

**STANDARD OPERATING PROCEDURE NO. 11****PASTE PH AND PASTE CONDUCTIVITY**

<b>REVISION LOG</b>		
Revision Number	Description	Date
0.0	Original SOP	10/23/03
11.1	Revision I	10/24/03
11.2	Revisions by PJP	5/19/2004
11.3	JRM	12/12/2004
11v4	Edits by LMK, changes made, sent to J. Hamilton and posted to Granite FTP site on 2/8/05	2/1/05
11v5	Revisions by KMD	1/29/07
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11v6	Editorial by SKA	10/22/08

**1.0 PURPOSE AND SCOPE**

This Standard Operating Procedure describes the method for determining the paste pH and paste conductivity of rock and soil samples. Paste tests are used to evaluate the geochemical behavior of mine waste materials subject to weathering under field conditions and to estimate the pH and conductivity of the pore water resulting from dissolution of secondary mineral phases on the surfaces of oxidized rock particles.

**2.0 RESPONSIBILITIES AND QUALIFICATIONS**

The Team Leader and Characterization Team will have the overall responsibility for implementing this SOP. They will be responsible for assigning appropriate staff to implement this SOP and for ensuring that the procedures are followed accurately.

All personnel performing these procedures are required to have the appropriate health and safety training. In addition, all personnel are required to have a complete understanding

of the procedures described within this SOP, and to receive specific training regarding these procedures, if necessary.

All environmental staff and assay laboratory staff are responsible for reporting deviations from this SOP to the Team Leader.

### **3.0 DATA QUALITY OBJECTIVES**

This SOP addresses objectives 1 and 2 in the data quality objectives outlined by Virginia McLemore for the "Geological and Hydrological Characterization at the MolyCorp Questa Mine, Taos County, New Mexico".

- 1. Determine how the hydrogeochemistry and water balance dynamics influence rock pile weathering and stability.
- 2. Determine how mineralogy, stratigraphy, and the internal structure of the rock piles contribute to weathering and stability.

### **4.0 RELATED STANDARD OPERATING PROCEDURES**

The procedures set forth in this SOP are intended for use with the following SOPs:

SOP 1	Data management (including verification and validation)
SOP 2	Sample management (including chain of custody)
SOP 3	Surveying (GPS)
SOP 5	Sampling outcrops, rock piles, and drill core (solid)
SOP 6	Drilling, logging, and sampling of subsurface materials (solid)
SOP 8	Sample preparation (solids)
SOP 9	Test pit excavation, logging, and sampling (solid)
SOP 22	Analytical Data Validation
SOP 36	Sample preservation, storage, and shipment

### **5.0 EQUIPMENT LIST**

The following materials are required for conducting paste pH and conductivity tests.

- A pH meter with a combination pH electrode
- pH 4 and pH 7 calibration standards
- A conductivity meter with standard calibration solution(s)
- Stirring rod
- 50 mL glass beaker
- Distilled or deionized water
- Sieve (No. 10)
- Scale
- Graduated cylinder
- Laboratory measurements (solids) forms (Appendix 1)

## 6.0 PROCEDURES

1. Calibrate pH and conductivity using the standard solutions and following the instructions provided with the meters. Record the calibration data on the laboratory test data sheet(s).
2. Obtain approximately 25 grams of fines (use sieve to obtain particles smaller than 1 mm) from the soil or rock sample to be tested, and place in a fresh or decontaminated beaker. Reseal the bag from which the paste test sample was obtained.
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. Let stand for 10 minutes.
6. Tip the testing container to one side to allow a pool of water or slurry to collect in the corner. Dip the probe into the slurry, allow the meter reading to stabilize, and record the data. The conductivity reading should be taken first, as electrolyte from the combination pH probe may affect the conductivity of the solution.
7. Decontaminate probes and containers by rinsing them with distilled water between tests.
8. Record the measurements in the laboratory notebook along with the date tested and the initials of the person taking the measurements.
9. After 20 tests, place the pH and conductivity probes in the standard solutions and record readings on the laboratory data sheets. If readings on the standard solutions have drifted by more than 5 percent, recalibrate the probe, record the calibration data, and retest the last 20 samples.

## 7.0 LIMITATIONS/INTERFERENCES

High conductivity (or TDS) levels indicate there is a considerable store of contaminated salts. These are usually sulfates, but other metal salts can also be present. When a sample is collected over depth, it is not always clear whether the stored salts precipitated following in-situ oxidations, or if the salts were generated somewhere higher in the profile and transported down and precipitated at the sample location. Look for stains along the flow path that can indicate if this is the case. Low pH readings indicate that oxidation and acid generation has occurred. However, a pH near neutral does not predict the potential for future acid generation. Readings taken on uncrushed samples in the field or lab usually provide a much better indication of the extent of oxidation than crushed samples do.

## 8.0 QUALITY ASSURANCE/QUALITY CONTROL

Verify the accuracy of the pH and conductivity meters using standard solutions. After 20 tests, place the pH and conductivity probes in the standard solutions and record readings on the laboratory data sheets. If readings on the standard solutions have drifted by more than 5 percent, recalibrate the probe, record the calibration data, and retest the last 20 samples. If the pH probe can't be re-calibrated such that when the 7-buffer reads 7.00

and the 4-buffer reads 4.0, plus or minus 0.2, the problem is most likely the electrode. Clean and rejuvenate the electrode according to the manufacturer's instructions.

## **9.0 DOCUMENTATION**

On the form (Appendix 1), record sample numbers according to SOP 1, along with the date analyzed, the pH and conductivity readings, and the initials of the person collecting the sample. Complete all relevant data fields on the sample form.

## **10.0 REFERENCE**

Sobek, A.A., Schuller, W.A. Freeman, J. R. and Smith, R. M., 1978, Field and Laboratory Methods Applicable to Overburden and Mine Soils, EPA 600/2-78-054, 203 p.

## APPENDIX 1. FORM

LABORATORY MEASUREMENTS SOLIDS										Pore water	
Sample_id	paste_pH	paste_conductivity (mS/cm)	paste_TDS (g/l)	paste_redox (mv)	SOP_number	Deviation_SOP	Person who analyzed	Laboratory_id	delta_D	delta_O	
CAP-JMS-0002-00	2.85	3.28			11		STM	NM1			
Comments:											
GHN-ACT-0001-05	3.46	0.905		663	11		SFA	NM6			
Comments: Test was done on crushed sample											
Record: 1 of 612											

ition number.