Final Status Survey Planning Worksheet

GENERAL SECTION	
Survey Area #: OOL-01	Survey Unit #: 01
Survey Unit Name: OOL-01-01 (Seal Pit Discharge Cove)	
FSSP Number: YNPS-FSSP-OOL01-01-**02** **(supplement subdivision survey plan – modifications of the original FSSP Worksheet and implementation of adjusted Type I errors are indicated by bold font.**	

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. ☑ Refer to YA-REPT-00-003-05, Note: The generic ALARA review applies to this survey unit because the costs involved in dredging would increase the Action Level.

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 <u>Statement of the problem</u>:

Survey Unit OOL-01-01 consists of sediment on the bottom of Sherman Reservoir and contains about **204.7** m^2 of surface area.

This FSS survey plan is designed as a result of the subdivision of survey unit OOL-01-01. The results of the investigation survey confirm the results of the original FSS survey and bounded the extent of the elevated area of residual radioactivity. Consequently, the decision was made to partially re-classify and subdivide survey unit OOL-01-01 into two survey units. Survey unit OOL-01-06 was designed as a class 1 survey unit and was surveyed against the design criteria of that survey plan. The remainder of survey unit OOL-01-01 will remain a class 2 survey unit. The Type I errors were adjusted from 0.05 to 0.025 and 7 additional measurements will be made to satisfy sample statistics in accordance with section 5.5.1 of the License Termination Plan.

This newly subdivided OOL-01-01 survey unit is bound by the shoreline if seal pit cove. The shorelines of survey area OOL-03 form the West and East boundaries, and the re-classified OOL-01-06 creates the northern boundary.

The problem as defined by this survey plan 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.

This plan is designed to determine the number of additional samples needed after adjusting the Type I error. This plan consists of collecting additional sediment samples as determined by DPF-8853.2 to satisfy the required number of samples in accordance with section 5.5.1 of the LTP.

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 investigations.

3.0 Identify the inputs to the decision:

Sample media:	Reservoir Sediments (treated as soil)
Types of measurements:	Sediment samples
Radionuclide-of-concern:	C-14, Co-60, Sr-90 and Cs-137
Applicable DCGL:	• 2.2 pCi C-14 per gram of sediment (10-mrem/y DCGL) • 1.6 pCi Co-60 per gram of sediment (10-mrem/y DCGL) • 0.69 pCi Sr-90 per gram of sediment (10-mrem/y DCGL • 3.4 pCi Cs-137 per gram of sediment (10-mrem/y DCGL)

Since the characterization data set present in the HSA did not account for C-14 and Sr-90 nuclides sufficiently, it was necessary to collect new samples from the reservoir. The Seal Pit Discharge Cove was selected as the location to collect the characterization data; it's assumed that the discharge would yield a conservative representation of the LTP radionuclides currently present in the Sherman Reservoir. Twenty-five samples in all were used to provide the sample statistics. The samples were collected for the most recent FSS effort on August 23, 2005. The data provided is sufficient to support FSS planning for the sub-division of unit 01. Based on the current data, C-14, Co-60, Sr-90 and Cs-137 are the radionuclides of concern; consequently the focus will be on the sediment concentrations of these radionuclides. The sample results from the data include:

- C-14 (16 detects) — C-14 is present in 100% of the 16 samples taken. Six samples exceeded 10% of the 10-mrem/y DCGL (0.22 pCi/g). The average activity concentration of C-14 for the samples is 0.22 pCi/g.
- Co-60 (22 detects) — Co-60 is present in 88% of the 25 samples taken. Nine samples exceeded 10% of the 10-mrem/y DCGL (0.16 pCi/g). The average activity concentration of Co-60 for the samples is 0.20 pCi/g.

• Cs-137 (25 detects)	Cs-137 is present in 100% of the 25 samples taken. Ten samples exceeded 10% of the 10-mrem/y DCGL (0.34 pCi/g). The average activity concentration of Cs-137 for the samples is 0.38 pCi/g.
• Sr-90 (9 detects)	Sr-90 is present in 56 % of the 16 samples taken. One samples exceeded 10% of the 10-mrem/y DCGL (0.07 pCi/g). The average activity concentration of Sr-90 for the samples is 0.02 pCi/g.

The gamma analysis performed did not detect Am-241 in any of the characterization sediment samples. This suggests that TRUs are not present in Survey Unit OOL-01-01. HTD nuclides and TRUs will be included in the assessment related to this survey plan. At least 5% of the FSS sediment samples will be sent to an independent laboratory for complete analyses of HTD nuclides and TRUs. In addition to sampling for HTD and TRU nuclides, 100% of the samples collected will be analyzed C-14 and for Sr-90.

Survey Design / Release Criteria

Average C-14 concentration:	0.22 pCi/g
Standard deviation C-14 (σ):	0.11 pCi/g
Average C0-60 concentration:	0.20 pCi/g
Standard deviation Co-60 (σ):	0.30 pCi/g
Average Sr-90 concentration:	0.02 pCi/g
Standard deviation Sr-90 (σ):	0.03 pCi/g
Average Cs-137 concentration:	0.38 pCi/g
Standard deviation Cs-137 (σ):	0.34 pCi/g
Surrogate DCGL:	N/A (a surrogate DCGL will not be used)
Investigation Level for sediment samples:	• 2.2 pCi C-14 per gram of sediment (10-mrem/y $DCGL_w$ for C-14) • 1.6 pCi Co-60 per gram of sediment (10-mrem/y $DCGL_w$ for Co-60) • 0.69 pCi Sr-90 per gram of sediment (10-mrem/y $DCGL_w$ for Sr-90) • 3.4 pCi Cs-137 per gram of sediment (10-mrem/y $DCGL_w$ for Cs-137) • If the sum of the $DCGL_w$ fractions for all detected LTP listed nuclides exceeds 1, an investigation will be conducted. • Additionally if any other LTP listed nuclide is identified at a concentration greater than its respective 10-mrem/y $DCGL_w$ an investigation will be conducted.
Investigation Level for scan	N/A per section 5.6.3.2.5 of the LTP
Radionuclides for analysis	All LTP nuclides with the focus on, C-14, Co-60, Sr-90 and Cs-137

MDCs for gamma analysis of sediment samples

Nuclide	10% of the 10 mrem/y $DCGL_w$ (pCi/g)
Co-60	0.16
Nb-94	0.29
Ag-108m	0.29
Sb-125	1.3
Cs-134	0.20
Cs-137	0.34
Eu-152	0.41
Eu-154	0.38
Eu-155	16

The desired MDCs in the laboratory analyses of FSS sediment 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 sediment samples.

MDCs for HTD nuclide:

Nuclide	10% of the 10 mrem/y $DCGL_w$ (pCi/g)
H-3	15
C-14	0.22
Fe-55	1200
Ni-63	33
Sr-90	0.07
Tc-99	0.57
Pu-238	1.3
Pu-239	1.2
Pu-241	39
Am-241	1.2
Cm-243	1.3

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 and will accompany the sediment samples.

Scan Coverage : N/A per section 5.6.3.2.5 of the LTP

QC checks and measurements:

- If applicable, QC checks for the Leica GPS will be performed in accordance with DP-8859.
- ONE QC split sample will be collected
  note: this is in accordance with DP-8852, "Final Status Survey Quality Assurance Project Plan (QAPP)" requirements.
- ONE QC recount sample will be performed and counted by the YNPS Chemistry Lab
  note: this is in accordance with DP-8852, "Final Status Survey Quality Assurance Project Plan (QAPP)" requirements.

4.0 Define the boundaries of the survey:

- Physical boundaries of Survey Unit OOL-01-01 are as shown on the attached map.
- The survey will be performed under appropriate weather conditions (as defined by instrumentation and equipment limitations and human tolerance).

- Divers will perform the survey in daylight hours allowing adequate daylight time for ingress and egress.
- The Dive Operations Plan will address diver safety concerns.
- Water Depth (Alternate sample locations will be chosen for samples with dive depths greater than 80 ft).

5.0 Develop a decision rule:

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

(a) If all the data show that the sediment concentrations of plant related nuclides and the sum of fractions of nuclides are below the 10-mrem/y DCGLs, accept the FSS data as valid and reject the null hypothesis (i.e., Survey Unit OOL-01-01 meets the release criteria).

(b) If the activity concentration for any LTP nuclide exceeds its respective $DCGL_w$, then perform an investigation survey.

(c) If the average concentration of any LTP-listed nuclide exceeds its respective DCGL or the average sum of fractions exceed one, then accept the null hypothesis (i.e., Survey Unit OOL-01-01 fails to meet the release criteria).

(d) If the average concentration of identified LTP-listed nuclide is less than DCGL and the sum of their DCGL fractions are less than 1, but some individual measurements exceed the DCGL, then apply the statistical test as the basis for accepting or rejecting the null hypothesis.

Note: Alternate actions beyond investigations are not expected to be necessary within this survey unit.

6.0 Specify tolerable limits on decision errors:

Null hypothesis:	Residual plant-related radioactivity in Survey Unit OOL-01-01 exceeds the release criteria.
Probability of type I error:	0.025
Probability of type II error:	0.05
LBGR:	Unity Rule therefore the applicable DCGL = 1 LGBR = 0.5

7.0 Optimize Design:

Type of statistical test: WRS Test ☑ Sign Test ☐ (background will be applied to this survey unit)

Number and Location of Samples: **15 sediment samples are required in accordance with DP 8853, "Determination of the Number and Location of FSS Samples and Measurements." Eight of the original sixteen samples from the original FSS survey still reside in the new survey unit. Seven additional samples are necessary to provide sufficient power in accordance with the requirement in section 5.5.1 in the LTP. Seven sediment samples will be collected in random locations with a random start (refer to the completed DPF-8853.2 in the survey package file). The number of sediment samples required was determined to be fifteen.**

Reference Area Background: Twenty sediment samples were collected from Harriman Reservoir in random locations in accordance with DP-8865, "Computer Determination Of The Number And Location Of FSS Samples And Measurements." If a background is applied the data contained in the reference area background technical report, YA-REPT-00-019-05, "Harriman Reservoir Reference Area Background Study" will be used.

