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U.S. DEPARTMENT OF ENERGY

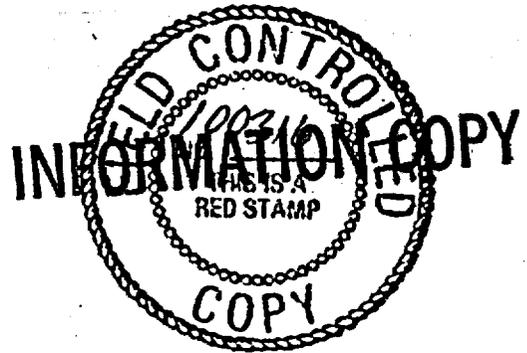
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YUCCA
MOUNTAIN

**YUCCA MOUNTAIN
SITE CHARACTERIZATION
PROJECT**

**CHEMISTRY, Eh, AND pH TESTS
OF GROUND WATER**



REVISION 2

**FIELD WORK PACKAGE
FWP-SB-97-004**



UNITED STATES DEPARTMENT OF ENERGY

YMP-267-RO
/97

**YUCCA MOUNTAIN SITE CHARACTERIZATION PROJECT
FWP APPROVAL**

QA: L

SECTION I (Project Engineer completes)

FWP Title:
Chemistry, Eh, and pH Test of Ground Water

FWP Identifier:
FWP-SB-97-004

Assigned Project Engineer/Preparer:
David Morreale

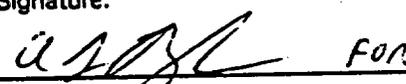
Affected Organizations:
CRWMS M&O (PIs, Constructor/Drilling Service Provider, TCO, CMO, Scientific Program Support, Photography Support)

HISTORY OF REVISIONS

Revision	Effective Date	Pages Affected	Reason for Change
0	07/21/97	N/A	Initial issue.
1	11/20/97	All	IncorpIncorporation of the driller's Work Program and streamlining of process.
2	06/15/98	4-6, 8-11, 13, 15-23, 25-29, Attachments 3 & 4	Update needs and requirements of PIs.

SECTION II (Project Engineer obtains signatures) (N/A for expedited changes)

The following signatures authorize field work to commence in accordance with this FWP and within the constraints identified in the Planning and Control System approved by the YMSCO.

SPO Manager Approval: Larry Hayes	Signature: 	Date: 6/8/98
Site Construction/Operations Manager Approval: Robert Sandifer	Signature: 	Date: 6-8-98
QA Manager Concurrence: Robert Clark	Signature: R.W. Clark	Date: 6/8/98
Support Operations Concurrence: P. Marler	Signature: 	Date: 6/8/98

SECTION III (Project Engineer obtains signatures) (N/A for non-expedited changes)

Work approved in the previous revision of this FWP may continue with the expedited changes identified in this revision. A full review of this expedited change will be initiated within 3 working days of the effective date of this revision.

TCO Manager: N/A	Signature:	Date:
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INTRODUCTION

This Field Work Package (FWP) controls activities related to the sampling and monitoring of boreholes UE-25 WT#17 and UE-25 WT#3 in accordance with the Quality Assurance Requirements and Description (QARD) requirements. Affected organizations are responsible for conducting field work in accordance with the Project requirement documents and this implementing FWP. The purpose of this work is to; (1) clean out the wells and remove existing piping and existing other equipment by pumping to purge stagnant water from the well, and (2) after the wells are assessed to be clean, allow a period for water chemistry stabilization to pump and test water from the wells to evaluate oxidation/reduction conditions in the saturated zone and to collect water samples for off-site analysis. The overall objectives of this activity are the characterization of the oxidation/reduction potential (Eh) and pH as it may alter the potential for radionuclide transport and minor element dissolved-ion geochemistry and isotopic analysis. The pumping effort is required to clean the boreholes and surrounding formations of drilling fluids used at the time of well construction and of the contaminated water altered by the oxidation of steel tubing for many years. The borehole cleaning, rehabilitation, and testing will be very similar to that used at USW WT-10. It is the affected organization's responsibility to determine the Quality Assurance (QA) program applicability for related activities in accordance with the Office of Civilian Radioactive Waste Management (OCRWM) approved QA program. The Test Coordination Office (TCO) may initiate addendums to this FWP to provide additional detail regarding the activities described and controlled herein.

1.0 SCOPE AND DESCRIPTION

1.1 GENERAL SCOPE DESCRIPTION

This FWP defines the process controls that will be utilized by the TCO to manage and coordinate cleanout of boreholes (UE-25 WT#17 and UE-25 WT#3), installation of non-metallic piping, and a pump with no exposed metallic compounds and field testing and sampling of saturated zone waters.

The following Site Characterization Plan sections apply to this test:

- 8.3.1.2.3.1 Characterization of the site saturated-zone ground-water flow systems.
- 8.3.1.3.1.1 Ground-water chemistry model.

1.1.1 Planned Test Activity, Location, and Site Improvement Description

Pls have requested the testing of boreholes UE-25 WT#17 and UE-25 WT#3 to aid in the collection of data necessary for hydrochemical evaluation of the saturated zone. The access roads and drill pads shall be maintained for the duration of this FWP.

Borehole UE-25 WT#17 is located 1/4 mile west of Yucca Mountain Road.
 Borehole UE-25 WT#3 is located 1/8 mile north of Yucca Mountain Road.

Table 1: Details for UE-25 WT#17

Well	Location	Completed Borehole Diameter (OD)		Depth (TD) (ft)	Depth to Water (ft)
		Diameter	Depth (ft)		
WT#17	Northing 748,420 Easting. 566,212 Elevation 3,689	10 3/4 O.D. casing	0 - 55	1450	1296
		8 3/4 borehole	55 - TD	fill at 1383	
		2 7/8" Casing & Screen	to 1376		

Table 2: Details for UE-25 WT#3

Well	Location	Completed Borehole Diameter (OD)		Depth (TD) (ft)	Depth to Water (ft)
		Diameter	Depth (ft)		
WT#3	Northing 745,995 Easting 573,385 Elevation 3,380	10 3/4 O.D.casing	0 - 40	1142	987
		8 3/4 borehole	40 - TD	fill at 1132	
		2 7/8" EUE tubing	to 1125		

1.1.2 Objectives

The scope of this test plan is to perform field measurements of the oxidation/reduction conditions in water pumped from boreholes UE-25 WT#17 and UE-25 WT#3 using the procedures discussed in Section 1.3. This will involve the measurement of Eh and pH using standard electrodes dissolved oxygen (DO), alkalinity, temperature, conductivity, and redox couples including Fe²⁺/Fe^{total}, H₂S/SO₄²⁻, and NH₄⁺/NO₂⁻/NO₃⁻. In addition, samples of the saturated zone waters will be collected for offsite analysis for pertinent water quality chemistry parameters including trace elements, cations and anions, isotopes, environment tracers (CFCs). The field data obtained through these measurements and analyses will be evaluated for consistency and estimates of accuracy and precision will be derived.

The data, evaluations and interpretations will be written up in a report to the Project Office.

One aspect of the measurement program that requires additional discussion concerns measurement of Eh and sampling of waters at different levels in the borehole. Reports of different types of corrosion and fouling at different levels on piping removed from the C-Holes suggest different redox conditions are likely to be present at different depths below the water table. Packer will be set 5' to 40' below static water level to preclude the impact of atmosphere oxygen.

The oxidation state of a redox sensitive chemical element (e.g., uranium, neptunium, plutonium, technetium) in solution is a function of the oxidation/reduction potential (i.e., Eh) of the solution. Compounds involving the lower oxidation states of the actinides and technetium (i.e., +4) are much less soluble (order of magnitude) than are compounds at the higher oxidation states. The performance assessments carried out to date suggest that neptunium and technetium (i.e., ²³⁷Np, ⁹⁹Tc) are major contributors to potential long-term doses at the accessible environment boundary. This reflects the conservative assumption that these constituents will be in their "oxidized" forms (i.e., +5 and +7 respectively) while transported through the Yucca Mountain flow system, and assumes that these radionuclides have reached the flow system.

Data on Eh presented by Ogard and Kerrisk (1984) suggest that conditions sufficiently reducing to stabilize these +4 oxidation states occur in some of the wells sampled on Yucca Mountain, while waters from other wells appear to reflect more oxidizing conditions. The problem with the Ogard and Kerrisk (1984) Eh analyses is that they were obtained with conventional techniques using either metal pumps or metal pipe with high pump rates or bailers open to the atmosphere. The use of pump and piping materials that are less redox sensitive (e.g., non-metallic) would allow much more accurate measurements of in-situ oxidation/reduction conditions. Further, in order to more fully constrain in-situ redox conditions in the saturated zone at Yucca Mountain, analyses of redox sensitive elements will be carried out.

1.2 SPECIFIC SCOPE DESCRIPTION

1.2.1 Test Plan and Organizational Responsibilities

Borehole Preparation

A workover of these boreholes (UE-25 WT#17, UE-25 WT#3) includes removal of current equipment from the holes purge boreholes, run pump shroud/packer replica using steel tubing to 20' above water level and removing, then installation of piping and pump, and pumping of ground water to obtain more natural ground water conditions. Borehole UE-25 WT#17 was drilled between 10/20/83 and 10/30/83. Borehole UE-25 WT#3 was drilled between 4/29/83 and 5/25/83.

UE-25 WT#17 AND UE-25 WT#3 Working Schedule Outline **Pre-Work Activities**

Receive approval from the Management & Operating (M&O) Contractor TCO to proceed.

Contact Principal Investigator (PI) 3-5 days prior to pulling existing tubing.

Notify Yucca Mountain Site Characterization Office Environmental (YMSCO), Safety and Health (ES&H) Department prior to commencing work.

- Receive Environmental Land Access Approval.
- Receive permit (Water Appropriation) to discharge water.

Conform with the provisions of the Approval of Land Access and Environmental Compliance document.

Refurbish U. S. Geological Survey (USGS) field trailer:

- Procure and install four new tires of the appropriate size and rating.
- Checkout and bring to current standards the electrical system.
- Checkout the air-conditioning/heating system of the trailer and refurbish as needed.
- Clean out the trailer of all debris except for the work benches, tables, and chairs.
- Clean and disinfect the inside of the trailer as a means of hazard control for Hantavirus.
- Items removed from trailer are to be placed into a locked USGS cage near the HRF.
- Plumb the trailer with PVC piping similar to the sketch in Attachment 7, in order to accommodate the Eh/pH testing. (*Note: the discharge water shall not come in contact with metal until after it exits the specialty plumbing going through the trailer.*)

Repair/maintain the access roads from the point of departure from the "Crest Road" to the pad for the duration of this work package.

Move In Rig Up

Mobilize Class XI drill rig (e.g., Failing 1500) and supporting equipment to site. (M&O Teammates may authorize the use of a different class rig).

Mobilize the refurbished USGS field trailer to the pad and set-up trailer for sampling & testing (Position trailer according to Attachment 6 sketch).

Install and test generator(s).

Provide 120 volt electrical power to the USGS field trailer, in accordance with M&O electrical recommendations.

Install and test electrical grounding system. Testing of the electrical grounding system and associated circuits shall be documented by a qualified Constructor/ Drilling Service Provider (CSP) electrical worker and verified by the rig superintendent.

- Ground electrical equipment on location in accordance with the 1996 National Electrical Code (NEC) Article 250 and 305 requirements.
- Graphite-based materials, such as "GEM", are an acceptable grounding medium.
- Any subsequent changes to the electrical grounding system shall be supervised and tested by a qualified CSP electrical worker and witnessed by the rig superintendent.
- Display a copy of grounding documentation at the location. Submit the original documentation at the CSP field office until the drill rig is demobilized. After demobilization, the original will be submitted with the record package(s).

Tag bottom of borehole with the current monitoring string. The depth shall be recorded on the Field Drilling Engineer (FDE) Daily Operations Report.

Pull and lay down the monitoring string and wellscreen tubing.

Possibly collect discrete zone water samples based on distribution of corrosion of removed monitor tubing.

Procure and clean 1,420 ft of 2 7/8" EUE-8-RD steel casing and wellscreen for monitor string for UE-25 WT#17, and 1,200 ft for UE-25 WT#3.

- All tubulars and the wellscreen shall be cleaned of grease, scale and/or rust to the extent determined adequate by the FDE and TCO.
- Cleaning may include running a brush and/or swab through the tubing and screen.
- Recommended wellscreen shall have 1/8" X 2" slots, with 24 slots per foot, (resulting in a minimum open flow area of 24 sq in, but may be changed by the M&O Teammates), and will be equipped with a bull-nosed cap on the bottom.
- Tubing shall be drift checked to assure that the I.D. of the tubing will accept the CSP water level probe.
- Install new 2 7/8" EUE monitoring string, screen and bull nose cap.

Run a conventional progressive cavity pump (i.e., Moyno model 20-H-685, 10 stage).

- Run the pump stator on a 3 ½" O.D., EUE, 8rd, 9.3lb/ft, J-55 tubing string.
- Land the pump intake at a depth of 1,368 ft for UE-25 WT#17, 1,084 ft for UE-25 WT#3, or as dictated by hole conditions and as directed by the TCO.
- Hook-up the electric/hydraulic power unit on the surface to enable adjustment of speed of the progressive cavity pump assembly.
- Deliver a water level probe, owned CSP, to the borehole pad.

Deliver Baker Tank(s), discharge piping to drill site.

Construct discharge system. A tank will be needed to hold at least 6 borehole volumes of water.

Receive orders from the TCO to start pump. Receipt of orders will be documented in the Scientific Programs Support (SPS) Engineer's Daily Field Operations Report.

Pre-test Clean out

Purge the well by pumping a minimum volume of six borehole water volumes or as directed by the TCO, from the borehole to allow representative water samples to be obtained for additional water quality analysis.

Install water level transducer. Using the water level probe, monitor drawdown in the monitoring string during pumping.

Store the discharged water in tanks until approval for surface discharge of purged water is received from the M&O Environmental Programs Department (EPD), or designated representative, to discharge the purged water.

- Location of discharge point shall be coordinated between the TCO and M&O Environmental. Open discharge to the dry drainage is the approved method for disposal of the pumped water.

Obtain water samples for water quality analyses, as requested by M&O Environmental.

