

Final Status Survey Planning Worksheet

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GENERAL SECTION	
Survey Area #: OOL-05	Survey Unit #: 01
Survey Unit Name: Southeast Half of Survey Area OOL-05	
FSSP Number: YNPS-FSSP-OOL-05-01-00 (CHAR)	
PREPARATION FOR FSS ACTIVITIES	
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"/>
1.3 The survey unit has been turned over for final status survey.	<input checked="" 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 checked="" 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 checked="" type="checkbox"/>
Classification: CLASS 1	<input type="checkbox"/> CLASS 2 <input type="checkbox"/> CLASS 3 <input checked="" type="checkbox"/>
DATA QUALITY OBJECTIVES (DQO)	
1.0 <u>Statement of problem:</u>	
Survey Area OOL-05 is an open land area with insufficient characterization data to begin a proper Final Status Survey. This will be a characterization survey, planned and performed with enough rigor that it could serve as the final status survey, depending upon the results.	
Survey Unit 01 is the section of OOL-05, about 10,400 m ² in size, representing approximately the southern half of Survey Area OOL-05. 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. 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.	
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.	
2.0 <u>Identify the decision:</u>	
Does residual plant-related radioactivity, if present in the survey unit, exceed the release criteria? Alternative actions that may be implemented in this effort are investigation, reclassification or resurvey, using these data as characterization data.	

3.0 Identify the inputs to the decision:

Sample media: soil

Types of measurements: soil samples and judgmental scans

Applicable DCGLs: 3.00 pCi Cs137 per g (10-mrem/y DCGL)

Radionuclide-of-concern: Cs137

The characterization data in the HSA is insufficient to support FSS planning. None of the thirteen soil samples that were collected in Survey Area OOL-005 were actually from Survey Unit 01. No analysis for Hard-to-Detect (HTD) nuclides was done in this survey area.

Average Cs-137: Based upon the history of the area, it is expected that this nuclide will be at background concentrations. Pelham Lake data, decayed to October 2004 give an average value of 0.808 pCi/g for Cs-137. This data may be updated when data is available from the reference area sampled in October 2004.

Standard deviation: (σ): $\sigma(\text{Cs-137}) = 0.339 \text{ pCi/g}$.

Surrogate DCGL: No surrogate DCGL will be used because the HTD nuclides were generally not produced by the plant in greater quantities (relative to their DCGLs) than the gamma emitters were. Even though Sr-90 may be detectable in the samples, it is less likely to have been produced by the plant than several of the gamma-emitters. Two samples will be analyzed for HTD nuclides.

Investigation Level for soil samples: To be determined, based upon background reference area data. In general, the investigation level will be at 50% of the DCGL plus any background that has been established (Cs-137 or Sr-90).

Investigation Level for scan: >background using an audible signal.

Expected background range for SPA-3 scan: 8,000 cpm to 15,000 cpm, depending on the presence of rock and boulders in the immediate vicinity of the measurement location.

Radionuclides for analysis: All LTP nuclides with the focus on Cs-137.

MDCs for gamma analysis of soil samples:

<u>Nuclide</u>	<u>10 - 50% DCGL (pCi/g)</u>
Co-60	0.14-0.70
Nb-94	0.25-1.3
Ag-108m	0.25-1.3
Sb-125	1.1-5.5
Cs-134	0.17-0.86
Cs-137	0.30-1.5
Eu-152	0.35-1.7
Eu-154	0.33-1.7
Eu-155	14-70

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.

MDCs for HTD nuclides: In addition to the MDC values listed above, the following MDC values will also be transmitted to the outside laboratory via the chain-of-custody form accompanying the FSS soil samples:

<u>Nuclide</u>	<u>10 - 50% DCGL (pCi/g)</u>
C-14	0.19-0.96
Fe-55	1000-5200
Ni-63	28-140
Sr-90	0.059-0.29
Tc-99	0.48-2.4
Pu-238	1.1-5.7
Pu-239	1.0-5.2
Pu-241	34-170
Am-241	1.0-5.2
Cm-243	1.1-5.5

Scan coverage: SPA-3 scans will be performed over an approximate 1m by 1m area surrounding each soil sample, as permitted by terrain and tree/brush density. Two biased scans will also be performed: one along the path of the old railway line which runs close to the south-east boundary of the unit; and the other near and parallel to the brook that is just north of the northern boundary of Unit 1. Each of these scans will cover an area approximately 10 m² in size (1 m in width and 10 m in length). These locations were selected because they are the closest points in Survey Unit-01 to on-going plant decommissioning activities or activities that may have involved licensed material during plant operations.

MDCR for SPA-3: The accompanying Table 1 provides MDCR by various general area background levels.

MDC(fDCGL) for SPA-3 scans: The accompanying Table 1 provides MDC(fDCGL) by various general area background levels.

QC checks and measurements: QC checks for the SPA-3 will be performed in accordance with DP-8540. Two QC split samples will be collected which is more than the 5% required by the LTP. This is being done in this early round survey in order to amass data on the HTD nuclides. The individual sample location numbers for split sampling have been chosen at random from the 17 random samples. In addition, two samples will be counted twice in house and the results compared.

4.0 Define the boundaries of the survey:

Boundaries of Survey Unit 01 are as shown on the attached map. There are no structures present in the Survey Unit 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. Any of the sample locations that happen to fall on this concrete slag will be dealt with according to General Instructions, #6. The survey will be performed under normal (fall) weather conditions and in daylight hours (allowing adequate daylight time for ingress and egress).

5.0 Develop a decision rule:

- (a) If all the sample data show that the soil concentrations of all plant-related nuclides are below the DCGL, reject the null hypothesis (i.e., Survey Unit 01 meets the release criteria).
- (b) If the action levels are exceeded, then perform an investigation survey. This may include the use of a statistical test.
- (c) If the average concentration of any individual nuclide exceeds the DCGL or if the sum of

fractions exceeds one, then accept the null hypothesis (i.e., Survey Unit 01 fails to meet the release criteria).

6.0 Specify tolerable limits on decision errors:

Null hypothesis: Residual plant-related radioactivity in Survey Unit 01 exceeds the release criteria.

Probability of type I error: 0.05

Probability of type II error: 0.05

LBGR: $(3.00 \text{ pCi/g})/2 = 1.50 \text{ pCi/g}$

7.0 Optimize Design:

Type of statistical test: WRS Test Sign Test

Cs-137 is present in background due to fallout - Cs-137 in reference area (decay-corrected to October 2004): 0.81 pCi/g.

Basis including background reference location (if WRS test is specified): YA-REPT-00-006-03

Number of samples : 17 random samples plus five biased samples.

Note: 17 FSS soil samples will be collected in randomly selected locations, accounting for locations that cannot be sampled. This number has been chosen, based upon experience, with the expectation that the data will be useable for the FSS survey. No characterization data were available. In addition to the random samples, five biased samples will be taken.

Biased samples: Biased sample locations will be selected before, or at the time of sample collection and their locations will be added to the map, with the last letter "B". The addition of these samples and the relocation of any samples may be added to the map without requiring a revision. The coordinates of the biased sample locations will be determined and added to the record. The locations will be chosen, after the random locations, to include one or more soil samples in locations where runoff from the concrete slag may have concentrated any activity that may have fallen on the slag. In such a location, it would be no surprise if fallout nuclides, i.e., Cs-137 and Sr-90 were found in above average concentrations. Other biased sample locations will be selected to increase the sample density in areas that that would have been most readily accessible, and therefore, most easily impacted during plant operations.

GENERAL INSTRUCTIONS

1. Collect 17 random 1-liter FSS soil samples and 5 biased 1-liter soil samples in accordance with DP-8120, using sampling equipment as stated in DP-8120. Two of the 17 FSS soil samples will be QC split samples.
2. Soil sample designation:
 - (a) FSS soil samples: OOL-05-01-001-F through OOL-05-01-017-F.
 - (b) Biased FSS soil sample: OOL-05-01-018-F-B through OOL-05-01-022-F-B.
 - (c) 2 QC split samples: OOL-05-01-001-F-S and OOL-05-01-015-F-S. These two will be analyzed for hard-to-detect nuclides, in addition to being analyzed by gamma spectroscopy. The results of the off-site gamma spec will be compared with the on-site results in accordance with DP-8864.
 - (d) 2 recount samples: OOL-05-01-007-F and OOL-05-011-F will be counted twice on site. The results will be compared in accordance with DP-8864.
3. All soil samples will be received and prepared in accordance with DP-8813.
4. Chain of Custody form will be used in accordance with DP-8123 for the two split samples since they

will be sent to an off-site laboratory.

5. The measurement locations will be identified using GPS. In cases where the location cannot be determined directly using GPS, an offset will be used to describe the distance and bearing from a known GPS location. Each location will be marked with a flag, either prior to or at the time of the sampling. The FSS Radiological Engineer or FSS Field Supervisor will guide the FSS Technicians to the sample locations.

6. Any locations that are not suitable for soil sampling, for example, because of the presence of a rock or concrete slag, will be relocated to the nearest suitable location and documented in the log. In cases where concrete slag is the obstacle, at least one sample should be collected consisting of decayed and composted organic matter from a nearby pocket, if such a sample can be obtained with sufficient volume, even though it may not contain any mineral soil. This will be considered a "soil" sample for analysis purposes. Such a sample should be described in the sample log. The actual sample location will be marked. The coordinates of the actual sample location will be determined using GPS, or the sample location will be otherwise documented.

7. 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-8540. The instrument response checks shall be performed before issue and after use.

8. The job hazards associated with the FSS in Survey Unit 01 are addressed in the accompanying JHA for OOL-05-01.

9. All personnel participating in this survey shall be trained in accordance with DP-8868.

SPECIFIC INSTRUCTIONS

1. FSS Technicians will perform scans by moving the SPA-3 detector at a speed ≤ 0.5 m/s, keeping the probe less than 3 inches from the surface, and following a serpentine pattern that includes at least 3 passes across each square meter. When scanning and walking, a slow pace (i.e., 1 step per second) shall be used. Scanning will be performed in the rate-meter mode with the audible feature on. Surveyors 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. Location(s) where detectable-above-background scan readings are found will be investigated.

A first level investigation may be done with the SPA-3/E-600 to determine if the observed increase in the scan measurement is due to the presence of rocks and boulders. SPA-3 scans performed in non-impacted areas have shown that rock formations accounted for increased count rates. If it can be demonstrated that the presence of rocks and boulders is the cause of an increased count rate during a SPA-3 scan, record that finding on form DPF-8856.2. If it is demonstrated that the rocks and boulders do not account for an above background SPA-3 measurement, a soil sample will be collected at the point of the highest SPA-3 reading in the scanned area. Detailed descriptions of investigation actions will be recorded on form DPF-8856.2 and the location of the above background scan and sample will be recorded on the survey map. The location description must include sufficient detail to revisit the spot at a later time. If a soil sample is collected during the first level investigation, the sample designation will consist of the measurement location code plus the letter "I" (for investigation). For example, if a soil sample is collected during a first level investigation at measurement location 001, it will be designated OOL-05-01-001-F-I. If the investigation calls for more than one sample, sequentially number the investigation samples as "I1", "I2", etc.

2. Gamma analysis will be performed on all soil samples.

3. All sample analysis will achieve the MDC values stated in the DQO section of this plan.

NOTIFICATION POINTS

QA notification point(s) (y/n) y Specify: 1. Date/time of initial pre-survey briefing;
2. Date/time of commencement of soil sampling; 3. Date/time of first soil scan measurement; 4.
Date/time of the two biased soil scan measurements. NOTIFIED/Dick Trubian

FSI point(s) (y/n) n Specify: _____

Prepared by J. Hummer Date 11/8/04
FSS Radiological Engineer

Reviewed by J. Basin Date 4/8/04
FSS Radiological Engineer

Approved by R. Smith Date 11/8/04
FSS Project Manager

Table 1 (p. 1 of 2)

SPA-3 Scan

Inputs:

Scan speed: 0.5 m/s MDCR = 1.38*sqrt(b)/sqrt(p)*t

Where:

b = background counts in time t

p = surveyor efficiency 0.5

t = time the detector is above localized activity = 1.12 s = 0.0187 min

Assume:

Localized contam diam = 56 cm

$$MDC(fDCGL_{EMC}) = MDCR \sum (f^i / E_i AF^i DCGL^i) \quad (DP-8853)$$

AF = Area Factor

E_i = Scanning instrument efficiency (YA-REPT-00-015-04)

f = radionuclide fraction

	Cs-137	Co-60
E _i =	188	379 cpm/pCi/g
DCGL	3	1.4
f =	1	0
AF =	1	1

BKG(dpm)	BKG/t	MDCR	MDC(fDCGL _{emc} (10))
7000	130.7	1195	2.12E+00
8000	149.3	1278	2.27E+00
9000	168.0	1355	2.40E+00
10000	186.7	1428	2.53E+00
11000	205.3	1498	2.66E+00
12000	224.0	1565	2.77E+00
13000	242.7	1629	2.89E+00
14000	261.3	1690	3.00E+00
15000	280.0	1749	3.10E+00
16000	298.7	1807	3.20E+00
17000	317.3	1862	3.30E+00
18000	336.0	1916	3.40E+00
19000	354.7	1969	3.49E+00
20000	373.3	2020	3.58E+00
21000	392.0	2070	3.67E+00
22000	410.7	2119	3.76E+00
23000	429.3	2166	3.84E+00
24000	448.0	2213	3.92E+00

Table 1 (p. 2 of 2)

SPA-3 Scan

Inputs:

Scan speed: 0.25 m/s MDCR = 1.38*sqrt(b)/sqrt(p)*t

Where:

b = background counts in time t

p = surveyor efficiency 0.5

t = time the detector is above localized activity = 2.24 s = 0.0373 min

Assume:

Localized contam diam = 56 cm

$$MDC(fDCGL_{EMC}) = MDCR \sum (f^i / E_i AF^i DCGL^i) \quad (DP-8853)$$

AF = Area Factor

E_i = Scanning instrument efficiency (YA-REPT-00-015-04)

f = radionuclide fraction

	Cs-137	Co-60
E _i =	188	379 cpm/pCi/g
DCGL	3	1.4
f =	1	0
AF =	1	1

BKG(dpm)	BKG/t	MDCR	MDC(fDCGL _{emc} (10))
7000	261.3	845	1.50E+00
8000	298.7	903	1.60E+00
9000	336.0	958	1.70E+00
10000	373.3	1010	1.79E+00
11000	410.7	1059	1.88E+00
12000	448.0	1106	1.96E+00
13000	485.3	1152	2.04E+00
14000	522.7	1195	2.12E+00
15000	560.0	1237	2.19E+00
16000	597.3	1278	2.27E+00
17000	634.7	1317	2.34E+00
18000	672.0	1355	2.40E+00
19000	709.3	1392	2.47E+00
20000	746.7	1428	2.53E+00
21000	784.0	1464	2.60E+00
22000	821.3	1498	2.66E+00
23000	858.7	1532	2.72E+00
24000	896.0	1565	2.77E+00

Final Status Survey Planning Worksheet

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GENERAL SECTION

Survey Area #: OOL-05

Survey Unit #: 03

Survey Unit Name: Northernmost Unit in Survey Area OOL-05

FSSP Number: YNPS-FSSP-OOL05-03-00

PREPARATION FOR FSS ACTIVITIES

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.
- 1.2 ALARA review has been completed for the survey unit. (YA-REPT-00-003-05)
- 1.3 The survey unit has been turned over for final status survey.
- 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.
- 1.5 Activities conducted within area since turnover for FSS have been reviewed.
Based on reviewed information, subsequent walkdown: not warranted warranted
If warranted, subsequent walkdown has been performed and documented per DP-8854.
OR
The basis has been provided to and accepted by the FSS Project Manager for not performing a subsequent walkdown.
- 1.6 A final classification has been performed.
Classification: CLASS 1 CLASS 2 CLASS 3

DATA QUALITY OBJECTIVES (DQO)

1.0 Statement of problem:

The real estate associated with survey unit OOL-05-03 is owned by Trans-Canada. This parcel generally extends from the northern boundary of survey unit OOL-05-08 northward to the shoreline of the Deerfield River. 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.

The data collected under this plan will be used to determine whether or not residual plant-related radioactivity in soil of Survey Unit OOL05-03 meet LTP release criteria.

The planning team for this effort consists of the FSS Project Manager, FSS Radiological Engineer, FSS Field Supervisor, and FSS Technicians. The FSS Rad. Engineer will make primary decisions with the concurrence of the FSS Project Manager.

2.0 Identify the decision:

Does residual plant-related radioactivity, if present in the survey unit, exceed LTP release criteria? Alternative actions that may be implemented in this effort are investigations and remediation followed by re-surveying.

3.0 Identify the inputs to the decision:

Sample media: soil

Types of measurements: soil samples and SPA-3 scans.

Radionuclide-of-concern: Cs-137

Characterization data contained in the Yankee 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 decay-adjusted average Cs-137 concentration, 0.03 pCi/g, is well below the DCGL value for Cs-137 (3.0 pCi/g).

a. Soil Samples:

For planning purposes, only Cs-137 was selected as the radionuclide-of-concern for the unit. However, 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 soil sample for all LTP-listed gamma-emitting nuclides (excluding Am-241 and Cm-243). Two soil samples will be sent to an independent laboratory for analyses of gamma-emitters and HTD radionuclides (these analyses will include Am-241 and Cm-243).

Average concentration: Cs-137 = 0.03 pCi/g

Standard deviation (σ): Cs-137 = 0.09 pCi/g

Applicable DCGL: 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). These DCGLs are presented in Table 1.

TABLE 1

Nuclide	DCGL (pCi/g)	Nuclide	DCGL (pCi/g)	Nuclide	DCGL (pCi/g)
Co-60	1.4E+0	Eu-152	3.6E+0	Sr-90	6.0E-1
Nb-94	2.5E+0	Eu-154	3.3E+0	Tc-99	5.0E+0
Ag108m	2.5E+0	Eu-155	1.4E+2	Pu-238	1.2E+1
Sb125	1.1E+1	H-3	1.3E+2	Pu-239/240	1.1E+1
Cs-134	1.7E+0	C-14	1.9E+0	Pu-241	3.4E+2
Cs-137	3.0E+0	Fe-55	1.0E+4	Am-241	1.0E+1
		Ni-63	2.8E+2	Cm-243/244	1.1E+1

Investigation Level for soil samples: Investigation levels for soil samples are 1) $>DCGL_w$ for any LTP-listed nuclide, or 2) a sum of $DCGL_w$ fractions >1.0 .

MDCs for gamma analysis of soil samples are listed in Table 2.

TABLE 2

Nuclide	Target MDC (pCi/g)	Nuclide	Target MDC (pCi/g)	Nuclide	Target MDC (pCi/g)
Co-60	1.4E-1	Sb125	1.1E+0	Eu-152	3.5E-1
Nb-94	2.5E-1	Cs-134	1.7E-1	Eu-154	3.3E-1
Ag108m	2.5E-1	Cs-137	3.0E-1	Eu-155	1.4E+1

Note: If a target MDC value cannot be achieved in analysis, then a value no greater than 5X the listed value must be achieved in the analysis.

