

OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT

YUCCA MOUNTAIN QUALITY ASSURANCE DIVISION

QUALITY ASSURANCE SURVEILLANCE REPORT OF

NEUTRON-ACCESS BOREHOLE DRILLING PROGRAM

AND

SAMPLE HANDLING METHODOLOGY

SURVEILLANCE NUMBER YMP-SR-92-001

CONDUCTED DECEMBER 4, 1991

ACTIVITIES SURVEILLED:

DRILLING AND CORING OF THE NEUTRON-ACCESS BOREHOLES BY REYNOLDS  
ELECTRICAL AND ENGINEERING COMPANY, INC. AND RAYTHEON SERVICES NEVADA  
AND THE YUCCA MOUNTAIN SITE CHARACTERIZATION PROJECT OFFICE  
SAMPLE MANAGEMENT FACILITY HANDLING OF THE  
NEUTRON-ACCESS BOREHOLE CORE SAMPLES

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## 1.0 EXECUTIVE SUMMARY

This report contains the results of the Office of Civilian Radioactive Waste Management (OCRWM) Quality Assurance Surveillance No. YMP-SR-92-001 of the neutron-access borehole drilling program conducted by Reynolds Electrical and Engineering Company, Inc. (REECo) and Raytheon Services Nevada (RSN) and the neutron-access borehole sampling handling methods being used by the Sample Management Facility (SMF). The surveillance was conducted at the borehole site of USW-UZ-54, the SMF field trailer, and the SMF on December 4, 1991. The surveillance was conducted by a team from the Verification Group of the Yucca Mountain Quality Assurance Division (YMQAD) of the Office of Quality Assurance in accordance with the OCRWM Quality Assurance Administrative Procedure QAAP 18.3, Revision 2, "Surveillance Program."

The surveillance of the drilling program and core handling activities was conducted to verify compliance to pertinent implementing procedures and obtain an outside view of certain non-quality affecting drilling activities. The SMF personnel were found to be complying with the neutron access borehole sample handling procedure, BTP-SMF-013. The RSN and REECo personnel supervising the drilling and coring at the rig were using professionally accepted and good industry techniques to accomplish their assigned tasks. The procedures followed by the drilling rig personnel were not designated as quality-affecting but were still examined for appropriate professional technique.

There were no deficiency documents generated as a result of this surveillance and any recommendations to be made will be included in Section 8.0 of the report.

## 2.0 SCOPE

The surveillance was intended to examine the adherence to BTP-SMF-013, Revision 0, "Staging, Packaging, and Documenting Neutron-Access Borehole Samples," and investigate certain non-quality assurance designated drilling and coring activities associated with obtaining those samples. The drilling activities, though designated as non-quality affecting, were examined to verify adherence to accepted professional techniques as used in the drilling industry. These professional techniques if properly employed would increase the safety and integrity of the core and cuttings samples and increase the efficiency and cost effectiveness of the drilling rig operation.

## 3.0 SURVEILLANCE TEAM

The surveillance team consisted of the following personnel:

- K. T. McFall, Surveillance Team Leader, Quality Assurance Scientist,  
Science Applications International Corporation (SAIC)/YMQAD
- C. C. Warren, Surveillance Team Member, Quality Assurance Engineer,  
MAC Technical Services Company/YMQAD
- A. C. Williams, Observer, U.S. Department of Energy/YMQAD

#### 4.0 PERSONNEL CONTACTED DURING THE SURVEILLANCE

The following personnel were contacted during the course of the surveillance:

C. L. Lugo, SAIC, Deputy Department Manager, SMF  
E. L. Wright, RSN, Field Exploration Drilling Section Manager  
D. M. Cunningham, RSN, Senior Field Drilling Engineer  
M. R. Whitfield, U.S. Geological Survey (USGS), Site Hydrologist  
G. Abend, USGS, Quality Assurance Specialist  
P. J. Wilson, REECo, Senior Quality Assurance Specialist  
H. R. Tuthill, RSN, Quality Control Manager  
R. R. Sowards, REECo, Drilling Superintendent  
D. R. Williams, DOE/Yucca Mountain Site Characterization Project  
Office, (YMPO), Field Test Coordinator  
A. Flint, USGS, Principal Investigator  
J. A. Hartley, SAIC, Field Shift Supervisor  
C. Lewis, Harza Engineering Company, SMF Curator  
J. H. Davis, SAIC, Field Shift Supervisor

#### 5.0 SURVEILLANCE RESULTS

##### 1. BTP-SMF-013, Revision 0

Handling, videotaping, removing specimens, packaging specimens for storage, determining depth intervals, and record keeping activities were observed for core extracted from Neutron-Access Borehole USW UZ N54. The above activities were evaluated to determine the degree of compliance to YMPO Branch Technical Procedure BTP-SMF-013, Revision 0 and Interim Change Notice No. 1. During the evaluation, processing of extracted core identified as Run 35, Interval 155.6 through 160.6 was observed from its removal at Borehole USW UZ N54 through delivery to SMF personnel, videotaping, marking, and packaging and boxing of specimens for transport to the SMF. All observed activities were found to be in compliance with BTP-SMF-013.

At the SMF, a sample of Field Test Control Department Specimen Logs for core specimens from Neutron-Access Borehole USW UZ N54 were examined and all were found to be completed in accordance with the requirements of BTP-SMF-013. Specimens Logs reviewed were for all logs for the following stored core specimens intervals (depth in feet):

91.0 - 91.5            110.6 - 115.4            120.4 - 127.5            135.2 - 140.5

In addition, a sample of cuttings from Borehole USW UZ N54 was examined at the SMF to verify that identification of containers and storage was in accordance with BTP-SMF-013 requirements. Cuttings containers examined were for the following intervals (depth in feet):

2.8 - 4.8                      76.0 - 86.0                      95.9 - 105.0

Identification and storage of cuttings was found to be in compliance with BTP-013 requirements.

## 2. Non-quality Affecting Activities

A list of questions was developed for this surveillance by personnel who are familiar with and technically competent in the field of drilling and coring. The questions were based on an understanding of field operations and were intended to verify that the drilling and coring activities involved with Borehole USW UZ N54 were being conducted in a manner consistent with accepted modern industry techniques. The procedures being followed by REECo and RSN on the borehole site are classified as non-quality affecting and thus not subject to audit by the Quality Assurance Organization. However, it was felt that a check on these activities would be prudent since the end result of this drilling and coring is the core from the borehole which becomes quality-affecting as soon as it is delivered into the possession of the SMF.

Listed below are the questions and the responses to those questions as provided by the REECo, RSN, USGS, and SMF site personnel.

1. What is being done to protect the borehole at night and over the weekends from inclement weather and possible animal incursion?

A large plastic tarp is spread around the hole and anchored with an earthen berm on the up slope side of the hole to prevent run-off during a rain from entering the hole. Additionally, a clean, empty 5 gallon bucket is placed over the casing stickup and anchored securely.

2. What has been done to prevent a recurrence of the problems encountered on USW UZ N55 caused by deviation of the borehole from the vertical?

A large steel baseplate is being used to stabilize the top of the drill string and the core bit has been changed to one with larger stones to increase penetration to the maximum while still obtaining the best core results.

3. Who is the delegated site representative for the USGS when the Principal Investigator (PI) is not on site?

A cadre of 5 USGS personnel out of the Denver office rotate site duties. During the surveillance there were 2 individuals present; M. R. Whitfield and G. Abend.

4. What has been done for hole protection when a borehole is completed?

A steel cap on a chain is welded to the top of the steel casing and placed over the top. A chain link is also welded to the casing in such a manner that a lock can be used.

