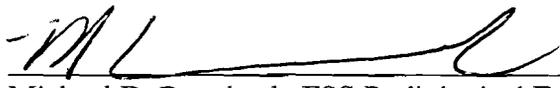


**YANKEE NUCLEAR POWER STATION
FINAL STATUS SURVEY REPORT**

REPORT NO.: YNPS-FSS-OOL-13-00

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- Appendix C – ALARA Evaluations, OOL-13
- Appendix D – 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 – ISOCS Scan Data
- Attachment E – ORTEC Direct Measurement 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 _o	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-13 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

OOL-13 has a single Survey Unit, OOL-13-01 which is a Class 1 Survey Unit. OOL-13-01 is a section of the Sherman Reservoir bank near the rail spur terminus. It is located adjacent to and down slope of the location of the Radiologically Controlled Area (RCA) at the time of characterization. The land was owned by U. S. Gen at the time that the License Termination Plan (LTP) was written and is currently owned by TransCanada.

1.2 Dates(s) of Survey

Table 1 Date of Surveys

Survey Unit	Survey Start Date	Survey End Date	DQA Date
OOL-13-01	7/17/2006	7/26/2006	8/29/2006

1.3 Number and Types of Measurements Collected

Final Status Survey Plan (FSSP) was developed for this Survey Unit 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 15 systematic direct measurement measurements were taken in the Survey Unit, providing data for the non-parametric testing of the Survey Area. In addition to the direct measurement samples, ISOCS scans were performed to provide 100 percent coverage of the Survey Area.

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. Direct measurement 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-13 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 Unit 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 Unit, 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 Units 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 direct measurements/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 direct measurements/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

Survey Area OOL-13 consists of a land area and contains about 926 square meters of surface area. Survey Area OOL-13 is bounded by OOL-01 on the north, OOL-15 on the east, OOL-14 on the south, and OOL-12 and OOL-02 on the west. There are no subsurface systems that traverse or connect within Survey Area OOL-13. OOL-13-01 is a section of the Sherman Reservoir bank near the rail spur terminus. It is located adjacent to and down slope of the location of the Radiologically Controlled Area (RCA) at the time of characterization. The land was owned by U. S. Gen at the

time that the License Termination Plan (LTP) was written and is currently owned by TransCanada.

3.2 History of Survey Area

The bounds of OOL-13 were established because this area was used for road and rail transportation of radioactive waste that included spent fuel and irradiated hardware (control rods). Survey Area OOL-13 is located down slope from the RCA and was susceptible to contamination by surface water run-off from the RCA. The western boundary of OOL-13 is the property line between USGen and YAEC. The land was owned by U. S. Gen at the time that the License Termination Plan (LTP) was written and is currently owned by TransCanada.

Railroad service to the plant was terminated during the early 1970s. The railroad tracks within the YNPS site and two flat bed cars remained in service to support plant operations.

After construction of the service building annex in the mid-1970s, vehicle traffic had to drive east, around the end of the warehouse/garage structure in order to access the east end of the RCA. The area east of the warehouse/garage structure lies within OOL-13.

Events and activities causing contamination within the RCA are notable because some of that contamination may have migrated into Survey Area OOL-13.

3.3 Division of Survey Area into Survey Units

OOL-13 has a single Survey Unit, OOL-13-01 which is a Class 1 Survey Unit.

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

Survey Unit	Date	Activity
OOL-13-01	5-16-06	Performed walk-down of Survey Unit
	7-17-06	Established Isolation and Controls
	5-16-06	Performed Unit Classification
	5-15-06	Performed Sample Quantity Calculations, established DQOs
	5-31-06	Performed Job Hazard Analysis
	7-14-06 & 7-24-06	Generated FFS Sample Plans
	7-17-06 to 7-26-06	Initiated Scans, and Direct measurements.
	8-29-06	Performed DQA, FSS Complete

4.1.2 Radionuclide Selection and Basis

During the initial DQO process, Cs-137 was identified as the radiological nuclide of concern. Characterization survey data from the HSA data indicated no other LTP-specified radionuclides warrant consideration in the OOL-13 Survey Area, however, the soil samples were evaluated for all LTP listed nuclides.

4.1.3 Scoping & Characterization

The characterization data in the HSA was sufficient to support FSS planning. Based on a review of the HSA data, Cs-137, Cs-134 and Ag-108m were detected at greater than minimum detectable concentrations, with Cs-137 at the highest concentrations and most frequently detected. No samples showed activity greater than 10% of DCGL.

