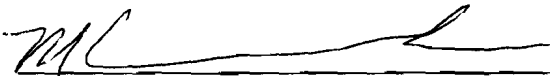


**YANKEE NUCLEAR POWER STATION
FINAL STATUS SURVEY REPORT**

REPORT NO.: YNPS-FSS-OOL-09-00

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Section	Table of Contents	Page
1.0	EXECUTIVE SUMMARY	1
1.1	IDENTIFICATION OF SURVEY AREA AND UNITS	1
1.2	DATES OF SURVEYS	1
1.3	NUMBER AND TYPES OF MEASUREMENTS COLLECTED	1
1.4	SUMMARY OF SURVEY RESULTS	2
1.5	CONCLUSIONS	2
2.0	FSS PROGRAM OVERVIEW	2
2.1	SURVEY PLANNING	2
2.2	SURVEY DESIGN	2
2.3	SURVEY IMPLEMENTATION	3
2.4	SURVEY DATA ASSESSMENT	3
2.5	QUALITY ASSURANCE AND QUALITY CONTROL MEASURES	3
3.0	SURVEY AREA INFORMATION.....	4
3.1	SURVEY AREA DESCRIPTION	4
3.1.1	<i>OOL-09-01 Description</i>	4
3.1.2	<i>OOL-09-02 Description</i>	4
3.1.3	<i>OOL-09-03 Description</i>	4
3.1.4	<i>OOL-09-04 Description</i>	5
3.1.5	<i>OOL-09-05 Description</i>	5
3.2	HISTORY OF SURVEY AREA	5
3.3	DIVISION OF SURVEY AREA INTO SURVEY UNITS	6
4.0	SURVEY UNIT INFORMATION.....	6
4.1	SUMMARY OF RADIOLOGICAL DATA SINCE HISTORICAL SITE ASSESSMENT (HSA)	6
4.1.1	<i>Chronology and Description of Surveys Since HSA</i>	6
4.1.2	<i>Radionuclide Selection and Basis</i>	6
4.1.2.1	<i>OOL-09-01 Radionuclides of Concern</i>	6
4.1.2.2	<i>OOL-09-02 Radionuclides of Concern</i>	6
4.1.2.3	<i>OOL-09-03 Radionuclides of Concern</i>	7
4.1.2.4	<i>OOL-09-04 Radionuclides of Concern</i>	7
4.1.2.5	<i>OOL-09-05 Radionuclides of Concern</i>	7
4.1.3	<i>Scoping & Characterization</i>	7
4.2	BASIS FOR CLASSIFICATION	7
4.3	REMEDIAL ACTIONS AND FURTHER INVESTIGATIONS	8
4.3.1	<i>OOL-09-01 Remedial Actions and Further Investigations</i>	8
4.3.2	<i>OOL-09-02 Remedial Actions and Further Investigations</i>	8
4.3.3	<i>OOL-09-03 Remedial Actions and Further Investigations</i>	8
4.3.4	<i>OOL-09-04 Remedial Actions and Further Investigations</i>	8
4.3.5	<i>OOL-09-05 Remedial Actions and Further Investigations</i>	8
4.4	UNIQUE FEATURES OF SURVEY AREA	8
4.5	ALARA PRACTICES AND EVALUATIONS	8
5.0	SURVEY UNIT FINAL STATUS SURVEY	9
5.1	SURVEY PLANNING	9
5.1.1	<i>Final Status Survey Plan and Associated DQOs</i>	9
5.1.2	<i>Deviations from the FSS Plan as Written in the LTP</i>	11
5.1.3	<i>DCGL Selection and Use</i>	11
5.1.4	<i>Measurements</i>	12
5.2	SURVEY IMPLEMENTATION ACTIVITIES	12
5.3	SURVEILLANCE SURVEYS	13
5.3.1	<i>Periodic Surveillance Surveys</i>	13
5.3.2	<i>Resurveys</i>	13
5.3.3	<i>Investigations</i>	13
5.4	SURVEY RESULTS	14
5.5	DATA QUALITY ASSESSMENT	17
5.5.1	<i>OOL-09-01 Data Quality Assessment</i>	17

5.5.2	<i>OOL-09-02 Data Quality Assessment</i>	18
5.5.3	<i>OOL-09-03 Data Quality Assessment</i>	18
5.5.4	<i>OOL-09-04 Data Quality Assessment</i>	18
5.5.5	<i>OOL-09-05 Data Quality Assessment</i>	19
6.0	QUALITY ASSURANCE AND QUALITY CONTROL	19
6.1	INSTRUMENT QC CHECKS	19
6.2	SPLIT SAMPLES AND RECOUNTS	19
6.2.1	<i>OOL-09-01 Split Samples and Recounts</i>	19
6.2.2	<i>OOL-09-02 Split Samples and Recounts</i>	19
6.2.3	<i>OOL-09-03 Split Samples and Recounts</i>	20
6.2.4	<i>OOL-09-04 Split Samples and Recounts</i>	20
6.2.5	<i>OOL-09-05 Split Samples and Recounts</i>	20
6.3	SELF-ASSESSMENTS	20
7.0	CONCLUSION	20

Table	List of Tables	Page
TABLE 1	DATE OF SURVEYS AND DQOS	1
TABLE 2	DATES OF SURVEYS SINCE HSA	6
TABLE 3	SURVEY AREA OOL-09 DESIGN PARAMETERS	9
TABLE 4	SOIL DCGL VALUES	11
TABLE 5	FSS ACTIVITY SUMMARY FOR OOL-09	12
TABLE 6	SOIL SAMPLE SUMMARY	14
TABLE 7	ISOCS SCAN SUMMARY	15

List of Appendices

Appendix A – YNPS-FSSP-OOL-09, “*Final Status Survey Planning Worksheets*”

Appendix B – YA-REPT-00-015-04, “*Instrument Efficiency Determination for Use in Minimum Detectable Concentration Calculations in Support of the Final Status Survey at Yankee Rowe*”

Appendix C – YA-REPT-00-003-05, “*Generic ALARA Review for Final Status Survey of Soil at YNPS*”

Appendix D – ALARA Evaluations, OOL-09

Appendix E – YA-REPT-00-018-05, “*Use of In-situ Gamma Spectrum Analysis to Perform Elevated Measurement Comparison in Support of Final Status Surveys*”

List of Attachments

Attachment A – Maps and Posting Plots

Attachment B – Data Quality Assessment Plots and Curves

Attachment C – Instrument QC Records

Attachment D – ORTEC Direct Measurement Data

Attachment E – ISOCS Scan Data

(In the electronic version, every Table of Contents, Figures, Appendices and Attachments, as well as every mention of a Figure, Appendix or Attachment is a hyperlink to the actual location or document.)

List of Abbreviations and Acronyms

AL	Action Level
ALARA	As Low As Reasonably Achievable
c/d	Counts per Disintegration
DCGL	Derived Concentration Guideline Level
DCGL _{EMC}	DCGL for small areas of elevated activity
DCGL _W	DCGL for average concentration over a wide area, used with statistical tests
DQO	Data Quality Objectives
EMC	Elevated Measurement Comparison
ETD	Easy-to-Detect
FSS	Final Status Survey
FSSP	Final Status Survey Plan
GPS	Global Positioning System
H ₀	Null Hypothesis
HSA	Historical Site Assessment
HTD	Hard-to-Detect
ISOCS	<i>In-situ</i> Object Counting System [®]
LBGR	Lower Bound of the Grey Region
LTP	License Termination Plan
MARSSIM	Multi-Agency Radiation Survey and Site Investigation Manual
MDA	Minimum Detectable Activity
MDC	Minimum Detectable Concentration
PAB	Primary Auxiliary Building
QAPP	Quality Assurance Project Plan
QC	Quality Control
RCA	Radiological Controlled Area
RP	Radiation Protection
RSS	Reactor Support Structure
SFP	Spent Fuel Pool
VC	Vapor Container
VCC	Vertical Concrete Cask
VSP	Visual Sample Plan
YNPS	Yankee Nuclear Power Station

1.0 EXECUTIVE SUMMARY

A Final Status Survey (FSS) was performed of Survey Area OOL-09 in accordance with Yankee Nuclear Power Station's (YNPS) License Termination Plan (LTP). This FSS was conducted as an open land area FSS with soil DCGLs.