- Sample containers shall be supplied by M&O Environmental, or representative.
- M&O Environmental shall be responsible for the collection and analysis of water samples.

Install a surface discharge pipeline (Nominal 3.5" O.D. X 3.07" I.D.) from the borehole wellhead to the discharge point.

- Minimum distance to the discharge point shall be 100 ft down grade along the flagged route.

NOTE: No water shall be discharged until written approval is provided by the M&O Environmental Sciences Department.

Install a totalizing flowmeter in the surface discharge pipeline, in accordance with Manufacturer's instructions and/or TCO requirements.

Install a safety relief valve (set to release at pressures of 50-120 psi, as determined by the FDE) at the wellhead immediately upstream from the connection point of the surface discharge pipeline. Disposal of any released fluid will be by hose to the discharge water storage tanks.

TCO personnel shall oversee wellbore cleanout conducted by the contractor, until the well is clean or until the PI has determined that sufficient pumping has been done to satisfy the current test's requirements.

The pumping rates shall be between approximately 18-80 gpm. Each change in pump rate will be documented on the SPS Engineer's Daily Operations Report.

- If the water level drops to within 50 ft of the pump intake, as determined by readings from the pressure transducer, the pumping rate shall be reduced to a new rate determined by the PI and/or TCO to avoid a pump-off situation.
- Provide personnel to operate pump and monitor/support pump testing operations during daylight shift only. If daily pumping is prematurely terminated or changed to avoid a pump-off situation, while the PI is not on location, CSP shall document this change and immediately notify the PI and TCO.

The TCO site representative, in concurrence with the PI shall determine the adequacy of the borehole cleaning and will direct the termination of pumping.

Pull and lay down the progressive cavity pump from the borehole, and wait on orders.

Beginning at this time, water level and water chemistry will be given six weeks to stabilize.

Borehole Testing

The preferred method to the measurement of Eh in UE-25 WT#17 and UE-25 WT#3 saturated zone waters, involves pumping water from the saturated zone using non-metallic enclosed pump (i. e., minimal metal exposure) with non-metallic piping in a borehole free of metallic components (e. g., metal casing, metal pipe) below the water table. The pump system will have an epoxy coating on total internal/external surfaces exposed to water. The water will be pumped to the surface and passed through a flow-through measurement cell containing a pH electrode, an Eh electrode, reference electrodes and a temperature sensor. The

water will be maintained under a sufficient overpressure, in non-metallic pipes, to prevent degassing. Water samples will be taken from the flowing well for analysis of other chemical constituents. Alternatively, the pressurized containers could be taken to a location at which the atmospheric pressure is equivalent to that at the water table. Some of the chemical analyses will be carried out in the field (e.g., alkalinity, DO, redox couples) while other analyses will be carried out in a laboratory (e.g., major cations and anions, silica, and isotopes, CFC's trace elements). The packer assembly will be fluoropolymer coated (~ 98% - 99% of components).

UE-25 WT#17 and UE-25 WT#3 Pump Test

Eh/pH Ground Water Testing Conduct LANL testing activities.

Deliver standard equipment to log well for Eh and pH, received from PI. The equipment consists of a probe connected to an electrical cable. The signal from the probe is fed to a Eh/pH meter at the surface. The PI shall install and operate probe. The TCO site representative shall be on site overseeing PI's activities.

Fabricate a pump shroud/packer mandral (i.e., dummy pump shroud/packer made from steel pipe and plate) with an approximate 7½" diameter.

Run the dummy assembly using 2-7/8" OD steel tubing to 20 ft above the water level in the borehole. Trip out the borehole with dummy assembly and lay down. (Note: If hole problems are encountered during the running of the dummy assembly, the M&O Teammate shall come to agreement on the next step of action to condition the hole for pump/packer system installation.)

Procure and clean 1,500 ft of 2-7/8" OD 8-RD long form threaded and coupled API model 1,510 downhole fiberglass tubing and 1-1/2" nominal size 10-RD threaded and coupled fiberglass tubing. All composite tubulars shall be cleaned of grease and checked internally for unwanted materials to the extent determined adequate by the FDE and TCO.

Deliver special pump, support equipment and fiberglass tubing to the wellsite. Also, ensure USGS field trailer, a generator and Baker Tank are at the wellsite.

Pickup and assemble electrical submersible pump (epoxy coated), pump shroud, electrical pump cable, and 1-1/2" nominal size 10-RD fiberglass tubing. The onsite pump representative shall make the electrical pump cable and pump leads splices. Run the assembly in the borehole to the location of the inflatable packer.

Install and inflate packer (fluoropolymer coated), using nylon inflation tubing, and feed the electrical pump individual electrical conductors through the packer feed through sub. The onsite packer representative shall make the nylon tubing

connection to the packer. Use only adhesive tape and nylon straps to secure the electrical pump cable and inflation tubing to the fiberglass pipe below the water table. If required, install steel bands at a minimal to secure the tubing and cable to string not in contact with the water.

Run the pump/packer assembly using 2-7/8" OD 1510 downhole tubing to the desired depth in the hole for Eh/pH testing. The onsite packer representative shall terminate the nylon tubing, install the inflation kit, and regulator to argon gas containers.

Inflate packer using argon gas.

Land the pump/packer string using the wellhead assembly provided by the pump vendor. The pump/packer assembly string shall be landed with the fiberglass tubing in tension. (The pump/packer assembly string shall not be placed in compression.)

The pump representative shall setup/assistance in the hookup of the variable speed drive and electrical pump cable at the surface. Provide generator set up and electrical power to the pump system.

Install the 2" PVC pipe discharge from the wellhead to the water quality test trailer. Install discharge line similar to the Site Equipment Layout Sketches for WT#17 and WT#3 in the Attachments. The discharge line from the water quality test trailer to the approved discharge point may be constructed of steel, PVC pipe, or fire hose (i.e., discharge line similar to borehole purging activities).

Install a pressure gauge (0-120 psig) in the surface discharge pipeline in close proximity to the totalizing flowmeter, to provide some safeguard to the PVC flow-through instrument system in USGS trailer.

Install a totalizing flowmeter in the surface discharge pipeline, in accordance with Manufacturer's instructions and/or TCO requirements.

Receive order from the TCO to start pump. Receipt of orders will be documented in the SPS Engineer's Daily Field Operations Report.

Start pump at the lowest possible rate and pump well for testing.

The TCO site representative, in concurrence with the PI, shall determine the adequacy of the borehole testing and shall notify the M&O teammates and will direct the termination of pumping.

Direct discharge to and through modified USGS field trailer, such that produced water does not contact metal. Following flow path through trailer, water will be discharged to the ground in purging stage of test.

Nothing will be left in the hole after completion of measurements.

Borehole Sampling

Sampling at boreholes UE-25 WT#17 and UE-25 WT#3 will consist of field measurement of the oxidation/reduction conditions in the ground water. This will involve the measurement of Eh using standard electrodes in a closed, non-metallic circuit within the modified field trailer. In addition, the waters will be sampled and analyzed for pertinent water quality parameters including pH, DO, alkalinity, trace elements, isotopes, environmental tracers (CFCs), major cations and anions, silica, conductivity, and several common redox couples.

Completion of Work

Remove pump, packer and tubing from borehole.

Install long-term monitoring string(s) in each well as follows (or as determined by the TCO):

- 1 string 2 7/8" internally flush with a minimum of 12 ft of slotted screen, as described above and a bullnose cap at bottom.
- Depth to be determined by USGS and TCO.

Report all TFMs.

Demobilize drill rig.

Install a cap and lock on the surface casing for borehole security in accordance with Borehole Protection and Access Procedure. Return key to the designated representative for borehole security.

The CSP drilling superintendent, FDE, and TCO shall visually check the drill pad, produced water discharge area, and access road(s) for surface characteristics that may prevent proper drainage, and correct accordingly.

Fishing and System Repair Contingency

Repair all systems as needed.

Complete fishing activities as needed (Use professional fisher person, if needed, as determined by concurrence between TCO, SPS, Construction Management Organization [CMO], and CSP lead people).

ORGANIZATIONAL RESPONSIBILITIES

The organizations involved in implementing work under this FWP, as currently assigned by the U.S. Department of Energy (DOE), the Yucca Mountain Site Characterization Project (YMP) Planning and Control System (PACS), and the governing manager, include:

TEST COORDINATION OFFICE

The TCO is responsible for coordinating and monitoring test activities in support of participants and the YMSCO, and providing regular reports on test status. The TCO shall assign a Data Manager and a FWP Records Coordinator (FWPRC) to monitor the FWP records process. The TCO has the responsibility to schedule and coordinate field activities with all affected organizations of the Project, to define requests, and control field work scope that fall within the approved scope of this FWP. These responsibilities, when shared with the sponsoring recognized organizations, will ensure that data and information gathered from the test activities described herein will meet requirements for site characterization and be consistent with the M&O Safety & Health Plan. The TCO is responsible for test coordination and implementation and maintains a Field Test Coordinator (FTC) and Field Test Representative (FTR) or Designee in the field whenever construction or test-related activities are occurring. These representatives are responsible for ensuring that all testing requirements and constraints are adequately met during test set-up and implementation consistent with test design and implementing documents.

NATURAL ENVIRONMENT PROGRAM OPERATIONS/PRINCIPAL INVESTIGATORS

The Natural Environment Program Operations (NEPO) will provide Scientific PIs, scientific staff, instrumentation and equipment necessary for providing, maintaining, and calibrating all required scientific equipment and instrumentation, accepting and instrumenting the scientific borehole, conducting, monitoring and reporting the field tests (in accordance with applicable procedures). The PIs will request all field test support functions through the TCO. The PIs are responsible for ensuring that the data and information gathered during test activities described herein are acceptable to meet requirements for site characterization and are qualified in accordance with QA requirements.

CONSTRUCTION MANAGEMENT ORGANIZATION

The CMO will provide a management interface between the TCO and M&O Constructor. The TCO will coordinate testing field activities with the CMO and the CMO will ensure that all testing related construction and setup is provided. The CMO is responsible for safety oversight of all construction activities.

CONSTRUCTOR/DRILLING SERVICE PROVIDER

The CSP will conduct workover operations, road enhancement, drilling operations,

labor and materials, assist in sample collection, and borehole testing support. Construction-related TFM and daily reports will be provided.

SCIENTIFIC PROGRAMS SUPPORT

SPS will provide FDE personnel and SAMPLE COLLECTION personnel to be scheduled and called out by the TCO. The FDE is responsible for drilling workover-related measurements, monitoring and analyses of test activities, and other activities as required by the TCO. The FDE is responsible for oversight of workover system configurations and will support the TCO, U.S. Department of Energy (DOE), and CMO as subject matter experts for drilling engineering. Sample Collection personnel will provide appropriate identification, packaging, and shipping support for any samples collected as identified by the TCO.

PHOTOGRAPHY SUPPORT

Photography Support personnel will provide Photography and Photography processing support including archiving and distribution to assist in the documentation of testing activities as coordinated through the TCO. Call out for this support, as defined by the DOE or PI will be coordinated through the TCO.

1.2.2 Field Testing Equipment

Pump(s), PVC and fiberglass piping, instrumentation and testing equipment, and mobile data collection trailer will be used for this activity. Additional testing equipment is identified in the PI's procedure. The PI will provide special equipment to conduct Eh and pH logs of the boreholes.

The PI organizations will provide the testing equipment required for field activities and will have approved procedures and or scientific notebook procedures to follow when using this equipment. PIs are responsible for maintaining documentation for testing equipment, calibration and methods used to collect data.

1.2.3 Computer Software

Software (excluding that which is an integral part of measuring and test equipment) that uses numerical methods for complex scientific, engineering, or mathematical calculations will be controlled in accordance with appropriate QA procedures. No manipulation of raw data will occur in the field during data collection, unless performed by the PI under approved procedures or documented in the PI's scientific notebook. No data manipulation software is identified at this time.

1.3 IMPLEMENTING FIELD DOCUMENTS

This FWP provides the process controls utilized by the TCO to manage testing for UE-25 WT#17 and UE-25 WT#3 boreholes. The TCO will implement the

preparations for and the conductance of test-related activities in conjunction with the affecting referenced work program. Activities performed are to conform with the provisions of the Approval of Land Access and Environmental Compliance document.

The following procedures, or their equivalents, will be utilized to conduct work within the scope of this FWP. (The roles and responsibilities by which these procedures are applied in executing the work are presented in Section 3).

Procedure Number	Title
AP-17.1Q	Record Source Responsibilities for Inclusionary Records
LANL-CST-DP-35	pH Measurement
LANL-CST-DP-101	Colloid Sampling for YAP Studies
LANL-YMP-QP-03.5	Documenting Scientific Investigations
NWI-DS-001Q	Field Logging, Handling, and Documenting Borehole Samples
NWI-DS-002Q	Field Drilling Support Activities
SN0104	Saturated Zone Hydrochemistry Sampling
YAP-2.8Q	Tracers, Fluids, and Materials Data Reporting and Management
YAP-13.1Q	Borehole Protection and Access
YAP-30.2	Land Access and Environmental Compliance
YAP-SII.4Q	The Collection, Submission, and Documentation of Non-Core and Non-Cuttings Samples to the Sample Management Facility
YAP-SIII.3Q	Processing of Technical Data on the Yucca Mountain Site Characterization Project

1.4 Data and Other Deliverables

1.4.1 Data Submittals

The Site Characterization results obtained from testing these boreholes will provide information to confirm the 3-D Geologic Framework Model and hydrologic transport models. Information for the 3-D Geologic Framework model is gathered and collected through the Technical Data Information Form (TDIF). These models support work required for Performance Assessment, the Total System Performance Assessment, and the License Application. The PIs have the responsibility for the collection, analysis, submittal, and reporting of data in compliance with Project and participant plans and procedures for their specific

testing activities as described in this FWP. The TCO Data Manager in conjunction with the PI manages and facilitates the flow of test-related data. Data record responsibility is addressed in Section 6.0 of this FWP. All transfers of data between participants or to outside parties shall be conducted in accordance with YAP-SIII.3Q.

