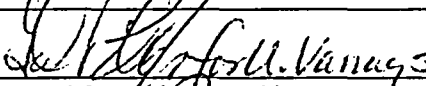
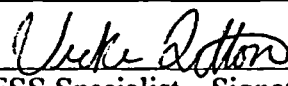

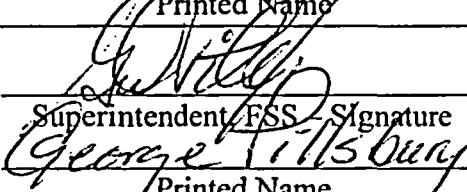



**MAINE YANKEE
FINAL STATUS SURVEY RELEASE RECORD
FR-0910 FIRE POND FOOTPRINT
SURVEY UNIT 1**

Prepared By:	<div style="text-align: center;"> FSS Engineer - Signature <u>George Pillsbury</u> Printed Name</div>	Date: <u>11/2/04</u>
Reviewed By:	<div style="text-align: center;"> FSS Specialist - Signature <u>Vicki Litton</u> Printed Name</div>	Date: <u>11-3-04</u>
Reviewed By:	<div style="text-align: center;"> Independent Review - Signature <u>W.T. Cooper</u> Printed Name</div>	Date: <u>11/4/04</u>
Approved By:	<div style="text-align: center;"> Superintendent/FSS - Signature <u>George Pillsbury</u> Printed Name</div>	Date: <u>11/4/04</u>
Approved By:	<div style="text-align: center;"> FSS, MOP - Signature <u>JAMES R. PARKER</u> Printed Name</div>	Date: <u>11/17/04</u>

**MAINE YANKEE
FINAL STATUS SURVEY RELEASE RECORD
FR-0910 FIRE POND FOOTPRINT
SURVEY UNIT 1**

A. SURVEY UNIT DESCRIPTION

FR0910 Survey Area includes the Fire Pond footprint and the adjacent Fire Pond Pump House concrete slab, located about 700 feet northwest of the plant (Maine State Grid Coordinates 623500 E and 408250 N) as shown on map FR-0910-01 (Attachment 1). Water for firefighting was stored in a man-made water storage pond, constructed of concrete and gravel, and rubber-lined. The pond was 278 feet long, 200 feet wide and 15 feet deep, with a capacity of approximately 3.4 million gallons. Makeup water for the pond was supplied from the offsite Montsweag Reservoir, located near the junction of U.S. Route 1 and Route 144. Water was drawn from the water storage pond by two fire pumps located in the Fire Pump House. Survey Unit 1 consists of the Fire Pond footprint with a surface area of 9979 m²; Survey Unit 2 consists of the Pump House Slab (119.3 m²). The survey unit was located outside of the plant's radiologically restricted area (RA) and industrial area.

B. SURVEY UNIT DESIGN INFORMATION

Survey Unit 1 consists of the Fire Pond footprint and was designated a Class 3 survey unit¹ in accordance with the LTP (Table 5-1C).

The survey unit design parameters are summarized in Table 1. Given a relative shift of 3.0, it was determined that 14 direct soil sample points were required for the Sign Test. The soil measurement locations were randomly generated and are shown on map FR-0910-02 (Attachment 1). Soil samples were analyzed with laboratory gamma spectroscopy instrumentation.

A 1% to 10% scan coverage of the area was required.² Scan grids (125 total³) were typically 8 m² as shown on map FR-0910-03 (Attachment 1). The total scan area was approximately 1000 m², thus meeting the upper scan coverage requirement of 10%.

The survey instruments used, their MDC value, and alarm setpoints, are provided in Attachment 2.

Background values were established for the scan measurements. These background values were used to establish scan alarm setpoints. See additional discussion in Section D.

-
- 1 The sediment layer at the bottom of the Fire Pond was found to have an average of about 1 pCi/gram of Cs-137. The Cs-137 in the sediment was determined to be the result of non-plant derived Cs-137 present in the environment that concentrated in organic material (EC-049-01).
 - 2 LTP Table 5-3
 - 3 The locations of the scanning grids were biased primarily to areas of the Fire Pond that were undisturbed, and were reasonably smooth to accommodate scanning with the SPA3 detector.

TABLE 1
SURVEY UNIT DESIGN PARAMETERS

Survey Unit	Design Criteria	Basis
Area	9979 m ²	No limit for Class 3 Area
Number of Direct Measurements Required	14	Based on adjusted LBGR of 2.76 pCi/g, sigma ⁴ of 0.48 pCi/g, and a relative shift of 3.0. Type I = Type II = 0.05
Sample Area	N/A	Class 3 Area
Sample Grid Spacing	N/A	Class 3 Area
Scan Grid Area	125 grids sized 2 m x 4 m	Class 3 Area
Area Factor	N/A	Class 3 Area
Scan Survey Area	1000 m ²	Class 3 Area: 1% - 10%
Background		
SPA-3 (scan)	Average background \pm 1000 c/m	DI 6-150, EC-009-01, LTP Section 5
Scan Investigation Level	3 sigma of background + DCGL See Table 2-2	EC-009-01 (Reference 1)
DCGL	4.2 pCi/g	LTP Revision 3 (Reference 2)
Design DCGL _{EMC}	N/A	Class 3 Area

C. SURVEY RESULTS

Fourteen direct measurements were obtained in Survey Unit 1. The resulting soil sample measurement data are presented in Table 2. All direct measurements were below the DCGL.

