STANDARD OPERATING PROCEDURE NO. 4

TAKING PHOTOGRAPHS

REVISION LOG		
Revision Number	Description	Date
4.0	Original SOP	11/18/03
4.1	Revision by McLemore after field testing and comments by Peters, Hamilton, and updates to DQOs	1/3/04
4.2	Corrections by PJP	9/22/2004
4v3	Revision by VTM after discussions with PIs and field testing	10/19/04
4v3	Prepare for posting to Molycorp website (Jakc Hamilton) and for lab audit (George Robinson) by LMK	3/20/07
4v4	Editorial by SKA	10/22/08

1.0 PURPOSE AND SCOPE

This Standard Operating Procedure (SOP) provides technical guidance and procedures that will be employed to take and archive photographs. It addresses equipment, field procedures, field data collection, and personnel responsibilities.

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.

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 receive specific training regarding these procedures, if necessary.

All staff are responsible for reporting deviations from this SOP to the Team Leader.

3. DATA QUALITY OBJECTIVES

This SOP addresses the following objectives in the data quality objectives outline by Virginia McLemore for the "Geological and Hydrological Characterization at the Molycorp Questa Mine, Taos County, New Mexico".

- Determine how mineralogy, stratigraphy, and internal structure of the rock piles contribute to weathering and stability. Photographs provide a visual record of the mineralogy, stratigraphy, and internal structure of the rock piles at field scale as well as microscopic (thin section, electron microprobe).
- Determine if cementation forms in the rock piles and the effect of such cementation on the stability of the rock piles. Photographs provide a visual record of the cementation of the rock piles at field scale as well as microscopic (thin section, electron microprobe).
- Determine how the concentration and location of pyrite and its weathering products in the waste rock piles affect the weathering process. Photographs provide a visual record of the location of pyrite and its weathering products of the rock piles at field scale and especially at the microscopic scale (thin section, electron microprobe).
- Determine if the geotechnical and geochemical characteristics of the bedrock (foundation) underlying the rock piles influences the rock pile stability. Photographs provide a visual record of the characteristics of the rock piles.

4.0 RELATED STANDARD OPERATING PROCEDURES

The procedures for taking photographs 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 (chain of custody)
- SOP 5 Sampling outcrops, rock piles, and drill core (solid)
- SOP 6 Drilling, logging, and sampling of subsurface materials (solid)
- SOP 9 Test pit excavation, logging, and sampling (solid)
- SOP 24 Petrographic analyses (including alteration)
- SOP 26 Electron microprobe analyses

5.0 EQUIPMENT LIST

The following materials and equipment are needed for taking photographs:

- Field logbook and forms
- Indelible black-ink pens
- Digital camera or camera with film
- Scanner

6.0 PROCEDURES

Photographs will be taken of selective sample sites, test pits, trenches or long walls, drill core, thin sections, and probe sections. Additional types of photographs will be taken and stored with the database as appropriate. Digital cameras or cameras with film can be

used. However, slides and prints must be scanned electronically in order to be stored with the database. The slides and prints will be labeled and retained by the photographer or Project Manager. Digital photographs and scans will be taken at high resolution so that publication of the photograph will be possible. Historic photographs of the mine site from the NMBGMR photograph archive will be included as appropriate. It is recommended that each photograph include the sample number or some other identification in the field of view when appropriate. Each photograph should also contain, when practical, a ruler or some other object included in the photograph for scale. Each photograph should have a GPS location.

Any photograph that will be used in a presentation or paper must be logged in the database and a copy sent to the final database site.

7.0 DOCUMENTATION

Documentation of the photographs acquired in the field and laboratory will provide information on the photograph and also provide a permanent record of field activities.

All photograph forms should be filled out with waterproof ink or information entered into the database. The date, time, photographer's initials, and the field identification number will be recorded. The photograph form (Appendix 1) is included in the sample field, drill log, test pit log, and petrographic forms. At a minimum, each photograph shall contain the following information:

- Photograph number (see below)
- Date
- Photographer's initials
- Field identification number
- Camera type and number of pixels

8.0 SAMPLE NOMENCLATURE SCHEME

The photograph number will be based upon the type of photograph (G, O, F, P, H, D, T), as defined below.

