014	<0.05	<0.025	<0.025	<0.05	<0.001	3.00	<0.05	<0.05	<0.005	<0.005	<0.25	<0.005
PL-WQ	1/10/1996																			
PL-WQ	4/3/1996																			
PL-WQ	9/25/1996																			
PL-WQ	1/15/1997																			
PL-NW	6/20/2008																			
PL-E	6/20/2008																			
PL-WQ (0 ft)	1/30/2010	<0.025	5.50	0.006	<0.010	0.017	<0.20	0.056	0.37	<0.030	11.00	1.30	<0.00020	41.00	<0.040	0.067	<0.025	<0.0025	0.031	<0.0050
PL-WQ-03 (3 ft)	9/10/2010	<0.005	1.70	<0.001	0.012	0.016	0.13	0.063	0.34	<0.006	2.00	0.03	<0.0002	45.00	0.015	0.067	<0.005	<0.001	0.021	<0.005
PL-WQ-01 (28 ft)	9/10/2010	<0.0050	1.60	<0.001	0.012	0.016	0.13	0.064	0.35	<0.006	1.90	0.03	<0.0002	44.00	0.015	0.068	0.0054	<0.001	0.022	<0.001
PL-WQ-04 (comp)	9/10/2010	<0.005	1.60	<0.001	0.011	0.015	0.13	0.061	0.33	<0.006	1.90	0.02	<0.0002	43.00	0.015	0.065	0.0056	<0.001	0.023	<0.005
PL-WQ-05 (7ft)	1/20/2011	<0.025	0.48	<0.001	0.010	0.016	<0.2	0.062	0.39	<0.03	0.61	<0.1	<0.0002	42.00	<0.04	0.069	<0.025	<0.001	0.025	<0.001
PL-WQ-06 (17 ft)	1/20/2011	<0.025	0.51	<0.001	0.011	0.016	<0.2	0.062	0.38	<0.03	0.59	<0.1	<0.0002	44.00	<0.04	0.066	<0.025	<0.001	0.025	<0.005
PL-WQ-07 (26 ft)	1/20/2011	<0.025	0.54	<0.005	0.012	0.016	<0.2	0.061	0.39	<0.03	0.64	<0.1	<0.0002	39.00	<0.04	0.068	0.026	<0.005	0.031	<0.005
PL-WQ-08 (comp)	1/20/2011	<0.025	0.48	<0.005	0.010	0.015	<0.2	0.060	0.37	<0.03	0.59	<0.1	<0.0002	44.00	<0.04	0.066	<0.025	<0.005	0.030	<0.005
PL-WQ-09 (1 ft)	4/14/2011	<0.0050	0.13	<0.0010	0.012	0.010	0.16	0.059	0.34	< 0.006	0.11	< 0.020	< 0.00020	44.00	0.025	0.061	< 0.0050	< 0.0010	0.019	< 0.0010
PL-WQ-10 (3 ft)	4/14/2011	<0.0050	0.13	<0.0010	0.012	0.010	0.16	0.057	0.33	< 0.0060	0.11	< 0.020	< 0.00020	41.00	0.023	0.058	< 0.0050	< 0.0010	0.019	< 0.0010
PL-WQ-11 (16 ft)	4/14/2011	<0.0050	0.13	<0.0010	0.012	0.010	0.16	0.058	0.34	< 0.0060	0.12	< 0.020	< 0.00020	41.00	0.024	0.059	0.0055	< 0.0010	0.020	< 0.0010
PL-WQ-12 (comp)	4/14/2011	<0.0050	0.13	<0.0010	0.012	0.010	0.16	0.059	0.34	< 0.0060	0.12	< 0.020	< 0.00020	42.00	0.024	0.060	< 0.0050	< 0.0010	0.023	< 0.0010
pit wall seepage	2/25/1993		3720.00								684.00	375.00		142.00						
pit wall seepage	8/19/2010	<0.25	540.00	0.0016	<0.1	0.140	<0.2	0.140	1.50	<0.3	80.00	1600.00	<0.001	24.00	<0.4	<0.5	<0.25	<0.01	0.086	<0.0010

Notes: no data are available for blank cells (not analyzed)
outlier values in gray shading

Appendix A.
Table A-1. Pit lake water-quality data

sample location	analysis date	uranium (mg/L)	vadium (mg/L)	zinc (mg/L)	pH (std. units)	specific conductance (µS/cm)	total dissolved solids (mg/L)	total alkalinity (mg/L as CaCO3)	nitrate as total N (mg/L)	total cyanide (mg/L)	calcium (mg/L)	magnesium (mg/L)	sodium (mg/L)	potassium (mg/L)	carbote (mg/L)	bicarbote (mg/L)	chloride (mg/L)	sulfate (mg/L)	fluoride (mg/L)	ammonia (mg/L)	total suspended solids	comments
PL-WQ	4/3/1989			0.4			3,546				640	129	165	11		96	47	2,240				
PL-WQ	11/14/1990						4,064										102	2,770				
PL-WQ	2/11/1991				7.20	3,980	2,711		0.1		600	157.3	224	16.4	0	55	80	2,437	4.8			
PL-WQ	7/19/1991				7.76	6,340	4,520		0.03		684	209.1	248	20.3	0	88	89	2,920	6.3			
PL-WQ	8/29/1991				7.61		4,384										89	2,674				
PL-WQ	11/26/1991				7.61		4,175										87	2,540				
PL-WQ	3/15/1992				4.88		3,819										85	2,857				
PL-WQ	5/25/1992				4.82		3,846										90	2,665				
PL-WQ	7/16/1992				4.36		4,229										76	2,397				
PL-WQ	10/8/1992				4.85		4,258										90	2,706				
PL-WQ	11/27/1992				6.26		3,900										731	2,500				
PL-WQ	12/15/1992				6.04		4,151										89	2,902				
PL-WQ	2/25/1993				6.29		3,951										92	2,748				
PL-WQ	9/23/1993			0.0	6.71		4,468										111	1,566				
PL-WQ	3/17/1994			1.0	7.46		3,179										101	2,670				
PL-WQ	9/22/1994				8.04		5,124										141					
PL-WQ	12/12/1994			0.1	7.71	4,720	4,600		<5		580	250	350	17	0	102	140	2,910	8.1			
PL-WQ	12/19/1994			0.1	7.52	4,690	4,380		<5		550	250	320	18	0	104	130	2,970	8.1			
PL-WQ	1/29/1995				7.69		4,675										218	2,906				
PL-WQ	3/29/1995				7.53		4,891										109	2,610				
PL-WQ	6/27/1995						5,640										161	2,924				
PL-WQ	9/21/1995			0.1	8.31	5,230	5,230		<5		620	300	430	21	0	122	150	3,170	10.0			
PL-WQ	1/10/1996				7.90		5,398										183	3,452				
PL-WQ	4/3/1996				7.95		5,378										189	3,304				
PL-WQ	9/25/1996				8.26		6,041										200	3,290				
PL-WQ	1/15/1997				8.05		5,772										216	3,509				
PL-NW	6/20/2008				4.43		7,540	<2.5			504	485	624	23	<2.5	<3	259	4,520				NMED
PL-E	6/20/2008				4.43		7,950	<2.5			508	495	638	24	<2.5	<3	230	4,460				NMED
PL-WQ (0 ft)	1/30/2010			6.4	6.00	5,700	7,770	<20	<2.0		540	570	690	25	<2.0	<20	390	5,200	18.0			
PL-WQ-03 (3 ft)	9/10/2010	0.12	<0.05	6.8	6.71	6,700	8,390	<20	<1.0		580	640	760	26	<2	<20	400	5,600	17.0		<10	
PL-WQ-01 (28 ft)	9/10/2010	0.12	<0.05	6.7	6.67	6,600	8,400	<20	<1.0		570	630	750	26	<2	<20	400	6,200	18.0		<10	
PL-WQ-04 (comp)	9/10/2010	0.11	<0.05	6.6	6.70	6,700	8,340	<20	<1.0		560	610	730	26	<2	<20	380	6,000	15.0		<10	
PL-WQ-05 (7ft)	1/20/2011	0.11	<0.25	5.8	7.17	7,900	8,170	31	<0.1		570	640	740	29	<2	31	380	5,700	15.0	<1	<10	
PL-WQ-06 (17 ft)	1/20/2011	0.11	<0.25	5.7	7.19	8,000	8,120	31	<0.1		570	640	740	29	<2	31	380	5,600	16.0	<1	12	
PL-WQ-07 (26 ft)	1/20/2011	0.11	<0.25	6.0	7.18	8,000	8,210	30	<0.1		590	660	760	29	<2	30	400	5,900	16.0	<1	<10	
PL-WQ-08 (comp)	1/20/2011	0.11	<0.25	5.3	7.23	8,000	7,780	30	<0.1		520	590	680	28	<2	30	380	5,500	16.0	<1	14	
PL-WQ-09 (1 ft)	4/14/2011	0.11	< 0.050	5.2	7.62	7,800	8,590	41	< 0.10		610	680	800	32	< 2.0	41	420	5,600	17.0	< 1.0	< 10	
PL-WQ-10 (3 ft)	4/14/2011	0.12	< 0.050	5.0	7.68	7,800	8,700	41	< 0.10		600	670	790	32	< 2.0	41	420	5,800	16.0	< 1.0	< 10	
PL-WQ-11 (16 ft)	4/14/2011	0.12	< 0.050	5.1	7.69	7,800	8,600	41	< 0.10		590	660	770	32	< 2.0	41	400	5,700	16.0	< 1.0		
PL-WQ-12 (comp)	4/14/2011	0.11	< 0.050	5.0	7.72	7,800	8,390	41	0.1		600	670	780	32	< 2.0	41	410	5,700	16.0	< 1.0	< 10	
pit wall seepage	2/25/1993			51.0	1.90				0.9		446	236	93	3.1		<1	35	10,000	11.1			
pit wall seepage	8/19/2010	1.40	<2.5	12.0	2.00	6,500	13,900	<20	<1.0	<0.005	470	190	<50	<50	<2	<20	21	11,000	51.0			

Notes: no data are available for blank cells (not analyzed)
outlier values in gray shading

Appendix A.
Table A-2. Surface-water-quality data

sample location	analysis date	silver (mg/L)	aluminum (mg/L)	arsenic (mg/L)	barium (mg/L)	beryllium (mg/L)	boron (mg/L)	cadmium (mg/L)	cobalt (mg/L)	chromium (mg/L)	copper (mg/L)	iron (mg/L)	mercury (mg/L)	manganese (mg/L)	molybdenum (mg/L)	nickel (mg/L)	lead (mg/L)	antimony (mg/L)	selenium (mg/L)	thallium (mg/L)	uranium (mg/L)	vanadium (mg/L)	zinc (mg/L)	pH (std. units)	specific conductance (µS/cm)	total dissolved solids (mg/L)	total alkalinity (mg/L as CaCO3)	nitrate as total N (mg/L)	total cyanide (mg/L)	calcium (mg/L)	magnesium (mg/L)	sodium (mg/L)	potassium (mg/L)	carbonate (mg/L)	bicarbonate (mg/L)	chloride (mg/L)	sulfate (mg/L)	fluoride (mg/L)	original order
SWQ-1	12/28/1982							<0.005			<0.05	<0.01	<0.001	<0.05	<0.05				<0.005					8.00		250		0.90	<0.01							10.0	68	0.3	1
SWQ-1	2/21/1983							<0.005			<0.05	<0.01	<0.001	<0.05	<0.05				<0.005					8.00		470		4.40	<0.01							20.0	161	0.3	2
SWQ-1	7/16/1992																							7.37		965										47.2	298		3
SWQ-1	11/27/1992																							8.31		545										16.7	181		4
SWQ-1	2/25/1993																							8.34		844										28.9	323		5
SWQ-1	4/1/1993	<0.01	<0.1	<0.005	<0.5		0.02	<0.002	<0.05	<0.02	<0.01	<0.05	<0.001	<0.02	<0.02	<0.01	<0.02		<0.005				<0.01	8.30	1,150	782	360	0.00	<0.01	109	36	107	1.8	0	430	27.0	276	0.5	6
SWQ-2	10/27/1981	<0.02	<0.01	<0.01	<0.2		<0.1	<0.005	<0.02	<0.01	<0.05	<0.05	0.004	<0.05	<0.05		<0.02		<0.005					8.70		1,060		6.60	<0.01	175						46.0	460	0.8	7
SWQ-2	2/25/1982							<0.005			<0.05	0.13	<0.001	<0.05	<0.05				<0.005					8.10		1,360		4.20	<0.01							80.0	658	0.7	8
SWQ-2	5/12/1982							<0.005			<0.05	<0.01	<0.001	<0.05	<0.05				<0.005					7.90		1,380		3.00	<0.01							108.0	700	0.7	9
SWQ-2	2/21/1983							<0.005			<0.05	<0.01	<0.001	<0.05	<0.05				<0.005					8.40		990		0.80	<0.01							68.0	445	0.7	10
SWQ-2	5/13/1983							<0.005			<0.05	<0.01	<0.001	<0.05	<0.05				<0.005					8.40		1,120		0.30	<0.01							84.0	517	0.8	11
SWQ-2	8/9/1983							<0.005			<0.05	<0.01	<0.001	0.06	<0.05				<0.005					8.00		1,620		<0.20	<0.01							142.0	675	0.7	12
SWQ-2	11/1/1983							<0.005			<0.05	<0.01	<0.001	<0.05	<0.05				<0.005					8.20		1,170		0.30	<0.01							72.0	553	0.8	13
SWQ-2	12/23/1983							<0.005			<0.05	<0.01	<0.001	<0.05	<0.05				<0.005					8.00		1,180		11.20	<0.01							82.0	550	0.5	14
SWQ-2	3/16/1984							<0.005			<0.05	<0.01	<0.001	<0.05	<0.05				<0.005					8.30		1,140		5.30	<0.01							68.0	515	0.8	15
SWQ-2	5/30/1984							<0.005			<0.05	<0.01	<0.001	<0.05	<0.05				<0.005					8.10		1,420		0.40	<0.01							94.0	720	0.8	16
SWQ-2	9/12/1984							<0.005			<0.05	<0.01	<0.001	<0.05	<0.05				<0.005					8.10		1,190		0.40	<0.01							80.0	577	0.9	17
SWQ-2	11/27/1984							<0.005			<0.05	<0.01	<0.001	<0.05	<0.05				<0.005					8.20		1,360		<0.20	<0.01							88.0	675	0.8	18
SWQ-2	5/17/1985																							8.00		1,640										102.0	770		19
SWQ-2	11/13/1985																							7.90		1,590										94.0	770		20
SWQ-2	10/13/1986																							7.90		1,840										136.0	830		21
SWQ-2	7/19/1991	<0.02		<0.002	<0.01			<0.005		<0.02		<0.05	<0.0002	<0.02			<0.005		<0.001					7.57	4,310	3,019		12.74		561	129	264	10.9	0	362	216.7	1,586	0.6	22
SWQ-2	7/16/1992																							7.57		2,305										93.4	1,155		23
SWQ-2	10/8/1992																							7.53		2,685										130.7	1,471		24
SWQ-2	12/15/1992																							7.61		3,108										192.5	1,613		25
SWQ-2	2/25/1993																							7.58		2,713										135.9	1,459		26
SWQ-2	3/31/1993	<0.01	<0.1	<0.005	<0.5		0.08	<0.002	<0.05	<0.02	0.01	<0.05	<0.001	0.03	<0.02	<0.01	<0.02		0.008				0.01	7.70	3,150	2,720	300	14.50	<0.01	436	83	279	2.1	0	376	123.0	1,460	0.6	27
SWQ-2	6/23/1994																							8.87		3,958										197.3	2,369		28
SWQ-2	1/29/1995																							7.64		2,653										89.2	1,286		29
SWQ-2	3/29/1995																							7.83		2,866										83.9	1,388		30
SWQ-2	6/27/1995																							7.74		3,235										127.3	1,877		31
SWQ-2	9/21/1995																							7.58		500										31.1	271		32
SWQ-2	1/10/1996																							7.37		3,991										167.2	2,337		33
SWQ-2	4/3/1996																							8.06		4,464										222.6	2,566		34
SWQ-2	9/25/1996																							7.66		3,997										143.7	1,987		35
SWQ-2	1/15/1997																							7.43		3,436										148.0	1,356		36
SWQ-2	8/25/2010	<0.005	1.5	<0.001	0.010	<0.002	<0.04	<0.002	<0.006	<0.006	0.09	0.67	<0.0002		<0.008	<0.01	<0.005	<0.001	<0.001	<0.001	<0.001	<0.05	<0.01	7.42	89	78	21	<1.00	<0.01	6.5		3.3	1.9	<2	21	0.7	11	0.6	37
SWQ-2	4/28/2011	<0.005	<0.02	<0.001	0.019	<0.002	<0.04	<0.002	<0.006	<0.006	0.01	<0.02	<0.0002		0.008	<0.01	<0.005	<0.001	0.002	<0.001	<0.001	<0.05	<0.01							79		41	2.9						38
SWQ-2	5/4/2011																												<0.01										39
SWQ-2A	10/27/1981	<0.02	<0.01	<0.01	<0.2		<0.01	<0.005	<0.02	<0.01	<0.05	<0.05	<0.001	<0.05	<0.05		<0.02		<0.005					8.20		830		0.30	<0.01	107						46.0	360	0.6	40
SWQ-2A	2/25/1982							<0.005			<0.05	0.10	<0.001	<0.05	<0.05				<0.005					8.40		800		0.20	<0.01							50.0	320	0.7	41
SWQ-3	7/19/1991	<0.02		<0.002	0.030			<0.005		<0.02		0.14	<0.0002	<0.02			<0.005		<0.001					7.52	3,120	2,191		1.39		334	85	190	7.4	0		143.9	1,108	0.7	42
SWQ-3	8/29/1991										0.02													7.82		3,596								0		231.3	1,884		43
SWQ-3	11/26/1991										0.00													7.71		2,857										141.1	1,419		44
SWQ-3	3/15/1992																							8.08		2,393										99.2	1,248		45
SWQ-3	5/25/1992																							8.07		2,380										102.9	1,185		46
SWQ-3	7/16/1992																							7.66		3,364										128.7	1,654		47

Appendix A.
Table A-2. Surface-water-quality data

sample location	analysis date	silver (mg/L)	aluminum (mg/L)	arsenic (mg/L)	barium (mg/L)	beryllium (mg/L)	boron (mg/L)	cadmium (mg/L)	cobalt (mg/L)	chromium (mg/L)	copper (mg/L)	iron (mg/L)	mercury (mg/L)	manganese (mg/L)	molybdenum (mg/L)	nickel (mg/L)	lead (mg/L)	antimony (mg/L)	selenium (mg/L)	thallium (mg/L)	uranium (mg/L)	vanadium (mg/L)	zinc (mg/L)	pH (std. units)	specific conductance (µS/cm)	total dissolved solids (mg/L)	total alkalinity (mg/L as CaCO3)	nitrate as total N (mg/L)	total cyanide (mg/L)	calcium (mg/L)	magnesium (mg/L)	sodium (mg/L)	potassium (mg/L)	carbonate (mg/L)	bicarbonate (mg/L)	chloride (mg/L)	sulfate (mg/L)	fluoride (mg/L)	original order
SWQ-3	10/8/1992																							7.49		3,611										174.4	1,667		48
SWQ-3	11/27/1992																							8.35		1,866										160.5	952		49
SWQ-3	12/15/1992																							8.15		3,436										221.6	1,549		50
SWQ-3	2/25/1993																							8.01		2,974										150.7	1,574		51
SWQ-3	3/31/1993	<0.01	<0.1	<0.005	<0.5		0.06	<0.002	<0.05	<0.02	0.01	<0.05	<0.001	<0.02	<0.02	<0.01	<0.02		<0.005				<0.01	8.10	3,330	2,950	310	6.90	<0.01	445	109	271	2.2	0	409	135.0	1,580	1.0	52
SWQ-3	9/28/1993																							8.13		4,432										226.9	1,254		53
SWQ-3	6/23/1994																							8.37		2,934										157.4	1,712		54
SWQ-3	1/29/1995																							7.93		3,185										237.6	1,672		55
SWQ-3	3/29/1995																							8.23		3,216										100.6	1,710		56
SWQ-3	6/27/1995																							7.51		3,393										200.3	1,792		57
SWQ-3	9/21/1995																							8.73		3,741										178.5	2,382		58
SWQ-3	1/10/1996																							7.78		3,666										112.0	1,937		59
SWQ-3	4/3/1996																									3,635										157.0	2,236		60
SWQ-3	9/25/1996																							7.64		2,568										96.7	1,153		61
SWQ-3	1/15/1997																							8.13		3,436										148.0	1,356		62
SWQ-3	8/19/2010	<0.005	<0.02	<0.001	0.062	<0.002	0.14	<0.002	<0.006	<0.006	0.06	0.06	<0.0002	0.14	0.05	<0.01	<0.005	<0.001	0.013	<0.001	0.029	<0.05	0.02	8.00	4,100	4,500	250	<1.00	<0.005	530	190	490	5.7	<2	250	130.0	2,900	1.5	64
SWQ-3	10/21/2010	<0.005	<0.02	<0.005	0.053	<0.002	0.09	<0.002	<0.006	<0.006	0.02	0.05	<0.0002	0.03	0.03	<0.01	<0.005	<0.001	0.016	<0.001	0.027	<0.05	0.48	7.99	4,600	5,080	530	<1.00		630	260	520	4.3	<2	530	93.0	3,100	1.3	65
SWQ-3	1/27/2011																							7.81	3,868														63
SWQ-3	4/27/2011	<0.005	0.079	<0.001	0.032	<0.002	0.08	<0.002	<0.006	<0.006	0.01	0.03	<0.033	0.03	0.02	<0.01	<0.005	<0.001	0.007	<0.001	0.012	<0.05	0.03	7.92	4,400	4,590	430	0.15	<0.01	610	210	410	3.8	<2	430	74.0	2,900	1.4	66

Appendix A.
Table A-3. Groundwater-quality data

sample location	analysis date	silver (mg/L)	aluminum (mg/L)	arsenic (mg/L)	barium (mg/L)	beryllium (mg/L)	boron (mg/L)	cadmium (mg/L)	cobalt (mg/L)	chromium (mg/L)	copper (mg/L)	iron (mg/L)	mercury (mg/L)	manganese (mg/L)	molybdenum (mg/L)	nickel (mg/L)	lead (mg/L)	antimony (mg/L)	selenium (mg/L)	thallium (mg/L)	uranium (mg/L)	vanadium (mg/L)	zinc (mg/L)	pH (std. units)	specific conductance (µS/cm)	total dissolved solids (mg/L)	total alkalinity (mg/L as CaCO3)	nitrate as total N (mg/L)	total cyanide (mg/L)	calcium (mg/L)	magnesium (mg/L)	sodium (mg/L)	potassium (mg/L)	carbonate (mg/L)	bicarbonate (mg/L)	chloride (mg/L)	sulfate (mg/L)	fluoride (mg/L)	total suspended solids
GWQ-1	2/2/1981											1.70												7.90		520				74	20	60		0	276	20	156		
GWQ-1	3/27/1981			<0.01							<0.05						<0.02						0.16					5.50	<0.01									0.6	
GWQ-1	6/11/1981	<0.025	<0.05	<0.005	<0.1	<0.002	<0.1	<0.0005	<0.05	<0.025	<0.025	<0.05	<0.001	<0.03	<0.05	<0.05	<0.005	<0.005	<0.005	<0.005			<0.05																
GWQ-1	6/15/1981	<0.02	<0.25	<0.002	<0.2		0.076	<0.005	<0.05	<0.05	<0.02	<0.05	<0.001	<0.02	<0.1	<0.05	<0.02		0.0022	<0.005			0.12	7.40	700	500		3.75	<0.01	81	12	49	3.06	0	251	22	117	0.5	
GWQ-1	2/25/1982							<0.005			<0.05	0.14	<0.001	0.063	<0.05				<0.005					7.90		410		0.20	<0.01							22	84	0.3	
GWQ-1	3/30/1989	<0.1	<0.1		<0.1	<0.1	<0.1	<0.1	<0.05	<0.1	<0.1	<0.1		<0.05	<0.1	<0.1	<0.1						<0.1			512				84	16	61	3		280	20	133		
GWQ-1	7/19/1991	<0.02		0.003	0.01			<0.005		<0.02	<0.02	<0.05	<0.0002	<0.02			<0.005		<0.002					7.34	799	543		5.19		88	18	40	2.7	0	262	21	136	0.6	
GWQ-1	3/31/1993	<0.01	<0.01	<0.005	<0.5		0.03	<0.002	<0.05	<0.02	<0.01	<0.05	<0.001	<0.02	<0.02	<0.01	<0.02		<0.005				<0.01	7.70	822	536	230	4.90	<0.01	82	21	67	2.1	0	297	22	160	0.5	
GWQ-1	5/25/1994	<0.025	0.025	<0.005	<0.1			<0.0005		<0.025	<0.025	<0.05	<0.001	<0.03		<0.05	<0.005	<0.005	<0.005				<0.05	7.90	760	614		4.30		80	18	55	2.7	0	270	22	150	0.5	
GWQ-1	7/21/1994	<0.025	<0.05	<0.005	<0.1	<0.002	<0.1	<0.0005	<0.05	<0.025	<0.025	<0.05	<0.001	<0.03	<0.05	<0.05	<0.005	0.0052	<0.005	<0.005			<0.05	7.97	861	558		4.20		95	19	66	2.7	0	278	25	162	0.5	
GWQ-3	3/27/1981			<0.01							<0.05						<0.02						0.16					5.50	<0.01									0.6	
GWQ-3	6/15/1981	<0.02	<0.01	0.004	<0.2		0.108	<0.005	<0.05	<0.01	<0.05	<0.1	<0.001	<0.05	<0.05	<0.05	0.073		0.0037				0.32	7.00	1,100	868		0.10	<0.01	146	33	95	1.7	0	327	32	383	0.7	
GWQ-3	2/25/1982							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					7.90		1,040		0.40	<0.01							56	490	0.6	
GWQ-3	5/12/1982							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					7.90		930		0.20	<0.01							56	410	0.7	
GWQ-3	6/30/1982							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					7.60		860		0.40	<0.01							48	365	0.7	
GWQ-3	12/23/1982							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					8.50		990		0.20	<0.01							64	340	0.7	
GWQ-3	2/21/1983							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					7.70		970		0.20	<0.01							68	428	0.7	
GWQ-3	5/13/1983							<0.005			<0.05	<0.1	<0.001	<0.05	0.11				<0.005					8.00		980		0.30	<0.01							82	437	0.6	
GWQ-3	8/9/1983							<0.005			<0.05	0.11	<0.001	<0.05	<0.05				<0.005					7.80		1,060		<0.2	<0.01							78	385	0.7	
GWQ-3	11/1/1983							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					8.00		1,240		0.30	<0.01							90	529	0.7	
GWQ-3	3/16/1984							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					8.20		1,190		3.40	<0.01							74	530	0.3	
GWQ-6	6/15/1981	<0.02	<0.01	<0.01	<0.2		0.135	<0.005	<0.05	<0.01	<0.02	<0.1	<0.001	0.11	<0.05	<0.05	<0.02		0.0046				<0.025	7.30	600	400		3.30	<0.01	68	11	57	2.4	0	309	33	41	1.1	
GWQ-6	2/25/1982							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					8.30		810		0.50	<0.01							102	220	1.1	
GWQ-6	4/1/1993	<0.01	<0.1	<0.005	0.6		0.09	<0.002	<0.05	<0.02	0.03	5.05	<0.001	0.36	<0.02	<0.01	<0.02		<0.005				0.03	7.70	597	304	310	1.10	<0.01	49	14	53	3.1	0	322	22	10	0.8	
GWQ-7	2/2/1981											3.80												7.90		530				74	27	51		0	278	20	156		
GWQ-7	3/27/1981			<0.01							<0.05						<0.02						0.28					1.40	<0.01									0.6	
GWQ-7	4/6/1981			0.003							<0.05						<0.01						0.24					0.90	0.36									0.6	
GWQ-7	6/15/1981	<0.02	<0.01	<0.002	<0.2		<0.1	<0.005	<0.05	<0.01	<0.02	<0.05	<0.001	<0.02	<0.05	<0.05	<0.05		<0.0005				0.38	7.20	700	496		1.10	<0.01	88	24	61	2.33	0	285	25	165	0.5	
GWQ-7	8/7/1981											0.02												7.40		475				80	19	139			268	100	150		
GWQ-7	8/10/1981			<0.01							<0.05	1.70					<0.02						0.63	7.70		490		1.20	<0.01	68	21	48			229	24	162	0.6	
GWQ-7	10/23/1981	<0.02	<0.01	<0.01	<0.02		<0.1	<0.005	<0.02	<0.01	<0.05	0.14	<0.001	<0.05	<0.05	<0.05	<0.02		<0.005				0.41			500		1.30	<0.01	71						26	162	0.5	
GWQ-7	11/6/1981	<0.02	<0.01	<0.01	<0.2		<0.1	<0.005	<0.02	<0.01	<0.05	<0.1	<0.001	<0.05	<0.05	<0.05	<0.02		<0.005				0.19	8.10		480		1.20	<0.01	71						24	158	0.8	
GWQ-7	2/25/1982							<0.005			<0.05	0.17	<0.001	<0.05	<0.05				<0.005					8.00		510		0.80	<0.01							26	162	0.5	
GWQ-7	12/28/1982							<0.005			<0.05	0.26	<0.001	0.16	<0.05				<0.005					8.10		250		<0.2	<0.01							20	40	0.3	
GWQ-7	2/21/1983							<0.005			<0.05	<0.1	<0.001	0.27	<0.05				<0.005					8.30		250		2.80	<0.01							22	47	0.4	
GWQ-7	3/16/1983													<0.05																									
GWQ-7	5/13/1983							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					8.10		470		1.20	<0.01							20	158	0.6	
GWQ-7	8/9/1983							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					8.00		490		1.00	<0.01							22	130	0.6	
GWQ-7	11/1/1983							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					8.10		500		1.80	<0.01							22	137	0.6	
GWQ-7	3/16/1984							<0.005			<0.05	<0.1	<0.001	<0.05	0.08				<0.005					8.30		450		1.00	<0.01							20	140	0.8	
GWQ-7	5/30/1984							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					7.70		470		0.90	0.02							20	154	0.6	
GWQ-7	9/12/1984							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					8.00		500		1.40	<0.01							20	128	0.6	
GWQ-7	11/27/1984							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					7.70		490		1.40	<0.01							18	144	0.6	
GWQ-7	5/17/1985																							7.90		500										20	144		
GWQ-7	11/13/1985																							7.80		450										18	137		
GWQ-7	5/23/1986																							7.90		490										22	142		
GWQ-7	10/8/1986																							7.40		460										22	116		
GWQ-7	3/30/1989	<0.1	<0.1		<0.1	<0.1	<0.1	<0.1	<0.05	<0.1	<0.1	<0.1		<0.05	<0.1	<0.1	<0.1						0.10			492				80	22	47	2		278	16	131		
GWQ-7	3/30/1993	<0.01	<0.1	<0.005	<0.5		0.04	<0.002	<0.05	<0.02	<0.01	<0.05	<0.001	<0.02	<0.02	<0.01	<0.02		<0.005				0.10	7.80	752	482	250	1.38	<0.01	68	31	52	1.6	0	298	21	138	0.6	
GWQ-7	5/25/1994	<0.025	0.25	<0.005	<0.1			0.00058		<0.025	0.11	0.72	<0.001	1.1		<0.05	<0.005	<0.005	<0.005				<0.05	7.26	*2,630*	*2,420*		<1		490	51	80	14	0	480	20	*1,300*	2.1	
GWQ-7	7/21/1994	<0.025	<0.05	<0.005	<0.1	<0.002	<0.1	<0.0005	<0.05	<0.025	<0.025	1.20	<0.001	0.21	<0.05	<0.05	<0.005	<0.005	<0.005	<0.005			<0.05	7.72	660	224		<1		*14*	8	47	13	0	349	22	*<5*	16.0	
GWQ-8	6/4/1976						<0.1					0.00		0.003										7.48	780	560		16.80		122	16	76	1.72		241	17	114	0.5	
GWQ-8	2/2/1981											1.70												7.90		520		60.00		74	20				276	20	156		
GWQ-8	8/19/1981	<0.02	<0.25	<0.004	<1		0.076	<0.01	<0.05	<0.05	<0.05	<0.1	<1	0.047	<0.1	<0.05	<0.05		0.004				0.69	7.42		608		2.80	<0.05	73	12	84	4.2	<1	283	24	134	0.6	

Appendix A.
Table A-3. Groundwater-quality data

sample location	analysis date	silver (mg/L)	aluminum (mg/L)	arsenic (mg/L)	barium (mg/L)	beryllium (mg/L)	boron (mg/L)	cadmium (mg/L)	cobalt (mg/L)	chromium (mg/L)	copper (mg/L)	iron (mg/L)	mercury (mg/L)	manganese (mg/L)	molybdenum (mg/L)	nickel (mg/L)	lead (mg/L)	antimony (mg/L)	selenium (mg/L)	thallium (mg/L)	uranium (mg/L)	vanadium (mg/L)	zinc (mg/L)	pH (std. units)	specific conductance (µS/cm)	total dissolved solids (mg/L)	total alkalinity (mg/L as CaCO3)	nitrate as total N (mg/L)	total cyanide (mg/L)	calcium (mg/L)	magnesium (mg/L)	sodium (mg/L)	potassium (mg/L)	carbonate (mg/L)	bicarbonate (mg/L)	chloride (mg/L)	sulfate (mg/L)	fluoride (mg/L)	total suspended solids
GWQ-8	2/25/1982							<0.005			<0.05	<0.1	<0.001	0.17	<0.05				<0.005					7.60		380		0.30	<0.01							38	220	1.0	
GWQ-8	3/31/1993	<0.01	<0.05	<0.005	0.042		0.03	<0.0005	<0.01	<0.01	0.01	<0.05	<0.0002	<0.01	<0.02	<0.01	<0.002		<0.005				0.09	7.60	1,110	764	240	6.30	<0.01	132	18	94	1.8	0	298	38	283	0.5	
GWQ-8	5/25/1994	<0.025	<0.025	<0.005	<0.1		<0.1	<0.0005	<0.05	<0.025	<0.025	0.24	<0.001	<0.03	<0.05	<0.05	<0.005	<0.005	<0.005				<0.05	7.97	1,060	792		5.30		120	20	76	2.4	0	272	41	290	0.5	
GWQ-9	6/4/1976						<0.1					0.00		0.001										8.60	480	350		4.00		69	15	30	1.56		188	20	34	0.4	
GWQ-9	2/2/1981											1.80												7.90		510				73	24	49		0	273	20	156		
GWQ-9	3/27/1981			<0.01							<0.05						<0.02						0.16					1.40	<0.01									0.6	
GWQ-9	4/6/1981			0.002							<0.05						<0.01						0.13					1.20	0.15									0.6	
GWQ-9	8/7/1981											0.06												7.40		450				80	19	129			268	100	140		
GWQ-9	8/10/1981			<0.01							<0.05	0.49					0.033						0.96	8.00		470		1.40	<0.01	76	20	47			268	22	148	0.5	
GWQ-9	10/8/1981	<0.02	<0.25	<0.004	<1		0.044	<0.01	<0.05	<0.05	<0.05	<0.1	<1	<0.02	<0.1	<0.05	<0.05		<0.002				0.35	7.22		476		0.96	<0.05	52	17	71	3.3	<1	302	22	133	0.6	
GWQ-9	2/25/1982							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					8.30		430		0.90	<0.01							26	160	0.5	
GWQ-9	12/28/1982							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					7.80		480		1.00	<0.01							20	150	0.5	
GWQ-9	2/21/1983							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					8.00		480		1.40	<0.01							20	161	0.5	
GWQ-9	5/13/1983							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					8.20		460		1.10	<0.01							20	158	0.5	
GWQ-9	8/9/1983							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					8.00		480		0.90	<0.01							20	135	0.5	
GWQ-9	11/1/1983							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					8.20		460		0.80	<0.01							18	132	0.5	
GWQ-9	3/16/1984							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					8.10		460		1.70	<0.01							18	132	0.7	
GWQ-9	5/30/1984							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					7.60		450		0.90	<0.01							18	154	0.5	
GWQ-9	9/12/1984							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					8.00		470		1.30	<0.01							20	132	0.5	
GWQ-9	11/27/1984							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					7.90		470		1.50	<0.01							16	132	0.5	
GWQ-9	5/17/1985																							8.00		490										20	149		
GWQ-9	11/13/1985																							7.80		450										20	142		
GWQ-9	5/23/1986																							7.90		490										36	137		
GWQ-9	10/8/1986																							7.60		460										20	125		
GWQ-10	4/6/1981			0.002				<0.01			<0.05		<1				<0.01						0.12					4.60	0.02				8.25					0.5	
GWQ-10	8/10/1981	<0.02	10.2	<0.004	<1		0.016	<0.01	<0.05	<0.05	<0.05	2.31	<1	1.18	<0.1	<0.05	<0.05		<0.002				0.23	7.48		528		0.22	<0.05	74	11	59	8.32	<1	219	24	143	1.1	
GWQ-10	10/27/1981	<0.02	<0.01	<0.01	<0.2		<0.1	<0.005	<0.02	<0.01	<0.05	<0.01	<0.001	<0.05	<0.05	<0.05	<0.02		<0.005				0.25	8.20		520		1.10	<0.01	68						22	168	0.6	
GWQ-10	10/30/1981	<0.02	<0.25	<0.005	<1		0.77	<0.01	<0.05	<0.05	<0.05	<1	<0.001	<0.02	<0.1	<0.02	<0.05		<0.002				0.24	8.10		588		0.66	<0.05	72						23	122	1.0	
GWQ-10	11/6/1981	<0.02	<0.01	<0.01	<0.2		<0.1	<0.005	<0.02	<0.01	<0.05	<0.1	<0.001	<0.05	<0.05	<0.05	<0.02		<0.005				0.28	7.90		500		2.00	<0.01	84						22	162	0.7	
GWQ-10	11/13/1981	<0.001	0.37	<0.005	0.25		0.037	0.001		<0.005			<0.0005	0.5	<0.01	<0.05	<0.005		0.01	<0.005			0.90	7.75	700	509		1.80	0.001	70	17	39	2.34		276	23	141	0.6	
GWQ-10	11/17/1981	<0.02	<0.01	<0.01	<0.2		<0.1	<0.005	<0.02	<0.01	<0.05	<0.1	<0.001	<0.05	<0.05	<0.05	<0.02		<0.005				0.28	7.90		500		1.80	<0.01	70						26	156	0.6	
GWQ-10	11/23/1981	<0.02	<0.01	<0.01	<0.2		<0.1	<0.005	<0.02	<0.01	<0.05	<0.1	<0.001	<0.05	<0.05	<0.05	<0.02		<0.005				0.37	7.70		650		1.80	<0.01							26	161	0.6	
GWQ-10	12/7/1981	<0.02	<0.01	<0.01	<0.2		<0.1	<0.005	<0.02	<0.01	<0.05	<0.1	<0.001	<0.05	<0.05	<0.05	<0.02		<0.005				0.87	8.20		490		1.80	<0.01	67						24	168	0.5	
GWQ-10	12/15/1981	<0.02	<0.01	<0.01	<0.2		<0.1	<0.005	<0.02	<0.01	<0.05	<0.1	<0.001	<0.05	<0.05	<0.05	<0.02		<0.005				0.44	7.90		550		2.60	<0.01	89						24	181	0.7	
GWQ-10	12/22/1981	<0.02	<0.01	<0.01	<0.2		<0.1	<0.005	<0.02	<0.01	<0.05	<0.1	<0.001	<0.05	<0.05	<0.05	<0.02		<0.005				0.35	8.10		480		2.50	<0.01	85						24	168	0.5	
GWQ-10	1/5/1982	<0.02	<0.01	<0.01	<0.2		<0.1	<0.005	<0.02	<0.01	<0.05	0.13	<0.001	<0.05	<0.05	<0.05	<0.02		<0.005				0.31	7.50		430		2.90	<0.01	80						22	174	0.6	
GWQ-10	1/26/1982							<0.005			<0.05	<0.1	<0.001	<0.05	<0.1				<0.005					7.80		490		2.30	<0.01							24	162	0.6	
GWQ-10	2/22/1982							<0.005			<0.05	0.12	<0.001	<0.05	<0.05				<0.005					7.60		510		2.10	<0.01							24	161	0.6	
GWQ-10	4/26/1982							<0.005			<0.05	0.41	<0.001	<0.05	<0.05				<0.005					7.40		840		2.00	<0.01							20	168	0.6	
GWQ-10	5/17/1982							<0.005			<0.05	0.10	<0.001	<0.05	<0.05				<0.005					7.70		490		2.30	<0.01							28	175	0.6	
GWQ-10	6/8/1982							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					8.00		500		2.20	<0.01							22	162	0.5	
GWQ-10	6/30/1982							<0.005			<0.05	0.62	<0.001	<0.05	<0.05				<0.005					8.00		510		3.30	<0.01							20	160	0.6	
GWQ-10	9/2/1982							<0.001						<0.05	<0.01				<0.005					7.30	690	506		2.25		83	17	58	2.73		278	22	143	0.5	
GWQ-10	12/23/1982							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					8.50		500		1.70	<0.01							26	138	0.6	
GWQ-10	2/21/1983							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					7.90		470		2.40	<0.01							24	161	0.6	
GWQ-10	5/13/1983							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					8.00		480		2.40	0.02							32	161	0.6	
GWQ-10	8/9/1983							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					7.90		510		2.40	<0.01							36	142	0.6	
GWQ-10	11/1/1983							<0.005			<0.05	0.17	<0.001	<0.05	<0.05				<0.005					8.10		500		4.80	<0.01							34	125	0.6	
GWQ-10	3/16/1984							<0.005			<0.05	0.11	<0.001	<0.05	<0.05				<0.005					8.20		500		3.50	<0.01							42	128	0.5	
GWQ-10	5/30/1984							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					7.50		530		3.30	<0.01							56	161	0.5	
GWQ-10	9/12/1984							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					7.80		580		4.20								68	158	0.5	
GWQ-10	11/27/1984							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					7.70		580		4.90	<0.01							64	163	0.6	
GWQ-10	5/17/1985																							7.80		570										52	163		
GWQ-10	11/13/1985																							7.70		500										42	149		

Appendix A.
Table A-3. Groundwater-quality data

sample location	analysis date	silver (mg/L)	aluminum (mg/L)	arsenic (mg/L)	barium (mg/L)	beryllium (mg/L)	boron (mg/L)	cadmium (mg/L)	cobalt (mg/L)	chromium (mg/L)	copper (mg/L)	iron (mg/L)	mercury (mg/L)	manganese (mg/L)	molybdenum (mg/L)	nickel (mg/L)	lead (mg/L)	antimony (mg/L)	selenium (mg/L)	thallium (mg/L)	uranium (mg/L)	vanadium (mg/L)	zinc (mg/L)	pH (std. units)	specific conductance (µS/cm)	total dissolved solids (mg/L)	total alkalinity (mg/L as CaCO3)	nitrate as total N (mg/L)	total cyanide (mg/L)	calcium (mg/L)	magnesium (mg/L)	sodium (mg/L)	potassium (mg/L)	carbonate (mg/L)	bicarbonate (mg/L)	chloride (mg/L)	sulfate (mg/L)	fluoride (mg/L)	total suspended solids
GWQ-10	5/23/1986																							7.90		560										58	151		
GWQ-10	10/8/1986																							7.50		550										54	137		
GWQ-10	3/4/1987	<0.1	<0.1		<0.1	<0.1	<0.1	<0.1	<0.05	<0.1	<0.1	<0.1		<0.05	<0.1	<0.1	<0.1	0.9					<0.1		740	568				90	21	74	2.34		256	59	150		
GWQ-10	5/25/1987																																				154		
GWQ-10	1/12/1988	<0.1	<0.1		<0.1	<0.1	<0.1	<0.1	<0.05	<0.1	<0.1	<0.1		<0.05	<0.1	<0.1	<0.1						<0.1			648				116	24	64	3		243	79	173		
GWQ-10	4/4/1988																									552										65	171		
GWQ-10	8/23/1988																									692										63	179		
GWQ-10	2/9/1989																									618										76	181		
GWQ-10	6/1/1989																									604										68	163		
GWQ-10	11/30/1989																									620										72	162		
GWQ-10	11/14/1990																									635										93	178		
GWQ-10	2/11/1991			<0.001																						696										78	214		
GWQ-10	7/19/1991	<0.02		0.002	0.02			<0.005		<0.02		0.07	<0.0002	<0.02			<0.005		0.002					8.05	975	645		3.88		106	24	47	3.9	0	242	83	167	0.5	
GWQ-10	8/29/1991																							7.44		665										85	192		
GWQ-10	11/26/1991																							7.46		648										58	171		
GWQ-10	3/15/1992																							7.85		641										83	192		
GWQ-10	5/25/1992																							7.41		621										84	169		
GWQ-10	7/16/1992																							7.51		626										76	167		
GWQ-10	10/8/1992																							7.43		659										83	161		
GWQ-10	11/27/1992																							7.89		654										80	174		
GWQ-10	12/15/1992																							7.48		582										91	169		
GWQ-10	2/25/1993																							7.39		620										96	176		
GWQ-10	3/30/1993	<0.01	<0.1	<0.005	<0.5		0.04	<0.002	<0.05	<0.02	<0.01	<0.05	<0.001	<0.02	<0.02	<0.01	<0.02		<0.005				0.11	7.80	1,020	642	200	3.90	<0.01	104	27	71	2.3	0	254	94	183	0.5	
GWQ-10	9/28/1993																							7.70		693										96	143		
GWQ-10	5/26/1994	<0.025	0.85	<0.005	<0.1			<0.0005		<0.025	0.026	1.10	<0.001	0.059		<0.05	<0.005	<0.005	<0.005				0.55	7.82	1,050	1,000		3.50		100	25	56	3.1	0	232	92	175	0.5	
GWQ-10	6/23/1994																							7.97		671										104	192		
GWQ-10	7/23/1994	<0.025	<0.05	<0.005	<0.1	<0.002	<0.1	<0.0005	<0.05	<0.025	<0.025	<0.05	<0.001	<0.03	<0.05	<0.05	<0.005	<0.005	<0.005	<0.005			<0.05	7.97	1,050	696		3.50		110	26	66	2.8	0	238	98	184	0.5	
GWQ-10	9/22/1994																							7.45		668										89	156		
GWQ-10	1/29/1995																							7.52		672										88	66		
GWQ-10	3/29/1995																							7.67		622										85	176		
GWQ-10	6/27/1995																							7.29		677										85	169		
GWQ-10	9/21/1995																							7.42		693										91	187		
GWQ-10	1/10/1996																							7.29		654										98	198		
GWQ-10	4/3/1996																							6.95		628										97	218		
GWQ-10	9/25/1996																							7.56		679										86	191		
GWQ-10	1/15/1997																							7.59		746										91	204		
GWQ-11	8/10/1981	<0.02	<0.25	<0.004	<1		0.092	<0.01	<0.05	<0.05	<0.05	1.14	<1	0.45	<0.1	<0.05	<0.05		0.006				<0.05	7.38		612		1.02	<0.05	68	14	48	7.88	<1	237	37	123	0.9	
GWQ-11	10/27/1981	<0.02	<0.01	<0.01	<0.2		<0.1	<0.005	<0.02	<0.01	<0.05	<0.1	<0.001	<0.05	<0.05	<0.05	<0.02		<0.005				0.17	8.10		550		0.70	<0.01	72						36	183	1.0	
GWQ-11	10/30/1981	<0.02	<0.25	<0.005	<1		0.55	<0.01	<0.05	<0.05	<0.05	<0.1	<0.001	<0.02	<0.1	<0.02	<0.05		<0.011				0.23	8.40		536		0.61	<0.05							39	101	1.0	
GWQ-11	11/6/1981	<0.02	<0.01	<0.01	<0.2		<0.1	<0.005	<0.02	<0.01	<0.05	<0.1	<0.001	<0.05	<0.05	<0.05	<0.02		<0.005				0.29	8.10		520		1.50	<0.01	67						36	168	1.0	
GWQ-11	11/13/1981	<0.001	<0.25	<0.005	0.2		0.041	0.001		<0.005			<0.0005	<0.05	0.12	<0.05	<0.005		0.023				0.79	7.70	700	544		1.33	<0.001	83	17	44	3.9		241	38	156	1.0	
GWQ-11	11/17/1981	<0.02	<0.01	<0.01	<0.2		<0.1	<0.005	<0.02	<0.01	<0.05	<0.1	<0.001	<0.05	<0.05	<0.05	<0.02		<0.005				0.64	8.00		520		1.30	<0.01	71						36	165	1.0	
GWQ-11	11/23/1981	<0.02	<0.01	<0.01	<0.2		<0.1	<0.005	<0.02	<0.01	<0.05	<0.1	<0.001	<0.05	<0.05	<0.05	<0.02		<0.005				0.53	7.80		570		1.70	<0.01	67						36	181	0.9	
GWQ-11	12/7/1981	<0.02	<0.01	<0.01	<0.2		<0.1	<0.005	<0.02	<0.01	<0.05	<0.1	0.0064	<0.05	<0.05	<0.05	<0.02		<0.005				1.60	7.90		560		1.60	<0.01	57						56	184	0.9	
GWQ-11	12/15/1981	<0.02	<0.01	<0.01	<0.2		<0.1	<0.005	<0.02	<0.01	<0.05	<0.1	<0.001	<0.05	<0.05	<0.05	<0.02		<0.005				1.10	7.90		570		1.50	<0.01	85						38	191	1.0	
GWQ-11	12/22/1981	<0.02	<0.01	<0.01	<0.2		<0.1	<0.005	<0.02	<0.01	<0.05	0.27	<0.001	0.093	<0.05	<0.05	<0.02		<0.005				0.42	8.00		530		1.90	<0.01	82						40	185	0.5	
GWQ-11	1/5/1982	<0.02	<0.01	<0.01	<0.2		<0.1	<0.005	<0.02	<0.01	<0.05	0.14	<0.001	<0.05	<0.05	<0.05	<0.02		<0.005				0.44	7.50		480		2.50	<0.01	79						40	174	1.0	
GWQ-11	1/26/1982							<0.005			<0.05	<0.1	<0.001	<0.05	<0.1				<0.005					7.90		500		1.70	<0.01							40	168	1.0	
GWQ-11	2/22/1982							<0.005			<0.05	0.11	<0.001	<0.05	<0.05				<0.005					7.70		510		1.40	<0.01							38	168	0.9	
GWQ-11	4/26/1982							<0.005			<0.05	0.36	<0.001	<0.05	0.05				<0.005					7.60		510		1.30	<0.01							40	165	0.8	
GWQ-11	5/17/1982							<0.005			<0.05	0.11	<0.001	<0.05	<0.05				<0.005					7.80		510		1.90	<0.01							44	185	0.8	
GWQ-11	6/8/1982							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					7.90		530		1.70	<0.01							44	185	0.8	
GWQ-11	6/30/1982							<0.005			<0.05	0.39	<0.001	<0.05	<0.05				<0.005					7.90		590		2.30	<0.01							44	198	0.8	
GWQ-11	9/2/1982							<0.001						<0.05	<0.01				<0.005					7.30	940	700		1.94		111	28	58	3.51		226	52	248	0.8	

Appendix A.
Table A-3. Groundwater-quality data

sample location	analysis date	silver (mg/L)	aluminum (mg/L)	arsenic (mg/L)	barium (mg/L)	beryllium (mg/L)	boron (mg/L)	cadmium (mg/L)	cobalt (mg/L)	chromium (mg/L)	copper (mg/L)	iron (mg/L)	mercury (mg/L)	manganese (mg/L)	molybdenum (mg/L)	nickel (mg/L)	lead (mg/L)	antimony (mg/L)	selenium (mg/L)	thallium (mg/L)	uranium (mg/L)	vanadium (mg/L)	zinc (mg/L)	pH (std. units)	specific conductance (µS/cm)	total dissolved solids (mg/L)	total alkalinity (mg/L as CaCO3)	nitrate as total N (mg/L)	total cyanide (mg/L)	calcium (mg/L)	magnesium (mg/L)	sodium (mg/L)	potassium (mg/L)	carbonate (mg/L)	bicarbonate (mg/L)	chloride (mg/L)	sulfate (mg/L)	fluoride (mg/L)	total suspended solids
GWQ-11	12/23/1982							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					8.50		650		1.60	<0.01							52	235	0.8	
GWQ-11	2/21/1983							<0.005			<0.05	0.38	<0.001	<0.05	<0.05				<0.005					8.00		600		1.70	<0.01							44	218	0.8	
GWQ-11	5/13/1983							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					8.10		570		1.90	0.01							44	206	0.8	
GWQ-11	8/9/1983							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					7.90		580		2.00	<0.01							46	168	0.8	
GWQ-11	11/1/1983							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					8.00		580		4.80	<0.01							46	174	0.8	
GWQ-11	3/16/1984							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					8.30		540		3.80	<0.01							52	184	0.6	
GWQ-11	5/30/1984							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					7.50		550		1.90	<0.01							58	195	0.8	
GWQ-11	9/12/1984							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					7.90		590		2.30	<0.01							60	181	0.8	
GWQ-11	11/27/1984							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					7.70		570		2.30	<0.01							60	165	0.8	
GWQ-11	5/17/1985																							7.80		640										64	197		
GWQ-11	11/13/1985																							7.70		600										62	183		
GWQ-11	5/23/1986																							7.80		650										66	210		
GWQ-11	10/8/1986																							7.60		560										70	200		
GWQ-11	3/4/1987	<0.1	<0.1		<0.1	<0.1	<0.1	<0.1	<0.05	<0.1	<0.1	<0.1		<0.05	<0.1	<0.1	<0.1	1.1					<0.1	6.70	820	696				108	26	62	3.51		220	69	200		
GWQ-11	5/25/1987																																				230		
GWQ-11	1/12/1988	<0.1	<0.1		<0.1	<0.1	<0.1	<0.1	<0.05	<0.1	<0.1	<0.1		<0.05	<0.1	<0.1	<0.1						<0.1			718				128	31	63	4		214	77	253		
GWQ-11	4/4/1988																									694										75	278		
GWQ-11	8/23/1988																									772										73	294		
GWQ-11	2/9/1989																									730										77	258		
GWQ-11	6/1/1989																									708										70	238		
GWQ-11	11/30/1989																									732										80	254		
GWQ-11	11/14/1990																									746										104	257		
GWQ-11	2/11/1991			<0.001																						790										89	233		
GWQ-11	7/19/1991	<0.02		0.004	0.1			<0.005		<0.02		<0.05	<0.0002	<0.02			<0.002		0.002					7.36	1,100	785		3.93		123	34	40	3.9	0	221	90	210	0.7	
GWQ-11	8/29/1991																							7.46		771										93	279		
GWQ-11	11/26/1991																							7.29		770										89	241		
GWQ-11	3/15/1992																							7.91		765										65	260		
GWQ-11	5/25/1992																							7.45		761										96	258		
GWQ-11	10/8/1992																							7.42		755										96	227		
GWQ-11	11/27/1992																							7.85		763										96	248		
GWQ-11	12/15/1992										0.017													7.59		741										98	220		
GWQ-11	2/25/1993																							7.64		762										104	273		
GWQ-11	3/30/1993	<0.01	0.2	<0.005	<0.5		0.04	<0.002	<0.05	<0.02	<0.01	0.33	<0.001	0.03	<0.02	<0.01	<0.02		<0.005				0.03	7.70	1,170	776	180	4.10	<0.01	126	34	68	2.9	0	227	104	271	0.5	
GWQ-11	9/28/1993																							7.57		800										106	208		
GWQ-11	5/25/1994	<0.025	0.14	<0.005	<0.1			<0.0005		<0.025	<0.025	0.16	<0.001	<0.03		<0.05	<0.005	<0.005	<0.005				<0.05	7.88	1,130	820		3.80		120	34	55	3.5	0		110	260	0.7	
GWQ-11	6/23/1994																							7.42		802										117	275		
GWQ-11	7/22/1994	<0.025	<0.05	<0.005	<0.1	<0.002	<0.1	<0.0005	<0.05	<0.025	<0.025	<0.05	<0.001	<0.03	<0.05	<0.05	<0.005	0.0055	<0.005	<0.005			<0.05	7.70	1,210	808		3.80		140	37	66	3.4	0		116	272	0.7	
GWQ-11	9/22/1994																							7.37		816										112	235		
GWQ-11	1/29/1995																							7.60		861										200	159		
GWQ-11	3/29/1995																							7.96		793										99	137		
GWQ-11	6/27/1995																							7.67		835										102	279		
GWQ-11	9/21/1995																							7.58		865										112	290		
GWQ-11	1/10/1996																							7.36		777										121	288		
GWQ-11	4/3/1996																							7.38		767										119	277		
GWQ-11	9/25/1996																							7.78		835										116	230		
GWQ-11	1/15/1997																							7.68		860										127	304		
GWQ94-13	11/15/1994	<0.025	<0.05	<0.005	<0.1	<0.002	<0.1	<0.0005	<0.05	<0.025	<0.025	0.11	<0.001	<0.03	<0.05	<0.05	<0.005	<0.005	<0.005	<0.005			<0.05	7.74	2,026	1,570		4.60		270	56	110	3.9	0	159	190	720	0.4	
GWQ94-13	7/1/1996	<0.05	<0.025	<0.005	<0.05	<0.002	<0.05	<0.0005	<0.05	<0.025	<0.025	<0.05	<0.001	<0.03	<0.05	<0.05	<0.005	<0.002	0.0068	<0.001			<0.05	7.76	2,000	1,520		5.20		290	62	120	3.6	0	156	200	620	0.3	
GWQ94-13	7/2/2010	<0.005	<0.020	<0.001	0.04	<0.002	<0.04	<0.002	<0.006	<0.006	<0.006	<0.02	0.00026	<0.002	<0.008	<0.01	<0.005	<0.001	0.024	<0.001	0.0016	<0.05	<0.01	8.00	2,200	1,730	120	5.90		320	62	110	3.4	<2	120	290	770	0.4	10
GWQ94-13	10/5/2010	<0.005	<0.02	<0.005	0.038	<0.002	<0.04	<0.002	<0.006	<0.006	<0.006	<0.02	<0.0002	<0.002	<0.008	<0.01	<0.005	<0.001	0.024	<0.001	0.0015	<0.05	<0.01	7.39	2,100	1,670	120	5.80		300	62	110	3.4	<2	120	280	760	0.3	<10
GWQ94-13	5/11/2011	<0.005	<0.02	0.0038	0.037	<0.002	<0.04	<0.002	<0.006	<0.006	<0.006	<0.02	<0.0002	<0.002	<0.008	<0.01	<0.005	<0.001	0.028	<0.001	0.0017	<0.05	0.04	7.66	2,100	1,670	130	6.50	<0.005	310	61	120	3.3	<2	130	290	800	0.3	<10
GWQ94-14	11/14/1994	<0.025	<0.05	<0.005	<0.1	<0.002	<0.1	<0.0005	<0.05	<0.025	<0.025	<0.05	<0.001	<0.03	<0.05	<0.05	<0.005	<0.005	<0.005	<0.005			<0.05	7.95	745	560		1.30		81	23	46	1.9	0	279	22	140	0.5	
GWQ94-14	6/30/1996	<0.05	<0.025	<0.005	<0.05	<0.002	<0.05	<0.0005	<0.05	<0.025	<0.025	<0.05	<0.001	<0.03	<0.05	<0.05	<0.005	<0.002	<0.005	<0.001			<0.05	8.44	641	520		1.50		87	23	51	1.9	5	261	26	140	0.5	
GWQ94-14	1/29/2010	<0.005	<0.02	0.0032	0.045	<0.002	<0.04	<0.002	<0.006	<0.006	<0.006	<0.02	<0.0002	<0.002	<0.008	<0.01	<0.005	<0.0025	0.0068	<0.0025			0.01	8.00	820	550	210	2.20	<0.005	96	26	49	2	<2	210	50	150	0.5	