1.4.2 Test Deliverables

**Test Products: Measurement of Eh and pH in Saturated Zone Water
A/E Technical Support to SBT Activities
Sample Acquisition and Management**

1.5 Planned Tracers, Fluids, and Materials Usage and Determination of Importance Evaluation (DIE)

The CSP shall record daily water use by application and report this information as well as all construction-related TFM use/removal. The TCO shall report testing related use/removal. TFM reporting will be done in accordance with YAP-2.8Q. TFM requirements contained in the DIEs shall be applied as QA controls to limit potential impacts for these activities.

Any TFM planned for the testing of Boreholes UE-25 WT#17 and UE-25 WT#3 will have been approved before use. Refer to Section 3.2 for contingency plans for TFM usage.

All work shall be in compliance with: DIE BAA000000-01717-2200-00101, Rev. 00, "DIE for Surface-Based Testing Activities." Requirements contained in the DIE shall be applied as QA controls to limit potential impacts from these activities.

2.0 SAMPLING PLAN

Sample locations, sampling of water at different levels in the boreholes, will be identified by the affected PIs, and provided to the TCO. The current version of YAP-SII.4Q, and applicable PI procedures, shall be used to document collection and provide traceability of all water samples taken from the borehole. The measurement of Eh and pH in boreholes UE-25 WT#17 and UE-25 WT#3 involves pumping water from the saturated zone using a pump with minimal metal exposure to the ground water, and non-metallic (i.e., fiberglass and/or PVC) piping from below the water table to the test instruments. All metal will be coated with epoxy or teflon sealant below the water table. The water is pumped to the surface and passes through a flow-through measurement cell containing a pH electrode, an Eh electrode, reference electrodes and a temperature sensor.

Requirements for collecting the sample are to indicate the time, date, and the depth zone of borehole sample production when collecting the sample, and then fill the sample bottle from the return water coming out of the borehole. PI organizations will provide all non-standard sample packaging materials, transportation containers, and any associated equipment prior to the sample collection activity. PI organizations shall provide specialty equipment needed to gather non-standard data or information.

2.1 Master Sample Matrix for Activity

Type of Sample	Organization	Sampling Intervals
Groundwater Samples	LANL	Below Water Table
Groundwater Samples for Measuring Colloids	LANL	Below Water Table
Groundwater Samples for Isotopes, Trace Elements, and CFCs	USGS	Below Water Table
Groundwater Samples for Major and Minor Isotopes and Trace Elements	UNLV	Below Water Table

2.2 Contingency Plans for Sampling

In instances where a sample or test location is identified, but the sample or test is not required immediately or sampling is constrained due to safety or construction considerations, the TCO may identify a construction or test exclusion zone to allow later sampling.

Should the PI determine that metal contamination to the borehole water has occurred, every effort should be made to remove the contaminate. The PI may direct sample collection to be deferred, four to eight weeks for re-equilibration.

3.0 WORK IMPLEMENTATION AND CONTROL

3.1 Construction, Site Improvements, and Testing

The following list of activities includes those that both implement QARD requirements and management guidance. Items flagged with QA: are recognized as being quality affecting unless specifically graded out by the organization performing the task. Items specifically graded out shall be appropriately documented and controlled in the organization performing the task. Items identified with a QA:N/A do not implement QARD requirements and are therefore considered administrative in scope.

Work in the field shall be in compliance with the Surface-Based Testing Facilities Requirements Document (SBTFRD).

GENERAL ITEMS

QA: AFFECTED ORGANIZATIONS are prohibited from bringing chloride-based materials (e.g., NaCl, MgCl) on the pad or emplacing them in the borehole (e.g., as an electrical grounding medium for pad equipment, without documented evaluation and approval by the TCO prior to utilization.

QA:N/A PIs, SPS personnel who perform testing activities specific to this FWP, shall coordinate field activities through the TCO.

QA:N/A The TCO will serve as point-of-contact for all testing activities defined in this FWP.

QA:N/A The CMO will transmit direction from the TCO to the constructor/drilling service provider.

QA:N/A The TCO shall ensure that Photography and support services are provided as needed by the PI to collect scientific data.

QA:N/A The TCO will initiate and communicate tasks identified in this FWP.

QA:N/A Throughout the implementation of this FWP, the TCO will provide regular reports to the DOE and M&O Managers addressing test specific progress.

QA:N/A PIs will provide necessary information to support TCO planning, management, and reporting requirements.

QA: A list of sample numbers, which the TCO submits to the Records Processing Center (RPC), will be provided by **SAMPLE COLLECTION SUPPORT** and the PIs to the TCO.

QA:N/A The **CONSTRUCTOR/DRILLING SERVICE PROVIDER** will provide labor, support equipment and materials required for test instrumentation installation, including surface support equipment, grouting, lifting, and access, as directed, coordinated and scheduled by the TCO, through the CMO.

QA:N/A: AFFECTED ORGANIZATIONS will participate in the CSP's daily Toolbox Safety Meetings that are held at YMP worksite.

QA:N/A The TCO or designee may also conduct and document additional testing specific Toolbox Safety Meetings as necessary, as agreed to by the CMO.

QA: The **CONSTRUCTOR/DRILLING SERVICE PROVIDER** may not use potable water nor DUSTAC for dust suppression, no chlorine-containing salt grounding solutions.

QA: The TCO will visually check drill pad for changes to drainage characteristics that would create preferential flow into the borehole and for evidence of water ponding. These checks will be scheduled to the most restrictive of the following criteria: (1) at least monthly during construction/maintenance activities, (2) at least yearly during non-site disturbing activities, or (3) within 72 hours after 1 inch of liquid precipitation falls within a 24 hour period (as measured at the EFPD Site 1 [NTS-60] Weather Station near North Portal).

QA: The **CONSTRUCTOR/DRILLING SERVICE PROVIDER** shall take measures (e.g., grading, borehole casing above g/p and cap) to prevent uncontrolled surface water (e.g. precipitation, pad runoff) from entering the borehole, pumpable water shall be removed upon discovery.

QA:N/A PHOTOGRAPHY SUPPORT personnel will take Photographs as directed by the TCO and provide a list of Photograph identifiers.

QA:N/A A list of Photograph negative numbers supporting this FWP shall be submitted to the RPC by the TCO according to approved Project procedures.

QA: **AFFECTED ORGANIZATIONS** shall minimize the amount of hydrocarbons (i. e., hydraulic fluid, fuels, oils, etc.), coolants, acids, paints, powders, solvents, cementitious materials, or other non-committed TFM spilled, lost, or purposely emplaced on the pad, access road, and/or borehole.

QA: The **CONSTRUCTOR/DRILLING SERVICE PROVIDER** will check vehicles for hydrocarbon leaks at least monthly, and will contain, mitigate and repair hydrocarbon leaks in excess of drips from all site sources upon discovery.

QA: PIs are responsible for collection, management, and submittal of data, in compliance with Project and applicable PI plans and procedures. All transfers of data between YMP Participants, submittal of data to the YMP database, and transfer of data to outside parties shall be conducted in accordance with YAP-SIII.3Q, "Processing of Technical Data on the Yucca Mountain Site Characterization Project," and other applicable plans and procedures.

QA: Daily records shall be made and reports shall be provided monthly by the **CONSTRUCTOR/DRILLING SERVICE PROVIDER** in accordance with YAP 2.8Q

Tracers, Fluids, and Materials (TFM) Data Reporting and Management, of water usage for construction and workover activities on the pad(s).

QA:N/A Measures shall be taken by **CONSTRUCTOR/DRILLING SERVICE PROVIDER** to ensure that secondary containment (e.g., plastic sheet liner material) is provided for systems containing considerable quantities of any fluids, for which there is a potential concern of a spill or release to the environment.

QA: AFFECTED ORGANIZATIONS shall leave surface casings in place or re-install them if removed to prevent surface water intrusion into boreholes.

QA: The **CONSTRUCTOR/DRILLING SERVICE PROVIDER** shall limit water application to 2.6 ft/yr, or 0.48 gal/sq. yd. per day unless approved by the Safety Assurance Department and they shall prevent ponding of water.

QA:N/A The **TCO** and/or **PROJECT ENGINEER** will notify the **PI** prior to work beginning, and prior to the removal of existing tubing and other existing equipment currently in the boreholes, so a sample(s) of corrosion production may be obtained.

BOREHOLE PREPARATION ACTIVITIES

QA:N/A The **TCO** will coordinate the collection and documentation of water samples generated from testing activities associated with this FWP.

QA:N/A The **CONSTRUCTOR/DRILLING SERVICE PROVIDER** will supply the personnel to operate and maintain DOE equipment.

QA:N/A The **TCO** will maintain a presence on behalf of DOE.

QA: The **CONSTRUCTOR/DRILLING SERVICE PROVIDER** or **FIELD DRILLING ENGINEER** will measure daily water use and removal in accordance with the TFM procedure consistent with the State Permit UNEV89031.

QA: The **FDE** will report to the **TCO** water usage during workover and pump test priming operations.

QA:N/A The **CONSTRUCTOR/DRILLING SERVICE PROVIDER/ FIELD DRILLING ENGINEER** will: (1) note a general activity list in the daily/shift logs; (2) note who is the driller on site during workover operations; and (3) note changes to drill rig class.

QA:N/A, CONTRACTOR/DRILLING SERVICE PROVIDER to report diesel fuel usage, hours, and type of equipment operated on a monthly basis to EPD.

QA: The **FIELD DRILLING ENGINEER** will provide on-site monitoring and report workover/pump test activities on a Daily Operations Report.

QA: Following the completion of workover activities, the **PIs** or designee shall inspect and document to the **TCO** any unacceptable borehole characteristics and provide to the **TCO** further direction to obtain a suitable borehole.

TEST INSTRUMENTATION AND INSTALLATION

QA: The **PIs**, or scientific staff shall install instrumentation in accordance with their **QA** technical procedures or scientific notebook procedures.

QA:N/A Water pump control shall be in accordance with the State Permit. The **CONSTRUCTOR/DRILLING SERVICE PROVIDER** shall assure that the total amount pumped does not exceed that stated in the permit.

QA:N/A Prior to discharging water, the **CONSTRUCTOR/DRILLING SERVICE PROVIDER** will obtain approval from the **M&O EPD**.

QA:N/A The **PI** or **TCO** may request the **Constructor/Provider** to provide labor, support equipment and materials for grouting to be done to secure any instrument package in a borehole or to the surface of the rock.

QA:N/A The **TCO** or **PI** shall ensure that non-metallic piping is used and that the pump has minimal metal components exposed to the ground water.

TESTING

QA: The **PIs**, or scientific staff will collect field data in accordance with scientific notebook procedures identified in Section 1.3 or other applicable **QA** procedures.

QA: The **PIs**, or scientific staff personnel will collect water samples in accordance with **YAP-SII.4Q**.

QA: The **PI** will transmit initial and reduced data to the records system in accordance with **YAP-SIII.3Q** as identified in Section 6.1 of this **FWP**.

QA:N/A The **CONSTRUCTOR/DRILLING SERVICE PROVIDER** shall ensure that existing instrumentation in the borehole (i.e., transducers) are replaced, if required. The **TCO** will notify the constructor prior to completion.

POST-TEST CHARACTERIZATION

QA: The **PI** will install instrumentation and/or conduct post-test characterization

activities in accordance with their QA technical procedures or scientific notebook procedure.

QA:N/A The PI will identify instrument packages to be removed. Nothing belonging to PI shall remain in hole.

FISHING OPERATIONS

QA:N/A In the event drilling tools and/or equipment are lost downhole; the CSP will use a fishing subcontractor or recover lost items.

QA:N/A Prior to initiation of downhole fishing operations, a mutually agreeable fishing plan shall be developed and agreed upon by the TCO, FDE, CSP, and fishing subcontractor.

SYSTEM REPAIR

QA:N/A The CSP will maintain and repair drilling system components, as required, to ensure safe operations and will not compromise the goals of this FWP.

3.2 Contingency Plans

Any item lost in the borehole will be evaluated and pursued using fishing operations for recovery using requirements listed in the Surface-Based Testing Facilities Requirements Document (YMP/CM-0022). If not recoverable, it shall be reported and recorded in the TFM database in accordance with YAP-2.8Q. If fishing operations are implemented, water use shall be kept to a minimum, maintained and a permanent record kept as stipulated in the Surface-Based Testing Facilities Requirements Document (YMP/CM-0022).

No foreign material is to be left in or around the borehole following completion of the drilling activity to the extent practical.

Every effort shall be made to avoid spilling of fuels, lubricants or coolants into or around the borehole area. Should spills occur, the area should be cleaned up as much as practical (e.g., recovery of oil-soaked sand). Any spilled materials not recovered shall be recorded in terms of quality, description of local area impacted, and nature of material spilled. This record shall be entered into the activities records and reported to the TFM Manager in accordance with YAP 2.8Q.

3.3 Prerequisites and Hold Points

No QA Hold Points and Prerequisites apply.

3.4 Stop Work

Affected organizations must inform the TCO if quality-related work elements cannot be conducted as described in this FWP. The TCO will, if applicable, stop work on those elements. If FWP revisions are required, work on affected elements will be stopped until the modifications have been completed and controlled by the Project. The Assistant Manager for Environmental, Safety and Health (AMESH) or any individual may stop work for any Safety and Health (S&H) related issues if an imminent danger exists. Employees' rights relating to S&H imminent danger conditions are described in Section 1.8.3 of the M&O Safety and Health Plan.

3.5 Special Instructions

N/A

4.0 ADMINISTRATIVE (NON-QA) INSTRUCTIONS

4.1 Environmental, Safety & Health

4.1.1 Environmental

Environmental Compliance

All work done by affected organizations shall be in compliance with the Environmental Stipulation Letters produced for the activities at the UE-25 WT#17 & UE-25 WT#3. (Listed as #13 in Section 8, page 28.)

4.1.2 Safety and Health

1. General S&H requirements apply to this test activity; there are no specific requirements.
2. Participating organizations shall comply with the requirements of the M&O Safety and Health Plan and established M&O procedures and rules.

Safety and Health Roles and Responsibilities: The TCO and the M&O for the YMP regards the S&H of all employees to be of paramount importance. In order to establish and maintain a high degree of S&H awareness on the YMP, all organizations and employees involved with the scientific characterization activities must clearly understand their roles and responsibilities in maintaining a safe and healthful workplace.