Thirty-four grids had alarms and required investigation. In addition, one direct measurement (C014) location was investigated due to Co-60 activity being identified in the sample. The results of the investigation are discussed in Section D.

⁴ LTP Table 5-1C

TABLE 2**DIRECT MEASUREMENTS**

Sample Number	Cs-137 (pCi/g)	Co-60 (pCi/g)	Unitized Value of Unity Rule
FR0910-01-3-S001	< 7.14E-02	< 6.71E-02	6.17E-02
FR0910-01-3-S002	< 8.37E-02	< 7.61E-02	7.07E-02
FR0910-01-3-S003	< 5.75E-02	< 5.69E-02	5.16E-02
FR0910-01-3-S004	< 5.45E-02	< 5.52E-02	4.98E-02
FR0910-01-3-S005	< 6.22E-02	< 6.57E-02	5.86E-02
FR0910-01-3-S006	< 5.00E-02	< 5.47E-02	4.84E-02
FR0910-01-3-S007	< 5.57E-02	< 5.14E-02	4.75E-02
FR0910-01-3-S008	< 5.26E-02	< 5.40E-02	4.85E-02
FR0910-01-3-S009	< 5.11E-02	< 5.37E-02	4.80E-02
FR0910-01-3-S010	< 6.04E-02	< 6.20E-02	5.57E-02
FR0910-01-3-S011	< 5.14E-02	< 5.41E-02	4.83E-02
FR0910-01-3-S012	< 5.39E-02	< 5.34E-02	4.84E-02
FR0910-01-3-S013	< 6.26 E-02	< 7.01E-02	6.16E-02
FR0910-01-3-S014	2.51E-01 ± 5.24E-02	3.07E-01 ± 4.34E-02	2.64E-01
Mean	7.27E-02	7.72E-02	0.0688
Median	5.66E-02	5.61E-02	0.0507
Standard Deviation	5.21E-02	6.66E-02	0.0566
Range	5.00E-02 to 2.51E-01	5.14E-02 to 3.07E-01	4.75E-02 to 2.64E-01

NOTE: "<" symbol denotes less than MDA value for isotope analyzed.

D. SURVEY UNIT INVESTIGATIONS PERFORMED AND RESULTS

Of the 125 grids scanned, 34 grids alarmed and were investigated. A soil sample was taken at the highest scan value in the grid. The soil samples were isotopically analyzed and the results are shown in Attachment 3. Co-60 was not detected in the soil samples, but Cs-137 was detected at the expected environmental levels that are well below the DCGL of 4.2 pCi/g. In addition, direct soil sample S014 showed low level Co-60 activity. This finding was investigated by taking an additional five biased soil samples from the area around S014. The results showed no evidence of Co-60 activity. Scans of the area were performed to identify the areas of highest activity for sampling.

During the time of the FR-0910 survey, the scan methodology changed as a result of detailed investigation into the data processing mechanism of the E600 data logger. Key program changes resulting from the E600 investigation were setting the investigation level at 3 sigma of background (excluding the DCGL term) and the use of local scaler background measurements in establishing the investigation level.

As a result of the above-mentioned work with the E600 instrument, a review of Survey Unit 1 background and scan data was conducted. A revised alarm setpoint (14,666 cpm) was calculated based on the latest scan methodology and the previously established background. This review indicated that four additional scan grids (FR-0910-1-S0094, 0113, 0122, and 0123) may have alarmed had the revised setpoint been used. No further investigation was considered warranted for the following reasons.

1. The scan grids for this Class 3 area are relatively small (8 m²).
2. Adjacent or nearby grids did receive alarms and were investigated; no plant-derived nuclides were detected above expected background levels.
3. All investigation soil samples elsewhere in the survey unit indicated values well below the DCGL of 4.2 pCi/g (Table 3-1, Attachment 3).

Therefore, additional investigation of scan grids FR-0910-1-S0094, 0113, 0122, and 0123 would not likely reveal the presence of plant-derived activity above background.

E. SURVEY UNIT DATA ASSESSMENT

An analysis of the direct sample measurement results, including the mean, median, standard deviation, and sample result range, are provided in Table 2. All results were below the unitized DCGL with a maximum value of 0.264.

Of the 14 soil samples from random locations within the Fire Pond (shown in Table 2), one sample (FR0910-01-3-S014) was found to have both Co-60 and Cs-137 at detectable levels. Five additional soil samples were collected at the location of the positive soil sample. None of the samples showed Co-60 and all five showed Cs-137 at levels of 0.23 to 0.28 pCi/g. It is believed that the Co-60 (which was confined to a very small area) was likely due to wind blown contamination from the nearby RA.

