Final Status Survey Report

For

Saxton Nuclear Experimental Corporation
Open Land Area OL3

Prepared by GPU Nuclear, Inc.

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Executive Summary

This report presents the results and conclusions of the final status survey (FSS) of the Class 1 open land areas around the south central portion of the Saxton Nuclear Experimental Corporation (SNEC) facility designated as OL3. This FSS survey was conducted in May and June of 2005.

The FSS was performed in accordance with the SNEC License Termination Plan (LTP). The survey area (OL3) was divided into six survey units. In addition, four of the six survey units had asphalt paving and/or concrete structures. Asphalt and concrete will be covered in a separate OL3 FSS Report. Each of the survey units in this report consisted of relatively flat open land.

Data were collected from each survey unit in accordance with the specific survey design data collection requirements. The following is a summary of the soil measurements:

1) Direct NaI(Tl) scans of all or parts of 94 100-square meter grids covering 100% of the actual land area
2) 67 soil samples collected and then analyzed by laboratory gamma spectroscopy

The FSS survey data demonstrate that 8,184 square meters of open land in the OL3 survey area meets the radiological release criteria for unrestricted use specified in 10CFR20.1402. Therefore, GPU Nuclear, Inc. concludes that the open land portion of the survey area meets the NRC requirements and may be released for unrestricted use.

1.0 Purpose and Scope

This report presents the results and conclusions of the final status survey of the open land area designated OL3 of the SNEC facility. It provides the information required by 10CFR50.82(a)(11) and the SNEC license termination plan (LTP) to demonstrate that this area meets the radiological criteria for unrestricted use specified in 10CFR20.1402.

This report describes the radiological data collected in six Class 1 survey units of open land surface. This report only addresses the FSS performed on the specific area designated as OL3 on reference 9.1. The format of this report follows the guidance contained in reference 9.2.

2.0 Survey Area Description

Survey Area OL3 is a Class 1 impacted area encompassing the south-central portion of the SNEC Site. The original survey area contained about 8,900 square meters of surface area: divided into open land and paved surfaces and concrete. Because it exceeded the size guidance in the SNEC LTP for Class 1 survey areas (2000 square meters recommended maximum), the survey area was divided into five smaller survey units. Subsequent to OL9-2 (impacted, Class 2) data analysis, five additional grids were included as a sixth survey unit in OL3, bringing the total surface area to 9,400 square meters. Layout of the survey area and individual units, relative to the site layout, are shown in Attachment 1-1 of Appendix A. The six survey units are discussed below. The OL3 designation is taken from the drawing, reference 9.1.

Survey Unit OL3-1 is located such that OL3-6 is to the north, OL9 to the west and south, and OL3-2 to the east. The survey unit is approximately 2,000 square meters: all of it soil.

Survey Unit OL3-2 is located such that OL1 is to the north, OL3-1 to the west, OL7-1 to the south, and OL3-3 to the east. The survey unit is approximately 1,800 square meters of which 654 square meters is soil, 921 square meters is concrete, and 225 square meters is asphalt.

Survey Unit OL3-3 is located such that OL1 is to the north, both OL3-2 and OL7-1 are to the west, OL3-4 to the south, and OL3-5 to the east. The survey unit is approximately 1,800 square meters: all of it soil.

Survey Unit OL3-4 is located such that both OL3-3 and OL3-5 are to the north and OL7-1 surrounds the remainder. The survey unit is approximately 1,300 square meters of which 1,294 square meters is soil and 6 square meters is concrete. There is no asphalt in this survey unit.

Survey Unit OL3-5 is located such that OL1 is to the north, OL3-3 to the west, OL3-4 to the south, and OL7-1 to the east. The survey unit is approximately 2,000 square meters of which 1,972 square meters is soil and 28 square meters is concrete. There is no asphalt in this survey unit.

Survey Unit OL3-6 is located such that OL9 is to the north and west, OL3-1 to the south, and OL1 to the east. The survey unit is approximately 500 square meters of which 464 square meters is soil and 36 square meters is concrete. There is no asphalt in this survey unit.

3.0 Operating History

3.1 Plant Operation

The Saxton Nuclear Experimental Corporation (SNEC) facility included a pressurized water reactor (PWR), which was licensed to operate at 23.5 megawatts thermal (23.5 MWTh). The facility is owned by the Saxton Nuclear Experimental Corporation and is licensed by GPU Nuclear, Inc. The SNEC facility is maintained under a Title 10 Part 50 license and associated Technical Specifications. In 1972, the license was amended to possess but not operate the SNEC reactor.