1.1 Identification of Survey Area and Units

The OOL-09 Survey Area is comprised of 5 Survey Units in the area of the site known as the Southeast Construction Fill Area (SCFA). The SCFA was not part of the plant RCA and there were no sub-surface systems that traversed or connected within the Survey Unit. Survey Unit OOL-09-01 is a partially wooded open land area approximately 1,102 m² in size. OOL-09-01 was surveyed as a Class 1 Survey Unit. Survey Unit OOL-09-02, located to the west-central portion of the SCFA, is an open land area consisting of approximately 1,123 m² in surface area. OOL-09-02 was surveyed as a Class 1 Survey Unit. Survey Unit OOL-09-03, located to the western half of the SCFA, is a partially wooded open land area consisting of approximately 5,217 m² in surface area. OOL-09-03 was surveyed as a Class 3 Survey Unit. Survey Unit OOL-09-04, located to the eastern half of the SCFA, is a partially wooded open land area consisting of approximately 7,186.7 m² in surface area. OOL-09-04 was surveyed as a Class 3 Survey Unit. Survey Unit OOL-09-05, located to the southwestern corner of the SCFA, is an open land area consisting of approximately 735.6 m² in surface area. OOL-09-05 was surveyed as a Class 1 Survey Unit.

A map of the Survey Area and Survey Units in relation to the site is found in Attachment A.

1.2 Dates of Surveys

Table 1 Date of Surveys and DQOs

Survey Unit	Survey Start Date	Survey End Date	DQA Date
OOL-09-01	6/12/2006	6/15/2006	7/26/2006
OOL-09-02	6/15/2006	6/19/2006	7/24/2006
OOL-09-03	7/14/2006	7/17/2006	8/29/2006
OOL-09-04	7/18/2006	7/19/2006	8/29/2006
OOL-09-05	7/07/2006	7/11/2006	8/23/2006

1.3 Number and Types of Measurements Collected

Final Status Survey Plans were developed for these Survey Units in accordance with YNPS LTP and FSS procedures using the MARSSIM protocol. The planning and design of the survey plan employed the Data Quality Objective (DQO) process, ensuring that the type, quantity and quality of data gathered was appropriate for the decision making process and that the resultant decisions were technically sound and defensible. A total of 100 statistical soil samples were taken in the Survey Area,

providing data for the non-parametric testing of the Survey Area. In addition to the soil samples, 100% of the Class 1 areas were scanned, and approximately 10% of the class 3 areas were scanned.

1.4 Summary of Survey Results

Following the survey, the data were reviewed against the survey design to confirm completeness and consistency, to verify that the results were valid, to ensure that the survey plan objectives were met and to verify Survey Unit classification. Soil sample surveys indicated that none of the systematic measurements exceeded the $DCGL_w$, depicted in Attachment B. Retrospective power curves were generated and demonstrated that an adequate number of samples were collected to support the Data Quality Objectives. Therefore, the null hypothesis (H_0) (that the Survey Unit exceeds the release criteria) is rejected.

1.5 Conclusions

Based upon the evaluation of the data acquired for the FSS, OOL-09 meets the release requirements set forth in the YNPS LTP. The Total Effective Dose Equivalent (TEDE) to the average member of the critical group does not exceed 25 mRem/yr, including that from groundwater. 10CFR20 Subpart E ALARA requirements have been met as well as the site release criteria for the administrative level DCGLs that ensure that the Massachusetts Department of Public Health's 10 mRem/yr limit will also be met.

2.0 FSS PROGRAM OVERVIEW

2.1 Survey Planning

The YNPS FSS Program employs a strategic planning approach for conducting final status surveys with the ultimate objective to demonstrate compliance with the DCGLs, in accordance with the YNPS LTP. The DQO process is used as a planning technique to ensure that the type, quantity, and quality of data gathered is appropriate for the decision-making process and that the resultant decisions are technically sound and defensible. Other key planning measures are the review of historical data for the Survey Area and the use of peer review for plan development.

2.2 Survey Design

In designing the FSS, the questions to be answered are: "Does the residual radioactivity, if present in the Survey Area, exceed the LTP release criteria?" and "Is the potential dose from this radioactivity ALARA?" In order to answer these questions, the radionuclides present in the Survey Area must be identified, and the Survey Units classified. Survey Units are classified with respect to the potential for contamination: the greater the potential for contamination, the more stringent the classification and the more rigorous the survey.

The survey design additionally includes the number, type and locations of soil samples (as well as any judgmental assessments required), scanning requirements, and instrumentation selection with the required sensitivities or detection levels. DCGLs are developed relative to the surface/material of the Survey Unit and are used to determine the minimum sensitivity required for the survey. Determining the acceptable decision error rates, the lower bound of the gray region (LBGR), statistical test selection and the calculation of the standard deviation and relative shift allows for the development of a prospective power curve plotting the probability of the Survey Unit passing FSS.

2.3 Survey Implementation

Once the planning and development has been completed, the implementation phase of the FSS program begins. Upon completion of remediation and final characterization activities, a final walk down of the Survey Unit is performed. If the unit is determined to be acceptable (i.e. physical condition of the unit is suitable for FSS), it is turned over to the FSS team, and FSS isolation and control measures are established. After the Survey Unit isolation and controls are in place, grid points are identified for the soil samples, using Global Positioning System (GPS) coordinates whenever possible, consistent with the Massachusetts State Plane System, and the area scan grid is identified. Data is collected and any required investigations are performed.

2.4 Survey Data Assessment

The final stage of the FSS program involves assessment of the data collected to ensure the validity of the results, to demonstrate achievement of the survey plan objectives, and to validate Survey Unit classification. During this phase, the DQOs and survey design are reviewed for consistency between DQO output, sampling design and other data collection documents. A preliminary data review is conducted to include: checking for problems or anomalies, calculation of statistical quantities and preparation of graphical representations for data comparison. Statistical tests are performed, if required, and the assumptions for the tests are verified. Conclusions are then drawn from the data, and any deficiencies or recommendations for improvement are documented.

2.5 Quality Assurance and Quality Control Measures

YNPS FSS activities are implemented and performed under approved procedures, and the YNPS Quality Assurance Project Plan (QAPP) assures plans, procedures and instructions have been followed during the course of FSS, as well as providing guidance for implementing quality control measures specified in the YNPS LTP.

3.0 SURVEY AREA INFORMATION

3.1 Survey Area Description

OOL-09 Survey Area is comprised of 5 Survey Units in the area of the site known as the Southeast Construction Fill Area (SCFA). The SCFA was not part of the plant RCA, there were no structures in the area and there were no sub-surface systems that traversed or connected within the survey area. A map of the Survey Area and Unit divisions are found in Attachment A.

3.1.1 OOL-09-01 Description

Survey Unit OOL-09-01 is mostly open land, partly wooded area approximately 1,102 m² located to the west side of the SCFA. The Survey Unit was not part of the RCA during plant operations and was not expected to contain plant related nuclides. During decommissioning the Survey Unit became a Restricted Area-Radioactive Material Area due to the storage of Reactor Support Structure (RSS) concrete and debris. RSS concrete and debris was removed from the Survey Unit and the Survey Unit was remediated. Remediation resulted in a large depression on the east side of the Survey Unit. The west side of the Survey Unit rises to a forested area then drops to the road leading to the SCFA. The west side of the Survey Unit is in direct line of sight and close proximity to the ISFSI.

