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RPP-48609, Rev. 0

Completion Report for the 2010 UPR-82 (C-152 Diversion Box) Direct Push Characterization

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Abstract: This report contains information for driving 4 probe holes at 241-C-152 diversion box and installing deep electrodes.

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RPP-48609
Revision 0

Completion Report for the 2010 UPR-82 (C-152 Diversion Box) Direct Push Characterization

Prepared for the U.S. Department of Energy
Assistant Secretary for Environmental Management

Contractor for the U.S. Department of Energy
Office of River Protection under Contract DE-AC27-08RV14800

washingtonriver
protectionsolutions

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Richland, Washington 99352

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TERMS

Energy*Solutions*	Energy*Solutions* Federal Services, Inc., Northwest Operations
RPP	River Protection Project
WAC	*Washington Administrative Code*
WRPS	Washington River Protection Solutions, LLC
DOW	Description of Work

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COMPLETION REPORT FOR THE 2010 UPR-82 (C-152 DIVERSION BOX) DIRECT PUSH CHARACTERIZATION

1.0 INTRODUCTION

The U.S. Department of Energy assigned the River Protection Project (RPP) Washington River Protection Solutions, LLC (WRPS) Richland, Washington, to collect and provide subsurface data from inside the 241-C Tank Farm, around the 241-C-152 diversion box, located in the 200 East Area of the Hanford Site. WRPS contracted Energy*Solutions* Federal Services, Inc., Northwest Operations (Energy*Solutions*) to perform the field activities required to gather this data. This data was intended to provide information about the distribution and movement of contaminants in the vadose zone under and adjacent to the diversion box, and it will be used for eventual closure planning for the single-shell tank farm.

FSWO-DOW-036, *Description of Work: UPR-82 (C-152 Diversion Box) Direct Push Characterization*, Rev. 0 (see Appendix A) provides a detailed description of the scope of work performed. Energy*Solutions* was responsible for the provision of equipment and personnel to conduct the direct push activities and safety oversight. The following were included in the overall Energy*Solutions* work scope: Providing for global positioning surveys, providing subcontract geophysical logging services, providing technical support and preparing final reports. The following appendices contain copies of documentation generated during the performance of the above work scope.

Appendix A, FSWO-DOW-036, *Description of Work: UPR-82 (C-152 Diversion Box) Direct Push Characterization*, Rev. 0
Appendix B, Global Positioning System Coordinates and Map
Appendix C, Drilling and Sampling Daily Work Records
Appendix D, Small Diameter Geophysical Logging of Four Probeholes in the 241-C Tank Farm Adjacent to UPR-200-E-82
Appendix E, Washington State Department of Ecology Documents
Appendix F, Safety Documentation

2.0 SUMMARY OF ACTIVITIES

The Description of Work for this project, FSWO-DOW-036, Rev. 0 (Appendix A) was prepared and submitted in July 2010. The DOW provides detailed work instructions and information for conducting characterization efforts near the C-152 Diversion Box. Drilling equipment and support items were staged at the first UPR-82 investigative location October 4, 2010. A hydraulic hammer unit was used for placing four exploration

boreholes to the approximate target depth of 60.96 meters (200 feet) below ground surface, or in some cases, refusal, for geophysical logging. The four investigative sites were designated as C7940, C7941, C7942, C7943. These exploratory boreholes were used for geophysical logging and resistivity probe placement.

Borehole C7943 location proved to be challenging. Two separate boreholes were pushed at that location. The first borehole (C7943A) was pushed to the maximum required depth. However, the tubing broke at 37.8 meters (124 feet) below ground surface. For probe installation purposes, an adjacent borehole was pushed (designated as C7943). The second borehole met refusal at 54.87 meters (180 feet), with the tubing breaking at 45.11 meters (148 feet) below ground surface. The Closure and Corrective Measures Technical Point of Contact chose to place a multilevel resistivity probe in the shallow borehole (C7943) based on logging data collected from C7943A. All tubing below the breaks was abandoned in place. A total of 29 joints of tubing and two bottom assemblies were abandoned at these two locations.

Each exploratory location was selected based on ground-penetrating radar data and as-built infrastructure drawings. Investigation included geophysical logging from total depth to surface, using a Bismuth Germanium Oxide spectral gamma scintillation detector and a neutron-neutron moisture probe. The logging data is intended to aid in defining the extent of subsurface contamination. Cesium-137 (Cs-137) was detected near the surface in three exploratory boreholes. A maximum concentration of 16 pCi/g of Cs-137 was detected near the surface in borehole C7941. None of the four boreholes displayed low-energy gamma activity other than that from natural activity and Cs-137. Detailed results from the geophysical logging activities are provided in Appendix D.

The hydraulic hammer unit and associated personnel initially began mobilization and site setup October 4, 2010. They commenced pushing their first borehole for this task October 6, 2010. The work scope was completed on November 7, 2010. Including mobilization and demobilization of equipment, there were 24 field days that the hydraulic hammer unit and crew were dedicated to the UPR-82 activities. There were approximately 80 hours of down time associated with this task. For exact dates and explanations of down time, refer to the Drilling and Sampling (Percussion) Daily Work Records located in Appendix C.

3.0 DIRECT PUSHING AND LOGGING DETAILS

3.1 DIRECT PUSHING

In accordance with FSWO-DOW-036, Rev. 0, exploration hole placement was accomplished with the use of a hydraulic hammer system mounted on a tractor-type carrier. For investigative purposes, a 6.35 centimeter (2.5-inch) outside diameter x 4.45 centimeter (1.75-inch) inside diameter casing was driven at predetermined locations

to specified depths, or refusal. Each push location was then geophysically logged. The data was reviewed by WRPS personnel and probe locations and depths were selected.

3.2 GLOBAL POSITIONING SATELLITE SURVEYING

With the use of a Trimble[1] 5800 Global Positioning Satellite Survey system and per FSWO-DOW-036, Rev. 0, the original locations of the exploratory boreholes were identified using paint and stakes. Once the task was completed and the boreholes decommissioned, each exploratory borehole was recorded for accuracy. These recorded coordinates were placed on a map showing their locations in direct relation to structures and underground storage tanks in the vicinity. The coordinates, elevations and a map showing completed boreholes are provided in Appendix B.

3.3 GEOPHYSICAL LOGGING

Pacific Northwest Geophysics and Three Rivers Scientific conducted the geophysical logging data collection and analysis services on the 6.35 centimeter (2.5-inch) exploration probe boreholes. For the geophysical logging, a portable small diameter logging system was used to collect spectral gamma and moisture data from the bottom of the borehole to the ground surface. Calibration and operation details, survey results and data interpretation, as well as copies of the collected and processed log data, are provided in Appendix D.

4.0 BOREHOLE DECOMMISSIONING

Decommissioning of all the boreholes was conducted in accordance with the *Washington Administrative Code* (WAC) 173-160 requirements. Each exploration borehole required decommissioning and simultaneous placement of multilevel resistivity probes. This was accomplished by knocking the drive tip out of the bottom of the tubing then back pulling the tubing while filling it with bentonite to near the desired probe placement depth. Approximately 0.3 meter (1 foot) of silica sand was then added to within 0.15 meter (6 inches) of the depth at which the resistivity probe was to be placed. The resistivity probe was placed, and then approximately 0.91 meter (3.0 feet) of diatomaceous earth was added to the borehole, encasing the probe. Approximately 3.79 liters (1.0 gallon) of water was then added, followed with another 0.3 meter (1 foot) of silica sand. Granular bentonite was then placed from above the sand to near the next probe depth. The process was repeated for each probe location. After all the probes were placed, granular bentonite was added to surface while back pulling the remaining tubing. A protective steel casing was cemented in place approximately 30.48 centimeters (12 inches) deep at

[1]Trimble is a registered trademark of Trimble Navigation Ltd., Sunnyvale, California.

the surface to protect the protruding probe wiring. Washington State Department of Ecology documentation (Resource Protection Well Reports) is provided in Appendix E.

Table 1 shows the exploration boreholes, coordinates, pushed depths and resistivity probe placement depths.

Table 1. Borehole Information.

Borehole # and Type	Northing (In meters)	Easting (In meters)	Elevation (In meters)	Hole Depth (In feet)	Multi-Level Probe(s) Depth (In feet)
C7940 Logging	136545.1	575022.1	202.955	203	16, 36, 56, 76, 96, 116, 136, 156 and 176.5
C7941 Logging	136548.2	575046.5	201.950	202	14, 34, 54, 74, 94, 114, 134, 154 and 173
C7942 Logging	136526.1	575049.6	202.649	203	16, 36, 56, 76, 96, 116, 136, 156, and 176.5
C7943	136520.1	575034.5	203.175	180	16, 36, 56, 76, 96, 116 and 135
C7943A Logging	136519.7	575034.7	203.147	203.9	NA

5.0 ENVIRONMENTAL, SAFETY AND HEALTH

During the UPR-82 activities, the job site was surveilled by Energy*Solutions* Operations Safety for safety and health compliance. The work scope conducted under the subject statement of work was completed with no lost time, reportable *Occupational Safety and Health Act of 1970* injuries, or first aid cases.

There were two incidences of equipment contamination. Health Physics Technicians detected radon on the steering wheel of the backhoe used for this push activity. The radon decayed quickly with time and no further action was necessary. Secondly, a piece of drive rod was radiologically contaminated with 650 counts per minute of detectable

contamination. The rod was discarded as radioactive waste. Associated safety documentation is provided in Appendix G.

6.0 REFERENCES

WAC 173-160, "Minimum Standards for Construction and Maintenance of Wells," *Washington Administrative Code*, as amended.

Occupational Safety and Health Act of 1970, 29 USC 651 et seq.

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APPENDIX A

FSWO-DOW-036, DESCRIPTION OF WORK: UPR-82 (C-152 DIVERSION BOX) DIRECT PUSH CHARACTERIZATION, REV. 0

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FSWO-DOW-036
Rev. 0

DESCRIPTION OF WORK
UPR-82 (C-152 DIVERSION BOX) DIRECT PUSH CHARACTERIZATION

July 2010

Prepared for
Washington River Protection Solutions, LLC

by
Remediation and Well Services
Energy*Solutions* Federal Services, Inc., Northwest Operations

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FIGURE

Figure 1. 241-C-152 Diversion Box Probe Hole Locations. 2

TABLE

Table 1. Coordinates for Up to Four Exploration Direct Push Probe Holes 4

TERMS

cm	centimeter
DOE	U.S. Department of Energy
DOW	description of work
Ecology	State of Washington Department of Ecology
Energy*Solutions*	Energy*Solutions* Federal Services, Inc., Northwest Operations
ES&H	Environmental, Safety, and Health
ft	foot
HHU	hydraulic hammer unit
in.	inch
m	meter
RCRA	*Resource Conservation and Recovery Act of 1976*
WAC	*Washington Administrative Code*
Well ID	Well identification
WRPS	Washington River Protection Solutions, LLC

FSWO-DOW-036, Rev. 0

DESCRIPTION OF WORK
UPR-82 (C-152 DIVERSION BOX) DIRECT PUSH CHARACTERIZATION

1.0 INTRODUCTION AND BACKGROUND

1.1 INTRODUCTION

The U.S. Department of Energy (DOE) Office of River Protection and the State of Washington Department of Ecology (Ecology) (the regulator for *Resource Conservation and Recovery Act of 1976* [RCRA] treatment, storage, and disposal facilities) have agreed that a RCRA Corrective Action Project be created with explicit milestones. These milestones are part of the *Hanford Federal Facility Agreement and Consent Order* (i.e., M45 milestone series). The Closure and Corrective Measures Program is managing the RCRA Corrective Action Program. This program includes collection of subsurface vadose zone data.

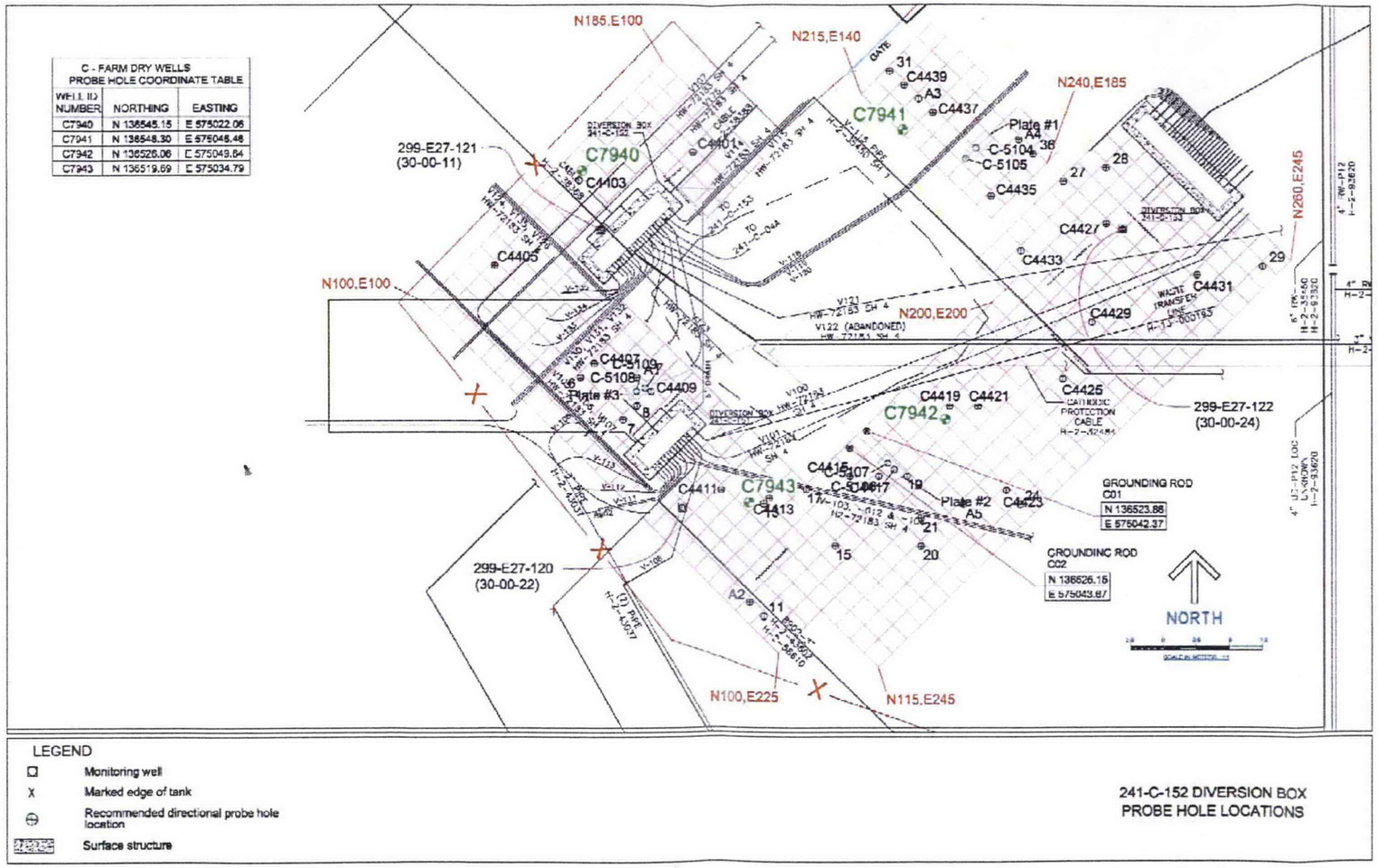
A multi-discipline team, which consists of Washington River Protection Solutions, LLC (WRPS) personnel, Energy*Solutions* Federal Services, Inc., Northwest Operations (Energy*Solutions*), and other lower-tier subcontractors, is necessary to implement the field activities of the site-specific work plans. This description of work (DOW) identifies specific actions for characterization efforts in the area around the 241-C-152 Diversion Box.

This work is being conducted at the direction of the WRPS Closure and Corrective Measures Group. This DOW provides the work instructions for conducting the construction and characterization efforts.

1.2 TANK FARM BACKGROUND

The Hanford Site has 149 underground single-shell tanks that store hazardous radioactive waste. These tanks are grouped into 12 tank farms. The tanks sit below grade with at least 2 m (7 ft) of soil cover that shields operating personnel from radiation exposure. Tank pits are located on top of the tanks and provide access to the tanks, pumps, and monitoring equipment. Many of the tanks have leaked, and there have been leaks in the associated infrastructure (e.g., pipelines, diversion boxes). Some of the leaked waste has been shown to have impacted groundwater and exceeded compliance standards.

Figure 1. 241-C-152 Diversion Box Probe Hole Locations.



1.1.2 Physical Setting

The single-shell tanks were constructed in excavations of near-surface sediments that overlie the Columbia River Basalt Group. Columbia River basalt forms the basement bedrock. Up to approximately 150 m (500 ft) of continental sediments overlie basalt. From oldest to youngest, these deposits include the following.

- Several facies of the Miocene-to-Pliocene age, fluvial-lacustrine Ringold Formation.
- Variably cemented and pedogenically altered deposits of the Plio-Pleistocene unit (referred to as Lower Cold Creek), which developed on the eroded and weathered surface of the Ringold Formation.
- A relatively loose, fine-grained silty-to-sandy unit designated the Hanford formation/Plio-Pleistocene unit interval (referred to as Upper Cold Creek).
- Deposits from Pleistocene age cataclysmic floods (i.e., Hanford formation) that blanket the study area with mostly sand- and silt-dominated facies, capped by a sequence of gravel-dominated facies.

2.0 METHOD

To obtain information about the vertical and horizontal extent of contamination, a hydraulic hammer-driven probe system mounted on a tractor-type carrier has been selected. For this application, the locations for investigation (exploration) are selected through an iterative process as outlined in Section 3.0, "Probe Hole Locations."

2.1 EXPLORATORY PROBE HOLES

Four investigative sites are outlined for exploratory push investigation and geophysical log data collection. All of the exploratory push locations will be advanced to approximately 61 m (200 ft) below ground surface or refusal. All exploratory pushes greater than 9.14 m (30 ft) in total depth require an Ecology-approved variance (*Washington Administrative Code* [WAC] 173-160, "Minimum Standards for Construction and Maintenance of Wells").

The exploratory probe holes are pushed using a single tubing string that is 6.4 cm (2.5 in.) outside diameter x 4.45 cm (1.75-in.) inside diameter (e.g., the exploratory push). All probe holes will be decommissioned per applicable WAC 173-160 requirements (e.g., filled with bentonite or bentonite/cement grout as required) as the push tubing is extracted.

3.0 PROBE HOLE LOCATIONS

3.1 PROBE HOLE LOCATION DOCUMENTATION

Figure 1 is a general location map showing the UPR-82 (C-152 Diversion Box) probe holes and the immediate surrounding area. Specific probe hole locations are also identified in Figure 1. These locations were selected through an iterative process using ground-penetrating radar scan data and as-built infrastructure drawing reviews. The location coordinates of the selected sites were plotted with computer-aided drafting (see Figure 1). Probe hole locations will be documented on Well Information Reports/Field Activity Reports.

3.2 PROBE HOLE LOCATION INFORMATION

All exploratory probe hole activities will be tracked and documented on Field Activity Reports by referencing the Well identification (Well ID) number provided in Table 1. All sampling and exploration push activities will be documented in the Field Activity Reports and sampling chain of custody forms, and all exploration push locations will be identified prior to conducting the exploration push by use of global positioning survey equipment.

Table 1. Coordinates for Up to Four Exploration Direct Push Probe Holes.

No.	Well ID	Northing	Easting
1	C7940	N 136545.15	E 575022.06
2	C7941	N 136548.30	E 575046.46
3	C7942	N 136526.06	E 575049.64
4	C7943	N 136519.69	E 575034.79

4.0 WORK TASKS

4.1 SITE SETUP

The push equipment will be mobilized and a controlled work area set up surrounding the preselected work locations (see Table 1 and Figure 1 above). A pre-survey of the Hydraulic Hammer Unit (HHU) will be conducted (per WRPS procedure) prior to moving the equipment into the work zone. As noted above, ground-penetrating radar scans and as-built drawing reviews and comparisons have been completed to properly select the probe hole locations. The HHU consists of a mobile carrier with a hydraulically powered hammer and mast system. Support equipment to be used during field activities will be mobilized into the work area as needed. A forklift will transport needed support equipment to and from the push locations. WRPS personnel will provide support, as necessary, for guiding the equipment to the work location and for subsequent movement of the unit to the listed probe hole locations.

WRPS Radiological Control Technicians and Nuclear Chemical Operators will be onsite to support work during activities that create potential personnel exposure. Contamination control measures will consist of laying spill protection material beneath the equipment (when required). Spill protection may consist of placement of rubber matting, felt or plastic sheeting, or both, on and around the HHU when necessary and prudent. Control of the work area and control of potential contamination are aided by restricting site entries by unnecessary personnel. WRPS Health Physics personnel will provide direction and support to ensure radiological protection is maintained for all personnel associated with the work.

4.2 PRECAUTIONARY MEASURES

During advancement of the probe hole, casing (push rods) will be driven into the subsurface by use of the HHU. The probe hole locations have been positioned to avoid impacting known or mapped structures, or both. Additionally, all due caution will be taken and push advance rates and resistance will be carefully observed to preclude damage to any tank farm infrastructures should the as-built drawings be in error. If rod advance indicates that obstructions are present, push advance will stop, the direct push equipment and work area will be placed in safe condition and the Closure and Corrective Measures Lead (Harold Sydnor) or his designee and the WRPS shift supervisor will be notified. If during push operations, the probe hole is deemed to be "at refusal" as defined by trained operators of the direct push equipment (refusal is defined as a minimum of one inch of advance per minute of impact operations), the depth will be noted in the Field Activity Report.

All activities using the HHU will conform to the manufacturer's operating manual and applicable procedures that relate to the specific phase of work. As the push rods are extracted from the exploratory and sampling holes, the onsite Health Physics Technician will monitor for radiological contamination. WRPS tank-farm-qualified Nuclear Chemical Operators will perform any decontamination required. The sealing requirements for decommissioning of the probe holes are defined in the appropriate sections of WAC 173-160.

4.3 GEOPHYSICAL LOGGING

At refusal or target total depth of the exploratory borings, Pacific Northwest Geophysics will conduct logging operations to gather geophysical information. The following logging suites will be used.

1. Bismuth germanium oxide @ 100 seconds/0.5 ft.
2. Additional logging with the "Red" and/or "Green" Geiger/Muller equipment, if necessary, based on observed bismuth germanium oxide results.
3. Moisture logging.

Logging data will be collected from the total depth to surface. The logging analyst, Energy*Solutions* site personnel, and the Closure and Corrective Measures Technical Lead will

review the field log data. Based on the log data sets, sampling intervals may be selected. Logging activities will be conducted in accordance with applicable Pacific Northwest Geophysics and Energy*Solutions* procedures and the Energy*Solutions* Quality Assurance Plans.

5.0 SAMPLING

No sampling will be performed for this project.

6.0 PROBE HOLE DECOMMISSIONING

Applicable requirements contained in WAC 173-160 will be used to control and guide actions for the decommissioning of the probe holes. Each probe hole will be filled with bentonite, a bentonite slurry or grout (neat cement or cement-bentonite mixture) during the push rod extraction process. At the direction of the Closure and Corrective Measures Technical Lead, multi-level resistivity electrodes may be placed in selected exploration probe holes. These electrodes will be sealed in place with diatomaceous earth, and will be completed with a surface protective casing, cemented in place.

7.0 ENVIRONMENTAL, SAFETY, AND HEALTH PROGRAM

The primary concern for Energy*Solutions* and the client (WRPS) is the safety of personnel assigned to perform activities related to the 241-C investigation/characterization. These issues are addressed and all Energy*Solutions*, WRPS, and applicable *Occupational Safety and Health Act of 1970* safety and health requirements are applied and adhered to during the field operations. An activity-specific Job Hazard Analysis outlines the specific activity hazards and the mitigation methodologies. The documentation governing the operation of the direct push rig, sampling, and decommissioning activities (AHA-10-003, *UPR 82 Characterization Activities*, Rev. 0, or most current revision) is included as a portion of the WRPS Tank Farm Work Package.

Energy*Solutions* Safety or WRPS Tank Farm Industrial Hygiene and Safety personnel, or both, will survey the job site for safety and health compliance. Energy*Solutions* personnel and safety representatives will provide onsite inspections and visits during drilling, sampling and decommissioning or construction activities to ensure compliance with the guidance outlined in the Activity Hazard Analysis. Routine inspection reports will be provided to the Closure and Corrective Measures Technical Lead. Inspection will be conducted routinely, based on activities underway at the job site.

Energy*Solutions* subscribes to the Integrated Safety Management System and has implemented an Integrated Safety Management System approach into all of its work tasks. These requirements flow down, not only internally to Energy*Solutions* employees but also to Energy*Solutions* subcontractors. All of the following are in effect and will be observed, enforced and followed:

- Safety rules and procedures for safe job performance,
- Radiological Work Permit,
- WAC 173-160,
- *Occupational Safety and Health Act of 1970,* and
- Client-identified standards.

These requirements are communicated to everyone associated with the project (visitors included) using the Energy*Solutions* Activity Hazard Analysis. The Activity Hazard Analysis is part of the Energy*Solutions* Environmental, Safety, and Health (ES&H) Program.

This program encompasses environment, safety and health, including pollution prevention and waste minimization. All work for this project will be analyzed in accordance with the five core functions of the Energy*Solutions* Integrated Safety Management System.

- Define the scope of work.
- Identify the work hazards and ES&H requirements.
- Analyze the work hazards and implement controls.
- Perform the work activity within the developed controls.
- Provide feedback on the adequacy of controls and safety management improvement.

The specific procedures used to accomplish these core functions are found in the Energy*Solutions* ES&H Program.

7.1 ENVIRONMENTAL, SAFETY, AND HEALTH PROGRAM KEY ELEMENTS

- Line management is responsible for the protection of employees, the public, and the environment.
- Clear and unambiguous lines of authority and responsibility for ensuring ES&H are established and maintained at all organizational levels.
- Personnel have "stop work" authority.
- Personnel possess the experience, knowledge, skills and abilities that are necessary to discharge their responsibilities.
- Resources are effectively allocated to address ES&H, programmatic, and operational considerations. Protecting employees, the public, and the environment is a priority whenever activities are planned and performed.
- Before work is performed, the associated hazards are evaluated and an agreed-upon set of ES&H standards and requirements is established which, if properly implemented, provides

adequate assurance that employees, the public and the environment are protected from adverse consequences.

- Administrative and engineering controls to prevent and mitigate hazards are tailored to the work being performed and associated hazards. Emphasis should be on designing the work and/or controls to reduce or eliminate the hazards and to prevent accidents, unplanned releases, and exposures.

7.2 WRPS-REQUIRED ENVIRONMENTAL, SAFETY, AND HEALTH ELEMENTS

WRPS has provided a Field Work Supervisor who is trained to the comprehensive list of WRPS, DOE, and Hanford Site-specific procedures and requirements applicable to conducting work within the confines of the 241-C Tank Farm. While executing the work scope detailed in this DOW, Energy*Solutions* will comply with all applicable directives and orders resulting from WRPS requirements. The application of these requirements will be directed by the WRPS Field Work Supervisor.

8.0 QUALITY ASSURANCE

All work on the Hanford Site is subject to the requirements of DOE Order 5700.6C, *Quality Assurance*. A Quality Assurance program has been described in applicable sections of FS-WO-QAPP-001, *Federal Services Hanford Quality Assurance Program Plan*, and FSWO-QAP-001, *Quality Assurance Procedures*.

All work will be performed in accordance with approved procedures and this work plan.

9.0 REFERENCES

AHA-10-003, 2010. *UPR 82 Characterization Activities*. Rev. 0, Energy*Solutions* Technical Services, Richland, Washington.

DOE Order 5700.6C, 1996, *Quality Assurance*, U.S. Department of Energy, Chg. 1, Washington, D.C.

Ecology, EPA, and DOE, *Hanford Federal Facility Agreement and Consent Order*, 6 vols., Washington State Department of Ecology, U.S. Environmental Protection Agency, and U.S. Department of Energy, Olympia, Washington, as amended.

FS-WO-QAPP-001, *Federal Services Hanford Quality Assurance Program Plan*, Energy*Solutions* Federal Services, Western Operations, Richland, Washington.

