NYE COUNTY NUCLEAR WASTE REPOSITORY

PROJECT OFFICE

TECHNICAL PROCEDURE

TITLE: Slug Testing of Individual Pumping Ports		Revision: 0 Date: 1/18/1999 Page: 1 of 7
PROCEDURE No.: TP - 9.6	SUPERSEDES:	
APPROVAL Project Manager Date Les W Bradshaw 1.29.99	CONCURRENCE J M Stellavato 1-29-99 On-Site Geotechnical Representative Date Claudio Muirhead FOR Perry Montazer 1/29/99 Principal Investigator Date 25 JAN 1999 Project Quality Assurance Officer Date	

QUALITY ASSURANCE RECORD
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1. PURPOSE

The purpose of this procedure is to provide instructions to NWRPO personnel for conduction of slug testing at Westbay instrumented boreholes as part of the Borehole Testing segment of Nye

County's Early Warning Drilling Program (EWDP). As described in the EWDP Borehole Testing Plan, hydraulic testing will be performed on completed boreholes that are instrumented with Westbay systems (see Attachment 1). These tests will consist of slug tests of individual pumping ports in an attempt to establish certain hydraulic characteristics of specific zones. The implementation of this procedure ensures that data gathered during these slug tests as part of the Nye County independent scientific investigation program meet NWRPO quality assurance (QA) requirements for scientific data.

2. SCOPE

2.1 APPLICABILITY

This procedure applies to the NWRPO principal investigator (PI) or designated personnel and contractors performing the scientific investigation tasks listed in the above section. These individuals shall be referred to herein as NWRPO personnel.

2.2 TRAINING

NWRPO personnel shall be trained before conducting work and shall document that they have read and understand this procedure. Personnel performing the tasks described in this technical procedure shall be professional geoscientists or engineers with applicable previous experience. Personnel performing field calibrations as well as data-collection tasks shall be trained in procedures specifically applicable to the equipment used.

3. DEFINITIONS

MOSDAX: The instrument packages that are lowered to and connected with monitoring ports in the access tube of the Westbay downhole instrument assembly to measure pressure and temperature

PERMEABILITY: a measure of the ability of a porous medium to transmit fluids such as water

SLUG TEST: a test made by pressurizing the Westbay access tube so the water level reaches a pre-calculated level in the zone being tested and then quickly relieving the pressure and analyzing the water level response

4. RESPONSIBILITIES

The project QA Officer shall be responsible for the coordination of the internal review of this technical procedure.

The PI shall be responsible for the preparation and modification of this procedure, as well as oversight of the performance of this procedure.

NWRPO personnel shall be responsible for the implementation of this procedure.

5. PROCESS

This procedure concerns the activities performed by NWRPO personnel related to the conduction of slug tests of individual pumping ports at designated monitoring wells as part of the borehole testing phase of the EWDP. Any deviation from this procedure shall be documented in the field and/or office logbooks (i.e., scientific notebooks).

The performance of the tasks specified in this procedure shall be documented in scientific notebooks. All documentation shall meet the requirements of QAP-3.2, "Procedures for Documentation of Scientific Investigations."

5.1 BACKGROUND

As mentioned in section 1.0, slug tests of individual pumping ports are controlled field experiments to determine hydraulic characteristics of specific zones within the formations of interest. The standard slug test consists of increasing or decreasing the water level in the Westbay tubing to produce a sudden pulse change in water level. The subsequent water level recovery is used to obtain hydraulic properties of the formations.

Water level recovery will be measured through the use of a string of Mosdax pressure transducers previously installed in the monitoring well. Water level will be determined by taking borehole pressure probe measurements in the particular zone of interest and then calculating water level by adding the elevation of the probe to the pressure measurement.