The facility was built from 1960 to 1962 and operated from 1962 to 1972 primarily as a research and training reactor. After shutdown in 1972, the facility was placed in a condition equivalent to the current SAFSTOR status. Since then, it has been maintained in a monitored condition. The fuel was removed in 1972 and shipped to a (now DOE) facility at Savannah River, SC, who is now the owner of the fuel. As a result of this action, neither SNEC nor GPU Nuclear, Inc. has any further responsibility for the spent fuel from the SNEC facility. The building and structures that supported reactor operation were partially decontaminated by 1974.

In the late 1980s and through the 1990s, additional decontamination and disassembly of the containment vessel and support buildings and final equipment and large component removal was completed. Final decontamination and dismantlement of the reactor support structures and buildings was completed in 1992. Large component structures, pressurizer, steam generator, and reactor vessel were removed in late 1998. Containment vessel removal (to below grade) and backfill was completed in late 2003. Decontamination, disassembly, and demolition of the SNEC facility buildings and equipment have been completed and the facility is in the process of Final Status Survey for unrestricted release and license termination.

3.2 Survey Area Remediation Status

OL3 has been subjected to extensive remediation. Contamination was detected in the "burn area" in the eastern portion of OL3-4 and southern portion of OL3-5. Subsequently soil was removed, the area was rescanned, and additional soil samples were taken. Neither scans nor samples exhibited activity greater than the DCGL.

Soil from the northernmost portion of OL3-5 was removed during the 1994 Saxton Soil Remediation Project. Soil activity as high as 38 pCi/g was removed with subsequent scans and sampling producing no activity greater than the DCGL.

One grid adjacent to the former SSGS cooling water intake, currently in OL3-6, was subject to recent remediation when activity was found during an FSS survey of OL9-2. Because remediation of OL9-2 (an impacted Class 2 area unit) was required, the grids were transferred to an adjacent impacted Class 1 area, namely OL3. The highest activity found was 14.4 pCi/g. Sampling, following removal of approximately 18 inches of soil, produced no activity greater than the DCGL.

4.0 Site Release Criteria

The site release criteria applied to the open land areas in OL3 corresponds to the radiological dose criteria for unrestricted use per 10CFR20.1402. The dose criteria is met "if the residual radioactivity that is distinguishable from background radiation results in a Total Effective Dose Equivalent (TEDE) to an average member of the critical group that does not exceed 25 mrem/yr, including that from groundwater sources of drinking water, and that the residual radioactivity has been reduced to levels that are as low as reasonably achievable (ALARA)".

Levels of residual radioactivity that correspond to the allowable dose to meet the site or survey unit release criteria were derived by analyses using a resident farmer family scenario. The dose modeling for this scenario is explained in the SNEC LTP (reference 9.3). The derived concentration guideline levels (DCGL) shown in Table 5-1 of the SNEC LTP form the basis for satisfying the site release criteria.

Residual radioactivity sample results for the soils were used to calculate a surrogate Cs-137 DCGL. The adjusted surrogate DCGL was developed using the methodology described in the SNEC LTP section 5.2.3.2.3 based on nuclide specific DCGLs from Table 5-1 of the LTP.

An adjustment was made to the surrogate Cs-137 DCGL to address the de-listed radionuclides as described in the LTP section 6.2.2.3. SNEC has instituted an

administrative limit of 75% of the DCGL for all measurement results. The de-listed radionuclides are conservatively accounted for in this 25% reduction since the de-listed radionuclides were only 4.7% of the dose contribution. These adjustment factors are discussed in section 6 of the SNEC LTP.

5.0 Final Status Survey Design / DQO Process

The SNEC calculation providing the design of the survey for these survey units is provided in Appendix A. Since the survey units were all Class 1, scan measurements were conducted on 100% of the surface of each survey unit. Scans were conducted using an NaI detector with a narrow window optimized for Cs-137 to reduce background.

The number of soil sample points was determined by using the COMPASS computer program (reference 9.6, attachment 7 of appendix A). These points were located on survey maps using the Visual Sample Plan program (reference 9.7, attachment 6 of appendix A). Samples are collected to a depth of 1 meter to match the site surface dose model used in the SNEC LTP (reference 9.3).

The survey design uses a surrogate Cs-137 effective DCGL from a radionuclide mix analysis developed from soil samples, collected before the Final Status Survey, taken in an adjacent survey area. The radionuclide mix (including the hard-to-detects listed in Table 5-1 of the LTP) for all survey units was based on the CV Yard Soil data (attachment 2 of appendix A). CV Yard Soil data were chosen because they were generally greater than MDA and, by virtue of their close proximity to OL3, would be representative of the nuclide mix expected to be found in OL3.

