YANKEE NUCLEAR POWER STATION
FINAL STATUS SURVEY REPORT

REPORT NO.: YNPS-FSS-OOL-05-00

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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-05

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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

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(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	*In-situ* 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-05 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-05 Survey Area is comprised of 9 Survey Units in the area of the site known as the USGen, (now Trans Canada) Deerfield River Frontage. OOL-05 consists of the TransCanada owned land area located between the YAEC property and the Deerfield River. Survey Unit OOL-05-01 is a Class 3 Survey Unit approximately 10,400 m^2 in size. Survey Unit OOL-05-02 was combined into adjacent survey units and therefore not used. Survey Unit OOL-05-03 is a Class 2 Survey Unit consisting of approximately 9,772.9 m^2 in surface area. Survey Unit OOL-05-04 is a Class 2 Survey Unit comprising approximately 2718 m^2 in surface area. Survey Unit OOL-05-05 is a Class 1 Survey Unit consisting of approximately 1520 m^2 in surface area. Survey Unit OOL-05-06 is a Class 1 Survey Unit consisting of approximately 937 m^2 in surface area. Survey Unit OOL-05-07 is a Class 3 Survey Unit consisting of approximately 2,468 m^2 in surface area. Survey Unit OOL-05-08 is a Class 2 Survey Unit consisting of approximately 3,388 m^2 in surface area. Survey Unit OOL-05-09 is a Class 1 Survey Unit consisting of approximately 1,662 m^2 in surface area. Survey Unit OOL-05-10 is a Class 1 Survey Unit consisting of approximately 975 m^2 in surface area.

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-05-01	11/09/2004	11/10/2004	6/21/2006
OOL-05-03	8/31/2006	9/05/2006	10/11/2006
OOL-05-04	8/18/2006	8/22/2006	10/09/2006
OOL-05-05	7/21/2006	7/28/2006	8/29/2006
OOL-05-06	7/24/2006	7/31/2006	8/29/2006
OOL-05-07	8/31/2006	8/31/2006	10/16/2006
OOL-05-08	9/08/2006	9/12/2006	10/17/2006
OOL-05-09	9/08/2006	9/13/2006	10/18/2006
OOL-05-10	9/08/2006	9/08/2006	10/18/2006

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 163 statistical soil samples were taken in the Survey Area, providing data for the non-parametric testing of the Survey Area as well as 13 biased samples. In addition to the soil samples, 100% of the Class 1 areas were scanned and approximately 10-20 % of the class 2 areas were scanned. Scanning of the Class 3 areas consisted of biased scans.

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_o) (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-05 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 per year, 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 per year 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-05 Survey Area is comprised of 9 Survey Units. A map of the Survey Area and Unit divisions are found in Attachment A.

3.1.1 OOL-05-01 Description

Survey Unit OOL-05-01 is about 10,400 m^2 in size, representing approximately the southern half of Survey Area OOL-05. OOL-05-01 is bordered by OOL-05-07 and OOL-05-08 on the north and by the Deerfield River on the west. Non-impacted land forms the southern boundary and OOL-06-02 forms the eastern border. It is primarily a heavily wooded, open land area, which has not been disturbed since plant construction, with the exception of an abandoned rail road bed and part of the access road. There are no structures present in the Survey Unit OOL-05-01, with the exception of a large sign near the river which has partially fallen down. This sign had nothing to do with plant operations. There is an area within the unit where it appears that concrete was dumped and allowed to harden. This was apparently done during construction, so it is safe to assume that the soil under the concrete is not impacted by plant operations.

This unit is classified as a Class 3 unit on the basis of its history and a result of sampling since the HSA was written.

3.1.2 OOL-05-03 Description

The real estate associated with survey unit OOL-05-03 is owned by TransCanada. This parcel generally extends from the northern boundary of survey unit OOL-05-08 northward to the shoreline of the Deerfield River. OOL-04-01 and OOL-04 04 form the eastern boundary and OOL-05-07 forms the western boundary. The surface area of OOL-05-03 is 9772.9 m2. Approximately half of the southern portion of the survey unit is an open field, while the northern half is a significantly wooded region along the river. A road to the hydroelectric station traverses survey unit OOL-05-03. Characterization soil samples indicate that the concentrations of plant-related radioactivity in soil are well below DCGLs. However, since the survey unit may have been subject to low-level contamination resulting from minor inadvertent run-off from decommissioning activities

conducted in nearby Class 1 units, survey unit OOL-05-03 has been assigned a Class 2 status.

3.1.3 OOL-05-04 Description

Survey unit OOL-05-04 includes some land owned by TransCanada and consists of the land between the access road and the radioactive waste parking area. OOL-05-04 is bordered by OOL-06-02 and OOL-06-03 on the south. OOL-04-04 forms the east boundary and OOL-05-10 forms the northern boundary. OOL-05-08 forms the western boundary. Survey unit 04 has a surface area of approximately 2,718 m2. It contains a portion of the unnamed tributary (a small brook that runs east to west in the northwest section of the site) between the outflow of the two culverts that cross the access road near the gatehouse and the intake of the culverts that cross the road going down to the radioactive waste parking area. The boundary between survey area OOL-05 and OOL-06 was stated to be along the boundary between US Gen (now TransCanada) property and Yankee property in the HSA. The original boundary (per the HSA) was adjusted so that the brook and its immediate surroundings would be in the same survey area.

An initial final status survey for the area was performed in 2005. The 2005 survey focused only on the land that was to be covered with clean soils as part of an environmental restoration effort as the final step of a PCB remediation effort conducted in the unit. After that survey, the Final Status Survey group relinquished control of the unit because of the continuing impact from discharges from the West Storm Drain, the storm drains coming from the radioactive waste parking area and the nearby access road where roll-off containers were staged for shipment. Release of the survey unit from FSS control was supported by the decision to perform a completely new FSS at a later time. The FSS described in this report is the new FSS that was referenced.

This unit was reclassified from a Class 3 to a Class 2 at the beginning of the planning process, on the basis of its history and results of sampling since the HSA was written. The sample results from the 2005 survey support the reclassification of Survey Unit OOL-05-04.

3.1.4 OOL-05-05 Description

Survey Unit OOL-05-05 is the east inner section of OOL-05, approximately 1520 m^2 in size. The unit is a portion of the TransCanada-owned land that lies west of the industrial yard between the Yankee property and the Deerfield River. OOL-05-05 is bordered by OOL-05-10 on the south and OOL-04-04 on the east and north. OOL-05-06 forms the

western border. OOL-05-05 is an open land area comprised of soils and is relatively level. It was utilized as part of the radioactive waste staging area parking lot. The staging of roll-offs has impacted the original classification of Class 3 (CR Action Item Response # 2005-460-2). As a result, the unit has been re-classified as Class 1.

3.1.5 OOL-05-06 Description

Survey Unit OOL-05-06 is the west inner section of OOL-05 adjacent to Survey Unit OOL-05-05, approximately 937 m^2 in size. The unit is a portion of the TransCanada-owned land that lies west of the industrial yard between the Yankee property and the Deerfield River. OOL-05-06 is bordered by OOL-05-10 on the south and OOL-05-05 on the east. OOL-04-04 forms the northern border and OOL-05-09 forms the western border. It was utilized as part of the radioactive waste staging area parking lot. The staging of roll-offs has impacted the original classification of Class 3 (CR Action Item Response # 2005-460-2). As a result, the unit has been re-classified as Class 1.

3.1.6 OOL-05-07 Description

Survey Unit OOL-05-07 includes some heavily wooded land owned by TransCanada and is surrounding the west end of the unnamed tributary. This unit is bordered by survey unit OOL-05-03 to the north, survey unit OOL-05-01 to the south, survey unit OOL-05-08 to the east and the Deerfield River to the west. Survey Unit OOL-05-07 has an area of approximately 2468 m2. This unit is classified as a Class 3 unit on the basis of its history and a result of sampling since the HSA was written.

