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July 8, 2005 E910-05-029

U.S. Nuclear Regulatory Commission Attention: Document Control Desk Washington, DC 20555

Gentlemen,

Subject Saxton Nuclear Experimental Corporation (SNEC) Operating License No., DPR-4 Docket No. 50-146 FSS Report for Open Land Area OL8

The purpose of this letter is to submit for your review the attached FSS Report for Open Land Area OL8. One CD-ROM is included in this submission. The CD-ROM labeled: "FSS Report for Open Land Area OL8 – Publicly Available" contains the following 7files:

Document Title	File Name	File Size (Mbytes)
Main Report	001 FSS Report – OL8.pdf	0.219
Appendix A (pages 1 to 9)	002 OL8 – Appendix A (1-9).pdf	35.6
Appendix A (attachments 1-1 to 3-1)	003 OL8 – Appendix A (attachments 1-1 to 3-1).pdf	31.3
Appendix A (attachment 4-1 to 6-10)	004 OL8 – Appendix A (attachments 4-1 to 6-10).pdf	31.9
Appendix A (attachment 7-1 to 7-11)	005 OL8– Appendix A (attachments 7-1 to 7-11).pdf	23.7
Appendix A (attachment 8-1 to 9-1)	006 OL8– Appendix A (attachments 8-1 to 9-1).pdf	22.4
Appendix B to Appendix F	-006 OL4 – Appendix B to •••7 Appendix F.pdf	22.0

If you have any questions on this information, please contact Mr. Art Paynter at (814) 635-4384.

Sincer G. A. Kuehn

Program Director, SNEC

cc: NRC Project Manager NRC Project Scientist, Region 1 Mr. Tim Bauer, ORISE Project Leader

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Prepared by GPU Nuclear, Inc.

June, 2005

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Executive Summary

This report presents the results and conclusions of the final status survey (FSS) of the Class 3 open land area around the perimeter of the Saxton Nuclear Experimental Corporation (SNEC) facility designated as OL8. This FSS survey was conducted in April and June of 2005.

The FSS was performed in accordance with the SNEC License Termination Plan (LTP). The survey area (OL8) was divided into five survey units. Each unit consisted of relatively flat open land. Data was collected from each survey unit in accordance with the specific survey design data collection requirements. The following is a summary of the measurements performed in April:

- 1) Direct Nal(TI) scans of all or part of 47 100-square meter grids covering about 10% of the actual land area
- 2) 81 soil samples collected and then analyzed by laboratory gamma spectroscopy

The following is a summary of the measurements performed in June:

- 1) Direct Nal(TI) scan of grid AK-131, 100 square meters, covering about 100% of the land area
- 2) 5 soil samples collected and then analyzed by laboratory gamma spectroscopy

The collected FSS survey data demonstrate that the 46,300 square meters of the OL8 survey area meet the radiological release criteria for unrestricted use specified in 10CFR20.1402. Therefore, GPU Nuclear, Inc. concludes that the area meets the NRC requirements and may be released for unrestricted use.

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1.0 Purpose and Scope

This report presents the results and conclusions of the final status survey of the open land area designated OL8 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 five Class 3 survey units of open land. This report only addresses the FSS performed on the specific land area designated as OL8 on reference 9.1. The format of this report follows the guidance contained in reference 9.2.

2.0 Survey Area Description

Survey Area OL8 is a Class 3 impacted, open land area encompassing the perimeter of the SNEC Site. The survey unit encompasses about 46,300 square meters of open land. Because the area exceeds the size guidance in the SNEC LTP for Class 3 survey units (10000 square meters recommended maximum), the survey area was divided into five survey units. Layout of the survey area and individual units, relative to the site layout, are shown in Attachment 1-1 of Appendix A. The five survey units are discussed below. The OL8 designation is taken from the drawing, reference 9.1.

Survey Unit OL8-1 is an open land area in the northwest to west section of the site. The survey unit is approximately 9800 square meters.