Cs-137, Co-60, H-3, and Sr-90 were positively detected in one or more of these samples and are accounted for in the adjusted surrogate DCGL. The following table (Table 1) presents the Data Quality Objectives (DQO) and other relevant information from the survey design package.

Table 1 – DQO/Design

DQO/Design Parameter	OL3-1	OL3-2	OL3-3	OL3-4	OL3-5	OL3-6
SNEC Design Calc. #	E900-05-024	E900-05-024	E900-05-024	E900-05-024	E900-05-024	E900-05-024
MARSSIM Classification	1	1	1	1	1	1
Survey Unit Area (m^2)	2000 total 2000 soil	1800 total 654 soil *	1800 total 1800 soil	1300 total 1294 soil *	2000 total 1972 soil *	500 total 464 soil *
Statistical Test	Sign	Sign	Sign	Sign	Sign	Sign

Type 1 decision error (α)	0.05	0.05	0.05	0.05	0.05	0.05
Type 2 decision error (β)	0.1	0.1	0.1	0.1	0.1	0.1
LBGR (pCi/gm)	4.1	3.9	3.3	2.4	3.6	2.8
Estimated σ (pCi/gm)	0.07	0.13	0.34	0.65	0.23	0.51
Relative Shift (Δ/σ)	2.99	2.93	2.91	2.93	2.98	2.96
Number of static points	11	11	11	11	11	11
DCGLw (Cs-137 pCi/gm)	5.73	5.73	5.73	5.73	5.73	5.73
Action Level (Cs-137 pCi/gm)	4.30	4.30	4.30	4.30	4.30	4.30
Scan MDC (pCi/gm)	5.67	5.67	5.67	5.67	5.67	5.67
SNEC Survey Request #	SR246	SR247	SR248	SR249	SR250	SR251
Scan Survey Instrument	L2350-1 w/ 44-10	L2350-1 w/ 44-10	L2350-1 w/ 44-10	L2350-1 w/ 44-10	L2350-1 w/ 44-10	L2350-1 w/ 44-10

* The remaining non-soil surface areas are described in the OL3 Paved Surfaces and Concrete FSS Report

6.0 Final Status Survey Results

The following sections provide the survey summary results for each survey unit as required by the respective design. Summary data was taken from references 9.10, 9.11, 9.12, 9.13, 9.14, and 9.15 which are filed in the SNEC history files.

6.1 Summary for Survey Unit OL3-1

6.1.1 Scan survey

Scan measurements were made in 20 grids using a 2 inch by 2 inch NaI detector with an MDCscan of 5.67 pCi/gm (Table 2 on page 3 of appendix A). The Administrative Limit was 4.30 pCi/gm (Table 1 on page 2 of appendix A) and the adjusted surrogate Cs-137 DCGLw for this survey unit was 5.73 pCi/gm (Table 1 on page 2 of appendix A). Since this is a Class 1 impacted survey unit, the EMC applies.

Of the 20 grids scanned, two grids had inaccessible regions due to trees. A total of 2.3 square meters was inaccessible resulting in approximately 1997.7 square meters actually scanned in the 2,000 square meter survey unit. This is slightly less than 100 percent of the unit surface area.

The scans conducted in 19 grids did not identify any activity in the soils greater than the MDCscan. The Administrative Limit was >160 ncpm. A reading of 830 ncpm was received in grid AR138. This elevated point produced a soil sample of 89.24 pCi/g Cs-137 and 0.33 pCi/g Co-60. No other readings greater than 160 ncpm were detected in OL3-1.

The elevated soil reading was put through the EMC and the survey unit passed (see the First Energy Site Report EMC Calculation for OL3-1 and supporting documentation in Appendix B of this document). The EMC passes MARSSIM equation 8.2 with a value of 0.75. A sample taken from the re-excavated location revealed 1.12 pCi/g Cs-137.

6.1.2 Soil samples

A total of 11 random start, triangular grid, systematic soil sample locations were defined for the survey unit based on a conservative relative shift of about 2.99. Using an LBGR of 95% of the DCGL, only 11 samples were required. Given the variability used for the survey design (0.07 pCi/gm) and the Administrative Limit of 4.30 pCi/gm, the LBGR used was conservative. No biased samples were required.

None of the design fixed point soil samples in OL3-1 showed activity in excess of the Administrative Limit. Table 2 below shows the Cs-137 results (no other licensed isotopes were detected) for each sample along with the mean, standard deviation, and range of the soil sample data. Results that are less than MDA are assumed to be positive at the MDA value for the statistics in the table thereby overestimating the mean.