3.1.7 OOL-05-08 Description

Survey Unit OOL-05-08 is in the northeast section of OOL-05, approximately 3388 m^2 in size. The unit is a portion of the larger area of TransCanada-owned land that lies west of the industrial yard between the Yankee property and the Deerfield River. The Survey Unit is bordered by OOL-06-02, OOL-05-04 and OOL-05-09 on the south. OOL-04-04 forms the eastern border. OOL-05-03 forms the northern border and OOL-05-01 forms the western border. OOL-05-08 encompasses the large excavation where the abandoned leech field was removed. Due to the natural contour of the land, the unit receives run-off from an adjacent Class 1 survey unit (OOL-05-09). For that reason, OOL-05-08 was established as a buffer zone for OOL-05-09 and has been classified as a Class 2 survey unit.

3.1.8 OOL-05-09 Description

OOL-05-09 is an open land area, located in the south western corner of the radioactive waste area that is owned by TransCanada. The Survey Unit is bordered by OOL-05-06 on the east, OOL-05-10 and OOL-05-08 on the south, OOL-05-08 on the west and north. Survey Unit OOL-05-09 has an area of approximately 1662 m2. The Survey Unit is comprised of soils, small rocks and some turf. The terrain consists of level ground, slight grades and steep walled excavations. Initial HSA classification of this Survey Unit identified a Class 3, however, subsequent activities and the relocation of an alternate radioactive waste storage site prompted a reclassification of the unit to a Class 1 area.

3.1.9 OOL-05-10 Description

OOL-05-10 is an asphalt roadway located in the radioactive waste area on property owned by TransCanada. The roadway runs approximately east to west and is bordered on the north and west by units OOL-05-05, OOL-05-06, OOL-05-08 and OOL-05-09. Survey units OOL-06-02 and OOL-06-03 form the southern border while OOL-04-04 forms the east border. OOL-05-10 is comprised almost entirely of asphalt and has a total area of 975 square meters. Initial classification of this survey unit was Class 3, however, during demolition the roadway has been used as a staging area for roll-offs and inter-modals containing radioactive material awaiting shipment. Since, in effect, the unit was used as a radioactive waste storage area; management decision was made to reclassify this unit to a Class 1 area.

3.2 History of Survey Area

As originally designed, Survey Area OOL-05 was not part of the RCA and was not intended to be used for storing radioactive material or processing radioactive waste. As the decommissioning of YNPS progressed it became apparent that portions of OOL-05 would need to be utilized for the storage of various containers, containing radioactive materials, awaiting shipment off-site. Additionally, an alternate radioactive waste processing area was established in the survey area enabling the completion of the FSS in the industrial area. The survey units impacted by these decisions have been re-classified as appropriate.

3.3 Division of Survey Area into Survey Units

The OOL-05 Survey Area is divided into 9 Survey Units. OOL-05-05, OOL-05-06, OOL-05-09 and OOL-05-10 are class 1 Survey Units. OOL-05-03, OOL-05-04 and OOL-05-08 are class 2 Survey Units. OOL-05-01 and OOL-05-07 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-05.

Table 2 Dates of Surveys since HSA

Survey Unit	Survey Start Date	Survey End Date	Description
OOL-05-01	11/09/2004	11/10/2004	FSS Survey
OOL-05-03	8/31/2006	9/05/2006	FSS Survey
OOL-05-04	8/18/2006	8/22/2006	FSS Survey
OOL-05-05	7/21/2006	7/28/2006	FSS Survey
OOL-05-06	7/24/2006	7/31/2006	FSS Survey
OOL-05-07	8/31/2006	8/31/2006	FSS Survey
OOL-05-08	9/08/2006	9/12/2006	FSS Survey
OOL-05-09	9/08/2006	9/13/2006	FSS Survey
OOL-05-10	9/08/2006	9/08/2006	FSS Survey

4.1.2 Radionuclide Selection and Basis

4.1.2.1 OOL-05-01 Radionuclides of Concern

Characterization data in the HSA was insufficient to support FSS planning therefore the survey was designed as a characterization survey, planned and performed with enough rigorousness so that if the data supported, the survey would serve as an FSS. The data supported the FSS for this unit. Based upon the history of the surrounding area, it was expected that Cs-137 would be at background concentrations and be the only nuclide of concern.

The presence of all LTP-required radionuclides (gamma-emitters, HTD beta emitters, and TRUs) in the soil was evaluated under the survey plan. The YNPS Chemistry Department analyzed each FSS soil sample for all LTP

gamma-emitting nuclides, except Cm-243/244. In addition, QC split samples were sent to an independent laboratory for analysis of gamma-emitters, HTD beta-emitting nuclides and alpha-emitting nuclides, including Cm-243/244.

If multiple nuclides are identified in the analyses then the unity rule (i.e. sum-of-fractions) will be employed to show compliance with the release criteria.

4.1.2.2 OOL-05-03 Radionuclides of Concern

Characterization data contained in the YNPS HSA were used in the FSS planning for unit OOL-05-03. Cesium-137 was the most frequently identified easy-to-detect plant-related radionuclide in the surface soil samples collected within the unit in mid to late 1990s.

The presence of all LTP-required radionuclides (gamma-emitters, HTD beta emitters, and TRUs) in the soil was evaluated under the survey plan. The YNPS Chemistry Department analyzed each FSS soil sample for all LTP gamma-emitting nuclides, except Cm-243/244. In addition, QC split samples were sent to an independent laboratory for analysis of gamma-emitters, HTD beta-emitting nuclides and alpha-emitting nuclides, including Cm-243/244.

If multiple nuclides are identified in the analyses then the unity rule (i.e. sum-of-fractions) will be employed to show compliance with the release criteria.

4.1.2.3 OOL-05-04 Radionuclides of Concern

The data from 33 soil samples collected in the 2005 survey effort were used as the basis for this survey plan. Cs-137 and Co-60 were identified at levels above their respective MDAs in several of those samples. One sample was sent to an offsite laboratory for analyses of the LTP HTD nuclides; none were identified. Accordingly, Cs-137 and Co-60 were selected as the radionuclides of concern.

The presence of all LTP-required radionuclides (gamma-emitters, HTD beta emitters, and TRUs) in the soil was evaluated under the survey plan. The YNPS Chemistry Department analyzed each FSS soil sample for all LTP gamma-emitting nuclides, except Cm-243/244. In addition, QC

split samples were sent to an independent laboratory for analysis of gamma-emitters, HTD beta-emitting nuclides and alpha-emitting nuclides, including Cm-243/244.

Since multiple nuclides were assumed to be present in the survey unit, the unity rule (i.e. sum-of-fractions) was employed to show compliance with the release criteria.

4.1.2.4 OOL-05-05 Radionuclides of Concern

Soil sample data presented in the HSA were used in the planning for OOL-05-05. The concentration of plant-related radionuclides in most of those samples was below the detection sensitivity. Cs-137 was the only significant plant-related nuclide (identified at 0.411 pCi/g in 1 sample, all other concentrations were <MDA), therefore Cs-137 was identified as the radionuclide of concern for planning purposes.

The presence of all LTP-required radionuclides (gamma-emitters, HTD beta emitters, and TRUs) in the soil was evaluated under the survey plan. The YNPS Chemistry Department analyzed each FSS soil sample for all LTP gamma-emitting nuclides, except Cm-243/244. In addition, QC split samples were sent to an independent laboratory for analysis of gamma-emitters, HTD beta-emitting nuclides and alpha-emitting nuclides, including Cm-243/244.

If multiple nuclides are identified in the analyses then the unity rule (i.e. sum-of-fractions) will be employed to show compliance with the release criteria.

4.1.2.5 OOL-05-06 Radionuclides of Concern

Soil sample data presented in the HSA were used in the planning for OOL-05-06. The concentration of plant-related radionuclides in most of those samples was below the detection sensitivity. Cs-137 was the only significant plant-related nuclide (identified at 0.411 pCi/g in 1 sample, all other concentrations were <MDA), therefore Cs-137 was identified as the radionuclide of concern for planning purposes.