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Discussion: **The collection of sediment samples for survey unit OOL-01-01 was started on September 23,2005. Sixteen systematic grid samples were collected. Two of the sixteen samples had results that exceed the 10 mrem per year soil DCGL. Survey Unit OOL-01-01 was re-classified in part sub-divided into two survey units. Survey Unit OOL-01-06 was bounded the extent of the elevated area and was classified as a class 1 survey unit. This FSS plan represents the remnant of survey unit OOL-01-01 and will remain a class 2 survey unit. 7 additional samples are needed to provide sufficient statistical power for the FSS. The location of the samples will be chosen randomly.**

GENERAL INSTRUCTIONS

1. **Collect 7 sediment samples following the guidance of the Dive Operations Plan. One of the 7 sediment samples will be analyzed as a QC split sample to fulfill the QC requirement of DP-8852 "Final Status Survey Quality Assurance Project Plan (QAPP)." All 7 sediment samples will also be analyzed for the C-14 and Sr-90 nuclides.**
2. **Sediment sample designation:**

FSS sediment samples:	**OOL-01-01-038-F-SD through OOL-01-01-044-F-SD corresponding to FSS sample locations 001 through 007.**
	OOL-01-01-038-F-SD-H through OOL-01-01-044-F-SD-H corresponding to the same 7 samples when analyzed off-site for C-14 and Sr-90.
QC split sample:	**OOL-01-01-041-F-SD-S is to be designated as QC split sample and will be analyzed off-site. The results will be compared to the on-site analysis results for sample OOL-01-01-004-F-SD in accordance with DP-8864, "Split Sample Assessment for Final Status Survey."**
Recount samples:	**OOL-04-01-038-F-SD is to be counted twice on site, the letters RC will be appended to the suffix representing the recounted result. The results will be compared in accordance with DP-8864, "Split Sample Assessment for Final Status Survey."**

3. Determine the sample locations using GPS, in accordance with DP-8859 and mark the sample location in accordance with DP-8124 "Collection of Pond Sediment Samples For Site Characterization."
4. If a survey location falls on riprap or an obstruction whereby the desired volume of sediment cannot be achieved another survey location will be chosen in accordance with DP-8856, "Preparation of Survey Plans."
5. If a survey location falls depths greater than 80 feet another survey location will be chosen in accordance with DP-8856, "Preparation of Survey Plans".
6. Divers will collect the sediment samples. Approximately 2 liters of sediment shall be collected in plastic Ziploc bags or in hard plastic containers using a trowel or equivalent tool.
7. All sediment samples will be received and prepared in accordance with DP-8813, "Sample Receipt and Preparation."

8. Chain of Custody form will be used in accordance with DP-8123, "Sample Security and Chain of Custody" for all sediment samples sent to an off-site laboratory.
9. The job hazards associated with the Survey described in this package are addressed in the accompanying Job Hazard Assessment for OOL-01-01.
10. Diver Safety will be addressed in the accompanying Dive Operations Plan.
11. All personnel (excluding divers) participating in this survey shall be trained in accordance with DP-8868, "Final Status Survey Training Program."

SPECIFIC INSTRUCTIONS

1. Determine the sample location by GPS per DP-8859, Operation of The Leica Geosystems GPS 1200 Global Positioning System For Identification Of Final Status Survey Measurement Locations". If a designated sample location is obstructed or deemed incapable of yielding enough sediment, the FSS Radiological Engineer or the FSS Field Supervisor will select an alternate location in accordance with DP-8856, "Preparation of Survey Plans". A detailed description of the alternate location will be recorded on form DPF-8856.2. The coordinates for the alternate location will be recorded with GPS in accordance with DP-8859, and the survey unit map will be annotated appropriately to reflect the alternate location.
2. **Sediment Samples**
   - **YNPS Chemistry will analyze OOL-01-01-038-F-SD through OOL-01-01-044-F-SD for gamma-emitting nuclides.**
   - **OOL-01-01-038-F-SD will be counted twice by YNPS Chemistry. The designation for the recounted sample will be OOL-01-01-038-F-SD-RC.**
   - **Upon completion of on-site analysis for gamma emitting nuclides, OOL-01-01-038-F-SD through OOL-01-01-044-F-SD will be renamed (Excluding OOL-01-01-041-F-SD) appending the letter H to the suffix and sent to the off-site laboratory (i.e. OOL-01-01-038-F-SD-H). The off-site laboratory will analyze these samples for C-14 and Sr-90 only.**

     Note: renaming the off-site samples is necessary to ensure unique naming convention for the C-14 and Sr-90 results.

     - **OOL-01-01-041-F-SD will be renamed appending the letter S to the suffix and sent to the off-site laboratory. The off-site laboratory will analyze OOL-01-01-041-F-SD-S as a QC split sample. This sample will be analyzed for all LTP listed nuclides.**
3. 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 off-site laboratory using an attachment to the Chain-of Custody form.
4. If any LTP-listed nuclides exceed the investigation levels outlined in the DQO section the FSS Radiological Engineer will determine the appropriate investigation.
5. Sample Preparation:
   - Decant any standing water and then homogenize the wet sediment in a container large enough for the entire sample. Prepare an aliquot of at least 500 ml for wet samples sent to the off-site laboratory for analysis. The 500 ml sample will be sufficient to perform either a split sample analysis or a HTD analysis commensurate with this plan.
   - An aliquot of 500 ml or greater volume of wet sediment is to be placed in screw top plastic containers for shipment to the off-site laboratory for analysis. Appending the letter H to the suffix and send to the off-site laboratory. The off-site laboratory will analyze these samples for C-14

and Sr-90 only.

- The remaining sediment is to be dried in the drying oven in pans not the marinelli container. YNPS Chemistry will analyze the samples for gamma-emitting nuclides.
- 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 off-site laboratory using an attachment to the Chain-of Custody form.

NOTIFICATION POINTS

QA notification point(s) (y/n) * n Specify:

FSI point(s) (y/n) n

Specify:	Field Supervisor Signature /Date:
1.	
2.	

Prepared by _____ Date 7-31-06
FSS Radiological Engineer

Reviewed by _____ Date 7-31-06
FSS Radiological Engineer

Approved by _____ Date 7/31/06
FSS Project Manager

Final Status Survey Planning Worksheet

GENERAL SECTION	
Survey Area #: OOL-01	Survey Unit #: 02
Survey Unit Name: OOL-01-02 (Circulating Water System Intake)	
FSSP Number: YNPS-FSSP-OOL01-02-00	

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. ☑ Refer to YA-REPT-00-003-05, Note: The generic ALARA review applies to this survey unit because the costs involved in dredging would increase the Action Level.

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 the problem:

Survey Unit OOL-01-02 consists of sediment on the bottom of Sherman Reservoir and contains about 401 m^2 of surface area.

Unit 02 is located at the tip of the peninsula north of the Screenwell Pump House and bound to the south by the shoreline of survey area OOL-03 and GPS coordinates in the Sherman Reservoir. The area of this unit represent the location within which riprap will be positioned upon completion of FSS survey activities. Recent sediment results from seal pit characterization data were used for planning this FSS survey package. Survey Unit OOL-01-02 was reclassified to a Class 2 from Class 3 based on the review of the characterization data. The data indicates that activity concentrations of Co-60 and Sr-90 exceeded 10% of their respective 25 mrem/year soil DCGLs.

Upon completion of FSS survey activities; placement of riprap for final grade can commence.

The problem as defined by this survey plan 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 the release criteria? Alternative actions that may be implemented in this effort are investigations.

3.0 Identify the inputs to the decision:

Sample media:	Reservoir Sediments
Types of measurements:	Sediment samples
Radionuclide-of-concern:	C-14, Co-60, Sr-90 and Cs-137
Applicable DCGL:	• 2.2 pCi C-14 per gram of sediment (10-mrem/y DCGL) • 1.6 pCi Co-60 per gram of sediment (10-mrem/y DCGL) • 0.7 pCi Sr-90 per gram of sediment (10-mrem/y DCGL • 3.5 pCi Cs-137 per gram of sediment (10-mrem/y DCGL)

Since the characterization data set present in the HSA did not account for C-14 and Sr-90 nuclides sufficiently, it was necessary to collect new samples from the reservoir. The Seal Pit Discharge Cove was selected as the location to collect the characterization data; it's assumed that the discharge would yield a conservative representation of the LTP radionuclides currently present in the Sherman Reservoir. Twelve samples in all were used to provide the sample statistics. The samples were collected between June 29, 2005 and July 8, 2005. The characterization data provided is sufficient to support FSS planning of Survey Unit OOL-01-02. Based on the current data, C-14, Co-60, Sr-90 and Cs-137 are the radionuclides of concern; consequently the focus will be on the sediment concentrations of these radionuclides. The sample results from the characterization data include:

- C-14 (9 detects) — C-14 is present in 82% of the 11 characterization samples analyzed for HTD. Six samples exceeded 10% of the 10-mrem/y DCGL (0.22 pCi/g). The average activity concentration of C-14 for the samples is 0.28 pCi/g.
- Co-60 (11 detects) — Co-60 is present in 92% of the characterization samples taken. Four samples exceeded 10% of the 10-mrem/y DCGL (0.16 pCi/g). The average activity concentration of Co-60 for the samples is 0.18 pCi/g.
- Cs-137 (12 detects) — Cs-137 is present in 100% of the characterization samples taken. Two samples exceeded 10% of the 10-mrem/y DCGL (0.35 pCi/g). The average activity concentration of Cs-137 for the samples is 0.30 pCi/g.
- Sr-90 (10 detects) — Sr-90 is present in 91% of the 11 characterization samples analyzed for HTD. Three samples exceeded 10% of the 10-mrem/y DCGL (0.67 pCi/g).

The average activity concentration of Sr-90 for the samples is 0.08 pCi/g.

The gamma analysis performed did not detect Am-241 in any of the characterization sediment samples. This suggests that TRUs are not present in Survey Unit OOL-01-02. HTD nuclides and TRUs will be included in the assessment related to this survey plan. At least 5% of the FSS sediment samples will be sent to an independent laboratory for complete analyses of HTD nuclides and TRUs. 100% of the samples collected will be analyzed C-14 and Sr-90.

Survey Design / Release Criteria

Average C-14 concentration:	0.28 pCi/g
Standard deviation C-14 (σ):	0.14 pCi/g
Average Co-60 concentration:	0.18 pCi/g
Standard deviation Co-60 (σ):	0.18 pCi/g
Average Sr-90 concentration:	0.08 pCi/g
Standard deviation Sr-90 (σ):	0.12 pCi/g
Average Cs-137 concentration:	0.30 pCi/g
Standard deviation Cs-137 (σ):	0.22 pCi/g
Surrogate DCGL:	N/A (a surrogate DCGL will not be used)
Investigation Level for sediment samples:	• 2.19 pCi C-14 per gram of sediment (10-mrem/y $DCGL_w$ for C-14) • 1.60 pCi Co-60 per gram of sediment (10-mrem/y $DCGL_w$ for Co-60) • 0.67 pCi Sr-90 per gram of sediment (10-mrem/y $DCGL_w$ for Sr-90) • 3.46 pCi Cs-137 per gram of sediment (10-mrem/y $DCGL_w$ for Cs-137) • If the sum of the fractions for all detected LTP listed nuclides exceeds 1, an investigation will be conducted. • Additionally if any other LTP listed nuclide is identified at a concentration greater than its respective 10-mrem/y $DCGL_w$ an investigation will be conducted.
Investigation Level for scan	N/A per section 5.6.3.2.5 of the LTP
Radionuclides for analysis	All LTP nuclides with the focus on, C-14, Co-60, Sr-90 and Cs-137

MDCs for gamma analysis of sediment samples

Nuclide	10% of the 10 mrem/y $DCGL_w$ (pCi/g)
Co-60	0.16
Nb-94	0.29
Ag-108m	0.29
Sb-125	1.26
Cs-134	0.19
Cs-137	0.35

Eu-152	0.40
Eu-154	0.38
Eu-155	16

The desired MDCs in the laboratory analyses of FSS sediment 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 sediment samples.

