

## Final Status Survey Planning Worksheet

Page 1 of 7

<b>GENERAL SECTION</b>	
Survey Area No.: OOL-16	Survey Unit No.: 01
Survey Unit Name: Furlon House Lot	
FSSP Number: YNPS-FSSP-OOL-16-01-01	
<b>PREPARATION FOR FSS ACTIVITIES</b>	
Check marks in the boxes below signify affirmative responses and completion of the action.	
1.1 Files have been established for survey unit FSS records.	<input checked="" type="checkbox"/>
1.2 ALARA review has been completed for the survey unit.	<input checked="" type="checkbox"/> Refer to <u>YA-REPT-00-003-05</u>
1.3 The survey unit has been turned over for final status survey.	<input type="checkbox"/>
1.4 An initial DP-8854 walkdown has been performed and a copy of the completed Survey Unit Walkdown Evaluation is in the survey area file.	<input checked="" type="checkbox"/>
1.5 Activities conducted within area since turnover for FSS have been reviewed.	<input type="checkbox"/>
Based on reviewed information, subsequent walkdown: <input checked="" type="checkbox"/> not warranted <input type="checkbox"/> warranted	
If warranted, subsequent walkdown has been performed and documented per DP-8854. <input type="checkbox"/>	
OR	
The basis has been provided to and accepted by the FSS Project Manager for not performing a subsequent walkdown. <input type="checkbox"/>	
1.6 A final classification has been performed.	<input type="checkbox"/>
1.7 Classification: CLASS 1 <input type="checkbox"/> CLASS 2 <input type="checkbox"/> CLASS 3 <input checked="" type="checkbox"/>	
<b>DATA QUALITY OBJECTIVES (DQO)</b>	
<b>1.0 State the problem:</b>	
<p>Survey Unit OOL-16-01 consists of the Furlon House Lot, approximately 2342.4 m<sup>2</sup> in surface area. Survey Unit OOL-16-01 is entirely bounded by non-impacted YAEC-owned property. The only subsurface structure that traverses or connects within OOL-16-01 is the sanitary sewer system that services the Furlon House. Survey Unit OOL-16-01 contains soil that was excavated during the construction activities of the YNPS site. Because site excavated soils were deposited, low levels of radioactivity may minimally impact this area. OOL-16-01 was never part of the RCA, did not contain any radioactive systems and no decommissioning activities were performed in this area; therefore it meets the criteria for a Class 3 survey unit. The problem at hand is to demonstrate that the years of plant operation did not result in an accumulation of plant-related radioactivity that exceeds the release criteria.</p> <p>The planning team for this effort consists of the FSS Project Manager, FSS Radiological Engineer, FSS Field Supervisor, and FSS Technicians. The FSS Radiological Engineer will make primary decisions with the concurrence of the FSS Project Manager.</p>	
<b>2.0 Identify the decision:</b>	
Does residual plant-related radioactivity, if present in the survey unit, exceed the release criteria? Alternative actions may include no action, investigation, resurvey, remediation and reclassification.	
<b>3.0 Identify the inputs to the decision:</b>	

<i>Sample media:</i>	Soil
<i>Types of measurements:</i>	Soil samples and gamma scans
<i>Radionuclides-of-concern:</i>	Cs <sup>137</sup>

The characterization data in the HSA is not sufficient to support FSS planning. Two characterization soil samples were collected from this relatively small survey unit. The results were consistent with historical use information in that no plant-related radionuclide was identified in either sample. The characterization samples were not analyzed for hard-to-detect (HTD) nuclides such as H<sup>3</sup>, Sr<sup>90</sup>, and TRUs. However, given that the gamma analysis did not identify any plant-related radioactivity, plant-related HTD nuclides are not expected to be present in absence of plant-related gamma-emitters, which were historical more abundant in all the plant waste streams. Survey Unit OOL-18-01 Monroe Hill Lot was utilized to store Low-level Rad Waste containers in the same manner as OOL-16-01; therefore 13 additional characterization samples from OOL-18 taken on 6/5/06 were used to support this plan. Nevertheless, all FSS soil samples will be analyzed for the LTP-listed gamma-emitting radionuclides, and at least 5% of the FSS soil samples will be sent to an independent laboratory for complete analyses (HTD nuclides and TRUs).

