Final Status Survey Planning Worksheet

GENERAL SECTION

Survey Area #: SVC-01 | Survey Unit #: 18

Survey Unit Name: Service Building Foundation – South Vertical Edge

FSSP Number: YNPS-FSSP-SVC01-18-00

PREPARATION FOR FSS ACTIVITIES

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

1.1 Files have been established for survey unit FSS records. ☑

1.2 ALARA review has been completed for the survey unit. ☑

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

1.4 An initial DP-8854 walkdown has been performed and a copy of the completed Survey Unit Walkdown Evaluation is in the survey area file. ☑

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

Based on reviewed information, subsequent walkdown: ☑ not warranted ☐ warranted

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

OR

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

1.6 A final classification has been performed. ☑

Classification: CLASS 1 ☑ CLASS 2 ☐ CLASS 3 ☐

DATA QUALITY OBJECTIVES (DQO)

1.0 Statement of problem:

The service building foundation was exposed during the excavation campaigns to remove radiologically contaminated soil and PCB-contaminated soil from the "alley way" (unit NOL01-04). Survey Unit SVC01-18 serves as the north boundary for survey unit NOL01-04. It is approximately 512 ft^2 (48m^2) of concrete surface area. The data collected under this plan will be used to determine whether or not residual plant-related radioactivity on the exposed concrete surface of Survey Unit SVC01-18 meets LTP release criteria.

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

2.0 Identify the decision:

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

3.0 Identify the inputs to the decision:

Sample media: concrete

Types of measurements: Fixed-point measurements, beta scans, and gamma scans.

Radionuclides-of-concern: Co-60 (assumed as a conservative measure for the reasons stated in YNPS-FSSP-BRT01-10-00).

FSS planning for unit SVC01-18 used the FSS data from unit BRT01-10 because there is no reason to expect the radiological characteristics of SVC01-18 to be different from BRT01-10 (the 2 units are adjacent).

The mean value of fixed-point measurements from BRT01-10 was 1.8E3 dpm/100cm^2 ± 4.8E2 dpm/100cm^2. The FSS net measurements ranged from no detectable to 2.8E3 dpm/100cm^2 (or 44% of the DCGL for Co-60).

Average radiation level: 1.8E3 dpm/100cm^2 (mean of FSS data for BRT01-10)

Standard deviation (σ): 4.8E2 dpm/100cm^2 (standard deviation of FSS data for BRT01-10)

DCGLs:

(1) Applicable $DCGL_w$: 6.3E3 dpm/100cm^2 (Co-60 assumed)

Note: the $DCGL_w$ value corresponds to 8.73 mrem/y.

Although most of the concrete of Survey Unit SVC01-18 has a relatively smooth surface, some localized areas contain pits and irregular surfaces (typical depths in these areas are approximately ¼ - ½ inch, although some increase it as much as 1 inch), which will increase the source-to-detector distance for some localized areas under the 100cm^2 window of the detector. These irregularities in the concrete surfaces will be taken into account through the efficiency factor applied to the measurements collected with the HP-100. Technical report YA-REPT-00-015-04 provides instrument efficiency factors (ε_i) for various source-to-detector distances. The ε_i value for a source-to-detector distance of 1 inch was selected as a representative efficiency for data collected with the HP-100 from the pitted/irregular surfaces because it accounts for the ½ inch stand-off and the most common depth of pits and surface irregularities (¼ - ½ inch). In contrast to the localized pitted/irregular areas, most of the concrete of the east vertical wall is relatively smooth. The ε_i value for a distance of ½ inch will be applied to HP-100 data collected from smooth concrete surfaces. The efficiency factors provided in YA-REPT-00-015-04 are used below:

- ε_i = 0.2413 c/e for smooth concrete surfaces (reflects a source to detector distance = ½ inch), and
  = 0.149 c/e for pitted/irregular surfaces (reflects a source to detector distance = 1 inch)
- ε_s = 0.25 e/d (consistent with the Co-60 assumption made in this plan)
- total efficiency for smooth surface = $\varepsilon_i \cdot \varepsilon_s$ = 0.2413 c/e · 0.25 e/d = 0.0603 c/d
- total efficiency for pitted/irregular surfaces = $\varepsilon_i \cdot \varepsilon_s$ = 0.149 c/e · 0.25 e/d = 0.0373 c/d

(2) Gross measurement $DCGL_w$ (for HP-100): 6.3E3 dpm/100cm^2

- for smooth concrete surface: 6.3E3 dpm/100cm^2 * 0.0603 c/d = 3.8E2 cpm/100cm^2
- for pitted/irregular surface: 6.3E3 dpm/100cm2 * 0.0373 c/d = 2.3E2 cpm/100cm^2

(3) Applicable $DCGL_{EMC}$ for fixed-point measurements: $DCGL_w$ * AF = 6.3E3 dpm/100cm^2 *2.4 = 1.5E4 dpm/100cm^2

- for smooth concrete surface: 1.5E4 dpm/100cm^2 * 0.0603 c/d = 9.1E2 cpm/100cm^2
- for pitted/irregular surface: 1.5E4 dpm/100cm2 * 0.0373 c/d = 5.6E2 cpm/100cm^2

Note: the DCGL and $DCGL_{EMC}$ value refer to above-background radioactivity.