FSWO-DOW-036, Rev. 0

FSWO-QAP-001, *Quality Assurance Procedures*, Energy*Solutions* Federal Services, Western Operations, Richland, Washington.

Occupational Safety and Health Act of 1970, 29 USC 651 et seq.

Resource Conservation and Recovery Act of 1976, 42 USC 6901 et seq.

WAC 173-160, "Minimum Standards for Construction and Maintenance of Wells," *Washington Administrative Code*, as amended.

APPENDIX B

GLOBAL POSITIONING SYSTEM COORDINATES AND MAP

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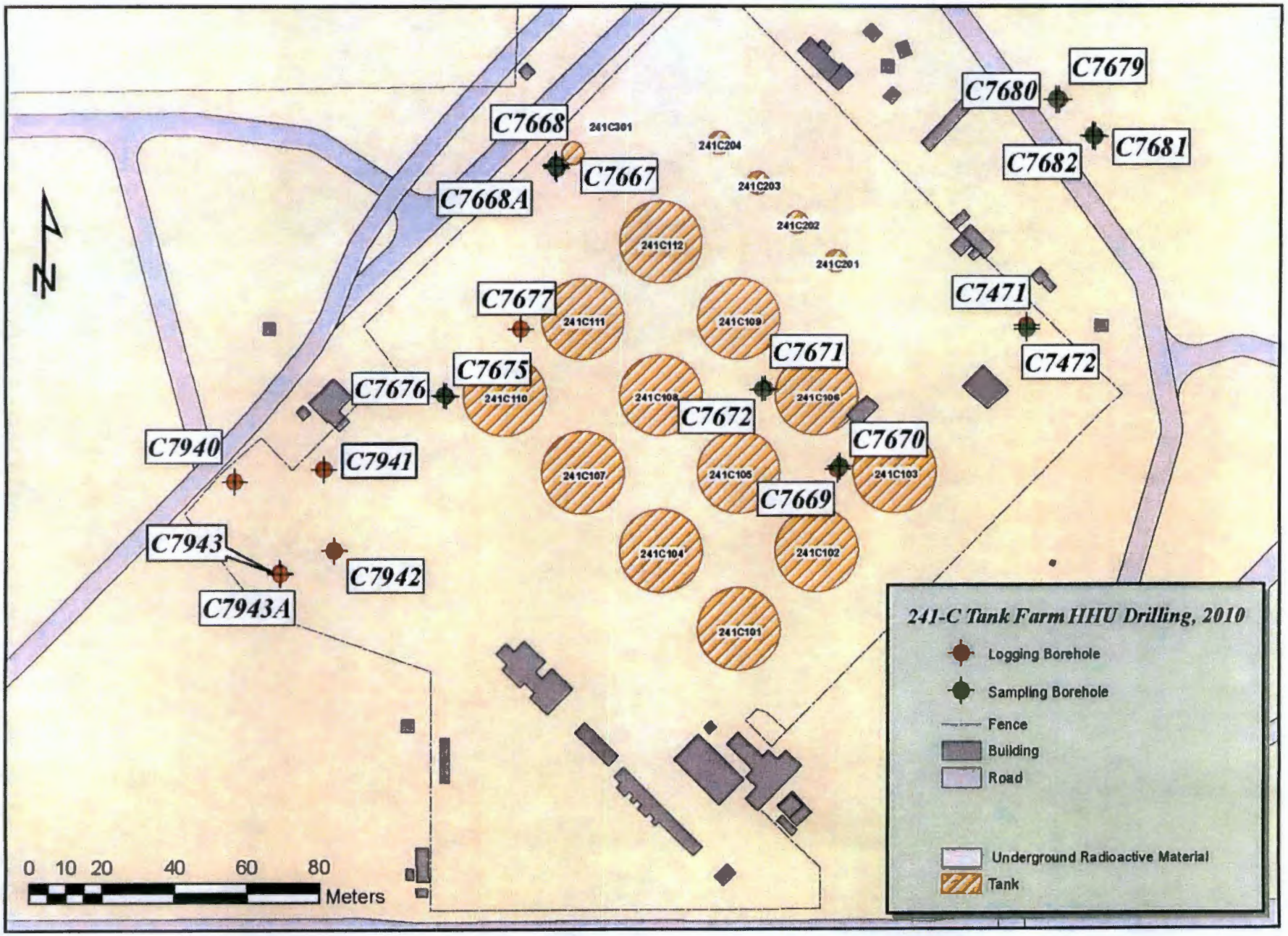
241-C Tank Farm HHU Drilling, 2010
Logging Borehole
Sampling Borehole
Fence
Building
Road
Underground Radioactive Material
Tank
0 10 20 40 60 80
Meters
N
C7668
C7667
C7668A
C7677
C7675
C7676
C7940
C7941
C7943
C7943A
C7942
C7672
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241C202
241C201
241C112
241C111
241C110
241C109
241C108
241C107
241C106
241C105
241C104
241C103
241C102
241C101

Name	Northing	Easting	Elevation
GABLEMT	141087.6	579577.8	328.796
C7942	136526.1	575049.6	202.649
C7943A	136519.7	575034.7	203.147
C7940	136545.1	575022.1	202.955
C7941	136548.2	575046.5	201.95
C7943	136520.1	575034.5	203.175

APPENDIX C

DRILLING AND SAMPLING DAILY WORK RECORDS

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ENERGYSOLUTIONS

ENERGY SOLUTIONS, WESTERN OPERATIONS

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DRILLING AND SAMPLING (PERCUSSION) DAILY WORK RECORD

PURPOSE: Mobilize CASE HHU into farm and set-up on #C7943			DATE: 10-04-10
LOCATION: "C" Tank Farm, 200 East Area, Hanford	EXCAVATION: DAN-4054	U-DIG #: 10213014	REPORT #: 01
START CARD NO. SE08172	DECOMMISSION NO. AE10775	RWP: CO-601, Rev. 1	AHA-09-008, Rev. 0
SAMPLING SUMMARY	SITE/EQUIPMENT INSPECTION: (Yes) No	HHU CASE#1 HHU CAT #2 HHUXL#3	

Sample #	Interval ft.
1	N/A
2	
3	
4	

BOREHOLE SUMMARY

Borehole = C7943 Tubing 5 1/2" @ 65 w/ N/A ft bgs: S.L. N/A

Borehole = N/A Tubing ' @ w/ ft bgs: S.L.

Borehole = N/A Tubing ' @ w/ ft bgs: S.L.

GEOPHYSICAL LOGGING

Boring #	Interval	Type
1	N/A	
2		
3		

TIME	WORK SUMMARY
0600	Safety meeting at office. Noise protection and continuing OSHA 30 Hr. refresher.
0745	Travel to "C" Farm, MO 524.
0815	Onsite at MO 524. Standby for pre-job.
1115	Pre-job by FWS C. Lehmann. Attendees: IH-J. Peoples, NCO-S. Snook, RCT-B. Barnard, K. Olson-ESFS, L. Amos-ESFS, M Walkup-
----	ESFS and M. Ehrgott-ESFS.
1200	Acc in at "C" Farm Aces station under RWP CO-601, Rev. 1. Obtain electronic dosimetry.
1232	Mobilized CASE HHU and support equipment into farm and set-up on #C7943.
1340	Secured site and exited farm.
1400	Turned in electronic dosimetry, traveled to office. Completed timecard and paperwork.
1530	End of shift.

N/A

OPERATOR/LICENSE: Olson/1217 ES SUPPORT: Ehrgott, Amos, Walkup NCO Snook HPT Barnard FWS Lehmann	WEATHER: 71 F, partly cloudy with winds from the southwest at 10-20 mph. DOWNTIME:	DISCARDED ITEMS: N/A

REFERENCE/CONTRACT INFORMATION: TFC-WO-10-1765; FSWO-DOW-036; RPP-PLAN-3939364; ECN-127555

REPORT BY: M. W. Walkup	REVIEWED BY: D. F. Skoglie
TITLE: ES TECHNICAL PREPARER	TITLE: ES TECHNICAL REVIEWER
SIGNATURE: [signature]	SIGNATURE: David F. Skoglie DATE: 10/5/10

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DRILLING AND SAMPLING (PERCUSSION) DAILY WORK RECORD

PURPOSE: Begin pushing probe hole #C7943 | **DATE:** 10-05-10

LOCATION: "C" Tank Farm, 200 East Area, Hanford | **EXCAVATION:** DAN-4054 | **U-DIG #:** 10213014 | **REPORT #:** 02

START CARD NO. SE08172 | **DECOMMISSION NO.** AE10775 | **RWP:** CO-601, Rev. 1 | AHA-09-008, Rev. 0

SAMPLING SUMMARY | **SITE/EQUIPMENT INSPECTION:** (Yes) No | (HHU CASE#1) HHU CAT #2 HHUXL#3

Sample #'s	Interval	%
1.	NA	
2.		
3		
4		

BOREHOLE SUMMARY

Borehole # C-7943 Tubing # 2.5" @ 10' ft bgs S.L.

Borehole # Tubing # @ to ft bgs S.L.

Borehole # Tubing # @ to ft bgs S.L.

GEOPHYSICAL LOGGING

Borehole #	Interval	Type
1	NA	
2		
3		

TIME	WORK SUMMARY
0600	Safety meeting at office. Effects of Weather.
0615	Travel to 'C' Farm
0645	Arrive at Access station, Acc in
0700	stand-by for pre-job (RCTs)
0745	pre-job
0800	stand-by for AvP-11, vacuum
01100	Lunch
01120	Continue stand-by for AvP-11, Pick up bentonite
	at chem-storage, travel to office, paperwork and
1430	time cards
1530	End of shift
	NA

OPERATOR/LICENSE: Olson/1217
ES SUPPORT Ehrgott, Amos, Walkup, Weakley
VCO Stock, Williams
HPT Templeton, Barnard
FWS Lehmann

WEATHER: 72 F, partly cloudy with winds from the southwest at 5-10 mph.

DOWNTIME: .75 hr for RCTs
6 hrs for AvP-11

DISCARDED ITEMS: NA

REFERENCE/CONTRACT INFORMATION: TFC-WO-10-1765; FSWO-DOW-036; RPP-PLAN-3939364; ECN-127555

REPORT BY: Kelly Olson
TITLE: ES TECHNICAL PREPARER
SIGNATURE: Kelly Olson

REVIEWED BY: D.E. Skeghe
TITLE: ES TECHNICAL REVIEWER
SIGNATURE: David E. Skeghe **DATE:** 10/06/10

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DRILLING AND SAMPLING (PERCUSSION) DAILY WORK RECORD

PURPOSE: Possibly begin pushing probe hole #C7943 | **DATE:** 10-06-10

LOCATION: "C" Tank Farm, 200 East Area, Hanford | **EXCAVATION:** DAN-4054 | **U-DIG #:** 10213014 | **REPORT #:** 03

START CARD NO. SE08172 | **DECOMMISSION NO.** AE10775 | **RWP:** CO-601, Rev. 1 | **AHA-**09-008, Rev. 0

SAMPLING SUMMARY | **SITE/EQUIPMENT INSPECTION:** (Yes) No | (HHU CASE#1) HHU CAT #2 HHUXL#3

Sample # | Interval | %

1 NA
2
3
4

BOREHOLE SUMMARY

Borehole = 2 1/2" Tubing 2.5" @ 0 to 128' ft bgs S.L. 2.3

Borehole = \ Tubing \ @ \ to \ ft bgs S.L. \

Borehole = \ Tubing \ @ \ to \ ft bgs S.L. \

GEOPHYSICAL LOGGING

Boring = Interval Typ.

1 NA
2
3

TIME	WORK SUMMARY
0600	Safety meeting at office. Topic: Head Protection—Hard Hats. , continue stand-by,
\	for AOP-11, ~SHA training at office
0830	AOP-11 lifted, travel to 'C' farm, Ace in
0915	Pre-job
0930	Dress into whites, RCT performed ground survey, Finish set-up
\	on Zone, Begin driving C-7943, Drove 2 1/2" tubing from 0'
\	to 60', decommissioned old push hole near north fence line,
\	Head heated up
11:00	Lunch + let head cool
11:30	Continue driving C-7943, Drive from 60' to 128'
	letting head cool periodically, clean-up and survey
	out.
1330	Stand-by for RCT support
1430	Travel to office, paperwork and time cards
1530	End of shift.
	NA

OPERATOR/LICENSE: Olson/1217
ES SUPPORT: Ehrgott, Amos, Walkup, Cauldy
VCO: Stack, Williams
HPT: Bernard
FWS: Lehmann

WEATHER: 75 F, mostly sunny with winds light and variable from the southwest.

DOWNTIME: 2.5 hr - AOP11
1 hr RCT support

DISCARDED ITEMS:
1 large pin
4 Lynch pins
1 bag chips

REFERENCE/CONTRACT INFORMATION: TFC-WO-10-1765; FSWO-DOW-036; RPP-PLAN-3939364; ECN-127555

REPORT BY: Kelly Olson
TITLE: ES TECHNICAL PREPARER
SIGNATURE: Kelly Olson

REVIEWED BY: D. E. Skoglie
TITLE: ES TECHNICAL REVIEWER
SIGNATURE: David E. Skoglie **DATE** 10/7/10

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DRILLING AND SAMPLING (PERCUSSION) DAILY WORK RECORD

PURPOSE: Continue pushing probe hole #C7943 | **DATE:** 10-07-10

LOCATION: "C" Tank Farm, 200 East Area, Hanford | **EXCAVATION:** DAN-4054 | **U-DIG #:** 10213014 | **REPORT #:** 04

START CARD NO. SE08172 | **DECOMMISSION NO.** AE10775 | **RWP:** CO-601, Rev. 1 AHA-09-008, Rev. 0

SAMPLING SUMMARY | **SITE/EQUIPMENT INSPECTION** (Yes) No | (HHU CASE#1) HHU CAT #2 HHUXL#3

Sample # | Interval %

1
2. NA
3.
4

BOREHOLE SUMMARY

Borehole # C-7943 Tubing 2½" @ 128' to 203 ft bgs S.U. 13'
Borehole # \ Tubing \ @ \ to \ ft bgs S.U. \
Borehole # \ Tubing \ @ \ to \ ft bgs S.U. \

GEOPHYSICAL LOGGING

Boring # | Interval | Type

1 C7943 NA
2.
3.

TIME	WORK SUMMARY
0600	Safety meeting at office. Topic: Eye Protection.
0615	Travel to "C" Farm, Ace in at Aces station
0700	Stand-by for RCRS for pre-job
0800	Pre-Job
0815	Stand-by for Vapor issues, exhauster start-up
1115	Cleared to enter Farm. Drove 2½" tubing at C-7943 from 128' to 203' (T.D.) letting head cool periodically. Harder formation 128' to 170', softer formation 170' to 200', harder 200'-203' bgs, clean-up and survey out.
1430	Travel to office, paperwork and time cards
1630	End of shift

NA

OPERATOR/LICENSE: Olson/1217
ES SUPPORT: Ehrgott, Weakley, Walkup
VCO Williams, Snook
HPT Templeton, Barnard, Mince
FWS Lehmann PNG R Price

WEATHER: 68 F, partly cloudy with a chance of showers. Winds from the south at 10-20 mph.

DOWNTIME: 3 hr for vapor issues
1 hr for RCRS

DISCARDED ITEMS: 2 Lynch pins

REFERENCE/CONTRACT INFORMATION: TFC-WO-10-1765; FSWO-DOW-036; RPP-PLAN-3939364; ECN-127555

REPORT BY: Kelly Olson
TITLE: ES TECHNICAL PREPARER
SIGNATURE: Kelly Olson

REVIEWED BY: D. E. Skoglie
TITLE: ES TECHNICAL REVIEWER
SIGNATURE: David E. Skoglie **DATE:** 10/08/10

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DRILLING AND SAMPLING (PERCUSSION) DAILY WORK RECORD

PURPOSE: Mobilize to #C7942, set-up and begin pushing probe hole. PNG begin logging #C7943. **DATE:** 10-08-10

LOCATION: "C" Tank Farm, 200 East Area, Hanford | **EXCAVATION:** DAN-4054 | **U-DIG #:** 10213014 | **REPORT #:** 05

START CARD NO. SE08172 | **DECOMMISSION NO.** AE10775 | **RWP:** CO-601, Rev. 1 | **AHA-09-008**, Rev. 0

SAMPLING SUMMARY | **SITE/EQUIPMENT INSPECTION:** (Yes) No | (HHU CASE#1) HHU CAT#2 HHUXL#3

Sample = s Interval %

1
2 NA
3
4

BOREHOLE SUMMARY

Borehole = C-7942 Tubing 2½" @ 0' to 132' ft bgs S.L. 23'
Borehole = \ Tubing \ @ \ to \ ft bgs S.L. \
Borehole = \ Tubing \ @ \ to \ ft bgs S.L. \

GEOPHYSICAL LOGGING

	Boring =	Interval	Type
1	C7943	203'-150'	GAMMA
2	\	\	\
3	\	\	\

TIME	WORK SUMMARY
0600	Safety meeting at office. Topic: Housekeeping.
0615	Travel to 'C' farm, see in at ecer station
0700	Stand-by for pre-job (RC75)
0800	Pre-job
0830	Press in, inspect rig, Tag hole C-7943 Tag = 202.9', (note-
\	tape and logging equipment hung up slightly at 128' b.t.c.), move
\	rig and set up on C-7942, set up zone, drove 2½"
\	tubing from 0' to 84' letting head cool periodically,
\	survey out. (P.N.G set up + begin gamma logging C-7943).
1100	Lunch
1130	Dress into whites, Drive 2½" tubing at C-7942 from 84' to
	132' letting head cool periodically, P.N.G gamma logged from
	203' to 150' at C-7943, survey out.
1330	Travel to office, paperwork and time cards.
1430	End of shift

NA

OPERATOR/LICENSE: Olson/1217
ES SUPPORT: Weakley, Wallop
NCO: Snook, Williams
HPT: Templeton, Barnard
FWS: Lehmann P.N.G. R Price

WEATHER: 73 F, partly cloudy with a chance of showers. Winds from the southwest at 5-15 mph.

DOWNTIME: 1 hr for Rcrs

DISCARDED ITEMS:
1 2½" drive head
4 Lynch pins

REFERENCE/CONTRACT INFORMATION: TFC-WO-10-1765; FSWO-DOW-036; RPP-PLAN-3939364; ECN-127555

REPORT BY: Kelly Olson
TITLE: ES TECHNICAL PREPARER
SIGNATURE: Kelly Olson

REVIEWED BY: D.E. Skoglie
TITLE: ES TECHNICAL REVIEWER
SIGNATURE: David E. Skoglie **DATE:** 10/9/10

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DRILLING AND SAMPLING (PERCUSSION) DAILY WORK RECORD

PURPOSE: Complete pushing probe hole #C7942. PNG/ESFS continue gamma logging #C7943. Begin pushing C-7940 | DATE: 10-11-10

LOCATION: "C" Tank Farm, 200 East Area, Hanford | EXCAVATION: DAN-4054 | L-DIG #: 10213014 | REPORT #: 06

START CARD NO. SE08172 | DECOMMISSION NO. AE10775 | RWP: CO-601, Rev. 1 | AHA-09-008, Rev. 0

SAMPLING SUMMARY | SITE/EQUIPMENT INSPECTION: (Yes) No | (HHU CASE#1) HHU CAT #2 HHUXL#3

Sample = s Interval %

1
2
3
4 NA

BOREHOLE SUMMARY

Borehole = C-7942 Tubing: 2½" @ 132' to 203' ft bgs: S.I 1.3'

Borehole = C-7940 Tubing: 2½" @ 0' to 52' ft bgs: S.I 2.3

Borehole = \ Tubing: \ @ \ to \ ft bgs S.I \

GEOPHYSICAL LOGGING

Borehole #	Interval	Type
1 C7943	150'	Gamma
2 \	\	\
3 \	\	\

TIME	WORK SUMMARY
0600	Safety meeting at office. Topic: Continuing 30 Hr. OSHA training by ESFS Safety Staff.
0700	Travel to 'C' farm, see in
0730	stand-by for RCTs.
0815	Pre-job
0830	Press into whites, enter farm, inspect rig, PNG begin gamma logging C-7943, Drove 2½" tubing at C-7942 from 132' to 180' letting head cool periodically - survey out
1130	Lunch
1200	Drive C-7942 from 180'-203' bgs, Tag hole at 203' bgs
1215	Move rig and equipment to C-7940 and set-up rig and zone, moved 2½" casing up from lower 'C' farm, (No logging for PNG due to computer issues), Drove 2½" tubing at C-7940 from 0' to 52', survey out, return dosemiter.
1400	survey, logging equipment out of farm, clean-up.
1430	Travel to office, paperwork, time cards
1530	End of shift
	NA

OPERATOR/LICENSE: Olson/1217
ES SUPPORT Weakley, Walkup, Ehrgott, Amos, Steffle
VCO Snook, Williams, Sharp
HPT Templeton, Barnard
FWS Lehmann PNG R. Price

WEATHER: 63 F, mostly sunny, winds light from the west.

DOWNTIME: .75 hr for RCTs

DISCARDED ITEMS: 4 Lynch pins

REFERENCE/CONTRACT INFORMATION: TFC-WO-10-1765; FSWO-DOW-036; RPP-PLAN-3939364; ECN-127555

REPORT BY: Kelly Olson
TITLE: ES TECHNICAL PREPARER
SIGNATURE: Kelly Olson

REVIEWED BY: D.E. Skeglie
TITLE: ES TECHNICAL REVIEWER
SIGNATURE: David E Skeglie DATE: 10/12/10

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DRILLING AND SAMPLING (PERCUSSION) DAILY WORK RECORD

PURPOSE: Continue pushing probe hole #C7940. PNG/ESFS continue gamma logging #C7943.

DATE: 10-12-10

LOCATION: "C" Tank Farm, 200 East Area, Hanford

EXCAVATION: DAN-4054

L-DIG #: 10213014

REPORT #: 07

START CARD NO. SE08172

DECOMMISSION NO. AE10775

RWP: CO-601, Rev. 1 AHA-09-008, Rev. 0

SAMPLING SUMMARY

SITE/EQUIPMENT INSPECTION: (Yes) No

HHU (CASE#1) HHU CAT #2 HHUXL#3

Sample # | Interval | %

NA

BOREHOLE SUMMARY

Borehole # C 7940 Tubing 25" @ 52' to 192' ft bgs. S.L. 23'

Borehole # Tubing @ to ft bgs. S.L.

Borehole # Tubing @ to ft bgs. S.L.

GEOPHYSICAL LOGGING

Boring #	Interval	Type
1 C7943	150' - 71'	Gamma
2		
3		

TIME	WORK SUMMARY
0600	Safety meeting at office. Topic: Hand Protection.
0630	Travel to "C" Farm, Acc in St Accs states
0700	stand-by for RCTs pre-job
0900	Pre-job
0815	Dress into whites, enter C-Farm, inspect rig, PNG begin
"	gamma logging C-7943, Moved remaining rods from lower
"	"C" Farm to site, begin driving C-7940 from 52' letting
"	head cool periodically. Crew rotated to allow driving through
"	Lunch. Drive C-7940 from 52' to 192' pulling out and
	clean up, PNG gamma logged from 150' - 71' bgs
1430	Travel to office, paperwork, time cards
1530	End of Shift

NA

OPERATOR/LICENSE: Olson/1217
ES SUPPORT Weakley Walkup Ehrgott Imos
VCO Kasik, Williams, Wheeler
HPT Tomlinson, Brand ESFS Steffler
FWS Lehmann PNG R Price

WEATHER: 69 F, mostly sunny, winds light and variable from the south.

DOWNTIME: 1 hr for RCTs

DISCARDED ITEMS: 4 lynch pins

REFERENCE/CONTRACT INFORMATION: TFC-WO-10-1765; FSWO-DOW-036; RPP-PLAN-3939364; ECN-127555

REPORT BY: Kelly Olson
TITLE: ES TECHNICAL PREPARER
SIGNATURE: Kelly Olson

REVIEWED BY: D. E. Skoglie
TITLE: ES TECHNICAL REVIEWER
SIGNATURE: David E Skoglie DATE: 10/13/10

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DRILLING AND SAMPLING (PERCUSSION) DAILY WORK RECORD

PURPOSE: Complete pushing probe hole #C7940. PNG/ESFS log #C7943 and #C7942		DATE: 10-13-10
LOCATION: "C" Tank Farm. 200 East Area. Hanford	EXCAVATION: DAN-4054 U-DIG #: 10213014	REPORT #: 08

START CARD NO. SE08172 | DECOMMISSION NO. AE10775 | RWP: CO-601, Rev. 1 AHA-09-008, Rev. 0

SAMPLING SUMMARY | SITE/EQUIPMENT INSPECTION (Yes) No | (HHU CASE#1) HHU CAT #2 HHUXL#3

Sample #	Interval	%
1	NA	
2		
3		
4		

BOREHOLE SUMMARY

Borehole # C-7942 Tubing 6.5" @ 192' to 203' ft bgs S.L. 1.3'

Borehole # \ Tubing \ @ \ to \ ft bgs S.L. \

Borehole # \ Tubing \ @ \ to \ ft bgs S.L. \

GEOPHYSICAL LOGGING

Boring #	Interval	Type
1 C7943	71-0	Gamma
2 C7942	\	\
3	\	\

TIME	WORK SUMMARY
0600	Safety meeting at office. Topic: Hand Tools.
0630	Travel to "C" Farm, gate in
0700	stand-by for RCTs, pre-job
0815	Pre-job
0830	Dress into whites, enter farm, inspect rig, drive C-7940 from 192-203' BGS Tagged bottom at 203', Moved rig to RBA to survey out for maintenance, P.N.G. entered farm and continue gamma logging at C-7942
0945	survey rig out of farm for maintenance while standing-by for logging, unable to survey rig out during day due to Radon on steering wheel
1100	Lunch
1130	Continue stand-by for logging, unable to survey rig out in P.M. PNG gamma logged C-7943 from 71'-0'
1430	Travel to office, paperwork, time cards
1530	End of shift
	NA

OPERATOR/LICENSE: Olson/1217 ES SUPPORT Weakley, Walker, Ehrgott, Imes VCO Stook, Williams HPT. Gaspeto, Barnard FHS Lehmann PNG R Price	WEATHER: 69 F, mostly sunny, winds light and variable from the north. DOWNTIME: 1.25 hr for RCTs 5.8 hr for logging	DISCARDED ITEMS: N/A

REFERENCE/CONTRACT INFORMATION: TFC-WO-10-1765: FSWO-DOW-036: RPP-PLAN-3939364: ECN-127555

REPORT BY: Kelly Olson	REVIEWED BY: D.E. Skoghe
TITLE: ES TECHNICAL PREPARER	TITLE: ES TECHNICAL REVIEWER
SIGNATURE: Kelly Olson	SIGNATURE: David E. Skoghe DATE: 10/13/10

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ENERGY SOLUTIONS, WESTERN OPERATIONS

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DRILLING AND SAMPLING (PERCUSSION) DAILY WORK RECORD

PURPOSE: ESFS/PNG gamma log #C7942. Moisture log #C7943 and #C7940.		DATE: 10-14-10
LOCATION: "C" Tank Farm, 200 East Area, Hanford	EXCAVATION: DAN-4054 U-DIG #: 10213014	REPORT #: 09

START CARD NO. SE08172 | DECOMMISSION NO. AE10775 | RWP: CO-601, Rev. 1 AHA-09-008, Rev. 0

SITE/EQUIPMENT INSPECTION: (Yes) No | (HHU CASE#1) HHU CAT #2 HHUXL#3

SAMPLING SUMMARY

Sample # s	Interval	%
1	NA	
2.		
3.		
4.		