Appendix A.
Table A-3. Groundwater-quality data

sample location	analysis date	silver (mg/L)	aluminum (mg/L)	arsenic (mg/L)	barium (mg/L)	beryllium (mg/L)	boron (mg/L)	cadmium (mg/L)	cobalt (mg/L)	chromium (mg/L)	copper (mg/L)	iron (mg/L)	mercury (mg/L)	manganese (mg/L)	molybdenum (mg/L)	nickel (mg/L)	lead (mg/L)	antimony (mg/L)	selenium (mg/L)	thallium (mg/L)	uranium (mg/L)	vanadium (mg/L)	zinc (mg/L)	pH (std. units)	specific conductance (µS/cm)	total dissolved solids (mg/L)	total alkalinity (mg/L as CaCO3)	nitrate as total N (mg/L)	total cyanide (mg/L)	calcium (mg/L)	magnesium (mg/L)	sodium (mg/L)	potassium (mg/L)	carbonate (mg/L)	bicarbonate (mg/L)	chloride (mg/L)	sulfate (mg/L)	fluoride (mg/L)	total suspended solids
GWQ94-14	6/29/2010	<0.005	<0.020	0.0023	0.048	<0.002	<0.04	<0.002	<0.006	<0.006	<0.006	<0.02	<0.0002	<0.002	<0.008	<0.01	<0.005	<0.001	0.0052	<0.001	0.0014	<0.05	<0.01	8.00	820	573	210	2.30		98	25	45	1.7	<2	210	49	150	0.5	<10
GWQ94-14	10/5/2010	<0.005	<0.02	0.0024	0.045	<0.002	<0.04	<0.002	<0.006	<0.006	<0.006	<0.02	<0.0002	<0.002	<0.008	<0.01	<0.005	<0.001	0.0053	<0.001	0.0013	<0.05	<0.01	7.57	840	563	210	2.20		94	27	47	1.7	<2	210	50	150	0.5	<10
GWQ94-14	5/13/2011	<0.005	<0.02	0.0028	0.045	<0.002	<0.04	<0.002	<0.006	<0.006	<0.006	<0.02	<0.0002	<0.002	<0.008	<0.01	<0.005	<0.001	0.0061	<0.001	0.0015	<0.05	0.05	7.84	840	570	210	2.20	0.012	97	27	49	1.8	<2	210	48	150	0.6	<10
GWQ94-15	11/14/1994	<0.025	<0.05	<0.005	<0.1	<0.002	<0.1	<0.0005	<0.05	<0.025	<0.025	<0.05	<0.001	<0.03	<0.05	<0.05	<0.005	<0.005	<0.005	<0.005			<0.05	7.74	1,058	790		2.10		110	29	68	2.5	0	265	110	180	0.5	
GWQ94-15	7/1/1996	<0.05	<0.025	<0.005	<0.05	<0.002	<0.05	<0.0005	<0.05	<0.025	<0.025	0.41	<0.001	<0.03	<0.05	<0.05	<0.005	<0.002	<0.005	<0.001			<0.05	7.31	1,190	780		2.50		140	38	77	2.4	0	227	130	240	0.4	
GWQ94-15	1/29/2010	<0.005	<0.020	0.0042	0.058	<0.002	<0.040	<0.002	<0.0060	<0.0060	<0.006	<0.02	<0.0002	<0.002	<0.008	<0.01	<0.005	<0.0025	0.021	<0.0025			0.02	7.00	1,500	1,080	160	4.10	<0.005	180	47	84	3	<2	160	170	420	0.3	
GWQ94-15	6/29/2010	<0.005	<0.020	<0.0010	0.059	<0.002	<0.040	<0.002	<0.0060	<0.0060	<0.006	<0.02	<0.0002	0.0049	<0.008	<0.01	<0.005	<0.001	0.0095	<0.001	0.0017	<0.05	<0.01	8.00	1,100	805	180	2.70		140	34	60	2.1	<2	180	110	260	0.4	<10
GWQ94-15	10/1/2010	<0.005	<0.02	<0.001	0.056	<0.002	<0.04	<0.002	<0.006	<0.006	<0.006	<0.02	<0.0002	<0.002	<0.008	<0.01	<0.005	<0.001	0.012	<0.001	0.0018	<0.05	<0.01	7.52	1,100	794	190	2.70	<0.01	130	37	65	2.2	<2	190	110	260	0.4	<10
GWQ94-15	5/13/2011	<0.005	<0.02	0.0036	0.056	<0.002	<0.04	<0.002	<0.006	<0.006	<0.006	<0.02	<0.0002	<0.002	<0.008	<0.01	<0.005	<0.001	0.012	<0.001	0.0018	<0.05	<0.01	7.74	1,200	808	190	2.80	<0.005	130	38	68	2.3	<2	190	120	270	0.4	<10
GWQ94-16	11/13/1994	<0.025	<0.05	<0.005	<0.1	<0.002	<0.1	<0.0005	<0.05	<0.025	<0.025	<0.05	<0.001	0.038	<0.05	<0.05	<0.005	<0.005	<0.005	<0.005			<0.05	7.55	1,600	1,140		3.80		190	51	78	3.7	0	199	190	410	0.7	
GWQ94-16	7/1/1996	<0.05	<0.025	<0.005	<0.05	<0.002	<0.05	<0.0005	<0.05	<0.025	<0.025	0.22	<0.001	<0.03	<0.05	<0.05	<0.005	<0.002	<0.005	<0.001			<0.05	7.95	1,620	1,160		3.70		200	54	80	3.4	0	193	200	500	0.6	
GWQ94-16	6/29/2010	<0.005	<0.02	0.0022	0.039	<0.002	0.048	<0.002	<0.006	<0.006	<0.006	<0.02	<0.0002	<0.002	<0.008	<0.01	<0.005	<0.001	0.011	<0.001	0.0025	<0.05	<0.01	8.00	1,600	1,190	180	3.70		210	50	74	3.1	<2	180	180	440	0.6	<10
GWQ94-16	9/30/2010	<0.005	<0.02	0.0024	0.038	<0.002	0.053	<0.002	<0.006	<0.006	<0.006	<0.02	<0.0002	<0.002	<0.008	<0.01	<0.005	<0.001	0.015	<0.001	0.0024	<0.05	<0.01	7.50	1,500	1,170	180	3.90	<0.01	200	51	78	3.1	<2	180	190	440	0.7	<10
GWQ94-16	5/10/2011	<0.005	<0.02	0.0026	0.038	<0.002	0.056	<0.002	<0.006	<0.006	<0.006	<0.02	<0.0002	<0.002	<0.008	<0.01	<0.005	<0.001	0.012	<0.001	0.0023	<0.05	0.01	7.58	1,600	1,150	180	4.00	<0.01	200	49	74	3.1	<2	180	190	430	0.6	<10
GWQ94-17	11/15/1994	<0.025	<0.05	<0.005	<0.1	<0.002	<0.1	<0.0005	<0.05	<0.025	<0.025	<0.05	<0.001	<0.03	<0.05	<0.05	<0.005	<0.005	<0.005	<0.005			<0.05	7.71	1,147	820		2.40		120	33	62	2.4	0	232	110	240	0.5	
GWQ94-17	6/30/1996	<0.05	<0.025	<0.005	<0.05	<0.002	<0.05	<0.0005	<0.05	<0.025	<0.025	0.06	<0.001	<0.03	<0.05	<0.05	<0.005	<0.002	<0.005	<0.001			<0.05	8.56	925	690		2.00		120	28	61	2	7	227	81	190	0.5	
GWQ94-17	7/6/2010	<0.005	<0.02	0.0022	0.047	<0.002	<0.04	<0.002	<0.006	<0.006	<0.006	<0.02	<0.0002	<0.002	<0.008	<0.01	<0.005	<0.001	0.0062	<0.001	0.0016	<0.05	<0.01	8.00	880	629	200	2.00		110	27	49	1.8	<2	200	68	180	0.5	61
GWQ94-20	11/15/1994	<0.025	<0.05	<0.005	<0.1	<0.002	0.11	<0.0005	<0.05	<0.025	<0.025	<0.05	<0.001	0.42	<0.05	<0.05	<0.005	<0.005	<0.005	<0.005			<0.05	7.66	588	370		1.00		48	10	67	3.2	0	296	19	40	0.4	
GWQ94-20	6/30/1996	<0.05	<0.025	<0.005	0.12	<0.002	0.086	<0.0005	<0.05	<0.025	<0.025	<0.05	<0.001	<0.03	<0.05	<0.05	<0.005	<0.002	<0.005	<0.001			<0.05	8.79	597	390		<1		58	10	75	3.1	19	273	21	56	0.3	
GWQ94-21A	11/13/1994	<0.025	<0.05	<0.005	<0.1	<0.002	<0.1	<0.0005	<0.05	<0.025	<0.025	<0.05	<0.001	0.20	<0.05	<0.05	<0.005	<0.005	<0.005	<0.005			<0.05	7.25	672	480		1.00		82	23	39	2.1	0	267	18	130	0.6	
GWQ94-21A	6/30/1996	<0.05	<0.025	<0.005	<0.05	<0.002	<0.05	<0.0005	<0.05	<0.025	<0.025	<0.05	<0.001	<0.03	<0.05	<0.05	<0.005	<0.002	<0.005	<0.001			<0.05	8.22	649	470		1.10		86	22	37	1.5	0	268	16	120	0.5	
GWQ94-21B	11/13/1994	<0.025	<0.05	<0.005	<0.1	<0.002	<0.1	<0.0005	<0.05	<0.025	<0.025	<0.05	<0.001	0.37	<0.05	<0.05	<0.005	<0.005	<0.005	<0.005			<0.05	7.57	669	440		<1		71	18	56	2.6	0	255	19	130	0.4	
GWQ94-21B	6/30/1996	<0.05	<0.025	<0.005	<0.05	<0.002	<0.05	<0.0005	<0.05	<0.025	<0.025	<0.05	<0.001	<0.03	<0.05	<0.05	<0.005	<0.002	<0.005	<0.001			<0.05	8.60	648	470		1.10		87	22	40	1.7	10	256	17	120	0.5	
GWQ96-22A	7/13/1996	<0.05	<0.025	<0.005	<0.05	<0.002	<0.05	<0.0005	<0.05	<0.025	<0.025	<0.05	<0.001	0.08	<0.05	<0.05	<0.005	<0.003	<0.005	<0.001			<0.05	7.50	1,040	700		<1		71	7	150	2.5	0	124	89	250	3.3	
GWQ96-22A	4/9/1997										<0.025	6.50	<0.001	2.80					<0.005					7.58	930	770										20	150	0.8	
GWQ96-22A	8/8/1997	<0.025	0.028	<0.005	0.057	<0.002	0.23	<0.002	<0.05	<0.025	<0.05	0.13		0.53	<0.05	<0.05	<0.005		<0.005	<0.001			<0.05	7.65	1,140	700		<1		73	8	170	6.2	0	177	89	230	2.2	
GWQ96-22A	1/30/2010	<0.005	<0.02	0.0029	0.094	<0.002	0.28	<0.002	<0.006	<0.006	<0.006	2.10	<0.0002	0.74	<0.008	<0.01	<0.005	<0.0025	<0.0025	<0.0025			<0.01	8.00	920	557	320	<1	<0.005	51	4	160	2.8	<2	320	81	44	2.6	
GWQ96-22A	7/1/2010	<0.005	<0.02	0.0035	0.079	<0.002	0.28	<0.002	<0.006	<0.006	<0.006	0.02	<0.0002	0.65	<0.008	<0.01	<0.005	<0.001	0.0011	<0.001	<0.001	<0.05	<0.01	8.00	920	573	310	<1		53	4	150	2.8	<2	310	70	52	2.7	19
GWQ96-22A	10/7/2010	<0.005	<0.02	0.0035	0.084	<0.002	0.28	<0.002	<0.006	<0.006	<0.006	0.32	<0.0002	0.49	<0.008	<0.01	<0.005	<0.001	<0.001	<0.001	<0.001	<0.05	<0.01	8.00	720	564	340	<1		49	4	150	2.8	<2	340	75	34	2.7	11
GWQ96-22B	7/13/1996	<0.05	<0.025	<0.005	0.096	<0.002	0.12	<0.0005	<0.05	<0.025	<0.025	<0.05	<0.001	0.41	<0.05	<0.05	<0.005	<0.003	<0.005	<0.001			<0.05	7.75	1,070	650		<1		66	10	130	10	0	141	210	79	1.8	
GWQ96-22B	10/7/2010	<0.005	<0.02	0.0057	0.11	<0.002	0.24	<0.002	<0.006	<0.006	<0.006	9.30	<0.0002	1.20	<0.008	<0.01	<0.005	<0.001	0.0011	<0.001	<0.001	<0.05	<0.01	7.52	1,200	730	480	2.10		72	6	200	3.6	<2	480	110	<0.5	3.0	25
GWQ96-23A	7/14/1996	<0.05	0.28	<0.005	0.064	<0.002	<0.05	<0.0005	<0.05	<0.025	<0.025	0.26	<0.001	0.05	<0.05	<0.05	<0.005	<0.003	<0.005	<0.001			<0.05	7.95	760	520		<1		59	18	98	4.2	0	280	22	140	0.8	
GWQ96-23A	4/9/1997										<0.025	0.10	<0.001	0.75					<0.005						850	580										16	170	1.4	
GWQ96-23A	8/8/1997	<0.025	0.036	<0.005	0.13	<0.002	0.067	<0.002	<0.05	<0.025	<0.025	0.82		1.60	<0.05	<0.05	<0.005		<0.005	<0.001			<0.05	7.68	1,310	920		<1		130	36	72	2.5	0	328	18	410	1.2	
GWQ96-23A	1/30/2010	<0.005	<0.02	0.0027	0.091	<0.002	0.074	<0.002	<0.006	<0.006	<0.006	0.66	<0.0002	0.63	<0.008	<0.01	<0.005	<0.0025	<0.0025	<0.0025			<0.01	8.00	1,100	689	640	<1		150	45	69	1.6	<2	640	12	6	1.7	
GWQ96-23A	7/1/2010	<0.005	<0.02	0.0011	0.13	<0.002	0.068	<0.002	<0.006	<0.006	<0.006	0.05	<0.0002	0.37	<0.008	<0.01	<0.005	<0.001	0.0014	<0.001	0.0025	<0.05	<0.01	8.00	1,200	804	510	<1		150	40	81	1.5	<2	510	14	140	1.5	13
GWQ96-23A	10/6/2010	<0.005	<0.02	<0.001	0.087	<0.002	0.08	<0.002	<0.006	<0.006	<0.006	0.31	<0.0002	0.41	<0.008	<0.01	<0.005	<0.001	0.0013	<0.001	0.0037	<0.05	<0.01	7.89	1,200	769	580	<1		140	45	80	1.3	<2	580	12	99	1.6	<10
GWQ96-23A	5/12/2011	<0.005	<0.02	<0.001	0.078	<0.002	0.071	<0.002	<0.006	<0.006	<0.006	0.04	<0.0002	0.29	<0.008	<0.01	<0.005	<0.001	0.0012	<0.001	0.003	<0.05	0.02	8.16	1,100	752	600	<0.1	<0.005	150	42	78	1.3	<2	600	13	74	1.7	<10
GWQ96-23B	7/14/1996	<0.05	7.4	<0.005	0.093	<0.002	0.058	<0.0005	<0.05	<0.025	<0.025	3.70	<0.001	0.13	<0.05	<0.05	<0.005	<0.003	<0.005	<0.001			<0.05	8.15	780	550		<1		67	20	79	4	0	234	20	170	1.1	
GWQ96-23B	10/6/2010	<0.005	<0.02	<0.001	0.1	<0.002	0.14	<0.002	<0.006	<0.006	<0.006	1.40	<0.0002	0.36	<0.008	<0.01	<0.005	<0.001	0.0011	<0.001	<0.001	<0.05	<0.01	7.85	900	554	480	<1		78	22	110	1.6	<2	480	19	<0.5	2.1	<10
GWQ96-23B	5/12/2011	<0.005	<0.02	<0.001	0.11	<0.002	0.14	<0.002	<0.006	<0.006	<0.006	0.93	<0.0002	0.34	<0.008	<0.01	<0.005	<0.001	0.0014	<0.001	<0.001	<0.05	0.07	7.99	890	556	490	<0.1	<0.005	81	22	110	1.7	<2	490	17	<0.5	2.1	24
IW-1	3/4/1987																							6.60	3,950	3,802				564		274	3.12		193	575	1,901		
IW-1	7/19/1991	<0.02		<0.002	<0.01			<0.005		<0.02	<0.02	<0.05	0.0005	<0.02			<0.005		0.015					7.87	6,460	4,235		9.06		636	182	375	7	0	222	633	1,985	0.7	
IW-1	8/29/1991																							7.13		4,120										642	1,918		
IW-1	11/26/1991																							7.53		3,979										615	1,634		
IW-1	3/15/1992																							7.88		4,026										611	2,201		
IW-1	5/25/1992																							7.09		4,155										598	2,203		
IW-1	7/16/1992																							7.12		4,297										585	1,775		
IW-1	10/8/1992																							6.96		3,996										617	1,727		
IW-1	11/27/1992																							7.71		4,004										605	1,717		
IW-1	12/15/1992																							7.40		3,969										609	1,415		
IW-1	9/28/1993																							7.12		3,661										521	1,150		
IW-1	3/17/1994																							7.00		3,684										405	1,569		
IW-1	5/24/1994	<0.025	0.94	<0.005	<0.1			<0.0005		<0.025	<0.025	1.00	<0.001	<0.03		<0.05	<0.005	<0.005	<0.005				0.05	7.84	3,920	3,500		5.80		550	170	250	2.9	0	248	470	1,500	0.7	

Appendix A.
Table A-3. Groundwater-quality data

sample location	analysis date	silver (mg/L)	aluminum (mg/L)	arsenic (mg/L)	barium (mg/L)	beryllium (mg/L)	boron (mg/L)	cadmium (mg/L)	cobalt (mg/L)	chromium (mg/L)	copper (mg/L)	iron (mg/L)	mercury (mg/L)	manganese (mg/L)	molybdenum (mg/L)	nickel (mg/L)	lead (mg/L)	antimony (mg/L)	selenium (mg/L)	thallium (mg/L)	uranium (mg/L)	vanadium (mg/L)	zinc (mg/L)	pH (std. units)	specific conductance (µS/cm)	total dissolved solids (mg/L)	total alkalinity (mg/L as CaCO3)	nitrate as total N (mg/L)	total cyanide (mg/L)	calcium (mg/L)	magnesium (mg/L)	sodium (mg/L)	potassium (mg/L)	carbonate (mg/L)	bicarbonate (mg/L)	chloride (mg/L)	sulfate (mg/L)	fluoride (mg/L)	total suspended solids
IW-1	6/23/1994																							7.69		3,555										474	1,444		
IW-1	7/22/1994	<0.025	<0.05	<0.005	<0.1	<0.002	0.1	<0.0005	<0.05	<0.025	<0.025	<0.05	<0.001	<0.03	<0.05	<0.05	<0.005	<0.005	0.018	0.0063			<0.05	7.51	4,100	3,450		5.90		570	200	280	2.5	0	256	431	1,480	0.7	
IW-1	9/22/1994																							7.05		3,466										436	1,348		
IW-1	1/29/1995																							7.18		3,395										663	1,479		
IW-1	3/29/1995																							7.49		3,465										419	1,351		
IW-1	6/27/1995																							6.99		3,599										446	1,680		
IW-1	9/21/1995																							6.82		35										459	1,711		
IW-1	1/10/1996																							7.23		3,437										442	1,596		
IW-1	9/25/1996																							7.17		3,551										568	1,493		
IW-1	1/15/1997																							7.44		36										410	1,695		
IW-2	9/2/1982							<0.001						<0.05	<0.01				<0.005					7.30	4,250	4,010		1.38		320	174	720	234		185	409	2,252	1.2	
IW-2	5/25/1994	<0.025	22	<0.005	0.12	<0.002		<0.0005		0.046	<0.025	16.00	<0.001	0.77		0.097	0.0073	<0.005	<0.005				0.08	7.75	2,890	2,400		1.50		430	94	290	3.2	0	534	340	1,000	0.7	
IW-2	7/22/1994	<0.025	<0.05	<0.005	<0.1	<0.002	0.15	<0.0005	<0.05	<0.025	<0.025	<0.05	<0.001	0.036	<0.05	<0.05	<0.005	<0.005	0.014	0.0073			<0.05	7.78	3,400	2,390		<1		390	110	360	1.3	0	300	380	1,040	0.7	
IW-2	1/31/2010	<0.005	0.13	0.0092	0.024	<0.002	0.075	<0.002	0.0065	<0.006	<0.006	1.30	<0.0002	1.6	0.02	<0.01	<0.005	<0.0025	0.033	<0.0025			<0.01	8.00	3,200	2,770	260	<2	<0.005	390	120	290	1.6	<2	260	600	1,200	0.7	
IW-2	6/29/2010	<0.005	<0.02	<0.001	0.029	<0.002	0.061	<0.002	<0.006	<0.006	<0.006	0.87	0.00048	2.2	0.024	<0.01	<0.005	<0.001	0.029	<0.001	0.006	<0.05	<0.01	7.00	3,400	2,700	250	<2		390	110	260	1.8	<2	250	580	1,100	0.7	31,000
IW-2	9/30/2010	<0.005	0.044	<0.001	0.028	<0.002	0.073	<0.002	<0.006	<0.006	<0.006	0.41	<0.0002	2.2	0.02	<0.01	<0.005	<0.001	0.037	<0.001	0.0057	<0.05	0.02	7.36	3,000	2,280	250	<2	<0.01	360	110	270	1.6	<2	250	500	1,000	0.7	71,000
IW-2	5/9/2011	<0.005	<0.02	<0.001	0.037	<0.002	0.081	<0.002	0.017	<0.006	<0.006	0.36	<0.0002	3.6	0.021	<0.01	<0.005	0.0032	0.031	<0.001	0.0062	<0.05	0.02	7.31	3,200	2,360	240	1.70	<0.01	370	110	260	2.3	<2	240	520	1,100	0.6	20,000
IW-3	9/2/1982							<0.001						<0.05	<0.01				<0.005					7.20	1,700	1,562		4.12		234	42	168	3.51		179	159	707	0.4	
IW-3	2/25/1993																							7.27		3,892										590	1,739		
IW-3	5/26/1994	<0.025	32	<0.005	0.2			<0.0005		0.059	6	22.00	<0.001	0.35		0.19	0.077	<0.005	<0.005				0.15	7.83	1,790	1,870		5.70		240	51	69	4	0	341	209	415	0.5	
IW-3	7/23/1994	<0.025	<0.05	<0.005	<0.1	<0.002	<0.1	<0.0005	<0.05	<0.025	0.058	<0.05	<0.001	0.13	0.062	<0.05	<0.005	0.0055	0.011	<0.005			<0.05	7.76	1,860	1,300		5.00		200	66	89	3.5	0	255	206	437	0.5	
IW-3	4/3/1996																							7.04		3,364										433	1,566		
MW-4	6/13/1975																							7.90	620					46	10	73	4.4	0	226	15	110	0.6	
MW-4	7/20/1994	<0.025	<0.05	<0.005	<0.1	<0.002	<0.1	<0.0005	<0.05	<0.025	<0.025	<0.05	<0.001	<0.03	<0.05	<0.05	<0.005	<0.005	<0.005	<0.005			<0.05	8.34	408	256		<1		15	13	56	3.4	2	139	17	66	0.3	
NP-1	10/8/1981	<0.02	<0.25	<0.004	<1		<0.004	<0.01	<0.05	<0.05	<0.05	0.27	<1	0.92	<0.1	<0.05	<0.05		0.003				0.40	7.60		496		0.47	<0.05	56	14	62	8.25	<1	266	25	108	0.8	
NP-1	11/4/1981	<0.02	<0.01	<0.01	<0.2		<0.1	<0.005	<0.02	<0.01	<0.05	<0.1	<0.001	0.6	<0.05	<0.05	<0.02		<0.005				0.14	8.10		470		0.30	0.04	54						28	148	1.0	
NP-1	11/13/1981	<0.001	<0.25	<0.005	0.2		0.044	0.006		<0.005			<0.0005	1.34	0.011	<0.05	<0.005		0.029				0.44	7.65	625	470		0.09	0.001	72	19	39	5.85		274	24	131	0.8	
NP-1	11/17/1981	<0.02	<0.01	<0.005	0.24		<0.1	<0.005	<0.02	<0.01	0.069	<0.1	<0.001	1.4	0.06	<0.05	<0.02		<0.005				3.90	8.00		460		0.20	<0.01	59						24	154	0.8	
NP-1	11/23/1981	<0.02	<0.01	<0.01	0.02		<0.1	<0.005	<0.02	<0.02	<0.05	<0.1	<0.001	1.2	<0.05	<0.05	<0.02		<0.005				4.10	7.70		530		0.20	<0.01	58						26	146	0.8	
NP-1	12/7/1981	<0.02	<0.01	<0.01	<0.2		<0.1	<0.005	<0.02	<0.01	<0.05	<0.1	<0.001	1.2	<0.05	<0.05	<0.02		<0.005				5.10	7.30		490		0.20	<0.01	58						24	158	0.8	
NP-1	12/15/1981	<0.02	<0.01	<0.01	<0.2		<0.1	<0.005	<0.02	<0.01	<0.05	<0.1	<0.001	1.2	<0.05	<0.05	<0.02		<0.005				5.30	7.80		480		<0.2	<0.01	68						24	151	0.8	
NP-1	12/22/1981	<0.02	<0.01	<0.01	<0.2		<0.1	<0.005	<0.02	<0.01	<0.05	<0.1	<0.001	1	<0.05	<0.05	<0.02		<0.005				4.10	7.80		450		0.30	<0.01	66						22	149	0.8	
NP-1	1/5/1982	<0.02	<0.01	<0.01	<0.2		<0.1	<0.005	<0.02	<0.01	<0.05	0.14	0.0012	0.71	<0.05	<0.05	<0.02		<0.02				4.10	7.60		400		0.70	<0.01	67						22	163	0.8	
NP-1	1/26/1982							<0.005			<0.05	<0.1	<0.001	0.45	<0.1				<0.005					7.90		440		0.50	<0.01							22	154	0.7	
NP-1	2/22/1982							<0.005			0.48	0.83	<0.001	0.26	<0.05				<0.005					7.90		460		0.60	<0.01							24	158	0.7	
NP-1	4/26/1982							<0.005			<0.05	1.20	<0.001	0.16	<0.05				<0.005					7.90		440		0.70	<0.01							26	154	0.6	
NP-1	5/24/1982											<0.1		0.28																									
NP-1	5/28/1982											<0.1		0.22																									
NP-1	6/8/1982							<0.005			<0.05	<0.1	<0.001	0.25	<0.05				<0.005					7.50		500		1.10	<0.01							20	162	0.6	
NP-1	6/30/1982							<0.005			<0.05	<0.1	<0.001	0.18	<0.05				<0.005					7.70		500		1.10	<0.01							18	143	0.6	
NP-1	10/27/1982							<0.005			<0.05	0.45	<0.001	0.058	<0.05				<0.005					7.70		470		1.30	<0.01							20	151	0.7	
NP-1	2/21/1983							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					7.70		490		1.30	<0.01							18	156	0.7	
NP-1	5/13/1983							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					7.90		470		1.10	<0.01							24	149	0.6	
NP-1	8/9/1983							<0.005			<0.05	0.22	<0.001	<0.05	<0.05				<0.005					7.80		480		1.10	<0.01							22	130	0.6	
NP-1	11/1/1983							<0.005			<0.05	0.14	<0.001	<0.05	<0.05				<0.005					7.80		500		2.10	<0.01							18	125	0.6	
NP-1	3/16/1984							<0.005			<0.05	<0.1	0.0083	<0.05	<0.05				<0.005					8.20		480		1.80	<0.01							22	124	0.6	
NP-1	4/9/1984												<0.001																										
NP-1	5/30/1984							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					7.50		510		0.70	<0.01							22	154	0.6	
NP-1	9/12/1984							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					7.70		480		1.10	<0.01							22	137	0.6	
NP-1	11/27/1984							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					7.80		480		1.10	<0.01							16	144	0.6	
NP-1	5/17/1985																							7.60		510										20	144		
NP-1	11/13/1985																							7.30		480										16	149		
NP-1	5/23/1986																							7.60		500										18	142		
NP-1	10/8/1986																							7.40		470										22	107		

Appendix A.
Table A-3. Groundwater-quality data

sample location	analysis date	silver (mg/L)	aluminum (mg/L)	arsenic (mg/L)	barium (mg/L)	beryllium (mg/L)	boron (mg/L)	cadmium (mg/L)	cobalt (mg/L)	chromium (mg/L)	copper (mg/L)	iron (mg/L)	mercury (mg/L)	manganese (mg/L)	molybdenum (mg/L)	nickel (mg/L)	lead (mg/L)	antimony (mg/L)	selenium (mg/L)	thallium (mg/L)	uranium (mg/L)	vanadium (mg/L)	zinc (mg/L)	pH (std. units)	specific conductance (µS/cm)	total dissolved solids (mg/L)	total alkalinity (mg/L as CaCO3)	nitrate as total N (mg/L)	total cyanide (mg/L)	calcium (mg/L)	magnesium (mg/L)	sodium (mg/L)	potassium (mg/L)	carbonate (mg/L)	bicarbonate (mg/L)	chloride (mg/L)	sulfate (mg/L)	fluoride (mg/L)	total suspended solids
NP-1	3/30/1989	<0.1	<0.1		<0.1	<0.1	<0.1	<0.1	<0.05	<0.1	<0.1	<0.1		<0.05	<0.1	<0.1	<0.1						2.60			492				88	23	46	3		279	15	137		
NP-1	7/19/1991	<0.02		0.003	0.02			<0.005		<0.02		0.59	<0.0002	<0.02			0.007		<0.002					8.04	761	530		0.99		81	24	31	2	0	256	22	133	0.6	
NP-1	8/29/1991																							7.69		501										21	141		
NP-1	11/26/1991																							7.12		1,484										23	137		
NP-1	3/15/1992																							7.80		510										22	146		
NP-1	5/25/1992																							7.49		608										29	128		
NP-1	7/16/1992																							7.50		487										22	142		
NP-1	10/8/1992																							7.35		517										22	129		
NP-1	11/27/1992																							7.85		498										21	142		
NP-1	12/15/1992																							7.58		502										24	125		
NP-1	2/25/1993																							7.42		510										23	138		
NP-1	3/30/1993	<0.01	<0.1	<0.005	<0.5		0.03	<0.002	<0.05	<0.02	<0.01	0.17	<0.001	<0.02	<0.02	<0.01	<0.02		<0.005				1.13	7.70	767	496	240	1.10	<0.01	79	27	52	1.8	0	306	22	145	0.6	
NP-1	9/28/1993																							7.48		508										36	110		
NP-1	3/17/1994																							7.30		516										24	134		
NP-1	5/24/1994	<0.025	0.83	0.005	<0.1			0.0096		<0.025	<0.025	9.50	<0.001	0.1		<0.05	0.016	<0.005	<0.005				5.70	7.53	680	510		1.10		79	23	48	2.5	0	263	22	130	0.6	
NP-1	6/23/1994																							7.50		453										40	142		
NP-1	7/21/1994	<0.025	<0.05	<0.005	<0.1	<0.002	<0.1	<0.0005	<0.05	<0.025	<0.025	0.05	<0.001	0.27	<0.05	<0.05	<0.005	<0.005	<0.005	<0.005			4.90	7.87	698	464		<1		71	23	47	2.2	0	249	23	133	0.7	
NP-1	9/22/1994																							7.49		488										24	119		
NP-1	1/29/1995																							7.94		407										26	125		
NP-1	3/29/1995																							7.98		392										23	86		
NP-1	6/27/1995																							8.02		385										24	114		
NP-1	9/21/1995																							7.96		373										27	145		
NP-1	1/10/1996																							7.73		277										26	109		
NP-1	4/3/1996																							7.89		300										26	123		
NP-1	9/25/1996																							8.22		320										24	94		
NP-1	1/15/1997																							8.42		318										26	109		
NP-1	1/31/2010	<0.005	<0.020	<0.0025	0.037	<0.002	<0.04	<0.002	<0.006	<0.006	<0.006	0.10	<0.0002	0.0088	<0.008	<0.01	<0.005	<0.0025	0.0055	<0.0025			0.38	8.00	780	514	220	1.40	<0.005	87	29	52	2	<2	220	38	140	0.6	
NP-1	6/28/2010	<0.005	<0.020	0.0034	0.043	<0.002	<0.04	<0.002	<0.006	<0.006	<0.006	<0.02	<0.0002	<0.002	<0.008	<0.01	<0.005	<0.001	0.0045	<0.001	0.0019	<0.05	0.05	8.00	790	548	230	1.40		90	26	46	1.9	<2	230	37	150	0.6	<10
NP-1	10/5/2010	<0.005	0.14	0.0035	0.041	<0.002	0.04	<0.002	<0.006	<0.006	<0.006	<0.02	<0.0002	<0.002	<0.008	<0.01	<0.005	<0.001	0.0045	<0.001	0.0018	<0.05	0.06	7.63	800	537	220	4.90		86	28	50	1.9	<2	220	35	140	0.6	13
NP-2	10/8/1981	<0.02	<0.25	0.024	<1		0.08	<0.01	<0.05	<0.05	<0.05	<0.1	<1	0.62	<0.1	<0.05	<0.05		<0.002				0.31	7.39		476		0.23	<0.05	46	15	94	9.57	<1	159	45	198	1.8	
NP-2	11/6/1981	<0.02	<0.01	<0.01	<0.2		<0.1	<0.005	<0.02	<0.01	<0.05	<0.1	<0.001	0.39	0.21	<0.05	<0.02		<0.005				1.70	7.60		450		0.40	<0.01	53						35	164	1.4	
NP-2	11/13/1981	<0.001	<0.25	<0.005	<0.1		0.04	<0.001		<0.005			<0.0005	0.79	0.04	<0.01	<0.005		0.017				3.18	7.65	675	466		0.25	0.0026	65	19	60	3.9		221	31	162	1.1	
NP-2	11/23/1981	<0.02	<0.01	<0.01	0.02		<0.1	<0.005	<0.02	<0.02	<0.05	<0.1	<0.001	0.54	0.06	<0.05	<0.02		<0.005				3.50	7.70		520		0.70	<0.01	57						30	156	0.9	
NP-2	12/7/1981	<0.02	<0.01	<0.01	<0.2		<0.1	<0.005	<0.02	<0.01	<0.05	<0.1	<0.001	0.54	0.06	<0.05	<0.02		<0.005				4.40	7.50		490		0.60	<0.01	53						30	160	0.8	
NP-2	12/15/1981	<0.02	<0.01	<0.01	<0.2		<0.1	<0.005	<0.02	<0.01	<0.05	<0.1	<0.001	0.52	0.072	<0.05	<0.02		<0.005				2.90	8.00		480		0.50	<0.01	62						32	161	0.9	
NP-2	12/22/1981	<0.02	<0.01	<0.01	0.21		<0.1	<0.005	<0.02	<0.01	<0.05	0.12	<0.001	0.51	0.053	<0.05	<0.02		<0.005				2.80	8.00		440		0.80	<0.01	73						32	161	0.6	
NP-2	1/5/1982	<0.02	<0.01	<0.01	<0.2		<0.1	<0.005	<0.02	<0.01	<0.05	0.14	<0.001	0.49	0.07	<0.05	<0.02		<0.02				3.20	7.60		400		0.90	<0.01	65						28	158	0.9	
NP-2	1/26/1982							<0.005			<0.05	<0.1	<0.001	0.34	<0.1				<0.005					8.00		450		1.10	<0.01							24	160	0.7	
NP-2	2/22/1982							<0.005			0.069	0.37	<0.001	0.3	<0.05				<0.005					8.00		440		0.80	<0.01							30	151	0.7	
NP-2	4/26/1982							<0.005			<0.05	1.20	<0.001	0.29	<0.05				<0.005					8.00		450		2.40	<0.01							42	149	1.0	
NP-2	5/18/1982							0.015			<0.05	0.68	<0.001	0.078	<0.05				<0.005					7.90		460		1.80	<0.01							34	128	0.6	
NP-2	5/24/1982											<0.1		<0.05																									
NP-2	5/28/1982											<0.1		<0.05																									
NP-2	6/8/1982							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					7.80		490		0.90	<0.01							26	158	0.5	
NP-2	6/30/1982							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					7.80		490		1.40	<0.01							26	133	0.6	
NP-2	9/2/1982							<0.001						<0.05	<0.01				<0.005					7.40	650	468		1.66		74	18	58	1.95		316	26	127	0.5	
NP-2	10/27/1982							<0.005			<0.05	0.29	<0.001	<0.05	<0.05				<0.005					7.90		440		1.60	<0.01							26	120	0.6	
NP-2	2/21/1983							<0.005			<0.05	0.12	<0.001	<0.05	<0.05				<0.005					7.80		440		1.60	<0.01							24	127	0.6	
NP-2	5/13/1983							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					8.10		460		1.50	<0.01							24	139	0.6	
NP-2	8/9/1983							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					7.90		560		1.60	<0.01							36	148	0.6	
NP-2	11/1/1983							<0.005			<0.05	0.17	<0.001	<0.05	<0.05				<0.005					8.00		470		2.30	<0.01							24	111	0.6	
NP-2	3/16/1984							<0.005			<0.05	<0.1	0.001	<0.05	<0.05				<0.005					8.20		500		1.60	<0.01							30	146	0.8	
NP-2	5/30/1984							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					7.70		520		1.40	<0.01							32	175	0.6	
NP-2	9/12/1984							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					7.80		470		1.70	<0.01							22	134	0.6	

sample location	analysis date	silver (mg/L)	aluminum (mg/L)	arsenic (mg/L)	barium (mg/L)	beryllium (mg/L)	boron (mg/L)	cadmium (mg/L)	cobalt (mg/L)	chromium (mg/L)	copper (mg/L)	iron (mg/L)	mercury (mg/L)	manganese (mg/L)	molybdenum (mg/L)	nickel (mg/L)	lead (mg/L)	antimony (mg/L)	selenium (mg/L)	thallium (mg/L)	uranium (mg/L)	vanadium (mg/L)	zinc (mg/L)	pH (std. units)	specific conductance (µS/cm)	total dissolved solids (mg/L)	total alkalinity (mg/L as CaCO3)	nitrate as total N (mg/L)	total cyanide (mg/L)	calcium (mg/L)	magnesium (mg/L)	sodium (mg/L)	potassium (mg/L)	carbonate (mg/L)	bicarbonate (mg/L)	chloride (mg/L)	sulfate (mg/L)	fluoride (mg/L)	total suspended solids
NP-2	11/27/1984							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					7.90		470		1.70	<0.01							20	125	0.6	
NP-2	5/17/1985																							7.80		480										22	120		
NP-2	11/13/1985																							7.40		460										22	115		
NP-2	5/23/1986																							7.60		480										28	113		
NP-2	10/8/1986																							7.40		430										24	100		
NP-2	3/30/1989	<0.1	<0.1		<0.1	<0.1	<0.1	<0.1	<0.05	<0.1	<0.1	<0.1		0.06	<0.1	<0.1	<0.1						0.50			376				52	18	65	3		183	29	124		
NP-2	7/19/1991	<0.02		<0.002	<0.01			<0.005		<0.02	<0.02	<0.05	<0.0002	<0.02			<0.005		0.018					7.55	726	453		0.02		34	24	48	0.8	0	56	61	181	0.6	
NP-2	8/29/1991																							8.11		471										63	198		
NP-2	11/26/1991																							7.45		460										63	170		
NP-2	3/15/1992											<0.05												8.07		467										68	194		
NP-2	5/25/1992											<0.05												8.34		456										67	162		
NP-2	7/16/1992											<0.05												8.13		479										65	184		
NP-2	10/8/1992																							8.26		494										78	179		
NP-2	11/27/1992																							8.38		451										64	179		
NP-2	12/15/1992											<0.05												8.43		612										83	167		
NP-2	2/25/1993																							8.62		475										78	197		
NP-2	3/30/1993	<0.01	0.5	<0.005	0.6		0.1	<0.002	<0.05	<0.02	0.01	1.85	<0.001	0.07	<0.02	<0.01	<0.02		0.005				0.67	7.70	1,910	1,310	240	3.30	<0.01	163	61	163	0.9	0	289	239	436	1.3	
NP-2	9/28/1993																							7.92		1,170										207	300		
NP-2	3/17/1994																							7.65		971										118	301		
NP-2	5/24/1994	<0.025	4.6	<0.005	<0.1			0.00097		<0.025	<0.025	4.50	<0.001	0.19		<0.05	0.0079	<0.005	<0.005				4.10	8.03	1,250	878		<0.1		120	47	100	2.3	0	261	130	300	1.0	
NP-2	6/23/1994																							7.69		848										124	268		
NP-2	7/22/1994	<0.025	<0.05	<0.005	<0.1	<0.002	<0.1	<0.0005	<0.05	<0.025	<0.025	<0.05	<0.001	<0.03	<0.05	<0.05	<0.005	0.0059	<0.005	<0.005			1.20	7.88	1,360	878		1.50		120	43	120	1.3	0	270	128	299	0.9	
NP-2	9/22/1994																							7.55		963										124	253		
NP-2	1/29/1995																							7.57		791										94	121		
NP-2	3/29/1995																							7.69		1,164										91	229		
NP-2	6/27/1995																							7.93		778										96	247		
NP-2	9/21/1995																							7.36		722										87	212		
NP-2	1/10/1996																							7.10		632										79	173		
NP-2	4/3/1996																							7.23		603										77	169		
NP-2	9/25/1996																							7.68		598										57	118		
NP-2	1/15/1997																							7.44		536										56	148		
NP-2	1/31/2010	<0.005	<0.02	0.0032	0.058	<0.002	<0.04	<0.002	<0.006	<0.006	<0.006	0.09	<0.0002	0.19	<0.008	<0.01	<0.005	<0.0025	0.017	<0.0025			1.10	8.00	1,100	746	160	2.50	<0.005	120	35	75	2.4	<2	160	150	210	0.5	
NP-2	6/28/2010	<0.005	<0.02	<0.001	0.057	<0.002	<0.04	<0.002	<0.006	<0.006	<0.006	<0.02	<0.0002	0.021	<0.008	<0.01	<0.005	<0.001	0.012	<0.001	0.0017	<0.05	0.26	7.00	1,200	846	170	2.70		130	35	71	2.2	<2	170	170	260	0.4	740
NP-3	10/8/1981	<0.02	<0.25	0.005	<1		0.188	<0.01	<0.05	<0.05	<0.05	<0.1	<1	0.81	<0.1	<0.05	<0.05		0.005				1.25	6.98		460		<0.05	<0.05	41	10	79	9.71	<1	211	29	95	1.6	
NP-3	10/27/1981	<0.02	<0.01	<0.01	0.2		<0.1	<0.005	<0.02	<0.01	<0.05	0.39	<0.001	1	0.16	<0.05	<0.02		<0.005				0.98	8.00		390		0.40	<0.01	41						28	148	1.9	
NP-3	10/30/1981	<0.02	<0.25	<0.005	<1		0.29	<0.01	<0.05	<0.05	<0.05	<0.1	<0.001	1.03	<0.1	<0.02	<0.05		<0.002				0.93	7.89		428		<0.05	<0.05							31	102	1.6	
NP-3	11/6/1981	<0.02	<0.01	<0.01	<0.2		<0.1	<0.005	<0.02	<0.01	<0.05	<0.1	<0.001	0.47	0.26	<0.05	<0.02		<0.005				1.10	7.90		380		0.20	<0.01	39						28	140	1.6	
NP-3	11/13/1981	0.023	<0.25	0.009	<0.1		0.034	<0.001		<0.005			<0.0005	1.01	0.065	<0.05	<0.005		0.023				1.59	7.60	600	446		0.16		55	13	44	5.85		190	27	141	1.4	
NP-3	11/17/1981	<0.02	<0.01	<0.01	0.24		<0.1	<0.005	<0.02	<0.01	<0.05	<0.1	<0.001	1	0.2	<0.05	<0.02		<0.005				1.20	8.10		390		<0.2	<0.01	44						26	144	1.4	
NP-3	11/23/1981	<0.01	<0.01	<0.01	0.02		<0.1	<0.005	<0.02	<0.02	<0.05	<0.1	<0.001	0.96	0.15	<0.05	<0.02		<0.005				1.90	7.80		460		0.20	<0.01	47						26	144	1.2	
NP-3	12/7/1981	<0.02	<0.01	<0.01	<0.2		<0.1	<0.005	<0.02	<0.01	<0.05	<0.1	<0.001	0.78	0.13	<0.05	<0.02		<0.005				3.50	7.90		450		<0.2	<0.01	47						28	153	1.1	
NP-3	12/15/1981	<0.02	<0.01	<0.01	<0.2		<0.1	<0.005	<0.02	<0.01	<0.05	<0.1	<0.001	0.87	0.094	<0.05	<0.02		<0.005				2.50	7.80		450		0.20	<0.01	56						26	149	1.1	
NP-3	12/22/1981	<0.02	<0.01	<0.01	<0.2		<0.1	<0.005	<0.02	<0.01	<0.05	<0.1	<0.001	0.76	0.1	<0.05	<0.02		<0.005				2.10	7.90		410		0.20	<0.01	73						26	149	0.9	
NP-3	1/5/1982	<0.02	<0.01	<0.01	<0.2		<0.1	<0.005	<0.02	<0.01	<0.05	0.31	<0.001	0.72	0.01	<0.05	<0.02		<0.02				1.70	7.70		360		0.20	<0.01	56						26	154	1.1	
NP-3	1/26/1982							<0.005			<0.05	<0.1	<0.001	0.7	<0.1				<0.005					8.10		400		0.20	<0.01							30	151	1.0	
NP-3	2/22/1982							<0.005			<0.05	0.14	<0.001	0.66	<0.05				<0.005					8.00		420		<0.2	<0.01							28	137	0.9	
NP-3	4/26/1982							<0.005			<0.05	0.24	<0.001	0.4	<0.05				<0.005					7.90		410		<0.2	<0.01							28	146	0.8	
NP-3	5/24/1982											<0.1		0.053																									
NP-3	5/28/1982											<0.1		0.063																									
NP-3	6/8/1982							<0.005			<0.05	<0.1	<0.001	0.1	<0.05				<0.005					7.90		500		1.90	<0.01							30	150	0.5	
NP-3	6/30/1982							<0.005			<0.05	<0.1	<0.001	0.081	<0.05				<0.005					7.90		510		1.80	<0.01							26	128	0.5	
NP-3	9/2/1982							<0.001						<0.05	<0.01				<0.005					7.50	750	498		1.94		77	15	64	3.9		308	28	124	0.5	
NP-3	10/27/1982							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					8.00		450		1.60	<0.01							26	132	0.6	
NP-3	2/21/1983							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					8.20		410		1.40	<0.01							26	131	0.5	

Appendix A.
Table A-3. Groundwater-quality data

sample location	analysis date	silver (mg/L)	aluminum (mg/L)	arsenic (mg/L)	barium (mg/L)	beryllium (mg/L)	boron (mg/L)	cadmium (mg/L)	cobalt (mg/L)	chromium (mg/L)	copper (mg/L)	iron (mg/L)	mercury (mg/L)	manganese (mg/L)	molybdenum (mg/L)	nickel (mg/L)	lead (mg/L)	antimony (mg/L)	selenium (mg/L)	thallium (mg/L)	uranium (mg/L)	vanadium (mg/L)	zinc (mg/L)	pH (std. units)	specific conductance (µS/cm)	total dissolved solids (mg/L)	total alkalinity (mg/L as CaCO3)	nitrate as total N (mg/L)	total cyanide (mg/L)	calcium (mg/L)	magnesium (mg/L)	sodium (mg/L)	potassium (mg/L)	carbonate (mg/L)	bicarbonate (mg/L)	chloride (mg/L)	sulfate (mg/L)	fluoride (mg/L)	total suspended solids
NP-3	5/13/1983							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					8.00		500		2.10	<0.01							64	139	0.5	
NP-3	8/9/1983							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					7.80		630		2.30	<0.01							114	100	0.5	
NP-3	11/1/1983							<0.005			<0.05	0.14	<0.001	<0.05	<0.05				<0.005					7.90		760		3.80	<0.01							162	163	0.5	
NP-3	3/16/1984							<0.005			<0.05	<0.1	0.001	<0.05	<0.05				<0.005					8.10		870		3.20	<0.01							228	216	0.6	
NP-3	5/30/1984							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					7.80		1,060		2.90	<0.01							248	292	0.4	
NP-3	9/12/1984							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					7.70		1,140		3.10	<0.01							270	292	0.4	
NP-3	11/27/1984							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					7.80		1,150		3.50	<0.01							290	348	0.4	
NP-3	5/17/1985																							7.70		1,470										310	453		
NP-3	11/13/1985																							7.20		1,520										288	541		
NP-3	5/23/1986																							7.50		1,590										282	624		
NP-3	10/8/1986																							7.40		1,710										272	620		
NP-3	3/3/1987																																				695		
NP-3	3/4/1987																							6.80	1,850	1,882				320	67	117	4.29		188	283	695		
NP-3	5/25/1987																																				736		
NP-3	1/12/1988	<0.1	<0.1		<0.1	<0.1	<0.1	<0.1	<0.05	<0.1	<0.1	<0.1		0.57	<0.1	<0.1	<0.1						1.10			1,584				268	57	142	38		30	359	755		
NP-3	4/4/1988																									1,772										254	587		
NP-3	8/23/1988																									1,744										251	835		
NP-3	2/9/1989																									1,583										254	763		
NP-3	6/1/1989																									1,596										241	714		
NP-3	11/30/1989																									1,600										159	743		
NP-3	11/14/1990																									1,675										229	822		
NP-3	2/11/1991			<0.001																						1,551										256	971		
NP-3	7/19/1991	<0.02		<0.002	<0.01			<0.005		<0.02	<0.02	0.28	0.0002	0.08			<0.005		0.011					8.29	2,520	1,663		0.23		287	53	190	7	0	192	239	820	0.7	
NP-3	8/29/1991																							7.84		1,616										254	854		
NP-3	11/26/1991																							7.08		1,613										248	745		
NP-3	3/15/1992																							7.63		1,644										228	921		
NP-3	5/25/1992																							7.85		1,607										216	753		
NP-3	7/16/1992																							7.26		1,578										226	802		
NP-3	10/8/1992																							7.69		1,445										212	799		
NP-3	11/27/1992																							7.49		1,640										255	796		
NP-3	12/15/1992										0.01													7.75		1,558										223	545		
NP-3	2/25/1993																							7.65		1,580										219	794		
NP-3	3/30/1993	<0.01	0.1	<0.005	<0.5		0.02	<0.002	<0.05	<0.02	0.01	4.99	<0.001	0.32	<0.02	<0.01	<0.02		<0.005				6.98	7.40	2,070	1,560			<0.01	296	35	129	4.1	0	29	205	825	0.5	
NP-3	9/28/1993										<0.001	<0.05		0.24									1.04	7.88		1,544										210	619		
NP-3	3/17/1994										0.012	0.24		0.33									2.58	7.46		1,609										170	747		
NP-3	6/23/1994																							7.77		1,628										206	779		
NP-3	7/22/1994	<0.025	<0.05	<0.005	<0.1	<0.002	<0.1	<0.0005	<0.05	<0.025	<0.025	<0.05	<0.001	0.61	<0.05	<0.05	<0.005	<0.005	<0.005	<0.005			1.80	7.83	2,160	1,620		<1		320	73	120	4.5	0	118	194	796	0.3	
NP-3	9/22/1994																							7.65		1,691										196	707		
NP-3	1/29/1995																							7.45		1,623										*566*	652		
NP-3	3/29/1995																							7.48		1,639										186	558		
NP-3	6/27/1995																							7.38		1,607										203	717		
NP-3	9/21/1995																							7.50		1,557										208	822		
NP-3	1/10/1996																							7.32		1,464										209	724		
NP-3	4/3/1996																							7.29		1,415										208	723		
NP-3	9/25/1996																							7.72		1,472										191	537		
NP-3	1/15/1997																							7.51		1,478										207	657		
NP-3	7/8/2010	<0.005	<0.02	<0.0010	0.03	<0.002	<0.04	<0.002	<0.006	<0.006	<0.006	0.05	<0.0002	0.031	<0.008	<0.01	<0.005	<0.001	0.023	<0.001	0.0014	<0.05	0.44	8.00	2,100	1,740	120	6.80		310	60	120	3.6	<2	120	270	790	0.4	100
NP-3	10/7/2010	<0.005	<0.02	<0.005	0.031	<0.002	<0.04	<0.002	<0.006	<0.006	<0.006	0.10	<0.0002	0.015	<0.008	<0.01	<0.005	<0.001	0.023	<0.001	0.0015	<0.05	0.31	7.57	2,000	1,660	120	5.60		290	60	110	3.5	<2	120	290	830	0.3	97
NP-3	5/11/2011	<0.005	<0.02	0.0029	0.032	<0.002	<0.04	<0.002	<0.006	<0.006	<0.006	0.04	<0.0002	0.022	<0.008	<0.01	<0.005	<0.001	0.027	<0.001	0.0015	<0.05	0.24	7.69	2,100	1,640	130	6.20	<0.005	300	57	120	3.3	<2	130	270	790	0.3	400
NP-4	4/26/1982							<0.005			0.051	3.80	<0.001	0.6	0.07				<0.005					8.60		410		0.60	<0.01							46	132	1.5	
NP-4	5/17/1982							<0.005			<0.05	0.11	<0.001	<0.05	<0.05				<0.005					9.40		310		1.30	<0.01							46	138	1.0	
NP-4	5/24/1982											<0.1		<0.05																									
NP-4	5/28/1982											<0.1		<0.05																									
NP-4	6/8/1982							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					8.40		420		4.50	<0.01							26	140	0.5	

Appendix A.
Table A-3. Groundwater-quality data

sample location	analysis date	silver (mg/L)	aluminum (mg/L)	arsenic (mg/L)	barium (mg/L)	beryllium (mg/L)	boron (mg/L)	cadmium (mg/L)	cobalt (mg/L)	chromium (mg/L)	copper (mg/L)	iron (mg/L)	mercury (mg/L)	manganese (mg/L)	molybdenum (mg/L)	nickel (mg/L)	lead (mg/L)	antimony (mg/L)	selenium (mg/L)	thallium (mg/L)	uranium (mg/L)	vanadium (mg/L)	zinc (mg/L)	pH (std. units)	specific conductance (µS/cm)	total dissolved solids (mg/L)	total alkalinity (mg/L as CaCO3)	nitrate as total N (mg/L)	total cyanide (mg/L)	calcium (mg/L)	magnesium (mg/L)	sodium (mg/L)	potassium (mg/L)	carbonate (mg/L)	bicarbonate (mg/L)	chloride (mg/L)	sulfate (mg/L)	fluoride (mg/L)	total suspended solids
NP-4	6/30/1982							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					9.50		270		<0.2	<0.01							28	115	0.4	
NP-4	9/2/1982							<0.001						<0.05	<0.01				<0.005					8.50	410	252		0.03		7	4	71	3.9		63	29	107	0.4	
NP-4	10/27/1982							0.0061			<0.05	0.34	<0.001	<0.05	<0.05				<0.005					8.90		230		<0.2	<0.01							36	108	0.4	
NP-4	2/21/1983							<0.005			<0.05	0.28	0.001	<0.05	<0.05				<0.005					9.30		250		0.20	<0.01							48	115	0.4	
NP-4	5/13/1983							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					7.90		340		<0.2	<0.01							76	134	0.4	
NP-4	8/9/1983							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					8.80		430		<0.2	<0.01							94	156	0.3	
NP-4	11/1/1983							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					8.20		530		0.60	<0.01							114	206	0.3	
NP-4	3/16/1984							<0.005			<0.05	<0.1	0.001	<0.05	<0.05				<0.005					8.00		540		0.20	<0.01							126	256	0.6	
NP-4	5/30/1984							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					8.00		630		<0.2	<0.01							134	320	0.3	
NP-4	9/12/1984							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					8.00		760		0.90	<0.01							134	339	0.3	
NP-4	11/27/1984							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					8.50		740		0.20	<0.01							140	354	0.3	
NP-4	5/17/1985																							8.20		770										146	348		
NP-4	11/13/1985																							8.00		690										142	292		
NP-4	5/23/1986																							8.00		690										136	300		
NP-4	10/8/1986																							7.80		660										134	290		
NP-4	5/25/1987																																				279		
NP-4	1/12/1988	<0.1	<0.1		<0.1	<0.1	<0.1	<0.1	<0.05	<0.1	<0.1	<0.1		0.06	<0.1	<0.1	<0.1						0.10			612				76	21	86	5		24	137	256		
NP-4	4/4/1988																									610										130	329		
NP-4	8/23/1988																									688										132	292		
NP-4	2/9/1989																									604										130	267		
NP-4	6/1/1989																									580										116	244		
NP-4	11/30/1989																									572										97	237		
NP-4	11/14/1990																									262										153	255		
NP-4	2/11/1991			<0.001																						676										126	289		
NP-4	7/19/1991	<0.02		<0.002	0.28			<0.005		<0.02		5.14	<0.0002	<0.02			<0.005		<0.002					7.81	802	532		0.07		63	21	67	3.1	0	55	112	199	0.4	
NP-4	8/29/1991																							8.37		532										111	232		
NP-4	11/26/1991																							8.54		522										99	194		
NP-4	3/15/1992																							8.85		465										103	217		
NP-4	5/25/1992																							8.62		439										106	171		
NP-4	7/16/1992																							7.64		458										94	177		
NP-4	10/8/1992																							9.01		535										103	183		
NP-4	11/27/1992																							8.12		495										98	202		
NP-4	12/15/1992																							9.52		424										84	151		
NP-4	2/25/1993																							9.85		349										77	151		
NP-4	3/31/1993	<0.01	0.3	<0.005	<0.5		0.04	<0.002	<0.05	<0.02	0.01	0.62	0.009	0.84	<0.02	<0.01	<0.02		<0.005				2.41	7.60	813	504	230	3.70	<0.01	76	17	79	2.2	0	275	45	134	0.5	
NP-4	9/28/1993																							8.20		437										57	109		
NP-4	5/26/1994	<0.025	3.5	<0.005	<0.1			0.0034		<0.025	<0.025	15.00	<0.001	0.16		<0.05	0.018	<0.005	<0.005				12.00	8.10	800	666		4.30		73	15	62	3	0	320	39	131	0.5	
NP-4	6/23/1994																							8.13		498										49	134		
NP-4	7/23/1994	<0.025	<0.05	<0.005	<0.1	<0.002	<0.1	<0.0005	<0.05	<0.025	<0.025	<0.05	<0.001	<0.03	<0.05	<0.05	<0.005	0.01	<0.005	<0.005			0.51	7.90	828	536		4.60		88	16	72	2.5	0	279	34	120	0.5	
NP-4	9/22/1994																							7.73		547										37	111		
NP-4	1/29/1995																							7.88		447										35	111		
NP-4	3/29/1995																							7.86		494										34	122		
NP-4	6/27/1995																							7.37		487										33	134		
NP-4	9/21/1995																							7.51		509										35	132		
NP-4	1/10/1996																							7.35		483										35	123		
NP-4	4/3/1996																							7.19		475										26	123		
NP-4	9/25/1996																							7.75		504										32	126		
NP-4	1/15/1997																							7.43		2,651										98	1,113		
NP-4	1/31/2010	<0.005	<0.02	<0.0025	0.036	<0.002	<0.04	<0.002	<0.006	<0.006	<0.006	0.04	<0.0002	0.0098	<0.008	<0.01	<0.005	<0.0025	0.0057	<0.0025			1.30	8.00	900	626	210	7.40	<0.005	100	18	79	2.4	<2	210	40	190	0.5	
NP-4	7/2/2010	<0.005	<0.02	<0.001	0.039	<0.002	<0.04	<0.002	<0.006	<0.006	<0.006	<0.02	<0.0002	0.002	<0.008	<0.01	<0.005	<0.001	0.0043	<0.001	0.0023	<0.05	0.82	8.00	910	640	210	7.50		110	18	70	2.1	<2	210	39	190	0.5	140
NP-5	11/4/1981	<0.02	<0.01	<0.01	<0.2		<0.1	<0.005	<0.02	<0.01	<0.05	<0.1	<0.001	0.1	<0.05	<0.05	<0.02		<0.005				0.14	8.00		570		4.10	<0.01	86						50	196	1.3	
NP-5	11/13/1981	<0.001	0.239	<0.005	0.218		0.07	<0.001		<0.005	<0.1		<0.0005	0.14	0.015	0.019	<0.005		0.014				<0.05	7.70	650	488		3.56	0.001	89	14	44	5.07		187	38	162	1.3	
NP-5	11/17/1981	<0.02	<0.01	<0.01	<0.2		<0.1	<0.005	<0.02	<0.01	<0.05	<0.1	<0.001	0.3	0.07	<0.05	<0.02		<0.005				0.19	8.00		500		2.70	<0.01	72						42	158	1.3	
NP-5	11/23/1981	<0.1	<0.01	<0.01	<0.2		<0.1	<0.005	<0.02	<0.02	<0.05	<0.1	<0.001	0.091	<0.05	<0.05	<0.02		<0.005				0.21	7.80		580		4.00	<0.01	73						36	161	1.2	

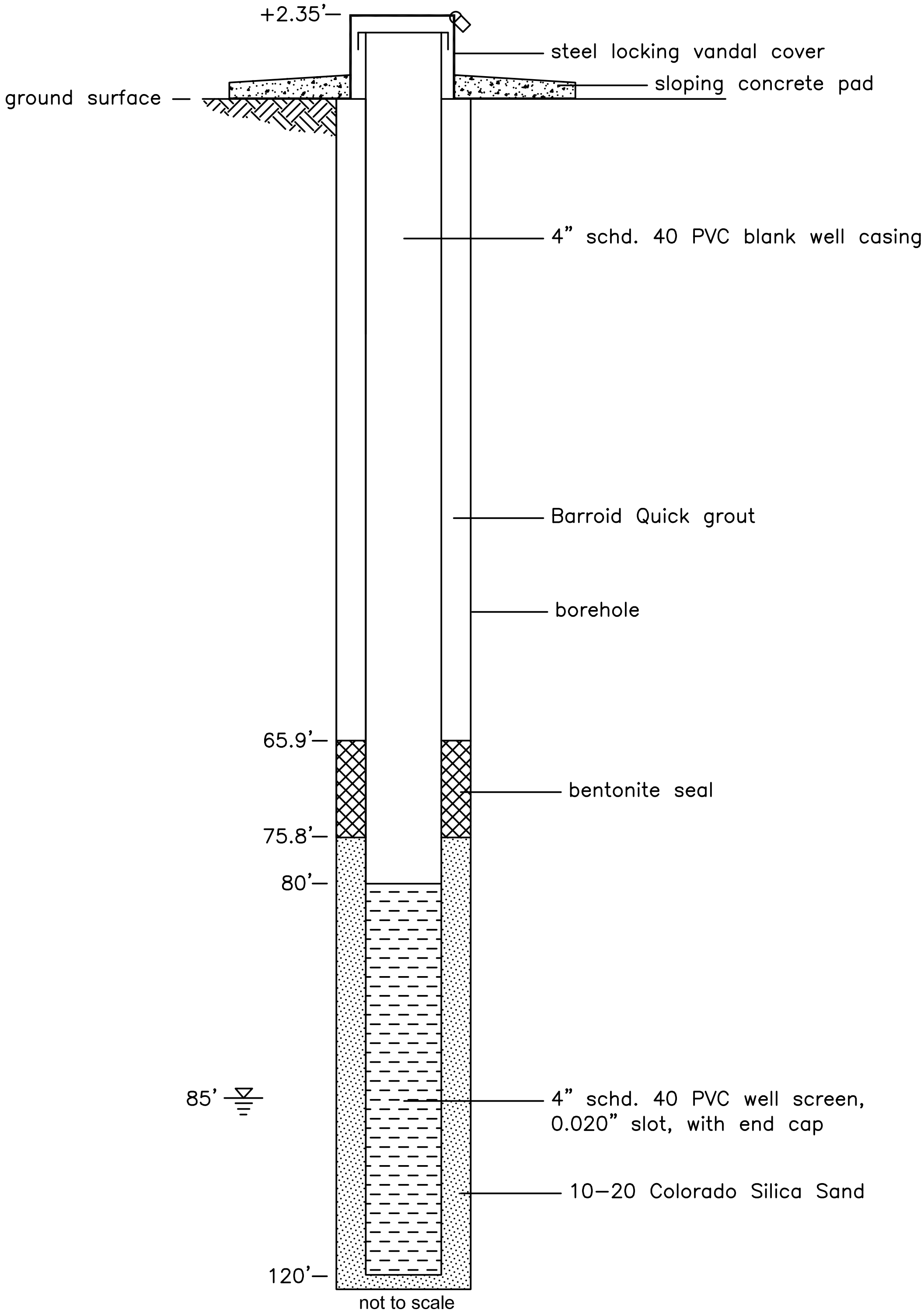
Appendix A.
Table A-3. Groundwater-quality data

sample location	analysis date	silver (mg/L)	aluminum (mg/L)	arsenic (mg/L)	barium (mg/L)	beryllium (mg/L)	boron (mg/L)	cadmium (mg/L)	cobalt (mg/L)	chromium (mg/L)	copper (mg/L)	iron (mg/L)	mercury (mg/L)	manganese (mg/L)	molybdenum (mg/L)	nickel (mg/L)	lead (mg/L)	antimony (mg/L)	selenium (mg/L)	thallium (mg/L)	uranium (mg/L)	vanadium (mg/L)	zinc (mg/L)	pH (std. units)	specific conductance (µS/cm)	total dissolved solids (mg/L)	total alkalinity (mg/L as CaCO3)	nitrate as total N (mg/L)	total cyanide (mg/L)	calcium (mg/L)	magnesium (mg/L)	sodium (mg/L)	potassium (mg/L)	carbonate (mg/L)	bicarbonate (mg/L)	chloride (mg/L)	sulfate (mg/L)	fluoride (mg/L)	total suspended solids
NP-5	12/7/1981	<0.02	<0.01	<0.01	<0.2		<0.1	<0.005	<0.02	<0.01	<0.05	<0.1	<0.001	<0.05	<0.05	<0.05	<0.02		<0.005				0.24	7.90		510		3.10	<0.01	66						34	172	1.2	
NP-5	12/15/1981	<0.02	<0.01	<0.01	<0.2		<0.1	<0.005	<0.02	<0.01	<0.05	<0.1	<0.001	0.08	<0.05	<0.05	<0.02		<0.005				0.37	7.80		500		3.30	<0.01	90						36	168	1.2	
NP-5	12/22/1981	<0.02	<0.01	<0.01	<0.2		<0.1	<0.005	<0.02	<0.01	<0.05	<0.1	<0.001	<0.05	<0.05	<0.05	<0.02		<0.005				0.32	7.90		460		3.80	<0.01	101						36	161	1.1	
NP-5	1/5/1982	<0.02	<0.01	<0.01	<0.2		<0.1	<0.005	<0.02	<0.01	<0.05	0.18	<0.001	<0.05	<0.05	<0.05	<0.02		<0.02				0.40	7.70		420		4.10	<0.01	87						34	163	1.1	
NP-5	1/26/1982							<0.005			<0.05	<0.01	<0.001	<0.05	<0.1				<0.005					8.00		440		2.90	<0.01							32	158	1.1	
NP-5	2/22/1982							<0.005			<0.05	0.12	<0.001	<0.05	<0.05				<0.005					8.00		450		2.00	<0.01							32	150	1.0	
NP-5	4/26/1982							<0.005			0.31	3.80	<0.001	6.9	<0.05				<0.005					7.90		450		1.10	0.04							30	154	1.1	
NP-5	5/17/1982							<0.005			<0.05	0.14	<0.001	<0.05	<0.05				<0.005					8.00		490		6.70	<0.01							36	165	1.1	
NP-5	5/24/1982											<0.1		<0.05																									
NP-5	5/28/1982											<0.1		<0.05																									
NP-5	6/8/1982							<0.005			<0.05	0.44	<0.001	<0.05	<0.05				<0.005					8.10		420		4.50	<0.01							30	150	0.9	
NP-5	6/30/1982							<0.005			<0.05	0.36	<0.001	<0.05	<0.05				<0.005					8.10		460		3.90	<0.01							28	133	0.9	
NP-5	9/2/1982							<0.001						<0.05	<0.01				<0.005					7.60	650	472		4.20		73	22	46	3.9		206	34	137	0.8	
NP-5	10/27/1982							<0.005			<0.05	0.21	<0.001	<0.05	<0.05				<0.005					8.00		440		3.70	<0.01							34	139	0.8	
NP-5	2/21/1983							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					8.30		420		1.30	<0.01							26	139	0.5	
NP-5	5/13/1983							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					8.90		290		0.20	<0.01							70	134	0.4	
NP-5	8/9/1983							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					8.10		460		3.70	<0.01							26	108	0.8	
NP-5	11/1/1983							<0.005			<0.05	0.10	<0.001	<0.05	<0.05				<0.005					8.20		440		5.20	<0.01							30	111	0.8	
NP-5	3/16/1984							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					8.00		380		3.00	<0.01							26	130	0.4	
NP-5	5/30/1984							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					7.80		400		2.90	<0.01							22	139	0.8	
NP-5	9/12/1984							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					8.00		420		3.40	<0.01							28	125	0.8	
NP-5	11/27/1984							<0.005			<0.05	<0.1	<0.001	<0.05	<0.05				<0.005					8.20		420		3.20	<0.01							28	120	0.8	
NP-5	5/17/1985																							7.90		450										28	130		
NP-5	11/13/1985																							7.80		400										24	134		
NP-5	5/23/1986																							7.90		430										28	120		
NP-5	10/8/1986																							7.80		420										28	113		
NP-5	3/30/1989	<0.1	<0.1		<0.1	<0.1	<0.1	<0.1	<0.05	<0.1	<0.1	<0.1		<0.05	<0.1	<0.1	<0.1						0.40			458				82	22	39	3		211	32	125		
NP-5	8/29/1991																							7.68		499										39	152		
NP-5	11/26/1991																							7.00		472										38	130		
NP-5	3/15/1992																							7.89		456										47	141		
NP-5	5/25/1992																							7.80		490										76	131		
NP-5	7/16/1992																							7.63		476										38	132		
NP-5	10/8/1992																							7.64		431										39	133		
NP-5	11/27/1992																							8.01		475										117	134		
NP-5	12/15/1992										0.025													7.80		402										40	104		
NP-5	2/25/1993																							7.65		487										41	141		
NP-5	3/30/1993	<0.01	0.2	<0.005	<0.5		0.04	<0.002	<0.05	<0.02	<0.01	0.29	<0.001	0.02	<0.02	<0.01	<0.02		<0.005				0.19	7.80	746	488	200	4.00	<0.01	76	26	43	2.5	0	221	39	146	0.8	
NP-5	9/28/1993																							7.79		518										48	109		
NP-5	5/24/1994	<0.025	1.1	<0.005	<0.1			<0.0005		<0.025	<0.025	1.20	<0.001	0.086		<0.05	0.0077	<0.005	<0.005				2.30	7.84	680	520		3.40		86	26	40	3.4	0	211	41	130	0.7	
NP-5	6/23/1994																							7.66		466										54	142		
NP-5	7/23/1994	<0.025	<0.05	<0.005	<0.1	<0.002	<0.1	<0.0005	<0.05	<0.025	<0.025	<0.05	<0.001	<0.03	<0.05	<0.05	<0.005	<0.005	<0.005	<0.005			<0.05	7.89	749	494		3.30		79	24	45	3.1	0	206	41	131	0.7	
NP-5	9/22/1994																							7.73		526										43	118		
NP-5	1/29/1995																							7.99		490										44	101		
NP-5	3/29/1995																							7.94		449										42	131		
NP-5	6/27/1995																							7.64		525										43	119		
NP-5	9/21/1995																							7.71		483										44	135		
NP-5	1/10/1996																							8.04		406										42	137		
NP-5	4/3/1996																							7.67		405										32	130		
NP-5	9/25/1996																							8.09		504										43	129		
NP-5	1/15/1997																							7.76		498										46	141		
NP-5	6/28/2010	<0.005	<0.02	0.0014	0.018	<0.002	<0.04	<0.002	<0.006	<0.006	<0.006	<0.02	<0.0002	<0.002	<0.008	<0.01	<0.005	<0.001	0.0067	<0.001	0.0013	<0.05	0.29	8.00	900	623	160	3.90		100	31	44	2.9	<2	160	80	180	0.7	23
NP-5	9/30/2010	<0.005	<0.02	0.0015	0.018	<0.002	0.041	<0.002	<0.006	<0.006	<0.006	<0.02	<0.0002	0.005	<0.008	<0.01	<0.005	<0.001	0.0079	<0.001	0.0013	<0.05	0.20	7.72	910	629	170	4.00	<0.01	99	33	46	2.8	<2	170	83	170	0.7	31
NP-5	5/10/2011	<0.005	<0.02	0.0018	0.019	<0.002	0.042	<0.002	<0.006	<0.006	<0.006	<0.02	<0.0002	<0.002	<0.008	<0.01	<0.005	<0.001	0.0076	<0.001	0.0013	<0.05	0.26	7.76	940	636	160	4.10	<0.01	100	32	45	2.9	<2	160	79	180	0.6	130

Notes: outlier values in gray shading

Appendix B.

