
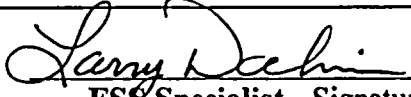
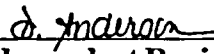
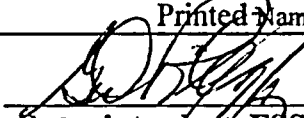



**MAINE YANKEE  
FINAL STATUS SURVEY RELEASE RECORD  
FR-0111 YARD WEST EXCAVATIONS  
SURVEY UNIT 14**

Prepared By:	 _____ FSS Engineer - Signature <u>G.S. Madison</u> _____ Printed Name	Date: <u>2/17/05</u>
Reviewed By:	 _____ FSS Specialist - Signature <u>Larry Dockins</u> _____ Printed Name	Date: <u>2/17/05</u>
Reviewed By:	 _____ Independent Review - Signature <u>D. ANDERSON</u> _____ Printed Name	Date: <u>2/17/05</u>
Approved By:	 _____ Superintendent, FSS - Signature <u>George Pillsbury</u> _____ Printed Name	Date: <u>2/17/05</u>
Approved By:	 _____ FSS, MOP - Signature <u>JAMES R. PARKER</u> _____ Printed Name	Date: <u>2/17/05</u>

**MAINE YANKEE  
FINAL STATUS SURVEY RELEASE RECORD  
FR-0111 YARD WEST EXCAVATIONS  
SURVEY UNIT 14**

**A. SURVEY UNIT DESCRIPTION**

FR-0111 Yard West Excavations Survey Unit 14 is a 1475 m<sup>2</sup> rectangular area (hole) created in part from the removal of three feet of sand from the Containment interior and the excavation and removal of the Containment walls and liner down to the 17' elevation. This area includes a portion of the sand filled Containment interior which had originally been filled to the 20' elevation but was excavated down to the 17' elevation after complete removal of the Containment dome rubble and remnants. The area also includes new clean fill portions (surfaces) of land that were previously excavated, surveyed and filled after completion of FR-0110 (Alleyway). The area also includes previously unsurveyed portions of the Main Steam Valve House (FA-1500) slab where embedded pipe remnants were removed. Also included were previously unsurveyed portions of FA-1600 Electrical Penetrations remnants.

The area is bounded west by FR-0111 Survey Units 10 and 11, south by FR-0111 Unit 13, east by FR-0111 Unit 18, and north by FR-0111 Survey Unit 15 and FA-0400. The survey unit's southeast corner is located at coordinates 407,520 N / 623,914 E using Maine State Coordinate System (West Zone) NAD 1927. The location of the survey unit in relation to the Containment Building and the surrounding FR-0111 survey units is shown on Map FR0111U14-SITE (Attachment 1). An abstract of the terrain levels and excavated depths is shown on map FR0111U14-INFO (Attachment 1).

**B. SURVEY UNIT DESIGN INFORMATION**

Survey Unit 14 met the LTP Revision 3 definition for a Class 1 survey unit. The survey unit design parameters are shown in Table 1. Given a relative shift of 0.8, it was determined that 40 direct measurements were required for the Sign Test. Because the measurement locations were based on a systematic square grid with a random start point, the N=40 design led to a survey unit map with 41 locations. The direct point locations are illustrated on map FR0111U14-DIRT (Attachment 1). Direct measurements (soil samples) were collected from required locations and analyzed with laboratory gamma spectroscopy instrumentation.

In accordance with the LTP, scans covering 100% of the 1,475 m<sup>2</sup> area were required for the Class 1 survey unit. This was accomplished by use of an *in situ* gamma spectroscopy detector (ISOCS) configured at a 0.7, 2.0, or 3.0-meter distance from the surface to obtain overlapping 1.5-m<sup>2</sup>, 12-m<sup>2</sup>, or 28-m<sup>2</sup> fields of view, respectively. The ISOCS detector was positioned perpendicular to the surface. Locations of the 104 survey scans are shown on map FR0111U14-SCAN. Scans were performed using the Canberra<sup>®</sup> In-Situ Object Counting System (ISOCS).

The combination of all ISOCS scans ensured 100% scan coverage of all exposed surfaces within Survey Unit 14. The survey instruments used are listed by model and serial number in Attachment 2 (Table 2-1). Scan MDCs are also listed in Attachment 2 (Table 2-2) and are compared to the DCGL, the investigation level, and the DCGL<sub>EMC</sub>. As shown in this table, the scan MDC is less than the scan investigation level, thus providing high confidence (95% or higher) that an elevated area would be detected in the scanning process. Further, since the investigation level was always less than the design DCGL<sub>EMC</sub>, no EMC sample size adjustment was necessary.

**TABLE 1**  
**SURVEY UNIT DESIGN PARAMETERS**

Survey Unit	Design Criteria	Basis
Area	1,475 m <sup>2</sup>	Class 1, < 2,000 m <sup>2</sup>
Number of Direct Measurements Required	40	Based on an LBGR of 1.2 pCi/g, sigma <sup>1</sup> of 1.33 pCi/g, and a relative shift of 0.8. Type I = Type II = 0.05
Sample Area	37 m <sup>2</sup>	1,475 m <sup>2</sup> / 40 = 37 m <sup>2</sup>
Sample Grid Spacing	6.1 m	(37) <sup>1/2</sup>
Scan Grid Area	ISOCS scan at various distances	See Section B
Area Factor	1.65	Class 1 Area, LTP Table 6-12
Scan Area	1,475 m <sup>2</sup>	Class 1 Area – 100%
Scan Investigation Level	1.0 pCi/g Cs-137 0.36 pCi/g Co-60	ISOCS investigation levels with detector at 3-meter height (28 m <sup>2</sup> FOV) geometry (Reference 6)
	2.2 pCi/g Cs-137 0.8 pCi/g Co-60	ISOCS investigation levels with detector at 0.7-meter and 2.0-meter heights (Reference 6)
DCGL	2.39 pCi/g Cs-137 0.86 pCi/g Co-60	References 4 and 7
Design DCGL <sub>EMC</sub>	3.9 pCi/g Cs-137 1.4 pCi/g Co-60	DCGL x Area Factor for Class 1 survey unit, per LTP Section 5.6.3

<sup>1</sup> LTP Revision 3, Table 5-1C for RCA Yard West, R0100.

## C. SURVEY RESULTS

A total of 41 direct measurements were performed in Survey Unit 14. The results are presented in Table 2. All direct measurements were below the DCGL.

ISOCS gamma scans were performed at 104 locations using investigation levels of 1.0 pCi/g Cs-137 and 0.36 pCi/g Co-60 for the 28 m<sup>2</sup> field of view or investigation levels of 2.2 pCi/g Cs-137 and 0.8 pCi/g Co-60 using 1.5 m<sup>2</sup> and 12 m<sup>2</sup> field of views. The ISOCS scans were designed to achieve overlapping scan coverage to ensure 100% coverage for the survey unit. The gamma scans were performed for a sufficient count time to achieve a Minimum Detectable Activity of approximately 30% of the DCGL.

Three scan activity locations (S068, S078, and S080) identified Co-60 levels above the Co-60 investigation level of 0.36 pCi/g. An investigation was performed and documented using survey investigation package XR 0111-14. Refer to Section D for further discussion of the investigation performed.

