ATTACHMENT 14

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, SLURRY WALLC_{X1}1,
EXCAVATED SOIL FROM SLURRY WALL CONSTRUCTION

October 9, 2006

45 Pages

Final Status Survey SlurryWallC$_{x1}$1

Excavated Soil from Slurry Wall Construction
Survey Date: 06-11-2004

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: _____ Date: 8-19-04
(ESSG Supervisor)

Signed: _____ Date: 12-07-04
(ES Superintendent)

Signed: _____ Date: 12-8-04
(RP & ES Manager)

Final Status Survey Area Requirements
for Survey SlurryWallC$_{x1}$1
Excavated Soil from Slurry Wall Construction

Survey Description

Final Status Survey SlurryWallC$_{x1}$1 is composed of excavated soil originating from multiple Survey Units within the former Protected Area (Units 1, 2, 3, 6, 7, 10) and areas peripheral to the security fence (Units 12, 16, and 17). 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 excavated soil for Final Status Survey (FSS) will be graded to a maximum depth of one (1) meter and surveyed as a Class 1 area in accordance with Special Case Surveys, Procedure RM-76, *Final Status Survey Design,* Section 2.4, and the requirements established in LTP 5.4.2.4 as revised. 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 excavated soil from the slurry wall construction originates from multiple survey unit areas. Survey Units 1, 2, 3, 6, 7, and 10 are located within the former Protected Area and have been identified as Class 1, Group A areas (LTP, Chapter 2). Survey Units with this classification have historically been used as material transport and waste storage areas with radioactivity concentration levels less that 50% of the site DCGL value. Survey Units 12, 16, and 17 are included as minor peripheral locations affected by the construction process.

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:

- Slurry Wall Interference Excavation, Characterization of Subsurface, dated 08/20/03 and 10/09/03.
- Survey 01A$_2$1, Butler Bldg. and Cal Shack Foundation Removal, 07/24/03.
- Survey -12A$_{dc3}$2, Deep Core Boring, 08/23/01.
- Survey 17A$_1$3, Characterization of Survey Unit 17, 07/12/01.
- Survey 12A$_2$2, Characterization of Survey Unit 12, 07/03/01.
- Survey 16A$_1$3, Characterization of Survey Unit 16, 06/05/01.
- Survey 03A$_2$1, Characterization of soil under asphalt, 09/25/00.
- Survey 06A$_2$1, Characterization of soil under asphalt, 09/25/00.
- Survey 06A$_{dc2}$1, Deep Core Boring, 10/14/99.
- Survey 03A$_{dc2}$1, Deep Core Boring, 09/26/99.
- Survey 12A$_1$2, Characterization Survey, judgmental samples, 09/23/99.
- Survey 12A$_{dc2}$2, Deep Core Boring, 09/23/99.

- Survey $03A_{dc1}1$, Deep Core Boring, 09/22/99.
- Survey $10A_{1}1$, Characterization of Survey Unit 10, 08/02/99.
- Survey $06A_{1}1$, Characterization of Survey Unit 6, 07/29/99.
- Survey $07A_{1}1$, Characterization of Survey Unit 7, 07/28/99.
- Survey $01A_{dc1}1$, Deep Core Boring, 07/26/99.
- Survey $02A_{dc1}1$, Deep Core Boring, 07/26/99.
- Survey $12A_{dc1}2$, Deep Core Boring, 07/25/99.
- Survey $02A_{1}1$, Characterization of Survey Unit 2, 07/13/99.
- Survey $03A_{1}1$, Characterization of Survey Unit 3, 07/13/99.
- Survey $06A_{dc1}1$, Geoprobe Core Boring, 04/30/99.
- Survey $07A_{dc1}1$, Geoprobe Core Boring, 04/30/99.

Quality Assurance/Quality Control
As a minimum 5% of the sample population of this survey shall be selected for QA/QC verification in accordance with BRP Procedure RM-79, *Final Status Survey Quality Control.* Both split samples and sample recounts will take place. In addition, a minimum of 5% of the survey area will receive a verification scan. QA/QC soil samples and verification scan locations will be selected using the RAND function in Microsoft 2000 software program.

Additional Sample Analysis Requirements
The location from which the slurry wall spoils were excavated intersects the identified waterborne pathway for Tritium migration and shall require Tritium in soil analyses for a minimum of 10% of the sample population. Soil for Tritium analysis will be collected in the same locations as those collected for QA/QC evaluation. Tritium samples will be sent to an independent laboratory for analysis.

Post-Construction Expectations
Survey $SlurryWallC_{x1}1$ 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 $SlurryWallC_{x1}1$ in accordance with the survey requirements established in RM-76, *Final Status Survey Design,* RM-77, *Final Status Survey Implementation,* and LTP, Chapter 5. Survey size will be based on 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 will be stockpiled in the Soil Verification Area (SVA) for future use.

DATA QUALITY OBJECTIVES

Survey SlurryWallC$_{x1}$1
Excavated Soil from Slurry Wall Construction

1. STATE THE PROBLEM

The Problem:
To demonstrate that the level of residual radioactivity in the excavated soil originating from construction of the slurry wall 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 is to be prepared for Final Status Survey (FSS) by grading out to a depth of one (1) meter or less. The excavated 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 to 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 BRP Environmental Services Survey Group (ESSG). The primary decision maker will be the Final Status Survey 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 Final Status Survey to collect, and analyze field data.

Resources:
The primary resources needed to determine the answer to the problem are two (2) 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.

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 within the affected Local Coordinate Grids during the characterization process. The soil samples obtained are both judgmentally and statistically selected as a result of multiple surveys across the area to be excavated. 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 and BRP Procedure RM-76, *Final Status Survey Design.*

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 1,800 m^2.

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 significant 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 06/11/04.

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.

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 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 and BRP Procedure RM-76, *Final Status Survey Design*. 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 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 5% of the sample population will be collected for quality evaluation. These samples may include sample splits, sample recounts, or 3rd party sample analysis. Quality analyses will be conducted as defined in LTP, Chapter 5 and Procedure RM-79, *Final Status Survey Quality Control.*

Additional Sample Analysis Requirements
An additional quantity of soil shall be collected for Tritium Analysis in the same locations as samples selected for QA/QC. A minimum of 10% of the sample population will be sampled. Tritium analyses will be performed by an independent laboratory. Data results will be provided in the FSS package.