MDCs for analyses of HTD nuclides are presented in Table 3.

TABLE 3

Nuclide	Target MDC (pCi/g)	Nuclide	Target MDC (pCi/g)	Nuclide	Target MDC (pCi/g)
H-3	1.3E+1	Sr-90	5.9E-2	Pu-241	3.4E+1
C-14	1.9E-1	Tc-99	4.8E-1	Am-241	1.0E+0
Fe-55	1.0E+3	Pu-238	1.1E+0	Cm-243/244	1.1E+0
Ni-63	2.8E+1	Pu-239/240	1.0E+0		

Note: If a target MDC value cannot be achieved in analysis, then a value no greater than 5X the listed value must be achieved in the analysis.

b. Scan Coverage:

A minimum of 10% of the surface area (i.e. $\geq 977 \text{ m}^2$) within OOL-05-03 will be scan surveyed using a SPA-3 detector. Scan surveys will be biased to include: 1) areas adjacent to where the septic leach field had been excavated; 2) the boundary shared with survey unit OOL-05-08; 3) along the drainage ditch associated with the access roadway to the hydro-electric generating station; and 4) as directed by either the cognizant FFS Radiological Engineer or Field Supervisor. Boundaries of areas where scan surveys are performed should be marked such that the area can be plotted on a map and the surface area can be calculated via GPS technology (or similar). Increase coverage as necessary to ensure that at least 977 m^2 has been scan surveyed.

Investigation Level for SPA-3 scan: >background indication using an audible signal with headphones

MDCR for SPA-3: Attachment 1 provides MDCR values by various background levels.

MDC for SPA-3 scans: Attachment 1 also provides MDC values by various background levels.

c. QC checks and measurements:

- QC checks for the SPA-3 will be performed in accordance with DP-8504.
- QC checks for the GPS system will be performed in accordance with DP-8859.
- Two QC split samples will be collected, and QC recounts for 2 soil samples will be performed by the YNPS Chemistry Lab.

4.0 Define the boundaries of the survey:

Boundaries of OOL05-03 are as shown on the attached map. 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 Decision Rules:

Upon review of the FSS data collected under this survey plan, determine the status of the survey unit and take actions as appropriate:

- (a) If all the sample data show that the soil concentrations of LTP-listed nuclides are below the DCGL_w and the sum of fractions of LTP-listed nuclides are below unity, then reject the null hypothesis (i.e., Survey Unit OOL-05-03 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_w or the average sum of fractions of LTP-listed nuclides exceeds unity, then accept the null hypothesis (i.e., Survey Unit OOL-05-03 fails to meet the release criteria).
- (d) Alternate actions include investigations, reclassification, remediation and resurvey.

6.0 Specify tolerable limits on decision errors:

Null hypothesis: Residual plant-related radioactivity in Survey Unit OOL05-03 exceeds the release criteria.

Probability of type I error: 0.05

Probability of type II error: 0.05

LBGR: 1.5

7.0 Optimize Design:

Type of statistical test: WRS Test Sign Test

Basis including background reference location (if WRS test is specified): N/A

Number samples (per DP-8853): 18 (15 "required", plus 3 samples for added statistical power)

Biased samples: None

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. Standing water must be removed prior to the collection of any FSS measurement in that area.
3. Soil samples shall be collected in accordance with DP-8120.
4. Chain of Custody forms shall be used in accordance with DP-8123 for all soil samples sent to an off-site laboratory.
5. All soil samples shall 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.
6. 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.
7. 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.
8. The job hazards associated with the survey described in this package are addressed in the accompanying Job Hazard Assessment (JHA) for OOL-05-03.

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 18 (1-liter) soil samples in accordance with DP-8120. Two of the 18 soil samples will be analyzed as QC split samples 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-05-03-001-F through OOL-05-03-018-F corresponding to FSS sample locations 001 through 018 on the survey map.
QC split samples:	OOL-05-03-009-F-S and OOL-05-03-018-F-S are to be designated as QC split samples. Do not dry these samples because they are to be shipped off-site for further analysis.
Recount samples:	OOL-05-03-003-F-RC and OOL-05-03-005-F-RC are to be counted twice on site. The results will be compared in accordance with DP-8864.

4. **Sample Analysis:**

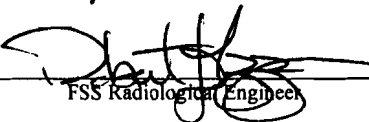
- Gamma analysis will be performed on all soil samples. If any of the gamma analyses show that an investigation level has been exceeded an investigation survey will be conducted under a revision to this survey plan.
- YNPS Chemistry will analyze OOL-05-03-003-F and OOL-05-03-005-F as sample recounts. The recounted samples will be identified as OOL-05-03-003-F-RC and OOL-05-03-005-F-RC, respectively.
- On-site gamma analysis of the FSS samples shall achieve the MDC values stated in the DQO section of this plan.
- The off-site laboratory will analyze OOL-05-03-009-F-S and OOL-05-03-018-F-S for all LTP nuclides. The MDCs will be communicated to the laboratory using an attachment to the Chain-of-Custody form. Each sample will be prepared in accordance with DP-8813, "Sample Receipt and Preparation." These samples are not to be dried prior to shipment. Ensure that the lid of the container is secured and sealed with electrical tape to prevent loss of moisture during shipping.

5. Scan Surveys:

- SPA-3 scan surveys are to be executed using a probe speed of no greater than 0.25m/s (approximately 10 inches/s).
- The location of scan surveys will be biased to include: 1) areas adjacent to where the septic leach field had been excavated; 2) the boundary shared with survey unit OOL-05-08; 3) along the drainage ditch associated with the access roadway to the hydro-electric generating station; 4) low lying areas where run-off water has potentially collected; and 5) as directed by either the cognizant FFS Radiological Engineer or Field Supervisor.
- Boundaries of areas where scan surveys are performed should be marked such that the area can be plotted on a map and the surface area can be calculated via GPS technology (or similar). Increase coverage as necessary to ensure that at least 977 m² has been scan surveyed. Documentation should include the location of any non-perimeter SPA-3 scan and an estimate of the scanned area.
- Scan speeds will be observed by the FSS Field Supervisor and documented on DPF-8856.2.
- In the event that elevated instrument responses (above background) are observed, initial investigations should be conducted to determine if the increase is due to the presence of localized natural activity in rocks. SPA-3 scan surveys performed in non-impacted areas have shown that rock formations generally account for increased count rates. If it can be demonstrated that the presence of rocks is the cause of an increased count rate, record that finding on form DPF-8856.2. If it is demonstrated that the rocks do not account for elevated instrument responses, a soil sample will be collected at the point of the highest response in the area being surveyed. Document detailed descriptions of investigation actions on form DPF-8856.2. The location of the elevated instrument response and associated sample shall be recorded on a map of the survey unit, including sufficient information to relocate the sample point. If a soil sample is collected during the first level investigation, the sample designation will continue the soil sample numbering sequence plus the letter "I" (for investigation).

Prepared by 
FFS Radiological Engineer

Date 8/29/06

Reviewed by 
FFS Radiological Engineer

Date 8/29/06

Approved by 
FFS Project Manager

Date 8/30/06

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

Scan Speed

In/Sec	m/Sec	BKG (cpm)
39	1.00	0
20	0.50	1,000
13	0.33	2,000
8	0.20	3,000
5	0.13	6,000
4	0.10	7,000

(0.25 m/s)

Final Status Survey Planning Worksheet

GENERAL SECTION	
Survey Area #: OOL-05	Survey Unit #: 04
Survey Unit Name: Unnamed Tributary Along Main Access Road	
FSSP Number: YNPS-FSSP-OOL-05-04-03	
PREPARATION FOR FSS ACTIVITIES	
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 YA-REPT-003-05	
1.3 The survey unit has been turned over for final status survey. <input checked="" 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 checked="" 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 checked="" type="checkbox"/>	
Classification: CLASS 1 <input type="checkbox"/> CLASS 2 <input checked="" type="checkbox"/> CLASS 3 <input type="checkbox"/>	
1.0 <u>Statement of problem:</u>	
<p>Survey unit 04 includes some land owned by TransCanada and consists of the land between the access road and the Radwaste parking area. It contains a portion of the unnamed tributary (hereinafter called the brook) 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 Radwaste 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 Historical Site Assessment (HSA). The original boundary (per the HSA) was adjusted just before this plan was written, so that the brook and its immediate surroundings would be in the same survey area. Survey unit 04 has a surface area of approximately 2,718 m².</p> <p>A 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 Radwaste 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. Although this plan is identified as a revision of the 2005 survey plan, it represents a new FSSP.</p> <p>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 04.</p> <p>The objective of this final status survey plan is the collection of quality survey data in accordance with the LTP. The data collected under this plan will be used to determine whether or not residual plant-related radioactivity in soil of Survey Unit OOL-05-04 meet LTP release criteria.</p> <p>The planning team for this effort consists of the FSS Project Manager, FSS Radiological Engineer, FSS Field</p>	

Supervisor, and FSS Technicians. The FSS Radiological Engineer will make primary decisions with the concurrence of the FSS Project Manager.

2.0 Identify the decision:

Does residual plant-related radioactivity, if present in the survey unit, exceed the release criteria? Alternative actions that may be implemented in this effort are no action, investigation and/or remediation followed by a re-survey.

3.0 Identify the inputs to the decision:

Sample media: Soil

Types of measurements: Soil samples and SPA-3 scans

Applicable DCGLs: The DCGLs applied under this survey plan correspond to annual doses of 8.73mrem/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 ⁶⁰	1.4 ^{E+00}	Eu ¹⁵²	3.5 ^{E+00}	Sr ⁹⁰	5.9 ^{E-01}
Nb ⁹⁴	2.5 ^{E+00}	Eu ¹⁵⁴	3.3 ^{E+00}	Tc ⁹⁹	4.8 ^{E+00}
Ag ^{108m}	2.5 ^{E+00}	Eu ¹⁵⁵	1.4 ^{E+02}	Pu ²³⁸	1.1 ^{E+01}
Sb ¹²⁵	1.1 ^{E+01}	H ³	1.3 ^{E+02}	Pu ^{239/240}	1.0 ^{E+01}
Cs ¹³⁴	1.7 ^{E+00}	C ¹⁴	1.9 ^{E+00}	Pu ²⁴¹	3.4 ^{E+02}
Cs ¹³⁷	3.0 ^{E+00}	Fe ⁵⁵	1.0 ^{E+04}	Am ²⁴¹	1.0 ^{E+01}
		Ni ⁶³	2.8 ^{E+02}	Cm ^{243/244}	1.1 ^{E+01}

Radionuclides-of-concern: Co⁶⁰ and Cs¹³⁷

The data from 32 soil samples collected in the 2005 survey were used as the basis for this survey plan. Cs¹³⁷ and Co⁶⁰ 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, Cs¹³⁷ and Co⁶⁰ were selected as the radionuclides of interest.

Average concentrations: Cs¹³⁷: 0.11 pCi/g; Co⁶⁰: 0.022 pCi/g

Standard Deviation(σ): Cs¹³⁷: 0.12 pCi/g; Co⁶⁰: 0.070 pCi/g

Surrogate DCGL: A surrogate DCGL is will not be used.

Investigation Level for soil samples: >DCGL, or a sum of DCGL fractions >1.0.

Note: The investigation criteria apply to all LTP-listed nuclide identified in soil samples collected under this plan.

Radionuclides for analysis:

All LTP nuclides with the focus on Co⁶⁰ and Cs¹³⁷. All samples will be analyzed for all LTP gamma emitters that are not included in the HTD analysis. Two QC split samples will be sent off site for HTD analysis.

MDCs for analysis of soil samples:

Note: MDC values will be transmitted to the outside laboratory via the chain-of-custody form accompanying the FSS soil samples.

Nuclide	Target MDC (pCi/g)	Nuclide	Target MDC (pCi/g)	Nuclide	Target MDC (pCi/g)
Co ⁶⁰	1.4 ^{E-01}	Sb ¹²⁵	1.1 ^{E+00}	Eu ¹⁵²	3.5 ^{E-01}
Nb ⁹⁴	2.5 ^{E-01}	Cs ¹³⁴	1.7 ^{E-01}	Eu ¹⁵⁴	3.3 ^{E-01}
Ag ^{108m}	2.5 ^{E-01}	Cs ¹³⁷	3.0 ^{E-01}	Eu ¹⁵⁵	1.4 ^{E+01}
H ³	1.3 ^{E+01}	Sr ⁹⁰	5.9 ^{E-02}	Pu ²⁴¹	3.4 ^{E+01}
C ¹⁴	1.9 ^{E-01}	Tc ⁹⁹	4.8 ^{E-01}	Am ²⁴¹	1.0 ^{E+00}

Fe ⁵⁵	1.0 ^{E+03}	Pu ²³⁸	1.1 ^{E+00}	Cm ^{243/244}	1.1 ^{E+00}
Ni ⁶³	2.8 ^{E+01}	Pu ^{239/240}	1.0 ^{E+00}		

Note: If a target MDC value cannot be achieved in analysis, then a value no greater than 5X the listed value must be achieved in the analysis.

Scan coverage: SPA-3 scans will be performed over a ~~2-meter~~ ^{1-meter} wide path along the entire perimeter of the survey unit and for an area extending 3 meters perpendicular to the outfall flow direction and 3 meters in the downstream direction of each drain outfall. 8/24/06

Scan Investigation Level: Reproducible indication above background using SPA-3 and audible discrimination.

SPA-3 MDCR/MDC: See Attachment 1.

QC checks and measurements: QC checks for the SPA-3 will be performed in accordance with DP-8504. QC checks for the Leica GPS will be performed in accordance with DP-8859. Two QC split samples will be collected, and QC recounts for 2 soil samples will be performed by the YNPS Chemistry Lab.

4.0 Define the boundaries of the survey:

Boundaries of OOL-05-04 are as shown on the attached map. 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 Decision Rules:

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-05-04 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_w or the average sum of fractions of LTP-listed nuclides exceeds unity, then accept the null hypothesis (i.e., Survey Unit OOL-05-04 fails to meet the release criteria).

Note: Alternate actions include no action, investigations, reclassification, remediation and resurvey.

6.0 Specify tolerable limits on decision errors:

Null hypothesis: Residual licensed radioactive materials in Survey Unit OOL-05-04 exceed the LTP release criteria. Hypothesis testing is as follows:

Probability of type I error: 0.05

Probability of type II error: 0.05

LBGR: Sum of Fractions 0.5; Adjusted = 0.83

7.0 Optimize Design:

Type of statistical test: WRS Test Sign Test

Basis including background reference location (if WRS test is specified): N/A

Number samples (per DP-8853): 15

Biased samples: Two (1 at the outfall of each storm drain).

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 shall be collected in accordance with DP-8120.
3. Chain of Custody forms shall be used in accordance with DP-8123 for all soil samples sent to an off-site

laboratory.

4. All soil samples shall 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 Job Hazard Assessment (JHA) for OOL-05-04.
8. All personnel participating in this survey shall be trained in accordance with DP-8868.

SPECIFIC INSTRUCTIONS

1. 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:
 - (a) Collect 15 (2-liter) systematic soil samples in accordance with DP-8120. Two of the soil samples will be analyzed as QC split samples. The same QC split samples will be sent to an offsite laboratory for analysis of all LTP-listed hard-to-detect nuclides.
 - (b) Collect 2 biased soil samples in accordance with DP-8120; 1 at the outfall for each of the storm drains that discharge to the unit. The FSS Field Supervisor is responsible for recording the sample location and sample number on the survey map and on DPF-8856.2.

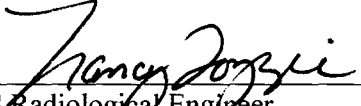
3. Soil Sample Designations:

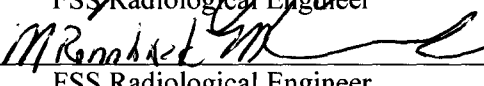
FSS soil samples	OOL-05-04-070-F through OOL-05-04-084-F corresponding to FSS sample locations 070 through 084.
FSS biased soil samples	OOL-05-04-085-F-B (from the West Storm Drain outfall) and OOL-05-04-086-F-B (from the parking lot storm drain outfall).
QC split samples:	OOL-05-04-070-F-S and OOL-05-04-084-F-S are to be designated as QC split samples.
Recount samples:	Recounts for samples OOL-05-04-076-F and OOL-05-04-081-F are to be designated OOL-05-04-076-F-RC and OOL-05-04-081-F-RC, respectively.


4. Sample Analysis:

- Gamma analysis will be performed on all soil samples.
- YNPS Chemistry will analyze OOL-05-04-076-F and OOL-05-04-081-F as sample recounts. The recounted samples will be identified as OOL-05-04-076-F-RC and OOL-05-04-081-F-RC, respectively.
- 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.
- YNPS Chemistry will analyze OOL-05-04-070-F-S and OOL-05-04-084-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 HTD 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.

5. If the results for any FSS soil sample exceed an investigation level, an investigation survey will be performed under a revision to this plan.
6. SPA-3 scans, using a probe speed of no greater than 0.25m/s (approximately 10 inches/s), will be performed for the following areas:
 - A 1-meter wide path along the entire perimeter of the survey unit. It may be necessary to trim the vegetative growth for most of the area prior to scanning.
 - An area extending 3 meters perpendicular to the outfall flow direction and 3 meters in the downstream direction of each drain outfall.
7. For the SPA-3 scans, a first level investigation may be conducted to determine if the observed increase above background levels in the scan measurement is due to the presence of rocks. SPA-3 scans performed in non-impacted areas have shown that rock formations accounted for increased count rates. If it can be demonstrated that the presence of rocks is the cause of an increased count rate during a SPA-3 scan, record that finding on form DPF-8856.2. If it is demonstrated that the rocks do not account for an above background SPA-3 measurement, a soil sample will be collected at the point of the highest SPA-3 reading in the scanned area. Detailed descriptions of investigation actions will be recorded on form DPF-8856.2 and the location of the above background scan and sample will be recorded on the survey map. The location description must include sufficient detail to revisit the spot at a later time. If a soil sample is collected during the first level investigation, the sample designation will continue the soil sample numbering sequence plus the letter "I" (for investigation).