**TABLE 2**  
**DIRECT MEASUREMENTS**

Sample Number	Cs-137 (pCi/g)	Uncertainty (pCi/g)	Co-60 (pCi/g)	Uncertainty (pCi/g)	Unitized Value of Unity Rule
FR0111-14-1S001-SS-Dirt	< 4.94E-02		< 4.47E-02		7.26E-02
FR0111-14-1S002-SS-Dirt	< 5.13E-02		< 5.33E-02		8.34E-02
FR0111-14-1S003-SS-Dirt	< 4.40E-02		< 5.51E-02		8.25E-02
FR0111-14-1S004-SS-Dirt	< 4.21E-02		< 4.98E-02		7.55E-02
FR0111-14-1S005-SS-Dirt	< 4.18E-02		< 4.59E-02		7.09E-02
FR0111-14-1S006-SS-Dirt	< 4.54E-02		< 5.35E-02		8.12E-02
FR0111-14-1S007-SS-Dirt	< 4.02E-02		< 4.51E-02		6.93E-02
FR0111-14-1S008-SS-Dirt	< 5.26E-02		< 4.67E-02		7.63E-02
FR0111-14-1S009-SS-Dirt	<b>6.58E-02</b>	2.71E-02	< 4.91E-02		8.46E-02
FR0111-14-1S010-SS-Dirt	< 4.13E-02		< 5.01E-02		7.55E-02
FR0111-14-1S011-SS-Dirt	< 4.14E-02		< 4.64E-02		7.13E-02
FR0111-14-1S012-SS-Dirt	< 4.14E-02		< 4.23E-02		6.65E-02
FR0111-14-1S013-SS-Dirt	< 4.11E-02		< 4.20E-02		6.60E-02
FR0111-14-1S014-SS-Dirt	< 4.46E-02		< 4.52E-02		7.12E-02
FR0111-14-1S015-SS-Dirt	< 4.74E-02		< 4.34E-02		7.03E-02
FR0111-14-1S016-SS-Dirt	<b>9.67E-02</b>	2.91E-02	< 5.01E-02		9.87E-02
FR0111-14-1S017-SS-Dirt	<b>6.75E-02</b>	2.66E-02	< 4.72E-02		8.31E-02
FR0111-14-1S018-SS-Dirt	< 4.45E-02		< 4.63E-02		7.25E-02
FR0111-14-1S019-SS-Dirt	< 5.67E-02		<b>8.95E-02</b>	3.95E-02	1.28E-01
FR0111-14-1S020-SS-Dirt	< 5.11E-02		< 6.24E-02		9.39E-02
FR0111-14-1S021-SS-Dirt	< 5.10E-02		< 6.03E-02		9.15E-02
FR0111-14-1S022-SS-Dirt	< 4.11E-02		< 4.49E-02		6.94E-02
FR0111-14-1S023-SS-Dirt	< 4.04E-02		< 4.64E-02		7.09E-02
FR0111-14-1S024-SS-Dirt	<b>1.30E-01</b>	3.07E-02	< 4.70E-02		1.09E-01
FR0111-14-1S025-SS-Dirt	< 5.06E-02		< 5.07E-02		8.01E-02
FR0111-14-1S026-SS-Dirt	< 3.88E-02		< 3.78E-02		6.02E-02
FR0111-14-1S027-SS-Dirt	<b>1.60E-01</b>	3.41E-02	< 6.81E-02		1.46E-01
FR0111-14-1S028-SS-Dirt	< 4.53E-02		< 4.64E-02		7.29E-02
FR0111-14-1S029-SS-Dirt	< 4.53E-02		< 5.11E-02		7.84E-02
FR0111-14-1S030-SS-Dirt	< 4.03E-02		< 4.65E-02		7.09E-02
FR0111-14-1S031-SS-Dirt	< 4.23E-02		< 4.67E-02		7.20E-02
FR0111-14-1S032-SS-Dirt	< 4.43E-02		< 4.71E-02		7.33E-02
FR0111-14-1S033-SS-Dirt	<b>1.11E-01</b>	3.28E-02	<b>1.95E-01</b>	3.03E-02	2.73E-01
FR0111-14-1S034-SS-Dirt	< 4.82E-02		< 4.84E-02		7.64E-02
FR0111-14-1S035-SS-Dirt	< 3.89E-02		< 4.07E-02		6.36E-02
FR0111-14-1S036-SS-Dirt	< 4.10E-02		< 4.26E-02		6.67E-02
FR0111-14-1S037-SS-Dirt	< 4.47E-02		< 4.32E-02		6.89E-02
FR0111-14-1S038-SS-Dirt	< 3.71E-02		< 4.22E-02		6.46E-02
FR0111-14-1S039-SS-Dirt	< 3.75E-02		< 4.72E-02		7.06E-02
FR0111-14-1S040-SS-Dirt	< 3.95E-02		< 4.17E-02		6.50E-02
FR0111-14-1S041-SS-Dirt	< 4.02E-02		< 4.28E-02		6.66E-02
Mean	5.30E-02		5.23E-02		8.30E-02
Median	4.45E-02		4.67E-02		7.26E-02
Standard Deviation	2.58E-02		2.45E-02		3.48E-02
Range	3.71E-02 to 1.60E-01		3.78E-02 to 1.95E-01		6.02E-02 to 2.73E-01

“<” indicates MDA value. Bold indicates positive detection value.

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#### **D. SURVEY UNIT INVESTIGATIONS PERFORMED AND RESULTS**

Co-60 exceeding the investigation level of 0.36 pCi/g was identified at three scan locations: S068, S078, and S080. To investigate the elevated Co-60 scan measurements, ISOCS scans were performed within each 28 m<sup>2</sup> field of view at a height of 0.7-m. A total of 12 investigation scans were performed for S068 (due to the overlapping field of view from S080) while 14 scans were performed for S078 and S080. The 0.7-m height provided a 1.5-m<sup>2</sup> field of view for each of the scans. Configuration of the ISOCS scans is shown on map XR0111U14-SCAN (Attachment 1).

For the S068 location, three ISOCS scans identified Co-60 above the MDA with the highest reported value of 0.59 pCi/g at location X007. The remaining scans were less than the MDA for Co-60. In addition, Cs-137 was not identified above the MDA. Of the 14 scans performed at S080, two scans identified Co-60 below the 0.8 pCi/g investigation level and two scans identified Cs-137 below the 2.2 pCi/g investigation level. The remaining scans were less than MDA for both Co-60 and Cs-137. Fourteen ISOCS scans were performed at S078. A total of six gamma scans identified Co-60, while three scans identified Cs-137. The gamma scan for location X014 identified Co-60 above the 0.8 pCi/g investigation level and Cs-137 above the 1.0 pCi/g investigation level. The remaining S078 scans were less than MDA for both Co-60 and Cs-137.

E-600/SPA-3 instrumentation was used in addition to ISOCS scans to determine the locations of highest activity within each scan grid. Soil samples were collected at the locations identified as containing the highest activity and the results are reported in Table 3-1. The soil sample obtained in S068 did not identify Co-60 or Cs-137 above the MDA. The S080 soil sample identified both Co-60 and Cs-137 below the unitized DCGL. The S078 soil sample location was determined to contain elevated Co-60 activity and additional investigation measures were implemented. Locations of the soil samples are provided on XR0111U14-SCAN2 (Attachment 1).

Based on the elevated soil sample results, additional E-600/SPA-3 scans were performed over 100% of S078. At the three locations of elevated activity, scaler measurements were obtained. Because one of the locations was the original S078SS0000 sample location, soil samples were collected at the remaining two highest points within S078. These locations were denoted as S078SS0100 and S078SS0200. Both soil samples reported Co-60 activities above the DCGL. As a result, localized remediation of the area was performed prior to continuing final survey activities. Following remediation within S078, ISOCS scans were performed at the initial location of S078SS000 (labeled S078GS0002) and the investigation location of S078SS0100 (labeled S078GS102). The post remediation ISOCS scan results were less than the 0.8 pCi/g Co-60 and 2.2 pCi/g Cs-137 investigation levels and are reported in Table 3-1 (Attachment 3). Post remediation soil samples taken from both locations did not identify Co-60 or Cs-137 activity above the MDA. Sample location S078SS0200 was removed from the survey unit and will be added to the Class 1 final survey package of FR-0111 Survey Unit 15 as discussed further in Section G.

