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Final Status Survey Report #22 Documentation

(UNDER SEPARATE COVER)



FINAL

COLUMBUS CLOSURE PROJECT
FINAL STATUS SURVEY REPORT FOR REMAINING
LAND AREAS INSIDE THE WJN SITE RESTRICTED
AREA

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

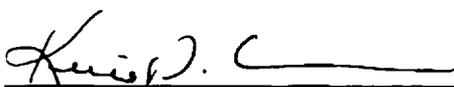
**FINAL Status Survey Report for the Remaining Land Areas Inside the WJN Site
Restricted Area**

Revision Data Compiled By:



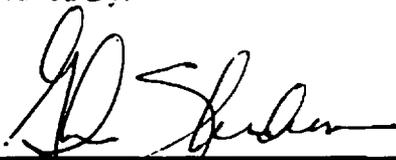
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Contract Number: DE-AC24-04OH20171

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1.0 Introduction

This report contains the Final Status Surveys (FSS) for the remaining land areas inside the West Jefferson North (WJN) site restricted area 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, 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 primarily in February of 2006.

The intent of this final status survey report is to provide a complete and unambiguous record of the radiological status of the areas of interest. Sufficient information and data are provided to enable an independent recreation 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 (ORAU, 1992).

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 comprehensive, annotated outline presented in Chapter 9 of NUREG-5849 (ORAU, 1992).

1.1 Background

On April 16, 1943, 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, 2003a).

The BCO facilities at the King Avenue Site, Columbus, Ohio, and the West Jefferson North (WJN) and South (WJS) Sites, West Jefferson, Ohio, became partially radiologically contaminated as a result of the R&D activities. Decontamination of the King Avenue and WJS Sites has been completed and remediation has been completed 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, 2003a). The Assistant Secretary for Nuclear Energy of the DOE accepted the decontamination and decommissioning

(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, 2003a). 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 establish 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, 2003a).

The DOE has contracted ECC&E2 Closure Services, LLC (Closure Services), to safely remove DOE radioactive material and contamination from the WJN site. Removal of radioactive material has been 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 for the remaining land areas inside the WJN Site Restricted Area under Closure Services' control to demonstrate that these areas are 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. The CCP is the successor of the BCLDP. The WJN site has one permanent structure remaining, the WJN Well House associated with the CCP. Three former research facilities, JN-1, JN-2, and JN-3 have been demolished as well as JN-6, the guard house. Several outfalls, filter beds, and wells are also located at the site. See **Figure 1** for site map of the CCP.

2.1 Area Description

Final status surveys of the remaining areas within the WJN Site Restricted Area included two groups of land parcels. The first group included land parcels not previously evaluated for unrestricted release. These parcels are identified as Sections A through F in **Figure 2**. The second group included land parcels meeting the unrestricted release criteria that had been excavated and backfilled. These parcels are identified as the excavation areas of Buildings JN-1, JN-2, and JN-3.

Figure 2 details the land parcels lying within the fenced restricted area. Sections A through F, and the previously excavated areas of Buildings JN-1, JN-2, and JN-3 are shown on the figure. **Figures 3 through 10** detail the individual grid maps for Sections A through F.

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

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. These areas are not expected to contain residual radioactivity, based on knowledge of site history and previous information.

Sections A thru F are considered Unaffected Areas as defined in NUREG/CR-5849.

CS Characterization Technicians performed walkover surveys of 100% of unexcavated portions of Sections A thru F. Expanded coverage was performed on these areas since

these areas were not scanned in any of the previous FSS efforts. Initial characterization sampling was performed by BMI prior to the major demolition and removal of the buildings, and remediation of the connecting areas. Results of this sampling indicated residual radioactive concentrations present within the areas were less than 25% of the screening criteria. Scanning measurements performed by CS Characterization Technicians indicated that the majority of Sections A through F were less than 25% of the screening criteria. However, the walkover scans did reveal four isolated locations within grids that were greater than 25% of the screening criteria. The four isolated locations were as follows:

- AA-1 - Waste Storage, Grids 3-048; 3-049; 3-061; 3-062
- AA-2 - Waste Storage, Grids 3-055; 3-056; 3-068; 3-069
- AA-3 - Waste Storage/Loading Area, Grids 1-042; 1-043; 1-044; 1-057; 1-058; 1-059, and
- AA-4 - Decon Area; Grids 1-140; 1-141; 1-155; 1-156

Characterization Technicians marked the areas with paint for removal by the Excavation Crews. Complete scans of the locations and adjacent grids were performed following the removal of the identified locations. Procedures DD-97-02, Section 6.4, required the reclassification of the quadrant or grouping of grids to affected areas. Tables 3 through 6 summarize the walkover scans, exposure rate surveys, and reported soil sample results.

3.0 Decommissioning Activities

3.1 *Decommissioning Objective*

The objective of the final status surveys performed within the land areas was to statistically demonstrate that the grounds are free of residual radioactive contamination. The grounds are determined to be free of residual radioactive contamination when 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.

4.0 Final Status Survey Procedures

Planning and implementation of the final status survey of the eight unaffected areas adhered to the requirements of the Final Status Plan (Battelle, 2000).

4.1 Sampling Parameters

In accordance with DD-97-02, section 6.4.3, a minimum of 6 soil samples was collected from each of the eight unaffected areas. Final status samples of four affected areas were obtained from survey grids. Survey grids were each ten by ten meters, with each grid divided into equal sized quadrants. Final status soil samples for affected areas were then obtained from each of the grid quadrants. Analyses of samples by gamma spectroscopy were performed by the on-site Radioanalytical Laboratory (RAL).

4.2 Major Contaminants Identified

The characterization of the remaining land areas inside the WJN site identified Cs-137 as the primary radiological contaminant of concern (RCOC). Other RCOCs included Cobalt-60 (Co-60), Europium-152 (Eu-152) and Eu-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 isotopic activity. Further, the release criteria set for Cs-137 is considered conservative for the decommissioning activities. The surrogate relationship of Cs-137 to other RCOCs was calculated using data presented in **Table 2**.

Table 2 presents the isotopic quantity and activity concentrations of samples collected from the Building JN-1 foundation and the backyard of the building, as well as the excavation of the Bog Area. Remediation samples were collected between October and November of 2005. These data are not associated with the release of the remaining land areas within the WJN site. Average activities for the multiple samples were calculated for each RCOC prior to setting the ratios against Cs-137.¹ For each RCOC, the average activity concentration was set as a ratio against the average Cs-137 activity concentration as obtained from previous actions at the filter beds. Cs-137 activity ratios for each RCOC utilized to calculate the RCOCs for the remaining areas within the WJN fence line are presented at the lower portion of **Table 2**.

¹ Battelle, *Radiological Status of Abandoned Filter Bed Presentation*, http://www.ohio.doe.gov/ccp_scb/. Posted 7/15/2003. Presentation provided by DOE to the CCP website. Page titled "Radioactive Inventory of the Abandoned North Filter Beds & Limit Fractions" contains sampling data obtained from March through September 2000 from the filter beds. Average Cs-137 ratios were utilized to calculate the activity concentrations of the isotopes of concern.

4.2.1 Guidelines Established

Table 1 presents the guidelines for residual radioactivity concentrations for soil and solid volumes as applied to the grounds. 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 has been received by the CCP which contains soil radioactivity concentration guidelines for Co-60, Sr-90, Cs-137, Ra-226, and Ra-228. NRC guidance for soil radioactivity concentration guidelines for natural, enriched and depleted uranium have also been incorporated into the release limits. Table 1 compiles soil residual radioactivity concentration guidelines to be utilized by the CCP. Its values have been generated primarily from the various reference technical documents and from soil guidelines generated from computer pathway analyses. Using the ratios from Table 2 and a Cs-137 to Pu-241 ratio of 2.8, obtained from ORIGEN 2.1 derived values, the sum of ratios of radionuclides will meet unity at a Cs-137 concentration of 7.3 pCi/g.

Exposure rates were compared to the 5 $\mu\text{R/hr}$ 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 $8 \pm 2 \mu\text{R/hr}$. In order to show compliance with the 5 $\mu\text{R/hr}$ above background release criterion, grounds exposure rate surveys must be less than or equal to 13 $\mu\text{R/hr}$ to be compliant.

5.0 Equipment and Procedures

5.1 Equipment

Survey instruments sensitive to gamma radiation are used to monitor the grounds for residual radioactive materials. Ludlum Model 44-10 two-inch by two-inch sodium iodide detectors with Eberline ESP-2 meters were used to scan the grounds. Ludlum Model 19 exposure rate meters were used to obtain microReontgen per hour ($\mu\text{R/hr}$) measurements.