3.1.2 OOL-09-02 Description

Survey Unit OOL-09-02 is an open land area approximately 1,123 m² located to the west-central portion of the SCFA. The Survey Unit was not part of the RCA during plant operations and was not expected to contain plant related nuclides. During decommissioning the Survey Unit became a Restricted Area-Radioactive Material Area due to the storage of Reactor Support Structure (RSS) concrete and debris. RSS concrete and debris was removed from the Survey Unit and the Survey Unit was remediated. Remediation resulted in a large depression on the west side of the Survey Unit. The east side of the Survey Unit rises slowly to the grade of the adjoining Survey Unit (OOL-09-04 a Class 3 Survey Unit).

3.1.3 OOL-09-03 Description

Survey Unit OOL-09-03 is a mostly forested, partially open land area approximately 5,217 m² located to the western half of the SCFA. OOL-09-03 provides a buffer area on the northern, western and southern sides of Class 1 Survey Units OOL-09-01, OOL-09-02 and OOL-09-05. OOL-

09-03 includes the roadway used to access the SCFA. The Survey Unit was not part of the RCA and was not expected to contain plant related nuclides. The Survey Unit consists of rolling to steeply inclined topography.

3.1.4 OOL-09-04 Description

Survey Unit OOL-09-04 is a part open land, part forested area of approximately 7,186.7 m² located to the eastern half of the SCFA. OOL-09-04 provides a buffer area on the eastern side of Class 1 Survey Units OOL-09-02 and OOL-09-05. Survey Unit OOL-09-04 shares a boundary with Class 3 Survey Unit OOL-09-03. OOL-09-04 was not part of the RCA and was not expected to contain plant related nuclides. The Survey Unit consists of rolling to steeply inclined topography.

3.1.5 OOL-09-05 Description

OOL-09-05 is open land area of approximately 735.6 m² surface area located to the southwestern corner of the SCFA. The Survey Unit was not part of the RCA during plant operations and was not expected to contain plant related nuclides. During decommissioning the Survey Unit became a Restricted Area-Radioactive Material Area due to the storage of waste and debris from demolition and decommissioning activities in the RCA and Industrial Area. Waste and debris was removed from the Survey Unit and the Survey Unit was remediated. Remediation resulted in the majority of the area becoming a large depression.

3.2 History of Survey Area

OOL-09 at one time contained an accumulation of soil and construction debris as well as discarded components that were generated over the life of the plant. Prior to decommissioning OOL-09 was not used for storing radioactive material or processing, packaging or disposal of radioactive waste. During decommissioning, RSS concrete rubble, as well as material >DCGL was stockpiled within the boundaries of OOL-09-01 and OOL-09-02 and OOL-09-05. OOL-09-01 and OOL-09-02 contain the footprint/remnants of Pile #24 – consisting of RCA soil and debris as well as RSS (Reactor Support Structures) concrete rubble. OOL-09-05 contains the footprint of Piles #151/152 – consisting of soil, rock and concrete rubble debris from excavations of the East Storm Drain, Mt. Herdon, the Service Building and the Alleyway (all within the RCA). Soil, rock and concrete rubble were transported within the boundaries of OOL-09-03 and OOL-09-04. The stockpiled material was removed from OOL-09-01, OOL-09-02 and OOL-09-05 and the areas were remediated as necessary.

3.3 Division of Survey Area into Survey Units

The OOL-09 Survey Area is divided into 5 Survey Units. OOL-09-01, OOL-09-02 and OOL-09-05 are class 1 Survey Units. OOL-09-03 and OOL-09-04 are class 3 Survey Units. A map of the Survey Area and Unit divisions are found in Attachment A.

4.0 SURVEY UNIT INFORMATION

4.1 Summary of Radiological Data Since Historical Site Assessment (HSA)

4.1.1 Chronology and Description of Surveys Since HSA

The Table below provides a summary of surveys performed during the Final Status Survey of OOL-09.

Table 2 Dates of Surveys since HSA

Survey Unit	Survey Start Date	Survey End Date	Description
OOL-09-01	6/12/2006	6/15/2006	FSS Survey
OOL-09-02	6/15/2006	6/19/2006	FSS Survey
OOL-09-03	7/14/2006	7/17/2006	FSS Survey
OOL-09-04	7/18/2006	7/19/2006	FSS Survey
OOL-09-05	7/07/2006	7/11/2006	FSS Survey

4.1.2 Radionuclide Selection and Basis

4.1.2.1 OOL-09-01 Radionuclides of Concern

During the initial DQO process, Co-60, Cs-137, C-14 and H-3 were identified as the radiological nuclides of concern for OOL-09-01. Characterization survey data from the HSA indicated Co-60 and Cs-137 were the only identified LTP specified radionuclides that warranted consideration in the OOL-09 Survey Area. However, during decommissioning, concrete rubble contaminated with H-3 and C-14 was stored on the ground in this Survey Unit. As a result, all soil samples were evaluated for all LTP listed nuclides.

4.1.2.2 OOL-09-02 Radionuclides of Concern

During the initial DQO process, Co-60, Cs-137, C-14 and H-3 were identified as the radiological nuclides of concern for OOL-09-02. Characterization survey data from the HSA indicated Co-60 and Cs-137 were the only identified LTP

specified radionuclides that warranted consideration in the OOL-09 Survey Area. However, during decommissioning, concrete rubble contaminated with H-3 and C-14 was stored on the ground in this Survey Unit. As a result, all soil samples were evaluated for all LTP listed nuclides.

4.1.2.3 OOL-09-03 Radionuclides of Concern

During the initial DQO process, Cs-137 was identified as the only radiological nuclide of concern for OOL-09-03. Characterization survey data from the HSA data indicated no other LTP-specified radionuclides warrant consideration in the OOL-09-03 Survey Unit. However, soil samples were evaluated for all LTP listed nuclides.

4.1.2.4 OOL-09-04 Radionuclides of Concern

During the initial DQO process, Cs-137 was identified as the only radiological nuclide of concern for OOL-09-04. Characterization survey data from the HSA data indicated no other LTP-specified radionuclides warrant consideration in the OOL-09-04 Survey Unit. However, soil samples were evaluated for all LTP listed nuclides.

4.1.2.5 OOL-09-05 Radionuclides of Concern

During the initial DQO process, Cs-137 was identified as the only radiological nuclide of concern for OOL-09-05. Characterization survey data from the HSA data indicated no other LTP-specified radionuclides warrant consideration in the OOL-09-05 Survey Unit. However, soil samples were evaluated for all LTP listed nuclides.

4.1.3 Scoping & Characterization

Characterization data for the OOL-09 Area was taken using ISOCS from 5/23/06 through 5/30/06. A total of 89 measurements were taken using ISOCS, resulting in one positive measurement for Co⁶⁰ and eight positive measurements for Cs¹³⁷. All other plant-related radionuclides were <MDA.

4.2 Basis for Classification

Based upon the radiological condition of this Survey Area identified in the operating history and as a result of the decommissioning activities performed to date, Survey Unit OOL-09-01, OOL-09-02, and OOL-09-05 were identified as Class 1 areas.

Survey Unit OOL-09-03 and OOL-09-04 were identified as Class 3 areas. The YNPS LTP allows for different classifications of Survey Units within a Survey Area.

4.3 Remedial Actions and Further Investigations

4.3.1 OOL-09-01 Remedial Actions and Further Investigations

No investigations or remedial actions were required in OOL-09-01.

4.3.2 OOL-09-02 Remedial Actions and Further Investigations

No investigations or remedial actions were required in OOL-09-02.

4.3.3 OOL-09-03 Remedial Actions and Further Investigations

No investigations or remedial actions were required in OOL-09-03.

4.3.4 OOL-09-04 Remedial Actions and Further Investigations

Six areas were investigated using ISOCS. No plant related radionuclides were identified in any of the ISOCS scans and no remediation was required. No elevated areas remained in OOL-09-04.

4.3.5 OOL-09-05 Remedial Actions and Further Investigations

Two areas were investigated using ISOCS. No plant related radionuclides were identified in any of the ISOCS scans and no remediation was required. No elevated areas remained in OOL-09-05.

