

ATTACHMENT 13

CONSUMERS ENERGY
BIG ROCKPOINT

DOCKET NUMBERS 50-155 AND 72-043

TRANSMITTAL OF SURVEY PACKAGES IN SUPPORT OF BIG ROCK POINT PHASED
LICENSE TERMINATION

CLASS 1 AREA –FINAL STATUS SURVEY, 11C_{x1}1,
EXCAVATED SOIL FROM RADWASTE STORAGE VAULTS

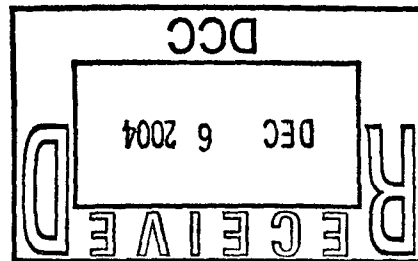
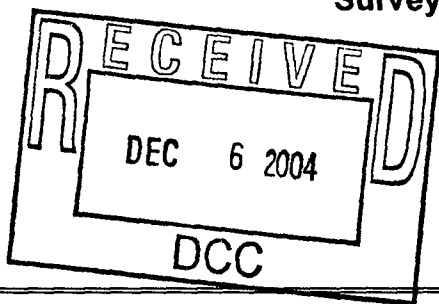
October 9, 2006

49 Pages

Final Status Survey 11C_{x1}1

Excavated Soil from Radwaste Storage Vaults

Survey Unit 11
Survey Date: 04-22-03



SURVEY PACKAGE CLOSURE

Final Status Survey Documentation is authorized for closure. All required reviews are completed and data analysis results meets the criteria established for unrestricted release as clean fill available for construction usage.

Signed: [Signature] Date: 7-22-04
(ESSG Supervisor)

Signed: [Signature] Date: 10/13/04
(ES Superintendent)

Signed: [Signature] Date: 10-13-04
(RP & ES Manager)

**Final Status Survey Area Requirements
for Survey 11C_{x1}1
Excavated Soil, Solid Radwaste Storage Vaults**

Survey Description

Final Status Survey 11C_{x1}1 is composed of excavated soil originating from the former location of the Radwaste Building contained in Survey Unit 11, Grids 451 and 452. Based on the Site Characterization (LTP, Chapter 2) and supporting surveys conducted during the excavation process, the residual radioactivity in soil removed from this area is not expected to exceed fractional concentrations of the DCGL value.

The stockpile of excavated soil for Final Status Survey (FSS) will be graded out to a maximum depth of one meter. The size of the survey will be based on the statistical requirements of the Sign Test for Class 1 areas as defined in LTP, Chapter 5. Sample locations will be established by random start, square grid pattern over the graded area. Each soil sample will be a full core, homogenized composite that is representative of total soil thickness. Surface scanning will be conducted over 100% of the survey area.

History

The Radwaste Building was a temporary storage and staging location for all radioactive waste prior to offsite shipment for disposal. This storage facility included subsurface concrete vaults used to contain the spent filters that originated from reactor effluent clean-up systems. Contamination events have occurred in this area and extensive soil remediation efforts have been documented. Excavation, building demolition, and the removal of soil for FSS were completed on March 6, 2003. This survey location is designated as a Class 1 area.

Current Radiological Status

Residual radioactivity in the soil removed from this area has not been identified above fractional values of the DCGL in any survey effort conducted to date. Input for this evaluation includes the following survey data:

- Final Status Survey 11C₁1, Final survey of excavated area around solid waste storage vaults, dated 03-25-03.
- Readiness Survey 11A₆1, Characterization of soils post-demolition of Vaults 3 and 4, final removal of debris dated 03-07-03.
- Readiness Survey 11A₅1, Characterization of soils post-demolition of Vaults 3 and 4 dated 03-06-03.
- Characterization Survey 11A₄1, Characterization of soils underneath Vaults 1 and 2 dated 12-30-02,
- Characterization Survey 11A_{x1}1, Scoping data of excavated soils originating from area around Vaults 3 and 4, dated 01-03-03 and 01-08-03.
- Characterization Survey 11A₃1, Radwaste Building dismantlement and foundation removal dated 11-26-02,
- Characterization Survey 11A₂1, Radwaste drain line removal dated 11-20-02,
- Primary Characterization Survey 11A₁1 dated 8-23-01,
- Characterization Survey 11A_{deepcore2}1 dated 2-11-00,
- Characterization Survey 11A_{deepcore1}1 dated 7-26-99.

Groundwater monitoring in Survey Unit 11 has not identified radioactivity above laboratory minimum detection limits.

Post-Construction Expectations

Survey 11C_{x1}1 will be performed in the following activity sequence:

1. Walkdown: Site Characterization personnel will perform a walkdown assessment to insure survey area preparations are complete and confirm that the following post-construction expectations have been satisfied:
 - Excavated soil graded to a thickness not exceeding one (1) meter,
 - All demolition debris has been removed from the survey area, and
 - The current survey area status meets all applicable safety requirements
2. Survey Area Isolation and Control: Control measures will be established to ensure that that any potential ongoing decommissioning activities in adjacent locations do not impact the current survey area status. Isolation and control measures include postings, barriers, access points, and the evaluation of ongoing work activities in adjacent areas.
3. Survey Design and Execution: Survey design and execution will follow the Data Quality Objectives for Survey 11C_{x1}1 in accordance with the survey requirements established in LTP, Chapter 5. Survey size will be based the statistical requirements of the Sign Test for Class 1 areas with soil samples collected in random start, systematic data point locations. Each soil sample will be a full core, homogenized composite representative of total soil thickness. Surface scanning will be performed with 100% survey area coverage. This survey will be conducted in accordance with approved BRP procedures and follow the guidance of NUREG 1575.
4. Data Quality Assessment : Isolation and control of the survey area will be maintained until the survey Data Quality Assessment demonstrates that the regulatory requirements for unrestricted site release have been satisfied. Once released for unrestricted use, this soil is scheduled to be used for return of the excavated area to grade elevation.

Quality Assurance/Quality Control

A field observation surveillance of this survey is scheduled to be conducted by MDEQ and USNRC, Region 3. In addition, a minimum of 5% of the soil samples obtained in Survey 11C_{x1}1 are to be randomly selected for data quality evaluation. Independent soil sample analyses will be performed by state and/or federal regulatory agencies as requested for data analysis comparison.

DATA QUALITY OBJECTIVES

Survey 11C_{x1}1

Final Status Survey of Excavated Soil from Radwaste Building Demolition

1. STATE THE PROBLEM

The Problem:

To demonstrate that the level of residual radioactivity in the excavated soil from the Radwaste Building demolition in Survey Unit 11 does not exceed the release criteria of 25 mrem/year Total Effective Dose Equivalent (TEDE) as specified in the License Termination Plan (LTP). This soil has been removed from the excavated area and is to be prepared for Final Status Survey (FSS) by grading out to a depth of one (1) meter or less. The soil for FSS is to be designated as a Class 1 survey area. It must be demonstrated that the prepared survey area meets the criteria established for unrestricted release prior disposition as clean fill available for construction usage.

Stakeholders:

The primary stakeholders interested in the answer to this problem are Consumers Energy Co., and the general public as represented by the Michigan Department of Environmental Quality (MDEQ), and the US Nuclear Regulatory Commission (USNRC).

The Planning Team:

The planning team consists of members of the Site Characterization group, Radiological Protection and Environmental Services (RPES), Consumers Energy Co. The primary decision maker will be the Final Status Survey (FSS) Supervisor. The Final Status Survey Supervisor will obtain input from the site Construction Group and Scheduling Group for issues relating to schedule and costs.

Schedule:

Approximately five (5) working days are projected to implement the FSS Plan to collect, and analyze field data. Activities related to the staging and shipment of radiological materials stored in the vicinity of Survey Unit 11 may impact access and temporarily limit the ability to perform the FSS.

Resources:

The primary resources needed to determine the answer to the problem are four (4) technicians to perform fieldwork, one (1) technician to prepare the samples and conduct laboratory analyses, and two (2) site characterization team members to prepare and review the design, generate maps, coordinate field activities and evaluate data. Ancillary support may be needed from the on-site construction group to control groundwater in the survey area.

2. IDENTIFY THE DECISION

Several decisions need to be defined to address the stated problem.

Principal Study Question (1):

Does the mean concentration of residual radioactivity in the survey unit exceed the release criteria stated above?

Decision (1):

Determine whether the mean concentration of residual radioactivity in the survey exceeds the release criteria stated in the problem.

Actions (1):

Alternative actions include failure of the survey unit, remediation, or no action required.

Principal Study Question (2):

Do any areas of elevated activity in the survey unit exceed the release criteria?

The Decision (2):

Determine if any areas of elevated activity in the survey unit exceed the release criteria.

Actions (2):

Alternative actions include confirmation and investigation, performing the elevated measurement comparison (EMC), remediation, or no action required.

Principal Study Question (3):

Is the potential dose from residual radioactivity in the survey unit ALARA as stated?

The Decision (3):

Determine if the potential dose from residual radioactivity in the survey unit is ALARA. ALARA requirements for soil remediation are defined in Chapter 4 of the LTP.

Actions (3):

Alternative actions include remediation or no action required.

3. IDENTIFY INPUTS TO THE DECISION

Information Needed:

Characterization measurements are required to define the radionuclides present and determine the extent and variability of residual radioactivity in the survey area for design and implementation of the FSS. Survey area classification, ALARA analysis, potential radionuclides of interest, and site-specific DCGL values are also required inputs to the decision process. The primary information required for evaluation is the analytical results of FSS measurements.

Source of the Information:

The soil sample data to be used for FSS development are the radionuclide-specific measurements of soil samples collected during the excavation process. Excavation of this area was performed between 01/01/03 and 01/08/03. The soil samples obtained were judgmentally selected during this time period to be representative of the stockpiled soil. The area for FSS has been designated as Class 1 (LTP Section 2.4.5.1.c). The ALARA analysis for potential soil remediation is provided in LTP, Section 4.4. Site-specific DCGL values and BRP radionuclides of interest are defined in LTP Section 5, Table 5-1.