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

- A VMS based Canberra Procount data acquisition system in conjunction with high purity germanium detectors for gamma spectroscopy of soil 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 concentration (MDC_{scan}) is determined to demonstrate that the MDC_{scan} is less than the modified Cs-137 cleanup criteria. The MDC_{scan} is calculated utilizing the methodology described in NUREG-1507 and the background count rate and a default detector response to Cs-137 (NRC, 1998). The equation used during the walkover surveys of the CCP incorporates a d' of 1.38 and a surveyor efficiency of 0.5. The ambient background in the area was 11,000 counts per minute (cpm). The following is the calculation of the MDC_{scan} :

$$b_t = (11,000 \text{ cpm}) \times (1 \text{ sec}) \times (1 \text{ min}/60 \text{ sec}) = 183 \text{ counts}$$

$$\text{MDCR} = (1.38) \times (\sqrt{183 \text{ counts}}) \times (60 \text{ sec}/1\text{min}) = 1120 \text{ cpm}$$

$$\text{MDCR}_{\text{surveyor}} = 1120 \text{ cpm}/\sqrt{0.5} = 1584 \text{ cpm}$$

$$\text{MDER} = 1584 \text{ cpm}/(900 \text{ cpm}/\mu\text{R/hr}) = 1.76 \mu\text{R/hr}$$

$$\text{MDC}_{\text{scan}} = (5 \text{ pCi/g}) * \frac{1.76 \mu\text{R/hr}}{1.307 \mu\text{R/hr}} = 6.73 \text{ pCi/g}$$

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 Exposure Rate Surveys

The calculated mean background exposure rate and the 95 percent confidence intervals used for the CCP grounds are $8 \pm 2 \mu\text{R/hr}$. The exposure rate readings were individually compared to the mean background value of $8 \pm 2 \mu\text{R/hr}$ in order to show compliance with the $5 \mu\text{R/hr}$ above background release criterion (grounds exposure rate surveys must be less than or equal to $13 \mu\text{R/hr}$ to be compliant). The average one meter measurement was $7.1 \mu\text{R/hr}$, the minimum measurement was $3 \mu\text{R/hr}$ and the maximum measurement was $11 \mu\text{R/hr}$. **Tables 3 through 14** presents the exposure rate results for each area.

The final status survey of land areas north of JN-4, conducted in January and February of 2005, identified generally elevated gamma scan levels and exposure rates. Exposure rates ranged from 14 to 20 microR/h and therefore were in excess of the release guideline of $5 \mu\text{R/h}$ above the mean site background level of $8 \pm 2 \mu\text{R/h}$. The FSS report for those land areas attributed the elevated gamma levels to residual contaminated materials at the site of the nearby JN-1 Building demolition activities and stated that the exposure rates would be resurveyed, following demolition and removal of the JN-1 Building. At the time of the survey of remaining land areas inside the WJN site restricted area, described in this report (i.e., November 2005), the contaminated materials had been removed from the JN-1 Building area, and the area had been backfilled. Surveys of Section F included a portion of the surfaces within the areas addressed by the earlier land survey north of Building JN-4. The exposure rates currently present in those areas, presented in Table 12, range from 8 to $9 \mu\text{R/h}$ – consistent with mean site background levels. Exposure rates in other surface grids, adjacent to areas addressed by the earlier land survey north of Building JN-4, are also in this same range of levels. These findings demonstrate that elevated gamma levels during the earlier survey were due to materials from the JN-1 Building, rather than from the soils themselves. Based on these results, it is concluded that the land areas north of Building JN-4 satisfy the established release guidelines. This conclusion is substantiated by the results of the ORISE verification survey of the land areas north of JN-1 in February 2006. That verification survey indicated exposure rates ranging from 6 to 11 microR/h and identified no locations of elevated surface gamma levels.

6.2 Grounds and Excavation Sampling

Cesium-137 is utilized as a surrogate for determining compliance to the cleanup criteria presented in **Table 1**. The CCP has consistently utilized Cs-137 as a surrogate for other radionuclides of concern as it is the predominate radionuclide present throughout the site and the buildings. Additionally, Cs-137 exhibits the lowest cleanup criteria of 15 pCi/g . The calculation of the Cs-137 surrogate value is performed utilizing sample results obtained prior to remediation of the area in question. **Table 2** presents the results of the pre-remediation samples of the Building JN-1 Backyard and the Bog Area. As such,

Table 2 reported analytical results are not associated with the remaining areas within the WJN fence line.

Compliance to the cleanup criteria presented in Table 1 is demonstrated through a "fraction of limit." The total quantity and activity concentrations are calculated using the average isotopic ratios of radionuclides to Cs-137 as obtained for the remediation of the Building JN-1 Backyard and the Bog Area, with the exception of Pu-241 (Battelle, 2003b). Pu-241 is calculated by applying a ratio to sum of Pu-238 and Pu-239 (Battelle, 2003c). Results for RCOCs are 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. Due to the low concentrations of Cs-137 present in the samples, a "fraction of limit" calculation was not performed for the sample results.

Table 7 thru 14 present the reported analytical results of the samples collected from Section A - F, the JN-2/3 and West Yard, and the JN-1 and East Yard. A minimum of six (6) locations distributed through each of Section A-F were collected according to Section 6.4.3 of DD-97-02, Rev. 0.

As stated, CS Characterization Technicians identified four isolated locations of elevated scanning measurements. These areas and the areas immediately adjacent to the elevated activity were then reclassified from unaffected areas to affected areas (AA). Samples were collected in each of the four grid quadrants from the affected areas identified during the walkover surveys. The following table presents a summary of the sampling results from the affected areas.

Location	Number of Samples	Cs-137 Average (pCi/g)	Cs-137 Standard Deviation (pCi/g)	Cs-137 Range (pCi/g)	Cs-137 Modified Screening Criteria (pCi/g)
AA-1	16	0.17	0.20	0.02 to 0.87	7.3
AA-2	16	0.10	0.08	0.02 to 0.26	7.3
AA-3	24	0.05	0.04	-0.001 to 0.14	7.3
AA-4	16	0.08	0.06	-0.03 to 0.21	7.3

Statistical analyses were performed on the sample data for Sections A -F and the JN-1 and JN-2/3 footprints in accordance with Section 6.4.3 of DD-97-02, Rev. 0 and NUREG/CR-5849, §8.5. As stated in §8.5, the EPA has recommended applying the calculated value of μ_a , relative to a guideline value, at a desired level of confidence. The value of μ_a is compared to the guideline value; if the μ_a is less than the guideline, the area meets the guideline at a 95% confidence level. This in turn means that the probability is less than 5% that the μ_a , will pass the test, when the true mean activity level exceeds the guideline value. The maximum calculated μ_a , for Cs-137 of 0.26 pCi/g, was less than the

modified screening criteria of 7.3 pCi/g. The comparison value calculation for each area is presented as Tables 15 through 22.

The following is a summary table of the results of soil sampling for Cs-137 for Section A-F and the JN-2/3 and JN-1 footprints:

Location	Number of Samples	Cs-137 Average (pCi/g)	Cs-137 Standard Deviation (pCi/g)	Cs-137 Range (pCi/g)	Cs-137 Comparison Value (pCi/g)	Cs-137 Modified Screening Criteria (pCi/g)
Section A	10	0.05	0.03	0.01 to 0.09	0.07	7.3
Section B	10	0.03	0.01	0.01 to 0.05	0.04	7.3
Section C	10	0.06	0.05	0.001 to 0.15	0.08	7.3
Section D	10	0.04	0.03	-0.01 to 0.08	0.06	7.3
Section E	10	0.13	0.12	-0.02 to 0.38	0.20	7.3
Section F	22	0.13	0.07	0.05 to 0.27	0.16	7.3
JN-2/3 Footprint	10	0.041	0.08	-0.01 to 0.04	0.09	7.3
JN-1 Footprint	10	0.17	0.17	0.05 to 0.62	0.26	7.3

6.3 Measurements

In accordance with NUREG/CR-5849, Section 4.2.3 and DD-97-02, Section 6.4.2 walkover surveys covered 100 percent of the ground areas. Scanning was performed with a two inch by two inch sodium iodide detector in accordance with Section 6.4.2 of DD-97-02. Surveys of the final state of the areas did not exceed the DLV of 18,374 cpm. Tables 7 through 14 present the walkover survey results for each area.

7.0 Conclusions

Reported analytical results for media samples obtained from the grounds are below the residual radioactivity concentrations for soil and solid volumes as presented in **Table 1**. The final status survey results demonstrate that the radiological endpoint criteria objectives of the NRC-approved Decommissioning Plan have been met for the eight unaffected areas and four affected areas addressed by this report and the areas are available for use without radiological restrictions.

8.0 References

Battelle, 2003a. "Decommissioning Plan for the Battelle Memorial Institute Columbus Operations." DD-93-19.

Battelle, 2003b. Waste Characterization, Classification, and Shipping Support Technical Basis Document, Rev. 5 for BCLDP West Jefferson Facility, November 2003. Isotopic mixture for Pu-241 is calculated using the values obtained from the ORIGEN2.1-derived data values presented in the technical basis document.

Battelle, 2000. "Radiological Characterization and Final Status Survey Plan for Battelle Columbus Laboratory Decommissioning Project West Jefferson Site." DD-97-02.

Battelle, 1993. "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.

U.S. Nuclear Regulatory Commission (NRC), 1998. "Minimum Detectable Concentrations With Typical Radiation Survey Instruments for Various Contaminants and Field Conditions" NUREG-1507.