Survey Unit OL8-2 is an open land area in the west, southwest section of the site. The survey unit is approximately 9500 square meters.

Survey Unit OL8-3 is an open land area in the south section of the site. The survey unit is approximately 9200 square meters.

Survey Unit OL8-4 is an open land area in the southeast section of the site. The survey unit is approximately 8900 square meters.

Survey Unit OL8-5 is an open land area in the east to northeast section of the site. The survey unit is approximately 8900 square meters.

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 reactor, containment vessel and support buildings have all been removed. 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, 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. Currently, decontamination, disassembly and demolition of the SNEC facility buildings and equipment has 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

There has been no remediation performed in any of the five units in OL8.

4.0 Site Release Criteria

The site release criteria applied to the open land areas of OL8 correspond 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 for open land 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 3, scan measurements were conducted over approximately 10% of the surface of each survey unit. Scans were conducted using an Nal detector with a narrow window optimized for Cs-137 to reduce background.

The number of 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 developed from a radionuclide mix analysis, from soil samples collected before the Final Status Survey, in the vicinity of the survey unit. The radionuclide mix (including the hard-to-detects listed in Table 5-1 of the LTP) for all five survey units, OL8-1 through OL8-5, 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, whereas all data from OL8 were near to or less than the MDA which led to an unrealistic DCGL.

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.

DQO/Design Parameter	OL8-1	OL8-2	OL8-3	OL8-4	OL8-5
SNEC Design Calc. #	E900-05- 013	E900-05- 013	E900-05- 013	E900-05- 013	E900-05- 013
MARSSIM Classification	3	3	3	3	3
Survey Unit Area (m²)	9800	9500	9200	8900	8900
Statistical Test	Sign	Sign	Sign	Sign	Sign
Type 1 decision error (α)	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
LBGR (pCi/gm)	3.4	4.1	3.6	4.2	3.6
Estimated σ (pCi/gm)	0.32	0.08	0.26	0.04	0.24
Relative Shift (Δ/σ)	2.77	2.62	2.72	2.60	2.92
Number of static points	11	11	11	11	11
DCGLw (Cs-137 pCi/gm)	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
Scan MDC (pCi/gm)	5.67	5.67	5.67	5.67	5.67
SNEC Survey Request #	SR196	SR197	SR198	SR199	SR200
Scan Survey Instrument	L2350-1 w/ 44-10				

Table 1 – DQO/Design

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 OL8-1

6.1.1 Scan survey

Scan measurements were made in 10 grids using a 2 inch by 2 inch Nal detector with an MDCscan of 5.67 pCi/gm (Table 2 on page 3 of appendix A). The action level 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 3 impacted survey unit, the EMC does not apply.

Of the 10 grids scanned, seven grids had inaccessible regions: mostly due to fallen/dead trees. Of the 10 grids, a total of about 25.5 square meters was not scanned due to interferences, resulting in approximately 974.5 square meters actually scanned in the 9800 square meter survey unit. This is slightly less than 10 percent of the unit surface area.

The scans conducted in all 10 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 OL8-1.

6.1.2 Soil samples

A total of 20 random start, triangular grid, systematic soil sample locations were defined for the survey unit based on a conservative relative shift of about 2.77. Three of the samples were not taken due to either standing water in the Shoup Run Shunt spillway or the existence of telephone cables in close proximity to the sample point. Using the typical LBGR of 50% of the DCGL, only 11 samples would have been required, which includes a 20% adjustment. Nine additional sample points were included in the total to account for potential interferences. Given the variability used for the survey design (0.32 pCi/gm) and the Action 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 OL8-1 showed activity in excess of the adjusted surrogate DCGLw. 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 OL8-1

Sample	Cs-137
Number	pCi/gm
1	0.20
2	0.28
3	<0.15

4	*
5	<0.16
6	**
7	<0.15
8	<0.15
9	<0.14
10	<0.15
11	*
12	<0.13
13	0.28
14	<0.16
15	0.30
16	<0.13
17	<0.18
18	0.29
19	<0.15
20	<0.18
Mean	0.19
Std Dev	0.06
Min	<0.13
Max	0.30