The presence of all LTP-required radionuclides (gamma-emitters, HTD beta emitters, and TRUs) in the soil was evaluated under the survey plan. The YNPS Chemistry Department analyzed each FSS soil sample for all LTP

gamma-emitting nuclides, except Cm-243/244. In addition, QC split samples were sent to an independent laboratory for analysis of gamma-emitters, HTD beta-emitting nuclides and alpha-emitting nuclides, including Cm-243/244.

If multiple nuclides are identified in the analyses then the unity rule (i.e. sum-of-fractions) will be employed to show compliance with the release criteria.

4.1.2.6 OOL-05-07 Radionuclides of Concern

Characterization data include 12 sediment samples that were screened by gamma spectroscopy. These twelve samples and information from the spill history formed the basis for FSS planning identifying Co-60 and Cs-137 as the radionuclides of concern.

The presence of all LTP-required radionuclides (gamma-emitters, HTD beta emitters, and TRUs) in the soil was evaluated under the survey plan. The YNPS Chemistry Department analyzed each FSS soil sample for all LTP gamma-emitting nuclides, except Cm-243/244. In addition, QC split samples were sent to an independent laboratory for analysis of gamma-emitters, HTD beta-emitting nuclides and alpha-emitting nuclides, including Cm-243/244.

Since multiple nuclides were assumed to be present in the survey unit, the unity rule (i.e. sum-of-fractions) was employed to show compliance with the release criteria.

4.1.2.7 OOL-05-08 Radionuclides of Concern

Soil sample data presented in the HSA were used in the planning for OOL-05-08. The concentration of plant-related radionuclides in most of those samples was below the detection sensitivity. Cs-137 was the only significant plant-related nuclide (identified at 0.411 pCi/g in 1 sample, all other concentrations were <MDA) therefore Cs-137 was identified as the radionuclide of concern for planning purposes.

The presence of all LTP-required radionuclides (gamma-emitters, HTD beta emitters, and TRUs) in the soil was evaluated under the survey plan. The YNPS Chemistry Department analyzed each FSS soil sample for all LTP

gamma-emitting nuclides, except Cm-243/244. In addition, QC split samples were sent to an independent laboratory for analysis of gamma-emitters, HTD beta-emitting nuclides and alpha-emitting nuclides, including Cm-243/244.

If multiple nuclides are identified in the analyses then the unity rule (i.e. sum-of-fractions) will be employed to show compliance with the release criteria.

4.1.2.8 OOL-05-09 Radionuclides of Concern

Based upon a review of YNPS historical data, Cs-137 was the only facility related radionuclide of concern identified.

The presence of all LTP-required radionuclides (gamma-emitters, HTD beta emitters, and TRUs) in the soil was evaluated under the survey plan. The YNPS Chemistry Department analyzed each FSS soil sample for all LTP gamma-emitting nuclides, except Cm-243/244. In addition, QC split samples were sent to an independent laboratory for analysis of gamma-emitters, HTD beta-emitting nuclides and alpha-emitting nuclides, including Cm-243/244.

If multiple nuclides are identified in the analyses then the unity rule (i.e. sum-of-fractions) will be employed to show compliance with the release criteria.

4.1.2.9 OOL-05-10 Radionuclides of Concern

Based upon a review of YNPS historical data, Cs-137 was the only facility related radionuclide of concern identified.

The presence of all LTP-required radionuclides (gamma-emitters, HTD beta emitters, and TRUs) in the soil was evaluated under the survey plan. The YNPS Chemistry Department analyzed each FSS soil sample for all LTP gamma-emitting nuclides, except Cm-243/244. In addition, QC split samples were sent to an independent laboratory for analysis of gamma-emitters, HTD beta-emitting nuclides and alpha-emitting nuclides, including Cm-243/244.

If multiple nuclides are identified in the analyses then the unity rule (i.e. sum-of-fractions) will be employed to show compliance with the release criteria.

4.1.3 Scoping & Characterization

4.1.3.1 OOL-05-01 Scoping & Characterization

Characterization data in the HSA was insufficient to support FSS planning therefore the survey was designed as a characterization survey, planned and performed with enough rigorousness so that if the data supported, the survey would serve as a FSS. The data supported the FSS for this unit.

4.1.3.2 OOL-05-03 Scoping & Characterization

Characterization data contained in the Yankee HSA were used in the FSS planning for unit OOL-05-03. Cs-137 was the most frequently identified easy-to-detect plant-related radionuclide in the surface soil samples collected within the unit in mid to late 1990s.

4.1.3.3 OOL-05-04 Scoping & Characterization

The data from 33 soil samples collected in the 2005 survey effort were used as the basis for this survey plan. Cs-137 and Co-60 were identified at levels above their respective MDAs in several of those samples. One sample was sent to an offsite laboratory for analyses of the LTP HTD nuclides; none were identified.

4.1.3.4 OOL-05-05 Scoping & Characterization

The HSA data from 13 soil samples collected from 1993 to 1998 identified Cs-137 as the only plant related radionuclide in one sample.

4.1.3.5 OOL-05-06 Scoping & Characterization

The HSA data from 13 soil samples collected from 1993 to 1998 identified Cs-137 as the only plant related radionuclide in one sample.

4.1.3.6 OOL-05-07 Scoping & Characterization

Characterization data include 12 sediment samples that were screened by gamma spectroscopy. These twelve samples and information from the spill history formed the basis for FSS

planning identifying Co-60 and Cs-137 as the radionuclides of interest.

4.1.3.7 OOL-05-08 Scoping & Characterization

The HSA data from 13 soil samples collected from 1993 to 1998 identified Cs-137 as the only plant related radionuclide in one sample.

4.1.3.8 OOL-05-09 Scoping & Characterization

Characterization data include 13 soil samples collected in 1998 identifying Cs-137 as the only plant related radionuclide.

4.1.3.9 OOL-05-10 Scoping & Characterization

Characterization data include 13 soil samples collected in 1998 identifying Cs-137 as the only plant related radionuclide.

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 Units OOL-05-05, OOL-05-06, OOL-05-09 and OOL-05-10 were re-classified from Class 3 units to Class 1 units. Survey Unit OOL-05-03, OOL-05-04 and OOL-05-08 were reclassified from Class 3 to Class 2 units. OOL-05-01 and OOL-05-07 remained Class 3 units as identified in the HSA. 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-05-01 Remedial Actions and Further Investigations

Three investigations were performed in response to indications greater than background with SPA-3. In all cases, the elevated readings were due to naturally occurring radionuclides (i.e. rocks).

4.3.2 OOL-05-03 Remedial Actions and Further Investigations

No investigations or remedial actions were required in OOL-05-03.

4.3.3 OOL-05-04 Remedial Actions and Further Investigations

Five investigations were performed using SPA-3 hand-held instrumentation. All areas investigated found elevated readings due to naturally occurring radionuclides or rocks.

4.3.4 OOL-05-05 Remedial Actions and Further Investigations

No investigations or remedial actions were required in OOL-05-05.

4.3.5 OOL-05-06 Remedial Actions and Further Investigations

No investigations or remedial actions were required in OOL-05-06.

4.3.6 OOL-05-07 Remedial Actions and Further Investigations

One investigation was performed in response to indication greater than background with SPA-3. The elevated reading was due to naturally occurring radionuclides (i.e. rocks).

4.3.7 OOL-05-08 Remedial Actions and Further Investigations

No investigations or remedial actions were required in OOL-05-08.

4.3.8 OOL-05-09 Remedial Actions and Further Investigations

No investigations or remedial actions were required in OOL-05-09.

4.3.9 OOL-05-10 Remedial Actions and Further Investigations

No investigations or remedial actions were required in OOL-05-10.

