

Attachment BB

Final Status Survey Report #30 Documentation

(UNDER SEPARATE COVER)

FSSR#
30



FINAL

**COLUMBUS CLOSURE PROJECT
CHARACTERIZATION AND FINAL STATUS
SURVEY REPORT
COOLING WASTE SEWER LINE – WEST SECTION**

Revision 1
June 16, 2006

Prepared by

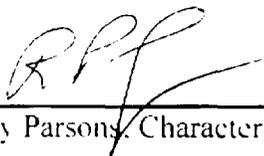
ECC & E2 Closure Services
1425 State Route 142 East
West Jefferson, OH 43162

Contract Number: DE-AC24-04OH20171

FSSR#
30

**Final Characterization and Final Status Report for
Cooling Waste Sewer Line – West Section**

Revision Data Compiled By:



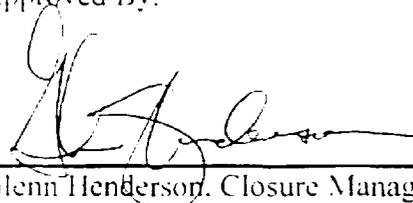
Randy Parsons, Characterization Lead 6/17/06
Date

Revised FSS Report Written By:



Keith Anderson, Site Radiation Safety Office June 16, 2006
Date

Approved By:



Glenn Henderson, Closure Manager June 17, 2006
Date



Dave Garber, Quality Assurance Manager 6/16/06
Date

Contract Number: DE-AC24-04OH20171

Signature page represents only revisions to this document that may reflect comments received by the U.S. Department of Energy, Battelle Memorial Institute, and the Oak Ridge Institute for Science and Education (ORISE). As such, original data compilation and drafting may have been by other Employees, Representatives, or Subcontractors of FCC&E Closure Services, LLC, not specifically represented by said Signatory Page.

Contract Number: DE-AC24-04OH20171

This report is a work prepared for the United States Government by ECC & E2 Closure Services, LLC. In no event shall either the United States Government or ECC & E2 Closure Services, LLC have any responsibility or liability for any consequences of any use, misuse, inability to use, or reliance upon the information as used by other parties contained herein, nor does it either warrant or otherwise represent in any way the accuracy, adequacy, efficacy, or applicability of the contents hereof to other parties.

Table of Contents

1.0	Introduction.....	1
1.1	Background.....	1
2.0	Site Description.....	3
2.1	Area Description.....	3
3.0	Decommissioning Activities.....	5
3.1	Decommissioning Objective.....	5
4.0	Final Status Survey Procedures.....	6
4.1	Sampling Parameters.....	6
4.2	Major Contaminants Identified.....	6
4.2.1	Guidelines Established.....	6
5.0	Equipment and Procedures.....	8
5.1	Equipment.....	8
5.2	Scanning Minimum Detectable Activities.....	8
5.3	Procedures.....	8
6.0	Survey Findings.....	10
6.1	Excavation Sampling.....	10
6.2	Scanning Measurements.....	11
6.3	Overburden Sampling.....	11
6.4	Exposure Rate Surveys.....	11
7.0	Conclusions.....	13
8.0	References.....	14

Figures

Figure 1	Site Map
Figure 2	CWS Line Excavation

Tables

Table 1	BCLDP Guidelines for Volumetric Residual Radioactivity Concentrations For Soil and Solid Volumes
Table 2	Cesium-137 Surrogate Analysis Data & Modified Cs-137 Screening Criteria
Table 3	Reported Cs-137 Concentrations (pCi/g) of Samples from Base of Excavation 210 to 300 Feet
Table 4	Reported Cs-137 Concentrations (pCi/g) of Samples from Base of Excavation 310 to 400 Feet
Table 5	Reported Cs-137 Concentrations (pCi/g) of Samples from Base of Excavation 410 to 500 Feet
Table 6	Summary Data for Excavation and Removal of West Section CWS Line

1.0 Introduction

This report contains the final status surveys (FSS) of the west section of the cooling waste sewer (CWS) line formerly located at the Columbus Closure Project (CCP), 1425 Plain City/Georgesville Road State Route 142 East, West Jefferson, OH 43162. Final status surveys were conducted according to the guidance presented in the *Manual for Conducting Surveys in Support of License Termination*, NUREG/CR-5849 (NUREG/CR-5849) and the *Radiological Characterization and Final Status Plan for Battelle Columbus Laboratories Decommissioning Project, West Jefferson Site*, DD-97-02 (Final Status Plan) (Battelle, 2000). The final status surveys were conducted between August and September of 2004, and performed according to Work Instruction 2806 (Closure Services, 2004).

The intent of this final status survey report is to provide a complete record of the radiological status following the excavation and removal of the west section of the CWS line. Sufficient information and data is provided to enable an independent re-creation and evaluation at some future date of both the survey activities and the reported results for the excavation. Information in this report is also available in referenced technical basis documents, final status survey plans and procedures, and the *Battelle Memorial Institute Columbus Operations, Decommissioning Plan*, DD-93-19 (BMI Decommissioning Plan), and reporting and quality assurance procedures.

To the extent practicable, this final status survey report is presented with minimal information incorporated by reference. This final status survey report has been generated following the outline presented in Chapter 9 of NUREG-5849 (ORAU, 1992).

1.1 Background

On April 16, 1943, Battelle Memorial Institute (BMI), acting through what is now its Battelle Columbus Operations (BCO), entered into Contract No. W-7405-ENG-92 with the Manhattan Engineering District to perform atomic energy research and development (R&D) activities. BCO performed nuclear materials research and development at privately-owned facilities for the Manhattan Engineering District and its successor agencies – the Atomic Energy Commission (AEC), the Energy Research and Development Agency (ERDA), and the Department of Energy (DOE). Research and development continued until 1988 (Battelle, 2003).

The BCO facilities were located at the King Avenue Site in Columbus, Ohio, and the West Jefferson North (WJN) and South (WJS) Sites, in West Jefferson, Ohio. The facilities became partially radiologically contaminated as a result of the R&D activities. Decontamination of the King Avenue Sites has been completed and activities continue at the WJN site. The DOE, as the successor to the AEC and the Government's earlier work, is the agreed party with predominant liability and responsibility for decontamination and decommissioning (D&D) of the BCO facilities (Battelle, 2003). The Assistant Secretary for Nuclear Energy of the DOE accepted the D&D of the WJN into the DOE's Surplus

Facilities Management Program as a major project (DOE, 1986). The DOE is the agency funding and managing the cleanup of the WJN (Battelle, 2003). However, the site is not a DOE-owned facility.

BMI holds U.S. Nuclear Regulatory Commission (NRC) license number SNM-7. BMI has continually operated and conducted D&D activities in full compliance with this NRC license. The BMI Decommissioning Plan for the WJN site does not serve as a declaration to terminate SNM-7, but establishes the criteria for performing D&D activities. The end goal of the BMI Decommissioning Plan is to reach unrestricted use conditions for the site (Battelle, 2003).

The DOE has contracted ECC&E2 Closure Services, LLC (Closure Services) to safely remove DOE radioactive materials and contamination from the WJN site. Removal of radioactive material will be to levels allowing future use of the site without radiological restrictions as described in the BMI Decommissioning Plan. Closure Services has conducted characterization and final status surveys of the excavation of the west section of the former CWS line to demonstrate that the area is available for unrestricted release.

2.0 Site Description

Created in 1984, the Battelle Columbus Decommissioning Project (BCLDP) is a remediation project that includes nine buildings at the King Avenue site and six at the WJN site. In 2003, the DOE changed the name of the BCLDP to the Columbus Closure Project (CCP). The CCP provide final closure of the remaining D&D activities at the WJN site. The WJN site had five permanent structures, including the nuclear research facilities Buildings JN-1, JN-2, JN-3, the security operations Building JN-6, and the Well House. The Well House is the only remaining permanent structure at the site. Several outfalls, filter beds, and wells have also been remediated at the site. The west section of the CWS line was connected to the former Building JN-3 cooling tower. The line then ran to an outfall that discharged eventually along the eastern edge of the site. **Figure 1** details the overall layout of the site. **Figure 2** show the location of the west section of the former CWS line.

2.1 Area Description

The west section of the CWS line excavation includes the section running from the northeast corner of the former Building JN-3, running 300 feet east toward the outfall. The CWS line ran from the connecting point at the cooling tower, around the south end of Building JN-3 and along the east side of the building. The line then curved towards the east, running between Building JN and the former JN-1. The CWS line was buried at depths ranging from 6 feet to 14 feet below surface grade. **Figure 2** details in brown, yellow, and blue the entire former CWS line. The west section of the CWS line is highlighted in yellow. This report includes the 300-foot section that starts 200 feet east of the far end of the excavation.

The Building JN-3 cooling tower was constructed in 1969 and located on the west side of reactor building. The CWS line carried condenser water and secondary cooling loop spillage from the reactor cooling tower to an outfall along the eastern edge of the site. Closure Services removed the section of the line running from the cooling tower, then along the south and east side of Building JN-3 during the excavation of the building foundation. The west section of the CWS line was excavated and removed in January 2006.

In August 2000, BMI obtained *in-situ* measurements of the interior of the sanitary sewer line for portions of the WJN site. Science & Engineering Associates, Inc. performed the *in-situ* survey under contract to BMI. Measurements from the survey indicated the presence of internal contamination above the residual surface contamination limits for unrestricted release. Based upon the preliminary investigation, the entire CWS line was removed and disposed as low level waste.

Two classifications of areas are used in NUREG-5849 and are termed **affected** or **unaffected**. These classifications are defined as (NRC, 1992):

Affected Areas: Areas that have potential radioactive contamination (based on plant operating history) or known radioactive contamination (based on past or preliminary radiological surveillance). This would normally include areas where radioactive materials were used and stored, where records indicate spills or other unusual occurrences that could have resulted in spread of contamination, and where radioactive materials were buried. Areas immediately surrounding or adjacent to locations where radioactive materials were used, stored, or buried are included in this classification because of the potential for inadvertent spread of contamination.