<i>Applicable DCGL:</i>		The DCGLs applied under this survey plan correspond to annual doses of 8.73 mrem/y (the 10-mrem/y DCGL adjusted for the dose contributions from sub-surface concrete structures and tritium in ground water).			
Nuclide	DCGL (pCi/g)	Nuclide	DCGL (pCi/g)	Nuclide	DCGL (pCi/g)
Co <sup>60</sup>	1.4E+00	Eu <sup>152</sup>	3.6E+00	Sr <sup>90</sup>	6.0E-01
Nb <sup>94</sup>	2.5E+00	Eu <sup>154</sup>	3.3E+00	Tc <sup>99</sup>	5.0E+00
Ag <sup>108m</sup>	2.5E+00	Eu <sup>155</sup>	1.4E+02	Pu <sup>238</sup>	1.2E+01
Sb <sup>125</sup>	1.1E+01	H <sup>3</sup>	1.3E+02	Pu <sup>239/240</sup>	1.1E+01
Cs <sup>134</sup>	1.7E+00	C <sup>14</sup>	1.9E+00	Pu <sup>241</sup>	3.4E+02
Cs <sup>137</sup>	3.0E+00	Fe <sup>55</sup>	1.0E+04	Am <sup>241</sup>	1.0E+01
		Ni <sup>63</sup>	2.8E+02	Cm <sup>243/244</sup>	1.1E+01

The presence of all LTP-listed radionuclides (gamma-emitters, HTD beta-emitters, and TRUs) in the soil will be evaluated under this survey plan. The YNPS Chemistry Dept. will analyze each FSS soil sample for all LTP-listed gamma-emitting nuclides, except Cm<sup>243/244</sup>. In addition, 5% of FSS soil samples will be sent to an independent laboratory for analyses of gamma-emitters, HTD beta-emitting radionuclides, and alpha-emitting radionuclides, which will include Cm<sup>243/244</sup>.

#### *Survey Design / Release Criteria*

<i>Classification:</i>	Class 3
<i>Average Cs<sup>137</sup> concentration:</i>	0.0293 pCi/g
<i>Standard deviation Cs<sup>137</sup> (σ):</i>	0.0327 pCi/g
<i>DCGL:</i>	3.0 pCi/g
<i>Surrogate DCGL:</i>	N/A (a surrogate DCGL will not be used)
<i>LBGR:</i>	2.9346 (Initial LBGR: 1.5)
<i>Number of Samples</i>	15 (calculated) + 5 (added), for a total of 20 samples. (+ 2 QC)
<i>Survey Unit Area:</i>	2342.4m <sup>2</sup>

<i>Grid Area (A/N):</i>	No grid.																								
<i>Investigation Level for soil samples:</i>	<ul style="list-style-type: none"> <li>• &gt;DCGL<sub>w</sub> for any LTP listed nuclide.</li> <li>• Sum of DCGL fractions &gt;1.0.</li> </ul>																								
<i>Scan Coverage:</i>	≥10% of the surface area using SPA-3.																								
<i>SPA-3 Gamma Scan Coverage:</i>	SPA-3 scans will be performed over an approximate 1m by 1m area surrounding each soil sample. At least three judgmental SPA-3 scans will be performed in Survey Unit OOL-16-01, each of which will cover an area of approximately 10 m <sup>2</sup> (1m in width and 10m in length). These scans will be performed in the parking lot area in the approximate location shown on the attached map.																								
<i>Investigation Level for SPA-3 Scans:</i>	Reproducible indication above background using SPA-3 and audible discrimination. The expected background range for SPA-3 scans is between 4,000 cpm and 10,000 cpm.																								
<i>Radionuclides for analysis:</i>	All LTP nuclides with the focus on Cs <sup>137</sup> .																								
<i>MDCs for gamma analysis of soil samples:</i>	<table border="1"> <thead> <tr> <th><u>Nuclide</u></th> <th><u>10% - 50% of DCGL (pCi/g)</u></th> </tr> </thead> <tbody> <tr> <td>Co<sup>60</sup></td> <td>1.4E-01 - 7.0E-01</td> </tr> <tr> <td>Nb<sup>94</sup></td> <td>2.5E-01 - 1.3E+00</td> </tr> <tr> <td>Ag<sup>108m</sup></td> <td>2.5E-01 - 1.3E+00</td> </tr> <tr> <td>Sb<sup>125</sup></td> <td>1.1E+00 - 5.6E+00</td> </tr> <tr> <td>Cs<sup>134</sup></td> <td>1.7E-01 - 8.7E-01</td> </tr> <tr> <td>Cs<sup>137</sup></td> <td>3.0E-01 - 1.5E+00</td> </tr> <tr> <td>Eu<sup>152</sup></td> <td>3.6E-01 - 1.8E+00</td> </tr> <tr> <td>Eu<sup>154</sup></td> <td>3.3E-01 - 1.7E+00</td> </tr> <tr> <td>Eu<sup>155</sup></td> <td>1.4E+01 - 6.9E+01</td> </tr> </tbody> </table> <p>The desired MDCs in the laboratory analyses of FSS soil samples will be the 10% DCGL values. If it is impractical to achieve those, the 50% DCGL values must be achieved in the laboratory analyses of the FSS soil samples.</p>	<u>Nuclide</u>	<u>10% - 50% of DCGL (pCi/g)</u>	Co <sup>60</sup>	1.4E-01 - 7.0E-01	Nb <sup>94</sup>	2.5E-01 - 1.3E+00	Ag <sup>108m</sup>	2.5E-01 - 1.3E+00	Sb <sup>125</sup>	1.1E+00 - 5.6E+00	Cs <sup>134</sup>	1.7E-01 - 8.7E-01	Cs <sup>137</sup>	3.0E-01 - 1.5E+00	Eu <sup>152</sup>	3.6E-01 - 1.8E+00	Eu <sup>154</sup>	3.3E-01 - 1.7E+00	Eu <sup>155</sup>	1.4E+01 - 6.9E+01				
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<i>MDCR for SPA-3:</i>	The accompanying MCDR/MDC table in Attachment 1 provides MDCR values by various background levels.																								
<i>MDC(fDCGL) for SPA-3 scans:</i>	The accompanying MCDR/MDC table in Attachment 1 provides MDC values, as a fraction of DCGL, by various background levels.																								
	<b>Note:</b> Any radiation levels detected above background in a Class 3 survey unit should be investigated. A Class 3 survey unit is expected to																								