4.4 Unique Features of Survey Area

Survey Units OOL-05-01 and OOL-05-07 were level to steeply inclined and heavily wooded. The southern half of OOL-05-03 was a fairly even open field while the northern half of the survey unit was steeply inclined and heavily wooded. OOL-05-04 consisted of a heavily vegetated area with a stream running through the center of the unit. OOL-05-05 and OOL-05-06 were fairly level open fields. OOL-05-08 and OOL-05-09 had large excavations within them (OOL-05-08 had the larger excavation). OOL-05-10 consisted entirely of an asphalt covered roadway.

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-05 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-05 Design Parameters

Survey Unit	Design Parameter	Value	Basis
OOL-05-01	Survey Unit Area	10400 m2	Class 3, Soil, no restrictions
	Number of Direct Measurements	15 (calculated) + 2 (added) Total: 17	α (Type I) = 0.05 β (Type II) = 0.05 σ: 0.262 Relative Shift: 2 DCGLw: 3 LBGR: 2.5
	Critical Value	12 for Sign test.	(17/2)+(1.645/2)*Square Root (17)
	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.
	Scanning Coverage Requirements	Judgmental	Class 3 Soil Area:
	Scan Investigation Level	> Background Audible	Class 3 Area: Detectable over background
OOL-05-03	Survey Unit Area	9772.9 m2	Class 2, Soil, > 2,000 m2, ≤ 10,000 m2
	Number of Direct Measurements	15 (calculated) + 3 (added) Total: 18	α (Type I) = 0.05 β (Type II) = 0.05 σ: 0.0858 Relative Shift: 2 DCGLw: 3

Survey Unit	Design Parameter	Value	Basis
			LBGR: 2.8284
	Critical Value	12 for Sign test.	(18/2)+(1.645/2)*Square Root (18)
	Gridded Sample Area Size Factor	542.9m2	Area / Number of Samples (9772.9 m2/18)
	Sample Grid Spacing:	Triangular: 25m	Square Root (9772.9 m2 / (0.866*18))
	Direct Measurement Investigation Level	> DCGLw	Class 2 Area: > DCGLw
	Scanning Coverage Requirements	977.3 m2	Class 2 Soil Area: 10-100% systematic & judgmental
	Scan Investigation Level	> Background Audible	Class 2 Area: > DCGLw or > MDC
OOL-05-04	Survey Unit Area	2718 m2	Class 2, Soil, > 2,000 m2, ≤ 10,000 m2
	Number of Direct Measurements	15 (calculated) + 0 (added) Total: 15	α (Type I) = 0.05 β (Type II) = 0.05 σ: 0.082 Relative Shift: 2 DCGLw (Unity): 1 LBGR: 0.84
	Critical Value	11 for Sign test.	(15/2)+(1.645/2)*Square Root (15)
	Gridded Sample Area Size Factor	181.2m2	Area / Number of Samples (2718 m2/15)
	Sample Grid Spacing:	Triangular: 14.5m	Square Root (2718 m2 / (0.866*15))
	Direct Measurement Investigation Level	> DCGLw	Class 2 Area: > DCGLw
	Scanning Coverage Requirements	271.8 m2	Class 2 Soil Area: 10-100% systematic & judgmental
	Scan Investigation Level	> Background Audible	Class 2 Area: > DCGLw or > MDC
OOL-05-05	Survey Unit Area	1520 m2	Class 1, Soil, ≤ 2,000 m2
	Number of Direct Measurements	15 (calculated) + 5 (added) Total: 20	α (Type I) = 0.05 β (Type II) = 0.05 σ: 0.0858 Relative Shift: 2 DCGLw: 3 LBGR: 2.8284
	Critical Value	14 for Sign test.	(20/2)+(1.645/2)*Square Root (20)
	Gridded Sample Area Size Factor	76m2	Area / Number of Samples (1520 m2/20)
	Sample Grid Spacing:	Triangular: 9.4m	Square Root (1520 m2 / (0.866*20))
	Direct Measurement Investigation Level	> DCGLemc or > DCGLw + 3 Sigma	Class 1 Area: > DCGLemc or > DCGLw + 3 Sigma
	Scanning Coverage Requirements	1520 m2	Class 1 Soil Area: 100%
	Scan Investigation Level	Co-60: 0.18pCi/gm, Cs-137 :	1m 180° ISOCS

Survey Unit	Design Parameter	Value	Basis
		0.7pCi/gm, or SOF >1	
OOL-05-06	Survey Unit Area	937 m2	Class 1, Soil, ≤ 2,000 m2
	Number of Direct Measurements	15 (calculated) + 5 (added) Total: 20	α (Type I) = 0.05 β (Type II) = 0.05 σ: 0.0858 Relative Shift: 2 DCGLw: 3 LBGR: 2.8284
	Critical Value	14 for Sign test.	(20/2)+(1.645/2)*Square Root (20)
	Gridded Sample Area Size Factor	46.9m2	Area / Number of Samples (937 m2/20)
	Sample Grid Spacing:	Triangular: 7.4m	Square Root (937 m2 / (0.866*20))
	Direct Measurement Investigation Level	> DCGLemc or > DCGLw + 3 Sigma	Class 1 Area: > DCGLemc or > DCGLw + 3 Sigma
	Scanning Coverage Requirements	937 m2	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-05-07	Survey Unit Area	2468 m2	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: 0.09 Relative Shift: 2 DCGLw: 1 (Unity) LBGR: 0.82
	Critical Value	11 for Sign test.	(15/2)+(1.645/2)*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.
	Scanning Coverage Requirements	Judgmental	Class 3 Soil Area:
	Scan Investigation Level	> Background Audible	Class 3 Area: Detectable over background
OOL-05-08	Survey Unit Area	3388 m2	Class 2, Soil, > 2,000 m2, ≤ 10,000 m2
	Number of Direct Measurements	15 (calculated) + 5 (added) Total: 20	α (Type I) = 0.05 β (Type II) = 0.05 σ: 0.0857 Relative Shift: 2 DCGLw: 3 LBGR: 2.8286
	Critical Value	14 for Sign test.	(20/2)+(1.645/2)*Square Root (20)

Survey Unit	Design Parameter	Value	Basis
	Gridded Sample Area Size Factor	169.4m2	Area / Number of Samples (3388 m2/20)
	Sample Grid Spacing:	Triangular: 14m	Square Root (3388 m2 / (0.866*20))
	Direct Measurement Investigation Level	> DCGLw	Class 2 Area: > DCGLw
	Scanning Coverage Requirements	338.8 m2	Class 2 Soil Area: 10-100% systematic & judgmental
	Scan Investigation Level	> Background Audible	Class 2 Area: > DCGLw or > MDC
OOL-05-09	Survey Unit Area	1662 m2	Class 1, Soil, ≤ 2,000 m2
	Number of Direct Measurements	15 (calculated) + 5 (added) Total: 20	α (Type I) = 0.05 β (Type II) = 0.05 σ: 0.0857 Relative Shift: 2 DCGLw: 3 LBGR: 2.8286
	Critical Value	14 for Sign test.	(20/2)+(1.645/2)*Square Root (20)
	Gridded Sample Area Size Factor	83.1m2	Area / Number of Samples (1662 m2/20)
	Sample Grid Spacing:	Triangular: 9.8m	Square Root (1662 m2 / (0.866*20))
	Direct Measurement Investigation Level	> DCGLemc or > DCGLw + 3 Sigma	Class 1 Area: > DCGLemc or > DCGLw + 3 Sigma
	Scanning Coverage Requirements	1662 m2	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-05-10	Survey Unit Area	975 m2	Class 1, Soil, ≤ 2,000 m2
	Number of Direct Measurements	15 (calculated) + 3 (added) Total: 18	α (Type I) = 0.05 β (Type II) = 0.05 σ: 0.0857 Relative Shift: 2 DCGLw: 3 LBGR: 2.8286
	Critical Value	12 for Sign test.	(18/2)+(1.645/2)*Square Root (18)
	Gridded Sample Area Size Factor	54.17m2	Area / Number of Samples (975 m2/18)
	Sample Grid Spacing:	Triangular: 7.9m	Square Root (975 m2 / (0.866*18))
	Direct Measurement Investigation Level	> DCGLemc or > DCGLw + 3 Sigma	Class 1 Area: > DCGLemc or > DCGLw + 3 Sigma
	Scanning Coverage Requirements	975 m2	Class 1 Soil Area: 100%
	Scan Investigation Level	> Background Audible	Class 1 Area: > DCGLemc

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-05 Survey Area and throughout this report, the administrative acceptance criterion of 8.73 mRem per year has been set for Soil LTP-listed radionuclides.

