

Final Status Survey Planning Worksheet

Page 1 of 5

GENERAL SECTION

Survey Area #: OOL-08

Survey Unit #: 01

Survey Unit Name: Outer Perimeter Zone of Survey Area OOL-08

FSSP Number: YNPS-FSSP-OOL08-01-02 (10-mrem/y DCGL for Cs-137 and MDCs for sample analysis revised)

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. ☒
- 1.3 The survey unit has been turned over for final status survey. ☒
- 1.4 An initial DP-8854 walkdown has been performed and a copy of the completed Survey Unit Walkdown Evaluation is in the survey area file. ☒
- 1.5 Activities conducted within area since turnover for FSS have been reviewed. ☒
- Based on reviewed information, subsequent walkdown: ☒ not warranted ☐ warranted
- If warranted, subsequent walkdown has been performed and documented per DP-8854. ☐

OR

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

- 1.6 A final classification has been performed. ☒

Classification: CLASS 1 ☐ CLASS 2 ☐ CLASS 3 ☒

DATA QUALITY OBJECTIVES (DQO)

1.0 Statement of problem:

Survey Unit 01 is the outer most section of OOL-08, approximately 87,140 m² in size, extending from west of the YNPS site to the east. It is primarily a heavily wooded, undisturbed open land area. The problem at hand is to demonstrate that the years of plant operation did not result in an accumulation of plant-related radioactivity that exceeds the release criteria.

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

2.0 Identify the decision:

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

3.0 Identify the inputs to the decision:

Sample media: soil

Types of measurements: soil samples and judgmental scans.

Applicable DCGL: 3.0 pCi Cs137 per g soil (10-mrem/y DCGL).

Radionuclide-of-concern: Cs137

The characterization data in the HSA is sufficient to support FSS planning. Based on a review of the HSA data, Cs137 is the only plant-related radionuclide that was identified consistently in the approximately 70 characterization soil samples (but its presence in soil also has a non-plant related origin – i.e., fallout from weapons testing). The characterization data (gamma analysis results in the HSA) include sporadic “hits” for the following LTP nuclides: Co-60 (1 hit), Cs-134 (1 hit), Sb-125 (single hit), and Eu-152 (1 hit). Note: The Cs-134 and Sb-125 hits were small fractions (< 2 %) of the respective DCGL. The Co-60 was detected in a 1994 sample and, if decay-corrected to today, would be <5% of the DCGL for Co-60. The characterization data from samples 423, 424, 425, and 426 indicate that the Co-60 was investigated - no Co-60 was detected in those 4 soil samples, which closely surround the location of the Co-60 hit. The single Eu-152 hit was approximately 18% of the DCGL; however, it was not detected in any of the 7 soil samples collected from surrounding, nearby locations. The Eu-152 hit is considered an anomaly. Based on the inconsistency of detection, low fractions of their respective DCGL, and absence in samples from surrounding locations, these 4 LTP nuclides are not considered constituents of a representative nuclide mixture for Survey Unit 01. All FSS random and biased soil samples will be analyzed for these 4 nuclides as well as all other plant-related gamma-emitting nuclides.

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

Also, the characterization data showed sporadic “hits” for the following non-LTP nuclides: Co-58 (single hit), Fe59 (single hit), Nb-95 (2 hits), Zr-95 (3 hits), Ru-106 (2 hits), Sb-124 (2 hits), and Ce-144 (2 hits). Each of these nuclides has a short half-life (≤ 1 y). The characterization soil samples in which these nuclides were identified were collected in 1998. Since then, an additional 6 years has passed making the total time since detection > 6 half-lives - these nuclides are not expected to be detected in any FSS soil sample.

Based on the characterization data, a representative nuclide mix for Survey Unit 01 (i.e., nuclides that would contribute to a SPA-3 reading) includes 8 naturally occurring gamma-emitting radionuclides plus Cs-137 as the only possible plant-related nuclide. The composition of that mix is as follows: 3.1% Ac-228, 3.9% Bi-212, 2.4% Bi-214, **4.2% Cs-137**, 67.6% K-40, 2.9% Pb-212, 2.4% Pb-214, 10.5% Ra-226, and 3.0% Tl-208.

Average Cs-137 concentration (characterization data): 0.94 pCi/g

Standard deviation (σ): 0.60 pCi/g

Surrogate DCGL: N/A

Investigation Level for soil samples: >2.31 pCi Cs-137 per g. This is 50% of the 10-mrem/y DCGL plus decay-adjusted average Cs-137 background in the reference area (0.81 pCi/g).

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

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

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

MDCs for gamma analysis of soil samples: 10 - 50% DCGL = 0.3 - 1.5 pCi Cs137 per g
= 0.25 - 1.3 pCi Ag-108m per g
= 0.14 - 0.7 pCi Co-60 per g
= 0.17 - 0.86 pCi Cs-134 per g
= 1.1 - 5.5 pCi Sb-125 per g
= 0.35 - 1.7 pCi Eu-152 per g

The desired MDCs in the laboratory analyses of FSS soil samples will be the 10% DCGL values. If those values cannot be achieved, the 50% DCGL values must be achieved in the laboratory analyses of the FSS soil samples. In addition to the MDC values listed above, the following MDC values will also be transmitted to the outside laboratory via the chain-of-custody form accompanying the FSS soil samples: Sr-90: 0.059 - 0.29 pCi/g; Pu-238: 1.1 - 5.7 pCi/g; Pu-239: 1.0 - 5.2 pCi/g; Pu-241: 34 - 170 pCi/g; Am-241: 1.0 - 5.2 pCi/g; and Cm-243: 1.1 - 5.5 pCi/g.

Scan coverage: SPA-3 scans will be performed over an approximate 1m by 1m area surrounding each soil sample, as permitted by terrain and tree/brush density. The purpose of scanning is to identify anomalies that cause above background radiation readings. Three biased scans will also be performed along the inner boundaries: (1) along the fence serving as the SW boundary between Survey Unit-01 and Survey Unit-02, (2) along the Wheeler Brook divertment, and (3) along NE section of the Wheeler Brook boundary between Survey Unit-01 and Survey Unit-03. Each of these scans will cover an area approximately 10 m² in size (1 m in width and 10 m in length). These locations were selected because they are the closest points in Survey Unit-01 to on-going plant decommissioning activities and are the boundaries to Survey Units 02 and 03, which serve as buffer zones for the YNPS plant yard.

MDCR for SPA-3: The accompanying Rev ^{3 QWB 11/10/04} 2 to Table 1 provides MDCR by various general area background levels.

MDC(fDCGL) for SPA-3 scans: The accompanying Rev ^{3 QWB 11/10/04} 2 to Table 1 provides MDC(fDCGL) by various general area background levels.

QC checks and measurements: QC checks for the SPA-3 will be performed in accordance with DP-8540. Two QC split samples will be collected (note: this exceeds the LTP requirement).

4.0 Define the boundaries of the survey:

Boundaries of Survey Unit 01 are as shown on the attached map. The plant 1000ft barbed wire fence defines the outer perimeter. The inner perimeter is defined by a security fence and Wheeler Brook. There are no structures present in the Survey Unit 01. The survey will be performed under normal (fall) weather conditions and in daylight hours (allowing adequate daylight time for ingress and egress).

5.0 Develop a decision rule:

- (a) If all the sample data show that the soil concentrations of all plant-related nuclides are below the DCGL, reject the null hypothesis (i.e., Survey Unit 01 meets the release criteria).
- (b) If the action levels are exceeded, then perform an investigation survey.
- (c) If the average Cs-137 concentration exceeds the DCGL, then accept the null hypothesis (i.e., Survey Unit 01 fails to meet the release criteria).

Note: Alternate actions beyond investigations are not expected to be necessary within this survey unit (based on characterization data).

6.0 Specify tolerable limits on decision errors:

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

Probability of type I error: 0.05

Probability of type II error: 0.05

LBGR: (3.0 pCi/g)/2 = 1.5 pCi/g

7.0 Optimize Design:

Type of statistical test: WRS Test ☒ Sign Test ☐

Note: 15 FSS soil samples will be collected in randomly selected locations, accounting for locations that

cannot be sampled, in the event that a later decision is made to apply the Sign test.

Cs-137 is present in background due to fallout - Cs-137 in reference area: $0.97 \text{ pCi/g} \pm 0.404 \text{ pCi/g}$ (decay-adjusted average = 0.81 pCi/g ; 8-y decay period = 10/96 to 10/04).

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

Number samples (per DP-8853): 15. Refer to accompanying DPF-8853.1.

Biased samples: 1 @ southern corner of boundary fence (opposite side of fence where characterization sample 3249 – Co-60 hit in survey unit 02); 1@ local area of characterization sample 193 (Cs-134 hit); 1@ local area of characterization sample 179 (Eu-152 hit); 2 @ outer perimeter of survey unit.

GENERAL INSTRUCTIONS

1. Collect 15 random 1-liter FSS soil samples and 5 biased 1-liter soil samples in accordance with DP-8120, using sampling equipment as stated in DP-8120. Two of the 15 FSS soil samples will be QC split samples.
2. Soil sample designation:
 - (a) FSS soil samples: OOL-08-01-001-F through OOL-08-01-015-F corresponding to FSS sample locations 001 through 015.
 - (b) Biased FSS soil sample: OOL-08-01-016-F-B through OOL-08-01-020-F-B corresponding to samples locations 016 through 020.
 - (c) 2 QC split samples: OOL-08-01-003-F-S and OOL-08-01-008-F-S, collected at FSS sample locations 003 and 008, respectively. The results will be compared in accordance with AP-8852, Attachment H.
 - (d) Soil samples OOL-08-001-F and OOL-08-01-002-F will be “sample recounts” and the results will be compared in accordance with AP-8852, Attachment H.
3. All soil samples will be received and prepared in accordance with DP-8813.
4. Chain of Custody form will be used in accordance with DP-8123 for all soil samples sent to an off-site laboratory.
5. The measurement locations have been identified using GPS, as permitted by tree cover, in accordance with DP-8859. Each location is marked with a white flag (2-3ft above the surface) and with blue and/or yellow marking tape tied to nearby trees. The FSS Radiological Engineer or FSS Field Supervisor will guide the FSS Technicians to the sample locations.
6. Survey instrument: Operation of the E-600 w/SPA-3 will be in accordance with DP-8535, with QC checks performed in accordance with DP-8540. The instrument response checks shall be performed before issue and after use.
7. The job hazards associated with the FSS in Survey Unit 01 are addressed in the accompanying JHA for OOL-08-01.
8. All personnel participating in this survey shall be trained in accordance with DP-8868.

SPECIFIC INSTRUCTIONS

1. FSS Technicians will perform scans by moving the SPA-3 detector at a speed $\leq 0.5 \text{ m/s}$, keeping the probe at a distance of less than 3 inches from the ground surface, and following a serpentine pattern that includes at least 3 passes across each square meter. When scanning and walking, a slow pace (i.e., 1 step per second) shall be used. Scanning will be performed in the rate-meter mode with the audible feature on. Surveyors will listen for upscale readings, to which they will respond by slowing down or stopping the probe to distinguish between random fluctuations in the background and greater than background readings. Location(s) where detectable-above-background scan readings are found will be

investigated.

A first level investigation may be done with the SPA-3/E-600 to determine if the observed increase in the scan measurement is due to the presence of rocks and boulders. SPA-3 scans performed in non-impacted areas have shown that rock formations accounted for increased count rates. If it can be demonstrated that the presence of rocks and boulders is the cause of an increased count rate during a SPA-3 scan, record that finding on form DPF-8856.2. If it is demonstrated that the rocks and boulders do not account for an above background SPA-3 measurement, a soil sample will be collected at the point of the highest SPA-3 reading in the scanned area. Detailed descriptions of investigation actions will be recorded on form DPF-8856.2 and the location of the above background scan and sample will be recorded on the survey map. The location description must include sufficient detail to revisit the spot at a later time. If a soil sample is collected during the first level investigation, the sample designation will consist of the measurement location code plus the letter "I" (for investigation). For example, if a soil sample is collected during a first level investigation at measurement location 001, it will be designated OOL-08-01-001-F-I. If the investigation calls for more than 1 sample, sequentially number the investigation samples as "I1", "I2", etc.

Scans performed at measurement locations along the inner boundary (e.g., at measurement locations 004 and 016, and the 3 boundary scans) may be influenced by the ISFSI. If the ambient background count rate at start of the scan is $\geq 20,000$ cpm, reduce the scan speed to 0.25 m/s (approximately 10 inches/s) and perform the scan as described above.

2. All designated measurement locations have been already identified by GPS per DP-8859. If a designated sample location is obstructed for any reason, the FSS Radiological Engineer or the FSS Field Supervisor will select an alternate location as close as reasonably possible to the designated location. A detailed description of the alternate location will be recorded on form DPF-8856.2, survey unit map will be annotated appropriately, and the alternate location will be conspicuously marked to facilitate re-visiting to identify and record the coordinates with GPS in accordance with DP-8859.

3. Gamma analysis will be performed on all soil samples. If any of the gamma analyses show that the Cs-137 concentration is greater than 2.31 pCi/g, an investigation survey will be conducted at that sample location.

4. The gamma analysis results will also be used to determine which 2 soil samples are to be sent to an independent laboratory for analyses of HTD nuclides and TRUs.

5. On-site gamma analysis of the FSS samples shall achieve the MDC values stated in the DQO section of this plan.

NOTIFICATION POINTS

QA notification point(s) (y/n) y Specify: 1. Date/time of initial pre-survey briefing, 2. date/time of commencement of soil sampling, 3. date/time of the first instrument sign-out for the instrumentation to be used for the soil scan measurement, 4. date/time of first soil scan measurement, 5. date/time of the soil scan measurements to be performed along the inner boundary NOTIFIED #1-4 (#5 N/A) Dida Friedman

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

Prepared by J. Brown
FSS Radiological Engineer

Date 11/3/04

Reviewed by J. Hammer
FSS Radiological Engineer

Date 11/3/04

Approved by [Signature]
FSS Project Manager

Date 11/3/04

Table 1, Rev. 2								
Background	scan speed	MDCR			scan speed	MDCR		
(cpm)	(m/s)	(cpm)	MDC(fDCGL(10))	MDC(fDCGL(25))	(m/s)	(cpm)	MDC(fDCGL(10))	MDC(fDCGL(25))
9000	0.5	1355	2.4	0.96	0.25	958	1.7	0.68
10000	0.5	1428	2.5	1.00	0.25	1010	1.8	0.72
11000	0.5	1498	2.7	1.10	0.25	1059	1.9	0.75
12000	0.5	1565	2.8	1.1	0.25	1106	2.0	0.78
13000	0.5	1629	2.9	1.2	0.25	1152	2.0	0.82
14000	0.5	1690	3.0	1.2	0.25	1195	2.1	0.85
15000	0.5	1749	3.1	1.2	0.25	1237	2.2	0.88
16000	0.5	1807	3.2	1.3	0.25	1278	2.3	0.91
17000	0.5	1862	3.3	1.3	0.25	1317	2.3	0.93
18000	0.5	1916	3.4	1.4	0.25	1355	2.4	0.96
19000	0.5	1969	3.5	1.4	0.25	1392	2.5	0.99
20000	0.5	2020	3.6	1.4	0.25	1428	2.5	1.0
25000	0.5	2259	4.0	1.6	0.25	1597	2.8	1.1
30000	0.5	2474	4.4	1.8	0.25	1749	3.1	1.2
40000	0.5	2857	5.1	2.0	0.25	2020	3.6	1.4
50000	0.5	3194	5.7	2.3	0.25	2259	4.0	1.6

Values in columns 5 and 9 have changed.
 Rev 3 supercedes
 This Table - see next page.