Unaffected Areas: All areas not classified as affected. Residual radioactive contamination is not expected in these areas based on knowledge of site history and previous information.

The excavation of the west section of the former CWS line was conducted in both affected and unaffected areas according to the above definition. The base of the excavation immediately underlying the sanitary line was classified as affected. The sidewalls of the excavation were classified as unaffected.

Excavation of the west section of the CWS line began at connecting point at the former foundation of Building JN-3. Removal then proceeded east along the run of the line. Characterization Technicians sampled and scanned the overburden soils removed as the excavation proceeded. Materials removed immediately adjacent to the sanitary sewer line were segregated and disposed as low level waste. Sanitary sewer line sections were then removed and disposed as low level waste. Characterization Technicians then surveyed the base and sidewalls of the excavation with a shielded Ludlum Model 44-10 two-inch by two-inch sodium iodide detector with Eberline ESP-2 meter. Samples were also collected from the base and sidewalls of the excavation trench to demonstrate compliance to the unrestricted release criteria.

3.0 Decommissioning Activities

3.1 Decommissioning Objective

The objective of the final status survey performed on the west section of the former CWS line was to statistically demonstrate that the remediation of the area was successful and that the excavation is free from residual radioactive contamination making it suitable for unrestricted release. The excavation is determined to be free of residual radioactive contamination when remaining soil contamination levels are below those presented in DD-93-03, Rev. 0. "Volumetric Release Criteria Technical Basis Document for Battelle Columbus Laboratory Decommissioning Project" (Battelle, 1993a). Table 1 presents the volumetric release criteria as presented in DD-93-03, Rev. 0. Unrestricted release criteria for scanning and exposure rate surveys are discussed in subsequent sections of the report.

4.0 Final Status Survey Procedures

Planning and implementation of the final status survey of the excavation non-baseline and baseline areas of the west section of the former CWS line adhered to the requirements the Final Status Plan (Battelle, 2000) and Work Instruction 2806 (Closure Services, 2004).

4.1 Sampling Parameters

Final status soil samples of the west section of the former CWS line excavation trench were taken following completion of the remediation. Soil samples were taken by dividing the trench into sections and collecting samples from the sidewalls and base of the trench. Sampling was performed according to WI-2806.

The Onsite Radioanalytical Laboratory (RAL) performed analysis of the samples by gamma spectroscopy.

4.2 Major Contaminants Identified

The characterization of the west section of the former CWS line excavation identified Cesium-137 (Cs-137) as the primary radiological contaminant of concern (RCOC). Other RCOCs included Cobalt-60 (Co-60), Europium-152 and 154 (Eu-152,154), Americium-241 (Am-241), Strontium-90 (Sr-90), Plutonium-238 (Pu-238), and Pu-239. Cs-137 is used as a surrogate for the other RCOC present in the soils as it typically accounts for 64 percent of the total radioisotopic activity. Further, the release criteria for Cs-137 is considered conservative for the decommissioning activities. Table 2 includes ratios of individual radionuclides as compared to Cs-137, as well as the analytical results from characterization samples obtained from the Building JN-1 backyard and the Bog Area during the Fall of 2005. Table 2 is not representative of the final condition of the excavation of the former CWS line, Building JN-1 backyard, or the Bog Area.

4.2.1 Guidelines Established

Table 1 presents the guidelines for residual radioactivity concentrations for soil and solid volumes as applied to the excavation and removal of the JN-3 Cooling Waste Sewer Line. Criteria for residual radioactivity concentrations in soil are defined in a number of references. DOE Order 5400.5, Section IV.a.2 provides generic guidelines for residual concentrations of Radium-226 (Ra-226), Ra-228, Thorium-230 (Th-230), and Th-232. NRC Guidance provided to the CCP contains soil radioactivity concentration guidelines for Co-60, Sr-90, Cs-137, Ra-226, and Ra-228, natural, enriched and depleted uranium. Table 1 values have been generated primarily from various reference technical documents and from soil guidelines generated using computer pathway analyses.

Table 2 presents data utilized from previous characterization samples collected during the excavation of the backyard of Building JN-1 and the Bog Area to establish a site-

specific ratio of Cs-137 to other RCOC. Analytical results from samples of the backyard and Bog Area were obtained during excavation during the Fall of 2005, and calculated ratios are presented in **Table 2**. Sampling data are characterization activities during excavation and do not represent the final condition of either area. Samples with a range of activity concentration for Cs-137 were selected in generating the site-specific, or the Bog Area Ratio.

The Bog Area Ratio is used to calculate the activity concentration of individual RCOC other than those detected by the RAL. The Pu-241 activity concentration is calculated by using a ratio of Pu-241 to the sum of Pu-238 and Pu-239, as obtained from the ORIGEN 2.1 derived values. (Battelle, 2003c) The resulting Cs-137 to Pu-241 ratio is 2.8. Using the ratios from **Table 2** and the Cs-137 to Pu-241 ratio of 2.8, the individual concentrations of all RCOCs can be derived. Derived activity concentrations are then applied to the unity rule to determine compliance to **Table 1** values, resulting in a modified screening criteria of 7.3 pCi/g for Cs-137.

Exposure rates were compared to the 5 microRoentgen per hour ($\mu\text{R/hr}$) above mean background limit listed in DD-97-02, Rev. 0. The calculated mean background exposure rate and the 95 percent confidence intervals used for the CCP grounds are $8 \pm 2 \mu\text{R/hr}$. Data collected from trench-like culverts located on Battelle property unassociated with site operations indicate a geometry effect, increasing the exposure rates inside the trenches by 3 to 5 $\mu\text{R/hr}$.

5.0 Equipment and Procedures

5.1 Equipment

A Ludlum Model 44-10 two-inch by two-inch sodium iodide detector with Eberline ESP-2 meter was used to scan the excavation. The detector was shielded for the scanning surveys performed of the excavation of the west section of the former CWS line. The Ludlum Model 19 exposure rate meter was used to obtain $\mu\text{R/hr}$ measurements.

Other instrumentation used in the Onsite Radioanalytical Laboratory (RAL) to support of the final status survey included:

- A VMS based Canberra Procount data acquisition system in conjunction with high purity germanium detectors for gamma spectroscopy (Specific that the instrument was used to conduct analysis of bulk samples.)
- A Tennelec Model LB5100 Simultaneous Alpha and Beta Gas Proportional Counter to count smear samples

5.2 Scanning Minimum Detectable Activities

Scanning minimum detectable concentrations (MDC_{scan}) is determined utilizing the background count rate and a default detector response to Cs-137. The equation during the walkover surveys of the CCP incorporates a dN of 1.38 and a surveyor efficiency of 0.5. The ambient background in the area for the detector was 9,500 counts per minute (cpm). The following is the calculation of the MDC_{scan} :

$$\begin{aligned} b_i &= (9,500 \text{ cpm}) \times (1 \text{ sec}) \times (1 \text{ min}/60 \text{ sec}) = 158 \text{ counts} \\ \text{MDCR} &= (1.38) \times (\sqrt{158 \text{ counts}}) \times (60 \text{ sec}/1 \text{ min}) = 1040 \text{ cpm} \\ \text{MDCR}_{\text{surveyor}} &= 1040 \text{ cpm}/\sqrt{0.5} = 1472 \text{ cpm} \\ \text{MDER} &= 1472 \text{ cpm}/(900 \text{ cpm}/\mu\text{R/hr}) = 1.63 \mu\text{R/hr} \\ \text{MDC}_{\text{scan}} &= (5 \text{ pCi/g}) * \frac{1.63 \mu\text{R/hr}}{1.307 \mu\text{R/hr}} = 6.2 \text{ pCi/g} \end{aligned}$$

5.3 Procedures

The Characterization Team was formally trained and qualified to applicable procedures prior to the initiation of the characterization and final status surveys. Documentation of training is maintained by CCP Project Records.

The following plans and procedures were utilized for the surveys:

DD-93-19, Rev. 5 Decommissioning Plan, Battelle Memorial Institute Columbus
Operations
DD-97-02, Rev. 0 Radiological Characterization and Final Status Plan for BCLDP
West Jefferson Site
SC-OP-002, Rev. 0 Facility Post-Decontamination Final Status Survey for Baseline
Areas
SC-SP-004.2, Rev. 3 Manual and Mechanical Collection of Surface and Subsurface Soil
Samples in Support of Site Characterization
HP-OP-100, Rev. 4 Operation and Calibration of the Eberline Model ESP-2 Survey
Meter
WI-2806 Excavation and Trench Sampling and Surveys

6.0 Survey Findings

6.1 Excavation Sampling

Samples of the excavation base were taken at a rate of one per linear meter as required by Section 6.3.3 of DD-97-02, Rev. 0. A total of 30 samples were taken from the sidewalls of the west section of the CWS line excavation as recommended by Section 6.4.3 of DD-97-02, Rev. 0. The following table lists the number of samples taken from the base and sidewalls of the entire excavation of the west section of the CWS line excavation.

Compliance to the cleanup criteria presented in Table 1 is demonstrated through a "fraction of limit." Activity concentrations are calculated using the average isotopic ratios of radionuclides to Cs-137 of the Bog Area Ratio, with the exception of Pu-241. (Battelle, 2003b) As previously stated, the Pu-241 activity concentration is calculated by using a ratio of Pu-241 to the sum of Pu-238 and Pu-239, as obtained from the ORIGEN 2.1 derived values. (Battelle, 2003c) The resulting Cs-137 to Pu-241 ratio is 2.8. Activity concentrations of the RCOs are then calculated using the Cs-137 result as the surrogate contaminant.