4.4 Unique Features of Survey Area

Survey Units OOL-09-01 and OOL-09-02 were an open excavation formed by the removal of the stockpiled RSS concrete rubble. OOL-09-03 and OOL-09-04 consisted of rolling to steeply inclined topography. OOL-09-05 consisted of an open excavation formed by the removal of piles 151 and 152.

4.5 ALARA Practices and Evaluations

The generic ALARA evaluation for soils is documented in Appendix C, Technical Report YA-REPT-00-003-05, "Generic ALARA Review for Final Status Survey of Soil at YNPS". The report is augmented by individual evaluations which are found in Appendix D, which concludes that no further remediation of soil below the DCGL is warranted.

5.0 SURVEY UNIT FINAL STATUS SURVEY

5.1 Survey Planning

5.1.1 Final Status Survey Plan and Associated DQOs

The FSS for OOL-09 Survey Area was planned and developed in accordance with the LTP using the DQO process. Form DPF-8856.1, found in YNPS Procedure 8856, "*Preparation of Survey Plans*," was used to provide guidance and consistency during development of the FSS Plans. The FSS Plans can be found in Appendix A. The DQO process allows for systematic planning and is specifically designed to address problems that require a decision to be made in a complex survey design and, in turn, provides alternative actions.

The DQO process was used to develop an integrated survey plan providing the Survey Unit identification, sample size, selected analytical techniques, survey instrumentation, and scan coverage. The Sign Test was specified for non-parametric statistical testing for this Survey Unit, if required. The design parameters developed are presented below.

Table 3 Survey Area OOL-09 Design Parameters

Survey Unit	Design Parameter	Value	Basis
OOL-09-01	Survey Unit Area	1102.3 m ²	Class 1, Soil, $\leq 2,000$ m ²
	Number of Direct Measurements	15 (calculated) + 10 (added) Total: 25	α (Type I) = 0.05 β (Type II) = 0.05 σ : 0.0546 Relative Shift: 2 DCGLw (Unity): 1 LBGR: 0.8908
	Critical Value	17 for Sign test.	$(25/2) + (1.645/2) * \text{Square Root}(25)$
	Gridded Sample Area Size Factor	44.09m ²	Area / Number of Samples (1102.3 m ² /25)
	Sample Grid Spacing:	Triangular: 7.1m	Square Root (1102.3 m ² /(0.866*25))
	Direct Measurement Investigation Level	> DCGL _{mc} or > DCGL _w + 3 Sigma	1m 180° ISOCS
	Scanning Coverage Requirements	1102.3 m ²	Class 1 Soil Area: 100%
	Scan Investigation Level	Co-60: 0.18pCi/gm, Cs-137 : 0.7pCi/gm, or SOF >1	1m 180° ISOCS
OOL-09-02	Survey Unit Area	1123 m ²	Class 1, Soil, $\leq 2,000$ m ²
	Number of Direct Measurements	15 (calculated) + 10 (added) Total: 25	α (Type I) = 0.05 β (Type II) = 0.05 σ : 0.0546 Relative Shift: 2

Survey Unit	Design Parameter	Value	Basis
			DCGLw (Unity): 1 LBGR: 0.8908
	Critical Value	17 for Sign test.	$(25/2) + (1.645/2) * \text{Square Root}(25)$
	Gridded Sample Area Size Factor	44.92m ²	Area / Number of Samples (1123 m ² /25)
	Sample Grid Spacing:	Triangular: 7.2m	Square Root (1123 m ² /(0.866*25))
	Direct Measurement Investigation Level	> DCGL _{emc} or > DCGLw + 3 Sigma	Class 1 Area: > DCGL _{emc} or > DCGLw + 3 Sigma
	Scanning Coverage Requirements	1123 m ²	Class 1 Soil Area: 100%
	Scan Investigation Level	Co-60: 0.18pCi/gm, Cs-137 : 0.7pCi/gm, or SOF >1	1m 180° ISOCS
OOL-09-03	Survey Unit Area	5217 m ²	Class 3, Soil, no restrictions
	Number of Direct Measurements	15 (calculated) + 0 (added) Total: 15	α (Type I) = 0.05 β (Type II) = 0.05 σ : 0.0327 Relative Shift: 2 DCGLw: 3 LBGR: 2.9346
	Critical Value	11 for Sign test.	$(15/2) + (1.645/2) * \text{Square Root}(15)$
	Gridded Sample Area Size Factor	Class 3: N/A	No grid in Class 3 area
	Sample Grid Spacing:	No Grid	No grid in Class 3 area, random locations
	Direct Measurement Investigation Level	> 50% DCGLw	Class 3 Area: > 50% DCGLw
	Scanning Coverage Requirements	Judgmental	Class 3 Soil Area: Judgmental
	Scan Investigation Level	>MDA LTP listed nuclides.	1m 180° ISOCS
	Survey Unit Area	7186.7 m ²	Class 3, Soil, no restrictions
	Number of Direct Measurements	15 (calculated) + 0 (added) Total: 15	α (Type I) = 0.05 β (Type II) = 0.05 σ : 0.0327 Relative Shift: 2 DCGLw: 3 LBGR: 2.9346
	Critical Value	11 for Sign test.	$(15/2) + (1.645/2) * \text{Square Root}(15)$
	Gridded Sample Area Size Factor	Class 3: N/A	No grid in Class 3 area
	Sample Grid Spacing:	No Grid	No grid in Class 3 area, random locations
	Direct Measurement Investigation Level	> 50% DCGLw	Class 3 Area: > 50% DCGLw
OOL-09-04	Scanning Coverage Requirements	Judgmental	Class 3 Soil Area: Judgmental
	Scan Investigation Level	> Background	Class 3 Area: Detectable over background

Survey Unit	Design Parameter	Value	Basis
OOL-09-05	Survey Unit Area	735.6 m ²	Class 1, Soil, $\leq 2,000$ m ²
	Number of Direct Measurements	15 (calculated) + 5 (added) Total: 20	α (Type I) = 0.05 β (Type II) = 0.05 σ : 0.0331 Relative Shift: 2 DCGLw: 3 LBGR: 2.9338
	Critical Value	14 for Sign test.	$(20/2) + (1.645/2) * \text{Square Root}(20)$
	Gridded Sample Area Size Factor	36.78m ²	Area / Number of Samples (735.6 m ² /20)
	Sample Grid Spacing:	Triangular: 6.5m	Square Root (735.6 m ² /(0.866*20))
	Direct Measurement Investigation Level	> DCGL _{emc} or > DCGL _w + 3 Sigma	Class 1 Area: > DCGL _{emc} or > DCGL _w + 3 Sigma
	Scanning Coverage Requirements	735.6 m ²	Class 1 Soil Area: 100%
	Scan Investigation Level	Co-60: 0.18pCi/gm, Cs-137 : 0.7pCi/gm, or SOF >1	1m 180° ISOCS

5.1.2 Deviations from the FSS Plan as Written in the LTP

The FSSP design was performed to the criteria of the LTP; therefore, no LTP deviations with potential impact to this Survey Area need to be evaluated.

5.1.3 DCGL Selection and Use

For the final evaluation of the OOL-09 Survey Area and throughout this report, the administrative acceptance criterion of 8.73 mRem/yr has been set for Soil LTP-listed radionuclides.

Table 4 Soil DCGL Values

Nuclide	Soil 8.73 mR/yr (pCi/g)	Nuclide	Soil 8.73 mR/yr (pCi/g)
Co-60	1.4E+00	H-3	1.3E+02
Nb-94	2.5E+00	C-14	1.9E+00
Ag-108m	2.5E+00	Fe-55	1.0E+04
Sb-125	1.1E+01	Ni-63	2.8E+02
Cs-134	1.7E+00	Sr-90	6.0E-01
Cs-137	3.0E+00	Tc-99	5.0E+00
Eu-152	3.6E+00	Pu-238	1.2E+01
Eu-154	3.3E+00	Pu-239	1.1E+01
Eu-155	1.4E+02	Pu-241	3.4E+02
Am-241	1.0E+01	Cm-243	1.1E+01

5.1.4 Measurements

Error tolerances and characterization sample population statistics drove the selection of the number of statistical measurements. The quantity of statistical measurements collected for each unit is listed above in the table titled “Survey Area OOL-09 Design Parameters”. Split samples and recounts are addressed under the quality control section 6.2. The OOL-09-01, OOL-09-02 and OOL-09-05 soil sampling grid was developed as a systematic grid with spacing consisting of a triangular pitch pattern with a random starting point. The OOL-09-03 and OOL-09-04 sample locations were randomly determined. Sample measurement locations are provided in Attachment A.