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

ECC & E2 Closure Services. "Columbus Closure Project Characterization and Final Status Survey Report for the JN-4 North Grounds Area", May 2006.

ORISE. Final Report – Verification Survey Results for the Active North Filter Bed (ANFB)-North Subsurface Sand Filter, JN-4 North Land Area, ANFB to Manhole -2 Trench, and the ANFB Former Dosing Chamber Excavation, Columbus Closure Project, West Jefferson Site, West Jefferson, Ohio. February 9, 2006.

Figures

Figure 1
Site Map

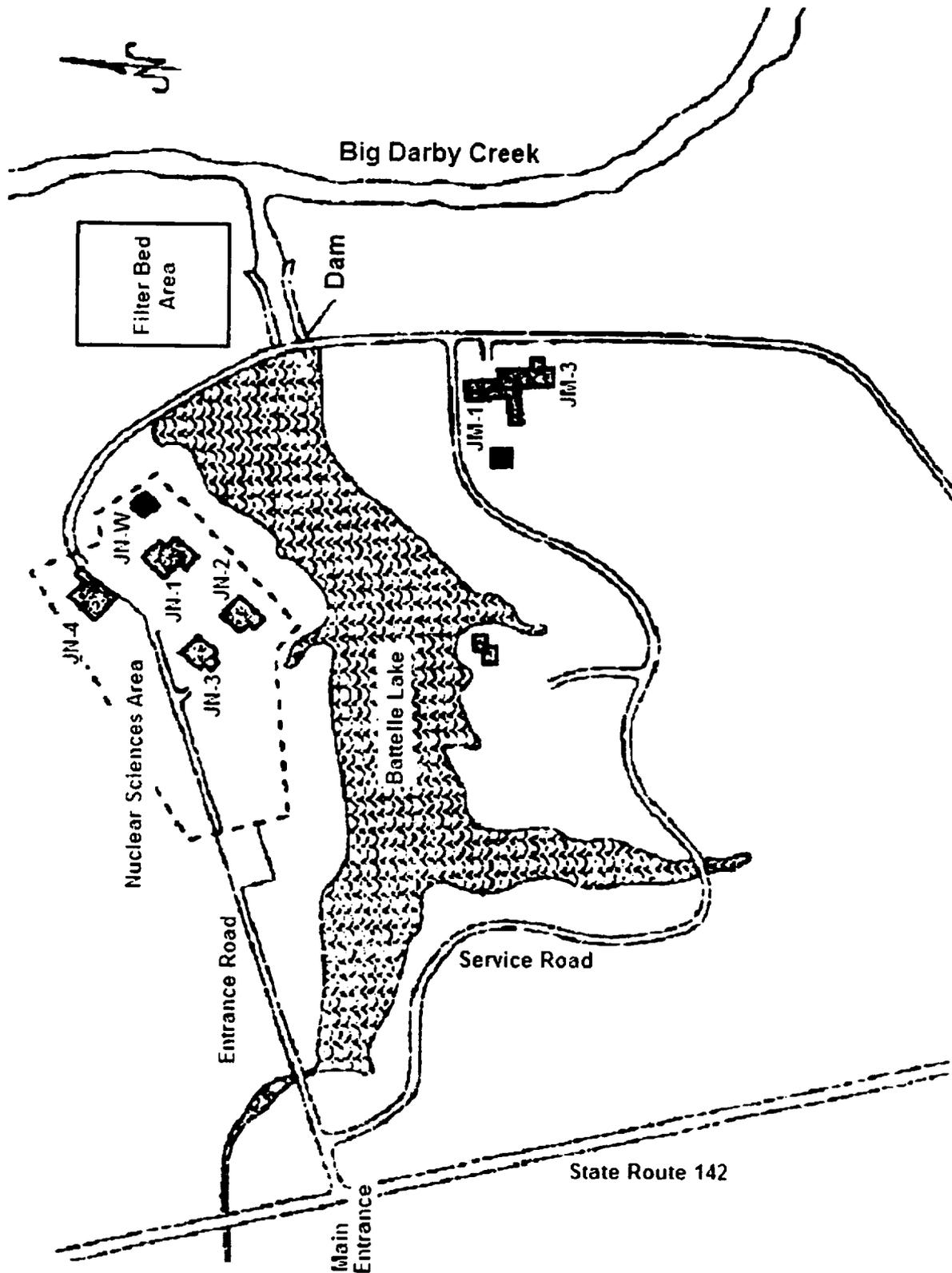


Figure 2
Area Designations

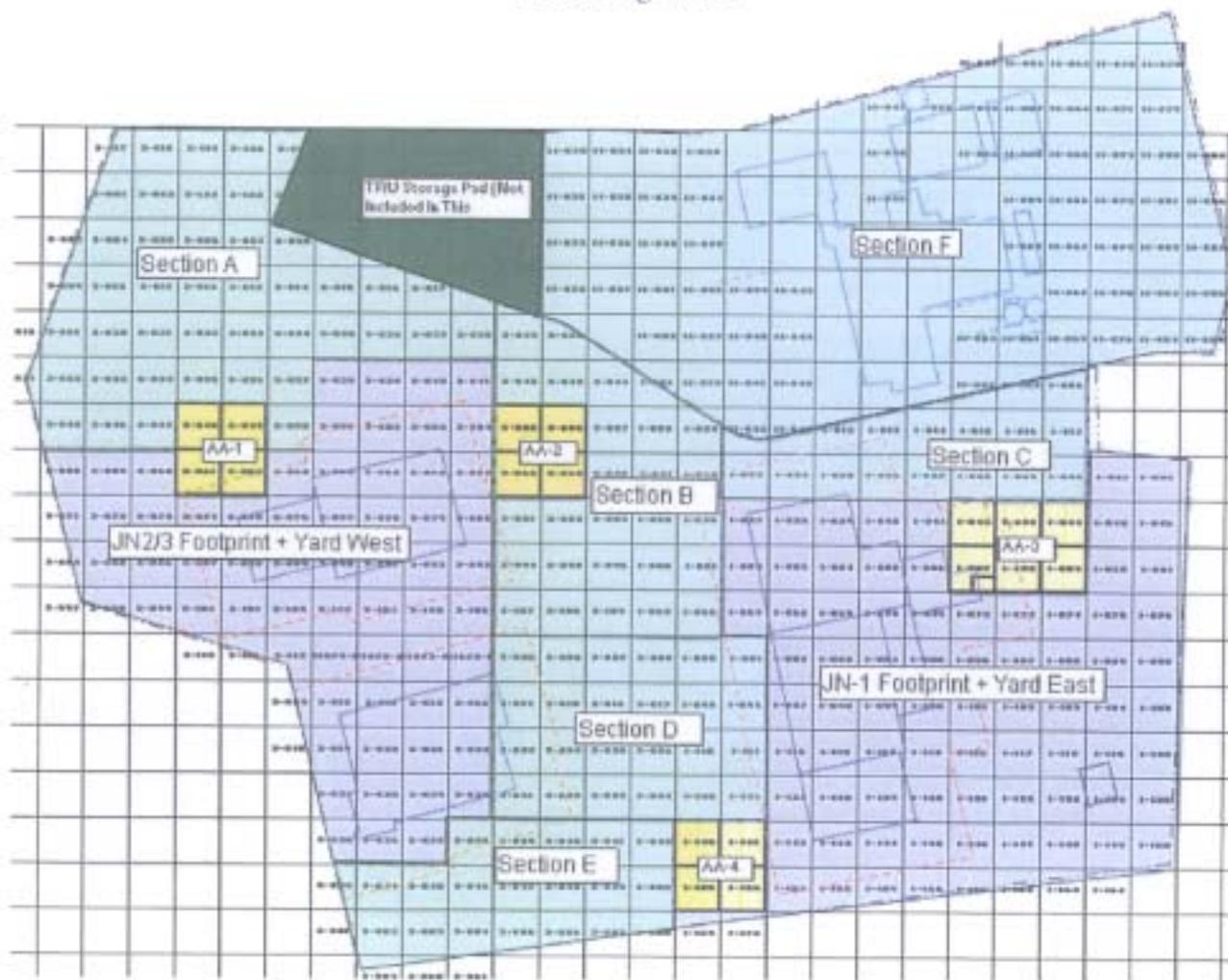


Figure 3
Section A Map



Figure 4
Section B Map

3-029	3-030			
3-042	3-043	3-044	1-001	
3-055	3-056	3-057	1-008	1-009
3-068	3-069	3-070	1-021	1-022
3-081	3-082	3-083	1-035	1-036
3-094	3-095	3-096	1-050	1-051
3-107	3-108	3-109	1-065	1-066