MDCs for HTD nuclide:

Nuclide	10% of the 10 mrem/y $DCGL_w$ (pCi/g)
H-3	14.7
C-14	0.22
Fe-55	1180
Ni-63	32.4
Sr-90	0.07
Tc-99	0.55
Pu-238	1.3
Pu-239	1.2
Pu-241	39
Am-241	1.18
Cm-243	1.26

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 and will accompany the sediment samples.

Scan Coverage : N/A per section 5.6.3.2.5 of the LTP

QC checks and measurements:

- If applicable, QC checks for the Leica GPS will be performed in accordance with DP-8859.
- ONE QC split sample will be collected
  note: this is in accordance with DP-8852, "Final Status Survey Quality Assurance Project Plan (QAPP)" requirements.
- ONE QC recount sample will be performed and counted by the YNPS Chemistry Lab
  note: this is in accordance with DP-8852.
- TWO QC Blank samples will be collected from uncontaminated soil. The blank samples will be prepared and analyzed using routine methods.
  note: this is in accordance with DP-8852.
- ONE QC Spike Sample will be analyzed by the YNPS Chemistry Lab in accordance with DP-8852.

4.0 Define the boundaries of the survey:

- Physical boundaries of Survey Unit OOL-01-02 are as shown on the attached map.

- The survey will be performed under appropriate weather conditions (as defined by instrumentation and equipment limitations and human tolerance).
- Divers will perform the survey in daylight hours allowing adequate daylight time for ingress and egress.
- Water Depth (Alternate sample locations will be chosen for samples with dive depths greater than 80 ft).
- The Dive Operations Plan will address diver safety concerns.

5.0 Develop a decision rule:

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

(a) If all the data show that the sediment concentrations of plant related nuclides and the sum of fractions of nuclides for all samples are below the 10-mrem/y DCGLs, accept the FSS data as valid and reject the null hypothesis (i.e., Survey Unit OOL-01-02 meets the release criteria).

(b) If the activity concentration for any LTP nuclide exceeds its respective $DCGL_w$, then perform an investigation survey.

(c) If the average concentration of any LTP-listed nuclide exceeds its respective DCGL or the average sum of fractions exceed one, then accept the null hypothesis (i.e., Survey Unit OOL-01-02 fails to meet the release criteria).

(d) If the average concentration of identified LTP-listed nuclide is less than DCGL and the sum of their DCGL fractions are less than 1, but some individual measurements exceed the DCGL, then apply the statistical test as the basis for accepting or rejecting the null hypothesis.

Note: Alternate actions beyond investigations are not expected to be necessary within this survey unit.

6.0 Specify tolerable limits on decision errors:

Null hypothesis:	Residual plant-related radioactivity in Survey Unit OOL-01-02 exceeds the release criteria.
Probability of type I error:	0.05
Probability of type II error:	0.05
LBGR:	Unity Rule therefore the applicable DCGL = 1 LGBR = 0.5

7.0 Optimize Design:

Type of statistical test: WRS Test ☑ Sign Test ☐ (background will be applied to this survey unit)

Number and Location of Samples: 16 sediment samples will be collected in systematic grid locations with a random start (refer to the completed DPF-8853.2 in the survey package file).

Reference Area Background: 20 sediment samples will be collected from Harriman Reservoir in random locations in accordance with DP-8865, "Computer Determination Of The Number And Location Of FSS Samples And Measurements."

GENERAL INSTRUCTIONS

1. Collect 16 sediment samples following the guidance of the Dive Operations Plan. One of the 16 sediment samples will be analyzed as a QC split sample to fulfill the QC requirement of DP-8852 "Final Status Survey Quality Assurance Project Plan (QAPP)." All 16 sediment samples will also be analyzed for the C-14 and Sr-90 nuclides.

2. The collection of sediment samples will be performed in accordance with the Dive Operations Plan.

3. Sediment sample designation:

FSS Sediment Samples:	OOL-01-02-001-F-SD through OOL-01-02-019-F-SD corresponding to FSS sample locations 001 through 019. One spike and two field blanks were added to the seventeen sediments samples for a total of nineteen samples. OOL-01-02-001-F-SD-H through OOL-01-02-019-F-SD-H (Except OOL-01-02-005-F-SD, OOL-01-02-009-F-S and OOL-01-02-012-F-SD-S) will be analyzed off-site for C-14 and Sr-90.
QC Split Sample:	OOL-01-02-012-F-SD-S is to be designated as the QC split sample. The results will be compared to the on-site analysis results for sample OOL-01-02-012-F-SD in accordance with DP-8864, "Split Sample Assessment for Final Status Survey."
Recount Samples:	OOL-01-02-002-F-SD is to be counted twice on site, the letters RC will be appended to the suffix (i.e. OOL-01-02-002-F-SD-RC) representing the recounted result. The results will be compared in accordance with DP-8864, "Split Sample Assessment for Final Status Survey."
Spike Sample:	Sample 009 will be labeled OOL-01-02-009-F-SD and will represent the spiked sample, the results of which will be compared to the expected activity to determine precision and accuracy in accordance with DP-8852, "Final Status Survey Quality Assurance Project Plan (QAPP)."
Field Blanks:	OOL-01-02-005-F-SD and OOL-01-02-017-F-SD will represent two blank samples. The samples will be collected prepared and analyzed in accordance with DP-8852, "Final Status Survey Quality Assurance Project Plan (QAPP)."

4. 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 Measurements" and the sample location marked in accordance with DP-8124 "Collection of Pond Sediment Samples For Site Characterization."

5. If random survey location may fall on riprap or an obstruction whereby the desired volume of sediment cannot be achieved another survey location will be chosen in accordance with DP-8856, "Preparation of Survey Plans."

6. If a random survey location falls depths greater than 80 feet another survey location will be chosen in accordance with DP-8856, "Preparation of Survey Plans."

7. Divers will collect the sediment samples. Approximately 2 liters of sediment shall be collected in

plastic Ziploc bags or in hard plastic containers using a trowel or equivalent tool.

8. All sediment samples will be received and prepared in accordance with DP-8813, "Sample Receipt and Preparation".
9. Chain of Custody form will be used in accordance with DP-8123, "Sample Security and Chain of Custody" for all sediment samples sent to an off-site laboratory.
10. The job hazards associated with the Survey described in this package are addressed in the accompanying Job Hazard Assessment for OOL-01-02.
11. Diver Safety will be addressed in the accompanying Dive Operations Plan.
12. All personnel (excluding divers) participating in this survey shall be trained in accordance with DP-8868, "Final Status Survey Training Program."

SPECIFIC INSTRUCTIONS

1. All designated measurement locations have already been identified by GPS per DP-8859, Operation of The Leica Geosystems GPS 1200 Global Positioning System For Identification Of Final Status Survey Measurement Locations". If a designated sample location is obstructed or deemed incapable of yielding enough sediment, the FSS Radiological Engineer or the FSS Field Supervisor will select an alternate location in accordance with DP-8856, "Preparation of Survey Plans". A detailed description of the alternate location will be recorded on form DPF-8856.2. The coordinates for the alternate location will be recorded with GPS in accordance with DP-8859, and the survey unit map will be annotated appropriately to reflect the alternate location.
2. Sediment Samples
   - YNPS Chemistry will analyze OOL-01-02-001-F-SD through OOL-01-02-019-F-SD for gamma-emitting nuclides.
   - OOL-01-02-002-F-SD will be counted twice by YNPS Chemistry. The designation for the recounted sample will be OOL-01-02-002-F-SD-RC.
   - OOL-01-02-012-F-SD will be renamed appending the letter S to the suffix and sent to the off-site laboratory. The off-site laboratory will analyze OOL-01-02-012-F-SD-S as a QC split sample. This sample will be analyzed for all LTP listed nuclides ~~(except H-3)~~. CM 9-25-05
   - Upon completion of on-site analysis for gamma emitting nuclides, OOL-01-02-001-F-SD through OOL-01-02-019-F-SD will be renamed (Excluding OOL-01-02-005-F-SD, OOL-01-02-009-F-SD and OOL-01-02-012-F-SD) appending the letter H to the suffix (i.e. OOL-01-02-001-F-SD-H and sent to the off-site laboratory. The off-site laboratory will analyze these samples for C-14 and Sr-90 only.

     Note: renaming the off-site samples is necessary to ensure unique naming convention for the C-14 and Sr-90 results.
3. 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 off-site laboratory using an attachment to the Chain-of Custody form.
4. If any LTP-listed nuclides exceed the investigation levels outlined in the DQO section the FSS Radiological Engineer will determine the appropriate investigation.

NOTIFICATION POINTS	
QA notification point(s) (y/n) * y	Specify:
1. Date/time of initial pre-survey briefing	QA Signature:
2. Date/time of commencement of sediment sampling	QA Signature:

*Email notification to trudeau@yankee.com with a copy to calsyn@yankee.com satisfies this step.

FSI point(s) (y/n) n

Specify:	Field Supervisor Signature /Date:
1.	
2.	

Prepared by _____ Date 8-18-05
FSS Radiological Engineer

Reviewed by _____ Date 8/18/05
FSS Radiological Engineer

Approved by _____ Date 8/25/05
FSS Project Manager

Final Status Survey Planning Worksheet

GENERAL SECTION	
Survey Area #: OOL-01	Survey Unit #: 03
Survey Unit Name: OOL-01-03	
FSSP Number: YNPS-FSSP-OOL01-03-00	

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. ☑ Refer to YA-REPT-00-003-05, Note: The generic ALARA review applies to this survey unit because the costs involved in dredging would increase the Action Level.

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 <u>Statement of the problem</u>:

Survey Unit OOL-01-03 consists of sediment on the bottom of Sherman Reservoir and contains about 751 m^2 of surface area.

Unit 03 is bound to the south by the seal pit cove. The shorelines of survey area OOL-03 form the eastern and western boundaries, and survey unit OOL-01-04 forms the northern boundary. Sediment results from the seal pit characterization and recent FSS effort were used for planning this FSS survey package. Survey Unit OOL-01-03 was reclassified to a Class 1 from a Class 3 based on the review of this data. The sediment results from the discharge cove indicate activity concentrations of Cs-137, Sr-90, Co-60 and C-14 that together exceed unity. It is possible that deposition of the radionuclides discovered in the discharge cove extend into survey unit OOL-01-03.

The problem as defined by this survey plan 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

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CM

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 investigations.