BOREHOLE SUMMARY

Borehole # \ Tubing: \ @ \ to \ ft bgs. S.U. \
Borehole # \ Tubing: \ @ \ to \ ft bgs: S.U. \
Borehole # \ Tubing: \ @ \ to \ ft bgs: S.U. \

GEOPHYSICAL LOGGING

Boring #	Interval	Type
1 C7943	203-55'	moisture
2. C7942	203 140'	Gamma
3	\	\

TIME	WORK SUMMARY
0600	Safety meeting at office. Topic: Refueling Equipment.
0630	Travel to 'C' farm
0700	Arrive at 'C' farm, stand-by for RCTS, pre-job
0900	Pre-job
0515	Pick-up source for moisture logging, P.N.G. Begin gamma logging at C-7942 and moisture logging at C-7943, Probe installation on stand-by for logging results, perform maintenance on rig while standing by for logging. (Radon decayed on rig steering-wheel overnight and rig was released).
1130	Lunch
1200	Continue stand-by for logging, and continue gamma logging C-7942 and moisture logging C-7943, moisture logged C-7943 from 203' to 55', gamma logged C-7942 from 203' to 140, return source, survey out.
1430	Travel to office, paperwork, time-cards
1530	End of shift.

NA

OPERATOR/LICENSE: Olson/1217 ES SUPPORT Weakley, Walkup, Ehrgott, Amos VCO- Smeck, Williams HPT Barnard, Temple ESFS Steffler FWS Lehmann PNG R Price	WEATHER: 68 F, mostly sunny, winds light and variable from the north. DOWNTIME: 1 hr for RCTS 7 hrs for logging	DISCARDED ITEMS: N/A

REFERENCE/CONTRACT INFORMATION: TFC-WO-10-1765; FSWO-DOW-036; RPP-PLAN-3939364; ECN-127555

REPORT BY: Kelly Olson	REVIEWED BY: D.F. Stoglie
TITLE: ES TECHNICAL PREPARER	TITLE: ES TECHNICAL REVIEWER
SIGNATURE: Kelly Olson	SIGNATURE: David F Stoglie DATE: 10/14/10

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DRILLING AND SAMPLING (PERCUSSION) DAILY WORK RECORD

PURPOSE: PNG gamma log #C7942. Moisture log #C7943 and #C7940. DATE: 10-18-10

LOCATION: "C" Tank Farm, 200 East Area, Hanford EXCAVATION: DAN-4054 U-DIG #: 10213014 REPORT #: 10

START CARD NO. SE08172 DECOMMISSION NO. AE10775 RWP: CO-601, Rev. 1 AHA: 100-008, Rev. 0

SAMPLING SUMMARY SITE/EQUIPMENT INSPECTION: Yes No HHU CASE#1 HHU CAT#2 HHU XL#3

Sample Interval

NA

BOREHOLE SUMMARY

Borehole Inbound Outbound Begin End

Borehole Inbound Outbound Begin End

Borehole Inbound Outbound Begin End

GEOPHYSICAL LOGGING

Boring	Interval	Type
C7943		
C7942	137'-118'	Gamma

TIME	WORK SUMMARY
0600	Safety meeting at office. Topic: Continuing OSHA 30 Hr. training by ESFS Safety Staff.
0700	Travel to 'C' farm, Ace in
0730	Stand-by for RCTs, precjob
0845	Pre-job
0900	P.U.G. Entered farm, set up and begin gamma logging on C-7942, drill crew on stand-by for logging results. Logged from 137'-118"
1000	Shut down logging due to all hands meeting for ESFS personel, survey out of farm, stand-by for All hands meeting
1100	Lunch
1130	Continue stand-by for all hands meeting
1430	Travel to office, paperwork, time cards
1530	End of shift

NA

OPERATOR LICENSE: Olson/1217
ES SUPPORT Weakley Walkup Ehrgott Jones
NCO Stocks U. Hatrel
HPT Brand Compton
EHS ~~Schmum~~ Chick PNG R Price

WEATHER: 60 F, mostly sunny, winds light and variable from the north.

DOWNTIME: 1.25 hr for RCTs 5 hr for all hands meeting

DISCARDED ITEMS: N/A

REFERENCE CONTRACT INFORMATION: TFC-WO-10-1765; FSWO-DOW-036; RPP-PLAN-3939364; ECN-127555

REPORT BY: Kelly Olson
TITLE: ENTECHNICAL PREPARER
SIGNATURE: Kelly Olson

REVIEWED BY: D.E. Skoglie
TITLE: ENTECHNICAL REVIEWER
SIGNATURE: David E. Skoglie DATE: 10/18/10

10/08/08 Rev 1

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DRILLING AND SAMPLING (PERCUSSION) DAILY WORK RECORD

PURPOSE: PSFS gamma log #C7942. Moisture log #C7943 and #C7940.			DATE: 10-19-10
LOCATION: "C" Tank Farm. 200 East Area. Hanford	EXCAVATION: DAN-4054	U-DIG #: 10213014	REPORT #: 11
START CARD NO. SE08172	DECOMMISSION NO. AE10775	RWP: CO-601. Rev. 1	AHA-09-008. Rev. 0
SAMPLING SUMMARY	SITE/EQUIPMENT INSPECTION: (Yes) No	(HHU CASE#1) HHU CAT #2	HHU XL#3

Sample = s Interval %

1
2 NA
3
4

BOREHOLE SUMMARY

Borehole = \ Tubing = \ @ \ to \ ft bgs. S.U \

Borehole = \ Tubing = \ @ \ to \ ft bgs S.U \

Borehole = \ Tubing = \ @ \ to \ ft bgs S.U \

GEOPHYSICAL LOGGING

Boring	Interval	Type
1 C7943	55 - 0	moisture
2 C7942	122 - 80'	Gamma
3 C7940	202 - 109'	moisture

WORK SUMMARY

TIME	WORK SUMMARY
0600	Safety meeting at office. Topic: Signaling Techniques.
0630	Travel to C. Farm
0700	Stand-by for RCTS pre-job
0900	Pre-job
0915	Pick-up service for logging, drill crew still on stand-by for logging results, P.N.G entered from and begin moisture on C-7943 and gamma at C-7942. Problems with one unit, moisture logged C-7943 from 55-0' Fixed equipment, gamma logged C-7942 from 122' ~~203'~~ to 80' moisture logged from 202' to 151'
1130	Lunch
1200	Continue logging activity, and stand-by for logging results. gamma logged C-7942 from 122' to 80' Moisture logged C-7940 from 202' to 109', survey out equipment.
1430	Travel to office, paperwork, and time cards
1530	End of shift

NA

OPERATOR/LICENSE: Olson/1217 ES SUPPORT Weakley Walker Ehrgott Amos VCO: Sawyer, Villareal HPT completion - ~~clark~~ Sawyer FWS Clark ESFS Steffler	WEATHER: 62 F, mostly sunny, winds light and variable from the southwest. DOWNTIME: 1 hr for RCTS 7 hr for logging results	DISCARDED ITEMS: N/A

REFERENCE/CONTRACT INFORMATION: TFC-WO-10-1765: FSWO-DOW-036: RPP-PLAN-3939364: ECN-127555

REPORT BY: Kelly Olson	REVIEWED BY: D E Skoglie
TITLE: ES TECHNICAL PREPARER	TITLE. ES TECHNICAL REVIEWER
SIGNATURE: Kelly Olson	SIGNATURE: David E. Skoglie DATE: 10/20/10

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DRILLING AND SAMPLING (PERCUSSION) DAILY WORK RECORD

PURPOSE: ESFS gamma log #C7942. Moisture log #C7940.		DATE: 10-20-10
LOCATION: "C" Tank Farm, 200 East Area, Hanford	EXCAVATION: DAN-4054 U-DIG #: 10213014	REPORT #: 12
START CARD NO. SE08172	DECOMMISSION NO. AE10775	RWP: CO-601, Rev. 1 AHA-09-008, Rev. 0
SAMPLING SUMMARY	SITE/EQUIPMENT INSPECTION (Yes) No	HHU (CASE#1) HHU CAT #2 HHUXL#3

Sample # s	Interval	%
1		
2	NA	
3		
4		

BOREHOLE SUMMARY

Borehole # C-7943 Tubing: 2.5", @ 203' to 0 ft bgs S.U.

Borehole # Tubing: @ to ft bgs S.U.

Borehole # Tubing: @ to ft bgs. S.U.

GEOPHYSICAL LOGGING

Boring #	Interval	Type
1 C7940	104 - 0'	moisture
2 C7942	80 - 0'	gamma
3		

WORK SUMMARY

TIME	WORK SUMMARY
0600	Safety meeting at office. Topic: The Spotter
0615	Travel to 'C' farm, Arr in
0700	Stand-by for RCTs
0745	Pre-job
0800	Dress into whites, enter farm, P.N.C. entered and begin
	logging activities, Move Rig#1 (case) into farm and set up
	rig and Zero at C-7943, inspect rig, back-pull casing
	3', run camera survey, found broken 2½" tubing at 124' from
	T.O.C., Bottom of 14 joints and bottom assembly =203', top
	of rods = 124.7 B.G.S survey out and stand-by for
	Probe placement info.
0930	Continue logging, stand-by for direction
1130	Lunch
1200	Continue logging and clean pipe while stand-by
	for direction, moisture logged C-7940 from 104-0';
	gamma logged C-7942 from 80' to 0'
1300	Received direction to decommission C-7943, Dressed into
	whites, entered farm, back-pulled C-7943 from 124'
	to 0'
1430	Travel to office, Paperwork and time cards
1530	End of shift
	NA

OPERATOR/LICENSE: Olson/1217 ES SUPPORT Weakley Walkup Ehrgott Amos VCO Saook, Williams HPT Templeton, Clayton FWS: Clark ESFS: Siegler	WEATHER: 65 F, mostly sunny, winds light and variable from the southwest. DOWNTIME: .75 hr for RCTs .3 hr for direction	DISCARDED ITEMS: 20 Joints 4' x 2½" pipe 1 Box x Box 2½" 1 Tipmaster 1 Expandable tip 4 bags bentonite

REFERENCE/CONTRACT INFORMATION: TFC-WO-10-1765; FSWO-DOW-036; RPP-PLAN-3939363; ECN-127555

REPORT BY: Kelly Olson	REVIEWED BY: D.E. Skoghie
TITLE: ES TECHNICAL PREPARER	TITLE: ES TECHNICAL REVIEWER
SIGNATURE: Kelly Olson	SIGNATURE: David E. Skoghie DATE: 10/20/10

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DRILLING AND SAMPLING (PERCUSSION) DAILY WORK RECORD

PURPOSE: ESFS gamma log #C7940. Moisture log #C7942. Begin re-pushing #C7941 DATE: 10-21-10

LOCATION: "U" Tank Farm, 200 East Area, Hanford | EXCAVATION: DAN-4054 | U-DIG #: 10213014 | REPORT #: 13

START CARD NO. SE08172 | DECOMMISSION NO. AE10775 | RWP: CO-601, Rev. 1 | AHA-09-4008, Rev. 0

SAMPLING SUMMARY | SITE/EQUIPMENT INSPECTION: (Yes) No | (HHU CASE#1) HHU CAT #2 HHUXL#3

Sample # | Interval

1 NA

2

3

4

BOREHOLE SUMMARY

Borehole C-7941 Tubing 2½" Dia 0 to 100 ft Angle 57 2.3'

Borehole — Tubing — Dia — to — ft Angle — —

Borehole — Tubing — Dia — to — ft Angle — —

GEOPHYSICAL LOGGING

Boring | Interval | Type

1 C-7940 203 - 133 Gamma

2 C-7942 204 33 Moisture

3 — — —

TIME	WORK SUMMARY
0600	Safety meeting at office. Topic: Wrenches.
0630	Travel to C-farm, sign in, pick up permit at B1
0715	stand-by for pre-job, work package
0800	Pre-job
0815	Stand-by for cranes to survey out of RBA in order to move rig into RBA to drive C-7941, PNG critical form and begin surveying equipment activities
0900	Dress into whites, enter farm, inspect rig, move Rig and equipment to RBA, successful Rig and equipment out of CA, Moved 57 joints and new 2½" rod on Rack #3 ready to drive
1100	Lunch
1130	Continue logging, Setup Rig and zone at C-7941, drove 2½" tubing from 0' - 100', letting head cool periodically, Survey out
1330	Travel to office, paperwork, time cards
1530	End of shift

NA

Rack #3
used 25 joints 2.5"

OPERATOR/LICENSE: Olson/1217
ES SUPPORT: Hockley, Walkup, Ehrgott, Imes, Neo, Sidek, Williams
HPT: Tomlinson
FWS: Lehman ESFS: Stettler

WEATHER: 68F, mostly sunny, winds light and variable from the southwest.
DOWNTIME: .25 hr for pickup, .75 for crane survey

DISCARDED ITEMS:
12 Lynch pins
1 plastic washer

REFERENCE/CONTRACT INFORMATION: TFC-WO-10-1765; FSWO-DOW-036; RPP-PLAN-3939364; ECN-127555

REPORT BY: Kelly Olson
TITLE: ES TECHNICAL PREPARER
SIGNATURE: Kelly Olson

REVIEWED BY: D.E. Skogue
TITLE: ES TECHNICAL REVIEWER
SIGNATURE: David E. Skogue DATE: 10/22/10

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DRILLING AND SAMPLING (PERCUSSION) DAILY WORK RECORD

PURPOSE: ESFS gamma log #C7940. Moisture log #C7942. Complete pushing boring #C7941. | DATE: 10-22-10

LOCATION: "C" Tank Farm, 200 East Area, Hanford | EXCAVATION: DAN-4054 | U-DIG #: 10213014 | REPORT #: 14

START CARD NO. SE08172 | DECOMMISSION NO. AE10775 | RWP: CO-601, Rev. 2 | AHA-09-008, Rev. 0

SAMPLING SUMMARY | SITE/EQUIPMENT INSPECTION: (Yes) No | (HHU CASE#1) HHU CAT #2 HHUXL#3

Sample # | Interval | %

1
2 NA
3
4

BOREHOLE SUMMARY

Borehole # C-7941 Tubing 2½" @ 100' to 202 ft bgs S.L. .3

Borehole # \ Tubing \ @ \ to \ ft bgs S.L. \

Borehole # \ Tubing \ @ \ to \ ft bgs S.L. \

GEOPHYSICAL LOGGING

Boring	Interval	Type
1 C7940	138-50	Gamma
2 C7942	23½-0'	Moisture
C7941	202-75'	Gamma

TIME	WORK SUMMARY
0600	Safety meeting at office. Topic: The right tool for the right job.
0615	Travel to "C" Farm, Ace in
0645	stand-by for RCTS pre-job
0730	Pre-job
0745	P.N.G begin logging activities, Enter RBA, inspect rig,
\	Begin driving 2½" tubing at C-7941, drove from 100'
\	to 164' letting head coil periodically, P.N.G completed
\	moisture on C-7942, continue gammas at C-7940.
1115	Lunch
1145	PNG Gamma logged from 138-50' at C-7940, Drove
\	C-7941 from 164' to 202' (T.D.), Tagged hole at
\	202' B.G.S. Moved Rig and equipment to C-7942,
\	survey out, P.N.G continue logging on swing shift.
1530	Travel to office, paperwork, time cards
1630	End of shift
	(PNG gamma logged C-7941 from 202'
	to 75' on swing shift)
	NA
	Rack #3
	used 25 joints 2½" (50 total)

OPERATOR/LICENSE: Olson/1217
ES SUPPORT: Weakley, Walkup, Ehrgott, Amos
NCO Stack, Williams
HPT Templeton, Clayton
FWS Lehmann ESFS Siegler

WEATHER: 66F, partly cloudy with winds from the southwest at 5-15 mph.
DOWNTIME: .15 hr for RCTS

DISCARDED ITEMS: 8 lynch pins

REFERENCE/CONTRACT INFORMATION: TFC-WO-10-1765; FSWO-DOW-036; RPP-PLAN-3939364; ECN-127555

REPORT BY: Kelly Olson
TITLE: ES TECHNICAL PREPARER
SIGNATURE: Kelly Olson

REVIEWED BY: L.E. Skogue
TITLE: ES TECHNICAL REVIEWER
SIGNATURE: David L. Skogue DATE: 10/22/10

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DRILLING AND SAMPLING (PERCUSSION) DAILY WORK RECORD

PURPOSE: PNG complete gamma logging #C7941.

DATE: 10-25-10

LOCATION: "C" Tank Farm, 200 East Area, Hanford

EXCAVATION: DAN-4054

U-DIG #: 10213014

REPORT #: 15

START CARD NO. SE08172

DECOMMISSION NO. AE10775

RWP: CO-601, Rev. 2 AHA-09-008, Rev. 0

SAMPLING SUMMARY

SITE/EQUIPMENT INSPECTION: Yes (No)

HHU CASE#1 HHU CAT #2 HHUXL#3

Sample #	Interval ft
1	NA
2	
3	
4	

BOREHOLE SUMMARY

Borehole = Tubing = @ to ft bgs S.L.

Borehole = Tubing = @ to ft bgs S.L.

Borehole = Tubing = @ to ft bgs S.L.

GEOPHYSICAL LOGGING

Boring #	Interval		Type
1 C7941	75'	0	Gamma
2			
3			

TIME	WORK SUMMARY
0600	Safety meeting at office. Topic: Speed of Trust Training.
	PNG continues logging operations at "C" Area. Drill crews in speed of trust and OSHA training
1200	Lunch
	Continue logging and training for drill crews
1530	End of shift
	PNG gamma logged C-7941 from 75' to 0'
	NA

OPERATOR/LICENSE: Olson/1217

ES SUPPORT Weakley, Walkup, Ebright, Imo

NCO Smith, Williams

HPT Templeton, Barnard

FWS Lehmann PNG Price

WEATHER: 61F, mostly cloudy with a chance of showers. Winds from the southwest at 15-20 mph.

DOWNTIME: 4 hrs training

DISCARDED ITEMS: N/A

REFERENCE/CONTRACT INFORMATION: TFC-WO-10-1765; FSWO-DOW-036; RPP-PLAN-3939364; ECN-127555

REPORT BY: Kelly Olson

TITLE: ES TECHNICAL PREPARER

SIGNATURE: Kelly Olson

REVIEWED BY: D.E. Skoglund

TITLE ES TECHNICAL REVIEWER

SIGNATURE: Daniel Skoglund

DATE: 10/26/10

10/09/09 Rev 1

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DRILLING AND SAMPLING (PERCUSSION) DAILY WORK RECORD

PURPOSE: ESFS gamma log #C7940 and moisture log #C7941 | DATE: 10-26-10

LOCATION: "C" Tank Farm, 200 East Area, Hanford | EXCAVATION: DAN-4054 | U-DIG #: 10213014 | REPORT #: 16

START CARD NO. SE08172 | DECOMMISSION NO. AE10775 | RWP: CO-601, Rev. 2 | AHA-09-008, Rev. 0

SAMPLING SUMMARY | SITE/EQUIPMENT INSPECTION: (Yes) No | (HHU CASE#1) HHU CAT #2 HHUXL#3

Sample #	Interval
2	Nil
3	
4	

BOREHOLE SUMMARY

Borehole = C-7942 Tubing 2½" @ 203 to 48 ft bgs SL 2.3'

Borehole = \ Tubing = \ @ \ to \ ft bgs SL \

Borehole = \ Tubing = \ @ \ to \ ft bgs SL \

GEOPHYSICAL LOGGING

Boring #	Interval	Type
1 C-7940	\	\
2 C-7941	202-0	moisture
3	\	\

TIME	WORK SUMMARY
0600	Safety meeting at office. Topic: Electric Power Tools.
0630	Travel to 'C' Farm, see in
0700	Stand-by for RCTS
0745	Pre-job
0800	Enter farm, P.N.G entered farm and begin logging, inspect rig, set
\	up rig and zone, back-pull casing one joint, Knock out tip, back-pull
\	from 196' to 170', set bottom probe at 176.5', installed bentonite to 178',
\	sand to 177', bentonite to 174', sand to 172, added 1gal H20 via tremie,
\	pulled tremie, back-pull casing to 150', add bentonite to 157.5, sand
\	to 156.5, bentonite to 153.5, sand to 152.5, (probe bottom 154-156 #2 probe)
\	install tremie, add 1gal H20 via tremie survey out
1130	Lunch
1200	Continue Logging activity, pull tremie pipe, back-pull 2.5"
	casing to 130' (#3 probe set 134'-136'), install bentonite to 132.5, sand
	to 136.5, Bentonite to 133.5, sand to 132.5, install tremie, add one gal H20, pull tremie,
	back-pull casing to 110' (#4 probe set 114-116'), install bentonite to 117.5, sand to 116.5,
	Bentonite to 113.5, sand to 112.5, install tremie pipe, add one gal H20, pull tremie,
	back pull casing to 90', install bentonite to 97.5 (#5 Probe set 94-96) sand to
	96.5, Bentonite to 93.5', sand to 92.5', install tremie add one gal H20 pull pipe
	to 70' (#6 Probe 74-76') install bentonite to 77.5, sand to 76.5, bentonite to 73.5, sand to
	72.5' install one gal H20 via tremie, back pull to 48', add bentonite to 57.5,
	sand to 56.5', bentonite to 53.5, sand to 52.5, add one gal H20, survey out
1430	Travel to office, paperwork time cards
1520	End of shift (P.N.G. Moisture logged C-7941 from 202'-0')

OPERATOR/LICENSE: Olson/1217
ES SUPPORT Weakley Walkup Ehrgott Amos
NCO Snock, Williams
HPT Temples Bernard
FWS Lehmann ESFS Steffler

WEATHER: 56 F, mostly cloudy with a chance of showers. Winds from the southwest at 15-25 mph. Gusts to 35 mph.

DOWNTIME: .75 hr for RCTS

DISCARDED ITEMS:
1 200' multi level probe
1-sack bentonite
1-sack sand
1-expendable tip
6 sacks bentonite

REFERENCE/CONTRACT INFORMATION: TFC-WO-10-1765; FSWO-DOW-036; RPP-PLAN-3939364; ECN-127555

REPORT BY: Kelly Olson
TITLE: ES TECHNICAL PREPARER
SIGNATURE: Kelly Ole

REVIEWED BY: D.E. Skoglie
TITLE: ES TECHNICAL REVIEWER
SIGNATURE: David E. Skoglie DATE: 10/27/10

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DRILLING AND SAMPLING (PERCUSSION) DAILY WORK RECORD

PURPOSE: ESFS complete gamma logging #C7940 and complete probe installation in #C7942, Re-drive C-7943 | DATE: 10-27-10

LOCATION: "C" Tank Farm, 200 East Area, Hanford | EXCAVATION: DAN-4054 | U-DIG #: 10213014 | REPORT #: 17

START CARD NO. SE08172 | DECOMMISSION NO. AE10775 | RWP: CO-601, Rev. 2 | AHA-09-008, Rev. 0

SAMPLING SUMMARY | SITE/EQUIPMENT INSPECTION: Yes No | HHL CASE#1 HHL CAT#2 HHLXL#3

Sample # | Interval

NA

BOREHOLE SUMMARY

Borehole C-7942 Tubing 25' to 48' to 0 ft bgs S.U. \

Borehole C-7943 Tubing 25' to 0' to 140' ft bgs S.U. 2.3

Borehole \ Tubing \ to \ to \ ft bgs S.U. \

GEOPHYSICAL LOGGING

Boring	Interval	Type
C-7940	50-0	Gamma
\	\	\
\	\	\

TIME	WORK SUMMARY
0600	Safety meeting at office. Topic: Screwdrivers.
0630	Travel to 'C' farm, see in
0715	Stand-by for RCT's + paperwork
0745	Pre-job
0800	Enter 'C' farm, inspect rig, PNG begin logging activity, pull 2½" casing at C-7942 back from 48' to 30' (#8 Probe set 24-26') install bentonite to 27.5', sand to 26.5, Diatomite to 27.5, sand to 22.5' install tremie pipe add one gal H2O, Pull tremie, back-pull casing to 10' (#9 Probe set at 14'-16') install bentonite to 17.5', sand to 16.5', Diatomite to 13.5', sand to 12.5, added one gal H2O, pulled remaining 10' of casing, and install bentonite to surface.
0945	Move Rig and equipment to C-7943, set up rig and zone, moved pipe with fork-lift, Drove 2½" tubing at C-7943 from 0' to 72' letting head cool periodically. survey out.
1100	Lunch
1130	Dress into whites, Drive C-7943 From 72' to 140' letting head cool periodically, survey out.
1430	Travel to offices, paperwork + time cards
1530	End of shift

NA

OPERATOR LICENSE: Olson/1217

ES SUPPORT: Hawkins, Walker, Burgess, Jones, Smith, Williams

HPT: Templeton, Barnard

FWS: Lemmon | ESFS: Stoffler

WEATHER: 54 F, mostly sunny with winds light and variable from the southwest.

DOWNTIME: .5 hr for RCTs + pre-surge

DISCARDED ITEMS:
2 sacks bentonite
1 sack sand
1 2½" drive head
1 large pin
4 Lynch pins

REFERENCE/CONTRACT INFORMATION: TFC-WO-10-1765; FSWO-DOW-036; RPP-PLAN-3939364; ECN-127555

REPORT BY: Kelly Olson | REVIEWED BY: D.E. Skoglie

TITLE: ES TECHNICAL PREPARER | TITLE: ES TECHNICAL REVIEWER

SIGNATURE: Kelly Olson | SIGNATURE: David E. Skoglie DATE: 10/25/10

10-0609 Rev 1

200 FT MULTI LEVEL RESISTIVITY PROBE WORK SHEET — BOREHOLE NO. C-7942

DIMENSIONS	PRELIMINARY AS-BUILT		CONSTRUCTION MATERIAL/TAG	
PLANNED	ACTUAL		MATERIAL	TAG
0 ft			SURFACE PROTECTION @ 1 FT BGS	
- 20 ft -	- 14 ft - 16	20' / 2'	Bentonite from 0 to 12.5 Sand from 12.5 to 13.5 D E from 13.5 to 16.5 Sand from 16.5 to 17.5	✓ ✓ ✓
- 40 ft -	- 34 ft - 36	20' / 2'	Bentonite from 17.5 to 32.5 Sand from 32.5 to 33.5 D E from 33.5 to 36.5 Sand from 36.5 to 37.5	✓ ✓
- 60 ft -	- 54 ft - 56	20' / 2'	Bentonite from 37.5 to 52.5 Sand from 52.5 to 53.5 D E from 53.5 to 56.5 Sand from 56.5 to 57.5	✓ ✓
- 80 ft -	- 74 ft - 76	20' / 2'	Bentonite from 57.5 to 72.5 Sand from 72.5 to 73.5 D E from 73.5 to 76.5 Sand from 76.5 to 77.5	✓ ✓
- 100 ft -	- 94 ft - 96	20' / 2'	Bentonite from 77.5 to 92.5 Sand from 92.5 to 93.5 D E from 93.5 to 96.5 Sand from 96.5 to 97.5	✓ ✓
- 120 ft -	- 114 ft - 116	20' / 2'	Bentonite from 97.5 to 112.5 Sand from 112.5 to 113.5 D E from 113.5 to 116.5 Sand from 116.5 to 117.5	✓ ✓
- 140 ft -	- 134 ft - 136	20' / 2'	Bentonite from 117.5 to 132.5 Sand from 132.5 to 133.5 D E from 133.5 to 136.5 Sand from 136.5 to 137.5	✓ ✓
- 160 ft -	- 154 ft - 156	20' / 2'	Bentonite from 137.5 to 152.5 Sand from 152.5 to 153.5 D E from 153.5 to 156.5 Sand from 156.5 to 157.5	✓ ✓
- 180 ft -	175 - 176 ft -	19 / 1.5	Bentonite from 157.5 to 174 Sand from 173 to 174 D E from 174 to 177 Sand from 177 to 178	✓ ✓
200'		200' probe		

MULTI LEVEL RESISTIVITY PROBE COLOR CODE.