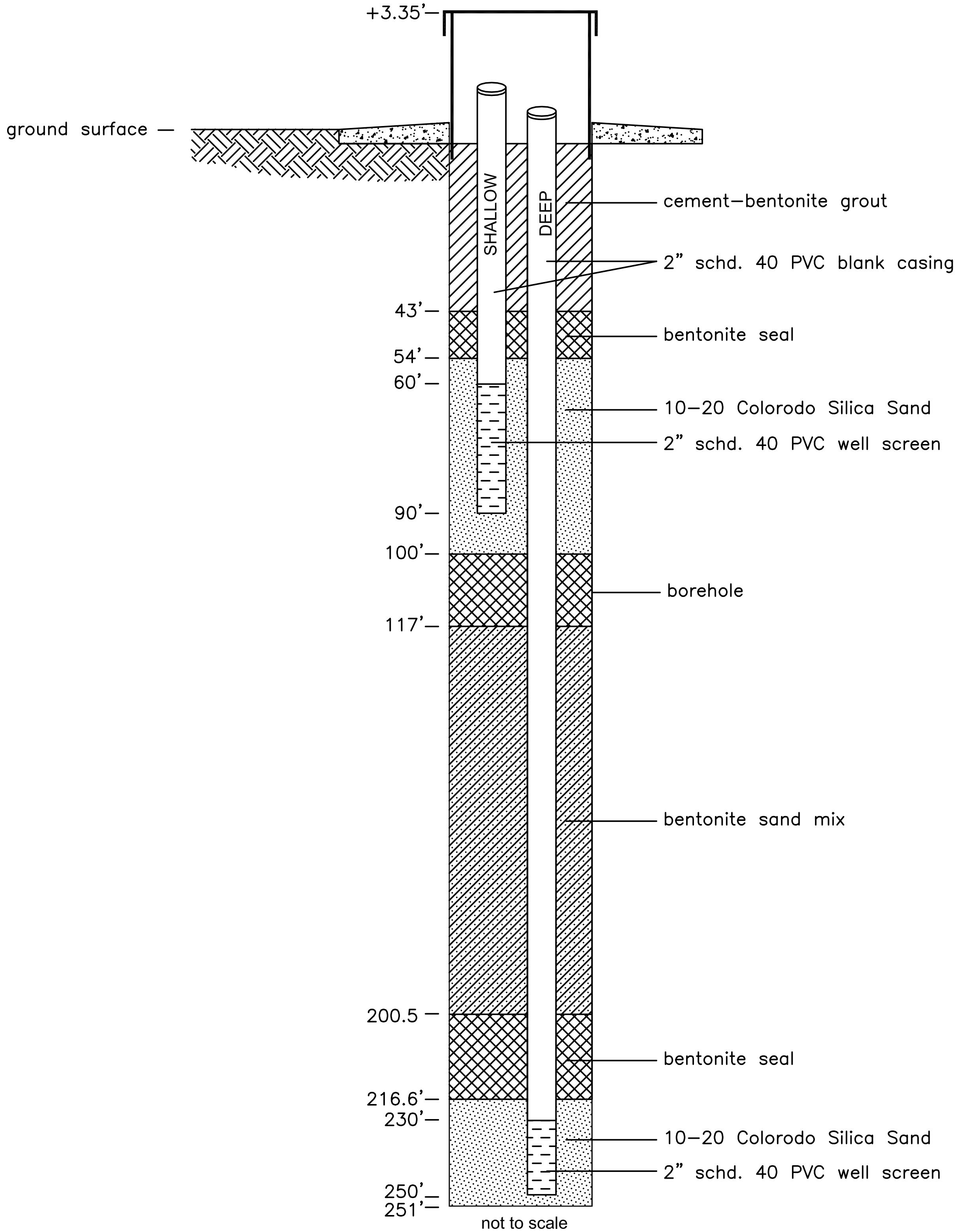
Construction diagrams for GWQ-5R, GWQ11-24(A,B), and GWQ11-25(A,B)



Well completion diagram for replacement monitoring well GWQ-5R.
LRG-15080 POD 3, completed September 1, 2011.

JOHN SHOMAKER & ASSOCIATES, INC.

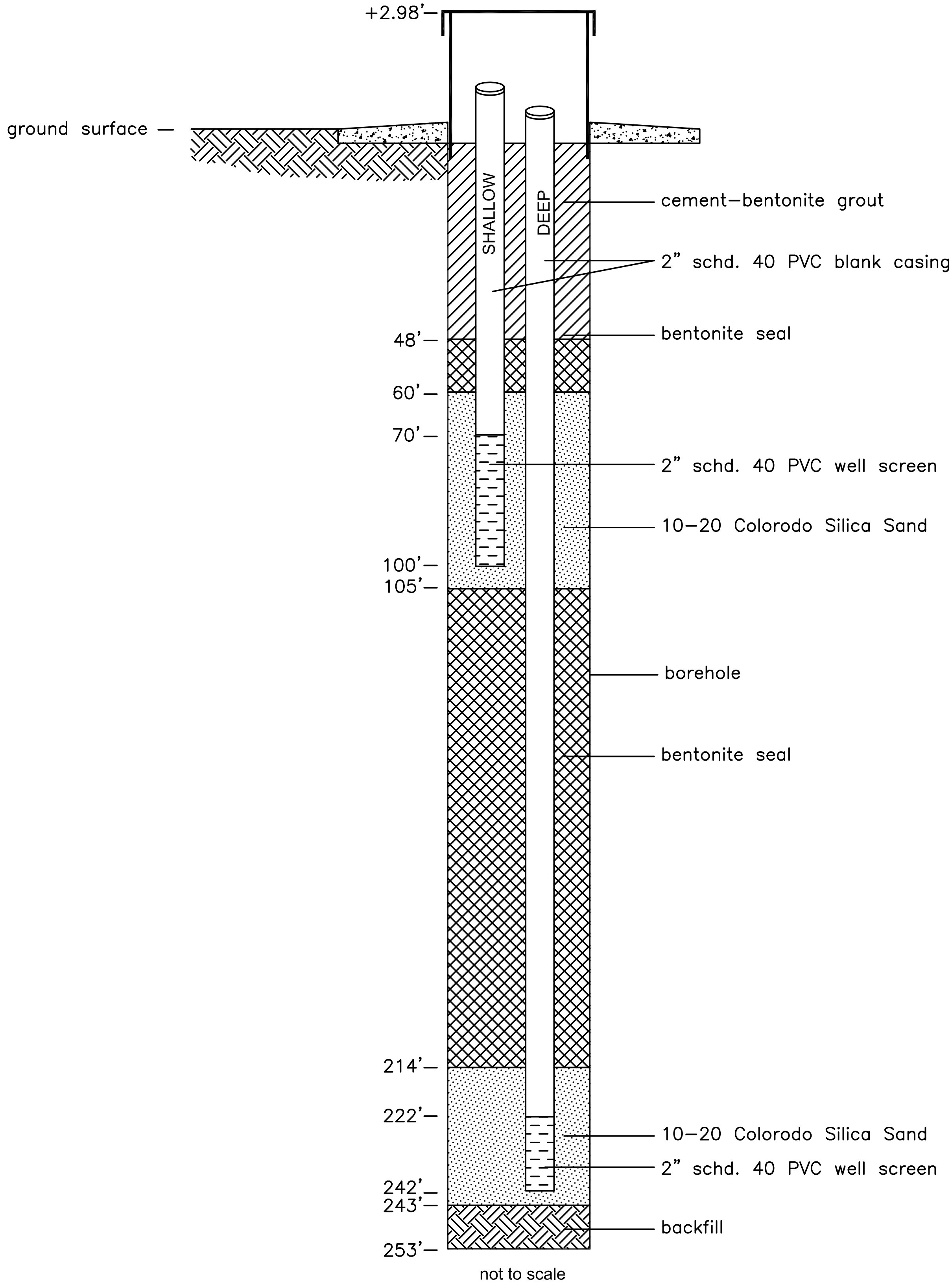
 10/13/2011



Well completion diagram of nested piezometer GWQ11-24.
LRG-15080 POD 1, completed August 5, 2011.

JOHN SHOMAKER & ASSOCIATES, INC.

02256 10/13/2011



Well completion diagram of nested piezometer GWQ11-25.
LRG-15080 POD 2, completed August 28, 2011.

JOHN SHOMAKER & ASSOCIATES, INC.

02257 10/13/2011

10-19-2011

Gmail

Steve Raugust <sraugust@themacresourcesgroup.com>

Copper Flat Mine status meeting proposed agenda and call-in information

2 messages

Jens Deichmann <jdeichmann@themacresourcesgroup.com> **Wed, Oct 19, 2011 at 4:58 PM**

To: "Myers, Kevin, OSE" <kevin.myers@state.nm.us>, "Huey, Greg, NMENV" <greg.huey@state.nm.us>, "Eustice, Chris, EMNRD" <chris.eustice@state.nm.us>, "Hennessey, Joseph, OSE" <Joseph.Hennessey@state.nm.us>, "Vollbrecht, Kurt, NMENV" <kurt.vollbrecht@state.nm.us>, "Jankowitz, Rachel J., DGF" <rachel.jankowitz@state.nm.us>, "Kliphuis, Trais, NMENV" <trais.kliphuis@state.nm.us>, Doug Haywood <dhaywood@blm.gov>, Mike Smith <mikesmit@blm.gov>, "Shepherd, Holland, EMNRD" <holland.shepherd@state.nm.us>
Cc: Steve Raugust <sraugust@themacresourcesgroup.com>, Ferol Baker <fbaker@themacresourcesgroup.com>

Here are the agenda items we propose for tomorrow's meeting. Of course we will want to include any that you might have as well.

1. Brief recap of progress in last month, remaining work to be be accomplished in field
2. Discuss Fish Bone Diagram and activity and deliverable sequencing and interdependency
3. The timing of the BDR and the PAP submittals as well as the expectations and level of effort for the PAP
4. The level of effort and content of the Closure Closeout Plan (PAP Reclamation Designs)
5. Progress on the MPO review for the Groundwater Discharge Plan
6. State agency expectation of involvement in 3rd Party NEPA contractor selection
7. Other

Call 1-888-757-27902. Enter participant pass code 187864
Thanks, Jens
--
Jens Deichmann
Permitting Manager - Regulatory
Copper Flat Mine
THEMAC Resources Group, LTD.
2425 San Pedro NE
Albuquerque, NM 87110
Office: 505.382.5770
Mobile: 505-681-2536
Fax: 505-881-4616
www.themacresourcesgroup.com

Steve Raugust <sraugust@themacresourcesgroup.com> **Wed, Oct 19, 2011 at 5:25 PM**

To: Jens Deichmann <jdeichmann@themacresourcesgroup.com>

11-03-2011

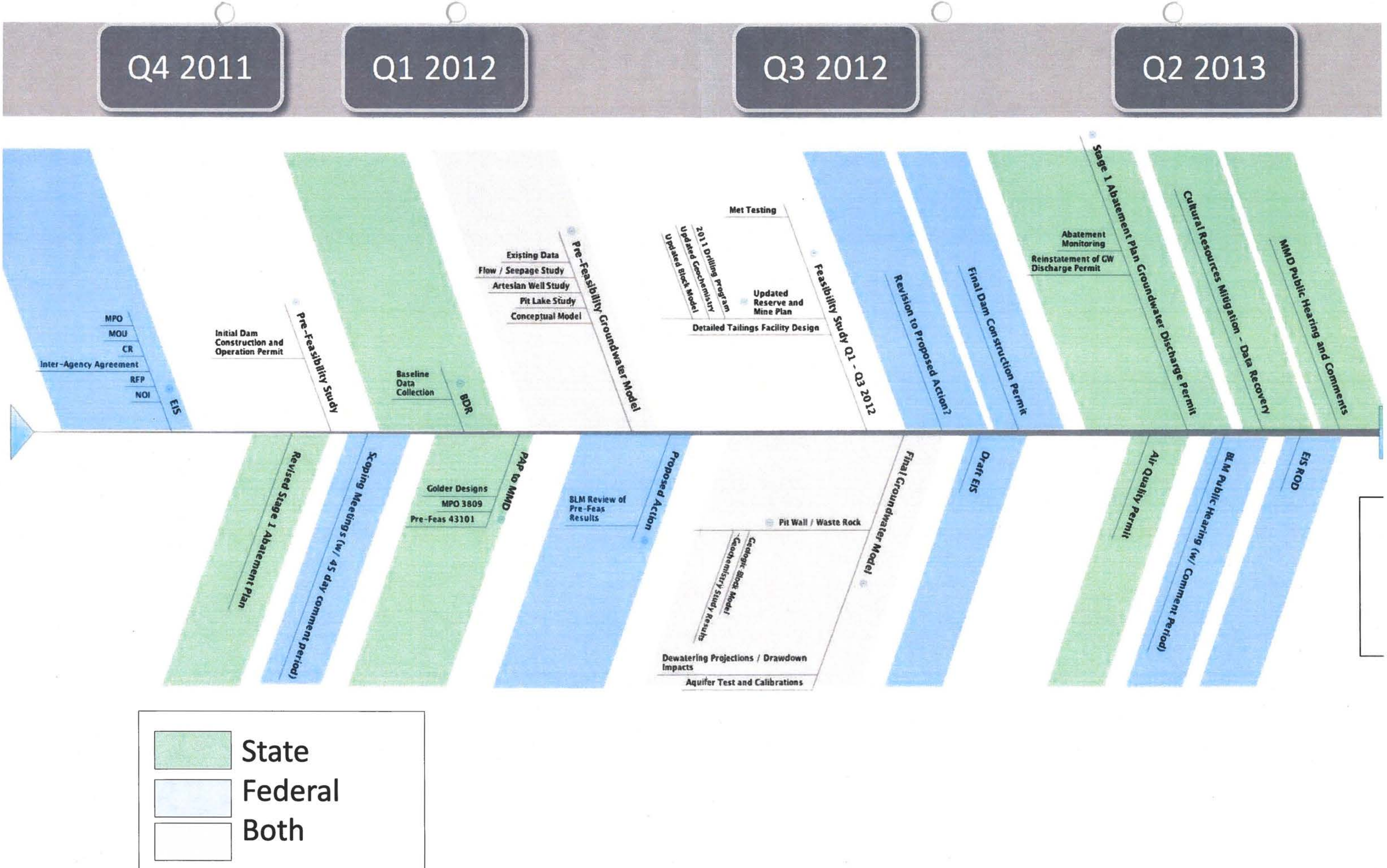
Meeting between NMED, NMCC & MMD to discuss progress of NMED technical review of the Copper Flat Mine Plan of Operations

November 3, 2011

Draft Comments on the Cu+ Flat Mine Plan of Operations, June, 2011. 43 CFR .3809

1. Page 3-3 and 5-8 state that post closure monitoring will be conducted for 5 years. MMD requires 12 years of monitoring before FA may be released, and GWQB may require additional ground water monitoring.
2. Page 3-3: Waste Rock for pad preparation, plant site development & reclamation? K waste only. Analysis required. materials Handling plan - ORE, mineralized W.R., W.R.
3. Page 3-6: liner may be required for any expansion of WRDF. Analysis required.
4. Page 3-7: spill contingency plan required.
5. Page 3-9: surge stockpile? Size? Location? Low grade pile blended?
6. Page 3-10:Concentrates loaded by front end loader? Dry stack? Handling plan required.
7. Page3-13: plans for new monitoring wells should be submitted for NMED approval. - APP adendum
8. Page 3-14: use process water for dust control? What are the WQ characteristics of the process water?
9. Page 3-19: Need to determine Borrow Areas.
10. Page 5-4 states that NMCC is currently preparing a Ground Water Discharge Permit. Actually, NMCC has submitted a Discharge Permit **application** and GWQB is currently conducting a technical review of that application in preparation for writing a Draft Discharge Permit.
11. Page 5-7: Wetland Alterations: approval from USACE?
12. Page 5-9: exceed 2.5:1 slope?
13. Page 5-18: include NMED
14. Page 5-25: joint FA between NMED & MMD?
15. Appendix D: NMCC acknowledges 2.5' of cover & 6" top dressing required. →
16. Appendix D: proposal to use old tailing material as dam construction material or liner bedding.
17. Appendix E: ERP for reagents? Pg 3-27
18. Need results of feasibility study for tailing design plan. Specific plans will be required for Draft DP preparation.
19. Results of WRP studies required for final WRP design & approval of build out.

{ P.L. Leak detection



Q4 2011
Q1 2012
Q3 2012
Q2 2013
EIS
MPO
MOU
CR
Inter-Agency Agreement
RFP
NOI
Pre-Feasibility Study
Initial Dam Construction and Operation Permit
BDR
Baseline Data Collection
Pre-Feasibility Groundwater Model
Existing Data
Flow / Seepage Study
Artesian Well Study
Pit Lake Study
Conceptual Model
Feasibility Study Q1 - Q3 2012
Met Testing
2011 Drilling Program
Updated Geochemistry
Updated Block Model
Updated Reserve and Mine Plan
Detailed Tailings Facility Design
Revision to Proposed Action?
Final Dam Construction Permit
Stage 1 Abatement Plan Groundwater Discharge Permit
Abatement Monitoring
Reinstatement of GW Discharge Permit
Cultural Resources Mitigation - Data Recovery
MMD Public Hearing and Comments
Revised Stage 1 Abatement Plan
Scoping Meetings (w/ 45 day comment period)
PAP to MMD
Golder Designs
MPO 3809
Pre-Feas 43101
Proposed Action
BLM Review of Pre-Feas Results
Final Groundwater Model
Pit Wall / Waste Rock
Geologic Block Model
Geochemistry Study Results
Dewatering Projections / Drawdown Impacts
Aquifer Test and Calibrations
Draft EIS
Air Quality Permit
BLM Public Hearing (w/ Comment Period)
EIS ROD
State
Federal
Both

11-8-2011

From: Haywood, Doug [dhaywood@blm.gov]
Sent: Tuesday, November 08, 2011 7:14 AM
To: Huey, Greg, NMENV
Subject: FW: Due date for the Copper flat mine proposal selection.

Interesting, your email just kicked back. Let me try it again.

Douglas

From: Haywood, Doug
Sent: Tuesday, November 08, 2011 7:08 AM
To: 'greg.huey@state.nm.us'; Montoya, Jennifer A
Subject: Due date for the Copper flat mine proposal selection.

Greg,

Sorry about the email. You have to love advances in technology! BLM needs your response by COB on Friday November 11, 2011. I will compile them on Monday and if we are all in agreement or with minor difference then BLM will select a contractor then, if there are some major concerns then I will schedule a conference call for Tuesday morning November 15, 2011. If you have any questions drop me a line.

Thanks,

Douglas Haywood
BLM Project Manager
575-525-4498

11-8-2011

From:	Haywood, Doug [dhaywood@blm.gov]
Sent:	Tuesday, November 08, 2011 6:53 AM
To:	Eustice, Chris, EMNRD
Cc:	Shepherd, Holland, EMNRD; Vollbrecht, Kurt, NMENV; Ennis, David, EMNRD; Huey, Greg, NMENV; Smith, Michael A; Montoya, Jennifer A
Subject:	RE: Proposals for Copper Flat EIS and EE

Chris,

For the short term, would you please just provide me with your priority ranking in an email. If there are areas that you feel really strong about one way or the other also include a little note so that BLM makes sure that we take that into account when making the final decision. I will compile/compare everyone's list on Monday November 14, 2011 or earlier if I get all the results back sooner. If there is one company that makes it to the top of the list then we will just go with it. If there are major conflicting items then I will schedule a conference call for Tuesday morning November 15, 2011 to iron out any concerns. If you have any questions please drop me a line.

Thanks,

Douglas Haywood
BLM Project Manager
575-525-4498

From: Eustice, Chris, EMNRD [mailto:chris.eustice@state.nm.us]
Sent: Friday, November 04, 2011 4:06 PM
To: Haywood, Doug
Cc: Shepherd, Holland, EMNRD; Vollbrecht, Kurt, NMENV; Ennis, David, EMNRD; Huey, Greg, NMENV; Smith, Michael A
Subject: FW: Proposals for Copper Flat EIS and EE

Doug,

MMD and NMED have received the three proposals for the EIS and EE at Copper Flat. MMD's understanding is we are to get to you (BLM) our recommendation in seven (7) calendar days, next Friday (11/11/11) at close of business. How would you prefer receiving MMD's and NMED's recommendations? Would you like to discuss the proposals via conference call or other means, or were you expecting something more formal, in writing perhaps?

Please advise.

Chris Eustice
Sr. Environmental Engineer
MMD, Mining Act Reclamation Bureau
1220 South St. Francis Drive
Santa Fe, NM 87505
505.476.3438

11-15-2011

Find A Way! Newsletter — Copper Flat

NOVEMBER 15, 2011

VOLUME 1, ISSUE 1

Site Update

Fence Closing

Jens Deichmann and Ann Carpenter are working with the BLM Las Cruces Office, in order to close off public access to the North Gate. "It's a safety concern for the public," Deichmann said.

Exploration Program

The Copper Flat geology team has organized themselves around a 10 on 4 off schedule, so that the team is working at the same time. Their yeomen's efforts in October completed the backlog of core and RQD logging and sent the samples into Skyline, beating their original completion schedule by about a week. We celebrated with pie...for days!!!

Pre-Feasibility Assistance

The site team is currently focused on assisting Ed with his Pre-Feasibility and Feasibility requests, relogging historic core for breccia details, logging RQD from core photos for additional pit slope study work, and readying their work focus to pull samples for metallurgical, density and geochem test work.

SPECIAL COVERAGE

- Permitting Briefing
- Community Update
- Upcoming Events
- Restaurant Picks

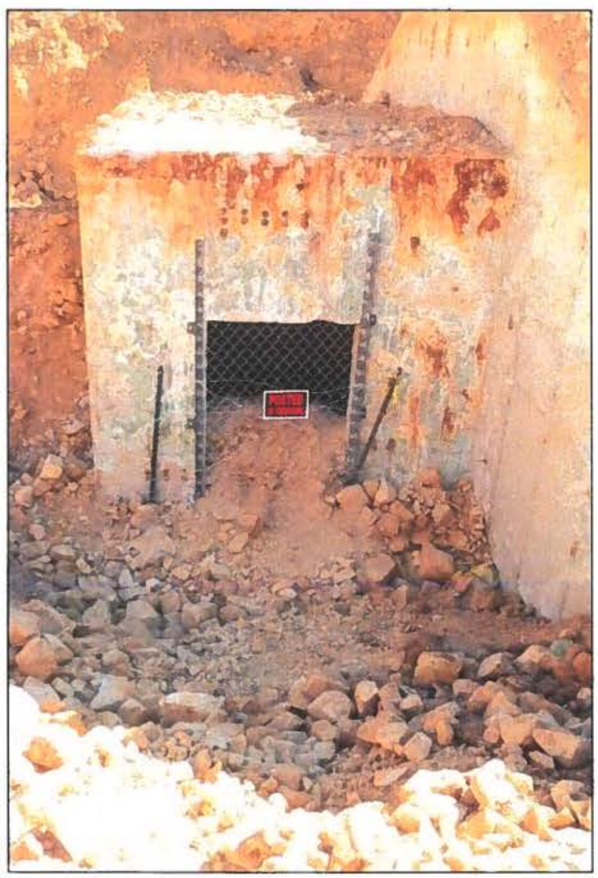
LEFT, RIGHT, ABOVE: THE TUNNELS HAVE BEEN SECURED. IT WAS A VERY SUCCESSFUL PROCESS, YIELDING A GREAT DEAL OF INFORMATION ABOUT THE SHAPE OF THE INFRASTRUCTURE.

Pre-Feasibility Wrap-Up

Ed Fidler is driving a hard deadline on the Pre-Feasibility work. As part of that effort, an engineering crew representing M3 conducted a site vist at Copper Flat, with a focus on studying the newly exposed foundations and crushing-related infrastructure that Rich Hasler successfully exposed and readied for the visit. Rich's hard work with the excavation contractors was able to help Ed keep this site evaluation moving forward as scheduled.

After a 'grueling' day in the field, everyone relaxed at the site office and ate pie from Pie-o-neer Café, Pie Town, NM (approx. 80 miles west of Socorro on Hwy 60).

Engineering work is wrapping up and the compilation and writing efforts have begun on the Pre-Feasibility Report, due in December 2011.



Permitting

Production Well Video

Rogers and Co Downhole Video was contracted to record video of the production wells. This work was essential for the Pumping Test, and also will support right of ways, conditions for re-entry, and rehabilitation of the wells. Andrew Feltman oversaw the activities. "It went great," Andrew said. "We were able to see inside the wells, getting information on the condition they're in and original construction specs. Plus, it was two really nice days in the sunshine."

Pipeline Inspection

Katie Lee, with Livingston Associates, was able to expose the pipeline, taking a look at its integrity for feasibility purposes. According to Steve Raugust, the one-mile segment of pipeline on State land appears to be in great shape. "They'll take a little clean-up work , but they can be reused with some redevelopment work," Steve said.

Third-Party EIS Contractor

We anticipate selecting the 3rd Party EIS contractor by November 14th. "We are poised to negotiate a contract quickly thereafter," Jens Deichmann said. "The next step will be scheduling the Scoping Meetings in TorC and Hillsboro."

CLOCKWISE FROM TOP: ROGERS AND CO PREPARES TO RECORD; INTERNAL VIEW OF PIPELINE; KATIE LEE OVERSSES PIPELINE INSPECTION; EXPOSURE OF PIPELINE; ROGERS VIEWS THE LIVE FEED.

Culinary Corner

The Pie-o-neer Café in Pie Town, NM (approx. 80 miles west of Socorro) has the best pies in the west!!

A favorite dining spot in TorC is Maria's on the west side of town, about a mile east of the Williamsburg entrance to I-25.

The Albuquerque team recently tried Patricia's Café, on San Mateo and Candelaria. Everyone enjoyed the homestyle New Mexican cuisine.

Notice of Intent

The team is eagerly waiting to hear if the NOI has been transferred from the BLM Las Cruces Office to the BLM State Office, which was supposed to have occurred on November 4. Review by the State office is expected to be completed fairly quickly, followed by transmittal to the Washington DC BLM office.

Copper Flat Community

Site T-Shirts

Christine Sumner designed T-shirts for the Copper Flat Site Team. Each shirt has a Copper Flat Logo on the front, and the person's favorite number along with his / her most common statement along with "Property of Copper Flat" on the back. The site team challenges the Albuquerque office to create t-shirts as well. Let the games begin!

Veteran's Day Giving

Spearheaded by Jens Deichmann, the NMCC team is planning a clothing drive to donate to disabled / homeless Veterans' organizations.

Day of the Tread Outing

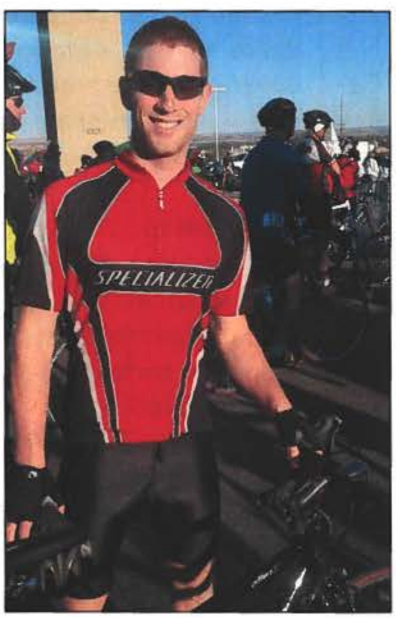
Steve Raugust, Jens Deichmann, and Zack Gorstein, participated in the *Day of the Tread* bike ride, to benefit Tingley Hospital. All three made it through the 100 mile ride, although Jens left the other two behind. "It was my first century," Zack said. "I couldn't have done it without the encouragement of my Copper Flat Family."

NMCC Stock Certificates

Steve Raugust received a phone call from a man named John Petushin, who had stock certificates for New Mexico Copper Corporation. After some research, we found that the stock was issued under an old NMCC, which was formed in 1936 and existed for 50 years, and is unrelated to the current NMCC. John generously volunteered to mail us the stock certificates for our use, as they were not redeemable anyway.

Crystal's Baby Photos

Crystal finally got around to sending Matthew's birth announcement (she's been focused on a lot of things this past summer-fall) with great photos of Matthew, including this one.



CLOCKWISE FROM TOP: STEVE DEALS WITH A TOUGH CASE OF HELMET-HAIR; A PHOTO OF ONE OF THE STOCK CERTIFICATES OF THE FORMER NMCC; FRONT AND BACK SHOTS OF THE GEO TEAM'S T-SHIRTS; CRYSTAL'S 4-MONTH OLD BABY MATTHEW; ZACK PREPARES AT THE STARTING LINE FOR A LONG RIDE.

Company Events

Christmas Holidays

We are tentatively planning on wrapping up site activities on December 15th, and returning January 5th. We still plan on having night watchmen at the site during this down time. We wish everyone a Happy Holiday season.

Dr. Chavez at Site

Dr. Bill Chavez will be at site November 18th for a mapping exercise with the Copper Flat Geo-Team and his graduate students. The exercise will target mapping from the north side of the pit and waste dumps to the north.

Conventions

Some of the NMCC team will be attending two regional mining conventions:

- SME conference in Tucson, February 19-22, 2012
- NWMA meeting in Reno, November 29—Dec 2, 2011

Regional Events

Spaceport Industry Day

Virgin Galactic hosted an Industry Day on 10/18 and set up a display table to meet with the 150 attendees, most of whom were potential contractors from all over the Country. Combining forces with the Mesilla Valley Economic Development Alliance (MVEDA), SCEDO was joined by Xacta Printing (the first local Virgin Galactic supplier), Tom Burris; Superintendent of Schools and D. Rush; CEO of Sierra Vista Hospital. Copper Flat is working with Virgin Galactic to create joint job training programs.

Old-Fashioned Christmas

MainStreet Truth or Consequences will hold its 4th annual Old-Fashioned Christmas Festival on December 9, 2011. Many businesses will be open for shopping and will provide hot food, hot drinks and sweet treats for the public. Live music will once again be a big part of the event this year, with bands performing at multiple venues throughout downtown.

Weekend of Lights Festival

On December 10, 2011, The Elephant Butte Chamber of Commerce will host the 17th annual Weekend of Lights Festival Luminaria Beach Walk and Floating Lights Parade, to benefit the Make A Wish Foundation. The event will feature thousands of twinkly Christmas lights and luminarias, campfires, an abundance of free delicious food and beverages, live music, hayrides, Santa and a stunning lighted boat parade. The event begins at 5 pm.

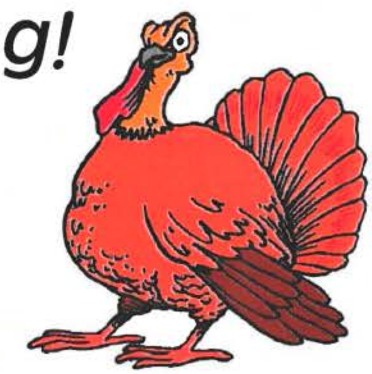
TorC Art Hop

TorC hosts an Art Hop on the second Saturday of each month, in which downtown art galleries, shops and restaurants will be open from 6 pm to 9 pm.

Third Thursday Speaker Series

On November 17, from 7 to 8 pm, the Geronimo Springs Museum will host The "Mexican Indians" Who Accompanied Onate: Old Friends and Allies or a Case of Mistaken Identity?

Happy Thanksgiving!



RIGHT: A LARGE AUDIENCE GATHERED FOR THE VIRGIN GALACTIC INDUSTRY DAY ON OCTOBER 18.

12-14-2011

Agency NMCC Meeting – 14 December 2011

1. General permitting Status
    a. NEPA: NOI, Scoping meetings
    b. ROWs
        i. Aquifer test: Gravel quarry, NPDES
        ii. GWQB NOI
        iii. Pipeline, production wells
    c. Baseline Data Report
        i. Clarification of Cultural Resource report content
        ii. Schedule for submittal of draft
2. Fishbone diagram – evolving form
3. Community update meetings 15 Dec. Hillsboro and 16 Dec. TorC
4. Reclamation planning guidance documents

12-16-2011

From: Katie Lee [klee@themacresourcesgroup.com]
Sent: Friday, December 16, 2011 1:39 PM
To: Vollbrecht, Kurt, NMENV
Cc: Jens Deichmann; Denise Weston; Huey, Greg, NMENV; Steve Raugust
Subject: Re: Proposed discharge questions

Thank you Kurt!

kl

On 12/16/2011 11:41 AM, Vollbrecht, Kurt, NMENV wrote:
Hi Katie,

This looks good. I would follow up with EPA on any constituents they may want you to add to the analytical list. The list provided meets NMED needs. The only other comment I have, is that I have to clarify that "it is unlikely that NMED will require a discharge permit" for the activities we are discussing. I'm not the decider on such matters and we can't really say definitively prior to receipt and review of the NOI.

Let me know if you have questions.

Kurt Vollbrecht, Geologist
New Mexico Environment Department
Ground Water Quality Bureau
Mining Environmental Compliance Section
(505) 827-0195

From: Katie Lee [mailto:klee@themacresourcesgroup.com]
Sent: Friday, December 16, 2011 9:53 AM
To: Vollbrecht, Kurt, NMENV
Cc: Jens Deichmann; Denise Weston; Huey, Greg, NMENV; Steve Raugust
Subject: Re: Proposed discharge questions

Hi Kurt,

Thank you for following up on my questions about NMED requirements for our proposed discharges associated with sampling and eventually conducting an aquifer test at our production wells in Sierra County via email 12-13-11. I am just going to reiterate what we plan to do in a little more detail here and if I have any of this incorrect, please let us know.

As I understand it, NMED concurs with our plan to follow these steps:

1. Pump the production wells we plan to sample until selected field parameters (which may be temperature, specific conductance or DO) stabilize or until three casing volumes have been purged, whichever occurs first. Direct purged water into an onsite temporary above ground tank such as a frac tank.
2. Upon appropriate purging, collect a representative groundwater sample and submit it for appropriate laboratory analysis. We plan to analyze sampled water for the same list of constituents in our Sampling and Analysis Plan (September 2010) and may also analyze for constituents the EPA may request if we choose to pursue an NPDES permit for discharges from the pumping test. These analyses are presented in the attached excel document.
3. Per your request, once laboratory results are received, NMCC will prepare a Notice of Intent (NOI) to

discharge for NMED review, to be sent as a pdf to you and Greg Huey. NMCC will request permission for the proposed discharge of the purged water held in the tanks and the proposed discharge of water for the subsequent aquifer test in the NOI.
4. Upon NMED approval, NMCC will discharge the purged water according to the submitted NOI. We anticipate proposing to discharge purged water and water extracted during our pumping test at the same time to the gravel quarry four miles east of the production wells, although this plan could vary depending on laboratory results and logistics.

NMCC will obtain all necessary state and federal permits before completing these proposed actions. If the laboratory results from groundwater sampling indicate purged water is not suitable for discharge to the surface, NMCC will handle it in an appropriate manner.

We understand, based on the results of previous groundwater analyses from these wells, that NMED will not require a Discharge Permit for these proposed discharges. We further understand that we may not discharge these waters without first submitting a Notice of Intent to discharge to the NMED and receiving approval upon review of that NOI.

We are planning to purge and sample only the wells necessary to complete our proposed aquifer test. If we find no difficulties with Production Well 1 and Production Well 3, we will only purge and sample these 2 wells. Based on our proposed purging plan, this will generate approximately 20,000 gallons per well or less, for a total purged volume of 40,000 gallons or less.

Thank you again for your time and review. We look forward to working with you. Please let me know if I've misunderstood any of NMED's requirements or if you have any questions.

Best regards,

Katie Lee
Project Scientist
Copper Flat Mine
THEMAC Resources Group, Ltd.

Mobile: 505.400.7925
Office phone: 505.830.6919
www.themacresourcesgroup.com

On 12/13/2011 11:37 AM, Vollbrecht, Kurt, NMENV wrote:
HI Katie,

I'll summarize our discussion from yesterday regarding an acceptable pathway for NMCC to follow with regards to a proposal to discharge both purge water and pump test water to the gravel quarry you mention below.

NMCC intends to purge the production wells and containerize the water in frac tanks while samples are submitted for analysis. Following receipt of analytical data, NMCC will prepare and submit a Notice of Intent to Discharge to NMED for both the purge water and the pump test water. The NOI should include the production well analytical data, a description of the materials present in the gravel pit (geologic formations including mineralogy) and a discussion regarding the volume of the combined discharge and the capacity and infiltration capabilities of the quarry as well as other information required under a NOI (form attached).

Assuming the quarry material is inert and the water quality in the production wells meets standards NMED would likely not require a permit for the proposed discharge. Following the NMED response to the NOI, NMCC could proceed with discharge assuming all other agency requirements have been met (and assuming the information in the NOI shows that there would be no potential impact to water quality...).

I'd recommend sending a PDF of the completed NOI to myself and Greg once it is prepared so we can expedite the process.

Let me know if I've summarized our discussion correctly or if you have other questions (or if the plan has changed).

Kurt Vollbrecht, Geologist
New Mexico Environment Department
Ground Water Quality Bureau
Mining Environmental Compliance Section
(505) 827-0195

From: Katie Lee [mailto:klee@themacresourcesgroup.com]
Sent: Friday, December 09, 2011 2:21 PM
To: Vollbrecht, Kurt, NMENV
Cc: Jens Deichmann; Denise Weston
Subject: Proposed discharge questions

Hi Kurt,

Glad to speak with you on the phone this morning. As we discussed, New Mexico Copper continues to work with the BLM regarding our right of way applications and supporting documentation for our proposed aquifer test. We have identified a gravel quarry on state land about 4 miles east of our production wells where water from purging or pumping the production wells could be discharged for infiltration without causing it to pool, run off or enter any waterways. We have received the appropriate right of way grant from the state land office to use this quarry in this way.

We understand from our communications with you that a NOI would be sufficient to allow NMED to evaluate and hopefully permit our proposed discharge of up to 150 acre feet of water over the course of a 14 day aquifer test.

Our question is this: if we are granted a right of way by the BLM that would allow us to purge and collect ground water samples from the four production wells several weeks or a few months in advance of the proposed aquifer test, would NMED require a NOI for that discharge? We estimate we'd be purging about 20,000 gallons (approximately 3 casing volumes) from each of the production wells for a total of about 80,000 gallons. We would propose to truck this water to the same gravel quarry for infiltration there.

If you have any questions about what I've tried to explain here, please let me know.

--
Katie Lee
Project Scientist
Copper Flat Mine
THEMAC Resources Group, Ltd.

Mobile: 505.400.7925
Office phone: 505.830.6919
www.themacresourcesgroup.com

1. **Name and mailing address of person proposing to discharge:**

______________________ **Work Phone:** ______________________

______________________ **Cell/Home Phone:** ______________________

______________________ **Fax:** ______________________

______________________ **Email:** ______________________

2. **Name of facility:**

____

3. **Physical location of discharge (if applicable, give street address, township, range, section, distance from closest town or landmark, directions to facility, location map):**

____

____

____

4. **Type of operation generating the discharge (e.g., truck wash, food processing plant, restaurant, etc.):**

____

5. **Source(s) of the discharge. Describe how the wastewater, sludge, or other discharges processed and/or disposed at your facility are generated. Identify all sources. Attach additional pages if needed:**

____

____

____

6. **Expected contaminants in the discharge (e.g., nitrate-nitrogen, metals, organic compounds, salts, etc.) Include estimated concentration if known, and copies of results of laboratory analyses, if available:**

____

7. **Describe all components of wastewater processing, treatment, storage, and disposal system (e.g., grease interceptor, lagoon, septic tank/leachfield, etc.) Include sizes, site layout map, plans and specifications, etc. if available:**

____

____

____

8. **Estimated maximum daily discharge volume in gallons per day (or other units):**

____

9. **Estimated depth to ground water (ft):** ______________________

Signature: ______________________ **Title:** ______________________

Printed name: ______________________ **Date:** ______________________

Please return this form to:
NMED Ground Water Quality Bureau
P.O. Box 5469
Santa Fe, New Mexico 87502-5469

Telephone: 505-827-2900
Fax: 505-827-2965

1-10-2012

From:	Jens Deichmann [jdeichmann@themacresourcesgroup.com]
Sent:	Tuesday, January 10, 2012 3:53 PM
To:	Eustice, Chris, EMNRD; Shepherd, Holland, EMNRD; Huey, Greg, NMENV; Vollbrecht, Kurt, NMENV; Jankowitz, Rachel J., DGF; Myers, Kevin, OSE; Perez, Norma, NMENV; Mendoza, Andrea J., OSE
Subject:	Publication of the BLM NOI
Attachments:	Copper Flat Federal Register NOI 1-9-12.pdf

I just wanted to let you all know that the Notice of Intent to conduct and EIS on Copper Flat was published yesterday in the Federal Register (see attached).
We are preparing our plans for the mine tour next Tuesday in coordination with Doug Haywood. If you have anything in particular you would like to see or learn about, please let Doug and me know.
Thanks, Jens

Jens Deichmann
Permitting Manager - Regulatory
Copper Flat Mine
THEMAC Resources Group, LTD.
2425 San Pedro NE
Albuquerque, NM 87110
Office: 505.830.6920
Mobile: 505.681.2536
Fax: 505.881.4616
www.themacresourcesgroup.com

participate in the scoping process and, if eligible, may request or be requested by the BLM to participate as a cooperating agency. The BLM will also brief county commissioners, Congressional delegations and grazing permittees during the EIS process.

You may submit comments on issues and planning criteria in writing to the BLM using one of the methods listed in the **ADDRESSES** section above. To be most helpful, please submit comments by the close of the 30-day scoping period or within 15 days after the last public meeting, whichever is later. Before including your address, phone number, email address, or other personal identifying information in your comment, you should be aware that your entire comment—including your personal identifying information—may be made publicly available at any time. While you can ask in your comment to withhold your personal identifying information from public review, we cannot guarantee that we will be able to do so.

The public is also encouraged to help identify any other management questions and concerns that should be addressed in the EIS.

The BLM will use an interdisciplinary approach to develop the EIS in order to consider the variety of resource issues and concerns identified. Specialists with expertise in the following disciplines will be involved in the NEPA process: Range management, wildlife biology, archaeology, riparian, soils, and outdoor recreation.

Authority: 40 CFR 1501.7, 43 CFR 1610.2.

Loretta Chandler,

Field Manager, BLM Owyhee Field Office.

[FR Doc. 2012–125 Filed 1–6–12; 8:45 am]

BILLING CODE 4310–GG–P

DEPARTMENT OF THE INTERIOR

Bureau of Land Management

[LLNML00000 L51100000.GN0000.LVEMG11CG230]

Notice of Intent To Prepare an Environmental Impact Statement for the Proposed Copper Flat Mine Plan of Operations, Sierra County, NM

AGENCY: Bureau of Land Management, Interior.

ACTION: Notice of Intent.

SUMMARY: In compliance with the National Environmental Policy Act (NEPA) of 1969, as amended, and the Federal Land Policy and Management Act of 1976, as amended, the Bureau of Land Management (BLM) Las Cruces District Office, Las Cruces, New Mexico, intends to prepare an Environmental Impact Statement (EIS) and by this notice is announcing the beginning of the scoping process to solicit public comments and identify issues.

DATES: This notice initiates the public scoping process for the EIS. Comments on issues may be submitted in writing until February 8, 2012. The date(s) and location(s) of any scoping meetings will be announced at least 15 days in advance through local media, newspapers and the BLM Web site at: *http://www.blm.gov/nm/st/en/fo/Las_Cruces_District_Office.html*. To be included in the Draft EIS, all comments must be received prior to the close of the scoping period or 15 days after the last public meeting, whichever is later. We will provide additional opportunities for public participation upon publication of the Draft EIS.

ADDRESSES: You may submit comments related to the Copper Flat EIS Project by any of the following methods:

- *Email: dhaywood@blm.gov.*
- *Fax:* (575) 525–4412.
- *Mail:* BLM Las Cruces District Office, 1800 Marquess Street, Las Cruces, NM 88005.

Documents pertinent to this proposal may be examined at the Las Cruces District Office.

FOR FURTHER INFORMATION CONTACT: Michael Smith, Geologist; telephone (575) 525–4421; address 1800 Marquess Street, Las Cruces, NM 88005 or by email *michaelsmith@blm.gov* and to have your name added to the mailing list. Persons who use a telecommunications device for the deaf (TDD) may call the Federal Information Relay Service (FIRS) at 1–(800) 877–8339 to contact the above individual during normal business hours. The FIRS is available 24 hours a day, 7 days a week, to leave a message or question with the above individual. You will receive a reply during normal business hours.

SUPPLEMENTARY INFORMATION: The BLM Las Cruces District Office has received a Mine Plan of Operations (Mine Plan) from the New Mexico Copper Corp. to re-start the Copper Flat Mine located in Sierra County, New Mexico. The proposed mine is located approximately 4 miles north-northeast of the town of Hillsboro, New Mexico. Lands involved in the mine include parts of the following sections:

New Mexico Principal Meridian

T. 15 S., R. 6 W.,
Sec. 31.
T. 15 S., R. 7 W.,
Secs. 25, 26, 35 and 36.

Mining, ore processing, and related activities would occur on both private land and public domain administered by the BLM. The proponent currently holds active mining claims over public domain land included in the proposed operation. The estimated project duration is 27 years from site construction to mine reclamation and closure. Mining at the existing open pit would be completed using standard multiple-bench methods. The pit would eventually widen to approximately 2,500 by 2,500 feet and deepen to 900 feet. Ore from the pit would be drilled, blasted, loaded and hauled to a planned processing facility immediately east of the pit. At this facility, the ore would be crushed and ground and copper and molybdenum minerals would be separated and concentrated using standard flotation techniques. Mineral concentrates would be transported by truck and rail to be processed offsite; onsite smelting or refining is not included in this proposal. Waste rock created during operations would be banked primarily on public domain land, and tailings would be disposed of into an expanded, existing tailings impoundment. Water for the proposed operation would be obtained from a well field located on BLM-administered land approximately 8 miles east of the mine in:

New Mexico Principal Meridian

T. 15 S., R. 5 W.,
Secs. 30 and 31.

Water would be piped to the proposed operation through an existing pipeline which roughly parallels the existing highway (New Mexico State Route 152). The total estimated disturbance on public domain land would be 745 acres. Reclamation would consist of removing processing equipment from Federal land, and restoring and seeding waste rock dumps and other disturbed areas. The BLM and the New Mexico Department of Energy, Minerals and Natural Resources would bond the proponent for site reclamation prior to granting authorization.

The purpose of the public scoping process is to determine relevant issues that will influence the scope of the environmental analysis, including alternatives, and guide the process for developing the EIS. At present, the BLM has identified the following preliminary issues:

1. Water use and effects on surface and subsurface hydrology;
2. Water quality effects and water quality protection;
3. Traffic;
4. Cultural Resources and Native American Religious Concerns;

02281

5. Threatened, Endangered and Special Status Species;

6. Livestock grazing; and

7. Reclamation and post-mining land use.

The BLM will utilize and coordinate the NEPA commenting process to satisfy the public involvement process for Section 106 of the National Historic Preservation Act (NHPA) (16 U.S.C. 470f) as provided for in 36 CFR 800.2(d)(3). Native American tribal consultations will be conducted in accordance with policy, and tribal concerns will be given due consideration, including impacts on Indian trust assets. Federal, State, and local agencies, along with other stakeholders that may be interested or affected by the BLM's decision on this project are invited to participate in the scoping process and, if eligible, may request or be requested by the BLM to participate as a cooperating agency.

Before including your address, phone number, email address, or other personal identifying information in your comment, you should be aware that your entire comment—including your personal identifying information—may be made publicly available at any time. While you can ask us in your comment to withhold your personal identifying information from public review, we cannot guarantee that we will be able to do so.

Authority: 40 CFR 1501.7.

Jesse Juen,

Associate State Director.

[FR Doc. 2012–128 Filed 1–6–12; 8:45 am]

BILLING CODE 4310–VC–P

DEPARTMENT OF THE INTERIOR

Bureau of Land Management

[LLNVS00560.L58530000.ES0000.241A; N–84625; 12–08807; MO# 4500025699; TAS: 14X5232]

Notice of Realty Action: Classification for Lease and/or Subsequent Conveyance for Recreation and Public Purposes of Public Land in Clark County, NV

AGENCY: Bureau of Land Management, Interior.

ACTION: Notice of Realty Action.

SUMMARY: In accordance with Section 7 of the Taylor Grazing Act and Executive Order Number 6910, the Bureau of Land Management (BLM) has examined and found suitable for classification for lease and/or subsequent conveyance under the provisions of the Recreation and Public Purposes (R&PP) Act, as amended, approximately 7.5 acres of public land in the City of Las Vegas, Clark County, Nevada. The State of Nevada proposes to use the land for a State office building.

DATES: Interested parties may submit written comments regarding the proposed classification of the land for lease and/or subsequent conveyance of the land, and the environmental assessment (EA), until February 23, 2012.

ADDRESSES: Send written comments to the BLM Las Vegas Field Manager, 4701 N. Torrey Pines Drive, Las Vegas, Nevada 89130, or email: *DDickey@blm.gov.*

FOR FURTHER INFORMATION CONTACT: Dorothy Jean Dickey, (702) 515–5119, or *DDickey@blm.gov.* Persons who use a telecommunications device for the deaf (TDD) may call the Federal Information Relay Service (FIRS) at 1 (800) 877–8339 to contact the above individual during normal business hours. The FIRS is available 24 hours a day, 7 days a week, to leave a message or question with the above individual. You will receive a reply during normal business hours.

SUPPLEMENTARY INFORMATION: The State of Nevada has filed an application to develop the following described land as a State office building with related facilities near Flamingo Road and El Capitan Way in Las Vegas:

Mount Diablo Meridian

T. 21 S., R. 60 E.,
Sec. 17, E½SW¼SW¼SE¼, and SW¼SW¼SW¼SE¼.

The area described contains 7.5 acres, more or less, in Clark County.

The State office building will consist of approximately 60,000 square feet of office and support space. Related facilities include a parking lot, landscaping, lighting, utilities, and ancillary equipment. Additional detailed information pertaining to this application, plan of development, and site plan is in case file N–84625, which is located in the BLM Las Vegas Field Office at the above address.

The land is not required for any Federal purpose. The lease and/or subsequent conveyance are consistent with the BLM Las Vegas Resource Management Plan dated October 5, 1998, and would be in the public interest. The State of Nevada, a qualified applicant under the R&PP Act, has not applied for more than the 640-acre limitation for public purpose uses in a year, and has submitted a statement in compliance with the regulations at 43 CFR 2741.4(b).

The lease and/or subsequent conveyance of the public land shall be subject to valid existing rights. Subject to limitations prescribed by law and regulations, prior to patent issuance, a holder of any Right-of-Way within the lease area may be given the opportunity to amend the Right-of-Way for conversion to a new term, including perpetuity, if applicable.

The lease and/or subsequent conveyance, when issued, will be subject to the provisions of the R&PP Act and applicable regulations of the Secretary of the Interior, and will contain the following terms, conditions, and reservations to the United States:

1. A Right-of-Way thereon for ditches or canals constructed by the authority of the United States, Act of August 30, 1890 (43 U.S.C. 945);
2. All minerals shall be reserved to the United States, together with the right to prospect for, mine, and remove such deposits from the same under applicable law and such regulations as the Secretary of the Interior may prescribe;
3. Valid existing rights;
4. Right-of-Way N–59691 for paved road and drainage, spandrels, bus turnouts, curb, gutter, sidewalks, streetlights, pipe conduit, and concrete lining, granted to Clark County, its successors or assigns, pursuant to the Act of October 21, 1976 (43 U.S.C. 1761);
5. Right-of-Way N–60971 for a 16-inch, underground natural gas pipeline and construction staging area, granted to Southwest Gas Corporation, its successors or assigns, pursuant to the Act of February 25, 1920, as amended (30 U.S.C. 185 sec. 28);
6. Right-of-Way N–74286 for two transformers, and underground electrical lines with related appurtenances, granted to Nevada Power Company, its successors or assigns, pursuant to the Act of October 21, 1976 (43 U.S.C. 1761); and
7. Right-of-Way N–88267 for multiple natural gas pipelines with below and above ground appurtenances granted to Southwest Gas Corporation, its successors or assigns, pursuant to the Act of February 25, 1920, as amended (30 U.S.C. 185 sec. 28);
8. An appropriate indemnification clause protecting the United States from claims arising out of the lessee's/patentee's use, occupancy, or occupations on the leased/patented lands.

