Final Status Survey Planning Worksheet

GENERAL SECTION

Survey Area #: OOL-13	Survey Unit #: 01

Survey Unit Name: Sherman Reservoir Bank – Rail Spur Terminus

FSSP Number: YNPS-FSSP-OOL13-01-01 **(Note: Revision comments in *Bold Italics and Underlined*)**

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 01 is a section of the Sherman Reservoir bank near the rail spur terminus. It is located adjacent to and down slope of the location of the Radiologically Controlled Area (RCA) at the time of characterization. The land was owned by U. S. Gen at the time that the License Termination Plan (LTP) was written and is currently owned by TransCanada. The LTP classified it as Class 1, because of its historical use and radiological conditions. 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 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 investigation, remediation, reclassification and resurvey.

3.0 Identify the inputs to the decision:

Sample medium:	Soil
Types of measurements:	Soil samples, ISOCS Assays and gamma scans
Radionuclide of concern:	Cs-137
Applicable DCGL (8.73 mrem/y):	$DCGL_W$: 3.0 pCi/g $DCGL_{EMC}$: 8.7 pCi/g

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

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

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

Survey Design / Release Criteria

Classification:	Class 1
Average Cs-137 concentration:	0.0468pCi/g
Standard deviation (σ) for Cs-137:	0.0305 pCi/g
Surrogate DCGL:	N/A (a surrogate DCGL will not be used)
Number of Samples:	15
Survey Unit Area:	926 m^2
Investigation Level for soil samples:	• $>DCGL_{EMC}$ for any LTP radionuclide -or- • A sum of $DCGL_{EMC}$ fractions>1.0 -or- • $>DCGL_W$ for any LTP radionuclide and a statistical outlier as defined by the LTP Note: The Cs-137 concentrations detected in the soil samples collected under this survey plan will not be adjusted to account for background Cs-137 (i.e., Cs-137 that can be attributed to fallout from nuclear weapons testing) because the average Cs-137 concentration in the characterization samples is lower than the decay-adjusted average Cs-137 background in the reference area (i.e., 0.82 pCi/g).
Radionuclides for analysis:	All LTP-listed nuclides with the focus on Cs-137.
MDCs for soil samples:	Table 1 shows the preferred and required MDC values that will be conveyed to the processing laboratories.

Table 1: MDCs for Soil Samples

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

ISOCS Assay Coverage:

100 % of the ***cleared land*** surface area, ensured by overlapping field-of-views using ISOCS in the 1m detector height with 180° open collimation configuration. ***100% of foliage covered surface area accessible to ISOCS, ensured by 100% overlapping field-of views using ISOCS in the 2m detector height with 90° collimation configuration. 2m, 90° ISOCS assays to be spaced on 2m centers.***

As determined by the FSSE, ISOCS assays in additional configurations (i.e. 1m, 90° collimation configuration) may be used to perform investigations of ISOCS assay measurements exceeding investigation criteria.

Investigation Level for ISOCS Measurements:

Table 2: ISOCS Investigation Levels

1m, 180° Open Collimation Configuration					
Nuclide	Inv. Level (pCi/g)	Nuclide	Inv. Level (pCi/g)	Nuclide	Inv. Level (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
2m, 90° Collimation Configuration					
Co^{60}	***1.01E+00***	***Sb^{125}***	***6.71E+00***	***Eu^{152}***	***2.21E+00***
Nb^{94}	***1.54E+00***	***Cs^{134}***	***1.83E+00***	***Eu^{154}***	***2.08E+00***
Ag^{108m}	***1.53E+00***	***Cs^{137}***	***4.32E+00***	***Eu^{155}***	***7.82E+01***
Note: These values were obtained from ***YA-REPT-00-018-05 and*** YA-EVAL-00-001-06 and .					

MDCs for ISOCS Measurements:

MDCs for ISOCS measurements are equal to the investigation levels in Table 2, above.