Letter in component 4	Definition
G	General
O	Historic
F	Field
P	Probe
H	Test pits, trenches, and long walls
D	Drill core
T	Thin section

The photograph (ID) number for G and O photographs will be a three letter designation for the feature, followed by the three letter initials of the photographer, followed by a G or O and a sequential number. GEN is used if a feature id is not appropriate. For example a photograph with the number GEN-VTM-G001 refers to photograph number 1 of a general type by VTM.

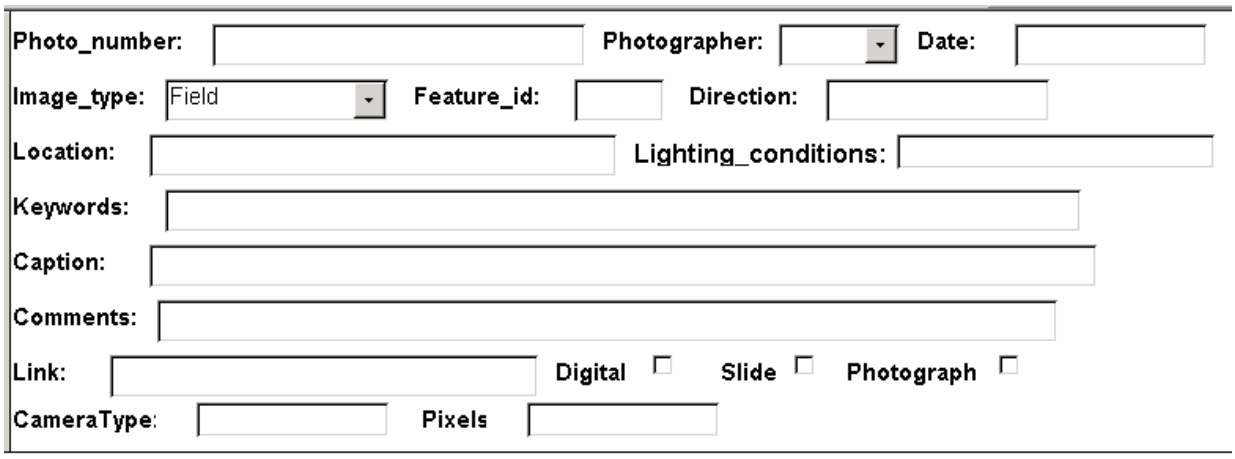
Test pit, trench, and high wall photographs will be designated by the three letter designation for the feature, followed by the test pit number (which includes three initials and three numbers), H, then a sequential number. For example a photograph number such as GHN-LFG-009-H002 is the second photograph of test pit LFG-009.

The photograph (ID) number for field, probe, and drill core samples will be comprised of the sample number (three components), and one additional component separated by dashes as discussed below. The fourth component of the photograph number will be identified with a letter (F, P, H, D) that corresponds to the type of photograph, followed by a sequential four-digit number. For example, a photograph number such as SSW-HRS-0001-F001 represents the first field photograph taken of field site SSW-HRS-0001. If no sample is collected of drill cores, test pits, then component 3 will be 000.

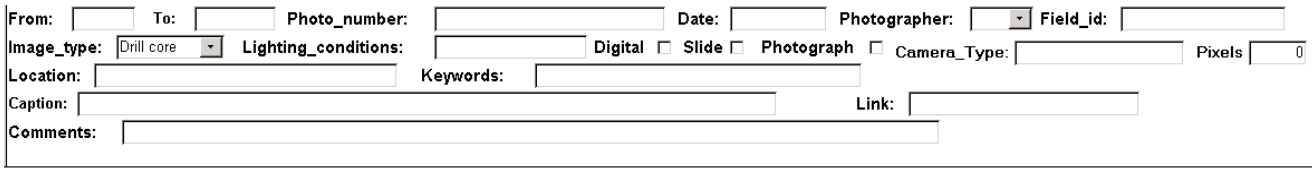
Component 1	Component 2	Component 3	Component 4
Three letter abbreviation for the mine feature, for example SSW for Sugar Shack West.	Three letter initials of the sample collector, for example HRS for Heather R. Shannon.	Sequential four number designation, for example 0001, if sample is collected. If no sample is collected, then the number is 000.	Letter representing type of photograph (see below), followed by a sequential three number designation, for example G001.

APPENDIX 1. FORMS

Field sample photograph form (part of sample field form and includes field_id).



Drill core photograph form (part of drill log form and includes hole_id).



Test pit photograph form (part of test pit log form and includes test_pit_id).