5.2 CALIBRATION OF EQUIPMENT

Laboratory and field calibration of the Westbay Mosdax probes will be conducted according to the procedures identified in NWRPO Technical Procedure 9.2 "Instrument Calibration and Collection and Processing of Data from Boreholes". The pressure gauges and pressure regulators to be used during the slug test should be factory calibrated to nationally recognized standards if available. However, if national standards do not exist for a particular gauge or regulator, the best available standard will be used, e.g., the manufacturer's calibration, a field calibration, or other appropriate method. It is understood that the unavailability of a national standard for calibration purposes will not impact the data adversely.

5.3 TESTING OF PACKERS FOR SEAL LEAKAGE

To seal off discrete testing zones within the borehole, inflatable packers will be placed in the borehole above and below each zone to be tested prior to installation of the Westbay assembly. Packer installation procedures are described in more detail in the NWRPO Workplan entitled "Early Warning Drilling Program Drilling and Well Construction Plan". To ensure that there is no leakage occurring at packer seals, pressure testing of the seals should be performed periodically.

5.4 COLLECTION AND RECORDING OF BACKGROUND DATA PRIOR TO COMMENCEMENT OF SLUG TEST

Prior to testing of the monitoring well, readings of temperature and pressure should be taken in the well at the zone of interest. The downhole transducer ranges should be from 0.1 to 150 psi. All boreholes where slug testing will be conducted will be completed

with the Westbay Mosdax assembly, which collects pressure and temperature data from the boreholes. Pressure and temperature data shall be downloaded from the wells through the dedicated borehole dataloggers prior to commencement of the slug test. Procedures for downloading data are detailed in the Westbay datalogger manual. The frequency of recording data in these test wells will be set to respond to changes in water level as small as 0.05 ft. The slug testing will commence after ensuring that at least 30 days of water-level records are available from the well to be tested.

5.5 PROCEDURE FOR CONDUCTION OF SLUG TEST AND COLLECTION OF DATA

1. Pressure and temperature measurements should be taken in the zone of interest just prior to beginning the slug test.

2. Water level decline will be induced by injecting air into the Westbay tubing. The zone to be tested will be exposed by sliding the sleeve of the Westbay assembly associated with the elevation of the zone to be tested open. The sleeve will be opened with the open and close tool. Prior to opening the sleeve, the Mosdax transducer string will be removed and the tubing will be tested to assure that no other sleeves are open. After the appropriate sleeve has been opened, the open and close tool should be removed and the tubing will be pressure tested to ensure that the selected screen is open and can communicate with the formation. The above procedures are detailed in the Westbay field manual for operation of the Mosdax instrument assembly in boreholes.

3. The Mosdax assembly should then be replaced in pre-selected positions. The wellhead cap will be installed and equipped with a pressure gauge that measures up to 50 psi gauge pressure. A nitrogen tank outlet, with two separate pressure regulators (0-1000 and 0-100 psi) connected in series, should be attached to the inlet to the Westbay tubing. The tubing should then be slowly pressurized to a pre-determined water level decline. In general, approximately 4.3 psi of air pressure will be required to depress the water table by about 10 feet.

4. After reaching the desired pressure, close the shut-in valve and then monitor the pressure gauge and the downhole transducers to ensure near-equilibrium conditions. Once a steady state is reached, open the relief valve to relieve the pressure quickly.

5. The water-level response should then be monitored through use of the pressure transducer and the Westbay assembly installed in the well. A portable field computer will be used to download data from the Westbay Mosdax Data Logger (MDL). Procedures for downloading data from the MDL are detailed in NWRPO Technical procedure 9.2.

6. DATA ACQUISITION METHODOLOGY AND LIMITATIONS

N/A

7. REFERENCES

All manuals related to the installation and operation of Westbay instruments in boreholes are maintained at the Nye County Geotechnical Representative's office, including, but not limited to:

- The Westbay field manual for operation of the Mosdax instrument assembly in boreholes
- The Westbay completion report for each applicable borehole

8. RECORDS

N/A

9. ATTACHMENTS

Attachment 1 - Conceptual Design of a Westbay Instrumented System

10. TEST CONDITIONS

The appropriateness of the test conditions shall be determined by the PI and field personnel.