SPA-3 Scan Coverage:	***SPA-3 scans will be performed in areas where restricted access prevents the use of ISOCS. These scans will cover 100% of the surface area that is not covered by ISOCS scans.*** SPA-3 scans **may** be performed for surface soil within the field-of-view of an ISOCS assay or surrounding an FSS sample location that exceeds the investigation criteria. The SPA-3 scan will cover 100% of the ISOCS assay total field-of-view area ($38.5m^2$ ***or $12.6m^2$*** as appropriate) or a 1-m radius around the FSS sample location ($3.14m^2$).
Investigation Level for SPA-3 Scans:	Reproducible indication above background using SPA-3 and audible discrimination.
Expected background range for SPA-3 scan:	7,000 cpm to 12,000 cpm, depending on the presence of rocks in the immediate vicinity of the measurement location and also the influence of the ISFSI dose rate.
MDCR for SPA-3:	The accompanying MDCR/MDC table in Attachment 1 provides MDCR values by various background levels.
MDC(fDCGL) for SPA-3 scans:	The accompanying MCDR/MDC table in Attachment 1 provides MDC values, as a fraction of DCGL, by various background levels. The table shows that scanning can be done effectively at the speed planned (0.5 m/s) in backgrounds up to 13,000 cpm. No background levels higher than this are anticipated.
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. • The YNPS Chemistry Lab will perform a QC recount of one soil sample.

4.0 Define the boundaries of the survey:

Boundaries of Survey Unit 01 are as shown on the attached map. The northern boundary is the Sherman Reservoir shore and Survey Area OOL-15. To the south are Survey Unit OOL-14-01 and Survey Unit OOL-12-01. To the west is Survey Unit OOL-03-02. Survey Unit OOL-15-01 is to the east. There are no structures present in the Survey Unit 01. The survey will be performed under appropriate weather conditions (as defined by instrumentation limitations and human tolerance).

5.0 Develop a decision rule:

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

(a) If all the sample data show that the soil concentrations of all plant-related nuclides and the sum of the fractions of these nuclides are below the 8.73-mrem/y DCGLs, reject the null hypothesis (i.e., Survey Unit OOL-13-01 meets the release criteria).
(b) If an investigation level is exceeded, then perform an investigation survey.
(c) If the average concentration of any LTP-listed nuclide exceeds the DCGL or the average sum of the fractions exceeds one, then accept the null hypothesis (i.e., Survey Unit OOL-13-01 fails to meet the release criteria).
(d) If the average concentration of an identified LTP-listed nuclide is less than $DCGL_w$ and the sum of their $DCGL_w$ fractions are less than 1, but some individual measurements exceed the $DCGL_w$, then apply the statistical test as the basis for accepting or rejecting the null hypothesis.

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 OOL-13-01

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	exceeds the release criteria.
Probability of type I error:	0.05
Probability of type II error:	0.05
LBGR:	2.94 pCi/g (Adjusted LBGR from DPF-8853..1)

7.0 Optimize Design:

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

Note: 15 FSS soil samples will be collected in locations based on a triangular grid with a random start location to support the application of the Sign test, if necessary.

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

Number of systematic samples: 15. (Refer to the completed DPF-8853.1 in the survey package file.)

Biased samples: Two from the level area where the most vehicular traffic has occurred.

Location of samples: Shown on the map included in the package file.

Rev. 1 Supplement to OOL-13-01 FSS Plan

This revision provides instructions for use of ISOCS in the 2m-90° collimation configuration. Use of ISOCS in this configuration is necessitated due to a large portion of the area having foliage cover. Evaluation of use of ISOCS in areas with foliage cover indicates that the 2m-90° configuration is the most appropriate geometry. To enhance coverage, ISOCS assays in the 2m-90° configuration will be spaced on 2-m centers.

This revision also provides instructions for performance of investigation surveys of ISOCS assays. ISOCS assays that exceed the investigation criteria (stated in Section 3.0 of this plan) or other measurements selected by the FSSE will be investigated. Due to foliage cover and steep embankments in the survey unit, it is difficult, and unsafe in some areas, to perform SPA-3 scans. Use the ISOCS in a collimated geometry will be used as appropriate for investigations.