have minimal contamination and not expected to have any hot spots. MARSSIM recommends scanning in a Class 3 survey unit be performed to verify proper classification. Scan MDC is not tied to the DCGL<sub>w</sub> in a Class 3 survey area and therefore scanning to levels above background is a measure of due-diligence on the appropriateness of the classification. (<http://www.ora.gov/ddsc/expert/answers/marssim.htm> question/answer dated 2/4/2003)

*QC checks and measurements:*

- QC checks for the Leica GPS will be performed in accordance with DP-8859.
- QC checks for the SPA-3 will be performed in accordance with DP-8504.
- Two QC split sample will be collected (note: this exceeds the DP-8852 requirements).
- YNPS Chemistry Lab will perform a QC Recount on at least one soil sample in accordance with DP-8852 requirements.

**4.0 Define the boundaries of the survey:**

Boundaries of Survey Unit OOL-16-01 are as shown on the attached map. The Furlon House Parking Lot is bounded on the east side by Monroe Hill Road, Lord Brook to the west and a wooded area to the north. The Furlon House footprint occupies the southwestern corner of the survey unit.

The survey will be performed under appropriate weather conditions (as defined by instrumentation limitations and human tolerance). Surveys may be performed on any shift of work.

**5.0 Develop a decision rule:**

Upon review of the FSS data collected under this survey plan:

- (a) If all the sample data show that the soil concentrations of LTP-listed nuclides are below the 8.73 mrem/year DCGLs and the sum of fractions of LTP-listed nuclides are below unity, then reject the null hypothesis (i.e., Survey Unit OOL-16-01 meets the release criteria).
- (b) If the investigation levels are exceeded, then perform an investigation survey.
- (c) If the average concentration of any LTP-listed nuclide exceeds its respective DCGL<sub>w</sub> or the average sum of fractions of LTP-listed nuclides exceeds unity, then accept the null hypothesis (i.e., Survey Unit OOL-16-01 fails to meet the release criteria).

Note: Alternate actions include investigations, reclassification, remediation and resurvey.

**6.0 Specify tolerable limits on decision errors:**

<i>Null hypothesis:</i>	Residual plant-related radioactivity in Survey Unit OOL-16-01 exceeds the release criteria.
<i>Probability of type I error:</i>	0.05
<i>Probability of type II error:</i>	0.05
<i>LBGR:</i>	The applicable soil (8.73-mrem/y) DCGL ÷ 2 LBGR = 2.9346 (Initial LBGR: 1.5)

**7.0 Optimize Design:**

Type of statistical test: WRS Test  Sign Test  (background will not be subtracted)

*Number and Location of Samples:* 20 soil samples will be collected in randomly selected locations (refer to accompanying DPF-8853.1).