For illustrative purposes, as indicated in LTP Section 5.9.3, a simplified general retrospective dose estimate can be calculated by subtracting fallout Cs-137 (0.19 pCi/g) from the average residual Cs-137 contamination level (0.073 pCi/g). The net result is -0.12 pCi/g. The resulting annual dose from Cs-137 is 0.0 mrem/y. The unity fraction for Co-60 (0.077) would result in an annual dose of 0.77 mrem/y (0.077 x 10 mrem/y). However, for the purposes of demonstrating compliance with the radiological criteria for license termination and the enhanced State Criteria, background activity is not subtracted from the soil sample analysis activity values.

F. ADDITIONAL DATA EVALUATION

Attachment 4 provides additional data evaluation associated with this Survey Unit, including relevant statistical information. Based on survey unit direct measurement data, this attachment provides the Sign Test Summary, Quantile Plot, Histogram, and Retrospective Power Curve.

1. The Sign Test Summary provides an overall summary of design input and resulting calculated values used to determine the required number (N) of direct measurements (per LTP Section 5.4.2). The Sign Test Summary is a separate statistical analysis that also calculates the mean, median, and standard deviation of the direct measurements.

The critical value and the result of the Sign Test are provided in the Sign Test Summary table, as well as a listing of the key release criteria. As is shown in the table, all of the key release criteria were clearly satisfied for the FSS of this survey unit.

2. The Quantile Plot was generated from direct measurement data listed in Table 2. The data set and plot are consistent with expectations for a Class 3 survey unit. All of the measurements are well below the unitized DCGL.
3. A Histogram Plot was also developed based on the direct measurement values. This plot shows that the direct data were essentially a normal distribution with one outlier.
4. A Retrospective Power Curve was constructed, based on FSS results. The curve shows that this survey unit having a mean residual activity at a small fraction of the DCGL has a high probability ("power") of meeting the release criteria. Thus, it can be concluded that the direct measurement data support rejection of the null hypothesis, providing high confidence that the survey unit satisfied the release criteria and that the data quality objectives were met.

G. CHANGES IN INITIAL SURVEY UNIT ASSUMPTIONS ON EXTENT OF RESIDUAL ACTIVITY

The survey was designed as a Class 3 area; the FSS results were consistent with that classification. The direct measurement sample standard deviation was less than the design sigma. Thus, no additional measurements were required.

H. LTP CHANGES SUBSEQUENT TO SURVEY UNIT FSS

The FSS of Survey Unit 1 was designed, performed and evaluated in late 2002. The design was performed to the criteria of the LTP, Revision 2. As discussed and reviewed in Section D of this Release Record, scan methodology changes were made during this time frame, relating to the use of the E600 instrument.

LTP changes have been made subsequent to the completion of this survey. Those LTP changes with potential for impact to this survey unit are listed below.

1. Requirement to check background ± 1000 cpm prior to the scan of each grid. (LTP Revision 3 Addenda, References 4 and 5).
2. Increased Scan MDC to 5.9 pCi/g (LTP Revision 3 Addenda, References 4 and 5).
3. Change in alarm setpoint methodology during the evolution of the use of E600 (deletion of the DCGL term).
4. LTP changes in the activated concrete license amendment (References 6 and 7).
5. The procedural commitment to the State of Maine of limiting grid size to 10 m^2 (Reference 8).

These LTP changes were evaluated and found to have no impact on the results or conclusions of the FSS of FR-0910 Survey Unit 1.

I. CONCLUSION

The FSS of this survey unit was designed based on the LTP designation as a Class 3 area. The survey design parameters are presented in Table 1. The required number of direct measurements was determined for the Sign Test in accordance with the LTP. As presented in Table 2, all direct measurements were less than the unitized DCGL.

A Sign Test Summary analysis demonstrated that the Sign Test criteria were satisfied. The direct measurement sigma was determined to be less than that used for design, thus indicating that a sufficient number of samples was taken.

The Retrospective Power Curve shown in Attachment 4 confirmed that sufficient samples were taken to support rejection of the null hypothesis, providing high confidence that the survey unit satisfied the release criteria and the data quality objectives were met. Attachment 4 also revealed that direct measurement data represented essentially a normal distribution, with one outlier.

The scan survey design for this survey unit was developed in accordance with the LTP with significant aspects of the design discussed in Section B and Table 1. Scanning resulted in 34 verified alarms (Section D) for evaluation. Attachment 3 shows the results of investigations. There were no indications of residual plant-derived activity at a significant fraction of the DCGL.

It is concluded that FR-0910, Survey Unit 1, met the release criteria of 10CFR20.1402 and the State of Maine enhanced criteria.