JWB
 11/10/04

Table 1, Rev.3

Background (cpm)	scan speed (m/s)	MDCR (cpm)	MDC(fDCGL(10))	MDC(fDCGL(25))	scan speed (m/s)	MDCR (cpm)	MDC(fDCGL(10))	MDC(fDCGL(25))
9000	0.5	1355	2.4	0.88	0.25	958	1.7	0.62
10000	0.5	1428	2.5	0.93	0.25	1010	1.8	0.66
11000	0.5	1498	2.7	0.98	0.25	1059	1.9	0.69
12000	0.5	1565	2.8	1.0	0.25	1106	2.0	0.72
13000	0.5	1629	2.9	1.1	0.25	1152	2.0	0.75
14000	0.5	1690	3.0	1.1	0.25	1195	2.1	0.78
15000	0.5	1749	3.1	1.1	0.25	1237	2.2	0.81
16000	0.5	1807	3.2	1.2	0.25	1278	2.3	0.83
17000	0.5	1862	3.3	1.2	0.25	1317	2.3	0.86
18000	0.5	1916	3.4	1.3	0.25	1355	2.4	0.88
19000	0.5	1969	3.5	1.3	0.25	1392	2.5	0.91
20000	0.5	2020	3.6	1.3	0.25	1428	2.5	0.9
25000	0.5	2259	4.0	1.5	0.25	1597	2.8	1.0
30000	0.5	2474	4.4	1.6	0.25	1749	3.1	1.1
40000	0.5	2857	5.1	1.9	0.25	2020	3.6	1.3
50000	0.5	3194	5.7	2.1	0.25	2259	4.0	1.5

GENERAL SECTION

Survey Area No.: OOL-08

Survey Unit No.: 02

Survey Unit Name: Southern End of West Inner Exclusion Zone

FSSP No.: YNPS-FSSP-OOL-08-02-01 **Changes in Bold****PREPARATION FOR FSS ACTIVITIES**

Check marks in the boxes below signify affirmative responses and completion of the action.

- 1.1 Files have been established for survey unit FSS records. X
- 1.2 ALARA review has been completed for the survey unit. X
- 1.3 The survey unit has been turned over for final status survey. X
- 1.4 An initial DP-5554 walk down has been performed and a copy of the completed Survey Unit Walk down Evaluation is in the survey area file. X
- 1.5 Activities conducted within area since turnover for FSS have been reviewed. X
- Based on reviewed information, subsequent walk down: X not warranted warranted
- If warranted, subsequent walk down has been performed and documented per DP-8854.
- OR
- The basis has been provided to and accepted by the FSS Project Manager for not performing a subsequent walk down.
- 1.6 A final classification has been performed. X
- Classification: Class 2

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

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

Members of the planning team: FSS Project manager, Radiological Engineer, Field Supervisor, and Technicians.*Primary decision maker/method:* FSS Radiological Engineer with concurrence of the FSS Project Manager.*Available resources/deadlines:* N/A*Concise description of problem:* Release of OOL-08-02 to demonstrate compliance with YNPS LTP release criterion.**2.0 Identify the decision:**

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

Principal study question: Is the residual radioactivity in OOL-08-02 below the 8.73 mr/yr release criterion?*Alternative actions:* If residual radioactivity in OOL-08-02 exceeds the 8.73 mr/yr release criterion, investigations will be performed, potentially resulting in remediation, reclassification or resurveys.*Decision statement:* Determine whether or not OOL-08-02 satisfies the 8.73 mr/yr release criterion.**3.0 Identify the inputs to the decision:**

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

Sources of information: 201 samples from historical data was sufficient to develop the DQOs for OOL-08-02. 20 new data measurements will be acquired to support DQAs.*Direct measurement technique:* Soil samples will be collected and analyzed on site for all ETD LTP listed radionuclides, 1 sample will be sent to an independent lab for analyses of all LTP listed radionuclides.*Scan measurement technique:* Surfaces will be scanned via a SPA-3 probe, and/or ISOCS Assays.*Sample matrix:* Soil*Radionuclide(s) of concern:* Based on a review of YNPS historical data, the following radionuclides are the only facility related radionuclides of concern: Co-60, Cs-137*Sample Quantity* 15 (calculated) + 5 (added), for a total of 20 samples. (+1 QC)*Gridded Sample Area Size* 355.85 m2 (Survey Unit Area/N)*Sample Grid Spacing:* Triangular: 20.3m

Survey Area No.:	OOL-08	Survey Unit No.:	02
Survey Unit Name: Southern End of West Inner Exclusion Zone			
FSSP No.:	YNPS-FSSP-OOL-08-02-01 Changes in Bold		
Detection Limits:	For direct measurements and sample analyses, Minimum Detectable Concentrations (MDCs) less than 10% of the DCGL are preferred, while MDCs up to 50% of the DCGL are acceptable. See Attachment 2 for MDC Table.		
MDC (fDCGL):	The accompanying MDCR/MDC table in Attachment 1 provides MDC values, as a fraction of DCGL, for various background levels.		
MDCR(surveyor):	The accompanying MDCR/MDC table in Attachment 1 provides MDCR values for various background levels.		
Background Measurements:	No reference area (background) measurements are required, the Sign Test will be used.		
Release criteria DCGL based on:	8.73 mr/yr for Soil. See Attachment 2 for radionuclide specific breakdown of DCGLs.		
4.0 Define the boundaries of the survey:			
Define the spatial and temporal boundaries that will be covered by the decision statement so data can be easily interpreted.			
Temporal boundaries:	The data are used to reflect the condition of radionuclides leaching into the ground water over a period of 1,000 years. The survey may be performed under appropriate weather conditions (as defined by instrument tolerance and personnel safety) on any shift of work.		
Spatial Boundaries:	YNPS has been divided into multiple survey areas and units with relatively homogeneous characteristics based on information collected during the years of facility operation, the HSA, and post remediation activities. The area of interest has been named OOL-08, and the survey unit is 02. The medium of interest is described as Soil. The radiological characteristics of this unit classify it as a Class 2 area. Which has > 2,000 m2, ≤ 10,000 m2 as a surface area guideline. The total surface area is 7117 m2, which is well within the > 2,000 m2, ≤ 10,000 m2 limit. The maximum length is 89.3m, and the maximum width is 216.7m. Soil is surveyed to a depth of 15 cm.		
Detailed description of unit:	See included GPS coordinates and maps that demonstrate the measurement locations, the survey unit boundaries and unit relationship to site. Survey Unit OOL-08-02 represents the portion of Survey Area OOL-08 which is adjacent to Survey Area OOL-10. The surface soils in this survey unit consists of soils that are undisturbed since original plant construction, a combination of soils redistributed on the site and non-site soils placed in the area during site modifications. The south and west portions of this unit were modified by construction of the Wheeler Brook Diversion Project and construction of the YAEC ISFSI and ISFSI access road. During Wheeler Brook Diversion Project construction soils from within the YNPS industrial area were used to stabilize soft ground under the Y-177 power line approximately 80 feet down slope from the top of the diversion berm. The surface area affected by site modifications typically are grass covered. The portion not affected by site modifications is covered with dense overgrowth with large rocks present or is tree covered.		
5.0 Develop a decision rule:			
Define the parameter of interest, specify action levels, and the DCGL.			
Investigation Levels:	If an investigation level below is exceeded, then perform an investigation survey.		
Direct measurements:	> DCGLw		
Scan measurements:	> DCGLw or > MDC		
Parameter of interest:	If there are no investigation issues, and the the residual radioactivity in OOL-08-02 systematic samples is less than the DCGLw then the survey unit is in compliance with the release criterion (8.73 mr/yr).		
Critical Value:	If the average concentration is less than DCGLw, the sum of fractions is less than 1, and less than 6 of the 20 samples are above the DCGLw, the Survey Units passes.		

Survey Area No.: OOL-08	Survey Unit No.: 02
Survey Unit Name: Southern End of West Inner Exclusion Zone	
FSSP No.: YNPS-FSSP-OOL-08-02-01 Changes in Bold	
6.0 Specify limits on decision errors:	
Specify the decision maker's limits on decision errors, used to establish performance goals for the data collection design.	
<i>Null Hypothesis (H_0):</i>	The residual radioactivity in the survey unit data is greater than the DCGLw
<i>Tolerance for Error:</i>	Type I Error: 0.05 (probability of rejecting the null hypothesis when it is true.) Type II Error: 0.05 (probability of accepting the null hypothesis when it is false.)
<i>DCGLw (Unity):</i>	1
<i>LBGR:</i>	0.6788 (Initial LBGR: 0.5)
<i>Relative shift (Δ/σ):</i>	2
<i>Sigma (σ):</i>	0.1606
<i>Power of survey design:</i>	See attachment for prospective power curve.
7.0 Optimize Design:	
Type of statistical test:	WRS Test _____ Sign Test <u> X </u>
(background will not be subtracted)	
Design optimization is included in the DQO process, and reflected in the data published in this plan.	
<i>Number & Location of Samples:</i>	20 Soil samples will be collected at locations based on a random start, systematic Triangular grid (refer to accompanying DPF-8853.2). See map for specific locations.
GENERAL INSTRUCTIONS	
<ol style="list-style-type: none"> 1 Where possible, measurement locations will be identified using GPS in accordance with DP-8859. Each location will be marked to assist in identifying the location. 2 Soil samples will be collected in accordance with DP-8120. 3 Chain of Custody form will be used in accordance with DP-8123 for all soil samples sent to an off-site laboratory. 4 All soil samples will be received and prepared in accordance with DP-8813. Note: Split samples to be sent to an off-site lab will not be dried prior to counting on site or shipping. 5 Survey instrument: Operation of the E-600 w/SPA-3 will be in accordance with DP-8535 with QC checks performed in accordance with DP-8504. The instrument response checks shall be performed before issue and after use. 6 All SPA-3 scans will be performed with the audible feature activated. Listen for upscale readings and respond by slowing down or stopping the probe to distinguish between random fluctuations in the background and greater than background readings. Investigate any reproducible upscale readings as described in the specific instructions. 7 The job hazards associated with the survey described in this package are addressed in the accompanying Job Hazard Assessment (JHA) for OOL-08-02. 8 All personnel participating in this survey shall be trained in accordance with DP-8868. 9 Collect ISOCS measurements in accordance with DP-8871 to provide at least 10% (711.7 m2) scan coverage of the survey unit. 	
SPECIFIC INSTRUCTIONS	
<ol style="list-style-type: none"> 1 <i>SPA-3 Scans:</i> <ul style="list-style-type: none"> • Move the SPA-3 in rate-meter mode at a speed of 0.1m or less per second, keeping the probe at a distance of $\leq 3''$ from the surface and following a serpentine path that includes at least 3 passes across each square meter. 2 <i>Scan Investigations:</i> <p>Note: Detailed descriptions of investigation actions shall be recorded in the daily survey journal (DPF-8856.2) and locations marked on a map.</p> <ul style="list-style-type: none"> • Scan a 1m radius footprint around the investigation location in accordance with the scan requirements above. The area of scan should be increased as necessary to bound any areas of elevated activity identified. Perform a sample investigation as noted below. 	

Survey Area No.: OOL-08	Survey Unit No.: 02
Survey Unit Name: Southern End of West Inner Exclusion Zone	
FSSP No.: YNPS-FSSP-OOL-08-02-01 Changes in Bold	

3 Sample Locations:
All designated measurement locations will be identified by GPS per DP-8859 or by use of reference points, tape measure and compass as necessary. If a designated sample location is obstructed for any reason, the FSS Radiological Engineer or the FSS Field Supervisor will select an alternate location in accordance with DP-8856. A detailed description of the alternate location will be recorded on form DPF-8856.2, the survey unit map will be annotated appropriately, and the alternate location will be conspicuously marked to facilitate re-visiting to identify and record the coordinates with GPS in accordance with DP-8859 or by measurement from a known reference point when a GPS is not available.

4 Sample Requirements:
Collect 20 samples in accordance with DP-8120. 1 of the 20 samples will be analyzed as a QC split sample to fulfill the QC requirement of DP-8852. The same QC split sample will be analyzed for HTD nuclides in accordance with section 5.6.3.2.1 of the LTP and DP-8856.

Biased samples:
Collect 2 biased samples in accordance with DP-8120. The radiological engineer assigned to this survey unit, or designee, will determine the locations of the biased samples.

5 Sample Designation:

FSS soil samples:
OOL-08-02-001-F through OOL-08-02-020-F corresponding to FSS sample locations 001 through 020.

Biased soil samples:
OOL-08-02-021-F-B through OOL-08-02-022-F-B corresponding to biased sample location 021 through 022.

QC split samples:
OOL-08-02-007-F-S is to be designated as QC split sample. This sample will be sent to the off-site laboratory (do not dry).

Recount samples:
OOL-08-02-006-F-RC will be counted twice on site. The results will be compared in accordance with DP-8864.

6 Sample Analysis:

- Gamma analysis will be performed on all soil samples. If any of the gamma analyses show that an investigation level has been exceeded an investigation survey will be conducted at that sample location as directed by the radiological engineer.
- YNPS Chemistry will analyze OOL-08-02-001-F through OOL-08-02-020-F and OOL-08-02-021-F-B through OOL-08-02-022-F-B for gamma-emitting nuclides.
- YNPS Chemistry will analyze OOL-08-02-006-F as a sample recount. The recounted sample will possess the naming convention OOL-08-02-006-F-RC.
- YNPS Chemistry will analyze OOL-08-02-007-F-S for gamma-emitting nuclides prior to being sent to the off-site laboratory. These samples will be analyzed for gamma-emitting nuclides and HTD at the off-site laboratory.
- All gamma analysis of the FSS samples shall achieve the MDC values stated in the DQO section of this plan. The MDC's will be communicated to the laboratory using an attachment to the Chain-of- Custody form.