The responsibility for S&H on the YMP begins with the Contractor, flows down through the CMO, then to the TCO and the Constructor. From these organizations, responsibility flows down to the respective organizations conducting actual work on

the YMP, including scientific characterization organizations, through the umbrella of the M&O Safety and Health Plan. The M&O Safety and Health Plan establishes implementing guidance through written YMP S&H programs and procedures (e.g., Occupational Respiratory Protection, Noise Control and Hearing Conservation).

Responsibility for the S&H of M&O employees flows through M&O line management and each organization's supervision, then ultimately to individual employees.

The Constructor/Drilling Service Provider: The CSP support services for the scientific characterization work being conducted on the YMP. The constructor organization has S&H responsibility for their own employees, for maintaining the YMP Site in a safe and healthful condition, for maintaining mobile and stationary equipment, some S&H training, and training in the safe operation of some limited pieces of equipment. The constructor/drilling service provider will not maintain a full-time presence at all remote worksites on the YMP, but will assist anytime when contacted. The TCO as the M&O manager for field testing activities, and/or assigned scientific organization staff (i.e., LLNL, LANL, SNL, LBNL, and/or USGS) will maintain M&O line management and/or organization supervision at the Site at all times.

TEST COORDINATION OFFICE and other Scientific Organizations: TCO and other scientific organizations are responsible for the S&H of their employees through M&O line management and each organization's supervision. When both the TCO and scientific organization line management and supervision occupy a YMP worksite at the same time, the TCO will have S&H coordinating responsibility. When a YMP worksite is not occupied by the TCO, scientific organization line management and each organization's supervision will have S&H coordinating responsibility.

The TCO and other scientific organizations always perform work under the M&O Safety and Health Plan, and/or their own organization's Safety and Health Plan. Organization supervisors are responsible for the workplace implementation of S&H standards, codes, regulations, Project procedures and programs.

The TCO, under agreement, with the CMO may conduct additional testing specific Toolbox Safety meetings at the beginning of each shift.

Individual M&O Employees: Individual M&O employees, regardless of their employer, are responsible for understanding the requirements of the S&H programs of their employer and specific YMP S&H programs (e.g., Occupational Respiratory Protection, Noise Control and Hearing Conservation, Personal Protective Equipment [PPE]). Individual M&O employees are responsible for ensuring that the S&H training they have received is followed and implemented, regardless of whether the training was received from their parent organization or on the YMP.

Individual M&O employees are responsible for immediately notifying the construction staff supervisor and the M&O line manager of unsafe acts, conditions, and/or equipment.

A discussion of the roles and responsibilities addressed in this FWP is also included in the ES&H Review that is conducted by the TCO S&H Specialist.

The ES&H Review is an attachment to the FWP and has been compiled in order to evaluate and transmit information on the potential hazards that may be encountered while installing, operating and/or maintaining scientific investigation equipment or instrumentation on the YMP. Each organization's line management and supervision should read the ES&H Review and use it as a guideline for informing, educating and implementing protective measures for the identified hazards. A copy of the ES&H Review, Laser Operating Permit, and Radiation Work Permit (RWP) for the temporary use of radioactive materials will be available at the TCO field office, the Las Vegas Office, and will be transmitted to test and constructor organizations working on the YMP.

Employee Training: Personnel requiring access to the YMP site must have completed or be escorted by an individual with General Employee Training (GET) and First Aid training. PPE is required for all persons entering any construction site on the YMP (e.g., hard hat, steel toed shoes, approved [ANSI Z87] safety glasses, and/or hearing protection [plugs or muffs]).

All participants shall adhere to the Occurrence Reporting and Processing System for accident reporting in accordance with DOE Order 0232.1.

4.2 POINTS OF CONTACT

Project Engineer	David Morreale	295-5215
FOC Visitor Control	Loretta Camp	295-5915
FOC Logistics Coordinator	Frederick Venzie	295-5438
TCO Manager	Ronald Oliver	295-3578
TCO Safety Coordinator	Michael Taylor	295-3647
Photography Support	Donald Unglesbee	295-5965
DOE/YMSCO	Drew Coleman	794-5537
Environmental	Thomas Pysto	295-5082
Construction Manager	Bob Law	295-3699
Contact for ESD Biologists	Kurt Rautenstrauch	295-4952
(DRI) Contact for DRI	Paul Buck	895-0424
Archaeologist		
Safety and Health Manager	Richard Royer	295-2442
Test Coordinator	Debra L. Edwards	295-5745
FWPRC	Alan Mitchell	295-6539
SPS Manager	Eddie Wright	295-2516

TCO Data Manager	Fred Homuth	295-4900
Constructor	Carey Johnson	295-6517
FTM	Richard Kovach	295-6180
Principal Investigator	Arend Meijer	505-256-3769
Safety Assurance Department	Bob Wernheuer	295-3966
M&O Manager NEPO	Larry Hayes	295-5604

4.3 Schedule

See Attachment 3 for Summary Schedule Information. The time estimated to mobilize, remove monitor string, perform geophysical logging activities, install monitor string and pump and discharge line, perform initial pump test, and remove pump is 28 eight-hour shifts. See Section 7.0, Attachment 8 "Surface-Based Drilling Working Schedule.

4.4 Summary Accounts and Prognosis

See Attachment 3 for Summary Account information.

5.0 FIELD VERIFICATION AND SCOPE COMPLETION

5.1 Field Verifications

No field verifications for this scope of work have been identified at this point.

5.2 Scope Completion

The scope of this FWP will be completed when each PI has notified the TCO in writing that all testing activities associated with this FWP have been completed and no further data will be collected. Scope completion will be documented by the PI.

5.3 Acceptance Criteria

Acceptance criteria for specific tests are included in the PI's procedures. Acceptance criteria for TCO checks for ponding of water include: the site identifier, is water ponding, are boreholes securely capped and sufficiently above ground, does the drainage pattern direct water away from the borehole, and are corrective measures required.

6.0 RECORDS

6.1 Records Identification

PIs are responsible for collection, management, and submittal of data, in

compliance with Project and applicable PI plans and procedures. All transfers of data between YMP Participants, submittal of data to the YMP database, and transfer of data to outside parties shall be conducted in accordance with YAP-SIII.3Q, "Processing of Technical Data on the Yucca Mountain Site Characterization Project," and other applicable plans and procedures.

All records shall be submitted to the RPC within 90 days of their completion. An information copy of any records submitted to the RPC will be sent to the TCO Project Engineer assigned to the activity. The FWPRC will coordinate and monitor the development of the FWP records package. The records package shall contain documents that demonstrate compliance with YMP procedures. The completed records package for this test may contain (or reference) the following:

Record	Organization	QA Designator
Revisions/Changes to this FWP	TCO	QA:L
FWP Specific DfEs	TCO	QA:L
Regular Reports Addressing Test Status	TCO	QA:N/A
Photograph Negative Numbers Supporting Test Activities	Photography Support	QA:N/A
Sample Numbers and Corresponding Accession Numbers Supporting Test Activities	Sample Collection Support and/or PIs	QA:L
Safety Reviews	TCO	QA:N/A
TCO Modifications to the FWP Work Sequence	TCO	QA:L
Construction/Testing Related use of TFMs	Constructor/Drilling Provider/TCO	QA:L
Documentation Identifying Work as Complete	PI Organizations and TCO	QA:L
Checks for Ponding of Water and Changes to Drainage Characteristics	TCO	QA:L
Toolbox Safety Meeting Documentation	CSP and TCO	QA:N/A
Daily Operations Report	FDE	QA:L
Unacceptable Borehole Characteristics	PI	QA:L

6.2 Records Generation

Activities within the scope of this FWP will be documented in accordance with AP-17.1Q. (See Section 6.1 above).

All records generated by the participants in this activity will meet the legibility, accuracy, and completeness requirements specified in AP-17.1Q, as applicable. If a scientific notebook is utilized, it shall be stored in accordance with the appropriate procedure(s).

7.0 ATTACHMENTS

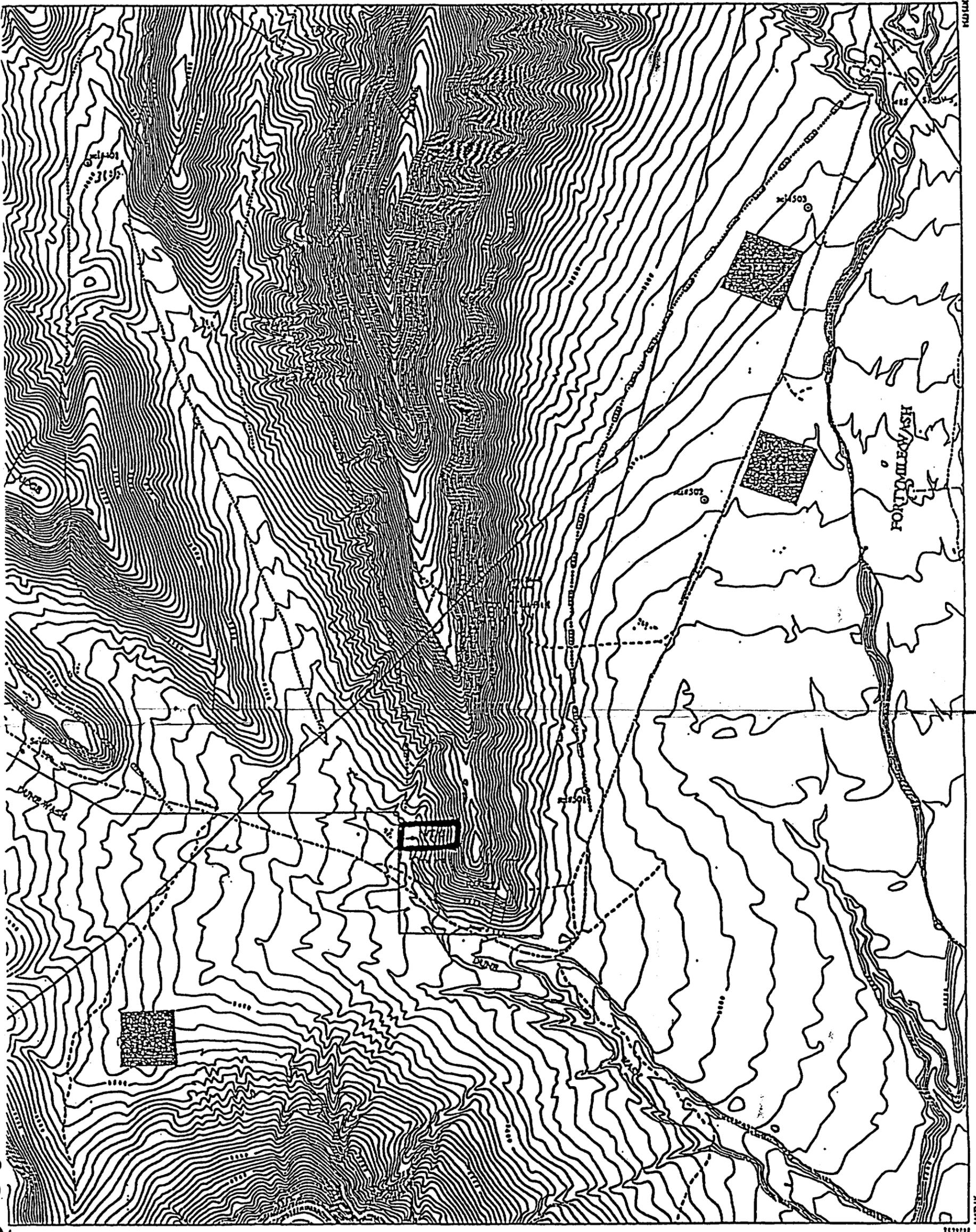
- Attachment 1 Location Maps for Planned Activity (QA:N/A)
- Attachment 2 Field Operations Permit (QA:N/A)
- Attachment 3 Summary Account and Summary Schedule Information (QA:N/A)
- Attachment 4 Environmental, Safety & Health Review (QA:N/A)
- Attachment 5 UE-25 WT #17 and WT #3 Borehole Diagrams (QA:N/A)
- Attachment 6 Site Equipment Layout Sketches (QA:N/A)
- Attachment 7 Diagrammatic Sketch of Flow Through Trailer Plumbing (QA:N/A)
- Attachment 8 Working Schedules (QA:N/A)

8.0 REFERENCES

1. Surface-Based Testing Facilities Requirements Document, YMP/CM-0022 Rev. 2, July 1997.
2. Quality Assurance Requirements and Description, DOE/RW-0333P, Rev. 7, June 2, 1997.
3. "Management and Operations Health and Safety Plan", B00000000-01717-4600-00016, Rev. 1, January 1, 1997.
4. "DIE for Surface-Based Testing Activities", BAA000000-01717-2200-00101, Rev. 00, July 3, 1997.
5. Memorandum, Distel to Pysto, "Boreholes USW WT-17 and WT-3", LV.SPO.TEST.BWD.05/97-090, dated 5/16/97.
6. Dixon (POCD) to Dyer (RSED), Approval of Land Access and Environmental Compliance for Developing and Cleaning of Existing WT Wells UE-25 WT-12, UE-25 WT-17 and USW WT-1, Phase II of the U.S. Geological Survey (USGS) Well Rework Program - USW WT-10 and UE-25 WT #13, POCD:MER-1643, 1/27/94.
7. S. Opp to D. Kovach and E. Wright, Additional Equipment needed for Eh and pH measurements for groundwater in wells WT-3 and WT-17, 5/20/97.
8. Land Access/Environmental Compliance Request Transmittal, 5/20/97, Drew Coleman (DOE/YMSCO).