3.0 Identify the inputs to the decision:

Sample media:	Reservoir Sediments (treated as soil)
Types of measurements:	Sediment samples
Radionuclide-of-concern:	C-14, Co-60, Sr-90 and Cs-137
Applicable DCGLs:	• 2.2 pCi C-14 per gram of sediment (10-mrem/y DCGL) • 1.6 pCi Co-60 per gram of sediment (10-mrem/y DCGL) • 0.69 pCi Sr-90 per gram of sediment (10-mrem/y DCGL • 3.4 pCi Cs-137 per gram of sediment (10-mrem/y DCGL)

Since the characterization data set present in the HSA did not account for C-14 and Sr-90 nuclides sufficiently, it was necessary to collect new samples from the reservoir. The Seal Pit Discharge Cove was selected as the location to collect data for its characterization. It's assumed that the cove bottom sediments would yield a conservative representation of the LTP radionuclides currently present in the Sherman Reservoir. Recent sediment samples collected from the Cove survey unit (OOL-01-01) was added to the original characterization data. Thirty samples in all were used to provide the statistics for characterization of survey unit OOL-01-03. The original characterization samples were collected between June 29, 2005 and July 8, 2005 and the FSS samples were collected on August 23, 2005. The data set provided is sufficient to support FSS planning of Survey Unit OOL-01-03. Based on this data, C-14, Co-60, Sr-90 and Cs-137 continue to be the radionuclides of concern; consequently the focus will be on the sediment concentrations of these radionuclides. The sample results from the characterization data include:

- C-14 (26 detects) — C-14 is present in 96% of the 27 characterization samples taken. Twelve samples exceeded 10% of the 10-mrem/y DCGL (0.22 pCi/g). The average activity concentration of C-14 for the samples is 0.23 pCi/g.
- Co-60 (26 detects) — Co-60 is present in 87% of the 30 characterization samples taken. Ten samples exceeded 10% of the 10-mrem/y DCGL (0.16 pCi/g). The average activity concentration of Co-60 for the samples is 0.17 pCi/g.
- Cs-137 (30 detects) — Cs-137 is present in 100% of the 30 characterization samples taken. Eight samples exceeded 10% of the 10-mrem/y DCGL (0.34 pCi/g). The average activity concentration of Cs-137 for the samples is 0.31 pCi/g.
- Sr-90 (18 detects) — Sr-90 is present in 67% of the 27 characterization samples taken. Four samples exceeded 10% of the 10-mrem/y DCGL (0.07 pCi/g). The average activity concentration of Sr-90 for the samples is 0.04 pCi/g.

The gamma analysis performed did not detect Am-241 in any of the characterization sediment samples. This suggests that TRUs are not present in Survey Unit OOL-01-03. HTD nuclides and TRUs will be included in the assessment related to this survey plan. At least 5% of the FSS sediment samples will be sent to an independent laboratory for complete analyses of HTD nuclides and TRUs. In addition to sampling for HTD and TRU nuclides, 100% of the samples collected will be analyzed C-14 and for Sr-90.

Survey Design / Release Criteria

Average C-14 concentration:	0.23 pCi/g
Standard deviation C-14 (σ):	0.13 pCi/g
Average C0-60 concentration:	0.17 pCi/g
Standard deviation Co-60 (σ):	0.25 pCi/g
Average Sr-90 concentration:	0.04 pCi/g
Standard deviation Sr-90 (σ):	0.08 pCi/g
Average Cs-137 concentration:	0.31 pCi/g
Standard deviation Cs-137 (σ):	0.31 pCi/g
Surrogate DCGL:	N/A (a surrogate DCGL will not be used)
$DCGL_{EMC}$ based on grid ~~space~~ ~~of 21.6 ft²~~ area of 37.6 m² (use 50 m² values)	
C-14	~~• 1.7E3 (Area Factor = 860)~~ = 814 pCi/g (AF = 370)
Co-60	~~• 2.5E0 (Area Factor = 1.4)~~ = 2.4 pCi/g (AF = 1.5)
Sr-90	~~• 3.3E1 (Area Factor = 54)~~ ~~= 27 pCi/g (AF =~~ = 18.4 pCi/g (AF = 27)
Cs-137	~~• 1.1E1 (Area Factor = 3.7)~~ = 10.5 pCi/g (AF = 3.1)
Investigation Level for sediment samples:	• If any LTP listed nuclide is greater than its $DCGL_{EMC}$, an investigation will be conducted. • If the sum of the $DCGL_{EMC}$ fractions for all detected LTP listed nuclides exceeds 1, an investigation will be conducted. • If any LTP listed nuclide is greater than its respective DCGLw and the value is a statistical outlier as defined in the LTP, an investigation will be conducted.
Investigation Level for scan	N/A per section 5.6.3.2.5 of the LTP
Radionuclides for analysis	All LTP nuclides with the focus on, C-14, Co-60, Sr-90 and Cs-137

MDCs for gamma analysis of sediment samples

Nuclide	10% of the 10 mrem/y $DCGL_w$ (pCi/g)
Co-60	0.16
Nb-94	0.29
Ag-108m	0.29
Sb-125	1.3
Cs-134	0.20

	Eu-155	16

The desired MDCs in the laboratory analyses of FSS sediment 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 sediment samples.

MDCs for HTD nuclide:

Nuclide	10% of the 10 mrem/y $DCGL_w$ (pCi/g)
H-3	15
C-14	0.22
Fe-55	1200
Ni-63	33
Sr-90	0.07
Tc-99	0.57
Pu-238	1.3
Pu-239	1.2
Pu-241	39
Am-241	1.2
Cm-243	1.3

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 and will accompany the sediment samples.

Scan Coverage : N/A per section 5.6.3.2.5 of the LTP

QC checks and measurements:

- If applicable, QC checks for the Leica GPS will be performed in accordance with DP-8859.
- TWO QC split sample will be collected

  note: this is in accordance with DP-8852, "Final Status Survey Quality Assurance Project Plan (QAPP)" requirements.
- ONE QC recount sample will be performed and counted by the YNPS Chemistry Lab

  note: this is in accordance with DP-8852, "Final Status Survey Quality Assurance Project Plan (QAPP)" requirements.

4.0 Define the boundaries of the survey:

- Physical boundaries of Survey Unit OOL-01-03 are as shown on the attached map.
- Visual observation of the condition of the bottom sediments was performed via underwater camera equipment on July 5, 2006 by the Normindo dive team and an FSS Engineer. The decision to scan the bottom with camera equipment instead of placing divers in the water in the vicinity of the intake was made because of diver safety considerations. Coordinates identifying an area surrounding the intake where it was deemed incapable of yielding enough sediment. The area surrounding the intake structure to the Sherman Dam was omitted from the survey area; the remaining area is shown in the attached map.
- The survey will be performed under appropriate weather conditions (as defined by instrumentation and equipment limitations and human tolerance).
- Divers will perform the survey in daylight hours allowing adequate daylight time for ingress and egress.
- The Dive Operations Plan will address diver safety concerns.

- Divers will perform the survey in daylight hours allowing adequate daylight time for ingress and egress.
- The Dive Operations Plan will address diver safety concerns.
- Water Depth (Alternate sample locations will be chosen for samples with dive depths greater than 80 ft).

5.0 Develop a decision rule:

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

(a) If all the data show that the sediment concentrations of plant related nuclides and the sum of fractions of nuclides are below the 10-mrem/y DCGLs, accept the FSS data as valid and reject the null hypothesis (i.e., Survey Unit OOL-01-03 meets the release criteria).

(b) If the investigation level is exceeded, then perform an investigation survey.

(c) If the average concentration of the radionuclide-of-concern is below the DCGL, or if the sum of the fractions for identified radionuclides-of-concern <1, but some measurements exceed the DCGL, then apply a statistical test as the basis for accepting or rejecting the null hypothesis.

(d) If the average concentration of any LTP-listed nuclide exceeds its respective DCGL or the average sum of fractions exceed one, then accept the null hypothesis (i.e., Survey Unit OOL-01-03 fails to meet the release criteria).

6.0 Specify tolerable limits on decision errors:

Null hypothesis:	Residual plant-related radioactivity in Survey Unit OOL-01-01 exceeds the release criteria.
Probability of type I error:	0.05
Probability of type II error:	0.05
LBGR:	Unity Rule therefore the applicable DCGL = 1 LGBR = 0.5

7.0 Optimize Design:

Type of statistical test: WRS Test ☑ Sign Test ☐ (background will be applied to this survey unit)

Number and Location of Samples: 20 sediment samples will be collected in systematic grid locations with a random start (refer to the completed DPF-8853.2 in the survey package file). The number of sediment samples required was determined to be 13, but 20 samples will be collected in a conservative effort to account for the inability to perform surface scans of the bottom sediments.

Reference Area Background: Twenty sediment samples were collected from Harriman Reservoir in random locations in accordance with DP-8865, "Computer Determination Of The Number And Location Of FSS Samples And Measurements." If a background is applied the data contained in the reference area background technical report, YA-REPT-00-019-05, "Harriman Reservoir Reference Area Background Study" will be used.

GENERAL INSTRUCTIONS

1. Collect 20 sediment samples following the guidance of the Dive Operations Plan. Two of the 20 sediment samples will be analyzed as a QC split sample to fulfill the QC requirement of DP-8852

"Final Status Survey Quality Assurance Project Plan (QAPP)." All 20 sediment samples will also be analyzed for the C-14 and Sr-90 nuclides.

2. Sediment sample designation:

FSS sediment samples:	OOL-01-03-001-F-SD through OOL-01-03-020-F-SD corresponding to FSS sample locations 001 through 020.
	OOL-01-03-001-F-SD-H through OOL-01-03-020-F-SD-H corresponding to the same 20 samples when analyzed off-site for C-14 and Sr-90. Excluding 003 and 013.
QC split sample:	OOL-01-03-003-F-SD-S and OOL-01-03-013-F-SD-S is to be designated as QC split sample and will be analyzed off-site. The results will be compared to the on-site analysis results for sample OOL-01-01-003-F-SD and OOL-01-03-013-F-SD in accordance with DP-8864, "Split Sample Assessment for Final Status Survey."
Recount samples:	OOL-01-03-002-F-SD is to be counted twice on site, the letters RC will be appended to the suffix representing the recounted result. Its designation will be OOL-01-03-002-F-SD-RC. The results will be compared in accordance with DP-8864, "Split Sample Assessment for Final Status Survey."

3. Determine the sample locations using GPS, in accordance with DP-8859 and mark the sample location in accordance with DP-8124 "Collection of Pond Sediment Samples For Site Characterization."
4. If a survey location falls on riprap or an obstruction whereby the desired volume of sediment cannot be achieved another survey location will be chosen in accordance with DP-8856, "Preparation of Survey Plans."
5. If a survey location falls in depths greater than 80 feet another survey location will be chosen in accordance with DP-8856, "Preparation of Survey Plans".
6. Divers will collect the sediment samples. Approximately 2 liters of sediment shall be collected in plastic Ziploc bags or in hard plastic containers using a trowel or equivalent tool.
7. All sediment samples will be received and prepared in accordance with DP-8813, "Sample Receipt and Preparation."
8. Chain of Custody form will be used in accordance with DP-8123, "Sample Security and Chain of Custody" for all sediment samples sent to an off-site laboratory.
9. The job hazards associated with the Survey described in this package are addressed in the accompanying Job Hazard Assessment for OOL-01-03.
10. Diver Safety will be addressed in the accompanying Dive Operations Plan.
11. All personnel (excluding divers) participating in this survey shall be trained in accordance with DP-8868, "Final Status Survey Training Program."