Investigation Levels:
Investigation levels are defined in LTP, Chapter 5 and Procedure RM-76, *Final Status Survey Design,* 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 SlurryWallC$_{x\,1}$1

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 SlurryWallC$_{x1}$1
Final Status Survey Design
Excavated Soils from Slurry Wall Construction

Survey Unit Description

Final Status Survey SlurryWallC$_{x1}$1 is composed of excavated soil originating Survey Units 1, 2, 3, 6, 7, 10, 12, 16 and 17. The majority of the area from which the excavated soil originated is designated as a Class 1 Area. Minor peripheral areas in Survey Units 12, 16, and 17 are also included. It must be demonstrated that the prepared survey area meets the criteria established for unrestricted release prior to disposition as clean fill.

The soil has been graded out to a maximum thickness of one (1) 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 in the immediate area of excavation during the slurry wall interference excavation, which took place prior to construction. Scoping data are detailed in Attachment 1. DCGL values for identified radionuclides are presented in Table 1 below:

Table 1
Input Data for Survey Design (pCi/g)

Radionuclides	Cs-137	Co-60
σ	0.11	0.01
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:

0000 4928 1408
0000 4928 1412

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

$$\sigma = \sqrt{\left(\frac{0.11}{11.93}\right)^2 + \left(\frac{0.01}{3.21}\right)^2}$$

$$\sigma = 0.01$$

Relative Shift

The DCGL for the weighted sum is 1.0. The relative shift is determined using an LBGR value set at 98% of the $DCGL_W$.

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

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

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

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 a minimum of 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.

Table 2
Random Numbers

Random #, X Axis	Random #, Y Axis
0.474870	0.911389

Survey Unit SlurryWallC$_{x1}$1 Dimensions: X (E/W) = 120 meters
Y (N/S) = 15 meters

Random Start Location: X = (0.474870)(120) = 57.0 meters
Y = (0.911389)(15) = 13.7 meters

Sample Spacing

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

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

n = number of samples.

$$L = \sqrt{\frac{1800}{18}} = 10.0 \text{ meters}$$

With sample spacing established at 10.0 meters, 24 data point locations are available for survey as identified in Attachment 2.

QA/QC Sampling

A minimum of 5% of the sample population and 5% of the scan survey area are required to be selected for QA/QC verification in accordance with BRP Procedure RM-79, *Final Status Survey Quality Control*. As a conservative measure, three (3) soil samples and 10% of the scan survey area will be selected for QA/QC evaluation. Soil samples will be selected using the RAND function in the Microsoft 2000 Excel software program:

RAND()*(b-a)+a *where* a = 1 *and* b = total number of soil samples to be collected.

Verification scan start point and track direction will be determined using the above function. The first sample location selected will determine the start point of the verification scan, and the second sample location will determine the direction in which the scan will track. QA/QC location results are listed in Table 3:

Table 3
Random Numbers Generated for QA/QC

QA/QC Soil Samples	Random Sample Number	Verification Scan	Random Sample Number
Split Sample:	**16**	**Start Point:**	**2**
Sample Recount:	**11**	**Scan Towards :**	**10**
Sample Recount:	**8**	**Minimum Scan Area Requirement:**	**180 m^2**

Surface Scanning

The coverage requirement for surface scanning in this Class 1 area 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 identification of potential areas of elevated activity in this survey area will be the Scan $_{DCGL}$ as defined by the following:

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

Scan $_{DCGL}$ for Co-60 = 1818 cpm

Scan $_{DCGL}$ for Cs-137 = 3518 cpm

Where:[1]

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

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

$DCGL_w$ = 11.93 pCi/g Cs-137 and 3.21 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 this Final Status Survey will assume all residual radioactivity to originate from Co-60 and the instrument response at the Co-60 $DCGL_w$ (1818) will be used as the scanning investigation level for Survey $SlurryWallC_{x1}1$.

[1] These values established in EA-BRP-SC-0201, *NaI Scanning Sensitivity for Open Land Survey*