Prepared by: N. Tozzie  Date: 8/14/06
FSS Radiological Engineer

Reviewed by: M. Renaldi  Date: 8-18-06
FSS Radiological Engineer

Approved by: M. C. J. J. J.  Date: 8/18/06
FSS Project Manager

YNPS-FSSP-OOL-05-04-3

Attachment 1

SPA-3 Scan Tables

Max Background

BKG(cpm)	MDCR	MDC(fDCGL)
4,000	639	1.15E+00
5,000	715	1.28E+00
6,000	783	1.40E+00
7,000	845	1.52E+00
8,000	904	1.62E+00
9,000	959	1.72E+00
10,000	1,011	1.81E+00
11,000	1,060	1.90E+00
12,000	1,107	1.98E+00
13,000	1,152	2.07E+00
14,000	1,196	2.14E+00
15,000	1,238	2.22E+00
16,000	1,278	2.29E+00
17,000	1,318	2.36E+00
18,000	1,356	2.43E+00
19,000	1,393	2.50E+00
20,000	1,429	2.56E+00
21,000	1,464	2.62E+00
22,000	1,499	2.69E+00
23,000	1,533	2.75E+00
24,000	1,565	2.81E+00
25,000	1,598	2.86E+00
26,000	1,629	2.92E+00
27,000	1,660	2.98E+00
28,000	1,691	3.03E+00
30,000	1,750	3.14E+00
32,000	1,808	3.24E+00
34,000	1,863	3.34E+00
36,000	1,917	3.44E+00
38,000	1,970	3.53E+00
40,000	2,021	3.62E+00

Scan Speed

In/Sec	m/Sec	BKG (cpm)
39	1.00	0
20	0.50	1,000
13	0.33	2,000
10	0.25	3,000
8	0.20	3,000
5	0.13	6,000
4	0.10	7,000

YNPS-FSSP-OOL-05-04-3
Attachment 2

DCGL MDC Table

Nuclide	Soil 0.72 m/yr (pCi/g)	10% MDC DCGL	50% MDC DCGL	Easy to Detect?
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

Final Status Survey Planning Worksheet

Page 1 of 5

GENERAL SECTION	
Survey Area #: OOL-05	Survey Unit #: 05
Survey Unit Name: Radwaste Paved Lot – East End	
FSSP Number: YNPS-FSSP-OOL05-05-00	
PREPARATION FOR FSS ACTIVITIES	
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"/> (YA-REPT-00-003-05)	
1.3 The survey unit has been turned over for final status survey. <input checked="" 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 checked="" 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 checked="" type="checkbox"/>	
Classification: CLASS 1 <input checked="" type="checkbox"/> CLASS 2 <input type="checkbox"/> CLASS 3 <input type="checkbox"/>	
DATA QUALITY OBJECTIVES (DQO)	
1.0 <u>Statement of problem:</u>	
Survey Unit OOL-05-05 is the east inner section of OOL-05, approximately 16,362 ft ² (1520 m ²) in size. The unit is a portion of the US Gen-owned land that lies west of the industrial yard between the Yankee property and the Deerfield River. It is currently part of the radioactive waste staging area parking lot. The staging of roll-offs has impacted the original classification (refer to the CR Action Item Response for items # 2005-460-2 for details). As a result, the unit has been re-classified as Class 1.	
The data collected under this plan will be used to determine whether or not residual plant-related radioactivity in soil of Survey Unit OOL05-05 meet LTP release criteria.	
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.	
2.0 <u>Identify the decision:</u>	
Does residual plant-related radioactivity, if present in the survey unit, exceed LTP release criteria? Alternative actions that may be implemented in this effort are investigations and remediation followed by re-surveying.	
3.0 <u>Identify the inputs to the decision:</u>	
<i>Sample media:</i> soil	
<i>Types of measurements:</i> soil samples, ISOCS measurements, and supplemental SPA-3 scans.	
<i>Radionuclide-of-concern:</i> Cs-137	
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). However, those data were collected prior to use of the unit as a radioactive waste package staging area. Composite samples of soil from the corners and wheels of the staged roll-offs have identified both Co-60 and Cs-137.	
The HSA data were used to obtain an estimate of Cs-137 variability, which was used to determine the number of systematic	

soil samples required to support statistical. For added statistical power, 5 additional samples were added for a total number of 20 statistical soil samples.

Although the characterization data do not include analyses for hard-to-detect (HTD) nuclides such as H-3, Sr-90, and TRUs, these nuclides will be included in the assessment for Survey Unit 05. Two of the FSS soil samples will be sent to an independent laboratory for complete analyses (HTD nuclides and TRUs).

a. Soil Samples:

For planning purposes, Cs-137 was selected as the radionuclide-of-concern for the unit. However, 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 soil sample for all LTP-listed gamma-emitting nuclides (excluding Am-241 and Cm-243). Two soil samples will be sent to an independent laboratory for analyses of gamma-emitters and HTD radionuclides (these analyses will include Am-241 and Cm-243).

Applicable DCGL: 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-60	1.4E+0	Eu-152	3.5E+0	Sr-90	5.9E-1
Nb-94	2.5E+0	Eu-154	3.3E+0	Tc-99	4.8E+0
Ag108m	2.5E+0	Eu-155	1.4E+2	Pu-238	1.1E+1
Sb125	1.1E+1	H-3	1.3E+2	Pu-239/240	1.0E+1
Cs-134	1.7E+0	C-14	1.9E+0	Pu-241	3.4E+2
Cs-137	3.0E+0	Fe-55	1.0E+4	Am-241	1.0E+1
		Ni-63	2.8E+2	Cm-243/244	1.1E+1

Average concentration: Cs-137 = 0.0292 pCi/g

Standard deviation (σ): Cs-137 = 0.0858 pCi/g

DCGL_{EMC}: Cs-137 = 8.4 pCi/g (based on AF = 2.8)

Investigation Level for soil samples: (a) >DCGL_{EMC} for Cs-137, or

(b) a sum of DCGL_{EMC} fractions >1.0, or

(c) >DCGL for Cs-137 and a statistical outlier as defined in the LTP

Note: the same criteria will be applied to any other LTP-listed if identified in the FSS soil samples.

MDCs for gamma analysis of soil samples:

Nuclide	Target MDC (pCi/g)	Nuclide	Target MDC (pCi/g)	Nuclide	Target MDC (pCi/g)
Co-60	1.4E-1	Sb125	1.1E+0	Eu-152	3.5E-1
Nb-94	2.5E-1	Cs-134	1.7E-1	Eu-154	3.3E-1
Ag108m	2.5E-1	Cs-137	3.0E-1	Eu-155	1.4E+1

Note: If a target MDC value cannot be achieved in analysis, then a value no greater than 5X the listed value must be achieved in the analysis.

MDCs for analyses of HTD nuclides:

Nuclide	Target MDC (pCi/g)	Nuclide	Target MDC (pCi/g)	Nuclide	Target MDC (pCi/g)
H-3	1.3E+1	Sr-90	5.9E-2	Pu-241	3.4E+1
C-14	1.9E-1	Tc-99	4.8E-1	Am-241	1.0E+0
Fe-55	1.0E+3	Pu-238	1.1E+0	Cm-243/244	1.1E+0
Ni-63	2.8E+1	Pu-239/240	1.0E+0		

Note: If a target MDC value cannot be achieved in analysis, then a value no greater than 5X the listed value must be achieved in the analysis.

b. Scan Coverage:

Scanning for 100% of the surface area within OOL05-05 will be accomplished through ISOCs measurements and supplemental SPA-3 scans. SPA-3 scans, as deemed necessary by the FFS Field Supervisor, will be performed to supplement ISOCs measurements or to provide scan coverage for surface area not included in the ISOCs measurements.

Investigation Level for ISOCS measurements: 0.7 pCi/g for Cs-137, or a sum of the fractions for detected LTP nuclides >1.0

Note: The investigation levels developed in this manner (in accordance with YA-EVAL-00-001-06) are sensitive enough to detect the DCGL_{EMC} values based on the grid area.

MDCs for ISOCS measurements:

Nuclide	MDC (pCi/g)	Nuclide	MDC (pCi/g)	Nuclide	MDC (pCi/g)
Co-60	1.8E-01	Sb-125	1.0E+00	Eu-152	4.1E-01
Nb-94	2.6E-01	Cs-134	3.0E-01	Eu-154	3.8E-01
Ag-108m	2.5E-01	Cs-137	7.0E-01	Eu-155	1.1E+01

Note: The MDCs listed in the above table are equal to the investigation level for ISOCS measurements. Contact the FSSE if the MDC values in the above table cannot be achieved in a reasonable count time.

Investigation Level for SPA-3 scan: >background indication using an audible signal with headphones

MDCR for SPA-3: Attachment 1 provides MDCR values by various background levels.

MDC (DCGL_{EMC}) for SPA-3 scans: Attachment 1 also provides MDC values by various background levels.

c. QC checks and measurements: QC checks for the SPA-3 will be performed in accordance with DP-8504. QC checks for ISOCS will be in accordance with DP-8869 and DP-8871. QC checks for the Leica GPS will be performed in accordance with DP-8859. Two QC split samples will be collected, and QC recounts for 2 soil samples will be performed by the YNPS Chemistry Lab.

4.0 Define the boundaries of the survey:

Boundaries of OOL05-05 are as shown on the attached map. 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 Decision Rules:

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

- 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-05-05 meets the release criteria).
- If the investigation levels are exceeded, then perform an investigation survey.
- If the average concentration of any LTP-listed nuclide exceeds its respective DCGL_w or the average sum of fractions of LTP-listed nuclides exceeds unity, then accept the null hypothesis (i.e., Survey Unit OOL-05-05 fails to meet the release criteria).

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

6.0 Specify tolerable limits on decision errors:

Null hypothesis: Residual plant-related radioactivity in Survey Unit OOL05-05 exceeds the release criteria.

Probability of type I error: 0.05

Probability of type II error: 0.05

LBGR: 1.5

7.0 Optimize Design:

Type of statistical test: WRS Test Sign Test

Basis including background reference location (if WRS test is specified): N/A

Number samples (per DP-8853): 15 + 5 additional = 20

Biased samples: None

GENERAL INSTRUCTIONS

- 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.
- Standing water must be removed prior to the collection of any FSS measurement in that area.
- Soil samples shall be collected in accordance with DP-8120.

4. Chain of Custody forms shall be used in accordance with DP-8123 for all soil samples sent to an off-site laboratory.
5. All soil samples shall 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.
6. Collect ISOCS measurements in accordance with DP-8871 to provide 100% scan coverage of the survey unit. Perform a SPA-3 scan for 100% of any area excluded by the ISOCS measurements.
7. 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.
8. 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.
9. The job hazards associated with the survey described in this package are addressed in the accompanying Job Hazard Assessment (JHA) for OOL-05-05.

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 (1-liter) soil samples in accordance with DP-8120. Two of the 20 soil samples will be analyzed as QC split samples 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-05-05-001-F through OOL-05-05-020-F corresponding to FSS sample locations 001 through 020.
QC split samples:	OOL-05-05-002-F-S and OOL-05-05-014-F-S are to be designated as QC split samples.
Recount samples:	OOL-05-05-003-F-RC and OOL-05-05-013-F-RC are 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 under a revision to this survey plan.
- YNPS Chemistry will analyze OOL-05-05-003-F and OOL-05-05-013-F as sample recounts. The recounted samples will be identified as OOL-05-05-003-F-RC and OOL-05-05-013-F-RC, respectively.
- 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.
- The off-site laboratory will analyze OOL-05-05-002-F-S and OOL-05-05-014-F-S for all LTP nuclides. Each sample will be prepared in accordance with DP-8813, "Sample Receipt and Preparation," but are not to be dried prior to shipment.

Note: Ensure that the lid of the container is secured and sealed with electrical tape to prevent loss of moisture during shipping.

5. ISOCS Assays:

- ISOCS investigation levels are based on specific spacing of ISOCS assays. ISOCS assays, when using the 180° collimator at 1-meter, are restricted to:

(1) A maximum spacing of 4 meters between assay locations. A maximum spacing of 2 meters from any survey unit boundary.

- ISOCS assays are designated as OOL-05-05-xxx-F-G where xxx corresponds to the 3-digit location indicated on survey map "ISOCS Scans".
 - QC checks shall be performed daily in accordance with DP-8869 and DP-8871. Resolve flags encountered prior to survey.
 - ISOCS assays to be performed with 180° collimator at 1m unless otherwise directed by the FSS Engineer. Make note on the daily survey journal (DPF-8856.2) if other geometries are used.
 - Designate additional assay locations in continuing sequence from the last number assigned to an FSS measurement. Record detailed information about additional assay locations on the daily survey journal.
 - If the results on any ISOCS assay exceed an investigation level, investigate the area within the field of view (7m diameter – 38.5m² area for 180°-1m) for that assay as directed in Specific Instruction # 6.
6. If the results of an ISOCS assay 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 ISOCS 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 the elevated area in the soil and on the survey map.
 - At location of the highest identified activity area:
 - Perform and record a 1-minute scaler mode SPA-3 measurement. Designate the reading as "OOL-05-05-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-05-05-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.
 - Re-perform the ISOCS assay. Designate the assay as "OOL-05-05-xxx-F-G-I" where "xxx" continues sequentially from the last number assigned to an FSS measurement.

Prepared by J. Beason
FSS Radiological Engineer

Date 7-20-06

Reviewed by G. P. Patel
FSS Radiological Engineer

Date 7/20/06

Approved by Mark C. Smith
FSS Project Manager

Date 7/21/06

SPA-3 Scan Tables

Max Background

BKG(cpm)	MDCR	MDC(fDCGLemc)
4,000	639	4.72E-01
5,000	715	5.28E-01
6,000	783	5.78E-01
7,000	845	6.25E-01
8,000	904	6.68E-01
9,000	959	7.08E-01
10,000	1,011	7.47E-01
11,000	1,060	7.83E-01
12,000	1,107	8.18E-01
13,000	1,152	8.51E-01
14,000	1,196	8.83E-01
15,000	1,238	9.14E-01
16,000	1,278	9.44E-01
17,000	1,318	9.73E-01
18,000	1,356	1.00E+00
19,000	1,393	1.03E+00
20,000	1,429	1.06E+00
21,000	1,464	1.08E+00
22,000	1,499	1.11E+00
23,000	1,533	1.13E+00
24,000	1,565	1.16E+00
25,000	1,598	1.18E+00
26,000	1,629	1.20E+00
27,000	1,660	1.23E+00
28,000	1,691	1.25E+00
30,000	1,750	1.29E+00
32,000	1,808	1.34E+00
34,000	1,863	1.38E+00
36,000	1,917	1.42E+00
38,000	1,970	1.46E+00
40,000	2,021	1.49E+00

Scan Speed

In/Sec	m/Sec	BKG (cpm)
39	1.00	4,000
20	0.50	8,000
13	0.33	13,000
10	0.25	17,000
8	0.20	22,000
5	0.13	35,000
4	0.10	44,000

*020

*017

*018

*019

*011

*012

*013

*014

*015

*016

*005

*006

*007

*008

*009

*010

*002

*003

*004

*001

Area: Area 1

X Coord	Y Coord	Label	Value	Type	Historical
271782.2510	3093601.4338	001		Systematic	
271766.8833	3093628.0514	002		Systematic	
271797.6187	3093628.0514	003		Systematic	
271828.3540	3093628.0514	004		Systematic	
271751.5157	3093654.6690	005		Systematic	
271782.2510	3093654.6690	006		Systematic	
271812.9864	3093654.6690	007		Systematic	
271843.7217	3093654.6690	008		Systematic	
271874.4570	3093654.6690	009		Systematic	
271905.1924	3093654.6690	010		Systematic	
271766.8833	3093681.2866	011		Systematic	
271797.6187	3093681.2866	012		Systematic	
271828.3540	3093681.2866	013		Systematic	
271859.0894	3093681.2866	014		Systematic	
271889.8247	3093681.2866	015		Systematic	
271920.5601	3093681.2866	016		Systematic	
271812.9864	3093707.9042	017		Systematic	
271843.7217	3093707.9042	018		Systematic	
271874.4570	3093707.9042	019		Systematic	
271859.0894	3093734.5218	020		Systematic	

Final Status Survey Planning Worksheet

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GENERAL SECTION

Survey Area #: OOL-05

Survey Unit #: 06

Survey Unit Name: Radwaste Paved Lot – East End

FSSP Number: YNPS-FSSP-OOL05-05-00

PREPARATION FOR FSS ACTIVITIES

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.
- 1.2 ALARA review has been completed for the survey unit. (YA-REPT-00-003-05)
- 1.3 The survey unit has been turned over for final status survey.
- 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.
- 1.5 Activities conducted within area since turnover for FSS have been reviewed.
Based on reviewed information, subsequent walkdown: not warranted warranted
If warranted, subsequent walkdown has been performed and documented per DP-8854.
OR
The basis has been provided to and accepted by the FSS Project Manager for not performing a subsequent walkdown.
- 1.6 A final classification has been performed.
Classification: CLASS 1 CLASS 2 CLASS 3

DATA QUALITY OBJECTIVES (DQO)

1.0 Statement of problem:

Survey Unit OOL-05-06 is the west inner section of OOL-05, approximately 10,090ft² (937 m²) in size. The unit is a portion of the US Gen-owned land that lies west of the industrial yard between the Yankee property and the Deerfield River. It is currently part of the radioactive waste staging area parking lot. The staging of roll-offs has impacted the original classification (refer to the CR Action Item Response for items # 2005-460-2 for details). As a result, the unit has been re-classified as Class 1.

The data collected under this plan will be used to determine whether or not residual plant-related radioactivity in soil of Survey Unit OOL05-06 meet LTP release criteria.

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.

2.0 Identify the decision:

Does residual plant-related radioactivity, if present in the survey unit, exceed LTP release criteria? Alternative actions that may be implemented in this effort are investigations and remediation followed by re-surveying.

3.0 Identify the inputs to the decision:

Sample media: soil

Types of measurements: soil samples, ISOCS measurements, and supplemental SPA-3 scans.

Radionuclide-of-concern: Cs-137

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). However, those data were collected prior to use of the unit as a radioactive waste package staging area. Composite samples of soil from the corners and wheels of the staged roll-offs have identified both Co-60 and Cs-137.

The HSA data were used to obtain an estimate of Cs-137 variability, which was used to determine the number of systematic

soil samples required to support statistical. For added statistical power, 5 additional samples were added for a total number of 20 statistical soil samples.

Although the characterization data do not include analyses for hard-to-detect (HTD) nuclides such as H-3, Sr-90, and TRUs, these nuclides will be included in the assessment for Survey Unit 06. Two of the FSS soil samples will be sent to an independent laboratory for complete analyses (HTD nuclides and TRUs).

a. Soil Samples:

For planning purposes, Cs-137 was selected as the radionuclide-of-concern for the unit. However, 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 soil sample for all LTP-listed gamma-emitting nuclides (excluding Am-241 and Cm-243). Two soil samples will be sent to an independent laboratory for analyses of gamma-emitters and HTD radionuclides (these analyses will include Am-241 and Cm-243).