## E. SURVEY UNIT DATA ASSESSMENT

An analysis of the direct sample measurement results, including the mean, median, standard deviation, and sample result range, is provided in Table 2. Of the 41 soil samples collected, 6 identified Cs-137 activity below the DCGL value of 2.39 pCi/g while 2 samples identified Co-60 activity below the DCGL value of 0.86 pCi/g. All other values were below the MDA. Identified sample activities or Minimum Detectable Activities are listed in Table 2. The mean and median activities were less than the DCGL for both Co-60 and Cs-137. The average of the DCGL unity fractions was 0.083 and the maximum reported unity value was less than 28% of the unitized DCGL. The Elevated Measurement Comparison Unity test was not performed since all reported sample activities were less than the DCGL for both Co-60 and Cs-137 for the direct measurements as were the final investigation results.

For illustrative purposes, as indicated in LTP Section 5.9.3, a simplified general retrospective dose estimate can be calculated from the average residual contamination level by subtracting the mean fallout Cs-137 value (0.19 pCi/g)<sup>2</sup> for disturbed soil from the survey unit sample mean activity (0.053 pCi/g). This would equate to an annual dose rate of 0.0 mrem/year. Taking into account the average residual contamination level for Co-60, the annual dose rate would equate to 0.47 mrem/year<sup>3</sup>. However, for purposes of demonstrating compliance with the radiological criteria for license termination and the enhanced State criteria, background activity was not subtracted from the 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 (Table 1) 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. The sample standard deviation is smaller than the design sigma; therefore no additional samples were required.

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<sup>2</sup> See Attachment E to Maine Yankee Procedure PMP 6.7.8 (Reference 5).

<sup>3</sup> This annual dose equivalent is based on LTP Table 6-11 which shows the RA contaminated soil contribution (for soils contaminated at the DCGL) to be 7.67 mrem/y. Therefore, the annual dose rate would equate to

$$\text{Annual Dose Rate} = 7.67 \times \left( \frac{0.0523}{0.86} \right) = 0.47 \text{ mrem / y}$$

2. The Quantile Plot was generated from the unity value data listed in Table 2. The data set and plot are consistent with expectations for a Class 1 survey unit. All of the measurements are well below the DCGLs of 2.39 pCi/g for Cs-137 and 0.86 pCi/g for Co-60 for land inside the restricted area. The one outlier was approximately 27% of the unitized DCGL.
3. A Histogram Plot was also developed based on the unity values. This plot shows a log-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 1 land survey area; the FSS results were consistent with that classification. The direct measurement sample standard deviation was less than the design sigma. Thus, a sufficient number of sample measurements were taken and no additional measurements were required.

Due to active remediation activities occurring in an adjacent survey unit, a small strip of area from FR-0111 Survey Unit 14 will be included in and resurveyed with the adjacent survey unit. The area will be included with FSS for FR-0111 Survey Unit 15. Refer to Attachment 1 map XR0111014-SCAN2 for the location of the subject area.

#### **H. LTP CHANGES SUBSEQUENT TO SURVEY UNIT FSS**

The FSS of Survey Unit 14 was designed, performed, and evaluated in the January/February 2005 time frame. The design was performed to the criteria of the LTP Revision 3 (References 2 and 4). LTP Change No. 05-001 (Reference 7) modified the Table 6-11, "Contaminated Material DCGL," to reflect an increased Deep Soil DCGL of 0.86 pCi/g for Co-60. As a result, the retrospective dose calculation was modified to include 2.04 mrem/y from Deep Soil and 5.63 mrem/y from Surface Soil. No subsequent LTP changes with potential impact to this survey unit need to be evaluated.



## **I. CONCLUSION**

The FSS of this survey unit was designed based on the LTP designation as a Class 1 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 DCGLs of 2.39 pCi/g Cs-137 and 0.86 pCi/g Co-60.

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 log-normal distribution with one outlier.

The scan survey design for this survey unit was developed in accordance with the LTP Revision 3 Addenda (Reference 2) with significant aspects of the design discussed in Section B and Table 1.

Elevated ISOCS scans within three scan grids were investigated and additional soil samples obtained. The elevated soil sample results from S078 determined the need for further localized remediation. As a result of additional remediation activities, two of the elevated areas were re-sampled and found to be less than the DCGLs for Co-60 and Cs-137. The remaining area of elevated activity at the boundary of the survey unit will be resurveyed with the Class 1 final survey of FR-0111 Survey Unit 15.

It is concluded that FR-0111 Survey Unit 14 meets the release criteria of 10CFR20.1402 and the State of Maine enhanced criteria.

## **J. REFERENCES**

1. Maine Yankee License Termination Plan, Revision 3, October 15, 2002 and Addenda provided by Maine Yankee letter to the NRC, MN-02-061, dated November 26, 2002
2. NRC letter to Maine Yankee, dated February 28, 2003
3. Maine Yankee letter to the NRC, MN-03-049, dated September 11, 2003 (LTP Supplement to LTP Revision 3)
4. Issuance of License Amendment No. 170, NRC letter to Maine Yankee, dated February 18, 2004
5. Maine Yankee Procedure PMP 6.7.8, FSS Data Processing and Reporting, Attachment E, Approach for Dealing With Background Radioactivity for Maine Yankee Final Status Surveys
6. Maine Yankee Calculation No. EC-003-04, Use of Canberra In Situ Object Counting System (ISOCS) for FSS Surveys
7. Maine Yankee LTP Change Number 05-001, Deep Soil Co-60 DCGL