The standard deviation of the samples collected from the survey unit was less than the variability assumed in the survey design, therefore the assessment of variability, relative shift, and number of samples required is consistent between the survey design and the survey results. Based on this assessment, neither changes to the survey design nor additional sampling is required.

Table 2 - Soil sample results for OL3-1

Sample Number	Cs-137 pCi/gm
1	.23
2	<.09
3	<.10

4	<.12
5	<.08
6	<.10
7	<.09
8	<.17
9	<.05
10	<.10
11	<.06
Mean	.11
Std Dev	.05
Min	<.05
Max	.23

6.2 Summary for Survey Unit OL3-2

6.2.1 Scan survey

Scan measurements were made in portions of 13 grids using a 2 inch by 2 inch NaI detector with an MDCscan of 5.67 pCi/gm (Table 2 on page 3 of appendix A). The Administrative Limit was 4.30 pCi/gm (Table 1 on page 2 of appendix A) and the adjusted surrogate Cs-137 DCGLw for this survey unit was 5.73 pCi/gm (Table 1 on page 2 of appendix A). Since this is a Class 1 impacted survey unit, the EMC applies.

No grids had inaccessible areas which resulted in approximately 673.5 square meters scanned. This is 100 percent of the unit soil surface area.

The scans conducted in all 13 grids did not identify any activity in the soils greater than the MDCscan. The action level was >160 ncpm. No area greater than 160 ncpm was found in OL3-2.

6.2.2 Soil samples

A total of 11 random start, triangular grid, systematic soil sample locations were defined for the survey unit based on a conservative relative shift of about 2.93. Using an LBGR of 91% of the DCGL, only 11 samples were required. Given the variability used for the survey design (0.13 pCi/gm) and the Administrative Limit of 4.30 pCi/gm, the LBGR used was conservative. No biased samples were required.

None of the design fixed point soil samples in OL3-2 showed activity in excess of the Administrative Limit. Table 3 below shows the Cs-137 results (no other licensed isotopes were detected) for each sample along with the mean, standard deviation, and range of the soil sample data. Results that are less than MDA are assumed to be positive at the MDA value for the statistics in the table thereby overestimating the mean.

The standard deviation of the samples collected from the survey unit was less than the variability assumed in the survey design, therefore the assessment of variability, relative shift, and number of samples required is consistent between the survey design and the survey results. Based on this assessment, neither changes to the survey design nor additional sampling is required.

Table 3 - Soil sample results for OL3-2

Sample Number	Cs-137 pCi/gm
1	<.05
2	<.14
3	.14
4	<.06
5	.31
6	<.07
7	.15
8	<.08
9	<.08
10	.17
11	<.07
Mean	.12
Std Dev	.08
Min	<.05
Max	.31

6.3 Summary for Survey Unit OL3-3

6.3.1 Scan survey

Scan measurements were made in 18 grids using a 2 inch by 2 inch NaI detector with an MDCscan of 5.67 pCi/gm (Table 2 on page 3 of appendix A). The Administrative Limit was 4.30 pCi/gm (Table 1 on page 2 of appendix A) and the adjusted surrogate Cs-137 DCGLw for this survey unit was 5.73 pCi/gm (Table 1 on page 2 of appendix A). Since this is a Class 1 impacted survey unit, the EMC applies.

Of the 18 grids scanned, a portion of one grid was inaccessible due to concrete. Of the 18 grids, a total of about 0.8 square meters was not scanned due to interferences, resulting in approximately 1799.2 square meters being scanned in the 1800 square meter soil survey unit. This is slightly less than 100 percent of the unit surface area.

The scans conducted in all 18 grids did not identify any activity in the soils greater than the MDCscan. The Administrative Limit was >160 ncpm. No area greater than 160 ncpm was found in OL3-3.

6.3.2 Soil samples

A total of 11 random start, triangular grid, systematic soil sample locations were defined for the survey unit based on a conservative relative shift of about 2.91. Using an LBGR of 77% of the DCGL, only 11 samples were required. Given the variability used for the survey design (0.34 pCi/gm) and the Administrative Limit Level of 4.30 pCi/gm, the LBGR used was conservative. No biased samples were required.

None of the design fixed point soil samples in OL3-3 showed activity in excess of the Administrative Limit. Table 4 below shows the Cs-137 results (no other licensed isotopes were detected) for each sample along with the mean, standard deviation, and range of the soil sample data. Results that are less than MDA are assumed to be positive at the MDA value for the statistics in the table thereby overestimating the mean.