GENERAL INSTRUCTIONS

1. Where possible, identify soil sample locations using GPS in accordance with DP-8859. Mark each location to assist in identifying the location. Relocate any locations that are not suitable for soil sampling to a suitable location and document it in the field log in accordance with DP-8856.
2. Collect soil samples in accordance with DP-8120.
3. Use Chain of Custody forms in accordance with DP-8123 for all soil samples sent to an off-site laboratory.
4. Receive and prepare all soil samples in accordance with DP-8813.
   Note: Split and biased samples to be sent to an off-site lab will not be dried prior to counting on site or shipping.
5. ***For areas of cleared land (no foliage)***, mark centerline ISOCS locations on a square grid pattern with a maximum spacing of 4 meters apart and 2 meters from the edges of the survey unit, covering 100% of the survey unit area ***as appropriate. For areas with foliage cover, mark centerline ISOCS locations on a square grid pattern with a maximum spacing of 2 meters apart and 1 meter from the edges of the survey unit.*** Show the ISOCS grid layout, at least approximately, on a map entitled "ISOCS Scans" of the survey unit.
6. Collect ISOCS measurements in accordance with DP-8871.
7. Survey instrument: Operate the E-600 w/SPA-3 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. SPA-3 ***scans of areas inaccessible to ISOCS*** and investigation scans:
   - Scan the area of concern with the SPA-3 in rate-meter mode moving the detector no faster than of 0.5 m/s, keeping the probe no more than 3" from the surface and following a serpentine path that includes at least

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3 passes across each square meter.

- 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.
- 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 a rock. 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 a rock is the cause of an increased count rate during a SPA-3 scan, record that finding on form DPF-8856.2 and close the investigation. Instructions on investigations where the source of the elevated count rate can not be attributed to a rock are given in Specific Instructions #6 and #7.

7. The job hazards associated with the survey described in this package are addressed in the accompanying Job Hazard Assessment (JHA) for OOL-13-01.
8. All personnel participating in this survey shall be trained in accordance with DP-8868.

SPECIFIC INSTRUCTIONS

1. Identify all designated sample locations by GPS per DP-8859 or by use of reference points, compass 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. Record a detailed description of the alternate location on form DPF-8856.2. Provide information to the RSS Rad Engineer so that the survey unit map can be annotated appropriately. Conspicuously post the alternate location 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. Soil sample locations are shown on map "FSS Samples".
2. Sample Requirements:
   - Collect 15 systematic 1-liter soil samples and two biased location samples in accordance with DP-8820. One of the random samples will be analyzed as a QC split sample to fulfill the QC requirement of DP-8852. The QC split sample 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:

Systematic FSS soil samples:	OOL-13-01-001-F through OOL-13-01-015-F corresponding to FSS sample locations 001 through 015. Analyzed by gamma spectroscopy by YNPS Chemistry.
Biased FSS soil samples:	OOL-13-01-016-F-B and OOL-13-01-017-F-B corresponding to samples locations 016 and 017. Analyzed by YNPS by gamma spectroscopy.
QC split sample:	OOL-13-01-009-F-S, collected at FSS sample location 009 is a QC split sample. Analyzed by off-site laboratory for all LTP radionuclides, including gamma emitters. Note: Sample OOL-13-01-009-F-S will be sent to the off-site laboratory as collected from the field (i.e., without drying) for HTD analysis. It may be counted wet for shipping purposes.
Recount sample:	Soil sample OOL-13-01-003-F will be counted twice and the results compared in accordance with DP-8864. The second count will be designated OOL-13-01-003-F-RC and will be analyzed by YNPS by gamma spectroscopy. Only the count designated OOL-13-01-003-F will be used as a measure of soil activity for that location.

4. Sample Analysis:
   - If any of the gamma analyses show that an investigation level has been exceeded, an investigation survey

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will be conducted at that sample location as directed in Specific Instruction #6.

- All analyses will achieve the required MDC values stated in the DQO section of this plan.