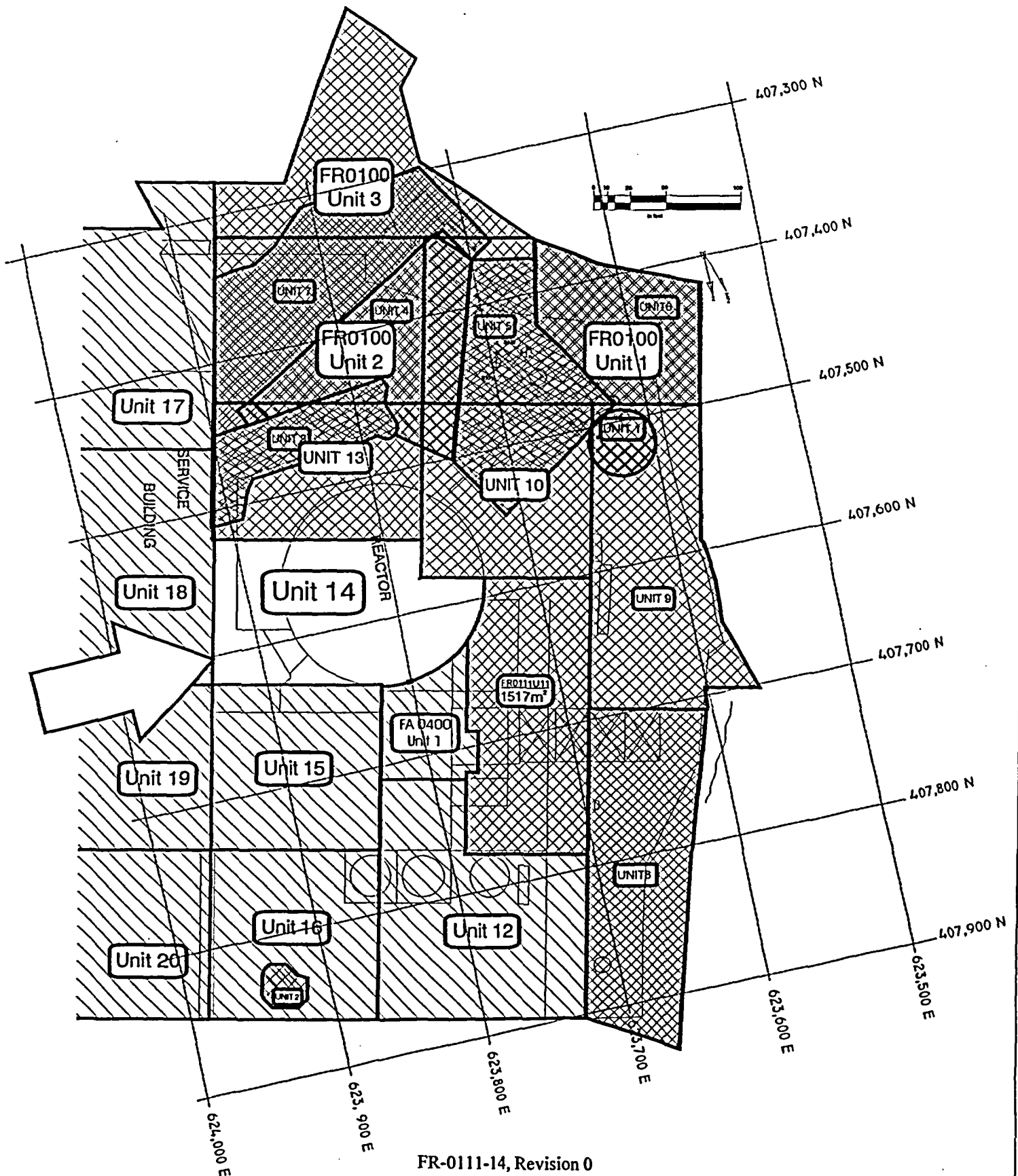
**Attachment 1**

**Survey Unit Maps**

Survey Type: ☐ Characterization ☐ Turnover ☒ Final Status Survey

Survey Area Name: Site Locator

Prepared By: Larry N. Dockins Date: 1/18/05



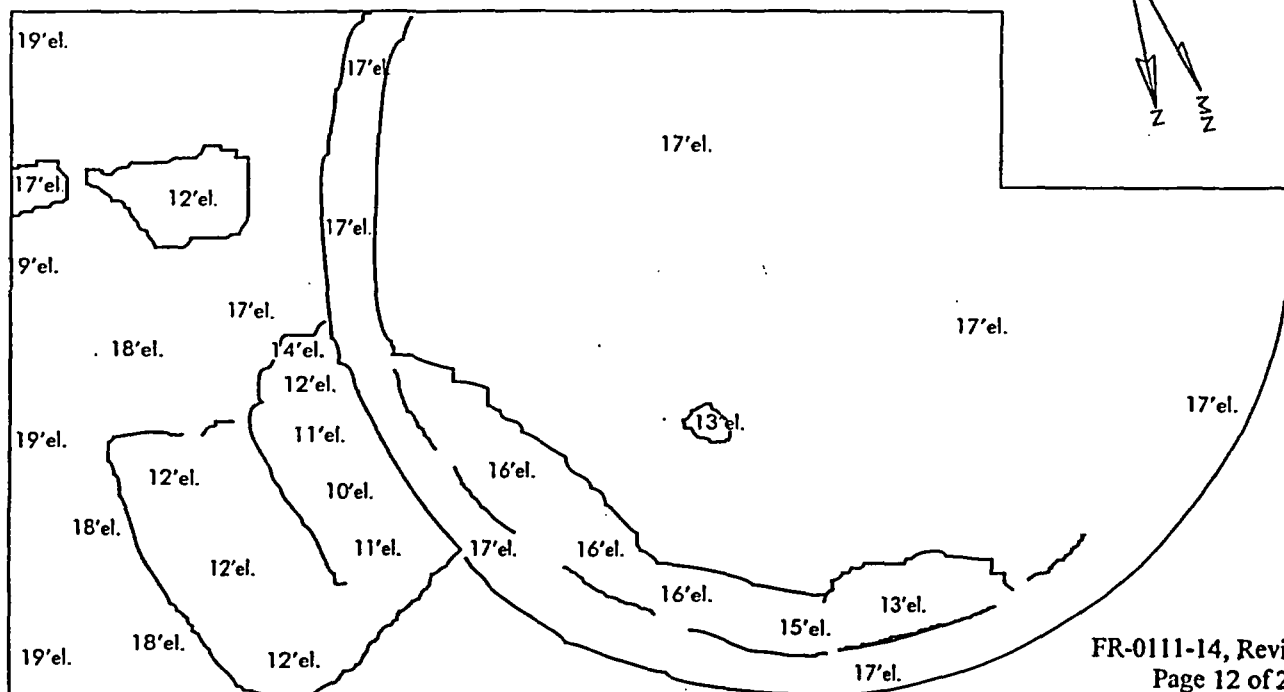
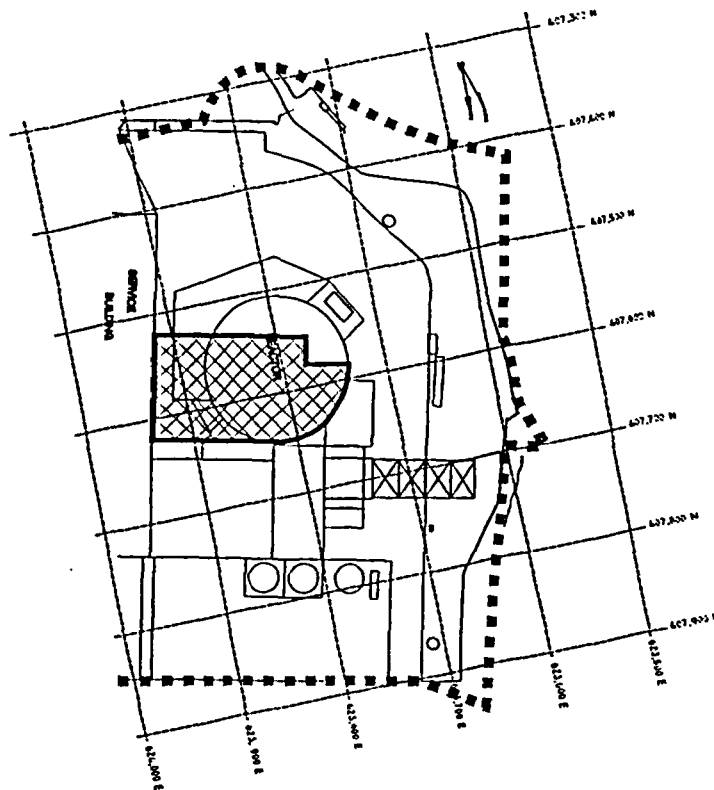
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☐ Turnover