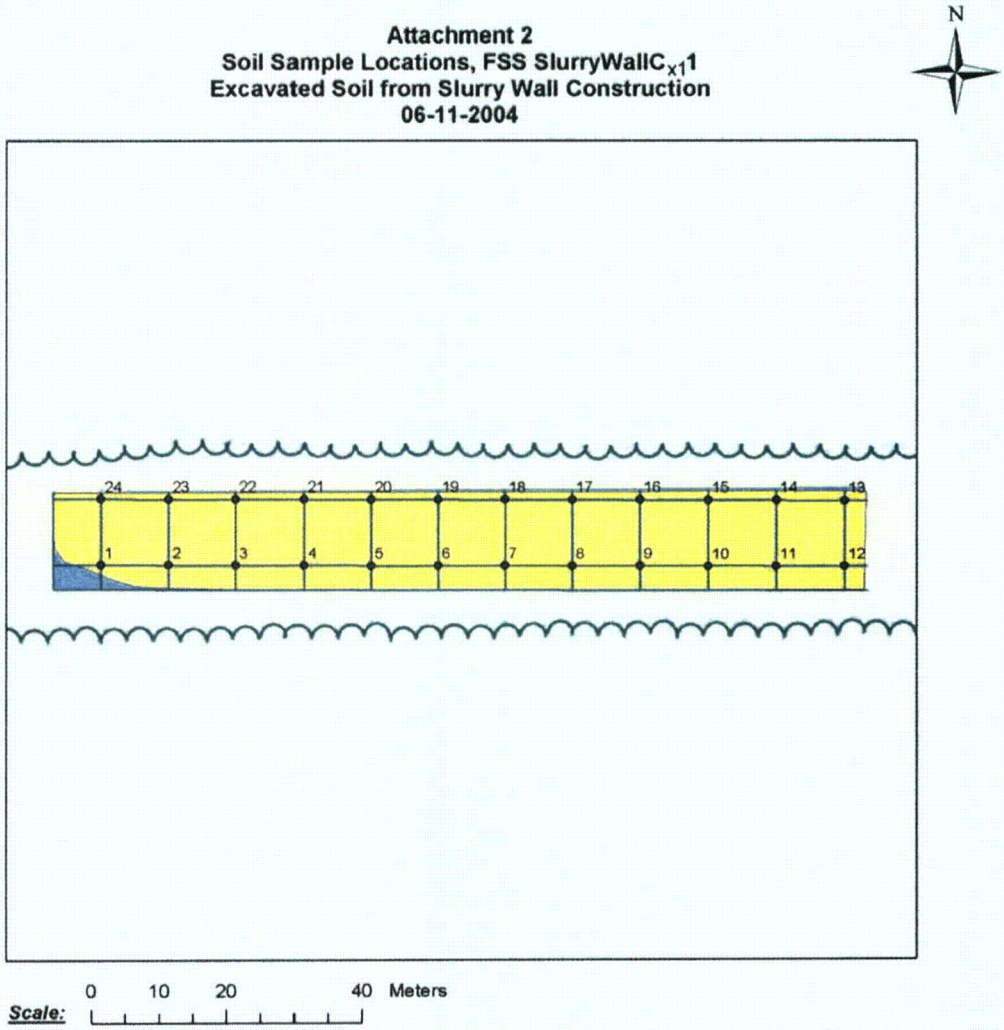
Attachment 1

Scoping Data
Survey SlurryWallC$_{x1}$1
Excavated Soil from
Slurry Wall Construction

Sample No.	Grid	X	Y	Z Top	Z Bottom	Cs-137 (pCi/g) Activity	Co-60 (pCi/g) Activity*
1	168	3.6	4.3	-1.22	-1.37	0.31	0.06
2	325	9.4	5.1	-1.83	-1.98	0.04	0.06
3	366	6.6	3.3	0	-0.15	0.31	0.08
4	224	7.6	3.9	-1.83	-1.98	0.05	0.06
5	294	5.2	7.7	-1.22	-1.37	0.03	0.06
6	200	5.2	3.9	-0.61	-0.76	0.08	0.04
7	274	6.9	6.6	-1.22	-1.37	0.10	0.06
8	366	1.5	4.1	-0.61	-0.76	0.04	0.05
9	237	2.8	5.3	-1.22	-1.37	0.05	0.05
10	255	8.3	4	-1.22	-1.37	0.060	0.05
					Mean:	**0.11**	**0.06**
					Median:	**0.06**	**0.06**
					St. Dev.:	**0.11**	**0.01**

Note: Co-60 was not identified in scoping sample data in this area. As a conservative measure, MDA values for Co-60 will be used for statistical purposes.

Attachment 2
Soil Sample Locations, FSS SlurryWallC$_{x1}$1
Excavated Soil from Slurry Wall Construction
06-11-2004



Legend

- Treeline
- SurveyBoundaries
- Excavated Soil
- Soil Sample Locations

Soil Sample Locations

Sample No.	X Coord.	Y Coord.
1	7.0	3.7
2	17.0	3.7
3	27.0	3.7
4	37.0	3.7
5	47.0	3.7
6	57.0	3.7
7	67.0	3.7
8	77.0	3.7

Sample No.	X Coord.	Y Coord.
9	87.0	3.7
10	97.0	3.7
11	107.0	3.7
12	117.0	3.7
13	117.0	13.7
14	107.0	13.7
15	97.0	13.7
16	87.0	13.7

Sample No.	X Coord.	Y Coord.
17	77.0	13.7
18	67.0	13.7
*19	57.0	13.7
20	47.0	13.7
21	37.0	13.7
22	27.0	13.7
23	17.0	13.7
24	7.0	13.7

Note: Coordinates for sample locations are w/r/t the southwest corner of the survey unit *where* X=0, Y=0.
*Sample No 19 is the Random Start Location.
Square Grid Pattern Spacing from Random Start is 10.0 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
9500	2.48	4	62.41	1,323.96	1.10	2.34	4.49	2.33
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 FSS SlurryWallC$_{x1}$1

Survey Area Description:

Approximately 1800 m^3 of excavated soil has been prepared for Special Case Final Status Survey in the Soil Verification Area and graded to a depth of 1 meter. This soil originated from construction of the slurry wall located in the restricted area and adjoining peripheral locations. Expectations for this survey area is that it meets the criteria established for unrestricted release prior to disposition as clean fill available for construction usage.

The survey area is authorized for Final Status Survey Implementation.

Designed by	6/10/04 Date
Technical Review by	6/11/04 Date

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

Step (+)		Initial	Date
1.0	PREPARATION FOR SURVEY Slurry Wall Cell (Survey #)		
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.	ESSG	6/11/04
✓	b. Survey area has been turned over to the Environmental Services Survey Group (ESSG) in acceptable condition for FSS.	ESSG	6/11/04
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)	ESSG	6/15/04

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

		Initial	Date
2.0	DATA COLLECTION		
2.1	Soil Survey:		
✓	All soil samples collected and controlled (Step 6.2.1).	ESSG	6/11/04
2.2	Surface Scan:		
✓	Surface Scan complete. Action response requirements have been conducted on any identified areas exceeding the investigation level (Step 6.3).	ESSG	6/15/04
2.3	Judgmental Soil Samples:		
N/A	a. Judgmental soil samples have been collected and controlled (Step 6.2.3).		
N/A	b. Deep core profiles performed in areas identified to contain elevated residual activity (Step 6.2.3).	ESSG	6/15/04 N/A
3.0	SAMPLE PREPARATION AND LABORATORY ANALYSIS		
3.1	Sample Preparation (Step 6.4.1):		
✓	a. Soil samples are homogenous		
✓	b. Soil samples are visibly dry prior to packing		
✓	c. Non-soil materials have been removed from sample		
✓	d. Soil samples have been transferred to one-liter Marinelli containers and are labeled and sealed.	ESSG	6/14/04

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

		Initial	Date
3.2	Laboratory Analysis:		
✓	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	6/17/04
3.3	Sample Control and Documentation:		
	Chain of custody documentation exhibits control of soil samples (Step 6.4.3).	ESSG	6/17/04

Reviewed by: _____ Date: 6/21/04

ATTACHMENT RM-59-1
SAMPLING AND ANALYSIS REPORT

DATE: 06-11-2004	TIME: 13:00	LOCATION:Powerline	TECH: MJK/DWP

SURVEY IDENTIFICATION / DESCRIPTION

Survey Slurry WallC$_{x1}$2, Final Status Survey of Excavated Soil from Slurry Wall Construction.