The class 1 areas; OOL-09-01, OOL-09-02, and OOL-09-05 were scanned 100% with ISOCS. The results are listed in the table below titled “ISOCS Scan Summary”. The class 3 areas; OOL-09-03 and OOL-09-04 scan coverage was approximately 10%. OOL-09-03 was scanned with ISOCS, and listed in the ISOCS table below. OOL-09-04 was scanned via SPA-3. Investigation scans in OOL-09-04 were performed using ISOCS.

5.2 Survey Implementation Activities

The Table below provides a summary of daily activities performed during the Final Status Survey of OOL-09.

Table 5 FSS Activity Summary for OOL-09

Survey Unit	Date	Activity
OOL-09-01	6/12/2006	Performed walk-down of Survey Unit
	6/12/2006	Established Isolation and Controls
	6/12/2006	Performed Job Hazard Analysis
	6/12/2006	Performed Unit Classification
	6/12/2006	Performed Sample Quantity Calculations, established DQOs
	6/12/2006	Generated FFS Sample Plans
	6/12/2006 to 6/15/06	Initiated Scans, and Direct measurements.
	7/26/2006	Performed DQA, FSS Complete
OOL-09-02	6/7/2006	Performed walk-down of Survey Unit
	6/15/2006	Established Isolation and Controls
	6/15/2006	Performed Job Hazard Analysis
	6/12/2006	Performed Unit Classification
	6/12/2006	Performed Sample Quantity Calculations, established DQOs
	6/13/2006	Generated FFS Sample Plans
	6/15/2006 to 6/19/2006	Initiated Scans, and Direct measurements.
	7/24/2006	Performed DQA, FSS Complete
OOL-09-03	7/12/2006	Performed walk-down of Survey Unit
	7/13/2006	Established Isolation and Controls

Survey Unit	Date	Activity
	7/12/2006	Performed Job Hazard Analysis
	7/10/2006	Performed Unit Classification
	7/12/2006	Performed Sample Quantity Calculations, established DQOs
	7/13/2006	Generated FFS Sample Plans
	7/14/2006 to 7/17/2006	Initiated Scans, and Direct measurements.
	8/29/2006	Performed DQA, FSS Complete
OOL-09-04	7/12/2006	Performed walk-down of Survey Unit
	7/13/2006	Established Isolation and Controls
	7/17/2006	Performed Job Hazard Analysis
	7/17/2006	Performed Unit Classification
	7/10/2006	Performed Sample Quantity Calculations, established DQOs
	7/10/2006	Generated FFS Sample Plans
	7/18/2006 to 7/19/06	Initiated Scans, and Direct measurements.
	8/29/2006	Performed DQA, FSS Complete
OOL-09-05	5/4/2006	Performed walk-down of Survey Unit
	7/7/2006	Established Isolation and Controls
	6/15/2006	Performed Job Hazard Analysis
	6/15/2006	Performed Unit Classification
	6/15/2006	Performed Sample Quantity Calculations, established DQOs
	6/19/2006	Generated FFS Sample Plans
	7/7/2006 to 7/11/2006	Initiated Scans, and Direct measurements.
	8/23/2006	Performed DQA, FSS Complete

5.3 Surveillance Surveys

5.3.1 Periodic Surveillance Surveys

Upon completion of the FSS of Survey Area OOL-09, the Survey Area was placed into the program for periodic surveillance surveys on a quarterly basis in accordance with YNPS procedure DP-8860, “*Area Surveillance Following Final Status Survey*.” These surveys provide assurance that areas with successful FSS remain unchanged until license termination.

5.3.2 Resurveys

No resurveys were performed in OOL-09.

5.3.3 Investigations

No additional investigations were required for this Survey Area due to surveillance surveys.

5.4 Survey Results

Soil sample surveys indicated that OOL-09 had no systematic measurements that exceeded the $DCGL_w$, depicted in Attachment B. Retrospective power curves were generated and demonstrated that an adequate number of samples were collected to support the Data Quality Objectives. Therefore, the null hypothesis (H_0) (that the Survey Unit exceeds the release criteria) is rejected.

Table 6 Soil Sample Summary

Sample Description	SOF	Sample Description	SOF	Sample Description	SOF	Sample Description	SOF	Sample Description	SOF
OOL-09-01-001-F	0.06	OOL-09-02-001-F	0.09	OOL-09-03-001-F	0.12	OOL-09-04-001-F	0.02	OOL-09-05-001-F	0.05
OOL-09-01-002-F	0.07	OOL-09-02-002-F	0.05	OOL-09-03-002-F	0.18	OOL-09-04-002-F	0.07	OOL-09-05-002-F	0.08
OOL-09-01-003-F	0.04	OOL-09-02-003-F	0.06	OOL-09-03-003-F	0.22	OOL-09-04-003-F	0.16	OOL-09-05-003-F	0.06
OOL-09-01-004-F	0.41	OOL-09-02-004-F	0.07	OOL-09-03-004-F	0.20	OOL-09-04-004-F	0.07	OOL-09-05-004-F	0.05
OOL-09-01-005-F	0.12	OOL-09-02-005-F	0.05	OOL-09-03-005-F	0.92	OOL-09-04-005-F	0.04	OOL-09-05-005-F	0.05
OOL-09-01-006-F	0.29	OOL-09-02-006-F	0.04	OOL-09-03-006-F	0.04	OOL-09-04-006-F	0.04	OOL-09-05-006-F	0.05
OOL-09-01-007-F	0.08	OOL-09-02-007-F	0.08	OOL-09-03-007-F	0.17	OOL-09-04-007-F	0.16	OOL-09-05-007-F	0.08
OOL-09-01-008-F	0.58	OOL-09-02-008-F	0.12	OOL-09-03-008-F	0.05	OOL-09-04-008-F	0.04	OOL-09-05-008-F	0.08
OOL-09-01-009-F	0.07	OOL-09-02-009-F	0.06	OOL-09-03-009-F	0.07	OOL-09-04-009-F	0.07	OOL-09-05-009-F	0.16
OOL-09-01-010-F	0.05	OOL-09-02-010-F	0.08	OOL-09-03-010-F	0.15	OOL-09-04-010-F	0.04	OOL-09-05-010-F	0.10
OOL-09-01-011-F	0.08	OOL-09-02-011-F	0.07	OOL-09-03-011-F	0.15	OOL-09-04-011-F	0.04	OOL-09-05-011-F	0.06
OOL-09-01-012-F	0.22	OOL-09-02-012-F	0.04	OOL-09-03-012-F	0.03	OOL-09-04-012-F	0.07	OOL-09-05-012-F	0.04
OOL-09-01-013-F	0.11	OOL-09-02-013-F	0.26	OOL-09-03-013-F	0.35	OOL-09-04-013-F	0.09	OOL-09-05-013-F	0.06
OOL-09-01-014-F	0.11	OOL-09-02-014-F	0.07	OOL-09-03-014-F	0.05	OOL-09-04-014-F	0.05	OOL-09-05-014-F	0.03
OOL-09-01-015-F	0.12	OOL-09-02-015-F	0.13	OOL-09-03-015-F	0.21	OOL-09-04-015-F	0.08	OOL-09-05-015-F	0.04
OOL-09-01-016-F	0.05	OOL-09-02-016-F	0.06					OOL-09-05-016-F	0.08
OOL-09-01-017-F	0.32	OOL-09-02-017-F	0.05					OOL-09-05-017-F	0.07
OOL-09-01-018-F	0.11	OOL-09-02-018-F	0.05					OOL-09-05-018-F	0.05
OOL-09-01-019-F	0.09	OOL-09-02-019-F	0.07					OOL-09-05-019-F	0.06
OOL-09-01-020-F	0.06	OOL-09-02-020-F	0.06					OOL-09-05-020-F	0.06
OOL-09-01-021-F	0.05	OOL-09-02-021-F	0.05						
OOL-09-01-022-F	0.08	OOL-09-02-022-F	0.17						
OOL-09-01-023-F	0.07	OOL-09-02-023-F	0.11						
OOL-09-01-024-F	0.08	OOL-09-02-024-F	0.04						
OOL-09-01-025-F	0.06	OOL-09-02-025-F	0.09						
Max	0.58	0.26		0.92		0.16		0.16	
Average	0.13	0.08		0.19		0.07		0.06	
Standard Deviation	0.13	0.05		0.22		0.04		0.03	