10/26/2010

C7942

- LT ORANGE ✓
- LT GREEN ✓
- LT BLUE ✓
- LT BROWN ✓
- ORANGE ✓
- GREEN ✓
- BLUE ✓
- BROWN ✓
- BOTTOM PROBE ✓ (TD)

BIG BLUE WIRE

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DRILLING AND SAMPLING (PERCUSSION) DAILY WORK RECORD

PURPOSE: Continue driving on #C7943 to TD of 180' then start probe installation #C7943		DATE: 10-28-10
LOCATION: "C" Tank Farm 200 East Area Hanford	EXCAVATION: DAN-4054 U-DIG #:10213014	REPORT #: 18
START CARD NO.SE08172	DECOMMISSION NO. AE10775	RWP: CO-601.Rev. 2 AHA-09-008.Rev.0
SAMPLING SUMMARY	SITE/EQUIPMENT INSPECTION (Yes) No	HHU CASE#1 HHU CAT #2 HHUXL#3

Sample = s Interval %

1
2 NA
3
4

BOREHOLE SUMMARY

Borehole = C-7943 Tubing 2.5" @ 140' to 180 ft bgs S.L 2.3

Borehole = \ Tubing \ @ \ to \ ft bgs S.L \

Borehole = \ Tubing \ @ \ to \ ft bgs S.L \

GEOPHYSICAL LOGGING

Boring = Interval Type

1 NA
2
3

TIME	WORK SUMMARY
0600	Safety meeting at office. Topic: Protecting Your Hands.
0630	Travel to "C" farm, gate in
0715	stand-by for RCTs & Package
0800	Pre-job
0815	Dress into whites, inspect rig, drive 2½" tubing at C-7943 from 140' to 180', survey out
1030	PNL on site for calibration at weather station, picked up materials for probe installation. Entered farm, tagged C-7943, found 1' of material in casing, back-pull 6" to 179.5', ran camera survey and found broken joint at 148' from T.O.C. 8 joints remaining in ground and one bottom assembly, bottom at 180' BGS, top at 145.7' BGS, survey out
1230	Lunch
1300	stand-by for support (operator + NCO)
1370	Move new pipe into farm, survey, fork-lift out, secure site
1425	Travel to office, paperwork, time-card
1530	End of shift
	NA
	Moved Rack #1 into farm
	Cno pipe used.

OPERATOR/LICENSE: Olson/1217 ES SUPPORT Weakley, Walkup Ehrgott, Amos NCO Swank, Williams HPT Templeton, Barnard FWS Lehman	WEATHER: 55 F sprinkles Cloudy DOWNTIME: .75 for package .5 hr for support	DISCARDED ITEMS: 9 Joints 4' x 2½" tubing 1 2' Box x Box 2½" 1 Tip holder 2½" 1 expendable tip

REFERENCE/CONTRACT INFORMATION:

REPORT BY: Kelly Olson	REVIEWED BY: D.E. Skoglie
TITLE: ES TECHNICAL PREPARER	TITLE: ES TECHNICAL REVIEWER
SIGNATURE: Kelly Olson	SIGNATURE: David E. Skoglie DATE: 10/28/10

10.06.09 Rev 1

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DRILLING AND SAMPLING (PERCUSSION) DAILY WORK RECORD

PURPOSE: Begin re-driving #C7943.			DATE: 11-01-10
LOCATION: "C" Tank Farm, 200 East Area, Hanford	EXCAVATION: DAN-4054	U-DIG #: 10213014	REPORT #: 19
START CARD NO. SE08172	DECOMMISSION NO. AE10775	RWP: CO-601, Rev. 2	AHA-09-008, Rev. 0

SAMPLING SUMMARY

Sample # s	interval	%
1	NA	
2		
3		
4		

SITE/EQUIPMENT INSPECTION: Yes / No

HHU CASE#1 / HHU CAT #2 / HHUXL#3

BOREHOLE SUMMARY

Borehole # C7943 Tubing 2.5" @ ~~205~~ 180' to 90 ft bgs S.L. 2'

Borehole # \ Tubing \ @ \ to \ ft bgs S.L. \

Borehole # \ Tubing \ @ \ to \ ft bgs S.L. \

GEOPHYSICAL LOGGING

Boring #	Interval	Type
1	NA	
2		
3		

TIME	WORK SUMMARY
0600	Safety meeting at office. Topic: Fire Extinguishers. AHA
0700	Travel to 'C' Farm, Acc in
0730	Stand-by for Package, RCTs
0800	Pre-job
0815	Dress into whites, enter Farm, inspect rig, back-pull
\	casing to 130', install bentonite from 180' to 136.5 (#1 Probe
\	set 133.5' to 135') sand to 135.5, diatomite to 132.5', sand to 131.5',
\	install one gal H2O via tremie, back-pull 2.5" casing to 110';
\	install bentonite to 117.5', sand to 116.5, diatomite to 113.5, sand to
\	112.5, install tremie pipe and add one gal H2O, Pull tremie, back-
\	pull casing to 90', install bentonite to 92.5, sand to 96.5, diatomite
\	to 93.5 sand to 92.5, install tremie pipe, add one gal
\	H2O via tremie, pull tremie pipe, secure site and survey
\	out.
1030	Stand-by for WRPS luncheon
1100	Lunch
1130	Stand-by for WRPS Luncheon in cafeteria
1530	End of shift
	NA

OPERATOR/LICENSE: Olson/1217
ES SUPPORT Weakley, Walkup, Ehrgott, Amos
NCO: K Snook, V. Kreal
HPT Templeton, Bernard
FWS. Lehmann

WEATHER: 68 F, mostly cloudy with a chance of rain. Winds from the southwest at 10-20 mph.

DOWNTIME: .5 hr for RCTs
4.5 hr for WRPS Luncheon

DISCARDED ITEMS:
1-160' multi-level Probe
3-sacks bentonite
1-sack sand
1-sack Diatomite

REFERENCE/CONTRACT INFORMATION: TFC-WO-10-1765; FSWO-DOW-036; RPP-PLAN-3939364; ECN-127555

REPORT BY: Kelly Olson
TITLE: ES TECHNICAL PREPARER
SIGNATURE: Kelly Olson

REVIEWED BY: D.E. Skoglie
TITLE: ES TECHNICAL REVIEWER
SIGNATURE: David E. Skoglie **DATE:** 11/02/10

10/06/09 Rev 1

ENERGYSOLUTIONS

ENERGY SOLUTIONS, WESTERN OPERATIONS

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DRILLING AND SAMPLING (PERCUSSION) DAILY WORK RECORD

PURPOSE: Complete probe installation at #C7943, begin installation at C-7940		DATE: 11-02-10
LOCATION: "C" Tank Farm, 200 East Area, Hanford	EXCAVATION: DAN-4054 U-DIG #: 10213014	REPORT #: 20
START CARD NO. SE08172	DECOMMISSION NO. AE10775	RWP: CO-601, Rev. 2 AHA-09-008, Rev. 0
SAMPLING SUMMARY	SITE/EQUIPMENT INSPECTION: Yes No	HHU CASE#1 HHU CAT #2 HHUXL#3

Sample # s Interval %

1
2
3 NA
4

BOREHOLE SUMMARY

Borehole # C-7943 Tubing (2½") @ 90' to 0 ft bgs S.U. ✓

Borehole # C-7940 Tubing (2½") @ 203' to 198 ft bgs. S.U. 2.7

Borehole # ✓ Tubing (✓) @ ✓ to ✓ ft bgs S.U. ✓

GEOPHYSICAL LOGGING

Boring # Interval Type

1.
2 NA
3.

TIME	WORK SUMMARY
0600	Safety meeting at office. Topic: RWP's and PPE Requirements.
0630	Travel to "C" farm, see in
0700	Stand-by, for Pickup, RCT)
0745	Pre-job
0800	Press into whites, enter farm, inspect rig, back-pull casing from
✓	90' to 70', install bentonite to 77.5', sand to 76.5, Diatomite to 73.5,
✓	sand to 72.5', install tremie, add one gal H2O via tremie, back-pull
✓	casing to 50', install bentonite to 57.5, sand to 56.5, diatomite to 52.5,
✓	sand to 52.5 (Probe depths = 74-76', 54-56, 34-36, 14-16), install
✓	tremie pipe, add one gal H2O, back pull casing to 30', install bentonite
✓	to 37.5', sand to 36.5, Diatomite to 33.5, sand to 32.5', install tremie, add
✓	one gal H2O, pull tremie, back-pull casing to 10', install bentonite to 17.5,
✓	sand to 16.5', diatomite to 13.5', sand to 12.5, install one gallon H2O,
✓	Pull remaining 10' of 2½" casing, survey out; Paperwork, Move and set
	up on C-7940, set up rig and zone, survey out.
1145	Lunch
1215	Enter zone, Back pull casing 203 to 199', Knock out tip, pull pipe
✓	to 170', add bentonite to 178, sand to 177', diatomite to 174', sand to 172
✓	(Bottom Probe 175'-176.5) add one gal H2O via tremie, back pull 2.5" casing
✓	at C-7940 to 148' bgs, add bentonite to 157.5', sand to 156.5, Diatomite to
✓	152.5, sand to 152.5', add one gal water via tremie, secure site and
✓	survey out.
1430	Travel to office, paperwork, timecards
1530	End of shift

OPERATOR/LICENSE: Olson/1217 ES SUPPORT Weakley, Walkup Ehrgott VCO Snook, Villareal HPT Templeton, Bernard FWS: Lehmann	WEATHER: 68 F, mostly cloudy with a chance of rain. Winds from the southwest at 5-10 mph. DOWNTIME: .75 hr for pickup	DISCARDED ITEMS: Issue diatomite 1 joint 2½" x 4' 5 Sacks bentonite 1 sacks sand 1 expendable tip 1 200' multi-level probe

REFERENCE/CONTRACT INFORMATION: TFC-WO-10-1765; FSWO-DOW-036; RPP-PLAN-3939364; ECN-127555

REPORT BY: Kelly Olson	REVIEWED BY: D.E. Skoglie
TITLE: ES TECHNICAL PREPARER	TITLE: ES TECHNICAL REVIEWER
SIGNATURE: Kelly Olson	SIGNATURE: David E Skoglie DATE: 11/02/10

10/06/09 Rev 1

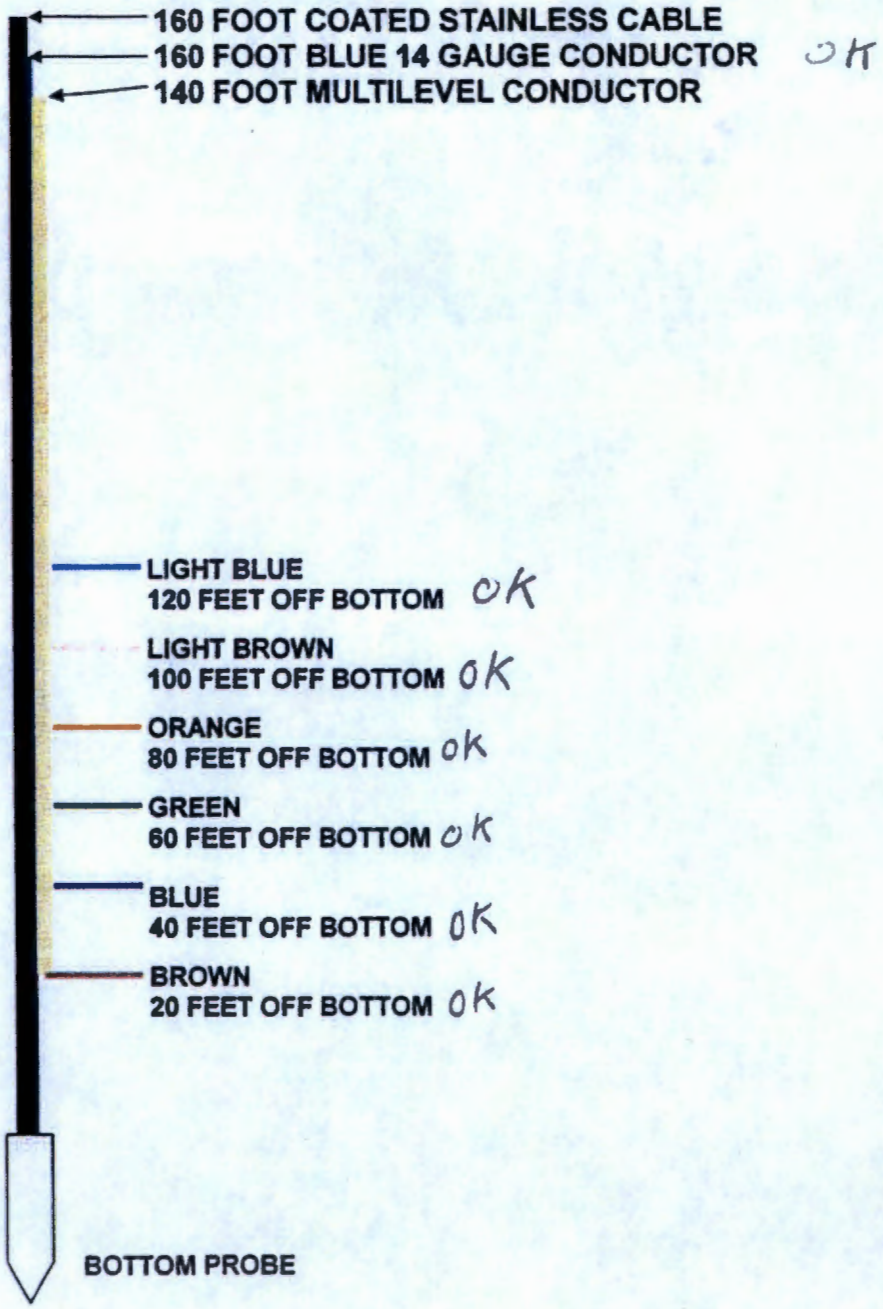
200 FT MULTI LEVEL RESISTIVITY PROBE WORK SHEET BOREHOLE NO: C-7943

DIMENSIONS	PRELIMINARY AS-BUILT		CONSTRUCTION MATERIAL/TAG	
PLANNED	ACTUAL		MATERIAL	TAG
0 ft			SURFACE PROTECTION @ 1 FT BGS	
- 20 ft -	- ft -	X	Bentonite from ____ to ____ Sand from ____ to ____ D.E. from ____ to ____ Sand from ____ to ____	NA NA
- 40 ft -	- ft -	X	Bentonite from ____ to ____ Sand from ____ to ____ D.E. from ____ to ____ Sand from ____ to ____	NA NA
- 60 ft -	- 14 ft - 16	2	Bentonite from 0 to 12.5 Sand from 12.5 to 12.5 D.E. from 12.5 to 16.5 Sand from 16.5 to 17.5	✓ ✓
- 80 ft -	- 34 ft - 36	18 2	Bentonite from 12.5 to 32.5 Sand from 32.5 to 33.5 D.E. from 33.5 to 36.5 Sand from 36.5 to 37.5	✓ ✓
- 100 ft -	- 54 ft - 56	18 2	Bentonite from 37.5 to 52.5 Sand from 52.5 to 53.5 D.E. from 53.5 to 56.5 Sand from 56.5 to 57.5	✓ ✓ ☐
- 120 ft -	- 74 ft - 76	18 2	Bentonite from 57.5 to 72.5 Sand from 72.5 to 73.5 D.E. from 73.5 to 76.5 Sand from 76.5 to 77.5	✓ ✓ ✓
- 140 ft -	- 94 ft - 96	18 2	Bentonite from 77.5 to 92.5 Sand from 92.5 to 93.5 D.E. from 93.5 to 96.5 Sand from 96.5 to ~~117~~ 97.5	✓ ✓ ✓
- 160 ft -	- 114 ft - 116	18 2	Bentonite from 97.5 to 112.5 Sand from 112.5 to 113.5 D.E. from 113.5 to 116.5 Sand from 116.5 to 117.5	✓ ✓ ✓
- 180 ft -	- 133.5 ft - 135	17.5 1.5	Bentonite from 117.5 to 132.5 Sand from 132.5 to 133.5 D.E. from 133.5 to 135.5 Sand from 135.5 to 136.5 180 Bentonite from ~~202~~ 136.5 to 136.5	✓ ✓ ✓

NOTE 1 Resistivity Probe measurements are to the bottom of the probe
Hydrated Diatomaceous Earth Y/N Volume of water applied 1 gal per interval

C-7943

160 FOOT MULTILEVEL PROBE



ENERGYSOLUTIONS

ENERGY SOLUTIONS, WESTERN OPERATIONS

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DRILLING AND SAMPLING (PERCUSSION) DAILY WORK RECORD

PURPOSE: Complete probe installation at #C7940.			DATE: 11-03-10
LOCATION: "C" Tank Farm, 200 East Area, Hanford	EXCAVATION: DAN-4054	U-DIG #: 10213014	REPORT #: 21
START CARD NO. SE08172	DECOMMISSION NO. AE10775	RWP: CO-601, Rev. 2	AHA 09-008, Rev. 0
SAMPLING SUMMARY	SITE/EQUIPMENT INSPECTION: (Yes) No	HHU CASE#1 (HHU CAT #2) HHUXL#3	

Sample # | Interval | %

1
2: NA
3
4

BOREHOLE SUMMARY

Borehole = C-7940 Tubing = 2½" @ 148' to 0' ft bgs: S.U.
Borehole = Tubing = @ to ft bgs: S.U.
Borehole = Tubing = @ to ft bgs: S.U.

GEOPHYSICAL LOGGING

Boring = Interval Type

1
2: NA
3

TIME	WORK SUMMARY
0600	Safety meeting at office. Topic: Fire Extinguishers. (Monthly Inspections)
0630	Travel to 'C' farm, gee in
0700	Arrive at 'C' farm, stand-by for RCTs
0745	Pre-job
0800	Enter farm, inspect rig, back-pull 2½" casing at C-7940 from 148' to 130', install bentonite to 137.5, (Probe depths = 134-136, 114-116', 94-96', 74-76', 54-56', 34-36', 14-16'), sand to 136.5, diatomite to 133.5, sand to 132.5, install tremie, add one gal H2O via tremie, Pull tremie, back-pull casing to 110', add bentonite to 117.5, sand to 116.5, diatomite to 113.5, sand to 112.5, install tremie add one gal H2O via tremie, pull tremie, back-pull casing to 90', add bentonite to 97.5, sand to 96.5, diatomite to 93.5, sand to 92.5, add one gal H2O via tremie.
1000	Survey out, break, paperwork
1020	Enter farm, back-pull 2½" casing to 70', add bentonite to 77.5', sand to 76.5, Diatomite to 73.5, sand to 72.5, install tremie pipe, add one gal H2O via tremie, Pull casing to 50', install bentonite to 57.5, sand to 56.5, Diatomite to 53.5, sand to 52.5, install tremie, add one gal H2O, pull tremie, Pull casing to 30', add bentonite to 37.5', sand to 36.5, Diatomite to 33.5, sand to 34.5, add one gal H2O via tremie, Pull casing to 10', add bentonite to 17.5, sand to 16.5, Diatomite to 13.5, sand to 12.5', add one gal H2O, pull remaining 10'
1245	Lunch
1315	Stand-by for access to RBA to complete C-7941
1400	Travel to office, paperwork, time cards
1530	End of shift

OPERATOR/LICENSE: Olson/1217 ES SUPPORT: Weakley, Walkup, Ehrgott NCO: Snook, Villareal HPT: Templeton, Barnard FWS: Lehmann	WEATHER: 57 F, partly cloudy with winds from the north at 5-10 mph DOWNTIME: .75 hr for RCTs 1.25 hr for access to RBA	DISCARDED ITEMS: 5-sacks bentonite (grounded) 1-sack chips 1-sack sand

REFERENCE/CONTRACT INFORMATION: TFC-WO-10-1765; FSWO-DOW-036; RPP-PLAN-3939364; ECN-127555

REPORT BY: Kelly Olson	REVIEWED BY: D.E. Skoglie
TITLE: ES TECHNICAL PREPARER	TITLE: ES TECHNICAL REVIEWER
SIGNATURE: Kelly Olson	SIGNATURE: David E. Skoglie DATE: 11/05/10

10-06-09 Rev 1

200 FT MULTI LEVEL RESISTIVITY PROBE WORK SHEET — BOREHOLE NO. C7940 (~~C742~~)

204.5 TD

DIMENSIONS	PRELIMINARY AS-BUILT		CONSTRUCTION MATERIAL/TAG	
PLANNED	ACTUAL		MATERIAL	TAG
0 ft			SURFACE PROTECTION & TOP BOB	
			Bentonite from 0 to 12.5	✓
			Sand from 12.5 to 13.5	
- 20 ft -	- 14 ft - 16	20' / 2'	D.E. from 13.5 to 16.5	✓
			Sand from 16.5 to 17.5	
			Bentonite from 17.5 to 32.5	✓
			Sand from 32.5 to 33.5	
- 40 ft -	- 34 ft - 36	20' / 2'	D.E. from 33.5 to 36.5	✓
			Sand from 36.5 to 37.5	
			Bentonite from 37.5 to 52.5	✓
			Sand from 52.5 to 53.5	
- 60 ft -	- 54 ft - 56	20' / 2'	D.E. from 53.5 to 56.5	✓
			Sand from 56.5 to 57.5	
			Bentonite from 57.5 to 72.5	✓
			Sand from 72.5 to 73.5	
- 80 ft -	- 74 ft - 76	20' / 2'	D.E. from 73.5 to 76.5	
			Sand from 76.5 to 77.5	✓
			Bentonite from 77.5 to 92.5	✓
			Sand from 92.5 to 93.5	
- 100 ft -	- 94 ft - 96	20' / 2'	D.E. from 93.5 to 96.5	
			Sand from 96.5 to 97.5	✓
			Bentonite from 97.5 to 112.5	✓
			Sand from 112.5 to 113.5	
- 120 ft -	- 114 ft - 116	20' / 2'	D.E. from 113.5 to 116.5	✓
			Sand from 116.5 to 117.5	
				✓
			Bentonite from 117.5 to 132.5	
- 140 ft -	- 134 ft - 136	20' / 2'	Sand from 132.5 to 133.5	✓
			D.E. from 133.5 to 136.5	
			Sand from 136.5 to 137.5	✓
			Bentonite from 137.5 to 152.5	✓
- 160 ft -	- 154 ft - 156	20' / 2'	Sand from 152.5 to 153.5	
			D.E. from 153.5 to 156.5	✓
			Sand from 156.5 to 157.5	
			Bentonite from 157.5 to 174	✓
	174 175	19	Sand from 174 to 175	
- 180 ft -	175 - 176	1.5	D.E. from 175 to 176	
200'		200' probe	Sand from 176 to 178	✓

Bottom of probe: 178

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ENERGY SOLUTIONS, WESTERN OPERATIONS

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DRILLING AND SAMPLING (PERCUSSION) DAILY WORK RECORD

PURPOSE: Standby for access to RBA in install probe in #C7941. Install monuments in #'s C7942 & C7943. | DATE: 11-04-10

LOCATION: "C" Tank Farm, 200 East Area, Hanford | EXCAVATION: DAN-4054 | U-DIG #: 10213014 | REPORT #: 22

START CARD NO. SE08172 | DECOMMISSION NO. AE10775 | RWP: CO-601, Rev. 2 AHA-09-008, Rev. 0

SAMPLING SUMMARY | SITE/EQUIPMENT INSPECTION: (Yes) No | HHU (CASE#1) HHU CAT #2 HHUXL#3

Sample # | Interval %

1
2 NA
3
4

BOREHOLE SUMMARY

Borehole # ___ Tubing ___ @ ___ to ___ ft bgs: S.C. ___
Borehole # ___ Tubing ___ @ ___ to ___ ft bgs: S.C. ___
Borehole # ___ Tubing ___ @ ___ to ___ ft bgs: S.C. ___

GEOPHYSICAL LOGGING

Boring # | Interval | Type

1 NA
2
3

TIME	WORK SUMMARY
0600	Safety meeting at office. Topic: Dressing for winter work.
0630	Travel to 'C' farm
0700	Arrive at 'C' farm, stand-by for RWP to be amended
0745	Pre Job
0815	Dress into whites, enter farm, inspect rig, Move rig and equipment near RBA to be surveyed, surveyed small items into RBA for upcoming work, Staged racks of tubing with forklift, installed surface protections at C-7942 and C-7943, clean-up area and survey out.
1030	Stand-by for permission to enter RBA
1100	Lunch
1130	Continue stand-by for permission to begin probe installation in RBA
1530	End of shift

NA

OPERATOR/LICENSE: Olson/1217
ES SUPPORT: Weakley, Walkup, Ehrgott, Imos
MCO: Snook, Villareal
HPT: Templeton, Bernard
FWS: Lehmann

WEATHER: 58 F, partly cloudy with light and variable winds.

DOWNTIME: .75 for RWP
4.5 hr stand-by for entry to RBA

DISCARDED ITEMS:
2 - surface protections
2 - sacks quickcrete

REFERENCE/CONTRACT INFORMATION: TFC-WO-10-1765; FSWO-DOW-036; RPP-PLAN-3939364; ECN-127555

REPORT BY: Kelly Olson
TITLE: ES TECHNICAL PREPARER
SIGNATURE: Kelly Olson

REVIEWED BY: D.E. Skoghe
TITLE: ES TECHNICAL REVIEWER
SIGNATURE: David E. Skoghe DATE: 11/05/10

10-06-09 Rev. 1

ENERGY SOLUTIONS

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Page 1 of 2

DRILLING AND SAMPLING (PERCUSSION) DAILY WORK RECORD

PURPOSE: Day shift standby for access to RBA in install probe in #C7941. Swing shift install probe in #C7941.

DATE: 11-05-10

LOCATION: "C" Tank Farm, 200 East Area, Hanford | EXCAVATION: DAN-4054 | L-DIG #: 10213014 | REPORT #: 23

START CARD NO. SE08172 | DECOMMISSION NO. AE10775 | RWP: CO-601, Rev. 3 | AHA: [illegible], Rev. 0

SAMPLING SUMMARY | SITE/EQUIPMENT INSPECTION: (Yes) No | HHC CASE#1, HHC CAT #2 HHCXL#3

BOREHOLE SUMMARY

NA

GEOPHYSICAL LOGGING

NA

TIME	WORK SUMMARY
0600	Safety meeting at office. Topic: Vehicle Operations.
0630	Travel to "C" Farm, arrive in
0715	Stand by for RCTS and package
0745	Pre-job
0815	Drive into whites, inspect rig, install surface protection at C-7940, move rig to RBA to be surveyed set.
0930	Stand by for Rig to dry in order to move into RBA
1045	Finish survey of Rig, set up on C-7941, Pull 2½" casing from 202' to 200', Knock out expendable tip, back pull casing to 166'
"	(First probe set 171.5 to 173) install bentonite to 179.5, sand to 173.5, Bentonite to 170.5, sand to 169.5', install tremie add one gal H2O back-pull casing
"	to 146', install bentonite to 155.5 (2nd probe set 152-154') sand to
"	154.5', bentonite to 151.5', sand to 150.5', install tremie add one
"	gal H2O via tremie, Pull tremie pipe.
1230	Lunch
1300	Back-pull casing to 126', (3rd probe set 132'-134') install
"	bentonite to 135.5', sand to 134.5', bentonite to 131.5', sand to
"	130.5', install tremie pipe, add one gallon H2O, Pull tremie,
"	Back pull casing to 106', add bentonite to 115.5
"	(4th probe set 112-114') add sand to 114.5, bentonite to
"	111.5', sand to 110.5, install tremie, add one gal H2O,
"	pull tremie, back-pull casing to 86', (5th probe set
"	92 to 94') add bentonite to 95.5, sand to 94.5, bentonite -
"	See sheet #2 →

OPERATOR LICENSE: Olson 1217

ES SUPPORT: [illegible]

HPT: [illegible]

FIELD: [illegible]

WEATHER: 58 F, partly cloudy with winds from the northeast at 5-10 mph.