- * Samples 4 and 11 were not taken due to the presence of standing water
- ** Sample 6 was not taken due to close proximity of telephone cables

6.2 Summary for Survey Unit OL8-2

6.2.1 Scan survey

Scan measurements were made in 10 grids using a 2 inch by 2 inch Nal detector with an MDCscan of 5.67 pCi/gm (Table 2 on page 3 of appendix A). The action level 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 3 impacted survey unit, the EMC does not apply.

Of the 10 grids scanned, five grids had small inaccessible areas mainly due to downed or otherwise dead trees. Of the 10 grids, a total of about 32.2 square meters was not scanned due to interferences, resulting in approximately 966.8 square meters actually scanned in the 9500 square meter survey unit. This is just greater than 10 percent of the unit surface area.

The scans conducted in all 10 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 OL8-2.

6.2.2 Soil samples

A total of 18 random start, triangular grid, systematic soil sample locations were defined for the survey unit based on a conservative relative shift of about 2.62. Five of the samples were not taken due to their proximity in the Shoup Run. Using the typical LBGR of 50% of the DCGL, only 11 samples would have been required, which includes a 20% adjustment. Seven additional sample points were included in the total to account for potential interferences. Given the variability used for the survey design (0.08 pCi/gm) and the Action 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 OL8-2 showed activity in excess of the adjusted surrogate DCGLw. 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.

Sample	Cs-137
Number	pCi/gm
1	< 0.20
2	< 0.17
3	0.18
4	< 0.11
5	<0.15
6	0.25
7	< 0.14
8	<0.14
9	<.08
10	<0.12
11	<0.18
12	*
13	*
14	*
15	*
16	*
. 17	0.17
18	<0.16

Table 3 - Soil sample results for OL8-2

Mean	0.16
Std Dev	0.04
Min	0.08
Max	0.25

* Samples 12 through 16 were not taken as they were inundated by Shoup's Run

6.3 Summary for Survey Unit OL8-3

6.3.1 Scan survey

Scan measurements were made in nine grids using a 2 inch by 2 inch Nal detector with an MDCscan of 5.67 pCi/gm (Table 2 on page 3 of appendix A). The action level 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 3 impacted survey unit, the EMC does not apply.

Of the nine grids scanned, portions of three grids were inaccessible due to trees or, in one case, an electric utility pole. Of the nine grids, a total of about 2.0 square meters was not scanned due to interferences, resulting in approximately 898 square meters actually scanned in the 9200 square meter survey unit. This is slightly less than 10 percent of the unit surface area.

In June of 2005, soil was inadvertently moved from an adjacent grid, AL-132 in survey unit OL7-1, to grid AK-131 in survey unit OL8-3. Subsequently the soil was removed and the grid was scanned over 100% of its surface.

The scans conducted in all ten 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 OL8-3.

6.3.2 Soil samples

A total of 18 random start, triangular grid, systematic soil sample locations were defined for the survey unit based on a conservative relative shift of about 2.72. One of the samples was not taken due to the steepness of the slope at that sample location. Using the typical LBGR of 50% of the DCGL, only 11 samples would have been required, which includes a 20% adjustment. Seven additional sample points were included in the total to account for potential interferences. Given the variability used for the survey design (0.26 pCi/gm) and the Action 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 OL8-3 showed activity in excess of the adjusted surrogate DCGLw. 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.

