June 8, 2005
E910-05-020

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 Spray Pond Area SP1

The purpose of this letter is to submit for your review the attached FSS Report for Spray Pond Area SP1. One CD-ROM is included in this submission. The CD-ROM labeled: FSS Report for Spray Pond Area SP1 – Publicly Available" contains the following 7files:

Document Title	File Name	File Size (Mbytes)
Main Report	001 FSS Report SP1.pdf	0.77
Appendix A (pages 1-7).	002 SP1 Appendix A (1-7).pdf	20.5
Appendix A (attachments 1-1 to 2-6)	003 SP1 Appendix A (attachments 1-1 to 2-6).pdf	35.7
Appendix A (attachments 3-1 to 4-6	004 SP1 Appendix A (attachments 3-1 to 4-6).pdf	34.3
Appendix A (attachments 5-1 to 7-4)	005 SP1 Appendix A (attachments 5-1 to 7-4).pdf	33.6
Appendix A (attachments 8-1 to 10-2)	006 SP1 Appendix A (attachments 8-1 to 10-2).pdf	38.9
Appendix B	007 SP1 Appendix B.pdf	8.62

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

Sincerely,

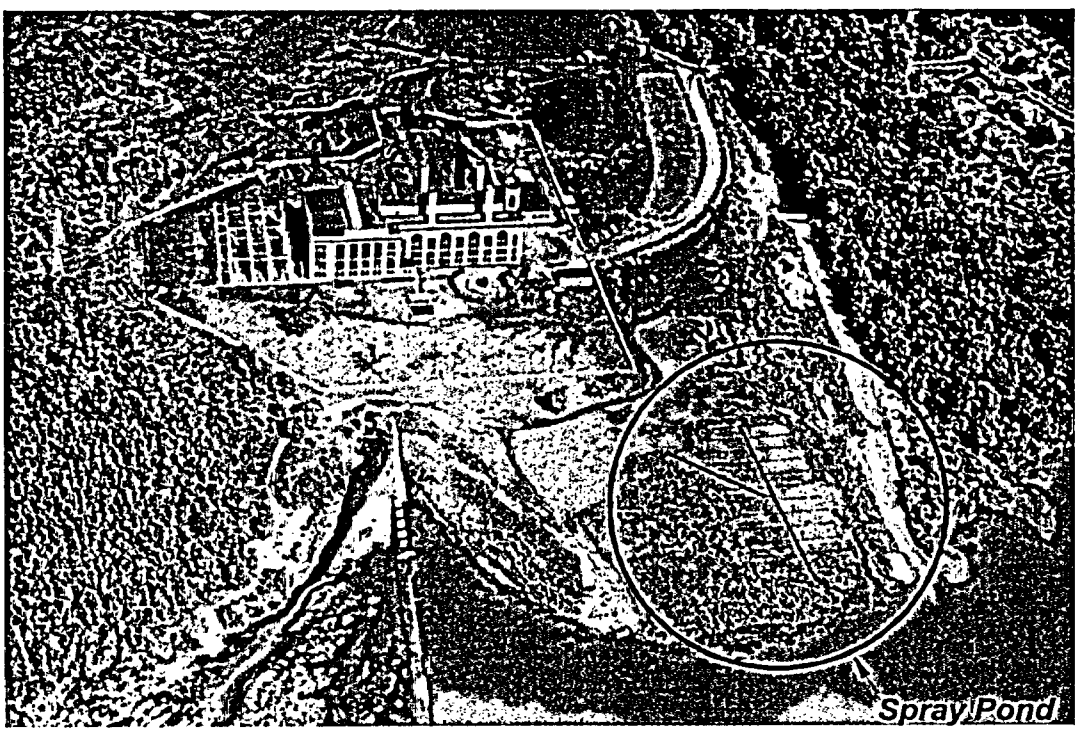
G. A. Kuehn
Program Director, SNEC

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

A020

Final Status Survey Report
Saxton Nuclear Experimental Corporation

Spray Pond Area



The Saxton Coal Fired Steam Generating Station - Photo from Operational Period Showing Spray Pond Area

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) conducted by GPU Nuclear, Inc. within the Spray Pond area (SP1). This report provides summary results from volumetric scanning and sampling of soils within SP1. This survey work began March of 2005, and concluded April 2005 and was performed in accordance with Revision 3 of the SNEC License Termination Plan (LTP) (**Reference 9.1**).