Figure 5
Section C Map

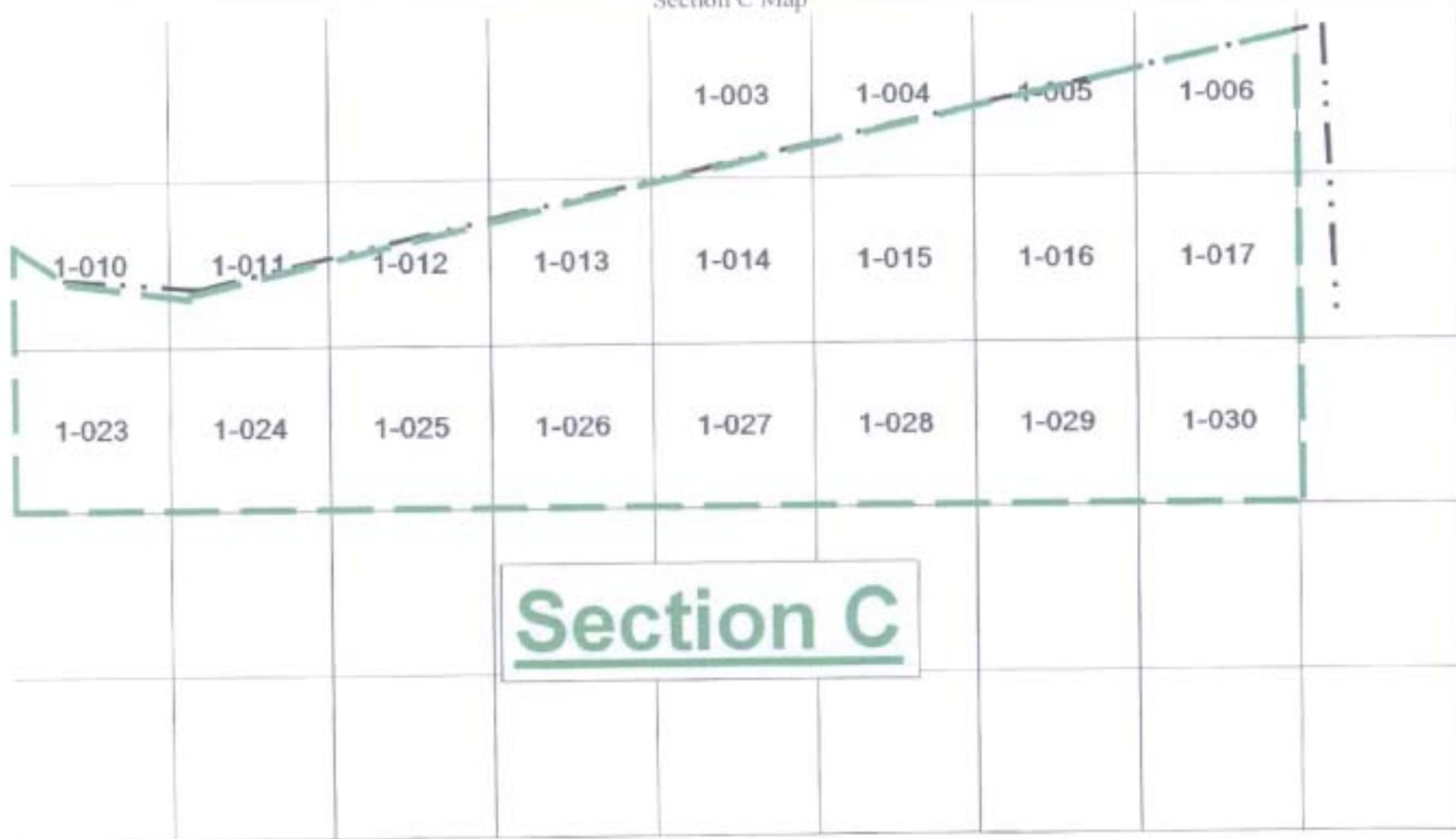


Figure 6
Section D Map

The map displays a grid of 24 numbered plots arranged in 4 rows and 6 columns. A central box labeled 'Section D' is positioned over the plots 2-016 and 2-025. The plots are numbered as follows:

2-005	2-006	2-007	2-008	1-080	1-081
2-014	2-015	2-016	2-017	1-095	1-096
2-023	2-024	2-025	2-026	1-110	1-111
2-031	2-032	2-033	2-034	1-125	1-126

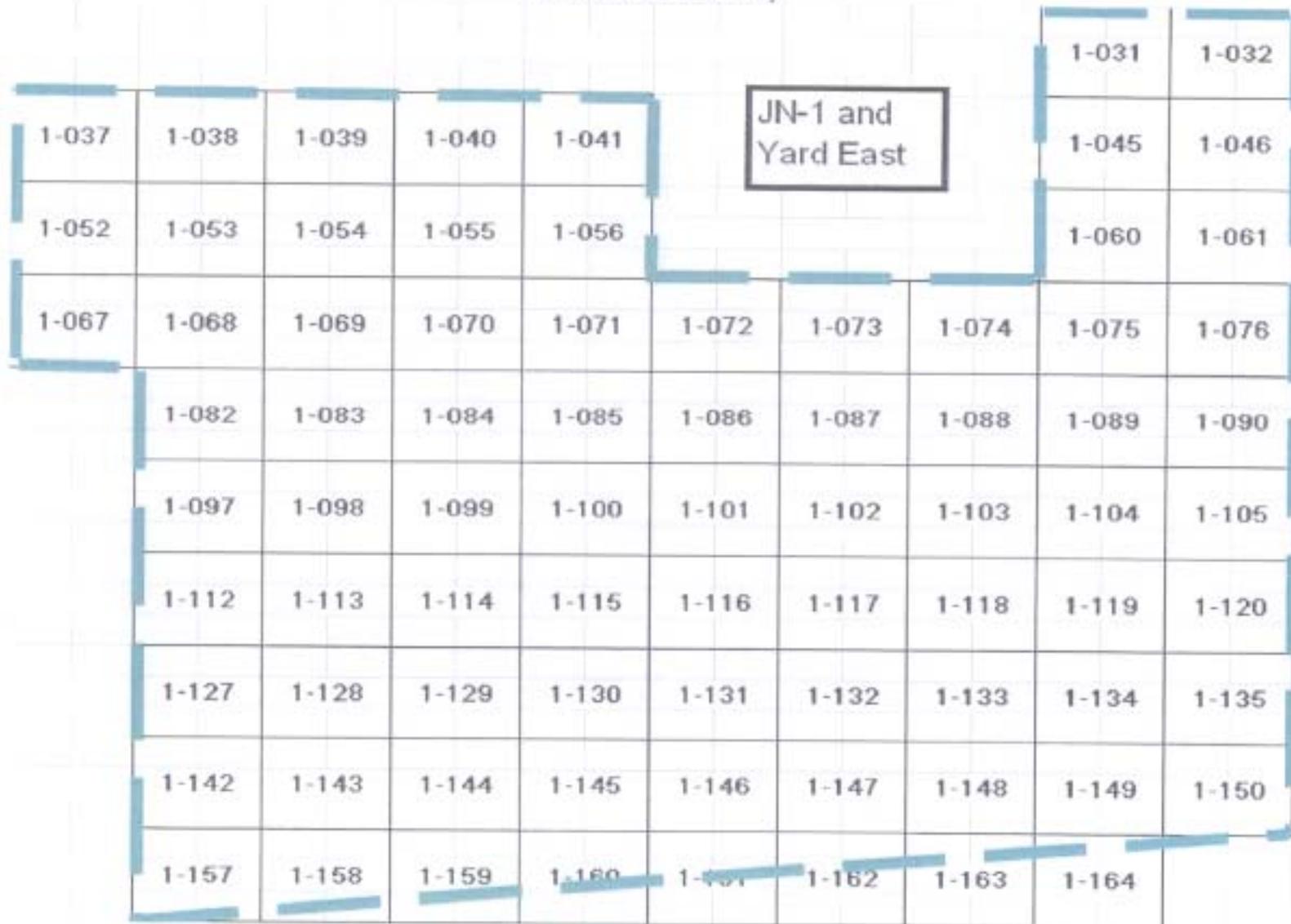
Figure 7
Section E Map



Figure 9
JN-2/3 and Yard West Map



Figure 10
JN-1 and Yard East Map



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
Am-243	na	30
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	
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
Pu-239	na	25
Pu-240	na	25
Pu-241	na	25
Pu-242	na	25
Ra-226 (0-15 cm of soil)	5 ^(2,3)	na
Ra-226 (>15 cm of soil)	15 ^(2,3)	na

Radionuclide ^(a)	King Avenue Concentration (pCi/g) ^(b)	West Jefferson Concentration (pCi/g) ^(b)
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

Table 1 Notes and References

Notes:

- 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.
- 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.
- Indicates that this radionuclide is not expected to be found at the indicated site.
- 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:

- 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).
- 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.
- DOE Order 5400.5, "Radiation Protection of the Public and the Environment".