DOWNTIME: .5 hr For RCTS, .25 hr For: [illegible]

DISCARDED ITEMS:
Pre-expendable tip
[illegible] with level probe
2 sack bentonite 1-4 x 2½" Red
1 surface protection 2 sacks bentonite sand
3 sacks concrete 8 sacks bentonite

REFERENCE CONTRACT INFORMATION: TFC-WO-10-1765; FSWO-DOW-036; RPP-PLAN 3939364; ECN-127555

REPORT BY: Kelly Olson
TITLE: [illegible]
SIGNATURE: Kelly Olson

REVIEWED BY: D.E. Skoglie
TITLE: [illegible]
SIGNATURE: David E. Skoglie
DATE: 11/8/10

ENERGYSOLUTIONS

DAILY WORK RECORD – CONTINUATION PAGE

Date	Boring #	Continuation of Report No.
11-05-10	C7941	23

TIME	WORK SUMMARY
	diatomite to 91.5', sand to 90.5, install tremie pipe, add one gal H2O via tremie, pull tremie pipe, back-pull 2½" casing to 66', (6th probe set 72-74') install bentonite to 75.5, sand to 74.5', diatomite to 71.5', sand to 70.5', install tremie pipe and add one gal H2O, pull tremie, pull casing to 46' (7th probe set 52'-54') install bentonite to 55.5, sand to 54.5, diatomite to 51.5', sand to 50.5', install tremie and add one gal H2O via tremie, pull tremie, back-pull 2½" casing to 26' (8th probe set 32-34') install bentonite to 25.5', sand to 34.5', diatomite to 31.5, sand to 30.5', install tremie and add one gal H2O, back-pull casing to 8', (9th probe set 12'-14'), install bentonite to 15.5', sand to 14.5', diatomite to 11.5', sand to 10.5', add one gal H2O via tremie, pull remaining casing and install bentonite to 1' bgs.
	Lost one joint of 2½" pipe to contamination (approximately 650 CPM of fixed contamination.). Pipe was sleeved and placed in C.A. Joint was #33, had been at 134'
1600	Moved rig and installed surface protection at C-7941, moved equipment back into CA, survey rig and plastic (ground protection) out of RBA and moved rig out of farm, clean-up and return dosimitry.
1701	Travel to office, paperwork, time cards
1830	End of shift
	NA

Report By	Kelly Olson	Reviewed By	D.E. Skoglie		
Title	ES Technical Preparer	Title	ES Technical Reviewer	Date	11/08/10
Signature	Kelly Olson	Signature	David E. Skoglie		100609 Rev 1

20 FT MULTI-LEVEL RESISTIVITY PROBE WORK SHEET — BOREHOLE NO. C-7941

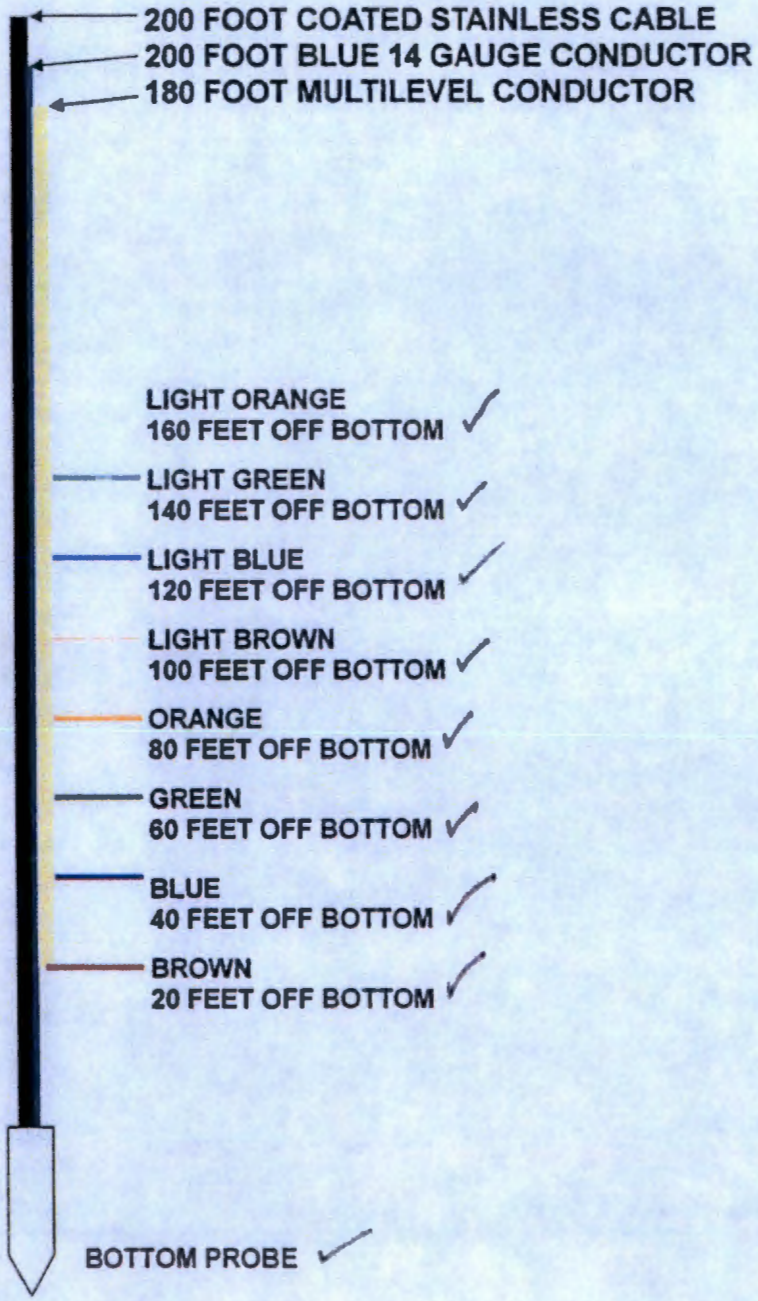
DIMENSIONS	PRELIMINARY AS-BUILT		CONSTRUCTION MATERIAL/TAG	
PLANNED	ACTUAL		MATERIAL	TAG
0 ft			SURFACE PROTECTION @ WELLHEAD	
			Bentonite from 0 to 10.5 Sand from 10.5 to 11.5	✓
- 20 ft -	- 12 ft - 14	18 2	D.E from 11.5 to 14.5 Sand from 14.5 to 15.5	✓
			Bentonite from 15.5 to 30.5 Sand from 30.5 to 31.5	✓
- 40 ft -	- 32 ft - 34	18 2	D.E from 31.5 to 34.5 Sand from 34.5 to 35.5	✓
			Bentonite from 35.5 to 50.5 Sand from 50.5 to 51.5	✓
- 60 ft -	- 52 ft - 54	18 2	D.E from 51.5 to 54.5 Sand from 54.5 to 55.5	✓
			Bentonite from 55.5 to 70.5 Sand from 70.5 to 71.5	✓
- 80 ft -	- 72 ft - 74	18 2	D.E from 71.5 to 74.5 Sand from 74.5 to 75.5	✓
			Bentonite from 75.5 to 90.5 Sand from 90.5 to 91.5	✓
- 100 ft -	- 92 ft - 94	18 2	D.E from 91.5 to 94.5 Sand from 94.5 to 95.5	✓
			Bentonite from 95.5 to 110.5 Sand from 110.5 to 111.5	✓
- 120 ft -	- 112 ft - 114	18 2	D.E from 111.5 to 114.5 Sand from 114.5 to 115.5	✓
				✓
- 140 ft -	- 132 ft - 134	18 2	Bentonite from 115.5 to 130.5 Sand from 130.5 to 131.5 D.E from 131.5 to 134.5 Sand from 134.5 to 135.5	✓
- 160 ft -	- 152 ft - 154	18 2	Bentonite from 135.5 to 150.5 Sand from 150.5 to 151.5 D.E from 151.5 to 154.5 Sand from 154.5 to 155.5	✓
- 180 ft -	- 172.5 ft - 173	17.5 1.5	Bentonite from 155.5 to 170.5 Sand from 170.5 to 171.5 D.E from 171.5 to 173.5 Sand from 173.5 to 174.5	✓

Bentonite chips [illegible] 20 [illegible] 1 per interval — Bentonite chips 202 to 174.5

CK 10/27/10

C-7941

200 FOOT MULTILEVEL PROBE



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DRILLING AND SAMPLING (PERCUSSION) DAILY WORK RECORD

PURPOSE: Install brass tags on probe holes and move pipe from RBA back into CA. **DATE:** 11-08-10

LOCATION: "C" Tank Farm, 200 East Area, Hanford | **EXCAVATION:** DAN-4054 | **U-DIG #:** 10213014 | **REPORT #:** 24

START CARD NO. SE08172 | **DECOMMISSION NO.** AE10775 | **RWP:** CO-601, Rev. 3 | AHA-09-008, Rev. 0

SAMPLING SUMMARY | **SITE/EQUIPMENT INSPECTION:** Yes No | HHU CASE#1 HHU CAT #2 HHUXL#3

Sample # s	Interval	%
1		
2	NA	
3		
4		

BOREHOLE SUMMARY

Borehole = \ Tubing \ @ \ to \ ft bgs S.L. \
Borehole = \ Tubing \ @ \ to \ ft bgs S.L. \
Borehole = \ Tubing \ @ \ to \ ft bgs S.L. \

GEOPHYSICAL LOGGING

Boring #	Interval	Type
1	NA	
2		
3		

TIME	WORK SUMMARY
0600	Safety meeting at office. Topic: Continuing OSHA 30 Hr. Training by ESFS Safety Staff.
0700	Travel to 'C' Farm
	All work completed in farm, arranged for transport of Rig for cleaning, arranged for well tags and gathered equipment for angle pushs (upcoming), clean up and store equipment
1530	End of shift

NA

OPERATOR/LICENSE: Olson/1217
ES SUPPORT Weakley, Walkup, Ehrgott, Amos
VCO Sack, U. Hazel
HPT Templeton, Barnard
FWS Davis

WEATHER: 55 F, partly cloudy and breezy. Winds from the southwest 10-20 mph.

DOWNTIME: N/A

DISCARDED ITEMS: N/A

REFERENCE/CONTRACT INFORMATION: TFC-WO-10-1765; FSWO-DOW-036; RPP-PLAN-3939364; ECN-127555

REPORT BY: Kelly Olson
TITLE: ES TECHNICAL PREPARER
SIGNATURE: Kelly Olson

REVIEWED BY: D.E. Skoglie
TITLE: ES TECHNICAL REVIEWER
SIGNATURE: David E. Skoglie **DATE** 11/08/10

10-06-09 Rev 1

ENERGYSOLUTIONS

ENERGY SOLUTIONS, WESTERN OPERATIONS

Page 1 of 1

DRILLING AND SAMPLING (PERCUSSION) DAILY WORK RECORD

PURPOSE: Mob of Equipment and Materials. House Keeping | **DATE:** 11-09-10

LOCATION: "C" Tank Farm 200 East Area Hanford | **EXCAVATION:** DAN-4054 | **U-DIG #:** 10213014 | **REPORT #:** 25

START CARD NO. SE08172 | **DECOMMISSION NO.** AE10775 | **RWP:** CO-601.Rev. 3 AHA-09-008.Rev.0

SAMPLING SUMMARY | **SITE/EQUIPMENT INSPECTION:** Yes (No) | HHU CASE#1 HHU CAT #2 HHUXL#3

Sample # | Interval | %

1
2 NA
3
4

BOREHOLE SUMMARY

Borehole # ___ Tubing ___ @ ___ to ___ ft bgs. S.L. ___
Borehole # ___ Tubing ___ @ ___ to ___ ft bgs. S.L. ___
Borehole # ___ Tubing ___ @ ___ to ___ ft bgs. S.L. ___

GEOPHYSICAL LOGGING

Boring # | Interval | Type

1 NA
2
3

TIME	WORK SUMMARY
0600	Safety meeting at office. Topic: Look and Live
0630	Travel to 'C' Farm, pick up ratchet straps, Pick up Cat, Rig #2 at 'S' labs, move rig to SX farm, meet driver from Powers equip., load and transport Cat rig to BY farm and unload rig and stage on Plastic, Travel to 'C' Farm load Case rig #1 on Powers equipment truck for transport to Powers shop for cleaning, banded racks of pipe and moved all new pipe from 'C' and 'BY' Farm to Energy NW to clean threads and treat with rust preventitive,
1130	Lunch
1200	Unload pipe at Energy NW, Powers equipment washed Case Rig #2 and returned rig to Energy NW, off-loaded rig and moved to shop and parked in shop on Felt, Moved Pipe into shop and begin cleaning threads
1500	Return to office, paperwork, timecards
1530	End of shift
	NA

OPERATOR/LICENSE: Olson/1217
ES SUPPORT Weakley, Walkup, Ehrgott, Amos
VCO Shook, Villaral
HPT Templeton, Barnard
FWS Clark

WEATHER: 54 F Partly cloudy

DOWNTIME: N/A

DISCARDED ITEMS: N/A

REFERENCE/CONTRACT INFORMATION:

REPORT BY: Keily Olson
TITLE: ES TECHNICAL PREPARER
SIGNATURE: Kelly Ol

REVIEWED BY: D.E. Skoglie
TITLE. ES TECHNICAL REVIEWER
SIGNATURE: David E Skoglie **DATE** 11/09/10

10/06/09 Rev 1

ENERGYSOLUTIONS

ENERGY SOLUTIONS, WESTERN OPERATIONS

Page 1 of 1

DRILLING AND SAMPLING (PERCUSSION) DAILY WORK RECORD

PURPOSE: Clean 21/2" . 25/8" rods @ ENW

DATE: 11-10-10

LOCATION: "C" Tank Farm Energy Northwest

EXCAVATION: DAN-4054

U-DIG #:10213014

REPORT #: 26

START CARD NO.SE08172

DECOMMISSION NO. AE10775

RWP: CO-601.Rev. 3 AHA-09-008.Rev.0

SAMPLING SUMMARY

SITE/EQUIPMENT INSPECTION: Yes No

HHU CASE#1 HHU CAT #2 HHUXL#3

Sample # Interval

1
2 NA
3
4

BOREHOLE SUMMARY

Borehole = Tubing @ to ft bgs S.C.

Borehole = Tubing @ to ft bgs S.C.

Borehole = Tubing @ to ft bgs S.C.

GEOPHYSICAL LOGGING

Boring Interval Type

1
2 NA
3

TIME	WORK SUMMARY
0600	Safety meeting at office. Topic: Construction Equipment Dangers
0630	Travel to Ent N W, cleaning rusted pipe, loading on racks, treating joints with rust preventive and storing inside building, work completed inside Farm, preparing equipment for upcoming work
1530	End of shift

NA

OPERATOR/LICENSE: Olson/1217
ES SUPPORT Weakley Walkup Ehrgott Amos
NCO. Snook Vikrekl
HPT. Templeton, Bennett
FWS. Clark

WEATHER: 59° F Rain cloudy

DOWNTIME: N/A

DISCARDED ITEMS: N/A

REFERENCE/CONTRACT INFORMATION:

REPORT BY: Kelly Olson
TITLE: ES TECHNICAL PREPARER
SIGNATURE: Kelly Olson

REVIEWED BY: D.E. Sloaglie
TITLE: ES TECHNICAL REVIEWER
SIGNATURE: Daniel E. Sloaglie DATE: 11/10/10

10-06-09 Rev 1

SOLUTIONS

ENERGY SOLUTIONS, WESTERN OPERATIONS

Page 1 of 1

DRILLING AND SAMPLING (PERCUSSION) DAILY WORK RECORD

PURPOSE: Clean Rods at En. N.W. DATE: 11/11/10

LOCATION: Energy N.W. EXCAVATION: DAN- 1054 L-DIG #: 10213014 REPORT #: 27

START CARD NO. SE0512 DECOMMISSION NO. AE10775 RWP: CO-601 AHA- 09-005 Rev 0

SAMPLING SUMMARY — SITE/EQUIPMENT INSPECTION: Yes (No) — HHL CASE#1 HHL CAT #2 HHUXL#3

Sample Interval

NA

BOREHOLE SUMMARY

Borehole Tubing in Hrs St

Borehole Tubing in Hrs St

Borehole Tubing in Hrs St

GEOPHYSICAL LOGGING

Boring Interval Type

NA

TIME	WORK SUMMARY
0600	Safety meeting at office, subject = Drive safely in winter
0700	Travel to En. N.W.
0730	Clean threads on drive rod, treat with rust preventitive and store in racks
1100	Lunch
1130	Continue to clean rods, also begin setting up plates and equipment for up-coming directional drilling at 'C' Farm
1430	Travel to office, paperwork, time-cards
1530	End of shift

NA

OPERATOR/LICENSE: Olson 1217
ES SUPPORT Amos, Ethgott
VCO N/A
HPT N/A
FHS Clark

WEATHER: 59 °F Fog in AM Cloudy

DOWNTIME: N/A

DISCARDED ITEMS: N/A

REFERENCE/CONTRACT INFORMATION:

REPORT BY: Kelly Olson
TITLE: ES TECHNICAL PREPARER
SIGNATURE: Kelly Olson

REVIEWED BY: D.E. Skoglie
TITLE: ES TECHNICAL REVIEWER
SIGNATURE: David E. Skoglie DATE 11/11/10

10/06/09 Rev 1

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APPENDIX D

SMALL DIAMETER GEOPHYSICAL LOGGING OF FOUR PROBEHOLES IN THE 241-C TANK FARM ADJACENT TO UPR-200-E-82

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SMALL DIAMETER GEOPHYSICAL LOGGING OF FOUR PROBEHOLES IN THE 241-C TANK FARM ADJACENT TO UPR-200-E-82

by

Russel Randall, PhD and Randall Price

to

Energy*Solutions* Federal Services, Inc.
2345 Stevens Drive
Richland, Washington 99354

December 2010

Pacific Northwest Geophysics
4200 West 19th Avenue
Kennewick, Washington 99338

Three Rivers Scientific
3740 Grant Court
West Richland, Washington 99353

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TERMS

BGO	Bismuth Germinate Oxide
DOE	U.S. Department of Energy
KUT	potassium, uranium and thorium
PNG	Pacific Northwest Geophysics

SMALL DIAMETER GEOPHYSICAL LOGGING OF FOUR PROBEHOLES IN THE 241-C TANK FARM ADJACENT TO UPR-200-E-82

1.0 PROBEHOLE SURVEYS

Pacific Northwest Geophysics (PNG) and Three Rivers Scientific provided small diameter logging in probeholes installed adjacent to the C-152 diversion box (UPR-200-E-82) within the 241-C Tank Farm.

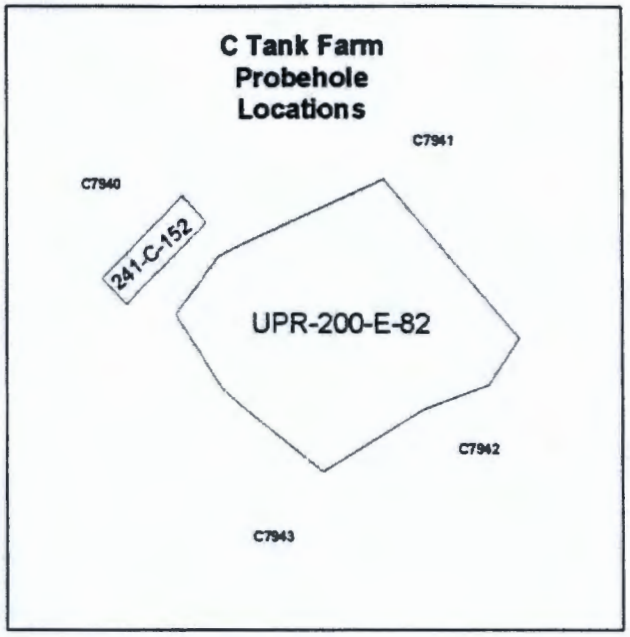
Logging surveys were conducted in each small diameter probehole with a Bismuth Germinate Oxide (BGO) spectral gamma scintillation detector and a neutron-neutron moisture probe. Detector calibration certificates for the BGO and neutron-moisture detectors are presented in Section 2.0, "Gamma and Moisture Surveys." The survey results for each probehole are presented in Appendix A.

2.0 GAMMA AND MOISTURE SURVEYS

The gamma and moisture logs were collected according to approved procedures (PNG 2009). The surveys were recorded from the bottom of the probehole to the ground surface. Zero depth reference is at the ground surface. A repeat measurement was acquired daily in at least one probehole to verify instrument repeatability. The main log and repeat intervals are presented on the same plot. The computed results of the main and repeat intervals were reviewed and for all of the intervals collected, the results agree within the uncertainty of the measurement counting statistics.

The survey results for each probehole are presented as a depth-versus-concentration plot in Appendix A. The plots are in numeric order of the probeholes (C7940–C7943). Appendix A also contains a table summarizing data for each probehole: probehole depth, maximum concentration of Cs-137 in pCi/g, and maximum detected depth of Cs-137. Figure 1 shows a map view of the probehole locations within the investigation site relative to the underground C-52 diversion box and UPR-200-E-82 cover. One probehole (C7941) was located in the radioactive material area (i.e., outside the perimeter fence of the 241-C Tank Farm).

Figure 1. Probehole Locations adjacent to C-152 Diversion Box at 241-C Tank.



2.1 GAMMA CALIBRATION AND SURVEYS

The spectral gamma scintillation detector uses a BGO crystal that is 2.54 cm (1 in.) in diameter by 10.1 cm (4 in.) long. Other components of the gamma logging probe are the high-voltage supply, photo-multiplier tube, pre-amp, and multi-channel analyzer. The settings of the detector components are fixed (i.e., set up during assembly, prior to calibration) and cannot be adjusted by the field-logging engineer. The detector gain and lower threshold are set to record gamma ray activity with energies between 300 and 3000 keV. Lantern mantles containing Th-232 are used as a field verifier at the beginning and ending of each day's logging activities to check detector resolution (integrity) and energy calibration (amplifier gain).

The spectral gamma surveys were logged at 100 seconds per 0.15 m (0.5 ft). A spectrum of 256 channels was collected each 0.15 m (0.5 ft) from the bottom of the probehole to the surface. The spectra were recorded with one spectrum per file (filename extension: "-.chn") in Ortec[1] PHA format. Spectra were processed to quantify the concentration of the naturally occurring radionuclides (K, U, & Th) and quantify Cs-137 when present above the minimum detection threshold. The minimum detection level for Cs-137 is 1 pCi/g. The calibration certificate is shown in Figure 2. Also the gross gamma was calibrated to the industry standard of equivalent

[1]Ortec is a registered trademark of EG&G Ortec, Gouda, Netherlands.

radium-226 (Eq.Ra) in pCi/g. Calibration was for the probehole conditions present at the investigation site.

2.2 NEUTRON MOISTURE CALIBRATION AND SURVEYS

The neutron moisture sonde combines the PNG-owned thermal-neutron detector and a U.S. Department of Energy (DOE)-owned sealed neutron source (50 millicuries americium and beryllium). The DOE-owned neutron source was used because it was already on the Hanford Site and was managed by the DOE Radiation Management Program. The neutron source is an integral component of a neutron moisture detector manufactured by Campbell Pacific Nuclear and is identified by the tool serial number H370608792.

The integrity of the sealed neutron source is always maintained when used in calibration and probehole logging activities. Source integrity is maintained by inserting the PNG-owned neutron detector module into the housing containing the sealed neutron source.

Calibration was performed in six borehole calibration models (Meisner and Randall 1995). Three of these models had a 15.24 cm (6-in.) hole size and three models had a 20.32 cm (8-in.) hole size. The moisture content was different for each borehole model within each set of three models (5, 12, and 20 percent by volume). The detector count rate in each of the six borehole calibration models is summarized in Table 1. The calibration certificate is shown in Figure 3.

Table 1. Moisture Calibration Data.

Moisture Content Percent – volume fraction	6 inch Models[a] (cps)	8 inch Models[a] (cps)
5% vf	103.87	81.1
12% vf	155.11	114.92
20% vf	191.9	140.17

[a]Count rates are mean of 10 sample measurements at 60-sec each, 2/25/2009.

The probehole size for this project was 6.35 cm (2.5 in.) in outside diameter. Therefore, the moisture calibration was extrapolated to the correct hole size. Figure 4 shows the moisture calibration certificate for the 6.35 cm (2.5-in.) hole size.

The probehole moisture survey was collected at 0.30 m/min (1 ft/min). Processing of the survey data requires that the detector raw survey data be normalized to the thickness of the steel casing present in the calibration models (0.826 cm [0.325 in.]) Given that the probehole casing thickness is 0.97 cm (0.38 in.), a correction factor of 1.055 is required to increase (normalize) the observed neutron detector count rate to the conditions of the calibration model (Meisner et al. 1996).

Figure 2. BGO Calibration Certificate.

Certificate of Calibration
SDGR.BGO.2

April 21, 2009

Data were taken at the Hanford KUT models on April 21, 2009. SDGR.BGO.2 is the designated Scintillator tool. Four models were used for Spectral KUT calibration. Ten spectra were recorded in order to perform statistical analysis. The observed statistical deviations were seen to be within the theoretically predicted variation, refer to the files compressed: AveOut2.XLS for this analysis. The instrument was covered with 0.94 cm (0.37 in.) wall thickness probe tubing.

The algorithm described in WHC-SD-EN-TI-293, *Procedures for Calibrating Scintillation Gamma-Ray Well Logging Tools Using Hanford Formation Models*, Rev. 0, determines the coefficient analysis. Three energy windows are used for each potassium, uranium and thorium (K U & T), and these are:

K: 1320-1575 keV U: 1650-2390 keV T: 2475-2765 keV

The concentration for each of the three elements is a linear combination of the count rates in the three windows. The resulting coefficients for each of the three elements are:

Concentration-K =	**4.712*K**	**-4.297*U**	**4.057*T**
Concentration-U =	**0.0*K**	**1.431*U**	**-2.998*T**
Concentration-T =	**0.0*K**	**-0.052*U**	**2.032*T**

Where K U & T are the count rates (c/s) in the listed energy windows and the resulting concentration values are in pCi/g.

Digital files condensed as Cal_SD-GR-2_2009-v0.zip. This compressed file contains:

- Calibration raw data
- Mathcad* data analysis files
- Spreadsheet data formatting

The undersigned certifies that the data archived in the file "Cal_SD-GR-2_2009-v0 zip" were collected and evaluated in accordance with WHC-SD-EN-TI-293, and that the above-stated calibration coefficients are correct and applicable for the tool SDGR.BGO.2 effective April 21, 2009.

*Mathcad is a registered trademark of Parametric Technology Corporation, Needham, Massachusetts.

Signature:

/s/ Russel Randall, PhD April 23, 2009
Three Rivers Scientific

Figure 3. Moisture Calibration Certificate, 15.24 cm (6-in.) and 20.32 cm (8-in.) Hole.

Certificate of Calibration for
Instrument SD-Moist792

February 25, 2009

Data were taken in the Moisture models on February 25, 2009, for the SD-Moist792 neutron-neutron moisture tool. The neutron source from DOE moisture tool # H370608792 was used with the passive neutron detector probe from PNG.

Six models were used for moisture calibration, three for 15.24 cm (6-in.) casing and three for 20.32 cm (8-in.) casing. Repeated spectra were recorded for each model in order to perform statistical analysis. The observed statistical variation agreed with the theoretically predicted variation, refer to the file MoistCal.xls for this analysis.

The coefficient generation is determined by the algorithm described in WHC-SD-EN-TI-306, *Radionuclide Logging System In Situ Vadose Zone Moisture Measurement Calibration*, Rev. 0. The regression function used is a power law form and defined by:

$$V = a \cdot CR^{\alpha}$$

Where V is the formation moisture content in volume fraction water in vf units. One vf unit is 1% by volume water. The coefficients a and α are fit coefficients, and CR is the deadtime corrected observed total count rate, (c/s).

6-in. casing	**8-in. casing**
a = .0001586	**a = .00008287**
α = 2.229	**α = 2.504**

The undersigned certifies that the data archived in data file "SD-Moist792_2009.zip" were collected and evaluated in accordance with WHC-SD-EN-TI-306, and that the above-stated calibration coefficients are correct and applicable for tool SD-Moist792, effective February 25, 2009.

Signature:

/s/ Russel Randall, PhD — February 28, 2009
Three Rivers Scientific

Figure 4. Moisture Calibration Certificate, 6.35 cm (2.5-in.) Hole.

Moisture Calibration Extrapolation to 2.5 Inch Borehole
Instrument SD-Moist792

February 25, 2009

Moisture calibration was performed in the Hanford physical models. These standards have 15.24 cm and 20.32 cm (6-in. and 8-in.) inside diameter casings. The Tank Farm Direct Push borehole is cased with a 5.08 cm (2.5 in.) outside diameter iron casing. The calibration for the moisture response is a function of borehole diameter.

The coefficient generation is determined by the algorithm described in WHC-SD-EN-TI-306, *Radionuclide Logging System In Situ Vadose Zone Moisture Measurement Calibration*, Rev. 0. The regression function used is a power law form and defined by:

$$V = a \cdot CR^{\alpha}$$

Where V is the formation moisture content in volume fraction water in vf units. One vf unit is 1% by volume water. The coefficients a and α are fit coefficients, and CR is the deadtime corrected observed total count rate, (c/s). A linear extrapolation was applied to determine the 5.08 cm (2.5-in.) borehole diameter.