The standard deviation of the samples collected from the survey unit was less than the variability assumed in the survey design, therefore the assessment of variability, relative shift, and number of samples required is consistent between the survey design and the survey results. Based on this assessment, neither changes to the survey design nor additional sampling is required.

Table 4 - Soil sample results for OL3-3

Sample Number	Cs-137 pCi/gm
1	0.27
2	<0.16
3	<0.08
4	<0.05
5	<0.10
6	0.14
7	<0.10
8	<0.06
9	<0.14
10	<0.06
11	<0.12
Mean	0.12
Std Dev	0.06
Min	<0.05
Max	0.27

6.4 Summary for Survey Unit OL3-4

6.4.1 Scan survey

Scan measurements were made in 13 grids using a 2 inch by 2 inch NaI detector with an MDCscan of 5.67 pCi/gm (Table 2 on page 3 of appendix A). The Administrative Limit was 4.30 pCi/gm (Table 1 on page 2 of appendix A) and the adjusted surrogate Cs-137 DCGLw for this survey unit was 5.73 pCi/gm (Table 1 on page 2 of appendix A). Since this is a Class 1 impacted survey unit, the EMC applies.

Of the 13 grids scanned, none had inaccessible areas. A total of 1288.75 square meters was scanned which represents 100 percent of the unit soil surface area.

The scans conducted in all 13 grids did not identify any activity in the soils greater than the MDCscan. The Administrative Limit was >160 ncpm. No area greater than 160 ncpm was found in OL3-4.

6.4.2 Soil samples

A total of 11 random start, triangular grid, systematic soil sample locations were defined for the survey unit based on a conservative relative shift of about 2.93. Using an LBGR of 56% of the DCGL, only 11 samples were required. Given the variability used for the survey design (0.65 pCi/gm) and the Administrative Limit Level of 4.30 pCi/gm, the LBGR used was conservative. No biased samples were required.

None of the design fixed point soil samples in OL3-4 showed activity in excess of the Administrative Limit. Table 5 below shows the Cs-137 results (no other licensed isotopes were detected) for each sample along with the mean, standard deviation, and range of the soil sample data. Results that are less than MDA are assumed to be positive at the MDA value for the statistics in the table thereby overestimating the mean.

The standard deviation of the samples collected from the survey unit was less than the variability assumed in the survey design, therefore the assessment of variability, relative shift, and number of samples required is consistent between the survey design and the survey results. Based on this assessment, neither changes to the survey design nor additional sampling is required.

Table 5 - Soil sample results for OL3-4

Sample Number	Cs-137 pCi/gm
1	<0.11
2	<0.14

3	<0.13
4	<0.20
5	<0.15
6	0.39
7	0.12
8	0.16
9	<0.06
10	0.10
11	0.10
Mean	0.15
Std Dev	0.09
Min	<0.06
Max	0.39

6.5 Summary for Survey Unit OL3-5

6.5.1 Scan survey

Scan measurements were made in 20 grids using a 2 inch by 2 inch NaI detector with an MDCscan of 5.67 pCi/gm (Table 2 on page 3 of appendix A). The Administrative Limit was 4.30 pCi/gm (Table 1 on page 2 of appendix A) and the adjusted surrogate Cs-137 DCGLw for this survey unit was 5.73 pCi/gm (Table 1 on page 2 of appendix A). Since this is a Class 1 impacted survey unit, the EMC applies.

Of the 20 grids scanned, a portion of one grid was inaccessible due to an electric utility pole. Of the 20 grids, a total of about 0.7 square meters was not scanned due to interferences, resulting in approximately 1980.3 square meters actually scanned in the 1981 square meter soil survey unit. This is slightly less than 100 percent of the unit soil surface area.

The scans conducted in 19 grids did not identify any activity in the soils greater than the MDCscan. The Administrative Limit was >160 ncpm. One scan, in grid AS122, produced a reading 9 gcpm above the alarm point. Subsequently, a soil sample was taken the outcome of which was 0.135 pCi/g Cs-137. This value is statistically insignificant when compared to the values in Reference 9.14 (produced in Table 6 below) and as such the EMC was not required to be performed.

6.5.2 Soil samples

A total of 12 random start, triangular grid, systematic soil sample locations were defined for the survey unit based on a conservative relative shift of about 2.98. Using an LBGR of 84% of the DCGL, only 11 samples were required. VSP could not fit an odd number of sample points into this surface area so 12 sample points were taken. Given the variability used for the survey design (0.23 pCi/gm) and

the Administrative Limit Level of 4.30 pCi/gm, the LBGR used was conservative. No biased samples were required.