Applicable DCGL: 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-60	1.4E+0	Eu-152	3.5E+0	Sr-90	5.9E-1
Nb-94	2.5E+0	Eu-154	3.3E+0	Tc-99	4.8E+0
Ag108m	2.5E+0	Eu-155	1.4E+2	Pu-238	1.1E+1
Sb125	1.1E+1	H-3	1.3E+2	Pu-239/240	1.0E+1
Cs-134	1.7E+0	C-14	1.9E+0	Pu-241	3.4E+2
Cs-137	3.0E+0	Fe-55	1.0E+4	Am-241	1.0E+1
		Ni-63	2.8E+2	Cm-243/244	1.1E+1

Average concentration: Cs-137 = 0.0292 pCi/g

Standard deviation (σ): Cs-137 = 0.0858 pCi/g

DCGL_{EMC}: Cs-137 = 9.3 pCi/g (based on AF = 3.1)

Investigation Level for soil samples: (a) >DCGL_{EMC} for Cs-137, or

(b) a sum of DCGL_{EMC} fractions >1.0, or

(c) >DCGL for Cs-137 and a statistical outlier as defined in the LTP

Note: the same criteria will be applied to any other LTP-listed if identified in the FSS soil samples.

MDCs for gamma analysis of soil samples:

Nuclide	Target MDC (pCi/g)	Nuclide	Target MDC (pCi/g)	Nuclide	Target MDC (pCi/g)
Co-60	1.4E-1	Sb125	1.1E+0	Eu-152	3.5E-1
Nb-94	2.5E-1	Cs-134	1.7E-1	Eu-154	3.3E-1
Ag108m	2.5E-1	Cs-137	3.0E-1	Eu-155	1.4E+1

Note: If a target MDC value cannot be achieved in analysis, then a value no greater than 5X the listed value must be achieved in the analysis.

MDCs for analyses of HTD nuclides:

Nuclide	Target MDC (pCi/g)	Nuclide	Target MDC (pCi/g)	Nuclide	Target MDC (pCi/g)
H-3	1.3E+1	Sr-90	5.9E-2	Pu-241	3.4E+1
C-14	1.9E-1	Tc-99	4.8E-1	Am-241	1.0E+0
Fe-55	1.0E+3	Pu-238	1.1E+0	Cm-243/244	1.1E+0
Ni-63	2.8E+1	Pu-239/240	1.0E+0		

Note: If a target MDC value cannot be achieved in analysis, then a value no greater than 5X the listed value must be achieved in the analysis.

b. Scan Coverage:

Scanning for 100% of the surface area within OOL05-05 will be accomplished through ISOCS measurements and supplemental SPA-3 scans. SPA-3 scans, as deemed necessary by the FFS Field Supervisor, will be performed to supplement ISOCS measurements or to provide scan coverage for surface area not included in the ISOCS measurements.

Investigation Level for ISOCS measurements: 0.7 pCi/g for Cs-137, or a sum of the fractions for detected LTP nuclides >1.0

Note: The investigation levels developed in this manner (in accordance with YA-EVAL-00-001-06) are sensitive enough to detect the DCGL_{FMC} values based on the grid area.

MDCs for ISOCS measurements:

Nuclide	MDC (pCi/g)	Nuclide	MDC (pCi/g)	Nuclide	MDC (pCi/g)
Co-60	1.8E-01	Sb-125	1.0E+00	Eu-152	4.1E-01
Nb-94	2.6E-01	Cs-134	3.0E-01	Eu-154	3.8E-01
Ag-108m	2.5E-01	Cs-137	7.0E-01	Eu-155	1.1E+01

Note: The MDCs listed in the above table are equal to the investigation level for ISOCS measurements. Contact the FSSE if the MDC values in the above table cannot be achieved in a reasonable count time.

Investigation Level for SPA-3 scan: >background indication using an audible signal with headphones

MDCR for SPA-3: Attachment 1 provides MDCR values by various background levels.

MDC (DCGL_{FMC}) for SPA-3 scans: Attachment 1 also provides MDC values by various background levels.

c. QC checks and measurements: QC checks for the SPA-3 will be performed in accordance with DP-8504. QC checks for ISOCS will be in accordance with DP-8869 and DP-8871. QC checks for the Leica GPS will be performed in accordance with DP-8859. Two QC split samples will be collected, and QC recounts for 2 soil samples will be performed by the YNPS Chemistry Lab.

4.0 Define the boundaries of the survey:

Boundaries of OOL05-05 are as shown on the attached map. 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 Decision Rules:

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

- 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-05-066 meets the release criteria).
- If the investigation levels are exceeded, then perform an investigation survey.
- If the average concentration of any LTP-listed nuclide exceeds its respective DCGL_w or the average sum of fractions of LTP-listed nuclides exceeds unity, then accept the null hypothesis (i.e., Survey Unit OOL-05-06 fails to meet the release criteria).

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

6.0 Specify tolerable limits on decision errors:

Null hypothesis: Residual plant-related radioactivity in Survey Unit OOL05-06 exceeds the release criteria.

Probability of type I error: 0.05

Probability of type II error: 0.05

LBGR: 1.5

7.0 Optimize Design:

Type of statistical test: WRS Test Sign Test

Basis including background reference location (if WRS test is specified): N/A

Number samples (per DP-8853): 15 + 5 additional = 20

Biased samples: None

GENERAL INSTRUCTIONS

- 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.
- Standing water must be removed prior to the collection of any FSS measurement in that area.
- Soil samples shall be collected in accordance with DP-8120.

4. Chain of Custody forms shall be used in accordance with DP-8123 for all soil samples sent to an off-site laboratory.
5. All soil samples shall 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.
6. Collect ISOCS measurements in accordance with DP-8871 to provide 100% scan coverage of the survey unit. Perform a SPA-3 scan for 100% of any area excluded by the ISOCS measurements.
7. 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.
8. 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.
9. The job hazards associated with the survey described in this package are addressed in the accompanying Job Hazard Assessment (JHA) for OOL-05-06.

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 (1-liter) soil samples in accordance with DP-8120. Two of the 20 soil samples will be analyzed as QC split samples 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-05-06-001-F through OOL-05-06-020-F corresponding to FSS sample locations 001 through 020.
QC split samples:	OOL-05-06-009-F-S and OOL-05-06-019-F-S are to be designated as QC split samples.
Recount samples:	OOL-05-06-006-F-RC and OOL-05-06-011-F-RC are 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 under a revision to this survey plan.
- YNPS Chemistry will analyze OOL-05-06-006-F and OOL-05-06-013-F as sample recounts. The recounted samples will be identified as OOL-05-06-006-F-RC and OOL-05-06-011-F-RC, respectively.
- 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.
- The off-site laboratory will analyze OOL-05-06-009-F-S and OOL-05-06-019-F-S for all LTP nuclides. Each sample will be prepared in accordance with DP-8813, "Sample Receipt and Preparation," but are not to be dried prior to shipment.

Note: Ensure that the lid of the container is secured and sealed with electrical tape to prevent loss of moisture during shipping.

5. **ISOCS Assays:**

- ISOCS investigation levels are based on specific spacing of ISOCS assays. ISOCS assays, when using the 180° collimator at 1-meter, are restricted to:

(1) A maximum spacing of 4 meters between assay locations. A maximum spacing of 2 meters from any survey unit boundary.

- ISOCS assays are designated as OOL-05-06-xxx-F-G where xxx corresponds to the 3-digit location indicated on survey map "ISOCS Scans".
- QC checks shall be performed daily in accordance with DP-8869 and DP-8871. Resolve flags encountered prior to survey.
- ISOCS assays to be performed with 180° collimator at 1m unless otherwise directed by the FSS Engineer. Make note on the daily survey journal (DPF-8856.2) if other geometries are used.
- Designate additional assay locations in continuing sequence from the last number assigned to an FSS measurement. Record detailed information about additional assay locations on the daily survey journal.
- If the results on any ISOCS assay exceed an investigation level, investigate the area within the field of view (7m diameter – 38.5m² area for 180°-1m) for that assay as directed in Specific Instruction # 6.

6. If the results of an ISOCS assay 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 ISOCS 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 the elevated area in the soil and on the survey map.
- At location of the highest identified activity area:
 - Perform and record a 1-minute scaler mode SPA-3 measurement. Designate the reading as "OOL-05-06-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-05-06-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.
 - Re-perform the ISOCS assay. Designate the assay as "OOL-05-06-xxx-F-G-I" where "xxx" continues sequentially from the last number assigned to an FSS measurement.

Prepared by J. Bueson
FSS Radiological Engineer

Date 7-20-06

Reviewed by J. P. Stahl
FSS Radiological Engineer

Date 7/20/06

Approved by Mark C. Esch
FSS Project Manager

Date 7/21/06

Final Status Survey Planning Worksheet

GENERAL SECTION	
Survey Area #: OOL-05	Survey Unit #: 07
Survey Unit Name: TransCanada / Deerfield River Frontage	
FSSP Number: YNPS-FSSP-OOL-05-07-00	
PREPARATION FOR FSS ACTIVITIES	
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 YA-REPT-003-05	
1.3 The survey unit has been turned over for final status survey. <input checked="" 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 checked="" 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 checked="" type="checkbox"/>	
Classification: CLASS 1 <input type="checkbox"/> CLASS 2 <input type="checkbox"/> CLASS 3 <input checked="" type="checkbox"/>	
1.0 <u>Statement of problem:</u>	
Survey unit 07 includes some 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. Unit 07 has an area of approximately 2468 m ² .	
This unit is classified as a Class 3 area at the beginning of the planning process on the basis of its history and results of sampling since the HSA was written.	
The problem at hand is to determine if the years of plant operation and decommissioning activities resulted in an accumulation of plant-related radioactivity that exceed the LTP release criteria.	
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.	
2.0 <u>Identify the decision:</u>	
Does residual plant-related radioactivity, if present in the survey unit, exceed the release criteria? Alternative actions that may be implemented in this effort are investigation, remediation and/or resurvey.	
3.0 <u>Identify the inputs to the decision:</u>	
<i>Sample media:</i> soil	

Types of measurements: Soil samples and scan investigations will be done with a E600 w/SPA-3.

Applicable DCGL's: 1.4 pCi/g (Co-60), 3.0 pCi/g (Cs-137), 130.0 pCi/g (H-3). All DCGL's are based on the 8.73-mrem/y DCGL.

Radionuclides-of-concern: Co-60, Cs-137, H-3 ^{12/15/04}

NOTE: Sr-90 and Ag108m were mentioned as radionuclides-of-concern in the HSA for OOL-05 but there is no data to indicate that these nuclides were identified in this survey unit.

Characterization data include 12 sediment samples that were screened by gamma spectroscopy. These twelve samples and information from the spill history form the basis for FSS planning. There is no data for H-3 levels in this unit.

Average concentrations: Co-60: 0.073 pCi/g; Cs-137: 0.222 pCi/g

Standard deviations(σ): Co-60: 0.106 pCi/g; Cs-137 = 0.147 pCi/g

Surrogate DCGL: The use of surrogate DCGL's is not anticipated, but can be implemented on the basis of HTD results which are not available at the time of this FSS but will be available at the time of data analysis.

Investigation Level for soil samples: 0.7pCi/g (Co-60) and 1.5pCi/g (Cs-137) (> 50% of the 8.73-mrem/y DCGL for Cs-137)

Additionally if any other LTP listed nuclide is identified at a concentration greater than 50% of its respective 8.73-mrem/y DCGL, or if the sum of the fractions for all detected LTP listed nuclides exceeds 0.5, an investigation will be conducted.

Investigation Level for scan: Reproducible indication above background using SPA 3 and audible discrimination. The expected background range for SPA-3 scan is between 8,000 cpm and 15,000 cpm, and is dependent on the geology (rock composition) in the immediate vicinity of the scan.

Table 1
DCGLs for Gamma Emitters

<u>Nuclide</u>	<u>Soil DCGL (pCi/g)</u>
Co-60	1.4E+0
Nb-94	2.5E+0
Ag-108m	2.5E+0
Sb-125	1.1E+1
Cs-134	1.7E+0
Cs-137	3.0E+0
Eu-152	3.6E+0
Eu-154	3.3E+0
Eu-155	1.4E+2

Radionuclides for analysis: All LTP nuclides with the focus on Co-60, Cs-137 and H-3. All samples will be analyzed for all LTP gamma emitters that are not included in the HTD and H-3 analysis. One sample will be sent off site for HTD analysis.

MDC's for gamma analysis of soil samples:

<u>Nuclide</u>	<u>10% of DCGL (pCi/g)</u>
Co-60	1.4E-1
Nb-94	2.5E-1
Ag-108m	2.5E-1
Sb-125	1.1E+0
Cs-134	1.7E-1
Cs-137	3.0E-1

Eu-152	3.6E-1
Eu-154	3.3E-1
Eu-155	1.4E+1

The desired MDC's 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.

MDC's for HTD nuclides: In addition to the MDC values listed above, the following MDC values will also be transmitted to the outside laboratory via the chain-of-custody form accompanying the FSS soil samples:

<u>Nuclide</u>	<u>10% DCGL (pCi/g)</u>
H-3	1.3E+1
C-14	1.9E-1
Fe-55	1.0E+3
Ni-63	2.8E+1
Sr-90	6.0E-2
Tc-99	5.0E-1
Pu-238	1.2E+0
Pu-239	1.1E+0
Pu-241	3.4E+1
Am-241	1.0E+0
Cm-243	1.1E+0

The MDC values for difficult to detect nuclides will be conveyed to the outside laboratory via the sample chain-of-custody form DPF-8823.1 which will accompany the soil samples. Again, these are the desired MDCs, if these are not practical to achieve, five times these values must be achieved.

Scan coverage: SPA-3 scans will be performed over an approximate 1m by 1m area surrounding each soil sample, as permitted by terrain. Four (4) judgmental SPA-3 scans will be performed in Survey Unit OOL-05-07, each of which will cover an area of approximately 10 m² (1 m in width and 10 m in length).

- The first scan area will be along the creek bed at the first bend.
- The second area will be along the creek bed at the second bend.
- The third area will be at the north end of the creeks outfall into the river.
- The fourth area will be at the south end of the creeks outfall into the river.

MDCR for SPA-3: The accompanying table in Attachment 1 provides MDCR values by various background levels.

MDC (fDCGL_{surveyor-emc}) for SPA-3 scans: The accompanying table in Attachment 1 provides MDC values by various background levels.

Note: 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 DCGLw 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.ornl.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.
- One QC split sample will be collected (note: this is in accordance with DP-8852 requirements.)

- One QC recount for soil samples will be performed by the YNPS Chemistry Lab (note: This is in accordance with DP-8852 requirements.)

4.0 Define the boundaries of the survey:

Boundaries of Survey Unit 07 are as shown on the attached map. This area will be posted as an FSS area.

There are no structures present in the Survey Unit 07. The survey will be performed under conditions compatible with instrument operation and in daylight hours.

5.0 Develop a decision rule:

Null hypothesis: Residual licensed radioactive materials in Survey Unit OOL-05-07 exceeds the release criterion. Hypothesis testing is as follows:

- (a) If all the sample data show that the soil concentrations of all plant-related nuclides are below the DCGL, reject the null hypothesis (i.e., Survey unit meets the release criteria).
- (b) If any investigation level is exceeded, then perform an investigation.
- (c) If the average concentration is below the DCGL, but individual measurements exceed the DCGL, then apply a statistical test to either accept or reject the null hypothesis.
- (d) If the average concentration of any individual nuclide exceeds the DCGL or if the sum of fractions exceeds one, then accept the null hypothesis (i.e., Survey Unit 07 fails to meet the release criteria).

6.0 Specify tolerable limits on decision errors:

Probability of type I error: 0.05

Probability of type II error: 0.05

LBGR: Unity/2 = 0.5

7.0 Optimize Design:

Type of statistical test: WRS Test Sign Test

Expected SPA-3 background: 8-13K cpm.

Basis including background reference location (if WRS test is specified): N/A

Number of samples: Fifteen (15) random samples.

Fifteen (15) FSS random soil samples will be collected in randomly selected locations. This number has been chosen, based upon characterization data, using the process outlined in DP-8853.

Note: ~~All samples will be sent to the off site laboratory for H-3 analysis.~~ In addition, sample OOL-05-07-004-F-S will be analyzed for ETD and HTD.

Biased samples: A minimum of four (4) biased sample locations will be selected before, or at the time of sample collection and their locations will be added to the map, with the letter "B" added to the sample number. The addition of these samples and the relocation of any samples may be added to the map without requiring a revision. The coordinates of the biased sample locations will be determined and added to the record.

Deleted per direction of FSS Manager

GENERAL INSTRUCTIONS

1. Collect fifteen (15) 1-liter FSS soil samples and four (4) biased 1-liter soil samples in accordance with DP-8120, using sampling equipment as stated in DP-8120. One (1) of the fifteen (15) FSS soil samples will be a QC split samples.
2. Soil sample designation:
 - (a) FSS soil samples: OOL-05-07-001-F through OOL-05-07-015-F corresponding to FSS sample locations 001 through 015.

OOL-05-07-001-F-H through OOL-05-07-015-F-H and OOL-05-07-016-F-B-H through OOL-05-07-019-F-B-H corresponding to the same nineteen (19) samples when analyzed off-site for tritium (H-3).
 - (b) Biased FSS soil sample: OOL-05-07-016-F-B through OOL-05-07-019-F-B.
 - (c) QC split sample: OOL-05-07-004-F-S. This sample will be analyzed for Hard-to-Detect (HTD) nuclides and H-3 in accordance with section 5.6.3.2.1 of the LTP and DP-8856.
 - (d) The off-site gamma spec will be compared with the on-site results in accordance with DP-8864.
 - (e) One (1) recount sample: OOL-05-07-002-F will be counted twice on site. The results will be compared in accordance with DP-8864.
3. All soil samples will be received and prepared in accordance with DP-8813, "Sample Receipt and Preparation."
4. Chain of Custody form will be used in accordance with DP-8123, "Sample Security and Chain of Custody" for all soil samples sent to an off-site laboratory.
5. The measurement locations have been identified using GPS, in accordance with DP-8859, "Operation of the Leica Geosystems GPS 1200 Global Positioning System for Identification of Final Status Survey Measurement Locations". **In cases where the location cannot be determined directly using GPS, an offset will be used to describe the distance and bearing from a known GPS location or benchmark.** Each location will be marked to assist in identifying the location. The FSS Radiological Engineer or FSS Field Supervisor will guide the FSS Technicians to the sample locations. **Any locations that are not suitable for soil sampling will be relocated. A surplus of alternate random sample locations will be generated, the relocated sample location will be selected from the list of alternate sample locations in numeric order. The alternate location will be documented in the field log in accordance with DP-8856, "Preparation of survey Plans."**
6. 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.
7. The job hazards associated with the FSS in Survey Unit 07 are addressed in the accompanying JHA for OOL-05-07.
8. All personnel participating in this survey shall be trained in accordance with DP-8868, "Final Status Survey Training Programs."

SPECIFIC INSTRUCTIONS

1. FSS Technicians will perform scans by moving the SPA-3 detector at a speed ≤ 0.5 m/s, keeping the probe less than 3 inches from the surface, and following a serpentine pattern that includes at least 3 passes across each square meter. When scanning and walking, a slow pace shall be used. Scanning will be performed in the rate-meter mode with the audible feature on. Surveyors 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. Location(s) where detectable-above-background scan readings are found will be investigated.