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	0.55	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	0.60	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	0.35	0.01	0.23	0.01

Limits		X _i Cs-137 Ratios		Activity (pCi/g) = Cs-137/Ratio	
Cs-137	15 pCi/g			Cs-137	7.30
Co-60	8 pCi/g	Cs/Co-60	35.7	Co-60	0.20
Eu-152	36 pCi/g	Cs/Eu-152	76.1	Eu-152	0.10
Eu-154	32 pCi/g	Cs/Eu-154	225.1	Eu-154	0.03
Am-241	30 pCi/g	Cs/Am-241	78.9	Am-241	0.09
Sr-90	5 pCi/g	Cs/Sr-90	4.1	Sr-90	1.78
Pu-238	25 pCi/g	Cs/Pu-238	57.5	Pu-238	0.13
Pu-239	25 pCi/g	Cs/Pu-239	83.1	Pu-239	0.09
Pu-241	25 pCi/g	*Cs/Pu-241	2.8	Pu-241	2.61
				Sum	0.99

Table 3
Affected Area (AA)-I Survey and Sampling Results

Sample ID	Location	Collection Date	Walkover Scan (Results in cpm)	Exposure Rate μR/hr	Cs-137 Content (Results in pCi/g)
RL06-0796-5120	Grid 3-048 NW	2/8/2006	13000	11	2.05E-01
RL06-0797-5121	Grid 3-048 NE	2/8/2006	12300	11	2.19E-01
RL06-0798-5122	Grid 3-048 SW	2/8/2006	12300	10	7.81E-02
RL06-0799-5123	Grid 3-048 SE	2/8/2006	12100	11	1.06E-01
RL06-0800-5124	Grid 3-049 NW	2/8/2006	12400	10	1.61E-01
RL06-0801-5125	Grid 3-049 NE	2/8/2006	12700	10	8.70E-01
RL06-0802-5126	Grid 3-049 SW	2/8/2006	13800	10	3.52E-01
RL06-0803-5127	Grid 3-049 SE	2/8/2006	14400	10	1.34E-01
RL06-0804-5128	Grid 3-061 NW	2/8/2006	10000	10	1.07E-01
RL06-0805-5129	Grid 3-061 NE	2/8/2006	10600	9	2.79E-02
RL06-0806-5130	Grid 3-061 SW	2/8/2006	10300	9	8.05E-02
RL06-0807-5131	Grid 3-061 SE	2/8/2006	10200	9	1.89E-02
RL06-0808-5132	Grid 3-062 NW	2/8/2006	11100	9	1.08E-01
RL06-0809-5133	Grid 3-062 NE	2/8/2006	11500	10	1.36E-01
RL06-0810-5134	Grid 3-062 SW	2/8/2006	10700	9	5.65E-02
RL06-0811-5135	Grid 3-062 SE	2/8/2006	10600	10	7.97E-02

Table 4
Affected Area (AA)-2 Survey and Sampling Results

Sample ID	Location	Collection Date	Walkover Scan (Results in cpm)	Exposure Rate μ R/hr	Cs-137 Content (Results in pCi/g)
RL06-0905-5220	Grid 3-055 NW	2/11/2006	9990	9	2.02E-02
RL06-09065221	Grid 3-055 NE	2/11/2006	12600	10	8.69E-02
RL06-0907-5222	Grid 3-055 SW	2/11/2006	10400	9	2.75E-02
RL06-0908-5223	Grid 3-055 SE	2/11/2006	12500	9	1.83E-02
RL06-0909-5224	Grid 3-056 NW	2/11/2006	11300	10	1.87E-01
RL06-0910-5225	Grid 3-056 NE	2/11/2006	11800	10	1.15E-01
RL06-0911-5226	Grid 3-056 SW	2/11/2006	12100	9	2.56E-01
RL06-0912-5227	Grid 3-056 SE	2/11/2006	13000	11	7.69E-02
RL06-0913-5228	Grid 3-068 NW	2/11/2006	10400	8	2.37E-01
RL06-0914-5229	Grid 3-068 NE	2/11/2006	12200	8	2.66E-02
RL06-0915-5230	Grid 3-068 SW	2/11/2006	10600	8	2.78E-02
RL06-0916-5231	Grid 3-068 SE	2/11/2006	10000	8	4.13E-02
RL06-0917-5232	Grid 3-069 NW	2/11/2006	14600	11	1.82E-01
RL06-0918-5233	Grid 3-069 NE	2/11/2006	14500	10	2.08E-01
RL06-0919-5234	Grid 3-069 SW	2/11/2006	16000	8	4.01E-02
RL06-0920-5235	Grid 3-069 SE	2/11/2006	12500	8	8.45E-02

Table 5
Affected Area (AA)-3 Survey and Sampling Results

Sample ID	Location	Collection Date	Walkover Scan (Results in cpm)	Exposure Rate μ R/hr	Cs-137 Content (Results in pCi/g)
RL06-0855-5172	Grid 1-042 NW	2/9/2006	9670	5	2.61E-02
RL06-0856-5173	Grid 1-042 NE	2/9/2006	9560	5	1.32E-01
RL06-0857-5174	Grid 1-042 SW	2/9/2006	9820	4	2.55E-02
RL06-0858-5175	Grid 1-042 SE	2/9/2006	9280	4	6.05E-03
RL06-0859-5176	Grid 1-043 NW	2/9/2006	9290	4	6.48E-02
RL06-0860-5177	Grid 1-043 NE	2/9/2006	8990	4	7.22E-02
RL06-0861-5178	Grid 1-043 SW	2/9/2006	9560	4	4.96E-02
RL06-0862-5179	Grid 1-043 SE	2/9/2006	8930	4	2.80E-02
RL06-0863-5180	Grid 1-044 NW	2/9/2006	8610	4	5.45E-02
RL06-0864-5181	Grid 1-044 NE	2/9/2006	9050	4	0.11
RL06-0865-5182	Grid 1-044 SW	2/9/2006	9300	5	3.59E-02
RL06-0866-5183	Grid 1-044 SE	2/9/2006	9010	5	7.72E-02
RL06-0867-5184	Grid 1-057 NW	2/9/2006	9550	4	2.69E-02
RL06-0868-5185	Grid 1-057 NE	2/9/2006	9620	4	8.85E-05
RL06-0869-5186	Grid 1-057 SW	2/9/2006	9060	5	1.57E-02
RL06-0870-5187	Grid 1-057 SE	2/9/2006	9500	5	5.28E-02
RL06-0871-5188	Grid 1-058 NW	2/9/2006	9040	4	6.27E-02
RL06-0872-5189	Grid 1-058 NE	2/9/2006	9030	5	3.85E-02
RL06-0873-5190	Grid 1-058 SW	2/9/2006	9460	4	4.02E-02
RL06-0874-5191	Grid 1-058 SE	2/9/2006	9480	5	0.133
RL06-0875-5192	Grid 1-059 NW	2/9/2006	9810	5	1.06E-01
RL06-0876-5193	Grid 1-059 NE	2/9/2006	9040	5	5.10E-03
RL06-0877-5194	Grid 1-059 SW	2/9/2006	9730	5	1.36E-01
RL06-0878-5195	Grid 1-059 SE	2/9/2006	10400	5	-9.55E-04

Table 6
Affected Area (AA)-4 Survey and Sampling Results

Sample ID	Location	Collection Date	Walkover Scan (Results in cpm)	Exposure Rate μR/hr	Cs-137 Content (Results in pCi/g)
RL06-0812-5136	Grid 1-140 NW	2/8/2006	9110	7	-3.35E-02
RL06-0813-5137	Grid 1-140 NE	2/8/2006	9720	8	3.90E-02
RL06-0814-5138	Grid 1-140 SW	2/8/2006	9930	8	2.12E-01
RL06-0815-5139	Grid 1-140 SE	2/8/2006	9430	8	7.86E-02
RL06-0816-5140	Grid 1-141 NW	2/8/2006	9730	8	6.30E-02
RL06-0817-5141	Grid 1-141 NE	2/8/2006	10200	8	9.28E-02
RL06-0818-5142	Grid 1-141 SW	2/8/2006	9260	9	8.69E-02
RL06-0819-5143	Grid 1-141 SE	2/8/2006	9820	9	1.08E-01
RL06-0820-5144	Grid 1-155 NW	2/8/2006	10300	8	-2.48E-02
RL06-0821-5145	Grid 1-155 NE	2/8/2006	10500	8	1.41E-01
RL06-0822-5146	Grid 1-155 SW	2/8/2006	9080	8	9.36E-02
RL06-0823-5147	Grid 1-155 SE	2/8/2006	8660	8	8.46E-02
RL06-0824-5148	Grid 1-156 NW	2/8/2006	9210	8	8.69E-02
RL06-0825-5149	Grid 1-156 NE	2/8/2006	10000	8	1.83E-02
RL06-0826-5150	Grid 1-156 SW	2/8/2006	11400	8	1.15E-01
RL06-0827-5151	Grid 1-156 SE	2/8/2006	11900	8	1.16E-01