Activity concentrations of Co-60, Cs-137, Sr-90, Eu-152 and 154, Pu-239, 240 and 241, and Am-241, are then compared to the respective release criteria and a "fraction of limit" calculated. The "fraction of limit" is determined by summing the ratios of each isotopic concentration to the respective release limit listed in Table 1. The "fraction of limit" is then applied to the unity rule. The unity rule requires that the summed value of the "fraction of limits" be less than 1. Application of the unity rule results in a modified screening criteria of 7.3 pCi/g for Cs-137.

Location	Number of Samples	Cs-137 Average (pCi/g)	Cs-137 Standard Deviation (pCi/g)	Cs-137 Modified Screening Criteria (pCi/g)
Excavation Base	111	3.44 E-3	2.58 E-3	7.3
Excavation Sidewalls	30	5.31 E-3	1.50E-2	7.3

A "fraction of limit" calculation to verify the original assumptions when soil sample results begin to approach detected Cs-137 levels above 4 pCi/g. Further remediation of an area may be conducted when Cs-137 level begin to consistently approach the modified screening criteria of 7.3 pCi/g. The "fraction of limit" for the west section of the CWS line base and sidewalls was not calculated as the reported activity concentration of the samples was very low. The maximum Cs-137 activity concentrations of soil samples collected from the base and sidewalls of the excavation were 0.019 pCi/g and 0.00375 pCi/g, respectively. Both samples were much lower than the modified screening criteria of 7.3 pCi/g for Cs-137.

Table 3, 4, and 5 presents the reported Cs-137 activity concentrations for samples obtained from the excavation of the west section of the CWS line. Table 6 presents the analytical results of samples taken from the sidewalls. "C" soils (base of the excavation trench), the "A" soils, and the "B" soils. "A" soils are those excavated from the ground surface to 3-feet above the former CWS line and are considered unaffected. "B" soils are those excavated from 3-feet to 1-foot above the former CWS line and are considered to be unaffected. "C" soils are those excavated from 1-foot above and 1-foot below the CWS line, and are considered affected.

6.2 Scanning Measurements

Scanning of the west section of the CWS line excavation was performed with a two inch by two inch sodium iodide detector. Results of the survey indicate a uniform distribution of residual radioactivity. Table 6 presents the results of the scanning survey for the west section of the CWS excavation.

6.3 Overburden Sampling

Sixty samples were taken from the overburden removed during the excavation and removal of the west section of the CWS line. The following table summarizes the number of samples obtained from the entire excavation.

Location	Number of Samples	Cs-137 Average (pCi/g)	Cs-137 Standard Deviation (pCi/g)	Cs-137 Modified Screening Criteria (pCi/g)
Overburden "A" Soils	30	2.01 E-2	3.85 E-2	7.3
Overburden "B" Soils	30	-3.35 E-3	3.19 E-3	7.3

The "fraction of limit" for the west section of the CWS line "A" and "B" overburden soils was not calculated as the reported activity concentration of the samples was very low. The maximum Cs-137 activity concentrations of soil samples collected from the "A" soils and the "B" soils was 0.12 pCi/g and 0.0438 pCi/g, respectively. Both samples were much lower than the modified screening criteria of 7.3 pCi/g for Cs-137.

6.4 Exposure Rate Surveys

The calculated mean background exposure rate and the 95 percent confidence intervals used for the CCP grounds are 8 ± 2 μ R/hr. The exposure rate readings obtained from the trench of the west section of the CWS line are presented in Table 6. The exposure rate readings were individually compared to the mean background value of 8 ± 2 μ R/hr in

order to show compliance with the 5 $\mu\text{R/hr}$ above background release criterion (grounds exposure rate surveys must be less than 13 $\mu\text{R/hr}$ to be compliant). Exposure rates ranged from 4 to 12 $\mu\text{R/hr}$ at 1-meter, exhibiting an average exposure rate of 8.2 $\mu\text{R/hr}$ at 1-meter. The minimum measurement of the area was 4 $\mu\text{R/hr}$ at 1-meter and the maximum measurement was 12 $\mu\text{R/hr}$ at 1-meter.

7.0 Conclusions

The characterization and final status survey results demonstrate that the radiological endpoint criteria objectives of the NRC-approved Decommissioning Plan have been met for the excavation addressed by this effort. (Battelle, 2003) Reported analytical results for media samples obtained from the excavation and overburden used as backfill are below the residual radioactivity concentrations for soil and solid volumes as presented in Table 1.

8.0 References

- American National Standards Institute (ANSI). 1997. ANSI-N323a. "Radiation Protection Instrumentation Test and Calibration."
- Battelle. 2003. "Decommissioning Plan for the Battelle Memorial Institute Columbus Operations." DD-93-19
- Battelle .2000. "Radiological Characterization and Final Status Survey Plan for Battelle Columbus Laboratory Decommissioning Project West Jefferson Site." DD-97-02
- Battelle. 1993a. "Surface Release Criteria Technical Basis Document." DD-93-02.
- Battelle. 1993b. "Volumetric Release Criteria Technical Basis Document for Battelle Columbus Laboratories Decommissioning Project." DD-93-03.
- U.S. Department of Energy (DOE), 1990. Finding of No Significant Impact. Decontamination and Decommissioning of the Battelle Columbus Laboratories in Columbus and West Jefferson, Ohio.
- U.S. Department of Energy (DOE), 1986. May 29, 1986 memorandum. Voight to Vaughan, approved by Vaughan, June 10, 1986.
- Oak Ridge Associated Universities (ORAU), 1992. "Manual for Conducting Radiological Surveys in Support of License Termination, Draft Report for Comment" NUREG/CR-5849, ORAU-92/C57, prepared for the Nuclear Regulatory Commission by the Environmental Survey and Assessment Program. Energy/Environmental Systems Division, ORAU, 1992.

FIGURES

Figure 1
Site Map

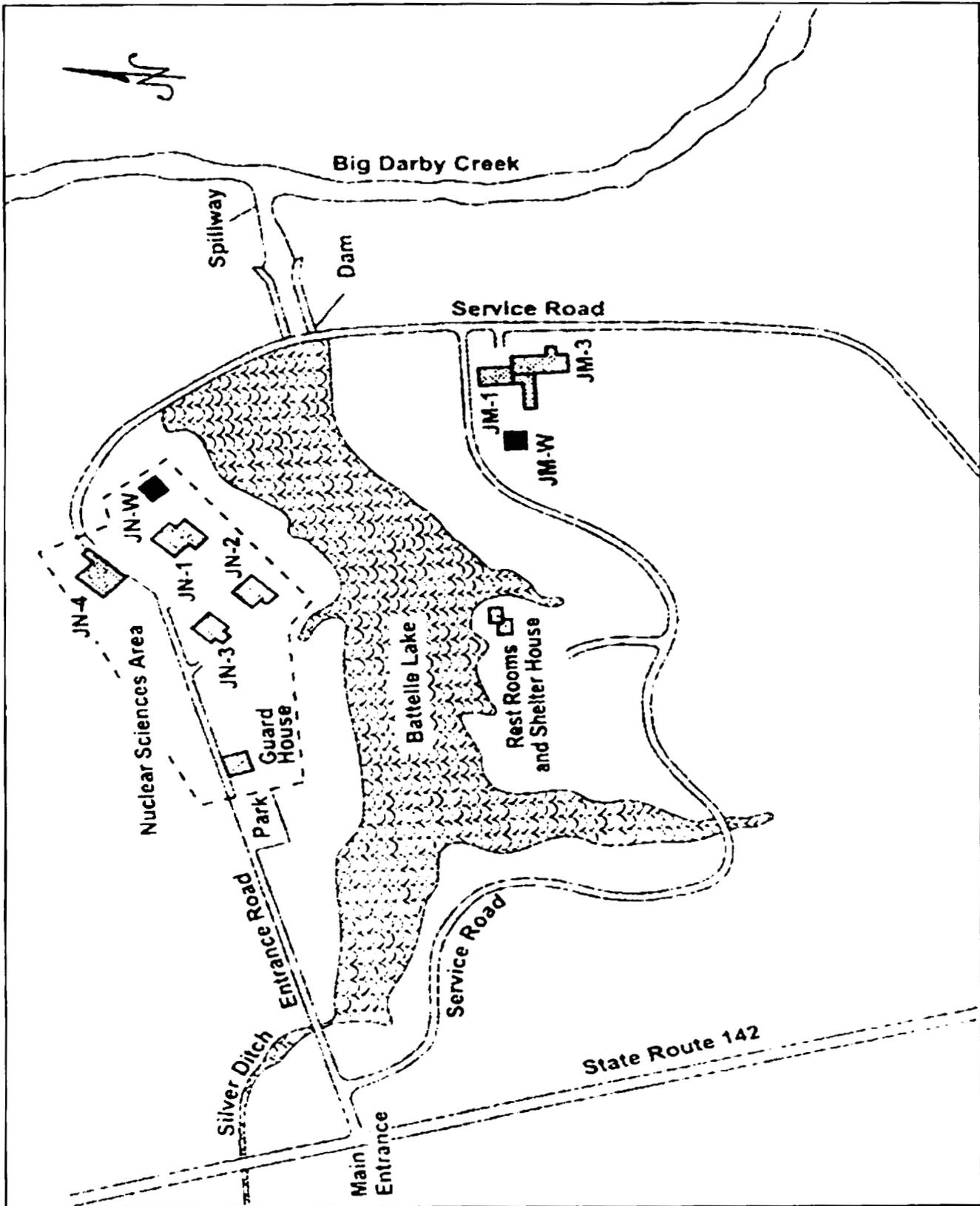


Figure 2, CWS Line Excavation



TABLES

Table 1
BCLDP GUIDELINES FOR RESIDUAL
RADIOACTIVITY CONCENTRATIONS FOR SOIL AND SOLID VOLUMES

Radionuclide ^(a)	King Avenue Concentration (pCi/g) ^(b)	West Jefferson Concentration (pCi/g) ^(b)
Natural Uranium	10 ⁽¹⁾	na ^(c)
Enriched Uranium	30 ⁽¹⁾	30 ⁽¹⁾
Depleted Uranium	35 ⁽¹⁾	35 ⁽¹⁾
Ac-227	19	19
Am-241	na ^(c)	30 ⁽⁴⁾
Am-243	na	30 ⁽⁴⁾
Ce-144	na	2.100
Cm-243	na	0.79
Cm-244	na	1.0
Co-60	8 ⁽²⁾	8 ⁽²⁾
Cs-134	na	33
Cs-137	15 ⁽²⁾	15 ⁽²⁾
C-14	940	940
Eu-152	na	36
Eu-154	na	32
Eu-155	na	1.800
Fe-55	na	2.7E+07
H-3 ^(d)	41,000	38,000
I-129	na	13
Mn-54	na	61
Ni-59	na	1.3E+07
Ni-63	na	4.9E+06
Np-237	na	0.58
Pa-231	18	18
Pb-210	140	na
Pu-238	na	25 ⁽⁴⁾
Pu-239	na	25 ⁽⁴⁾
Pu-240	na	25 ⁽⁴⁾
Pu-241	na	25 ⁽⁴⁾
Pu-242	na	25 ⁽⁴⁾
Ra-226 (0-15 cm of soil)	5 ^(2,3)	na

