

# **STANDARD OPERATING PROCEDURE NO. 12** **FIELD INSTRUMENT MEASUREMENTS** **(including instrument calibration)**

REVISION LOG		
Revision Number	Description	Date
12.0	Original SOP	12/2/03
12.1	Revisions by PJP	5/19/2004
12v1	Finalized by LMK for posting to Molycorp website and to send to George Robinson for lab audit	3/27/07
12v2	Editorial by SKA	10/22/08

## **1.0 PURPOSE AND SCOPE**

This standard operating procedure (SOP) describes procedures that will be used to obtain field parameter measurements for surface water and groundwater parameter samples. These parameters are pH, temperature, and specific conductivity (S.C.). This SOP describes field measurement procedures, personnel responsibilities and qualifications, and quality assurance/quality control (QA/QC) procedures.

## **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 RELATED STANDARD OPERATING PROCEDURES**

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

SOP 7	Decontamination of Sampling Equipment
SOP 16	Groundwater Sampling
SOP 20	Well Development

### **4.0 EQUIPMENT LIST**

In addition to the equipment cited in associated SOPs for well development and groundwater sample collection (SOP No. 20.0 and 16.0, respectively), the following meters which are the current equipment available, or their equivalent, are required for the implementation of this SOP.

- pH meter with a temperature scale
- Specific conductivity meter
- Combination meters or flow-through cell meters may also be used.

### **5.0 FIELD PARAMETER MEASUREMENTS**

Several of the parameters required to be measured are physically or chemically unstable and must be tested either in situ or immediately after sample collection using a field test kit or instrument. Examples of unstable parameters include pH, temperature, and dissolved oxygen. Although the specific conductivity of a substance is relatively stable, it is recommended that this characteristic be measured in the field. Most instruments measuring specific conductivity require temperature compensation; therefore, the temperature of the samples should be measured at the time the specific conductivity is measured.

Sampling personnel shall wear chemical-resistant gloves, which will be disposed of between locations when performing field measurements.

#### **5.1 PROCEDURES FOR COLLECTING SAMPLE FOR FIELD PARAMETER MEASUREMENTS**

Collect water samples for chemical analysis as described in SOP 16. Additional sample (volume) will be collected and placed in a separate container (if not using an in situ probe) for measuring field parameters. Field parameter measurements may be taken immediately before or after sample collection depending on the type of sample collected. If determining parameter stabilization during well development, samples for field parameter measurements will be collected periodically. The sample container can be used to measure all field parameters of the

sample. After the measurements have been recorded, the water should be discarded. Do not use this sample for chemical analysis.

## **5.2 METER USE AND CALIBRATION**

Field instruments will be calibrated daily prior to commencement of field measurement activities. Solutions used for standardizing and calibrating will be checked prior to field mobilization to determine if the expiration dates have been exceeded. Any expired solution will be discarded appropriately and replaced with a new solution.

### **5.2.1 pH Meter**

The pH meter must be calibrated each day prior to well evacuation and water sample collection. Calibration and operation of the pH meter should follow the manufacturer's specific instructions. In general, calibration is done by adjusting the meter with standard buffers that bracket the expected pH of the aqueous samples. For specific instructions refer to the manufacturer's instruction manual. Calibration procedures are to be conducted according to the manufacturer's instructions. Record time, temperature, and instrument response information on the Instrument\_Calibration form (Appendix 1).

Field sampling personnel will measure pH as follows:

1. If the pH is measured in a container, rinse the sample container with deionized water and then rinse it three times with the water to be sampled prior to measurement. If using an in-flow multi-measurement system, measurements are continuously displayed.
2. Rinse the pH probe with deionized water. Be sure to protect the fragile glass bulb at the end of the probe from damage.
3. Immerse the electrode in the water, allow the pH to stabilize, and monitor the drift of the instrument. Do not immerse the electrode above the top of the pH probe.
4. When the pH reading stabilizes, record in the field logbook the temperature to the nearest 0.1°C and the pH reading to the nearest 0.01 unit.
5. Between measurements, store the electrode in pH electrode storage solution or equivalent solution, if possible, or put a cotton swab soaked in electrode solution in the protective cap of the electrode.
6. Decontaminate the pH meter/in-flow multi-measurement system and associated equipment in accordance with SOP No. 6.0, Decontamination of Sampling Equipment.

QC requirements for pH measurements are provided in Section 5.3.

### **5.2.2 Specific Conductivity Meter**

Conductance is a measure of the ability of an aqueous solution to conduct electrical current and is expressed in reciprocal ohms (mhos). The International System of Units uses the siemen(s) to represent mhos. Calibration procedures are to be conducted according to the manufacturer's instructions. Record time, temperature, and instrument response information on the

Instrument\_Calibration form ([Appendix 1](#)). The procedures for measuring conductivity are as follows:

1. If the conductivity is measured in a container, rinse the sample container with deionized water and then rinse it three times with the water to be sampled prior to measurement. Rinse the probe with deionized water. If using an in-flow multi-measurement system, measurements are continuously displayed.
2. Insert the probe into the sample.
3. Allow the reading to stabilize before recording measurements.
4. Record on the Instrument\_Calibration form the conductivity, the units of measure, any scale multipliers and temperature of the sample.
5. During normal use, rinse the probe thoroughly with deionized water between measurements to minimize the buildup of interfering substances on the probe element.
6. Decontaminate conductivity meter/in-flow multi-measurement system and associated equipment in accordance with SOP No. 7.0, Decontamination of Sampling Equipment.

QC requirements for conductivity measurements are provided in Section 5.3.

### **5.2.3 In-flow Multi-Parameter Monitoring System**

The in-flow multi-parameter monitoring system or similar multi-parameter instruments may be used for measuring pH, temperature, conductivity, D.O., ORP, and turbidity. In-flow meters allow for the analysis of purge water, in-line, as it flows so that sampling can begin as soon as water stabilizes. The manufacturer's operation and maintenance manual shall be followed when operating or calibrating the instrument.

## **5.3 QUALITY ASSURANCE/QUALITY CONTROL**

QA/QC activities will be conducted in accordance with the governing applicable documents as well as quality requirements presented in this SOP. As noted in Section 5.2, all meters will be calibrated daily prior to use. In addition, each meter will be inspected daily prior to calibration. Furthermore, as described below a duplicate set of field parameter measurements will be collected for every 10 sampling stations.

### **5.3.1 QC Checks and Acceptance Criteria**

One duplicate field parameter measurement shall be collected for every ten sampling locations (10% frequency). Field parameter measurements are considered satisfactory if the duplicate measurements fall within the acceptable range in the table below.

<b>Field Parameter</b>	<b>Acceptable Range</b>
pH	$\pm 0.1$ pH unit

Temperature	$\pm 10\%$
Conductivity	$\pm 10\%$

If duplicate acceptance criteria are not met, the instrument must be re-calibrated and new parameter measurements obtained at the sample location where the original duplicate sample did not meet acceptance criteria.

## 6.0 DOCUMENTATION

Documentation of observations and data acquired in the field will provide information on the activities conducted and also provide a permanent record of field activities. The observations and data will be recorded on the Instrument\_Calibration form (Appendix 1). Data from the field forms will be entered into the electronic database on a daily basis.

# Appendix I. Calibration of Molycorp Field Instruments form

FIELD MEASUREMENTS FOR WATER SAMPLES										
Field_id	Water _flow	pH	Conductivity	Alkalinity	Temperature	color	turbidity	SOP_ number	Deviation _SOP	Field personnel
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>