SPA-3s were used for scan surveys of OOL-09-04. No activity greater than background or DCGL_w, attributable to plant radionuclides was present in OOL-09-04. ISOCS systems were used to perform scan surveys for the remainder of the units. Measurement results listed below are reported in sum of fraction of the investigation levels. A number less than one indicates that no investigation was warranted.

$$\text{Investigation level } (I_{LV}) = {}^1DCGL_w \times {}^2AF \times \text{AdjustmentFactor}$$

¹ Soil DCGL_w from Appendix 6E of YNPS LTP

² Area Factor for 1 m² taken from Appendix 6Q of YNPS LTP

$$\frac{C_1}{I_{LV_1}} + \frac{C_2}{I_{LV_2}} + \dots + \frac{C_n}{I_{LV_n}} \leq 1$$

where:

C_n = Concentration of radionuclide n

I_{LV} = Investigation level for radionuclide n

Table 7 ISOCS Scan Summary

Sample Title	SOF	Sample Title	SOF	Sample Title	SOF	Sample Title	SOF
OOL-09-01-101-F-G	0.00	OOL-09-02-101-F-G	0.00	OOL-09-03-101-F-G	0.00	OOL-09-05-101-F-G	0.00
OOL-09-01-102-F-G	0.00	OOL-09-02-102-F-G	0.00	OOL-09-03-102-F-G	0.00	OOL-09-05-102-F-G	0.00
OOL-09-01-103-F-G	0.00	OOL-09-02-103-F-G	0.00	OOL-09-03-103-F-G	0.00	OOL-09-05-103-F-G	0.00
OOL-09-01-104-F-G	0.00	OOL-09-02-104-F-G	0.00	OOL-09-03-104-F-G	0.00	OOL-09-05-104-F-G	0.00
OOL-09-01-105-F-G	0.00	OOL-09-02-105-F-G	0.00	OOL-09-03-105-F-G	0.00	OOL-09-05-105-F-G	0.00
OOL-09-01-106-F-G	0.09	OOL-09-02-106-F-G	0.64	OOL-09-03-106-F-G	0.00	OOL-09-05-106-F-G	0.00
OOL-09-01-107-F-G	0.17	OOL-09-02-107-F-G	0.00	OOL-09-03-107-F-G	0.00	OOL-09-05-107-F-G	0.00
OOL-09-01-108-F-G	0.07	OOL-09-02-108-F-G	0.00	OOL-09-03-108-F-G	0.00	OOL-09-05-108-F-G	0.00
OOL-09-01-109-F-G	0.00	OOL-09-02-109-F-G	0.00	OOL-09-03-109-F-G	0.00	OOL-09-05-109-F-G	0.00
OOL-09-01-110-F-G	0.00	OOL-09-02-110-F-G	0.00	OOL-09-03-110-F-G	0.00	OOL-09-05-110-F-G	0.00
OOL-09-01-111-F-G	0.00	OOL-09-02-111-F-G	0.00	OOL-09-03-111-F-G	0.00	OOL-09-05-111-F-G	0.00
OOL-09-01-112-F-G	0.00	OOL-09-02-112-F-G	0.00	OOL-09-03-112-F-G	0.00	OOL-09-05-112-F-G	0.00
OOL-09-01-113-F-G	0.00	OOL-09-02-113-F-G	0.00	OOL-09-03-113-F-G	0.00	OOL-09-05-113-F-G	0.00
OOL-09-01-114-F-G	0.18	OOL-09-02-114-F-G	0.00	OOL-09-03-114-F-G	0.00	OOL-09-05-114-F-G	0.00
OOL-09-01-115-F-G	0.13	OOL-09-02-115-F-G	0.00	OOL-09-03-115-F-G	0.00	OOL-09-05-115-F-G	0.00
OOL-09-01-116-F-G	0.00	OOL-09-02-116-F-G	0.00	OOL-09-03-116-F-G	0.00	OOL-09-05-116-F-G	0.00
OOL-09-01-117-F-G	0.00	OOL-09-02-117-F-G	0.00	OOL-09-03-117-F-G	0.00	OOL-09-05-117-F-G	0.00
OOL-09-01-118-F-G	0.00	OOL-09-02-118-F-G	0.00	OOL-09-03-118-F-G	0.00	OOL-09-05-118-F-G	0.00
OOL-09-01-119-F-G	0.07	OOL-09-02-119-F-G	0.00	OOL-09-03-119-F-G	0.00	OOL-09-05-119-F-G	0.00
OOL-09-01-120-F-G	0.00	OOL-09-02-120-F-G	0.00	OOL-09-03-120-F-G	0.00	OOL-09-05-120-F-G	0.00
OOL-09-01-121-F-G	0.00	OOL-09-02-121-F-G	0.00	OOL-09-03-121-F-G	0.00	OOL-09-05-121-F-G	0.00
OOL-09-01-122-F-G	0.00	OOL-09-02-122-F-G	0.00	OOL-09-03-121-F-G	0.00	OOL-09-05-122-F-G	0.00
OOL-09-01-123-F-G	0.00	OOL-09-02-123-F-G	0.00	OOL-09-03-122-F-G	0.00	OOL-09-05-123-F-G	0.00
OOL-09-01-124-F-G	0.00	OOL-09-02-124-F-G	0.00	OOL-09-03-123-F-G	0.00	OOL-09-05-124-F-G	0.00
OOL-09-01-125-F-G	0.00	OOL-09-02-125-F-G	0.00	OOL-09-03-124-F-G	0.00	OOL-09-05-125-F-G	0.00
OOL-09-01-126-F-G	0.00	OOL-09-02-126-F-G	0.00	OOL-09-03-125-F-G	0.00	OOL-09-05-126-F-G	0.00
OOL-09-01-127-F-G	0.00	OOL-09-02-127-F-G	0.00	OOL-09-03-126-F-G	0.00	OOL-09-05-127-F-G	0.88
OOL-09-01-128-F-G	0.00	OOL-09-02-128-F-G	0.00	OOL-09-03-127-F-G	0.00	OOL-09-05-128-F-G	0.00