A first level investigation may be done with the SPA-3/E-600 to determine if the observed increase in the scan measurement is due to the presence of rocks and boulders. SPA-3 scans performed in non-impacted areas have shown that rock formations accounted for increased count rates. If it can be demonstrated that the presence of rocks and boulders is the cause of an increased count rate during a SPA-3 scan, record that finding on form DPF-8856.2. If it is demonstrated that the rocks and boulders do not account for an above background SPA-3 measurement, a soil sample will be collected at the point of the highest SPA-3 reading in the scanned area. Detailed descriptions of investigation actions will be recorded on form DPF-8856.2 and the location of the above background scan and sample will be recorded on the survey map. The location description must include sufficient detail to revisit the spot at a later time. If a soil sample is collected during the first level investigation, the sample designation will consist of the next available measurement location code plus the letter "I" (for investigation). For example, if a soil sample is collected during a first level investigation at measurement location 003, and the next available three digit sample location is 020 then the sample number would be OOL-05-07-020-F-I

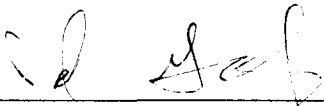
2. All designated measurement locations have been already identified by GPS per DP-8859. If a designated sample location is obstructed for any reason, the FSS Radiological Engineer or the FSS Field Supervisor will select an alternate location in accordance with DP-8856. A detailed description of the alternate location will be recorded on form DPF-8856.2, 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.

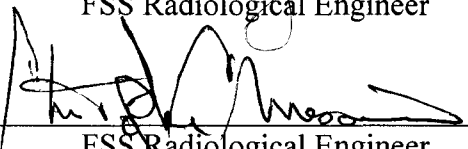
3. All sample analysis will achieve the MDC values stated in the DQO section of this plan.


4. Soil Samples:

- YNPS Chemistry will analyze all samples for gamma-emitting nuclides.
- YNPS Chemistry will analyze OOL-05-07-002-F as a sample recount. The recounted sample will possess the naming convention OOL-05-07-002-F-RC.
- Sample OOL-05-07-004-F-S will be analyzed for ETD and HTD.
- ~~The off site laboratory will analyze OOL-05-07-001-F-H through OOL-05-07-015-F-H and OOL-05-07-016-F-B-H through OOL-05-07-019-F-B-H for tritium (H-3). Each sample will be comprised of approximately 500 ml homogenous aliquot of wet sediment and prepared in accordance with DP-8813, "Sample Receipt and Preparation."~~ *final step deleted per FSS Manager*

5. On-site gamma analysis of the FSS samples shall achieve the MDC values stated in the DQO section of this plan. The MDC's will be communicated to the laboratory using an attachment to the Chain-of Custody form.

Prepared by  Date 5-4-06
FSS Radiological Engineer

Reviewed by  Date 5-4-06
FSS Radiological Engineer

Approved by  Date 8/29/06
FSS Project Manager

Final Status Survey Planning Worksheet

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GENERAL SECTION

Survey Area #: OOL-05

Survey Unit #: 08

Survey Unit Name: Trans-Canada-Deerfield River Frontage – SW Region

FSSP Number: YNPS-FSSP-OOL05-08-01

REVISION CHANGES IN BOLD ITALICS

PREPARATION FOR FSS ACTIVITIES

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.

1.2 ALARA review has been completed for the survey unit. (YA-REPT-00-003-05)

1.3 The survey unit has been turned over for final status survey.

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.

1.5 Activities conducted within area since turnover for FSS have been reviewed.

Based on reviewed information, subsequent walkdown: not warranted warranted

If warranted, subsequent walkdown has been performed and documented per DP-8854.

OR

The basis has been provided to and accepted by the FSS Project Manager for not performing a subsequent walkdown.

1.6 A final classification has been performed.

Classification: CLASS 1 CLASS 2 CLASS 3

DATA QUALITY OBJECTIVES (DQO)

1.0 Statement of problem:

Survey Unit OOL-05-08 is the southwest section of OOL-05, approximately 36,463 ft² (3388 m²) 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. 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.

The data collected under this plan will be used to determine whether or not residual plant-related radioactivity in soil of Survey Unit OOL05-08 meet LTP release criteria.

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.

2.0 Identify the decision:

Does residual plant-related radioactivity, if present in the survey unit, exceed LTP release criteria? Alternative actions that may be implemented in this effort are investigations and re-classification followed by re-surveying.

3.0 Identify the inputs to the decision:

Sample media: soil

Types of measurements: soil samples and SPA-3 scans.

Radionuclide-of-concern: Cs-137

Soil sample data presented in the HSA for area OOL-05 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). However, those data were collected prior to use of adjacent units as radioactive waste package staging areas. Composite samples of soil from the corners and wheels of the roll-offs that were staged in the adjacent units have identified both Co-60 and Cs-137.

The HSA data were used to obtain an estimate of Cs-137 variability, which was used to determine the number of systematic soil samples required to support statistical. For added statistical power, 5 additional samples were added for a total number of 20 statistical soil samples.

Although the characterization data do not include analyses for hard-to-detect (HTD) nuclides such as H-3, Sr-90, and TRUs, these nuclides will be included in the assessment for Survey Unit 05. Two of the FSS soil samples will be sent to an independent laboratory for complete analyses (HTD nuclides and TRUs).

a. Soil Samples:

For planning purposes, Cs-137 was selected as the radionuclide-of-concern for the unit. However, 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 soil sample for all LTP-listed gamma-emitting nuclides (excluding Am-241 and Cm-243). Two soil samples will be sent to an independent laboratory for analyses of gamma-emitters and HTD radionuclides (these analyses will include Am-241 and Cm-243).

Applicable DCGLs are presented in Table 1.: The DCGLs applied by this survey plan correspond to annual doses of 8.73 mrem/y (the 10-mrem/y DCGL adjusted for dose contributions from sub-surface concrete structures and tritium in ground water).

TABLE 1, Applicable DCGLs

Nuclide	DCGL (pCi/g)	Nuclide	DCGL (pCi/g)	Nuclide	DCGL (pCi/g)
Co-60	1.4E+0	Eu-152	3.6E+0	Sr-90	6.0E-1
Nb-94	2.5E+0	Eu-154	3.3E+0	Tc-99	5.0E+0
Ag108m	2.5E+0	Eu-155	1.4E+2	Pu-238	1.2E+1
Sb125	1.1E+1	H-3	1.3E+2	Pu-239/240	1.1E+1
Cs-134	1.7E+0	C-14	1.9E+0	Pu-241	3.4E+2
Cs-137	3.0E+0	Fe-55	1.0E+4	Am-241	1.0E+1
		Ni-63	2.8E+2	Cm-243/244	1.1E+1

Average concentration: Cs-137 = 0.0292 pCi/g

Standard deviation (σ): Cs-137 = 0.086 pCi/g

Investigation Level for soil samples: (a) >DCGL for Cs-137 (or any other detected LTP-listed nuclide), or
 (b) a sum of DCGL fractions >1.0, or
 (c) a statistical outlier as defined in the LTP

TABLE 2, MDCs for gamma analysis of soil samples

Nuclide	Target MDC (pCi/g)	Nuclide	Target MDC (pCi/g)	Nuclide	Target MDC (pCi/g)
Co-60	1.4E-1	Sb125	1.1E+0	Eu-152	3.5E-1
Nb-94	2.5E-1	Cs-134	1.7E-1	Eu-154	3.3E-1
Ag108m	2.5E-1	Cs-137	3.0E-1	Eu-155	1.4E+1

Note: If a target MDC value cannot be achieved in analysis, then a value no greater than 5X the listed value must be achieved in the analysis.

TABLE 3, MDCs for analyses of HTD nuclides

Nuclide	Target MDC (pCi/g)	Nuclide	Target MDC (pCi/g)	Nuclide	Target MDC (pCi/g)
H-3	1.3E+1	Sr-90	5.9E-2	Pu-241	3.4E+1
C-14	1.9E-1	Tc-99	4.8E-1	Am-241	1.0E+0
Fe-55	1.0E+3	Pu-238	1.1E+0	Cm-243/244	1.1E+0
Ni-63	2.8E+1	Pu-239/240	1.0E+0		

Note: If a target MDC value cannot be achieved in analysis, then a value no greater than 5X the listed value must be achieved in the analysis.

b. Scan Coverage:

A minimum of 10% of the surface area (i.e. $\geq 339 \text{ m}^2$) within OOL-05-08 will be scan surveyed. Scan surveys will be biased to include: 1) the boundary shared with survey unit OOL-05-09; 2) likely drainage paths and collection points; and 3) as directed by either the cognizant FFS Radiological Engineer or Field Supervisor. Locations where scan surveys are performed shall be identified on a map and include background and observed instrument responses. Documentation shall also include the dimensions of the area scanned so as to provide an estimate of the surface area covered. Increase coverage as necessary to ensure that at least 339 m^2 is scan surveyed.

Investigation Level for scan surveys: Instrument responses greater than background indication using an audible signal with headphones

MDCR for SPA-3: Attachment 1 (2 pages) provides MDCR and MDC values by various background levels. Page 1 of Attachment 1 is applicable for a scan speed of 0.25 meters/second while page 2 addresses a scan speed of 0.1 meters/second.

MDC for in-situ gamma spectroscopy: MDC values for in-situ gamma spectroscopy are based on investigation levels applicable to Class 1 survey units. It has been determined (before-the-fact) that a count time of 10 minutes is sufficient to achieve the necessary detection sensitivity.

c. QC checks and measurements: QC checks for the SPA-3 will be performed in accordance with DP-8504. QC checks for the Leica GPS will be performed in accordance with DP-8859. Two QC split samples will be collected, and QC recounts for 2 soil samples will be performed by the YNPS Chemistry Lab.

4.0 Define the boundaries of the survey:

Boundaries of OOL05-08 are as shown on maps provided in the survey package. 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 Decision Rules:

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-05-08 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 $DCGL_w$ or the average sum of fractions of LTP-listed nuclides exceeds unity, then accept the null hypothesis (i.e., Survey Unit OOL-05-08 fails to meet the release criteria).

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

6.0 Specify tolerable limits on decision errors:

Null hypothesis: Residual plant-related radioactivity in Survey Unit OOL05-08 exceeds the release criteria.

Probability of type I error: 0.05

Probability of type II error: 0.05

LBGR: 1.5

7.0 Optimize Design:

Type of statistical test: WRS Test Sign Test

Basis including background reference location (if WRS test is specified): N/A

Number samples (per DP-8853): 15 + 5 additional = 20

Biased samples: 2 (Two)

This is Revision 01 to the original YNPS-FSSP-OOL05-08. This revision provides guidance for determination of alternate sample locations for samples OOL-05-08-012-F, OOL-05-08-013-F and OOL-05-08-017-F. The physical locations of these samples are in a deep and unstable excavation. Site safety personnel determined there was no safe access to the sample locations or within 1 meter of the locations, therefore, they are considered not accessible for FSS. DP-8856 provides guidance for generating alternate sample locations. The guidance of DP-8856 is reflected in this revision. It is possible to obtain sample material from the original design locations of OOL-05-08-012-F and OOL-05-08-013-F using non-conventional means. Sample from these locations will be collected as biased samples.

*Note:
Sample OOL-05-08-013-F was
collected at original design
location. See R. Tozzie memo
dated 13 Sep 2006.
12/1/06*

GENERAL INSTRUCTIONS

1. Where possible, locations for the systematic soil samples 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. Standing water must be removed prior to the collection of any FSS measurement in that area.
3. Soil samples shall be collected in accordance with DP-8120.
4. Chain of Custody forms shall be used in accordance with DP-8123 for all soil samples sent to an off-site laboratory.
5. All soil samples shall 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.

6. 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.
7. 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.
8. The job hazards associated with the survey described in this package are addressed in the accompanying Job Hazard Assessment (JHA) for OOL-05-08.

All personnel participating in this survey shall be trained in accordance with DP-8868.

SPECIFIC INSTRUCTIONS

1. All designated soil sample 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, **if other than indicated below**, 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.

a. Sample locations OOL-05-08-012-F, OOL-05-08-013-F and OOL-05-08-017-F are to be relocated using the following:

- 1) *As shown on map "Alternate Samples Location Map #1" identify new locations for each sample starting with random location "a" and continuing alphabetically until an accessible location is determined. These random locations are within a box with dimensions of grid spacing "L" equal to approximately 14 meters.*
- 2) *If an accessible location cannot be determined as specified above then, as shown on map "Alternate Samples Location Map #21", identify new locations for each sample starting with random location "1" and continuing sequentially until accessible locations are determined. These random locations were generated across the entire survey unit.*

Note: Indicate on form DPF-8856.2 and on the survey map which method was used to determine alternate locations and which random locations correspond to the chosen location. Map "FSS Samples" will be revised to show the actual location of samples.

2. Sample Requirements:

Collect 22 (1-liter) soil samples in accordance with DP-8120 **with exception as noted below in step 3**. Two of the 20 soil samples will be analyzed as QC split samples 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-05-08-001-F through OOL-05-08-020-F corresponding to FSS sample locations 001 through 020.
QC split samples:	OOL-05-08- 09 ^{As 10/16/06} -F-S and OOL-05-08-016-F-S are to be designated as QC split samples. 009 ⁰⁰⁹

Recount samples:	OOL-05-08-004-F-RC and OOL-05-08-011-F-RC are to be counted twice on site. The results will be compared in accordance with DP-8864.
Biased samples	<i>OOL-05-08-021-F-B through OOL-05-08-022-F-B are biased samples. These samples are to be obtained at the original design locations of OOL-05-08-012-F and OOL-05-08-013-F respectively. These samples will require non-conventional means for sample (e.g. use of earth moving equipment bucket). Every effort should be made to collect only the top 6" of soil.</i>


4. Sample Analysis:

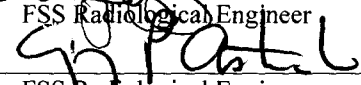
- Gamma analysis will be performed on all soil samples. If any of the gamma analyses show that an investigation level has been exceeded an investigation survey will be conducted under a revision to this survey plan.
- YNPS Chemistry will analyze OOL-05-08-004-F and OOL-05-08-011-F as sample recounts. The recounted samples will be identified as OOL-05-08-004-F-RC and OOL-05-08-011-F-RC, respectively.
- 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.
- The off-site laboratory will analyze OOL-05-08-~~09~~¹⁰-F-S and OOL-05-08-016-F-S for all LTP nuclides. Each sample will be prepared in accordance with DP-8813, "Sample Receipt and Preparation," but are not to be dried prior to shipment. Ensure that the lid of the container is secured and sealed with electrical tape to prevent loss of moisture during shipping.

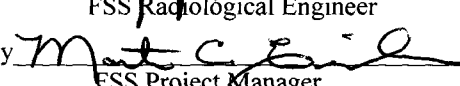
5. Scan surveys may be performed with either a SPA-3 detector or in-situ gamma spectroscopy (ISOCS). A minimum of 10% of the surface area (i.e. $\geq 339 \text{ m}^2$) within OOL-05-08 will be scan surveyed. Scan surveys will be biased to include: 1) the boundary shared with survey unit OOL-05-09; 2) likely drainage paths and collection points; and 3) as directed by either the cognizant FFS Radiological Engineer or Field Supervisor. Ensure that standing water has been removed from the area being scanned. Locations where scan surveys are performed should be identified on a map. Increase coverage as necessary to ensure that at least 339 m² is scan surveyed.

Scan surveys using a SPA-3 detector are to be performed with a probe speed of no greater than 0.1m/s (approximately 4 inches/sec). The SPA-3 scan speed will be observed by the FSS Field Supervisor and documented on DPF-8856.2. Documentation should include the location and estimate of the area surveyed. If an investigation condition is encountered, a first level investigation may be conducted to determine if the observed increase above background levels in the scan measurement is due to the presence of rocks. SPA-3 scans performed in non-impacted areas have shown that rock formations accounted for increased count rates. If it can be demonstrated that the presence of rocks is the cause of an increased count rate during a SPA-3 scan, record that finding on form DPF-8856.2. If it is demonstrated that the rocks do not account for an above background instrument response, a soil sample will be collected at the point of the highest response in the area being scanned. Document detailed descriptions of investigatory actions on form DPF-8856.2. The location of the elevated response (and sample) will be recorded on a survey map. The location description must include sufficient detail to revisit the spot at a later time. If a soil sample is collected during the first level investigation, the sample designation will continue the soil sample numbering sequence plus the letter "I" (for investigation)

Scan surveys using in-situ gamma spectroscopy (ISOCS) are to be performed using either a 1-meter/180° configuration or a 2-meter/90° configuration, applying a minimum spacing between scan survey locations of 4 meters or 3 meters respectively, ensuring that at least half of the applicable grid spacing is maintained at the boundaries of the survey unit. For either configuration, investigation levels are associated with detectable plant-derived radioactive material. Operation of the in-situ gamma spectroscopy equipment shall be in accordance with DP-8871, with QC checks performed once per shift in accordance with DP-8869 and DP-8871. Ensure that the detector is positioned perpendicular to the surface being evaluated. Notify the cognizant engineer if unusual or problematic topography is encountered.