The FSS will be conducted in accordance with applicable regulatory guidance as established in LTP Section 5 for Class 1 areas. Full core soil samples will be utilized for radionuclide-specific measurements in this evaluation.

4. BOUNDARIES OF THE STUDY

Boundaries of the Survey:

The target population for this survey is the total thickness of prepared soil in the survey area. The physical boundary of the survey includes all prepared soil in a defined survey area of 1313 m².

Temporal Boundaries:

Scanning and sampling in this survey unit will only be performed during daylight hours under dry weather conditions. Collection of data will take place when surface conditions are most favorable. Surface soils must be free of snow cover and standing water prior to surface scanning. Soils must be in a non-frozen state or fragmented for collection to satisfy BRP procedural sampling requirements. The anticipated start date for the survey is 03/25/03.

Constraints:

Cold weather or rainy conditions may effect the operation of electronic equipment. Adverse weather conditions that include accumulations of rain or snow may limit area access and delay survey efforts. Activities related to the staging and shipment of radiological materials stored in the vicinity of Survey Unit 11 may impact access and temporarily limit the ability to perform the FSS.

5. DEVELOP A DECISION RULE

The following decision rules have been developed to define a logical process for choosing among alternative actions for the principal study questions associated with this survey area.

Decision Rule (1):

If all reported concentrations for residual radioactivity are less than the site-specific DCGL's and the Unity Rule has been satisfied for each sample, then the survey unit meets the release criteria. No further action is required.

Decision Rule (2):

If the mean value of activity in the survey unit is greater than the DCGL, then the survey unit fails to meet the release criteria.¹ Remediate, resurvey, and evaluate the results relative to the decision rule.

Decision Rule (3):

If the mean activity in the survey unit is less than the DCGL and any individual sample measurement exceeds this value, conduct the Sign Test and the elevated measurement comparison (EMC) per LTP, Chapter 5. If the EMC and the Sign Test have been satisfied then the survey unit meets the release criteria and no further action is required. If the EMC or the Sign Test has not been satisfied then remediate the area(s) of elevated activity, resurvey as appropriate, and evaluate the results relative to the decision rule.

¹ When multiple radionuclides are present the mean activity value is determined as the average of the weighted sum. The DCGL of the weighted sum is 1.

Decision Rule (4):

If the potential dose from residual radioactivity in the survey unit is ALARA, then no further action is necessary. If the potential dose from residual radioactivity in the survey unit is not ALARA, then remediate and resurvey.

6. SPECIFY TOLERABLE LIMITS ON DECISION ERRORS

The Null Hypothesis:

It is assumed that residual radioactivity in the survey unit exceeds the release criterion.

Type I Error (α):

The α error is the maximum probability of rejecting the null hypotheses when it is true. The α error is defined in the LTP at a value of at 0.05 (5%) and cannot be changed to a less restrictive value unless prior approval is granted by the USNRC. The α error value of 0.05 will be used for survey planning and data assessment for this survey area.

Type II Error (β):

The β error is the probability of accepting the null hypothesis when it is false. A value of 0.05 (5%) will be used for survey planning and data assessment for this survey area.

The Lower Bound of the Gray Region (LBGR):

The LBGR is initially set at 0.5 for this survey unit. The LBGR may be adjusted during survey design to achieve an optimum relative shift between 1.0 and 3.0.

Relative Shift (Δ/σ):

The relative shift will be maintained within the range of 1.0 and 3.0 by adjusting the LBGR as appropriate.

7. OPTIMIZE DESIGN FOR OBTAINING DATA

Statistical Test

Sign Test:

Radionuclides of potential plant origin also present in soil as background activity resulting from fallout constitute only a small fraction of the DCGL. Therefore, the Sign Test will be used where applicable in the FSS evaluation to determine if the survey area meets the requirements for unrestricted release.

Number of Samples Determined:

The number of samples required for this survey will be determined based on the relative shift as defined by the requirements of the Sign Test (LTP, Chapter 5.). The LBGR is initially be set at 0.5 and may be adjusted as necessary for optimizing the survey design to achieve a relative shift between 1.0 and 3.0. Sample point locations are to be determined using a random start, systematic grid spacing. For sample point locations where access is impractical or unsafe, alternate locations will be randomly selected to achieve the sample size requirement.

Biased Sampling:

Co-60 is the most limiting radionuclide for identification by surface scanning; biased surface and subsurface core samples will be collected in any location that exceeds the scan investigation level.

Scan Coverage:

Scanning for this survey area will provide 100% coverage.

Number of Samples for Quality Control:

A minimum of two samples will be collected for quality evaluation. Sample splits will be taken as requested by the Michigan Department of Environmental Quality (DEQ). BRP laboratory samples will also be selected by Region 3, USNRC for independent evaluation. Quality analyses will be conducted as defined in LTP, Chapter 5.

Investigation Levels:

Investigation levels are defined in LTP, Chapter 5 by individual survey area classification; however, prior to regulatory approval of the LTP a more conservative approach for investigation will be established for this survey as shown below.

Investigation Levels for Survey 11C_{x11}

Classification	Scan Measurement	Soil Sample Analysis
Class 1	> DCGL	> DCGL _w

The investigation levels for soil sample measurements are meant to include any individual radionuclide result greater than the site-specific DCGL or where the combined radionuclide values exceed the unity rule. Co-60 is the most limiting radionuclide for identification by surface scanning; further investigation will be initiated at any location that exceeds the Co-60 Scan_{DCGL} of 1818 CPM above background as detailed in the survey design.

SURVEY DESIGN

Survey 11C_{x1}1
Final Status Survey Design
Excavated Soils, Solid Waste Storage Vault Area

Survey Unit Description

Final Status Survey 11C_{x1}1 is composed of excavated soil from the former location of the Solid Radwaste Storage Vaults in Survey Unit 11, Grids 451 and 452. The location from which the excavated soil originated (Survey Unit 11C₁1) is designated as a Class 1 area. This soil is temporarily stored in the area immediately surrounding the vault excavation site and will be used to return this location to grade elevation following successful completion of the final status survey of this material.

The soil has been graded out to a maximum thickness of one meter. Soil sample locations will be determined using a random start square grid pattern over the graded area. Each soil sample will be a homogenized composite representative of the total thickness of soil. Surface scanning will be conducted over 100% of the graded area.

Soil Sample Design

Scoping Data

Input for survey design was developed from ten (10) data points collected as soils were excavated. Scoping data are detailed in Attachment 1. DCGL values for identified radionuclides are presented in Table 1 below:

Input Data for Survey Design (pCi/g)		Table 1
Radionuclides	Cs-137	Co-60
σ	0.12	0.03
DCGL	11.93	3.21

Sample Requirements

The number of sample data points for this survey is based on the requirements of the Sign-Test. The Unity Rule is used for the presence of multiple radionuclides. The Standard Deviation of the weighted sum is described by the following:

$$\sigma = \sqrt{\left(\frac{\sigma_{CS137}}{DCGL_{CS137}}\right)^2 + \left(\frac{\sigma_{CO60}}{DCGL_{CO60}}\right)^2}$$

$$\sigma = \sqrt{\left(\frac{0.12}{11.93}\right)^2 + \left(\frac{0.03}{3.21}\right)^2}$$

$$\sigma = 0.01$$

Relative Shift

The DCGL for the weighted sum is 1.0. The relative shift, when determined using an LBGR value set at 50% of the DCGL_w is 50. To achieve a desired relative shift of 2, the LBGR has been adjusted to 0.98:

$$\text{Relative Shift} = \frac{DCGL - LBGR}{\sigma}$$

$$\text{Relative Shift} = \frac{1 - 0.98}{0.01}$$

$$\text{Relative Shift} = 2.0$$

With α and β error levels set at 0.05 and a maximum relative shift of 2.0, the Sign Test requires 15 sample data points (Table 5.5 NUREG 1575). As a conservative measure 18 samples will be collected in this survey unit.

Sample Locations

Sample locations are selected in a random-start systematic pattern with the southwest corner of the survey unit as origin (X=0, Y=0). Two random numbers between 0 and 1 are generated using the RAND function within Microsoft 2000 Excel software program (Table 2). The numbers are applied to the survey unit X and Y dimensions to determine the random start location.

Random Numbers Table 2	
Random #, X Axis	Random #, Y Axis
0.013237173	0.615922958

Survey Unit 11C_{x1}1 Dimensions: X (E/W) = 32 meters
Y (N/S) = 41 meters

Random Start Location: X = (0.013237173)(32) = 0.4 meters
Y = (0.615922958)(41) = 25.3 meters

Sample Spacing

Samples are located in a square grid pattern with sample spacing determined by the following:

$$L = \sqrt{\frac{A}{n}}, \quad \text{where } A = \text{area of survey unit and} \\ n = \text{number of samples.}$$

$$L = \sqrt{\frac{572}{18}} = 5.6 \text{ meters}$$

Sample point locations are identified in Attachment 2.

