

Preliminary Procedure for Drilling and Coring of Wet- and Dry-Lake Sediments

By Larry Benson

Technical Detailed Procedure HP-37  
NNWSI Project Quality Assurance Program

U.S. Geological Survey  
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## Preliminary Procedure for Drilling and Coring of Wet- and Dry-Lake Sediments

### 1.0 Purpose

The purpose of this procedure is to establish a generalized methodology for the coring of wet- and dry-lake sediments and to provide a consistent method of sample labelling and logging.

### 2.0 Scope

This procedure shall be followed by all USGS personnel assigned to Nevada Nuclear Waste Storage Investigations (NNWSI) who perform such tests and by any contractor performing such tests for the USGS.

### 3.0 Modifications

This procedure is a research procedure and as such is given only in broad outline. The choice of drill rig and coring apparatus depends on availability as well as the type of material being cored, e.g., clay, silt, sand, or gravel. The choice of equipment will be made by the hydrologist/geologist in charge of the drilling operation after consultation with the chief driller. Drilling methods will be altered in the field in order to optimize core recovery. A log will be kept of changes in coring procedure. The log shall describe the change in procedure and the depths over which the procedure was utilized. A final procedure will be written following the work based on field notes and this preliminary procedure.

### 4.0 Principle

Lake sediments house the preservable remains of biological organisms (ostracods, diatoms, pollen, etc.) that lived within or on the periphery of the lake during past times. The lake sediments themselves are the product of weathering and depositional processes which have occurred within the lake drainage basin. The types and abundance of organisms and sediments are a function of the climate (environment) in which they were produced. By studying the sediment record, one can evaluate the nature of past climates.

## 5.0 Procedure

### 5.1 Equipment Needed

- 5.1.1 Drill rig such as a <sup>1</sup> Gardner Denver 17W for dry-lake coring or a Mobile B-62 rotary wire-line rig for wet-lake coring.
- 5.1.2 For wet-lake coring a barge assembly and auxiliary equipment for transporting drill rig from launch site to the anchorage point.

The barge assembly shall be of sufficient buoyancy and deck area to support safely a 17.5 ton drill rig, 17 tons of drill tools and supplies, the contractor's anchoring system, and up to 8 government workers. The minimum deck space shall be 2400 square feet. The barge shall be a maximum of 7 feet deep, and will, when all equipment and personnel are on board, have a minimum of 18 inches of freeboard.

The minimum barge depth shall be determined prior to initiation of work by the hydrologist/geologist in charge.

For wet-lake coring with a barge, an anchoring system adequate for a soft mud bottom in approximately 120 feet of water is required. The anchoring system must be able to withstand intermittent winds of up to 70 mph. The anchoring system is to be composed of anchoring devices, winches, line, and auxiliary hardware needed to secure the barge.

- 5.1.3 For dry-lake coring, a backhoe capable of excavating a mud pit 15 X 10 X 6 feet deep.
- 5.1.4 Coring apparatus such as Shelby tubes, pitcher sampler, split barrel sampler or spilt spoon sampler as requested by hydrologist/geologist in charge.

<sup>1</sup> Any use of trade names is for description purposes only and does not imply endorsement of USGS.

- 5.1.5 For dry-lake coring, a water tank capable of holding up to 40,000 gallons of water.
- 5.1.6 Synthetic polymer drilling mud, bentonite mud, and soap.
- 5.1.7 Split PVC tubing to hold core and/or aluminum foil to wrap core or cap ends of Shelby tubes.
- 5.1.8 Log book, pens, etc. with which to record coring and sample-handling process.
- 5.1.9 Permanent-marker pen and fiber, or duct tape for marking core.

## 5.2 Method

- 5.2.1 Drill core near the center of the dry or wet lake so as to maximize potential of coring wet-period geologic record.
- 5.2.2 For dry lakes, excavate a mud pit 6 feet deep and hand sample side wall of mud pit every 2 to 4 inches of depth. A hand-operated bucket auger can be used to sample the same interval if a mud pit is not used.
- 5.2.3 For coring a dry lake with a Shelby-tube Pitcher sampler: Drill with air rotary to 6-foot depth using a 7-7/8 inch or larger bit; set 6 feet of 6 inch PVC surface casing. Then attach Shelby-tube to the Pitcher sampler drill-rod assembly and mark the 6-foot level on Shelby-tube Pitcher sampler assembly. Lower the assembly into hole until the mark is at ground level. Mark off 2 feet - 10 inches on the Kelly rod. Begin table rotation at ~ 60 rpm. Drill core to mark. Ream hole ~ 2X with air and water to clean debris from the sidewall and base off the hole. Remove Shelby tube from assembly.
- 5.2.4 For coring a dry-lake bed with a core-barrel split-inner tube: Drill and set sufficient surface casing to get the core barrel in the ground. Drill to a sufficient depth to get Kelly Drive bushing unit

into rotary drive table. Lower assembly into the hole until the core barrel is at total depth and rotate at ~ 60 rpm. Mark inner-tube length on the Kelly; then drill the length of inner tube. Ream hole ~ 2X with air and water to clean the hole. Pull assembly and detach core-barrel split inner tube.

- 5.2.5 To log Shelby-tube cores: Log tube number, depth interval cored, and amount not recovered. Cap the ends of the tube aluminum foil and tape. Label tubes: lake designation, tube number, interval cored, arrow indicating top of the tube.
- 5.2.6 To process split-inner tube cores: Open barrel in convenient work location, note major lithologic breaks and where core loss, if any, may have occurred. Record in the log book. Wrap coherent pieces twice in aluminum foil and tape; bag unconsolidated intervals.

Label the core samples; for 10-foot inner tubes each 10-foot interval is a run; each coherent wrapped piece is a segment; note that segment numbers continue sequentially throughout the entire core; they do not restart at the beginning of each run.