Table 4 Soil DCGL Values

Nuclide	Soil 8.73 mRem per year (pCi/g)	Nuclide	Soil 8.73 mRem per year (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-05 Design Parameters". Split samples and recounts are addressed under the quality control section 6.2. The OOL-05-03, OOL-05-04, OOL-05-05, OOL-05-06, OOL-05-08, OOL-05-09 and OOL-05-10 soil sampling grids were developed as a systematic grid with spacing consisting of a triangular pitch pattern with a random starting point. The OOL-05-01 and OOL-05-07 sample locations were randomly determined. Sample measurement locations are provided in Attachment A.

The class 1 areas; OOL-05-05, OOL-05-06, and OOL-05-09 were scanned 100% with ISOCS. The results are listed in the table below titled "ISOCS Scan Summary". The class 1 area; OOL-05-10 was scanned 100% with SPA-3 hand-held instrumentation. The Class 2 areas; OOL-05-03, OOL-05-04 and OOL-05-08 were scanned greater than 10% with SPA-3 hand-held instrumentation. The Class 3 areas; OOL-05-01 and OOL-07 consisted of biased SPA-3 scans. Investigative scans were performed using SPA-3 hand-held instrumentation.

5.2 Survey Implementation Activities

The Table below provides a summary of daily activities performed during the Final Status Survey of OOL-05.

Table 5 FSS Activity Summary for OOL-05

Survey Unit	Date	Activity
OOL-05-01	11/08/2004	Performed walk-down of Survey Unit
	11/08/2004	Established Isolation and Controls
	11/04/2004	Performed Job Hazard Analysis
	2/09/2005	Performed Unit Classification
	10/18/2005	Performed Sample Quantity Calculations, established DQOs
	11/08/2004	Generated FFS Sample Plans
	11/09/2004 to 11/10/2004	Initiated Scans, and Direct measurements.
	6/21/2006	Performed DQA, FSS Complete
OOL-05-03	8/30/2006	Performed walk-down of Survey Unit
	8/30/2006	Established Isolation and Controls
	8/28/2006	Performed Job Hazard Analysis
	8/28/2006	Performed Unit Classification
	8/28/2006	Performed Sample Quantity Calculations, established DQOs
	8/29/2006	Generated FFS Sample Plans
	8/31/2006 to 9/05/2006	Initiated Scans, and Direct measurements.
	10/11/2006	Performed DQA, FSS Complete
OOL-05-04	8/17/2006	Performed walk-down of Survey Unit
	8/18/2006	Established Isolation and Controls
	8/01/2006	Performed Job Hazard Analysis
	8/01/2006	Performed Unit Classification
	8/14/2006	Performed Sample Quantity Calculations, established DQOs
	8/14/2006	Generated FFS Sample Plans
	8/18/2006 to 8/22/2006	Initiated Scans, and Direct measurements.
	10/09/2006	Performed DQA, FSS Complete
OOL-05-05	7/20/2006	Performed walk-down of Survey Unit
	7/21/2006	Established Isolation and Controls
	7/20/2006	Performed Job Hazard Analysis
	7/20/2006	Performed Unit Classification
	7/20/2006	Performed Sample Quantity Calculations, established DQOs
	7/20/2006	Generated FFS Sample Plans
	7/21/2006 to 7/28/06	Initiated Scans, and Direct measurements.
	8/29/2006	Performed DQA, FSS Complete
OOL-05-06	7/20/2006	Performed walk-down of Survey Unit
	7/24/2006	Established Isolation and Controls
	7/20/2006	Performed Job Hazard Analysis
	7/20/2006	Performed Unit Classification
	7/20/2006	Performed Sample Quantity Calculations, established DQOs
	7/20/2006	Generated FFS Sample Plans
	7/24/2006 to 7/31/2006	Initiated Scans, and Direct measurements.

Survey Unit	Date	Activity
OOL-05-07	8/29/2006	Performed DQA, FSS Complete
	8/29/2006	Performed walk-down of Survey Unit
	8/29/2006	Established Isolation and Controls
	4/27/2006	Performed Job Hazard Analysis
	4/19/2006	Performed Unit Classification
	5/04/2006	Performed Sample Quantity Calculations, established DQOs
	5/04/2006	Generated FFS Sample Plans
	8/31/2006	Initiated Scans, and Direct measurements.
OOL-05-08	10/16/2006	Performed DQA, FSS Complete
	9/08/2006	Performed walk-down of Survey Unit
	9/08/2006	Established Isolation and Controls
	9/07/2006	Performed Job Hazard Analysis
	7/25/2006	Performed Unit Classification
	7/25/2006	Performed Sample Quantity Calculations, established DQOs
	9/12/2006	Generated FFS Sample Plans
	9/08/2006 to 9/12/2006	Initiated Scans, and Direct measurements.
OOL-05-09	10/17/2006	Performed DQA, FSS Complete
	9/08/2006	Performed walk-down of Survey Unit
	9/08/2006	Established Isolation and Controls
	8/02/2006	Performed Job Hazard Analysis
	8/01/2006	Performed Unit Classification
	8/02/2006	Performed Sample Quantity Calculations, established DQOs
	9/06/2006	Generated FFS Sample Plans
	9/08/2006 to 9/13/2006	Initiated Scans, and Direct measurements.
OOL-05-10	10/18/2006	Performed DQA, FSS Complete
	9/08/2006	Performed walk-down of Survey Unit
	9/08/2006	Established Isolation and Controls
	9/08/2006	Performed Job Hazard Analysis
	8/02/2006	Performed Unit Classification
	8/02/2006	Performed Sample Quantity Calculations, established DQOs
	9/08/2006	Generated FFS Sample Plans
	9/08/2006	Initiated Scans, and Direct measurements.
	10/18/2006	Performed DQA, FSS Complete

5.3 Surveillance Surveys

5.3.1 Periodic Surveillance Surveys

Upon completion of the FSS of Survey Area OOL-05, 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

Following Final Status Surveys, a quarterly surveillance was performed in Survey Unit OOL-05-04. The results of the surveillance were in agreement with the FSS.

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-05 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_o) (that the Survey Unit exceeds the release criteria) is rejected.