Prepared by  Tozic
FSS Radiological Engineer

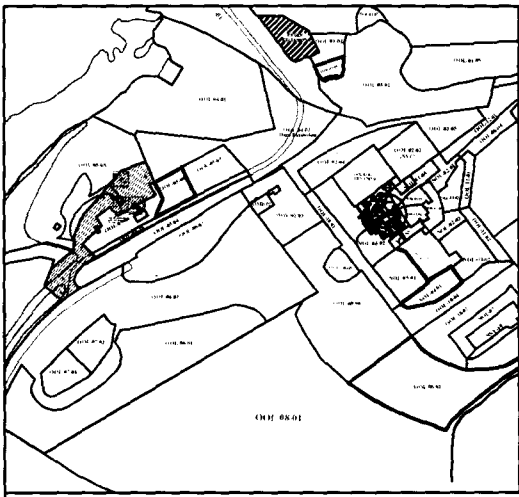
Reviewed by 
FSS Radiological Engineer

Approved by 
FSS Project Manager

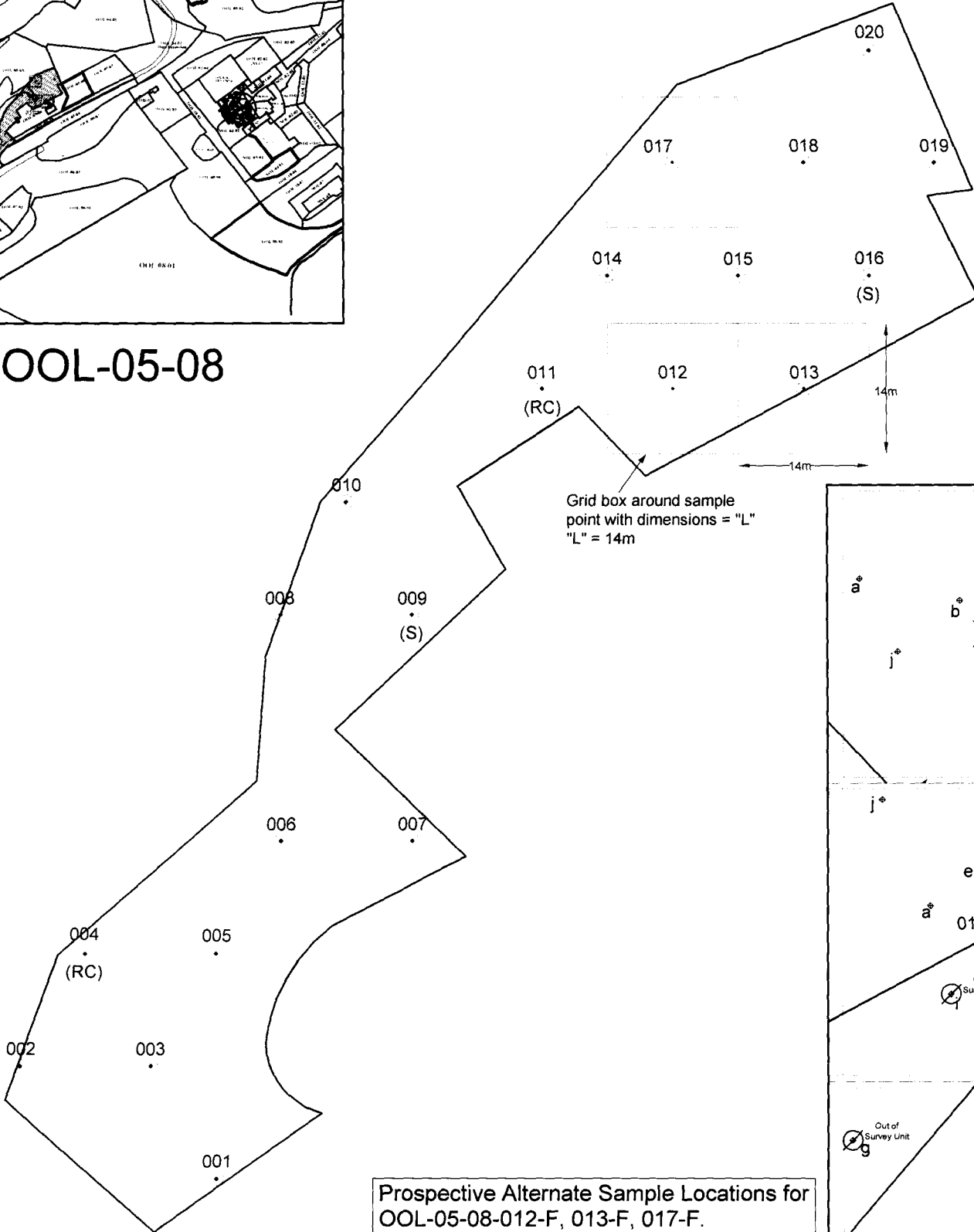
Date 9/12/06

Date 9/12/06

Date 9/12/06

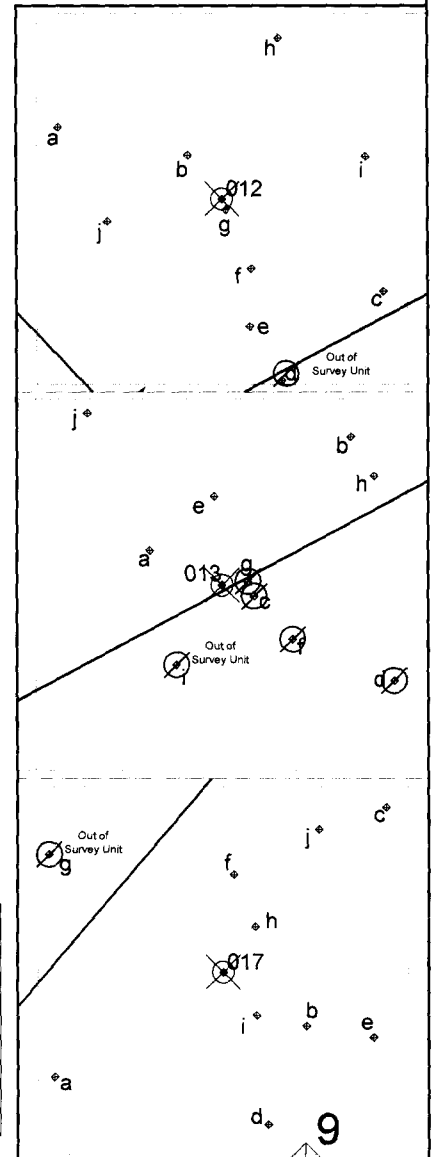


OOL-05-08

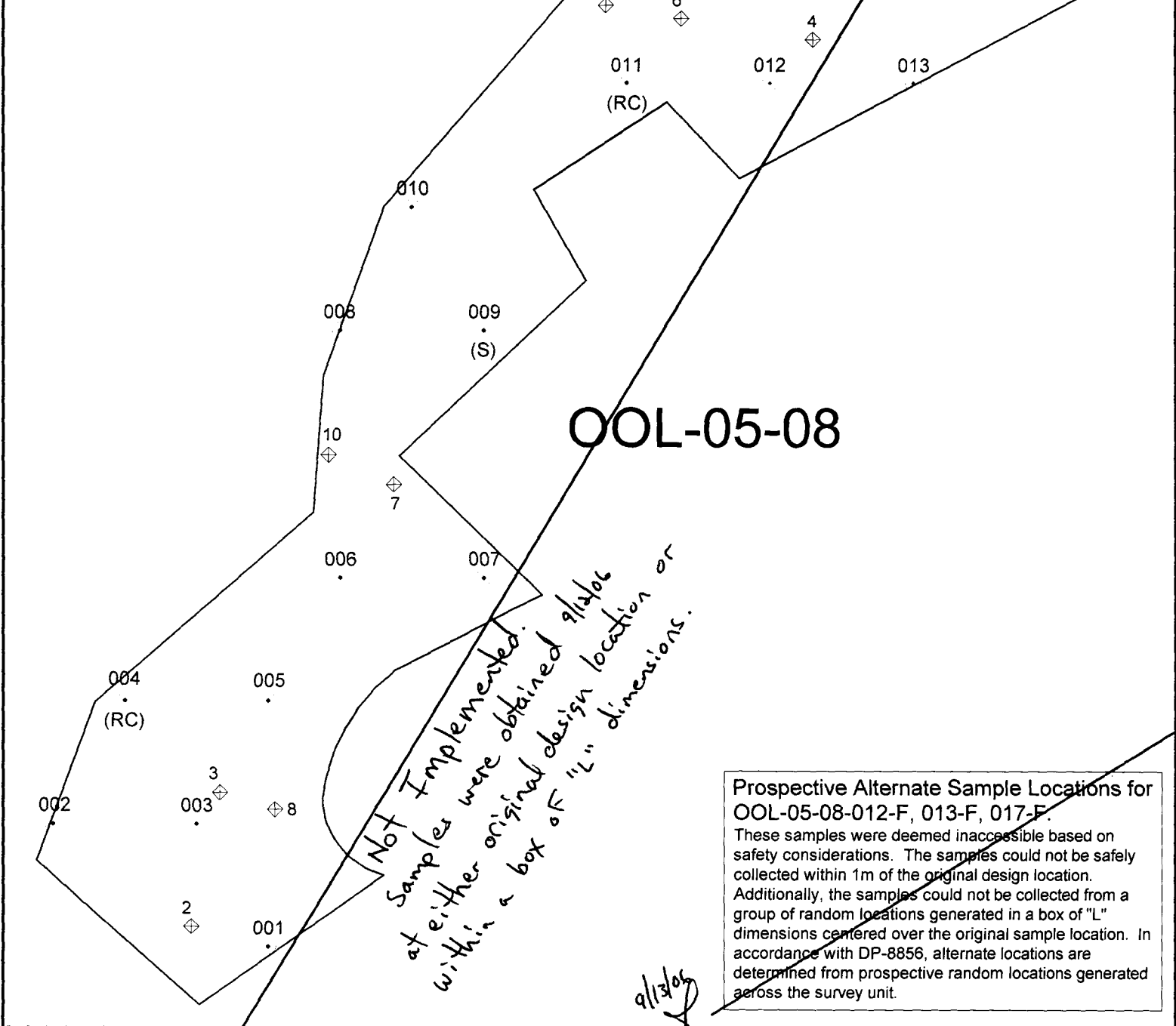
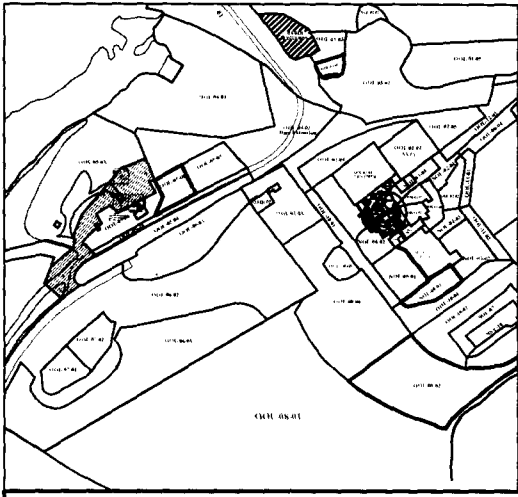


Prospective Alternate Sample Locations for OOL-05-08-012-F, 013-F, 017-F.

These samples were deemed inaccessible based on safety considerations. The samples could not be safely collected within 1m of the original design location. In accordance with DP-8856, random locations are generated within a box of "L" dimensions centered over the original sample location.



<p>Legend</p> <ul style="list-style-type: none"> = Sample Location = Alternate Location xxx = Sample Location ID 	<p>Map current as of Sept. 12, 2006</p> <p>Map Revision #: 0</p>	<p>Survey Area & Unit: OOL-05-08</p> <p>Alternate Sample Locations Random Locations in box of dimensions "L"</p>	Yankee Atomic Power Company	Prepared by: R. Tozzie
			Alternate Samples Location Map # 1	Date: Sept. 12, 2006



<p>Legend</p> <p>⊗ = Sample Location</p> <p>◇ = Alternate Location</p> <p>xxx = Sample Location ID</p>	<p>Map current as of Sept. 12, 2006</p> <p>Map Revision #: 0</p>	<p>Survey Area & Unit: OOL-05-08</p> <p>Alternate Sample Locations Random Locations Across Survey Unit</p>	<p>Yankee Atomic Power Company</p> <p>Alternate Samples Location Map # 2</p>	<p>Prepared by: R. Tozzie</p> <p>Date: Sept. 12, 2006</p>
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OOL-05-08-012r-GPS.txt

a	271524.7896	3093569.1494
b	271540.8199	3093565.6619
c	271564.9766	3093548.7925
d	271552.4289	3093537.7440
e	271548.5036	3093544.4271
f	271548.6569	3093551.6286
g	271545.5015	3093558.9617
h	271551.9892	3093580.1826
i	271562.7964	3093565.5480
j	271530.8577	3093557.4823

Coordinates for prospective replacement sample locations for
inaccessible location OOL-05-08-012. See FSSP OOL-05-08 Rev1

Generated 9/12/06

By: R. Tozzie

OOL-05-08-013r-GPS.txt

1	271582.0068	3093564.6188
2	271606.8751	3093578.5493
3	271594.9193	3093558.8589
4	271612.1941	3093548.4017
5	271590.0224	3093571.2523
6	271599.6501	3093553.5398
7	271594.1332	3093560.6987
8	271609.7441	3093573.7821
9	271585.3065	3093550.3609
10	271574.3611	3093581.4424

Not Used.
Sample was obtained at
original design location on 9/13/06
9/13/06

9/13/06

Coordinates for prospective replacement sample locations for
in accessible location OOL-05-08-13. See FSSP OOL-05-08 Rev 1.

Generated 9/13/06

By: R. Torzie

OOL-05-08-017r-GPS.txt

1	271524.1741	3093626.5301
2	271555.3646	3093632.8642
3	271565.2461	3093660.1360
4	271550.6137	3093620.5410
5	271563.6828	3093631.4626
6	271546.3649	3093651.7479
7	271523.4905	3093654.3128
8	271549.0372	3093645.2575
9	271549.1976	3093634.1987
10	271556.9112	3093657.4012

Coordinates for prospective replacement sample locations for
inaccessible location OOL-05-08-017. See FSSP OOL-05-08 Rev 1.

Generated 9/12/06

By R. Tozzie

OOL-05-08-ALT-GPS.txt

1	271621.8849	3093650.6176
2	271350.8895	3093289.1451
3	271369.0234	3093331.8618
4	271558.8324	3093574.4414
5	271492.5705	3093585.4405
6	271516.7120	3093581.2015
7	271424.6128	3093431.2234
8	271386.6769	3093326.4500
9	271555.2141	3093615.6939
10	271403.8071	3093440.6942

Not Used. Samples were obtained
9/13/06 at either original design location
or within a box of "L" dimensions.
9/13/06

9/13/06

GPS coordinates for prospective replacement sample locations
for inaccessible locations in survey unit OOL-05-08. See FSSP-001-05-08 Rev 1.

Generated 9/12/06

By: R. Torrie

00L-05-08-012

Area: Area 1

	X Coord	Y Coord	Label	Value	Type	Historical
a)	271524.7896	3093569.1494		0	Random	
b)	271540.8199	3093565.6619		0	Random	
c)	271564.9766	3093548.7925		0	Random	
d)	271552.4289	3093537.7440		0	Random	
e)	271548.5036	3093544.4271		0	Random	
f)	271548.6569	3093551.6286		0	Random	
g)	271545.5015	3093558.9617		0	Random	
h)	271551.9892	3093580.1826		0	Random	
i)	271562.7964	3093565.5480		0	Random	
j)	271530.8577	3093557.4823		0	Random	

Prospective Alternate Sample Locations
For 00L-05-08-012-F in Box of Dimensions = "L"

Generated 9/12/06

By: R. Torzie

OOL-05-08-012 Prospective Alternate Sample Locations

Random locations within a box of "L" dimensions (L = 14m)

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⊕

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⊕

9/12/06 by R. Tozzie 

00L-05-08-013

Area: Area 1

X Coord	Y Coord	Label	Value	Type	Historical
271582.0068	3093564.6188		0	Random	
271606.8751	3093578.5493		0	Random	
271594.9193	3093558.8589		0	Random	
271612.1941	3093548.4017		0	Random	
271590.0224	3093571.2523		0	Random	
271599.6501	3093553.5398		0	Random	
271594.1332	3093560.6987		0	Random	
271609.7441	3093573.7821		0	Random	
271585.3065	3093550.3609		0	Random	
271574.3611	3093581.4424		0	Random	

a
b
c
d
e
f
g
h
i
j

Not Used.
Samples were obtained 9/12/06
at original design location. 9/12/06
9/12/06

Prospective Alternate Sample Locations
For 00L-05-08-013-F in Box of Dimensions = "L"
Generated 9/12/06
By: R. Toxie

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OOL-05-08-013 Prospective Alternate Sample Locations

Random locations within a box of "L" dimensions (L = 14m)

9/12/06 By: R. Tozzie

00L-05-08-017

Area: Area 1

X Coord	Y Coord	Label	Value	Type	Historical
271524.1741	3093626.5301		0	Random	
271555.3646	3093632.8642		0	Random	
271565.2461	3093660.1360		0	Random	
271550.6137	3093620.5410		0	Random	
271563.6828	3093631.4626		0	Random	
271546.3649	3093651.7479		0	Random	
271523.4905	3093654.3128		0	Random	
271549.0372	3093645.2575		0	Random	
271549.1976	3093634.1987		0	Random	
271556.9112	3093657.4012		0	Random	

Prospective Alternate Sample Locations

For 00L-05-08-017-F in Box of Dimensions = "L"

Generated 9/12/06

By: R. Tozzie

00L-05-08

Area: Area 1

	X Coord	Y Coord	Label	Value	Type	Historical
1)	271621.8849	3093650.6176		0	Random	
2)	271359.8895	3093289.1451		0	Random	
3)	271369.0234	3093331.8618		0	Random	
4)	271558.8324	3093574.4414		0	Random	
5)	271492.5705	3093585.4405		0	Random	
6)	271516.7120	3093581.2015		0	Random	
7)	271424.6128	3093431.2234		0	Random	
8)	271386.6769	3093326.4500		0	Random	
9)	271555.2141	3093615.6939		0	Random	
10)	271403.8071	3093440.6942		0	Random	

Not used. Samples obtained
9/13/06 using original design
locations or within a box
of "L" dimensions. 9/13/06

Prospective Alternate Sample Locations
Points generated randomly across survey unit.