Sample Title	SOF	Sample Title	SOF	Sample Title	SOF	Sample Title	SOF
OOL-09-01-129-F-G	0.14	OOL-09-02-129-F-G	0.00	OOL-09-03-128-F-G	0.00	OOL-09-05-129-F-G	0.00
OOL-09-01-130-F-G	0.10	OOL-09-02-130-F-G	0.00	OOL-09-03-129-F-G	0.00	OOL-09-05-130-F-G	0.00
OOL-09-01-131-F-G	0.10	OOL-09-02-131-F-G	0.00	OOL-09-03-130-F-G	0.00	OOL-09-05-131-F-G	0.00
OOL-09-01-132-F-G	0.00	OOL-09-02-132-F-G	0.00	OOL-09-03-131-F-G	0.00	OOL-09-05-132-F-G	0.00
OOL-09-01-133-F-G	0.00	OOL-09-02-133-F-G	0.00	OOL-09-03-132-F-G	0.00	OOL-09-05-133-F-G	0.00
OOL-09-01-134-F-G	0.00	OOL-09-02-134-F-G	0.00	OOL-09-03-133-F-G	0.00	OOL-09-05-134-F-G	0.07
OOL-09-01-135-F-G	0.00	OOL-09-02-135-F-G	0.00	OOL-09-03-134-F-G	0.00	OOL-09-05-135-F-G	0.07
OOL-09-01-136-F-G	0.15	OOL-09-02-136-F-G	0.00	OOL-09-03-135-F-G	0.00	OOL-09-05-136-F-G	0.08
OOL-09-01-137-F-G	0.00	OOL-09-02-137-F-G	0.00	OOL-09-03-136-F-G	0.00	OOL-09-05-137-F-G	0.99
OOL-09-01-138-F-G	0.00	OOL-09-02-138-F-G	0.00	OOL-09-03-136-F-G	0.00	OOL-09-05-138-F-G	0.00
OOL-09-01-139-F-G	0.00	OOL-09-02-139-F-G	0.00	OOL-09-03-137-F-G	0.00	OOL-09-05-139-F-G	0.00
OOL-09-01-140-F-G	0.00	OOL-09-02-140-F-G	0.00	OOL-09-03-138-F-G	0.00	OOL-09-05-140-F-G	0.00
OOL-09-01-141-F-G	0.21	OOL-09-02-141-F-G	0.00	OOL-09-03-139-F-G	0.00	OOL-09-05-141-F-G	0.00
OOL-09-01-142-F-G	0.00	OOL-09-02-142-F-G	0.00	OOL-09-03-140-F-G	0.00	OOL-09-05-142-F-G	0.00
OOL-09-01-143-F-G	0.00	OOL-09-02-143-F-G	0.07	OOL-09-03-141-F-G	0.00	OOL-09-05-143-F-G	0.00
OOL-09-01-144-F-G	0.00	OOL-09-02-144-F-G	0.00	OOL-09-03-142-F-G	0.00	OOL-09-05-144-F-G	0.00
OOL-09-01-145-F-G	0.00	OOL-09-02-145-F-G	0.00	OOL-09-03-143-F-G	0.00	OOL-09-05-145-F-G	0.14
OOL-09-01-146-F-G	0.00	OOL-09-02-146-F-G	0.00	OOL-09-03-144-F-G	0.00	OOL-09-05-146-F-G	0.00
OOL-09-01-147-F-G	0.10	OOL-09-02-147-F-G	0.00	OOL-09-03-145-F-G	0.00	OOL-09-05-147-F-G	0.00
OOL-09-01-148-F-G	0.00	OOL-09-02-148-F-G	0.00	OOL-09-03-146-F-G	0.00	OOL-09-05-148-F-G	0.00
OOL-09-01-149-F-G	0.00	OOL-09-02-149-F-G	0.00	OOL-09-03-147-F-G	0.00	OOL-09-05-149-F-G	0.00
OOL-09-01-150-F-G	0.10	OOL-09-02-150-F-G	0.00	OOL-09-03-148-F-G	0.00	OOL-09-05-150-F-G	0.00
OOL-09-01-151-F-G	0.00	OOL-09-02-151-F-G	0.00	OOL-09-03-149-F-G	0.00	OOL-09-05-151-F-G	0.00
OOL-09-01-152-F-G	0.26	OOL-09-02-152-F-G	0.00	OOL-09-03-150-F-G	0.00	OOL-09-05-152-F-G	0.00
OOL-09-01-153-F-G	0.00	OOL-09-02-153-F-G	0.00			OOL-09-05-153-F-G	0.00
OOL-09-01-154-F-G-R	0.14	OOL-09-02-154-F-G	0.00	OOL-09-04-001-F-G-I	0.00	OOL-09-05-154-F-G	0.00
OOL-09-01-155-F-G	0.30	OOL-09-02-155-F-G	0.00	OOL-09-04-002-F-G-I	0.00	OOL-09-05-155-F-G	0.00
OOL-09-01-156-F-G	0.00	OOL-09-02-156-F-G	0.00	OOL-09-04-003-F-G-I	0.00	OOL-09-05-156-F-G	0.00
OOL-09-01-157-F-G	0.21	OOL-09-02-157-F-G	0.08	OOL-09-04-004-F-G-I	0.00	OOL-09-05-157-F-G	0.00
OOL-09-01-158-F-G	0.00	OOL-09-02-158-F-G	0.00	OOL-09-04-005-F-G-I	0.00	OOL-09-05-158-F-G	0.00
OOL-09-01-159-F-G	0.00	OOL-09-02-159-F-G	0.00	OOL-09-04-006-F-G-I	0.00	OOL-09-05-159-F-G	0.00
OOL-09-01-160-F-G	0.00	OOL-09-02-160-F-G	0.00	OOL-09-04-007-F-G-I	0.00	OOL-09-05-160-F-G	0.00
OOL-09-01-161-F-G	0.24	OOL-09-02-161-F-G	0.00	OOL-09-04-008-F-G-I	0.00	OOL-09-05-161-F-G	0.00
OOL-09-01-162-F-G	0.00	OOL-09-02-162-F-G	0.00	OOL-09-04-009-F-G-I	0.00	OOL-09-05-162-F-G	0.00
OOL-09-01-163-F-G	0.29	OOL-09-02-163-F-G	0.00	OOL-09-04-010-F-G-I	0.00		
OOL-09-01-164-F-G	0.00	OOL-09-02-164-F-G	0.00			OOL-09-05-300-F-G-I	0.00
OOL-09-01-165-F-G	0.00	OOL-09-02-165-F-G	0.00			OOL-09-05-301-F-G-I	0.00
OOL-09-01-166-F-G	0.00	OOL-09-02-166-F-G	0.00			OOL-09-05-302-F-G-I	0.00
OOL-09-01-167-F-G	0.16	OOL-09-02-167-F-G	0.00			OOL-09-05-303-F-G-I	0.00
OOL-09-01-168-F-G	0.00	OOL-09-02-168-F-G	0.00			OOL-09-05-304-F-G-I	0.00
OOL-09-01-169-F-G	0.00	OOL-09-02-169-F-G	0.00			OOL-09-05-305-F-G-I	0.00
OOL-09-01-170-F-G	0.00	OOL-09-02-170-F-G	0.00			OOL-09-05-306-F-G-I	0.00
OOL-09-01-171-F-G	0.00	OOL-09-02-171-F-G	0.00			OOL-09-05-307-F-G-I	0.00
OOL-09-01-172-F-G	0.00	OOL-09-02-172-F-G	0.00			OOL-09-05-308-F-G-I	0.00
OOL-09-01-173-F-G	0.00	OOL-09-02-173-F-G	0.00			OOL-09-05-309-F-G-I	0.00
OOL-09-01-174-F-G	0.00	OOL-09-02-174-F-G	0.00				
OOL-09-01-175-F-G	0.00	OOL-09-02-175-F-G	0.00				

Sample Title	SOF	Sample Title	SOF	Sample Title	SOF	Sample Title	SOF
OOL-09-01-176-F-G	0.38	OOL-09-02-176-F-G	0.00				
OOL-09-01-177-F-G	0.48	OOL-09-02-177-F-G	0.00				
OOL-09-01-178-F-G	0.32	OOL-09-02-178-F-G	0.00				
OOL-09-01-179-F-G	0.45	OOL-09-02-179-F-G	0.00				
OOL-09-01-180-F-G	0.00						
OOL-09-01-181-F-G	0.30						
OOL-09-01-182-F-G	0.00						
OOL-09-01-183-F-G	0.00						
OOL-09-01-184-F-G	0.39						
OOL-09-01-185-F-G	0.36						
OOL-09-01-186-F-G-R	0.00						
OOL-09-01-187-F-G	0.09						
OOL-09-01-188-F-G	0.10						
OOL-09-01-189-F-G	0.00						
OOL-09-01-190-F-G	0.26						
OOL-09-01-191-F-G	0.19						

Highest Scan Reading	0.48	0.64	0.00	0.99
Average Scan Reading	0.07	0.01	0.00	0.04
Standard Deviation	0.12	0.07	0.00	0.17

* Investigation scans were not used in calculating average or variance.