Investigation Level for fixed-point measurement:

- for smooth (i.e., vertical side) concrete surface: >9.1E2 cpm/100cm^2 above background
- for pitted/irregular (i.e., top) concrete surface: >5.6E2 cpm/100cm^2 above background

Investigation Level for HP-100 scan: Reproducible indication above background using the audible feature with headphones

Investigation Level for SPA-3 scan: Reproducible indication above background using the audible feature with headphones

Scan coverage: Beta scan with HP-100: 100% of the accessible concrete surface area on the vertical walls. Supplemental SPA-3 scans on the irregular surfaces of the vertical walls and cracks in the concrete

MDCR for HP-100: The accompanying table provides MDCR values by various background levels. The expected background for the HP-100 range is 100 - 400 cpm.

MDC(fDCGL$_{EMC}$) for HP-100 scans: The accompanying table provides MDC(fDCGL$_{EMC}$) values by various background levels.

QC checks and measurements: QC checks for the survey instruments will be performed in accordance with DP-8534. Pre- and post-use instrument QC checks will be performed.

4.0 Define the boundaries of the survey:

Boundaries of SVC01-18 are defined by the termination of the vertical surface of the NE section of the turbine building foundation. The survey will be performed under weather conditions that permit instrument operation and surveying.

5.0 Develop a decision rule:

(a) If all the FSS data show that residual levels of plant-related radioactivity are below the $DCGL_w$, reject the null hypothesis (i.e., Survey Unit meets the release criteria).
(b) If the investigation level is exceeded, then perform an investigation.
(c) If the average of the FSS measurements is below the $DCGL_w$, but some individual measurements exceed the $DCGL_w$, then apply a statistical test as the basis for accepting or rejecting the null hypothesis.
(d) If the average of the FSS measurements exceeds the $DCGL_w$, then accept the null hypothesis (i.e., Survey Unit fails

to meet the release criteria).

6.0 Specify tolerable limits on decision errors:

Null hypothesis: Residual plant-related radioactivity in Survey Unit SVC01-18 exceeds the release criteria.

Probability of type I error: 0.05

Probability of type II error: 0.05

7.0 *LBGR*: 6.3E3 dpm/100 $cm^2 \div 2 = 3.2E3$ dpm/100 cm^2

8.0 Optimize Design:

Type of statistical test: WRS Test ☐ Sign Test ☑

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

Number samples (per DP-8853): 15

Biased Measurements: None

GENERAL INSTRUCTIONS

1. The FSS Field Supervisor is responsible for contacting the QA Department regarding the FSS activities identified as QA notification points.

2. Mark the sampling points at the locations as follows:

(a) Locate and mark the random start point for the grid at a point 9ft, 5inches from the east end of the service building foundation and 1 ft, 11 inches from the top of the foundation.

(b) Locate and mark other fixed-point measurement locations at intervals of 63 inches to the west and east of the random start location. These locations are also 1 ft, 11 inches from the top of the foundation.

(c) If a measurement location shown in Figure 1 falls at a location that is obstructed (e.g., by soil) or from which a fixed-point measurement cannot be collected, select an alternate location in accordance with DP-8856.

Note: The dimensions used in planning allow the collection of 19 fixed-point measurements. It may be necessary to add or delete some measurement locations based on the actual length of the survey unit. These adjustments to the grid are acceptable as long as the random start point is used, the general grid structure is maintained, and at least 15 fixed-point measurement locations are identified.

3. Collect a series of ambient background measurements in accordance with step B.1.c in DP-8866 with the following variation of step B.1.c.2) using the HP-100 that is to be used to collect the fixed-point measurements:

(a) Cover the detector with a 1/8-inch Lucite (or equivalent) shield and collect 7 one-minute readings with the shielded detector facing towards but approximately 1m from the concrete surface (and approximately 1 m above the soil) at the west end, center, and east end of the survey unit.

(b) Record the background data on the attached Form 1(even if the measurement was logged).

4. Collect a fixed-point (1-min) measurement in accordance with DP-8534 at each of the marked locations.

(a) Designate the fixed-point measurements as SVC-01-18-001-F-FM through SVC-01-18-019-F-FM, as shown in Figure 1.

(b) Record each fixed-point measurement "as read" (in units of cpm) on the attached Form 2 (even if the reading was logged).

(c) When recording the measurements on Form 2, identify those measurements collected from an irregular concrete surface with an asterisk (*).

(d) Note on Form 2 any measurement location that was omitted or added due to field adjustments of the planned grid.

5. Perform HP-100 and SPA-3 scans as described in the Specific Instructions.

6. Survey instrument: Operation of the E-600 will be in accordance with DP-8534. Pre- and post-use QC checks for survey instruments are to be performed.