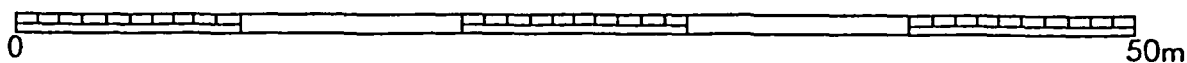
☒ Final Status Survey

Survey Area Name: **Excavation Depths (Approx. Elevations)**

Prepared By: Larry N. Dockins Date: 2/10/05



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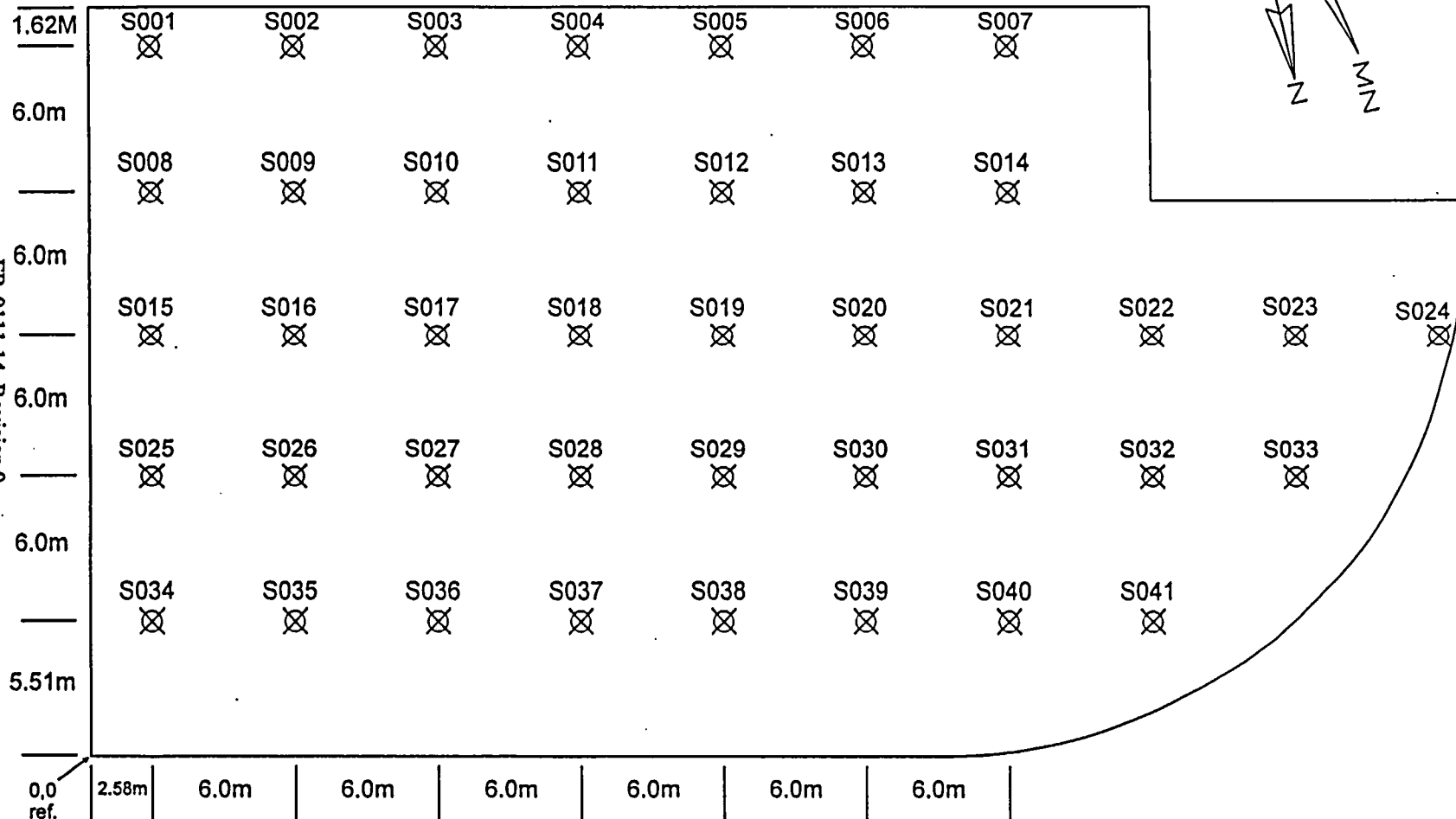
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☐ Turnover

☒ Final Status Survey

Survey Area Name: Direct Locations

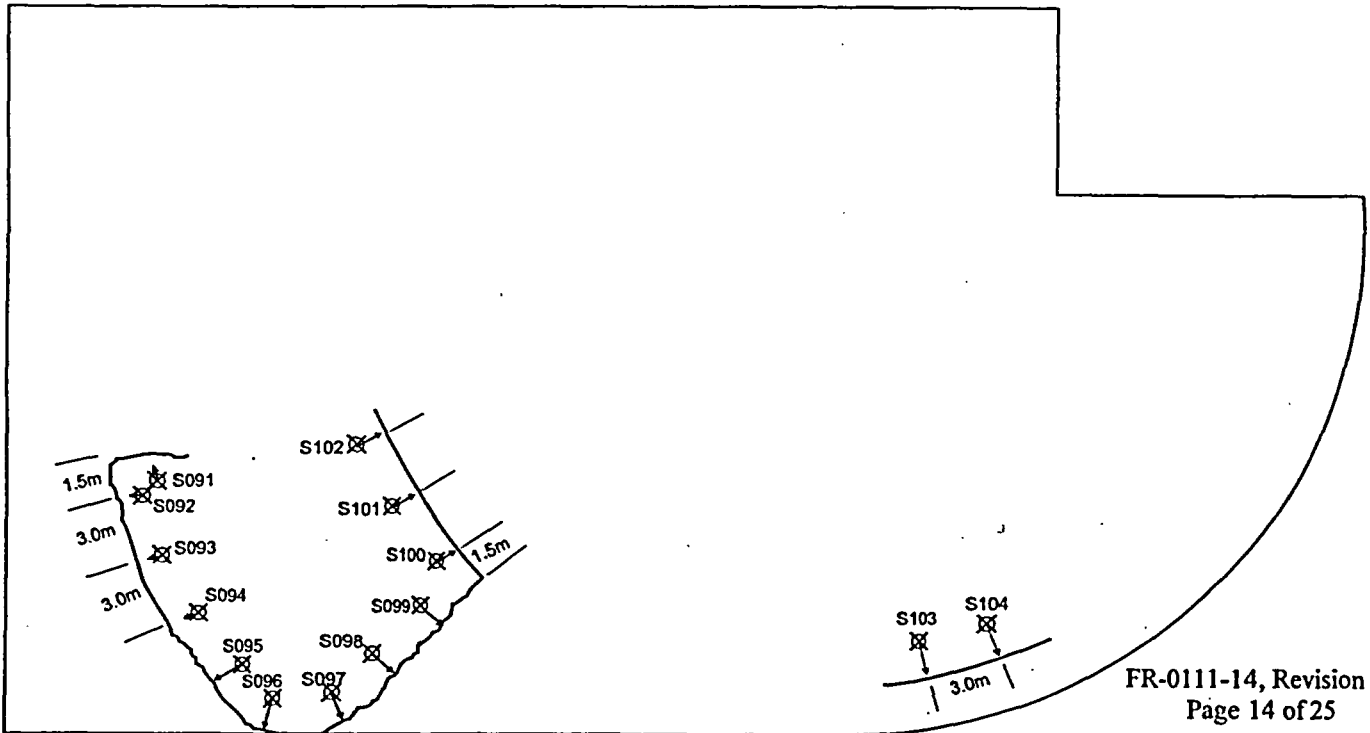
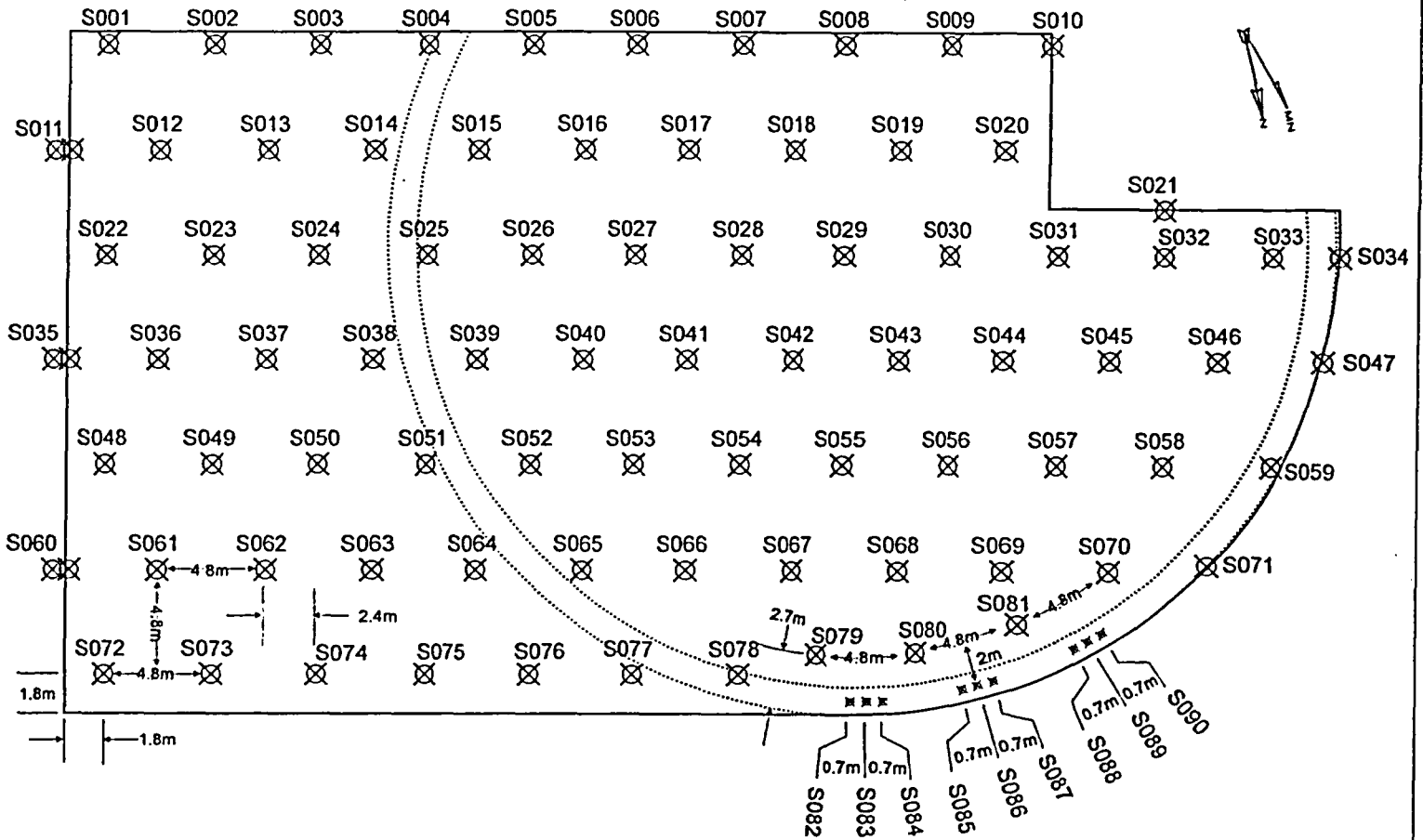
Prepared By: Larry N. Dockins Date: 1/18/05