9. R. Graves (USGS) to D. Edwards (USGS). Water Levels WT#3 and WT#17, 5/15/97.
10. Arend Meijer (M&O/LANL) to Dr. S. Nelson (LANL), Test Plan for Eh Measurements in WT-17 in FY97, 5/15/97.
11. B. Distel (M&O/WCFS) to Arend Meijer (M&O/LANL), Procurement of Items for Eh/pH testing, 5/15/97.
12. Arend Meijer (M&O/LANL) to David Morreale (M&O/WCFS), Eh/pH logging request, 3/18/98.
13. Dixon to Brocoum, Approval of Land Access and Environmental Compliance for pumping and Discharge at Boreholes WT-3 and WT-17, AMESH:WAF-0728, 01/02/98

LOCATION MAPS FOR PLANNED ACTIVITY



980924031102

<p>LEGEND</p> <ul style="list-style-type: none"> 3 Planned Burial 2 Planned Trench 2 Planned Pit 1 Existing Burial 1 Existing Trench 1 Existing Pit 1 Existing Foundation 1 Existing Structure 1 Quoted Where Location Uncertain 1 Pit 1 Discovered Along Pit 1 Pits That Cut Alluvium ~ Inferred Fault ~ Inferred Fault Cutting Alluvium ~ Concealed Fault ~ Anomalous Fault ~ Fracture ~ Scarp ~ Geologic Map Extent (OPRM-194) ~ Potential Repository Outline ~ Conceptual Controlled Area Boundary ~ FENCE ~ STP Range ~ Two-Lane Road ~ Unpaved, Improved Road ~ Trail ~ Parking Area ~ Disturbed Area Associated with Road ~ Right-Of-Way For Road ~ Drill Pad ~ Other Cleared Area ~ Spill Pile ~ Pond ~ Geologic Protection ~ Electrical Substation ~ Culvert/Drain ~ Trench ~ Material Storage Area ~ Ecological Study Plot 		<p>YUCCA MOUNTAIN SITE CHARACTERIZATION PROJECT SURFACE-BASED TESTING ACTIVITIES WITH GEOLOGIC STRUCTURE MAP SHEET 23</p> <p>Also Available on APERATURE CARD</p> <p>EG&G SA95-11-09</p>
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FIELD OPERATIONS PERMIT

FIELD OPERATIONS PERMIT

Estimated Start Date 6/2/97 Permit Number 97-15
 Permit Closed _____ FWP SR-97-004
 Date J.P. Closed _____ Date Approved June 10, 1997

Sponsoring Field Agency(ies): CRWMS M&O, LANL

Field Activity/Operation: (brief description) Eh/pH Testing of Borehole Water, including borehole workover for boreholes WT-17 and WT-3.

Field Points of Contact:		Telephone #	Radio Net
Field Work Coordinator	<u>Richard Kovach</u>	<u>295-6485</u>	
Construction/Drilling, etc.	<u>Richard McDonald</u>	<u>295-6180</u>	
Field Engineering	<u>Eddie Wright</u>	<u>295-5589</u>	
Principal Investigator(s)	<u>Ron E. Smith</u>	<u>295-3453</u>	
Site Safety Coordinator	<u>Mike Taylor TCO Safety</u>	<u>295-3647</u>	

Are radioactive or hazardous materials involved? Yes No
 If Yes, explain: _____

Permit approved by TOD: (if required) N/A Date: _____

The following guidelines apply to this work:

1. Provisions of applicable YMP-FOIs/NTS-SOPs except as may be described below.
2. All YMP materials being transported off the NTS must be processed through the YMSO-FOC and REECo RAMATROL.
3. The YMSO-FOC (S-5915) will be notified upon completion of this operations permit.
4. Safety and health coordination responsibilities assigned.
5. All hazardous waste packaged in appropriate containers and reported to the YMSO-FOC.
6. Personnel field safety training completed.
7. Head counts and personnel location are to be reported to YMSO-FOC each day before 0830 hours.
8. Daily progress reports provided to YMSO-FOC by 0830 hours the day following activity.
9. YMSO-FOC to notify OCC upon completion of activity.
10. All accidents are to be reported to the YMSO-FOC as soon as possible.
11. Comments/remarks _____

Agency Representative Signature (if required) _____


 R. James Nissenver

Permit Issued By _____

CC: TEST OPERATIONS DIVISIONS, NV
 OCC-CP-1, MS 210
 TEST SITE OFFICE, MS 701
 YUCCA MOUNTAIN SITE OFFICE, MS 717

Ground Water Chemistry Eh/pH Tests
FWP-SB-97-004, ATTACHMENT 3
Summary Account Information (QA:NA)

FWP-SB-97-004, R2
 Chemistry, Eh, and pH Tests of Ground Water

Summary Account Information

ID	Ground Water Chemistry Eh/pH Tests TASK DESCRIPTION	WBS#S	LEAD MATRIX ORG.	START DATE	FY 98 WORK PACKAGE NUMBER	FY98 FUNDING SUMMARY (\$K)	FY 98 COST ESTIMATE (\$K)
Borehole UE-25 WT-17 & WT-3 Cleaning Rehabilitation and Testing							
Test Implementation- Discrete							
3	Eh & pH Measurements	1.2.3.3.1.3.1	USGS	7/18/97	12332245UY	52	23
4	SZ Hydrochemistry	1.2.3.4	LANL	7/18/97	12342215M1	240	156
5	SZ Hydrochemistry	1.2.3.4	UNLV	7/18/97	12342215M1	142	121
Test Implementation- Matrix							
7	Test Coordination	1.2.3.9.	M&OLANL	10/1/97	12399090M1	2,101	21
8	Site Test Coordination	1.2.6.13	M&OLANL	10/1/97	126D2465M1	2,207	22
9	Testing Support	1.2.3.5.5	TCO/ KPB	10/1/97	12359090M1	1,191	36
10	Drilling Engineering & SMF Support	1.2.3.5.	M&O/SAIC	1/2/97	12359090M3	2,817	85
11	Photographic Support	1.2.12.6	M&O/TRW	12/18/97	12C69130M3	1,570	2
12	Project Schedule Analysis and Maintenance	1.2.9.2.1	M&O/TRW	12/18/97	12929135M1	2,600	16
Subtotals - Discrete						292	179
Subtotals - Matrix Support						12,486	180
Totals						12,778	360

Attachment 3
 2 Pages

Ground Water Chemistry Eh/pH Tests

FWP-SB-97-004, ATTACHMENT 3

Summary Schedule Information (QA:NA)

Note: years are represented in years.

ID	Task Name	Dur	Start	Finish	1997												1998											
					M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N			
1	UE-25 WT-17 & WT-3	395d	3/3/97	9/4/98																								
2	Test Implementation- Discrete	296d	7/18/97	9/4/98																								
3	Eh & pH Measurements	296d	7/18/97	9/4/98																								
4	SZ Hydrochemistry	296d	7/18/97	9/4/98																								
5	SZ Hydrochemistry	296d	7/18/97	9/4/98																								
6	Test Implementation- Matrix	395d	3/3/97	9/4/98																								
7	Test Coordination	395d	3/3/97	9/4/98																								
8	Site Test Coordination	308d	7/2/97	9/4/98																								
9	Testing Support	308d	7/2/97	9/4/98																								
10	Drilling Engineering & SMF Support	308d	7/2/97	9/4/98																								
11	Photographic Support	308d	7/2/97	9/4/98																								
12	Project Schedule Analysis and Maintenance	308d	7/2/97	9/4/98																								

Page 2 of 2

Project: Ground Water Chemistry Eh/pH Tests
Date: 5/18/98

Task



Summary



ADMINISTRATIVE USE ONLY

ENVIRONMENTAL, SAFETY AND HEALTH REVIEW

1.0 INTRODUCTION

This Environmental, Safety and Health (ES&H) Review of the Field Work Package FWP-SB-97-004, R1 for Chemistry Measurements of the Eh and pH conditions of ground water at Yucca Mountain has been compiled by the Test Coordination Office (TCO) ES&H. The purpose of this ES&H Review is to: (1) to provide a Preliminary Hazard Analysis (PHA) which identifies and lists the hazards; and (2) recommend engineering, administrative, personal protective equipment, and work practice control measures for conducting the measurement of the oxidation/ reduction conditions in the ground water.

This ES&H Review is also being compiled to ensure that information about hazards and control measures will be transmitted to all affected organizations on the YMP in order to integrate ES&H into all activities, process and operations at the UE-25 WT#17 and UE-25 WT#3 Borehole Sites.

Managers and supervisors should read/review this document and work with S&H to evaluate work processes and operations where Job Safety Analysis (JSA) will need to be conducted and documented.

1.1 EQUIPMENT SCOPE AND SCOPE

Borehole UE-25 WT#17 was drilled in 10/83, UE-25 WT#3 was drilled in 5/83. This ES&H Review will provide guidance for scientific personnel measuring the oxidation/ reduction conditions in the ground water. This will involve the measurement of Eh using standard electrodes. In addition, the waters will be sampled and analyzed for pertinent water quality parameters including: pH, dissolved oxygen (DO), alkalinity, major cations and anions, silica, temperature, conductivity, and several common redox couples.

A detailed description of the all activities can be found in FWP-SB-97-004 for Chemistry Measurements of the Eh and pH conditions of ground water at Yucca Mountain.

2.0 HAZARDS

2.1 SITE SPECIFIC HAZARDS

Potential hazards to surface-based testing personnel conducting Eh and pH tests of ground water at UE-25 WT#17 and UE-25 WT#3 on the YMP are:

HAZARD
No

Yes

- X **Working Alone/Working in Remote/Isolated Areas:** The UE-25 WT#17 and UE-25 WT#3 Boreholes are located in remote/isolated sites. Working alone is not permitted. A buddy system should always be used. Radio Net and/or telephone communications is required.
- X **Extended Working Hours/Extended Driving Hours:** During some UE-25 WT#17 and UE-25 WT#3 Borehole testing activities, extended working hours and extended driving hours will be encountered.
- X **Inclement Weather/Temperature Extremes:** High winds, rain, hail, lightning strikes and snow. Personnel working on the UE-25 WT#17 and UE-25 WT#3 Boreholes could encounter both cold and hot temperature extremes.
- X **Mechanical/Equipment:** Well hoisting equipment. Drill Rig and Hoisting Equipment.
- X **Physical Hazards - High Noise Levels:** Equipment used at the UE-25 WT#17 and UE-25 WT#3 Borehole site may require hearing protection.
- X **Chemical Hazards/Hazardous Materials:** Tracers, Fluids, and Materials (TFM) that may be used at the UE-25 WT#17 and UE-25 WT#3 Borehole sites must be on the YMP approved list.
- X **Electrical:** Power cables, junction boxes, extension cords, and hand tools.
- X **Fall Hazards:** When working at a height greater than six feet.
- X **High Pressure:** Air compressors and pneumatic equipment. Compressed air equipment, gas/air in bottles/cylinders.
- X **Hantavirus:** Enclosed work areas and buildings that have signs of rodent infestations (i.e., droppings, nesting materials) need to have traps set to eliminate the rodents, and the areas need to be cleaned and disinfected before occupancy by YMP Personnel.
- X **Biological Hazards:** Poisonous snakes, spiders and scorpions

may be encountered on these sites. Appropriate care should be exercised by field workers.

- X Fire: No "specific" hazards identified at this time.
- X Walking and Working Surfaces: Slips, trips and falls.

3.0 HAZARD CONTROLS

Working Alone/Working in Remote/Isolated Areas: The UE-25 WT#17 and UE-25 WT#3 Borehole sites are located in remote/isolated areas. Therefore, field work should be conducted in teams of two or more persons. Use of the buddy system is recommended. The scientific personnel conducting borehole activities shall be in two-way communications (either by radio and/or Phone) with a base station (ESF TCO-295-3483, Net #5 Radio; or Ranch Control-295-5915, YMP#1 Radio Net) and establish a regular check-in schedule.

At the beginning and end of daily borehole activities, scientific personnel need to check in with Ranch Control and the TCO with a head count of personnel.

Personnel conducting UE-25 WT#17 and UE-25 WT#3 Borehole activities should never venture into the field without a radio, first aid kit, and water.

For life-threatening injuries or medical emergencies, on the NTS Radio Network, call "Mayday, Mayday, Mayday". Ranch Control also has to be notified.

Extended Working Hours/Extended Driving Hours: During some UE-25 WT#17 and UE-25 WT#3 Borehole testing activities, extended working and extended driving hours will be encountered. Whenever possible, personnel conducting borehole activities should utilize the "buddy system". Transportation, back and forth to the borehole site should be done in pairs (or more) riding together in a single vehicle. Find someone to ride with you who will stay awake, talk and monitor your driving.

Nevada State Law requires you to wear seat belts, and the U.S. Department of Energy requires you to wear a seat belt if you are driving a government vehicle. Drivers of vehicles are responsible for ensuring that passengers wear their seat belts.

Inclement Weather/Temperature Extremes/Sunburns: Personnel conducting UE-25 WT#17 and UE-25 WT#3 Borehole activities could encounter severe inclement weather (rain, lightning strikes, and/or high winds) with little or no advance warning.

Sunburn is a very definite possibility if you are going to be outside most of the day. Always wear "sun screen", long pants and long sleeved shirt.

NTS Net Radio Control ("900") monitors the National Weather Service for conditions on the Nevada Test Site (NTS), and broadcasts them over all radio nets on the NTS, including the YMP Site. Borehole water testing personnel should have YMP Net #1 radios with them when they go into the field in order to monitor "900" weather control. If severe weather warnings and/or lightning strikes are issued, personnel should suspend work and take cover inside vehicles or leave the Site altogether.

At certain times of the year, severe cold and hot temperatures could be routinely encountered at borehole sites.

In Cold Environments: The objective of preventing UE-25 WT#17 and UE-25 WT#3 Borehole personnel from experiencing the effects of cold stress is centered around preventing the deep body (core) temperature from falling below 36 degrees C (96.8 degrees F). For a single, occasional exposure to a cold environment, a drop in core temperature to no lower than 35 degrees C (95 degrees F) is permitted.

Lower body temperatures will very likely result in reduced mental alertness, reduction in rational decision making, or loss of consciousness with the threat of fatal consequences.

In protecting UE-25 WT#17 and UE-25 WT#3 borehole water testing personnel from the effects of cold stress, the following items should be noted:

- Pain in the extremities may be the first early warning of danger to cold stress.
- Suits and cold weather gear should provide whole body protection, with emphasis on hands, feet and head from cold injury.
- The higher the wind speed and the lower the temperature in the work area, the greater the insulation value of the protective clothing required.
- If fine work is to be performed with bare hands for more than 10-20 minutes in cold conditions below 16 degrees C (60.8 degrees F), special provisions should be established for keeping employee's hands warm (fuel burners, warm air jets, electric radiators).
- If UE-25 WT#17 and UE-25 WT#3 water testing activities involve the use of evaporative chemicals/liquids (i.e., gasoline, alcohol, or cleaning fluids), special precautions should be taken to avoid soaking of clothing or gloves

with the liquids because of the added danger of cold injury due to evaporative cooling.