Table 6 Soil Sample Summary

Sample Description	SOF	Sample Description	SOF	Sample Description	SOF
OOL-05-01-001-F	0.15	OOL-05-03-001-F	0.16	OOL-05-04-070-F	0.04
OOL-05-01-002-F	0.16	OOL-05-03-002-F	0.10	OOL-05-04-071-F	0.08
OOL-05-01-003-F	0.09	OOL-05-03-003-F	0.16	OOL-05-04-072-F	0.17
OOL-05-01-004-F	0.17	OOL-05-03-004-F	0.06	OOL-05-04-073-F	0.09
OOL-05-01-005-F	0.11	OOL-05-03-005-F	0.03	OOL-05-04-074-F	0.03
OOL-05-01-006-F	0.23	OOL-05-03-006-F	0.26	OOL-05-04-075-F	0.05
OOL-05-01-007-F	0.03	OOL-05-03-007-F	0.18	OOL-05-04-076-F	0.03
OOL-05-01-008-F	0.22	OOL-05-03-008-F-A	0.02	OOL-05-04-077-F	0.25
OOL-05-01-009-F	0.03	OOL-05-03-009-F	0.22	OOL-05-04-078-F	0.04
OOL-05-01-010-F	0.09	OOL-05-03-010-F	0.23	OOL-05-04-079-F	0.07
OOL-05-01-011-F	0.20	OOL-05-03-011-F	0.05	OOL-05-04-080-F	0.03
OOL-05-01-012-F	0.45	OOL-05-03-012-F	0.04	OOL-05-04-081-F	0.12
OOL-05-01-013-F	0.15	OOL-05-03-013-F	0.37	OOL-05-04-082-F	0.07
OOL-05-01-014-F	0.30	OOL-05-03-014-F	0.12	OOL-05-04-083-F-A	0.04
OOL-05-01-015-F	0.07	OOL-05-03-015-F	0.04	OOL-05-04-084-F	0.05
OOL-05-01-016-F	0.18	OOL-05-03-016-F	0.06		
OOL-05-01-017-F	0.28	OOL-05-03-017-F	0.11		
		OOL-05-03-018-F	0.09		
Max	**0.45**	**Max**	**0.37**	**Max**	**0.25**
Average	**0.17**	**Average**	**0.13**	**Average**	**0.08**
Standard Deviation	**0.10**	**Standard Deviation**	**0.10**	**Standard Deviation**	**0.06**

Sample Description	SOF	Sample Description	SOF	Sample Description	SOF
OOL-05-05-001-F	0.05	OOL-05-06-001-F	0.04	OOL-05-07-001-F	0.15
OOL-05-05-002-F	0.04	OOL-05-06-002-F	0.03	OOL-05-07-002-F	0.18
OOL-05-05-003-F	0.06	OOL-05-06-003-F	0.01	OOL-05-07-003-F	0.29
OOL-05-05-004-F	0.04	OOL-05-06-004-F	0.07	OOL-05-07-004-F	0.06
OOL-05-05-005-F	0.03	OOL-05-06-005-F	0.02	OOL-05-07-005-F	0.16
OOL-05-05-006-F	0.04	OOL-05-06-006-F	0.08	OOL-05-07-006-F	0.19
OOL-05-05-007-F	0.05	OOL-05-06-007-F	0.05	OOL-05-07-007-F	0.12
OOL-05-05-008-F	0.03	OOL-05-06-008-F	0.04	OOL-05-07-008-F	0.11
OOL-05-05-009-F	0.05	OOL-05-06-009-F	0.04	OOL-05-07-009-F	0.08
OOL-05-05-010-F	0.04	OOL-05-06-010-F	0.08	OOL-05-07-010-F	0.15
OOL-05-05-011-F	0.07	OOL-05-06-011-F	0.04	OOL-05-07-011-F	0.06
OOL-05-05-012-F	0.05	OOL-05-06-012-F	0.05	OOL-05-07-012-F	0.09
OOL-05-05-013-F	0.04	OOL-05-06-013-F	0.05	OOL-05-07-013-F	0.20
OOL-05-05-014-F	0.03	OOL-05-06-014-F	0.05	OOL-05-07-014-F	0.20
OOL-05-05-015-F	0.04	OOL-05-06-015-F	0.06	OOL-05-07-015-F	0.49
OOL-05-05-016-F	0.04	OOL-05-06-016-F	0.08		
OOL-05-05-017-F	0.03	OOL-05-06-017-F	0.02		
OOL-05-05-018-F	0.06	OOL-05-06-018-F	0.06		
OOL-05-05-019-F	0.04	OOL-05-06-019-F	0.03		
OOL-05-05-020-F	0.05	OOL-05-06-020-F	0.06		
Max	**0.07**	**Max**	**0.08**	**Max**	**0.49**
Average	**0.04**	**Average**	**0.05**	**Average**	**0.17**
Standard Deviation	**0.01**	**Standard Deviation**	**0.02**	**Standard Deviation**	**0.11**

Sample Description	SOF	Sample Description	SOF	Sample Description	SOF
OOL-05-08-001-F-A	0.02	OOL-05-09-001-F	0.06	OOL-05-10-001-F	0.05
OOL-05-08-002-F	0.14	OOL-05-09-002-F	0.04	OOL-05-10-002-F-A	0.01
OOL-05-08-003-F	0.03	OOL-05-09-003-F	0.03	OOL-05-10-003-F	0.06
OOL-05-08-004-F	0.05	OOL-05-09-004-F	0.06	OOL-05-10-004-F-A	0.02
OOL-05-08-005-F	0.06	OOL-05-09-005-F	0.04	OOL-05-10-005-F	0.09
OOL-05-08-006-F	0.12	OOL-05-09-006-F	0.06	OOL-05-10-006-F-A	0.02
OOL-05-08-007-F-A	0.03	OOL-05-09-007-F	0.08	OOL-05-10-007-F	0.03
OOL-05-08-008-F	0.10	OOL-05-09-008-F	0.08	OOL-05-10-008-F-A	0.01
OOL-05-08-009-F	0.06	OOL-05-09-009-F	0.05	OOL-05-10-009-F-A	0.03
OOL-05-08-010-F	0.04	OOL-05-09-010-F	0.03	OOL-05-10-010-F	0.06
OOL-05-08-011-F	0.04	OOL-05-09-011-F	0.04	OOL-05-10-011-F-A	0.02
OOL-05-08-012-F	0.08	OOL-05-09-012-F	0.11	OOL-05-10-012-F-A	0.01
OOL-05-08-013-F	0.07	OOL-05-09-013-F	0.04	OOL-05-10-013-F-A	0.01
OOL-05-08-014-F	0.06	OOL-05-09-014-F	0.03	OOL-05-10-014-F-A	0.02
OOL-05-08-015-F	0.04	OOL-05-09-015-F	0.03	OOL-05-10-015-F-A	0.05
OOL-05-08-016-F	0.06	OOL-05-09-016-F	0.02	OOL-05-10-016-F	0.06
OOL-05-08-017-F	0.02	OOL-05-09-017-F	0.05	OOL-05-10-017-F-A	0.02
OOL-05-08-018-F	0.02	OOL-05-09-018-F	0.05	OOL-05-10-018-F -A	0.02
OOL-05-08-019-F	0.07	OOL-05-09-019-F	0.03		

Sample Description	SOF	Sample Description	SOF	Sample Description	SOF
OOL-05-08-020-F	0.05	OOL-05-09-020-F	0.05		
Max	**0.14**	**Max**	**0.11**	**Max**	**0.09**
Average	**0.06**	**Average**	**0.05**	**Average**	**0.03**
Standard Deviation	**0.03**	**Standard Deviation**	**0.02**	**Standard Deviation**	**0.02**

SPA-3s were used for scan surveys of OOL-05-01, OOL-05-03, OOL-05-04, OOL-05-07, OOL-05-08 and OOL-05-10. No activity greater than background, as indicated by an audible increase over the background count rate, or DCGLw, attributable to plant radionuclides was present in OOL-05-01, OOL-05-03, OOL-05-04, OOL-05-07, OOL-05-08 and OOL-05-10. Manholes and storm drains located in OOL-05-05 and OOL-05-06 were free released under YNPS procedure AP-0052, "*Radiation Protection Release of Equipment, Material and Vehicles*". 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 indicate that no investigation was warranted.