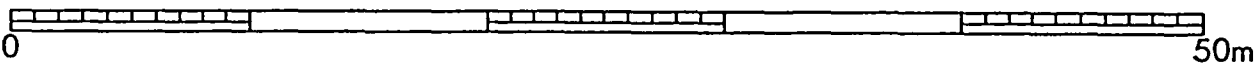
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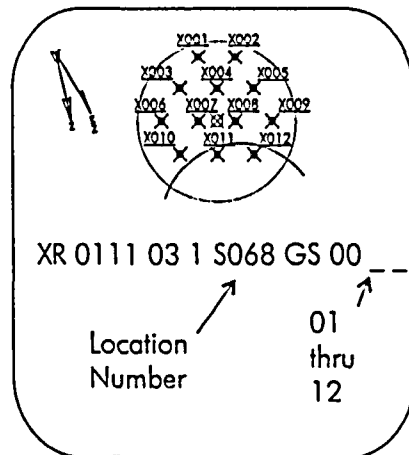
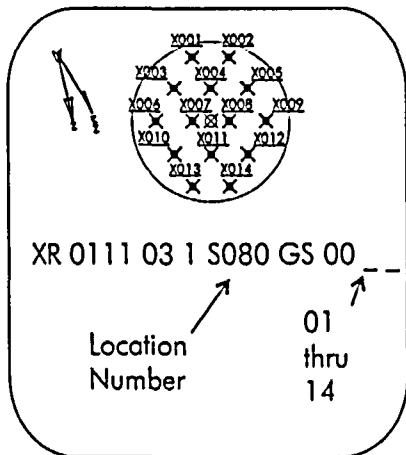
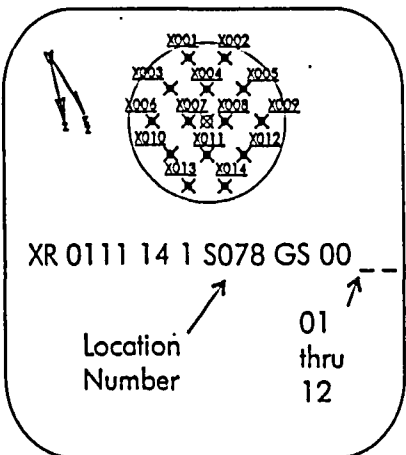
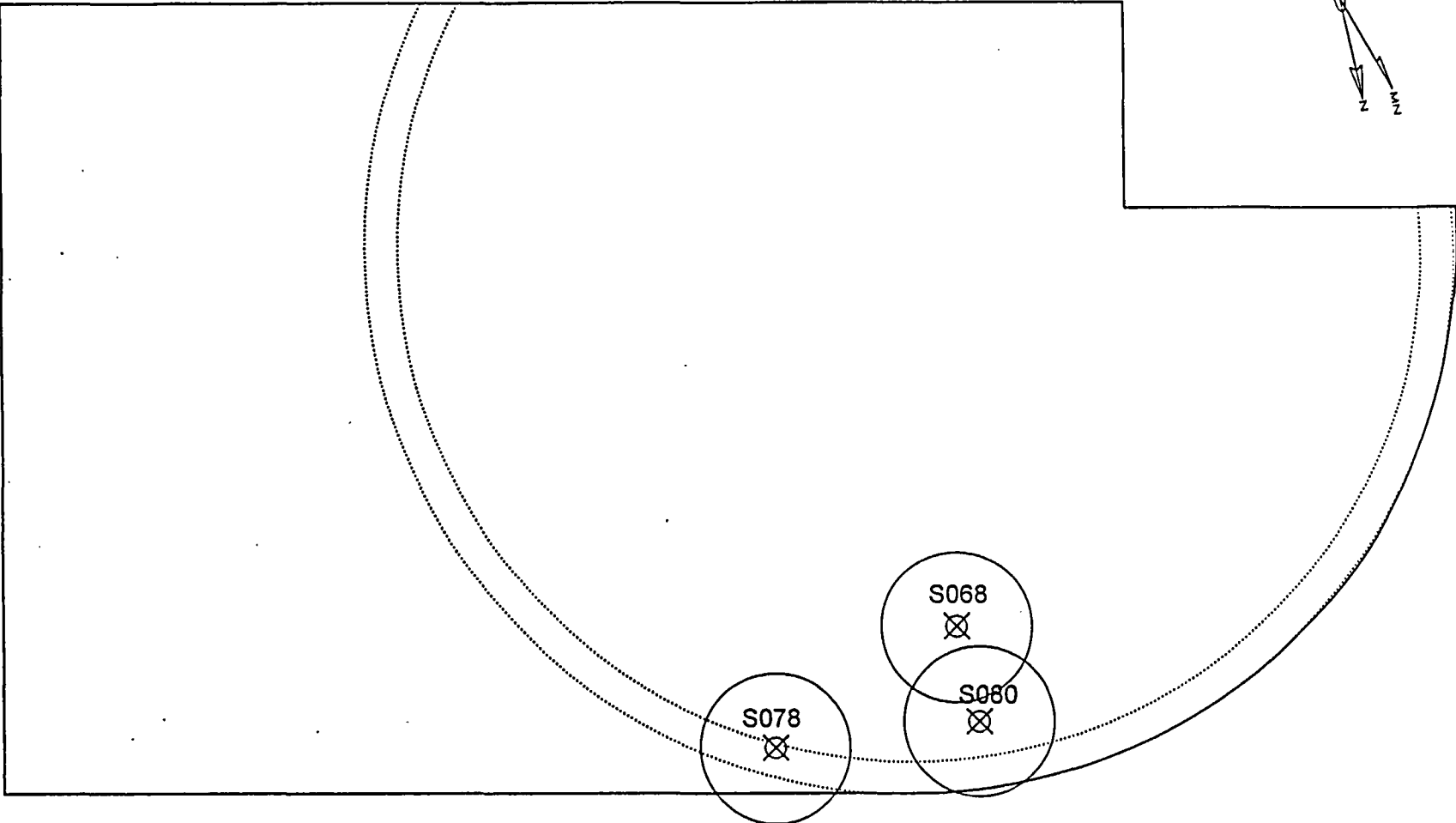
Survey Area Name: Site Locator