None of the design fixed point soil samples in OL3-5 showed activity in excess of the Administrative Limit. Table 6 below shows the Cs-137 results (no other licensed isotopes were detected) for each sample along with the mean, standard deviation, and range of the soil sample data. Results that are less than MDA are assumed to be positive at the MDA value for the statistics in the table thereby overestimating the mean.

The standard deviation of the samples collected from the survey unit was less than the variability assumed in the survey design, therefore the assessment of variability, relative shift, and number of samples required is consistent between the survey design and the survey results. Based on this assessment, neither changes to the survey design nor additional sampling is required.

Table 6 - Soil sample results for OL3-5

Sample Number	Cs-137 pCi/gm
1	<0.11
2	<0.17
3	0.10
4	<0.10
5	0.19
6	0.13
7	<0.14
8	0.21
9	<0.10
10	0.29
11	0.12
12	<0.07
Mean	0.14
Std Dev	0.06
Min	<0.07
Max	0.29

6.6 Summary for Survey Unit OL3-6

6.6.1 Scan survey

Scan measurements were made in five grids using a 2 inch by 2 inch NaI detector with an MDCscan of 5.67 pCi/gm (Table 2 on page 3 of appendix A). The Administrative Limit was 4.30 pCi/gm (Table 1 on page 2 of appendix A) and the adjusted surrogate Cs-137 DCGLw for this survey unit was 5.73 pCi/gm

(Table 1 on page 2 of appendix A). Since this is a Class 1 impacted survey unit, the EMC applies.

Of the five grids scanned, none had inaccessible areas. A total of 464 square meters was scanned which represents 100 percent of the unit soil surface area.

The scans conducted in all five grids did not identify any activity in the soils greater than the MDCscan. The Administrative Limit was >160 ncpm. No area greater than 160 ncpm was found in OL3-6.

6.6.2 Soil samples

A total of 11 random start, triangular grid, systematic soil sample locations were defined for the survey unit based on a conservative relative shift of about 2.96. Using an LBGR of 65% of the DCGL, only 11 samples were required. Given the variability used for the survey design (0.51 pCi/gm) and the Administrative Limit Level of 4.30 pCi/gm, the LBGR used was conservative. No biased samples were required.

None of the design fixed point soil samples in OL3-6 showed activity in excess of the Administrative Limit. Table 7 below shows the Cs-137 results (no other licensed isotopes were detected) for each sample along with the mean, standard deviation, and range of the soil sample data. Results that are less than MDA are assumed to be positive at the MDA value for the statistics in the table thereby overestimating the mean.

The standard deviation of the samples collected from the survey unit was less than the variability assumed in the survey design, therefore the assessment of variability, relative shift, and number of samples required is consistent between the survey design and the survey results. Based on this assessment, neither changes to the survey design nor additional sampling is required.

Table 7 - Soil sample results for OL3-6

Sample Number	Cs-137 pCi/gm
1	0.12
2	<0.09
3	<0.10
4	<0.05
5	<0.11
6	<0.14
7	<0.17
8	0.08
9	0.20
10	0.21

11	0.17
Mean	0.13
Std Dev	0.05
Min	<0.05
Max	0.21

7.0 Data Assessment

7.1 Assessment Criteria

The final status survey data has been reviewed to verify authenticity, appropriate documentation, quality, and technical acceptability. The review criteria for data acceptability are:

1) The instruments used to collect the data were capable of detecting the radiation of the radionuclide of interest at or below the investigation levels.

2) The calibration of the instruments used to collect the data was current and radioactive sources used for calibration were traceable to recognized standards or calibration organizations.

3) Instrument response was checked before and, when required, after instrument use each day data was collected.

4) Survey team personnel were properly trained in the applicable survey techniques and training was documented.

5) The MDCs and the assumptions used to develop them were appropriate for the instruments and the survey methods used to collect the data.

6) The survey methods used to collect the data were appropriate for the media and types of radiation being measured.

7) Special instrument methods used to collect data were applied as warranted by survey conditions, and were documented in accordance with an approved site Survey Request procedure.

8) The custody of samples that were sent for off-site analysis were tracked from the point of collection until final results were provided.

9) The final status survey data consists of qualified measurement results representative of current facility status and were collected in accordance with the applicable survey design package.

If a discrepancy existed where one or more criteria were not met, the discrepancy was reviewed and corrective action taken (as appropriate) in accordance with site procedures.