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

[1] Soil $DCGL_W$ from Appendix 6E of YNPS LTP
[2] Area Factor for 1 m^2 taken from Appendix 6Q of YNPS LTP

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

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
OOL-05-05-001-F-G	0.00	OOL-05-06-101-F-G	0.00	OOL-05-09-101-F-G	0.00
OOL-05-05-002-F-G	0.00	OOL-05-06-102-F-G	0.00	OOL-05-09-102-F-G	0.00
OOL-05-05-003-F-G	0.00	OOL-05-06-103-F-G	0.00	OOL-05-09-103-F-G	0.00
OOL-05-05-004-F-G	0.00	OOL-05-06-104-F-G	0.00	OOL-05-09-104-F-G	0.00
OOL-05-05-005-F-G	0.00	OOL-05-06-105-F-G	0.00	OOL-05-09-105-F-G	0.00
OOL-05-05-006-F-G	0.00	OOL-05-06-106-F-G	0.00	OOL-05-09-106-F-G	0.00
OOL-05-05-007-F-G	0.00	OOL-05-06-107-F-G	0.00	OOL-05-09-107-F-G	0.00
OOL-05-05-008-F-G	0.00	OOL-05-06-108-F-G	0.00	OOL-05-09-108-F-G	0.00
OOL-05-05-009-F-G	0.00	OOL-05-06-109-F-G	0.00	OOL-05-09-109-F-G	0.00
OOL-05-05-010-F-G	0.00	OOL-05-06-110-F-G	0.00	OOL-05-09-110-F-G	0.00
OOL-05-05-011-F-G	0.00	OOL-05-06-111-F-G	0.00	OOL-05-09-111-F-G	0.00
OOL-05-05-012-F-G	0.00	OOL-05-06-112-F-G	0.00	OOL-05-09-112-F-G	0.00
OOL-05-05-013-F-G	0.00	OOL-05-06-113-F-G	0.00	OOL-05-09-113-F-G	0.00
OOL-05-05-014-F-G	0.00	OOL-05-06-114-F-R	0.00	OOL-05-09-114-F-G	0.00
OOL-05-05-015-F-G	0.00	OOL-05-06-115-F-G	0.00	OOL-05-09-115-F-G	0.00
OOL-05-05-016-F-G	0.00	OOL-05-06-116-F-G	0.00	OOL-05-09-116-F-G	0.00
OOL-05-05-017-F-G	0.00	OOL-05-06-117-F-G	0.00	OOL-05-09-117-F-G	0.00

Sample Title	SOF	Sample Title	SOF	Sample Title	SOF
OOL-05-05-018-F-G	0.00	OOL-05-06-118-F-G	0.00	OOL-05-09-118-F-G	0.00
OOL-05-05-019-F-G	0.00	OOL-05-06-119-F-G	0.00	OOL-05-09-119-F-G	0.00
OOL-05-05-020-F-G	0.00	OOL-05-06-120-F-G	0.00	OOL-05-09-120-F-G	0.00
OOL-05-05-021-F-G	0.00	OOL-05-06-121-F-G	0.00	OOL-05-09-121-F-G	0.00
OOL-05-05-022-F-G	0.00	OOL-05-06-122-F-G	0.00	OOL-05-09-122-F-G	0.00
OOL-05-05-023-F-G	0.00	OOL-05-06-123-F-G	0.00	OOL-05-09-123-F-G	0.00
OOL-05-05-024-F-G	0.00	OOL-05-06-124-F-G	0.00	OOL-05-09-124-F-G	0.00
OOL-05-05-025-F-G	0.00	OOL-05-06-125-F-G	0.00	OOL-05-09-125-F-G	0.00
OOL-05-05-026-F-G	0.00	OOL-05-06-126-F-G	0.00	OOL-05-09-126-F-G	0.00
OOL-05-05-027-F-G	0.00	OOL-05-06-127-F-G	0.00	OOL-05-09-127-F-G	0.00
OOL-05-05-028-F-G	0.00	OOL-05-06-128-F-G	0.00	OOL-05-09-128-F-G	0.00
OOL-05-05-029-F-G	0.00	OOL-05-06-129-F-G	0.00	OOL-05-09-129-F-G	0.00
OOL-05-05-030-F-G	0.00	OOL-05-06-130-F-G	0.00	OOL-05-09-130-F-G	0.00
OOL-05-05-031-F-G	0.00	OOL-05-06-131-F-G	0.00	OOL-05-09-131-F-G	0.00
OOL-05-05-032-F-G	0.00	OOL-05-06-132-F-G	0.00	OOL-05-09-132-F-G	0.00
OOL-05-05-033-F-G	0.00	OOL-05-06-133-F-G	0.00	OOL-05-09-133-F-G	0.00
OOL-05-05-034-F-G	0.00	OOL-05-06-134-F-G	0.00	OOL-05-09-134-F-G	0.00
OOL-05-05-035-F-G	0.00	OOL-05-06-135-F-G	0.00	OOL-05-09-135-F-G	0.00
OOL-05-05-036-F-G	0.00	OOL-05-06-136-F-G	0.00	OOL-05-09-136-F-G	0.00
OOL-05-05-037-F-G	0.00	OOL-05-06-137-F-G	0.00	OOL-05-09-137-F-G	0.00
OOL-05-05-038-F-G	0.00	OOL-05-06-138-F-G	0.00	OOL-05-09-138-F-G	0.00
OOL-05-05-039-F-G	0.00	OOL-05-06-139-F-R	0.00	OOL-05-09-139-F-G	0.00
OOL-05-05-040-F-G	0.00	OOL-05-06-140-F-R	0.00	OOL-05-09-140-F-G	0.00
OOL-05-05-041-F-G	0.00	OOL-05-06-141-F-R	0.00	OOL-05-09-141-F-G	0.00
OOL-05-05-042-F-G	0.00	OOL-05-06-142-F-R	0.00	OOL-05-09-142-F-G	0.00
OOL-05-05-043-F-G	0.00	OOL-05-06-143-F-R	0.00	OOL-05-09-143-F-G	0.00
OOL-05-05-044-F-G	0.00	OOL-05-06-144-F-R	0.00	OOL-05-09-144-F-G	0.00
OOL-05-05-045-F-G	0.00	OOL-05-06-145-F-G	0.00	OOL-05-09-145-F-G	0.00
OOL-05-05-046-F-G	0.00	OOL-05-06-146-F-G	0.00	OOL-05-09-146-F-G	0.00
OOL-05-05-047-F-G	0.00	OOL-05-06-147-F-G	0.00	OOL-05-09-147-F-G	0.00
OOL-05-05-048-F-G	0.00	OOL-05-06-148-F-G	0.00	OOL-05-09-148-F-G	0.00
OOL-05-05-049-F-G	0.00	OOL-05-06-149-F-G	0.00	OOL-05-09-149-F-G	0.00
OOL-05-05-050-F-G	0.00	OOL-05-06-150-F-G	0.00	OOL-05-09-150-F-G	0.00
OOL-05-05-051-F-G	0.00	OOL-05-06-151-F-G	0.00	OOL-05-09-151-F-G	0.00
OOL-05-05-052-F-G	0.00	OOL-05-06-152-F-G	0.00	OOL-05-09-152-F-G	0.00
OOL-05-05-053-F-G	0.00	OOL-05-06-153-F-G	0.00	OOL-05-09-153-F-G	0.00
OOL-05-05-054-F-G	0.00	OOL-05-06-154-F-G	0.00	OOL-05-09-154-F-G	0.00
OOL-05-05-055-F-G	0.00	OOL-05-06-155-F-G	0.00	OOL-05-09-155-F-G	0.00
OOL-05-05-056-F-G	0.00	OOL-05-06-156-F-G	0.00	OOL-05-09-156-F-G	0.00
OOL-05-05-057-F-G	0.00	OOL-05-06-157-F-G	0.00	OOL-05-09-157-F-G	0.00
OOL-05-05-058-F-G	0.00	OOL-05-06-158-F-R	0.00	OOL-05-09-158-F-G	0.00
OOL-05-05-059-F-G	0.00	OOL-05-06-159-F-R	0.00	OOL-05-09-159-F-G	0.00
OOL-05-05-060-F-G	0.00	OOL-05-06-160-F-R	0.00	OOL-05-09-160-F-G	0.00
OOL-05-05-061-F-G	0.00	OOL-05-06-161-F-R	0.00	OOL-05-09-161-F-G	0.00
OOL-05-05-062-F-G	0.00	OOL-05-06-162-F-R	0.00	OOL-05-09-162-F-G	0.00
OOL-05-05-063-F-G	0.00	OOL-05-06-163-F-R	0.00	OOL-05-09-163-F-G	0.00
OOL-05-05-064-F-G	0.00	OOL-05-06-164-F-R	0.00	OOL-05-09-164-F-G	0.00