Sample	Cs-137
Number	pCi/gm
1	<0.24
2	<0.19
3	<0.18
. 4	<0.16
5	<0.19
6	<0.20
7	<0.10
8	<0.17
9	<0.12
10	<0.13
11	<0.16
12	<0.13
13	<0.12
14	<0.17
15	<0.22
16	<0.19
17	*
18	<0.18
Mean	0.17
Std Dev	0.04
Min	<0.10
Max	0.24

Table 4 - Soil sample results for OL8-3

* Sample 17 was not taken as a safety concern presented itself with the steepness of the slope down to Shoup's Run

In June of 2005, soil was inadvertently moved from an adjacent grid, AL-132 in survey unit OL7-1, to grid AK-131 in survey unit OL8-3. Subsequently the soil

was removed and five samples were taken to ensure that it met the OL8 design criteria.

None of the soil samples from the soil pile showed activity in excess of the adjusted surrogate DCGLw. In fact, they were all less than MDA. 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.

Sample	Cs-137
Number	pCi/gm
1	<0.11
2	<0.17
3	<0.13
4	<0.20
5	<0.08
Mean	<0.14
Std Dev	<0.05
Min	<0.08
Max	<0.20

Table 5 - Soil sample results for Grid AL132

6.4 Summary for Survey Unit OL8-4

6.4.1 Scan survey

Scan measurements were made in nine grids using a 2 inch by 2 inch Nal detector with an MDCscan of 5.67 pCi/gm (Table 2 on page 3 of appendix A). The action level 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 3 impacted survey unit, the EMC does not apply.

Of the nine grids scanned, one grid had a small inaccessible area due to a puddle of standing water. Of the nine grids, a total of about 0.5 square meters was not scanned due to interferences, resulting in approximately 899.5 square meters actually scanned in the 8900 square meter survey unit. This is slightly greater than 10 percent of the unit surface area.

The scans conducted in all nine 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 OL8-4.

6.4.2 Soil samples

A total of 18 random start, triangular grid, systematic soil sample locations were defined for the survey unit based on a conservative relative shift of about 2.60. Using the typical LBGR of 50% of the DCGL, only 11 samples would have been required, which includes a 20% adjustment. Seven additional sample points were included in the total to account for potential interferences. Given the variability used for the survey design (0.04 pCi/gm) and the Action 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 OL8-4 showed activity in excess of the adjusted surrogate DCGLw. 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.

Sample	Cs-137
Number	pCi/gm_
1	0.14
2	<0.07
3	<0.15
4	<0.17
5	<0.14
6	<0.11
7	<0.12
8	<0.14
9	<0.14
10	<0.11
11	<0.11
12	<0.17
13	<0.18
14	<0.16
15	0.22
16	<0.16
17	<0.12
18	<0.13
Mean	0.14
Std Dev	0.03

Table 6 - Soil sample results for OL8-4

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Min	< 0.07
Max	0.22

6.5 Summary for Survey Unit OL8-5

6.5.1 Scan survey

Scan measurements were made in nine grids using a 2 inch by 2 inch Nal detector with an MDCscan of 5.67 pCi/gm (Table 2 on page 3 of appendix A). The action level 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 3 impacted survey unit, the EMC does not apply.

None of the nine grids scanned had inaccessible areas. A total of 900 square meters was scanned of the 8900 square meter survey unit. This is slightly greater than 10 percent of the unit surface area.

The scans conducted in all nine 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 OL8-5.

6.5.2 Soil samples

A total of 18 random start, triangular grid, systematic soil sample locations were defined for the survey unit based on a conservative relative shift of about 2.92. Two of the samples were not taken due to being located in standing water. Using the typical LBGR of 50% of the DCGL, only 11 samples would have been required, which includes a 20% adjustment. Seven additional sample points were included in the total to account for potential interferences. Given the variability used for the survey design (0.24 pCi/gm) and the Action 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 OL8-5 showed activity in excess of the adjusted surrogate DCGLw. 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.