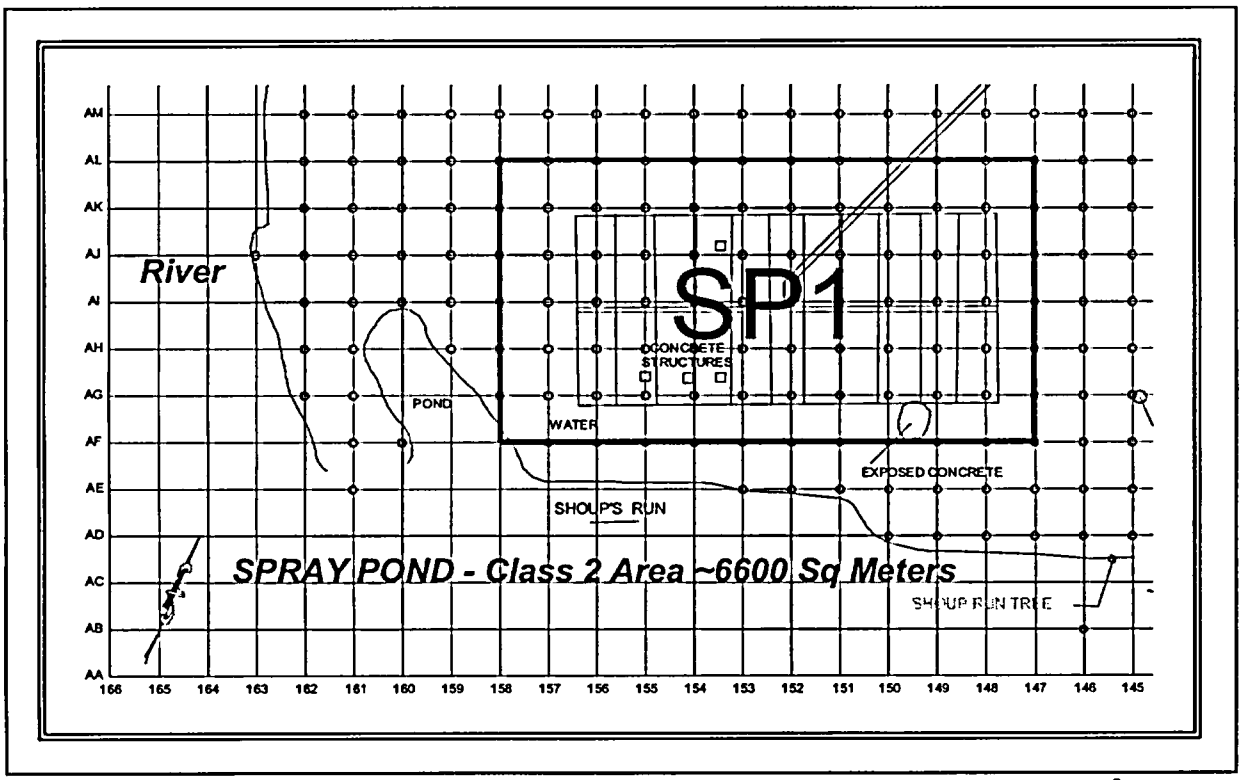


Figure 2, SNEC Facility site map showing approximate Spray Pond location (each grid is 100 m^2).

Survey data was collected from the SP1 area according to data collection requirements specified in the SP1 survey design (**Reference 9.2** and **Appendix A**). The following types of measurements were performed on materials found within the SP1 area during FSS activities.

1. NaI scanning measurements were performed in approximately 2,900 m^2 of this Class 2 open land area. The western portion of SP1 is at or near the same elevation as the Raystown Branch of the Juniata River, a portion of SP1 is at times, underwater and therefore inaccessible.

2. A total of 19 soil/soil-like samples one (1) meter in depth was obtained using the random start, triangular grid systematic methodology in this Class 2 open land area.

These samples were analyzed by gamma spectroscopy to determine the presence of radionuclides typical of the SNEC facility. An additional five (5) samples were collected at depth below one of the randomly selected locations (not more than ~2 meters below the surface).

FSS scan survey results were less than the action level for the applicable DCGLw in this survey unit. All soil and soil-like material samples from all sampling depths were below the applicable DCGLw. Therefore, this collection of FSS data demonstrate that this survey unit meets the radiological criteria for unrestricted use specified in 10 CFR 20.1402 (**Reference 9.3**).

Based on the results of this final status survey effort, GPU Nuclear, Inc. concludes that the SNEC site Spray Pond area (SP1) meets the NRC requirements for release to unrestricted use.

1.0 Purpose and Scope

This report presents the results and conclusions of the final status survey performed on the following area:

- Spray Pond (SP1) – A Class 2 open land area

This survey effort provides the information required by 10 CFR 50.82(a)(11) **(Reference 9.4)** and SNEC's License Termination Plan (LTP) and demonstrate that this area meets the radiological criteria for unrestricted use specified in 10 CFR 20.1402.

2.0 Survey Area Description

The Spray Pond area (SP1) survey unit is about 6,600 square meters in area and was designated a Class 2-survey unit because of previous site use and early scoping and characterization results. SP1 is contained within the area enclosed by site grid markers AF-158 and AL-158 on the west, and AF-147 and AL-147 on the east **(Reference 9.5)**. This open land area has (over time), become over-grown with grass, trees and small shrubs. The eastern portion contains an overburden of Saxton Steam Generating Station (SSGS) building debris that is several feet depth and effectively covers about half the original Spray Pond area. The western half of the Spray Pond is near the current Juniata River elevation and is frequently flooded during periods of heavy precipitation, causing the western portion of SP1 to be swampy and difficult to traverse during high water periods.