Radionuclide ^(a)	King Avenue Concentration (pCi/g) ^(b)	West Jefferson Concentration (pCi/g) ^(b)
Ra-226 (>15 cm of soil)	15 ^(2,3)	na
Ra-228	5 ^(2,3)	na
Ru-106	na	180
Sb-125	na	118
Sm-151	na	6,700
Sr-90	5 ⁽²⁾	5 ₍₂₎
Th-228	29	na
Th-230	5 ⁽³⁾	na
Th-232	5 ⁽³⁾	na

Notes and References

Notes:

- a. Activity concentrations above natural background concentrations. Where more than one radionuclide is present, the sum of the ratios of the individual radionuclide concentrations to their respective concentration limits shall not exceed 1.
- b. Concentrations for which no specific reference is cited have been derived from RESRAD calculations and are the more restrictive values calculated for soil deposition at a depth of 5 meters.
- c. Indicates that this radionuclide is not expected to be found at the indicated site.
- d. Difference in tritium activity concentrations are due to the difference in depths of the water tables at two sites. The water table depth at King Avenue is deeper than that at West Jefferson.

References:

1. Options 1 and 2 of the Branch Technical Position, "Disposal or Onsite Storage of Thorium or Uranium Wastes from Past Operations" (46 FR 52061, October 23, 1981).
2. NRC Memorandum, "Acceptable Cleanup Criteria and Practices for Decontamination and Decommissioning (License No. SNM-7)" dated April 17, 1992, to Harley L. Toy, License Coordinator and Manager, Nuclear Sciences, Battelle Memorial Institute from J.W.N. Hickey, Chief, Fuel Cycle Safety Branch, Division of Industrial and Medical Nuclear Safety, Office of Nuclear Material Safety and Safeguards.
3. DOE Order 5400.5, "Radiation Protection of the Public and the Environment".
4. NRC Policy and Guidance Directive FC83-23, "Termination of Byproduct, Source, and Special Nuclear Material Licenses".

Table 2, Cesium-137 Surrogate Analysis Data & Modified Cs-137 Screening Criteria

Sample #	pCi/g Cs-137	Fraction Cs-137 Lim	pCi/g Co-60	Fraction Co-60 Lim	pCi/g Eu-152	Fraction Eu-152 Lim	pCi/g Eu-154	Fraction Eu-154 Lim	pCi/g Am-241	Fraction Am-241 Lim	pCi/g Sr-90	Fraction Sr-90 Lim	pCi/g Pu-238	Fraction Pu-238 Lim	pCi/g Pu-239	Fraction Pu-239 Lim
RL05-2744	10.50	0.70	0.20	0.03	0.07	0.00	0.06	0.00	0.27	0.01	2.29	0.46	0.10	0.00	0.05	0.00
RL05-2745	16.30	1.09	0.46	0.06	0.07	0.00	0.09	0.00	-0.20	-0.01	1.97	0.39	0.20	0.01	0.17	0.01
RL05-2746	5.52	0.37	0.19	0.02	0.05	0.00	0.03	0.00	0.30	0.01	0.83	0.17	0.12	0.00	0.05	0.00
RL05-2747	6.43	0.43	0.20	0.03	0.10	0.00	0.03	0.00	-0.08	0.00	1.11	0.22	0.05	0.00	0.01	0.00
RL05-2748	18.30	1.22	0.56	0.07	0.14	0.00	0.07	0.00	0.36	0.01	1.34	0.27	0.14	0.01	0.08	0.00
RL05-2750	18.40	1.23	1.30	0.16	0.11	0.00	0.10	0.00	0.09	0.00	10.90	2.18	0.80	0.03	0.38	0.02
RL05-2751	12.90	0.86	0.40	0.05	0.07	0.00	0.03	0.00	-0.10	0.00	1.73	0.35	0.14	0.01	0.09	0.00
RL05-3012	16.10	1.07	0.19	0.02	0.15	0.00	0.09	0.00	-0.04	0.00	9.13	1.83	1.06	0.04	0.32	0.01
RL05-3014	4.40	0.29	0.01	0.00	0.05	0.00	0.04	0.00	-0.19	-0.01	0.91	0.18	0.05	0.00	0.01	0.00
RL05-3015	25.60	1.71	0.70	0.09	0.22	0.01	0.17	0.01	0.42	0.01	13.30	2.66	0.77	0.03	0.32	0.01
RL05-3017	15.70	1.05	0.38	0.05	0.04	0.00	0.02	0.00	-0.33	-0.01	8.15	1.63	0.62	0.02	0.33	0.01
RL05-3294	15.80	1.05	0.45	0.06	0.02	0.00	0.04	0.00	0.28	0.01	2.34	0.47	0.05	0.00	0.08	0.00
RL05-3296	8.10	0.54	0.27	0.03	-0.04	0.00	0.01	0.00	-0.28	-0.01	2.81	0.56	0.03	0.00	0.10	0.00
RL05-3297	43.20	2.88	0.75	0.09	-0.01	0.00	0.09	0.00	0.05	0.00	3.10	0.62	0.08	0.00	0.12	0.00
RL05-3300	19.50	1.30	0.49	0.06	0.03	0.00	0.04	0.00	-0.06	0.00	2.87	0.57	0.07	0.00	0.24	0.01
RL05-4049	19.50	1.30	0.26	0.03	0.11	0.00	0.11	0.00	0.36	0.01	1.22	0.24	0.98	0.04	0.31	0.01
RL05-4084	13.90	0.93	0.58	0.07	0.08	0.00	0.09	0.00	0.28	0.01	2.79	0.56	0.17	0.01	0.13	0.01
RL05-4085	19.90	1.33	0.30	0.04	0.09	0.00	0.11	0.00	0.47	0.02	5.37	1.07	0.36	0.01	0.12	0.00
RL05-4100	7.47	0.50	0.15	0.02	0.05	0.00	0.10	0.00	0.38	0.01	1.44	0.29	0.22	0.01	0.52	0.02
RL05-4101	7.05	0.47	0.04	0.00	-0.10	0.00	0.04	0.00	-0.01	0.00	0.56	0.11	0.54	0.02	0.93	0.04
RL05-4153	7.15	0.48	0.09	0.01	-0.02	0.00	-0.04	0.00	-0.03	0.00	2.24	0.45	0.13	0.01	0.53	0.02
RL05-4158	12.80	0.85	0.45	0.06	0.08	0.00	0.02	0.00	0.17	0.01	10.50	2.10	0.55	0.02	0.28	0.01
RL05-4159	7.56	0.50	0.24	0.03	0.02	0.00	-0.02	0.00	0.19	0.01	10.30	2.06	0.80	0.03	0.23	0.01
RL05-4161	11.00	0.73	0.25	0.03	0.08	0.00	0.08	0.00	0.07	0.00	9.45	1.89	0.77	0.03	0.24	0.01
RL05-4162	19.50	1.30	0.25	0.03	0.10	0.00	0.05	0.00	0.18	0.01	5.28	1.06	0.31	0.01	0.15	0.01
Average	14.50	0.97	0.37	0.05	0.06	0.00	0.06	0.00	0.10	0.00	4.48	0.90	0.36	0.01	0.23	0.01

Limits:

Cs-137	15 pCi/g
Co-60	8 pCi/g
Eu-152	36 pCi/g
Eu-154	32 pCi/g
Am-241	30 pCi/g
Sr-90	5 pCi/g
Pu-238	25 pCi/g
Pu-239	25 pCi/g
Pu-241	25 pCi/g

X_i Cs-137 Ratios

Cs/Co-60	36.7
Cs/Eu-152	76.1
Cs/Eu-154	225.1
Cs/Am-241	78.9
Cs/Sr-90	4.1
Cs/Pu-238	57.5
Cs/Pu-239	83.1
Cs/Pu-241	2.8

Activity (pCi/g) = Cs-137 Ratio

Cs-137	7.30
Co-60	0.20
Eu-152	0.10
Eu-154	0.03
Am-241	0.09
Sr-90	1.78
Pu-238	0.13
Pu-239	0.09
Pu-241	2.61

Limits (pCi/g)

15
8
36
32
30
5
25
25
25
Sum

Fraction

0.487
0.026
0.003
0.001
0.003
0.356
0.005
0.004
0.104
0.99

Table 3: Reported Cs-137 Concentrations (pCi/g) of Samples from Base of Excavator 210 to 300 Feet