Sample	Cs-137
Number	_pCi/gm_
1	*
2	*
3	<0.18
4	<0.16
5	0.08
6	<0.16
7	0.44
8	< 0.17
9	<0.12
10	< 0.18
11	<0.14
12	< 0.20
13	< 0.14
14	<0.13
15	< 0.16
16	<0.13
17	0.10
18	<0.17
Mean	0.17
Std Dev	0.08
Min	0.08
Max	0.44

Table 7 - Soil sample results for OL8-5

* Samples 1 and 2 were not taken because of the presence of standing water

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 B, C, D, E, and F. Since all five soil samples from grid AL132 were less than MDA, Appendix D would still show that OL8-3 meets the release criteria.

7.2 Summary of Overall Results

OL8-1 had no alarm points during scan surveys of slightly less than 10% of the surface. Scan MDCs were adequate. Seventeen soil samples were all less than the DCGLw. Both the scan fraction and number of soil samples meet the LTP and MARSSIM requirements.

OL8-2 had no alarm points during scan surveys of slightly greater than 10% of the surface. Scan MDCs were adequate. Thirteen soil samples were all less than the DCGLw. Both the scan fraction and number of soil samples meet the LTP and MARSSIM requirements.

OL8-3 had no alarm points during scan surveys of slightly less than 10% of the surface. Scan MDCs were adequate. Seventeen soil samples were all less than the DCGLw. Both the scan fraction and number of soil samples meet the LTP and MARSSIM requirements. Additionally, one grid AK131 was 100% scanned and five soil samples, from soil moved back to grid AL132, were taken. Both the scan fraction and number of soil samples meet the LTP and MARSSIM requirements.

OL8-4 had no alarm points during scan surveys of slightly greater than 10% of the surface. Scan MDCs were adequate. Eighteen soil samples were all less than the DCGLw. Both the scan fraction and number of soil samples meet the LTP and MARSSIM requirements.

OL8-5 had no alarm points during scan surveys of slightly greater than 10% of the surface. Scan MDCs were adequate. Sixteen 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 Approximately 25.5 square meters of the grids scanned for OL8-1 was inaccessible. The remaining scanned portion constituted slightly greater than 10 percent of the survey unit area: well within coverage requirements for class 3 survey units. Sample points 4, 6, and 11 were not taken due to either standing water or the presence of telephone cables. The survey design engineer approved not taking the three samples in accordance with Reference 9.8.

7.3.2 Approximately 32.2 square meters of the grids scanned for OL8-2 was inaccessible. The remaining scanned portion constituted slightly greater than 10 percent of the survey unit area: well within coverage requirements for class 3 survey units. Sample points 12 through 16 were deleted due to their being located in Shoup's Run. The survey design engineer approved not taking the five samples in accordance with Reference 9.8.

7.3.3 Approximately 2.0 square meters of the grids scanned for OL8-3 was inaccessible. The remaining scanned portion constituted slightly less than 10 percent of the survey unit area: well within coverage requirements for class 3 survey units. Sample point 17 deleted due to being located on a steep grade adjacent to Shoup's Run: creating a safety concern. The survey design engineer approved not taking the five samples in accordance with Reference 9.8. As part of the SNEC Corrective Action Program, and in conjunction with the survey design engineer, one additional grid was surveyed. Approximately 0.7 meters was inaccessible due to the presence of a yard drain. The remaining scanned portion constituted greater than 99 percent of the grid area: well in excess of the coverage requirements for class 3 survey units. Five soil samples

were taken from a pile of dirt inadvertently moved into OL8-3, then moved back out.

7.3.4 Approximately 0.5 square meters of the grids scanned for OL8-4 was inaccessible. The remaining scanned portion constituted slightly greater than 10 percent of the survey unit area: well within coverage requirements for class 3 survey units. All samples were taken.

7.3.5 All grids were accessible which constituted slightly greater than 10 percent of the survey unit area: well within coverage requirements for class 3 survey units. Sample points 1 and 2 were deleted due to the presence of standing water. The survey design engineer approved not taking the five samples in accordance with Reference 9.8.

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 50 m² in each survey unit. This represents about 5.1, 5.2, 5.6, 5.6, and 5.6 percent of survey units OL8-1, OL8-2, OL8-3, OL8-4, and OL8-5, respectively, and exceeds the minimum 5% required.