7. The applicable job hazards associated with this survey will be addressed in the Yankee Rowe Project Daily Activity Plan and reviewed by the FSS Field Supervisor during the pre-survey briefing.

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

SPECIFIC INSTRUCTIONS

1. Beta scans:

(a) Perform the HP-100 scans by moving the detector at a speed no greater than 2 inches per second, using a ½ inch

standoff.

(b) FSS Technicians will wear headphones while scanning and the survey instrument will be in the rate-meter mode. Surveyors will listen for upscale readings and respond to readings that exceed the investigation level.

(c) If the HP-100 scan investigation level is exceeded:

(1) confirm that the elevated scan reading is reproducible and not the result of a nearby source (e.g., waste pile or container),

(2) if a nearby source is identified, have it removed or shielded, document the finding on DP-8856.2, and repeat the scan,

(3) if reproducible and not caused by a nearby source, collect a fixed-point measurement at the location of the greater-than-investigation level reading,

(4) the designation for a fixed-point measurement collected during a first-level investigation will be SVC-01-18-0XX-F-FM-I, where "XX" continues the numbering sequence for fixed-point measurements. Record all investigation fixed-point measurements "as read" (in units of cpm) on the attached Form 2 (even if the measurement was logged).

(5) mark the location of the fixed-point measurement location for further investigation if it exceeds the investigation level for a fixed-point measurement. If a fixed-point measurement location has been identified for further investigation, the investigation will be conducted under a separate survey plan.

(d) The FSS Field Supervisor will record information relevant to the HP-100 scans on DPF-8856.2.

2. Perform SPA-3 scans:

(a) Perform SPA-3 of the irregular surfaces and over cracks in the concrete by moving the detector slowly (no greater than 0.25m/s) and keeping it < 3 inches from the surface.

(b) FSS Technicians will wear headphones while scanning and the survey instrument will be in the rate-meter mode. Surveyors will listen for upscale readings and respond to readings that exceed the SPA-3 investigation level.

(c) If a SPA-3 reading exceeds the investigation level:

(1) confirm that the above-background indication is reproducible and cannot be attributed to a nearby source,

(2) if a nearby source is identified, have it removed or shielded, document the finding on DP-8856.2, and repeat the scan,

(3) if the reading is reproducible and not caused by a nearby source, collect a fixed-point measurement with the HP-100 at the highest reading observed during the scan and clearly mark that location.

(4) Designate the investigation fixed-point measurement as described in step 1(c)(4) above.

(5) Record all investigation fixed-point measurements "as read" (in units of cpm) on the attached Form 2 (even if the measurement was logged). If further investigation is required, it will be conducted under a separate survey plan.

(d) The FSS Field Supervisor will record information relevant to the SPA-3 scans on DPF-8856.2

NOTIFICATION POINTS

QA notification* point(s) (y/n) __y__

(1) Date/time of initial pre-survey briefing _____ QA signature: _____

(2) Date/time of commencement of HP-100 measurements QA signature: _____

(3) Date/time of commencement of SPA-3 measurements QA signature: _____

(4) Time(s) of daily pre-shift briefing QA signature: _____
(for each shift that the FSS is performed)

* Voice mail notification or E-mail notification to Trudeau@yankeerowe.com with a copy to Marchi@cyapco.com satisfies this step.

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

Prepared by J. Bisson Date 11-23-05
FSS Radiological Engineer

Reviewed by Matt C. Ewin Date 11/23/05
FSS Radiological Engineer

Approved by D.C. Smith Date 11/23/05
FSS Project Manager

MDCR/MDC Table for Survey Unit SVC01-18

Background (cpm)	scan speed (in/s)	MDCR (cpm)	MDC(fDCGL(emc))
400	2	151	0.38
500	2	169	0.42
1000	2	239	0.60

detector = HP-100 (effic factor for 1in)

Form 1
Background Data

Survey Unit SVC01-18
Instrument No.: _____

Location	Measurement No.	Measurement (cpm)
BG location 1	1	
	2	
	3	
	4	
	5	
	6	
	7	
BG location 2	1	
	2	
	3	
	4	
	5	
	6	
	7	
BG location 3	1	
	2	
	3	
	4	
	5	
	6	
	7	

Form 2
FSS Fixed-Point Measurements

Survey Unit SVC01-18
Instrument No.: _____

Location	Measurement (cpm/100cm^2)
SVC-01-18-001-F-FM	
SVC-01-18-002-F-FM	
SVC-01-18-003-F-FM	
SVC-01-18-004-F-FM	
SVC-01-18-005-F-FM	
SVC-01-18-006-F-FM	
SVC-01-18-007-F-FM	
SVC-01-18-008-F-FM	
SVC-01-18-009-F-FM	
SVC-01-18-010-F-FM	
SVC-01-18-011-F-FM	
SVC-01-18-012-F-FM	
SVC-01-18-013-F-FM	
SVC-01-18-014-F-FM	
SVC-01-18-015-F-FM	
SVC-01-18-016-F-FM	
SVC-01-18-017-F-FM	
SVC-01-18-018-F-FM	
SVC-01-18-019-F-FM	