SURVEY TYPE

SURVEY TYPE: ___ Scoping ___ Characterization ___ Remediation
X Final X Scan (Motive) ___ Scan (Static)
___ Bulk Materials

SURVEY DESIGN

SURVEY DESIGN: ___ Judgmental X Statistical ___ Remediation
X Scan (100 %)

ANALYSIS

INST./SERIAL NO: Detector 6 DAILY CHECK: X SAT ___ UNSAT INIT: ___
Scan 23501/186201
INVESTIGATION OF UNIDENTIFIED PEAKS:
___ N/A X SAT ___ UNSAT INIT: ___

Minimum Detectable Activity / MDC (3.0.q, 4.2.b, 4.2.i) X SAT ___ UNSAT INIT: ___

COMMENTS

Final Status Survey of Excavated Soil from the Slurry Wall Construction involved 100% mobile scan with a NaI Detector and soil samples. Sample Design: Random start with a square grid systematic pattern. 24 soil samples were collected all of which showed concentrations of radioactivity at a fraction of the DCGL$_w$. 100% mobile scan identified 0 areas of activity above background.

TECHNICIAN SIGNATURE: [signature] DATE: 6-17-04
SECOND LEVEL REVIEW:
SIGNATURE: [signature] DATE: 6/21/04

Activity Summary
Final Status Survey SlurryWallC$_{x1}$1
Excavated Soil from Slurry Wall Construction
6-11-2004

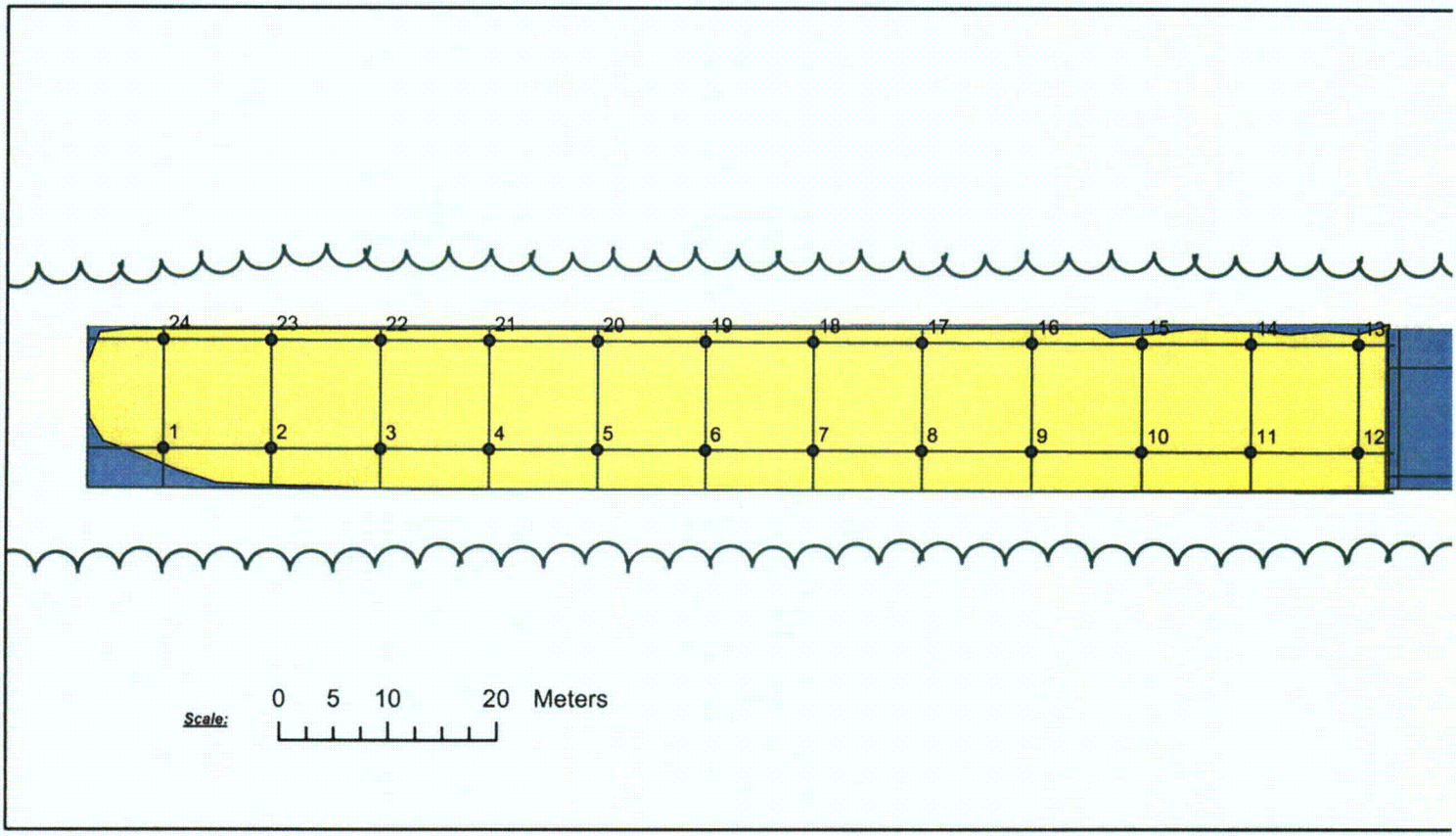
Sample No.	*Coordinate (x,y)	Cs-137 (pCi/g) Activity	Cs-137 (pCi/g) MDA	Co-60 (pCi/g) Activity	Co-60 (pCi/g) MDA
1	(7.0)(3.7)	0.11		nd	0.07
2	(17.0)(3.7)	0.13		nd	0.07
3	(27.0)(3.7)	nd	0.06	nd	0.07
4	(37.0)(3.7)	nd	0.05	nd	0.07
5	(47.0)(3.7)	nd	0.06	nd	0.07
6	(57.0)(3.7)	0.03		nd	0.06
7	(67.0)(3.7)	nd	0.06	nd	0.05
8	(77.0)(3.7)	nd	0.05	nd	0.07
9	(87.0)(3.7)	nd	0.05	nd	0.06
10	(97.0)(3.7)	nd	0.06	nd	0.07
11	(107.0)(3.7)	nd	0.05	nd	0.08
12	(117.0)(3.7)	nd	0.06	nd	0.06
13	(117.0)(13.7)	0.08		nd	0.04
14	(107.0)(13.7)	nd	0.04	nd	0.08
15	(97.0)(13.7)	0.46		nd	0.09
16	(87.0)(13.7)	nd	0.05	nd	0.06
17	(77.0)(13.7)	nd	0.06	nd	0.05
18	(67.0)(13.7)	0.07		nd	0.06
**19	(57.0)(13.7)	0.03		nd	0.07
20	(47.0)(13.7)	0.03		nd	0.05
21	(37.0)(13.7)	nd	0.05	nd	0.06
22	(27.0)(13.7)	0.04		nd	0.05
23	(17.0)(13.7)	nd	0.07	nd	0.06
24	(7.0)(13.7)	0.05		nd	0.07

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

**Sample 19 is the random start location for the survey.

Note: nd indicates activity not detected above MDA values.