5. ISOCS Assays:

   - ***For cleared land areas,*** set the ISOCS detector one meter above each of the marked ISOCS locations, using the 180° collimator unless otherwise directed by the FSS Engineer. ***For areas of foliage cover, set the ISOCS detector two meters above each of the ISOCS locations, using the 90° collimator. The area of the survey unit along the Sherman Reservoir has a steep embankment, to allow for physical control of ISOCS positioning, it may be necessary to align the ISOCS vertically.*** Make note on the daily survey journal (DPF-8856.2) if other geometries are used.
   - Collect ISOCS assays in accordance with DP-8871 to provide 100% scan coverage, as possible, of the survey unit. ***Areas inaccessible to ISOCS will be scanned using SPA-3.***
   - ISOCS assays are designated as OOL-13-01-xxx-F-G where xxx corresponds to the 3-digit location indicated on survey map "ISOCS Scans."
   - Perform QC checks at least once per shift in accordance with DP-8869 and DP-8871. Resolve flags encountered prior to survey.
   - 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.
   - Make note of any conditions within the ISOCS field of view that may affect analysis of ISOCS assay data such as mud, concrete, etc.
   - Designate any 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 – 38.5m^2 area for 180°-1m) for that assay as directed in Specific Instruction # 7.

6. If the result of any FSS sample (systematic and/or biased points) analysis exceeds 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).

   - Review ISOCS data for assays in which the sample requiring investigation may have been in the field of view.
   - Scan a 1m radius footprint around the sample location with a SPA-3 as described in the General Instructions section. The area of scan should be increased as necessary to bound any areas of elevated activity identified.
   - Mark the boundaries around any detected elevated areas in the soil and identify the boundaries on a survey map. Measure the total area of each outlined area in square centimeters.
   - Mark the location of the highest identified activity for each of the elevated areas in the soil and on the survey map.
   - At each identified area:
     - Perform and record a 1-minute scaler mode SPA-3 measurement. Designate the reading as "OOL-13-01-xxx-F-SC-I" where "xxx" continues sequentially from the last number assigned to an FSS measurement.
     - Obtain a soil sample at the location. Designate the sample as "OOL-13-01-xxx-F-I" where "xxx" continues sequentially from the last number assigned to an FSS measurement.
     - Perform and record a post sample 1-minute SPA-3 measurement. Designate the reading as described above, using the next sequential xxx.

7. If the results of an ISOCS assay exceed an investigation level, perform a ISOCS investigation as follows:

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

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Note: As determined by the FSSE, ISOCS assays in the 1m, 90° collimation configuration may be used to perform investigations of ISOCS assays exceeding investigation criteria or may be used in addition to SPA-3 scans.

Use of ISOCS for investigation:

- ***Perform ISOCS scan measurements at each investigation location as follows:***
  - ***Perform ISOCS scans at 1m height with 90° collimation***
  - ***Perform ISOCS scans at 5 locations within a 4-m grid centered over the original ISOCS scan location – One centered over the original scan location and one in each corner of the grid centered at 1.4 m from the center of the grid. ISOCS Scan Investigation Map #1 (to be prepared as necessary) shows the proper positioning for ISOCS investigation scans.***
  - ***Identify investigation ISOCS scans using the convention: OOL-13-01-xxx-F-G-I, where xxx indicates the next sequential location number starting with 301 (i.e. the first investigation ISOCS scan performed will be OOL-13-01-301-F-G-I).***
  - ***Indicate any observations in the daily survey journal. Locations of ISOCS scans should be recorded by use of GPS when available.***
- ***The FSSE will review investigation ISOCS scans and will direct performance of SPA-3 scans as set forth in the following steps.***

Use of SPA-3 for investigation

- Scan the ISOCS footprint (7-m diameter, ***or 4-m diameter as appropriate***) with a SPA-3 as described in the General Instructions section.
- Mark the boundaries around any detected elevated areas in the soil and identify the boundaries on a survey map. Measure the total area of each outlined area in square centimeters.
- Mark the location of the highest identified activity for each of the elevated areas in the soil and on the survey map.
- At each of the highest identified activity area:
  - Perform and record a 1-minute scaler mode SPA-3 measurement. Designate the reading as "OOL-13-01-xxx-F-SC-I" where "xxx" continues sequentially from the last number assigned to an FSS measurement.
  - Obtain a soil sample at the location. Designate the sample as "OOL-13-01-xxx-F-I" where "xxx" continues sequentially from the last number assigned to an FSS measurement.
  - Perform and record a post-sample 1-minute SPA-3 measurement. Designate the reading as described above.

NOTIFICATION POINTS

None.

Prepared by _____ Date 7/24/06
FSS Radiological Engineer

Reviewed by _____ Date 7/24/06
FSS Radiological Engineer

Approved by _____ Date 7/24/06
FSS Project Manager