7 ISOCS Assays:

- Collect at least 57 ISOCS measurements in accordance with DP-8871 to provide at least 10% (711.7 m2) scan coverage of the survey unit.
- ISOCS assays are designated as OOL-08-02-1xx -F-G, starting at "101" and continuing sequentially.
- QC checks shall be performed at least once per day in accordance with DP-8869 and DP-8871. Resolve flags encountered prior to survey.
- ISOCS assays to be performed with a 90° collimator, at a distance of 2m and a count time of 15 minutes unless otherwise directed by the FSS Engineer. Make note on the daily survey journal (DPF-8856.2) if other geometries are used.
- ISOCS assay locations are to be no closer that 2m from any boundry of the survey unit and spaced no closer than 4m between centers of FOV. Position the detector downward facing keeping the detector perpendicular to the ground.
- Provide field documentation of each ISOCS assay performed. Designate additional assay locations in continuing sequence from the last number assigned to an ISOCS assay Record detailed information about additional assay locations on the daily survey journal.

Survey Area No.: OOL-08	Survey Unit No.: 02
Survey Unit Name: Southern End of West Inner Exclusion Zone	
FSSP No.: YNPS-FSSP-OOL-08-02-01 Changes in Bold	
<ul style="list-style-type: none"> Remove standing water prior to performance of ISOCS assays. Contact the FSS Engineer for directions if conditions are such that standing water cannot be removed. If the results on any ISOCS assay indicate plant related radionuclides, investigate the area within the field of view (4m diameter, 12.6 m2 area) for that assay. <p>Investigation may include qualitative use of ISOCS performed by suspending the detector 1 meter from the reference plain with the 90° collimator in place. The original scan area will be rescanned in 4 quadrants.</p> <p>The isolated quadrant (3.14m2) with positive indications of plant related nuclides will be investigated using a shielded SPA-3 scan method as defined in steps 1 & 2 of this section.</p>	

Prepared by Ron Shippee *Ronald Shippee*
FSS Radiological Engineer

Date August 28 2006

Reviewed by *ml* *Rensbark*
FSS Radiological Engineer

Date 8-28-06

Approved by Martin Erickson *Martin Erickson*
FSS Project Manager

Date 8/28/06

Continued Investigation Activities for Elevated Soil Sample Results OOL-08-02

Soil sample OOL-08-02-017-F analysis results indicated residual radioactivity in excess of the investigation action level. The investigation of this sample location consisted of collection of 4 investigation soil samples, 1 on each compass point at a distance of 1 meter from sample location OOL-08-02-017-F.

Investigation soil sample OOL-08-02-024-F-I indicates residual radioactivity in excess of the investigation level and will also be investigated with 3 additional soil samples as follows:

- Continuing in the direction from sample location 017-F to sample location 024-F-I proceed 1 meter and collect an investigation soil sample at this location.
- Collect an 2 additional soil samples at a distance of 1 meter from sample location 024-F-I on a line perpendicular to the line connecting locations 017-F and 024-F-I.

Perform the following steps at each investigation soil sample locations.

- Identify the investigation sample locations using the next sequential sample number appended with the letter "I" (example OOL-08-02-XXX-F-I).
- Collect soil samples in accordance with DP-8120, sufficient volume of soil to provide a 1 liter marinelli of sample.
- Sieve the soil sample and load a 1 liter marinelli.
- The 1 liter marinelli sample will be prepared and analyzed using the FSS sample analysis protocol.
- Detailed descriptions of investigation actions shall be recorded in the daily survey journal (DPF-8856.2) and on a survey map (include date, time, instrument, etc...).

Prepared By: *Ronald D. Shuppel*

Date *8-21-06*

Approved By: *Math C. Enil*

Date *8/21/06*

Investigation Activities for Elevated Soil Sample Results OOL-08-02

Soil sample OOL-08-02-017-F analysis results indicates residual radioactivity in excess of the investigation action level. The investigation of this sample location will consist of collection of 4 investigation soil samples, 1 on each compass point at a distance of 1 meter from sample location OOL-08-02-017-F. In addition a scan survey using an E-600/SPA-3 combination survey meter may be performed, providing the local background count rate will allow detection of radioactivity at the MDCR. (SEE scan survey instructions in survey plan) If the MDCR is not discernable due to elevated background then the scan survey is not required.

Prepared By: *Ronald R. Shippel*

Date *8-16-06*

Approved By: *Mark C. Gail*

Date *8/16/06*

Final Status Survey Planning Worksheet

GENERAL SECTION

Survey Area #: OOL-08

Survey Unit #: 03

Survey Unit Name: East Inner Perimeter Zone of Survey Area OOL-08

FSSP Number: YNPS-FSSP-OOL08-03-01 (Revision 1 dated 7/18/06. Revised or added text is bolded)

PREPARATION FOR FSS ACTIVITIES

Check marks in the boxes below signify affirmative responses and completion of the action.

- 1.1 Files have been established for survey unit FSS records. ☒
- 1.2 ALARA review has been completed for the survey unit. ☒ (YA-REPT-00-003-05)
- 1.3 The survey unit has been turned over for final status survey. ☒
- 1.4 An initial DP-8854 walkdown has been performed and a copy of the completed Survey Unit Walkdown Evaluation is in the survey area file. ☒
- 1.5 Activities conducted within area since turnover for FSS have been reviewed. ☒
- Based on reviewed information, subsequent walkdown: ☒ not warranted ☐ warranted
- If warranted, subsequent walkdown has been performed and documented per DP-8854. ☐
- OR
- The basis has been provided to and accepted by the FSS Project Manager for not performing a subsequent walkdown. ☐
- 1.6 A final classification has been performed. ☒
- Classification: CLASS 1 ☐ CLASS 2 ☐ CLASS 3 ☒

DATA QUALITY OBJECTIVES (DQO)

1.0 Statement of problem:

Survey Unit 03 is the east inner section of OOL-08, approximately 13,900 m² in size, extending eastward from the site perimeter fence to Wheeler Brook. Survey Unit OOL-08-04 and Survey Area OOL-14 form its northern boundary and Survey Area OOL-09 forms the southern boundary. It is primarily an undeveloped open land section of the site property with some heavy vegetative overgrowth and wooded areas within it. The problem at hand is to demonstrate that the years of plant operation did not result in an accumulation of plant-related radioactivity that exceeds the release criteria.

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

The two soil samples sent off site for hard-to-detect analyses yielded concentrations of Sr-90 that were higher than expected. Subsequently, the remaining 13 samples were sent off-site to GEL for Sr-90 analysis. Although the Sr-90 concentrations for these samples were lower, additional investigation efforts were warranted. Revision 1 of this sample plan addresses investigation activities with respect to the concentrations of Sr-90.

During a walk down of the area to identify the investigation sample locations, it was noted that the composition of the soil matrix on the hilltop in the survey area is mostly a spongy material made up of peat and decaying conifer needles. This material seemed to extend down through a depth of 12-inches or more.

To support this investigation, additional soil samples from within OOL-08-03 are to be collected and sent off-site to be analyzed for Sr-90.

2.0 Identify the decision:

Does residual plant-related radioactivity, if present in the survey unit, exceed LTP release criteria? Alternative actions that may be implemented in this effort are investigation, remediation, reclassification and resurvey.

3.0 Identify the inputs to the decision:

<i>Sample medium:</i>	Soil
<i>Types of measurements:</i>	Soil samples and judgmental scans
<i>Radionuclide of concern:</i>	Cs-137
<i>Applicable DCGL:</i>	3.00 pCi Cs-137 per gram of soil (8.73 mrem/y DCGL)

The characterization data in the HSA is sufficient to support FSS planning. Based on a review of the HSA data, Cs-137 is the only identified plant-related radionuclide, as defined by the LTP, in the approximately 40 characterization soil samples (but its presence in soil could have a non-plant related origin – i.e., fallout from weapons testing).

It is noted that the characterization data do not include analyses for hard-to-detect (HTD) nuclides such as H-3, Sr-90, and TRUs. However, the gamma analysis did not detect Am-241 in any of the characterization soil samples, suggesting that TRUs are not present in Survey Unit OOL08-03. HTD nuclides and TRUs will be included in the assessment for Survey Unit 03. At least five percent of the FSS soil samples will be sent to an independent laboratory for complete analyses (HTD nuclides and TRUs).

Based on the characterization data, a representative nuclide mix for survey unit 03 (i.e., nuclides that would contribute to a SPA-3 reading) includes naturally occurring gamma-emitting radionuclides (e.g., K-40, Ac-228, Bi-212 & 214) plus Cs-137 as the only probable plant-related nuclide. However, all LTP-listed radionuclides will be included in the analyses of soil samples from Survey Unit 03.

Survey Design / Release Criteria

Classification: Class 3

Average Cs-137 concentration: 0.632pCi/g

Standard deviation (σ) for Cs-137: 0.437 pCi/g

Surrogate DCGL: N/A (a surrogate DCGL will not be used)

Investigation Level for soil samples: > 1.5 pCi Cs-137 per g (>50% of 8.73-mrem/y DCGL for Cs-137).

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

Note: The Cs-137 concentrations detected in the soil samples collected under this survey plan will not be adjusted to account for background Cs-137 (i.e., Cs-137 that can be attributed to fallout from nuclear weapons testing) because the average Cs-137 concentration in the characterization samples is lower than the decay-adjusted average Cs-137 background in the reference area (i.e., 0.82 pCi/g).

Investigation Level for scan: reproducible indication above background using an audible signal.

Expected background range for

SPA-3 scan:

8,000 cpm to 40,000 cpm, depending on the presence of rocks in the immediate vicinity of the measurement location and also the influence of the ISFSI dose rate.

Radionuclides for analysis:

All LTP-listed nuclides with the focus on Cs-137.

MDCs for soil samples:

Table 1 shows the preferred and required MDC values that will be conveyed to the processing laboratories.

Table 1: MDCs for Soil

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

Scan coverage:

SPA-3 scans will be performed over an approximate 1m by 1m area surrounding each soil sample. Six biased SPA-3 scans will also be performed in Survey Unit OOL-08-03: 3 along the east boundary and 3 along the south boundary. Each of the boundary scans will cover an area approximately 10 m² (1 m in width and 10 m in length). If the radiological influence from the ISFSI causes a background $\geq 20,000$ cpm, a soil sample will be collected in lieu of scanning. See "General Instructions" below.

MDCR for SPA-3:

The accompanying MCDR/MDC table in Attachment 1 provides MDCR values by various background levels.

MDC(fDCGL) for SPA-3 scans:

The accompanying MCDR/MDC table in Attachment 1 provides MDC values, as a fraction of DCGL, by various background levels.

Note: Any radiation levels detected above background in a Class 3 survey unit should be investigated. A Class 3 survey unit is expected to have minimal contamination and not expected to have any hot spots. MARSSIM recommends scanning in a Class 3 survey unit be performed to verify proper classification. Scan MDC is not tied to the DCGL_w in a Class 3 survey area and therefore scanning to levels above background is a measure of due-diligence on the appropriateness of the classification.

(<http://www.ornl.gov/ddsc/expert/answers/marssim.htm> question/answer dated 2/4/2003)

QC checks and measurements:

- QC checks for the Leica GPS will be performed in accordance with DP-8859.
- QC checks for the SPA-3 will be performed in accordance with DP-8504.
- Two QC split samples will be collected (Note: this exceeds the LTP requirement).

- QC recounts for 2 soil samples will be performed by the YNPS Chemistry Lab.

4.0 Define the boundaries of the survey:

Boundaries of Survey Unit 03 are as shown on the attached map. The inner perimeter is defined by a security fence and Wheeler Brook. There are no structures present in the Survey Unit 03. The survey will be performed under appropriate weather conditions (as defined by instrumentation limitations and human tolerance) and in daylight hours.

5.0 Develop a decision rule:

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

- If all the characterization sample data show that the soil concentrations of all plant-related nuclides and the sum of the fractions of these nuclides are below the 8.73-mrem/y DCGLs, accept the data as FSS data and reject the null hypothesis (i.e., Survey Unit OOL-08-03 meets the release criteria).
- If an investigation level is exceeded, then perform an investigation survey.
- If the average concentration of any LTP-listed nuclide exceeds the DCGL or the sum of the fractions exceeds one, then accept the null hypothesis (i.e., Survey Unit OOL-08-03 fails to meet the release criteria).

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

6.0 Specify tolerable limits on decision errors:

<i>Null hypothesis:</i>	Residual plant-related radioactivity in Survey Unit OOL-08-03 exceeds the release criteria.
<i>Probability of type I error:</i>	0.05
<i>Probability of type II error:</i>	0.05
<i>LBGR:</i>	2.13 pCi/g (Adjusted LBGR from DPF-8853..1)

7.0 Optimize Design:

Type of statistical test: WRS Test ☐ Sign Test ☒

Note: 15 FSS soil samples will be collected in randomly selected locations to support the application of the Sign test, if necessary.

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

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

Biased samples: Two from the edge of flowing water of Wheeler Brook. **Eight (biased) investigation samples are to be collected so as to further evaluate the regions where the elevated Sr-90 concentrations occurred. The location of one of these samples corresponds to the discharge point of a fire hose located on the hilltop. The fire hose was used to pump accumulated rainwater run-off from the industrial area of the facility where remediation activities had occurred.**

Location of samples: Shown on the map included in the package file. **The location of the eight investigation samples are designated by white flags annotated with the sample identifier. Sample locations are also depicted on a map in the package file.**

GENERAL INSTRUCTIONS

1. Collect 15 random and 2 biased 1-liter FSS soil samples in accordance with DP-8120, using sampling equipment as stated in DP-8120. Two of the 15 FSS random samples will be QC split samples.

Collect soil samples at eight locations to support investigation activities. At each location, collect a 1-liter soil sample for on-site (YAEC) analysis and a 500 ml sample to be sent off-site for analysis. On-site analysis is limited to gamma-emitting radionuclides. Off-site analyses are to be for gamma-emitting radionuclides and for Sr-90. Additionally, sample OOL-08-03-023-F-S is to be analyzed for C-14.

2. Soil sample designation:

Random FSS soil samples:	OOL-08-03-001-F through OOL-08-03-015-F corresponding to FSS sample locations 001 through 015.	
Biased FSS soil samples:	OOL-08-03-016-F-B and OOL-08-03-017-F-B corresponding to samples locations 016 and 017.	
QC split samples:	OOL-08-03-002-F-S and OOL-08-03-014-F-S, collected at FSS sample locations 002 and 014, respectively. The results will be compared in accordance with DP-8864. <u>Note:</u> Samples OOL-08-03-002-F-S and OOL-08-03-014-F-S will be sent to the off-site laboratory as collected from the field (i.e., <u>without</u> drying) for H-3 analysis. These samples will also be analyzed for gamma-emitters, HTD beta-emitters, and TRUs.	
Recount samples:	Soil samples OOL-08-03-003-F and OOL-08-03-013-F will be "sample recounts" and the results will be compared in accordance with DP-8864.	
Soil samples in lieu of boundary scans:	If boundary scans are aborted due to the ISFSI influence causing the background count rates to exceed 20,000 cpm, collect a soil sample along the intended scan path. Soil samples collected in lieu of SPA-3 scans will be designated in sequential order continuing with the next available sample number with -F-B as the suffix (e.g., OOL-08-03-018-F-B). The sample location(s) will be described on DPF-8856.2 and marked for subsequent collection of GPS coordinates	
Investigation Samples	OOL-08-03-019-F-I OOL-08-03-020-F-I OOL-08-03-021-F-I OOL-08-03-022-F-I	OOL-08-03-023-F-B OOL-08-03-024-F-I OOL-08-03-025-F-I OOL-08-03-026-F-I

3. All soil samples will be received and prepared in accordance with DP-8813.

4. Chain of Custody form will be used in accordance with DP-8123 for all soil samples sent to an off-site laboratory. The required MDCs for the analyses performed by the off-site laboratory will be communicated to the lab via an attachment to the Chain-of-Custody form.