Generated 9/11/06

By: R. Torrie

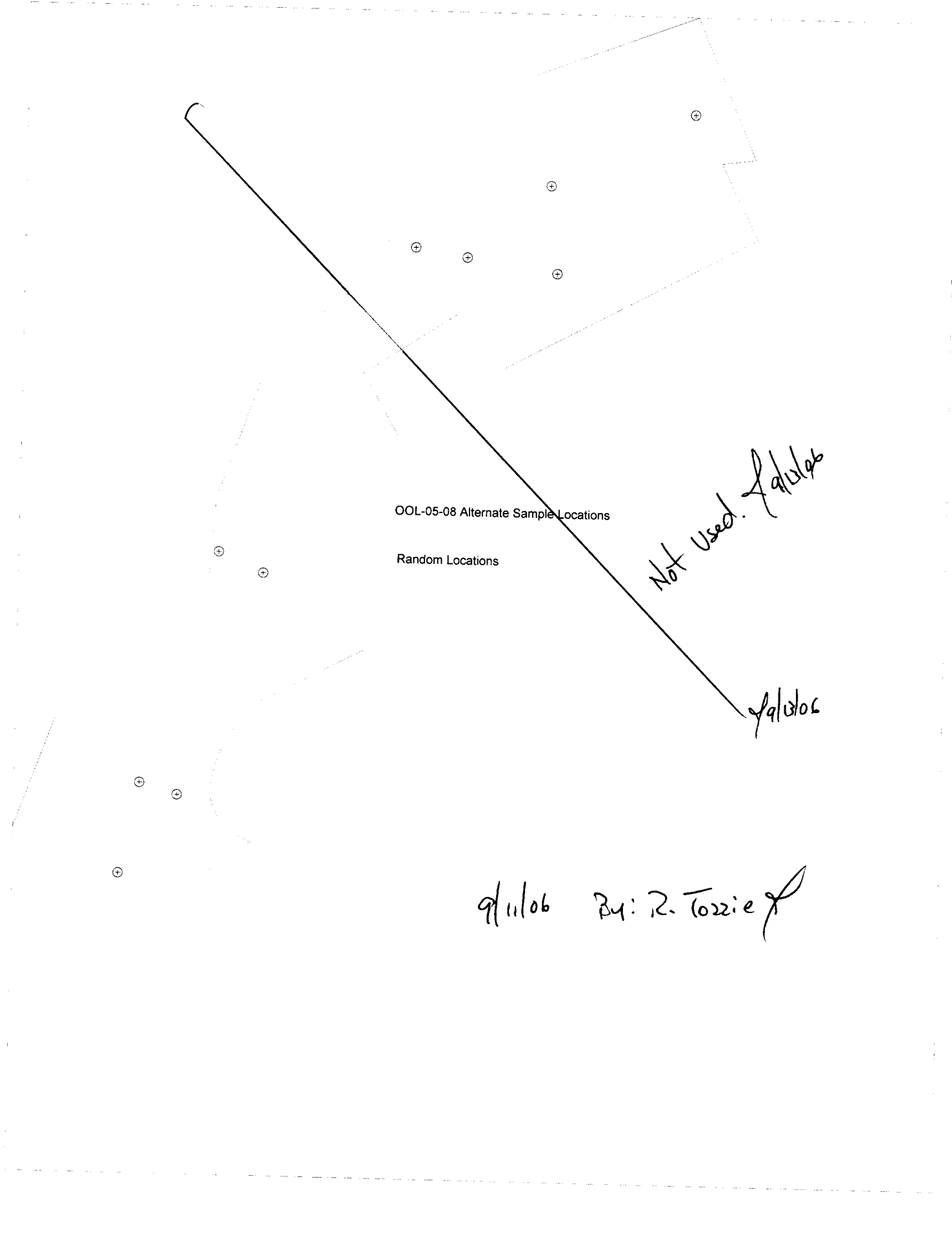
OOL-05-08 Alternate Sample Locations

Random Locations

Not Used. 9/11/06

9/11/06

9/11/06 By: R. Tozzie



SPA-3 Scan Tables

probe speed = 0.25 m/s

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

SPA-3 Scan Tables (probe speed = 0.1m/s)

Max Background

BKG(cpm)	MDCR	MDC(fDCGL)
4,000	404	7.16E-01
5,000	452	8.01E-01
6,000	495	8.78E-01
7,000	535	9.48E-01
8,000	571	1.01E+00
9,000	606	1.08E+00
10,000	639	1.13E+00
11,000	670	1.19E+00
12,000	700	1.24E+00
13,000	728	1.29E+00
14,000	756	1.34E+00
15,000	783	1.39E+00
16,000	808	1.43E+00
17,000	833	1.48E+00
18,000	857	1.52E+00
19,000	881	1.56E+00
20,000	904	1.60E+00
21,000	926	1.64E+00
22,000	948	1.68E+00
23,000	969	1.72E+00
24,000	990	1.76E+00
25,000	1,010	1.79E+00
26,000	1,030	1.83E+00
27,000	1,050	1.86E+00
28,000	1,069	1.90E+00
30,000	1,107	1.96E+00
32,000	1,143	2.03E+00
34,000	1,178	2.09E+00
36,000	1,212	2.15E+00
38,000	1,246	2.21E+00
40,000	1,278	2.27E+00



To: OOL-05-08 File
From: Greg Astrauckas *gpa*
Subject: Requested Analysis and Desired MDC

Date: September 7, 2006

Enclosed are 2 soil samples packaged in 1-liter marinelli containers. Please perform radionuclide analyses as indicated below:

SAMPLE ID	ANALYSIS REQUESTED
OOL-05-03-009-F-S	Gamma and HTD as shown below
OOL-05-03-016-F-S	Gamma and HTD as shown below

Every attempt to should be made to achieve the target MDC listed below. In the event that the target MDC cannot be reasonably achieved, the required MDC must be achieved. Note the target MDC is at 10% of the applicable DCGL_w and the required MDC is at 50% of the applicable DCGL_w.

GAMMA-EMITTING NUCLIDES

NUCLIDE	TARGET MDC (pCi/g)	REQUIRED MDC (pCi/g)
Co ⁶⁰	1.4E-01	7.0E-01
Nb ⁹⁴	2.5E-01	1.3E+00
Ag ^{108m}	2.5E-01	1.3E+00
Sb ¹²⁵	1.1E+00	5.6E+00
Cs ¹³⁴	1.7E-01	8.7E-01
Cs ¹³⁷	3.0E-01	1.5E+00
Eu ¹⁵²	3.6E-01	1.8E+00
Eu ¹⁵⁴	3.3E-01	1.7E+00
Eu ¹⁵⁵	1.4E+01	6.9E+01

HARD-TO-DETECT (HTD) NUCLIDES

NUCLIDE	TARGET MDC (pCi/g)	REQUIRED MDC (pCi/g)
H ³	1.3E+01	6.4E+01
C ¹⁴	1.9E-01	9.7E-01
Fe ⁵⁵	1.0E+03	5.1E+03
Ni ⁶³	2.8E+01	1.4E+02
Sr ⁹⁰	6.0E-02	3.0E-01
Tc ⁹⁹	5.0E-01	2.5E+00
Pu ²³⁸	1.2E+00	5.8E+00
Pu ²³⁹	1.1E+00	5.3E+00
Pu ²⁴¹	3.4E+01	1.7E+02
Am ²⁴¹	1.0E+00	5.1E+00
Cm ²⁴³	1.1E+00	5.6E+00

Please email results to: astrauckas@yankeerowe.com

GENERAL SECTION

Survey Area No.: OOL-05

Survey Unit No.: 09

Survey Unit Name: Alternate RW storage area in Radwaste

FSSP No.: YNPS-FSSP-OOL-05-09-00

PREPARATION FOR FSS ACTIVITIES

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. | X |
| 1.2 ALARA review has been completed for the survey unit. | X |
| 1.3 The survey unit has been turned over for final status survey. | X |
| 1.4 An initial DP-5554 walk down has been performed and a copy of the completed Survey Unit Walk down Evaluation is in the survey area file. | X |
| 1.5 Activities conducted within area since turnover for FSS have been reviewed. | X |
| Based on reviewed information, subsequent walk down: <u> X </u> not warranted _____ warranted | |
| If warranted, subsequent walk down has been performed and documented per DP-8854. | _____ |
| OR | |
| The basis has been provided to and accepted by the FSS Project Manager for not performing a subsequent walk down. | _____ |
| 1.6 A final classification has been performed. | X |
| Classification: Class I | |

DATA QUALITY OBJECTIVES (DQO)**1.0 State the problem:**

Define the problem so that the focus of the survey will be unambiguous.

Members of the planning team: FSS Project manager, Radiological Engineer, Field Supervisor, and Technicians.*Primary decision maker/method:* FSS Radiological Engineer with concurrence of the FSS Project Manager.*Available resources/deadlines:* N/A*Concise description of problem:* Release of OOL-05-09 to demonstrate compliance with YNPS LTP release criterion.**2.0 Identify the decision:**

Define the question that the survey will attempt to resolve and identify alternative actions that may be taken based on the outcome of the survey.

Principal study question: Is the residual radioactivity in OOL-05-09 below the 8.73 m^r/yr release criterion?*Alternative actions:* If residual radioactivity in OOL-05-09 exceeds the 8.73 m^r/yr release criterion, investigations will be performed, potentially resulting in remediation, reclassification or resurveys.*Decision statement:* Determine whether or not OOL-05-09 satisfies the 8.73 m^r/yr release criterion.**3.0 Identify the inputs to the decision:**

Informational inputs needed to resolve the decision statement and environmental variables that will be measured.

Sources of information: 13 samples from historical data were sufficient to develop the DQOs for OOL-05-09. 20 new data measurements will be acquired to support DQAs.*Direct measurement technique:* Soil samples will be collected and analyzed on site for all ETD LTP listed radionuclides, 2 samples will be sent to an independent lab for analyses of all LTP listed radionuclides.*Scan measurement technique:* Surfaces will be scanned via a SPA-3 probe, and/or ISOCS Assays.*Sample matrix:* Soil*Radionuclide(s) of concern:* Based on a review of YNPS historical data, the following radionuclides are the only facility related radionuclides of concern: Cs-137*Sample Quantity* 15 (calculated) + 5 (added), for a total of 20 samples. (+2 QC)*Gridded Sample Area Size* 83.1 m² (Survey Unit Area/N)*Sample Grid Spacing:* Triangular: 9.8m

Survey Area No.:	OOL-05	Survey Unit No.:	09
Survey Unit Name: Alternate RW storage area in Radwaste			
FSSP No.: YNPS-FSSP-OOL-05-09-00			
<i>Detection Limits:</i>	For direct measurements and sample analyses, Minimum Detectable Concentrations (MDCs) less than 10% of the DCGL are preferred, while MDCs up to 50% of the DCGL are acceptable. See Attachment 2 for MDC Table.		
<i>MDC (fDCGLemc):</i>	The accompanying MDCR/MDC table in Attachment 1 provides MDC values, as a fraction of DCGLemc, for various background levels.		
<i>MDCR(surveyor):</i>	The accompanying MDCR/MDC table in Attachment 1 provides MDCR values for various background levels.		
<i>Background Measurements:</i>	No reference area (background) measurements are required, the Sign Test will be used.		
<i>Release criteria DCGL based on:</i>	8.73 mr/yr for Soil. See Attachment 2 for radionuclide specific breakdown of DCGLs.		
4.0 Define the boundaries of the survey:			
Define the spatial and temporal boundaries that will be covered by the decision statement so data can be easily interpreted.			
<i>Temporal boundaries:</i>	The data are used to reflect the condition of radionuclides leaching into the ground water over a period of 1,000 years. The survey may be performed under appropriate weather conditions (as defined by instrument tolerance and personnel safety) on any shift of work.		
<i>Spatial Boundaries:</i>	YNPS has been divided into multiple survey areas and units with relatively homogeneous characteristics based on information collected during the years of facility operation, the HSA, and post remediation activities. The area of interest has been named OOL-05, and the survey unit is 09. The medium of interest is described as Soil. The radiological characteristics of this unit classify it as a Class 1 area. Which has $\leq 2,000$ m ² as a surface area limit. The total surface area is 1662 m ² , which is well within the $\leq 2,000$ m ² limit. The maximum length is 88m, and the maximum width is 30.5m. Soil is surveyed to a depth of 15 cm.		
<i>Detailed description of unit:</i>	See included GPS coordinates and maps that demonstrate the measurement locations, the survey unit boundaries and unit relationship to site. OOL-05-09 is an open land area located in the south western corner of the current Radwaste area 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. Initial HSA classification of this Survey Unit identified a Class 3, however, subsequent activities and the relocation of an alternate Radwaste storage site prompted a reclassification of the unit to a Class 1 area. The Survey Unit is comprised of soils, small rocks and some turf. The terrain consists of level ground, slight grades and steep walled excavations.		
5.0 Develop a decision rule:			
Define the parameter of interest, specify action levels, and the DCGL.			
<i>Investigation Levels:</i>	If an investigation level below is exceeded, then perform an investigation survey.		
<i>Direct measurements:</i>	> DCGLemc or > DCGLw + 3 Sigma		
<i>Scan measurements:</i>	> DCGLemc or > Bkgd for SPA-3		
<i>Parameter of interest:</i>	If there are no investigation issues, and the the residual radioactivity in OOL-05-09 systematic samples is less than the DCGLw then the survey unit is in compliance with the release criterion (8.73 mr/yr).		
<i>Critical Value:</i>	If the average concentration is less than DCGLw, the sum of fractions is less than 1, and less than 6 of the 20 samples are above the DCGLw, the Survey Units passes.		

Survey Area No.: OOL-05 Survey Unit No.: 09
 Survey Unit Name: Alternate RW storage area in Radwaste
 FSSP No.: YNPS-FSSP-OOL-05-09-00

6.0 Specify limits on decision errors:

Specify the decision maker's limits on decision errors, used to establish performance goals for the data collection design.

Null Hypothesis (H_0): The residual radioactivity in the survey unit data is greater than the DCGLw

Alternative Hypothesis (H_a): The residual radioactivity in the survey unit data is less than the DCGLw

Tolerance for Error: Type I Error: 0.05 (probability of rejecting the null hypothesis when it is true.)
 Type II Error: 0.05 (probability of accepting the null hypothesis when it is false.)

DCGLw: 3 (pCi/g)

LBGR: 2.8286 (Initial LBGR: 1.5)

Relative shift (Δ/σ): 2

Sigma (σ): 0.0857

Power of survey design: See attachment for prospective power curve.

7.0 Optimize Design:

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

Design optimization is included in the DQO process, and reflected in the data published in this plan.

Number & Location of Samples: 20 Soil samples will be collected at locations based on a random start, systematic Triangular grid (refer to accompanying DPF-8853.2). See map for specific locations.

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.
- 2 Soil samples will be collected in accordance with DP-8120.
- 3 Chain of Custody form will be used in accordance with DP-8123 for all soil samples sent to an off-site laboratory.
- 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. Listen for upscale readings and respond by slowing down or stopping the probe to distinguish between random fluctuations in the background and greater than background readings. Investigate any reproducible upscale readings as described in the specific instructions.
- 7 The job hazards associated with the survey described in this package are addressed in the accompanying Job Hazard Assessment (JHA) for OOL-05-09.
- 8 All personnel participating in this survey shall be trained in accordance with DP-8868.
- 9 Collect ISOCS measurements in accordance with DP-8871 to provide 100% scan coverage of the survey unit.

SPECIFIC INSTRUCTIONS

- 1 *SPA-3 Scans:*
 - Move the SPA-3 in rate-meter mode at a speed of 0.25m or less per second, keeping the probe at a distance of ≤ 3 " from the surface and following a serpentine path that includes at least 3 passes across each square meter. The maximum background a SPA-3 may be used in is 24000 cpm.
 - Perform supplemental/judgmental scans with SPA-3 in addition to ISOCS scans, as needed.
- 2 *Scan Investigations:*
 If any of the ISOCS scan measurements show that an investigation level has been exceeded an investigation survey will be conducted of that ISOCS scan location as directed by the radiological engineer. Note: Detailed descriptions of investigation actions shall be recorded in the daily survey journal (DPF-8856.2) and locations marked on a map.

Survey Area No.: OOL-05

Survey Unit No.: 09

Survey Unit Name: Alternate RW storage area in Radwaste

FSSP No.: YNPS-FSSP-OOL-05-09-00

3 *Sample Locations:*

All designated measurement locations will be identified by GPS per DP-8859 or by use of reference points, tape measure and compass 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 a GPS is not available.

4 *Sample Requirements:*

Collect 20 samples in accordance with DP-8120. Document sample collection date, time and sample collector on DPF-8856.2 for each sample collected.

2 of the 20 samples collected will be analyzed as QC split samples to fulfill the QC requirement of DP-8852. The same QC split samples will be analyzed for HTD nuclides in accordance with section 5.6.3.2.1 of the LTP and DP-8856.

Biased samples:

No biased samples will be collected.

5 *Sample Designation:*

FSS soil samples:

OOL-05-09-001-F through OOL-05-09-020-F corresponding to FSS sample locations 001 through 020.

Biased soil samples:

No biased samples will be collected.

QC split samples:

OOL-05-09-007-F-S and OOL-05-09-013-F-S are to be designated as QC split samples. These samples will be sent to the off-site laboratory (do not dry).

Recount samples:

OOL-05-09-006-F-RC will be counted twice on site. The results will be compared in accordance with DP-8864.

6 *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 by the radiological engineer.
- YNPS Chemistry will analyze OOL-05-09-001-F through OOL-05-09-020-F for gamma-emitting nuclides.
- YNPS Chemistry will analyze OOL-05-09-006-F as a sample recount. The recounted sample will possess the naming convention OOL-05-09-006-F-RC.
- YNPS Chemistry will analyze OOL-05-09-007-F-S and OOL-05-09-013-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 HTD at the off-site
- All gamma analysis of the FSS samples shall achieve the MDC values stated in the DQO section of this plan. The MDC's will be communicated to the laboratory using an attachment to the Chain-of- Custody form.

7 *ISOCS Assays:*

- Collect at least 44 ISOCS measurements in accordance with DP-8871 to provide 100% scan coverage of the survey unit.
- ISOCS assays are designated as OOL-05-09-xxx -F-G where "xxx" starts at 101 and continues sequentially.
- QC checks shall be performed at least once per shift in accordance with DP-8869 and DP-8871. Resolve flags encountered prior to survey.
- ISOCS assays to be performed with 180° collimator at 1m unless otherwise directed by the FSS Engineer. Make note on the daily survey journal (DPF-8856.2) if other geometries are used.
- For ISOCS assay locations shown on map titles "ISOCS Scans", position the detector downward facing keeping the detector perpendicular to the ground.
- Designate additional assay locations in continuing sequence from the last number assigned to an FSS ISOCS measurement to ensure 100% scan coverage. Record detailed information about additional assay locations on the daily survey journal.

Survey Area No.: OOL-05	Survey Unit No.: 09
Survey Unit Name: Alternate RW storage area in Radwaste	
FSSP No.: YNPS-FSSP-OOL-05-09-00	
• Remove standing water prior to performance of ISOCS assays. Contact the FSS Engineer for directions if conditions are such that standing water cannot be removed.	