- If work at the borehole sites needs to be performed contiguously in temperatures that are below -7 degrees C (19.4 degrees F) then a "Work-Warming Regimen" must be established and implemented.

Controlling Cold Stress:

Personnel conducting UE-25 WT#17 and UE-25 WT#3 water testing activities can find guidance for working in cold environments and for work/rest regimens in the 1993-1994 Threshold Limit Values Booklet for Chemical Substances and Physical Agents published by the American Conference of Governmental Industrial Hygienists (ACGIH).

In Hot Environments: Temperatures in Area 25 can reach 120 degrees F in the hottest part of the summer. Working in these hot work conditions/environments with elevated humidity readings will produce elevated heat stress levels. In conditions such as these, three types of emergencies can occur that involve heat stress; heat cramps, heat exhaustion and heat stroke.

Personnel conducting UE-25 WT#17 and UE-25 WT#3 water testing activities should be aware of the following symptoms of heat stress and accompanying first aid treatments:

Heat Cramps:

Symptoms:

1. Muscle cramps in legs and abdomen.
2. Pain accompanying cramps.
3. Profuse sweating.
4. Faintness.

First Aid Treatment:

1. Move to cool (air conditioned) place.
2. Sip salted water (1 teaspoon of salt in 1 quart).
3. Massage cramped muscles.
4. Obtain medical treatment.

Heat Exhaustion:

Symptoms:

1. Profuse sweating.
2. Intense thirst from dehydration.
3. Cool, moist skin (clammy and pale).
4. Fatigue, weakness, dazed.
5. Dizziness.

First Aid Treatment:

1. Move to cool (air conditioned) place.
2. Loosen tight clothing and remove excess clothing.
3. If conscious, sip salted water.
4. Treat for shock, lay on back and raise feet slightly.
5. Stay with the victim until medical aid arrives.

Heat Stroke:

(Please note: Heat Stroke is a medical emergency)

Symptoms:

1. Can occur suddenly, with little warning:
2. Dizziness, raging headache.
3. Hot, dry, flushed skin.
4. Full and fast pulse.
5. Breathing deep at first, later shallow breathing.
6. High temperature (106 degrees or higher).
7. Confused delirious behavior.
8. Muscle twitching, growing into convulsions.
9. Loss of consciousness or coma.

Emergency Care:

1. Heat Stroke is a true medical emergency, arrange transport to a medical facility without delay.
2. Move to cool (air conditioned) place.
3. Strip to underclothes.
4. Lay on back, head and shoulders raised slightly.
5. Assure breathing airway is open.
6. Put ice or cold wet cloth on head.
7. Cool body with water or wet cloth.
8. Do not give coffee, cigarettes or a stimulant.

Controlling Heat Stress: Personnel conducting UE-25 WT#17 and UE-25 WT#3 water testing activities should:

- Follow scheduled work/rest cycles. Guidance for work/rest regimens can be found in the 1993-1994 *Threshold Limit Values Booklet for Chemical Substances and Physical Agents*, published by the ACGIH.
- Workers should alternate between light and heavy work.
- Where possible, rotate duties among several workers.
- Drink plenty of water. Drink at least 16 ounces about an hour before and then 5 to 7 ounces every 15 to 20 minutes during work. Some people find electrolyte drinks (i.e., Gatorade) effective instead of, or in addition to water.
- Encourage workers to wear loose fitting, light-colored clothes whenever possible.

Personnel conducting UE-25 WT#17 and UE-25 WT#3 water testing activities should drink plenty of liquids and take frequent breaks. M&O Safety and Health (S&H) Department procedure, PRO-SH-008, Occupational Heat Stress, provides guidance for dealing with potential heat stress conditions and establishes responsibilities within the M&O.

Mechanical: When and if UE-25 WT#17 and UE-25 WT#3 water testing activities require scientific personnel to conduct work on electrical circuits or "certain types" of mechanical systems/components (i.e., belt drive systems), the system/components must first be de-energized, isolated and rendered inoperative before employees can begin work. This process de-energized, isolated and rendered inoperative, is known as Lockout - Tagout.

The Lockout - Tagout program is required by OSHA. It ensures that any time any type of work has to be done on electrical circuits and/or equipment with mechanical systems or components (i.e., belt drive systems, hoisting equipment, drill rig equipment) they have to be de-energized, isolated, and rendered inoperative before employees can begin work. The program requires that the control circuits to these pieces of equipment be locked and tagged out to prevent accidental activation. Contact the TCO Field Test Representative (FTR) to arrange Lockout - Tagout assistance with the Constructor.

Although the Lockout - Tagout program is not required for working around "all" equipment (i.e., automobiles, pickup trucks, front-end loaders, forklifts); scientific personnel conducting Eh and pH measurements at locations where drilling and other heavy equipment is being used should check-in with the construction personnel who operate the equipment, before working in the immediate area. Ensure that the operators/teamsters know of your presence and what work activities you have planned in the immediate area. To become familiar with an operation where Lockout - Tagout and heavy equipment is being used, attend the "toolbox safety meeting" that is held at all "construction jobsites", at the beginning of each shift. Talk with the constructor's employees and supervisors.

Physical Hazards - High Noise Levels: Personnel conducting UE-25 WT#17 and UE-25 WT#3 water testing activities need to be aware that some of the areas around the site may be classified as high noise level areas. Hearing protection (earplugs and/or earmuffs) must be used at all times and in all areas of these sites. Earmuffs are available from the Constructor's Tool Crib located on the ESF Pad. During certain operations, (drill rig operation) dual protection, both earplugs and earmuffs, may be required. Contact the TCO S&H Specialist for information on locations and activities where dual protection may be required. The M&O S&H Department Procedure PRO-SH-004 "Hearing Conservation Program" specifies the requirements for employees working in high noise level areas. All employees working in these areas must be in a "Hearing Conservation Program"

and, among other things obtain a baseline and annual audiogram (hearing test).

Chemical: Some of the chemicals and materials used for UE-25 WT#17 and UE-25 WT#3 water testing activities will be provided by the Constructor's Tool Crib. Other TFM that could be part of testing activities will be on the ESF approved list for materials that can be transported and used on the YMP.

A Determination of Importance Evaluation (DIE) has been completed in support of planned TFM usage. They capture any controls or constraints identified through the DIE process in the field implementing documentation.

The use or removal of testing related TFM by affected organizations must be identified and reported to the TCO prior to such use or removal. The TCO ES&H Specialist coordinates the annual inventory of hazardous chemicals, as required by OSHA regulation and the M&O S&H Department Procedure, PRO-SH-003, "Compliance with the OSHA Hazard Communication Standard". The affected organization must know the location of the Material Safety Data Sheets (MSDS), and the proper storage, use, transportation and Personal Protective Equipment (PPE) requirements for all the hazardous chemicals they use. The MSDS should always be reviewed before using any product or material underground. Contact M. F. Taylor, TCO ES&H Specialist, if there are questions regarding TFM usage in the ESF.

Electrical Hazards: Personnel who conduct UE-25 WT#17 and UE-25 WT#3 water testing activities will note that High Voltage cable(s) could be lying on the ground. Casual contact with power cables is not a safety concern. However, if the nature of any water testing activity could cause Physical damage to electrical cable jacket(s) or conductors, it is mandatory that the TCO FTR is contacted to arrange with the Constructor to have the cable(s) moved. Do not attempt to open or work on any electrical component. Contact the TCO FTR to obtain the services of the Constructor's electricians. All electrical systems must be locked and tagged out before any work can be attempted.

All UE-25 WT#17 and UE-25 WT#3 Borehole sites electrical outlets will be 3-Phase grounded OSHA Standard. All electrical outlets and cords at the UE-25 WT#17 and UE-25 WT#3 Borehole sites should be either part of an Assured Grounding Program or Ground Fault Circuit Interrupt (GFCI) protected. The Assured Grounding Program uses a color coding system that is changed every quarter (3 months) on extension cords and equipment. Contact the TCO FTR for assistance in getting equipment, tools, and extension cords entered into the Assured Grounding Program.

Fall Hazards: Scientific personnel conducting UE-25 WT#17 and UE-25 WT#3 water testing activities who might have to work at a height greater than 6 feet off

the ground, must either work behind OSHA approved scaffolding with guard rails (top rail minimum height, 42 inches, mid-rails, toeboards), or use OSHA approved fall protection equipment. This includes a body harness, lifelines, Sala Block and/or lanyards.

OSHA approved ladders (set at an angle of between 75 and 90 degrees) should always be used. Do not attempt to crawl up the side of a piece of equipment without fall protection aids. Approved fall protection equipment is available on the ESF Pad from the Constructor's Tool Crib. Lifeline and lanyards must be attached to structural components that will support at least 5,000 pounds.

Contact the TCO FTR to make arrangements for getting the proper fall protection equipment.

High Pressure: Personnel conducting UE-25 WT#17 and UE-25 WT#3 water testing activities could encounter air compressors, pneumatic equipment, and gas/air in bottles/cylinders. Never walk under or around any of this equipment while it is in operation.

Compressed air will be used to pressurize some of the equipment used to conduct testing at UE-25 WT#17 and UE-25 WT#3 borehole sites. Air compressors and air receivers (storage tanks) should be equipped with pressure relief valves/apparatuses. Air hoses should be equipped with "whip-checks" which prevent accidentally separated hoses from thrashing about, injuring employees. Never attempt to tighten, remove or adjust any compressed air or gas equipment, lines, or pipes while the components are pressurized. Compressed air equipment, lines, or pipes should be equipped with bleed down valves to ensure that all air pressure is relieved before attempting to tighten, remove or adjust any components. No work should ever be attempted on any system, lines, or components that are live or charged. Large K bottles or cylinders which contain 200 cubic feet of compressed gas may be encountered at the UE-25 WT#17 and UE-25 WT#3 sites. These cylinders are used for such operations as oxygen/acetylene cutting and sample testing. In general, any cylinder that is not being used should be stored in an upright position, secured to a rack with a chain, and have the protective cap over the cylinder valve. Cylinders should be transported using a cart that is designed for this purpose.

Hantavirus: An outbreak of a potentially fatal illness has occurred in the Southwest, primarily in New Mexico and Arizona, although two cases have been reported in Central Nevada.

The cause of the illness has been identified by the Center for Disease Control (CDC) as the Hantavirus.

Hantavirus is usually transmitted by contact with rodent saliva, urine, or feces. Rodents such as pocket mice, deer mice, canyon mice, and kangaroo rats are the primary carriers.

A study in 1993, by the CDC on the NTS found that only the deer mice population was infected, and the infections existed only at higher elevations on the NTS (Pahute Mesa, Rainier Mesa). No infected rodents were found in Area 25 locations.

As a precaution, all scientific personnel on the Yucca Mountain Site Characterization Project (YMP), working in "enclosed" field locations (buildings, trailers, sheds) should be aware of the possibility of exposure to the Hantavirus and follow this advice:

- Avoid human contact with rodents, rodent droppings, rodent nesting materials. Infected rodents carry the virus in saliva, urine and feces. Never touch a live or dead rodent.
- The virus can infect humans through breathing the dust of dried out rodent feces and urine, and contact with rodent feces/urine through skin that is cut, dried or broken. Avoid breathing the dust from rodent infested areas, avoid skin contact with rodent infested areas.
- If a facility in which scientific personnel are working has visible signs of "heavy" rodent infestations (rodent excreta) and/or rodent nests, the rodents should be trapped/removed and the facility cleaned and disinfected.
- Scientific personnel should make no attempt to remove or clean-up rodent infested areas. Constructor/Drilling Service Provider Industrial Hygiene has personnel that are trained in pest control techniques, and they have the expertise, equipment, and supplies to trap and cleanup heavy infestations.

Contact R. Kovach to arrange for the services of Constructor/Drilling Service Provider Industrial Hygiene.

Fire: The high fire hazard season at the NTS usually runs from Spring to Fall. Brush fires have been started by lightning strikes. Fires have also been started by vehicle's exhaust pipes coming into contact with brushes while off-road driving. Vehicle exhaust pipes can reach 500 degrees F or more. While the likelihood of such fires is remote, personnel conducting borehole activities need to remain alert to such fire hazards and report any fire as soon as it is sighted using the "900 Radio Net Control" to call the fire station. Personnel should carry fire extinguishers and shovels.

Walking and Working Surfaces: Personnel conducting UE-25 WT#17 and UE-25 WT#3 water testing activities should be aware that most borehole sites have rocky, gravel or dirt surfaces. These areas have gaps and irregularities on the walking surface. Slips, trips and falls could be hazardous.

4.0 ROLES AND RESPONSIBILITIES - SAFETY AND HEALTH

4.1 SAFETY AND HEALTH ROLES AND RESPONSIBILITIES

The CRWMS M&O is in charge of the YMP and has the responsibility for safety and health for all teammate organizations and employees.

Teammate organizations and employees perform work that is authorized by their respective FWPs, work plans and/or work procedures. Teammate organizations perform their work as an "integrated group" to the environment, safety and health polices and procedures as set forth by the CRWMS M&O.

From the CRWMS M&O, responsibility for ES&H flows down to the respective organizations conducting actual work on the YMP, including scientific characterization organizations, through the umbrella of the M&O Safety and Health Plan. The "M&O Safety and Health Plan" (B00000000-01717-4600-00016), establishes implementing guidance through written S&H programs and procedures (i.e., Occupational Respiratory Protection, Noise Control and Hearing Conservation, and Silica Awareness).

From the M&O, responsibility for the S&H of YMP employees flows through M&O line management and each organization's supervision, then ultimately on to individual employees.

In specific terms the following organizations are responsible for:

The Construction Management Office: The CMO is responsible for implementing the requirements of their FWPs with the Constructor organization. The CMO provides Constructor support services to the scientific characterization work on the YMP and is responsible for oversight and management of all construction activities on the YMP. The CMO is responsible for integrating the requirements of the M&O Safety and Health Plan and M&O S&H policy and procedures into all construction activities.