3.0 Operating History

3.1 Spray Pond Use

The Spray Pond was used to reduce the thermal load of water returning to the Raystown Branch of the Juniata River after cycling through SSGS facility systems. The SNEC Historical Site Assessment (HSA) **(Reference 9.6)** suggests that this thermal load reduction process was used largely in the warmer months when additional water temperature issues could have caused excessively high river temperatures after passing through SSGS facility systems. During use, water from the Discharge Tunnel was pumped via the Spray Pump facility to the Spray Pond. An optional travel path could have focused hot water to the area of the Intake Tunnel screen/rake assembly. This may have been done to reduce icing of intake screen water during colder periods. Regardless of how this system was used, and since many SSGS facility systems were to some degree radiologically contaminated from SNEC facility operations, the potential exists for

the Spray Pond to have experienced some detectable low level residual contamination over time.

Scoping and characterization activities eventually identified low level Cs-137 contamination in soil samples in this area, but no significant levels of other SNEC related radionuclides have been found.

3.2 Spray Pond Remediation Status

No remediation has been performed in the SP1 area. This area meets the definition of a Class 2-survey area since all previous sample analysis results have been below the DCGLw.

3.3 SNEC Facility Operating History

The Saxton Nuclear Experimental Corporation (SNEC) facility featured 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 build 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 storage condition. The fuel was removed in 1972 and shipped to a (now DOE) facility at Savannah River, South Carolina, 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 reactor, containment vessel and support buildings have all been removed from the site. The building and structures that supported reactor operation were partially decontaminated by 1974. In the late 1980's and through the 1990's, additional decontamination, disassembly and removal of the containment vessel support buildings, large and small components and other miscellaneous support

equipment was complete. By 1992 decontamination and dismantlement of the reactor support structures was complete. Large components such as the pressurizer, steam generator, and reactor vessel were removed in late 1998. The removal of the steel Containment Vessel (CV) (to ~ 4' below grade), and backfill was complete by late 2003. More recently, decontamination, disassembly and demolition of the remaining SNEC facility buildings including remnants of the coal fired Saxton Steam Generating Station (SSGS) has taken place. The SNEC facility is currently in the process of performing the Final Status Survey for unrestricted release leading to license termination.

4.0 Site Release Criteria

The site release criteria as applied to the Spray Pond, corresponds to the radiological dose criteria for unrestricted use per 10 CFR 20.1402. 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 and meet site or survey unit release criteria were derived by analyses using either the building occupancy (surface area) or resident farmer (volumetric) scenarios. The dose modeling for these scenarios is explained in Chapter 6 of the SNEC LTP, Revision 3. The derived concentration guideline levels (DCGLs) determined in the LTP form the basis for satisfying the site release criteria.

As described in Chapter 6 of the SNEC LTP (Reference 9.1), a correction to the gross activity DCGLw is made to address de-listed radionuclides and provide a reasonable SNEC established safety factor. The SNEC facility has instituted an administrative limit of 75% for the allowable dose (DCGL) for all measurement results. Thus the de-listed radionuclide dose is accounted for by using the 75% administrative limit.

4.1 Spray Pond Area Specific DCGLw Values

More than one hundred and twenty samples were taken in the SP1 area to various depths during the most recent characterization campaign. Most of these

results were at or near background levels for Cs-137, exhibiting a mean concentration of 0.39 ± 0.35 pCi/g. In addition, early scoping samples from this area add to an impressive database of sample results. Several of these samples were sent to an off-site laboratory for a more complete analysis to include all possible SNEC facility related radionuclides. Off-site analysis results were then pooled to create a conservative mix for the SP1 area. Since the SP1 Cs-137 concentrations are at or near background levels, the relative ratios between trace amounts of hard-to-detect radionuclides that include natural occurring radionuclides such as C-14, are not necessarily in their expected site-specific proportions. However, no effort was made to remove background levels from any radionuclide concentration, and therefore the effective DCGLw for the SP1 area is conservatively derived. The effective DCGLw values are provided in Table 1 below. See **Appendix A, Attachment 2-1** to **2-6** for the development of these effective DCGLw values.

Table 1, SPRAY POND – DCGLw VALUES

Gross Activity DCGLw (dpm/100 cm^2)	Volumetric DCGLw (pCi/g) for Cs-137
4,802 (3,601 A.L.)	3.94 (2.96 A.L.)

NOTE: A.L. is the site Administrative Limit or 75% of the effective DCGLw for the area.

5.0 Final Status Survey Design/DQO Process

Survey Designs (SD's) (see **Appendix A**) are developed IAW applicable sections of the SNEC License Termination Plan (LTP) and site procedures. During development, characterization activities are reviewed along with any post-remediation survey or sampling activities (as applicable). Survey unit variability is established from the best available or most representative measurement and/or sampling result. The Compass computer program (**Reference 9.7**) is then used to develop MDCscan parameters (for structural surfaces), the number of survey or sampling points in each survey unit, and other DQO design requirements. For open land areas, methodology from NUREG-1507 (**Reference 9.8**) is used to calculate MDCscan values that are then input to the Compass computer program. For structural surfaces, representative background values are extracted from previous measurements of non-impacted like-materials of similar age whenever possible. For open land areas, background concentrations of relevant SNEC radionuclides are not subtracted from sample data sets prior to developing individual

survey unit surrogate levels (of Cs-137). Thus the effective DCGLw values for open land areas are conservatively biased.