It is noted that the characterization data did not include analyses for hard-to-detect (HTD) nuclides such as H-3, Sr-90, and TRUs. However, the gamma analysis did not detect Am-241 in any of the characterization soil samples, suggesting that TRUs are not present in Survey Unit OOL-13-01. HTD nuclides were included in the assessment for OOL-13-01. Five percent of the FSS soil samples were sent to an independent laboratory for complete analyses.

Based on the characterization data, a representative nuclide mix for OOL-13-01 (i.e., nuclides that would contribute to a SPA-3 reading) includes naturally occurring gamma-emitting radionuclides (e.g., K-40, Ac-228, Bi-212 & 214) plus Cs-137 as the only probable plant-related nuclide. However, all LTP-listed radionuclides will be included in the analyses of soil samples from OOL-13-01.

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 Area OOL-13 is identified as a Class 1 Area.

4.3 Remedial Actions and Further Investigations

Neither remedial actions nor investigations were required for OOL-13-01.

4.4 Unique Features of Survey Area

Survey Area OOL-13 is an open land area containing soils having a steep waterfront covered by dense brush.

4.5 ALARA Practices and Evaluations

An ALARA evaluation was developed for Survey Area OOL-13 which concluded that additional remediation was not warranted. This evaluation is found in [Appendix C](#).

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-13 Survey Unit 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 Plan. The FSS Plan 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 2 Survey Area OOL-13 Design Parameters

Survey Unit	Design Parameter	Value	Basis
OOL-13-01	Area	926 m ²	Class 1, ≤2,000 m ²
	Number of Direct Measurements	15 (calculated)	α (Type I) = 0.05 β (Type II) = 0.05 σ : 0.0305
		Bias Samples: 2	Relative Shift: 2 Adjusted LBGR: 2.939 (Cs-137)
	Sample Area	61.7m ²	Area / Sample #
	Sample Grid Spacing: Triangular	8.4m	Square Root (Area/(0.866*Sample #))
	Scan area	926 m ²	Class 1 Area – 100%
	Scan Investigation Level	Co-60: 15pCi/gm Cs-137 : 66pCi/gm	See Appendix D

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-13 Survey Area and throughout this report, the administrative acceptance criterion of 8.73 mRem/yr has been set for Soil LTP-listed radionuclides.

Table 3 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 fixed point measurements. 15 measurements were needed in the event the Sign test may have been used. In addition to the 15 statistical measurements needed, 2 biased, 1 recount, and 1 split sample was also collected.

The direct measurement sampling grid was developed as a systematic grid with spacing consisting of a triangular pitch pattern with a random starting point. Sample measurement locations are provided in Attachment A.

5.2 Survey Implementation Activities

The Table below provides a summary of daily activities performed during the Final Status Survey of OOL-13.

Table 4 FSS Activity Summary for OOL-13

Survey Unit	Date	Activity
OOL-13-01	5-16-06	Performed walk-down of Survey Unit
	7-17-06	Established Isolation and Controls
	5-16-06	Performed Unit Classification
	5-15-06	Performed Sample Quantity Calculations, established DQOs
	5-31-06	Performed Job Hazard Analysis
	7-14-06 & 7-24-06	Generated FFS Sample Plans
	7-17-06 to 7-26-06	Initiated Scans, and Direct measurements.
	8-29-06	Performed DQA, FSS Complete

5.3 Surveillance Surveys

5.3.1 Periodic Surveillance Surveys

Upon completion of the FSS of Survey Area OOL-13, the Survey Unit 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-13-01.

5.3.3 Investigations

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

5.4 Survey Results

Direct measurement surveys indicated that OOL-13-01 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 (H₀) (that the Survey Unit exceeds the release criteria) is rejected.

Table 5 Direct Measurement Summary

Sample Description	Sum of Fractions
OOL-13-01-001-F	0.1
OOL-13-01-002-F	0.1
OOL-13-01-003-F	0.0
OOL-13-01-004-F	0.0

Sample Description	Sum of Fractions
OOL-13-01-005-F	0.1
OOL-13-01-006-F	0.1
OOL-13-01-007-F	0.1
OOL-13-01-008-F	0.1
OOL-13-01-009-F	0.1
OOL-13-01-010-F	0.1
OOL-13-01-011-F	0.0
OOL-13-01-012-F	0.2
OOL-13-01-013-F	0.1
OOL-13-01-014-F	0.1
OOL-13-01-015-F	0.1