Sample Title	SOF	Sample Title	SOF	Sample Title	SOF
OOL-05-05-065-F-G	0.00	OOL-05-06-165-F-R	0.00	OOL-05-09-165-F-G	0.00
OOL-05-05-066-F-G	0.00	OOL-05-06-166-F-G	0.00	OOL-05-09-166-F-G	0.00
OOL-05-05-067-F-G	0.00	OOL-05-06-167-F-G	0.00	OOL-05-09-167-F-G	0.00
OOL-05-05-068-F-G	0.00	OOL-05-06-168-F-G	0.00	OOL-05-09-168-F-G	0.00
OOL-05-05-069-F-G	0.00	OOL-05-06-169-F-G	0.00	OOL-05-09-169-F-G	0.00
OOL-05-05-070-F-G	0.00	OOL-05-06-170-F-G	0.00	OOL-05-09-170-F-G	0.00
OOL-05-05-071-F-G	0.00	OOL-05-06-171-F-G	0.00	OOL-05-09-171-F-G	0.00
OOL-05-05-072-F-G	0.00	OOL-05-06-172-F-G	0.00	OOL-05-09-172-F-G	0.00
OOL-05-05-073-F-G	0.00	OOL-05-06-173-F-R	0.00	OOL-05-09-173-F-G	0.10
OOL-05-05-074-F-G	0.00			OOL-05-09-174-F-G	0.10
OOL-05-05-075-F-G	0.00			OOL-05-09-175-F-G	0.00
OOL-05-05-076-F-G	0.00			OOL-05-09-176-F-G	0.00
OOL-05-05-077-F-G	0.00			OOL-05-09-177-F-G	0.00
OOL-05-05-078-F-G	0.00			OOL-05-09-178-F-G	0.00
OOL-05-05-079-F-G	0.00			OOL-05-09-179-F-G	0.00
OOL-05-05-080-F-G	0.00			OOL-05-09-180-F-G	0.00
OOL-05-05-081-F-G	0.00			OOL-05-09-181-F-G	0.00
OOL-05-05-082-F-G	0.00			OOL-05-09-182-F-G	0.00
OOL-05-05-083-F-G	0.00			OOL-05-09-183-F-G	0.00
OOL-05-05-084-F-G	0.00			OOL-05-09-184-F-G	0.00
OOL-05-05-085-F-G	0.00			OOL-05-09-185-F-G	0.00
OOL-05-05-086-F-G	0.00			OOL-05-09-186-F-G	0.00
OOL-05-05-087-F-G	0.00			OOL-05-09-187-F-G	0.00
OOL-05-05-088-F-G	0.00			OOL-05-09-188-F-G	0.00
OOL-05-05-089-F-G	0.00			OOL-05-09-189-F-G	0.00
OOL-05-05-090-F-G	0.00			OOL-05-09-190-F-G	0.00
OOL-05-05-091-F-G	0.00			OOL-05-09-191-F-G	0.00
OOL-05-05-092-F-G	0.00			OOL-05-09-192-F-G	0.00
OOL-05-05-093-F-G	0.00			OOL-05-09-193-F-G	0.00
OOL-05-05-094-F-G	0.00			OOL-05-09-194-F-G	0.00
OOL-05-05-095-F-G	0.00			OOL-05-09-195-F-G	0.00
OOL-05-05-096-F-G	0.00			OOL-05-09-196-F-G	0.00
OOL-05-05-097-F-G	0.00			OOL-05-09-197-F-G	0.00
OOL-05-05-098-F-G	0.00			OOL-05-09-198-F-G	0.00
OOL-05-05-099-F-G	0.00			OOL-05-09-199-F-G	0.00
OOL-05-05-100-F-G	0.00			OOL-05-09-200-F-G	0.00
OOL-05-05-101-F-G	0.00			OOL-05-09-201-F-G	0.00
OOL-05-05-102-F-G	0.00			OOL-05-09-202-F-G	0.00
OOL-05-05-103-F-G	0.00			OOL-05-09-203-F-G	0.00
OOL-05-05-104-F-G	0.00			OOL-05-09-204-F-G	0.00
OOL-05-05-105-F-G	0.00			OOL-05-09-205-F-G	0.00
OOL-05-05-106-F-R	0.00			OOL-05-09-206-F-G	0.00
OOL-05-05-107-F-G	0.00			OOL-05-09-207-F-G	0.00
OOL-05-05-108-F-G	0.00			OOL-05-09-208-F-G	0.00
OOL-05-05-109-F-G	0.00			OOL-05-09-209-F-G	0.00
OOL-05-05-110-F-G	0.00			OOL-05-09-210-F-G	0.00

Sample Title	SOF	Sample Title	SOF	Sample Title	SOF
				OOL-05-09-211-F-G	0.00
				OOL-05-09-212-F-G	0.00
				OOL-05-09-213-F-G	0.00
				OOL-05-09-214-F-G	0.00
				OOL-05-09-215-F-G	0.00
Max	**0.00**	**Max**	**0.00**	**Max**	**0.10**
Average	**0.00**	**Average**	**0.00**	**Average**	**0.00**
Standard Deviation	**0.00**	**Standard Deviation**	**0.00**	**Standard Deviation**	**0.01**

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-05-01 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. HTD sample results were <DCGLw. The data set range was within approximately three standard deviations with the scatter plot graphically illustrating that the data vary about the arithmetic mean. The data posting plot does not clearly reveal any systematic spatial trends. There are no especially unusual features associated with the quantile plot 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-05-03 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 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 exhibits a slight skew to the left. The survey maintained sufficient power to pass the unit and the data set verified the assumptions of the statistical test.

5.5.3 OOL-05-04 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 left. 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-05-05 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 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-05-06 Data Quality Assessment

Fixed point sample concentrations were below the DCGLw and no sum-of-fractions were equal to or greater than one. The data set range was within approximately three standard deviations with the scatter plot graphically illustrating that the data vary about the arithmetic mean. The data posting plot does not clearly reveal any systematic spatial trends. There are no especially unusual features associated with the quantile plot 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.

5.5.6 OOL-05-07 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 upper quartile and the frequency plot exhibits a slight skew to the left. The survey maintained sufficient power to pass the unit and the data set verified the assumptions of the statistical test.

5.5.7 OOL-05-08 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 left. 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.

5.5.8 OOL-05-09 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 range was within approximately three standard deviations with the scatter plot graphically illustrating that the data vary about the arithmetic mean. The data posting plot does not clearly reveal any systematic spatial trends. There are no especially unusual features associated with the quantile plot 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.

5.5.9 OOL-05-10 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 a slight asymmetry in the upper quartile and the frequency plot exhibits a slight skew to the left. 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 preformed 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-05 satisfied the above criteria for the survey. QC records are found in Attachment C.

6.2 Split Samples and Recounts

6.2.1 OOL-05-01 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-05-03 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-05-04 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*".

6.2.4 OOL-05-05 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*".

6.2.5 OOL-05-06 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*".

6.2.6 OOL-05-07 Split Samples and Recounts

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

6.2.7 OOL-05-08 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*".

6.2.8 OOL-05-09 Split Samples and Recounts

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

6.2.9 OOL-05-10 Split Samples and Recounts

One split and one recount "QC" samples were 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-05.

7.0 CONCLUSION

The FSS of OOL-05 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_o) is rejected.

OOL-05 meets the objectives of the Final Status Survey.

Based upon the evaluation of the data acquired for the FSS, OOL-05 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 per year, 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 per year limit will also be met.

List of Appendices

Appendix A – YNPS-FSSP-OOL-05, *"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-05

Appendix E – YA-REPT-01-018-05, "*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.)