For most survey units, the number of Compass calculated sample and/or survey locations are augmented to provide *"more than the minimum required coverage"*. Sample and/or survey point locations are plotted on drawings of individual survey areas using the Visual Sample Plan (VSP) computer code **(Reference 9.9)**. Diagrams showing sample and/or survey point locations are clearly depicted on survey maps along with any necessary physical dimensions from known site area landmarks. Diagrams are then provided to individual survey teams through the use of the Survey Request (SR's) procedure process **(Reference 9.10)**. SR's are issued as field working guidance documents. All SD's and SR's are reviewed and approved by the SNEC RSO (or his representative) before implementation. Data Quality Objectives (DQO's) for the SP1 area are presented in the following table.

Table 2, DQO/Design Parameters/Results

Survey Unit	SP1
SNEC Design Calculation. No.	E900-05-005 (Appendix A)
SNEC Survey Request No. (for FSS work)	SR-0192
Survey Area Classification	2
Total Area Size (m^2)	6,600
Scanning Goal (m^2)	3,300 (50% of total area)
Accessible Area Scanned (m^2)	~2,900 (~44%)
Applicable Statistical Test	Sign
Type I Decision Error (α)	0.05
Type II Decision Error (β)	0.10
Effective Soil $DCGL_w$ (Cs-137 pCi/g)	2.96 (Administrative Limit)
LBGR (Cs-137 pCi/g)	2.5 (Appendix A, Attachment 7-1 to 7-4)
Estimated σ (Cs-137 pCi/g)	0.346
Δ/σ	1.33
Minimum Number of FSS Samples Required by Compass	16 (Appendix A, Attachment 7-1 to 7-4)
Number of Sample Locations Specified by VSP	24 (Appendix A, Attachment 8-1)
Number of FSS Surface Samples Taken in Accessible Areas	19
Number of Samples Taken at Depth	5
Surface $DCGL_w$ (dpm/100 cm^2)	3,601*
Surface Scan MDC (dpm/100 cm^2)	440* (Appendix A, Attachment 5-1 & 5-2)
Scan Speed for Concrete (cm/sec)	10*
Estimated Scan MDC for Soil/Soil-Like Materials (Cs-137 pCi/g)	~4.9 (Appendix A, Attachment 4-1 & 4-2)
Scan Speed for Soil and Soil-Like Materials (cm/sec)	25

Table 2, DQO/Design Parameters/Results (Cont'd)

NaI Action Level During Scanning (FSS)	> 400 gcpm
Number of Alarm Points During Scanning Process	None
Number of Samples Taken During Characterization	> 120
Typical NaI Background Level (cpm)	~300
Survey Instrument Type (narrow window optimized for Cs-137)**	Ludlum 2350-1 w/44-10 NaI probe
Instrument Conversion Efficiency (cpm/mR/h)	≥ 209, 000 (Cs-137 window)
Cold Weather Detection Efficiency Loss Factor	~3%
Measurement Protocol	2" by 2" NaI scans and samples

*Few structural surfaces were encountered in accessible portions of scanned areas.
**The narrow window detector setting improves the signal to noise ratio for Cs-137.

5.1 Description of Survey Unit

Figure 2 shows that the SP1 area is approximately 6,600 square meters in total area. Native soil, river silt, cinders, coal ash, and building debris make up the vast majority of material types in the Spray Pond area. The eastern sector contains the majority of the building debris deposit and is easy to distinguish since it rises several feet above the western portion of SP1. Sampling in the eastern sector necessitates sampling at depth through the debris bed to a base soil layer. On the southern side of SP1 a man-made bank of boulders and soil separates the SP1 area from Shoup's Run. Shoup's Run enters the Raystown Branch of the Juniata River near the western border of the SP1 area.

5.2 Survey Design for the Spray Pond Open Land Area

The survey design for SP1 is provided in Appendix A. A total of thirty-three (33) grids (each 100 m^2) were randomly chosen yielding 3,300 square meters of potential scan area. If accessible, 100% of each randomly selected grid was to be scanned. Since SP1 is a Class 2 area, the initial scanning goal was set at 50% of the total SP1 area.

The number of random start, triangular grid, systematically spaced sample points were determined using the COMPASS computer program. The minimum number of sample points selected by Compass was sixteen (16). Each sample was to be one meter in depth to match the site area surface dose model discussed in the SNEC LTP. Sample points in the eastern sector of SP1 were to have one meter

deep samples taken of the surface debris bed and an additional sample for every meter of material down to the base soil depth.

All sample points were placed on survey maps of the SP1 area using the Visual Sample Plan (VSP) computer code. Two MDC scan values were determined in the event that any randomly selected grid contained significant quantities of tramp concrete materials which would present another material type within the survey unit. However, no significant concrete material was encountered in the randomly selected grid areas. In addition, sample results of soil/soil-like materials did not warrant further survey work of this type in this Class 2 area. Thus the need to perform additional scans of miscellaneous concrete fragments was considered unnecessary.