Maximum Sum of Fractions	0.2
Standard Deviation	0.04

Table 6 ISOCS Scan Summary

Sample Title	Unity	Sample Title	Unity	Sample Title	Unity
OOL-13-01-101-F-R	0.08	OOL-13-01-155-F-G	0.00	OOL-13-01-214-F-G	0.00
OOL-13-01-102-F-R	0.00	OOL-13-01-156-F-G	0.00	OOL-13-01-215-F-G	0.00
OOL-13-01-103-F-G-R	0.00	OOL-13-01-157-F-G	0.00	OOL-13-01-216-F-G	0.00
OOL-13-01-104-F-G	0.00	OOL-13-01-158-F-G	0.00	OOL-13-01-217-F-G	0.00
OOL-13-01-105-F-G	0.00	OOL-13-01-159-F-G	0.00	OOL-13-01-218-F-G	0.00
OOL-13-01-106-F-G	0.00	OOL-13-01-160-F-G	0.00	OOL-13-01-219-F-G	0.00
OOL-13-01-107-F-G	0.00	OOL-13-01-161-F-G	0.00	OOL-13-01-220-F-G	0.00
OOL-13-01-108-F-G	0.00	OOL-13-01-162-F-G	0.00	OOL-13-01-221-F-G	0.00
OOL-13-01-109-F-R	0.00	OOL-13-01-163-F-G	0.00	OOL-13-01-222-F-G	0.00
OOL-13-01-110-F-G	0.00	OOL-13-01-165-F-G	0.00	OOL-13-01-223-F-G	0.00
OOL-13-01-111-F-G	0.00	OOL-13-01-166-F-G	0.00	OOL-13-01-224-F-G	0.00
OOL-13-01-112-F-G	0.00	OOL-13-01-167-F-G	0.00	OOL-13-01-225-F-G	0.00
OOL-13-01-113-F-G	0.00	OOL-13-01-169-F-G	0.00	OOL-13-01-226-F-G	0.00
OOL-13-01-114-F-G	0.00	OOL-13-01-170-F-G	0.00	OOL-13-01-227-F-G	0.00
OOL-13-01-115-F-G	0.00	OOL-13-01-171-F-G	0.00	OOL-13-01-228-F-G	0.00
OOL-13-01-116-F-G-R	0.00	OOL-13-01-173-F-G	0.00	OOL-13-01-229-F-G	0.00
OOL-13-01-117-F-G	0.00	OOL-13-01-174-F-G	0.00	OOL-13-01-230-F-G	0.00
OOL-13-01-118-F-G	0.00	OOL-13-01-175-F-G	0.00	OOL-13-01-231-F-G	0.00
OOL-13-01-119-F-G	0.00	OOL-13-01-177-F-G	0.00	OOL-13-01-232-F-G	0.00
OOL-13-01-120-F-G	0.00	OOL-13-01-178-F-G	0.00	OOL-13-01-233-F-G	0.00
OOL-13-01-121-F-G	0.00	OOL-13-01-179-F-G	0.00	OOL-13-01-234-F-G	0.00
OOL-13-01-122-F-G	0.00	OOL-13-01-181-F-G	0.00	OOL-13-01-235-F-G	0.00
OOL-13-01-123-F-G	0.00	OOL-13-01-182-F-G	0.00	OOL-13-01-236-F-G	0.00
OOL-13-01-124-F-G	0.00	OOL-13-01-183-F-G	0.00	OOL-13-01-237-F-G	0.00
OOL-13-01-125-F-G	0.00	OOL-13-01-185-F-G	0.00	OOL-13-01-238-F-G	0.00
OOL-13-01-126-F-G	0.00	OOL-13-01-186-F-G	0.00	OOL-13-01-239-F-G	0.00
OOL-13-01-127-F-R	0.00	OOL-13-01-187-F-G	0.00	OOL-13-01-240-F-G	0.00
OOL-13-01-128-F-G	0.00	OOL-13-01-188-F-G	0.00	OOL-13-01-241-F-G	0.00
OOL-13-01-129-F-G	0.00	OOL-13-01-189-F-G	0.00	OOL-13-01-242-F-G	0.00