Surface Scanning

The coverage requirement for surface scanning of excavated soil is 100%. The Scan_{MDC} has been established at fractional values of the DCGL_w for typical background activity levels at Big Rock Point. Scan_{MDC} values for varying backgrounds are provided in Attachment 3. The investigation level for the identification of potential areas of elevated activity in excavated soil is the Scan_{DCGL} as defined by the following:

$$\text{Scan}_{\text{DCGL}} = \text{Detector Rating} \frac{\text{CPM}}{\text{uR/hr}} * \text{Exposure Model} \frac{\text{uRi/hr}}{\text{pCi/g}} * \text{DCGL}_w$$

Scan_{DCGL} for Cs137 = 3518 cpm

Scan_{DCGL} for Co-60 = 1818 cpm

Where:¹

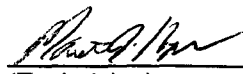
$$\text{Detector Rating} = \frac{1200 \text{ CPM}}{\text{uR/hr}} \text{ Cs-137 and } \frac{565 \text{ CPM}}{\text{uR/hr}} \text{ Co-60}$$

$$\text{Exposure Model} = \frac{1.229 \text{ uRi/hr}}{5 \text{ pCi/g}} \text{ Cs-137 and } \frac{5.029 \text{ uRi/hr}}{5 \text{ pCi/g}} \text{ Co-60}$$


$$\text{DCGL}_w = 11.93 \text{ pCi/g Cs-137 and } 3.2 \text{ pCi/g Co-60}$$

The DCGL_w for Co-60 is the most limiting value for scanning measurements performed to identify areas of potentially elevated activity. Scanning conducted for Final Status Survey will assume all residual radioactivity to originate from Co-60 and the instrument response at the Co-60 DCGL_w (1818 cpm) will be used as the scanning investigation level for Survey 11C_{x1}.

Survey Design Completed By:

 04-21-03
(Technician)

Survey Review and Approval:

 04-21-03
(Dept. Supervisor or Designate)

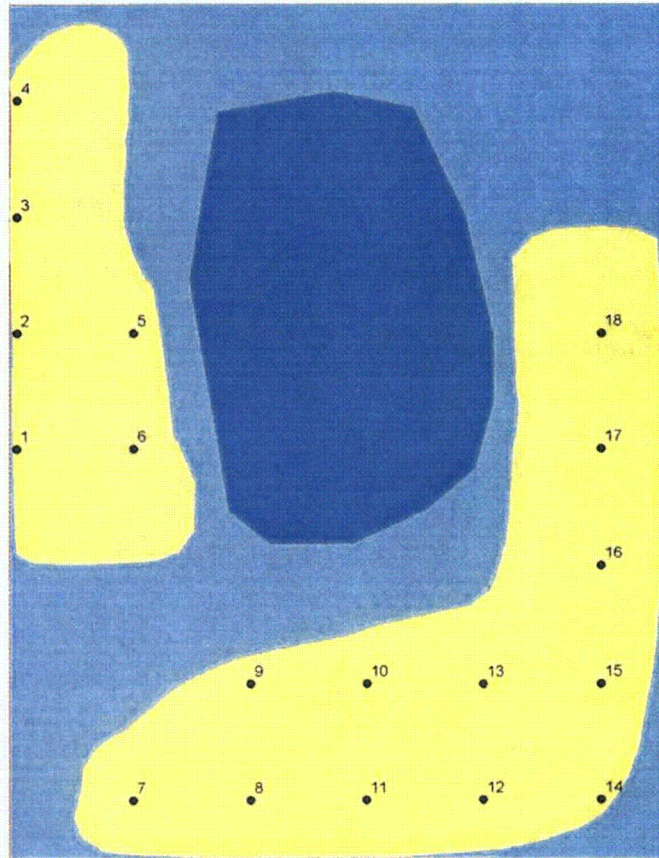
¹ These values established in EA-BRP-SC-020

Attachment 1
Scoping Data
Excavated Soil from
Solid Waste Storage Vault Removal
Survey Unit 11C_{x1}1
01/03-08/2003

Sample No.	Grid	X	Y	ZTop	ZBottom	Cs-137 (pCi/g) Activity	Co-60 (pCi/g) Activity
1	na	na	na	Na	na	0.04	0.01
2	na	na	na	Na	na	0.40	0.08
3	na	na	na	Na	na	0.07	-0.01
4	na	na	na	Na	na	0.03	-0.02
5	na	na	na	Na	na	0.07	0.03
6	na	na	na	Na	na	0.09	-0.01
7	na	na	na	Na	na	0.05	-0.00
8	na	na	na	Na	na	0.04	-0.01
9	na	na	na	Na	na	0.02	0.02
10	na	na	na	Na	na	-0.004	0.03






Mean:	0.08	0.01
Median:	0.05	0.00
St. Dev.:	0.12	0.03

Attachment 2
Soil Sample Locations, FSS 11Cx1_1
Excavated Soil
04-22-03



Scale: 0 2.5 5 10 Meters

Soil Sample Locations

Legend	
	11Cx1_1SurveyBoundaries
	Excavation
	Graded Soil
	Graded Soil
	Soil Sample Locations

Sample No.	X Coord.	Y Coord.	Sample No.	X Coord.	Y Coord.
1	0.4	19.7	10	17.2	8.5
2*	0.4	25.3	11	17.2	2.9
3	0.4	30.9	12	22.8	2.9
4	0.4	36.5	13	22.8	8.5
5	6.0	25.3	14	28.4	2.9
6	6.0	19.7	15	28.4	8.5
7	6.0	2.9	16	28.4	14.1
8	11.6	2.9	17	28.4	19.7
9	11.6	8.5	18	28.4	25.3

Note: Coordinates for sample locations are w/r/t the southwest corner of the survey unit where X=0, Y=0.

*Sample No. 2 is the Random Start Location.

Square Grid Pattern Spacing from Random Start is 5.6 meters.

Attachment 3

Scan MDC In Varying Backgrounds

				CPM	MDER uR/hr		Scan MDC pCi/g	
Background	d'	I	S _i	MDCR _{surveyor}	Cs-137	Co-60	Cs-137	Co-60
2000	2.48	4	28.64	607.47	0.51	1.08	2.06	1.07
2500	2.48	4	32.02	679.18	0.57	1.20	2.30	1.20
3000	2.48	4	35.07	744.00	0.62	1.32	2.52	1.31
3500	2.48	4	37.88	803.61	0.67	1.42	2.72	1.41
4000	2.48	4	40.50	859.10	0.72	1.52	2.91	1.51
4500	2.48	4	42.95	911.21	0.76	1.61	3.09	1.60
5000	2.48	4	45.28	960.50	0.80	1.70	3.26	1.69
5500	2.48	4	47.49	1,007.38	0.84	1.78	3.42	1.77
6000	2.48	4	49.60	1,052.17	0.88	1.86	3.57	1.85
6500	2.48	4	51.63	1,095.14	0.91	1.94	3.71	1.93
7000	2.48	4	53.57	1,136.48	0.95	2.01	3.85	2.00
7500	2.48	4	55.45	1,176.37	0.98	2.08	3.99	2.07
8000	2.48	4	57.27	1,214.95	1.01	2.15	4.12	2.14
8500	2.48	4	59.04	1,252.34	1.04	2.22	4.25	2.20
9000	2.48	4	60.75	1,288.65	1.07	2.28	4.37	2.27
10000	2.48	4	64.03	1,358.35	1.13	2.40	4.61	2.39
10500	2.48	4	65.61	1,391.90	1.16	2.46	4.72	2.45
11000	2.48	4	67.16	1,424.65	1.19	2.52	4.83	2.51
11500	2.48	4	68.67	1,456.67	1.21	2.58	4.94	2.56
12000	2.48	4	70.14	1,488.00	1.24	2.63	5.04	2.62
12500	2.48	4	71.59	1,518.68	1.27	2.69	5.15	2.67
13000	2.48	4	73.01	1,548.76	1.29	2.74	5.25	2.73
13500	2.48	4	74.40	1,578.26	1.32	2.79	5.35	2.78
14000	2.48	4	75.77	1,607.22	1.34	2.84	5.45	2.83
14500	2.48	4	77.11	1,635.67	1.36	2.89	5.55	2.88
15000	2.48	4	78.42	1,663.63	1.39	2.94	5.64	2.93
Modeled Exposure (uR/hr) @ 5 pCi/g								
	Cs-137	1.23E+00						
	Co-60	5.03E+00						

Attachment 4

Area Factors for Open Land Survey Evaluation

Contaminated Area (m ²)	Calculated Area Factors at Time of Peak Dose								
	H-3	Mn-54	Fe-55	Co-60	Sr-90	Cs-137	Eu-152	Eu-154	Eu-155
8094	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
4047	1.00	1.01	1.00	1.01	1.00	1.02	1.02	1.01	1.02
2024	1.00	1.03	1.00	1.03	1.00	1.03	1.03	1.03	1.03
1012	1.35	1.04	1.00	1.04	1.00	1.04	1.05	1.04	1.04
506	2.91	1.09	1.98	1.08	1.98	1.13	1.07	1.07	1.06
253	6.05	1.14	3.95	1.13	3.94	1.20	1.11	1.11	1.09
126	12.4	1.20	7.93	1.20	7.87	1.29	1.17	1.16	1.14
63	24.9	1.30	15.8	1.30	15.6	1.41	1.27	1.26	1.23
32	49.2	1.49	31.2	1.49	30.5	1.62	1.44	1.45	1.39
16	98.9	1.78	62.0	1.78	59.9	1.93	1.72	1.73	1.63
8	198	2.38	123	2.38	117	2.58	2.30	2.31	2.14
4	397	3.61	243	3.62	230	3.91	3.49	3.52	3.19
2	794	5.68	473	5.75	452	6.14	5.48	5.55	4.90
1	1590	9.57	905	9.73	887	10.3	9.24	9.39	7.88

RM-76-5
FINAL STATUS SURVEY APPROVAL
AND AUTHORIZATION FOR IMPLEMENTATION

Survey Code 11C-1

Survey Area Description:

FSS OF EXCAVATED SOIL FROM SOLID RADIOACTIVE STORAGE
VAULT AREA

The survey area is authorized for Final Status Survey Implementation.

_____*_____*_____
Designed by Date

_____*_____*_____
Technical Review by Date

*NOTE: ATTACHMENT RM-76-5 NOT UTILIZED.
APPROPRIATE SIGNATURES AND DATES ARE
LOCATED AT THE END OF THE SURVEY
DESIGN.