5. The measurement locations have been identified using GPS in accordance with DP-8859. Each location is marked with a flag. The FSS Radiological Engineer or FSS Field Supervisor will guide the FSS Technicians to the sample locations.

6. Survey instrument: Operation of the E-600 w/SPA-3 will be in accordance with DP-8535, with QC checks performed in accordance with DP-8504. The instrument response checks shall be performed before issue and after use.

7. The job hazards associated with this survey are addressed in the accompanying JHA for OOL-08-03.

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

SPECIFIC INSTRUCTIONS

1. FSS Technicians will perform scans by moving the SPA-3 detector at a speed ≤ 0.25 m/s, keeping the probe at a distance no greater than 3 inches from the ground surface, and following a serpentine pattern that includes at least 3 passes across each square meter. Scanning will be performed in the rate-meter mode with the audible feature on. Surveyors will listen for upscale readings, to which they will respond by slowing down or stopping the probe to distinguish between random fluctuations in the background and greater than background readings. Location(s) where detectable-above-background scan readings are found will be investigated.

A first level investigation may be done with the SPA-3/E-600 to determine if the observed increase in the scan

measurement is due to the presence of a rock. SPA-3 scans performed in non-impacted areas have shown that rock formations accounted for increased count rates. If it can be demonstrated that the presence of a rock is the cause of an increased count rate during a SPA-3 scan, record that finding on form DPF-8856.2. If it is demonstrated that the rocks do not account for an above background SPA-3 measurement, a soil sample will be collected at the point of the highest SPA-3 reading in the scanned area. Detailed descriptions of investigation actions will be recorded on form DPF-8856.2 and the location of the above background scan and sample will be recorded on the survey map. The location description must include sufficient detail to revisit the spot at a later time. If a soil sample is collected following the first level investigation, the sample designation will consist of the next sequential measurement location code plus the letter "I" (for investigation). For example, if an investigation soil sample is collected and the next available location code is 018, it will be designated OOL-08-03-018-F-I.

2. The ISFSI may have an influence on scans performed in Survey Unit OOL-08-03, particularly those performed in the southwest section. SPA-3 scanning will not be performed in areas where the ambient background count rate exceeds 20,000 cpm. An additional biased soil sample will be collected along the intended scan path in lieu of performing the scan.

3. Soil samples:

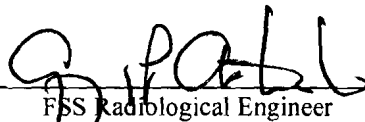
- YNPS Chemistry will dry and analyze all soil samples (**including investigation samples**) for gamma-emitting radionuclides, except samples OOL-08-03-002-F-S and OOL-08-03-014-F-S. If any of the gamma analyses show that the soil concentration of Cs-137 is > 1.5 pCi/g, or the concentration of any other LTP-listed gamma-emitting nuclide is greater than 50% of its DCGL, or the sum of the fractions for detected LTP-listed nuclides > 0.5 , an investigation survey will be conducted at that sample location. The on-site gamma analysis results may also be used to determine if other soil samples (in addition to the designated QC split samples) should be sent to the off-site laboratory for HTD nuclide analyses.
- YNPS Chemistry will analyze OOL-08-03-003-F and OOL-08-03-013-F as sample recounts. The recounted samples will use the sample numbers OOL-08-03-003-F-RC and OOL-08-03-013-F-RC respectively.
- OOL-08-03-002-F-S and OOL-08-03-014-F-S will be sent directly to the off-site laboratory. These samples will be analyzed for H-3, gamma-emitting nuclides, HTD beta-emitting nuclides, and TRUs. Ensure that the lid to the 1-liter Marinelli container for each sample is secured to prevent loss of moisture during shipping.
- YNPA Chemistry will dry and analyze all 1-liter soil samples (OOL-08-03-019 thru OOL-08-03-026) for gamma-emitting radionuclides.
- All 500ml investigation soil samples (OOL-08-03-019 thru OOL-08-03-026) will be sent directly (i.e. not dried) off-site to the Framatome E-Lab to be analyzed gamma-emitting nuclides and Sr-90. Additionally, OOL-08-03-023 will also be analyzed for H-3 and C-14.

4. On-site and off-site analyses of the FSS samples shall achieve the required MDC values stated in Section 3 of this plan. The MDCs will be communicated to the laboratory using an attachment to the Chain-of-Custody form.

NOTIFICATION POINTS

None.

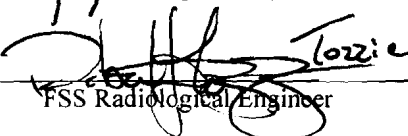
Prepared by


FSS Radiological Engineer

Date

7/18/06

Reviewed by


FSS Radiological Engineer

Date

7/18/06

Approved by


FSS Project Manager

Date

7/20/06

GENERAL SECTION	
Survey Area No.: OOL-08	Survey Unit No.: 04
Survey Unit Name: North Inner Perimeter of OOL-08	
FSSP No.: YNPS-FSSP-OOL-08-04-00	
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.	<u> X </u>
1.2 ALARA review has been completed for the survey unit.	<u> X </u>
1.3 The survey unit has been turned over for final status survey.	<u> X </u>
1.4 An initial DP-5554 walk down has been performed and a copy of the completed Survey Unit Walk down Evaluation is in the survey area file.	<u> X </u>
1.5 Activities conducted within area since turnover for FSS have been reviewed.	<u> X </u>
Based on reviewed information, subsequent walk down: <u> X </u> not warranted <u> </u> warranted	
If warranted, subsequent walk down has been performed and documented per DP-8854.	<u> </u>
OR	
The basis has been provided to and accepted by the FSS Project Manager for not performing a subsequent walk down.	<u> </u>
1.6 A final classification has been performed.	<u> X </u>
Classification: Class 2	
DATA QUALITY OBJECTIVES (DQO)	
1.0 State the problem:	
Define the problem so that the focus of the survey will be unambiguous.	
<i>Members of the planning team:</i>	FSS Project manager, Radiological Engineer, Field Supervisor, and Technicians.
<i>Primary decision maker/method:</i>	FSS Radiological Engineer with concurrence of the FSS Project Manager.
<i>Available resources/deadlines:</i>	N/A
<i>Concise description of problem:</i>	Release of OOL-08-04 to demonstrate compliance with YNPS LTP release criterion.
2.0 Identify the decision:	
Define the question that the survey will attempt to resolve and identify alternative actions that may be taken based on the outcome of the survey.	
<i>Principal study question:</i>	Is the residual radioactivity in OOL-08-04 below the 8.73 mr/yr release criterion?
<i>Alternative actions:</i>	If residual radioactivity in OOL-08-04 exceeds the 8.73 mr/yr release criterion, investigations will be performed, potentially resulting in remediation, reclassification or resurveys.
<i>Decision statement:</i>	Determine whether or not OOL-08-04 satisfies the 8.73 mr/yr release criterion.
3.0 Identify the inputs to the decision:	
Informational inputs needed to resolve the decision statement and environmental variables that will be measured.	
<i>Sources of information:</i>	12 samples from historical data was sufficient to develop the DQOs for OOL-08-04. 15 new data measurements will be acquired to support DQAs.
<i>Direct measurement technique:</i>	Soil samples will be collected and analyzed on site for all ETD LTP listed radionuclides, 1 sample will be sent to an independent lab for analyses of all LTP listed radionuclides.
<i>Scan measurement technique:</i>	Surfaces will be scanned via a SPA-3 probe.
<i>Sample matrix:</i>	Soil
<i>Radionuclide(s) of concern:</i>	Based on a review of YNPS historical data, the following radionuclides are the only facility related radionuclides of concern: Cs-137
<i>Sample Quantity</i>	15 (calculated) + 0 (added), for a total of 15 samples. (+1 QC)
<i>Gridded Sample Area Size</i>	52.87 m2 (Survey Unit Area/N)
<i>Sample Grid Spacing:</i>	Triangular: 7.8m

Survey Area No.: OOL-08		Survey Unit No.: 04	
Survey Unit Name: North Inner Perimeter of OOL-08			
FSSP No.:		YNPS-FSSP-OOL-08-04-00	
<i>Detection Limits:</i>		For direct measurements and sample analyses, Minimum Detectable Concentrations (MDCs) less than 10% of the DCGL are preferred , while MDCs up to 50% of the DCGL are acceptable . See Attachment 2 for MDC Table.	
<i>MDC (fDCGL):</i>		The accompanying MDCR/MDC table in Attachment 1 provides MDC values, as a fraction of DCGL, for various background levels.	
<i>MDCR(surveyor):</i>		The accompanying MDCR/MDC table in Attachment 1 provides MDCR values for various background levels.	
<i>Background Measurements:</i>		No reference area (background) measurements are required, the Sign Test will be used.	
<i>Release criteria DCGL based on:</i>		8.73 mr/yr for Soil. See Attachment 2 for radionuclide specific breakdown of DCGLs.	
4.0 Define the boundaries of the survey:			
Define the spatial and temporal boundaries that will be covered by the decision statement so data can be easily interpreted.			
<i>Temporal boundaries:</i>		The data are used to reflect the condition of radionuclides leaching into the ground water over a period of 1,000 years. The survey may be performed under appropriate weather conditions (as defined by instrument tolerance and personnel safety) on any shift of work.	
<i>Spatial Boundaries:</i>		YNPS has been divided into multiple survey areas and units with relatively homogeneous characteristics based on information collected during the years of facility operation, the HSA, and post remediation activities. The area of interest has been named OOL-08, and the survey unit is 04. The medium of interest is described as Soil. The radiological characteristics of this unit classify it as a Class 2 area. The total surface area is 793 m2, which is well within the Class 2 guidelines. The maximum length is 80.5m, and the maximum width is 15.6m. Soil is surveyed to a depth of 15 cm.	
<i>Detailed description of unit:</i>		See included GPS coordinates and maps that demonstrate the measurement locations, the survey unit boundaries and unit relationship to site. Survey unit 04 is a section of Survey Area OOL-08 and is located in the northeast corner of the site Industrial Area bordering the former warehouse and loading dock. Survey Unit 04 was an unused area within and adjacent to the protected/industrial area fence but outside of the Radiologically Controlled Area (RCA). OOL-08-04 is a thin strip of open land. The north side of the survey unit is characterized by a steep, near vertical drop associated with a concrete block wall running for three quarters of the length and the remainder being an exposed ledge. There are no sub-surface systems that traverse or connect within OOL-08-04. During decommissioning, backfill soil was stockpiled within the boundaries of Survey Unit 04.	
5.0 Develop a decision rule:			
Define the parameter of interest, specify action levels, and the DCGL.			
<i>Investigation Levels:</i>		If an investigation level below is exceeded, then perform an investigation survey.	
<i>Direct measurements:</i>		> DCGLw	
<i>Scan measurements:</i>		> DCGLw or > MDC	
<i>Parameter of interest:</i>		If there are no investigation issues, and the the residual radioactivity in OOL-08-04 systematic samples is less than the DCGLw then the survey unit is in compliance with the release criterion (8.73 mr/yr).	
<i>Critical Value:</i>		If the average concentration is less than DCGLw, the sum of fractions is less than 1, and less than 4 of the 15 samples are above the DCGLw, the Survey Units passes.	

Survey Area No.: OOL-08	Survey Unit No.: 04
Survey Unit Name: North Inner Perimeter of OOL-08	
FSSP No.: YNPS-FSSP-OOL-08-04-00	
6.0 Specify limits on decision errors:	
Specify the decision maker's limits on decision errors, used to establish performance goals for the data collection design.	
<i>Null Hypothesis (H_0):</i>	The residual radioactivity in the survey unit data is greater than the DCGLw
<i>Alternative Hypothesis (H_a):</i>	The residual radioactivity in the survey unit data is less than the DCGLw
<i>Tolerance for Error:</i>	Type I Error: 0.05 (probability of rejecting the null hypothesis when it is true.) Type II Error: 0.05 (probability of accepting the null hypothesis when it is false.)
<i>DCGLw:</i>	3 (pCi/g)
<i>LBGR:</i>	2.5588 (Initial LBGR: 1.5)
<i>Relative shift (Δ/σ):</i>	2
<i>Sigma (σ):</i>	0.2206
<i>Power of survey design:</i>	See attachment for prospective power curve.
7.0 Optimize Design:	
Type of statistical test: (background will not be subtracted)	WRS Test _____ Sign Test <u> X </u>
Design optimization is included in the DQO process, and reflected in the data published in this plan.	
<i>Number & Location of Samples:</i>	15 Soil samples will be collected at locations based on a random start, systematic Triangular grid (refer to accompanying DPF-8853.2). See map for specific locations.
GENERAL INSTRUCTIONS	
<ol style="list-style-type: none"> 1 Where possible, measurement locations will be identified using GPS in accordance with DP-8859. Each location will be marked to assist in identifying the location. 2 Soil samples will be collected in accordance with DP-8120. 3 Chain of Custody form will be used in accordance with DP-8123 for all soil samples sent to an off-site laboratory. 4 All soil samples will be received and prepared in accordance with DP-8813. Note: Split samples to be sent to an off-site lab will not be dried prior to counting on site or shipping. 5 Survey instrument: Operation of the E-600 w/SPA-3 will be in accordance with DP-8535 with QC checks performed in accordance with DP-8504. The instrument response checks shall be performed before issue and after use. 6 All SPA-3 scans will be performed with the audible feature activated. Listen for upscale readings and respond by slowing down or stopping the probe to distinguish between random fluctuations in the background and greater than background readings. Investigate any reproducible upscale readings as described in the specific instructions. 7 The job hazards associated with the survey described in this package are addressed in the accompanying Job Hazard Assessment (JHA) for OOL-08-04. 8 All personnel participating in this survey shall be trained in accordance with DP-8868. 	
SPECIFIC INSTRUCTIONS	
<ol style="list-style-type: none"> 1 <i>SPA-3 Scans:</i> <ul style="list-style-type: none"> • Move the SPA-3 in rate-meter mode at a speed of 0.25m or less per second, keeping the probe at a distance of $\leq 3"$ from the surface and following a serpentine path that includes at least 3 passes across each square meter. • Scan the 1m² area surrounding each sample point prior to collecting a sample. • Scan 2m path as indicated on SPA-3 scan map. 2 <i>Scan Investigations:</i> <p>Note: Detailed descriptions of investigation actions shall be recorded in the daily survey journal (DPF-8856.2) and</p> <ul style="list-style-type: none"> • Scan a 1m radius footprint around the investigation location in accordance with the scan requirements above. The area of scan should be increased as necessary to bound any areas of elevated activity identified. Perform a sample investigation as noted below. 	