Table 7
Section A Survey and Sampling Results

Sample ID	Location	Collection Date	Exposure Rate μR/hr	Walkover Scan (Results in cpm)	Cs-137 Content (Results in pCi/g)
N/A	Grid 3-117	N/A	7	10800	N/A
N/A	Grid 3-118	N/A	9	13000	N/A
N/A	Grid 3-119	N/A	9	12100	N/A
N/A	Grid 3-120	N/A	7	11300	N/A
N/A	Grid 3-121	N/A	8	11500	N/A
N/A	Grid 3-001	N/A	8	8400	N/A
N/A	Grid 3-002	N/A	7	9210	N/A
N/A	Grid 3-122	N/A	8	14800	N/A
RL06-0772-5100	Grid 3-123	2/6/2006	9	11600	5.56E-02
N/A	Grid 3-124	N/A	9	11300	N/A
N/A	Grid 3-003	N/A	6	10200	N/A
N/A	Grid 3-004	N/A	6	10300	N/A
N/A	Grid 3-005	N/A	8	11500	N/A
N/A	Grid 3-006	N/A	9	11900	N/A
N/A	Grid 3-007	N/A	10	12000	N/A
N/A	Grid 3-008	N/A	9	11700	N/A
N/A	Grid 3-009	N/A	8	10500	N/A
RL06-0773-5101	Grid 3-010	2/6/2006	8	12600	2.06E-02
N/A	Grid 3-011	N/A	7	13600	N/A
RL06-0774-5102	Grid 3-012	2/6/2006	7	12800	3.76E-02
N/A	Grid 3-013	N/A	8	12700	N/A
RL06-0775-5103	Grid 3-014	2/6/2006	8	8670	8.12E-03
N/A	Grid 3-015	N/A	6	9140	N/A
N/A	Grid 3-016	N/A	6	9640	N/A
N/A	Grid 3-017	N/A	7	7670	N/A
N/A	Grid 3-019	N/A	9	12100	N/A

Table 7
Section A Survey and Sampling Results

Sample ID	Location	Collection Date	Exposure Rate μR/hr	Walkover Scan (Results in cpm)	Cs-137 Content (Results in pCi/g)
N/A	Grid 3-020	N/A	9	11400	N/A
N/A	Grid 3-021	N/A	8	12200	N/A
RL06-0771-5099	Grid 3-022	2/6/2006	8	9970	3.92E-02
N/A	Grid 3-023	N/A	8	9470	N/A
N/A	Grid 3-024	N/A	9	12100	N/A
N/A	Grid 3-025	N/A	7	10800	N/A
RL06-0776-5104	Grid 3-026	2/6/2006	8	9920	5.97E-02
N/A	Grid 3-027	N/A	8	9270	N/A
RL06-0777-5105	Grid 3-028	2/6/2006	7	10800	7.41E-02
RL06-0778-5106	Grid 3-032	2/6/2006	9	11800	9.00E-02
N/A	Grid 3-033	N/A	8	10400	N/A
RL06-0779-5107	Grid 3-034	2/6/2006	9	11300	8.08E-02
N/A	Grid 3-035	N/A	9	11000	N/A
RL06-0780-5108	Grid 3-036	2/6/2006	9	10400	4.94E-02
N/A	Grid 3-037	N/A	8	11300	N/A
N/A	Grid 3-045	N/A	9	10800	N/A
N/A	Grid 3-046	N/A	9	10300	N/A
N/A	Grid 3-047	N/A	9	11600	N/A
N/A	Grid 3-048	N/A	10	12400	N/A
N/A	Grid 3-049	N/A	10	14000	N/A
N/A	Grid 3-050	N/A	8	11400	N/A

Table 8
Section B Survey and Sampling Results

Sample ID	Location	Collection Date	Exposure Rate μR/hr	Walkover Scan (Results in cpm)	Cs-137 Content (Results in pCi/g)
N/A	Grid 3-029	N/A	4	7930	N/A
N/A	Grid 3-030	N/A	3	9680	N/A
RL06-0784-5110	Grid 3-042	2/7/2006	3	11500	3.14E-02
N/A	Grid 3-043	N/A	3	10600	N/A
RL06-0785-5111	Grid 3-044	2/7/2006	3	7510	3.15E-02
N/A	Grid 1-001	N/A	4	13000	N/A
N/A	Grid 3-055	N/A	4	11800	N/A
RL06-0786-5112	Grid 3-056	2/7/2006	4	8160	3.54E-02
N/A	Grid 3-057	N/A	3	8370	N/A
N/A	Grid 1-008	N/A	3	13200	N/A
N/A	Grid 1-009	N/A	4	11300	N/A
RL06-0787-5113	Grid 3-068	2/7/2006	3	10200	4.75E-02
N/A	Grid 3-069	N/A	3	10600	N/A
RL06-0788-5114	Grid 3-070	2/7/2006	3	6700	1.29E-02
N/A	Grid 1-021	N/A	4	10500	N/A
N/A	Grid 1-022	N/A	4	13100	N/A
N/A	Grid 3-081	N/A	4	9220	N/A
N/A	Grid 3-082	N/A	4	8940	N/A
RL06-0789-5115	Grid 3-083	2/7/2006	4	9420	2.13E-02
RL06-0790-5116	Grid 1-035	2/7/2006	4	10600	1.52E-02
N/A	Grid 1-036	N/A	4	9860	N/A
RL06-0791-5117	Grid 3-094	2/7/2006	3	9210	2.57E-02
RL06-0792-5118	Grid 3-095	2/7/2006	4	10200	1.60E-02
N/A	Grid 3-096	N/A	4	9530	N/A
N/A	Grid 1-050	N/A	4	10000	N/A
N/A	Grid 1-051	N/A	4	11900	N/A

Table 8
Section B Survey and Sampling Results

Sample ID	Location	Collection Date	Exposure Rate μR/hr	Walkover Scan (Results in cpm)	Cs-137 Content (Results in pCi/g)
RL06-0793-5119	Grid 3-107	2/7/2006	4	9030	4.56E-02
N/A	Grid 3-108	N/A	4	9130	N/A
N/A	Grid 3-109	N/A	4	10170	N/A
N/A	Grid 1-065	N/A	3	9730	N/A
N/A	Grid 1-066	N/A	4	7760	N/A

Table 9
Section C Survey and Sampling Results

Sample ID	Location	Collection Date	Exposure Rate μR/hr	Walkover Scan (Results in cpm)	Cs-137 Content (Results in pCi/g)
N/A	Grid 1-003	N/A	7	9570	N/A
RL06-0885-5201	Grid 1-004	2/10/2006	8	9790	9.61E-02
N/A	Grid 1-005	N/A	7	9970	N/A
RL06-0888-5204	Grid 1-006	2/10/2006	7	9160	6.51E-02
RL06-0880-5196	Grid 1-010	2/10/2006	8	9250	1.73E-02
N/A	Grid 1-011	N/A	8	9740	N/A
RL06-0882-5198	Grid 1-012	2/10/2006	9	9840	2.30E-02
N/A	Grid 1-013	N/A	8	9700	N/A
RL06-0884-5200	Grid 1-014	2/10/2006	9	9770	1.26E-03
N/A	Grid 1-015	N/A	8	9820	N/A
RL06-0887-5203	Grid 1-016	2/10/2006	9	9830	3.13E-02
N/A	Grid 1-017	N/A	8	9490	N/A
N/A	Grid 1-023	N/A	8	9550	N/A
RL06-0881-5197	Grid 1-024	2/10/2006	9	9700	3.70E-02
N/A	Grid 1-025	N/A	9	9910	N/A
RL06-0883-5199	Grid 1-026	2/10/2006	8	9700	3.45E-02
N/A	Grid 1-027	N/A	9	9510	N/A
RL06-0886-5202	Grid 1-028	2/10/2006	8	10000	1.17E-01
N/A	Grid 1-029	N/A	8	9520	N/A
RL06-0889-5205	Grid 1-030	2/10/2006	9	9790	1.45E-01

Table 10
Section D Survey and Sampling Results

Sample ID	Location	Collection Date	Exposure Rate μR/hr	Walkover Scan (Results in cpm)	Cs-137 Content (Results in pCi/g)
RL06-5152-0833	Grid 2-005	2/8/2006	4	8540	2.07E-02
N/A	Grid 2-006	N/A	5	8680	N/A
RL06-5153-0834	Grid 2-007	2/8/2006	4	10800	3.53E-02
N/A	Grid 2-008	N/A	4	10300	N/A
RL06-5154-0835	Grid 1-080	2/8/2006	4	9830	2.27E-02
N/A	Grid 1-081	N/A	4	8660	N/A
N/A	Grid 2-014	N/A	4	9210	N/A
RL06-5155-0836	Grid 2-015	2/8/2006	4	8660	4.38E-02
N/A	Grid 2-016	N/A	4	9660	N/A
RL06-5156-0837	Grid 2-017	2/8/2006	4	9750	1.06E-02
N/A	Grid 1-095	N/A	4	9400	N/A
N/A	Grid 1-096	N/A	4	8000	N/A
N/A	Grid 2-023	N/A	4	9530	N/A
RL06-5157-0838	Grid 2-024	2/8/2006	4	9410	-1.28E-02
N/A	Grid 2-025	N/A	4	10900	N/A
RL06-5158-0839	Grid 2-026	2/8/2006	4	10400	7.73E-02
RL06-5159-0840	Grid 1-110	2/8/2006	4	9480	4.05E-02
N/A	Grid 1-111	N/A	4	8400	N/A
N/A	Grid 2-031	N/A	5	8070	N/A
RL06-5160-0841	Grid 2-032	2/8/2006	4	7980	8.19E-02
N/A	Grid 2-033	N/A	4	9360	N/A
RL06-5161-0842	Grid 2-034	2/8/2006	3	9170	6.44E-02
N/A	Grid 1-125	N/A	4	9040	N/A
N/A	Grid 1-126	N/A	4	9110	N/A