Activity Summary, FSS SlurryWallC $_{x1}$1
Excavated Soil from Slurry Wall Construction
06-11-2004



Legend

- Treeline
- SurveyBoundaries
- Excavated Soil
- Soil Sample Locations

Activity Summary

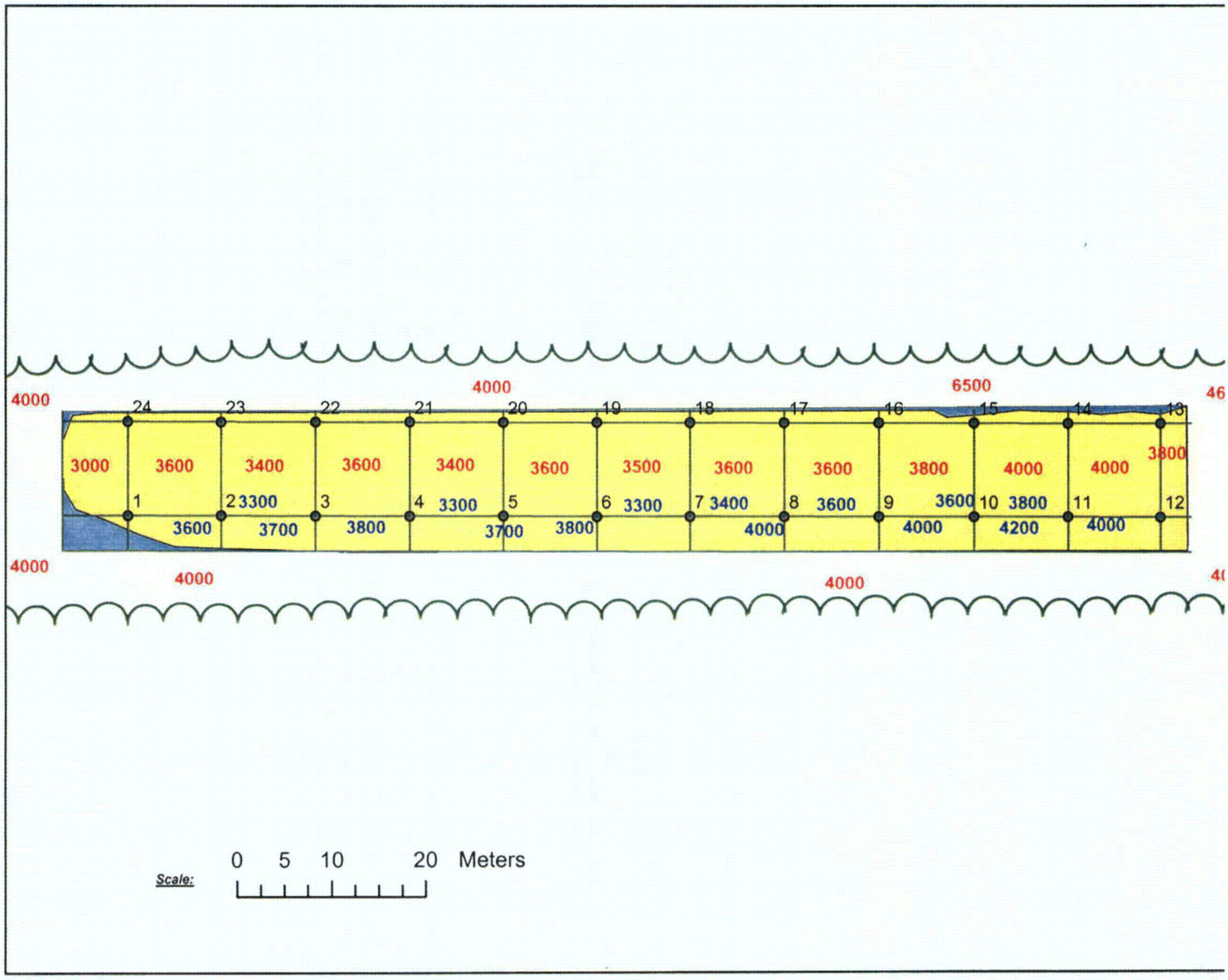
Sample No.	*Coordinate (x,y)	Cs-137 (pCi/g) Activity	Cs-137 (pCi/g) MDA	Co-60 (pCi/g) Activity	Co-60 (pCi/g) MDA
1	(7.0)(3.7)	0.11		nd	0.07
2	(17.0)(3.7)	0.13		nd	0.07
3	(27.0)(3.7)	nd	0.06	nd	0.07
4	(37.0)(3.7)	nd	0.05	nd	0.07
5	(47.0)(3.7)	nd	0.06	nd	0.07
6	(57.0)(3.7)	0.03		nd	0.06
7	(67.0)(3.7)	nd	0.06	nd	0.05
8	(77.0)(3.7)	nd	0.05	nd	0.07
9	(87.0)(3.7)	nd	0.05	nd	0.06
10	(97.0)(3.7)	nd	0.06	nd	0.07
11	(107.0)(3.7)	nd	0.05	nd	0.08
12	(117.0)(3.7)	nd	0.06	nd	0.06
13	(117.0)(13.7)	0.08		nd	0.04
14	(107.0)(13.7)	nd	0.04	nd	0.08
15	(97.0)(13.7)	0.46		nd	0.09
16	(87.0)(13.7)	nd	0.05	nd	0.06
17	(77.0)(13.7)	nd	0.06	nd	0.05
18	(67.0)(13.7)	0.07		nd	0.06
**19	(57.0)(13.7)	0.03		nd	0.07
20	(47.0)(13.7)	0.03		nd	0.05
21	(37.0)(13.7)	nd	0.05	nd	0.06
22	(27.0)(13.7)	0.04		nd	0.05
23	(17.0)(13.7)	nd	0.07	nd	0.06
24	(7.0)(13.7)	0.05		nd	0.07

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

**Sample 19 is the random start location for the survey.

Note: nd indicates activity not detected above MDA values.