Survey Area No.: OOL-08	Survey Unit No.: 04
Survey Unit Name: North Inner Perimeter of OOL-08	
FSSP No.: YNPS-FSSP-OOL-08-04-00	

3 *Sample Locations:*
 All designated measurement locations will be identified by GPS per DP-8859 or by use of reference points, tape measure and compass as necessary. If a designated sample location is obstructed for any reason, the FSS Radiological Engineer or the FSS Field Supervisor will select an alternate location in accordance with DP-8856. A detailed description of the alternate location will be recorded on form DPF-8856.2, the survey unit map will be annotated appropriately, and the alternate location will be conspicuously marked to facilitate re-visiting to identify and record the coordinates with GPS in accordance with DP-8859 or by measurement from a known reference point when a GPS is not available.

4 *Sample Requirements:* Collect 15 samples in accordance with DP-8120. 1 of the 15 samples will be analyzed as a QC split sample to fulfill the QC requirement of DP-8852. The same QC split sample will be analyzed for HTD nuclides in accordance with section 5.6.3.2.1 of the LTP and DP-8856.

Biased samples: No biased samples will be collected.

5 *Sample Designation:*

FSS soil samples: OOL-08-04-001-F through OOL-08-04-015-F corresponding to FSS sample locations 001 through 015.

Biased soil samples: No biased samples will be collected.

QC split samples: OOL-08-04-004-F-S, OOL-08-04-006-F-S and OOL-08-04-008-F-S to be designated as QC split sample. These samples will be sent to an off-site laboratory (Do not dry).

Recount samples: OOL-08-04-013-F-RC is to be counted twice on site. The results will be compared in accordance with DP-8864.

6 *Sample Analysis:*

- Gamma analysis will be performed on all soil samples. If any of the gamma analyses show that an investigation level has been exceeded an investigation survey will be conducted at that sample location as directed by the radiological engineer.
- YNPS Chemistry will analyze OOL-08-04-001-F through OOL-08-04-015-F for gamma-emitting nuclides.
- YPNS Chemistry will analyze OOL-08-04-013-F as a sample recount. The recounted sample will possess the naming convention OOL-08-04-013-F-RC.
- YNPS Chemistry will analyze OOL-08-04-004-F-S, OOL-08-04-006-F-S and OOL-08-04-008-F-S for gamma-emitting nuclides prior to being sent to the off-site laboratory. This sample will be analyzed for gamma-emitting nuclides and
- All gamma analysis of the FSS samples shall achieve the MDC values stated in the DQO section of this plan. The MDC's will be communicated to the laboratory using an attachment to the Chain-of-Custody form.

Survey Area No.: OOL-08	Survey Unit No.: 04
Survey Unit Name: North Inner Perimeter of OOL-08	
FSSP No.: YNPS-FSSP-OOL-08-04-00	

Prepared by Nancy Tozzie
FSS Radiological Engineer

Date July 13, 2006

Reviewed by Rennhak
FSS Radiological Engineer

Date 7-13-06

Approved by Martin Erickson
FSS Project Manager

Date 7/13/06

SPA-3 Scan Tables

Max Background

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

YNPS-FSSP-OOL-08-04-00

Attachment 2

DCGL MDC Table

Nuclide	Soil 3.73 mSv/y (pCi/g)	10% MDC DCGL	50% MDC DCGL	Entry to Database
Co-60	1.4E+00	1.4E-01	7.0E-01	ETD
Nb-94	2.5E+00	2.5E-01	1.3E+00	ETD
Ag-108m	2.5E+00	2.5E-01	1.3E+00	ETD
Sb-125	1.1E+01	1.1E+00	5.6E+00	ETD
Cs-134	1.7E+00	1.7E-01	8.7E-01	ETD
Cs-137	3.0E+00	3.0E-01	1.5E+00	ETD
Eu-152	3.6E+00	3.6E-01	1.8E+00	ETD
Eu-154	3.3E+00	3.3E-01	1.7E+00	ETD
Eu-155	1.4E+02	1.4E+01	6.9E+01	ETD
Am-241	1.0E+01	1.0E+00	5.1E+00	ETD
H-3	1.3E+02	1.3E+01	6.4E+01	HTD
C-14	1.9E+00	1.9E-01	9.7E-01	HTD
Fe-55	1.0E+04	1.0E+03	5.1E+03	HTD
Ni-63	2.8E+02	2.8E+01	1.4E+02	HTD
Sr-90	6.0E-01	6.0E-02	3.0E-01	HTD
Tc-99	5.0E+00	5.0E-01	2.5E+00	HTD
Pu-238	1.2E+01	1.2E+00	5.8E+00	HTD
Pu-239	1.1E+01	1.1E+00	5.3E+00	HTD
Pu-241	3.4E+02	3.4E+01	1.7E+02	HTD
Cm-243	1.1E+01	1.1E+00	5.6E+00	HTD

Final Status Survey Planning Worksheet
Page 1 of 10

GENERAL SECTION

Survey Area #: OOL-08

Survey Unit: 05

Survey Unit Name: Hillside Staging Area For Pre-Treated Soil

FSSP Number: YNPS-FSSP-OOL08-05-00

PREPARATION FOR FSS ACTIVITIES *

* Check marks in the boxes below signify affirmative responses and completion of the action.

Files have been established for survey unit FSS records. ☒

ALARA review has been completed for the survey unit ☒
See YA-REPT-00-003-05

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

An initial DP-8854 walk-down has been performed and a copy of the completed Survey Unit Walk-down Evaluation is in the survey area file. ☒

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

Based on reviewed information, subsequent walk-down is: ☒ not warranted
☐ warranted

If warranted, subsequent walk-down has been performed and documented per DP-8854. ☐

-- OR --

The basis has been provided to and accepted by the FSS Project Manager for not performing a subsequent walk-down. ☐

A final classification has been performed. ☒

Classification: CLASS 1 ☒ CLASS 2 ☐ CLASS 3 ☐

DATA QUALITY OBJECTIVES (DQO)

1.0 Statement Of Problem

The problem is to demonstrate that plant operations or decommissioning activities did not result in an accumulation of plant-related radioactivity in survey unit OOL-08-05 that exceeds the release criteria.

Survey unit OOL-08-05 is a small portion of the hillside east of the Administration Building (Survey Area OMB-03) and is most readily accessed from the roadway to the ISFSI. This survey unit had previously been a part of Survey Area OOL-08 which, based on the Historical Site Assessment and the LTP, was a Class 3 area.

During decommissioning, the subject survey unit was used to stage soils prior to on-site treatment for PCB contamination. Some of this soil may have contained plant-related radioactivity, albeit in concentrations most likely below the applicable DCGLs. However, there is a potential that the staged soil may have contained small discrete solid pieces of material with a high specific activity. Therefore, it was necessary to partition this area

Final Status Survey Planning Worksheet
Page 2 of 10

from OOL-08-02, assign a new survey unit designation (i.e. OOL-08-05) and reclassify this survey unit as Class 1. OOL-08-05 is an open land survey unit approximately 610 m² in surface area.

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 LTP release criteria?

Alternative actions that may be employed are investigation, remediation and re-survey.

3.0 Identify The Inputs To The Decision

Inputs to the decision include various information that will be required for the decision making process. Such inputs are listed and discussed in Table 1.

TABLE 1, Decision Inputs

Sample media	Soil
Types of measurements	<ul style="list-style-type: none"> • Direct measurements via soil sampling • Biased soil sampling may be performed, at the discretion of the FSS Supervisor or FSS Radiological Engineer. Locations will be identified using the GPS and recorded on the Daily Survey Journal (DPF-8856.2). • Gamma scans using in-situ gamma spectroscopy.
Radionuclides-of-concern	<p>Based on characterization data published in the Site Historical Assessment (HSA), the only radionuclide consistently identified in eight characterization samples is Cs-137. One of the eight samples (OG008-016) exhibited low concentrations of Co-60 and Cs-134. Additional HSA characterization samples adjacent to sample location OG008-016 were found to contain only Cs-137 activity. This condition is evidence that the Cs-134 & Co-60 activity in sample OG008-016 is not indicative of the typical radionuclide mix in the survey unit. The Co-60, if decay corrected, is <5% of its DCGL_w and the Cs-134 is <2% of its DCGL_w. Based on the inconsistency of detection, low fractions of their respective DCGL, and absence in samples from surrounding locations, these 2 LTP nuclides are not considered constituents of a representative nuclide mixture for Survey Unit 08-05.</p> <p>Also, the characterization data (sample OG008-018) exhibited Zr-95, a non-LTP nuclide. Since the collection of this sample, 6 half-lives have passed; this nuclide is not expected to be present in any FSS soil sample.</p> <p>The HSA data do not include analyses for hard-to-detect radionuclides such as H-3, Sr-90, and trans-uranics (TRUs). However, gamma spectroscopy did not detect Am-241 in any of the characterization soil samples, suggesting that TRUs are not present. Hard-to-detect radionuclides (including TRUs) will be included in the assessment for this survey unit. Five percent of the FSS soil</p>

Final Status Survey Planning Worksheet
Page 3 of 10

	<p>samples will be sent to an off-site (independent) laboratory for complete analyses to include hard-to-detect radionuclides.</p> <p>Table 2 lists both gamma emitting and hard-to-detect radionuclides.</p>
DCGL _W	Table 2 lists the DCGL _W values for both gamma-emitting and hard-to-detect radionuclides based upon 8.73 mrem/yr.
DCGL _{SURR}	Surrogates will not be used in this survey plan
DCGL _{EMC}	DCGL _{EMC} values to be applied to in-situ gamma spectroscopy (ISOCS) conservatively assume elevated activity to be within a one meter-square area. If necessary, the DCGL _{EMC} values will be adjusted if an actual area of elevated concentration is discovered with a source area greater than one meter-square. Applicable DCGL _{EMC} values are listed in Table 2.
MDC	Minimum Detectable Concentrations (MDC) to be achieved during analyses of soil samples is 10% of the applicable DCGL _W . However, if the 10% value cannot be achieved a value of up to 50% of the applicable DCGL _W is acceptable. Nuclide-specific MDC values are listed in Table 2. Where hard-to-detect radionuclides are to be analyzed by an outside laboratory, appropriate MDC values from Table 2 will be communicated via the chain-of-custody form accompanying the FSS soil samples.
Soil Sample Investigation Levels	Investigations will be conducted at fixed measurement location concentrations that either exceed the DCGL _{EMC} (see Table 2) or exceed the DCGL _W and the result is a statistical outlier (i.e. 3σ above the average of all results).
Scan Survey Investigation Levels	Investigation levels for in-situ gamma spectroscopy are listed in Table 2. Multiplying the DCGL _{EMC} by an offset geometry adjustment factor of 0.065 derives these levels. This factor accounts for the potential that all of the activity may be situated in a one meter-square area situated at the edge of the detector's field-of-view. See Technical Report YA-REPT-00-018-05 for details concerning this factor. In cases where more than one radionuclide is identified, the results will be compared against unity (i.e. sum-of-fractions).
Scan Survey coverage	Scan surveys will be conducted to evaluate 100% of the survey area. The method for this evaluation is via in-situ gamma spectroscopy.
Nuclide Library	<p>The radionuclide library applied to in-situ gamma spectroscopy data will include all gamma-emitting radionuclides listed in Table 2.</p> <p>Note: radionuclides identified as hard-to-detect are not included in nuclide libraries for in-site gamma spectroscopy.</p>
QC Measurements	<ul style="list-style-type: none"> • QC checks for the Leica GPS will be performed in accordance with DP-8859, as applicable. • One QC split sample will be collected in accordance with DP-8852, "Final Status Survey Quality Assurance Project Plan (QAPP)" requirements. The sample location number for the split sample has been chosen at random from the 16 random samples. • One QC recount sample will be performed and counted by the YNPS Chemistry Lab in accordance with DP-8852 and the results compared. • Two QC Blank samples will be collected from uncontaminated soil. The blank samples will be prepared and analyzed using routine methods in accordance with procedure DP-8852.

Final Status Survey Planning Worksheet
Page 4 of 10

	<ul style="list-style-type: none"> • The YNPS Chemistry Lab, in accordance with procedure DP-8852, will analyze one QC Spike Sample.
QC Checks For Field Instruments	QC checks for in-situ gamma spectroscopy detectors will be performed in accordance with procedure DP-8871.

TABLE 2, Nuclide-Specific Parameters

NUCLIDE	SOIL DCGL _w ¹ (pCi/g)	AREA FACTOR ²	SOIL DCGLEMC ³ (pCi/g)	INVESTIGATION LEVEL ⁴ (pCi/g)	MINIMUM DETECTABLE CONCENTRATION ⁵	
					(10% DCGL _w)	(50% DCGL _w)
Co-60	1.4	11	15	1.0	0.14	0.70
Nb-94	2.5	9.3	23	1.5	0.25	1.25
Ag-108m	2.5	9.2	23	1.5	0.25	1.25
Sb-125	11	9.1	100	6.5	1.1	5.5
Cs-134	1.7	16	27	1.8	0.17	0.85
Cs-137	3.0	22	66	4.3	0.3	1.5
Eu-152	3.5	9.4	33	2.1	0.36	1.8
Eu-154	3.3	9.6	32	2.1	0.33	1.65
Eu-155	140	8	1100	73	14	70
H-3 *	130				13	65
C-14 *	1.9				0.19	0.95
Fe-55 *	10000				1000	5000
Ni-63 *	280				28	140
Sr-90 *	0.6				.06	0.3
Tc-99 *	5.0				0.5	2.5
Pu-238 *	12				1.2	6.0
Pu-239, 240 *	11				1.1	5.5
Pu-241 *	340				34	170
Am-241 *	10				1.0	5.0
Cm-243, 244 *	11				1.1	5.5

Final Status Survey Planning Worksheet
Page 5 of 10

- * – Nuclide is considered hard-to-detect. Required evaluations are performed via analyses of soil samples.
- 1 – The listed DCGL_W concentrations are for 8.73 mrem/year (at two significant digits). Note that this table reflects those radionuclides listed in Table 2-6 of the LTP.
- 2 – Area Factors for a one-meter square area, as published in the Appendix 6Q of the LTP.
- 3 – DCGL_{EMC} values are derived by multiplying the DCGL_W by the applicable area factor. For in-situ gamma spectroscopy, the area factor for a one-meter square area is used.
- 4 – Nuclide-specific investigation levels are applicable to in-situ gamma spectroscopy. These levels are derived by multiplying the surrogated DCGL_{EMC} by an off-set geometry adjustment factor of 0.065. This factor accounts for the potential that all of the activity may be within a one-meter square area situated at the edge of the detector's field-of-view. See Technical Report YA-REPT-00-018-05 for the development and application of the off-set geometry adjustment factor. If other LTP-listed gamma-emitting radionuclides are identified during in-situ assays, investigation levels will be derived using the methodology described in the Technical Report.
- 5 – The Minimum Detectable Concentration (MDC) to be achieved during analyses of soil samples is 10% of the applicable DCGL_W. However, if it is impractical to achieve 10% of the DCGL_W, an alternate MDC value of up to 50% of the DCGL_W is acceptable.