2.51-in. borehole
a = .0002123
α = 2.010

The undersigned certifies that the analysis files are archived in the file "SD-Moist792_2009.zip" and were evaluated in accordance with Energy*Solutions* procedures and that the above-stated calibration coefficients are correct and applicable for tool SD-Moist792, effective February 25, 2009.

Signature:

/s/ Russel Randall, PhD — February 28, 2009
Three Rivers Scientific

3.0 REFERENCES

Meisner, James and Russel Randall, 1995, *Vadose Zone Moisture Measurement Through Steel Casing Evaluation*, WHC-SD-EN-TI-304, Rev.0, Westinghouse Hanford Company, Richland, Washington.

Meisner, James, Randall Price, and Russel Randall, 1996, *Radionuclide Logging System In Situ Vadose Zone Moisture Measurement Calibration*, WHC-SD-EN-TI-306, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

PNG, 2009, *Procedures: Calibration, Logging, Quality Assurance and Data Management*, Pacific Northwest Geophysics, Kennewick, Washington.

Randall, R. and D. Stromswold, 1995, *Procedures for Calibrating Scintillation Gamma-Ray Well Logging Tools Using Hanford Formation Models*, WHC-SD-EN-TI-293, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

APPENDIX A
SPECTRAL GAMMA AND MOISTURE SURVEY RESULTS

Survey plots follow for the four probeholes installed adjacent to the C-152 diversion box (UPR-200-E-82) within the C Tank Farm. Each probehole was surveyed with both the BGO spectral gamma and moisture probes. Each log plot is preceded by a header information page that shows the probehole coordinates, repeat/overlap intervals, isotopes analyzed, observations, and logging probe calibration dates. The log plots show a maximum of 100 feet per page with a 10-ft overlap between page breaks.

The spectral gamma survey data were processed to quantify the naturally occurring radionuclides (K, U, & Th) and the man-made radionuclide of Cs-137 (blue solid line). The spectra were processed both as individual spectra for each survey depth and as a moving sum of three spectra (i.e., sum of the individual survey depth and the two adjacent spectra, above and below the current depth position). Both results are presented on the results plot. The results for the 3-spectra sum are plotted as a wide line. Also the gross gamma was calibrated to the industry standard of equivalent radium-226 (Eq.Ra) in a scale of 2 to 5.5 pCi/g (brown line).

The neutron-neutron moisture survey data are shown with a blue dotted line. The moisture plot scale is 0-35 (% vf).

Table A1 contains a summary of the survey results for each probehole: maximum log depth, maximum detection level for Cs-137, and maximum depth of Cs-137 detection, and special observations by the analyst to flag the detection of other isotopes in addition to the natural radionuclides and Cs-137.

Table A1. Probehole Survey Summary.

Probehole ID.	Hole Depth (meters)	Hole Depth (feet)	Cs-137 (pCi/g) Max Detection	Cs-137 Max Detected Depth	Flag Isotopes Other Than Naturals and Cs-137
C7940	61.9	203	1.2 pCi/g at surface	1 ft	None
C7941	61.6	202	16 pCi/g at surface	1 ft	None
C7942	61.9	203	14 pCi/g at surface	1 ft	None
C7943	61.9	203	None	None	None

C-FARM C7940 HEADER INFORMATION

Small Diameter – Spectral Gamma & Moisture Survey

Probehole:	C7940	Northing:	136545.1	Depth Ref:
Log Date:	Oct 2010	Easting:	575022.1	Ground Surface
Project:	C Farm	Elevation:	202.955	

Repeat/Overlap Intervals

Spectral:	158-155	Moisture:	110-104
	141-138		
	50-46		

Isotopes Analyzed

Elements:	Energies Used (keV)
K-40	1462
Natural Uranium	1650-2390
Natural Thorium	2614
Cs-137	661

Observations

-Spectral:

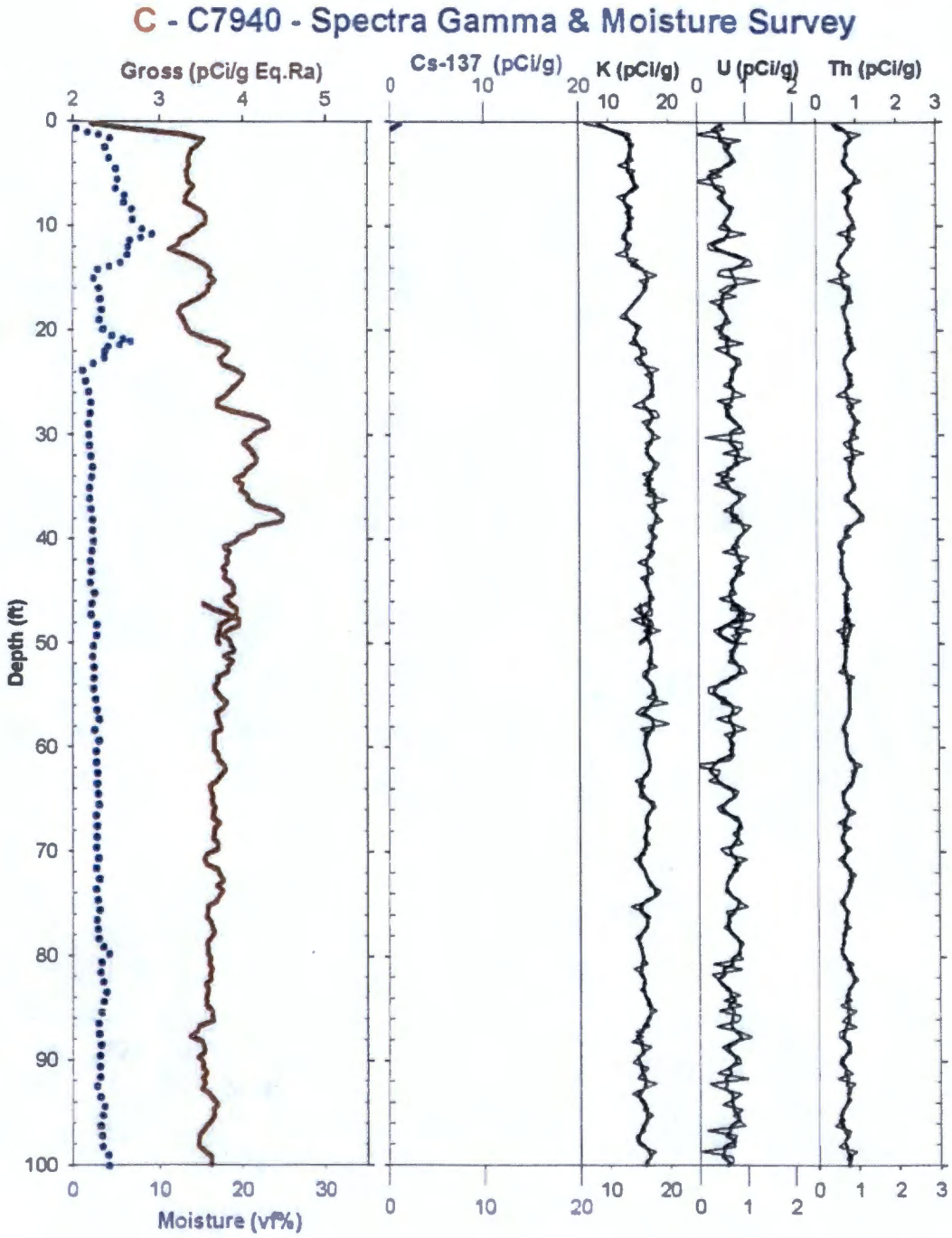
Cs-137 was observed at the surface, with a reading of 1.2 pCi/g. The plotted gross uses an energy threshold of 1000keV, and does not respond to Cs-137.

Moisture:

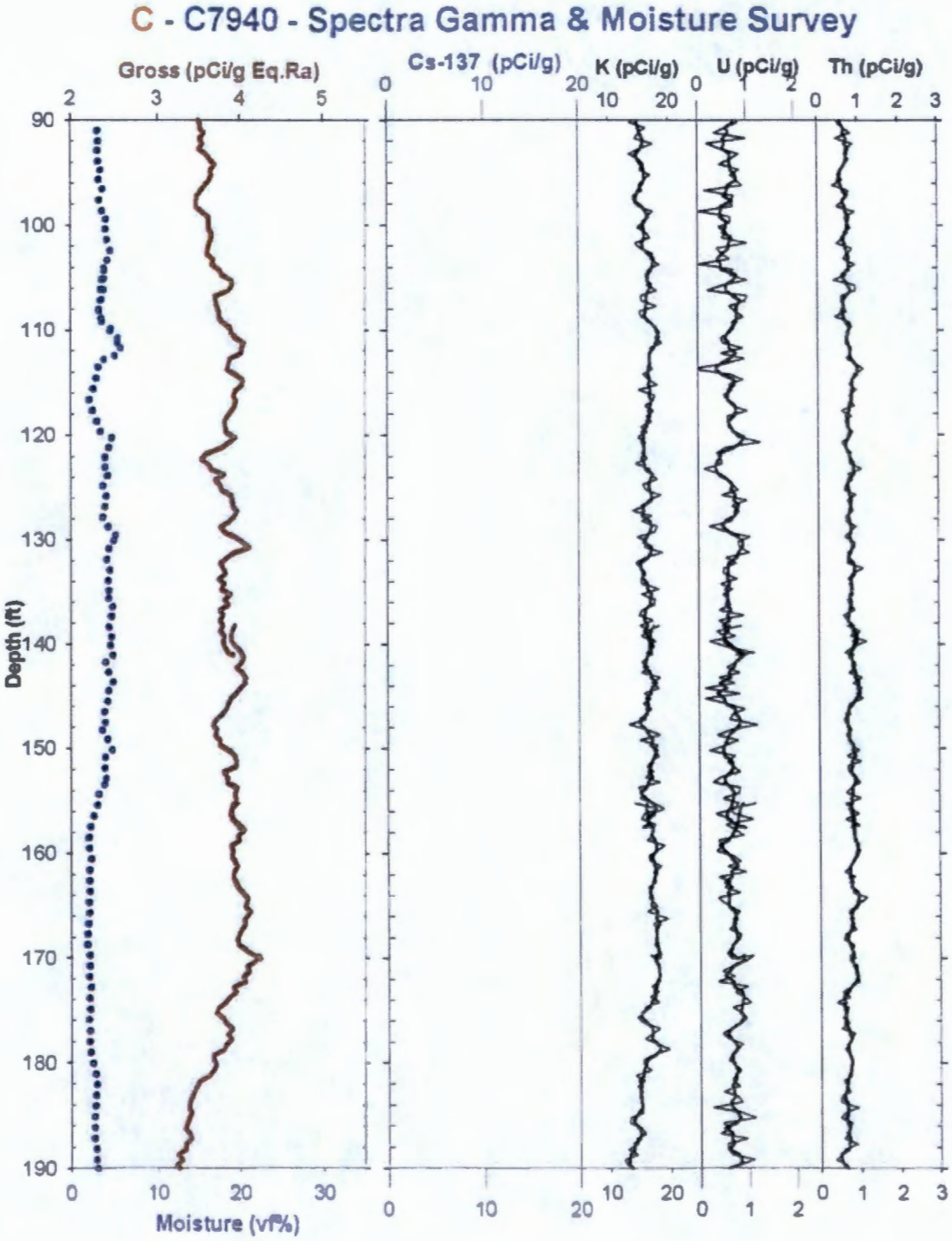
Moisture values range from 2-9%.

Calibration Certificates

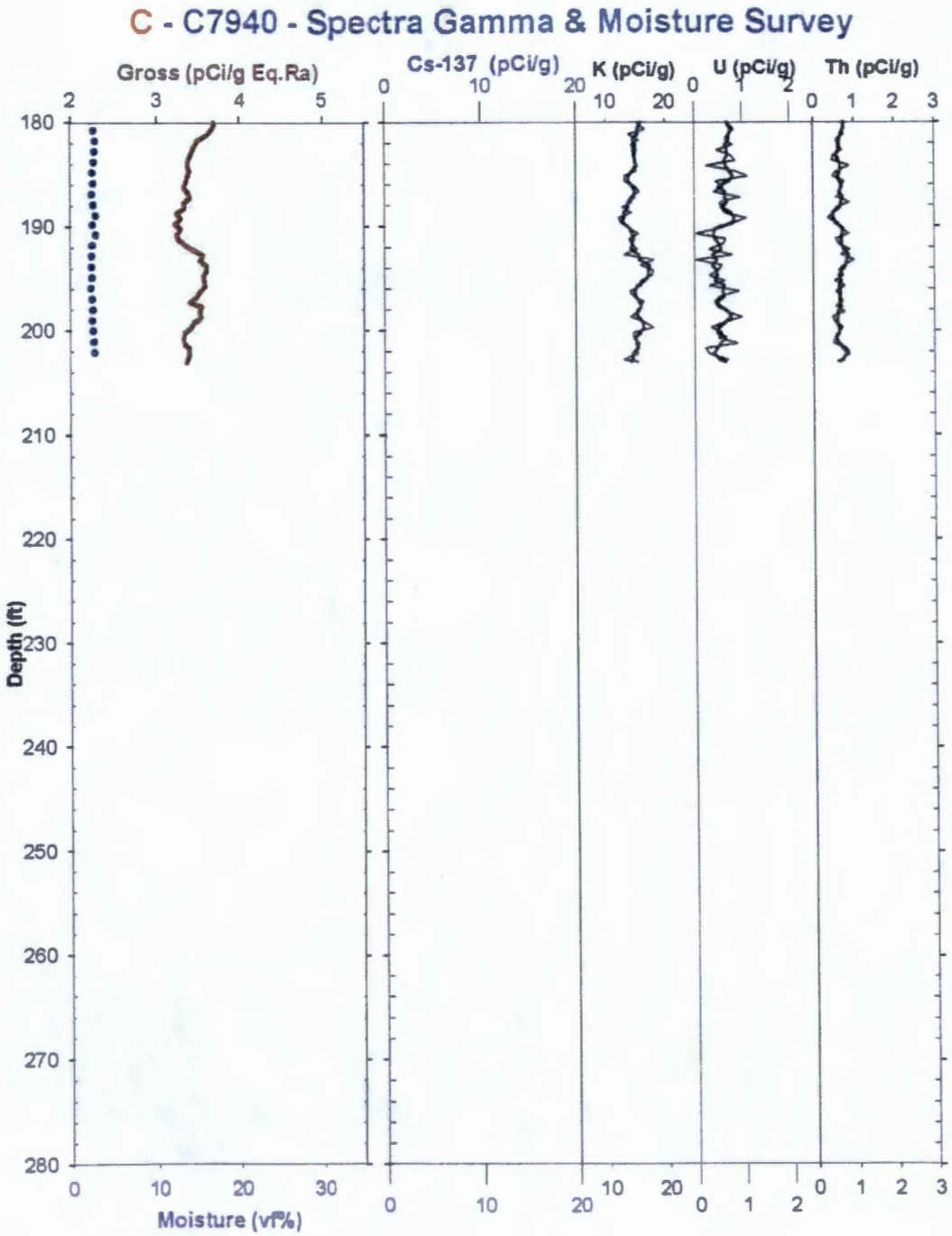
Spectral	
Date:	Apr 21, 2009
Electronic File:	Cal_SD-GR-2_2009-v0.zip
Moisture	
Date:	Feb 25, 2009
Electronic File:	SD-Moist792_2009.zip


C - C7940 - Spectra Gamma & Moisture Survey
Gross (pCi/g Eq.Ra)
Cs-137 (pCi/g)
K (pCi/g)
U (pCi/g)
Th (pCi/g)
Depth (ft)
Moisture (vf%)

A-3


C - C7940 - Spectra Gamma & Moisture Survey
Gross (pCi/g Eq.Ra)
Cs-137 (pCi/g)
K (pCi/g)
U (pCi/g)
Th (pCi/g)
Depth (ft)
Moisture (vf%)

A-4


C - C7940 - Spectra Gamma & Moisture Survey
Gross (pCi/g Eq.Ra)
Cs-137 (pCi/g)
K (pCi/g)
U (pCi/g)
Th (pCi/g)
Depth (ft)
Moisture (vf%)

A-5

C-FARM C7941 HEADER INFORMATION

Small Diameter – Spectral Gamma & Moisture Survey

Probehole:	C7941	Northing:	136548.2	Depth Ref:
Log Date:	Oct 2010	Easting:	575046.5	Ground Surface
Project:	C Farm	Elevation:	201.95	

Repeat/Overlap Intervals

Spectral: 75-72
71-70

Moisture: 109-102

Isotopes Analyzed

Elements:	Energies Used (keV)
K-40	1462
Natural Uranium	1650-2390
Natural Thorium	2614
Cs-137	661

Observations

-Spectral:

Cs-137 was observed at the surface, with a maximum of 15.7 pCi/g. The plotted gross uses an energy threshold of 1000keV, and does not respond to Cs-137.

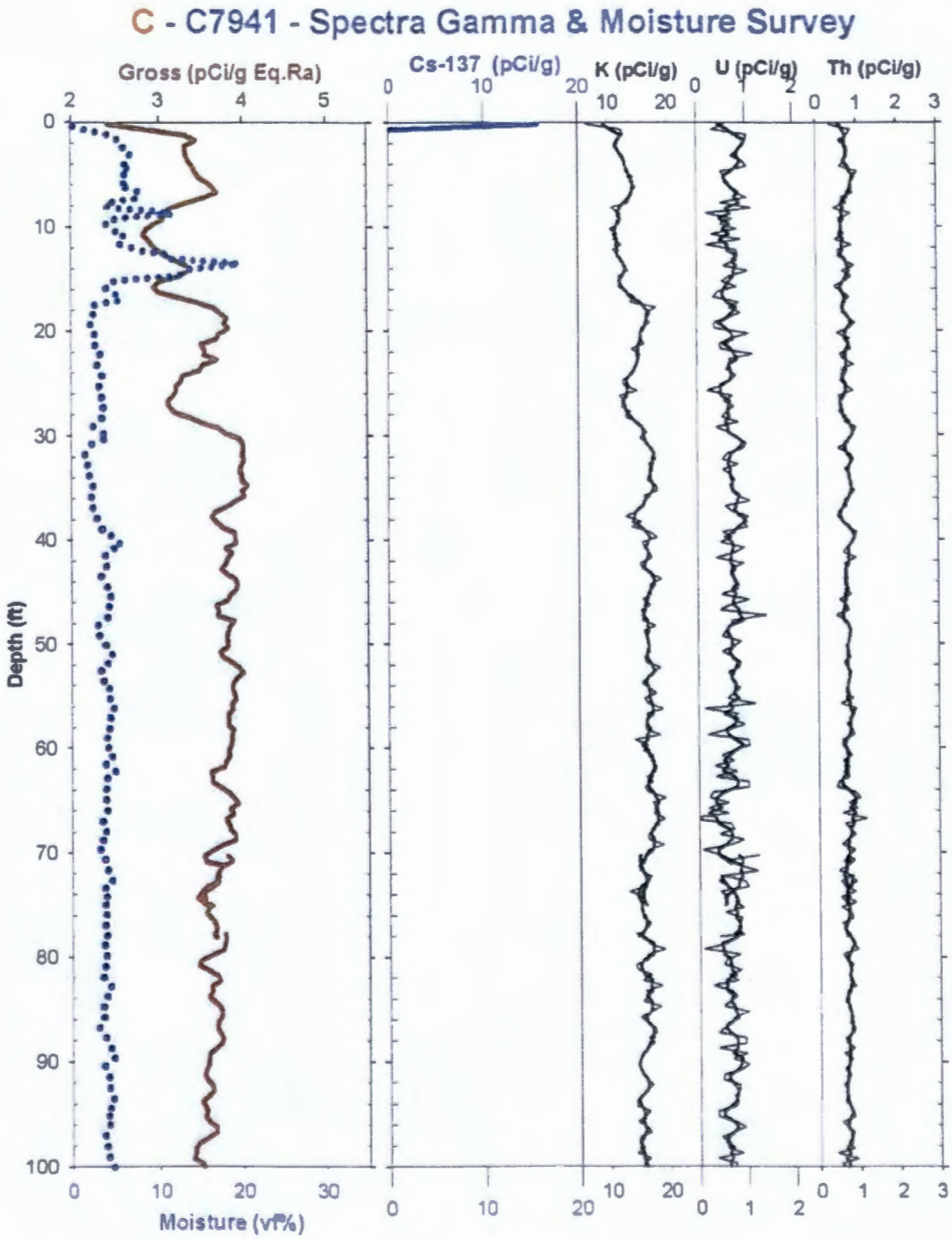
Moisture:

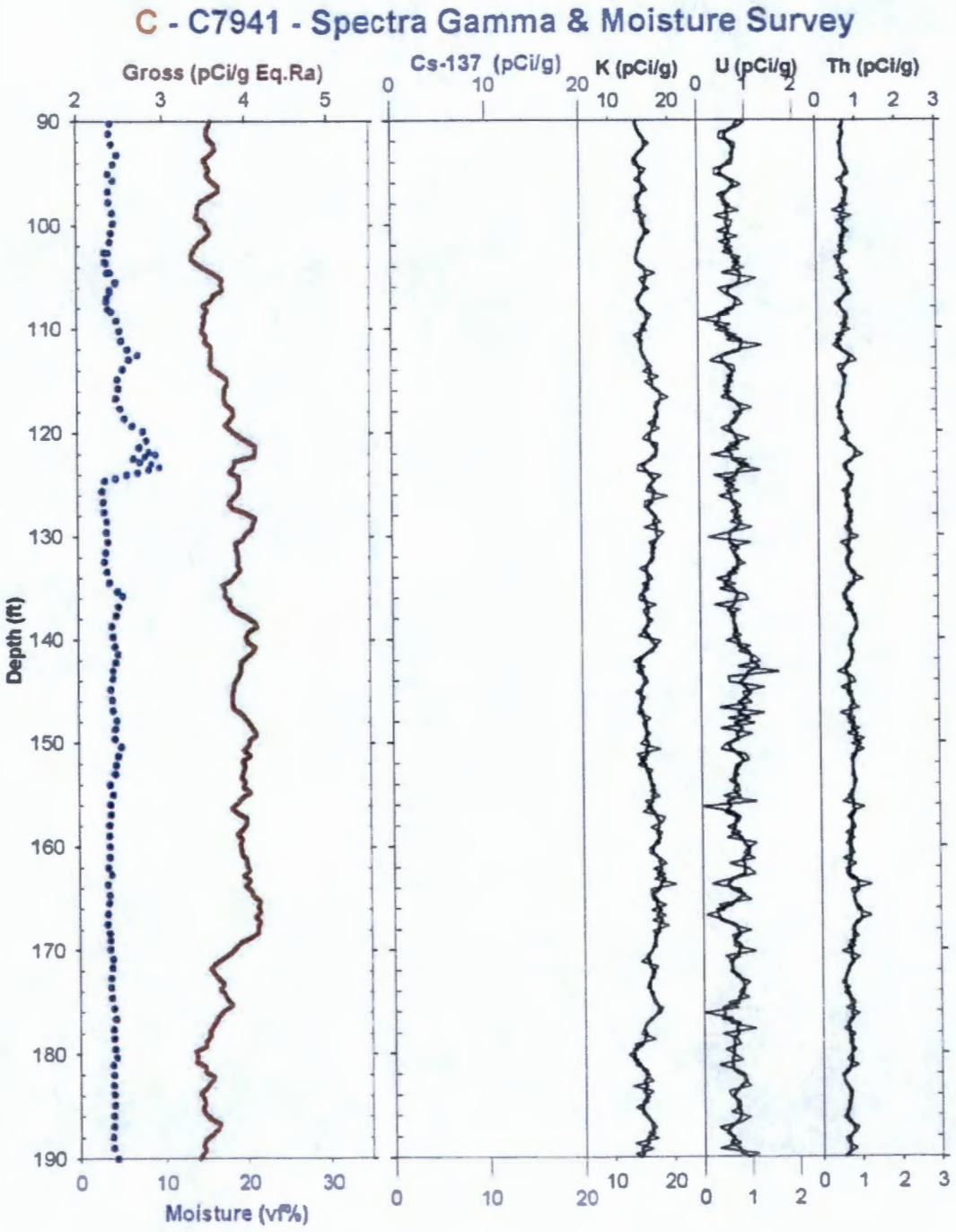
Moisture values range from 1-20%.