5.5 Data Quality Assessment

The Data Quality Assessment phase is the part of the FSS where survey design and data are reviewed for completeness and consistency, ensuring the validity of the results, verifying that the survey plan objectives were met, and validating the classification of the Survey Unit.

The sample design and the data acquired were reviewed and found to be in accordance with applicable YNPS procedures DP-8861, "*Data Quality Assessment*"; DP-8856, "*Preparation of Survey Plans*"; DP-8853, "*Determination of the Number and Locations of FSS Samples and Measurements*"; DP-8857, "*Statistical Tests*"; DP-8865, "*Computer Determination of the Number of FSS Samples and Measurements*" and DP-8852, "*Final Status Survey Quality Assurance Project Plan*".

The Data Quality Assessment power curves, scatter, quantile and frequency plots are found in Attachment B. Posting Plots are found in Attachment A.

5.5.1 OOL-09-01 Data Quality Assessment

The biased soil sample results were below the DCGLw. Fixed point sample concentrations were below the DCGLw and no sum-of-fractions were equal to or greater than one. The data set was within approximately

three standard deviations with normal dispersion about the arithmetic mean. The data posting plot does not clearly reveal any systematic spatial trends. The quantile plot exhibits some asymmetry in the lower quartile and the frequency plot demonstrates a normal distribution. The survey maintained sufficient power to pass the unit and the data set verified the assumptions of the statistical test.

5.5.2 OOL-09-02 Data Quality Assessment

Fixed point sample concentrations were below the DCGLw and no sum-of-fractions were equal to or greater than one. HTD sample results were <DCGLw. The data set was within approximately three standard deviations with normal dispersion about the arithmetic mean. The data posting plot does not clearly reveal any systematic spatial trends. The quantile plot exhibits some asymmetry in the lower quartile and the frequency plot demonstrates a normal distribution. The survey maintained sufficient power to pass the unit and the data set verified the assumptions of the statistical test.

5.5.3 OOL-09-03 Data Quality Assessment

Fixed point sample concentrations were below the DCGLw and no sum-of-fractions were equal to or greater than one. HTD sample results were <DCGLw. The data set was within approximately three standard deviations with normal dispersion about the arithmetic mean.. The quantile plot exhibits a slight asymmetry in the lower quartile and the frequency plot demonstrates a slight skew to the right however, the data posting plot does not clearly reveal any systematic spatial trends. The survey maintained sufficient power to pass the unit and the data set verified the assumptions of the statistical test.

5.5.4 OOL-09-04 Data Quality Assessment

Fixed point sample concentrations were below the DCGLw and no sum-of-fractions were equal to or greater than one. Scans requiring investigation were investigated and the elevated readings were resolved. HTD sample results were <DCGLw. The data set was within approximately three standard deviations with normal dispersion about the arithmetic mean. The data posting plot does not clearly reveal any systematic spatial trends. The quantile plot exhibits some asymmetry in the inner quartile and the frequency plot demonstrates a normal distribution. The survey maintained sufficient power to pass the unit and the data set verified the assumptions of the statistical test.

5.5.5 OOL-09-05 Data Quality Assessment

Fixed point sample concentrations were below the DCGLw and no sum-of-fractions were equal to or greater than one. Scans requiring investigation were investigated and the elevated readings were resolved. HTD sample results were <DCGLw. The data set was within approximately three standard deviations with normal dispersion about the arithmetic mean. The data posting plot does not clearly reveal any systematic spatial trends. The quantile plot exhibits a slight asymmetry in the lower quartile and the frequency plot demonstrates a normal distribution. The survey maintained sufficient power to pass the unit and the data set verified the assumptions of the statistical test.

6.0 QUALITY ASSURANCE AND QUALITY CONTROL

6.1 Instrument QC Checks

Operation of the portable ISOCS was in accordance with DP-8871, "*Operation of the Canberra Portable ISOCS System*," with QC checks performed in accordance with DP-8869, "*In-situ (ISOCS) Gamma Spectrum Assay System Calibration Procedure*" and DP-8871, "*Operation of the Canberra Portable ISOCS System*." Operation of the E-600 w/SPA-3 was in accordance with DP-8535, "*Setup and Operation of the Eberline E-600 Digital Survey Instrument*," with QC checks performed in accordance with DP-8540, "*Operation and Source Checks of Portable Friskers*." Instrument response checks were performed prior to and after use for the E-600 w/SPA-3 and once per shift for the Portable ISOCS. . Any flags (i.e. anomalies in the QC results) encountered during the ISOCS QC Source Count were corrected/resolved prior to surveying. All instrumentation involved with the FSS of OOL-09 satisfied the above criteria for the survey. QC records are found in Attachment C.

6.2 Split Samples and Recounts

6.2.1 OOL-09-01 Split Samples and Recounts

Two split and two recount 'QC' samples were gathered and within tolerable limits in accordance with DP-8864, "*Split Sample Assessment for Final Status Survey*".

6.2.2 OOL-09-02 Split Samples and Recounts

Two split and two recount "QC" samples were gathered and within tolerable limits in accordance with DP-8864, "*Split Sample Assessment for Final Status Survey*".

6.2.3 OOL-09-03 Split Samples and Recounts

One split and one recount “QC” sample was gathered and within tolerable limits in accordance with DP-8864,”*Split Sample Assessment for Final Status Survey*”.

6.2.4 OOL-09-04 Split Samples and Recounts

One split and one recount “QC” sample was gathered and within tolerable limits in accordance with DP-8864,”*Split Sample Assessment for Final Status Survey*”.

6.2.5 OOL-09-05 Split Samples and Recounts

Two split and one recount “QC” sample was gathered and within tolerable limits in accordance with DP-8864,”*Split Sample Assessment for Final Status Survey*”.

6.3 Self-Assessments

No self-assessments were performed during the FSS of OOL-09.

7.0 CONCLUSION

The FSS of OOL-09 has been performed in accordance with YNPS LTP and applicable FSS procedures. Evaluation of the soil sample data has shown none of the systematic soil samples exceeded the $DCGL_w$, depicted in Attachment B. Retrospective power curves were generated and demonstrated that an adequate number of samples were collected to support the Data Quality Objectives. Therefore, the null hypothesis (H_0) is rejected.

OOL-09 meets the objectives of the Final Status Survey.

Based upon the evaluation of the data acquired for the FSS, OOL-09 meets the release requirements set forth in the YNPS LTP. The Total Effective Dose Equivalent (TEDE) to the average member of the critical group does not exceed 25 mRem/yr, including that from groundwater. 10CFR20 Subpart E ALARA requirements have been met as well as the site release criteria for the administrative level DCGLs that ensure that the Massachusetts Department of Public Health’s 10 mRem/yr limit will also be met.

List of Appendices

Appendix A – YNPS-FSSP-OOL-09, *“Final Status Survey Planning Worksheets”*

Appendix B – YA-REPT-00-015-04, *“Instrument Efficiency Determination for Use in Minimum Detectable Concentration Calculations in Support of the Final Status Survey at Yankee Rowe”*

Appendix C – YA-REPT-00-003-05, *“Generic ALARA Review for Final Status Survey of Soil at YNPS”*

Appendix D – ALARA Evaluations, OOL-09

Appendix E – YA-REPT-00-018-05, *“Use of In-situ Gamma Spectrum Analysis to Perform Elevated Measurement Comparison in Support of Final Status Surveys”*

List of Attachments

Attachment A – Maps and Posting Plots

Attachment B – Data Quality Assessment Plots and Curves

Attachment C – Instrument QC Records

Attachment D – ORTEC Direct Measurement Data

Attachment E – ISOCS Scan Data

(In the electronic version, every Table of Contents, Figures, Appendices and Attachments, as well as every mention of a Figure, Appendix or Attachment is a hyperlink to the actual location or document.)