TEST COORDINATION OFFICE: The TCO is responsible for implementing the requirements of their FWP and for coordinating all testing requirements with construction operations. The TCO and other scientific organizations are responsible for the safety and health of their employees and conducting scientific characterization activities/operations that are in compliance with the M&O Safety

and Health Plan, the TCO FWP ES&H Review, and their own organization/ laboratory standards, codes, regulations, procedures and programs.

The Constructor: The Constructor performs activities and operations that support both construction operations and scientific characterization activities. The Constructor organization has S&H responsibility for all employees inside YMP construction sites/areas. The Constructor is responsible for maintaining YMP construction sites/areas in a safe and healthful condition, for maintaining mobile and stationary equipment, some S&H training (i.e., Toolbox Safety Meeting), and training in the safe operation of some pieces of equipment. The Constructor is responsible for conducting work in accordance with OSHA 29CFR 1926 and their own company, regulations, procedures and programs.

Managers and Supervisors: M&O Managers and Supervisors are responsible for evaluating their work operations, activities or processes that present hazards, then conducting and documenting a Job Safety Analysis (JSA). A JSA is a structured, step-wise method to identify discrete tasks in a job, recognize the hazard(s) involved in each task, and specify mitigations to eliminate or reduce the hazard(s) to an acceptable level (i.e., engineering, administrative, or PPE controls, employee S&H training). All JSAs must be conducted and documented in accordance with M&O S&H Procedure # PRO-TS-011, "Conducting a Job Safety Analysis". All JSAs must be reviewed and approved by M&O S&H. Contact the TCO ES&H Specialist for assistance in determining which scientific characterization activities require JSAs. Once the JSAs have been produced, reviewed and approved, they will be used as a performance guide for employee training purposes, and this training will be documented.

Individual M&O Employees: Individual M&O employees (once they have been trained and understand the requirements), regardless of their employer, are responsible for understanding the requirements of the ES&H programs of their employer and specific YMP ES&H programs (i.e., Occupational Respiratory Protection, Noise Control and Hearing Conservation, Personal Protective Equipment). Individual M&O employees are responsible for ensuring that the ES&H training they have received is followed and implemented, regardless of whether the training was received from their parent organization or on the YMP. Individual M&O employees are responsible for immediately notifying the construction shift supervisor and their M&O organization supervisor of unsafe acts, conditions, and/or equipment.

TCO Environmental, Safety and Health Review: The ES&H Review is an attachment to the FWP and has been compiled in order to identify hazards and recommend control measures for scientific characterization activities. Each organization's line management and supervision shall read the ES&H Review and use it as both guidelines and minimum requirements for informing, educating

and implementing protective measures (i.e., engineering, administrative, PPE controls, and/or S&H training to a JSA) for the identified hazards. A copy of the ES&H Review and RWP for the temporary use of radioactive materials will be available at the ESF TCO field office, the Las Vegas Office, and will be transmitted to test and constructor organizations working on the YMP.

4.2 EMPLOYEE TRAINING

Personnel requiring access to the YMP borehole sites must have completed or be escorted by an individual with General Employee Training (GET) and First Aid training.

PPE is required for all persons entering any construction site on the YMP (i.e., hard hat, steel toed shoes, approved (ANSI Z87) safety glasses, and/or hearing protection (plugs or muffs). Casual dress (shorts, no shirt, sandals) is not allowed at YMP borehole sites. Work shirts (short sleeve or long sleeve if you are worried about sunburn), long pants are the normal attire. M&O S&H Department Procedure PRO-SH-002, "Procurement of Required Personal Protective Equipment" describes how M&O employees go about obtaining prescription safety glasses and approved footwear through the M&O purchasing system.

All participants shall adhere to the M&O S&H Procedure PRO-SH-001, "Occupational Injury/Illness/Property Damage Reporting and Investigation" for guidance on occurrence reporting and processing of information through the DOE system.

4.3 OTHER TRAINING

All personnel entering YMP borehole sites who have not received the shift tool box briefing are to ask if a Constructor Supervisor is on site and receive the briefing from that person. This is to ensure compliance with applicable Occupational Safety and Health Administration (OSHA) Standards.

5.0 EMERGENCY RESOURCES LOCATION AND CONTACTS

5.1 Emergency Reporting

M&O S&H Procedure PRO-SH-005, "Emergency Management", was developed for supervisors who have responsibilities for a facility or operation. In case of an emergency, telephone: Dial 911. Over the Radio: "Mayday, Mayday, Mayday", then give name and net number, Net 900 Radio Control will then make contact and get details of assistance required.

5.2 NTS Radio Net

The NTS Radio Net (Station 900) is manned 24 hours a day, every day of the year. Personnel conducting Eh and pH testing at borehole locations can contact 900 over the radio and be patched into all other Net Systems on the NTS.

5.3 Nearest Hospital or Clinic

Mercury, Nevada (approximately 38 miles). For emergency care contact and/or go to the EMS paramedic trailer at the North Portal.

5.4 Conducting A Medical Needs Analysis

A medical needs analysis for operations at groundwater chemistry worksites will be conducted that is in accordance with M&O Safety and Health Department Procedure PRO-SH-012", "Conducting a Medical Needs Analysis." Medical coverage will then be provided based on this analysis

5.5 Nearest First Aid Kit/Eye Wash Station

First aid kits and eye wash stations should be located at all "active" borehole sites.

5.6 Nearest Potable Water

Carry potable drinking water when traveling to remote borehole sites on the YMP. Orange "Gott" Drinking Water Coolers with ice are available from the Constructor on the ESF Pad in the Switch Gear Building.

5.7 Suggested Emergency Evacuation Route and Meeting Area(s)

Situations may occur at YMP borehole sites that will require immediate evacuation of the operation. These situations may include, but are not limited to fire, explosions, and hazardous chemical releases or spills. If such a situation occurs, Notify 900 Radio Net Control and Ranch Control immediately. Follow the direction given.

6.0 TCO Personnel

Some TCO Personnel carry hand held radios and are available on the YMP Net #1 or NTS Net #5.

6.1 TCO Field Test Coordination Personnel and Phone Numbers

Richard Kovach, FTM
Eddie Wright, SPS Manager

295-6180
295-2516

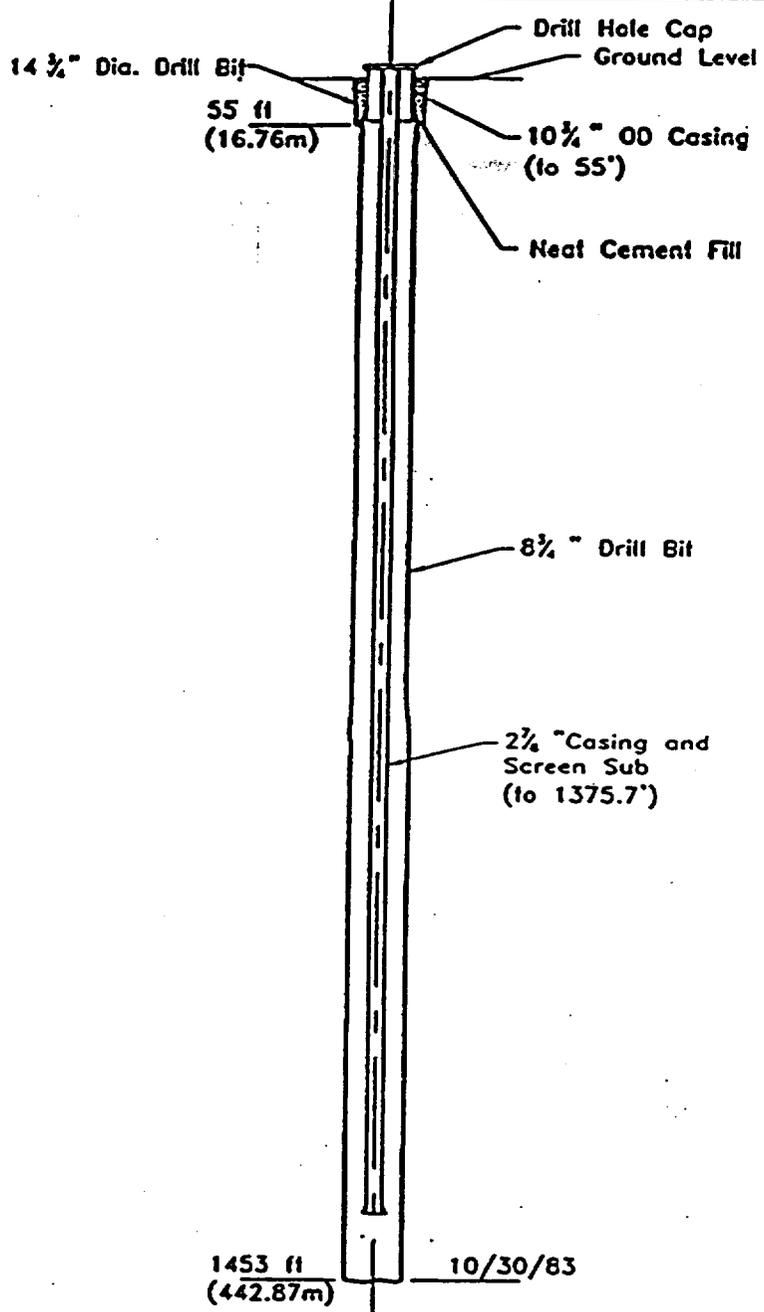
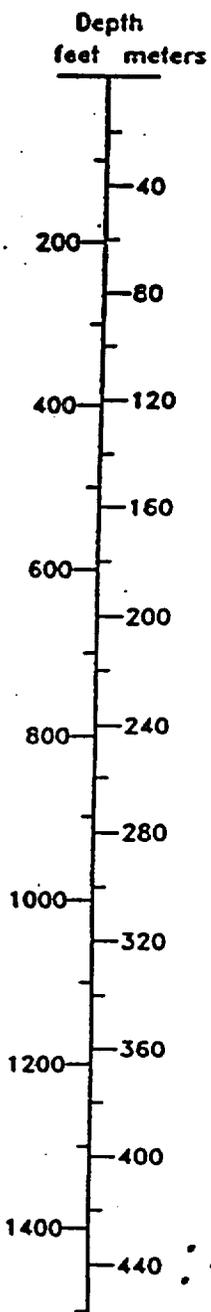
Eddie Wright, SPS Manager
William Distel
David Morreale
Catherine Longhouser, Secretary
Joe Spoeneman, FTR
Mike Taylor, ES&H Specialist

295-2516
295-6545
295-5215
295-3483
295-6189
295-3647 Beeper - 794-6676

UE-25 WT #17 and WT #3 BOREHOLE DIAGRAMS

M&O/SAIC
YMP Surface Based Testing
Drilling Engineering Section

HOLE DESIGNATION: UE-25 WT #17
SURFACE COORDINATES: N 748419.6 E 566211.9
SURFACE ELEVATION: 3688.5'
TOP OF CASING: 3689.4'
BOTTOM-HOLE COORD.: N 748364.09 E 566179.69
BOTTOM ELEVATION: 2235.5'
DATE STARTED: October 20, 1983
DATE COMPLETED: October 30, 1983



NOT TO SCALE

UE-25 WT #17
Water Table Test Hole

M&O/SAIC

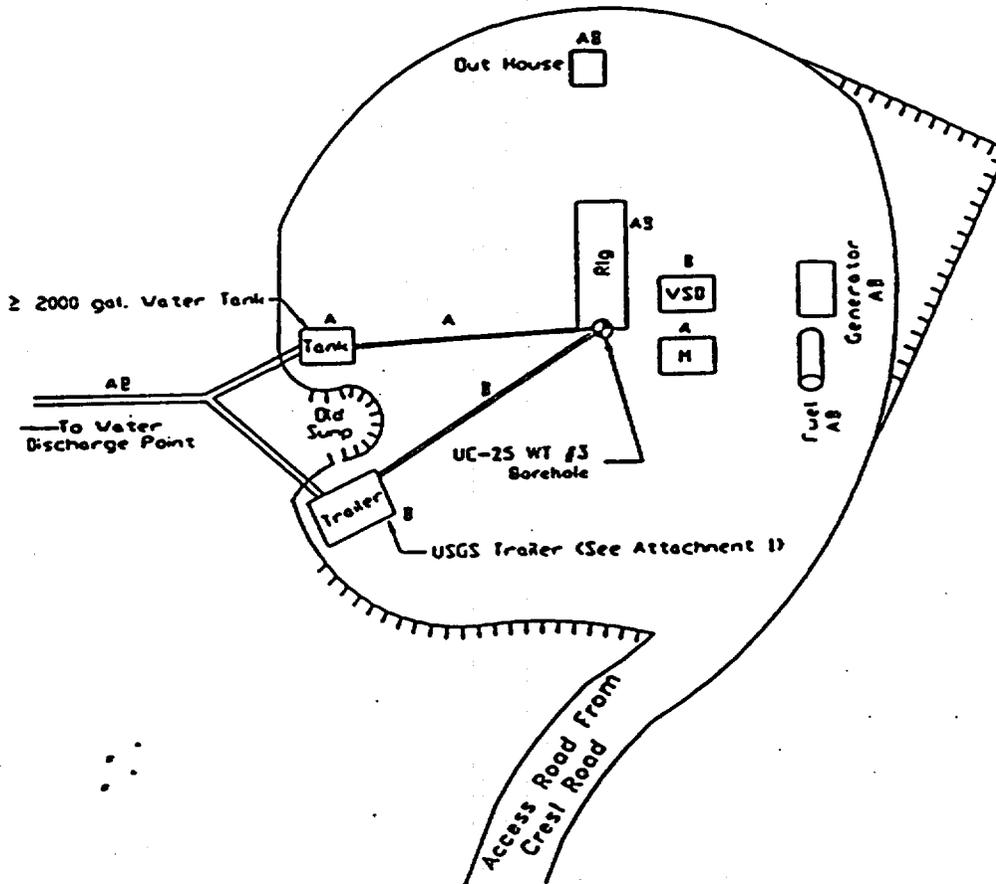
YMP Surface Based Testing
Drilling Engineering Section

Attachment

UE-25 WT#3
Site Equipment Layout Sketch

Notes:

- A = During clean out
- B = During Eh/pH testing & final completion.
- M = Moyno Power Unit



M&O/SAIC

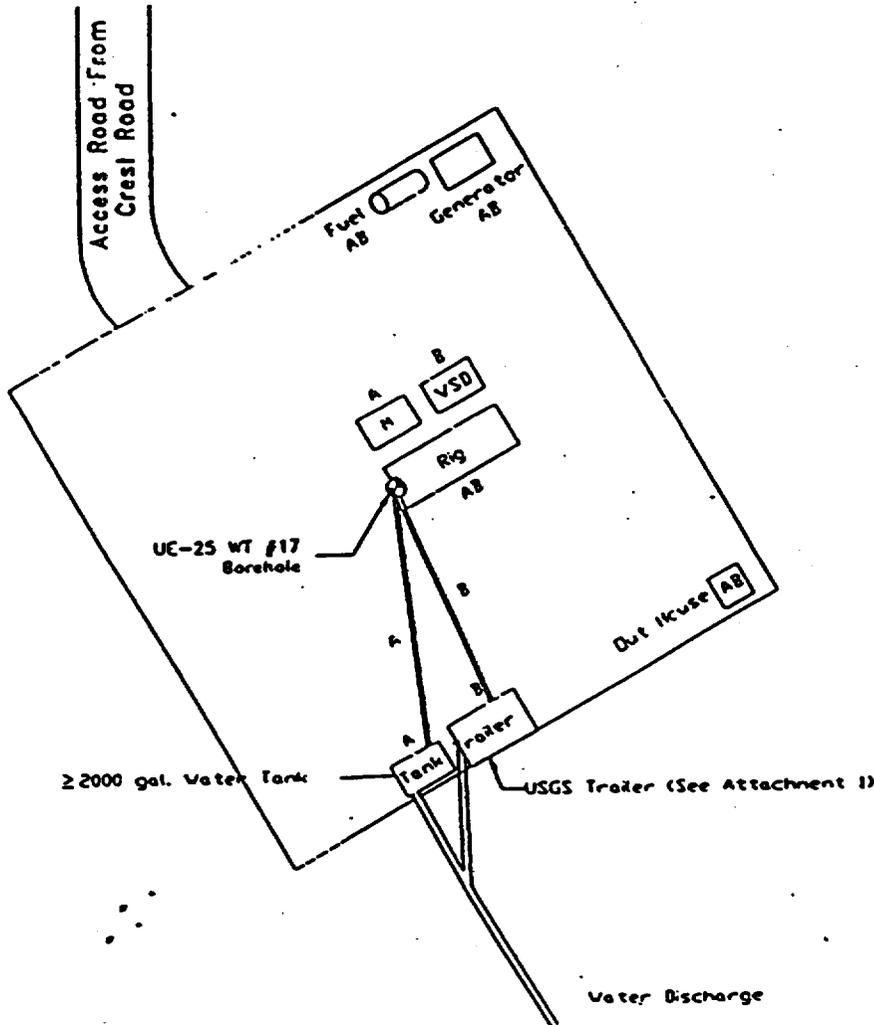
YMP Surface Based Testing
Drilling Engineering Section.

Attachment

UE-25 WT #17
Site Equipment Layout Sketch

Notes:

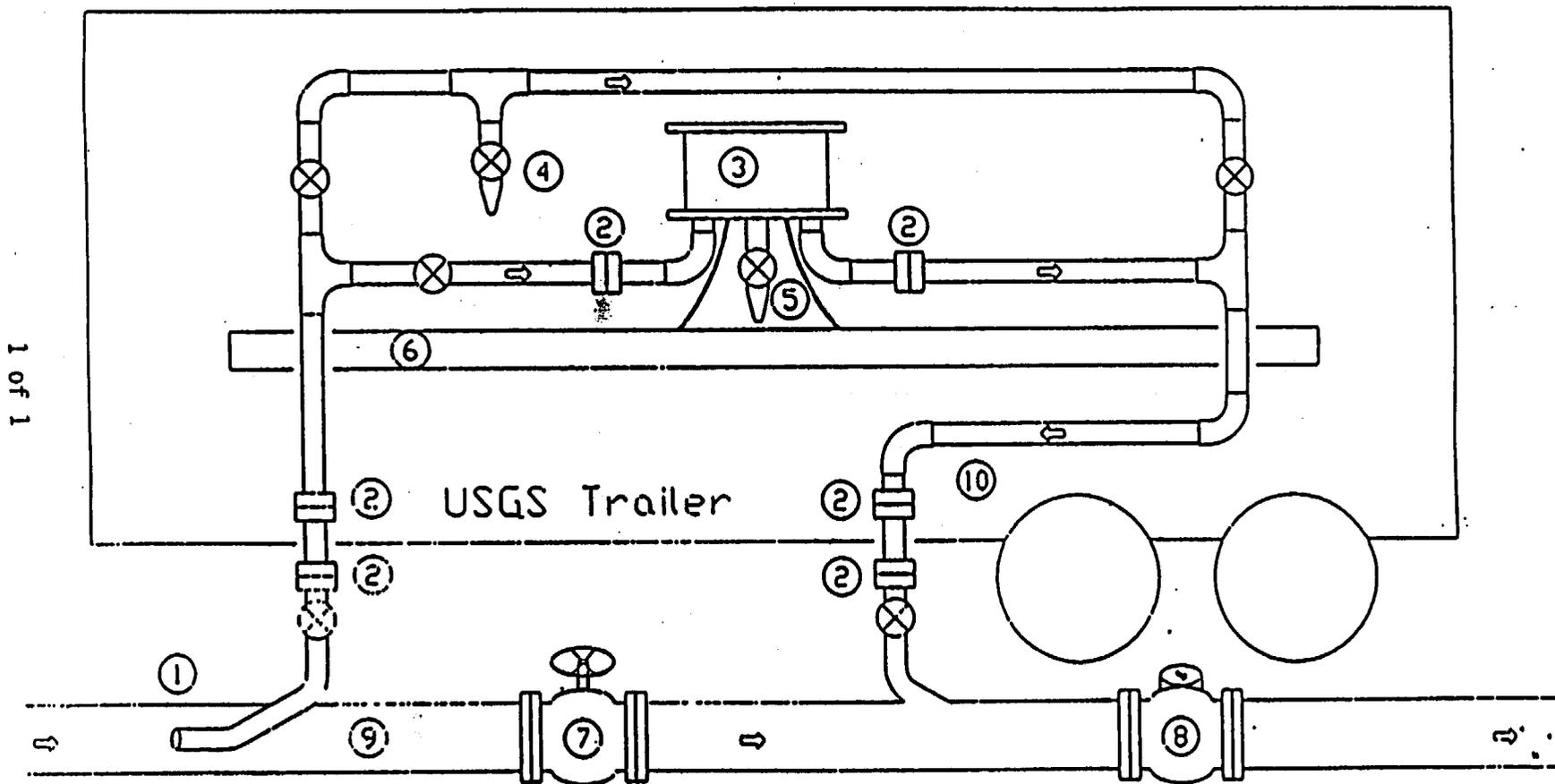
- A = During clean out
- B = During Eh/pH testing & final completion.
- Well at approx. center of approx. 200 ft. square existing pad



M&O/SAIC

YMP Surface Based Testing
Scientific Programs Support

Attachment
Diagrammatic Sketch of
Flow Thru Trailer Plumbing
Eh & pH Measurements
UE-25 WT #3 and UE-25 WT #17



1. Sample pick up / middle of discharge line.
2. Unions.
3. USGS flowthrough cell (or equivalent)
4. Secondary sampling spigot.
5. Sampling spigot integral to flow through cell.

6. Bench top.
7. Ball Valve - provide back pressure to cell, sample loop.
8. Flow meter.
9. Discharge pipe from well head (2" PVC).
10. Fluid return line.

Note: Upstream of (8) all ports are non-metallic.

Note: Flow through sample loop to be 1" PVC.

SK No SK-97-A-DR

Ground Water Chemistry Eh/pH Tests

Note: years are represented as 1977.

ID	Task Name	Month 1	Month 2	Month 3	Month 4	Month 5	Month 6	Month 7	Month 8	Month 9	
1	Workovers	23d						Workovers			
2	Eh / pH Testing	23d						Eh / pH Testing			
3	WT#17	23d						WT#17			
14	Pre-Cleanout	52d						Pre-Cleanout			
15	Identify and Stake Proposed Fluid Discharge Route	1d						Identify and Stake Proposed Fluid Discharge Route			
16	Environmental Survey for Discharge Route/Area	1d						Environmental Survey for Discharge Route/Area			
17	Receive Environmental OK for Discharge Route	1d						Receive Environmental OK for Discharge Route			
18	Equipment Procurement Request In to K/PB	0d						Equipment Procurement Request In to K/PB			
19	Receive Permit (DOE) to Discharge Water	0d						Receive Permit (DOE) to Discharge Water			
20	Receive Casual Access Permit	20						Receive Casual Access Permit			
21	TCO Approval to Mobilize Equipment	0d						TCO Approval to Mobilize Equipment			
22	Repair and Modify Access Road and Drill Pad	1d						Repair and Modify Access Road and Drill Pad			
23	Refurbish USGS Field Trailer	1d						Refurbish USGS Field Trailer			
24	Notify M&O ES&H Dept. Prior to Commencing Work	0d						Notify M&O ES&H Dept. Prior to Commencing Work			
25	Install and Test Generator(s) and Electrical Grounding System	2d						Install and Test Generator(s) and Electrical Grounding System			
26	Install Telephone Line(s)	1d						Install Telephone Line(s)			
27	Deliver Baker Tank(s) to Drill Site	1d						Deliver Baker Tank(s) to Drill Site			
28	Deliver Discharge Piping/Tank System to Drill Site	1d						Deliver Discharge Piping/Tank System to Drill Site			
29	Install Water Storage/Discharge/Tank System	1d						Install Water Storage/Discharge/Tank System			
30	Notify PI (LANL) 3 to 5 Days Prior to Pulling Tubing	0d						Notify PI (LANL) 3 to 5 Days Prior to Pulling Tubing			
31	Move-in and Set-up Modified USGS Field Trailer	1d						Move-in and Set-up Modified USGS Field Trailer			
32	MIRU Class XI Rig (Falling 1500) and Support Equipment	3d						MIRU Class XI Rig (Falling 1500) and Support Equipment			
33	Functional Check-out of Rig Systems (and Correction as needed)	1d						Functional Check-out of Rig Systems (and Correction as needed)			
34	Moyno Pump Checked as Operable	1d						Moyno Pump Checked as Operable			
35	Deliver Pump, Rods and Drive System to Well Site	1d						Deliver Pump, Rods and Drive System to Well Site			
36	Spud-in Meeting	1d						Spud-in Meeting			
37	All Pre-Cleanout Tasks Completed	0d						All Pre-Cleanout Tasks Completed			
38	Pre-test Cleanout	50d						Pre-test Cleanout			
40	Pull Existing Monitor Tubing	2d						Pull Existing Monitor Tubing			
41	Collect Discrete Zone Water Samples	1d						Collect Discrete Zone Water Samples			
42	Geochemistry & Geophysical Logging	2d						Geochemistry & Geophysical Logging			
43	Install Pump & Monitor String	3d						Install Pump & Monitor String			
44	Install Water Level Transducer in Monitor String	1d						Install Water Level Transducer in Monitor String			
45	Pump Well to Water Storage/Discharge System	2d						Pump Well to Water Storage/Discharge System			
46	Collect Water Quality Samples	1d						Collect Water Quality Samples			
47	Visual Inspection / Environmental Clearance to Discharge Water	1d						Visual Inspection / Environmental Clearance to Discharge Water			
48	Conduct Pump Test to Discharge System	5d						Conduct Pump Test to Discharge System			
49	Water Level Recovery	1d						Water Level Recovery			
50	Remove Water Level Transducer from Monitor String	1d						Remove Water Level Transducer from Monitor String			
51	Remove Pump and Monitor String	2d						Remove Pump and Monitor String			
52	Water Chemistry Stabilization (6 Calendar Weeks)	30d						Water Chemistry Stabilization (6 Calendar Weeks)			
53	Geophysical Logging (24 hour/day Scientific Operation)	4d						Geophysical Logging (24 hour/day Scientific Operation)			
54	Perform Geophysical and Geochemical Logging	4d						Perform Geophysical and Geochemical Logging			
55	Eh / pH Testing	23d						Eh / pH Testing			
56	Deliver Specialty Pump, Fiberglass Tubing, etc. to Well Site	1d						Deliver Specialty Pump, Fiberglass Tubing, etc. to Well Site			
57	Deliver Inflatable Packer, Inflation Tubing and Fittings to Well S	1d						Deliver Inflatable Packer, Inflation Tubing and Fittings to Well S			
58	Deliver USGS (loaned) Transducer to Well Site	1d						Deliver USGS (loaned) Transducer to Well Site			
59	Install Pump, Tubing, Transducer etc. for Testing	5d						Install Pump, Tubing, Transducer etc. for Testing			
60	Plumb Well to Non-metallic Discharge Piping to Modified Field	1d						Plumb Well to Non-metallic Discharge Piping to Modified Field			
61	Pump Well for Testing	15d						Pump Well for Testing			
62	Remove Pump, Packer, Tubing, etc. from Well	1d						Remove Pump, Packer, Tubing, etc. from Well			
63	Eh / pH Testing Completed	0d						Eh / pH Testing Completed			
64	Well Completion	4d						Well Completion			
65	Install Long-term Monitoring Strings per FWP	2d						Install Long-term Monitoring Strings per FWP			
66	Demobilize Class XI Rig and Equipment	2d						Demobilize Class XI Rig and Equipment			
67	Final Site Work	1d						Final Site Work			
68	Install Locking Cap on Borehole	1d						Install Locking Cap on Borehole			
69	COMPLETION OF WT#17 PLANNED WORK	0d						COMPLETION OF WT#17 PLANNED WORK			

APERTURE CARD
 Also Available on Aperture Card

Project: Borehole Drilling Schedule
Date: 10/17/87

Task: ██████████ Milestone: ◆
 Progress: ██████████ Summary: ◆
 Rotted Up Task: ██████████ Rotted Up Milestone: ◆

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