### GENERAL INSTRUCTIONS

1. Where possible, measurement locations will be identified using GPS in accordance with DP-8859. Each location will be marked to assist in identifying the location. Any locations that are not suitable for soil sampling will be relocated to the nearest suitable location and documented in the field log in accordance with DP-8856.
2. Soil samples will be collected in accordance with DP-8120.
3. Chain-of-Custody forms will be used in accordance with DP-8123 for all soil samples sent to an off-site laboratory. The required MDCs for the analyses performed by the off-site laboratory will be communicated to the Lab via an attachment to the Chain-of-Custody form.
4. All soil samples will be received and prepared in accordance with DP-8813. Note: Split samples to be sent to an off-site lab will not be dried prior to counting on site or shipping.
5. Survey instrument: Operation of the E-600 w/SPA-3 will be in accordance with DP-8535 with QC checks performed in accordance with DP-8504. The instrument response checks shall be performed before issue and after use.
6. All SPA-3 scans will be performed with the audible feature activated. FSS Technicians will listen for upscale readings to which they will respond by slowing down or stopping the probe to distinguish between random fluctuations in the background and greater than background readings.
7. The job hazards associated with the survey described in this package are addressed in the accompanying Job Hazard Assessment (JHA) for OOL-16-01.
8. All personnel participating in this survey shall be trained in accordance with DP-8868.

### SPECIFIC INSTRUCTIONS

1. All designated measurement locations will be identified by GPS per DP-8859 or by use of reference points and tape measure, as necessary. If a designated sample location is obstructed for any reason, the FSS Radiological Engineer or the FSS Field Supervisor will select an alternate location in accordance with DP-8856. A detailed description of the alternate location will be recorded on form DPF-8856.2, the survey unit map will be annotated appropriately, and the alternate location will be conspicuously marked to facilitate re-visiting to identify and record the coordinates with GPS in accordance with DP-8859 or by measurement from a known reference point when GPS is not available.
2. Sample Requirements:  
Collect 20 random 1-liter soil samples in accordance with DP-8120. Two of the 20 random soil samples will be analyzed as a QC split sample to fulfill the QC requirement of DP-8852. The same QC split samples will also be analyzed for Hard-to-Detect nuclides in accordance with section 5.6.3.2.1 of the LTP and DP-8856.
3. Soil Sample Designations:

FSS soil samples:	OOL-16-01-001-F through OOL-16-01-020-F corresponding to FSS sample locations 001 through 020.
Biased soil samples:	None.
QC split samples:	OOL-16-01-008-F-S and OOL-16-01-017-F-S to be designated as QC split samples.

	split samples.
Recount samples:	OOL-16-01-006-F-RC is to be counted twice on site. The results will be compared in accordance with DP-8864.

4. Sample Analysis:

- Gamma analysis will be performed on all soil samples. If any of the gamma analyses show that an investigation level has been exceeded an investigation survey will be conducted at that sample location as directed in specific instruction # 6.
- YNPS Chemistry will analyze OOL-16-01-001-F through OOL-16-01-020-F for gamma-emitting nuclides.
- YNPS Chemistry will analyze OOL-16-01-008-F-S and OOL-16-01-017-F-S for gamma-emitting nuclides prior to being sent to the off-site laboratory. These samples will be analyzed for gamma-emitting nuclides and HTDs as collected from the field (i.e. without drying) at the off-site laboratory. Ensure that the lid to the 1-liter Marinelli container is secured and sealed with electrical tape to prevent loss of moisture during shipping.
- YNPS Chemistry will analyze OOL-16-01-006-F as a sample recount. The recounted sample will possess the naming convention OOL-16-01-006-F-RC.
- On-site gamma analysis of the FSS samples shall achieve the MDC values stated in the DQO section of this plan. The MDCs will be communicated to the laboratory using an attachment to the Chain-of-Custody form.

5. If the results of any FSS sample (statistical points) analysis exceed an investigation level, perform a first level investigation as follows:

Note: Detailed descriptions of investigation actions shall be recorded in the daily survey journal (DPF-8856.2).

- Scan a 1-meter radius footprint around the sample location with a SPA-3 in rate-meter mode moving the detector at a speed of 0.25m or less per second, keeping the probe at a distance of approximately 3" from the surface and following a serpentine path that includes at least 3 passes across each square meter. The area of scan should be increased as necessary to bound any areas of elevated activity identified.
- Mark the boundaries around any detected elevated areas in the soil and identify the boundaries on a survey map. Measure the total area of each outlined area in square centimeters.
- Mark the location of the highest identified activity for each of the elevated areas in the soil and on the survey map.
- At each of the highest identified activity areas:
  - Perform and record a 1-minute scaler mode SPA-3 measurement. Designate the reading as "OOL-16-01-xxx-F-SC-I" where "xxx" continues sequentially from the last number assigned to an FSS measurement.
  - Obtain a soil sample at the location. Designate the sample as "OOL-16-01-xxx-F-I" where "xxx" continues sequentially from the last number assigned to an FSS measurement.
  - Perform and record a post sample 1-minute SPA-3 measurement. Designate the reading as described above.