Table 11
Section E Survey and Sampling Results

Sample ID	Location	Collection Date	Exposure Rate μR/hr	Walkover Scan (Results in cpm)	Cs-137 Content (Results in pCi/g)
N/A	Grid 2-038	N/A	9	8630	N/A
RL06-0894-5210	Grid 2-039	2/10/2006	8	8070	6.66E-02
N/A	Grid 2-040	N/A	6	8140	N/A
RL06-0897-5213	Grid 2-041	2/10/2006	6	10400	9.62E-02
N/A	Grid 2-042	N/A	7	11500	N/A
N/A	Grid 2-043	N/A	8	8880	N/A
RL06-0890-5206	Grid 2-044	2/10/2006	10	11000	1.72E-01
N/A	Grid 2-045	N/A	9	14800	N/A
RL06-0893-5209	Grid 2-046	2/10/2006	10	12400	2.30E-01
N/A	Grid 2-047	N/A	7	11000	N/A
RL06-0896-5212	Grid 2-048	2/10/2006	7	9800	8.17E-02
N/A	Grid 2-049	N/A	7	11900	N/A
RL06-0899-5215	Grid 2-050	2/10/2006	7	9450	-1.91E-02
RL06-0891-5207	Grid 2-052	2/10/2006	9	11700	2.28E-01
RL06-0892-5208	Grid 2-053	2/10/2006	9	12100	3.80E-01
N/A	Grid 2-054	N/A	9	12300	N/A
RL06-0895-5211	Grid 2-055	2/10/2006	8	11200	3.62E-02
N/A	Grid 2-056	N/A	8	8760	N/A
RL06-0898-5214	Grid 2-057	2/10/2006	7	8600	5.36E-02

Table 12
Section F Survey and Sampling Results

Sample ID	Location	Collection Date	Exposure Rate μR/hr	Walkover Scan (Results in cpm)	Cs-137 Content (Results in pCi/g)
N/A	Grid 11-020	N/A	10	11800	N/A
RL05-2654-2891	Grid 11-021	7/20/2005	9	10500	9.80E-02
RL05-2661-2898	Grid 11-022	7/20/2005	9	12900	2.31E-01
N/A	Grid 11-023	N/A	9	13900	N/A
N/A	Grid 11-024	N/A	10	12100	N/A
N/A	Grid 11-025	N/A	9	13100	N/A
RL05-2662-2899	Grid 11-026	7/20/2005	9	13600	2.72E-01
RL05-2667-2904	Grid 11-027	7/20/2005	9	11400	8.68E-02
N/A	Grid 11-028	N/A	9	12900	N/A
RL05-2655-2892	Grid 11-029	7/20/2005	9	12800	1.98E-01
N/A	Grid 11-030	N/A	9	13500	N/A
RL05-2668-2905	Grid 11-031	7/20/2005	8	14500	4.57E-02
N/A	Grid 11-032	N/A	9	14000	N/A
N/A	Grid 11-033	N/A	9	11100	N/A
N/A	Grid 11-035	N/A	8	12700	N/A
RL05-2669-2906	Grid 11-036	7/20/2005	9	12500	1.17E-01
RL05-2672-2909	Grid 11-037	7/20/2005	9	13200	6.96E-02
RL05-2673-2910	Grid 11-038	7/20/2005	9	14300	1.01E-01
RL05-2670-2907	Grid 11-039	7/20/2005	9	12200	2.41E-01
N/A	Grid 11-040	N/A	9	14000	N/A
N/A	Grid 11-041	N/A	9	16200	N/A
N/A	Grid 11-042	N/A	8	12700	N/A
N/A	Grid 11-043	N/A	9	11900	N/A
N/A	Grid 11-044	N/A	8	11700	N/A
N/A	Grid 11-045	N/A	8	16400	N/A

Table 12
Section F Survey and Sampling Results

Sample ID	Location	Collection Date	Exposure Rate μR/hr	Walkover Scan (Results in cpm)	Cs-137 Content (Results in pCi/g)
N/A	Grid 11-046	N/A	8	12600	N/A
RL05-2651-2888	Grid 11-050	7/20/2005	9	10800	2.15E-01
N/A	Grid 11-054	N/A	6	7040	N/A
N/A	Grid 11-055	N/A	7	6500	N/A
N/A	Grid 11-061	N/A	5	7010	N/A
N/A	Grid 11-062	N/A	7	6800	N/A
N/A	Grid 11-069	N/A	4	6470	N/A
RL05-2646-2883	Grid 11-070	7/20/2005	9	10500	6.61E-02
RL05-2649-2886	Grid 11-071	7/20/2005	9	10600	1.33E-01
RL05-2652-2889	Grid 11-072	7/20/2005	9	11200	2.23E-01
RL05-2658-2895	Grid 11-073	7/20/2005	7	12200	1.56E-01
RL05-2664-2901	Grid 11-074	7/20/2005	7	13200	1.48E-01
N/A	Grid 11-074	N/A	8	14100	N/A
N/A	Grid 11-076	N/A	7	17200	N/A
RL05-2647-2884	Grid 11-078	7/20/2005	8	10000	7.99E-02
RL05-2650-2887	Grid 11-079	7/20/2005	8	9990	1.47E-01
RL05-2653-2890	Grid 11-080	7/20/2005	7	10300	8.75E-02
RL05-2659-2896	Grid 11-081	7/20/2005	8	10900	5.86E-02
RL05-2665-2902	Grid 11-082	7/20/2005	7	12800	4.88E-02
N/A	Grid 11-083	N/A	7	14400	N/A
N/A	Grid 11-084	N/A	7	13400	N/A
RL05-2666-2903	Grid 11-087	7/20/2005	7	12500	4.92E-02
N/A	Grid 11-088	N/A	7	13600	N/A
N/A	Grid 11-089	N/A	7	13200	N/A

Table 13
JN-2/3 Yard and West Survey and Sampling Results

Sample ID	Location	Collection Date	Exposure Rate μR/hr	Walkover Scan (Results in cpm)	Cs-137 Content (Results in pCi/g)
N/A	Grid 3-059	N/A	4	11900	N/A
N/A	Grid 3-073	N/A	4	11600	N/A
N/A	Grid 3-088	N/A	5	11900	N/A
N/A	Grid 3-090	N/A	5	10500	N/A
N/A	Grid 3-092	N/A	3	8040	N/A
N/A	Grid 2-012	N/A	4	9760	N/A
N/A	Grid 2-028	N/A	4	9440	N/A
RL06-0844-5162	Grid 2-022	2/9/2006	N/A	N/A	3.44E-02
RL06-0845-5163	Grid 2-029	2/10/2006	N/A	N/A	8.69E-03
RL06-0846-5164	Grid 3-106	2/11/2006	N/A	N/A	3.18E-02
RL06-0847-5165	Grid 2-010	2/12/2006	4	11700	-2.10E-03
RL06-0848-5166	Grid 3-064	2/13/2006	6	11600	-4.85E-04
RL06-0849-5167	Grid 3-077	2/14/2006	N/A	N/A	-1.35E-02
RL06-0850-5168	Grid 3-089	2/15/2006	N/A	N/A	1.65E-02
RL06-0851-5169	Grid 3-105	2/16/2006	N/A	N/A	2.77E-01
RL06-0852-5170	Grid 2-027	2/17/2006	N/A	N/A	4.33E-02
RL06-0853-5171	Grid 3-112	2/18/2006	N/A	N/A	1.42E-02

Table 14
JN-1 Yard and East Survey and Sampling Results

Sample ID	Location	Collection Date	Exposure Rate μR/hr	Walkover Scan (Results in cpm)	Cs-137 Content (Results in pCi/g)
N/A	Grid 1-037	N/A	10	10900	N/A
N/A	Grid 1-052	N/A	10	11000	N/A
N/A	Grid 1-082	N/A	9	11900	N/A
N/A	Grid 1-112	N/A	10	11300	N/A
N/A	Grid 1-141	N/A	10	11500	N/A
N/A	Grid 1-148	N/A	11	11400	N/A
RL06-0757-5089	Grid 1-053	2/4/2006	9	11800	4.77E-02
RL06-0758-5090	Grid 1-083	2/4/2006	N/A	N/A	6.92E-02
RL06-0759-5091	Grid 1-085	2/4/2006	N/A	N/A	1.02E-01
RL06-0760-5092	Grid 1-087	2/4/2006	N/A	N/A	2.12E-01
RL06-0761-5093	Grid 1-113	2/4/2006	N/A	N/A	1.23E-01
RL06-0762-5094	Grid 1-116	2/4/2006	N/A	N/A	6.24E-01
RL06-0763-5095	Grid 1-129	2/4/2006	N/A	N/A	1.43E-01
RL06-0764-5096	Grid 1-132	2/4/2006	N/A	N/A	1.38E-01
RL06-0765-5097	Grid 1-143	2/4/2006	N/A	N/A	1.19E-01
RL06-0766-5098	Grid 1-145	2/4/2006	10	11900	9.79E-02