J. REFERENCES

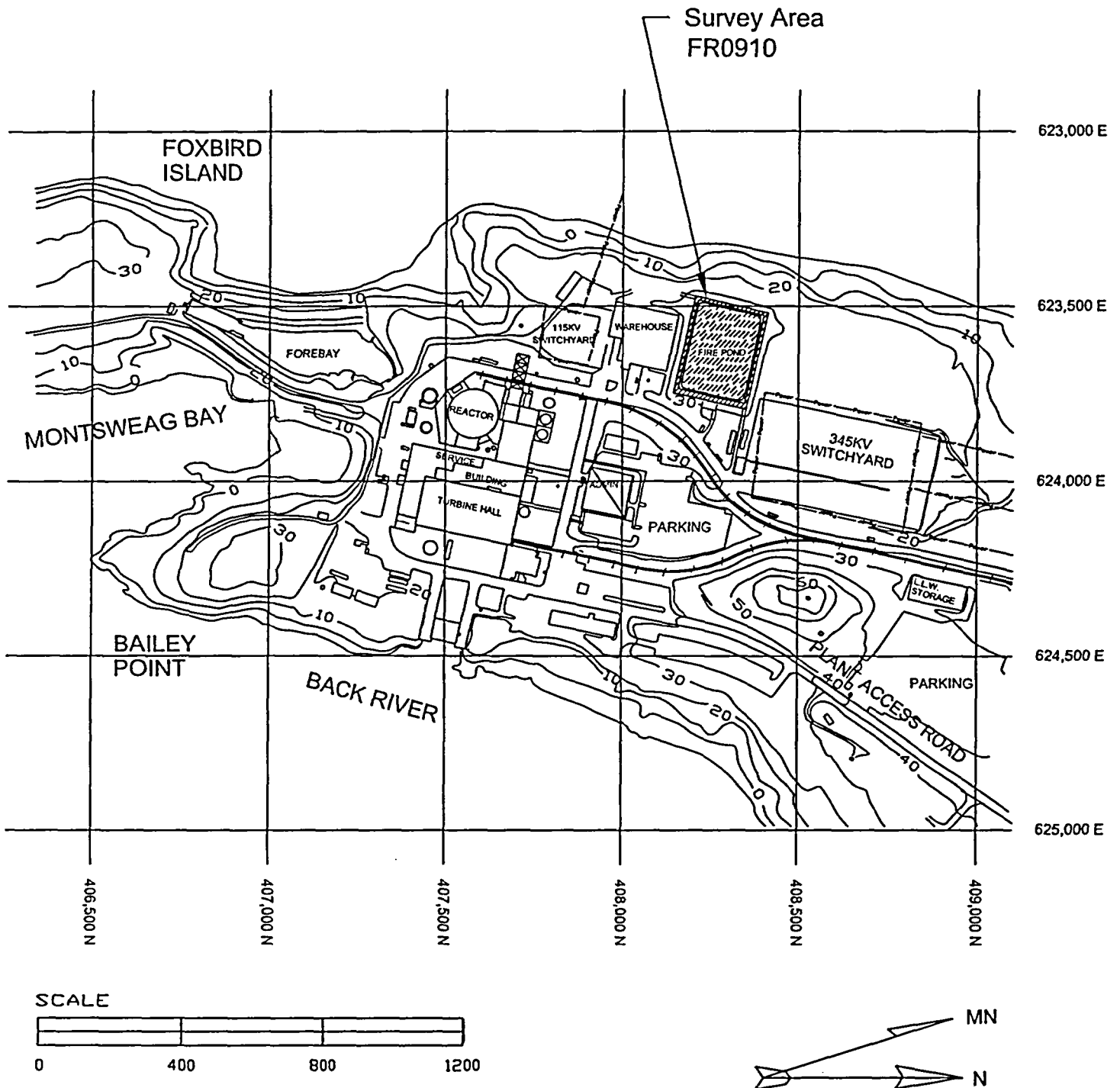
1. Maine Yankee Engineering Calculation, EC-009-01
2. Maine Yankee License Termination Plan, Revision 3, Maine Yankee letter to the NRC, MN-02-048, dated October 15, 2002
3. Approach for Dealing with Background Radioactivity for Maine Yankee Final Status Surveys, Attachment E to Maine Yankee Procedure, FSS Data Processing and Reporting, PMP 6.7.8
4. Maine Yankee License Termination Plan, Revision 3 Addenda, Maine Yankee letter to the NRC, MN-02-061, dated November 26, 2002
5. NRC letter to Maine Yankee, dated February 28, 2003, Approval of LTP Rev. 3 and Addenda
6. MY letter to the NRC, MN-03-049, dated September 11, 2003, "Proposed Change: Revised Activated Concrete DCGL and More Realistic Activated Concrete Dose Modeling"
7. NRC Letter to Maine Yankee dated February 18, 2004, Approval of Activated Concrete Amendment
8. MY Letter to the NRC, MN-03-009, February 26, 2003