Prepared By: Larry N. Dockins Date: 1/18/05



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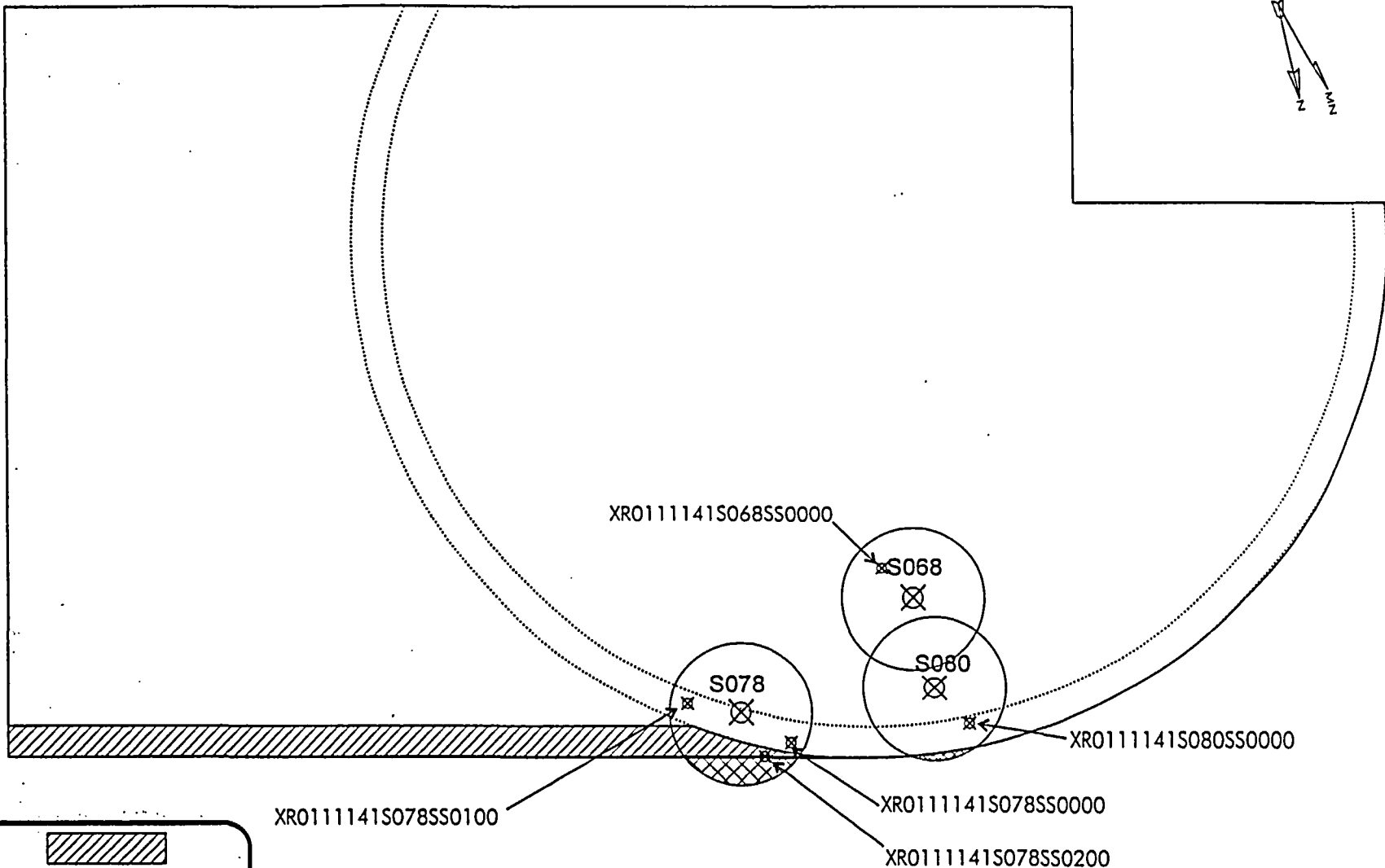


Survey Type: ☐ Characterization

☐ Turnover

☒ Final Status Survey

Survey Area Name: Scan Locations



Due to active remediation underway in FR0111 Unit 15 this portion of Survey Unit 14 will be included with FR0111 Unit 15 for remediation and re-survey.



**Attachment 2**  
**Survey Unit Instrumentation**

**TABLE 2-1****INSTRUMENT INFORMATION****ISOCS Detectors (Field Measurements)**

Detector Number	MDC (pCi/g)
7722	0.08 to 0.40
7780	0.08 to 0.40
7607	0.08 to 0.40

**HPGe Detectors (Laboratory Analysis)**

Detector Number	MDC (pCi/g)
FSS1	0.04 to 0.07
FSS2	0.04 to 0.07

**E-600/SPA-3 INSTRUMENTATION**

E600 S/N	Probe S/N
2490	2254

**TABLE 2-2****INSTRUMENT SCAN MDC, DCGL,  
INVESTIGATION LEVEL, AND DESIGN DCGL<sub>EMC</sub>**

Parameter	Instrument: ISOCS	Comments
Scan MDC	0.14 to 0.40 pCi/g Cs-137 0.08 to 0.26 pCi/g Co-60	~ 30% DCGL
DCGL	2.39 pCi/g Cs-137 0.86 pCi/g Co-60	Approved DCGL for land areas inside the Restricted Area (References 4 and 7)
Investigation Level (ISOCS @ 3 m)	1.0 pCi/g Cs-137 0.36 pCi/g Co-60	(Reference 6)
Investigation Level (ISOCS @ 0.7 m, 2 m)	2.2 pCi/g Cs-137 0.8 pCi/g Co-60	(Reference 6)
Design DCGL <sub>EMC</sub>	3.9 pCi/g Cs-137 1.4 pCi/g Co-60	DCGL x Area Factor for Class 1 survey unit, per LTP Section 5.6.3

**Attachment 3**

**Investigation Table**

**TABLE 3-1**

**INVESTIGATION TABLE**

INITIAL SURVEY				INVESTIGATION			POST-REMEDATION SURVEY				
Sample Location	Nuclide	ISOCS Invest. Level (pCi/g)	ISOCS Scan @ 3m (pCi/g)	Max ISOCS Invest. Scan @ 70 cm (pCi/g)	SPA-3 Scaler Value (cpm)	Soil Sample Results (pCi/g)	Post Remed. ISOCS Scans (pCi/g)	Post-Remed. Soil Sample Results (pCi/g)	Area Factor	Unitized Value of Unity Rule	DCGL <sub>EMC</sub> Unity
S068SS0000	Co-60	0.36	4.41E-01 ± 9.54E-02	5.93E-01 ± 1.18E-01	19,420	<5.06E-02	N/A	N/A	N/A	N/A	< DCGL
	Cs-137	1.00	<2.96E-01	<3.53E-01		<4.31E-02	N/A	N/A			
S078SS0000	Co-60	0.36	4.52E-01 ± 9.04E-02	1.25E+00 ± 1.47E-01	38,300	2.72E+02 ± 1.13E+01	4.92E-01 ± 9.34E-02	<5.43E-02	N/A	N/A	< DCGL
	Cs-137	1.00	<3.85E-01	1.42E+00 ± 2.71E-01		<4.95E-01	4.53E-01 ± 1.55E-01	<5.24E-02			
S078SS0100 <sup>4</sup>	Co-60	0.36	N/A	N/A	23,400	1.68E+02 ± 6.99E+00	<2.16E-01	<5.43E-02	N/A	N/A	< DCGL
	Cs-137	1.00	N/A	N/A		<3.91E-01	<2.60E-01	<4.28E-02			
S080SS0000	Co-60	0.36	4.26E-01 ± 8.66E-02	2.02E-01 ± 7.37E-02	12,460	2.00E-01 ± 2.95E-02	N/A	N/A	N/A	N/A	< DCGL
	Cs-137	1.00	2.90E-01 ± 1.34E-01	9.60E-01 ± 2.44E-01		1.63E+00 ± 1.22E-01	N/A	N/A			
						Co-60 Mean (pCi/g)	Cs-137 Mean (pCi/g)			Unitized Mean	
						5.23E-02	5.30E-02			8.30E-02	8.30E-02
EMC Unity Sum											8.30E-02