6.0 Final Status Survey Results

6.1 Summary of Survey Results for SP1

From **Appendix B**, approximately 44% of the total SP1 area were scanned during FSS activities. Since FSS scanning requirements for a Class 2 open land area are typically 10 to 100%, the total scanned area in SP1 is considered adequate. Instrument response above 400 gcpm was used as the action level during the FSS scanning efforts. No instrument alarms were reported. Worth noting is that during characterization activities in this same survey unit, the action level was set at 300 gross counts per minute (gcpm), which is at or near background levels. This resulted in a number of samples being taken based on exceeding an alarm that was driven by background levels. As expected, sample results from these alarm points were all below the applicable DCGLw, and alarms were attributed to elevated concentrations of naturally occurring radionuclides (e.g., KUT). In all, well over one hundred (100) characterization samples were taken in the SP1 area with the highest concentration identified as 1.8 pCi/g Cs-137 (see **Appendix A**, Attachment 9-1 and 9-2). During early scoping survey results in the SP1 area, one Cs-137 concentration of 2.8 pCi/g was identified (SNEC sample SX11SL990127, assayed by Teledyne, October 1999). Clearly, all sample analysis results, from early scoping, characterization and the current FSS sampling effort have been below the effective DCGLw for Cs-137.

FSS sample data are provided in Table 3 below. The variability of the samples identified in Table 3 is below the initial variability estimate used for survey planning purposes (see Table 2 sigma value).

Table 3, SP 1 Random Start, Triangular Grid, Systematically Spaced Soil Samples

	FSS SAMPLES FROM SPRAY POND (Cs-137 pCi/g) - SR-0192				
	Sample No.	Cs-137	Grid	Sample Point	Depth (m)
1	SXSL9930	0.27	AF-149	SP-6	0 - 1
2	SXSL9912	< 0.20	AH-157	SP-7	0 - 1
3	SXSL9913	0.62	AH-155	SP-8	0 - 1
4	SXSL9914	0.25	AH-154	SP-9	0 - 1
5	SXSL9933	0.24	AH-152	SP-10	0 - 1
6	SXSL9931	< 0.24	AH-150	SP-11A	0 - 1
	SXSL9932	0.17	AH-150	SP-11B	BASE SOIL
7	SXSL9880	0.22	AH-148	SP-12	0 - 1
8	SXSL9917	< 0.158	AI-158	SP-13A	0 - 1
	SXSL9918	< 0.2	AI-158	SP-13B	BASE SOIL
9	SXSL9911	0.19	AI-156	SP-14	0 - 1
10	SXSL9915	< 0.25	AI-155	SP-15	0 - 1
	SXSL9916	< 0.24	AI-155	SP-15 QC	0 - 1
11	SXSL9882	0.36	AI-153	SP-16	0 - 1
12	SXSL9925	0.66	AI-151	SP-17A	0 - 1
	SXSL9926	0.53	AI-151	SP-17B	BASE SOIL
13	SXSL9881	< 0.24	AI-149	SP-18	0 - 1
14	SXSL9919	< 0.19	AK-157	SP-19	0 - 1
15	SXSL9920	< 0.15	AK-155	SP-20	0 - 1
16	SXSL9921	< 0.19	AK-154	SP-21	0 - 1
17	SXSL9922	0.28	AK-152	SP-22	0 - 1
18	SXSL9923	0.68	AK-150	SP-23A	0 - 1
	SXSL9924	0.90	AK-150	SP-23B	BASE SOIL
19	SXSL9927	0.50	AK-148	SP-24A	0 - 1
	SXSL9928	< 0.13	AK-148	SP-24B	BASE SOIL
	SXSL9929	0.60	AK-148	SP-24B QC	0 - 1
	Average=>	*0.33*	Note: Samples 1 to 19 are surface sample point results for the SP1 area. Mean and sigma values are calculated over all samples reported including less than values.		
	STDEV=>	*0.21*			
	Max=>	*0.90*			
	Min=>	*0.13*			

NOTE: Base soil samples were taken below the initial 1-meter surface sample depth, but not greater than ~2 meters below the surface.

6.2 Survey and Sample Locations

There were twenty-four assigned sampling points as shown on the diagram of Figure 3. Each location with the exception of sample points one (1) through five (5), were sampled in accordance with **Appendix A** criteria. In addition, a randomly selected pool of grid numbers was chosen to be the scanned areas of record. This scan location diagram is provided as Figure 4.