6. If the results of a scan exceed an investigation level, perform a first level investigation as follows:

Note: Detailed descriptions of investigation actions shall be recorded in the daily survey journal (DPF-8856.2).

- Scan the footprint with a SPA-3 in rate-meter mode moving the detector at a speed of 0.25m or less per second, keeping the probe at a distance of approximately 3” from the surface and following a serpentine path that includes at least 3 passes across each square meter.
- Mark the boundaries around any detected elevated areas in the soil and identify the boundaries on a survey map. Measure the total area of each outlined area in square centimeters.
- Mark the location of the highest identified activity for each of the elevated areas in the soil and on the survey map.
- At each of the highest identified activity areas:
  - Perform and record a 1-minute scaler mode SPA-3 measurement. Designate the reading as “OOL-16-01-xxx-F-SC-I” where “xxx” continues sequentially from the last number assigned to an FSS measurement.
  - Obtain a soil sample at the location. Designate the sample as “OOL-16-01-xxx-F-I” where “xxx” continues sequentially from the last number assigned to an FSS measurement.
  - Perform and record a post sample 1-minute SPA-3 measurement. Designate the reading as described above.

**NOTIFICATION POINTS**

None.

Prepared by *Nancy J. Tozzi* <sup>N. TOZZI</sup> Date 7/13/06  
 FSS Radiological Engineer

Reviewed by *Mark J. DeMaso* Date 7-13-2006  
 FSS Radiological Engineer

Approved by *Mat C. Smith* Date 7/13/06  
 FSS Project Manager

**SPA-3 Scan Tables**

## Max Background

BKG(cpm)	MDCR	MDC(fDCGL)
4,000	639	1.13E+00
5,000	715	1.27E+00
6,000	783	1.39E+00
7,000	845	1.50E+00
8,000	904	1.60E+00
9,000	959	1.70E+00
10,000	1,011	1.79E+00
11,000	1,060	1.88E+00
12,000	1,107	1.96E+00
13,000	1,152	2.04E+00
14,000	1,196	2.12E+00
15,000	1,238	2.19E+00
16,000	1,278	2.27E+00
17,000	1,318	2.34E+00
18,000	1,356	2.40E+00
19,000	1,393	2.47E+00
20,000	1,429	2.53E+00
21,000	1,464	2.60E+00
22,000	1,499	2.66E+00
23,000	1,533	2.72E+00
24,000	1,565	2.78E+00
25,000	1,598	2.83E+00
26,000	1,629	2.89E+00
27,000	1,660	2.94E+00
28,000	1,691	3.00E+00
30,000	1,750	3.10E+00
32,000	1,808	3.21E+00
34,000	1,863	3.30E+00
36,000	1,917	3.40E+00
38,000	1,970	3.49E+00
40,000	2,021	3.58E+00

YNPS-FSSP-OOL-16-01-00

Attachment 2

DCGL MDC Table

Nuclide	SAI 0.73 mSv/y (pCi/g)	10% MDC DCGL	50% MDC DCGL	90% MDC DCGL
Co-60	1.4E+00	1.4E-01	7.0E-01	ETD
Nb-94	2.5E+00	2.5E-01	1.3E+00	ETD
Ag-108m	2.5E+00	2.5E-01	1.3E+00	ETD
Sb-125	1.1E+01	1.1E+00	5.6E+00	ETD
Cs-134	1.7E+00	1.7E-01	8.7E-01	ETD
Cs-137	3.0E+00	3.0E-01	1.5E+00	ETD
Eu-152	3.6E+00	3.6E-01	1.8E+00	ETD
Eu-154	3.3E+00	3.3E-01	1.7E+00	ETD
Eu-155	1.4E+02	1.4E+01	6.9E+01	ETD
Am-241	1.0E+01	1.0E+00	5.1E+00	ETD
H-3	1.3E+02	1.3E+01	6.4E+01	HTD
C-14	1.9E+00	1.9E-01	9.7E-01	HTD
Fe-55	1.0E+04	1.0E+03	5.1E+03	HTD
Ni-63	2.8E+02	2.8E+01	1.4E+02	HTD
Sr-90	6.0E-01	6.0E-02	3.0E-01	HTD
Tc-99	5.0E+00	5.0E-01	2.5E+00	HTD
Pu-238	1.2E+01	1.2E+00	5.8E+00	HTD
Pu-239	1.1E+01	1.1E+00	5.3E+00	HTD
Pu-241	3.4E+02	3.4E+01	1.7E+02	HTD
Cm-243	1.1E+01	1.1E+00	5.6E+00	HTD