MAK 03-16-04
Documentation format RM-76-5 in development
at time of final status survey
Und 7/22/04





RM-77-1
SURVEY IMPLEMENTATION CHECKLIST
Page 1 of 3

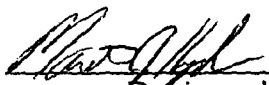
<u>Step</u>		<u>Initial</u>	<u>Date</u>
(✓) 1.0	PREPARATION FOR SURVEY		
	Survey # <u>UC₁ 1 - FSS EXCAVATED SOIL, SOLID RADIOACTIVE STORAGE VAULTS</u>		
1.1	Survey Area Status:		
✓	a. Final Status Survey Design has been approved for implementation (see RM-76-5, Final Status Survey Approval and Authorization for Supplementation).		
	1. Survey area walkdown complete		
	2. Survey area determined ready for FSS		
	3. Decommissioning activities that may impact the environmental status of the survey area have been completed.		
	4. Survey area environment is controlled by barriers and postings or other approved method to restrict access.	<u>MAH</u> ESSG	<u>*</u>
✓	b. Survey area has been turned over to the Environmental Services Survey Group (ESSG) in acceptable condition for FSS.	<u>DER</u> Const	<u>*</u>
1.2	Field Preparation:		
✓	a. Survey unit boundaries delineated (Step 6.1.1)		
✓	b. Statistical soil samples predetermined in the survey design are located and marked within the survey unit. (Step 6.1.2)		
✓	c. Soil sample locations verified (Step 6.1.2.c)		
✓	d. Instruments and equipment have been collected and calibrated for data measurement and collection (Step 6.1.3)		
✓	e. Field documentation is prepared (Step 6.1.4)	<u>ahp</u> ESSG	<u>*</u>

RM-77-1
SURVEY IMPLEMENTATION CHECKLIST
Page 2 of 3

		<u>Initial</u>	<u>Date</u>
2.0	DATA COLLECTION		
2.1	Soil Survey:		
<u>✓</u>	All soil samples collected and controlled (Step 6.2.1).	<u>Chp</u> ESSG	<u>*</u>
2.2	Surface Scan:		
<u>✓</u>	Surface Scan complete. Action response requirements have been conducted on any identified areas exceeding the investigation level (Step 6.3).	<u>MLL</u> ESSG	<u>*</u>
2.3	Judgmental Soil Samples:		
<u>✓</u>	a. Judgmental soil samples have been collected and controlled (Step 6.2.3).		
<u>✓</u>	b. Deep core profiles performed in areas identified to contain elevated residual activity (Step 6.2.3).	<u>MLL</u> ESSG	<u>*</u>
<hr/>			
3.0	SAMPLE PREPARATION AND LABORATORY ANALYSIS		
3.1	Sample Preparation (Step 6.4.1):		
<u>✓</u>	a. Soil samples are homogenous		
<u>✓</u>	b. Soil samples are visibly dry prior to packing		
<u>✓</u>	c. Non-soil materials have been removed from sample		
<u>✓</u>	d. Soil samples have been transferred to one-liter Marinelli containers and are labeled and sealed.	<u>MLL</u> ESSG	<u>*</u>

RM-77-1
SURVEY IMPLEMENTATION CHECKLIST
Page 3 of 3

- | | | <u>Initial</u> | <u>Date</u> |
|-------------------------------------|--|---|---|
| 3.2 | Laboratory Analysis: | | |
| <input checked="" type="checkbox"/> | Isotopic analyses are complete. The spectroscopy report requires a signature of completion by the laboratory analyst and a signature of evaluation documenting that a second level review has been performed (Step 6.4.2). | 
ESSG |  |
| 3.3 | Sample Control and Documentation: | | |
| | Chain of custody documentation exhibits control of soil samples (Step 6.4.3). | 
ESSG |  |


Reviewed by

03-16-04
Date

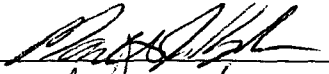

*NOTE: ATTACHMENT RM-77-1 NOT UTILIZED PRIOR TO SURVEY IMPLEMENTATION. IMPLEMENTATION TASKS WERE VERIFIED AND INITIALED BY QUALIFIED ESSG PERSONNEL WHO PERFORMED THE TASKS.

Documentation format RM-77-1 in development
at time of Final Status Survey
6/18/04

RM-59
SAMPLING AND ANALYSIS OF BULK MATERIAL
FOR SITE CHARACTERIZATION OR FREE RELEASE

Revision 6
Page 13 of 14

ATTACHMENT RM-59-1
SAMPLING AND ANALYSIS REPORT

DATE: 4-22-03	TIME: 0900	LOCATION: SURVEY UNIT 11	TECH: mjk/rs dwp/gls
SURVEY IDENTIFICATION / DESCRIPTION			
SURVEY UNIT 11, FINAL STATUS SURVEY, EXCAVATED SOIL, SOLID WASTE VAULT AREA			
SURVEY TYPE			
SURVEY TYPE:	Scoping	Characterization	Remediation
<input checked="" type="checkbox"/> Final	<input checked="" type="checkbox"/> Scan (Motive)	<input type="checkbox"/> Scan (Static)	
<input type="checkbox"/> Bulk Materials			
SURVEY DESIGN			
SURVEY DESIGN:	Judgmental	Random	Remediation
<input checked="" type="checkbox"/> Scan	(100 %)	<input checked="" type="checkbox"/> Random Scan Systematic	
ANALYSIS			
INST./SERIAL NO. SCAN: 23501/13620	DAILY CHECK: <input checked="" type="checkbox"/> SAT	<input checked="" type="checkbox"/> UNSAT	INIT: mjk
INVESTIGATION OF UNIDENTIFIED PEAKS:	N/A	<input checked="" type="checkbox"/> SAT	INIT: mjk
Minimum Detectable Activity / MDC (3.0.q, 4.2.b, 4.2.i)	<input checked="" type="checkbox"/> SAT	INIT: mjk	
COMMENTS			
Final Status Survey of Excavated Soil from RW Vault Excavation involved 100% mobile scan w/ NaI detector and soil samples. Soil sample design: Random start w/ square grid systematic pattern. 18 soil samples were collected all of which showed concentrations of radioactivity at a fraction of the DCLW. 100% mobile scan identified 0 areas of activity above background.			
TECHNICIAN SIGNATURE: 		DATE: 4-24-03	
SECOND LEVEL REVIEW: 		DATE: 4/29/03	

Activity Summary
Final Status Survey 11C_{x1}1
Excavated Soil
Solid Radwaste Vault Area

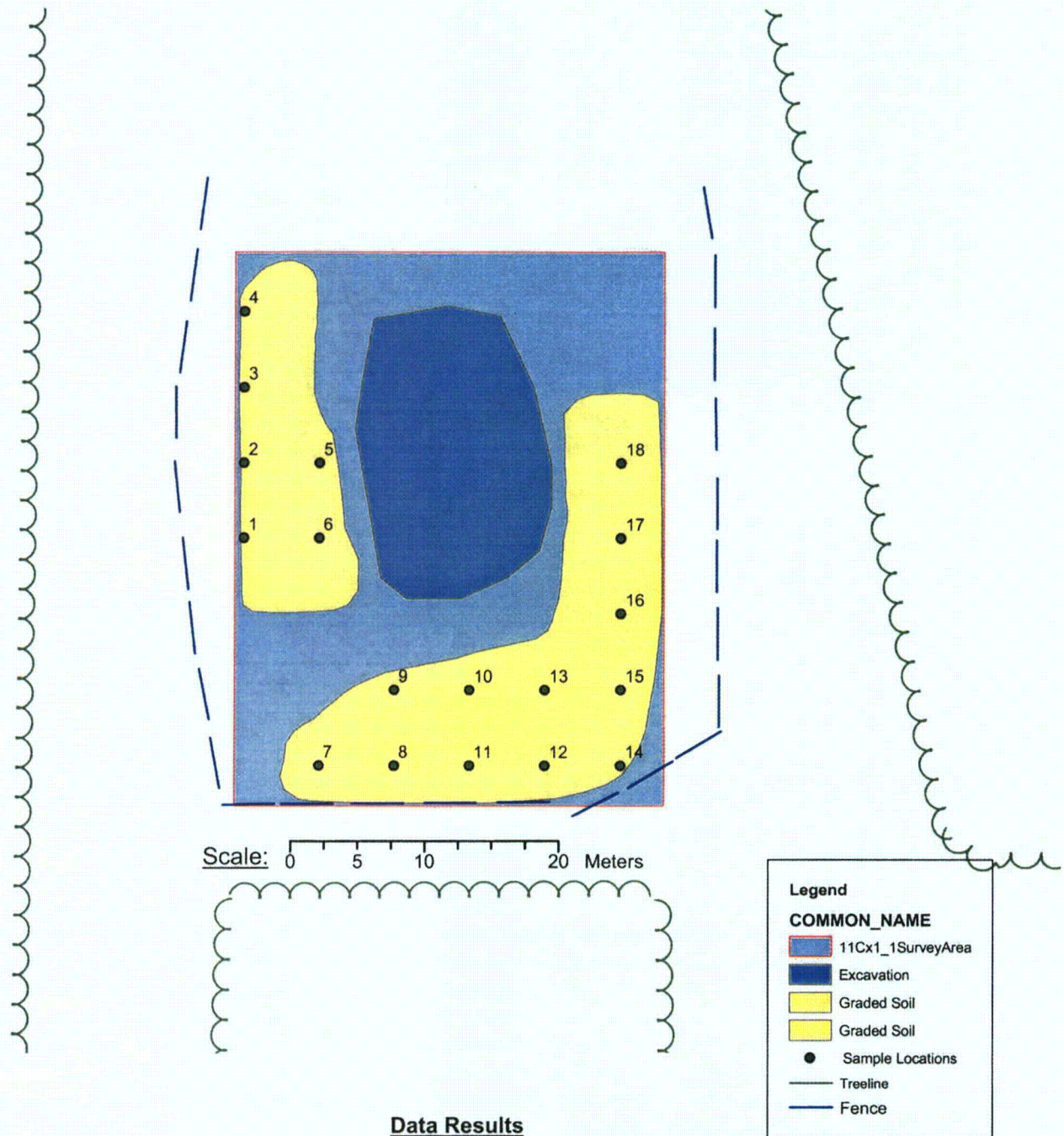
Sample No.	*Coordinate (x,y)	Cs-137 (pCi/g)		Co-60 (pCi/g)	
		Activity	MDA	Activity	MDA
1	(0.4)(19.7)	0.06		nd	0.06
2**	(0.4)(25.3)	0.09		nd	0.06
3	(0.4)(30.9)	nd	0.05	nd	0.04
4	(0.4)(36.5)	0.05		nd	0.06
5	(6.0)(25.3)	nd	0.06	nd	0.05
6	(6.0)(19.7)	nd	0.05	nd	0.05
7	(6.0)(2.9)	nd	0.05	nd	0.07
8	(11.6)(2.9)	nd	0.05	nd	0.06
9	(11.6)(8.5)	nd	0.05	nd	0.05
10	(17.2)(8.5)	nd	0.05	nd	0.05
11	(17.2)(2.9)	nd	0.05	nd	0.06
12	(22.8)(2.9)	nd	0.05	nd	0.05
13	(22.8)(8.5)	nd	0.06	nd	0.06
14	(28.4)(2.9)	0.06		nd	0.07
15	(28.4)(8.5)	nd	0.05	0.06	
16	(28.4)(14.1)	0.08		nd	0.05
17	(28.4)(19.7)	nd	0.06	nd	0.06
18	(28.4)(25.3)	0.05		nd	0.06