Upon publication of this notice in the **Federal Register**, the land described above will be segregated from all other forms of appropriation under the public land laws, including the general mining laws, except for lease and/or subsequent conveyance under the R&PP Act, leasing

1-17-2012

Huey, Greg, NMENV

From: maxyeh@windstream.net
Sent: Tuesday, January 17, 2012 6:07 PM
To: Huey, Greg, NMENV

Greg, now that the EIS process is getting under way, I assume the NMCC has decided on their methods. Did they go with dry tailings, or are they sticking with the old tailings pond and dam? I'm also curious what your department thinks about the mine pit being listed as a well. You can't very well hold them to kinds of protections wells necessitate to prevent ground water pollution, but then it's hardly normal to have trucks and equipment driving around inside a well. Apparently Quintana did it so they could appropriate water from the pit without going through a dewatering permit.
Max

1-17-2012

Agenda
COPPER FLAT MINE NEPA
Site Visit

January 17, 2012 at the Copper Flat Mine 11:00 AM to 4 PM
Directions are attached.

Kickoff Meeting

January 18, 2011 – 8:00 AM to 12:00
Organ Mountain Conference Room
BLM Las Cruces District, 1800 Marquess Street, Las Cruces, NM

Purpose of Meeting: Begin the process for conducting an environmental analysis and documentation for the Copper Flat Mine Plan of Operation in the Las Cruces District.

Welcome/Introductions: Doug Haywood, BLM Project Manager

1. BLM
2. Mangi Environmental
3. NMCC
4. Cooperating Agencies

Roles, Responsibilities, and Communications:

1. MOU, New Mexico Copper Corporation, Bureau of Land Management, Cooperating Agencies (MMD, NMED, OSE, NMDGF)
2. Review Team Members & Time Requirements

<u>BLM Actions/Concerns:</u>
Federal Register Notice of Intent (BLM): Douglas Haywood

Purpose & Need Statement (BLM): Jennifer Montoya

NEPA Analysis Discussion: Does BLM have any requirements, guidance documents? Jennifer Montoya

EIS & Data Report Formats: Jennifer Montoya

Public Participation Plan (BLM/Mangi): Douglas Haywood

1) Scoping letter
2) Public contact list by Mangi
3) Public Meetings
4) Comment Database by Mangi
5) Public/internal websites by Mangi/BLM

Mining Plan of Operations Status: Michael Smith

NEPA Analysis/Alternatives: Jennifer Montoya

1) No Action Alternative: 40 CFR part 1502.14 (d) requires that the alternative of no action be included in an Environmental Impact Statement. Due to the mining claimants' rights under the US mining laws, choosing the No Action Alternative is outside the authority of the authorized officer if it is a reasonable and legally compliant plan of operations.
2) Plan of Operations Proposed Action
3) Discussion of other alternatives to be considered or dismissed

<u>NMCC Actions/Concerns:</u>
Detailed Project Description to be provided: Jens Deichmann

Project Data Reports/Status of Availability: Jens Deichmann

Known Issues: Jens Deichmann

1) Ground and surface water use and possible contamination.

Potential Issues: Jens Deichmann

1) Air Quality degradation from emissions
2) Traffic control
3) Road construction standards
4) Ore transport 1) on BLM Roads 2) State Highways

Specific Discussion topics/questions: David Henney

1) Items to be provided by Mangi
    A) EIS Preparation Plan
    B) Action Plan
    C) Consultation support to BLM
    D) Scoping Meeting support to BLM
    E) Agency meeting support to BLM
    F) Public information support to BLM
    G) Planning Record File Scheme & Responsibility
2) Schedule

BLM Deciding Official Requirements: (What do we need for the final document package?)

Information Exchange: Mangi/BLM/NMCC/All

Information Mangi Requests from BLM:

- Any BLM style guide and style sheet for the EIS
- Applicable statutes, regulations, Executive Orders, BLM manuals, and handbook that will control or guide the preparation of the analysis
- Relevant GIS information applicable to the project area
- Significant project issues
- Contact list
- Visual aid examples expected for the scoping meetings
- Mailer/newsletter example
- News release example
- Project address/mailing list

- Recommended agency contact names to obtain relevant baseline information
- Applicable background information for the project site
- Applicable background information for the cumulative effects analysis

Information Mangi requests from NMCC

- Data Reports
- Electronic File versions of Plan of Operation
- Known references/studies/citations
- Consultation conducted to date
- Access issues to site

Monthly COOP Meeting

January 18, 2011 – 1:00 pM to 3:00
Organ Mountain Conference Room
BLM Las Cruces District, 1800 Marquess Street, Las Cruces, NM

1-18-2012

BUREAU OF LAND MANAGEMENT
MEETING/EVENT Copper Flat Kick Off

DATE 1 / 18 / 2012 **START TIME** 8 am/pm **FINISH TIME** _______ am/pm

NAME	ORGANIZATION/ Title	PHONE	E-MAIL
Jennifer Montoya	BLM-NEPA Coordinator	575-525-4316	jamontoya@blm.gov
Douglas Haywood	BLM - Project Manager	575-525-4498	dhaywood@blm.gov
Jens Deichmann	NMCC	505-681-2536	jdeichmann@themacresources grp
Bernard Pleau	Public Participation SME	505-250-5872	bpleau@Q.com
Dave Henney	Mangi Env. / PM	402-305-1279	dhenney2@cox.net
Mark Nelson	CDMSmith - Mangi Team	605-578-9739	nelsonmr@cdmsmith.com
Lee Wilson	-WA - Mangi	505 988-9811	[illegible]@lwasfi.com
Joseph Navarro	LCDO - BLM	575-525-4300	joe_navarro@nm.blm.gov
Michael Smith	LCDO BLM	575-525-4421	michael smith@blm.gov
EDWARD SEUM	BLM, LCDO	575 525 4313	ESEUM@NM.BLM.GOV
Joe Sanchez	BLM-LCDO	575-525-4391	Joe_Sanchez@nm.blm.gov
Kevin Myers	NMOSE-Hydrology	505-827-3521	Kevin.myers@state.nm.us
Kurt Vollbrecht	NMED - GWQB	505-827-0195	Kurt.Vollbrecht@state.nm.us
DJ Ennis	NM-Mining & Minerals	505-476-3434	david.ennis@state.nm.us
Cheryl S. Thacker	NMOSE - Water rights	575-524-6161 x1019	cheryl.thacker@state.nm.us
Norma Perez	NMENV - AQB	505-476-5564	norma.perez@state.nm.us
PAT MATHIS	NM Game & Fish	575-532-2100	patrick.mathis@state.nm.us

1-31-2012

PDF

Huey, Greg, NMENV

From:	Zack Gorstein [zgorstein@themacresourcesgroup.com]
Sent:	Tuesday, January 31, 2012 5:53 PM
To:	Zack Gorstein
Subject:	THEMAC Announces a 56% Increase in Recently Updated Measured & Indicated Resource Estimate
Attachments:	20120131 Resource Update MAC.pdf

Please find attached a news release regarding the Copper Flat Mine. If you are interested in gaining any further information for this release please contact Zack Gorstein at 505-234-6285.

Thank you.

Kind regards,

--

Zack Gorstein
Project / Sustainability Analyst
Copper Flat Mine
THEMAC Resources Group, Ltd
2425 San Pedro Dr. NE, Suite 100
Albuquerque, NM 87110

Office: 505-883-2510
Mobile: 843-412-8021
Fax: 505-881-4616
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THEMAC RESOURCES GROUP LIMITED

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T (+1) 604 806-6110 F (+1) 604 806-6112
TSXV: MAC

THEMAC Resources Group Limited Announces a 56% increase in Recently Updated Measured & Indicated Resource Estimate

Vancouver, British Colombia – January 31, 2012 – THEMAC Resources Group Ltd. (TSXV:MAC) ("THEMAC" or the "Company") today announced the completion of an updated National Instrument 43-101 (NI43-101) resource estimate of its 100% owned Copper Flat project located in Sierra County, New Mexico, prepared by M3 Engineering & Technology Corporation (M3) and Independent Mining Company (IMC), both located in Tucson, Arizona.

The recently completed resource estimate reflects the results of a previously announced drilling completed in 2010 and 2011; the re-assay of 2,969 historical pulps to obtain gold and silver values and continued geotechnical and engineering design studies.

Highlights

- The total Measured and Indicated Resource increased by 56% to 1,005,891,000 pounds of contained copper from the previously reported 645,000,000 pounds of contained copper.
- The total Resource (indicated and inferred) of 153,000 Ktons, of which 107,000 was indicated, that was reported in the 2010 Preliminary Economic Analysis (PEA) has been increased to 202,303 Ktons of which 194,097 Ktons is now measured and indicated resources.
- Only 8,206 Ktons remain classified as Inferred Resources.
- The re-analysis of 2,969 pulps of historical drill samples has permitted IMC to factor both gold and silver values into approximately half of the current resource model. As a result, additional re-assaying of historical pulps is planned with the intent to increase contained gold and silver.

The resource estimate summarized in the table below was prepared under the supervision of John M. Marek, P.Eng., President of Independent Mining Consultants of Tucson, Arizona who is an Independent Qualified Person as defined under NI 43-101, and reviewed by Raymond Irwin, P. Geo. , a Qualified Person for the Company. The subject resource classifications were assigned in conformance with NI 43-101 and its standards and guidelines.

"I am extremely pleased with the progress that is being made on the evaluation of the Copper Flat deposit and the results of the recently completed resource update. The continuing enhancement of the resource from the recent drilling is extremely positive for the economic viability of the copper flat project; and, the recent recovery in the commodity prices may also be expected to add substantially to the value of the resource" said Andre J. Douchane, CEO. "Having a copper resource that now contains a billion pounds puts the Copper Flat Project in a much different league than when it only had 645 million pounds of copper scheduled to be processed. Equally as exciting, we've added 430,000 ounces of gold and 9 million ounces of silver to the resource."

Assumptions

- The mineral resource is based on the application of the floating cone algorithm to the block model to establish the component of the deposit that has "reasonable prospects of economic extraction." The mineral resources are therefore contained within a computer-generated open pit geometry.
- Slightly different metal prices were used in the November 2011 resource estimate as compared to the June 30, 2010 study, comprising part of the PEA undertaken by SRK Consulting Inc.
- The cutoff grade reflects the estimated cost to process the ore plus site general and administrative expenses which total $7.25/ton.
- Ktons is equivalent to 1,000 short tons, and a short ton is equivalent to 2,000 lbs.
- Copper and molybdenum grades are dry weight.
- Gold and silver values are reported in Troy ounce/short ton.
- Gold and silver values were not available at the time of this study in the outer edges of the deposit so the inferred grades for gold and silver are respectively shown as zero or near zero.

January 2012 Updated NI 43-101 Resource:

Classification	Tonnage and Grade				
	Ktons	Cu %	Mo %	Au Oz/t	Ag Oz/t
Measured	41,236	0.33	0.011	0.003	0.07
Indicated	152,861	0.24	0.007	0.002	0.04
Measured + Indicated	194,097	0.26	0.008	0.002	0.05
Inferred	8,206	0.23	0.004	0	0.01

"Along with moving forward with engineering, definitive metallurgical test work and final mill design, we are also finalizing a spring drill program to bring the comparatively higher grade core that was described in earlier work up to NI 43-101 standards," said Ray Irwin, VP Exploration. "As the orebody is still open, the spring drilling program is viewed with optimistic anticipation."

Location and Project History

The Copper Flat project hosts a Laramide porphyry copper-molybdenum deposit containing recoverable gold and silver credits located in the Las Animas Mining District of Sierra County, NM, approximately 150 miles (242 km) south of Albuquerque, NM and 20 miles (32 km) southwest of Truth or Consequences, NM.

The Copper Flat project consists of 26 wholly owned patented mining claims, 184 unpatented mining claims and 29 placer mining claims totaling 4,241.2 acres or 1,717 ha.

This advanced stage exploration/development project operated for a short period of time in 1982 (March –June 1982) by Quintana Minerals Corporation before operations were curtailed due to falling copper prices. During this brief period of production, the Copper Flat mine produced 1.48 Mst of ore yielding 7.4 Mlbs. of copper, 2,301 ounces of gold and 55,966 ounces of silver.

About THEMAC Resources Group Limited

THEMAC is a copper development company with a strong management team and as of May 18, 2011, a 100% ownership interest in the Copper Flat copper-molybdenum-gold-silver project in New Mexico, USA. *We are committed to bringing the closed copper mine, Copper Flat, in Sierra County, New Mexico back into production with innovation and a sustainable approach to mining development and production, local economic opportunities and the best reclamation practices for our unique environment.* The Company is listed on the TSX Venture Exchange (ticker: MAC) and has issued share capital of 74,117,622 common shares (fully diluted share capital 136,423,241).

For more information please visit www.themacresourcesgroup.com or review the Company's filings on SEDAR (www.sedar.com).

Forward Looking Statements

This news release may contain certain information that constitutes forward-looking statements. Forward-looking statements are frequently characterized by words such as "plan," "expect," "project," "intend," "believe," "anticipate" and other similar words, or statements that certain events or conditions "may" or "will" occur, including statements regarding planned work on the Copper Flat Property. Forward-looking statements are based on the opinions and estimates of management at the date the statements are made, and are subject to a variety of risks and uncertainties and other factors that could cause actual events or results to differ materially from those projected in the forward-looking statements. These factors include the inherent risks involved in the exploration and development of mineral properties, the uncertainties involved in interpreting drilling results and other geological data, fluctuating metal prices, the availability of funds to complete work programs and studies, and other factors described above. The Company disclaims any obligation to update or revise any forward-looking statements if circumstances or management's estimates or opinions should change. The reader is cautioned not to place undue reliance on forward-looking statements.

For further information contact:

THEMAC Resources Group Limited
Andre J. Douchane, President & Chief Executive Officer
(+1) 416 671 8089 or (+1) 520 850 7529

Neither the TSX Venture Exchange (the "TSXV") nor its Regulation Services Provider (as that term is defined in the policies of the TSXV) has reviewed, nor do they accept responsibility for the adequacy or accuracy of, this release.

2-3-2012

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Las Cruces District Office
1800 Marquess Street
Las Cruces, New Mexico 88005
www.blm.gov/nm

TAKE PRIDE IN AMERICA

In Reply Refer To:
1793 (L0000)

GROUND WATER
FEB 20 2012
BUREAU

February 3, 2012

Dear Interested Party:

The Bureau of Land Management (BLM) Las Cruces District invites you to participate in the identification of issues to determine the scope for an Environmental Impact Statement (EIS) concerning the planned construction, operation, and mine reclamation of the Copper Flat Mine in Sierra County, New Mexico.

New Mexico Copper Corporation (NMCC) submitted a Mining Plan of Operations to the BLM for mining and processing copper and other minerals at the Copper Flat mine in central Sierra County. The proposed mine is located approximately 4 miles north-northeast of the town of Hillsboro, New Mexico. Mining, ore processing and related activities will occur on both private and BLM lands.

As the EIS process begins, the BLM's goal is to reach out and involve the public. The first opportunity for you to participate will be at the upcoming open houses for public scoping. The purpose of the public scoping process is to discover relevant issues that will influence the scope of the environmental analysis, including alternatives to the proposed action, and guide the process for developing the EIS.

Participants will have an opportunity to talk with resource and planning specialists, and are encouraged to provide comments on the scope of the EIS and on potential alternatives, to share issues and concerns, and to ask questions. BLM will consider these comments in determining the scope of the EIS, including alternatives to the proposed action.

The open house format also will allow the BLM, NMCC, and State agencies to provide information about the EIS process, the proposed action, as well as information regarding the development, operation, and mine reclamation for the Copper Flat mining claims. The public scoping open houses will be:

FEBRUARY 22, 2012 7-9 P.M.
HILLSBORO COMMUNITY CENTER
ELENORE ST.
HILLSBORO, NEW MEXICO

FEBRUARY 23, 2012 7-9 P.M.
TRUTH OR CONSEQUENCES CIVIC AND CONVENTION CENTER
400 WEST FOURTH
TRUTH OR CONSEQUENCES, NEW MEXICO

Your thoughts, ideas, and comments are important to us throughout the process. Please attend the scoping open houses or send us your written comments on the enclosed comment form before the scoping period ends, which is March 9, 2012.

You may also submit comments using any of the following methods:

EMAIL: BLM_NM_LCDO_Comments@blm.gov

FAX: 1(703) 760-4899

TOLL-FREE NUMBER: 1(866) 760-1421

MAIL:
Copper Flat Mine
C/O Mangi Environmental Group
7927 Jones Branch Drive
Mclean VA 22102

Also if you wish to be removed from the mailing list, please let us know by checking the box on the comment form. Otherwise your name will be retained on the list and you will receive information on the Copper Flat project in the future. Informational materials like this letter will be available on the Copper Flat website at www.cuflateis.com.

BLM will provide you an opportunity later in the process to review the Draft EIS, which is scheduled for release in January 2013. During the public review period, BLM will conduct public meetings to accept comments on the adequacy of the Draft EIS. Written comments will also be accepted during the review period.

If you have any questions, please contact Mike Smith at 575-525-4421.

Sincerely,

Bill Childress

Bill Childress
District Manager

1 Enclosure

Copper Flat Mine

Environmental Impact Statement

BLM WANTS TO HEAR FROM YOU!
SCOPING COMMENT FORM

Please return this form by **MARCH 9, 2012**. Additional sheets may be attached if more space is needed. Fold the form so the address is showing and tape or staple the edges together to mail it. **POSTAGE is required.**

Name

Address

City State Zip

Organization (if applicable)

Add to Mailing List ☐ YES ☐ NO

PLEASE PRINT

PLEASE READ CAREFULLY

Before including your address, phone number, email address, or other personal identifying information in your comment, you should be aware that your entire comment – including your personal identifying information – may be made publicly available at any time. While you can ask us in your comment to withhold your personal identifying information from public review, we cannot guarantee that we will be able to do so. All submissions from organizations or businesses, and from individuals identifying themselves as representatives or officials of organizations or businesses, are available for public inspection in their entirety.

2-6-2012

Huey, Greg, NMENV

From:	Erica Earhart [EEarhart@mangi.com]
Sent:	Monday, February 06, 2012 6:44 PM
To:	Dominguez, Dora, EDD; dhaywood@blm.gov; egarland@zianet.com; ELindsey@torcnm.org; erica.sichler@mail.house.gov; eshort_55@yahoo.com; Evelyn.Renfro@torcnm.org; Martinez, Fernando, EMNRD; Frances.Sanchez@torcnm.org; Freddie.Torres@torcnm.org; gerald.lafont@cityofelephantbutte.com; Huey, Greg, NMENV; gbneal@hotspringsld.com; bartoosandandgravel@windstream.net; Morales, Howie; ikeandmary@windstream.net; jpc@sierracountynm.gov; gerijay@valornet.com; jeanette_lyman@tomudall.senate.gov; jcox@sierracountynm.gov; phfss@torchousing.org
Subject:	Copper Flat EIS Scoping
Attachments:	SCOPING_LTR_CopperFlatEIS_FEB2012.pdf; scoping_commentform.pptx

Dear Interested Party,
This email retransmits the scoping letter for the Copper Flat EIS because a comment form was omitted from the previous mailing. Please read the attached scoping letter and use the attached comment sheet for all input.
Thank
you.

02301

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Las Cruces District Office
1800 Marquess Street
Las Cruces, New Mexico 88005
www.blm.gov/nm

TAKE PRIDE IN AMERICA

In Reply Refer To:
1793 (L0000)

February 3, 2012

Dear Interested Party:

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400 WEST FOURTH
TRUTH OR CONSEQUENCES, NEW MEXICO

Your thoughts, ideas, and comments are important to us throughout the process. Please attend the scoping open houses or send us your written comments on the enclosed comment form before the scoping period ends, which is March 9, 2012.

You may also submit comments using any of the following methods:

EMAIL: BLM_NM_LCDO_Comments@blm.gov

FAX: 1(703) 760-4899

TOLL-FREE NUMBER: 1(866) 760-1421

MAIL:
Copper Flat Mine
C/O Mangi Environmental Group
7927 Jones Branch Drive
Mclean VA 22102

Also if you wish to be removed from the mailing list, please let us know by checking the box on the comment form. Otherwise your name will be retained on the list and you will receive information on the Copper Flat project in the future. Informational materials like this letter will be available on the Copper Flat website at www.cuflateis.com.

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If you have any questions, please contact Mike Smith at 575-525-4421.

Sincerely,

Bill Childress

Bill Childress
District Manager

1 Enclosure

2-7-2012

rvred

NEW MEXICO
ENVIRONMENT DEPARTMENT

Ground Water Quality Bureau

SUSANA MARTINEZ
Governor

JOHN SANCHEZ
Lieutenant Governor

1190 St. Francis Drive, P.O. Box 5469
Santa Fe, New Mexico 87502-5469
Phone (505) 827-2900 Fax (505) 827-2965
www.nmenv.state.nm.us

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For delivery information visit our
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Return Receipt Fee (Endorsement Required)
Restricted Delivery Fee (Endorsement Required)
J. Steven Raugust, PG
NM Copper Corp.
2425 San Pedro Dr., NE, S
Albuquerque, NM 87110
PS Form 3800, August 2006
7008 1830 0003 4177 2346

CERTIFIED MAIL – RETURN RECEIPT REQUESTED

February 7, 2012

J. Steven Raugust, PG
New Mexico Copper Corporation
2425 San Pedro Drive NE, Suite 100
Albuquerque, NM 87110

RE: Amendment Approval: Site-Wide Stage 1 Abatement Plan Proposal for the Copper Flat Mine Facility

Dear Mr. Raugust:

The New Mexico Environment Department (NMED) has reviewed the "Amendment to the Stage 1 Abatement Plan Proposal for the Copper Flat Mine" (Proposal), dated October 14, 2011 for the Copper Flat Mine Facility. On January 27, 2012 a meeting was held between NMED and the New Mexico Copper Corporation (NMCC) to discuss the Proposal (Meeting). NMED hereby approves the additional work plan presented in the Proposal as described below.

The Proposal is based on the identified contaminants of concern at the site and the need for further characterization within three specific areas: the pit lake, waste rock piles, and tailings impoundment facility.

Four piezometer nests have been installed in the area surrounding the pit lake. The proposed investigation includes collection of four quarters of water quality and water level data from the pit lake and surrounding piezometer nests. A revised water balance for the area will be developed using these data in conjunction with on-site climate data. Additionally, an analysis of the pit lake chemistry will be conducted to determine if there are issues with meeting the applicable surface water quality standards at closure.

Materials tests are being performed on samples collected from the existing waste rock piles. The Proposal includes comparison of results from the waste rock characterization to water quality results obtained from surface water runoff samples, down gradient wells, and the pit area piezometer nests. Historical surface and ground water quality data will be statistically evaluated for significant increases in sulfate and TDS to determine if changes are attributable to the waste rock piles or other influences. NMCC is currently working to gain access to wells on U.S.

Bureau of Land Management (BLM) property. Once access is obtained, water quality samples from GWQ-1, GWQ-3, GWQ-5R, and GWQ-8 will be used to help make this evaluation.

The Proposal proposes to install one or two new monitoring wells down gradient of the known extent of the sulfate plume at the tailings impoundment facility. The first well would be installed east of existing well GWQ94-21. During the Meeting it was determined that this well shall be drilled using methods that provide for determination of the uppermost water table during drilling. This well shall be screened from five feet above the water table to thirty-five feet below the water table. If this first monitoring well does not define the eastward extent of the sulfate plume, a second well will be drilled east of the first proposed monitoring well.

Four additional quarters of data collection are proposed to complete the investigation; however, initiation of this effort is conditional on obtaining access to BLM property. Upon resolution of access issues, NMCC shall initiate collection of all necessary data.

If you have any questions, please contact Greg Huey at (505) 827-1046.

Sincerely,

Mary Ann Menetrey
Program Manager
Ground Water Quality Bureau

MAM:gmh

cc: Kurt Vollbrecht, GWQB MECS
Chris Eustice, EMNRD Mining and Minerals Division
James Bearzi, Bureau Chief, NMED SWQB

2-10-2012

rU Ted

Huey, Greg, NMENV

From:	Zack Gorstein [zgorstein@themacresourcesgroup.com]
Sent:	Friday, February 10, 2012 8:50 AM
To:	Zack Gorstein
Cc:	Ann Carpenter
Subject:	THEMAC Resources Announces Plans for the 2012 Copper Flat Exploration and Drilling Program
Attachments:	20120209 2012 Drilling PR MAC.pdf

Please find attached a press release on THEMAC Resources' 2012 Exploration and Drilling program.

If you have any questions, please do not hesitate to contact me at zgorstein@themacresourcesgroup.com.

Kind regards,

--

Zack Gorstein
Project / Sustainability Analyst
Copper Flat Mine
THEMAC Resources Group, Ltd
2425 San Pedro Dr. NE, Suite 100
Albuquerque, NM 87110

Office: 505-883-2510
Mobile: 843-412-8021
Fax: 505-881-4616
www.themacresourcesgroup.com

THEMAC RESOURCES GROUP LIMITED

Suite 2000 - 1066 West Hastings Street
Vancouver, BC - Canada V6E 3X2
T (+1) 604 806-6110 F (+1) 604 806-6112
TSXV: MAC

THEMAC Resources Announces Plans for the 2012 Copper Flat Exploration and Drilling Program

Vancouver, British Colombia – February 9, 2012 – THEMAC Resources Group Limited (TSXV:MAC) ("THEMAC" or the "Company") today announced details of its 2012 exploration and drilling program at the Copper Flat copper project, New Mexico.

As stated in the Company's update NI43-101 resource statement filed February 2, 2012 on SEDAR, the Copper Flat deposit currently contains a Measured and Indicated Resource totaling 194,097 Ktons averaging 0.26% copper, 0.008% molybdenum, 0.002 Oz/t gold and 0.05 Oz/t silver. Additionally, the deposit contains an Inferred Resource totaling 8,206 Ktons at a similar, but slightly lower average grade.

Proposed 2012 Exploration and Drilling Program

The 2012 Copper Flat drilling program will consist of up to 20 angled and vertical core holes totaling approximately 22,000 feet (6,700 meters), which is scheduled to commence during April. The proposed drilling program is designed to accomplish the following:

1) Increase the existing resources by extending known moderate to higher grade mineralization in all directions. The results of this extensional drilling will also be used to optimize the shape and orientation of the final pit design in the upcoming pre-feasibility study.
2) Upgrade additional Inferred Resources to the Indicated category.
3) Further evaluate and better define deeper (> 1,000 feet below the surface), higher grade (>0.50%) copper mineralization.
4) Further evaluate the structurally controlled gold and silver mineralization within and proximal to the Copper Flat deposit.

In addition to and in conjunction with the planned exploration and definition drilling, three to six steeply inclined core holes will be drilled to obtain additional geotechnical information, which will aid in the final pit design to be used in the upcoming feasibility study.

"The spring drilling program that is planned for Copper Flat will greatly improve our knowledge of what controls the precious metal deposition and to what extent the gold and silver occurs:" said Andre Douchane, CEO of THEMAC. "We accomplished a lot during 2011, starting from the filing of the draft plan of operations in 2010 to publishing the projects Notice of Intent in the US Federal Register this January which officially began the Environmental Impact Statement process; and, along the way we got the agency cooperating agreement in place and completed and funded the agreement to reimburse the BLM. The 2012 spring drilling program is just another key step toward final design and production."

Other work that may be undertaken during the 2012 exploration program includes the continued re-logging of historical core; and, in addition to the 2969 pulps re-assayed in 2011 it is planned to assay 4,000 more pulps from historical drilling to confirm copper and molybdenum grades as well as obtain needed gold and silver data in an effort to increase contained precious metals. Additionally, work will be directed toward updating the existing geologic map and undertaking geological reconnaissance and prospecting.

The advanced stage Copper Flat project is the site of a Laramide porphyry copper-molybdenum deposit containing recoverable gold and silver credits located in the Las Animas Mining District of Sierra County, NM, approximately 150 miles (242 kilometers) south of Albuquerque, NM and 20 miles (32 kilometers) southwest of Truth or Consequences, NM.

The Copper Flat project consists of 26 wholly-owned patented mining claims, 184 unpatented mining claims and 29 placer mining claims totaling 4,241 acres (1,717 hectares).

About THEMAC Resources Group Limited

THEMAC is a copper development company with a strong management team and as of May 18, 2011, a 100% ownership interest in the Copper Flat copper-molybdenum-gold-silver project in New Mexico, USA. *We are committed to bringing the closed copper mine, Copper Flat, in Sierra County, New Mexico back into production with innovation and a sustainable approach to mining development and production, local economic opportunities and the best reclamation practices for our unique environment.* The Company is listed on the TSX Venture Exchange (ticker: MAC) and has issued share capital of 74,117,622 common shares (fully diluted share capital 136,423,241).

For more information please visit www.themacresourcesgroup.com or review the Company's filings on SEDAR (www.sedar.com).

Forward-Looking Statements

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Andre J. Douchane, President & Chief Executive Officer
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2-12-2012

Huey, Greg, NMENV

From:	Erica Earhart [EEarhart@mangi.com]
Sent:	Friday, February 03, 2012 8:19 PM
To:	Dominguez, Dora, EDD; dhaywood@blm.gov; egarland@zianet.com; ELindsey@torcnm.org; erica.sichler@mail.house.gov; eshort_55@yahoo.com; Evelyn.Renfro@torcnm.org; Martinez, Fernando, EMNRD; Frances.Sanchez@torcnm.org; Freddie.Torres@torcnm.org; gerald.lafont@cityofelephantbutte.com; Huey, Greg, NMENV; gbneal@hotspringsld.com; bartoosandandgravel@windstream.net; Morales, Howie; ikeandmary@windstream.net; jpc@sierracountynm.gov; gerijay@valornet.com; jeanette_lyman@tomudall.senate.gov; jcox@sierracountynm.gov; phfss@torchousing.org
Subject:	Copper Flat EIS Scoping
Attachments:	SCOPING_LTR_CopperFlatEIS_FEB2012.pdf

Dear Interested Party,
Please review the Copper Flat Mine EIS scoping letter attached.
Thank you.

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Las Cruces District Office
1800 Marquess Street
Las Cruces, New Mexico 88005
www.blm.gov/nm

In Reply Refer To:
1793 (L0000)

February 3, 2012

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Sincerely,

Bill Childress

Bill Childress
District Manager

1 Enclosure

2-17-2012

From:	Zack Gorstein [zgorstein@themacresourcesgroup.com]
Sent:	Friday, February 17, 2012 1:56 PM
To:	Zack Gorstein
Subject:	THEMAC Resources Scoping Meeting Notification
Attachments:	THEMAC_Scoping Meeting Notification.pdf

The Copper Flat Mine is pleased to announce the schedule for the Bureau of Land Management Scoping Meetings. These meetings give the community an opportunity to comment on the opening of the Copper Flat Mine.

The Scoping Meetings will be held on February 22 at 7 pm at the Hillsboro community center, and February 23 at 7 pm at the TorC Civic and Convention Center.

Please see the attached notice for more information, and feel free to contact me with any questions.

Kind regards,

--
Zack Gorstein
Project / Sustainability Analyst
Copper Flat Mine
THEMAC Resources Group, Ltd
2425 San Pedro Dr. NE, Suite 100
Albuquerque, NM 87110

Office: 505-883-2510
Mobile: 843-412-8021
Fax: 505-881-4616
www.themacresourcesgroup.com

The Copper Flat Mine

Bureau of Land Management Scoping Meetings

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These meetings give the community an opportunity to comment on the opening of the Copper Flat Mine.

Please join us on the following days:

FEB. 22 2012 — 7 pm to 9 pm

Hillsboro Community Center
Elenore Street,
Hillsboro,
NM 88042
575-895-3300

FEB. 23 2012 — 7 pm to 9 pm

Truth or Consequences Civic and Convention Center
400 West Fourth,
Truth or Consequences,
NM 87901
575-894-6673

For more information please visit **www.cuflateis.com**
or call toll free **866-760-1421**

We look forward to seeing you.

LEARN MORE ABOUT THE COPPER FLAT MINE AT
www.themacresourcesgroup.com
OR CALL ZACK GORSTEIN, PROJECT & SUSTAINABILITY ANALYST AT
505-234-6285

THE MAC RESOURCES

This letter retransmits the scoping letter for the Copper Flat Mine Environmental Impact Statement because a comment form was omitted from the previous mailing.

New Mexico Environmental Department
Mining and Environmental Compliance Section
c/o Greg Huey
1190 St. Francis Dr.
Santa Fe, NM 87505

GROUND WATER
FEB 20 2012
BUREAU

UNITED STATES POSTAGE
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0003976093 FEB 06 2012
MAILED FROM ZIP CODE 22102

2-20-2012

PDFed

THEMAC RESOURCES

February 20, 2012

Mr. Chris Eustice
Senior Environmental Engineer
Mining and Minerals Division,
Mining Act Reclamation Program
Wendell Chino Building
1220 South St Francis Drive
Santa Fe, New Mexico 87505

Re: Transmission of DRAFT Baseline Data Report for Copper Flat Mine, Sierra County, New Mexico

Dear Chris,

Per your request, New Mexico Copper Corporation (NMCC) is pleased to provide you with one hard copy of the DRAFT Baseline Data Report (BDR) for the Copper Flat Mine. This DRAFT document is an informal submission, CONFIDENTIAL and not for public release. If you would like to review this report and provide comments that would improve the final version of this report, please do so by March 21, 2012.

Per independent requests from the other agencies with executed Cooperating Agency Memoranda of Understanding with the Bureau of Land Management, the DRAFT is being provided to the NMED Ground Water Bureau (1 Copy), Department of Game and Fish (1 Copy), and the NMED Air Quality Bureau (1 Copy). For each of these agencies, the same qualifications of an informal submission, CONFIDENTIAL, and not for public release apply.

NMCC is in the process of preparing a Permit Application Package and any questions or comments you might have upon review of the DRAFT Baseline Data Report would assist us in improving the quality of the final report, which will be included in the Permit Application Package. If you do not wish to provide comments now, you will have an opportunity to do so when NMCC submits the Final Baseline Data Report.

Thank you for your time. It is a pleasure working with you.

Best regards,
New Mexico Copper Corporation

J. Steven Raugust, CEG
Permitting Manager – Engineering

Katie Emmer
Katie Emmer
Project Scientist

Cc: Mr. Greg Huey, NMED Groundwater Bureau, Mining Environmental Compliance Section
Ms. Rachel Jankowitz, State of New Mexico Department of Game and Fish
Ms. Norma Perez, NMED Air Quality Bureau

Note: The DRAFT BDR is the same as the final version submitted with PAP on July 18, 2012

March 9, 2012

[redacted]

WB

State of New Mexico
Energy, Minerals and Natural Resources Department

Susana Martinez
Governor

John Bemis
Cabinet Secretary

Brett F. Woods, Ph.D.
Deputy Cabinet Secretary

Fernando Martinez, Director
Mining and Minerals Division

March 9, 2012

Mr. Kurt Vollbrecht, Mining Act Team Leader
Mining Environmental Compliance Section
Groundwater Quality Bureau
New Mexico Environment Department
Post Office Box 26110
Santa Fe, NM 87502

GROUND WATER
MAR 13 2012
BUREAU

RE: Request for Review and Comment, Permit Modification 12-1 to Minimal Impact Exploration Permit Application, Copper Flat Exploration 2 Project, Permit No. SI025EM

Dear Mr. Vollbrecht:

The New Mexico Mining and Minerals Division (MMD) received an application requesting a modification to Minimal Impact Exploration Permit No. SI025EM for the Copper Flat Exploration 2 Project located in Sierra County, NM from New Mexico Copper Corporation. A copy of the application is enclosed pursuant to 19.10.4.406.C.3 NMAC.

MMD requests that you review this application and provide comments to MMD no later than 20 days after your receipt of this letter.

Please contact me at (505) 476-3438, or via email at chris.eustice@state.nm.us with any questions or comments you may have regarding the application or this request.

Sincerely,

Chris Eustice, Permit Lead
Mining Act Reclamation Program

Enclosures

cc: Mine File SI025EM

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RESOURCES

February 16, 2012

Mr. Chris Eusctice
Permit Lead, MMD
1220 South St. Francis Drive
Santa Fe, NM 87505

RE: Copper Flat Exploration 2(SI025EM) Permit Modification Request #2

Dear Chris,

New Mexico Copper Corporation (a wholly-owned subsidiary of THEMAC Resources Group) proposes to modify the Copper Flat Exploration 2 Minimal Impact Permit #SI025EM. We intend add 18 drill locations, accommodating 20 holes, to our permit, while relinquishing 6 un-drilled holes (on 4 un-disturbed sites) from the existing permit.

In 2011, we drilled 16 holes for a total of 15,451 downhole feet, comprising 1.93 acres (14 drill pads, 60' x 100' ea.) permitted surface disturbance. Downhole reclamation was completed immediately after drilling. We are requesting release of this portion of Financial Assurance, and have attached Plugging Records as submitted to the Office of the State Engineer.

Furthermore, we would like to abandon the previous modification (9 additional holes on existing sites) which we submitted on August 4, 2011. Those additional holes will no longer be required.

<u>Roads and Overland Access</u>

Nearly all of the proposed drill sites in this modification have been located on or adjacent to existing 2-wheel-drive navigable roads.

Three sites, listed below, will require some minor surface improvement (i.e., new road). Widths of 10' will be generous to accommodate our equipment, and these very short road segments will not need to accommodate two vehicles passing.

Site	Length of Road Required
24	80 feet
30	50 feet
CNI-5	100 feet

Total Road Length: <u>230 ft</u>
Disturbance Area: <u>0.05 ac</u>

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Drill Pads

We will be constructing pads of no greater than 30' by 60'. Our current drill program will employ a Boart Longyear LF 70 truck-mounted core rig requiring minimal auxiliary equipment. Drill pipe will be staged on a pipe truck immediately behind the rig. This will greatly decrease the area of surface disturbance.

Drill sites which were permitted under the 2011 permit but which will be drilled in 2012 (detailed below) were not prepared or disturbed ahead of time, and will now be constructed to the 30' by 60' size. For this reason, our area of disturbance will be significantly decreased.

Drill Sites

The following drill sites, approved in 2011, were drilled in 2011. We have no further drilling activities planned for these sites. Downhole reclamation was completed on all holes. We will apply for bond release upon completion of surface reclamation.

All coordinates are given in UTM meters, NAD 83 Zone 13 S (un-surveyed).

Site	NMCC Hole Name	UTM N (m)	UTM E (m)	Hole Length (ft)
C	CF-11-13	3650933	263097	1,200
D	CF-11-14	3650903	263097	1,200
E	CF-11-06	3650899	263257	1,177
H	CF-11-01	3650838	263240	310
	CF-11-01B			1,111
J-1/J-2	CF-11-07	3650774	263360	109
	CF-11-04			812
K	CF-11-03	3650751	263077	1,154
Q	CF-11-11	3650653	263341	1,198
R-1/R-2	CF-11-05	3650625	263249	1,200
	CF-11-09			1,200
S	CF-11-08	3650596	263187	1,200
NE-F	CF-11-02	3651004	263305	1,097
JK-9	CF-11-12	3650812	263384	1,200
JK-16	CF-11-10	3650673	263144	106
	CF-11-10B			1,177

Downhole Disturbance: 15,451 ft
Surface Disturbance: 1.93 ac

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The following drill sites, approved in 2011, have not been drilled, but we wish to retain them under our permit, and drill them during 2012. In some cases, these hole locations will be adjusted <100'. We will be re-naming the sites to fit with this year's drill program designations, as outlined below. The intended hole lengths have been updated.

Site	UTM N	UTM E	Hole Length	New Site Name
A	3650973	263112	1,050	CNI-6
B	3650951	263316	1,050	CNI-1
I	3650782	263024	1,050	CNI-5
P	3650653	263097	1,050	CNI-4
T	3650606	262998	1,050	3
JK-1	3650981	263152	1,050	7
JK-5	3650949	263401	1,100	20
JK-6	3650919	263346	1,050	16
JK-8	3650883	263462	1,050	CNI-2
(B)	3650883	263462	1,050	22
JK-10	3650680	263447	1,050	CNI-3
JK-14	3650596	263111	1,200	5A

Proposed Downhole Disturbance: 13,100 ft
Proposed Surface Disturbance: 0.45 ac

The following drill sites, approved in 2011, have not been drilled or disturbed, but we wish to retain them under our permit. However, they represent a later phase of drilling, and we do not wish to bond for downhole disturbance at this time. (Permitted surface disturbance *is* included in our Financial Assurance calculation below.)

Site	UTM N	UTM E
NE-C	3651081	263261
NE-G	3650993	263188
F	3650866	263347
G	3650845	263026
L	3650742	263410
M	3650712	263327
O	3650681	263404
U	3650413	263145

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JK-2	3651032	263214
JK-4	3651050	263305
JK-7	3650872	263398
JK-11	3650652	263387
JK-12, V	3650563	263241
JK-13	3650566	263050
JK-15	3650638	263035

Proposed Downhole Disturbance: 0 ft
Proposed Surface Disturbance: 0.62 ac

The following drill sites, approved in 2011, have not been drilled or disturbed, and we wish to relinquish them from our permit:

Site	UTM N	UTM E
NE-B	3651112	263285
NE-D, JK-3	3651053	263215
NE-E	3651022	263199
N-1, N-2	3650690	263060

We wish to add the following drill sites to our permit through this modification:

Site		UTM N	UTM E	Hole Length
1		3650689	262989	1,200
2		3650802	262989	1,100
4		3650607	263050	1,100
	(A)	3650607	263050	2,000
4B		3650730	263050	1,050
5		3650516	263100	1,050
6		3650691	263111	1,500
9		3650954	263172	1,050
11		3650619	263233	1,500
13		3650741	263233	1,500
17		3650588	263370	1,050
18		3650611	263415	1,100
21		3650651	263477	1,200
	(B)	3650651	263477	1,200

23	3650575	263536	1,050
24	3651010	263616	1,050
25A	3650598	263587	1,050
30	3650840	262928	1,050
31	3650818	263579	1,050
8A	3650575	263171	1,200

Proposed Downhole Disturbance: <u>24,050 ft</u>
Proposed Surface Disturbance: <u>0.74 ac</u>

In summary, given the MMD's approval of this modification, our permitted drill sites will stand:

Site	UTM N	UTM E	Hole Length	Comment
C	3650933	263097	1,200	Drilled 2011
D	3650903	263097	1,200	Drilled 2011
E	3650899	263257	1,177	Drilled 2011
H	3650838	263240	310	Drilled 2011
(B)			1,111	Drilled 2011
J-1/J-2	3650774	263360	109	Drilled 2011
(B)	3650774	263360	812	Drilled 2011
K	3650751	263077	1,154	Drilled 2011
Q	3650653	263341	1,198	Drilled 2011
R-1/R-2	3650625	263249	1,200	Drilled 2011
(B)			1,200	Drilled 2011
S	3650596	263187	1,200	Drilled 2011
NE-F	3651004	263305	1,097	Drilled 2011
JK-9	3650812	263384	1,200	Drilled 2011
JK-16	3650673	263144	106	Drilled 2011
(B)			1,177	Drilled 2011
CNI-6	3650973	263112	1,050	Formerly A
CNI-1	3650951	263316	1,050	Formerly B
CNI-5	3650782	263024	1,050	Formerly I
CNI-4	3650653	263097	1,050	Formerly P
3	3650606	262998	1,050	Formerly T
7	3650981	263152	1,050	Formerly JK-1
20	3650949	263401	1,100	Formerly JK-5
16	3650919	263346	1,050	Formerly JK-6
CNI-2	3650883	263462	1,050	Formerly JK-8 (AKA 22)
(22)			1,050	Formerly JK-8 (AKA Site 22)

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CNI-3	3650680	263447	1,050	Formerly JK-10
5A	3650596	263111	1,500	Formerly JK-14
NE-C	3651081	263261	No Downhole Bond	Permitted 2011
NE-G	3650993	263188	No Downhole Bond	Permitted 2011
F	3650866	263347	No Downhole Bond	Permitted 2011
G	3650845	263026	No Downhole Bond	Permitted 2011
L	3650742	263410	No Downhole Bond	Permitted 2011
M	3650712	263327	No Downhole Bond	Permitted 2011
O	3650681	263404	No Downhole Bond	Permitted 2011
U	3650413	263145	No Downhole Bond	Permitted 2011
JK-2	3651032	263214	No Downhole Bond	Permitted 2011
JK-4	3651050	263305	No Downhole Bond	Permitted 2011
JK-7	3650872	263398	No Downhole Bond	Permitted 2011
JK-11	3650652	263387	No Downhole Bond	Permitted 2011
JK-12, V	3650563	263241	No Downhole Bond	Permitted 2011
JK-13	3650566	263050	No Downhole Bond	Permitted 2011
JK-15	3650638	263035	No Downhole Bond	Permitted 2011
1	3650689	262989	1,200	New Site
2	3650802	262989	1,100	New Site
4	3650607	263050	1,100	New Site
(A)			2,000	(Site 4)
4B	3650730	263050	1,050	New Site
5	3650516	263100	1,050	New Site
6	3650691	263111	1,500	New Site
9	3650954	263172	1,050	New Site
11	3650619	263233	1,500	New Site
13	3650741	263233	1,500	New Site
17	3650588	263370	1,050	New Site
18	3650611	263415	1,100	New Site
21	3650651	263477	1,200	New Site
(B)			1,200	(Site 21)
23	3650575	263536	1,050	New Site
24	3651010	263616	1,050	New Site
25A	3650598	263587	1,050	New Site
30	3650840	262928	1,050	New Site
31	3650818	263579	1,050	New Site
8A	3650575	263171	1,200	New Site

The attached map shows our intended project disposition.

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Financial Assurance

The following factors were used to estimate Financial Assurance:

Existing Disturbance under Permit SI025EM

Surface (Drill Pads)	1.93 ac		
Downhole	15,451 ft	@ $6.50/ft =	$100,431.50*

* This amount will not be included in the final Financial Assurance figure, as downhole reclamation is complete

Proposed Additional Disturbance

Surface				
	Road	0.05 ac		
	Drill Pads	1.81 ac		
Downhole		37,150 ft	@ $6.50/ft =	$241,475

Total Bond Disturbance

Surface	**3.79 ac**	**@ $5,400.00 First Acre** **$3,300.00 Subsequent Acres** **Total = $14,607**
Downhole	**$37,150 ft**	**@ $6.50/ft = $241,475**

Total Financial Assurance, 2012:	**$256,082.00**
2011 Financial Assurance:	$394,082.00

NMCC will be requesting a reduction of our Financial Assurance bond in the amount of $138,000.00 to reflect our decreased surface and downhole disturbance forecasts, as well as the completed downhole reclamation (abandonment) of 15,451 ft drilled in 2011.

I have enclosed a check for the $250 permit modification fee.

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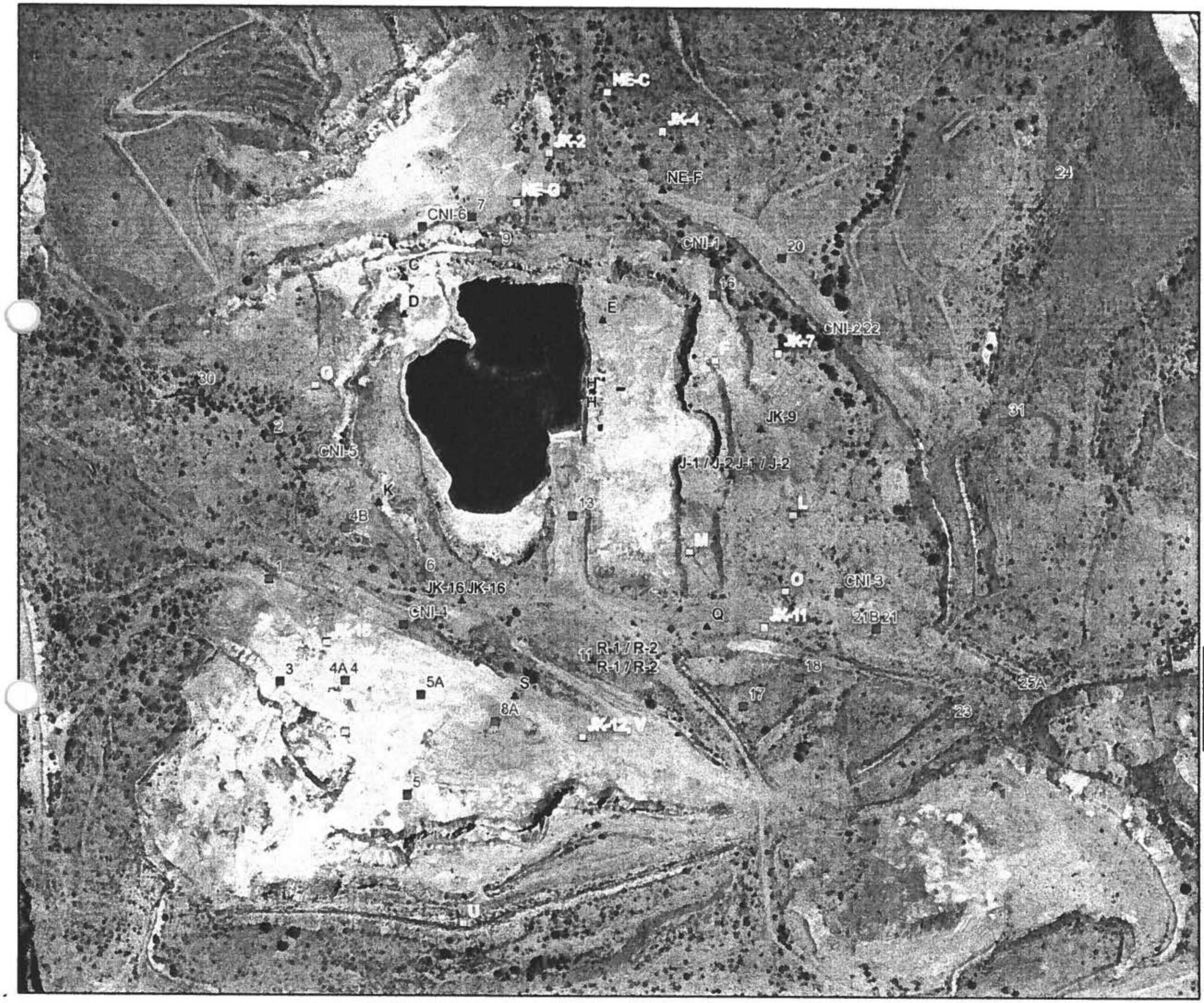
Thanks once again for all of your assistance during this process. Your ready knowledge of regulations has been a tremendous help in composing these modifications. Please don't hesitate to contact me with any questions or for any more information I can provide.

Best regards,

Andrew Feltman
Project Geologist
New Mexico Copper Corporation – Copper Flat Mine
(A Wholly Owned Subsidiary of THEMAC Resources Group, Ltd.)
Office: 505.872.0297
Mobile: 251.591.5251
www.themacresourcesgroup.com



■ New Sites, 2012
■ 2011 Permitted, Not Drilled
□ 2011 Permitted, No Hole Bond
▲ 2011 Drilled
— New Road, 2012

0 100 200 400 Feet

Coordinate System: NAD 1983 UTM Zone 13N
Projection: Transverse Mercator
Datum: North American 1983
False Easting: 500,000.0000
False Northing: 0.0000
Central Meridian: -105.0000
Scale Factor: 0.9996
Latitude Of Origin: 0.0000
Units: Meter

N

Minimal Impact Permit S102EM Modification	
THEMAC Resource Group, Ltd Copper Flat Mine	2/16/2012
	APF

3-16-2012

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March 16, 2012

Doug Haywood
Program Manager
Bureau of Land Management
Las Cruces District Office
1800 Marquess Street
Las Cruces, NM 88005

Re: Revised and More Detailed Scoping Comments, Copper Flat Mine, Sierra County New Mexico

Doug,

The purpose of this letter is to submit revised and more detailed scoping comments from NMCC in regards to the proposed Copper Flat Mine. This letter provides the list of specific alternatives being considered by NMCC in the design process. These are alternatives that need to be included as part of the EIS process. They are:

Tailings Deposition Method:
NMCC is evaluating a different tailings deposition method versus the conventional tailings storage facility described in the MPO. The method under evaluation is referred to as dry-stack tailings deposition or paste tailings deposition. The two names are sometimes used interchangeably depending on the amount of retained moisture in the tailings at the time of deposition. The method differs from conventional tailings deposition in terms of the method of construction, overall water consumption, erosion control methods, air quality control methods and the general footprint of the tailings storage facility. Additionally, impacts to project economics as well as the overall feasibility of the method are key issues in the assessment of this alternative.

Tailings Storage Facility Design:
NMCC is evaluating the utilization of a single synthetic liner and under drain system for the Copper Flat Mine. The current design incorporates two synthetic liners and two under drain systems. Evaluations by multiple engineering firms are underway to compare containment and process water collection effectiveness as well as long-term structural stability of the two designs. Assuming the evaluations are favorable to the single synthetic liner design, NMCC would like to consider this alternative.

Mining and Processing Rate:
NMCC is evaluating an increase in the processing rate. The current rate for ore processing in the MPO is 17,500 short tons per day. Processing rates up to 25,000 short tons per day are being evaluated. There would also be a corresponding increase in the mining rate. The total tons of ore processed over the life of the mine would remain about the same as that in the MPO. The footprint of the processing plant,

tailings storage facility and pit area would also remain about the same as that in the MPO. This is an important alternative with regards to project economics and feasibility.

Waste Rock Disposal:
Recent geotechnical data and analysis has determined that the pit slopes will need to be constructed at a lesser angle in some areas of the pit than presented in the MPO. This is necessary to allow the safe mining of the ore body. One result of this new determination is an increase in the amount of waste rock that will need to be mined and placed in the waste rock disposal area. NMCC continues efforts in the collection of geotechnical data and the analysis of the pit slopes. As these efforts go forward, the volume of material in the waste rock disposal area will be impacted. This alternative is necessary to provide for the safe and economic mining of the resource.

Thank you for your time. We look forward to working with you in this process and invite any questions you might have regarding these alternatives. We will of course provide additional information to the BLM as the engineering studies are completed.

Sincerely,

NEW MEXICO COPPER CORPORATION

Jens Deichmann
Permitting Manager

Copper Flat Mine EIS
Alternatives Development Outline

1. **Regulatory Framework**
   a. **Alternatives**
      i. CEQ regulations (40 CFR 1502.14) – rigorously explore and objectively evaluate all reasonable alternatives
         1. CEQ 40 Questions (2a) – reasonable alternatives include those that are practical or feasible from the technical and economic standpoint and using common sense, rather than simply desirable from the standpoint of the applicant
      ii. DOI NEPA regulations (43 CFR 46.415) – reasonable alternatives that meet the purpose and need of the proposed action and address one or more significant issues related to the proposed action
         1. 43 CFR 46.420 – reasonable alternatives are technically and economically practical or feasible and meet the purpose and need of the proposed action
      iii. BLM NEPA Handbook – alternatives may need to reflect the decision space and authority of other agencies if decisions are being made by more than one agency
   b. **Purpose and Need**
      i. CEQ regulations (40 CFR 1502.13) – briefly specify the underlying purpose and need to which the agency is responding in proposing the alternatives including the proposed action.
      ii. DOI NEPA regulations (43 CFR 46.420) – consider the needs and goals of the parties involved in the application as well as the public interest
         1. needs and goals of parties involved may be described as background information
         2. BLM's purpose and need for action will determine the range of alternatives
      iii. BLM NEPA Handbook – purpose and need statement for an externally generated action must describe the BLM purpose and need, not the external proponent's purpose and need
      iv. Surface Management regulations (43 CFR 3809) – in response to actions authorized by mining laws, prevent unnecessary and undue degradation of public lands, reclaim disturbed areas, and coordinate with state agencies to avoid duplication

2. **Draft Purpose and Need Statement**
   a. **Need** – allow NMCC reasonable access to public land to conduct mining activities permitted under the general mining laws
   b. **Purpose** – approve an MPO that prevents unnecessary and undue degradation of public lands and reclaims disturbed areas

3. **Alternatives Development**
   a. **No Action**
   b. **Proposed Action** – MPO as presented by NMCC *(discussion below is preliminary draft descriptions subject to change)*
      i. Components – separate activities or facilities of the action
         1. Construction (Site Preparation)

2. Exploration (Access and Sampling)
3. Operation (Extraction and Processing)
4. Reclamation (Closure and Monitoring)

ii. Elements – actions that comprise the components

1. Construction – tailings impoundment, waste rock disposal, haul roads, access roads, fencing and exclusionary devices, stormwater diversion, topsoil salvage, plant area (mill and processing facilities, administration/ancillary facilities), water supply network
2. Exploration – access roads, drill pads, staging areas
3. Operation – open pit, ore processing, dewatering, tailings impoundment process, power source and consumption, water source and consumption, schedule, transport, operating plans
4. Reclamation – remove equipment and facilities, stabilize pit walls, stabilize tailing impoundment walls, recontour disturbed areas, revegetate disturbed areas, alleviate potential for acid rock drainage, remove roads, plug drill holes, abandon wells, monitor pit water and groundwater

c. Process to Identify Alternatives

i. Consider planning, feasibility, and engineering studies prepared by NMCC

ii. Consider options to or different means of implementing components and elements of MPO

iii. Consider operational and environmental issues identified by agencies

1. *TBD from agency input*
2. *TBD from agency input*

iv. Consider operational and environmental issues identified from scoping process

1. *TBD from scoping comments*
2. *TBD from scoping comments*
3. *TBD from scoping comments*

d. Alternative 1

i. Xxxx

ii. Xxxx

iii. Xxxx

e. Alternative 2

i. Xxxx

ii. Xxxx

iii. Xxxx

4. Process to Screen Alternatives for Analysis or Elimination

a. Screening Process – could be a one-step or two-step process depending on the number and complexity of alternatives to be screened

i. One-step Process: Qualitative evaluation based on general criteria; general criteria focus on alternative meeting purpose and need and being reasonable (i.e., technically and economically practical or feasible to implement)

1. *TBD general criterion*
2. *TBD general criterion*

3. *TBD general criterion*

ii. Two-step Process: 1st step as described above; 2nd step consists of qualitative and quantitative evaluation based on specific criteria; specific criteria are subsets of general criteria and assigned weights based on relative importance and feasibility of criteria in identifying a reasonable alternative

1. *TBD specific criterion*
2. *TBD specific criterion*
3. *TBD specific criterion*

b. Decision Matrix – tabulate the outcome of the screening process to indicate alternative carried forward to analysis and alternatives eliminated from analysis

i. One-step Process: qualitatively rate alternatives as positive, negative, or neutral against the general criteria; alternatives with a net positive rating will be analyzed, net negative or net neutral will be eliminated

ii. Two-step Process: 1st step as described above; assign values to alternatives based on likelihood of meeting specific criteria; calculate score and rank alternatives; eliminate low ranking alternatives

3-24-2012

Copper Flat Mine EIS
Alternatives Development Outline

Circa 3-20-2012

1. **Regulatory Framework**
   a. **Alternatives**
      i. CEQ regulations (40 CFR 1502.14) – rigorously explore and objectively evaluate all reasonable alternatives
         1. CEQ 40 Questions (2a) – reasonable alternatives include those that are practical or feasible from the technical and economic standpoint and using common sense, rather than simply desirable from the standpoint of the applicant
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         1. needs and goals of parties involved may be described as background information
         2. BLM's purpose and need for action will determine the range of alternatives
      iii. BLM NEPA Handbook – purpose and need statement for an externally generated action must describe the BLM purpose and need, not the external proponent's purpose and need
      iv. Surface Management regulations (43 CFR 3809) – in response to actions authorized by mining laws, prevent unnecessary and undue degradation of public lands, reclaim disturbed areas, and coordinate with state agencies to avoid duplication

2. **Draft Purpose and Need Statement**
   a. **Need** – ~~allow~~ authorize NMCC reasonable access to public land to conduct mining activities permitted under the general mining laws
   b. **Purpose** – approve an MPO that prevents unnecessary and undue degradation of public lands and reclaims disturbed areas

3. **Alternatives Development**
   a. **No Action**
   b. **Proposed Action** – MPO as presented by NMCC *(discussion below is preliminary draft descriptions subject to change)*
      i. Components – separate activities or facilities of the action
         1. Construction (Site Preparation)

2. Exploration (Access and Sampling)
3. Operation (Extraction and Processing)
4. Reclamation (Closure and Monitoring)

ii. Elements – actions that comprise the components

1. Construction – tailings impoundment, waste rock disposal, haul roads, access roads, fencing and exclusionary devices, stormwater diversion, topsoil salvage, plant area (mill and processing facilities, administration/ancillary facilities), water supply network **(water pump testing?)**
2. Exploration – access roads, drill pads, staging areas
3. Operation – open pit, ore processing, dewatering, tailings impoundment process, power source and consumption, water source and consumption, schedule, transport, operating plans
4. Reclamation – remove equipment and facilities, stabilize pit walls, stabilize tailing impoundment walls, recontour disturbed areas, revegetate disturbed areas, alleviate potential for acid rock drainage, remove roads, plug drill holes, abandon wells, monitor pit water and groundwater

c. **Process to Identify Alternatives**

i. Consider planning, feasibility, and engineering studies prepared by NMCC

ii. Consider options to or different means of implementing components and elements of MPO

iii. Consider operational and environmental issues identified by agencies

1. TBD from agency input

2. TBD from agency input

iv. Consider operational and environmental issues identified from scoping process

1. TBD from scoping comments

2. TBD from scoping comments

3. TBD from scoping comments

d. **Alternative 1**

i. Xxxx

ii. Xxxx

iii. Xxxx

e. **Alternative 2**

i. Xxxx

ii. Xxxx

iii. Xxxx

4. **Process to Screen Alternatives for Analysis or Elimination**

a. **Screening Process** – could be a one-step or two-step process depending on the number and complexity of alternatives to be screened

i. One-step Process: Qualitative evaluation based on general criteria; general criteria focus on alternative meeting purpose and need and being reasonable (i.e., technically and economically practical or feasible to implement)

1. TBD general criterion

2. *TBD general criterion*
3. *TBD general criterion*

ii. Two-step Process: 1st step as described above; 2nd step consists of qualitative and quantitative evaluation based on specific criteria; specific criteria are subsets of general criteria and assigned weights based on relative importance and feasibility of criteria in identifying a reasonable alternative

1. *TBD specific criterion*
2. *TBD specific criterion*
3. *TBD specific criterion*

b. Decision Matrix – tabulate the outcome of the screening process to indicate alternatives carried forward to analysis and alternatives eliminated from analysis

i. One-step Process: qualitatively rate alternatives as positive, negative, or neutral against the general criteria; alternatives with a net positive rating will be analyzed, net negative or net neutral will be eliminated

ii. Two-step Process: 1st step as described above; assign values to alternatives based on likelihood of meeting specific criteria; calculate score and rank alternatives; eliminate low ranking alternatives

Purpose and Need

Background

The New Mexico Copper Corporation (NMCC) submitted a Mine Plan of Operation (MPO) to the Las Cruces District Office (LCDO) on November 4, 2011. The MPO proposes to reestablish a poly-metallic mine and processing facility in Sierra County, New Mexico. Mining, ore processing, and related activities would occur on both private land and public land administered by the BLM. Mill concentrate would be transported by truck to rail facilities where it would be shipped to a smelter in Arizona, or port facilities for processing overseas.