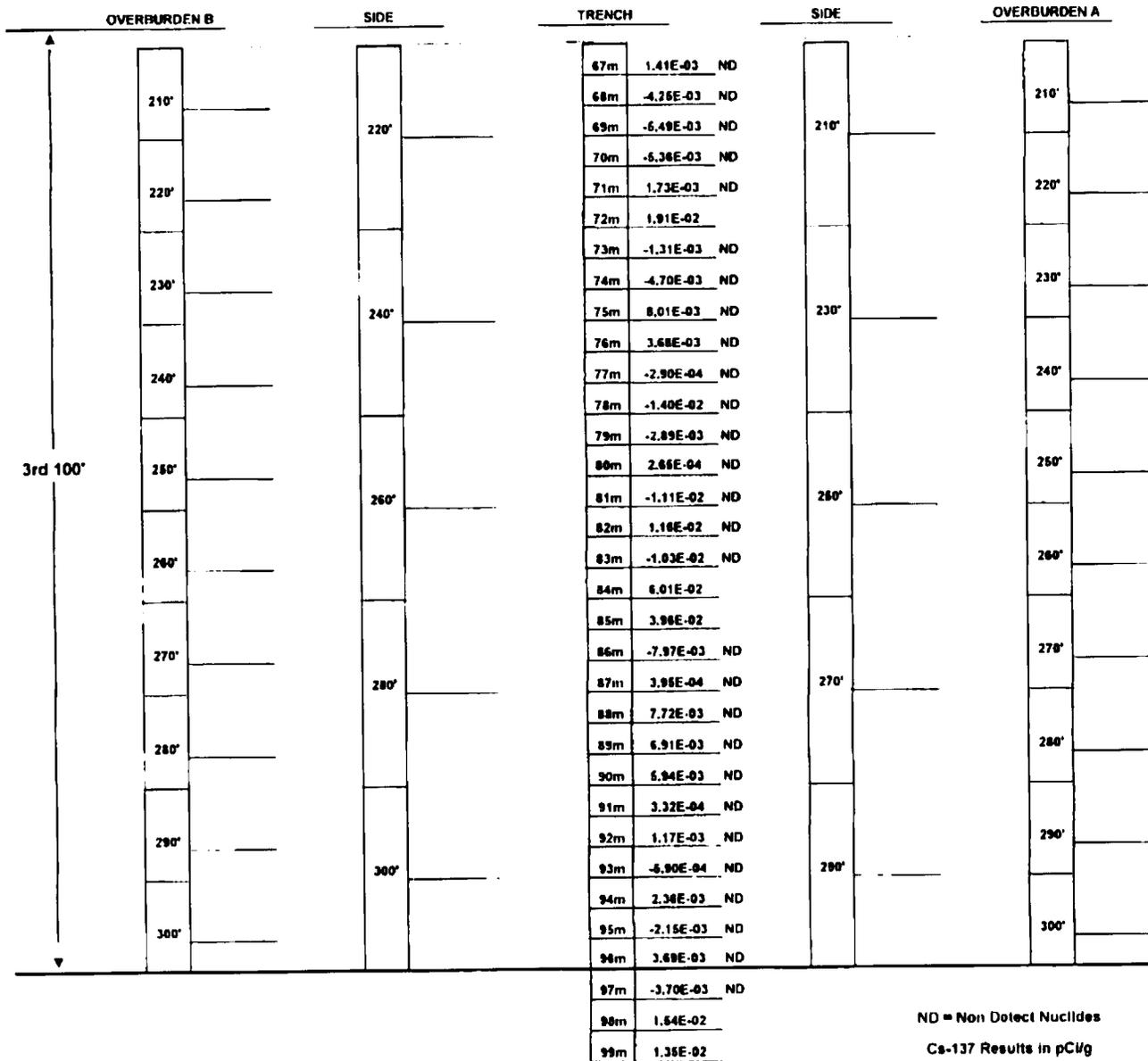


Table 4
Reported Cs-137 Concentrations (pCi/g) of Samples from Base of Excavation 310 to 400 Feet

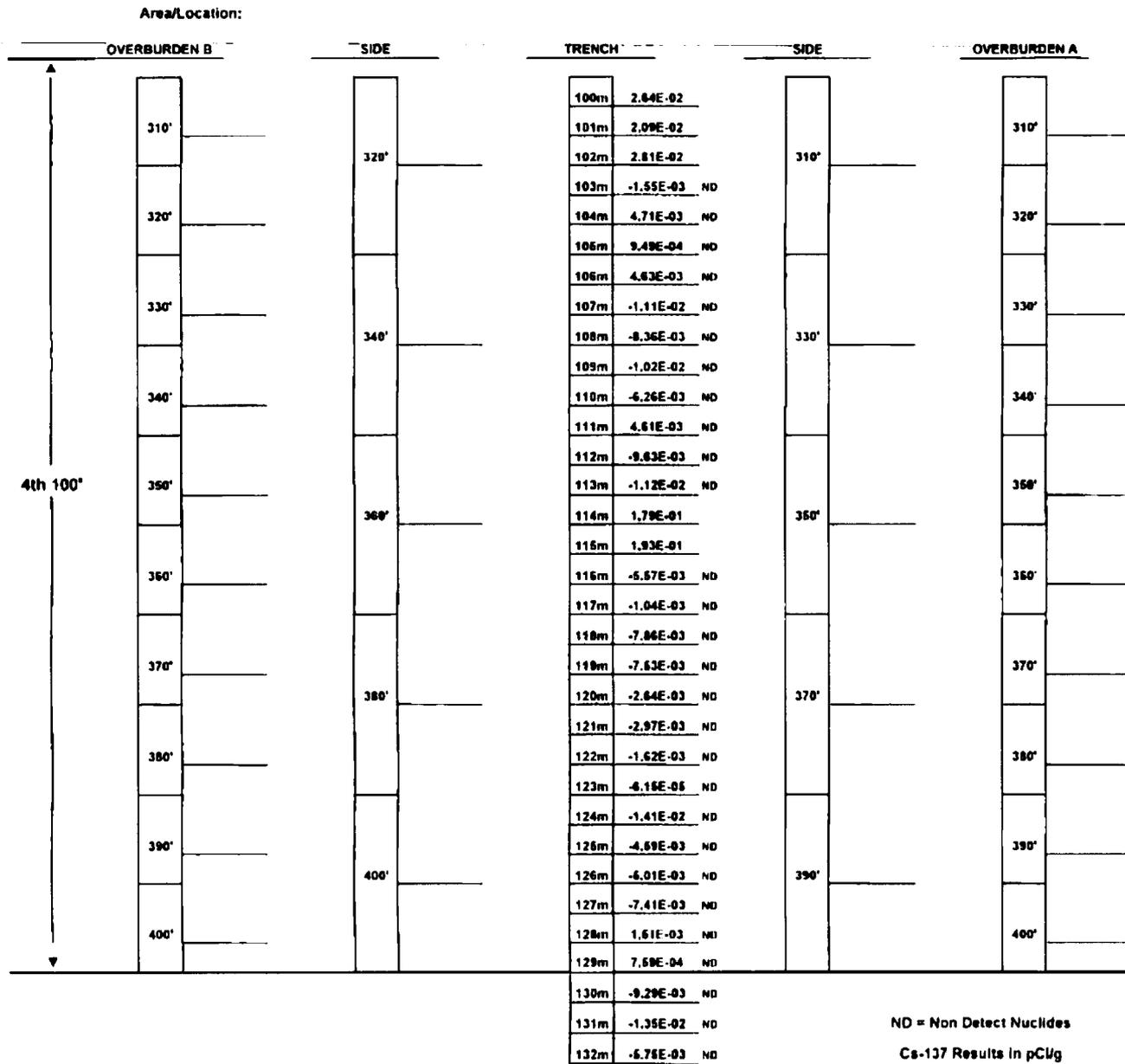


Table 5
Reported Cs-137 Concentrations (pCi/g) of Samples from Basin of Escarpment 410 to 500 Feet