*Coordinate location relative to SW Corner of survey unit where X=0 m. and Y=0 m.

**Sample 2 is the random start location for the survey.

Note: nd indicates activity not detected above MDA values.

Activity Summary Map
Final Status Survey 11Cx1_1
Excavated Soil, Radwaste Vault Area
04-22-03



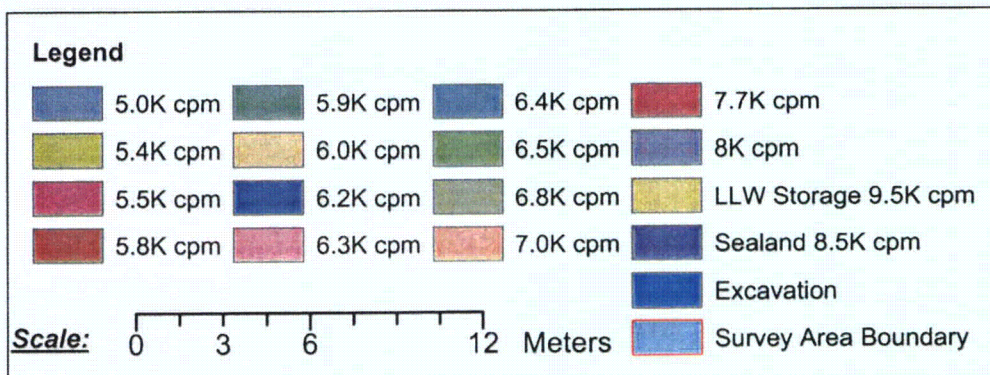
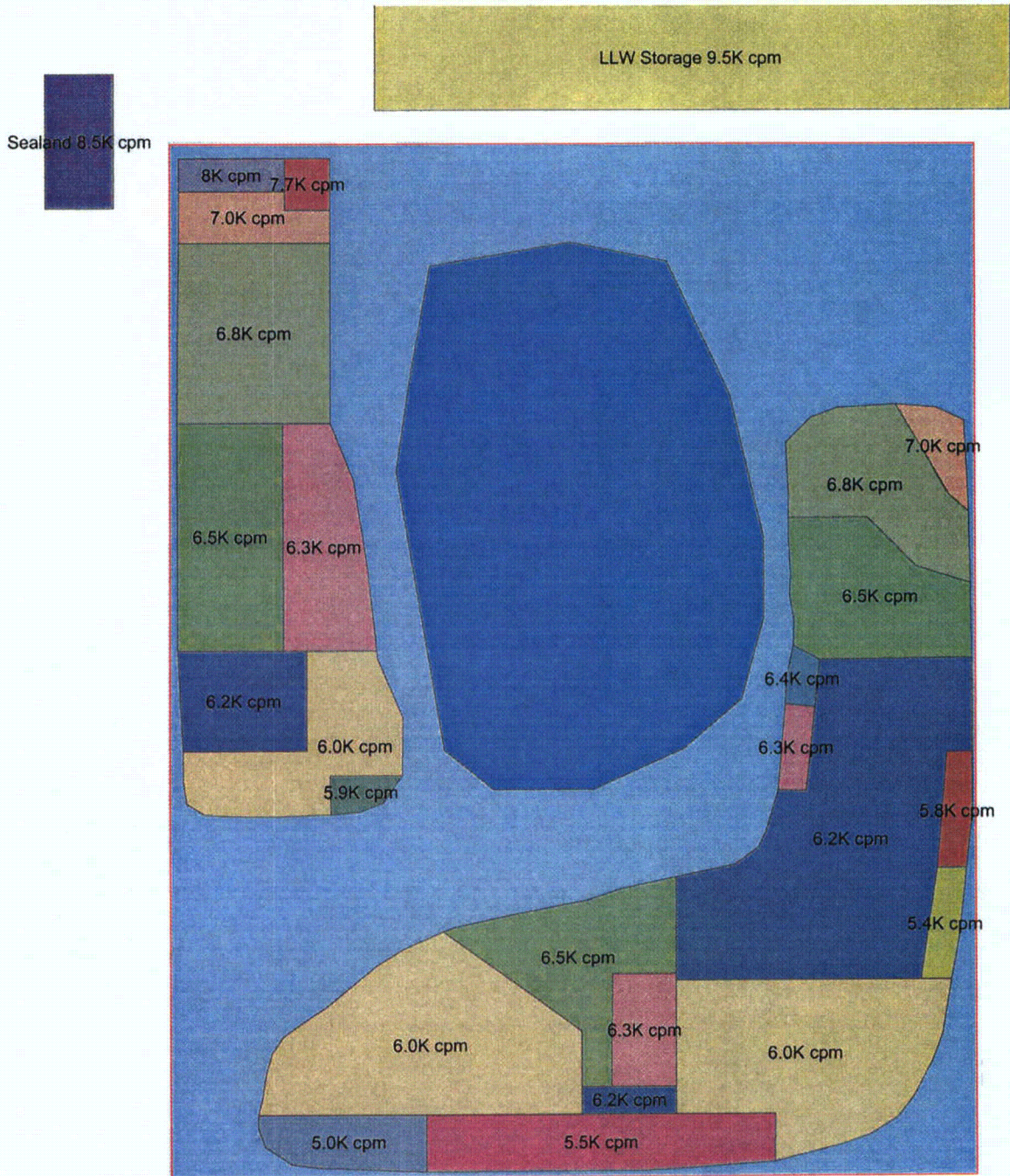
Data Results

Sample	Cs-137 (pCi/g)		Co-60 (pCi/g)	
	Activity	MDA	Activity	MDA
1	0.06		nd	0.06
2	0.09		nd	0.06
3	nd	0.05	nd	0.04
4	0.05		nd	0.06
5	nd	0.06	nd	0.05
6	nd	0.05	nd	0.05
7	nd	0.05	nd	0.07
8	nd	0.05	nd	0.06
9	nd	0.05	nd	0.05

Sample	Cs-137 (pCi/g)		Co-60 (pCi/g)	
	Activity	MDA	Activity	MDA
10	nd	0.05	nd	0.05
11	nd	0.05	nd	0.06
12	nd	0.05	nd	0.05
13	nd	0.06	nd	0.06
14	0.06		nd	0.07
15	nd	0.05	0.06	
16	0.08		nd	0.05
17	nd	0.06	nd	0.06
18	0.05		nd	0.06

Note: nd indicates activity not detected above MDA values.

FSS 11Cx1_1
Excavated Soil, Radwaste Vault Area
100% Mobile Scan Results
04-22-03



RM-72-1
CHAIN-OF-CUSTODY RECORD

Sample Number	* Sampling Location	Date	Time	Final Disposition of Sample
1	(0.4)(19.7)	4/22/03	0908	65C
2	(0.4)(25.3)		0916	65C
3	(0.4)(30.9)		0922	65C
4	(0.4)(36.5)		0925	65C
5	(6.0)(25.3)		0929	65C
6	(6.0)(19.7)		0933	65D
7	(6.0)(2.9)		0938	65D
8	(11.6)(2.9)		0943	65D
9	(11.6)(8.5)		0949	65D
10	(17.2)(8.5)		0952	65D
11	(17.2)(2.9)		0956	65E
12	(22.8)(2.9)		1002	65E
13	(22.8)(8.5)		1011	65E
14	(28.4)(2.9)		1021	65E
15	(28.4)(8.5)		1018	29D
16	(28.4)(14.1)		1043	65E
17	(28.4)(19.7)		1035	65F
18	(28.4)(25.3)		1039	65F

(Samples may be analyzed and stored, shipped for offsite evaluation or analyzed and disposed of.)

*NOTE: SAMPLE LOCATION IS W/R/T THE SOUTHWEST CORNER OF THE SURVEY UNIT Where: X=0meters
Y=0meters

1. Relinquished by: SAMPLES 2 & 15 <i>[Signature]</i>	Date 4/24/03	Time 10:04	Received in good condition by: → SENT TO ORISE PER REQUEST OF WRL
2. Relinquished by:	Date	Time	Received in good condition by: Verified release to soil storage <i>[Signature]</i> 11/10
3. Relinquished by:	Date	Time	Received in good condition by:
4. Relinquished by:	Date	Time	Received in good condition by:

RM-78-3
DATA ASSESSMENT REPORT
Page 1 of 8

FINAL STATUS SURVEY: 11C-1 - FSS EXCAVATED SOIL
SOLID RADIOACTIVE STORAGE VULTS

1.0 DATA VERIFICATION

1.1 Data Acceptance

- ☒ Review the Implementation Checklist (RM-77-1) to verify that survey isolation and control measures were executed prior to FSS and are being maintained.
- ☒ Review RM-77, Final Status Survey Implementation, to verify that methods, techniques, and survey activities required for FSS have been applied in accordance with the appropriate procedures.