The statistical test does not need to be performed for this final status survey since the data clearly show that the survey unit meets the release criteria because all measurements in the survey units are less than or equal to the DCGLw; however, the statistical tests (DQA Process) are shown in Appendices C, D, E, F, G, and H.

7.2 Summary of Overall Results

OL3-1 had one alarm point during scan surveys of slightly less than 100% of the surface. The EMC was performed and the survey unit still passed (see section 7.3.1). As an ALARA practice, the alarm point area was remediated and post-remediation scans revealed no areas greater than background. Scan MDCs were adequate. The eleven random start systematic soil samples were all less than the DCGLw. Both the scan fraction and number of soil samples meet the LTP and MARSSIM requirements.

OL3-2 had no alarm points during scan surveys of 100% of the surface. Scan MDCs were adequate. Eleven soil samples were all less than the DCGLw. Both the scan fraction and number of soil samples meet the LTP and MARSSIM requirements.

OL3-3 had no alarm points during scan surveys of slightly less than 100% of the surface. Scan MDCs were adequate. Eleven soil samples were all less than the DCGLw. Both the scan fraction and number of soil samples meet the LTP and MARSSIM requirements.

OL3-4 had no alarm points during scan surveys of 100% of the surface. Scan MDCs were adequate. Eleven soil samples were all less than the DCGLw. Both the scan fraction and number of soil samples meet the LTP and MARSSIM requirements.

OL3-5 had one alarm point during scan surveys of 100% of the surface. A soil sample taken at the alarm point revealed no activity greater than the average of the survey unit, so the EMC was not performed. Scan MDCs were adequate. Twelve soil samples were all less than the DCGLw. Both the scan fraction and number of soil samples meet the LTP and MARSSIM requirements.

OL3-6 had no alarm points during scan surveys of 100% of the surface. Scan MDCs were adequate. Eleven soil samples were all less than the DCGLw. Both the scan fraction and number of soil samples meet the LTP and MARSSIM requirements.

7.3 Survey Variations (Design, survey request, LTP)

7.3.1 One alarm point of 830 ncpm was detected in grid AR138 while conducting scans of the survey unit. The survey design engineer, upon reviewing the data and visually inspecting the location of the alarm point, requested taking four soil samples, one on the spot and three at the boundary, and performing additional scans following removal of the samples. The elevated area was bounded and soil samples were taken the results of which are shown in Table 8 below.

Table 8 – OL3-1 Alarm Point Soils

Sample Point	Cs-137 (pCi/gm)	Co-60 (pCi/gm)
AR138, AP1	89.240	0.329
AR138, SP1	0.109	N/A
AR138, SP2	0.098	N/A
AR138, SP3	0.099	N/A

The followup scans showed no activity greater than 160 ncpm. After reviewing the soil sampling results, the survey design engineer requested analysis of the remainder of the elevated measurement soil sample. The remaining soil was found to contain 22.99 pCi/g of Cs-137 with no Co-60 detected. The sample location hole was re-excavated, sampled, and an NaI detector was lowered down the hole in 0.25 meter increments to see whether any indications were detected. NaI readings increased steadily from 188 gcpm at the surface to 367 gcpm at one meter. The increase was attributed to geometry changes involving:

1. moving from two pi to almost four pi, as the probe descended into the excavation,
2. the probe being in contact with the bottom of the excavation, and
3. decreasing diameter of the excavation with increasing depth.

The sample taken from the re-excavated location was 1.12 pCi/g Cs-137 which is below the DCGLw. See the First Energy Site Report EMC Calculation for OL3-1 and supporting documentation in Appendix B of this document. The EMC passes MARSSIM equation 8.2 with a value of 0.75.

Grid AS139, SP9 was only dug to one half meter to avoid contacting buried telephone lines that control the Penelec Saxton electrical sub-station.

7.3.2 The soil surface area as designed was 654 square meters; however, actual measurements indicated a true surface area of 673.5 square meters. There were no anomalies, inconsistencies, or variations with regard to OL3-2 soils.

7.3.3 The soil surface area as designed was 1800 square meters; however, actual measurements indicated a slightly smaller area, due to the presence of

miscellaneous concrete, of 1799.2 square meters. There were no anomalies, inconsistencies, or variations with regard to OL3-3 soils.

7.3.4 The soil surface area as designed was 1294 square meters; however, actual measurements indicated a true surface area of 1288.75 square meters. There were no anomalies, inconsistencies, or variations with regard to OL3-4 soils.

7.3.5 The soil surface area as designed was 1972 square meters; however, actual measurements indicated a true surface area of 1981 square meters.