Agency Purpose and Need

The purpose of the proposed action is to provide NMCC authorization to conduct mining activities leading to the extraction of copper ore.

The need for the BLM to authorize this project is established under the General Mining Law of 1872, as amended. Under the law, persons are entitled to reasonable access to explore for and develop mineral deposits on public domain land. As the federal agency responsible for managing mineral rights and access on certain federal lands, the BLM must ensure that NMCC's proposal complies with BLM Surface Management Regulation (43 CFR 3809), the Mining and Mineral Policy Act of 1979 (as amended) and Federal Land Policy and Management Act of 1976.

NMCC #	Agency #	Comment
45	SWQB	The introductory paragraph to Section 8, Surface Water, includes the statement "Numerous ephemeral tributaries feed into the Rio Grande from the west, but none contribute perennial flow to the Rio Grande." Lack of perennial flow to the Rio Grande does not negate the fact that both Las Animas Creek and Percha Creek include perennial reaches that support fisheries and water quality must be protected as required under §20.6.4.103 of the New Mexico Administrative Code (NMAC). This paragraph should be reworded to acknowledge the important contribution of these waters of the State as a natural resource.
46		Section 8.1, Surface Water Characteristics of Site and Vicinity. During the joint agency inspection that was conducted on October 26, 2010 (Inspection), Grayback Arroyo exhibited surface water pools and small flows along a reach of several hundred yards that did not appear to be the result of direct precipitation. In addition, there is significant riparian vegetation indicating that Grayback Arroyo should be classified as an intermittent water of the State pursuant to §20.6.4.98 NMAC. The SAP should acknowledge this classification rather than describing Grayback Arroyo as an ephemeral channel.
47		Section 8.2, Historical Data: This section states that "Surface water at the Site was most recently investigated by ABC (1996), who collected flow and water quality from Percha Creek and Las Animas Creek." In 2004, the SWQB conducted a water quality survey that included Las Animas Creek and Percha Creek. These data are available from the State through a public records request.
48		Section 8.6.1.2, Water Quality Sampling: As observed during the Inspection, set up and placement of the automated samplers appeared adequate. SWQB staff did suggest to the applicant that stream sample collection targeting the rising limb of the hydro graph would be preferred since research indicates that the first surge of storm runoff is likely to carry the most pollutants.
49		Section 9 of the SAP states that the Rio Grande is the only significant surface water resource in the area. This statement is questionable since perennial reaches of the tributaries originating from the eastern side of the Black Range provide important sources of surface water to residents west of the Rio Grande and provide unique riparian and wildlife habitat year round. The SAP then states that Las Animas Creek and Percha Creek are intermittent streams. As previously discussed, these streams contain perennial reaches that support fisheries and should be acknowledged as such.

50	GWQB	Section 7.4 of the SAP proposes to review the existing geochemical data prior to determining the locations for collection of additional samples for identification of ore and waste rock zones within the proposed pit outlines. A phased approach is proposed that will contribute to a sampling program focused on the main material types within the proposed pit outlines, with more samples being collected from the material types with the greatest predicted tonnage. NMED agrees that this phased approach is an efficient methodology for identification of geologic strata but requests that addendums to the approved SAP be submitted for agency approval at developmental intervals prior to moving forward with the proceeding stage of geochemical sampling.
51		Section 7.4.2 states that "exploration drilling is currently ongoing in the expansion areas." During the Inspection, a map of the proposed exploration drilling areas was discussed, but at this time no minimal impact exploration application has been submitted for NMED review. Such an application is necessary before exploratory drilling may proceed.
52		Section 7.4.3 mentions "a number of field tests" that may be used to determine the geochemistry of specific material types prior to moving on with standard static testing. These field tests should be identified and described in the requested addendum to the SAP for geochemical sampling.
53		Section 8.6.2.1 discusses using five profiles and two tie lines to determine Pit Lake depth; however, Figure 8-2 shows eight profile lines. This discrepancy should be resolved.
54		Section 9.1.1 cites Figure 9-2 as depicting three aquifers: the crystalline bedrock aquifer, the Santa Fe Group aquifer system, and the Quaternary alluvial aquifer. Figure 9-2 does not provide any reference to the crystalline bedrock aquifer and does not function as a "conceptual model" of the Site ground water flow system as the title suggests. This figure should be replaced with an appropriately designed diagram.

55		Section 9.1.2.1 states that ground water elevation data are derived from wells greater than 4,000 feet distance from the Pit Lake, but then states confidently that the ground water gradients in the area are toward the Pit Lake. The section also references Figure 9-6 as demonstrating ground water gradients toward the Pit Lake; however, the vertical scales on opposite sides of this diagram are not coordinated: the scale on the left side of the figure is approximately 80 feet to one inch, while the scale on the right side of the figure is approximately 5 feet to one inch. This gross discrepancy in scale negates the effectiveness of this figure as a tool in ground water gradient interpretation. In addition, the figure, circa 1998, shows the Pit Lake elevation at 5,436.5 ft amsl, while the text in the section reported the Pit Lake elevation at 5,442 ft amsl in 1997 and 5,444 ft amsl in 2010. The section concludes by stating that the Pit Lake elevation remains below the pre-mining water level elevation of 5,500 to 5,540 ft amsl. This is in contradiction to the Preliminary Environmental Impact Statement (BLM, 1999) cited previously in the section, which describes pre-mining ground elevation as 5,500 to 5,540 ft amsl.
56		Figure 9-9 shows well EIW as the closest monitoring well to the Pit Lake. However, the SAP does not include water depths in this well or Pit Lake elevations in the monitoring network. A denser monitoring well field may be necessary to delineate a local ground water divide, and the SAP should require that Pit Lake elevation measurements be taken at the same time as water level measurements in adjacent ground water monitoring wells to better define the potentiometric surface across the Site. Statements regarding site-wide ground water levels should be re-evaluated pending a more thorough hydrological investigation.

57		Section 9.1.3 states that concentrations of total dissolved solids (TDS) and sulfate down-gradient of the Pit Lake have increased gradually over time and suggests that impacts to water quality in the vicinity of the Pit Lake may be naturally occurring. However, Figure 15 from Raugust (2003) shows an increase in TDS from approximately 550 mg/L to almost 1,000 mg/L between 1996 and 1998 in well GWQ-96-23A. Further review of Raugust (2003) reveals conflicting statements regarding wells in location to the Pit Lake. In the "Study Area Investigations" section, the manuscript states that "Prior to 1996, only one well was available for sampling groundwater in the vicinity of the pit lake. This monitoring well, GWQ-4, is located approximately one-half mile east of the existing pit." However, in the "Conclusions" section the manuscript references water quality collected from monitoring well GWQ-5 in 1981. NMED recommends that, rather than adopt conclusions from references not submitted for agency review, NMCC provide appropriate data and develop conclusions based on the analysis of those data.
58		'Section 9.1.5 references the MMD Guidance Document for Part 6 New Mining Operations, stating that the SAP must include supporting material to justify the use of historic data NMED requests that, regardless of justification, an inventory of all existing data be compiled and reported prior to validation and possible exclusion of these data.
59		Section 9.3 proposes reducing the number of wells monitored for water quality parameters after the initial four quarters of data collection. NMCC should be aware that under NMED abatement plan requirements and the discharge plan permitting process these wells will require separate evaluation by NMED prior to being removed from any approved sampling plan.
60		Section 9.4.2 discusses the possible need for installation of additional monitoring wells. New well drilling and installation must meet NMED and NM OSE requirements. New well locations should be proposed to NMED under a Stage One Abatement Plan and/or Discharge Plan proposal. In addition, this section references Table 9-4 for a summary of previous pumping tests and resulting aquifer characteristics. This table does not provide sufficient information to determine the source or validity of the data provided and the SAP should provide for agency review a summary of the individual aquifer tests used to compile these data prior to determination as to the adequacy of the existing data to support the hydrologic impact analysis.

61		Section 9.7 references Figure 9-9 to provide locations of the wells proposed for sampling in Table 9-2. Well GWQ-12 at the southern end of the tailing disposal facility is not proposed for water quality sampling. As previously stated, well EIW is also not included in the SAP. NMCC should provide justification with supporting data as to why these and other available wells are excluded from the SAP.
62		During the Inspection, a previously identified well was located adjacent to the lower Greyback Arroyo downstream of the tailing dam. It was supposed that this well may be the McCravey-Greyback well. A data review should be conducted for this well and justification for or against its inclusion in the SAP should be included. Furthermore, this well was open to the environment and efforts should be made to properly secure it with an appropriate cap.

Resolution	Notes
Section 8.1.1 now includes the statement: "Both Las Animas and Percha Creeks have perennial reaches that support fisheries."	
Grayback is discussed in Section 8.1.2.3, Greenhorn Arroyo Drainage Basin	
Data was requested and received from SWQB, but NMCC didn't reference because there is no flow data in published reports. See Sec 8.1.2.1.2, 8.1.2.2.2.	
Auto samplers were set to turn on every 15 minutes through monsoon season, however there was not enough runoff generated in precipitation events in 2011 to trigger a sample collection.	
Corrected or removed as applicable.	

See Section 7.5 for Geochemical Characterization	
All exploration drilling has properly permitted and documented through MMD and OSE.	
See Section 7.5 for Geochemical Characterization	
See Figure 8-8	
See Figure 8-11 for the current Conceptual Model of the site and surrounds.	

See Figure 8-16 and Discussion in Section 8.1.2.3.4	
See Figure 8-16 and Discussion in Section 8.1.2.3.4. Figure 8-14 presents Regional 2011 groundwater elevation contours and Table 8-17 presents a Summary of 2011 Water Level Measurements Used.	

Table 8-19 presents Identified Dissolved Constituents of Concern for the Pit Lake. Appendix 8-E presents Pit Lake Analytical Results.	
The BDR does compile historic data in tables and appedices of Section 8.	
NMCC's Stage I AP was submitted under separate cover. NMED approved this plan in February 2012.	
NMCC maintains communication with NMED and the NM OSE regarding new wells and obtains proper permits prior to drilling new wells.	

See Section 8.2.4 for Groundwater Data. See Section 8.2.4.1.3 for Well Selection Rationale.	
See Section 8.2.4 for Groundwater Data. See Section 8.2.4.1.3 for Well Selection Rationale. In addtion, the subject well in this discussion is not actually McGravey-Grayback, but is GWQ-1. Currently, this well is under a Right-of-Way access request by NMCC to the BLM. This ROW is still in process and once granted, NMCC plans to rehabilitate the well including a proper well head. For the baseline data, this well was not included due to it's unmaitained condition.	

3-20-12

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THEMAC RESOURCES GROUP LIMITED

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TSXV: MAC

THEMAC Resources Announces a Design Milling Rate Increase up to 25,000 TPD at Copper Flat

Vancouver, British Colombia – March 20, 2012 – THEMAC Resources Group Limited (TSXV:MAC) ("THEMAC" or the "Company") today announced that the ongoing metallurgical testing program being conducted in connection with the preparation of the preliminary feasibility study for the Copper Flat Property, has confirmed an enhanced processing plant size based upon existing plant infrastructure and ore characteristics. The test work, being conducted at the directive of Tucson-based M3 Engineering and Technology Corporation, has also presented encouraging results in the area of optimized copper, molybdenum and gold recoveries.

Highlights:

- Existing infrastructure includes foundations from existing crushing and grinding equipment. To take advantage of these structures, and meet the processing plant needs, grinding test work conducted by Hazen Research, Inc. was completed on a large core sample from Copper Flat. The resulting data was modeled and interpreted by Control Systems Services. These results indicate that the grinding circuit proposed will, if installed and operating at full capacity, be capable of processing approximately 25,000 short tons per day (tpd). This represents a designed increase, utilizing the currently installed foundations, of 8,000 tpd over the milling rate originally anticipated in the Company's preliminary assessment previously announced in July, 2010.
- Ongoing test work at Mineral Advisory Group R&D, LLC for the flotation of ore types shows very encouraging preliminary results. This has the potential to enhance the historical 90 percent mill recoveries for copper and silver. Future work will focus on finalizing reagent suites and directing specific reagent types toward improving molybdenum recovery rates over historical test work. Test parameters are also in place to investigate gold recovery improvements in the flotation process.
- Results from a mineralogy review for gold deportment by G & T Resources Ltd. of the mineralization at Copper Flat have been received. The Automatic Digital Image System review indicates that an opportunity exists to increase gold recovery through gravity separation. A test protocol is in progress with FL Smith Knelson Concentrators to fully quantify the increase in gold recoveries.
- Settling and rheological characterization tests are scheduled with Pocock International, Inc. to validate the sizing of process equipment and previous test work completed in this area.

"Initial metallurgical test work results for Copper Flat are very exciting," said Andre J. Douchane, CEO. "Increasing design throughput from 17,500 tpd, from our June 2010 PEA, to 25,000 tpd, while keeping the same mill foundation footprint, is a real win for the project. This potential increase in throughput will impact the project's payback of capital expenditures and profitability in a very positive way. The enhanced gold recovery potential seen in these test results is also very encouraging, leading us to believe that gold will be a major contributor to the project's economics."

The continuing metallurgical test work is scheduled to be completed during second quarter of 2012, in time to be included in the Copper Flat prefeasibility study.

About THEMAC Resources Group Limited

THEMAC is a copper development company with a strong management team and as of May 18, 2011, a 100% ownership interest in the Copper Flat copper-molybdenum-gold-silver project in New Mexico, USA. *We are committed to bringing the closed copper mine, Copper Flat, in Sierra County, New Mexico back into production with innovation and a sustainable approach to mining development and production, local economic opportunities and the best reclamation practices for our unique environment.* The Company is listed on the TSX Venture Exchange (ticker: MAC) and has issued share capital of 74,117,622 common shares (fully diluted share capital 136,423,241).

For more information please visit www.themacresourcesgroup.com or review the Company's filings on SEDAR (www.sedar.com).

Forward Looking Statements

This news release may contain certain information that constitutes forward-looking statements. Forward-looking information and statements are frequently characterized by words such as "plan," "expect," "project," "intend," "believe," "anticipate" and other similar words, or statements that certain events or conditions "may" or "will" occur, including statements regarding: the expected throughput capacity of the mill and the effect that will have on payback and profitability; expected enhanced recoveries of copper, gold and silver based on test results; and timing of completion of test work. The forward-looking information and statements made in this press release are based on the opinions and estimates of, and assumptions made by, management at the date the statements are made. Forward-looking information and statements are subject to a variety of risks and uncertainties and other factors that could cause actual events or results to differ materially from those projected in the forward-looking statements. These factors include the inherent risks involved in the exploration and development of mineral properties, the uncertainties involved in interpreting test results and other geological and technical data, fluctuating metal prices, the ability to obtain necessary permits and approvals the availability of funds to complete work programs and studies, and other factors described above. The Company disclaims any obligation to update or revise any forward-looking statements if circumstances or management's estimates or opinions should change, except as required by applicable law. The reader is cautioned not to place undue reliance on forward-looking statements.

For further information contact:

THEMAC Resources Group Limited
Andre J. Douchane, Chief Executive Officer (+1) 416 671 8089 or (+1) 520 850 7529

Neither the TSX Venture Exchange (the "TSXV") nor its Regulation Services Provider (as that term is defined in the policies of the TSXV) has reviewed, nor do they accept responsibility for the adequacy or accuracy of this release.

3-23-2012

(PDF

Vollbrecht, Kurt, NMENV

From: Menzie, David, NMENV
Sent: Friday, March 23, 2012 11:32 AM
To: Vollbrecht, Kurt, NMENV
Subject: RE: Cu Flat

Kurt,

They are jurisdictional under NM State Standards and likely jurisdictional under the federal CWA but the Corps and I have not always agreed on what should be jurisdictional under the CWA

David Menzie, Geologist
NM Environment Department
Surface Water Quality Bureau
Watershed Protection Section
Silver City Field Office
3082 32nd St., By-Pass Road, Ste.D
Silver City, NM 88061
Phone (575) 956-1548
david.menzie@state.nm.us

From: Vollbrecht, Kurt, NMENV
Sent: Friday, March 23, 2012 11:25 AM
To: Menzie, David, NMENV
Subject: Cu Flat

Hi Dave,

There was a question raised at the Cu Flat NEPA meeting Wednesday regarding the wetlands that now exists in Grayback Arroyo on the mine site. The question was whether or not the wetlands is jurisdictional?

You may not know the answer, but let me know what you do know and I will pass the info along...I'm still trying to come up to speed on the site in a general sense. Game and Fish Rachel indicated you had talked about it in the field at some point in time.

Kurt Vollbrecht, Geologist
New Mexico Environment Department
Ground Water Quality Bureau
Mining Environmental Compliance Section
(505) 827-0195

3-31-2012

02359

Proposed Copper Flat Copper Mine
Bureau of Land Management
Las Cruces District

Environmental Impact Statement

Scoping Report
March 2012

Sierra County, New Mexico

NATIONAL SYSTEM OF PUBLIC LANDS
U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

Table of Contents

Appendices (in separate volume)

Tables

Figures

List of Acronyms and Abbreviations

ANP	Acid Neutralizing Potential
BLM	Bureau of Land Management
CFR	Code of Federal Regulations
DEIS	Draft Environmental Impact Statement
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
FEIS	Final Environmental Impact Statement
GHG	Green House Gases
I -	Interstate
LCDO	Las Cruces District Office
MBTA	Migratory Bird Treaty Act
MPO	Mining Plan of Operations
NEPA	National Environmental Policy Act
NM	New Mexico
NMCC	New Mexico Copper Corporation
NOI	Notice of Intent
PAG	Potentially Acid-Generating
SAP	Sampling and Analysis Plan
THPO	Tribal historic Preservation Officers
TorC	Truth or Consequences

1.0 Introduction

The New Mexico Copper Corporation (NMCC) submitted a Mining Plan of Operations (MPO) to the Bureau of Land Management Las Cruces District Office (BLM LCDO) proposing to re-start mining operations at the Copper Flat Mine located in Sierra County, New Mexico. As identified in the MPO, the Proposed Action is to re-establish a poly-metallic mine and processing facility at the Copper Flat site. The proposed mine is located approximately four miles north-northeast of the town of Hillsboro, New Mexico within portions of Township 15 South; Range 6 and 7 West; and Sections 25, 26, 31, 35, and 36.

Mining, ore processing, and related activities would occur on both private land and public domain administered by the BLM. The proponent currently holds active mining claims over public domain land included in the proposed operation. NMCC proposes a mine permit area encompassing all five sections which would be divided between public lands (745 acres) and private estate (841 acres). At full development the pit would be approximately 2,500 by 2,500 feet and 900 feet deep. The BLM LCDO will prepare an environmental impact statement (EIS) to assess the restart, development, and operations of Copper Flat at the existing mine site in Sierra County. The entire project is also subject to the regulatory jurisdiction of the State of New Mexico.

This report describes the Proposed Project, agency and public scoping meetings and materials, and summarizes substantive public comments received during the public scoping period held from January 9, 2012 through March 9, 2012. In addition, a separate volume includes eight appendices of supplemental information as follows:

- Appendix A: Notice of Intent
- Appendix B: Public Meeting Newspaper Notices
- Appendix C: Press Release and List of Television Stations, Radio Stations, and Newspapers
- Appendix D: Letter Sent to Agencies
- Appendix E: Agency and Public Scoping Meetings Sign-In Sheets
- Appendix F: Public Scoping Meeting Materials
- Appendix G: Public Scoping Comment Form
- Appendix H: Coded Comments

2.0 Project Description

New Mexico Copper Corporation submitted a Plan of Operations to the BLM LCDO proposing to restart the Copper Flat Mine located in Sierra County, New Mexico. The Proposed Action identified in the MPO is to re-establish a poly-metallic mine and processing facility at the Copper Flat site. The proposed mine is located approximately four miles north-northeast of the town of Hillsboro, New Mexico. Lands involved in the mine would include parts of the following: Township 15 South, Range 6 and 7 West, and Sections 25, 26, 31, 35, and 36. Total surface disturbance associated with the MPO would be 1,586 acres, which would be divided between public lands (745 acres) and private estate (841 acres). The existing pit would eventually be enlarged to 2,500 feet by 2,500 feet and would reach an ultimate depth of 900 feet. This would mean that the proposed pit would disturb an additional 17 acres of mostly private land. No smelting of copper ore would occur on-site. Mill concentrate would be transported by truck approximately 40 miles on State Route 152 and Interstate 25 (I-25) to rail facilities in Rincon, New Mexico, where it would be shipped to a smelter in Arizona or port facilities. NMCC currently projects an operational life of 17 years and an additional 15 for reclamation and post-closure monitoring.

- Mine development includes baseline data gathering, initial site development and construction, which would be conducted to facilitate mine construction and operation.
- Mine operation consists of the activities related to production of copper ore from the mine, and transport of the ore offsite for mineral processing. The production phase would last approximately 17 years.
- Mine reclamation is designed to remove surface facilities, re-contour the disturbed area, replace stockpiled soil, and establish vegetation suitable for the post-mining land use of grazing and recreation.

The BLM LCDO issued a Notice of Intent (NOI) in the *Federal Register* on January 9, 2011 to prepare an EIS for this project in compliance with the National Environmental Policy Act (NEPA), and the Council on Environmental Quality's regulations for implementing NEPA (40 Code of Federal Regulations (CFR) Parts 1500–1508). Exploration and mining activities on BLM-administered lands are controlled by the regulations of the Secretary of the Interior contained in 43 CFR, Subparts 3715 and 3809 and for Wilderness Study Areas, 43 CFR, Subpart 3802. These regulations require mining operations to protect public health, prevent unnecessary or undue degradation of the land, and minimize adverse environmental effects on BLM surface resources.

To provide agencies and the public with a general understanding of the proposed Copper Flat Mine project – pursuant to Section 102 (2) (c) of NEPA – the EIS will evaluate the environmental impacts of the proposed Plan of Operations and determine whether to approve the Plan as proposed or to require additional mitigation measures to minimize impacts to the environment, in accordance with BLM regulations.

3.0 Notification of Scoping Meetings

As noted above, an NOI was published in the *Federal Register* on January 9, 2012, informing the public of BLM's intent to prepare an EIS. The notice also explained public scoping meetings would be held with 15 days prior notification in local media. These local media ads notified the public that the public scoping meetings would be held in Hillsboro and Truth or Consequences on February 22nd and 23rd, 2012, respectively. A copy of the NOI and administrative memorandum are provided in Appendix A.

Notices were printed in local newspapers in the weeks preceding the public scoping meetings, including an advertisement that identified the meeting times and locations. A list of the names of the publications and dates of these advertisements and legal notices are included in Table 1. Copies of the newspaper advertisements and legal notices are included in Appendix B.

Table 1 – Newspapers and Dates of Public Notices

Newspaper	Publication Dates	Location
Albuquerque Journal	2/7/2012	Albuquerque, New Mexico (NM)
The Herald	2/7/2012	Truth or Consequences, NM
Las Cruces Sun-News	2/7/2012	Las Cruces, NM
Las Cruces Bulletin	2/10/2012	Las Cruces, NM
Sierra County Sentinel	2/10/2012	Truth or Consequences, NM

3.1 Tribal Consultation

Tribal leaders and Tribal Historic Preservation Officers (THPOs) received letters with similar information provided to the agencies as well as information on the National Historic Preservation Act (NHPA) Section 106 consultation process. Tribal consultations are pending more project details.

4.0 Public Scoping Meetings

The BLM LCDO conducted two public scoping meetings with an open-house followed by a presentation and public comment session. The first was held from 7-9 p.m. on Wednesday, February 22nd in Hillsboro, NM at the Hillsboro Community Center on Elenore Street; the second was held from 7-9 p.m. on Thursday, February 23rd in Truth or Consequences, NM at the Truth or Consequences Civic/Convention Center on 500 West Fourth. Photos from each open house meeting are shown on the next pages.

4.1 Purpose

The purpose of the public scoping meetings was to provide the public with information regarding the proposed project; answer questions; identify concerns regarding the potential environmental impacts that may result from development and operation of the project; and gather information to determine the scope of issues to be addressed in the EIS.

4.2 Public Scoping Meeting Materials

The open-house portion of the meeting was used to encourage discussion and information sharing and to ensure that the public had opportunities to speak with representatives of the U.S. Bureau of Land Management, Las Cruces District Office; State of New Mexico; and New Mexico Copper Corporation. Several display stations with exhibits, maps and other informational materials were staffed by representatives of the BLM LCDO, State of New Mexico Minerals and Mining Division, State of New Mexico Environment Department, NMCC, and Mangi Environmental Group to answer questions. Additionally, BLM and NMCC provided fact sheets and informational materials at the meetings. Information stations at the public scoping meetings included the following:

- Sign-in and Welcome table
- Project Overview, Purpose and Need
- General Copper Flat information
- Two "Parallel Processes – NEPA/EIS and New Mexico Permit Reviews" Posters

- "Cause-and-Effect-Questions" © Diagram

Sign-in sheets (Appendix E) and comment forms (Appendix G) were made available to all scoping meeting attendees. Attendees were invited to write comments and questions directly on the Cause-and-Effect-Questions diagram, which is included in Appendix F.

Figure 1 – Scoping Meeting at the Hillsboro Community Center

Figure 2 – Scoping Meeting at the Truth or Consequences Civic/Convention Center

4.3 Collection of Comments

Public comments were submitted via comment forms, letters, emails, faxes, website, a 1-800 number, and orally during the meetings to a court recorder. All comments were delivered to either the BLM LCDO or Mangi Environmental Group. A summary of the public comments received and organized by category is provided below. Appendix H is a copy of every comment received with the coding (mark-up of issues raised). Each commenter was assigned a two-part code: commenter's initials followed by a number assigned in consecutive sequence. For example, the first commenter with initials AC would be AC01 and the second person with the same initials would be AC02 and so on. Appendix H has the comments in order of commenter code. The exception is that any comments made during the public meetings are at the end of Appendix H because they contain multiple people's comments.

An Access database was created to allow for viewing the issues raised by a commenter or all the commenters that raised that issue. Due to Access's limitation to 255 characters including spaces, the actual commenter's words may have been abbreviated to fit the space limitation without losing the intent.

4.4 Summary of Comments

A total of 115 submissions were received during the scoping comment period from 94 commenters. The transcript from each scoping meeting was considered a single submission. The vast majority of submissions voiced concerns or raised issues on more than one topic. Multiple people provided more than one submission. Some people utilized multiple methods to provide the same submission (e.g. email and hard copy). These duplicate submissions are being kept on file, but the comments in the submission were only considered once in this document. Public comments were submitted via letter, email, fax, the 1-800 number, website, and comment forms distributed at the public scoping meetings and by mail as well as oral comments dictated at the public meetings and recorded in the meeting transcripts by the court recorder (also included in Appendix H). Submissions include those made by private citizens, elected officials, government agencies, and entities and representatives of non-governmental organizations. No form letters were received.

4.4.1 Issues Identified During Scoping

Following is a summary of issues identified through the scoping process which will be addressed in the EIS relative to the resource topic area (Table 2). Because water was a known major issue, separate codes were created for main aspects, such as water rights, water quality, and groundwater, to better understand specifically what the public's concerns regarding water were. The general water code was reserved for other concerns, such as hydrology. A similar situation exists with biological resources and socioeconomics. There is overlap between the codes when the commenter voiced more than one issue in that sentence(s) and due to the interplay between the NEPA aspects.

Table 2 – Summary of Scoping Comments Received

Resource Area	No. of Commenters	No. of Comments	Summary of Issues
Alternative (A)	7	45	Consideration of less water-intensive option(s) and alternatives plans for accidents or dust management. Concern for lack of alternatives in NOI and water treatment issues. Suggestions by NMCC and EPA (RS01) about alternatives' parameters, such as less than 24 hour schedule.
Biological Resources (BI) (e.g. nature, environment, etc.)	16	29	Need for environmental studies and environmental protection, especially from wastes. Concerns about harming the environment.
Threatened and Endangered Species (BI-01)	5	13	Provided information on these species. Concerns about the Chiricahua Leopard Frog (Endangered), common Blackhawk, and bald eagle (both NM Threatened). Do Biological Assessment.
Wildlife (BI-02)	18	94	Impacts from nighttime operation, exposure to waste products particularly water (pit and tailings). Impacts from reduced water quantity. MW01 listed ways to handle the pit. Harm restoration of blacktailed prairie dog and bolson tortoise. Increases in road kill. Need for monitoring.
Vegetation (BI-03)	19	54	Grayback Arroyo is a distinct vegetation type. Concerns for the Arizona sycamores, especially along Animas Creek. Water quantity impacts to vegetation, especially riparian habitat. Reduction of population/capacity. Impacts to irrigated crops. Impacts from spills/leaks. Concerns with noxious weeds/exotic plants.
Avian and Migratory Species (BI-04)	3	5	Migratory Bird Treaty Act (MBTA), interruption of migratory patterns due to dust or noise.
Oppose Project (CO)	19	29	General opposition to the project, citing irresponsibility to allow mine, water, and/or other environmental concerns.
Support Project (CS)	25	39	General support of the project, citing new jobs and capital, and positive experience(s) with NMCC.
Successful Mining Earlier (CS-01)	5	6	Statements that the mine worked well earlier.

Resource Area	No. of Commenters	No. of Comments	Summary of Issues
General and/or Data on Resources (G)	17	65	Requests for new data (as opposed to reliance on 1999 EIS) and missing data in MPO and other NMCC reports. Provided/requested data on different resource areas. Issues with earlier Alta groundwater data. Suggestions by Environmental Protection Agency (EPA) on scope and content. Proponent requests to limit analysis and required new information as well as to include data forthcoming.
Regulatory (permitting, laws, etc.) (G-01)	20	116	Concerns regarding regulatory constraints; and requests to follow regulation to the maximum. Questions/concerns about the 1872 Mining Act, necessary permits/conditions of permits. Noting NM Mining and Minerals Division does not allow mines requiring perpetual care. Questions/concerns about water rights and bonding. Suggestions for additional cooperating agencies.
Cumulative Impacts (G-02)	8	31	Questions regarding interactive impacts with other mining interests, water use, and climate change. Regulations and suggestions provided from EPA.
Possible Mitigation (M)	8	37	Pit and wildlife mitigations suggested, monitoring to allow for corrective actions, and request for mitigation plan or description in EIS. Several suggestions by EPA.
Operations (designs, processes, etc.) (OI)	17	122	Various questions regarding operation activities and design, the processing location of the copper, and plans for scenarios like accidents.
Suggested Operations (OI-01)	7	144	Suggestions for various aspects of the design, such as possibility of treated water re-injection for waste management and water resue.
Physical Resources (PI)	1	3	Requests to collect data and disclose impacts to geochemical and physical environment.
Geology and Sediment Conditions (PI-01)	9	38	Concerns with current status including contamination of soil, ability of soil to handle wastes. Requests for studies. Concerns about faults, erosion, and soil pollution. Suggestions from EPA on scope.
Mineral Resources (PI-02)	9	25	Questions about mining claims, release of minerals, such as uranium, from rocks, and contamination.

Resource Area	No. of Commenters	No. of Comments	Summary of Issues
Wetland Resources (PI-03)	3	12	Concerns about existing wetland conditions, potential impacts to water, and wastes on wetlands. Many EPA suggestions.
Water (e.g. general hydrology or water concerns) (PI-04)	27	78	Concerns about general water impacts, specifically from waste management activities and spills. Request to provide baseline data and studies. Suggestions by EPA on scope.
Water quality (PI-04a)	22	133	Concerns about water contamination mostly from spills and waste management, especially the tailing pond.
Water quantity (PI-04b)	36	146	Concerns about water levels with regards to shortages during droughts. Cone of depression concerns. Questions regarding duration and quantity of water withdrawal.
Groundwater (PI-04c)	40	168	Concerns about other wells and water table, groundwater contamination, and cone of depression. Impacts to geothermal forces of hot springs.
Surface Water (PI-04d)	29	98	Concerns about "pumping" impacts to surface water and to quality and quantity of run-off. Many citing concerns over Animas and Percha Creeks, Caballo Reservoir, and Rio Grande River.
Water Rights (PI-04e)	13	58	Concerns about impacts to existing water rights/pumping before the completion of EIS. Many questioned validity of NMCC's water rights and requested ruling from Office of State Engineer.
Air Quality (PI-05)	14	59	Questions on the types and sources of pollution as well as potentially affected areas. Many concerns about dust, especially from piles and tailings; dust's contaminants; and visual quality, such as nighttime sky. Several mentioned regulations and permits.
Sustainability (PI-06)	5	8	Questions about recycling wastes, existing minerals, and water quantity. Desire to become resource independent.
Climate Change (PI-08)	6	10	Concerns that the project would exacerbate climate change issues, specifically drought and temperature, greenhouse gas emissions, and insistence that climate change be included in impact analysis.
Requests (e.g. general requests for the process or for the EIS) (R)	30	158	Requests ranged from studies, to process, to analysis. See Section 4.4.8 for details.

Resource Area	No. of Commenters	No. of Comments	Summary of Issues
Request Draft EIS (R-01)	2	2	Two requested copies of the Draft Environmental Impact Statement (DEIS).
Request General Data (R-03)	9	17	General informational questions and requests for modeling and studies on hydrology and specific socioeconomic resources.
Request Scoping Period Reinitiation (R-04)	1	1	Felt the scoping meetings were more town hall events than scoping meetings.
Request Substantial EIS Review Period (R-05)	1	1	The public needs time to share concerns with any new information in the MPO.
Speed up Process (R-06)	7	8	Requests to utilize existing data to expedite EIS process. Requests to expedite the process to start this mine.
Recreation and Tourism (SI-01)	10	30	One commenter discussed positive tourism related to mining. Concerns about hot springs and reservoir impacts, adverse impacts to tourism, such as attractiveness of area to tourists, e.g. impacts to buildings and Scenic Byway. Impacts to birding tourism.
Visual Resources (SI-02)	7	14	Concerns that mine would generally degrade visual quality, especially due to nighttime activities (light) and dust. Scenic Byway and other road impacts.
Noise and Vibrations (SI-03)	9	18	Concerns that blasting and vibrations as well as their impacts to structures. Impacts to people and animals. Cause traffic noise pollution and nuisances; especially from nighttime activities. Based on modeling, may need to limit activities.
Transportation and Traffic (SI-04)	15	64	Questions about actual amounts of traffic, congestion, road closures, road capacities, cost of road maintenance and improvements, risks and prevention of accidents, and transportation routes/methods of transferring load. Importance of NM152. Road closures concerns. Request for traffic study.
Socioeconomics (e.g. costs and quality of life) (SI-06)	59	266	Questions about changes to quality of life and economy. Further details included in Section 4.4.11.

Resource Area	No. of Commenters	No. of Comments	Summary of Issues
Human Health and Safety (SI-06a)	18	67	Concerns about exposures to hazards including hazardous chemicals and wastes, and general accidents including transportation incidents; and requests to identify and address risks/hazards. Questions about long-term health issues for workers and community; as well as the relationship between clean water and air and the public health.
Environmental Justice (SI-06b)	7	7	Discussion about poverty and welfare. EPA commented about following Executive Order 12898.
Need Jobs or Job Creation (SI-06d)	25	51	Several stated the community need for jobs.
Concern for Job Loss (SI-06e)	3	7	Concerns that the mining activity would cause for a decrease in other jobs, such as tourism or farming, and could preclude other jobs in the future due to water usage. Concerns over impacts over potential for project to go bankrupt.
Tax Base (small or need to expand) (SI-06f)	6	6	Area needs a larger tax base. They believe the project will help this.
Tax Revenue Increase (SI-06g)	10	27	Comments support the positive benefits the project's tax revenues would provide, such as improved infrastructure.
Historical Issues (SI-07)	2	2	Concerns about the "historical" sycamores.
Public Services and Infrastructure (SI-09)	19	54	Concerns about the capacity and responsibility for the cost of needed improvements and maintenance of infrastructure, such as roads and health care services. Concerns about degradation of water infrastructure. Also, positive statements of infrastructure improvements.
Land Use (including reclamation) (SI-10)	19	44	Concerns about conflicting land uses (agriculture, tourism, spaceport, etc.), reclamation and post-mine uses, and property values. Questions regarding quantity of disturbed land. Positives of and suggestions offered for mine reclamation.
Range and Livestock (SI-10a)	1	9	Water use and waste management impacts to ranching.

Resource Area	No. of Commenters	No. of Comments	Summary of Issues
Protected Areas (National Parks, etc.) (SI-11)	1	1	National Park Service noted no comment on project.
Wilderness Areas (SI-11b)	1	1	Concern about the Gila Wilderness.
Waste Management (SI-12)	15	99	Several expressed about the tailings pond concerns, especially its liner and stock piles. Questions on impacts from chemicals, spills and releases, such as from rocks, and lifespan/extent of these contaminants. Other inquired about plans for monitoring and responses/clean-up as well as post-mine risks. Several concerns about transportation of materials. Several recommendations made by EPA.
Hazardous Materials and Waste (SI-12a)	6	129	Questions about the potential risks of substances, including quantities and methods of cleaning up and disposal; requests for studies; and some post- operational concerns, including liner. Molybdenum and copper exposure issues. Some suggestions from EPA.
Cultural Resources (SI-13)	9	14	Concern for cultural resource damage and deterioration, especially from blasting and traffic at and around mining site. Requests to identify cultural resources and avoid them. Some general guidance from EPA.
Artifacts (SI-13)	4	4	Concerns that mining activities, especially blasting, would harm artifacts at and near the mine.
Total	704	2766	

Codes were designed in the database anticipating issues that evolved during similar mining projects. Some codes representing issues were not raised during the scoping process but may become relevant during the draft comments. There were two late comments, which brought up no new issues.

In light of the number of comments and breadth of topics, the below is a summary of the top ten issues by number of commenters in ascending order. Because water was a known major issue, separate codes were created for main aspects, such as water rights, water quality, and groundwater, to better understand specifically what the public's concerns regarding water were. The general water code was reserved for other concerns, such as hydrology. A similar situation exists with biological resources and socioeconomics. There is overlap between the codes when the commenter voiced more than one issue in that sentence(s) and due to the interplay between the NEPA aspects. Please note that the Selected Example Comments Subsection consists of comments or summarized comments collected during the scoping process.

4.4.2 Regulatory (G-01)

Summary

116 comments regarding regulatory issues from 20 different commenters were received during the scoping period. Many questioned the validity of the 1872 Mining Act, claiming it is outdated and no longer addresses modern issues. Commenters questioning the use of unpatented mining claims. Some comments were concerned with EPA regulations of the mine like how often the mine would be inspected. Some comments expressed that due to conflicts with other resource concerns, the NMCC should not be granted a mining permit. Some commenters felt that mining regulation would constrain economic progress, and as such, the NMCC should be exempt from permitting and regulations in light of the current economic situation. Several requested that the NMCC apply for state and federal permits to regulate water use, air quality control measures, Department of Transportation safety regulations, and hazardous materials regulations. Some commenters were unsure of the need for a new EIS is mandated since the 1999 EIS was stopped due to copper prices and not because a final decision was made.

Selected Example Comments:

- For hazardous products stored on the Copper Flat Mine site, will there be an EPA inspector on site at all times or might EPA be doing inspections periodically?
- We also are very concerned that the subdivisions of governments being consulted and participating in this process does not apparently include NM Department of Transportation.
- Since the various owners of the rights NMCC has acquired have failed to use the water for over 29 years, the rights must be considered invalid. Besides the law of forfeiture for non-use, non-use is grounds for a charge of abandonment.
- The EIS should identify water bodies in the analysis area that have been placed on the New Mexico 303(d) list.
- The DEIS should analyze the ability of the mine to comply with future National Pollutant Discharge Elimination System requirements. The DEIS monitoring program should also be analyzed to determine if it is compatible with future permits.
- I am concerned that with no regular monitoring following the reclamation phase of the Copper Flat mine, a leakage or a breach could get into the local ground water and contaminate it with toxins.

4.4.3 Water Quality (PI-04a)

Summary

133 comments regarding water quality from 22 different commenters were received during the scoping period. These comments mainly raised concerns about mining practices polluting the ground water through seepage or nonpoint source pollution. Several commenters posed questions regarding the water treatment and management of the open-water pit. There was also some concern that the open pit would attract wildlife that may then consume contaminated water. The use of pit water to control dust was addressed in terms of impacts to air quality and potential pollution, where the water would be sprayed. Others concerns included the potentially indirect water quality impacts to the local population, wildlife, and agriculture.

Selected Example Comments:

- What are all the potential sources of water pollution at the mine, potential contamination pathways, vulnerable communities and environments, and means to prevent such pollution?
- How will surface water run-on and run-off be controlled and minimized?
- What will the quality of the pit water be?
- The EIS should present historic water quality data for the existing pit lake, including uranium concentration, in tabular form, and modeled predictions of future pit lake water quality.
- Pit water is high in total dissolved solids and sulfate concentrations and sometimes higher than allowable in copper concentration and acidity so as to be possibly toxic to wildlife.
- We have clean, wonderful water, and I would hate to see it depleted and polluted by any mining operation.
- The pit violates all well regulations designed to prevent groundwater contamination through the well. It is not sealed from surface water runoff, having no barrier protecting groundwater from oil and gas drippings from trucks & mining equipment, etc.
- Pit water will be acidic and contain metals, including uranium. If used for dust control, as planned, will airborne dust that will be entrained by the strong regional winds contravene the Clean Air Act?
- What are the short and long term costs to Sierra County residents for health issues relating to air and water pollution from Copper Flat?
- Why should the monitoring of water quality around the tailings impoundment last for only 12 years? The threat of water pollution from that impoundment is perpetual. How long do synthetic impoundment liners last? How long has the existing liner been in place?

4.4.4 Support Project (CS)

Summary

39 comments were received from 25 commenters that support the project. These commenters addressed past mining operations and their experience(s) with both Quintana and NMCC. Many

commenters spoke positively of past mining as a good source of jobs and use of the land. Several complimented NMCC on their public involvement.

Selected Example Comments:

- The production well and a lot of the pipeline leading to the mine is on my ranch. When Quintana Minerals developed these, it was a win-win situation for both of us and they never did anything here without first consulting me. It has been the same with NMCC.
- This part of Sierra County has been a mining and ranching area for 150 years. This is the best and most productive multiple-use for this land.
- America runs on mining and minerals. The American people need copper. The American people need gold and other precious minerals.
- I too grew up with a little rock hound in me [like her father], a love for the mining industry and a respect for the value it could offer to our area. This is mining county. It is a wonderful way to grow up. It is our right.
- She knows that NMCC has put a lot of money and thought into the project. I understand fully what they have to go through to prove not only to NMCC that this is the right step, but to BLM, Sierra County, and all the environmental & wacko people here.
- We see the mine going into operation as a positive, not just because of the economic impact it will have but the reclamation of the currently disturbed land.
- I was pleasantly surprised to see your timeline as you spoke tonight on what needs to be done. I hope that we continue to move aggressively, because we do need jobs, we need economic development in our communities, and we strongly support it.
- I feel that the Copper Flat Mine will face various hurdles to achieve their project and I support their effort.

4.4.5 Need Jobs or Job Creation (SI-06d)

Summary

51 comments from 25 commenters addressed the need for jobs and job creation in Sierra County. Many commenters were concerned with the current economy in Sierra County. Several comments argued that young people and families were leaving the area because they could not find work and were not hopeful about the growth of existing businesses and services. Some were also interested in the increased taxes and tax base that the mine would bring to the community, and increased revenue at local businesses. However, some were concerned that the trade-off between current mining activities and other, more permanent, developments and use of water would not be enough to sustain the community long-term.

Selected Example Comments:

- The private sector companies are struggling to provide jobs and services. Not a week or month goes by without someone asking for a job.
- Lack of local opportunities for youth with and without college. Copper Flat will provide training & jobs for those with little or no experience. Give Mine Safety and Health Administration training and certification
- Downtown Truth or Consequences (TorC) was either boarded up or art galleries. There is nothing for the young people, except fast food. Little young families since no place for

them to work unless city, county, or state or phone company where established people with few openings.

- The reclamation of the Copper Flat Mine would generate economic development within Sierra County. This project would also generate much-needed employment opportunities for the citizens of our County.
- The job situation is linked to water. And the creation of jobs by the mining industry is relatively inefficient. That is almost all the other industries create more jobs for the same amount of water.
- Groesbeck, Texas is a town half the size of TorC but has brand new infrastructure. The money came from taxes from the mine - the thing that's going to help our community. Not only to provide jobs, but to provide a tax base and much needed county services.
- Job creation and tax revenues in the community. Employing local people in a variety of direct and indirectly related jobs, as well as generating significant tax revenues, would offer important economic benefits to Sierra County and its communities.

4.4.6 Water (PI-04)

Summary

78 comments from 27 commenters concerned water. Water issues are connected to the local economy in terms of water rights and water quantity, and many commenters were concerned with the amount of water proposed to be used by the mine and impacts to groundwater and stream levels. There are many concerns with water quality and quantity and how this will affect the people, plants, and animals in the area. Several comments requested information on how water would specifically be used, treated, and monitored during the mining processes. The pit and the pit water were also mentioned, with concerns about potential runoff and how the water will be treated before used to control dust. Commenters expressed concerns about mining operations either polluting local wells or lowering the water table to the point of rendering the local wells useless.

Selected Example Comments:

- How would the design of pits, ponds, and lagoons prevent leakage, overflow, and access by birds and other wildlife, etc.?
- Holding pond for water from the pit may pollute ground water.
- Using pit water for dust control spreads the concentration of metals on the land surface susceptible for migration.
- What is the extent, nature and cause of existing pollution at the site, what reclamation is currently underway, and how will this impact the proposed?
- We think serious geological, hydrological, and biological studies are needed for this alternative treatment of the pit waters as surface water.
- My concerns are about the acute and chronic health effects to our local communities, which include those nearby and downwind or downstream from the site and along the transportation corridor.
- The NOI states that the "total estimated disturbance on public domain land would be 745 acres" When mine's air and water pollutants dispersal is included, how much public land

is "disturbed"? What about along the shipping route for the concentrates? These numbers need to be made public.

- There is known contamination from existing tailings, the nature of the pit as a flow through or hydraulic sink has not been adequately proven and the extent of existing contamination appears to be downplayed in the SAP submittal.
- Channeling water is stealing water from all the roots of the sycamores.

4.4.7 Surface Water (PI-04d)

Summary

98 comments from 29 commenters concerned surface water, mainly focused on water quantity and water quality. Commenters are concerned that mining operations would reduce stream levels and pollute surface water areas, which can affect wildlife, plants, and livestock operations. There is concern that the aquifer would be permanently affected by mining activities and this drawdown would affect surface water over the long term.

Selected Example Comments:

- What is existing quality of surface water?
- How would surface water run-on and run-off be controlled and minimized?
- Cone of depression at the mine might lower surface water levels in the Animas Creek watershed.
- Disruption of surface waters and a complete system of seeps, seasonal seeps, springs, natural seasonal ponds, etc. might affect the Animas Creek watershed system.
- What will the cumulative impact of the Mine's use of water be, including the drawdown caused by its production wells and evaporation from the open pit?
- The effect of prolonged pumping at projected consumption levels on existing residential and commercial wells in the area is a huge concern of ours.
- The EIS should include rigorous hydrologic modeling that details the probability, extent, and intensity of potential drawdown impacts on surface aquatic and riparian habitat.
- There are a few small perennial and intermittent riparian areas in Grayback Arroyo that are believed result from alterations in stream flow associated with the previous mine development.
- The watershed drains into the Rio Grande River, which is crucial for downstream farming and agriculture livelihoods.
- Use of water from the pit lake would, then, require an application to the Office of State Engineer for appropriation of surface water and a review of the effects upon the whole system of surface waters in the area.
- Contamination from spoil piles will continue to infiltrate or runoff into the pit lake after mining is discontinued. The contaminated water is dangerous to wildlife and ranch stock and will contribute acid mine drainage to the groundwater.

4.4.8 Requests (R)

Summary

30 commenters provided 158 requests, ranging from requests for specific data to operational suggestions. Some commenters specifically utilized the word request while others used wording that indicated they were requesting something to be done. Many requested surveys and resource analysis plans for topics such as historical water quality and regime, wildlife surveys, socioeconomic reports and projections, and reclamation plans. Some commenters were concerned about the longevity of the mine and the possibility for copper prices to drop and for the mine to bankrupt. Many commenters were interested in the progress of the EIS and mine and requested their names be added to the mailing list.

Selected Example Comments:

- I request that the BLM take immediate action to prevent pre-EIS completion pumping, and that they make NMCC provide a bond equal to any potential damage to the surrounding wells or aquifers to ensure they will not do any massive pumping.
- Proposal that no water be used until mine permit is issued, after hydrology study is complete, and that the NMCC must bond water use for several million dollars.
- If it is unavoidable to initiate activity during this general bird breeding season due to MBTA, nest surveys should be conducted by a qualified biologist, and actions taken to avoid destruction or disturbance of breeding birds.
- Request for an analysis of risk reduction in the use of double liners.
- Since NMCC has stated that it can operate the mine as long as copper prices stay above $3 a pound, we also would like a Monte Carlo estimate of the possibility of that historically exceptional price level enduring for the 17-year projected mine lifetime.
- Can you send me the declarations of the pre-basin water rights owned by Frost and Gray and NMCC? Or can you just tell me what uses they can put the water to?
- Hillsboro Water requests of BLM that a fully scoped and funded Social Impact Assessment be included in the EIS with particular emphasis on the social and economic disruption of the Cu Flat proposal on the water supply of Hillsboro.
- Lack of specificity in Plan of Operation makes any adequate EIS impossible. Alternative: redo Plan after having decided on chemicals, dams, linings, water, etc.

4.4.9 Water Quantity (PI-04b)

Summary

146 comments from 36 commenters were concerned with water quantity. Commenters were concerned that the water use of the mine coupled with potential water pollution would affect the amount of safe drinking water available to the people, agriculture, plants, and wildlife of Sierra County. Several comments asked how they can be assured that the amount of water proposed to be used would not affect the amount of water available for other uses or permanently deplete the aquifer.

Selected Example Comments:

- How will you be able to ensure fresh drinking water for all those residents during these droughts?
- Copper Flat's groundwater withdrawals will affect Hillsboro Water's water supply both in terms of the quantity of the water available and in terms of the water available.
- Hillsboro Water requests of BLM that a predictive assessment and modeling protocol be developed which will determine when the water supply will be stressed to the point of endangering the safety, welfare, and livelihood of the members of Hillsboro Water.
- The required amount of water needed to extract ore from this open pit mine is reason enough to prohibit this operation from being permitted.
- With the effects of climate change and forecasts for long-term drought in this desert location means that the aquifer that supplies water to Hillsboro and surrounding rural communities could be depleted making this part of Sierra County uninhabitable.
- Because water will undoubtedly become increasingly limited in Sierra County, the large proposed rate of pumping by the mine has the potential of serious impacts on native vegetation and wildlife species.
- Replenishment of those waters removed by dewatering, through injections into the ground away from the pit, is equally uncertain since the area is highly fractured. Thus dewatering may profoundly affect the water levels in Hillsboro, only three miles away.
- Our small Mutual Domestic system here in Hillsboro is very concerned of losing our water supply. Okay we've heard "it's not been proven yet." What is their plan if we do run out?

4.4.10 Groundwater (PI-04c)

Summary

168 comments from 40 commenters were about groundwater. Commenters were concerned that mining activities might either reduce available groundwater or pollute the groundwater, which in turn would affect the community and environment. There is also concern about the development of a cone of depression if mining operations pull water from the aquifer, and how this would affect wells, surface water, and wildlife. Some commenters questioned water use during droughts and water conservation practices in general to maintain the groundwater.

Selected Example Comments:

- My concern is for the groundwater that will be flowing from this mine after use that could contaminate drinking water for residents east of the mine site to the river.
- What are the most likely contaminants that could inadvertently be released into groundwater, and in what amount?
- Cone of depression at the mine might reduce well production in the area generally and at Hillsboro specifically.
- What will be the rate and extent of drawdown caused by the Mine's operations, and how will this drawdown impact existing water users, water rights, surface flows, and springs, etc.?

- Reduction of streamflow by lowering of groundwater table in Las Animas and Percha Creeks could damage or eliminate deciduous riparian forests that provide essential habitat for virtually all wildlife species in the region.
- Sierra County's groundwater water supply is diminishing from drought but use. Uses in county need to conserve water, which is supported by New Mexico laws & regulations that allow legal challenge of water use on grounds of water conservation.
- Sometimes the cottonwoods lose their leaves in July for lack of groundwater. Years ago when Copper Flat first opened, the wells were pumping sand within three months.
- In the March 1999 Preliminary Final Environmental Impact Statement for the Copper Flat Project page 4-12, last paragraph, it is stated "Private wells in the Palomas Basin may experience a drawdown of 2 to 10 feet during groundwater withdrawal." Note that all of this is for a 10 year period of pumping, not 17.
- While NMCC may now be making an effort to update data, they are a long way from disproving 1998 Daniel D. Stephens & Associates' findings and adequately filling data gaps needed to provide comprehensive characterization to assure protection of aquifers, streams, and other public land resources.

4.4.11 Socioeconomics (SI-06)

<u>Summary</u>

266 comments from 59 commenters concerned socioeconomics. The comments addressed the current state of Sierra County's economy and the pressing need for jobs and increased tax revenue. Some commenters suggested using the mine as a source of tourism as well. However, other commenters were concerned that the presence of the mine and mining operations might negatively impact current tourism revenue that depends on the quality of the environment and surface water recreation. Several comments requested information how the community might be compensated for potential problems associated with mining such as loss of land use and water (both quality and quantity). Information was also requested on how the loss of land and water use might affect the economy. Some commenters stated that the mine is an economic opportunity and there may not be other economic opportunities as large in the future for the area.

<u>Selected Example Comments</u>:

- Will there be compensation to the residents and their livestock when water becomes not usable?
- No other operation of this sort, with the large number of opportunities that Copper Flat will provide has existed in Sierra County for many decades, and none is likely in the foreseeable future.
- When the mine is in operation, I plan to include the location as a stop on four itineraries for group tours. Visitors can learn about the copper mining process and how useful copper is in our daily life.
- Opportunities for positive effects to Sierra County's economy, like many rural western counties with large federal and state land holdings, are rare and cannot be squandered.
- Hillsboro Water requests of BLM that a fully scoped and funded Social Impact Assessment be included in the EIS with particular emphasis on the social and economic disruption of the Copper Flat proposal on the water supply of Hillsboro.

- Damage to tourism is a cultural and aesthetic quality of life issue.
- Provide indemnification for preventing other claim holders from working their claims.
- Draining on electrical grid might have negative repercussions in Hillsboro.
- How will the long-term post-mining value of the land and environment be preserved? What are the post-mining land uses?
- Without a tax base our infrastructure will continue to degrade, we may not be able to improve healthcare, etc.

4.5 NMCC Public Meeting Comments

Although NMCC's meetings were not part of the NEPA process, NMCC provided a list of concerns. Any of the concerns that were not raised by the public during the scoping period are below.

- How to avoid human error and inspectors.
- Use existing structure to minimize disturbance.
- Use building color that matches or is compatible with the natural environment.
- Potential impact from permanent engineering structure on stream channel post-closure.
- Post-closure activities could take more than 10 years, what is the time table?
- Issues that power lines, especially to production wells, will be used by birds.
- What is the neutralization process, and are there enough neutralizers in the rock, i.e. Calcite, feldspar, dolomite? What are the byproducts from, for instance, the reaction of iron compounds/materials with neutralizers?
- Exceeding acid rock evaluation and future volume increases-need geochemical evaluation, and evaluation of biological (acid bacteria) that use or survive on acid producing area
- EIS should avoid use of "approximate" and/or "approximately" as it shows uncertainty, and thus need to evaluate this uncertainty (%) and confidence level of the evaluation.
- Assumptions should be supported by "methods" and "literatures", etc.
- How will EIS address post-closure impacts of channel diversion and road constructions? Indirect effect on ephemeral water and flood plain-ecosystem should be described in the EIS.
- Use of particle trap and other controls to reduce emissions and air pollutants, use of trap controls that reduce 80% of the particles and new equipments and vehicles.
- Greenhouse Gases.
- Mercury air emissions and air pollutants need to be considered because of the elderly community near the mine.
- Potential future hot spots in the mine to Cabala Lake, such as seepage release into the environment.
- What is the deficit (for neutralizer rocks), and are these rocks used in the area for water resources?
- Identify various receptors for air quality analyses and radius of the impact(s).
- Kinetic testing for waste rock to evaluate acid neutralizing potential, i.e. is it 1:1, 2:1, or 3:1 ratio ([Acid Neutralizing Potential] ANP: [Potentially Acid-Generating] PAG).

5.0 Issues or Alternatives Excluded from Analysis in the EIS

The Council on Environmental Quality and the National Environmental Policy Act requires an agency to: "…identify and eliminate from detailed study issues which are not significant or which have been covered by prior environmental review (Sec. 1506.3)…" Non-significant issues are those that are: 1) outside the scope of the proposed action; 2) already decided by law, regulation, BLM Land Use Plans, or other higher level decision; 3) irrelevant to the decision to be made; or 4) conjectural and not supported by scientific or factual evidence.

The issues and alternatives that can be excluded from further analysis are one of the elements for an alternatives development meeting held on March 21, 2012. That meeting will provide a systematic basis for determining and supporting the elimination these issues and alternatives.

Comparison of Alternatives Used in other Projects

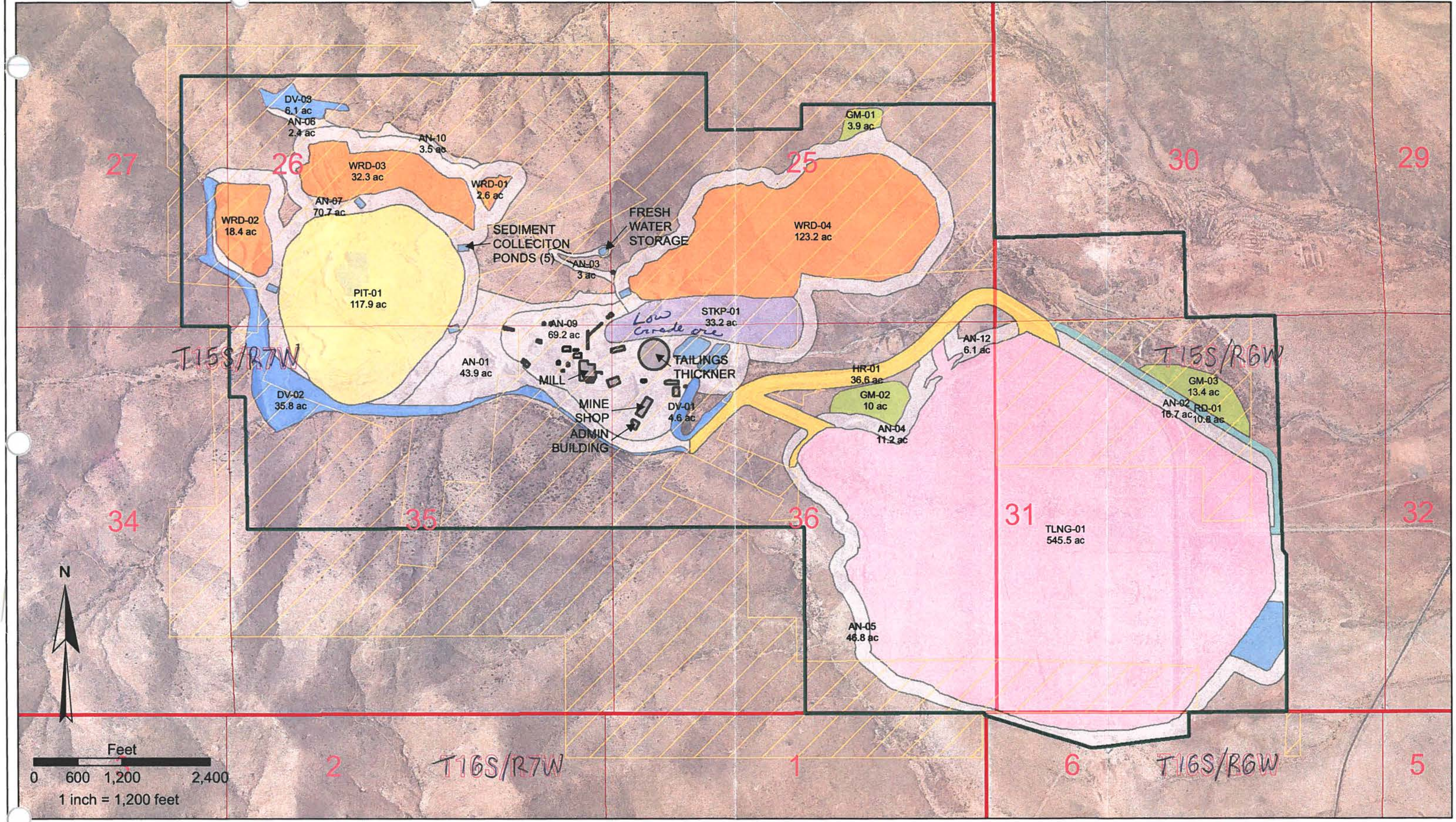
Project EISs discussed:
Copper Flat DEIS, 1996
Rosemont Mine EIS, Pima County AZ, Sept 2011
NorthMet EIS, St Louis County MN, Oct 2009
Emigrant Mine EIS, Elko County, NV, Dec 2010
Betze Pit Expansion EIS, Carlin, NV, Aug 2008

Alternatives Assessed

- Reduced Stripping Ratio (1996 Copper Flat DEIS). This alternative was based upon a different economic analysis that allowed for the mining of lower grade ore from the result of using a lower stripping ratio and still be profitable. They would use 3 dump sites, reduce the size of the disposal area, create a shallower pit and fewer trucks would be needed.
- Consolidated Waste Rock Disposal (1996 Copper Flat DEIS). This alternative allowed for all waste rock disposal to be deposited upon a single site thereby alleviating some additional machinery and truck.
- Phased Tailings (Rosemont EIS). The Phased Tailings Alternative incorporates a waste rock perimeter buttress that would completely surround the dry-stack tailings
- Barrel Alternative (Rosemont EIS). Places all of the tailings in different location (upper Barrel Canyon & lower portion of Wasp Canyon)
- Scholefield-McCleary Alternative (Rosemont EIS). Places all of the tailings in different location (Combination of Scholefield & McCleary Canyons)
- Use of Dual Mine Pits (NorthMet EIS)
- Mine Site Reactive Runoff as Make-up Water (NorthMet EIS)
- Development of an in-pit engineered stream channel as a permanent diversion of an existing intermittent stream channel (Emigrant Mine EIS).
- Use of the Rain Mine office and maintenance complex vs. construction of a new complex at the Emigrant Mine site (Emigrant Mine EIS).
- Regrading backfilled areas to eliminate terraces and avoid trapezoidal shaped features (Emigrant Mine EIS).
- Installation of surface water control structures to address material handling procedures, spill prevention and response, and sediment and erosion control (Emigrant Mine EIS).
- Coordination between Newmont, BLM, and local ranchers to reduce effects of mining on grazing management including development of water sources for livestock; installation of cattle guards, and new fenced corridors to accommodate movement of livestock between allotments (Emigrant Mine EIS).
- Bazza Waste Rock Facility – use of an alternate site (Betze Pit Expansion EIS).