Attachment 1

Survey Unit Maps

Survey Type: ☐ Characterization ☐ Turnover ☒ Final Status Survey

Survey Area Name: Fire Pond



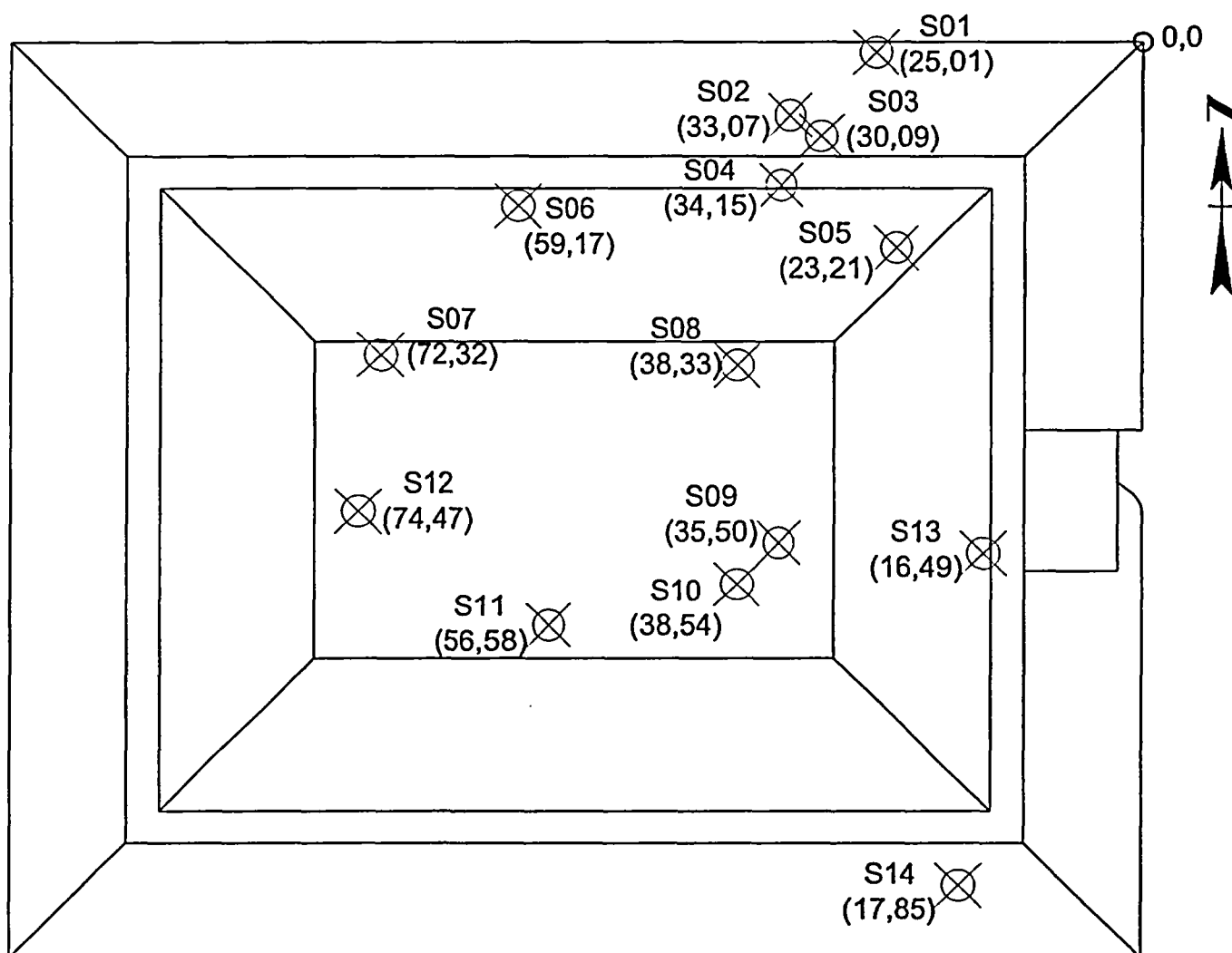
Survey Type: ☐ Characterization ☐ Turnover ☒ Final Status Survey

Survey Area Name: FIRE POND

Fire Pond

FR 0910 Unit 01

Soil Sample Locations



- Soil sample Location

(## - ##) - Soil Sample Location Coordinates In meters (W,S)