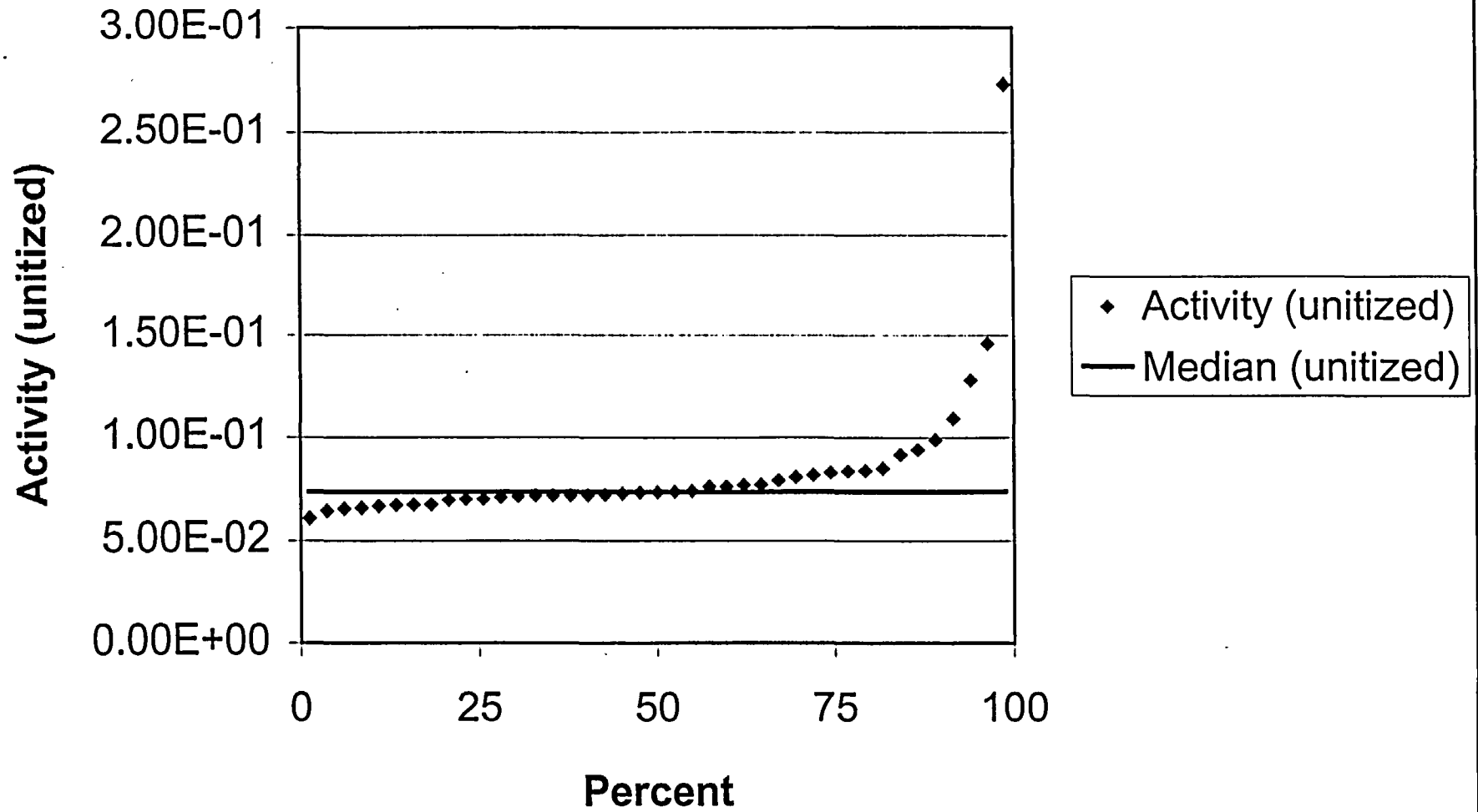
<sup>4</sup> Sample location S078SS0100 was broken out during the investigation of S078. The initial ISOCS investigation levels and maximum ISOCS scan results for S078SS0000 also apply to S078SS0100.

**Attachment 4**  
**Statistical Data**

## Survey Package FR0111 Unit 14 UNITY Soil Sign Test Summary

Evaluation Input Values		Comments
Survey Package:	FR0111	
Survey Unit:	14	Yard West Excavations
Evaluator:	G. Madison	
DCGL <sub>w</sub> :	1.00E+00	Unity
DCGL <sub>emc</sub> :	1.60E+00	AF x Unity
LBGR:	5.00E-01	50% of DCGL
Sigma:	5.66E-01	Unitized Design Sigma
Type I error:	0.05	
Type II error:	0.05	
Nuclide:	UNITY	
Soil Type:	N/A	
Calculated Values		Comments
Z <sub>1-<math>\alpha</math></sub> :	1.645	
Z <sub>1-<math>\beta</math></sub> :	1.645	
Sign p:	0.788145	
Calculated Relative Shift:	0.8	
Relative Shift Used:	0.8	Uses 3.0 if Relative Shift is >3
N-Value:	33	
N-Value+20%:	40	
Sample Data Values		Comments
Number of Samples:	41	
Median:	7.26E-02	
Mean:	8.30E-02	
Net Sample Standard Deviation:	3.48E-02	
Total Standard Deviation:	3.48E-02	Sum of samples and reference
Maximum:	2.73E-01	
Sign Test Results		Comments
Adjusted N Value:	41	
S+ Value:	41	
Critical Value:	26	
Sign test results:	Pass	
Criteria Satisfaction		Comments
Sufficient samples collected:	Pass	
Maximum value <DCGL <sub>w</sub> :	Pass	
Median value <DCGL <sub>w</sub> :	Pass	
Mean value <DCGL <sub>w</sub> :	Pass	
Maximum value <DCGL <sub>emc</sub> :	Pass	
Total Standard Deviation <=Sigma:	Pass	
Criteria comparison results:	Pass	
Final Status		Comments
The survey unit passes all conditions:	Pass	Survey Unit Passes

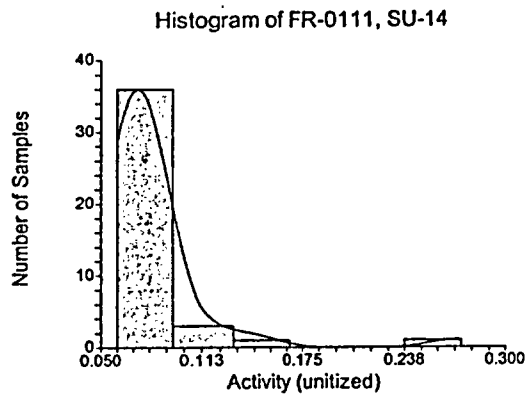
## FR-0111 SU-14 Quantile Plot



## One-Sample T-Test Report

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Database  
Variable C2

### Plots Section





# One-Sample T-Test Power Analysis

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## Chart Section