Alternatives Eliminated from Consideration:

- Tailings Impoundment Lining (1996 Copper Flat DEIS). Lining alternatives would have technical and/or economic constraints that could potentially increase the level of impacts. Alternative was not technically or economically feasible or effective in avoiding or minimizing impacts.
- Pit Backfill (1996 Copper Flat DEIS). Two types considered – sequential and post operational. Sequential eliminated because of configuration of pit. Post Operational eliminated because it would add an additional 850,000 man hours to the end of the project making it economically unfeasible.
- Mining Other Locations (Rosemont EIS).
- Utilizing Alternative Mining Methods (Rosemont EIS).
- Mining Ore Using Shafts & Adits (Rosemont EIS).
- Reducing Pit Size (Rosemont EIS).
- In Situ Leaching (Rosemont EIS).
- Hi Temp/Hi Pressure Leaching (Rosemont EIS).
- Traditional Slurry Tailings (Rosemont EIS).
- Pit Configuration Allowing Continuous Backfill (Rosemont EIS).
- Partial/Complete Pit Backfill (Rosemont EIS).
- Waste Rock & Tailings Reconfigure/Relocation (Rosemont EIS).
- Relocating Waste Rock and Tailings to Existing Mines (Rosemont EIS).
- Avoiding Placement in Drainages (Rosemont EIS).
- Deposit Tailings on the Northwestern Slope of the Santa Rita Mountains (Rosemont EIS).
- Using a Natural Backfill Configuration (Rosemont EIS).
- Modifying the Life of the Mine (Rosemont EIS).
- Alternative Water Supplies (Rosemont EIS).
- Alternative Transportation (Rosemont EIS).
- Land Exchange or Purchase (Rosemont EIS).
- In-pit reactive waste rock disposal (NorthMet EIS)
- Off-site non-reactive waste rock disposal (NorthMet EIS)
- In-pit tailings disposal (NorthMet EIS)
- Chemical modification of reactive waste rock stockpiles (NorthMet EIS)
- Co-disposal of reactive waste rock and tailings on a lined tailings basin (NorthMet EIS)
- Pretreatment of Mine Site reactive runoff and discharge to publicly owned treatment works (NorthMet EIS)
- Pretreatment of tailings basin process water and discharge (NorthMet EIS)
- Use existing Heap Leach Facility at nearby Rain Mine (Emigrant Mine EIS)
- Modified Waste Rock facility (Betze Pit Expansion EIS).
- Offsite Waste Rock facility (Betze Pit Expansion EIS).
- Underground mining (Betze Pit Expansion EIS).
- Reduced Tailings facility (Betze Pit Expansion EIS).



EXPLANATION

Public | Plant Facilities | Waste Rock | Tailings | Pit | Diversion | Access Road

Mine Boundary | Pond | Topsoil Stockpile | Ore Stockpile | Haul Road | Ancillary

IF THE ABOVE BAR DOES NOT SCALE 1 INCH, THE DRAWING SCALE IS ALTERED

DESIGN:	DRAWN:	REVIEWED:
CHECKED:	APPROVED:	DATE: 12/1/2010

FILE NAME: PoO_Fig3-01_PropFacilities_JQG_20101123

NEW MEXICO COPPER CORPORATION

COPPER FLAT MINE

DRAWING TITLE: **PROPOSED FACILITY LAYOUT**

DRAWING NO. FIGURE 3-1 | SHEET 4 OF 28 | REVISION NO. A

JOB NO. 191000-03

02388

4-5-2012

~~2-3-2012~~

Vollbrecht, Kurt, NMENV

From:	Katie Emmer [kemmer@themacresourcesgroup.com]
Sent:	Thursday, April 05, 2012 9:27 AM
To:	Vollbrecht, Kurt, NMENV; Myers, Kevin, OSE; Steve Raugust
Cc:	dweston@bhinc.com; Steve Finch (sfinch@shomaker.com); Anthony Hom (ahom@blm.gov); Johnson, Mike S., OSE; Mendoza, Andrea J., OSE; Jens Deichmann
Subject:	RE: Hydrogeologic Analysis of NMCC Proposed Pumping Test

Kurt,

Thanks for your feedback. We'll discuss your suggestions about mentioning the NPDES permit and NOI process in this report; it is discussed in the EA itself as well. We are incorporating NMOSE comments as well.

As you know, the NPDES permit draft was published for public comment by the EPA on March 31; we'll see how that process moves forward. We remain committed to the plan to collect ground water data from the production wells and use it to submit an NOI to NMED prior to any potential discharge to the gravel quarry as we discussed in our emails with you in December 2011. Of course, we won't be doing any of this until we receive a right of way grant from the BLM.

Thanks again. We're always available to discuss any questions or concerns you might have regarding our plans and status. We'll of course stay in touch as things develop.

Katie

From: Vollbrecht, Kurt, NMENV [mailto:kurt.vollbrecht@state.nm.us]
Sent: Wednesday, April 04, 2012 6:26 PM
To: Katie Emmer; Myers, Kevin, OSE; Steve Raugust
Cc: dweston@bhinc.com; Steve Finch (sfinch@shomaker.com); Anthony Hom (ahom@blm.gov); Johnson, Mike S., OSE; Mendoza, Andrea J., OSE; Jens Deichmann
Subject: [BULK] RE: Hydrogeologic Analysis of NMCC Proposed Pumping Test
Importance: Low

HI Katie,

I have no substantive comments on what is included in the Hydrogeologic Analysis. OSE is the appropriate agency to review and comment on the details of the pump test.

Something I didn't see is a discussion of the process for acquiring an NPDES permit or submittal of a Notice of Intent to NMED for the proposed discharge locations. Perhaps this is covered elsewhere and not intended to be within the scope of this document. As a standalone document it might be prudent to at least mention how/where that is being addressed.

Let me know if you have any questions.

Kurt Vollbrecht, Geologist
New Mexico Environment Department
Ground Water Quality Bureau
Mining Environmental Compliance Section
(505) 827-0195

From: Katie Emmer [mailto:kemmer@themacresourcesgroup.com]
Sent: Tuesday, April 03, 2012 4:03 PM
To: Myers, Kevin, OSE; Steve Raugust

Cc: dweston@bhinc.com; Steve Finch (sfinch@shomaker.com); Vollbrecht, Kurt, NMENV; Anthony Hom (ahom@blm.gov); Johnson, Mike S., OSE; Mendoza, Andrea J., OSE; Jens Deichmann
Subject: RE: Hydrogeologic Analysis of NMCC Proposed Pumping Test

Kevin,

Thank you for your quick response. We will incorporate these clarifications into our *Hydrogeologic Analysis of NMCC Proposed Pumping Test* once all comments from BLM and NMED are received. As Steve Raugust communicated to you and others yesterday we plan send a letter to NMOSE with a description of our workplan for the proposed pumping test along with the finalized report as soon as it is ready; we'll copy BLM on it at that time so that they are aware.

We appreciate the time you've taken to review and provide feedback on our report and your willingness to work with us and other agencies in these efforts.

Best regards,

Katie Emmer
Project Scientist
Copper Flat Mine
THEMAC Resources Group, Ltd.

Mobile: 505.400.7925
Office phone: 505.830.6916

From: Myers, Kevin, OSE [mailto:kevin.myers@state.nm.us]
Sent: Tuesday, April 03, 2012 3:19 PM
To: Katie Emmer; Steve Raugust
Cc: dweston@bhinc.com; Steve Finch (sfinch@shomaker.com); Vollbrecht, Kurt, NMENV; Anthony Hom (ahom@blm.gov); Johnson, Mike S., OSE; Mendoza, Andrea J., OSE
Subject: [BULK] RE: Hydrogeologic Analysis of NMCC Proposed Pumping Test
Importance: Low

Katie and Steve,

As requested by NMCC, OSE Hydrology Bureau(OSE) review focused on Section 1.4 of *revised Hydrogeologic Analysis of NMCC Proposed Pumping Test* dated March 27, 2012 (Revised Report). OSE provides the following comments:

Comment 1: Overall, the Revised Report Section 1.4 provides an adequate description of proposed monitoring of MW-11, which will be a focus for discerning if the aquifer test has drawdown at this location prior to any impact of Las Animas Creek. As indicated, Las Animas Creek flows will not be the sole basis for stopping test. Observed or measured creek flows may be part of other relevant observations and measurements that may be used to evaluate the progress of the aquifer test.

Comment 2: OSE recommends adding sentence that requires, at a minimum, qualitative observations for Las Animas Creek flows near monitoring well nest of MW-9, MW-10, and MW-11. As written, Section 1.4 mentions monitoring Las Animas Creek only if water is flowing enough to place a transducer. As would be important for higher flows with quantitative measurements, qualitative observations of no flow or low flow would be equally important to document throughout pre-test, pumping and recovery phases.

Comment 3: OSE recommends that NMCC and JSAI exchange contact information with emails and phone numbers prior to the 2-week pre-test data collection phase. NMCC and JSAI should contact both OSE Hydrology Bureau and District IV.

OSE Hydrology will be the primary contact for the aquifer test and OSE District IV will be copied on daily email correspondence.

As a clarification, OSE Hydrology Bureau provides technical support to Water Rights Division, which includes district offices.

If you have any questions about the above comments, contact me.

Kevin Myers, Hydrologist
Hydrology Bureau - NM OSE
P.O. Box 25102
Santa Fe, NM 87504-5102
Ph: (505) 827-3521
Fax: (505) 476-0220

http://www.ose.state.nm.us/

From: Katie Emmer [mailto:kemmer@themacresourcesgroup.com]
Sent: Wednesday, March 28, 2012 9:05 AM
To: Vollbrecht, Kurt, NMENV; Myers, Kevin, OSE; Anthony Hom (ahom@blm.gov)
Cc: 'Denise Weston'; Steve Finch (sfinch@shomaker.com); Steve Raugust
Subject: Hydrogeologic Analysis of NMCC Proposed Pumping Test

Kevin and Kurt,

This morning we submitted to BLM the revised Hydrogeologic report regarding the setting and proposed pumping test and wanted to share it with you as well (see attached). This revision addresses comments and presents the monitoring plan we discussed in our March 16th meeting with BLM in Las Cruces. We have proposed that BLM review this report by April 4th and are hoping to schedule a call on April 5th to cover any responses they may have. If you have time and inclination, it would be great if you could take a look at this and see if you are comfortable as well. If we are successful in setting a time for a call on April 5th, we would invite you to participate if you have time.

Kevin – BLM and NMCC are both interested in dialoging with you further regarding how the monitoring during the pumping test will work. We've attempted to document it here in this report (Section 1.4), but we will be following this up with a letter to you directly so we can work something out in writing soon.

I imagine I may see you both in the interagency meeting this afternoon at 2, but I wanted to send this to you so that you have it.

Best regards,

Katie Emmer
Project Scientist
Copper Flat Mine
THEMAC Resources Group, Ltd.

Mobile: 505.400.7925
Office phone: 505.830.6919
www.themacresourcesgroup.com

4-24-12

Shore, Lawrence, NMENV

From: Shore, Lawrence, NMENV
Sent: Tuesday, April 24, 2012 2:41 PM
To: Vollbrecht, Kurt, NMENV
Subject: Copper Flat Job

Kurt,
I have filed all the loose correspondence I could find and organized them in the blue case folder 001 #7. I selected 23 documents that were related to the Stage 1 Abatement Plan, PDFed them and sent them to Bruce Frederick at the Environmental Law Center. They should keep him busy for awhile.

Larry Shore
Geologist
New Mexico Environment Department
Ground Water Quality Bureau
Mining Environmental Compliance Section (MECS)
505-827-2797

NEW MEXICO
ENVIRONMENT DEPARTMENT

Office of General Counsel

SUSANA MARTINEZ
Governor
JOHN A. SANCHEZ
Lieutenant Governor

Harold Runnels Building
1190 Saint Francis Drive (87505)
PO Box 5469, Santa Fe, NM 87502-5469
Phone (505) 827-2855 Fax (505) 827-1628
www.nmenv.state.nm.us
Ryan Flynn, General Counsel

DAVE MARTIN
Cabinet Secretary
BUTCH TONGATE
Deputy Secretary

April 23, 2012

VIA E-MAIL

Bruce Frederick
bfrederick@nmelc.org

Re: Request to Inspect Public Records

Dear Mr. Frederick:

On April 23, 2012, this office received a request for public information. You request information pertaining to: Cooper Flat Mine-Documents associated with Stage 1 Abatement Plan. (See attached request).

I forwarded your request to the bureau on April 23, 2012. The bureau will respond by May 8, 2012.

Should you have any questions, please contact the Ground Water Quality Bureau at (505) 827-0652.

Sincerely,

Melissa Y. Mascareñas
New Mexico Environment Department
Department Public Records Custodian

cc: Jerry Schoeppner, Acting Chief, Ground Water Quality Bureau

NEW MEXICO ENVIRONMENT DEPARTMENT
INSPECTION OF PUBLIC RECORD REQUEST FORM

Please fill out the following information:

1. Date: 4/23/12
2. Requestor's Name: Bruce Frederick
3. Requestor's Address: 1405 Luisa St. #5, SF, NM 87505
4. Phone No.: (505) 989-9022
5. Company Being Represented: NMELC
6. Address: Same
7. Document or File being requested to be reviewed or copied (please describe the records in sufficient detail to enable Department personnel to reasonably identify & locate the records:

Copper Flat mine - Documents associated w/ Stage 1 Abatement plan, in e-format if possible.

8. NMED Bureau where Document/File can be found (if known): Ground WAter

[signature]
Signature

The cost for copying by NMED is as indicated on Attachment A. Please send this request to:

Melissa Y. Mascareñas
Inspection of Public Records Officer
1190 St. Francis Drive, Ste. N-4050
Santa Fe, New Mexico 87505
or fax: (505) 827-1628

Revised 7/05/11

Vollbrecht, Kurt, NMENV

From: Vollbrecht, Kurt, NMENV
Sent: Monday, May 14, 2012 9:04 AM
To: Steve Raugust; Ennis, David, EMNRD
Cc: Shepherd, Holland, EMNRD; Eustice, Chris, EMNRD; Katie Emmer
Subject: RE: Copper Flat - Auto-Sampling & Surface Water

Steve,

DJ and I discussed this prior to his email response to you and had agreement on the path forward as presented, so consider his email to be a "joint response".

Let me know if you have any further questions.

Kurt

From: Steve Raugust [sraugust@themacresourcesgroup.com]
Sent: Friday, May 11, 2012 8:56 AM
To: Ennis, David, EMNRD
Cc: Shepherd, Holland, EMNRD; Eustice, Chris, EMNRD; Vollbrecht, Kurt, NMENV; Katie Emmer
Subject: RE: Copper Flat - Auto-Sampling & Surface Water

Thanks David,

NMCC will wait for a response from NMED, but with MMD's blessing and NMED concurrence, NMCC would propose to disable the auto-samplers in Las Animas and Percha Creeks. However, we will wait to hear from NMED to do that. We would leave them where they are or dismantle them and store until such time as the mine is operational and it makes since to re-activate them.

With respect to Greenhorn/Grayback arroyo system, the best path forward would be to keep the auto-samplers operational at least through the technical review of the BDR. Perhaps we will get lucky and catch an opportunistic sample in SWQ-1, 2, or 3 that might supplement the baseline data. However, I would argue that the surface baseline data in Grayback Arroyo is not insufficient and here is why:

- Surface water in Grayback Arroyos at the SWQ-1, 2, and 3 locations were checked each quarter from August 2010 to April 2011; specifically, August 2010, October 2010, January 2011 and April 2011.
- If the location was not dry or defensible data could not be obtained (static or stagnant water), the locations were sampled and that data presented in Appendix 8-C
- In addition, NMCC was asked by MMD to collect a sediment sample in each drainage, Grayback, Percha, and Las Animas. This was done and actually two sediment samples were collected from Grayback and the results of these samples are located in Appendix 8-D.

I would argue that this meets the minimum requirements as described in the MMD Guidance document. That said, a conservative path forward would be to maintain the auto-samplers through the formal technical review of the BDR, which would allow them NMED and MMD the opportunity to review the data in more detail and provide some guidance to NMCC should the data still be deemed insufficient at that time. I think that what this exercise is telling me is that the BDR needs to do a better job of explaining that we evaluated each location each quarter and when we had flow and collect a defensible sample, we did including sediment samples. A table in the text and the suggested denotation of dry or no flow per sampling event in Appendix 8-C would help clarify this. Guidance is a flexible concept, but we would welcome MMD/NMED advise if the surface water characterization is insufficient, because in my opinion it does meet the guidance recommendations.

NMCC will proceed on this path unless we hear differently from NMED. That path would be temporarily disable the auto-samplers in Perch and Las Animas Creeks, but maintain the auto-samplers in Grayback Arroyo at least through the technical review of the BDR.

Let me know if anyone has any issues with this plan.

From: Ennis, David, EMNRD [mailto:David.Ennis@state.nm.us]
Sent: Thursday, May 10, 2012 4:18 PM
To: Steve Raugust
Cc: Shepherd, Holland, EMNRD; Eustice, Chris, EMNRD; Vollbrecht, Kurt, NMENV
Subject: [BULK] Copper Flat - Auto-Sampling & Surface Water
Importance: Low

Steve,

MMD has reviewed both the SAP and the draft BDR with respect to the issue you raised the other day regarding continued surface water sampling. In short, MMD is of the opinion that additional surface water sampling of the Greenhorn Basin is needed in order to satisfy the requirements of the BDR. At this time, the SWQ data points do not appear to have met the minimum requirement of quarterly sampling over the course of a 12 month period. While it is understood that the SWQ locations have been largely dry (especially SWQ-1), MMD's opinion is that additional attempts to collect surface water samples are warranted from this surface water basin. As such, it is recommended that the opportunistic and/or auto-sampling program continue at the SWQ locations. MMD also recommends that Appendix 8-C be modified to reflect when these sampling locations were checked by NMCC and were found to be dry. While dry, it remains valid baseline data as it demonstrates baseline conditions, at least to some extent.

In contrast, the sampling results from Las Animas and Percha Creeks appear to adequately meet the requirements of the BDR. Therefore it is at the discretion of NMCC whether to continue the opportunistic/auto-sampling program in these locations.

If you have any questions, please let me know.

Thanks,
DJ

DJ Ennis, P.G.
Mining and Minerals Division / 1220 S. St. Francis Drive / Santa Fe, NM 87505
(505) 476-3434 / david.ennis@state.nm.us

Vollbrecht, Kurt, NMENV

From: Powell, Richard, NMENV
Sent: Thursday, May 31, 2012 7:44 AM
To: Vollbrecht, Kurt, NMENV
Subject: RE: NM water quality standards for Coppr Flat pit lake

Who are they?

Here's how the coal mining regulations define impoundment:

IMPOUNDMENT - means a closed basin, naturally formed or artificially built, which is dammed or excavated for the retention of water or sediment.

And how they define permanent diversion:

PERMANENT DIVERSION - means a diversion remaining after surface coal mining and reclamation operations are completed which has been approved for retention by the director and other appropriate state and federal agencies.

So I guess if you creatively combine the two, you have:

PERMANENT IMPOUNDMENT - means a closed basin, naturally formed or artificially built, which is dammed or excavated for the retention of water or sediment remaining after mining and reclamation operations are completed, which has been approved for retention by the director and other appropriate state and federal agencies.

Or the non-coal mining regulations define impoundment:

"Impoundment" means a basin constructed for the retention of water or sediment, but does not include impoundments for process solutions or tailings.

So if you creatively combine these, you have:

PERMANENT IMPOUNDMENT - means a basin constructed for the retention of water or sediment remaining after mining and reclamation operations are completed, which has been approved for retention by the director and other appropriate state and federal agencies.

I personally prefer combination of the two:

PERMANENT IMPOUNDMENT - means a basin, naturally formed or artificially built, which is dammed or excavated for the retention of water or sediment remaining after mining and reclamation operations are completed, which has been approved for retention by the director and other appropriate state and federal agencies.

From: Vollbrecht, Kurt, NMENV
Sent: Wednesday, May 30, 2012 5:15 PM
To: Powell, Richard, NMENV
Subject: RE: NM water quality standards for Coppr Flat pit lake

Now they want me to define "permanent impoundment"...

Kurt Vollbrecht, Geologist
New Mexico Environment Department
Ground Water Quality Bureau
Mining Environmental Compliance Section
(505) 827-0195

From: Powell, Richard, NMENV
Sent: Wednesday, May 30, 2012 9:58 AM
To: Vollbrecht, Kurt, NMENV
Subject: RE: NM water quality standards for Coppr Flat pit lake

And all other permanent impoundments (not actively used for treatment) as well. Our regulations allow for a Use Attainability Analysis (UAA) which may result in a change to the designated use(s). See 20.6.4.15 NMAC.

From: Vollbrecht, Kurt, NMENV
Sent: Thursday, May 24, 2012 11:43 AM
To: Powell, Richard, NMENV
Subject: RE: NM water quality standards for Coppr Flat pit lake

This question just came up during a discussion for copper rules closure requirements. Would the statement below apply to an and all pit lakes at copper mines?

Kurt Vollbrecht, Geologist
New Mexico Environment Department
Ground Water Quality Bureau
Mining Environmental Compliance Section
(505) 827-0195

From: Powell, Richard, NMENV
Sent: Tuesday, May 15, 2012 9:06 AM
To: Vollbrecht, Kurt, NMENV
Subject: RE: NM water quality standards for Coppr Flat pit lake

As a permanent impoundment, we would consider this an unclassified perennial water with designated uses of warmwater aquatic life, livestock watering, wildlife habitat and primary contact as specified in 20.6.4.99 NMAC (*Standards for Interstate and Intrastate Surface Waters, New Mexico Water Quality Control Commission, 20.6.4 New Mexico Administrative Code)* as amended through January 14, 2011 (NMWQS) http://www.nmcpr.state.nm.us/nmac/parts/title20/20.006.0004.htm. Applicable water quality criteria for these uses is specified in 20.6.4.900 NMAC.

From: Vollbrecht, Kurt, NMENV
Sent: Tuesday, May 15, 2012 8:47 AM
To: Powell, Richard, NMENV
Subject: FW: NM water quality standards for Coppr Flat pit lake

Hi Rich-can you provide an answer to this? My guess is he is asking about standards after closure.

Let me know what information is necessary to respond...thanks.

Kurt Vollbrecht, Geologist
New Mexico Environment Department
Ground Water Quality Bureau

Mining Environmental Compliance Section
(505) 827-0195

From: Nelson, Mark [mailto:NelsonMR@cdmsmith.com]
Sent: Monday, May 14, 2012 4:57 PM
To: Vollbrecht, Kurt, NMENV
Subject: NM water quality standards for Coppr Flat pit lake

Hi Kurt-

Which New Mexico water quality standards apply to the Copper Flat pit lake?

To save you time, I could also look up the standards, if you can help with the use designations that apply to the pit lake.

Thanks
Mark

Mark R. Nelson, PG | Project Hydrogeologist/Geochemist, Mining Project Specialist
CDM Smith |12445 Misty Meadows Rd. | Nemo, SD 57759 | T: 605.578.9739 | Cell: 605.390.9042
nelsonmr@cdmsmith.com

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Las Cruces District Office
1800 Marquess Street
Las Cruces, New Mexico 88005
www.blm.gov/nm

TAKE PRIDE® IN AMERICA

In Reply Refer To:
2800 (L0310)

JUN 7 2012

Dear Interested Party:

The Bureau of Land Management (BLM) received a right-of-way application from the New Mexico Copper Corporation (NMCC), to construct, operate, maintain, and terminate existing water facility infrastructure and new temporary water facility infrastructure approximately 11 miles east of Hillsboro, New Mexico (see enclosed vicinity map). The NMCC is proposing a pumping test on existing water facility infrastructure and collecting data on aquifer properties to establish aquifer baseline data. Objectives of the pumping test include:

- Evaluating the current conditions of wells used for pumping
- Determine potential aquifer boundary conditions
- Gather data on aquifer properties in the vicinity of existing wells
- Obtain a better understanding of the interaction of the wells when pumped as a well field (two wells at the same time).

Existing water facility infrastructure is located on public land identified on the enclosed project area figure (PW-1, PW-2, PW-3, PW-4, and ancillary connecting pipelines). Two alternatives for temporary water facility infrastructure would be located on public land as identified below, and on the enclosed project area figure.

Alternative A: A temporary above-ground pipeline (Temporary Pipeline Corridor) from the existing water facilities would be used in conjunction with the associated infiltration area (within an existing but un-used gravel quarry) located on state land for the purpose of transporting test water to the infiltration area.

Alternative B: A temporary above-ground pipeline would extend from the existing water facilities to Greyback Arroyo for the purpose of transporting test water to Greyback Arroyo.

To comply with the National Environmental Policy Act (NEPA), the BLM has analyzed the environmental effects of this proposed action in an environmental assessment (EA). The EA will be posted on the BLM's website for a 30-day review and public comment by early June 2012 at http://www.blm.gov/nm/st/en/fo/Las_Cruces_District_Office.html.

If you have any questions or comments regarding this proposed project, or if you need additional information, please contact Anthony Hom at (575) 525-4331, or Douglas Haywood at (575) 525-4498.

Sincerely,

David L. Wallace
Assistant District Manager
Division of Multi-Resources

2 Enclosures

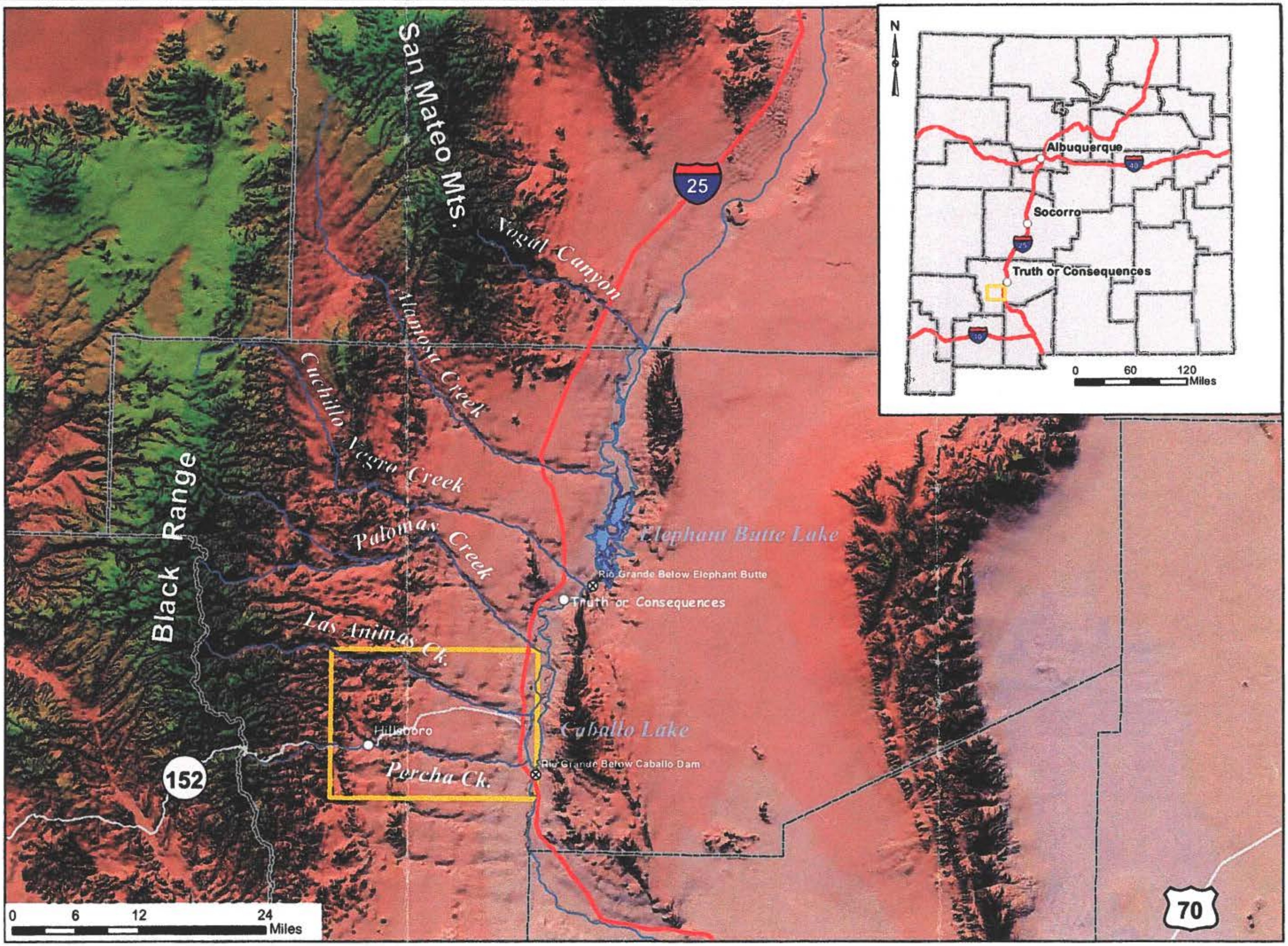


Figure 1. Vicinity Map

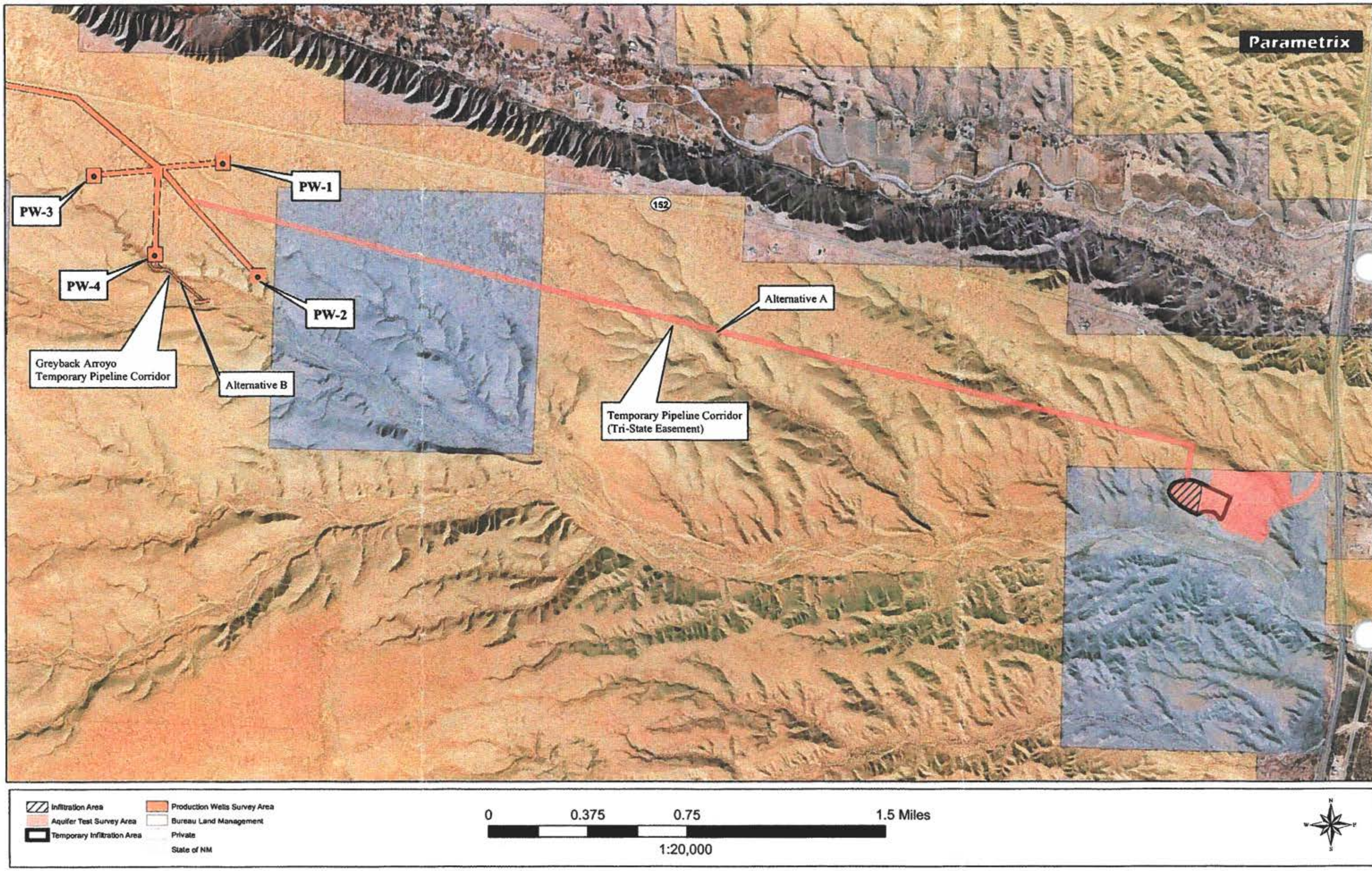


Figure 2: Project Area with Proposed Alternatives

Vollbrecht, Kurt, NMENV

From: Vollbrecht, Kurt, NMENV
Sent: Tuesday, June 19, 2012 10:23 AM
To: Eustice, Chris, EMNRD
Cc: Shepherd, Holland, EMNRD; Menzie, David, NMENV
Subject: Copper Flat Exploration Modification
Attachments: Copper Flat Exp 2.pdf

Chris,

NMED has reviewed the proposed modification to the Copper Flat Minimal Impact Exploration project (permit mod 12-2 to SI025EM). NMED initially submitted comments dated February 3, 2011 (attached). The proposed modification will not result in any additional impacts or concerns and the previous NMED comments are still applicable. Let me know if you have any questions.

Thanks,

Kurt Vollbrecht, Geologist
New Mexico Environment Department
Ground Water Quality Bureau
Mining Environmental Compliance Section
(505) 827-0195

Susana Martinez
Governor

John Bemis
Cabinet Secretary

Brett F. Woods, Ph.D.
Deputy Cabinet Secretary

Fernando Martinez, Director
Mining and Minerals Division

June 8, 2012

GROUND WATER
JUN 13 2012
BUREAU

Mr. Kurt Vollbrecht, Mining Act Team Leader
Mining Environmental Compliance Section
Groundwater Quality Bureau
New Mexico Environment Department
Post Office Box 26110
Santa Fe, NM 87502

RE: Request for Review and Comment, Permit Modification 12-2 to Minimal Impact Exploration Permit No. SI025EM, Copper Flat Exploration 2 Project

Dear Mr. Vollbrecht:

The New Mexico Mining and Minerals Division (MMD) received an application requesting a modification to Minimal Impact Exploration Permit No. SI025EM for the Copper Flat Exploration 2 Project located in Sierra County, NM from New Mexico Copper Corporation. A copy of the application is enclosed pursuant to 19.10.4.406.C.3 NMAC.

MMD requests that you review this application and provide comments to MMD no later than 20 days after your receipt of this letter.

Please contact me at (505) 476-3438, or via email at chris.eustice@state.nm.us with any questions or comments you may have regarding the application or this request.

Sincerely,

Chris Eustice, Permit Lead
Mining Act Reclamation Program

Enclosures

cc: Mine File SI025EM

THEMAC RESOURCES

June 1, 2012

Mr. Chris Eusctice
Permit Lead, MMD
1220 South St. Francis Drive
Santa Fe, NM 87505

RE: Copper Flat Exploration 2 (SI025EM) Permit Modification Request #3 - REVISION

Dear Chris,

New Mexico Copper Corporation (a wholly-owned subsidiary of THEMAC Resources Group) proposes to further modify the Copper Flat Exploration 2 Minimal Impact Permit #SI025EM. The following letter replaces my letter of May 15 and further expands our modification request.

We intend to:

(1) Add 7 drill locations (accommodating 7 holes)
(2) Deepen one already-permitted hole by 900'
(3) Relocate one permitted hole and deepen by 50'

The modifications are as follows:

Site	UTM N (m)	UTM E (m)	Length (ft)	Comment
JK-12	3650563	263241	2,000	Deepen permitted hole by 900'
9	3650965	263252	1,100	Relocate permitted hole to new location, deepen 50'
17	3650588	263370	1,500	New Site (previously dropped from Modification 2)
B	3650542	263340	2,000	New Site
E	3650945	263543	1,200	New Site
X	3650425	263589	500	New Site
8B	3650665	263175	1,500	New Site
W6	3650978	263066	1,200	New Site
SQ	3650637	263341	1,500	New Site

(Site 17 was previously included in Modification #2, but later dropped by NMCC)

The attached map shows the location of sites involved in this modification as well as sites already approved under Permit SI025EM.

THEMAC RESOURCES

Roads and Overland Access

All of the proposed drill sites in this modification are located on existing 2-wheel-drive navigable roads (see accompanying aerial photograph map). This modification will involve no new road or overland travel.

Drill Pads

We will construct pads of no greater than 30' by 60'. Our current drill program employs a track-mounted core rig requiring minimal auxiliary equipment.

Ownership

All land affected by this modification consists of patented claims held by New Mexico Copper Corporation.

Disturbance

Existing Permitted Disturbance (Modification 2)

Surface (Drill Pads & Roads)	2.95 ac
Downhole	35,350 ft

Proposed Additional Disturbance (Modification 3)

Surface (7 Drill Pads, 30' x 60')	0.29 ac
Downhole	10,350 ft

Total Permitted Disturbance (Upon Approval of Modification 3)

Surface (Drill Pads)	3.24 ac
Downhole	45,700 ft

THEMAC RESOURCES

Financial Assurance

To date, 12 holes have been drilled and abandoned in 2012 (see attached map). Drill plugging records have been submitted to the Office of the State Engineer. Those holes are:

Site	Permit Depth
3	1,050
5A	1,500
7	1,050
20	1,200
L	1,200
16	1,050
JK-7	1,200
JK-11	1,200
23	1,050
24	1,050
13	1,500
5	1,050

Total Downhole: 14,100 ft

We ask that the F.A. currently posted for these completed & reclaimed holes be deemed sufficient to cover our proposed modifications. A comparison follows

Proposed disturbance:

Downhole: 10,350 feet @ $6.50/ft = $67,275

Surface: 0.29 acres @ $3,300/ac = $957

Total: $68,232

Reclaimed disturbance (2012):

14,100 feet @ $6.50/ft = $91,650

The current bond posted for this permit is $241,710.
This modification represents an increase of F.A. liability of $68,232. However, the reclamation already completed represents an F.A. liability of $91,650. In the interest of expedience, we request that, upon approval of Modification 3, we be permitted to proceed with activities without modifying the F.A.

THEMAC RESOURCES

We are actively drilling under our approved permit, and hope to receive approval of this additional modification as quickly as possible so as to include these modifications in our current drilling campaign. Please contact me if there is anything else I can provide, or anything I can do to facilitate the review process. The $250 permit modification fee was submitted with the original Modification 3 request.

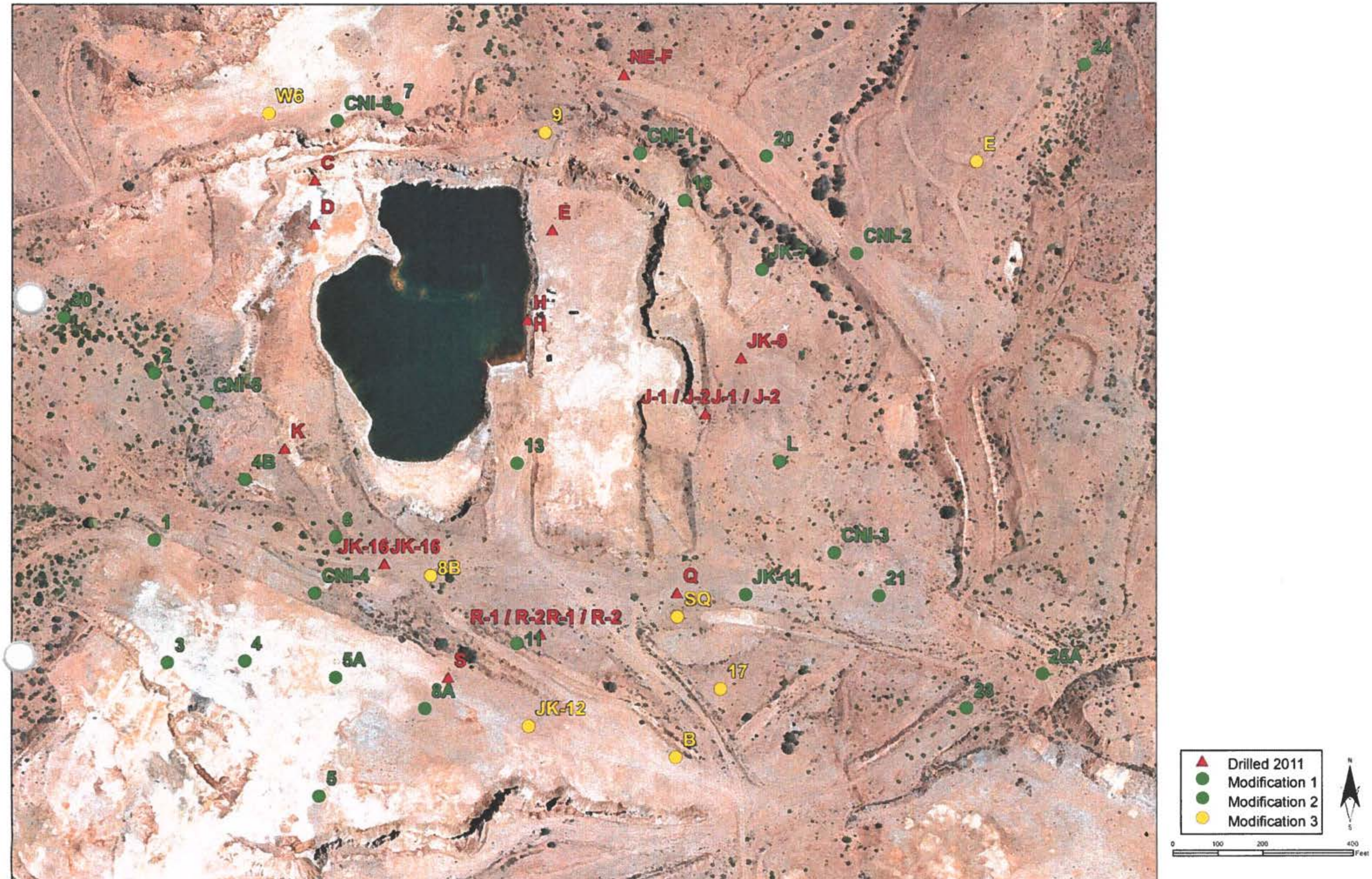
Also, please note that our office address has changed. Our new office address is:

2424 Louisiana Boulevard NE, Suite 301
Albuquerque, NM 87110

Thanks once again for all of your current and past assistance.

Best regards,

Andrew Feltman
Project Geologist
New Mexico Copper Corporation – Copper Flat Mine
(A Wholly Owned Subsidiary of THEMAC Resources Group, Ltd.)
Office: 505.872.0297
Mobile: 251.591.5251
www.themacresourcesgroup.com



Copper Flat Exploration 2
(SI025EM) Permit Modification 3

THEMAC Resource Group, Ltd Copper Flat Mine	6/1/2012
	APF

Holes Drilled & Plugged in 2012

0 100 200 400 Feet

Coordinate System: NAD 1983 UTM Zone 13N
Projection: Transverse Mercator
Datum: North American 1983
False Easting: 500 000.0000
False Northing: 0.0000
Central Meridian: -105.0000
Scale Factor: 0.9996
Latitude Of Origin: 0.0000
Units: Meter

N
S

Holes Drilled & Plugged in 2012	
THEMAC Resource Group, Ltd Copper Flat Mine	6/1/2012
	APF

Shore, Lawrence, NMENV

From: Vollbrecht, Kurt, NMENV
Sent: Thursday, June 21, 2012 12:05 PM
To: Shore, Lawrence, NMENV
Subject: FW: Notice of Intent from NMCC
Attachments: NMCC_NOI_6_20_12.pdf

Here is the email from NMCC.

If the water quality is as expected, I would think "No DP Required" would suffice, but it is up to Jerry whether we issue temporary permission or not...

Kurt Vollbrecht, Geologist
New Mexico Environment Department
Ground Water Quality Bureau
Mining Environmental Compliance Section
(505) 827-0195

From: Katie Emmer [mailto:kemmer@themacresourcesgroup.com]
Sent: Thursday, June 21, 2012 10:19 AM
To: Vollbrecht, Kurt, NMENV
Cc: Steve Raugust; Jens Deichmann
Subject: Notice of Intent from NMCC

Hi Kurt,

As we discussed, I am submitting NMCC's Notice of Intent for proposed discharge from the pumping test at two possible locations. As you suggested, I am sending this electronically only, but if you'd like a hard copy I will put that in the mail no problem.

The two discharge locations are referred to as Alternative A and Alternative B. Alternative A is an inactive gravel quarry on state land; Alternative B is a location south of the production wells in Grayback Arroyo. As we've been issued an NPDES permit for the Grayback Arroyo location and it is much closer to the wells, it is our preferred option; however this decision is subject to BLM concurrence. This discharge would not occur without the right of way grant we've applied for with the BLM and is subject to other permits. The public comment period for the Environmental Assessment the BLM completed on these proposed actions ends on July 9, 2012. We are hopeful for a decision from BLM in July.

The NPDES for the proposed discharge was issued by EPA on May 31, 2012 and will be effective, assuming no appeals, on July 1, 2012. If you don't have a copy of that permit and would like one please let me know, I'd be happy to provide it.

If you have any questions or other data requests, please let me know.

Thank you,

Katie Emmer
Project Scientist
THEMAC
Copper Flat Mine

7-1-12 NM0031101

New Mexico Environment Department
Ground Water Quality Bureau

Ground Water Quality Bureau – Pollution Prevention Section Notice of Intent

1. Name and mailing address of person proposing to discharge:

New Mexico Copper Corporation

Jens Deichmann

2424 Louisiana Blvd NE, Suite 301

Albuquerque, NM 87110

Work Phone: 505-830-6920

Cell Phone: 505-681-2536

Fax: 505-881-4616

Email: jdeichmann@themacresourcesgroup.com

2. Name of facility:

Copper Flat Production Well Field

3. Physical location of discharge (if applicable, give street address, township, range, section, distance from closest town or landmark, directions to facility, location map):

Two possible locations:
A: inactive gravel quarry near the intersection of I-25 and NM HWY 152 east of the Copper Flat Production Wells, see "Infiltration Area" connected to Production Wells by "Alternative A" in attached Figure 2: Northern portion of T16S, R5W, Section 2, lots 1 and 3, inclusive.
Or B: South of Copper Flat Production Wells in Grayback arroyo, see "Alternative B" in attached Figure 2, Latitude 32° 57' 42" North, Longitude 107° 22' 22" West T15S, R5W, Section 31, SW1/4NE1/4

4. Type of operation generating the discharge (e.g., truck wash, food processing plant, restaurant, etc.):

Pumping test at Copper Flat Production Well field, lasting approximately 16 days. Some discharge may occur prior to pumping test.

5. Source(s) of the discharge. Describe how the wastewater, sludge, or other discharges processed and/or disposed at your facility are generated. Identify all sources. Attach additional pages if needed:

Groundwater from Copper Flat Production Wells: likely PW-1 and PW-3, although PW-2 could be used if conditions at PW-1 or PW-3 preclude their use

6. Expected contaminants in the discharge (e.g., nitrate-nitrogen, metals, organic compounds, salts, etc.) Include estimated concentration if known, and copies of results of laboratory analyses, if available:

No contaminants will be discharged. See attached laboratory analysis from PW-1 and PW-3, May 2012.

7. Describe all components of wastewater processing, treatment, storage, and disposal system (e.g., grease interceptor, lagoon, septic tank/leachfield, etc.) Include sizes, site layout map, plans and specifications, etc. if available:

No processing or treatment is needed or planned. Water may be stored temporarily in above ground temporary mobile tanks prior to discharge.

8. Estimated maximum daily discharge volume in gallons per day (or other units):

The average daily discharge would be 9.4 acre feet per day. Maximum discharge would be 13.2 acre feet per day. Total discharge will not exceed 150 acre feet.

9. Estimated depth to ground water (ft): At A, unused gravel quarry: 60 ft below ground surface. At B, Grayback arroyo: greater than 250 ft below ground level.

Signature: [signature] **Date:** 6/20/12

Printed name: Jens Deichmann **Title:** Project Manager

Please return this form to:
NMED Ground Water Quality Bureau
P.O. Box 5469
Santa Fe, New Mexico 87502-5469

Telephone: 505-827-2900
Fax: 505-827-2965

300'–1000'

Copper Flat Production
Well Data

Well Name	Date	Boron	Barium	Beryllium	Bicarbonate	Cadmium	Calcium	Chloride	Chromium	Cobalt	Copper	Fluoride	Iron	Lead	Magnesium	uranium	Arsnic	Vanadium
		.75	1.0	NA	NA	.01	NA	(mg/L) 250	.05	.05	1	1.6	1.0	.05	NA	.03		
PW-1																		
	12/23/1975				144.6		22	16.3				0.46			2.8			
	8/14/1981						28				<0.05		0.2	<0.02	4			
	8/2/1994																	
	5/1/2012	0.065	0.011	<0.002	150	<0.002	36	32	<0.006	<0.006	<0.006	1	0.04	<0.005	3.1	.0032	.0033	ND
PW-2																		
	1/15/1976				153.1		21	17				0.66			3.4			
	11/27/1984					<0.005					<0.05		<0.1					
	8/2/1994	<0.1	<0.1	<0.002		<0.0005	60		<0.025	<0.05	<0.025		0.062	<0.005	8.4			
PW-3																		
	1/27/1976				158		23	24.1				0.64			2.7			
	8/14/1981						16				-0.05		0.31	<0.02	1			
	8/2/1994																	
	5/2/2012	0.095	0.0078	<0.002	120	<0.002	20	50	0.006	<0.006	<0.006	1.9	0.065	<0.005	1	.0013	.0074	ND
PW-4																		
	8/2/1994	<0.1	<0.1	<0.002		<0.0005	21		<0.025	<0.05	<0.025		<0.05	<0.005	1.7			
		ok	ok	-	-	OK	-	OK	ok	OK	OK		OK	ok	~			

Well Name	Date	Manganese	Mercury	Molybdenum	Nickel	Nitrate	Potassium	Selenium	Silver	Sodium	Sulfate	TDS	Thallium	Zinc	pH	CN
		.2	.002	1.0	.2	10.0	(mg/L) NA	.05	.05	NA	600	1000	NA	10.	6-9	
PW-1																
	12/23/1975					3.5	4.5			38	10	217			7.8	
	8/14/1981									53				<0.05		
	8/2/1994															
	5/1/2012	0.0024	<0.0002	<0.008	<0.01	0.59	3.4	<0.001	<0.005	58	28	294	<0.001	0.024	8.02	ND
PW-2																
	1/15/1976					3.5	4.3			39	<5	257			8.1	
	11/27/1984	<0.05	<0.001					<0.005								
	8/2/1994	0.032	<0.001		<0.05		3.4	<0.005	<0.025	46			<0.005	<0.05		
PW-3																
	1/27/1976					2.6	5.1			44	<5	243			8	
	8/14/1981									87				0.19		
	8/2/1994															
	5/2/2012	0.0026	<0.0002	<0.008	<0.01	0.7	3.3	<.001	<0.005	81	26	303	<0.001	0.021	8.03	ND
PW-4																
	8/2/1994	<0.03	<0.001	<0.05	<0.05		3.5	<0.005	<0.025	73			<0.005	<0.05		
		ok	ok	ok	ok	ok	-	ok	ok	-	ok	ok	-	ok	ok	

Pump PW-1 3 days then PW-3 +
Blend - pumped @ similar rates
PW-2 as backup

PW-1 looks good (straight)
PW-3 had sounding tube in it

1. Name and mailing address of person proposing to discharge:

New Mexico Copper Corporation
Jens Deichmann
2424 Louisiana Blvd NE, Suite 301
Albuquerque, NM 87110

Work Phone: 505-830-6920
Cell Phone: 505-681-2536
Fax: 505-881-4616
Email: jdeichmann@themacresourcesgroup.com

2. Name of facility:

Copper Flat Production Well Field

3. Physical location of discharge (if applicable, give street address, township, range, section, distance from closest town or landmark, directions to facility, location map):

Two possible locations:
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Or B: South of Copper Flat Production Wells in Grayback arroyo, see "Alternative B" in attached Figure 2, Latitude 32° 57' 42" North, Longitude 107° 22' 22" West T15S, R5W, Section 31, SW1/4NE1/4

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Groundwater from Copper Flat Production Wells: likely PW-1 and PW-3, although PW-2 could be used if conditions at PW-1 or PW-3 preclude their use

6. Expected contaminants in the discharge (e.g., nitrate-nitrogen, metals, organic compounds, salts, etc.) Include estimated concentration if known, and copies of results of laboratory analyses, if available:

No contaminants will be discharged. See attached laboratory analysis from PW-1 and PW-3, May 2012.

7. Describe all components of wastewater processing, treatment, storage, and disposal system (e.g., grease interceptor, lagoon, septic tank/leachfield, etc.) Include sizes, site layout map, plans and specifications, etc. if available:

No processing or treatment is needed or planned. Water may be stored temporarily in above ground temporary mobile tanks prior to discharge.

8. Estimated maximum daily discharge volume in gallons per day (or other units):

The average daily discharge would be 9.4 acre feet per day. Maximum discharge would be 13.2 acre feet per day. Total discharge will not exceed 150 acre feet.

9. Estimated depth to ground water (ft): At A, unused gravel quarry: 60 ft below ground surface. At B, Grayback arroyo: greater than 250 ft below ground level.

Signature: [signature] **Date:** 6/20/12

Printed name: Jens Deichmann **Title:** Project Manager

Please return this form to:
NMED Ground Water Quality Bureau
P.O. Box 5469
Santa Fe, New Mexico 87502-5469

Telephone: 505-827-2900
Fax: 505-827-2965

Copper Flat Production
Well Data

Well Name	Date	Boron	Barium	Beryllium	Bicarbonate	Cadmium	Calcium	Chloride	Chromium	Cobalt	Copper	Fluoride	Iron	Lead	Magnesium
		(mg/L)													
PW-1															
	12/23/1975				144.6		22	16.3				0.46			2.8
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	5/1/2012	0.065	0.011	<0.002	150	<0.002	36	32	<0.006	<0.006	<0.006	1	0.04	<0.005	3.1
PW-2															
	1/15/1976				153.1		21	17				0.66			3.4
	11/27/1984					<0.005					<0.05		<0.1		
	8/2/1994	<0.1	<0.1	<0.002		<0.0005	60		<0.025	<0.05	<0.025		0.062	<0.005	8.4
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PW-4															
	8/2/1994	<0.1	<0.1	<0.002		<0.0005	21		<0.025	<0.05	<0.025		<0.05	<0.005	1.7

Well Name	Date	Manganese	Mercury	Molybdenum	Nickel	Nitrate	Potassium	Selenium	Silver	Sodium	Sulfate	TDS	Thallium	Zinc	pH
		(mg/L)													
PW-1															
	12/23/1975					3.5	4.5			38	10	217			7.8
	8/14/1981									53				<0.05	
	8/2/1994														
	5/1/2012	0.0024	<0.0002	<0.008	<0.01	0.59	3.4	<0.001	<0.005	58	28	294	<0.001	0.024	8.02
PW-2															
	1/15/1976					3.5	4.3			39	<5	257			8.1
	11/27/1984	<0.05	<0.001					<0.005							
	8/2/1994	0.032	<0.001		<0.05		3.4	<0.005	<0.025	46			<0.005	<0.05	
PW-3															
	1/27/1976					2.6	5.1			44	<5	243			8
	8/14/1981									87				0.19	
	8/2/1994														
	5/2/2012	0.0026	<0.0002	<0.008	<0.01	0.7	3.3	<.001	<0.005	81	26	303	<0.001	0.021	8.03
PW-4															
	8/2/1994	<0.03	<0.001	<0.05	<0.05		3.5	<0.005	<0.025	73			<0.005	<0.05	

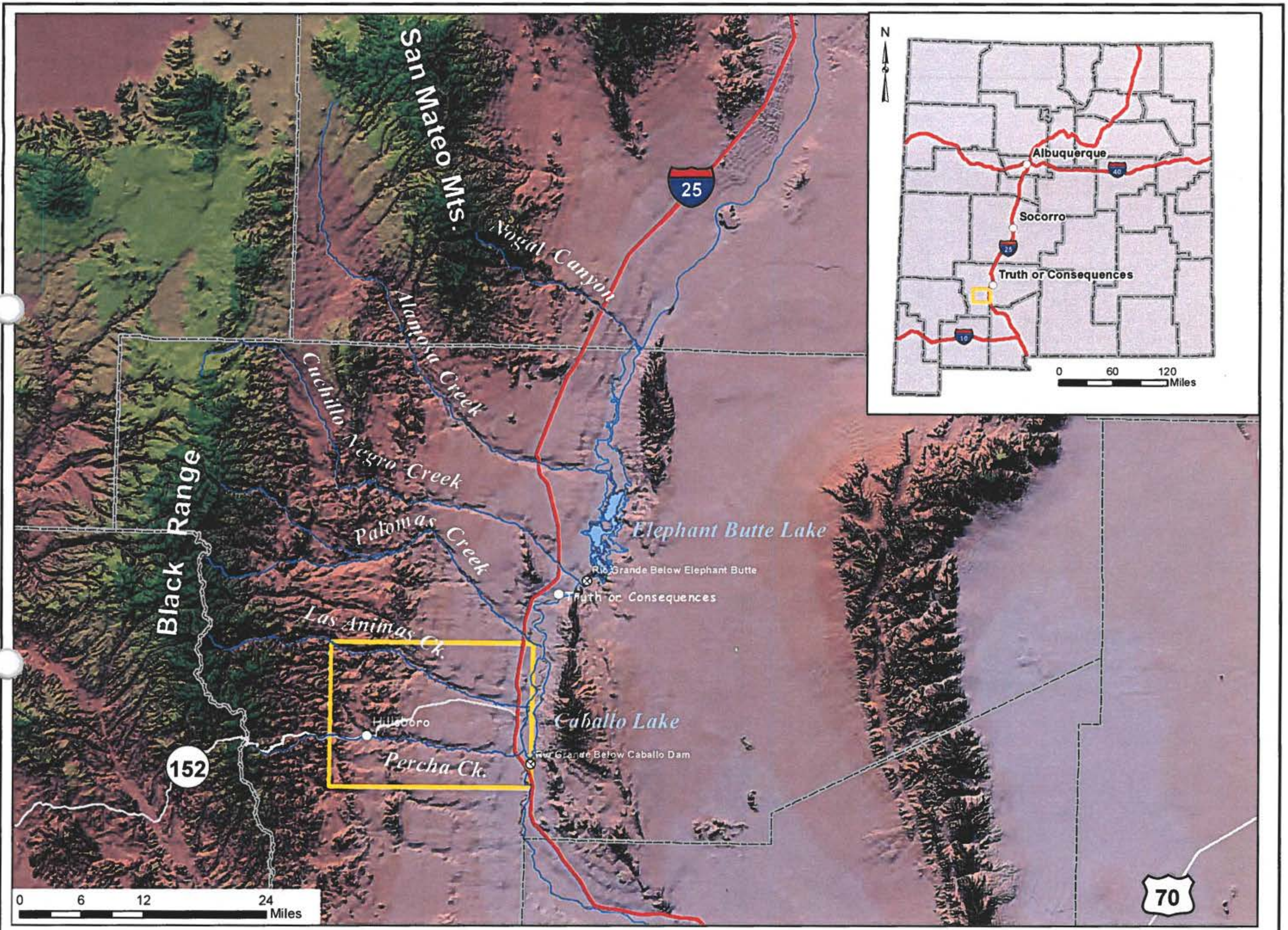

Figure 1. Vicinity Map

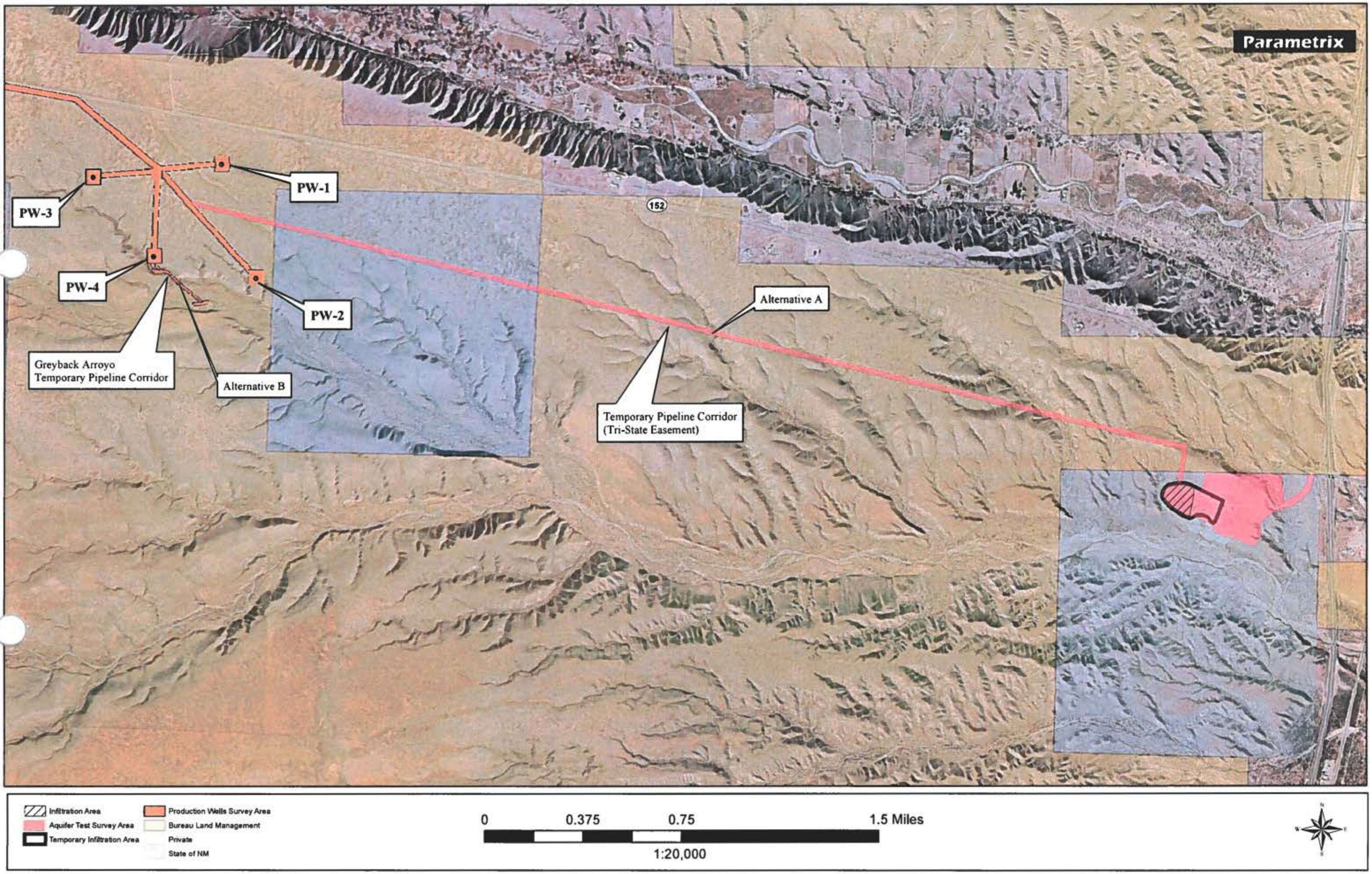

Figure 2: Project Area with Proposed Alternatives

HALL
ENVIRONMENTAL
ANALYSIS
LABORATORY

Hall Environmental Analysis Laboratory
4901 Hawkins NE
Albuquerque, NM 87109
TEL: 505-345-3975 FAX: 505-345-4107
Website: www.hallenvironmental.com

May 14, 2012

Katie Emmer

New Mexico Copper Corp
2425 San Pedro Dr NE Ste 100
Albuquerque, New Mexico 87109
TEL: (505) 400-7925
FAX

RE: Cu Flat

OrderNo.: 1205153

Dear Katie Emmer:

Hall Environmental Analysis Laboratory received 1 sample(s) on 5/3/2012 for the analyses presented in the following report.