7.4.2 Soil Samples

One soil sample from OL8-2 and two soil samples from each of the other four units received QC split gamma spectroscopy analyses. These duplicates had good agreement as shown in Table 8 below. Nine QC splits out of 81 samples exceeds the 5% minimum criterion.

Sample	QC Result
Result	(pCi/gm)
(pCi/gm)	
<0.16	0.10
<0.15	<0.12
<0.17	<0.17
<0.24	<0.20
<0.18	0.20
< 0.07	<0.15
<0.13	<0.16
<0.16	<0.18
<0.13	<0.18
	Sample Result (pCi/gm) <0.16 <0.15 <0.17 <0.24 <0.18 <0.07 <0.13 <0.16 <0.13

Table 8 – OL8 QC Split Comparison

Two soil samples from grid AL132 received QC split gamma spectroscopy analyses. These duplicates had good agreement as shown in Table 9 below. Two QC splits out of five samples exceeds the 5% minimum criterion.

Sample Point	Sample Result (pCi/gm)	QC Result (pCi/gm)
AL132, SP1	<0.11	<0.11
AL132, SP5	<0.08	<0.13

 Table 9 – Grid AL132 QC Split Comparison

8.0 Final Survey Conclusions

The Open Land Areas OL8-1, OL8-2, OL8-3, OL8-4, and OL8-5 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 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 OL8 is suitable for unrestricted release.

9.0 <u>References</u>

- 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 E900-05-013, "Open Land FSS Design OL8"
- 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 SR196 for FSS of OL8-1
- 9.11 SNEC SR197 for FSS of OL8-2
- 9.12 SNEC SR198 for FSS of OL8-3
- 9.13 SNEC SR199 for FSS of OL8-4
- 9.14 SNEC SR200 for FSS of OL8-5
- 9.15 SNEC SR183 Miscellaneous Grids Throughout the North West Quadrant of the Site
- 9.16 SNEC Corrective Action Program (CAP) #S2005-013

10.0 <u>Appendices</u>

Appendix A - SNEC Calculation E900-05-013, "Open Land FSS Design – OL8" (9 pages plus numerous attachments)

Appendix B - COMPASS DQA Surface Soil Report OL8-1 (2 pages)

Appendix C - COMPASS DQA Surface Soil Report OL8-2 (2 pages)

Appendix D - COMPASS DQA Surface Soil Report OL8-3 (2 pages)

Appendix E - COMPASS DQA Surface Soil Report OL8-4 (2 pages)

Appendix F - COMPASS DQA Surface Soil Report OL8-5 (2 pages)

Appendix B to Appendix F

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APPENDIX B

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COMPASS DQA Surface Soil Report OL8-1



Assessment Summary

Site:	OL8		
Planner(s):	Tristan M. Tritch		
Survey Unit Name:	OL8-1		
Report Number:	1		
Survey Unit Samples:	17		
Reference Area Samples:	0		
Test Performed:	Sign	Test Result:	Not Performed
Judgmental Samples:	0	EMC Result:	Not Performed
Assessment Conclusion:	Reject Null Hypothesis (S	urvey Unit PASSES	5)

Retrospective Power Curve





Survey Unit Data

NOTE:	Type = "S" indicates survey unit sample.
	Type = "R" indicates reference area sample.