4.0 Define The Boundaries Of The Survey

Survey Unit OOL-08-05 is located outside of the RCA directly west of the location of the (former) Reactor Support Structure. It is bounded by Survey Unit OOL-08-02 on the north, south and west sides and by the ISFSI Road (Survey Area OOL-10) on the east.

Surveying of OOL-08-05 will be performed when weather conditions will not adversely affect the data acquisition.

5.0 Develop A Decision Rule

If all sample data demonstrate that concentrations of plant-related nuclides in the soil are below the DCGLs (i.e. the sum-of-fractions for these nuclides are less than unity), then reject the null hypothesis because the survey unit meets the release criteria.

If the investigation levels are exceeded, perform an investigation survey. This may include the use of a statistical test.

If the average of the direct measurements is below the DCGL_W, but some individual measurements exceed the DCGL_W, then apply the Sign statistical test as the basis for accepting or rejecting the null hypothesis.

If the average concentration exceeds the DCGL_W then accept the null hypothesis (i.e. the survey unit does not meet the release criteria).

6.0 Specify Tolerable Limits On Decision Errors

Null Hypothesis – The null hypothesis (H_0), as required by MARSSIM, is stated and tested in the negative form: "Residual licensed radioactive materials in the survey unit exceeds the release criterion."

Probability of type I (α) error	0.05%
Probability of type I (β) error	0.05%
Adjusted LBGR	2.98

7.0 Optimize Design

Type Of Statistical Test – ☐ WRS Test
☒ Sign Test
Background to be Applied – ☐ Media-Specific
☐ Ambient
☒ None

If WRS test is specified, record bkgd reference area location: N/A

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

Number Of Direct Measurements: 16 direct measurement soil samples will be taken using a triangular grid laid out from a random starting point.

INSTRUCTIONS

Collect 16 random 1-liter FSS soil samples and 2 biased 1-liter soil samples in accordance with procedure DP-8120, using sampling equipment as stated in procedure DP-8120. Two of the 16 FSS soil samples will be QC split samples.

Soil sample designation is as follows:

- FSS soil samples: OOL-08-05- 001 -F through OOL-08-05-016-F.
- Biased FSS soil sample: OOL-08-05- 017 -F-B through OOL-08-05- 018 -F-B.
- Two QC split samples: OOL-08-05- 001 -F-S and OOL-08-05- 013 -F-S. These will be analyzed for hard-to-detect nuclides, in addition to being analyzed by gamma spectroscopy.
- The gamma spectroscopy results from off-site laboratories will be compared with the on-site results in accordance with procedure DP-8864.
- Two samples (OOL-08-05- 006 -F-RC and OOL-08-05- 014 -F) will be re-counted on site. The results will be compared in accordance with DP-8864.

All soil samples will be handled and prepared in accordance with procedure DP-8813.

A Chain of Custody form (DPF-8123.1) will be used in accordance with procedure DP-8123 for the two QC split samples sent to an off-site laboratory.

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

Locations determined to be not suitable for soil sampling (e.g. due to rock or ledge, etc.), will be relocated in accordance with procedure DP-8856 and documented in the log.

Operation of the E-600 w/SPA-3 will be in accordance with procedure DP-8535. QC checks shall be performed in accordance with procedure DP-8540. The instrument response checks shall be performed before issue and after use.

The job hazards associated with the FSS in Survey Unit OOL-08-05 are addressed in the accompanying JHA for NOL-06-02.

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

SPECIFIC INSTRUCTIONS

Designations of survey points including investigations are as follows.

ISOCS

- Start with OOL-08-05-100-F-G and increment as needed.
- For investigations, append applicable measurement identifier. For example, if ISOCS point OOL-08-05-123-F-G is to be investigated, use OOL-08-05-123-F-I-G-001 for the first ISOCS investigation survey of ISOCS point number 123.

Soil Samples

- Start with OOL-08-05-001-F and increment the soil sample number as needed.
- For soil sample recounts, append “-RC” as follows: If, for example, soil sample OOL-08-05-016-F is to be recounted, use OOL-08-05-016-F-RC.
- For soil sample splits, append “-S” as follows: If, for example, soil sample OOL-08-05-014-F is to be split, use OOL-08-05-014-F-S.
- For soil sample investigations, append terms as follows: If, for example, soil sample OOL-08-05-014-F is to be investigated:
 - Use OOL-08-05-014-F-I-G-001 for the first ISOCS investigatory survey of soil sample number 014.
 - Use OOL-08-05-014-F-I-SC-001 for the first SPA-3 investigatory scan of soil sample number 014.
 - Use OOL-08-05-025-F-I for the first investigatory soil sample of soil sample number 014. NOTE that this is an incremented number with the “I” appended.

Alternate or additional measurement or sample designations will be determined by the FSS Engineer and shall be reflected in the log.

Collect soil samples at the 16 locations specified on the map, as well as biased locations as directed by the FSS Engineer.

- Soil samples are collected in accordance with DP-8120. Remove extraneous vegetation, debris, rocks, etc prior to placing the soil into the one-liter marinelli beaker.
- Soil samples are to be received and prepared in accordance with DP-8813.
- Soil samples are to be analyzed onsite for easy-to-detect nuclides and associated MDCs as listed in Table 1 above.

- 1.1. Two soil samples (OOL-08-05-006-F and OOL-08-05-014-F) will be counted twice and the results evaluated in accordance with DP-8864.

Final Status Survey Planning Worksheet
Page 8 of 10

- 1.2. Two soil samples (OOL-08-05-001-F and OOL-08-05-013-F) will be split:
 - 1.2.1. The results will be evaluated in accordance with DP-8864.
 - 1.2.2. The Chain-of-Custody will be maintained in accordance with DP-8123.
- 1.3. Send the following soils to the offsite lab for analysis of hard-to-detect nuclides and associated MDCs as listed in Table 2 above.
 - 1.3.1. The split soil samples specified above. Do not dry split samples sent off-site for analysis.
- 1.4. The direct measurement locations may be identified using GPS.
 - 1.4.1. If the location cannot be determined directly using GPS, an offset will be used to describe the distance and bearing from a known GPS location.
 - 1.4.2. Each location will be marked either prior to or at the time of the sampling.
 - 1.4.3. The FSS Radiological Engineer or FSS Field Supervisor will guide the FSS Technician to the sample locations as necessary.
2. Scan 100% of the soil area using ISOCS at a 1m height with 180-degree open collimation at the locations specified on the ISOCS map.
 - 2.1. Operation of the Portable ISOCS will be in accordance with DP-8871, with QC checks performed once per shift in accordance with DP-8869 and DP-8871. Resolve flags encountered prior to survey.
 - 2.2. Lay out the grid by placing parallel rows of markers forming a square pattern at a maximum distance of 4.0 m apart and a maximum of 2.0 m from the edge of each surface area.
 - 2.2.1. As a prerequisite for scan grid point count acquisition, ensure all standing water, ice, and/or snow has been removed from the scan field of view. Incidental amounts of moisture occurring during the acquisition such as rain or snow are acceptable, since the short duration of a count (600 seconds) should not accumulate significant absorber interference.
 - 2.2.2. Angle the detector as necessary perpendicular to the scan surface and perform an analysis in accordance with DP-8871 using a preset count time sufficient to meet the MDAs referenced in the survey plan.
 - 2.2.3. Using the 180-degree open collimation configuration, position the ISOCS detector directly above (perpendicular to the reference plane) each marker 1m from the surface to be scanned.
 - 2.2.4. Add additional scan points closer than 4.0 m apart as necessary to achieve 100% unit survey coverage, however, a fully documented GPS survey coordinate survey is required for any additional ISOCS scan points.
 - 2.2.5. In deep holes, ISOCS may be used to survey vertical or sloping surfaces. As with horizontal surfaces, the ISOCS should be positioned perpendicularly 1m from the surface.
 - 2.2.6. For areas where concrete walls or berms exist in the field of view, estimate the percentage of concrete in the field of view and record on the log sheet.
 - 2.2.7. For areas with saturated soil, such as low points of mud holes, estimate the percentage of saturated soil in the field of view and record on the log sheet. Note: Investigation levels will be reduced on these locations by 20% per guidance in YA-REPT-00-018-05 Rev 0 to account for matrix moisture attenuation effects.

Final Status Survey Planning Worksheet
Page 9 of 10

- 2.3. Review the report ensuring that the MDAs have been met.
- 2.4. Review the report for identified nuclides and compare values against the $DCGL_{EMC}$.
3. Operation of the E-600 will be in accordance with DP-8535
 - 3.1. QC checks will be performed in accordance with DP-8540.
 - 3.2. Resolve flags encountered prior to survey.
4. All personnel participating in this survey shall be trained in accordance with DP-8868.
5. If an ISOCS measurement needs to be investigated, obtain additional radiological data as follows.
 - 5.1. Scan the ISOCS footprint with a SPA-3 at approximately 3" or less per second in rate-meter mode with audible on.
 - 5.2. If the SPA-3 background exceeds 20,000 cpm contact the FSS Engineer.
 - 5.3. Mark the boundaries around any detected elevated areas in the soil.
 - 5.4. Identify the boundaries on the survey map.
 - 5.5. Measure the total area of each outlined area in square centimeters.
 - 5.6. Indicate on the map and the actual location the highest identified activity among all of the elevated areas.
 - 5.7. Indicate the highest reading on the map for each elevated area.
 - 5.8. At the highest reading in each elevated area:
 - 5.8.1. First, perform and record a SPA-3 reading.
 - 5.8.2. Second, obtain a soil sample at that location.
 - 5.8.3. Third, obtain a second SPA-3 reading in the same location and manner as the first.
 - 5.9. Re-perform the ISOCS measurement.
6. If a direct measurement needs to be investigated, obtain additional radiological data as follows.
 - 6.1. Review ISOCS data that may or may not confirm that the soil sample direct measurement was in fact above the investigation level. Because direct measurement locations are usually not coincidentally directly below an ISOCS shot, one or more ISOCS shots may indicate the need to investigate a single or multiple direct measurement locations.
 - 6.2. Scan a 2-meter radius footprint around the direct measurement location using a SPA-3 at approximately 3" or less per second in rate-meter mode with audible on.
 - 6.3. If the background exceeds 20,000 cpm contact the FSS Engineer.
 - 6.4. Mark the boundaries around any detected elevated areas in the soil.
 - 6.5. Identify the boundaries on the survey map.
 - 6.6. Measure the total area of each outlined area in square centimeters.
 - 6.7. Indicate on the map and the actual location the highest identified activity among all of the elevated areas.
 - 6.8. Indicate the highest reading on the map for each elevated area.
 - 6.9. At the highest reading in each elevated area:
 - 6.9.1. First, perform and record a SPA-3 reading.

Final Status Survey Planning Worksheet
Page 10 of 10

- 6.9.2. Second, obtain a soil sample at that location.
 - 6.9.3. Third, obtain a second SPA-3 reading in the same location and manner as the first.
 - 6.10. Obtain a second soil sample around and below the hole from where the first soil sample was obtained.
 - 6.11. Re-perform the ISOCS measurement.
 - 7. Document investigative actions on DPF-8856.2.
 - 8. Upon completion of the survey:
 - 8.1. Verify that MDAs have been met.
 - 8.2. Assess nuclides listed in the LTP through the use of the unity rule.
- Perform an investigation as indicated by the results of the actions listed above.

NOTIFICATION POINTS

FSI point(s) (Y/N) N

FSS Radiological Engineer Signature/Date

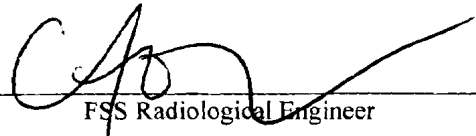
1 –

2 –


SIGN-OFFS

Prepared by 
FSS Radiological Engineer

Date 5/7/06

Reviewed by 
FSS Radiological Engineer

Date 9 May 2006

Approved by 
FSS Project Manager

Date 5/10/06

GENERAL SECTION

Survey Area No.: OOL-08 Survey Unit No.: 06

Survey Unit No.: 06

Survey Unit Name: North Inner Exclusion Zone

FSSP No.: YNPS-FSSP-OOL-08-06-01 (Changes in bold)

PREPARATION FOR FSS ACTIVITIES

Check marks in the boxes below signify affirmative responses and completion of the action.

X

X

X

X

X

warranted

X

DATA QUALITY OBJECTIVES (DQO)	
1. Define the problem	What is the problem? What are the data quality objectives (DQOs)?
2. Develop a data quality plan	What data are needed? How will the data be collected? How will the data be analyzed?
3. Collect the data	What data are needed? How will the data be collected? How will the data be analyzed?
4. Analyze the data	What data are needed? How will the data be collected? How will the data be analyzed?
5. Report the results	What data are needed? How will the data be collected? How will the data be analyzed?

1.0 State the problem:

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

Members of the planning team: FSS Project manager, Radiological Engineer, Field Supervisor, and Technicians.

Primary decision maker/method: FSS Radiological Engineer with concurrence of the FSS Project Manager.

Available resources/deadlines: N/A

Concise description of problem: Release of OOL-08-06 to demonstrate compliance with YNPS LTP release criterion.

2.0 Identify the decision:

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

Principal study question: Is the residual radioactivity in OOL-08-06 below the 8.73 mrem/yr release criterion?

Alternative actions: If residual radioactivity in OOL-08-06 exceeds the 8.73 mCi/yr release criterion, investigations will be performed, potentially resulting in remediation, reclassification or resurveys.

Decision statement: Determine whether or not OOL-08-06 satisfies the 8.73 mr/yr release criterion.

3.0 Identify the inputs to the decision:

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

Sources of information: 200 samples from historical data was sufficient to develop the DQOs for OOL-08-06.
20 new data measurements will be acquired to support DOAs.

Direct measurement technique: Soil samples will be collected and analyzed on site for all ETD LTP listed radionuclides, 1 sample will be sent to an independent lab for analyses of all LTP listed radionuclides.

Scan measurement technique: Surfaces will be scanned via a SPA-3 probe, and/or ISOCS Assays.