Figure 3, Random Start, Triangular Grid, Systematic Spacing Sample Points

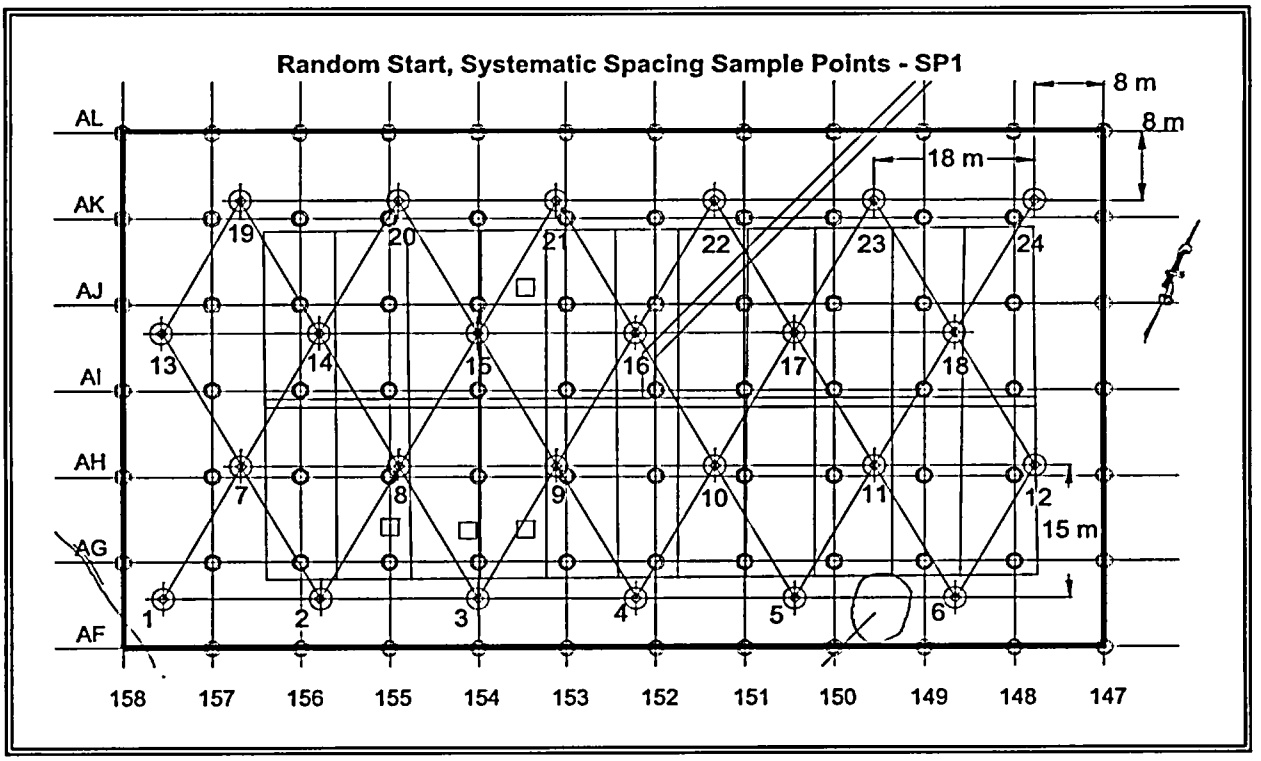
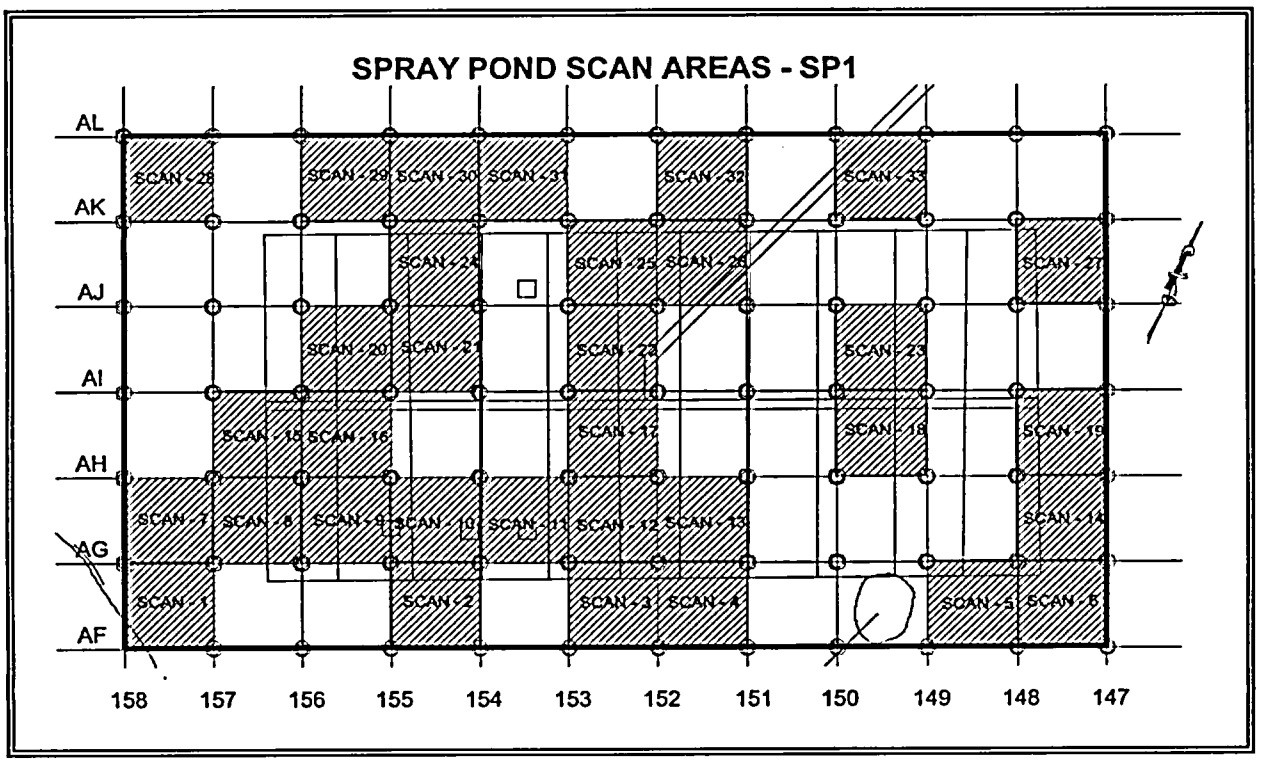


Figure 4, Randomly Placed Scan Locations



7.0 Data Assessment

7.1 Assessment Criteria

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) MDC values 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 was tracked from the point of collection until final results were provided.