Sample Number	Туре	Cs-137 (pCi/g)	
AU147 SP1	S	0.2	
AU144 SP2	S	0.28	
AU142 SP3	S	0.15	
AW143 SP5	S	0.16	
AZ147 SP7	S	0.15	
BE147 SP8	S	0.15	
BJ147 SP9	S	0.14	
BJ144 SP10	S	0.14	
BJ139 SP12	S	0.13	
BJ136 SP13	S	0.28	
BJ133 SP14	S	0.16	
BJ130 SP15	S	0.3	
BJ127 SP16	S	0.13	
BN127 SP17	S	0.18	
BN125 SP18	S	0.29	
BN122 SP19	Š	0.15	
BN119 SP20	Š	0.18	

Basic Statistical Quantities Summary

Statistic	Survey Unit	Background	DQO Results
Sample Number	17	N/A	N=11
Mean (pCi/g)	0.19	N/A	0.46
Median (pCi/g)	0.16	N/A	N/A
Std Dev (pCi/g)	0.06	N/A	0.3249
High Value (pCi/g)	0.30	N/A	N/A
Low Value (pCi/g)	0.13	N/A	N/A

APPENDIX C

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COMPASS DQA Surface Soil Report OL8-2



Assessment Summary

Site:	OL8		
Planner(s):	Tristan M. Tritch		
Survey Unit Name:	OL8-2		
Report Number:	1		
Survey Unit Samples:	13		
Reference Area Samples:	0		
Test Performed:	Sign	Test Result:	Not Performed
Judgmental Samples:	0	EMC Result:	Not Performed
Assessment Conclusion:	Reiect Null Hypothesis (S	Survey Unit PASSE	S)

Retrospective Power Curve





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Survey Unit Data

NOTE: Type = "S" indicates survey unit sample. Type = "R" indicates reference area sample.

Sample Number	Туре	Cs-137 (pCi/g)	
AQ143 SP1	S	0.2	
AQ145 SP2	S	0.17	
A0146 SP3	S	0.18	
A0149 SP4	S	0.11	
AM150 SP5	S	0.15	
AM153 SP6	S	0.24	
AM155 SP7	S	0.14	
AM158 SP8	S	0.14	
AM160 SP9	S	0.08	
AK159 SP10	S	0.12	
AI160 SP11	S	0.18	
AG141 SP17	S	0.17	
AG139 SP18	S	0.16	

Basic Statistical Quantities Summary

Statistic	Survey Unit	Background	DQO Results
Sample Number	13	··· N/A	N=11
Mean (pCi/g)	0.16	N/A	0.14
Median (pCi/g)	0.16	N/A	N/A
Std Dev (pCi/g)	0.04	N/A	0.0764
High Value (pCi/g)	0.25	N/A	N/A
Low Value (pCi/g)	0.08	N/A	N/A

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APPENDIX D

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COMPASS DQA Surface Soil Report OL8-3

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Assessment Summary

Site:	OL8		
Planner(s):	Tristan M. Tritch		
Survey Unit Name:	OL8-3		
Report Number:	1		
Survey Unit Samples:	17		
Reference Area Samples:	0		
Test Performed:	Sign	Test Result:	Not Performed
Judgmental Samples:	0	EMC Result:	Not Performed
Assessment Conclusion:	Reject Null Hypothesis (S	urvey Unit PASSE	S)



Retrospective Power Curve



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Survey Unit Data

NOTE:	Type = "S" indicates survey unit sample.
	Type = "R" indicates reference area sample.

Sample Number	Туре	Cs-137 (pCi/g)	
AK136 SP1	S	0.24	
AK131 SP2	S	0.19	
AK129 SP3	S	0.18	
AK127 SP4	S	0.16	
AI137 SP5	S	0.19	
AI135 SP6	S	0.2	
AI130 SP7	S	0.1	
AI128 SP8	S	0.17	
A1125 SP9	S	0.12	
AI123 SP10	S	0.13	
AF134 SP11	S	0.16	
AF129 SP12	S	0.13	
AF127 SP13	S	0.12	
AF124 SP14	S	0.17	
AD125 SP15	S	0.22	
AD123 SP16	Š	0.19	
AB124 SP18	S	0.18	

Basic Statistical Quantities Summary

Survey Unit	Background	DQO Results
17	N/A	N=11
0.17	N/A	0.29
0.17	N/A	N/A
0.04	N/A	0.2571
0.24	N/A	N/A
0.10	N/A	N/A
	Survey Unit 17 0.17 0.17 0.04 0.24 0.10	Survey Unit Background 17 N/A 0.17 N/A 0.17 N/A 0.04 N/A 0.24 N/A 0.10 N/A