Sample matrix: Soil

Radionuclide(s) of concern: Based on a review of YNPS historical data, the following radionuclides are the only facility related radionuclides of concern: Co-60, Cs-137

Sample Quantity 15 (calculated) + 5 (added), for a total of 20 samples. (+1 QC)

Gridded Sample Area Size 421.75 m² (Survey Unit Area/N)

Sample Grid Spacing: Triangular: 22.1m

Survey Area No.:	OOL-08	Survey Unit No.:	06
Survey Unit Name: North Inner Exclusion Zone			
FSSP No.:	YNPS-FSSP-OOL-08-06-01 (Changes in bold)		
Detection Limits:	For direct measurements and sample analyses, Minimum Detectable Concentrations (MDCs) less than 10% of the DCGL are preferred, while MDCs up to 50% of the DCGL are acceptable. See Attachment 2 for MDC Table.		
MDC (fDCGL):	The accompanying MDCR/MDC table in Attachment 1 provides MDC values, as a fraction of DCGL, for various background levels.		
MDCR(surveyor):	The accompanying MDCR/MDC table in Attachment 1 provides MDCR values for various background levels.		
Background Measurements:	No reference area (background) measurements are required, the Sign Test will be used.		
Release criteria DCGL based on:	8.73 mr/yr for Soil. See Attachment 2 for radionuclide specific breakdown of DCGLs.		
4.0 Define the boundaries of the survey:			
Define the spatial and temporal boundaries that will be covered by the decision statement so data can be easily interpreted.			
Temporal boundaries:	The data are used to reflect the condition of radionuclides leaching into the ground water over a period of 1,000 years. The survey may be performed under appropriate weather conditions (as defined by instrument tolerance and personnel safety) on any shift of work.		
Spatial Boundaries:	YNPS has been divided into multiple survey areas and units with relatively homogeneous characteristics based on information collected during the years of facility operation, the HSA, and post remediation activities. The area of interest has been named OOL-08, and the survey unit is 06. The medium of interest is described as Soil. The radiological characteristics of this unit classify it as a Class 2 area. Which has > 2,000 m2, ≤ 10,000 m2 as a surface area limit. The total surface area is 8435 m2, which is well within the > 2,000 m2, ≤ 10,000 m2 limit. The maximum length is 139.3m, and the maximum width is 79.7m. Soil is surveyed to a depth of 15 cm.		
Detailed description of unit:	See included GPS coordinates and maps that demonstrate the measurement locations, the survey unit boundaries and unit relationship to site. Survey Unit OOL-08-06 is located adjacent to the west side of the industrial area of the site. It is bounded on the east by OOL-10-1, on the south by OOL-08-02, on the west by OOL-08-01 and on the north by OOL-02-03. The Y-177 power line runs overhead from north to south. There is an abandoned buried electrical conduit that provided power to the Admin. Building and the potable water pump house. There are two electrical manholes located along this run of conduit, one at the top of the hill in front of the Admin. Building footprint and a second located in a level area under the Y-177 power line up slope and south of the electrical switchyard. A potable water line crosses the survey unit from east to west. Survey Unit OOL-08-05, a class 1-survey unit is located adjacent to OOL-08-06. The soil in OOL-08-06 consists of soil essentially un-disturbed since plant construction. The surface is tree covered with large rocks present along the western side hill portion. The surface under the power line is covered with brush and some large rocks.		
5.0 Develop a decision rule:			
Define the parameter of interest, specify action levels, and the DCGL.			
Investigation Levels:	If an investigation level below is exceeded, then perform an investigation survey.		
Direct measurements:	> DCGLw		
Scan measurements:	> DCGLw or > MDC		
Parameter of interest:	If there are no investigation issues, and the the residual radioactivity in OOL-08-06 systematic samples is less than the DCGLw then the survey unit is in compliance with the release criterion (8.73 mr/yr).		
Critical Value:	If the average concentration is less than DCGLw, the sum of fractions is less than 1, and less than 6 of the 20 samples are above the DCGLw, the Survey Units passes.		

Survey Area No.: OOL-08	Survey Unit No.: 06
Survey Unit Name: North Inner Exclusion Zone	
FSSP No.: YNPS-FSSP-OOL-08-06-01 (Changes in bold)	
6.0 Specify limits on decision errors:	
Specify the decision maker's limits on decision errors, used to establish performance goals for the data collection design.	
<i>Null Hypothesis (H_0):</i>	The residual radioactivity in the survey unit data is greater than the DCGLw
<i>Alternative Hypothesis (H_a):</i>	The residual radioactivity in the survey unit data is less than the DCGLw
<i>Tolerance for Error:</i>	Type I Error: 0.05 (probability of rejecting the null hypothesis when it is true.) Type II Error: 0.05 (probability of accepting the null hypothesis when it is false.)
<i>DCGLw (Unity):</i>	1
<i>LBGR:</i>	0.683 (Initial LBGR: 0.5)
<i>Relative shift (Δ/σ):</i>	2
<i>Sigma (σ):</i>	0.1585
<i>Power of survey design:</i>	See attachment for prospective power curve.
7.0 Optimize Design:	
Type of statistical test: (background will not be subtracted)	WRS Test _____ Sign Test <u> X </u>
Design optimization is included in the DQO process, and reflected in the data published in this plan.	
<i>Number & Location of Samples:</i>	20 Soil samples will be collected at locations based on a random start, systematic Triangular grid (refer to accompanying DPF-8853.2). See map for specific locations.
GENERAL INSTRUCTIONS	
<ol style="list-style-type: none"> 1 Where possible, measurement locations will be identified using GPS in accordance with DP-8859. Each location will be marked to assist in identifying the location. 2 Soil samples will be collected in accordance with DP-8120. 3 Chain of Custody form will be used in accordance with DP-8123 for all soil samples sent to an off-site laboratory. 4 All soil samples will be received and prepared in accordance with DP-8813. Note: Split samples to be sent to an off-site lab will not be dried prior to counting on site or shipping. 5 Survey instrument: Operation of the E-600 w/SPA-3 will be in accordance with DP-8535 with QC checks performed in accordance with DP-8504. The instrument response checks shall be performed before issue and after use. 6 All SPA-3 scans will be performed with the audible feature activated. Listen for upscale readings and respond by slowing down or stopping the probe to distinguish between random fluctuations in the background and greater than background readings. Investigate any reproducible upscale readings as described in the specific instructions. 7 The job hazards associated with the survey described in this package are addressed in the accompanying Job Hazard Assessment (JHA) for OOL-08-06. 8 All personnel participating in this survey shall be trained in accordance with DP-8868. 9 Collect ISOCS measurements in accordance with DP-8871 to provide at least 10% (843.5 m2) scan coverage of the survey unit. 	
SPECIFIC INSTRUCTIONS	
<ol style="list-style-type: none"> 1 <i>SPA-3 Scans:</i> <ul style="list-style-type: none"> • Move the SPA-3 in rate-meter mode at a speed of 0.25m or less per second, keeping the probe at a distance of $\leq 3''$ from the surface and following a serpentine path that includes at least 3 passes across each square meter. • 2 <i>Scan Investigations:</i> <p>Note: Detailed descriptions of investigation actions shall be recorded in the daily survey journal (DPF-8856.2) and locations marked on a map.</p> <ul style="list-style-type: none"> • Scan a 1m radius footprint around the investigation location in accordance with the scan requirements above. The area of scan should be increased as necessary to bound any areas of elevated activity identified. Perform a sample investigation as noted below. 	

Survey Area No.: OOL-08

Survey Unit No.: 06

Survey Unit Name: North Inner Exclusion Zone

FSSP No.: YNPS-FSSP-OOL-08-06-01 (**Changes in bold**)

3 *Sample Locations:*

All designated measurement locations will be identified by GPS per DP-8859 or by use of reference points, tape measure and compass as necessary. If a designated sample location is obstructed for any reason, the FSS Radiological Engineer or the FSS Field Supervisor will select an alternate location in accordance with DP-8856. A detailed description of the alternate location will be recorded on form DPF-8856.2, the survey unit map will be annotated appropriately, and the alternate location will be conspicuously marked to facilitate re-visiting to identify and record the coordinates with GPS in accordance with DP-8859 or by measurement from a known reference point when a GPS is not available.

4 *Sample Requirements:*

Collect 20 samples in accordance with DP-8120. 1 of the 20 samples will be analyzed as a QC split sample to fulfill the QC requirement of DP-8852. The same QC split sample will be analyzed for HTD nuclides in accordance with section 5.6.3.2.1 of the LTP and DP-8856.

Biased samples:

No biased samples will be collected.

5 *Sample Designation:*

FSS soil samples:

OOL-08-06-001-F through OOL-08-06-020-F corresponding to FSS sample locations 001 through 020.

Biased soil samples:

No biased samples will be collected.

QC split samples:

OOL-08-06-007-F-S is to be designated as QC split sample. This sample will be sent to the off-site laboratory (do not dry).

Recount samples:

OOL-08-06-006-F-RC will be counted twice on site. The results will be compared in accordance with DP-8864.

6 *Sample Analysis:*

- Gamma analysis will be performed on all soil samples. If any of the gamma analyses show that an investigation level has been exceeded an investigation survey will be conducted at that sample location as directed by the radiological engineer.
- YNPS Chemistry will analyze OOL-08-06-001-F through OOL-08-06-020-F for gamma-emitting nuclides.
- YNPS Chemistry will analyze OOL-08-06-006-F as a sample recount. The recounted sample will possess the naming convention OOL-08-06-006-F-RC.
- YNPS Chemistry will analyze OOL-08-06-007-F-S for gamma-emitting nuclides prior to being sent to the off-site laboratory. These samples will be analyzed for gamma-emitting nuclides and HTD at the off-site laboratory.
- All gamma analysis of the FSS samples shall achieve the MDC values stated in the DQO section of this plan. The MDC's will be communicated to the laboratory using an attachment to the Chain-of- Custody form.

7 *ISOCS Assays:*

- Collect at least 67 ISOCS measurements in accordance with DP-8871 to provide at least 10% (843.5 m2) scan coverage of the survey unit. Concentrate ISOCS scan measurements in accessible areas along the east and west boundaries.
- ISOCS assays are designated as OOL-08-06-xxx -F-G where "xxx" continues sequentially from the last number assigned to an FSS measurement.
- QC checks shall be performed at least once per **day** in accordance with DP-8869 and DP-8871. Resolve flags encountered prior to survey.
- ISOCS assays to be performed with 90° collimator at 2m unless otherwise directed by the FSS Engineer. Make note on the daily survey journal (DPF-8856.2) if other geometries are used.
- For ISOCS assay position the detector downward facing keeping the detector perpendicular to the ground.
- Document ISOCS scan measurement locations on map titled "ISOCS Scans". Designate additional assay locations in continuing sequence from the last number assigned to an FSS measurement. Record detailed information about additional assay locations on the daily survey journal.

Survey Area No.: OOL-08	Survey Unit No.: 06
Survey Unit Name: North Inner Exclusion Zone	
FSSP No.: YNPS-FSSP-OOL-08-06-01 (Changes in bold)	
<ul style="list-style-type: none"> • Remove standing water prior to performance of ISOCS assays. Contact the FSS Engineer for directions if conditions are such that standing water cannot be removed. • If the results on any ISOCS assay indicate plant related radionuclides, investigate the area within the field of view (4m diameter, 12.6 m2 area) for that assay. <p>Investigation may include qualitative use of ISOCS performed by suspending the detector 1 meter from the reference plain with the 90° colimator in place. The original scan area will be rescanned in 4 quadrants.</p> <p>The isolated quadrant (3.14m2) with positive indications of plant related nuclides will be investigated using a shielded SPA-3 scan method as defined in steps 1 & 2 of this section.</p>	

Prepared by Ron Shippee *Ronald Shippee*
FSS Radiological Engineer

Date August 7, 2006

Reviewed by Rennback *ML*
FSS Radiological Engineer

Date 8-7-06

Approved by Martin Erickson *Mate C. Erickson*
FSS Project Manager

Date 8/7/06

100

GENERAL SECTION	
Survey Area No.: OOL-08	Survey Unit No.: 07
Survey Unit Name: Southern End of West Inner Exclusion Zone Subdivision	
FSSP No.: YNPS-FSSP-OOL-08-07-00	
PREPARATION FOR FSS ACTIVITIES	
Check marks in the boxes below signify affirmative responses and completion of the action.	
1.1 Files have been established for survey unit FSS records.	<u> X </u>
1.2 ALARA review has been completed for the survey unit.	<u> X </u>
1.3 The survey unit has been turned over for final status survey.	<u> X </u>
1.4 An initial DP-5554 walk down has been performed and a copy of the completed Survey Unit Walk down Evaluation is in the survey area file.	<u> X </u>
1.5 Activities conducted within area since turnover for FSS have been reviewed.	<u> X </u>
Based on reviewed information, subsequent walk down: <u> X </u> not warranted <u> </u> warranted	
If warranted, subsequent walk down has been performed and documented per DP-8854.	<u> </u>
OR	
The basis has been provided to and accepted by the FSS Project Manager for not performing a subsequent walk down.	<u> </u>
1.6 A final classification has been performed.	<u> X </u>
Classification: Class 1	
DATA QUALITY OBJECTIVES (DQO)	
1.0 State the problem:	
Define the problem so that the focus of the survey will be unambiguous.	
<i>Members of the planning team:</i>	FSS Project manager, Radiological Engineer, Field Supervisor, and Technicians.
<i>Primary decision maker/method:</i>	FSS Radiological Engineer with concurrence of the FSS Project Manager.
<i>Available resources/deadlines:</i>	N/A
<i>Concise description of problem:</i>	Release of OOL-08-07 to demonstrate compliance with YNPS LTP release criterion.
2.0 Identify the decision:	
Define the question that the survey will attempt to resolve and identify alternative actions that may be taken based on the outcome of the survey.	
<i>Principal study question:</i>	Is the residual radioactivity in OOL-08-07 below the 8.73 mr/yr release criterion?
<i>Alternative actions:</i>	If residual radioactivity in OOL-08-07 exceeds the 8.73 mr/yr release criterion, investigations will be performed, potentially resulting in remediation, reclassification or resurveys.
<i>Decision statement:</i>	Determine whether or not OOL-08-07 satisfies the 8.73 mr/yr release criterion.
3.0 Identify the inputs to the decision:	
Informational inputs needed to resolve the decision statement and environmental variables that will be measured.	
<i>Sources of information:</i>	201 samples from historical data was sufficient to develop the DQOs for OOL-08-07. 15 new data measurements will be acquired to support DQAs.
<i>Direct measurement technique:</i>	Soil samples will be collected and analyzed on site for all ETD LTP listed radionuclides, 1 sample will be sent to an independent lab for analyses of all LTP listed radionuclides.
<i>Scan measurement technique:</i>	Surfaces will be scanned via a SPA-3 probe.
<i>Sample matrix:</i>	Soil
<i>Radionuclide(s) of concern:</i>	Based on a review of YNPS historical data, the following radionuclides are the only facility related radionuclides of concern: Co-60, Cs-137
<i>Sample Quantity</i>	15 (calculated) + 0 (added), for a total of 15 samples. (+1 QC)
<i>Gridded Sample Area Size</i>	38.13 m2 (Survey Unit Area/N)
<i>Sample Grid Spacing:</i>	Triangular: 6.6m