Mobile Scan, FSS SlurryWallC$_{x1}$1
Excavated Soil from Slurry Wall Construction
06-15-2004



Legend

- Treeline
- SurveyBoundaries
- Excavated Soil
- Soil Sample Locations

Primary Scan : 100 %

Technician Signature: [signature] **Date:** 6/15/04
Time: 11:10

QC Verification Scan: 10 %

Technician Signature: [signature] **Date:** 6/15/04
Time: 13:00

Numbers in **Red** indicate Average General Area Activity (cpm) Identified During Mobile Scan
Numbers in **Blue** indicate Average General Area Activity (cpm) Identified During QC Verification Scan

RM-72-1
CHAIN-OF-CUSTODY RECORD

Sample Number	Sampling Location	Date	Time	Final Disposition of Sample
1	(7.0)(3.7)	6/14/04	13:09	68A
2	(17.0)(3.7)		13:25	68A
3	(27.0)(3.7)		13:39	68A
4	(37.0)(3.7)		13:54	68A
5	(47.0)(3.7)		14:05	68A
6	(57.0)(3.7)		14:14	68B
7	(67.0)(3.7)		14:29	68B
8 RECOUNT	(77.0)(3.7)		14:40	68B
9	(87.0)(3.7)		14:46	68B
10	(97.0)(3.7)		14:54	68B
11 RECOUNT	(107.0)(3.7)		15:01	68C
12	(117.0)(3.7)		15:07	68C
13	(117.0)(13.7)		15:10	68C
14	(107.0)(13.7)		15:17	68C
15	(97.0)(13.7)		15:22	68C
16	(87.0)(13.7)		15:29	68D
17	(77.0)(13.7)		15:33	68D
18	(67.0)(13.7)		15:36	68D
*19 RANDOM START	(57.0)(13.7)		15:43	68D
20	(47.0)(13.7)		15:46	68E

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

1. Relinquished by:	Date 6/12/04	Time 15:30	Received in good condition by: LOCKED IN OVEN/CHEMLAB
2. Relinquished by:	Date 6/14/04	Time 15:42	Received in good condition by: FINAL DISPOSITION - PERMANENT STORAGE
3. Relinquished by:	Date	Time	Received in good condition by:
4. Relinquished by:	Date	Time	Received in good condition by:

Sweepwater Creek - Page 2 of 2

RM-72-1
CHAIN-OF-CUSTODY RECORD

Sample Number	Sampling Location	Date	Time	Final Disposition of Sample
21	(37.0)(13.7)	6/11/04	15:52	68E
22	(27.0)(13.7)		16:01	66E
23	(17.0)(13.7)		16:11	66E
24	(07.0)(13.7)		16:23	68E
QA SPLIT #1D	(87.0)(13.7)		15:29	68D

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

1. Relinquished by: SEE PAGE 1 FOR CUSTODY INFO.	Date	Time	Received in good condition by:
2. Relinquished by:	Date	Time	Received in good condition by:
3. Relinquished by:	Date	Time	Received in good condition by:
4. Relinquished by:	Date	Time	Received in good condition by:

BEST COPY AVAILABLE

RM-72

WORKING CONTROLLED COPY

0000 4928 1431

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

FINAL STATUS SURVEY: Sherry Wall Cal

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:

N/A 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 _____ Date 6/18/04

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.
- ~~N/A~~ ✓ Results of judgmental samples have been reviewed and evaluated.
- ~~N/A~~ ✓ Review to ensure that the analytical results of judgmental samples do not impact the evaluation for unrestricted release of the survey area.

RM-78-3
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 → * We were able to place 24 statistical samples in the survey

b. Total number of statistical samples determined as valid: 24

c. Calculate % Completeness: $\frac{b \times 120}{a}$ = 160 %

✓ Qualified data are ≥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 RM-78-3-1 for verification of analysis results.
- Refer to Additional Sampling Requirements section for Tritium in Soil Data Results.

Assessor

6/18/04
Date

RM-78-3
DATA ASSESSMENT REPORT
Page 5 of 8

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 24 *REFER TO ATTACHMENT 78-3-1, ANALYSIS OF DATA RESULTS,

b. Calculation of the Mean 0.005 (SOR)

c. Calculation of the Median 0.003 (SOR)

d. Calculation Standard Deviation 0.010 (SOR)

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 in 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.

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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

✓ 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.

NA 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.

RM-78-3
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 — Date 6/18/04

Reviews:

Technical Review — Date 8-19-04

ES Superintendent — Date 11/30/04

RP&ES Manager — Date 12-8-04

RM 78-3, Attachment 1:
Analysis of Data Results
Final Status Survey SlurryWallC$_{x1}$1
Excavated Soil from Slurry Wall Construction

Sample Number	Cs-137 (pCi/g)	Co-60 (pCi/g)	Weighted Sum	*Weighted Sum <DCGLw?	DCGL-W. Sum	Sign
1	0.115	0.0089	0.012	yes	0.988	+1
2	0.132	-0.0078	0.009	yes	0.991	+1
3	-0.003	-0.0135	-0.004	yes	0.996	+1
4	0.005	0.0213	0.007	yes	0.993	+1
5	0.018	0.0217	0.008	yes	0.992	+1
6	0.028	-0.0094	-0.001	yes	0.999	+1
7	0.015	-0.0174	-0.004	yes	0.996	+1
8	0.023	0.0211	0.008	yes	0.992	+1
9	0.014	-0.0083	-0.001	yes	0.999	+1
10	0.002	-0.0070	-0.002	yes	0.998	+1
11	-0.003	-0.0096	-0.003	yes	0.997	+1
12	0.008	-0.0098	-0.002	yes	0.998	+1
13	0.082	0.0014	0.007	yes	0.993	+1
14	-0.024	0.0120	0.002	yes	0.998	+1
15	0.455	0.0021	0.039	yes	0.961	+1
16	-0.023	0.0128	0.002	yes	0.998	+1
17	0.024	0.0031	0.003	yes	0.997	+1
18	0.072	0.0087	0.009	yes	0.991	+1
19	0.028	0.002	0.0029	yes	0.997	+1
20	0.026	0.004	0.0033	yes	0.997	+1
21	0.0004	0.020	0.0063	yes	0.994	+1
22	0.038	-0.008	0.0008	yes	0.999	+1
23	0.040	0.011	0.0068	yes	0.993	+1
24	0.050	0.025	0.0120	yes	0.988	+1