APPENDIX E

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COMPASS DQA Surface Soil Report OL8-4



Assessment Summary

Site:	OL8		
Planner(s):	Tristan M. Tritch		
Survey Unit Name:	OL8-4		
Report Number:	1		
Survey Unit Samples:	18		
Reference Area Samples:	0		
Test Performed:	Sign	Test Result:	Not Performed
Judgmental Samples:	0	EMC Result:	Not Performed
Assessment Conclusion:	Reject Null Hypothesis (S	urvey Unit PASSES	S)



Retrospective Power Curve



Survey Unit Data

NOTE: Type = "S" indicates survey unit sample. Type = "R" indicates reference area sample.

Sample Number	Туре	Cs-137 (pCi/g)	
AD122 SP1	S	0.14	
AD119 SP2	S	0.07	
AD117 SP3	S	0.14	
AF118 SP4	S	0.17	
AF120 SP5	S	0.14	
AI122 SP6	S	0.11	
AI119 SP7	S	0.12	
AI117 SP8	S	0.14	
AK116 SP9	S	0.14	
AK118 SP10	S	0.11	
AK120 SP11	S	0.11	
AM119 SP12	S	0.17	
AM117 SP13	S	0.18	
A0116 SP14	S	0.16	
A0118 SP15	S	0.22	
A0120 SP16	S	0.16	
AQ119 SP17	S	0.12	
AQ117 SP18	S	0.13	

Basic Statistical Quantities Summary

Statistic	Survey Unit	Background	DQO Results
Sample Number	18	N/A	N=11
Mean (pCi/g)	0.14	N/A	0.33
Median (pCi/g)	0.14	N/A	N/A
Std Dev (pCi/g)	0.03	N/A	0.0385
High Value (pCi/g)	0.22	N/A	N/A
Low Value (pCi/g)	0.07	N/A	N/A

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APPENDIX F

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... COMPASS DQA Surface Soil Report OL8-5



Assessment Summary

Site:	OL8	18 1	
Planner(s):	Tristan M. Tritch		
Survey Unit Name:	OL8-5		
Report Number:	1		
Survey Unit Samples:	16		
Reference Area Samples:	0		
Test Performed:	Sign	Test Result:	Not Performed
Judgmental Samples:	0	EMC Result:	Not Performed
Assessment Conclusion:	Reject Null Hypothesis (S	Survey Unit PASSE	S)

Retrospective Power Curve





Survey Unit Data

NOTE:	Type = "S" indicates survey unit sample.
	Type = "R" Indicates reference area sample

Sample Number	Туре	Cs-137 (pCi/g)	
AP113 SP3	S	0.18	
AR113 SP4	S	0.16	
AU113 SP5	S	0.08	
AV115 SP6	S	0.16	
BD113 SP7	S	0.44	
BE111 SP8	S	0.16	
BH111 SP9	S	0.12	
BI109 SP10	S	0.18	
BJ107 SP11	S	0.14	
BJ102 SP12	S	0.2	
BJ98 SP13	S	0.14	
BK96 SP14	S	0.13	
BK92 SP15	S	0.16	
BL90 SP16	Š	0.13	
BO90 SP17	Š	0.1	
BQ90 SP18	S	0.17	

Basic Statistical Quantities Summary

Survey Unit	Background	DQO Results
16	N/A	N=11
0.17	N/A	0.29
0.16	N/A	N/A
0.08	N/A	0.2395
0.44	N/A	N/A
0.08	N/A	N/A
-	Survey Unit 16 0.17 0.16 0.08 0.44 0.08	Survey Unit Background 16 N/A 0.17 N/A 0.16 N/A 0.08 N/A 0.44 N/A 0.08 N/A