⊗ Starting At The Northeast Corner Of The Fire Pond Berm

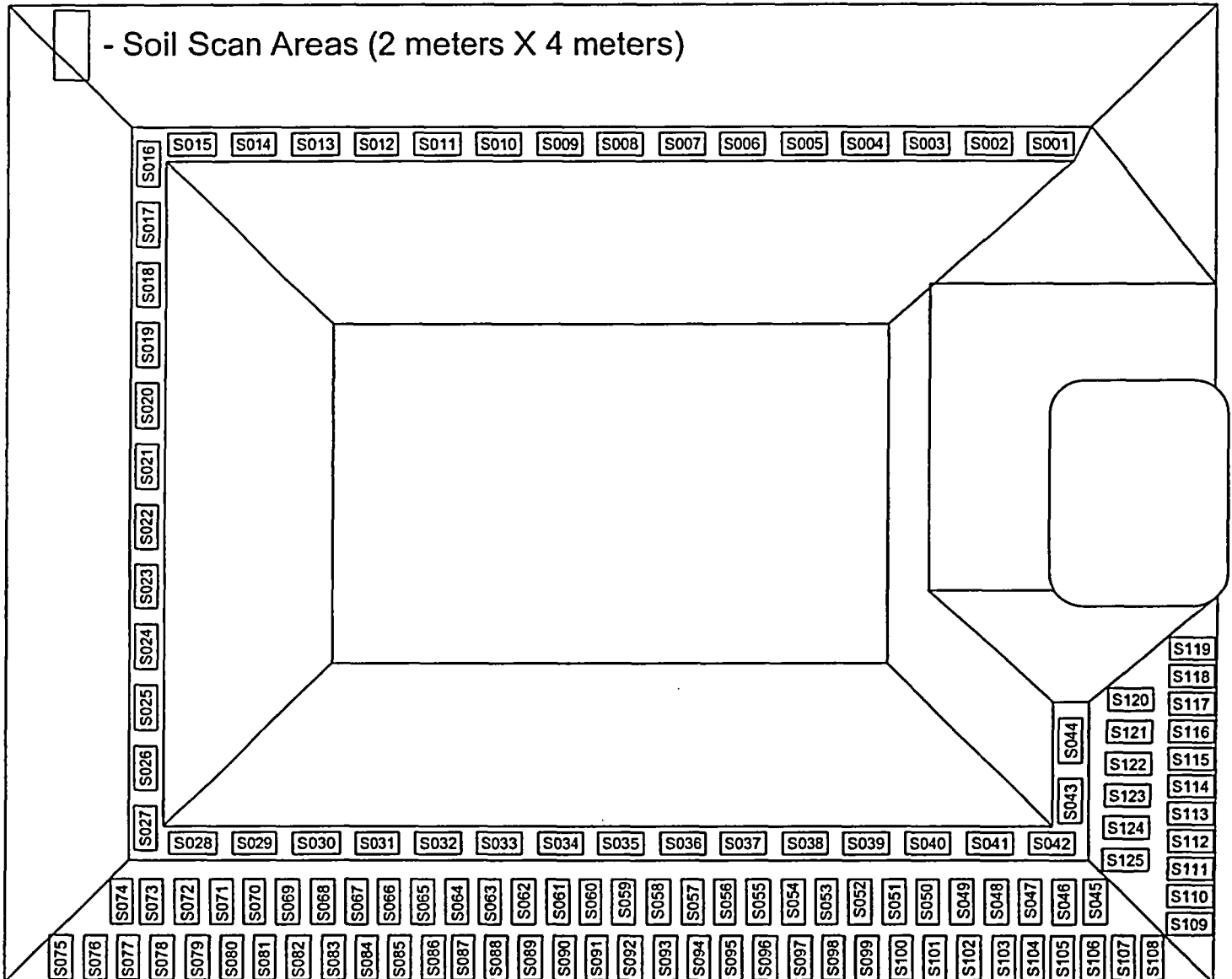
Survey Type: ☐ Characterization ☐ Turnover ☒ Final Status Survey

Survey Area Name: FIRE POND

Fire Pond FR 0910 Unit 1 Soil Scan Areas



- Soil Scan Areas (2 meters X 4 meters)



Attachment 2

Survey Unit Instrumentation

TABLE 2-1

INSTRUMENT INFORMATION

E-600 S/N	Probe S/N (type)
1619	725328 (SPA-3)
1619	725329 (SPA-3)
1625	725332 (SPA-3)
1641	725329 (SPA-3)
1643	725328 (SPA-3)
1619	726560 (SPA-3)
1643	726560 (SPA-3)
1928	725332 (SPA-3)

HPGe Detectors for Lab Analysis of Volumetric Samples

Detector Number	MDC (pCi/g)
FSS-1	0.02 to 0.11
FSS-2	0.02 to 0.11

TABLE 2-2

INSTRUMENT SCAN MDC AND COMPARISON WITH DCGL AND INVESTIGATION LEVEL

Detector	SPA-3	Comments
Scan MDC (pCi/g)	5.9	LTP Table 5-6, Design Scan MDC (LTP Revision 3 Addenda, Reference 4)
DCGL (pCi/g)	4.2 (Cs-137) 1.5 (Co-60)	DCGL for land areas outside the Restricted Area applied (LTP Revision 3 Addenda, Reference 4)
Investigation Level (Alarm Setpoint) cpm	14,810 3.0 sigma of background + DCGL	EC-009-01 (Reference 1)