St. Deviation (SOR): 0.010
Mean (SOR): 0.005
Median (SOR): 0.003

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.*

* *If all measurement data are less than the DCGL$_w$, then the Sign Test is not required.*

RM-79-1
FSS QUALITY CONTROL EVALUATION RESULTS

FSS Package # Slurry Wall Cx1 QC Package # Slurry Wall Cx1

QC Measurement Type	Acceptance Criteria Met*?	Reference
✓ 1. Replicate Scan	(Yes) / No	Step 5.1.3
2. Sample Recounts		Step 5.1.4.1
✓ a. In-house	(Yes) / No	
___ b. Third party	Yes / No	
3. Split Samples		Step 5.1.4.2
✓ c. In-house	(Yes) / No	
___ 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 Verification Scan Information is documented in the Implementation Section of this ~~report~~ package.

2a. In-House Sample Recount Worksheet Attached.

3c. In-House Split Sample Worksheet Attached.

Reviews:

Evaluator — Date: 6/18/04

Technical Review — Date: 8-19-04

QA Verification
Split Sample Analysis

Date: 6/11/2004

QA: SlurryWallC$_{x1}$ Excavated Soil From SL

Type: Sample Split

Lab: In- House

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

			A	B	C	D	E	F	G	
Sample	Radionuclide	BRP Result Below MDA	BRP Results (pCi/g)	BRP % Error (Sigma)	BRP Resolution	Acceptance Ratio (Table 1)	Recount Result Below MDA	Recount Results (pCi/g)	Comparison Ratio F/A	Results in Agreement Compare G with D)
16	Co-60	<	0.0612	n/a	n/a	n/a	<	0.0803	1.31	YES
16	Cs-137	<	0.0528	n/a	n/a	n/a	<	0.0620	1.18	YES

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

< Indicates results less than the MDA.

QA Verification
Sample Recount Analysis

Date: 6/11/2004

QA: Slurry WallC$_{x1}$1 Excavated Soil From SL

Type: Sample Recounts

Lab: In- House

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

Sample	Radionuclide	BRP Result Below MDA	A BRP Results (pCi/g)	B BRP % Error (Sigma)	C BRP Resolution	D Acceptance Ratio (Table 1)	E Recount Result Below MDA	F Recount Results (pCi/g)	G Comparison Ratio F/A	Results in Agreement Compare G with D)
8	Co-60	<	0.0664	n/a	n/a	n/a	<	0.0426	0.64	YES
8	Cs-137	<	0.0532	n/a	n/a	n/a		0.0261	0.49	YES
11	Co-60	<	0.0797	n/a	n/a	n/a	<	0.0649	0.81	YES
11	Cs-137	<	0.0493	n/a	n/a	n/a	<	0.0577	1.17	YES

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

< Indicates results less than the MDA.

Tritium in Soil
Analysis of Data Results
Final Status Survey SlurryWallC$_{x1}$1
Excavated Soil from Slurry Wall Construction
06-11-2004

Sample Number	Tritium in Soil (pCi/g)
8	0.0025
11	0.0017
16	0.0173

Mean:	**0.01**
Median:	**0.00**
St. Dev:	**0.01**

Note: DCGL for Tritium is 327 pCi/g.
Sample data results are a fraction of the DCGL.

GENERAL ENGINEERING LABORATORIES, LLC
2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Company : Big Rock Nuclear Facility
Address : 10269 US 31 North
Charlevoix, Michigan 49720--9436

Report Date: July 22, 2004

Contact: Mr. Chuck Barsy
Project: Routine Analytical-Chuck

Client Sample ID:	#8 CX11 Slurry Wall	Project:	ROCK2000
Sample ID:	116414001	Client ID:	ROCK001
Matrix:	Soil		
Collect Date:	06-JUL-04 12:42		
Receive Date:	08-JUL-04		
Collector:	Client		

Parameter	Qualifier	Result		DL	RL	Units	DF	AnalystDate	Time	Batch	Method
Gravimetric Solids											
ASTM D 2216 % Moisture											
Moisture		6.08				percent		BSW1 07/09/04	1316	347667	1
Rad Liquid Scintillation Analysis											
LSC, Tritium Vacuum, Solid											
Tritium	U	35.7	+/-245	426	500	pCi/L		AB1 07/16/04	1314	348560	2

The following Analytical Methods were performed

Method	Description	Analyst Comments
1	ASTM D2216	
2	GL-RAD-A-002	

Notes:
The Qualifiers in this report are defined as follows :

B Target analyte was detected in the sample as well as the associated blank.
BD Flag for results below the MDC or a flag for low tracer recovery.
E Concentration of the target analyte exceeds the instrument calibration range.
H Analytical holding time exceeded.
J Rad results: Estimated value, result activity is less than the MDA + 2-sigma uncertainty.
U Indicates the target analyte was analyzed for but not detected above the detection limit.
UI Uncertain identification for gamma spectroscopy.
X Lab-specific qualifier-please see case narrative, data summary package or contact your project manager for details.
h Sample preparation or preservation holding time exceeded.
+/- Rad results: Uncertainty 2-sigma.

The above sample is reported on an "as received" basis.
Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless qualified on the Certificate of Analysis.

This data report has been prepared and reviewed in accordance with General Engineering Laboratories, LLC standard operating procedures. Please direct any questions to your Project Manager, Sarah Kozlik.