SPECIFIC INSTRUCTIONS

1. Determine the sample location by GPS per DP-8859, Operation of The Leica Geosystems GPS 1200

Global Positioning System For Identification Of Final Status Survey Measurement Locations". If a designated sample location is obstructed or deemed incapable of yielding enough sediment, the FSS Radiological Engineer or the FSS Field Supervisor will select an alternate location in accordance with DP-8856, "Preparation of Survey Plans". A detailed description of the alternate location will be recorded on form DPF-8856.2. The coordinates for the alternate location will be recorded with GPS in accordance with DP-8859, and the survey unit map will be annotated appropriately to reflect the alternate location.

2. Sediment Samples:

- Decant any standing water and then homogenize the wet sediment in a container large enough for the entire sample. Prepare an aliquot of at least 500 ml for wet samples sent to the off-site laboratory for analysis. The 500 ml sample will be sufficient to perform either a split sample analysis or a HTD analysis commensurate with this plan.
- An aliquot of 500 ml or greater volume of wet sediment is to be placed in screw top plastic containers for shipment to the off-site laboratory for analysis. OOL-01-03-001-F-SD through OOL-01-03-020-F-SD will be renamed (Excluding OOL-01-03-003-F-SD and OOL-01-03-013-F-SD) appending the letter H to the suffix and sent to the off-site laboratory (i.e. OOL-01-03-001-F-SD-H). The off-site laboratory will analyze these samples for C-14 and Sr-90 only.

  Note: renaming the off-site samples is necessary to ensure unique naming convention for the C-14 and Sr-90 results.

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- OOL-01-03-~~002~~-F-SD and OOL-01-03-013-F-SD will be renamed appending the letter S to the suffix and sent to the off-site laboratory. The off-site laboratory will analyze OOL-01-03-003-F-SD-S and OOL-01-03-013-F-SD-S as a QC split sample. This sample will be analyzed for all LTP listed nuclides.
- The remaining sediment is to be dried in the drying oven in pans not the marinelli container. YNPS Chemistry will analyze OOL-01-03-001-F-SD through OOL-01-03-020-F-SD for gamma-emitting nuclides.
- OOL-01-03-002-F-SD will be counted twice by YNPS Chemistry. The designation for the recounted sample will be OOL-01-03-002-F-SD-RC.

3. 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 off-site laboratory using an attachment to the Chain-of Custody form.
4. If any LTP-listed nuclides exceed the investigation levels outlined in the DQO section the FSS Radiological Engineer will determine the appropriate investigation.

NOTIFICATION POINTS

n/a

Prepared by _____ Date 7-20-2006
FSS Radiological Engineer

Reviewed by _____ Date 7/20/06
FSS Radiological Engineer

Approved by _____ Date 7/20/06
FSS Project Manager

Final Status Survey Planning Worksheet

GENERAL SECTION	
Survey Area #: OOL-01	Survey Unit #: 04
Survey Unit Name: OOL-01-04	
FSSP Number: YNPS-FSSP-OOL01-04-00	

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. ☑ Refer to YA-REPT-00-003-05, Note: The generic ALARA review applies to this survey unit because the costs involved in dredging would increase the Action Level.

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 <u>Statement of the problem</u>:

Survey Unit OOL-01-04 consists of sediment on the bottom of Sherman Reservoir and contains about 67,120m^2 of surface area.

Unit 04 is bound on the south by the northern boundary of survey unit OOL-01-05 (west reservoir cove). The shorelines of survey area OOL-03 and non-impacted property owned by TransCanada form the southern and western boundaries. The shoreline of survey area OOL-15 and non-impacted property owned by TransCanada form the eastern boundary. The northern boundary is defined by non-impacted property owned by TransCanada. Characterization and FSS results from sediment samples collected within the seal pit discharge cove (OOL-01-01, which is not directly adjacent) were used for planning this FSS survey package. Survey Unit OOL-01-04 was reclassified to a Class 2 based on the review of the data. The data indicates that activity concentrations for three of the twenty-four samples would have exceed unity based on 10-mrem/y soil DCGLs.

The problem as defined by this survey plan 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 the release criteria? Alternative actions that may be implemented in this effort are investigations.

3.0 Identify the inputs to the decision:

Sample media:	Reservoir Sediments (treated as soil but at 10-mrem/y DCGLs)
Types of measurements:	Sediment samples
Radionuclide-of-concern:	C-14, Co-60, Sr-90 and Cs-137
Applicable DCGL:	• 2.2E+00 pCi C-14 per gram of sediment (10-mrem/y DCGL) • 1.6E+00 pCi Co-60 per gram of sediment (10-mrem/y DCGL) • 6.9E-01 pCi Sr-90 per gram of sediment (10-mrem/y DCGL • 3.4E+00 pCi Cs-137 per gram of sediment (10-mrem/y DCGL)

Since the characterization data set present in the HSA did not account for C-14 and Sr-90 nuclides sufficiently, it was necessary to use additional sample data from the reservoir. The Seal Pit Discharge Cove characterization and FSS data were used to provide ample sample statistics; it's assumed that the samples collected in the discharge would yield a conservative representation of the LTP radionuclides present in OOL-01-04. Twenty-four samples were used to provide the sample statistics for C-14 and Sr-90 and twenty-nine samples for Co-60 and Cs-137. The samples were collected between July 8, 2005 and August 23, 2005. The characterization data provided is sufficient to support FSS planning of Survey Unit OOL-01-04. Based on the current data, C-14, Co-60, Sr-90 and Cs-137 are the radionuclides of concern; consequently the focus will be on the sediment concentrations of these radionuclides. The sample results include:

- C-14 (23 detects*) — C-14 is present in 96% of the 24 characterization samples. None of the samples exceeded 10% of the 25-mrem/y DCGL (5.3 pCi/g). The average activity concentration of C-14 for the samples is 0.22 pCi/g.
- Co-60 (22 detects*) — Co-60 is present in 92% of the 24 characterization samples. Five samples exceeded 10% of the 25-mrem/y DCGL (3.8 pCi/g). The average activity concentration of Co-60 for the samples is 0.22 pCi/g.
- Sr-90 (18 detects*) — Sr-90 is present in 75% of the 24 characterization samples. Three samples exceeded 10% of the 25-mrem/y DCGL (1.6 pCi/g). The average activity concentration of Sr-90 for the samples is 0.04 pCi/g.

• Cs-137 (24 detects*)	Cs-137 is present in 100% of the 24 characterization samples. Two samples exceeded 10% of the 25-mrem/y DCGL (8.1 pCi/g). The average activity concentration of Cs-137 for the samples is 0.38 pCi/g.

Note *: Detects as used in this section refer the number of results in pCi/g where the reported activity concentration exceeded the critical level (2.33 sigma).

The gamma analysis performed did not detect Am-241 in any of the characterization sediment samples. This suggests that TRUs are not present in Survey Unit OOL-01-04. HTD nuclides and TRUs will be included in the assessment related to this survey plan. At least 5% of the FSS sediment samples will be sent to an independent laboratory for complete analyses of HTD nuclides and TRUs. In addition to sampling for HTD and TRU nuclides, 100% of the samples collected will be analyzed C-14 and for Sr-90.

Survey Design / Release Criteria

Average C-14 concentration:	0.22 pCi/g
Standard deviation C-14 (σ):	0.12 pCi/g
Average C0-60 concentration:	0.22 pCi/g
Standard deviation Co-60 (σ):	0.27 pCi/g
Average Sr-90 concentration:	0.04 pCi/g
Standard deviation Sr-90 (σ):	0.09 pCi/g
Average Cs-137 concentration:	0.38 pCi/g
Standard deviation Cs-137 (σ):	0.33 pCi/g
Surrogate DCGL:	N/A (a surrogate DCGL will not be used)
Investigation Level for sediment samples:	• 2.2 pCi C-14 per gram of sediment (10-mrem/y $DCGL_w$ for C-14) • 1.6 pCi Co-60 per gram of sediment (10-mrem/y $DCGL_w$ for Co-60) • 0.69 pCi Sr-90 per gram of sediment (10-mrem/y $DCGL_w$ for Sr-90) • 3.4 pCi Cs-137 per gram of sediment (10-mrem/y $DCGL_w$ for Cs-137) • If the sum of the $DCGL_w$ fractions for all detected LTP listed nuclides exceeds 1, an investigation will be conducted. • Additionally if any other LTP listed nuclide is identified at a concentration greater than its respective 10-mrem/y $DCGL_w$ an investigation will be conducted.
Investigation Level for scan	N/A per section 5.6.3.2.5 of the LTP
Radionuclides for analysis	All LTP nuclides with the focus on, C-14, Co-60, Sr-90 and Cs-137

MDCs for gamma analysis of sediment samples

Nuclide	10% of the 10 mrem/y $DCGL_w$ (pCi/g)
Co-60	1.6E-01
Nb-94	2.9E-01
Ag-108m	2.9E-01

Sb-125	1.3E+00
Cs-134	2.0E-01
Cs-137	3.4E-01
Eu-152	4.1E-01
Eu-154	3.8E-01
Eu-155	1.6E+01

The desired MDCs in the laboratory analyses of FSS sediment 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 sediment samples.

MDCs for HTD nuclide:

Nuclide	10% of the 10 mrem/y $DCGL_w$ (pCi/g)
H-3	1.5E+01
C-14	2.2E-01
Fe-55	1.2E+03
Ni-63	3.3E+01
Sr-90	6.9E-02
Tc-99	5.7E-01
Pu-238	1.3E+00
Pu-239	1.2E+00
Pu-241	3.9E+01
Am-241	1.2E+00
Cm-243	1.3E+00

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 and will accompany the sediment samples.

Scan Coverage : N/A per section 5.6.3.2.5 of the LTP

QC checks and measurements:

- If applicable, QC checks for the Leica GPS will be performed in accordance with DP-8859.
- ONE QC split sample will be collected
  note: this is in accordance with DP-8852, "Final Status Survey Quality Assurance Project Plan (QAPP)" requirements.
- ONE QC recount sample will be performed and counted by the YNPS Chemistry Lab
  note: this is in accordance with DP-8852, "Final Status Survey Quality Assurance Project Plan (QAPP)" requirements.

4.0 Define the boundaries of the survey:

- Physical boundaries of Survey Unit OOL-01-04 are as shown on the attached map.
- The survey will be performed under appropriate weather conditions (as defined by instrumentation and equipment limitations and human tolerance).
- Divers will perform the survey in daylight hours allowing adequate daylight time for ingress and egress.
- The Dive Operations Plan will address diver safety concerns.

- Water Depth (Alternate sample locations will be chosen for samples with dive depths greater than 80 ft).

5.0 Develop a decision rule:

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

(a) If all the data show that the sediment concentrations of plant related nuclides and the sum of fractions of nuclides are below the 10-mrem/y DCGLs, accept the FSS data as valid and reject the null hypothesis (i.e., Survey Unit OOL-01-04 meets the release criteria).

(b) If the activity concentration for any LTP nuclide exceeds its respective $DCGL_w$, 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 exceed one, then accept the null hypothesis (i.e., Survey Unit OOL-01-04 fails to meet the release criteria).

(d) If the average concentration of 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 beyond investigations are not expected to be necessary within this survey unit.