One alarm point of 9 gcpm above the alarm setpoint was detected in grid AS122 while conducting scans of the survey unit. The survey design engineer, upon reviewing the data and visually inspecting the location of the alarm point, requested taking one soil sample directly on the spot and performing additional scans following removal of the samples. Analysis of the soil sample revealed 0.135 pCi/g of Cs-137 and the followup scans showed no activity greater than 160 ncpm. The EMC was not performed because the sample was not statistically different from the average of the other soil samples in the unit.

7.3.6 There were no anomalies, inconsistencies, or variations with regard to OL3-6 soils.

7.4 QC comparisons

7.4.1 Scan surveys

Numerous grids were partially rescanned as QC duplicates. The QC rescans did not identify any activity above alarm points and so are in agreement with the primary scans. QC scans were conducted on 100, 186, 100, 80, 100, and 30 square meters in each survey unit. This represents about 5.0, 27.6, 5.6, 6.2, 5.1, and 6.5 percent of survey units OL3-1, OL3-2, OL3-3, OL3-4, OL3-5, and OL3-6, respectively, and meets the minimum 5% required.

7.4.2 Soil Samples

One soil sample from OL3-2 and two soil samples from the other four units received QC split gamma spectroscopy analyses. These duplicates had good agreement as shown in Table 9 below. Seven QC splits out of 67 samples exceeds the 5% minimum criterion.

Table 9 – OL3 QC Split Comparison

Sample Point	Sample Result (pCi/gm)	QC Result (pCi/gm)
OL3-1, SP9	<0.05	<0.05
OL3-1, SP10	<0.10	<0.11
OL3-2, SP7	0.15	<0.20
OL3-3, SP10	<0.06	<0.06
OL3-4, SP9	<0.06	<0.07
OL3-5, SP7	<0.14	<0.11
OL3-6, SP5	<0.11	<0.11

8.0 Final Survey Conclusions

The Open Land Areas OL3-1, OL3-2, OL3-3, OL3-4, OL3-5, and OL3-6 final status surveys were performed in accordance with the LTP, site procedures, design calculations, and Survey Request requirements. FSS data was collected to meet and/or exceed the quantity specified or required for each survey unit design. The survey data for each survey unit meets the following conditions:

1) The average residual radioactivity in the soils is less than the derived surrogate DCGLw in all three survey units.

2) All measurements (in the as-left condition) in all survey units were less than the DCGLw.

These conditions satisfy the release criteria established in the SNEC LTP and the radiological criteria for unrestricted use given in 10CFR20.1402. Therefore it is concluded that the SNEC Open Land Area designated OL3 is suitable for unrestricted release.

9.0 References

9.1 SNEC Facility Site area grid map Drawing number SNECRM-020
9.2 SNEC procedure E900-ADM-4500.60 "Final Status Survey Report"
9.3 SNEC License Termination Plan
9.4 NUREG 1575 "Multi-Agency Radiation Survey and Site Investigation Manual" (MARSSIM), revision 1 August 2000
9.5 SNEC Calculation E900-05-022, "Open Land FSS Design – OL7 Soils"
9.6 COMPASS computer program, Version 1.0.0, Oak Ridge Institute for Science and Education

9.7 VISUAL SAMPLE PLAN computer program, Version 3.0, Battelle Memorial Institute
9.8 SNEC procedure E900-IMP-4500.59, "Final Site Survey Planning and DQA"
9.9 SNEC procedure E900-IMP-4520.04, "Survey Methodology to Support SNEC License Termination"
9.10 SNEC SR246 for FSS of OL3-1
9.11 SNEC SR247 for FSS of OL3-2
9.12 SNEC SR248 for FSS of OL3-3
9.13 SNEC SR249 for FSS of OL3-4
9.14 SNEC SR250 for FSS of OL3-5
9.15 SNEC SR251 for FSS of OL3-6

10.0 Appendices

Appendix A - SNEC Calculation E900-05-024, "Open Land FSS Design – OL3" (9 pages plus numerous attachments)
Appendix B - First Energy Site Report EMC Calculation for OL3-1 (10 pages)
Appendix C - COMPASS DQA Surface Soil Report OL3-1 (2 pages)
Appendix D - COMPASS DQA Surface Soil Report OL3-2 (2 pages)
Appendix E - COMPASS DQA Surface Soil Report OL3-3 (2 pages)
Appendix F - COMPASS DQA Surface Soil Report OL3-4 (2 pages)
Appendix G - COMPASS DQA Surface Soil Report OL3-5 (2 pages)
Appendix H - COMPASS DQA Surface Soil Report OL3-6 (2 pages)