1.2 Field QC Records:

- ☒ Review all assessments, Condition Reports and audits to ensure that identified issues have been resolved.

Comments: _____

- ☒ Verify scan instrumentation was in calibration and the QC source checks were performed prior to and after surveys.

- ☒ Verify daily QC source checks for Canberra gamma spectroscopy detector properly logged prior to soil sample analysis.

1.3 Review Verification:

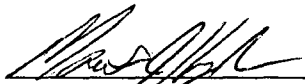
- ☒ Verify that the Data Quality Objectives are complete.
- ☒ Verify that the survey design has been technically reviewed.

RM-78-3
DATA ASSESSMENT REPORT
Page 2 of 8

- ☒ Verify that gamma spectroscopy results have received a technical review.
- ☒ Verify the Sample and Analysis Report (RM-59-1) is completed and reviewed.

Data Verification Completed: ☒ Yes ☐ No

Comments _____



Assessor

3/22/04

Date

RM-78-3
DATA ASSESSMENT REPORT
Page 3 of 8

2.0 DATA VALIDATION

2.1 Documentation Review:

Perform documentation review for quality control purposes and validate the data collected is complete and appropriate for use as defined by the survey design. Documentation includes:

- ☒ Field measurement records
- ☒ Chain-of-custody
- ☒ Quality Control (QC) measurement records
- ☒ Current qualification of survey personnel
- ☒ (N/A) Corrective Action Reports
- ☒ Data inputs (laboratory spectroscopy)
- ☒ Sample preparation techniques

2.2 Detection Limit Review:

- ☒ Scan MDCs are below established site DCGLs.
- ☒ Forced-count values are assigned as necessary when activity is not detected in a sample.
- ☒ Minimum Detectable Concentration (MDC) values of gamma spectroscopy are below established DCGLs.

2.3 Quality Control (QC) Data Review:

- ☒ Quality Control (QC) data results have received required reviews and are complete and consistent.
- ☒ Results of judgmental samples have been reviewed and evaluated.
- ☒ Review to ensure that the analytical results of judgmental samples do not impact the evaluation for unrestricted release of the survey area.

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DATA ASSESSMENT REPORT
Page 4 of 8

2.4 Qualification of Data:

Statistical radionuclide-specific measurements for completeness. Evaluate the survey for determination of data usability and confirm that sufficient qualified data are present for the decision process.

- a. Total number of statistical samples planned for the survey: 18
- b. Total number of statistical samples determined as valid: 18
- c. Calculate % Completeness: $\frac{b \times 120}{a} = \underline{120\%}$

☒ Qualified data are $\geq 100\%$ completeness and are sufficient to support the Sign Test requirement for determination of unrestricted release.

Data Validation Completed: Yes No

Comments: Refer to Attachment 1, Analysis of Data Results,
for verification of data in section 2.4


Assessor

3/24/04
Date

RM-78-3
DATA ASSESSMENT REPORT
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3.0 DATA QUALITY ASSESSMENT

3.1 Review the DQOs and Survey Design:

- ☒ Confirm that all inputs to the decision have been reviewed and are complete.
- ☒ Verify that boundaries or constraints identified in the survey area have not affected the quality of the data.
- ☒ Review the Statement of Hypothesis and confirm that it remains relevant.
- ☒ Confirm that Type I and Type II error limits are consistent with DQOs.
- ☒ Confirm that the survey design is consistent with DQOs and that the appropriate number of data points were obtained.

3.2 Preliminary Review:

3.2.1 Preliminary Evaluation:

- ☒ Quality Assessment (QA) reports consistent with procedure RM-79, Final Status Survey Quality Control.
- ☒ Survey is of sufficient intensity to satisfy classification requirement.
- ☒ Potential trends of radioactivity levels in the survey area do not impact a decision for unrestricted release.

Comments: _____

RM-78-3
DATA ASSESSMENT REPORT
Page 6 of 8

3.2.2 Calculate Basic Statistical Quantities:

- a. Number of qualified data points 18 *REFER TO ATTACHMENT 1 FOR STATISTICAL QUANTITIES.
- b. Calculation of the Mean (SDR) 0.009
- c. Calculation of the Median (SDR) 0.008
- d. Calculation Standard Deviation (SDR) 0.006

N/A Attach graphic representation of the data if any radionuclide-specific measurements exceed 50% of the DCGL.

✓ Sample QA/QC measurements consistent with FSS data

3.3 Statistical Evaluation:

NOTE: If all measurement data are less than the $DCGL_w$, statistical testing is not required and the survey unit meets the regulatory requirement for unrestricted release.

✓ All survey measurements are below the $DCGL_w$.

3.3.1 Verify Assumptions of the Statistical Test

N/A Review the posting plot to verify that the if data exhibits spatial independence. Spatial trends must be investigated and resolved prior to further assessment.

N/A Review to verify dispersion symmetry. The appearance of skewed data must be investigated for cause and documented prior to further assessment.

RM-78-3
DATA ASSESSMENT REPORT
Page 7 of 8

N/A Review the dataset standard deviation and range for data variance. Questionable data must be investigated for cause and documented prior to further assessment.

N/A Compare the prospective power curve with the retrospective power curve. Verify that the data exhibits adequate power and confirm that the sample size is sufficient to satisfy the DQOs.

3.4 Draw Conclusions from the Data:

3.4.1 Investigation Levels and Response Actions

N/A Determine if data results have exceeded any investigation level. Document findings.

3.4.2 Evaluation for Unrestricted Release

Select applicable conclusion:

✓ Survey area acceptance criteria met and survey area satisfies the requirements for unrestricted release:

✓ All concentrations are less than the $DCGL_w$. The Null Hypothesis is rejected.

N/A The mean concentration of the survey area is below the $DCGL_w$ but individual measurements in the survey unit exceed the $DCGL_w$. The Sign Test and EMC evaluation are successful and the Null Hypothesis is rejected.

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DATA ASSESSMENT REPORT
Page 8 of 8


NA Survey area acceptance criteria not met and survey area fails to satisfy the requirements for unrestricted release:

NA The mean concentration in the survey area exceeds the DCGL_w and the null hypothesis is confirmed.

NA The mean concentration of the survey area is below the DCGL_w but individual measurements in the Unit exceed the DCGL_w. The Sign Test and EMC evaluation are unsuccessful and the null hypothesis is confirmed.

Data Quality Assessment Completed: Yes No

Comments _____




Assessor

3/24/04

Date

Reviews:



Technical Review

7/22/04

Date



ES Superintendent

7/29/04

Date



RP&ES Manager

10-13-04

Date

Analysis of Data Results
Final Status Survey 11C_{x1}1
Excavated Soil
Solid Radwaste Storage Vault Area

Sample Number	Cs-137 (pCi/gm)	Co-60 (pCi/gm)	Weighted Sum	**Weighted Sum <DCGLw?	DCGL-W. Sum	Sign
1	0.056	0.005	0.006	yes	0.994	+1
2	0.092	0.003	0.019	yes	0.981	+1
3	0.013	-0.009	0.001	yes	0.999	+1
4	0.049	0.003	0.010	yes	0.990	+1
5	0.051	0.011	0.012	yes	0.988	+1
6	0.029	0.012	0.008	yes	0.992	+1
7	0.007	0.035	0.008	yes	0.992	+1
8	0.011	0.009	0.004	yes	0.996	+1
9	0.018	-0.0002	0.0035	yes	0.997	+1
10	0.029	0.003	0.006	yes	0.994	+1
11	0.023	0.018	0.008	yes	0.992	+1
12	0.009	-0.019	-0.002	yes	0.998	+1
13	0.018	0.010	0.006	yes	0.994	+1
14	0.057	0.033	0.018	yes	0.982	+1
15	0.007	0.059	0.013	yes	0.987	+1
16	0.080	0.005	0.017	yes	0.983	+1
17	0.022	0.011	0.007	yes	0.993	+1
18	0.049	0.017	0.013	yes	0.987	+1

St. Deviation (SOR): 0.006
Mean (SOR): 0.009
Median (SOR): 0.008

Number of Positive Differences (S+): n/a

Critical Value, k, Table I.3 of Marssim: n/a

S+ > than k?: n/a

Survey Unit Pass or Fail: ****Pass**

**Note: Forced-Count values are used for samples with activity levels below the MDA.*

***Note: If all measurement data are less than the DCGL_w, then the Sign Test is not required.*

FSS Quality Control

The FSS survey of excavated soil from solid radwaste storage vaults (11C_{x1}1) was completed prior to development and implementation of BRP Procedure RM-79. Quality control activities implemented for this survey were conducted to satisfy the requirements specified in the BRP License Termination Plan. Some aspects of this process are not identical to the specific methodology developed later as specified in Procedure RM-79.

Quality verifications through data comparison with confirmatory measurements conducted by regulatory agencies serve to validate the conclusion for unrestricted release of this survey unit.

QA Verification

Sample Recount Analysis

Date: 3/22/2004

QA: 11C_{x1}1, Solid Radwaste Storage Vaults

Type: Sample RecountLab: **ORISE for USNRC**

Table 1

Acceptance Criteria	
Resolution	Ratio
<4	N/A
4-7	0.5-2.0
8-15	0.6-1.66
16-50	0.75-1.33
51-200	0.8-1.25
>200	0.85-1.18

[illegible]

$$\text{Resolution } C = \frac{A}{(A)(B/100)}$$

< Indicates results less than the MDA.