Prepared by Ron Shippee *Ronald Shippee*
FSS Radiological Engineer

Date September 6, 2006

Reviewed by *Robert Tozzie*
FSS Radiological Engineer

Date 9/6/06

Approved by Martin Erickson *Martin Erickson*
FSS Project Manager

Date 9/6/06

SPA-3 Scan Tables

Max Background

BKG(cpm)	MDCR	MDC(fDCGLemc)
4,000	639	4.05E-01
5,000	715	4.52E-01
6,000	783	4.96E-01
7,000	845	5.35E-01
8,000	904	5.72E-01
9,000	959	6.07E-01
10,000	1,011	6.40E-01
11,000	1,060	6.71E-01
12,000	1,107	7.01E-01
13,000	1,152	7.30E-01
14,000	1,196	7.57E-01
15,000	1,238	7.84E-01
16,000	1,278	8.09E-01
17,000	1,318	8.34E-01
18,000	1,356	8.58E-01
19,000	1,393	8.82E-01
20,000	1,429	9.05E-01
21,000	1,464	9.27E-01
22,000	1,499	9.49E-01
23,000	1,533	9.70E-01
24,000	1,565	9.91E-01
25,000	1,598	1.01E+00
26,000	1,629	1.03E+00
27,000	1,660	1.05E+00
28,000	1,691	1.07E+00
30,000	1,750	1.11E+00
32,000	1,808	1.15E+00
34,000	1,863	1.18E+00
36,000	1,917	1.21E+00
38,000	1,970	1.25E+00
40,000	2,021	1.28E+00

Scan Speed

In/Sec	m/Sec	BKG (cpm)
39	1.00	6,000
20	0.50	12,000
13	0.33	18,000
10	0.25	24,000
8	0.20	30,000
5	0.13	48,000
4	0.10	61,000

YNPS-FSSP-OOL-05-09-00

Attachment 2

DCGL MDC Table

Nuclide	Soil 8.73 m/yr (pCi/g)	10% MDC DCGL	50% MDC DCGL	Entry to Biosphere	Area Factor	DCGLarea
Co-60	1.4E+00	1.4E-01	7.0E-01	ETD	1.4E+00	2.0E+00
Nb-94	2.5E+00	2.5E-01	1.3E+00	ETD	1.2E+00	3.0E+00
Ag-108m	2.5E+00	2.5E-01	1.3E+00	ETD	1.2E+00	3.0E+00
Sb-125	1.1E+01	1.1E+00	5.6E+00	ETD	1.2E+00	1.3E+01
Cs-134	1.7E+00	1.7E-01	8.7E-01	ETD	2.0E+00	3.4E+00
Cs-137	3.0E+00	3.0E-01	1.5E+00	ETD	2.8E+00	8.4E+00
Eu-152	3.6E+00	3.6E-01	1.8E+00	ETD	1.2E+00	4.3E+00
Eu-154	3.3E+00	3.3E-01	1.7E+00	ETD	1.2E+00	4.0E+00
Eu-155	1.4E+02	1.4E+01	6.9E+01	ETD	1.2E+00	1.7E+02
Am-241	1.0E+01	1.0E+00	5.1E+00	ETD	8.7E+00	8.7E+01
H-3	1.3E+02	1.3E+01	6.4E+01	HTD	2.0E+01	2.6E+03
C-14	1.9E+00	1.9E-01	9.7E-01	HTD	1.5E+02	2.9E+02
Fe-55	1.0E+04	1.0E+03	5.1E+03	HTD	5.2E+01	5.2E+05
Ni-63	2.8E+02	2.8E+01	1.4E+02	HTD	3.8E+01	1.1E+04
Sr-90	6.0E-01	6.0E-02	3.0E-01	HTD	1.4E+01	8.4E+00
Tc-99	5.0E+00	5.0E-01	2.5E+00	HTD	1.1E+01	5.5E+01
Pu-238	1.2E+01	1.2E+00	5.8E+00	HTD	9.7E+00	1.2E+02
Pu-239	1.1E+01	1.1E+00	5.3E+00	HTD	9.7E+00	1.1E+02
Pu-241	3.4E+02	3.4E+01	1.7E+02	HTD	8.7E+00	3.0E+03
Cm-243	1.1E+01	1.1E+00	5.6E+00	HTD	3.3E+00	3.6E+01

GENERAL SECTION

Survey Area No.: OOL-05

Survey Unit No.: 10

Survey Unit Name: Radwaste Roadway

FSSP No.: YNPS-FSSP-OOL-05-10-00

PREPARATION FOR FSS ACTIVITIES

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. X
- 1.2 ALARA review has been completed for the survey unit. X
- 1.3 The survey unit has been turned over for final status survey. X
- 1.4 An initial DP-5554 walk down has been performed and a copy of the completed Survey Unit Walk down Evaluation is in the survey area file. X
- 1.5 Activities conducted within area since turnover for FSS have been reviewed. X
- Based on reviewed information, subsequent walk down: X not warranted warranted
- If warranted, subsequent walk down has been performed and documented per DP-8854.
- OR
- The basis has been provided to and accepted by the FSS Project Manager for not performing a subsequent walk down.
- 1.6 A final classification has been performed. X
- Classification: Class I

DATA QUALITY OBJECTIVES (DQO)**1.0 State the problem:**

Define the problem so that the focus of the survey will be unambiguous.

Members of the planning team: FSS Project manager, Radiological Engineer, Field Supervisor, and Technicians.*Primary decision maker/method:* FSS Radiological Engineer with concurrence of the FSS Project Manager.*Available resources/deadlines:* N/A*Concise description of problem:* Release of OOL-05-10 to demonstrate compliance with YNPS LTP release criterion.**2.0 Identify the decision:**

Define the question that the survey will attempt to resolve and identify alternative actions that may be taken based on the outcome of the survey.

Principal study question: Is the residual radioactivity in OOL-05-10 below the 8.73 m^r/yr release criterion?*Alternative actions:* If residual radioactivity in OOL-05-10 exceeds the 8.73 m^r/yr release criterion, investigations will be performed, potentially resulting in remediation, reclassification or resurveys.*Decision statement:* Determine whether or not OOL-05-10 satisfies the 8.73 m^r/yr release criterion.**3.0 Identify the inputs to the decision:**

Informational inputs needed to resolve the decision statement and environmental variables that will be measured.

Sources of information: 13 samples from historical data was sufficient to develop the DQOs for OOL-05-10. 18 new data measurements will be acquired to support DQAs.*Direct measurement technique:* Soil samples will be collected and analyzed on site for all ETD LTP listed radionuclides, 1 sample will be sent to an independent lab for analyses of all LTP listed radionuclides.*Scan measurement technique:* Surfaces will be scanned via a SPA-3 probe, and/or ISOCS Assays.*Sample matrix:* Soil*Radionuclide(s) of concern:* Based on a review of YNPS historical data, the following radionuclides are the only facility related radionuclides of concern: Cs-137*Sample Quantity* 15 (calculated) + 3 (added), for a total of 18 samples. (+1 QC)*Gridded Sample Area Size* 54.17 m² (Survey Unit Area/N)*Sample Grid Spacing:* Triangular: 7.9m

Survey Area No.: OOL-05 Survey Unit No.: 10

Survey Unit Name: Radwaste Roadway

FSSP No.: YNPS-FSSP-OOL-05-10-00

Detection Limits: For direct measurements and sample analyses, Minimum Detectable Concentrations (MDCs) less than 10% of the DCGL are preferred, while MDCs up to 50% of the DCGL are acceptable. See Attachment 2 for MDC Table.

MDC (DCGL_{emc}): The accompanying MDCR/MDC table in Attachment 1 provides MDC values, as a fraction of DCGL_{emc}, for various background levels.

MDCR(surveyor): The accompanying MDCR/MDC table in Attachment 1 provides MDCR values for various background levels.

Background Measurements: No reference area (background) measurements are required, the Sign Test will be used.

Release criteria DCGL based on: 8.73 mr/yr for Soil. See Attachment 2 for radionuclide specific breakdown of DCGLs.

4.0 Define the boundaries of the survey:

Define the spatial and temporal boundaries that will be covered by the decision statement so data can be easily interpreted.

Temporal boundaries: The data are used to reflect the condition of radionuclides leaching into the ground water over a period of 1,000 years. The survey may be performed under appropriate weather conditions (as defined by instrument tolerance and personnel safety) on any shift of work.

Spatial Boundaries: YNPS has been divided into multiple survey areas and units with relatively homogeneous characteristics based on information collected during the years of facility operation, the HSA, and post remediation activities. The area of interest has been named OOL-05, and the survey unit is 10. The medium of interest is described as Soil. The radiological characteristics of this unit classify it as a Class 1 area. Which has $\leq 2,000$ m² as a surface area limit. The total surface area is 975 m², which is well within the $\leq 2,000$ m² limit. The maximum length is 165.4m, and the maximum width is 8.1m. Soil is surveyed to a depth of 15 cm.

Detailed description of unit: See included GPS coordinates and maps that demonstrate the measurement locations, the survey unit boundaries and unit relationship to site. OOL-05-10 is an asphalt roadway located in the Radwaste area on property owned by TransCanada. The roadway runs approximately east to west and is bordered on the north, east and west by units OOL-05-08, OOL-05-06 and OOL-05-05. Survey units OOL-06-02 and OOL-06-03 form the southern border. Initial classification of this survey unit was Class 3, however, during demolition the roadway has been used as a staging area for rollofs and intermodals containing radioactive material awaiting shipment. Since, in effect, the unit was used as a radwaste storage area, the decision was made to reclassify this unit to a Class 1 area. OOL-05-10 is comprised almost entirely of asphalt and has a total area of 975 square meters.

5.0 Develop a decision rule:

Define the parameter of interest, specify action levels, and the DCGL.

Investigation Levels: If an investigation level below is exceeded, then perform an investigation survey.

Direct measurements: $> DCGL_{emc}$ or $> DCGL_w + 3 \text{ Sigma}$

Scan measurements: $> DCGL_{emc}$

Parameter of interest: If there are no investigation issues, and the the residual radioactivity in OOL-05-10 systematic samples is less than the DCGL_w then the survey unit is in compliance with the release criterion (8.73 mr/yr).

Critical Value: If the average concentration is less than DCGL_w, the sum of fractions is less than 1, and less than 5 of the 18 samples are above the DCGL_w, the Survey Units passes.

Survey Area No.: OOL-05 Survey Unit No.: 10

Survey Unit Name: Radwaste Roadway

FSSP No.: YNPS-FSSP-OOL-05-10-00

6.0 Specify limits on decision errors:

Specify the decision maker's limits on decision errors, used to establish performance goals for the data collection design.

Null Hypothesis (H₀): The residual radioactivity in the survey unit data is greater than the DCGLw

Alternative Hypothesis (H_a): The residual radioactivity in the survey unit data is less than the DCGLw

Tolerance for Error: Type I Error: 0.05 (probability of rejecting the null hypothesis when it is true.)
Type II Error: 0.05 (probability of accepting the null hypothesis when it is false.)

DCGLw: 3 (pCi/g)

LBGR: 2.8286 (Initial LBGR: 1.5)

Relative shift (Δσ): 2

Sigma (σ): 0.0857

Power of survey design: See attachment for prospective power curve.

7.0 Optimize Design:

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

Design optimization is included in the DQO process, and reflected in the data published in this plan.

Number & Location of Samples: 18 Soil samples will be collected at locations based on a random start, systematic Triangular grid (refer to accompanying DPF-8853.2). See map for specific locations.

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.
- 2 Soil samples will be collected in accordance with DP-8120.
- 3 Chain of Custody form will be used in accordance with DP-8123 for all soil samples sent to an off-site laboratory.
- 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. Listen for upscale readings and respond by slowing down or stopping the probe to distinguish between random fluctuations in the background and greater than background readings. Investigate any reproducible upscale readings as described in the specific instructions.
- 7 The job hazards associated with the survey described in this package are addressed in the accompanying Job Hazard Assessment (JHA) for OOL-05-10.
- 8 All personnel participating in this survey shall be trained in accordance with DP-8868.
- 9 Collect ISOCS measurements in accordance with DP-8871 to provide 100% scan coverage of the survey unit.

SPECIFIC INSTRUCTIONS

- 1 *SPA-3 Scans:*
 - Move the SPA-3 in rate-meter mode at a speed of 0.25m or less per second, keeping the probe at a distance of ≤ 3" from the surface and following a serpentine path that includes at least 3 passes across each square meter. The maximum background a SPA-3 may be used in is 26000 cpm.
 - Perform supplemental/judgmental scans with SPA-3 in addition to ISOCS scans, as needed.
- 2 *Scan Investigations:*

Note: Detailed descriptions of investigation actions shall be recorded in the daily survey journal (DPF-8856.2) and locations marked on a map.

 - Scan a 1m radius footprint around the investigation location in accordance with the scan requirements above. The area of scan should be increased as necessary to bound any areas of elevated activity identified. Perform a sample investigation as noted below.

Survey Area No.: OOL-05

Survey Unit No.: 10

Survey Unit Name: Radwaste Roadway

FSSP No.: YNPS-FSSP-OOL-05-10-00

3 *Sample Locations:*

All designated measurement locations will be identified by GPS per DP-8859 or by use of reference points, tape measure and compass 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 a GPS is not available.

4 *Sample Requirements:*

Collect 18 samples in accordance with DP-8120. 1 of the 18 samples will be analyzed as a QC split sample to fulfill the QC requirement of DP-8852. The same QC split sample will be analyzed for HTD nuclides in accordance with section 5.6.3.2.1 of the LTP and DP-8856." If a sample point falls on asphalt, then a sample will be drawn for both the asphalt and the soil below.

Biased samples:

No biased samples will be collected.

5 *Sample Designation:*

FSS soil samples:

OOL-05-10-001-F through OOL-05-10-018-F corresponding to FSS sample locations 001 through 018."Asphalt samples will have an A after the F

Biased soil samples:

No biased samples will be collected.

QC split samples:

OOL-05-10-006-F-S is to be designated as QC split sample. This sample will be sent to the off-site laboratory (do not dry).

Recount samples:

OOL-05-10-005-F-RC will be counted twice on site. The results will be compared in accordance with DP-8864.

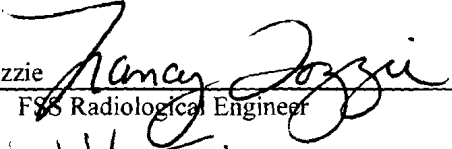
6 *Sample Analysis:*

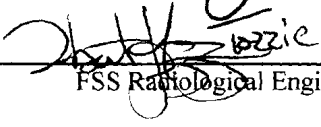
- Gamma analysis will be performed on all soil samples. If any of the gamma analyses show that an investigation level has been exceeded an investigation survey will be conducted at that sample location as directed by the radiological engineer.
- YNPS Chemistry will analyze OOL-05-10-001-F through OOL-05-10-018-F for gamma-emitting nuclides.
- YNPS Chemistry will analyze OOL-05-10-005-F as a sample recount. The recounted sample will possess the naming convention OOL-05-10-005-F-RC.
- YNPS Chemistry will analyze OOL-05-10-006-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 HTD at the off-site laboratory.
- All gamma analysis of the FSS samples shall achieve the MDC values stated in the DQO section of this plan. The MDC's will be communicated to the laboratory using an attachment to the Chain-of- Custody form.

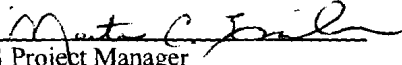
7 *ISOCS Assays:*

- Collect at least 26 ISOCS measurements, if ISOCS is used for scanning, in accordance with DP-8871 to provide 100% scan coverage of the survey unit.
- ISOCS assays are designated as OOL-05-10-xxx -F-G where "xxx" continues sequentially from the last number assigned to an FSS measurement.
- QC checks shall be performed at least once per shift in accordance with DP-8869 and DP-8871. Resolve flags encountered prior to survey.
- ISOCS assays to be performed with 180° collimator at 1m unless otherwise directed by the FSS Engineer. Make note on the daily survey journal (DPF-8856.2) if other geometries are used.
- For ISOCS assay locations shown on map titles "ISOCS Scans", position the detector downward facing keeping the detector perpendicular to the ground.
- Designate additional assay locations in continuing sequence from the last number assigned to an FSS measurement. Record detailed information about additional assay locations on the daily survey journal.

Survey Area No.: OOL-05	Survey Unit No.: 10
Survey Unit Name: Radwaste Roadway	
FSSP No.: YNPS-FSSP-OOL-05-10-00	
<ul style="list-style-type: none"> • Remove standing water prior to performance of ISOCS assays. Contact the FSS Engineer for directions if conditions are such that standing water cannot be removed. • If the results on any ISOCS assay exceed an investigation level, investigate the area within the field of view (7m diameter, 38.5 m2 area) for that assay. • Note: Detailed information pertaining to additional assay locations will be provided on the Daily Survey Journal. 	

Prepared by Nancy Tozzie  Date September 8, 2006
FSS Radiological Engineer

Reviewed by  Date 9/8/06
FSS Radiological Engineer

Approved by Martin Erickson  Date September 8, 2006
FSS Project Manager

YNPS-FSSP-OOL-05-10-00

Attachment 1

SPA-3 Scan Tables

Max Background

BKG(cpm)	MDCR	MDC(fDCGLemc)
4,000	639	3.91E-01
5,000	715	4.37E-01
6,000	783	4.79E-01
7,000	845	5.17E-01
8,000	904	5.53E-01
9,000	959	5.86E-01
10,000	1,011	6.18E-01
11,000	1,060	6.48E-01
12,000	1,107	6.77E-01
13,000	1,152	7.04E-01
14,000	1,196	7.31E-01
15,000	1,238	7.57E-01
16,000	1,278	7.81E-01
17,000	1,318	8.06E-01
18,000	1,356	8.29E-01
19,000	1,393	8.52E-01
20,000	1,429	8.74E-01
21,000	1,464	8.95E-01
22,000	1,499	9.16E-01
23,000	1,533	9.37E-01
24,000	1,565	9.57E-01
25,000	1,598	9.77E-01
26,000	1,629	9.96E-01
27,000	1,660	1.02E+00
28,000	1,691	1.03E+00
30,000	1,750	1.07E+00
32,000	1,808	1.11E+00
34,000	1,863	1.14E+00
36,000	1,917	1.17E+00
38,000	1,970	1.20E+00
40,000	2,021	1.24E+00

Scan Speed

In/Sec	m/Sec	BKG (cpm)
39	1.00	6,000
20	0.50	13,000
13	0.33	19,000
10	0.25	26,000
8	0.20	32,000
5	0.13	52,000
4	0.10	65,000

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Attachment 2

DCGL MDC Table

Nuclide	Soil 8.73 m ² /yr (pCi/g)	10% MDC DCGL	50% MDC DCGL	Easy to Detect?	Area Factor	DCGLemc
Co-60	1.4E+00	1.4E-01	7.0E-01	ETD	1.4E+00	2.0E+00
Nb-94	2.5E+00	2.5E-01	1.3E+00	ETD	1.2E+00	3.0E+00
Ag-108m	2.5E+00	2.5E-01	1.3E+00	ETD	1.2E+00	3.0E+00
Sb-125	1.1E+01	1.1E+00	5.6E+00	ETD	1.2E+00	1.3E+01
Cs-134	1.7E+00	1.7E-01	8.7E-01	ETD	2.1E+00	3.6E+00
Cs-137	3.0E+00	3.0E-01	1.5E+00	ETD	2.9E+00	8.7E+00
Eu-152	3.6E+00	3.6E-01	1.8E+00	ETD	1.2E+00	4.3E+00
Eu-154	3.3E+00	3.3E-01	1.7E+00	ETD	1.3E+00	4.3E+00
Eu-155	1.4E+02	1.4E+01	6.9E+01	ETD	1.2E+00	1.7E+02
Am-241	1.0E+01	1.0E+00	5.1E+00	ETD	1.1E+01	1.1E+02
H-3	1.3E+02	1.3E+01	6.4E+01	HTD	2.6E+01	3.4E+03
C-14	1.9E+00	1.9E-01	9.7E-01	HTD	2.2E+02	4.2E+02
Fe-55	1.0E+04	1.0E+03	5.1E+03	HTD	7.0E+01	7.0E+05
Ni-63	2.8E+02	2.8E+01	1.4E+02	HTD	5.1E+01	1.4E+04
Sr-90	6.0E-01	6.0E-02	3.0E-01	HTD	1.8E+01	1.1E+01
Tc-99	5.0E+00	5.0E-01	2.5E+00	HTD	1.5E+01	7.5E+01
Pu-238	1.2E+01	1.2E+00	5.8E+00	HTD	1.3E+01	1.6E+02
Pu-239	1.1E+01	1.1E+00	5.3E+00	HTD	1.3E+01	1.4E+02
Pu-241	3.4E+02	3.4E+01	1.7E+02	HTD	1.1E+01	3.7E+03
Cm-243	1.1E+01	1.1E+00	5.6E+00	HTD	3.6E+00	4.0E+01