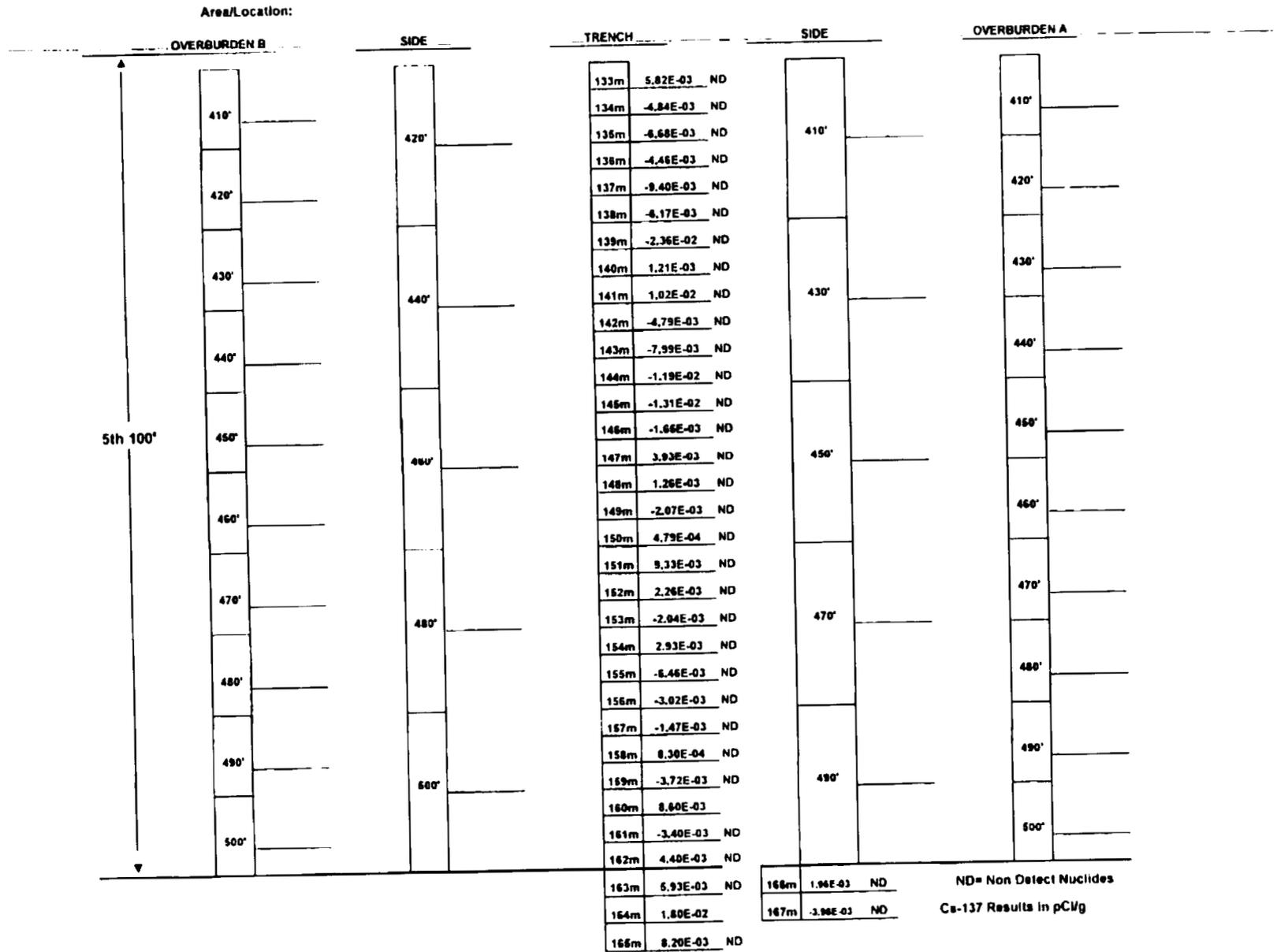


Table 6
Summary Data for Excavation and Removal of West Section CWS Line

Sample ID	Sample Location	Collection Date	Sample Field Screen (Kcpm)	Walkover Scan Survey (Kcpm)	Exposure Rate Survey (μ R/hr)	Cs-137 Activity Concentration (pCi/g)
RL06-0010-4473	A Soil @ 210'	12/30/2005	7.13E+00	N/A	N/A	7.50E-02
RL06-0009-4472	A Soil @ 220'	12/30/2005	7.24E+00	N/A	N/A	3.40E-02
RL06-0008-4471	A Soil @ 230'	12/30/2005	7.08E+00	N/A	N/A	4.50E-02
RL06-0007-4470	A Soil @ 240'	12/30/2005	7.36E+00	N/A	N/A	7.00E-03
RL06-0006-4469	A Soil @ 250'	12/30/2005	7.53E+00	N/A	N/A	6.50E-02
RL06-0005-4468	A Soil @ 260'	12/30/2005	7.24E+00	N/A	N/A	7.60E-02
RL06-0004-4467	A Soil @ 270'	12/30/2005	7.33E+00	N/A	N/A	1.08E-01
RL06-0003-4466	A Soil @ 280'	12/30/2005	7.32E+00	N/A	N/A	1.20E-01
RL06-0002-4465	A Soil @ 290'	12/30/2005	7.37E+00	N/A	N/A	2.60E-02
RL06-0001-4464	A Soil @ 300'	12/30/2005	7.20E+00	N/A	N/A	6.80E-02
RL06-0090-4530	A Soil @ 310'	1/7/2006	7.93E+00	N/A	N/A	1.74E-02
RL06-0091-4531	A Soil @ 320'	1/7/2006	7.94E+00	N/A	N/A	4.99E-03
RL06-0092-4532	A Soil @ 330'	1/7/2006	7.80E+00	N/A	N/A	1.08E-02
RL06-0093-4533	A Soil @ 340'	1/7/2006	7.50E+00	N/A	N/A	7.56E-03
RL06-0094-4534	A Soil @ 350'	1/7/2006	8.67E+00	N/A	N/A	2.26E-02
RL06-0095-4535	A Soil @ 360'	1/7/2006	8.11E+00	N/A	N/A	7.12E-03
RL06-0096-4536	A Soil @ 370'	1/7/2006	7.48E+00	N/A	N/A	6.41E-03
RL06-0097-4537	A Soil @ 380'	1/7/2006	7.03E+00	N/A	N/A	3.47E-02
RL06-0278-4696	A Soil @ 390'	1/12/2006	8.53E+00	N/A	N/A	-2.06E-02
RL06-0279-4697	A Soil @ 400'	1/13/2006	8.44E+00	N/A	N/A	-8.45E-04
RL06-0280-4698	A Soil @ 410'	1/14/2006	8.16E+00	N/A	N/A	-1.72E-02
RL06-0281-4699	A Soil @ 420'	1/15/2006	9.69E+00	N/A	N/A	2.34E-03
RL06-0282-4700	A Soil @ 430'	1/16/2006	9.28E+00	N/A	N/A	2.31E-03
RL06-0283-4701	A Soil @ 440'	1/17/2006	8.37E+00	N/A	N/A	-8.03E-03
RL06-0284-4702	A Soil @ 450'	1/18/2006	8.43E+00	N/A	N/A	-2.62E-02
RL06-0285-4703	A Soil @ 460'	1/19/2006	9.10E+00	N/A	N/A	-8.91E-03
RL06-0286-4704	A Soil @ 470'	1/20/2006	9.40E+00	N/A	N/A	-2.13E-02
RL06-0287-4705	A Soil @ 480'	1/21/2006	8.00E+00	N/A	N/A	-1.57E-03
RL06-0288-4706	A Soil @ 490'	1/22/2006	7.85E+00	N/A	N/A	-1.17E-02

Table 6
Summary Data for Excavation and Removal of West Section CWS Line

Sample ID	Sample Location	Collection Date	Sample Field Screen (Kcpm)	Walkover Scan Survey (Kcpm)	Exposure Rate Survey (μ R/hr)	Cs-137 Activity Concentration (pCi/g)
RL06-0289-4707	A Soil @ 500'	1/23/2006	7.91E+00	N/A	N/A	-1.96E-02
RL06-0056-4508	B Soil @ 210'	1/5/2006	7.44E+00	N/A	N/A	2.50E-02
RL06-0057-4509	B Soil @ 220'	1/5/2006	7.65E+00	N/A	N/A	4.38E-02
RL06-0058-4510	B Soil @ 230'	1/5/2006	8.14E+00	N/A	N/A	3.18E-02
RL06-0059-4511	B Soil @ 240'	1/5/2006	7.96E+00	N/A	N/A	-1.41E-02
RL06-0146-4583	B Soil @ 250'	1/9/2006	7.85E+00	N/A	N/A	3.14E-03
RL06-0147-4584	B Soil @ 260'	1/9/2006	7.85E+00	N/A	N/A	9.53E-03
RL06-0148-4585	B Soil @ 270'	1/9/2006	7.85E+00	N/A	N/A	7.69E-03
RL06-0149-4586	B Soil @ 280'	1/9/2006	7.79E+00	N/A	N/A	1.41E-02
RL06-0293-4708	B Soil @ 290'	1/12/2006	7.89E+00	N/A	N/A	-4.51E-03
RL06-0294-4709	B Soil @ 300'	1/12/2006	8.05E+00	N/A	N/A	1.35E-03
RL06-0295-4710	B Soil @ 310'	1/12/2006	8.78E+00	N/A	N/A	-2.06E-02
RL06-0296-4711	B Soil @ 320'	1/12/2006	7.40E+00	N/A	N/A	-1.72E-03
RL06-0297-4712	B Soil @ 330'	1/12/2006	7.67E+00	N/A	N/A	-2.04E-02
RL06-0298-4713	B Soil @ 340'	1/12/2006	7.66E+00	N/A	N/A	5.20E-04
RL06-0299-4714	B Soil @ 350'	1/12/2006	8.28E+00	N/A	N/A	-1.42E-02
RL06-0300-4715	B Soil @ 360'	1/12/2006	8.71E+00	N/A	N/A	-2.14E-03
RL06-0301-4716	B Soil @ 370'	1/12/2006	7.57E+00	N/A	N/A	-8.48E-04
RL06-0302-4717	B Soil @ 380'	1/12/2006	8.82E+00	N/A	N/A	-9.20E-04
RL06-0303-4718	B Soil @ 390'	1/12/2006	8.96E+00	N/A	N/A	-1.53E-02
RL06-0304-4719	B Soil @ 400'	1/12/2006	8.19E+00	N/A	N/A	6.11E-03
RL06-0305-4720	B Soil @ 410'	1/12/2006	9.10E+00	N/A	N/A	-3.90E-02
RL06-0306-4721	B Soil @ 420'	1/12/2006	9.60E+00	N/A	N/A	6.86E-03
RL06-0307-4722	B Soil @ 430'	1/12/2006	9.05E+00	N/A	N/A	-2.02E-02
RL06-0308-4723	B Soil @ 440'	1/12/2006	8.12E+00	N/A	N/A	-2.00E-02
RL06-0309-4724	B Soil @ 450'	1/12/2006	9.55E+00	N/A	N/A	-2.13E-02
RL06-0310-4725	B Soil @ 460'	1/12/2006	9.21E+00	N/A	N/A	-1.37E-02
RL06-0311-4726	B Soil @ 470'	1/12/2006	8.08E+00	N/A	N/A	4.78E-03
RL06-0312-4727	B Soil @ 480'	1/12/2006	8.15E+00	N/A	N/A	-1.46E-02