Calibration Certificates

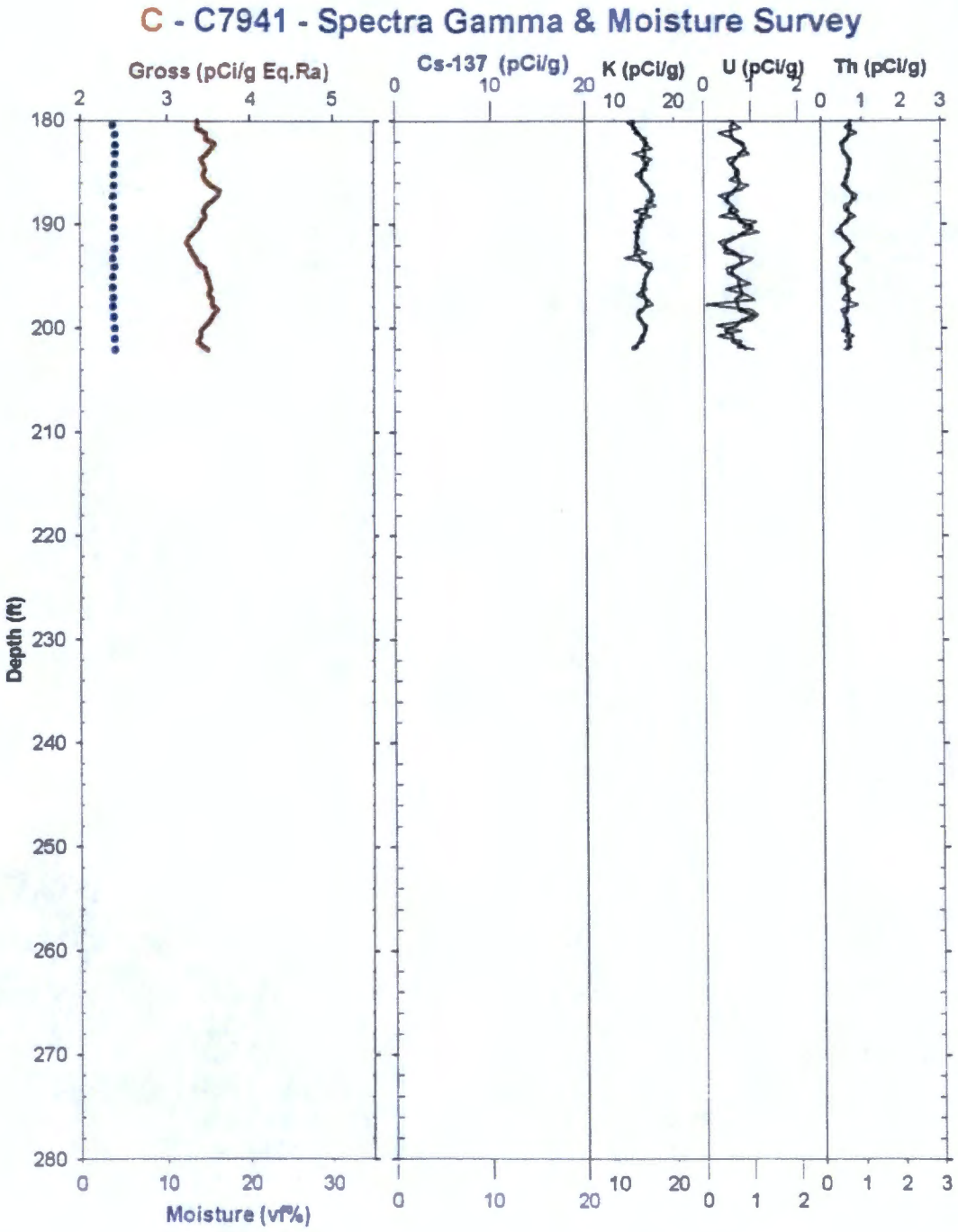
Spectral
Date: Apr 21, 2009
Electronic File: Cal_SD-GR-2_2009-v0.zip

Moisture
Date: Feb 25, 2009
Electronic File: SD-Moist792_2009.zip


C - C7941 - Spectra Gamma & Moisture Survey
Gross (pCi/g Eq.Ra)
Cs-137 (pCi/g)
K (pCi/g)
U (pCi/g)
Th (pCi/g)
Depth (ft)
Moisture (vf%)


C - C7941 - Spectra Gamma & Moisture Survey
Gross (pCi/g Eq.Ra)
Cs-137 (pCi/g)
K (pCi/g)
U (pCi/g)
Th (pCi/g)
Depth (ft)
Moisture (vf%)

A-8


C - C7941 - Spectra Gamma & Moisture Survey
Gross (pCi/g Eq.Ra)
Cs-137 (pCi/g)
K (pCi/g)
U (pCi/g)
Th (pCi/g)
Depth (ft)
Moisture (vf%)

C-FARM C7942 HEADER INFORMATION

Small Diameter – Spectral Gamma & Moisture Survey

Probehole:	C7942	Northing:	136526.1	Depth Ref:
Log Date:	Oct 2010	Easting:	575049.6	Ground Surface
Project:	C Farm	Elevation:	202.649	

REPEAT/OVERLAP INTERVALS

Spectral:	137-134	Moisture:	134-127
	122-118		30-23
	83-80		

Isotopes Analyzed

Elements:	Energies Used (keV)
K-40	1462
Natural Uranium	1650-2390
Natural Thorium	2614
Cs-137	661

Observations

-Spectral:

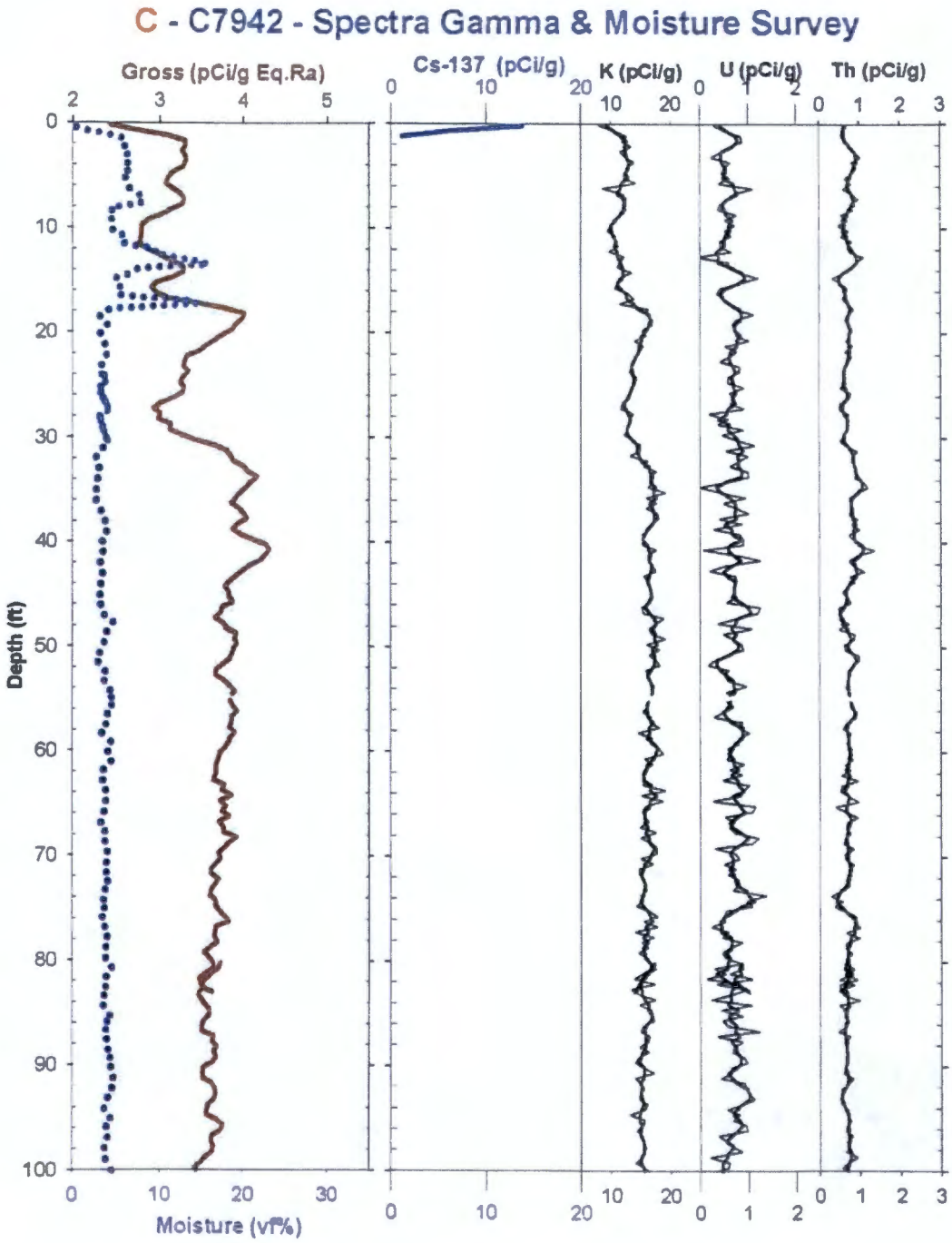
Cs-137 was observed from surface to 1ft, with a maximum of 13.7 pCi/g. The plotted gross uses an energy threshold of 1000keV, and does not respond to Cs-137.

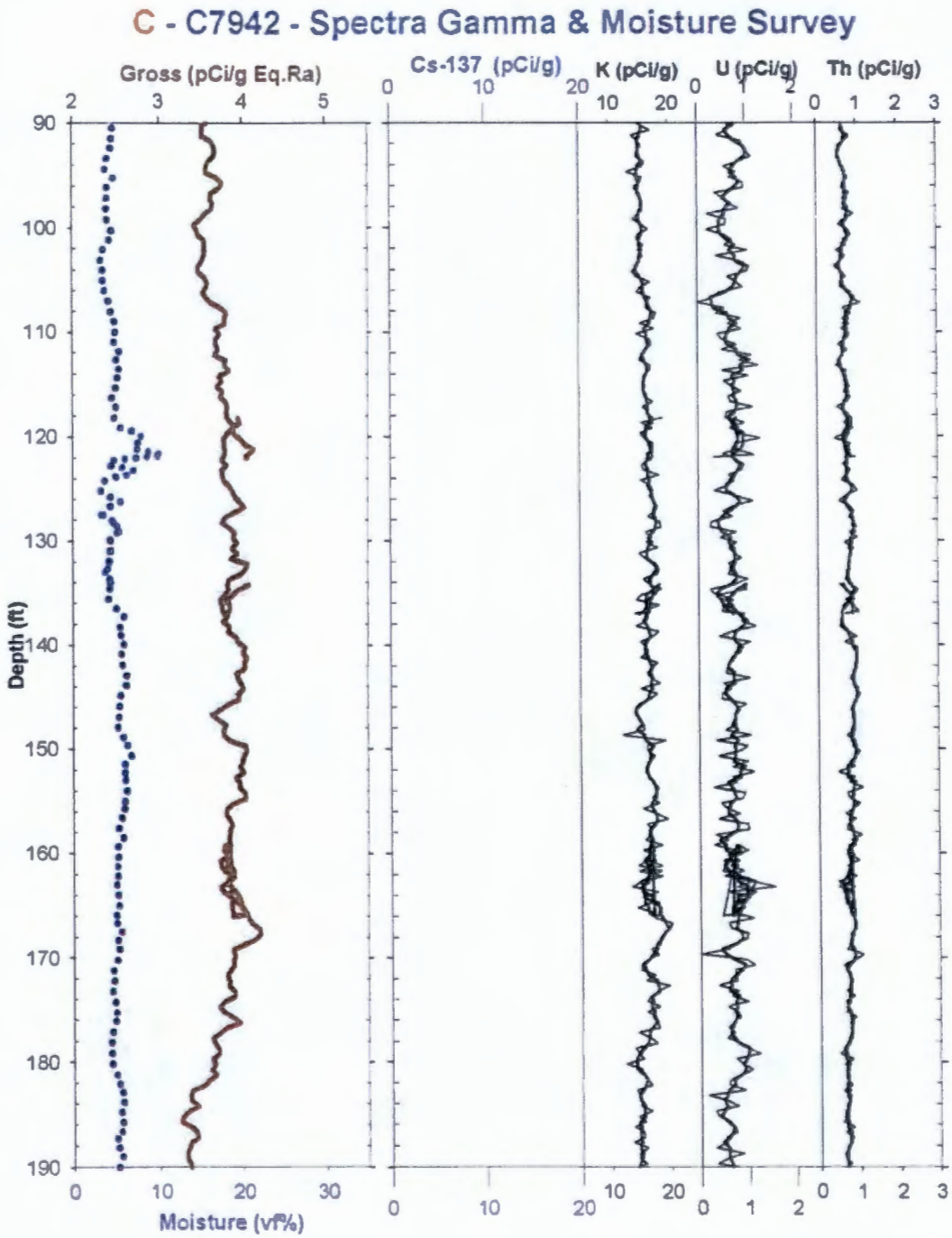
Moisture:

Moisture values range from 3-16%.

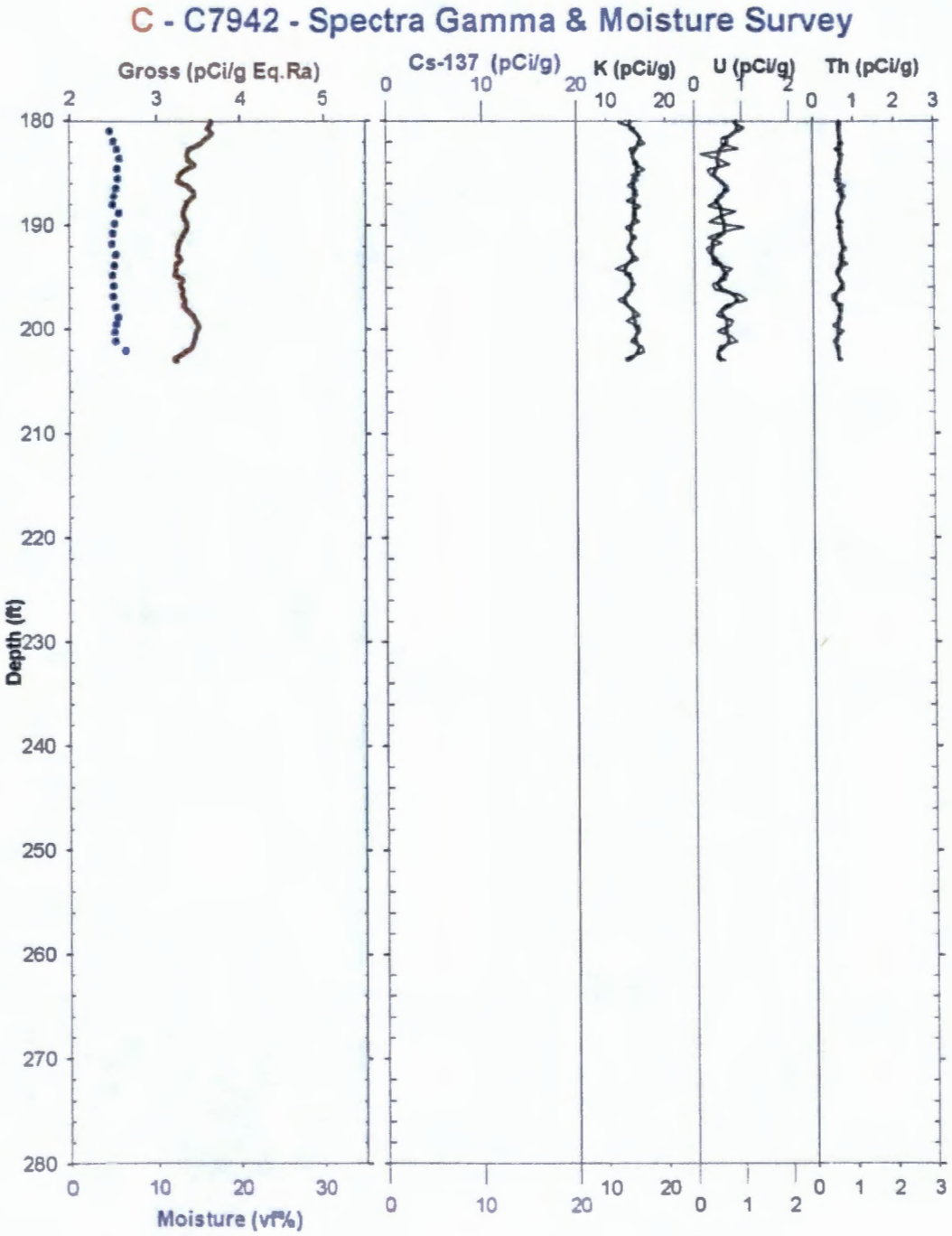
Calibration Certificates

Spectral	
Date:	Apr 21, 2009
Electronic File:	Cal_SD-GR-2_2009-v0.zip
Moisture	
Date:	Feb 25, 2009
Electronic File:	SD-Moist792_2009.zip


C - C7942 - Spectra Gamma & Moisture Survey
Gross (pCi/g Eq.Ra)
Cs-137 (pCi/g)
K (pCi/g)
U (pCi/g)
Th (pCi/g)
Depth (ft)
Moisture (vf%)


C - C7942 - Spectra Gamma & Moisture Survey
Gross (pCi/g Eq.Ra)
Cs-137 (pCi/g)
K (pCi/g)
U (pCi/g)
Th (pCi/g)
Depth (ft)
Moisture (vf%)

A-12


C - C7942 - Spectra Gamma & Moisture Survey
Gross (pCi/g Eq.Ra)
Cs-137 (pCi/g)
K (pCi/g)
U (pCi/g)
Th (pCi/g)
Depth (ft)
Moisture (vf%)

A-13

C-FARM C7943 HEADER INFORMATION

Small Diameter – Spectral Gamma & Moisture Survey

Probehole:	C7943	Northing:	136519.7	Depth Ref:
Log Date:	Oct 2010	Easting:	575034.7	Ground Surface
Project:	C Farm	Elevation:	203.147	

Repeat/Overlap Intervals

Spectral:	152-147	Moisture:	140-132
	150-148		55-53
	75-71		

Isotopes Analyzed

Elements:	Energies Used (keV)
K-40	1462
Natural Uranium	1650-2390
Natural Thorium	2614
Cs-137	661

Observations

Spectral:

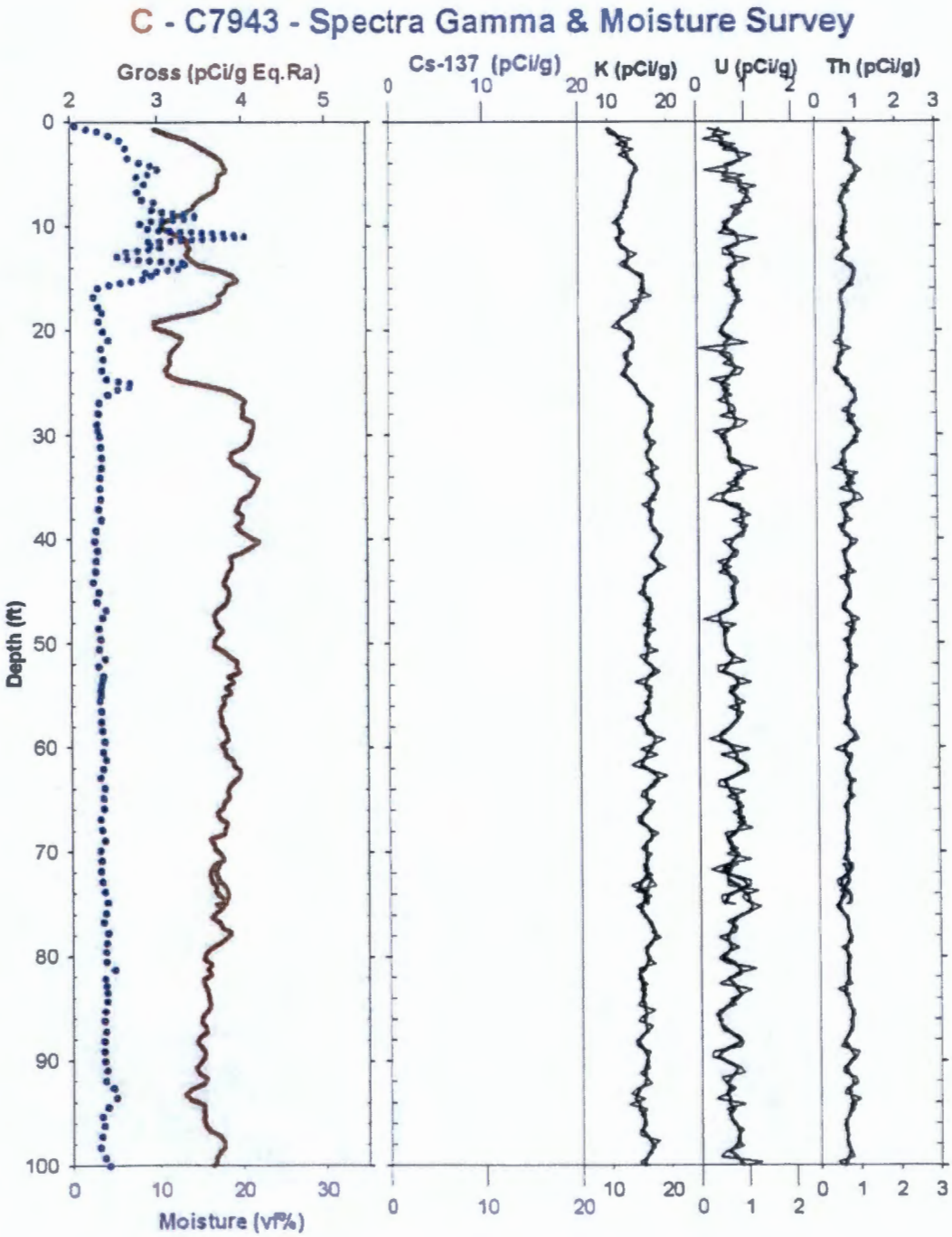
Cs-137 was not observed. The plotted gross uses an energy threshold of 1000keV, and does not respond to Cs-137.

Moisture:

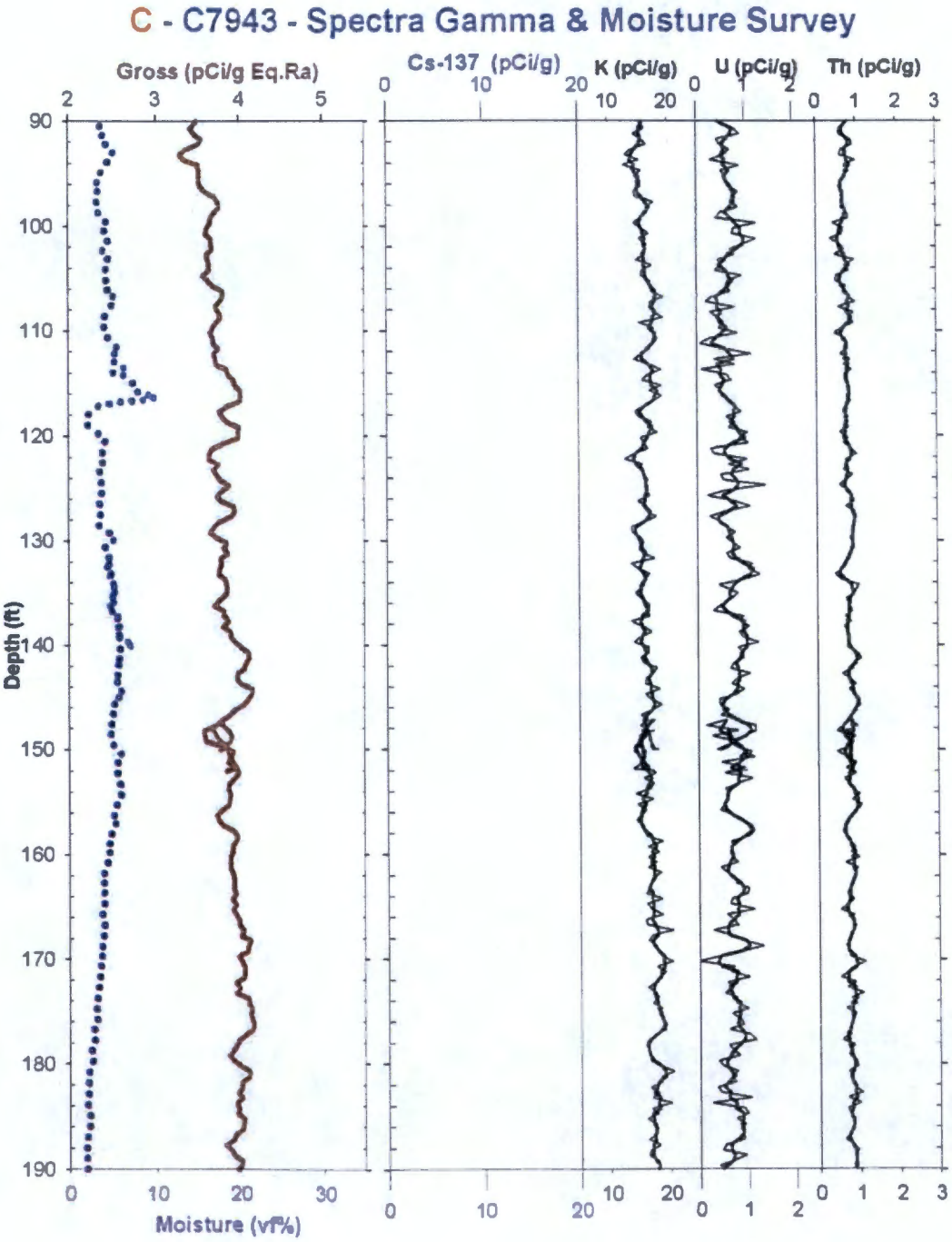
Moisture values range from 2-20%.

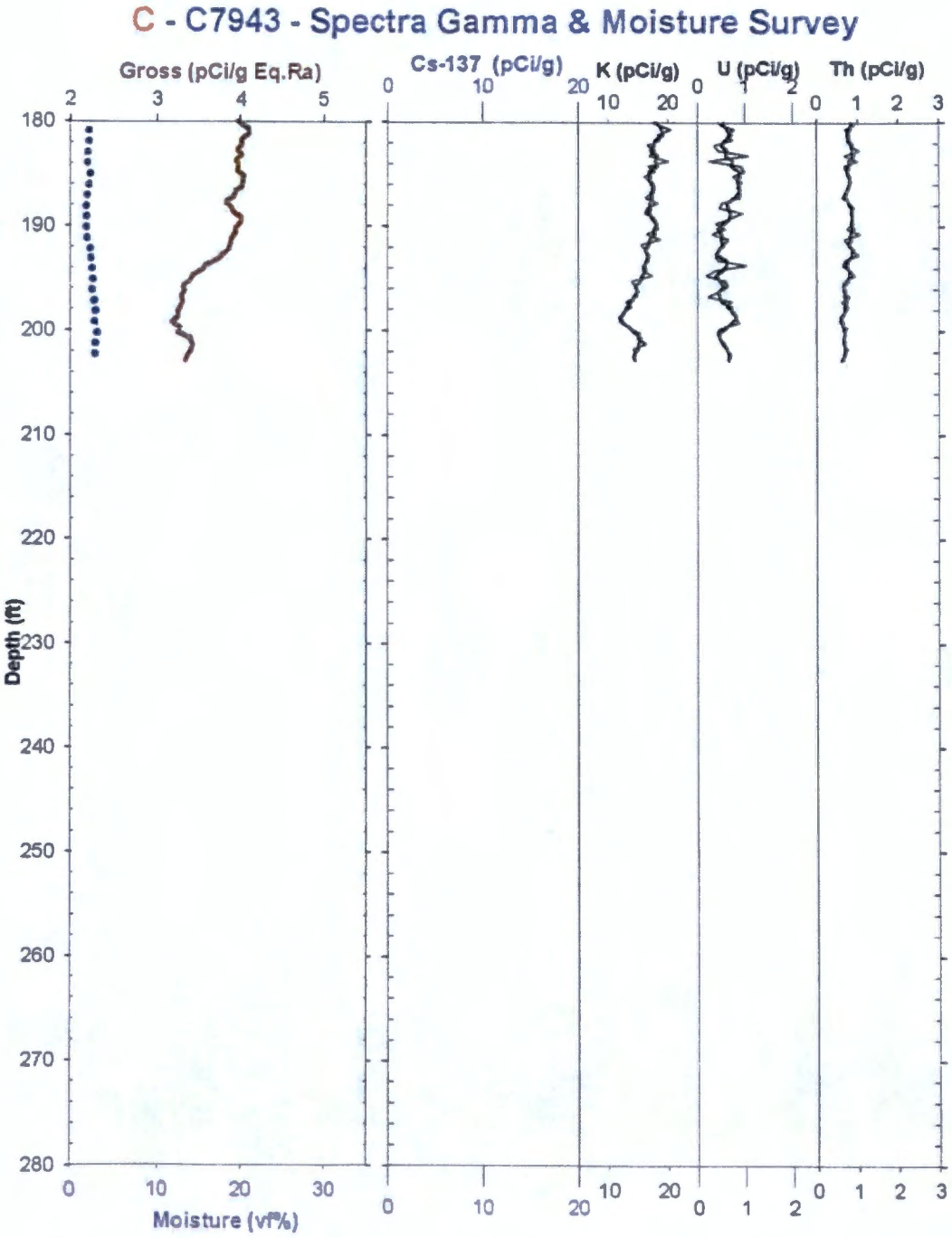
Calibration Certificates

Spectral	
Date:	Apr 21, 2009
Electronic File:	Cal_SD-GR-2_2009-v0.zip
Moisture	
Date:	Feb 25, 2009
Electronic File:	SD-Moist792_2009.zip


C - C7943 - Spectra Gamma & Moisture Survey
Gross (pCi/g Eq.Ra)
Cs-137 (pCi/g)
K (pCi/g)
U (pCi/g)
Th (pCi/g)
Depth (ft)
Moisture (vf%)

A-15


C - C7943 - Spectra Gamma & Moisture Survey
Gross (pCi/g Eq.Ra)
Cs-137 (pCi/g)
K (pCi/g)
U (pCi/g)
Th (pCi/g)
Depth (ft)
Moisture (vf%)


C - C7943 - Spectra Gamma & Moisture Survey
Gross (pCi/g Eq.Ra)
Cs-137 (pCi/g)
K (pCi/g)
U (pCi/g)
Th (pCi/g)
Depth (ft)
Moisture (vf%)

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APPENDIX E

WASHINGTON STATE DEPARTMENT OF ECOLOGY DOCUMENTS

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ENERGYSOLUTIONS

November 19, 2010 FS-NW-LT-5418

State of Washington
Department of Ecology
Nuclear Waste Program
Hanford Project
3100 Port of Benton Boulevard
Richland, Washington 99354

Subject: Water Well Reports

To Whom It May Concern,

Attached are Water Well Report forms addressing decommissioning operations for five geotechnical borings relating to Notice of Intent Start Cards SE08172 and Abandonment Start Cards AE10775 (UPR-82 location) as noted on boring specific water well reports.

The borings were drilled using direct push technology. The work was conducted in Benton County on the Hanford Site's C Tank Farm. The boreholes have been GPS surveyed.

If you have any questions, please contact me at 375-9587.