These were analyzed according to EPA procedures or equivalent. To access our accredited tests please go to www.hallenvironmental.com or the state specific web sites. See the sample checklist and/or the Chain of Custody for information regarding the sample receipt temperature and preservation. Data qualifiers or a narrative will be provided if the sample analysis or analytical quality control parameters require a flag. All samples are reported as received unless otherwise indicated.

Please don't hesitate to contact HEAL for any additional information or clarifications.

Sincerely,

Andy Freeman
Laboratory Manager
4901 Hawkins NE
Albuquerque, NM 87109

NM Copper
May 1, 2012

Analytical Parameter	Analysis Method	Lab Detection Limit (mg/L unless noted)
Thallium	EPA Method 200.7	0.01
~~Titanium~~	~~EPA Method 200.7~~	~~0.005~~
Uranium	EPA Method 200.8	0.01
Vanadium	EPA Method 200.7	0.005
Zinc	EPA Method 200.7	0.005
Solids		
Total Suspended Solids (TSS)	SM 2540D	1.0 μg/L
Total Dissolved Solids (TDS)	SM 2540C	10
Alkalinity		
Alkalinity, total (as $CaCO_3$)	SM 2320B	20
Carbonate	SM 2320B	20
Bicarbonate	SM 2320B	20
Other		
pH	150.1	12.45
Specific Conductance	120.1	0.01 μS/cm
Cyanide	Kelada-01	0.005

Note: NA = not applicable as sample will not be analyzed for a given parameter.

NM Copper
May 1, 2012

Table 9-3

Analytical Parameters and Analysis Methods for Groundwater Samples

Analytical Parameter	Analysis Method	Lab Detection Limit (mg/L unless noted)
Anions		
Fluoride	EPA Method 300.0	0.1
Chloride	EPA Method 300.0	0.1
Nitrogen, Nitrite (as N)	EPA Method 300.0	0.1
Nitrogen, Nitrate (as N)	EPA Method 300.0	0.1
Sulfate	EPA Method 300.0	0.5
Dissolved Metals		
Aluminum	EPA Method 200.7	0.02
Antimony	EPA Method 200.8	0.005
Arsenic	EPA Method 200.8	0.02
Barium	EPA Method 200.7	0.002
Beryllium	EPA Method 200.7	0.002
Boron	EPA Method 200.7	0.04
Cadmium	EPA Method 200.7	0.002
Calcium	EPA Method 200.7	0.50
Chromium	EPA Method 200.7	0.006
Cobalt	EPA Method 200.7	0.006
Copper	EPA Method 200.7	0.0003
Iron	EPA Method 200.7	0.02
Lead	EPA Method 200.7	0.005
Magnesium	EPA Method 200.7	0.50
Manganese	EPA Method 200.7	0.002
Mercury	EPA Method 7470 CVAA	0.0002
Molybdenum	EPA Method 200.7	0.008
Nickel	EPA Method 200.7	0.01
Potassium	EPA Method 200.7	1.0
Selenium	EPA Method 200.8	0.02
Silicon	EPA Method 200.7	0.08
Silver	EPA Method 200.7	0.005
Sodium	EPA Method 200.7	0.5

Chain-of-Custody Record

Client: New Mexico Copper Corp

Mailing Address: 2425 San Pedro Dr NE
Suite 100, ABQ NM

Phone #: 505.400.7925

email or Fax#:

QA/QC Package:
☐ Standard ☐ Level 4 (Full Validation)

Accreditation
☐ NELAP ☐ Other ____________

☐ EDD (Type) ____________

Turn-Around Time:
☐ Standard ☒ Rush Need Results by May 11 via email

Project Name:
CuFlat

Project #:
Production Well Sampling

Project Manager:
Katie Emmer

Sampler: CMC

On Ice: ☒ Yes ☐ No

Sample Temperature: 3.7

HALL ENVIRONMENTAL ANALYSIS LABORATORY

www.hallenvironmental.com

4901 Hawkins NE - Albuquerque, NM 87109

Tel. 505-345-3975 Fax 505-345-4107

Analysis Request

Date	Time	Matrix	Sample Request ID	Container Type and #	Preservative Type	HEAL No. 1205016	BTEX + MTBE + TMB's (8021)	BTEX + MTBE + TPH (Gas only)	TPH Method 8015B (Gas/Diesel)	TPH (Method 418.1)	EDB (Method 504.1)	8310 (PNA or PAH)	RCRA 8 Metals	Anions (F,Cl,NO_3,NO_2,PO_4,SO_4)	8081 Pesticides / 8082 PCB's	8260B (VOA)	8270 (Semi-VOA)	see enclosed list				Air Bubbles (Y or N)
5.1.12	1400	H_2O	PW-1	500		-001												X				
↓	↓	↓	↓	125	H_2SO_4	-001												↓				
↓	↓	↓	↓	125	HNO_3 + filter	-001												↓				
↓	↓	↓	↓	500	HNO_3	-001												↓				
↓	↓	↓	↓	500	NaOH	-001												↓				

Date:	Time:	Relinquished by:	Received by:	Date	Time
5/1/12	14:30	[signature]	[signature]	May 1 2012	14:30
5/2/12	07:50	[signature]	[signature]	05/02/12	0730

Remarks: Please email results to: Katie Emmer
kemmer@themacresourcesgroup.com
Please add Hardness, per Katie. 5/3

If necessary, samples submitted to Hall Environmental may be subcontracted to other accredited laboratories. This serves as notice of this possibility. Any sub-contracted data will be clearly notated on the analytical report.

HALL ENVIRONMENTAL ANALYSIS LABORATORY

Hall Environmental Analysis Laboratory
4901 Hawkins NE
Albuquerque, NM 87109
TEL: 505-345-3975 FAX: 505-345-4107
Website: www.hallenvironmental.com

Sample Log-In Check List

Client Name: NEW MEXICO COPPER CORP   Work Order Number: 1205076

Received by/date: AT 05/02/12

Logged By: Anne Thorne   5/2/2012 7:30:00 AM   Anne Thorne

Completed By: Anne Thorne   5/2/2012   Anne Thorne

Reviewed By: AT 05/02/12

Chain of Custody

1. Were seals intact? Yes ☐ No ☐ Not Present ☑
2. Is Chain of Custody complete? Yes ☑ No ☐ Not Present ☐
3. How was the sample delivered? Client

Log In

4. Coolers are present? (see 19. for cooler specific information) Yes ☑ No ☐ NA ☐
5. Was an attempt made to cool the samples? Yes ☑ No ☐ NA ☐
6. Were all samples received at a temperature of >0° C to 6.0°C Yes ☑ No ☐ NA ☐
7. Sample(s) in proper container(s)? Yes ☑ No ☐
8. Sufficient sample volume for indicated test(s)? Yes ☑ No ☐
9. Are samples (except VOA and ONG) properly preserved? Yes ☑ No ☐
10. Was preservative added to bottles? Yes ☐ No ☑ NA ☐
11. VOA vials have zero headspace? Yes ☑ No ☐ No VOA Vials ☐
12. Were any sample containers received broken? Yes ☐ No ☑
13. Does paperwork match bottle labels? Yes ☑ No ☐
    (Note discrepancies on chain of custody)
14. Are matrices correctly identified on Chain of Custody? Yes ☑ No ☐
15. Is it clear what analyses were requested? Yes ☑ No ☐
16. Were all holding times able to be met? Yes ☑ No ☐
    (If no, notify customer for authorization.)

# of preserved bottles checked for pH: 1
(<2 or >12 unless noted)
Adjusted?
Checked by: AT 05/02/12

Special Handling (if applicable)

17. Was client notified of all discrepancies with this order? Yes ☐ No ☐ NA ☑

Person Notified: Date:
By Whom: Via: ☐ eMail ☐ Phone ☐ Fax ☐ In Person
Regarding:
Client Instructions:

18. Additional remarks:

19. **Cooler Information**

Cooler No	Temp °C	Condition	Seal Intact	Seal No	Seal Date	Signed By
1	3.4	Good	Not Present			

QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: 1205076

14-May-12

Client: New Mexico Copper Corp

Project: Cu Flat

Sample ID MB-1800	SampType: MBLK	TestCode: SM 2540D: TSS	
Client ID: PBW	Batch ID: 1800	RunNo: 2570	
Prep Date: 5/3/2012	Analysis Date: 5/3/2012	SeqNo: 71656	Units: mg/L

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Suspended Solids	ND	4.0								

Sample ID LCS-1800	SampType: LCS	TestCode: SM 2540D: TSS	
Client ID: LCSW	Batch ID: 1800	RunNo: 2570	
Prep Date: 5/3/2012	Analysis Date: 5/3/2012	SeqNo: 71657	Units: mg/L

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Suspended Solids	93	4.0	96.60	0	96.3	82.9	110			

Sample ID 1205034-001BDUP	SampType: DUP	TestCode: SM 2540D: TSS	
Client ID: BatchQC	Batch ID: 1800	RunNo: 2570	
Prep Date: 5/3/2012	Analysis Date: 5/3/2012	SeqNo: 71663	Units: mg/L

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Suspended Solids	ND	4.0						0	15	

Qualifiers:

*/X	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
J	Analyte detected below quantitation limits	ND	Not Detected at the Reporting Limit
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit

QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: **1205076**

14-May-12

Client: New Mexico Copper Corp

Project: Cu Flat

Sample ID **MB-1832** SampType: **MBLK** TestCode: **SM2540C MOD: Total Dissolved Solids**
Client ID: **PBW** Batch ID: **1832** RunNo: **2634**
Prep Date: **5/7/2012** Analysis Date: **5/8/2012** SeqNo: **73329** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Total Dissolved Solids	ND	20.0								

Sample ID **LCS-1832** SampType: **LCS** TestCode: **SM2540C MOD: Total Dissolved Solids**
Client ID: **LCSW** Batch ID: **1832** RunNo: **2634**
Prep Date: **5/7/2012** Analysis Date: **5/8/2012** SeqNo: **73330** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Total Dissolved Solids	1,020	20.0	1,000	0	102	80	120			

Sample ID **1205078-002GMS** SampType: **MS** TestCode: **SM2540C MOD: Total Dissolved Solids**
Client ID: **BatchQC** Batch ID: **1832** RunNo: **2634**
Prep Date: **5/7/2012** Analysis Date: **5/8/2012** SeqNo: **73337** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Total Dissolved Solids	4,890	20.0	1,000	3,791	110	80	120			

Sample ID **1205078-002GMSD** SampType: **MSD** TestCode: **SM2540C MOD: Total Dissolved Solids**
Client ID: **BatchQC** Batch ID: **1832** RunNo: **2634**
Prep Date: **5/7/2012** Analysis Date: **5/8/2012** SeqNo: **73338** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Total Dissolved Solids	4,930	20.0	1,000	3,791	114	80	120	0.733	20	

Qualifiers:

- */X Value exceeds Maximum Contaminant Level.
- E Value above quantitation range
- J Analyte detected below quantitation limits
- R RPD outside accepted recovery limits
- B Analyte detected in the associated Method Blank
- H Holding times for preparation or analysis exceeded
- ND Not Detected at the Reporting Limit
- RL Reporting Detection Limit

QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: 1205076

14-May-12

Client: New Mexico Copper Corp

Project: Cu Flat

Sample ID **1205005-001A MS** SampType: **MS** TestCode: **SM2320B: Alkalinity**
Client ID: **BatchQC** Batch ID: **R2560** RunNo: **2560**
Prep Date: Analysis Date: **5/3/2012** SeqNo: **71221** Units: **mg/L CaCO3**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Total Alkalinity (as CaCO3)	ND	20	80.00	0	0	62.6	110			S

Sample ID **1205005-001A MSD** SampType: **MSD** TestCode: **SM2320B: Alkalinity**
Client ID: **BatchQC** Batch ID: **R2560** RunNo: **2560**
Prep Date: Analysis Date: **5/3/2012** SeqNo: **71222** Units: **mg/L CaCO3**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Total Alkalinity (as CaCO3)	ND	20	80.00	0	0	59.9	111	0	10	S

Sample ID **1205120-001B MS** SampType: **MS** TestCode: **SM2320B: Alkalinity**
Client ID: **BatchQC** Batch ID: **R2560** RunNo: **2560**
Prep Date: Analysis Date: **5/3/2012** SeqNo: **71242** Units: **mg/L CaCO3**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Total Alkalinity (as CaCO3)	360	20	80.00	299.4	70.9	62.6	110			

Sample ID **1205120-001B MSD** SampType: **MSD** TestCode: **SM2320B: Alkalinity**
Client ID: **BatchQC** Batch ID: **R2560** RunNo: **2560**
Prep Date: Analysis Date: **5/3/2012** SeqNo: **71243** Units: **mg/L CaCO3**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Total Alkalinity (as CaCO3)	350	20	80.00	299.4	67.1	59.9	111	0.869	10	

Qualifiers:

- */X Value exceeds Maximum Contaminant Level.
- E Value above quantitation range
- J Analyte detected below quantitation limits
- R RPD outside accepted recovery limits
- B Analyte detected in the associated Method Blank
- H Holding times for preparation or analysis exceeded
- ND Not Detected at the Reporting Limit
- RL Reporting Detection Limit

QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: **1205076**

14-May-12

Client: New Mexico Copper Corp

Project: Cu Flat

Sample ID **1205005-001A DUP** SampType: **DUP** TestCode: **SM4500-H+B: pH**

Client ID: **BatchQC** Batch ID: **R2560** RunNo: **2560**

Prep Date: Analysis Date: **5/3/2012** SeqNo: **71363** Units: **pH units**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
pH	3.92	1.68						0.762		H

Sample ID **1205120-001B DUP** SampType: **DUP** TestCode: **SM4500-H+B: pH**

Client ID: **BatchQC** Batch ID: **R2560** RunNo: **2560**

Prep Date: Analysis Date: **5/3/2012** SeqNo: **71373** Units: **pH units**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
pH	7.73	1.68						0.645		H

Qualifiers:

*/X	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
J	Analyte detected below quantitation limits	ND	Not Detected at the Reporting Limit
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit

QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: **1205076**

14-May-12

Client: New Mexico Copper Corp

Project: Cu Flat

Sample ID 1205170-001D	SampType: DUP	TestCode: EPA 120.1: Specific Conductance	
Client ID: BatchQC	Batch ID: R2646	RunNo: 2646	
Prep Date:	Analysis Date: 5/7/2012	SeqNo: 73516	Units: µmhos/cm

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Conductivity	610	0.010						0	20	

Qualifiers:

*/X	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
J	Analyte detected below quantitation limits	ND	Not Detected at the Reporting Limit
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit

QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: **1205076**

14-May-12

Client: New Mexico Copper Corp

Project: Cu Flat

Sample ID 1205066-002AMSD	SampType: MSD			TestCode: EPA Method 300.0: Anions						
Client ID: BatchQC	Batch ID: R2544			RunNo: 2544						
Prep Date:	Analysis Date: 5/2/2012			SeqNo: 70853		Units: mg/L				
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Nitrogen, Nitrate (As N)	3.0	0.10	2.500	0.5059	98.7	82.8	116	10.2	20	
Sulfate	47	0.50	10.00	36.66	101	80.5	119	2.50	20	

Qualifiers:

*/X	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
J	Analyte detected below quantitation limits	ND	Not Detected at the Reporting Limit
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit

QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: **1205076**

14-May-12

Client: New Mexico Copper Corp

Project: Cu Flat

Sample ID **1205079-001AMSD** SampType: **MSD** TestCode: **EPA Method 300.0: Anions**
Client ID: **BatchQC** Batch ID: **R2544** RunNo: **2544**
Prep Date: Analysis Date: **5/2/2012** SeqNo: **70810** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Nitrogen, Nitrite (As N)	1.2	0.10	1.000	0	122	77.6	111	4.14	20	S
Nitrogen, Nitrate (As N)	2.4	0.10	2.500	0	95.5	82.8	116	2.38	20	

Sample ID **MB** SampType: **MBLK** TestCode: **EPA Method 300.0: Anions**
Client ID: **PBW** Batch ID: **R2544** RunNo: **2544**
Prep Date: Analysis Date: **5/2/2012** SeqNo: **70849** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Fluoride	ND	0.10								
Chloride	ND	0.50								
Nitrogen, Nitrite (As N)	ND	0.10								
Nitrogen, Nitrate (As N)	ND	0.10								
Sulfate	ND	0.50								

Sample ID **LCS** SampType: **LCS** TestCode: **EPA Method 300.0: Anions**
Client ID: **LCSW** Batch ID: **R2544** RunNo: **2544**
Prep Date: Analysis Date: **5/2/2012** SeqNo: **70850** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Fluoride	0.50	0.10	0.5000	0	99.0	90	110			
Chloride	4.7	0.50	5.000	0	94.2	90	110			
Nitrogen, Nitrite (As N)	0.98	0.10	1.000	0	98.0	90	110			
Nitrogen, Nitrate (As N)	2.5	0.10	2.500	0	98.3	90	110			
Sulfate	9.6	0.50	10.00	0	95.7	90	110			

Sample ID **1205066-002AMS** SampType: **MS** TestCode: **EPA Method 300.0: Anions**
Client ID: **BatchQC** Batch ID: **R2544** RunNo: **2544**
Prep Date: Analysis Date: **5/2/2012** SeqNo: **70852** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Fluoride	1.1	0.10	0.5000	0.5616	101	72.9	113			
Nitrogen, Nitrite (As N)	0.93	0.10	1.000	0	92.7	77.6	111			
Nitrogen, Nitrate (As N)	3.3	0.10	2.500	0.5059	111	82.8	116			
Sulfate	48	0.50	10.00	36.66	113	80.5	119			

Sample ID **1205066-002AMSD** SampType: **MSD** TestCode: **EPA Method 300.0: Anions**
Client ID: **BatchQC** Batch ID: **R2544** RunNo: **2544**
Prep Date: Analysis Date: **5/2/2012** SeqNo: **70853** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Fluoride	1.0	0.10	0.5000	0.5616	93.8	72.9	113	3.52	20	
Nitrogen, Nitrite (As N)	0.79	0.10	1.000	0	78.5	77.6	111	16.5	20	

Qualifiers:

- */X Value exceeds Maximum Contaminant Level.
- E Value above quantitation range
- J Analyte detected below quantitation limits
- R RPD outside accepted recovery limits
- B Analyte detected in the associated Method Blank
- H Holding times for preparation or analysis exceeded
- ND Not Detected at the Reporting Limit
- RL Reporting Detection Limit

QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: 1205076

14-May-12

Client: New Mexico Copper Corp
Project: Cu Flat

Sample ID **MB** SampType: **MBLK** TestCode: **EPA Method 300.0: Anions**
Client ID: **PBW** Batch ID: **R2544** RunNo: **2544**
Prep Date: Analysis Date: **5/2/2012** SeqNo: **70797** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Fluoride	ND	0.10								
Chloride	ND	0.50								
Nitrogen, Nitrite (As N)	ND	0.10								
Nitrogen, Nitrate (As N)	ND	0.10								
Sulfate	ND	0.50								

Sample ID **LCS** SampType: **LCS** TestCode: **EPA Method 300.0: Anions**
Client ID: **LCSW** Batch ID: **R2544** RunNo: **2544**
Prep Date: Analysis Date: **5/2/2012** SeqNo: **70798** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Fluoride	0.47	0.10	0.5000	0	93.8	90	110			
Chloride	4.6	0.50	5.000	0	92.9	90	110			
Nitrogen, Nitrite (As N)	0.93	0.10	1.000	0	92.9	90	110			
Nitrogen, Nitrate (As N)	2.4	0.10	2.500	0	97.4	90	110			
Sulfate	9.5	0.50	10.00	0	94.8	90	110			

Sample ID **1205075-001BMS** SampType: **MS** TestCode: **EPA Method 300.0: Anions**
Client ID: **BatchQC** Batch ID: **R2544** RunNo: **2544**
Prep Date: Analysis Date: **5/2/2012** SeqNo: **70800** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Fluoride	0.68	0.10	0.5000	0.1911	98.1	72.9	113			
Nitrogen, Nitrite (As N)	1.0	0.10	1.000	0	101	77.6	111			
Nitrogen, Nitrate (As N)	2.5	0.10	2.500	0	99.9	82.8	116			

Sample ID **1205075-001BMSD** SampType: **MSD** TestCode: **EPA Method 300.0: Anions**
Client ID: **BatchQC** Batch ID: **R2544** RunNo: **2544**
Prep Date: Analysis Date: **5/2/2012** SeqNo: **70801** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Fluoride	0.65	0.10	0.5000	0.1911	90.9	72.9	113	5.39	20	
Nitrogen, Nitrite (As N)	0.90	0.10	1.000	0	90.2	77.6	111	10.8	20	
Nitrogen, Nitrate (As N)	2.3	0.10	2.500	0	91.3	82.8	116	8.94	20	

Sample ID **1205079-001AMS** SampType: **MS** TestCode: **EPA Method 300.0: Anions**
Client ID: **BatchQC** Batch ID: **R2544** RunNo: **2544**
Prep Date: Analysis Date: **5/2/2012** SeqNo: **70809** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Nitrogen, Nitrite (As N)	1.3	0.10	1.000	0	127	77.6	111			S
Nitrogen, Nitrate (As N)	2.4	0.10	2.500	0	97.8	82.8	116			

Qualifiers:

*/X	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
J	Analyte detected below quantitation limits	ND	Not Detected at the Reporting Limit
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit

QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: **1205076**

14-May-12

Client: New Mexico Copper Corp
Project: Cu Flat

Sample ID **MB-1862** | SampType: **MBLK** | TestCode: **EPA Method 245.1: Mercury**
Client ID: **PBW** | Batch ID: **1862** | RunNo: **2669**
Prep Date: **5/9/2012** | Analysis Date: **5/9/2012** | SeqNo: **74223** | Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Mercury	ND	0.00020								

Sample ID **LCS-1862** | SampType: **LCS** | TestCode: **EPA Method 245.1: Mercury**
Client ID: **LCSW** | Batch ID: **1862** | RunNo: **2669**
Prep Date: **5/9/2012** | Analysis Date: **5/9/2012** | SeqNo: **74224** | Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Mercury	0.0049	0.00020	0.005000	0	97.4	80	120			

Sample ID **1204854-004AMS** | SampType: **MS** | TestCode: **EPA Method 245.1: Mercury**
Client ID: **BatchQC** | Batch ID: **1862** | RunNo: **2669**
Prep Date: **5/9/2012** | Analysis Date: **5/9/2012** | SeqNo: **74226** | Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Mercury	0.0049	0.00020	0.005000	0	97.2	75	125			

Sample ID **1204854-004AMSD** | SampType: **MSD** | TestCode: **EPA Method 245.1: Mercury**
Client ID: **BatchQC** | Batch ID: **1862** | RunNo: **2669**
Prep Date: **5/9/2012** | Analysis Date: **5/9/2012** | SeqNo: **74227** | Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Mercury	0.0049	0.00020	0.005000	0	97.1	75	125	0.0957	20	

Qualifiers:

*/X	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
J	Analyte detected below quantitation limits	ND	Not Detected at the Reporting Limit
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit

QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: **1205076**

14-May-12

Client: New Mexico Copper Corp

Project: Cu Flat

Sample ID LCS	SampType: LCS			TestCode: EPA 200.8: Dissolved Metals					
Client ID: LCSW	Batch ID: R2629			RunNo: 2629					
Prep Date:	Analysis Date: 5/8/2012			SeqNo: 73283	Units: mg/L				
Analyte	**Result**	**PQL**	**SPK value**	**SPK Ref Val**	**%REC**	**LowLimit**	**HighLimit**	**%RPD**	**RPDLimit**	**Qual**
Antimony	0.023	0.0010	0.02500	0	92.8	85	115			
Arsenic	0.023	0.0010	0.02500	0	93.1	85	115			
Thallium	0.023	0.0010	0.02500	0	92.9	85	115			

Sample ID MB	SampType: MBLK			TestCode: EPA 200.8: Dissolved Metals						
Client ID: PBW	Batch ID: R2629			RunNo: 2629						
Prep Date:	Analysis Date: 5/8/2012			SeqNo: 73284	Units: mg/L					
Analyte	**Result**	**PQL**	**SPK value**	**SPK Ref Val**	**%REC**	**LowLimit**	**HighLimit**	**%RPD**	**RPDLimit**	**Qual**
Antimony	ND	0.0010								
Arsenic	ND	0.0010								
Thallium	ND	0.0010								

Sample ID LCS	SampType: LCS			TestCode: EPA 200.8: Dissolved Metals						
Client ID: LCSW	Batch ID: R2708			RunNo: 2708						
Prep Date:	Analysis Date: 5/10/2012			SeqNo: 75447	Units: mg/L					
Analyte	**Result**	**PQL**	**SPK value**	**SPK Ref Val**	**%REC**	**LowLimit**	**HighLimit**	**%RPD**	**RPDLimit**	**Qual**
Selenium	0.026	0.0010	0.02500	0	104	85	115			
Uranium	0.025	0.0010	0.02500	0	99.2	85	115			

Sample ID MB	SampType: MBLK			TestCode: EPA 200.8: Dissolved Metals						
Client ID: PBW	Batch ID: R2708			RunNo: 2708						
Prep Date:	Analysis Date: 5/10/2012			SeqNo: 75448	Units: mg/L					
Analyte	**Result**	**PQL**	**SPK value**	**SPK Ref Val**	**%REC**	**LowLimit**	**HighLimit**	**%RPD**	**RPDLimit**	**Qual**
Selenium	ND	0.0010								
Uranium	ND	0.0010								

Qualifiers:

*/X	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
J	Analyte detected below quantitation limits	ND	Not Detected at the Reporting Limit
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit

QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: 1205076

14-May-12

Client: New Mexico Copper Corp

Project: Cu Flat

Sample ID 1205193-005EMSD	SampType: MSD	TestCode: EPA Method 200.7: Dissolved Metals
Client ID: BatchQC	Batch ID: R2670	RunNo: 2670
Prep Date:	Analysis Date: 5/9/2012	SeqNo: 74186 Units: mg/L

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Magnesium	390	5.0	250.0	124.9	106	70	130	0.684	20	
Sodium	460	5.0	250.0	192.5	106	70	130	0.966	20	

Sample ID MB	SampType: MBLK	TestCode: EPA Method 200.7: Dissolved Metals
Client ID: PBW	Batch ID: R2670	RunNo: 2670
Prep Date: 5/9/2012	Analysis Date: 5/9/2012	SeqNo: 74215 Units: mg/L

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Boron	ND	0.040								
Calcium	ND	1.0								
Iron	ND	0.020								
Magnesium	ND	1.0								
Potassium	ND	1.0								
Sodium	ND	1.0								

Sample ID LCS	SampType: LCS	TestCode: EPA Method 200.7: Dissolved Metals
Client ID: LCSW	Batch ID: R2670	RunNo: 2670
Prep Date:	Analysis Date: 5/9/2012	SeqNo: 74216 Units: mg/L

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Boron	0.51	0.040	0.5000	0	101	85	115			
Calcium	54	1.0	50.00	0	107	85	115			
Iron	0.47	0.020	0.5000	0.004190	93.2	85	115			
Magnesium	54	1.0	50.00	0	109	85	115			
Potassium	53	1.0	50.00	0	106	85	115			
Sodium	54	1.0	50.00	0	107	85	115			

Qualifiers:

*/X	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
J	Analyte detected below quantitation limits	ND	Not Detected at the Reporting Limit
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit

QC SUMMARY REPORT

WO#: **1205076**

Hall Environmental Analysis Laboratory, Inc.

14-May-12

Client: New Mexico Copper Corp
Project: Cu Flat

Sample ID **MB** | SampType: **MBLK** | TestCode: **EPA Method 200.7: Dissolved Metals**
Client ID: **PBW** | Batch ID: **R2622** | RunNo: **2622**
Prep Date: | Analysis Date: **5/8/2012** | SeqNo: **72991** | Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Aluminum	ND	0.020								
Barium	ND	0.0020								
Beryllium	ND	0.0020								
Cadmium	ND	0.0020								
Chromium	ND	0.0060								
Cobalt	ND	0.0060								
Copper	ND	0.0060								
Lead	ND	0.0050								
Manganese	ND	0.0020								
Molybdenum	ND	0.0080								
Nickel	ND	0.010								
Silicon	ND	0.080								
Silver	ND	0.0050								
Vanadium	ND	0.050								
Zinc	ND	0.010								

Sample ID **LCS** | SampType: **LCS** | TestCode: **EPA Method 200.7: Dissolved Metals**
Client ID: **LCSW** | Batch ID: **R2622** | RunNo: **2622**
Prep Date: | Analysis Date: **5/8/2012** | SeqNo: **72992** | Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Aluminum	0.52	0.020	0.5000	0	105	85	115			
Barium	0.49	0.0020	0.5000	0	98.9	85	115			
Beryllium	0.52	0.0020	0.5000	0	103	85	115			
Cadmium	0.50	0.0020	0.5000	0	99.2	85	115			
Chromium	0.49	0.0060	0.5000	0	98.5	85	115			
Cobalt	0.47	0.0060	0.5000	0	94.9	85	115			
Copper	0.50	0.0060	0.5000	0	99.9	85	115			
Lead	0.50	0.0050	0.5000	0	99.3	85	115			
Manganese	0.48	0.0020	0.5000	0	96.9	85	115			
Molybdenum	0.49	0.0080	0.5000	0.002030	98.4	85	115			
Nickel	0.47	0.010	0.5000	0	93.9	85	115			
Silicon	2.6	0.080	2.500	0	104	85	115			
Silver	0.094	0.0050	0.1000	0	94.1	85	115			
Vanadium	0.52	0.050	0.5000	0	104	85	115			
Zinc	0.50	0.010	0.5000	0	101	85	115			

Sample ID **1205193-005EMS** | SampType: **MS** | TestCode: **EPA Method 200.7: Dissolved Metals**
Client ID: **BatchQC** | Batch ID: **R2622** | RunNo: **2622**
Prep Date: | Analysis Date: **5/8/2012** | SeqNo: **73030** | Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual

Qualifiers:

- */X Value exceeds Maximum Contaminant Level.
- E Value above quantitation range
- J Analyte detected below quantitation limits
- R RPD outside accepted recovery limits
- B Analyte detected in the associated Method Blank
- H Holding times for preparation or analysis exceeded
- ND Not Detected at the Reporting Limit
- RL Reporting Detection Limit

Client: New Mexico Copper Corp

Project: Cu Flat

Sample ID **1205193-005EMS** SampType: **MS** TestCode: **EPA Method 200.7: Dissolved Metals**
Client ID: **BatchQC** Batch ID: **R2622** RunNo: **2622**
Prep Date: Analysis Date: **5/8/2012** SeqNo: **73030** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Aluminum	0.54	0.020	0.5000	0	107	70	130			
Barium	0.52	0.0020	0.5000	0.02182	98.9	70	130			
Zinc	0.54	0.010	0.5000	0.03785	101	70	130			

Sample ID **1205193-005EMSD** SampType: **MSD** TestCode: **EPA Method 200.7: Dissolved Metals**
Client ID: **BatchQC** Batch ID: **R2622** RunNo: **2622**
Prep Date: Analysis Date: **5/8/2012** SeqNo: **73031** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Aluminum	0.53	0.020	0.5000	0	106	70	130	1.33	20	
Barium	0.51	0.0020	0.5000	0.02182	97.2	70	130	1.71	20	
Zinc	0.53	0.010	0.5000	0.03785	98.0	70	130	2.48	20	

Sample ID **1205193-005EMS** SampType: **MS** TestCode: **EPA Method 200.7: Dissolved Metals**
Client ID: **BatchQC** Batch ID: **R2670** RunNo: **2670**
Prep Date: Analysis Date: **5/9/2012** SeqNo: **74182** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Potassium	56	1.0	50.00	4.808	102	70	130			

Sample ID **1205193-005EMSD** SampType: **MSD** TestCode: **EPA Method 200.7: Dissolved Metals**
Client ID: **BatchQC** Batch ID: **R2670** RunNo: **2670**
Prep Date: Analysis Date: **5/9/2012** SeqNo: **74183** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Potassium	57	1.0	50.00	4.808	104	70	130	2.44	20	

Sample ID **1205193-005EMS** SampType: **MS** TestCode: **EPA Method 200.7: Dissolved Metals**
Client ID: **BatchQC** Batch ID: **R2670** RunNo: **2670**
Prep Date: Analysis Date: **5/9/2012** SeqNo: **74185** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Iron	4.5	0.10	2.500	2.034	99.6	70	130			
Magnesium	390	5.0	250.0	124.9	107	70	130			
Sodium	460	5.0	250.0	192.5	107	70	130			

Sample ID **1205193-005EMSD** SampType: **MSD** TestCode: **EPA Method 200.7: Dissolved Metals**
Client ID: **BatchQC** Batch ID: **R2670** RunNo: **2670**
Prep Date: Analysis Date: **5/9/2012** SeqNo: **74186** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Iron	4.6	0.10	2.500	2.034	101	70	130	1.03	20	

Qualifiers:

*/X	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
J	Analyte detected below quantitation limits	ND	Not Detected at the Reporting Limit
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit

Analytical Report
Lab Order **1205076**
Date Reported: **5/14/2012**

Hall Environmental Analysis Laboratory, Inc.

CLIENT: New Mexico Copper Corp | **Client Sample ID:** PW-1
Project: Cu Flat | **Collection Date:** 5/1/2012 2:00:00 PM
Lab ID: 1205076-001 | **Matrix:** AQUEOUS | **Received Date:** 5/2/2012 7:30:00 AM

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
EPA METHOD 300.0: ANIONS						Analyst: **BRM**
Fluoride	1.0	0.10		mg/L	1	5/2/2012 12:52:03 PM
Chloride	32	10		mg/L	20	5/2/2012 1:03:17 PM
Nitrogen, Nitrite (As N)	ND	0.10		mg/L	1	5/2/2012 12:52:03 PM
Nitrogen, Nitrate (As N)	0.59	0.10		mg/L	1	5/2/2012 12:52:03 PM
Sulfate	28	0.50		mg/L	1	5/2/2012 12:52:03 PM
EPA METHOD 200.7: DISSOLVED METALS						Analyst: **ELS**
Aluminum	ND	0.020		mg/L	1	5/8/2012 8:02:55 AM
Barium	0.011	0.0020		mg/L	1	5/8/2012 8:02:55 AM
Beryllium	ND	0.0020		mg/L	1	5/8/2012 8:02:55 AM
Boron	0.065	0.040		mg/L	1	5/9/2012 8:36:51 AM
Cadmium	ND	0.0020		mg/L	1	5/8/2012 8:02:55 AM
Calcium	36	1.0		mg/L	1	5/9/2012 8:36:51 AM
Chromium	ND	0.0060		mg/L	1	5/8/2012 8:02:55 AM
Cobalt	ND	0.0060		mg/L	1	5/8/2012 8:02:55 AM
Copper	ND	0.0060		mg/L	1	5/8/2012 8:02:55 AM
Iron	0.040	0.020		mg/L	1	5/9/2012 8:36:51 AM
Lead	ND	0.0050		mg/L	1	5/8/2012 8:02:55 AM
Magnesium	3.1	1.0		mg/L	1	5/9/2012 8:36:51 AM
Manganese	0.0024	0.0020		mg/L	1	5/8/2012 8:02:55 AM
Molybdenum	ND	0.0080		mg/L	1	5/8/2012 8:02:55 AM
Nickel	ND	0.010		mg/L	1	5/8/2012 8:02:55 AM
Potassium	3.4	1.0		mg/L	1	5/9/2012 8:36:51 AM
Silicon	17	0.40		mg/L	5	5/8/2012 8:06:09 AM
Silver	ND	0.0050		mg/L	1	5/8/2012 8:02:55 AM
Sodium	58	1.0		mg/L	1	5/9/2012 8:36:51 AM
Vanadium	ND	0.050		mg/L	1	5/8/2012 8:02:55 AM
Zinc	0.024	0.010		mg/L	1	5/8/2012 8:02:55 AM
EPA 200.8: DISSOLVED METALS						Analyst: **SNV**
Antimony	ND	0.0010		mg/L	1	5/8/2012 1:15:26 PM
Arsenic	0.0033	0.0010		mg/L	1	5/8/2012 1:15:26 PM
Selenium	ND	0.0010		mg/L	1	5/10/2012 2:28:58 PM
Thallium	ND	0.0010		mg/L	1	5/8/2012 1:15:26 PM
Uranium ✓	0.0032	0.0010		mg/L	1	5/10/2012 2:28:58 PM
EPA METHOD 245.1: MERCURY						Analyst: **ELS**
Mercury	ND	0.00020		mg/L	1	5/9/2012 11:59:45 AM
SM2340B: HARDNESS						Analyst: **ELS**
Hardness (As CaCO3)	100	6.6		mg/L	1	5/9/2012
EPA 120.1: SPECIFIC CONDUCTANCE						Analyst: **DBD**
Conductivity	450	0.010		µmhos/cm	1	5/7/2012 12:31:49 PM

Qualifiers:

*/X	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
J	Analyte detected below quantitation limits	ND	Not Detected at the Reporting Limit
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	Spike Recovery outside accepted recovery limits		

HALL
ENVIRONMENTAL
ANALYSIS
LABORATORY

Hall Environmental Analysis Laboratory
4901 Hawkins NE
Albuquerque, NM 87109
TEL: 505-345-3975 FAX: 505-345-4107
Website: www.hallenvironmental.com

May 14, 2012

Katie Emmer
New Mexico Copper Corp
2425 San Pedro Dr NE Ste 100
Albuquerque, New Mexico 87109
TEL: (505) 400-7925
FAX

RE: Cu Flat OrderNo.: 1205076

Dear Katie Emmer:

Hall Environmental Analysis Laboratory received 1 sample(s) on 5/2/2012 for the analyses presented in the following report.

These were analyzed according to EPA procedures or equivalent. To access our accredited tests please go to www.hallenvironmental.com or the state specific web sites. See the sample checklist and/or the Chain of Custody for information regarding the sample receipt temperature and preservation. Data qualifiers or a narrative will be provided if the sample analysis or analytical quality control parameters require a flag. All samples are reported as received unless otherwise indicated.

Please don't hesitate to contact HEAL for any additional information or clarifications.

Sincerely,

Andy Freeman
Laboratory Manager
4901 Hawkins NE
Albuquerque, NM 87109

Hall Environmental Analysis Laboratory, Inc.

CLIENT: New Mexico Copper Corp | **Client Sample ID:** PW-1
Project: Cu Flat | **Collection Date:** 5/1/2012 2:00:00 PM
Lab ID: 1205076-001 | **Matrix:** AQUEOUS | **Received Date:** 5/2/2012 7:30:00 AM

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
SM4500-H+B: PH						Analyst: **JLF**
pH	8.02	1.68	H	pH units	1	5/3/2012 1:22:52 PM
SM2320B: ALKALINITY						Analyst: **JLF**
Bicarbonate (As CaCO3)	150	20		mg/L CaCO3	1	5/3/2012 1:22:52 PM
Carbonate (As CaCO3)	ND	2.0		mg/L CaCO3	1	5/3/2012 1:22:52 PM
Total Alkalinity (as CaCO3)	150	20		mg/L CaCO3	1	5/3/2012 1:22:52 PM
SM2540C MOD: TOTAL DISSOLVED SOLIDS						Analyst: **KS**
Total Dissolved Solids	294	20.0		mg/L	1	5/8/2012 3:12:00 PM
SM 2540D: TSS						Analyst: **KS**
Suspended Solids	ND	4.0		mg/L	1	5/3/2012 5:30:00 PM

Qualifiers:

*/X	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
J	Analyte detected below quantitation limits	ND	Not Detected at the Reporting Limit
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	Spike Recovery outside accepted recovery limits		

Anatek Labs, Inc.

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504 E Sprague Ste. D • Spokane WA 99202 • (509) 838-3999 • Fax (509) 838-4433 • email spokane@anateklabs.com

Client:	HALL ENVIRONMENTAL ANALYSIS LAB	**Batch #:**	120503026
Address:	4901 HAWKINS NE SUITE D	**Project Name:**	1205076
	ALBUQUERQUE, NM 87109		
Attn:	ANDY FREEMAN		

Analytical Results Report

Sample Number	120503026-001	**Sampling Date**	5/1/2012	**Date/Time Received**	5/3/2012	12:24 PM
Client Sample ID	1205076-001D / PW-1	**Sampling Time**	2:00 PM	**Extraction Date**		
Matrix	Water	**Sample Location**				
Comments						

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
Cyanide	ND	mg/L	0.01	5/11/2012	CRW	EPA 335.4	

Authorized Signature

John Coddington, Lab Manager

MCL EPA's Maximum Contaminant Level
ND Not Detected
PQL Practical Quantitation Limit

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The results reported relate only to the samples indicated.
Soil/solid results are reported on a dry-weight basis unless otherwise noted.

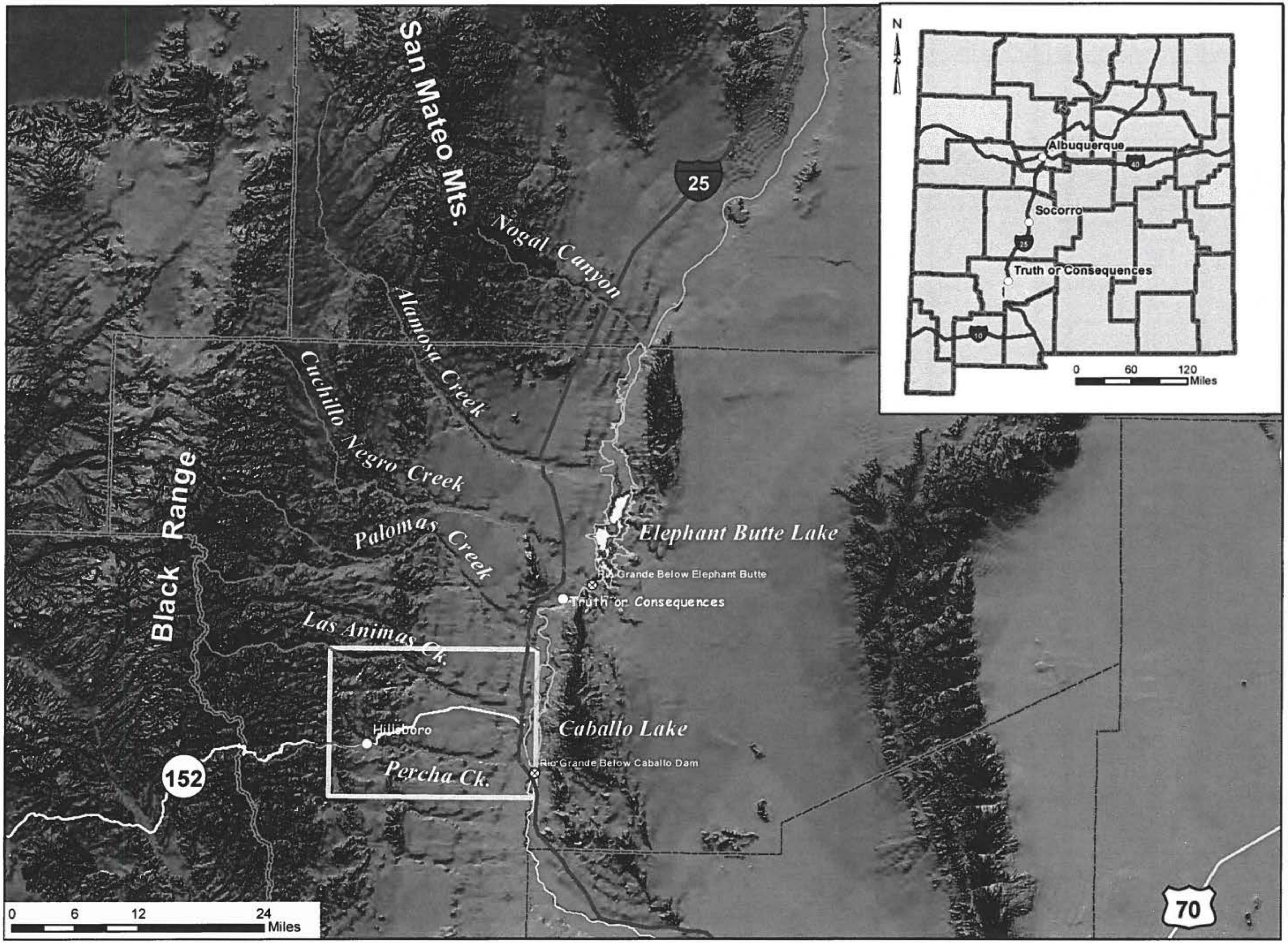

Figure 1. Vicinity Map

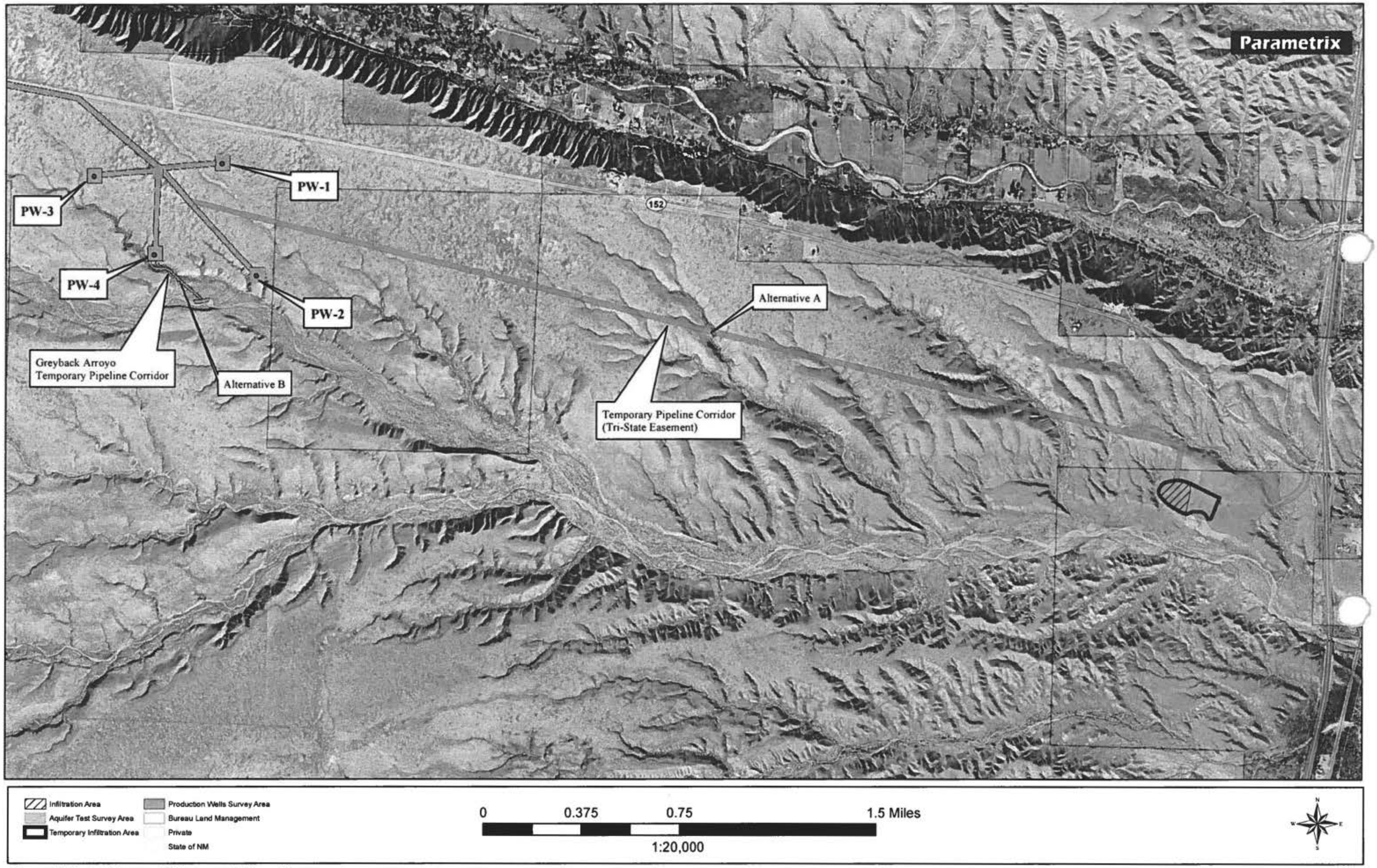

Figure 2: Project Area with Proposed Alternatives

Analytical Report
Lab Order **1205153**
Date Reported: **5/14/2012**

Hall Environmental Analysis Laboratory, Inc.

CLIENT: New Mexico Copper Corp | **Client Sample ID:** PW-3
Project: Cu Flat | **Collection Date:** 5/2/2012 2:30:00 PM
Lab ID: 1205153-001 | **Matrix:** AQUEOUS | **Received Date:** 5/3/2012 8:35:00 AM

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
EPA METHOD 300.0: ANIONS						Analyst: **BRM**
Fluoride	1.9	0.10		mg/L	1	5/3/2012 12:04:13 PM
Chloride	50	10		mg/L	20	5/3/2012 12:41:28 PM
Nitrogen, Nitrite (As N)	ND	0.10		mg/L	1	5/3/2012 12:04:13 PM
Nitrogen, Nitrate (As N)	0.70	0.10		mg/L	1	5/3/2012 12:04:13 PM
Sulfate	26	0.50		mg/L	1	5/3/2012 12:04:13 PM
EPA METHOD 200.7: DISSOLVED METALS						Analyst: **ELS**
Aluminum	ND	0.020		mg/L	1	5/8/2012 8:09:23 AM
Barium	0.0078	0.0020		mg/L	1	5/8/2012 8:09:23 AM
Beryllium	ND	0.0020		mg/L	1	5/8/2012 8:09:23 AM
Boron	0.095	0.040		mg/L	1	5/9/2012 8:40:03 AM
Cadmium	ND	0.0020		mg/L	1	5/8/2012 8:09:23 AM
Calcium	20	1.0		mg/L	1	5/9/2012 8:40:03 AM
Chromium	0.0060	0.0060		mg/L	1	5/8/2012 8:09:23 AM
Cobalt	ND	0.0060		mg/L	1	5/8/2012 8:09:23 AM
Copper	ND	0.0060		mg/L	1	5/8/2012 8:09:23 AM
Iron	0.065	0.020		mg/L	1	5/9/2012 8:40:03 AM
Lead	ND	0.0050		mg/L	1	5/8/2012 8:09:23 AM
Magnesium	1.0	1.0		mg/L	1	5/9/2012 8:40:03 AM
Manganese	0.0026	0.0020		mg/L	1	5/8/2012 8:09:23 AM
Molybdenum	ND	0.0080		mg/L	1	5/8/2012 8:09:23 AM
Nickel	ND	0.010		mg/L	1	5/8/2012 8:09:23 AM
Potassium	3.3	1.0		mg/L	1	5/9/2012 8:40:03 AM
Silicon	21	0.40		mg/L	5	5/8/2012 8:12:46 AM
Silver	ND	0.0050		mg/L	1	5/8/2012 8:09:23 AM
Sodium	81	1.0		mg/L	1	5/9/2012 8:40:03 AM
Vanadium	ND	0.050		mg/L	1	5/8/2012 8:09:23 AM
Zinc	0.021	0.010		mg/L	1	5/8/2012 8:09:23 AM
EPA 200.8: DISSOLVED METALS						Analyst: **SNV**
Antimony	ND	0.0010		mg/L	1	5/8/2012 1:19:22 PM
Arsenic	0.0074	0.0010		mg/L	1	5/8/2012 1:19:22 PM
Selenium	ND	0.0010		mg/L	1	5/10/2012 2:32:54 PM
Thallium	ND	0.0010		mg/L	1	5/8/2012 1:19:22 PM
Uranium	0.0013	0.0010		mg/L	1	5/10/2012 2:32:54 PM
EPA METHOD 245.1: MERCURY						Analyst: **ELS**
Mercury	ND	0.00020		mg/L	1	5/9/2012 12:01:31 PM
SM2340B: HARDNESS						Analyst: **ELS**
Hardness (As CaCO3)	53	6.6		mg/L	1	5/9/2012
EPA 120.1: SPECIFIC CONDUCTANCE						Analyst: **DBD**
Conductivity	460	0.010		µmhos/cm	1	5/7/2012 12:36:13 PM

Qualifiers:

*/X	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
J	Analyte detected below quantitation limits	ND	Not Detected at the Reporting Limit
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	Spike Recovery outside accepted recovery limits		

Hall Environmental Analysis Laboratory, Inc.

CLIENT: New Mexico Copper Corp | **Client Sample ID:** PW-3
Project: Cu Flat | **Collection Date:** 5/2/2012 2:30:00 PM
Lab ID: 1205153-001 | **Matrix:** AQUEOUS | **Received Date:** 5/3/2012 8:35:00 AM

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
SM4500-H+B: PH						Analyst: **JLF**
pH	8.03	1.68	H	pH units	1	5/3/2012 5:14:04 PM
SM2320B: ALKALINITY						Analyst: **JLF**
Bicarbonate (As CaCO3)	120	20		mg/L CaCO3	1	5/3/2012 5:14:04 PM
Carbonate (As CaCO3)	ND	2.0		mg/L CaCO3	1	5/3/2012 5:14:04 PM
Total Alkalinity (as CaCO3)	120	20		mg/L CaCO3	1	5/3/2012 5:14:04 PM
SM2540C MOD: TOTAL DISSOLVED SOLIDS						Analyst: **KS**
Total Dissolved Solids	303	20.0		mg/L	1	5/8/2012 3:12:00 PM
SM 2540D: TSS						Analyst: **KS**
Suspended Solids	ND	4.0		mg/L	1	5/4/2012 4:36:00 PM

Qualifiers:

*/X	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
J	Analyte detected below quantitation limits	ND	Not Detected at the Reporting Limit
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	Spike Recovery outside accepted recovery limits		

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504 E Sprague Ste. D • Spokane WA 99202 • (509) 838-3999 • Fax (509) 838-4433 • email spokane@anateklabs.com

Client:	HALL ENVIRONMENTAL ANALYSIS LAB	**Batch #:**	120504004
Address:	4901 HAWKINS NE SUITE D	**Project Name:**	1205153
	ALBUQUERQUE, NM 87109		
Attn:	ANDY FREEMAN		

Analytical Results Report

Sample Number	120504004-001	**Sampling Date**	5/2/2012	**Date/Time Received**	5/4/2012	10:18 AM
Client Sample ID	1205153-001D / PW-3	**Sampling Time**	2:30 PM			
Matrix	Water	**Sample Location**				
Comments						

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
Cyanide	ND	mg/L	0.01	5/8/2012	CRW	EPA 335.4	

Authorized Signature

John Coddington, Lab Manager

MCL EPA's Maximum Contaminant Level
ND Not Detected
PQL Practical Quantitation Limit

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The results reported relate only to the samples indicated.
Soil/solid results are reported on a dry-weight basis unless otherwise noted.

QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: **1205153**

14-May-12

Client: New Mexico Copper Corp

Project: Cu Flat

Sample ID **MB** | SampType: **MBLK** | TestCode: **EPA Method 200.7: Dissolved Metals**
Client ID: **PBW** | Batch ID: **R2622** | RunNo: **2622**
Prep Date: | Analysis Date: **5/8/2012** | SeqNo: **72991** | Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Aluminum	ND	0.020								
Barium	ND	0.0020								
Beryllium	ND	0.0020								
Cadmium	ND	0.0020								
Chromium	ND	0.0060								
Cobalt	ND	0.0060								
Copper	ND	0.0060								
Lead	ND	0.0050								
Manganese	ND	0.0020								
Molybdenum	ND	0.0080								
Nickel	ND	0.010								
Silicon	ND	0.080								
Silver	ND	0.0050								
Vanadium	ND	0.050								
Zinc	ND	0.010								

Sample ID **LCS** | SampType: **LCS** | TestCode: **EPA Method 200.7: Dissolved Metals**
Client ID: **LCSW** | Batch ID: **R2622** | RunNo: **2622**
Prep Date: | Analysis Date: **5/8/2012** | SeqNo: **72992** | Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Aluminum	0.52	0.020	0.5000	0	105	85	115			
Barium	0.49	0.0020	0.5000	0	98.9	85	115			
Beryllium	0.52	0.0020	0.5000	0	103	85	115			
Cadmium	0.50	0.0020	0.5000	0	99.2	85	115			
Chromium	0.49	0.0060	0.5000	0	98.5	85	115			
Cobalt	0.47	0.0060	0.5000	0	94.9	85	115			
Copper	0.50	0.0060	0.5000	0	99.9	85	115			
Lead	0.50	0.0050	0.5000	0	99.3	85	115			
Manganese	0.48	0.0020	0.5000	0	96.9	85	115			
Molybdenum	0.49	0.0080	0.5000	0.002030	98.4	85	115			
Nickel	0.47	0.010	0.5000	0	93.9	85	115			
Silicon	2.6	0.080	2.500	0	104	85	115			
Silver	0.094	0.0050	0.1000	0	94.1	85	115			
Vanadium	0.52	0.050	0.5000	0	104	85	115			
Zinc	0.50	0.010	0.5000	0	101	85	115			

Sample ID **1205193-005EMS** | SampType: **MS** | TestCode: **EPA Method 200.7: Dissolved Metals**
Client ID: **BatchQC** | Batch ID: **R2622** | RunNo: **2622**
Prep Date: | Analysis Date: **5/8/2012** | SeqNo: **73030** | Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual

Qualifiers:

*/X	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
J	Analyte detected below quantitation limits	ND	Not Detected at the Reporting Limit
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit

QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: 1205153

14-May-12

Client: New Mexico Copper Corp

Project: Cu Flat

Sample ID 1205193-005EMS	SampType: MS	TestCode: EPA Method 200.7: Dissolved Metals								
Client ID: BatchQC	Batch ID: R2622	RunNo: 2622								
Prep Date:	Analysis Date: 5/8/2012	SeqNo: 73030	Units: mg/L							
Analyte	**Result**	**PQL**	**SPK value**	**SPK Ref Val**	**%REC**	**LowLimit**	**HighLimit**	**%RPD**	**RPDLimit**	**Qual**
Aluminum	0.54	0.020	0.5000	0	107	70	130			
Barium	0.52	0.0020	0.5000	0.02182	98.9	70	130			
Zinc	0.54	0.010	0.5000	0.03785	101	70	130			

Sample ID 1205193-005EMSD	SampType: MSD	TestCode: EPA Method 200.7: Dissolved Metals								
Client ID: BatchQC	Batch ID: R2622	RunNo: 2622								
Prep Date:	Analysis Date: 5/8/2012	SeqNo: 73031	Units: mg/L							
Analyte	**Result**	**PQL**	**SPK value**	**SPK Ref Val**	**%REC**	**LowLimit**	**HighLimit**	**%RPD**	**RPDLimit**	**Qual**
Aluminum	0.53	0.020	0.5000	0	106	70	130	1.33	20	
Barium	0.51	0.0020	0.5000	0.02182	97.2	70	130	1.71	20	
Zinc	0.53	0.010	0.5000	0.03785	98.0	70	130	2.48	20	

Sample ID 1205193-005EMS	SampType: MS	TestCode: EPA Method 200.7: Dissolved Metals								
Client ID: BatchQC	Batch ID: R2670	RunNo: 2670								
Prep Date:	Analysis Date: 5/9/2012	SeqNo: 74182	Units: mg/L							
Analyte	**Result**	**PQL**	**SPK value**	**SPK Ref Val**	**%REC**	**LowLimit**	**HighLimit**	**%RPD**	**RPDLimit**	**Qual**
Potassium	56	1.0	50.00	4.808	102	70	130			

Sample ID 1205193-005EMSD	SampType: MSD	TestCode: EPA Method 200.7: Dissolved Metals								
Client ID: BatchQC	Batch ID: R2670	RunNo: 2670								
Prep Date:	Analysis Date: 5/9/2012	SeqNo: 74183	Units: mg/L							
Analyte	**Result**	**PQL**	**SPK value**	**SPK Ref Val**	**%REC**	**LowLimit**	**HighLimit**	**%RPD**	**RPDLimit**	**Qual**
Potassium	57	1.0	50.00	4.808	104	70	130	2.44	20	

Sample ID 1205193-005EMS	SampType: MS	TestCode: EPA Method 200.7: Dissolved Metals								
Client ID: BatchQC	Batch ID: R2670	RunNo: 2670								
Prep Date:	Analysis Date: 5/9/2012	SeqNo: 74185	Units: mg/L							
Analyte	**Result**	**PQL**	**SPK value**	**SPK Ref Val**	**%REC**	**LowLimit**	**HighLimit**	**%RPD**	**RPDLimit**	**Qual**
Iron	4.5	0.10	2.500	2.034	99.6	70	130			
Magnesium	390	5.0	250.0	124.9	107	70	130			
Sodium	460	5.0	250.0	192.5	107	70	130			

Sample ID 1205193-005EMSD	SampType: MSD	TestCode: EPA Method 200.7: Dissolved Metals								
Client ID: BatchQC	Batch ID: R2670	RunNo: 2670								
Prep Date:	Analysis Date: 5/9/2012	SeqNo: 74186	Units: mg/L							
Analyte	**Result**	**PQL**	**SPK value**	**SPK Ref Val**	**%REC**	**LowLimit**	**HighLimit**	**%RPD**	**RPDLimit**	**Qual**
Iron	4.6	0.10	2.500	2.034	101	70	130	1.03	20	

Qualifiers:

*/X	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
J	Analyte detected below quantitation limits	ND	Not Detected at the Reporting Limit
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit

QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: 1205153

14-May-12

Client: New Mexico Copper Corp

Project: Cu Flat

Sample ID 1205193-005EMSD		SampType: MSD			TestCode: EPA Method 200.7: Dissolved Metals					
Client ID: BatchQC		Batch ID: R2670			RunNo: 2670					
Prep Date:		Analysis Date: 5/9/2012			SeqNo: 74186		Units: mg/L			
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Magnesium	390	5.0	250.0	124.9	106	70	130	0.684	20	
Sodium	460	5.0	250.0	192.5	106	70	130	0.966	20	

Sample ID MB		SampType: MBLK			TestCode: EPA Method 200.7: Dissolved Metals					
Client ID: PBW		Batch ID: R2670			RunNo: 2670					
Prep Date: 5/9/2012		Analysis Date: 5/9/2012			SeqNo: 74215		Units: mg/L			
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Boron	ND	0.040								
Calcium	ND	1.0								
Iron	ND	0.020								
Magnesium	ND	1.0								
Potassium	ND	1.0								
Sodium	ND	1.0								

Sample ID LCS		SampType: LCS			TestCode: EPA Method 200.7: Dissolved Metals					
Client ID: LCSW		Batch ID: R2670			RunNo: 2670					
Prep Date:		Analysis Date: 5/9/2012			SeqNo: 74216		Units: mg/L			
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Boron	0.51	0.040	0.5000	0	101	85	115			
Calcium	54	1.0	50.00	0	107	85	115			
Iron	0.47	0.020	0.5000	0.004190	93.2	85	115			
Magnesium	54	1.0	50.00	0	109	85	115			
Potassium	53	1.0	50.00	0	106	85	115			
Sodium	54	1.0	50.00	0	107	85	115			

Qualifiers:

- */X Value exceeds Maximum Contaminant Level.
- E Value above quantitation range
- J Analyte detected below quantitation limits
- R RPD outside accepted recovery limits
- B Analyte detected in the associated Method Blank
- H Holding times for preparation or analysis exceeded
- ND Not Detected at the Reporting Limit
- RL Reporting Detection Limit

QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: **1205153**

14-May-12

Client: New Mexico Copper Corp
Project: Cu Flat

Sample ID **LCS** | SampType: **LCS** | TestCode: **EPA 200.8: Dissolved Metals**
Client ID: **LCSW** | Batch ID: **R2629** | RunNo: **2629**
Prep Date: | Analysis Date: **5/8/2012** | SeqNo: **73283** | Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Antimony	0.023	0.0010	0.02500	0	92.8	85	115			
Arsenic	0.023	0.0010	0.02500	0	93.1	85	115			
Thallium	0.023	0.0010	0.02500	0	92.9	85	115			

Sample ID **MB** | SampType: **MBLK** | TestCode: **EPA 200.8: Dissolved Metals**
Client ID: **PBW** | Batch ID: **R2629** | RunNo: **2629**
Prep Date: | Analysis Date: **5/8/2012** | SeqNo: **73284** | Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Antimony	ND	0.0010								
Arsenic	ND	0.0010								
Thallium	ND	0.0010								

Sample ID **LCS** | SampType: **LCS** | TestCode: **EPA 200.8: Dissolved Metals**
Client ID: **LCSW** | Batch ID: **R2708** | RunNo: **2708**
Prep Date: | Analysis Date: **5/10/2012** | SeqNo: **75447** | Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Selenium	0.026	0.0010	0.02500	0	104	85	115			
Uranium	0.025	0.0010	0.02500	0	99.2	85	115			

Sample ID **MB** | SampType: **MBLK** | TestCode: **EPA 200.8: Dissolved Metals**
Client ID: **PBW** | Batch ID: **R2708** | RunNo: **2708**
Prep Date: | Analysis Date: **5/10/2012** | SeqNo: **75448** | Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Selenium	ND	0.0010								
Uranium	ND	0.0010								

Qualifiers:

*/X	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
J	Analyte detected below quantitation limits	ND	Not Detected at the Reporting Limit
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit

QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: **1205153**

14-May-12

Client: New Mexico Copper Corp
Project: Cu Flat

Sample ID MB-1862	SampType: MBLK	TestCode: EPA Method 245.1: Mercury							
Client ID: PBW	Batch ID: 1862	RunNo: 2669							
Prep Date: 5/9/2012	Analysis Date: 5/9/2012	SeqNo: 74223	Units: mg/L						
Analyte	**Result**	**PQL**	**SPK value**	**SPK Ref Val**	**%REC**	**LowLimit**	**HighLimit**	**%RPD**	**RPDLimit**	**Qual**
Mercury	ND	0.00020								

Sample ID LCS-1862	SampType: LCS	TestCode: EPA Method 245.1: Mercury								
Client ID: LCSW	Batch ID: 1862	RunNo: 2669								
Prep Date: 5/9/2012	Analysis Date: 5/9/2012	SeqNo: 74224	Units: mg/L							
Analyte	**Result**	**PQL**	**SPK value**	**SPK Ref Val**	**%REC**	**LowLimit**	**HighLimit**	**%RPD**	**RPDLimit**	**Qual**
Mercury	0.0049	0.00020	0.005000	0	97.4	80	120			

Sample ID 1204854-004AMS	SampType: MS	TestCode: EPA Method 245.1: Mercury								
Client ID: BatchQC	Batch ID: 1862	RunNo: 2669								
Prep Date: 5/9/2012	Analysis Date: 5/9/2012	SeqNo: 74226	Units: mg/L							
Analyte	**Result**	**PQL**	**SPK value**	**SPK Ref Val**	**%REC**	**LowLimit**	**HighLimit**	**%RPD**	**RPDLimit**	**Qual**
Mercury	0.0049	0.00020	0.005000	0	97.2	75	125			

Sample ID 1204854-004AMSD	SampType: MSD	TestCode: EPA Method 245.1: Mercury								
Client ID: BatchQC	Batch ID: 1862	RunNo: 2669								
Prep Date: 5/9/2012	Analysis Date: 5/9/2012	SeqNo: 74227	Units: mg/L							
Analyte	**Result**	**PQL**	**SPK value**	**SPK Ref Val**	**%REC**	**LowLimit**	**HighLimit**	**%RPD**	**RPDLimit**	**Qual**
Mercury	0.0049	0.00020	0.005000	0	97.1	75	125	0.0957	20	

Qualifiers:

- */X Value exceeds Maximum Contaminant Level.
- E Value above quantitation range
- J Analyte detected below quantitation limits
- R RPD outside accepted recovery limits
- B Analyte detected in the associated Method Blank
- H Holding times for preparation or analysis exceeded
- ND Not Detected at the Reporting Limit
- RL Reporting Detection Limit

QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: **1205153**

14-May-12

Client: New Mexico Copper Corp

Project: Cu Flat

Sample ID **MB**	SampType: **MBLK**	TestCode: **EPA Method 300.0: Anions**	
Client ID: **PBW**	Batch ID: **R2561**	RunNo: **2561**	
Prep Date:	Analysis Date: **5/3/2012**	SeqNo: **71254**	Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Fluoride	ND	0.10								
Chloride	ND	0.50								
Nitrogen, Nitrite (As N)	ND	0.10								
Nitrogen, Nitrate (As N)	ND	0.10								
Sulfate	ND	0.50								

Sample ID **LCS**	SampType: **LCS**	TestCode: **EPA Method 300.0: Anions**	
Client ID: **LCSW**	Batch ID: **R2561**	RunNo: **2561**	
Prep Date:	Analysis Date: **5/3/2012**	SeqNo: **71255**	Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Fluoride	0.48	0.10	0.5000	0	95.5	90	110			
Chloride	4.8	0.50	5.000	0	96.2	90	110			
Nitrogen, Nitrite (As N)	0.98	0.10	1.000	0	98.2	90	110			
Nitrogen, Nitrate (As N)	2.5	0.10	2.500	0	101	90	110			
Sulfate	9.8	0.50	10.00	0	97.5	90	110			

Sample ID **1205153-001AMS**	SampType: **MS**	TestCode: **EPA Method 300.0: Anions**	
Client ID: **PW-3**	Batch ID: **R2561**	RunNo: **2561**	
Prep Date:	Analysis Date: **5/3/2012**	SeqNo: **71257**	Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Fluoride	2.4	0.10	0.5000	1.941	84.8	72.9	113			
Nitrogen, Nitrite (As N)	0.96	0.10	1.000	0	96.5	77.6	111			
Nitrogen, Nitrate (As N)	3.3	0.10	2.500	0.7031	102	82.8	116			
Sulfate	37	0.50	10.00	26.34	106	80.5	119			

Sample ID **1205153-001AMSD**	SampType: **MSD**	TestCode: **EPA Method 300.0: Anions**	
Client ID: **PW-3**	Batch ID: **R2561**	RunNo: **2561**	
Prep Date:	Analysis Date: **5/3/2012**	SeqNo: **71258**	Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Fluoride	2.4	0.10	0.5000	1.941	84.1	72.9	113	0.155	20	
Nitrogen, Nitrite (As N)	0.92	0.10	1.000	0	92.4	77.6	111	4.30	20	
Nitrogen, Nitrate (As N)	3.1	0.10	2.500	0.7031	97.9	82.8	116	3.36	20	
Sulfate	37	0.50	10.00	26.34	102	80.5	119	1.04	20	

Sample ID **1205167-005AMS**	SampType: **MS**	TestCode: **EPA Method 300.0: Anions**	
Client ID: **BatchQC**	Batch ID: **R2561**	RunNo: **2561**	
Prep Date:	Analysis Date: **5/3/2012**	SeqNo: **71285**	Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual

Qualifiers:

*/X	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
J	Analyte detected below quantitation limits	ND	Not Detected at the Reporting Limit
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit

QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: **1205153**

14-May-12

Client: New Mexico Copper Corp
Project: Cu Flat

Sample ID **1205167-005AMS** SampType: **MS** TestCode: **EPA Method 300.0: Anions**
Client ID: **BatchQC** Batch ID: **R2561** RunNo: **2561**
Prep Date: Analysis Date: **5/3/2012** SeqNo: **71285** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Nitrogen, Nitrite (As N)	0.94	0.10	1.000	0	94.4	77.6	111			

Sample ID **1205167-005AMSD** SampType: **MSD** TestCode: **EPA Method 300.0: Anions**
Client ID: **BatchQC** Batch ID: **R2561** RunNo: **2561**
Prep Date: Analysis Date: **5/3/2012** SeqNo: **71286** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Nitrogen, Nitrite (As N)	0.94	0.10	1.000	0	94.4	77.6	111	0.0232	20	

Sample ID **MB** SampType: **MBLK** TestCode: **EPA Method 300.0: Anions**
Client ID: **PBW** Batch ID: **R2561** RunNo: **2561**
Prep Date: Analysis Date: **5/4/2012** SeqNo: **71314** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Fluoride	ND	0.10								
Chloride	ND	0.50								
Nitrogen, Nitrite (As N)	ND	0.10								
Nitrogen, Nitrate (As N)	ND	0.10								
Sulfate	ND	0.50								

Sample ID **LCS** SampType: **LCS** TestCode: **EPA Method 300.0: Anions**
Client ID: **LCSW** Batch ID: **R2561** RunNo: **2561**
Prep Date: Analysis Date: **5/4/2012** SeqNo: **71315** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Fluoride	0.51	0.10	0.5000	0	101	90	110			
Chloride	4.7	0.50	5.000	0	93.9	90	110			
Nitrogen, Nitrite (As N)	0.96	0.10	1.000	0	96.1	90	110			
Nitrogen, Nitrate (As N)	2.5	0.10	2.500	0	98.0	90	110			
Sulfate	9.5	0.50	10.00	0	94.7	90	110			

Sample ID **1205174-001BMS** SampType: **MS** TestCode: **EPA Method 300.0: Anions**
Client ID: **BatchQC** Batch ID: **R2561** RunNo: **2561**
Prep Date: Analysis Date: **5/4/2012** SeqNo: **71317** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Fluoride	1.4	0.10	0.5000	0.9876	91.1	72.9	113			
Chloride	14	0.50	5.000	8.329	103	78	107			
Nitrogen, Nitrite (As N)	0.96	0.10	1.000	0	95.8	77.6	111			
Nitrogen, Nitrate (As N)	6.0	0.10	2.500	3.372	106	82.8	116			
Sulfate	45	0.50	10.00	35.20	102	80.5	119			

Qualifiers:

*/X	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
J	Analyte detected below quantitation limits	ND	Not Detected at the Reporting Limit
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit

QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: **1205153**

14-May-12

Client: New Mexico Copper Corp
Project: Cu Flat

Sample ID **1205174-001BMSD**		SampType: **MSD**			TestCode: **EPA Method 300.0: Anions**					
Client ID: **BatchQC**		Batch ID: **R2561**			RunNo: **2561**					
Prep Date:		Analysis Date: **5/4/2012**			SeqNo: **71318**		Units: **mg/L**			
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Fluoride	1.4	0.10	0.5000	0.9876	90.1	72.9	113	0.330	20	
Chloride	13	0.50	5.000	8.329	103	78	107	0.0337	20	
Nitrogen, Nitrite (As N)	0.96	0.10	1.000	0	95.7	77.6	111	0.0653	20	
Nitrogen, Nitrate (As N)	6.0	0.10	2.500	3.372	106	82.8	116	0.00611	20	
Sulfate	45	0.50	10.00	35.20	101	80.5	119	0.199	20	

Qualifiers:

*/X	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
J	Analyte detected below quantitation limits	ND	Not Detected at the Reporting Limit
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit

QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: **1205153**

14-May-12

Client: New Mexico Copper Corp

Project: Cu Flat

Sample ID **1205170-001D**	SampType: **DUP**	TestCode: **EPA 120.1: Specific Conductance**	
Client ID: **BatchQC**	Batch ID: **R2646**	RunNo: **2646**	
Prep Date:	Analysis Date: **5/7/2012**	SeqNo: **73516**	Units: **µmhos/cm**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Conductivity	610	0.010						0	20	

Qualifiers:

*/X	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
J	Analyte detected below quantitation limits	ND	Not Detected at the Reporting Limit
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit

QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: **1205153**

14-May-12

Client: New Mexico Copper Corp

Project: Cu Flat

Sample ID **1205005-001A DUP**	SampType: **DUP**		TestCode: **SM4500-H+B: pH**							
Client ID: **BatchQC**	Batch ID: **R2560**		RunNo: **2560**							
Prep Date:	Analysis Date: **5/3/2012**		SeqNo: **71363**		Units: **pH units**					
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
pH	3.92	1.68						0.762		H

Sample ID **1205120-001B DUP**	SampType: **DUP**		TestCode: **SM4500-H+B: pH**							
Client ID: **BatchQC**	Batch ID: **R2560**		RunNo: **2560**							
Prep Date:	Analysis Date: **5/3/2012**		SeqNo: **71373**		Units: **pH units**					
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
pH	7.73	1.68						0.645		H

Qualifiers:

*/X	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
J	Analyte detected below quantitation limits	ND	Not Detected at the Reporting Limit
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit

QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: **1205153**

14-May-12

Client: New Mexico Copper Corp

Project: Cu Flat

Sample ID 1205005-001A MS	SampType: MS	TestCode: SM2320B: Alkalinity								
Client ID: BatchQC	Batch ID: R2560	RunNo: 2560								
Prep Date:	Analysis Date: 5/3/2012	SeqNo: 71221	Units: mg/L CaCO3							
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Total Alkalinity (as CaCO3)	ND	20	80.00	0	0	62.6	110			S

Sample ID 1205005-001A MSD	SampType: MSD	TestCode: SM2320B: Alkalinity								
Client ID: BatchQC	Batch ID: R2560	RunNo: 2560								
Prep Date:	Analysis Date: 5/3/2012	SeqNo: 71222	Units: mg/L CaCO3							
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Total Alkalinity (as CaCO3)	ND	20	80.00	0	0	59.9	111	0	10	S

Sample ID 1205120-001B MS	SampType: MS	TestCode: SM2320B: Alkalinity								
Client ID: BatchQC	Batch ID: R2560	RunNo: 2560								
Prep Date:	Analysis Date: 5/3/2012	SeqNo: 71242	Units: mg/L CaCO3							
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Total Alkalinity (as CaCO3)	360	20	80.00	299.4	70.9	62.6	110			

Sample ID 1205120-001B MSD	SampType: MSD	TestCode: SM2320B: Alkalinity								
Client ID: BatchQC	Batch ID: R2560	RunNo: 2560								
Prep Date:	Analysis Date: 5/3/2012	SeqNo: 71243	Units: mg/L CaCO3							
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Total Alkalinity (as CaCO3)	350	20	80.00	299.4	67.1	59.9	111	0.869	10	

Qualifiers:

*/X	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
J	Analyte detected below quantitation limits	ND	Not Detected at the Reporting Limit
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit

QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: **1205153**

14-May-12

Client: New Mexico Copper Corp

Project: Cu Flat

Sample ID **MB-1832** SampType: **MBLK** TestCode: **SM2540C MOD: Total Dissolved Solids**

Client ID: **PBW** Batch ID: **1832** RunNo: **2634**

Prep Date: **5/7/2012** Analysis Date: **5/8/2012** SeqNo: **73329** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Total Dissolved Solids	ND	20.0								

Sample ID **LCS-1832** SampType: **LCS** TestCode: **SM2540C MOD: Total Dissolved Solids**

Client ID: **LCSW** Batch ID: **1832** RunNo: **2634**

Prep Date: **5/7/2012** Analysis Date: **5/8/2012** SeqNo: **73330** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Total Dissolved Solids	1,020	20.0	1,000	0	102	80	120			

Sample ID **1205078-002GMS** SampType: **MS** TestCode: **SM2540C MOD: Total Dissolved Solids**

Client ID: **BatchQC** Batch ID: **1832** RunNo: **2634**

Prep Date: **5/7/2012** Analysis Date: **5/8/2012** SeqNo: **73337** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Total Dissolved Solids	4,890	20.0	1,000	3,791	110	80	120			

Sample ID **1205078-002GMSD** SampType: **MSD** TestCode: **SM2540C MOD: Total Dissolved Solids**

Client ID: **BatchQC** Batch ID: **1832** RunNo: **2634**

Prep Date: **5/7/2012** Analysis Date: **5/8/2012** SeqNo: **73338** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Total Dissolved Solids	4,930	20.0	1,000	3,791	114	80	120	0.733	20	

Qualifiers:

- */X Value exceeds Maximum Contaminant Level.
- E Value above quantitation range
- J Analyte detected below quantitation limits
- R RPD outside accepted recovery limits
- B Analyte detected in the associated Method Blank
- H Holding times for preparation or analysis exceeded
- ND Not Detected at the Reporting Limit
- RL Reporting Detection Limit

QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: **1205153**

14-May-12

Client: New Mexico Copper Corp

Project: Cu Flat

Sample ID **MB-1808**		SampType: **MBLK**			TestCode: **SM 2540D: TSS**					
Client ID: **PBW**		Batch ID: **1808**			RunNo: **2606**					
Prep Date: **5/4/2012**		Analysis Date: **5/4/2012**			SeqNo: **72551**		Units: **mg/L**			
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Suspended Solids	ND	4.0								

Sample ID **LCS-1808**		SampType: **LCS**			TestCode: **SM 2540D: TSS**					
Client ID: **LCSW**		Batch ID: **1808**			RunNo: **2606**					
Prep Date: **5/4/2012**		Analysis Date: **5/4/2012**			SeqNo: **72552**		Units: **mg/L**			
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Suspended Solids	94	4.0	96.60	0	97.3	82.9	110			

Sample ID **1205122-001BDUP**		SampType: **DUP**			TestCode: **SM 2540D: TSS**					
Client ID: **BatchQC**		Batch ID: **1808**			RunNo: **2606**					
Prep Date: **5/4/2012**		Analysis Date: **5/4/2012**			SeqNo: **72556**		Units: **mg/L**			
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Suspended Solids	ND	4.0						0	15	

Qualifiers:

*/X	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
J	Analyte detected below quantitation limits	ND	Not Detected at the Reporting Limit
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit

Chain-of-Custody Record

HALL ENVIRONMENTAL ANALYSIS LABORATORY

www.hallenvironmental.com

4901 Hawkins NE - Albuquerque, NM 87109

Tel. 505-345-3975 Fax 505-345-4107

Client: NMCC

Mailing Address: 2425 San Pedro NE Ste 100 Albuquerque, NM

Phone #: 505-400-7925

email or Fax#:

QA/QC Package: ☐ Standard ☐ Level 4 (Full Validation)

Accreditation ☐ NELAP ☐ Other

☐ EDD (Type)

Turn-Around Time: ☐ Standard ☒ Rush Need Results May 11

Project Name: Cu Flat

Project #: Production Well Sampling

Project Manager: Katie Emmer

Sampler: CMC

On Ice: ☒ Yes ☐ No

Sample Temperature: 1.1

Analysis Request

Date	Time	Matrix	Sample Request ID	Container Type and #	Preservative Type	HEAL No. 1205155	BTEX + MTBE + TMB's (8021)	BTEX + MTBE + TPH (Gas only)	TPH Method 8015B (Gas/Diesel)	TPH (Method 418.1)	EDB (Method 504.1)	8310 (PNA or PAH)	RCRA 8 Metals	Anions (F,Cl,NO_3,NO_2,PO_4,SO_4)	8081 Pesticides / 8082 PCB's	8260B (VOA)	8270 (Semi-VOA)	See attached list					Air Bubbles (Y or N)
5.2.12	14:30	H_2O	PW-3	500	none	-001												✓					
				125	H_2SO_4	-001																	
				125	HNO_3 & filter	-001																	
				500	HNO_3	-001																	
				500	NaOH	-001																	

Date	Time	Relinquished by	Received by	Date	Time
5-3-12	8:35	[signature]	[signature]	05/03/12	0835

Remarks: Please add Hardness per Andy of Katie 5/3
Need Results by May 11
Please email to: Kemmer@themacresourcesgroup.com

If necessary, samples submitted to Hall Environmental may be subcontracted to other accredited laboratories. This serves as notice of this possibility. Any sub-contracted data will be clearly notated on the analytical report.

HALL ENVIRONMENTAL ANALYSIS LABORATORY

Hall Environmental Analysis Laboratory
4901 Hawkins NE
Albuquerque, NM 87109
TEL: 505-345-3975 FAX: 505-345-4107
Website: www.hallenvironmental.com

Sample Log-In Check List

Client Name: NEW MEXICO COPPER CORP   Work Order Number: 1205153

Received by/date: AT 05/03/12

Logged By: Anne Thorne   5/3/2012 8:35:00 AM   Anne Thorne

Completed By: Anne Thorne   5/3/2012   Anne Thorne

Reviewed By: AT 05/03/12

Chain of Custody

1. Were seals intact? Yes ☐ No ☐ Not Present ☑
2. Is Chain of Custody complete? Yes ☑ No ☐ Not Present ☐
3. How was the sample delivered? Client

Log In

4. Coolers are present? (see 19. for cooler specific information) Yes ☑ No ☐ NA ☐
5. Was an attempt made to cool the samples? Yes ☑ No ☐ NA ☐
6. Were all samples received at a temperature of >0° C to 6.0°C Yes ☑ No ☐ NA ☐
7. Sample(s) in proper container(s)? Yes ☑ No ☐
8. Sufficient sample volume for indicated test(s)? Yes ☑ No ☐
9. Are samples (except VOA and ONG) properly preserved? Yes ☑ No ☐
10. Was preservative added to bottles? Yes ☐ No ☑ NA ☐
11. VOA vials have zero headspace? Yes ☐ No ☐ No VOA Vials ☑
12. Were any sample containers received broken? Yes ☐ No ☑
13. Does paperwork match bottle labels? Yes ☑ No ☐
(Note discrepancies on chain of custody)
14. Are matrices correctly identified on Chain of Custody? Yes ☑ No ☐
15. Is it clear what analyses were requested? Yes ☑ No ☐
16. Were all holding times able to be met? Yes ☑ No ☐
(If no, notify customer for authorization.)

# of preserved bottles checked for pH: 3 / (<2 or >12 unless noted)
Adjusted? ______
Checked by: AT 05/03/12

Special Handling (if applicable)

17. Was client notified of all discrepancies with this order? Yes ☐ No ☐ NA ☑

Person Notified: ______ Date ______
By Whom: ______ Via: ☐ eMail ☐ Phone ☐ Fax ☐ In Person
Regarding: ______
Client Instructions: ______

18. Additional remarks:

19. **Cooler Information**

Cooler No	Temp °C	Condition	Seal Intact	Seal No	Seal Date	Signed By
1	1.6	Good	Not Present			

Table 9-3
Analytical Parameters and Analysis Methods for Groundwater Samples

Analytical Parameter	Analysis Method	Lab Detection Limit (mg/L unless noted)
Anions		
Fluoride	EPA Method 300.0	0.1
Chloride	EPA Method 300.0	0.1
Nitrogen, Nitrite (as N)	EPA Method 300.0	0.1
Nitrogen, Nitrate (as N)	EPA Method 300.0	0.1
Sulfate	EPA Method 300.0	0.5
Dissolved Metals		
Aluminum	EPA Method 200.7	0.02
Antimony	EPA Method 200.8	0.005
Arsenic	EPA Method 200.8	0.02
Barium	EPA Method 200.7	0.002
Beryllium	EPA Method 200.7	0.002
Boron	EPA Method 200.7	0.04
Cadmium	EPA Method 200.7	0.002
Calcium	EPA Method 200.7	0.50
Chromium	EPA Method 200.7	0.006
Cobalt	EPA Method 200.7	0.006
Copper	EPA Method 200.7	0.0003
Iron	EPA Method 200.7	0.02
Lead	EPA Method 200.7	0.005
Magnesium	EPA Method 200.7	0.50
Manganese	EPA Method 200.7	0.002
Mercury	EPA Method 7470 CVAA	0.0002
Molybdenum	EPA Method 200.7	0.008
Nickel	EPA Method 200.7	0.01
Potassium	EPA Method 200.7	1.0
Selenium	EPA Method 200.8	0.02
Silicon	EPA Method 200.7	0.08
Silver	EPA Method 200.7	0.005
Sodium	EPA Method 200.7	0.5

Analytical Parameter	Analysis Method	Lab Detection Limit (mg/L unless noted)
Thallium	EPA Method 200.7	0.01
~~Titanium~~	~~EPA Method 200.7~~	~~0.005~~
Uranium	EPA Method 200.8	0.01
Vanadium	EPA Method 200.7	0.005
Zinc	EPA Method 200.7	0.005
Solids		
Total Suspended Solids (TSS)	SM 2540D	1.0 μg/L
Total Dissolved Solids (TDS)	SM 2540C	10
Alkalinity		
Alkalinity, total (as $CaCO_3$)	SM 2320B	20
Carbonate	SM 2320B	20
Bicarbonate	SM 2320B	20
Other		
pH	150.1	12.45
Specific Conductance	120.1	0.01 μS/cm
Cyanide	Kelada-01	0.005

Note: NA = not applicable as sample will not be analyzed for a given parameter.

From: Hom, Anthony [ahom@blm.gov]
Sent: Wednesday, June 27, 2012 10:53 AM
To: Katie Emmer; Denise Weston (dweston@bhinc.com)
Cc: Smith, Michael A; Seum, Edward R; Vollbrecht, Kurt, NMENV; Haywood, Doug; Jens Deichmann (jdeichmann@themacresourcesgroup.com)
Subject: RE: Shapefiles For BLM

Katie/Denise,
We met this morning, and we've determined that, so long as NMCC does not have to do any new ground disturbing activity to use the existing well (Greyback Well), we can probably CX and amend the monitoring well ROW to authorize its use. If it needs to be drilled, or cleared in any way we won't be able to do this.

The 2 new wells will need to be addressed in the EIS, as it is clear that these are needed for the discharge permit/abatement plan. BLM would amend the monitoring well ROW to include the two new wells, after the ROD is signed.

For the location of the 3 wells, whatever Doug directs you to do will be sufficient for me.

All of the monitoring wells on BLM will remain authorized under ROW, even after the MPO is approved.

Thanks, and if you have any questions, just give me a call.

Anthony Hom
Realty Specialist
US Bureau of Land Management
Las Cruces District Office
Las Cruces, New Mexico
Office: 575-525-4331
Cell: 575-202-8841

From: Katie Emmer [mailto:kemmer@themacresourcesgroup.com]
Sent: Wednesday, June 27, 2012 8:56 AM
To: Hom, Anthony
Subject: RE: Shapefiles For BLM

Thanks. I had a conversation with Kurt Vollbrecht yesterday afternoon so he gave me a head's up about some of the things BLM has to consider as well as NMED's position. We appreciate your time and will look forward to hearing from you.

From: Hom, Anthony [mailto:ahom@blm.gov]
Sent: Wednesday, June 27, 2012 8:55 AM
To: Katie Emmer; Haywood, Doug; Smith, Michael A
Cc: 'Denise Weston'; Jens Deichmann
Subject: RE: Shapefiles For BLM

Katie,
I'm actually here...just not an early bird like Doug (his day is usually ½ over when I get in) – ha, ha!

We're going to meet with Edward today about how to proceed with authorization of these monitoring wells. We'll give you some rational direction, hopefully by end of the day.

Thanks.

Anthony Hom
Realty Specialist
US Bureau of Land Management
Las Cruces District Office
Las Cruces, New Mexico
Office: 575-525-4331
Cell: 575-202-8841

From: Katie Emmer [mailto:kemmer@themacresourcesgroup.com]
Sent: Wednesday, June 27, 2012 8:26 AM
To: Haywood, Doug; Smith, Michael A; Hom, Anthony
Cc: 'Denise Weston'; Jens Deichmann
Subject: FW: Shapefiles For BLM

Hi Doug,

Thanks for the head's up about Anthony being out and you being gone from this afternoon through July 3. I've attached a pdf of a map that shows the wells we're interested in, as well as the associated shapefiles we sent Anthony.

We're interested in establishing the BLM land ownership line near Proposed Wells A and B in T15S R6W, Section 31 and near GWQ-3 in T15S R7W Section 25. The attached pdf map is a little busy but it does show these three wells. I hope this is helpful. Please call me with any questions or concerns.

Thank you for your assistance.

Katie
505-400-7925

Vollbrecht, Kurt, NMENV

From: Katie Emmer [kemmer@themacresourcesgroup.com]
Sent: Tuesday, July 03, 2012 2:42 PM
To: Hom, Anthony; Haywood, Doug; Dave Henney
Cc: Jens Deichmann; Smith, Michael A; Denise Weston (dweston@bhinc.com); Vollbrecht, Kurt, NMENV; Steve Raugust
Subject: RE: Stage 1 Abatement
Attachments: 28 June 2012 Coop Agency Mtg Notes.pdf

Hello All,

I've attached our meeting notes from the cooperating agency meeting on 28 June; this may help fill in some gaps on topics that Dave Henney couldn't hear over the phone.

I'd also like to clarify what we understand to be our current position on the Stage I Abatement Plan.

As noted in the meeting notes, the NMED approved a Stage I Abatement Plan that calls for one or two new monitoring wells to the east of the existing tailing dam to characterize the eastern extent of a known ground water plume. (The Stage I also calls for characterization work at the pit lake and in surrounding wells, for which NMCC does not need BLM access because the wells are on private land, and for characterization work down gradient of existing waste rock piles. NMCC would need BLM access to one well (GWQ-3) to complete monitoring down gradient of waste rock piles according to the plan).

During the meeting, we discussed BLM's latest email that stated that the proposed monitoring wells are clearly tied to the abatement plan and the discharge permit and therefore "the 2 new wells will need to be addressed in the EIS" and not drilled until after the ROD comes out.

Kurt Vollbrecht had spoken with Mike Smith about this topic. Kurt indicated that the NMED sees the proposed wells as necessary but not urgent. If the BLM would prefer to wait to drill these wells until after the ROD comes out, NMED could wait now and then would likely make these wells a condition of a discharge permit in addition to monitoring wells for Stage I characterization once access is secured. Kurt indicated that he sees NMCC as responsible for this characterization and abatement whether the mine is built or not and also said the wells do not affect the NMED's ability to issue the discharge permit.

Kurt indicated that he will look at the other two pieces of the Stage I Abatement Plan (monitoring at and around the pit lake and monitoring down gradient from waste rock piles) and communicate with NMCC if/how NMED might want these pieces to proceed even while the proposed monitoring wells are delayed. yes

We left the meeting with the understanding that the drilling of these monitoring wells will be postponed but we may receive directive from NMED on going forward on other characterization work, or all characterization work may be postponed. If NMED would like the other characterization work to proceed, NMCC would approach BLM about an amendment to an existing right of way to monitor wells to allow ground water monitoring at GWQ-3, hopefully through a categorical exclusion. We do not know if or how Mangi might go about addressing the proposed monitoring wells in the EIS process.

I hope these clarifications on our understanding as well as the attached meeting notes elucidate the current status of the Stage I Abatement Plan work. We do not plan to request access to drill proposed monitoring wells east of the tailing dam at this time. If directed by NMED, we may request access to GWQ-3 for groundwater monitoring in the future.

If you have any questions or corrections, please let us know.

Best regards,

Katie Emmer
Project Scientist
THEMAC
Copper Flat Mine

Mobile: 505.400.7925
Office phone: 505.830.6919
www.themacresourcesgroup.com

From: Hom, Anthony [mailto:ahom@blm.gov]
Sent: Tuesday, July 03, 2012 9:10 AM
To: Haywood, Doug; Dave Henney
Cc: Jens Deichmann; Smith, Michael A; Katie Emmer; Denise Weston (dweston@bhinc.com); Vollbrecht, Kurt, NMENV (kurt.vollbrecht@state.nm.us)
Subject: RE: Stage 1 Abatement

Dave/Doug,
NMCC is formulating a proposal to amend an existing BLM ROW grant (which currently covers about 10 existing monitoring wells), to add a few more ground water monitoring wells. The three monitoring wells they're proposing to add are required by NMED to: 1) monitor existing conditions of the groundwater as relates to some existing tailings 2) monitor during mining operation 3) be used in the abatement plan.

BLM has only had pre-application discussions with NMCC about these, so aside from well locations, this is all I know. I've cc'd NMCC, and Kurt Vollbrecht with NMED to correct this explanation, if needed.

Hope this helps. Thanks.

Anthony Hom
Realty Specialist
US Bureau of Land Management
Las Cruces District Office
Las Cruces, New Mexico
Office: 575-525-4331
Cell: 575-202-8841

From: Haywood, Doug
Sent: Tuesday, July 03, 2012 7:35 AM
To: Dave Henney
Cc: Hom, Anthony; jdeichmann@themacresourcesgroup.com
Subject: RE: Stage 1 Abatement

Dave,

I will have Anthony get with you on this.

Thanks,
Douglas Haywood
BLM Project Manager
575-525-4498

Vollbrecht, Kurt, NMENV

From: Katie Emmer [kemmer@themacresourcesgroup.com]
Sent: Tuesday, July 03, 2012 2:42 PM
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Cc: Jens Deichmann; Smith, Michael A; Denise Weston (dweston@bhinc.com); Vollbrecht, Kurt, NMENV; Steve Raugust
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If you have any questions or corrections, please let us know.

Best regards,

Katie Emmer
Project Scientist
THEMAC
Copper Flat Mine

Mobile: 505.400.7925
Office phone: 505.830.6919
www.themacresourcesgroup.com

From: Hom, Anthony [mailto:ahom@blm.gov]
Sent: Tuesday, July 03, 2012 9:10 AM
To: Haywood, Doug; Dave Henney
Cc: Jens Deichmann; Smith, Michael A; Katie Emmer; Denise Weston (dweston@bhinc.com); Vollbrecht, Kurt, NMENV (kurt.vollbrecht@state.nm.us)
Subject: RE: Stage 1 Abatement

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Anthony Hom
Realty Specialist
US Bureau of Land Management
Las Cruces District Office
Las Cruces, New Mexico
Office: 575-525-4331
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From: Haywood, Doug
Sent: Tuesday, July 03, 2012 7:35 AM
To: Dave Henney
Cc: Hom, Anthony; jdeichmann@themacresourcesgroup.com
Subject: RE: Stage 1 Abatement

Dave,

I will have Anthony get with you on this.

Thanks,
Douglas Haywood
BLM Project Manager
575-525-4498

Cooperating Agencies Meeting, June 28, 2012
Attendance:
MMD: DJ Ennis, Holland Shepherd
NMCC: Jens Deichmann, Steve Raugust, Katie Emmer
NMED: Kurt Vollbrecht
NMOSE: Kevin Meyers
One the phone: Mangi- David Henney, NM Air Quality Bureau: Elizabeth Bisby Kehn

1. EIS D.Henney: Mangi is working on the affected environment, Mangi Specialists have contacted their BLM counterparts.
   A call with LWA is scheduled for 9 July
   Mangi is internally working to minimize overlap between groundwater, surface water, geology and other topics to cover everything just once.
   Received response to Data Validation Report, reviewing.
   EA106 report was received in May, Kathy indicated they are waiting for some revisions but they will write it up as they have it now and revise as necessary
   DBSA has been talking to NMOSE about water rights, something is still under review, a question of quantity with a difference of about 1,000 AF
   K.Meyers: Understands there is some change from the declaration and a field check that added about 900 AF, check with district IV
   S.Raugust: This is a difference that has to do with ownership, all of the water right is under LRG 4652, it's just Frost and Gray had 6,462 AF/Yr and HydroResources had about 1,019 AF/Yr (922 for LRG 4652 and 97 for LRG 4654) the LRG 4652 points of diversion were unzipped after Quintana and NMCC has recombined the LRG 4652 declarations through purchases, but the total should be around 7,481AF.
   D.Henney: if you could clarify with J.Kutz or P.Shuh at DBSA
   J.Deichmann: Asks for DH to get clarity on how NMCC should contact DBSA, should BLM be on the call?
   D.Henney: That's good, I will check on that.
2. Traffic Analysis:
   D.Henney asks if SS needs to withdraw his request for information from the NMDOT or will DW do that? SS sent DW a list of analyses he wants. J.Deichmann: Believes this list is covered with the possible exception of an accident analysis.
   D.Henney: Notes they asked for additional information on blasting, JD confirms we will get back to him on that when we get it from E.Fidler
   D.Henney: Said some of the figures they have for the EA2 JSAI report are flawed: Figure 4, 5; also the MPO seems to be missing all of the figures for chapter 3 as well as Figure 5-2.
   J.Deichmann: We are working on a modification of the MPO to show the pit geometry and other details with a 25,000 TPD throughput. MPO should not be missing info for Chapter 3 because the MPO was checked page by page. Henney to check to make sure LWA has the correct version of the MPO.

3. Tours:
   JDeichmann: tours occurred on June 12, 13, 14 with good turnouts and conversations. Only two attended the NGO tour on June 12, Sally Smith of GRIP and Dan Lorimier of the Sierra Club. About 50 attended the two public tours. The Hillsboro Water Authority was there and John Hawley answered a lot of good water questions on one of the tours, able to show why dewatering the pit could not adversely impact Hillsboro wells.
   Additional tours will be scheduled next quarter.
4. NMOSE Cooperating Agency Agreement
   K.Meyers: we do have an executed agreement; this was sent to BLM on or near June 11. KM will send to NMCC
   J.Deichmann: We will provide the BDR, any other documents we may have not shared yet.
5. EA#2
   KLE gives update on EA2, the public comment period will end 9 July. BLM will select Alternative A or B.
   KV: Has NMCC NOI and believes they will do a temporary permission; however they only give permission for 120 days so he will wait until he understands from NMCC that a ROW has been obtained and the pumping test is imminent.
6. NPDES permit
   The NPDES will be effective on 1 July
7. NMOSE permits
   SR: Our WR-04 permit to repair/deepen our production wells was submitted in February and we have been advised by Andrea Mendoza that it has been passed to John Romero. This permit is straight forward and routine and we do not understand why this is taking so long. This permit is quickly becoming time critical.
   KM: Will send an email to AM and copy JR to inquire.
   LRG 15291 came in response to NMCC's submission of a permit with 19 conditions, most of which NMCC is aware of and on board about. Condition 19 is concerning to NMCC because it is not anything we have heard about previously. We'd like to clarify and be sure that this condition:
      Is making the decision to shut the test down a mutual decision with NMOSE and NMCC
      Define what "suggests a potential impact" actually means – this is too fuzzy
      Calls for concerned owners of other wells have to collect a trend of data points before a decision to shut the test off can be made
   NMCC would also like to understand what the intention of assigning a 2nd water right number to this permit may be
   KM: You may be sending a letter to state aggrievance, or you may just be sending a letter to clarify your position. He does not know if NMOSE would amend the permit and put the letter in the file or actually re-issue the permit.
   KM: There are a lot of factors that could cause other well owners to perceive an impact.
   Discussion of "impairment" at NMOSE
   NMOSE would be concerned by depletions to the stream, senior water users.
   SR: this model will provide the tools to evaluate potential impacts.
   HS: MMD needs to see the water balance.
8. Stage I Abatement Plan
   KE: Summary of Stage I status: The NMED approved a Stage I abatement plan that calls for one or two new monitoring wells to the east of the existing tailing dam to characterize the eastern extent of a known ground water plume. These wells are on BLM land and NMCC has approached

BLM about applying for a Right of way grant to drill them. BLM has called KV about this proposed action with some concerns.
KV: The BLM concern was that approving a series of actions was going to appear "pre-decisional" and they asked KV if the proposed monitoring wells are time critical. KV told BLM that these wells are necessary but not urgent. The wells would be monitored during operations and since the new tailings dam proposed would take out the existing monitoring wells east of the existed dam, these wells will become tied to the discharge permit during operations. KV left the decision to BLM.
KE: The BLM sent an email stating that the monitoring wells are clearly tied to the abatement plan and the discharge permit and therefore "the 2 new wells will need to be addressed in the EIS" and not drilled until after the ROD comes out. This reasoning surprised us, because we understood from NMED that the wells are necessary for abatement regardless of whether the mine is complete and that Kurt does not consider the abatement plan wells as necessary to issue the discharge permit.
KV: The wells don't affect our ability to issue the discharge permit, but they will likely be a condition of it.
SR: We could monitor the pit and waste rock with a CX from BLM to access the last well proposed for monitoring for which we do not have access. SR is resistant to monitoring at the dam to collect information we already have.
KV: We probably want data from the wells that exist east of the dam before they are taken out.
JD: Kurt, could you email BLM and clarify your position?
KV: I could call or respond to this email
SR: Once we finish the PAP, Golder is tasked with updating the Discharge permit with updated waste management, spill prevention, closure and other associated plans.
KM: You have wells that will be removed with the dam extension, be sure to put in P & A reports with the NMOSE
SR: We've retroactively permitted the wells we have on BLM lands in anticipation of turning in P/A reports. We need to do a similar group retroactive well permit on those left on private lands. Monitoring wells did not require permits at the times when these wells were installed and need file numbers prior to abandonment. NMCC is aware of the OSE well abandonment procedures.

9. MORP:
   SR: The MORP is imminent.
   Public notice: DJE: Public notice goes to the "long list" at submission, and public notice is required again once deemed complete. DJE will get the list to JD. MMD usually sees photocopied certified mail stubs, 4 to a sheet + the affidavits of certification from the newspaper as proof of public notice.
10. Closure/Closeout Plan
    SR: Question re: the difference between the Closure and Closeout Plans
    DJE: Existing mines in Part 5 must submit a Closeout Plan, new mines in Part 6 submit a Reclamation Plan
    KV: NMED our rules call for a Closure Plan for the Discharge Permit.
    KM: Freeport submits a Closure/Closeout Plan to cover both MMD and NMED with the same document because Part 5 applies to them.
11. Air Quality
    JD: Class one is doing our permit application and modeling, this has been held up in a wait for the prefeasibility study. We believe we will still be a minor source. Sent a message to P. Wise to

ask when to request a pre-application meeting. Confirmed with EBK that she will be the one to attend that meeting, not Norma.

12. Next meeting: August 16 at 14:00

    Last question from DHenney: There was a public comment asking if the mine would impact nearby springs, do you know of any beyond the hot springs in TorC?
    SR: There are warm springs west of the mine. Your geologist can look at this and see the mine is in the Animas Uplift and that those warm springs are fed by water from the Black Range to the west. The mine will not impact them.

From: Dave Henney [mailto:dhenney@mangi.com]
Sent: Thursday, June 28, 2012 3:52 PM
To: Haywood, Doug; jdeichmann@themacresourcesgroup.com
Subject: Stage 1 Abatement

It was difficult or impossible to hear some of the Cooperators meeting attendees if they weren't close to the microphone. So, I was aware of some discussion under the topic of Stage 1 Abatement rlated to ROW access for monitoring wells on BLM property. Further, that BLM has indicated a discussion related to this needs to be in the EIS and some needed action cannot occur until after the ROD is signed. I didn't get enough of the detail at that point to have an understanding and am wondering if there is a document, letter. Email, or ??? that could help me understand what may have to be added to the EIS.

Thanks

Dave

PUBLIC NOTICE

COPPER MINE PROJECT
New Mexico Copper Corporation
2424 Louisiana NE, Suite 301
Albuquerque, NM 87110

New Mexico Copper Corporation (NMCC), a wholly-owned subsidiary of THEMAC Resources Group, Ltd., is proposing re-establishment of a poly-metallic mine and processing facility located near Hillsboro, New Mexico. The proposed Project would consist of an open pit mine, flotation mill, tailing storage facility, waste rock disposal area, a low-grade ore stockpile, and ancillary facilities. In most respects, the facilities, disturbance and operations would be similar to the former operation.

The Project is located in Sierra County, New Mexico, approximately 22 miles southwest of Truth or Consequences and five miles northeast of Hillsboro. The general area can be reached by traveling south 15 miles from Truth or Consequences on Interstate Highway 25, then 10 miles west on New Mexico Highway 152. The Project area lies two miles west-northwest from Highway 152. The project area encompasses all or parts of Township 15 South, Range 7 West, Sections, 25, 26, 27, 35, & 36; Township 15 South, Range 6 West, Sections 25, 26, 27, 30, 31, 32, 33, & 34; Township 15 South, Range 5 West, Sections 30 & 31; and Township 16 South, Range 6 West, Section 6.

A Permit Application Package (PAP) consisting of a Baseline Data Report and a Mine Operations and Reclamation Plan (MORP) has been prepared in compliance with 19.10.6 NMAC New Mexico Mining Commission Rules for new mines, and submitted for review to the Mining and Minerals Division (MMD) of the New Mexico Energy, Minerals and Natural Resources Department.

The application is available for public inspection at the MMD Office in Santa Fe, NM, the Hillsboro, NM Public Library, and the Truth or Consequences, NM Public Library. It may also be viewed on the MMD website at www.emnrd.state.nm.us/MMD/MARP/MARPMain Page.htm, by clicking on the Pending Permit Applications link. Interested persons may submit written comments and/or a request for a public hearing on the application to the MMD Director at:

New Mexico Mining and Minerals Division
Fernando Martinez, Division Director
1220 South St. Francis Drive
Santa Fe, New Mexico 87505
(505) 476-3400

All interested persons may submit written comments regarding the application to the Director. Written comments must be received by the Director prior to the close of the hearing record following any public hearing that is held. If no public hearing is held, written comments will be considered only if they are received by the Director within 60 days after the newspaper publication of the notice of the application or within 60 days after the person filing the comment received notice of the application, whichever is later.

Any interested party may request a public hearing on the application. Such a request must be made within thirty (30) days of the date of the newspaper publication of the notice of the application unless the Director determines a longer period in which to make the request is appropriate and such period is specified in the published notice. If a hearing is timely requested, the Director shall set a hearing unless the request is clearly frivolous. The Director may hold a public hearing absent any request. Title 19, Chapter 10 NMAC regulations for public notice and hearing may be viewed at http://www.nmcpr.state.nm.us/nmac/_title19/T19C010.htm.

NOTA PUBLICA

COPPER MINE PROJECT
New Mexico Copper Corporation
2424 Louisiana NE, Suite 301
Albuquerque, NM 87110

La Corporación del Cobre de Nuevo México (NMCC), un filial de entera propiedad del Grupo de Recursos de THEMAC, S.a., propone restablecimiento de una facilidad polietileno-metálico de mina y procesamiento ubicó cerca de Hillsboro, Nuevo México. El Proyecto propuesto consistiría en una mina abierta de hoyo, molino de flotación, siguiendo instalación de almacenaje, área de disposición de piedra de desecho, una reservas de baja calidad de mineral, y las facilidades adicionales. En la mayoría de los respeto, las facilidades, el alboroto y las operaciones serían semejantes a la operación anterior. El Proyecto es ubicado en el Condado de Sierra, Nuevo México, aproximadamente 22 suroeste de millas de la Verdad o Consecuencias y de cinco noreste de millas de Hillsboro. El área general puede ser alcanzada viajes al sur 15 millas de la Verdad o Consecuencias en la Carretera Interestatal 25, entonces 10 oeste de millas en la Carretera de Nuevo México 152. El área del Proyecto está dos oesnoroeste de millas de la Carretera 152. El área del proyecto abarca todo o las partes de Municipio 15 del sur, la Gama 7 Occidental, las Secciones, 25, 26, 27, 35, & 36; Municipio 15 del sur, la Gama 6 Occidental, las Secciones 25, 26, 27, 30, 31, 32, 33, & 34; Municipio 15 del sur, la Gama 5 Occidental, las Secciones 30 & 31; y el Municipio 16 del sur, la Gama 6 Occidental, la Sección 6.

Un Paquete de la Aplicación del Permiso (PAPILLA) consistiendo en un Informe de Datos de Línea de fondo y un Mío Operaciones y Recuperación Planean (MORP) ha sido preparado en conformidad con NMAC 19.10.6 Nuevo México que Mina Reglas de Comisión para nuevas minas, y sometido para la revisión a la Minería y la División de Minerales (MMD) de la Energía de Nuevo México, los Minerales y el Departamento Natural de Recursos.

La aplicación está disponible para la inspección pública en la Oficina de MMD en Santa Fe, en NM, en el Hillsboro, en NM Biblioteca pública, y en la Verdad o las Consecuencias, NM Biblioteca pública. También puede ser visto en el sitio web de MMD en Página.htm de www.emnrd.state.nm.us/MMD/MARP/MARPMain Page.htm, para hacer clic en las Aplicaciones Pendientes de Permiso ligan. Las personas interesadas pueden someterse comentarios escritos y/o una petición para una audición del público en la aplicación al Director de MMD en:

New Mexico Mining and Minerals Division
Fernando Martinez, Division Director
1220 South St. Francis Drive
Santa Fe, New Mexico 87505
(505) 476-3400

Todas las personas interesadas pueden someterse comentarios escritos con respecto a la aplicación al Director. Los comentarios escritos deben ser recibidos por el Director antes del fin del registro de oído que sigue cualquier audición del público que es tenido. Si ninguna audición pública es tenida, es escrita comentarios serán considerados sólo si son recibidos por el Director dentro de 60 días después de la publicación periodística de la nota de la aplicación o dentro de 60 días después de la persona que archiva el comentario nota recibida de la aplicación, el que es más tarde.

Algún partido interesado puede solicitar una audición del público en la aplicación. Tal petición debe ser hecha dentro de treinta (30) días de la fecha de la publicación periodística de la nota de la aplicación a menos que el Director determine un período más largo en el que hacer la petición es apropiado y tal período es especificado en la nota publicada. Si una audición es oportuna solicitado, el Director pondrá una audición a menos que la petición sea claramente frívola. El Director puede tener una audición del público ausente cualquier petición. El título 19, el Capítulo 10 regulaciones de NMAC para la nota y el oído públicos pueden ser vistas en http://www.nmcpr.state.nm.us/nmac/_title19/T19C010.htm.

State of New Mexico
ENVIRONMENT DEPARTMENT

Ground Water Quality Bureau

Harold Runnels Building
1190 Saint Francis Drive, PO Box 5469
Santa Fe, NM 87502-5469
Telephone (505) 827-2855 Fax (505) 827-2965
www.nmenv.state.nm.us

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Mr. Jens Deichmann
NM Copper Corporati
2424 Louisiana Blvd.,
Albuquerque, NM 87

PS Form 3800, August 2006

CERTIFIED MAIL—RETURN RECEIPT REQUESTED

August 13, 2012

Mr. Jens Deichmann
New Mexico Copper Corporation
2424 Louisiana Blvd, Suite 301
Albuquerque, NM 87110

RE: Temporary Permission to Discharge, Copper Flat Production Well field Pump Test

Dear Mr. Deichmann:

The New Mexico Environment Department ("NMED") received a "Notice of Intent" ("NOI") from New Mexico Copper Corporation (NMCC) dated June 20, 2012. This NOI proposes to discharge up to 150 acre feet of water from a pump test of approximately 16 days duration. Two locations are proposed for the discharge, including an unused gravel quarry or directly to Grayback Arroyo pursuant to NPDES Permit No. NM0031101. The location of the proposed gravel quarry discharge is several hundred yards west of I-25 in Section 2, T16S, R5W. Depth to ground water beneath the gravel quarry is approximately 60 feet below ground surface (bgs). The proposed location of the discharge in Grayback Arroyo is several miles further to the west in Section 31, T15S, R5W. Depth to ground water beneath the Grayback Arroyo discharge location is approximately 250 feet bgs.

NMCC is proposing to discharge water from 2 to 3 production wells (PW-1 and PW-3 primary, PW-2 backup) associated with the proposed Copper Flat Mine. The production wells were previously used in conjunction with mining and milling operations at the Copper Flat Mine in the early 1980's. Water quality data from that time frame indicates that ground water standards as set forth in Section 20.6.2.3103 NMAC of the Water Quality Control Commission Regulations (WQCC) were met. Recent ground water quality data shows that fluoride levels in well PW-3 slightly exceeds the ground water standard for fluoride. The discharge from the pump test will blend water from two wells (PW-1 and PW-3) and the final water quality discharged is not expected to exceed WQCC standards. Furthermore, the first aquifer present beneath both discharge locations is the same aquifer from which the water is being withdrawn. NMCC shall provide NMED with the results of any sampling required pursuant to their NPDES permit.

NMED has determined that a Discharge Permit is not required for this discharge as described in the NOI, and grants permission to NMCC to discharge pump test water in accordance with 20.6.2.3106.B NMAC, which states: "[F]or good cause shown the secretary [of the New Mexico Environment Department] may allow such person to discharge without a discharge permit for a period not to exceed 120 days." The period of this Temporary Permission begins on the first day of discharge and ends 120 consecutive days thereafter. NMCC, or its representative, shall notify NMED of the beginning and ending dates of discharge under this Temporary Permission.

NMCC is advised that nothing in this Temporary Permission shall be construed in any way as relieving NMCC of its obligation to comply with all applicable federal, state, and local laws, regulations, permits, or orders (20.6.2 NMAC). Additionally the approval of this Temporary Permission to discharge does not relieve NMCC of liability if the discharge should result in actual pollution of surface or ground water that may be actionable under other laws and/or regulations (20.6.2.3109 NMAC).

Please contact Kurt Vollbrecht at (505) 827-0195 if you have any questions.

Sincerely,

Jerry Schoeppner, Chief
Ground Water Quality Bureau
New Mexico Environment Department

JS:kv

copies:
Chris Eustice, MMD
Rich Powell, NMED SWQB
Anthony Hom, BLM Las Cruces District Office, 1800 Marquess Street Las Cruces, NM 88005

Cooperating Agencies - NMCC Meeting
16 August 2012
MMD Conference room
Call in: 760-984-1000, PIN 1087 467

1. EIS status
2. Briefing on recent mine tours - Jens - Ladder Ranch
3. ROWs - Update on EA#2 ROW /aquifer test – new schedule - Katie
4. Impact of delayed aquifer test – revised EIS schedule - Jens
5. Well rehab approval in advance of aquifer test – Awaiting OSE approval - Katie
6. Stage 1 Abatement Plan status – ROW issue - Steve
7. Submittal of MORP, public notice - Steve
8. Foundation excavations – awaiting approval
9. Air quality permit application - Jens
10. Traffic analysis and road condition assessment - Jens
11. Next meeting date

Next Mtg
Sept. 24 @ 1:00 - 3:00

8-16-12 Copper Flat Monthly Mtg

- Pump Test EA
  - FONSI posted on BLM website
  - Allowed 30 day protest period
    - ends Aug 27
  - Comments on FONSI are posted online w/ BLM response
  - Possibly have ROW Sept 15, start well rehab Sept. 17
  - Final report Dec. 21?

- ROD for EIS - Dec. 2013
  DEIS Feb 2013

- Stage I
  proceed w/ monitoring as proposed
  - Pit Lake + Waste Rock
    - Evaluate TI plan - need to make certain have clean valid data set since we will lose these wells

- MORP - will come to NMED for comment next week
  - EE will be short summary that references EIS - Mary will draft

- Foundations... BLM permitting issues
  - may need to re-cover?

State of New Mexico
Energy, Minerals and Natural Resources Department

Susana Martinez
Governor

John Bemis
Cabinet Secretary

Brett F. Woods, Ph.D.
Deputy Cabinet Secretary

Fernando Martinez, Director
Mining and Minerals Division

August 22, 2012

Mr. Jens Deichmann, Project Manager
New Mexico Copper Corporation
2424 Louisiana Blvd., NE, Suite 301
Albuquerque, New Mexico 87110

Re: New Mine Permit Application Determined Administratively Complete; New Mexico Copper Corporation, Permit No. SI027RN, Copper Flat Mine, Sierra County, New Mexico

Dear Mr. Deichmann,

Pursuant to Part 19.10.6.605.A of the New Mexico Mining Act Rules the New Mexico Mining and Minerals Division (MMD) has determined that an application for a New Mine Permit submitted to MMD, on July 17, 2012, by New Mexico Copper Corporation (NMCC) is administratively complete. The New Mine Permit Application proposes to disturb up to 1270 acres of federal and private surface lands within the permit boundaries proposed for development of an open pit copper mine located approximately 5 miles northeast of the community of Hillsboro, in Sierra County New Mexico.

Pursuant to Part 19.10.6.605.B of the New Mexico Mining Act Rules NMCC shall, within 30 days receipt of this letter, in a form approved by the Director of MMD, give public notice of the application pursuant to 19.10.9 of the New Mexico Mining Act Rules. Therefore, and pursuant to 10.10.9.903.I of the New Mexico Mining Act Rules, NMCC shall provide to the Director of MMD timely proof that the notice of this determination has been provided to everyone who has indicated to the applicant in writing that they desire information regarding the application, and to a list maintained by the Director of individuals and organizations who have requested notice of applications.

MMD will now distribute the application to other reviewing agencies and begin technically reviewing the application. If you have any questions, please contact me at 505-476-3437 or Chris Eustice of my staff at 505-476-3438.

Sincerely,

Holland Shepherd, Program Manager
Mining Act Reclamation Program (MARP)
Mining and Minerals Division

Cc: Fernando Martinez, Director, MMD
Chris Eustice, Permit Lead, MMD/MARP
Mine File (SI027RN)