Table 6
Summary Data for Excavation and Removal of West Section CWS Line

Sample ID	Sample Location	Collection Date	Sample Field Screen (Kcpm)	Walkover Scan Survey (Kcpm)	Exposure Rate Survey ($\mu\text{R/hr}$)	Cs-137 Activity Concentration (pCi/g)
RL06-0313-4728	B Soil @ 490'	1/12/2006	7.78E+00	N/A	N/A	-1.43E-02
RL06-0314-4729	B Soil @ 500'	1/12/2006	8.08E+00	N/A	N/A	-1.73E-02
RL06-0192-4622	C Soil @ 63m	1/10/2006	6.82E+00	1.11E+01	5.00E+00	-7.09E-03
RL06-0193-4623	C Soil @ 64m	1/10/2006	7.38E+00	1.14E+01	6.00E+00	7.32E-03
RL06-0194-4624	C Soil @ 65m	1/10/2006	7.24E+00	1.25E+01	5.00E+00	2.70E-04
RL06-0195-4625	C Soil @ 66m	1/10/2006	6.78E+00	1.29E+01	6.00E+00	4.81E-03
RL06-0196-4626	C Soil @ 67m	1/10/2006	7.01E+00	1.35E+01	1.10E+01	1.41E-03
RL06-0197-4627	C Soil @ 68m	1/10/2006	6.96E+00	1.36E+01	1.20E+01	-4.25E-03
RL06-0198-4628	C Soil @ 69m	1/10/2006	6.77E+00	1.55E+01	1.00E+01	-5.49E-03
RL06-0199-4629	C Soil @ 70m	1/10/2006	6.79E+00	1.41E+01	1.10E+01	-5.36E-03
RL06-0200-4630	C Soil @ 71m	1/10/2006	7.02E+00	1.47E+01	1.10E+01	1.73E-03
RL06-0201-4631	C Soil @ 72m	1/10/2006	6.98E+00	1.51E+01	1.10E+01	1.91E-02
RL06-0202-4632	C Soil @ 73m	1/10/2006	6.82E+00	1.45E+01	1.00E+01	-1.31E-03
RL06-0203-4633	C Soil @ 74m	1/10/2006	6.87E+00	1.43E+01	1.00E+01	-4.70E-03
RL06-0204-4634	C Soil @ 75m	1/10/2006	7.04E+00	1.50E+01	1.00E+01	8.01E-03
RL06-0205-4635	C Soil @ 76m	1/10/2006	6.98E+00	1.33E+01	1.20E+01	3.68E-03
RL06-0206-4636	C Soil @ 77m	1/10/2006	7.07E+00	1.51E+01	1.00E+01	-2.90E-04
RL06-0207-4637	C Soil @ 78m	1/10/2006	6.77E+00	1.36E+01	1.00E+01	-1.40E-02
RL06-0208-4638	C Soil @ 79m	1/10/2006	7.25E+00	1.62E+01	1.10E+01	-2.89E-03
RL06-0209-4639	C Soil @ 80m	1/10/2006	7.72E+00	1.49E+01	1.00E+01	2.65E-04
RL06-0210-4640	C Soil @ 81m	1/10/2006	7.26E+00	1.46E+01	1.00E+01	-1.11E-02
RL06-0211-4641	C Soil @ 82m	1/10/2006	7.25E+00	1.36E+01	1.00E+01	1.16E-02
RL06-0212-4642	C Soil @ 83m	1/10/2006	7.20E+00	1.34E+01	1.00E+01	-1.03E-02
RL06-0213-4643	C Soil @ 84m	1/10/2006	7.08E+00	1.35E+01	1.10E+01	6.01E-02
RL06-0214-4644	C Soil @ 85m	1/10/2006	7.03E+00	1.51E+01	1.00E+01	3.96E-02
RL06-0215-4645	C Soil @ 86m	1/10/2006	7.04E+00	1.34E+01	1.10E+01	-7.97E-03
RL06-0216-4646	C Soil @ 87m	1/10/2006	7.09E+00	1.37E+01	1.10E+01	3.95E-04
RL06-0217-4647	C Soil @ 88m	1/10/2006	7.26E+00	1.33E+01	1.10E+01	7.72E-03
RL06-0218-4648	C Soil @ 89m	1/10/2006	7.39E+00	1.34E+01	1.00E+01	6.91E-03

Table 6
Summary Data for Excavation and Removal of West Section CWS Line

Sample ID	Sample Location	Collection Date	Sample Field Screen (Kcpm)	Walkover Scan Survey (Kcpm)	Exposure Rate Survey (μ R/hr)	Cs-137 Activity Concentration (pCi/g)
RL06-0219-4649	C Soil @ 90m	1/10/2006	7.40E+00	1.37E+01	1.10E+01	5.94E-03
RL06-0220-4650	C Soil @ 91m	1/10/2006	7.38E+00	1.42E+01	1.20E+01	3.32E-04
RL06-0221-4651	C Soil @ 92m	1/10/2006	6.91E+00	1.63E+01	1.20E+01	1.17E-03
RL06-0222-4652	C Soil @ 93m	1/10/2006	6.95E+00	1.55E+01	1.10E+01	-5.90E-04
RL06-0223-4653	C Soil @ 94m	1/10/2006	6.92E+00	1.18E+01	1.00E+01	2.36E-03
RL06-0224-4654	C Soil @ 95m	1/10/2006	6.94E+00	1.30E+01	1.10E+01	-2.15E-03
RL06-0262-4657	C Soil @ 96m	1/11/2006	6.95E+00	1.15E+01	9.00E+00	3.69E-03
RL06-0263-4658	C Soil @ 97m	1/11/2006	7.09E+00	1.25E+01	1.00E+01	-3.70E-03
RL06-0264-4659	C Soil @ 98m	1/11/2006	8.94E+00	1.28E+01	1.00E+01	1.54E-02
RL06-0265-4660	C Soil @ 99m	1/11/2006	8.46E+00	1.17E+01	1.00E+01	1.35E-02
RL06-0266-4661	C Soil @ 100m	1/11/2006	8.63E+00	1.18E+01	9.00E+00	2.64E-02
RL06-0267-4662	C Soil @ 101m	1/11/2006	9.44E+00	1.15E+02	9.00E+00	2.09E-02
RL06-0268-4663	C Soil @ 102m	1/11/2006	8.11E+00	1.21E+01	1.00E+01	2.81E-02
RL06-0269-4664	C Soil @ 103m	1/11/2006	8.04E+00	1.29E+01	1.00E+01	-1.55E-03
RL06-0270-4665	C Soil @ 104m	1/11/2006	8.00E+00	1.24E+01	1.00E+01	4.71E-03
RL06-0271-4666	C Soil @ 105m	1/11/2006	8.32E+00	1.17E+01	9.00E+00	9.49E-04
RL06-0272-4667	C Soil @ 106m	1/11/2006	8.12E+00	1.19E+01	9.00E+00	4.63E-03
RL06-0273-4668	C Soil @ 107m	1/11/2006	8.81E+00	1.21E+01	1.00E+01	-1.11E-02
RL06-0274-4669	C Soil @ 108m	1/11/2006	7.80E+00	1.16E+01	1.00E+01	-8.36E-03
RL06-0275-4670	C Soil @ 109m	1/11/2006	7.40E+00	1.17E+01	9.00E+00	-1.02E-02
RL06-0276-4671	C Soil @ 110m	1/11/2006	7.60E+00	1.13E+01	1.00E+01	-6.26E-03
RL06-0315-4730	C Soil @ 111m	1/12/2006	7.63E+00	1.18E+01	9.00E+00	4.61E-03
RL06-0316-4731	C Soil @ 112m	1/12/2006	7.19E+00	8.66E+00	6.00E+00	-9.63E-03
RL06-0320-4732	C Soil @ 113m	1/12/2006	7.31E+00	7.84E+00	8.00E+00	-1.12E-02
RL06-0321-4733	C Soil @ 114m	1/12/2006	8.18E+00	7.81E+00	8.00E+00	1.79E-01
RL06-0322-4734	C Soil @ 115m	1/12/2006	8.39E+00	1.02E+01	9.00E+00	1.93E-01
RL06-0323-4735	C Soil @ 116m	1/12/2006	9.37E+00	9.99E+00	9.00E+00	-5.57E-03
RL06-0324-4736	C Soil @ 117m	1/12/2006	9.03E+00	9.80E+00	1.00E+01	-1.04E-02
RL06-0325-4737	C Soil @ 118m	1/12/2006	8.47E+00	1.17E+01	9.00E+00	-7.86E-03