6.0 Specify tolerable limits on decision errors:

Null hypothesis:	Residual plant-related radioactivity in Survey Unit OOL-01-04 exceeds the release criteria.
Probability of type I error:	0.05
Probability of type II error:	0.05
LBGR:	Unity Rule therefore the applicable DCGL = 1 LGBR = 0.5

7.0 Optimize Design:

Type of statistical test: WRS Test ☑ Sign Test ☐ (background will be applied to this survey unit)

Number and Location of Samples: 20 sediment samples will be collected in systematic grid locations with a random start (refer to the completed DPF-8853.2 in the survey package file). The number of sediment samples required was determined to be ~~15~~ 13, but 20 samples will be collected in a conservative effort to account for the inability to perform surface scans of the bottom sediments.

Reference Area Background: Twenty sediment samples were collected from Harriman Reservoir in random locations in accordance with DP-8865, "Computer Determination Of The Number And Location Of FSS Samples And Measurements." If a background is applied the data contained in the reference area background technical report, YA-REPT-00-019-05, "Harriman Reservoir Reference Area Background Study" will be used.

GENERAL INSTRUCTIONS

1. Collect 20 sediment samples following the guidance of the Dive Operations Plan. One of the 20 sediment samples will be analyzed as a QC split sample to fulfill the QC requirement of DP-8852 "Final Status Survey Quality Assurance Project Plan (QAPP)." All 20 sediment samples will be

analyzed for the Co-60, Cs-137, C-14 and Sr-90 nuclides.

2. Sediment sample designation:

FSS sediment samples:	OOL-01-04-001-F-SD through OOL-01-04-020-F-SD corresponding to FSS sample locations 001 through 020.
	OOL-01-04-001-F-SD-H through OOL-01-04-020-F-SD-H corresponding to the same 20 samples when analyzed off-site for C-14 and Sr-90.
QC split sample:	OOL-01-04-010-F-SD-S is to be designated as QC split sample and will be analyzed off-site. The results will be compared to the on-site analysis results for sample OOL-01-04-010-F-SD in accordance with DP-8864, "Split Sample Assessment for Final Status Survey."
Recount samples:	OOL-01-04-003-F-SD is to be counted twice on site, the letters RC will be appended to the suffix representing the recounted result. The results will be compared in accordance with DP-8864, "Split Sample Assessment for Final Status Survey."

3. Determine the sample locations using GPS, in accordance with DP-8859 and mark the sample location in accordance with DP-8124 "Collection of Pond Sediment Samples For Site Characterization."
4. If a survey location falls on riprap or an obstruction whereby the desired volume of sediment cannot be achieved another survey location will be chosen in accordance with DP-8856, "Preparation of Survey Plans."
5. If a survey location falls depths greater than 80 feet another survey location will be chosen in accordance with DP-8856, "Preparation of Survey Plans".
6. Divers will collect the sediment samples. Approximately 2 liters of sediment shall be collected in plastic Ziploc bags or in hard plastic containers using a trowel or equivalent tool.
7. All sediment samples will be received and prepared in accordance with DP-8813, "Sample Receipt and Preparation."
8. Chain of Custody form will be used in accordance with DP-8123, "Sample Security and Chain of Custody" for all sediment samples sent to an off-site laboratory.
9. The job hazards associated with the Survey described in this package are addressed in the accompanying Job Hazard Assessment for OOL-01-04.
10. Diver Safety will be addressed in the accompanying Dive Operations Plan.
11. All personnel (excluding divers) participating in this survey shall be trained in accordance with DP-8868, "Final Status Survey Training Program."

SPECIFIC INSTRUCTIONS

1. Determine the sample location by GPS per DP-8859, Operation of The Leica Geosystems GPS 1200 Global Positioning System For Identification Of Final Status Survey Measurement Locations". If a designated sample location is obstructed or deemed incapable of yielding enough sediment, the FSS Radiological Engineer or the FSS Field Supervisor will select an alternate location in accordance with

DP-8856, "Preparation of Survey Plans". A detailed description of the alternate location will be recorded on form DPF-8856.2. The coordinates for the alternate location will be recorded with GPS in accordance with DP-8859, and the survey unit map will be annotated appropriately to reflect the alternate location.

2. Sediment Samples
   - YNPS Chemistry will analyze OOL-01-04-001-F-SD through OOL-01-04-020-F-SD for gamma-emitting nuclides.
   - OOL-01-04-003-F-SD will be counted twice by YNPS Chemistry. The designation for the recounted sample will be OOL-01-04-003-F-SD-RC.
   - The off-site laboratory will analyze OOL-01-04-001-F-SD-H through OOL-01-04-020-F-SD-H for C-14 and Sr-90. 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."
   - OOL-01-04-010-F-SD-S will be sent to the off-site laboratory and analyzed as a QC split sample. This sample will be analyzed for all LTP listed nuclides including Total Chemical Uranium (TCU).
3. 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 off-site laboratory using an attachment to the Chain-of Custody form.
4. If any LTP-listed nuclides exceed the investigation levels outlined in the DQO section the FSS Radiological Engineer will determine the appropriate investigation.

NOTIFICATION POINTS

Prepared by _____ Date 6-30-06
FSS Radiological Engineer

Reviewed by _____ Date 7-5-06
FSS Radiological Engineer

Approved by _____ Date 7-7-06
FSS Project Manager
For Marty Erickson

Final Status Survey Planning Worksheet

GENERAL SECTION	
Survey Area #: OOL-01	Survey Unit #: 05
Survey Unit Name: OOL-01-05	
FSSP Number: YNPS-FSSP-OOL01-05-00	

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. ☑ Refer to YA-REPT-00-003-05, Note: The generic ALARA review applies to this survey unit because the costs involved in dredging would increase the Action Level.

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 <u>Statement of the problem</u>:

Survey Unit OOL-01-05 consists of sediment on the bottom of Sherman Reservoir and contains about 4,540 m^2 of surface area.

Unit 05 is bound on the south by the northern boundary of survey unit OOL-03-03 (Sherman Reservoir Shoreline). The shorelines of survey area OOL-03 and OOL-13 form the southern and western boundaries. The shoreline of survey area OOL-15 forms the eastern boundary. The northern boundary is defined by the southern boundary of survey unit OOL-01-04. Characterization and FSS results from sediment samples collected within the seal pit discharge cove (OOL-01-01, which is not directly adjacent) were used for planning this FSS survey package. Survey Unit OOL-01-05 was reclassified to a Class 2 based on the review of the data. The data indicates that activity concentrations for three of the twenty-four samples would have exceed unity based on 10-mrem/y soil DCGLs.

The problem as defined by this survey plan 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 the release criteria? Alternative actions that may be implemented in this effort are investigations.

3.0 Identify the inputs to the decision:

Sample media:	Reservoir Sediments (treated as soil but at 10-mrem/y DCGLs)
Types of measurements:	Sediment samples
Radionuclide-of-concern:	C-14, Co-60, Sr-90 and Cs-137
Applicable DCGL:	• 2.2E+00 pCi C-14 per gram of sediment (10-mrem/y DCGL) • 1.6E+00 pCi Co-60 per gram of sediment (10-mrem/y DCGL) • 6.9E-01 pCi Sr-90 per gram of sediment (10-mrem/y DCGL • 3.4E+00 pCi Cs-137 per gram of sediment (10-mrem/y DCGL)

Since the characterization data set present in the HSA did not account for C-14 and Sr-90 nuclides sufficiently, it was necessary to use additional sample data from the reservoir. The Seal Pit Discharge Cove characterization and FSS data were used to provide ample sample statistics; it's assumed that the samples collected in the discharge would yield a conservative representation of the LTP radionuclides present in OOL-01-05. Twenty-four samples were used to provide the sample statistics for C-14, Sr-90, Co-60 and Cs-137. The samples were collected between July 8, 2005 and August 23, 2005. The characterization data provided is sufficient to support FSS planning of Survey Unit OOL-01-05. Based on the current data, C-14, Co-60, Sr-90 and Cs-137 are the radionuclides of concern; consequently the focus will be on the sediment concentrations of these radionuclides. The sample results include:

- C-14 (23 detects*) — C-14 is present in 96% of the 24 characterization samples. None of the samples exceeded 10% of the 25-mrem/y DCGL (5.3 pCi/g). The average activity concentration of C-14 for the samples is 0.22 pCi/g.
- Co-60 (22 detects*) — Co-60 is present in 92% of the 24 characterization samples. Five samples exceeded 10% of the 25-mrem/y DCGL (3.8 pCi/g). The average activity concentration of Co-60 for the samples is 0.22 pCi/g.
- Sr-90 (18 detects*) — Sr-90 is present in 75% of the 24 characterization samples. Three samples exceeded 10% of the 25-mrem/y DCGL (1.6 pCi/g). The average activity

concentration of Sr-90 for the samples is 0.04 pCi/g.

- Cs-137 (24 detects*) Cs-137 is present in 100% of the 24 characterization samples. Two samples exceeded 10% of the 25-mrem/y DCGL (8.1 pCi/g). The average activity concentration of Cs-137 for the samples is 0.38 pCi/g.

Note *: Detects as used in this section refer the number of results in pCi/g where the reported activity concentration exceeded the critical level (2.33 sigma).

The gamma analysis performed did not detect Am-241 in any of the characterization sediment samples. This suggests that TRUs are not present in Survey Unit OOL-01-05. HTD nuclides and TRUs will be included in the assessment related to this survey plan. At least 5% of the FSS sediment samples will be sent to an independent laboratory for complete analyses of HTD nuclides and TRUs. In addition to sampling for HTD and TRU nuclides, 100% of the samples collected will be analyzed C-14 and for Sr-90.

Survey Design / Release Criteria

Average C-14 concentration:	0.22 pCi/g
Standard deviation C-14 (σ):	0.12 pCi/g
Average C0-60 concentration:	0.22 pCi/g
Standard deviation Co-60 (σ):	0.27 pCi/g
Average Sr-90 concentration:	0.04 pCi/g
Standard deviation Sr-90 (σ):	0.09 pCi/g
Average Cs-137 concentration:	0.38 pCi/g
Standard deviation Cs-137 (σ):	0.33 pCi/g
Surrogate DCGL:	N/A (a surrogate DCGL will not be used)
Investigation Level for sediment samples:	• 2.2 pCi C-14 per gram of sediment (10-mrem/y $DCGL_w$ for C-14) • 1.6 pCi Co-60 per gram of sediment (10-mrem/y $DCGL_w$ for Co-60) • 0.69 pCi Sr-90 per gram of sediment (10-mrem/y $DCGL_w$ for Sr-90) • 3.4 pCi Cs-137 per gram of sediment (10-mrem/y $DCGL_w$ for Cs-137) • If the sum of the $DCGL_w$ fractions for all detected LTP listed nuclides exceeds 1, an investigation will be conducted. • Additionally if any other LTP listed nuclide is identified at a concentration greater than its respective 10-mrem/y $DCGL_w$ an investigation will be conducted.
Investigation Level for scan	N/A per section 5.6.3.2.5 of the LTP
Radionuclides for analysis	All LTP nuclides with the focus on, C-14, Co-60, Sr-90 and Cs-137

MDCs for gamma analysis of sediment samples	Nuclide	10% of the 10 mrem/y $DCGL_w$ (pCi/g)
	Co-60	1.6E-01
	Nb-94	2.9E-01
	Ag-108m	2.9E-01
	Sb-125	1.3E+00
	Cs-134	2.0E-01
	Cs-137	3.4E-01
	Eu-152	4.1E-01
	Eu-154	3.8E-01
	Eu-155	1.6E+01
	The desired MDCs in the laboratory analyses of FSS sediment 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 sediment samples.	
MDCs for HTD nuclide:	Nuclide	10% of the 10 mrem/y $DCGL_w$ (pCi/g)
	H-3	1.5E+01
	C-14	2.2E-01
	Fe-55	1.2E+03
	Ni-63	3.3E+01
	Sr-90	6.9E-02
	Tc-99	5.7E-01
	Pu-238	1.3E+00
	Pu-239	1.2E+00
	Pu-241	3.9E+01
	Am-241	1.2E+00
	Cm-243	1.3E+00
	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 and will accompany the sediment samples.	
Scan Coverage :	N/A per section 5.6.3.2.5 of the LTP	
QC checks and measurements:	• If applicable, QC checks for the Leica GPS will be performed in accordance with DP-8859. • ONE QC split sample will be collected note: this is in accordance with DP-8852, "Final Status Survey Quality Assurance Project Plan (QAPP)" requirements. • ONE QC recount sample will be performed and counted by the YNPS Chemistry Lab note: this is in accordance with DP-8852, "Final Status Survey Quality Assurance Project Plan (QAPP)" requirements.	