11. PERSONNEL REQUIREMENTS

There are no specific personnel requirements other than those described in Section 2.2.

12. SPECIAL ENVIRONMENTAL TEST/STORAGE CONDITIONS

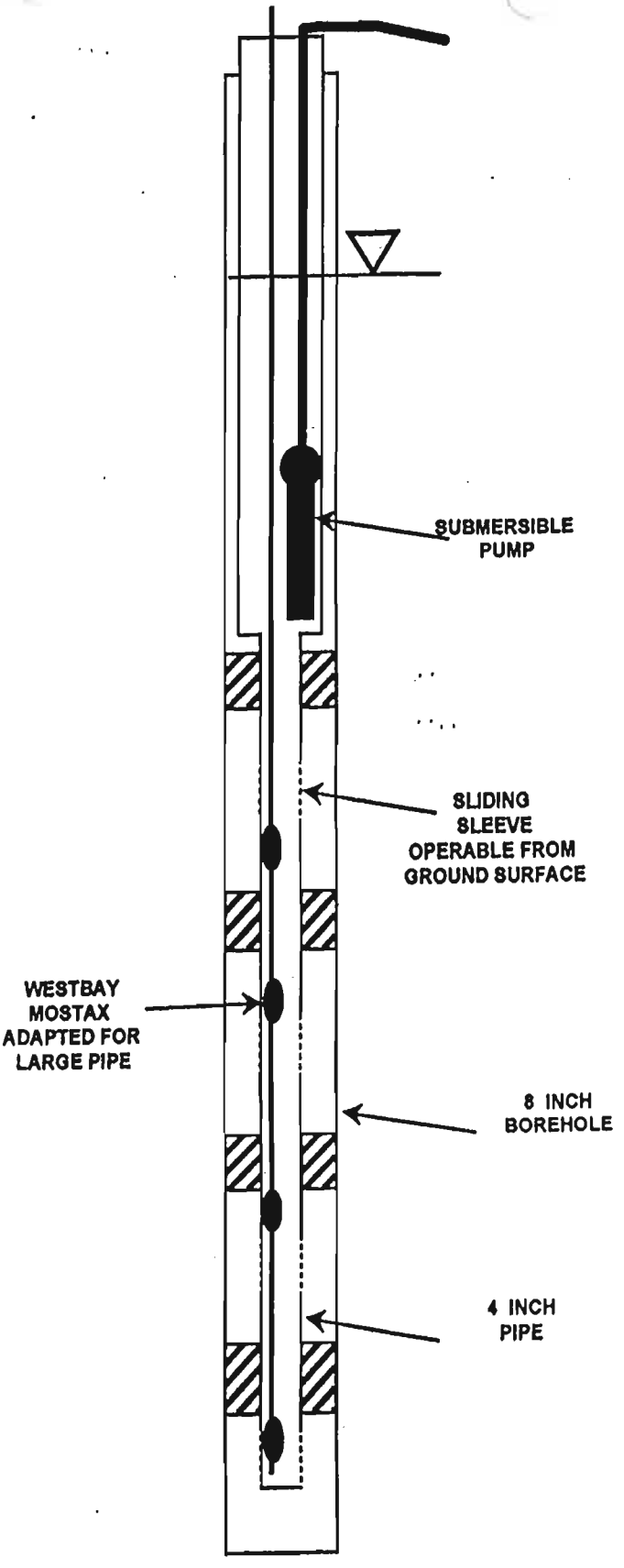
There are no special requirements for environmental test or storage conditions.

13. INSPECTION HOLD POINTS

There are no applicable inspection hold points.

14. ACCEPTABLE DETAIL AND ACCURACY LEVELS

Verification of calculations shall be made with a relative error of less than 1 in 1,000.



CONCEPTUAL DESIGN OF A WESTBAY SYSTEM

ATTACHMENT 1