Reviewed by

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Charlevoix, Michigan 49720--9436

Report Date: July 22, 2004

Contact: Mr. Chuck Barsy
Project: Routine Analytical-Chuck

Client Sample ID:	#11 CX11 Slury Wall	Project:	ROCK2000
Sample ID:	116414002	Client ID:	ROCK001
Matrix:	Soil		
Collect Date:	06-JUL-04 12:53		
Receive Date:	08-JUL-04		
Collector:	Client		

Parameter	Qualifier	Result		DL	RL	Units	DF	AnalystDate	Time	Batch	Method
Gravimetric Solids											
ASTM D 2216 % Moisture											
Moisture		7.45				percent		BSW1 07/09/04	1316	347667	1
Rad Liquid Scintillation Analysis											
LSC, Tritium Vacuum, Solid											
Tritium	U	23.3	+/-246	428	500	pCi/L		AB1 07/16/04	1346	348560	2

The following Analytical Methods were performed

Method	Description	Analyst Comments
1	ASTM D2216	
2	GL-RAD-A-002	

Notes:
The Qualifiers in this report are defined as follows :

B Target analyte was detected in the sample as well as the associated blank.
BD Flag for results below the MDC or a flag for low tracer recovery.
E Concentration of the target analyte exceeds the instrument calibration range.
H Analytical holding time exceeded.
J Rad results: Estimated value, result activity is less than the MDA + 2-sigma uncertainty.
U Indicates the target analyte was analyzed for but not detected above the detection limit.
UI Uncertain identification for gamma spectroscopy.
X Lab-specific qualifier-please see case narrative, data summary package or contact your project manager for details.
h Sample preparation or preservation holding time exceeded.
+/- Rad results: Uncertainty 2-sigma.

The above sample is reported on an "as received" basis.
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Address : 10269 US 31 North
Charlevoix, Michigan 49720--9436

Report Date: July 22, 2004

Contact: Mr. Chuck Barsy
Project: Routine Analytical-Chuck

Client Sample ID:	#16 CX11 Slurry Wall	Project:	ROCK2000
Sample ID:	116414003	Client ID:	ROCK001
Matrix:	Soil		
Collect Date:	06-JUL-04 12:49		
Receive Date:	08-JUL-04		
Collector:	Client		

Parameter	Qualifier	Result		DL	RL	Units	DF	AnalystDate	Time	Batch	Method
Gravimetric Solids											
ASTM D 2216 % Moisture											
Moisture		6.50				percent		BSW1 07/09/04	1316	347667	1
Rad Liquid Scintillation Analysis											
LSC, Tritium Vacuum, Solid											
Tritium	U	226	+/-254	426	500	pCi/L		AB1 07/16/04	1418	348560	2

The following Analytical Methods were performed

Method	Description	Analyst Comments
1	ASTM D2216	
2	GL-RAD-A-002	

Notes:
The Qualifiers in this report are defined as follows :

B Target analyte was detected in the sample as well as the associated blank.
BD Flag for results below the MDC or a flag for low tracer recovery.
E Concentration of the target analyte exceeds the instrument calibration range.
H Analytical holding time exceeded.
J Rad results: Estimated value, result activity is less than the MDA + 2-sigma uncertainty.
U Indicates the target analyte was analyzed for but not detected above the detection limit.
UI Uncertain identification for gamma spectroscopy.
X Lab-specific qualifier-please see case narrative, data summary package or contact your project manager for details.
h Sample preparation or preservation holding time exceeded.
+/- Rad results: Uncertainty 2-sigma.
The above sample is reported on an "as received" basis.
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Reviewed by

T348560

TRITIUM WATER/SOIL

Using the Vacuum Distillation Rig

Filename : H3VAC.WAT
File type : Excel
Version # : 13
Batch : 348560
Analyst : AB1
Date : 7/15/2004
BKG Count time : 30 min

Procedure Code : LSC_VH3S
Parmname : Tritium
Batch Counted on : BROWN

Sample ID	Sample Dup
1200661910	116414001
1200661911	116414001
1200661912	

BRP Sample ID	Sample ID	Sample Volume mL	Initial Sample Aliquot(g)	Total Moisture	Position#	Count Time min	Raw CPM	Net Sample CPM	Counting Efficiency %	Bkg CPM
Sluggwall Grl #8	116414001	10.00	1255.84	87.14	40-2	30	7.50	0.20	25.27	7.30
Sluggwall Grl #11	116414002	10.00	696.50	52.29	40-3	30	7.43	0.13	25.16	7.30
Sluggwall Grl #16	116414003	10.00	733.28	56.09	40-4	30	8.57	1.27	25.29	7.30
	116414004	10.00	732.32	55.68	40-5	30	8.17	0.87	25.29	7.30
	116414005	10.00	545.61	80.61	40-6	30	7.63	0.33	24.91	7.30
	116414006	10.00	401.26	54.39	40-7	30	8.73	1.43	25.08	7.30
	1200661909	10.00	10.00	10.00	40-8	30	8.50	1.20	25.18	7.30
	1200661910	10.00	1255.84	87.14	40-9	30	8.53	1.23	25.33	7.30
	1200661911	10.00	1255.84	87.14	40-10	30	97.50	90.20	25.18	7.30
	1200661912	10.00	10.00	10.00	40-11	30	49.73	42.43	25.35	7.30

Results in pCi/g

MA 7/22/04

T348560

Run Date	Sample Type	Standard ID	NC	NC units	Recovery/RPD
7/16/2004 16:59	DUP				**0%**
7/16/2004 17:31	MS	0134-G	1.12	pCi/g	**100%**
7/16/2004 18:03	LCS	0134-G	8.06	pCi/g	**94%**

BRP SAMPLE ID	Time Counted	Tritium MDA pCi/g	**Tritium RESULT pCi/g**	Tritium ERROR pCi/g	**MDA Met?**	**Error Met?**
SlurrywallCal #8	7/16/2004 13:14	0.0296	0.0025	0.0170	Yes	Yes
SlurrywallCal #11	7/16/2004 13:46	0.0321	0.0017	0.0185	Yes	Yes
SlurrywallCal #16	7/16/2004 14:18	0.0326	0.0173	0.0194	Yes	Yes
	7/16/2004 14:50	0.0324	0.0118	0.0191	Yes	Yes
	7/16/2004 15:22	0.0638	0.0088	0.0369	Yes	Yes
	7/16/2004 15:55	0.0582	0.0348	0.0349	Yes	Yes
	7/16/2004 16:27	0.4273	0.2146	0.2544	Yes	Yes
	7/16/2004 16:59	0.0295	0.0152	0.0176	Yes	Yes
	7/16/2004 17:31	0.0297	1.1195	0.0455	Yes	Yes
	7/16/2004 18:03	0.4245	7.5400	0.4802	Yes	Yes

mn 7/22/04