4.0 Define the boundaries of the survey:

- Physical boundaries of Survey Unit OOL-01-05 are as shown on the attached map.
- The survey will be performed under appropriate weather conditions (as defined by instrumentation and

equipment limitations and human tolerance).

- Divers will perform the survey in daylight hours allowing adequate daylight time for ingress and egress.
- The Dive Operations Plan will address diver safety concerns.
- Water Depth (Alternate sample locations will be chosen for samples with dive depths greater than 80 ft).

5.0 Develop a decision rule:

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

(a) If all the data show that the sediment concentrations of plant related nuclides and the sum of fractions of nuclides are below the 10-mrem/y DCGLs, accept the FSS data as valid and reject the null hypothesis (i.e., Survey Unit OOL-01-05 meets the release criteria).

(b) If the activity concentration for any LTP nuclide exceeds its respective $DCGL_w$, 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 exceed one, then accept the null hypothesis (i.e., Survey Unit OOL-01-05 fails to meet the release criteria).

(d) If the average concentration of 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 beyond investigations are not expected to be necessary within this survey unit.

6.0 Specify tolerable limits on decision errors:

Null hypothesis:	Residual plant-related radioactivity in Survey Unit OOL-01-05 exceeds the release criteria.
Probability of type I error:	0.05
Probability of type II error:	0.05
LBGR:	Unity Rule therefore the applicable DCGL = 1 LGBR = 0.5

7.0 Optimize Design:

Type of statistical test: WRS Test ☑ Sign Test ☐ (background will be applied to this survey unit)

Number and Location of Samples: 20 sediment samples will be collected in systematic grid locations with a random start (refer to the completed DPF-8853.2 in the survey package file). The number of sediment samples required was determined to be 13, but 20 samples will be collected in a conservative effort to account for the inability to perform surface scans of the bottom sediments.

Reference Area Background: Twenty sediment samples were collected from Harriman Reservoir in random locations in accordance with DP-8865, "Computer Determination of the Number and Location of FSS Samples and Measurements." If a background is applied the data contained in the reference area background technical report, YA-REPT-00-019-05, "Harriman Reservoir Reference Area Background

Study" will be used.

GENERAL INSTRUCTIONS

1. Collect 20 sediment samples following the guidance of the Dive Operations Plan. One of the 20 sediment samples will be analyzed as a QC split sample to fulfill the QC requirement of DP-8852 "Final Status Survey Quality Assurance Project Plan (QAPP)." All 20 sediment samples will also be analyzed for the C-14 and Sr-90 nuclides.
2. Sediment sample designation:

FSS sediment samples:	OOL-01-05-001-F-SD through OOL-01-05-020-F-SD corresponding to FSS sample locations 001 through 020. OOL-01-05-001-F-SD-H through OOL-01-05-020-F-SD-H corresponding to the same 20 samples when analyzed off-site for C-14 and Sr-90.
QC split sample:	OOL-01-05-003-F-SD-S is to be designated as QC split sample and will be analyzed off-site. The results will be compared to the on-site analysis results for sample OOL-01-05-003-F-SD in accordance with DP-8864, "Split Sample Assessment for Final Status Survey."
Recount samples:	OOL-01-05-013-F-SD is to be counted twice on site, the letters RC will be appended to the suffix representing the recounted result. The results will be compared in accordance with DP-8864, "Split Sample Assessment for Final Status Survey."

3. Determine the sample locations using GPS, in accordance with DP-8859 and mark the sample location in accordance with DP-8124 "Collection of Pond Sediment Samples For Site Characterization."
4. If a survey location falls on riprap or an obstruction whereby the desired volume of sediment cannot be achieved another survey location will be chosen in accordance with DP-8856, "Preparation of Survey Plans."
5. If a survey location falls depths greater than 80 feet another survey location will be chosen in accordance with DP-8856, "Preparation of Survey Plans".
6. Divers will collect the sediment samples. Approximately 2 liters of sediment shall be collected in plastic Ziploc bags or in hard plastic containers using a trowel or equivalent tool.
7. All sediment samples will be received and prepared in accordance with DP-8813, "Sample Receipt and Preparation."
8. Chain of Custody form will be used in accordance with DP-8123, "Sample Security and Chain of Custody" for all sediment samples sent to an off-site laboratory.
9. The job hazards associated with the Survey described in this package are addressed in the accompanying Job Hazard Assessment for OOL-01-05.
10. Diver Safety will be addressed in the accompanying Dive Operations Plan.
11. All personnel (excluding divers) participating in this survey shall be trained in accordance with DP-

8868, "Final Status Survey Training Program."

SPECIFIC INSTRUCTIONS

1. Determine the sample location by GPS per DP-8859, Operation of The Leica Geosystems GPS 1200 Global Positioning System For Identification Of Final Status Survey Measurement Locations". If a designated sample location is obstructed or deemed incapable of yielding enough sediment, the FSS Radiological Engineer or the FSS Field Supervisor will select an alternate location in accordance with DP-8856, "Preparation of Survey Plans". A detailed description of the alternate location will be recorded on form DPF-8856.2. The coordinates for the alternate location will be recorded with GPS in accordance with DP-8859, and the survey unit map will be annotated appropriately to reflect the alternate location.
2. Sediment Samples
   - YNPS Chemistry will analyze OOL-01-05-001-F-SD through OOL-01-05-020-F-SD for gamma-emitting nuclides.
   - OOL-01-05-013-F-SD will be counted twice by YNPS Chemistry. The designation for the recounted sample will be OOL-01-05-013-F-SD-RC.
   - The off-site laboratory will analyze OOL-01-05-001-F-SD-H through OOL-01-05-020-F-SD-H for C-14 and Sr-90. 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."
   - OOL-01-05-003-F-SD-S will be sent to the off-site laboratory and analyzed as a QC split sample. This sample will be analyzed for all LTP listed nuclides including Total Chemical Uranium (TCU).
3. 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 off-site laboratory using an attachment to the Chain-of Custody form.
4. If any LTP-listed nuclides exceed the investigation levels outlined in the DQO section the FSS Radiological Engineer will determine the appropriate investigation.

NOTIFICATION POINTS

Prepared by _____ Date 6-29-06
FSS Radiological Engineer

Reviewed by _____ Date 7-5-06
FSS Radiological Engineer

Approved by _____ Date 7-5-06
FSS Project Manager
FOR MARTY ERICKSON

DQA REVIEW
CM
9-12-06

Final Status Survey Planning Worksheet

GENERAL SECTION	
Survey Area #: OOL-01	Survey Unit #: 06
Survey Unit Name: OOL-01-06 (Subdivision of the Seal Pit Discharge Cove Northern Boundary)	
FSSP Number: YNPS-FSSP-OOL01-06-00	

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. ☑ Refer to YA-REPT-00-003-05, Note: The generic ALARA review applies to this survey unit because the costs involved in dredging would increase the Action Level.

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 <u>Statement of the problem</u>:

Survey Unit OOL-01-06 consists of sediment on the bottom of Sherman Reservoir and contains about 185.8 m^2 of surface area.

This FSS survey plan is designed as a result of the re-classification in part of survey unit OOL-01-01. The partial re-classification was necessary following the investigation survey performed in unit 01. The results of the investigation survey confirm the result of the original FSS survey and bound the extent of the elevated area of residual radioactivity. The decision was made to partially re-classify and sub-divide OOL-01-01 into two survey units. The newly sub-divided survey unit will be classified as a class 1 unit and will be surveyed against the design criteria established in this plan.

The problem as defined by this survey plan 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 the release criteria? Alternative actions that may be implemented in this effort are investigations.

3.0 Identify the inputs to the decision:

Sample media:	Reservoir Sediments (treated as soil)
Types of measurements:	Sediment samples
Radionuclide-of-concern:	C-14, Co-60, Sr-90 and Cs-137
Applicable DCGL:	• 2.2 pCi C-14 per gram of sediment (10-mrem/y DCGL) • 1.6 pCi Co-60 per gram of sediment (10-mrem/y DCGL) • 0.69 pCi Sr-90 per gram of sediment (10-mrem/y DCGL • 3.4 pCi Cs-137 per gram of sediment (10-mrem/y DCGL)

Recent sediment samples collected from the Cove survey unit (OOL-01-01) were added to the original characterization data. Thirty samples in all were used to provide the statistics for characterization of survey unit OOL-01-06. The original characterization samples were collected between June 29, 2005 and July 8, 2005 and the FSS samples were collected on August 23, 2005. The data set provided is sufficient to support FSS planning of Survey Unit OOL-01-06. Based on this data, C-14, Co-60, Sr-90 and Cs-137 continue to be the radionuclides of concern; consequently the focus will be on the sediment concentrations of these radionuclides. The sample results from the characterization data include:

- C-14 (26 detects) — C-14 is present in 96% of the 27 characterization samples taken. Twelve samples exceeded 10% of the 10-mrem/y DCGL (0.22 pCi/g). The average activity concentration of C-14 for the samples is 0.23 pCi/g.
- Co-60 (26 detects) — Co-60 is present in 87% of the 30 characterization samples taken. Ten samples exceeded 10% of the 10-mrem/y DCGL (0.16 pCi/g). The average activity concentration of Co-60 for the samples is 0.17 pCi/g.
- Cs-137 (30 detects) — Cs-137 is present in 100% of the 30 characterization samples taken. Eight samples exceeded 10% of the 10-mrem/y DCGL (0.34 pCi/g). The average activity concentration of Cs-137 for the samples is 0.31 pCi/g.
- Sr-90 (17 detects) — Sr-90 is present in 63% of the 27 characterization samples taken. Four samples exceeded 10% of the 10-mrem/y DCGL (0.07 pCi/g). The average activity concentration of Sr-90 for the samples is 0.04 pCi/g.