9) 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.

7.2 Survey Variations (Design, Survey Request, LTP)

7.2.1 3,300 square meters of the SP1 area was randomly selected for scanning. About 400 square meters of survey area were inaccessible in the randomly selected grid areas. The remaining available portion constituted 44% percent of the total survey unit area, which is well within coverage requirements for a Class 2-survey unit in accordance with SNEC LTP requirements.

7.2.2 Sample points one (1) through five (5) were not sampled since standing water and extreme wet soil conditions did not permit collection during the FSS implementation period. These sample locations were not relocated because there was no other reasonable points of relief in the area. However, the survey design was robust and the minimum required number of samples was still obtained.

7.2.3 Sample points 11, 17, 23 and 24 were located in the eastern sector of the survey unit where building debris is prevalent, and as a result, a base soil sample was collected in addition to the surface one (1) meter thick sample. Sample 13 was collected in an area where recent deposits of river silt and sand covered the sample point. Thus, two samples were recovered in this area as well, using the same technique of collecting a surface one (1) meter thick sample and then collecting a base soil layer below the overburden. No samples were collected at depths greater than about two (2) meters.

7.2.4 The following Table provides a list of grid numbers that were partially scanned, and the reasons for scanning only a portion of the entire grid. However, some portion of all original randomly selected grids was scanned.

Table 4, Area Unavailable for Scanning Survey (m^2)

Grid No.	Approximate Size of Area	Obstruction
AG-155	10 m^2	Standing Water
AG-154	36 m^2	Standing Water
AG-156	10 m^2	Trees & Standing Water
AG-157	11 m^2	Trees & Standing Water
AH-157	3 m^2	Logs & Trees
AF-158	34 m^2	River Bank, Logs, Trees, Stone Wall &, Brush
AG-158	2 m^2	River Bank, Stump & Trees
AK-156	24 m^2	Brush
AK-158	30 m^2	Trees & Brush
AI-155	1 m^2	Trees
AJ-155	8 m^2	Standing Water & Trees
AK-155	19 m^2	Standing Water & Trees
AG-152	2 m^2	Trees
AG-153	50 m^2	Standing Water
AH-153	3 m^2	Standing Water
AI-153	6 m^2	Standing Water
AF-155	80 m^2	Standing Water, Stone Wall & Trees
AF-153	50 m^2	Standing Water & Stone Wall
AF-152	50 m^2	Standing Water & Stone Wall
AK-152	3 m^2	Concrete Debris
AK-154	1 m^2	Trees
AJ-152	1 m^2	Trees

NOTE: Each grid is 100 m^2 in total area.

7.3 Quality Control Measurements

7.3.1 Two (2) Quality Control (QC) samples were taken in the SP1 survey unit. The SNEC LTP requires gamma-ray spectrometry scans of sample splits at a minimum frequency of at least 1 QC sample for every 20 samples collected (5%). Results for the two- (2) samples collected are in partial agreement i.e., one repeat sample exhibits about the same analysis result as the previous sample from the same location. The other result shows positive results for the repeat sample only.

There are several reasons why split samples do not always give nearly equal analysis results. A few possible rationale are listed below:

- Contaminated materials are not evenly dispersed throughout all sample media taken at the same sample location,
- Sample media contain near background levels of contaminants and differ only within the range of existing background for the area/location,

- Cross contamination of collection equipment,
- Errors in sample processing and analysis,
- Sample logging errors, etc.

Regardless of the reason for the difference, all QC sample results are below the assigned SP1 DCGLw. See Table 5 below.

Table 5, QC Sample Comparison (Cs-137)

Grid No.	Sample	Location ID	Initial pCi/g	QC Sample	QC Location ID	QC pCi/g
AI-155	SXSL9915	SP-15	< 0.249	SXSL9916	SP-15 QC	< 0.244
AK-148	SXSL9928	SP-24A	< 0.134	SXSL9929	SP-24B QC	0.596

7.3.2 Sections of sixteen (16) grids were re-scanned as QC duplicates. In all, QC scanning covered approximately 170 m^2 of the SP1 area. All scan results were below the alarm point assigned by the survey design.

The number of square meters scanned during QC scanning surveys, and the number of samples re-taken as a part of the QC programmatic self-checking process met site procedural requirements, and the requirements of the SNEC LTP (> 5% of the area re-surveyed/re-sampled).

7.4 Assessment Summary

Statistical testing of the data does not need to be performed for this final status survey since the data clearly show that the survey unit meets the site release criteria. This survey unit clearly meets the criterion because of the following:

1. ☒ All measurements in the survey units are less than or equal to the DCGLW, or

2. ☐ A background reference area was used, and the difference between the maximum survey unit measurement and the lowest background reference area measurement are less than or equal to the DCGL.