RM-79-1
FSS QUALITY CONTROL EVALUATION RESULTS

FSS Package # 11C_{x11} EXCAVATED SOIL AND QC Package # 11C_{x11}
RADWASTE STORAGE
VAULTS

QC Measurement Type	Acceptance Criteria Met*?	Reference
<input checked="" type="checkbox"/> 1. Replicate Scan	<input checked="" type="radio"/> Yes <input type="radio"/> No	Step 5.1.3
2. Sample Recounts		Step 5.1.4.1
<input type="checkbox"/> a. In-house	Yes / No	
<input checked="" type="checkbox"/> b. Third party	<input checked="" type="radio"/> Yes <input type="radio"/> No	
3. Split Samples		Step 5.1.4.2
<input type="checkbox"/> c. In-house	Yes / No	
<input type="checkbox"/> d. Third party	Yes / No	

*NOTE: If Acceptance Criteria is not met, completion of Attachment RM-79-2, FSS Quality Control Investigation Results, is required.

Comments:

1. REPLICATE SCAN PERFORMED BY USNRC PERSONNEL. NRC FOUND AREA SATISFACTORY. REFER TO INSPECTION REPORT 05000155/2003-002 (P/NMS) ATTACHED.
2. NRC CHOSE SAMPLES TO BE RECOUNTED BY 3RD PARTY LAB. RESULTS IN AGREEMENT

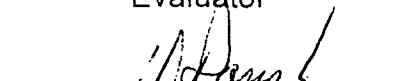
Reviews:



Evaluator

3/24/04

Date



Technical Review

7/22/04

Date

FSS Quality Control

The FSS survey of the Radwaste Storage Vault excavated soil (11C_{x1}1) was completed prior to development and implementation of final status survey quality control procedure RM-79. Quality control activities implemented for this survey were conducted to satisfy the requirements specified in the BRP License Termination Plan. Some aspects of this process are not identical to the specific methodology developed later as specified in Procedure RM-79.

Quality verifications through data comparison with confirmatory measurements conducted by regulatory agencies serve to validate the conclusion for unrestricted release of this survey unit.



UNITED STATES
NUCLEAR REGULATORY COMMISSION

REGION III
801 WARRENVILLE ROAD
LISLE, ILLINOIS 60532-4351

Withdraw

8369A

D, IR

June 18, 2003

Copies To: LLC

RSRC

Doc File

Docket File

Mr. Kurt M. Haas
General Manager
Big Rock Point Nuclear Plant
Consumers Energy Company
10269 US 31 North
Charlevoix, MI 49720

SUBJECT: BIG ROCK POINT INSPECTION REPORT 05000155/2003-002(DNMS) &
INSPECTION REPORT 07200043/2003-002(DNMS)

Dear Mr. Haas:

On May 19, 2003, the NRC completed an inspection at the Big Rock Point Nuclear Plant. The purpose of the inspection was to determine whether decommissioning activities were conducted safely and in accordance with NRC requirements. Specifically, the inspectors evaluated decommissioning support activities, spent fuel safety and radiological safety. At the conclusion of on-site inspections on March 20 and April 24, 2003, the inspectors discussed the inspection findings with you and members of your staff. An additional telephone exit interview was conducted on May 19, 2003, to discuss the results of the NRC's independent soil sample analyses.

This inspection consisted of an examination of decommissioning activities at the Big Rock Point Nuclear Plant as they relate to safety and compliance with the Commission's rules and regulations. Areas examined during the inspection are identified in the enclosed report. Within these areas, the inspection consisted of a selective examination of procedures and representative records, observations of activities in progress, and interviews with personnel.

Based on the results of this inspection, the NRC did not identify any violations. The decommissioning activities reviewed were being conducted in accordance with applicable regulations and license conditions.

In accordance with 10 CFR 2.790 of the NRC's "Rules of Practice," a copy of this letter and its enclosure will be made available electronically for public inspection in the NRC Public Document Room or from the NRC's document system (ADAMS), accessible from the NRC Web site at <http://www.nrc.gov/reading-rm/adams.html>.

K. Haas

-2-

We will gladly discuss any questions you may have regarding this inspection.

Sincerely,

/RAI

Christopher G. Miller
Decommissioning Branch

Docket Nos. 05000155; 07200043
License No. DPR-6

Enclosures: Inspection Report 05000155/2003-002(DNMS) &
Inspection Report 07200043/2003-002(DNMS)

cc w/encl: R. A. Fenech, Senior Vice President,
Nuclear, Fossil, and Hydro Operations
Richard Whale, Michigan Public Service Commission
L. Shekter Smith, Michigan Department of
Environmental Quality
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U.S. NUCLEAR REGULATORY COMMISSION

REGION III

Docket No. 05000155; 07200043
License No. DPR-06

Report Nos. 05000155/2003-002(DNMS) &
07200043/2003-002(DNMS)

Licensee: Consumers Energy Company

Facility: Big Rock Point Nuclear Plant

Location: 10269 U.S. 31 North
Charlevoix, MI 49720

Dates: March 17 - May 19, 2003

Inspector: William Snell, Health Physics Manager
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Decommissioning Branch
Division of Nuclear Materials Safety

EXECUTIVE SUMMARY

Big Rock Point Restoration Project NRC Inspection Report 05000155/2003-002(DNMS) & Inspection Report 07200043/2003002(DNMS)

This routine decommissioning inspection involved review of the licensee's performance related to decommissioning support activities, spent fuel safety and radiological safety. During this assessment period, the licensee completed placing spent fuel into dry storage casks and moving the casks to the Independent Spent Fuel Storage Installation (ISFSI). In addition, a canister of greater than class C waste was placed on the ISFSI, and all the fuel racks were removed from the Spent Fuel Pool. Overall, the licensee's major decommissioning activities were properly monitored and controlled.

Decommissioning Support Activities

- The inspectors determined that Revision 19 of the Defueled Security, Suitability, Training, and Qualification Plan, submitted in accordance with 10 CFR 50.54(p) resulted in no decrease in effectiveness to the security plan. (Section 1.1)
- The licensee submitted Revision 38 to the Defueled Security Plan in accordance with 10 CFR 50.54(p). The security plan change does not relieve the licensee from complying with applicable security advisories and orders issued by the NRC. The inspectors determined that the changes to the Defueled Security Plan did not decrease the effectiveness of the plan. (Section 1.2)

Spent Fuel Safety

- Based on direct observations of the Horizontal Transfer System (HTS) test program and reviews of the HTS procedures, the inspectors determined that the licensee personnel could safely transfer a loaded canister between the transfer cask and a storage cask without using the containment building crane. Procedures and administrative controls had been established to ensure compliance with NRC requirements.

Radiological Safety

- The inspectors determined that the licensee's pre-demolition surface survey program was capable of measuring the designed radiological survey criteria of 5000 disintegrations per minute per 100 square centimeters (dpm/100 cm²). (Section 3.1)
- The bulk material assay system was designed assuming a uniform spatial distribution of contamination within a waste volume. In conjunction with the pre-demolition surface survey program, the inspectors determined the system, as designed, will meet the requirements of the licensee's waste disposal criteria of 5 picocuries per gram. (Section 3.2)
- The licensee's radioanalytical laboratory equipment, laboratory quality assurance program, and analytical procedures were adequate. The program for laboratory analyses was effectively implemented. (Section 3.3)

- Licensee personnel performed soil surface scanning and sample collection at the site of the Old Radwaste Building and its underground vault in accordance with the final status survey program specified in the Big Rock Point Restoration Project License Termination Plan (LTP), which the NRC has received for review and approval. Six of seven soil samples sent to the Oak Ridge Institute for Science and Education (ORISE) for independent analyses showed statistical agreement with the licensee's results. The ORISE personnel concluded that the statistical difference in the one sample was probably due to a small particle of elevated activity in the sample. However, in all cases the sample results were less than the Derived Concentration Guideline Levels (DCGLs). (Section 3.4)
- The inspectors did not identify any concerns regarding the licensee's activities associated with a radioactive waste shipment of contaminated concrete debris and a spent fuel rack. (Section 3.5)

Report Details¹

1.0 Decommissioning Support Activities

1.1 Safeguards Program Implementation (81700)

a. Inspection Scope

The inspectors reviewed Revision 19, dated October 8, 2002, to the Defueled Security Suitability, Training, and Qualification Plan. The purpose of the review was to verify that the change did not decrease the effectiveness of the security plan. The security plan revision was submitted in accordance with 10 CFR 50.54(p).

b. Observations and Findings

The revision to the security plan was primarily administrative in nature and addressed security measures for movement of spent fuel.

c. Conclusions

The inspectors determined that Revision 19 of the Defueled Security, Suitability, Training, and Qualification Plan, submitted in accordance with 10 CFR 50.54(p) resulted in no decrease in effectiveness to the security plan.

1.2 Safeguards Program Implementation (81700)

a. Inspection Scope

The inspector reviewed Revision 38, dated March 27, 2003, to the Defueled Security Plan. The purpose of the review was to verify that the changes did not decrease the effectiveness of the security plan.

b. Observations and Findings

The revision to the security plan was primarily administrative in nature and described under what conditions the provisions of the defueled security plan would be applicable. The revision also showed changes in the security management organizational structure and reporting responsibilities.

c. Conclusions

The licensee submitted Revision 38 to the Defueled Security Plan in accordance with 10 CFR 50.54(p). The security plan change does not relieve the licensee from complying with applicable security advisories and orders issued by the NRC. The inspectors determined that the changes to the Defueled Security Plan did not decrease the effectiveness of the plan.

¹A list of acronyms used in the report is included at the end of the Report Details.