Table 6
Summary Data for Excavation and Removal of West Section CWS Line

Sample ID	Sample Location	Collection Date	Sample Field Screen (Kcpm)	Walkover Scan Survey (Kcpm)	Exposure Rate Survey (μ R/hr)	Cs-137 Activity Concentration (pCi/g)
RL06-0326-4738	C Soil @ 119m	1/12/2006	8.13E+00	1.27E+01	1.00E+01	-7.53E-03
RL06-0327-4739	C Soil @ 120m	1/12/2006	7.61E+00	1.16E+01	9.00E+00	-2.64E-03
RL06-0328-4740	C Soil @ 121m	1/12/2006	7.05E+00	1.11E+01	6.00E+00	-2.97E-03
RL06-0329-4741	C Soil @ 122m	1/12/2006	7.44E+00	1.28E+01	6.00E+00	-1.62E-03
RL06-0330-4742	C Soil @ 123m	1/12/2006	8.21E+00	1.25E+01	6.00E+00	-6.15E-05
RL06-0331-4743	C Soil @ 124m	1/12/2006	7.12E+00	1.21E+01	6.00E+00	-1.41E-02
RL06-0332-4744	C Soil @ 125m	1/12/2006	7.24E+00	1.29E+01	6.00E+00	-4.59E-03
RL06-0333-4745	C Soil @ 126m	1/12/2006	7.57E+00	1.19E+01	6.00E+00	-5.01E-03
RL06-0334-4746	C Soil @ 127m	1/12/2006	6.98E+00	1.49E+01	5.00E+00	-7.41E-03
RL06-0335-4747	C Soil @ 128m	1/12/2006	7.45E+00	1.11E+01	5.00E+00	1.51E-03
RL06-0336-4748	C Soil @ 129m	1/12/2006	7.02E+00	1.24E+01	5.00E+00	7.59E-04
RL06-0337-4749	C Soil @ 130m	1/12/2006	8.63E+00	1.14E+01	6.00E+00	-9.29E-03
RL06-0338-4750	C Soil @ 131m	1/12/2006	7.38E+00	1.23E+01	5.00E+00	-1.35E-02
RL06-0339-4751	C Soil @ 132m	1/12/2006	7.13E+00	1.21E+01	5.00E+00	-5.75E-03
RL06-0352-4752	C Soil @ 133m	1/13/2006	6.93E+00	1.17E+01	5.00E+00	5.82E-03
RL06-0353-4753	C Soil @ 134m	1/13/2006	8.70E+00	1.20E+01	5.00E+00	-4.84E-03
RL06-0354-4754	C Soil @ 135m	1/13/2006	7.01E+00	1.15E+01	6.00E+00	-6.68E-03
RL06-0355-4755	C Soil @ 136m	1/13/2006	7.39E+00	1.24E+01	6.00E+00	-4.46E-03
RL06-0356-4756	C Soil @ 137m	1/13/2006	8.00E+00	1.32E+01	5.00E+00	-9.43E-03
RL06-0357-4757	C Soil @ 138m	1/13/2006	7.74E+00	1.29E+01	5.00E+00	-6.17E-03
RL06-0358-4758	C Soil @ 139m	1/13/2006	7.75E+00	1.19E+01	5.00E+00	-2.36E-02
RL06-0359-4759	C Soil @ 140m	1/13/2006	8.06E+00	1.22E+01	6.00E+00	1.21E-03
RL06-0360-4760	C Soil @ 141m	1/13/2006	6.84E+00	1.19E+01	6.00E+00	1.02E-02
RL06-0361-4761	C Soil @ 142m	1/13/2006	7.24E+00	1.20E+01	5.00E+00	-4.79E-03
RL06-0362-4762	C Soil @ 143m	1/13/2006	9.01E+00	1.24E+01	6.00E+00	-7.99E-03
RL06-0363-4763	C Soil @ 144m	1/13/2006	7.15E+00	1.19E+01	6.00E+00	-1.19E-02
RL06-0364-4764	C Soil @ 145m	1/13/2006	7.27E+00	1.38E+01	6.00E+00	-1.31E-02
RL06-0365-4765	C Soil @ 146m	1/13/2006	7.13E+00	1.23E+01	5.00E+00	-1.65E-03
RL06-0366-4766	C Soil @ 147m	1/13/2006	7.24E+00	1.22E+01	5.00E+00	3.93E-03

Table 6
Summary Data for Excavation and Removal of West Section CWS Line

Sample ID	Sample Location	Collection Date	Sample Field Screen (Kcpm)	Walkover Scan Survey (Kcpm)	Exposure Rate Survey (μ R/hr)	Cs-137 Activity Concentration (pCi/g)
RL06-0367-4767	C Soil @ 148m	1/13/2006	7.31E+00	1.21E+01	6.00E+00	1.26E-03
RL06-0368-4768	C Soil @ 149m	1/13/2006	6.92E+00	1.44E+01	5.00E+00	-2.07E-03
RL06-0369-4769	C Soil @ 150m	1/13/2006	6.72E+00	1.18E+01	6.00E+00	4.79E-04
RL06-0370-4770	C Soil @ 151m	1/13/2006	7.07E+00	1.14E+01	6.00E+00	9.33E-03
RL06-0371-4771	C Soil @ 152m	1/13/2006	6.91E+00	1.22E+01	6.00E+00	2.26E-03
RL06-0372-4772	C Soil @ 153m	1/13/2006	7.18E+00	1.32E+01	6.00E+00	-2.04E-03
RL06-0373-4773	C Soil @ 154m	1/13/2006	6.95E+00	1.12E+01	5.00E+00	2.93E-03
RL06-0374-4774	C Soil @ 155m	1/13/2006	8.04E+00	1.10E+01	5.00E+00	-6.46E-03
RL06-0375-4775	C Soil @ 156m	1/13/2006	8.24E+00	1.12E+01	5.00E+00	-3.02E-03
RL06-0377-4776	C Soil @ 157m	1/13/2006	7.70E+00	1.13E+01	5.00E+00	-1.47E-03
RL06-0378-4777	C Soil @ 158m	1/13/2006	7.28E+00	1.05E+01	5.00E+00	8.30E-04
RL06-0379-4778	C Soil @ 159m	1/13/2006	8.46E+00	9.51E+00	4.00E+00	-3.72E-03
RL06-0380-4779	C Soil @ 160m	1/13/2006	7.23E+00	9.44E+00	4.00E+00	8.60E-03
RL06-0381-4780	C Soil @ 161m	1/13/2006	7.53E+00	1.04E+01	5.00E+00	-3.40E-03
RL06-0382-4781	C Soil @ 162m	1/13/2006	7.13E+00	1.25E+01	5.00E+00	4.40E-03
RL06-0383-4782	C Soil @ 163m	1/13/2006	7.11E+00	1.23E+01	5.00E+00	5.93E-03
RL06-0384-4783	C Soil @ 164m	1/13/2006	7.63E+00	1.25E+01	6.00E+00	1.80E-02
RL06-0385-4784	C Soil @ 165m	1/13/2006	7.83E+00	1.30E+01	6.00E+00	8.20E-03
RL06-0386-4785	C Soil @ 166m	1/13/2006	7.25E+00	1.16E+01	6.00E+00	1.96E-03
RL06-0387-4786	C Soil @ 167m	1/13/2006	7.61E+00	1.24E+01	6.00E+00	-3.98E-03
RL06-0481-4864	Sidewall Soil @ 210'	1/19/2006	7.54E+00	1.20E+01	1.00E+01	-5.47E-03
RL06-0482-4865	Sidewall Soil @ 220'	1/19/2006	7.19E+00	1.23E+01	9.00E+00	-2.85E-02
RL06-0483-4866	Sidewall Soil @ 230'	1/19/2006	7.84E+00	1.17E+01	9.00E+00	3.72E-03
RL06-0484-4867	Sidewall Soil @ 240'	1/19/2006	8.57E+00	1.26E+01	9.00E+00	8.61E-03
RL06-0485-4868	Sidewall Soil @ 250'	1/19/2006	8.00E+00	1.41E+01	9.00E+00	-3.78E-03
RL06-0486-4869	Sidewall Soil @ 260'	1/19/2006	8.11E+00	1.28E+01	1.00E+01	1.10E-03
RL06-0487-4870	Sidewall Soil @ 270'	1/19/2006	7.62E+00	1.30E+01	9.00E+00	-9.55E-03
RL06-0488-4871	Sidewall Soil @ 280'	1/19/2006	8.09E+00	1.40E+01	1.00E+01	1.22E-02
RL06-0489-4872	Sidewall Soil @ 290'	1/19/2006	7.82E+00	1.30E+01	1.00E+01	-2.16E-02

Table 6
Summary Data for Excavation and Removal of West Section CWS Line

Sample ID	Sample Location	Collection Date	Sample Field Screen (Kcpm)	Walkover Scan Survey (Kcpm)	Exposure Rate Survey (μ R/hr)	Cs-137 Activity Concentration (pCi/g)
RL06-0490-4873	Sidewall Soil @ 300'	1/19/2006	7.81E+00	1.35E+01	1.10E+01	-1.60E-02
RL06-0491-4874	Sidewall Soil @ 310'	1/19/2006	7.57E+00	1.21E+01	9.00E+00	1.38E-02
RL06-0492-4875	Sidewall Soil @ 320'	1/19/2006	7.49E+00	1.28E+01	1.00E+01	3.08E-03
RL06-0494-4876	Sidewall Soil @ 330'	1/19/2006	7.89E+00	1.25E+01	1.00E+01	-1.48E-03
RL06-0495-4877	Sidewall Soil @ 340'	1/19/2006	7.38E+00	1.30E+01	9.00E+00	-2.85E-02
RL06-0496-4878	Sidewall Soil @ 350'	1/19/2006	7.49E+00	1.20E+01	1.00E+01	-6.00E-03
RL06-0497-4879	Sidewall Soil @ 360'	1/19/2006	7.51E+00	1.50E+01	1.00E+01	3.75E-02
RL06-0498-4880	Sidewall Soil @ 370'	1/19/2006	7.58E+00	1.29E+01	1.00E+01	9.77E-03
RL06-0499-4881	Sidewall Soil @ 380'	1/19/2006	7.63E+00	1.21E+01	1.10E+01	1.67E-03
RL06-0500-4882	Sidewall Soil @ 390'	1/19/2006	7.30E+00	1.26E+01	9.00E+00	-6.82E-03
RL06-0501-4883	Sidewall Soil @ 400'	1/19/2006	7.92E+00	1.49E+01	1.00E+01	-8.26E-03
RL06-0502-4884	Sidewall Soil @ 410'	1/19/2006	7.81E+00	1.18E+01	1.10E+01	-3.55E-03
RL06-0503-4885	Sidewall Soil @ 420'	1/19/2006	7.64E+00	1.29E+01	1.00E+01	-2.08E-03
RL06-0504-4886	Sidewall Soil @ 430'	1/19/2006	7.72E+00	1.33E+01	1.00E+01	-4.57E-03
RL06-0505-4887	Sidewall Soil @ 440'	1/19/2006	7.47E+00	1.48E+01	9.00E+00	-2.41E-02
RL06-0506-4888	Sidewall Soil @ 450'	1/19/2006	7.71E+00	1.28E+01	1.00E+01	-2.27E-02
RL06-0507-4889	Sidewall Soil @ 460'	1/19/2006	7.88E+00	1.25E+01	9.00E+00	-6.59E-03
RL06-0508-4890	Sidewall Soil @ 470'	1/19/2006	8.36E+00	1.28E+01	9.00E+00	-2.79E-02
RL06-0509-4891	Sidewall Soil @ 480'	1/19/2006	7.73E+00	1.26E+01	9.00E+00	-1.81E-02
RL06-0510-4892	Sidewall Soil @ 490'	1/19/2006	7.38E+00	1.22E+01	9.00E+00	1.35E-02
RL06-0511-4893	Sidewall Soil @ 500'	1/19/2006	7.85E+00	1.30E+01	8.00E+00	-1.86E-02