The gamma analysis performed did not detect Am-241 in any of the characterization sediment samples. This suggests that TRUs are not present in Survey Unit OOL-01-06. HTD nuclides and TRUs will be included in the assessment related to this survey plan. At least 5% of the FSS sediment samples will be sent to an independent laboratory for complete analyses of HTD nuclides and TRUs. In addition to sampling for HTD and TRU nuclides, 100% of the samples collected will be analyzed C-14 and for Sr-90.

Survey Design / Release Criteria

Average C-14 concentration:	0.23 pCi/g
Standard deviation C-14 (σ):	0.13 pCi/g
Average C0-60 concentration:	0.17 pCi/g
Standard deviation Co-60 (σ):	0.25 pCi/g
Average Sr-90 concentration:	0.04 pCi/g
Standard deviation Sr-90 (σ):	0.08 pCi/g
Average Cs-137 concentration:	0.31 pCi/g
Standard deviation Cs-137 (σ):	0.31 pCi/g
Surrogate DCGL:	N/A (a surrogate DCGL will not be used)

$DCGL_{EMC}$ based on grid ~~space of 21.6 ft²~~ area of 12.39 m² (Use 25 m² values) 12/30/06

C-14	~~1.7E3~~ (Area Factor = 860) 12/30/06	=> 1,892 pCi/g
Co-60	~~2.5E0~~ (Area Factor = ~~1.4~~ =1.8) 12/30/06	=> 2.88 pCi/g
Sr-90	~~3.3E1~~ (Area Factor = 54)	=> 37.26 pCi/g
Cs-137	~~1.1E1~~ (Area Factor = 3.7)	=> 12.58 pCi/g

Investigation Level for sediment samples:

- If any LTP listed nuclide is greater than its $DCGL_{EMC}$, an investigation will be conducted.
- If the sum of the $DCGL_{EMC}$ fractions for all detected LTP listed nuclides exceeds 1, an investigation will be conducted.
- If any LTP listed nuclide is greater than its respective DCGLw and the value is a statistical outlier as defined in the LTP, an investigation will be conducted.

Investigation Level for scan — N/A per section 5.6.3.2.5 of the LTP

Radionuclides for analysis — All LTP nuclides with the focus on, C-14, Co-60, Sr-90 and Cs-137

MDCs for gamma analysis of sediment samples

Nuclide	10% of the 10 mrem/y $DCGL_w$ (pCi/g)
Co-60	0.16
Nb-94	0.29
Ag-108m	0.29
Sb-125	1.3
Cs-134	0.20
Cs-137	0.34
Eu-152	0.41
Eu-154	0.38
Eu-155	16

The desired MDCs in the laboratory analyses of FSS sediment 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 sediment samples.

MDCs for HTD nuclide:

Nuclide	10% of the 10 mrem/y $DCGL_w$ (pCi/g)
H-3	15
C-14	0.22
Fe-55	1200
Ni-63	33
Sr-90	0.07
Tc-99	0.57
Pu-238	1.3
Pu-239	1.2
Pu-241	39
Am-241	1.2
Cm-243	1.3

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 and will accompany the sediment samples.

Scan Coverage : N/A per section 5.6.3.2.5 of the LTP

QC checks and measurements:

- If applicable, QC checks for the Leica GPS will be performed in accordance with DP-8859.
- ~~TWO~~ ONE QC split sample will be collected Cm 7-20-06
  note: this is in accordance with DP-8852, "Final Status Survey Quality Assurance Project Plan (QAPP)" requirements.
- ONE QC recount sample will be performed and counted by the YNPS Chemistry Lab
  note: this is in accordance with DP-8852, "Final Status Survey Quality Assurance Project Plan (QAPP)" requirements.

4.0 Define the boundaries of the survey:

- Physical boundaries of Survey Unit OOL-01-06 are as shown on the attached map.
- The survey will be performed under appropriate weather conditions (as defined by instrumentation and equipment limitations and human tolerance).
- Divers will perform the survey in daylight hours allowing adequate daylight time for ingress and egress.
- The Dive Operations Plan will address diver safety concerns.

5.0 Develop a decision rule:

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

(a) If all the data show that the sediment concentrations of plant related nuclides and the sum of fractions of nuclides are below the 10-mrem/y DCGLs, accept the FSS data as valid and reject the null hypothesis (i.e., Survey Unit OOL-01-06 meets the release criteria).

(b) If the investigation level is exceeded, then perform an investigation survey.

(c) If the average concentration of the radionuclide-of-concern is below the DCGL, or if the sum of the fractions for identified radionuclides-of-concern <1, but some measurements exceed the DCGL, then apply a statistical test as the basis for accepting or rejecting the null hypothesis.

(d) If the average concentration of any LTP-listed nuclide exceeds its respective DCGL or the average sum of fractions exceed one, then accept the null hypothesis (i.e., Survey Unit OOL-01-06 fails to meet the release criteria).

6.0 Specify tolerable limits on decision errors:

Null hypothesis:	Residual plant-related radioactivity in Survey Unit OOL-01-06 exceeds the release criteria.
Probability of type I error:	0.05
Probability of type II error:	0.05
LBGR:	Unity Rule therefore the applicable DCGL = 1 LGBR = 0.5

7.0 Optimize Design:

Type of statistical test: WRS Test ☑ Sign Test ☐ (background will be applied to this survey unit)

Number and Location of Samples: 15 sediment samples will be collected in systematic grid locations with a random start (refer to the completed DPF-8853.2 in the survey package file). The number of sediment samples required was determined to be 13, but 15 samples will be collected in a conservative effort to account for the inability to perform surface scans of the bottom sediments.

Reference Area Background: Twenty sediment samples were collected from Harriman Reservoir in random locations in accordance with DP-8865, "Computer Determination Of The Number And Location Of FSS Samples And Measurements." If a background is applied the data contained in the reference area background technical report, YA-REPT-00-019-05, "Harriman Reservoir Reference Area Background Study" will be used.

GENERAL INSTRUCTIONS

1. Collect 15 sediment samples following the guidance of the Dive Operations Plan. One of the 15 sediment samples will be analyzed as a QC split sample to fulfill the QC requirement of DP-8852 "Final Status Survey Quality Assurance Project Plan (QAPP)." All 15 sediment samples will also be analyzed for the C-14 and Sr-90 nuclides.
2. Sediment sample designation:

FSS sediment samples:	OOL-01-06-001-F-SD through OOL-01-06-015-F-SD corresponding to FSS sample locations 001 through 015. OOL-01-06-001-F-SD-H through OOL-01-06-015-F-SD-H corresponding to the same 15 samples when analyzed off-site for C-14 and Sr-90.
QC split sample:	OOL-01-06-013-F-SD-S is to be designated as QC split sample and will be analyzed off-site. The results will be compared to the on-site analysis

be analyzed off-site. The results will be compared to the on-site analysis results for sample OOL-01-06-013-F-SD in accordance with DP-8864, "Split Sample Assessment for Final Status Survey."

Recount samples: OOL-01-06-005-F-SD is to be counted twice on site, the letters RC will be appended to the suffix representing the recounted result. The results will be compared in accordance with DP-8864, "Split Sample Assessment for Final Status Survey."

3. Determine the sample locations using GPS, in accordance with DP-8859 and mark the sample location in accordance with DP-8124 "Collection of Pond Sediment Samples For Site Characterization."
4. If a survey location falls on riprap or an obstruction whereby the desired volume of sediment cannot be achieved another survey location will be chosen in accordance with DP-8856, "Preparation of Survey Plans."
5. Divers will collect the sediment samples. Approximately 2 liters of sediment shall be collected in plastic Ziploc bags or in hard plastic containers using a trowel or equivalent tool.
6. All sediment samples will be received and prepared in accordance with DP-8813, "Sample Receipt and Preparation."
7. Chain of Custody form will be used in accordance with DP-8123, "Sample Security and Chain of Custody" for all sediment samples sent to an off-site laboratory.
8. The job hazards associated with the Survey described in this package are addressed in the accompanying Job Hazard Assessment for OOL-01-06.
9. Diver Safety will be addressed in the accompanying Dive Operations Plan.
10. All personnel (excluding divers) participating in this survey shall be trained in accordance with DP-8868, "Final Status Survey Training Program."

SPECIFIC INSTRUCTIONS

1. Determine the sample location by GPS per DP-8859, Operation of The Leica Geosystems GPS 1200 Global Positioning System For Identification Of Final Status Survey Measurement Locations". If a designated sample location is obstructed or deemed incapable of yielding enough sediment, the FSS Radiological Engineer or the FSS Field Supervisor will select an alternate location in accordance with DP-8856, "Preparation of Survey Plans". A detailed description of the alternate location will be recorded on form DPF-8856.2. The coordinates for the alternate location will be recorded with GPS in accordance with DP-8859, and the survey unit map will be annotated appropriately to reflect the alternate location.
2. Sediment Samples
   - Decant any standing water and then homogenize the wet sediment in a container large enough for the entire sample. Prepare an aliquot of at least 500 ml for wet samples sent to the off-site laboratory for analysis. The 500 ml sample will be sufficient to perform either a split sample analysis or a HTD analysis commensurate with this plan.
   - An aliquot of 500 ml or greater volume of wet sediment is to be placed in screw top plastic containers for shipment to the off-site laboratory for analysis. OOL-01-06-001-F-SD through OOL-01-06-015-F-SD will be renamed (Excluding OOL-01-06-013-F-SD) appending the letter H to the suffix and sent to the off-site laboratory (i.e. OOL-01-06-001-F-SD-H). The off-site laboratory will analyze these

samples for C-14 and Sr-90 only.

Note: renaming the off-site samples is necessary to ensure unique naming convention for the C-14 and Sr-90 results.

- OOL-01-06-013-F-SD will be renamed appending the letter S to the suffix and sent to the off-site laboratory. The off-site laboratory will analyze OOL-01-06-013-F-SD-S as a QC split sample. This sample will be analyzed for all LTP listed nuclides.
- The remaining sediment is to be dried in the drying oven in pans not the marinelli container. YNPS Chemistry will analyze OOL-01-06-001-F-SD through OOL-01-06-015-F-SD for gamma-emitting nuclides.
- OOL-01-06-005-F-SD will be counted twice by YNPS Chemistry. The designation for the recounted sample will be OOL-01-06-005-F-SD-RC.

3. 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 off-site laboratory using an attachment to the Chain-of Custody form.
4. If any LTP-listed nuclides exceed the investigation levels outlined in the DQO section the FSS Radiological Engineer will determine the appropriate investigation.
5. 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 off-site laboratory using an attachment to the Chain-of Custody form.
6. If any LTP-listed nuclides exceed the investigation levels outlined in the DQO section the FSS Radiological Engineer will determine the appropriate investigation.

NOTIFICATION POINTS

n/a

Prepared by _____ Date 7-20-2006
FSS Radiological Engineer

Reviewed by _____ Date 7/20/06
FSS Radiological Engineer

Approved by _____ Date 7/20/06
FSS Project Manager