Very truly yours,

Martin G. Gardner, Manager
Remediation and Well Services

jmr

Attachments

CHPRC	- S. H. Worley	R3-60
WRPS	-H.A. Sydnor	E6-31
Energy*Solutions*	- K. D. Reynolds	G2-02
	D. E. Skoglie	G2-02
	R. Z. Steffler	G2-02
	MGG File/LB	

2345 Stevens Drive, Suite 240 • Richland, WA 99354
509.371.8006 • Fax: 509.375.9500 • www.energysolutions.com

ENERGYSOLUTIONS

FS-NW-LT-5418

ATTACHMENTS

Resource Protection Well Reports

Consisting of 6 pages
including cover sheet

Please print, sign and return to the Department of Ecology

RESOURCE PROTECTION WELL REPORT

CURRENT Notice of Intent No. AE10775

(SUBMIT ONE WELL REPORT PER WELL INSTALLED)

Construction/Decommission *("x" in box)*

☐ Construction

☒ Decommission

ORIGINAL INSTALLATION Notice of Intent Number: SE08172

Consulting Firm Energy Solutions

Unique Ecology Well IDTag No. C7940

WELL CONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

☒ Driller ☐ Engineer ☐ Trainee

Name (Print Last, First Name) Skoglie, David

Driller/Engineer /Trainee Signature David E Skoglie

Driller or Trainee License No. 1580

If trainee, licensed driller's Signature and License Number:

Type of Well *("x in box)*

☐ Resource Protection

☒ Geotech Soil Boring

Property Owner U.S. Department of Energy

Site Address 825 Jadwin Ave.

City Richland County Benton

Location SE 1/4-1/4 NE 1/4 Sec 02 Twn 12 R 26E

EWM ☒ or WWM ☐

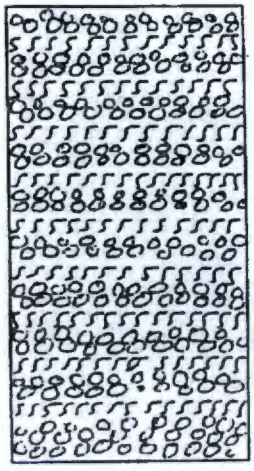
Lat/Long (s, t, r still REQUIRED) Lat Deg ____ Min ____ Sec ____ Long Deg ____ Min ____ Sec ____

Tax Parcel No. N/A

Cased or Uncased Diameter 3.0 inch Static Level N/A

Work/Decommission Start Date 10/11/2010

Work/Decommission Completed Date 11/05/2010

Construction Design	Well Data	Formation Description
The direct push tubing (2.5 inch O.D.) was driven to a depth of 203 ft bgs. The drive point O.D. is ~3.0 inches diameter. Geophysical logging (Moisture and Gamma) was conducted to identify sample locations. The boring was decommissioned and nine moisture probes were installed at 176.5, 156, 136, 116, 96, 76, 56 and 36 and 16 ft bgs. Reference Variance Request for Direct Push Bore-holes dated 3/12/2009.		UPR-82, C Tank Farm, 200 East Area, Hanford Site, Benton County Formation was sand with minor gravel layers (noted during driving).
0.0 16 36 56 76 96 116 136 156 176.5 203 	Surface protection and identification marker (boring number and date decommissioned) were set in place. 0 = bentonite crumbles S = sand/diatomite	

SCALE: 1"= 67 ft PAGE 1 OF 1

ECY 050-12 (Rev 7/06)

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Please print, sign and return to the Department of Ecology

RESOURCE PROTECTION WELL REPORT

CURRENT Notice of Intent No. AE10775

(SUBMIT ONE WELL REPORT PER WELL INSTALLED)

Construction/Decommission *("x" in box)*

☐ Construction

☒ Decommission

ORIGINAL INSTALLATION Notice of Intent Number:

SE08172

Consulting Firm Energy Solutions

Unique Ecology Well IDTag No. C7941

WELL CONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

☒ Driller ☐ Engineer ☐ Trainee

Name (Print Last, First Name) Skoglie, David

Driller/Engineer /Trainee Signature David Skoglie

Driller or Trainee License No. 1580

If trainee, licensed driller's Signature and License Number:

Type of Well *("x in box)*

☐ Resource Protection

☒ Geotech Soil Boring

Property Owner U.S. Department of Energy

Site Address 825 Jadwin Ave.

City Richland County Benton

Location SE1/4-1/4 NE1/4 Sec 02 Twn 12 R 26E

EWM ☒ or WWM ☐

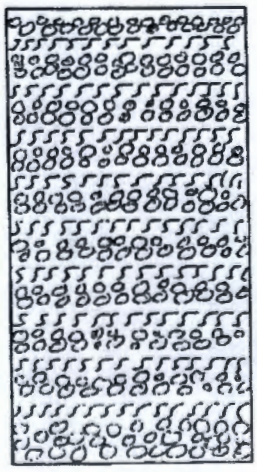
Lat/Long (s, t, r still REQUIRED) Lat Deg ____ Min ____ Sec ____ Long Deg ____ Min ____ Sec ____

Tax Parcel No. N/A

Cased or Uncased Diameter 3.0 inch Static Level N/A

Work/Decommission Start Date 10/21/2010

Work/Decommission Completed Date 11/05/2010

Construction Design	Well Data	Formation Description
The direct push tubing (2.5 inch O.D.) was driven to a depth of 202 ft bgs. The drive point O.D. is ~3.0 inches diameter. Geophysical logging (Moisture and Gamma) was conducted to identify sample locations. The boring was decommissioned and nine moisture probes were installed at 173, 154, 134, 114, 94, 74, 54 and 34 and 14 ft bgs. Reference Variance Request for Direct Push Bore-holes dated 3/12/2009.		UPR-82, C Tank Farm, 200 East Area, Hanford Site, Benton County Formation was sand with minor gravel layers (noted during driving).
0.0 14 34 54 74 94 114 134 154 173 202 	Surface protection and identification marker (boring number and date decommissioned) were set in place. 0 = bentonite crumbles S = sand/diatomite	

SCALE: 1"= 67 ft PAGE 1 OF 1

ECY 050-12 (Rev 7/06)

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Please print, sign and return to the Department of Ecology

RESOURCE PROTECTION WELL REPORT

CURRENT Notice of Intent No. AE10775

(SUBMIT ONE WELL REPORT PER WELL INSTALLED)

Construction/Decommission *("x" in box)*

☐ Construction
☒ Decommission

ORIGINAL INSTALLATION Notice of Intent Number: SE08172

Consulting Firm Energy Solutions

Unique Ecology Well IDTag No. C7942

WELL CONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

☒ Driller ☐ Engineer ☐ Trainee

Name (Print Last, First Name) Skoglie, David

Driller/Engineer /Trainee Signature David E. Skoglie

Driller or Trainee License No. 1580

If trainee, licensed driller's Signature and License Number:

Type of Well *("x in box)*

☐ Resource Protection
☒ Geotech Soil Boring

Property Owner U.S. Department of Energy

Site Address 825 Jadwin Ave.

City Richland County Benton

Location SE1/4-1/4 NE1/4 Sec 02 Twn 12 R 26E

EWM ☒ or WWM ☐

Lat/Long (s, t, r still REQUIRED) Lat Deg ____ Min ____ Sec ____ Long Deg ____ Min ____ Sec ____

Tax Parcel No. N/A

Cased or Uncased Diameter 3.0 inch Static Level N/A

Work/Decommission Start Date 10/08/2010

Work/Decommission Completed Date 11/04/2010

Construction Design	Well Data	Formation Description
The direct push tubing (2.5 inch O.D.) was driven to a depth of 203 ft bgs. The drive point O.D. is ~3.0 inches diameter. Geophysical logging (Moisture and Gamma) was conducted to identify sample locations. The boring was decommissioned and nine moisture probes were installed at 176, 156, 136, 116, 96, 76, 56 and 36 and 16 ft bgs. Reference Variance Request for Direct Push Bore-holes dated 3/12/2009.		UPR-82, C Tank Farm, 200 East Area, Hanford Site, Benton County Formation was sand with minor gravel layers (noted during driving).
0.0 16 36 56 76 96 116 136 156 176 203	Surface protection and identification marker (boring number and date decommissioned) were set in place. 0 = bentonite crumbles S = sand/diatomite	

SCALE: 1"= 67 ft PAGE 1 OF 1

ECY 050-12 (Rev. 7/06)

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Please print, sign and return to the Department of Ecology

RESOURCE PROTECTION WELL REPORT

CURRENT Notice of Intent No. AE10775

(SUBMIT ONE WELL REPORT PER WELL INSTALLED)

Construction/Decommission *("x" in box)*

☐ Construction
☒ Decommission

ORIGINAL INSTALLATION Notice of Intent Number: SE08172

Consulting Firm Energy Solutions

Unique Ecology Well IDTag No. C7943

WELL CONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

☒ Driller ☐ Engineer ☐ Trainee

Name (Print Last, First Name) Skoglie, David

Driller/Engineer /Trainee Signature David E. Skoglie

Driller or Trainee License No. 1580

If trainee, licensed driller's Signature and License Number:

Type of Well *("x in box)*

☐ Resource Protection
☒ Geotech Soil Boring

Property Owner U.S. Department of Energy

Site Address 825 Jadwin Ave.

City Richland County Benton

Location SE1/4-1/4 NE1/4 Sec 02 Twn 12 R 26E

EWM ☒ or WWM ☐

Lat/Long (s, t, r still REQUIRED) Lat Deg _____ Min _____ Sec _____

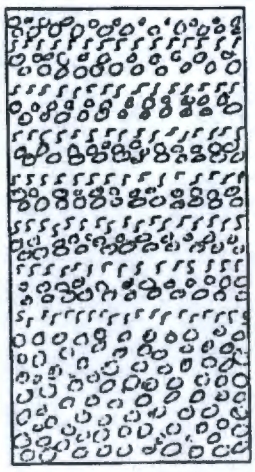
Long Deg _____ Min _____ Sec _____

Tax Parcel No. N/A

Cased or Uncased Diameter 3.0 inch Static Level N/A

Work/Decommission Start Date 10/27/2010

Work/Decommission Completed Date 11/04/2010

Construction Design	Well Data	Formation Description
The direct push tubing (2.5 inch O.D.) was driven to a depth of 180 ft bgs. The drive point O.D. is ~3.0 inches diameter. Geophysical logging (Moisture and Gamma) was conducted to identify sample locations. The boring was decommissioned and seven moisture probes were installed at 135, 116, 96, 76, 56, 36 and 16 ft bgs. Reference Variance Request for Direct Push Bore-holes dated 3/12/2009.	Tubing break at 148 ft bgs.	UPR-82, C Tank Farm, 200 East Area, Hanford Site, Benton County Formation was sand with minor gravel layers (noted during driving).
0.0 16 36 56 76 96 116 135 180 	Surface protection and identification marker (boring number and date decommissioned) were set in place. 0 = bentonite crumbles S = sand/diatomite	

SCALE: 1"= 60 ft PAGE 1 OF 1

ECY 050-12 (Rev. 7/06)

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Please print, sign and return to the Department of Ecology

RESOURCE PROTECTION WELL REPORT

(SUBMIT ONE WELL REPORT PER WELL INSTALLED)

CURRENT Notice of Intent No. AE10775

Construction/Decommission *("x" in box)*

☐ Construction

☒ Decommission

ORIGINAL INSTALLATION Notice of Intent Number: SE08172

Consulting Firm Energy Solutions

Unique Ecology Well IDTag No. C7943A

WELL CONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief

☒ Driller ☐ Engineer ☐ Trainee

Name (Print Last, First Name) Skuglic, David

Driller/Engineer /Trainee Signature [signature]

Driller or Trainee License No. 1580

If trainee, licensed driller's Signature and License Number:

Type of Well *("x in box)*

☐ Resource Protection

☒ Geotech Soil Boring

Property Owner U.S. Department of Energy

Site Address 825 Jadwin Ave.

City Richland County Benton

Location SE1/4-1/4 NE1/4 Sec 02 Twn 12 R 26E

EWM ☒ or WWM ☐

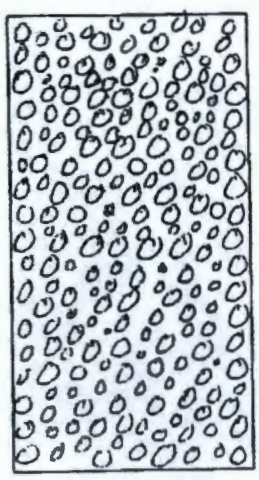
Lat/Long (s, t, r still REQUIRED) Lat Deg ____ Min ____ Sec ____ Long Deg ____ Min ____ Sec ____

Tax Parcel No. N/A

Cased or Uncased Diameter 3.0 inch Static Level N/A

Work/Decommission Start Date 10/06/2010

Work/Decommission Completed Date 10/20/2010

Construction Design	Well Data	Formation Description
The direct push tubing (2.5 inch O.D.) was driven to a depth of 203 ft bgs. The drive point O.D. is ~3.0 inches diameter. Geophysical logging (Moisture and Gamma) was conducted to identify sample locations. The boring was decommissioned. Reference Variance Request for Direct Push Bore-holes dated 3/12/2009.	Tubing break at 124 ft bgs.	UPR-82, C Tank Farm, 200 East Area, Hanford Site, Benton County Formation was sand with minor gravel layers (noted during driving).
0.0  203	Borehole location was surveyed. 0 = bentonite crumbles	

SCALE: 1"= 67 ft PAGE 1 OF 1

ECY 050-12 (Rev 7/06)

Ecology is an Equal Opportunity Employer

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APPENDIX F

SAFETY DOCUMENTATION

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ENERGYSOLUTIONS

Field Safety and Health Inspection Report

Date:	10/5/2010	Time:	1130	Inspected by:	Kris Hutchings
Location:		C Tank farm UPR 82 Direct Push Project			
Work Activities		Direct push activities at UPR 82 siteC7942			
Weather Conditions		Clear skies, humid, 70 F			

Observations

Industrial Hygiene		Industrial Safety					
N/A	IH Monitoring/Sampling	YES	Applicable PPE	YES	Heavy Equipment	N/A	Excavations
N/A	Hazard Communication	YES	Walking/Working Surfaces	N/A	Elevating Work Platforms	N/A	Underground Utilities
N/A	Respiratory Protection	YES	Housekeeping	N/A	Crane and Rigging	N/A	Machine Guarding
N/A	Confined Space	N/A	Showers and Eyewash Stations	N/A	Vehicular Traffic	YES	Rotating/Moving Equipment
N/A	First Aid/injury/illness	N/A	Electrical	N/A	Fall Hazards	N/A	Hand/Power Tools
N/A	Heat Stress (WGBT)	N/A	L.O.T.O.	N/A	Falling Objects	N/A	Stored Energy
YES	Ergonomics	N/A	Overhead Utilities	N/A	Ladders and Stairs	YES	Pinch Points
N/A	Ventilation/IEQ	YES	Signs and Barricades	N/A	Scaffolds	YES	Applicable Permits
YES	Noise and/or Vibration	N/A	Fire Hazards	N/A	Air/Steam/Fluid > 500 psi	N/A	Pre-Job Meetings
N/A	Lighting	N/A	Compressed Gas Storage	N/A	Steam/Fluid >200°F	YES	Work Documents
N/A	Other IH	N/A	Exits/Doors/Fire Lanes	YES	Employee Concern	N/A	Other (Safety)

Comments/Items needing addressed

A sound survey of the worksite at UPR 82 C7942 was conducted to assess the hazards present at the current work location. The survey concluded that the work barriers and signage were able to communicate clearly that hearing protection was required when the equipment was operating. Additional barrier material was placed outside of the fence line to discourage pedestrian traffic that walked the fence line (image 1). Workers were practicing fair ergonomic practices to reduce back strain and repetitive motion to the greatest extent possible during observation. Applicable PPE was worn properly and the work area was clear from debris. A photo of the site can be seen below (image 2). The results of the sound survey can also be seen below (image 3). As work progresses on the project and moves nearer the fence line, limiting the pedestrian traffic along the area is a concern. Workers have been instructed to increase signage when work begins at the next direct push location. A worker question about the sound levels associated with the drill head was addressed by measuring the drill head at different points. The area at the bottom of the unit where the pipe threads is the loudest—as it is the point of impact for the hydraulic hammer. It was also demonstrated that the sound levels at the operator station decrease gradually as the pipe length descends into the soil.

Signature/Date	10/12/10	*Review Signature/Date*	
	KRIS HUTCHINGS		

071610 Rev 1

ENERGYSOLUTIONS

Field Safety and Health Inspection Report

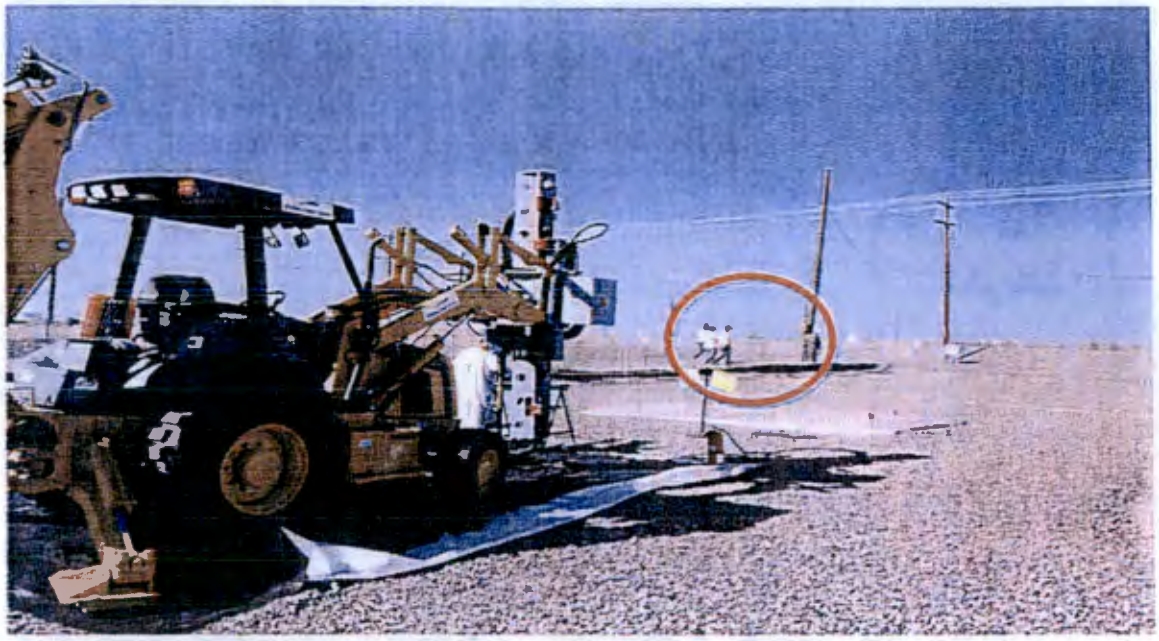


Image 1--Work site image. Notice the workers walking the fence line in close proximity to the work. Drillers ceased work as they noticed foot traffic; however they were not able to always notice the traffic immediately. Recommendation was made that additional signage be placed to encourage workers to take a different route to the main C farm change out trailer.

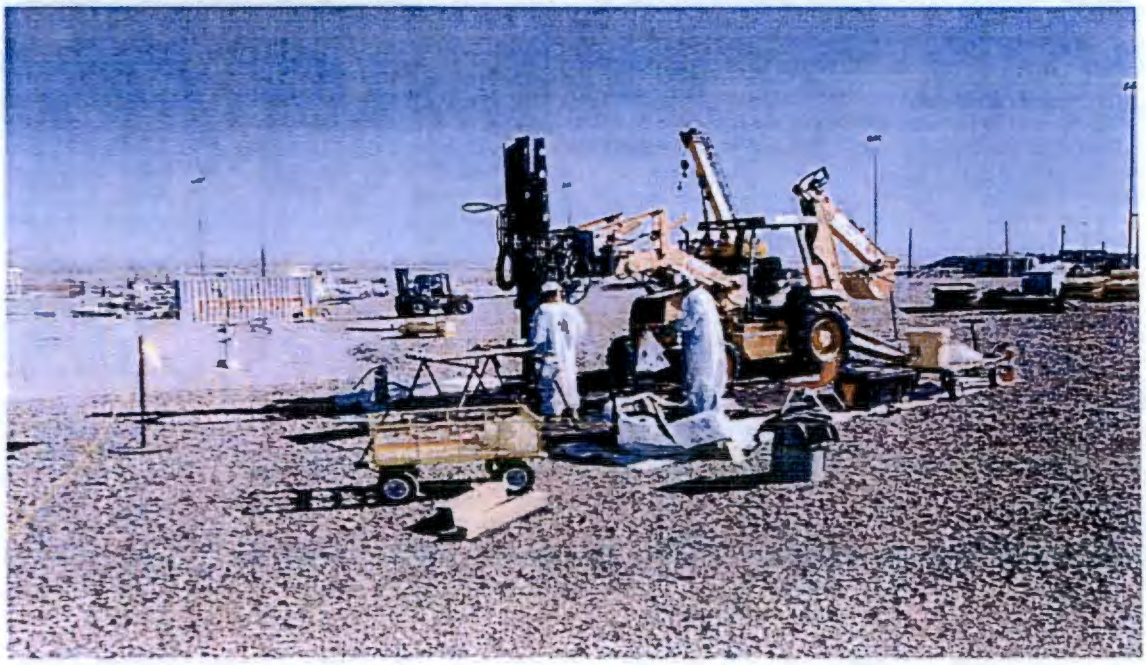
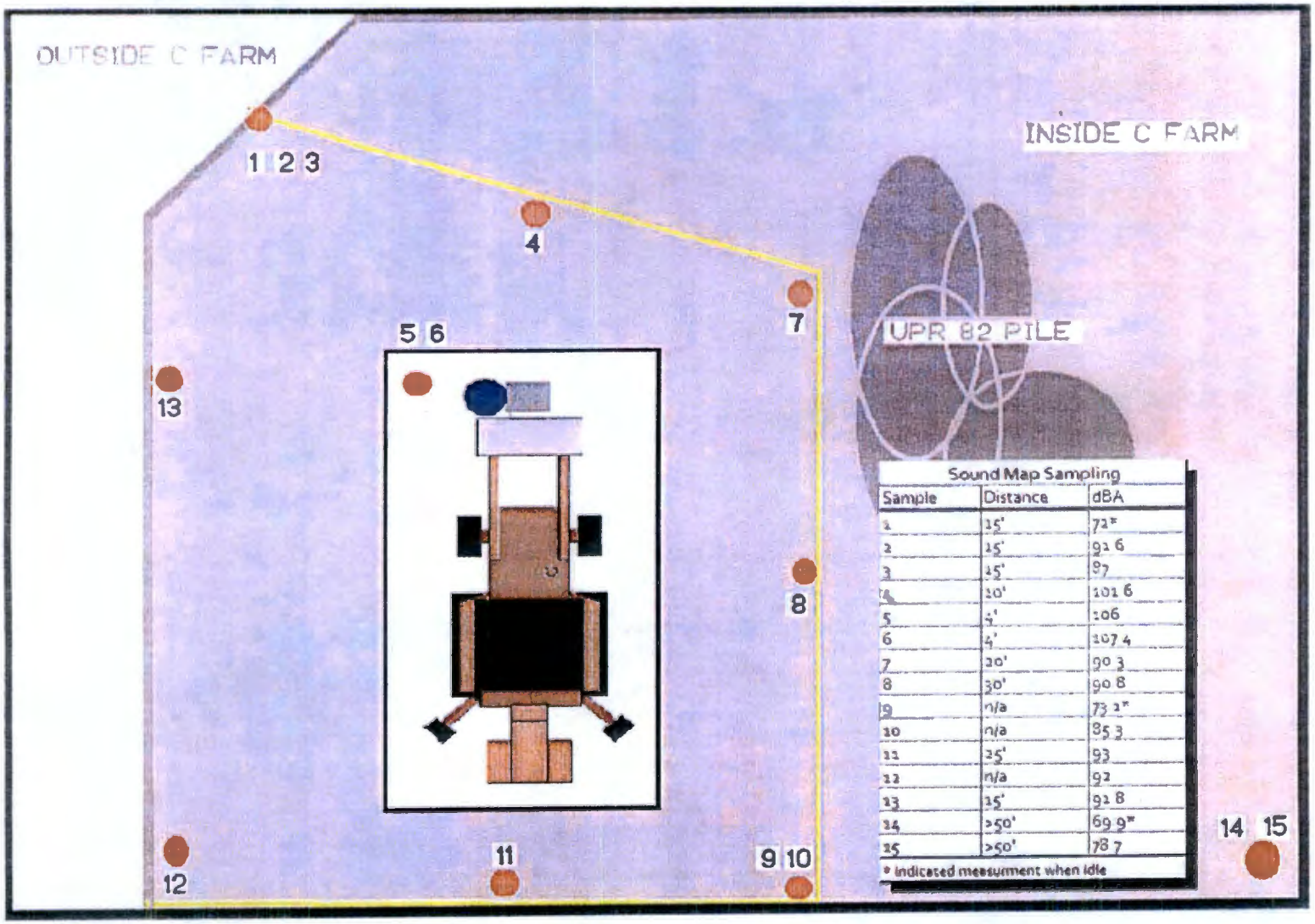


Image 2--Work site image taken from fence line to demonstrate proximity of fence to work activities

071610 Rev 1



Sound Map Sampling

Sample	Distance	dBA
1	15'	72*
2	15'	92.6
3	15'	97
4	20'	101.6
5	4'	106
6	4'	107.4
7	20'	90.3
8	30'	90.8
9	n/a	73.2*
10	n/a	85.3
11	25'	93
12	n/a	92
13	15'	92.8
14	>50'	69.9*
15	>50'	78.7

* indicated measurment when idle

071610 Rev 1

ENERGYSOLUTIONS

Field Safety and Health Inspection Report

Date:	10/12/2010	Time:	0900	Inspected by:	Kris Hutchings
Location:		C Tank farm UPR 82 Direct Push Project			
Work Activities		Direct push activities at UPR 82 siteC7940			
Weather Conditions		Clear skies, 64 F, light breeze			

Observations

Industrial Hygiene		Industrial Safety					
N/A	IH Monitoring/Sampling	YES	Applicable PPE	YES	Heavy Equipment	N/A	Excavations
N/A	Hazard Communication	YES	Walking/Working Surfaces	N/A	Elevating Work Platforms	N/A	Underground Utilities
N/A	Respiratory Protection	YES	Housekeeping	N/A	Crane and Rigging	N/A	Machine Guarding
N/A	Confined Space	N/A	Showers and Eyewash Stations	N/A	Vehicular Traffic	YES	Rotating/Moving Equipment
N/A	First Aid/injury/illness	N/A	Electrical	N/A	Fall Hazards	N/A	Hand/Power Tools
N/A	Heat Stress (WGBT)	N/A	L.O.T.O.	N/A	Falling Objects	N/A	Stored Energy
YES	Ergonomics	N/A	Overhead Utilities	N/A	Ladders and Stairs	YES	Pinch Points
N/A	Ventilation/IEQ	YES	Signs and Barricades	N/A	Scaffolds	YES	Applicable Permits
YES	Noise and/or Vibration	N/A	Fire Hazards	N/A	Air/Steam/Fluid > 500 psi	N/A	Pre-Job Meetings
N/A	Lighting	N/A	Compressed Gas Storage	N/A	Steam/Fluid >200°F	YES	Work Documents
N/A	Other IH	N/A	Exits/Doors/Fire Lanes	YES	Employee Concern	N/A	Other (Safety)

Comments/Items needing addressed

Workers were observed in the process of unloading pipe from transport pallet. Workers used team lifting and good ergonomic practices (see image 1). The current drill site is in close proximity to a heavily trafficked area –both pedestrian and vehicular. Upon recommendation the crew erected additional hearing protection signage, and were able to locate some traffic safety cones to create a work space buffer (see image 2). It is recommended that the signs that were borrowed from support to facilitate better signage be retired from use after this project. They are not OSHA compliant warning signs (see image 3). This observation stems from 29CFR 1926.200 (c) (2) which states "Caution signs shall have yellow as the predominating color; black upper panel and boarders; yellow lettering of "caution" on the black panel; and on the lower yellow panel for addition sign wording. Black lettering shall be used for additional wording." Crews were attentive and ceased work when individuals were in near the work site. It was observed that the increased signage had a minimal deterrent effect on traffic through the area however (see image 4). Work at this location will be finished quickly, however it is recommended that future activities with similar conditions, i.e. close proximity to trafficked areas, should utilize additional control practices to alter the flow of traffic.

Signature/Date	10/13/10	*Review Signature/Date*	10/13/10
	KRIS HUTCHINGS		Rob Zane

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Field Safety and Health Inspection Report

Figure 1

Figure 2

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Figure 4

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