Sample Title	Unity	Sample Title	Unity	Sample Title	Unity
OOL-13-01-130-F-G	0.00	OOL-13-01-190-F-G	0.00	OOL-13-01-243-F-G	0.00
OOL-13-01-131-F-G	0.00	OOL-13-01-191-F-G	0.00	OOL-13-01-245-F-G	0.00
OOL-13-01-132-F-G	0.00	OOL-13-01-192-F-G	0.00	OOL-13-01-246-F-G	0.00
OOL-13-01-133-F-G	0.00	OOL-13-01-193-F-G	0.00	OOL-13-01-247-F-G	0.00
OOL-13-01-134-F-G	0.00	OOL-13-01-194-F-G	0.00	OOL-13-01-249-F-G	0.00
OOL-13-01-135-F-G	0.00	OOL-13-01-195-F-G	0.00	OOL-13-01-250-F-G	0.00
OOL-13-01-136-F-G	0.00	OOL-13-01-196-F-G	0.00	OOL-13-01-251-F-G	0.00
OOL-13-01-137-F-G	0.00	OOL-13-01-197-F-G	0.00	OOL-13-01-260-F-G	0.00
OOL-13-01-138-F-G	0.00	OOL-13-01-198-F-G	0.00	OOL-13-01-261-F-G	0.00
OOL-13-01-139-F-G	0.00	OOL-13-01-199-F-G	0.00	OOL-13-01-262-F-G	0.00
OOL-13-01-140-F-G	0.00	OOL-13-01-200-F-G	0.00	OOL-13-01-263-F-G	0.00
OOL-13-01-141-F-G	0.00	OOL-13-01-201-F-G	0.00	OOL-13-01-264-F-G	0.00
OOL-13-01-142-F-G	0.08	OOL-13-01-202-F-G	0.00	OOL-13-01-265-F-G	0.00
OOL-13-01-143-F-G	0.00	OOL-13-01-203-F-G	0.00	OOL-13-01-266-F-G	0.00
OOL-13-01-144-F-G	0.00	OOL-13-01-204-F-G	0.00	OOL-13-01-267-F-G	0.00
OOL-13-01-145-F-G	0.00	OOL-13-01-205-F-G	0.00	OOL-13-01-268-F-G	0.00
OOL-13-01-146-F-G	0.09	OOL-13-01-206-F-G	0.00	OOL-13-01-269-F-G	0.00
OOL-13-01-147-F-G	0.03	OOL-13-01-207-F-G	0.00	OOL-13-01-270-F-G	0.00
OOL-13-01-148-F-G	0.00	OOL-13-01-208-F-G	0.00	OOL-13-01-271-F-G	0.00
OOL-13-01-149-F-G	0.00	OOL-13-01-209-F-G	0.00	OOL-13-01-272-F-G	0.00
OOL-13-01-150-F-G	0.09	OOL-13-01-210-F-G	0.00	OOL-13-01-273-F-G	0.00
OOL-13-01-151-F-G	0.04	OOL-13-01-211-F-G	0.00	OOL-13-01-274-F-G	0.00
OOL-13-01-152-F-G	0.00	OOL-13-01-212-F-G	0.00	OOL-13-01-275-F-G	0.00
OOL-13-01-153-F-G	0.00	OOL-13-01-213-F-G	0.00	OOL-13-01-276-F-G	0.00
OOL-13-01-154-F-G	0.00				

The following locations were removed from the initial survey plan, as they were located outside the Survey Unit and in the Sherman Reservoir: 164, 168, 172, 176, 180, 184, 244, 248, 252, 253, 254, 255, 256, 257, 258, and 259.

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.

A data set review was performed on OOL-13-01. The data range was within three standard deviations and exhibited a normal variance about the arithmetic mean. The frequency plot exhibited a Poisson distribution with the exception of one data point skewed slightly high; however this data point was a small fraction of the DCGLw and a review of the posting plot did not clearly reveal any systematic spatial trends. The quantile plot did not display noticeable asymmetry. The power function, shown by the retrospective power curve, was adequate to pass the FSS of the Survey Unit and the retrospective standard deviation was approximately equal the prospective standard deviation. The data set verified the assumptions of the statistical test.

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.

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*." Instrument response checks were performed 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-13 satisfied the above criteria for the survey. QC records are found in Attachment C.

6.2 Split Samples and Recounts

One recount and one split '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-13.

7.0 CONCLUSION

The FSS of OOL-13 has been performed in accordance with YNPS LTP and applicable FSS procedures. Evaluation of the direct measurement data has shown none of the systematic direct 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) is rejected.

OOL-13 meets the objectives of the Final Status Survey.

Based upon the evaluation of the data acquired for the FSS, OOL-13 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-13, *“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 – ALARA Evaluations, OOL-13

Appendix D – 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 – ISOCS Scan Data

Attachment E – ORTEC Direct Measurement 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.)