Table 15
Section A Comparison Value Calculation

Area/Volume ID		Number of Data Points	t95% (n-1) Value from Table B-1 of NUREG/CR-5849
Inside WJN Fenceline	Section A	10	1.833

	Sample Number	Cs-137 Result (pCi/g)
1	RL06-0772-5100	5.56E-02
2	RL06-0773-5101	2.06E-02
3	RL06-0774-5102	3.76E-02
4	RL06-0775-5103	8.12E-03
5	RL06-0771-5099	3.92E-02
6	RL06-0776-5104	5.97E-02
7	RL06-0777-5105	7.41E-02
8	RL06-0778-5106	9.00E-02
9	RL06-0779-5107	8.08E-02
10	RL06-0780-5108	4.94E-02

Comparison Value Calculation

$$\mu_{\alpha} = \bar{x} + t_{1-\alpha, df} \frac{S_x}{\sqrt{n}}$$

Average	Comparison Value
0.051512	0.07

Standard Deviation	Modified Cleanup Criteria
0.03	7.3

Comparison < Criteria
Yes

Table 16
Section B Comparison Value Calculation

Area/Volume ID		Number of Data Points	t95% (n-1) Value from Table B-1 of NUREG/CR-5849
Inside WJN Fencline	Section B	10	1.833
		Cs-137 Result (pCi/g)	
	Sample Number		
	1	RL06-0784-5110	3.14E-02
	2	RL06-0785-5111	3.15E-02
	3	RL06-0786-5112	3.54E-02
	4	RL06-0787-5113	4.75E-02
	5	RL06-0788-5114	1.29E-02
	6	RL06-0789-5115	2.13E-02
	7	RL06-0790-5116	1.52E-02
	8	RL06-0791-5117	2.57E-02
	9	RL06-0792-5118	1.60E-02
	10	RL06-0793-5119	4.56E-02

Comparison Value Calculation

$$\mu_{\alpha} = \bar{x} + t_{1-\alpha, df} \frac{S_x}{\sqrt{n}}$$

Average	Comparison Value
0.02825	0.04

Standard Deviation	Modified Cleanup Criteria
0.01	7.3

Comparison < Criteria
Yes

Table 17
Section C Comparison Value Calculation

Area/Volume ID		Number of Data Points	t95% (n-1) Value from Table B-1 of NUREG/CR-5849
Inside WJN Fencline	Section C	10	1.833

	Sample Number	Cs-137 Result (pCi/g)
1	RL06-0885-5201	9.61E-02
2	RL06-0888-5204	6.51E-02
3	RL06-0880-5196	1.73E-02
4	RL06-0882-5198	2.30E-02
5	RL06-0884-5200	1.26E-03
6	RL06-0887-5203	3.13E-02
7	RL06-0881-5197	3.70E-02
8	RL06-0883-5199	3.45E-02
9	RL06-0886-5202	1.17E-01
10	RL06-0889-5205	1.45E-01

Comparison Value Calculation

$$\mu_{\alpha} = \bar{x} + t_{1-\alpha, df} \frac{S_x}{\sqrt{n}}$$

Average
0.056756

Comparison Value
0.08

Standard Deviation
0.05

Modified Cleanup Criteria
7.3

Comparison < Criteria
Yes

Table 18
Section D Comparison Value Calculation

Area/Volume ID		Number of Data Points	t95% (n-1) Value from Table B-1 of NUREG/CR-5849
Inside WJN Fenceline	Section D	10	1.833
		Cs-137 Result	
	Sample Number	(pCi/g)	
1	RL06-5152-0833	2.07E-02	
2	RL06-5153-0834	3.53E-02	
3	RL06-5154-0835	2.27E-02	
4	RL06-5155-0836	4.38E-02	
5	RL06-5156-0837	1.06E-02	
6	RL06-5157-0838	-1.28E-02	
7	RL06-5158-0839	7.73E-02	
8	RL06-5159-0840	4.05E-02	
9	RL06-5160-0841	8.19E-02	
10	RL06-5161-0842	6.44E-02	

Comparison Value Calculation

$$\mu_{\alpha} = \bar{x} + t_{1-\alpha, df} \frac{S_x}{\sqrt{n}}$$

Average	Comparison Value
0.038437	0.06

Standard Deviation	Modified Cleanup Criteria
0.03	7.3

Comparison < Criteria
Yes

Table 19
Section E Comparison Value Calculation

Area/Volume ID		Number of Data Points	t95% (n-1) Value from Table B-1 of NUREG/CR-5849
Inside WJN Fencline	Section E	10	1.833

	Sample Number	Cs-137 Result (pCi/g)
1	RL06-0894-5210	6.66E-02
2	RL06-0897-5213	9.62E-02
3	RL06-0890-5206	1.72E-01
4	RL06-0893-5209	2.30E-01
5	RL06-0896-5212	8.17E-02
6	RL06-0899-5215	-1.91E-02
7	RL06-0891-5207	2.28E-01
8	RL06-0892-5208	3.80E-01
9	RL06-0895-5211	3.62E-02
10	RL06-0898-5214	5.36E-02

Comparison Value Calculation

$$\mu_{\alpha} = \bar{x} + t_{1-\alpha,df} \frac{S_x}{\sqrt{n}}$$

Average	Comparison Value
0.13252	0.20

Standard Deviation	Modified Cleanup Criteria
0.12	7.3

Comparison < Criteria
Yes

Table 20
Section F Comparison Value Calculation

Area/Volume ID		Number of Data Points	t95% (n-1) Value from Table B-1 of NUREG/CR-5849
Inside WJN Fenceline	Section F	22	1.721

	Sample Number	Cs-137 Result (pCi/g)
1	RL05-2654-2891	9.80E-02
2	RL05-2661-2898	2.31E-01
3	RL05-2662-2899	2.72E-01
4	RL05-2667-2904	8.68E-02
5	RL05-2655-2892	1.98E-01
6	RL05-2668-2905	4.57E-02
7	RL05-2669-2906	1.17E-01
8	RL05-2672-2909	6.96E-02
9	RL05-2673-2910	1.01E-01
10	RL05-2670-2907	2.41E-01
11	RL05-2651-2888	2.15E-01
12	RL05-2646-2883	6.61E-02
13	RL05-2649-2886	1.33E-01
14	RL05-2652-2889	2.23E-01
15	RL05-2658-2895	1.56E-01
16	RL05-2664-2901	1.48E-01
17	RL05-2647-2884	7.99E-02
18	RL05-2650-2887	1.47E-01
19	RL05-2653-2890	8.75E-02
20	RL05-2659-2896	5.86E-02
21	RL05-2665-2902	4.88E-02
22	RL05-2666-2903	4.92E-02

Comparison Value Calculation

$\mu_{\alpha} = \bar{x} + t_{1-\alpha,df} \frac{S_x}{\sqrt{n}}$	Average	Comparison Value
	1.31E-01	0.16
	Standard Deviation	Modified Cleanup Criteria
	0.07	7.3
		Comparison < Criteria
		Yes

Table 21
JN-2/3 Yard and West Comparison Value Calculation

Area/Volume ID	Number of Data Points	t95% (n-1) Value from Table B-1 of NUREG/CR-5849
Inside WJN Fencline JN-2/3 Foundation	10	1.833

	Sample Number	Cs-137 Result (pCi/g)
1	RL06-0844-5162	3.44E-02
2	RL06-0845-5163	8.69E-03
3	RL06-0846-5164	3.18E-02
4	RL06-0847-5165	-2.10E-03
5	RL06-0848-5166	-4.85E-04
6	RL06-0849-5167	-1.35E-02
7	RL06-0850-5168	1.65E-02
8	RL06-0851-5169	2.77E-01
9	RL06-0852-5170	4.33E-02
10	RL06-0853-5171	1.42E-02

Comparison Value Calculation

$$\mu_{\alpha} = \bar{x} + t_{1-\alpha,df} \frac{S_x}{\sqrt{n}}$$

Average	Comparison Value
0.0409805	0.09
Standard Deviation	Modified Cleanup Criteria
0.08	7.3
	Comparison < Criteria
	Yes

Table 22
JN-1 Yard and East Comparison Value Calculation

Area/Volume ID	Number of Data Points	t95% (n-1) Value from Table B-1 of NUREG/CR-5849
Inside WJN Fenceline	JN-1 Foundation	10
		1.833

	Sample Number	Cs-137 Result (pCi/g)
1	RL06-0757-5089	4.77E-02
2	RL06-0758-5090	6.92E-02
3	RL06-0759-5091	1.02E-01
4	RL06-0760-5092	2.12E-01
5	RL06-0761-5093	1.23E-01
6	RL06-0762-5094	6.24E-01
7	RL06-0763-5095	1.43E-01
8	RL06-0764-5096	1.38E-01
9	RL06-0765-5097	1.19E-01
10	RL06-0766-5098	9.79E-02

Comparison Value Calculation

$$\mu_{\alpha} = \bar{x} + t_{1-\alpha, df} \frac{S_x}{\sqrt{n}}$$

Average	Comparison Value
0.16758	0.26

Standard Deviation	Modified Cleanup Criteria
0.17	7.3

Comparison < Criteria
 Yes