5. How are depth measurements determined? What backup is used to insure accurate depth determination?

The depth is calculated by REECo by adding the lengths of machined 5.00 foot drill pipe joints as they go in the hole and a running pipe tally is kept current at all times. The casing is measured to the nearest .01 foot as it is put in the hole. A running pipe tally is also kept on the casing. These two pipe tallies must match. RSN also keeps an independent pipe tally and this tally must match that of REECo. Additionally, The SMF personnel as part of their quality-affecting procedures are required to measure the core from each 5 foot core run. If there is a discrepancy there are provisions in RSN Project Procedure PP-10-01, Revision 0, "Field Drilling Engineer Support Activities," Paragraph 6.5.8.10.1 which describe how to resolve it. The documentation requirements of the resolution of the depth discrepancy are set forth in paragraph 6.5.8.10.4 of that same procedure. An additional check can be made by logging the hole with conventional geophysical tools and comparing the logs with the SMF core examinations.

6. Since depth measurements are made from ground level, what efforts are being made to insure that there is no degradation of the original ground level after repeated tripping in and out of the hole and work on and around the rig over an extended period of time?

The steel baseplate which is now being used is sufficiently large to provide protection for the continued integrity of the original ground level determination.

7. If the casing joints which were used on borehole USW UZ N55 had to be cut with a welder's torch, what precautions were taken to prevent the hot welding fragments or slag from going down the hole and possibly adding undesirable contamination?

Not all the casing that was extracted from the borehole required cutting to separate. The casing was removed from the hole until it could be unscrewed and laid out on the ground where it was cut. The casing was not cut over the hole where contamination could occur.

8. How are the cuttings collected while drilling the hole?

The cuttings are collected through the use of compressed air which lifts the dust and rock fragments to the surface where they are sent through a cyclone and they then drop out onto the ground or into a bucket if a sample is desired.

9. What procedures are in place to control the interfaces between the participants concerning the neutron-access boreholes? RSN, REECo, YMPO, and USGS.

The Job Package, the Work Planning Package, and the Criteria Letter spell out the necessary interfaces.

10. Who is performing the wellsite lithological logging, if any?

The preliminary lithological logging is performed as a part of the function of the SMF when the core is examined.

11. Are the procedures to which work is being accomplished available for reference at the location where the work is being done?

Yes, the USGS is using the job package; RSN has copies of their procedures on site, and REECo keeps a copy of their procedures in the doghouse which adjacent to the location of the rig.

12. It was noted that there was some moisture on the core as well as some contamination of the core with oil from the compressor. What effect are these conditions having on PI's efforts and what is being done to eliminate the oil contamination?

The PI feel that the water is very small in amount and is mercurial in nature. Its location so far above the saturated zone that it is a function of fracturing which decreases with depth, and is of no real concern.

The oil found on the core was caused by the compressor blowing oil into the air lines used to cool the bits and lift the cuttings. The PI felt that the impact of the oil on the cuttings was slight in reference to the activities outlined in his study plan. He stated that since the oil contamination was minor in nature, being just a small amount now and then on the core, precautions could be taken to either remove the oil by chipping the oily portions off the core or working around them. A new scrubber has been put on the compressor and the problem of oil spotting the core has been reduced.

## 6.0 RECOMMENDATIONS

There are no deficiency documents generated as a result of this surveillance, however, there are two recommendations concerning the oil on the core and the REECo and RSN grading packages. The recommendations are as follows:

1. There should be additional efforts made to remove the contamination of the core with oil from the air compressor. While the PI for this particular study may not be overly concerned with the oil on the core, other investigators may find it a sufficient impediment to negate their efforts. Future scientific investigations may not be able to tolerate core contamination of this type.
2. There is some confusion concerning the REECo and RSN grading packages. The REECo grading package indicates that all their activities are designated as "QA/NA" while the grading package for RSN which is providing the overview for the activities are designated "QA." Why does the designation change from "QA/NA" to "QA" depending on who is performing a certain task or overseeing that task being accomplished? This question should be addressed.