Survey Area No.: OOL-08		Survey Unit No.: 07	
Survey Unit Name: Southern End of West Inner Exclusion Zone Subdivision			
FSSP No.:		YNPS-FSSP-OOL-08-07-00	
<i>Detection Limits:</i>		For direct measurements and sample analyses, Minimum Detectable Concentrations (MDCs) less than 10% of the DCGL are preferred, while MDCs up to 50% of the DCGL are acceptable. See Attachment 2 for MDC Table.	
<i>MDC (fDCGL_{emc}):</i>		The accompanying MDCR/MDC table in Attachment 1 provides MDC values, as a fraction of DCGL _{emc} , for various background levels.	
<i>MDCR(surveyor):</i>		The accompanying MDCR/MDC table in Attachment 1 provides MDCR values for various background levels.	
<i>Background Measurements:</i>		No reference area (background) measurements are required, the Sign Test will be used.	
<i>Release criteria DCGL based on:</i>		8.73 mr/yr for Soil. See Attachment 2 for radionuclide specific breakdown of DCGLs.	
4.0 Define the boundaries of the survey:			
Define the spatial and temporal boundaries that will be covered by the decision statement so data can be easily interpreted.			
<i>Temporal boundaries:</i>		The data are used to reflect the condition of radionuclides leaching into the ground water over a period of 1,000 years. The survey may be performed under appropriate weather conditions (as defined by instrument tolerance and personnel safety) on any shift of work.	
<i>Spatial Boundaries:</i>		YNPS has been divided into multiple survey areas and units with relatively homogeneous characteristics based on information collected during the years of facility operation, the HSA, and post remediation activities. The area of interest has been named OOL-08, and the survey unit is 07. The medium of interest is described as Soil. The radiological characteristics of this unit classify it as a Class 1 area. Which has $\leq 2,000$ m ² as a surface area limit. The total surface area is 572 m ² , which is well within the $\leq 2,000$ m ² limit. The maximum length is 28m, and the maximum width is 11m. Soil is surveyed to a depth of 15 cm.	
<i>Detailed description of unit:</i>		See included GPS coordinates and maps that demonstrate the measurement locations, the survey unit boundaries and unit relationship to site. Survey Unit OOL-08-07 represents the portion of Survey Unit OOL-08-02 which exhibited Cesium values equal to the DCGL _w . Since the Classification of OOL-08-02 was a Class 2, a portion of the original survey unit was "carved out" and reclassified a Class 1 survey unit. Scanning and fixed-point sampling in the remainder of OOL-08-02 indicated that the area covered by this survey plan (OOL-08-07) is the only portion of OOL-08-02 where cesium levels approaching DCGL _w exist. The survey unit is covered with dense overgrowth with large rocks present or is tree covered.	
5.0 Develop a decision rule:			
Define the parameter of interest, specify action levels, and the DCGL.			
<i>Investigation Levels:</i>		If an investigation level below is exceeded, then perform an investigation survey.	
<i>Direct measurements:</i>		> DCGL _{emc} or > DCGL _w + 3 Sigma	
<i>Scan measurements:</i>		> DCGL _{emc}	
<i>Parameter of interest:</i>		If there are no investigation issues, and the the residual radioactivity in OOL-08-07 systematic samples is less than the DCGL _w then the survey unit is in compliance with the release criterion (8.73 mr/yr).	
<i>Critical Value:</i>		If the average concentration is less than DCGL _w , the sum of fractions is less than 1, and less than 4 of the 15 samples are above the DCGL _w , the Survey Units passes.	

Survey Area No.: OOL-08	Survey Unit No.: 07
Survey Unit Name: Southern End of West Inner Exclusion Zone Subdivision	
FSSP No.: YNPS-FSSP-OOL-08-07-00	
6.0 Specify limits on decision errors:	
Specify the decision maker's limits on decision errors, used to establish performance goals for the data collection design.	
<i>Null Hypothesis (H_0):</i>	The residual radioactivity in the survey unit data is greater than the DCGLw
<i>Alternative Hypothesis (H_a):</i>	The residual radioactivity in the survey unit data is less than the DCGLw
<i>Tolerance for Error:</i>	Type I Error: 0.05 (probability of rejecting the null hypothesis when it is true.) Type II Error: 0.05 (probability of accepting the null hypothesis when it is false.)
<i>DCGLw (Unity):</i>	1
<i>LBGR:</i>	0.6802 (Initial LBGR: 0.5)
<i>Relative shift (Δ/σ):</i>	2
<i>Sigma (σ):</i>	0.1599
<i>Power of survey design:</i>	See attachment for prospective power curve.
7.0 Optimize Design:	
Type of statistical test:	WRS Test _____ Sign Test <u> X </u>
(background will not be subtracted)	
Design optimization is included in the DQO process, and reflected in the data published in this plan.	
<i>Number & Location of Samples:</i>	15 Soil samples will be collected at locations based on a random start, systematic Triangular grid (refer to accompanying DPF-8853.2). See map for specific locations.
GENERAL INSTRUCTIONS	
<ol style="list-style-type: none"> 1 Where possible, measurement locations will be identified using GPS in accordance with DP-8859. Each location will be marked to assist in identifying the location. 2 Soil samples will be collected in accordance with DP-8120. 3 Chain of Custody form will be used in accordance with DP-8123 for all soil samples sent to an off-site laboratory. 4 All soil samples will be received and prepared in accordance with DP-8813. Note: Split samples to be sent to an off-site lab will not be dried prior to counting on site or shipping. 5 Survey instrument: Operation of the E-600 w/SPA-3 will be in accordance with DP-8535 with QC checks performed in accordance with DP-8504. The instrument response checks shall be performed before issue and after use. 6 All SPA-3 scans will be performed with the audible feature activated. Listen for upscale readings and respond by slowing down or stopping the probe to distinguish between random fluctuations in the background and greater than background readings. Investigate any reproducible upscale readings as described in the specific instructions. 7 The job hazards associated with the survey described in this package are addressed in the accompanying Job Hazard Assessment (JHA) for OOL-08-07. 8 All personnel participating in this survey shall be trained in accordance with DP-8868. 	
SPECIFIC INSTRUCTIONS	
<ol style="list-style-type: none"> 1 <i>SPA-3 Scans:</i> <ul style="list-style-type: none"> • Perform a 100 % scan of the surface area. Move the SPA-3 in rate-meter mode at a speed of 0.2m or less per second, keeping the probe at a distance of $\leq 3''$ from the surface and following a serpentine path that includes at least 3 passes across each square meter. The maximum background a SPA-3 may be used in is 36000 cpm. 2 <i>Scan Investigations:</i> <p>Note: Detailed descriptions of investigation actions shall be recorded in the daily survey journal (DPF-8856.2) and locations marked on a map.</p> <ul style="list-style-type: none"> • Scan a 1m radius footprint around the investigation location in accordance with the scan requirements above. The area of scan should be increased as necessary to bound any areas of elevated activity identified. Perform a sample investigation as noted below. 	

Survey Area No.: OOL-08	Survey Unit No.: 07
Survey Unit Name: Southern End of West Inner Exclusion Zone Subdivision	
FSSP No.: YNPS-FSSP-OOL-08-07-00	

3 *Sample Locations:*
All designated measurement locations will be identified by GPS per DP-8859 or by use of reference points, tape measure and compass as necessary. If a designated sample location is obstructed for any reason, the FSS Radiological Engineer or the FSS Field Supervisor will select an alternate location in accordance with DP-8856. A detailed description of the alternate location will be recorded on form DPF-8856.2, the survey unit map will be annotated appropriately, and the alternate location will be conspicuously marked to facilitate re-visiting to identify and record the coordinates with GPS in accordance with DP-8859 or by measurement from a known reference point when a GPS is not available.

4 *Sample Requirements:* Collect 15 samples in accordance with DP-8120. 1 of the 15 samples will be analyzed as a QC split sample to fulfill the QC requirement of DP-8852. The same QC split sample will be analyzed for HTD nuclides in accordance with section 5.6.3.2.1 of the LTP and DP-8856.

Biased samples: No biased samples will be collected.

5 *Sample Designation:*

FSS soil samples: OOL-08-07-001-F through OOL-08-07-015-F corresponding to FSS sample locations 001 through 015.

Biased soil samples: No biased samples will be collected.

QC split samples: OOL-08-07-005-F-S is to be designated as QC split sample. This sample will be sent to the off-site laboratory (do not dry).

Recount samples: OOL-08-07-004-F-RC will be counted twice on site. The results will be compared in accordance with DP-8864.

6 *Sample Analysis:*

- Gamma analysis will be performed on all soil samples. If any of the gamma analyses show that an investigation level has been exceeded an investigation survey will be conducted at that sample location as directed by the radiological engineer.
- YNPS Chemistry will analyze OOL-08-07-001-F through OOL-08-07-015-F for gamma-emitting nuclides.
- YNPS Chemistry will analyze OOL-08-07-004-F as a sample recount. The recounted sample will possess the naming convention OOL-08-07-004-F-RC.
- YNPS Chemistry will analyze OOL-08-07-005-F-S for gamma-emitting nuclides prior to being sent to the off-site laboratory. These samples will be analyzed for gamma-emitting nuclides and HTD at the off-site laboratory.
- All gamma analysis of the FSS samples shall achieve the MDC values stated in the DQO section of this plan. The MDC's will be communicated to the laboratory using an attachment to the Chain-of- Custody form.

7 *Sample Investigation:*
If the results of any FSS sample (statistical and/or biased points) analysis exceed an investigation level, perform a first level investigation as follows:
Note: Detailed descriptions of investigation actions shall be recorded in the daily survey journal (DPF-8856.2).

- Scan a 1m radius footprint around the sample location with a SPA-3 in accordance with the scan requirements above. The area of scan should be increased as necessary to bound any areas of elevated activity identified.
- Mark the location of the highest identified activity for each of the elevated areas in the soil and on the survey map.
- Mark the boundaries around any detected elevated areas in the soil and identify the boundaries on a survey map. Measure the total area of each outlined area in square centimeters.
- At each of the highest identified activity area:
 - Perform and record a 1-minute scaler mode SPA-3 measurement. Designate the reading as 'OOL-08-07-xxx-F-SC-I' where 'xxx' continues sequentially from the last number assigned to an FSS measurement.
 - Obtain a soil sample at the location. Designate the sample as 'OOL-08-07-xxx-F-I' where 'xxx' continues sequentially from the last number assigned to an FSS measurement.
 - Perform and record a post sample 1-minute SPA-3 measurement. Designate the reading as described above.

Survey Area No.: OOL-08	Survey Unit No.: 07
Survey Unit Name: Southern End of West Inner Exclusion Zone Subdivision	
FSSP No.: YNPS-FSSP-OOL-08-07-00	

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Date September 12, 2006

Reviewed by Rennick
FSS Radiological Engineer

Date 9-12-06

Approved by Martin Erickson
FSS Project Manager

Date 9/12/06

SPA-3 Scan Tables

Max Background

BKG(cpm)	MDCR	MDC(fDCGLemc)
4,000	571	3.33E-01
5,000	639	3.72E-01
6,000	700	4.07E-01
7,000	756	4.40E-01
8,000	808	4.70E-01
9,000	857	4.99E-01
10,000	903	5.26E-01
11,000	947	5.51E-01
12,000	989	5.76E-01
13,000	1,030	6.00E-01
14,000	1,069	6.22E-01
15,000	1,106	6.44E-01
16,000	1,142	6.65E-01
17,000	1,177	6.86E-01
18,000	1,212	7.05E-01
19,000	1,245	7.25E-01
20,000	1,277	7.44E-01
21,000	1,309	7.62E-01
22,000	1,340	7.80E-01
23,000	1,370	7.97E-01
24,000	1,399	8.15E-01
25,000	1,428	8.31E-01
26,000	1,456	8.48E-01
27,000	1,484	8.64E-01
28,000	1,511	8.80E-01
30,000	1,564	9.11E-01
32,000	1,616	9.41E-01
34,000	1,665	9.70E-01
36,000	1,714	9.98E-01
38,000	1,760	1.03E+00
40,000	1,806	1.05E+00

Scan Speed

In/Sec	m/Sec	BKG (cpm)
39	1.00	7,000
20	0.50	14,000
13	0.33	21,000
10	0.25	28,000
5	0.13	57,000
4	0.10	72,000

YNPS-FSSP-OOL-08-07-00

Attachment 2

DCGL MDC Table

Nuclide	DCGL MDC Level (pCi/g)	DCGL MDC Level (Bq/g)	DCGL MDC Level (Bq/g)	DCGL MDC Level (pCi/g)	DCGL MDC Level (Bq/g)	DCGL MDC Level (Bq/g)
Co-60	1.4E+00	1.4E-01	7.0E-01	ETD	1.5E+00	2.1E+00
Nb-94	2.5E+00	2.5E-01	1.3E+00	ETD	1.3E+00	3.3E+00
Ag-108m	2.5E+00	2.5E-01	1.3E+00	ETD	1.3E+00	3.3E+00
Sb-125	1.1E+01	1.1E+00	5.6E+00	ETD	1.3E+00	1.4E+01
Cs-134	1.7E+00	1.7E-01	8.7E-01	ETD	2.3E+00	3.9E+00
Cs-137	3.0E+00	3.0E-01	1.5E+00	ETD	3.1E+00	9.3E+00
Eu-152	3.6E+00	3.6E-01	1.8E+00	ETD	1.3E+00	4.7E+00
Eu-154	3.3E+00	3.3E-01	1.7E+00	ETD	1.3E+00	4.3E+00
Eu-155	1.4E+02	1.4E+01	6.9E+01	ETD	1.3E+00	1.8E+02
Am-241	1.0E+01	1.0E+00	5.1E+00	ETD	1.5E+01	1.5E+02
H-3	1.3E+02	1.3E+01	6.4E+01	HTD	3.9E+01	5.1E+03
C-14	1.9E+00	1.9E-01	9.7E-01	HTD	3.7E+02	7.0E+02
Fe-55	1.0E+04	1.0E+03	5.1E+03	HTD	1.0E+02	1.0E+06
Ni-63	2.8E+02	2.8E+01	1.4E+02	HTD	7.7E+01	2.2E+04
Sr-90	6.0E-01	6.0E-02	3.0E-01	HTD	2.7E+01	1.6E+01
Tc-99	5.0E+00	5.0E-01	2.5E+00	HTD	2.3E+01	1.2E+02
Pu-238	1.2E+01	1.2E+00	5.8E+00	HTD	1.9E+01	2.3E+02
Pu-239	1.1E+01	1.1E+00	5.3E+00	HTD	1.9E+01	2.1E+02
Pu-241	3.4E+02	3.4E+01	1.7E+02	HTD	1.5E+01	5.1E+03
Cm-243	1.1E+01	1.1E+00	5.6E+00	HTD	4.0E+00	4.4E+01