Attachment 3

Investigation Table

TABLE 3-1
INVESTIGATION TABLE

Original Survey Results			Investigation Results		
Investigation Location	Alarm Setpoint (cpm)	Max Scan Value (cpm)	Max Investigation Scan (cpm)	Cs-137 (pCi/g)	Comparison to DCGL
Grid S037	14,810	14,810	14490	< 6.32E-02	< DCGL
Grid S038	14,810	15,720	14400	< 5.40E-02	< DCGL
Grid S039	14,810	16,020	15180	< 6.08E-02	< DCGL
Grid S040	14,810	16,040	15460	< 6.50E-02	< DCGL
Grid S041	14,810	16,850	15910	< 5.19E-02	< DCGL
Grid S042	14,810	15,410	15640	< 5.96E-02	< DCGL
Grid S043	14,810	15,200	14680	< 5.50E-02	< DCGL
Grid S044	14,810	16,910	16150	< 5.72E-02	< DCGL
Grid S045	14,810	19,440	16110	2.55E-01 + 4.10E-02	< DCGL
Grid S047	14,810	14,900	15730	2.01E-01 + 3.60E-02	< DCGL
Grid S048	14,810	16,530	14640	2.32E-01 + 3.78E-02	< DCGL
Grid S049	14,810	15,180	14860	2.03E-01 + 3.30E-02	< DCGL
Grid S050	14,810	16,350	15960	2.08E-01 + 3.59E-02	< DCGL
Grid S051	14,810	17,700	14790	2.40E-01 + 3.74E-02	< DCGL
Grid S053	14,810	14,860	14020	2.38E-01 + 3.86E-02	< DCGL
Grid S060	14,810	15,020	13570	1.18E-01 + 2.77E-02	< DCGL
Grid S067	14,810	15,260	13730	< 4.92E-02	< DCGL
Grid S068	14,810	17,400	14130	< 6.89E-02	< DCGL
Grid S069	14,810	22,400	14260	< 7.86E-02	< DCGL
Grid S070	14,810	21,700	14220	< 8.27E-02	< DCGL
Grid S071	14,810	22,200	13990	< 7.57E-02	< DCGL
Grid S072	14,810	22,700	14440	< 5.90E-02	< DCGL
Grid S073	14,810	22,000	15290	< 8.40E-02	< DCGL
Grid S074	14,810	23,700	14790	< 5.11E-02	< DCGL
Grid S092	14,810	17,540	13320	2.93E-01 + 4.10E-02	< DCGL
Grid S105	14,810	15,180	14550	< 3.85E-02	< DCGL
Grid S108	14,810	14,960	15570	2.66E-01 + 3.79E-02	< DCGL
Grid S114	14,810	15,000	16630	1.34E-01 + 3.18E-02	< DCGL
Grid S115	14,810	15,000	15350	1.63E-01 + 3.20E-02	< DCGL
Grid S116	14,810	15,900	16110	6.80E-02 + 2.65 E-02	< DCGL
Grid S117	14,810	14,800	15380	2.28E-01 + 3.92E-02	< DCGL
Grid S118	14,810	15,900	15420	9.22E-02 + 2.65E-02	< DCGL
Grid S119	14,810	15,000	14090	2.26E-01 + 3.81E-02	< DCGL
Grid S124	14,810	14,810	16080	1.87E-01 + 3.44E-02	< DCGL
FR0910-01-3-- S014 Soil Sample	N/A	N/A	17,640	5 Soil Samples Average = 2.60E-02	< DCGL

NOTES:

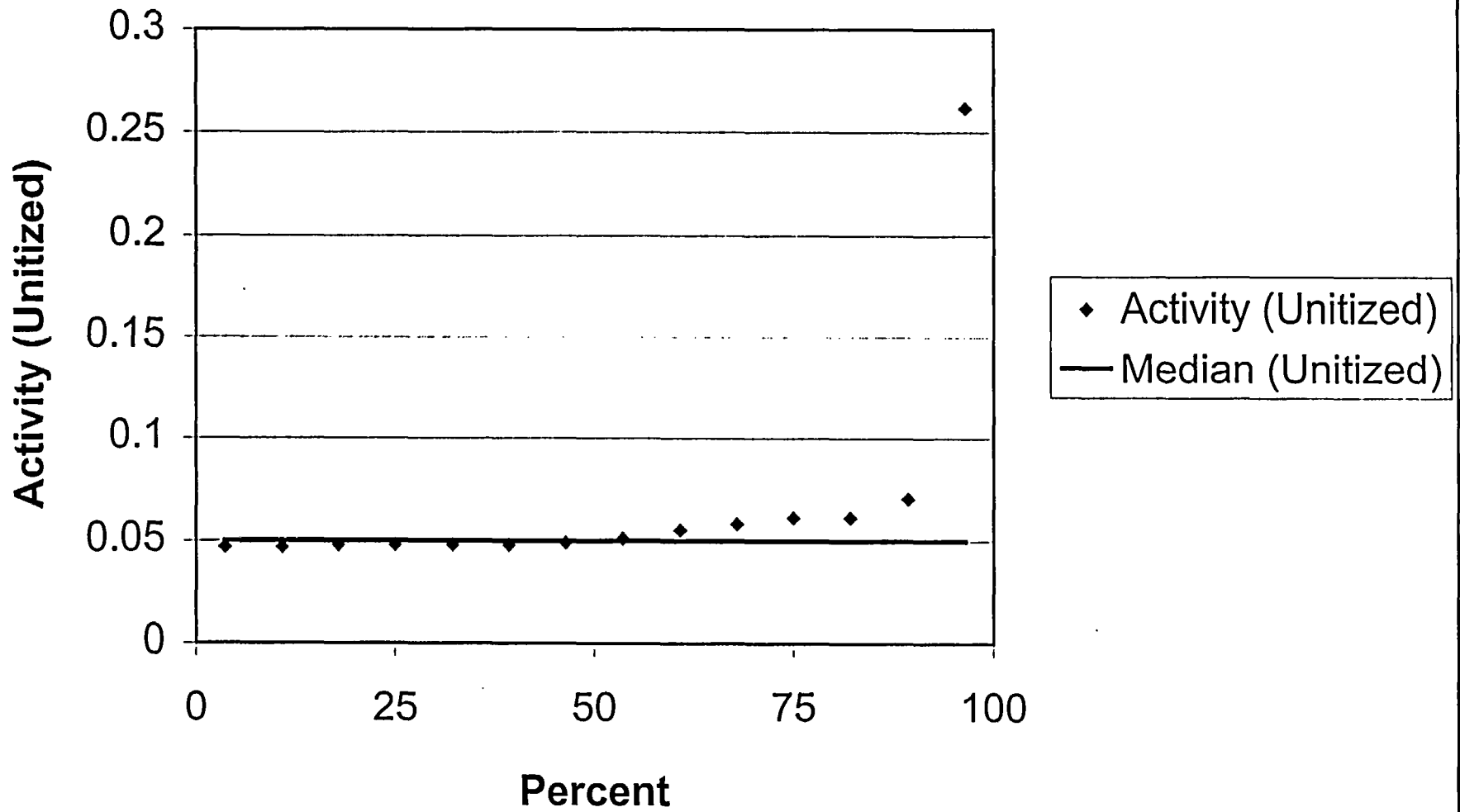
1. Samples were also analyzed for Co-60; all were less than MDA.
2. "<" indicates MDA.

Attachment 4
Statistical Data

Survey Package FR-0910 Unit 1 UNITY Soil Sign Test Summary

Evaluation Input Values		Comments
Survey Package:	FR-0910	Forebay
Survey Unit:	01	
Evaluator:	GP	
DCGL _w :	1.00E+00	Unitized
DCGL _{emc} :	N/A	
LBGR:	5.00E-01	
Sigma:	1.14E-01	
Type I error:	0.05	
Type II error:	0.05	
Nuclide:	UNITY	
Soil Type:	N/A	
Calculated Values		Comments
Z _{1-α} :	1.645	
Z _{1-β} :	1.645	
Sign p:	0.99865	
Calculated Relative Shift:	4.3	
Relative Shift Used:	3.0	Uses 3.0 if Relative Shift is >3
N-Value:	11	
N-Value+20%:	14	
Sample Data Values		Comments
Number of Samples:	14	
Median:	5.00E-02	
Mean:	6.81E-02	
Net Sample Standard Deviation:	5.63E-02	
Total Standard Deviation:	5.63E-02	SRSS
Maximum:	2.62E-01	
Sign Test Results		Comments
Adjusted N Value:	14	
S+ Value:	14	
Critical Value:	10	
Sign test results:	Pass	
Criteria Satisfaction		Comments
Sufficient samples collected:	Pass	
Maximum value <DCGL _w :	Pass	
Median value <DCGL _w :	Pass	
Mean value <DCGL _w :	Pass	
Maximum value <DCGL _{emc} :	Pass	
Total Standard Deviation <=Sigma:	Pass	
Criteria comparison results:	Pass	
Final Status		Comments
The survey unit passes all conditions:	Pass	

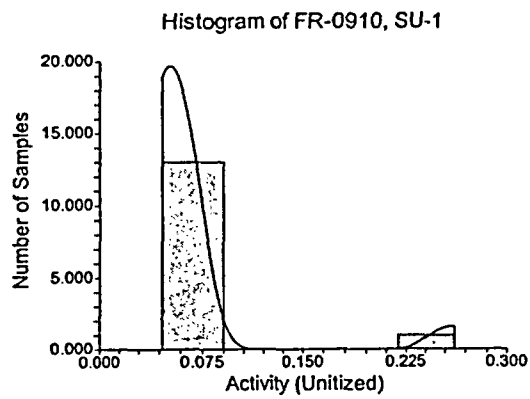
FR-0910 SU-1 Quantile Plot



One-Sample T-Test Report

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Variable C2

Plots Section



One-Sample T-Test Power Analysis

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Chart Section