8.0 Final Status Survey Conclusions

The FSS for the Spray Pond area (SP1) was performed in accordance with Revision 3 of the SNEC LTP and site implementing procedures. Final status survey data were collected to meet and/or exceed the quantity and quality specified for this survey unit as prescribed by the applicable survey design. The survey data for each survey unit met the following conditions:

1. The average residual radioactivity within the SP1 area is less than the assigned DCGLw.

2. Since all measurements were less than the DCGLw, no $DCGL_{EMC}$ criteria need be applied.

3. No remediation was performed to reduce levels of residual radioactivity below concentrations necessary to meet DCGLw values.

These conditions satisfy the release criteria established in the SNEC LTP and the radiological criteria for unrestricted use given in 10 CFR 20.1402. Therefore, it is concluded that the SNEC Spray Pond Area (SP1) as described in this report is suitable for unrestricted release.

9.0 References

9.1 SNEC License Termination Plan

9.2 SNEC Calculation E900-05-005, "Spray Pond – Survey Design".

9.3 Code of Federal Regulations, 10 CFR 20.1402.

9.4 Code of Federal Regulations, 10 CFR 50.82(a)(11).

9.5 SNEC Facility Site Area Grid Map - Drawing Number SNECRM-020.

9.6 SNEC Facility Historical Site Assessment Report, March 2000.

9.7 COMPASS computer program, Version 1.0.0, Oak Ridge Institute for Science and Education.

9.8 NUREG-1507, "Minimum Detectable Concentrations with Typical Radiation Survey Instruments for Various Contaminants and Field Conditions".

9.9 VISUAL SAMPLE PLAN computer program, Version 3.0, Battelle Memorial Institute.

9.10 SNEC Procedure E900-IMP-4520.04, "Survey Methodology to Support SNEC License Termination"

9.11 SNEC Procedure E900-ADM-4500.60 "Final Status Survey Report".

9.12 NUREG 1575 "Multi-Agency Radiation Survey and Site Investigation Manual" (MARSSIM), revision 1 August 2000

9.13 SNEC Procedure E900-IMP-4500.59, "Final Site Survey Planning and DQA"

Appendix B

SURVEY REQUEST CONTINUATION SHEET			
SR NUMBER	SR-0192	AREA/LOCATION	SP1
SPECIFIC SAMPLING/SURVEY INSTRUCTIONS OR COMMENTS			

RESULTS SUMMARY FOR SR-0192

SR-0192 was issued to obtain radiological survey and sampling data to ensure Final Site Survey activities are complete. The survey unit covered under this SR is SP1 (grids are listed in the SR). The SR required the following radiological measurements.

- Surface scan measurements using a 2" x 2" NaI detector (set to identify Cs-137). Survey techniques will be IAW the SR.
- A minimum of 16 Site Surface Dose Model Samples were required to be taken for analysis on HPGe detectors.
- Site Surface Dose Model Samples (Auger Method). Obtain samples as directed in the SR. Using the auger, obtain a 1 meter drill, and scan the extracted soil. If changes in soil consistency are noted or activity is detected to exceed the action level, obtain a one minute static measurement.
- Site Surface Dose Model Samples (Track Hoe Method). In areas where the auger does not penetrate the ground, obtain samples in areas as directed by the SR. Using digging equipment, expose the soil in shallow layers, and scan the extracted soil.
- QC Repeat Measurements. A minimum of 5% of all surface scan measurements and sampling will be re-performed using identical methodology.
- Additional sampling/surveys may be performed at the request of the SR coordinator.

1. Summary of Results

A. Surface Scan Measurements (2" x 2" NaI Detector)

A 100% surface scan was required of certain grids, IAW the SR. Surface scanning was performed on all required grids. A total of 44.3 % of this Class 2 area was surveyed, which is well within design basis.

Results: All areas indicated activity below the action level of ≥ 400 gross CPM (counts per minute).

B. Surface Static Measurements

No static measurements were obtained.

Results: Not Applicable.

Appendix B

SURVEY REQUEST CONTINUATION SHEET			
SR NUMBER	SR-0192	**AREA/LOCATION**	SP1
SPECIFIC SAMPLING/SURVEY INSTRUCTIONS OR COMMENTS			

C. Site Surface Dose Model Sampling

Twenty four (24) soil samples were obtained. These samples were statistically spaced based on a random starting point due to the lack of noticeable elevated activity during scan surveys.

Results: All soil samples taken for this SR ranged in activity from <0.1 pCi/g to 0.9 pCi/g for the surrogate isotope, Cs-137, with no other licensed isotopes identified for this particular SR.

2. Quality Control (QC) Measurements and Comparisons

- **Repeat Scan measurements and Soil samples** were performed and met the applicable acceptance criteria established in Section 4.6 of E900-IMP-4520.04. Scan survey QC measurements were reproduced for 5.82% of area scanned. Soil sample QC were reproduced for 8.33% of sample points.

3. Exceptions and Discrepancies

- See scan survey worksheet and sample survey worksheet in SR-0192 package for a listing of exceptions to the original SR survey plan.

4. Special Note(s)

- As stated previously, as this is a Class 2 area, coverage of approximately 10%-50% will suffice to show due diligence in survey technique for release of the site for unrestricted use.

Chris Marthaler 5-12-05

Print/Sign Date