2.0 Spent Fuel Safety

2.1 Operation of an Independent Spent Fuel Storage Installation (ISFSI) (60855)

a. Inspection Scope

The inspector observed various portions of the licensee's test program for the Horizontal Transfer System (HTS) to determine whether the licensee was capable of safely transferring a loaded canister between the transfer cask and a storage cask located on the ISFSI storage pad. Prior to allowing the licensee to remove the containment building crane, a successful demonstration of the licensee's capability to transfer the canister without the use of the containment building crane was required. The test program was examined to ensure that all conditions and requirements of the Certificate of Compliance, the Safety Analysis Report, Technical Specifications, and 10 CFR Part 72 requirements were met.

b. Observations

The inspectors reviewed licensee procedures and observed the implementation of those procedures, which tested the licensee's capability to safely transfer a loaded canister between the transfer cask and a storage cask. The procedures were well developed and complete. The licensee held pre-job briefings prior to the implementation of each segment of the procedure. These pre-job meetings were conducted in a professional manner, and the necessary issues to enhance safety (such as the need for three way communication, pre-staging of equipment, and teamwork among work parties) were discussed.

The inspectors observed various portions of implementing the transfer procedures. Licensee personnel exercised good safety practices during heavy lifts and completed the lifts in accordance with procedures. The inspectors observed proper work coverage by health physics and security personnel on the ISFSI storage pad during work activities. The inspector observed good communication and teamwork between licensee personnel from various work groups.

c. Conclusions

Based on direct observations of the HTS test program and reviews of the HTS procedures, the inspectors determined that the licensee personnel could safely transfer a loaded canister between the transfer cask and a storage cask without using the containment building crane. Procedures and administrative controls had been established to ensure compliance with NRC requirements.

3.0 Radiological Safety

3.1 Pre-demolition Surface Contamination Surveys (83750)

a. Inspection Scope

The inspectors reviewed the licensee's pre-demolition surface survey program. The review included an evaluation of analytical procedures and the survey instruments' capability to meet the specified pre-demolition minimum detectable activity criteria.

b. Observations and Findings

The inspectors interviewed the licensee's health physics technical personnel and observed calibration and sensitivity tests of the radiological survey instruments that will be used to conduct the pre-demolition final surface surveys. Prior to demolition, the surveys will verify that building surface contamination levels are less than 5000 disintegrations per minute per 100 square centimeters (dpm/100 cm²). Based on the observed verification of the instruments' capabilities, the inspectors determined the survey instruments were accurate, and would meet the specified minimum detectable activity criteria based on the planned counting times. Use of the instruments would allow the licensee to measure the designed survey criteria of 5000 dpm/100 cm².

c. Conclusions

The inspectors determined that the licensee's pre-demolition surface survey program was capable of measuring the designed radiological survey criteria of 5000 dpm/100 cm².

3.2 Bulk Material Assay (86750)

a. Inspection Scope

Inspectors evaluated the bulk material assay program and the technical basis for design, calibration, and operation of the bulk assay radiation detection system, to determine whether the system would meet the requirements of the licensee's waste disposal criteria of 5 picocuries per gram (5 pCi/g).

b. Observations and Findings

By cover letter dated February 5, 2002, and in accordance with the provisions of 10 CFR 20.2002, the NRC approved the licensee's proposal to dispose of demolition debris in a State of Michigan landfill. The licensee's proposal contained a commitment that all demolition debris would be monitored by a bulk assay radiation detection system with an alarm setpoint established at or below a 5 picocuries per gram (5 pCi/g) limit prior to disposal. The inspectors reviewed procedures and documents regarding the design, calibration and operation of the bulk assay radiation detection system. The monitoring facilities and equipment were inspected and observed in operation, and personnel knowledgeable of the system were interviewed.

The bulk assay radiation detection system consisted of two side by side trailers spaced just far enough apart for a truck to drive between them. The demolition debris (which was primarily concrete) was deposited into a large roll-off type container, which was positioned on the truck. The truck was driven between the trailers. A scale was located between the trailers so each load could be weighed. Four high-purity germanium detectors were located inside the trailers, and two sodium iodide plastic scintillation detectors were located on the outside of the trailers. The dimensions of the roll-off containers were 670 cm (length) x 229 cm (width) x 107 cm (height) [263 x 90 x 42 inches]. The container was assayed by positioning the roll-off container with two detectors on each side of the container, and with each detector centered to measure a quadrant of the container, 350 cm x 115 cm x 107 cm.

The inspectors found that the bulk material assay system is designed only for a uniform spatial distribution of contamination within a waste volume. To ensure the bulk material assay system functions as designed, additional steps will be required to ensure a uniform spatial distribution of contamination exists within a waste volume prior to the assay. The licensee will ensure that the concrete waste to be monitored by the bulk monitoring system is uniform and less than the 5pCi/gram limit by performing extensive surface contamination surveys of the concrete walls and exposed surfaces prior to the concrete being turned into rubble.

c. Conclusions

The bulk material assay system was designed assuming a uniform spatial distribution of contamination within a waste volume. In conjunction with the pre-demolition surface survey program, the inspectors determined the system, as designed, will meet the requirements of the licensee's waste disposal criteria of 5 pCi/g.

3.3 Quality Assurance/Quality Control (QA/QC) of Radioanalytical Laboratory (83750)

a. Inspection Scope

The inspectors evaluated the radioanalytical laboratory, including the Quality Assurance and Quality Control program and pertinent analytical procedures, to ensure that sample analyses were being performed in an acceptable manner and that the results were accurate. The inspectors also reviewed portions of the licensee's program for laboratory analyses, interviewed laboratory personnel, and reviewed gamma spectrum analyses of a selection of previously analyzed archived samples.

b. Observations and Findings

The laboratory was equipped with high purity germanium detectors for soil sample analyses. The inspectors conducted independent calibration and quality control checks. The analytical results of soil samples previously analyzed were accurate. The inspectors reviewed the results of the licensee's radiochemistry cross check program, and found the results were in agreement with the comparison.

c. Conclusions

The licensee's radioanalytical laboratory equipment, laboratory quality assurance program, and analytical procedures were adequate. The program for laboratory analyses was effectively implemented.

3.4 Soil Sampling at Site of Old Radwaste Building (83801)

a. Inspection Scope

Inspectors evaluated licensee surface surveys and soil sampling for the unrestricted release of the site where the Old Radwaste Building was located.

b. Observations and Findings

*These findings addressed in FSS 1K11
at Pough 7/22/04*

The licensee completed the demolition of the Old Radwaste Building and underground vault that was located within the building, and had removed all demolition debris from the area. Soil that been removed from around the vault during it's demolition was spread out on the ground in a layer of one meter or less in depth. The licensee had previously collected soil samples from within the hole where the vault had been located, and was collecting additional samples of the spread out dirt during the inspection. The inspectors observed the licensee performing surface scanning of the soil and collecting soil samples in accordance with the final status survey program specified in the Big Rock Point Restoration Project License Termination Plan (LTP), which the NRC had received for review and approval. After observing the licensee's surface scanning and soil collection and archiving techniques, the inspectors determined that the licensee's techniques were acceptable. The inspectors conducted independent scanning of some of the same areas as the licensee, and obtained similar results.

The NRC sent seven of the soil samples collected and analyzed by the licensee to the Oak Ridge Institute for Science and Education (ORISE) for independent analyses. In all cases but one, ORISE obtained results similar to those of the licensee. In sample #6, the radiological activity of the Cs-137 values were not within statistical agreement. Since the sample size used by ORISE to analyze the sample was smaller than the sample size used by Big Rock Point, ORISE personnel counted the remaining sample material, recombined the soil, took two samples from the recombined soil, and counted them. In none of the cases were the analytical results statistically equivalent. ORISE personnel concluded that the statistical difference was probably due to a small particle of elevated activity in the sample. However, since the results were in all cases less than the Derived Concentration Guideline Levels (DCGLs), no further review was pursued. The results of the analyses are listed in the following table.

Soil Sample Survey Results
Radwaste Building Demolition
Data in picoCuries per gram (pCi/g)

BRP Sample # 2
BRP Sample # 15

Sample #	NRC (ORISE)		Big Rock Point	
	Co-60	Cs-137	Co-60	Cs-137
1	0.02	0.09	<MDA ^a	0.09
2	0.09	0.04	0.06	<MDA
3	0.02	0.02	<MDA	0.06
4	0.02	0.51	<MDA	0.37
5	0.12	0.47	0.13	0.43
6	0.11	2.28	0.12	1.62
7	0.80	3.02	0.73	3.45

^aLess than the minimum detectable activity (MDA).

c. Conclusions

these findings addressed for FSS 11C x1, remaining values for FSS 11C, base elevation survey BRP 7/22/04

Licensee personnel performed soil surface scanning and sample collection at the site of the Old Radwaste Building and its underground vault in accordance with the final status survey program specified in the Big Rock Point Restoration Project License Termination Plan (LTP), which the NRC has received for review and approval. Six of seven soil samples sent to the Oak Ridge Institute for Science and Education (ORISE) for independent analyses showed statistical agreement with the licensee's results. The ORISE personnel concluded that the statistical difference in the one sample was probably due to a small particle of elevated activity in the sample. However, in all cases the sample results were less than the Derived Concentration Guideline Levels (DCGLs).

3.5 Transportation (86750)

a. Inspection Scope

The inspectors reviewed the licensee's activities regarding a radioactive waste shipment.

b. Observations and Findings

The inspectors observed activities and reviewed transportation documents associated with a shipment of radioactive waste to GTS Duretek facilities in Tennessee. The shipment contained a spent fuel rack in a sea-land container and contaminated concrete debris in three B25 boxes. After reviewing all shipping documents and survey data from the four containers and truck, the inspectors determined that the documents were completed as required. The licensee informed the driver of who was to be notified in the event of an incident, and the driver signed to indicate that he had examined the truck and containers prior to departure. The inspectors did not identify any problems with the shipment.

LICENSEE DOCUMENTS REVIEWED

Licensee documents reviewed and utilized during the course of this inspection are specifically identified in the "Report Details" above.